

TOYOTA

2005-2006

TUNDRA



•SERVICE •REPAIR •MAINTENANCE

TOYOTA TUNDRA REPAIR MANUAL

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NOTE:
**SERVICE MANUAL IS ALSO
NAVIGATABLE USING BOOK-
MARKS AND IS SEARCHABLE**

HOW TO USE THIS MANUAL

INOKN-01

GENERAL INFORMATION

1. INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the section title and major heading are given at the top of every page.

2. PRECAUTION

At the beginning of each section, a PRECAUTION that pertains to all repair operations contained in that section is given.

Read these precautions before starting any repair task.

3. TROUBLESHOOTING

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause. The fundamentals of how to proceed with troubleshooting are described on page IN-19.

Be sure to read this before performing troubleshooting.

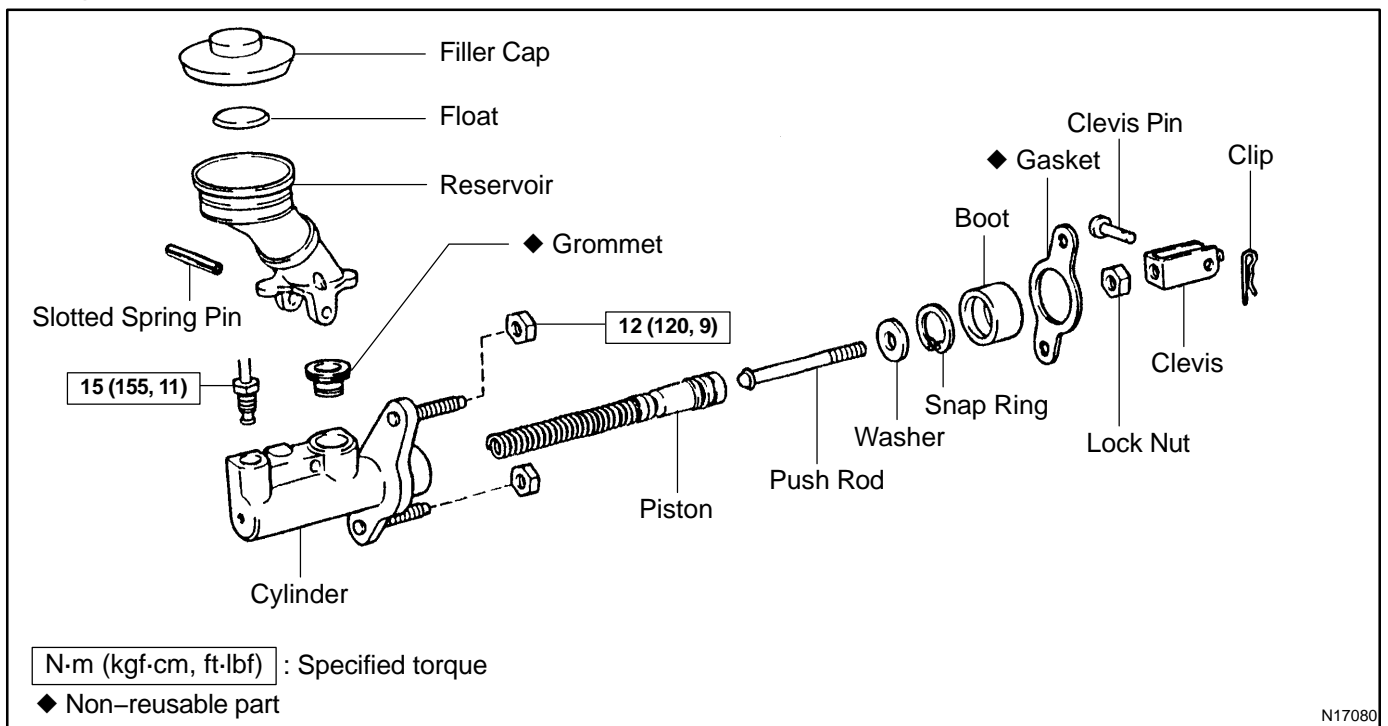
4. PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

5. REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

Example:



The procedures are presented in a step-by-step format:

- The illustration shows what to do and where to do.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.

Example:

*Illustration:
what to do and where to do*

Task heading : what to do

21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration.

SST 09350-30020 (09350-06120)

Set part No. *Component part No.*

Detailed text : how to do task

(b) Measure the stroke applying and releasing the compressed air (392 — 785 kPa, 4 — 8 kgf/cm² or 57 — 114 psi) as shown in the illustration.

Piston stroke: 1.40 — 1.70 mm (0.0551 — 0.0669 in.)

Specification

This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

6. REFERENCES

References have been kept to a minimum. However, when they are required, you are given the page to refer to.

7. SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found in Service Specifications section for quick reference.

8. CAUTIONS, NOTICES, HINTS:

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you perform the repair efficiently.

9. SI UNIT

The UNITS given in this manual are primarily expressed according to the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System.

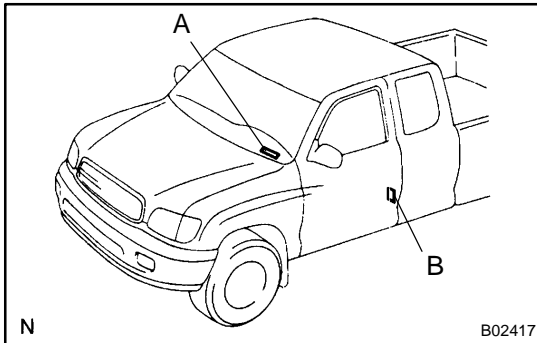
Example:

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION AND ENGINE SERIAL NUMBER

IN01P-08

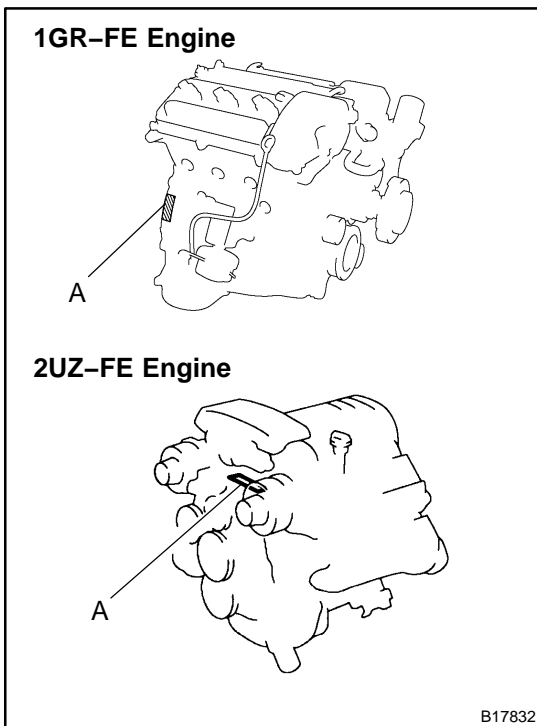


1. VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the vehicle identification number plate and certification label.

A: Vehicle Identification Number Plate

B: Certification Label



2. ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block, as shown in the illustration.

A: Engine Serial Number

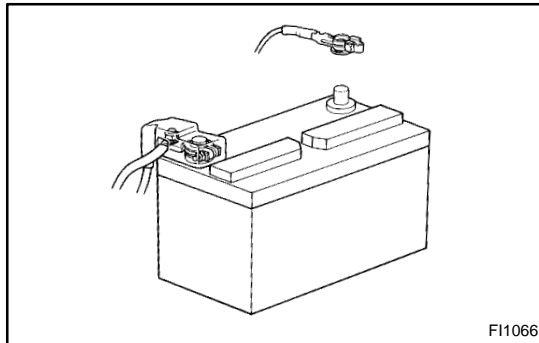
REPAIR INSTRUCTIONS

GENERAL INFORMATION

INOCO-32

BASIC REPAIR HINT

- (a) Prevent damage and maintain vehicle cleanliness by protective covering on the fender, seat and floor.
- (b) During disassembly, line up parts in the order they were removed to facilitate reassembly.

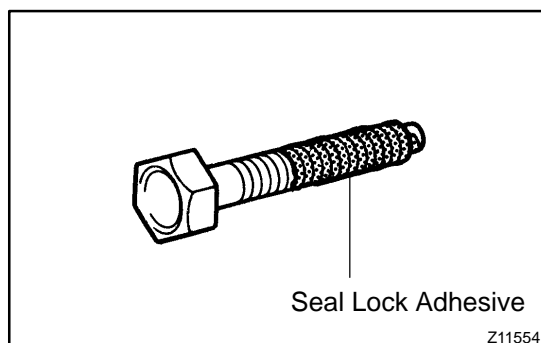


- (c) Installation and removal of battery terminal:

NOTICE:

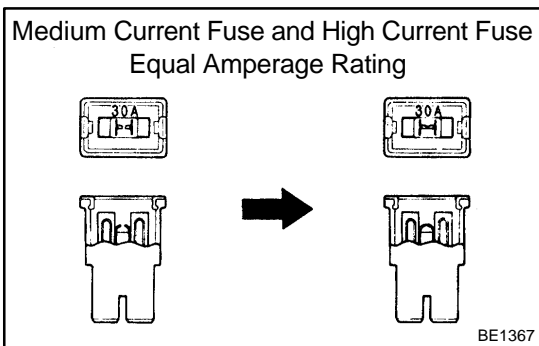
When connecting the negative (-) terminal make sure that the steering wheel is centered.

- (1) Before performing electrical work, disconnect the negative (-) terminal cable from the battery.
 - (2) If it is necessary to disconnect the battery for inspection or repair, first disconnect the negative (-) terminal cable.
 - (3) To prevent damage to the battery terminal when disconnecting the terminal cable, loosen the cable nut and raise the cable straight up. Do not twist or pry the cable off.
 - (4) Clean the battery terminals and cable ends with a clean shop rag. Do not scrape them with a file or other abrasive objects.
 - (5) Install the cable ends to the battery terminals after loosening the nut, and tighten the nut after installation. Do not use a hammer to tap the cable ends onto the terminals.
 - (6) Be sure the cover for the positive (+) terminal is properly in place.
- (d) Check hose and wiring connectors to make sure that they are connected securely and correctly.
 - (e) Non-reusable parts:
 - (1) Always replace cotter pins, gaskets, O-rings, oil seals, etc. with new ones.
 - (2) Non-reusable parts are indicated in component illustrations by the "◆" symbols.



- (f) Precoated parts
Precoated parts are bolts, nuts, etc. that are coated with a seal lock adhesive at the factory.
 - (1) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.
 - (2) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply new seal lock adhesive to the bolt, nut or threads.

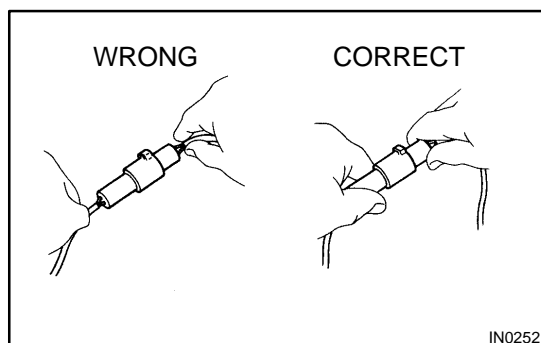
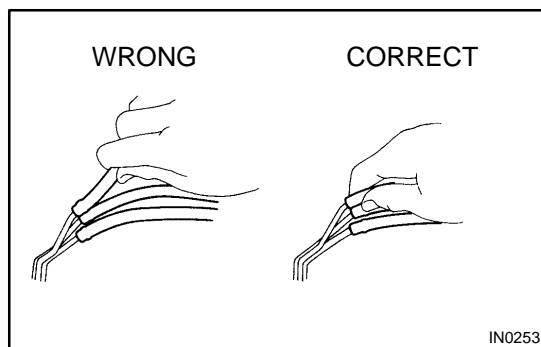
- (3) Precoated parts are indicated in component illustrations by the "★" symbols.
- (g) When necessary, use a sealer on gaskets to prevent leaks.
- (h) Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
- (i) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in the Preparation section in this manual.



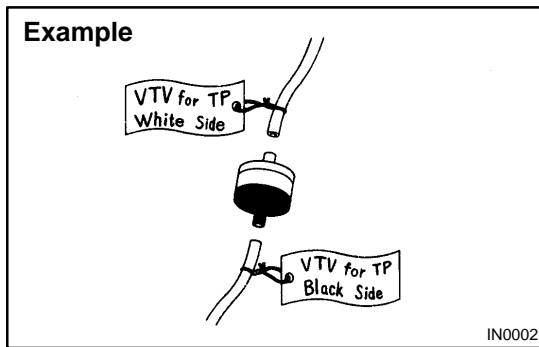
- (j) When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

Illustration	Symbol	Part Name	Abbreviation
<p>BE5594</p>	<p>IN0365</p>	FUSE	FUSE
<p>BE5595</p>	<p>IN0366</p>	MEDIUM CURRENT FUSE	M-FUSE
<p>BE5596</p>	<p>IN0367</p>	HIGH CURRENT FUSE	H-FUSE
<p>BE5597</p>	<p>IN0367</p>	FUSIBLE LINK	FL
<p>BE5598</p>	<p>IN0368</p>	CIRCUIT BREAKER	CB

- (k) Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (see page [IN-8](#)).
- Release the parking brake on a level surface and shift to the N position.
 - When jacking up the front wheels of the vehicle, first place chocks behind the rear wheels.
 - When jacking up the rear wheels of the vehicle, place chocks in front of the front wheels.
 - When jacking up only the front or rear wheels, set rigid racks and place chocks on front and behind the wheels in contact with the ground.
 - After the vehicle is jacked up, be sure to support it on rigid racks. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a job that can be finished quickly.
- (l) Observe the following precautions to avoid damage to the following parts:
- (1) Do not open the cover or case of the ECU unless absolutely necessary. (Static electricity transmitted through human touch may destroy the IC.)



- (2) To disconnect vacuum hoses, pull off the end of the hose, not the middle.
- (3) To pull apart electrical connectors, pull on the connector itself, not the wires.
- (4) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
- (5) When steam cleaning an engine, protect the electronic components, air filter and emission-related components from water.
- (6) Never use an impact wrench to remove or install temperature switches or temperature sensors.
- (7) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
- (8) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter for adjustment. Once the hose has been stretched, it may leak air.



- (m) Installation and removal of vacuum hose:
- (1) When disconnecting vacuum hoses, use tags to identify where they should be reconnected to.
 - (2) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.
- (n) Unless otherwise stated, all resistance should be measured at an ambient temperature of 20°C (68°F). Measurement should be made after the engine has cooled down. If measured at high temperatures immediately after the vehicle has been running, resistance may be outside specifications.

FOR ALL OF VEHICLES PRECAUTION

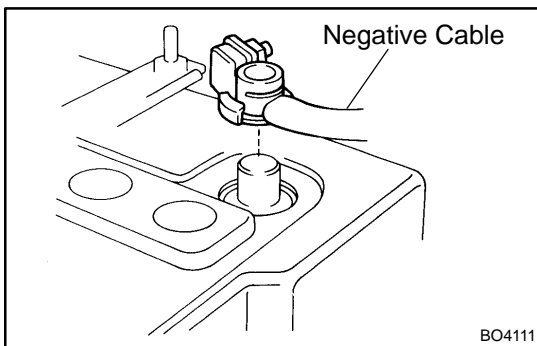
INOKM-01

1. FOR VEHICLES EQUIPPED WITH SRS AIRBAG AND SEAT BELT PRETENSIONER

- (a) The TOYOTA TUNDRA is equipped with an SRS (Supplemental Restraint System), such as the driver airbag, front passenger airbag assembly and seat belt pretensioner.

Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy during servicing, possibly leading to a serious accident.

Further, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in this manual.



(b) GENERAL NOTICE

- (1) Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshooting. When troubleshooting the SRS, always check the diagnostic trouble codes before disconnecting the battery (see page [DI-1810](#)).

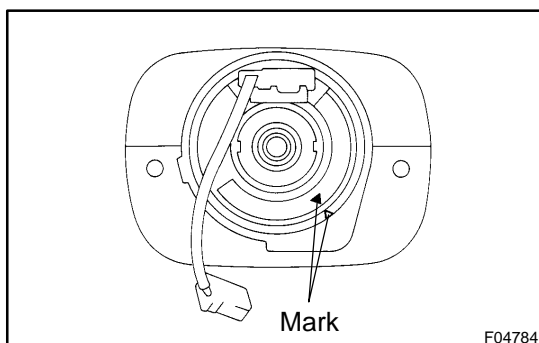
- (2) Work must be started after 90 seconds from the time the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery.

(The supplemental restraint system is equipped with a back-up power source because if work is started within 90 seconds of disconnecting the negative (-) terminal cable from the battery, the SRS may deploy.)

When the negative (-) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized in each memory system. When work is finished, reset the clock and audio systems as before.

To avoid erasing the memory of each memory system, never use a back-up power supply from another battery.

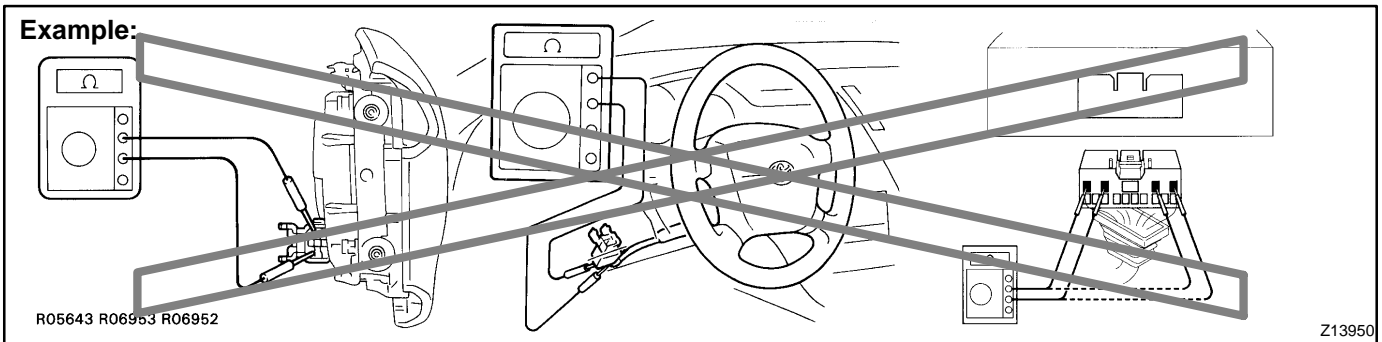
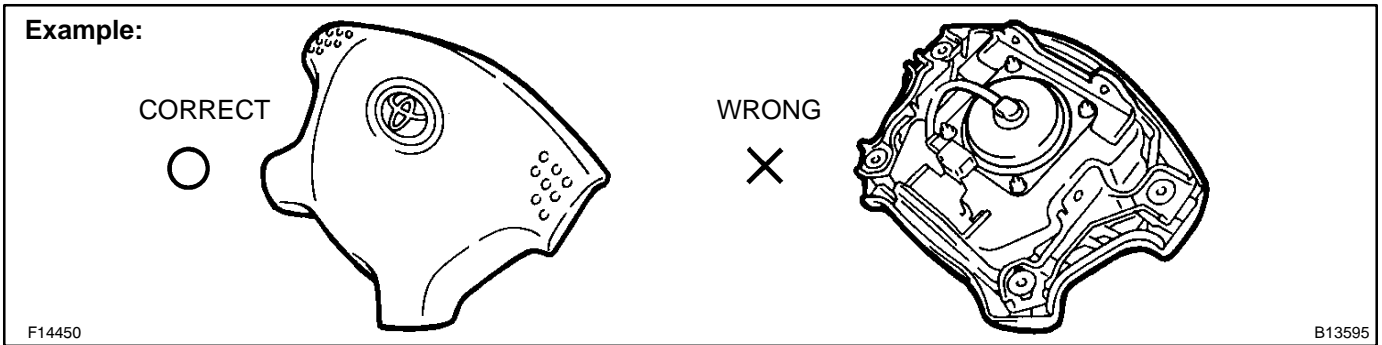
- (3) Even in case of a minor collision where the SRS does not deploy, the steering wheel pad (see page [RS-24](#)), front passenger airbag assembly (see page [RS-38](#)), side airbag assembly (see page [RS-77](#), [RS-52](#) or [RS-67](#)) curtain shield airbag assembly (see page [RS-85](#)) and seat belt pretensioner (see page [BO-241](#)) should be inspected.
- (4) Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.
- (5) Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs.
- (6) Never disassemble or repair the airbag sensor assembly, steering wheel pad, front passenger airbag assembly or seat belt pretensioner.
- (7) If the airbag sensor assembly, steering wheel pad, front passenger airbag assembly or seat belt pretensioner has been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
- (8) Do not directly expose the airbag sensor assembly, steering wheel pad, front passenger airbag assembly or seat belt pretensioner to hot air or flames.
- (9) Use a voltmeter/ohmmeter with high impedance (10 k Ω /V minimum) for troubleshooting of the electrical circuit.
- (10) Information labels are attached to the periphery of the SRS components. Follow the instructions on the labels.
- (11) After work on the supplemental restraint system is completed, check the SRS warning light (see page [DI-1855](#)).



(c) SPIRAL CABLE (in Combination Switch)

The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position, otherwise cable disconnection and other troubles may result. Refer to [SR-28](#) or [SR-42](#) concerning correct steering wheel installation.

- (d) STEERING WHEEL PAD (with Airbag)
 - (1) When removing the steering wheel pad or handling a new steering wheel pad, it should be placed with the pad top surface facing up.
Storing the pad with its metallic surface upward may lead to a serious accident if the airbag inflates for some reason. In addition, do not store a steering wheel pad on top of another one.
 - (2) Never measure the resistance of the airbag squib. This may cause the airbag to deploy, which could cause serious injury.
 - (3) Grease or detergents of any kind should not be applied to the steering wheel pad.
 - (4) Store the steering wheel pad where the ambient temperature remains below 93°C (200°F), with low humidity and away from electrical noise.
 - (5) Before using an electric welder, first disconnect the airbag connector (the connector is yellow and has 4 pins) under the steering column near the combination switch connector.
 - (6) As a safety measure, always deploy airbags using an SST before disposal (see page RS-25).
Deploy airbags in a safe place away from electrical noise.

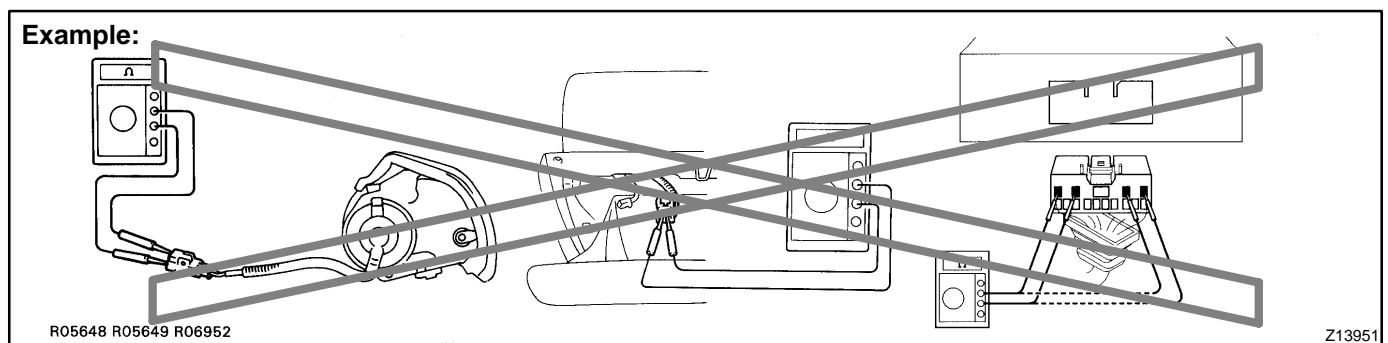
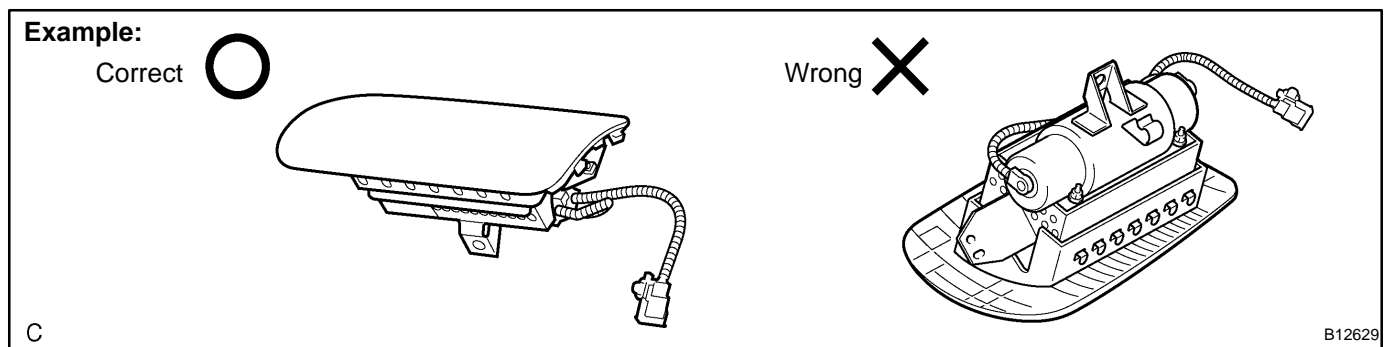


(e) FRONT PASSENGER AIRBAG ASSEMBLY

- (1) Always store a removed or new front passenger airbag assembly with the airbag deployment side facing up.

Storing the airbag assembly with the airbag deployment side facing down could cause a serious accident if the airbag inflates.

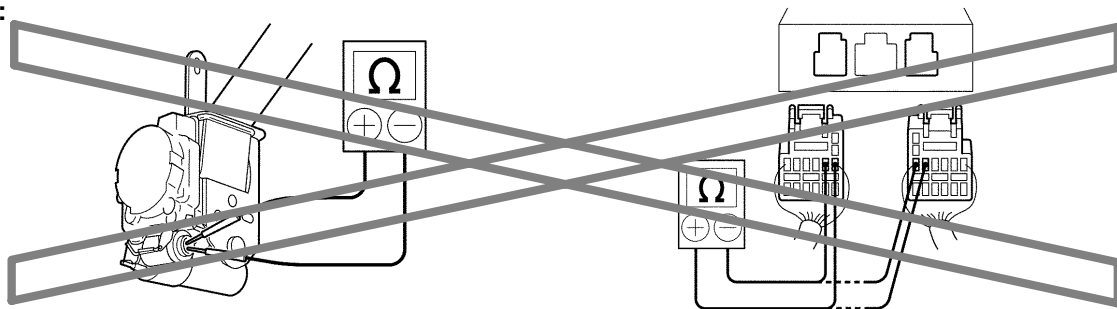
- (2) Never measure the resistance of the airbag squib. This may cause the airbag to deploy, which could cause serious injury.
- (3) Grease or detergents of any kind should not be applied to the steering wheel pad.
- (4) Store the steering wheel pad where the ambient temperature remains below 93°C (200°F), with low humidity and away from electrical noise.
- (5) Before using an electric welder, first disconnect the airbag connector (the connector is yellow and has 4 pins) under the steering column near the combination switch connector.
- (6) As a safety measure, always deploy airbags using an SST before disposal (see page RS-39). Deploy airbags in a safe place away from electrical noise.



(f) SEAT BELT PRETENSIONER

- (1) Never measure the resistance of the seat belt pretensioner. This may cause the seat belt pretensioner to activate, which could cause serious injury.
- (2) Never disassemble the seat belt pretensioner.
- (3) Never install the seat belt pretensioner in another vehicle.
- (4) Store the seat belt pretensioner where the ambient temperature remains below 80°C (176°F), with low humidity and away from electrical noise.
- (5) Before using an electric welder, first disconnect the connector (the connector is yellow and has 2 pins).
- (6) As a safety measure, always activate the seat belt pretensioner before disposal (see page [BO-245](#)). Activate the pretensioner in a safe place away from electrical noise.
- (7) The seat belt pretensioner becomes hot after activation. Allow it to cool before disposing. Never use water to cool the seat belt pretensioner.

Example:

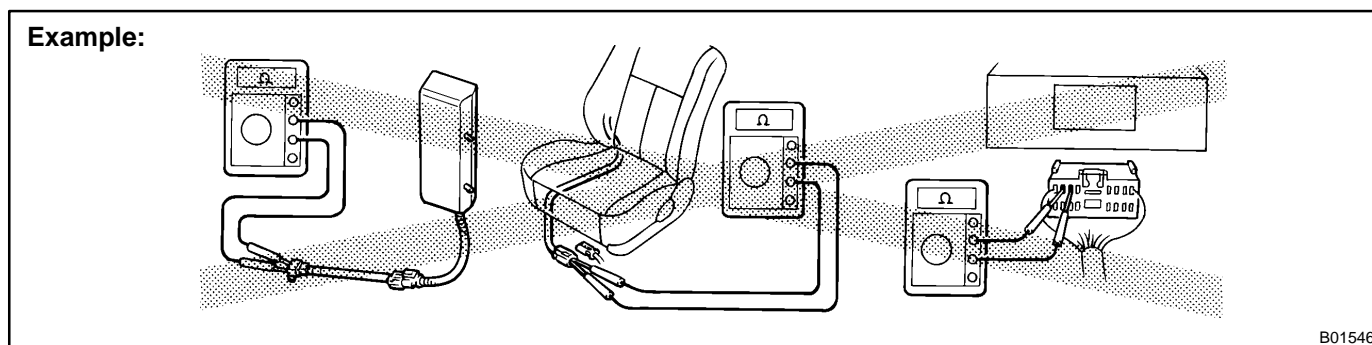
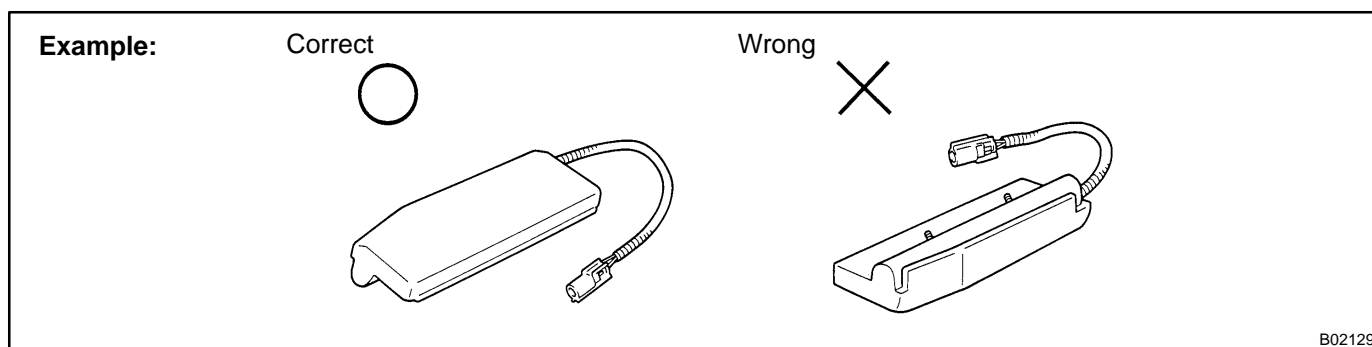


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(g) SIDE AIRBAG ASSEMBLY

- (1) Always store a removed or new side airbag assembly with the airbag deployment side facing up. Storing the airbag assembly with the airbag deployment side facing down could cause a serious accident if the airbag inflates.
- (2) Never measure the resistance of the airbag squib (This may cause the airbag to deploy, which is very dangerous.).
- (3) Grease should not be attached to the side airbag assembly and the surface should not be cleaned with any kind of detergents.
- (4) Store the airbag assembly where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.
- (5) When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the seat before starting work.
- (6) When disposing of a vehicle or the side airbag assembly alone, the airbag should be deployed using an SST before disposal (See page [RS-78](#), [RS-53](#) or [RS-68](#)).

Perform the operation in a safe place away from electrical noise.



(h) CURTAIN SHIELD AIRBAG ASSEMBLY

- (1) Always store a removed or new curtain shield airbag assembly in a clear plastic bag, and keep it in a safe place.

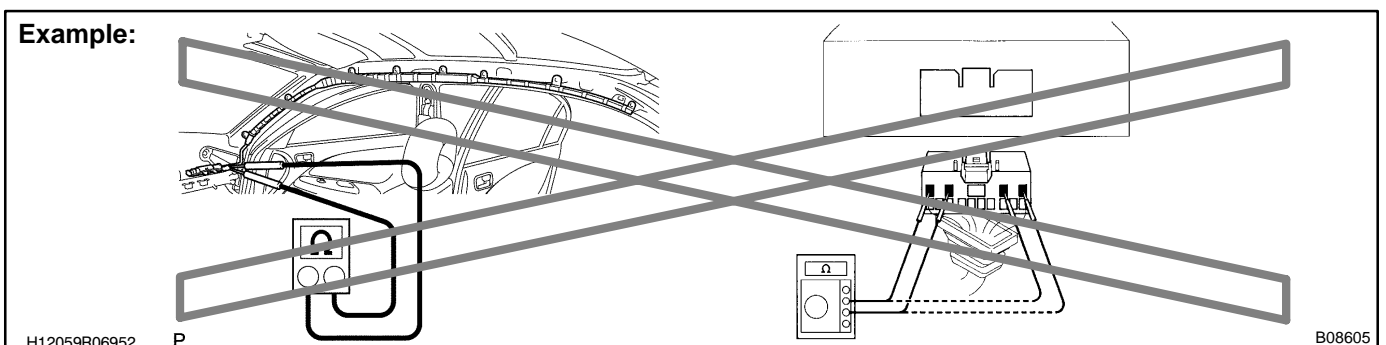
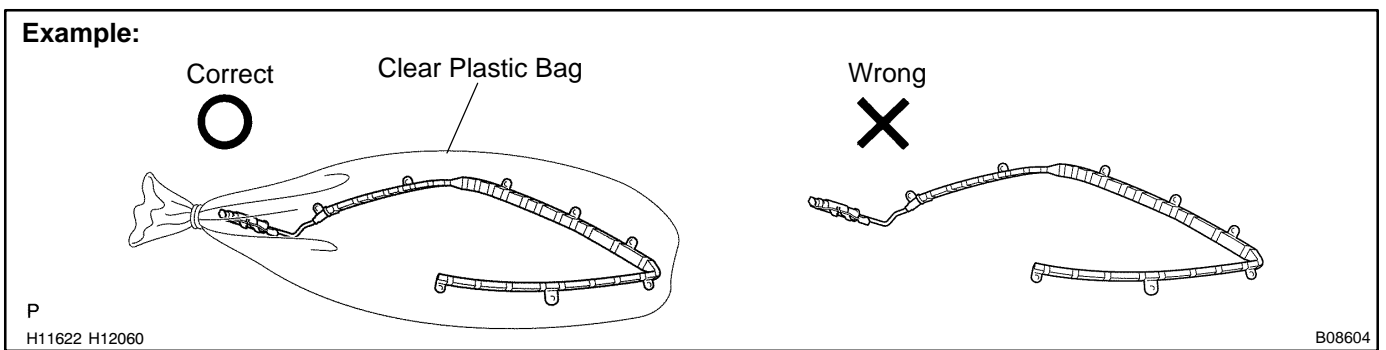
NOTICE:

Protection bag is not reused.

CAUTION:

Never disassemble the curtain shield airbag assembly

- (2) Never measure the resistance of the airbag squib (This may cause the airbag to deploy, which is very dangerous.).
- (3) Grease should not be attached to the curtain shield airbag assembly and the surface should not be cleaned with any kind of detergents.
- (4) Store the airbag assembly where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.
- (5) When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) into the instrument panel before starting work.
- (6) When disposing of a vehicle or the curtain shield airbag assembly alone, the airbag should be deployed using an SST before disposal (See page RS-86). Perform the operation in a safe place away from electrical noise.



(i) AIRBAG SENSOR ASSEMBLY

- (1) If an airbag sensor assembly has been involved in a collision where its SRS has deployed, do not re-use it.
- (2) The connectors to the airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. Failure to do so could cause undesired deployment of the SRS.
- (3) To avoid serious injury, servicing the SRS must be started 90 seconds after:
 - The ignition switch is turned to the LOCK position.
 - The negative (-) terminal cable is disconnected from the battery.

Even if only loosening the set bolts of the airbag sensor assembly, you must follow the above guidelines.

(j) WIRE HARNESS AND CONNECTOR

The SRS wire harness is integrated with the instrument panel wire harness assembly. All the connectors in the system are a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken, etc., repair or replace it as shown on page [RS-139](#).

2. FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION:

If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

- (a) Use only unleaded gasoline.
- (b) Avoid prolonged idling.
Avoid idling the engine for more than 20 minutes.
- (c) Avoid spark jump test.
 - (1) Perform spark jump tests only when absolutely necessary. Perform this test as rapidly as possible.
 - (2) While testing, never race the engine.
- (d) Avoid prolonged engine compression measurement.
Engine compression tests must be done as rapidly as possible.
- (e) Do not run engine when the fuel tank is nearly empty.
This may cause the engine to misfire and create an extra load on the converter.
- (f) Avoid coasting with ignition turned off.
- (g) Do not dispose of used catalyst with gasoline or oil contaminated parts.

3. IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

For vehicles with mobile communication systems such as two-way radios and cellular telephones, observe the following precautions.

- (1) Install the antenna as far away as possible from the ECU and sensors of the vehicle's electronic system.
- (2) Install the antenna feeder at least 20 cm (7.87 in.) away from the ECU and sensors of the vehicle's electronic systems. For details about ECU and sensor locations, refer to the applicable component's section.
- (3) Avoid winding the antenna feeder together with other wiring as much as possible, and also avoid running the antenna feeder parallel with other wire harnesses.
- (4) Check that the antenna and feeder are correctly adjusted.
- (5) Do not install powerful mobile communications system.

4. FOR USING OBD II SCAN TOOL OR HAND-HELD TESTER

CAUTION:

Observe the following items for safety reasons:

- Before using the hand-held tester or OBD II scan tool, the hand-held tester's operator manual or OBD II scan tool's instruction book should be read thoroughly.
- Be sure to route all cables securely when driving with the hand-held tester or OBD II scan tool connected to the vehicle. (I.e. keep cables away from feet, pedals, steering wheel and shift lever.)
- Two persons are required when test-driving with the hand-held tester or OBD II scan tool: one person to drive the vehicle and another to operate the hand-held tester or OBD II scan tool.

HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

GENERAL INFORMATION

IN01T-19

A large number of ECU controlled systems are used in the TOYOTA TUNDRA. In general, ECU controlled systems are considered to be a very intricate, requiring a high level of technical knowledge to troubleshoot. However, following the problem checking procedures of the ECU controlled system's circuits carefully is not complex. If you have an adequate understanding of the system and a basic knowledge of electricity, accurate diagnosis and necessary repair can be performed.

This manual emphasizes the above standpoint to help service technicians perform accurate and effective troubleshooting. Detailed information on major ECU controlled systems in this vehicle are outlined below:

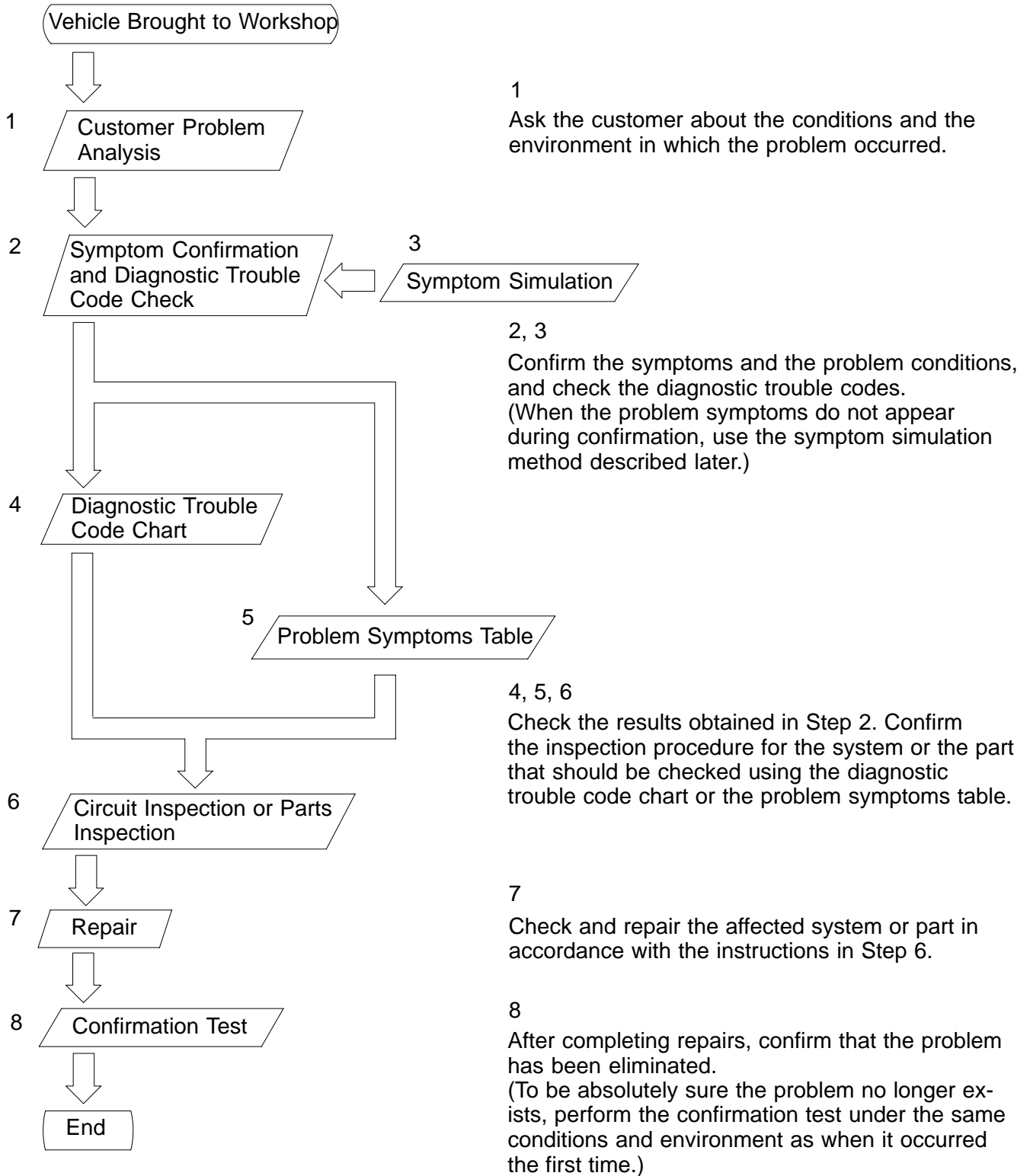
System	Page
1. Engine 1GR-FE	DI-1
2. Engine 2UZ-FE	DI-420
3. Automatic Transmission A750E for 1GR-FE	DI-943
4. Automatic Transmission A750E/A750F for 2UZ-FE	DI-1108
5. Tire Pressure Warning System	DI-1280
6. Anti-Lock Brake System	DI-1383
7. ABS with EBD & BA & TRAC & VSC System	DI-1456
8. Can Communication System	DI-1693
9. Supplemental Restraint System	DI-1810
10. TOYOTA Vehicle Intrusion Protection System	DI-2297
11. Cruise Control System	DI-2341
12. Sliding Roof System	DI-2376
13. Body Control System	DI-2391
14. Driver Door Control System	DI-2453
15. Passenger Door Control System	DI-2475
16. Multiplex Communication System	DI-2495
17. Audio System	DI-2519
18. Rear Seat Audio System	DI-2633
19. Rear Seat Entertainment System	DI-2669
20. Navigation System	DI-2753

FOR USING OBD II SCAN TOOL OR HAND-HELD TESTER

- Before using the tester, read its user manual thoroughly.
- Connect the cable of the tester to DLC3, turn the ignition switch ON and operate the tester. If the tester cannot communicate with the ECU controlled system, there is a problem on the vehicle side or tester side.
 - (1) If communication is normal when the tester is connected to another vehicle, inspect the diagnosis data link line (Bus \oplus line) or ECU power circuit of the vehicle.
 - (2) If communication is still not possible when the tester is connected to another vehicle, the problem lies in the tester. Perform the Self Test procedures outlined in the Tester Operator's Manual.

HOW TO PROCEED WITH TROUBLESHOOTING

Carry out troubleshooting in accordance with the procedure below. Only a basic procedure is shown. Details in the Diagnostics section show the most effective methods for each circuit. Confirm troubleshooting procedures first for the relevant circuit before beginning troubleshooting of that circuit.



2. SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE CHECK

The diagnostic system in the TOYOTA TUNDRA fulfills various functions.






- The first function is the Diagnostic Trouble Code (DTC) Check. In a DTC Check, a previous malfunction's DTC can be checked by a technician during troubleshooting. (A DTC is a code stored in the ECU memory whenever a malfunction in the signal circuits to the ECU occurs.)
- Another function is the Input Signal Check, which checks if the signals from various switches are sent to the ECU correctly. By using these check functions, the problem areas can be narrowed down and troubleshooting is more effective. Diagnostic functions are incorporated in the following systems in the TOYOTA TUNDRA.

System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
1. Engine 1GR-FE	<input type="radio"/> (with Check Mode)	<input type="radio"/>	<input type="radio"/>
2. Engine 2UZ-FE	<input type="radio"/> (with Check Mode)	<input type="radio"/>	<input type="radio"/>
3. Automatic Transmission A750E for 1GR-FE	<input type="radio"/> (with Check Mode)	<input type="radio"/>	<input type="radio"/>
4. Automatic Transmission A750E/A750F for 2UZ-FE	<input type="radio"/> (with Check Mode)	<input type="radio"/>	<input type="radio"/>
5. Tire Pressure Warning System	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Anti-Lock Brake System	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. ABS with EBD & BA & TRAC & VSC System	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Can Communication System	<input type="radio"/>		
9. Supplemental Restraint System	<input type="radio"/> (with Check Mode)	<input type="radio"/>	
10. Cruise Control System	<input type="radio"/>	<input type="radio"/>	
11. Sliding Roof System		<input type="radio"/>	<input type="radio"/>
12. Body Control System		<input type="radio"/>	<input type="radio"/>
13. Driver Door Control System		<input type="radio"/>	<input type="radio"/>
14. Passenger Door Control System		<input type="radio"/>	<input type="radio"/>
15. Multiplex Communication System	<input type="radio"/>		

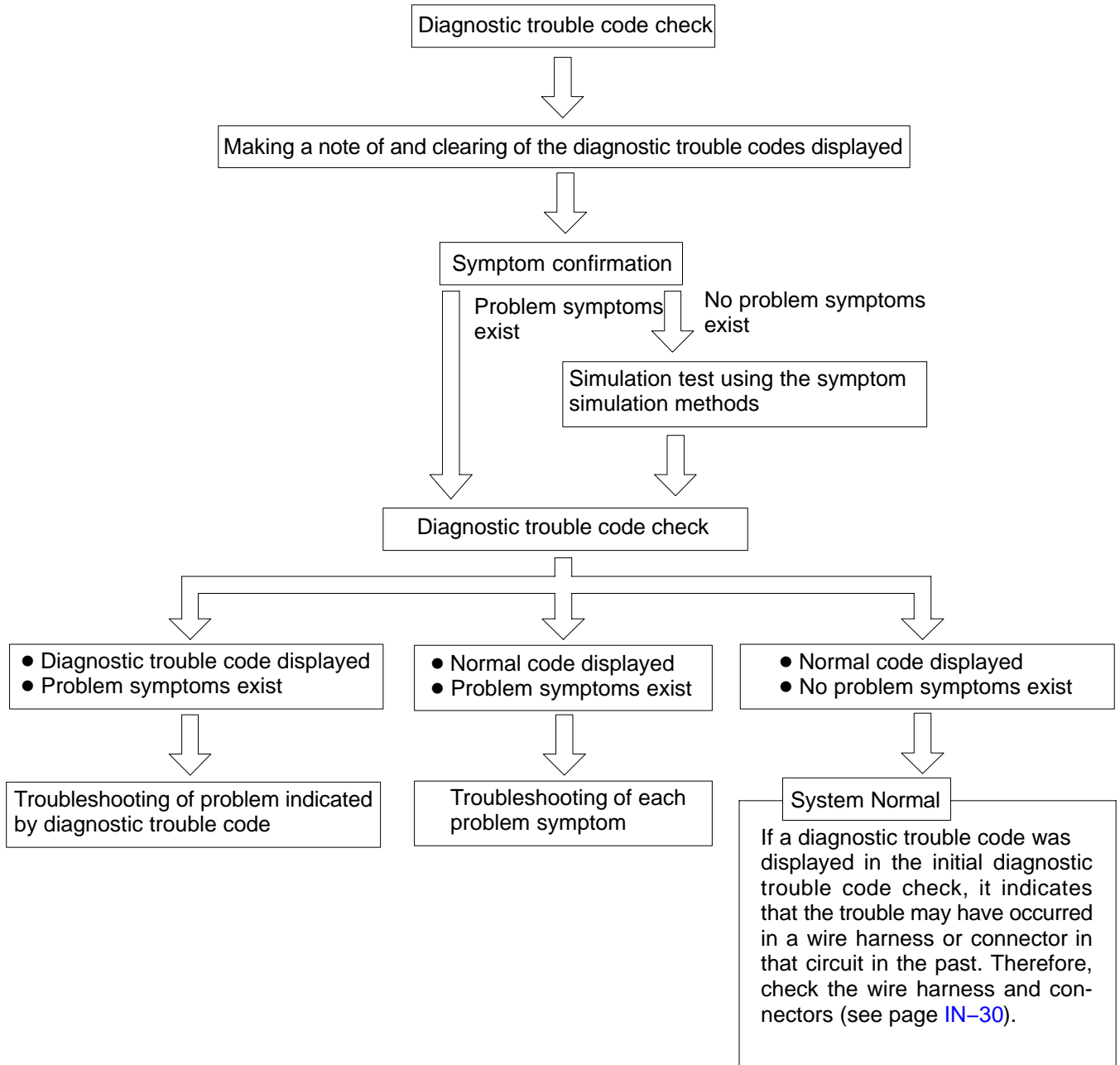
In the DTC Check, it is very important to determine whether the problem indicated by the DTC is: 1) still occurring, or 2) occurred in the past but has since returned to normal. In addition, the DTC should be compared to the problem symptom to see if they are related. For this reason, DTCs should be checked before and after confirmation of symptoms (i.e., whether or not problem symptoms exist) to determine current conditions, as shown in the table below.

Never skip the DTC Check. Failure to check DTCs may, depending on the case, result in unnecessary troubleshooting for systems operating normally or lead to repairs not pertinent to the problem. Follow the procedures listed above in the correct order.

DIAGNOSTIC TROUBLE CODE CHECK PROCEDURE

Diagnostic Trouble Code Check (Make a note of and then clear)	Confirmation of Symptoms	Diagnostic Trouble Code Check	Problem Condition
Diagnostic Trouble Code Display	Problem symptoms exist	Same diagnostic trouble code is displayed	Problem is still occurring in the diagnostic circuit
	 No problem symptoms exist	Normal code is displayed	The problem is still occurring in a place other than in the diagnostic circuit (The diagnostic trouble code displayed first is either for a past problem or it is a secondary problem)
	Normal Code Display  Problem symptoms exist  No problem symptoms exist		The problem occurred in the diagnostic circuit in the past
Normal Code Display		 Problem symptoms exist	Normal code is displayed
	 No problem symptoms exist	Normal code is displayed	The problem occurred in a place other than the diagnostic circuit in the past

Taking into account the points on the previous page, a flow chart showing how to proceed with troubleshooting using the diagnostic trouble code check is shown below. Directions from the flow chart will indicate how to proceed to DTC troubleshooting or to the troubleshooting of problem symptoms table.



3. SYMPTOM SIMULATION

The most difficult case in troubleshooting is when no problem symptoms occurring. In such cases, a thorough customer problem analysis must be carried out. Then simulate a simulation of the same or similar conditions and environment in which the problem occurred in the customer’s vehicle should be carried out. No matter how much skill or experience a technician has, troubleshooting without confirming the problem symptoms will lead to something important in the repair operation being overlooked and lead to mistakes or delays in repairs.

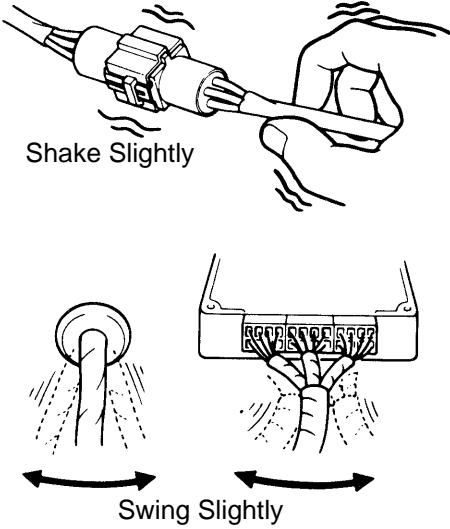
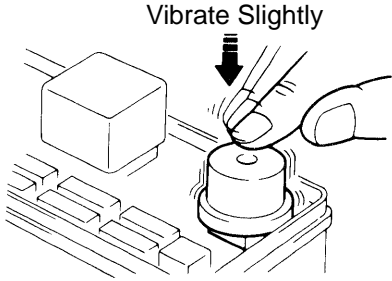
For example:

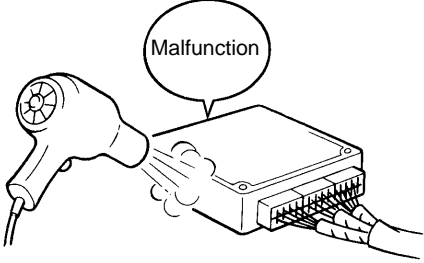

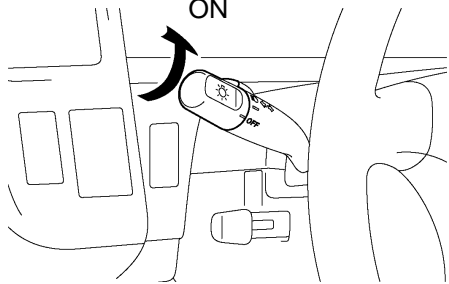
With a problem that only occurs when the engine is cold, or occurs as a result of vibration caused by road during driving, the problem can never be determined as long as the symptoms are being checked on stationary vehicle or a vehicle with a warmed-up engine.

Vibration, heat or water penetration (moisture) is difficult to reproduce. The symptom simulation tests below are effected substitutes for the conditions and can be applied on a stationary vehicle.

Important Points in the Symptom Simulation Test:

In the symptom simulation test, the problem symptoms as well as problem area or parts must be confirmed. First, narrow down the possible problem circuits according to the symptoms. Then, connect the tester and carry out the symptom simulation test, judging whether the circuit being tested is defective or normal, and also confirming the problem symptoms at the same time. Refer to the problem symptoms table for each system to narrow down the possible causes of the symptom.

<p>1</p>	<p>VIBRATION METHOD: When vibration seems to be the major cause.</p>	
<p>CONNECTORS Slightly shake the connector vertically and horizontally.</p> <p>WIRE HARNESS Slightly shake the wire harness vertically and horizontally. The connector joint, fulcrum of the vibration, and body through portion are the major areas that should be checked thoroughly.</p>	 <p>The diagrams illustrate two vibration methods. The top diagram shows a hand holding a connector with the text 'Shake Slightly' and wavy lines indicating movement. The bottom diagram shows a hand holding a wire harness with the text 'Swing Slightly' and arrows indicating a swinging motion.</p> <p>F12331 F12332</p>	
<p>PARTS AND SENSOR Apply slight vibration with a finger to the part of the sensor considered to be the cause of the problem and check whether or not the malfunction occurs.</p> <p>HINT: Applying strong vibration to relays may result in open relays.</p>	 <p>The diagram shows a hand applying vibration to a sensor component on a circuit board. The text 'Vibrate Slightly' is above the hand, and a downward arrow indicates the direction of vibration.</p> <p>F12330</p>	

<p>2</p>	<p>HEAT METHOD: When the problem seems to occur when the suspect area is heated.</p>
<p>Heat the component that is the likely cause of the malfunction with a hair dryer or similar device. Check whether or not if the malfunction occurs.</p> <p>NOTICE:</p> <p>(1) Do not heat to more than 60°C (140°F). (Exceeding this temperature may damage components.)</p> <p>(2) Do not apply heat directly to parts in the ECU.</p>	 <p>F12334</p>
<p>3</p>	<p>WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high-humidity condition.</p>
<p>Sprinkle water onto the vehicle and check whether or not if the malfunction occurs.</p> <p>NOTICE:</p> <p>(1) Never sprinkle water directly into the engine compartment. Indirectly change the temperature and humidity by applying water spray onto the front of the radiator.</p> <p>(2) Never apply water directly onto electronic components.</p> <p>HINT:</p> <p>If a vehicle is subject to water leakage, the leaked water may damage the ECU. When testing a vehicle with a water leakage problem, special caution must be taken.</p>	 <p>F16649</p>
<p>4</p>	<p>OTHER: When a malfunction seems to occur when electrical load is excessive.</p>
<p>Turn on all electrical loads including the heater blower, head lights, rear window defogger, etc. and check to see if the malfunction occurs.</p>	 <p>B02389</p>

4. DIAGNOSTIC TROUBLE CODE CHART

Use Diagnostic Trouble Codes (DTCs) (from the DTC checks) in the table below to determine the trouble area and proper inspection procedure. Engine diagnostic trouble code chart is shown below as an example.

● DTC No.
Indicates the diagnostic trouble code.

● Page or Instructions
Indicates the page where the inspection procedure for each circuit is to be found, or gives instructions for checking and repairs.

● Trouble Area
Indicates the suspect area of the problem.

● Detection Item
Indicates the system of the problem or contents of the problem.

DTC CHART (SAE Controlled)

HINT:
Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check mode, check the circuit for that code listed in the table below. For details of each code, refer to the "See page" under the "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI-24)	Mass Air Flow Circuit Malfunction	<ul style="list-style-type: none"> ● Open or short in mass air flow meter circuit ● Mass air flow meter ● ECM 	○	○
P0101 (DI-28)	Mass Air Flow Circuit Range/ Performance Problem	<ul style="list-style-type: none"> ● Mass air flow meter 	○	○
P0110 (DI-29)	Intake Air Temp. Circuit Malfunction	<ul style="list-style-type: none"> ● Open or short in intake air temp. sensor circuit ● Intake air temp. sensor ● ECM 	○	○
P0115 (DI-33)	Engine Coolant Temp. Circuit Malfunction	<ul style="list-style-type: none"> ● Open or short in engine coolant temp. sensor circuit ● Engine coolant temp. sensor ● ECM 	○	○
P0116 (DI-37)	Engine Coolant Temp. Circuit Range/ Performance Problem	<ul style="list-style-type: none"> ● Engine coolant temp. sensor ● Cooling system 	○	○
	Throttle Position Sensor/Switch Malfunction	<ul style="list-style-type: none"> ● Open or short in throttle position sensor circuit ● Throttle position sensor ● ECM 		
	Throttle Position Sensor/ Switch Range/ Performance Problem	<ul style="list-style-type: none"> ● Throttle position sensor 		

5. PROBLEM SYMPTOMS TABLE

The suspected circuits or parts for each problem symptom are shown in the table below. Use this table to troubleshoot when, during a DTC check, a "Normal" code is displayed in the diagnostic trouble code check but the problem is still occurring. Numbers in the table show the inspection order in which the circuits or parts should be checked.

HINT:

In some cases, a problem is not detected by the diagnostic system even though a problem symptom is present. It is possible that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a completely different system.

● Page
Indicates the page where the flow chart for each circuit is located.

● Circuit Inspection, Inspection Order
Indicates the circuit which needs to be checked for a problem symptom.

● Problem Symptom

● Circuit or Part Name
Indicates the circuit or part which needs to be checked.

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST-2 ST-17
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI-147 DI-151 IN-29
No complete combustion (Does not start)	1. Fuel pump control circuit	DI-151
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI-144 DI-151 EM-3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI-144 DI-151
Hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI-144 DI-151
Engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	AC-88
Engine idle speed (Poor idling)	1. A/C signal circuit 2. Fuel pump control circuit	
Engine idle speed (Poor idling)	1. Compression 2. Fuel pump control circuit	

6. CIRCUIT INSPECTION

How to read and use each page is shown below.

• Diagnostic Trouble Code No. and Detection Item

• Circuit Description
The major role and operation of the circuit and its component parts are explained.

DTC	P0325	Knock Sensor 1 Circuit Malfunction
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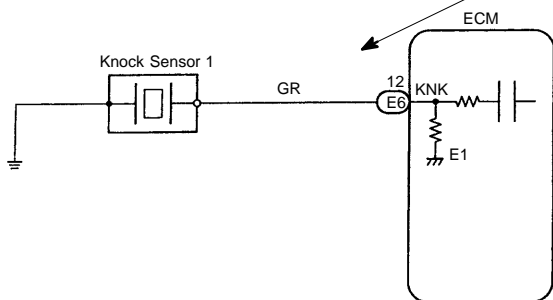
CIRCUIT DESCRIPTION
Knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed 1,200 rpm or more.	<ul style="list-style-type: none"> • Open or short in knock sensor1 circuit • Knock sensor 1 (looseness) • ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

• Indicates the diagnostic trouble code (DTC), set parameter and suspect area of the problem.

WIRING DIAGRAM



• Wiring Diagram
This is a wiring diagram of the circuit. Use this diagram together with an ELECTRICAL WIRING DIAGRAM to thoroughly understand the circuit.
Wire colors are indicated by an alphabetical code: B = Black; L = Blue; R = Red; BR = Brown; LG = Light Green; V = Violet; G = Green; O = Orange; W = White; GR = Gray; P = Pink; Y = Yellow; SB = Sky Blue.
The first letter indicates the basic wire color and the second letter indicates the color of the stripe.

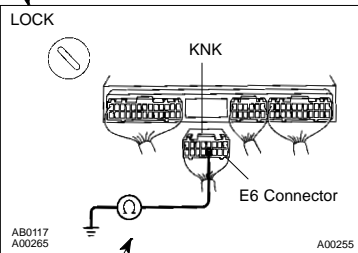
- Indicates the position of the ignition switch during the check.



- Inspection Procedure
Use the inspection procedure to determine if the circuit is normal or abnormal. If it is abnormal, use it to determine whether the problem is located in the sensors, actuators, wire harness or ECU.

INSPECTION PROCEDURE

1 Check continuity between terminal KNK of ECM connector and body ground.



PREPARATION:

- (a) Remove the glove compartment (See page SF-68).
- (b) Disconnect the E6 connector of ECM.

CHECK:

Measure resistance between terminal KNK of ECM connector and body ground.

OK:

Resistance: 1 MΩ or higher

OK

Go to step 3.

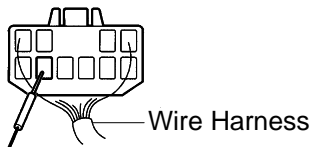
NG

2 Check knock sensor (See page SF-61).

OK

Replace knock sensor.

- Indicates the place to check the voltage or resistance.
- Indicates the connector position to checked (from the front or back side).

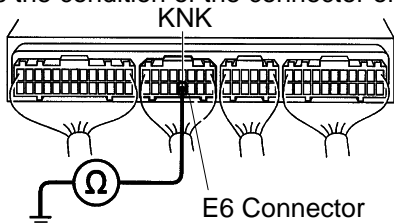


Check from the connector back side (with harness).

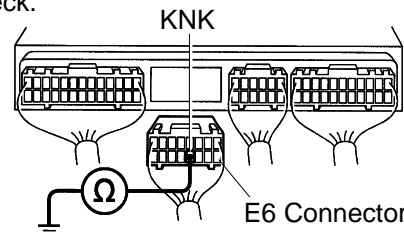


Check from the connector front side (without harness). In this case, care must be taken not to bend the terminals.

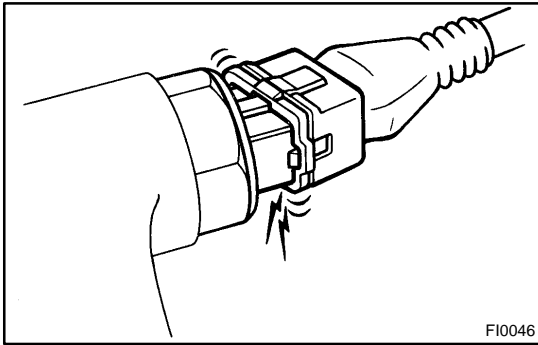
- Indicates the condition of the connector of ECU during the check.



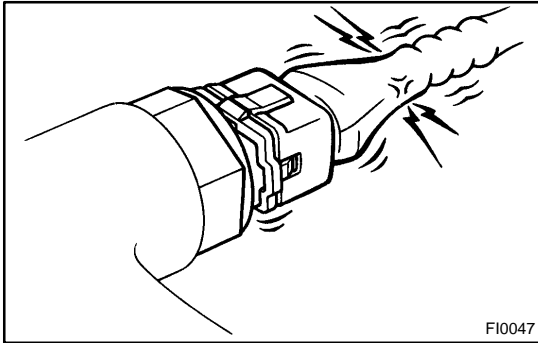
Connector being checked is connected.



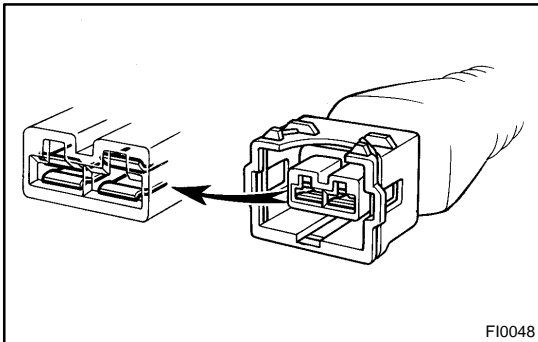
Connector being checked is disconnected.



FI0046



FI0047



FI0048

HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE

1. CONNECTOR CONNECTION AND TERMINAL INSPECTION

- For troubleshooting, diagnostic trouble code (DTC) charts or problem symptom table are provided for each circuit with detailed inspection procedures in this manual.
- When component parts, wire harnesses and connectors of each circuit are found to be normal in troubleshooting, the problem is most likely in the ECU. Accordingly, if diagnosis is performed without the problem symptoms occurring, refer to Step 8 to replace the ECU. Always confirm that the problem symptoms are occurring, or proceed with inspection while using the symptom simulation method.
- The instructions "Check wire harness and connector" and "Check and replace ECU" which appear in the inspection procedure are common and applicable to all DTCs. Follow the procedure outlined below whenever these instructions appear.

OPEN CIRCUIT:

An open circuit could result from a disconnected wire harness, a faulty contact in the connector, a connector terminal pulled out, etc.

HINT:

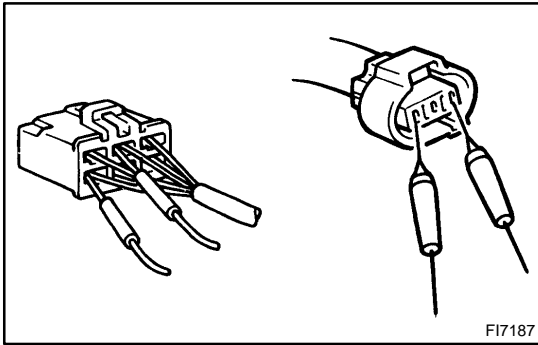
- A wire is rarely broken in its middle. Most problems occur at the wire ends. Carefully check the connectors of sensors and actuators.
- Faulty contacts could be due to rusting, contamination, and/or deformation of connector terminals. In some cases: 1) simply disconnecting and reconnecting the connectors will fix the problem, or 2) even though no abnormality is found in the wire harness or connector, the problem disappears after the check (meaning the cause was most likely in the wire harness or connectors).

SHORT CIRCUIT:

A short circuit could result from contact between the wire harness and the body ground or a short circuiting switch.

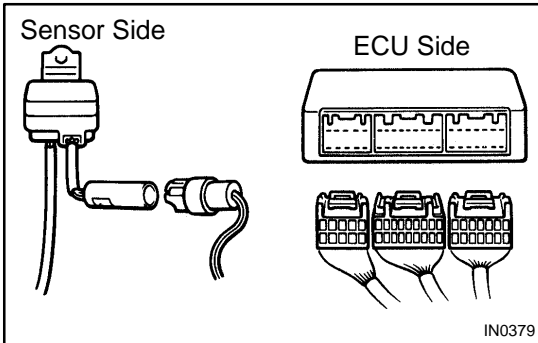
HINT:

When there is a short circuit between the wire harness and body ground, check thoroughly if wire harness is caught in the body or is clamped properly.



2. CONNECTOR HANDLING

When inserting tester probes into a connector, insert them from the rear of the connector. When necessary, use mini test leads. For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals.



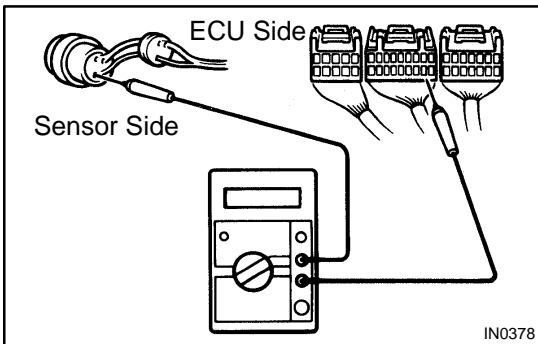
3. CONTINUITY CHECK (OPEN CIRCUIT CHECK)

- (a) Disconnect the connectors at both ECU and sensor sides.
- (b) Measure the resistance between the applicable terminals of the connectors.

Resistance: Below 1 Ω

HINT:

Measure the resistance while lightly shaking the wire harness vertically and horizontally.



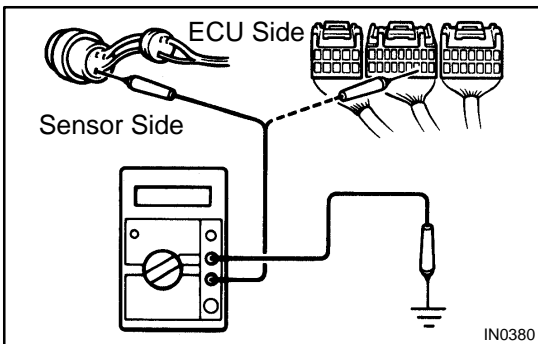
4. RESISTANCE CHECK (SHORT CIRCUIT CHECK)

- (a) Disconnect the connectors on both ends.
- (b) Measure the resistance between the applicable terminals of the connectors and body ground. Be sure to carry out this check on the connectors on both ends.

Resistance: 10 kΩ or higher

HINT:

Measure the resistance while lightly shaking the wire harness vertically and horizontally.

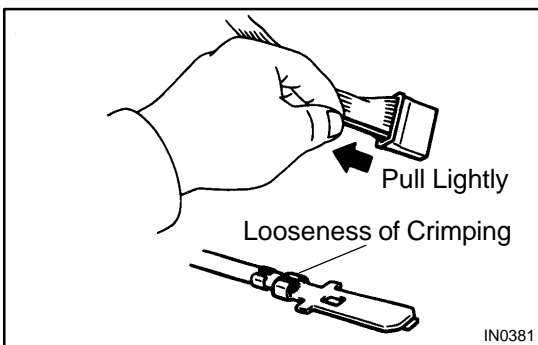


5. VISUAL CHECK AND CONTACT PRESSURE CHECK

- (a) Disconnect the connectors at both ends.
- (b) Check for rust or foreign material, etc. in the terminals of the connectors.
- (c) Check crimped portions for looseness or damage and check that the terminals are secured in the lock portion.

HINT:

The terminals should not come out when pulled lightly from the back.



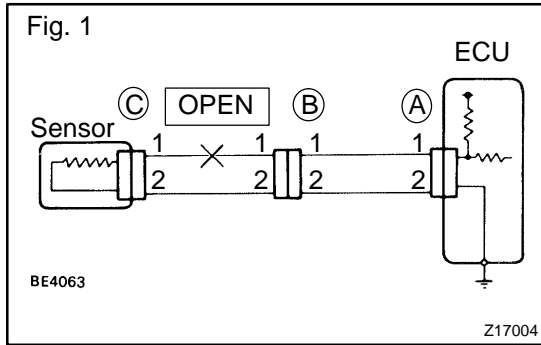
- (d) Prepare a test male terminal and insert it in the female terminal, then pull it out.

NOTICE:

When testing a gold-plated female terminal, always use a gold-plated male terminal.

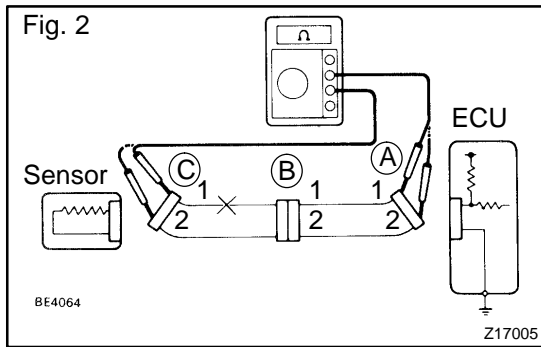
HINT:

If a test terminal is pulled out more easily than others, there may be poor contact in that section.

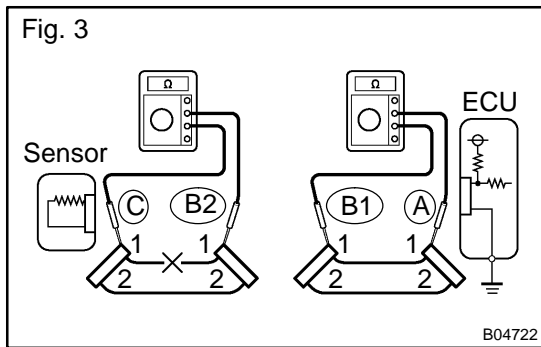


6. CHECK OPEN CIRCUIT

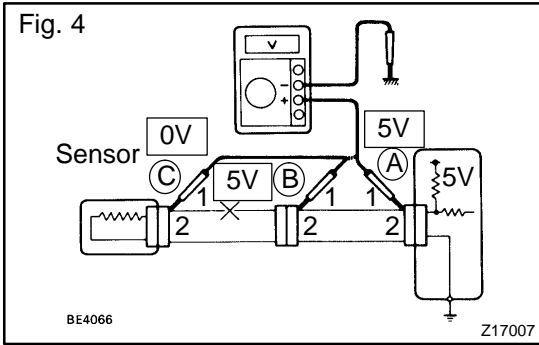
For an open circuit in the wire harness in Fig. 1, perform a continuity check (step (a) below) or a voltage check (step (b) below).



- (a) Check the continuity.
 - (1) Disconnect connectors A and C and measure the resistance between them.
 - In the case of Fig. 2:
 - Between terminal 1 of connector A and terminal 1 of connector C → 10 kΩ or higher (open)
 - Between terminal 2 of connector A and terminal 2 of connector C → Below 1 Ω
 - An open circuit exists in the wire harness between terminal 1 of A and terminal 1 of C.



- (2) Disconnect connector B and measure the resistance between the connectors.
 - In the case of Fig. 3:
 - Between terminal 1 of connector A and terminal 1 of connector B1 → Below 1 Ω
 - Between terminal 1 of connector B2 and terminal 1 of connector C → 10 kΩ or higher (open)
 - An open circuit exists in the wire harness between terminal 1 of B2 and terminal 1 of C.



- (b) Check the voltage.
In a circuit in which voltage is applied to the ECU connector terminal, an open circuit can be checked by conducting a voltage check.

As shown in Fig. 4, with each connector still connected, measure the voltage between body ground and terminal 1 of connector A at the ECU 5V output terminal, terminal 1 of connector B, and terminal 1 of connector C (in that order).

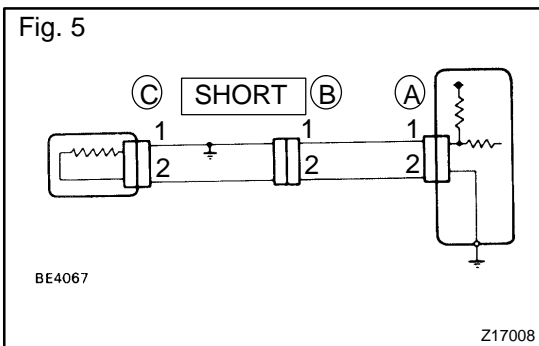
Example results:

5V: Between Terminal 1 of connector A and Body Ground

5V: Between Terminal 1 of connector B and Body Ground

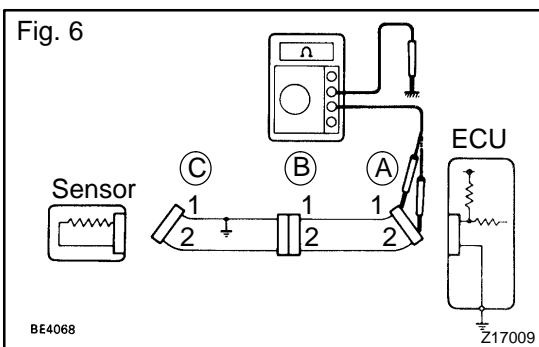
0V: Between Terminal 1 of connector C and Body Ground

In the above example, an open circuit is in the wire harness between terminal 1 of B and terminal 1 of C.



7. CHECK SHORT CIRCUIT

If the wire harness is shorted (Fig. 5), locate the section by conducting a resistance check with ground below.



Check the resistance with ground.

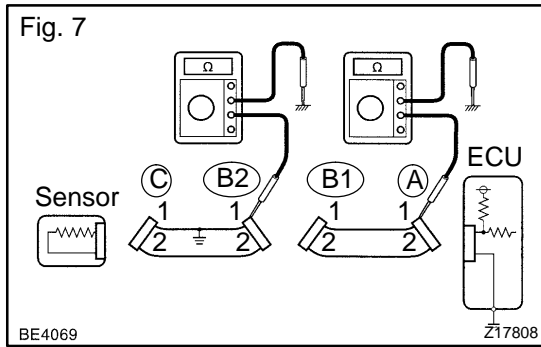
- (1) Disconnect connectors A and C and measure the resistance between terminals 1 and 2 of connector A and body ground.

In the case of Fig. 6:

Between terminal 1 of connector A and body ground → Below 1 Ω (short)

Between terminal 2 of connector A and body ground → 10 kΩ or higher

A short circuit is between terminal 1 of connector A and terminal 1 of connector C.



- (2) Disconnect connector B and measure the resistance between terminal 1 of connector A and body ground, and terminal 1 of connector B2 and body ground.

In the case of Fig. 7:

Between terminal 1 of connector A and body ground → 10 kΩ or higher

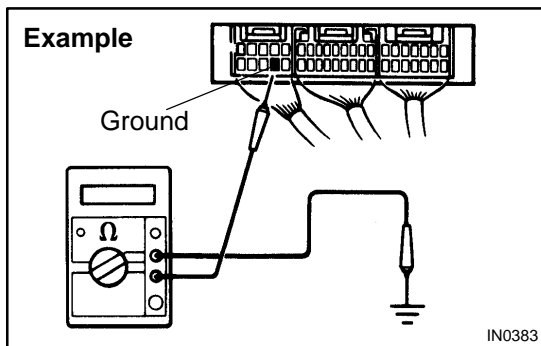
Between terminal 1 of connector B2 and body ground → Below 1 Ω (short)

A short circuit is between terminal 1 of connector B2 and terminal 1 of connector C.

8. CHECK AND REPLACE ECU

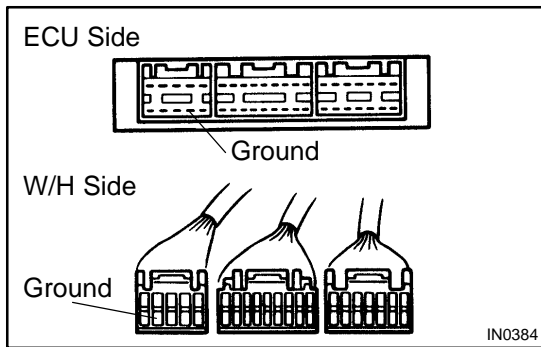
First check the ECU ground circuit. If it is faulty, repair it. If it is normal, the ECU could be faulty. Replace the ECU with a functioning one and check if the symptoms occur.

If the trouble symptoms stop, replace the ECU.



- (1) Measure the resistance between the ECU ground terminal and the body ground.

Resistance: Below 1 Ω



- (2) Disconnect the ECU connector. Check for bent ground terminals (on the ECU side and the wire harness side). Lastly, check the contact pressure.

TERMS

ABBREVIATIONS USED IN THIS MANUAL

IN04Q-34

Abbreviations	Meaning
ABS	Anti-Lock Brake System
A/C	Air Conditioner
AC	Alternating Current
ACC	Accessory
ACIS	Acoustic Control Induction System
ACM	Active Control Engine Mount
ACSD	Automatic Cold Start Device
A.D.D.	Automatic Disconnecting Differential
A/F	Air-Fuel Ratio
AHC	Active Height Control Suspension
ALR	Automatic Locking Retractor
ALT	Alternator
AMP	Amplifier
ANT	Antenna
APPROX.	Approximately
ASSY	Assembly
A/T, ATM	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
AUTO	Automatic
AUX	Auxiliary
AVG	Average
AVS	Adaptive Variable Suspension
B+	Battery Voltage
BA	Brake Assist
BACS	Boost Altitude Compensation System
BAT	Battery
BDC	Bottom Dead Center
B/L	Bi-Level
B/S	Bore-Stroke Ratio
BTDC	Before Top Dead Center
BVSV	Bimetallic Vacuum Switching Valve
CB	Circuit Breaker
CCo	Catalytic Converter For Oxidation
CCV	Canister Closed Valve
CD	Compact Disc
CF	Cornering Force
CG	Center Of Gravity
CH	Channel
CKD	Complete Knock Down
COMB.	Combination
CPE	Coupe
CPS	Combustion Pressure Sensor
CPU	Central Processing Unit
CRS	Child Restraint System
CTR	Center
C/V	Check Valve
CV	Control Valve
CW	Curb Weight

DC	Direct Current
DEF	Defogger
DFL	Deflector
DIFF.	Differential
DIFF. LOCK	Differential Lock
D/INJ	Direct Injection
DLC	Data Link Connector
DLI	Distributorless Ignition
DOHC	Double Overhead Camshaft
DP	Dash Pot
DS	Dead Soak
DSP	Digital Signal Processor
DTC	Diagnostic Trouble Code
DVD	Digital Versatile Disc
EBD	Electric Brake Force Distribution
EC	Electrochromic
ECAM	Engine Control And Measurement System
ECD	Electronically Controlled Diesel
ECDY	Eddy Current Dynamometer
ECT	Electronic Control Transmission
ECU	Electronic Control Unit
ED	Electro-Deposited Coating
EDU	Electronic Driving Unit
EDIC	Electric Diesel Injection Control
EFI	Electronic Fuel Injection
E/G	Engine
EGR	Exhaust Gas Recirculation
EGR-VM	EGR-Vacuum Modulator
ELR	Emergency Locking Retractor
EMPS	Electric Motor Power Steering
ENG	Engine
ESA	Electronic Spark Advance
ETCS-i	Electronic Throttle Control System-intelligent
EVAP	Evaporative Emission Control
EVP	Evaporator
E-VRV	Electric Vacuum Regulating Valve
EX	Exhaust
FE	Fuel Economy
FF	Front-Engine Front-Wheel-Drive
F/G	Fuel Gauge
FIPG	Formed In Place Gasket
FL	Fusible Link
F/P	Fuel Pump
FPU	Fuel Pressure Up
FR	Front
F/W	Flywheel
FW/D	Flywheel Damper
FWD	Front-Wheel-Drive
GAS	Gasoline
GND	Ground
GPS	Global Positioning System
HAC	High Altitude Compensator

INTRODUCTION – TERMS

H/B	Hatchback
H-FUSE	High Current Fuse
HI	High
HID	High Intensity Discharge (Head Lamp)
HSG	Housing
HT	Hard Top
HWS	Heated Windshield System
IC	Integrated Circuit
IDI	Indirect Diesel Injection
IFS	Independent Front Suspension
IG	Ignition
I/A	Integrated Ignition Assembly
IN	Intake (Manifold, Valve)
INT	Intermittent
I/P	Instrument Panel
IRS	Independent Rear Suspension
ISC	Idle Speed Control
J/B	Junction Block
J/C	Junction Connector
KD	Kick-Down
LAN	Local Area Network
LB	Liftback
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left-Hand
LHD	Left-Hand Drive
L/H/W	Length, Height, Width
LLC	Long-Life Coolant
LNG	Liquified Natural Gas
LO	Low
LPG	Liquified Petroleum Gas
LSD	Limited Slip Differential
LSP & PV	Load Sensing Proportioning And Bypass Valve
LSPV	Load Sensing Proportioning Valve
MAP	Manifold Absolute Pressure
MAX.	Maximum
MIC	Microphone
MIL	Malfunction Indicator Lamp
MIN.	Minimum
MG1	Motor Generator No.1
MG2	Motor Generator No.2
MP	Multipurpose
MPI	Multipoint Electronic Injection
MPX	Multiplex Communication System
M/T, MTM	Manual Transmission (Transaxle)
MT	Mount
MTG	Mounting
N	Neutral
NA	Natural Aspiration
NO.	Number
O2S	Oxygen Sensor
O/D	Overdrive

OEM	Original Equipment Manufacturing
OHC	Overhead Camshaft
OHV	Overhead Valve
OPT	Option
ORVR	On-board Refilling Vapor Recovery
O/S	Oversize
P & BV	Proportioning And Bypass Valve
PCS	Power Control System
PCV	Positive Crankcase Ventilation
PKB	Parking Brake
PPS	Progressive Power Steering
PS	Power Steering
PTC	Positive Temperature Coefficient
PTO	Power Take-Off
P/W	Power Window
R & P	Rack And Pinion
RAM	Random Access Memory
R/B	Relay Block
RBS	Recirculating Ball Type Steering
R/F	Reinforcement
RFS	Rigid Front Suspension
RH	Right-Hand
RHD	Right-Hand Drive
RLY	Relay
ROM	Read Only Memory
RR	Rear
RRS	Rigid Front Suspension
RWD	Rear-Wheel Drive
SDN	Sedan
SEN	Sensor
SICS	Starting Injection Control System
SOC	State Of Charge
SOHC	Single Overhead Camshaft
SPEC	Specification
SPI	Single Point Injection
SRS	Supplemental Restraint System
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
STJ	Cold-Start Fuel Injection
SW	Switch
SYS	System
T/A	Transaxle
TACH	Tachometer
TBI	Throttle Body Electronic Fuel Injection
TC	Turbocharger
TCCS	TOYOTA Computer-Controlled System
TCV	Timing Control Valve
TDC	Top Dead Center
TEMP.	Temperature
TEMS	TOYOTA Electronic Modulated Suspension
TFT	TOYOTA Free-Tronic

INTRODUCTION - TERMS

TIS	Total Information System For Vehicle Development
T/M	Transmission
TMC	TOYOTA Motor Corporation
TMMK	TOYOTA Motor Manufacturing Kentucky, Inc.
TRC	Traction Control System
TURBO	Turbocharge
TWC	Three-Way Catalyst
U/D	Underdrive
U/S	Undersize
VCV	Vacuum Control Valve
VENT	Ventilator
VIM	Vehicle Interface Module
VIN	Vehicle Identification Number
VPS	Variable Power Steering
VSC	Vehicle Skid Control
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
VVT-i	Variable Valve Timing-intelligent
W/	With
WGN	Wagon
W/H	Wire Harness
W/O	Without
1ST	First
2ND	Second
2WD	Two Wheel Drive Vehicle (4 x 2)
3RD	Third
4TH	Fourth
4WD	Four Wheel Drive Vehicle (4 x 4)
4WS	Four Wheel Steering System
5TH	Fifth

GLOSSARY OF SAE AND TOYOTA TERMS

This glossary lists all SAE-J1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their TOYOTA equivalents.

SAE ABBREVIATIONS	SAE TERMS	TOYOTA TERMS ()--ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner, A/CL
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	--
B+	Battery Positive Voltage	+B, Battery Voltage
BARO	Barometric Pressure	HAC
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	--
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	--
CTOX	Continuous Trap Oxidizer	--
CTP	Closed Throttle Position	LL ON, Idle ON
DFI	Direct Fuel Injection	Direct Injection (DI/INJ)
DI	Distributor Ignition	--
DLC3	Data Link Connector 3	OB2 II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Trouble Code
DTM	Diagnostic Test Mode	--
ECL	Engine Coolant Level	--
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM), Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	Distributorless Ignition (DLI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	--
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	--
FEPROM	Flash Erasable Programmable Read Only Memory	--
FF	Flexible Fuel	--
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)
HO2S	Heated Oxygen Sensor	Heated Oxygen Sensor (HO ₂ S)

INTRODUCTION – TERMS

IAC	Idle Air Control	Idle Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect Injection (IDL)
IFS	Inertia Fuel-Shutoff	–
ISC	Idle Speed Control	–
KS	Knock Sensor	Knock Sensor
MAF	Mass Airflow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
MDP	Manifold Differential Pressure	–
MFI	Multipoint Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Lamp
MST	Manifold Surface Temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non-Volatile Random Access Memory	–
O2S	Oxygen Sensor	Oxygen Sensor, O ₂ Sensor (O ₂ S)
OBD	On-Board Diagnostic	On-Board Diagnostic System (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Convert (OC), CCo
OL	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	–
PNP	Park/Neutral Position	–
PROM	Programmable Read Only Memory	–
PSP	Power Steering Pressure	–
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	–
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	E-ABV
SFI	Sequential Multipoint Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
SRT	System Readiness Test	–
ST	Scan Tool	–
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter
TCM	Transmission Control Module	Transmission ECU, ECT ECU

TP	Throttle Position	Throttle Position
TR	Transmission Range	-
TVV	Thermal Vacuum Valve	Bimetallic Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
TWC	Three-Way Catalytic Converter	Three-Way Catalytic (TWC) Manifold Converter CC _{RO}
TWC+OC	Three-Way + Oxidation Catalytic Converter	CC _R + CCo
VAF	Volume Airflow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor
WOT	Wide Open Throttle	Full Throttle
WU-OC	Warm Up Oxidation Catalytic Converter	-
WU-TWC	Warm Up Three-Way Catalytic Converter	-
3GR	Third Gear	-
4GR	Fourth Gear	-

OUTSIDE VEHICLE

GENERAL MAINTENANCE

MA001-44

These maintenance checks on the vehicle are performed on the owner's responsibility. The owner may perform the maintenance or take the vehicle to a service center.

Check the parts of the vehicle described below on a daily basis. In most cases, special tool are not required. It is recommended that the owner perform these check.

The procedures for general maintenance are as follows.

1. GENERAL NOTES

- Maintenance requirements vary depending on the country.
- Check the maintenance schedule in the owner's manual supplement.
- Following the maintenance schedule is mandatory.
- Determine the appropriate time to service the vehicle using either miles driven or time (month) elapsed, whichever reaches the specification first.
- Maintain similar intervals between periodic maintenance unless noted.
- Failing to check each vehicle part could lead to poor engine performance and increase exhaust emissions.

2. TIRES

- (a) Check the tire pressure with a gauge. Make adjustment if necessary.
- (b) Check the surfaces of tires for cuts, damage or excessive wear.

3. WHEEL NUTS

Check for nuts that are loose or missing. Tighten them if necessary.

4. TIRE ROTATION (See page SA-3)

Check the maintenance schedule in the owner's manual supplement.

5. WINDSHIELD WIPER BLADES

Check the blades for wear or cracks whenever they are unable to wipe the windshield clean. Replace them if necessary.

6. FLUID LEAKS

- (a) Check under the vehicle for leaking fuel, oil, water and other fluid.
- (b) If you smell gasoline fumes or notice any leak, find the cause and correct it.

7. DOORS AND ENGINE HOOD

- (a) Check that all of the doors and the trunk lid operate smoothly, and that all the latches lock securely.
- (b) When the primary latch is released, check that the engine hood secondary latch prevents the hood from opening.

INSIDE VEHICLE

MA002-52

GENERAL MAINTENANCE

These maintenance checks on the vehicle are performed on the owner's responsibility. The owner may perform the maintenance or take the vehicle to a service center.

Check the parts of the vehicle described below on a daily basis. In most cases, special tool are not required. It is recommended that the owner perform these check.

The procedures for general maintenance are as follows.

1. GENERAL NOTES

- Maintenance requirements vary depending on the country.
- Check the maintenance schedule in the owner's manual supplement.
- Following the maintenance schedule is mandatory.
- Determine the appropriate time to service the vehicle using either miles driven or time (month) elapsed, whichever reaches the specification first.
- Maintain similar intervals between periodic maintenance unless noted.
- Failing to check each vehicle part could lead to poor engine performance and increase exhaust emissions.

2. LAMPS

- (a) Check that the headlamps, stop lamps, taillamps, turn signal lamps, and other lamps are all working.
- (b) Check that the headlamps are aimed properly.

3. WARNING LAMPS AND BUZZERS

Check that all the warning lamps and buzzers are working.

4. HORN

Check that the horn is working.

5. WINDSHIELD

Check for scratches, pits or abrasions.

6. WINDSHIELD WIPER AND WASHER

- (a) Check if the wind washers are aimed properly. Also, check if the washer fluid hits the center of the operating range of each wiper on the windshield.
- (b) Check that the wipers do not streak.

7. WINDSHIELD DEFROSTER

When the heater or air conditioner is on the defroster setting, check that air comes out of the defroster outlet.

8. REAR VIEW MIRROR

Check that the rear view mirror is securely mounted.

9. SUN VISORS

Check that the sun visors move freely and are securely mounted.

10. STEERING WHEEL

Check that the steering wheel has the proper freeplay. Also check for steering difficulty, freeplay in the steering wheel and unusual noises.

11. SEATS

- (a) Check that the seat adjusters operate smoothly.
- (b) Check that all the latches lock securely in all positions.
- (c) Check that the head restraints move up and down smoothly and that the locks hold securely in all latched positions.
- (d) When the rear seatbacks are folded down, check if the latches lock securely.

12. SEAT BELTS

- (a) Check that the seat belt system such as the buckles, retractors and anchors operate properly and smoothly.
- (b) Check that the belt webbing is not cut, frayed, worn or damaged.

13. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort and catching.

14. CLUTCH PEDAL (See page CL-2)

- (a) Check the pedal for smooth operation.
- (b) Check that the pedal has the proper freeplay.

15. BRAKE PEDAL (See page BR-10)

- (a) Check the pedal for smooth operation.
- (b) Check that the pedal has the proper reserve distance and freeplay.
- (c) Check the brake booster function.

16. BRAKES

In a safe place, check that the vehicle remains straight when applying the brakes.

17. PARKING BRAKE (See page BR-18)

- (a) Check that the parking brake pedal has the proper range of motion.
- (b) On a low incline, check that the parking brake alone can stabilize the vehicle.

18. AUTOMATIC TRANSMISSION "PARK" MECHANISM

- (a) Check the lock release mechanism of the selector lever for proper and smooth operation.
- (b) When the selector lever is in the "P" position and all brakes are released on a low incline, check that the vehicle is stabilized.

UNDER HOOD

MA003-52

GENERAL MAINTENANCE

1. GENERAL NOTES

- Maintenance requirements vary depending on the country.
- Check the maintenance schedule in the owner's manual supplement.
- Following the maintenance schedule is mandatory.
- Determine the appropriate time to service the vehicle using either miles driven or time (month) elapsed, whichever reaches the specification first.
- Maintain similar intervals between periodic maintenance unless noted.
- Failing to check each vehicle part could lead to poor engine performance and increase exhaust emissions.

2. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

3. ENGINE COOLANT LEVEL

Check that the coolant level is between the "FULL" and "LOW" lines on the see-through reservoir.

4. RADIATOR AND HOSES

- (a) Check that the front of the radiator is clean and free of leaves, dirt and bugs.
- (b) Check the hoses for cracks, kinks, rotting and loose connections.

5. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all the battery cells is between the upper and lower lines on the case.

6. BRAKE AND CLUTCH FLUID LEVELS

Check that the brake and clutch fluid levels are near the upper level line on the see-through reservoirs.

7. ENGINE DRIVE BELTS

Check the drive belt for fraying, cracks, wear or oiliness.

8. ENGINE OIL LEVEL

Check if the level of engine oil is between "F" and "L" on the dipstick with the engine turned off.

9. POWER STEERING FLUID LEVEL

- Check the level on the dipstick.
- The level should be in the "HOT" or "COLD" range depending on the fluid temperature.

10. AUTOMATIC TRANSMISSION FLUID

Visually check the overflow plug and oil pan for fluid leaks or traces of fluid.

11. EXHAUST SYSTEM

Check for unusual exhaust sounds or abnormal exhaust fumes. Find the cause and correct it.

ENGINE INSPECTION

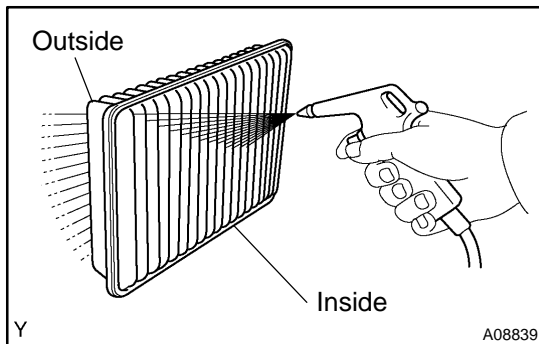
MA004-20

HINT:

Perform the following procedures.

1. **REPLACE TIMING CHAIN OR BELT**
(1GR-FE: See pages [EM-32](#) and [EM-44](#))
(2UZ-FE: See pages [EM-16](#) and [EM-23](#))
2. **INSPECT VALVE CLEARANCE**
(1GR-FE: See page [EM-4](#))
(2UZ-FE: See page [EM-4](#))
3. **INSPECT DRIVE BELT(S)**
(1GR-FE: See pages [SR-3](#) and [AC-17](#))
(2UZ-FE: See page [SR-3](#) and [AC-17](#))
4. **REPLACE ENGINE OIL AND OIL FILTER**
(1GR-FE: See page [LU-3](#))
(2UZ-FE: See page [LU-2](#))
5. **REPLACE ENGINE COOLANT**
(1GR-FE: See page [CO-2](#))
(2UZ-FE: See page [CO-2](#))
6. **INSPECT EXHAUST PIPES AND MOUNTINGS**

Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage.



7. INSPECT AIR FILTER

- (a) Visually check that the air filter is not excessively dirty or oily.

HINT:

Oiliness may indicate a stuck PCV valve.

If necessary, replace the air filter.

- (b) Clean the air filter with compressed air.
First blow from the inside of the filter thoroughly then repeat from the outside.

8. REPLACE AIR FILTER

Replace the air filter with a new one.

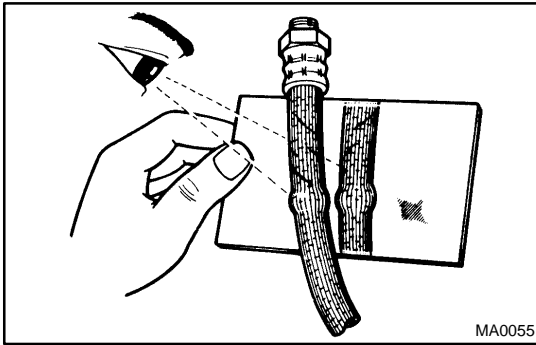
9. INSPECT FUEL LINES AND CONNECTIONS, AND FUEL TANK VAPOR VENT SYSTEM HOSES AND FUEL TANK BAND

Visually inspect the fuel lines for cracks, leakage, loose connections, deformation or tank band looseness.

10. REPLACE GASKET IN FUEL TANK CAP

- (1GR-FE: See page [EC-6](#))
- (2UZ-FE: See page [EC-9](#))

11. **REPLACE SPARK PLUGS**
(1GR-FE: See page [IG-1](#))
(2UZ-FE: See page [IG-1](#))
12. **INSPECT CHARCOAL CANISTER**
(1GR-FE: See page [EC-6](#))
(2UZ-FE: See page [EC-9](#))



BRAKE INSPECTION

MA014-07

1. INSPECT BRAKE LINE PIPES AND HOSES

HINT:

Work in a well-lighted area. Check the entire circumference and length of the brake hoses using a mirror if necessary. Turn the front wheels fully to the right or left before beginning.

- (a) Check all the brake lines and hoses for:
 - Damage
 - Wear
 - Deformation
 - Cracks
 - Corrosion
 - Leaks
 - Bends
 - Twists
- (b) Check all the clamps for tightness and connections for leakage.
- (c) Check that the hoses and lines are not near sharp edges, moving parts and the exhaust system.
- (d) Check that the lines installed pass through the center of the grommets.

2. INSPECT FRONT BRAKE PADS AND DISCS

(See page [BR-44](#))

HINT:

If a squealing or scraping noise occurs from the brake during driving, check the pad wear indicator.

If there are traces of the indicator contacting the disc rotor, the disc pad should be replaced.

3. INSPECT REAR BRAKE LININGS AND DRUMS

(See page [BR-51](#))

CHASSIS

INSPECTION

1. INSPECT STEERING LINKAGE

- (a) Check the steering wheel freeplay (see page [SR-9](#)).
- (b) Check the steering linkage for looseness or damage.
 - Check that the tie rod ends do not have excessive play.
 - Check that the dust seals and boots are not damaged.
 - Check that the boot clamps are not loose.

2. INSPECT STEERING GEAR HOUSING OIL

Check the steering gear housing for oil leaks.

If leakage is found, check for cause and repair.

3. INSPECT BALL JOINTS AND DUST COVERS

- (a) Inspect the ball joints for excessive looseness.
- (b) Inspect the dust cover for damage.

4. 4WD:

INSPECT DRIVE SHAFT BOOTS

Inspect the drive shaft boots for loose clamps, grease leakage or damage.

5. CHECK OIL LEVEL IN MANUAL TRANSMISSION, TRANSFER AND DIFFERENTIAL

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole.

If the level is low, add oil until it reaches the bottom of the fire hole.

Transmission oil: See page [MT-7](#).

Transfer oil: See page [TR-5](#).

Front differential oil (4WD): See page [SA-36](#).

Rear differential oil: See page [SA-101](#).

6. REPLACE MANUAL TRANSMISSION, TRANSFER AND DIFFERENTIAL OIL

- (a) Remove the drain plug and drain the oil.
- (b) Reinstall drain plug securely.
- (c) Add new oil until it reaches the bottom of the fire hole.

Transmission oil: See page [MT-7](#).

Transfer oil: See page [TR-5](#).

Front differential oil (4WD): See page [SA-36](#).

Rear differential oil: See page [SA-101](#).

7. CHECK FLUID LEVEL IN AUTOMATIC TRANSMISSION (See page [AT-4](#))

8. REPLACE AUTOMATIC TRANSMISSION FLUID

- (a) Remove the drain plug and drain the fluid.
- (b) Reinstall the drain plug securely.
- (c) Fill the transmission (See page [AT-4](#)).

9. LUBRICATE PROPELLER SHAFT AND TIGHTEN BOLTS

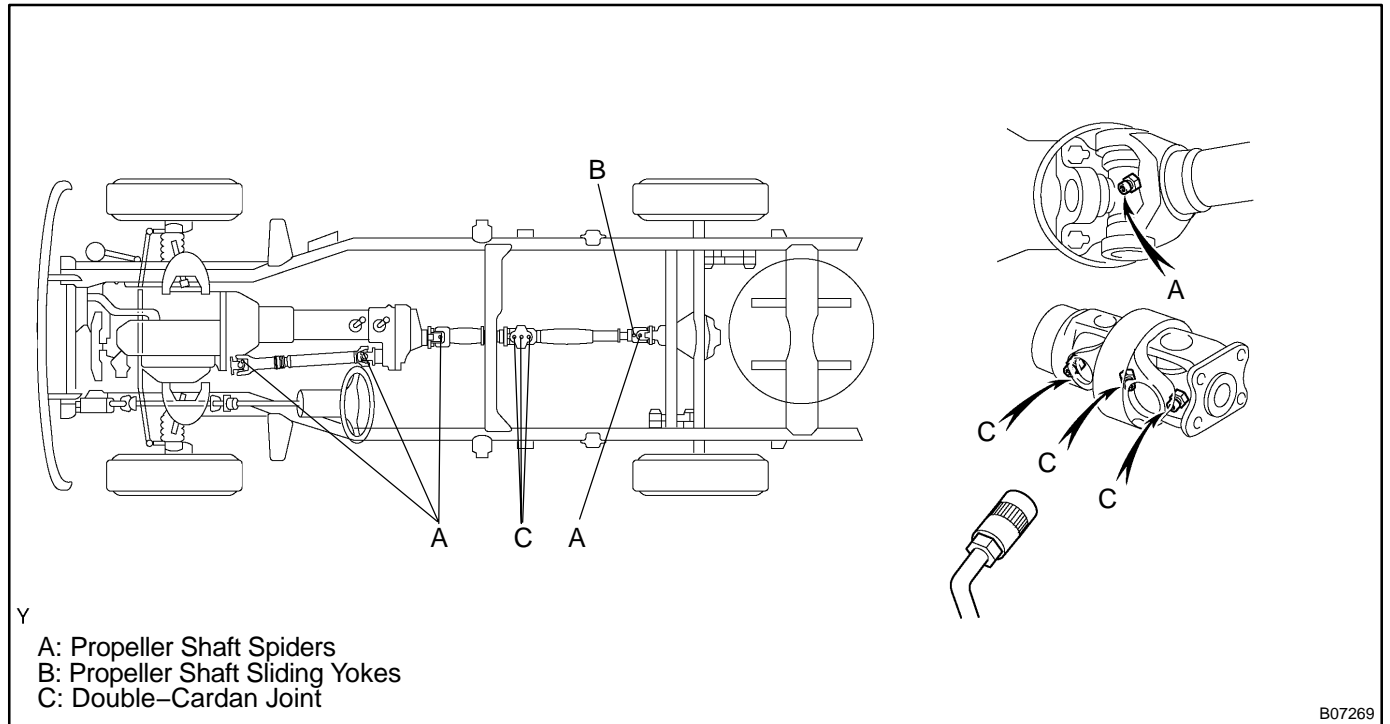
(a) 4WD:

Lubricate the propeller shaft, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

Grease grade:

Propeller shaft (Except Double-cardan joint): Lithium base chassis grease NLGI No. 2

Double-cardan joint: Molybdenum disulphide lithium base chassis grease NLGI No. 2



(b) Tighten the bolts for propeller shaft (2WD: See page PR-8) (4WD: See page PR-15).

10. ROTATE TIRES (See page SA-3)

BODY

MA04E-02

INSPECTION

TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

- (a) Where necessary, tighten all parts of the chassis.
- Front axle and suspension
 - Drive train
 - Rear axle and suspension
 - Brake system
 - Engine mounting, etc.
- (b) Where necessary, tighten all parts of the body.
- Seat belt system
 - Seats
 - Doors and hood
 - Body mountings
 - Fuel tank
 - Exhaust pipe system, etc.

MAINTENANCE EQUIPMENT

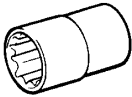

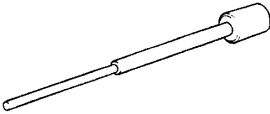
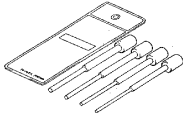
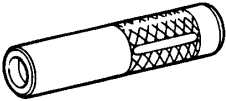
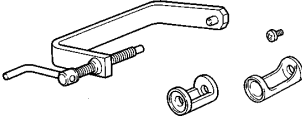
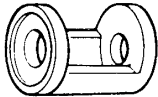
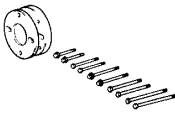
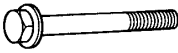

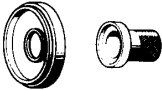
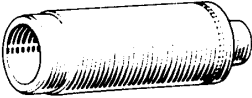
PP05-02

Mirror	Brake hose
Torque wrench	


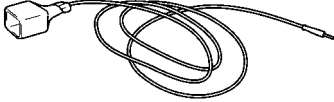

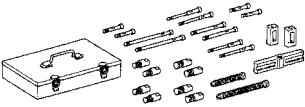
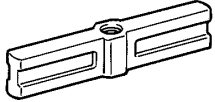
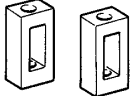
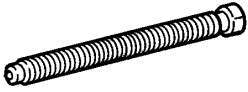
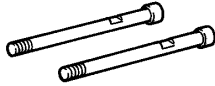
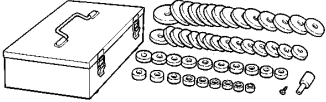


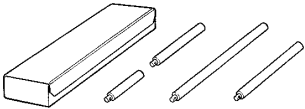

ENGINE MECHANICAL (1GR-FE)

SST (Special Service Tools)

PP445-01

	09011-38121	12 mm Socket Wrench for 12 Pointed Head	CYLINDER BLOCK
	09032-00100	Oil Pan Seal Cutter	TIMING CHAIN
	09201-01055	Valve Guide Bushing Remover & Replacer 5.5	CYLINDER HEAD
	09201-10000	Valve Guide Bushing Remover & Replacer Set	CYLINDER HEAD
	09201-41020	Valve Stem Oil Seal Replacer	CYLINDER HEAD
	09202-70020	Valve Spring Compressor	CYLINDER HEAD
	(09202-00010)	Attachment	CYLINDER HEAD
	09213-54015	Crankshaft Pulley Holding Tool	TIMING CHAIN
	(91651-60855)	Bolt	TIMING CHAIN
	09222-30010	Connecting Rod Bushing Remover & Replacer	CYLINDER BLOCK
	09223-78010	Crankshaft Oil Seal Replacer	CYLINDER BLOCK
	09226-10010	Crankshaft Front & Rear Bearing Replacer	TIMING CHAIN

PREPARATION - ENGINE MECHANICAL (1GR-FE)

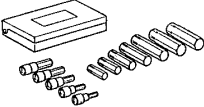
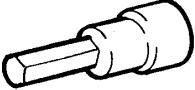
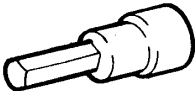
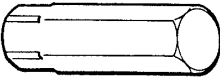
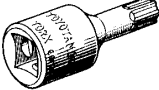
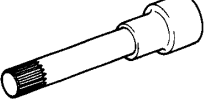
	<p>09330-00021 Companion Flange Holding Tool</p>	<p>TIMING CHAIN</p>
	<p>09843-18030 Tacho-pulse Pickup Wire No.2</p>	<p>IDLE SPEED</p>
	<p>09843-18040 Diagnosis Check Wire No.2</p>	<p>IGNITION TIMING</p>
	<p>09950-50013 Puller C Set</p>	<p>TIMING CHAIN</p>
	<p>(09951-05010) Hanger 150</p>	<p>TIMING CHAIN</p>
	<p>(09952-05010) Slide Arm</p>	<p>TIMING CHAIN</p>
	<p>(09953-05020) Center Bolt 150</p>	<p>TIMING CHAIN</p>
	<p>(09954-05031) Claw No.3</p>	<p>TIMING CHAIN</p>
	<p>09950-60010 Replacer Set</p>	<p>CYLINDER BLOCK CYLINDER HEAD</p>
	<p>(09951-00250) Replacer 25</p>	<p>CYLINDER HEAD</p>
	<p>(09951-00350) Replacer 35</p>	<p>CYLINDER BLOCK</p>
	<p>09950-70010 Handle Set</p>	<p>CYLINDER BLOCK CYLINDER HEAD</p>
	<p>(09951-07100) Handle 100</p>	<p>CYLINDER HEAD</p>



(09951-07150) Handle 150

CYLINDER BLOCK
CYLINDER HEAD

RECOMMENDED TOOLS

	09040-00011 Hexagon Wrench Set .	
	(09043-20080) Socket Hexagon Wrench 8.	
	(09043-20100) Socket Hexagon Wrench 10.	
	(09043-30140) Straight Hexagon Wrench 14.	
	09042-00010 Torx Socket T30 .	
	09043-50100 Bi-hexagon Wrench 10 mm .	

EQUIPMENT

CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator with magnetic base	
Engine sling device	
Feeler gauge	
Heater	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Reamer	
Spring tester	
Steel square	
Tachometer	
Timing light	
Torque wrench	
Valve seat cutter	
V-block	
Vernier calipers	
Wooden block	
Press	

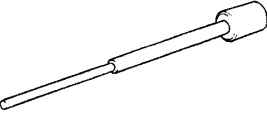
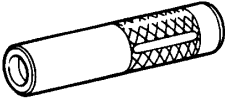
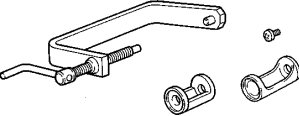
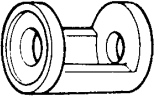

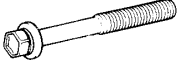
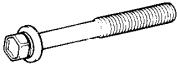

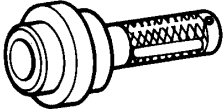
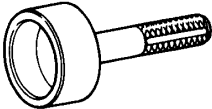

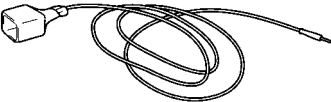
SSM (Special Service Materials)

08826-00080	Seal Packing Black or equivalent (FIPG)	
08826-00100	Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	
08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	


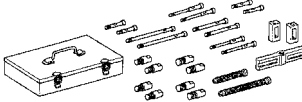
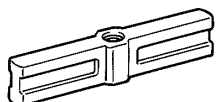
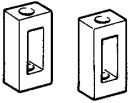
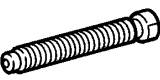

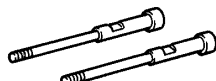
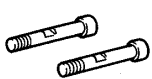
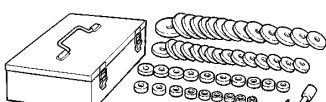


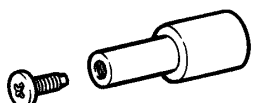
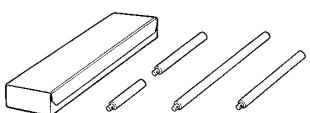
ENGINE MECHANICAL (2UZ-FE)


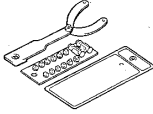
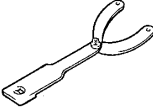


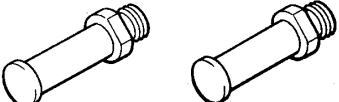
SST (Special Service Tools)

PP431-01

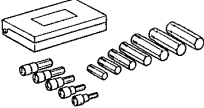

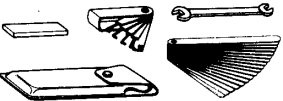


	09201-01055	Valve Guide Bushing Remover & Replacer 5.5	
	09201-41020	Valve Stem Oil Seal Replacer	
	09202-70020	Valve Spring Compressor	
	(09202-00010)	Attachment	
	09213-70011	Crankshaft Pulley Holding Tool	
	(90105-08076)	Bolt	
	(90119-08216)	Bolt	
	09222-30010	Connecting Rod Bushing Remover & Replacer	
	09223-46011	Crankshaft Front Oil Seal Replacer	Crankshaft pulley Crankshaft timing pulley
	09223-56010	Crankshaft Rear Oil Seal Replacer	
	09330-00021	Companion Flange Holding Tool	Crankshaft pulley
	09843-18030	Tacho-pulse Pickup Wire No.2	

PREPARATION - ENGINE MECHANICAL (2UZ-FE)

	<p>09843-18040 Diagnosis Check Wire No.2</p>	
	<p>09950-50013 Puller C Set</p>	
	<p>(09951-05010) Hanger 150</p>	<p>Crankshaft pulley Crankshaft timing pulley</p>
	<p>(09952-05010) Slide Arm</p>	<p>Crankshaft pulley Crankshaft timing pulley</p>
	<p>(09953-05010) Center Bolt 100</p>	<p>Crankshaft pulley Crankshaft timing pulley</p>
	<p>(09953-05020) Center Bolt 150</p>	<p>Crankshaft pulley Crankshaft timing pulley</p>
	<p>(09954-05011) Claw No.1</p>	<p>Crankshaft timing pulley</p>
	<p>(09954-05021) Claw No.2</p>	<p>Crankshaft pulley</p>
	<p>09950-60010 Replacer Set</p>	
	<p>(09951-00240) Replacer 24</p>	
	<p>(09951-00440) Replacer 44</p>	
	<p>(09952-06010) Adapter</p>	
	<p>09950-70010 Handle Set</p>	

	(09951-07100) Handle 100	Spark plug tube Valve guide bushing
	09960-10010 Variable Pin Wrench Set	
	(09962-01000) Variable Pin Wrench Arm Assy	Camshaft sub-gear
	(09963-00400) Pin 4	Camshaft sub-gear
	(09963-00500) Pin 5	Camshaft sub-gear
	(09963-01000) Pin 10	Camshaft sub-gear

RECOMMENDED TOOLS

	09040-00011 Hexagon Wrench Set .	
	09090-04020 Engine Sling Device	For suspension engine
	09200-00010 Engine Adjust Kit .	
	09258-00030 Hose Plug Set .	Plug for vacuum hose, fuel hose etc.
	09904-00010 Expander Set .	

EQUIPMENT

Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune-up tester	
Groove cleaning tool	
Heater	
Magnetic finger	
Micrometer	
Pin hole grinder	
OBD II scan tool	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Press	
Soft brush	
Ridge reamer	
Solvent	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
V-block	
Vernier calipers	
Wire brush	Valve

SSM (Special Service Materials)

08826-00080	Seal Packing Black or equivalent (FIPG)	Camshaft bearing cap Cylinder head semi-circular plug Cylinder head cover Rear oil seal retainer
08826-00080	Seal Packing Black or equivalent (FIPG)	Camshaft housing plug
08826-00100	Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	Coolant drain union
08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	Drive plate bolt Torque converter clutch bolt
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	No.1 idler pulley bolt

EMISSION CONTROL (1GR-FE) EQUIPMENT

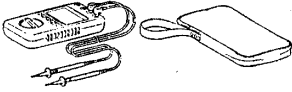
PP43H-01

Vacuum gauge	
Pressure gauge	

EMISSION CONTROL (2UZ-FE)

RECOMMENDED TOOLS

PP42V-02

	09082-00040 TOYOTA Electrical Tester.	
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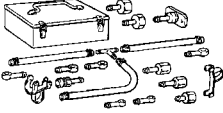
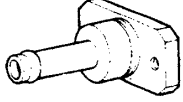
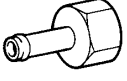

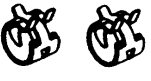
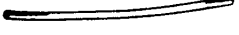
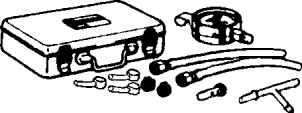


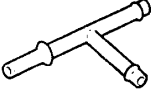
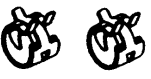
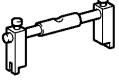
EQUIPMENT






MITYVAC (Hand-held vacuum pump)	
Pressure gauge	
Torque wrench	
Vacuum gauge	
Hose Clipper	

SFI (1GR-FE)

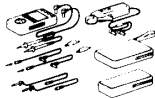
SST (Special Service Tools)

PP43I-01

	<p>09268-41047 Injection Measuring Tool Set</p>	<p>INJECTOR FUEL PUMP</p>
	<p>(09268-41091) NO.7 Union</p>	<p>INJECTOR</p>
	<p>09268-41140 Adapter</p>	<p>INJECTOR</p>
	<p>09268-41400 Clamp</p>	<p>INJECTOR</p>
	<p>(90467-13001) Clip</p>	<p>FUEL PUMP</p>
	<p>(95336-08070) Hose</p>	<p>INJECTOR FUEL PUMP</p>
	<p>09268-45014 EFI Fuel Pressure Gauge</p>	<p>FUEL PUMP</p>
	<p>(09268-41200) Gauge</p>	<p>FUEL PUMP</p>
	<p>(09268-41220) Hose</p>	<p>FUEL PUMP</p>
	<p>(09268-41250) T Joint</p>	<p>FUEL PUMP</p>
	<p>(90467-13001) Clip</p>	<p>FUEL PUMP</p>
	<p>09808-14020 Retainer Tool, Fuel Pump</p>	<p>FUEL PUMP</p>

	(09808-01410) Holder	FUEL PUMP
	(09808-01420) Claw	FUEL PUMP
	(09808-01430) Bolt	FUEL PUMP
	09842-30070 Wiring "F" EFI Inspection	SFI SYSTEM
	09842-30080 EFI Inspection Wire "H"	INJECTOR

RECOMMENDED TOOLS

	09082-00050 TOYOTA Electrical Tester Set.	
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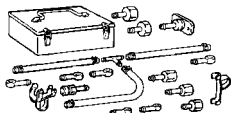
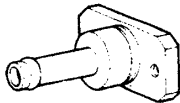
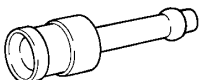

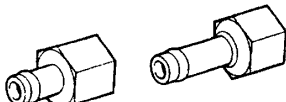
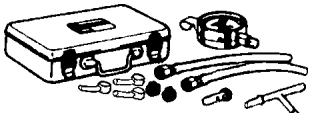
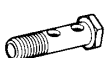

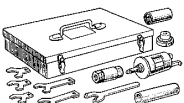
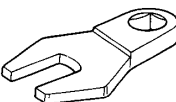
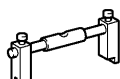
EQUIPMENT





Graduated cylinder	
Transmission jack	

SFI (2UZ-FE)

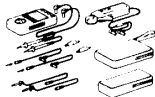


SST (Special Service Tools)

PP433-01

	09268-21010 Fuel Hose Puller	
	09268-41047 Injection Measuring Tool Set	
	(09268-41091) NO.7 Union	
	(09268-41110) Adaptor	
	(09268-41300) Clamp	
	(09268-52011) Injection Measuring Attachment	
	09268-45014 EFI Fuel Pressure Gauge	
	(09268-41190) Adapter	
	(90405-06167) I Union	
	09612-24014 Steering Gear Housing Overhaul Tool Set	
	(09617-24011) Steering Rack Wrench	Fuel pressure pulsation damper
	09808-14020 Retainer Tool, Fuel Pump	

	(09808-01410) Holder	
	(09808-01420) Claw	
	(09808-01430) Bolt	
	09842-30070 Wiring "F" EFI Inspection	

RECOMMENDED TOOLS

	09082-00050 TOYOTA Electrical Tester Set.	
	(09082-00040) TOYOTA Electrical Tester.	
	09258-00030 Hose Plug Set .	Plug for vacuum hose, fuel hose etc.

EQUIPMENT

Graduated cylinder	Injector
OBD II scan tool	
Sound scope	Injector
Torque wrench	
Vacuum gauge	

COOLING (1GR-FE)

EQUIPMENT

PP435-01

Heater	
Radiator cap tester	
Slide calipers	
Thermometer	
Torque wrench	

COOLANT

Item	Capacity	Classification
Engine coolant	11.6 liters (12.3 US qts, 10.2 Imp. qts)	"Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology

COOLING (2UZ-FE)

EQUIPMENT

PP1AQ-05

Heater	Thermostat
Radiator cap tester	
Thermometer	Thermostat
Torque wrench	

COOLANT

Item	Capacity	Classification
Engine coolant	11.6 liters (12.3 US qts, 10.2 Imp. qts)	"TOYOTA Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology

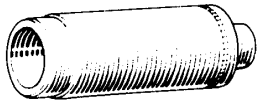
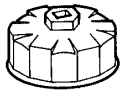
SSM (Special Service Materials)

	08826-00100 Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	Water inlet housing
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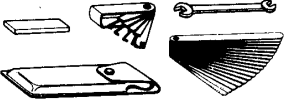
LUBRICATION (1GR-FE)

SST (Special Service Tools)

PP43L-01

	09226-10010 Crankshaft Front & Rear Bearing Replacer	OIL PUMP
	09228-07501 Oil Filter Wrench	OIL AND FILTER

RECOMMENDED TOOLS

	09200-00010 Engine Adjust Kit .	
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EQUIPMENT

Oil pressure gauge	
Drain hose	

LUBRICANT

Engine oil			API grade SL, Energy-Conserving or ILSAC multigrade engine oil. SAE 5W-30 is the best choice for good fuel economy, and good starting in cold weather.
Drain and refill	w/ Oil filter change	4.5 liters (4.8 US qts, 4.0 Imp. Qts)	
	w/o Oil filter change	4.2 liters (4.4 US qts, 3.7 Imp. Qts)	
Dry fill		5.6 liters (5.9 US qts, 4.9 Imp. Qts)	



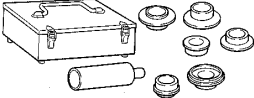

SSM (Special Service Materials)

08833-00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	
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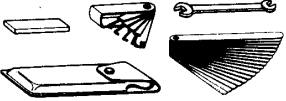
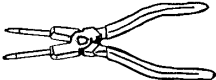
LUBRICATION (2UZ-FE)

SST (Special Service Tools)

PP24A-04

	09032-00100 Oil Pan Seal Cutter	
	09228-07501 Oil Filter Wrench	
	09316-60011 Transmission & Transfer Bearing Replacer	
	(09316-00011) Replacer Pipe	Crankshaft front oil seal

RECOMMENDED TOOLS

	09200-00010 Engine Adjust Kit .	
	09905-00013 Snap Ring Pliers .	

EQUIPMENT

Oil pressure gauge	
Precision straight edge	
Torque wrench	

LUBRICANT

Item	Capacity	Classification
Engine oil Dry fill Drain and refill w/ Oil filter change w/o Oil filter change	7.1 liters (7.5 US qts, 6.2 Imp. qts) 6.2 liters (6.6 US qts, 5.5 Imp. qts) 5.7 liters (6.0 US qts, 5.0 Imp qts)	API grade SL Energy-Conserving or ILSAC multigrade engine oil.

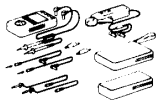
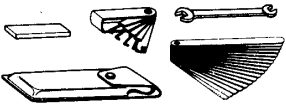
SSM (Special Service Materials)

08826-00080	Seal Packing Black or equivalent (FIPG)	Oil pump No.1 oil pan No.2 oil pan
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Oil pressure switch

IGNITION (1GR-FE)

RECOMMENDED TOOLS

PP43Q-01

	<p>09082-00050 TOYOTA Electrical Tester Set.</p>	
	<p>09200-00010 Engine Adjust Kit .</p>	

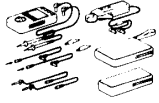

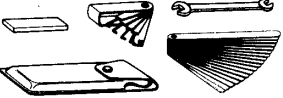
EQUIPMENT

Spark plug cleaner	
Torque wrench	

IGNITION (2UZ-FE)

RECOMMENDED TOOLS

PP3WQ-01

	<p>09082-00050 TOYOTA Electrical Tester Set.</p>	
	<p>(09082-00040) TOYOTA Electrical Tester.</p>	
	<p>09200-00010 Engine Adjust Kit .</p>	

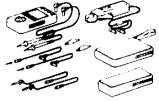

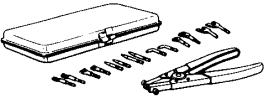

EQUIPMENT

Megger (Insulation resistance meter)	Spark plug
Spark plug cleaner	
Torque wrench	

STARTING (1GR-FE)

RECOMMENDED TOOLS

PP438-01

	<p>09082-00050 TOYOTA Electrical Tester Set.</p>	
	<p>(09082-00040) TOYOTA Electrical Tester.</p>	
	<p>09904-00010 Expander Set .</p>	
	<p>(09904-00050) No. 4 Claw</p>	

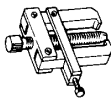
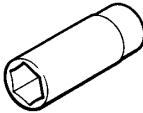

EQUIPMENT

Dial indicator	Commutator
Magnetic finger	Steel ball
Press	Armature bearing, Magnetic switch terminal kit
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V-block	Commutator
Vernier calipers	Commutator, Brush

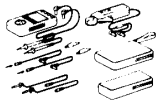

STARTING (2UZ-FE)

SST (Special Service Tools)

PP1AZ-07

	09286-46011	Injection Pump Spline Shaft Puller	Armature bearing
	09810-38140	Starter Magnet Switch Nut Wrench 14	
	09820-00031	Alternator Rear Bearing Replacer	Armature front bearing

RECOMMENDED TOOLS

	<p>09082-00050 TOYOTA Electrical Tester Set.</p>	
	<p>(09082-00040) TOYOTA Electrical Tester.</p>	


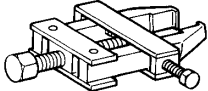

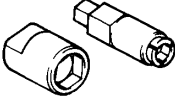
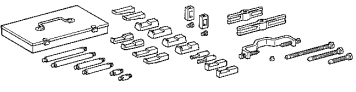
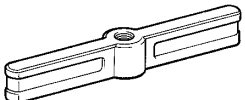
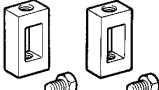
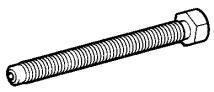
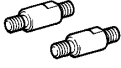
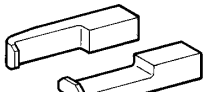

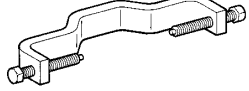
EQUIPMENT

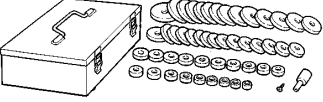


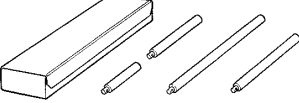

Dial indicator	Commutator
Magnetic finger	Steel ball
Press	Armature bearing, Magnetic switch terminal kit
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V-block	Commutator
Vernier calipers	Commutator, Brush

CHARGING (1GR-FE)

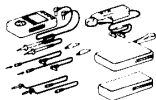

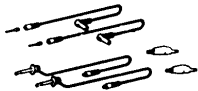
SST (Special Service Tools)

PP43C-01

	09285-76010	Injection Pump Camshaft Bearing Cone Replacer	
	09820-00021	Alternator Rear Bearing Puller	
	09820-00031	Alternator Rear Bearing Replacer	
	09820-63011	Alternator Pulley Set Nut Wrench Set	
	09950-40011	Puller B Set	
	(09951-04020)	Hanger 200	
	(09952-04010)	Slide Arm	
	(09953-04020)	Center Bolt 150	
	(09954-04010)	Arm 25	
	(09955-04071)	Claw No.7	
	(09957-04010)	Attachment	
	(09958-04011)	Holder	

	09950-60010 Replacer Set	
	(09951-00250) Replacer 25	
	(09951-00470) Replacer 47	
	09950-70010 Handle Set	
	(09951-07100) Handle 100	

RECOMMENDED TOOLS

	09082-00050 TOYOTA Electrical Tester Set.	
	(09082-00040) TOYOTA Electrical Tester.	
	(09083-00150) Test Lead Set	


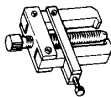
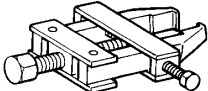

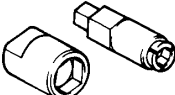
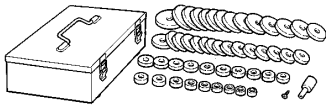



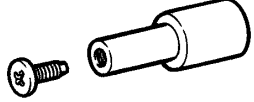
EQUIPMENT

Ammeter (A)	
Dial indicator with magnetic base	
Ohmmeter	

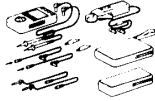
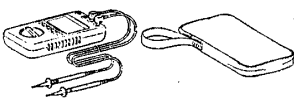
CHARGING (2UZ-FE)

SST (Special Service Tools)

PP249-03

	09285-76010	Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286-46011	Injection Pump Spline Shaft Puller	Rectifier end frame
	09820-00021	Alternator Rear Bearing Puller	
	09820-00031	Alternator Rear Bearing Replacer	
	09820-63011	Alternator Pulley Set Nut Wrench Set	
	09950-60010	Replacer Set	Rotor front bearing
	(09951-00260)	Replacer 26	
	(09951-00460)	Replacer 46	70 A type
	(09951-00520)	Replacer 52	80 A type
	(09952-06010)	Adapter	

RECOMMENDED TOOLS

	<p>09082-00050 TOYOTA Electrical Tester Set.</p>	
	<p>(09082-00040) TOYOTA Electrical Tester.</p>	

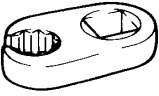
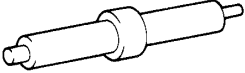
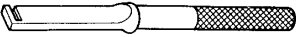
EQUIPMENT

Battery specific gravity gauge+	Battery
Torque wrench	
Vernier calipers	Rotor (Slip ring)

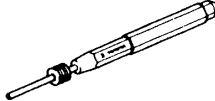

CLUTCH

SST (Special Service Tools)

PP43G-01

	09023-00101 Union Nut Wrench 10mm	CLUTCH RELEASE CYLINDER CLUTCH MASTER CYLINDER
	09301-00110 Clutch Guide Tool	CLUTCH UNIT
	09333-00013 Clutch Diaphragm Spring Aligner	CLUTCH UNIT

RECOMMENDED TOOLS

	09031-00030 Pin Punch .	
	09904-00010 Expander Set .	



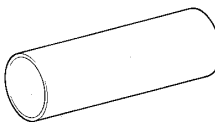
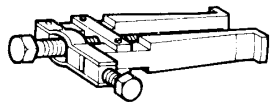

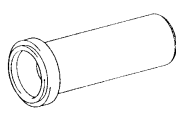
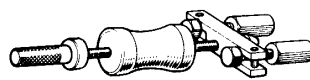
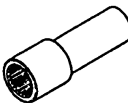

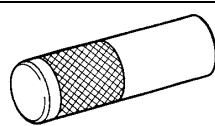
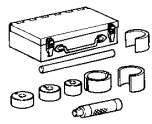

EQUIPMENT

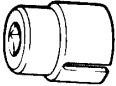
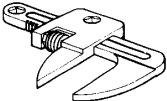
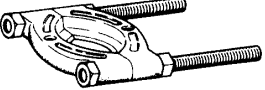
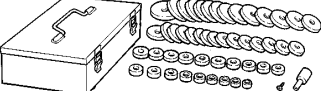


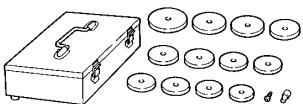

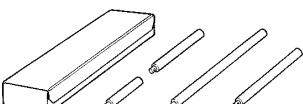



Vernier calipers	
Dial indicator	

MANUAL TRANSMISSION (RA60)

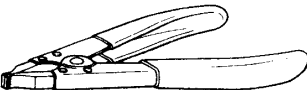
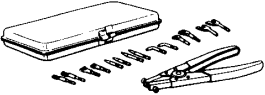
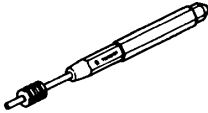
SST (Special Service Tools)

PP444-01

	09023-00101	Union Nut Wrench 10mm	MANUAL TRANSMISSION UNIT
	09255-10012	Crankshaft Rear Bearing Remover & Replacer	MANUAL TRANSMISSION ASSEMBLY
	09308-14010	Replacer Pipe A	COUNTER GEAR INPUT SHAFT
	09308-55010	Oil Seal Puller	MANUAL TRANSMISSION ASSEMBLY
	09309-37010	Transmission Bearing Replacer	COUNTER GEAR INPUT SHAFT
	09388-40010	Input Oil Seal Replacer	MANUAL TRANSMISSION ASSEMBLY
	09520-00031	Rear Axle Shaft Puller	MANUAL TRANSMISSION ASSEMBLY
	09556-16030	Differential Drive Pinion Holding Tool 28	MANUAL TRANSMISSION ASSEMBLY
	(09608-03070)	Replacer <mk2>	COUNTER GEAR
	09608-06041	Front Hub Inner Bearing Cone Replacer	COUNTER GEAR
	09710-20010	Front Suspension Bushing Tool Set<mk2>	OUTPUT SHAFT
	(09710-06060)	Spacer<mk2>	OUTPUT SHAFT

	<p>09817-16011 Back-up Light Switch Tool</p>	<p>MANUAL ASSEMBLY TRANSMISSION</p>
	<p>09922-10010 Variable Open Wrench</p>	<p>MANUAL ASSEMBLY TRANSMISSION</p>
	<p>09950-00020 Bearing Remover</p>	<p>COUNTER GEAR OUTPUT SHAFT INPUT SHAFT</p>
	<p>09950-60010 Replacer Set</p>	<p>COUNTER GEAR OUTPUT SHAFT MANUAL TRANSMISSION ASSEMBLY</p>
	<p>(09951-00540) Replacer 54</p>	<p>COUNTER GEAR</p>
	<p>(09951-00650) Replacer 65</p>	<p>OUTPUT SHAFT MANUAL TRANSMISSION ASSEMBLY</p>
	<p>09950-60020 Replacer Set No.2</p>	<p>MANUAL ASSEMBLY TRANSMISSION</p>
	<p>(09951-00640) Replacer 64</p>	<p>MANUAL ASSEMBLY TRANSMISSION</p>
	<p>09950-70010 Handle Set</p>	<p>MANUAL ASSEMBLY TRANSMISSION</p>
	<p>(09951-07100) Handle 100</p>	<p>MANUAL ASSEMBLY TRANSMISSION</p>
	<p>(09951-07360) Handle 360</p>	<p>MANUAL ASSEMBLY TRANSMISSION</p>
	<p>(09951-07360) Handle 360</p>	<p>MANUAL ASSEMBLY TRANSMISSION</p>

RECOMMENDED TOOLS

	09905-00012 Snap Ring No.1 Expander	
	09904-00010 Expander Set .	
	09031-00040 Pin Punch .	

EQUIPMENT

Plastic hammer	
Chisel	
Feeler gauge	
Dial indicator with magnetic base	
Belt	
Wooden block	
Hexagon wrench	
Vernier caliper	
Micrometer	
Cylinder gauge	

LUBRICANT

Transmission oil	1.8 liters (1.9 US qts, 1.5 Imp. qts)	API GL-4 or GL-5 SAE 75W-90
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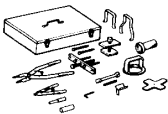
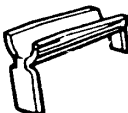
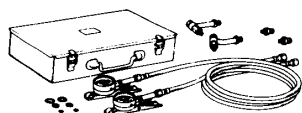
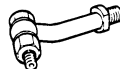

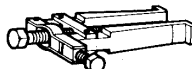


SSM (Special Service Materials)

08826-00090 Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	
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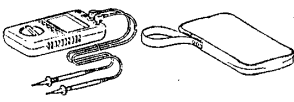
AUTOMATIC TRANSMISSION (A750E, A750F)

SST (Special Service Tools)

PP420-01

	09350-30020	TOYOTA Automatic Transmission Tool Set	
	(09351-32020)	Stator Stopper	Torque converter clutch and drive plate
	09992-00095	Automatic Transmission Oil Pressure Gauge Set	
	(09992-00231)	Adaptor C	
	(09992-00271)	Gauge Assy	
	09308-10010	Oil Seal Puller	Extension housing oil seal
	09325-40010	Transmission Oil Plug	Extension housing oil seal
	09023-12701	Union Nut Wrench 17mm	Oil cooler pipe

RECOMMENDED TOOLS

	09082-00040 TOYOTA Electrical Tester.	
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EQUIPMENT

OBD II scan tool	
Torque wrench	
Calipers	Torque converter clutch
Straight edge	Torque converter clutch
Dial indicator	Drive plate runout


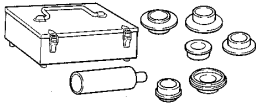
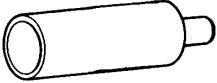


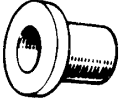
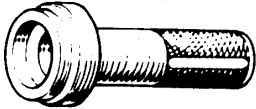
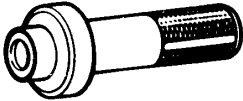

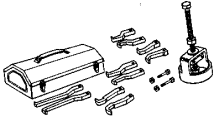
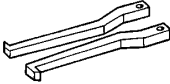
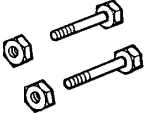
LUBRICANT


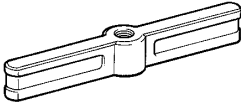
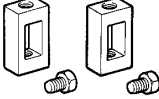
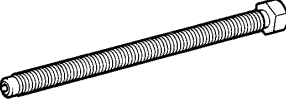
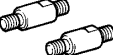
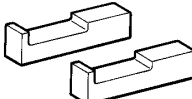

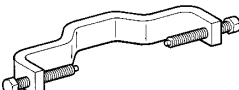
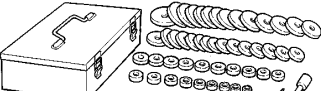




Item	Capacity	Classification
Automatic transmission fluid Dry fill Drain and refill	10.4 liters (11.0 US qts, 9.2 Imp qts) 3.0 liters (3.2 US qts, 2.6 Imp qts)	Toyota Genuine ATF WS

TRANSFER

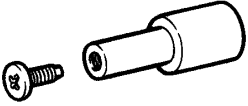
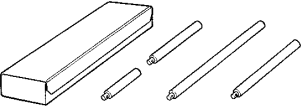

SST (Special Service Tools)

PP43Y-01

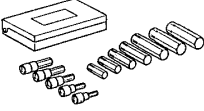
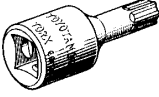

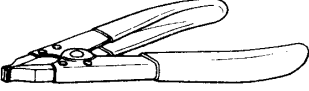
	<p>09223-15020 Oil Seal & Bearing Replacer</p>	<p>PLANETARY GEAR</p>
	<p>09316-60011 Transmission & Transfer Bearing Replacer</p>	<p>OIL SEAL REAR OUTPUT SHAFT</p>
	<p>(09316-00011) Replacer Pipe</p>	<p>OIL SEAL REAR OUTPUT SHAFT</p>
	<p>(09316-00071) Replacer "F"</p>	<p>REAR OUTPUT SHAFT</p>
	<p>09330-00021 Companion Flange Holding Tool</p>	<p>TRANSFER ASSEMBLY</p>
	<p>09515-30010 Rear Wheel Bearing Replacer</p>	<p>PLANETARY GEAR</p>
	<p>09554-22010 Differential Oil Seal Replacer</p>	<p>OIL SEAL</p>
	<p>09554-30011 Differential Oil Seal Replacer</p>	<p>PLANETARY GEAR</p>
	<p>09555-55010 Differential Drive Pinion Bearing Replacer</p>	<p>PLANETARY GEAR REAR OUTPUT SHAFT DRIVEN SPROCKET</p>
	<p>09612-65014 Steering Worm Bearing Puller</p>	<p>PLANETARY GEAR</p>
	<p>(09612-01030) Claw "C"</p>	<p>PLANETARY GEAR</p>
	<p>(09612-01050) Hanger Pin with Nut</p>	<p>PLANETARY GEAR</p>

	<p>09950-40011 Puller B Set</p>	<p>TRANSFER ASSEMBLY</p>
	<p>(09951-04020) Hanger 200</p>	<p>TRANSFER ASSEMBLY</p>
	<p>(09952-04010) Slide Arm</p>	<p>TRANSFER ASSEMBLY</p>
	<p>(09953-04030) Center Bolt 200</p>	<p>TRANSFER ASSEMBLY</p>
	<p>(09954-04010) Arm 25</p>	<p>TRANSFER ASSEMBLY</p>
	<p>(09955-04051) Claw No.5</p>	<p>TRANSFER ASSEMBLY</p>
	<p>(09957-04010) Attachment</p>	<p>TRANSFER ASSEMBLY</p>
	<p>(09958-04011) Holder</p>	<p>TRANSFER ASSEMBLY</p>
	<p>09950-60010 Replacer Set</p>	<p>OIL SEAL PLANETARY GEAR</p>
	<p>(09951-00220) Replacer 22</p>	<p>OIL SEAL</p>
	<p>(09951-00350) Replacer 35</p>	<p>OIL SEAL</p>
	<p>(09951-00570) Replacer 57</p>	<p>PLANETARY GEAR</p>
	<p>(09951-00590) Replacer 59</p>	<p>OIL SEAL</p>

PREPARATION - TRANSFER

	<p>(09952-06010) Adapter</p>	<p>OIL SEAL</p>
	<p>09950-70010 Handle Set</p>	<p>OIL SEAL PLANETARY GEAR</p>
	<p>(09951-07100) Handle 100</p>	<p>OIL SEAL PLANETARY GEAR</p>

RECOMMENDED TOOLS

	<p>09040-00011 Hexagon Wrench Set .</p>	
	<p>09042-00010 Torx Socket T30 .</p>	
	<p>(09082-00040) TOYOTA Electrical Tester.</p>	
	<p>09905-00012 Snap Ring No.1 Expander</p>	

EQUIPMENT

Dial indicator	
Micrometer	
Torque wrench	
Feeler gauge	
Magnetic finger	
Steel square	

LUBRICANT

Transfer oil	1.0 liters (1.1 US qts, 0.9 Imp. Qts)	API GL-4 or GL-5 SAE 75W-90
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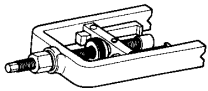
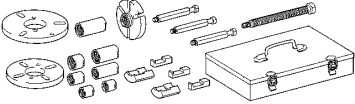




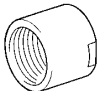
SSM (Special Service Materials)

08826-00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

PROPELLER SHAFT

SST (Special Service Tools)

PPOEY-04

	09325-40010	Transmission Oil Plug	PROPELLER SHAFT ASSEMBLY
	09330-00021	Companion Flange Holding Tool	PROPELLER SHAFT ASSEMBLY
	09332-25010	Universal Joint Bearing Remover & Replacer	SPIDER BEARING
	09950-30012	Puller A Set	PROPELLER SHAFT ASSEMBLY
	(09951-03010)	Upper Plate	PROPELLER SHAFT ASSEMBLY
	(09953-03010)	Center Bolt	PROPELLER SHAFT ASSEMBLY
	(09954-03010)	Arm	PROPELLER SHAFT ASSEMBLY
	(09955-03030)	Lower Plate 130	PROPELLER SHAFT ASSEMBLY
	(09956-03020)	Adapter 18	PROPELLER SHAFT ASSEMBLY




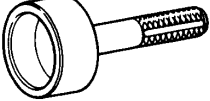
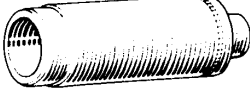
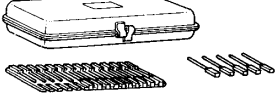

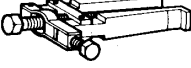


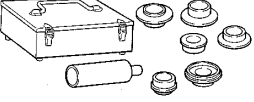

EQUIPMENT

Dial indicator	
Torque wrench	






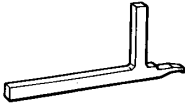


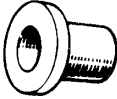

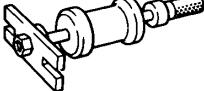
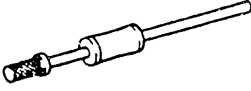
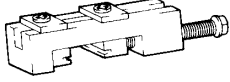
SUSPENSION AND AXLE




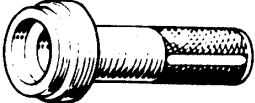

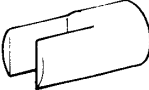
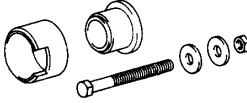

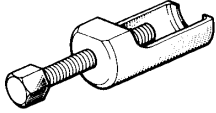
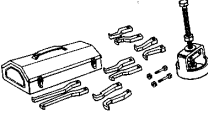
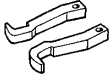
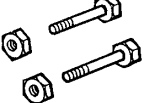
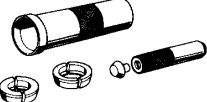
SST (Special Service Tools)

PP25D-04

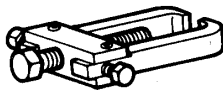

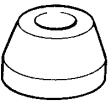
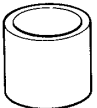
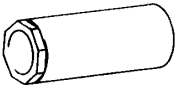

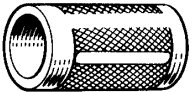
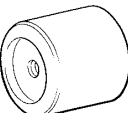
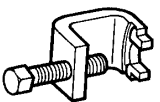
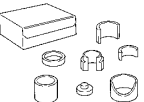

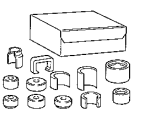

	09023-00101	Union Nut Wrench 10mm	Rear axle
	09223-15020	Oil Seal & Bearing Replacer	Front differential
	09223-15030	Oil Seal & Bearing Replacer	Front axle
	09223-56010	Crankshaft Rear Oil Seal Replacer	Rear axle
	09226-10010	Crankshaft Front & Rear Bearing Replacer	Front differential
	09240-00020	Wire Gauge Set	Front drive shaft
	09308-00010	Oil Seal Puller	Front differential Rear axle
	09308-10010	Oil Seal Puller	Front differential Rear differential
	09309-37010	Transmission Bearing Replacer	Front differential Front suspension
	09316-12010	Transfer Bearing Replacer	Rear differential
	09316-60011	Transmission & Transfer Bearing Replacer	Rear axle
	(09316-00051)	Replacer "D"	

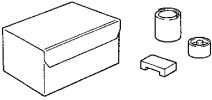

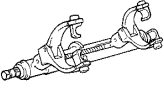
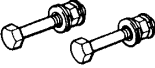
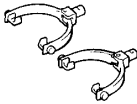
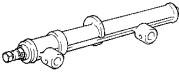
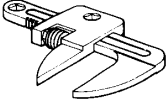
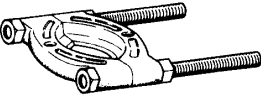
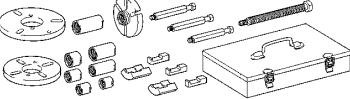



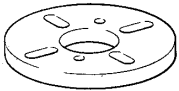
PREPARATION - SUSPENSION AND AXLE

	<p>09318-12010 Transfer Bearing Adjusting Nut Wrench</p>	<p>Front axle (2WD)</p>
	<p>09330-00021 Companion Flange Holding Tool</p>	<p>Front differential Rear differential</p>
	<p>09350-20015 TOYOTA Automatic Transmission Tool Set</p>	<p>Front differential</p>
	<p>(09369-20040) Piston Spring Compressor Set</p>	
	<p>09502-12010 Differential Bearing Replacer</p>	<p>Front differential Front suspension</p>
	<p>09504-22012 Differential Side Bearing Replacer</p>	<p>Rear differential</p>
	<p>09506-30012 Differential Drive Pinion Rear Bearing Cone Replacer</p>	<p>Front differential</p>
	<p>09506-35010 Differential Drive Pinion Rear Bearing Replacer</p>	<p>Rear differential</p>
	<p>09515-30010 Rear Wheel Bearing Replacer</p>	<p>Rear axle</p>
	<p>09520-01010 Drive Shaft Remover Attachment</p>	<p>Front drive shaft</p>
	<p>09520-24010 Differential Side Gear Shaft Puller</p>	<p>Front drive shaft</p>
	<p>(09520-32040) Shocker Set</p>	
	<p>09521-24010 Drive Shaft Boot Clamping Tool</p>	<p>Front drive shaft</p>



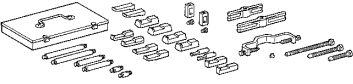
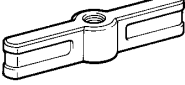
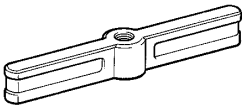
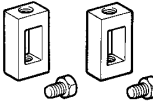
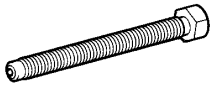

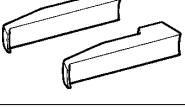
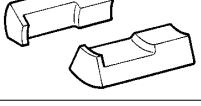
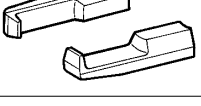

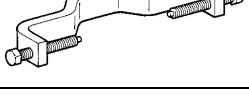
	<p>09521-25011 Rear Axle Shaft Puller</p>	<p>Rear axle</p>
	<p>09523-36010 Rear Axle Hub Guide Tool</p>	<p>Rear differential</p>
	<p>09527-17011 Rear Axle Shaft Bearing Remover</p>	<p>Front axle</p>
	<p>09554-22010 Differential Oil Seal Replacer</p>	<p>Front differential</p>
	<p>09556-22010 Drive Pinion Front Bearing Remover</p>	<p>Front differential Rear differential</p>
	<p>09564-32011 Differential Preload Adaptor</p>	<p>Front differential</p>
	<p>09570-22011 Differential Mounting Cushion Remover & Replacer</p>	<p>Front differential</p>
	<p>09608-32010 Steering Knuckle Oil Seal Replacer</p>	<p>Front differential</p>
	<p>09610-20012 Pitman Arm Puller</p>	<p>Front suspension</p>
	<p>09612-65014 Steering Worm Bearing Puller</p>	<p>Front differential</p>
	<p>(09612-01020) Claw "B"</p>	
	<p>(09612-01050) Hanger Pin with Nut</p>	
	<p>09613-26010 Steering Worm Bearing Cone Remover</p>	<p>Front suspension</p>

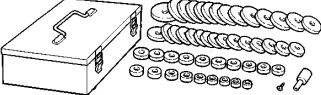








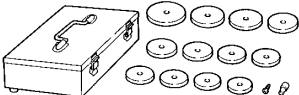



PREPARATION - SUSPENSION AND AXLE

	09628-62011	Ball Joint Puller	Front drive shaft Front suspension
	09630-24014	Steering Rack Oil Seal Tool Set	Rear suspension
	(09620-24041)	Seal Ring Guide	
	09631-12090	Seal Ring Tool	Front suspension
	09631-20060	Bearing Guide Nut Wrench	Front suspension
	09632-36010	Steering Vane Pump Bearing Replacer	Front suspension Rear suspension
	09636-20010	Upper Ball Joint Dust Cover Replacer	Front differential
	09649-17010	Steering Knuckle Tool	Front axle Rear differential
	09650-17011	Hub Bolt Remover	Front axle Rear axle
	09710-28012	Front Suspension Bushing Tool Set	Rear suspension
	(09710-07062)	Bushing Replacer	
	09710-30021	Suspension Bushing Tool Set	
	(09710-03051)	Bushing Replacer	Front axle Front suspension

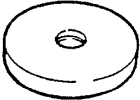
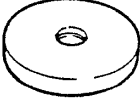
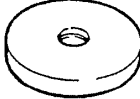
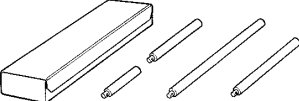

	<p>09710-30041 Rear Suspension Bushing Tool Set</p>	<p>Rear suspension</p>
	<p>(09710-03211) Remover</p>	
	<p>09727-30021 Coil Spring Compressor</p>	<p>Front suspension</p>
	<p>(09727-00010) Bolt Set</p>	
	<p>(09727-00021) Arm Set</p>	
	<p>(09727-00031) Compressor</p>	
	<p>09922-10010 Variable Open Wrench</p>	<p>Front suspension</p>
	<p>09950-00020 Bearing Remover</p>	<p>Front drive shaft Front differential Front suspension Rear differential</p>
	<p>09950-30012 Puller A Set</p>	
	<p>(09951-03010) Upper Plate</p>	<p>Front differential Rear differential</p>
	<p>(09953-03010) Center Bolt</p>	<p>Front differential Rear differential</p>
	<p>(09954-03010) Arm</p>	<p>Front differential Rear differential</p>
	<p>(09955-03030) Lower Plate 130</p>	<p>Front differential Rear differential</p>

PREPARATION - SUSPENSION AND AXLE

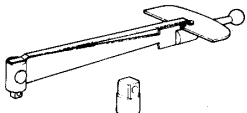
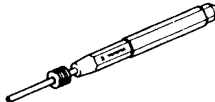
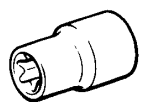
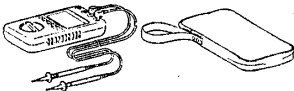
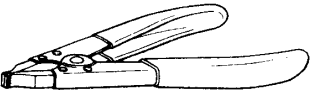
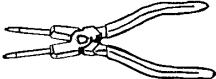
	(09956-03020) Adapter 18	Front differential
	(09956-03050) Adapter 24	Rear differential
	09950-40011 Puller B Set	
	(09951-04010) Hanger 150	Front axle Front differential Front suspension Rear differential
	(09951-04020) Hanger 200	Front axle
	(09952-04010) Slide Arm	Front axle Front differential Front suspension Rear differential
	(09953-04020) Center Bolt 150	Front axle Front differential Front suspension Rear differential
	(09954-04010) Arm 25	Front axle Front differential Front suspension Rear differential
	(09955-04011) Claw No.1	Front differential
	(09955-04031) Claw No.3	Front axle Front suspension
	(09955-04061) Claw No.6	Front differential Rear differential
	(09957-04010) Attachment	Front axle Front differential Front suspension Rear differential
	(09958-04011) Holder	Front axle Front differential Front suspension Rear differential

	<p>09950-60010 Replacer Set</p>	
	<p>(09951-00350) Replacer 35</p>	<p>Rear suspension</p>
	<p>(09951-00380) Replacer 38</p>	<p>Front differential</p>
	<p>(09951-00480) Replacer 48</p>	<p>Front differential Rear differential</p>
	<p>(09951-00540) Replacer 54</p>	<p>Front differential</p>
	<p>(09951-00560) Replacer 56</p>	<p>Rear axle</p>
	<p>(09951-00610) Replacer 61</p>	<p>Rear axle</p>
	<p>(09951-00640) Replacer 64</p>	<p>Rear differential</p>
	<p>(09951-00650) Replacer 65</p>	<p>Front axle Front differential</p>
	<p>09950-60020 Replacer Set No.2</p>	
	<p>(09951-00680) Replacer 68</p>	<p>Front suspension</p>
	<p>(09951-00710) Replacer 71</p>	<p>Rear axle Rear differential</p>
	<p>(09951-00790) Replacer 79</p>	<p>Front differential</p>

PREPARATION - SUSPENSION AND AXLE

	(09951-00810) Replacer 81	Front axle
	(09951-00890) Replacer 89	Rear axle
	(09951-00910) Replacer 91	Front axle Rear differential
	09950-70010 Handle Set	Front axle, Front differential Rear axle Rear differential Rear suspension
	(09951-07150) Handle 150	

RECOMMENDED TOOLS

	09025-00010 Torque Wrench (30 kgf-cm)	
	09031-00030 Pin Punch .	
	09044-00010 Torx Socket E14 .	
	09082-00040 TOYOTA Electrical Tester.	
	09905-00012 Snap Ring No.1 Expander .	
	09905-00013 Snap Ring Pliers .	

Torx is a registered trademark of Textron Inc.

EQUIPMENT

Dial indicator with magnetic base	
Torque wrench	
Micrometer	
Voltmeter	
Ohmmeter	
Saw	

LUBRICANT

Item	Capacity	Application
Front drive shaft Outboard joint grease (Color = Black) Inboard joint grease (Color = Black)	205 – 225 g (7.23 – 7.94 oz.) 190 – 210 g (6.70 – 7.41 oz.)	
Front differential Differential oil	1.15 liters (1.22 US qts., 1.01 Imp. qts.)	Hypoid gear oil API GL-5 SAE 75W-90
Rear differential (Standard type) Differential oil 2WD Standard Cab and Access Cab: Double Cab 4WD Standard Cab and Access Cab: Double Cab	3.80 liters (4.02 US qts., 3.34 Imp. qts.) 4.00 liters (4.23 US qts., 3.52 Imp. qts.) 3.50 liters (3.70 US qts., 3.08 Imp. qts.) 4.00 liters (4.23 US qts., 3.52 Imp. qts.)	Hypoid gear oil API GL-5 Above -18°C (0°F) SAE 90 Below -18°C (0°F) SAE 80W or 80W-90
Rear differential (LSD type) Differential oil 2WD Standard Cab and Access Cab: Double Cab 4WD Standard Cab and Access Cab: Double Cab	3.15 liters (3.33 US qts., 2.77 Imp. qts.) 3.35 liters (3.54 US qts., 2.95 Imp. qts.) 2.85 liters (3.01 US qts., 2.51 Imp. qts.) 3.35 liters (3.54 US qts., 2.95 Imp. qts.)	Hypoid gear oil for LSD API GL-5 Above -18°C (0°F) SAE 90 Below -18°C (0°F) SAE 80W or 80W-90





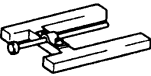
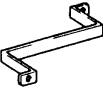
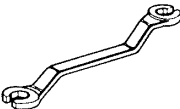

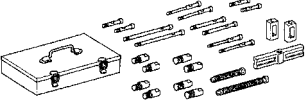
SSM (Special Service Materials)

08826-00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Front differential
08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	Front differential
08833-00100	THREE BOND 1360K or equivalent	Rear differential

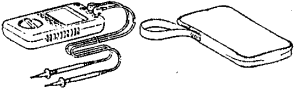
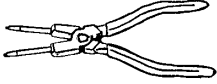
BRAKE

SST (Special Service Tools)

PP446-01

	<p>09023-00101 Union Nut Wrench 10mm</p>	
	<p>09703-30010 Brake Shoe Return Spring Tool</p>	
	<p>09709-29018 LSPV Gauge Set</p>	
	<p>09718-00010 Shoe Hold Down Spring Driver</p>	
	<p>09737-00011 Brake Booster Push Rod Gauge</p>	
	<p>09737-00020 Brake Booster Push Rod Wrench</p>	
	<p>09751-36011 Brake Line Union Nut 10 x 12 mm Wrench</p>	
	<p>09843-18020 Diagnosis Check Wire</p>	
	<p>09950-50013 Puller C Set</p>	

RECOMMENDED TOOLS

 A line drawing of a Toyota Electrical Tester, showing a rectangular device with a dial and two test leads.	09082-00040 TOYOTA Electrical Tester.	
 A line drawing of Snap Ring Pliers, showing a pair of pliers with curved ends.	09905-00013 Snap Ring Pliers .	

EQUIPMENT


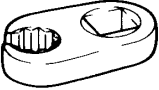
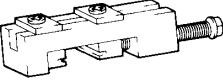
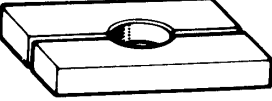
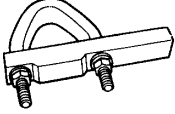
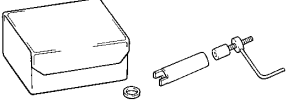
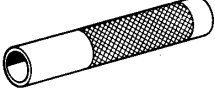
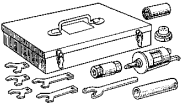
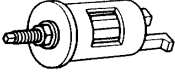
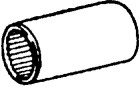
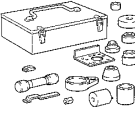
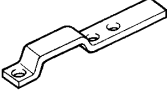
Torque wrench	
Micrometer	Brake disc
Dial indicator	Brake disc
Vernier calipers	Brake drum

LUBRICANT

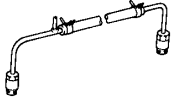
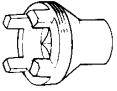
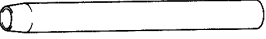

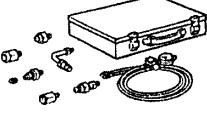

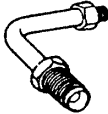
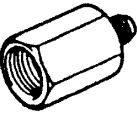

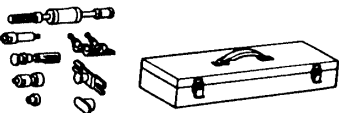

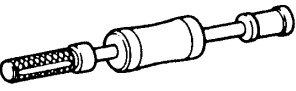
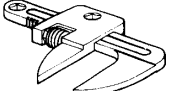
Item	Capacity	Classification
Brake fluid	-	SAE J1703 or FMVSS No.116 DOT 3

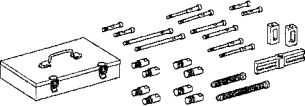
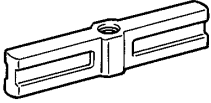
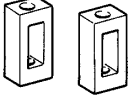
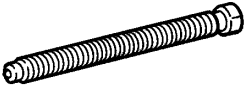
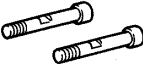
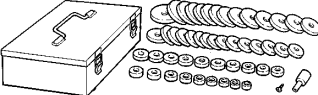







STEERING**SST (Special Service Tools)**

PP447-01








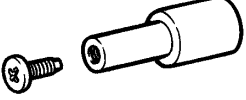
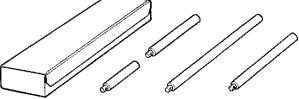




	09023-12701	Union Nut Wrench 17mm	PS gear
	09023-38401	Union Nut Wrench 14mm	PS gear
	09521-24010	Drive Shaft Boot Clamping Tool	PS gear
	09527-20011	Rear Axle Shaft Bearing Remover	PS gear
	09612-00012	Rack & Pinion Steering Rack Housing Stand	PS gear
	09612-07010	Main Shaft Retaining Ring Remover & Replacer	Steering column
	09612-22011	Tilt Handle Bearing Replacer	PS gear
	09612-24014	Steering Gear Housing Overhaul Tool Set	
	(09613-22011)	Steering Rack Shaft Bushing Puller	PS gear
	09616-00011	Steering Worm Bearing Adjusting Socket	PS gear
	09630-00014	Power Steering Gear Housing Overhaul Tool Set	
	(09631-00132)	Vane Pump Bracket	PS vane pump (1GR-FE)

PREPARATION - STEERING

	<p>09631-12071 Steering Rack Oil Seal Test Tool</p>	<p>PS gear</p>
	<p>09631-16010 Cylinder End Stopper Nut Wrench</p>	<p>PS gear</p>
	<p>09631-20051 Steering Rack Cover "C"</p>	<p>PS gear</p>
	<p>09631-20081 Seal Ring Tool</p>	<p>PS gear</p>
	<p>09640-10010 Power Steering Pressure Gauge Set</p>	
	<p>(09641-01010) Gauge Assy</p>	<p>Power steering fluid</p>
	<p>(09641-01030) Attachment B</p>	<p>Power steering fluid</p>
	<p>(09641-01060) Attachment E</p>	<p>Power steering fluid</p>
	<p>09816-30010 Oil Pressure Switch Socket</p>	<p>PS gear</p>
	<p>09910-00015 Puller Set</p>	
	<p>(09911-00011) Puller Clamp</p>	<p>Steering column</p>
	<p>(09912-00010) Puller Slide Hammer</p>	<p>Steering column</p>
	<p>09922-10010 Variable Open Wrench</p>	<p>PS gear</p>

	09950-50013 Puller C Set	
	(09951-05010) Hanger 150	Steering column
	(09952-05010) Slide Arm	Steering column
	(09953-05020) Center Bolt 150	Steering column
	(09954-05021) Claw No.2	Steering column
	09950-60010 Replacer Set	
	(09951-00180) Replacer 18	PS gear
	(09951-00250) Replacer 25	PS gear
	(09951-00260) Replacer 26	PS gear
	(09951-00280) Replacer 28	PS vane pump (1GR-FE)
	(09951-00300) Replacer 30	PS gear
	(09951-00310) Replacer 31	PS gear
	(09951-00320) Replacer 32	PS gear

PREPARATION - STEERING

	(09951-00330) Replacer 33	PS vane pump (2UZ-FE)
	(09951-00340) Replacer 34	PS gear
	(09951-00360) Replacer 36	PS gear
	(09951-00400) Replacer 40	Steering column (Double Cab)
	(09951-00430) Replacer 43	Steering column (Standard Cab, Access Cab)
	(09951-00460) Replacer 46	Steering column PS gear
	(09951-00490) Replacer 49	PS gear
	(09952-06010) Adapter	PS gear
	09950-70010 Handle Set	
	(09951-07100) Handle 100	PS vane pump (1GR-FE, 2UZ-FE)
	(09951-07150) Handle 150	Steering column PS gear
	(09951-07200) Handle 200	PS gear
	(09951-07360) Handle 360	Steering column PS gear

RECOMMENDED TOOLS

	<p>09025-00010 Small Torque Wrench (30 kgf-cm)</p>	<p>PS vane pump PS gear</p>
	<p>09042-00010 Torx Socket T30 .</p>	<p>Steering column</p>

Torx is a registered trademark of Textron Inc.

EQUIPMENT

Caliper gauge	PS vane pump (1GR-FE, 2UZ-FE)
Vernier calipers	PS vane pump (1GR-FE, 2UZ-FE)
Dial indicator	PS gear
Feeler gauge	PS vane pump (1GR-FE, 2UZ-FE)
Micrometer	PS vane pump (1GR-FE, 2UZ-FE)
Torque wrench	

LUBRICANT

Item	Capacity	Classification
Power steering fluid Total	1.0 liters (1.1 US qts, 0.9 Imp.qts)	ATF DEXRON® II or III

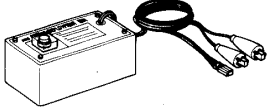
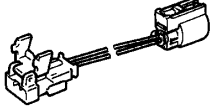
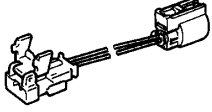
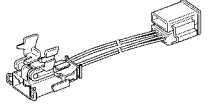

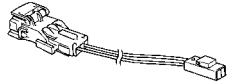

SSM (Special Service Materials)

08833-00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	PS gear
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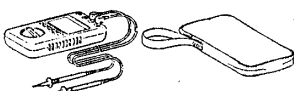
SUPPLEMENTAL RESTRAINT SYSTEM

SST (Special Service Tools)

PP420-02

	<p>09082-00700 SRS Airbag Deployment Tool</p>	
	<p>09082-00750 Airbag Deployment Wire Sub-harness No.3</p>	
	<p>09082-00760 Airbag Deployment Wire Sub-harness No.4</p>	
	<p>09082-00780 Airbag Deployment Wire Sub-Harness No.6</p>	
	<p>09082-00802 Airbag Deployment Wire Sub-Harness No.8</p>	
	<p>(09082-10801) Wire A</p>	
	<p>(09082-30801) Wire C</p>	

RECOMMENDED TOOLS

 A line drawing of a Torx T30 socket. The socket is cylindrical with a hexagonal base and a central hole. The text "TORX" and "T30" are visible on the side of the socket.	09042-00010 Torx Socket T30 .	
 A line drawing of a Toyota Electrical Tester. It consists of a rectangular device with a probe and a small display or indicator. A separate component, possibly a lead or a second probe, is shown next to it.	09082-00040 TOYOTA Electrical Tester.	

Torx is a registered trademark of Textron Inc.


EQUIPMENT

Torque wrench	
Bolt: Length: 35 mm (1.387 in.) Pitch: 1.0 mm (0.039 in.) Diam.: 6.0 mm (0.236 in.)	Airbag disposal
Tire Width: 185 mm (7.28 in.) Inner diam.: 360mm (14.17 in.)	Airbag disposal
Tire with disc wheel Width: 185 mm (7.28 in.) Inner diam.: 360 mm (14.17 in.)	Airbag disposal
Plastic bag	Airbag disposal


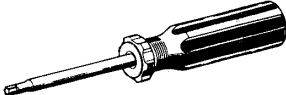

BODY ELECTRICAL

SST (Special Service Tools)

PP06F-12

	09843-18020 Diagnosis Check Wire	
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RECOMMENDED TOOLS

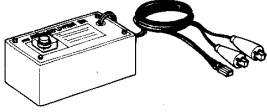
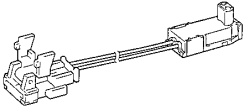

	09082-00040 TOYOTA Electrical Tester.	
	09041-00030 Torx Driver T30 .	For removing and installing steering wheel pad
	09042-00010 Torx Socket T30 .	For removing and installing steering wheel pad

EQUIPMENT

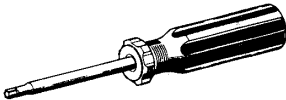
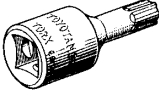
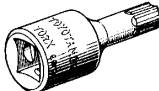
Voltmeter	
Ammeter	
Ohmmeter	
Test lead	
Syphon	Brake fluid level warning switch
Bulb (3.4 W)	
Torque wrench	

BODY**SST (Special Service Tools)**

PP25L-02

	09082-00700 SRS Airbag Deployment Tool	
	09082-00740 Airbag Deployment Wire Sub-harness No.2	
	09812-00020 Door Hinge Set Bolt Wrench	

RECOMMENDED TOOLS

	09041-00030 Torx Driver T30 .	
	09042-00010 Torx Socket T30 .	
	09042-00020 Torx Socket T40 .	

Torx is a registered trademark of Textron Inc.

EQUIPMENT

Clip remover	
Torque wrench	
Torx® driver	
Hog ring pliers	
Tape	To avoid surface damage
Adhesive tape	To avoid surface damage
Double – stick tape	
Adhesive	
Cleaner	
Shop rag	Regulator handle
Knife	Moulding
Heat light	Moulding
Piano wire	Windshield
Sealer gun	
Brush	
Putty spatula	
Wooden block or similar object	For tying both piano wire ends
Plastic sheet	To avoid surface damage
Rope (no projections, difficult to break)	Seat belt pretensioner disposal
Tire Width: 185 mm (7.28 in.) Inner diam.: 360 mm (14.17 in.)	Seat belt pretensioner disposal
Tire with disc wheel Width: 185 mm (7.28 in.) Inner diam.: 360 mm (14.17 in.)	Seat belt pretensioner disposal
Vinyl bag	Seat belt pretensioner disposal

LUBRICANT

Item	Capacity	Classification
MP grease	-	-


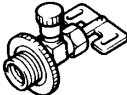







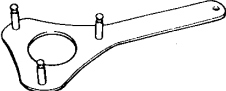


SSM (Special Service Materials)

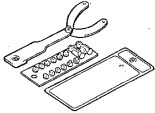
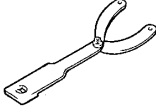

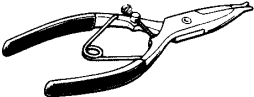
08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	
08833-00030	Three cement black or equivalent	
08850-00801	Windshield Glass Adhesive Set or equivalent	

AIR CONDITIONING

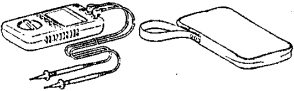

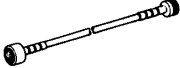
SST (Special Service Tools)

PP43F-01

	<p>07110-58060 Air Conditioner Service Tool Set</p>	
	<p>(07117-58060) Refrigerant Drain Service Valve</p>	
	<p>(07117-58070) T-Joint</p>	
	<p>(07117-58080) Quick Disconnect Adapter</p>	
	<p>(07117-58090) Quick Disconnect Adapter</p>	
	<p>(07117-88060) Refrigerant Charging Hose</p>	
	<p>(07117-88070) Refrigerant Charging Hose</p>	
	<p>(07117-88080) Refrigerant Charging Hose</p>	
	<p>07112-66040 Magnetic Clutch Remover</p>	
	<p>07112-76060 Magnetic Clutch Stopper</p>	
	<p>07116-38360 Gas Leak Detector Assembly</p>	
	<p>09870-00025 A/C Quick Joint Puller No.2</p>	<p>Liquid tube</p>

	<p>09960-10010 Variable Pin Wrench Set</p>	
	<p>(09962-01000) Variable Pin Wrench Arm Assy</p>	
	<p>(09963-00500) Pin 5</p>	
	<p>95994-10020 Snap Ring Pliers (DENSO Part No.)</p>	

RECOMMENDED TOOLS

	09082-00040 TOYOTA Electrical Tester.	
	09216-00021 Belt Tension Gauge .	
	09216-00030 Belt Tension Gauge Cable .	

EQUIPMENT

Voltmeter	
Ammeter	
Ohmmeter	
Test lead	
Thermometer	Thermistor
Torque wrench	
Dial indicator	Magnetic clutch
Plastic hammer	Magnetic clutch
Hexagon wrench	Expansion valve


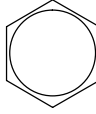
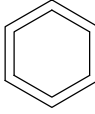
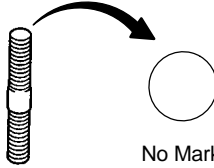
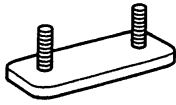

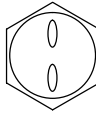
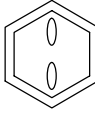

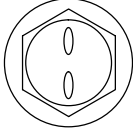
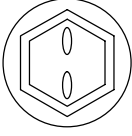











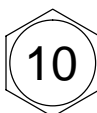

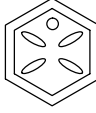


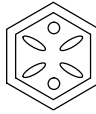
LUBRICANT

Item	Capacity	Classification
Compressor oil	-	ND-OIL 8 or equivalent
When replacing receiver	20 cc (0.71 fl.oz.)	
When replacing condenser	40 cc (1.4 fl. oz.)	
When replacing evaporator	40 to 50 cc (1.4 to 1.7 fl. oz.)	

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

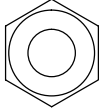
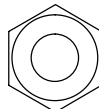
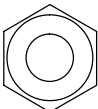


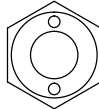
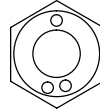
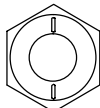
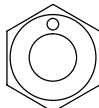
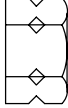
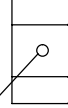
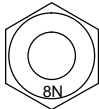
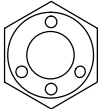
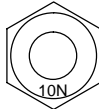
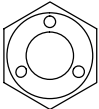
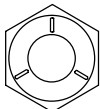
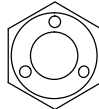

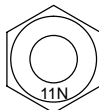
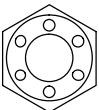

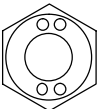
SS02S-01

Bolt Type				Class
Hexagon Head Bolt		Stud Bolt	Weld Bolt	
Normal Recess Bolt	Deep Recess Bolt			
  No Mark	 No Mark	 No Mark		4T
 				5T
  w/ Washer	 w/ Washer			6T
 	 			7T
		 		8T
				9T
	 			10T
	 			11T

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N-m	kgf-cm	ft-lbf	N-m	kgf-cm	ft-lbf
4T	6	1	5	55	48 in.-lbf	6	60	52 in.-lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.-lbf	7.5	75	65 in.-lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.-lbf	9	90	78 in.-lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

HOW TO DETERMINE NUT STRENGTH

Present Standard Hexagon Nut	Nut Type		Class
	Old Standard Hexagon Nut		
	Cold Forging Nut	Cutting Processed Nut	
 No Mark			4N
 No Mark (w/ Washer)	 No Mark (w/ Washer)	 No Mark	5N (4T)
  			6N
	 	  *	7N (5T)
 			8N
 	 	 No Mark	10N (7T)
 			11N
 			12N

*: Nut with 1 or more marks on one side surface of the nut.

B06432

HINT:

Use the nut with the same number of the nut strength classification or the greater than the bolt strength classification number when tightening parts with a bolt and nut.

Example: Bolt = 4T

Nut = 4N or more

ENGINE MECHANICAL (1GR-FE)

SS1MH-01

SERVICE DATA

Compression pressure	Minimum	1.3 MPa (13.3 kgf-cm ² , 189 psi) or more 1.0 MPa (10.2 kgf-cm ² , 145 psi) 0.1 MPa (1.0 kgf-cm ² , 15 psi) or less
	Difference of pressure between each cylinder	
Valve clearance	at cold intake Exhaust Valve clearance adjusting shim No. 06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74	0.15 to 0.25 mm (0.006 to 0.010 in.) 0.29 to 0.39 mm (0.011 to 0.015 in.) 5.060 mm (0.1992 in.) 5.080 mm (0.2000 in.) 5.100 mm (0.2008 in.) 5.120 mm (0.2016 in.) 5.140 mm (0.2024 in.) 5.160 mm (0.2031 in.) 5.180 mm (0.2039 in.) 5.200 mm (0.2047 in.) 5.220 mm (0.2055 in.) 5.240 mm (0.2063 in.) 5.260 mm (0.2071 in.) 5.280 mm (0.2079 in.) 5.300 mm (0.2087 in.) 5.320 mm (0.2094 in.) 5.340 mm (0.2102 in.) 5.360 mm (0.2110 in.) 5.380 mm (0.2118 in.) 5.400 mm (0.2126 in.) 5.420 mm (0.2134 in.) 5.440 mm (0.2142 in.) 5.460 mm (0.2150 in.) 5.480 mm (0.2157 in.) 5.500 mm (0.2165 in.) 5.520 mm (0.2173 in.) 5.540 mm (0.2181 in.) 5.560 mm (0.2189 in.) 5.580 mm (0.2197 in.) 5.600 mm (0.2205 in.) 5.620 mm (0.2213 in.) 5.640 mm (0.2220 in.) 5.660 mm (0.2228 in.) 5.680 mm (0.2236 in.) 5.700 mm (0.2244 in.) 5.720 mm (0.2252 in.) 5.740 mm (0.2260 in.)
Ignition timing	w/ Terminals TC and CG connected of DLC3 w/o Terminals TC and CG connected of DLC3	8 to 12° BTDC at idle 7 to 24° BTDC at idle
Idle speed		650 to 750 rpm
Timing chain	No. 1 and No. 2 Timing chain elongation Camshaft timing gear diameter (w/ No. 1 chain) Camshaft timing gear diameter (w/ No. 2 chain) Camshaft timing sprocket (w/ No. 2 chain) Crankshaft timing gear diameter (w/ chain) Idle gear No. 1 diameter (w/ chain)	Maximum Minimum Minimum Minimum Minimum Minimum
Idle gear shaft oil clearance	Idle gear shaft diameter Idle gear inside diameter Oil clearance Standard Maximum	22.987 to 23.000 mm (0.9050 to 0.9055 in.) 23.02 to 23.03 mm (0.9063 to 0.9067 in.) 0.020 to 0.043 mm (0.0008 to 0.0017 in.) 0.093 mm (0.0037 in.)

SERVICE SPECIFICATIONS – ENGINE MECHANICAL (1GR-FE)

Chain tensioner	No. 2 depth	Maximum	1.0 mm (0.039 in.)		
	Slipper depth	Maximum	1.0 mm (0.039 in.)		
Chain vibration damper	Depth	Maximum	1.0 mm (0.039 in.)		
Cylinder head	Warpage	Maximum	0.10 mm (0.0039 in.)		
	Cylinder head bolt thread outside diameter	Standard	10.85 to 11.00 mm (0.4272 to 0.4331 in.)		
		Minimum	10.7 mm (0.421 in.)		
	Valve guide bushing bore diameter	Standard	10.295 to 10.315 mm (0.4053 to 0.4061 in.)		
Valve guide bushing diameter	Standard	10.333 to 10.344 mm (0.4068 to 0.4072 in.)			
	O/S 0.05		10.383 to 10.394 mm (0.4088 to 0.4092 in.)		
	Protrusion height		9.3 to 9.7 mm (0.366 to 0.382 in.)		
Intake manifold	Warpage				
	Intake air surge tank side:	Maximum	0.8 mm (0.031 in.)		
	Cylinder head side:	Maximum	0.2 mm (0.008 in.)		
Exhaust manifold	Warpage	Maximum	0.7 mm (0.028 in.)		
Valve	Stem diameter	Intake	5.470 to 5.485 mm (0.2154 to 0.2159 in.)		
		Exhaust	5.465 to 5.480 mm (0.2152 to 0.2158 in.)		
	Valve face angle			44.5°	
		Margin thickness	Standard	1.0 mm (0.039 in.)	
	Minimum		0.5 mm (0.020 in.)		
	Stem oil clearance	Standard	Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)	
			Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)	
			Maximum	Intake	0.08 mm (0.0031 in.)
				Exhaust	0.10 mm (0.0039 in.)
	Valve overall length	Standard	Intake	106.95 mm (4.2106 in.)	
		Exhaust	105.80 mm (4.1654 in.)		
	Minimum	Intake	106.40 mm (4.1890 in.)		
		Exhaust	105.30 mm (4.1457 in.)		
Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)		
	Free length		47.80 mm (1.8819 in.)		
	Installed tension at 33.3 mm (1.311 in.)		186.2 to 205.8 N (19.0 to 21.0 kgf, 41.9 to 46.3 lbf)		
Valve guide bushing	Inside diameter		5.51 to 5.53 mm (0.2169 to 0.2177 in.)		
Valve lifter	Lifter diameter		30.966 to 30.976 mm (1.2191 to 1.2195 in.)		
	Lifter bore diameter		31.009 to 31.025 mm (1.2208 to 1.2215 in.)		
	Oil clearance	Standard	0.033 to 0.059 mm (0.0013 to 0.0023 in.)		
		Maximum	0.08 mm (0.0031 in.)		
Camshaft	Thrust clearance	Standard	0.04 to 0.09 mm (0.016 to 0.035 in.)		
		Maximum	0.11 mm (0.0043 in.)		
	Circle runout		0.06 mm (0.0024 in.)		
	Cam lobe height	Standard	Intake	44.168 to 44.268 mm (1.7389 to 1.7428 in.)	
			Exhaust	44.580 to 44.680 mm (1.7551 to 1.7591 in.)	
		Minimum	Intake	44.018 mm (1.7330 in.)	
			Exhaust	44.430 mm (1.7492 in.)	
	Journal diameter	No. 1		35.971 to 35.985 mm (1.4162 to 1.4167 in.)	
		Other		22.959 to 22.975 mm (0.9039 to 0.9045 in.)	
	Oil clearance	Standard			
			RH side No. 1 (Intake)	0.008 to 0.038 mm (0.0003 to 0.0015 in.)	
			RH side No. 1 (Exhaust)	0.040 to 0.079 mm (0.0016 to 0.0031 in.)	
			LH side No. 1 (Intake)	0.040 to 0.079 mm (0.0016 to 0.0031 in.)	
		Other	0.025 to 0.062 mm (0.0010 to 0.0024 in.)		
		Maximum			
		RH side No. 1 (Intake)	0.07 mm (0.0028 in.)		
		Other	0.10 mm (0.0039 in.)		

Connecting rod	Thrust clearance	Standard	0.15 to 0.30 mm (0.0059 to 0.0118 in.)	
		Maximum	0.35 mm (0.0138 in.)	
	Connecting rod oil clearance	Standard	0.026 to 0.046 mm (0.0010 to 0.0018 in.)	
		Maximum	0.066 mm (0.0025 in.)	
	Connecting rod bolt tension portion diameter	Standard	7.2 to 7.3 mm (0.283 to 0.287 in.)	
		Minimum	7.0 mm (0.276 in.)	
	Connecting rod bearing center wall thickness	Mark	1	1.484 to 1.487 mm (0.0584 to 0.0585 in.)
			2	1.487 to 1.490 mm (0.0585 to 0.0587 in.)
			3	1.490 to 1.493 mm (0.0587 to 0.0588 in.)
			4	1.493 to 1.496 mm (0.0588 to 0.0589 in.)
	Rod alignment	Maximum per 100 mm (3.94 in.)		0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)		0.05 mm (0.0059 in.)
	Bushing inside diameter	Mark	A	22.005 to 22.008 mm (0.8663 to 0.8665 in.)
B			22.009 to 22.011 mm (0.8665 to 0.8666 in.)	
C			22.012 to 22.014 mm (0.8666 to 0.8667 in.)	
Bushing oil clearance	Standard		0.005 to 0.011 mm (0.0002 to 0.0004 in.)	
	Maximum		0.050 mm (0.0020 in.)	
Crankshaft	Thrust clearance	Standard	0.04 to 0.24 mm (0.0016 to 0.0094 in.)	
		Maximum	0.30 mm (0.0118 in.)	
	Crankshaft bearing cap set bolt tension portion diameter	Standard		10.0 to 10.2 mm (0.393 to 0.402 in.)
		Maximum		0.06 mm (0.0024 in.)
	Circuit runout			71.988 to 72.000 mm (2.8342 to 2.8346 in.)
	Main journal diameter			0.02 mm (0.0008 in.)
	Main journal taper and out-of-round	Maximum		55.992 to 56.000 mm (2.2044 to 2.2047 in.)
	Crank pin diameter			0.02 mm (0.0008 in.)
	Crank pin taper and out-of-round	Maximum		0.018 to 0.030 mm (0.0007 to 0.0012 in.)
	Oil clearance	Standard		0.018 to 0.030 mm (0.0007 to 0.0012 in.)
		Maximum		0.046 mm (0.0018 in.)
	Main journal bore diameter on cylinder block			77.000 to 77.016 mm (3.0315 to 3.0321 in.)
	Standard bearing center wall thickness	Mark	1	2.488 to 2.491 mm (0.0980 to 0.0981 in.)
			2	2.491 to 2.494 mm (0.0981 to 0.0982 in.)
3			2.494 to 2.497 mm (0.0982 to 0.0983 in.)	
4			2.497 to 2.500 mm (0.0984 to 0.0985 in.)	
5			2.500 to 2.503 mm (0.0984 to 0.0985 in.)	

SERVICE SPECIFICATIONS – ENGINE MECHANICAL (1GR-FE)

Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)	
	Cylinder bore diameter	Standard Maximum	94.000 to 94.012 mm (3.7008 to 3.7013 in.) 94.132 mm (3.7060 in.)	
Piston and piston ring	Piston diameter		93.910 to 93.920 mm (3.6972 to 3.6976 in.)	
	Piston oil clearance	Standard	0.080 to 0.102 mm (0.0031 to 0.0040 in.)	
		Maximum	0.13 mm (0.0051 in.)	
	Piston pin hole inside diameter	Mark		
		A		22.001 to 22.004 mm (0.8662 to 0.8663 in.)
		B		22.005 to 22.007 mm (0.8663 to 0.8664 in.)
		C		22.008 to 22.010 mm (0.8665 to 0.8665 in.)
	Piston pin diameter	Mark		
		A		21.997 to 22.000 mm (0.8660 to 0.8661 in.)
		B		22.001 to 22.003 mm (0.8661 to 0.8663 in.)
		C		22.004 to 22.006 mm (0.8663 to 0.8664 in.)
	Bushing oil clearance	Standard		0.001 to 0.007 mm (0.00004 to 0.00028 in.)
		Maximum		0.040 mm (0.0016 in.)
	Piston ring groove clearance	No. 1		0.02 to 0.07 mm (0.0008 to 0.0028 in.)
No. 2			0.02 to 0.06 mm (0.0008 to 0.0024 in.)	
Oil			0.07 to 0.15 mm (0.0028 to 0.0060 in.)	
Piston ring end gap	Standard	No. 1	0.30 to 0.40 mm (0.0118 to 0.0157 in.)	
		No. 2	0.40 to 0.50 mm (0.0157 to 0.0197 in.)	
	Oil	(Side rail)		0.10 to 0.40 mm (0.0039 to 0.0157 in.)
		Maximum	No. 1	1.0 mm (0.039 in.)
		No. 2	1.1 mm (0.043 in.)	
		Oil		
		(Side rail)		1.0 mm (0.039 in.)

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head		20	200	15
Bearing cap x Cylinder head	for 10 mm (0.39 in.) head	9.0	92	80 in.·lbf
Bearing cap x Cylinder head	for 12 mm (0.47 in.) head	24	245	18
Chain tensioner No. 2 x Cylinder head		19	194	14
Camshaft timing sprocket x Camshaft		100	1,020	74
Camshaft timing gear assembly x Camshaft		100	1,020	74
Chain tensioner x Cylinder block		10	102	7
Timing chain cover plate x Timing chain cover		9.0	92	80
V-bank cover		7.5	76	66 in.·lbf
Air cleaner		8.0	82	71 in.·lbf
Fan pulley x Water pump		21	214	15
Vane pump x Engine		43	438	32
Oil level gauge guide x Cylinder block		9.0	92	80
Generator x Generator bracket		43	438	32
Generator wire x Generator		9.8	100	7
Wire harness clamp bracket x Generator		8.0	82	71 in.·lbf
Suction hose sub-assy x Cylinder block		8.0	82	71 in.·lbf
Cooler compressor x V-ribbed belt tensioner		25	255	18
Idler pulley No. 1 x Cylinder block		54	551	40
Idler pulley No. 2 x Cylinder block		39	398	29
Water inlet x Cylinder head		9.0	92	80 in.·lbf
V-ribbed belt tensioner x Cylinder block		36	367	27
Oil pan x Cylinder block	Bolt A, B, Nut	21	214	15
(See page EM-89)	Bolt C	10	102	7
Oil pan x transmission		37	377	27
Oil strainer x Oil pan		9.0	92	80 in.·lbf
Oil pan No. 2 x Oil pan	Bolt	9.0	92	80 in.·lbf
(See page EM-89)	Nut	10	102	7
Drain plug x Oil pan No. 2		40	408	30
Stud bolt x Oil pan		4.0	41	35 in.·lbf
Crankshaft pulley set bolt		250	2,549	184
Timing chain cover x Cylinder head and cylinder block		23	235	17
Chain vibration damper No. 1 x Cylinder block		19	194	14
Idle gear shaft No. 2 x Cylinder block		60	612	44
Intake air surge tank x Intake manifold		28	286	21
Surge tank stay x Intake air surge tank and cylinder head		21	214	15
Ignition coil x Cylinder head cover		10	102	7
Oil baffle plate x Surge tank stay No. 1		9.0	92	80 in.·lbf
Cylinder head cover x Cylinder head	Bolt A, Nut	9.0	92	80 in.·lbf
(See page EM-89)	Bolt B	10	102	7
Throttle body bracket		21	214	15
Exhaust manifold x Cylinder head		21	214	15
Front exhaust pipe x Exhaust manifold		62	630	46
Manifold stay x Front exhaust pipe and transmission		40	408	30

SERVICE SPECIFICATIONS – ENGINE MECHANICAL (1GR-FE)

RH front exhaust pipe x Center exhaust pipe		43	440	32
Water by-pass joint x Cylinder head		9.0	92	80 in.-lbf
LH front exhaust pipe x Center exhaust pipe		48	490	35
Intake manifold x Cylinder head		26	265	19
Oil filter cap housing x Cylinder head cover		9.0	92	80 in.-lbf
Camshaft timing oil control valve x Cylinder head		9.0	92	80 in.-lbf
Fuel pipe bracket		9.0	92	80 in.-lbf
Ventilation valve x Cylinder head cover		27	275	20
VVT sensor x Cylinder head		9.0	92	80 in.-lbf
Oil control valve filter x Cylinder head		62	632	46
Cylinder head x Cylinder block (See page EM-89)	1st 2nd	36 turn 180°	367 turn 180°	27 turn 180°
LH Cylinder head x Cylinder block		30	306	22
Camshaft bearing cap No. 1 x Cylinder head		24	245	18
Camshaft bearing cap No. 2 x Cylinder head		9.0	92	80 in.-lbf
Stud bolt x Cylinder head (See page EM-82)	A and C B	4.0 19.5	41 199	35 in.-lbf 14
Union x Cylinder head		15	153	11
Straight screw plug x Cylinder head		80	816	59
Drive plate x Crankshaft		49	500	36
Engine mounting bracket x Frame bracket		38	388	28
Water outlet pipe No. 1 x Cylinder block		10	102	7
Knock sensor x Cylinder block		20	204	15
Water drain lock x Cylinder block		25	255	18
Connecting rod cap x Connecting rod	1st 2nd	25 Turn 90°	250 Turn 90°	18 Turn 90°
Oil nozzle x Cylinder block		9.0	92	80 in.-lbf
Crankshaft bearing cap x Crankshaft	1st 2nd	61 Turn 90°	622 Turn 90°	45 Turn 90°
Rear oil seal retainer x Cylinder block	Bolt Nut	10 9.0	102 92	7.0 80 in.-lbf
Stud bolt x Cylinder block (See page EM-128)	A B C	11 4.5 4.0	112 46 41	8.1 40 in.-lbf 35 in.-lbf
Clamp x Exhaust tail pipe		32	326	24
Heated oxygen sensor (Bank 1, 2) x Front exhaust pipe		44	450	33
Exhaust center pipe x LH front exhaust pipe		48	490	35
Exhaust center pipe x RH front exhaust pipe		43	440	32

ENGINE MECHANICAL (2UZ-FE)

SS00Q-13

SERVICE DATA

Compression pressure	at 250 rpm STD Minimum Difference of pressure between each cylinder	1,373 kPa (14.0 kgf/cm ² , 199 psi) or more 1,030 kPa (10.5 kgf/cm ² , 149 psi) 98 kPa (1.0 kgf/cm ² , 14 psi) or less
Valve clearance	at cold Intake Exhaust Valve clearance adjusting shim	0.15 to 0.25 mm (0.006 to 0.010 in.) 0.25 to 0.35 mm (0.010 to 0.014 in.) No.00 2.000 mm (0.0787 in.) No.02 2.020 mm (0.0795 in.) No.04 2.040 mm (0.0803 in.) No.06 2.060 mm (0.0811 in.) No.08 2.080 mm (0.0819 in.) No.10 2.100 mm (0.0827 in.) No.12 2.120 mm (0.0835 in.) No.14 2.140 mm (0.0843 in.) No.16 2.160 mm (0.0850 in.) No.18 2.180 mm (0.0858 in.) No.20 2.200 mm (0.0866 in.) No.22 2.220 mm (0.0874 in.) No.24 2.240 mm (0.0882 in.) No.26 2.260 mm (0.0890 in.) No.28 2.280 mm (0.0898 in.) No.30 2.300 mm (0.0906 in.) No.32 2.320 mm (0.0913 in.) No.34 2.340 mm (0.0921 in.) No.36 2.360 mm (0.0929 in.) No.38 2.380 mm (0.0937 in.) No.40 2.400 mm (0.0945 in.) No.42 2.420 mm (0.0953 in.) No.44 2.440 mm (0.0961 in.) No.46 2.460 mm (0.0969 in.) No.48 2.480 mm (0.0976 in.) No.50 2.500 mm (0.0984 in.) No.52 2.520 mm (0.0992 in.) No.54 2.540 mm (0.1000 in.) No.56 2.560 mm (0.1008 in.) No.58 2.580 mm (0.1016 in.) No.60 2.600 mm (0.1024 in.) No.62 2.620 mm (0.1031 in.) No.64 2.640 mm (0.1039 in.) No.66 2.660 mm (0.1047 in.) No.68 2.680 mm (0.1055 in.) No.70 2.700 mm (0.1063 in.) No.72 2.720 mm (0.1071 in.) No.74 2.740 mm (0.1079 in.) No.76 2.760 mm (0.1087 in.) No.78 2.780 mm (0.1094 in.) No.80 2.800 mm (0.1102 in.)
Ignition timing	w/ Terminals TC and E1 connected of DLC1	5 to 15° BTDC @ idle
Idle speed	–	700 ± 50 rpm
Timing belt tensioner	Protrusion from housing end	10.5 to 11.5 mm (0.413 to 0.453 in.)

SERVICE SPECIFICATIONS – ENGINE MECHANICAL (2UZ-FE)

Cylinder head	Warpage	Maximum	0.10 mm (0.039 in.)	
	Valve seat			
	Refacing angle		30°, 45°, 60°	
	Contacting angle		45°	
	Contacting width		1.0 to 1.4 mm (0.039 to 0.055 in.)	
	Valve guide bushing bore diameter	STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)	
		O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)	
	Cylinder head bolt thread inside diameter	STD	9.810 to 9.960 mm (0.3862 to 0.3921 in.)	
Protrusion height	Minimum		9.700 mm (0.3819 in.)	
	Intake		9.2 to 9.8 mm (0.362 to 0.386 in.)	
	Exhaust		8.2 to 8.8 mm (0.323 to 0.346 in.)	
Valve guide bushing	Inside diameter		5.510 to 5.530 mm (0.2169 to 0.2374 in.)	
	Outside diameter (for repair part)	STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)	
		O/S 0.05	10.383 to 10.394 mm (0.4088 to 0.4092 in.)	
Valve	Valve overall length	STD Intake	95.05 mm (3.7421 in.)	
		Exhaust	95.10 mm (3.7441 in.)	
		Minimum Intake	94.55 mm (3.7224 in.)	
		Exhaust	94.60 mm (3.7244 in.)	
	Valve face angle		44.5°	
	Stem diameter	Intake		5.470 to 5.485 mm (0.2154 to 0.2159 in.)
		Exhaust		5.465 to 5.480 mm (0.2152 to 0.2157 in.)
	Stem oil clearance	STD Intake		0.025 to 0.060 mm (0.0010 to 0.0024 in.)
		Exhaust		0.030 to 0.065 mm (0.0012 to 0.0026 in.)
		Maximum Intake		0.08 mm (0.0031 in.)
		Exhaust		0.10 mm (0.0039 in.)
	Margin thickness	STD		1.0 mm (0.039 in.)
Minimum			0.5 mm (0.020 in.)	
Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)	
	Free length		54.1 mm (2.130 in.)	
	Installed tension at 35.0 mm (1.378 in.)		210 to 226 N (21.4 to 23.0 kgf, 47.2 to 50.7 lbf)	
Valve lifter	Lifter diameter		30.968 to 30.976 mm (1.2192 to 2.2195 in.)	
	Lifter bore diameter		31.000 to 31.016 mm (1.2205 to 1.2211 in.)	
	Oil clearance	STD	0.024 to 0.050 mm (0.0009 to 0.0020 in.)	
	Maximum		0.07 mm (0.0028 in.)	
Camshaft	Thrust clearance	STD Intake	0 to 0.040 mm (0 to 0.0016 in.)	
		Exhaust	0.030 to 0.070 mm (0.0011 to 0.0028 in.)	
		Maximum Intake	0.12 mm (0.0047 in.)	
		Exhaust	0.10 mm (0.0039 in.)	
	Journal oil clearance	STD		0.030 to 0.071 mm (0.0012 to 0.0028 in.)
		Maximum		0.10 mm (0.0039 in.)
	Timing tube journal oil clearance	STD		0.036 to 0.057 mm (0.0014 to 0.0022 in.)
		Maximum		0.075 mm (0.0030 in.)
	Journal diameter			26.954 to 26.970 mm (1.0612 to 1.0618 in.)
	Timing tube journal diameter	STD		39.955 to 39.964 mm (1.5730 to 1.5734 in.)
	Circle runout			0.03 mm (0.0012 in.)
	Cam lobe height	STD Intake		42.61 to 42.71 mm (1.6776 to 1.6815 in.)
		Exhaust		42.63 to 42.71 mm (1.6783 to 1.6823 in.)
		Minimum Intake		42.46 mm (1.6717 in.)
		Exhaust		42.48 mm (1.6724 in.)
	Camshaft gear backlash	STD		0.020 to 0.200 mm (0.0008 to 0.0079 in.)
Maximum			0.30 mm (0.0188 in.)	
Camshaft gear spring end free distance			18.2 to 18.8 mm (0.712 to 0.740 in.)	
Manifold	Warpage	Maximum Exhaust	0.10 mm (0.0039 in.)	

Cylinder block	Cylinder head surface warpage	Maximum	0.07 mm (0.0028 in.)
	Cylinder bore diameter	STD Mark 2	94.010 to 94.023 mm (3.7012 to 3.7017 in.)
		Maximum STD O/S 050	94.223 mm (3.7096 in.) 94.723 mm (3.7292 in.)
	Main bearing cap bolt tension portion diameter	STD	10.760 to 10.970 mm (0.4236 to 0.4319 in.)
Minimum		10.40 mm (0.4094 in.)	
Piston and piston ring	Piston diameter	STD Mark 2	93.912 to 93.940 mm (3.6973 to 3.6984 in.)
		O/S 0.50	94.392 to 94.440 mm (3.7162 to 3.7181 in.)
	Piston oil clearance	STD	0.030 to 0.071 mm (0.0012 to 0.0028 in.)
		Maximum	0.13 mm (0.0051 in.)
	Piston ring groove clearance	No.1	0.030 to 0.080 mm (0.0012 to 0.0031 in.)
		No.2	0.020 to 0.060 mm (0.0008 to 0.0024 in.)
	Piston ring end gap	STD No.1	0.300 to 0.400 mm (0.0118 to 0.0157 in.)
		No.2	0.450 to 0.600 mm (0.0177 to 0.0236 in.)
		Oil	0.100 to 0.350 mm (0.0039 to 0.0138 in.)
		Maximum No.1	1.10 mm (0.0433 in.)
	No.2	1.30 mm (0.0512 in.)	
	Oil	0.75 mm (0.0295 in.)	
Connecting rod	Thrust clearance	STD	0.160 to 0.290 mm (0.0063 to 0.0138 in.)
		Maximum	0.35 mm (0.0138 in.)
	Connecting rod thickness		22.880 to 22.920 mm (0.9008 to 0.9024 in.)
	Connecting rod oil clearance	STD	0.021 to 0.047 mm (0.0008 to 0.0019 in.)
		Maximum	0.059 mm (0.0023 in.)
	Connecting rod bearing center wall thickness (Reference)	Mark 2	1.487 to 1.490 mm (0.0585 to 0.0587 in.)
		Mark 3	1.490 to 1.493 mm (0.0587 to 0.0588 in.)
		Mark 4	1.493 to 1.496 mm (0.0588 to 0.0589 in.)
		Mark 5	1.496 to 1.499 mm (0.0589 to 0.0590 in.)
		Mark 6	1.499 to 1.502 mm (0.0590 to 0.0591 in.)
		Mark 7	1.502 to 1.505 mm (0.0591 to 0.0593 in.)
		Rod bend	Maximum per 100 mm (3.94 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Bushing inside diameter		22.005 to 22.014 mm (0.8663 to 0.8667 in.)
	Piston pin diameter		21.997 to 22.009 mm (0.8660 to 0.8664 in.)
Bushing oil clearance	STD	0.005 to 0.011 mm (0.0002 to 0.0004 in.)	
	Maximum	0.05 mm (0.0020 in.)	
Connecting rod bolt tension portion diameter	STD	7.200 to 7.300 mm (0.2835 to 0.2874 in.)	
	Minimum	7.00 mm (0.2756 in.)	
Crankshaft	Thrust clearance	STD	0.020 to 0.220 mm (0.0008 to 0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.440 to 2.490 mm (0.0961 to 0.0980 in.)
	Main journal bore diameter on cylinder block (with main bearing)		66.986 to 67.000 mm (2.6372 to 2.6378 in.)
	Main journal oil clearance	STD No.1, No.5 others	0.028 to 0.046 mm (0.0011 to 0.0018 in.) 0.040 to 0.058 mm (0.0016 to 0.0023 in.)
		Maximum	0.065 mm (0.0026 in.)
Main journal diameter		66.988 to 67.000 mm (2.6373 to 2.6378 in.)	

SERVICE SPECIFICATIONS – ENGINE MECHANICAL (2UZ-FE)

Crankshaft (cont'd)	Main bearing center wall thickness (Reference)		
		No.1 and No.5 Mark 3	2.487 to 2.490 mm (0.0979 to 0.0980 in.)
		Mark 4	2.490 to 2.493 mm (0.0980 to 0.0981 in.)
		Mark 5	2.493 to 2.496 mm (0.0981 to 0.0983 in.)
		Mark 6	2.496 to 2.499 mm (0.0983 to 0.0984 in.)
		Mark 7	2.499 to 2.502 mm (0.0984 to 0.0985 in.)
		Others Mark 1	2.481 to 2.484 mm (0.0977 to 0.0978 in.)
		Mark 2	2.484 to 2.487 mm (0.0978 to 0.0979 in.)
		Mark 3	2.487 to 2.490 mm (0.0979 to 0.0980 in.)
		Mark 4	2.490 to 2.493 mm (0.0980 to 0.0981 in.)
		Mark 5	2.493 to 2.496 mm (0.0981 to 0.0983 in.)
		Crank pin diameter	51.982 to 52.000 mm (2.0465 to 2.0472 in.)
		Circle runout	Maximum 0.04 mm (0.0016 in.)
	Main journal taper and out-of-round	Maximum 0.02 mm (0.0008 in.)	
	Crank pin taper and out-of-round	Maximum 0.02 mm (0.0008 in.)	

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Fan shroud x Radiator assembly		5.5	50	43 in.·lbf
Radiator bracket x Radiator assembly		20	200	15
A/C Compressor x Cylinder block		49	500	36
Generator x Generator bracket		39	400	29
No.1 idler pulley, No.2 idler pulley x Cylinder Block		34.5	350	25
Camshaft timing pulley x Camshaft timing tube		8.1	83	72 in.·lbf
Drive belt tensioner x Cylinder block		16	160	12
Timing belt tensioner x Oil pump		26	270	19
Crankshaft pulley x Crankshaft		245	2,500	181
Fan bracket x Cylinder block	12 mm head	16	160	12
	14 mm head	32	330	24
No.2 timing belt cover x Cylinder block		16	160	12
No.3 timing belt cover x Cylinder block, cylinder head		7.5	80	66 in.·lbf
Drive belt idler pulley x Fan bracket		39	400	29
Fluid coupling x Fan bracket		29	296	21
Exhaust manifold x Cylinder head		44	450	33
Cylinder head x Cylinder block	1st	40	408	30
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
Camshaft bearing cap x Cylinder head	Bolt A	7.5	80	66 in.·lbf
	Others	16	160	12
Cylinder head cover x Cylinder head		6.0	60	53 in.·lbf
Engine hanger x Cylinder head		37	380	27
Front water bypass joint, Rear water bypass joint x Cylinder head		18	185	13
Intake manifold x Cylinder head		18	185	13
Timing belt rear plate x Cylinder head		7.5	80	66 in.·lbf
Drive plate x Crankshaft	1st	49	500	36
	2nd	Turn 90°	Turn 90°	Turn 90°
Transmission x Cylinder block		72	730	53
Transmission x No.1 oil pan		37	380	27
Drive plate x Torque converter clutch		48	490	35
Flywheel housing under cover x Transmission		18	185	13
Engine rear mounting bracket x Transmission		65	663	48
Frame crossmember x Rear engine mounting insulator	Bolt A	18	183	13
	Bolt B	72	730	53
Frame bracket x Engine mounting bracket		38	388	28
PS pump x Cylinder head		62	632	46
Main bearing cap x Cylinder block	1st	27	275	20
	2nd	Turn 90°	Turn 90°	Turn 90°
Connecting rod cap x Connecting rod	1st	24.5	250	18
	2nd	Turn 90°	Turn 90°	Turn 90°
Rear oil seal retainer x Cylinder block		8.0	80	71 in.·lbf
Engine coolant drain union x Cylinder block		49	500	36
Engine mounting bracket x Cylinder block		36	370	27
Water bypass pipe x Cylinder block		18	185	13

SERVICE SPECIFICATIONS - ENGINE MECHANICAL (2UZ-FE)

Front exhaust pipe x Exhaust manifold	62	630	46
Center exhaust pipe x Front exhaust pipe	48	489	35
Heated oxygen sensor (Bank 1, 2 sensor 2) x Front exhaust pipe	44	450	32

EMISSION CONTROL (1GR-FE)

TORQUE SPECIFICATION

SS1MJ-01

Part tightened	N·m	kgf·cm	ft·lbf
PCV valve x LH cylinder head cover	27	275	20
Charcoal canister x Charcoal canister cover	14.7	150	11
Heated oxygen sensor x Front exhaust pipe	44	450	33
A/F sensor x Front exhaust pipe	44	450	33
Exhaust manifold x Cylinder head	21	214	15
Manifold stay x Exhaust manifold	40	408	30
Front exhaust pipe x Exhaust manifold	62	630	46
Exhaust center pipe x LH front exhaust pipe	48	489	35
Exhaust center pipe x RH front exhaust pipe	43	440	32

EMISSION CONTROL (2UZ-FE)

SERVICE DATA

SS1M8-02

VSV for air injection system	Resistance	at 20°C (68°F)	33 to 39 Ω
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TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Front exhaust pipe x Exhaust manifold	62	632	46
Front exhaust pipe x Center pipe	48	489	35
Heated oxygen sensor x Front exhaust pipe	44	450	32
Air pump assembly x Cylinder head	16	163	12
Air switching valve No.2 x Cylinder head	10	102	7
Air tube No.3 x Cylinder head	10	102	7

SFI (1GR-FE)

SERVICE DATA

SS1MK-01

Fuel pressure	Fuel pressure at idle remains for 5 minutes after engine has stopped	281 to 287 kPa (2.87 to 2.93 kgf-cm ² , 40.8 to 41.7 psi) 147 kPa (1.5 kgf-cm ² , 21 psi) or more
Fuel pump	Resistance at 20°C (68°F)	0.2 to 3.0 Ω
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage at 20°C (68°F)	11.6 to 12.4 Ω 76 to 91 cm (4.6 to 5.5 cu in.) per 15 15 cm ³ (0.9 cu in.) or less 1 drop or less per 12 min.
MAF meter	Resistance (THA-E2) at -20°C (-4°F) at 20°C (68°F) at 60°C (140°F)	13.6 to 18.4 kΩ 2.21 to 2.69 kΩ 0.49 to 0.67 kΩ
VSV for ACIS	Resistance at 20°C (68°F)	33 to 39 Ω
Fuel pump resistor	Resistance at 20°C (68°F)	0.70 to 0.76 Ω
VSV for EVAP	Resistance at 20°C (68°F)	26 to 30 Ω
ECT sensor	Resistance at 20°C (68°F) at 80°C (176°F)	2.32 to 2.59 kΩ 0.310 to 0.326 kΩ
Fuel cut rpm	Fuel cut off rpm Fuel return rpm	2,500 rpm 1,200 rpm
Throttle body	Standard percentage of the valve opening angle Resistance at 20°C (68°F)	60% or more 0.3 to 100 Ω
Camshaft timing oil control valve	Resistance at 20°C (68°F)	6.9 to 7.9 Ω
Knock sensor	Resistance at 20°C (68°F)	120 to 280 kΩ
Air fuel ratio sensor	Resistance at 20°C (68°F) terminal 1 (HT) - 2 (+B) at 500°C (932°F) terminal 1 (HT) - 2 (+B) terminal 1 (HT) - 4 (AF)	1.8 to 3.4 Ω 5.0 to 7.5 Ω No continuity
Heated oxygen sensor	Resistance at 20°C (68°F)	5 to 10 Ω

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Fuel tank band x Body	62	632	45
Fuel pressure regulator x Fuel delivery pipe	9.0	92	80 in.·lbf
V-bank cover	7.5	76	66 in.·lbf
Air cleaner	8.0	82	71
Fuel delivery pipe x Intake manifold	15	153	11
Intake air surge tank x surge tank stay	21	214	16
Intake air surge tank x throttle body bracket	21	214	16
Intake air surge tank x Intake manifold	28	286	21
Fuel pressure regulator x Fuel delivery pipe	9.0	92	80 in.·lbf
Fuel pipe bracket x Body	20	204	15
Charcoal canister x Body	14.7	150	11
Throttle body x Intake manifold	11	112	9
Camshaft timing oil control valve x Cylinder head	9.0	92	80 in.·lbf
ECT sensor x Front water bypass joint	20	204	15
Knock sensor x Cylinder block	20	204	15
Water outlet pipe x Cylinder block	9.0	92	80 in.·lbf
Accelerator pedal x Body	5.0	51	44 in.·lbf

SFI (2UZ-FE)

SERVICE DATA

SS0CB-24

Fuel pump	Resistance	at 20°C (68°F)	0.2 to 3.0 Ω
Fuel pressure regulator	Fuel pressure	at no vacuum	265 to 304 kPa (2.7 to 3.1 kgf/cm ² , 38 to 44 psi)
Injector	Resistance	at 20°C (68°F)	13.4 to 14.2 Ω
	Injection volume		56 to 69 cm ³ (3.4 to 4.2 cu in.) per 15 seconds
	Difference between each cylinder		13 cm ³ (0.8 cu in.) or less
	Fuel leakage		1 drop or less per 12 minutes
MAF meter	Resistance (THA - E2)	at -20°C (-4°F) at 20°C (68°F) at 60°C (140°F)	12.5 to 16.9 kΩ 2.19 to 2.67 kΩ 0.50 to 0.68 kΩ
Throttle body	Throttle body fully closed angle		5.5°
Throttle control motor	Motor resistance	at 20°C (68°F)	0.3 to 100 Ω
VSV for EVAP	Resistance	at 20°C (68°F)	30 to 34 Ω
VSV for ACIS	Resistance	at 20°C (68°F)	33 to 39 Ω
VT sensor	Resistance	Cold Hot	835 to 1,400 Ω 1,060 to 1,645 Ω
Knock sensor	Resistance	at 20°C (68°F)	120 to 280 Ω
ECT sensor	Resistance	at -20°C (-4°F) 0°C (32°F) 20°C (68°F) 40°C (104°F) 60°C (140°F) 80°C (176°F)	10 to 20 kΩ 4 to 7 kΩ 2 to 3 kΩ 0.9 to 1.3 kΩ 0.4 to 0.7 kΩ 0.2 to 0.4 kΩ
Air-fuel ratio sensor	Heater coil resistance	at 20°C (68°F)	11 to 16 kΩ
Heated oxygen sensor	Heater coil resistance	at 20°C (68°F)	11 to 16 kΩ
Accelerator pedal position sensor	Standard throttle valve opening percentage Sensor lever full-open position		60 % or more
Fuel cut rpm		Fuel return rpm	1,400 rpm
Fuel pump resistor		at 20°C (68°F)	0.70 to 0.76 kΩ

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Fuel pressure pulsation damper x Delivery pipe for use with SST	33 39	340 400	24 29
Fuel pressure regulator x RH delivery pipe	7.5	80	66 in.·lbf
Front fuel pipe x Lower intake manifold	7.5	80	66 in.·lbf
Fuel return pipe x Delivery pipe	7.5	80	66 in.·lbf
Delivery pipe x Intake manifold	21	214	15
Fuel tank band x Body	62	632	45
Fuel pressure regulator x Delivery pipe	7.5	76	66 in.·lbf
Throttle body x Intake manifold	18	185	13
ECT sensor x Front water bypass joint	19.6	200	14
Knock sensor x Cylinder head	20	204	15
Air-fuel ratio sensor x Exhaust manifold	44	450	32
Heated oxygen sensor x Front exhaust pipe	44	450	32
Fuel pump resister x Body	8	82	71 in.·lbf
Camshaft oil control valve x Cylinder head	7.5	80	66 in.·lbf
Air pump assembly x Cylinder head	16	163	12

COOLING (1GR-FE)

SERVICE DATA

SS1MD-01

Water inlet w/ thermostat		
Valve opening temperature		80 to 84 °C (176 to 183 °F)
Valve lift	at 95 °C (203 °F)	8 mm (0.31 in.) or more
Radiator cap		
Relief valve opening pressure	Standard	93 to 123 kPa (0.95 to 1.25 kgf/cm ² , 13.5 to 17.8 psi)
	Minimum	78 kPa (0.8 kgf/cm ² , 11.4 psi)

TORQUE SPECIFICATION

Part Tightened	N-m	kgf·cm	ft·lbf
Cylinder block water drain cock plug x Cylinder block water drain cock	13	130	9
Water pump assy x Timing chain or belt cover sub-assy			
10 mm (0.39 in.) head	9.0	92	80 in.·lbf
12 mm (0.47 in.) head	23	235	17
Idler pulley sub-assy No. 2 x Timing chain or belt cover sub-assy	39	398	29
Water inlet x Timing chain or belt cover sub-assy	9.0	92	80 in.·lbf
Fan shroud x Radiator	5.0	51	44 in.·lbf
Fan w/ fluid coupling x Water pump	21	214	15
V-bank cover x Intake air surge tank	7.5	76	66 in.·lbf
Engine under cover sub-assy No. 1 x Frame assy	29	296	21
Water inlet w/ thermostat x Water inlet	9.0	92	80 in.·lbf
Radiator x Radiator support	18	184	13

COOLING (2UZ-FE)

SERVICE DATA

SS009-06

Thermostat	Valve opening temperature		80 to 84°C (176 to 183°F)
	Valve lift	at 95°C (203°F)	10 mm (0.39 in.) or more
Radiator cap	Relief valve opening pressure	Standard	74 to 103 kPa (0.75 to 1.05 kgf/cm ² , 10.7 to 14.9 psi)
		Minimum	59 kPa (0.6 kgf/cm ² , 8.6 psi)

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Drain plug x Union on cylinder block	12.7	130	9
Fan x Fluid coupling	5.5	55	47 in.·lbf
Water pump x Cylinder block	Bolt	21	15
	Stud bolt and nut	18	13
Water inlet housing x Water pump	18	185	13
Water inlet x Water inlet housing	19	195	14
Radiator x Radiator support	12.7	130	9
No.1 fan shroud x Radiator	5	50	44 in.·lbf
Radiator mounting bolt	12	120	9

LUBRICATION (1GR-FE)**SERVICE DATA**

SS1MM-01

Oil pressure		at idle speed at 3,000 rpm	29 kPa (0.3 kgf-cm ² , 4.3 psi) or more 294 to 588 kPa (3.0 to 6.0 kgf-cm ² , 43 to 85 psi)
Oil pump	Tip clearance	Standard	0.06 to 0.16 mm (0.0024 to 0.0063 in.)
		Maximum	0.16 mm (0.0063 in.)
	Side clearance	Standard	0.03 to 0.09 mm (0.0012 to 0.0035 in.)
		Maximum	0.09 mm (0.0035 in.)
	Body clearance	Standard	0.250 to 0.325 mm (0.0098 to 0.0128 in.)
		Maximum	0.325 mm (0.0128 in.)

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Oil pressure switch	15	152	11
Drain plug x Oil pan No. 2	40	408	30
Oil pipe x Timing chain cover	9.0	92	80 in.·lbf
Oil pump cover x Timing chain cover	9.0	92	80 in.·lbf
Relief valve plug x Oil pump cover	49	500	36
Union bolt x Oil filter bracket	68	693	50
Oil filter bracket x Timing chain cover	19	194	14

LUBRICATION (2UZ-FE)

SS00B-06

SERVICE DATA

Oil pressure		at idle speed at 3,000 rpm	29 kPa (0.3 kgf/cm ² , 4.3 psi) or more 294 to 588 kPa (3.0 to 6.0 kgf/cm ² , 43 to 85 psi)
Oil pump	Tip clearance	Standard	0.060 to 0.180 mm (0.0024 to 0.0071 in.)
		Maximum	0.18 mm (0.0071 in.)
	Side clearance	Standard	0.030 to 0.090 mm (0.0012 to 0.0035 in.)
		Maximum	0.09 mm (0.0035 in.)
	Body clearance	Standard	0.250 to 0.325 mm (0.0098 to 0.0128 in.)
		Maximum	0.325 mm (0.0128 in.)

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
No.2 oil pan x Drain plug	39	400	29
Oil pump body cover x Oil pump body	10	105	8
Oil pump x Cylinder block	14 mm head	30.5	22
	Others	15.5	11
Relief valve x Oil pump body	49	500	36
Oil strainer x Cylinder block, Oil pump	7.5	80	66 in.·lbf
No.1 oil pan x Oil pump, Oil seal retainer, Cylinder block	10 mm head	7.5	66 in.·lbf
	12 mm head	28	21
Oil pan baffle plate x No.1 oil pan	7.5	80	66 in.·lbf
No.2 oil pan x No.1 oil pan	7.5	80	66 in.·lbf
Oil filter bracket x Oil pump	18	185	13
Oil dipstick guide x Cylinder head	15	153	11
Oil cooler x Oil filter bracket	68.6	700	51
Oil nozzle x Cylinder block	9.0	92	80 in.·lbf

IGNITION (1GR-FE)**SERVICE DATA**

SS1MO-01

Spark plug	Recommended spark plug	NGK made	LFR6C-11
		DENSO made	K20HR-U11
	Electrode gap	Standard	1.0 to 1.1 mm (0.039 to 0.043 in.)
		Maximum	1.46 mm (0.057 in.)
Crankshaft position sensor	Resistance	Cold	1,630 to 2,740 Ω
		Hot	2,065 to 3,225 Ω

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	184	13
Ignition coil x Cylinder head cover	10	102	7
V-bank cover	7.5	76	66 in.·lbf
Air cleaner assy	8.0	82	71 in.·lbf
Throttle body bracket x Intake air surge tank	21	214	16
Intake air surge tank x Intake manifold	28	286	21
Surge tank stay x Intake air surge tank	21	214	16
Oil baffle plate x Surge tank stay No. 1	9.0	92	80
Crankshaft position sensor x Cylinder block	10	102	7
Cooler compressor x V-ribbed belt tensioner	25	255	18
Suction hose sub-assy	8.0	82	71 in.·lbf
VVT sensor x Cylinder head	9.0	92	80 in.·lbf

IGNITION (2UZ-FE)

SS006-08

SERVICE DATA

Firing order	-		1 - 8 - 4 - 3 - 6 - 5 - 7 - 2
Spark plug	Recommended spark plug	DENSO made	SK20R11
		NGK made	IFR6A11
	Electrode gap		1.0 to 1.1 mm (0.039 to 0.043 in.)
Crankshaft position sensor	Resistance	Cold	1,630 to 2,740 Ω
		Hot	2,065 to 3,225 Ω

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	17.5	180	13
Ignition coil (with igniter) x Cylinder head cover	7.5	76	66 in.·lbf
Camshaft position sensor x LH cylinder head	7.5	76	66 in.·lbf
Crankshaft position sensor x Oil pump	6.5	65	58 in.·lbf

STARTING (1GR-FE)

SERVICE DATA

SS1MB-01

Starter (1.6 kW type)		
Rated voltage and output power		12 V 1.6 kW
No-load characteristics	Current	90 A or less at 11.5 V
Starter armature assy		
Commutator length	Standard	3.1 mm (0.122 in.)
	Minimum	3.8 mm (0.150 in.)
Starter commutator end frame assy		
Brush holder length	Standard	9.0 mm (0.354 in.)
	Minimum	4.0 mm (0.158 in.)
Starter armature assy		
Snap ring length	Maximum	5.0 mm (0.197 in.)
Starter (2.0 kW type)		
Rated voltage and output power		12 V 2.0 kW
No-load characteristics	Current	100 A or less at 11.5 V
Starter armature assy		
Circle runout	Maximum	0.05 mm (0.0020 in.)
Commutator diameter	Standard	35.0 mm (1.378 in.)
	Minimum	34.0 mm (1.339 in.)
Undercut depth	Standard	0.7 mm (0.028 in.)
	Minimum	0.2 mm (0.008 in.)
Starter yoke		
Shunt coil resistance	at 20°C (68°F)	1.5 to 1.9 Ω
Brush		
Brush length	Standard	15.0 mm (0.591 in.)
	Minimum	9.0 mm (0.354 in.)
Starter brush holder assy		
Brush spring load	Standard	21.5 to 27.5 N (2.2 to 2.8 kgf, 4.8 to 6.2 lbf)
	Minimum	12.7 N (1.3 kgf, 2.9 lbf)

TORQUE SPECIFICATION

Part Tightened	N-m	kgf·cm	ft·lbf
Starter assy x Transmission housing	37	377	27
Starter assy x Terminal 30	9.8	100	7
Starter commutator end frame assy x Starter drive housing assy (Starter Assy 1.6 kW)	6.0	61	53 in.·lbf
Starter drive housing assy x Repair service starter kit (Starter Assy 1.6 kW)	7.5	76	66 in.·lbf
Lead wire x Repair service starter kit (Starter Assy 1.6 kW)	10	102	7.4
Commutator end frame x Brush holder (Starter Assy 2.0 kW)	3.8	39	34 in.·lbf
Starter drive housing assy x Magnetic Starter Switch (Starter Assy 2.0 kW)	9.3	95	82 in.·lbf
Commutator end frame x Starter drive housing assy (Starter Assy 2.0 kW)	9.3	95	82 in.·lbf
Lead wire x Terminal C of starter (Starter Assy 2.0 kW)	5.9	60	52 in.·lbf
Engine wire x Cylinder block	13	133	10

STARTING (2UZ-FE)

SERVICE DATA

SS00D-03

Starter (1.4 kW type)	Rated voltage and output power		12 V 1.4 kW
	No-load characteristics	Current	90 A or less at 11.5 V
		rpm	3,000 rpm or more
	Brush length	Standard	15.5 mm (0.610 in.)
		Minimum	10.0 mm (0.394 in.)
	Spring installed load	Standard	17.6 to 23.5 N (1.8 to 2.4 kgf, 4.0 to 5.3 lbf)
		Minimum	11.8 N (1.20 kgf, 2.7 lbf)
	Commutator		
		Diameter	Standard
		Minimum	29.0 mm (1.142 in.)
	Undercut depth	Standard	0.6 mm (0.024 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
Magnetic switch			
Contact plate for wear	Maximum	0.9 mm (0.035 in.)	
Starter (2.0 kW type)	Rated voltage and output power		12 V 2.0 kW
	No-load characteristics	Current	100 A or less at 11.5 V
		rpm	2,500 rpm or more
	Brush length	Standard	15.0 mm (0.591 in.)
		Minimum	9.0 mm (0.354 in.)
	Spring installed load	Standard	21.5 to 27.5 N (2.2 to 2.8 kgf, 4.8 to 6.2 lbf)
		Minimum	12.7 N (1.3 kgf, 2.9 lbf)
	Commutator		
		Diameter	Standard
		Minimum	34.0 mm (1.339 in.)
	Undercut depth	Standard	0.7 mm (0.028 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
Field frame			
Shunt coil resistance	at 20°C (68°F)	1.5 to 1.9 Ω	
Magnetic switch			
Contact plate for wear	Maximum	0.9 mm (0.035 in.)	

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Terminal 30 nut, Terminal C nut x Terminal bolt		17	170	13
End cover x Magnetic switch housing	1.4 kW type	2.5	25	22 in.·lbf
	2.0 kW type	3.6	37	32 in.·lbf
End cover x Brush holder	1.4 kW type	1.5	15	13 in.·lbf
	2.0 kW type	3.8	39	34 in.·lbf
Starter hosing x Magnetic switch	1.4 kW type	5.9	60	52 in.·lbf
	2.0 kW type	9.3	95	82 in.·lbf
End cover with field frame x Magnetic switch	1.4 kW type	5.9	60	52 in.·lbf
	2.0 kW type	9.3	95	82 in.·lbf
Lead wire of field coil x Terminal C		5.9	60	52 in.·lbf
Wire clamp, Starter wire x Starter		9.81	100	84 in.·lbf
Starter x Cylinder block		39	400	29

CHARGING (1GR-FE)**SERVICE DATA**

SS1MF-01

Battery		
Voltage	at 20°C (68°F)	12.5 to 12.9 V
Except maintenance-free battery	Standard specific gravity	1.25 to 1.29 at 20 °C (68 °F)
Voltage regulator		
Regulating voltage		13.2 to 14.8 V
Generator brush holder assy		
Brush length	Standard	10.5 mm (0.413 in.)
	Minimum	4.5 mm (0.177 in.)
Generator rotor assy		
Resistance	at 20°C (68°F)	2.3 to 2.7 Ω
Slip ring diameter	Standard	14.2 to 14.4 mm (0.559 to 0.567 in.)
	Minimum	14.0 mm (0.551 in.)

TORQUE SPECIFICATION

Part Tightened	N-m	kgf·cm	ft·lbf
Generator assy x V-ribbed belt tensioner and cylinder head	43	438	32
Generator assy x Wire harness clamp bracket	8.0	82	71 in.·lbf
Generator assy x Terminal B	9.8	100	7
Wire harness stay x Body	8.0	82	71 in.·lbf
V-bank cover x Intake air surge tank sub-assy and Air cleaner assy	7.5	76	66 in.·lbf
Engine under cover sub-assy No.1 x Frame assy	29	296	21
Engine under cover assy rear x Frame assy	29	296	21
Retainer plate x Drive end frame assy generator	2.6	27	23 in.·lbf
Generator coil assy x Drive frame assy generator	5.8	59	51 in.·lbf
Generator brush holder assy x Generator coil assy	1.8	18	16 in.·lbf
Generator rear end cover x Generator coil assy	4.6	47	41 in.·lbf
Generator pulley x Generator rotor assy	110	1,122	81

CHARGING (2UZ-FE)

SERVICE DATA

SS00F-06

Battery	Exempt maintenance-free		
	Specific gravity	at 20° C (68° F)	1.25 to 1.29
Maintenance-free	Voltage	at 20° C (68° F)	12.5 to 12.9 V
Generator	Rated output		12V 100A
	Rotor coil resistance	at 20° C (68° F)	2.1 to 2.5 Ω
	Slip ring diameter	Standard	14.2 to 14.4 mm (0.559 to 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
Brush exposed length	Standard	10.5 mm (0.413 in.)	
	Minimum	1.5 mm (0.059 in.)	
Voltage regulator	Regulating voltage		13.2 to 14.8 V

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Bearing retainer x Drive end frame		3.0	31	27 in.·lbf
Rectifier end frame x Drive end frame	without Cord clip	4.5	46	39 in.·lbf
	with Cord clip	5.4	55	48 in.·lbf
Generator pulley x Rotor		110.5	1,125	81
Rectifier holder x Lead wire on rectifier end frame		2.94	30	26 in.·lbf
Voltage regulator x Rectifier end frame, Rectifier holder		1.96	20	17 in.·lbf
Brush holder x Rectifier holder, Voltage regulator		1.96	20	17 in.·lbf
Rear end cover x Rectifier holder		4.4	45	39 in.·lbf
Plate terminal x Rectifier holder	Bolt	3.85	39	34 in.·lbf
	Nut	4.4	45	39 in.·lbf
Terminal insulator x Rectifier holder		4.1	42	36 in.·lbf
Generator x Cylinder block		39	400	29

CLUTCH

SERVICE DATA

SS07T-04

Pedal height from dash panel		170.2 to 180.2 mm (6.701 to 7.095 in.)
Pedal height from dash insulator		157.7 to 167.7 mm (6.209 to 6.602 in.)
Push rod play at pedal top		1.0 to 5.0 mm (0.039 to 0.197 in.)
Pedal freeplay		5.0 to 15.0 mm (0.197 to 0.591 in.)
Clutch release point from pedal full stroke end position	Standard	25 mm (0.98 in.) or more
Disc rivet head depth	Minimum	0.3 mm (0.012 in.)
Disc runout	Maximum	0.7 mm (0.027 in.)
Flywheel runout	Maximum	0.1 mm (0.004 in.)
Diaphragm spring for wear	Maximum depth	0.5 mm (0.020 in.)
	Maximum width	6.0 mm (0.236 in.)
Diaphragm spring tip non-alignment	Maximum	0.5 mm (0.020 in.)

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Master cylinder mounting nut	14	143	10
Clutch line union	15	155	11
Bleeder plug x Release cylinder body	11	110	8
Release cylinder installation bolt	12	120	9
Clutch accumulator installation bolt	12	120	9
Clutch housing cover installation bolt	12	120	9
Clutch cover x Flywheel	19	195	14
Release fork support x Transmission	47	479	35

MANUAL TRANSMISSION (RA60)

SS1MQ-01

SERVICE DATA

Reverse idle gear thrust clearance	Standard Maximum	0.10 to 0.55 mm (0.0039 to 0.0217 in.) 0.55 mm (0.0217 in.)
Reverse idle gear radial clearance	Standard Maximum	0.015 to 0.050 mm (0.0006 to 0.0020 in.) 0.050 mm (0.0020 in.)
Input shaft gear thrust clearance	3rd 4th 6th	0.09 to 0.52 mm (0.0035 to 0.0205 in.) 0.12 to 0.38 mm (0.0047 to 0.0150 in.) 0.20 to 0.48 mm (0.0079 to 0.0189 in.)
Input shaft gear radial clearance	3rd and 4th 6th	0.015 to 0.067 mm (0.00059 to 0.00264 in.) 0.015 to 0.065 mm (0.00059 to 0.00256 in.)
Synchronizer ring set No. 3 to 3rd gear clearance	Standard Inner Middle Outer Minimum Inner Middle Outer	1.20 to 2.20 mm (0.0472 to 0.0866 in.) 0.60 to 1.80 mm (0.0236 to 0.0709 in.) 0.80 to 1.80 mm (0.0315 to 0.0709 in.) 1.20 mm (0.0472 in.) 0.60 mm (0.0236 in.) 0.80 mm (0.0315 in.)
Synchronizer ring No. 3 to 4th gear clearance	Standard Minimum	0.70 to 1.50 mm (0.0276 to 0.0591 in.) 0.70 mm (0.0276 in.)
Synchronizer ring No. 3 to 6th gear clearance	Standard Minimum	0.70 to 1.50 mm (0.0276 to 0.0591 in.) 0.70 mm (0.0276 in.)
Wide of the hub sleeve – Thickness of the gear shift fork	No. 2 and No. 3	0.26 to 0.84 mm (0.0102 to 0.0331 in.)
Input shaft runout	Maximum	0.03 mm (0.0012 in.)
Input shaft journal diameter (See page MT-34)	Part A B C D E	Standard Minimum Standard Minimum Standard Minimum Standard Minimum Standard Minimum
Gear inside diameter	3rd gear Standard Maximum 4th gear Standard Maximum 6th gear Standard Maximum	34.002 to 34.015 mm (1.3387 to 1.3392 in.) 34.002 mm (1.3387 in.) 44.985 to 45.000 mm (1.7711 to 1.7717 in.) 44.985 mm (1.7711 in.) 44.985 to 45.000 mm (1.7711 to 1.7717 in.) 44.985 mm (1.7711 in.) 41.985 to 42.000 mm (1.6530 to 1.6535 in.) 41.985 mm (1.6530 in.) 32.967 to 32.980 mm (1.2979 to 1.2984 in.) 32.967 mm (1.2979 in.) 51.015 to 51.040 mm (2.0085 to 2.0094 in.) 51.040 mm (2.0094 in.) 51.015 to 51.040 mm (2.0085 to 2.0094 in.) 51.040 mm (2.0094 in.) 51.015 to 51.040 mm (2.0085 to 2.0094 in.) 51.040 mm (2.0094 in.)
3rd gear thrust washer thickness	Standard Minimum	7.12 to 7.18 mm (0.2803 to 0.2827 in.) 7.12 mm (0.2803 in.)

Input shaft bearing snap ring thickness	Standard clearance	0.1 mm (0.0039 in.) or less
	Mark	
	A	2.65 to 2.70 mm (0.1043 to 0.1063 in.)
	B	2.70 to 2.75 mm (0.1063 to 0.1083 in.)
	C	2.75 to 2.80 mm (0.1083 to 0.1102 in.)
	D	2.80 to 2.85 mm (0.1102 to 0.1122 in.)
	E	2.85 to 2.90 mm (0.1122 to 0.1142 in.)
F	2.90 to 2.95 mm (0.1142 to 0.1161 in.)	
Clutch hub No. 2 snap ring thickness	Standard clearance	0.1 mm (0.0039 in.) or less
	Mark	
	A	1.77 to 1.82 mm (0.0697 to 0.0717 in.)
	B	1.82 to 1.87 mm (0.0717 to 0.0736 in.)
	C	1.87 to 1.92 mm (0.0726 to 0.0756 in.)
	D	1.92 to 1.97 mm (0.0756 to 0.0776 in.)
	E	1.97 to 2.02 mm (0.0776 to 0.0795 in.)
F	2.02 to 2.07 mm (0.0795 to 0.0815 in.)	
G	2.07 to 2.12 mm (0.0815 to 0.0835 in.)	
3rd gear thrust washer snap ring thickness	Standard clearance	0.1 mm (0.0039 in.) or less
	Mark	
	A	2.07 to 2.12 mm (0.0815 to 0.0835 in.)
	B	2.12 to 2.17 mm (0.0835 to 0.0854 in.)
	C	2.17 to 2.22 mm (0.0854 to 0.0874 in.)
	D	2.22 to 2.27 mm (0.0874 to 0.0894 in.)
	E	2.27 to 2.32 mm (0.0894 to 0.0913 in.)
F	2.32 to 2.37 mm (0.0913 to 0.0933 in.)	
Clutch hub No. 3 snap ring thickness	Standard clearance	0.1 mm (0.0039 in.) or less
	Mark	
	A	2.10 to 2.15 mm (0.0827 to 0.0846 in.)
	B	2.15 to 2.20 mm (0.0846 to 0.0866 in.)
	C	2.20 to 2.25 mm (0.0866 to 0.0886 in.)
	D	2.25 to 2.30 mm (0.0886 to 0.0906 in.)
	E	2.30 to 2.35 mm (0.0906 to 0.0925 in.)
F	2.35 to 2.40 mm (0.0925 to 0.0945 in.)	
G	2.40 to 2.45 mm (0.0945 to 0.0965 in.)	
Output shaft inside diameter	Standard	45.009 to 45.025 mm (1.7720 to 1.7726 in.)
	minimum	45.025 mm (1.7726 in.)
Synchronizer ring to 5th gear clearance	Standard	0.70 to 1.50 mm (0.0276 to 0.0591 in.)
	Minimum	0.70 mm (0.0276 in.)
Counter gear shaft gear thrust clearance	1st and 2nd	0.10 to 0.42 mm (0.0039 to 0.0165 in.)
	Reverse	0.12 to 0.28 mm (0.0047 to 0.0110 in.)
Counter gear shaft gear radial clearance	1st and 2nd	0.015 to 0.067 mm (0.00059 to 0.00264 in.)
	Reverse	0.015 to 0.065 mm (0.00059 to 0.00256 in.)
Synchronizer ring set No. 1 to 1st gear clearance	Standard	
	Inner	1.48 to 2.12 mm (0.0583 to 0.0835 in.)
	Middle	0.68 to 1.92 mm (0.0268 to 0.0756 in.)
	Outer	0.88 to 1.72 mm (0.0346 to 0.0677 in.)
	Minimum	
	Inner	1.48 mm (0.0583 in.)
Middle	0.68 mm (0.0268 in.)	
Outer	0.88 mm (0.0346 in.)	

SERVICE SPECIFICATIONS – MANUAL TRANSMISSION (RA60)

Synchronizer ring set No. 1 to 2nd gear clearance	Standard	
	Inner	1.48 to 2.12 mm (0.0583 to 0.0835 in.)
	Middle	0.68 to 1.92 mm (0.0268 to 0.0756 in.)
	Outer	0.88 to 1.72 mm (0.0346 to 0.0677 in.)
	Minimum	
	Inner	1.48 mm (0.0583 in.)
	Middle	0.68 mm (0.0268 in.)
	Outer	0.88 mm (0.0346 in.)
Reverse synchronizer ring to reverse gear clearance	Standard	0.70 to 1.30 mm (0.0278 to 0.0512 in.)
	Minimum	0.70 mm (0.0278 in.)
Wide of the hub sleeve – Thickness of the gear shift fork	No. 1	0.15 to 0.35 mm (0.0059 to 0.0138 in.)
	No. 4	0.26 to 0.84 mm (0.0102 to 0.0331 in.)
Counter gear shaft runout	Maximum	0.03 mm (0.0012 in.)
Counter gear shaft journal diameter (See page MT-52)	Part	
	A Standard	34.002 to 34.015 mm (1.3387 to 1.3392 in.)
	Minimum	34.002 mm (1.3387 in.)
	B Standard	36.985 to 37.000 mm (1.4561 to 1.4567 in.)
	Minimum	36.985 mm (1.4561 in.)
	C Standard	47.985 to 78.000 mm (1.8892 to 1.8898 in.)
	Minimum	47.985 mm (1.8892 in.)
	D Standard	53.985 to 54.000 mm (2.1254 to 2.1260 in.)
	Minimum	53.985 mm (2.1254 in.)
	E Standard	34.002 to 34.015 mm (1.3387 to 1.3392 in.)
Minimum	34.002 mm (1.3387 in.)	
Gear inside diameter	1st gear	
	Standard	54.015 to 54.040 mm (2.1266 to 2.1276 in.)
	Maximum	54.040 mm (2.1276 in.)
	2nd gear	
	Standard	60.015 to 60.040 mm (2.3628 to 2.3638 in.)
	Maximum	60.040 mm (2.3638 in.)
Reverse gear	Standard	51.015 to 51.040 mm (2.0085 to 2.0094 in.)
	Maximum	51.040 mm (2.0094 in.)
Clutch hub No. 1 snap ring thickness	Standard	0.1 mm (0.0039 in.) or less
	Mark	
	A	2.28 to 2.33 mm (0.0898 to 0.0917 in.)
	B	2.33 to 2.38 mm (0.0917 to 0.0937 in.)
	C	2.38 to 2.43 mm (0.0937 to 0.0957 in.)
	D	2.43 to 2.48 mm (0.0957 to 0.0976 in.)
	E	2.48 to 2.53 mm (0.0976 to 0.0996 in.)
	F	2.53 to 2.58 mm (0.0996 to 0.1016 in.)
G	2.58 to 2.63 mm (0.1016 to 0.1035 in.)	
Counter gear shaft bearing snap ring thickness	Standard	0.1 mm (0.0039 in.) or less
	Mark	
	A	2.35 to 2.40 mm (0.0925 to 0.0945 in.)
	B	2.40 to 2.45 mm (0.0945 to 0.0965 in.)
	C	2.45 to 2.50 mm (0.0965 to 0.0984 in.)
	D	2.50 to 2.55 mm (0.0984 to 0.1004 in.)
	E	2.55 to 2.60 mm (0.1004 to 0.1024 in.)
	F	2.60 to 2.65 mm (0.1024 to 0.1043 in.)
	G	2.65 to 2.70 mm (0.1043 to 0.1063 in.)
	G	2.70 to 2.75 mm (0.1063 to 0.1083 in.)
	J	2.75 to 2.80 mm (0.1083 to 0.1102 in.)
	K	2.80 to 2.85 mm (0.1102 to 0.1122 in.)
	L	2.85 to 2.90 mm (0.1122 to 0.1142 in.)
M	2.90 to 2.95 mm (0.1142 to 0.1161 in.)	

Needle roller bearing inner race snap ring thickness	Standard Mark	0.1 mm (0.0039 in.) or less A 2.35 to 2.40 mm (0.0925 to 0.0945 in.) B 2.40 to 2.45 mm (0.0945 to 0.0965 in.) C 2.45 to 2.50 mm (0.0965 to 0.0984 in.) D 2.50 to 2.55 mm (0.0984 to 0.1004 in.) E 2.55 to 2.60 mm (0.1004 to 0.1024 in.) F 2.60 to 2.65 mm (0.1024 to 0.1043 in.) G 2.65 to 2.70 mm (0.1043 to 0.1063 in.) G 2.70 to 2.75 mm (0.1063 to 0.1083 in.) J 2.75 to 2.80 mm (0.1083 to 0.1102 in.) K 2.80 to 2.85 mm (0.1102 to 0.1122 in.) L 2.85 to 2.90 mm (0.1122 to 0.1142 in.) M 2.90 to 2.95 mm (0.1142 to 0.1161 in.)
Oil seal drive in depth	Front case oil seal Extension housing oil seal	60.0 to 60.8 mm (2.362 to 2.394 in.) -0.5 to 0.5 mm (-0.0197 to 0.0197 in.)

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Transmission x Engine (See page MT-7)	Bolt A	72	730	53
	Bolt B	37	380	27
Transmission cover x Transmission		12	120	9
Engine rear mounting x Transmission		65	660	48
Crossmember x Frame		72	734	53
Engine rear mounting x Crossmember		18	180	13
Starter x Transmission		39	400	29
Starter wire x Starter		9.8	100	7
Clutch release cylinder x Transmission		12	120	9
Clutch accumulator x Transmission		12	120	9
Clutch housing cover x Transmission		12	120	9
Clutch line x Clutch release cylinder		15	155	11
Stabilizer bar bracket x Frame		37	377	27
Filler plug x Transmission		37	380	27
Front exhaust pipe x Exhaust manifold		62	630	46
LH front exhaust pipe x Center exhaust manifold		48	490	35
RH front exhaust pipe x Exhaust pipe support		43	440	32
Manifold stay x Front exhaust pipe and transmission		40	408	30
Propeller shaft x Differential		88	897	65
Center support bearing x Body		40	410	30
Drain plug x Transmission		37	380	27
Control sub assembly x Front case		21	214	15
Back-up lamp switch x Front case		44	449	32
Plug x Front case		39	397	29
Release fork support x Clutch housing		47	480	35
Shift lever housing x Shift & select lever shaft		33	337	24
Control retainer x Exhaust housing		20	204	15
Front case x Middle case		40	408	30
Reverse idler gear shaft set bolt		28	286	21
Transmission oil separator x Middle case		8.5	87	75 in.·lbf
Middle case x Rear case		40	408	30
Lock ball pin x Rear case		24.5	250	18
Bearing lock plate x Rear case		11	115	8
Extension housing x Rear case		29	296	21
Speedometer sensor x Extension housing		13	133	10
Shift fork x Interlock bracket		19.5	200	14
Shift select lever x Shift & select lever cam		33	340	25

AUTOMATIC TRANSMISSION (A750E, A750F)

SS1MV-01

SERVICE DATA

2UZ-FE (A750E)		
Line pressure (Wheel locked)	Engine idling D position R position AT stall (Throttle valve fully opened) D position R position	361 – 421 kPa (3.7 – 4.3 kgf-cm ² , 52 – 61 psi) 495 – 576 kPa (5.0 – 5.9 kgf-cm ² , 72 – 84 psi) 1,236 – 1,332 kPa (12.6 – 13.6 kgf-cm ² , 179 – 193 psi) 1,229 – 1,349 kPa (12.5 – 13.8 kgf-cm ² , 178 – 196 psi)
Engine stall revolution	D and R positions	2,200 ± 150 rpm
Time lag	N → D position	Less than 1.2 seconds
	N → R position	Less than 1.5 seconds
Engine idle speed (A/C OFF)	N position	700 ± 50 rpm
Drive plate runout	Max.	0.20 mm (0.0079 in.)
Torque converter runout	Max.	0.30 mm (0.0118 in.)
Shift schedule		
D position (Throttle valve fully opened)	1 → 2 2 → 3 3 → 4 4 → 5 5 → 4 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 89 – 101 km/h (55 – 62 mph) 126 – 145 km/h (78 – 90 mph) 171 – 188 km/h (106 – 117 mph) 166 – 183 km/h (103 – 114 mph) 116 – 130 km/h (72 – 81 mph) 78 – 87 km/h (48 – 54 mph) 36 – 43 km/h (22 – 27 mph)
(Throttle valve fully closed)	4 → 5 5 → 4	46 – 53 km/h (29 – 33 mph) 23 – 29 km/h (14 – 18 mph)
4 position (O/D OFF) (Throttle valve fully opened)	1 → 2 2 → 3 3 → 4 5 → 4 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 89 – 101 km/h (55 – 62 mph) 126 – 145 km/h (78 – 90 mph) 182 – 200 km/h (113 – 124 mph) 116 – 130 km/h (72 – 81 mph) 78 – 87 km/h (48 – 54 mph) 36 – 43 km/h (22 – 27 mph)
3 position (Throttle valve fully opened)	1 → 2 2 → 3 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 89 – 101 km/h (55 – 62 mph) 127 – 142 km/h (79 – 88 mph) 78 – 87 km/h (48 – 54 mph) 36 – 43 km/h (22 – 27 mph)
2 position (Throttle valve fully opened)	1 → 2 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 84 – 97 km/h (52 – 60 mph) 36 – 43 km/h (22 – 27 mph)
L position (Throttle valve fully opened)	2 → 1	36 – 43 km/h (22 – 27 mph)
Lock-up point	Throttle valve opening 5 %	
D position		
5th gear	Lock-up ON Lock-up OFF	66 – 74 km/h (41 – 46 mph) 59 – 67 km/h (37 – 42 mph)
4 position		
4th gear	Lock-up ON Lock-up OFF	107 – 118 km/h (66 – 73 mph) 100 – 111 km/h (62 – 69 mph)

SERVICE SPECIFICATIONS – AUTOMATIC TRANSMISSION (A750E, A750F)

2UZ-FE (A750F)		
Line pressure (Wheel locked)	Engine idling D position R position AT stall (Throttle valve fully opened) D position R position	361 – 421 kPa (3.7 – 4.3 kgf-cm ² , 52 – 61 psi) 495 – 576 kPa (5.0 – 5.9 kgf-cm ² , 72 – 84 psi) 1,236 – 1,332kPa (12.6 – 13.6 kgf-cm ² , 179 – 193 psi) 1,229 – 1,349 kPa (12.5 – 13.8 kgf-cm ² , 178 – 196 psi)
Engine stall revolution	D and R positions	2,200 ± 150 rpm
Time lag	N → D position N → R position	Less than 1.2 seconds Less than 1.5 seconds
Engine idle speed (A/C OFF)	N position	700 ± 50 rpm
Drive plate runout	Max.	0.20 mm (0.0079 in.)
Torque converter runout	Max.	0.30 mm (0.0118 in.)
Shift schedule D position (Throttle valve fully opened)	1 → 2 2 → 3 3 → 4 4 → 5 5 → 4 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 88 – 101 km/h (55 – 62 mph) 126 – 145 km/h (78 – 90 mph) 170 – 188 km/h (106 – 117 mph) 165 – 182 km/h (103 – 113 mph) 116 – 130 km/h (72 – 81 mph) 78 – 87 km/h (48 – 54 mph) 36 – 43 km/h (22 – 27 mph)
(Throttle valve fully closed)	4 → 5 5 → 4	46 – 53 km/h (29 – 33 mph) 23 – 29 km/h (14 – 18 mph)
4 position (O/D OFF) (Throttle valve fully opened)	1 → 2 2 → 3 3 → 4 5 → 4 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 88 – 101 km/h (55 – 62 mph) 126 – 145 km/h (78 – 90 mph) 181 – 199 km/h (112 – 124 mph) 116 – 130 km/h (72 – 81 mph) 78 – 87 km/h (48 – 54 mph) 36 – 43 km/h (22 – 27 mph)
3 position (Throttle valve fully opened)	1 → 2 2 → 3 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 88 – 101 km/h (55 – 62 mph) 127 – 142 km/h (79 – 88 mph) 78 – 87 km/h (48 – 54 mph) 36 – 43 km/h (22 – 27 mph)
2 position (Throttle valve fully opened)	1 → 2 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 84 – 97 km/h (52 – 60 mph) 36 – 43 km/h (22 – 27 mph)
L position (Throttle valve fully opened)	2 → 1	36 – 43 km/h (22 – 27 mph)
Lock-up point	Throttle valve opening 5 %	
D position		
5th gear	Lock-up ON Lock-up OFF	66 – 74 km/h (41 – 46 mph) 59 – 67 km/h (37 – 42 mph)
4 position		
4th gear	Lock-up ON Lock-up OFF	107 – 118 km/h (66 – 73 mph) 100 – 110 km/h (62 – 68 mph)

1GR-FE (A750E)		
Line pressure (Wheel locked)	Engine idling D position R position AT stall (Throttle valve fully opened) D position R position	363 – 423 kPa (3.7 – 4.3 kgf-cm ² , 53 – 61 psi) 484 – 564 kPa (4.9 – 5.8 kgf-cm ² , 70 – 82 psi) 1,282 – 1,381 kPa (13.1 – 14.1 kgf-cm ² , 186 – 200 psi) 1,218 – 1,338 kPa (12.4 – 13.6 kgf-cm ² , 177 – 194 psi)
Engine stall revolution	D and R positions	2,400 ± 150 rpm
Time lag	N → D position N → R position	Less than 1.2 seconds Less than 1.5 seconds
Engine idle speed (A/C OFF)	N position	700 ± 50 rpm
Drive plate runout	Max.	0.20 mm (0.0079 in.)
Torque converter runout	Max.	0.30 mm (0.0118 in.)
Shift schedule D position (Throttle valve fully opened)	1 → 2 2 → 3 3 → 4 4 → 5 5 → 4 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 92 – 105 km/h (57 – 65 mph) 133 – 153 km/h (83 – 95 mph) 170 – 188 km/h (106 – 117 mph) 163 – 180 km/h (101 – 112 mph) 118 – 133 km/h (73 – 83 mph) 79 – 88 km/h (49 – 55 mph) 37 – 44 km/h (23 – 27 mph)
(Throttle valve fully closed)	4 → 5 5 → 4	44 – 51 km/h (27 – 32 mph) 26 – 32 km/h (16 – 20 mph)
4 position (O/D OFF) (Throttle valve fully opened)	1 → 2 2 → 3 3 → 4 5 → 4 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 92 – 105 km/h (57 – 65 mph) 133 – 153 km/h (83 – 95 mph) 182 – 200 km/h (113 – 124 mph) 118 – 133 km/h (73 – 83 mph) 79 – 88 km/h (49 – 55 mph) 37 – 44 km/h (23 – 27 mph)
3 position (Throttle valve fully opened)	1 → 2 2 → 3 4 → 3 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 92 – 105 km/h (57 – 65 mph) 127 – 142 km/h (79 – 88 mph) 79 – 88 km/h (49 – 55 mph) 37 – 44 km/h (23 – 27 mph)
2 position (Throttle valve fully opened)	1 → 2 3 → 2 2 → 1	47 – 60 km/h (29 – 37 mph) 84 – 97 km/h (52 – 60 mph) 37 – 44 km/h (23 – 27 mph)
L position (Throttle valve fully opened)	2 → 1	40 – 47 km/h (25 – 29 mph)
Lock-up point D position 5th gear	Throttle valve opening 5 % Lock-up ON Lock-up OFF	65 – 73 km/h (40 – 45 mph) 58 – 66 km/h (36 – 41 mph)
4 position 4th gear	Lock-up ON Lock-up OFF	65 – 73 km/h (40 – 45 mph) 58 – 66 km/h (36 – 41 mph)

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Drain plug x Oil pan		20	204	15
Overflow plug x Oil pan		20	204	15
Refill plug x Transmission case		39	400	29
Speed sensor NT x Automatic transmission		5.4	55	48 in.·lbf
Speed sensor SP2 x Automatic transmission		5.4	55	48 in.·lbf
Transmission wire set bolt x Automatic transmission		5.4	55	48 in.·lbf
Transmission wire clamp x Valve body	A	11	112	8
	B	10	100	7
Oil pan x Transmission case		4.4	45	39 in.·lbf
Park/neutral position switch	Bolt	13	130	10
	Nut	6.9	70	61 in.·lbf
Shift solenoid valve S1 x Valve body		6.4	65	56 in.·lbf
Shift solenoid valve S2 x Valve body		10	102	7
Shift solenoid valve SR x Valve body		6.4	65	57 in.·lbf
Shift solenoid valve SLU, SL2 x Valve body		6.4	65	57 in.·lbf
Shift solenoid valve SLT, SL1 x Valve body		6.4	65	57 in.·lbf
Valve body x Transmission case		11	112	8
Oil strainer x Valve body		10	100	7
Parking lock pawl bracket x Transmission case		7.4	75	65 in.·lbf
Oil cooler x Body		11	110	8
Transmission oil cooler bracket x Oil cooler		4.9	50	43 in.·lbf
Oil cooler tube clamp x Body		5.0	50	48 in.·lbf
Shift lever x Shift lever housing		18	180	13
Shift lever housing x Steering column assembly		12	120	9
Parking lock cable No. 1 x Shift lever housing		2.9	29	25 in.·lbf
Parking lock cable No. 2 x Column upper bracket		2.2	23	19 in.·lbf
Parking lock cable housing x Steering column assembly		10.5	110	8
Heat insulator		16	164	12
Shift control cable x Transmission		14.5	148	11
Shift control cable bracket x Transmission		19.5	199	14
Oil cooler pipe clamp x Transmission		12	122	9
Oil cooler pipe x Transmission		34	346	25
Stabilizer bar		37	377	27
1GR-FE: Starter wire x Starter		9.8	100	7
1GR-FE: Starter		37	377	27
Rear end plate x Transmission		18	185	13
Torque converter clutch x Drive plate		48	490	35
Engine rear mounting insulator x Crossmember		18	185	13
Crossmember x Frame		72	734	53
Engine rear mounting insulator x Extension housing		65	660	48
Automatic transmission x Engine	17 mm head	71	724	52
	14 mm head	37	377	27

TRANSFER

SERVICE DATA

SS1MT-01

Transfer unit	Hose installation depth		13 mm (0.51 in.) or more
Input shaft	Input shaft snap ring thickness	Mark	
		A	2.10 to 2.15 mm (0.0827 to 0.0846 in.)
		B	2.15 to 2.20 mm (0.0846 to 0.0866 in.)
		C	2.20 to 2.25 mm (0.0866 to 0.0886 in.)
		D	2.25 to 2.30 mm (0.0886 to 0.0906 in.)
		E	2.30 to 2.35 mm (0.0906 to 0.0925 in.)
		F	2.35 to 2.40 mm (0.0925 to 0.0945 in.)
		G	2.40 to 2.45 mm (0.0945 to 0.0965 in.)
		H	2.45 to 2.50 mm (0.0965 to 0.0984 in.)
		J	2.50 to 2.55 mm (0.0984 to 0.1004 in.)
		K	2.55 to 2.60 mm (0.1004 to 0.1024 in.)
		L	2.60 to 2.65 mm (0.1024 to 0.1043 in.)
		M	2.65 to 2.70 mm (0.1043 to 0.1063 in.)
		N	2.70 to 2.75 mm (0.1063 to 0.1083 in.)
P	2.75 to 2.80 mm (0.1083 to 0.1102 in.)		
Q	2.80 to 2.85 mm (0.1102 to 0.1122 in.)		
R	2.85 to 2.90 mm (0.1122 to 0.1142 in.)		
S	2.90 to 2.95 mm (0.1142 to 0.1161 in.)		
T	2.95 to 3.00 mm (0.1161 to 0.1181 in.)		
U	3.00 to 3.05 mm (0.1181 to 0.1201 in.)		
	Input shaft journal outer diameter	Minimum	47.59 mm (1.8736 in.)
	Input shaft bushing inside diameter	Maximum	39.14 mm (1.5409 in.)

SERVICE SPECIFICATIONS – TRANSFER

Rear output shaft	Drive sprocket thrust clearance	Standard	0.10 to 0.25 mm (0.0039 to 0.0098 in.)
		Maximum	0.25 mm (0.0098 in.)
	Rear output shaft journal outer diameter		
	Part A	Minimum	27.98 mm (1.1016 in.)
	Part B	Minimum	36.98 mm (1.4561 in.)
	Drive sprocket radial clearance	Standard	0.010 to 0.055 mm (0.0004 to 0.0022 in.)
		Maximum	0.055 mm (0.0022 in.)
	Front drive shift fork to clutch sleeve clearance	Maximum	1.0 mm (0.039 in.)
	High and low shift fork to clutch sleeve clearance	Maximum	1.0 mm (0.039 in.)
	Rear output shaft snap ring thickness	Mark	
		K	2.00 to 2.05 mm (0.0787 to 0.0807 in.)
		L	2.05 to 2.10 mm (0.0807 to 0.0827 in.)
		A	2.10 to 2.15 mm (0.0827 to 0.0846 in.)
	B	2.15 to 2.20 mm (0.0846 to 0.0866 in.)	
	C	2.20 to 2.25 mm (0.0866 to 0.0886 in.)	
	D	2.25 to 2.30 mm (0.0886 to 0.0906 in.)	
	E	2.30 to 2.35 mm (0.0906 to 0.0925 in.)	
	F	2.35 to 2.40 mm (0.0925 to 0.0945 in.)	
	G	2.40 to 2.45 mm (0.0945 to 0.0965 in.)	
	H	2.45 to 2.50 mm (0.0965 to 0.0984 in.)	
	J	2.50 to 2.55 mm (0.0984 to 0.1004 in.)	
Planetary gear	Pinion gear thrust clearance	Standard	0.11 to 0.84 mm (0.0043 to 0.0331 in.)
		Maximum	0.84 mm (0.0331 in.)
	Pinion gear radial clearance	Standard	0.009 to 0.038 mm (0.0004 to 0.0015 in.)
		Maximum	0.038 mm (0.0015 in.)
	Outer bearing snap ring thickness	Mark	
		1	1.45 to 1.50 mm (0.0571 to 0.0591 in.)
		2	1.50 to 1.55 mm (0.0591 to 0.0610 in.)
	3	1.55 to 1.60 mm (0.0610 to 0.0630 in.)	
	4	1.60 to 1.65 mm (0.0630 to 0.0650 in.)	
	5	1.65 to 1.70 mm (0.0650 to 0.0669 in.)	

TORQUE SPECIFICATION

Part tightened	N-m	kgf-cm	ft-lbf
Rear propeller shaft x Rear differential	88	897	65
Center support bearing x Body	40	410	30
Rear propeller shaft x Transfer	88	897	65
Transfer x Transfer adaptor	24	244	17
Front propeller shaft x Front differential	74	750	54
Front propeller shaft x Transfer	88	897	65
Engine rear mounting x Transfer	65	664	48
Engine rear mounting x Crossmember	18	185	13
Crossmember x Frame	72	740	53
Heat insulator x Crossmember	16	164	12
Front exhaust pipe x Exhaust manifold	62	630	46
Filler plug x Transfer	37	380	27
Head screw plug x Transfer	19	190	14
Oil pump body x Front case	7.5	76	66 in.-lbf
Separator with oil strainer x Front case	7.5	76	66 in.-lbf
Transfer 4WD position switch	37	377	27
Transfer for L4 position switch	37	377	27
Actuator assembly set bolt	20	204	15
Shift fork shaft stopper set bolt	19	190	14
Straight screw plug	19	190	14
Front case x Rear case	28	285	21
Extension housing x Rear case	12	122	9
Front and rear companion flange lock nut	118	1,203	87
Upper cover x Front case	18	184	13
Front bearing retainer x Front case	11.5	117	8
Protector x Front case	18	184	13
Vehicle speed sensor assembly set bolt	11	112	8

PROPELLER SHAFT

SS1MS-01

SERVICE DATA

Propeller shaft	runout	Maximum	0.8 mm (0.031 in.)	
Spider bearing axial play	2WD and 4WD front propeller shaft	Maximum	0.05 mm (0.0020 in.)	
	4WD rear propeller shaft	Maximum	0 mm (0 in.)	
4WD rear propeller shaft	Snap ring thickness	Color	Mark	
		–	9	2.44 to 2.46 mm (0.0961 to 0.0969 in.)
		–	10	2.46 to 2.48 mm (0.0969 to 0.0976 in.)
		–	1	2.28 to 2.30 mm (0.0898 to 0.0906 in.)
		–	2	2.30 to 2.32 mm (0.0906 to 0.0913 in.)
		–	None	2.32 to 2.34 mm (0.0913 to 0.0921 in.)
		Brown	–	2.34 to 2.36 mm (0.0921 to 0.0929 in.)
		Blue	–	2.36 to 2.38 mm (0.0929 to 0.0937 in.)
		–	6	2.38 to 2.40 mm (0.0937 to 0.0945 in.)
		–	7	2.40 to 2.42 mm (0.0945 to 0.0953 in.)
		–	8	2.42 to 2.44 mm (0.0953 to 0.0961 in.)
		–	J	2.18 to 2.20 mm (0.0858 to 0.0866 in.)
		–	K	2.20 to 2.22 mm (0.0866 to 0.0874 in.)
		–	F	2.22 to 2.24 mm (0.0874 to 0.0882 in.)
		–	G	2.24 to 2.26 mm (0.0882 to 0.0890 in.)
		–	H	2.26 to 2.28 mm (0.0890 to 0.0898 in.)
		–	A	2.48 to 2.50 mm (0.0976 to 0.0984 in.)
–	B	2.50 to 2.52 mm (0.0984 to 0.0992 in.)		
–	C	2.52 to 2.54 mm (0.0992 to 0.1000 in.)		
–	D	2.54 to 2.56 mm (0.1000 to 0.1008 in.)		
–	E	2.56 to 2.58 mm (0.1008 to 0.1016 in.)		
2WD and 4WD front propeller shaft	Snap ring thickness	Color		
		Blue	1.638 mm (0.0645 in.)	
		Yellow	1.588 mm (0.0625 in.)	
		Silver	1.537 mm (0.0605 in.)	
		Copper	1.511 mm (0.0595 in.)	
		Black	1.486 mm (0.0585 in.)	
		Red	1.435 mm (0.0565 in.)	
Green	1.384 mm (0.0545 in.)			

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
PROPELLER SHAFT ASSEMBLY (2WD)				
Center support bearing x Body		40	410	30
Propeller shaft x Differential		88	897	65
Intermediate shaft x Center support bearing x Center yoke	1st	181	1,845	133
	2nd	Loosen nut		
	3rd	82	835	60
PROPELLER SHAFT ASSEMBLY (4WD)				
Rear propeller shaft x Rear differential		88	897	65
Rear propeller shaft x Transfer		88	897	65
Front propeller shaft x Front differential		88	897	65
Front propeller x Transfer		88	897	65
Center support bearing x Body		40	410	30
Intermediate shaft x Center support bearing x Companion flange	1st	181	1,845	133
	2nd	Loosen nut		
	3rd	82	835	60

SUSPENSION AND AXLE

SERVICE DATA

SS051-14

Cold tire inflation pressure	● B, C-cab type			
	Tire size: P245/70R16	Front	200 kPa (2.0 kgf/cm ² , 29 psi)	
		Rear	240 kPa (2.4 kgf/cm ² , 35 psi)	
	Tire size: P265/70R16	Front	180 kPa (1.8 kgf/cm ² , 26 psi)	
		Rear	200 kPa (2.0 kgf/cm ² , 29 psi)	
	Tire size: P265/70R16*5	Front	200 kPa (2.0 kgf/cm ² , 29 psi)	
		Rear	210 kPa (2.1 kgf/cm ² , 30 psi)	
	Tire size: P265/65R17	Front	200 kPa (2.0 kgf/cm ² , 29 psi)	
		Rear	220 kPa (2.2 kgf/cm ² , 32 psi)	
	● D-cab type			
Tire size: P245/70R16	Front	220 kPa (2.2 kgf/cm ² , 32 psi)		
	Rear	240 kPa (2.4 kgf/cm ² , 35 psi)		
Tire size: P265/70R16	Front	200 kPa (2.0 kgf/cm ² , 29 psi)		
	Rear	220 kPa (2.2 kgf/cm ² , 32 psi)		
Tire size: P265/70R16*5	Front	220 kPa (2.2 kgf/cm ² , 32 psi)		
	Rear	230 kPa (2.3 kgf/cm ² , 33 psi)		
Tire size: P265/65R17	Front	200 kPa (2.0 kgf/cm ² , 29 psi)		
	Rear	220 kPa (2.2 kgf/cm ² , 32 psi)		
Front wheel alignment	● Vehicle height (B-cab for U.S.A.)			
	GSK30L-TRFDKA Tire size: P245/70R16		Front: A*1 - B*2 Rear: C*3 - D*4	75.2 mm (2.961 in.) -50.8 mm (-2.055 in.)
	GSK30L-TRBDKA Tire size: P245/70R16		Front: A*1 - B*2 Rear: C*3 - D*4	77.9 mm (3.067 in.) -50.2 mm (-1.976 in.)
	UCK30L-TRBDKA Tire size: P245/70R16		Front: A*1 - B*2 Rear: C*3 - D*4	77.2 mm (3.039 in.) -54.5 mm (-2.146 in.)
	UCK40L-TRBDKA Tire size: P245/70R16		Front: A*1 - B*2 Rear: C*3 - D*4	53.5 mm (2.106 in.) -68.1 mm (-2.681 in.)
	● Vehicle height (D-cab for U.S.A.)			
	UCK31L-PRBSKA Tire size: P245/70R16		Front: A*1 - B*2 Rear: C*3 - D*4	68.0 mm (2.677 in.) -52.2 mm (-2.055 in.)
	Tire size: P265/70R16		Front: A*1 - B*2 Rear: C*3 - D*4	68.3 mm (2.689 in.) -51.4 mm (-2.024 in.)
	Tire size: P265/70R16 (B2BB (ORP))		Front: A*1 - B*2 Rear: C*3 - D*4	65.8 mm (2.591 in.) -51.6 mm (-2.031 in.)
	Tire size: P265/65R17		Front: A*1 - B*2 Rear: C*3 - D*4	67.9 mm (2.673 in.) -52.7 mm (-2.075 in.)
	UCK31L-PRBLKA Tire size: P265/70R16		Front: A*1 - B*2 Rear: C*3 - D*4	68.1 mm (2.681 in.) -51.5 mm (-2.028 in.)
	Tire size: P265/70R16 (B2BB (ORP))		Front: A*1 - B*2 Rear: C*3 - D*4	65.6 mm (2.583 in.) -51.6 mm (-2.031 in.)
	Tire size: P265/65R17		Front: A*1 - B*2 Rear: C*3 - D*4	67.6 mm (2.661 in.) -52.7 mm (-2.075 in.)

Front wheel alignment	UCK41L-PRBSKA		
	Tire size: P245/70R16	Front: A*1 – B*2	56.7 mm (2.232 in.)
		Rear: C*3 – D*4	-57.1 mm (-2.248 in.)
	Tire size: P265/70R16	Front: A*1 – B*2	57.0 mm (2.244 in.)
		Rear: C*3 – D*4	-56.3 mm (-2.217 in.)
	Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	54.5 mm (2.146 in.)
		Rear: C*3 – D*4	-57.9 mm (-2.280 in.)
	Tire size: P265/65R17	Front: A*1 – B*2	56.5 mm (2.224 in.)
		Rear: C*3 – D*4	-57.6 mm (-2.268 in.)
	UCK41L-PRBLKA		
	Tire size: P265/70R16	Front: A*1 – B*2	57.0 mm (2.244 in.)
		Rear: C*3 – D*4	-56.6 mm (-2.228 in.)
	Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	54.6 mm (2.150 in.)
		Rear: C*3 – D*4	-58.2 mm (-2.291 in.)
	Tire size: P265/65R17	Front: A*1 – B*2	56.5 mm (2.224 in.)
		Rear: C*3 – D*4	-57.9 mm (-2.280 in.)
● Vehicle height (C-cab for U.S.A. 2WD models)			
GSK30L-ARFSKA			
Tire size: P245/70R16	Front: A*1 – B*2	62.4 mm (2.457 in.)	
	Rear: C*3 – D*4	-63.1 mm (-2.484 in.)	
Tire size: P265/70R16	Front: A*1 – B*2	62.4 mm (2.457 in.)	
	Rear: C*3 – D*4	-62.9 mm (-2.476 in.)	
GSK30L-ARBSKA			
Tire size: P245/70R16	Front: A*1 – B*2	64.9 mm (2.555 in.)	
	Rear: C*3 – D*4	-62.4 mm (-2.457 in.)	
Tire size: P265/70R16	Front: A*1 – B*2	65.0 mm (2.559 in.)	
	Rear: C*3 – D*4	-62.3 mm (-2.453 in.)	
UCK30L-ARBSKA			
Tire size: P245/70R16	Front: A*1 – B*2	73.2 mm (2.882 in.)	
	Rear: C*3 – D*4	-50.0 mm (-1.969 in.)	
Tire size: P265/70R16	Front: A*1 – B*2	73.2 mm (2.882 in.)	
	Rear: C*3 – D*4	-49.8 mm (-1.961 in.)	
Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	71.4 mm (2.811 in.)	
	Rear: C*3 – D*4	-50.9 mm (-2.004 in.)	
Tire size: P265/65R17	Front: A*1 – B*2	72.9 mm (2.870 in.)	
	Rear: C*3 – D*4	-50.8 mm (-2.000 in.)	
Tire size: P265/65R17 (B2BC (SPORT))	Front: A*1 – B*2	83.5 mm (3.287 in.)	
	Rear: C*3 – D*4	-40.6 mm (-1.598 in.)	
UCK30L-ASBLKA			
Tire size: P265/70R16	Front: A*1 – B*2	72.0 mm (2.835 in.)	
	Rear: C*3 – D*4	-54.5 mm (-2.146 in.)	
Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	70.0 mm (2.756 in.)	
	Rear: C*3 – D*4	-55.6 mm (-2.189 in.)	
Tire size: P265/65R17	Front: A*1 – B*2	71.6 mm (2.819 in.)	
	Rear: C*3 – D*4	-55.5 mm (-2.185 in.)	
Tire size: P265/65R17 (B2BC (SPORT))	Front: A*1 – B*2	82.0 mm (3.228 in.)	
	Rear: C*3 – D*4	-44.7 mm (-1.760 in.)	

*1: Ground clearance of the front drive shaft center

*2: Ground clearance of the front adjusting cam bolt center

*3: Ground clearance of the rear axle shaft center

*4: Ground clearance of the leaf spring front side bushing center

*5: Off-road package

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Front wheel alignment	UCK30L-ASBSKA		
	Tire size: P265/70R16	Front: A*1 – B*2	70.4 mm (2.772 in.)
		Rear: C*3 – D*4	-24.8 mm (-0.976 in.)
	Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	68.6 mm (2.701 in.)
		Rear: C*3 – D*4	-25.8 mm (-1.016 in.)
	Tire size: P265/65R17	Front: A*1 – B*2	70.1 mm (2.760 in.)
		Rear: C*3 – D*4	-25.7 mm (-1.012 in.)
	Tire size: P265/65R17 (B2BC (SPORT))	Front: A*1 – B*2	81.7 mm (3.217 in.)
		Rear: C*3 – D*4	-25.3 mm (-0.996 in.)
	UCK30L-ASBSKA		
	Tire size: P265/70R16	Front: A*1 – B*2	69.2 mm (2.724 in.)
		Rear: C*3 – D*4	-29.5 mm (-1.161 in.)
	Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	67.2 mm (2.646 in.)
		Rear: C*3 – D*4	-30.6 mm (-1.205 in.)
Tire size: P265/65R17	Front: A*1 – B*2	68.8 mm (2.709 in.)	
	Rear: C*3 – D*4	-30.4 mm (-1.197 in.)	
Tire size: P265/65R17 (B2BC (SPORT))	Front: A*1 – B*2	80.3 mm (3.161 in.)	
	Rear: C*3 – D*4	-29.3 mm (-1.154 in.)	
● Vehicle height (C-cab for U.S.A. 4WD models)			
UCK40L-ARBSKA			
Tire size: P245/70R16	Front: A*1 – B*2	48.0 mm (1.890 in.)	
	Rear: C*3 – D*4	-67.1 mm (-2.642 in.)	
Tire size: P265/70R16	Front: A*1 – B*2	48.1 mm (1.894 in.)	
	Rear: C*3 – D*4	-66.9 mm (-2.634 in.)	
Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	74.3 mm (2.925 in.)	
	Rear: C*3 – D*4	-62.3 mm (-2.453 in.)	
Tire size: P265/65R17	Front: A*1 – B*2	47.7 mm (1.878 in.)	
	Rear: C*3 – D*4	-67.9 mm (-2.673 in.)	
UCK40L-ARBLKA			
Tire size: P265/70R16	Front: A*1 – B*2	47.3 mm (1.862 in.)	
	Rear: C*3 – D*4	-71.8 mm (-2.827 in.)	
Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	73.3 mm (2.886 in.)	
	Rear: C*3 – D*4	-67.2 mm (-2.646 in.)	
Tire size: P265/65R17	Front: A*1 – B*2	46.9 mm (1.846 in.)	
	Rear: C*3 – D*4	-72.8 mm (-2.866 in.)	
UCK40L-ASBSKA			
Tire size: P265/70R16	Front: A*1 – B*2	44.5 mm (1.752 in.)	
	Rear: C*3 – D*4	-40.9 mm (-1.610 in.)	
Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	70.7 mm (2.783 in.)	
	Rear: C*3 – D*4	-36.3 mm (-1.429 in.)	
Tire size: P265/65R17	Front: A*1 – B*2	44.1 mm (1.736 in.)	
	Rear: C*3 – D*4	-41.9 mm (-1.650 in.)	
UCK40L-ASBLKA			
Tire size: P265/70R16	Front: A*1 – B*2	44.2 mm (1.740 in.)	
	Rear: C*3 – D*4	-44.7 mm (-1.760 in.)	
Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	70.3 mm (2.768 in.)	
	Rear: C*3 – D*4	-40.1 mm (-1.579 in.)	
Tire size: P265/65R17	Front: A*1 – B*2	43.8 mm (1.724 in.)	
	Rear: C*3 – D*4	-45.7 mm (-1.799 in.)	

- *1: Ground clearance of the front drive shaft center
- *2: Ground clearance of the front adjusting cam bolt center
- *3: Ground clearance of the rear axle shaft center
- *4: Ground clearance of the leaf spring front side bushing center

● Vehicle height (For CANADA)			
Front wheel alignment	GSK30L–TRBDKK Tire size: P245/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	75.2 mm (2.961 in.) –50.8 mm (–2.000 in.)
	UCK40L–TRBDKK Tire size: P245/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	51.5 mm (2.028 in.) –69.0 mm (–2.717 in.)
	UCK30L–ARBSKK Tire size: P245/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	74.9 mm (2.949 in.) –49.1 mm (–1.933 in.)
	Tire size: P265/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	75.0 mm (2.953 in.) –48.9 mm (–1.925 in.)
	Tire size: P265/65R17	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	72.1 mm (2.839 in.) –56.3 mm (–2.217 in.)
	UCK40L–ARBSKK Tire size: P245/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	49.3 mm (1.941 in.) –74.2 mm (–2.921 in.)
	Tire size: P265/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	49.4 mm (1.945 in.) –74.0 mm (–2.913 in.)
	Tire size: P265/70R16 (B2BB (ORP))	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	75.6 mm (2.977 in.) –69.3 mm (–2.728 in.)
	Tire size: P265/65R17	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	49.0 mm (1.929 in.) –75.0 mm (–2.953 in.)
	UCK40L–ARBLKK Tire size: P265/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	48.5 mm (1.909 in.) –78.7 mm (–3.098 in.)
Tire size: P265/70R16 (B2BB (ORP))	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	74.7 mm (2.941 in.) –74.0 mm (–2.913 in.)	
Tire size: P265/65R17	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	48.1 mm (1.894 in.) –79.7 mm (–3.138 in.)	
UCK31L–PRBSKK Tire size: P245/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	69.6 mm (2.740 in.) –50.5 mm (–1.988 in.)	
Tire size: P265/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	70.0 mm (2.756 in.) –49.7 mm (–1.957 in.)	
Tire size: P265/65R17	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	69.5 mm (2.736 in.) –51.0 mm (–2.008 in.)	
UCK41L–PRBSKK Tire size: P245/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	56.5 mm (2.224 in.) –55.6 mm (–2.189 in.)	
Tire size: P265/70R16	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	56.8 mm (2.236 in.) –54.8 mm (–2.157 in.)	
Tire size: P265/70R16 (B2BB (ORP))	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	54.4 mm (2.142 in.) –56.4 mm (–2.220 in.)	
Tire size: P265/65R17	Front: A* ¹ – B* ² Rear: C* ³ – D* ⁴	56.3 mm (2.217 in.) –56.1 mm (–2.209 in.)	

*1: Ground clearance of the front drive shaft center

*2: Ground clearance of the front adjusting cam bolt center

*3: Ground clearance of the rear axle shaft center

*4: Ground clearance of the leaf spring front side bushing center

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Front wheel alignment	UCK41L-PRBLKK		
	Tire size: P265/70R16	Front: A*1 – B*2	57.4 mm (2.260 in.)
		Rear: C*3 – D*4	-54.1 mm (-2.130 in.)
	Tire size: P265/70R16 (B2BB (ORP))	Front: A*1 – B*2	55.0 mm (2.165 in.)
		Rear: C*3 – D*4	-55.7 mm (-2.193 in.)
	Tire size: P265/65R17	Front: A*1 – B*2	56.9 mm (2.240 in.)
	Rear: C*3 – D*4	-55.5 mm (-2.185 in.)	

*1: Ground clearance of the front drive shaft center

*2: Ground clearance of the front adjusting cam bolt center

*3: Ground clearance of the rear axle shaft center

*4: Ground clearance of the leaf spring front side bushing center

Front wheel alignment	● Camber (B-cab for U.S.A.) Right-left error: 30' (0.5°) or less	
	GSK30L-TRFDKA Tire size: P245/70R16	-0°08'±45' (-0.14°±0.75°)
	GSK30L-TRBDKA Tire size: P245/70R16	-0°10'±45' (-0.18°±0.75°)
	UCK30L-TRBDKA Tire size: P245/70R16	-0°10'±45' (-0.16°±0.75°)
	UCK40L-TRBDKA Tire size: P245/70R16	0°11'±45' (0.19°±0.75°)
	● Camber (D-cab for U.S.A.) Right-left error: 30' (0.5°) or less	
	UCK31L-PRBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	-0°02'±45' (-0.04°±0.75°) -0°02'±45' (-0.04°±0.75°) -0°01'±45' (-0.01°±0.75°) -0°02'±45' (-0.04°±0.75°)
	UCK31L-PRBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	-0°02'±45' (-0.03°±0.75°) 0°00'±45' (0.00°±0.75°) -0°02'±45' (-0.03°±0.75°)
	UCK41L-PRBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°08'±45' (0.13°±0.75°) 0°08'±45' (0.13°±0.75°) 0°09'±45' (0.15°±0.75°) 0°08'±45' (0.13°±0.75°)
	UCK41L-PRBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°08'±45' (0.13°±0.75°) 0°09'±45' (0.15°±0.75°) 0°08'±45' (0.13°±0.75°)
	● Camber (C-cab for U.S.A. 2WD models) Right-left error: 30' (0.5°) or less	
	GSK30L-ARFSKA Tire size: P245/70R16 Tire size: P265/70R16	0°04'±45' (0.07°±0.75°) 0°04'±45' (0.07°±0.75°)
	GSK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16	0°01'±45' (0.03°±0.75°) 0°01'±45' (0.03°±0.75°)
	UCK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	-0°07'±45' (-0.11°±0.75°) -0°07'±45' (-0.11°±0.75°) -0°08'±45' (-0.14°±0.75°) -0°07'±45' (-0.11°±0.75°) -0°19'±45' (-0.31°±0.75°)
	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	-0°05'±45' (-0.08°±0.75°) -0°03'±45' (-0.05°±0.75°) -0°05'±45' (-0.08°±0.75°) -0°16'±45' (-0.27°±0.75°)
	UCK30L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	-0°07'±45' (-0.11°±0.75°) -0°05'±45' (-0.08°±0.75°) -0°07'±45' (-0.11°±0.75°) -0°19'±45' (-0.31°±0.75°)

SERVICE SPECIFICATIONS - SUSPENSION AND AXLE

Front wheel alignment	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	-0°05'±45' (-0.08°±0.75°) -0°03'±45' (-0.05°±0.75°) -0°05'±45' (-0.08°±0.75°) -0°16'±45' (-0.27°±0.75°)
	● Camber (C-cab for U.S.A. 4WD models) Right-left error: 30' (0.5°) or less	
	UCK40L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°14'±45' (0.24°±0.75°) 0°14'±45' (0.24°±0.75°) -0°06'±45' (-0.10°±0.75°) 0°14'±45' (0.24°±0.75°)
	UCK40L-ARBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°16'±45' (0.26°±0.75°) -0°02'±45' (-0.03°±0.75°) 0°16'±45' (0.26°±0.75°)
	UCK40L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°15'±45' (0.25°±0.75°) -0°05'±45' (-0.09°±0.75°) 0°15'±45' (0.25°±0.75°)
	UCK40L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°16'±45' (0.26°±0.75°) -0°04'±45' (-0.06°±0.75°) 0°16'±45' (0.26°±0.75°)
	● Camber (For CANADA) Right-left error: 30' (0.5°) or less	
	GSK30L-TRBDKK Tire size: P245/70R16	-0°08'±45' (-0.14°±0.75°)
	UCK40L-TRBDKK Tire size: P245/70R16	0°13'±45' (0.21°±0.75°)
	UCK30L-ARBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/65R17	-0°08'±45' (-0.14°±0.75°) -0°08'±45' (-0.14°±0.75°) -0°08'±45' (-0.14°±0.75°)
	UCK40L-ARBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°14'±45' (0.24°±0.75°) 0°14'±45' (0.24°±0.75°) -0°07'±45' (-0.11°±0.75°) 0°14'±45' (0.24°±0.75°)
	UCK40L-ARBLKK Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°15'±45' (0.25°±0.75°) -0°05'±45' (-0.09°±0.75°) 0°15'±45' (0.25°±0.75°)
	UCK31L-PRBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/65R17	-0°04'±45' (-0.06°±0.75°) -0°04'±45' (-0.06°±0.75°) -0°04'±45' (-0.06°±0.75°)
	UCK41L-PRBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°08'±45' (0.13°±0.75°) 0°08'±45' (0.13°±0.75°) 0°09'±45' (0.15°±0.75°) 0°08'±45' (0.13°±0.75°)
	UCK41L-PRBLKK Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°07'±45' (0.12°±0.75°) 0°08'±45' (0.14°±0.75°) 0°07'±45' (0.12°±0.75°)

Front wheel alignment	● Caster (B-cab for U.S.A.)		Right-left error: 30' (0.5°) or less
	GSK30L-TRFDKA Tire size: P245/70R16	2° 00' ± 45' (2.00° ± 0.75°)	
	GSK30L-TRBDKA Tire size: P245/70R16	2° 03' ± 45' (2.05° ± 0.75°)	
	UCK30L-TRBDKA Tire size: P245/70R16	1° 56' ± 45' (1.93° ± 0.75°)	
	UCK40L-TRBDKA Tire size: P245/70R16	1° 25' ± 45' (1.42° ± 0.75°)	
	● Caster (D-cab for U.S.A.)		Right-left error: 30' (0.5°) or less
	UCK31L-PRBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	2° 01' ± 45' (2.02° ± 0.75°) 2° 04' ± 45' (2.06° ± 0.75°) 2° 09' ± 45' (2.15° ± 0.75°) 2° 10' ± 45' (2.16° ± 0.75°)	
	UCK31L-PRBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	2° 04' ± 45' (2.06° ± 0.75°) 2° 08' ± 45' (2.14° ± 0.75°) 2° 09' ± 45' (2.15° ± 0.75°)	
	UCK41L-PRBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	1° 52' ± 45' (1.86° ± 0.75°) 1° 47' ± 45' (1.79° ± 0.75°) 1° 52' ± 45' (1.86° ± 0.75°) 1° 54' ± 45' (1.90° ± 0.75°)	
	UCK41L-PRBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	1° 47' ± 45' (1.79° ± 0.75°) 1° 51' ± 45' (1.85° ± 0.75°) 1° 53' ± 45' (1.89° ± 0.75°)	
	● Caster (C-cab for U.S.A. 2WD models)		Right-left error: 30' (0.5°) or less
	GSK30L-ARFSKA Tire size: P245/70R16 Tire size: P265/70R16	1° 32' ± 45' (1.54° ± 0.75°) 1° 41' ± 45' (1.68° ± 0.75°)	
	GSK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16	1° 35' ± 45' (1.59° ± 0.75°) 1° 43' ± 45' (1.71° ± 0.75°)	
	UCK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	2° 02' ± 45' (2.03° ± 0.75°) 2° 05' ± 45' (2.09° ± 0.75°) 2° 08' ± 45' (2.13° ± 0.75°) 2° 10' ± 45' (2.16° ± 0.75°) 2° 30' ± 45' (2.50° ± 0.75°)	
	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	1° 58' ± 45' (1.96° ± 0.75°) 1° 59' ± 45' (1.99° ± 0.75°) 2° 02' ± 45' (2.03° ± 0.75°) 2° 23' ± 45' (2.38° ± 0.75°)	
	UCK30L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	2° 40' ± 45' (2.66° ± 0.75°) 2° 41' ± 45' (2.69° ± 0.75°) 2° 44' ± 45' (2.73° ± 0.75°) 2° 51' ± 45' (2.85° ± 0.75°)	

SERVICE SPECIFICATIONS - SUSPENSION AND AXLE

Front wheel alignment	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	$2^{\circ}31' \pm 45'$ ($2.52^{\circ} \pm 0.75^{\circ}$) $2^{\circ}34' \pm 45'$ ($2.56^{\circ} \pm 0.75^{\circ}$) $2^{\circ}36' \pm 45'$ ($2.60^{\circ} \pm 0.75^{\circ}$) $2^{\circ}44' \pm 45'$ ($2.73^{\circ} \pm 0.75^{\circ}$)
	● Caster (C-cab for U.S.A. 4WD models) Right-left error: 30' (0.5°) or less	
	UCK40L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	$1^{\circ}26' \pm 45'$ ($1.43^{\circ} \pm 0.75^{\circ}$) $1^{\circ}25' \pm 45'$ ($1.42^{\circ} \pm 0.75^{\circ}$) $1^{\circ}52' \pm 45'$ ($1.86^{\circ} \pm 0.75^{\circ}$) $1^{\circ}30' \pm 45'$ ($1.50^{\circ} \pm 0.75^{\circ}$)
	UCK40L ARBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	$1^{\circ}17' \pm 45'$ ($1.28^{\circ} \pm 0.75^{\circ}$) $1^{\circ}43' \pm 45'$ ($1.72^{\circ} \pm 0.75^{\circ}$) $1^{\circ}22' \pm 45'$ ($1.36^{\circ} \pm 0.75^{\circ}$)
	UCK40L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	$2^{\circ}00' \pm 45'$ ($2.00^{\circ} \pm 0.75^{\circ}$) $2^{\circ}26' \pm 45'$ ($2.44^{\circ} \pm 0.75^{\circ}$) $2^{\circ}05' \pm 45'$ ($2.08^{\circ} \pm 0.75^{\circ}$)
	UCK40L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	$1^{\circ}54' \pm 45'$ ($1.90^{\circ} \pm 0.75^{\circ}$) $2^{\circ}20' \pm 45'$ ($2.33^{\circ} \pm 0.75^{\circ}$) $1^{\circ}59' \pm 45'$ ($1.98^{\circ} \pm 0.75^{\circ}$)
	● Caster (For CANADA) Right-left error: 30' (0.5°) or less	
	GSK30L-TRBDKK Tire size: P245/70R16	$2^{\circ}00' \pm 45'$ ($2.00^{\circ} \pm 0.75^{\circ}$)
	UCK40L-TRBDKK Tire size: P245/70R16	$1^{\circ}23' \pm 45'$ ($1.39^{\circ} \pm 0.75^{\circ}$)
	UCK30L-ARBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/65R17	$2^{\circ}04' \pm 45'$ ($2.07^{\circ} \pm 0.75^{\circ}$) $2^{\circ}07' \pm 45'$ ($2.12^{\circ} \pm 0.75^{\circ}$) $2^{\circ}42' \pm 45'$ ($2.70^{\circ} \pm 0.75^{\circ}$)
	UCK40L-ARBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	$1^{\circ}17' \pm 45'$ ($1.28^{\circ} \pm 0.75^{\circ}$) $1^{\circ}16' \pm 45'$ ($1.26^{\circ} \pm 0.75^{\circ}$) $1^{\circ}42' \pm 45'$ ($1.70^{\circ} \pm 0.75^{\circ}$) $1^{\circ}20' \pm 45'$ ($1.34^{\circ} \pm 0.75^{\circ}$)
	UCK40L-ARBLKK Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	$1^{\circ}08' \pm 45'$ ($1.13^{\circ} \pm 0.75^{\circ}$) $1^{\circ}34' \pm 45'$ ($1.57^{\circ} \pm 0.75^{\circ}$) $1^{\circ}13' \pm 45'$ ($1.21^{\circ} \pm 0.75^{\circ}$)
	UCK31L-PRBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/65R17	$2^{\circ}05' \pm 45'$ ($2.08^{\circ} \pm 0.75^{\circ}$) $2^{\circ}07' \pm 45'$ ($2.11^{\circ} \pm 0.75^{\circ}$) $2^{\circ}13' \pm 45'$ ($2.21^{\circ} \pm 0.75^{\circ}$)
	UCK41L-PRBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	$1^{\circ}53' \pm 45'$ ($1.89^{\circ} \pm 0.75^{\circ}$) $1^{\circ}49' \pm 45'$ ($1.82^{\circ} \pm 0.75^{\circ}$) $1^{\circ}53' \pm 45'$ ($1.89^{\circ} \pm 0.75^{\circ}$) $1^{\circ}56' \pm 45'$ ($1.93^{\circ} \pm 0.75^{\circ}$)
	UCK41L-PRBLKK Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	$1^{\circ}50' \pm 45'$ ($1.84^{\circ} \pm 0.75^{\circ}$) $1^{\circ}55' \pm 45'$ ($1.91^{\circ} \pm 0.75^{\circ}$) $1^{\circ}57' \pm 45'$ ($1.95^{\circ} \pm 0.75^{\circ}$)

Front wheel alignment	● Steering axis inclination (B-cab for U.S.A.) Right-left error: 30' (0.5°) or less	
	GSK30L-TRFDKA Tire size: P245/70R16	10°31'±45' (10.51°±0.75°)
	GSK30L-TRBDKA Tire size: P245/70R16	10°34'±45' (10.56°±0.75°)
	UCK30L-TRBDKA Tire size: P245/70R16	10°32'±45' (10.54°±0.75°)
	UCK40L-TRBDKA Tire size: P245/70R16	10°10'±45' (10.17°±0.75°)
	● Steering axis inclination (D-cab for U.S.A.) Right-left error: 30' (0.5°) or less	
	UCK31L-PRBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°25'±45' (10.41°±0.75°) 10°24'±45' (10.40°±0.75°) 10°22'±45' (10.37°±0.75°) 10°24'±45' (10.40°±0.75°)
	UCK31L-PRBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°23'±45' (10.39°±0.75°) 10°22'±45' (10.37°±0.75°) 10°34'±45' (10.56°±0.75°)
	UCK41L-PRBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°14'±45' (10.24°±0.75°) 10°14'±45' (10.24°±0.75°) 10°13'±45' (10.21°±0.75°) 10°14'±45' (10.24°±0.75°)
	UCK41L-PRBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°14'±45' (10.24°±0.75°) 10°13'±45' (10.21°±0.75°) 10°14'±45' (10.24°±0.75°)
	● Steering axis inclination (C-cab for U.S.A. 2WD models) Right-left error: 30' (0.5°) or less	
	GSK30L-ARFSKA Tire size: P245/70R16 Tire size: P265/70R16	10°18'±45' (10.30°±0.75°) 10°18'±45' (10.30°±0.75°)
	GSK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16	10°20'±45' (10.34°±0.75°) 10°20'±45' (10.33°±0.75°)
	UCK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	10°29'±45' (10.48°±0.75°) 10°28'±45' (10.47°±0.75°) 10°27'±45' (10.45°±0.75°) 10°28'±45' (10.47°±0.75°) 10°40'±45' (10.67°±0.75°)
	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	10°26'±45' (10.44°±0.75°) 10°25'±45' (10.42°±0.75°) 10°26'±45' (10.44°±0.75°) 10°38'±45' (10.64°±0.75°)
	UCK30L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	10°28'±45' (10.47°±0.75°) 10°27'±45' (10.45°±0.75°) 10°28'±45' (10.47°±0.75°) 10°40'±45' (10.67°±0.75°)

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Front wheel alignment	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	10°26'±45' (10.44°±0.75°) 10°25'±45' (10.42°±0.75°) 10°26'±45' (10.44°±0.75°) 10°38'±45' (10.64°±0.75°)
	● Steering axis inclination (C-cab for U.S.A. 4WD models) Right-left error: 30' (0.5°) or less	
	UCK40L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°07'±45' (10.11°±0.75°) 10°07'±45' (10.11°±0.75°) 10°29'±45' (10.48°±0.75°) 10°07'±45' (10.11°±0.75°)
	UCK40L-ARBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°06'±45' (10.10°±0.75°) 10°27'±45' (10.45°±0.75°) 10°06'±45' (10.10°±0.75°)
	UCK40L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°07'±45' (10.11°±0.75°) 10°28'±45' (10.47°±0.75°) 10°07'±45' (10.11°±0.75°)
	UCK40L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°06'±45' (10.10°±0.75°) 10°27'±45' (10.45°±0.75°) 10°06'±45' (10.10°±0.75°)
	● Steering axis inclination (For CANADA) Right-left error: 30' (0.5°) or less	
	GSK30L-TRBDKK Tire size: P245/70R16	10°31'±45' (10.51°±0.75°)
	UCK40L-TRBDKK Tire size: P245/70R16	10°09'±45' (10.15°±0.75°)
	UCK30L-ARBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/65R17	10°31'±45' (10.51°±0.75°) 10°30'±45' (10.50°±0.75°) 10°30'±45' (10.50°±0.75°)
	UCK40L-ARBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°07'±45' (10.12°±0.75°) 10°07'±45' (10.12°±0.75°) 10°29'±45' (10.49°±0.75°) 10°07'±45' (10.12°±0.75°)
	UCK40L-ARBLKK Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°06'±45' (10.10°±0.75°) 10°28'±45' (10.46°±0.75°) 10°06'±45' (10.10°±0.75°)
	UCK31L-PRBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/65R17	10°26'±45' (10.43°±0.75°) 10°26'±45' (10.43°±0.75°) 10°26'±45' (10.43°±0.75°)
	UCK41L-PRBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°14'±45' (10.24°±0.75°) 10°14'±45' (10.24°±0.75°) 10°13'±45' (10.21°±0.75°) 10°14'±45' (10.24°±0.75°)
	UCK41L-PRBLKK Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	10°15'±45' (10.25°±0.75°) 10°13'±45' (10.22°±0.75°) 10°15'±45' (10.25°±0.75°)

Front wheel alignment	● Toe-in (total) (B-cab for U.S.A.)		Rack end length difference: 1.5 mm (0.059 in.) or less
	GSK30L-TRFDKA Tire size: P245/70R16		0°05'±45' (0.08°±0.2°, 1.38±2 mm, 0.05±0.08 in.)
	GSK30L-TRBDKA Tire size: P245/70R16		0°04'±45' (0.07°±0.2°, 1.20±2 mm, 0.05±0.08 in.)
	UCK30L-TRBDKA Tire size: P245/70R16		0°05'±45' (0.08°±0.2°, 1.28±2 mm, 0.05±0.08 in.)
	UCK40L-TRBDKA Tire size: P245/70R16		0°04'±45' (0.06°±0.2°, 0.97±2 mm, 0.04±0.08 in.)
	● Toe-in (total) (D-cab for U.S.A.)		Rack end length difference: 1.5 mm (0.059 in.) or less
	UCK31L-PRBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17		0°07'±45' (0.10°±0.2°, 1.82±2 mm, 0.07±0.08 in.) 0°07'±45' (0.11°±0.2°, 1.87±2 mm, 0.07±0.08 in.) 0°07'±45' (0.12°±0.2°, 2.01±2 mm, 0.08±0.08 in.) 0°07'±45' (0.11°±0.2°, 1.87±2 mm, 0.07±0.08 in.)
	UCK31L-PRBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17		0°07'±45' (0.11°±0.2°, 1.89±2 mm, 0.07±0.08 in.) 0°07'±45' (0.12°±0.2°, 2.02±2 mm, 0.08±0.08 in.) 0°07'±45' (0.11°±0.2°, 1.89±2 mm, 0.07±0.08 in.)
	UCK41L-PRBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17		0°06'±45' (0.10°±0.2°, 1.72±2 mm, 0.07±0.08 in.) 0°06'±45' (0.11°±0.2°, 1.78±2 mm, 0.07±0.08 in.) 0°07'±45' (0.11°±0.2°, 1.90±2 mm, 0.07±0.08 in.) 0°06'±45' (0.11°±0.2°, 1.78±2 mm, 0.07±0.08 in.)
	UCK41L-PRBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17		0°06'±45' (0.11°±0.2°, 1.78±2 mm, 0.07±0.08 in.) 0°07'±45' (0.11°±0.2°, 1.90±2 mm, 0.07±0.08 in.) 0°06'±45' (0.11°±0.2°, 1.78±2 mm, 0.07±0.08 in.)
	● Toe-in (total) (C-cab for U.S.A. 2WD models)		Rack end length difference: 1.5 mm (0.059 in.) or less
	GSK30L-ARFSKA Tire size: P245/70R16 Tire size: P265/70R16		0°08'±45' (0.14°±0.2°, 2.29±2 mm, 0.09±0.08 in.) 0°08'±45' (0.14°±0.2°, 2.36±2 mm, 0.09±0.08 in.)
	GSK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16		0°08'±45' (0.13°±0.2°, 2.13±2 mm, 0.08±0.08 in.) 0°08'±45' (0.13°±0.2°, 2.19±2 mm, 0.09±0.08 in.)
	UCK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))		0°05'±45' (0.09°±0.2°, 1.50±2 mm, 0.06±0.08 in.) 0°06'±45' (0.09°±0.2°, 1.55±2 mm, 0.06±0.08 in.) 0°06'±45' (0.10°±0.2°, 1.66±2 mm, 0.07±0.08 in.) 0°06'±45' (0.09°±0.2°, 1.55±2 mm, 0.06±0.08 in.) 0°03'±45' (0.04°±0.2°, 0.72±2 mm, 0.03±0.08 in.)
	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))		0°06'±45' (0.10°±0.2°, 1.67±2 mm, 0.07±0.08 in.) 0°06'±45' (0.10°±0.2°, 1.79±2 mm, 0.07±0.08 in.) 0°06'±45' (0.10°±0.2°, 1.67±2 mm, 0.07±0.08 in.) 0°03'±45' (0.05°±0.2°, 0.86±2 mm, 0.03±0.08 in.)
	UCK30L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))		0°06'±45' (0.09°±0.2°, 1.55±2 mm, 0.06±0.08 in.) 0°06'±45' (0.10°±0.2°, 1.66±2 mm, 0.07±0.08 in.) 0°06'±45' (0.09°±0.2°, 1.55±2 mm, 0.06±0.08 in.) 0°03'±45' (0.04°±0.2°, 0.72±2 mm, 0.03±0.08 in.)

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Front wheel alignment	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	0°06'±45' (0.10°±0.2°, 1.67±2 mm, 0.07±0.08 in.) 0°06'±45' (0.10°±0.2°, 1.79±2 mm, 0.07±0.08 in.) 0°06'±45' (0.10°±0.2°, 1.67±2 mm, 0.07±0.08 in.) 0°03'±45' (0.05°±0.2°, 0.86±2 mm, 0.03±0.08 in.)
	● Toe-in (total) (C-cab for U.S.A. 4WD models) Rack end length difference: 1.5 mm (0.059 in.) or less	
	UCK40L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°05'±45' (0.08°±0.2°, 1.31±2 mm, 0.05±0.08 in.) 0°05'±45' (0.08°±0.2°, 1.35±2 mm, 0.05±0.08 in.) -0°02'±45' (-0.03°±0.2°, -0.48±2 mm, -0.02±0.08 in.) 0°05'±45' (0.08°±0.2°, 1.35±2 mm, 0.05±0.08 in.)
	UCK40L-ARBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°05'±45' (0.09°±0.2°, 1.45±2 mm, 0.06±0.08 in.) -0°01'±45' (-0.02°±0.2°, -0.38±2 mm, -0.01±0.08 in.) 0°05'±45' (0.09°±0.2°, 1.45±2 mm, 0.06±0.08 in.)
	UCK40L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°05'±45' (0.08°±0.2°, 1.40±2 mm, 0.06±0.08 in.) -0°02'±45' (-0.03°±0.2°, -0.43±2 mm, -0.02±0.08 in.) 0°05'±45' (0.08°±0.2°, 1.40±2 mm, 0.06±0.08 in.)
	UCK40L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°05'±45' (0.09°±0.2°, 1.45±2 mm, 0.06±0.08 in.) -0°01'±45' (-0.02°±0.2°, -0.38±2 mm, -0.01±0.08 in.) 0°05'±45' (0.09°±0.2°, 1.45±2 mm, 0.06±0.08 in.)
	● Toe-in (total) (For CANADA) Rack end length difference: 1.5 mm (0.059 in.) or less	
	GSK30L-TRBDKK Tire size: P245/70R16	0°05'±45' (0.08°±0.2°, 1.38±2 mm, 0.05±0.08 in.)
	UCK40L-TRBDKK Tire size: P245/70R16	0°03'±45' (0.04°±0.2°, 1.11±2 mm, 0.04±0.08 in.)
	UCK30L-ARBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/65R17	0°05'±45' (0.08°±0.2°, 1.38±2 mm, 0.05±0.08 in.) 0°05'±45' (0.09°±0.2°, 1.42±2 mm, 0.06±0.08 in.) 0°05'±45' (0.09°±0.2°, 1.42±2 mm, 0.06±0.08 in.)
	UCK40L-ARBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°05'±45' (0.08°±0.2°, 1.28±2 mm, 0.05±0.08 in.) 0°05'±45' (0.08°±0.2°, 1.32±2 mm, 0.05±0.08 in.) 0°02'±45' (0.03°±0.2°, -0.52±2 mm, 0.02±0.08 in.) 0°05'±45' (0.08°±0.2°, 1.32±2 mm, 0.05±0.08 in.)
	UCK40L-ARBLKK Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°05'±45' (0.09°±0.2°, 1.42±2 mm, 0.06±0.08 in.) -0°05'±45' (-0.08°±0.2°, -1.41±2 mm, -0.06±0.08 in.) 0°05'±45' (0.09°±0.2°, 1.42±2 mm, 0.06±0.08 in.)
	UCK31L-PRBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/65R17	0°06'±45' (0.10°±0.2°, 1.70±2 mm, 0.07±0.08 in.) 0°06'±45' (0.11°±0.2°, 1.75±2 mm, 0.07±0.08 in.) 0°06'±45' (0.11°±0.2°, 1.75±2 mm, 0.07±0.08 in.)
	UCK41L-PRBSKK Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°06'±45' (0.10°±0.2°, 1.72±2 mm, 0.07±0.08 in.) 0°06'±45' (0.11°±0.2°, 1.78±2 mm, 0.07±0.08 in.) 0°07'±45' (0.11°±0.2°, 1.90±2 mm, 0.07±0.08 in.) 0°06'±45' (0.11°±0.2°, 1.78±2 mm, 0.07±0.08 in.)
	UCK41L-PRBLKK Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	0°06'±45' (0.10°±0.2°, 1.74±2 mm, 0.07±0.08 in.) 0°07'±45' (0.11°±0.2°, 1.86±2 mm, 0.07±0.08 in.) 0°06'±45' (0.10°±0.2°, 1.74±2 mm, 0.07±0.08 in.)

Front wheel alignment	● Wheel angle (B-cab for U.S.A.)	
	GSK30L-TRFDKA Tire size: P245/70R16	Inside wheel -35° 24' (-35.40°) Outside wheel: Reference 32° 13' (32.21°)
	GSK30L-TRBDKA Tire size: P245/70R16	-35° 21' (-35.35°) 32° 10' (32.16°)
	UCK30L-TRBDKA Tire size: P245/70R16	-35° 22' (-35.37°) 32° 11' (32.18°)
	UCK40L-TRBDKA Tire size: P245/70R16	-35° 59' (-35.98°) 32° 31' (32.51°)
	● Wheel angle (D-cab for U.S.A.)	
	UCK31L-PRBSKA Tire size: P245/70R16	-35° 32' (-35.53°) 32° 19' (32.32°)
	Tire size: P265/70R16	-35° 32' (-35.53°) 32° 19' (32.32°)
	Tire size: P265/70R16 (B2BB (ORP))	-35° 34' (-35.56°) 32° 21' (32.35°)
	Tire size: P265/65R17	-35° 32' (-35.53°) 32° 19' (32.32°)
	UCK31L-PRBLKA Tire size: P265/70R16	-35° 32' (-35.53°) 32° 19' (32.32°)
	Tire size: P265/70R16 (B2BB (ORP))	-35° 34' (-35.57°) 32° 22' (32.36°)
	Tire size: P265/65R17	-35° 32' (-35.53°) 32° 19' (32.32°)
	UCK41L-PRBSKA Tire size: P245/70R16	-35° 49' (-35.81°) 32° 28' (32.47°)
	Tire size: P265/70R16	-35° 49' (-35.81°) 32° 28' (32.47°)
	Tire size: P265/70R16 (B2BB (ORP))	-35° 51' (-35.85°) 32° 30' (32.50°)
	Tire size: P265/65R17	-35° 49' (-35.81°) 32° 28' (32.47°)
UCK41L-PRBLKA Tire size: P265/70R16	-35° 49' (-35.81°) 32° 28' (32.47°)	
Tire size: P265/70R16 (B2BB (ORP))	-35° 51' (-35.85°) 32° 30' (32.50°)	
Tire size: P265/65R17	-35° 49' (-35.81°) 32° 28' (32.47°)	
● Wheel angle (C-cab for U.S.A. 2WD models)		
GSK30L-ARFSKA Tire size: P245/70R16	-35° 40' (-35.67°) 32° 26' (32.44°)	
Tire size: P265/70R16	-35° 40' (-35.66°) 32° 26' (32.44°)	

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Front wheel alignment	GSK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16	-35°37' (-35.62°) 32°24' (32.40°) -35°37' (-35.61°) 32°24' (32.40°)
	UCK30L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	-35°26' (-35.44°) 32°14' (32.24°) -35°26' (-35.44°) 32°14' (32.24°) -35°28' (-35.47°) 32°16' (32.26°) -35°26' (-35.44°) 32°14' (32.24°) -35°13' (-35.22°) 32°02' (32.03°)
	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	-35°28' (-35.47°) 32°16' (32.27°) -35°30' (-35.50°) 32°18' (32.30°) -35°28' (-35.47°) 32°16' (32.27°) -35°16' (-35.26°) 32°04' (32.07°)
	UCK30L-ASBSKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	-35°26' (-35.44°) 32°14' (32.24°) -35°28' (-35.47°) 32°16' (32.26°) -35°26' (-35.44°) 32°14' (32.24°) -35°13' (-35.22°) 32°02' (32.02°)
	UCK30L-ASBLKA Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17 Tire size: P265/65R17 (B2BC (SPORT))	-35°28' (-35.47°) 32°16' (32.27°) -35°30' (-35.50°) 32°18' (32.30°) -35°28' (-35.47°) 32°16' (32.27°) -35°16' (-35.26°) 32°04' (32.07°)
	● Wheel angle (C-cab for U.S.A. 4WD models)	
	UCK40L-ARBSKA Tire size: P245/70R16 Tire size: P265/70R16 Tire size: P265/70R16 (B2BB (ORP)) Tire size: P265/65R17	-36°05' (-36.08°) 32°35' (32.59°) -36°05' (-36.08°) 32°35' (32.59°) -35°32' (-35.54°) 32°09' (32.15°) -36°05' (-36.08°) 32°35' (32.59°)

Front wheel alignment	UCK40L-ARBLKA Tire size: P265/70R16	-36°07' (-36.11°) 32°37' (32.61°)
	Tire size: P265/70R16 (B2BB (ORP))	-35°34' (-35.57°) 32°11' (32.18°)
	Tire size: P265/65R17	-36°07' (-36.11°) 32°37' (32.61°)
	UCK40L-ASBSKA Tire size: P265/70R16	-36°06' (-36.10°) 32°36' (32.60°)
	Tire size: P265/70R16 (B2BB (ORP))	-35°34' (-35.56°) 32°10' (32.16°)
	Tire size: P265/65R17	-35°06' (-36.10°) 32°36' (32.60°)
	UCK40L-ASBLKA Tire size: P265/70R16	-36°07' (-36.11°) 32°37' (32.61°)
	Tire size: P265/70R16 (B2BB (ORP))	-35°34' (-35.57°) 32°11' (32.18°)
	Tire size: P265/65R17	-35°24' (-35.40°) 32°13' (32.21°)
	● Wheel angle (For CANADA)	
GSK30L-TRBDKK Tire size: P245/70R16	-35°24' (-35.40°) 32°13' (32.21°)	
UCK40L-TRBDKK Tire size: P245/70R16	-36°01' (-36.02°) 32°32' (32.54°)	
UCK30L-ARBSKK Tire size: P245/70R16	-35°24' (-35.40°) 32°13' (32.21°)	
Tire size: P265/70R16	-36°24' (-35.40°) 32°13' (32.21°)	
Tire size: P265/65R17	-35°24' (-35.40°) 32°13' (32.21°)	
USK40L-ARBSKK Tire size: P245/70R16	-36°04' (-36.07°) 32°35' (32.58°)	
Tire size: P265/70R16	-36°04' (-36.07°) 32°35' (32.58°)	
Tire size: P265/70R16 (B2BB (ORP))	-35°32' (-35.53°) 32°08' (32.14°)	
Tire size: P265/65R17	-36°04' (-36.07°) 32°35' (32.58°)	
UCK40L-ARBLKK Tire size: P265/70R16	-36°06' (-36.10°) 32°36' (32.60°)	
Tire size: P265/70R16 (B2BB (ORP))	-35°34' (-35.56°) 32°10' (32.17°)	
Tire size: P265/65R17	-36°06' (-36.10°) 32°36' (32.60°)	

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Front wheel alignment	UCK31L-PRBSKK Tire size: P245/70R16	-35° 29' (-35.49°) 32° 17' (32.29°)	
	Tire size: P265/70R16	-35° 29' (-35.49°) 32° 17' (32.29°)	
	Tire size: P265/65R17	-35° 29' (-35.49°) 32° 17' (32.29°)	
	UCK41L-PRBSKK Tire size: P245/70R16	-35° 49' (-35.81°) 32° 28' (32.47°)	
	Tire size: P265/70R16	-35° 49' (-35.81°) 32° 28' (32.47°)	
	Tire size: P265/70R16 (B2BB (ORP))	-35° 51' (-35.85°) 32° 30' (32.50°)	
	Tire size: P265/65R17	-35° 49' (-35.81°) 32° 28' (32.47°)	
	UCK41L-PRBLKK Tire size: P265/70R16	-35° 48' (-35.80°) 32° 28' (32.46°)	
	Tire size: P265/70R16 (B2BB (ORP))	-35° 50' (-35.84°) 32° 29' (32.49°)	
	Tire size: P265/65R17	-35° 48' (-35.80°) 32° 28' (32.46°)	
	Front drive shaft	Front drive shaft length	523.5 ± 2.0 mm (20.610 ± 0.079 in.)
	Front suspension	Upper ball joint turning torque	0.7 – 4.4 N·m (7 – 45 kgf·cm, 6 – 39 in.-lbf)
Front suspension	Lower ball joint excessive play	Maximum 0.5 mm (0.020 in.)	
	Lower ball joint turning torque	0.1 – 6.5 N·m (1 – 66 kgf·cm, 1 – 58 in.-lbf)	
	Stabilizer bar link ball joint turning torque	0.05 – 2.0 N·m (0.5 – 20 kgf·cm, 0.4 – 17 in.-lbf)	

Front differential	Companion flange vertical runout	Maximum	0.10 mm (0.0039 in.)	
	Companion flange lateral runout	Maximum	0.10 mm (0.0039 in.)	
	Drive pinion preload (at starting)	New bearing Reused bearing	1.2 – 1.9 N·m (12 – 19 kgf·cm, 10.4 – 16.5 in.·lbf) 0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.·lbf)	
	Total preload (at starting)		Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)	
	Drive pinion to ring gear backlash		0.13 – 0.18 mm (0.0051 – 0.0071 in.)	
	Side gear backlash		0 – 0.20 mm (0 – 0.0079 in.)	
	Rear oil seal drive in depth		4.5 ± 0.3 mm (0.177 ± 0.012 in.)	
	Side oil seal drive in depth		0 mm (0 in.)	
	Side tube oil seal drive in depth		5.5 ± 0.3 mm (0.217 ± 0.012 in.)	
	Side gear thrust washer thickness			0.96 – 1.04 mm (0.0378 – 0.0409 in.)
				1.06 – 1.14 mm (0.0417 – 0.0449 in.)
				1.16 – 1.24 mm (0.0457 – 0.0488 in.)
				1.26 – 1.34 mm (0.0496 – 0.0528 in.)
	Side gear bearing adjusting washer thickness			2.00 – 2.02 mm (0.0787 – 0.0795 in.)
				2.03 – 2.05 mm (0.0799 – 0.0807 in.)
				2.06 – 2.08 mm (0.0811 – 0.0819 in.)
				2.09 – 2.11 mm (0.0823 – 0.0831 in.)
				2.12 – 2.14 mm (0.0835 – 0.0843 in.)
				2.15 – 2.17 mm (0.0846 – 0.0854 in.)
				2.18 – 2.20 mm (0.0858 – 0.0866 in.)
				2.21 – 2.23 mm (0.0870 – 0.0878 in.)
				2.24 – 2.26 mm (0.0882 – 0.0890 in.)
				2.27 – 2.29 mm (0.0894 – 0.0902 in.)
				2.30 – 2.32 mm (0.0906 – 0.0913 in.)
				2.33 – 2.35 mm (0.0917 – 0.0925 in.)
				2.36 – 2.38 mm (0.0929 – 0.0937 in.)
				2.39 – 2.41 mm (0.0941 – 0.0949 in.)
				2.42 – 2.44 mm (0.0953 – 0.0961 in.)
				2.45 – 2.47 mm (0.0965 – 0.0972 in.)
				2.48 – 2.50 mm (0.0976 – 0.0984 in.)
				2.51 – 2.53 mm (0.0988 – 0.0996 in.)
				2.54 – 2.56 mm (0.1000 – 0.1008 in.)
			2.57 – 2.59 mm (0.1012 – 0.1020 in.)	
		2.60 – 2.62 mm (0.1024 – 0.1031 in.)		
		2.63 – 2.65 mm (0.1035 – 0.1043 in.)		
		2.66 – 2.68 mm (0.1047 – 0.1055 in.)		
		2.69 – 2.71 mm (0.1059 – 0.1067 in.)		
		2.72 – 2.74 mm (0.1071 – 0.1079 in.)		
		2.75 – 2.77 mm (0.1083 – 0.1091 in.)		
		2.78 – 2.80 mm (0.1094 – 0.1102 in.)		

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Front differential	Drive pinion bearing adjusting washer thickness		1.69 – 1.71 mm (0.0665 – 0.0673 in.)
			1.72 – 1.74 mm (0.0677 – 0.0685 in.)
			1.75 – 1.77 mm (0.0689 – 0.0697 in.)
			1.78 – 1.80 mm (0.0701 – 0.0709 in.)
			1.81 – 1.83 mm (0.0713 – 0.0720 in.)
			1.84 – 1.86 mm (0.0724 – 0.0732 in.)
			1.87 – 1.89 mm (0.0736 – 0.0744 in.)
			1.90 – 1.92 mm (0.0748 – 0.0756 in.)
			1.93 – 1.95 mm (0.0760 – 0.0768 in.)
			1.96 – 1.98 mm (0.0772 – 0.0780 in.)
			1.99 – 2.01 mm (0.0783 – 0.0791 in.)
			2.02 – 2.04 mm (0.0795 – 0.0803 in.)
			2.05 – 2.07 mm (0.0807 – 0.0815 in.)
			2.08 – 2.10 mm (0.0819 – 0.0827 in.)
			2.11 – 2.13 mm (0.0831 – 0.0839 in.)
			2.14 – 2.16 mm (0.0843 – 0.0850 in.)
			2.17 – 2.19 mm (0.0854 – 0.0862 in.)
			2.20 – 2.22 mm (0.0866 – 0.0874 in.)
			2.23 – 2.25 mm (0.0878 – 0.0886 in.)
			2.26 – 2.28 mm (0.0890 – 0.0898 in.)
	2.29 – 2.31 mm (0.0902 – 0.0909 in.)		
	2.32 – 2.34 mm (0.0913 – 0.0921 in.)		
	A.D.D. sleeve fork to clutch sleeve clearance		0.35 mm (0.0138 in.) or less
	Differential case needle bearing press in depth		0.3 ± 0.3 mm (0.012 ± 0.012 in.)
Rear axle shaft	Axle shaft bearing backlash	Maximum	0.7 mm (0.028 in.)
	Axle shaft deviation	Maximum	0.1 mm (0.004 in.)
	Shaft runout	Maximum	2.0 mm (0.079 in.)
	Flange runout	Maximum	0.1 mm (0.004 in.)
Rear differential	Companion flange runout	Maximum	0.09 mm (0.0035 in.)
	Ring gear runout	Maximum	0.05 mm (0.0020 in.)
	Drive pinion to ring gear backlash		0.13 – 0.18 mm (0.0051 – 0.0071 in.)
	Drive pinion preload (at starting)	New bearing Reused bearing	1.3 – 1.9 N·m (13 – 19 kgf·cm, 11.4 – 16.7 in.·lbf) 0.6 – 0.9 N·m (6.1 – 9.2 kgf·cm, 5.3 – 8.0 in.·lbf)
	Total preload (at starting)		Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)
	Differential case runout	Maximum	0.04 mm (0.0016 in.)
	Side gear thrust washers for wear or damage		1.77 – 2.49 mm (0.0697 – 0.0980 in.)
	Clutch plate for wear or damage		1.57 – 1.63 mm (0.0618 – 0.0642 in.)
	Compression spring free length		26.4 mm (1.039 in.)
	Adjusting shim mark and thickness	A B C D E	0.15 mm (0.0059 in.) 0.20 mm (0.0079 in.) 0.25 mm (0.0098 in.) 0.30 mm (0.0118 in.) 0.35 mm (0.0138 in.)
Rear differential	Side gear backlash		0.05 – 0.20 mm (0.0020 – 0.0079 in.)

Rear differential	Differential case to rotation torque	Standard	27.5 – 43.0 N-m (281 – 439 kgf-cm, 20 – 32 ft-lbf)	
	Ring gear runout	Maximum	0.05 mm (0.0020 in.)	
	Drive pinion oil seal drive in depth		0 mm (0 in.)	
	Side gear thrust washer thickness			1.80 mm (0.0709 in.)
				1.86 mm (0.0732 in.)
				1.92 mm (0.0756 in.)
				1.98 mm (0.0780 in.)
				2.04 mm (0.0803 in.)
				2.10 mm (0.0827 in.)
				2.22 mm (0.0850 in.)
				2.28 mm (0.0874 in.)
				2.34 mm (0.0898 in.)
				2.34 mm (0.0921 in.)
				2.40 mm (0.0945 in.)
		2.46 mm (0.0969 in.)		

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Rear differential	Side bearing adjusting washer thickness	58	2.58 mm (0.1015 in.)
		60	2.60 mm (0.1024 in.)
		62	2.62 mm (0.1031 in.)
		64	2.64 mm (0.1039 in.)
		66	2.66 mm (0.1047 in.)
		68	2.68 mm (0.1055 in.)
		70	2.70 mm (0.1063 in.)
		72	2.72 mm (0.1071 in.)
		74	2.74 mm (0.1079 in.)
		76	2.76 mm (0.1087 in.)
		78	2.78 mm (0.1094 in.)
		80	2.80 mm (0.1102 in.)
		82	2.82 mm (0.1110 in.)
		84	2.84 mm (0.1118 in.)
		86	2.86 mm (0.1126 in.)
		88	2.88 mm (0.1134 in.)
		90	2.90 mm (0.1142 in.)
		92	2.92 mm (0.1150 in.)
		94	2.94 mm (0.1157 in.)
		96	2.96 mm (0.1165 in.)
		98	2.98 mm (0.1173 in.)
		00	3.00 mm (0.1181 in.)
		02	3.02 mm (0.1189 in.)
		04	3.04 mm (0.1197 in.)
		06	3.06 mm (0.1205 in.)
		08	3.08 mm (0.1213 in.)
		10	3.10 mm (0.1220 in.)
		12	3.12 mm (0.1228 in.)
		14	3.14 mm (0.1236 in.)
		16	3.16 mm (0.1244 in.)
		18	3.18 mm (0.1252 in.)
		20	3.20 mm (0.1260 in.)
		22	3.22 mm (0.1268 in.)
		24	3.24 mm (0.1276 in.)
		26	3.26 mm (0.1283 in.)
		28	3.28 mm (0.1291 in.)
		30	3.30 mm (0.1299 in.)
		32	3.32 mm (0.1307 in.)
		34	3.34 mm (0.1315 in.)
		36	3.36 mm (0.1323 in.)
		38	3.38 mm (0.1331 in.)
40	3.40 mm (0.1339 in.)		
42	3.42 mm (0.1346 in.)		
44	3.44 mm (0.1354 in.)		
46	3.46 mm (0.1362 in.)		
48	3.48 mm (0.1370 in.)		

Rear differential	Drive pinion bearing adjusting washer thickness	87	1.87 mm (0.0736 in.)
		88	1.88 mm (0.0740 in.)
		89	1.89 mm (0.0744 in.)
		90	1.90 mm (0.0748 in.)
		91	1.91 mm (0.0752 in.)
		92	1.92 mm (0.0756 in.)
		93	1.93 mm (0.0760 in.)
		94	1.94 mm (0.0764 in.)
		95	1.95 mm (0.0768 in.)
		96	1.96 mm (0.0772 in.)
		97	1.97 mm (0.0776 in.)
		98	1.98 mm (0.0780 in.)
		99	1.99 mm (0.0783 in.)
		00	2.00 mm (0.0787 in.)
		01	2.01 mm (0.0791 in.)
		02	2.02 mm (0.0795 in.)
		03	2.03 mm (0.0799 in.)
		04	2.04 mm (0.0803 in.)
		05	2.05 mm (0.0807 in.)
		06	2.06 mm (0.0811 in.)
		07	2.07 mm (0.0815 in.)
		08	2.08 mm (0.0819 in.)
		09	2.09 mm (0.0823 in.)
		10	2.10 mm (0.0827 in.)
		11	2.11 mm (0.0831 in.)
		12	2.12 mm (0.0835 in.)
		13	2.13 mm (0.0839 in.)
		14	2.14 mm (0.0843 in.)
15	2.15 mm (0.0846 in.)		
16	2.16 mm (0.0850 in.)		
17	2.17 mm (0.0854 in.)		
18	2.18 mm (0.0858 in.)		
19	2.19 mm (0.0862 in.)		
20	2.20 mm (0.0866 in.)		
21	2.21 mm (0.0870 in.)		
22	2.22 mm (0.0874 in.)		
23	2.23 mm (0.0878 in.)		
24	2.24 mm (0.0882 in.)		
25	2.25 mm (0.0886 in.)		
26	2.26 mm (0.0890 in.)		
27	2.27 mm (0.0894 in.)		
28	2.28 mm (0.0898 in.)		

TORQUE SPECIFICATION

Part tightened	N-m	kgf-cm	ft-lbf
TIRE PRESSURE MONITOR RECEIVER			
Tire pressure monitor receiver set bolt	7.5	76	66 in.-lbf
TIRE PRESSURE MONITOR VALVE			
Tire pressure monitor valve set nut	4.0	41	35 in.-lbf
FRONT AXLE			
Hub nut	110	1,150	83
Tie rod end lock nut	55	560	41
Steering knuckle x Lower ball joint	65	662	48
Steering knuckle x Brake caliper	123	1,250	90
Steering knuckle x Dust cover	18	185	13
Drive shaft lock nut	235	2,400	173
Upper suspension arm x Upper ball joint	105	1,100	77
Brake line clamp x Steering knuckle	28	285	21
ABS speed sensor x Steering knuckle	8.0	82	71 ft-lbf
ABS speed sensor wire harness clamp x Steering knuckle	8.0	82	71 ft-lbf
ABS speed sensor wire harness clamp x Upper suspension arm	8.0	82	71 ft-lbf
Axle hub bearing lock nut (2WD)	274	2,800	203
FRONT DIFFERENTIAL			
Drive pinion x Companion flange	See page SA-48		
Differential front mounting cushion x Chassis frame	137	1,400	101
Differential rear mounting cushion x Chassis frame	87	890	64
Differential front mounting cushion x Differential	157	1,600	116
Differential rear mounting cushion x Differential	108	1,100	80
Ring gear x Differential case	97	985	71
Differential carrier x Differential tube	78	800	58
Differential carrier x Side bearing retainer	69	700	51
Differential x Front propeller shaft	74	750	54
A.D.D. clutch case x Differential	78	800	58
A.D.D. clutch case x Differential tube	78	800	58
A.D.D. actuator x A.D.D. clutch case	21	210	15
Tube with wire harness assembly clamp x Differential carrier	13	130	9
Drain plug	65	660	48
Filler plug	39	400	29
FRONT SUSPENSION			
Suspension support x Chassis frame	64	650	47
Piston rod x Suspension support	25	250	18
Lower suspension arm x Shock absorber	135	1,400	100
Upper suspension arm x Chassis frame	98	1,000	72
Lower suspension arm x Chassis frame	130	1,325	96
Lower suspension arm x Lower ball joint	159	1,620	117
Power steering gear	Left side nut	130	1,350
	Center bolt	165	1,700
	Right side bolt and nut	165	1,700
Tie rod end x Lower ball joint	91	930	67

No. 1, No. 2 spring bumper	31 (23)	315 (235)	23 (17)
Lower suspension arm x Stabilizer bar link	69	700	51

() For use with SST

Part tightened	N·m	kgf·cm	ft·lbf
Stabilizer bar x Stabilizer bar link	19	190	14
Stabilizer bar bracket x Chassis frame	37	375	27
REAR AXLE			
Hub nut	110	1,150	83
Axle housing x Backing plate	69	700	51
Brake line union nut	15	155	11
ABS speed sensor x Axle housing	8.0	82	71 in.·lbf
REAR DIFFERENTIAL			
LH differential case x RH differential case	47	480	35
Differential carrier x Bearing cap	113	1,150	83
Differential case x Ring gear	125	1,270	92
Differential carrier x Axle housing	73	740	54
Drive pinion x Companion flange	See page SA-133		
REAR SUSPENSION			
Shock absorber x Chassis frame	20	200	15
Shock absorber x Axle housing	87	890	64
U-bolt x Spring seat	133	1,350	98
Leaf spring front side set nut	170	1,735	125
Leaf spring x Shackle	170	1,735	125
Shackle x Chassis frame	170	1,735	125
Leaf spring center bolt	44	450	33
Bracket x Axle housing	29	296	21
Stabilizer bar link x Chassis frame	69	704	51
Stabilizer bar x Stabilizer bar link	69	704	51

BRAKE

SERVICE DATA

SS084-04

Brake pedal height (from dash panel) (w/o VSC, standard, access cab)		163.6 to 173.6 mm (6.44 to 6.83 in.)
Brake pedal height (from dash panel) (w/ VSC, standard, access cab)		164.0 to 174.0 mm (6.46 to 6.85 in.)
Brake pedal height (from dash panel) (double cab)		151.1 to 165.1 mm (5.95 to 6.50 in.)
Stop light switch clearance		0.5 to 2.4 mm (0.020 to 0.094 in.)
Brake pedal free play		1 to 6 mm (0.04 to 0.24 in.)
Parking brake pedal travel at 294 N (30 kgf, 66 lbf)		8 to 10 clicks
Parking brake lever travel at 196 N (20 kgf, 44 lbf)		19 to 25 clicks
Brake booster push rod to piston clearance (w/ SST)		0 mm (0 in.)
Brake pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf)		More than 95 mm (3.74 in.)
Front brake pad thickness	STD	11.5 mm (0.453 in.)
	Minimum	1.0 mm (0.039 in.)
Front brake disc thickness	STD	28.0 mm (1.102 in.)
	Minimum	26.0 mm (1.024 in.)
Front brake disc runout	Maximum	0.07 mm (0.0028 in.)
Rear brake drum inside diameter	STD	295.0 mm (11.614 in.)
	Maximum	297.0 mm (11.693 in.)
Rear brake shoe lining thickness	STD	6.0 mm (0.236 in.)
	Minimum	1.0 mm (0.039 in.)
Rear brake drum to shoe clearance		0.5 mm (0.020 in.)
Rear axle load (includes vehicle weight) (standard cab)		950 kg (2,094 lb)
Rear axle load (includes vehicle weight) (access cab) 1GR-FT		1,000 kg (2,205 lb)
Rear axle load (includes vehicle weight) (access cab) 2UZ-FT		1,050 kg (2,315 lb)
Rear brake pressure (front brake pressure at 7,845 kPa (80 kgf/cm ² , 1,138 psi)		5,110 ± 490 kPa (52.1 ± 5 kgf/cm ² , 741 ± 71 psi)
Fluid pressure (LSP & BV) initial set		120 mm (4.72 in.)
Fluid pressure (LSP & BV) adjustment range		112 to 128 mm (4.41 to 5.04 in.)
Valve piston pin and load sensing contact surface	Wear limit	0.7 mm (0.028 in.)

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Master cylinder x Piston stopper bolt	10	100	7
Master cylinder x Reservoir	1.8	18	16 in.·lbf
Master cylinder x Booster (w/o VSC)	13	130	9
Brake master cylinder x Master cylinder body (w/ VSC)	25	255	11
Bleeder plug	11	110	8
Parking brake wire lock nut x Adjust nut	5.4	55	48 in.·lbf
Brake booster x Body	13	130	9
Brake line union nut x ABS actuator	15.2	155	11.2
Brake line union nut x Hydraulic brake booster	15.2	155	11.2
Hydraulic brake booster x Body	14.2	145	10
Hydraulic brake booster x Brake actuator bracket No. 1	7.8	80	69 in.·lbf
Hydraulic brake booster x Brake actuator bracket	7.8	80	69 in.·lbf
Hydraulic brake booster x Master cylinder reservoir assembly	1.7	17	15 in.·lbf
Hydraulic brake booster x Brake actuator tube No. 1	15.2	155	11.2
Hydraulic brake booster x Wire harness	2.9	30	26
Pump motor assembly x Hydraulic brake booster	7.8	80	69 in.·lbf
Hydraulic brake booster x Pump motor bracket	7.8	80	69 in.·lbf
Hydraulic brake booster x Master cylinder solenoid	31.9	325	24
Clevis lock nut (w/ VSC)	25.5	260	19
Clevis lock nut (w/o VSC)	25	255	11
Brake booster accumulator assembly x Pump motor assembly	57.4	585	42
Yaw rate sensor x Body	12.5	128	9
Brake line union nut	15	155	11
Front disc brake caliper x Steering knuckle	123	1,250	90
Rear drum brake wheel cylinder x Backing plate	10	100	7
Parking brake bellcrank bracket x Backing plate	13	130	9
LSP & BV x LSP & BV bracket	13	130	9
LSP & BV bracket x Load sensing spring assembly	18	185	13
Load sensing spring assembly x Shackle No. 1	18	185	13
Shackle No. 1 x Shackle No. 2	13	130	9
Shackle No. 2 x Shackle bracket	13	130	9
LSP & BV bracket x Frame	29	300	22
Shackle bracket x Rear axle housing	29	300	22
Actuator bracket x ABS actuator	5.4	55	48 in.·lbf
Actuator bracket x Body	11.2	114	8
Speed sensor installation bolt	8.0	82	71 in.·lbf
Front speed sensor harness x Steering knuckle	8.0	82	71 in.·lbf
Front speed sensor harness x Upper arm	8.0	82	71 in.·lbf
Front speed sensor harness x Coil support	8.0	82	71 in.·lbf
Rear speed sensor harness x Rear axle housing	8.0	82	71 in.·lbf

STEERING

SERVICE DATA

SS08W-05

POWER STEERING FLUID		
Oil level rise	Maximum	5 mm (0.20 in.)
Oil pressure at idle speed with valve closed	Minimum	8,336 kPa (85 kgf/cm ² , 1,209 psi)
STEERING WHEEL		
Steering wheel freeplay	Maximum	30 mm (1.18 in.)
Steering effort at idle speed	Reference:	4.9 N·m (50 kgf·cm, 43 in.·lbf)
PS VANE PUMP (1GR-FE)		
Pump shaft and front housing bushing oil clearance	Maximum	0.07 mm (0.0028 in.)
Vane plate thickness	STD	1.405-1.411 mm (0.05531-0.05555 in.)
Vane plate and pump rotor groove clearance	Maximum	0.03 mm (0.0012 in.)
Flow control valve spring length	Minimum	36.9 mm (1.453 in.)
Pump rotating torque	Maximum	0.27 N·m (2.8 kgf·cm, 2.4 in.·lbf) or less
PS VANE PUMP (2UZ-FE)		
Pump shaft and front housing bushing oil clearance	STD	0.03-0.05 mm (0.0012-0.0020 in.)
Pump shaft and front housing bushing oil clearance	Maximum	0.07 mm (0.0028 in.)
Vane plate height	Minimum	8.6 mm (0.339 in.)
Vane plate thickness	Minimum	1.397 mm (0.0550 in.)
Vane plate length	Minimum	14.991 mm (0.5902 in.)
Vane plate and pump rotor groove clearance	Maximum	0.033 mm (0.0013 in.)
Vane plate length	Pump rotor and cam ring mark	
	None	14.999-15.001 mm (0.59051-0.59059 in.)
	1	14.997-14.999 mm (0.59043-0.59051 in.)
	2	14.995-14.997 mm (0.59035-0.59043 in.)
	3	14.993-14.995 mm (0.59027-0.59035 in.)
	4	14.991-14.993 mm (0.59020-0.59027 in.)
Flow control valve spring length	Minimum	33.2 mm (1.307 in.)
Pump rotating torque	Maximum	0.28 N·m (2.8 kgf·cm, 2.4 in.·lbf) or less
PS GEAR		
Steering rack runout	Maximum	0.09 mm (0.0035 in.)
Total preload	Turning	1.0-1.45 N·m (10-10.45 kgf·cm, 8.7-12.6 in.·lbf)

TORQUE SPECIFICATION

Part tightened	N-m	kgf-cm	ft-lbf
STEERING COLUMN (Standard Cab, Access Cab)			
Steering wheel pad set screw (Torx® screw)	8.8	90	78 in.-lbf
Steering wheel set nut	50	510	37
Control valve shaft x No. 2 intermediate shaft assembly	35	360	26
No. 2 intermediate shaft assembly x Sliding yoke	35	360	26
Sliding yoke x No. 2 universal joint assembly	35	360	26
No. 2 universal joint assembly x Main shaft assembly	35	360	26
Steering column assembly set nut	26	260	19
Column hole cover set bolt	8.0	82	71 in.-lbf
Shift lever set bolt	A/T	18	180
Non-tilt steering column:	–	–	–
Shift lever housing x Column upper tube	A/T	12	120
Turn signal bracket x Column upper tube	7.5	75	65 in.-lbf
Column upper tube x Column tube assembly	19	195	14
Tilt steering column:	–	–	–
Shift lever housing x Column housing support	A/T	12	120
Turn signal bracket x Steering column housing	7.5	75	65 in.-lbf
Column housing support x Column tube assembly	19	195	14
STEERING COLUMN (Double Cab)			
Steering wheel pad set screw (Torx® screw)	8.8	90	78 in.-lbf
Steering wheel set nut	50	510	37
Control valve shaft x No. 2 intermediate shaft assembly	35	360	26
No. 2 intermediate shaft assembly x Sliding yoke	35	360	26
No. 2 universal joint assembly x Sliding yoke	35	360	26
No. 2 universal joint assembly x Main shaft assembly	35	360	26
Steering column assembly set nut	26	260	19
Column hole cover No. 2 set bolt	8.0	82	71 in.-lbf
Shift lever set bolt	18	180	13
Shift lever housing x Column tube assembly	12	120	9
Turn signal bracket x Steering column housing	7.5	75	65 in.-lbf
Tilt lever lock shaft	9.0	90	78 in.-lbf
PS VANE PUMP (1GR-FE)			
Union bolt x Pressure feed tube	46.5	474	34
Bracket x Pump assembly	21	210	15
Front housing x Rear housing	22	220	16
Pressure port union x Front housing	69	700	51
Suction port union x Front housing	12	120	9
Oil pressure switch x Front housing	21	210	15
PS VANE PUMP (2UZ-FE)			
Union bolt x Pressure feed tube	46.5	475	34
PS vane pump assembly set stud bolt	22	220	16
PS vane pump assembly set bolt and nut	44	450	33
Suction port union set bolt	13	130	9

SERVICE SPECIFICATIONS - STEERING

Pressure port union		83	850	61
Front housing x Rear housing		24	240	17
PS GEAR				
Turn pressure tube union nut		13 (15)	135 (150)	10 (11)
Tie rod end lock nut		55	560	41
Rack x Rack end		76 (103)	770 (1,050)	56 (76)
Rack guide spring cap lock nut		51 (69)	520 (700)	38 (51)
Rack housing cap		59	600	43
Self-locking nut		30	300	22
Control valve housing set bolt		18	185	13
PS gear assembly set bolt		165	1,700	123
PS gear assembly set bolt and nut		130	1,350	96
Bracket x Body	Bolt and nut	165	1,700	123
Bracket x Body	Stud bolt	20	200	15
Pressure feed and return tubes x Control valve housing		22 (25)	227 (250)	16 (18)
Control valve shaft x No. 2 intermediate shaft assembly		35	360	26
Tie rod end x Lower arm		91	930	67

(): For use without SST

SUPPLEMENTAL RESTRAINT SYSTEM

TORQUE SPECIFICATION

SS08D-04

Part tightened	N·m	kgf·cm	ft·lbf
STEERING WHEEL PAD AND SPIRAL CABLE			
Steering wheel set nut	50	510	37
Steering wheel pad set screw (Torx® screw)	8.8	90	78 in.·lbf
FRONT PASSENGER AIRBAG ASSEMBLY			
Front passenger airbag assembly x Instrument panel	5.0	51	44 in.·lbf
Front passenger airbag assembly x Instrument panel	20	204	15
SIDE AIRBAG ASSEMBLY (Power Adjuster Type)			
Front seat x Body	37	377	27
Front seat inner belt x Front seat	42	428	31
Seatback cover bracket x Seatback frame	5.5	56	49 in.·lbf
Armrest assembly x Front seat	37	377	27
SIDE AIRBAG ASSEMBLY (Manual Adjuster Type)			
Front seat x Body	37	377	27
Front seat inner belt x Front seat	42	428	31
Seatback cover bracket x Seatback frame	5.5	56	49 in.·lbf
Armrest assembly x Front seat	37	377	27
SIDE AIRBAG ASSEMBLY (Passenger Side of Split Type)			
Front seat x Body	37	377	27
Front seat center belt x Front seat	42	428	31
Seatback cover bracket x Seatback frame	5.5	56	49 in.·lbf
Armrest assembly x Front seat	20	204	15
CURTAIN SHIELD AIRBAG ASSEMBLY			
Curtain shield airbag assembly x Body	9.8	100	7
AIRBAG SENSOR ASSEMBLY			
Airbag sensor assembly x Body	17.5	179	13
FRONT AIRBAG SENSOR			
Front airbag sensor x Body	17.5	179	13
SIDE AIRBAG SENSOR ASSEMBLY			
Side airbag sensor assembly x Body	17.5	179	13
CURTAIN SHIELD AIRBAG SENSOR ASSEMBLY			
Curtain shield airbag sensor assembly x Body	17.5	179	13
SEAT POSITION SENSOR ASSEMBLY (For Driver Seat)			
Seat position sensor assembly x Front seat	8.0	82	71 in.·lbf
SEAT POSITION SENSOR (For Front Passenger Seat)			
Seat position sensor x Front seat	8.0	82	71 in.·lbf
OCCUPANT CLASSIFICATION ECU (Except Separate Seat)			
Occupant classification ECU x Front seat	3.0	30	27 in.·lbf
SEAT BELT TENSION SENSOR (Except Separate Seat)			
Front seat inner belt RH x Front seat (Split seat)	42	430	32
Front seat outer belt floor anchor RH x Body (Bench seat)	42	430	32

BODY ELECTRICAL

SERVICE DATA

SS03A-06

SPEEDOMETER (On-vehicle)	
USA:	
Standard indication (mph)	Allowable range (mph)
20	19 – 22
40	39 – 42.5
60	59.5 – 63.5
80	79.5 – 84
100	100 – 105
CANADA:	
Standard indication (km/h)	Allowable range (km/h)
20	17.5 – 21.5
40	38 – 42
60	58 – 63
80	78 – 84
100	98.5 – 104.5
120	119 – 125
140	139 – 146
160	159 – 167
TACHOMETER (On-vehicle) / DC 13.5 V 25°C at (77°F)	
2UZ-FE:	
Standard indication	Allowable range
700	630 – 770
1,000	900 – 1,100
2,000	1,875 – 2,125
3,000	2,850 – 3,150
4,000	3,850 – 4,150
5,000	4,850 – 5,150
6,000	5,820 – 6,180
TACHOMETER (On-vehicle) / DC 13.5 V 25°C at (77°F)	
1GR-FE:	
Standard indication	Allowable range
700	630 – 770
1,000	900 – 1,000
2,000	1,850 – 2,150
3,000	2,800 – 3,200
4,000	3,800 – 4,200
5,000	4,800 – 5,100
6,000	5,750 – 6,250
FUEL SENDER GAUGE	
Float position mm (in.)	Resistance (Ω)
SF: Approx. 116.5 (4.59) ± 2.5 (0.10)	Approx. 4.0
1/2: Approx. 14 (0.55)	Approx. 59.0
W/L: Approx. 72.2 (2.84)	Approx. 98.8

SE: Approx. 100 (3.90) \pm 2.5 (0.10)	Approx. 110.0 \pm 2.5
ENGINE COOLANT TEMPERATURE RECEIVER GAUGE	
Temperature °C (°F)	Resistance (k Ω)
-20 (-4)	13.54 to 16.63
20 (68)	2.28 to 2.63
80 (176)	0.31 to 0.33
110 (230)	0.138 to 0.15

BODY

TORQUE SPECIFICATION

SS13G-06

Part tightened	N·m	kgf·cm	ft·lbf
FRONT BUMPER			
Steel bumper type:			
Front bumper arm x Body	58	590	43
Front bumper reinforcement x Body	50	510	37
Front bumper bar x Front bumper side mounting bracket	4.9	50	43 in.·lbf
Front bumper side mounting bracket x Front bumper arm	12	120	9
Front bumper bar x Front balance panel	4.9	50	43 in.·lbf
Resin bumper type:			
Front bumper reinforcement x Body	50	510	37
Front bumper cover x Body	7	71	61 in.·lbf
Front bumper cover x Front bumper extension	5	51	44 in.·lbf
REAR BUMPER			
Rear bumper arm x Body	80	810	59
Rear bumper reinforcement x Rear bumper arm	80	810	59
Rear bumper bar x Rear bumper reinforcement	45	459	33
Rear bumper bar x Rear bumper reinforcement	29	310	22
w/ Towing hitch:			
Rear bumper reinforcement x Body	100	1020	74
Receiver hitch bracket x Rear bumper reinforcement	160	1632	118
HOOD			
Hood hinge x Hood	13	133	10
Hood lock x Body	7.8	80	69 in.·lbf
HOOD SUPPORT			
Hood support x Hood	22	224	16
Hood support x Body	22	224	16
FRONT DOOR			
Door hinge x Body	23	235	17
Door hinge x Door panel	23	235	17
Door check x Body	27	275	20
Door check x Door panel	5.0	51	44 in.·lbf
Door striker x Body	23	235	17
Outside handle x Door panel	5.5	56	49 in.·lbf
Door lock x Door panel	Torx® screw	5.0	51
Door lock x Door panel	Bolt	8.0	82
w/ Power door lock:			
Door lock x Door panel	Bolt	5.5	56
Window regulator x Door panel	Bolt	8.0	82
	Nut	5.0	51
Door glass x Window regulator		5.0	51
Outside rear view mirror x Door panel		8.0	82
FRONT DOOR (Double Cab)			
Door hinge x Body	23	235	17

SERVICE SPECIFICATIONS – BODY

Part tightened	N-m	kgf-cm	ft-lbf
Door hinge x Door panel	23	235	17
Door check x Body	30	306	22
Door check x Door panel	5.5	56	49 in.-lbf
Door striker x Body	23	235	17
Outside handle x Door panel	5.5	56	49 in.-lbf
Door lock x Door panel	Torx® screw	5.0	51
Door lock x Door panel	Bolt	5.0	51
Window regulator x Door panel	8.0	82	71 in.-lbf
Door glass x Window regulator	8.0	82	71 in.-lbf
Outside rear view mirror x Door panel	8.0	82	71 in.-lbf
REAR DOOR (Double Cab)			
Door hinge x Body	23	235	17
Door hinge x Door panel	23	235	17
Door check x Body	30	306	22
Door check x Door panel	5.5	56	49 in.-lbf
Door striker x Body	23	235	17
Outside handle x Door panel	5.5	56	49 in.-lbf
Door lock x Door panel	Torx® screw	5.0	51
Window regulator x Door panel	8.0	82	71 in.-lbf
Door glass x Window regulator	8.0	82	71 in.-lbf
ACCESS DOOR			
Door hinge x Body	23	235	17
Door hinge x Door panel	23	235	17
Door check x Body	27	275	20
Door check x Door panel	5.0	51	44 in.-lbf
Cancel lever x Door panel	5.0	51	44 in.-lbf
Outside handle x Door panel	5.5	56	49 in.-lbf
Upper door lock x Door panel	12.5	128	9
Lower door lock x Door panel	5.0	51	44 in.-lbf
Door controller x Door panel	12.5	128	9
FRONT WIPER AND WASHER			
Wiper link x Body	5.5	56	49 in.-lbf
Wiper motor x Wiper link	5.5	56	49 in.-lbf
Wiper arm x Wiper link	20	204	15
WHEEL OPENING MOULDING			
Resin bumper type:			
Front bumper extension x Front bumper cover	5.0	51	44 in.-lbf
WINDSHIELD			
Inner rear view mirror x screw	Double cab	2.5	25
BACK WINDOW GLASS			
Power slide type:			
Back window regulator assembly x Body	5.5	56	49 in.-lbf
Tether anchor bracket x Body	20	200	15
Power vertical type:			
Back window regulator assembly x Body	8.0	82	71 in.-lbf

SERVICE SPECIFICATIONS - BODY

Part tightened		N-m	kgf-cm	ft-lbf
Service hole cover x Body		8.0	82	71
SLIDING ROOF				
Sliding roof housing x Body		5.5	56	49 in.-lbf
INSTRUMENT PANEL				
Front passenger airbag assembly x Instrument panel reinforcement		20	204	15
Front passenger airbag assembly x Instrument panel		5.0	51	44 in.-lbf
Steering wheel set nut		50	510	37
Steering wheel x Steering wheel pad		8.8	90	78 in.-lbf
TAIL GATE				
Tail gate hinge x Tail gate		17	178	13
Tail gate x Body		17	178	13
Tail gate cable x Tail gate		14	143	10
Tail gate cable x Body		14	143	10
Tail gate lock striker x Body		13	133	10
Tail gate handle x Tail gate		5.5	56	49 in.-lbf
Tail gate lock x Tail gate	LH	12.5	128	9
Tail gate lock x Tail gate	RH	13	133	10
FRONT SEAT				
Separate type:				
Armrest x Seatback assembly		37	380	27
Front seat inner belt x Seat frame assembly		42	430	32
w/ Side airbag: Seatback cover bracket x Seat frame assembly		5.5	56	49 in.-lbf
Front seat x Body		37	380	27
Bench type:				
Outer track assembly x Seat cushion frame		20	204	15
Seatback frame x Armrest		18	185	13
Seatback assembly x Seat cushion assembly		42	430	32
Seat track lower rear bracket x Outer track assembly		20	204	15
Seat position sensor (for driver seat) x RH Outer track assembly		8.0	82	71 in.-lbf
Seat position sensor (for passenger seat) x LH Outer track assembly		8.0	82	71 in.-lbf
Occupant classification ECU x Seat cushion frame		3.0	30	27 in.-lbf
Front seat x Body		37	380	27
Split type, Driver's side:				
Front seat inner belt x Seat frame assembly		42	430	32
w/ Side airbag: Seatback cover bracket x Seat frame assembly		5.5	56	49 in.-lbf
Front seat x Body		37	380	27
Split type, Passenger's side:				
Seat track handle sub-assembly x Seat cushion frame		10	102	7
Front seat inner belt x Seat cushion frame		42	430	32
Seat track x Seat cushion frame		15	153	11
Seat track lower bracket x Seat cushion frame		20	204	15
Front seat center belt retractor x Seatback frame	Bolt	21	214	15
	Nut	42	430	32

SERVICE SPECIFICATIONS - BODY

Part tightened		N-m	kgf-cm	ft-lbf
Front seat center belt x Seat cushion frame	Bolt	42	430	32
	Nut	5.5	56	49 in.-lbf
Seatback frame x Seat cushion frame	Torx® screw	42	430	32
	Bolt A	55	561	41
	Bolt B	21	214	15
w/ Side airbag: Seatback cover bracket x Seatback frame		5.5	56	49 in.-lbf
Center armrest assembly x Seatback frame		20	204	15
Seat position sensor (for passenger seat) x Inner seat track		8.0	82	71 in.-lbf
Occupant classification ECU x Seat cushion frame		3.0	30	27 in.-lbf
Front seat x Body		37	380	27
REAR SEAT (Bench type)				
Center armrest hinge x Center armrest		5.0	51	44 in.-lbf
Center armrest x Seatback assembly		21	215	16
Seatback assembly x Seatback lock		21	215	16
Seat cushion hinge plate x Seatback assembly		21	215	16
Seat cushion assembly x Seatback lock		21	215	16
Rear seat x Body		19	195	14
CRS tether anchor bracket x Seatback frame		9.0	92	80 in.-lbf
REAR SEAT (LH)				
Rear seat cushion hinge x Body		37	380	27
Rear No. 1 seat outer adjuster x Seat cushion frame		43	440	32
Rear No. 1 seat outer adjuster x Seatback frame		43	440	32
Rear No. 1 seat inner adjuster x Seat cushion frame		43	440	32
Rear No.1 seat inner adjuster x Seatback frame		43	440	32
Rear No.1 seat inner adjuster x Seat inner bracket		43	440	32
Rear seat shoulder belt guide x Seatback frame		42	430	32
REAR SEAT (RH)				
Rear seat cushion hinge x Body		37	380	27
Rear seat lock x Seat cushion frame		43	440	32
Rear seat reclining adjuster x Seat cushion frame		43	440	32
Rear seat reclining adjuster x Seatback frame		43	440	32
SEAT BELT				
Standard cab:				
Adjustable anchor x Body		42	430	32
Front seat outer belt shoulder anchor x Body		42	430	32
Front seat outer belt floor anchor x Body		42	430	32
Front seat outer belt retractor x Body	Upper bolt	8.5	87	75 in.-lbf
	Lower bolt	42	430	32
Front seat inner belt x Body		42	430	32
CRS tether anchor bracket x Body		20	204	15
Front seat center belt retractor x Body	Upper bolt	8.5	87	75 in.-lbf
	Lower bolt	42	430	32
Front seat center belt x Body		42	430	32
Access cab:				
Front seat outer belt shoulder anchor x Body		42	430	32

SERVICE SPECIFICATIONS - BODY

Part tightened		N-m	kgf-cm	ft-lbf
Front seat outer belt floor anchor x Body		42	430	32
Front seat outer belt retractor x ELR bracket	Upper bolt	8.5	87	75 in.-lbf
	Lower bolt	42	430	32
Front seat inner belt x Body		42	430	32
Part tightened		N-m	kgf-cm	ft-lbf
Front seat inner belt x Front seat		42	430	32
Front seat center belt x Front seat		42	430	32
Front seat center belt retractor x Front seat	Bolt	8.5	87	75 in.-lbf
	Nut	42	430	32
Rear seat outer belt shoulder anchor x Body		42	430	32
Rear seat outer belt floor anchor x Body		42	430	32
Rear seat outer belt retractor x Body		42	430	32
Rear seat inner belt x Body		42	430	32
Rear seat center belt x Body		42	430	32
Rear seat center belt retractor x Body	Upper bolt	8.5	87	75 in.-lbf
	Lower bolt	42	430	32
CRS tether anchor bracket x Body		20	204	15
Double cab:				
Front seat outer belt shoulder anchor x Adjustable anchor		42	430	32
Front seat outer belt floor anchor x Body		42	430	32
Front seat outer belt retractor x Body		42	430	32
Adjustable anchor x Body		42	430	32
Front seat inner belt x Front seat		42	430	32
Front seat inner belt x Body		42	430	32
Front seat center belt x Body		42	430	32
Front seat center belt retractor x Front seat	Bolt	8.5	87	75 in.-lbf
	Nut	42	430	32
Rear seat outer belt shoulder anchor x Adjustable anchor		42	430	32
Rear seat outer belt floor anchor x Body		42	430	32
Rear seat outer belt retractor x Body	Upper bolt	8.5	87	75 in.-lbf
	Lower bolt	42	430	32
Rear seat center belt retractor x Rear seat		43	440	32
Rear seat center belt floor anchor x Rear seat		43	440	32
Rear seat inner belt		43	440	32

AIR CONDITIONING

SERVICE DATA

SS08B-05

Refrigerant charge volume		
	Access cab, Standard cab	600 ± 50 g (21.16 ± 1.76 oz.)
	Double cab	530 ± 50 g (18.69 ± 1.76 oz.)
Idle-up speed (1GR-FE)		
	Magnetic clutch not engaged	700 ± 50 rpm
	Magnetic clutch engaged	700 ± 50 rpm
Idle-up speed (2UZ-FE)		
	Magnetic clutch not engaged	750 ± 50 rpm
	Magnetic clutch engaged	800 ± 50 rpm
Magnetic clutch clearance	1GR-FE engine	0.35 to 0.60 mm (0.013 to 0.023 in.)
	2UZ-FE engine	0.5 ± 0.15 mm (0.020 ± 0.0059 in.)

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Compressor x Compressor bracket	1GR-FE engine	24	245	18
	2UZ-FE engine	25	250	18
Compressor bracket x Engine		47	475	34
Idle pulley lock nut		39	400	29
Compressor x Discharge hose		10	100	7
Compressor x Suction hose		10	100	7
Cooling unit x Suction tube		32	330	24
Expansion valve x Evaporator		5.4	55	48 in.·lbf
Receiver x Liquid tube		5.4	55	48 in.·lbf
Condenser x Liquid tube		10	100	7
Condenser x Discharge hose		10	100	7
Pressure switch x Liquid tube		10	100	7
Pressure plate x Compressor	1GR-FE engine	18	183	13
	2UZ-FE engine	13.2	135	9

ENGINE (1GR-FE)

DIDSK-01

PRECAUTION

NOTICE:

Perform the **RESET MEMORY (AT initialization)** when replacing the automatic transaxle assembly, engine assembly or ECM (see page [DI-961](#)).

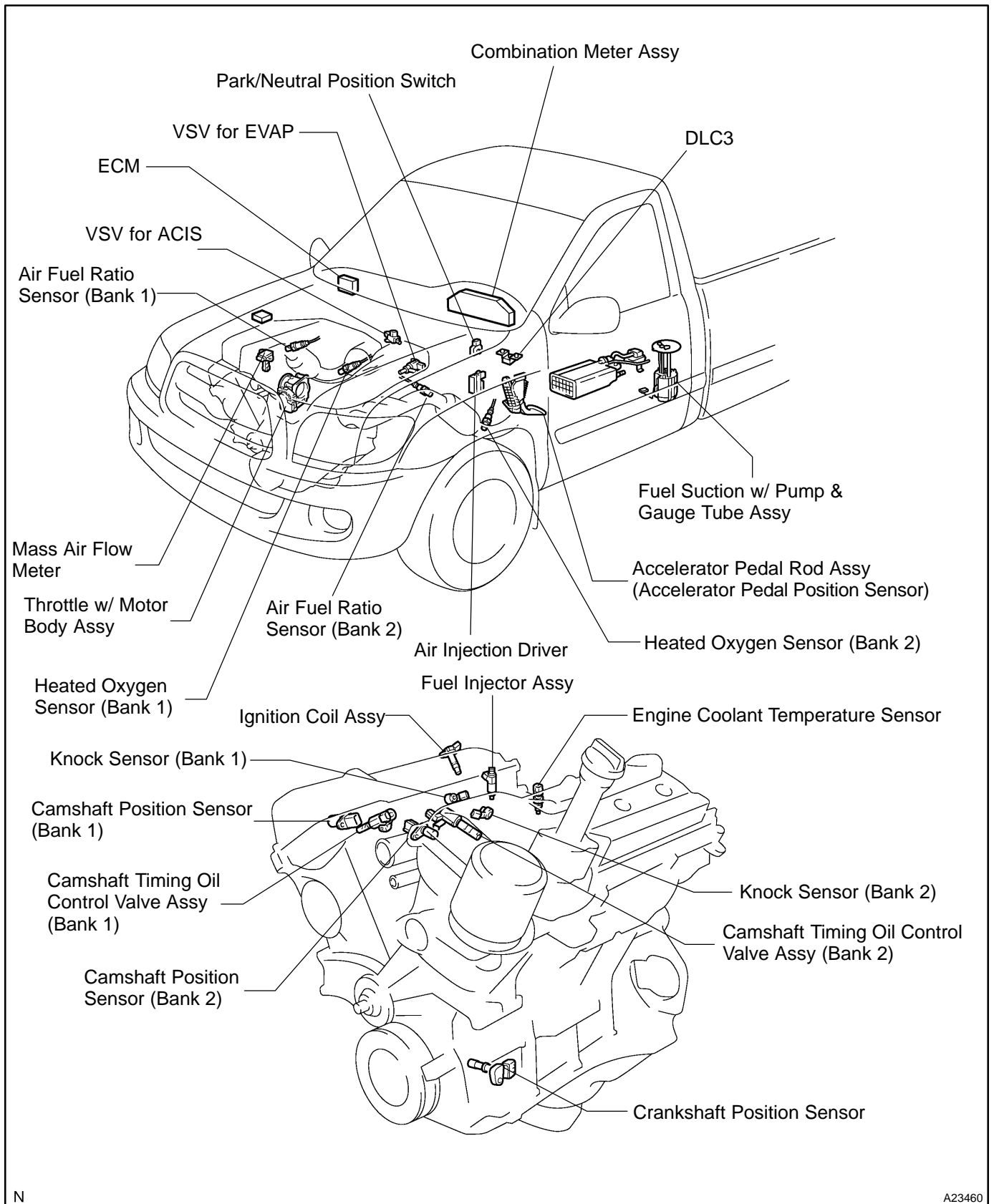
HINT:

RESET MEMORY (AT initialization) can not be completed by only removing the battery.

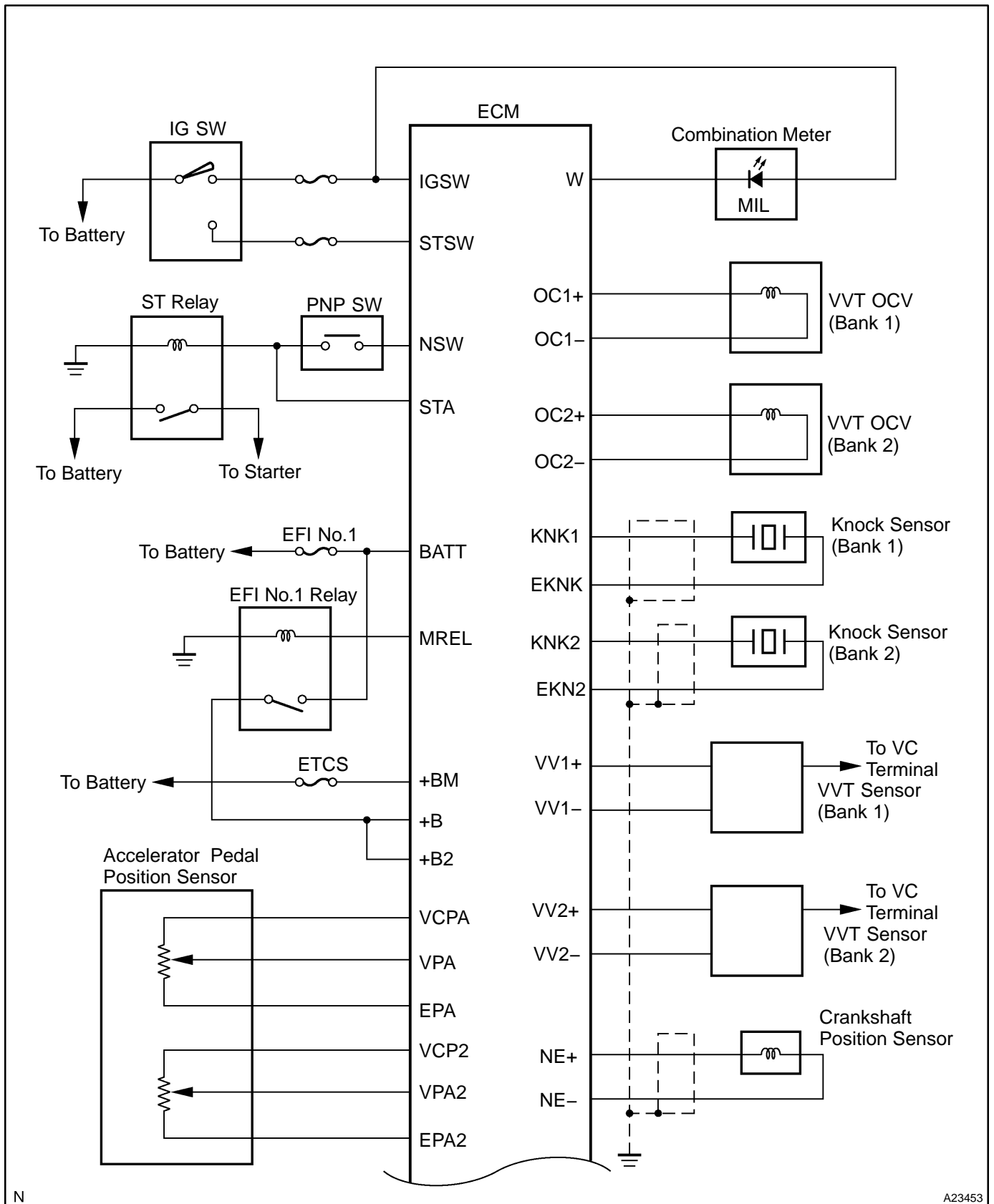
DEFINITION OF TERMS

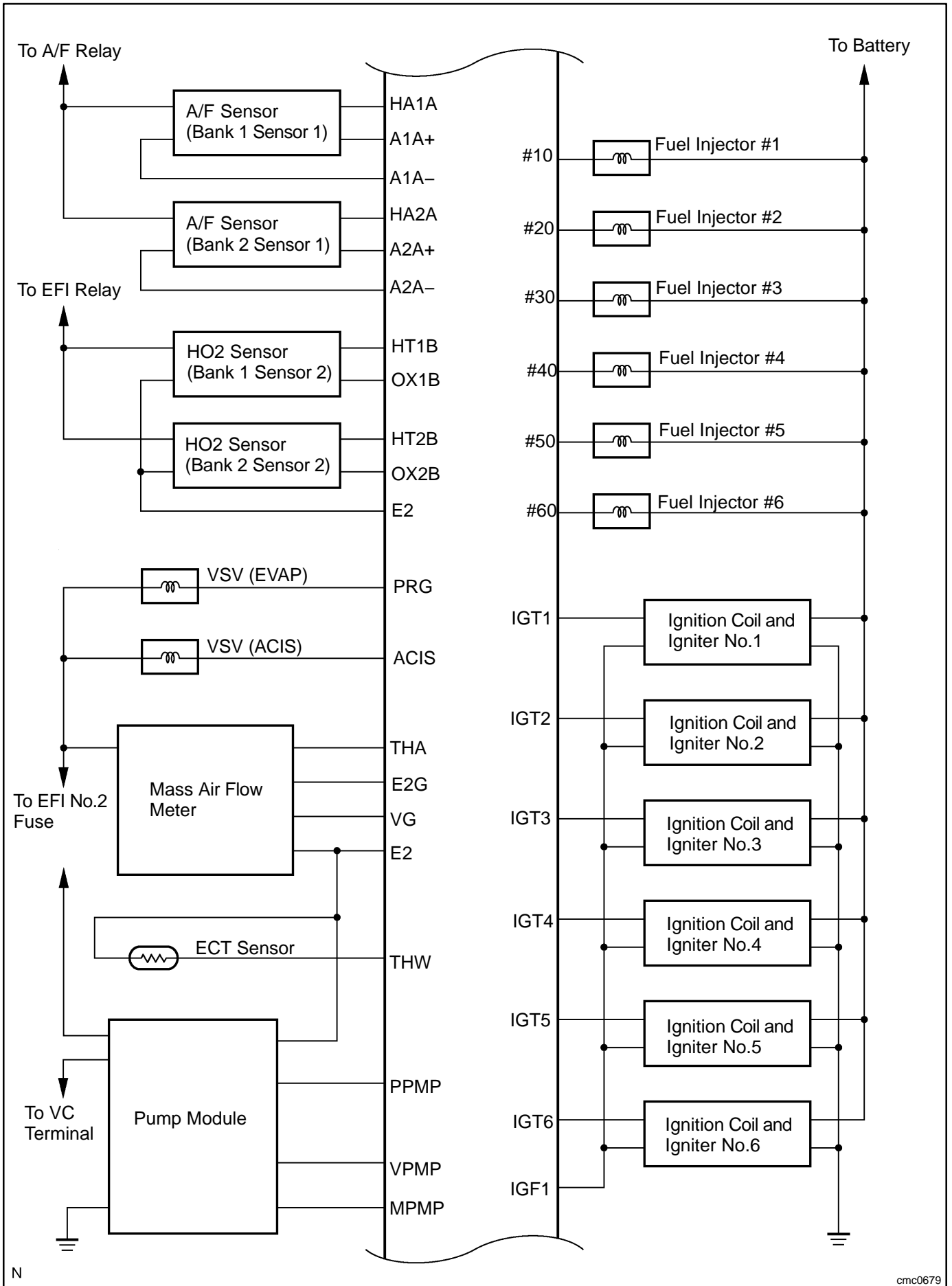
Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. When a sensor is being monitored, the next sensor or component will not be monitored until the sensor monitoring is finished.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects malfunction every time an enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

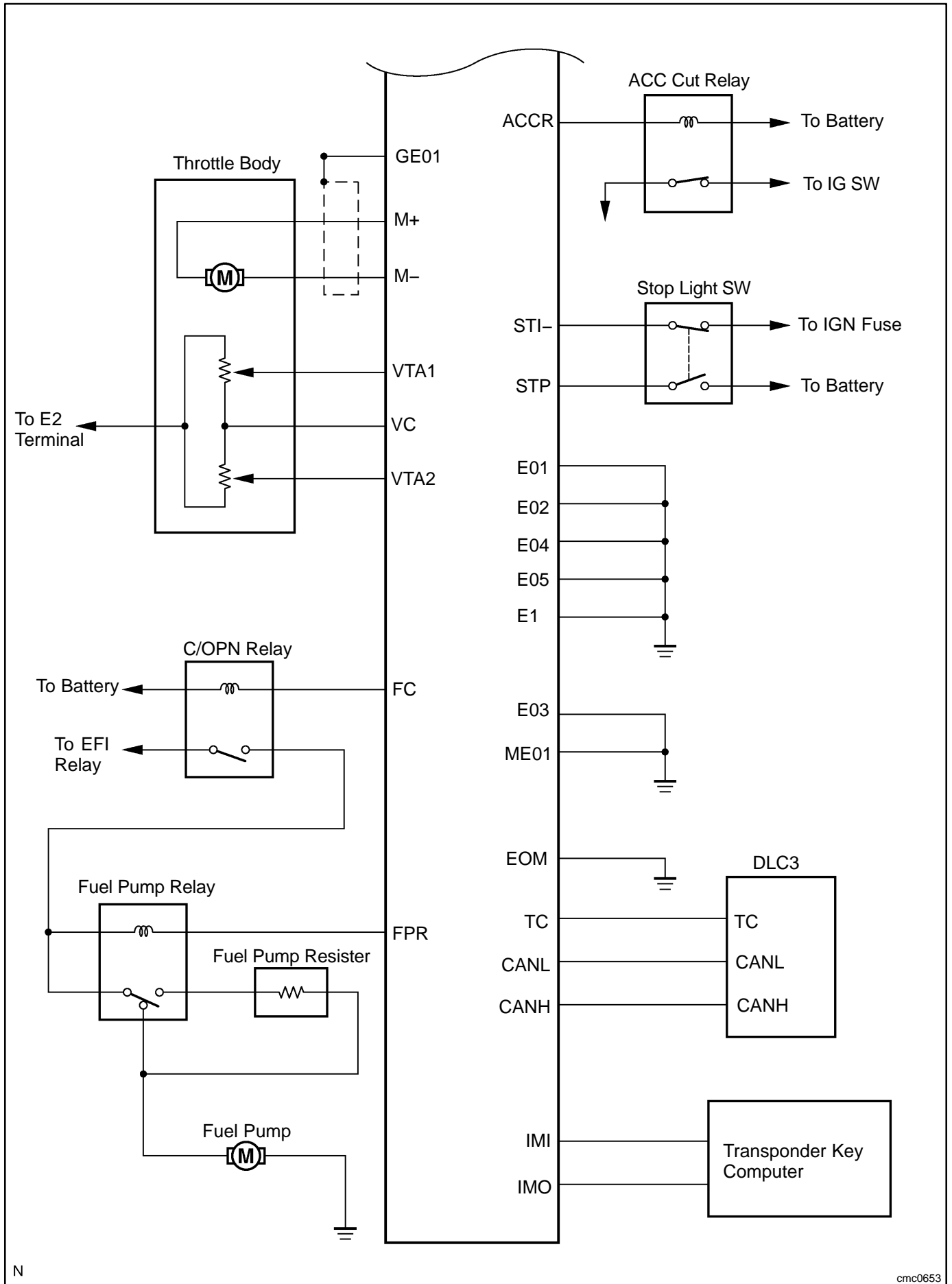
LOCATION



SYSTEM DIAGRAM





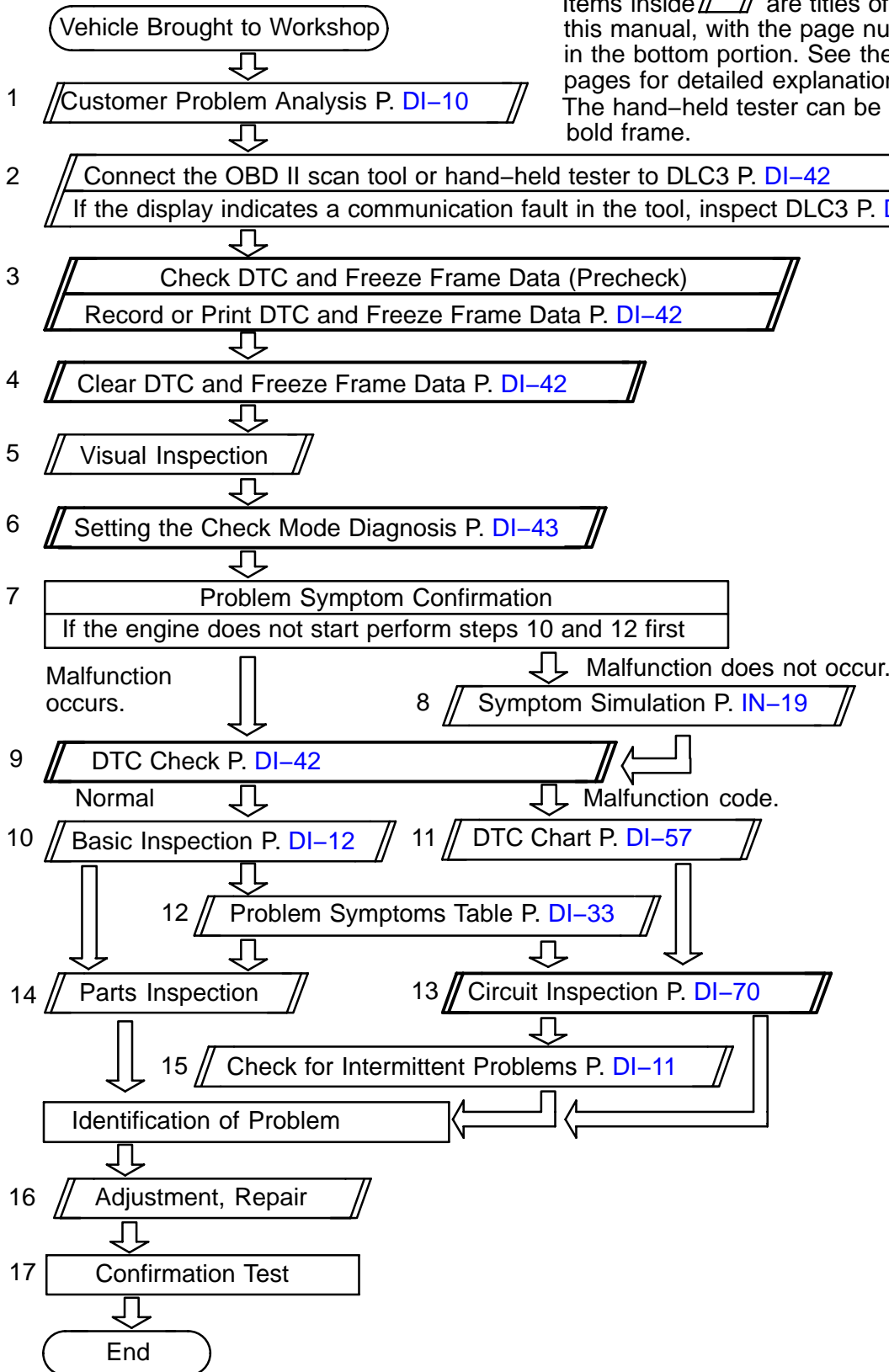


HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.

Items inside **//** are titles of pages in this manual, with the page number in the bottom portion. See the indicated pages for detailed explanations.

The hand-held tester can be used at **//**.



CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's
Name _____

Customer's Name		VIN	
Driver's Name		Production Date	
Data Vehicle Brought in		Licence Plate No.	
Engine model		Odometer Reading	km miles

Problem Symptoms	<input type="checkbox"/> Engine does not Start	<input type="checkbox"/> Engine does not crank	<input type="checkbox"/> No initial combustion	<input type="checkbox"/> No complete combustion
	<input type="checkbox"/> Difficult to Start	<input type="checkbox"/> Engine cranks slowly <input type="checkbox"/> Other _____		
	<input type="checkbox"/> Poor Idling	<input type="checkbox"/> Incorrect first idle <input type="checkbox"/> Idling rpm is abnormal <input type="checkbox"/> High (rpm) <input type="checkbox"/> Low (rpm) <input type="checkbox"/> Rough idling <input type="checkbox"/> Other _____		
	<input type="checkbox"/> Poor Driveability	<input type="checkbox"/> Hesitation <input type="checkbox"/> Back fire <input type="checkbox"/> Muffler explosion (after-fire) <input type="checkbox"/> Surging <input type="checkbox"/> Knocking <input type="checkbox"/> Other _____		
	<input type="checkbox"/> Engine Stall	<input type="checkbox"/> Soon after starting <input type="checkbox"/> After accelerator pedal depressed <input type="checkbox"/> After accelerator pedal released <input type="checkbox"/> During A/C operation <input type="checkbox"/> Shifting from N to D <input type="checkbox"/> Other _____		
	<input type="checkbox"/> Others	_____		

Dates Problem Occurred		_____		
Problem Frequency		<input type="checkbox"/> Constant <input type="checkbox"/> Sometimes (times per day/month) <input type="checkbox"/> Once only <input type="checkbox"/> Other _____		
Condition When Problem Occurs	Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Other _____		
	Outdoor Temperature	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold (approx. ____ °C/ ____ °F)		
	Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Other _____		
	Engine Temp.	<input type="checkbox"/> Cold <input type="checkbox"/> Warming up <input type="checkbox"/> After warming up <input type="checkbox"/> Any temp. <input type="checkbox"/> Other _____		
	Engine Operation	<input type="checkbox"/> Starting <input type="checkbox"/> Just after starting (min.) <input type="checkbox"/> Idling <input type="checkbox"/> Racing <input type="checkbox"/> Driving <input type="checkbox"/> Constant speed <input type="checkbox"/> Acceleration <input type="checkbox"/> Deceleration <input type="checkbox"/> A/C switch ON/OFF <input type="checkbox"/> Other _____		

Condition of malfunction indicator light (MIL)		<input type="checkbox"/> Remains on <input type="checkbox"/> Sometimes lights up <input type="checkbox"/> Does not light up		
DTC Inspection	Normal Mode (Pre-check)	<input type="checkbox"/> Normal <input type="checkbox"/> Malfunction code(s) (code) <input type="checkbox"/> Freeze frame data ()		
	Check Mode	<input type="checkbox"/> Normal <input type="checkbox"/> Malfunction code(s) (code) <input type="checkbox"/> Freeze frame data ()		

CHECK FOR INTERMITTENT PROBLEMS

HINT:

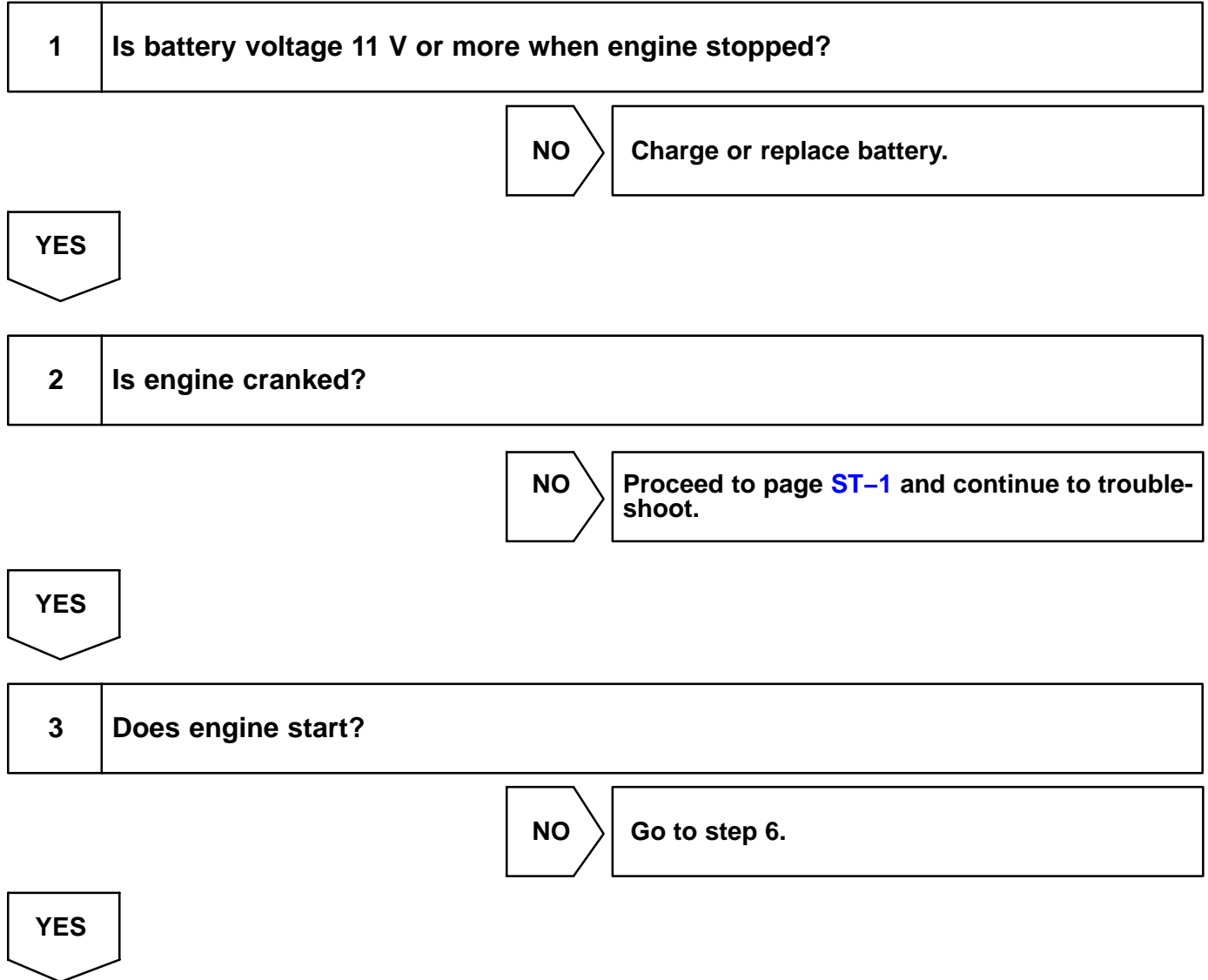
Hand-held tester only:

Inspect the vehicle's ECM using check mode. Intermittent problems are easier to detect with a hand-held tester when the ECM is in check mode. In check mode, the ECM uses 1trip detection logic, which is more sensitive to malfunctions than normal mode (default), which uses 2trip detection logic.

- (c) Clear DTCs (see page [DI-42](#)).
- (d) Switch the ECM from normal mode to check mode using a hand-held tester (see page [DI-43](#)).
- (e) Perform a simulation test (see page [IN-19](#)).
- (f) Check and wiggle the harness(es), connector(s) and terminal(s) (see page [IN-30](#)).

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.



4	Check air filter.
----------	--------------------------

PREPARATION:

Remove the air filter.

CHECK:

Visual check that the air filter is not excessively dirty or oily.

NG	Repair or replace air filter.
-----------	--------------------------------------

OK

5	Check idle speed (See page EM-25).
----------	---

NG	Proceed to problem symptoms table on page DI-33.
-----------	---

OK

6	Check fuel pressure (See page SF-5).
----------	---

NG	Proceed to page SF-5 and continue to trouble-shoot.
-----------	--

OK

7	Check for spark (See page IG-1).
----------	---

NG	Proceed to page IG-1 and continue to trouble-shoot.
-----------	--

OK

Proceed to problem symptoms table on page DI-33.

REGISTRATION

NOTICE:

The Vehicle Identification Number (VIN) must be input into the replacement ECM.

HINT:

The VIN is in the form of a 17–digit alphanumeric vehicle identification number. A hand–held tester is required to register the VIN.

1. DESCRIPTION

This registration section consists of three parts, Input Instructions, Read VIN and Write VIN.

- (a) Input Instructions: Explains the general VIN input instructions using a hand–held tester.
- (b) Read VIN: Explains the VIN reading process in a flowchart. This process allows the VIN stored in the ECM to be read, in order to confirm that the two VINs, provided with the vehicle and stored in the vehicle’s ECM, are the same.
- (c) Write VIN: Explains the VIN writing process in a flowchart. This process allows the VIN to be input into the ECM. If the ECM is changed, or the VIN and VIN do not match, the VIN can be registered, or overwritten in the ECM by following this procedure.

2. INPUT INSTRUCTIONS

- (a) Hand–held tester
The arrow buttons (UP, DOWN, RIGHT and LEFT) and numerical buttons (0 to 9) are used, in order to input the VIN.
- (b) Cursor Operation
To move the cursor around the tester screen, press the RIGHT and LEFT buttons.
- (c) Alphabetical Character Input
 - (1) Press the UP and DOWN buttons to select the desired alphabetical character.
 - (2) After selection, the cursor should move.
- (d) Numeric Character Input
 - (1) Press the numerical button corresponding to the number that you want to input.
 - (2) Select or input the correct character using the UP/DOWN buttons, or the numerical buttons.

HINT:

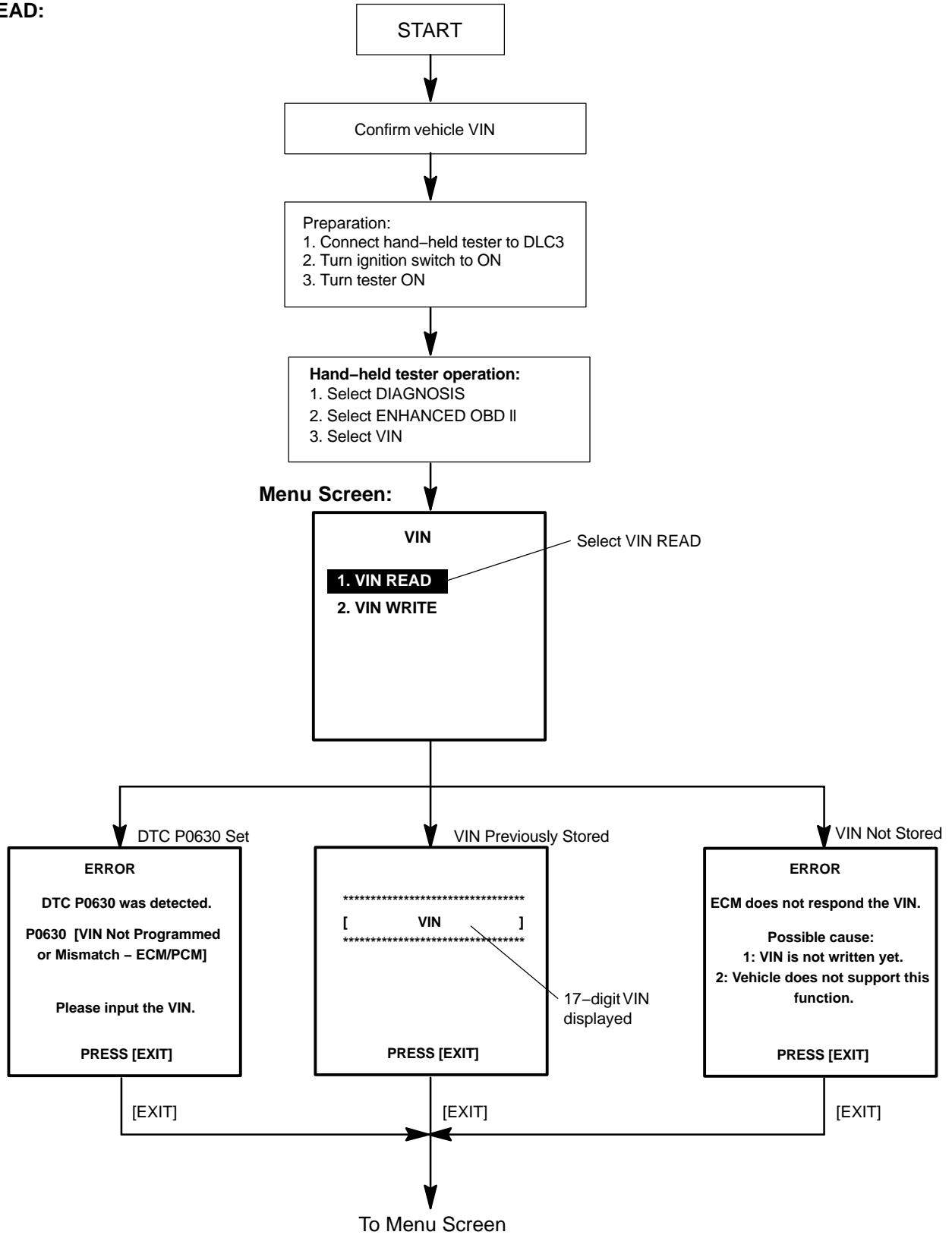
Numerical characters can be selected by using the UP and DOWN buttons.

- (e) Correction
 - (1) After input, the cursor should move.
 - (2) When correcting the input character(s), put the cursor onto the character using the RIGHT or LEFT buttons.
- (f) Finishing Input Operation
 - (1) Make sure that the input VIN matches the vehicle VIN after input.
 - (2) Press the ENTER button on the tester.

3. READ VIN (Vehicle Identification Number)

(a) Read VIN using a hand-held tester.

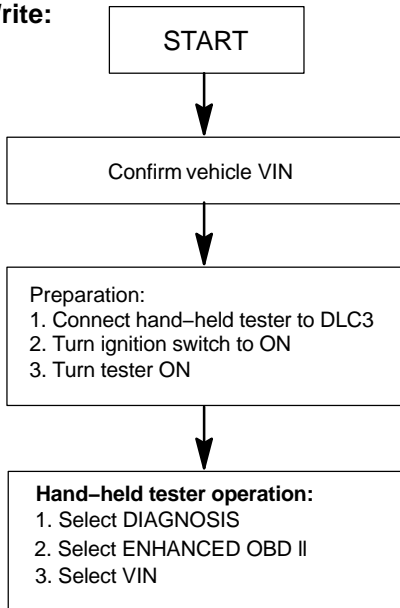
READ:



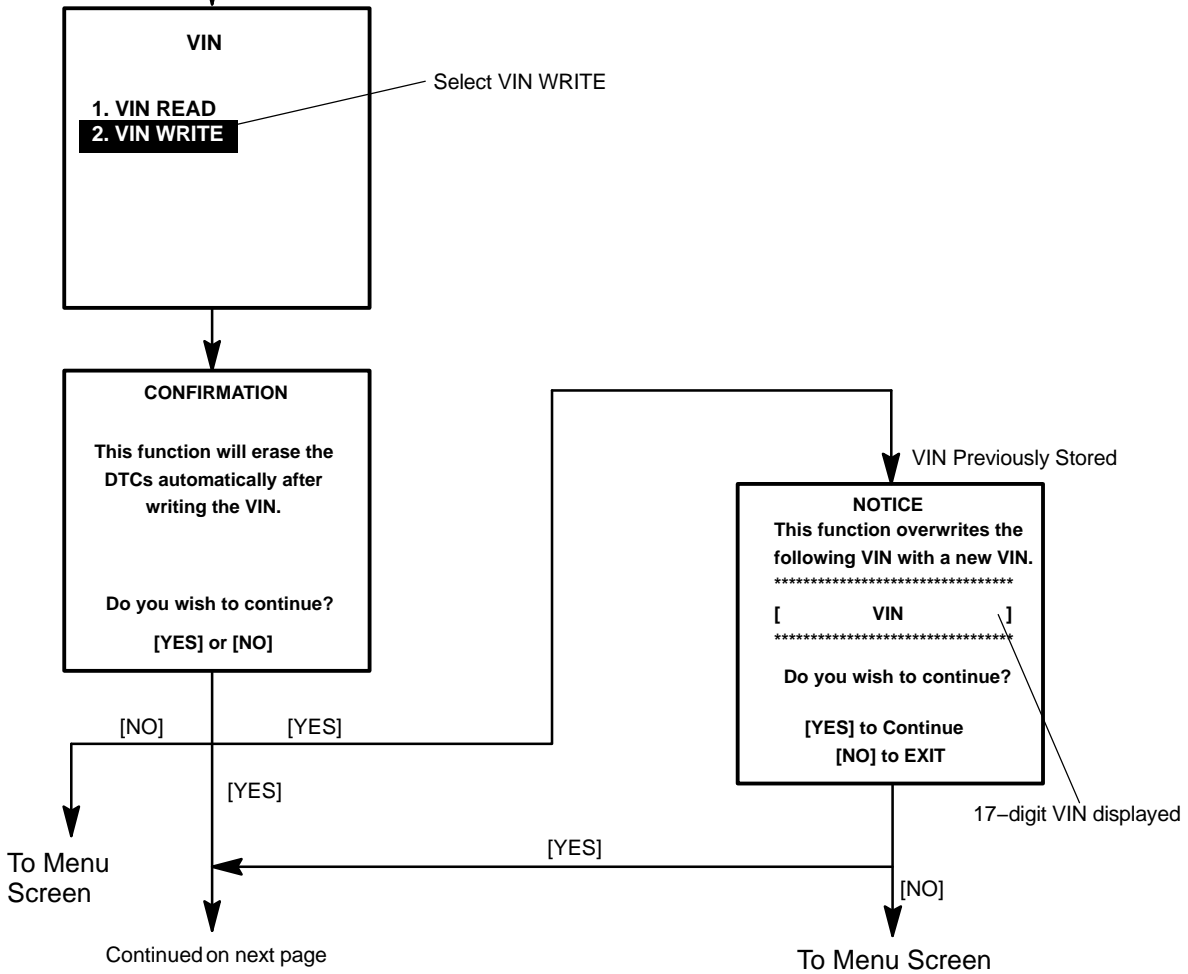
4. WRITE VIN

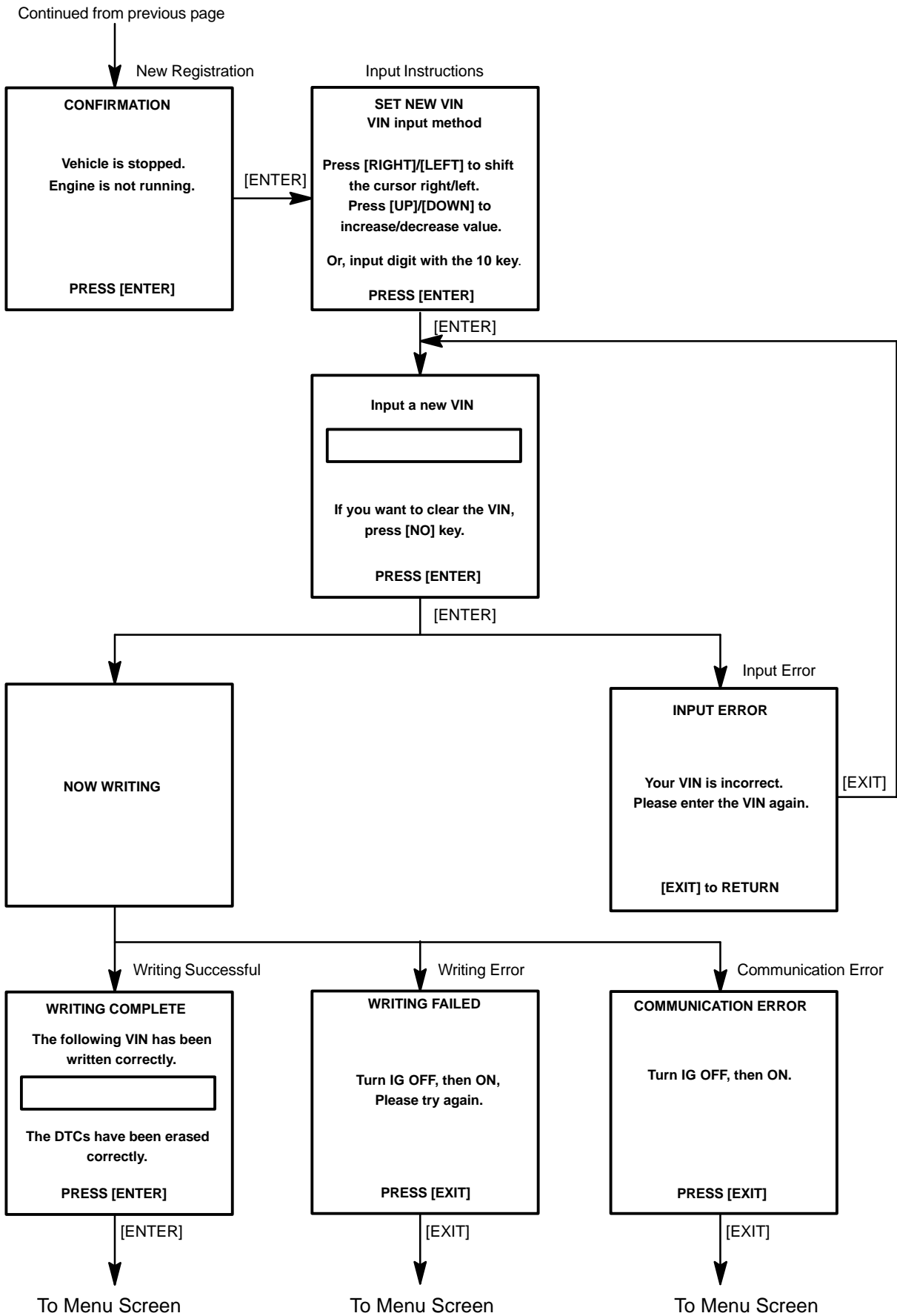
(a) Write VIN using the hand-held tester.

Write:



Menu Screen:





DIAGNOSTICS - ENGINE (1GR-FE)

Monitor detected malfunction	Fault code		Component/system		Monitor disablement (X - disabled)																														
	Code 1	Code 2	Code 1	Code 2	P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308				
					VVT_VSV1,2	VVT System1 - Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	P0125	P0128	O2 Sensor - Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire				
P0500	P0500	VSS																							X	X	X	X	X	X	X	X			
P0511	P0511	IAC valve																							X	X	X	X	X	X	X	X			
P0510	P0510	Idle switch														X	X							X	X	X	X	X	X	X	X	X			
P0560	P0560	System Voltage																						X	X	X	X	X	X	X	X	X			
P0617	P0617	Starter signal																																	
P0705	P0705	Shift lever position switch																																	
P0710	P0710-P0713	Trans fluid temp sensor																																	
P0720-P0793	P0720-P0793	Output speed sensor																																	
P0715-P0717	P0715-P0717	Input speed sensor																																	
P0724	P0724	Stop lamp switch																																	
P0741-P0796	P0741-P0796	Trans solenoid (function)																																	
P0748-P0798	P0748-P0799	Trans solenoid (range)																																	
P0850	P0850	PNP switch																															X		
P1010,P1020	P1010,P1020	VVTL																							X							X			
P1011,12,(21,22)	P1011,12,(21,22)	VVTL system1,(2)																							X						X				
P1126	P1126	Electronic magnet clutch																																	
P1129	P1129	Electronic throttle system																																	
P1430	P1430	HC adsorber ACT press sensor																																	
P2004,6	P2004,6	Intake Manifold Runner Control																																	
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																																	
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																																	
P2102,P2103	P2102,P2103	Throttle motor																																	
P2120-P2138	P2120-P2138	Accel position sensor																																	
P2196,P2198	P2196,P2198	A/F sensor (rationality)																							X			X	X						
P2226	P2226	BARO sensor																								X		X	X						
P2237,P2240	P2237,P2240	A/F sensor (open)																							X			X	X						
P2423,24	P2423,24	HC Adsorption Catalyst																																	
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																																	
P2431	P2431	AIR Pressure Sensor(Rationality)																																	
P2440	P2440	AIR control valve stuck open																								X	X	X	X	X	X	X	X	X	X
P2441	P2441	AIR control valve stuck close																								X	X	X	X	X	X	X	X	X	X
P2444	P2444	AIP stuck On																								X	X	X	X	X	X	X	X	X	X
P2445	P2445	AIP stuck Off																								X	X	X	X	X	X	X	X	X	X
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																																	
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																							X			X	X						

Monitor detected malfunction	Fault code		Component/system		Monitor disablement (X - disabled)	
	Fault code	Component/system	Fault code	Component/system	Fault code	Component/system
	P0010,P0020	P0010,P0020	VVT VSV1,2			
	P0011	P0011	VVT System1 - Advance			
	P0012	P0012	VVT System1 - Retard			
	P0016,P0018	P0016,P0018	VVT System - Misalignment			
	P0021	P0021	VVT System2 - Advance			
	P0022	P0022	VVT System2 - Retard			
	P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1			
	P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1			
	P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2			
	P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3			
	P0100,P0101	P0100-P0103	MAF sensor			
	P0105,P0106	P0105-P0108	MAP sensor			
	P0110	P0110-P0113	IAT sensor			
	P0115,P0116	P0115-P0118	ECT sensor			
	P0120,P0121	P0120-P0223,P2135	TP sensor			
	P0125	P0125	Insufficient ECT for Closed Loop			
	P0128	P0128	Thermostat			
	P0130-P0153	P0130-P0153	O2 Sensor - Sensor1			
	P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1			
	P0136,P0156	P0136,P0156	O2 Sensor - Sensor2			
	P0142,P0162	P0142,P0162	O2 Sensor - Sensor3			
	P0171,P0172	P0171,P0172	Fuel system			
	P0300-P0308	P0300-P0308	Misfire			
	P0325,P0330	P0325-P0333	Knock sensor			
	P0335	P0335	CKP sensor			
	P0340, P0341	P0340, P0341	CMP sensor			
	P0340-P0346	P0340-P0346	VVT sensor1,2			
	P0351-P0358	P0351-P0358	Ignitor			
	P0385	P0385	CKP sensor 2			
	P0401	P0401	EGR system (closed)			
	P0402	P0402	EGR system (open)			
	P0405,P0409	P0405-P0409	Lift sensor			
	P0420,P0430	P0420,P0430	Catalyst			
	P0442-P0456	P0442-P0456	EVAP system			
	P0450,P0451	P0450-P0453	EVAP press sensor			
			Trans solenoid (function)*2	P0741-P0796	P0741-P0796	
			Trans solenoid (range)	P0748-P0999	P0748-P0798	
			PNP switch	P0850	P0850	
			VVTL	P1010,P1020	P1010,P1020	
			VVTL system1,(,2)	P1011,12,(,21,22)	P1011,12,(,21,22)	
			Electronic magnet clutch	P1126	P1126	
			Electronic throttle system	P1129	P1129	
			HC adsorber ACT press sensor	P1430	P1430	
			Intake Manifold Runner Control	P2004,6	P2004, P2006	
			Intake Manifold Runner Control Circuit	P2009,10	P2009, P2010	
			Intake Manifold Runner Position Sensor	P2014,16,17	P2014,16,17	
			Throttle motor	P2102,P2103	P2102, P2103	
			Accel position sensor	P2120-P2138	P2120-P2138	
			A/F Sensor(Rationality) - Sensor1	P2196,P2198	P2196, P2198	
			BARO sensor	P2226	P2226	
			A/F Sensor(Open) - Sensor1	P2237,P2240	P2237, P2240	
			HC Adsorption Catalyst	P2423,24	P2423,24	
			AIR Pressure Sensor(Low/High)	P2430,2,3	P2430,2,3	
			AIR Pressure Sensor(Rationality)	P2431	P2431	
			AIR control valve stuck open	P2440	P2440	
			AIR control valve stuck close	P2441	P2441	
			AIP stuck On	P2444	P2444	
			AIP stuck Off	P2445	P2445	
			Trans solenoid(SLU-SLD)	P2714-P2759	P2714-P2759	
			A/F Sensor (Slow response) - Sensor1	P2A00,P2A03	P2A00, P2A03	

DIAGNOSTICS - ENGINE (1GR-FE)

Monitor disablement (X - disabled)

Monitor detected malfunction	Fault code		Component/system		Monitor disablement (X - disabled)	
	Code 1	Code 2	Code 1	Code 2	Code 1	Code 2
P0500	P0500	VSS	Trans solenoid (function)*2	P0741-P0796	Trans solenoid (function)*2	P0741-P0796
P0511	P0511	IAC valve	Trans solenoid (range)	P0748-P0999	Trans solenoid (range)	P0748-P0798
P0510	P0510	Idle switch	PNP switch	P0850	PNP switch	P0850
P0560	P0560	System Voltage	VVTL	P1010,P1020	VVTL	P1010,P1020
P0617	P0617	Starter signal	VVTL system1,(,2)	P1011,12,(,21,22)	VVTL system1,(,2)	P1011,12,(,21,22)
P0705	P0705	Shift lever position switch	Electronic magnet clutch	P1126	Electronic magnet clutch	P1126
P0710	P0710-P0713	Trans fluid temp sensor	Electronic throttle system	P1129	Electronic throttle system	P1129
P0720-P0793	P0720-P0793	Output speed sensor	HC adsorber ACT press sensor	P1430	HC adsorber ACT press sensor	P1430
P0715-P0717	P0715-P0717	Input speed sensor	Intake Manifold Runner Control	P2004,6	Intake Manifold Runner Control	P2004,P2006
P0724	P0724	Stop lamp switch	Intake Manifold Runner Control Circuit	P2009,10	Intake Manifold Runner Control Circuit	P2009,P2010
P0741-P0796	P0741-P0796	Trans solenoid (function)	Intake Manifold Runner Position Sensor	P2014,16,17	Intake Manifold Runner Position Sensor	P2014,16,17
P0748-P0798	P0748-P0799	Trans solenoid (range)	Throttle motor	P2102,P2103	Throttle motor	P2102,P2103
P0850	P0850	PNP switch	Accel position sensor	P2120-P2138	Accel position sensor	P2120-P2138
P1010,P1020	P1010,P1020	VVTL	A/F Sensor(Rationality) - Sensor1	P2196,P2198	A/F Sensor(Rationality) - Sensor1	P2196,P2198
P1011,12,(,21,22)	P1011,12,(,21,22)	VVTL system1,(,2)	BARO sensor	P2226	BARO sensor	P2226
P1126	P1126	Electronic magnet clutch	A/F Sensor(Open) - Sensor1	P2237,P2240	A/F Sensor(Open) - Sensor1	P2237,P2240
P1129	P1129	Electronic throttle system	HC Adsorption Catalyst	P2423,24	HC Adsorption Catalyst	P2423,24
P1430	P1430	HC adsorber ACT press sensor	AIR Pressure Sensor(Low/High)	P2430,2,3	AIR Pressure Sensor(Low/High)	P2430,2,3
P2004,6	P2004,6	Intake Manifold Runner Control	AIR Pressure Sensor(Rationality)	P2431	AIR Pressure Sensor(Rationality)	P2431
P2009,10	P2009,10	Intake Manifold Runner Control Circuit	AIR control valve stuck open	P2440	AIR control valve stuck open	P2440
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor	AIR control valve stuck close	P2441	AIR control valve stuck close	P2441
P2102,P2103	P2102,P2103	Throttle motor	AIP stuck On	P2444	AIP stuck On	P2444
P2120-P2138	P2120-P2138	Accel position sensor	AIP stuck Off	P2445	AIP stuck Off	P2445
P2196,P2198	P2196,P2198	A/F sensor (rationality)	Trans solenoid(SLU-SLD)	P2714-P2759	Trans solenoid(SLU-SLD)	P2714-P2759
P2226	P2226	BARO sensor	A/F Sensor (Slow response) - Sensor1	P2A00,P2A03	A/F Sensor (Slow response) - Sensor1	P2A00,P2A03
P2237,P2240	P2237,P2240	A/F sensor (open)				
P2423,24	P2423,24	HC Adsorption Catalyst				
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)				
P2431	P2431	AIR Pressure Sensor(Rationality)				
P2440	P2440	AIR control valve stuck open				
P2441	P2441	AIR control valve stuck close				
P2444	P2444	AIP stuck On				
P2445	P2445	AIP stuck Off				
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)				
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)				

O2S TEST RESULT

INTRODUCTION

The O2S TEST RESULT refers to the results of the engine control module (ECM) when it monitors the oxygen sensor (O2S), and it can be read using the hand-held tester. Based on this, you can find the O2S's conditions.

The ECM monitors the O2S in the various items. You can read the monitor result (TEST DATA) of each monitor item using the O2S TEST RESULT. However, the output value of the TEST DATA is the latest "snapshot" value that is taken after monitoring and therefore it is not dynamic.

In this repair manual, the description of the O2S TEST RESULT (for O2S related DTCs) are written in a table.

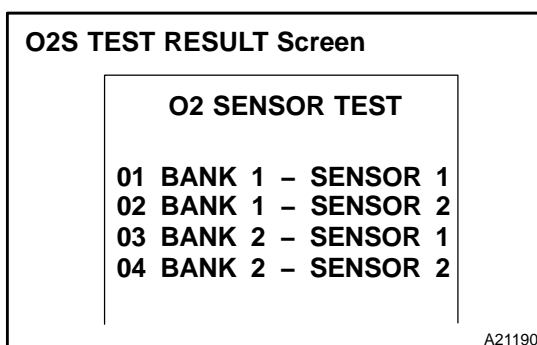
This table consists of 5 items:

- (1) TEST ID (a code applied to each TEST DATA)
- (2) Description of TEST DATA
- (3) Conversion Factor (When Conversion Factor has a value written in the table, multiply the TEST DATA value appearing on the scan tool by the Conversion Factor value. The result will be the required value.)
- (4) Unit
- (5) Standard Value

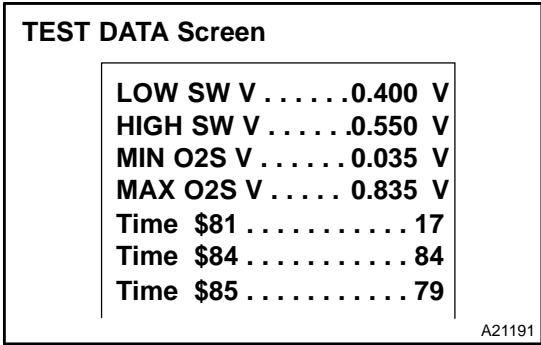
If the TEST DATA value appearing on the scan tool is out of the standard value, the O2S is malfunctioning. If it is within the standard value, the O2S is functioning normally. However, if the value is on the borderline of the standard value, the O2S may malfunction very soon.

HOW TO READ O2S TEST RESULT USING HAND-HELD TESTER

- (a) Connect the hand-held tester to the DLC3.



- (b) On the tester screen, select the following menus: DIAGNOSIS / CARB OBDII / O2S TEST RESULT. A list of the O2S equipped on the vehicle will be displayed.



- (c) Select the desired O2S and press ENTER. The following screen will appear.
- (d) Press HELP and * simultaneously. More information will appear.
- (e) Example:
 - (1) The hand-held tester displays "17" as a value of the "TIME \$81" (see the illustration on the left).
 - (2) Find the Conversion Factor value of "TIME \$81" in the O2S TEST RESULT chart below. 0.3906 is specified for \$81 in this chart.
 - (3) Multiply "17" in step (1) by 0.3906 (Conversion Factor) in the step (2).
 $17 \times 0.3906 = 6.6 \%$
 - (4) If the answer is within the standard value, the "TIME \$81" can be confirmed to be normal.

O2S TEST RESULT Chart

TEST ID	Description of TEST DATA	Conversion Factor	Unit	Standard Value
\$81	Percentage of monitoring time when the HO2S voltage is less than 0.05V	Multiply 0.3906	%	Within 60 %

CHECKING MONITOR STATUS

1. OUTLINE

The monitor results and the test values can be checked with the hand-held tester.

The engine control module (ECM) monitors the emissions-related components as the thermostat, catalyst converter and evaporative emissions (EVAP), and determines whether they are functioning normally or not. When finished and monitoring, the ECM stores the monitor results and the test values.

The monitor result indicates whether the component is functioning normally or not. The test value is the value that was used to determine the monitor result. If the test value is outside the test limit (malfunction criterion), the ECM determines the component is malfunctioning. Some emissions-related components have multiple test values to determine monitor result. If one of these test values is outside test limit, the ECM determines the component is determine monitor result. If one of these test values is outside test limit, the ECM determines the components is malfunctioning.

2. DESCRIPTION

The test value and test limit information are described as shown in the following table. This information is included under "MONITOR RESULT" in the emissions-related DTC sections.

Thermostat:

MID	TID	Scaling	Test Result	Minimum Test Limit	Maximum Test Limit
\$E1	\$E8	Multiply by 0.1 [°C]	ECT sensor output when estimated ECT reached to malfunction criteria	Malfunction criteria	Maximum test limit

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic hand-held tester.

3. PROCEDURE (USING HAND-HELD TESTER)

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch and hand-held tester ON.
- Clear DTCs.
- Allow the vehicle to drive, in accordance with the applicable drive pattern described in the READINESS MONITOR DRIVE PATTERN section (see page [DI-27](#)).
- Check the monitor result. Select the hand-held tester menus: DIAGNOSIS/ENHANCED OBDII/MONITOR INFO/MONITOR STATUS. The monitor result appears after the component name.
 - AVAIL indicates the component has not been monitored yet.
 - COMPL indicates the component is functioning normally.
 - INCMPL indicates the component is malfunctioning.
- Check the test value(s). Select the hand-held tester menus: DIAGNOSIS/ENHANCED OBDII/MONITOR INFO/TEST RESULT.
- Select the component and press ENTER. If the monitor result has been COMPL or INCMPL, the accuracy test value appears.
- Compare the test value with the test limits, MIN and MAX.
 - If the test value is outside of the test limit, the component is malfunctioning.
 - If the test value is on the borderline of the test limit, a malfunction is concealed in the component.

HINT:

The monitor result might on rare occasions be COMPL even if the malfunction indicator lamp (MIL) is illuminated. This indicates the system malfunctioned on a previous driving cycle. This might be caused by an intermittent problem.

READINESS MONITOR DRIVE PATTERN

1. PURPOSE OF THE READINESS TESTS

- The On-Board Diagnostic (OBD II) system is designed to monitor the performance of emission-related components and report any detected abnormalities in the form of Diagnostic Trouble Codes (DTCs). Since the various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called Readiness Monitors. Many state Inspection and Maintenance (I/M) programs require that vehicles complete their Readiness Monitors prior to beginning an emission test.
- The current status of the Readiness Monitors can be seen by using the hand-held tester with version 9.0 software (or newer), or a generic OBD II Scan tool.
- To view the Readiness Monitor status using the hand-held tester, select "Monitor Status" from the Enhanced OBD II Menu.
- A status of "complete" indicates that the necessary conditions have been met to run the performance tests for the related Readiness Monitor.
- The Readiness Monitor will be reset to "incomplete" if:
 - ECM has lost power (battery or fuse).
 - DTCs have been cleared.
 - The conditions for running the Readiness Monitor have not been met.
- In the event that any Readiness Monitor shows "incomplete," follow the appropriate Readiness Monitor Drive Pattern to activate the monitor and change the readiness status to "complete."

CAUTION:

Strictly observe the posted speed limits, traffic laws, and road conditions when performing these drive patterns.

NOTICE:

These drive patterns represent the fastest method to satisfy all necessary conditions which allow the specific readiness monitor to complete.

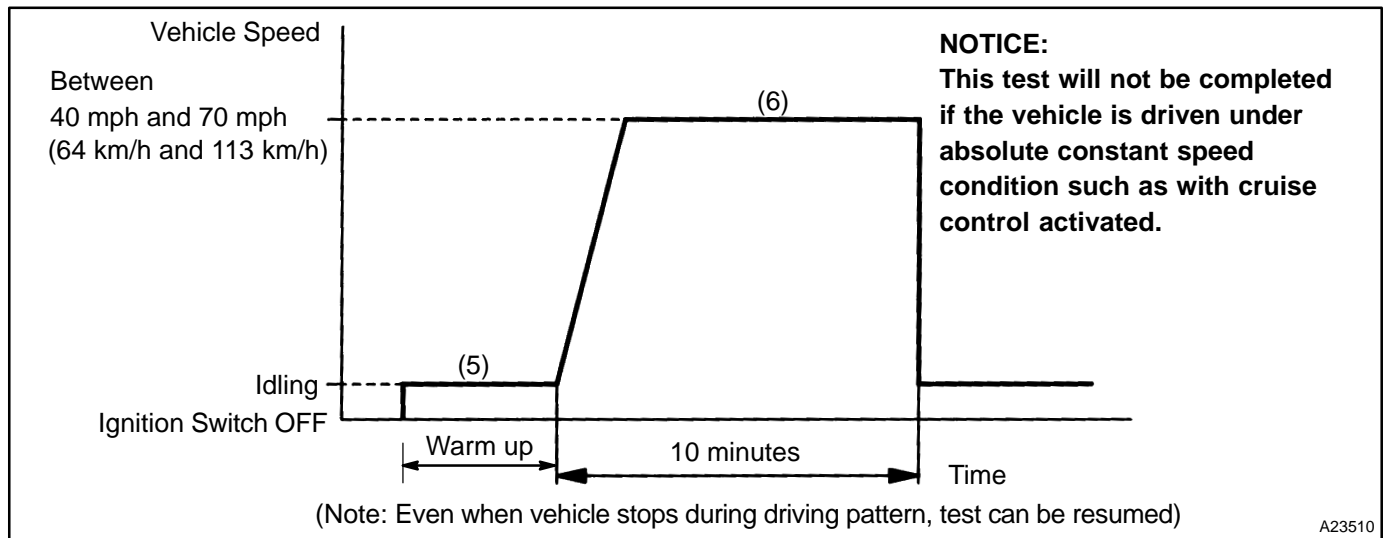
In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors) the drive pattern can be resumed, and in most cases, the readiness monitor will still set to "complete".

To ensure rapid completion of readiness monitors, avoid sudden changes in vehicle load and speed (driving up and down hills and/or sudden acceleration).

Contents:

TITLE	STEP(s)
CATALYST MONITOR	2
EVAP MONITOR	3, 4
AIR-FUEL RATIO (A/F) AND OXYGEN SENSOR (O ₂ S) MONITOR	5
OXYGEN SENSOR HEATER MONITOR	6

2. CATALYST MONITOR (ACTIVE AIR-FUEL RATIO CONTROL TYPE)



(a) Preconditions

The monitor will not run unless:

- The MIL is OFF

(b) Drive Pattern

- (1) Connect a hand-held tester or OBD II scan tool to the DLC3.
- (2) Turn the ignition switch to ON.
- (3) Turn the tester or scan tool ON.
- (4) Clear DTCs (where set) (see page [DI-42](#)).
- (5) Start the engine and warm it up.
- (6) Drive the vehicle at between 40 mph and 70 mph (64 km/h and 113 km/h) for at least 10 minutes.

(c) Monitor Status

- (1) Check the Readiness Monitor status displayed on the tester or scan tool.
- (2) If the status does not switch to COMPL (complete), extend the driving time.

3. EVAP MONITOR (VACUUM PRESSURE MONITOR)

NOTICE:

A cold soak must be performed prior to conducting the drive pattern to complete the Internal Pressure Readiness Monitor.

(a) Cold Soak Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400 m) or less

(b) Cold Soak Procedure

Let the vehicle cold soak for 8 hours or until the difference between IAT and ECT becomes less than 7°C (13°F)

HINT:

Examples:

- Scenario 1

ECT = 24°C (75°F)

IAT = 16°C (60°F)

Difference between ECT and IAT is 8°C (15°F)

→ The monitor will not run because difference between ECT and IAT is greater than 7°C (13°F)

- Scenario 2

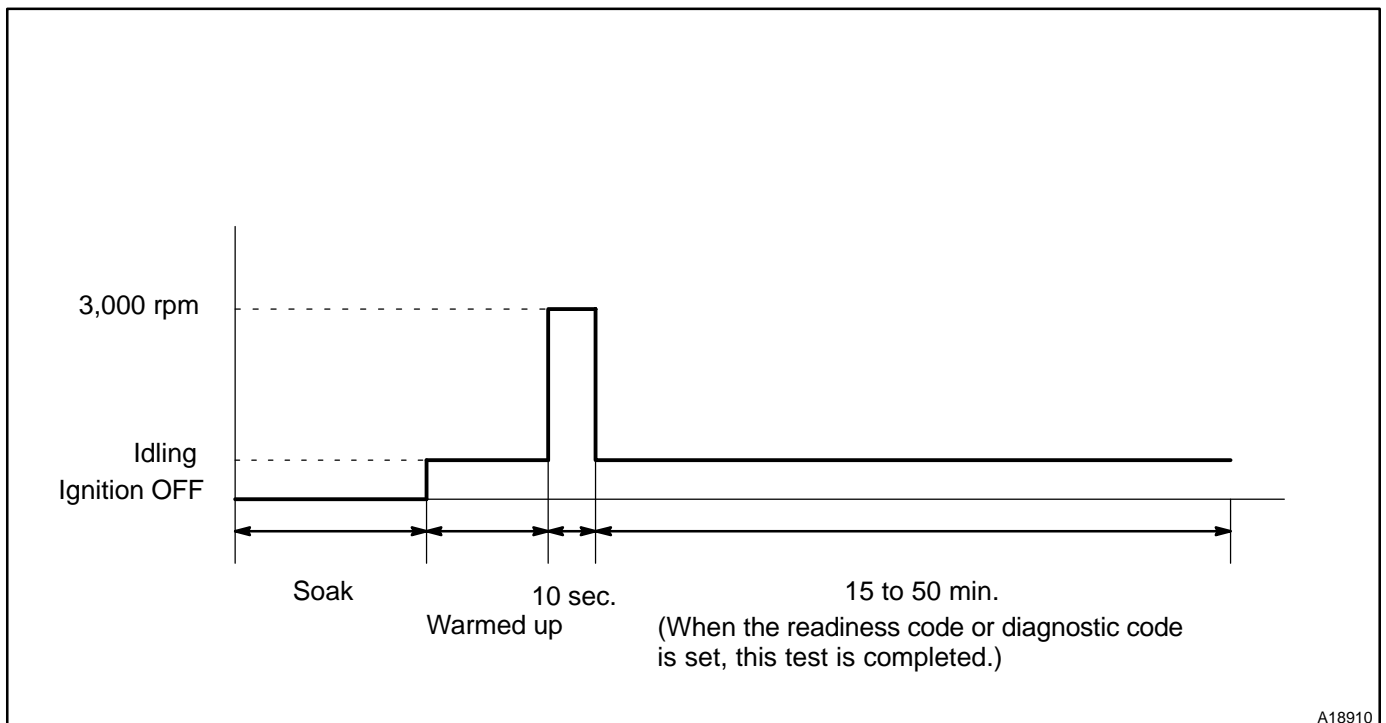
ECT = 21°C (70°F)

IAT = 20°C (68°F)

Difference between ECT and IAT is 1°C (2°F)

→ The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

4. EVAP MONITOR (VACUUM PRESSURE MONITOR) (CONTINUED)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400 m) or less
- Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F)
- Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95°F)
- Cold Soak Procedure has been completed
- Before starting the engine, the difference between ECT and IAT must be less than 7°C (13°F)

HINT:

Examples:

- Scenario 1
ECT = 24°C (75°F)
IAT = 16°C (60°F)
Difference between ECT and IAT is 8°C (15°F)
→ The monitor will not run because difference between ECT and IAT is higher than 7°C (13°F)
- Scenario 2
ECT = 21°C (70°F)
IAT = 20°C (68°F)
Difference between ECT and IAT is 1°C (2°F)
→ The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

The readiness test can be completed in cold ambient conditions (less than 40°F / 4.4°C) and/or at high altitudes (more than 7,800 feet / 2,400 m) if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

- (1) Connect the OBD II scan tool to DLC3 to check monitor status and preconditions (refer to (a)).
- (2) Release pressure in fuel tank by removing the fuel tank cap and then reinstall it.
- (3) Start the engine and allow it to idle until ECT becomes 75°C (167°F) or higher.
- (4) Run the engine at 3,000 rpm for approximately 10 seconds.
- (5) Allow the engine to idle with the A/C ON (to create slight load) for 15 to 50 minutes.

NOTICE:

If the vehicle is not equipped with A/C, put a slight load on the engine by doing the following :

- **Securely set the parking brake.**
- **Block the drive wheels with wheel chocks.**
- **Allow the vehicle to idle in drive for 15 to 50 minutes.**

5. AIR-FUEL RATIO (A/F) AND OXYGEN SENSOR (HO2) MONITOR (ACTIVE AIR-FUEL RATIO CONTROL TYPE)

(a) Preconditions

The monitor will not run unless:

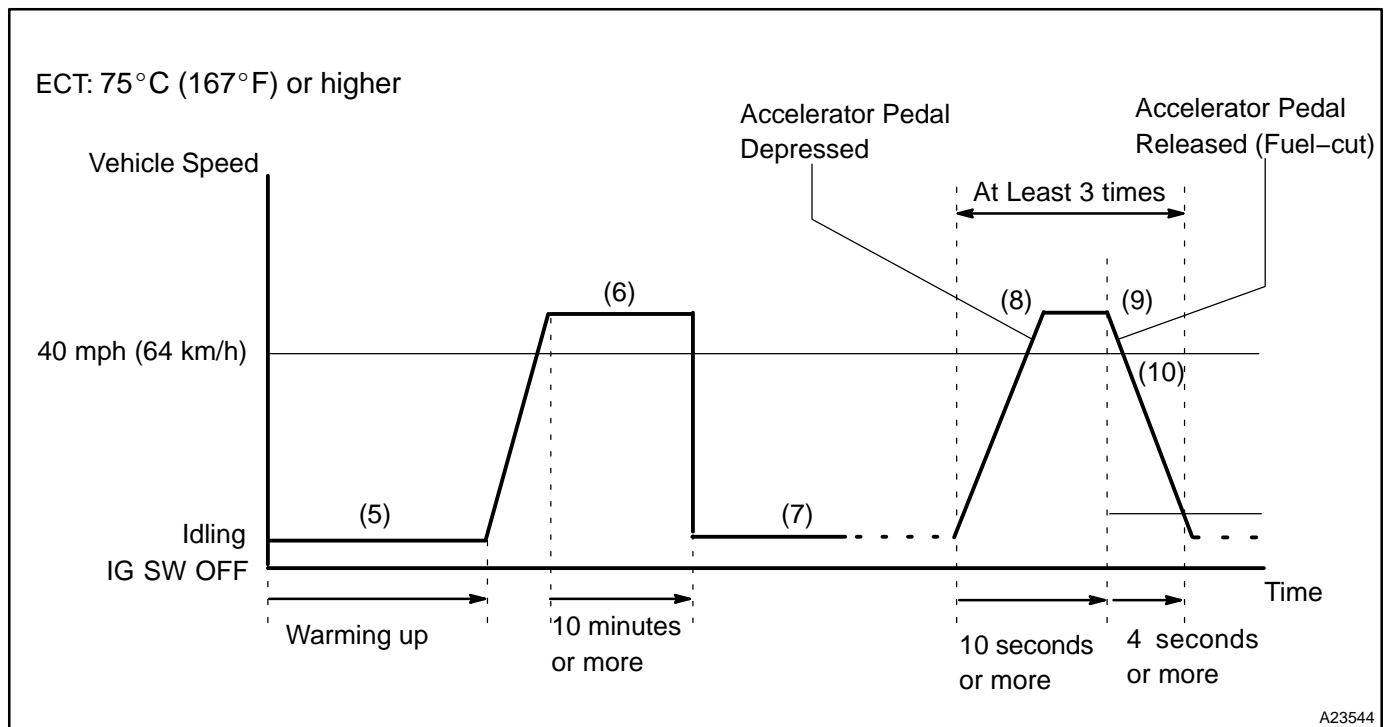
- 2 minutes or more have elapsed since the engine was started.
- The Engine Coolant Temperature (ECT) is 75°C (167°F) or higher.
- Air-fuel ratio feedback control is performed.
- Fuel-cut control is performed for 8 seconds or more.

(b) Drive Pattern

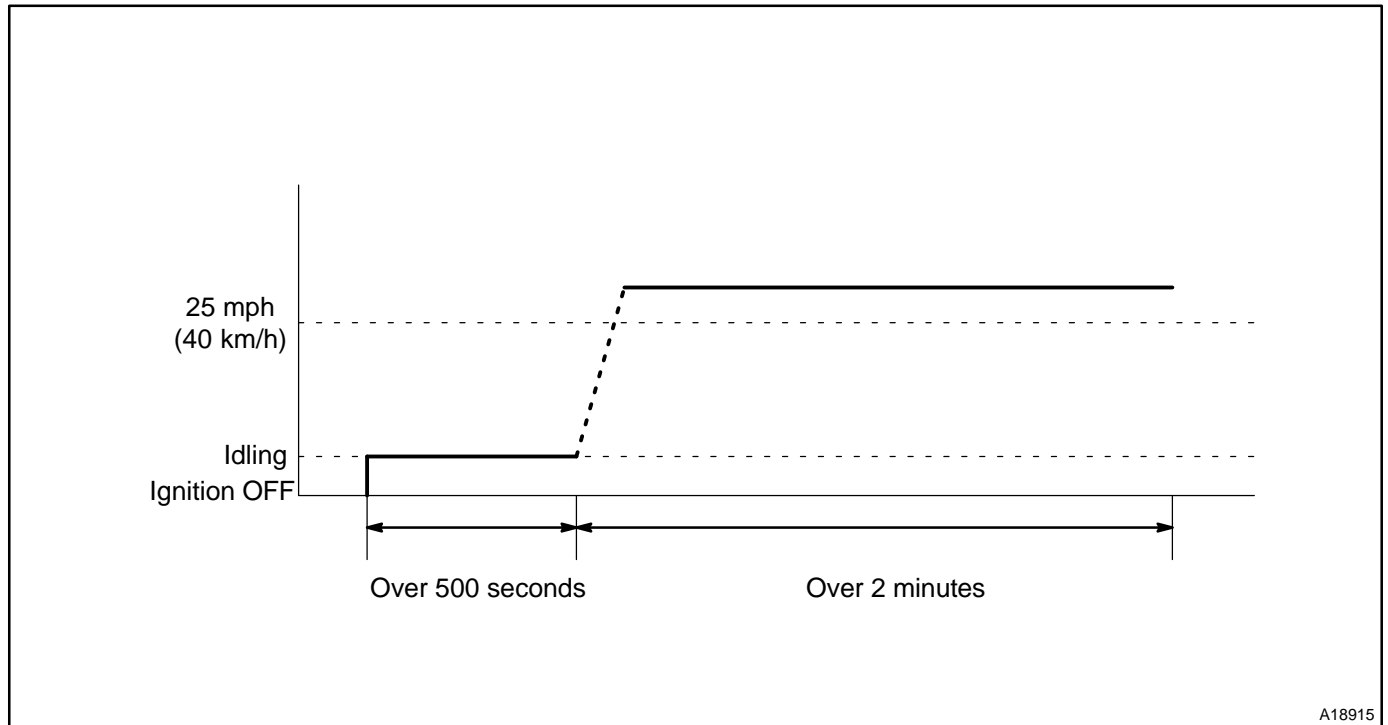
- (1) Connect the hand-held tester to DLC3.
- (2) Turn the ignition switch to ON.
- (3) Clear DTCs (see page DI-42).
- (4) Start the engine, and warm it up until the ECT reaches 75°C (167°F) or higher.
- (5) Drive the vehicle at 40 mph (64 km/h) or more for at least 10 minutes.
- (6) Change the transmission to 2nd gear.
- (7) Accelerate the vehicle to 30 mph (48 km/h) or more by depressing the accelerator pedal for at least 10 seconds.
- (8) Soon after performing step (8) above, release the accelerator pedal for at least 4 seconds without depressing the brake pedal, in order to execute fuel-cut control.
- (9) Stop the vehicle and allow the engine to idle for 10 seconds or more.
- (10) Allow the vehicle to decelerate until the vehicle speed declines to less than 6 mph (10 km/h).
- (11) Repeat steps from (8) through (10) above at least 3 times in one driving cycle.

(c) Monitor Status

- (1) Check the Readiness Monitor status displayed on the tester.
- (2) If the status does not switch to COMPL (complete), make sure that the preconditions have been met, and then perform steps from (5) through (11) in Drive Pattern above.



6. OXYGEN SENSOR HEATER MONITOR



A18915

(a) Preconditions

The monitor will not run unless:

- MIL is OFF

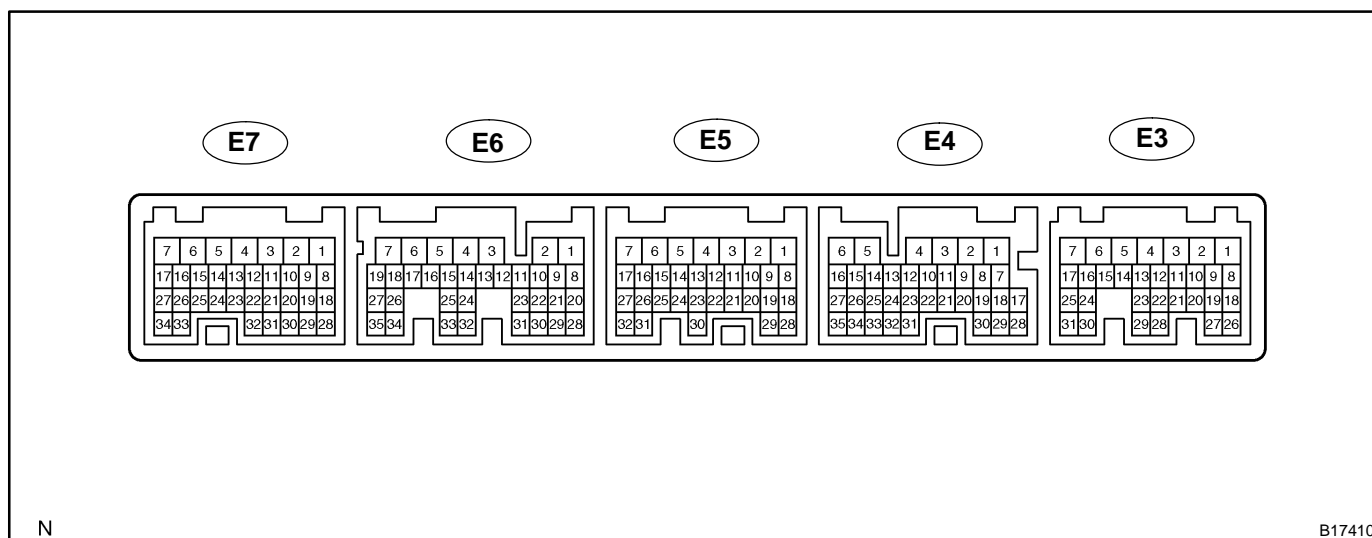
(b) Drive Pattern

- (1) Connect the OBD II scan tool to the DLC3 to check monitor status and preconditions (refer to (a)).
- (2) Start the engine and allow it to idle for 500 seconds or more.
- (3) Drive the vehicle at 25 mph (40 km/h) or more for at least 2 minutes.
- (4) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure the preconditions are met, turn the ignition off and then repeat steps (2) and (3).

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	<ol style="list-style-type: none"> 1. Cranking holding function circuit 2. Starter 3. Starter relay 4. Park/neutral position switch 	DI-404 ST-1 ST-26 DI-993
No initial combustion (Does not start)	<ol style="list-style-type: none"> 1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM) 	DI-409 DI-414 IN-30
No complete combustion (Does not start)	<ol style="list-style-type: none"> 1. Fuel pump control circuit 	DI-414
Engine cranks normally but difficult to start	<ol style="list-style-type: none"> 1. Starter signal circuit 2. Fuel pump control circuit 3. Compression 	DI-276 DI-414 EM-3
Difficult to start with cold engine	<ol style="list-style-type: none"> 1. Starter signal circuit 2. Fuel pump control circuit 	DI-276 DI-414
Difficult to start with hot engine	<ol style="list-style-type: none"> 1. Starter signal circuit 2. Fuel pump control circuit 	DI-276 DI-414
High engine idle speed (Poor idling)	<ol style="list-style-type: none"> 1. A/C switch circuit 2. ECM power source circuit 	- DI-409
Low engine idle speed (Poor idling)	<ol style="list-style-type: none"> 1. A/C switch circuit 2. Fuel pump control circuit 	- DI-414
Rough idling (Poor idling)	<ol style="list-style-type: none"> 1. Compression 2. Fuel pump control circuit 	DI-414
Hunting (Poor idling)	<ol style="list-style-type: none"> 1. ECM power source circuit 2. Fuel pump control circuit 	IN-30 DI-414
Hesitation/Poor acceleration (Poor driveability)	<ol style="list-style-type: none"> 1. Fuel pump control circuit 2. A/T faulty 	DI-414 -
Surging (Poor driveability)	<ol style="list-style-type: none"> 1. Fuel pump control circuit 	DI-414
Engine stalls soon after starting	<ol style="list-style-type: none"> 1. Fuel pump control circuit 	DI-414
Engine stalls during A/C operation	<ol style="list-style-type: none"> 1. A/C switch circuit 2. Engine control module (ECM) 	- IN-30
Unable to refuel/Difficult to refuel	<ol style="list-style-type: none"> 1. ORVR system 	-

TERMINALS OF ECM



Each ECM terminals' standard voltage is shown in the table below. In the table, first follow the information under "Condition".

Look under "Symbols (Terminals No.)" for the terminals to be inspected.

The standard voltage between the terminals is shown under "STD Voltage".

Use the illustration above as a reference for the ECM terminals.

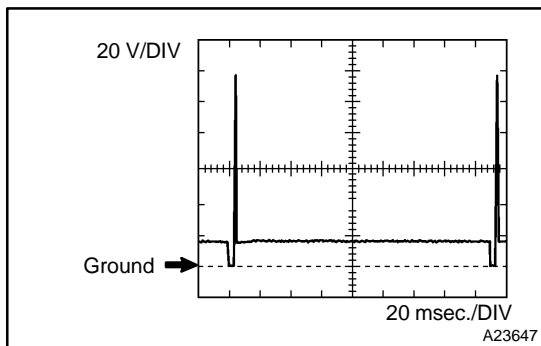
Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
BATT (E3-3) - E1 (E5-1)	B-R - BR	Always	9 to 14 V
+BM (E3-7) - E1 (E5-1)	G-Y - BR		
IGSW (E3-9) - E1 (E5-1)	B-O - BR		
+B (E3-1) - E1 (E5-1)	W-L - BR	IG switch ON	9 to 14 V
+B2 (E3-2) - E1 (E5-1)	W-L - BR		
MREL (E3-8) - E1 (E5-1)	GR-G - BR	IG switch ON	9 to 14 V
VC (E7-23) - E2 (E7-28)	G-B - B-W	IG switch ON	4.5 to 5.5 V
VG (E7-30) - E2G (E7-29)	R-L - G-W	Idling, P or N position, A/C switch OFF	0.5 to 3.0 V
THA (E7-22) - E2 (E7-28)	Y-G - B-W	Idling, Intake air temp. 20°C (68°F)	0.5 to 3.4 V
THW (E7-21) - E2 (E7-28)	G-Y - B-W	Idling, Engine coolant temp. 80°C (176°F)	0.2 to 1.0 V
VTA1 (E7-20) - E2 (E7-28)	GR - B-W	IG switch ON, Accelerator pedal released	0.5 to 1.2 V
		IG switch ON, Accelerator pedal depressed	3.2 to 4.8 V
VTA2 (E7-19) - E2 (E7-28)	R-B - B-W	IG switch ON, Accelerator pedal released	2.0 to 3.1 V
		IG switch ON, Accelerator pedal depressed	4.5 to 5.5 V
VPA (E3-18) - EPA (E3-20)	R-G - V-R	IG switch ON, Accelerator pedal released	0.5 to 1.1 V
		IG switch ON, Accelerator pedal depressed	2.6 to 4.5 V
VPA2 (E3-19) - EPA2 (E3-21)	L - LG-R	IG switch ON, Accelerator pedal released	1.2 to 2.0 V
		IG switch ON, Accelerator pedal depressed	3.4 to 5.3 V
VCPA (E3-26) - EPA (E3-20)	P-G - V-R	IG switch ON	4.5 to 5.5 V
VCP2 (E3-27) - EPA2 (E3-21)	G-R - LG-R	IG switch ON	4.5 to 5.5 V
#10 (E5-2) - E01 (E7-7)	R - W-B	IG switch ON	9 to 14 V
#20 (E5-3) - E01 (E7-7)	W - W-B		
#30 (E5-4) - E01 (E7-7)	G - W-B		
#40 (E5-5) - E01 (E7-7)	R-B - W-B		
#50 (E5-6) - E01 (E7-7)	L - W-B		
#60 (E5-7) - E01 (E7-7)	Y - W-B		
		Idling	Pulse generation (See waveform 1)

DIAGNOSTICS - ENGINE (1GR-FE)

KNK1 (E6-29) - EKNK (E6-28)	G - R	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See waveform 2)
KNK2 (E6-21) - EKN2 (E6-20)	W - B		
OC1+ (E5-17) - OC1- (E5-16)	W-R - G-B	Accelerate slowly after engine warmed-up	Pulse generation (See waveform 3)
OC2+ (E5-15) - OC2- (E5-14)	L-R - V	Accelerate slowly after engine warmed-up	Pulse generation (See waveform 3)
VV1+ (E5-19) - VV1- (E5-29)	L - Y	Idling	Pulse generation (See waveform 4)
VV2+ (E5-18) - VV2- (E5-28)	L - G	Idling	Pulse generation (See waveform 4)
NE+ (E5-21) - NE- (E5-20)	R - G	Idling	Pulse generation (See waveform 4)
PRG (E7-34) - E1 (E5-1)	G-W - BR	IG switch ON	9 to 14 V
SPD (E4-8) - E1 (E5-1)	G-O - BR	IG switch ON, Rotate driving wheel slowly	Pulse generation (See waveform 5)
M+ (E7-5) - E1 (E5-1)	G - BR	Idling	Pulse generation (See waveform 6)
M- (E7-4) - E1 (E5-1)	R - BR	Idling	Pulse generation (See waveform 7)
FPR (E5-30) - E1 (E5-1)	R-G - BR	IG switch ON	0 to 3.0 V
FC (E3-10) - E1 (E5-1)	Y - BR	IG switch ON	9 to 14 V
IGT1 (E7-8) - E1 (E5-1) IGT2 (E7-9) - E1 (E5-1) IGT3 (E7-10) - E1 (E5-1) IGT4 (E7-11) - E1 (E5-1) IGT5 (E7-12) - E1 (E5-1) IGT6 (E7-13) - E1 (E5-1)	B-L - BR L-W - BR LG - BR V - BR L-B - BR R-W - BR	Idling	Pulse generation (See waveform 9)
IGF1 (E7-24) - E1 (E5-1)	B-Y - BR	IG switch ON	4.5 to 5.5 V
		Idling	Pulse generation (See waveform 8)
HA1A (E6-2) - E1 (E5-1)	Y - BR	Idling	Below 3.0 V
HA2A (E6-1) - E1 (E5-1)	G - BR	IG switch ON	9 to 14 V
A1A+ (E6-22) - E1 (E5-1)	V - BR	Always (Ignition switch ON)	3.3 V*1
A1A- (E6-30) - E1 (E5-1)	P - BR	Always (Ignition switch ON)	3.0 V*1
A2A+ (E6-23) - E1 (E5-1)	G - BR	Always (Ignition switch ON)	3.3 V*1
A2A- (E6-31) - E1 (E5-1)	P - BR	Always (Ignition switch ON)	3.0 V*1
HT1B (E7-1) - E1 (E5-1)	L - BR	Idling	Below 3.0 V
HT2B (E6-5) - E1 (E5-1)	G-B - BR	IG switch ON	9 to 14 V
OX1B (E7-18) - E2 (E7-28)	B - B-W	Idling	Pulse generation (See waveform 9)
OX2B (E6-33) - E2 (E7-28)	B - B-W	Idling	Pulse generation (See waveform 9)
STP (E3-15) - E1 (E5-1)	G-W - BR	Brake pedal is depressed	7.5 to 14 V
		Brake pedal is released	Below 1.5 V
STI- (E3-16) - E1 (E5-1)	B - BR	Brake pedal is depressed	Below 1.5 V
		Brake pedal is released	7.5 to 14 V
STA (E5-11) - E1 (E5-1)	B - BR*1 P - BR*2	Shift lever position P or N, Ignition switch START	6.0 V or more
STSW (E5-12) - E1 (E5-1)	R-L - BR	Shift lever position P or N, ignition switch START	6.0 V or more

NSW (E6-8) - E1 (E5-1)	L-R - BR	IG switch ON, Other shift position in P, N	9 to 14 V
		IG switch ON, Shift position in P, N	0 to 3.0 V
W (E4-30) - E1 (E5-1)	V-G - BR	Idling	9 to 14 V
		IG switch ON	Below 3.0 V
TACH (E4-1) - E1 (E5-1)	L-W - BR	Idling	Pulse generation (See waveform 10)
ACIS (E7-33) - E1 (E5-1)	B - BR	IG switch ON	9 to 14 V
VPMP (E3-5) - E1 (E5-1)	L-B - BR	Ignition switch ON	9 V to 14 V
MPMP (E3-6) - E1 (E5-1)	R-W - BR	• Vacuum pump OFF	0 V to 3 V
		• Vacuum pump ON	9 V to 14 V
PPMP (E3-22) - E1 (E5-1)	L-W - BR	Ignition switch ON	3 V to 3.6 V

*1: M/T
*2: A/T



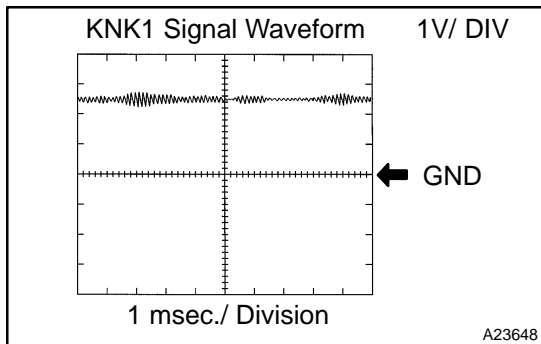
WAVEFORM 1

Fuel injector

ECM Terminal Names	Between #10 (to 60) and E01
Tester Ranges	20 V/DIV, 20 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



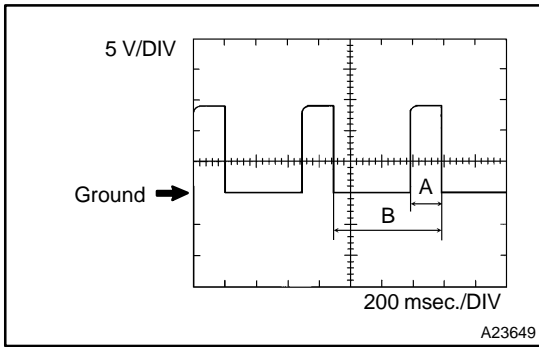
WAVEFORM 2

Knock sensor

ECM Terminal Name	Between KNK1 and EKNK Between KNK2 and EKN2
Tester Range	1 V/DIV, 1 msec./DIV
Condition	Maintain engine RPM at 2,000 rpm after engine warmed-up

HINT:

- The wavelength becomes shorter as engine rpm increases.
- The waveforms and amplitudes displayed differ slightly depending on the vehicle.



WAVEFORM 3

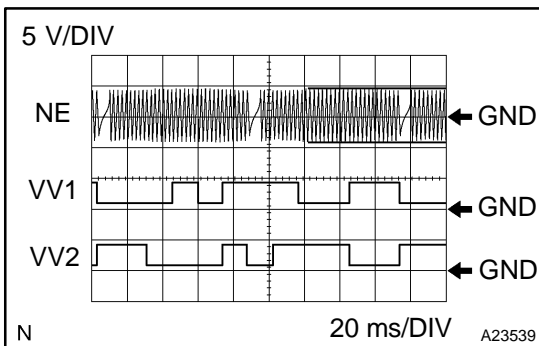
VVT OCV

ECM Terminal Name	Between OC1+ and OC1- Between OC2+ and OC2-
Tester Range	0.2 V/DIV, 200 msec./DIV
Condition	Accelerate slowly after engine warmed-up

HINT:

In the DATA LIST, the items VVT OCV DUTY B1 and B2 show the duty ratio of voltage flowing to the OCV (see illustration on left).

VVT OCV DUTY B1, B2 = $A/B \times 100$ (%)



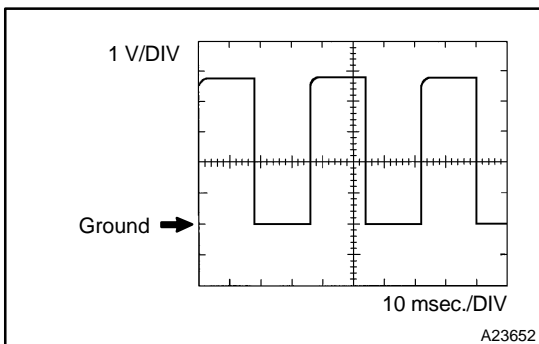
WAVEFORM 4

- (a) VVT sensor bank 1
- (b) VVT sensor bank 2
- (c) Crankshaft position sensor

ECM Terminal Name	(a) Between VV1+ and VV1- (b) Between VV2+ and VV2- (c) Between NE+ and NE-
Tester Range	5 V/DIV, 20 msec./DIV
Condition	Idle after engine warmed-up

HINT:

The wavelength becomes shorter as the engine rpm increases.



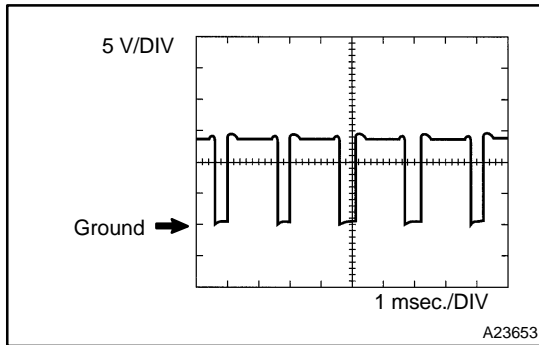
WAVEFORM 5

Vehicle speed signal

ECM Terminal Name	Between SPD and E1
Tester Range	5 V/DIV, 10 msec./DIV
Condition	Driving by 40 km/h (25 mph)

HINT:

The wavelength becomes shorter as vehicle speed increases.

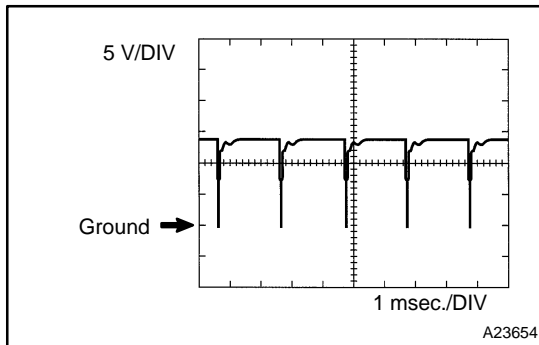
**WAVEFORM 6**

Throttle actuator positive terminal

ECM Terminal Name	Between M+ and ME01
Tester Range	5 V/DIV, 1 msec./DIV
Condition	Idle after engine warmed-up

HINT:

The duty ratio varies depending on the throttle opening operation.

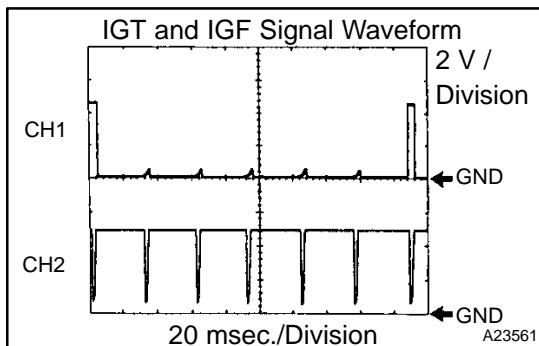
**WAVEFORM 7**

Throttle actuator negative terminal

ECM Terminal Name	Between M- and ME01
Tester Range	5 V/DIV, 1 msec./DIV
Condition	Idle after engine warmed-up

HINT:

The duty ratio varies depending on the throttle opening operation.

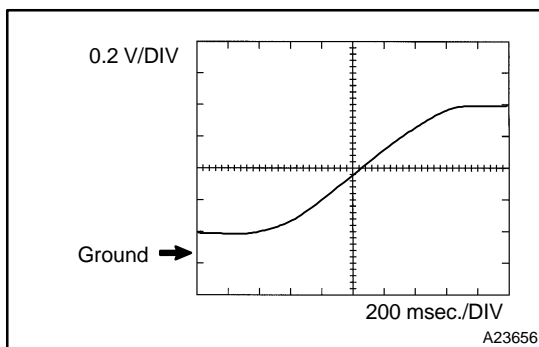
**WAVEFORM 8**

- (a) Igniter IGT signal (from ECM to igniter)
 (b) Igniter IGF1 signal (from igniter to ECM)

ECM Terminal Name	(a) Between IGT1 (to IGT6) and E1 (b) Between IGF1 and E1
Tester Range	2 V/DIV, 20 msec./DIV
Condition	Idling

HINT:

The wavelength becomes shorter as vehicle speed increases.

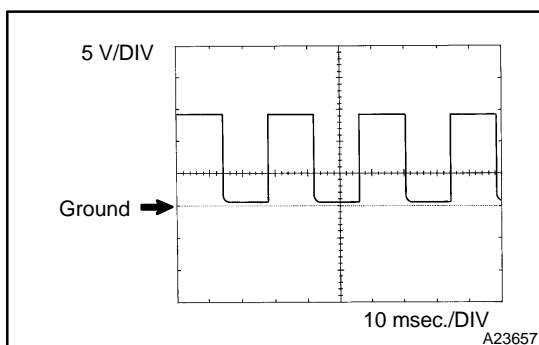
**WAVEFORM 9**

Heated oxygen sensor

ECM Terminal Names	Between OX1B and E2
Tester Ranges	0.2 V/DIV, 200 msec./DIV
Conditions	Engine speed maintained 2,500 rpm for 2 minutes after warming up sensor

HINT:

In the DATA LIST, item O2S B1S2 shows the ECM input values from the heated oxygen sensor.

**WAVEFORM 10**

Engine speed signal

ECM Terminal Names	Between TACH and E1
Tester Ranges	5 V/DIV, 10 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as vehicle speed increases.

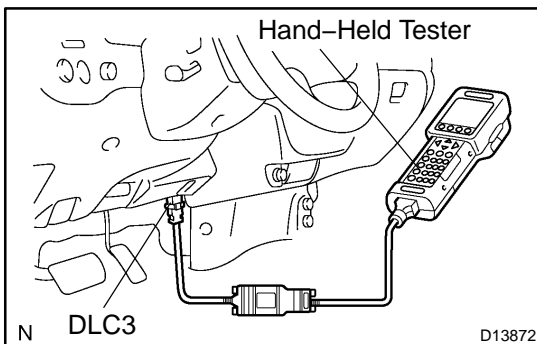


DIAGNOSIS SYSTEM

1. Description

- When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the hand-held tester. Various data output from the vehicle's ECM can then be read.
- OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Light (MIL) on the instrument panel when the computer detects a malfunction in: 1) the emission control system/components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the computer. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (See page [DI-57](#)).

If the malfunction does not reoccur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain recorded in the ECM memory.



To check the DTC, connect the hand-held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand-held tester also enables you to erase the DTC and check the freeze frame data and various forms of engine data (See the instruction manual for the hand-held tester). The DTC includes SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set according to the SAE, while manufacturer controlled codes can be set by a manufacturer with certain restrictions (See the DTC chart on page [DI-57](#)).

2. NORMAL MODE AND CHECK MODE

The diagnosis system operates in "normal mode" during normal vehicle use. In "normal mode", 2 trip detection logic* is used to ensure accurate detection of malfunctions. A "check mode" is also available to technicians as an option. In "check mode", 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions (See page [DI-11](#)).

3. 2-TRIP DETECTION LOGIC

When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. This is known as 1st trip detection. If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate. This is known as 2nd trip detection.

- Freeze frame data:
The freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

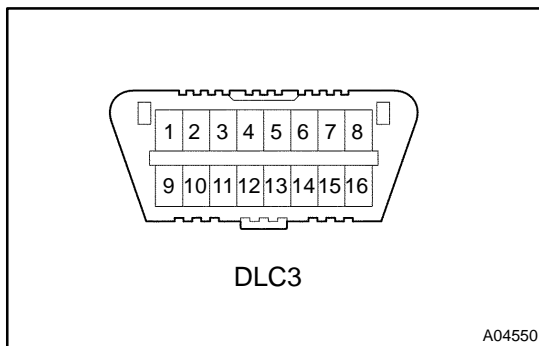
Priorities for troubleshooting:

When multiple DTCs occur, find out the order in which the DTCs should be inspected by checking the component's DTC chart. If no instructions are written in the DTC chart, check DTCs in the following order of priority:

- DTCs other than fuel trim malfunction DTCs (P0171, P0172, P0174 and P0175) and misfire DTCs (P0300 to P0306).
- Fuel trim malfunction DTCs (P0171, P0172, P0174 and P0175).
- Misfire DTCs (P0300 to P0306).

4. CHECK DLC3

The vehicle's ECM uses the ISO 9141–2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.



Symbol	Terminal Description	Condition	Specified Condition
SIL (7) – SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) – Body ground	Chassis ground	Always	Below 1 Ω
SG (5) – Body ground	Signal ground	Always	Below 1 Ω
BAT (16) – Body ground	Battery positive	Always	11 to 14 V
CANH (6) – CANL (14)	HIGH–level CAN bus line	Ignition switch OFF	54 to 69 Ω
CANH (6) – Battery positive	HIGH–level CAN bus line	Ignition switch OFF	1 M Ω or higher
CANH (6) – CG (4)	HIGH–level CAN bus line	Ignition switch OFF	1 k Ω or higher
CANL (14) – Battery positive	LOW–level CAN bus line	Ignition switch OFF	1 M Ω or higher
CANL (6) – CG (4)	LOW–level CAN bus line	Ignition switch OFF	1 k Ω or higher

HINT:

Connect the cable of the hand–held tester to the DLC3, turn the ignition switch ON and attempt to use the hand–held tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.

- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

5. INSPECT BATTERY VOLTAGE

Battery Voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

6. CHECK MIL

- (a) The MIL comes on when the ignition switch is turned ON and the engine is not running.

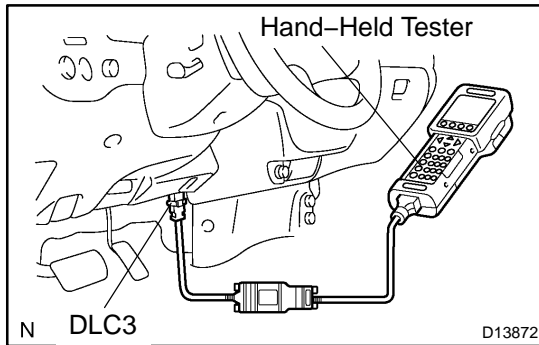
HINT:

If the MIL is not illuminated, troubleshoot the MIL circuit (See page [DI-417](#)).

- (b) When the engine is started, the MIL should not illuminate. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

7. ALL READINESS

For this vehicle, using the hand-held tester allows readiness codes corresponding to all DTCs to be read. When diagnosis (normal or malfunctioning) has been complete, readiness codes are set. Enter the following menus: ENHANCED OBD II / MONITOR STATUS on the hand-held tester.



DTC CHECK / CLEAR

1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the hand-held tester or generic OBD II scan tool.

These scan tools can display pending DTCs and current DTCs. Some DTCs are not stored if the ECM does not detect a malfunction during consecutive driving. However, the detected malfunction during once driving is stored as pending DTC.

- (a) Connect the hand-held tester to the CAN VIM. Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (b) Turn the ignition switch to ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES (or PENDING CODE).
- (d) Confirm the DTCs and freeze frame data and then write them down.
- (e) See page [DI-57](#) to confirm the details of the DTCs.

NOTICE:

When simulating a symptom with the hand-held tester to check the DTCs, use the normal mode. For DTC chart subject to "2 trip detection logic", perform either of the following actions.

Turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL illuminates and the DTCs are recorded in the ECM.

2. CLEAR DTC

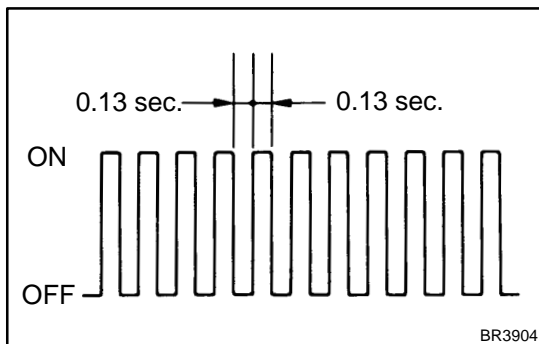
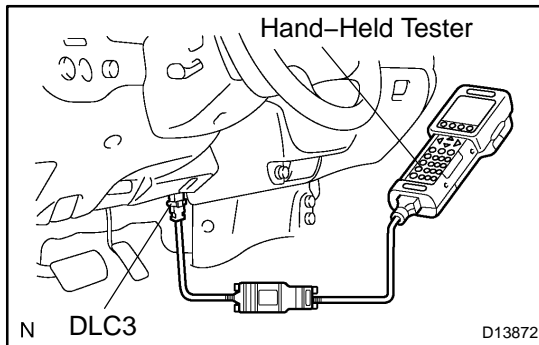
- (a) Connect the hand-held tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES and press YES.

CHECK MODE PROCEDURE

HINT:

Hand-held tester only:

Check mode has a higher sensitivity to detect malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect.



1. CHECK MODE PROCEDURE

- (a) Make sure that the items below are true.
 - (1) Battery positive voltage 11 V or more
 - (2) Throttle valve fully closed
 - (3) Transmission in the P or N position
 - (4) A/C switched OFF
- (b) Turn the ignition switch OFF.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch ON.
- (e) Change the ECM to check mode with the hand-held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All DTCs and freeze frame data recorded will be erased if:

- 1) the hand-held tester is used to change the ECM from normal mode to check mode or vice-versa; or
- 2) during check mode, the ignition switch is turned from ON to ACC or OFF.

- (f) Start the engine. The MIL should turn off after the engine starts.
- (g) Simulate the conditions of the malfunction described by the customer.
- (h) After simulating the malfunction conditions, use the hand-held tester diagnosis selector to check the DTC, freeze frame data and other data.
- (i) After checking the DTC, inspect the applicable circuit.

2. CLEAR DTC (Using the hand-held tester)

- (a) Connect the OBD II scan tool or the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand-held tester. For the hand-held tester: 1) enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES; and 2) press YES. For the OBD II scan tool, see its instruction manual.

3. CLEAR DTC (Not using the hand-held tester)

- (a) Remove the EFI No. 1 and ETCS fuses from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.

After disconnecting the battery terminal, perform the "INITIALIZE" procedure.

FAIL-SAFE CHART

If any of the following code is recorded, the ECM enters fail-safe mode.

DTC No.	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0031 P0032 P0037 P0038 P0051 P0052 P0057 P0058	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0100 P0102 P0103	Ignition timing is calculated from engine speed and throttle angle	"Pass" condition detected
P0110 P0112 P0113	Intake air temperature is fixed at 20°C (68°F)	"Pass" condition detected
P0115 P0117 P0118	Engine coolant temperature is fixed at 80°C (176°F)	"Pass" condition detected
P0120 P0121 P0122 P0123 P0220 P0222 P0223 P0606 P0607 P0657 P2102 P2103 P2111 P2112 P2118 P2119 P2135	<p>If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.</p> <p>If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly. If the accelerator pedal is depressed quickly, the vehicle may speed up and slow down erratically.</p>	"Pass" condition is detected and then the ignition switch is turned OFF.

P0351 P0352 P0353 P0354 P0355 P0356 P0357 P0358	Fuel cut	"Pass" condition detected
P2120 P2121 P2122 P2123 P2125 P2127 P2128 P2138	The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.	"Pass" condition is detected and the ignition switch is turned OFF.

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

By reading the DATA LIST displayed on a hand-held tester, you can check values, including those of the switches, sensors, and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening diagnostic time.

NOTICE:

In the table below, the values listed under Normal Conditions are for reference only. Do not depend solely on these values when determining whether or not a part is faulty.

- (a) Warm up the engine.
- (b) Turn the ignition switch to OFF.
- (c) Connect a hand-held tester to the DLC3.
- (d) Turn the ignition switch to ON.
- (e) Turn the tester ON.
- (f) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
- (g) Check the values by referring to the table below.

Hand-Held Tester Display	Measurement Item:Range (Display)	Normal Condition *	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder: Min.: 0 ms, Max.: 32.64 ms	2.3 to 3.8 ms: Idling	—
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: -64 deg., Max.: 63.5 deg.	BTDC 4 to 17°: Idling	—
CALC LOAD	Calculated load by ECM: Min.: 0 %, Max.: 100 %	• 11 to 21 %: Idling • 12 to 22 %: Running without load (2,500 rpm)	—
VEHICLE LOAD	Vehicle load: Min.: 0 %, Max.: 25700 %	Actual vehicle load	—
MAF	Air flow rate from MAF meter: Min.: 0 g/s, Max.: 655 g/s	2.0 to 3.9 g/s: Idling	If the value approximately 0.0 g/s: • Mass air flow meter power source circuit open • VG circuit open or short If the value 160.0 g/s or more: • E2G circuit open
ENGINE SPD	Engine speed: Min.: 0 rpm, Max.: 16,383 rpm	600 ± 50 rpm: Idling	—
VEHICLE SPD	Vehicle speed: Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
COOLANT TEMP	Engine coolant temperature: Min.: -40°C, Max.: 140°C	80 to 100°C (176 to 212°F): After warming up	• If the value -40°C (-40°F): sensor circuit open • If the value 140°C (284°F): sensor circuit shorted
INTAKE AIR	Intake air temperature: Min.: -40°C, Max.: 140°C	Equivalent to ambient air temperature	• If the value -40°C (-40°F): sensor circuit open • If the value 140°C (284°F): sensor circuit shorted
AIR-FUEL RATIO	Air-fuel ratio: Min.: 0, Max.: 1.999	0.8 to 1.2: During idling	—
EVAP VAPOR PRES	EVAP vapor pressure: Min.: -8192 Pa, Max.: 8191 Pa	0 Pa: Fuel tank cap removed	—
PURGE DENSITY	Learning value of purge density/ Min.: -50, Max.: 350	Idling: -40 to 0 %	Service data

PURGE FLOW	Purge flow: Min.: 0 %, Max.: 102.4 %	0 to 100 %: Idling	—
EVAP PURGE VSV	EVAP (Purge) VSV control duty: Min.: 0 %, Max.: 100 %	0 to 100 %: During idling	Order signal from ECM
VAPOR PRESS	Vapor pressure: Min.: -4.125 kPa, Max.: 2.125 kPa	0 kPa: Fuel tank cap removed	Pressure inside fuel tank monitored by the vapor pressure sensor
KNOCK CRRT VAL	Correction learning value of knocking: Min.: -64 CA, Max.: 1,984 CA	0 to 22 °CA: Driving, 44 mph (70 km/h)	Service data
KNOCK FB VAL	Feedback value of knocking: Min.: -64 CA, Max.: 1,984 CA	-22 to 0 °CA Driving, 44 mph (70 km/h)	Service data
ACCEL POS #1	Absolute Accelerator Pedal Position (APP) No. 1: Min.: 0 %, Max.: 100 %	10 to 22 %: accelerator pedal is released 54 to 86 %: accelerator pedal is fully depressed	—
ACCEL POS #2	Absolute APP No. 2: Min.: 0 %, Max.: 100 %	12 to 42 %: accelerator pedal is released 66 to 98 %: The accelerator pedal is fully depressed	—
ACCEL POS #1	APP sensor No. 1 voltage: Min.: 0 V, Max.: 4.98 V	—	ETCS freeze data
ACCEL POS #2	APP sensor No. 2 voltage: Min.: 0 V, Max.: 4.98 V	—	ETCS freeze data
ACCEL POS #1	APP sensor No. 1 voltage: Min.: 0 V, Max.: 5 V	0.5 to 1.1 V: accelerator pedal is released. 2.6 to 4.5 V: or pedal is fully depressed.	—
ACCEL POS #2	APP sensor No. 2 voltage: Min.: 0 V, Max.: 5 V	1.2 to 2.0 V: accelerator pedal is released. 3.4 to 5.3 V: accelerator pedal is fully depressed.	—
ACCEL IDL POS	Whether or not accelerator pedal position sensor detecting idle: ON or OFF	ON: Idling	—
THRTL LEARN VAL	Throttle valve fully closed (learned value):	0.4 to 0.8 V	—
ACCEL SSR #1 AD	Accelerator fully closed value No.1 (AD): Min.: 0, Max.: 4.98 V	—	ETCS service data
ACCEL LRN VAL#1	Accelerator fully closed learning value No.1: Min.: 0, Max.: 124.512	—	ETCS service data
ACCEL LRN VAL#2	Accelerator fully closed learning value No.2: Min.: 0, Max.: 124.512	—	ETCS service data
FAIL #1	Whether or not fail safe function executed: ON or OFF	ON: ETCS has failed	—
FAIL #2	Whether or not fail safe function executed: ON or OFF	ON: ETCS has failed	—
ST1	Starter signal: ON or OFF	ON: Cranking	—

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SYSGUARD JUDGE	System guard: ON or OFF	—	ETCS service data
OPN MALFUNCTION	Open side malfunction: ON or OFF	—	ETCS service data
THROTTLE POS	Absolute throttle position sensor: Min.: 0 %, Max.: 100 %	• 10 to 24 %: Throttle fully closed • 64 to 96 %: Throttle fully open	Read the value with intrusive operation (active test)
THROTTL IDL POS	Whether or not throttle position sensor detecting idle: ON or OFF	ON: Idling	—
THRTL REQ POS	Throttle requirement position: Min.: 0 V, Max.: 5 V	0.5 to 1.0 V: Idling	—
THROTTLE POS	Throttle sensor positioning: Min.: 0 %, Max.: 100 %	10 to 18 %: Idling	Calculated value based on VTA1
THROTTLE POS #2	Throttle sensor positioning #2: Min.: 0 %, Max.: 100 %	—	Calculated value based on VTA2
THROTTLE POS #1	Throttle position sensor No. 1 output voltage: Min.: 0 V, Max.: 4.9 V	—	ETCS freeze data
THROTTLE POS #2	Throttle position sensor No.2 output voltage: Min.: 0 V, Max.: 4.9 V	—	ETCS freeze data
THROTTLE POS #1	Throttle position No. 1: Min.: 0 V, Max.: 5 V	• 0.5 to 1.2 V: Throttle fully closed • 3.2 to 4.8 V: Throttle fully opened	—
THROTTLE POS #2	Throttle position No. 2: Min.: 0 V, Max.: 5 V	• 2.0 to 2.9 V: Throttle fully closed • 4.6 to 5.5 V: Throttle fully open	Read the value with intrusive operation (active test)
THRTL COMND VAL	Throttle position command value: Min.: 0 V, Max.: 4.98 V	0.5 to 4.8 V	ETCS service data
THROTTLE SSR #1	Throttle sensor opener position No. 1: Min.: 0 V, Max.: 4.98 V	0.6 to 0.9 V	ETCS service data
THROTTLE SSR #2	Throttle sensor opener position No. 2: Min.: 0 V, Max.: 4.98 V	2.2 to 2.6 V	ETCS service data
THRTL SSR #1 AD	Throttle sensor opener position No.1 (AD): Min.: 0 V, Max.: 4.98 V	0.6 to 0.9 V	ETCS service data
THROTTLE MOT	Whether or not throttle motor control permitted: ON or OFF	ON: Idling	Read the value with the power switch ON (Do not start engine)
THROTTLE MOT	Throttle motor current: Min.: 0 A, Max.: 80 A	0 to 3.0 A: Idling	—
THROTTLE MOT	Throttle motor: Min.: 0 %, Max.: 100 %	0.5 to 40 %: Idling	—
THROTTLE MOT	Throttle motor current: Min.: 0 A, Max.: 19.92 A	0 to 3.0 A: Idling	—
THROTL OPN DUTY	Throttle motor opening duty ratio: Min.: 0 %, Max.: 100 %	0 to 40 %: During idling	When accelerator pedal depressed, duty ratio increased
THROTL CLS DUTY	Throttle motor closed duty ratio: Min.: 0 %, Max.: 100 %	0 to 40 %: During idling	When accelerator pedal released quickly, duty ratio increased
THRTL MOT (OPN)	Throttle motor duty ratio (open): Min.: 0 %, Max.: 100 %	—	ETCS service data
THRTL MOT (CLS)	Throttle motor duty ratio (close): Min.: 0 %, Max.: 100 %	—	ETCS service data

O2S B1 S2	Heated oxygen sensor output voltage for bank 1 sensor 2: Min.: 0 V, Max.: 1.275 V	0.1 to 0.9 V: Driving 44 mph (70 km/h)	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
O2S B2 S2	Heated oxygen sensor output voltage for bank 1 sensor 2: Min.: 0 V, Max.: 1.275 V	0.1 to 0.9 V: Driving 44 mph (70 km/h)	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
AFS B1 S1	A/F sensor output voltage for bank 1 sensor 1: Min.: 0 V, Max.: 7.999 V	2.8 to 3.8 V: Idling	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
AFS B2 S1	A/F sensor output voltage for bank 1 sensor 1: Min.: 0 V, Max.: 7.999 V	2.8 to 3.8 V: Idling	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
TOTAL FT #1	Total fuel trim of bank 1 Average value for fuel trim system of bank 1: Min.: -0.5, Max.: 1,496	-0.2 to 0.2: Idling	—
TOTAL FT #2	Total fuel trim of bank 1 Average value for fuel trim system of bank 1: Min.: -0.5, Max.: 1,496	-0.2 to 0.2: Idling	—
SHORT FT #1	Short-term fuel trim of bank 1: Min.: -100 %, Max.: 99.2%	0 ± 20 %	This item the short-term fuel compensation used to maintain the air-fuel ratio at stoichiometric air-fuel ratio
SHORT FT #2	Short-term fuel trim of bank 1: Min.: -100 %, Max.: 99.2%	0 ± 20 %	This item the short-term fuel compensation used to maintain the air-fuel ratio at stoichiometric air-fuel ratio
LONG FT #1	Long-term fuel trim of bank 1: Min.: -100 %, Max.: 99.2 %	0 ± 20 %	This item the overall fuel compensation carried out in long-term to compensate a continual deviation of the short-term fuel trim from the central value
LONG FT #2	Long-term fuel trim of bank 1: Min.: -100 %, Max.: 99.2 %	0 ± 20 %	This item the overall fuel compensation carried out in long-term to compensate a continual deviation of the short-term fuel trim from the central value
FUEL SYS #1	Fuel system status (Bank1): OL or CL or OL DRIVE or OL FAULT or CL FAULT	CL: Idling after warming up	<ul style="list-style-type: none"> • OL (Open Loop): Has not yet satisfied conditions to go closed loop • CL (Closed Loop): Using heated oxygen sensor as feedback for fuel control. • OL DRIVE: Open loop due to driving conditions (fuel enrichment) • OL FAULT: Open loop due to detected system fault • CL FAULT: Closed loop but heated oxygen sensor, which used for fuel control malfunctioning

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FUEL SYS #2	Fuel system status (Bank1): OL or CL or OL DRIVE or OL FAULT or CL FAULT	CL: Idling after warming up	<ul style="list-style-type: none"> • OL (Open Loop): Has not yet satisfied conditions to go closed loop • CL (Closed Loop): Using heated oxygen sensor as feedback for fuel control. • OL DRIVE: Open loop due to driving conditions (fuel enrichment) • OL FAULT: Open loop due to detected system fault • CL FAULT: Closed loop but heated oxygen sensor, which used for fuel control malfunctioning
O2FT B1 S2	Short-term fuel trim associated with the bank 1 sensor 2: Min.: -100 %, Max.: 99.2 %	0 ± 20 %	Same as SHORT FT #1
O2FT B2 S2	Short-term fuel trim associated with the bank 1 sensor 2: Min.: -100 %, Max.: 99.2 %	0 ± 20 %	Same as SHORT FT #1
AF FT B1 S1	Short-term fuel trim associated with the bank 1 sensor 1: Min.: 0, Max.: 1.999	<ul style="list-style-type: none"> • Value less than 1 (0.000 to 0.999) = Lean • Stoichiometric air-fuel ratio=1 • Value greater than 1 (1.001 to 1.999) = RICH 	—
AF FT B2 S1	Short-term fuel trim associated with the bank 1 sensor 1: Min.: 0, Max.: 1.999	<ul style="list-style-type: none"> • Value less than 1 (0.000 to 0.999) = Lean • Stoichiometric air-fuel ratio=1 • Value greater than 1 (1.001 to 1.999) = RICH 	—
CAT TEMP B1S1	Catalyst temperature (Bank 1, Sensor 1): Min.: -40, Max.: 6,513.5 °C	—	—
CAT TEMP B2S1	Catalyst temperature (Bank 1, Sensor 1): Min.: -40, Max.: 6,513.5 °C	—	—
CAT TEMP B1S2	Catalyst temperature (Bank 1, Sensor 2): Min.: -40, Max.: 6,513.5 °C	—	—
CAT TEMP B2S2	Catalyst temperature (Bank 1, Sensor 2): Min.: -40, Max.: 6,513.5 °C	—	—
INI COOL TEMP	Initial engine coolant temperature: Min.: -40°C, Max.: 140°C	Close to ambient air temperature	Service data
INI INTAKE TEMP	Initial intake air temperature: Min.: -40°C, Max.: 140°C	Close to ambient air temperature	Service data
INJ VOL	Injection volume (cylinder 1): Min.: 0 ml, Max.: 2.048 ml	0 to 0.5 ml	Quantity of fuel injection volume for 10 times
ACC RELAY	ACC relay: ON or OFF	ON: Cranking	—
STARTER RELAY	Starter relay: ON or OFF	ON: Cranking	—
STARTER SIG	Starter signal: ON or OFF	ON: Cranking	—
STARTER CONTROL	Starter switch status: ON or OFF	ON: Cranking	—
PS SW	Power steering signal: ON or OFF	ON: Power steering operation	—

PS SIGNAL	Power steering signal: ON or OFF	ON: When steering wheel first turned after ignition switch turned to ON	This signal status usually ON until ignition switch turned to OFF
CTP SW	Closed throttle position switch: ON or OFF	• ON: Throttle fully closed • OFF: Throttle open	—
PNP SW (NSW)	PNP switch status: ON or OFF	ON: P or N position	—
A/C SIG	A/C signal: ON or OFF	ON: A/C ON	—
ELECT LOAD SIG	Electrical load signal: ON or OFF	ON: Headlights or defogger is turned ON	—
STOP LIGHT SW	Stop lamp switch: ON or OFF	ON: brake pedal is depressed.	—
+BM	Whether or not electric throttle control system power inputted: ON or OFF	ON: Idling	—
+BM VOLTAGE	+BM voltage: Min.: 0, Max.: 19.92	10 to 15 V: Idling	ETCS service data
BATTERY VOLTAGE	Battery voltage: Min.: 0 V, Max.: 65.535 V	9 to 14 V: Idling	—
ACTUATOR POWER	Actuator power supply: ON or OFF	ON: Idling	ETCS service data
ATM PRESSURE	Atmospheric pressure: Min.: 0 kPa, Max.: 150 kPa	Equivalent to atmospheric pres- sure (absolute pressure)	—
ACT VSV	A/C cut status for Active Test: ON or OFF	—	Active Test support data
ACIS VSV	VSV for ACIS control: ON or OFF	—	Active Test support data
EVAP (Purge) VSV	VSV status for EVAP control: ON or OFF	—	Active Test support data
FUEL PUMP / SPD	Fuel pump/speed status: ON or OFF	—	Active Test support data
FUEL SP CTL	Fuel pump speed control status: ON or OFF	—	Active Test support data
VVT CTRL B1	VVT control status: ON or OFF	—	Active Test support data
VVT CTRL B2	VVT control status: ON or OFF	—	Active Test support data
VACUUM PUMP	Key-off EVAP system pump sta- tus: ON or OFF	—	Active Test support data
EVAP VENT VAL	Key-off EVAP system vent valve status: ON or OFF	—	Active Test support data
TC/TE1	TC and TE1 terminal of DLC3: ON or OFF	—	—
VVTL AIM ANGL #1	VVT aim angle (bank 1): Min.: 0 %, Max.: 100 %	0 %: Idling	VVT duty signal value during intru- sive operation
VVTL AIM ANGL #2	VVT aim angle (bank 1): Min.: 0 %, Max.: 100 %	0 %: Idling	VVT duty signal value during intru- sive operation
VVT CHNG ANGL #1	VVT change angle: Min.: 0°FR, Max.: 60°FR	0 to 5 °FR: Idling	Displacement angle during intru- sive operation
VVT CHNG ANGL #2	VVT change angle: Min.: 0°FR, Max.: 60°FR	0 to 5 °FR: Idling	Displacement angle during intru- sive operation

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VVT OCV DUTY B1	VVT OCV operation duty: Min.: 0 %, Max.: 100 %	0 %: Idling	Requested duty value for intrusive operation
VVT OCV DUTY B2	VVT OCV operation duty: Min.: 0 %, Max.: 100 %	0 %: Idling	Requested duty value for intrusive operation
FC IDL	Fuel cut idle: ON or OFF	ON: Fuel cut operation	FC IDL = "ON" when throttle valve fully closed and engine speed over 2,800 rpm
FC TAU	Fuel cut TAU: Fuel cut during very light load: ON or OFF	ON: Fuel cut operating	The fuel cut being performed under very light load to prevent the engine combustion from becoming incomplete
IGNITION	Ignition counter: Min.: 0, Max.: 800	0 to 800	—
CYL #1, #2, #3, #4, #5, #6	Misfire ratio of the cylinder 1 to 4: Min.: 0, Max.: 255	0 %	This item displayed in only idling
CYL ALL	All cylinders misfire rate: Min.: 0, Max.: 255	0 to 35	—
MISFIRE RPM	Engine RPM for first misfire range: Min.: 0 rpm, Max.: 6,375 rpm	0 rpm: Misfire 0	—
MISFIRE LOAD	Engine load for first misfire range: Min.: 0 g/rev, Max.: 3.98 g/rev	0 g/rev: Misfire 0	—
MISFIRE MARGIN	Misfire monitoring: Min.: -100 %, Max.: 99.22 %	-100 to 99.2 %	Misfire detecting margin
#CODES	#Codes: Min.: 0, Max.: 255	—	Number of detected DTCs
CHECK MODE	Check mode: 0: ON, 1: OFF	ON: Check mode ON	See page DI-43
SPD TEST	Check mode result for vehicle speed sensor: 0: COMPL, 1: INCOMPL	—	See page DI-43
MISFIRE TEST	Check mode result for misfire monitor: 0: COMPL, 1: INCOMPL	—	See page DI-43
OXS1 TEST	Check mode result for HO2 sensor : 0: COMPL, 1: INCOMPL	—	See page DI-43
OXS2 TEST	Check mode result for HO2 sensor : 0: COMPL, 1: INCOMPL	—	See page DI-43
A/F SSR TEST B1	Check mode result for air-fuel ratio sensor : 0: COMPL, 1: INCOMPL	—	See page DI-43
A/F SSR TEST B2	Check mode result for air-fuel ratio sensor : 0: COMPL, 1: INCOMPL	—	See page DI-43
MIL	MIL status: ON or OFF	ON: MIL ON	—
MIL ON RUN DIST	MIL ON Run Distance: Min.: 0 second, Max.: 65,535 seconds	Distance after DTC detected	—
MIL ON RUN TIME	Running time from MIL ON: Min.: 0 minute, Max.: 65,535 minutes	Equivalent to running time after MIL was ON	—

ENG RUN TIME	Engine run time: Min.: 0 second, Max.: 65,535 seconds	Time after engine start	Service data
TIME DTC CLEAR	Time after DTC cleared: Min.: 0 minute, Max.: 65,535 minutes	Equivalent to time after DTCs were erased	—
DIST DTC CLEAR	Distance after DTC cleared: Min.: 0 km/h, Max.: 65535 km/h	Equivalent to drive distance after DTCs were erased	—
WU CYC DTC CLEAR	Warm-up cycle after DTC cleared: Min.: 0, Max.: 255	—	Number of warm-up cycles after DTC cleared
MODEL CODE	Model code:	—	Identifying the model code: GSK3#
ENGINE TYPE	Engine type:	—	Identifying the engine type: 1GRFE
CYLINDER NUMBER	Cylinder number: Min.: 0, Max.: 255	—	Identifying the cylinder number: 6
TRANSMISSION	Transmission type:	—	Identifying the transmission type: ECT(5AT), M/T
DESTINATION	Destination	—	Identifying the destination: A (America)
MODEL YEAR	Model year: Min.: 0, Max.: 255	—	Identifying the model year: 200#
SYSTEM	System identification	—	Identifying the engine system: GASLIN (gasoline engine)

*1: If no idling conditions are specified, the transmission gear selector lever should be in the N or P position, and the A/C switch and all accessory switches should be OFF.

2. ACTIVE TEST

HINT:

Performing an ACTIVE TEST enables components including the relays, VSV (Vacuum Switching Valve), and actuators, to be operated without removing any parts. The ACTIVE TEST can be performed with a hand-held tester. Performing an ACTIVE TEST as the first step of troubleshooting is one method of shortening diagnostic time.

DATA LIST can be displayed during ACTIVE TESTS.

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Turn the tester ON.
- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
- (e) Perform the ACTIVE TEST by referring to the table below.

Hand-held Tester Displays	Test Details	Control Ranges	Diagnostic Notes
INJ VOL	Change injection volume	Between -12 % and 25 %	<ul style="list-style-type: none"> • All injectors tested at the same time • Perform test at less than 3,000 rpm • Injection volume can be changed in 1 % graduations within control range
A/F CONTROL	Change injection volume	Lower by 12.5 % or increase by 25 %	<ul style="list-style-type: none"> • Perform test at less than 3,000 rpm • A/F CONTROL enables checking and graphing of A/F (Air Fuel Ratio) sensor and Heated Oxygen (HO2) sensor voltage outputs • To conduct test, select following menu items: ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press YES and ENTER followed by F4
FUEL PMP SP CTL	Fuel pump speed control	ON (low speed)/OFF (high speed)	Test possible when following conditions met: <ul style="list-style-type: none"> • Engine switch on (IG) • Engine is stopped
INTAKE CTL VSV1	ACIS VSV	ON/OFF	–
EVAP VSV (ALONE)	Activate EVAP VSV control	ON/OFF	–
VVT CTRL B1	Turn on and off OCV (Oil Control Valve)	ON/OFF	<ul style="list-style-type: none"> • Engine stalls or idles roughly when OCV turned ON • Normal engine running or idling when OCV off
VVT CTRL B2	Turn on and off OCV (Oil Control Valve)	ON/OFF	<ul style="list-style-type: none"> • Engine stalls or idles roughly when OCV turned ON • Normal engine running or idling when OCV off
A/C CUT SIG	Control A/C cut signal	ON/OFF	–
FUEL PUMP/SPD	Activate fuel pump (C/OPN Relay)	ON/OFF	–
TC/TE1	Turn on and off TC and TE1 connection	ON/OFF	<ul style="list-style-type: none"> • ON: TC and TE1 connected • OFF: TC and TE1 disconnected
FC IDL PROHBT	Prohibit idling fuel cut control	ON/OFF	–
STARTER	Starter	ON/OFF	–
ACC CUT	Active ACC cut relay	ON/OFF	Test possible when following conditions met: <ul style="list-style-type: none"> • Engine switch on (IG) • Engine is stopped

ETCS OPEN SLOW	Throttle actuator	ON: throttle valve opens slowly	This test is possible when the following conditions are met: • Ignition switch ON • Engine does not start • Fully depressing accelerator pedal (APP: 58 degrees or more)
ETCS CLOSE SLOW	Throttle actuator	ON: throttle valve closes slowly	Same as above
ETCS OPEN FAST	Throttle actuator	ON: throttle valve opens fast	Same as above
ETCS CLOSE FAST	Throttle actuator	ON: throttle valve closes fast	Same as above
FUEL CUT #1	Cylinder #1 injector fuel cut	ON/OFF	This test is possible during vehicle stopping and engine idling.
FUEL CUT #2	Cylinder #2 injector fuel cut	ON/OFF	Same as above
FUEL CUT #3	Cylinder #3 injector fuel cut	ON/OFF	Same as above
FUEL CUT #4	Cylinder #4 injector fuel cut	ON/OFF	Same as above
FUEL CUT #5	Cylinder #5 injector fuel cut	ON/OFF	Same as above
FUEL CUT #6	Cylinder #6 injector fuel cut	ON/OFF	Same as above
VVT B1	Control the VVT (bank 1)	-128 to 127% This valve added to present OCV control duty 100%: Maximum advance -100%: Maximum retard	Engine stall or rough idle when the VVT actuator is operated by 100%. This test is possible during idle.
VVT B2	Control the VVT (bank 2)	Between -128% and 127%	Same as above
VENT VALVE (ALONE)	Activate vent valve (built into pump module)	ON/OFF	-
VCUUM PUMP	Activate vacuum pump (built into pump module)	ON/OFF	-

3. SYSTEM CHECK

HINT:

Performing a SYSTEM CHECK enables the system, which consists of multiple actuators, to be operated without removing any parts. In addition, it can show whether or not any DTCs are set, and can detect potential malfunctions in the system. The SYSTEM CHECK can be performed with a hand-held tester.

- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON.
- Turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK.
- Perform the SYSTEM CHECK by referring to the table below.

Hand-held Tester Displays	Test Details	Recommended Fuel Temperatures	Diagnostic Notes
EVAP SYS CHECK (AUTO OPERATION)	Perform 5 steps in order to operate EVAP key-off monitor automatically	35°C (95°F) or less	• If no DTCs in PENDING CODE after performing this test, system functioning normally • Refer to EVAP Inspection Procedure on page DI-368
EVAP SYS CHECK (MANUAL OPERATION)	Perform 5 steps in order to operate EVAP key-off monitor manually	35°C (95°F) or less	• Used to detect malfunctioning parts • Refer to EVAP Inspection Procedure on page DI-368

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the "See page" under the respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	MIL*1	Memory
P0010 (DI-70)	Camshaft Position "A" Actuator Circuit (Bank 1)	<ul style="list-style-type: none"> • Open or short in OCV circuit • OCV • ECM 	○	○
P0011 (DI-76)	Camshaft Position "A" –Timing Over– Advanced or System Performance (Bank 1)	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM 	○	○
P0012 (DI-76)	Camshaft Position "A" –Timing Over– Retarded (Bank 1)	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM 	○	○
P0016 (DI-81)	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	<ul style="list-style-type: none"> • Open or short in VVT sensor circuit • VVT sensor • ECM 	○	○
P0018 (DI-81)	Crankshaft Position – Camshaft Position Correlation (Bank 2 Sensor A)	<ul style="list-style-type: none"> • Open or short in VVT sensor circuit • VVT sensor • ECM 	○	○
P0020 (DI-70)	Camshaft Position "A" Actuator Circuit (Bank 2)	<ul style="list-style-type: none"> • Open or short in OCV circuit • OCV • ECM 	○	○
P0021 (DI-76)	Camshaft Position "A" –Timing Over– Advanced or System Performance (Bank 2)	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM 	○	○
P0022 (DI-76)	Camshaft Position "A" –Timing Over– Retarded (Bank 2)	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM 	○	○
P0031 (DI-84)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM 	○	○
P0032 (DI-84)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Short in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM 	○	○
P0037 (DI-90)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM 	○	○
P0038 (DI-90)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM 	○	○

P0051 (DI-84)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM 	○	○
P0052 (DI-84)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Short in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM 	○	○
P0057 (DI-90)	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM 	○	○
P0058 (DI-90)	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM 	○	○
P0100 (DI-98)	Mass or Volume Air Flow Circuit	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM 	○	○
P0101 (DI-106)	Mass or Volume Air Flow Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Mass air flow meter 	○	○
P0102 (DI-98)	Mass or Volume Air Flow Circuit Low Input	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM 	○	○
P0103 (DI-98)	Mass or Volume Air Flow Circuit High Input	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM 	○	○
P0110 (DI-109)	Intake Air Temperature Circuit	<ul style="list-style-type: none"> • Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM 	○	○
P0112 (DI-109)	Intake Air Temperature Circuit Low Input	<ul style="list-style-type: none"> • Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM 	○	○
P0113 (DI-109)	Intake Air Temperature Circuit High Input	<ul style="list-style-type: none"> • Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM 	○	○
P0115 (DI-115)	Engine Coolant Temperature Circuit	<ul style="list-style-type: none"> • Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM 	○	○
P0116 (DI-121)	Engine Coolant Temperature Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Engine coolant temperature sensor 	○	○
P0117 (DI-115)	Engine Coolant Temperature Circuit Low Input	<ul style="list-style-type: none"> • Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM 	○	○
P0118 (DI-115)	Engine Coolant Temperature Circuit High Input	<ul style="list-style-type: none"> • Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM 	○	○
P0120 (DI-123)	Throttle Pedal Position Sensor/Switch "A" Circuit	<ul style="list-style-type: none"> • Open or short in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM 	○	○
P0121 (DI-133)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Throttle control motor and sensor 	○	○

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P0122 (DI-123)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	<ul style="list-style-type: none"> • Short in throttle control motor and sensor circuit • Throttle control motor and sensor • Short in VTA1 circuit • Open in VC circuit • ECM 	○	○
P0123 (DI-123)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	<ul style="list-style-type: none"> • Open in throttle control motor and sensor circuit • Throttle control motor and sensor • Open in VTA1 circuit • Open in E2 circuit • VC and VTA1 circuit are short-circuited • ECM 	○	○
P0125 (DI-135)	Insufficient Coolant Temperature for Closed Loop Fuel Control	<ul style="list-style-type: none"> • Cooling system • Engine coolant temperature sensor • Thermostat 	○	○
P0128 (DI-138)	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<ul style="list-style-type: none"> • Thermostat • Cooling system • Engine coolant temperature sensor • ECM 	○	○
P0136 (DI-142)	Oxygen Sensor Circuit Malfunc- tion (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay 	○	○
P0137 (DI-142)	Oxygen Sensor Circuit Low Volt- age (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Open in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor sensor heater • EFI relay • Gas leakage from exhaust system 	○	○
P0138 (DI-142)	Oxygen Sensor Circuit High Volt- age (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Short in heated oxygen sensor circuit • Short in heated oxygen sensor • ECM internal circuit malfunction 	○	○
P0156 (DI-142)	Oxygen Sensor Circuit Malfunc- tion (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay 	○	○
P0157 (DI-142)	Oxygen Sensor Circuit Low Volt- age (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Open in heated oxygen sensor (sensor 2) circuit • Heated oxygen sensor (sensor 2) • Heated oxygen sensor heater (sensor 2) • EFI relay • Gas leakage from exhaust system 	○	○
P0158 (DI-142)	Oxygen Sensor Circuit High Volt- age (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Short in heated oxygen sensor (sensor 2) circuit • Short in heated oxygen sensor (sensor 2) • ECM internal circuit malfunction 	○	○
P0171 (DI-160)	System too Lean (Bank 1)	<ul style="list-style-type: none"> • Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater • EFI relay • PCV piping • ECM 	○	○

P0172 (DI-160)	System too Rich (Bank 1)	<ul style="list-style-type: none"> • Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • ECM 	○	○
P0174 (DI-160)	System too Lean (Bank 2)	<ul style="list-style-type: none"> • Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 2 sensor 1) circuit • Heated oxygen sensor (bank 2 sensor 1) • Heated oxygen sensor heater • EFI relay • PCV piping • ECM 	○	○
P0175 (DI-160)	System too Rich (Bank 2)	<ul style="list-style-type: none"> • Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 2 sensor 1) circuit • Heated oxygen sensor (bank 2 sensor 1) • ECM 	○	○
P0220 (DI-123)	Throttle/Pedal Position Sensor/ Switch "B" Circuit	<ul style="list-style-type: none"> • Throttle control motor and sensor • ECM 	○	○
P0222 (DI-123)	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	<ul style="list-style-type: none"> • Throttle control motor and sensor • Short in VTA2 circuit • Open in VC circuit • ECM 	○	○
P0223 (DI-123)	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	<ul style="list-style-type: none"> • Throttle control motor and sensor • Open in VTA2 circuit • Open in E2 circuit • VC and VTA2 circuit are short-circuited • ECM 	○	○
P0230 (DI-174)	Fuel Pump Primary Circuit	<ul style="list-style-type: none"> • Open or short in fuel pump relay circuit • Fuel pump relay • Circuit opening relay • Fuel pump • ECM 	-	○

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<p>P0300 (DI-179)</p>	<p>Random/Multiple Cylinder Misfire Detected</p>	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	<p>○*2</p>	<p>○</p>
<p>P0301 (DI-179)</p>	<p>Cylinder 1 Misfire Detected</p>	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	<p>○*2</p>	<p>○</p>
<p>P0302 (DI-179)</p>	<p>Cylinder 2 Misfire Detected</p>	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	<p>○*2</p>	<p>○</p>
<p>P0303 (DI-179)</p>	<p>Cylinder 3 Misfire Detected</p>	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	<p>○*2</p>	<p>○</p>

P0304 (DI-179)	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	○*2	○
P0305 (DI-179)	Cylinder 5 Misfire Detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	○*2	○
P0306 (DI-179)	Cylinder 6 Misfire Detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	○*2	○
P0327 (DI-197)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Short in knock sensor circuit • Knock sensor • ECM 	○	○
P0328 (DI-197)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Open in knock sensor circuit • Knock sensor • ECM 	○	○
P0332 (DI-197)	Knock Sensor 2 Circuit Low Input (Bank 2)	<ul style="list-style-type: none"> • Short in knock sensor circuit • Knock sensor • ECM 	○	○
P0333 (DI-197)	Knock Sensor 2 Circuit High Input (Bank 2)	<ul style="list-style-type: none"> • Open in knock sensor circuit • Knock sensor • ECM 	○	○
P0335 (DI-203)	Crankshaft Position Sensor "A" Circuit	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM 	○	○

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P0339 (DI-203)	Crankshaft Position Sensor "A" Circuit Intermittent	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM 	-	○
P0340 (DI-209)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • LH camshaft timing pulley • Jumping teeth of timing belt • ECM 	○	○
P0342 (DI-209)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	Same as DTC P0340	○	○
P0343 (DI-209)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	Same as DTC P0340	○	○
P0345 (DI-209)	Camshaft Position Sensor "A" Circuit (Bank 2)	Same as DTC P0340	○	○
P0347 (DI-209)	Camshaft Position Sensor "A" Circuit (Bank 2)	Same as DTC P0340	○	○
P0348 (DI-209)	Camshaft Position Sensor "A" Circuit (Bank 2)	Same as DTC P0340	○	○
P0351 (DI-216)	Ignition Coil "A" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 1 circuit from No. 1 ignition coil with igniter to ECM • No. 1 ignition coil with igniter • Ignition system • ECM 	○	○
P0352 (DI-216)	Ignition Coil "B" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 2 circuit from No. 2 ignition coil with igniter to ECM • No. 2 ignition coil with igniter • Ignition system • ECM 	○	○
P0353 (DI-216)	Ignition Coil "C" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 3 circuit from No. 3 ignition coil with igniter to ECM • No. 3 ignition coil with igniter • Ignition system • ECM 	○	○
P0354 (DI-216)	Ignition Coil "D" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 4 circuit from No. 4 ignition coil with igniter to ECM • No. 4 ignition coil with igniter • Ignition system • ECM 	○	○
P0355 (DI-216)	Ignition Coil "E" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 5 circuit from No. 5 ignition coil with igniter to ECM • No. 5 ignition coil with igniter • Ignition system • ECM 	○	○
P0356 (DI-216)	Ignition Coil "F" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 6 circuit from No. 6 ignition coil with igniter to ECM • No. 6 ignition coil with igniter • Ignition system • ECM 	○	○
P0420 (DI-228)	Catalyst System Efficiency Below Threshold (Bank 1)	<ul style="list-style-type: none"> • Gas leakage on exhaust system • Heated oxygen sensor (bank 1 sensor 1, 2) • Three-way catalytic converter 	○	○

P0430 (DI-228)	Catalyst System Efficiency Below Threshold (Bank 2)	<ul style="list-style-type: none"> Gas leakage on exhaust system Heated oxygen sensor (bank 2 sensor 1, 2) Three-way catalytic converter 	○	○
P043E (DI-353)	Evaporate Emission System Reference Orifice Clog Up	<ul style="list-style-type: none"> Pump module ECM 	○	○
P043F (DI-353)	Evaporate Emission System Reference Orifice High Flow	<ul style="list-style-type: none"> Pump module ECM 	○	○
P0441 (DI-236)	Evaporative Emission Control System Incorrect Purge Flow	<ul style="list-style-type: none"> Purge valve Purge valve circuit (between purge valve and ECM) Leakage from EVAP line (between purge valve and intake manifold) EVAP line (between purge valve and canister) clogged ECM 	○	○
P0450 (DI-243)	Evaporative Emission Control System Pressure Sensor/Switch [Fuel Tank Pressure Sensor]	<ul style="list-style-type: none"> Pump module (including pressure sensor) ECM 	○	○
P0451 (DI-243)	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance	<ul style="list-style-type: none"> Pump module (including pressure sensor) 	○	○
P0452 (DI-243)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	<ul style="list-style-type: none"> Pump module (including pressure sensor) Connector/Wire harness (between pump module and ECM) ECM 	○	○
P0453 (DI-243)	Evaporative Emission Control System Pressure Sensor/Switch High Input	<ul style="list-style-type: none"> Pump module (include pressure sensor) Connector/Wire harness (between pump module and ECM) ECM 	○	○
P0455 (DI-252)	Evaporative Emission Control System Leak Detected (Gross Leak)	<ul style="list-style-type: none"> Fuel tank cap (loose) Leakage from EVAP line (between canister and fuel tank) Leakage from EVAP line (between purge valve and canister) Leakage from pump module Leakage from fuel tank Leakage from canister 	○	○
P0456 (DI-252)	Evaporative Emission Control System Leak Detected (Very Small Leak)	<ul style="list-style-type: none"> Same as DTC No. P0445 	○	○
P0500 (DI-257)	Vehicle Speed Sensor "A"	<ul style="list-style-type: none"> Combination meter Open or short in vehicle speed sensor circuit Vehicle speed sensor ECM 	○	○
P0503 (DI-257)	Vehicle Speed Sensor "A" Intermittent/Erratic/High	<ul style="list-style-type: none"> Combination meter Open or short in vehicle speed sensor circuit Vehicle speed sensor ECM 	-	○
P0504 (DI-261)	Brake Switch "A"/"B" Correlation	<ul style="list-style-type: none"> Short in stop lamp switch signal circuit STOP fuse Stop lamp switch ECM 	-	○
P0505 (DI-266)	Idle Air Control System	<ul style="list-style-type: none"> Air induction system Electric throttle control system PCV hose connection 	○	○
P050A (DI-269-1)	Cold Start Idle Air Control System Performance	<ul style="list-style-type: none"> ETCS (Electronic Throttle Control System) Air induction system PCV hose connections ECM 	○	○

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P050B (DI-269-1)	Cold Start Ignition Timing Performance	<ul style="list-style-type: none"> • ETCS (Electronic Throttle Control System) • Air induction system • PCV hose connections • ECM 	○	○
P0560 (DI-270)	System Voltage	<ul style="list-style-type: none"> • Back-up power source circuit • EFI No. 1 fuse • ECM 	○	○
P0604 (DI-274)	Internal Control Module Random Access Memory (RAM) Error	<ul style="list-style-type: none"> • ECM 	○	○
P0606 (DI-274)	ECM/PCM Processor	<ul style="list-style-type: none"> • ECM 	○	○
P0607 (DI-274)	Control Module Performance	<ul style="list-style-type: none"> • ECM 	○	○
P0617 (DI-276)	Starter Relay Circuit High	<ul style="list-style-type: none"> • Park/neutral position switch • Starter relay circuit • Ignition switch • ECM 	○	○
P0630 (DI-281)	VIN not Programmed or Mis- match-ECM/PCM	<ul style="list-style-type: none"> • ECM 	○	○
P0657 (DI-274)	Actuator Supply Voltage Circuit/ Open	<ul style="list-style-type: none"> • ECM 	○	○
P0705 (DI-993)	Transmission Range Sensor Cir- cuit Malfunction (PRNDL Input)	<ul style="list-style-type: none"> • Electronic Controlled Automatic Transaxle (ECT) 	○	○
P0710 (DI-999)	Transmission Fluid Temperature Sensor "A" Circuit	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0711 (DI-1005)	Transmission Fluid Temperature Sensor "A" Performance	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0712 (DI-999)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0713 (DI-999)	Transmission Fluid Temperature Sensor "A" Circuit High Input	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0717 (DI-1008)	Input/Turbine Speed Sensor "A" Circuit No Signal	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0722 (DI-1013)	Output Speed Sensor Circuit No Signal	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0724 (DI-1017)	Brake Switch "B" Circuit High	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0748 (DI-1020)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0751 (DI-1025)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0756 (DI-1031)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0771 (DI-1037)	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0776 (DI-1042)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0778 (DI-1048)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○

P0781 (DI-1053)	1-2 Shift (1-2 Shift Valve)	• Electronic control automatic transmission (ECT)	○	○
P0973 (DI-1058)	Shift Solenoid "A" Control Circuit Low (Shift solenoid Valve S1)	• Electronic control automatic transmission (ECT)	○	○
P0974 (DI-1058)	Shift Solenoid "A" Control Circuit High (Shift solenoid Valve S1)	• Electronic control automatic transmission (ECT)	○	○
P0976 (DI-1063)	Shift Solenoid "B" Control Circuit Low (Shift solenoid Valve S2)	• Electronic control automatic transmission (ECT)	○	○
P0977 (DI-1063)	Shift Solenoid "B" Control Circuit High (Shift solenoid Valve S2)	• Electronic control automatic transmission (ECT)	○	○
P0985 (DI-1068)	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	• Electronic control automatic transmission (ECT)	○	○
P0986 (DI-1068)	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	• Electronic control automatic transmission (ECT)	○	○
P2102 (DI-283)	Throttle Actuator Control Motor Circuit Low	• Open in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM	○	○
P2103 (DI-283)	Throttle Actuator Control Motor Circuit High	• Short in throttle control motor and sensor circuit • Throttle control motor and sensor • Throttle valve • Throttle body • ECM	○	○
P2111 (DI-287)	Throttle Actuator Control System – Stuck Open	• Throttle control motor and sensor circuit • Throttle control motor and sensor • Throttle valve • Throttle body	○	○
P2112 (DI-287)	Throttle Actuator Control System – Stuck Closed	• Throttle control motor and sensor circuit • Throttle control motor and sensor • Throttle valve • Throttle body	○	○
P2118 (DI-291)	Throttle Actuator Control Motor Current Range/Performance	• Open in throttle control motor and sensor power source circuit • ETCS fuse • ECM	○	○
P2119 (DI-296)	Throttle Actuator Control Throttle Body Range/Performance	• Electric throttle control system • Throttle body	○	○
P2120 (DI-299)	Throttle/Pedal Position Sensor/Switch "D" Circuit	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2121 (DI-309)	Throttle/Pedal Position Sensor/Switch "D" Circuit Range/Performance	• Accelerator pedal position sensor	○	○
P2122 (DI-299)	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	• Open in accelerator pedal position sensor circuit • Accelerator pedal position sensor • VCPA circuit open • VPA circuit open or ground short • ECM	○	○
P2123 (DI-299)	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	• Short in accelerator pedal position sensor circuit (+B circuit) • Accelerator pedal position sensor • EPA circuit open • ECM	○	○
P2125 (DI-299)	Throttle/Pedal Position Sensor/Switch "E" Circuit	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○

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P2127 (DI-299)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	<ul style="list-style-type: none"> • Open in accelerator pedal position sensor circuit • Accelerator pedal position sensor • VCP2 circuit open • VPA2 circuit open or ground short • ECM 	○	○
P2128 (DI-299)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	<ul style="list-style-type: none"> • Short in accelerator pedal position sensor circuit (+B circuit) • Accelerator pedal position sensor • EPA circuit open • ECM 	○	○
P2135 (DI-123)	Throttle/Pedal Position Sensor/ Switch "A" / "B" Voltage Correlation	<ul style="list-style-type: none"> • Throttle control motor and sensor • VTA1 and VTA2 circuit are short-circuited • ECM 	○	○
P2138 (DI-299)	Throttle/Pedal Position Sensor/ Switch "D" / "E" Voltage Correlation	<ul style="list-style-type: none"> • Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • VPA and VPA2 circuit are short circuited • ECM 	○	○
P2195 (DI-312)	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • ECM 	○	○
P2196 (DI-312)	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • ECM 	○	○
P2197 (DI-312)	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • ECM 	○	○
P2198 (DI-312)	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • ECM 	○	○
P2238 (DI-330)	Oxygen Sensor Pumping Current Circuit Low (For A/F Sensor) (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○

P2239 (DI-330)	Oxygen Sensor Pumping Current Circuit High (For A/F Sensor) (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2241 (DI-330)	Oxygen Sensor Pumping Current Circuit Low (For A/F Sensor) (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2242 (DI-330)	Oxygen Sensor Pumping Current Circuit High (For A/F Sensor) (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2252 (DI-330)	Oxygen Sensor Reference Ground Current Circuit Low (For A/F Sensor) (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2253 (DI-330)	Oxygen Sensor Reference Current Circuit High (For A/F Sensor) (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2255 (DI-330)	Oxygen Sensor Reference Ground Current Circuit Low (For A/F Sensor) (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2256 (DI-330)	Oxygen Sensor Reference Current Circuit High (For A/F Sensor) (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2401 (DI-339)	Evaporative Emission System Leak Detection Pump Control Circuit Low	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P2402 (DI-339)	Evaporative Emission System Leak Detection Pump Control Circuit High	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P2419 (DI-345)	Evaporate Emission System Switching Valve Control Circuit Low	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P2420 (DI-345)	Evaporate Emission System Switching Valve Control Circuit High	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P2610 (DI-351)	ECM/PCM Internal Engine Off Timer Performance	<ul style="list-style-type: none"> • ECM 	○	○
P2714 (DI-1073)	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2716 (DI-1079)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2740 (DI-1083)	Transmission Fluid Temperature Sensor "B" Circuit	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○

DIAGNOSTICS - ENGINE (1GR-FE)

P2742 (DI-1083)	Transmission Fluid Temperature Sensor "B" Circuit Low Input	• Electronic control automatic transmission (ECT)	○	○
P2743 (DI-1083)	Transmission Fluid Temperature Sensor "B" Circuit High Input	• Electronic control automatic transmission (ECT)	○	○
P2757 (DI-1089)	Torque Converter clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	• Electronic control automatic transmission (ECT)	○	○
P2759 (DI-1097)	Torque Converter clutch Pressure Control Solenoid Electrical (Shift Solenoid Valve SLU)	• Electronic control automatic transmission (ECT)	○	○
P2A00 (DI-359)	A/F Sensor Circuit Slow Response (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • EFI relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • PCV valve and hose • PCV hose connections • ECM 	○	○
P2A03 (DI-359)	A/F Sensor Circuit Slow Response (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • EFI relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • PCV valve and hose • PCV hose connections • ECM 	○	○

*1: - MIL does not light up. ○ MIL lights up.

*2: MIL lights up or blinks.

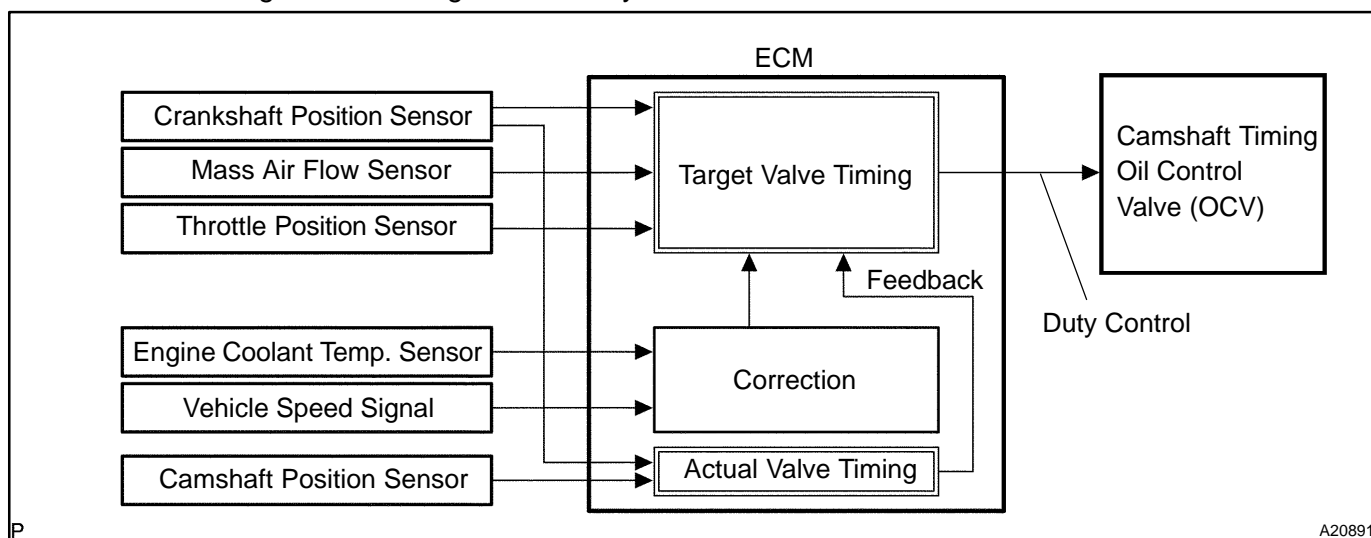
CIRCUIT INSPECTION

DTC	P0010	Camshaft Position "A" Actuator circuit (Bank 1)
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DTC	P0020	Camshaft Position "A" Actuator circuit (Bank 2)
------------	--------------	--

CIRCUIT DESCRIPTION

The Variable Valve Timing (VVT) system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target "duty-cycle" control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. Camshaft timing control is performed based on engine operation conditions such as intake air volume, throttle position and engine coolant temperature. The ECM controls the OCV, based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As a result, the relative position between the camshaft and the crankshaft is optimized, and the engine torque improves, fuel economy improves, and exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using signals from the camshaft position sensor and the crankshaft position sensor, and performs feedback control. This is how target valve timing is verified by the ECM.



P

A20891

DTC No.	DTC Detecting Condition	Trouble Area
P0010 P0020	Open or short in OCV circuit	<ul style="list-style-type: none"> • Open or short in OCV circuit • OCV • ECM

MONITOR DESCRIPTION

After the ECM sends the "target" duty-cycle signal to the OCV (Oil Control Valve), the ECM monitors the OCV current to establish an "actual" duty-cycle. When the actual duty-cycle ratio varies from the target duty-cycle, the ECM sets a DTC.

MONITOR STRATEGY

Related DTCs	P0010	VVT oil control valve bank 1 range check
	P0020	VVT oil control valve bank 2 range check
Required sensors/components	OCV	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Battery voltage	11 V	13 V
Target duty ratio	-	70%
Starter	OFF	
Current cut status	Not cut	

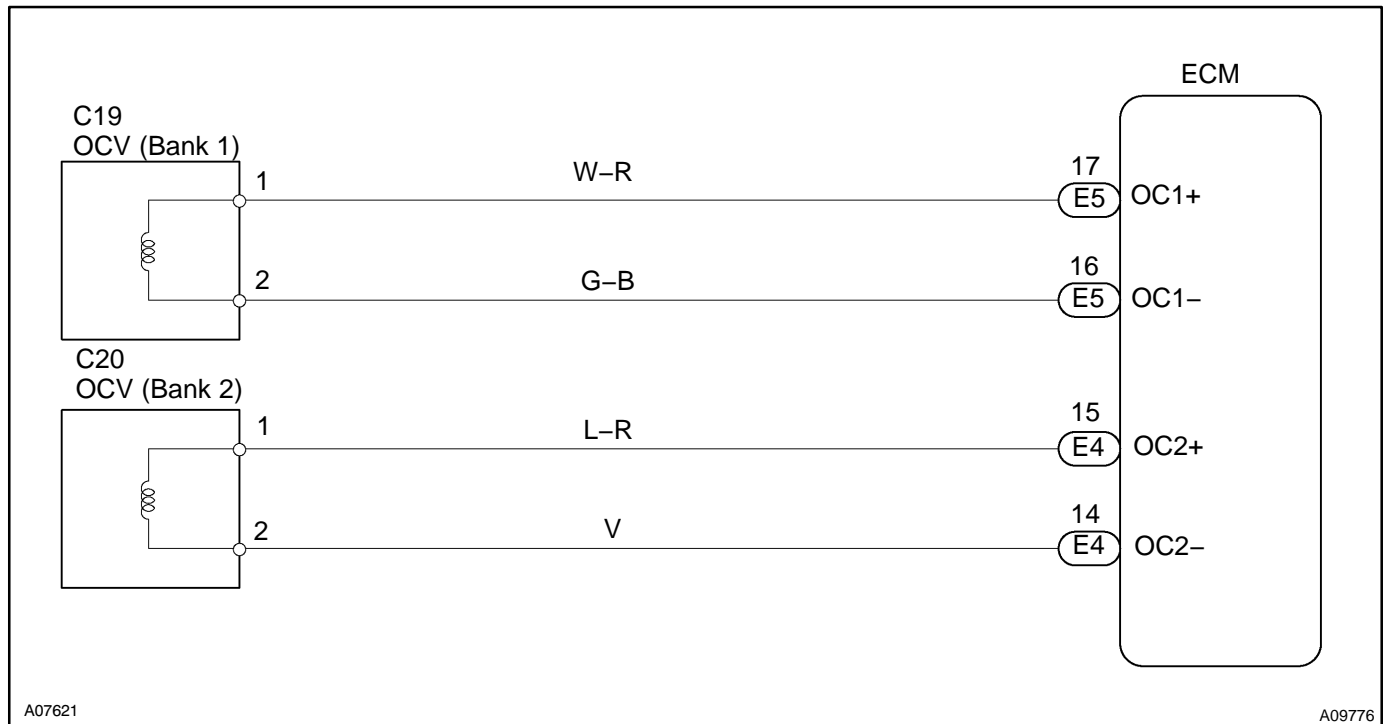
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition 1 or 2
1. Output signal duty for OCV	Output duty ratio is 100% (always ON) but target duty ratio is less than 70%
2. Output signal duty for OCV	Output duty is 3% or less despite the ECM supplying current to the OCV

COMPONENT OPERATING RANGE

Parameter	Standard Value
Output signal duty for OCV	"More than 3%" and "less than 100%"

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0010 displayed, check left bank OCV circuit.
- If DTC P0020 displayed, check right bank OCV circuit.
- Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check OCV circuit.
----------	---------------------------

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and warm it up.
- (c) Turn the ignition switch to ON and turn the hand-held tester ON.

CHECK:

- (a) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1 or VVT CTRL B2.
- (b) Using the hand-held tester, operate the OCV and check the engine speed.

OK:

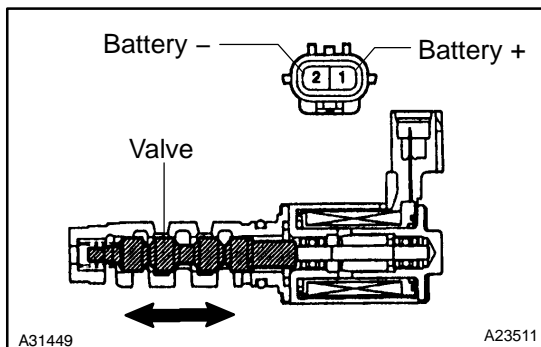
Standard:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK	Check for intermittent problems (See page DI-11).
-----------	--

NG

2	Check operation of OCV).
----------	---------------------------------



PREPARATION:

- (a) Start the engine and warmed it up.
- (b) Disconnect the OCV connector.
- (c) Apply battery positive voltage between the terminals of the OCV.

CHECK:

Check the engine speed.

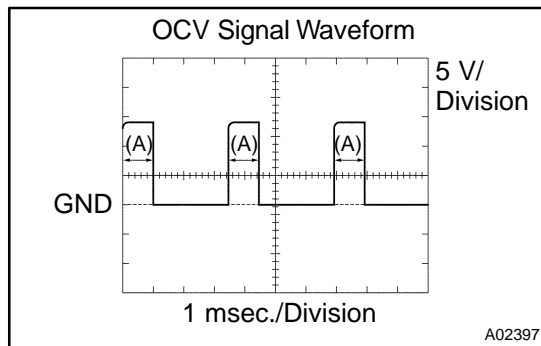
OK:

Rough idle or engine stalled.

NG	Replace OCV.
-----------	---------------------

OK

3 Check voltage between terminals OC1+ and OC1-, OC2+ and OC2- of ECM connector.

**CHECK:**

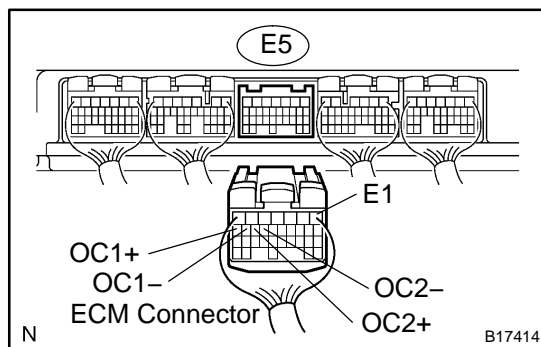
- Inspection using the oscilloscope.
- During idling, check the waveform between the specified terminals of the E5 ECM connector.

HINT:

The waveform frequency (A) is lengthened as the engine speed becomes higher.

OK:**Standard:**

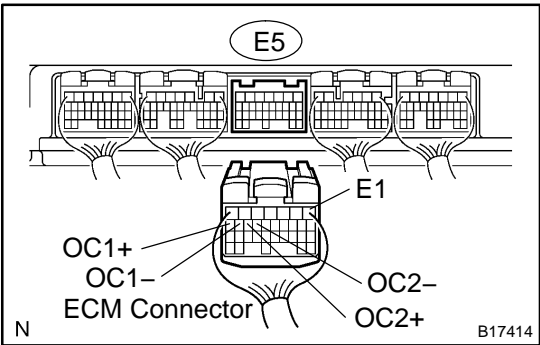
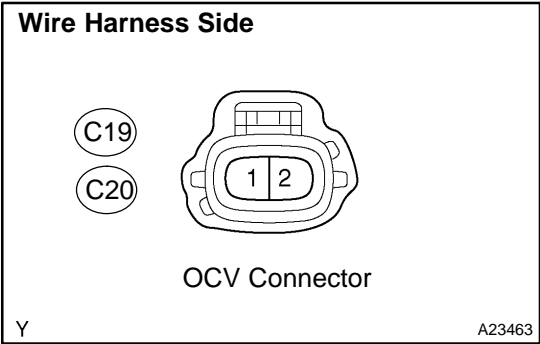
The correct waveform is as shown.

**NG**

Replace ECM (See page SF-66).

OK

4 Check for open and short in harness and connector between OCV and ECM.



PREPARATION:

- (a) Disconnect the C19 or C20 OCV connector.
- (b) Disconnect the E5 ECM connector.

CHECK:

Check for resistance between the wire harness side connectors.

OK:

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OCV (C20-1) – OC1+ (E5-17)	Below 1 Ω
OCV (C20-2) – OC1- (E5-16)	Below 1 Ω
OCV (C19-1) – OC2+ (E5-15)	Below 1 Ω
OCV (C19-2) – OC2- (E5-14)	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OCV (C20-1) or OC1+ (E5-17) – E1 (E5-1)	10 kΩ or higher
OCV (C20-2) or OC1- (E5-16) – E1 (E5-1)	10 kΩ or higher
OCV (C19-1) or OC2+ (E5-15) – E1 (E5-1)	10 kΩ or higher
OCV (C19-2) or OC2- (E5-14) – E1 (E5-1)	10 kΩ or higher

NG → **Repair or replace harness or connector.**

OK

Check for intermittent problems (See page DI-11).

DTC	P0011	Camshaft Position "A" –Timing Over-Advanced or System Performance (Bank 1)
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DTC	P0012	Camshaft Position "A" –Timing Over-Retarded (Bank 1)
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DTC	P0021	Camshaft Position "A" –Timing Over-Advanced or System Performance (Bank 2)
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DTC	P0022	Camshaft Position "A" –Timing Over-Retarded (Bank 2)
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CIRCUIT DESCRIPTION

Refer to DTCs P0010 on page [DI-70](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0011 P0021	Advanced cam timing: After engine is warmed up and engine speed is at 400 to 4,000 rpm, condition (a) continues. (1 trip detection logic) (a) Valve timing does not change from current valve timing	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM
P0012 P0022	Retarded cam timing: After engine is warmed up and engine speed is at 400 to 4,000 rpm, condition (a) continues. (2 trip detection logic) (a) Valve timing does not change from current valve timing	

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target "duty-cycle" control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.

Example:

A DTC will set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the crankshaft angle (CA) and the condition continues for more than 4.5 sec.; or 2) the OCV is forcibly activated 70 times or more.

Advanced cam DTCs are subject to "1 trip" detection logic.

Retarded cam DTCs are subject to "2 trip" detection logic.

MONITOR STRATEGY

Related DTCs	P0011	VVT system advance (Bank 1)
	P0012	VVT system retard (Bank 1)
	P0021	VVT system advance (Bank 2)
	P0022	VVT system retard (Bank 2)
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Crankshaft position sensor
Frequency of operation	Once per drive cycle	
Duration	10 sec.	
MIL operation	P0011, P0021: Immediate P0012, P0022: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Battery voltage	11 V	–
Engine RPM	500 rpm	4,000 rpm
ECT	75°C (167°F)	100°C (212°F)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0011, P0021 (Advance):	
Deviation of actual valve timing and target valve timing	More than 5°CA (Crankshaft angle)
Valve timing	No change at advanced valve timing
P0012, P0022 (Retard):	
Deviation of actual valve timing and target valve timing	More than 5°CA (Crankshaft angle)
Valve timing	No change at retarded valve timing

WIRING DIAGRAM

Refer to DTCs P0010 on page [DI-70](#).

INSPECTION PROCEDURE

HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Bank 2 refers to bank that does not include cylinder No. 1.
- If DTC P0011, P0012 is displayed, check the bank 1 VVT system.
- If DTC P0021, P0022 is displayed, check the bank 2 VVT system.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check operation of OCV.
----------	--------------------------------

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and warm it up.
- (c) Turn the ignition switch to ON and turn the hand-held tester ON.

CHECK:

- (a) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1 or VVT CTRL B2.
- (b) Using the hand-held tester, operate the OCV and check the engine speed.

OK:**Standard:**

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK**VVT system is OK.***

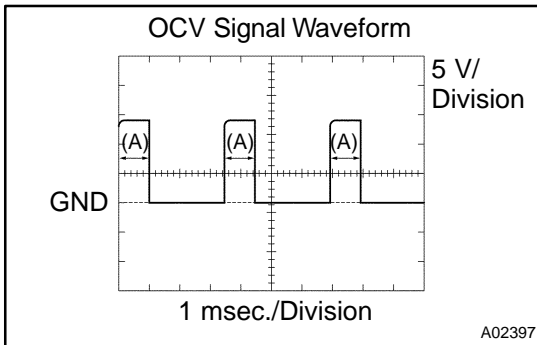
*: DTC P0011, P0012, P0021 or P0022 is also output when a foreign object is detected in some parts of the system in the engine oil, and then the system returns to normal in a short time. As ECM is controlled to eject a foreign object, there is no problem on the VVT. There is also no problem on the VVT as the oil filter should catch the foreign object in the engine oil.

NG

2	Check valve timing (See page EM-44).
----------	---

NG**Adjust valve timing.****OK**

3 Check voltage between terminals OCV+ and OCV- of ECM connector.

**CHECK:**

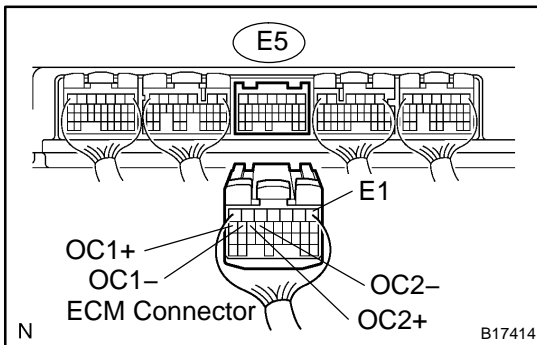
- (a) Inspection using the oscilloscope.
- (b) During idling, check the waveform between the specified terminals of the E5 ECM connector.

HINT:

The waveform frequency (A) is lengthened as the engine speed becomes higher.

OK:**Standard:**

The correct waveform is as shown.

**NG**

Replace ECM (See page [SF-66](#)).

OK

4 Check OCV (See page [EM-70](#)).

NG

Replace OCV, and then go to step 6.

OK

5 Check camshaft timing gear assembly (See page [EM-70](#)).

NG

Replace camshaft timing gear, and then go to step 7.

OK

6	Check oil control valve filter.
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NG	Replace oil control valve filter.
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7	Check whether or not DTC P0010, P0012, P0021 or P0022 is stored.
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PREPARATION:

- (a) Clear the DTC (See page [DI-42](#)).
- (b) Perform simulation test.

CHECK:

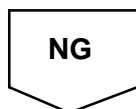
Check whether or not DTC P0011, P0012, P0021 or P0022 is stored (See page [DI-42](#)).

OK:**Standard:**

DTC P0011, P0012, P0021 or P0022 is not stored.

OK	VVT system is OK.*
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*: DTC P0011, P0012, P0021 or P0022 is also output when a foreign object is detected in some parts of the system in the engine oil, and then the system returns to normal in a short time. As ECM is controlled to eject a foreign object, there is no problem on the VVT. There is also no problem on the VVT as the oil filter should catch the foreign object in the engine oil.



Replace ECM (See page SF-66).
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DTC	P0016	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)
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DTC	P0018	Crankshaft Position – Camshaft Position Correlation (Bank 2 Sensor A)
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CIRCUIT DESCRIPTION

The crankshaft position sensor (CKP) system consists of a crankshaft position sensor plate and a pick-up coil.

The sensor plate has 34 teeth and is installed on the crankshaft. The pick-up coil is made of an iron core and magnet. The sensor plate rotates and as each tooth passes through the pick-up coil, a pulse signal is created. The pick-up coil generates 34 signals for each engine revolution. Based on these signals, the ECM calculates the crankshaft position and engine RPM. Using these calculations, the fuel injection time and ignition timing are controlled.

DTC No.	DTC Detection Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and VVT sensor 1 signal (2 trip detection logic)	<ul style="list-style-type: none"> • Mechanical system (Jumped tooth of timing chain, chain stretched) • ECM
P0018	Deviation in crankshaft position sensor signal and VVT sensor 2 signal (2 trip detection logic)	

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the Variable Valve Timing (VVT) system to control the intake valve camshaft. The VVT system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target "duty-cycle" control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft. The ECM calibrates the valve timing of the VVT system by setting the camshaft to the maximum retard angle when the engine speed is idling. The ECM closes the OCV to retard the cam. The ECM stores this value as "VVT learned value." (When the difference between the target valve timing and the actual valve timing is 5 degrees or less, the ECM stores this in its memory.)

If the learned value meets both of the following conditions ("a" and "b"), the ECM interprets this as a defect in the VVT system and sets a DTC.

- (a) "VVT learning" value is less than 22° CA or more than 47° CA.
- (b) Above condition continues for more than 18 seconds.

MONITOR STRATEGY

Related DTCs	P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (Bank 1)
	P0018	Deviation in crankshaft position sensor signal and camshaft position sensor signal (Bank 2)
Required sensors/components	Crankshaft position sensor, Camshaft position sensor	
Frequency of operation	Once per drive cycle	
Duration	60 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Engine RPM	500 rpm	1,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

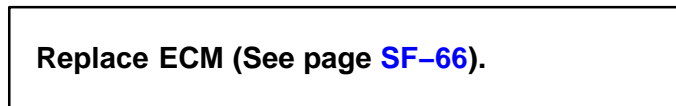
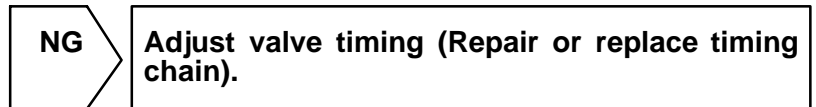
Detection Criteria	Threshold
One of the following condition is met	Condition (a) or (b)
(a) VVT learning value at maximum retarded valve timing	Less than 22.5° CA (Crankshaft angle)
(b) VVT learning value at maximum retarded valve timing	More than 45.2° CA (Crankshaft angle)

INSPECTION PROCEDURE

HINT:

- If DTC P0016 is displayed, check left bank VVT sensor.
- If DTC P0018 is displayed, check right bank VVT sensor.
- Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check valve timing (Check for loose and jumping teeth of timing chain) (See page EM-44).
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DTC	P0031	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 1 Sensor 1)
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DTC	P0032	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 1 Sensor 1)
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DTC	P0051	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 2 Sensor 1)
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DTC	P0052	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 2 Sensor 1)
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HINT:

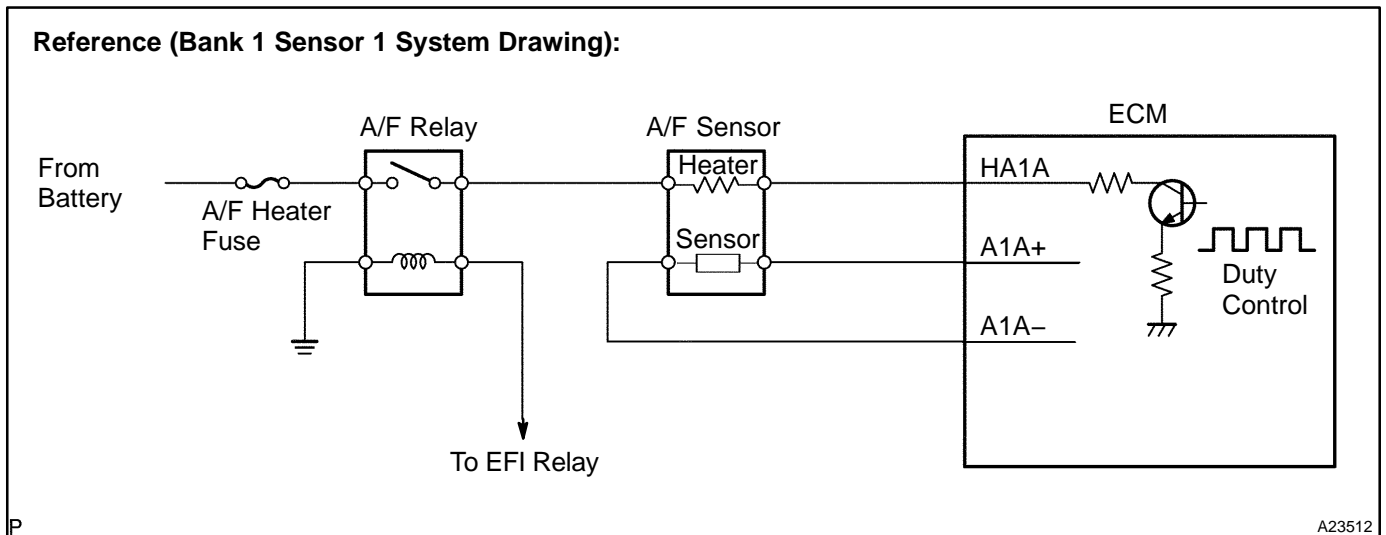
Although each DTC title (DTC description) says "oxygen sensor", these DTCs are related to the "A/F sensor".

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page [DI-312](#).

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The A/F sensor heater circuit uses a relay on the B+ side of the circuit.



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0051	Heated current is 0.8 A or less when heater operates (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in heater circuit of A/F sensor • A/F sensor heater
P0032 P0052	Hybrid IC high current limiter port is fail (1 trip detection logic)	<ul style="list-style-type: none"> • A/F sensor heater relay • ECM

HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

MONITOR DESCRIPTION

The ECM uses the Air–Fuel Ratio sensor (A/F sensor) information to regulate the air–fuel ratio close to the stoichiometric ratio. This maximizes the catalytic converter’s ability to purify exhaust gases. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM.

The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to exhaust gas. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The zirconia element generates a small voltage when there is a large difference in the oxygen concentrations of the exhaust and the outside air. The platinum coating amplifies the voltage generation. When heated, the sensor becomes very efficient. If the temperature of the exhaust is low, the sensor will not generate useful voltage signals without supplemental heating. The ECM regulates the supplemental heating using a duty–cycle approach to regulate the average current in the heater element. If the heater current is out of the normal range, the sensor’s output signals will be inaccurate and the ECM can not regulate the air–fuel ratio properly.

When the heater current is out of the normal operating range, the ECM interprets this as a malfunction and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0031	A/F sensor heater (Bank 1) range check (Low current)
	P0032	A/F sensor heater (Bank 1) range check (High current)
	P0051	A/F sensor heater (Bank 2) range check (Low current)
	P0052	A/F sensor heater (Bank 2) range check (High current)
Required sensors/components	Main sensors/components	A/F sensor heater
	Related sensors/components	–
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
P0031, P0051 (Low current):		
Battery voltage	10.5 V	–
A/F sensor heater duty ratio	50%	–
Time after engine start	10 sec.	–
P0032, P0052 (High current):		
Time after engine start	10 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0031, P0051 (Low current):	
A/F sensor heater current	Less than 0.8 A
P0032, P0052 (High current):	
A/F sensor heater current	More than 10 A

COMPONENT OPERATING RANGE

Parameter	Standard Value
A/F sensor heater current	1.8 to 3.4 A at 20 °C (68 °F)

MONITOR RESULT

Refer to page [DI-26](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page [DI-27](#)).

- TID (Test Identification Data) is assigned to each emissions-related component.
- TLT (Test Limit Type):
If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.

TID \$07: A/F sensor heater

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	\$01	Multiply by 0.00017 (A)	Maximum heater current (Bank 1)	Malfunction criteria for A/F sensor heater
1	\$10	Multiply by 0.00017 (A)	Maximum heater current (Bank 2)	Malfunction criteria for A/F sensor heater

WIRING DIAGRAM

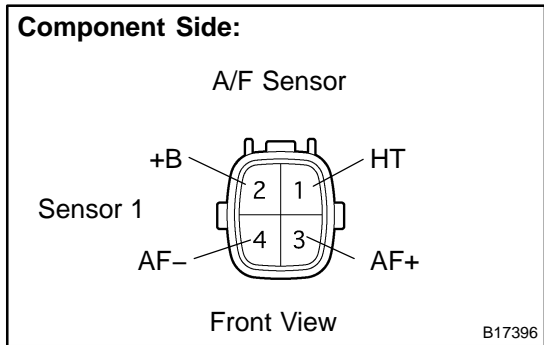
Refer to DTC P2195 on page [DI-312](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1 Check resistance of air-fuel ratio (A/F) sensor heater.



PREPARATION:

Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

OK:

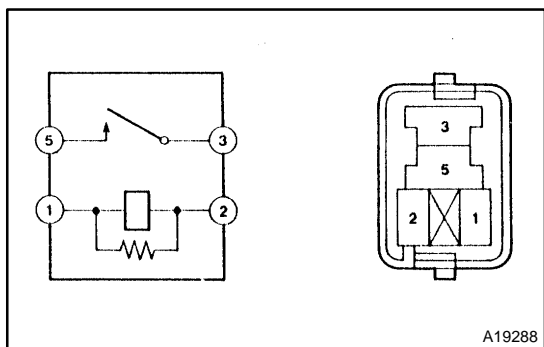
Standard:

Tester Connection	Specified Condition
HT (1) - +B (2)	1.8 Ω to 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 kΩ or higher

NG Replace air-fuel ratio (A/F) sensor.

OK

2 Check A/F relay.



PREPARATION:

Remove the A/F relay from the engine room J/B.

CHECK:

Inspect the A/F relay.

OK:

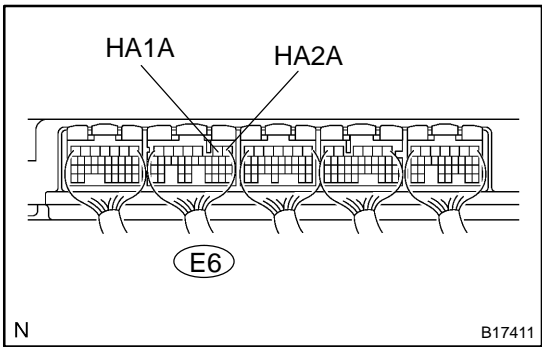
Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Usually	10 KΩ or higher
3 - 5	Apply B+ between terminals 2 and 4	Below 1 Ω

NG Replace A/F relay.

OK

3 Check voltage between terminals HA1A, HA2A of ECM connectors and body ground.



PREPARATION:

Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminals of the ECM connectors and body ground.

HINT:

- Connect terminal HA1A to the bank 1 sensor 1.
- Connect terminal HA2A to the bank 2 sensor 1.

OK:

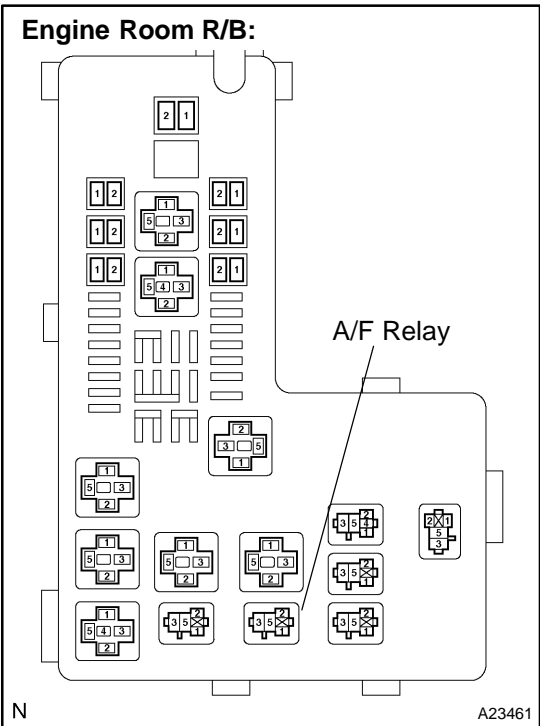
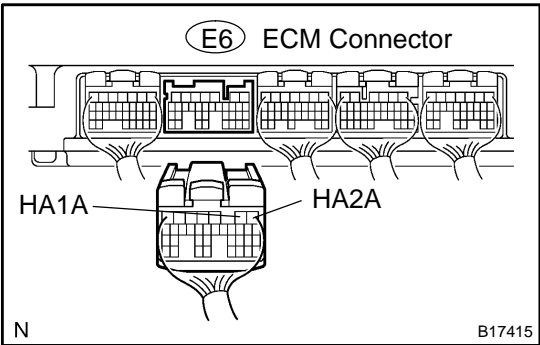
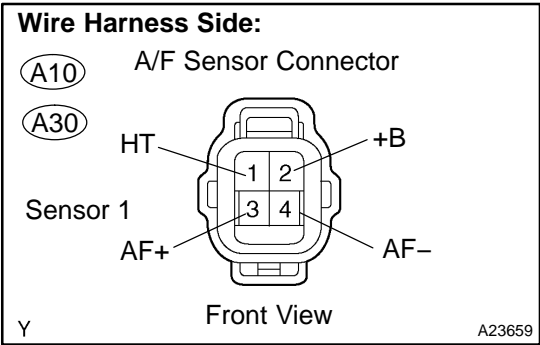
Standard:

Tester Connection	Specified Condition
HA1A (E6-2) - Body ground	9 V to 14 V
HA2A (E6-1) - Body ground	9 V to 14 V

NG Replace ECM (See page [SF-66](#)).

NG

4 Check for open and short circuit in harness and connector between A/F sensor and ECM, A/F sensor and A/F relay.



PREPARATION:

- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Disconnect the E6 ECM connector.

CHECK:

Check for resistance between the wire harness side connectors.

OK:

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
HT (A10-1) - HA1A (E6-2)	Below 1 Ω
HT (A30-1) - HA2A (E6-1)	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
HT (A10-1) or HA1A (E6-2) - Body ground	10 kΩ or higher
HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher

PREPARATION:

- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Remove the A/F sensor heater relay from the engine room R/B.

CHECK:

Check for resistance between the wire harness side connectors.

OK:

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (A10-2) - A/F sensor heater relay (3)	Below 1 Ω
+B (A47-2) - A/F sensor heater relay (3)	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (A10-2) or A/F sensor heater relay (3) - Body ground	10 kΩ or higher
+B (A30-2) or A/F sensor heater relay (3) - Body ground	10 kΩ or higher

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF-66).

DTC	P0037	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)
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DTC	P0038	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)
------------	--------------	--

DTC	P0057	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)
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DTC	P0058	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)
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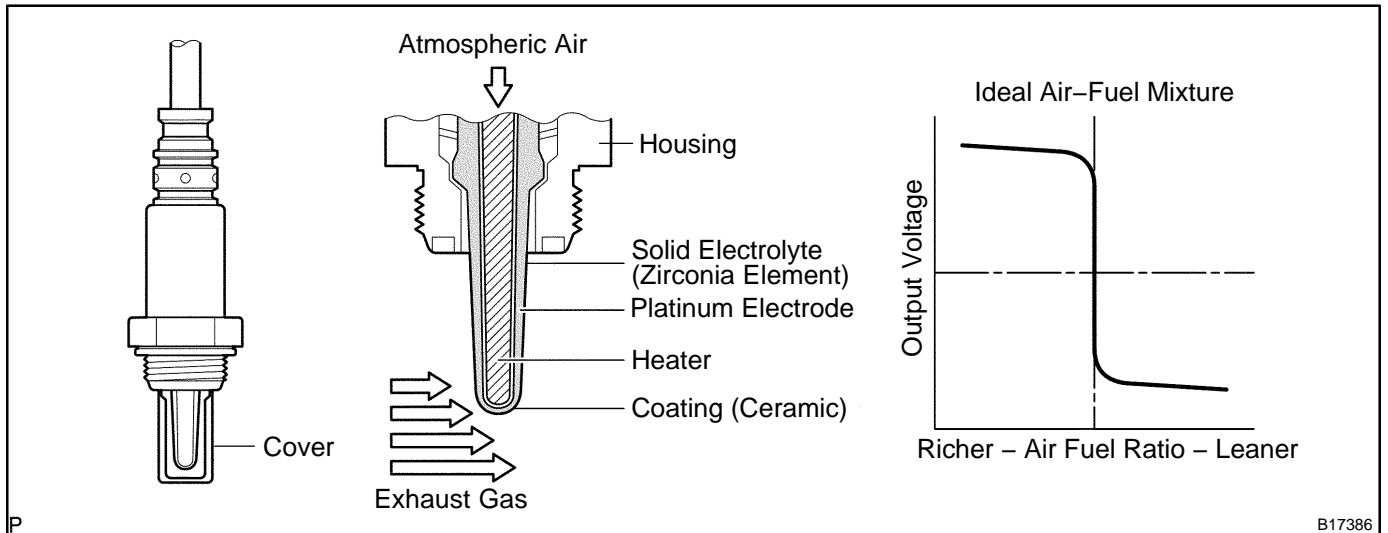
CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NO_x components of the exhaust gas, a three-way catalytic converter is used, but for the most efficient use of the three-way catalytic converter, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric air-fuel ratio.

The heated oxygen sensor has the characteristic which its output voltage changes suddenly in the vicinity of the stoichiometric air-fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback to control the air-fuel ratio.

When the air-fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).

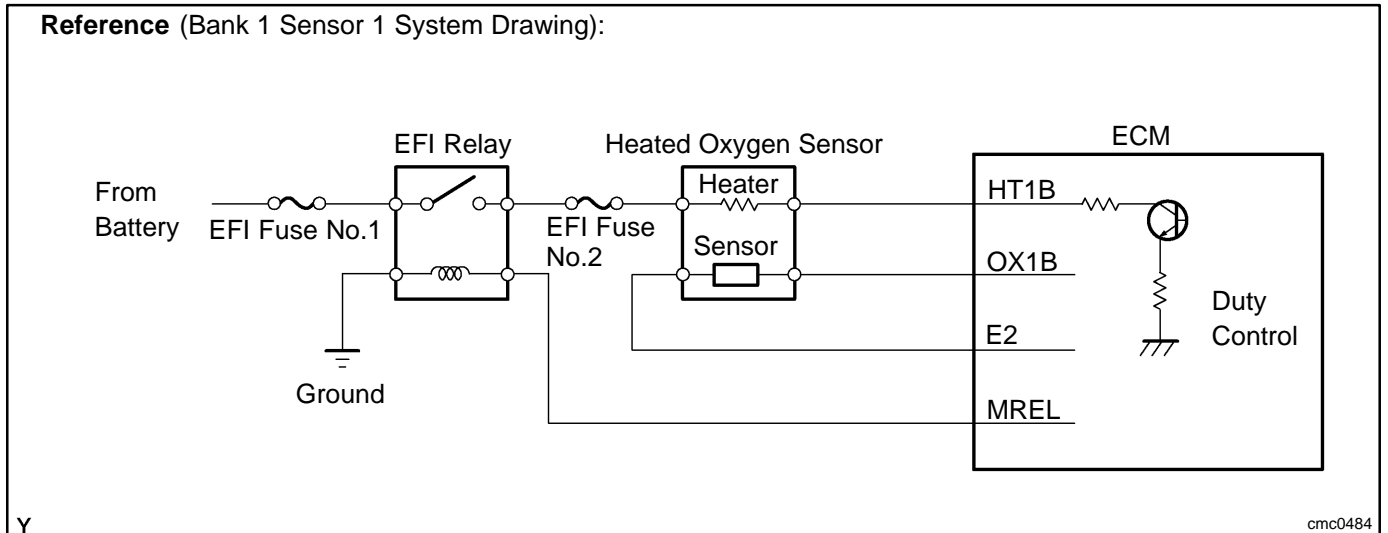
When the air-fuel ratio is RICHER than the stoichiometric air-fuel ratio, the oxygen concentration in the exhaust gas is reduced and the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V). The ECM judges by the voltage output from the heated oxygen sensor whether the air-fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the heated oxygen sensor causes output of abnormal voltage, this disables the ECM for performing an accurate air-fuel ratio control. The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.



HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing):



Y

DTC No.	DTC Detecting Condition	Trouble Area
P0037 P0057	Heater current is less than 0.3 A when the heater operates with more than 10.5 V positive battery voltage	<ul style="list-style-type: none"> • Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM
P0038 P0058	When heater operates, heater current exceeds 2.0 A	<ul style="list-style-type: none"> • Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM

HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Bank 2 refers to bank that does not includes cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine assembly.
- Sensor 2 refers to the sensor farther away from the engine assembly.

MONITOR DESCRIPTION

The sensing portion of the heated oxygen sensor has a zirconia element which is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and difference of the oxygen concentration between the inside and outside surface of sensor is large, the zirconia element will generate voltage signals. In order to increase the oxygen concentration detecting capacity in the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When current in the sensor is out of the standard operating range, the ECM interprets this as a fault in the heated oxygen sensor and sets a DTC.

Example:

The ECM will set a high current DTC if the current in the sensor is more than 2.0 A when the heater is OFF. Similarly, the ECM will set a low current DTC if the current is less than 0.3 A when the heater is ON.

MONITOR STRATEGY

Related DTCs	P0037	Rear HO2S heater (Bank 1) range check (Low Current)
	P0038	Rear HO2S heater (Bank 1) range check (High Current)
	P0057	Rear HO2S heater (Bank 2) range check (Low Current)
	P0058	Rear HO2S heater (Bank 2) range check (High Current)
Required sensors/components	Main sensors/components	HO2S heater
	Related sensors/components	Vehicle speed sensor (VSS)
Frequency of operation	Continuous	
Duration	0.3 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
P0037, P0057 (Low current):		
Battery voltage	10.5 V	-
Engine	Running	
Starter	OFF	
Intrusive heating	Not operating	
All heater is turned OFF and intrusive heating is operated when the following conditions are met	Condition (a) and (b)	
(a) Heater	ON	
(b) Heater current	-	0.3 A
P0038, P0058 (High current):		
Case 1:		
Battery voltage	10.5 V	-
Engine	Running	
Starter	OFF	
Intrusive heating	Not operating	
Case 2:		
Battery voltage	10.5 V	-
All heater is turned OFF and intrusive heating is operated when the following conditions are met	Condition (a) and (b)	
(a) Heater	ON	
(b) Heater current	2 A	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0037, P0057 (Low current):	
HO2S heater current during intrusive heating	Less than 0.3 A (when battery voltage is 10.5 V or more)
P0038, P0058 (High current):	
Case 1:	
HO2S heater current	2 A or more
Case 2:	
HO2S heater current during intrusive heating	More than 2 A

COMPONENT OPERATING RANGE

Parameter	Standard Value
HO2S heater current	0.4 to 1 A (at idle, warmed-up engine and +B: 11 to 14 V)

MONITOR RESULT

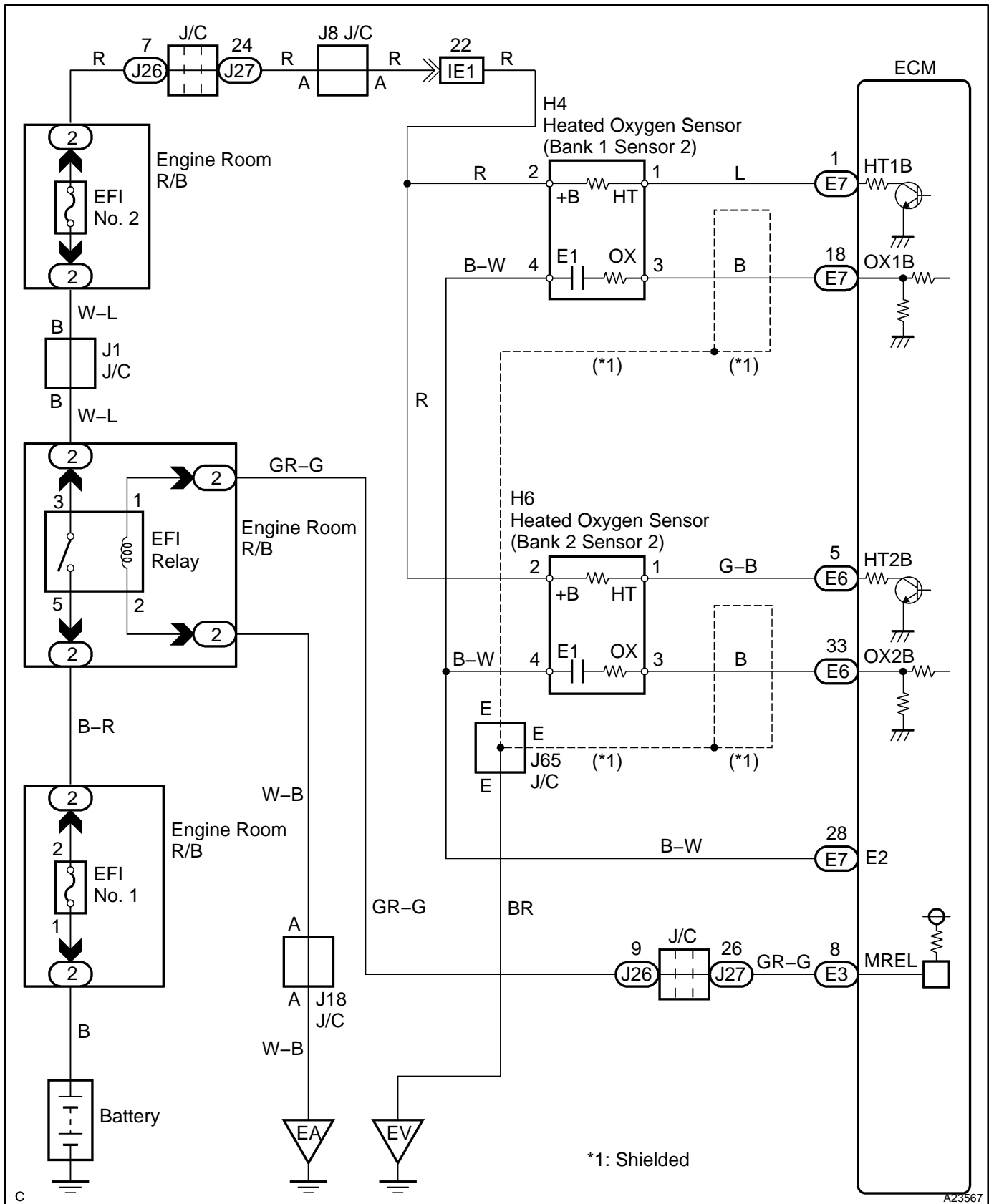
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page [DI-27](#)).

- TID (Test Identification Data) is assigned to each emissions-related component.
- TLT (Test Limit Type):
If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.

TID \$04: HO2S heater

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	\$02	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 2)	Malfunction threshold for HO2S heater
1	\$20	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 2 Sensor 2)	Malfunction threshold for HO2S heater

WIRING DIAGRAM

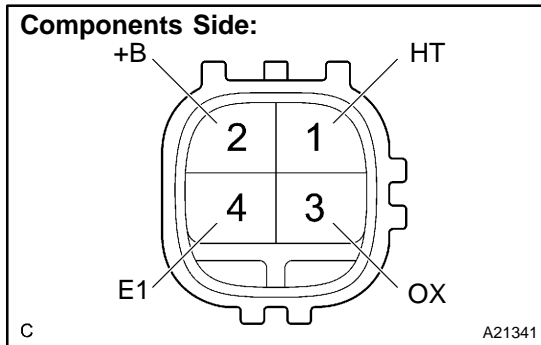


INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful to determine whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. when a malfunction occurred.

1 Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the H4 or H6 heated oxygen sensor connector.

CHECK:

Measure resistance between terminals of the heated oxygen sensor.

OK:

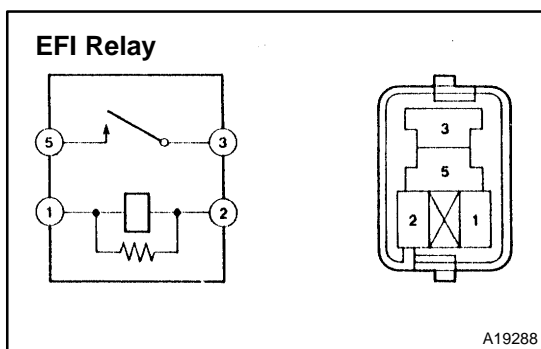
Standard:

Tester Connection	Specified Condition
HT (H4-1) - +B (H4-2)	11 to 16 Ω at 20°C (68°F)
HT (H6-1) - +B (H6-2)	11 to 16 Ω at 20°C (68°F)

NG Replace heated oxygen sensor.

OK

2 Check EFI relay.



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

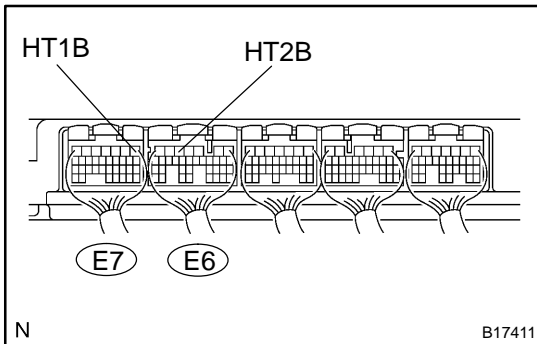
Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Usually	10 K Ω or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace EFI relay.

OK

3 Check voltage between terminals HT1B, HT2B of ECM connectors and body ground.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals of the ECM connectors and body ground.

OK:

Standard:

Tester Connection	Specified Condition
HT1B (E7-1) - Body ground	9 to 14 V
HT2B (E6-5) - Body ground	9 to 14 V

HINT:

- Connect terminal HT1B to the bank 1 sensor 2.
- Connect terminal HT2B to the bank 2 sensor 2.

NG

Replace ECM (See page SF-66).

NG

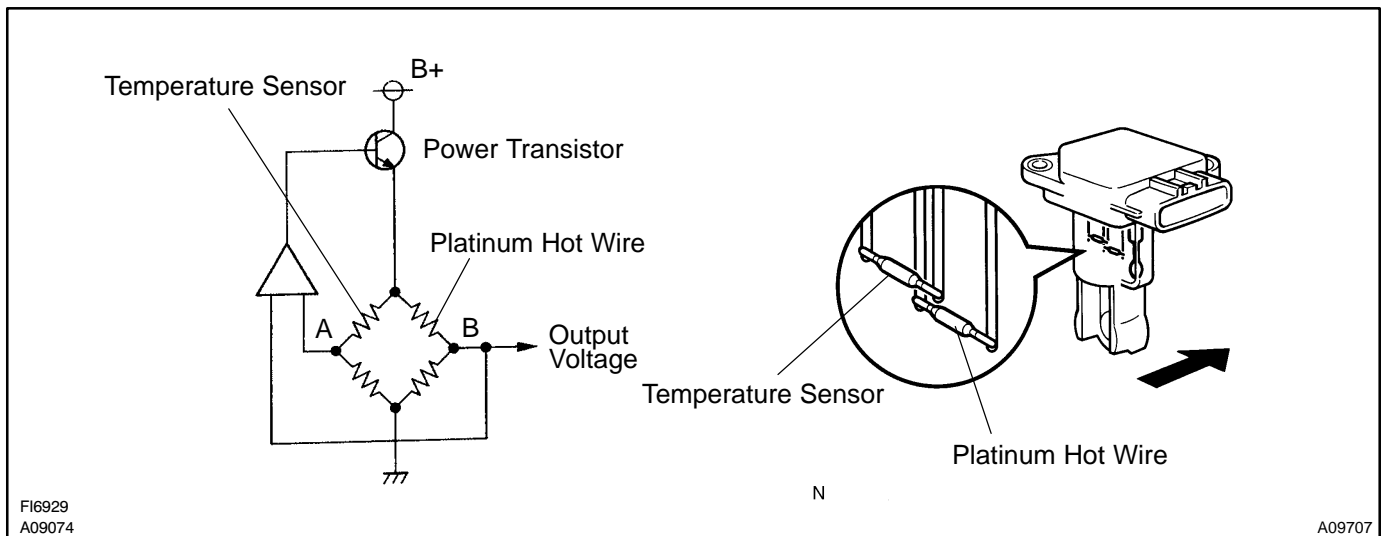
Check and repair harness or connector between EFI relay and heated oxygen sensor, and heated oxygen sensor and ECM (See page SF-66).

DTC	P0100	Mass or Volume Air Flow Circuit
DTC	P0102	Mass or Volume Air Flow Circuit Low Input
DTC	P0103	Mass or Volume Air Flow Circuit High Input

CIRCUIT DESCRIPTION

The Mass Air Flow (MAF) meter measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.

By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the airflow through the sensor. The ECM interprets this voltage as the intake air amount. The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit for more than 3 sec.	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102	Short in mass air flow meter circuit for more than 3 sec.	
P0103	Short in mass air flow meter circuit for more than 3 sec. (+B circuit)	

HINT:

After confirming DTC P0100, P0102 or P0103, use the hand-held tester to confirm the MAF ratio from the ALL menu (to reach the ALL menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL).

Mass Air Flow Value (gm/sec.)	Malfunction
Approx. 0.0	<ul style="list-style-type: none"> • Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	<ul style="list-style-type: none"> • EVG circuit open

MONITOR DESCRIPTION

If there is a defect in the MAF (Mass Air Flow) meter or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.

Example:

When the MAF meter voltage output is less than 0.2 V, or more than 4.9 V, and if either the condition continues for more than 3 sec.

MONITOR STRATEGY

Related DTCs	P0100	Mass air flow meter circuit range check (Fluttering)
	P0102	Mass air flow meter circuit range check (Low voltage)
	P0103	Mass air flow meter circuit range check (High voltage)
Required sensors/components	Mass air flow meter	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (When engine speed is at less than 4,000 rpm) 2 driving cycles (When engine speed is at 4,000 rpm or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI-18
The typical enabling condition is not available	-

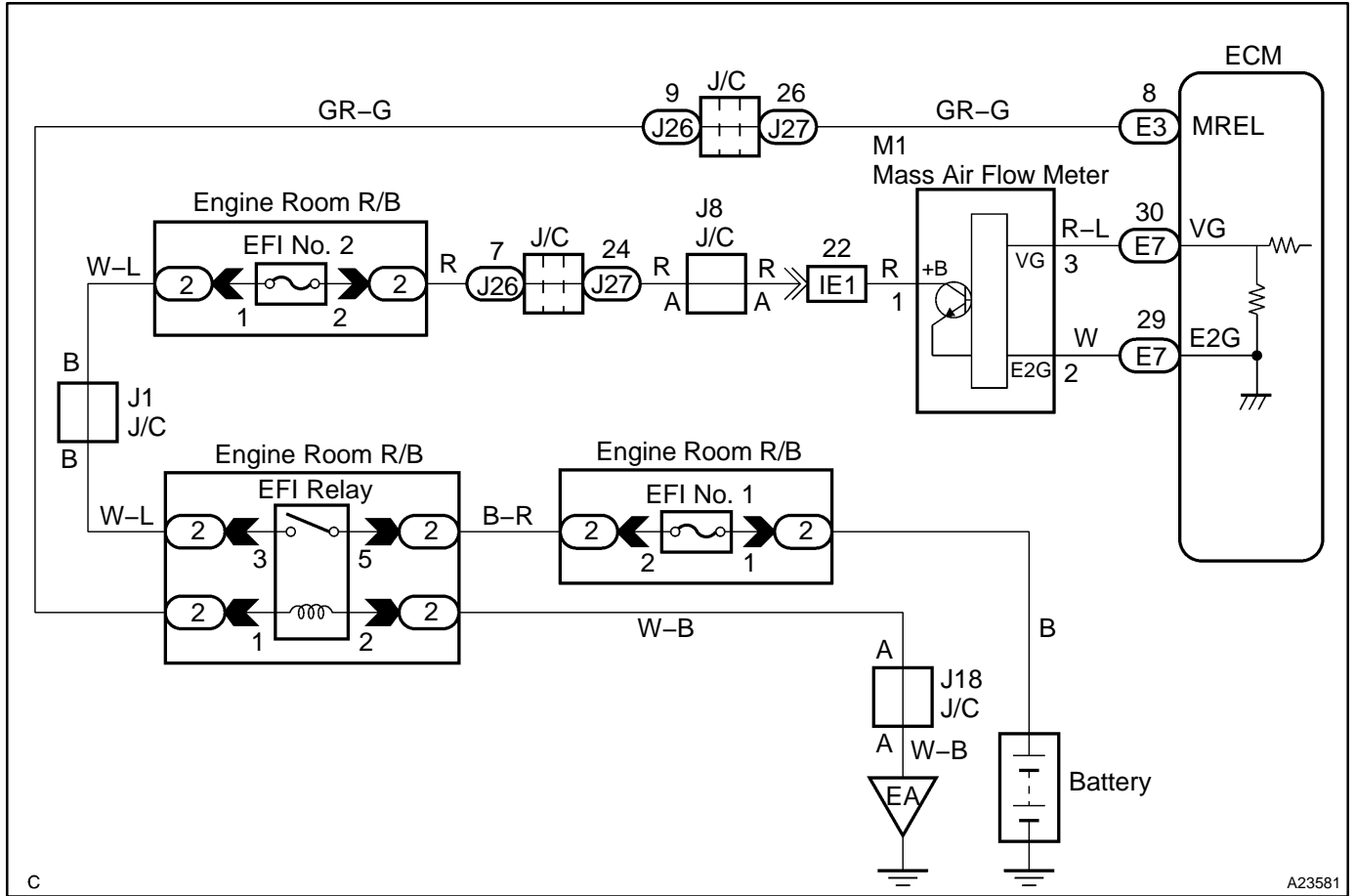
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0100:	
Mass air flow meter voltage	Less than 0.2 V, or more than 4.9 V
P0102:	
Mass air flow meter voltage	Less than 0.2 V
P0103:	
Mass air flow meter voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Mass air flow meter voltage	0.4 to 2.2 V

WIRING DIAGRAM



C

A23581

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read value of mass air flow rate.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) Start the engine.
- (d) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.

CHECK:

Read the mass air flow rate on the hand-held tester.

RESULT:

Air Flow Rate (g/s)	Proceed to
0.0	A
271.0 or more	B
Between 1 and 270.0 (*1)	C

*1: The value must change when the throttle valve is opened or closed.

B

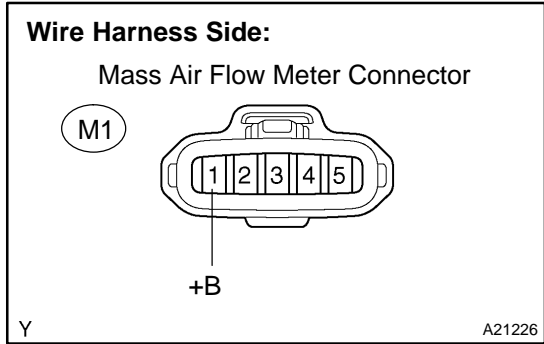
Go to step 6.

C

**Check for intermittent problems
(See page DI-11).**

A

2 Check voltage of mass air flow meter power source.



PREPARATION:

- (a) Disconnect the M1 mass air flow meter connector.
- (b) Turn the ignition switch to ON.

CHECK:

Measure voltage between terminal 1 of the mass air flow meter connector and body ground.

OK:

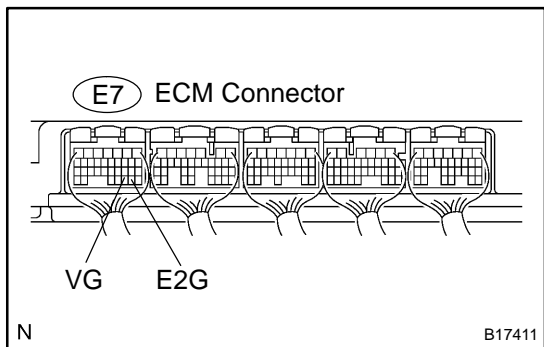
Standard:

Tester Connection	Specified Condition
+B (M1-1) - Body ground	9 to 14 V

NG Go to step 5.

OK

3 Check voltage between terminal VG of ECM connector and body ground.



PREPARATION:

Start the engine.

CHECK:

Measure the voltage between the specified terminal of the E7 ECM connector.

HINT:

The shift position should be P or N and the A/C switch should be turned OFF.

OK:

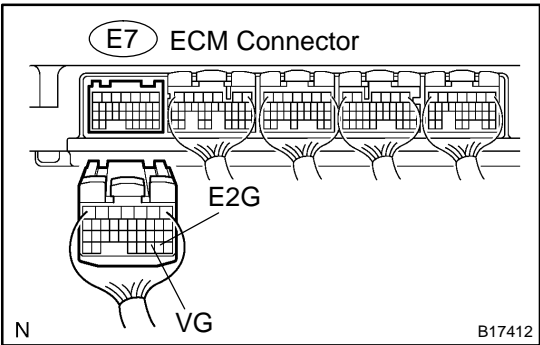
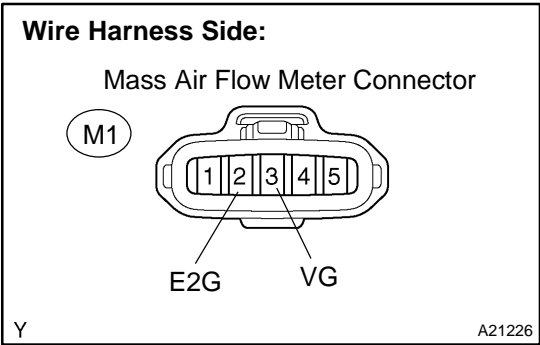
Standard:

Tester Connection	Condition	Specified Condition
VG (E7-30) - E2G (E7-29)	Engine is idling	0.5 to 3.0 V

NG Replace ECM (See page [SF-66](#)).

NG

4 Check for open and short in harness and connector between mass air flow meter and ECM.



PREPARATION:

- (a) Disconnect the M1 mass air flow meter connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

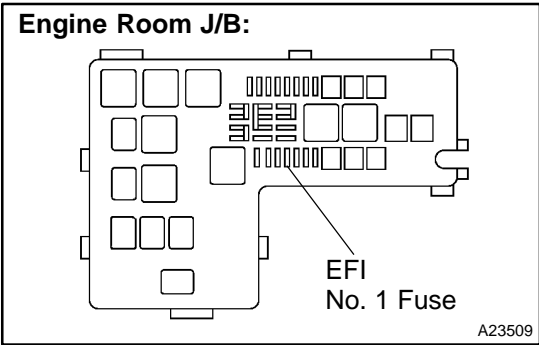
Tester Connection	Specified Condition
VG (M1-3) - VG (E7-30)	Below 1 Ω
E2G (M1-2) - E2G (E7-29)	Below 1 Ω
VG (M1-3) or VG (E7-30) - Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

Replace mass air flow meter.

5 Check for open and short in harness and connector between mass air flow meter and EFI relay.



PREPARATION:

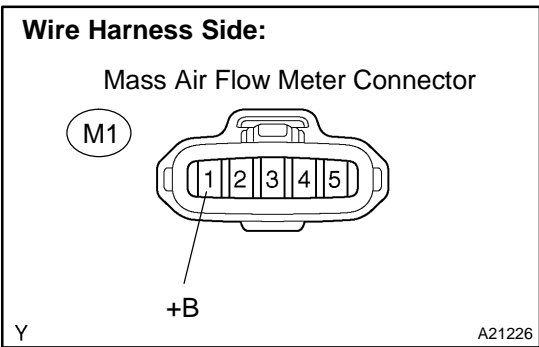
Remove the EFI No. 1 fuse from the engine room J/B.

CHECK:

Check for resistance in the EFI No. 1 fuse.

OK:

Standard:
Below 1 Ω



PREPARATION:

- (a) Install the EFI No. 1 fuse.
- (b) Disconnect the M1 mass air flow meter connector.
- (c) Remove the EFI relay from the engine room J/B.

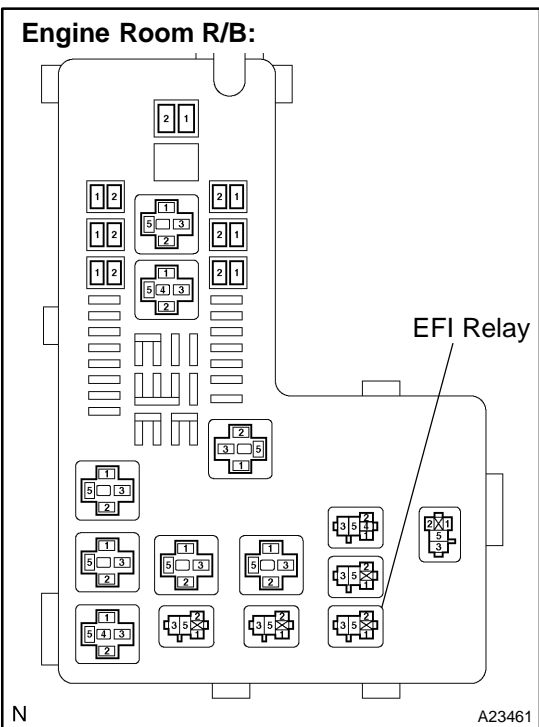
CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
+B (M1-1) – Engine Room J/B (EFI relay terminal 1)	Below 1 Ω
+B (M1-1) or Engine room J/B (EFI relay terminal 1) – Body ground	10 kΩ or higher

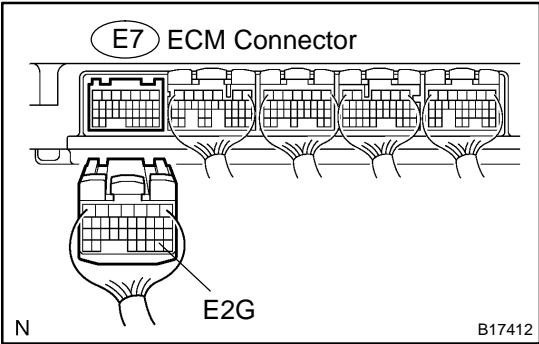


NG → **Repair or replace harness or connector.**

OK

Check ECM power source circuit (See page DI-409).

6 Check continuity between terminal E2G of ECM connector and body ground.



CHECK:

Check the resistance between terminal of the E7 ECM connector and body ground.

OK:

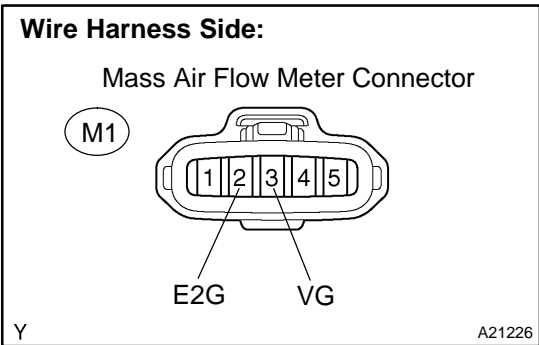
Standard:

Tester Connection	Specified Condition
E2G (E7-29) - Body ground	Below 1 Ω

NG Replace ECM (See page [SF-66](#)).

OK

7 Check for open in harness and connector between mass air flow meter and ECM.



PREPARATION:

- (a) Disconnect the M1 mass air flow meter connector.
- (b) Disconnect the E7 ECM connector.

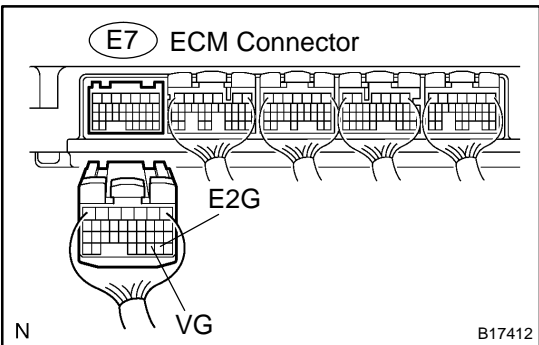
CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VG (M1-3) - VG (E7-30)	Below 1 Ω
E2G (M1-2) - E2G (E7-29)	Below 1 Ω
VG (M1-3) or VG (E7-30) - Body ground	10 kΩ or higher
E2G (M1-2) or E2G (E7-29) - Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

Replace mass air flow meter.

DTC	P0101	Mass or Volume Air Flow Circuit Range/ Performance Problem
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CIRCUIT DESCRIPTION

Refer to DTC P0100, P0102 and P0103 on page [DI-98](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0101	After engine is warmed up, conditions (a), (b), (c) and (d) continue for more than 10 seconds: (2 trip detection logic) (a) Throttle valve fully closed (b) Voltage output of the mass air flow meter is more than 2.2 V. (c) Engine coolant temperature is more than 70 °C (158 °F). (d) Engine speed is less than 2,000 rpm.	• Mass air flow meter
	Conditions (a), (b) and (c) continue for more than 10 seconds at engine speed: (2 trip detection logic) (a) Engine speed is more than 300 rpm. (b) VTA is more than 0.1 V. (c) Voltage output of the mass air flow meter is less than 0.83 V.	

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter helps the ECM calculate the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the air flow through the MAF meter. The ECM interprets this voltage as the intake air amount. If there is a defect in the MAF meter or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.

Example:

If the voltage is more than 2.2 V at idle or less than 0.83 V at idle OFF, the ECM interprets this as a defect in the MAF meter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101	Mass air flow meter rationality (Low voltage)
		Mass air flow meter rationality (High voltage)
Required sensors/components	Main sensors/components	Mass air flow meter
	Related sensors/components	Engine speed sensor, Engine coolant temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
High voltage:		
Engine speed	-	2,000 rpm
MAF meter voltage	-	4.9 V
Engine coolant temperature	70°C (158°F)	-
Low voltage:		
Engine speed	300 rpm	-
MAF meter voltage	0.2 V	-
Fuel cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Mass air flow meter voltage (High voltage)	More than 2.2 V (varies with throttle position sensor voltage)
Mass air flow meter voltage (Low voltage)	Less than 0.83 V (varies with throttle position sensor voltage)

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides DTC P0101) being output?
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES.

CHECK:

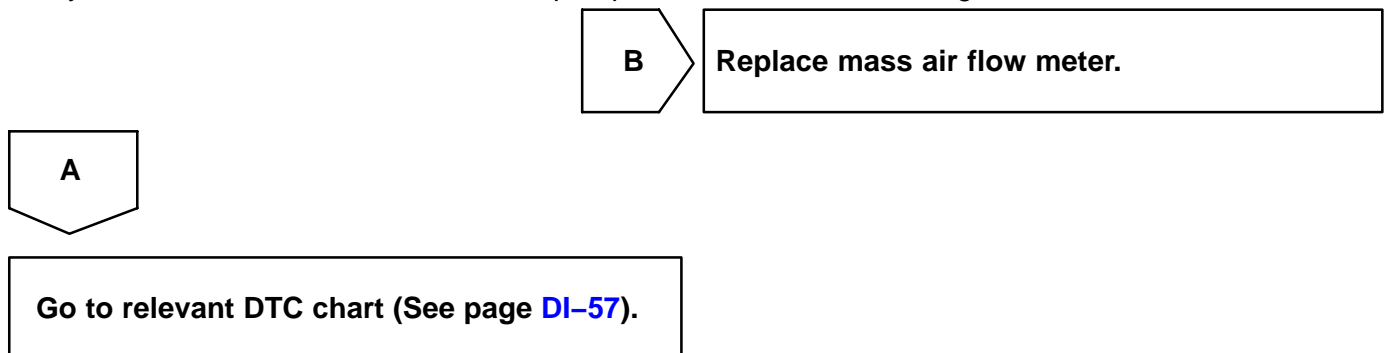
Read the DTC using the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
"P0101" and other DTCs	A
Only P0101	B

HINT:

If any other codes besides P0101 are output, perform the troubleshooting for those codes first.

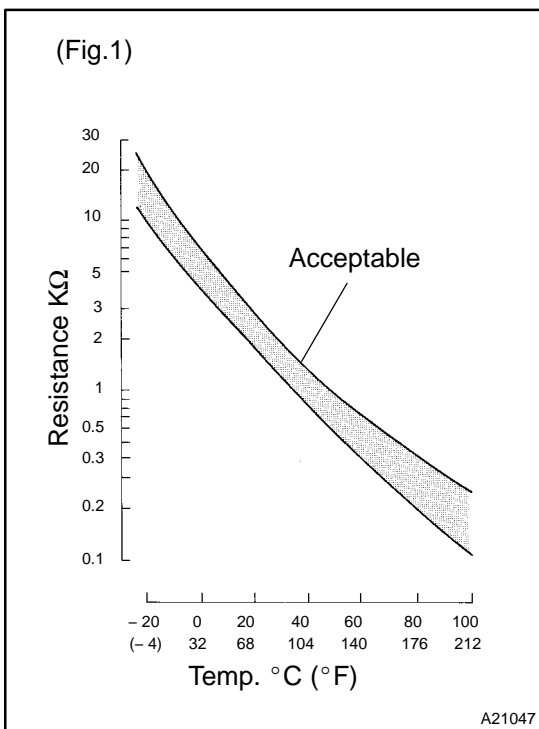


DTC	P0110	Intake Air Temperature Circuit
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DTC	P0112	Intake Air Temperature Circuit Low Input
------------	--------------	---

DTC	P0113	Intake Air Temperature Circuit High Input
------------	--------------	--

CIRCUIT DESCRIPTION



The intake air temperature (IAT) sensor, mounted on the mass air flow (MAF) meter, monitors the intake air temperature. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The resistance varies as voltage changes to the ECM terminal.

(See Fig. 1).

The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.

That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the voltage at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temperature sensor circuit for 0.5 sec.	<ul style="list-style-type: none"> • Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temperature sensor circuit for 0.5 sec.	
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 sec.	

HINT:

After confirming DTC "P0110, P0112 or P0113", use the hand-held tester to confirm the intake air temperature in the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL".

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F) or more	Short circuit

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the IAT (Intake Air Temperature) sensor and sets a DTC.

Example:

When the sensor voltage output is equal to -40°C (-40°F), or more than 140°C (284°F).

MONITOR STRATEGY

Related DTCs	P0110	Intake air temperature sensor range check (Fluttering)
	P0112	Intake air temperature sensor range check (Low voltage)
	P0113	Intake air temperature sensor range check (High voltage)
Required sensors/components	Intake air temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI-18
The typical enabling condition is not available	–

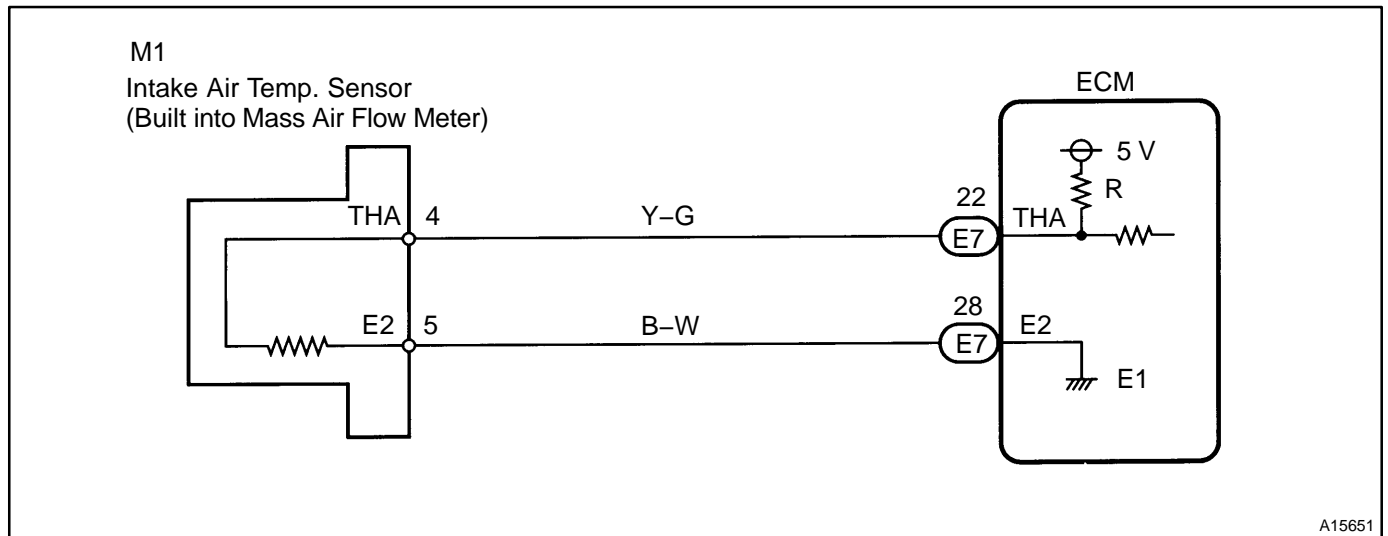
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0110:	
Intake air temperature sensor voltage (Intake air temperature)	Less than 0.18 V or more than 4.91 V (More than 140°C (284°F), or less than -40°C (-40°F))
P0112:	
Intake air temperature sensor voltage (Intake air temperature)	Less than 0.18 V (More than 140°C (284°F))
P0113:	
Intake air temperature sensor voltage (Intake air temperature)	More than 4.91 V (Less than -40°C (-40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Intake air temperature sensor voltage	0.18 V (140°C (284°F)) to 4.91 V (-40°C (-40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read value of intake air temperature.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

OK:

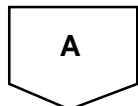
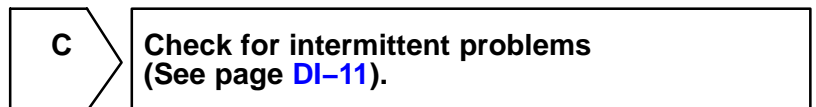
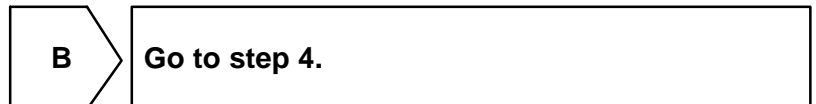
Same as actual intake air temperature.

RESULT:

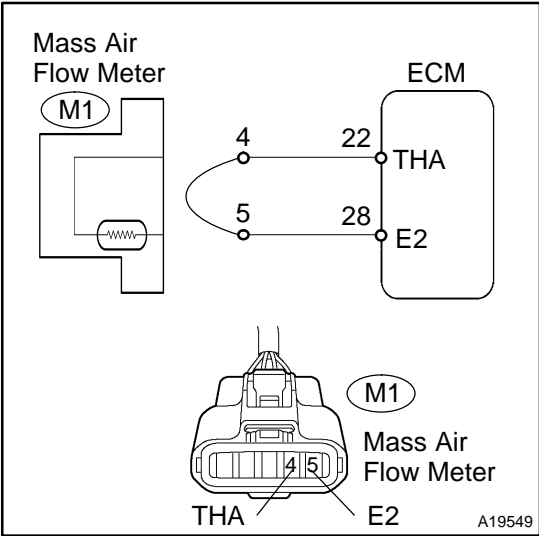
Displayed Temperature	Proceed to
-40°C (-40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

HINT:

- If there is an open circuit, the hand-held tester indicates -40°C (-40°F).
- If there is a short circuit, the hand-held tester indicates 140°C (284°F) or more.



2 Check for open in harness or ECM.



PREPARATION:

- (a) Disconnect the M1 mass air flow meter connector.
- (b) Connect terminals 4 and 5 of the mass air flow meter wire harness side connector.
- (c) Turn the ignition switch to ON.
- (d) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

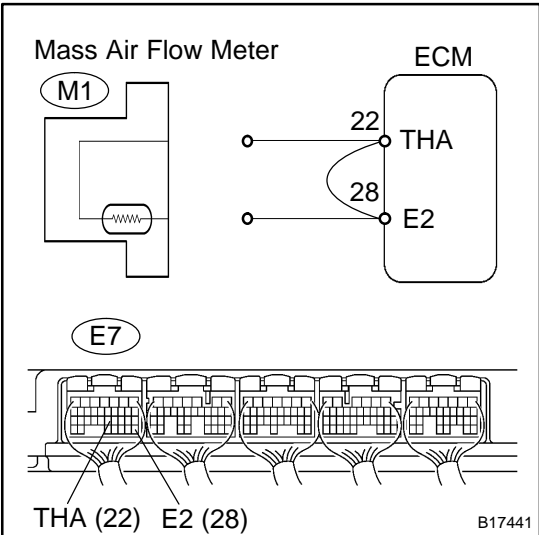
OK:

Standard: 140°C (284°F)

OK Confirm good connection at sensor. If OK, replace mass air flow meter.

NG

3 Check for open in harness or ECM.



PREPARATION:

- (a) Connect terminals THA and E2 of the E7 ECM connector.
- HINT:**
Before checking, do a visual and contact pressure check for the ECM connector.
- (b) Turn the ignition switch to ON.
 - (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

OK:

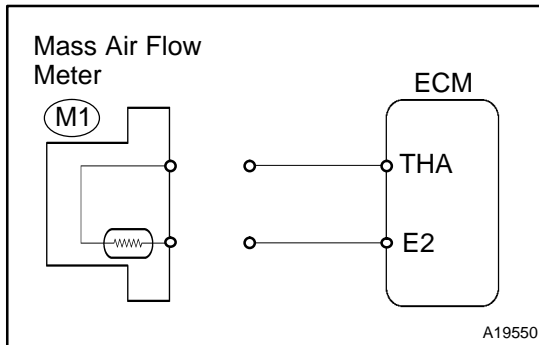
Standard: 140°C (284°F) or more

OK Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF-66).

4 Check for short in harness and ECM.



PREPARATION:

- Disconnect the M1 mass air flow meter connector.
- Turn the ignition switch to ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

OK:

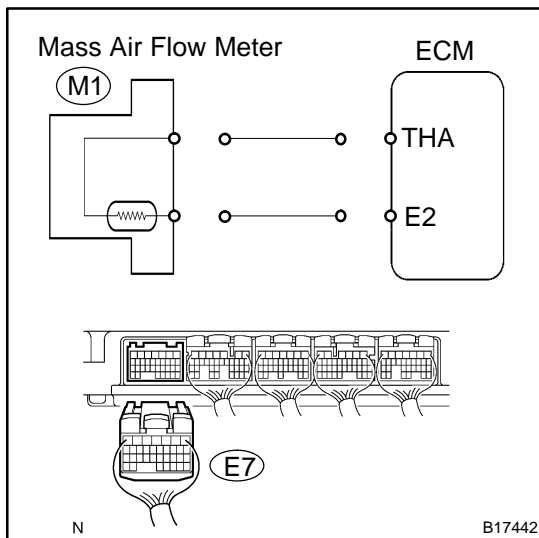
Standard: -40°C (-40°F)

OK

Replace mass air flow meter.

NG

5 Check for short in harness or ECM.



PREPARATION:

- Disconnect the E7 ECM connector.
- Turn the ignition switch to ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

OK:

Standard: -40°C (-40°F)

OK

Repair or replace harness or connector.

NG

Replace ECM (See page [SF-66](#)).

DTC	P0115	Engine Coolant Temperature Circuit
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DTC	P0117	Engine Coolant Temperature Circuit Low Input
------------	--------------	---

DTC	P0118	Engine Coolant Temperature Circuit High Input
------------	--------------	--

CIRCUIT DESCRIPTION

A thermistor is built in the Engine Coolant Temperature (ECT) sensor and changes the resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as the Intake Air Temperature (IAT) sensor.

HINT:

If the ECM detects the DTC "P0115, P0117 or P0118", it operates the fail-safe function in which the ECT is assumed to be 80°C (176°F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temperature sensor circuit for 0.5 sec.	<ul style="list-style-type: none"> • Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0117	Step 4	Short in engine coolant temperature sensor circuit for 0.5 sec.	
P0118	Step 2	Open in engine coolant temperature sensor circuit for 0.5 sec.	

HINT:

After confirming DTC "P0115, P0117 or P0118", use the OBD II scan tool or the hand-held tester to confirm the engine coolant temperature from the DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL.

Displayed Temperature	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F) or more	Short circuit

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The resistance varies as output voltage from the sensor changes.

The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Example:

When the ECM calculates that the ECT is less than -40°C (-40°F), or more than 140°C (284°F), and if either the condition continues for 0.5 sec. or more, the ECM will set a DTC.

MONITOR STRATEGY

Related DTCs	P0115	Engine coolant temperature sensor range check (Fluttering)
	P0117	Engine coolant temperature sensor range check (Low voltage)
	P0118	Engine coolant temperature sensor range check (High voltage)
Required sensors/components	Engine coolant temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI-18
The typical enabling condition is not available	-

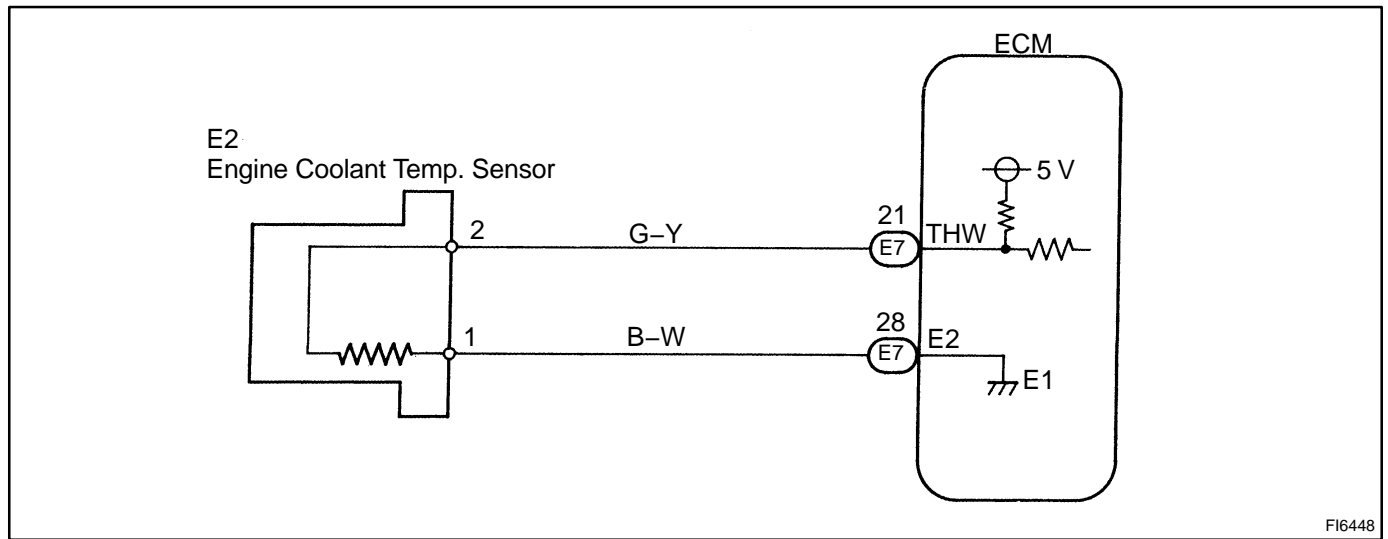
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0115:	
Engine coolant temperature sensor voltage (Coolant temperature)	Less than 0.14 V or more than 4.91 V (More than 140°C (284°F), or less than -40°C (-40°F))
P0117:	
Engine coolant temperature sensor voltage (Coolant temperature)	Less than 0.14 V (More than 140°C (284°F))
P0118:	
Engine coolant temperature sensor voltage (Coolant temperature)	More than 4.91 V (Less than -40°C (-40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor voltage	0.14 V (140°C (284°F)) to 4.91 V (-40°C (-40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different system that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read value of engine coolant temperature.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the the hand-held tester.

OK:

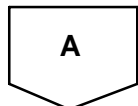
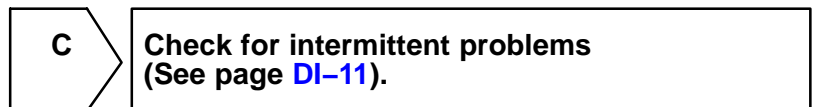
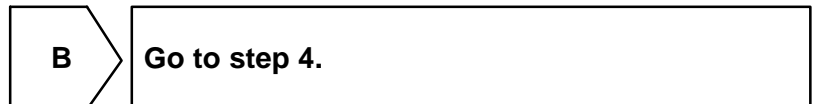
Same value as actual engine coolant temperature.

RESULT:

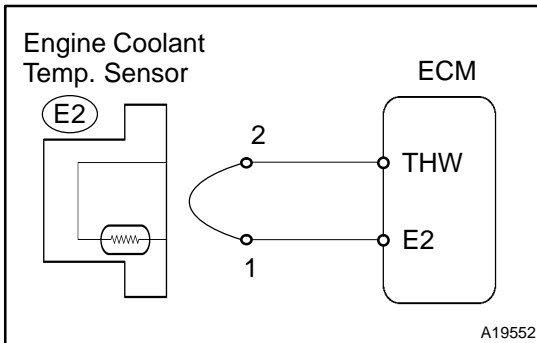
Displayed Temperature	Proceed to
-40°C (-40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

HINT:

- If there is an open circuit, hand-held tester indicates -40°C (-40°F).
- If there is a short circuit, hand-held tester indicates 140°C (284°F) or more.



2 Check for open in harness or ECM.



PREPARATION:

- Disconnect the E2 engine coolant temperature (ECT) sensor connector.
- Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
- Turn the ignition switch to ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the hand-held tester.

OK:

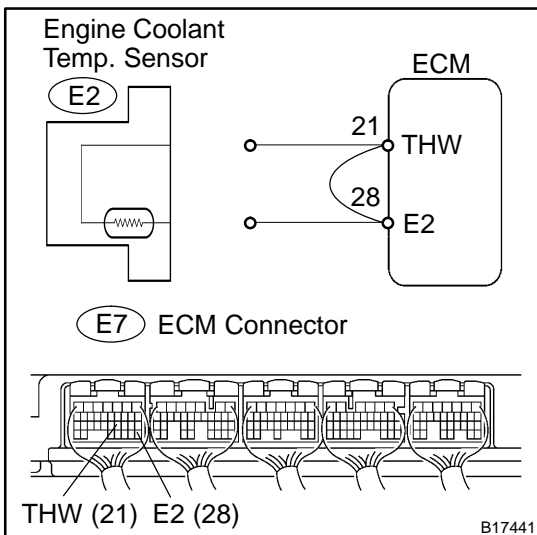
Standard: 140°C (284°F)

OK

Confirm good connection at sensor. If OK, replace engine coolant temperature sensor.

NG

3 Check for open in harness or ECM.



PREPARATION:

- Disconnect the E2 engine coolant temperature sensor connector.
- Connect terminals THW and E2 of the E7 ECM connector.

HINT:

Before checking, do a visual and contact pressure checks for the ECM connector.

- Turn the ignition switch to ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or the hand-held tester.

OK:

Standard: 140°C (284°F)

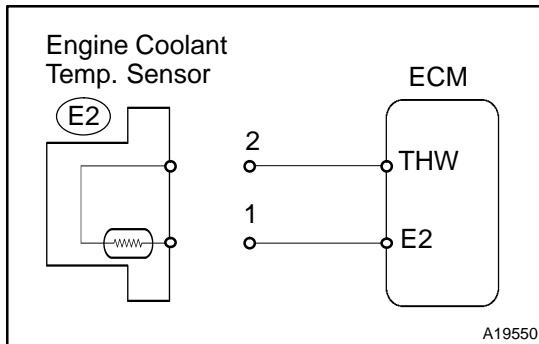
OK

Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF-66).

4 Check for short in harness and ECM.



PREPARATION:

- Disconnect the E2 engine coolant temperature sensor connector.
- Turn the ignition switch to ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the hand-held tester.

OK:

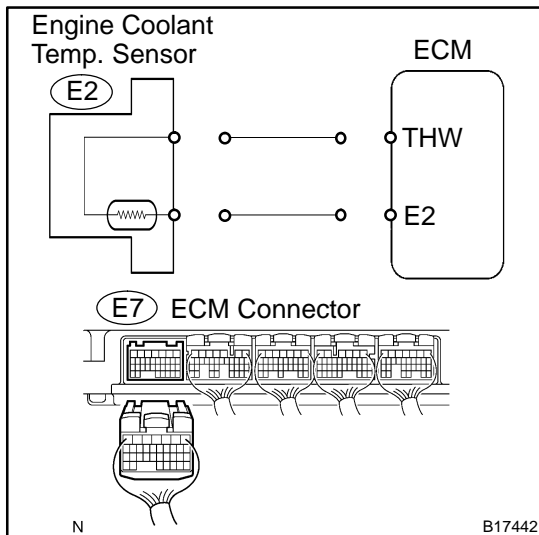
Standard: -40°C (-40°F)

OK

Replace engine coolant temperature sensor.

NG

5 Check for short in harness or ECM.



PREPARATION:

- Disconnect the E7 ECM connector.
- Turn the ignition switch to ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the hand-held tester.

OK:

Standard: -40°C (-40°F)

OK

Repair or replace harness or connector.

NG

Replace ECM (See page SF-66).

DTC	P0116	Engine Coolant Temperature Circuit Range/ Performance Problem
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CIRCUIT DESCRIPTION

Refer to DTC P0115 on page [DI-115](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0116	If the engine coolant temperature was 35°C (95°F) or more but less than 60°C (140°F) when the engine is started, and if conditions (a) and (b) are met: (a) Vehicle has accelerated and decelerated. (b) Engine coolant temperature remains within 3°C (5.4°F) of the initial engine coolant temperature (2 trip detection logic)	• Engine coolant temperature sensor
	If the engine coolant temperature is more than 60°C (140°F) when the engine is started, and if conditions (a) and (b) are met: (a) Vehicle has accelerated and decelerated. (b) If the engine coolant temperature sensor records a temperature variation below 1°C (1.8°F) successively 6 times (6 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Examples:

- (1) Upon starting the engine, the ECT is between 35°C (95°F) and 60°C (140°F). If after driving for 250 sec., the ECT still remains within 3°C (5.4°F) of the starting temperature, a DTC will be set (2 trip detection logic).
- (2) Upon starting the engine, the ECT is over 60°C (140°F). If after driving for 250 sec., the ECT still remains within 1°C (1.8°F) of the starting temperature, a DTC will be set (6 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0116	Engine coolant temperature sensor range check (Stuck)
Required sensors/components	Main sensors/components	Engine coolant temperature sensor
	Related sensors/components	Intake air temperature sensor, Crankshaft position sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	250 sec.	
MIL operation	2 driving cycles (When temperature is fixed between 35°C (95°F) and 60°C (140°F)) 6 driving cycles (When temperature is fixed at 60°C (140°F) or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Case 1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):		
Cumulative idle off period	250 sec.	–
Speed increase 18.6 mph (30 km/h) or more	10 times	–
Engine coolant temperature	35°C (95°F)	60°C (140°F)
Intake air temperature	–6.7°C (20°F)	–
Case 2 (When temperature is fixed at 60°C (140°F) or more):		
Engine coolant temperature at engine start	60°C (140°F)	–
Intake air temperature	–6.7°C (20°F)	–
Stop and go	Once or more (Stop for 20 sec. or more and accelerate to more than 43.5 mph (70 km/h) with in 40 sec.)	
Steady driving and stop *	Once or more	

*: Vehicle is driven by 40.4 mph (65 km/h) or more for 30 sec. or more and the vehicle speed reaches 43.5 mph (70 km/h). The vehicle is decelerated from 40.4 mph (65 km/h) to 1.86 mph (3 km/h) or less within 35 sec. and stopped for 10 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):	
Change of engine coolant temperature value	Less than 3°C (5.4°F)
Case2 (When temperature is fixed at 60°C (140°F) or more):	
Change of engine coolant temperature value	1°C (1.8°F) or less

COMPONENT OPERATING RANGE

Standard Value
Engine coolant temperature changes with the actual engine coolant temperature.

INSPECTION PROCEDURE

HINT:

- If DTC P0115, P0116, P0117, P0118 and P0125 are output simultaneously, ECT sensor circuit may be open or shorted. Perform the troubleshooting of DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace engine coolant temperature sensor.

DTC	P0120	Throttle/Pedal Position Sensor/Switch "A" Circuit
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DTC	P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input
------------	--------------	--

DTC	P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input
------------	--------------	---

DTC	P0220	Throttle/Pedal Position Sensor/Switch "B" Circuit
------------	--------------	--

DTC	P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input
------------	--------------	--

DTC	P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High Input
------------	--------------	---

DTC	P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation
------------	--------------	--

HINT:

This is the purpose for the "throttle position sensor".

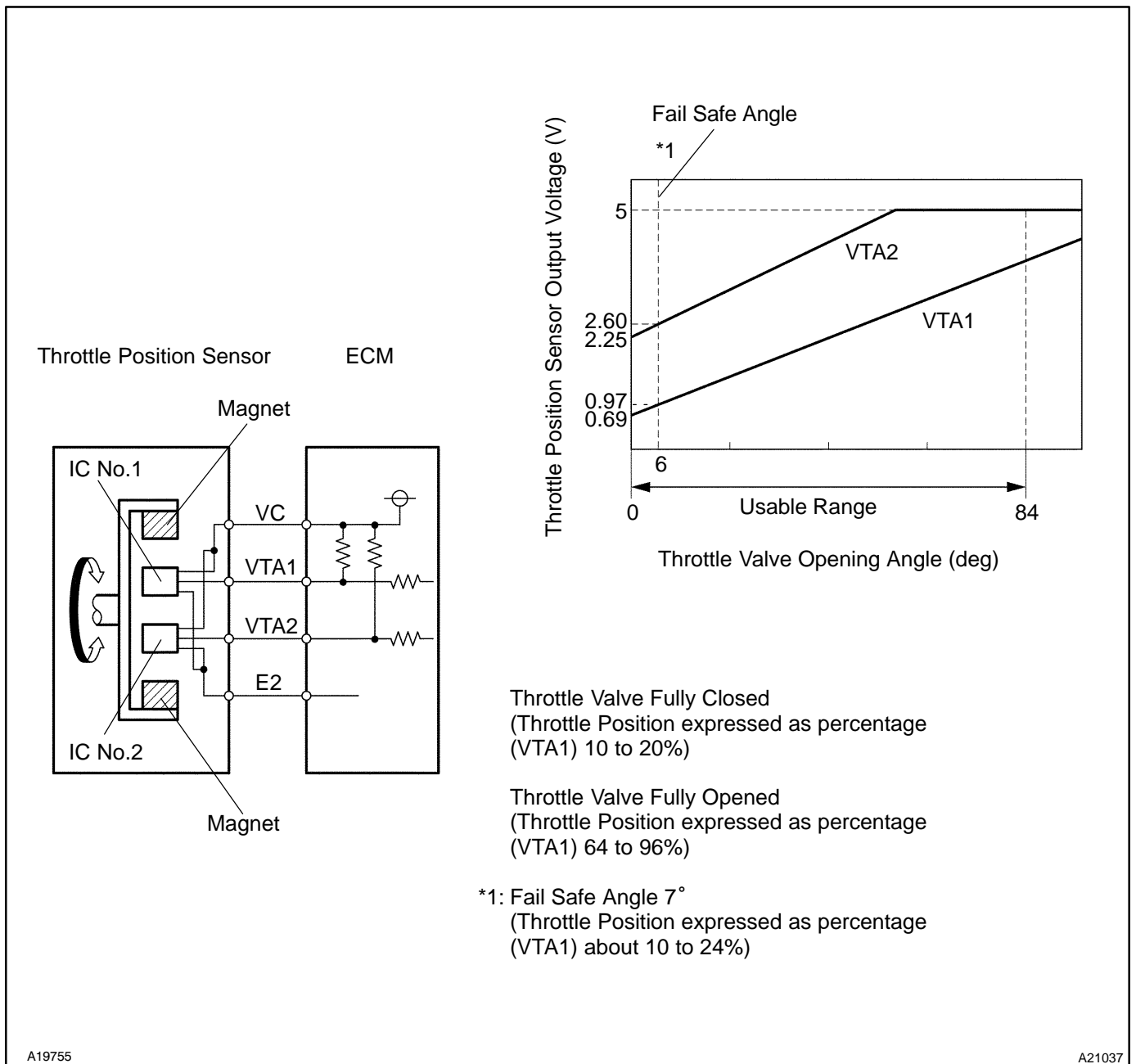
CIRCUIT DESCRIPTION

HINT:

- This Electrical Throttle Control System (ETCS) does not use a throttle cable.
- This throttle position sensor is a non-contact type.

The throttle position sensor is mounted on the throttle body. It detects the opening angle of the throttle valve. This sensor is electronically controlled and uses Hall-effect elements, so that accurate control and reliability can be obtained. The throttle position sensor has 2 sensor elements / signal outputs: VTA1 and VTA2. VTA1 used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. Voltage applied to VTA1 and VTA2 change between 0 V and 5 V in proportion to the opening angle of the throttle valve. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.

The ECM judges the current opening angle of the throttle valve from these signals input from terminals VTA1 and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to driver inputs.



DIAGNOSTICS - ENGINE (1GR-FE)

DTC No.	DTC Detection Condition	Trouble Area
Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 sec. (Open or short in the throttle control motor and sensor circuit)		
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA1 is "0.2 V or less" or VTA1 is "4.535 V or more"	<ul style="list-style-type: none"> • Open or short in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM
P0122	(a) VTA1 is 0.2 V or less	<ul style="list-style-type: none"> • Short in throttle control motor and sensor circuit • Throttle control motor and sensor • Short in VTA1 circuit • Open in VC circuit • ECM
P0123	(a) VTA1 is 4.535 V or more	<ul style="list-style-type: none"> • Open in throttle control motor and sensor circuit • Throttle control motor and sensor • Open in VTA1 circuit • Open in E2 circuit • VC and VTA1 circuit are short-circuited • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) VTA2 is "1.75 V or less" or VTA2 is "4.8 V or more"	<ul style="list-style-type: none"> • Throttle control motor and sensor • ECM
P0222	(a) VTA2 is 1.75 V or less	<ul style="list-style-type: none"> • Throttle control motor and sensor • Short in VTA2 circuit • Open in VC circuit • ECM
P0223	(a) VTA2 is "4.8 V or more" and VTA1 is "0.2 V or more" and VTA1 is "2.02 V or less"	<ul style="list-style-type: none"> • Throttle control motor and sensor • Open in VTA2 circuit • Open in E2 circuit • VC and VTA2 circuit are short-circuited • ECM
P2135	Condition (a) continues for 0.5 sec. or more, or condition (b) continues for 0.4 sec. or more: (a) Difference between VTA1 and VTA2 is 0.02 V or less (b) VTA1 is "0.2 V or less" and VTA2 is "1.75 V or less"	<ul style="list-style-type: none"> • VTA1 and VTA2 circuit are short-circuited • Throttle control motor and sensor • ECM

HINT:

- After confirming DTCs, use the hand-held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.
- THROTTLE POS means the VTA1 signal and the THROTTLE POS #2 means the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal fully released	Accelerator pedal fully depressed
THROTTLE POS	10 to 24%	64 to 96%
THROTTLE POS #2	2.1 to 3.1 V	4.5 to 5.5 V

MONITOR DESCRIPTION

The ECM uses throttle position sensor to monitor the throttle valve opening angle.

- (a) There is an expected specific voltage difference between VTA1 and VTA2 for each throttle opening angle.
 - If the difference between VTA1 and VTA2 is incorrect the ECM interprets this as a fault and will set a DTC.
- (b) VTA1 and VTA2 each have a specific voltage operating range.
 - If VTA1 or VTA2 is out of the normal operating range the ECM interprets this as a fault and will set a DTC.
- (c) VTA1 and VTA2 should never be close to the same voltage levels.
 - If VTA1 is within the range of ± 0.02 V of VTA2 the ECM interprets this as a short circuit in the throttle position sensor system and will set a DTC.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0120	Throttle position sensor (sensor 1) range check (Fluttering)
	P0122	Throttle position sensor (sensor 1) range check (Low voltage)
	P0123	Throttle position sensor (sensor 1) range check (High voltage)
	P0220	Throttle position sensor (sensor 2) range check (Fluttering)
	P0222	Throttle position sensor (sensor 2) range check (Low voltage)
	P0223	Throttle position sensor (sensor 2) range check (High voltage)
	P2135	Throttle position sensor range check (Correlation)
Required sensors/components	Throttle position sensor	
Frequency of operation	Continuous	
Duration	Accelerator pedal ON: 2 sec. Accelerator pedal OFF: 10 sec. P2135: 0.5 sec. or 0.4 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI-18
Throttle control motor power	ON

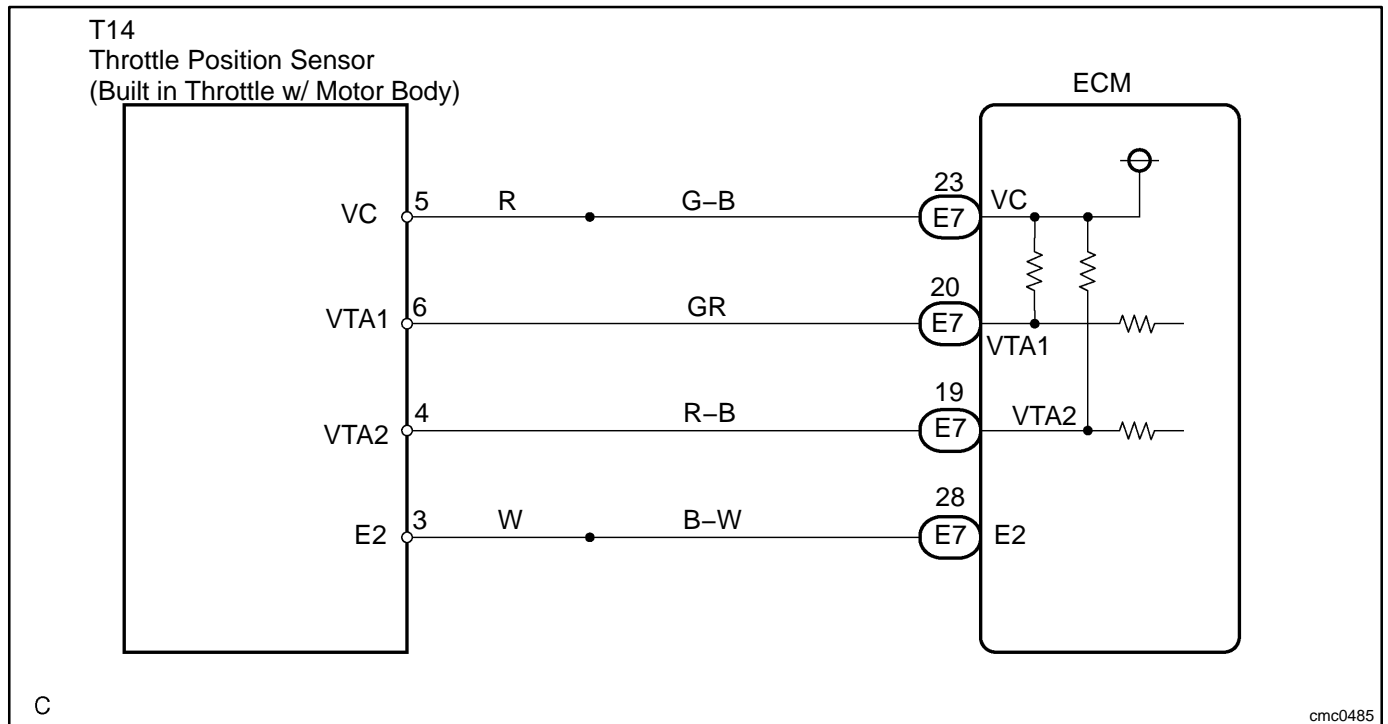
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0120:	
VTA1 voltage	0.2 V or less, or 4.535 V or more
P0122:	
VTA1 voltage	0.2 V or less
P0123:	
VTA1 voltage	4.535 V or more
P0220:	
VTA2 voltage	1.75 V or less, or 4.8 V or more
P0222:	
VTA2 voltage	1.75 V or less
P0223:	
Both of the following conditions are met for 2 sec. or more:	Condition 1 and 2
1. VTA1 voltage	0.2 to 2.02 V
2. VTA2 voltage	4.8 V or more
P2135:	
Different between VTA1 and VTA2 voltage	0.02 V or less
Both of the following conditions are met:	Condition 1 and 2
1. VTA1 voltage	0.2 V or less
2. VTA2 voltage	1.75 V or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle position sensor VTA1 voltage	0.6 to 3.96 V
Throttle position sensor VTA2 voltage	2.25 to 5.0 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different system that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read the voltage for throttle position sensor data.
----------	--

PREPARATION:

Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / THROTTLE POS and THROTTLE POS #2.

CHECK:

Read voltage value displayed on the hand-held tester.

OK:

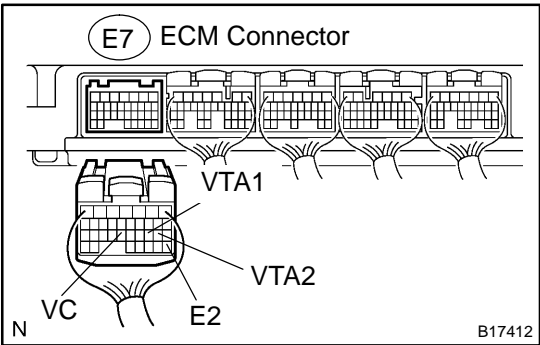
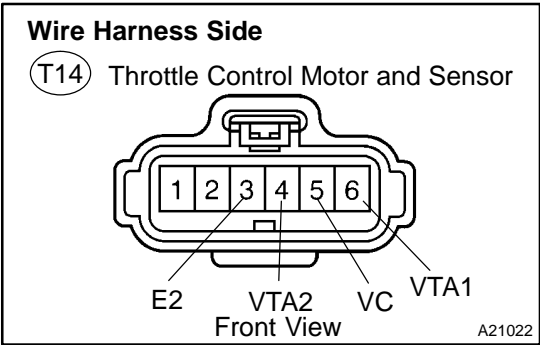
RESULT:

Throttle position expressed as percentage and voltage				Trouble area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.5 V	100 %	4.5 to 5.5 V	E2 circuit open	
0 % or 100 %	2.1 to 3.1 V (Fail safe)	0 % or 100 %	2.1 to 3.1 V (Fail safe)	VTA1 circuit open or ground short	
about 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	about 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
10 to 24 %	2.15 to 3.05 V	64 to 96 % (Does not fail safe)	4.5 to 5.5 V (Does not fail safe)	Throttle position sensor circuit is normal	

B	Go to step 5.
----------	----------------------

A

2 Check for open and short in harness and connector between ECM and throttle position sensor.



PREPARATION:

- (a) Disconnect the T14 throttle control motor and sensor connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:

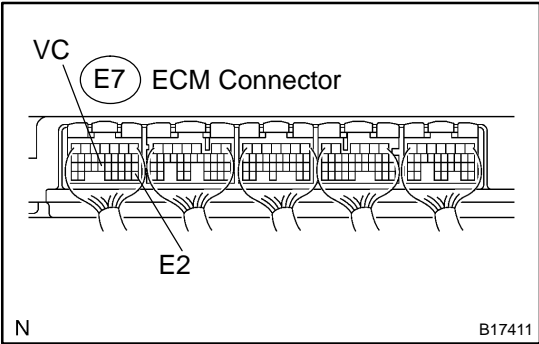
Standard:

Tester Connection	Specified Condition
VC (T14-5) – VC (E7-23)	Below 1 Ω
VTA1 (T14-6) – VTA1 (E7-20)	Below 1 Ω
VTA2 (T14-4) – VTA2 (E7-19)	Below 1 Ω
E2 (T14-3) – E2 (E7-28)	Below 1 Ω
VC (T14-5) or VC (E7-23) – Body ground	10 kΩ or higher
VTA1 (T14-6) or VTA1 (E7-20) – Body ground	10 kΩ or higher
VTA2 (T14-4) or VTA2 (E7-19) – Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

3 Check voltage between terminals VC and E2 of ECM connector.



PREPARATION:

- (a) Disconnect the T14 throttle control motor and sensor connector.
- (b) Turn the ignition switch to ON.

CHECK:

Measure the voltage between the specified terminals of the E7 ECM connector.

OK:

Standard:

Tester Connection	Specified Condition
VC (E7-23) - E2 (E7-28)	4.5 to 5.5 V

NG → **Replace ECM (See page SF-66).**

OK

4 Replace throttle body (See page SF-40).

NEXT

5	Check if DTC output recur.
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PREPARATION:

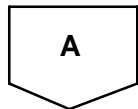
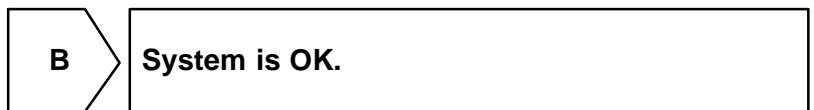
- (a) Clear the DTC (See page [DI-42](#)).
- (b) Start the engine.
- (c) Run the engine at idle for 15 seconds or more.

CHECK:

Read the DTC.

RESULT:

Display (DTC Output)	Proceed to
"P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135" are output again	A
No DTC output	B



Replace ECM (See page [SF-66](#)).

DTC	P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem
------------	--------------	--

HINT:

This is the purpose of the "throttle position sensor".

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page [DI-123](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0121	Condition (a) continues for 2.0 sec.: (a) Difference between VTA1 and VTA2 deviates from the threshold	Throttle body

MONITOR DESCRIPTION

The ECM uses throttle position sensor to monitor the throttle valve opening angle.

This sensor includes two signals, VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. There are several checks that the ECM performs confirm proper operation of the throttle position sensor and VTA1.

There is a specific voltage difference expected between VTA1 and VTA2 for each throttle opening angle. If the voltage output difference of the VTA1 and VTA2 deviates from the normal operating range, the ECM interprets this as a malfunction of the throttle position sensor. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0121	Throttle position sensor rationality
Required sensors/components	Throttle position sensor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Either of the following conditions is met	Condition (a) or (b)	
(a) Ignition switch	ON	
(b) Electric throttle motor power	ON	
TP sensor malfunction (P0120, P0122, P0123, P0220, P0222, P0223, P2135)	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Different between VTA1 and VTA2 $ VTA1 - (VTA2 \times 0.8) ^*$ * Corrected by learning value	Less than 0.8 V and more than 1.6 V

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace throttle body (See page [SF-40](#)).

DTC	P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control
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CIRCUIT DESCRIPTION

Refer to DTC P0115 on page [DI-115](#).

DTC No.	DTC Detection Condition	Trouble Area
P0125	If THW or THA is less than -19.45°C (-3°F) at engine start and 20 min. or more after starting engine, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	<ul style="list-style-type: none"> • Cooling system • Engine coolant temperature sensor • Thermostat
	If THW and THA is between -19.45°C (-3°F) and -8.34°C (17°F) at engine start, 109 sec. or more after starting engine and engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	
	If THW and THA greater than -8.34°C (17°F) at engine start and 61 sec. or more after starting engine, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the temperature of the engine coolant. The resistance of the sensor varies with the actual coolant temperature. The ECM applies a voltage to the sensor and the varying resistance of the sensor cause the signal voltage to vary. The ECM monitors the ECT signal voltage after engine start-up. If, after sufficient time has passed, the sensor still reports that the engine is not warmed up enough for closed-loop fuel control after sufficient time has passed, the ECM interprets this as a fault in the sensor or cooling system and sets a DTC.

Example:

The engine coolant temperature was 0°C (32°F) at engine start. After 5 min. running time, the ECT sensor still indicates that the engine is not warmed up enough to begin air fuel ratio feedback control of the air-fuel ratio. The ECM interprets this as a fault in the sensor or cooling system and will set a DTC.

MONITOR STRATEGY

Related DTCs	P0125	Insufficient coolant temperature for closed loop fuel control
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Cooling system, Thermostat
	Related sensors/components	Mass air flow meter
Frequency of operation	Continuous	
Duration	61 sec. (at engine start, engine coolant or intake air temperature of -8.34°C (17°F) or more) 109 sec. (at engine start, engine coolant or intake air temperature of -19.45 to -8.34°C (-3 to 17°F)) 20 min. (at engine start, engine coolant or intake air temperature of less than -19.45°C (-3°F))	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Fuel cut	OFF	
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Time until "engine coolant temperature" detection temperature reaches feedback start temperature	
When the temperature at the time of engine starting is -8.34°C (17°F) or more	Engine coolant temperature is less than "closed-loop enable temperature" when 61 sec. or more after engine start
When the temperature at the time of engine starting is -19.45 to -8.34°C (-3 to 17°F)	Engine coolant temperature is less than "closed-loop enable temperature" when 109 sec. or more after engine start
When the temperature at the time of engine starting is -19.45°C (-3°F) or less	Engine coolant temperature is less than "closed-loop enable temperature" when 20 min. or more after engine start

INSPECTION PROCEDURE

HINT:

- If DTC P0115, P0116, P0117, P0118 and P0125 are output simultaneously, engine coolant temperature sensor circuit may be open or short. Perform the troubleshooting of DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides DTC P0125) being output?
----------	--

PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to ON and push the hand-held tester main switch ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

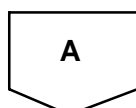
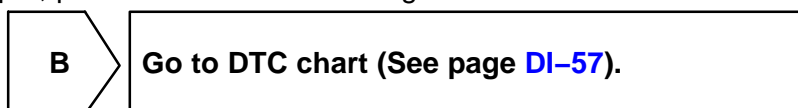
Read the DTCs using the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
P0125	A
"P0125" and other DTCs	B

HINT:

If any other codes besides "P0125" are output, perform the troubleshooting for those DTCs first.



2 Inspect thermostat (See page CO-11).**CHECK:**

Check the valve opening temperature of the thermostat.

OK:

Valve opening temperature is 80 to 84°C (176 to 183°F)

HINT:

Also check that the valve is completely closed under opening temperature as above.

NG**Replace thermostat (See page CO-11).****OK****3 Check cooling system.****CHECK:**

Check that there is detect in the cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG**Repair or replace cooling system.****OK****Replace engine coolant temperature sensor.**

DTC	P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)
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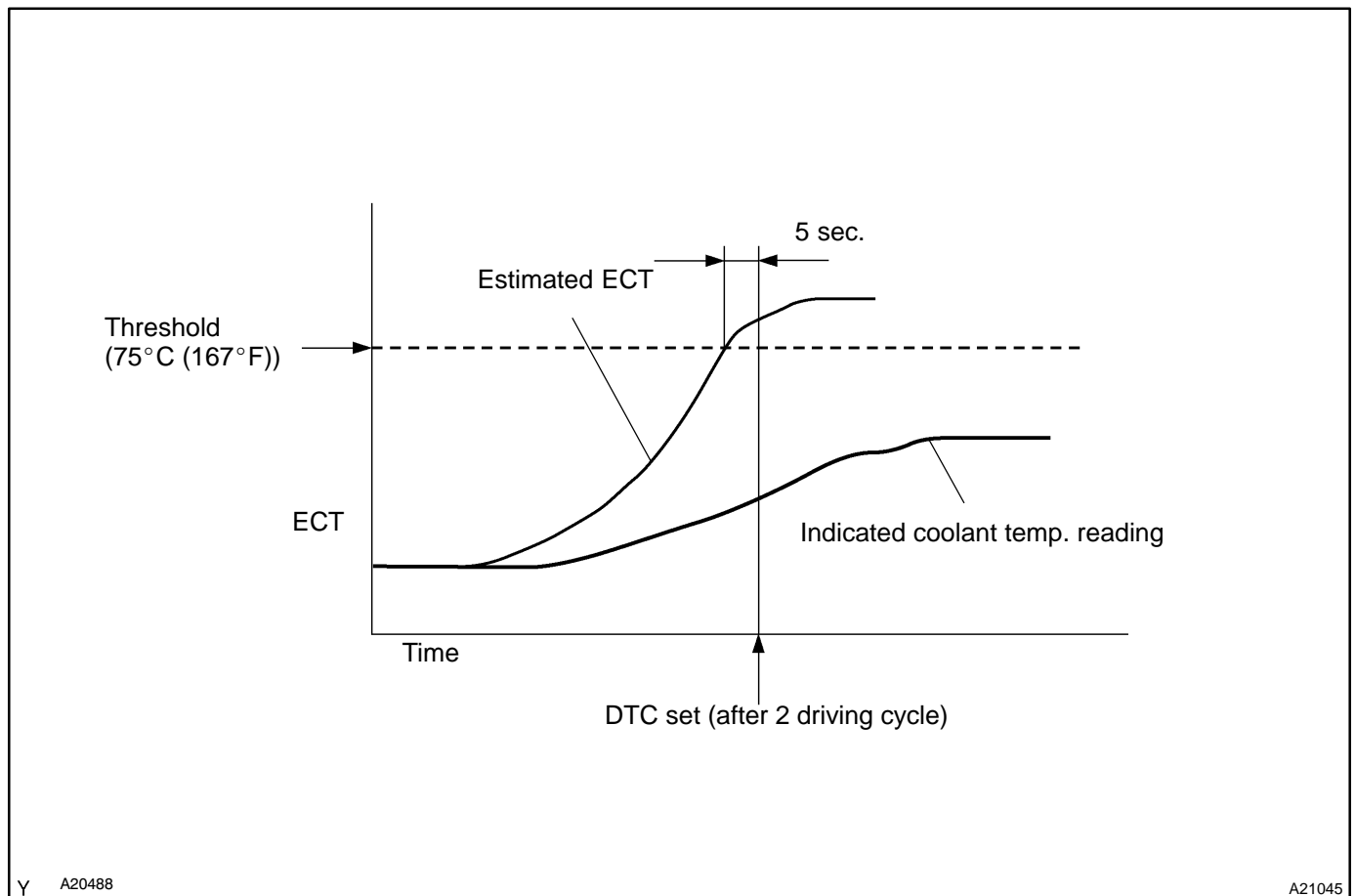
HINT:

This is the purpose of "thermostat" malfunction detection.

CIRCUIT DESCRIPTION

If the engine coolant temperature does not reach 75°C (167°F) despite sufficient warm-up time has elapsed.

DTC No.	DTC Detection condition	Trouble Area
P0128	Condition (a), (b) and (c) are met: (a) Cold start (b) After sufficient warm-up time has elapsed (c) Engine coolant temperature greater than 75°C (167°F)	<ul style="list-style-type: none"> • Thermostat • Cooling system • Engine coolant temperature sensor • ECM

MONITOR DESCRIPTION

The ECM estimates the coolant temperature based on starting temperature, engine loads, and engine speeds. The ECM then compares the estimated temperature with the actual ECT (Engine Coolant Temperature). When the estimated coolant temperature reaches 75°C (167°F), the ECM checks the actual ECT. If the actual ECT is less than 75°C (167°F), the ECM will interpret this as a fault in the thermostat or engine cooling system and set a DTC.

MONITOR STRATEGY

Related DTCs	P0128	Thermostat
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Engine cooling system, Thermostat
	Related sensors/components	Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	15 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Battery voltage	11.0 V	–
Either of the following conditions is met	Condition 1 or 2	
1. All of the following conditions are met	Condition (a), (b) and (c)	
(a) ECT at engine start – IAT at engine start	–15 to 7°C (–27 to 12.6°F)	
(b) ECT at engine start	–10 to 56°C (14 to 133°F)	
(c) IAT at engine start	–10 to 56°C (14 to 133°F)	
2. All of the following conditions are met	Condition (a), (b) and (c)	
(a) ECT at engine start – IAT at engine start	7°C (44.6°F)	–
(b) ECT at engine start	–	56°C (133°F)
(c) IAT at engine start	–10°C (14°F)	–
Accumulated time that vehicle speed is 80 mph (128 km/h) or more	–	20 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that both of following conditions 1 and 2 are met	5 sec. or more
1. Estimated ECT	75°C (167°F) or more
2. ECT sensor output	Less than 75°C (167°F)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor output value after warm up	75°C (167°F) or more

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides DTC P0128) being output?
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PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTC using the hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
P0128	A
P0128 and other DTCs	B

HINT:

If any other codes besides P0128 are output, perform the troubleshooting for those DTCs first.

B

Go to DTC chart (See page [DI-57](#)).

A

2	Check cooling system.
----------	------------------------------

CHECK:

- (a) Check for defects in the cooling system that might cause the system to be too cold, such as abnormal radiator fan operation or a modified cooling system.
- (b) Check the valve opening temperature of the thermostat.

OK:

Valve opening temperature is 80 to 84°C (176 to 183°F)

HINT:

Also check that the valve is completely closed under opening temperature as above.

NG

Repair or replace cooling system.

OK

3	Inspect thermostat (See page CO-11).
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CHECK:

Check the valve lift.

OK:

Valve lift: 10 mm (0.39 in.) or more at 95°C (203°F)

NG	Replace thermostat (See page CO-11).
-----------	---

OK

Replace ECM (See page SF-66).
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DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)
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DTC	P0137	Oxygen Sensor Circuit Low Voltage (Bank 1 Sensor 2)
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DTC	P0138	Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)
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DTC	P0156	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)
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DTC	P0157	Oxygen Sensor Circuit Low Voltage (Bank 2 Sensor 2)
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DTC	P0158	Oxygen Sensor Circuit High Voltage (Bank 2 Sensor 2)
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HINT:

Sensor 2 refers to the sensor mounted behind the Three-Way Catalytic Converter (TWC) and located far from the engine assembly.

CIRCUIT DESCRIPTION

In order to obtain a high purification rate of the carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NOx) components in the exhaust gas, a TWC is used. For the most efficient use of the TWC, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric air-fuel level. For the purpose of helping the ECM to deliver accurate air-fuel ratio control, a Heated Oxygen (HO2) sensor is used.

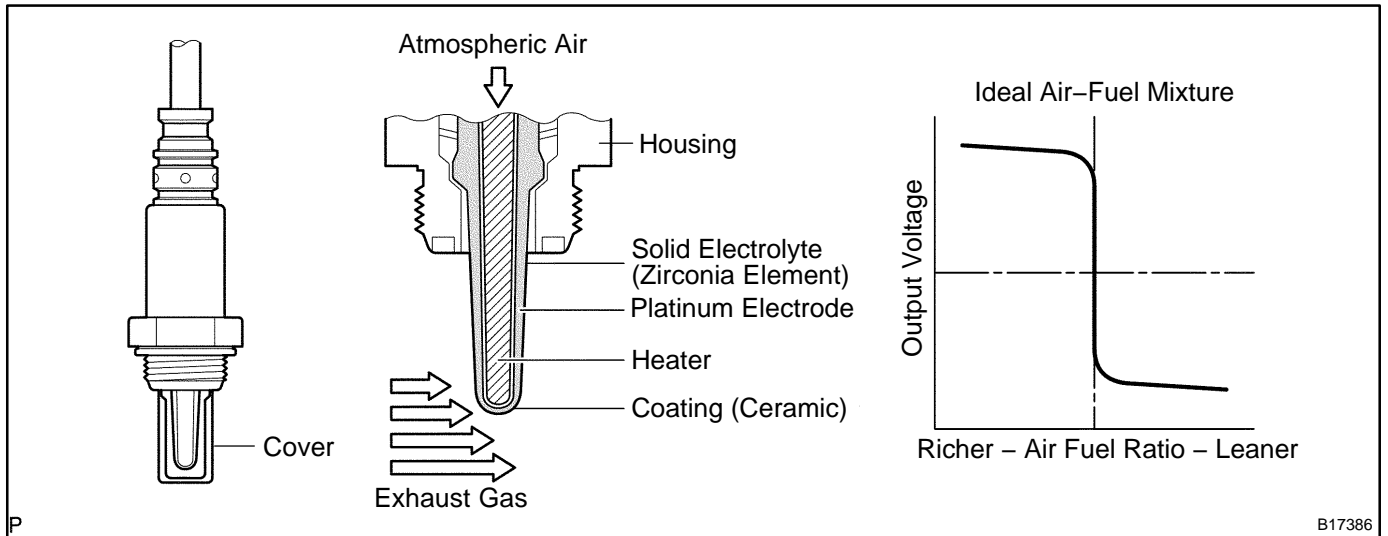
The HO2 sensor is located behind the TWC, and detects the oxygen concentration in the exhaust gas. Since the sensor is integrated with the heater that heats the sensing portion, it is possible to detect the oxygen concentration even when the intake air volume is low (the exhaust gas temperature is low).

When the air-fuel ratio becomes lean, the oxygen concentration in the exhaust gas is rich. The HO2 sensor informs the ECM that the post-TWC air-fuel ratio is lean (low voltage, i.e. less than 0.45 V).

Conversely, when the air-fuel ratio is richer than the stoichiometric air-fuel level, the oxygen concentration in the exhaust gas becomes lean. The HO2 sensor informs the ECM that the post-TWC air-fuel ratio is rich (high voltage, i.e. more than 0.45 V). The HO2 sensor has the property of changing its output voltage drastically when the air-fuel ratio is close to the stoichiometric level.

The ECM uses the supplementary information from the HO2 sensor to determine whether the air-fuel ratio after the TWC is rich or lean, and adjusts the fuel injection time accordingly. Thus, if the HO2 sensor is work-

ing improperly due to internal malfunctions, the ECM is unable to compensate for deviations in the primary air-fuel ratio control.



P

B17386

DTC No.	DTC Detecting Condition	Trouble Area
P0136 P0156	The rear heated oxygen sensor voltage during active control is 0.2 V or less, or 0.6 V or more. (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1) • EFI relay • Gas leakage from exhaust system
P0136 P0156	(a) and (b) is met for more than 30 seconds : (a) Estimated rear oxygen sensor temperature is less than 800°C (1,472°F). (b) Rear oxygen sensor impedance is less than 5 Ω.	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1) • EFI relay • Gas leakage from exhaust system
P0137 P0157	The rear heated oxygen sensor voltage during active control is 0.2 V or less. (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1) • EFI relay • Gas leakage from exhaust system
P0137 P0157	(a) and (b) is met for more than 90 seconds : (a) Estimated rear oxygen sensor temperature is less than 450°C (842°F). (b) Rear oxygen sensor impedance is less than 15 kΩ.	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1) • EFI relay • Gas leakage from exhaust system
P0138 P0158	The rear heated oxygen sensor voltage during active control is 0.6 V or more. (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1) • EFI relay • Gas leakage from exhaust system
P0138 P0158	The rear heated oxygen sensor output voltage 1.2 V or higher for more than 30 seconds. (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1) • EFI relay • Gas leakage from exhaust system

MONITOR DESCRIPTION

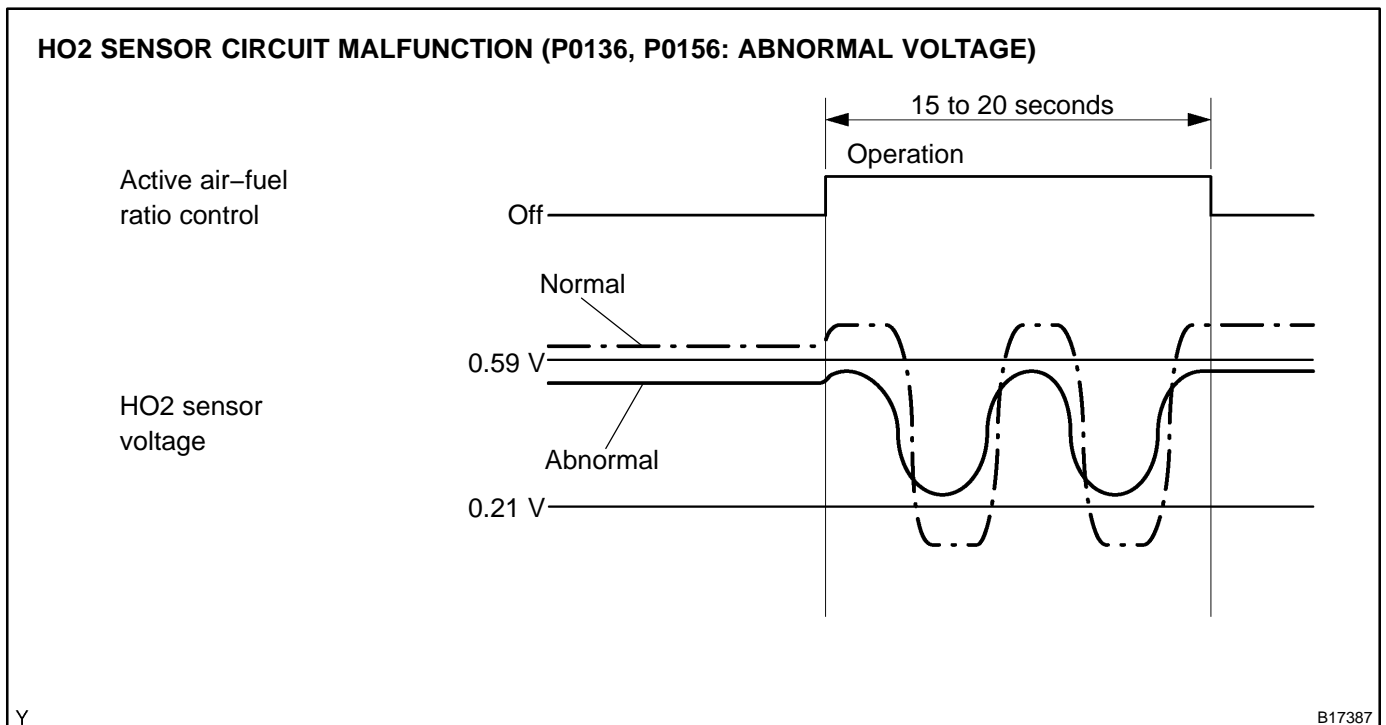
Active Air-Fuel Ratio Control

The ECM usually performs air-fuel ratio feedback control so that the Air-Fuel Ratio (A/F) sensor output indicates a near stoichiometric air-fuel level. This vehicle includes active air-fuel ratio control in addition to regular air-fuel ratio control. The ECM performs active air-fuel ratio control to detect any deterioration in the Three-Way Catalytic Converter (TWC) and Heated Oxygen (HO2) sensor malfunctions (refer to the diagram below).

Active air-fuel ratio control is performed for approximately 15 to 20 seconds while driving with a warm engine. During active air-fuel ratio control, the air-fuel ratio is forcibly regulated to become lean or rich by the ECM. If the ECM detects a malfunction, one of the following DTCs is set: DTC P0136, P0156 (abnormal voltage output), P0137, P0157 (open circuit) and P0138, P0158 (short circuit).

Abnormal Voltage Output of HO2 Sensor (DTC P0136, P0156)

While the ECM is performing active air-fuel ratio control, the air-fuel ratio is forcibly regulated to become rich or lean. If the sensor is not functioning properly, the voltage output variation is small. For example, when the HO2 sensor voltage does not decrease to less than 0.21 V and does not increase to more than 0.59 V during active air-fuel ratio control, the ECM determines that the sensor voltage output is abnormal and sets DTC P0136.



Open or Short in the Heated Oxygen (HO2) Sensor Circuit (DTC P0137, P0157, P0138 or P0158)

During active air-fuel ratio control, the ECM calculates the Oxygen Storage Capacity (OSC)* of the Three-Way Catalytic Converter (TWC) by forcibly regulating the air-fuel ratio to become rich or lean.

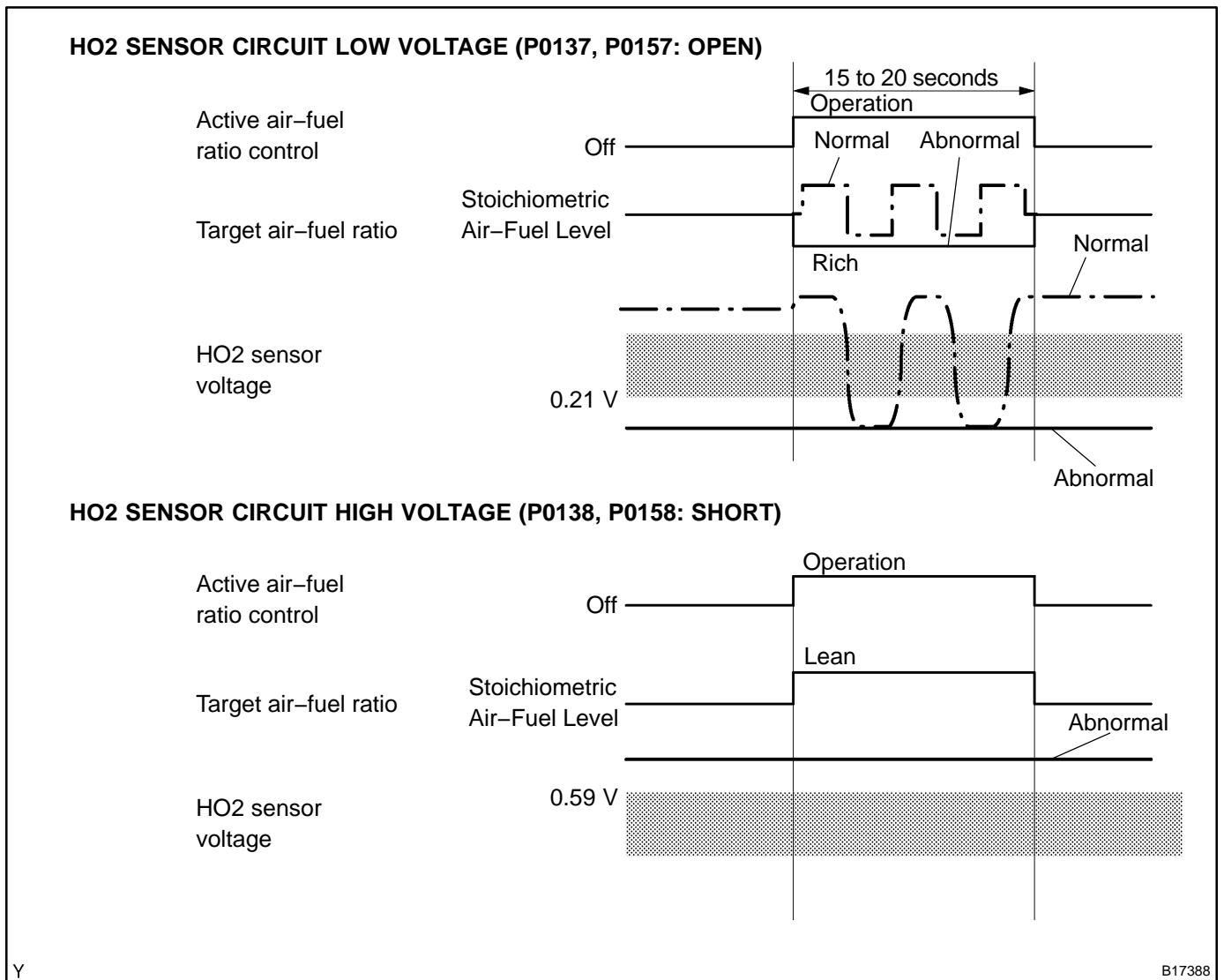
If the HO2 sensor has an open or short, or the voltage output of the sensor noticeably decreases, the OSC indicates an extraordinarily high value. Even if the ECM attempts to continue regulating the air-fuel ratio to become rich or lean, the HO2 sensor output does not change.

While performing active air-fuel ratio control, when the target air-fuel ratio is rich and the HO2 sensor voltage output is 0.21 V or less (lean), the ECM interprets this as an abnormally low sensor output voltage and sets DTC P0137 or P0157. When the target air-fuel ratio is lean and the voltage output is 0.59 V or more (rich) during active air-fuel ratio control, the ECM determines that the sensor voltage output is abnormally high, and sets DTC P0138 or P0158.

HINT:

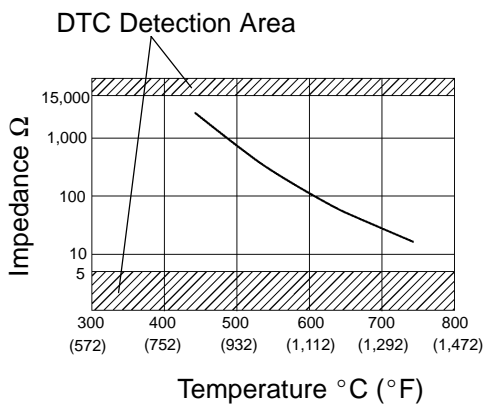
DTC P0138 or P0158 is also set if the HO2 sensor voltage output is more than 1.2 V for 30 seconds or more.

*: The TWC has the capability to store oxygen. The OSC and the emission purification capacity of the TWC are mutually related. The ECM determines whether the catalyst has deteriorated, based on the calculated OSC value (see page DI-228).



High or Low Impedance of Heated Oxygen (HO₂) Sensor (DTC P0136, P0156, P0137 or P0157)

Interrelation between temperature of the element and impedance:



During normal air–fuel ratio feedback control, there are small variations in the exhaust gas oxygen concentration. In order to continuously monitor the slight variation of the HO₂ sensor signal while the engine is running, the impedance* of the sensor is measured by the ECM. The ECM determines that there is a malfunction in the sensor when the measured impedance deviates from the standard range.

*: The effective resistance in an alternating current electrical circuit.

HINT:

- The impedance can not be measured using an ohmmeter.
- DTC P0136 or P0156 indicates the deterioration of the HO₂ sensor. The ECM sets the DTC by calculating the impedance of the sensor when the typical enabling conditions are satisfied (1 driving cycle).
- DTC P0137 or P0157 indicates an open or short circuit in the HO₂ sensor (1 driving cycle). The ECM sets this DTC when the impedance of the sensor exceeds the threshold 15 kΩ.

MONITOR STRATEGY

Related DTCs	P0136	Heated rear oxygen sensor (Bank 1) output voltage (Output voltage)
		Heated rear oxygen sensor (Bank 1) impedance (Low)
	P0137	Heated rear oxygen sensor (Bank 1) output voltage (Low voltage)
		Heated rear oxygen sensor (Bank 1) impedance (High)
	P0138	Heated rear oxygen sensor (Bank 1) output voltage (High voltage)
		Heated rear oxygen sensor (Bank 1) output voltage (Extremely high)
	P0156	Heated rear oxygen sensor (Bank 2) output voltage (Output voltage)
		Heated rear oxygen sensor (Bank 2) impedance (Low)
	P0157	Heated rear oxygen sensor (Bank 2) output voltage (Low voltage)
		Heated rear oxygen sensor (Bank 2) impedance (High)
	P0158	Heated rear oxygen sensor (Bank 2) output voltage (High voltage)
		Heated rear oxygen sensor (Bank 2) output voltage (Extremely high)
Required sensors/components	Main sensors/components	Heated rear oxygen sensor
	Related sensors/components	Mass air flow meter
Frequency of operation	Once per driving cycle: Active air-fuel ratio control detection Continuous: Others	
Duration	20 sec.: Heated oxygen sensor output (Output voltage, High voltage, Low voltage) 30 sec.: Heated oxygen sensor impedance (Low) 90 sec.: Heated oxygen sensor impedance (High) 10 sec.: Heated oxygen sensor voltage (Extremely high)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Heated oxygen sensor output voltage (Output voltage, High voltage and Low voltage):		
Active air-fuel ratio control	Performing	
Active air-fuel ratio control being when all of following conditions met	-	
Battery voltage	11 V	-
ECT	75°C (167°F)	-
Idle	OFF	
Engine RPM	-	3,200 rpm
A/F sensor status	Activated	

Fuel system status	Closed loop	
Fuel-cut	OFF	
Engine load	10 to 70%	
Heated oxygen sensor impedance (Low):		
Battery voltage	11 V	-
Estimated sensor temperature	-	700°C (1,292°F)
ECM monitor	Completed	
P0606	Not set	
Heated oxygen sensor impedance (High):		
Battery voltage	11 V	-
Estimated sensor temperature	520°C (968°F)	-
ECM monitor	Completed	
P0606	Not set	
Heated oxygen sensor output voltage (Extremely high):		
Battery voltage	11 V	-
Time after engine start	2 sec.	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Heated oxygen sensor output voltage (Output voltage):	
Either of the following conditions is met:	Condition 1 or 2
1. All of the following conditions are met:	Condition (a), (b) and (c)
(a) Commanded air-fuel ratio	14.3 or less
(b) Rear HO2S voltage	0.21 to 0.59 V
(c) OSC (Oxygen Storage Capacity of catalyst)	2.5 g or more
2. All of the following conditions are met:	Condition (a), (b) and (c)
(a) Commanded air-fuel ratio	14.9 or more
(b) Rear HO2S voltage	0.21 to 0.59 V
(c) OSC (Oxygen Storage Capacity of catalyst)	2.5 g or more
Heated oxygen sensor output voltage (Low voltage):	
All of the following conditions are met:	Condition 1, 2 and 3
1. Commanded air-fuel ratio	14.3 or less
2. Rear HO2S voltage	Less than 0.21 V
3. OSC (Oxygen Storage Capacity of catalyst)	2.5 g or more
Heated oxygen sensor output voltage (High voltage):	
All of the following conditions are met:	Condition 1, 2 and 3
1. Commanded air-fuel ratio	14.9 or more
2. Rear HO2S voltage	More than 0.59 V
3. OSC (Oxygen Storage Capacity of catalyst)	2.5 g or more
Heated oxygen sensor impedance (Low):	
Duration of following condition	30 sec. or more
Heated oxygen sensor impedance	Less than 5 Ω
Heated oxygen sensor impedance (High):	
Duration of following condition	90 sec. or more
Rear oxygen sensor impedance	15 kΩ or more

Heated oxygen sensor output voltage (Extremely high):	
Duration of following condition	10 sec. or more
Rear oxygen sensor voltage	More than 1.2 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Rear oxygen sensor voltage	1.2 V or more

O2S TEST RESULT

Refer to page [DI-24](#) for detailed information on O2S TEST RESULT.

Test ID	Test Item	Description	Unit Conversion	Unit	Standard Value
\$07	Output Voltage	Minimum rear HO2 sensor output voltage	Multiply by 0.005	V	Less than TEST LIMIT
\$08	Output Voltage	Maximum rear HO2 sensor output voltage	Multiply by 0.005	V	More than TEST LIMIT
\$91	OSC	Maximum OSC in catalytic converter	Multiply by 0.0156	g	Less than TEST LIMIT

If the sensor voltage is outside the standard values, the ECM interprets this as a malfunction and sets a DTC.

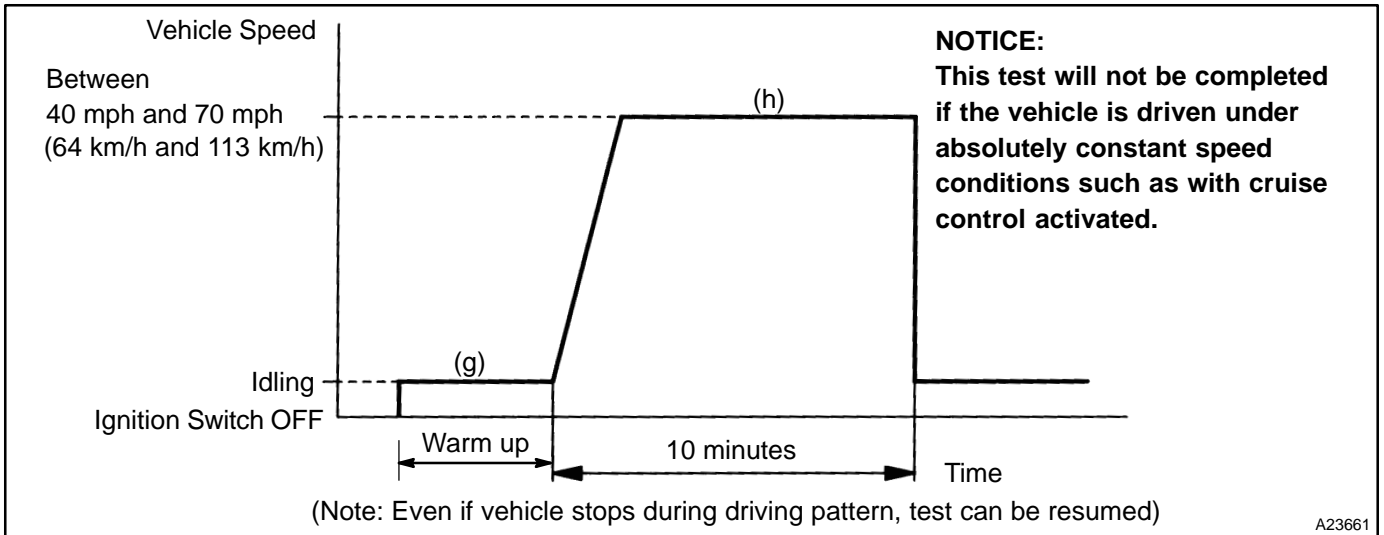
WIRING DIAGRAM

Refer to DTC P2195 on page [DI-312](#).

CONFIRMATION DRIVING PATTERN

HINT:

- This confirmation driving pattern is used in steps 5, 8 and 11 of the following diagnostic troubleshooting procedure when using a hand-held tester.
- Performing this confirmation pattern will activate the Heated Oxygen (HO2) sensor monitor. (The catalyst monitor is performed simultaneously.) This is very useful for verifying the completion of a repair.



READINESS TESTS	
MISFIRE MON	AVAIL
FUEL SYS MON	AVAIL
COMP MON	AVAIL
CAT EVAL	INCMPL
HTD CAT EVAL	N/A
EVAP EVAL	INCMPL
2nd AIR EVAL	N/A
A/C EVAL	N/A
O2S EVAL	INCMPL
O2S HTR EVAL	INCMPL
EGR EVAL	N/A

A76855 A23660

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Turn the tester ON.
- (d) Clear DTCs (where set) (see page DI-42).
- (e) Select the following menu items: DIAGNOSIS / CARB OBD II / READINESS TESTS.
- (f) Check that O2S EVAL is INCMPL (incomplete).
- (g) Start the engine and warm it up.
- (h) Drive the vehicle at 40 mph to 70 mph (64 km/h to 113 km/h) for at least 10 minutes.
- (i) Note the state of the Readiness Tests items. Those items will change to COMPL (complete) as O2S EVAL monitor operates.
- (j) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES and check if any DTCs (any pending DTCs) are set.

HINT:

If O2S EVAL does not change to COMPL, and any pending DTCs fail to set, extend the driving time.

INSPECTION PROCEDURE**HINT:**

Hand-held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following "A/F CONTROL" (Heated oxygen sensor or another can be distinguished).

- (a) Perform ACTIVE TEST by hand-held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to -12.5 % or +25 %.

- (1) Connect the hand-held tester to the DLC3 on the vehicle.
- (2) Turn the ignition switch ON.
- (3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 seconds.
- (4) Select the menu "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL".
- (5) Perform "A/F CONTROL" with the engine in an idle condition (press the right or left button).

RESULT:

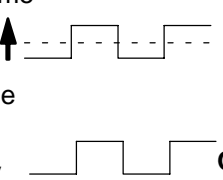
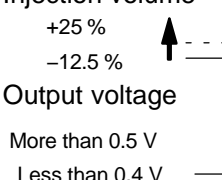
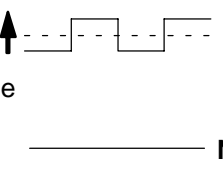
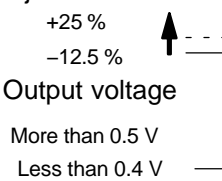
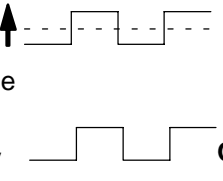
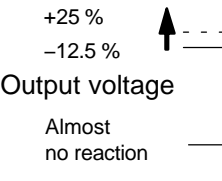
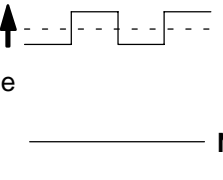
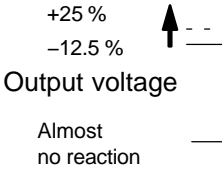
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume
 +25 % → rich output: More than 0.5 V
 -12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few seconds delay in the sensor 1 (front sensor) output. And there is approximately 20 seconds delay in the sensor 2 (rear sensor).

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of the heated oxygen sensors.

For displaying the graph indication, first enter "ACTIVE TEST / A/F CONTROL / USER DATA," then select "O2S B1S1 and O2S B1S2" by pressing "YES" button, and push "ENTER" button before pressing "F4" button.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspected trouble area
Case 1	Injection volume +25 % ↑ -12.5 %  Output voltage More than 0.5 V Less than 0.4 V OK	Injection volume +25 % ↑ -12.5 %  Output voltage More than 0.5 V Less than 0.4 V OK	—
Case 2	Injection volume +25 % ↑ -12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % ↑ -12.5 %  Output voltage More than 0.5 V Less than 0.4 V OK	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % ↑ -12.5 %  Output voltage More than 0.5 V Less than 0.4 V OK	Injection volume +25 % ↑ -12.5 %  Output voltage Almost no reaction NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % ↑ -12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % ↑ -12.5 %  Output voltage Almost no reaction NG	Extremely rich or lean actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

HINT:

- If different DTCs that are related to different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. when a malfunction occurred.

1	Read output DTC.
----------	-------------------------

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

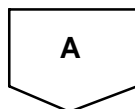
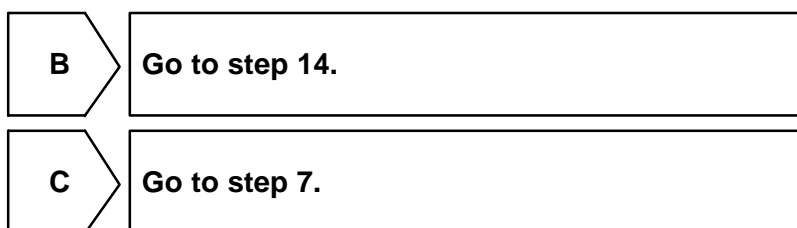
Read the DTC using the hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
P0138, P0158	A
P0137, P0157	B
P0136, P0156	C

HINT:

If any other codes besides P0136, P0137, P0138, P0156, P0157 and/or P0158 are output, perform the troubleshooting for those DTCs first.



2	Check output voltage of heated oxygen sensor.
----------	--

PREPARATION:

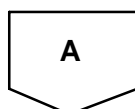
- (a) Connect the hand-held tester to the DLC3.
- (b) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S2 or B2S2.
- (d) Allow the engine to idle.

CHECK:

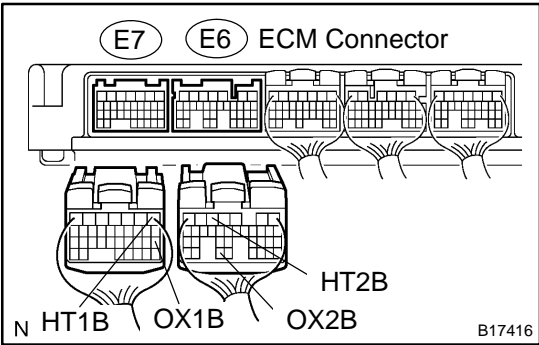
Read the Heated Oxygen (HO₂) sensor output voltage while idling.

RESULT:

HO ₂ Sensor Output Voltages	Proceed To
More than 1.2 V	A
Less than 1.0 V	B



3 Check for short in harness and connector between terminal OX1B and HT1B, OX2B and HT2B of ECM.



PREPARATION:

- (a) Turn the ignition switch to OFF and wait for 5 minutes.
- (b) Disconnect the E6 and E7 ECM connectors.

CHECK:

Check the resistance.

OK:

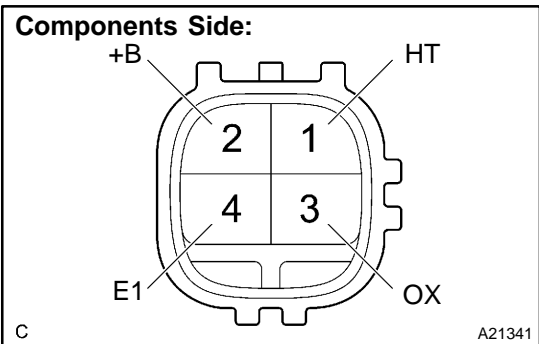
Standard:

Tester Connections	Specified Conditions
HT1B (E7-1) - OX1B (E7-18)	10 kΩ or higher
HT2B (E6-5) - OX2B (E6-33)	10 kΩ or higher

NG Replace ECM (See page SF-66).

NG

4 Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between terminals of the heated oxygen sensor.

OK:

Standard:

Tester Connection	Specified Condition
HT (1) - +B (2)	11 to 16 Ω at 20°C (68°F)
+B (2) - OX (3)	10 kΩ or higher

NG Replace heated oxygen sensor.

OK

Repair or replace harness or connector.

5 Perform confirmation driving pattern.

NEXT

6	Check whether DTC output recurs (DTC P0138, P0158)
----------	---

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P0138 or P0158	A
No output	B

B	Check for intermittent problems (See page DI-11).
----------	--

A

Replace heated oxygen sensor.

7	Check output voltage of heated oxygen sensor.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Start the engine.
- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S2.
- (e) After warming up the engine, run the engine at an engine speed of 2,500 rpm for 3 minutes.

CHECK:

Read the output voltage of the HO2 sensor when the engine rpm is suddenly increased.

HINT:

Quickly accelerate the engine to 4,000 rpm 3 times using the accelerator pedal.

Standard: Fluctuates between 0.4 V or less and 0.5 V or more.

NG	Go to step 14.
-----------	-----------------------

OK

8	Perform confirmation driving pattern.
----------	--

NEXT

9	Check whether DTC output recurs (DTC P0136, P0156)
----------	---

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P0136 or P0156	A
No output	B

B

Check for intermittent problems (See page DI-11).

A

10	Replace heated oxygen sensor.
-----------	--------------------------------------

NEXT

11	Perform confirmation driving pattern.
-----------	--

NEXT

12	Check whether DTC output recurs (DTC P0136, P0156)
-----------	---

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P0136 or P0156	A
No output	B

B

Repair completed.

A

13	Perform active test (injection volume).
-----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and turn the tester ON.
- (c) Warm up the engine.
- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / INJ VOL.

CHECK:

Change the fuel injection volume using the tester, monitoring the voltage output of Air-Fuel Ratio (A/F) and HO2 sensors displayed on the tester.

HINT:

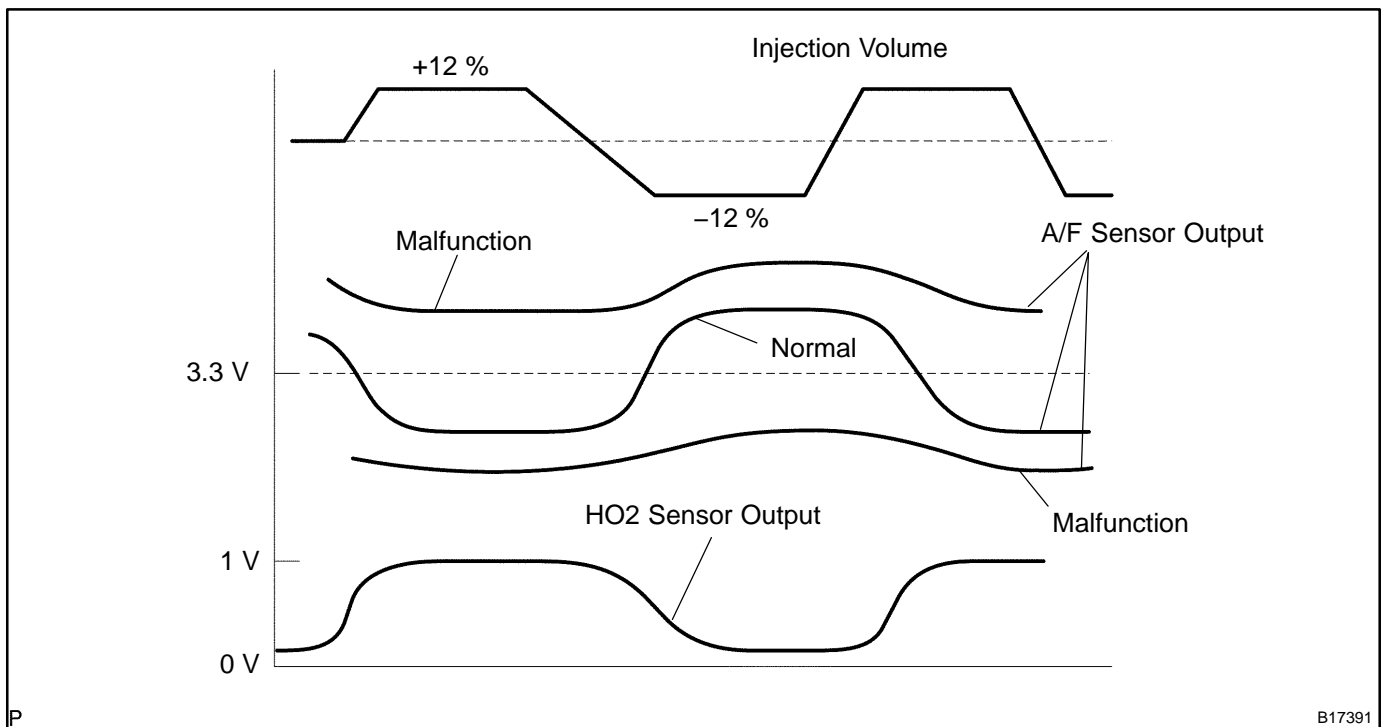
- Change the fuel injection volume within the range of -12 % and +12 %. The injection volume can be changed in 1 % graduations within the range.
- The A/F sensor is displayed as AFS B1S1, and the HO2 sensor is displayed as O2S B1S2, on hand-held testers.

RESULT:

Tester Display (Sensor)	Voltage Variations	Proceed To
AFS B1S1 (AFS B2S1) (A/F)	Alternates between more and less than 3.3 V	OK
AFS B1S1 (AFS B2S1) (A/F)	Remains at more than 3.3 V	NG
AFS B1S1 (AFS B2S1) (A/F)	Remains at less than 3.3 V	NG

HINT:

A normal HO2 sensor voltage (O2S B1S2) reacts in accordance with increases and decreases in fuel injection volumes. When the A/F sensor voltage remains at either less or more than 3.3 V despite the HO2 sensor indicating a normal reaction, the A/F sensor is malfunctioning.



NG	Replace air-fuel ratio (A/F) sensor.
-----------	---

OK

Check and repair extremely rich or lean actuarial air fuel ratio (injector, fuse pressure, gas leakages from exhaust system, etc.)

14 Check for exhaust gas leakage.

CHECK:

Check for exhaust gas leakage from the exhaust manifold and pipe.

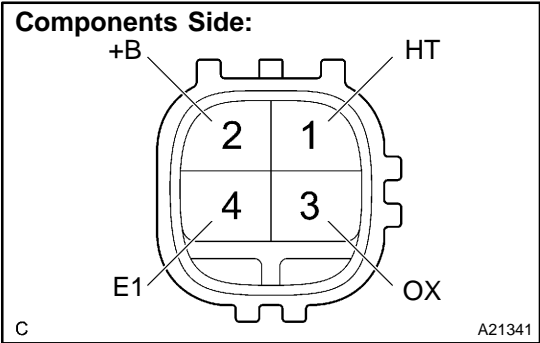
OK:

No exhaust gas leakage.

NG Repair or replace exhaust gas leakage point.

OK

15 Inspect heated oxygen sensor.



PREPARATION:

Disconnect the HO2 sensor connector.

CHECK:

Measure the resistance between the terminals of the HO2 sensor connector.

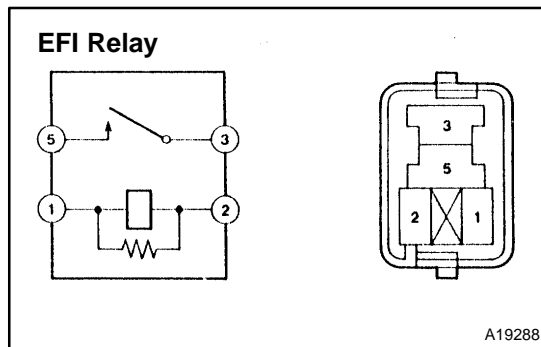
OK:

Standard:

Tester Connections	Specified Conditions
HT (2) - +B (1)	11 to 16 Ω at 20°C (68°F)
HT (2) - E (3)	10 kΩ or higher

NG Replace heated oxygen sensor.

OK

16 Check EFI relay.
**PREPARATION:**

Remove the EFI relay from the engine room J/B.

CHECK:

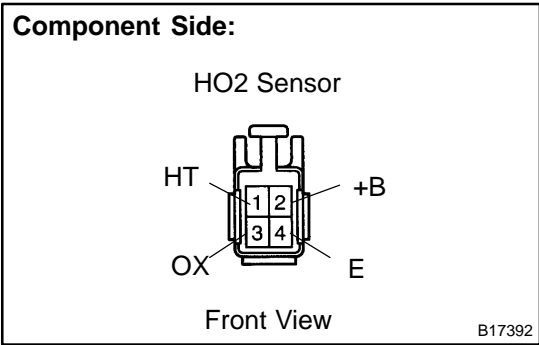
Inspect the EFI relay.

OK:**Standard:**

Terminal No.	Condition	Specified Condition
3 - 5	Usually	10 K Ω or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG**Replace EFI relay.****OK**

17 Check for open and short in harness and connector between ECM and heated oxygen sensor.



PREPARATION:

- (a) Disconnect the heated oxygen sensor connector.
- (b) Disconnect the E6 and E7 ECM connectors.

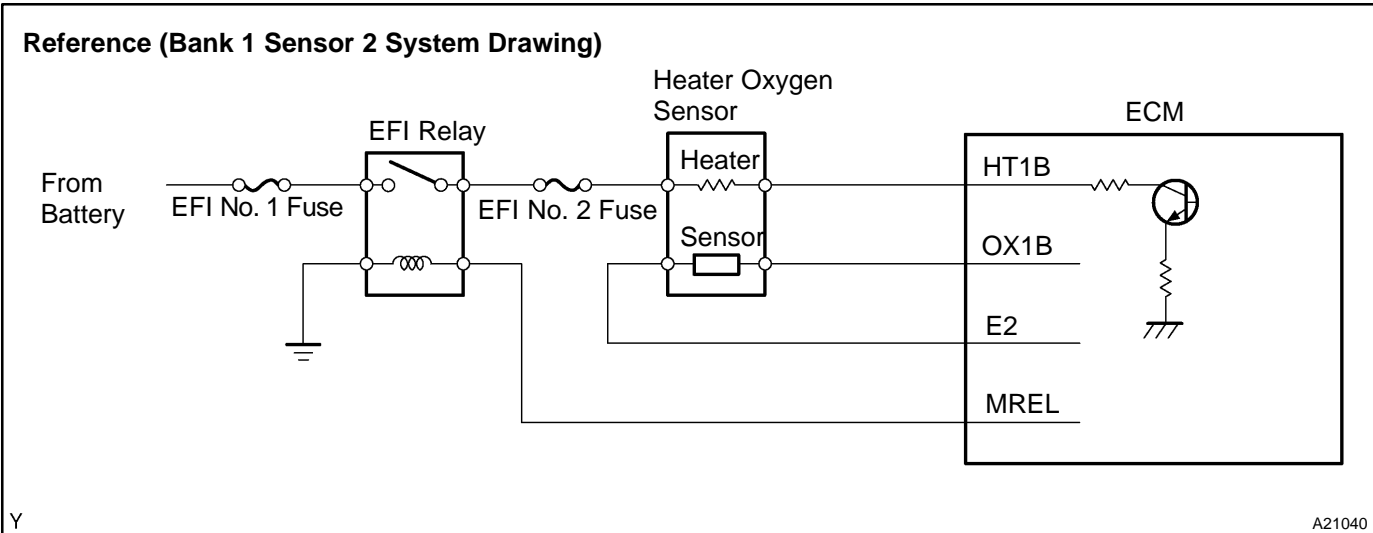
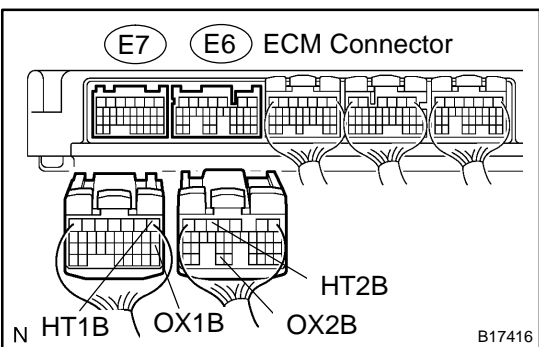
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
OX (H4-3) - OX1B (E7-18)	Below 1 Ω
HT (H4-1) - HT1B (E7-1)	Below 1 Ω
OX (H6-3) - OX2B (E6-33)	Below 1 Ω
HT (H6-1) - HT2B (E6-5)	Below 1 Ω
OX (H4-3) or OX1B (E7-18) - Body ground	10 kΩ or higher
HT (H4-1) or HT1B (E7-1) - Body ground	10 kΩ or higher
OX (H6-3) or OX2B (E6-33) - Body ground	10 kΩ or higher
HT (H6-1) or HT2B (E6-5) - Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

Replace heated oxygen sensor.

DTC	P0171	System too Lean (Bank 1)
------------	--------------	---------------------------------

DTC	P0172	System too Rich (Bank 1)
------------	--------------	---------------------------------

DTC	P0174	System too Lean (Bank 2)
------------	--------------	---------------------------------

DTC	P0175	System too Rich (Bank 2)
------------	--------------	---------------------------------

CIRCUIT DESCRIPTION

The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim consists of both the short-term and long-term fuel trims.

The short-term fuel trim is fuel compensation that is used to constantly maintain the air-fuel ratio at stoichiometric levels. The signal from the Air-Fuel Ratio (A/F) sensor indicates whether the air-fuel ratio is rich or lean compared to the stoichiometric ratio. This triggers a reduction in the fuel injection volume if the air-fuel ratio is rich and an increase in the fuel injection volume if it is lean.

Factors such as individual engine differences, wear over time and changes in operating environment cause short-term fuel trim to vary from the central value. The long-term fuel trim, which controls overall fuel compensation, compensates for long-term deviations in the fuel trim from the central value caused by the short-term fuel trim compensation.

If both the short-term and long-term fuel trims are lean or rich beyond predetermined values, it is interpreted as a malfunction, and the ECM illuminates the MIL and sets a DTC.

DIAGNOSTICS – ENGINE (1GR-FE)

DTC No.	DTC Detecting Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up the engine, fuel trim is considered to be in error on LEAN side (2 trip detection logic)	<ul style="list-style-type: none"> • Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • PCV piping • ECM
P0172 P0175	When air–fuel ratio feedback is stable after warming up the engine, fuel trim is considered to be in error on RICH side (2 trip detection logic)	<ul style="list-style-type: none"> • Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • ECM

HINT:

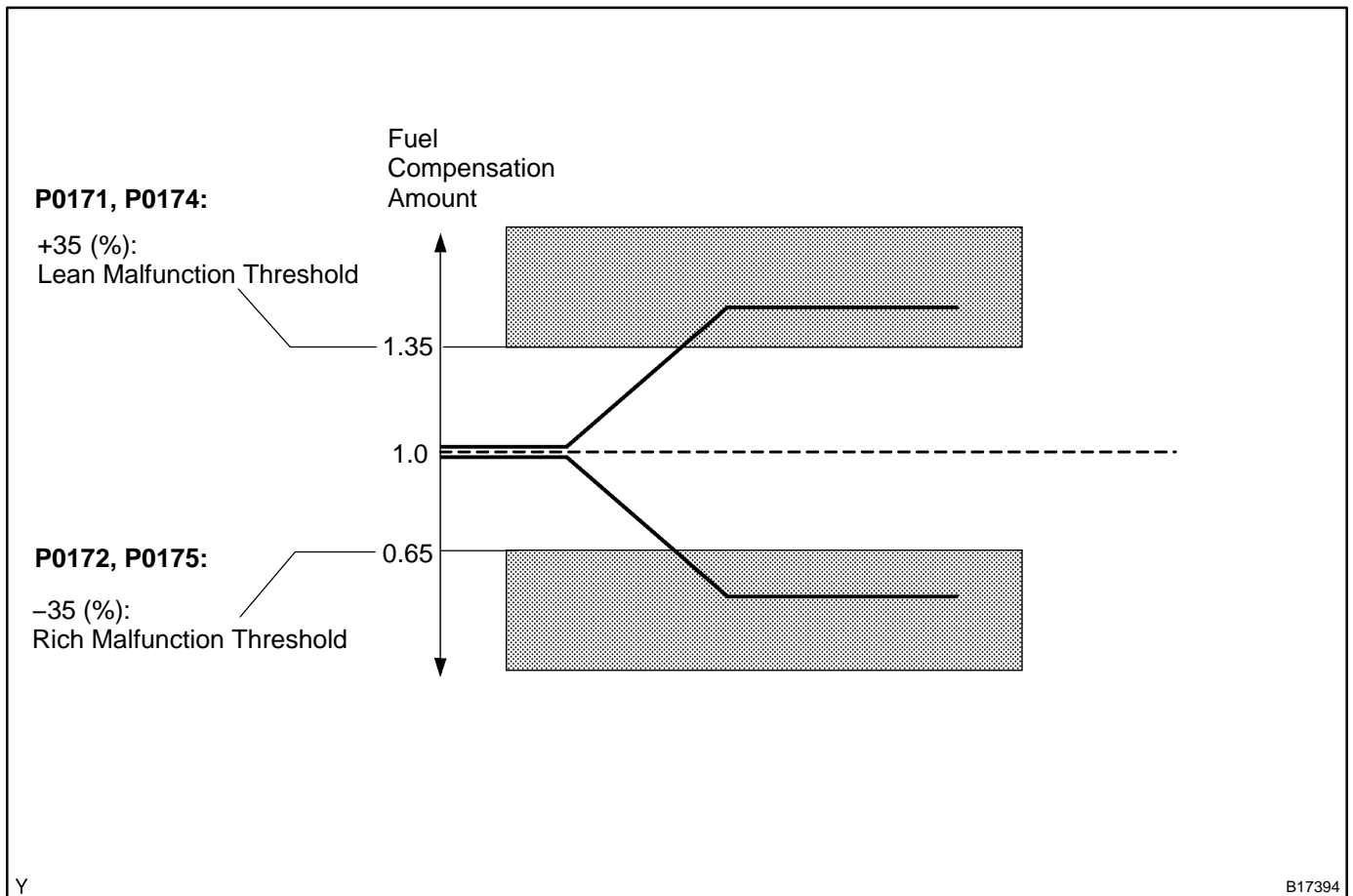
- When DTC P0171 or P0174 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 or P0175 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 or P0174 may be recorded. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within $\pm 35\%$ (engine coolant temperature is more than $75\text{ }^{\circ}\text{C}$ (167°F)), the system is functioning normally.

MONITOR DESCRIPTION

Under closed-loop fuel control, fuel injection volumes that deviate from those estimated by the ECM cause changes in the long-term fuel trim compensation value. The long-term fuel trim is adjusted when there are persistent deviations in the short-term fuel trim values. Deviations from the ECM's estimated fuel injection volumes also affect the average fuel trim learning value, which is a combination of the average short-term fuel trim (fuel feedback compensation value) and the average long-term fuel trim (learning value of the air-fuel ratio). If the average fuel trim learning value exceeds the malfunction thresholds, the ECM interprets this a fault in the fuel system and sets a DTC.

Example:

The average fuel trim leaning value is more than +35 % or less than -35 %, the ECM interprets this as a fuel system malfunction.



MONITOR STRATEGY

Related DTCs	P0171	Fuel system lean (Bank 1)
	P0172	Fuel system rich (Bank 1)
	P0174	Fuel system lean (Bank 2)
	P0175	Fuel system rich (Bank 2)
Required sensors/components	Main sensors/components	Fuel system
	Related sensors/components	Engine coolant temperature sensor, Mass air flow meter, Crankshaft position sensor, A/F sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Battery voltage	11 V	-
Fuel system status	Closed-loop	
Either of the following conditions is met:	Condition 1 or 2	
1. Engine RPM	-	1,100 rpm
2. Intake air amount per revolution	0.22 g/sec.	-
Catalyst monitor	No executed	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
EVAP purge-cut	Executing
Either of the following conditions is met	Condition 1 or 2
1. Average between short-term fuel trim and long-term fuel trim	35% or more (varies with ECT)
2. Average between short-term fuel trim and long-term fuel trim	-35% or less (varies with ECT)

WIRING DIAGRAM

Refer to DTC P2195 on page [DI-312](#).

INSPECTION PROCEDURE

HINT:

Hand-held tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- (1) Connect a hand-held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 (AFS B2S1) and OS2 B1S2 (OS2 B2S2)) displayed on the tester.

HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

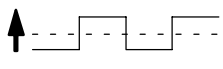

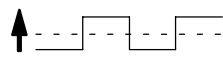
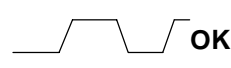
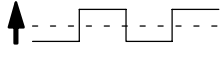

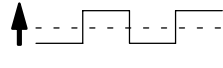
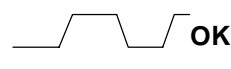
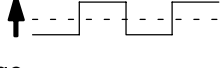
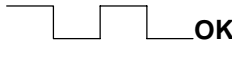
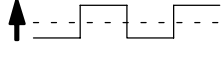
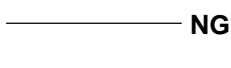
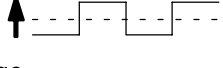

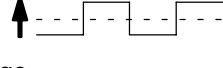

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 % ↑  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0 V	Injection volume +25 % ↑  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	—
2	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 % ↑  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 % ↑  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0V	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

HINT:

- Read freeze frame data using a hand-held tester or OBD II scan tool. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.
- A low A/F sensor voltage could be caused by a rich air-fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air-fuel mixture. Check for conditions that would cause the engine to run lean.

1	Check any other DTCs output (in addition to DTC P0171, P0172, P0174 or P0175).
----------	---

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0171, P0172, P0174 or P0175	A
P0171, P0172, P0174 or P0175 and other DTCs	B

HINT:

If any DTCs other than P0171, P0172, P0174 or P0175 are output, troubleshoot those DTCs first.

B	Go to DTC chart (See page DI-57).
----------	--

A

2	Check connection of PCV piping.
----------	--

OK:

PCV hose is connected correctly and is not damaged.

NG	Repair or replace PCV piping.
-----------	--------------------------------------

OK

3	Check air induction system (See page SF-1).
----------	--

CHECK:

Check the air induction system for vacuum leaks.

NG

Repair or replace air induction system.
--

OK

4	Perform active test (A/F control).
----------	---

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and turn the tester ON.
- (c) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (d) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (e) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (f) Monitor the voltage outputs of A/F and HO2 sensors (AFS B1S1 (AFS B2S1) and O2S B1S2 (O2S B2S2)) displayed on the tester.

HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

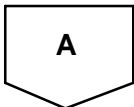
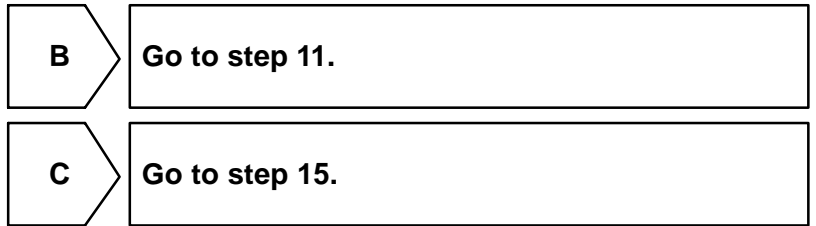
Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO2)	-12.5 %	Lean	Less than 0.4

Result:

Status AFS B1S1 (AFS B2S1)	Status O2S B1S2 (O2S B2S2)	A/F Condition and A/F Sensor Condition	Misfires	Suspected Trouble Areas	Proceed To
Lean/Rich	Lean/Rich	Normal	—	—	C
Lean	Lean	Actual air-fuel ratio lean	May occur	<ul style="list-style-type: none"> • PCV valve and hose • PCV hose connections • Injector blockage • Gas leakage from exhaust system • Air induction system • Fuel pressure • Mass Air Flow (MAF) meter • Engine Coolant Temperature (ECT) sensor 	A
Rich	Rich	Actual air-fuel ratio rich	—	<ul style="list-style-type: none"> • Injector leakage or blockage • Gas leakage from exhaust system • Ignition system • Fuel pressure • MAF meter • ECT sensor 	A
Lean	Lean/Rich	A/F sensor malfunction	—	• A/F sensor	B
Rich	Lean/Rich	A/F sensor malfunction	—	• A/F sensor	B

Lean: During A/F CONTROL, the A/F sensor output voltage (AFS) is consistently more than 3.35 V, and the HO2 sensor output voltage (O2S) is consistently less than 0.4 V.

Rich: During A/F CONTROL, the AFS is consistently less than 3.0 V, and the O2S is consistently more than 0.55 V.



5	Read value of coolant temperature.
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the COOLANT TEMP twice, when the engine is cold and also when warmed up.

OK:

With cold engine: Same as ambient air temperature.

With warm engine: Between 75°C and 95°C (167°F and 203°F)



6	Read value of mass air flow meter.
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF and COOLANT TEMP.
- (d) Allow the engine to idle until the COOLANT TEMP reaches 75°C (167°F) or more.

CHECK:

Read the MAF with the engine in an idling condition and at an engine speed of 2,500 rpm.

Standard:

MAF while engine idling: Between 1.4 gm/s and 2.3 gm/s (shift position: N, A/C: OFF).

MAF at engine speed of 2,500 rpm: Between 5.4 gm/s and 7.9 gm/s (shift position: N, A/C: OFF).

NG	Replace mass air flow meter.
-----------	-------------------------------------

OK

7	Check fuel pressure (See page SF-5).
----------	---

CHECK:

Check the fuel pressure (high or low pressure).

NG	Check and replace fuel pump, pressure regulator, fuel pipe line and filter (See page SF-1).
-----------	--

OK

8	Check exhaust system for gas leakage.
----------	--

CHECK:

Check for exhaust gas leakage from the exhaust manifold and pipe.

OK:

No exhaust gas leakage.

NG	Repair or replace exhaust gas leakage point.
-----------	---

OK

9 Check for spark and ignition (See page IG-1).

HINT:

If the spark plugs or ignition system malfunction, engine misfire may occur. The misfire counter can be read with the hand-held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / MISFIRE / CYL#1 (to CYL#8).

NG → **Repair or replace ignition system.**

OK

10 Check injector injection (See page SF-26).

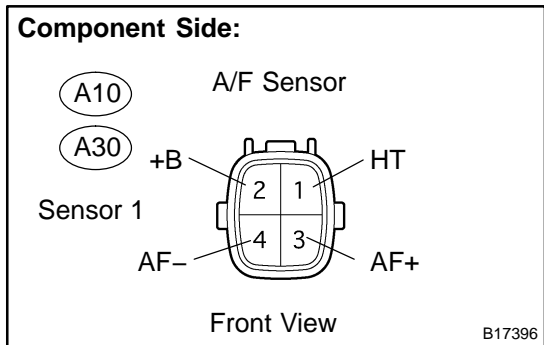
HINT:

If the injectors malfunction, engine misfires may occur. The misfire counter can be read with the hand-held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / MISFIRE / CYL#1 (to CYL#8).

NG → **Replace injector.**

OK

11 Check resistance of air-fuel ratio (A/F) sensor heater.



PREPARATION:

Disconnect the A10 or A30 air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

OK:

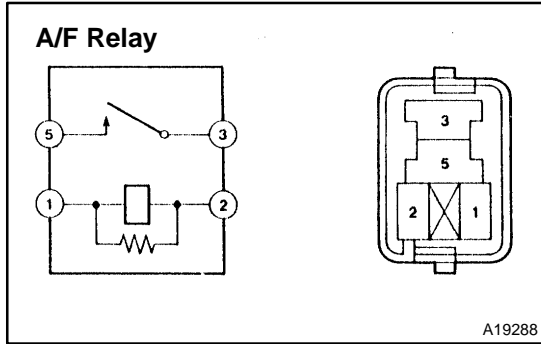
Standard:

Tester Connection	Specified Condition
HT (1) - +B (2)	1.8 to 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 kΩ or higher

NG → **Replace air-fuel ratio (A/F) sensor.**

OK

12 Check A/F relay.



PREPARATION:

Remove the A/F relay from the engine room J/B.

CHECK:

Inspect the A/F relay.

OK:

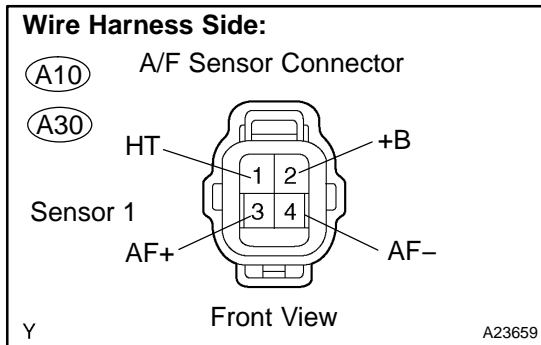
Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Usually	10 K Ω or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace A/F relay.

OK

13 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Turn the ignition switch to ON.

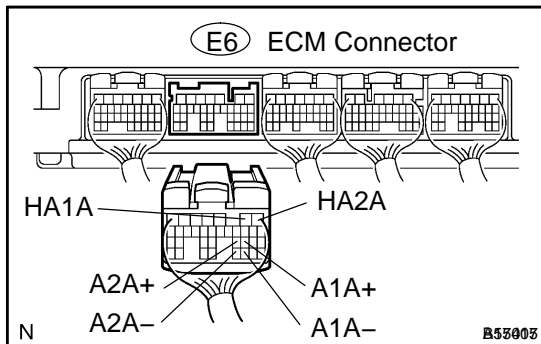
CHECK:

Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

OK:

Standard:

Tester Connections	Specified Conditions
+B (2) - Body ground	9 to 14 V



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E6 ECM connector.

CHECK:

Check the resistance.

OK:

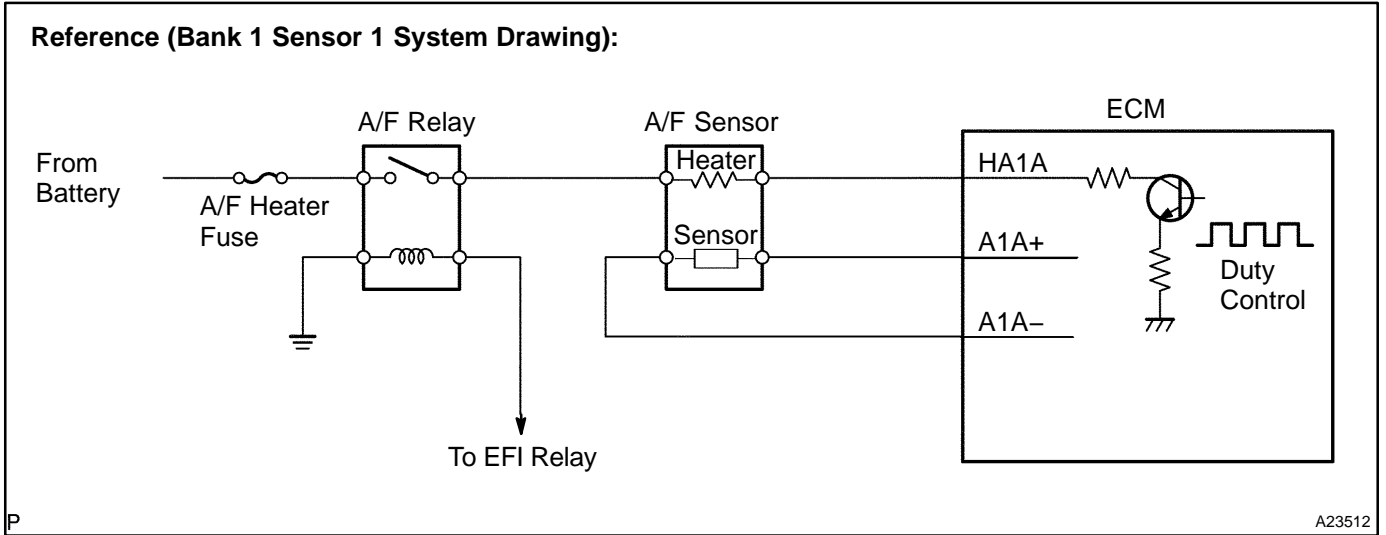
Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω
AF+ (A10-3) - A1A+ (E6-22) AF+ (A30-3) - A2A+ (E6-23)	Below 1 Ω
AF- (A10-4) - A1A- (E6-30) AF- (A30-4) - A2A- (E6-31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher
AF+ (A10-3) or A1A+ (E6-22) - Body ground AF+ (A30-3) or A2A+ (E6-23) - Body ground	10 kΩ or higher
AF- (A10-4) or A1A- (E6-30) - Body ground AF- (A30-4) or A2A- (E6-31) - Body ground	10 kΩ or higher

Reference (Bank 1 Sensor 1 System Drawing):



P

A23512

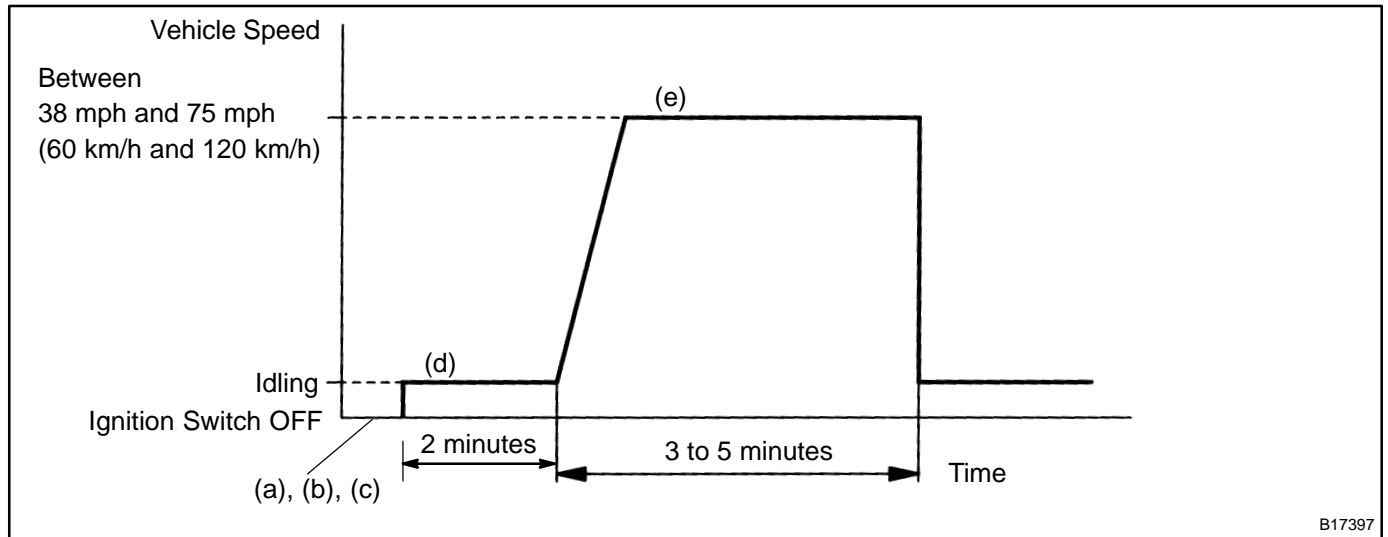
NG → **Replace or replace harness or connector.**

OK

14 **Replace air fuel ratio sensor.**

NEXT

15	Perform confirmation driving pattern.
-----------	--



- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Clear DTCs (see page [DI-42](#)).
- (d) Switch the ECM from normal mode to check mode using the tester (see page [DI-43](#)).
- (e) Start the engine and warm it up with all the accessories switched OFF.
- (f) Drive the vehicle at 38 mph to 75 mph (60 km/h to 120 km/h) and at an engine speed of between 1,400 rpm and 3,200 rpm for 3 to 5 minutes.

HINT:

If the system is still malfunctioning, the MIL will be illuminated during step (e).

NOTICE:

If the conditions in this test are not strictly followed, no malfunction will be detected.

NEXT

16	Check whether DTC output recurs (DTC P0171, P0172, P0174 or P0175)
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CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P0171, P0172, P0174 or P0175	A
No output	B

B → **Go to step 5.**

A

END

DTC	P0230	Fuel Pump Primary Circuit
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CIRCUIT DESCRIPTION

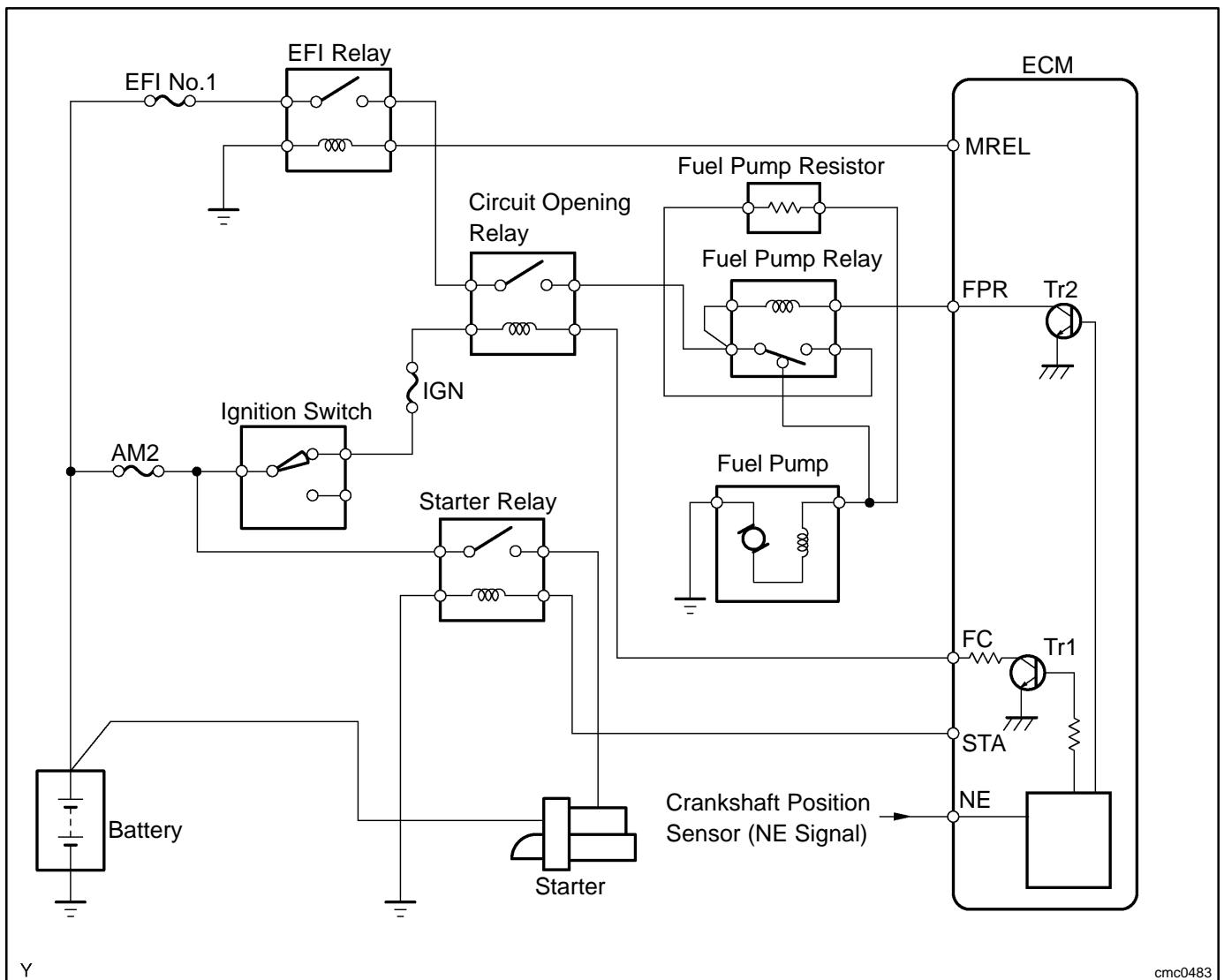
In the diagram below, when the engine is cranked, current flows from terminal STAR of the ECM to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).

When the STA signal and NE signal are input to the ECM, the Tr1 is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump, and the fuel pump operates.

While the NE signal is generated (engine running), the ECM keeps the Tr1 ON (circuit opening relay ON) and the fuel pump also keeps operating.

The fuel pump speed is controlled at two levels (high speed or low speed) by the condition of the engine (starting, light load, heavy load). When the engine starts (STA ON), the Tr2 in the ECM is OFF, so the fuel pump relay closes and battery positive voltage is applied directly to the fuel pump. The fuel pump operates at high speed.

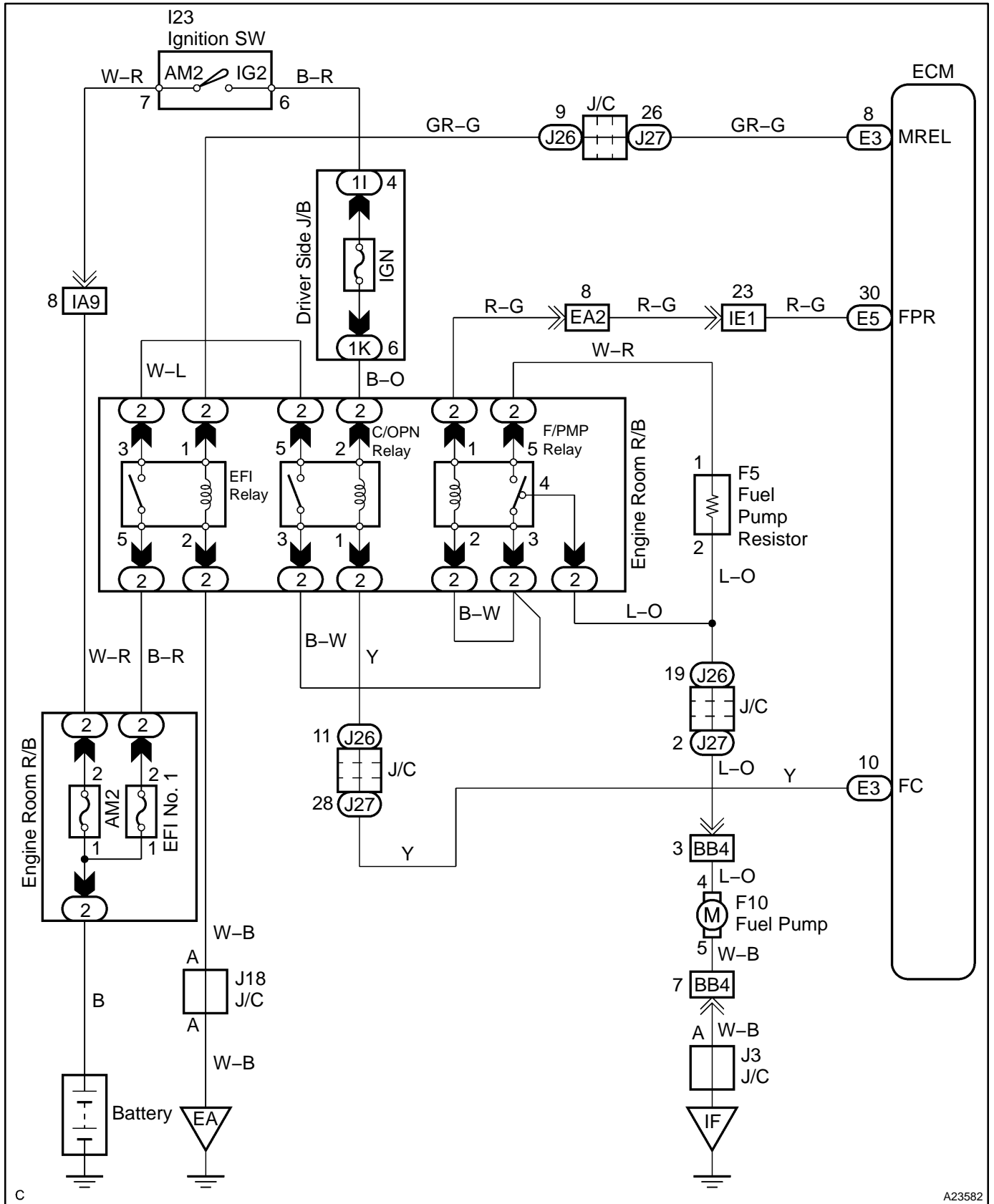
After the engine starts while idling or light loads, since the Tr2 goes ON, power is supplied to the fuel pump via the fuel pump resistor. The fuel pump operates at low speed.



DIAGNOSTICS - ENGINE (1GR-FE)

DTC No.	DTC Detecting Condition	Trouble Area
P0230	Open or short in fuel pump relay circuit	<ul style="list-style-type: none">• Open or short in fuel pump relay circuit• Fuel pump relay• Circuit opening relay• Fuel pump• ECM

WIRING DIAGRAM



HINT:

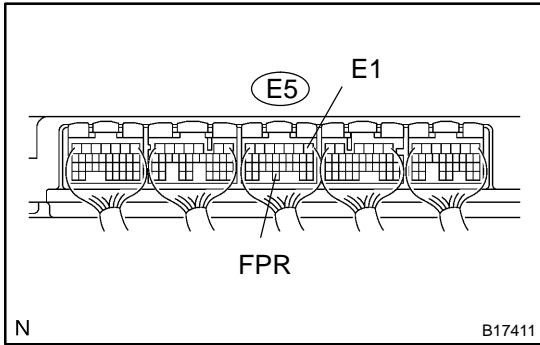
This diagnostic chart is based on premise that engine is started. If the engine is not started, proceed to problem symptoms table on [DI-33](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Check voltage between terminal FPR and E1 of ECM.



CHECK:

Measure the voltage between terminals of E5 ECM connectors.

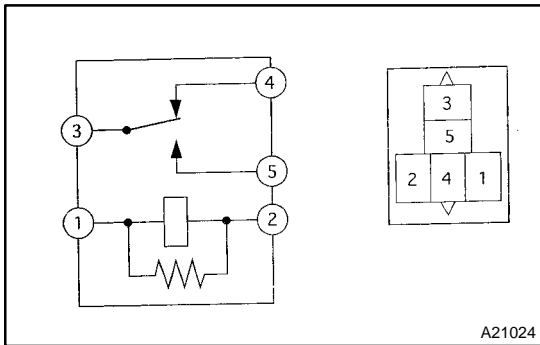
OK:

Tester Connection	Condition	Specified Condition
FPR (E5-30) - E1 (E5-1)	STA signal ON	9 to 14 V
FPR (E5-30) - E1 (E5-1)	STA signal OFF	0 to 3 V

OK Replace ECM (See page SF-66).

NG

2 Check fuel pump relay.



PREPARATION:

Remove the fuel pump relay from the engine room R/B.

CHECK:

Inspect the fuel pump relay.

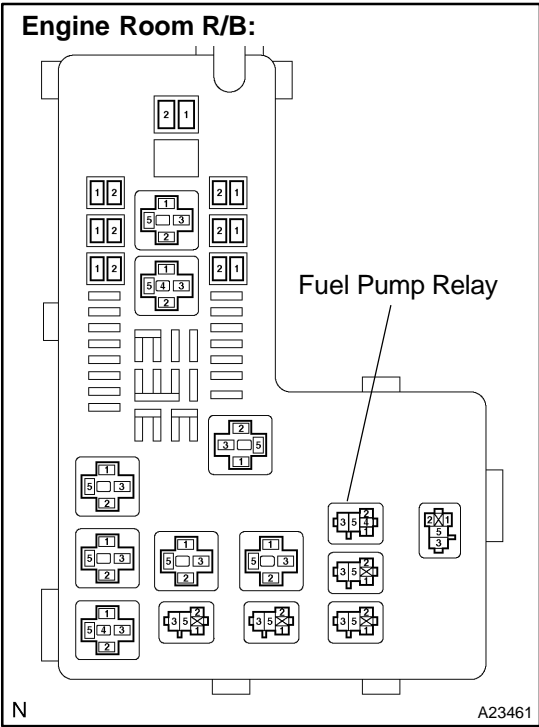
OK:

Terminal No.	Condition	Specified Condition
3 - 4	Apply B+ between terminals 1 and 2	10 kΩ or higher
3 - 4	Usually	Below 1 Ω
3 - 5	Usually	10 kΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace fuel pump relay.

OK

3 Check for open and short in harness and connector between fuel pump relay and ECM.



PREPARATION:

- (a) Remove the fuel pump relay from the engine room J/B.
- (b) Disconnect the E5 ECM connector.

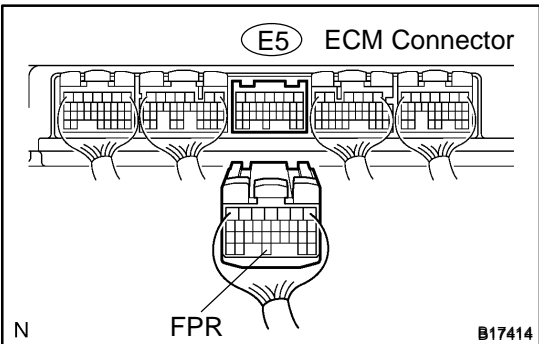
CHECK:

Measure the resistance between wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
Engine Room J/B (Fuel pump relay terminal 1) – FPR (E5-30)	Below 1 Ω
Engine Room J/B (Fuel pump relay terminal 1) or FPR (E5-30) – Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

Replace ECM (See page [SF-66](#)).

DTC	P0300	Random/Multiple Cylinder Misfire Detected
DTC	P0301	Cylinder 1 Misfire Detected
DTC	P0302	Cylinder 2 Misfire Detected
DTC	P0303	Cylinder 3 Misfire Detected
DTC	P0304	Cylinder 4 Misfire Detected
DTC	P0305	Cylinder 5 Misfire Detected
DTC	P0306	Cylinder 6 Misfire Detected

CIRCUIT DESCRIPTION

When a misfire occurs in the engine, hydrocarbons (HC) enter the exhaust in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emission levels. High concentrations of HC can also cause the temperature of the catalyst to increase, possibly damaging the catalyst. To prevent this increase in emissions and limit the possibility of thermal damage, the ECM monitors the misfire rate. When the temperature of the catalyst reaches a point of thermal degradation, the ECM will blink the MIL. For monitoring misfire, the ECM uses both the camshaft position sensor and the crankshaft position sensor. The camshaft position sensor is used to identify misfiring cylinders and the crankshaft position sensor is used to measure variations in the crankshaft rotation speed. The misfire counter increments when crankshaft rotation speed variations exceed threshold values.

If the misfiring rate exceeds the threshold value, which could cause emissions deterioration, the ECM illuminates the MIL.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system
P0301 P0302 P0303 P0304 P0305 P0306	Misfiring of each cylinder is detected	<ul style="list-style-type: none"> • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM

HINT:

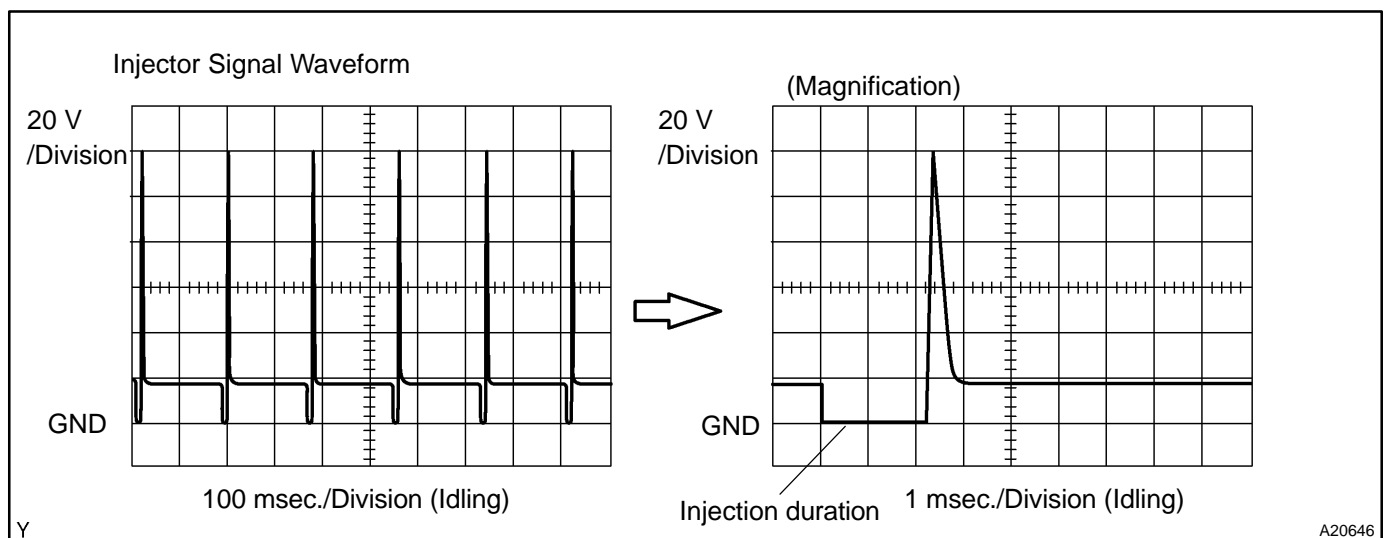
When several codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.

Reference: Inspection using the oscilloscope.

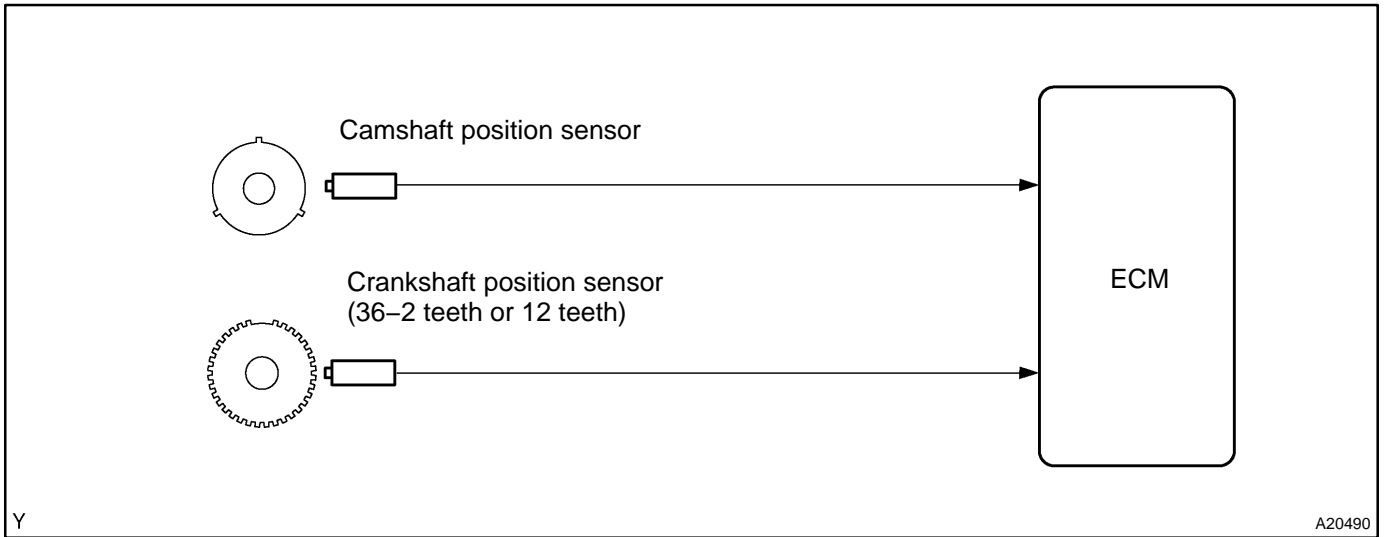
With the engine idling, check the waveform between terminals #1 to #8 and E01 of the ECM connectors.

HINT:

The correct waveform is as shown in the illustration.



MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:

The ECM will illuminate the MIL when the percentage of misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will set the MIL. Four occurrences are required to set the MIL 1,000 revolutions after engine start.

The ECM blinks the MIL (the MIL blinks immediately) if:

- Within 200 engine revolutions at a high rpm, the threshold for "percentage of misfire causing catalyst damage" is reached 1 time.
- Within 200 engine revolutions at a normal rpm, the threshold for "percentage of misfire causing catalyst damage" is reached 3 time.

MONITOR STRATEGY

Related DTCs	P0300	Random/Multiple cylinder misfire detected
	P0301	Cylinder 1 misfire detected
	P0302	Cylinder 2 misfire detected
	P0303	Cylinder 3 misfire detected
	P0304	Cylinder 4 misfire detected
	P0305	Cylinder 5 misfire detected
	P0306	Cylinder 6 misfire detected
Required sensors/components	Main sensors/components	Camshaft position sensor, Crankshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Intake air temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	Every 1,000 revolutions (soon after engine is started: 1 time, other: 4 times) (emission related misfire) Every 200 revolutions (1 or 3 times) (catalyst deteriorating misfire)	
MIL operation	2 driving cycles: MIL ON Immediate: MIL flashing (Catalyst deteriorating misfire)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

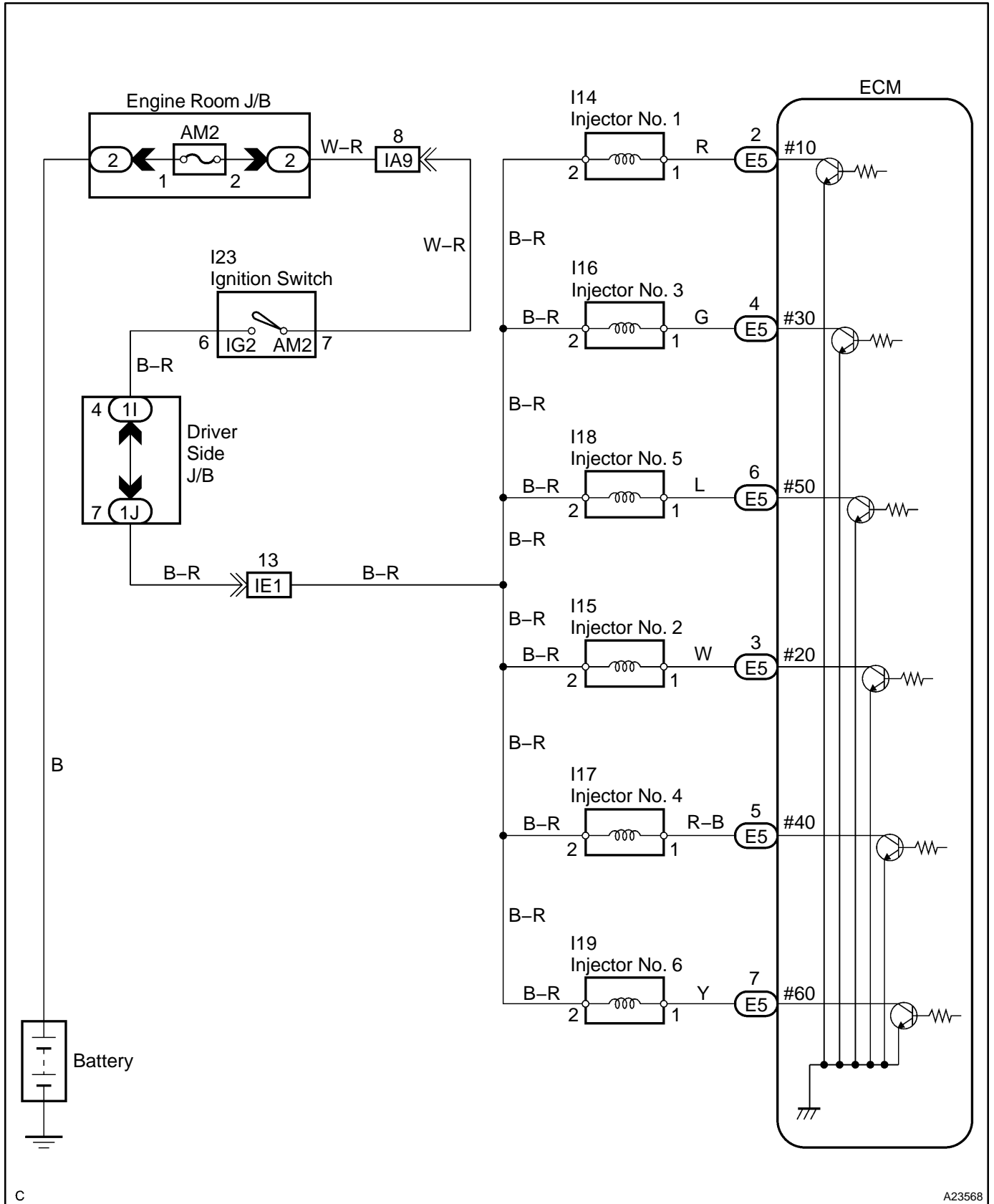
Item	Specification	
	Minimum	Maximum
All:		
The monitor will run whenever these DTCs are not present	See page DI-18	
Battery voltage	8 V	-
VVT system	Not operate by scan tool	
Engine RPM	450 to 5,400rpm (Manual transmission) 400 to 5,400rpm (Automatic transmission)	
Either of the following conditions is met:	Condition (a) or (b)	
(a) ECT at engine start	-7°C (19°F)	-
(b) ECT	20°C (68°F)	-
Fuel-cut	OFF	
Emission-related-misfire:		
First 1,000 revolutions after engine start, or check mode	Crankshaft 1,000 revolutions	
Except above	Crankshaft 1,000 revolutions x 4	
Catalyst-damage-misfire (MIL blinks):		
All of the following conditions 1, 2 and 3 are met	Crankshaft 200 revolutions	
1. Driving cycle	1st	
2. Check mode	OFF	
3. Engine RPM	-	2,800 rpm
Except above	Crankshaft 200 revolutions x 3	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Emission-related-misfire:	
Misfire rate:	2.9% or more (Manual transmission) 2.0% or more (Automatic transmission)
Catalyst-damage-misfire (MIL blinks):	
Number of misfire per 200 revolutions	77 or more (varies with intake air amount and RPM)
Paired cylinders misfire	Detected

WIRING DIAGRAM

Refer to DTC P0351 on page [DI-216](#) for the wiring diagram of the ignition system.



CONFIRMATION DRIVING PATTERN

- (a) Connect the hand-held tester to the DLC3.
- (b) Record DTC and the freeze frame data.
- (c) Use the hand-held tester to set the check mode (See page [DI-43](#)).
- (d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
- (e) Drive the vehicle several times with the engine speed, load and surrounding range shown as ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the DATA LIST.

If you have no hand-held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:

In order to memorize the DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the DATA LIST for the following period of time. Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode, and all DTCs, etc., are erased.

Engine Speed	Time
Idling	3 minutes 30 seconds or more
1,000 rpm	3 minutes or more
2,000 rpm	1 minute 30 seconds or more
3,000 rpm	1 minute or more

- (f) Check if there is misfire, and the DTC and the freeze frame data. Record the DTC's, freeze frame data and misfire counter data.
- (g) Turn the ignition switch OFF and wait for at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire DTCs are memorized simultaneously, troubleshoot the non-misfire DTCs first.
- If the misfire does not occur when the vehicle is brought to the workshop, the misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (See confirmation driving pattern).
- On 6 or 8 cylinder engines, misfiring cylinder identification is disabled at high engine speed and only a general misfire fault code P0300 is stored instead of a cylinder specific misfire fault code (P0301 to P0306).

If the misfire starts in a high engine speed area or the misfire occurs only in a high engine speed area, only code P0300 may be stored.

When only a general misfire fault code like P0300 is stored:

- Erase the general misfire fault code using the hand-held tester
- Start the engine and drive the confirmation pattern.
- Read the value of the misfire ratio for each cylinder. Or read the DTC.
- Repair the cylinder that has a high misfire ratio. Or repair the cylinder indicated by the DTC.
- After finishing repairs, drive the confirmation pattern again and confirm that no misfire occurs.
- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is over the range of $\pm 20\%$, there is a possibility that the air-fuel ratio is becoming RICH (-20% or less) or LEAN ($+20\%$ or more).
- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during engine warm-up.
- If the misfire cannot be reproduced, the following reasons may apply: 1) the vehicle has low fuel, 2) improper fuel is being used, or 3) the ignition plug is contaminated.
- Be sure to check the value on the misfire counter after the repair.

1	Are there any other codes (besides DTC P0300, P0301, P0302, P0303, P0304 P0305 or P0306) being output?
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs using hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
"P0300, P0301, P0302, P0303, P0304, P0305 and/or P0306"	A
"P0300, P0301, P0302, P0303, P0304, P0305 or P0306" and other DTCs	B

HINT:

If any other codes besides "P0300, P0301, P0302, P0303, P0304, P0305 or P0306" are output, perform the troubleshooting for those DTCs.

B	Go to DTC chart (See page DI-57).
----------	--

A

2	Check wire harness, connector and vacuum hose in engine room.
----------	--

CHECK:

- (a) Check the connection conditions of the wire harness and connector.
- (b) Check for the disconnection and damaged of the vacuum hose.

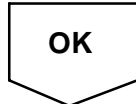
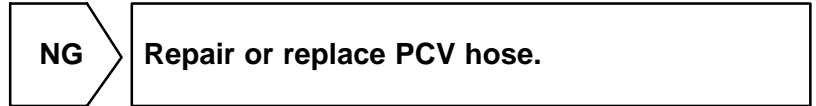
NG	Repair or replace, then confirm that there is no misfire (See confirmation driving pattern).
-----------	---

OK

3	Check connection of PCV hose.
----------	--------------------------------------

OK:

PCV hose is connected correctly and is not damaged.



4	Connect hand-held tester, and read the number of misfire.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) Start the engine.
- (d) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / CYL#1 to CYL#6.

CHECK:

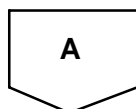
Read the number of misfire on the hand-held tester.

HINT:

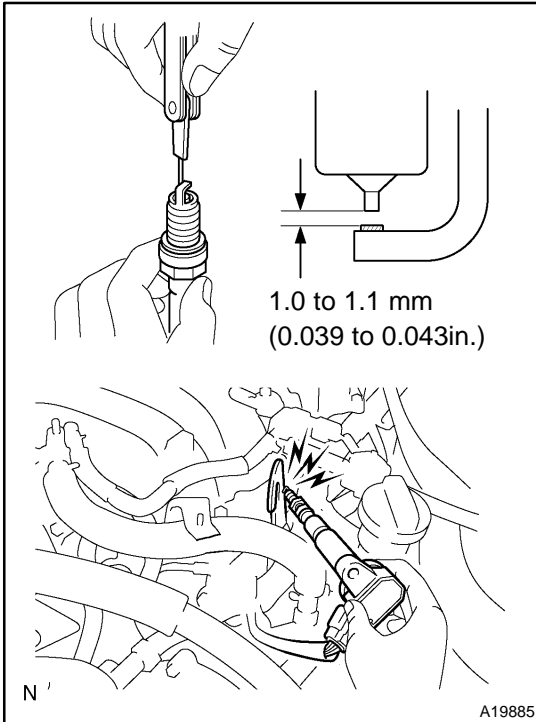
When a misfire is not reproduced, be sure to branch below based on the stored DTC.

RESULT:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B



5 Check spark plug and spark of misfiring cylinder.



PREPARATION:

- Remove the ignition coil assembly.
- Remove the spark plug.

CHECK:

- Check the electrode for carbon deposits.
- Check the spark plug type (See page [IG-1](#)).
- Check electrode gap.

OK:

No large carbon deposit present.

Not wet with gasoline or oil.

Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)

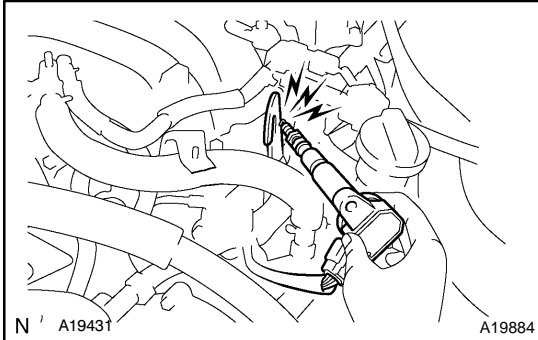
NOTICE:

If adjusting the gap of a new spark plug, bend only "the base / ground" electrode. Do not touch the tip. Never attempt to adjust the gap of a used plug.

NG

Replace spark plug.

OK

6 Change normal spark plug and check spark of misfiring cylinder.**PREPARATION:**

- (a) Change to the normal spark plug.
 - (1) Remove the spark plug that may be faulty from the ignition coil assembly.
 - (2) Install another spark plug to the ignition coil assembly.
- (b) Disconnect the injector connectors.
- (c) Ground the spark plug.

CHECK:

Check if spark occurs while the engine is being cranked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

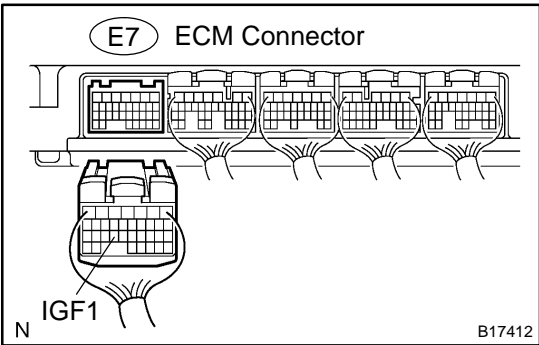
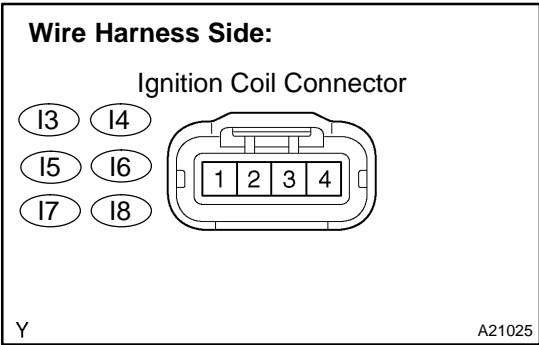
Do not crank the engine for more than 2 seconds.

OK:

Spark jumps across electrode gap.

OK**Go to step 8.****NG**

7 Check for open and short in harness and connector between ignition coil and ECM.



PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil connector.
- (b) Disconnect the E7 ECM connector.

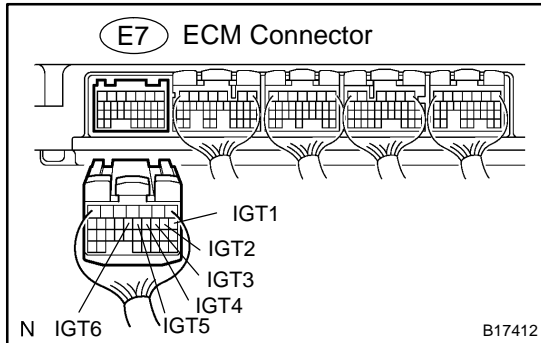
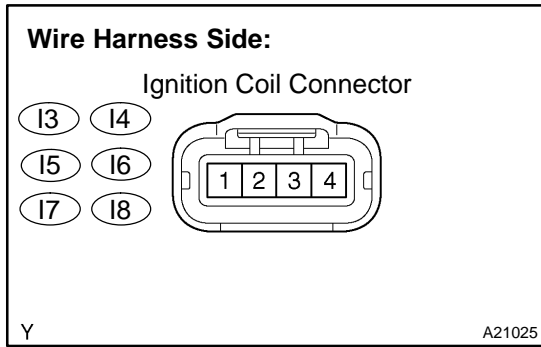
CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
Ignition coil (I3-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I4-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I5-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I6-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I7-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I8-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I3-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I4-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I5-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I6-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I7-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I8-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher



PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

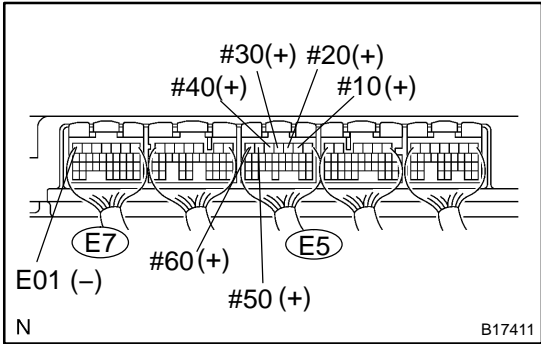
Tester Connection	Specified Condition
Ignition coil (I3-3) - IGT1 (E7-8)	Below 1 Ω
Ignition coil (I4-3) - IGT2 (E7-9)	Below 1 Ω
Ignition coil (I5-3) - IGT3 (E7-10)	Below 1 Ω
Ignition coil (I6-3) - IGT4 (E7-11)	Below 1 Ω
Ignition coil (I7-3) - IGT5 (E7-12)	Below 1 Ω
Ignition coil (I8-3) - IGT6 (E7-13)	Below 1 Ω
Ignition coil (I3-3) or IGT1 (E7-8) - Body ground	10 kΩ or higher
Ignition coil (I4-3) or IGT2 (E7-9) - Body ground	10 kΩ or higher
Ignition coil (I5-3) or IGT3 (E7-10) - Body ground	10 kΩ or higher
Ignition coil (I6-3) or IGT4 (E7-11) - Body ground	10 kΩ or higher
Ignition coil (I7-3) or IGT5 (E7-12) - Body ground	10 kΩ or higher
Ignition coil (I8-3) or IGT6 (E7-13) - Body ground	10 kΩ or higher

OK Replace ignition coil with igniter, then confirm that there is no misfire.

NG

Repair or replace harness or connector.

8 Check ECM terminal of misfiring cylinder.



PREPARATION:

Turn the ignition switch to ON.

CHECK:

Measure the voltage between the terminals of the E5 and E7 ECM connectors.

OK:

Standard:

Tester Connection	Specified Condition
#10 (E5-2) – E01 (E7-7)	9 to 14 V
#20 (E5-3) – E01 (E7-7)	9 to 14 V
#30 (E5-4) – E01 (E7-7)	9 to 14 V
#40 (E5-5) – E01 (E7-7)	9 to 14 V
#50 (E5-6) – E01 (E7-7)	9 to 14 V
#60 (E5-7) – E01 (E7-7)	9 to 14 V

OK → Go to step 11.

NG

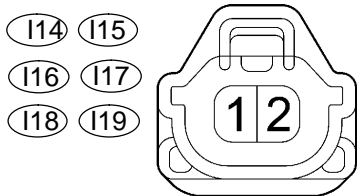
9 Check injector resistance of misfiring cylinder (See page SF-21).

NG → Replace injector.

OK

10 Check for open and short in harness and connector between ignition SW and injector, injector and ECM of misfiring cylinder.

Wire Harness Side:
Injector Connector



C

A21343

PREPARATION:

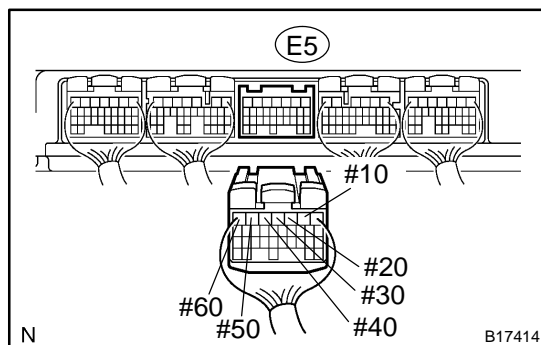
- Disconnect the I14, I15, I16, I17, I18 or I19 injector connector.
- Disconnect the E5 ECM connector.

CHECK:

Measure the resistance of the wire harness side connectors between the ECM and injector.

OK:

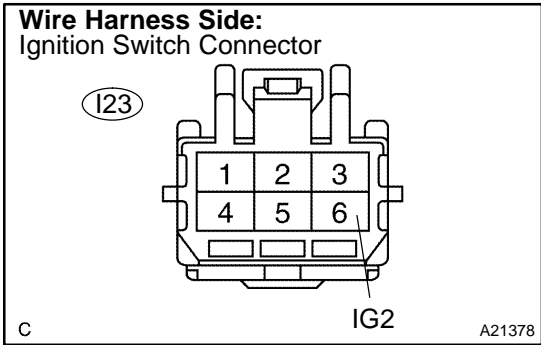
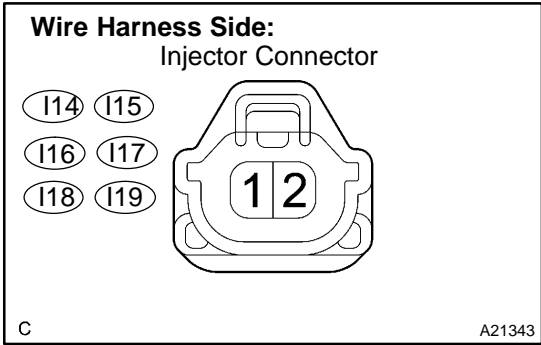
Standard:



N

B17414

Tester Connection	Specified Condition
Injector (I14-1) - #10 (E5-2)	Below 1 Ω
Injector (I15-1) - #20 (E5-3)	Below 1 Ω
Injector (I16-1) - #30 (E5-4)	Below 1 Ω
Injector (I17-1) - #40 (E5-5)	Below 1 Ω
Injector (I18-1) - #50 (E5-6)	Below 1 Ω
Injector (I19-1) - #60 (E5-7)	Below 1 Ω
Injector (I14-1) or #10 (E5-2) - Body ground	10 k Ω or higher
Injector (I15-1) or #20 (E5-3) - Body ground	10 k Ω or higher
Injector (I16-1) or #30 (E5-4) - Body ground	10 k Ω or higher
Injector (I17-1) or #40 (E5-5) - Body ground	10 k Ω or higher
Injector (I18-1) or #50 (E5-6) - Body ground	10 k Ω or higher
Injector (I19-1) or #60 (E5-7) - Body ground	10 k Ω or higher



PREPARATION:

- (a) Disconnect the I14, I15, I16, I17, I18 or I19 injector connector.
- (b) Disconnect the I23 ignition switch connector.

CHECK:

Measure the resistance of the wire harness side connectors between the injector and ignition switch.

OK:

Standard:

Tester Connection	Specified Condition
Injector (I14-2) - IG2 (I23-6)	Below 1 Ω
Injector (I15-2) - IG2 (I23-6)	Below 1 Ω
Injector (I16-2) - IG2 (I23-6)	Below 1 Ω
Injector (I17-2) - IG2 (I23-6)	Below 1 Ω
Injector (I23-2) - IG2 (I23-6)	Below 1 Ω
Injector (I19-2) - IG2 (I23-6)	Below 1 Ω
Injector (I14-2) or IG2 (I23-6) - Body ground	10 kΩ or higher
Injector (I15-2) or IG2 (I23-6) - Body ground	10 kΩ or higher
Injector (I16-2) or IG2 (I23-6) - Body ground	10 kΩ or higher
Injector (I17-2) or IG2 (I23-6) - Body ground	10 kΩ or higher
Injector (I18-2) or IG2 (I23-6) - Body ground	10 kΩ or higher
Injector (I19-2) or IG2 (I23-6) - Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

11 Check injector injection of misfiring cylinder (See page SF-26).

NG Replace injector.

OK

12 Check compression pressure of misfiring cylinder (See page [EM-3](#)).

NG Repair or replace.

OK

13 Check valve clearance of misfiring cylinder (See page [EM-4](#)).

NG Adjust valve clearance.

OK

14 Check result of step 4, and proceed to each step.

RESULT:

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B Check for intermittent problems (See page [DI-11](#)).

A

15 Check valve timing (Check for looseness or a jumped tooth of timing chain) (See page [EM-44](#)).

NG Adjust valve timing (Repair or replace timing belt).

OK

16 Check fuel pressure (See page SF-5).

NG Check and replace fuel pump, pressure regulator, fuel pipe line and filter (See page SF-1).

OK

17 Check intake air temperature and mass air flow rate.

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.

CHECK:

Check the intake air temperature.

- (1) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
- (2) Read its value displayed on the hand-held tester.

OK:

Equivalent to ambient temperature

CHECK:

Check the air flow rate.

- (1) When using hand-held tester, enter the following menu: DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL/MAF.
- (2) Read its value displayed on the hand-held tester.

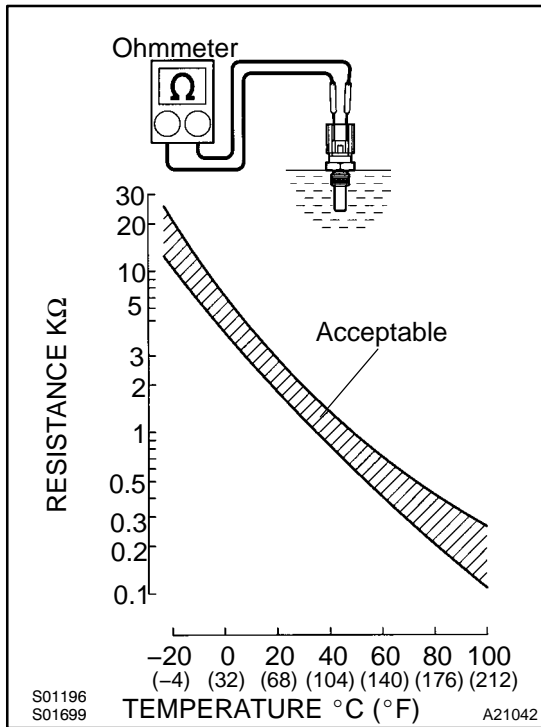
OK:

Condition	Air Flow Rate (g/s)
Ignition switch ON (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
Idling to quickly accelerating	Air flow rate fluctuates

NG Replace mass air flow meter.

OK

18 Check engine coolant temperature sensor.



PREPARATION:

Remove the engine coolant temperature sensor.

CHECK:

Measure the resistance between the terminals of the engine coolant temperature sensor.

Resistance:

Tester Connection	Specified Condition
1 - 2	2.32 to 2.59 kΩ (20°C (68°F))
1 - 2	0.310 to 0.326 kΩ (80°C (176°F))

NOTICE:

In case of checking the engine coolant temperature sensor in the water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (by warming up or cooling down) and repeat the test.

NG Replace engine coolant temperature sensor.

OK

19 Check result of step 4, and proceed to each step.

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B Go to step 5.

A

Check for intermittent problems (See page DI-11).

DTC	P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)
------------	--------------	---

DTC	P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)
------------	--------------	--

DTC	P0332	Knock Sensor 2 Circuit Low Input (Bank 2)
------------	--------------	--

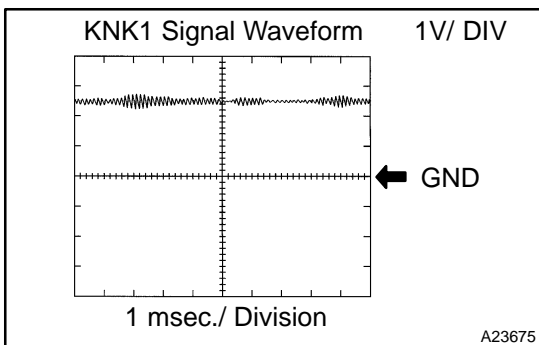
DTC	P0333	Knock Sensor 2 Circuit High Input (Bank 2)
------------	--------------	---

CIRCUIT DESCRIPTION

A flat type knock sensor (non-resonant type) has the structure that can detect the vibration in a wider band of frequency from about 6 kHz to 15 kHz and has the following features.

Knock sensors are fitted on the right bank and left bank of the cylinder block to detect engine knocking. Each knock sensor contains a piezoelectric element which generates voltage when it becomes deformed. Generation of the voltage occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded in order to suppress the knocking.

DTC No.	DTC Detection Condition	Trouble Area
P0327 P0332	Output voltage of the knock sensor 1 or 2 is 0.5 V or less	<ul style="list-style-type: none"> • Short in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM
P0328 P0333	Output voltage of the knock sensor 1 or 2 is 4.5 V or more	<ul style="list-style-type: none"> • Open in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM



Reference: Inspection using the oscilloscope.
The correct waveform is as shown.

Item	Details
Terminal	KNK1 - EKNK or KNK2 - EKN2
Equipment Settings	0.01 to 10 V/Division, 0.01 to 10 msec./Division
Condition	After warming up the engine, keep the engine speed at 4,000 rpm.

MONITOR DESCRIPTION

The knock sensor located on the cylinder block detects spark knock.

When spark knock occurs, the sensor pick-up vibrates in a specific frequency range. When the ECM detects the voltage in this frequency range, it retards the ignition timing to suppress the spark knock.

If there is a defect in the knock sensor or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the knock sensor and sets a DTC.

Example:

When the knock sensor voltage output is less than 0.5 V, or more than 4.5 V, and if either the condition continues for more than 3 sec.

MONITOR STRATEGY

Related DTCs	P0327	Knock sensor (Bank 1) range check (Low voltage)
	P0328	Knock sensor (Bank 1) range check (High voltage)
	P0332	Knock sensor (Bank 2) range check (Low voltage)
	P0333	Knock sensor (Bank 2) range check (High voltage)
Required sensors/components	Main sensors/components	Knock sensor
	Related sensors/components	Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

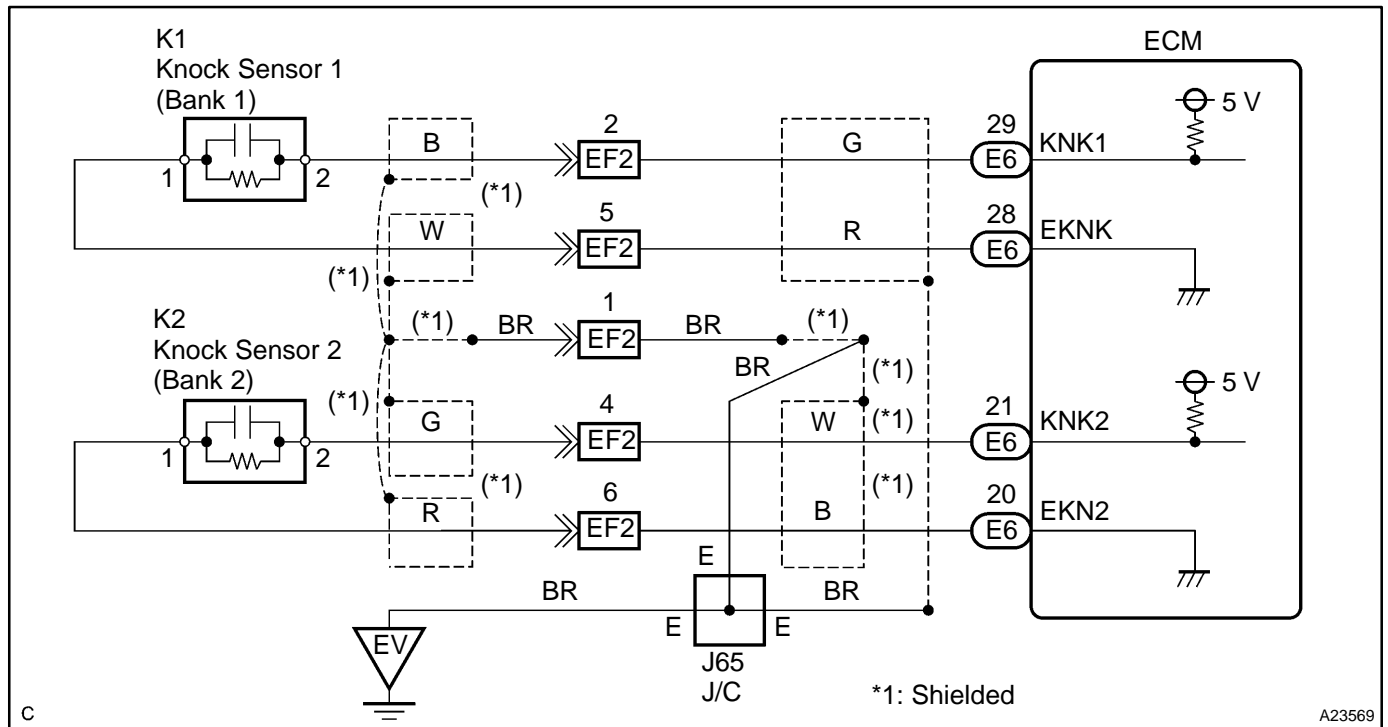
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Battery voltage	10.5 V	–
Time after engine start	5 sec.	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Knock sensor range check (Low voltage) P0327, P0332:	
Knock sensor voltage	Less than 0.5 V
Knock sensor range check (High voltage) P0328, P0333:	
Knock sensor voltage	More than 4.5 V

WIRING DIAGRAM



C

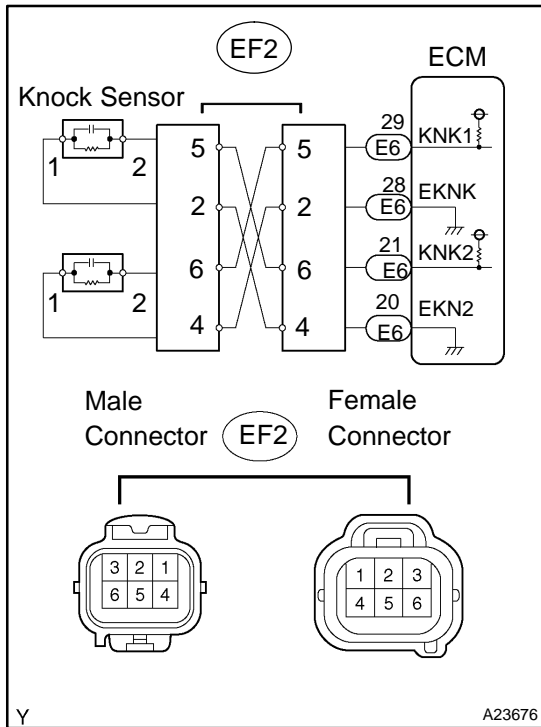
A23569

INSPECTION PROCEDURE

HINT:

- DTC P0327 and P0328 are for the bank 1 knock sensor circuit.
- DTC P0332 and P0333 are for the bank 2 knock sensor circuit.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 Connect hand-held tester, and check knock sensor circuit.



PREPARATION:

- (a) Disconnect the EF2 connector.
- (b) Using lead wires, connect the EF2 connectors as follows.

Male Connector – Female Connector
Terminal 5 – Terminal 6
Terminal 2 – Terminal 4
Terminal 6 – Terminal 5
Terminal 4 – Terminal 2

- (c) Warm up the engine.
- (d) Run the engine at 3,000 rpm for 10 seconds or more.

CHECK:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the hand-held tester ON.
- (c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read DTCs.

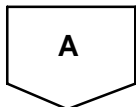
Result :

Display	Proceed to
DTCs same as when vehicle brought in P0327, P0328 → P0327, P0328 or P0332, P0333 → P0332, P0333	A
DTCs different from when vehicle brought in P0327, P0328 → P0332, P0333 or P0332, P0333 → P0327, P0328	B

- (e) Reconnect the EF2 connector.

B

Go to step 4.

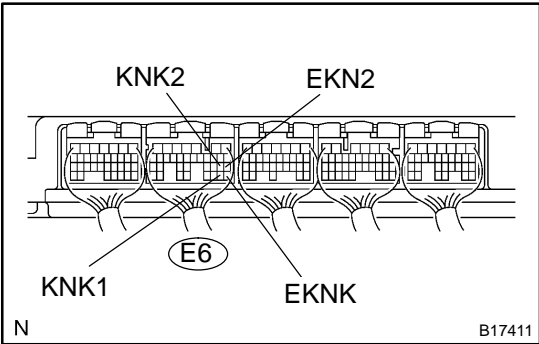


2 Check for open and short in harness and connector between EF2 connector and ECM (See page [IN-30](#)).

NG Repair or replace harness or connector.

OK

3 Measure voltage between terminals KNK1 and EKNK, KNK2 and EKN2 of ECM.



PREPARATION:

- (a) Disconnect the E6 ECM connector.
- (b) Turn the ignition switch to ON.

CHECK:

Measure the voltage between the specified ECM terminals.

OK:

Standard:

Tester Connection	Specified Condition
KNK1 (E6-29) - EKNK (E6-28)	4.5 to 5.5 V
KNK2 (E6-21) - EKN2 (E6-20)	4.5 to 5.5 V

- (a) Reconnect the ECM connector.

NG Replace ECM (See page [SF-66](#)).

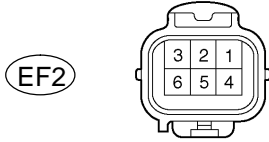
OK

Check for intermittent problems (See page [DI-11](#)).

4 Check knock sensor.

Wire Harness Side:

Male Connector



Front View

Y

A23674

PREPARATION:

Disconnect the EF2 connector.

CHECK:

- (a) Check the resistance between the terminals of the EF2 male connector.

OK:

Standard:

Tester Connection	Specified Condition
EF2 male connector 2 - 5	120 to 280 kΩ
EF2 male connector 4 - 6	120 to 280 kΩ

- (b) Reconnect the EF2 connector.

OK

Check for intermittent problems
(See page [DI-11](#)).

NG

5 Check for open and short in harness and connector between EF2 connector and knock sensor (See page [IN-30](#)).

HINT:

- If DTC P0327 or P0328 has changed to P0332 or P0333, check the knock sensor circuit on the right bank side.
- If DTC P0332 or P0333 has changed to P0327 or P0328, check the knock sensor circuit on the left bank side.

NG

Repair or replace harness or connector.

OK

Replace knock sensor.

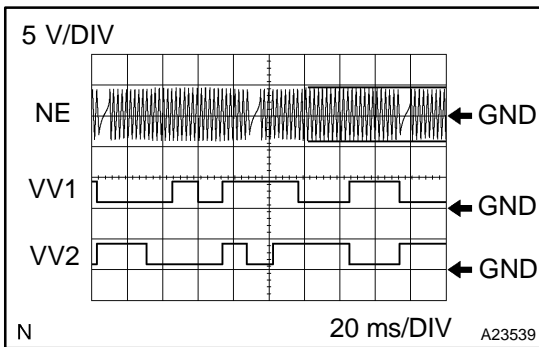
DTC	P0335	Crankshaft Position Sensor "A" Circuit
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DTC	P0339	Crankshaft Position Sensor "A" Circuit Intermittent
------------	--------------	--

CIRCUIT DESCRIPTION

The crankshaft position sensor system consists of a crankshaft position sensor plate and a pick-up coil. The sensor plate has 34 teeth and is installed on the crankshaft. The pick-up coil is made of an iron core and magnet. The sensor plate rotates and as each tooth passes through the pick-up coil, a pulse signal is created. The pick-up coil generates 34 signals for each engine revolution. Based on these signals, the ECM calculates the crankshaft position and engine RPM. Using these calculations, the fuel injection time and ignition timing are controlled.

DTC No.	DTC Detecting Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM
P0339	In condition (a), (b) and (c), when no crankshaft position sensor (NE) signal is input for 0.05 sec. or more. : (1 trip detection logic) (c) Engine revolution 1,000 rpm or more (d) STA signal is OFF (e) 3 sec. or more has lapsed after STA signal is switched from ON to OFF.	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM



Reference: Inspection using the oscilloscope.

The correct waveform is as shown in the illustration.

Tester Connection	Specified Condition
VV1+ (E5-19) - VV1- (E5-29)	Correct waveform is as shown
VV2+ (E5-18) - VV2- (E5-28)	
NE+ (E5-21) - NE- (E5-20)	

MONITOR DESCRIPTION

If there are no signals from the crankshaft sensor even though the engine is revolving, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0335	Crankshaft position sensor range check or rationality
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Engine speed sensor
Frequency of operation	Continuous	
Duration	Case 1: 0.016 sec. Case 2: 3 times	
MIL operation	Immediate	
Sequence of operation	None	

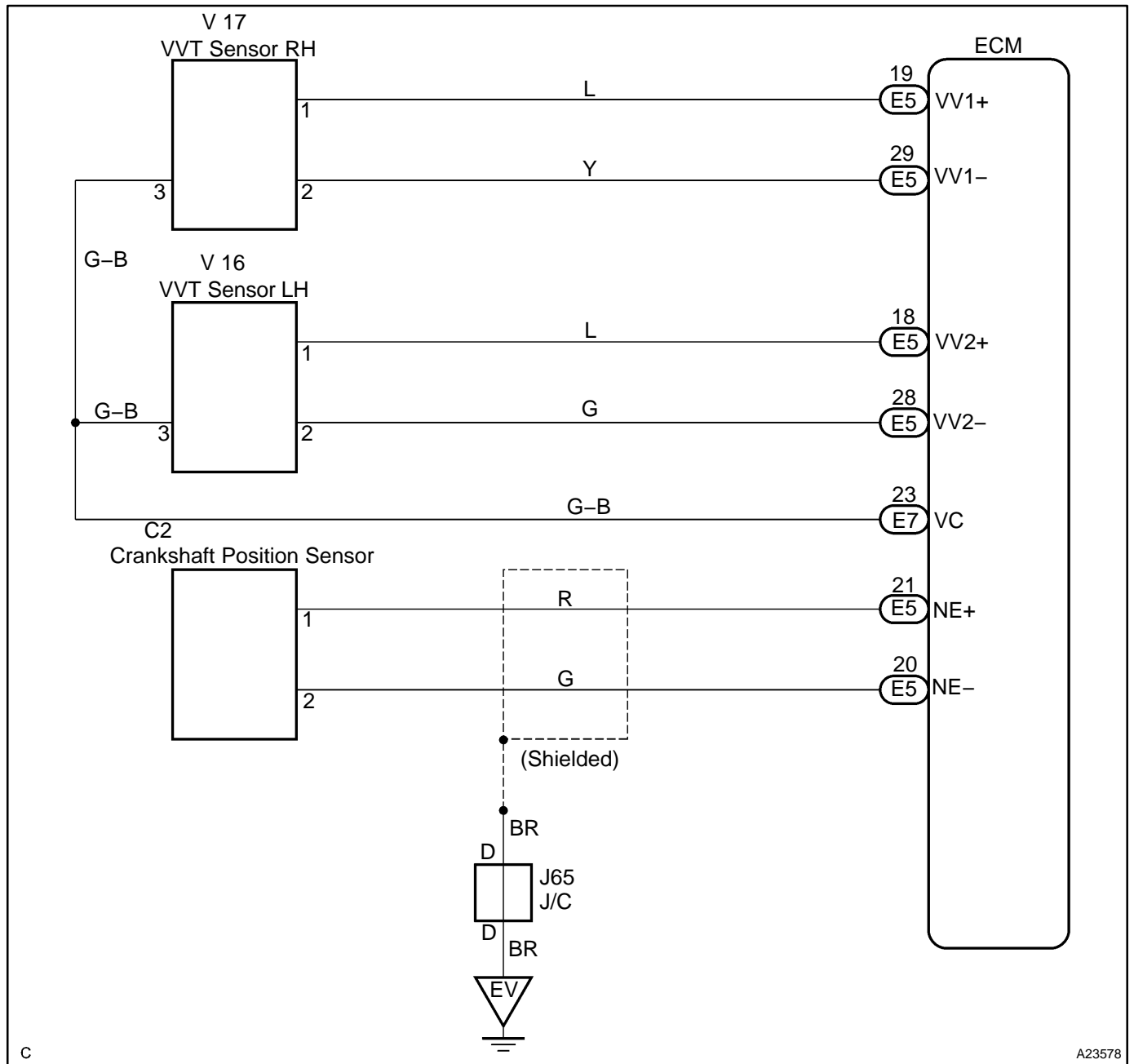
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Case 1:		
Engine speed	600 rpm	–
Starter	OFF	
Time after starter ON to OFF	3 sec.	–
Case 2:		
Time after starter ON to OFF	0.3 sec.	–
Number of camshaft position sensor signal pulse	6	–
Ignition switch	ON	
Battery voltage	7 V	–
Camshaft position sensor circuit fail	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1:	
Engine speed signal	No signal
Case 2:	
Number of crankshaft position sensor signal pulse	132 or less, or 174 or more

WIRING DIAGRAM



C

A23578

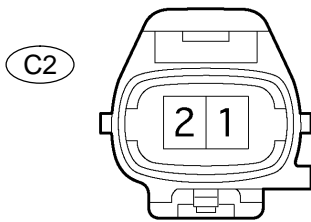
INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand-held tester. Freeze frame records the engine conditions when a malfunction is detected. When troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.
- READ VALUE ON HAND-HELD TESTER
 - (a) Connect the hand-held tester to the DLC3.
 - (b) Start the engine and push the hand-held tester tool main switch ON.
 - (c) When using hand-held tester, enter the following menu: "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / ENGINE SPD".
- The engine speed can be confirmed in DATA LIST using the hand-held tester. If there are no NE signals from the crankshaft position sensor despite the engine revolving, the engine speed will be indicated as zero. If voltage output of the crankshaft position sensor is insufficient, the engine speed will be indicated as lower RPM (than the actual RPM).

1 Check resistance of crankshaft position sensor.

Component Side



Crankshaft Position Sensor

A21026

PREPARATION:

Disconnect the C2 crankshaft position sensor connector.

CHECK:

Measure the resistance between terminals 1 and 2.

OK:

Standard:

Tester Connection	Specified Condition
1 - 2	985 to 1,600 Ω at cold
1 - 2	1,265 to 1,890 Ω at hot

NOTICE:

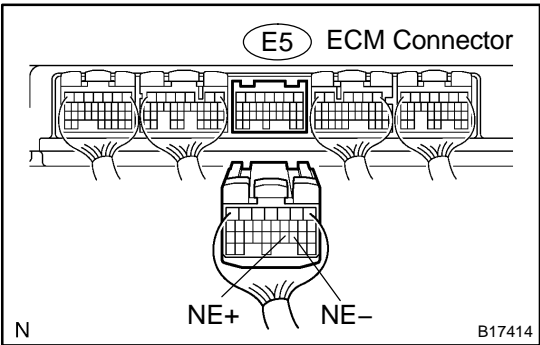
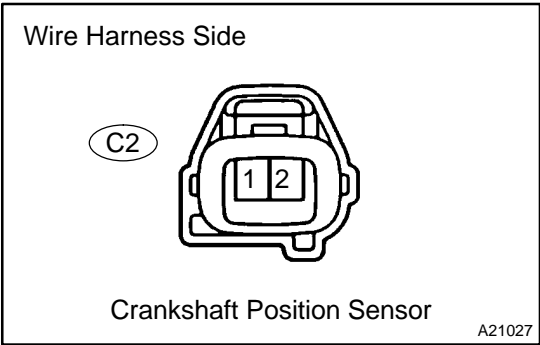
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG

Replace crankshaft position sensor.

OK

2 Check for open and short in harness and connector between ECM and crankshaft position sensor.



PREPARATION:

- (a) Disconnect the C2 crankshaft position sensor connector.
- (b) Disconnect the E5 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

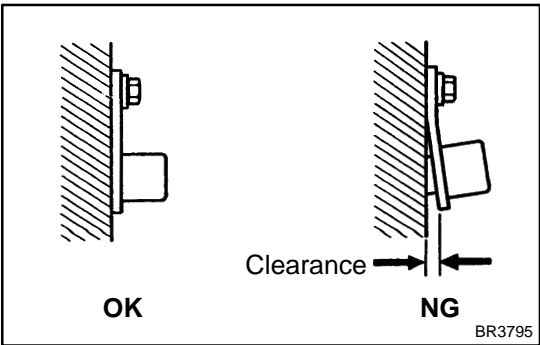
Standard:

Tester Connection	Specified Condition
Crankshaft position sensor (C2-1) - NE+ (E5-21)	Below 1 Ω
Crankshaft position sensor (C2-2) - NE- (E5-20)	Below 1 Ω
Crankshaft position sensor (C2-1) or NE+ (E5-21) - Body ground	10 kΩ or higher
Crankshaft position sensor (C2-2) or NE- (E5-20) - Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

3 Check sensor installation (crankshaft position sensor).



CHECK:

Check the crankshaft position sensor installation.

OK:

The crankshaft position sensor is installed properly.

NG Tighten sensor installation bolt.

OK

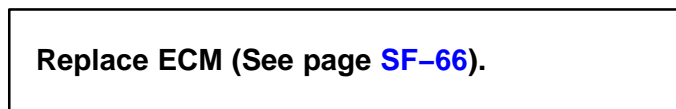
4	Inspect teeth of sensor plate.
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PREPARATION:

Remove the crankshaft angle sensor plate (See page [EM-111](#)).

CHECK:

Check the teeth of sensor plate.



DTC	P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)
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DTC	P0342	Camshaft Position Sensor "A" Circuit Low Input (Bank 1 or Single Sensor)
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DTC	P0343	Camshaft Position Sensor "A" Circuit High Input (Bank 1 or Single Sensor)
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DTC	P0345	Camshaft Position Sensor "A" Circuit (Bank 2)
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DTC	P0347	Camshaft Position Sensor "A" Circuit Low Input (Bank 2)
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DTC	P0348	Camshaft Position Sensor "A" Circuit High Input (Bank 2)
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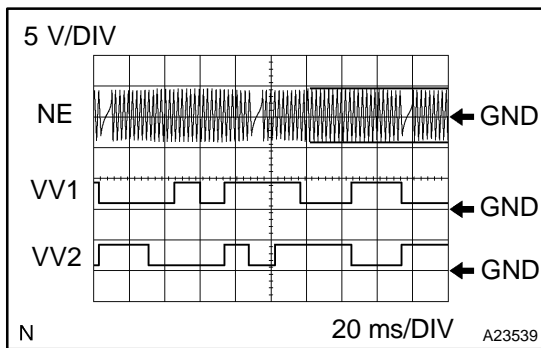
CIRCUIT DESCRIPTION

The camshaft position sensor (G signal) consists of a magnet and MRE element.

The camshaft drive gear has 5 teeth on its inner circumference. When the camshaft gear rotates, air gap changes between the protrusion on the gear and the pickup coil. The change affects the magnetic field and result in change in the resistance of the MRE element. The crankshaft angle sensor plate has 32 teeth and output 32 signals every engine revolution. The ECM detects the standard crankshaft angle based on the G signal and actual crankshaft angle and engine speed by NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0340 P0345	No camshaft position sensor signal to ECM during cranking for 4 seconds or more. (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Jumping teeth of timing belt • ECM
P0340 P0345	No camshaft position sensor signal to ECM at engine speed 600 rpm or more for 5 seconds or more. (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Jumping teeth of timing belt • ECM

P0340 P0345	Input voltage to ECM remains 0.3 V or less, or 4.7 V or higher for more than 5 seconds, when 2 or more seconds have elapsed after turning the ignition switch ON. (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Jumping teeth of timing belt • ECM
P0342 P0347	Input voltage to ECM remains 0.3 V or less for more than 5 seconds, when 2 or more seconds have elapsed after turning the ignition switch ON. (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Jumping teeth of timing belt • ECM
P0343 P0348	Input voltage to ECM remains 4.7 V or higher for more than 5 seconds, when 2 or more seconds have elapsed after turning the ignition switch ON. (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Jumping teeth of timing belt • ECM



Inspection using the oscilloscope.

The correct waveform is as shown in the illustration.

Tester Connection	Specified Condition
VV1+ (E5-25) – VV1- (E5-24)	Correct waveform is as shown
VV2+ (E5-18) – VV2- (E5-28)	Correct waveform is as shown
NE+ (E5-21) – NE- (E5-20)	Correct waveform is as shown

MONITOR DESCRIPTION

If there are no signals from the camshaft position sensor even though the engine is turning, or if the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0340	Camshaft position sensor range check
		Camshaft position/crankshaft position misalignment
		Camshaft position sensor range check (Fluctuating)
	P0342	Camshaft position sensor range check (Low voltage)
	P0343	Camshaft position sensor range check (High voltage)
	P0345	VVT sensor range check (While starting engine)
		VVT sensor range check (After starting engine)
		VVT sensor range check (Fluctuating)
	P0347	VVT sensor range check (Low voltage)
P0348	VVT sensor range check (High voltage)	
Required sensors/components	Main sensors/components	VVT sensor, Camshaft position sensor
	Related sensors/components	Crankshaft position sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	4 sec.: P0340 (Camshaft position sensor range check), P0345 (VVT sensor range check (While starting engine)) 5 sec.: Others	
MIL operation	2 driving cycles: P0340 (Camshaft position sensor range check), P0345 (VVT sensor range check (While starting engine)) Immediate: Others	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Camshaft position sensor range check:		
Starter	ON and not starter ON again	
Minimum battery voltage while starter ON	-	11 V
Camshaft position/crankshaft position misalignment:		
Engine RPM	600 rpm	-
Starter	OFF	
Camshaft position sensor range check (Fluctuating, Low voltage, High voltage):		
Starter	OFF	
Ignition switch ON and time after ignition switch is OFF to ON	2 sec.	-
VVT sensor range check (While starting engine):		
Starter	ON	
Battery voltage while starter ON once at least	-	11 V

VVT sensor range check (After starting engine):		
Engine RPM	600 rpm	-
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	
VVT sensor range check (Fluctuating, Low voltage, High voltage):		
Starter	OFF	
Ignition switch ON and time after ignition switch is OFF to ON	2 sec.	-
Battery voltage	8 V	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Camshaft position sensor range check:	
Camshaft position sensor signal	No signal
Camshaft position/crankshaft position misalignment:	
Camshaft position and crankshaft position phase	Mis-aligned
Camshaft position sensor range check (Fluctuating):	
Camshaft position sensor voltage	Less than 0.3 V, or more than 4.7 V
Camshaft position sensor range check (Low voltage):	
Camshaft position sensor voltage	Less than 0.3 V
Camshaft position sensor range check (High voltage):	
Camshaft position sensor voltage	More than 4.7 V
VVT sensor range check (While starting engine):	
VVT sensor signal	No signal
VVT sensor range check (After starting engine):	
VVT sensor signal	No signal
VVT sensor range check (Fluctuating):	
VVT sensor voltage	Less than 0.3 V, or more than 4.7 V
VVT sensor range check (Low voltage):	
VVT sensor voltage	Less than 0.3 V
VVT sensor range check (High voltage):	
VVT sensor voltage	More than 4.7 V

WIRING DIAGRAM

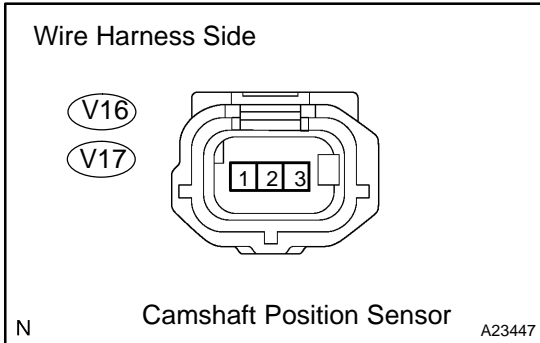
Refer to DTC P0335 on page [DI-203](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Check camshaft position sensor power source.



PREPARATION:

Disconnect the camshaft position sensor connector.

CHECK:

Measure the voltage between terminal 3 of the camshaft position sensor wire harness side connector and body ground.

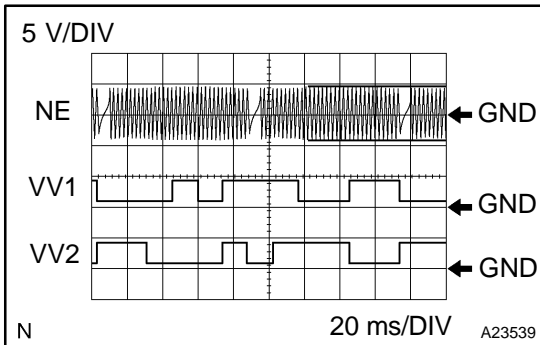
OK:

Standard:
4.5 to 5.5 V

NG Check and repair harness and connector.

OK

2 Check signal of camshaft position sensor.



PREPARATION:

Start the engine.

CHECK:

Using oscilloscope, measure the signal waveform between terminal 3 of the camshaft position sensor and body ground.

OK:

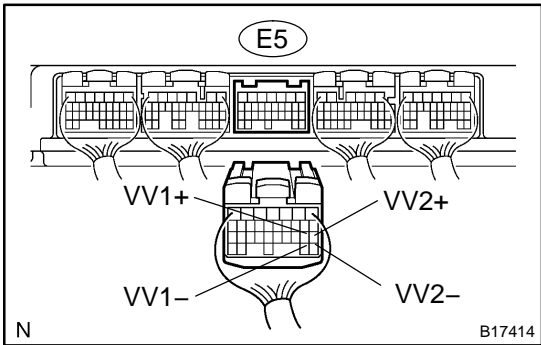
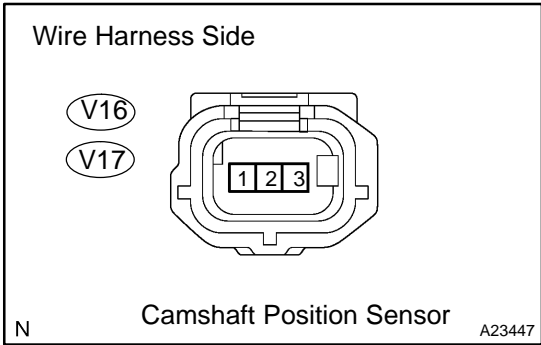
Standard:

Tester Connection	Specified Condition
VV1+ (E5-19) - VV1- (E5-29)	Correct waveform is as shown
VV2+ (E5-18) - VV2- (E5-28)	Correct waveform is as shown
NE+ (E5-21) - NE- (E5-20)	Correct waveform is as shown

OK Replace ECM (See page SF-66).

NG

3 Check for open and short in harness and connector between ECM and camshaft position sensor.



PREPARATION:

- (a) Disconnect the camshaft position sensor connector.
- (b) Disconnect the E5 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

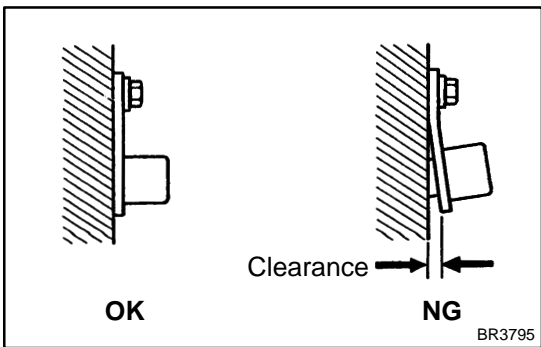
Standard:

Tester Connection	Specified Condition
Camshaft position sensor (V17-1) - VV1+ (E5-19)	Below 1 Ω
Camshaft position sensor (V17-2) - VV1- (E5-29)	Below 1 Ω
Camshaft position sensor (V16-1) - VV2+ (E5-18)	Below 1 Ω
Camshaft position sensor (V16-2) - VV2- (E5-28)	Below 1 Ω
Camshaft position sensor (V17-1) or VV1+ (E5-19) - Body ground	10 kΩ or higher
Camshaft position sensor (V16-2) or VV1- (E5-29) - Body ground	10 kΩ or higher
Camshaft position sensor (V16-1) or VV2+ (E5-18) - Body ground	10 kΩ or higher
Camshaft position sensor (V16-2) or VV2- (E5-28) - Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

4 Check sensor installation (Camshaft position sensor).



CHECK:

Check the VVT position sensor installation.

OK:

The VVT sensor is installed properly.

NG Tighten sensor installation bolt.

OK

5	Inspect teeth of camshaft timing belt pulley.
----------	--

PREPARATION:

Remove the camshaft timing belt pulley (See page [EM-53](#)).

CHECK:

Check the camshaft timing belt pulley.

NG	Replace camshaft timing pulley.
-----------	--

OK

Replace Camshaft position sensor (See page IG-11).

DTC	P0351	Igniter Coil "A" Primary/Secondary Circuit
DTC	P0352	Igniter Coil "B" Primary/Secondary Circuit
DTC	P0353	Igniter Coil "C" Primary/Secondary Circuit
DTC	P0354	Igniter Coil "D" Primary/Secondary Circuit
DTC	P0355	Igniter Coil "E" Primary/Secondary Circuit
DTC	P0356	Igniter Coil "F" Primary/Secondary Circuit

HINT:

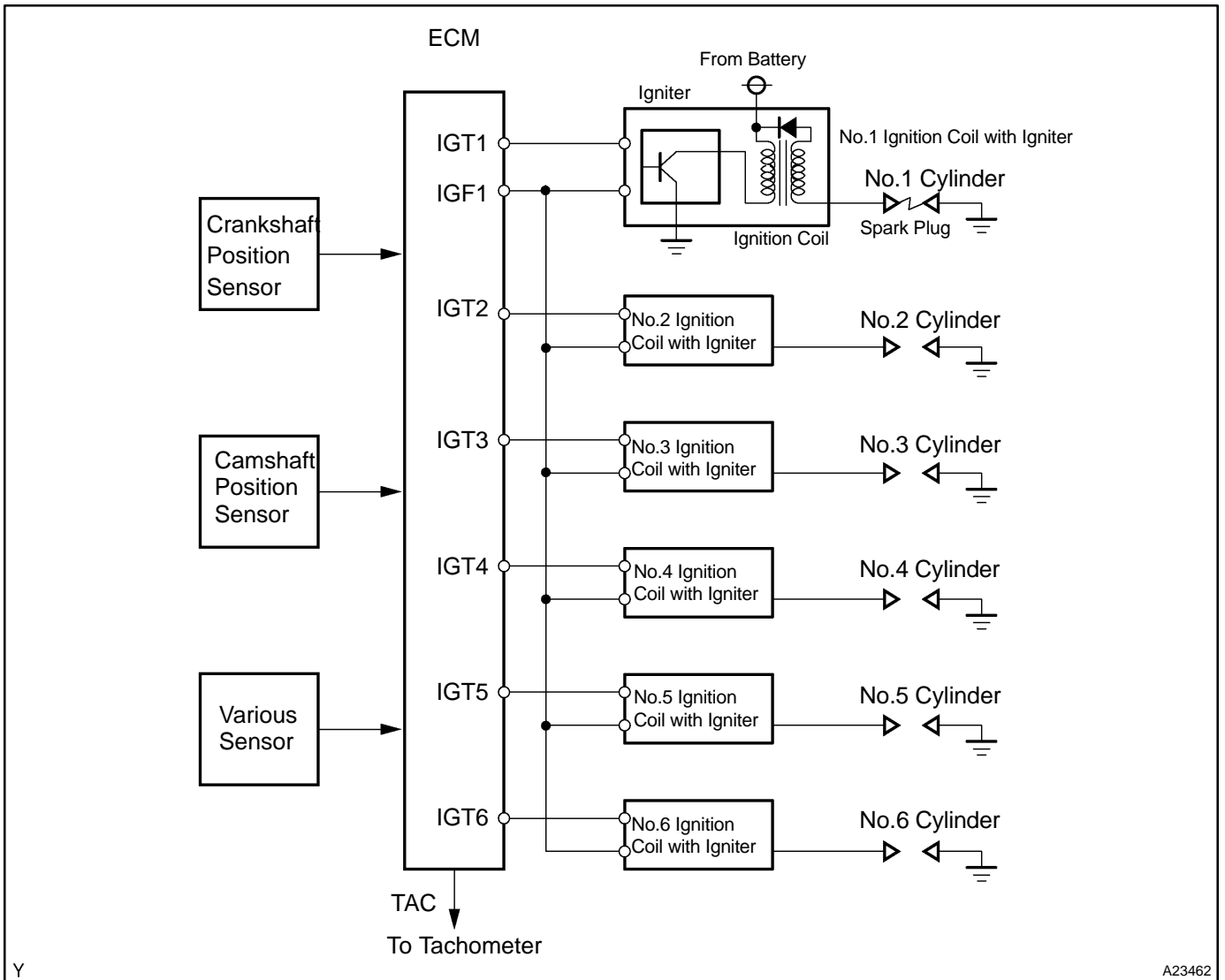
- These DTCs indicate a malfunction related to primary circuit.
- If DTC P0351 is displayed, check No. 1 ignition coil with igniter circuit.
- If DTC P0352 is displayed, check No. 2 ignition coil with igniter circuit.
- If DTC P0353 is displayed, check No. 3 ignition coil with igniter circuit.
- If DTC P0354 is displayed, check No. 4 ignition coil with igniter circuit.
- If DTC P0355 is displayed, check No. 5 ignition coil with igniter circuit.
- If DTC P0356 is displayed, check No. 6 ignition coil with igniter circuit.

CIRCUIT DESCRIPTION

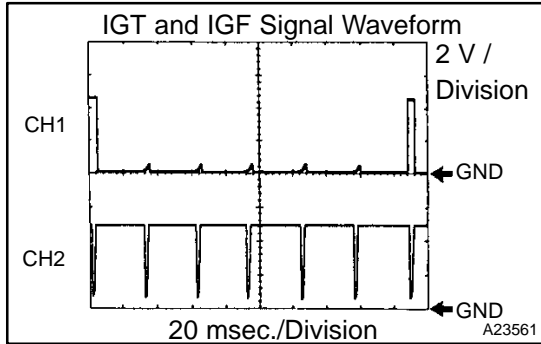
These DTCs indicate a malfunction related to primary circuit.

The DIS is a 1-cylinder ignition system which ignites one cylinder with one ignition coil. In the 1-cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition signals (IGTs) for each cylinder. Using the IGT, the ECM turns on and off the power transistor inside the igniter and this switches on and off the current to the primary coil. When the current to the primary coil is cut off, high-voltage is generated in the secondary coil and this voltage is applied to the spark plugs to create sparks inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation signal (IGF) for each cylinder ignition to the ECM.



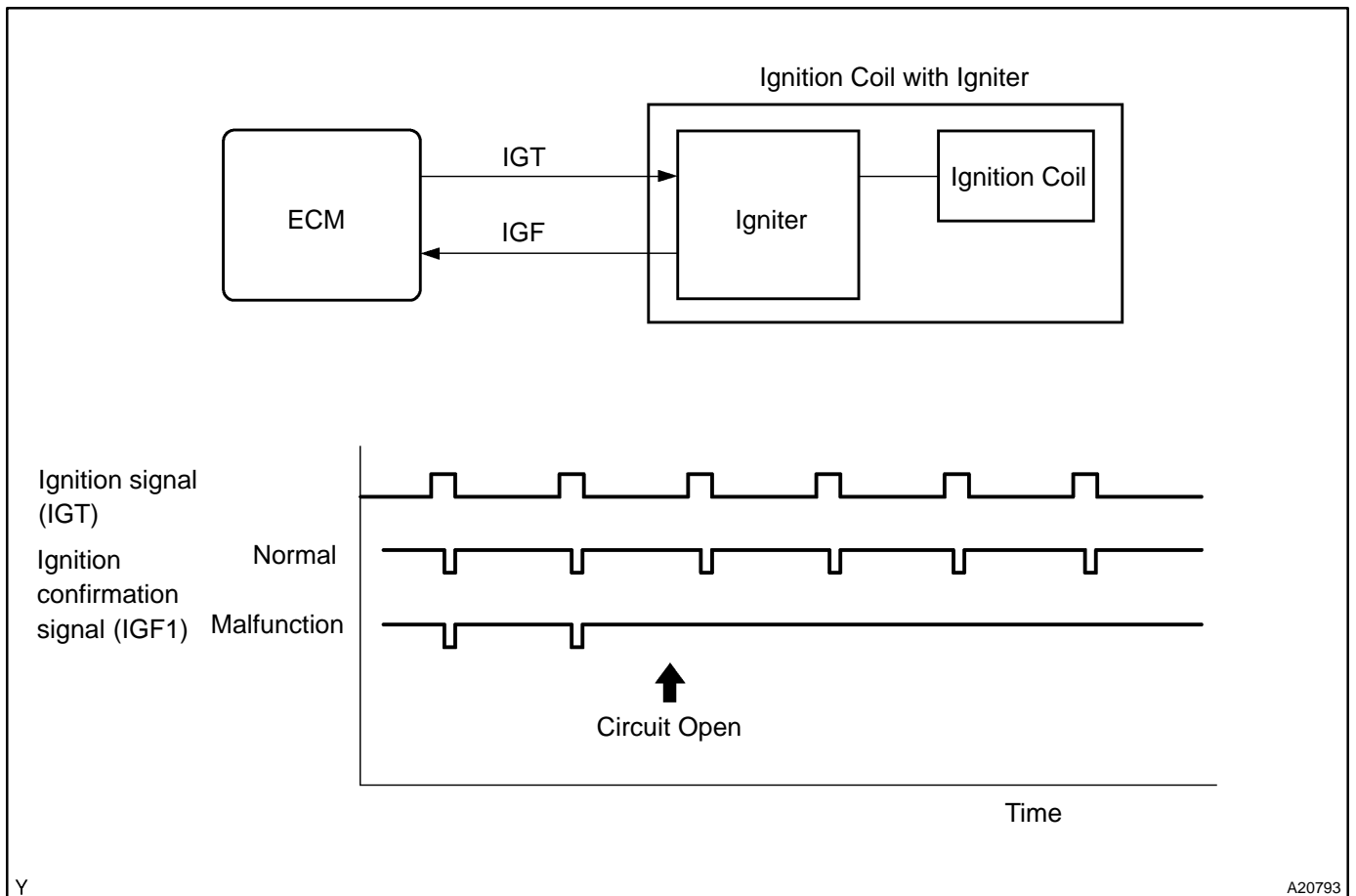
DTC No.	DTC Detecting Condition	Trouble Area
P0351 P0352 P0353 P0354 P0355 P0356	No IGF1 signal to ECM while engine is running	<ul style="list-style-type: none"> • Open or short in IGF1 and IGT1 to IGT6 circuit from ignition coil with igniter to ECM • No. 1 to No. 6 ignition coil with igniter (primary ignition) • Ignition system • ECM



Reference: Inspection using the oscilloscope.

During cranking or idling, check the waveform between terminals IG1 to IG6 and E1, and terminal IGF1 and E1 of the E5 and E7 ECM connectors.

MONITOR DESCRIPTION



If the ECM does not receive the IGF1 after sending the IGT it interprets this as a fault in the igniter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0351	No. 1 ignition coil with igniter circuit malfunction
	P0352	No. 2 ignition coil with igniter circuit malfunction
	P0353	No. 3 ignition coil with igniter circuit malfunction
	P0354	No. 4 ignition coil with igniter circuit malfunction
	P0355	No. 5 ignition coil with igniter circuit malfunction
	P0356	No. 6 ignition coil with igniter circuit malfunction
Required sensors/components	Igniter	
Frequency of operation	Continuous	
Duration	0.256 sec. + 4 sparks	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Engine speed	–	1,500 rpm
Either of the following conditions is met:	Condition 1 or 2	
1. Following conditions are met:	Condition (a) and (b)	
(a) Engine speed	–	500 rpm
(b) Battery voltage	6 V	–
2. Following conditions are met:	Condition (a) and (b)	
(a) Engine speed	500 rpm	–
(b) Battery voltage	10 V	–

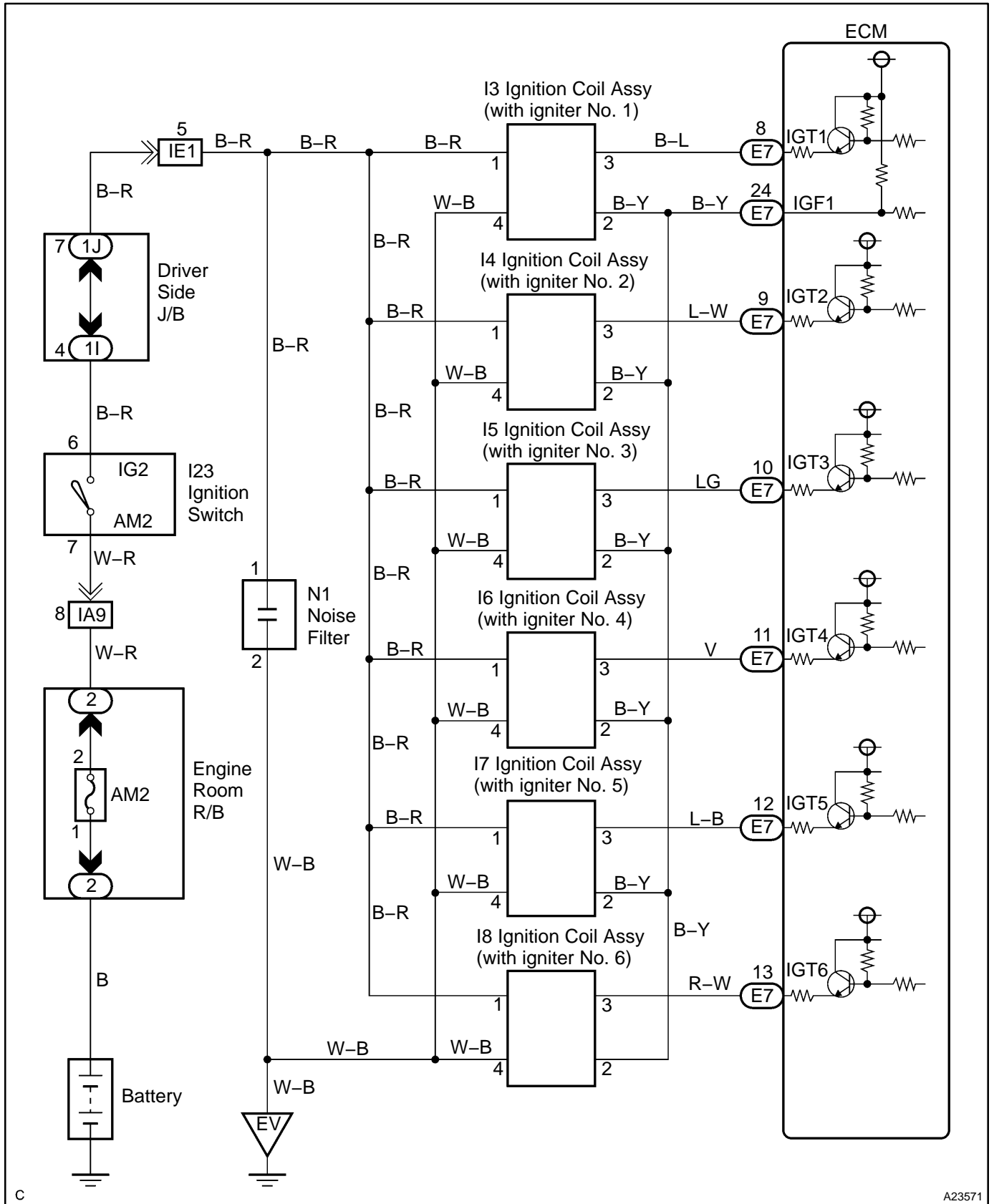
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
"Ignition signal fail count"	More than 2
"Ignition signal fail count" is on the right:	When IGF does not return despite sending IGT.

COMPONENT OPERATING RANGE

Standard Value
Confirmed signal number = ignition signal number

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

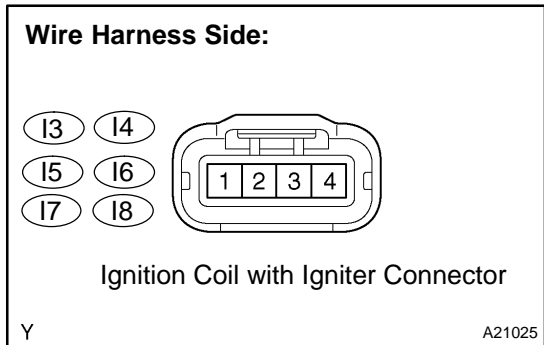
Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check spark plug and spark (See page IG-1).
----------	--

NG	Go to step 4.
-----------	----------------------

OK

2	Check for open and short in harness and connector in IGF signal circuits between ECM and ignition coil with igniter.
----------	---



PREPARATION:

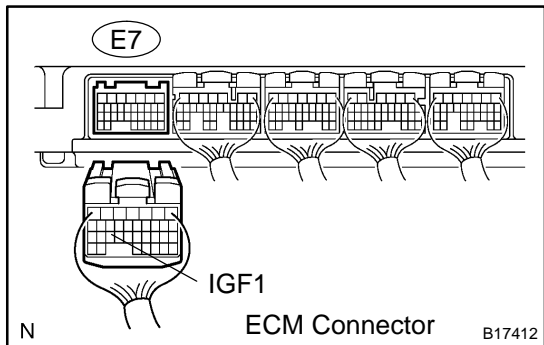
- (a) Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil with igniter connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:



Tester Connection	Specified Condition
Ignition coil (I3-2) – IGF1 (E7-24)	Below 1 Ω
Ignition coil (I4-2) – IGF1 (E7-24)	Below 1 Ω
Ignition coil (I5-2) – IGF1 (E7-24)	Below 1 Ω
Ignition coil (I6-2) – IGF1 (E7-24)	Below 1 Ω
Ignition coil (I7-2) – IGF1 (E7-24)	Below 1 Ω
Ignition coil (I8-2) – IGF1 (E7-24)	Below 1 Ω
Ignition coil (I3-2) or IGF1 (E7-24) – Body ground	10 kΩ or higher
Ignition coil (I4-2) or IGF1 (E7-24) – Body ground	10 kΩ or higher
Ignition coil (I5-2) or IGF1 (E7-24) – Body ground	10 kΩ or higher
Ignition coil (I6-2) or IGF1 (E7-24) – Body ground	10 kΩ or higher
Ignition coil (I7-2) or IGF1 (E7-24) – Body ground	10 kΩ or higher
Ignition coil (I8-2) or IGF1 (E7-24) – Body ground	10 kΩ or higher

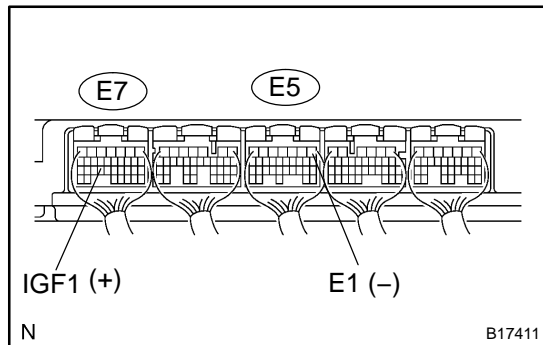
NG

Repair or replace harness or connector.

OK

3

Disconnect ignition coil with igniter connector, and check voltage between terminals IGF1 and E1 of ECM connector.

**PREPARATION:**

- (a) Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil with igniter connector.
- (b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the E8 and E6 ECM connectors.

OK:**Standard:**

Tester Connection	Specified Condition
IGF1 (E7-24) - E1 (E5-1)	4.5 to 5.5 V

NG

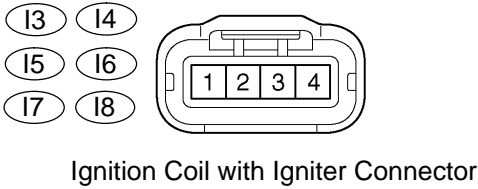
Replace ECM (See page [SF-66](#)).

OK

Replace ignition coil with igniter.

4 Check for open and short in harness and connector in IGT signal circuit between ECM and ignition coil with igniter.

Wire Harness Side:



Y A21025

PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil connector.
- (b) Disconnect the E7 ECM connector.

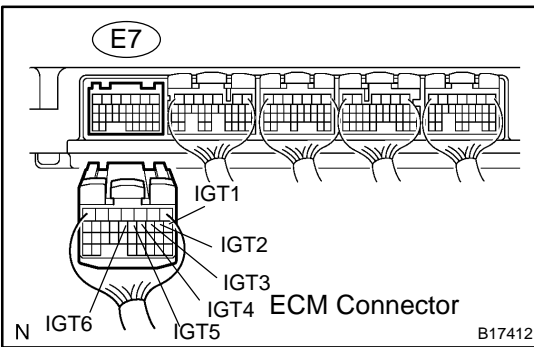
CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

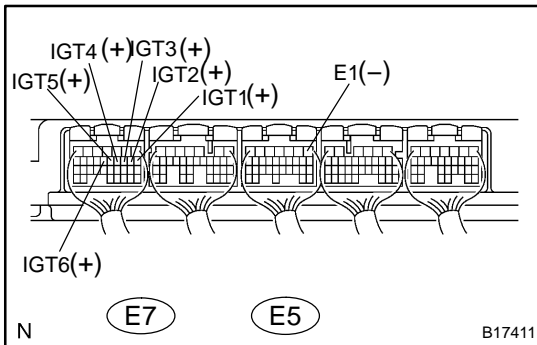
Tester Connection	Specified Condition
Ignition coil (I3-3) - IGT1 (E7-8)	Below 1 Ω
Ignition coil (I4-3) - IGT2 (E7-9)	Below 1 Ω
Ignition coil (I5-3) - IGT3 (E7-10)	Below 1 Ω
Ignition coil (I6-3) - IGT4 (E7-11)	Below 1 Ω
Ignition coil (I7-3) - IGT5 (E7-12)	Below 1 Ω
Ignition coil (I8-3) - IGT6 (E7-13)	Below 1 Ω
Ignition coil (I3-3) or IGT1 (E7-8) - Body ground	10 kΩ or higher
Ignition coil (I4-3) or IGT2 (E7-9) - Body ground	10 kΩ or higher
Ignition coil (I5-3) or IGT3 (E7-10) - Body ground	10 kΩ or higher
Ignition coil (I6-3) or IGT4 (E7-11) - Body ground	10 kΩ or higher
Ignition coil (I7-3) or IGT5 (E7-12) - Body ground	10 kΩ or higher
Ignition coil (I8-3) or IGT6 (E7-13) - Body ground	10 kΩ or higher



B17412

NG Repair or replace harness or connector.

OK

5 Check voltage between terminals IGT1 to IGT6 and E1 of ECM connector.
**PREPARATION:**

Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil with igniter connector.

CHECK:

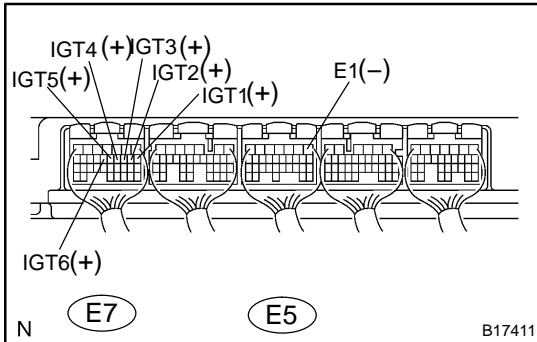
Measure the voltage between terminals the E5 and E7 ECM connectors when the engine is cranked.

OK:**Standard:**

Tester Connection	Specified Condition
IGT1 (E7-8) - E1 (E5-1)	More than 0.1 V or less than 4.5 V
IGT2 (E7-9) - E1 (E5-1)	
IGT3 (E7-10) - E1 (E5-1)	
IGT4 (E7-11) - E1 (E5-1)	
IGT5 (E7-12) - E1 (E5-1)	
IGT6 (E7-13) - E1 (E5-1)	

NG**Replace ECM (See page SF-66).****OK**

- 6 Disconnect ignition coil with igniter connector, and check voltage between terminals IGT1 to IGT6 and E1 of ECM connector.**

**PREPARATION:**

- Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil with igniter connector.
- Turn the ignition switch to ON.

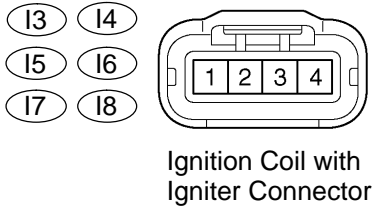
CHECK:

Measure the voltage between terminals the E5 and E7 ECM connectors when the engine is cranked.

OK:**Standard:**

Tester Connection	Specified Condition
IGT1 (E7-8) - E1 (E5-1)	4.5 V or more
IGT2 (E7-9) - E1 (E5-1)	4.5 V or more
IGT3 (E7-10) - E1 (E5-1)	4.5 V or more
IGT4 (E7-11) - E1 (E5-1)	4.5 V or more
IGT5 (E7-12) - E1 (E5-1)	4.5 V or more
IGT6 (E7-13) - E1 (E5-1)	4.5 V or more

NG**Replace ECM (See page SF-66).****OK**

7 Check ignition coil with igniter power source circuit.
Wire Harness Side:


Y

A21025

PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil with igniter connector.
- (b) Turn the ignition switch to ON.

CHECK:

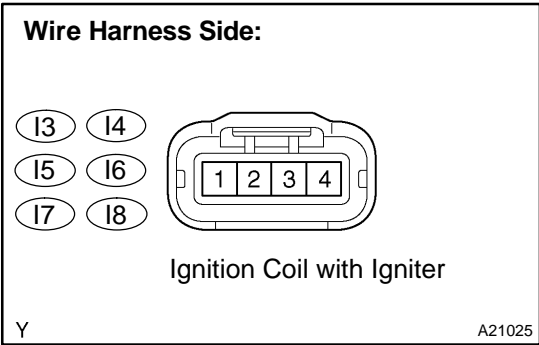
Measure the voltage between the terminal of the wire harness side connector and body ground.

OK:
Standard:

Tester Connection	Specified Condition
I3-1 - Body ground	9 to 14 V
I4-1 - Body ground	9 to 14 V
I5-1 - Body ground	9 to 14 V
I6-1 - Body ground	9 to 14 V
I7-1 - Body ground	9 to 14 V
I8-1 - Body ground	9 to 14 V

OK
Repair ignition coil with igniter.
NG

8 Check for open and short in harness and connector between ignition switch and ignition coil with igniter.



PREPARATION:

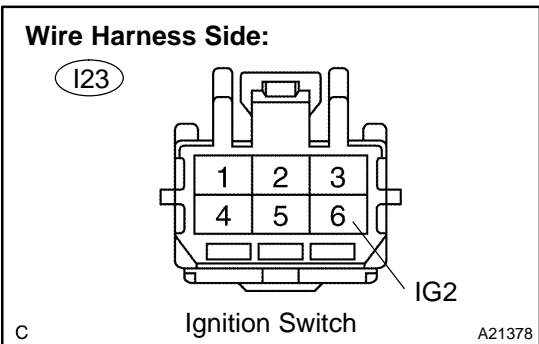
- (a) Disconnect the I3, I4, I5, I6, I7 or I8 ignition coil with igniter connector.
- (b) Disconnect the I23 ignition switch connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:



Tester Connection	Specified Condition
Ignition coil (I3-1) - IG2 (I23-6)	Below 1 Ω
Ignition coil (I4-1) - IG2 (I23-6)	Below 1 Ω
Ignition coil (I5-1) - IG2 (I23-6)	Below 1 Ω
Ignition coil (I6-1) - IG2 (I23-6)	Below 1 Ω
Ignition coil (I7-1) - IG2 (I23-6)	Below 1 Ω
Ignition coil (I8-1) - IG2 (I23-6)	Below 1 Ω
Ignition coil (I3-1) or IG2 (I23-6) - Body ground	10 kΩ or higher
Ignition coil (I4-1) or IG2 (I23-6) - Body ground	10 kΩ or higher
Ignition coil (I5-1) or IG2 (I23-6) - Body ground	10 kΩ or higher
Ignition coil (I6-1) or IG2 (I23-6) - Body ground	10 kΩ or higher
Ignition coil (I7-1) or IG2 (I23-6) - Body ground	10 kΩ or higher
Ignition coil (I8-1) or IG2 (I23-6) - Body ground	10 kΩ or higher

NG **Repair or replace harness or connector.**

OK

Replace ignition coil with igniter.

DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)
------------	--------------	--

DTC	P0430	Catalyst System Efficiency Below Threshold (Bank 2)
------------	--------------	--

MONITOR DESCRIPTION

The ECM uses the two sensors, mounted in front of and behind the Three-way Catalytic Converter (TWC), to monitor its efficiency.

The first sensor, the Air-Fuel Ratio (A/F) sensor (sensor 1), sends pre-catalyst information to the ECM. The second sensor, the Heated Oxygen (HO2) sensor (sensor 2), sends post-catalyst information to the ECM. The ECM compares the information transmitted by these two sensors to determine the efficiency of the TWC performance and its ability to store oxygen.

When the TWC is functioning properly, the variation in the oxygen concentration in the exhaust gas, after it has passed through the TWC, is small. In this condition, the voltage output of sensor 2 slowly alternates between the rich and lean signal voltages (shown in the illustration below). As the TWC performance efficiency deteriorates, its oxygen storage capacity decreases, and the variation in the oxygen concentration in the exhaust gas increases. As a result, the sensor voltage output fluctuates frequently.

While the catalyst monitor is running, the ECM measures the signal lengths of both sensors 1 and 2, and calculates the ratio of the signal lengths to determine the extent of the TWC deterioration. If the deterioration level exceeds the preset threshold, the ECM interprets this as the TWC malfunction. The ECM then illuminates the MIL and sets the DTC.

DTC No.	DTC Detecting Condition	Trouble Area
P0420 P0430	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, each waveform of heated oxygen sensors has same amplitude (2 trip detection logic)	<ul style="list-style-type: none"> • Gas leakage on exhaust system • Heated oxygen sensor (bank 1, 2 sensor 1, 2) • Three-way catalytic converter

HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

MONITOR STRATEGY

Related DTCs	P0420	Bank 1 catalyst is deteriorated
	P0430	Bank 2 catalyst is deteriorated
Required sensors/components	Main sensors/components	Front and rear heated oxygen sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor, Engine speed sensor, Intake air temperature sensor
Frequency of operation	Once per driving cycle	
Duration	30 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Battery voltage	11 V	-
IAT	-10°C (14°F)	-
ECT	75°C (167°F)	-
Atmospheric pressure coefficient	0.75	-
Idle	OFF	
Engine RPM	-	3,200 rpm
A/F sensor	Activated	
Fuel system status	Closed loop	
Engine load	10 to 70 %	
All of the following conditions are met	Condition 1, 2 and 3	
1. MAF	5 to 70 g/sec	
2. Front catalyst temperature (estimated)	650 to 840°C (1,202 to 1,544°F)	
3. Rear catalyst temperature (estimated)	100 to 900°C (212 to 1,652°F)	
Rear HO2S monitor	Completed	
Shift position	4th	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Oxygen storage capacity (OSC) of catalyst	Less than 0.04

MONITOR RESULT

Refer to page [DI-26](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page [DI-27](#)).

- TID (Test Identification Data) is assigned to each emissions-related component.
- TLT (Test Limit Type):
If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

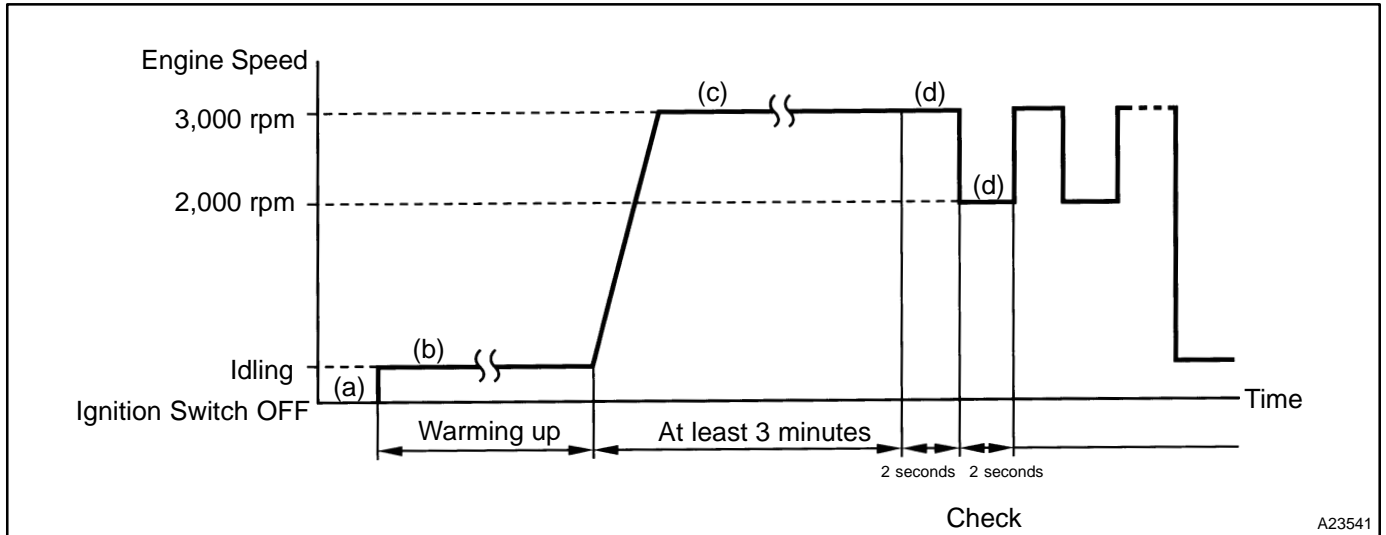
TID \$01: Catalyst (Active A/F control method)

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	\$01	Multiply by 0.0078 (no dimension)	Oxygen storage capacity (bank 1): Calculated by HO2S 2 output	Malfunction criteria for catalyst deterioration
1	\$02	Multiply by 0.0078 (no dimension)	Oxygen storage capacity (bank 2): Calculated by HO2S 2 output	Malfunction criteria for catalyst deterioration

WAVEFORMS OF AIR-FUEL RATIO (A/F) AND HEATED OXYGEN (HO2) SENSORS

HINT:

Perform the operation with the engine speeds and time durations described below prior to check the waveforms of the A/F and HO2 sensors. This is in order to activate the sensors sufficiently to obtain the appropriate inspection results.

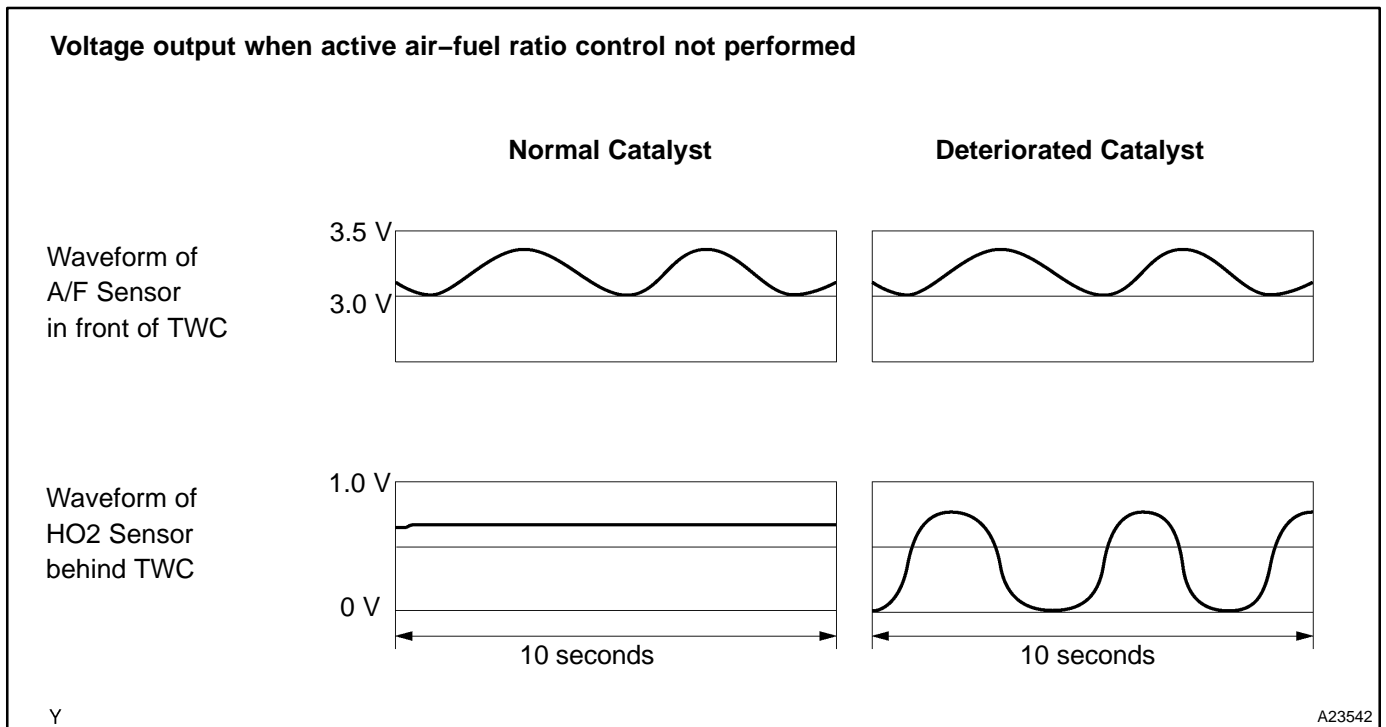


- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and warm it up with all the accessories switched OFF, until the engine coolant temperature stabilizes.
- (c) Run the engine at an engine speed of between 2,500 rpm and 3,000 rpm for at least 3 minutes.
- (d) After confirming that the waveform of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor (bank 1, 2 sensor 2 (OX1B, OX2B)).

HINT:

- If either of the voltage outputs of the Air-Fuel Ratio (A/F) or Heated Oxygen (HO2) sensors does not fluctuate, or either of the sensors makes a noise, the sensor may be malfunctioning.
- If the voltage outputs of both the sensors remain lean or rich, the air-fuel ratio may be extremely lean or rich. In such cases, perform the following A/F CONTROL using a hand-held tester.

- If the Three-Way Catalytic Converter (TWC) has deteriorated, the HO₂ sensor (located behind the TWC) voltage output fluctuates up and down frequently, even under normal driving conditions (active air-fuel ratio control is not performed).



A/F CONTROL

HINT:

Hand-held tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO₂) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- Connect a hand-held tester to the DLC3.
- Start the engine and turn the tester ON.
- Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- Monitor the voltage outputs of the A/F and HO₂ sensors (AFS B1S1 and OS2 B1S2) displayed on the tester.

HINT:

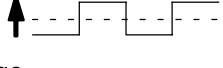
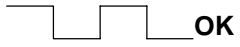
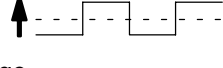
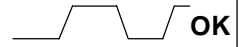
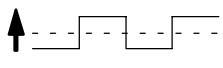

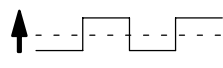
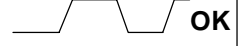
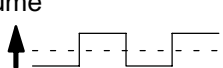

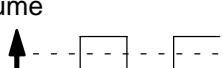
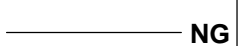


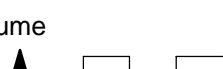

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 % ↑  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0 V	Injection volume +25 % ↑  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	—
2	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 % ↑  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 % ↑  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0V	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides DTC P0420 or P0430) being output?
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTC using the hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
"P0420 and/or P0430"	A
"P0420 or P0430" and other DTCs	B

HINT:

If any other codes besides "P0420 and/or P0430" are output, perform the troubleshooting for those DTCs first.

B

Go to DTC chart (See page [DI-57](#)).

A

2	Check gas leakage on exhaust system.
----------	---

NG

Repair or replace exhaust gas leakage point.

OK

3	Check A/F sensor (bank 1, 2 sensor 1) (See page SF-64).
----------	--

HINT:

Refer to the HINT following the end of this flowchart.

NG

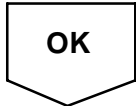
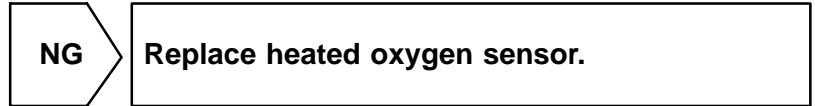
Replace A/F sensor.

OK

4	Check heated oxygen sensor (bank 1, 2 sensor 2) (See page SF-64).
----------	--

HINT:

Refer to the HINT following the end of this flowchart.



Replace front and rear three-way catalytic converter in the bank a malfunction is detected.

HINT:

Hand-held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following "A/F CONTROL" (Heated oxygen sensor or another can be distinguished).

(a) Perform ACTIVE TEST by hand-held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to -12.5 % or +25 %.

- (1) Connect the hand-held tester to the DLC3 on the vehicle.
- (2) Turn the ignition switch to ON.
- (3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 seconds.
- (4) Select the menu "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL".
- (5) Perform "A/F CONTROL" with the engine in an idle condition (press the right or left button).

RESULT:

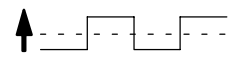
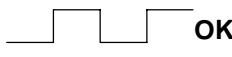
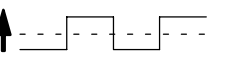
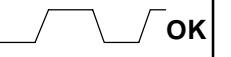
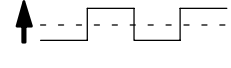
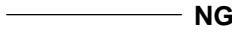
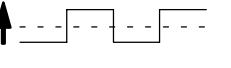

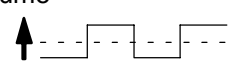

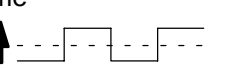

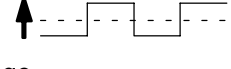

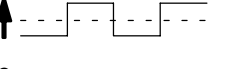

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume

+25 % → rich output: More than 0.5 V

-12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few second delay in the sensor 1 (front sensor) output. And there is approximately 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspected trouble area
Case 1	Injection volume +25 % ↑ -12.5 % ↓  Output voltage More than 0.5 V ↑ Less than 0.4 V ↓  OK	Injection volume +25 % ↑ -12.5 % ↓  Output voltage More than 0.5 V ↑ Less than 0.4 V ↓  OK	—
Case 2	Injection volume +25 % ↑ -12.5 % ↓  Output voltage Almost no reaction  NG	Injection volume +25 % ↑ -12.5 % ↓  Output voltage More than 0.5 V ↑ Less than 0.4 V ↓  OK	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % ↑ -12.5 % ↓  Output voltage More than 0.5 V ↑ Less than 0.4 V ↓  OK	Injection volume +25 % ↑ -12.5 % ↓  Output voltage Almost no reaction  NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % ↑ -12.5 % ↓  Output voltage Almost no reaction  NG	Injection volume +25 % ↑ -12.5 % ↓  Output voltage Almost no reaction  NG	Extremely rich or lean actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of the heated oxygen sensors (sensor 1 and 2).

For displaying the graph indication, enter "ACTIVE TEST / A/F CONTROL / USER DATA" then select "O2S B1S1 and O2S B1S2" by pressing "YES" button and push "ENTER" button before pressing "F4" button.

NOTICE:

If the vehicle is short of fuel, the air-fuel ratio becomes LEAN and DTCs P0133 and/or P0153 will be recorded, and the MIL then comes on.

- If different DTCs related to different systems while terminal E2 as ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand-held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow
------------	--------------	---

DTC SUMMARY

DTCs	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P0441	Purge VSV (Vacuum Switching Valve) stuck open	Vacuum pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If stabilized pressure higher than [second 0.02 inch leak pressure standard x 0.2], ECM determines that purge VSV stuck open	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (Purge VSV – ECM) • ECM • Pump module • Leakage from EVAP system 	While ignition Switch OFF	2 trip
P0441	Purge VSV stuck closed	After EVAP leak check performed, purge VSV turned ON (open), and atmospheric air introduced into EVAP system. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If pressure does not return to near atmospheric pressure, ECM determines that purge valve stuck closed	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (Purge VSV – ECM) • ECM • Pump module • Leakage from EVAP system 	While ignition Switch OFF	2 trip
P0441	Purge flow	While engine running, following conditions successively met: <ul style="list-style-type: none"> • Negative pressure not created in EVAP system when purge VSV turned ON (open) • EVAP system pressure change less than 0.5 kPa (3.75 mmHg) when vent valve turned ON (closed) • Atmospheric pressure change before and after purge flow monitor less than 0.1 kPa (0.75 mmHg) 	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (Purge VSV – ECM) • Leakage from EVAP line (Purge VSV – Intake manifold) • ECM 	While engine running	2 trip

CIRCUIT DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) Inspection Procedure (see page [DI-368](#)).

MONITOR DESCRIPTION

The two monitors, Key-Off and Purge Flow, are used to detect malfunctions relating to DTC P0441. The Key-Off monitor is initiated by the ECM internal timer, known as the soak timer, 5 hours* after the ignition switch is turned to OFF. The purge flow monitor runs while the engine is running.

1. KEY-OFF MONITOR

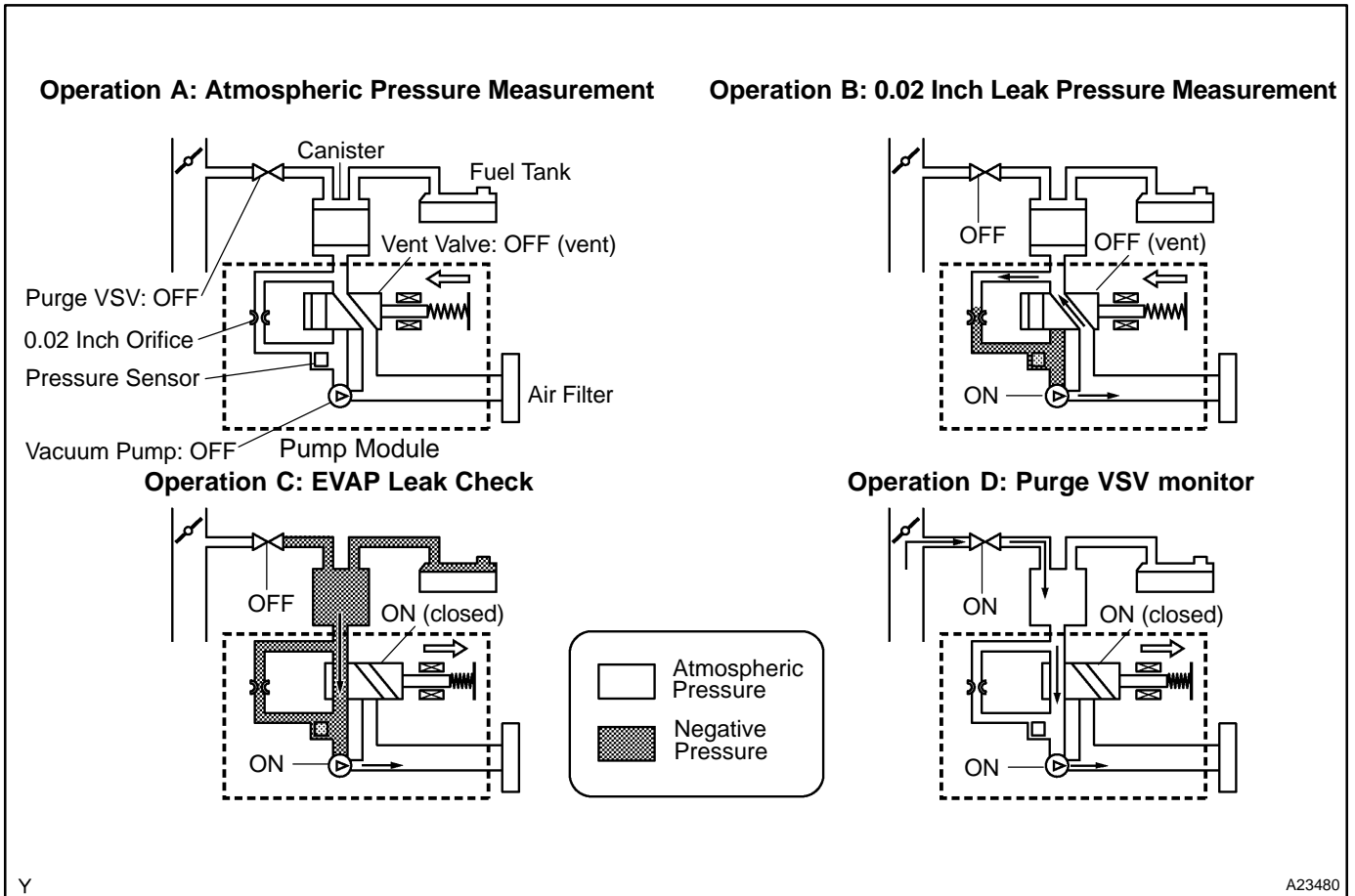
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

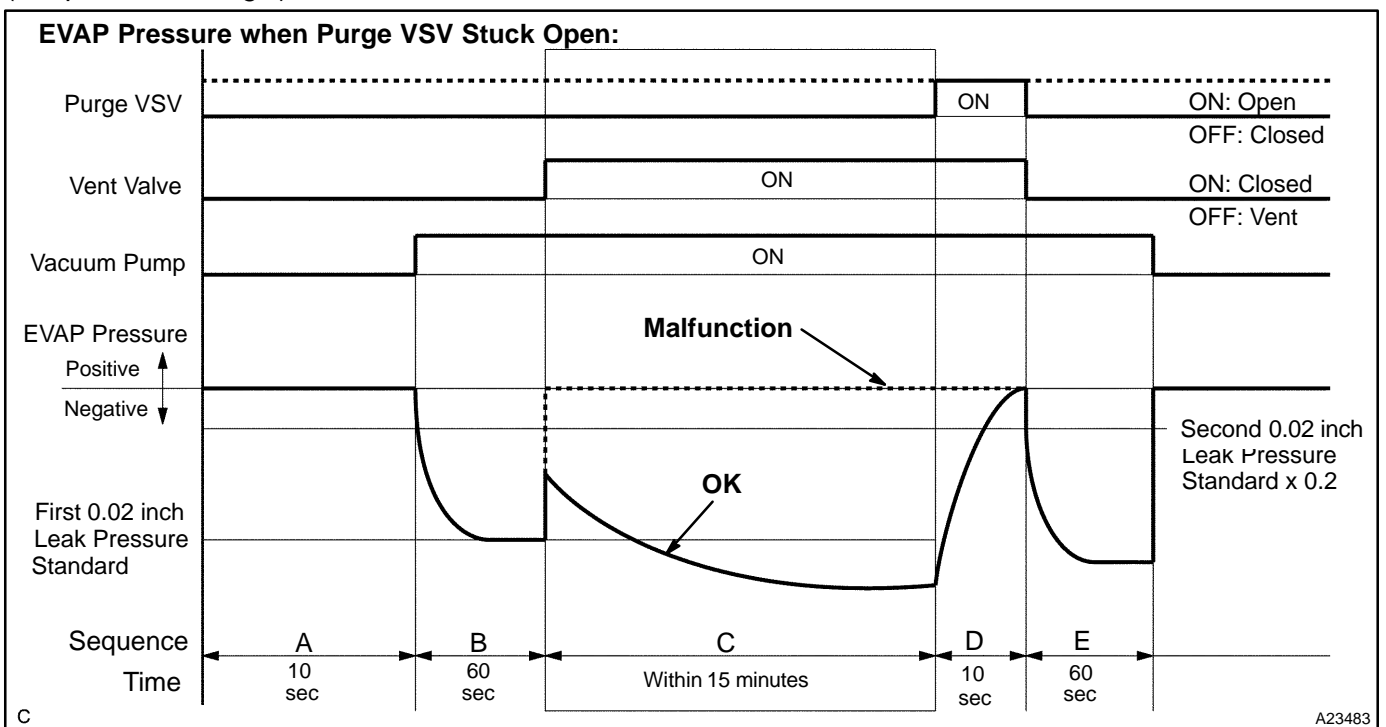
Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



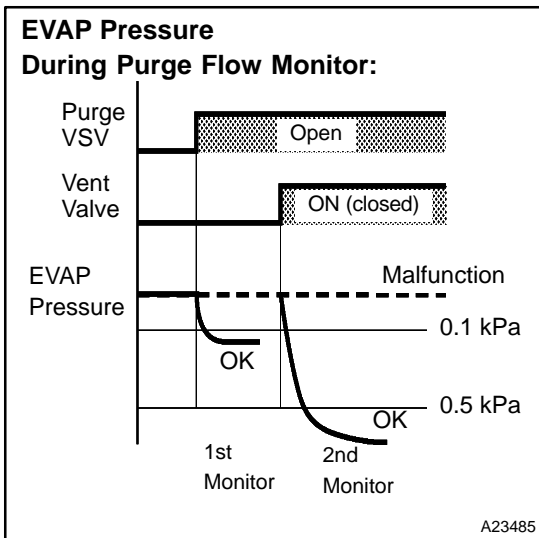
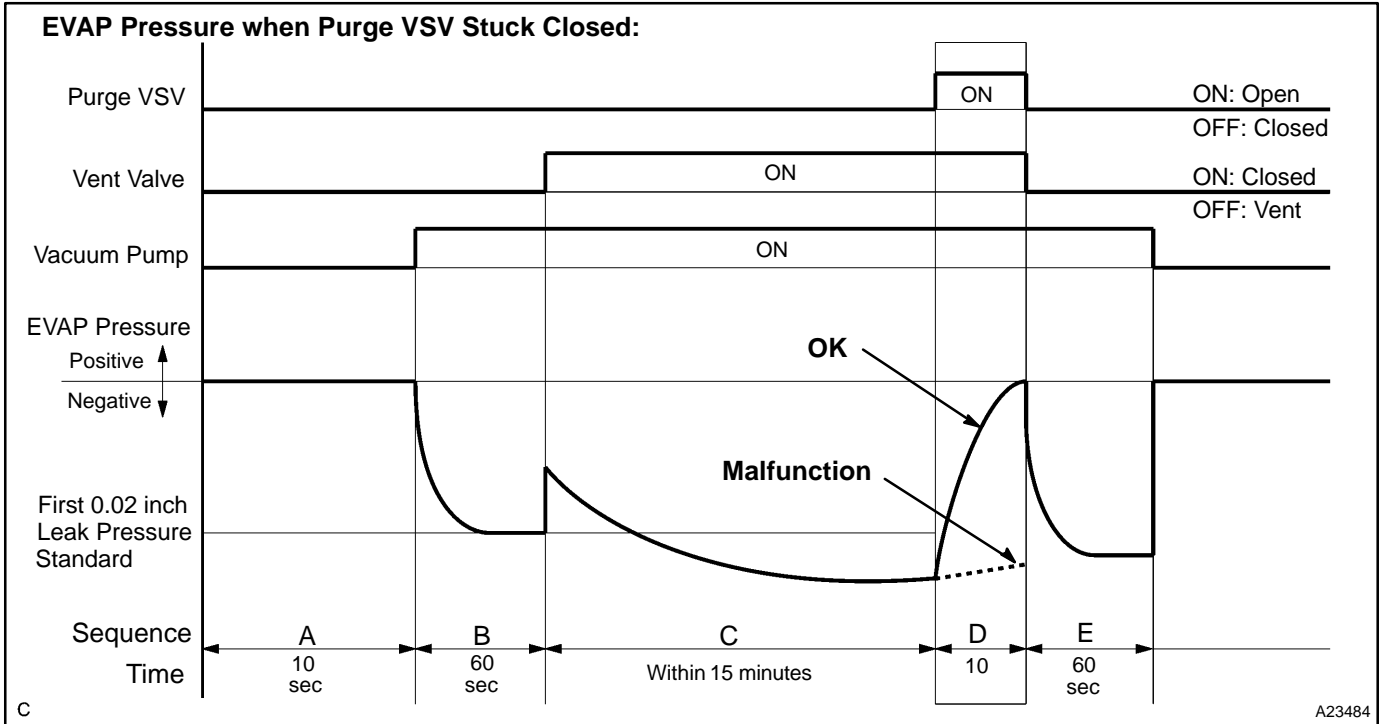
(a) Purge VSV stuck open

In operation C, the vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The EVAP system pressure is then measured by the ECM using the pressure sensor. If the stabilized system pressure is higher than [second 0.02 inch leak pressure standard x 0.2], the ECM interprets this as the purge VSV (Vacuum Switching Valve) being stuck open. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).



(b) Purge VSV stuck closed

In operation D, the pressure sensor measures the EVAP system pressure. The pressure measurement for purge VSV monitor is begun when the purge VSV is turned ON (open) after the EVAP leak check. When the measured pressure indicates an increase of 0.3 kPa (2.25 mmHg) or more, the purge VSV is functioning normally. If the pressure does not increase, the ECM interprets this as the purge VSV being stuck closed. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).



2. PURGE FLOW MONITOR

The purge flow monitor consists of the two step monitors. The 1st monitor is conducted every time and the 2nd monitor is activated if necessary.

- The 1st monitor
While the engine is running and the purge VSV (Vacuum Switching Valve) is ON (open), the ECM monitors the purge flow by measuring the EVAP pressure change. If negative pressure is not created, the ECM begins the 2nd monitor.
- The 2nd monitor
The vent valve is turned ON (closed) and the EVAP pressure is then measured. If the variation in the pressure is less than 0.5 kPa (3.75 mmHg), the ECM interprets this as the purge VSV being stuck closed, and illuminates the MIL and sets DTC P0441 (2 trip detection logic).

Atmospheric pressure check:

In order to ensure reliable malfunction detection, the variation between the atmospheric pressures, before and after conduction of the purge flow monitor, is measured by the ECM.

MONITOR STRATEGY

Related DTCs	P0441	Purge VSV stuck open
		Purge VSV stuck closed
		Purge flow
Required sensors/components	Purge VSV, Pump module	
Frequency of operation	Once per driving cycle	
Duration	Purge VSV stuck open and closed: Within 15 min. (varies with amount of fuel in tank) Purge flow: Within 10 min.	
MIL operation	2 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Purge VSV stuck open and closed:		
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	-
Vehicle speed	-	2.5 mph (4 km/h)
Ignition switch	OFF	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions are met before IG switch OFF	Condition 1 and 2	
1. Duration that vehicle is driven	5 min.	-
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Time after key off	5 or 7 or 9.5 hours	
EVAP key-off monitor sequence	1 to 8	
1. Atmospheric pressure	-	
Next sequence is run if the following condition is set	-	
Atmospheric pressure change	-	0.3 kPa (2.25 mmHg) for 1 sec.
2. First reference pressure measurement	-	
Next sequence is run if all of the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.38 to -7.93 mmHg)	
3. Reference pressure	Saturated	

DIAGNOSTICS – ENGINE (1GR-FE)

3. EVAP canister vent valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	-
4. Vacuum introduction	-	
Next sequence is run if the following condition is set	Condition 1 and 2	
EVAP pressure	Saturated within 12 minutes	
5. EVAP canister purge valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	-
6. Second reference pressure measurement	-	
Next sequence is run if all of the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure measurement	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.4 to -7.92 mmHg)	
3. Reference pressure	Saturated	
4. Difference between first reference pressure and second reference pressure	-	0.7 kPa (5.25 mmHg)
7. Leak check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure when vacuum introduction is complete	-	Less than second reference pressure
8. Atmospheric pressure measurement	-	
EVAP monitor is complete if the following condition is set	-	
Atmospheric pressure difference between sequence 1 and 8	-	0.3 kPa (2.25 mmHg)
Purge flow:		
Engine condition	Running	
ECT	4.4°C (40°F)	-
IAT	4.4°C (40°F)	-
EVAP pressure sensor	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP system check	Not operated by scan tool	
Battery voltage	10 V	-
Purge duty cycle	8 %	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Purge VSV stuck open:	
EVAP pressure when vacuum introduction is complete	Higher than reference pressure x 0.2
Purge VSV stuck closed:	
EVAP pressure change after EVAP canister purge valve is open	Less than 0.3 kPa (2.25 mmHg)
Purge flow:	
Both of the following conditions are met	Condition 1 or 2
1. EVAP pressure change when purge flow is started	Less than 0.1 kPa (0.75 mmHg)
2. FTP change during purge operation when vent valve is closed	Less than 0.5 kPa (3.75 mmHg)

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-26](#) for detailed information on Monitor Result.

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

DTC	P0450	Evaporative Emission Control System Pressure Sensor/Switch
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DTC	P0451	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance
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DTC	P0452	Evaporative Emission Control System Pressure Sensor/Switch Low Input
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DTC	P0453	Evaporative Emission Control System Pressure Sensor/Switch High Input
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DTC SUMMARY

DTC	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P0450	Pressure sensor voltage abnormal fluctuation	Sensor output voltage rapidly fluctuates beyond upper and lower malfunction thresholds for 0.5 seconds.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (ignition OFF) • Ignition ON 	1 trip
P0451	Pressure sensor noising	Sensor output voltage fluctuates frequently in certain time period.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (ignition OFF) • Engine running 	2 trip
P0451	Pressure sensor stuck	Sensor output voltage does vary in certain time period.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (ignition OFF) 	2 trip
P0452	Pressure sensor voltage low	Sensor output voltage is less than 0.45 V for 0.5 seconds.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • Ignition ON • EVAP monitoring (ignition OFF) 	1 trip
P0453	Pressure sensor voltage high	Sensor output voltage is more than 4.9 V for 0.5 seconds.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • Ignition ON • EVAP monitoring (ignition OFF) 	1 trip

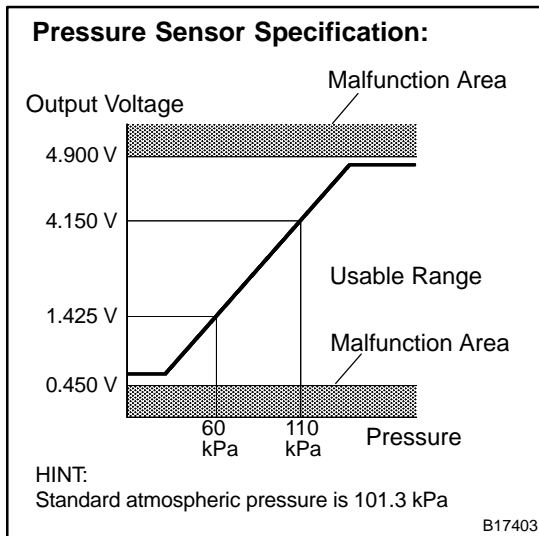
HINT:

The pressure sensor is built into the pump module.

CIRCUIT DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) Inspection Procedure (see page [DI-368](#)).

MONITOR DESCRIPTION



- (a) DTC P0450: Pressure sensor voltage abnormal fluctuation.
If the pressure sensor voltage output rapidly fluctuates between less than 0.45 V and more than 4.9 V, the ECM interprets this as an open or short circuit malfunction in the pressure sensor or its circuit, and stops the EVAP (Evaporative Emission) system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).
- (b) DTC P0451: Pressure sensor noising or stuck
If the pressure sensor voltage output fluctuates rapidly for 10 seconds, the ECM stops the EVAP system monitor. The ECM interprets this as noise from the pressure sensor, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC.
Alternatively, if the sensor voltage output does not change for 10 seconds, the ECM interprets this as the sensor being stuck, and stops the monitor. The ECM then illuminates the MIL and sets the DTC.
(Both the malfunctions are detected by 2 trip detection logic)
- (c) DTC P0452: Pressure sensor voltage low
If the pressure sensor voltage output is below 0.45 V, the ECM interprets this as an open or short circuit malfunction in the pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).
- (d) DTC P0453: Pressure sensor voltage high
If the pressure sensor voltage output is 4.9 V or more, the ECM interprets this as an open or short circuit malfunction in the pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0450	Evaporative emission control system pressure sensor/switch chattering
	P0451	Evaporative emission control system pressure sensor noise
		Evaporative emission control system pressure sensor stuck
	P0452	Evaporative emission control system pressure sensor/switch low input
	P0453	Evaporative emission control system pressure sensor/switch high input
Required sensors/components	Pump module	
Frequency of operation	Once per driving cycle	
Duration	0.5 sec.: P0450, P0452, P0453 10 sec.: P0451	
MIL operation	Immediate: P0450, P0452, P0453 2 driving cycles: P0451	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Pressure sensor noise:		
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	–
IAT	4.4 to 35°C (40 to 95°F)	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
Either of the following conditions is met	Condition 1 or 2	
1. Time after key off	5 or 7 or 9.5 hours	
2. Engine condition	Running	
Pressure sensor stuck:		
Battery voltage	10.5 V	–
IAT	4.4 to 35°C (40 to 95°F)	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Time after key off	5 or 7 or 9.5 hours	
Pressure sensor chattering, low/high voltage:		
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Pressure sensor noise:	
Frequency that EVAP pressure change is 0.3 kPa (2.3 mmHg) or more	10 times or more for 10 sec.
Pressure sensor stuck:	
EVAP pressure change during reference pressure measurement	Less than 0.65 kPa (4.9 mmHg)
Pressure sensor chattering:	
EVAP pressure	Less than 42.11 kPa (315.90 mmHg), or more than 123.761 kPa (928.440 mmHg)
Pressure sensor low voltage:	
EVAP pressure	Less than 42.11 kPa (315.90 mmHg)
Pressure sensor high voltage:	
EVAP pressure	More than 123.761 kPa (928.440 mmHg)

INSPECTION PROCEDURE

NOTICE:

- When a vehicle is brought into the workshop, leave it as it is. Do not change the vehicle condition. For example, do not tighten the fuel tank cap.
- Do not disassemble the pump module.
- A hand-held tester is required to conduct the following diagnostic troubleshooting procedure.

1	Confirm DTC and EVAP pressure.
----------	---------------------------------------

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON (do not start the engine).
- (c) Turn the tester ON.

CHECK:

- (a) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (b) Read DTCs.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / VAPOR PRESS.
- (d) Read the EVAP (Evaporative Emission) pressure displayed on the tester.

RESULT:

Display (DTC Output)	Test Results	Suspected Trouble Areas	Proceed To
P0451	—	• Pressure sensor	C
P0452	Less than 45 kpa (338 mmHg)	• Wire harness/connector (ECM – pressure sensor) • Pressure sensor • Short in ECM circuit	A
P0453	More than 120 kPa (900 mmHg)	• Wire harness/connector (ECM – pressure sensor) • Pressure sensor • Open in ECM circuit	B

B

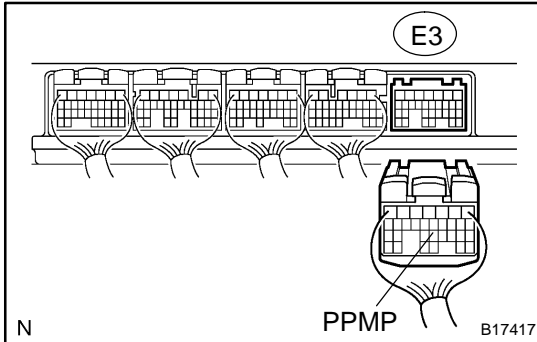
Go to step 4.

C

Go to EVAP inspection procedure (See page [DI-368](#)).

A

2 Measure resistance between terminal PPMP of ECM and body ground.



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between PPMP terminal of the ECM connector and the body ground.

RESULT:

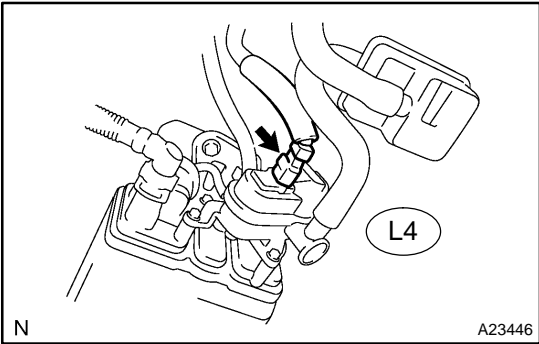
Test Results	Suspected Trouble Areas	Proceed To
10 Ω or less	<ul style="list-style-type: none"> • Wire harness/connector (ECM – pressure sensor) • Short in pressure sensor circuit 	A
10 k Ω or more	<ul style="list-style-type: none"> • Wire harness/connector (ECM – pressure sensor) • Short in ECM circuit 	B

B

Go to step 7.

A

3 Measure resistance between terminal PPMP of ECM and body ground.

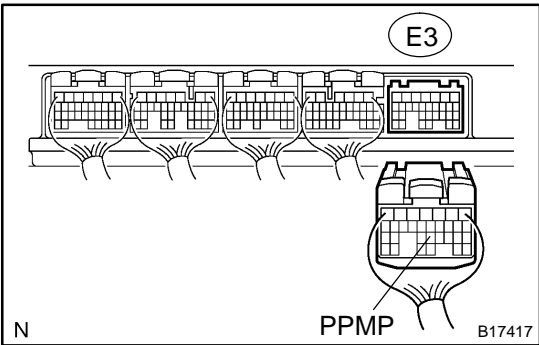


PREPARATION:

- (a) Disconnect the L4 canister connector.
- (b) Disconnect the E3 ECM connector.

CHECK:

Check the resistance between PPMP terminal of the ECM connector and the body ground.



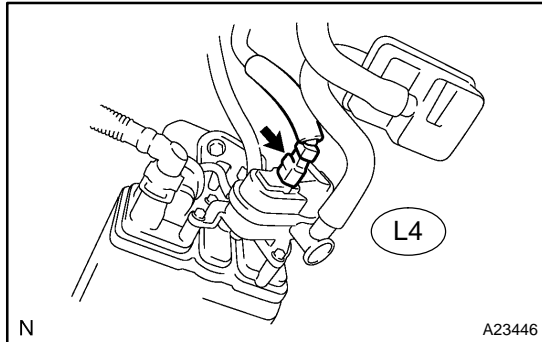
Result:

Test Results	Suspected Trouble Areas	Proceed To
10 kΩ or more	• Short in pressure sensor circuit	A
10 Ω or less	• Short in wire harness/connector (ECM – pressure sensor)	B

A → **Go to step 5.**

B → **Go to step 6.**

4 Measure voltage and resistance of pump module connector.



PREPARATION:

- (a) Disconnect the L4 canister connector.
- (b) Turn the ignition switch to ON.

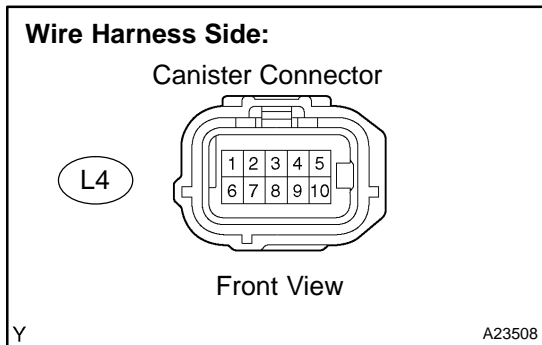
CHECK:

Measure the voltage and resistance of the L4 connector.

OK:

Standard:

Tester Connections	Specified Conditions
L4-4 - Body ground	Between 4.5 V and 5.5 V
L4-3 - Body ground	Between 4.5 V and 5.5 V
L4-2 - Body ground	100 Ω or less



RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Voltage and resistance within standard ranges	• Open in pressure sensor circuit	A
Voltage and resistance outside standard ranges	• Open in wire harness/connector (ECM - pressure sensor)	B

B Go to step 6.

A

5 Replace charcoal canister assembly.

NEXT Go to step 8.

6 Repair or replace wire harness and connectors.

HINT:

If the exhaust tail pipe has been removed, go to the next step before reinstalling it.

NEXT Go to step 8.

7	Replace ECM (See page SF-66).
----------	--

NEXT

8	Check whether DTC output recurs.
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Wait for at least 60 seconds.

CHECK:

On the tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/DTC INFO/PENDING CODES.

HINT:

If no pending DTC is displayed on the tester, the repair has been successfully completed.

NEXT

Completed

DTC	P0455	Evaporative Emission Control System Leak Detected (Gross Leak)
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DTC	P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)
------------	--------------	--

DTC SUMMARY

DTC	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P0455	EVAP gross leak	Vacuum pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If stabilized pressure higher than [second 0.02 inch leak pressure standard x 0.2], ECM determines that EVAP system has large leakage.	<ul style="list-style-type: none"> • Fuel tank cap (loose) • Leakage from EVAP line (Canister – Fuel tank) • Leakage from EVAP line (Purge VSV – Canister) • Pump module • Leakage from fuel tank • Leakage from canister 	While ignition switch OFF	2 trip
P0456	EVAP small leak	Vacuum pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If stabilized pressure larger than second 0.02 inch leak pressure, ECM determines that EVAP system has small leakage.	Same above	While ignition switch OFF	2 trip

CIRCUIT DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) Inspection Procedure (see page [DI-368](#)).

MONITOR DESCRIPTION

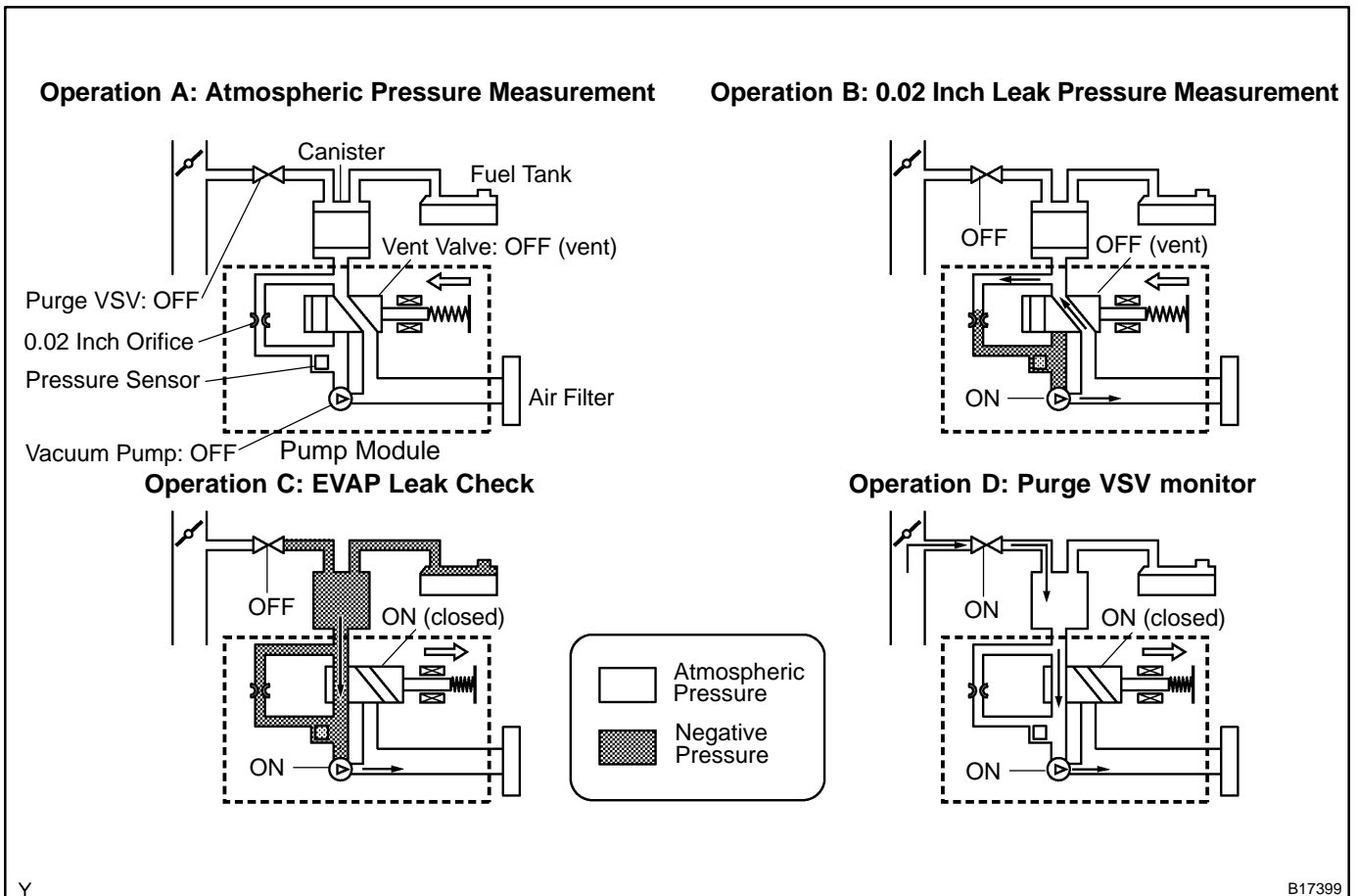
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.

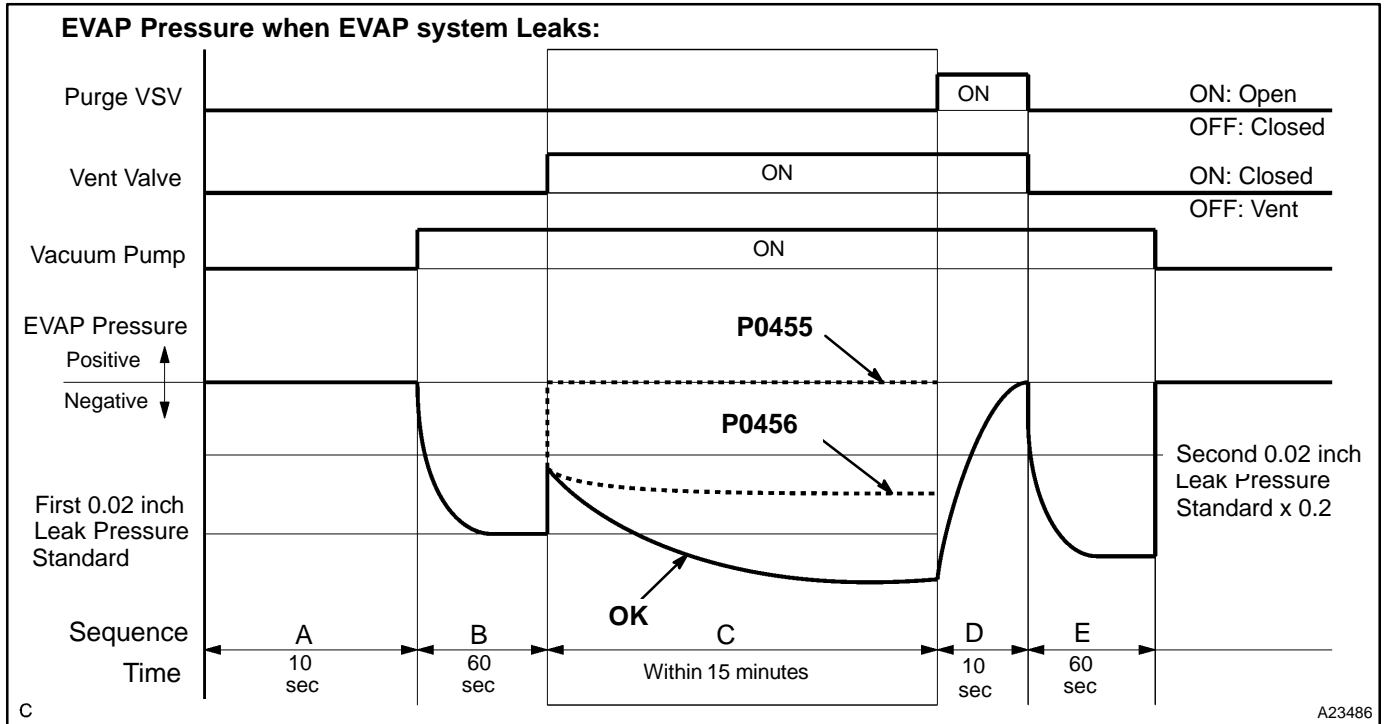


(a) P0455: EVAP (Evaporative Emission) gross leak

In operation C, the vacuum pump creates negative pressure (vacuum) in the EVAP system and the EVAP system pressure is measured. If the stabilized system pressure is higher than [second 0.02 inch leak pressure standard x 0.2] (near atmospheric pressure), the ECM determines that the EVAP system has a large leakage, illuminates the MIL and sets the DTC (2 trip detection logic).

(b) P0456: EVAP very small leak

In operation C, the vacuum pump creates negative pressure (vacuum) in the EVAP system and the EVAP system pressure is measured. If the stabilized system pressure is higher than second 0.02 inch leak pressure standard, the ECM determines that the EVAP system has a small leakage, illuminates the MIL and sets the DTC (2 trip detection logic).



MONITOR STRATEGY

Related DTCs	P0455	Gross leak detected
	P0456	Very small leak (0.020 inch hole) detected
Required sensors/components	Purge VSV, Pump module	
Frequency of operation	Once per driving cycles	
Duration	Within 15 min. (varies with amount of fuel in tank)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	-

DIAGNOSTICS - ENGINE (1GR-FE)

Vehicle speed	-	2.5 mph (4 km/h)
Ignition switch	OFF	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions are met before IG switch OFF	Condition 1 and 2	
1. Duration that vehicle is driven	5 min.	-
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Time after key off	5 or 7 or 9.5 hours	
EVAP key-off monitor sequence	1 to 8	
1. Atmospheric pressure	-	
Next sequence is run if the following condition is set	-	
Atmospheric pressure change	-	0.3 kPa (2.25 mmHg) for 1 sec.
2. First reference pressure measurement	-	
Next sequence is run if all of the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.38 to -7.93 mmHg)	
3. Reference pressure	Saturated	
3. EVAP canister vent valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	-
4. Vacuum introduction	-	
Next sequence is run if the following condition is set	Condition 1 and 2	
EVAP pressure	Saturated within 12 minutes	
5. EVAP canister purge valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	-

6. Second reference pressure measurement	–	
Next sequence is run if all of the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure measurement	–	–1 kPa (–7.5 mmHg)
2. Reference pressure	–4.85 to –1.057 kPa (–36.4 to –7.92 mmHg)	
3. Reference pressure	Saturated	
4. Difference between first reference pressure and second reference pressure	–	0.7 kPa (5.25 mmHg)
7. Leak check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure when vacuum introduction is complete	–	Less than second reference pressure
8. Atmospheric pressure	–	
EVAP monitor is complete is the following condition is set	–	
Atmospheric pressure difference between sequence 1 and 8	–	0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Small leak (0.020 inch) malfunction detection:	
EVAP pressure when vacuum introduction is complete	Between reference pressure and reference pressure x 0.2
Gross leak detection:	
EVAP pressure when vacuum introduction is complete	Higher than reference pressure x 0.2

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-26](#) for detailed information.

INSPECTION PROCEDURE

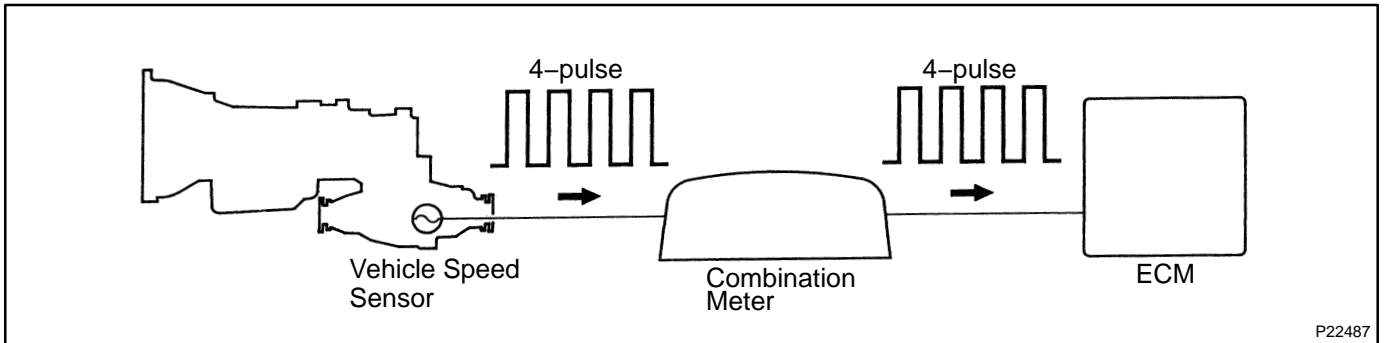
Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

DTC	P0500	Vehicle Speed Sensor "A"
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DTC	P0503	Vehicle Speed Sensor "A" Intermittent/ Erratic/High
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CIRCUIT DESCRIPTION

The No.1 vehicle speed sensor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0500	Step 1	No vehicle speed sensor signal to ECM under following conditions: (1 trip detection logic) • Vehicle is being driven	<ul style="list-style-type: none"> • Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM
P0503	DI-11	Intermittent problem in the vehicle speed sensor circuit	<ul style="list-style-type: none"> • Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM

MONITOR DESCRIPTION

The ECM assumes that the vehicle is driven when the park/neutral position switch is OFF and it has been over 4 sec. since the actual vehicle speed was 6 mph (9 km/h) or more.

If there is no signal from the vehicle speed sensor when these conditions are satisfied, the ECM concludes that there is a fault in the vehicle speed sensor. The ECM will turn on the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0500	Vehicle speed sensor "A" pulse input error
Required sensors/components	Main sensors	Vehicle speed sensor
	Related sensors	Park/Neutral position switch, Engine coolant temperature sensor, Combination meter
Frequency of operation	Continuous	
Duration	Case 1: 500 times Case 2: 8 sec.	
MIL operation	Case 1: Immediate Case 2: 2 driving cycles	
Sequence of operation	None	

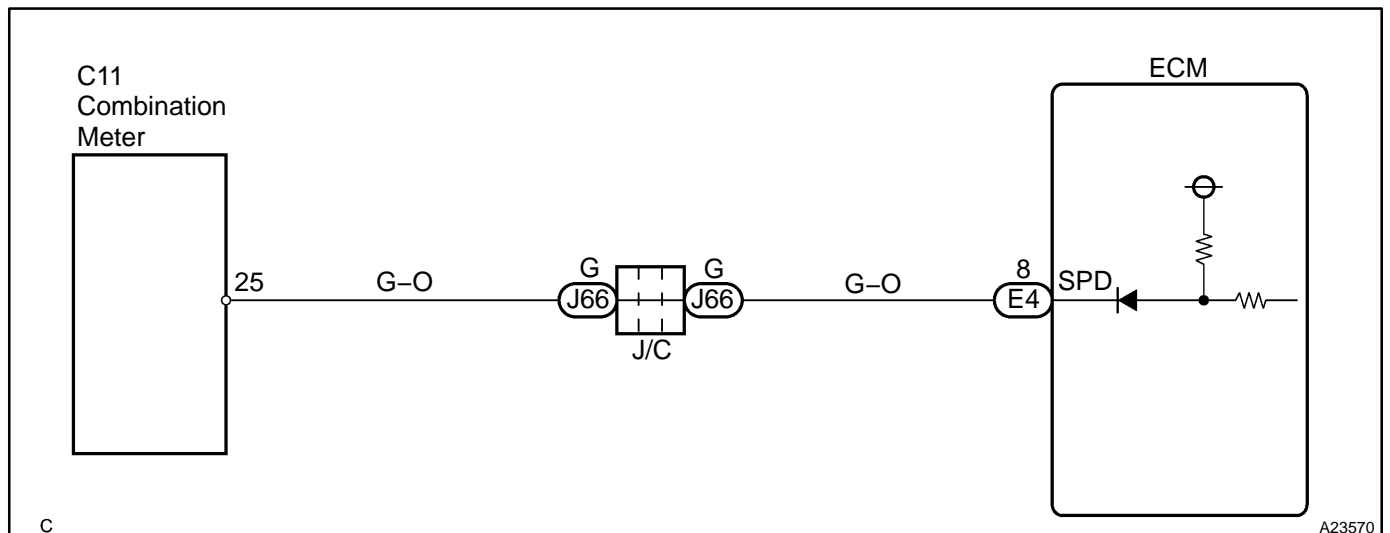
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Case 1:		
Vehicle speed is 5.59 mph (9 km/h) or more	4 sec.	-
Park/neutral position switch	OFF	
Case 2:		
ECT	70°C (158°F)	-
Fuel cut at high engine speed	Not executing	
Engine RPM	2,000 rpm	6,800 rpm
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1, 2	
Sensor signal	No pulse input

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check operation of speedometer.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) Start the engine.
- (d) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / VEHICLE SPD.

CHECK:

Read the mass air flow rate on the hand-held tester.

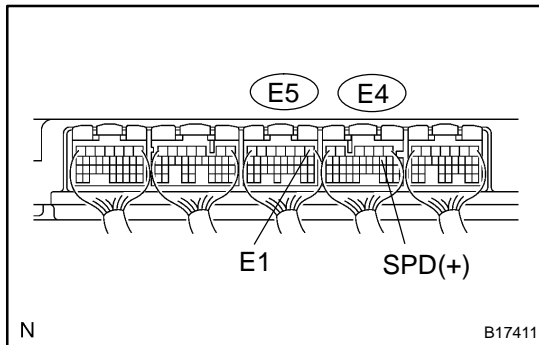
RESULT:

Vehicle speed	Proceed to
Vehicle speed remains 0 km/h (0 mph)	A
Vehicle speed is lower than actual speed	A
Vehicle speed is same as actual speed	B

NG

Check speedometer circuit. See combination meter troubleshooting (See page [BE-2](#)).

OK

2 Check voltage between terminal SPD and E1 of ECM connector.
**PREPARATION:**

- Shift the shift lever to neutral.
- Jack up the rear wheel on one side.
- Turn the ignition switch to ON.

CHECK:

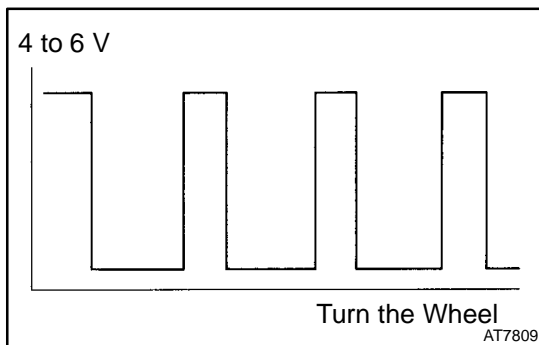
Measure the voltage between the specified terminal of the E4 and E5 ECM connectors when the wheel is turned slowly.

OK:**Standard:**

Tester Connection	Specified Condition
SPD (E4-8) - E1 (E5-1)	Generated intermittently

HINT:

The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.

**NG**

Check and repair harness and connector between combination meter and ECM.

OK

Replace ECM (See page [SF-66](#)).

DTC	P0504	Brake Switch "A"/"B" Correlation
------------	--------------	---

CIRCUIT DESCRIPTION

In addition to turning on the stop lamps, the stop lamp switch signals are used for a variety of engine, transmission, and suspension functions as well as being an input for diagnostic checks. It is important that the switch operates properly, therefore this switch is designed with two complementary signal outputs: STP and STI-. The ECM analyzes these signal outputs to detect malfunctions in the stop lamp switch.

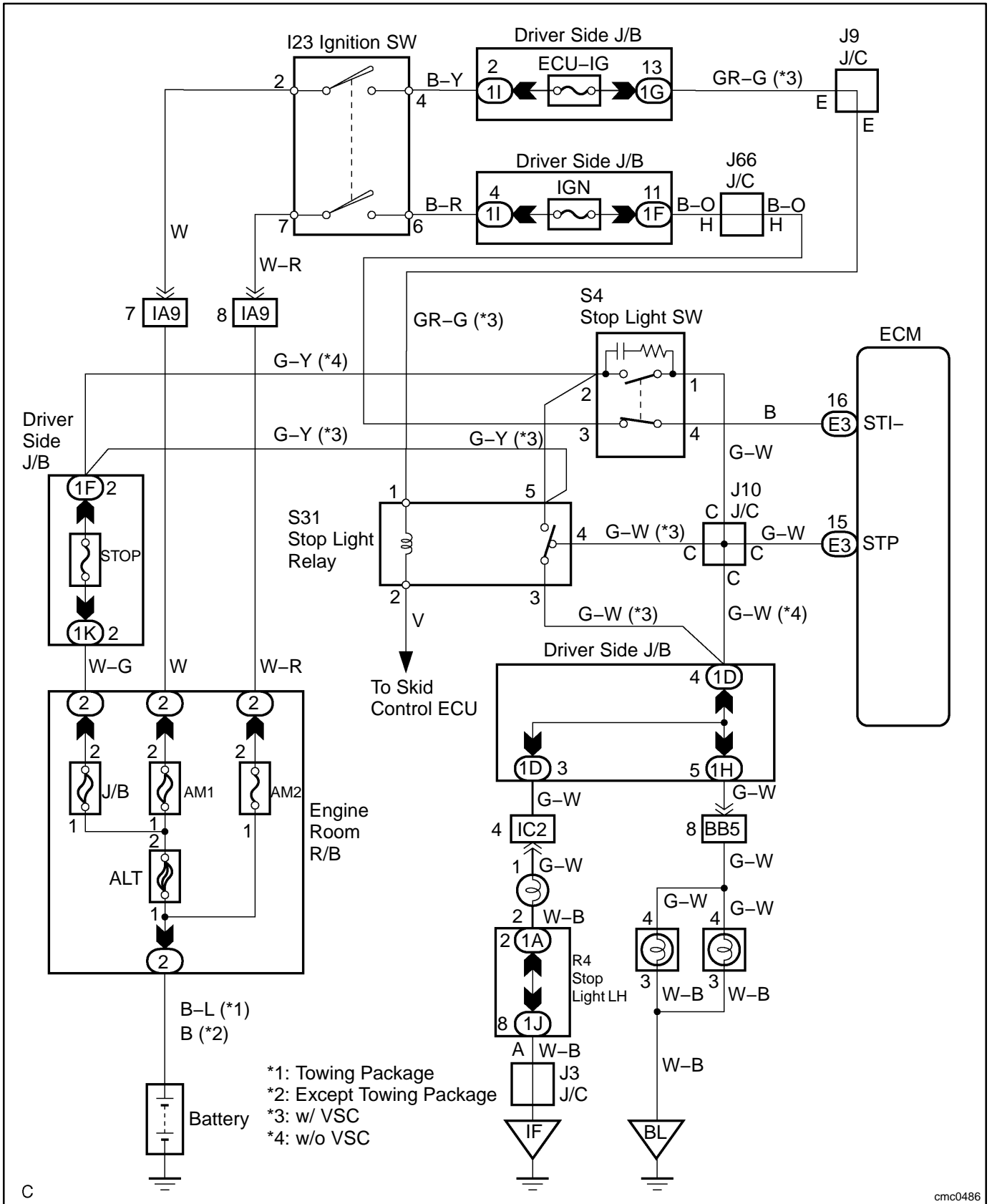
HINT:

Normal condition is as shown in the table.

Signal	Brake pedal released	In transition	Brake pedal depressed
STP	OFF	ON	ON
STI-	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 sec. or more: (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the STI- signal is OFF	<ul style="list-style-type: none"> • Short in stop lamp switch signal circuit • Stop lamp fuse • Stop lamp switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

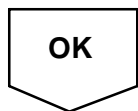
Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check operation of stop light.
----------	---------------------------------------

CHECK:

Check if the stop lights come on and go off normally when the brake pedal is depressed and released.

NG	Check and repair stop light circuit.
-----------	---

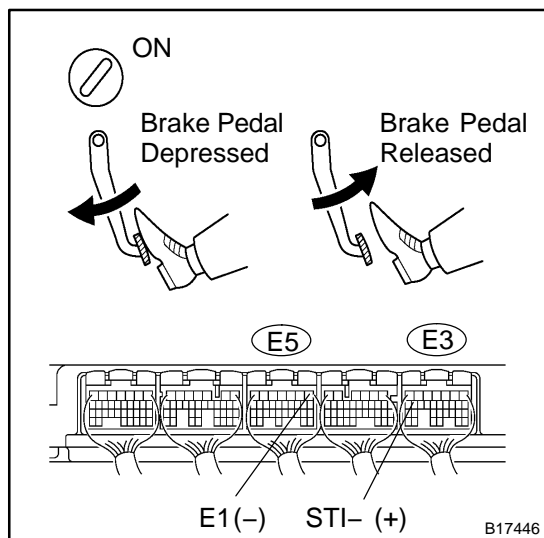


2	Check stop light switch (See page BE-70).
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NG	Replace stop light switch.
-----------	-----------------------------------



3 Check STP signal and STI- voltage.



PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to ON.
- Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STOP LIGHT SW".

CHECK:

Read the signal displayed on the hand-held tester.

OK:

Standard:

Brake Pedal	Specified Condition
Depressed	STP Signal ON
Released	STP Signal OFF

CHECK:

Measure the voltage between the specified terminals of the E3 and E5 ECM connectors.

OK:

Standard:

Tester Connection	Brake Pedal	Specified Condition
STI- (E3-16) - E1 (E5-1)	Depressed	Below 1.5 V
STI- (E3-16) - E1 (E5-1)	Released	7.5 to 14 V

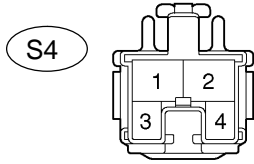
OK

Check for intermittent problems (See page [DI-11](#)).

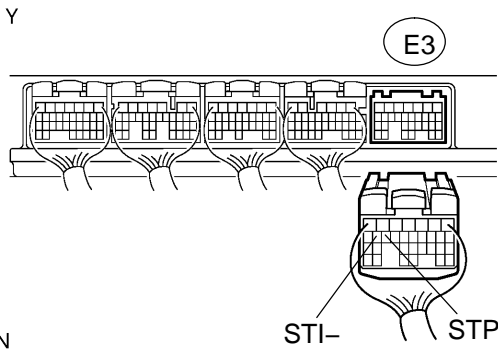
NG

4 Check harness and connector between ECM and stop light switch.

Wire Harness Side:



Stop Light Switch Connector



A23478

PREPARATION:

- (a) Disconnect the S4 stop light switch connector.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
Stop light switch (S4-1) - STP (E3-15)	Below 1 Ω
Stop light switch (S4-4) - STI- (E3-16)	Below 1 Ω
Stop light switch (S4-1) or STP (E3-15) - Body ground	10 kΩ or higher
Stop light switch (S4-4) or STI- (E3-16) - Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

Replace ECM (See page [SF-66](#)).

DTC	P0505	Idle Air Control System
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CIRCUIT DESCRIPTION

The idle speed is controlled by the ETCS (Electronic Throttle Control System).

The ETCS is composed of the throttle motor which operates the throttle valve, and the throttle position sensor, which detects the opening angle of the throttle valve.

The ECM controls the throttle motor to provide the proper throttle valve opening angle to obtain the target idle speed.

DTC No.	DTC Detection Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	<ul style="list-style-type: none"> • ETCS • Air induction system • PCV hose connection • ECM

MONITOR DESCRIPTION

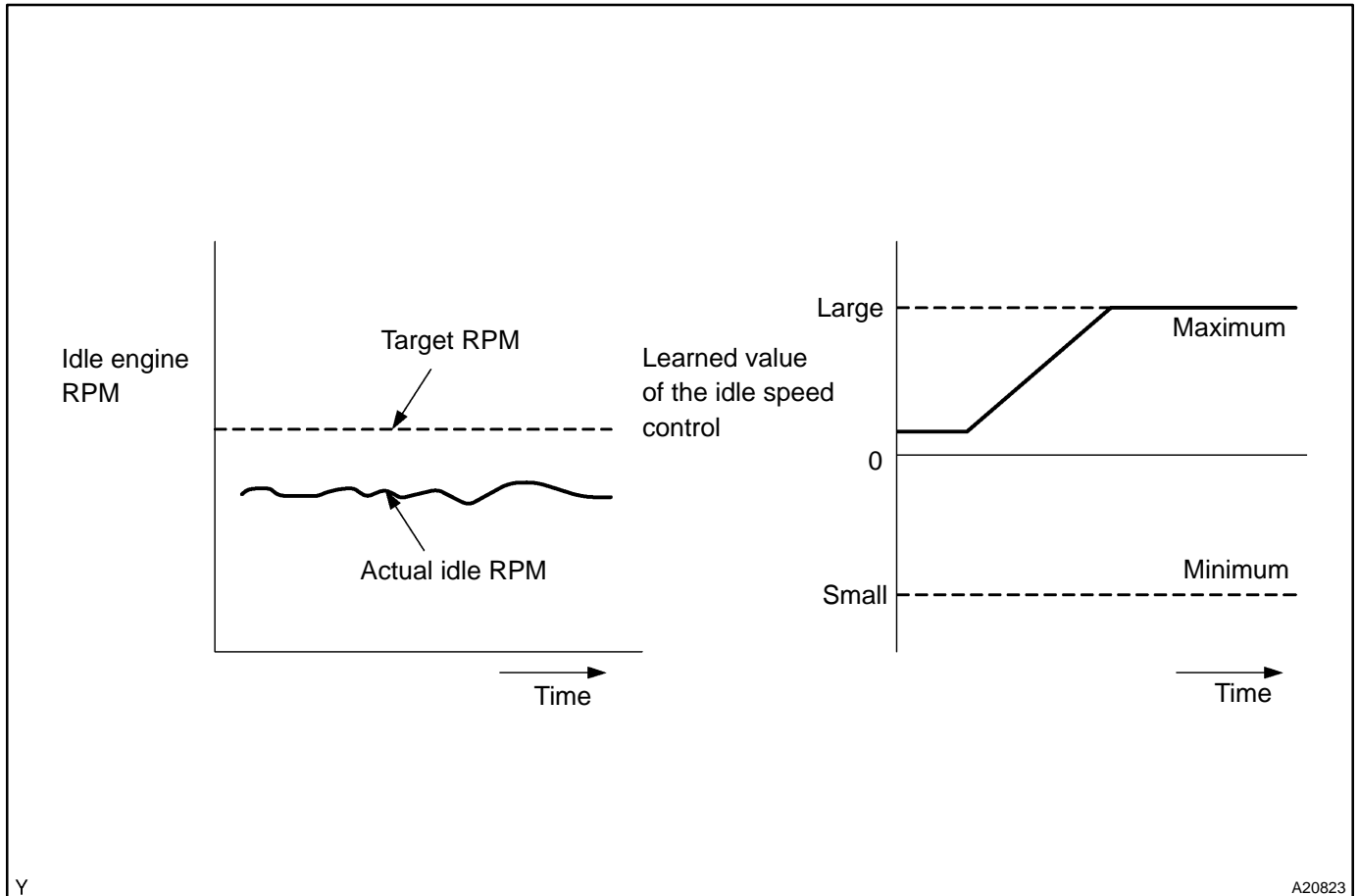
The ECM regulates the idle speed by opening and closing the throttle valve using the ETCS. The ECM concludes that the idle speed control ECM function is malfunctioning if: 1) the actual idle RPM varies more than the specified amount, or 2) a learning value of the idle speed control remains at the maximum or minimum five times or more during a driving cycle. The ECM will turn on the MIL and set a DTC.

Example:

If the actual idle RPM varies from the target idle RPM by more than 100 (*1) rpm five times during a driving cycle, the ECM will turn on the MIL and a DTC is set.

HINT:

*1: RPM threshold varies with engine load.



MONITOR STRATEGY

Related DTCs	P0505	Idle air control malfunction
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Vehicle speed sensor, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	10 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition 1 or 2
1. Frequency that both of the following conditions (a) and (b) are met:	5 times or more
(a) Engine RPM - target engine RPM	Less than -100 rpm or more than 150 rpm
(b) Vehicle condition	Stop after vehicle was driven by 6.25 mph (10 km/h) or more
2. Frequency that both of the following conditions (c) and (d) are met:	Once
(c) Engine RPM - target engine RPM	Less than -100 rpm or more than 150 rpm
(d) Intake air control flow rate learning value	1.3 L/sec. or less, or 8.5 L/sec. or more

INSPECTION PROCEDURE

HINT:

- When the throttle position is slightly opened (the accelerator pedal is slightly depressed) because a floor carpet is overlapped on the accelerator pedal, or if the accelerator pedal is not fully released, etc., DTC P0505 will possibly be detected.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides P0505) being output?
----------	--

PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to ON and push the hand-held tester main switch ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

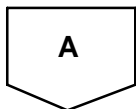
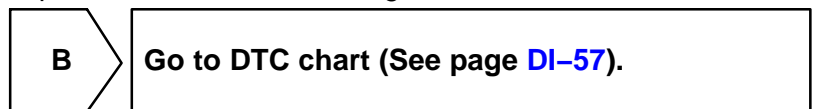
Read the DTC using the hand-held tester.

RESULT:

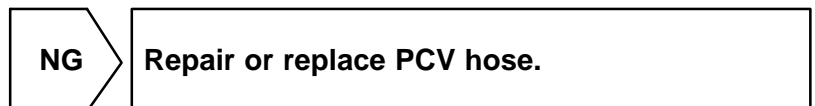
Display (DTC Output)	Proceed to
P0505	A
"P0505" and other DTCs	B

HINT:

If any other codes besides P0505 are output, perform the troubleshooting for those DTCs first.



2	Check connection of PCV hose.
----------	--------------------------------------



3	Check air induction system (See page SF-1).
----------	--

CHECK:

Check for vacuum leaks in air induction system.

OK:

No leakage.

NG	Repair or replace air induction system.
-----------	--

OK

Check electric throttle control system (See page SF-39).

DTC	P050A	Cold Start Idle Air Control System Performance
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DTC	P050B	Cold Start Ignition Timing Performance
------------	--------------	---

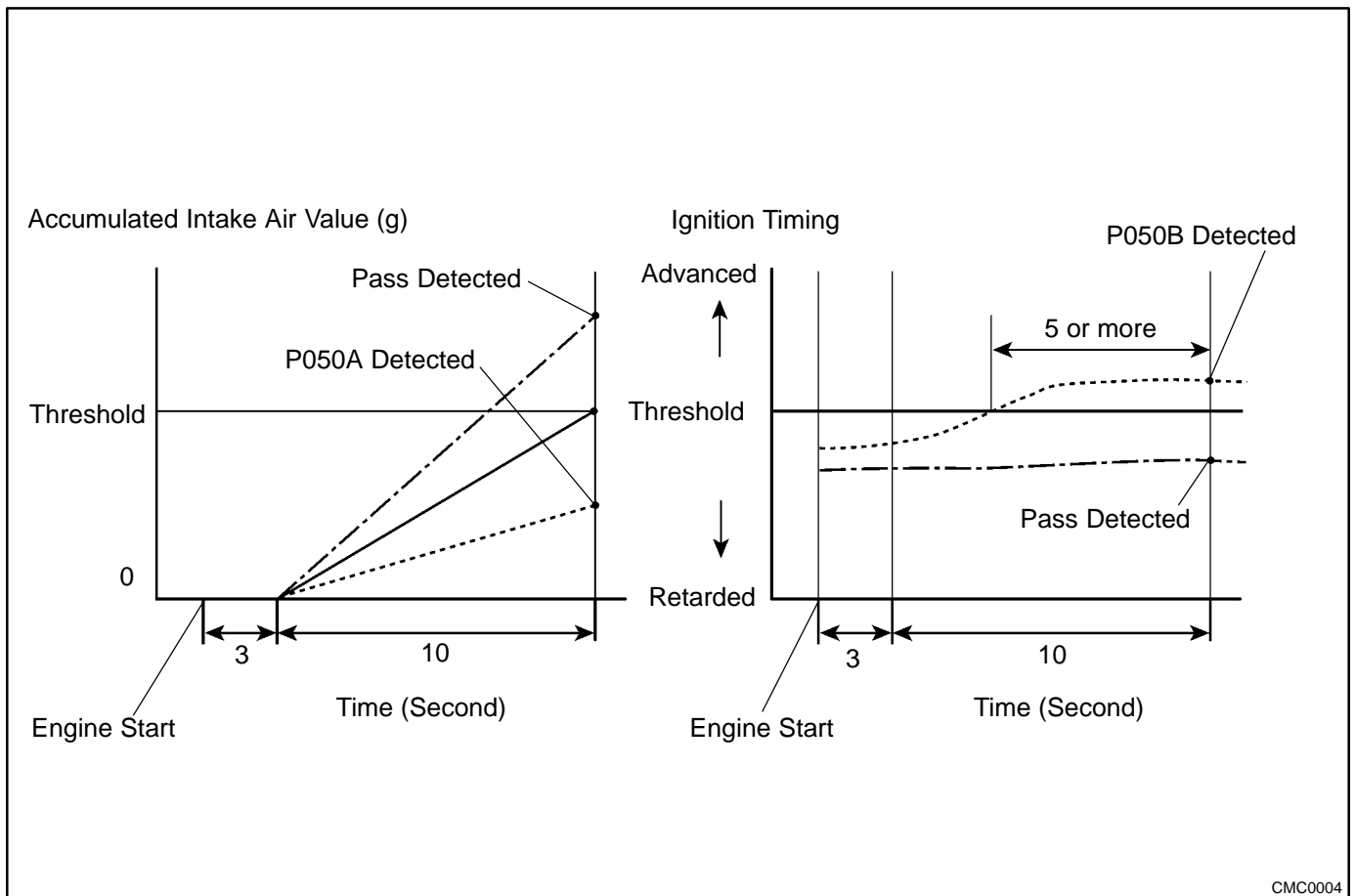
DESCRIPTION

The Electronic Throttle Control System (ETCS) controls the engine idling speed. The ETCS operates the throttle actuator to open and close the throttle valve, and adjusts the intake air amount to achieve the target idling speed.

In addition, the ECM retards the ignition timing and the ETCS increases the intake air amount to quickly increase the catalyst temperature at cold start.

DTC No.	DTC Detection Conditions	Trouble Areas
P050A	Accumulated intake air amount during 10 seconds of idling after cold start, less than threshold (2 trip detection logic)	<ul style="list-style-type: none"> • Throttle body assembly • Mass air flow meter • Air induction system • PCV hose connections • ECM
P050B	Ignition timing retard value insufficient for 5 seconds or more during 10 seconds of P050A monitoring duration at cold start (2 trip detection logic)	<ul style="list-style-type: none"> • Throttle body assembly • Mass air flow meter • Air induction system • PCV hose connections • ECM

MONITOR DESCRIPTION



The ECM monitors the intake air amount during idling and the ignition timing.

When the engine coolant temperature is between -10°C and 50°C (14°F and 122°F), the ECM calculates the idling intake air amount for 10 seconds, beginning 3 seconds after the engine starts.

When the accumulated value is below the threshold, the ECM interprets this as a malfunction in the Idle Speed Control (ISC) system at cold start.

The ECM also monitors the ignition timing at cold start, and judges it to be incorrect when it is advanced to the same value for a warm engine for 5 seconds or more of the 10 second monitoring period.

Example:

P050A is detected when all conditions below are met (2 trip detection logic).

1. The engine coolant temperature is -10°C (14°F) or more when the engine starts.
2. The engine idles for 13 seconds after engine start.
3. The accumulated intake air amount is below the threshold.

If a malfunction is not repaired successfully, the ECM sets the DTC and illuminates the MIL 13 seconds after the engine is next started.

NOTICE:

When the negative battery terminal is disconnected during inspection or repairs, the ISC learning values are cleared. The ISC learning must be performed by warming up the engine and idling for 5 minutes with the engine coolant temperature at 75°C (167°F) or more because DTCs cannot be detected with the ISC learning values cleared.

MONITOR STRATEGY

Related DTCs	P050A	Idle speed control problem at cold
	P050B	Idle ignition timing problem at cold
Required Sensors/Components (Main)	Mass air flow meter	
Required Sensors/Components (Related)	Engine Coolant Temperature (ECT) sensor, Throttle position sensor, Vehicle speed sensor	
Frequency of Operation	Once per driving cycles	
Duration	10 seconds	
MIL Operation	2 driving cycles	
Sequence of Operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
P050A:		
Battery voltage	8 V	-
Time after engine start	3 seconds	-
Starter	OFF	
ECT at engine start	-10°C (14°F)	-
ECT	-10°C (14°F)	50°C (122°F)
Engine idling time	3 seconds	-
Fuel-cut	OFF	
Vehicle speed	-	1.875 mph (3 km/h)
Time after shift position changed	1 second	-
P050B:		
Battery voltage	8 V	-
Time after engine start	3 seconds	-
Starter	OFF	
ECT at engine start	-10°C (14°F)	-
ECT	-10°C (14°F)	50°C (122°F)
Engine idling time	3 seconds	-
Fuel-cut	OFF	
Vehicle speed	-	1.875 mph (3 km/h)

TYPICAL MALFUNCTION THRESHOLDS

P050A:

Accumulated air flow amount (M/T)	Varies with ECT (Example: Less than 42.5 g)
Accumulated air flow amount (A/T)	Varies with ECT (Example: Less than 47.5 g, or less than 42.5 g)

P050B:

Accumulated time when ignition timing retard is cut off	5 seconds or more
---	-------------------

INSPECTION PROCEDURE

HINT:

Read the freeze frame data using the intelligent tester. The freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, the freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Check any other DTCs output (In addition to DTC P050A and/or P050B).
----------	---

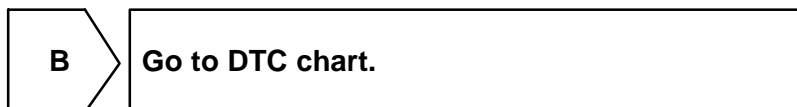
- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Select the following the menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (e) Read the DTCs.

Result:

Display (DTC Output)	Proceed To
P050A and/or P050B	A
P050A and/or P050B and other DTCs	B

HINT:

If any DTCs other than P050A and P050B are output, troubleshoot those DTCs first.



2	Read value using intelligent tester (Fuel trim).
----------	---

HINT:

Calculate the total fuel trim values to check the characteristic deviation of the mass air flow meter.

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / SHORT FT #1 and LONG FT #1.
- (e) Read the values displayed on the tester.
- (f) Add together the SHORT FT #1 and LONG FT #1 values to obtain the total FUEL TRIM.

OK:

Total of the SHORT FT #1 and LONG FT #1 values is between -20 % and 20 %.

OK**Go to step 8.****NG****3****Check PCV hose connections.****OK:****PCV hose is connected correctly and is not damaged.****NG****Go to step 5.****OK****4****Check air induction system.**

(a) Check the air induction system for vacuum leakage.

OK:**No leakage from the air induction system.****OK****Go to step 6.****NG****Go to step 7.****5****Repair or replace PCV hose.****NEXT****Go to step 11.****6****Replace mass air flow meter.****NEXT****Go to step 11.****7****Repair or replace air induction system.****NEXT****Go to step 11.**

8 Check throttle valve.

(a) Check for deposits around the throttle valve.

OK:

No deposits around the throttle valve.

OK

Go to step 9.

NG

Go to step 10.

9 Replace ECM.

NEXT

Go to step 11.

10 Replace throttle body assembly.

NEXT

11 Check whether DTC output recurs (DTC P050A and/or P050B).

NOTICE:

In this operation, the engine must be cold (the same level as the engine coolant temperature recorded in the freeze frame data).

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Clear DTCs (See page DI-42).
- (e) Switch the ECM from normal mode to check mode using the tester (See page DI-43)
- (f) Start the engine to idle for a minute.

OK:

Stable fast idling.

- (g) Read DTCs.

OK:

No DTCs output.

NEXT

END

DTC	P0560	System Voltage
------------	--------------	-----------------------

MONITOR DESCRIPTION

The battery supplies electricity to the ECM even when the ignition switch is OFF. This electricity allows the ECM to store data such as DTC history, freeze frame data, fuel trim values, and other data.

If the battery voltage falls below a minimum level, the ECM will conclude that there is a fault in the power supply circuit. The next time the engine starts, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detecting Condition	Trouble Area
P0560	Open in back up power source circuit	<ul style="list-style-type: none"> • Open in back-up power source circuit • EFI No. 1 fuse • ECM

HINT:

If DTC P0560 present, the ECM will not store another DTC.

MONITOR STRATEGY

Related DTCs	P0560	System voltage malfunction
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (*1)	
Sequence of operation	None	

*1: The DTC is set immediate. The MIL will be illuminated after the engine starts in the next time.

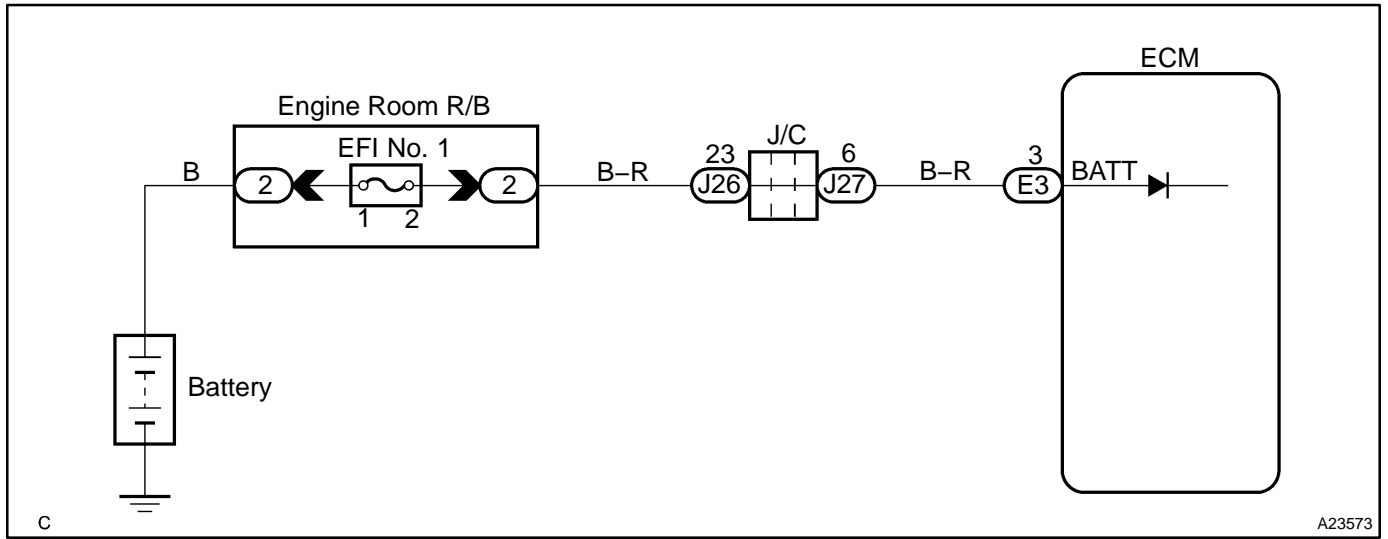
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Stand-by RAM	Initialized	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Battery voltage	Less than 3.5 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check battery voltage.
----------	-------------------------------

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / BATTERY VOLTAGE.

CHECK:

Read the battery voltage on the hand-held tester

RESULT:

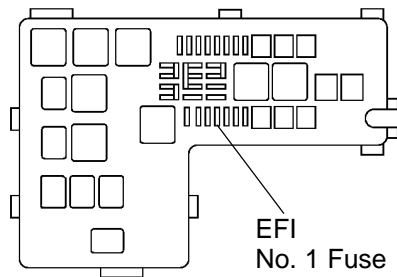
Battery voltage	Proceed to
0 V	A
Except 0 V	B

B → **Go to step 5.**

A

2 Check EFI No. 1 fuse of engine room J/B.

Engine Room J/B:



A23509

PREPARATION:

Remove the EFI No. 1 fuse from the engine room J/B.

CHECK:

Check the resistance of the EFI No. 1 fuse.

OK:

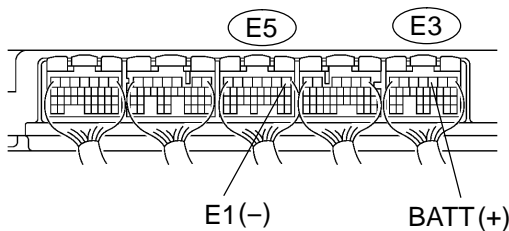
Standard: Below 1 Ω

NG

Check for short in all harness and components connected to EFI No. 1 fuse and replace the fuse.

OK

3 Check voltage between terminal BATT and E1 of ECM connector.



N

B17411

CHECK:

Measure the voltage between terminals of the E5 and E3 ECM connectors.

OK:

Standard:

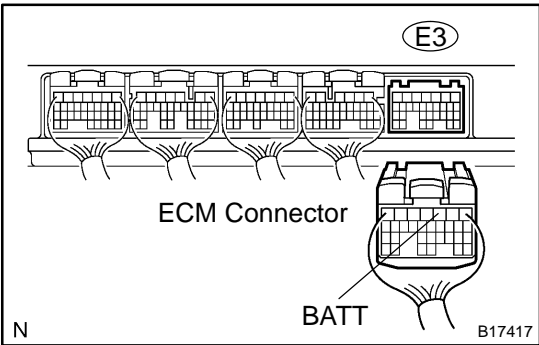
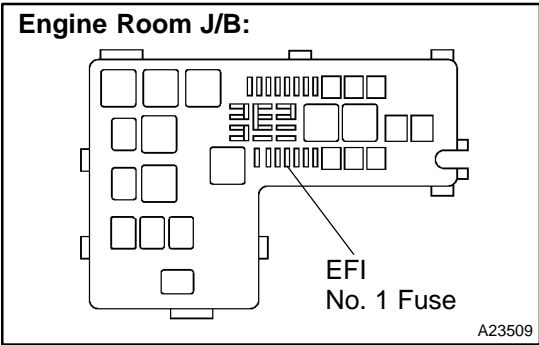
Tester Connection	Specified Condition
BATT (E3-3) - E1 (E5-1)	9 to 14 V

OK

Check for intermittent problems (See page [DI-11](#)).

NG

4 Check for open and short in harness and connector between ECM and EFI No. 1 fuse, EFI No. 1 fuse and battery.



PREPARATION:

- (a) Remove the EFI No. 1 fuse from the engine room J/B.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connector.

OK:

Standard:

Tester Connection	Specified Condition
Engine Room J/B (EFI No. 1 fuse terminal 2) - BATT (E3-3)	Below 1 Ω
Engine Room J/B (EFI No. 1 fuse terminal 2) or BATT (E3-3) - Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

5 Check the battery (See page CH-1).

NG Replace battery.

OK

Check and replace engine room J/B.

DTC	P0604	Internal Control Module Random Access Memory (RAM) Error
DTC	P0606	ECM/PCM Processor
DTC	P0607	Control Module Performance
DTC	P0657	Actuator Supply Voltage Circuit / Open

MONITOR DESCRIPTION

The ECM continuously monitors its internal memory status, internal circuits, and output signals to the throttle actuator. This self-check insures that the ECM is functioning properly. If any malfunction is detected, the ECM will set the appropriate DTC and illuminate the MIL.

The ECM memory status is diagnosed by internal "mirroring" of the main CPU and the sub CPU to detect RAM (Random Access Memory) errors. The two CPUs also perform continuous mutual monitoring.

The ECM sets a DTC if: 1) outputs from the 2 CPUs are different and deviate from the standards, 2) the signals to the throttle actuator deviate from the standards, 3) a malfunction is found in the throttle actuator supply voltage, and 4) any other ECM malfunction is found.

DTC No.	DTC Detecting Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM malfunction	• ECM

MONITOR STRATEGY

Related DTCs	P0604	Random access memory (RAM) error
	P0606	CPU malfunction
	P0607	ECM range check
	P0657	ETCS power supply
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	Within 1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI-18
The typical enabling condition is not available	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0604:	
RAM	RAM check fail
P0606:	
Either of the following conditions is met	Condition 1 or 2
1. Difference between TP of main CPU and TP of sub CPU	0.3 V or more
2. Difference between APP of main CPU and APP of sub CPU	0.3 V or more
P0607:	
Either of the following conditions is met	Condition 1 or 2
1. All of the following conditions are met	Condition (a), (b) and (c)
(a) CPU reset	1 time or more
(b) Difference between TP and APP learned	0.4 V or more
(c) Electronic throttle actuator	OFF
2. CPU reset	2 times or more
P0657:	
ECTS power supply when ignition switch OFF to ON	7 V or more

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace ECM (See page [SF-66](#)).

DTC	P0617	Starter Relay Circuit High
------------	--------------	-----------------------------------

MONITOR DESCRIPTION

While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. If the vehicle is being driven and the ECM detects the starter control signal (STA), the ECM concludes that the starter control circuit is malfunctioning. The ECM will turn on the MIL and a DTC is set.

DTC No.	DTC Detection Condition	Trouble Area
P0617	When all conditions (a), (b) and (c) are satisfied for 20 seconds with battery (+B) voltage 10.5 V or more (a) Vehicle speed \geq 12.43 mph (20 km/h) (b) Engine revolution \geq 1,000 rpm (c) STA signal ON	<ul style="list-style-type: none"> • Park/neutral position switch • Starter relay circuit • Ignition switch • ECM

MONITOR STRATEGY

Related DTCs	P0617	Starter signal error
Required sensors/components	Main sensors/components	Starter signal
	Related sensors/components	Vehicle speed sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	20 sec.	
MIL operation	Immediate	
Sequence of operation	None	

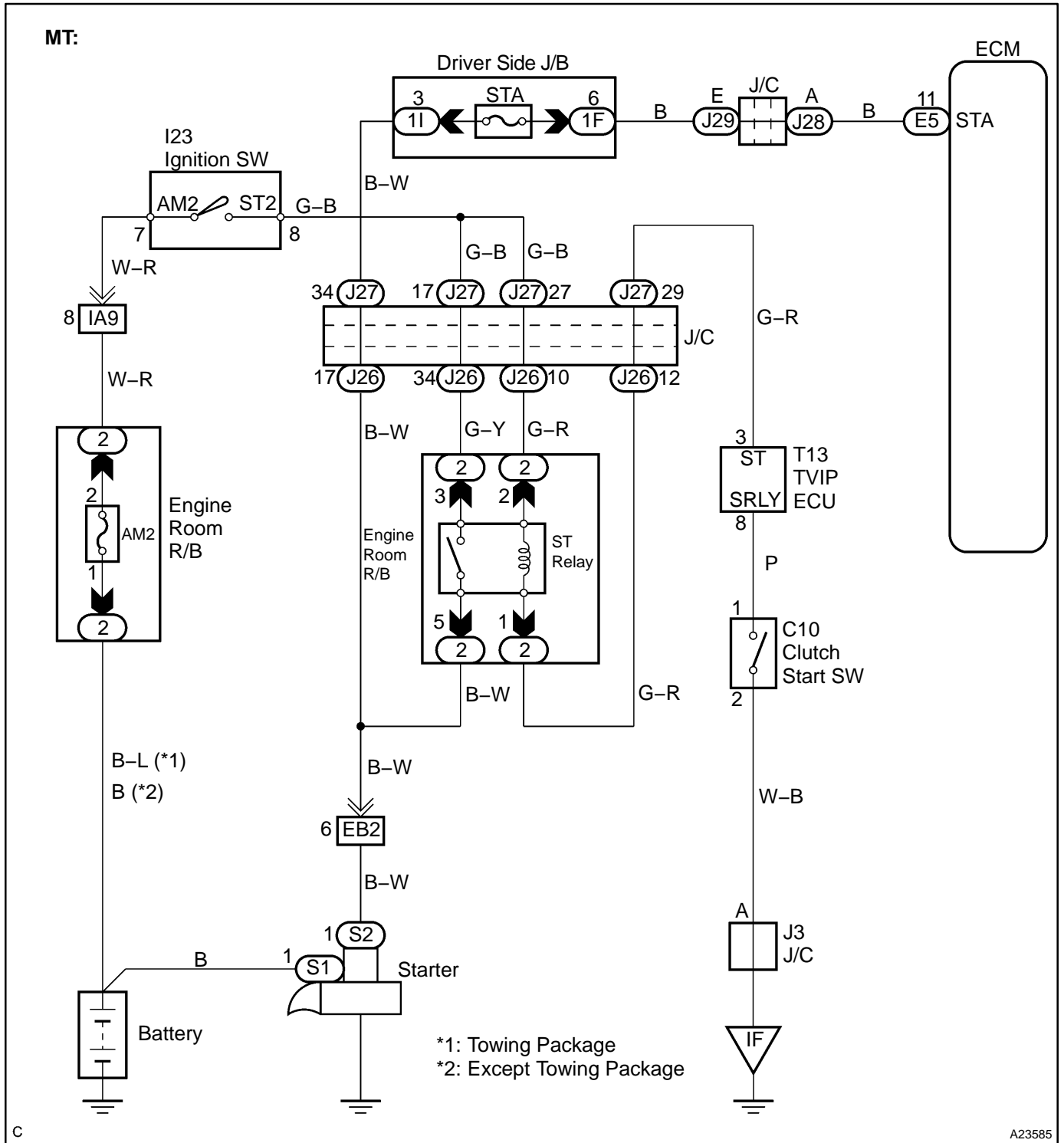
TYPICAL ENABLING CONDITIONS

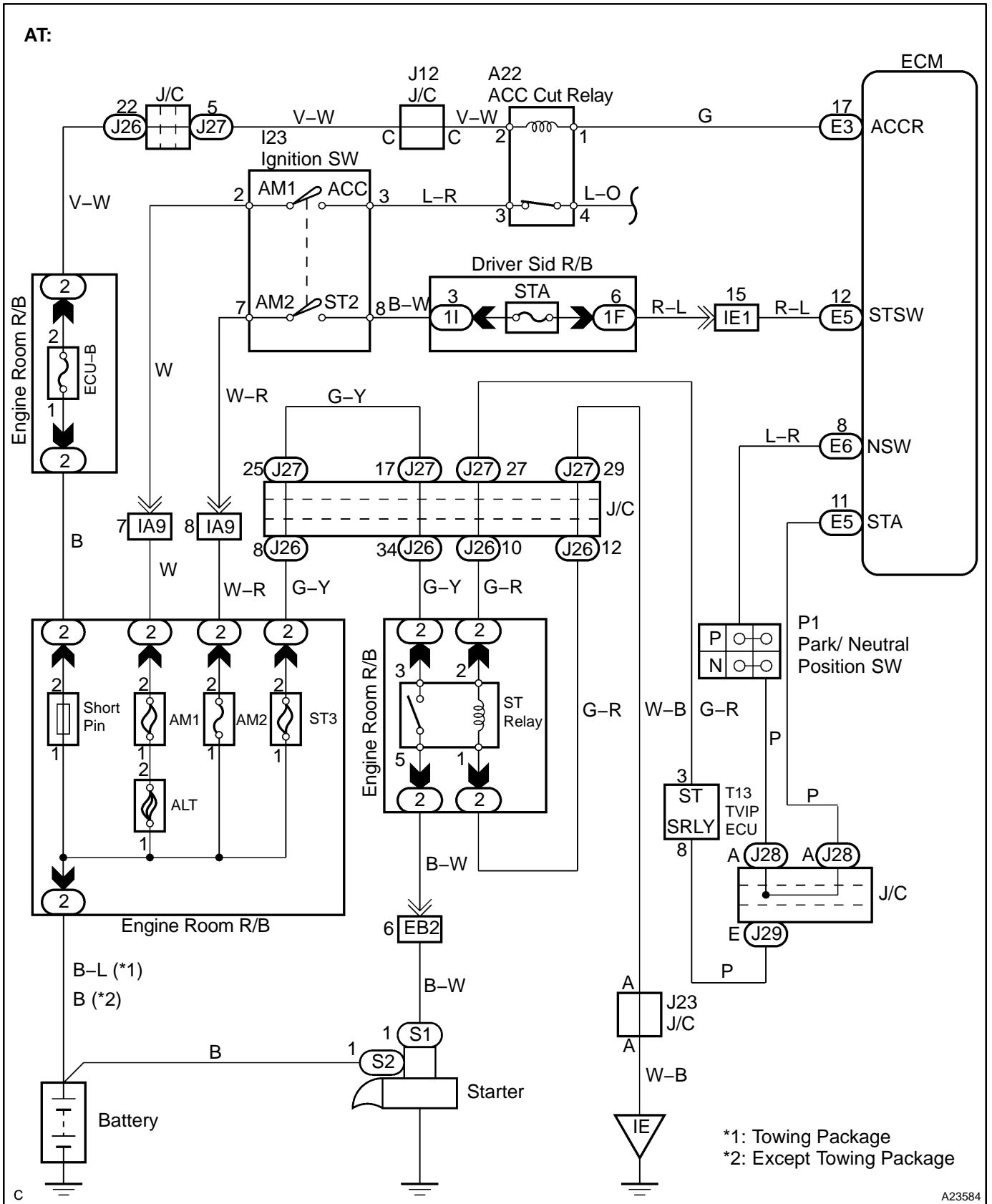
Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Battery voltage	10.5 V	–
Vehicle speed	12.43 mph (20 km/h)	–
Engine RPM	1,000 rpm	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Starter signal	ON (at "more than 12.43 mph (20 km/h) and more than 1,000 rpm")

WIRING DIAGRAM





INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and check STA signal.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON, and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand-held tester while the starter operates.

OK:

Standard:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK	Go to step 5.
-----------	----------------------

NG

2	Check park/neutral position switch (See page DI-993).
----------	--

NG	Replace park/neutral position switch. Go to step 4 after the replacement.
-----------	--

OK

3	Check ignition switch (See page BE-37).
----------	--

NG	Replace ignition switch. Go the step 5 after the replacement.
-----------	--

OK

4	Connect hand-held tester, and check STA signal.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON, and push the hand-held tester main switch ON.
- (c) On the hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand-held tester while the starter operates.

OK:**Standard:**

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

NG

Repair or replace harness or connector.

OK

5	Check DTC reoccur
----------	--------------------------

PREPARATION:

- (a) Connect the hand-held tester.
- (b) Turn the ignition switch to ON and hand-held tester main switch ON.
- (c) Clear DTC (See page [DI-42](#)).
- (d) Drive the vehicle more than 25 mph (40 km/h) for 20 seconds or more.

CHECK:

Check DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

A

Replace ECM (See page [SF-66](#)).

B

**Check for intermittent problems
(See page [DI-11](#)).**

DTC	P0630	VIN not Programmed or Mismatch ECM/PCM
------------	--------------	---

CIRCUIT DESCRIPTION

DTC P0630 is set when the Vehicle Identification Number (VIN) is not stored in the Engine Control Module (ECM) or the input VIN is not accurate. Input the VIN with the hand-held tester.

DTC No.	DTC Detecting Condition	Trouble Area
P0630	<ul style="list-style-type: none"> • VIN is not stored in ECM. • Input VIN in ECM is not accurate. 	ECM

MONITOR STRATEGY

Related DTCs	P0630	VIN not programmed
Required sensors/components	Main sensors/components	ECM
	Related sensors/components	-
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
VIN code	Not programmed

COMPONENT OPERATING RANGE

Parameter	Standard Value
VIN code	Programmed

INSPECTION PROCEDURE

1	Read current DTC.
----------	--------------------------

NOTICE:

If P0630 is present, the VIN must be input to the ECM using the hand-held tester. However, all DTCs are cleared automatically by the tester when inputting the VIN. If DTCs other than P0630 are present, check them first.

NEXT

2	Input VIN with hand-held tester (See page DI-14).
----------	--

NEXT

END

DTC	P2102	Throttle Actuator Control Motor Circuit Low
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DTC	P2103	Throttle Actuator Control Motor Circuit High
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CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM. It opens and closes the throttle valve.

The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM. This feedback allows the ECM to control the throttle motor and monitor the throttle opening angle as the ECM responds to driver inputs.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2102	Conditions (a) and (b) continue for 2.0 seconds: (1 trip detection logic) (a) Throttle control motor output duty 80 % or more (b) Throttle control motor current less than 0.5 A or less	<ul style="list-style-type: none"> • Open in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM
P2103	Either of the following condition is met. (1 trip detection logic) (a) Hybrid IC diagnosis signal fail (b) Hybrid IC current limiter port fail	<ul style="list-style-type: none"> • Short in throttle control motor and sensor circuit • Throttle control motor and sensor • Throttle valve • Throttle body • ECM

MONITOR DESCRIPTION

The ECM monitors the current through the electronic throttle motor and detects malfunctions or open circuit in the throttle motor based on the voltage of the current. When the current deviates from the standard, the ECM concludes that there is a fault in the throttle motor.

Or, if the throttle valve is not functioning properly (for example, stuck ON), the ECM concludes that there is a fault, turns on the MIL and sets a DTC is set.

Example:

When the current is more than 10 A. Or the current is less than 0.5 A when the motor driving duty ratio is exceeding 80%. The ECM concludes that the current is out of range, turns on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2102	Throttle actuator control motor current (Low current)
	P2103	Throttle actuator control motor current (High current)
Required sensors/components	Throttle actuator motor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

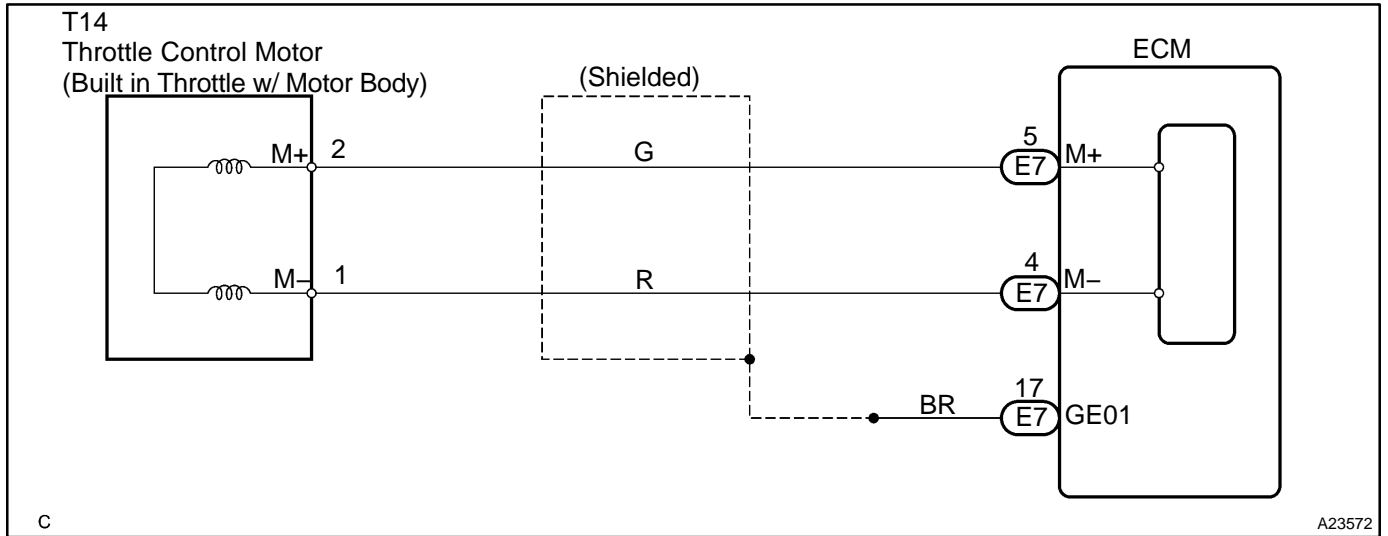
Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
P2102:		
Throttle motor	ON	
Duty-cycle ratio to open throttle actuator	80%	–
Throttle actuator power supply	8 V	–
Current motor current – Motor current at 0.016 sec. before	–	0.2 A
P2103:		
Throttle motor	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Throttle actuator power supply	8 V	–
2. Throttle actuator power	ON	
Battery voltage	8 V	–
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2102:	
Throttle motor current	Less than 0.5 A (when motor drive duty 80% or more)
P2103:	
Either of the following conditions is met:	Condition 1 or 2
1. Hybrid IC diagnosis signal	Fail
2. Hybrid IC current limiter port	Fail

WIRING DIAGRAM

Refer to DTC P0120 on page [DI-123](#).



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check throttle control motor.
----------	--------------------------------------

Component Side:
Throttle Control Motor and Sensor

The diagram shows the component side of the throttle control motor and sensor connector. It has six terminals numbered 1 to 6 from right to left. Terminals 2 and 1 are labeled M+ and M- respectively. The component is identified as T14.

PREPARATION:

Disconnect the throttle control motor and sensor connector.

CHECK:

Measure the resistance between terminals of the throttle control motor.

OK:

Standard:

Tester Connection	Specified Condition
M+ (T14-2) - M- (T14-1)	0.3 to 100 Ω (20°C (68°F))

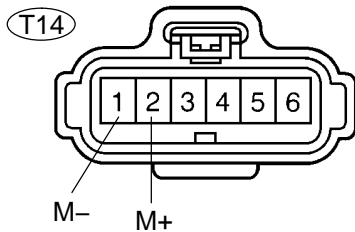
NG → Replace throttle body (See page [SF-40](#)).

OK

2 Check for open and short in harness and connector between throttle control motor and ECM.

Wire Harness Side:

Throttle Control Motor and Sensor



A21022

PREPARATION:

- Disconnect the T14 throttle control motor and sensor connector.
- Disconnect the E7 ECM connector.

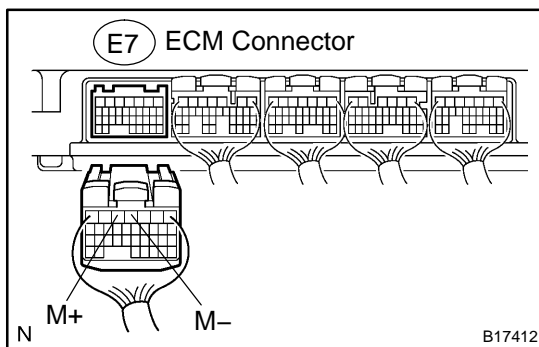
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
M+ (T14-2) - M+ (E7-5)	Below 1 Ω
M- (T14-1) - M- (E7-4)	Below 1 Ω
M+ (T14-2) or M+ (E7-5) - Body ground	10 k Ω or higher
M- (T14-1) or M- (E7-4) - Body ground	10 k Ω or higher



B17412

NG

Repair or replace harness or connector.

OK

3 Visually check throttle valve.

CHECK:

Check the area between the throttle valve and the housing for foreign objects. Also, check if the valve can open and close smoothly.

OK:

The throttle valve is not contaminated by foreign objects and can move smoothly.

NG

Remove foreign object and clean throttle body.

OK

Replace ECM (See page [SF-66](#)).

DTC	P2111	Throttle Actuator Control System -Stuck Open
------------	--------------	---

DTC	P2112	Throttle Actuator Control System -Stuck Closed
------------	--------------	---

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM. It opens and closes the throttle valve using gears. The opening angle of the throttle valve is detected by the throttle position sensor, which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM to control the throttle motor and set the throttle valve angle in response to driver input.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	Throttle motor locked during ECM order to close. (1 trip detection logic)	<ul style="list-style-type: none"> • Throttle control motor and sensor circuit • Throttle control motor and sensor
P2112	Throttle motor locked during ECM order to open. (1 trip detection logic)	<ul style="list-style-type: none"> • Throttle body • Throttle valve

MONITOR DESCRIPTION

The ECM concludes that there is a malfunction of the ETCS (Electronic Throttle Control System) when the throttle valve remains at a fixed angle despite high drive current from the ECM. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2111	Throttle motor actuator lock (Open)
	P2112	Throttle motor actuator lock (Closed)
Required sensors/components	Main sensors/components	Throttle actuator motor
	Related sensors/components	Throttle position sensor
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
P2111:		
System guard*	ON	
Throttle actuator current	2 A	–
Throttle actuator duty to close side	80%	–
P2112:		
System guard*	ON	
Throttle actuator current	2 A	–
Throttle actuator duty to open side	80%	–
All:		
*System guard is ON when the following conditions are met:	–	
Throttle actuator	ON	
Throttle actuator duty calculation	Executing	
Throttle position sensor	Fail determined	
Throttle actuator current–cut operation	Not executing	
Throttle actuator power supply	4 V	–
Throttle actuator	Fail determined	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
TP sensor voltage change	No change

WIRING DIAGRAM

Refer to DTC P0120 on page [DI-123](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check any other DTC output (in addition to DTC P2111 or P2112).
----------	--

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

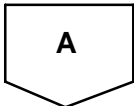
- (a) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2111 and/or P2112	A
P2111 and/or P2112 and other DTCs	B

HINT:

If any DTCs other than P2111 and/or P2112 are output, troubleshoot those DTCs first.



2	Visually check throttle valve.
----------	---------------------------------------

PREPARATION:

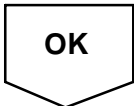
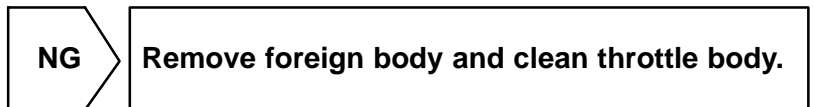
Remove the air cleaner assy.

CHECK:

Check whether or not a foreign body is caught between the throttle valve and housing. Also, check if the valve can open and close smoothly.

OK:

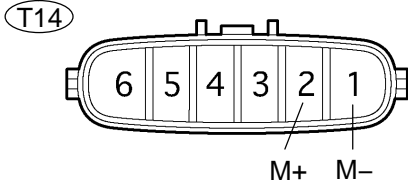
The throttle valve is not contaminated by foreign objects and can move smoothly.



3 Check throttle control motor.

Component Side:

Throttle Control Motor and Sensor



A21034

PREPARATION:

Disconnect the throttle control motor and sensor connector.

CHECK:

Measure the resistance between terminals of the throttle control motor.

OK:

Standard:

Tester Connection	Specified Condition
M+ (T14-2) - M- (T14-1)	0.3 to 100 Ω (20°C (68°F))

NG

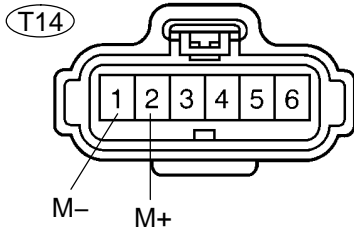
Replace throttle body (See page SF-40).

OK

4 Check for open and short in harness and connector between ECM and throttle control motor.

Wire Harness Side:

Throttle Control Motor and Sensor



A21022

PREPARATION:

- (a) Disconnect the T14 throttle control motor and sensor connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

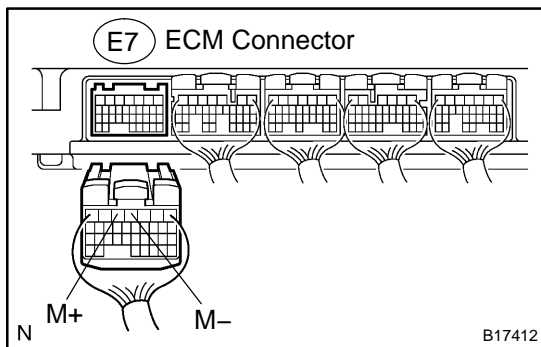
Tester Connection	Specified Condition
M+ (T14-2) - M+ (E7-5)	Below 1 Ω
M- (T14-1) - M- (E7-4)	Below 1 Ω
M+ (T14-2) or M+ (E7-5) - Body ground	10 kΩ or higher
M- (T14-1) or M- (E7-4) - Body ground	10 kΩ or higher

NG

Repair or replace harness or connector.

OK

Check for intermittent problems (See page DI-11).



B17412

DTC	P2118	Throttle Actuator Control Motor Current Range/Performance
------------	--------------	--

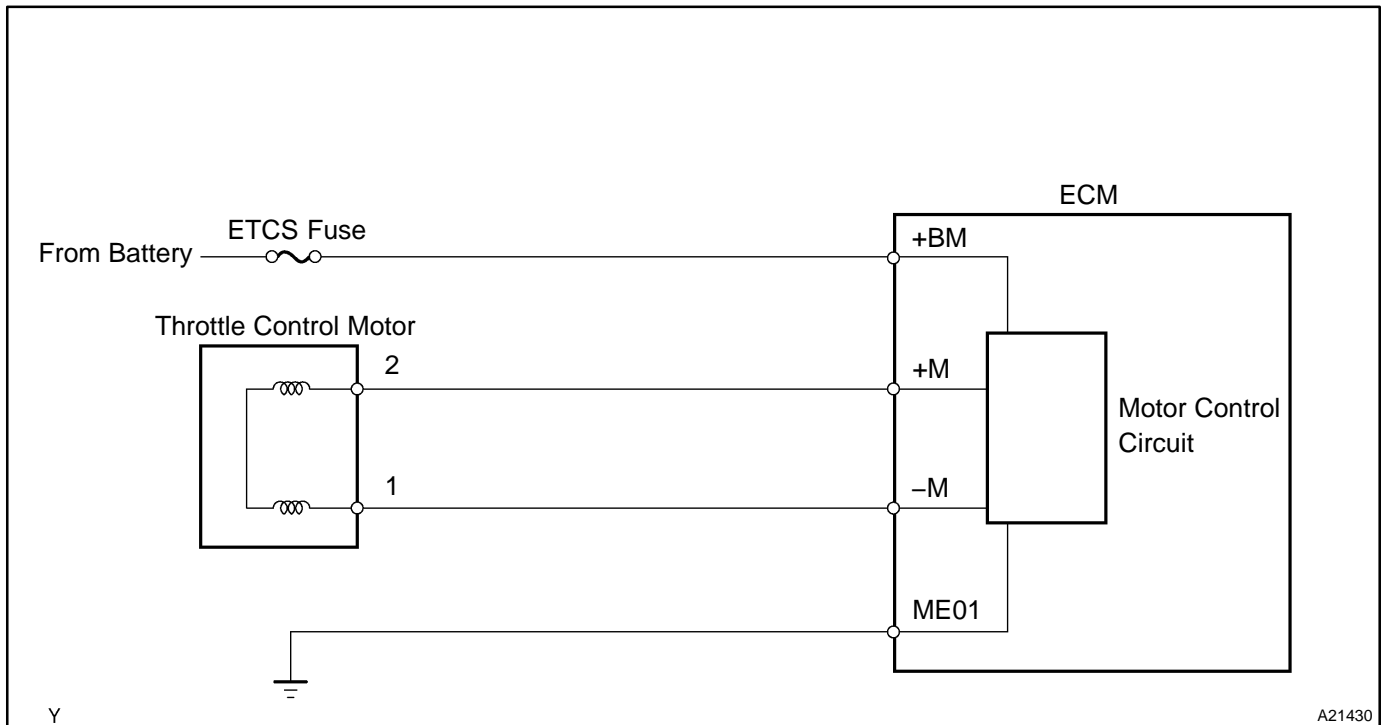
CIRCUIT DESCRIPTION

The Electronic Throttle Control System (ETCS) has a dedicated power supply circuit. The voltage (+BM) is monitored and when the voltage is low (less than 4V), the ECM concludes that the ETCS has a fault and current to the throttle control motor is cut.

When the voltage becomes unstable, the ETCS itself becomes unstable. For this reason, when the voltage is low, the current to the motor is cut. If repairs are made and the system has returned to normal, turn the ignition switch OFF. The ECM then allows current to flow to the motor and the motor can be restarted.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.



DTC No.	DTC Detection Condition	Trouble Area
P2118	Open in ETCS power source circuit (+BM)	<ul style="list-style-type: none"> • Open in ETCS power source circuit • ETCS fuse • ECM

MONITOR DESCRIPTION

The ECM monitors the battery supply voltage applied to the electronic throttle motor +BM. When the power supply voltage drops below the threshold, the ECM concludes that the power supply has an open circuit. The MIL is turned on and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2118	Throttle actuator motor power supply line range check (Low voltage)
Required sensors/components	Throttle actuator motor	
Frequency of operation	Continuous	
Duration	0.8 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Actuator power	ON	
Battery voltage	8 V	–

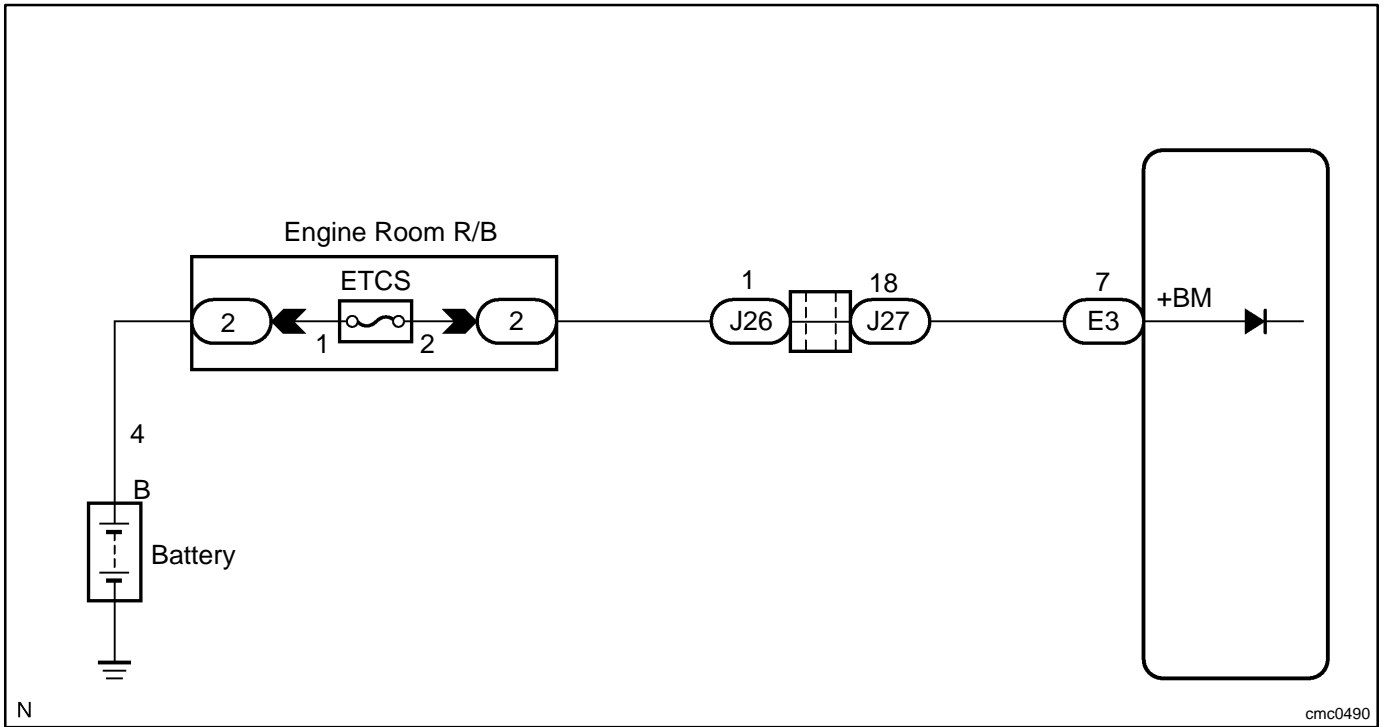
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Throttle actuator motor power supply voltage	Less than 4 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle actuator motor power supply voltage	9 to 14 V

WIRING DIAGRAM



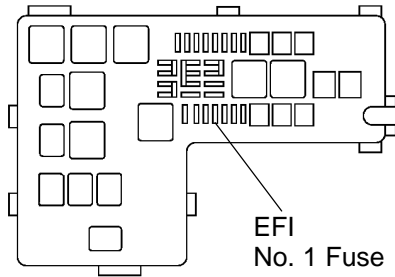
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Check ETCS fuse.

Engine Room J/B:



A23509

PREPARATION:

Remove the ETCS fuse from the engine room J/B.

CHECK:

Check the resistance of the ETCS fuse.

OK:

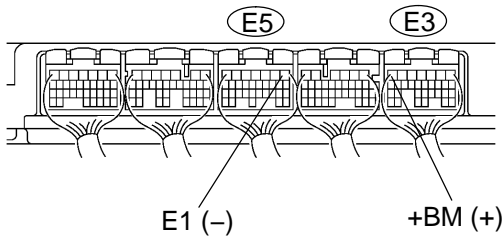
Below 1 Ω

NG

Check for short in all harness and components connected to ETCS fuse.

OK

2 Check voltage between terminal +BM and E1 of ECM connector.



N

B17411

CHECK:

Measure the voltage between the specified terminals of the E5 and E3 ECM connector.

OK:

Standard:

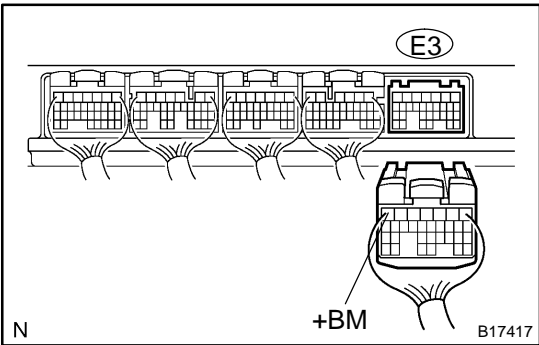
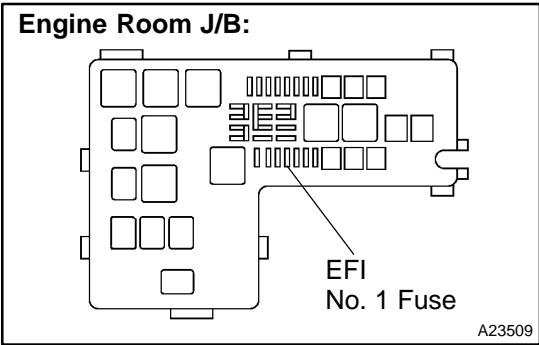
Tester Connection	Specified Condition
+BM (E3-7) - E1 (E5-1)	9 to 14 V

OK

Check for intermittent problems (See page [IN-30](#)).

NG

3 Check for open or short in harness or connector between battery and ETCS fuse, ETCS fuse and ECM.



PREPARATION:

- (a) Remove the ETCS fuse from the engine room J/B.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connector.

OK:

Standard:

Tester Connection	Specified Condition
Engine Room J/B (ETCS fuse terminal 2) - +BM (E3-7)	Below 1 Ω
Engine Room J/B (ETCS fuse terminal 2) or +BM (E3-7) - Body ground	10 kΩ or higher

PREPARATION:

Disconnect the battery cable from the battery positive terminal.

CHECK:

Measure the resistance between the battery cable and engine room J/B.

OK:

Standard:

Tester Connection	Specified Condition
Engine Room J/B (ETCS fuse terminal 1) - Battery positive cable	Below 1 Ω
Engine Room J/B (ETCS fuse terminal 1) or Battery positive cable - Body ground	10 kΩ or higher

NG **Repair or replace harness or connector.**

OK

Check engine room J/B.

DTC	P2119	Throttle Actuator Control Throttle Body Range/Performance
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CIRCUIT DESCRIPTION

The Electric Throttle Control System (ETCS) is composed of a throttle motor that operates the throttle valve, a throttle position sensor that detects the opening angle of the throttle valve, an accelerator pedal position sensor that detects the accelerator pedal position, and the ECM that controls the ETCS system.

The ECM operates the throttle motor to position the throttle valve for proper response to driver inputs. The throttle position sensor, mounted on the throttle body, detects the opening angle of the throttle valve and provides this signal to the ECM so that the ECM can regulate the throttle motor.

DTC No.	DTC Detection Condition	Trouble Area
P2119	Throttle opening angle continues to vary greatly from target throttle opening angle (1 trip detection logic)	<ul style="list-style-type: none"> • Electric throttle control system • Throttle body

MONITOR DESCRIPTION

The ECM determines the "actual" throttle angle based on the throttle position sensor signal. The "actual" throttle position is compared to the "target" throttle position commanded by the ECM. If the difference of these two values exceeds a specified limit, the ECM interprets this as a fault in the ETCS (Electronic Throttle Control System). The ECM turns on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2119	Electronic throttle control system failure
Required sensors/components	Main sensors	Throttle actuator motor
	Related sensors	Throttle position sensor
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI-18	
System guard*	ON	
*System guard is ON when the following conditions are met:	-	
Throttle actuator	ON	
Throttle actuator duty calculation	Executing	
Throttle position sensor	Fail determined	
Throttle actuator current-cut	Not executing	
Throttle actuator power supply	4 V	-
Throttle actuator	Fail determined	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition (a) or (b)
(a) Commanded closed throttle position - current throttle position	0.3 V or more
(b) Commanded open throttle position - current throttle position	0.3 V or more

COMPONENT OPERATING RANGE

Standard Value
Commanded throttle position and current throttle position are nearly the same

WIRING DIAGRAM

Refer to DTC P2102 and P2103 on page [DI-283](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Are there any other codes (besides DTC P2119) being output?

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTC using the hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
P2119	A
"P2119" and other DTC	B

HINT:

If any other codes besides P2119 are output, perform the troubleshooting for those DTCs first.

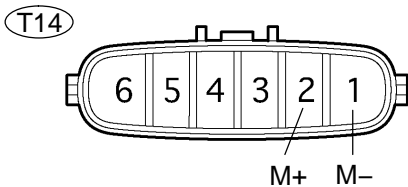
B Go to DTC chart (See page [DI-57](#)).

A

2 Check throttle control motor.

Component Side:

Throttle Control Motor and Sensor



A21034

PREPARATION:

Disconnect the throttle control motor and sensor connector.

CHECK:

Measure the resistance between terminals of the throttle control motor.

OK:

Standard:

Tester Connection	Specified Condition
M+ (T14-2) - M- (T14-1)	0.3 to 100 Ω (20°C (68°F))

NG Replace throttle body (See page [SF-40](#)).

OK

3	Replace ECM and clear DTC (Check if DTC outputs reoccur).
----------	--

PREPARATION:

- (a) Replace ECM.
- (b) Clear the DTC (See page [DI-42](#)).
- (c) Start and warm up the engine.
- (d) Run the engine at idle for 15 seconds or more.

CHECK:

Read the DTC using the hand-held tester (See page [DI-42](#)).

OK:

No DTC output.

OK

System is normal.

NG

Replace throttle body.

DTC	P2120	Throttle/Pedal Position Sensor/Switch "D" Circuit
DTC	P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input
DTC	P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input
DTC	P2125	Throttle/Pedal Position Sensor/Switch "E" Circuit
DTC	P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input
DTC	P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input
DTC	P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation

HINT:

This is the repair procedure for the "accelerator pedal position sensor".

CIRCUIT DESCRIPTION

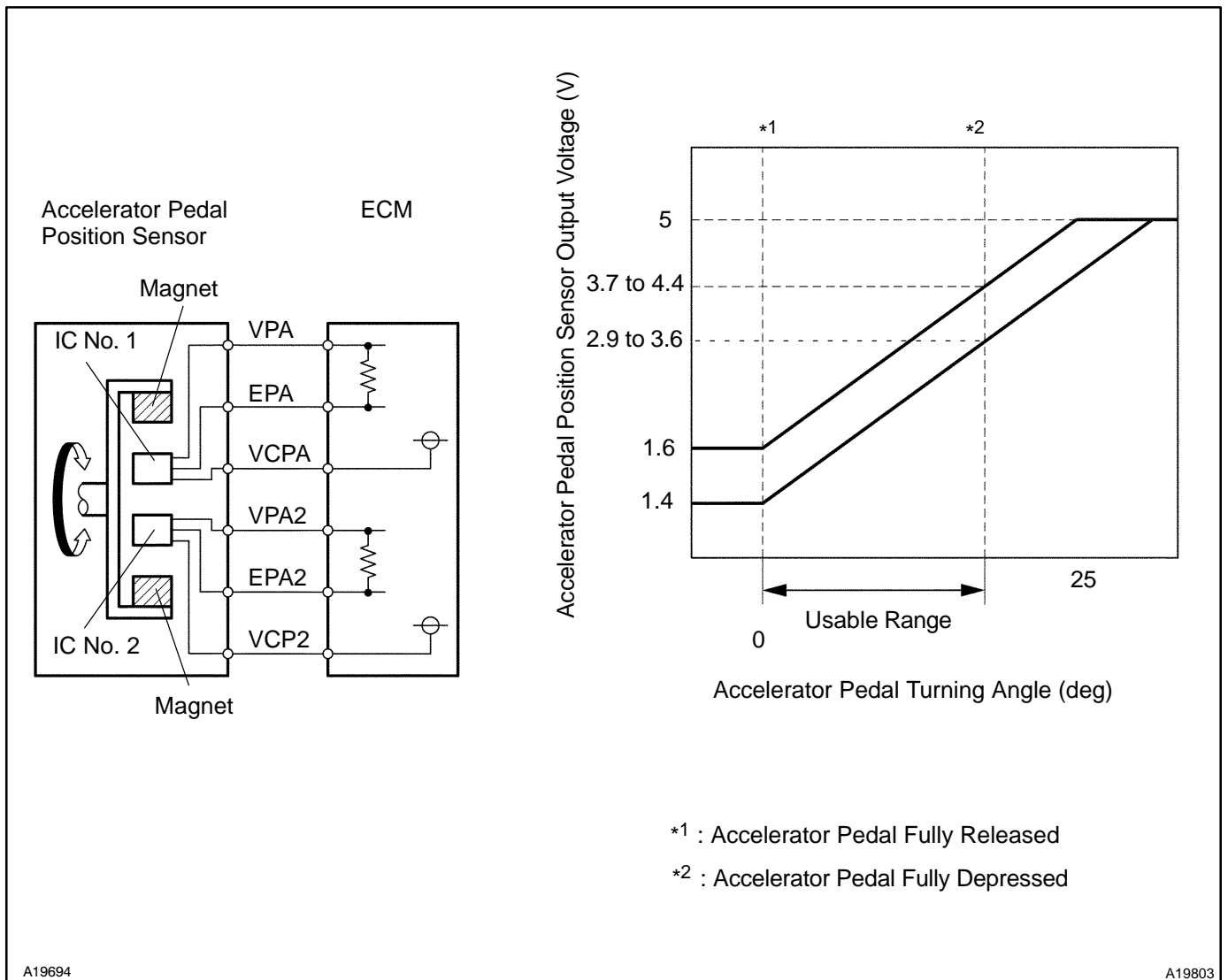
HINT:

- This electrical throttle control system does not use a throttle cable.
- This accelerator pedal position sensor is a non-contact type.

The accelerator pedal position sensor is mounted in the accelerator pedal to detect the angle of the accelerator pedal. This sensor is electronically controlled and uses Hall-effect elements.

In the accelerator pedal position sensor, the voltage applied to terminals VPA and VPA2 of the ECM changes between 0 V and 5 V in proportion to the angle of the accelerator pedal. The VPA is a signal to indicate the actual accelerator pedal angle and is used for the engine control. VPA2 is used to detect malfunctions of the sensor itself.

The ECM judges the current angle of the accelerator pedal from these signals input from terminals VPA and VPA2, and the ECM controls the throttle motor based on these signals.



DIAGNOSTICS – ENGINE (1GR-FE)

DTC No.	DTC Detection Condition (Open or short in accelerator pedal position sensor circuit)	Main trouble Area
P2120	Condition (a) continues for 0.5 seconds or more: (a) $VPA \leq 0.4\text{ V}$ or $VPA \geq 4.8\text{ V}$	<ul style="list-style-type: none"> Accelerator pedal position sensor ECM
P2122	Condition (a) and (b) continues for 0.5 seconds or more: (a) $VPA \leq 0.4\text{ V}$ (b) $VPA2 \geq 0.04\text{ V}$	<ul style="list-style-type: none"> Accelerator pedal position sensor VCPA circuit open VPA circuit open or ground short ECM
P2123	Condition (a) continues for 2.0 seconds or more: (a) $VPA \geq 4.8\text{ V}$	<ul style="list-style-type: none"> Accelerator pedal position sensor EPA circuit open ECM
P2125	Condition (a) continues for 0.5 seconds or more: (a) $VPA2 \leq 1.2\text{ V}$ or $VPA2 \geq 4.8\text{ V}$ and $0.4\text{ V} \leq VPA \leq 3.45\text{ V}$	<ul style="list-style-type: none"> Accelerator pedal position sensor ECM
P2127	Condition (a) and (b) continues for 0.5 seconds or more: (a) $VPA2 \leq 1.2\text{ V}$ (b) $VPA \geq 0.04\text{ V}$	<ul style="list-style-type: none"> Accelerator pedal position sensor VCP2 circuit open VPA2 circuit open or ground short ECM
P2128	Condition (a) and (b) continues for 2.0 seconds or more: (a) $VPA2 \geq 4.8\text{ V}$ (a) $0.4\text{ V} \leq VPA \leq 3.45\text{ V}$	<ul style="list-style-type: none"> Accelerator pedal position sensor EPA circuit open ECM
P2138	Condition (a) or (b) continues for 2.0 seconds or more: (a) $ VPA - VPA2 \leq 0.02\text{ V}$ (b) $VPA \leq 0.4\text{ V}$ and $VPA2 \leq 1.2\text{ V}$	<ul style="list-style-type: none"> VPA and VPA2 circuit are short circuited Accelerator pedal position sensor ECM

HINT:

After confirming DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138 use the OBD II scan tool or the hand-held tester to confirm the accelerator pedal opening percentage.

Trouble area	Accelerator pedal position expressed as voltage			
	Accelerator pedal completely released		Accelerator pedal fully depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VC circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
E2 circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

MONITOR DESCRIPTION

When VPA or VPA2 deviates from the standard, or the difference between the voltage outputs of the two sensors is less than threshold, the ECM concludes that there is a defect in the accelerator pedal position sensor. The ECM turns on the MIL and a DTC is set.

Example:

When the voltage output of the VPA is below 0.4 V or exceeds 4.8 V.

FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving.

If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2120	Accelerator position sensor 1 (VPA) range check (Fluttering)
	P2122	Accelerator position sensor 1 (VPA) range check (Low voltage)
	P2123	Accelerator position sensor 1 (VPA) range check (High voltage)
	P2125	Accelerator position sensor 2 (VPA2) range check (Fluttering)
	P2127	Accelerator position sensor 2 (VPA2) range check (Low voltage)
	P2128	Accelerator position sensor 2 (VPA2) range check (High voltage)
	P2138	Accelerator position sensor correlation range check
Required sensors/components	Accelerator position sensor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Ignition switch	ON	
Throttle control motor power	ON	

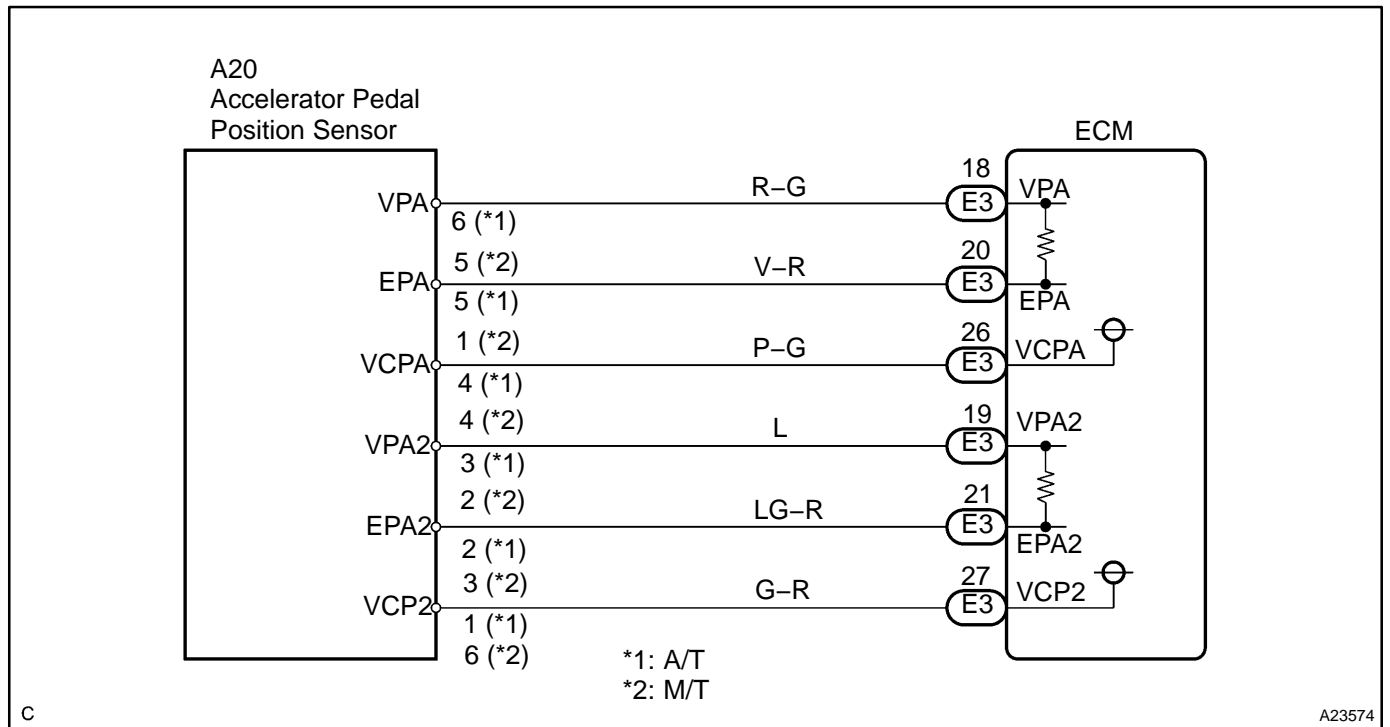
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2120:	
Either of the following conditions is met	Condition 1 or 2
1. VPA1 voltage when VPA2 voltage is 0.04 V or more	0.4 V or less
2. VPA1 voltage	4.8 V or more
P2122:	
VPA1 voltage when VPA2 voltage is 0.04 V or more	0.4 V or less
P2123:	
VPA1 voltage	4.8 V or more
P2125:	
Either of the following conditions is met	Condition 1 or 2
1. VPA2 voltage when VPA1 voltage is 0.04 V or more	1.2 V or less
2. VPA2 voltage when VPA1 voltage is 0.4 to 3.45 V	4.8 V or more
P2127:	
VPA2 voltage when VPA1 voltage is 0.04 V or more	1.2 V or less
P2128:	
VPA2 voltage when VPA1 voltage is 0.4 to 3.45 V	4.8 V or more
P2138:	
Either of the following condition is met:	Condition 1 or 2
1. Difference between VPA1 and VPA2 voltage	0.02 V or less
2. Both of the following conditions are met:	(a) and (b)
(a) VPA1 voltage	0.4 V or less
(b) VPA2 voltage	1.2 V or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
VPA voltage	More than 0.4 V and less than 4.8 V
VPA2 voltage	More than 1.2 V and Less than 4.8 V
Difference between VPA and VPA2 voltages	More than 0.02 V

WIRING DIAGRAM

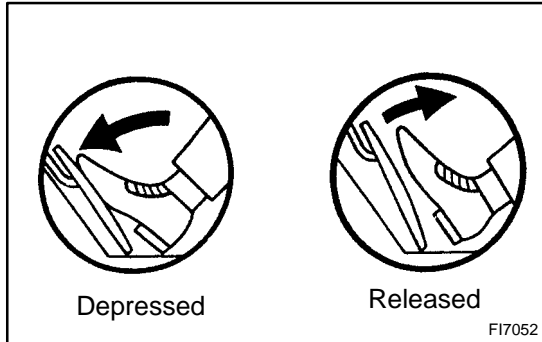


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 **Connect hand-held tester, and read the voltage for accelerator pedal position sensor data.**



PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Standard:

Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

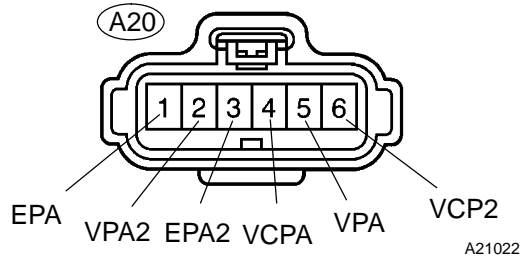
OK **Go to step 5.**

NG

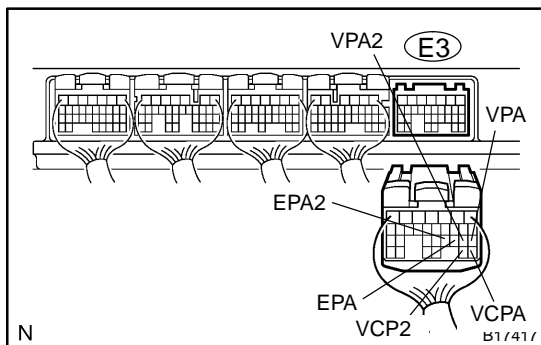
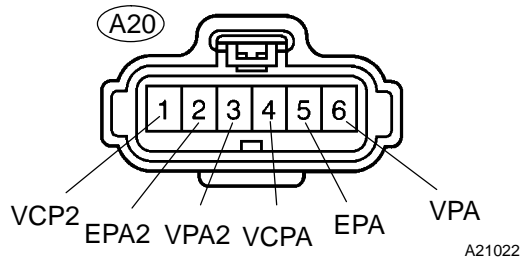
2 Check for open and short in harness and connector in VCPA, VCP2, VPA, VPA2 EPA and EPA2 circuit between ECM and accelerator pedal position sensor.

Wire Harness Side:

Accelerator Pedal Position Sensor (M/T)

**Wire Harness Side:**

Accelerator Pedal Position Sensor (A/T)

**PREPARATION:**

- Disconnect the A20 accelerator pedal position sensor connector.
- Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:**Standard:**

Tester Connection	Specified Condition
VPA (A20-5) - VPA (E3-18) ^{*1}	Below 1 Ω
VPA (A20-6) - VPA (E3-18) ^{*2}	Below 1 Ω
EPA (A20-1) - EPA (E3-20) ^{*1}	Below 1 Ω
EPA (A20-5) - EPA (E3-20) ^{*2}	Below 1 Ω
VCPA (A20-4) - VCPA (E3-26)	Below 1 Ω
VPA2 (A20-2) - VPA2 (E3-19) ^{*1}	Below 1 Ω
VPA2 (A20-3) - VPA2 (E3-19) ^{*2}	Below 1 Ω
EPA2 (A20-3) - EPA2 (E3-21) ^{*1}	Below 1 Ω
EPA2 (A20-2) - EPA2 (E3-21) ^{*2}	Below 1 Ω
VCP2 (A20-6) - VCP2 (E3-27) ^{*1}	Below 1 Ω
VCP2 (A20-1) - VCP2 (E3-27) ^{*2}	Below 1 Ω
VPA (A20-5) or VPA (E3-18) - Body ground ^{*1}	10 kΩ or higher
VPA (A20-6) or VPA (E3-18) - Body ground ^{*2}	10 kΩ or higher
EPA (A20-1) or EPA (E3-20) - Body ground ^{*1}	10 kΩ or higher
EPA (A20-5) or EPA (E3-20) - Body ground ^{*2}	10 kΩ or higher
VCPA (A20-4) or VCPA (E3-26) - Body ground	10 kΩ or higher
VPA2 (A20-2) or VPA2 (E3-19) - Body ground ^{*1}	10 kΩ or higher
VPA2 (A20-3) or VPA2 (E3-19) - Body ground ^{*2}	10 kΩ or higher
EPA2 (A20-3) or EPA2 (E3-21) - Body ground ^{*1}	10 kΩ or higher
EPA2 (A20-2) or EPA2 (E3-21) - Body ground ^{*2}	10 kΩ or higher
VCP2 (A20-6) or VCP2 (E3-27) - Body ground ^{*1}	10 kΩ or higher
VCP2 (A20-1) or VCP2 (E3-27) - Body ground ^{*2}	10 kΩ or higher

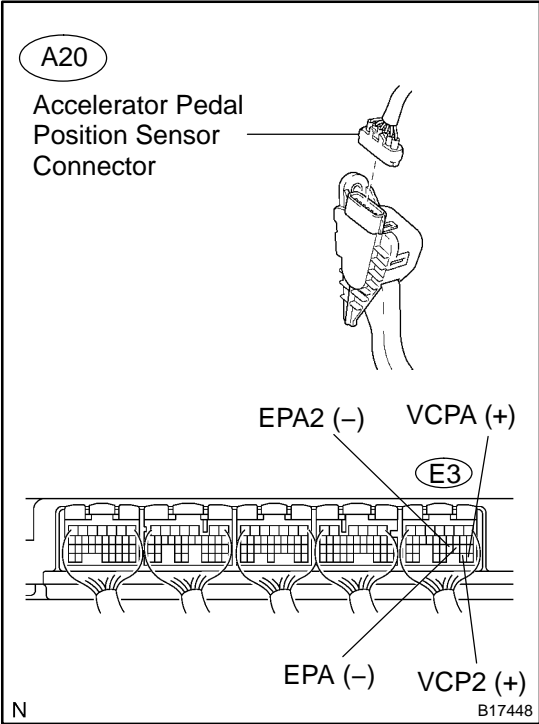
*1: M/T

*2: A/T

NG Repair or replace harness and connector.

OK

3 Check voltage between terminals VCPA and EPA, and VCP2 and EPA2 of ECM terminals.



PREPARATION:

- (a) Disconnect the A20 accelerator pedal position sensor connector.
- (b) Turn the ignition switch to ON.

CHECK:

Measure the voltage between the specified terminals of the E3 ECM connector.

OK:

Standard:

Tester Connection	Specified Condition
VCPA (E3-26) - EPA (E3-20)	4.5 to 5.5 V
VCP2 (E3-27) - EPA2 (E3-21)	4.5 to 5.5 V

NG Replace ECM (See page SF-66).

OK

4 Replace accelerator pedal assembly.

NEXT

5	Check whether DTC output recurs (DTC P2120, P2122, P2123, P2125, P2127, P2128 or P2138)
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PREPARATION:

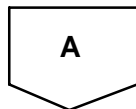
- (a) Connect the hand-held tester to the DLC3.
- (b) Disconnect the battery terminals or remove the EFI No. 1 fuse and ETCS fuse (Clear DTCs).
- (c) Start the engine.
- (d) Drive the engine at idle for 15 seconds or more.
- (e) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

CHECK:

Read the DTC output.

RESULT:

Display (DTC Output)	Proceed To
P2120, P2122, P2123, P2125, P2127, P2128 or P2138	A
No output	B



Replace ECM (See page [SF-66](#)).

DTC	P2121	Throttle/Pedal Position Sensor/Switch "D" Circuit Range/Performance
------------	--------------	--

HINT:

This is repair procedure for the "accelerator pedal position sensor".

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page [DI-299](#).

DTC No.	DTC Detecting Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 seconds: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	<ul style="list-style-type: none"> • Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

MONITOR DESCRIPTION

The accelerator pedal position sensor is mounted on the accelerator pedal bracket. The accelerator pedal position sensor has 2 sensor elements/signal outputs: VPA1 and VPA2. VPA1 is used to detect the actual accelerator pedal angle (used for engine control) and VPA2 is used to detect malfunctions in VPA1. When the difference between the voltage outputs of VPA1 and VPA2 deviates from the standard, the ECM concludes the accelerator pedal position sensor has a malfunction. The ECM turns on the MIL and a DTC is set.

FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving.

If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2121	Accelerator position sensor (rationality)
Required sensors/components	Accelerator position sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-18	
Either of the following conditions is met	Condition 1 or 2	
1. Ignition switch	ON	
2. Throttle control motor power	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Difference between VPA1 voltage (learned value) and VPA2 voltage (learned value)	Less than 0.4 V, or more than 1.2 V

WIRING DIAGRAM

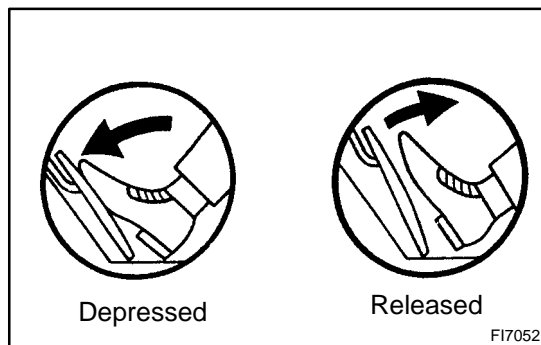
Refer to DTC P2120 on page [DI-299](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read the voltage for accelerator pedal position sensor data.
----------	---



PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Standard:

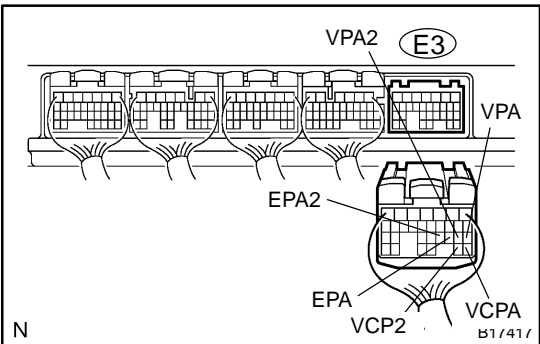
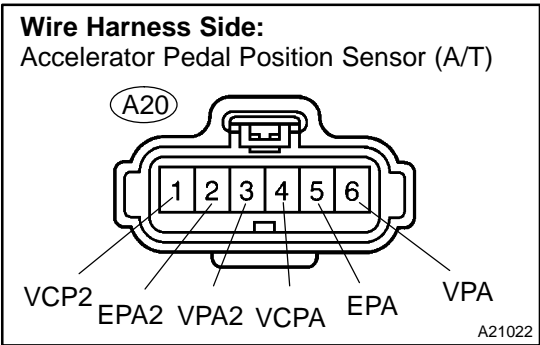
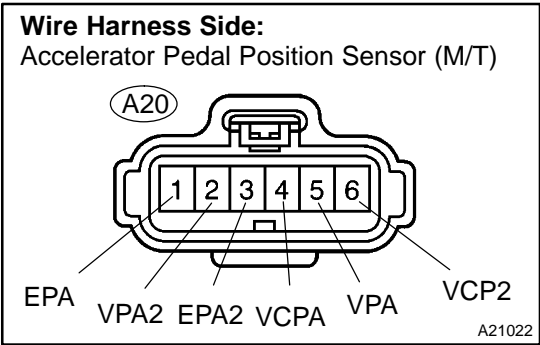
Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK

Replace ECM (See page [SF-66](#)).

NG

2 Check for open and short in harness and connector between accelerator pedal position sensor and ECM.



PREPARATION:

- (a) Disconnect the A20 accelerator pedal position sensor connector.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VPA (A20-5) - VPA (E3-18) ^{*1}	Below 1 Ω
VPA (A20-6) - VPA (E3-18) ^{*2}	Below 1 Ω
EPA (A20-1) - EPA (E3-20) ^{*1}	Below 1 Ω
EPA (A20-5) - EPA (E3-20) ^{*2}	Below 1 Ω
VCPA (A20-4) - VCPA (E3-26)	Below 1 Ω
VPA2 (A20-2) - VPA2 (E3-19) ^{*1}	Below 1 Ω
VPA2 (A20-3) - VPA2 (E3-19) ^{*2}	Below 1 Ω
EPA2 (A20-3) - EPA2 (E3-21) ^{*1}	Below 1 Ω
EPA2 (A20-2) - EPA2 (E3-21) ^{*2}	Below 1 Ω
VCP2 (A20-6) - VCP2 (E3-27) ^{*1}	Below 1 Ω
VCP2 (A20-1) - VCP2 (E3-27) ^{*2}	Below 1 Ω
VPA (A20-5) or VPA (E3-18) - Body ground ^{*1}	10 kΩ or higher
VPA (A20-6) or VPA (E3-18) - Body ground ^{*2}	10 kΩ or higher
EPA (A20-1) or EPA (E3-20) - Body ground ^{*1}	10 kΩ or higher
EPA (A20-5) or EPA (E3-20) - Body ground ^{*2}	10 kΩ or higher
VCPA (A20-4) or VCPA (E3-26) - Body ground	10 kΩ or higher
VPA2 (A20-2) or VPA2 (E3-19) - Body ground ^{*1}	10 kΩ or higher
VPA2 (A20-3) or VPA2 (E3-19) - Body ground ^{*2}	10 kΩ or higher
EPA2 (A20-3) or EPA2 (E3-21) - Body ground ^{*1}	10 kΩ or higher
EPA2 (A20-2) or EPA2 (E3-21) - Body ground ^{*2}	10 kΩ or higher
VCP2 (A20-6) or VCP2 (E3-27) - Body ground ^{*1}	10 kΩ or higher
VCP2 (A20-1) or VCP2 (E3-27) - Body ground ^{*2}	10 kΩ or higher

*1: M/T

*2: A/T

NG

Repair or replace harness or connector.

OK

Replace accelerator pedal pedal assembly.

DTC	P2195	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 1 Sensor 1)
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DTC	P2196	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 1 Sensor 1)
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DTC	P2197	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 2 Sensor 1)
------------	--------------	--

DTC	P2198	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 2 Sensor 1)
------------	--------------	--

HINT:

- Although the DTC titles say oxygen sensor, these DTCs relate to the Air-Fuel Ratio (A/F) sensor.
- Sensor 1 refers to the sensor mounted in front of the Three-Way Catalytic Converter (TWC) and located near the engine assembly.

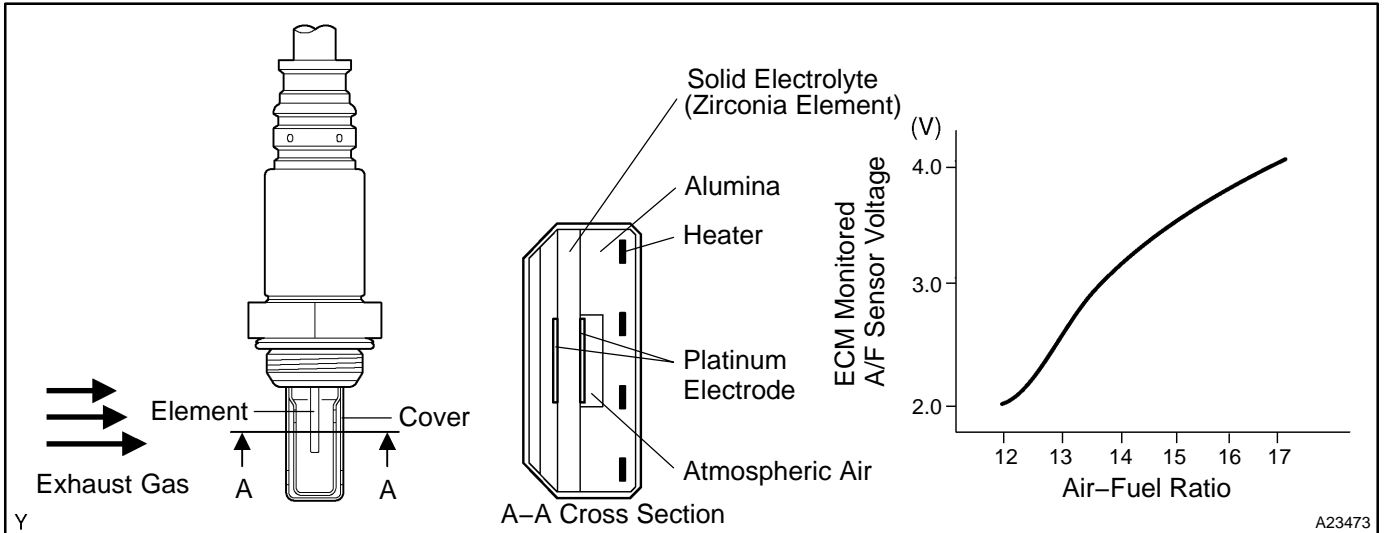
CIRCUIT DESCRIPTION

The A/F sensor generates a voltage* that corresponds to the actual air-fuel ratio. This sensor voltage is used to provide the ECM with feedback so that it can control the air-fuel ratio. The ECM determines the deviation from the stoichiometric air-fuel ratio level, and regulates the fuel injection time. If the A/F sensor malfunctions, the ECM is unable to control the air-fuel ratio accurately.

The A/F sensor is the planar type and is integrated with the heater, which heats the solid electrolyte (zirconia element). This heater is controlled by the ECM. When the intake air volume is low (the exhaust gas temperature is low), a current flows into the heater to heat the sensor, in order to facilitate accurate air-fuel ratio detection. In addition, the sensor and heater portions are narrower than the conventional type. The heat generated by the heater is conducted to the solid electrolyte through the alumina, therefore the sensor activation is accelerated.

In order to obtain a high purification rate of the carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NOx) components in the exhaust gas, a TWC is used. For the most efficient use of the TWC, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric level.

*: Value changes inside the ECM. Since the A/F sensor is the current output element, a current is converted to a voltage inside the ECM. Any measurements taken at the A/F sensor or ECM connectors will show a constant voltage.



DTC No.	DTC Detection Conditions	Trouble Areas
P2195 P2197	While fuel-cut operation performing (during vehicle deceleration), air-fuel ratio sensor current is 3.6 mA or more for 3 seconds.	<ul style="list-style-type: none"> • A/F sensor (sensor 1) • ECM
P2196 P2198	While fuel-cut operation performing (during vehicle deceleration), air-fuel ratio sensor current is less than 1.4 mA for 3 seconds.	<ul style="list-style-type: none"> • A/F sensor (sensor 1) • ECM

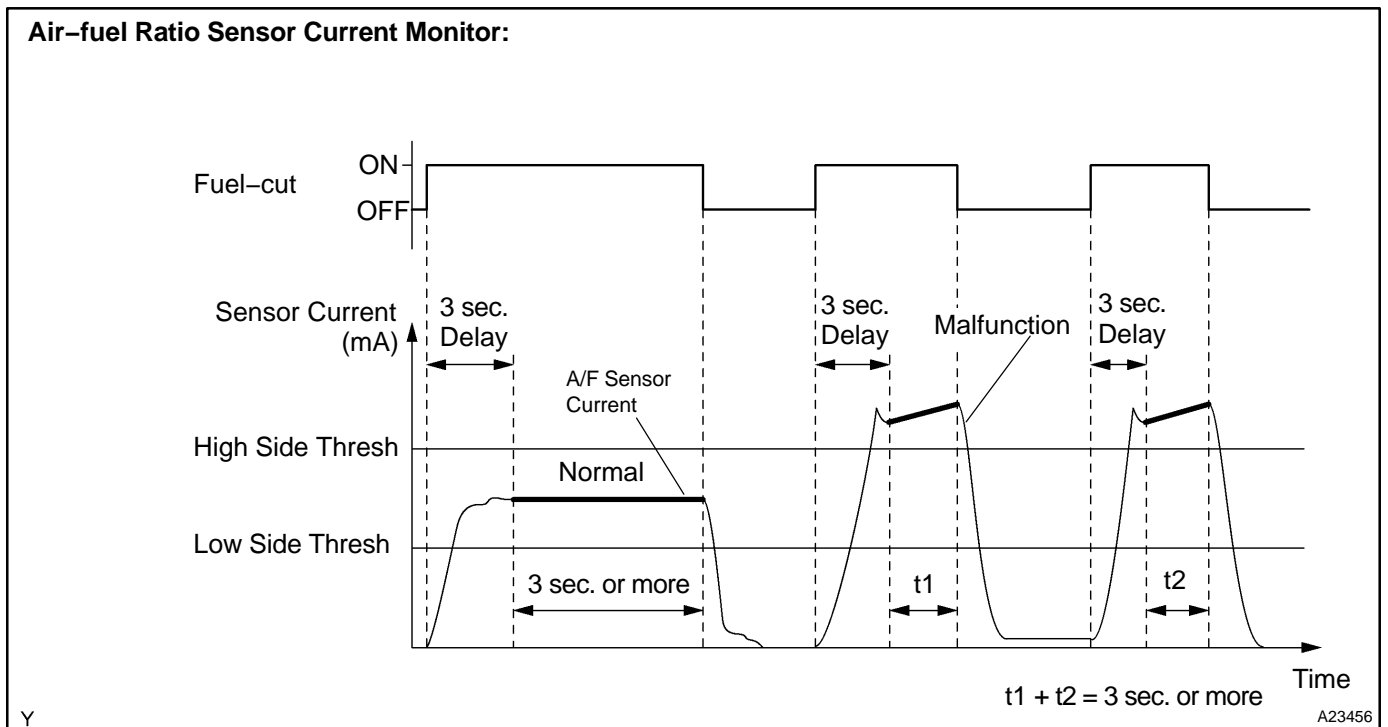
HINT:

- When any of these DTCs are set, check the A/F sensor voltage output by selecting the following menu items on a hand-held tester: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / AFS B1S1.
- Short-term fuel trim values can also be read using a hand-held tester.

MONITOR DESCRIPTION

A rich air-fuel mixture causes a low air-fuel ratio sensor current, and a lean air fuel mixture causes a high air fuel ratio sensor current. Therefore, the sensor output becomes high during acceleration, and the sensor becomes low during deceleration.

The ECM monitors the air-fuel ratio sensor current during fuel-cut and detects an unusual current value. If the cumulative time the sensor output is out of range exceeds more than 3 seconds, the ECM interprets a malfunction in the air-fuel ratio sensor and sets a DTC.



MONITOR STRATEGY

Related DTCs	P2195	A/F sensor (Bank 1) signal stuck lean
		A/F sensor (Bank 1) current (high side)
	P2196	A/F sensor (Bank 1) signal stuck rich
		A/F sensor (Bank 1) current (low side)
	P2197	A/F sensor (Bank 2) signal stuck lean
		A/F sensor (Bank 2) current (high side)
	P2198	A/F sensor (Bank 2) signal stuck rich
		A/F sensor (Bank 2) current (low side)
Required sensors/components	A/F sensor	
Frequency of operation	Continuous	
Duration	10 sec.: A/F sensor signal stuck lean/rich 3 sec.: A/F sensor current (high/low side)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
P2195, P2197 (A/F sensor signal stuck lean):		
Duration while all of following conditions met	2 sec.	-
Rear HO2S voltage	0.15 V	-
Time after engine start	30 sec.	-
A/F sensor status	Activated	
Fuel system status	Closed-loop	
Engine	Running	
P2196, P2198 (A/F sensor signal stuck rich):		
Duration while all of following conditions met	2 sec.	-
Rear HO2S voltage	-	0.6 V
Time after engine start	30 sec.	-
A/F sensor status	Activated	
Fuel system status	Closed-loop	
Engine	Running	
P2195, P2197 (A/F sensor current (High side)):		
Battery voltage	11 V	-
ECT	75°C (167°F)	-
Atmospheric pressure/760 mmHg	0.75	-
A/F sensor status	Activated	
Continuous time of fuel-cut	3 to 10 sec.	
P2196, P2198 (A/F sensor current (Low side)):		
Battery voltage	11 V	-
ECT	75°C (167°F)	-
Atmospheric pressure/760 mmHg	0.75	-
A/F sensor status	Activated	
Continuous time of fuel-cut	3 to 10 sec.	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2195, P2197 (A/F sensor signal stuck lean):	
A/F sensor voltage	More than 3.8 V
P2196, P2198 (A/F sensor signal stuck rich):	
A/F sensor voltage	Less than 2.8 V
P2195, P2197 (A/F sensor current (High side)):	
A/F sensor current	3.6 mA or more
P2196, P2198 (A/F sensor current (Low side)):	
A/F sensor current	Less than 1.57 mA

MONITOR RESULT

Refer to page [DI-26](#) for detailed information.

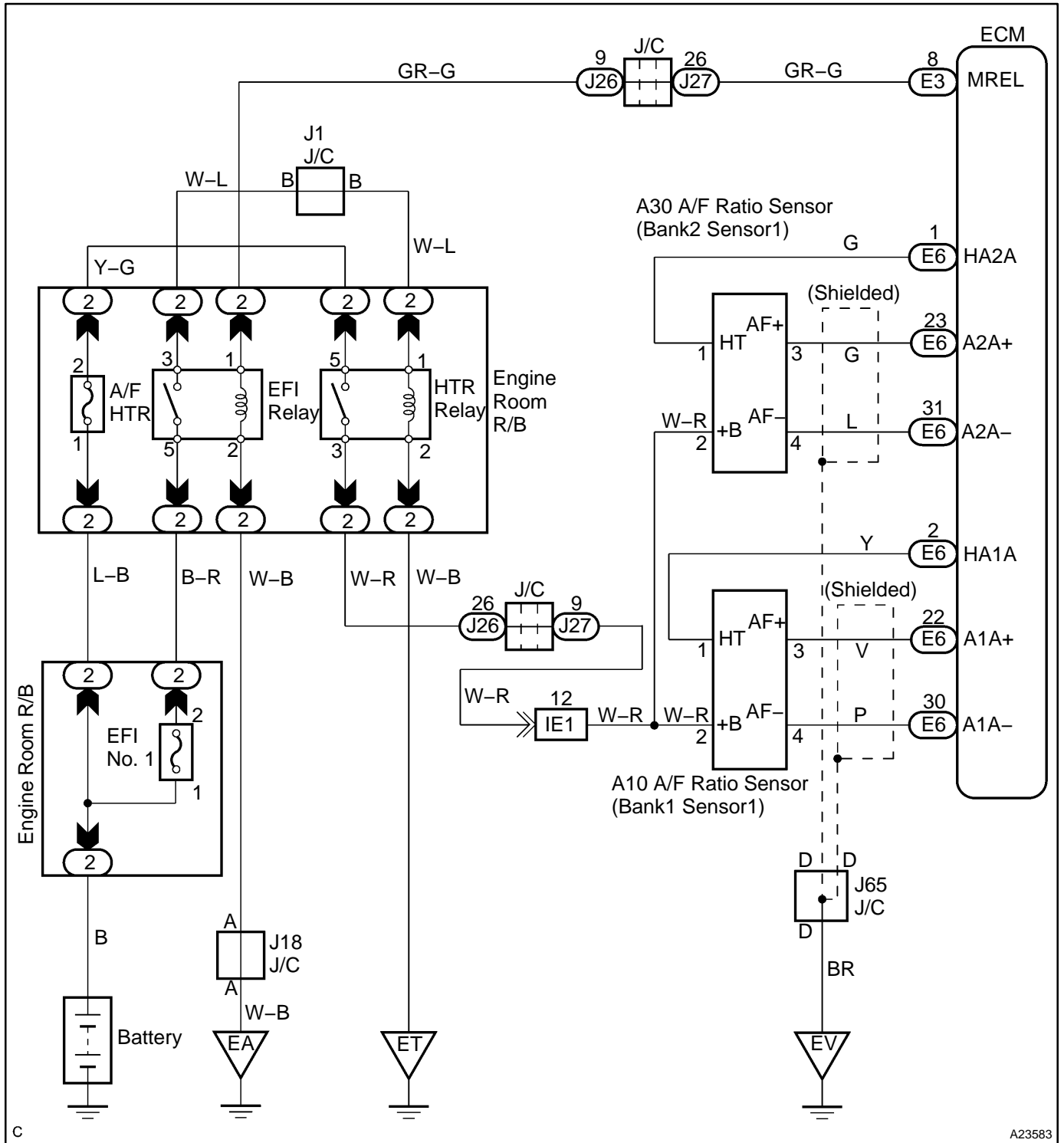
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page [DI-27](#)).

- TID (Test Identification Data) is assigned to each emissions-related component.
- TLT (Test Limit Type):
If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID \$06: A/F sensor (Active A/F control method)

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	\$01	Multiply by 0.0003 (V)	Cumulative A/F sensor locus length (Bank 1)	Lower malfunction criterion for A/F sensor
0	\$01	Multiply by 0.0003 (V)	Cumulative A/F sensor locus length (Bank 1)	Upper malfunction criterion for A/F sensor
1	\$11	Multiply by 0.0003 (V)	Cumulative A/F sensor locus length (Bank 2)	Lower malfunction criterion for A/F sensor
0	\$11	Multiply by 0.0003 (V)	Cumulative A/F sensor locus length (Bank 2)	Upper malfunction criterion for A/F sensor
1	\$02	Multiply by 0.000039 (A)	A/F sensor current (Bank 1)	Lower malfunction criterion for A/F sensor
0	\$02	Multiply by 0.000039 (A)	A/F sensor current (Bank 1)	Upper malfunction criterion for A/F sensor
1	\$12	Multiply by 0.000039 (A)	A/F sensor current (Bank 2)	Lower malfunction criterion for A/F sensor
0	\$12	Multiply by 0.000039 (A)	A/F sensor current (Bank 2)	Upper malfunction criterion for A/F sensor

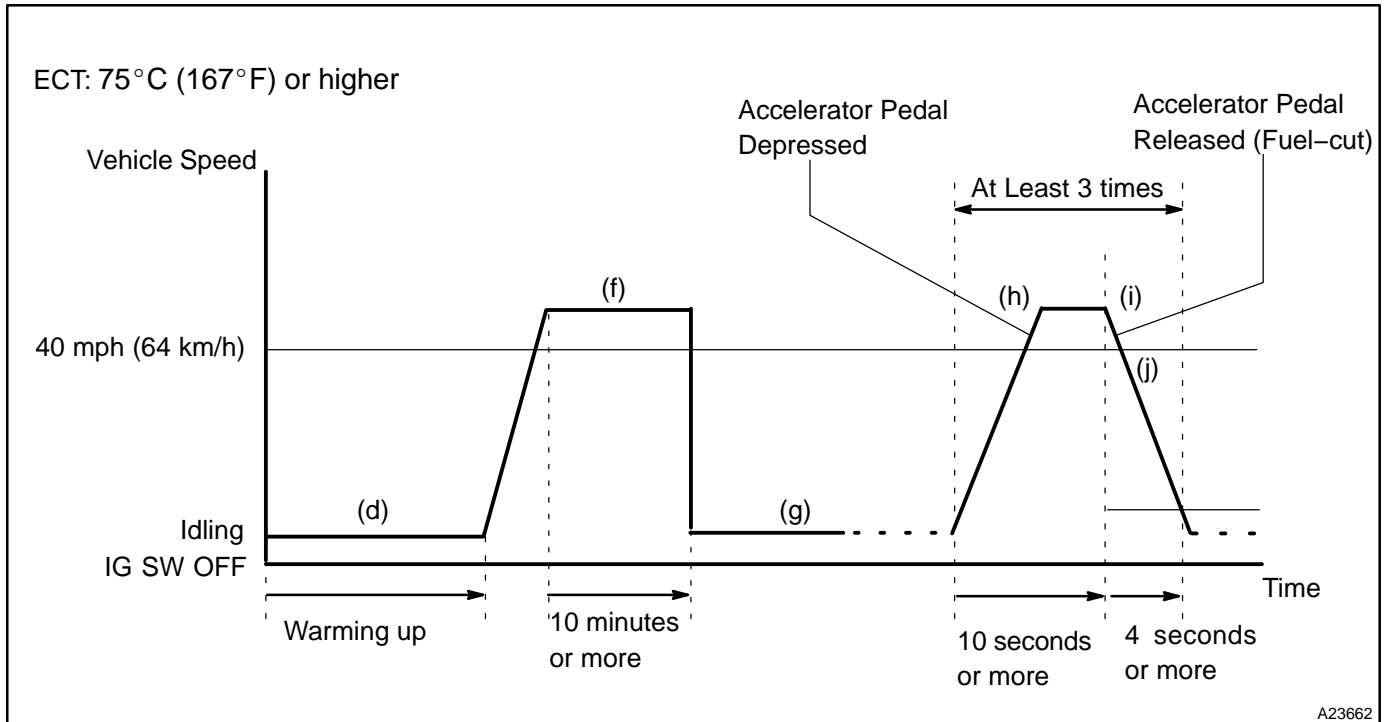
WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

HINT:

This confirmation driving pattern is used in steps 2, 4, 7, 17 and 21 of the following diagnostic troubleshooting procedure when using a hand-held tester.



- (a) Connect the hand-held tester to DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Clear DTC (See page DI-42).
- (d) Start the engine, and warm it up until the ECT reaches 75°C (167°F) or higher.
- (e) On the hand-held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/DATA LIST/FC IDL.
- (f) Drive the vehicle at 40 mph (64 km/h) or more for at least 10 minutes.
- (g) Change the transmission to 2nd gear.
- (h) Drive the vehicle at proper vehicle speed to perform fuel-cut operation.

HINT:

Fuel-cut is performed under following conditions met:

- Accelerator pedal fully released.
 - Engine speed 2,500 rpm or more (fuel injection returns at 1,000 rpm).
- (i) Accelerate the vehicle to 30 mph (48 km/h) or more by depressing the accelerator pedal for at least 10 seconds.
 - (j) Soon after performing step (8) above, release the accelerator pedal for at least 4 seconds without depressing the brake pedal, in order to execute fuel-cut control.
 - (k) Stop the vehicle and allow the engine to idle for 10 seconds or more.
 - (l) Allow the vehicle to decelerate until the vehicle speed declines to less than 6 mph (10 km/h).
 - (m) Repeat steps from (8) through (10) above at least 3 times in one driving cycle.

HINT:

Completing all A/F sensor monitors are required to change the value in TEST RESULT.

CAUTION:

Strictly observe of posted speed limits, traffic laws, and road conditions when performing these drive pattern.

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO₂) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- (1) Connect a hand-held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO₂ sensors (AFS B1S1 (AFS B2S1) and OS2 B1S2 (O2S B2S2)) displayed on the tester.

HINT:

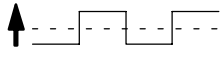
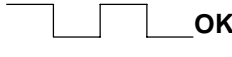
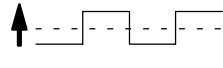
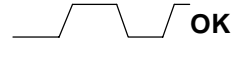
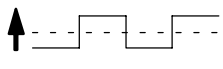
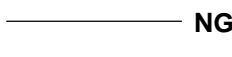
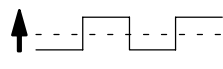

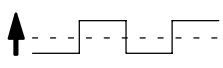
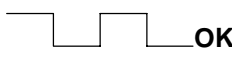
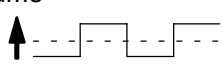
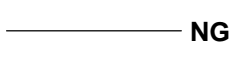
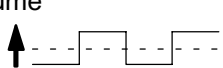

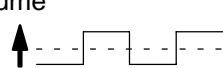

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO ₂)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO ₂)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0 V	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	—
2	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0V	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

HINT:

- Read freeze frame data using a hand-held tester or OBD II scan tool. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.
- A low A/F sensor voltage could be caused by a rich air-fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air-fuel mixture. Check for conditions that would cause the engine to run lean.

1	Check any other DTCs output (in addition to DTC P2195, P2196, P2197 or P2198).
----------	---

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

- (a) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
P2195, P2196, P2197 or P2198 and other DTCs	B

HINT:

If any DTCs other than P2195, P2196, P2197 or P2198 are output, troubleshoot those DTCs first.

B	Go to DTC chart (See page DI-57).
----------	--

A

2	Check A/F sensor output current.
----------	---

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Clear DTC (See page [DI-42](#)).
- (d) On the hand-held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/MONITOR INFO/MONITOR STATUS.
- (e) Check that the status of O2S MON is COMPL.
- (f) On the hand-held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/MONITOR INFO/TEST RESULT/RANGE B1S1 and B2S1.
- (g) Check the test value of the air-fuel ratio sensor output current during fuel-cut.

RESULT:

Test Value	Proceed to
Out of normal range (1.4 mA or more, and less than 3.6 mA)	A
Within normal range (Less than 1.4 mA, or 3.6 mA or more)	B

B	Go to step 20.
----------	-----------------------

A

3	Read value output voltage of A/F sensor.
----------	---

PREPARATION:

- (a) Connect the OBD II scan tool to the DLC3.
- (b) Start the engine and turn the scan tool ON.
- (c) Warm up the Air-Fuel Ratio (A/F) sensor at an engine speed of 2,500 rpm for 90 seconds.

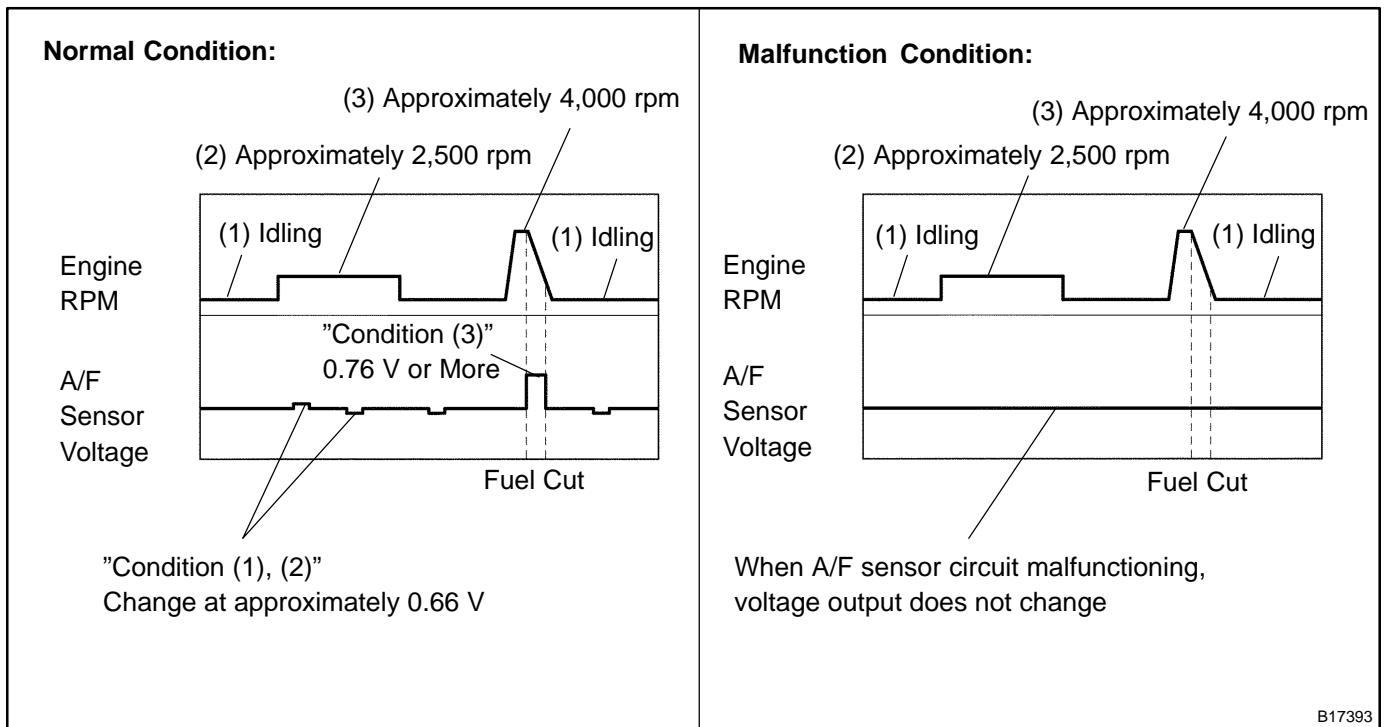
CHECK:

- (a) Using the scan tool, check the A/F sensor voltage 3 times, once when the engine is in each of the following conditions:
 - (1) While idling (check for at least 30 seconds)
 - (2) At an engine speed of approximately 2,500 rpm (without any sudden changes in engine speed)
 - (3) Raise the engine speed to 4,000 rpm and then quickly release the accelerator pedal so that the throttle valve is fully closed.

Standard:

Conditions	A/F Sensor Voltage Variations	Reference
(1) and (2)	Changes at approx 0.66 V	Between 0.62 V and 0.7 V
(3)	Increases to 0.76 V or more	This occurs during engine deceleration (when fuel-cut performed)

For more information, see the diagrams below.



B17393

HINT:

- If the output voltage of the A/F sensor remains at approximately 0.66 V (see Malfunction Condition diagram) under any conditions, including those above, the A/F sensor may have an open circuit. (This will also happen if the A/F sensor heater has an open circuit.)
- If the output voltage of the A/F sensor remains at either approximately 0.76 V or more, or 0.56 V or less (see Malfunction Condition diagram) under any conditions, including those above, the A/F sensor may have a short circuit.
- The ECM stops fuel injection (fuel cut) during engine deceleration. This causes a lean condition and results in a momentary increase in the A/F sensor output voltage.

- The ECM must establish a closed throttle valve position learning value to perform fuel cut. If the battery terminal has been reconnected, the vehicle must be driven over 10 mph (16 km/h) to allow the ECM to learn the closed throttle valve position.
- When the vehicle is driven:
The output voltage of the A/F sensor may be below 0.56 V during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element; therefore, the current is converted into a voltage inside the ECM. Measuring the voltage at the connectors of the A/F sensor or ECM will show a constant voltage result.

NG Go to step 9.

OK

4 Perform confirmation driving pattern.

NEXT

5 Check whether DTC output recurs (DTC P2195, P2196, P2197 or P2198)

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B Go to step 5.

A

6 Replace air fuel ratio sensor.

NEXT

7 Perform confirmation driving pattern.

NEXT

8 Check whether DTC output recurs (DTC P2195, P2196, P2197 or P2198)

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
 (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B

Go to step 5.

A

9 Confirm whether vehicle has run out of fuel in past.

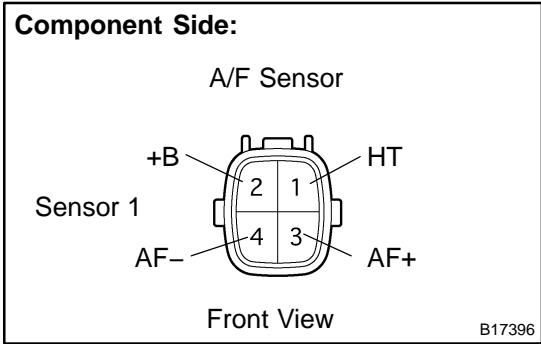
NO

Check for intermittent problems
(See page [DI-11](#)).

YES

DTC caused by running out of fuel.

10 Check resistance of air-fuel ratio (A/F) sensor heater.



PREPARATION:

Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

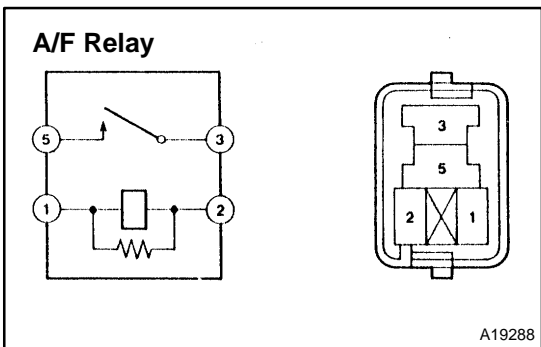
OK:

Tester Connection	Specified Condition
HT (1) - +B (2)	Between 1.8 Ω and 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 kΩ or higher

NG Replace air-fuel ratio (A/F) sensor.

OK

11 Check A/F relay.



PREPARATION:

Remove the A/F relay from the engine room J/B.

CHECK:

Inspect the A/F relay.

OK:

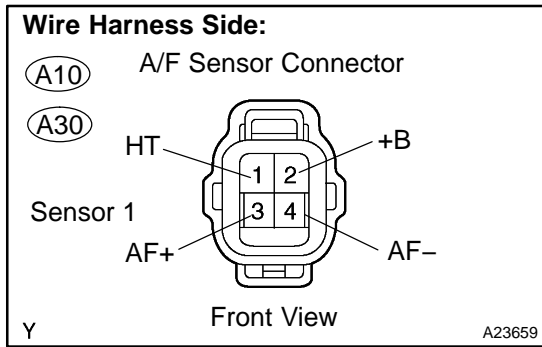
Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 KΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace EFI relay.

OK

12 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

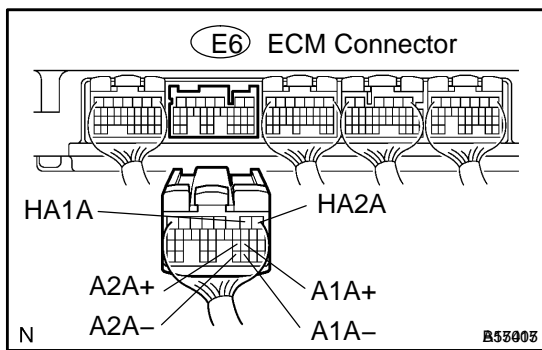
- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Turn the ignition switch to ON.

CHECK:

- (a) Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

Standard:

Tester Connections	Specified Conditions
+B (2) - Body ground	Between 9 V and 14 V



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E6 ECM connector.

CHECK:

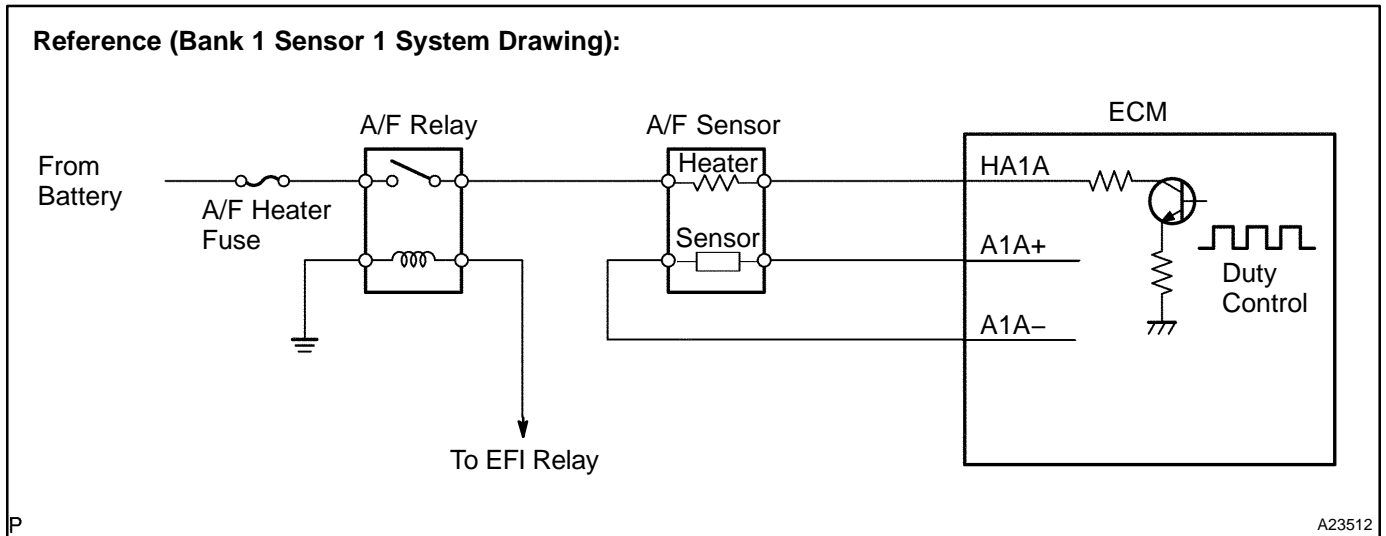
- (a) Check the resistance.

Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω
AF+ (A10-3) - A1A+ (E6-22) AF+ (A30-3) - A2A+ (E6-23)	Below 1 Ω
AF- (A10-4) - A1A- (E6-30) AF- (A30-4) - A2A- (E6-31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher
AF+ (A10-3) or A1A+ (E6-22) - Body ground AF+ (A30-3) or A2A+ (E6-23) - Body ground	10 kΩ or higher
AF- (A10-4) or A1A- (E6-30) - Body ground AF- (A30-4) or A2A- (E6-31) - Body ground	10 kΩ or higher



NG

Replace or replace harness or connector.

OK

13 Check air induction system (See page SF-1).

CHECK:

Check the air induction system for vacuum leaks.

NG

Repair or replace air induction system.

OK

14 Check fuel pressure (See page SF-5).

CHECK:

Check the fuel pressure (high or low pressure).

NG

Check and replace fuel pump, pressure regulator, fuel pipe line and filter (See page SF-1).

OK

15 Check injector injection (See page SF-26).

NG

Replace injector.

OK

16 Replace air fuel ratio sensor.

NEXT

17 Perform confirmation driving pattern.

NEXT

18 Check whether DTC output recurs (DTC P2195, P2196, P2197 or P2198)

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
 (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B

Replace ECM (See page [SF-66](#)) and perform confirmation driving pattern.

A

19 Confirm whether vehicle has run out of fuel in past.

NO

Check for intermittent problems (See page [DI-11](#)).

YES

DTC caused by running out of fuel.

20	Replace air fuel ratio sensor.
-----------	---------------------------------------

NEXT

21	Perform confirmation driving pattern.
-----------	--

NEXT

22	Check whether DTC output recurs (DTC P2195, P2196, P2197 or P2198)
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CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

A → **Replace ECM (See page SF-66).**

B

END

DTC	P2238	Oxygen Sensor Pumping Current Circuit Low (For A/F Sensor)(Bank 1 Sensor1)
DTC	P2239	Oxygen Sensor Pumping Current Circuit High (For A/F Sensor)(Bank 1 Sensor1)
DTC	P2241	Oxygen Sensor Pumping Current Circuit Low (For A/F Sensor)(Bank 2 Sensor1)
DTC	P2242	Oxygen Sensor Pumping Current Circuit High (For A/F Sensor)(Bank 2 Sensor1)
DTC	P2252	Oxygen Sensor Reference Ground Circuit Low (For A/F Sensor)(Bank 1 Sensor1)
DTC	P2253	Oxygen Sensor Reference Ground Circuit High (For A/F Sensor)(Bank 1 Sensor1)
DTC	P2255	Oxygen Sensor Reference Ground Circuit Low (For A/F Sensor)(Bank 2 Sensor1)
DTC	P2256	Oxygen Sensor Reference Ground Circuit High (For A/F Sensor)(Bank 2 Sensor1)

HINT:

- Although the DTC titles say oxygen sensor, these DTCs relate to the Air-Fuel Ratio (A/F) sensor.
- Sensor 1 refers to the sensor mounted in front of the Three-Way Catalytic Converter (TWC) and located near the engine assembly.

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page [DI-312](#).

DTC No.	DTC Detection Conditions	Trouble Areas
P2238 P2241	<ul style="list-style-type: none"> • Case 1: Condition (a) or (b) continues for 5.0 seconds or more (1 trip detection logic): (a) AF+ voltage 0.5 V or less (b) (AF+) - (AF-) = 0.1 V or less • Case 2: A/F sensor admittance: Less than 0.022 1/Ω (1 trip detection logic) 	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater • EFI relay • A/F sensor heater and relay circuits • ECM
P2239 P2242	AF+ voltage more than 4.5 V for 5.0 seconds or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater • EFI relay • A/F sensor heater and relay circuits • ECM
P2252 P2255	AF- voltage 0.5 V or less for 5.0 seconds or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater • EFI relay • A/F sensor heater and relay circuits • ECM
P2253 P2256	AF- voltage more than 4.5 V for 5.0 seconds or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater • EFI relay • A/F sensor heater and relay circuits • ECM

MONITOR DESCRIPTION

The Air-Fuel Ratio (A/F) sensor varies its output voltage in proportion to the air-fuel ratio. If the A/F sensor impedance (alternating current resistance) or voltage output deviates greatly from the standard range, the ECM determines that there is an open or short malfunction in the A/F sensor circuit.

MONITOR STRATEGY

Related DTCs	P2238	A/F sensor (Bank 1) open circuit between AF+ and AF-
		A/F sensor (Bank 1) short circuit between AF+ and AF-
		A/F sensor (Bank 1) short circuit between AF+ and GND
	P2239	A/F sensor (Bank 1) short circuit between AF+ and +B
	P2241	A/F sensor (Bank 2) open circuit between AF+ and AF-
		A/F sensor (Bank 2) short circuit between AF+ and AF-
		A/F sensor (Bank 2) short circuit between AF+ and GND
	P2242	A/F sensor (Bank 2) short circuit between AF+ and +B
	P2252	A/F sensor (Bank 1) short circuit between AF- and GND
	P2253	A/F sensor (Bank 1) short circuit between AF- and +B
P2255	A/F sensor (Bank 2) short circuit between AF- and GND	
P2256	A/F sensor (Bank 2) short circuit between AF- and +B	
Required sensors/components	A/F sensor	
Frequency of operation	Once per driving cycle	
Duration	10 sec.: A/F sensor open circuit between AF+ and AF- 5 sec.: Others	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
P2238, P2241 (A/F sensor open circuit between AF+ and AF-):		
AF+ terminal voltage	0.5 to 4.5 V	
AF- terminal voltage	0.5 to 4.5 V	
Difference between AF+ terminal and AF- terminal voltage	0.1 to 0.8 V	
ECT	5°C (41°F)	-
Engine	Running	
Fuel-cut	OFF	
Time after fuel-cut OFF	5 sec.	-
A/F sensor heater	ON	
Time after A/F sensor heating	20 sec.	-
Battery voltage	11 V	-
Ignition switch	ON	
Time after ignition switch is OFF to ON	5 sec.	-
Others:		
Battery voltage	11 V	-
Ignition switch	ON	
Time after ignition switch is OFF to ON	5 sec.	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2238, P2241 (A/F sensor open circuit between AF+ and AF-):	
A/F sensor admittance	Bellow 0.022 1/ohm
P2238, P2241 (A/F sensor short circuit between AF+ and GND):	
AF+ terminal voltage	0.5 V or less
P2238, P2241 (A/F sensor short circuit between AF+ and AF-):	
Difference between A/F+ terminal and AF- terminal voltage	0.1 V or less
P2239, P2242 (A/F sensor short circuit between AF+ and +B):	
AF+ terminal voltage	More than 4.5 V
P2252, P2255 (A/F sensor short circuit between AF- and GND):	
AF- terminal voltage	0.5 V or less
P2253, P225+ (A/F sensor short circuit between AF- and +B):	
AF- terminal voltage	More than 4.5 V

WIRING DIAGRAM

Refer to DTC P2195 on page [DI-312](#).

INSPECTION PROCEDURE

HINT:

Hand-held tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- (1) Connect a hand-held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 (AFS B2S1) and OS2 B1S2 (O2S B2S2)) displayed on the tester.

HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

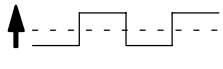
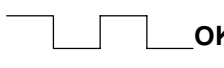
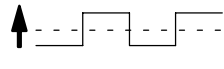
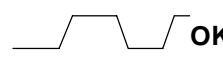
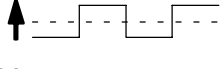
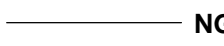
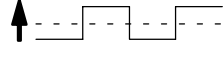
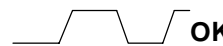
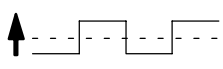

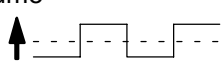

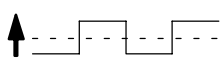

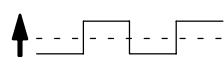

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

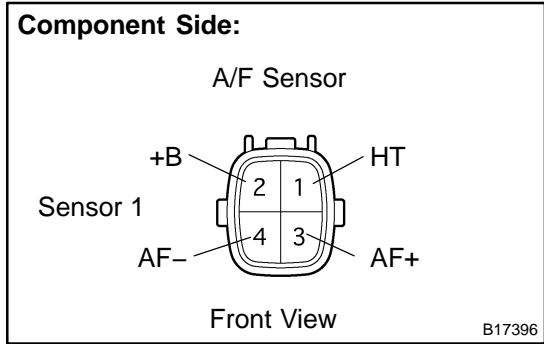
- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0 V	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	—
2	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0V	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

HINT:

Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1 Check resistance of air-fuel ratio (A/F) sensor heater.



PREPARATION:

Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

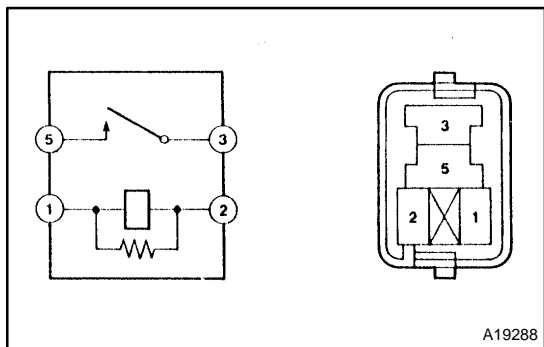
OK:

Tester Connection	Specified Condition
HT (1) - +B (2)	1.8 Ω to 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 k Ω or higher

NG Replace air-fuel ratio (A/F) sensor.

OK

2 Check A/F relay.



PREPARATION:

Remove the A/F relay from the engine room J/B.

CHECK:

Inspect the A/F relay.

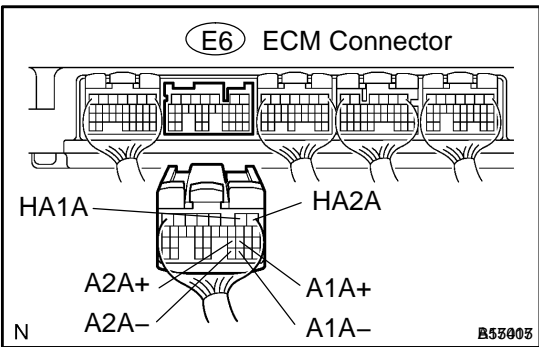
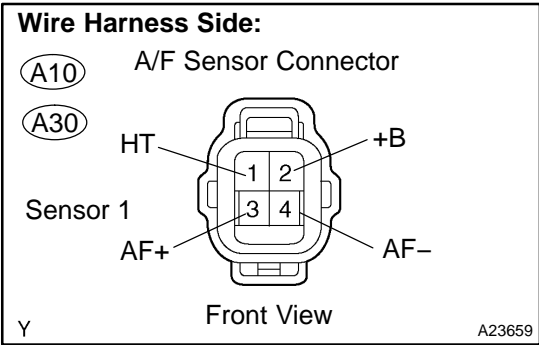
OK:

Terminal No.	Condition	Specified Condition
3 - 5	Usually	10 k Ω or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace EFI relay.

OK

3 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Turn the ignition switch to ON.

CHECK:

- (a) Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

OK:

Standard:

Tester Connections	Specified Conditions
+B (2) - Body ground	9 V to 14 V

PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E6 ECM connector.

CHECK:

- (a) Check the resistance.

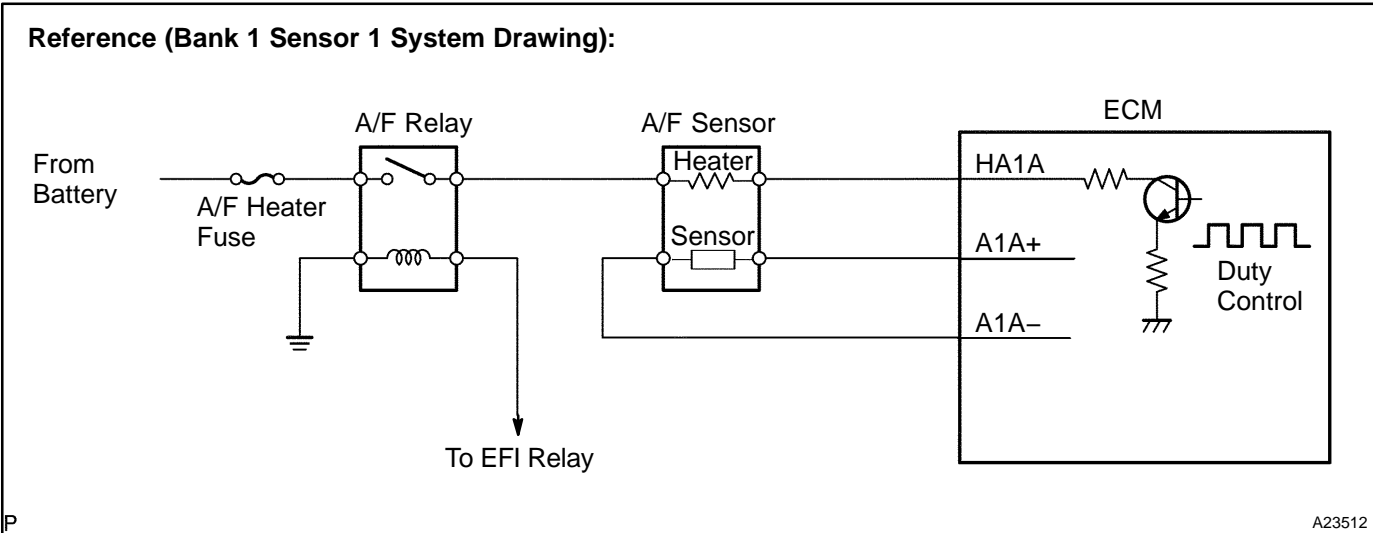
OK:

Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω
AF+ (A10-3) - A1A+ (E6-22) AF+ (A30-3) - A2A+ (E6-23)	Below 1 Ω
AF- (A10-4) - A1A- (E6-30) AF- (A30-4) - A2A- (E6-31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher
AF+ (A10-3) or A1A+ (E6-22) - Body ground AF+ (A30-3) or A2A+ (E6-23) - Body ground	10 kΩ or higher
AF- (A10-4) or A1A- (E6-30) - Body ground AF- (A30-4) or A2A- (E6-31) - Body ground	10 kΩ or higher



NG

Replace or replace harness or connector.

OK

Replace ECM (See page [SF-66](#)).

DTC	P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low
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DTC	P2402	Evaporative Emission System Leak Detection Pump Control Circuit High
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CIRCUIT DESCRIPTION

Refer to EVAP Inspection Procedure (see page [DI-368](#)).

DTCs	Monitoring Item	DTC Detection Condition	Trouble Areas	Detection Timing	Detection Logic
P2401	Vacuum pump stuck OFF	One of following conditions are met: <ul style="list-style-type: none"> • 0.02 inch orifice low-flow • 0.02 inch orifice high-low • Vacuum pump ON stuck • Vacuum pump OFF stuck • Vent valve ON (Closed) stuck 	<ul style="list-style-type: none"> • Pump module • Connector / Wire harness (Pump module - ECM) • ECM 	While ignition switch OFF	2 trips
P2402	Vacuum pump stuck ON	NOTE: P043E, P043F, P2401, P2402 and P2419 have same DTC detection conditions.			

WIRING DIAGRAM

Refer to EVAP Inspection Procedure (see page [DI-368](#)).

MONITOR DESCRIPTION

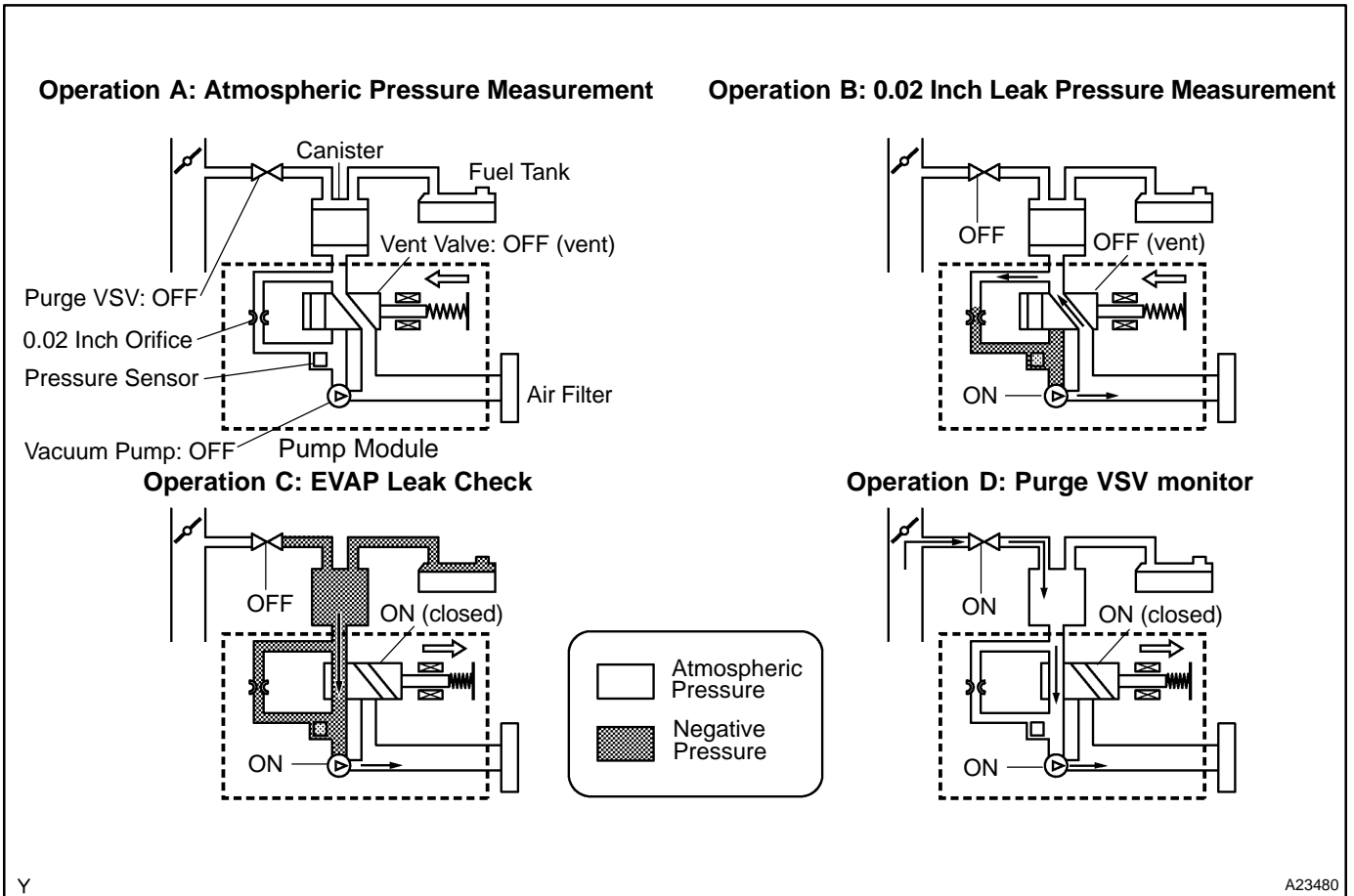
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

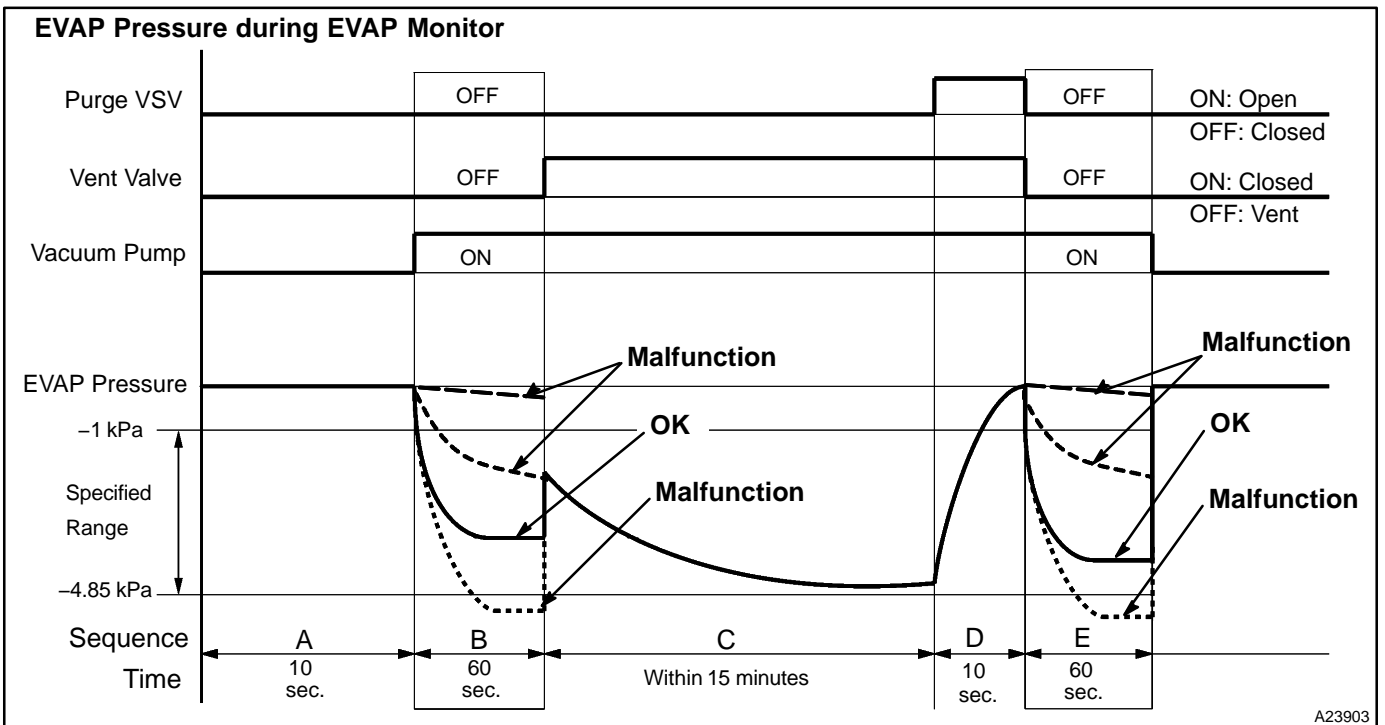
*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
–	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	–
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	–

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



In sequence B and E, to determine the leak criterion, the vacuum pump creates negative pressure in the canister pump module through the 0.02 inch orifice. If the pressure is out of specified range or is not saturated, the ECM illuminates the MIL and sets DTCs P043E, P043F, P2401, P2402 and P2419 (2-trip detection logic).



MONITOR STRATEGY

Related DTCs	P2401	Vacuum pump stuck OFF
	P2402	Vacuum pump stuck ON
Required sensors/components	Purge VSV and pump module	
Frequency of operation	Once per driving cycle	
Duration	Within 2 minutes	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	–
Vehicle speed	–	2.5 mph (4 km/h)
Ignition switch	OFF	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions are met before IG switch OFF	Condition 1 and 2	
1. Duration that vehicle is driven	5 min.	–
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Time after key off	5 or 7 or 9.5 hours	
EVAP key-off monitor sequence	1 to 8	
1. Atmospheric pressure	–	
Next sequence is run if the following condition is set	–	
Atmospheric pressure change for 10 sec.	–	0.3 kPa (2.25 mmHg) for 1 sec.
2. First reference pressure measurement	–	
Next sequence is run if all of the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	–	–1 kPa (–7.5 mmHg)
2. Reference pressure	–4.85 to –1.057 kPa (–36.38 to –7.93 mmHg)	
3. Reference pressure	Saturated	

DIAGNOSTICS - ENGINE (1GR-FE)

3. EVAP canister vent valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	-
4. Vacuum introduction	-	
Next sequence is run if the following condition is set	Condition 1 and 2	
EVAP pressure	Saturated within 12 minutes	
5. EVAP canister purge valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	-
6. Second reference pressure measurement	-	
Next sequence is run if all of the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure measurement	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.4 to -7.92 mmHg)	
3. Reference pressure	Saturated	
4. Difference between first reference pressure and second reference pressure	-	0.7 kPa (5.25 mmHg)
7. Leak check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure when vacuum introduction is complete	-	Less than second reference pressure
8. Atmospheric pressure measurement	-	
EVAP monitor is complete if the following condition is set	-	
Atmospheric pressure difference between sequence 1 and 8	-	2.25 mmHg (0.3 kPa)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
One of the following conditions set	Condition 1, 2, 3, 4 or 5
1. EVAP pressure just after reference pressure measurement start	-1 kPa (-7.5 mmHg) or more
2. Reference pressure	-4.85 kPa (-36.38 mmHg) or less
3. Reference pressure	-1.057 kPa (-7.93 mmHg) or more
4. Reference pressure	Not saturated
5. Difference between first reference pressure and second reference pressure	More than 0.7 kPa (5.25 mmHg)

MONITOR RESULT (MODE 06 DATA)

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

DTC	P2419	Evaporate Emission System Switching Valve Control Circuit Low
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DTC	P2420	Evaporate Emission System Switching Valve Control Circuit High
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CIRCUIT DESCRIPTION

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

DTCs	Monitoring Item	DTC Detection Conditions	Trouble Areas	Detection Timing	Detection Logic
P2419	Vent valve stuck ON (Closed)	One of following conditions are met: <ul style="list-style-type: none"> • 0.02 inch orifice low-flow • 0.02 inch orifice high-flow • Vacuum pump ON stuck • Vacuum pump OFF stuck • Vent valve ON (Closed) stuck NOTE: P043E, P043F, P2401, P2402 and P2419 have same DTC detection conditions.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	While Ignition switch OFF	2 trips
P2420	Vent valve stuck OFF (Vent)	Vent valve OFF (Vent) stuck			

WIRING DIAGRAM

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

MONITOR DESCRIPTION

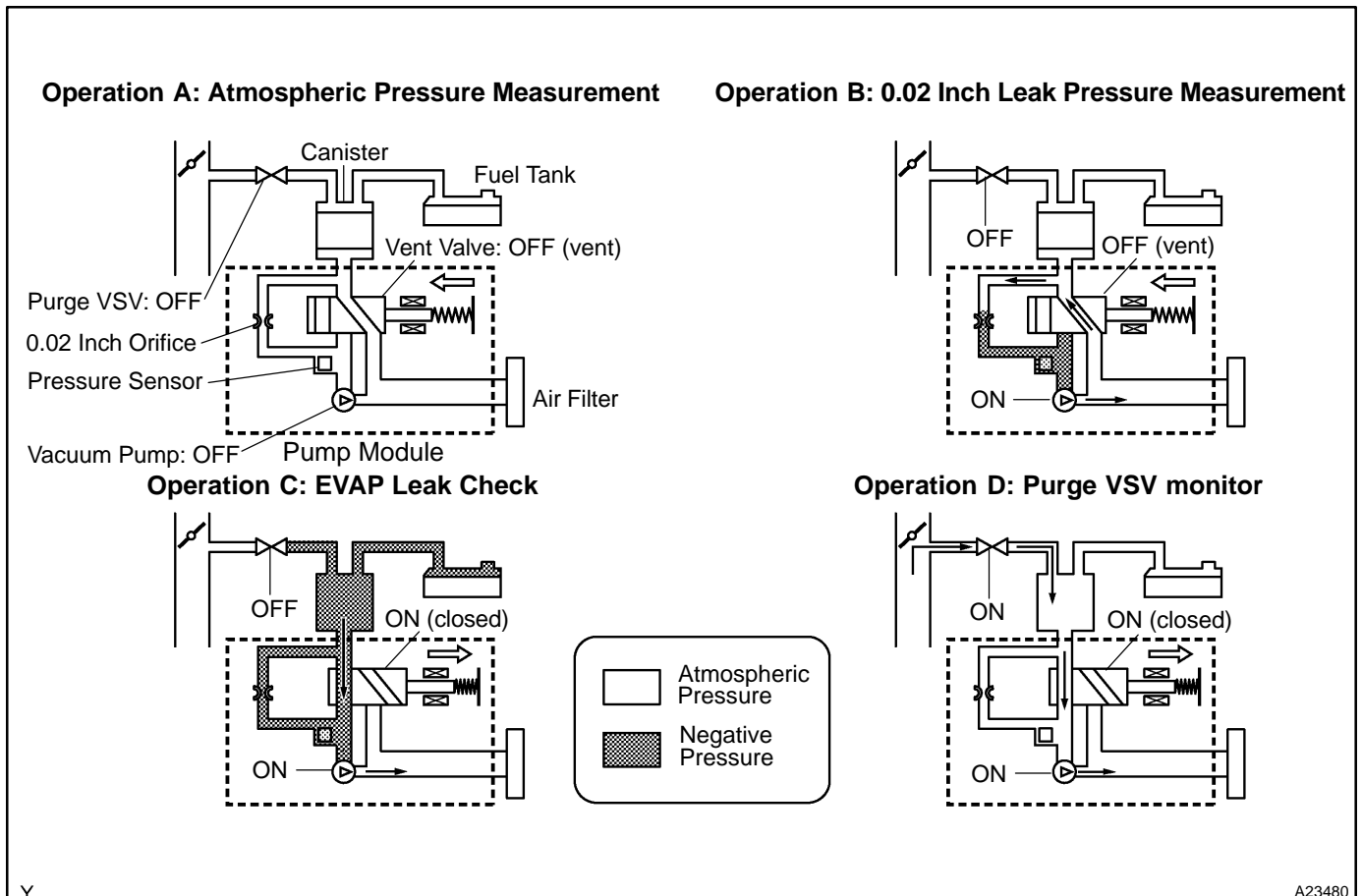
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

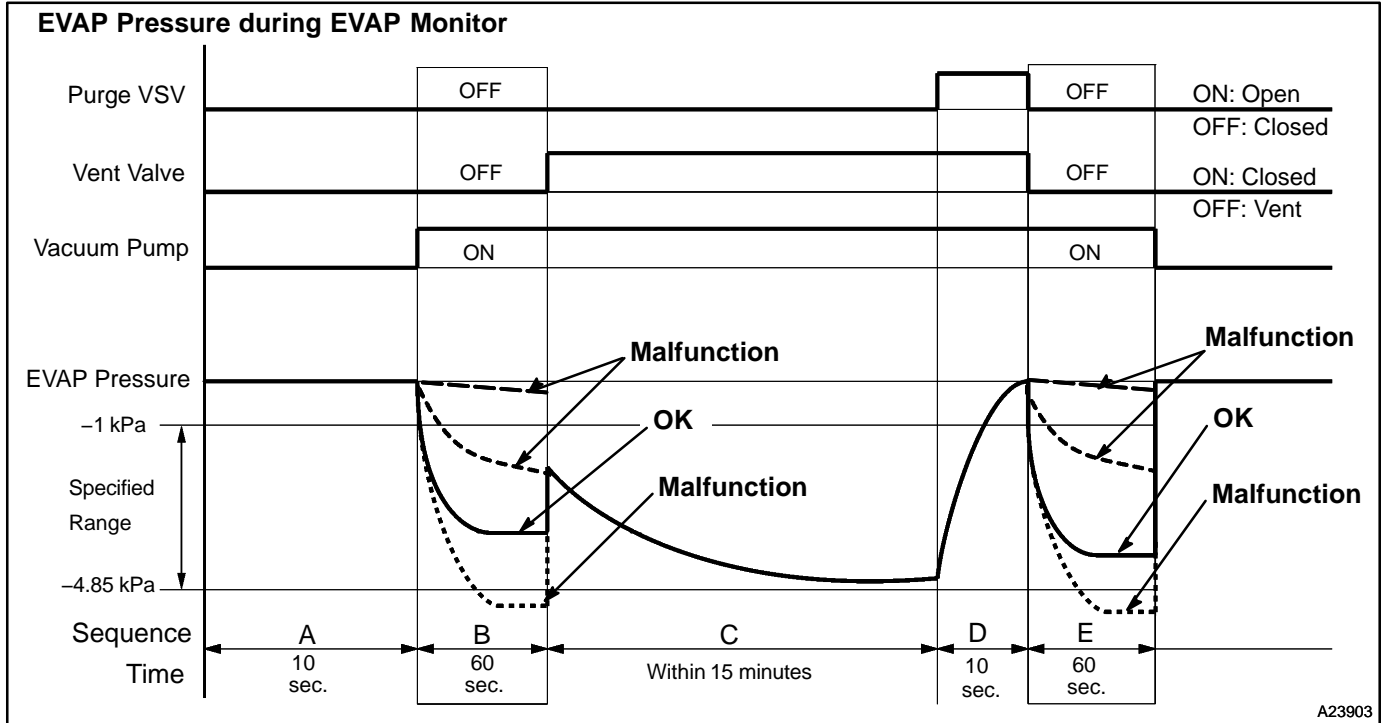
Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



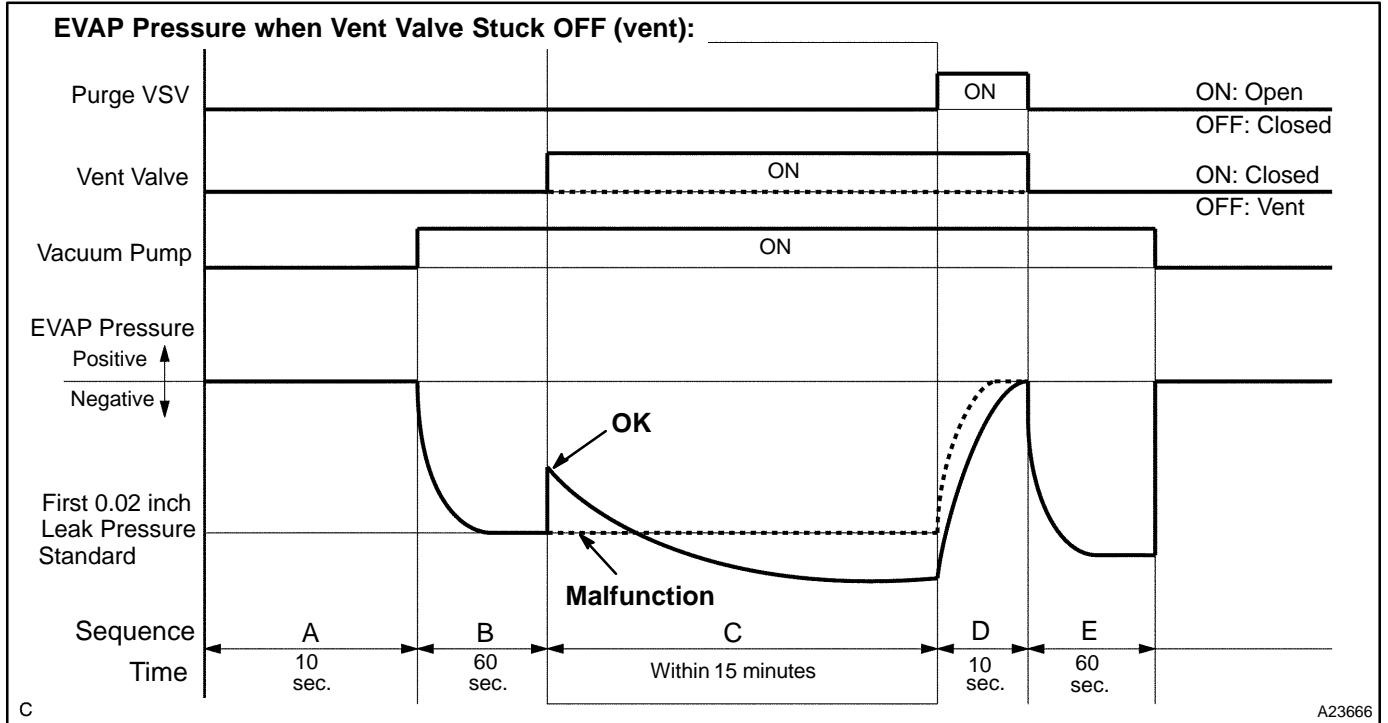
(a) P2419: Vent valve stuck ON (Closed)

In sequence B and E, to determine the leak criterion, the vacuum pump creates negative pressure in the canister pump module through the 0.02 inch orifice. If the pressure is out of specified range or is not saturated, the ECM illuminates the MIL and sets DTCs P043E, P043F, P2401, P2402 and P2419 (2-trip detection logic).



(b) P2420: Vent valve stuck OFF (vent)

In sequence C, the vent valve turns ON (closes) and the EVAP (Evaporative Emission) system pressure is then measured by the ECM, using the pressure sensor, to conduct an EVAP leak check. If the pressure does not increase when the vent valve turned ON (closed), the ECM interprets this as the vent valve being stuck OFF (vent). The ECM illuminates the MIL and sets the DTC.



MONITOR STRATEGY

Related DTCs	P2419	Vent valve stuck open
	P2420	Vent valve stuck closed
Required sensors/components	Vent valve	
Frequency of operation	Once per driving cycle	
Duration	Within 2 minutes	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	-
Vehicle speed	-	2.5 mph (4 km/h)
Ignition switch	OFF	
EVAP pressure sensor malfunction (P450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	

DIAGNOSTICS – ENGINE (1GR-FE)

Both of the following conditions are met before IG switch OFF	Condition 1 and 2	
1. Duration that vehicle is driven	5 min.	-
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Time after key off	5 or 7 or 9.5 hours	
EVAP key-off monitor sequence	1 to 8	
1. Atmospheric pressure	-	
Next sequence is run if the following condition is set	-	
Atmospheric pressure change	-	0.3 kPa (2.25 mmHg) for 1 sec.
2. First reference pressure measurement	-	
Next sequence is run if all of the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.38 to -7.93 mmHg)	
3. Reference pressure	Saturated	
3. EVAP canister vent valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	-
4. Vacuum introduction	-	
Next sequence is run if the following condition is set	Condition 1 and 2	
EVAP pressure	Saturated within 12 minutes	
5. EVAP canister purge valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	-
6. Second reference pressure measurement	-	
Next sequence is run if all of the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure measurement	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.4 to -7.92 mmHg)	
3. Reference pressure	Saturated	
4. Difference between first reference pressure and second reference pressure	-	0.7 kPa (5.25 mmHg)

7. Leak check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure when vacuum introduction is complete	–	Second reference pressure
8. Atmospheric pressure	–	
EVAP monitor is complete is the following condition is set	–	
Atmospheric pressure difference between sequence 1 and 8	–	0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Vent valve stuck open:	
One of the following conditions is set	Condition 1, 2, 3, 4 or 5
1. EVAP pressure just after reference pressure measurement start	–1 kPa (–7.5 mmHg) or more
2. Reference pressure	–4.85 kPa (–36.38 mmHg) or less
3. Reference pressure	–1.057 kPa (–7.93 mmHg) or more
4. Reference pressure	Not saturated
5. Difference between first reference pressure and second reference pressure	More than 0.7 kPa (5.25 mmHg)
Vent valve stuck closed:	
EVAP pressure change after EVAP canister vent valve is ON	Less than 0.3 kPa (2.25 mmHg)

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-26](#) for detailed information.

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

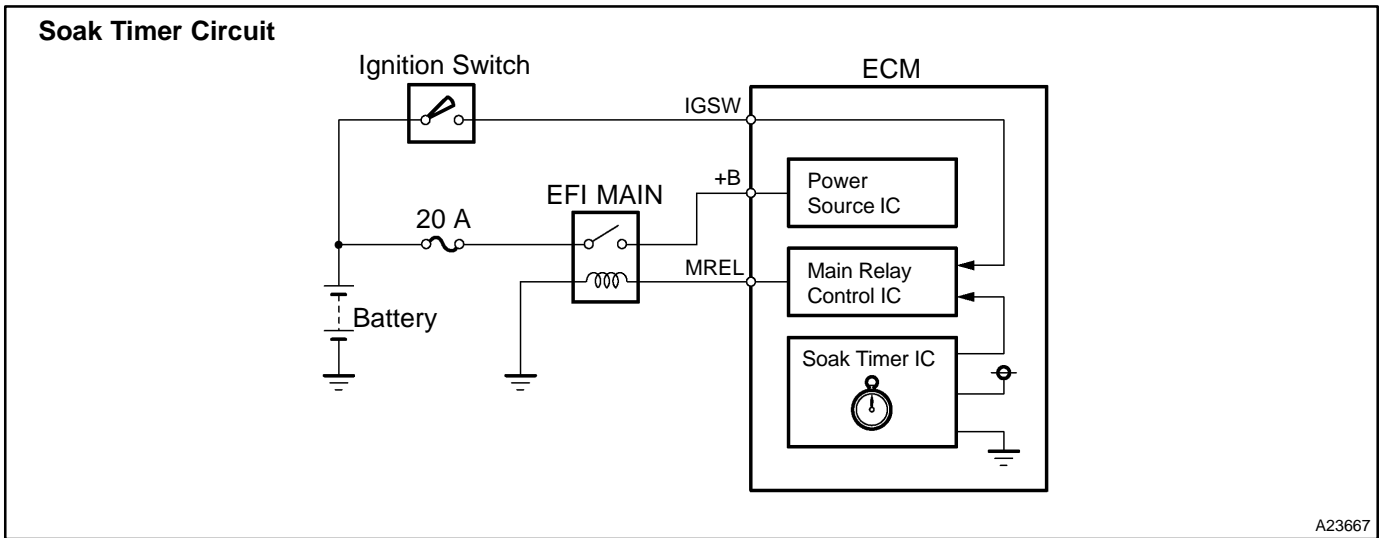
DTC	P2610	ECM/PCM Internal Engine OFF Timer Performance
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DTC SUMMARY

DTC	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P2610	Soak timer (built into ECM)	ECM internal malfunction	ECM	Engine running	2 trip

CIRCUIT DESCRIPTION

To ensure the accuracy of the EVAP (Evaporative Emission) monitor values, the soak timer, which is built into the ECM, measures 5 hours (± 15 minutes) from when the ignition switch is turned OFF, before the monitor is run. This allows the fuel to cool down, which stabilizes the Fuel Tank Pressure (FTP). When 5 hours have elapsed, the ECM turns on.



MONITOR DESCRIPTION

5 hours after the ignition switch is turned OFF, the soak timer activates the ECM to begin the EVAP system monitor. While the engine is running, the ECM monitors the synchronization of the soak timer and the CPU clock. If these two are not synchronized, the ECM interprets this as a malfunction, illuminates the MIL and sets the DTC (2 trip detection logic).

MONITOR STRATEGY

Related DTCs	P2610	Soak timer (built into ECM)
Required sensors/components	ECM	
Frequency of operation	Once per driving cycle	
Duration	10 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Soak time measurement when ECM CPU clock counts 10 min.	Less than 7 min., or more than 13 min.

INSPECTION PROCEDURE

HINT:

- DTC P2610 is set if an internal ECM problem is detected. Diagnostic procedures are not required. ECM replacement is required.
- Read freeze frame data using a hand-held tester or OBD II scan tool. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Replace ECM (See page SF-66).
----------	--

NEXT

Check whether DTC output recurs.

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Clear DTCs (see page [DI-42](#)).
- (d) Start the engine and wait for 10 minutes or more.
- (e) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (f) If no pending DTC is displayed, the repair has been successfully completed.

DTC	P043E	Evaporate Emission System Reference Orifice Clog Up
------------	--------------	--

DTC	P043F	Evaporate Emission System Reference Orifice High Flow
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

DTC	Monitoring Item	Detection Conditions	Trouble Areas	Detection Timing	Detection Logic
P043E	0.02 inch orifice clogged	One of following conditions are met: <ul style="list-style-type: none"> • 0.02 inch orifice low-flow • 0.02 inch orifice high-flow • Vacuum pump ON stuck • Vacuum pump OFF stuck • Vent valve ON (Closed) stuck 	<ul style="list-style-type: none"> • Pump module • Connector / Wire harness (Pump module - ECM) • ECM 	While ignition switch OFF	2 trips
P043F	0.02 inch orifice high-flow	NOTE: P043E, P043F, P2401, P2402 and P2419 have same DTC detection conditions.			

WIRING DIAGRAM

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

MONITOR DESCRIPTION

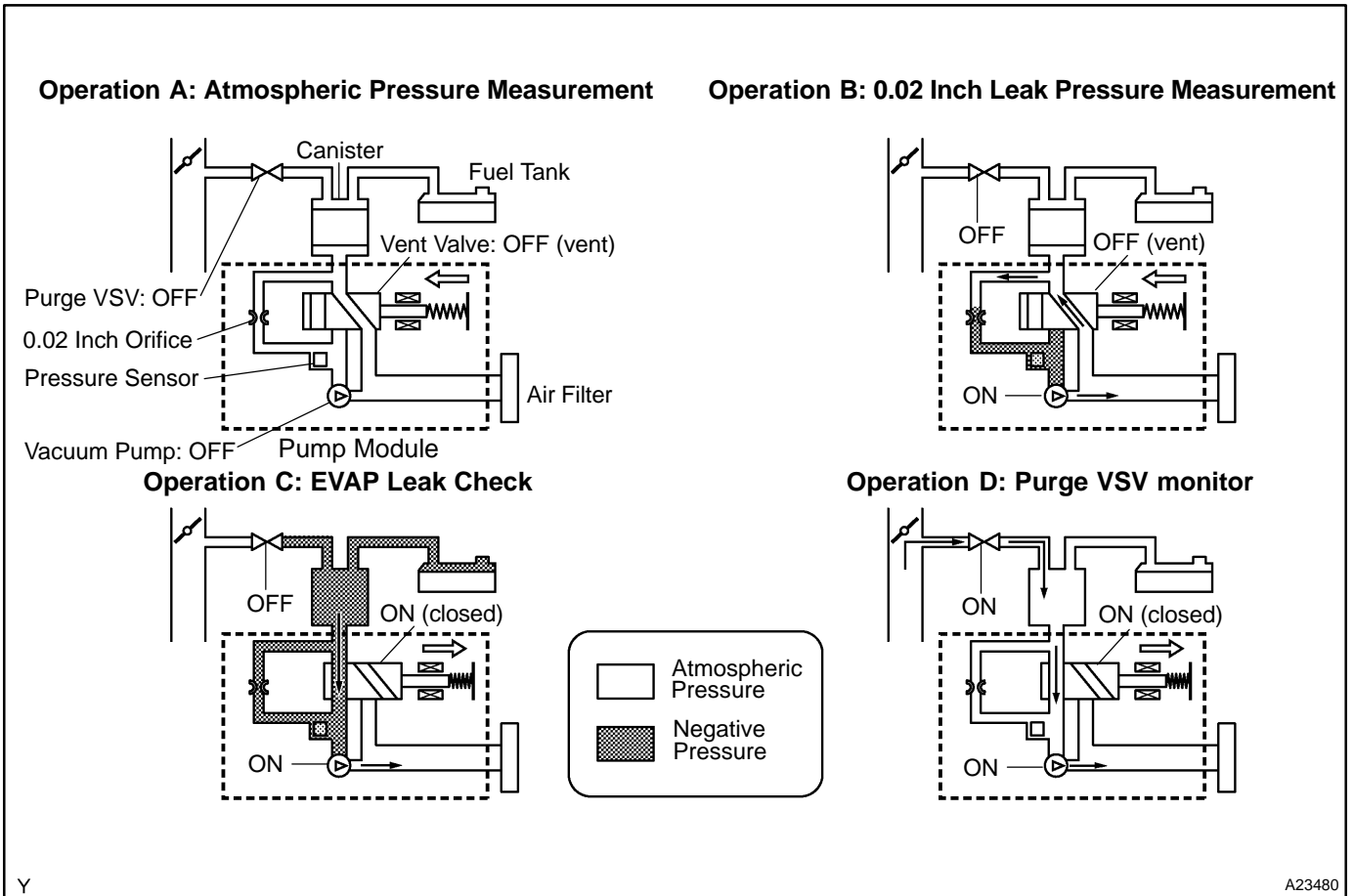
5 hours after the ignition switch is turned to OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

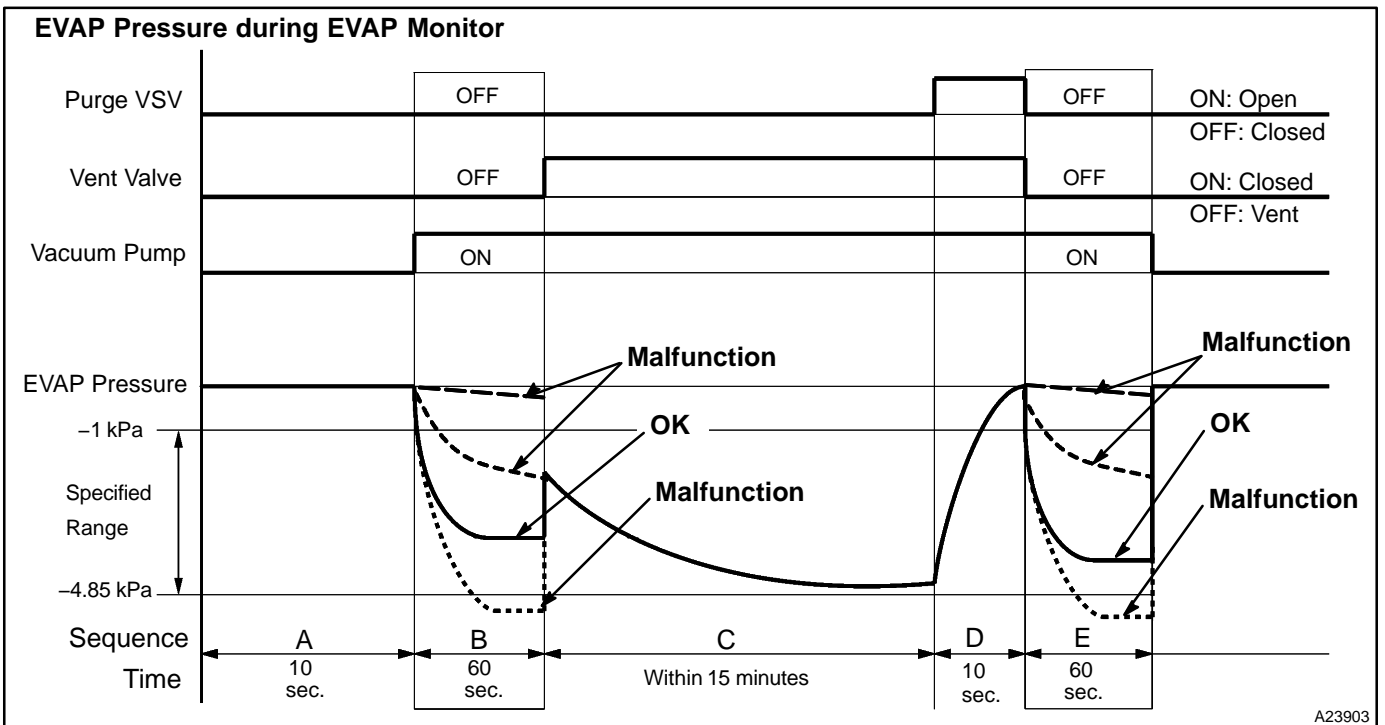
*: If the engine coolant temperature is not below 35°C (95°F) after 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure does not reach between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	0.02 inch leak pressure measurement	Leak check is performed after 0.02 inch reference pressure is measured. If stabilized system pressure higher than 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



In sequence B and E, to determine the leak criterion, the vacuum pump creates negative pressure in the canister pump module through the 0.02 inch orifice. If the pressure is out of specified range or is not saturated, the ECM illuminates the MIL and sets DTCs P043E, P043F, P2401, P2402 and P2419 (2-trip detection logic).



MONITOR STRATEGY

Related DTCs	P043E	0.02 inch orifice clog (built-in pump module)
	P043F	0.02 inch orifice high-flow (built-in pump module)
Required sensors/components	Pump module	
Frequency of operation	Once per driving cycle	
Duration	Within 2 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	–
Vehicle speed	–	2.5 mph (4 km/h)
Ignition switch	OFF	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions are met before IG switch OFF	Condition 1 and 2	
1. Duration that vehicle is driven	5 min.	–
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Time after key off	5 or 7 or 9.5 hours	
EVAP key-off monitor sequence	1 to 8	
1. Atmospheric pressure	–	
Next sequence is run if the following condition is set	–	
Atmospheric pressure change	–	0.3 kPa (2.25 mmHg) for 1 sec.
2. First reference pressure measurement	–	
Next sequence is run if all of the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	–	–1 kPa (–7.5 mmHg)
2. Reference pressure	–4.85 to –1.057 kPa (–36.38 to –7.93 mmHg)	
3. Reference pressure	Saturated	

DIAGNOSTICS – ENGINE (1GR-FE)

3. EVAP canister vent valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	-
4. Vacuum introduction	-	
Next sequence is run if the following condition is set	Condition 1 and 2	
EVAP pressure	Saturated within 12 minutes	
5. EVAP canister purge valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	-
6. Second reference pressure measurement	-	
Next sequence is run if all of the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure measurement	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.4 to -7.92 mmHg)	
3. Reference pressure	Saturated	
4. Difference between first reference pressure and second reference pressure	-	0.7 kPa (5.25 mmHg)
7. Leak check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure when vacuum introduction is complete	-	Less than second reference pressure
8. Atmospheric pressure measurement	-	
EVAP monitor is complete if the following condition is set	-	
Atmospheric pressure difference between sequence 1 and 8	-	0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
One of the following conditions is met	Condition 1, 2, 3, 4 or 5
1. EVAP pressure just after reference pressure measurement start	More than -1 kPa (-7.5 mmHg)
2. Reference pressure	Less than -4.85 kPa (-36.4 mmHg)
3. Reference pressure	-1.057 kPa (-7.9 mmHg) or more
4. Reference pressure	Not saturated
5. Difference between first reference pressure and second reference pressure	0.7 kPa (5.3 mmHg) or more

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-26](#) for detailed information on Monitor Result.

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [DI-368](#)).

DTC	P2A00	A/F Sensor Circuit Slow Response (Bank 1 Sensor 1)
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DTC	P2A03	A/F Sensor Circuit Slow Response (Bank 2 Sensor 1)
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CIRCUIT DESCRIPTION

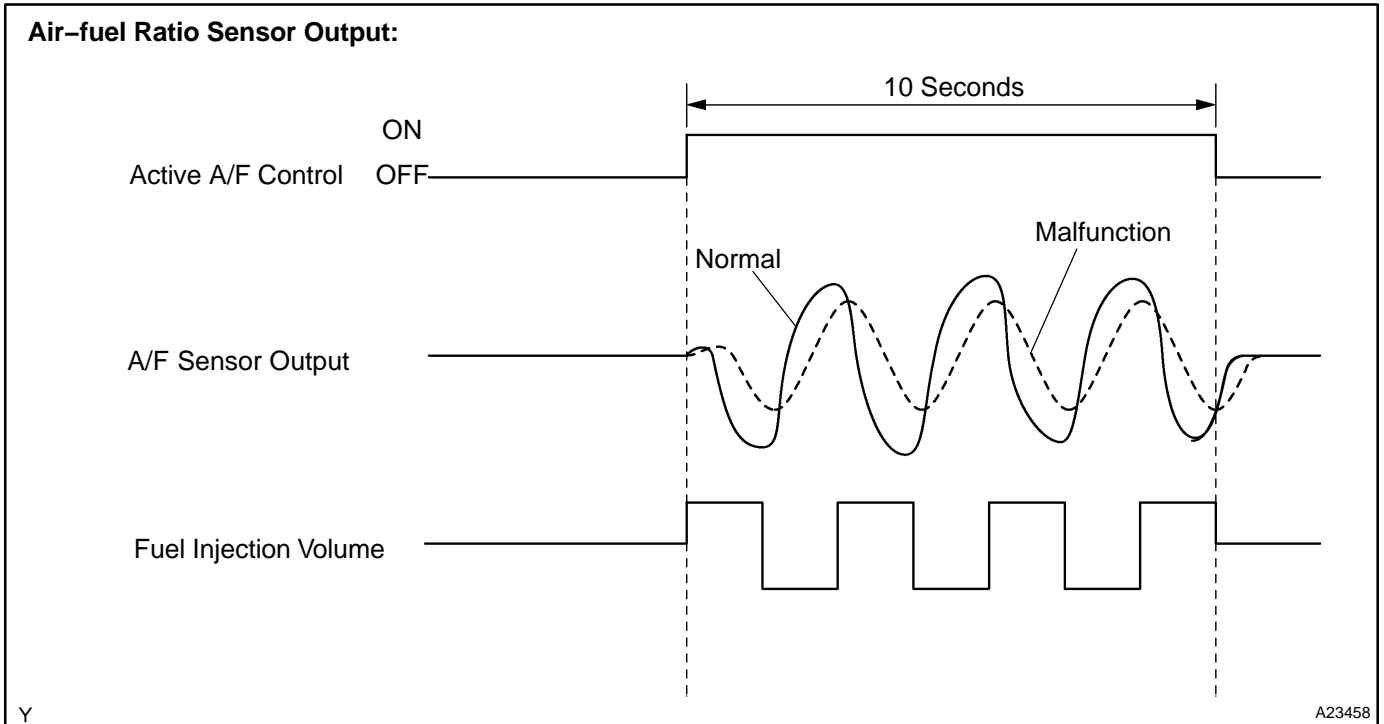
Refer to DTC P2195 on page [DI-312](#).

DTC No.	DTC Detection Conditions	Trouble Areas
P2A00 P2A03	Calculated test value for A/F sensor response rate deterioration level is less than threshold.	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • ECM

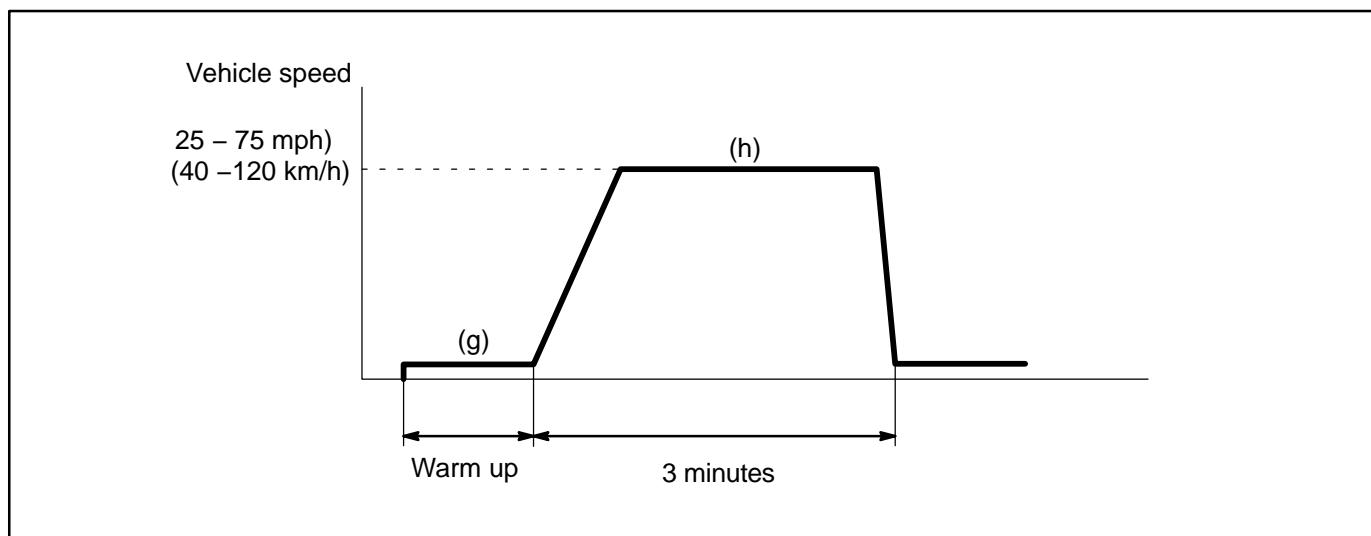
MONITOR DESCRIPTION

After engine is warmed up, the ECM performs air-fuel ratio feedback control to regulate the air-fuel ratio at stoichiometric ratio. In addition, this vehicle performs Active A/F Ratio Control for approximately 10 seconds after preconditions met in order to measure the A/F sensor response rate. During active air-fuel ratio control, the ECM forcibly increases and decreases the injection volume for certain amount based on learned stoichiometric air -fuel ratio during usual air-fuel feedback control, and measures the A/F sensor response rate. The ECM calculates the signal from the A/F sensor while value for A/F sensor response rate deterioration level.

If the test value for A/F sensor response rate deterioration level is less than threshold, ECM interprets this as a malfunction, and sets the DTC.



CONFIRMATION DRIVING PATTERN



- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Turn the hand-held tester ON.
- (d) Clear DTCs.
- (e) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/MONITOR INFO/MONITOR RESULT.
- (f) Check that RES RATE B1 S1 is INCOMPL.
- (g) Start the engine and warm it up.
- (h) Drive the vehicle at between 25 mph and 75 mph (40 km/h and 120km/h) for 3 minutes. However, the vehicle should be driven at constant-speed.
- (i) When detection is complete, Response rate of MONITOR RESULT changes.
If the value does not change, perform step (h) once more.
- (j) Notes the value of the Monitor Result.
- (k) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/DTC INFO/ PENDING CODES.
- (l) Check if any DTCs (any pending DTCs) are set.

MONITOR STRATEGY

Related DTCs	P2A00	A/F sensor (Bank 1) slow response
	P2A03	A/F sensor (Bank 2) slow response
Required sensors/components	A/F sensor	
Frequency of operation	Once per driving cycle	
Duration	10 to 15 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-18	
Active A/F control is performed when the following conditions are set	-	
Battery voltage	11 V	-
ECT	75° C (167° F)	-
Idle	OFF	
Engine RPM	-	4,000 rpm
A/F sensor status	Activated	
Fuel cut	OFF	
Engine load	10 to 70%	
Shift position	2nd	-
Catalyst monitor	Not yet	
MAF	3 to 10.5 g/sec	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Response rate deterioration level	Less than 0.2 V

WIRING DIAGRAM

Refer to DTC P2195 on page [DI-312](#).

INSPECTION PROCEDURE

HINT:

Hand-held tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- (1) Connect a hand-held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 (AFS B2S1) and OS2 B1S2 (O2S B2S2)) displayed on the tester.

HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

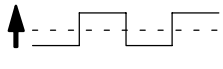
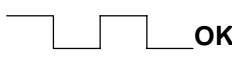
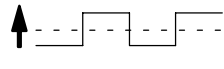
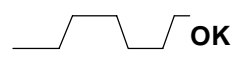
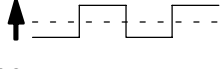
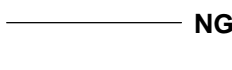
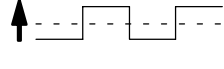
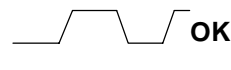
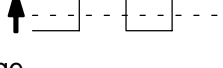
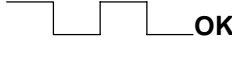
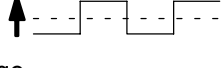
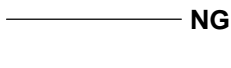
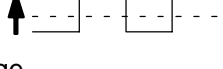

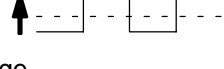

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0 V	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	—
2	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0V	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

HINT:

- DTC P2A00 and/or P2A03 may be also set, when the air-fuel ratio is stuck rich or lean.
- A low A/F sensor voltage could be caused by a rich air-fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air-fuel mixture. Check for conditions that would cause the engine to run lean.
- Read freeze frame data using a hand-held tester or OBD II scan tool. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1 Check any other DTCs output (in addition to DTC P2A00 or P2A03).

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

- (a) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2A00 and/or P2A03	A
P2A00 and/or P2A03 and other DTCs	B

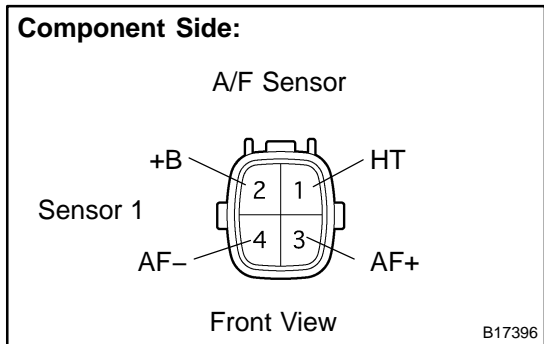
HINT:

If any DTCs other than P2A00 and/or P2A03 are output, troubleshoot those DTCs first.

B Go to DTC chart (See page [DI-57](#)).

A

2 Check resistance of air-fuel ratio (A/F) sensor heater.



PREPARATION:

Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

OK:

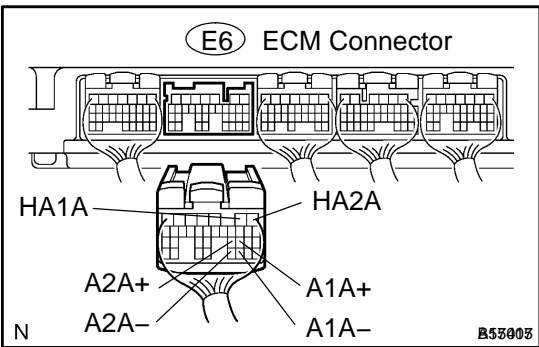
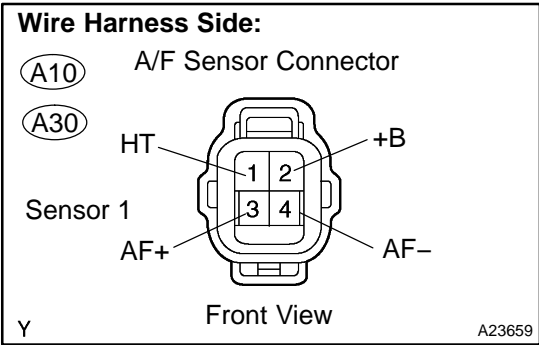
Standard:

Tester Connection	Specified Condition
HT (1) - +B (2)	1.8 Ω to 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 kΩ or higher

NG Replace air-fuel ratio (A/F) sensor.

OK

3 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Turn the ignition switch to ON.

CHECK:

- (a) Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

OK:

Standard:

Tester Connections	Specified Conditions
+B (2) - Body ground	9 V to 14 V

PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E6 ECM connector.

CHECK:

- (a) Check the resistance.

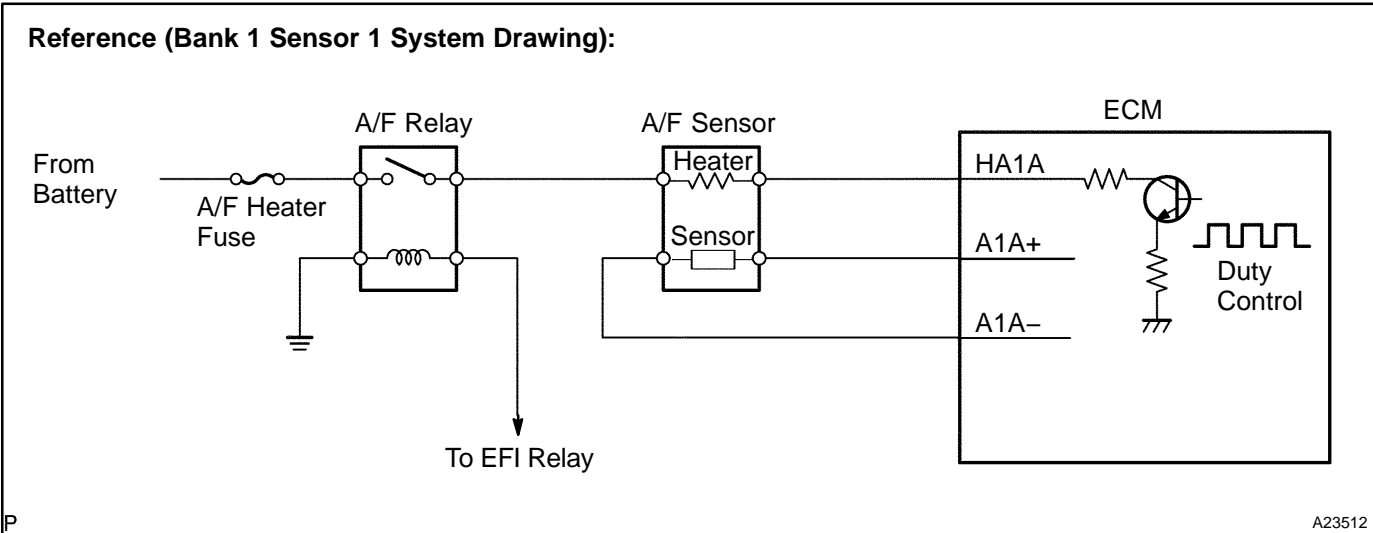
OK:

Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω
AF+ (A10-3) - A1A+ (E6-22) AF+ (A30-3) - A2A+ (E6-23)	Below 1 Ω
AF- (A10-4) - A1A- (E6-30) AF- (A30-4) - A2A- (E6-31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher
AF+ (A10-3) or A1A+ (E6-22) - Body ground AF+ (A30-3) or A2A+ (E6-23) - Body ground	10 kΩ or higher
AF- (A10-4) or A1A- (E6-30) - Body ground AF- (A30-4) or A2A- (E6-31) - Body ground	10 kΩ or higher



NG

Replace or replace harness or connector.

OK

4 Perform confirmation driving pattern.

NEXT

5 Check whether DTC output recurs (DTC P2A00 or P2A03)

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2A00 or P2A03	A
No output	B

B

Check for intermittent problems
(See page [DI-11](#)).

A

6 Replace air fuel ratio sensor.

NEXT

7 Perform confirmation driving pattern.

NEXT

8	Check whether DTC output recurs (DTC P2A00 or P2A03)
----------	---

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2A00 or P2A03	A
No output	B

A → **Check air-fuel ratio extremely lean or rich (See page [DI-160](#)).**

B

END

EVAP (Evaporative Emission) Inspection Procedure

DTCS RELATING TO EVAP SYSTEM

DTCs	Monitoring Items	See Page
P043E	0.02 inch orifice clogged (built into pump module)	DI-353
P043F	0.02 inch orifice high-flow (built into pump module)	DI-353
P0441	<ul style="list-style-type: none"> Purge VSV (Vacuum Switching Valve) stuck closed Purge VSV stuck open Purge flow 	DI-236
P0450	Pressure sensor (built into pump module) voltage abnormal fluctuation	DI-243
P0451	<ul style="list-style-type: none"> Pressure sensor (built into pump module) noise Pressure sensor (built into pump module) signal becomes fixed/flat 	DI-243
P0452	Pressure sensor (built into pump module) voltage low	DI-243
P0453	Pressure sensor (built into pump module) voltage high	DI-243
P0455	EVAP gross leak	DI-252
P0456	EVAP small leak	DI-252
P2401	Vacuum pump stuck OFF (built into pump module)	DI-339
P2402	Vacuum pump stuck ON (built into pump module)	DI-339
P2419	Vent valve stuck open (vent) (built into pump module)	DI-345
P2420	Vent valve stuck closed (built into pump module)	DI-345
P2610	Soak timer (built into ECM)	DI-351

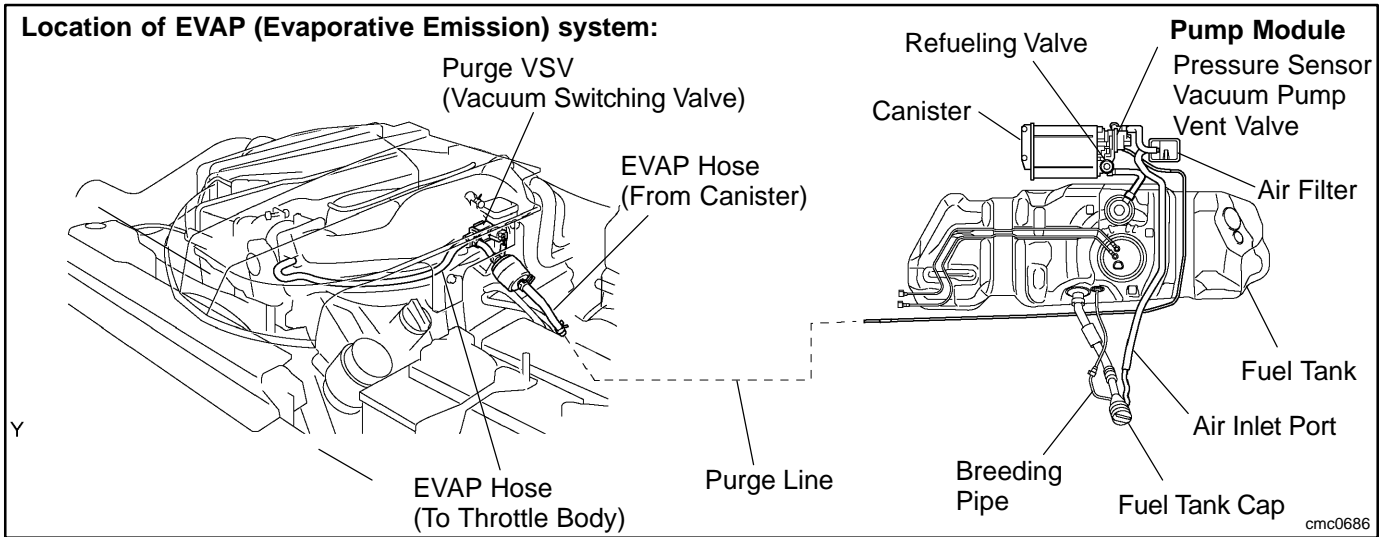
If any EVAP system DTCs are set, the malfunctioning area can be determined using the table below.

Malfunctioning Areas	DTCs											
	P043E P043F	P0441	P0450	P0451	P0452	P0453	P0455	P0456	P2401 P2402	P2419	P2420	
0.02 inch orifice clogged	●								●	●		
0.02 inch orifice high-flow	●								●	●		
Purge VSV stuck open		●					●					
Purge VSV stuck closed		●										
Pressure sensor stuck				●								
Pressure sensor noise				●								
Pressure sensor low output			●		●							
Pressure sensor high output			●			●						
Gross leak		●					●					
Small leak								●				
Vacuum pump stuck OFF	●								●	●		
Vacuum pump stuck ON	●								●	●		
Vent valve stuck open (vent)	●								●	●		
Vent valve stuck closed											●	

NOTICE:

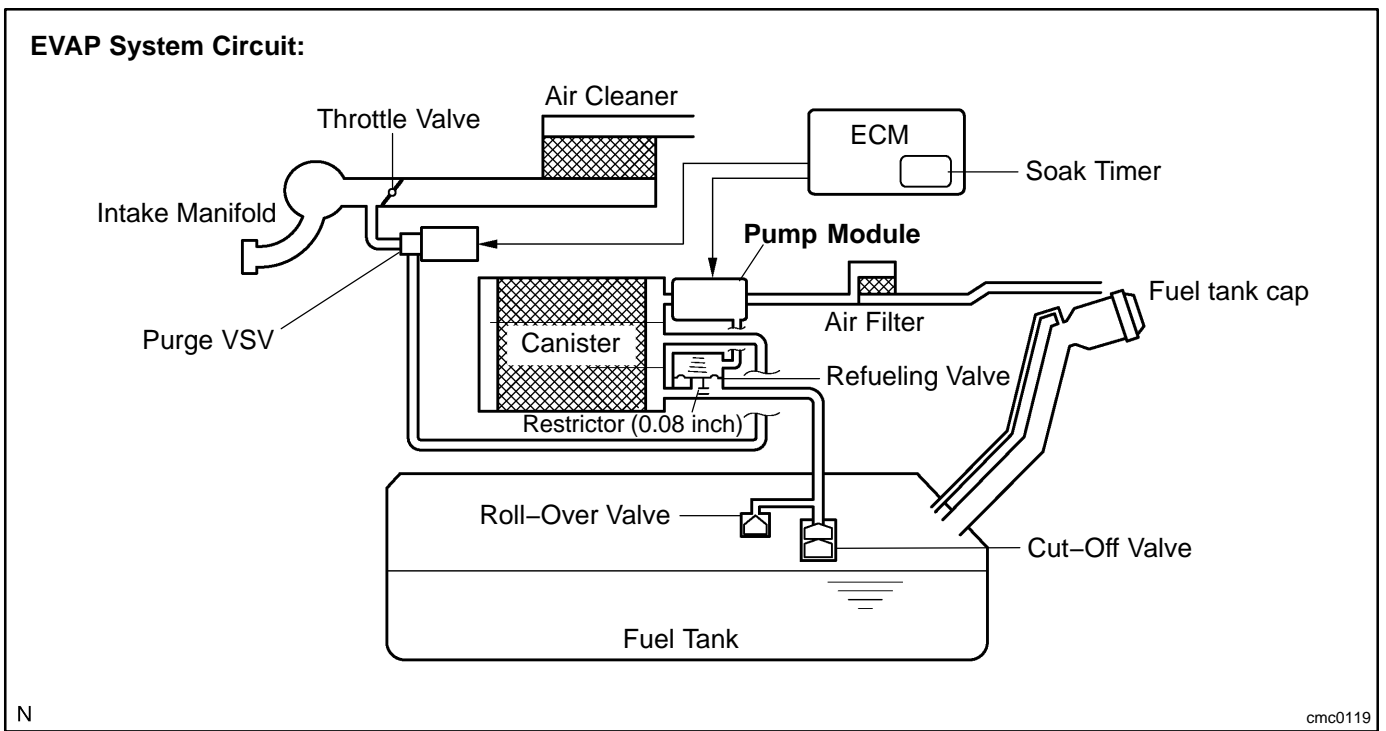
If the 0.02 inch reference pressure difference between the first and second checks is greater than the specification, the DTCs corresponding to the reference pressure (P043E, P043F, P0441, P0455, P0456, P2401, P2420) will be all stored.

CIRCUIT DESCRIPTION



HINT:

The canister is located near the fuel tank, underneath the body.



While the engine is running, if a predetermined condition (closed-loop, etc.) is met, the purge VSV is opened by the ECM and stored fuel vapors in the canister are purged to the intake manifold. The ECM changes the duty cycle ratio of the purge VSV to control purge flow volume.

The purge flow volume is also determined by the intake manifold pressure. Atmospheric pressure is allowed into the canister through the vent valve to ensure that the purge flow is maintained when the negative pressure (vacuum) is applied to the canister.

The following two monitors run to confirm appropriate EVAP system operation.

Key-off monitor

This monitor checks for EVAP (Evaporative Emission) system leaks and pump module malfunctions. The monitor starts 5 hours* after the ignition switch is turned OFF. More than 5 hours are required to allow enough time for the fuel to cool down to stabilize the Fuel Tank Pressure (FTP), thus making the EVAP system monitor more accurate.

The electric vacuum pump creates negative pressure (vacuum) in the EVAP system and the pressure is measured. Finally, the ECM monitors for leaks from the EVAP system, and malfunctions in both the pump module and purge VSV, based on the EVAP pressure.

HINT:

*:If the engine coolant temperature is not below 35°C 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

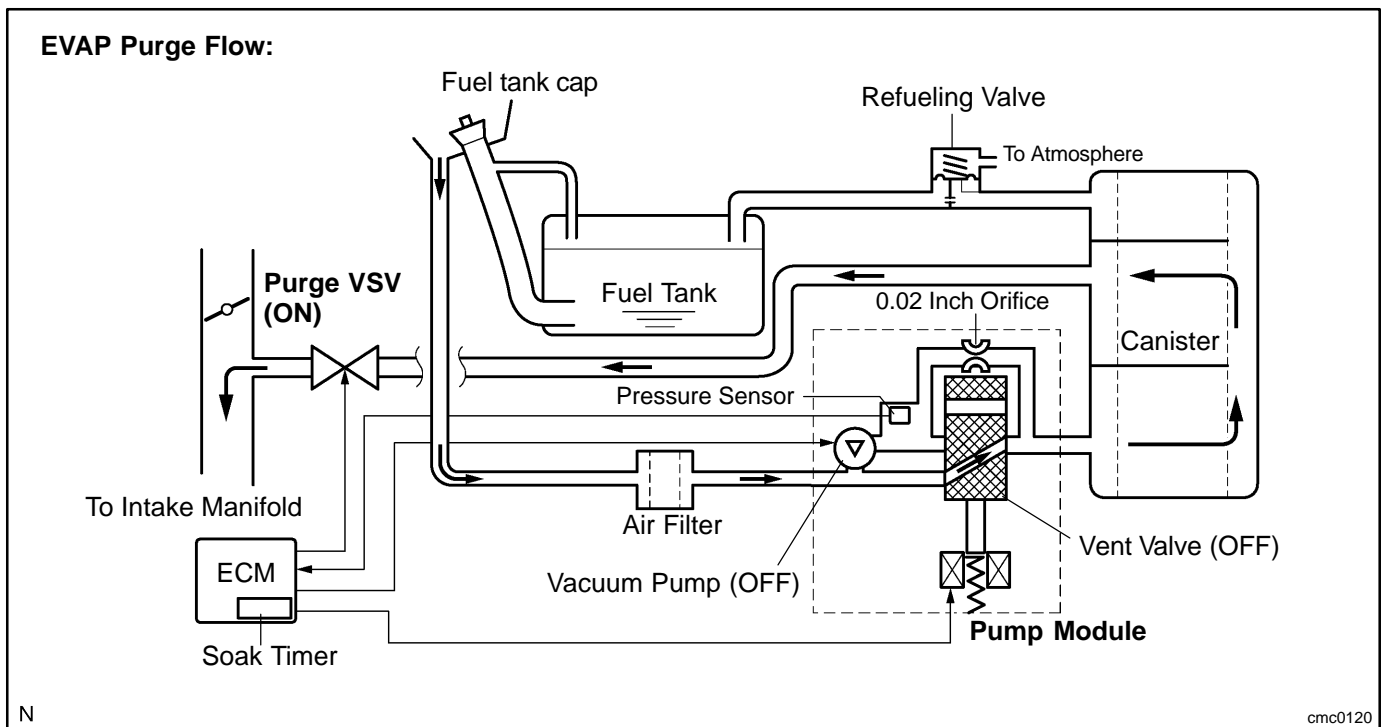
Purge flow monitor

The purge flow monitor consists of the two monitors. The 1st monitor is always conducted every time and the 2nd monitor is activated if necessary.

- The 1st monitor
While the engine is running and the purge VSV (Vacuum Switching Valve) is ON (open), the ECM monitors the purge flow by measuring the EVAP pressure change. If negative pressure is not created, the ECM begins the 2nd monitor.
- The 2nd monitor
The vent valve is turned ON (closed) and the EVAP pressure is then measured. If the variation in the pressure is less than 0.5 kpa (3.75 mmHg), the ECM interprets this as the purge VSV being stuck closed, and illuminates the MIL and sets DTC P0441 (2 trip detection logic).

Atmospheric pressure check:

In order to ensure reliable malfunction detection, the variation between the atmospheric pressures, before and after conduction of the purge flow monitor, is measured by the ECM.

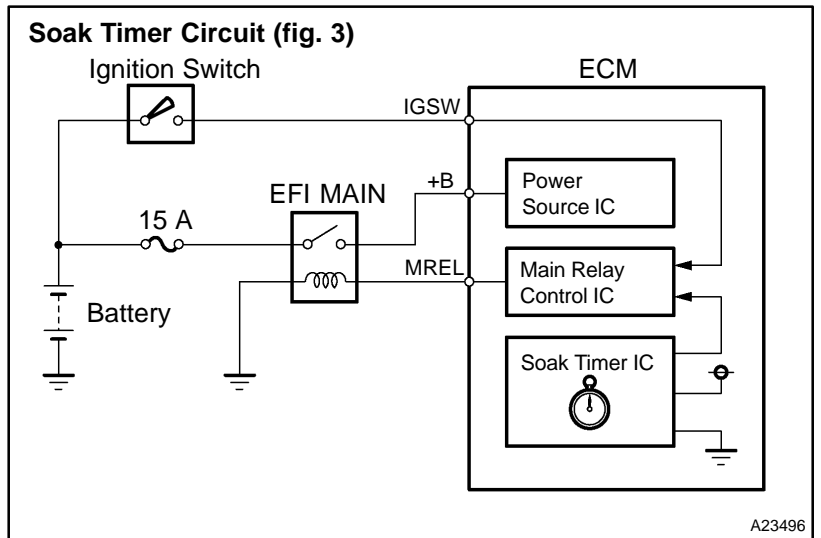
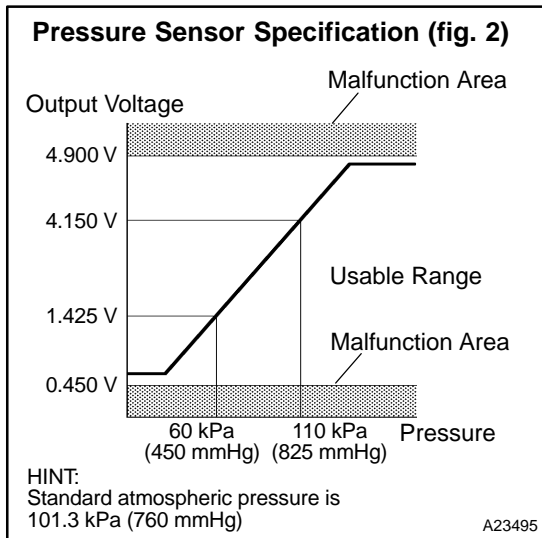
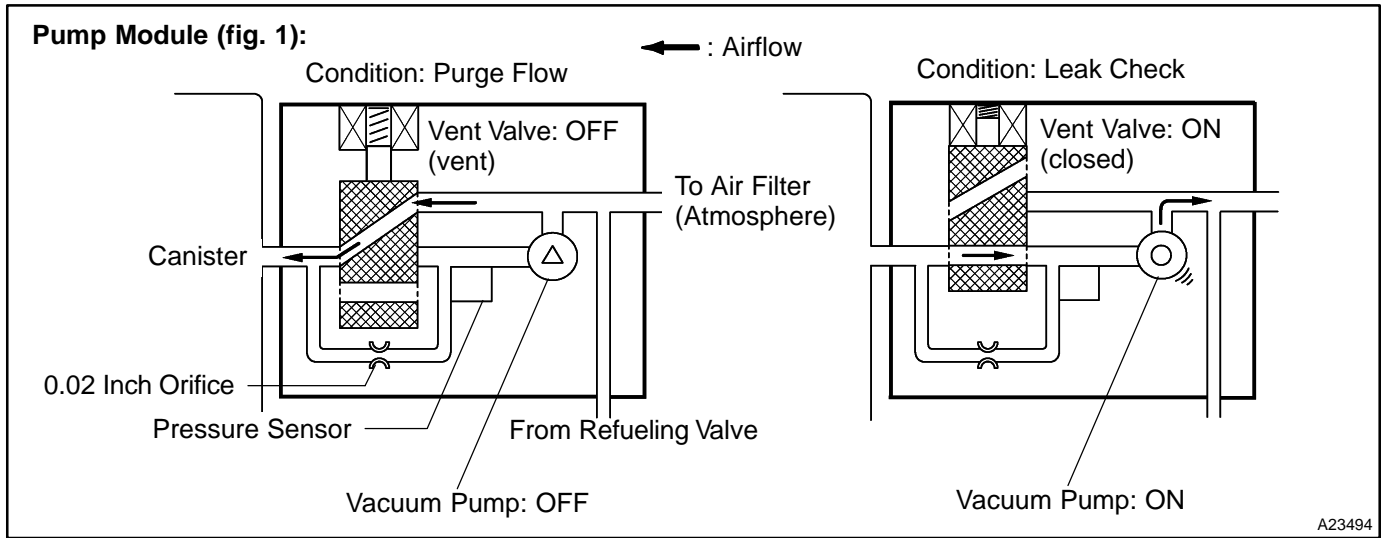


DIAGNOSTICS – ENGINE (1GR-FE)

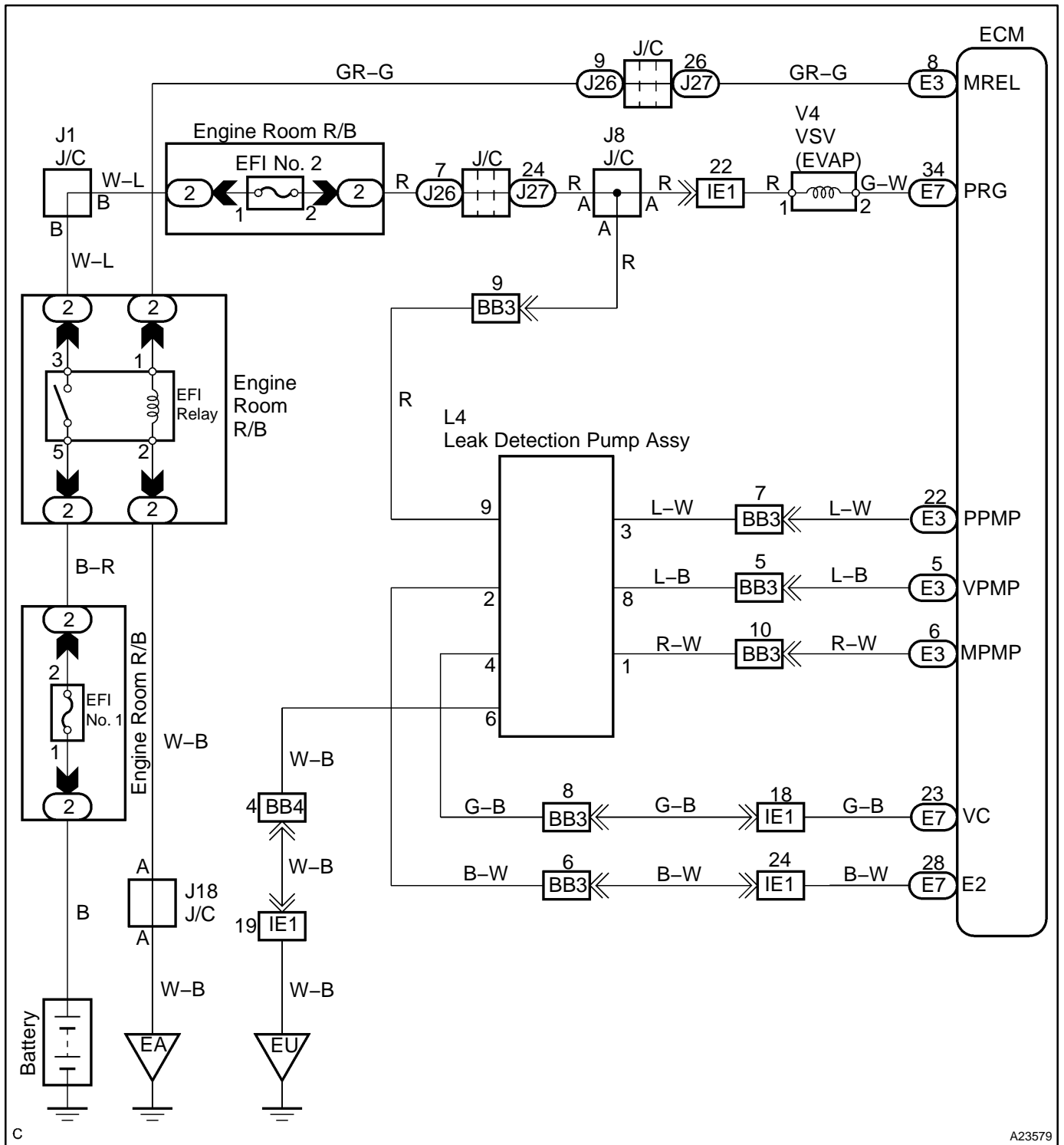
Components	Operations
Canister	Contains activated charcoal to absorb EVAP (Evaporative Emissions) generated in fuel tank.
Cut-off valve	Located in fuel tank. Valve floats and closes when fuel tank is 100 % full.
Purge VSV (Vacuum Switching Valve)	Opens or closes line between canister and intake manifold. ECM uses purge VSV to control EVAP purge flow. In order to discharge EVAP absorbed by canister to intake manifold, ECM opens purge VSV. EVAP discharge volume to intake manifold controlled by purge VSV duty cycle ratio (current-carrying time). (Open: ON, Close: OFF)
Refueling valve	Controls EVAP pressure from fuel tank to canister. Valve consists of diaphragm, spring and restrictor (diameter: 0.08 inch). When fuel vapor and pressure inside fuel tank increase, valve opens. While EVAP purged, valve closes and restrictor prevents large amount of vacuum from affecting pressure in fuel tank. Valve opened while refueling. When valve open, adding fuel into fuel tank possible.
Roll-over valve	Located in fuel tank. Valve closes by its own weight when vehicle overturns to prevent fuel from spilling out.
Service port	Used for connecting vacuum gauge for inspecting EVAP system.
Soak timer	Built into ECM. To ensure accurate EVAP monitor, measures 5 hours* after ignition switch turned to OFF. This allows fuel to cool down, stabilizing Fuel Tank Pressure (FTP). When approx. 5 hours* elapsed, ECM activates.
Pump module	Consists of (a) to (d) below. Pump module cannot be disassembled.
(a) Vent valve	Vents and closes EVAP system. When ECM turns valve ON, EVAP system closed. When, ECM turns valve OFF, EVAP system vented. Negative pressure (vacuum) created in EVAP system to check for EVAP leaks by closing purge VSV, turning on vent valve (closed) and operating vacuum pump (refer to fig. 1).
(b) Pressure sensor	Indicates pressure as voltages. ECM supplies regulated 5 V to pressure sensor, and uses feedback from sensor to monitor EVAP system pressure (refer to fig 2).
(c) Vacuum pump	Creates negative pressure (vacuum) in EVAP system for leak check.
(d) 0.02 inch orifice	Has opening with 0.02 inch diameter. Vacuum produced through orifice by closing purge VSV, turning off vent valve and operating vacuum pump, to monitor 0.02 inch leak pressure. 0.02 inch leak pressure indicates small leak of EVAP.

HINT:

*:If the engine coolant temperature is not below 35°C after 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.



WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

A hand-held tester is required to conduct the following diagnostic troubleshooting procedure.

HINT:

- Using hand-held tester monitor results enables the EVAP (Evaporative Emission) system to be confirmed.
- Read freeze frame data using a hand-held tester Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Confirm DTC.
----------	---------------------

- Turn the ignition switch to OFF and wait for 10 seconds.
- Turn the ignition switch to ON.
- Turn the ignition switch to OFF and wait for 10 seconds.
- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON and turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Confirm DTCs and freeze frame data.

If any EVAP system DTCs are set, the malfunctioning area can be determined using the table below.

Malfunctioning Areas	DTCs											
	P043E P043F	P0441	P0450	P0451	P0452	P0453	P0455	P0456	P2401 P2402	P2419	P2420	
0.02 inch orifice clogged	●								●	●		
0.02 inch orifice high-flow	●								●	●		
Purge VSV stuck open		●					●					
Purge VSV stuck closed		●										
Pressure sensor signal becomes fixed/flat				●								
Pressure sensor noise				●								
Pressure sensor voltage low			●		●							
Pressure sensor voltage high			●			●						
Gross leak		●					●					
Small leak								●				
Vacuum pump stuck OFF	●								●	●		
Vacuum pump stuck ON	●								●	●		
Vent valve stuck ON (closed)	●								●	●		
Vent valve stuck OFF (vent)											●	

NOTICE:

If the 0.02 inch reference pressure difference between the first and second checks is greater than the specification, the DTCs corresponding to the reference pressure (P043E, P043F, P0441, P0455, P0456, P2401, P2420) will be all stored.

NEXT

2	Perform EVAP system check.
----------	-----------------------------------

NOTICE:

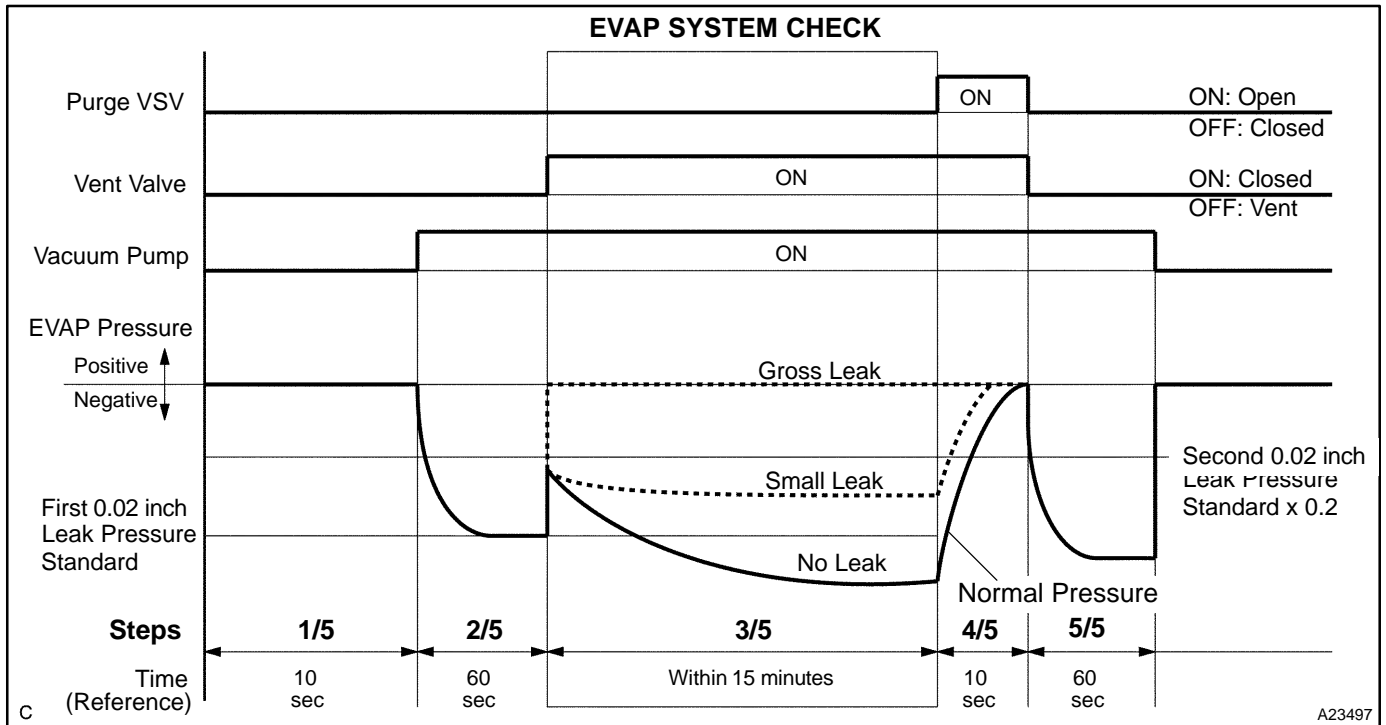
- **In the EVAP SYSTEM CHECK (AUTO OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed automatically by the hand-held tester. It takes a maximum of approximately 18 minutes.**
 - **Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90% full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.**
 - **Do not run the engine in this step.**
 - **When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).**
- (a) Clear DTC (See page [DI-42](#)).
- (b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (c) After the EVAP SYSTEM CHECK is completed, check for pending DTCs by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

HINT:

If no pending DTC is displayed, perform the Monitor Confirmation after this repair is completed. After this confirmation, check for pending DTCs. If no DTC is displayed, the EVAP system is normal.



3 Perform EVAP system manual operation check.

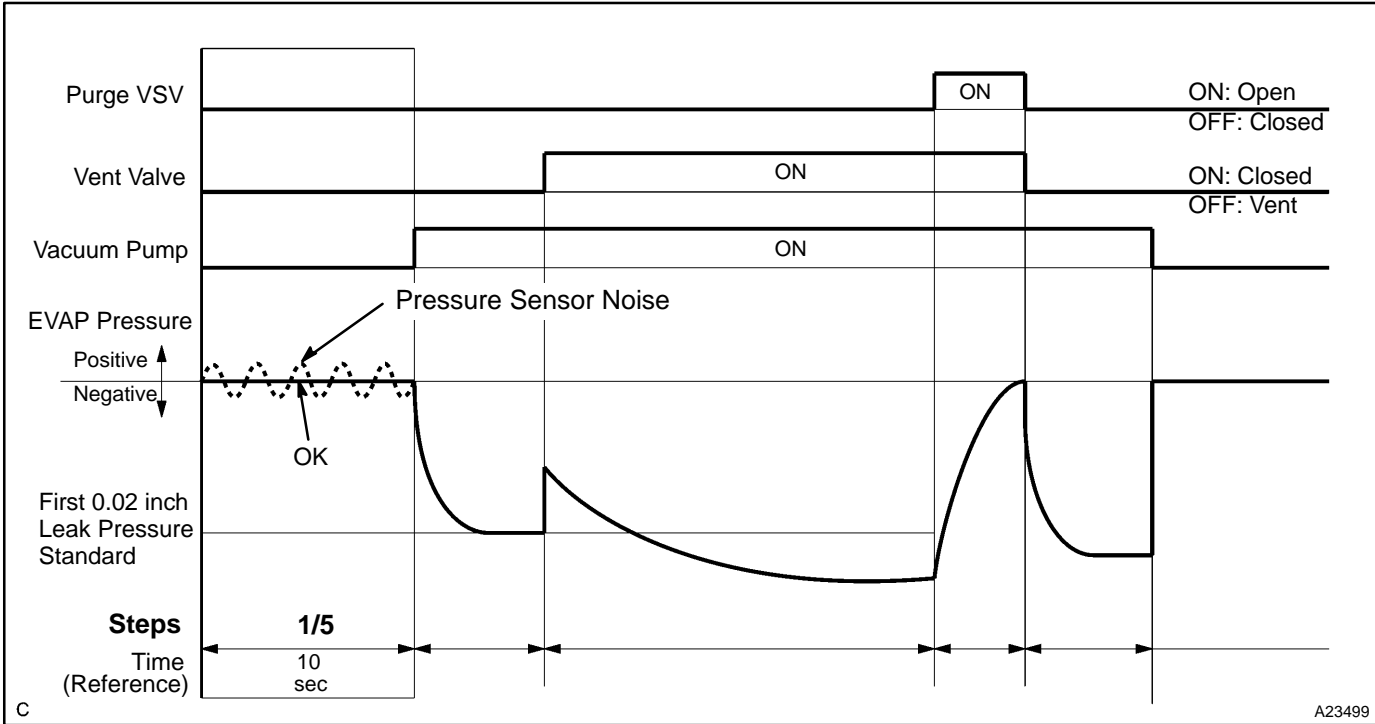


NOTICE:

- In the EVAP SYSTEM CHECK (MANUAL OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed manually by the hand-held tester.
 - Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90% full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.
 - Do not run the engine in this step.
 - When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).
- (a) Clear DTC (See page DI-42).
 - (b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / MANUAL OPERATION.

NEXT

4 Perform EVAP system step 1/5 check.



(a) Check the EVAP pressure in step 1/5.

Result:

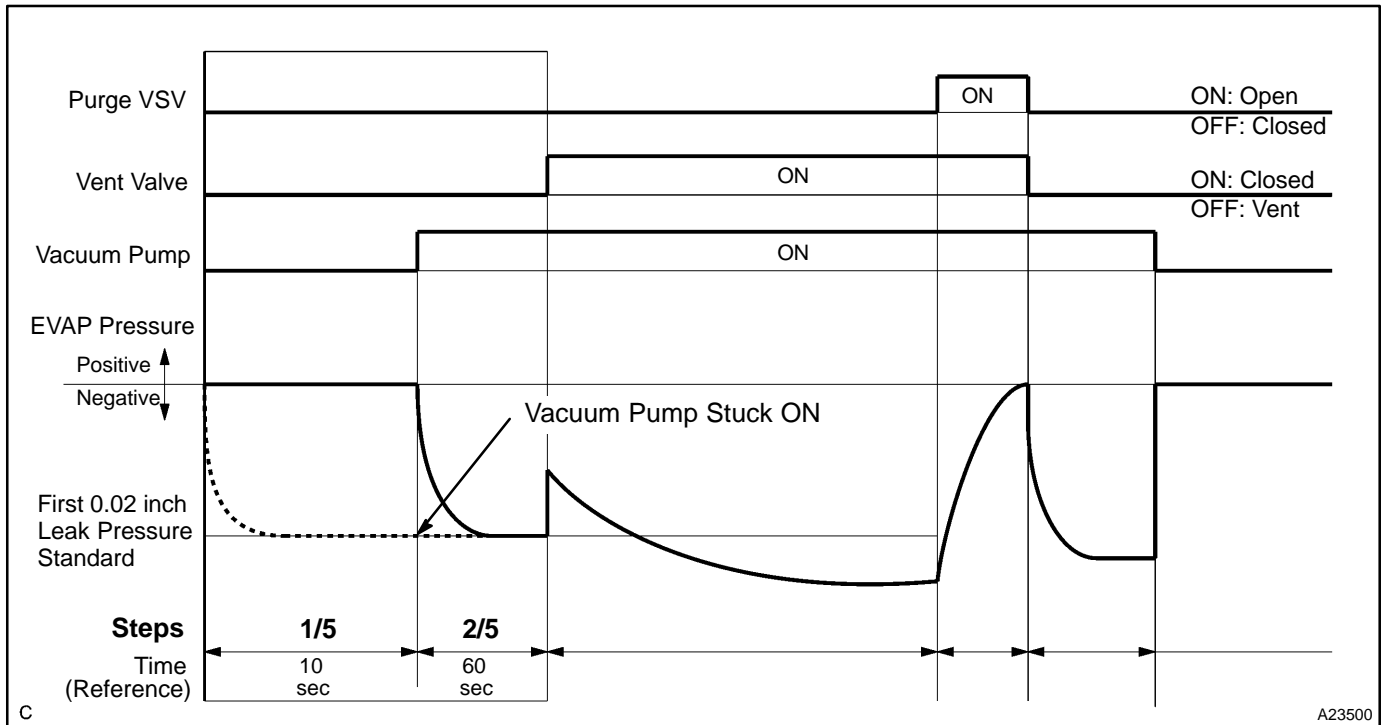
DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	Virtually no variation in EVAP pressure	Not yet determined	A
P0451	EVAP pressure fluctuates by ± 0.3 kPa (2.25 mmHg) or more	Pressure sensor noising	B

*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

B Go to step 30

A

5 Perform EVAP system step 1/5 to 2/5 check.



(a) Check the EVAP pressure in step 1/5 and 2/5.

Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	Virtually no variation in EVAP pressure during step 1/5. Then decreases to 0.02 inch leak pressure standard*	Not yet determined	A
P2402	Small difference between EVAP pressures during steps 1/5 and 2/5	Vacuum pump stuck ON	B

*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

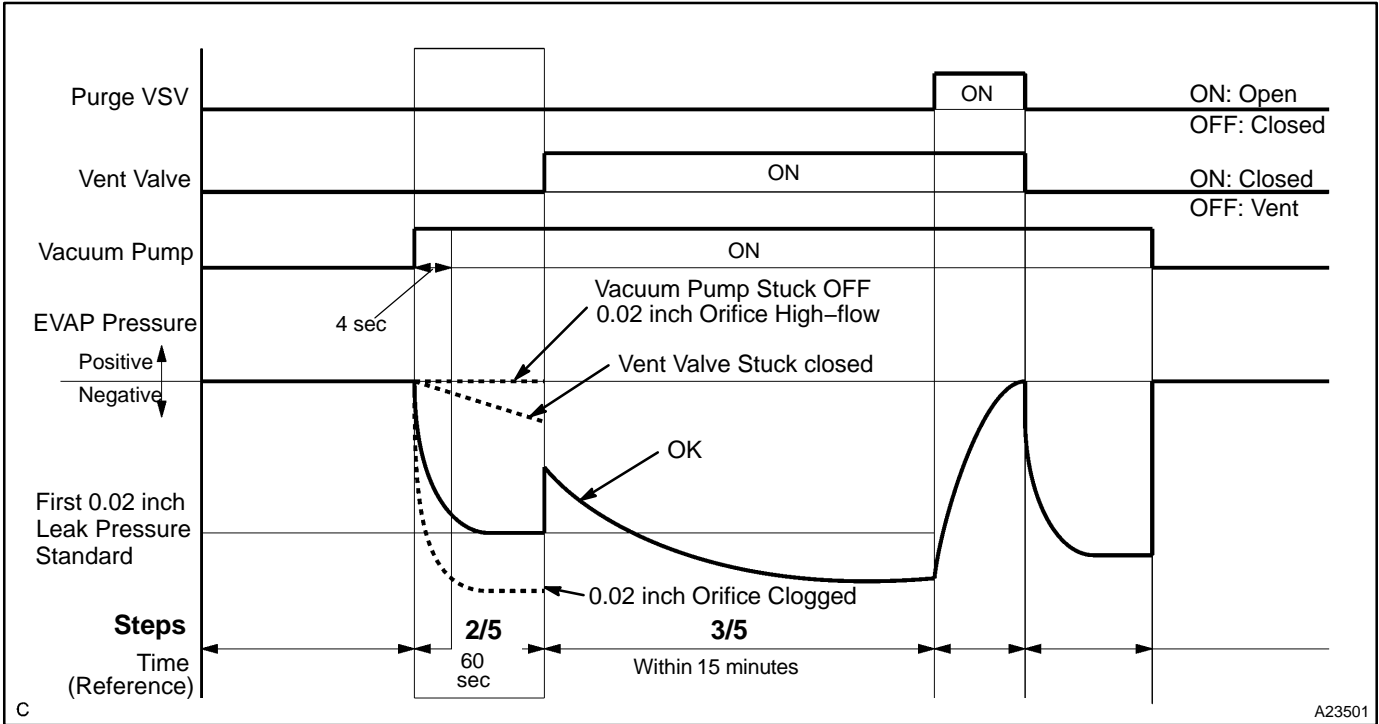
HINT:

The 0.02 inch leak pressure standard is the value determined in step 2/5.

B Go to step 23.

A

6 Perform EVAP system step 2/5 check.



HINT:

Make a note of the pressures checked in steps (a) and (b) below.

- (a) Check the EVAP pressure 4 seconds after the vacuum pump is activated*.
- (b) Check the EVAP pressure again when it has stabilized. This pressure is the 0.02 inch leak pressure standard.

*: The vacuum pump begins to operate as step 1/5 is proceeded to step 2/5.

Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure in step (b) between -4.85 kPa and -1.06 kPa (-36.38 mmHg and -7.95 mmHg)	Not yet determined	A
P043F and P2401	EVAP pressure in step (b) -1.06 kPa (-7.95 mmHg) or more	<ul style="list-style-type: none"> • 0.02 inch orifice high-flow • Vacuum pump stuck OFF 	B
P043E	EVAP pressure in step (b) below -4.85 kPa (-36.38 mmHg)	0.02 inch orifice clogged	C
P2419	EVAP pressure in step (a) more than -1.06 kPa (-7.95 mmHg)	Vent valve stuck closed	D

*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

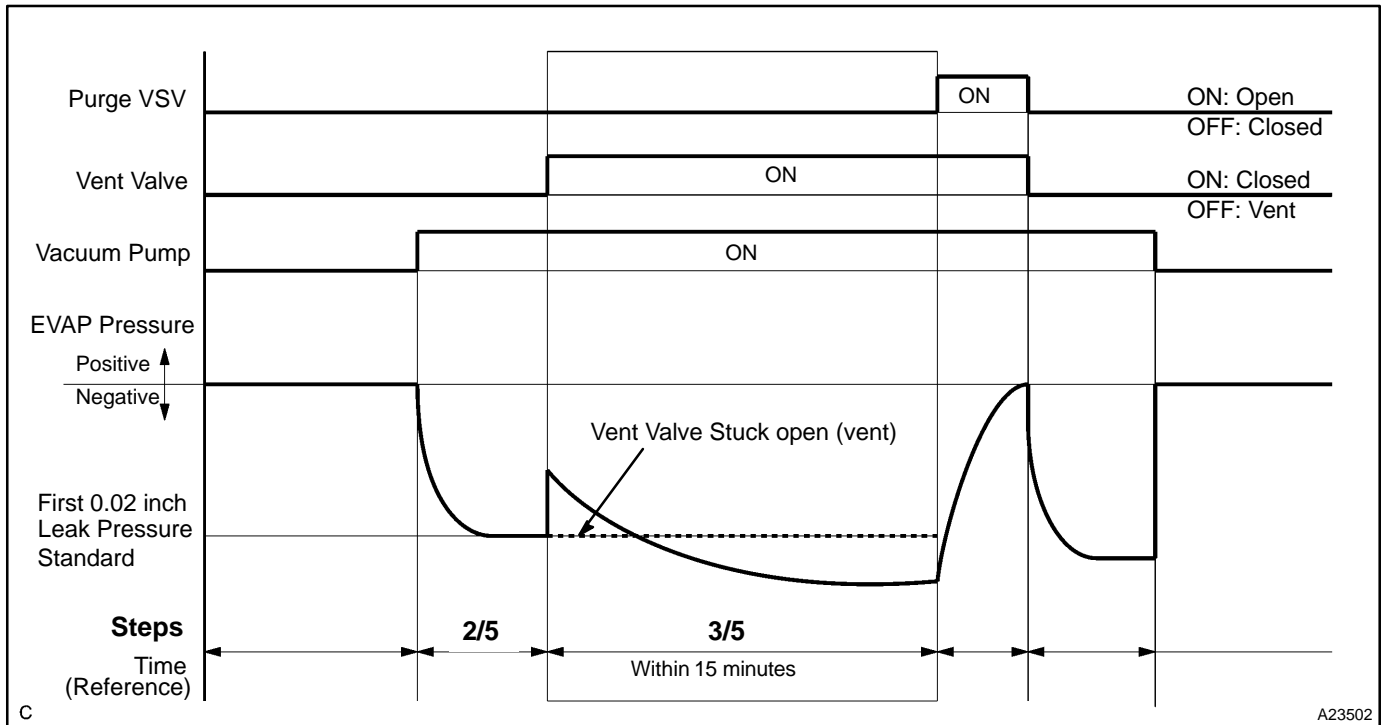
B Go to step 11

C Go to step 30

D Go to step 19

A

7 Perform EVAP system step 2/5 to 3/5 check.



(a) Check the EVAP pressure increase in step 3/5.

Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure increases by 0.3 kPa (2.25 mmHg) or more within 10 seconds of proceeding from step 2/5 to step 3/5	Not yet determined	A
P2420	No variation in EVAP pressure despite proceeding from step 2/5 to step 3/5	Vent valve stuck open (vent)	B
P0451	No variation in EVAP pressure during steps 1/5 through 3/5	Pressure sensor malfunction stuck	C

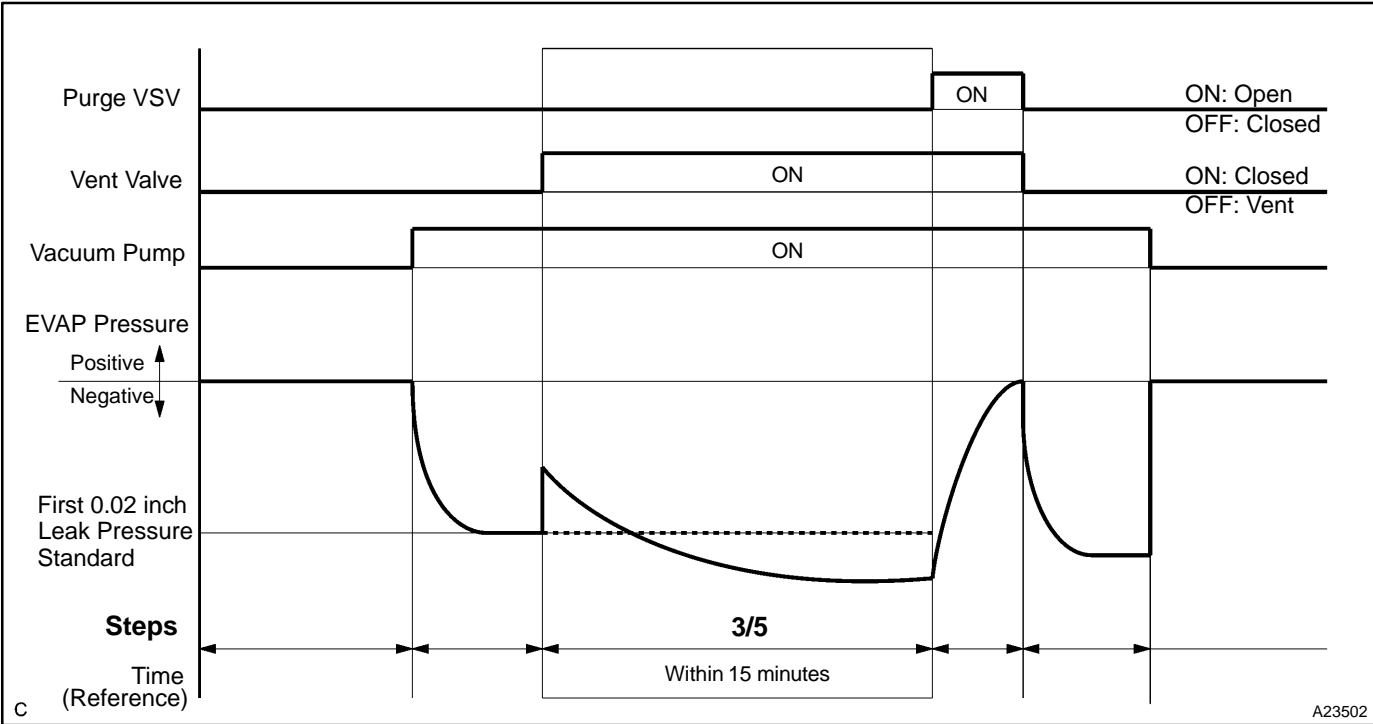
*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

B Go to step 19.

C Go to step 30.

A

8 Perform EVAP system step 3/5 check.



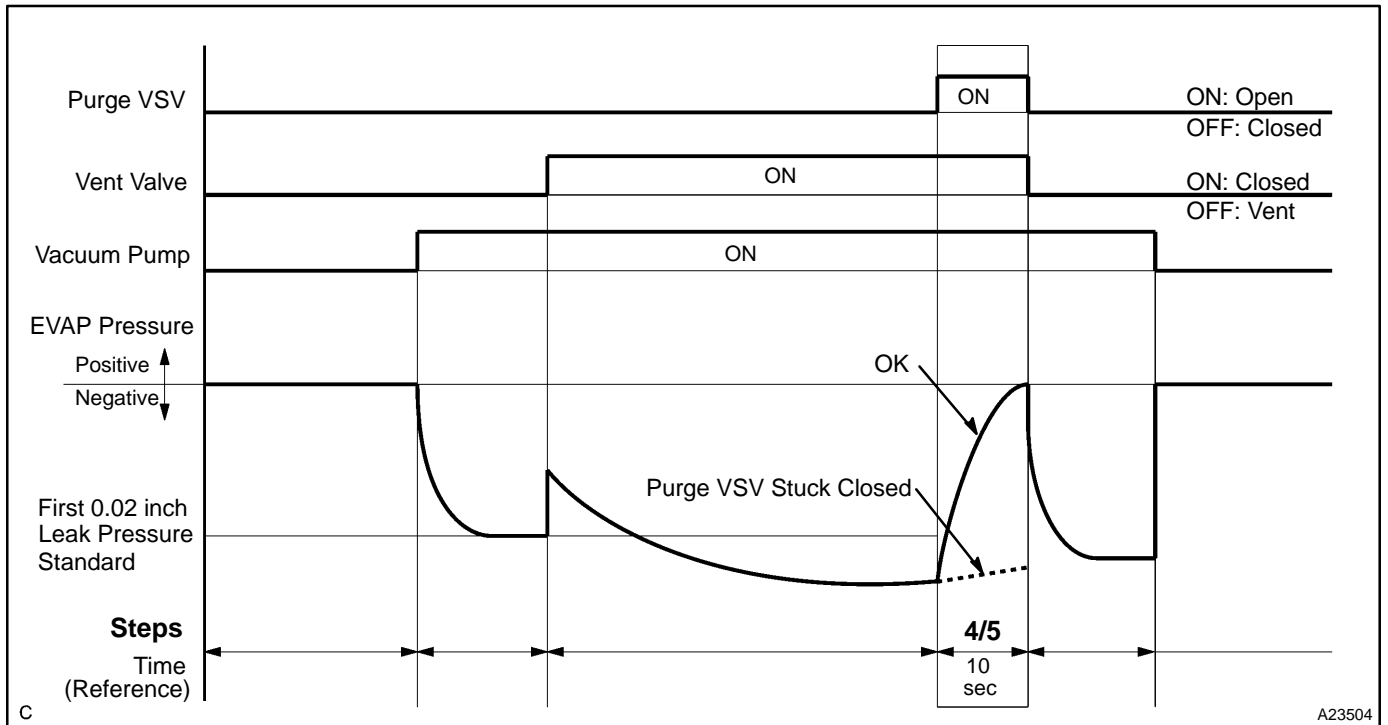
- (a) Wait until the EVAP pressure change is less than 0.1 kPa (0.75 mmHg) for 30 seconds.
- (b) Measure the EVAP pressure and record it.

HINT:

A few minutes are required for the EVAP pressure to become saturated. When there is little fuel in the fuel tank, it takes up to 12 minutes.

NEXT

9 Perform EVAP system step 4/5 check.



(a) Check the EVAP pressure in step 4/5.

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure increases by 0.3 kPa (2.25 mmHg) or more within 10 seconds of proceeding from step 3/5 to step 4/5	Not yet determined	A
P0441	EVAP pressure increases by 0.3 kPa (2.25 mmHg) or more within 10 seconds of proceeding from step 3/5 to step 4/5	Problems in EVAP hose between pure VSV and throttle body	B
P0441	Variation in EVAP pressure is less than 0.3 kPa (2.25 mmHg) for 10 seconds, after proceeding from step 3/5 to step 4/5	Purge VSV stuck closed	C

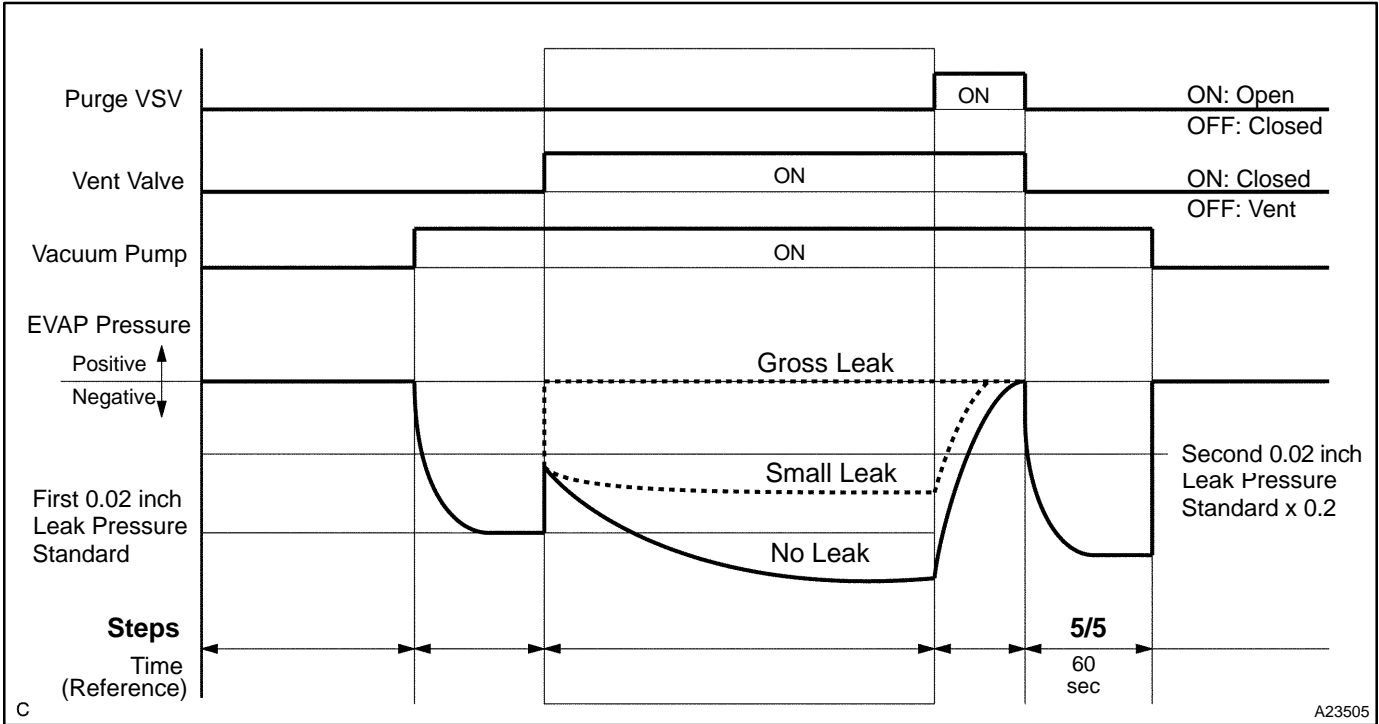
*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

B Go to step 15.

C Go to step 12.

A

10 Perform EVAP system step 5/5 check.

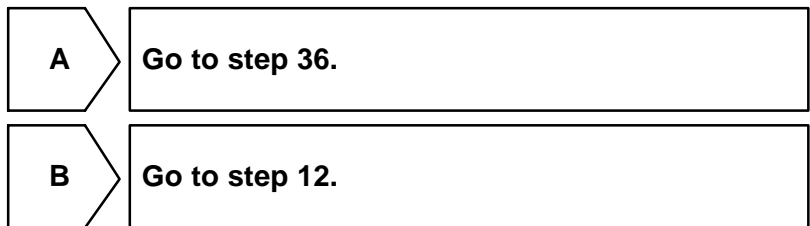


- (a) Check the EVAP pressure in step 5/5.
- (b) Compare the EVAP pressure in step 3/5 and the second 0.02 inch leak pressure standard (step 5/5).

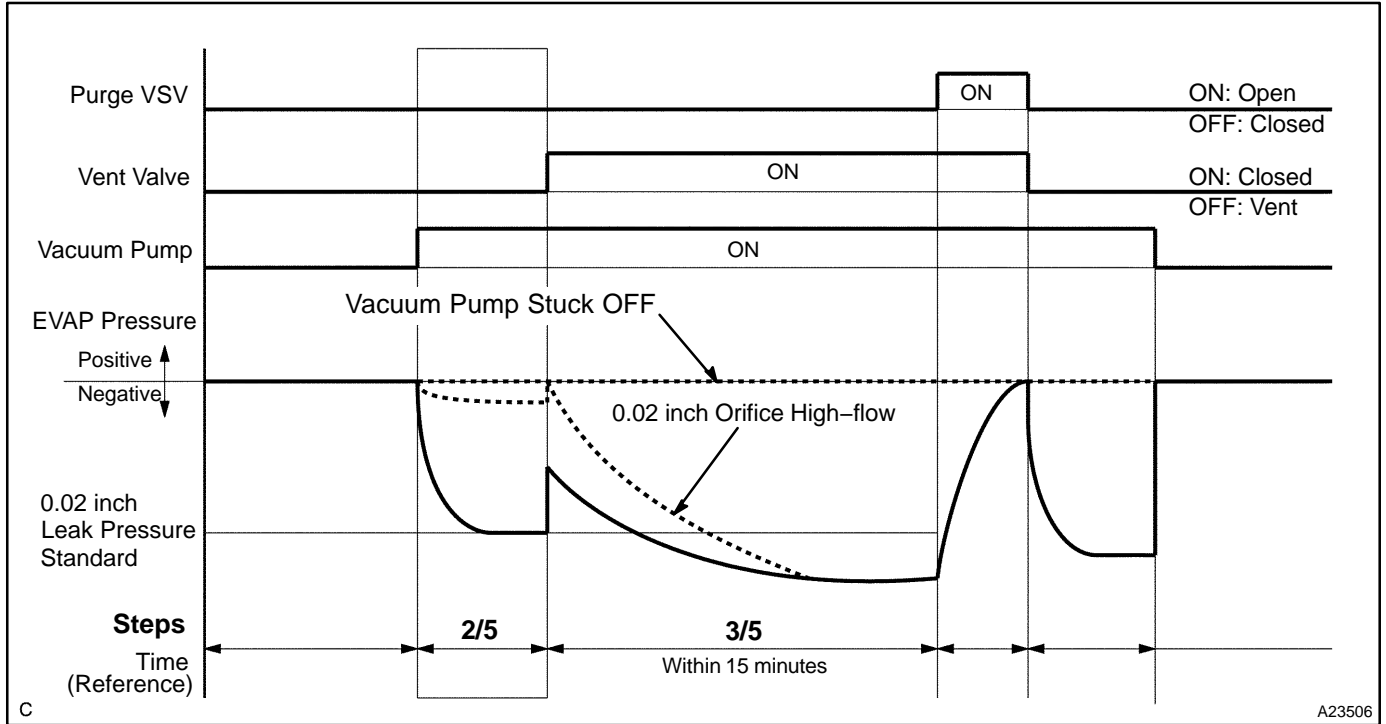
Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure (step 3/5) lower than the second 0.02 inch leak pressure standard (step 5/5)	Not yet determined (no leakage from EVAP system)	A
P0441 and P0455	EVAP pressure (step 3/5) higher than [second 0.02 inch leak pressure standard (step 5/5) x 0.2]	<ul style="list-style-type: none"> • Purge VSV stuck open • EVAP gross leak 	B
P0456	EVAP pressure (step 3/5) higher than second 0.02 inch leak pressure standard (step 5/5)	EVAP small leak	B

*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.



11 Perform EVAP system step 3/5 check.



(a) Check the EVAP pressure in step 3/5.

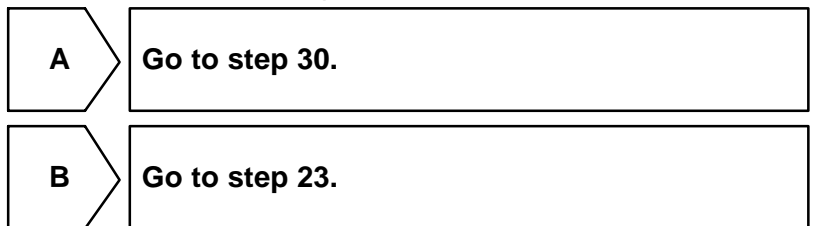
Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure less than [0.02 inch leak pressure standard x 0.2]	0.02 inch orifice high-flow	A
—	EVAP pressure more than [0.02 inch leak pressure standard x 0.2]	Vacuum pump stuck OFF	B

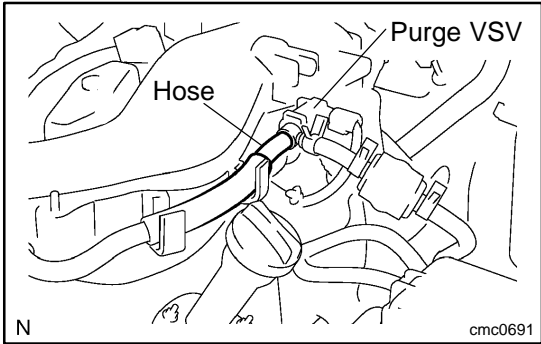
*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

HINT:

The 0.02 inch leak pressure standard is the value determined in step 2/5.



12 Perform active test of purge VSV.



PREPARATION:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II/ ACTIVE TEST / EVAP VSV.
- (b) Disconnect the hose (connected to the canister) from the purge VSV.
- (c) Start the engine.

CHECK:

- (a) On the tester, turn off the purge VSV (EVAP VSV: OFF).
- (b) Use your finger to confirm that the purge VSV has no suction.
- (c) Using the tester, turn on the purge VSV (EVAP VSV: ON).
- (d) Use your finger to confirm that the purge VSV has suction.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
No suction when purge VSV turned OFF, and suction applied when tuned ON	Purge VSV normal	A
Suction applied when purge VSV turned OFF	Purge VSV stuck open	B
No suction when purge VSV turned ON	<ul style="list-style-type: none"> • Purge VSV stuck closed • Problems with EVAP hose between purge VSV and throttle body 	C

B Go to step 14.

C Go to step 15.

A

13	Check fuel tank cap.
-----------	-----------------------------

CHECK:

(a) Check that the fuel tank cap is correctly installed and confirm the fuel tank cap meets OEM specification.

HINT:

If an EVAP tester is available, check the fuel tank cap using the tester.

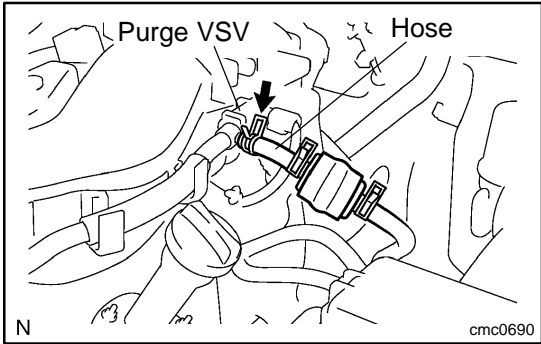
- (1) Tighten the fuel tank cap.
- (2) Remove the fuel tank cap and install it onto a fuel tank cap adaptor.
- (3) Connect an EVAP tester pump hose to the adaptor, and pressurize to 3.2 to 3.7 kPa (24 to 28 mmHg) using an EVAP tester pump.
- (4) Seal the adaptor and wait for 2 minutes.
- (5) Check the pressure. If the pressure is 2 kPa (15 mmHg) or more, the fuel tank cap is normal.

PREPARATION:

Test Results	Suspected Trouble Areas	Proceed To
Fuel tank cap correctly installed	—	A
Fuel tank cap loose	<ul style="list-style-type: none"> • Fuel tank cap improperly installed • Defective fuel tank cap • Fuel tank cap does not meet OEM specifications 	B
No fuel tank cap	—	C

A	Go to step 29.
B	Go to step 27.
C	Go to step 28.

14 Inspect EVAP VSV.



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the V4 purge VSV connector.
- (c) Disconnect the hose (connected to the canister) from the purge VSV.
- (d) Start the engine.

CHECK:

Use your finger to confirm that the purge VSV has no suction.

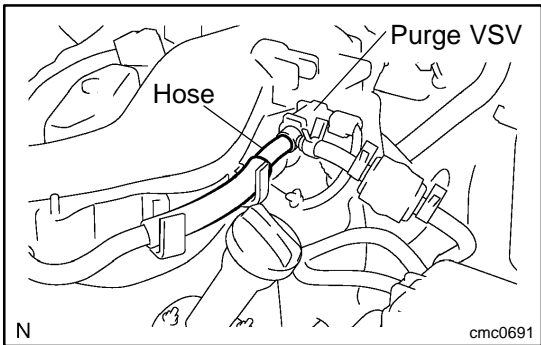
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
No suction	ECM	A
Suction applied	Purge VSV	B

A Go to step 34.

B Go to step 30.

15 Check EVAP hose between purge VSV and throttle body.



PREPARATION:

- (a) Disconnect the hose (connected to the throttle body) from the purge VSV.
- (b) Start the engine.

CHECK:

- (a) Use your finger to confirm that the hose has suction.

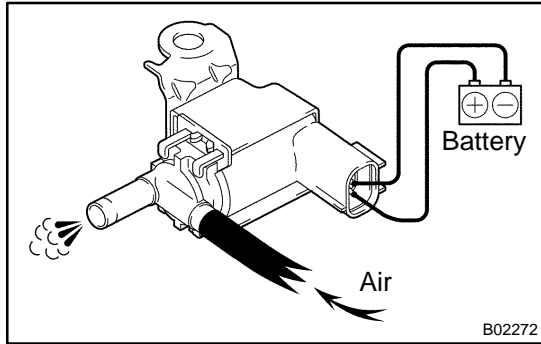
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between purge VSV and throttle body normal	A
No suction	<ul style="list-style-type: none"> • Throttle body • EVAP hose between purge VSV and throttle body 	B

B Go to step 26.

A

16 Inspect EVAP VSV.



PREPARATION:

- (a) Remove the purge VSV.
- (b) Apply battery voltage to the terminals of the purge VSV.

CHECK:

Using an air gun, confirm that air flows from port A to port B.

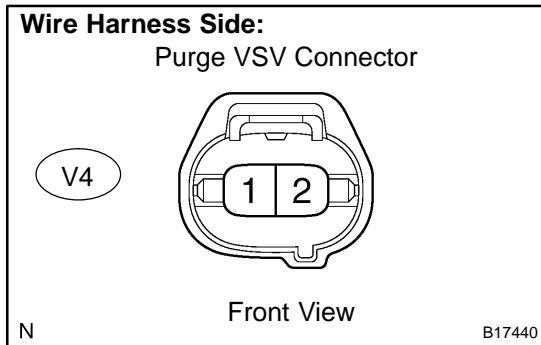
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between purge VSV and throttle body normal	A
No suction	<ul style="list-style-type: none"> • Throttle body • EVAP hose between purge VSV and throttle body 	B

B → **Go to step 31.**

A

17 Measure purge VSV terminal voltage.



PREPARATION:

- (a) Disconnect the V4 purge VSV connector.
- (b) Turn the ignition switch to ON.

CHECK:

- (a) Measure the voltage between terminal 1 of the purge VSV connector and the body ground.

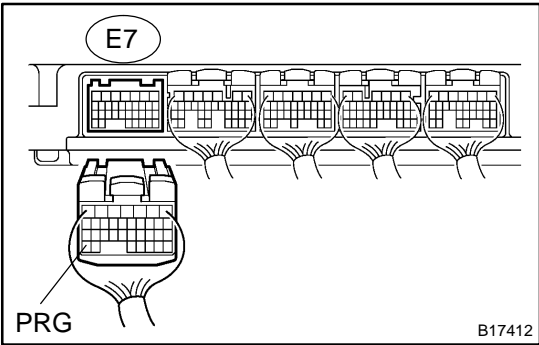
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Between 11 V and 14 V	Normal	A
Other than result above	Wire harness or connectors between purge VSV and ECM	B

B → **Go to step 32.**

A

18 Check for open and short circuit in harness and connector between purge VSV and ECM.



PREPARATION:

Disconnect the E7 ECM connector and the V4 purge VSV connector.

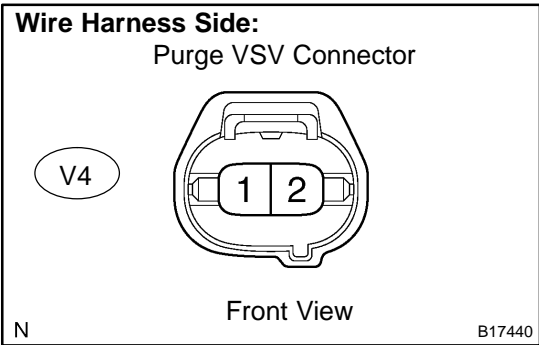
CHECK:

Check the resistance.

OK:

Standard:

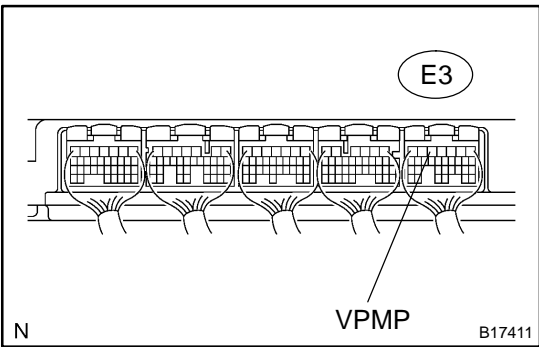
Tester Connections	Specified Conditions
E7-34 (PRG) - V4-1	Below 1 Ω
E7-34 (PRG) - Body ground	10 kΩ or higher
V4-1 - Body ground	10 kΩ or higher



OK → Go to step 35.

NG → Go to step 32.

19 Perform active test for vent valve.



PREPARATION:

- (a) Turn the ignition switch to ON.
- (b) On the hand-held tester, select the following menu items: DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ VENT VALVE (ALONE).

CHECK:

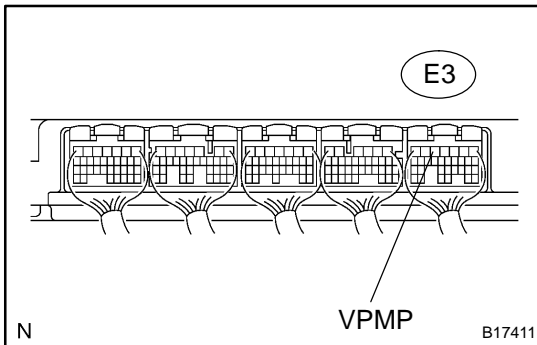
Measure the voltage between terminal VPMP of the ECM connector and the body ground when the vent valve is turned ON (close) and OFF (vent) using the tester.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V when OFF Below 3 V when ON	Vent valve	A
Below 3 V when OFF and ON	ECM	B

A → Go to step 22.

B → Go to step 35.

20 Perform active test for vent valve.

PREPARATION:

- (a) Turn the ignition switch to ON.
- (b) On the hand-held tester, select the following menu items:
DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ VENT VALVE (ALONE).

CHECK:

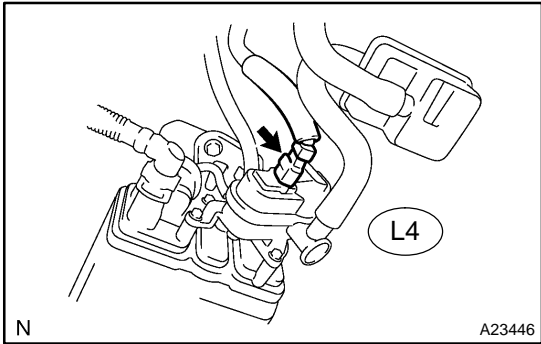
Measure the voltage between terminal VPMP of the ECM connector and the body ground when the vent valve is turned ON (close) and OFF (vent) using the tester.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Below 3 V when OFF and ON	Power source of vent valve	A
Between 9 V and 14 V when OFF Below 3 V when ON	Vent valve	B
Between 9 V and 14 V when OFF and ON	ECM	C

B
Go to step 24.
C
Go to step 35.
A

21 Inspect pump module power source circuit.

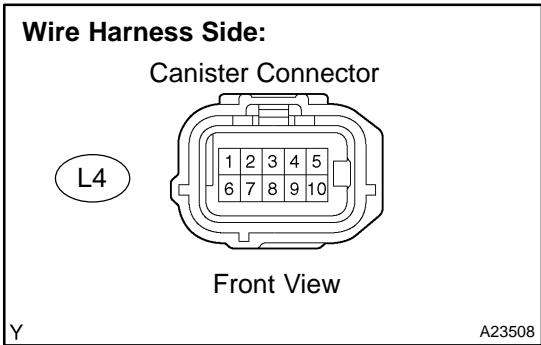


PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the L4 canister connector.
- (c) Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminal 9 of the canister connector and the body ground.



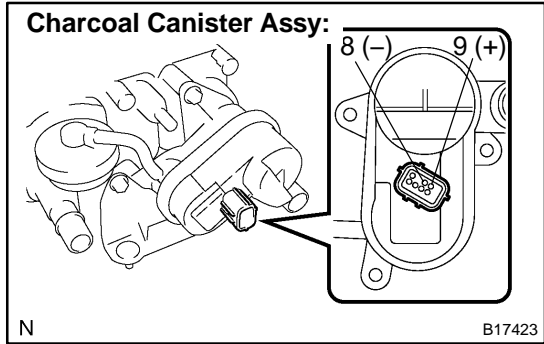
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V	Normal	A
Between 0 V and 3 V	Power source wire harness of vent valve	B

B Go to step 32.

A

22 Inspect vent valve operation of pump module.



PREPARATION:

- (a) Disconnect the L4 canister connector.
- (b) Turn the ignition switch to OFF.
- (c) Apply the battery voltage to terminals 9 and 8 of the pump module.

CHECK:

Touch the pump module to confirm the vent valve operation.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Operating	Wire harness between vent valve and ECM	A
Not operating	Vent valve	B

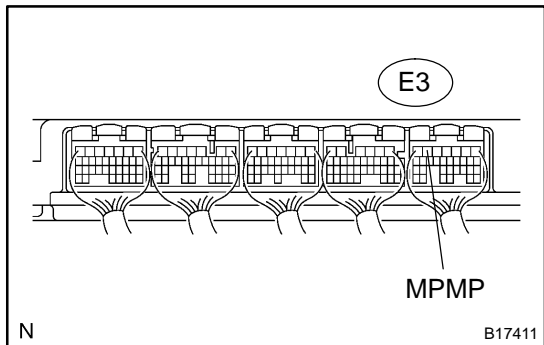
A

Go to step 32.

B

Go to step 30.

23 Perform active test for vacuum pump.



PREPARATION:

On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP (ALONE).

CHECK:

Measure the voltage between terminal MPMP of the ECM connector and the body ground when the vacuum pump is turned ON and OFF using the tester.

Result:

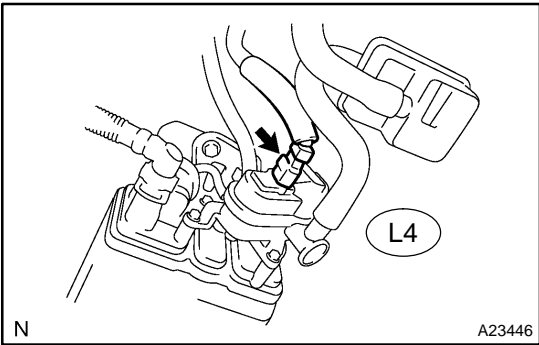
Tests Results	Suspected Trouble Areas	Proceed To
Between 0 V and 3 V when OFF Between 9 V and 14 V when ON	ECM normal	A
Between 9 V and 14 V when OFF Between 0 V and 3 V when ON	ECM	B

B

Go to step 35.

A

24 Check for open and short circuit in harness and connector between pump module and ECM.

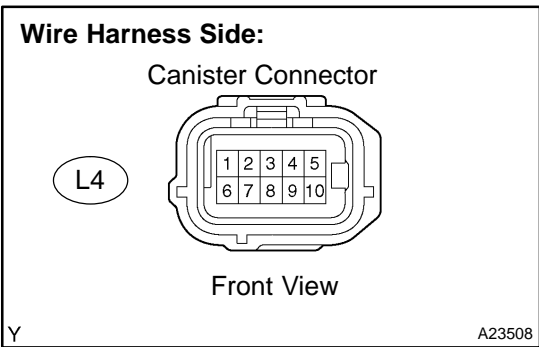


PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the L4 canister connector.
- (c) Turn the ignition switch to ON.
- (d) On the hand-held tester, select the following menu items:DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP (ALONE).
- (e) Turn the vacuum pump ON.

CHECK:

Measure the voltage between terminal 1 of the canister connector and the body ground.



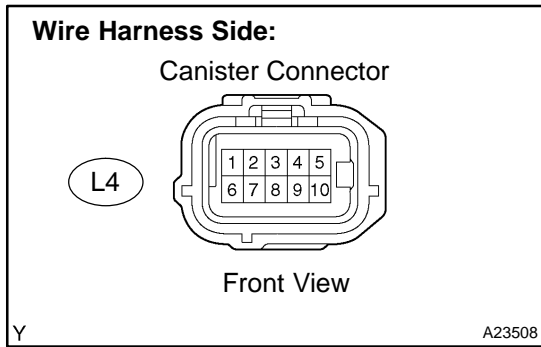
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V	Normal	A
Between 0 V and 3 V	Wire harness between ECM and vacuum pump	B

B Go to step 32.

A

25 Check for open and short in harness and connector between pump module and ECM.



PREPARATION:

- (a) Disconnect the L4 canister connector.
- (b) Turn the ignition switch to OFF.

CHECK:

Check the resistance between terminal 6 of the canister connector and the body ground.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Below 1 Ω	Vacuum pump	A
10 kΩ or more	Wire harness between vacuum pump and body ground	B

A Go to step 30.

B Go to step 32.

26 Inspect throttle body.

PREPARATION:

- (a) Stop the engine.
- (b) Disconnect the EVAP hose from the throttle body.
- (c) Start the engine.

CHECK:

- (a) Use your finger to confirm that the port of the throttle body has suction.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between throttle body and purge VSV	A
No suction	Throttle body	B

A Go to step 33.

B Go to step 34.

27	Correctly reinstall or replace fuel tank cap.
-----------	--

HINT:

- When reinstalling the fuel tank cap, tighten it until a few click sounds are heard.
- When replacing the fuel tank cap, use a fuel tank cap that meets OEM specifications, and install it until a few click sounds are heard.

NEXT	Go to step 37.
-------------	-----------------------

28	Replace fuel tank cap.
-----------	-------------------------------

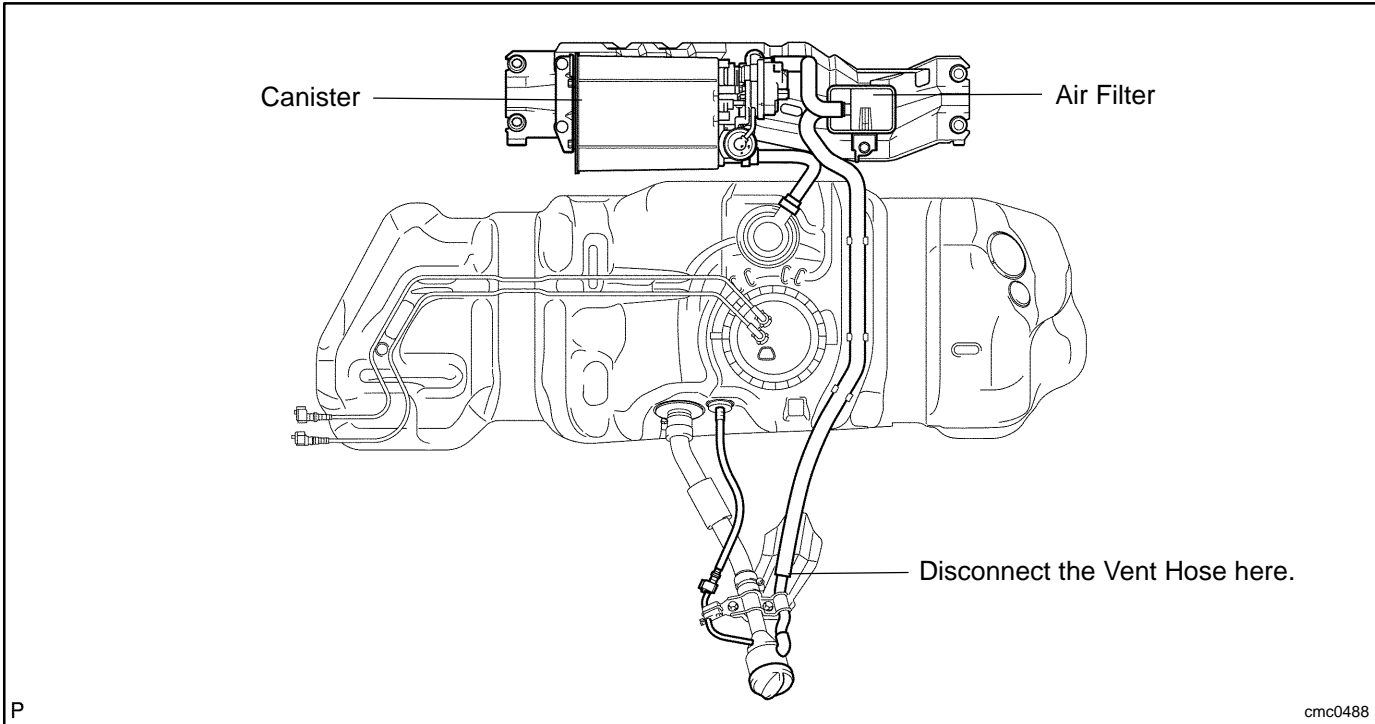
HINT:

When installing the fuel tank cap, tighten it until a few click sounds are heard.

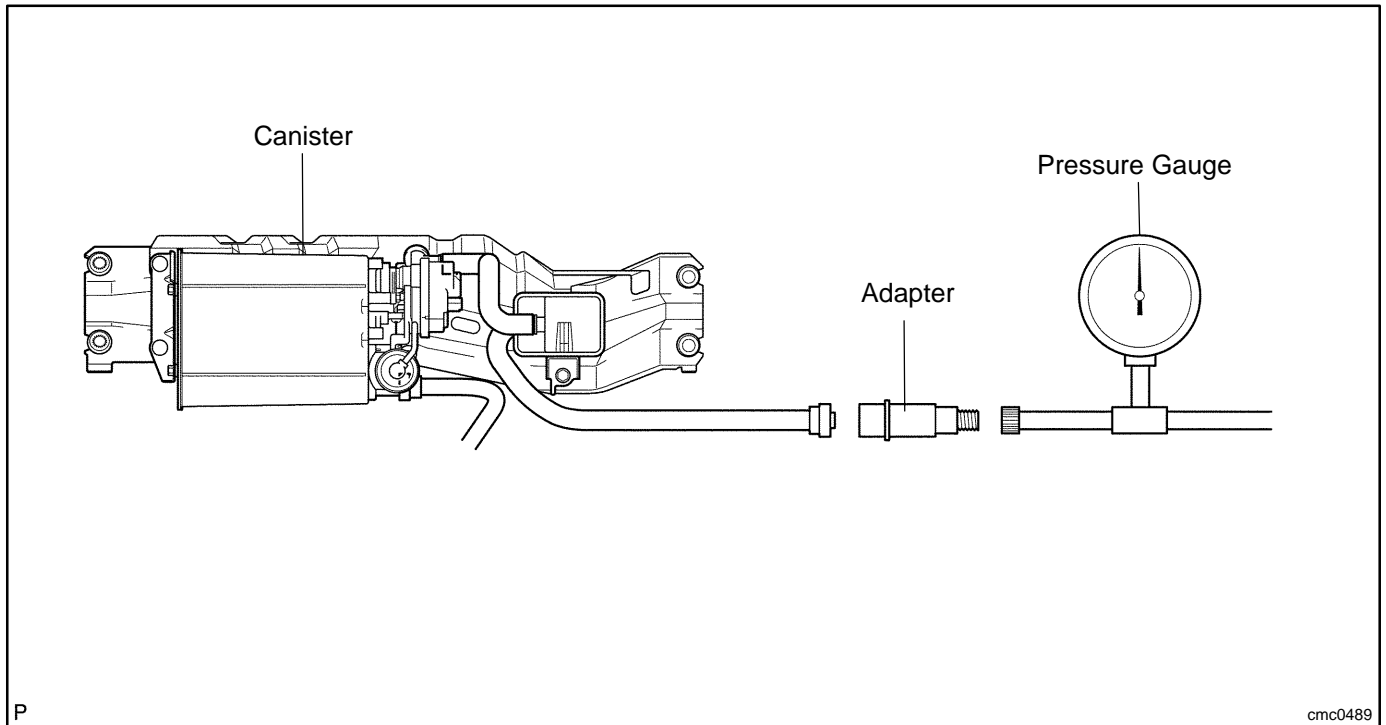
NEXT	Go to step 37.
-------------	-----------------------

29	Locate EVAP leak.
-----------	--------------------------

(a) Disconnect the vent hose.



- (b) Connect the EVAP pressure tester tool to the canister with the adapter.



- (c) Pressurize the EVAP system by 3.2 to 3.7 kPa (24 to 28 mmHg).
 (d) Apply soapy water to the piping and the connecting parts of the EVAP system.
 (e) Look for areas where bubbles appear. This indicates leak point.
 (f) Repair or replace the leak point.

NEXT

Go to step 37.

30

Replace charcoal canister.

NEXT

Go to step 37.

31

Replace EVAP VSV.

- (a) Disconnect the connector and the hoses from the purge VSV.
 (b) Remove the purge VSV.
 (c) Install a new purge VSV.
 (d) Reconnect the connector and hoses.

NEXT

Go to step 37.

32

Repair or replace wire harness or connector.

NEXT

Go to step 37.

33	Replace EVAP hose between EVAP VSV and throttle body.
-----------	--

NEXT

Go to step 37.

34	Inspect throttle body.
-----------	-------------------------------

- (a) Remove the throttle body (see page [SF-40](#)).
- (b) Check that the EVAP purge port of the throttle body is not clogged. If necessary, replace the throttle body.

NEXT

Go to step 37.

35	Replace ECM (See page SF-66)
-----------	---

NEXT

Go to step 37.

36	Repair or replace parts and components indicated by output DTCs.
-----------	---

- (a) Repair the malfunctioning areas indicated by the DTCs that had been confirmed when the vehicle was brought in.

NEXT

Go to step 37.

37	Perform EVAP system auto operation check.
-----------	--

NOTICE:

- In the EVAP SYSTEM CHECK (AUTO OPERATION), the series of 4 EVAP SYSTEM CHECK steps is performed automatically by the hand-held tester. It takes a maximum of approximately 15 minutes.
 - Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90 % full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.
 - Do not run the engine in this step.
 - When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing an EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).
- (a) Clear DTCs (see page [DI-42](#)).
- (b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (c) After the SYSTEM CHECK is completed, check for pending DTCs by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

HINT:

If no pending DTC is found, the repair has been successfully completed.

NEXT**Completed**

Monitor Confirmation

HINT:

After a repair, check Monitor Status by performing the Key–Off Monitor Confirmation and Purge Flow Monitor Confirmation described below.

1. KEY–OFF MONITOR CONFIRMATION

(a) Preconditions

The monitor will not run unless:

- The vehicle has been driven for 10 minutes or more (in a city area or on a free way)
- The fuel tank is less than 90 % full
- The altitude is less than 8,000 ft (2,400 m)
- The Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F)
- The Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95°F)
- The vehicle remains stationary (the vehicle speed is 0 mph [0 km/h])

(b) Monitor Conditions

- (1) Allow the engine to idle for at least 5 minutes.
- (2) Turn the ignition switch to OFF and wait for 6 hours (8 or 10.5 hours).

HINT:

Do not start the engine until checking MONITOR STATUS. If the engine is started, the steps described above must be repeated.

(c) Monitor Status

- (1) Connect a hand–held tester to the DLC3.
- (2) Turn the ignition switch to ON and turn the tester ON.
- (3) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (4) Check the Monitor Status displayed on the tester.

HINT:

If INCMP is displayed, the monitor is not completed. Make sure that the preconditions have been met, and perform the Monitor Conditions again.

2. PURGE FLOW MONITOR CONFIRMATION (P0441)

HINT:

Perform this monitor confirmation after the Key–Off Monitor Confirmation shows COMPL (complete).

(a) Preconditions

The monitor will not run unless:

- The vehicle has been driven for 10 minutes or more (in a city area or on a free way)
- The ECT is between 4.4°C and 35°C (40°F and 95°F)
- The IAT is between 4.4°C and 35°C (40°F and 95°F)

(b) Monitor Conditions

- (1) Release the pressure from the fuel tank by removing and reinstalling the fuel tank cap.
- (2) Warm the engine up until the ECT reaches more than 75°C (167°F).
- (3) Increase the engine speed to 3,000 rpm once.
- (4) Allow the engine to idle and turn A/C ON for 1 minute.

(c) Monitor Status

- (1) Turn the ignition switch to OFF (where ON or the engine is running).
- (2) Connect a hand-held tester to the DLC3.
- (3) Turn the ignition switch to ON and turn the tester ON.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (5) Check the Monitor Status displayed on the tester.

HINT:

If INCMP is displayed, the monitor is not completed. Make sure that the preconditions have been met, and perform the Monitor Conditions again.

MONITOR RESULT

Refer to page [DI-26](#) for detailed information.

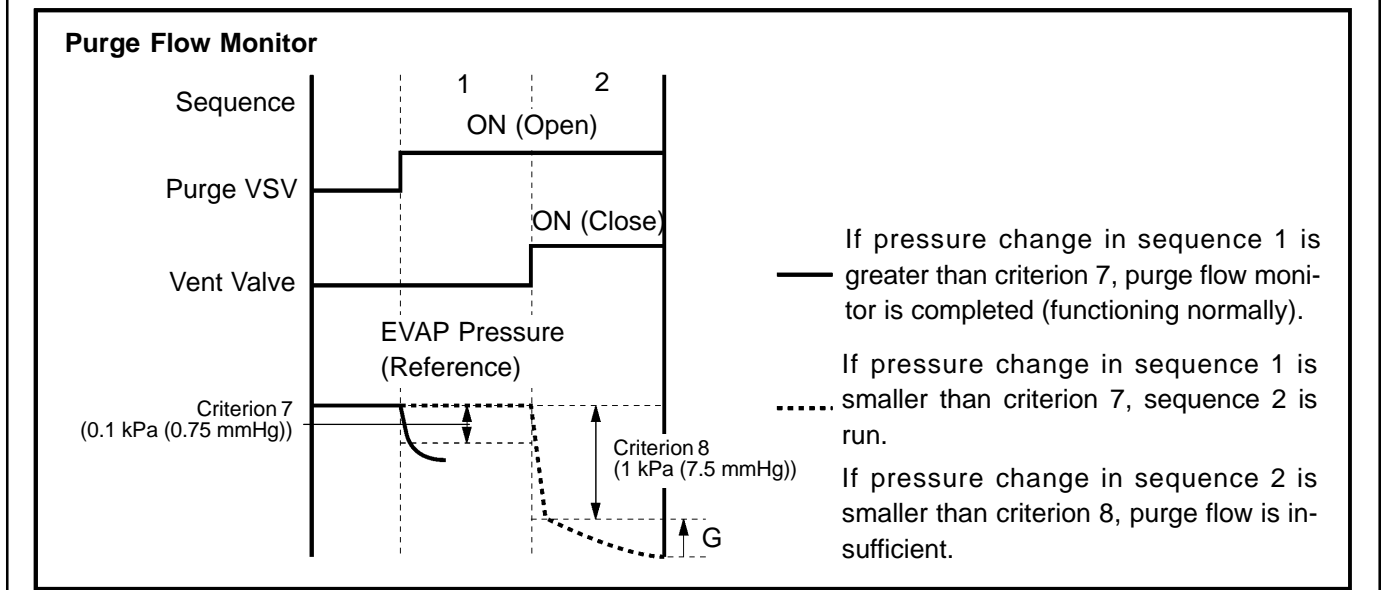
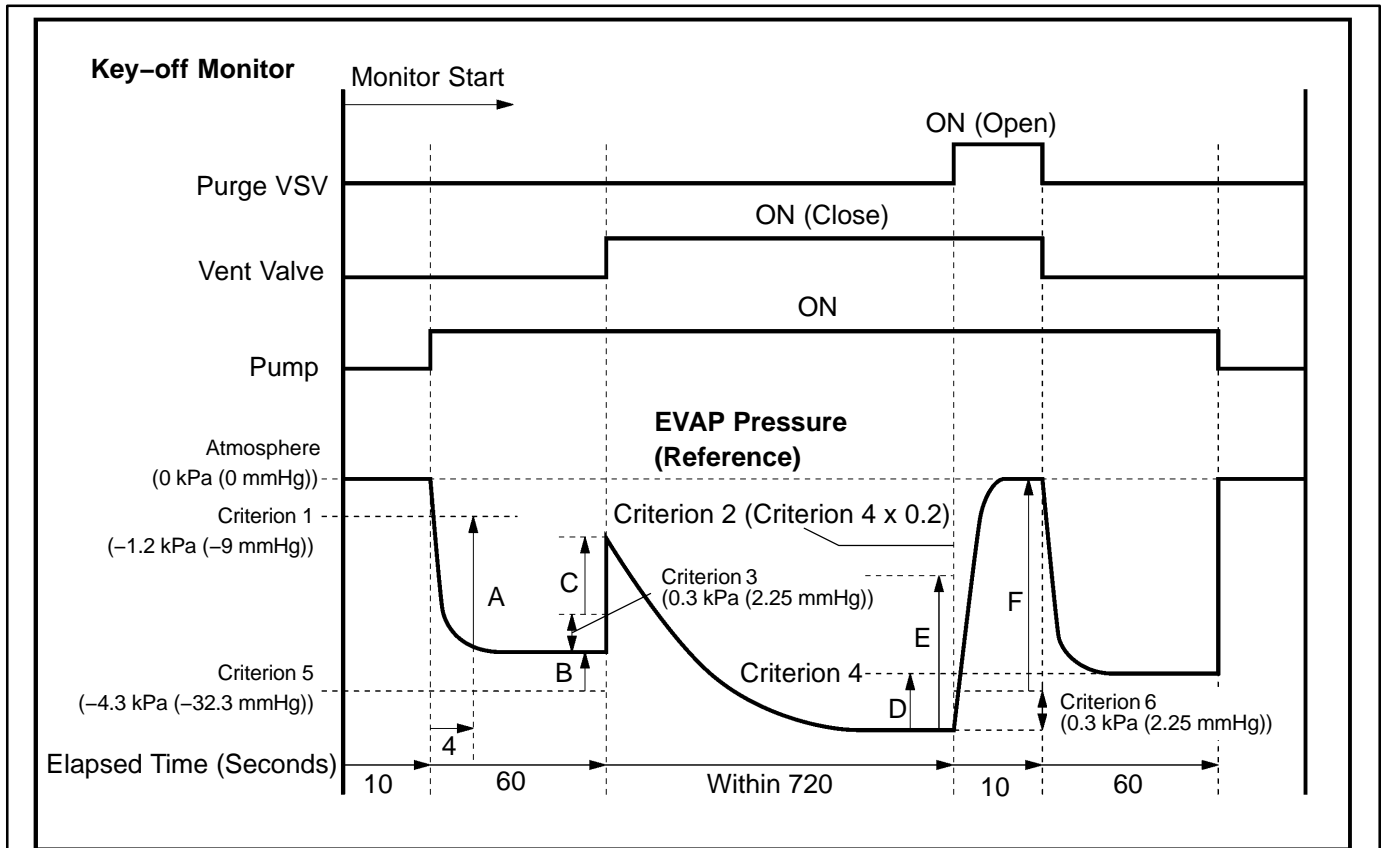
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

EVAP-Key-off monitor

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$3D	\$C9	Multiply by 0.01 (kPa)	Test value for small leak (P0456): Refer to pressure D*.	Minimum test limit for small leak	Maximum test limit for small leak
\$3D	\$CA	Multiply by 0.01 (kPa)	Test value for gross leak (P0455): Refer to pressure E*.	Minimum test limit for gross leak	Maximum test limit for gross leak
\$3D	\$CB	Multiply by 0.01 (kPa)	Test value for vacuum pump stuck OFF (P2401): Refer to pressure A*.	Minimum test limit for vacuum pump stuck OFF	Maximum test limit for vacuum pump stuck OFF
\$3D	\$CD	Multiply by 0.01 (kPa)	Test value for vacuum pump stuck ON (P2402): Refer to pressure A*.	Minimum test limit for vacuum pump stuck ON	Maximum test limit for vacuum pump stuck ON
\$3D	\$CE	Multiply by 0.01 (kPa)	Test value for vent valve stuck OFF (vent) (P2420): Refer to pressure C*.	Minimum test limit for vent valve stuck ON	Maximum test limit for vent valve stuck ON
\$3D	\$CF	Multiply by 0.01 (kPa)	Test value for vent valve stuck ON (closed) (P2419): Refer to pressure A*.	Minimum test limit for vent valve stuck OFF	Maximum test limit for vent valve stuck OFF
\$3D	\$D0	Multiply by 0.01 (kPa)	Test value for 0.02 inch orifice low flow (P043E): Refer to pressure B*.	Minimum test limit for 0.02 inch orifice low flow	Maximum test limit for 0.02 inch orifice low flow
\$3D	\$D1	Multiply by 0.01 (kPa)	Test value for 0.02 inch orifice high flow (P043F): Refer to pressure A*.	Minimum test limit for 0.02 inch orifice high flow	Maximum test limit for 0.02 inch orifice high flow
\$3D	\$D4	Multiply by 0.01 (kPa)	Test value for purge VSV stuck close (P0441): Refer to pressure F*.	Minimum test limit for purge VSV stuck close	Maximum test limit for purge VSV stuck close
\$3D	\$D5	Multiply by 0.01 (kPa)	Test value for purge VSV stuck open (P0441): Refer to pressure E*.	Minimum test limit for purge VSV stuck open	Maximum test limit for purge VSV stuck open
\$3D	\$D7	Multiply by 0.01 (kPa)	Test value for purge flow (P0441): Refer to pressure G*.	Minimum test limit for purge flow	Maximum test limit for purge flow

* Pressure A to G are indicated as shown in the diagram below.

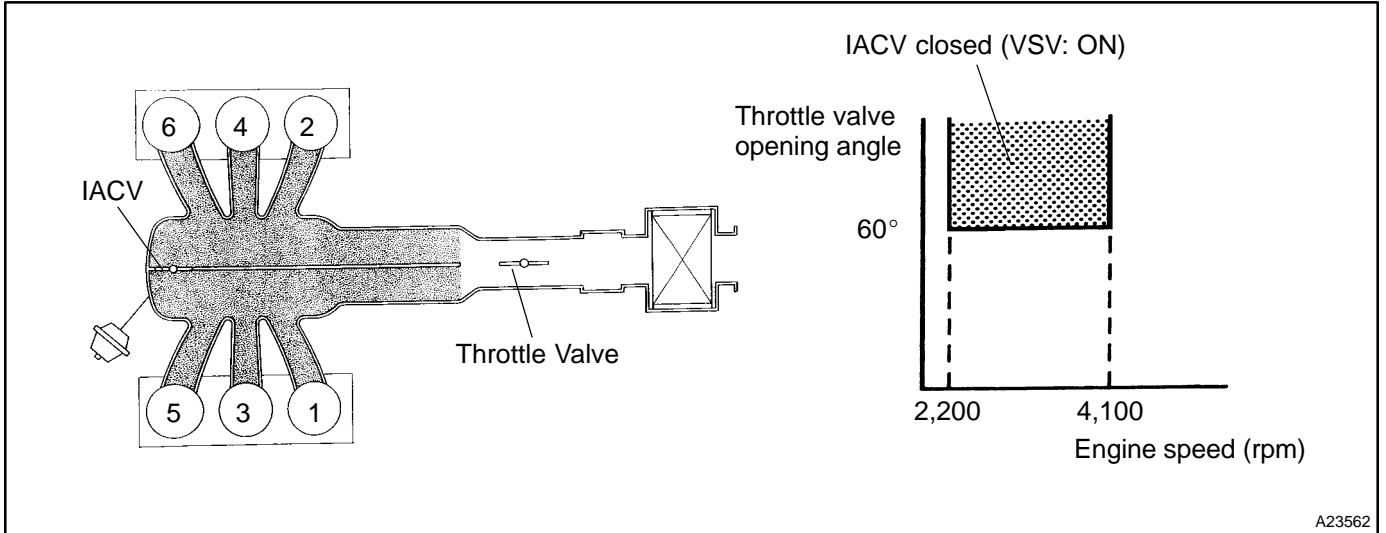


IACV Control VSV Circuit

CIRCUIT DESCRIPTION

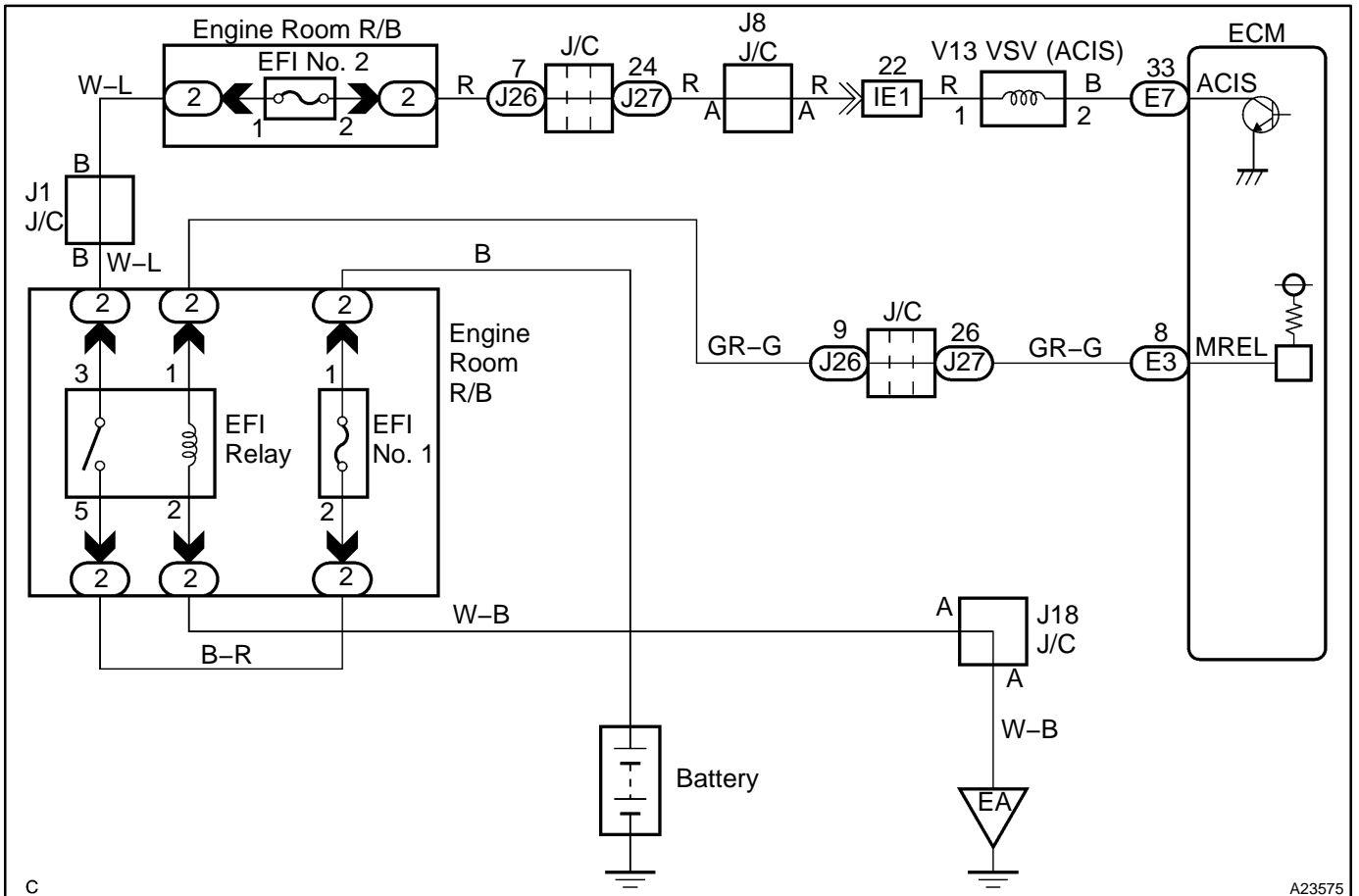
This circuit opens and closes the Intake Air Control Valve (IACV) in response to the engine load in order to increase the intake efficiency (ACIS: Acoustic Control Induction System).

When the engine speed is between 2,200 and 4,100 rpm and the throttle valve opening angle is 60° or more, the ECM supplies current to the VSV (ON status), so the IACV will close. Besides that condition, the VSV is usually OFF and the IACV is open.



A23562

WIRING DIAGRAM

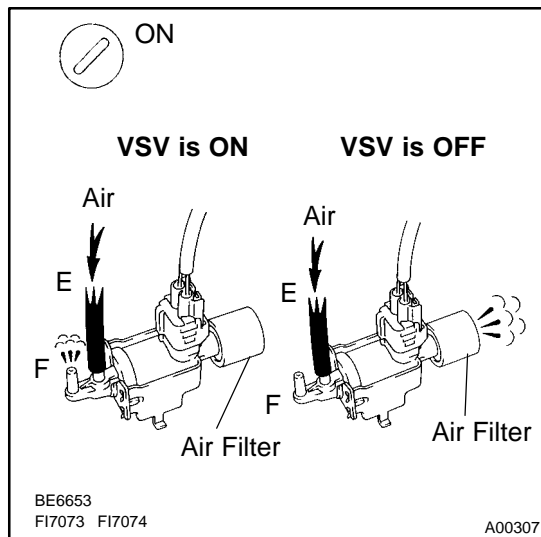


c

A23575

INSPECTION PROCEDURE

1 Connect hand-held tester and check operation of VSV for ACIS.

**PREPARATION:**

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to ON and hand-held tester main switch ON.
- Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / INTAKE CTL VSV1. Operate the VSV for AICS.

CHECK:

Check operation of VSV when VSV is operated by the hand-held tester.

OK:

VSV is ON:

Air from pipe E is flowing out through pipe F.

VSV is OFF:

Air from pipe E is flowing out through the air filter.

OK

Check for ACIS system (See page [SF-49](#)).

NG

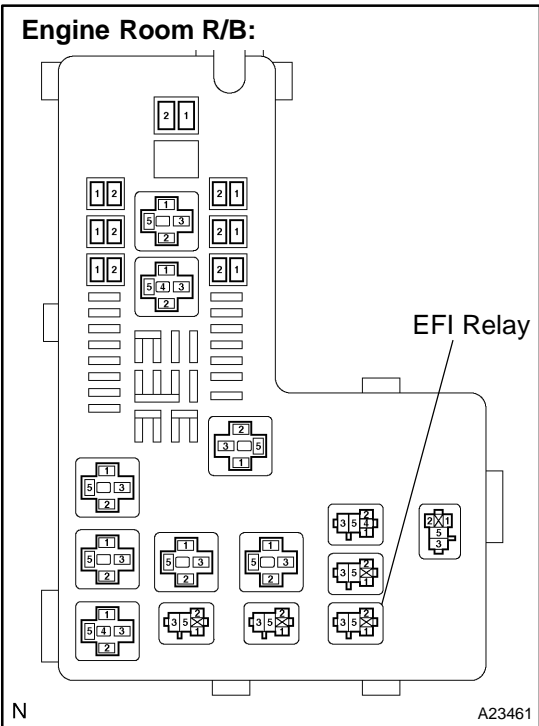
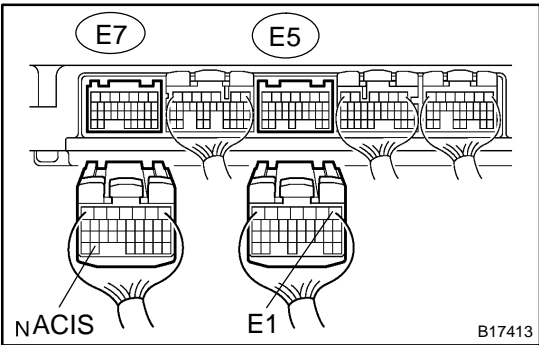
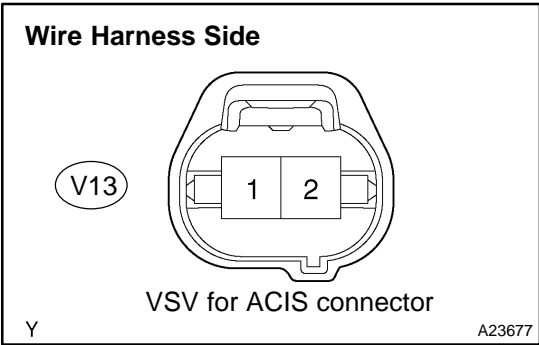
2 Check VSV for ACIS (See page [SF-49](#)).

NG

Replace VSV for ACIS.

OK

3 Check for open and short in harness and connector between EFI main relay (Marking: EFI) and ECM.



- (a) Check the wire harness between the VSV for ACIS and connector the ECM connector.
- (1) Disconnect the VSV for ACIS connector.
 - (2) Disconnect the E5 and E7 ECM connector.
 - (3) Check for resistance between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for ACIS (V13-2) - ACIS (E7-33)	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VSV for ACIS (V13-2) or ACIS (E7-33) - E1 (E5-1)	10 kΩ or higher

- (b) Check the wire harness between the VSV for ACIS connector and the EFI relay.
- (1) Disconnect the VSV for ACIS connector.
 - (2) Remove the EFI relay from the engine room R/B.
 - (3) Check for resistance between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for ACIS (V13-1) - EFI relay terminal 3 of R/B	Below 1 Ω

NG → **Repair or replace harness or connector.**

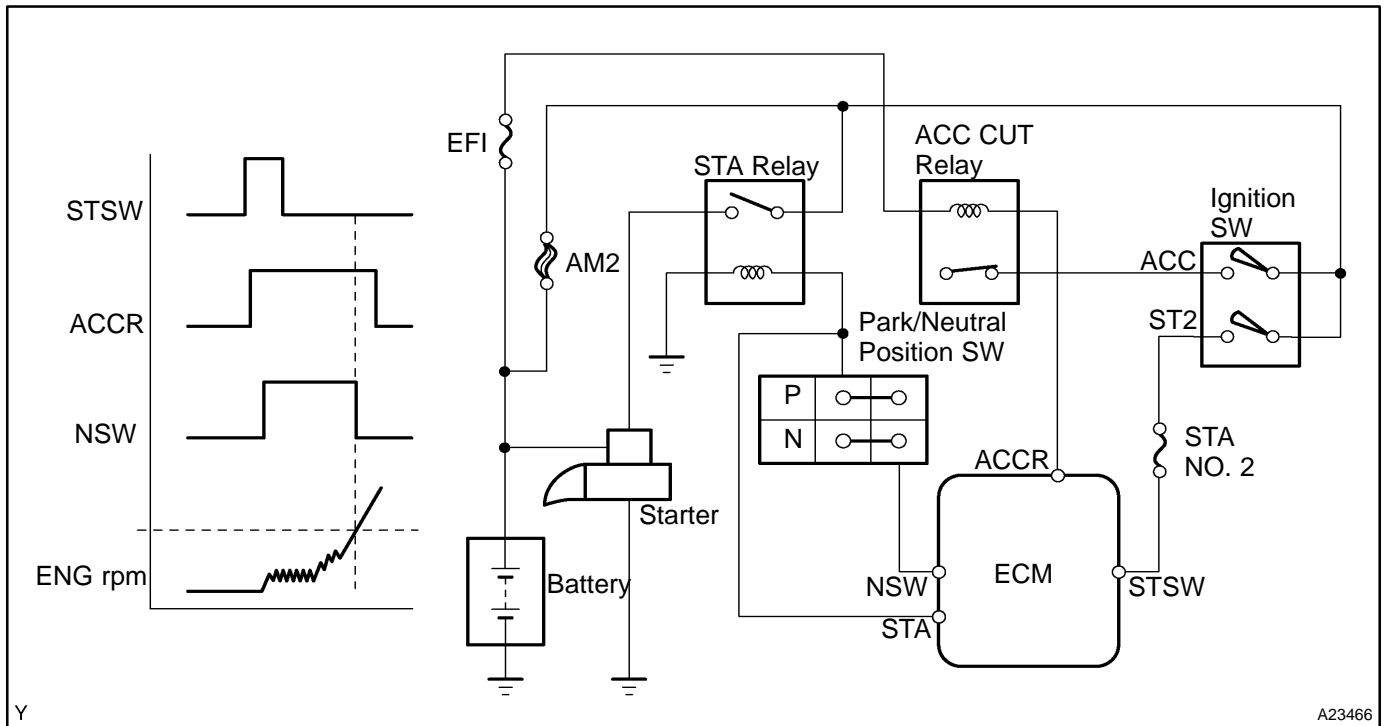
OK

Replace ECM (See page SF-66).

Cranking Holding Function Control Circuit

CIRCUIT DESCRIPTION

The system detects the ignition switch's starting signal (STSW signal) and then supplies current to the starter until the ECM judges that the engine has started successfully. The purpose is to reduce the holding time of the ignition key.



WIRING DIAGRAM

Refer to DTC P0617 on page [DI-276](#).

INSPECTION PROCEDURE

1	Check operation of engine cranking.
---	--

CHECK:

When turning the ignition switch to the START position, check whether the starter motor starts.

OK:

Engine is cranked.

OK

Check for intermittent problems
(See page [DI-11](#)).

NG

2 Connect hand-held tester, and check STA signal.

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON, and push the hand-held tester main switch ON.
- (c) On the hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand-held tester while the starter operates.

OK:

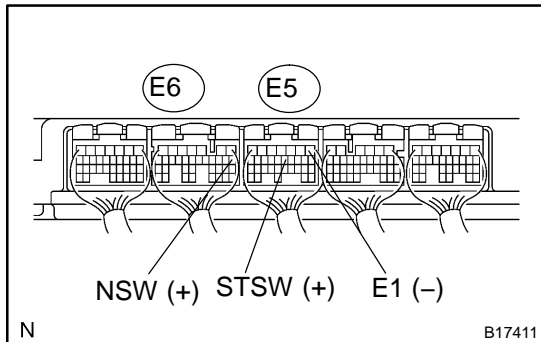
Standard:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

NG → **Repair or replace harness or connector.**

OK

3 Check voltage between terminals STSW and STAR/NSW of ECM connector.



- (a) Measure the voltage between the terminals of the E6 and E5 ECM connectors, while cranking the engine (ignition switch START position).

Standard:

Symbols (Terminal No.)	Specified condition
NSW (E6-8) - E1 (E5-1)	9 to 14 V
STSW (E5-12) - E1 (E5-1)	9 to 14 V

Result:

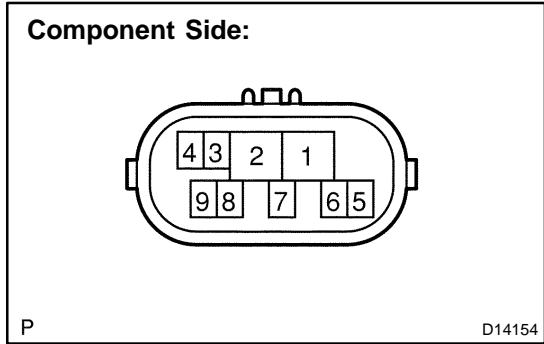
Terminal STAR	Terminal STSW	Proceed to
9 to 14 V	9 to 14 V	A
0 V	9 to 14 V	B
0 V	0 V	C

B → **Replace ECM (See page SF-66).**

C → **Go to step 8.**

A

4 Check park/neutral position switch assembly.



- (a) Disconnect the park/neutral position switch connector.
- (b) Check for resistance between each terminal shown below when the shift lever is moved to each range.

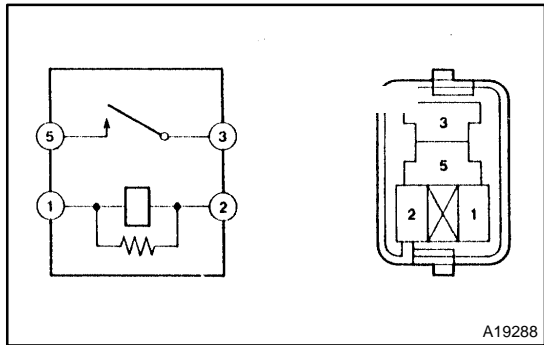
Standard:

Shift range	Terminal No.	Specified condition
P	1 - 3	Below 1 Ω
	6 - 9	
R	2 - 3	Below 1 Ω
N	3 - 5	Below 1 Ω
	6 - 9	
D	3 - 7	Below 1 Ω
3	3 - 4	Below 1 Ω
2, L	3 - 8	Below 1 Ω

NG Check and repair harness and connector.

OK

5 Check starter relay.



- (a) Remove the starter relay from the engine room R/B.
- (b) Inspect the starter relay.

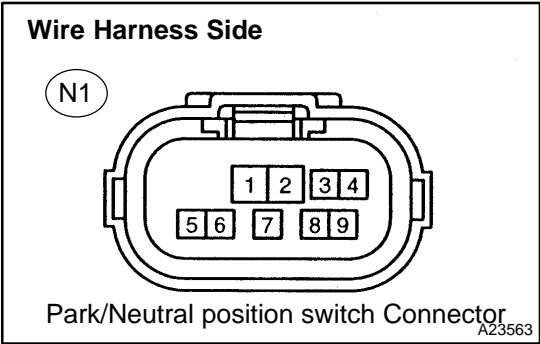
Standard:

Terminal No.	Specified condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (Apply battery voltage terminals 1 and 2)

NG Replace starter relay.

OK

6 Check harness and connector park/neutral position switch and starter relay.



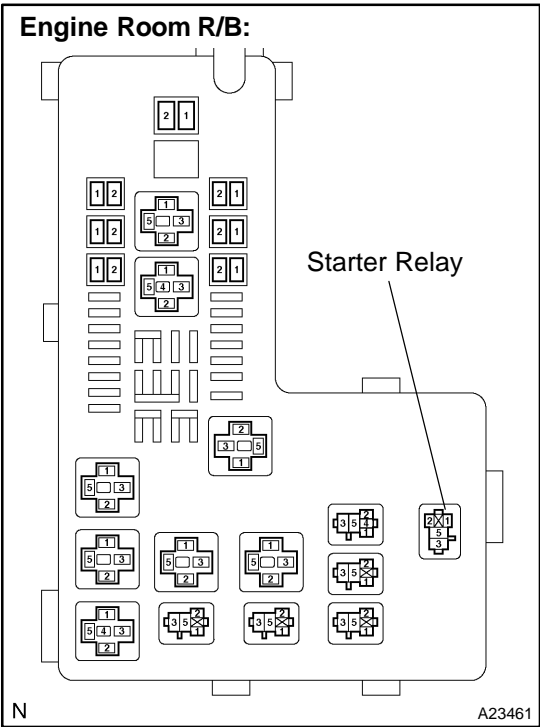
- (a) Check the harness and the connector between the park/neutral position switch connector and the starter relay.
 - (1) Disconnect the park/neutral position switch connector.
 - (2) Remove the starter relay from the engine room R/B.
 - (3) Check for resistance between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Park/Neutral position switch (N1-6) - Starter relay (1)	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Park/Neutral position switch (N1-6) or Starter relay (1) - Body ground	10 kΩ or higher



- (b) Check the harness and the connector between the starter relay and the body ground.
 - (1) Remove the starter relay from the engine room R/B.
 - (2) Check for resistance between the starter relay and the body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (2) - Body ground	Below 1 Ω

OK

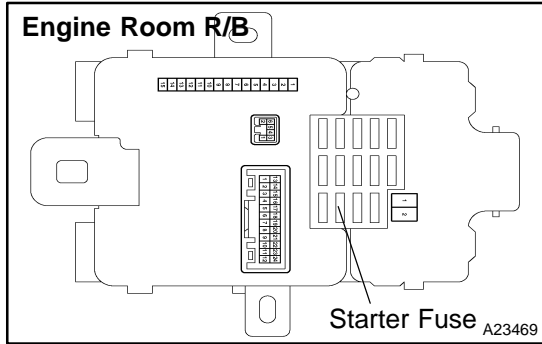
NG Repair or replace harness or connector.

7 Check starter assembly (See page ST-12 (1.6 kw) or ST-24 (2.0 kw))

OK

NG Replace starter assembly.

8 Check STA fuse.



- (a) Remove the starter relay from the engine room R/B.
- (b) Measure the voltage between the terminal of the engine room R/B and the body ground.

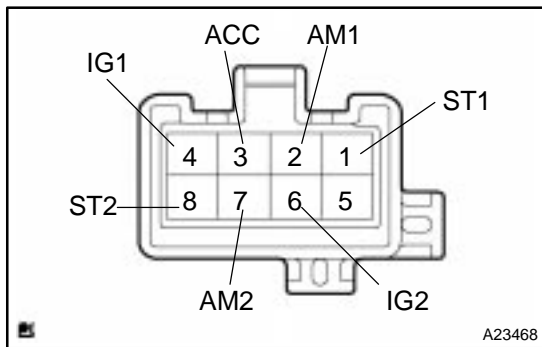
Standard:

Symbols (Terminal No.)	Specified condition
Starter relay (5) - Body ground	9 to 14 V

NG Check for short in all harness and components connected to STA fuse, and replace fuse.

OK

9 Check ignition switch.



- (a) Check for resistance between the connector terminals shown in the chart below.

Standard:

Switch position	Terminal No.	Specified condition
LOCK	All terminal to terminal	10 kΩ or higher
ACC	2 - 3	Below 1 Ω
ON	2 - 3, 2 - 4, 3 - 4 6 - 7	Below 1 Ω
START	1 - 2, 1 - 4, 2 - 4 6 - 7, 6 - 8, 7 - 8	Below 1 Ω

NG Replace ignition switch.

OK

Check and repair harness and connector.

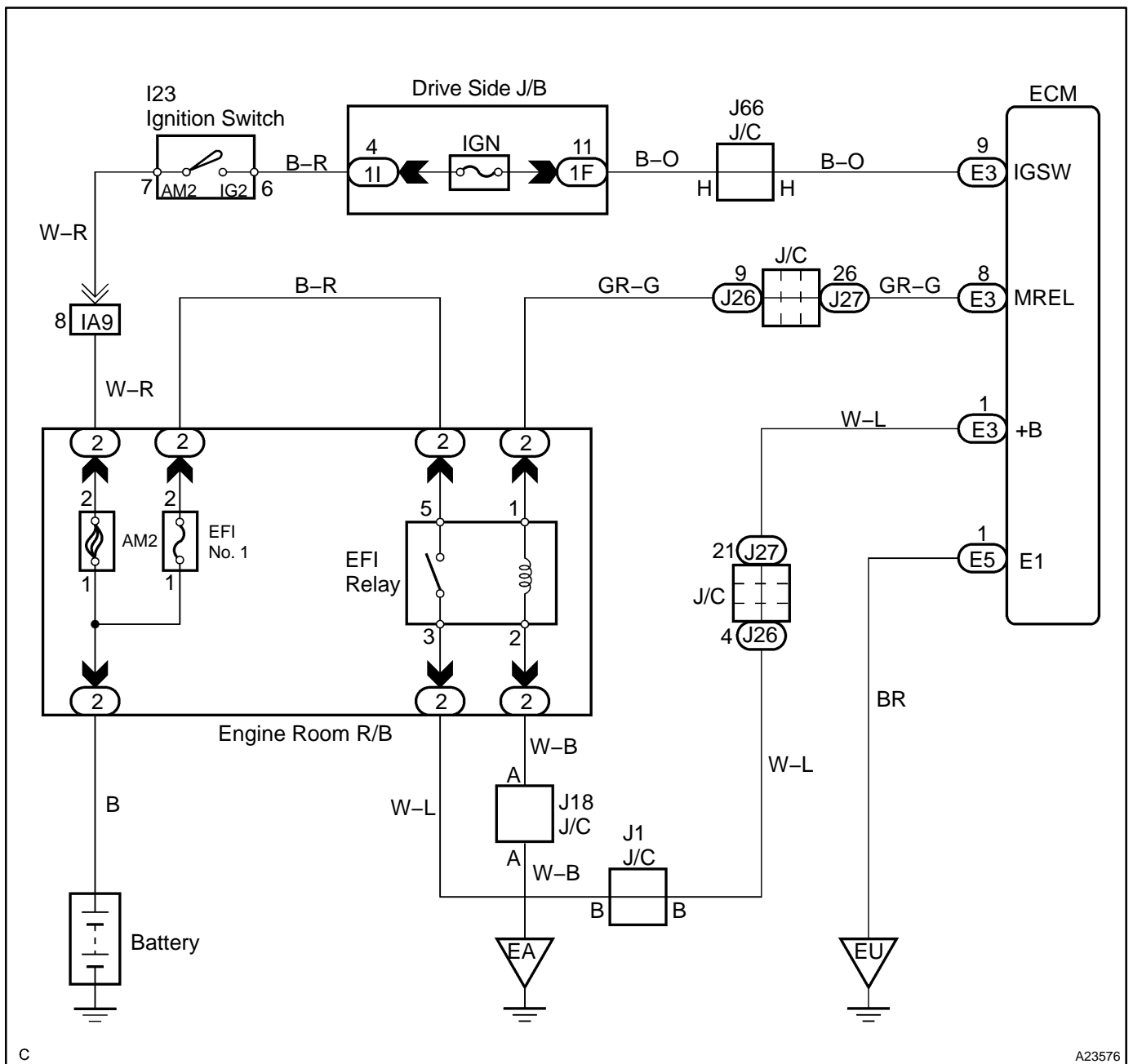
ECM Power Source Circuit

CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the EFI relay control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI relay.

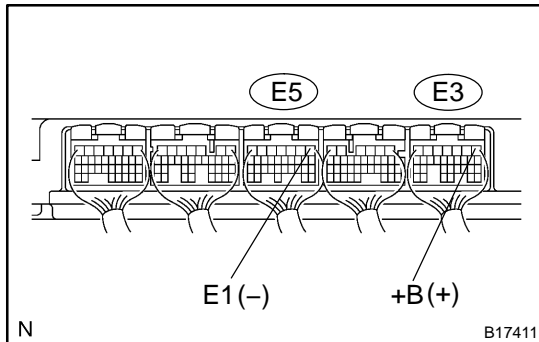
This signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

- 1 Check voltage between terminals +B and E1 of ECM connector.

**PREPARATION:**

Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminals +B and E1 of the ECM connectors.

OK:

Standard: 9 to 14 V

OK

Proceed to next circuit inspection shown in the Problem symptoms table (See page [DI-33](#)).

NG

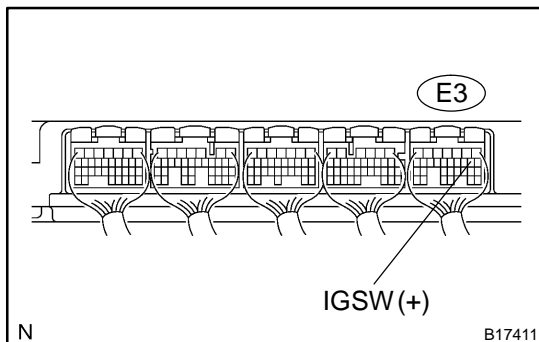
- 2 Check for open in harness and connector between terminal E1 of ECM and body ground (See page [IN-30](#)).

NG

Repair or replace harness or connector.

OK

- 3 Check voltage between terminal IGSW of ECM connector and body ground.

**PREPARATION:**

Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminal IGSW of the ECM connector and body ground.

OK:

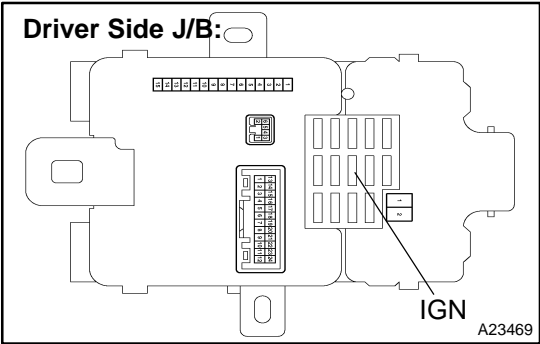
Standard: 9 to 14 V

OK

Go to step 6.

NG

4 Check IGN fuse.



PREPARATION:
Remove the IGN fuse from the instrument panel J/B.

CHECK:
Check the resistance of the IGN fuse.

OK:
Below 1 Ω

NG Check for short in all harness and components connected to IGN fuse, and replace the fuse.

OK

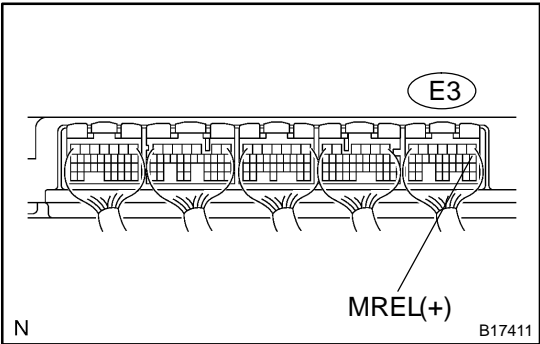
5 Check ignition switch (See page BE-37).

NG Replace ignition switch.

OK

Check and repair harness and connector between battery and ignition switch, and ignition switch and ECM.

6 Check voltage between terminal MREL of ECM connector and body ground.



PREPARATION:
Turn the ignition switch to ON.

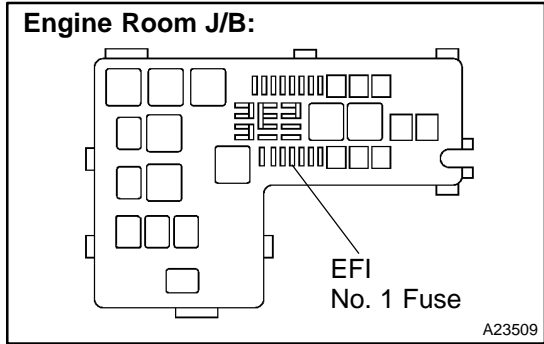
CHECK:
Measure the voltage between terminal MREL of the ECM connector and body ground.

OK:
Standard: 9 to 14 V

NG Replace ECM (See page SF-66).

OK

7 Check EFI No. 1 fuse of engine room J/B.



PREPARATION:

Remove the EFI No. 1 fuse from the engine room J/B.

CHECK:

Check resistance of EFI No. 1 fuse.

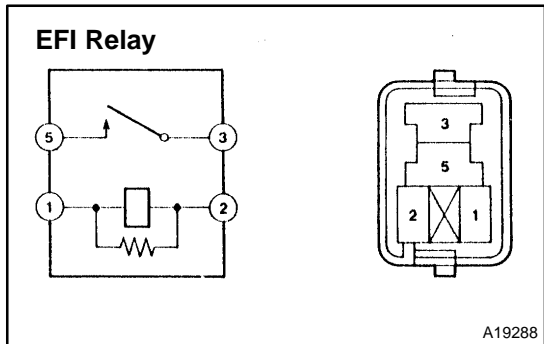
OK:

Below 1 Ω

NG Check for short in all harness and components connected to EFI No. 1 fuse, and replace the fuse.

OK

8 Check EFI relay).



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 KΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace EFI relay.

OK

9 Check for open and short in harness and connector between terminal MREL of ECM and body ground (See page IN-30).

NG Repair or replace harness or connector.

OK

Check and repair harness or connector between EFI No. 1 fuse and battery.

Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

Refer to DTC P0230 on page [DI-174](#).

WIRING DIAGRAM

Refer to DTC P0230 on page [DI-174](#).

INSPECTION PROCEDURE

1 Check fuel pump operation (See page [SF-5](#)).

OK

Go to step 8.

NG

2 Connect hand-held tester, and check operation of fuel pump relay.

PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to ON and push the hand-held tester main switch ON.
- Enter the following menu: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD.

CHECK:

Check the operation of the fuel pump relay when it is switched ON and OFF by the hand-held tester.

OK:

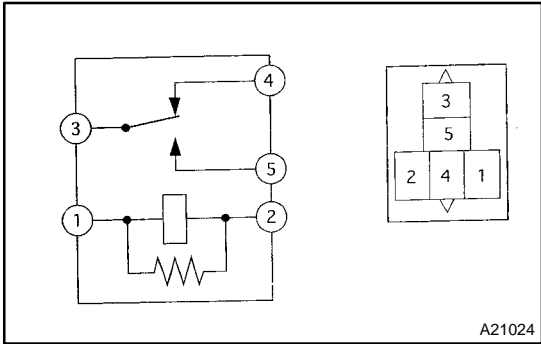
Operating noise can be heard from the fuel pump relay.

OK

Go to step 4.

NG

3 Check fuel pump relay.



PREPARATION:

Remove the fuel pump relay from the engine room R/B.

CHECK:

Inspect the fuel pump relay.

OK:

Terminal No.	Condition	Specified Condition
3 - 4	Apply B+ between terminals 1 and 2	10 KΩ or higher
3 - 4	Always	Below 1 Ω
3 - 5	Always	10 KΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace fuel pump relay.

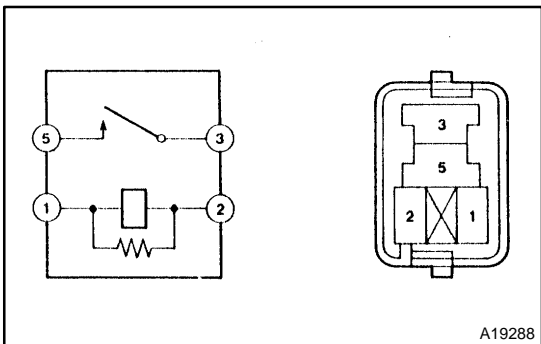
OK

4 Check fuel pump (See page SF-13).

NG Repair or replace fuel pump.

OK

5 Check circuit opening relay.



PREPARATION:

Remove the C/OPN relay from the engine room J/B.

CHECK:

Inspect the C/OPN relay.

OK:

Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 KΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace circuit opening relay.

OK

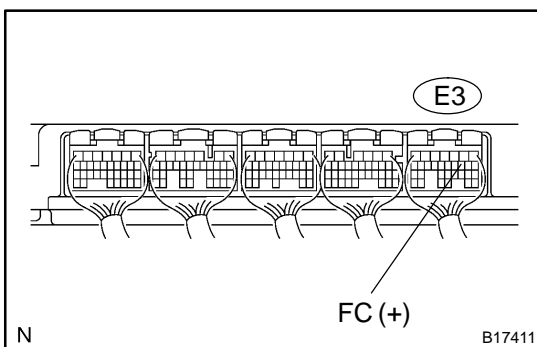
- 6** Check for open in harness and connector between EFI relay and fuel pump, and fuel pump and body ground (See page [IN-30](#)).

NG

Repair or replace harness or connector.

OK

- 7** Check voltage between terminal FC and E1 of ECM connector.



PREPARATION:

Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminal FC of the ECM connector and body ground.

OK:

Voltage: 9 to 14 V

NG

Check for open in harness and connector between battery and FC terminal of ECM (See page [SF-66](#)).

OK

Proceed to problem symptoms table (See page [DI-33](#)).

- 8** Check fuel pump resistor (See page [SF-57](#)).

NG

Replace fuel pump resistor.

OK

Check and repair harness and connector between fuel pump relay and fuel pump resistor, and fuel pump resistor and fuel pump (See page [IN-30](#)).

INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below.

MIL remains on	Start inspection from step 1
MIL does not light up	Start inspection from step 3
1	Clear DTC.

PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to ON and push the hand-held tester main switch ON.
- Read the DTC (See page [DI-42](#)).
- Clear the DTC (See page [DI-42](#)).

CHECK:

- Check for DTCs.

OK:

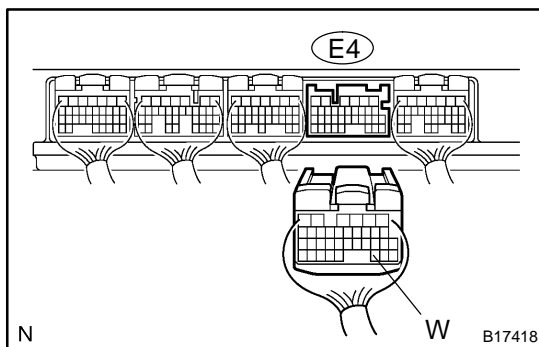
DTC is not output.

NG

Repair circuit indicated by output code
(See page [DI-57](#)).

OK

2 Check Harness and connector (Check for short in wire harness).



PREPARATION:

- Disconnect the E4 ECM connector.
- Turn the ignition switch ON.

CHECK:

Check that MIL goes off.

OK:

MIL goes off.

OK

Replace ECM (See page [SF-66](#)).

NG

Check and repair harness and connector between combination meter and ECM.

3	Check that MIL lights up.
----------	----------------------------------

CHECK:

Check that MIL lights up when turning the ignition switch to ON.

OK:

MIL lights up (Engine stopped)

OK	System OK.
-----------	-------------------

NG

4	Inspect combination meter assy (MIL circuit).
----------	--

See the combination meter troubleshooting on page [BE-86](#).

NG	Repair or replace bulb or combination meter assembly.
-----------	--

OK

Check and repair harness and connector between combination meter and ECM.
--

ENGINE (2UZ-FE)

D1DQ0-01

PRECAUTION

NOTICE:

Perform the **RESET MEMORY (AT initialization)** when replacing the automatic transmission assembly, engine assembly or ECM (See page [DI-1126](#)).

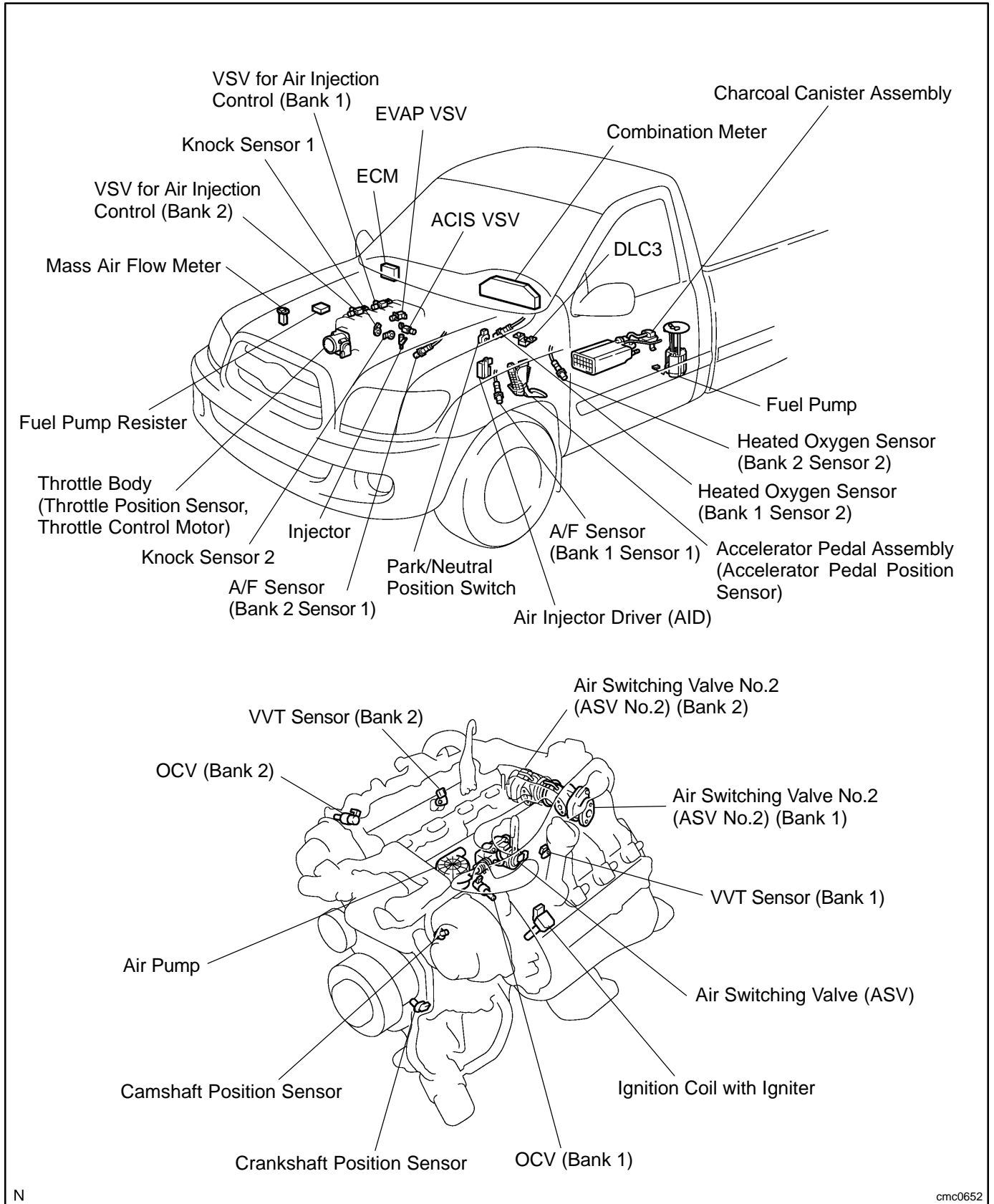
HINT:

Initialization can not be completed by only removing the battery.

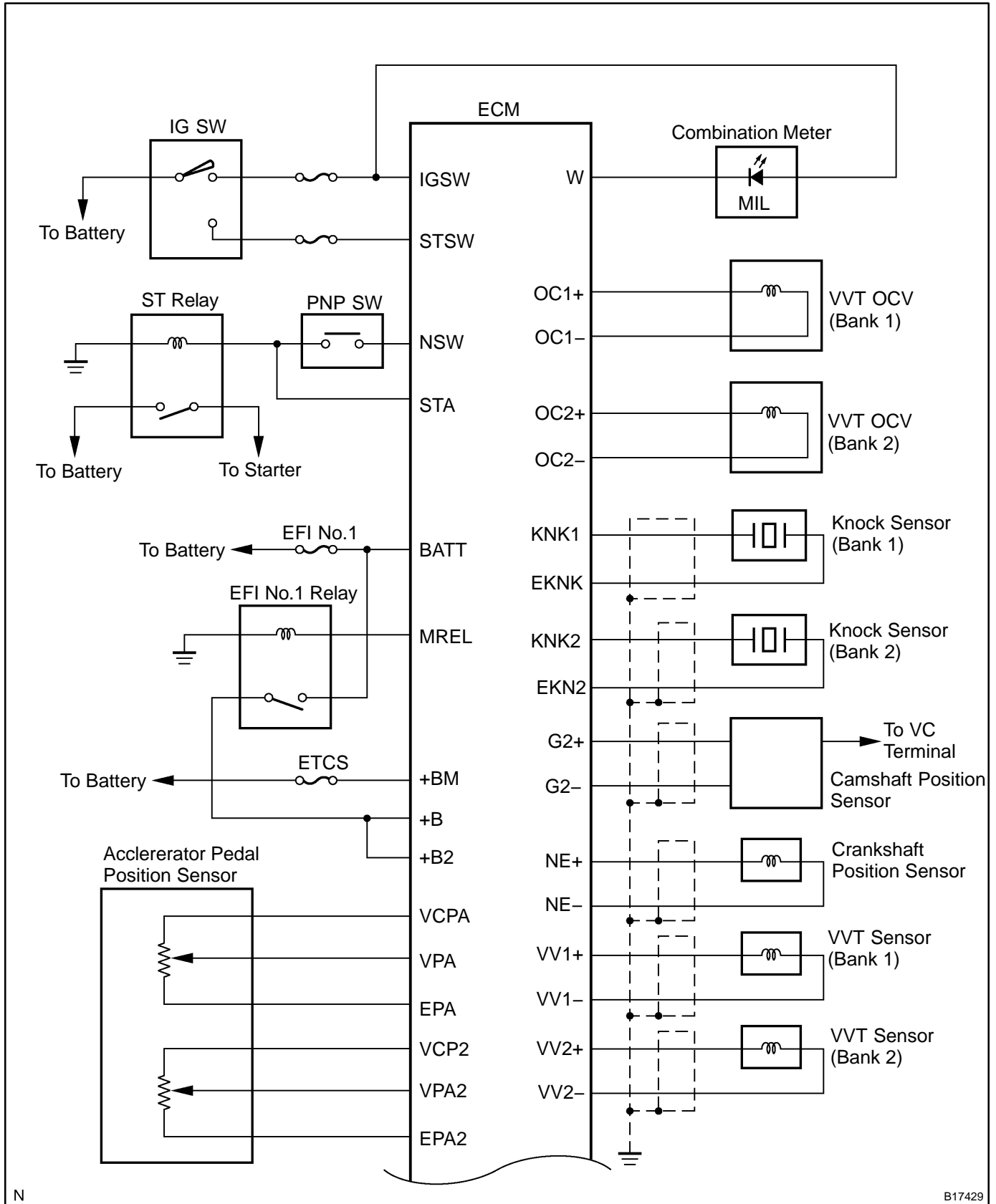
DEFINITION OF TERMS

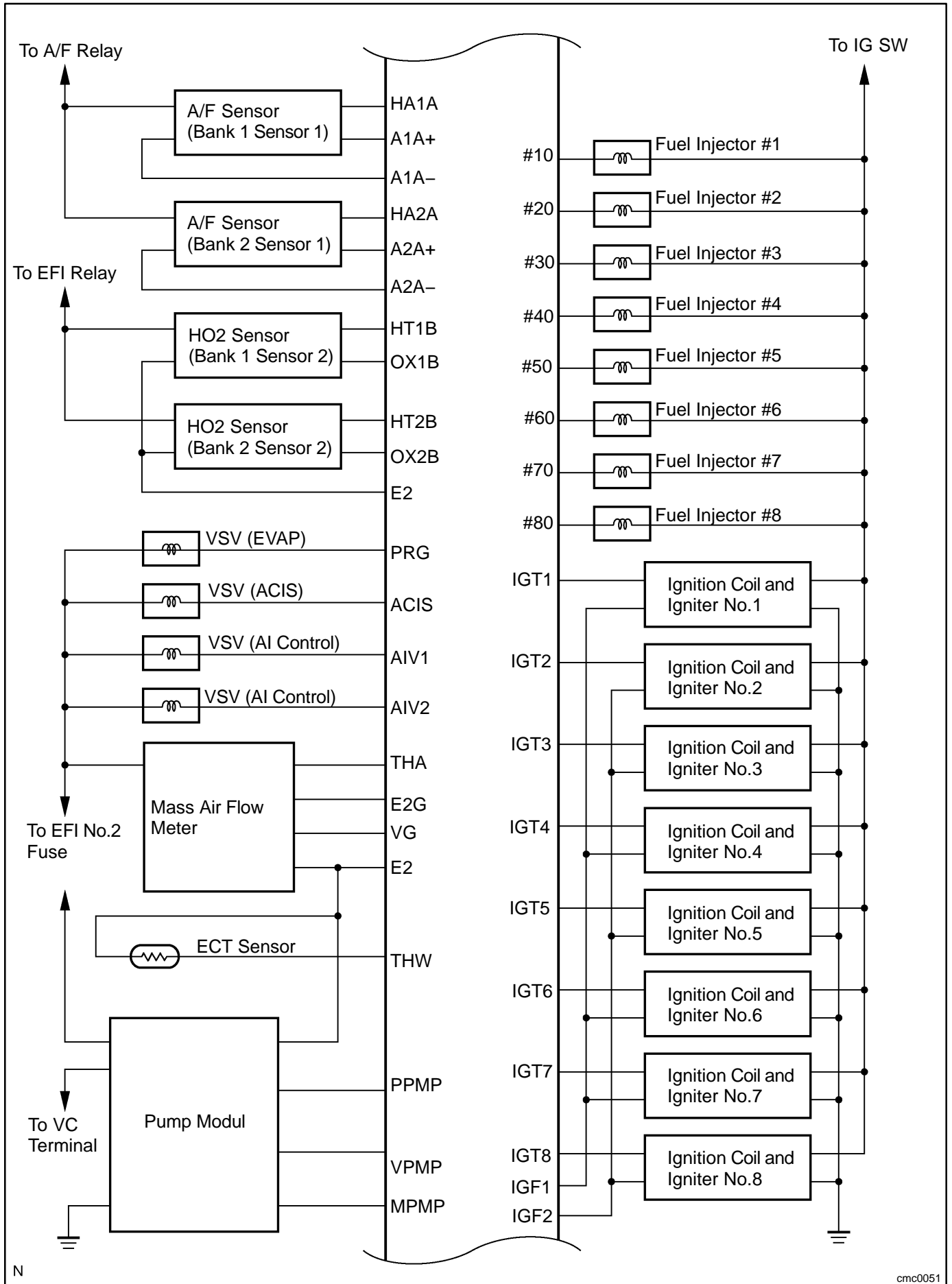
Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. When a sensor is being monitored, the next sensor or component will not be monitored until the sensor monitoring is finished.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects malfunction every time an enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

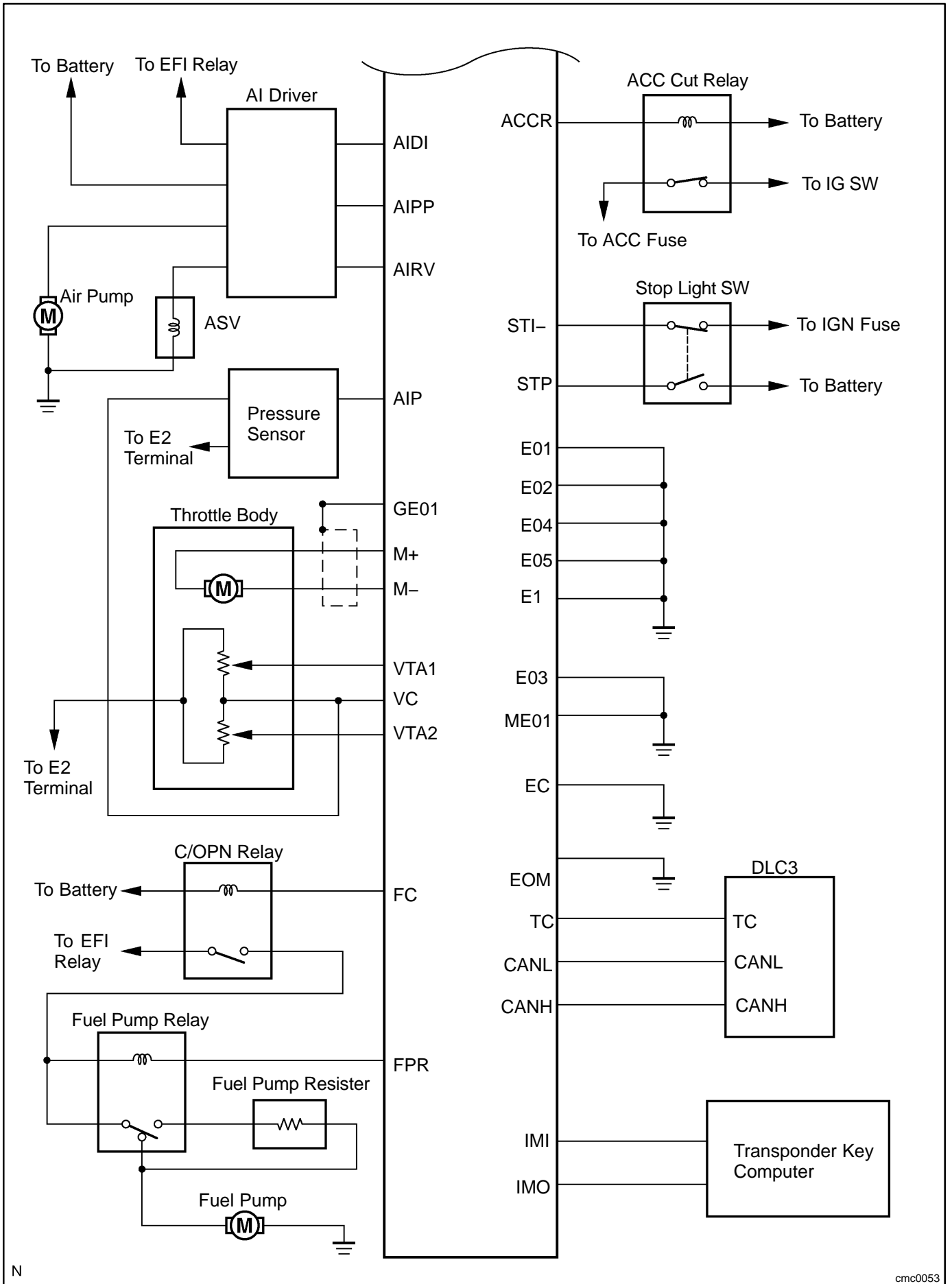
LOCATION



SYSTEM DIAGRAM



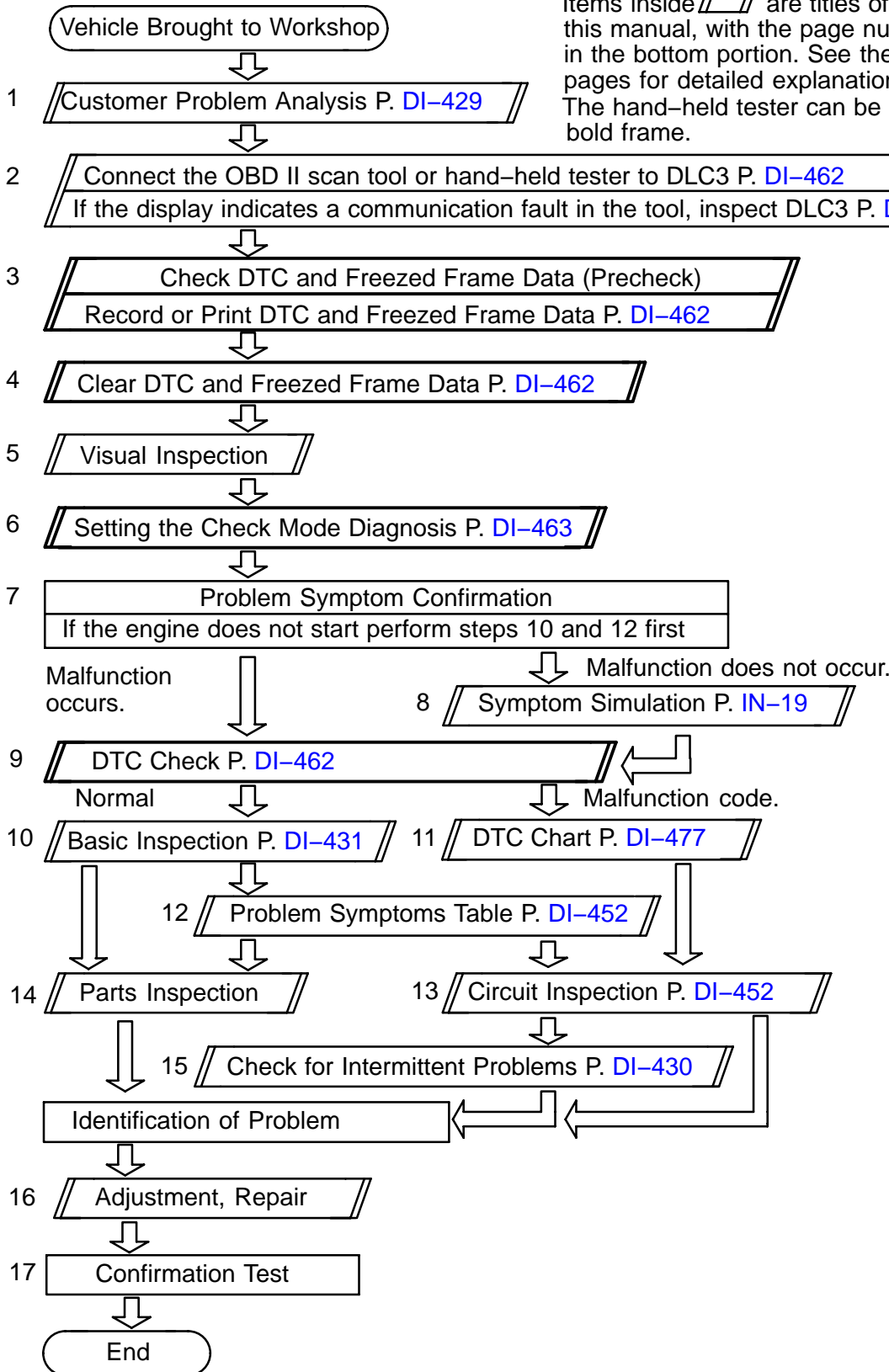




HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.

Items inside **//** are titles of pages in this manual, with the page number in the bottom portion. See the indicated pages for detailed explanations. The hand-held tester can be used at **//**.



CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet		Inspector's Name _____	
Customer's Name		VIN	
Driver's Name		Production Date	
Data Vehicle Brought in		Licence Plate No.	
Engine model		Odometer Reading	km miles
Problem Symptoms	<input type="checkbox"/> Engine does not Start	<input type="checkbox"/> Engine does not crank <input type="checkbox"/> No initial combustion <input type="checkbox"/> No complete combustion	
	<input type="checkbox"/> Difficult to Start	<input type="checkbox"/> Engine cranks slowly <input type="checkbox"/> Other _____	
	<input type="checkbox"/> Poor Idling	<input type="checkbox"/> Incorrect first idle <input type="checkbox"/> Idling rpm is abnormal <input type="checkbox"/> High (rpm) <input type="checkbox"/> Low (rpm) <input type="checkbox"/> Rough idling <input type="checkbox"/> Other _____	
	<input type="checkbox"/> Poor Driveability	<input type="checkbox"/> Hesitation <input type="checkbox"/> Back fire <input type="checkbox"/> Muffler explosion (after-fire) <input type="checkbox"/> Surging <input type="checkbox"/> Knocking <input type="checkbox"/> Other _____	
	<input type="checkbox"/> Engine Stall	<input type="checkbox"/> Soon after starting <input type="checkbox"/> After accelerator pedal depressed <input type="checkbox"/> After accelerator pedal released <input type="checkbox"/> During A/C operation <input type="checkbox"/> Shifting from N to D <input type="checkbox"/> Other _____	
	<input type="checkbox"/> Others		
Dates Problem Occurred			
Problem Frequency		<input type="checkbox"/> Constant <input type="checkbox"/> Sometimes (times per day/month) <input type="checkbox"/> Once only <input type="checkbox"/> Other _____	
Condition When Problem Occurs	Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Other _____	
	Outdoor Temperature	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold (approx. ____ °C/ ____ °F)	
	Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Other _____	
	Engine Temp.	<input type="checkbox"/> Cold <input type="checkbox"/> Warming up <input type="checkbox"/> After warming up <input type="checkbox"/> Any temp. <input type="checkbox"/> Other _____	
	Engine Operation	<input type="checkbox"/> Starting <input type="checkbox"/> Just after starting (min.) <input type="checkbox"/> Idling <input type="checkbox"/> Racing <input type="checkbox"/> Driving <input type="checkbox"/> Constant speed <input type="checkbox"/> Acceleration <input type="checkbox"/> Deceleration <input type="checkbox"/> A/C switch ON/OFF <input type="checkbox"/> Other _____	
Condition of malfunction indicator light (MIL)		<input type="checkbox"/> Remains on <input type="checkbox"/> Sometimes light up <input type="checkbox"/> Does not light up	
DTC Inspection	Normal Mode (Pre-check)	<input type="checkbox"/> Normal <input type="checkbox"/> Malfunction code(s) (code) <input type="checkbox"/> Freezed frame data ()	
	Check Mode	<input type="checkbox"/> Normal <input type="checkbox"/> Malfunction code(s) (code) <input type="checkbox"/> Freezed frame data ()	

CHECK FOR INTERMITTENT PROBLEMS

HINT:

Hand-held tester only:

Inspect the vehicle's ECM using check mode. Intermittent problems are easier to detect with a hand-held tester when the ECM is in check mode. In check mode, the ECM uses 1trip detection logic, which is more sensitive to malfunctions than normal mode (default), which uses 2 trip detection logic.

- (a) Clear DTCs (see page [DI-462](#)).
- (b) Switch the ECM from normal mode to check mode using a hand-held tester (see page [DI-463](#)).
- (c) Perform a simulation test (see page [IN-19](#)).
- (d) Check and wiggle the harness(es), connector(s) and terminal(s) (see page [IN-30](#)).

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	Is battery voltage 11 V or more when engine stopped?
----------	---

NO	Charge or replace battery.
-----------	-----------------------------------

YES

2	Is engine cranked?
----------	---------------------------

NO	Proceed to page ST-18 and continue to troubleshoot.
-----------	--

YES

3	Does engine start?
----------	---------------------------

NO	Go to step 6.
-----------	----------------------

YES

4 Check air filter.**PREPARATION:**

Remove the air filter.

CHECK:

Visual check that the air filter is not excessively dirty or oily.

NG**Repair or replace air filter.****OK****5 Check idle speed (See page [EM-11](#)).****NG****Proceed to problem symptoms table on page [DI-452](#).****OK****6 Check fuel pressure (See page [SF-7](#)).****NG****Proceed to page [SF-7](#) and continue to trouble-shoot.****OK****7 Check for spark (See page [IG-1](#)).****NG****Proceed to page [IG-1](#) and continue to trouble-shoot.****OK****Proceed to problem symptoms table on page [DI-452](#).**

REGISTRATION

NOTICE:

The Vehicle Identification Number (VIN) must be input into the replacement ECM.

HINT:

The VIN is in the form of a 17–digit alphanumeric vehicle identification number. A hand–held tester is required to register the VIN.

1. DESCRIPTION

This registration section consists of three parts, Input Instructions, Read VIN and Write VIN.

- (a) Input Instructions: Explains the general VIN input instructions using a hand–held tester.
- (b) Read VIN: Explains the VIN reading process in a flowchart. This process allows the VIN stored in the ECM to be read, in order to confirm that the two VINs, provided with the vehicle and stored in the vehicle's ECM, are the same.
- (c) Write VIN: Explains the VIN writing process in a flowchart. This process allows the VIN to be input into the ECM. If the ECM is changed, or the VIN and VIN do not match, the VIN can be registered, or overwritten in the ECM by following this procedure.

2. INPUT INSTRUCTIONS

- (a) Hand–held tester
The arrow buttons (UP, DOWN, RIGHT and LEFT) and numerical buttons (0 to 9) are used, in order to input the VIN.
- (b) Cursor Operation
To move the cursor around the tester screen, press the RIGHT and LEFT buttons.
- (c) Alphabetical Character Input
 - (1) Press the UP and DOWN buttons to select the desired alphabetical character.
 - (2) After selection, the cursor should move.
- (d) Numeric Character Input
 - (1) Press the numerical button corresponding to the number that you want to input.
 - (2) Select or input the correct character using the UP/DOWN buttons, or the numerical buttons.

HINT:

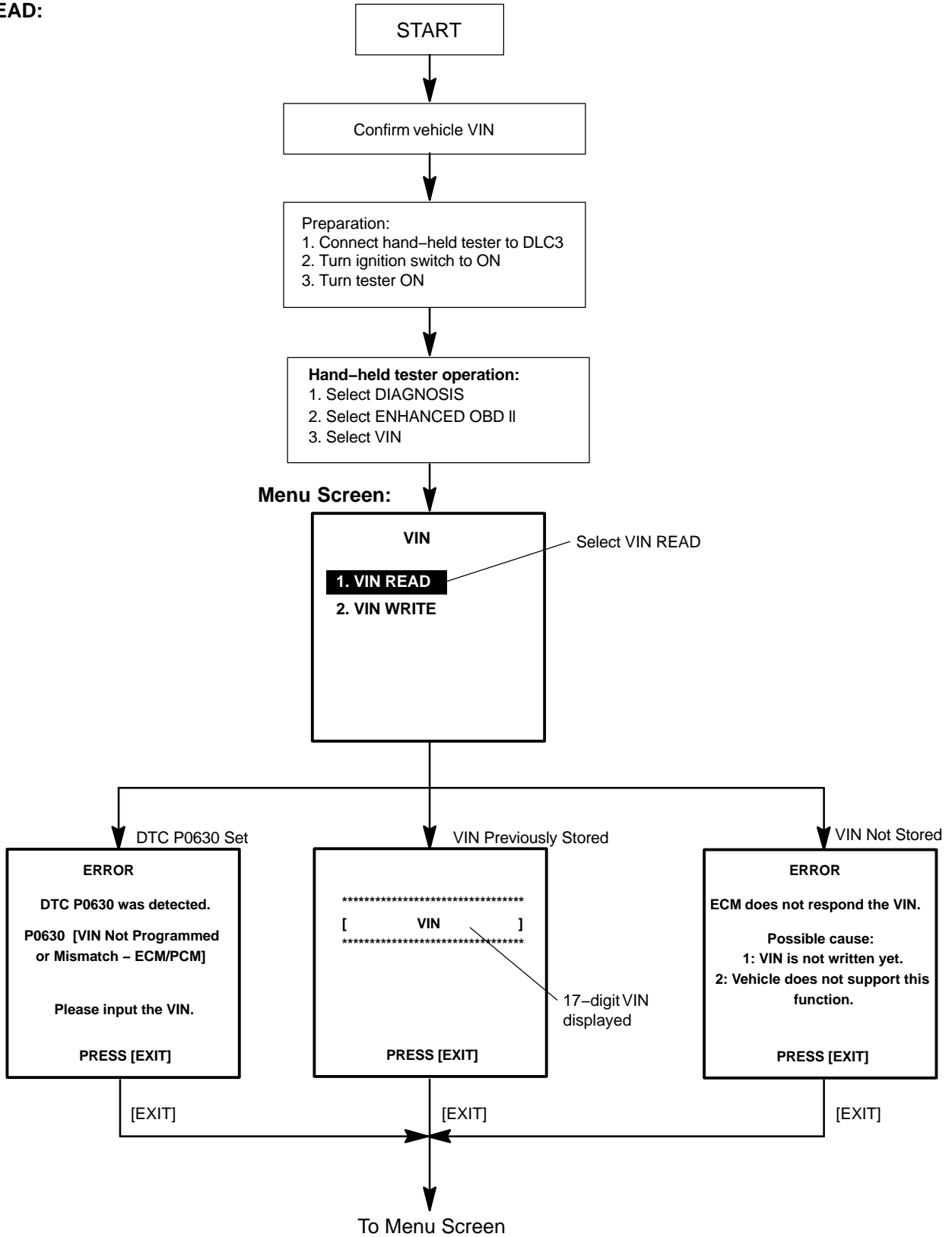
Numerical characters can be selected by using the UP and DOWN buttons.

- (e) Correction
 - (1) After input, the cursor should move.
 - (2) When correcting the input character(s), put the cursor onto the character using the RIGHT or LEFT buttons.
- (f) Finishing Input Operation
 - (1) Make sure that the input VIN matches the vehicle VIN after input.
 - (2) Press the ENTER button on the tester.

3. READ VIN (Vehicle Identification Number)

(a) Read VIN using a hand-held tester.

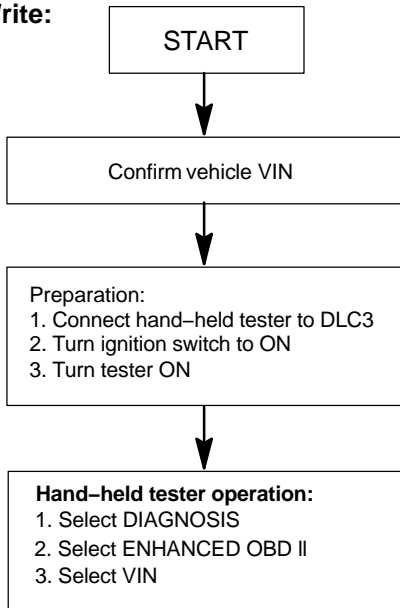
READ:



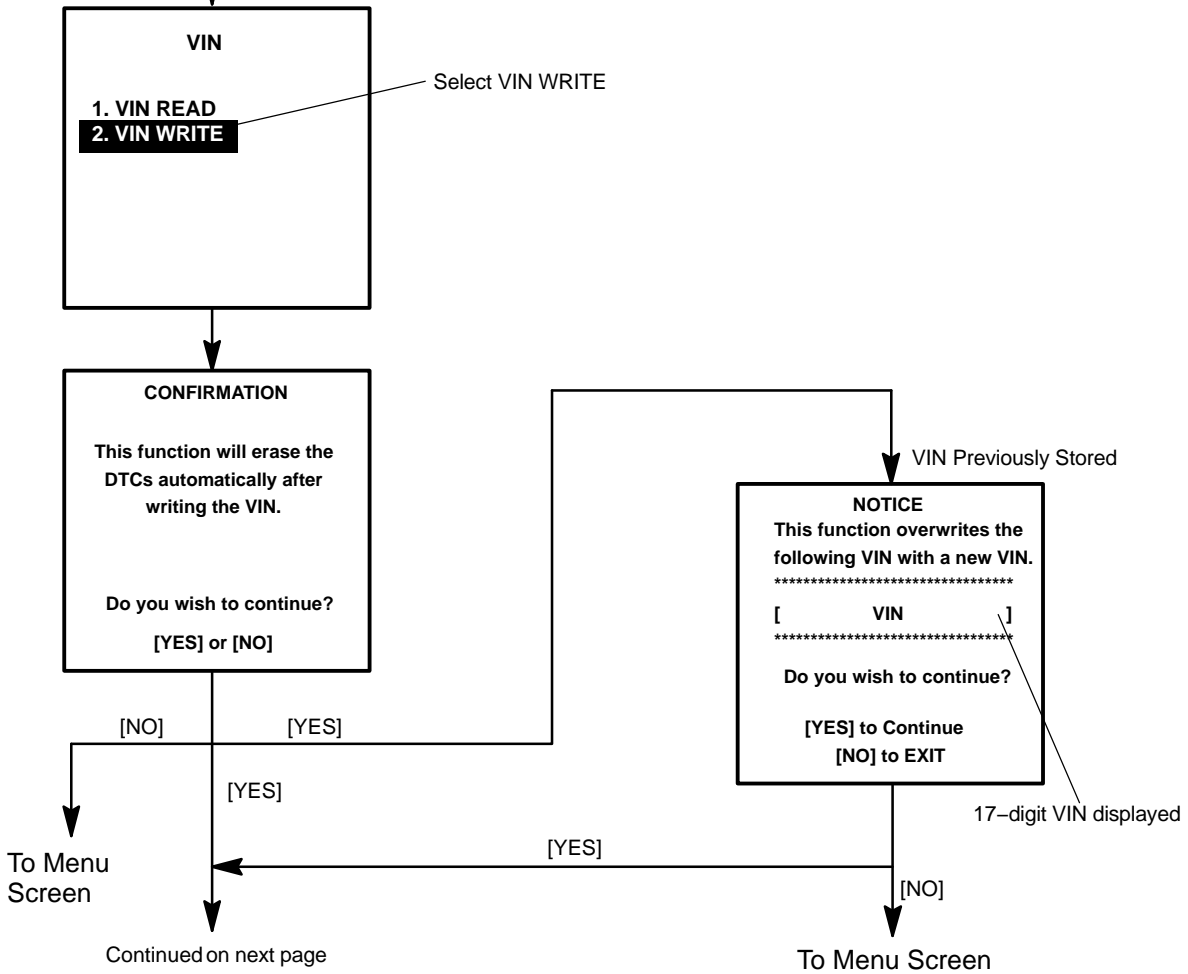
4. WRITE VIN

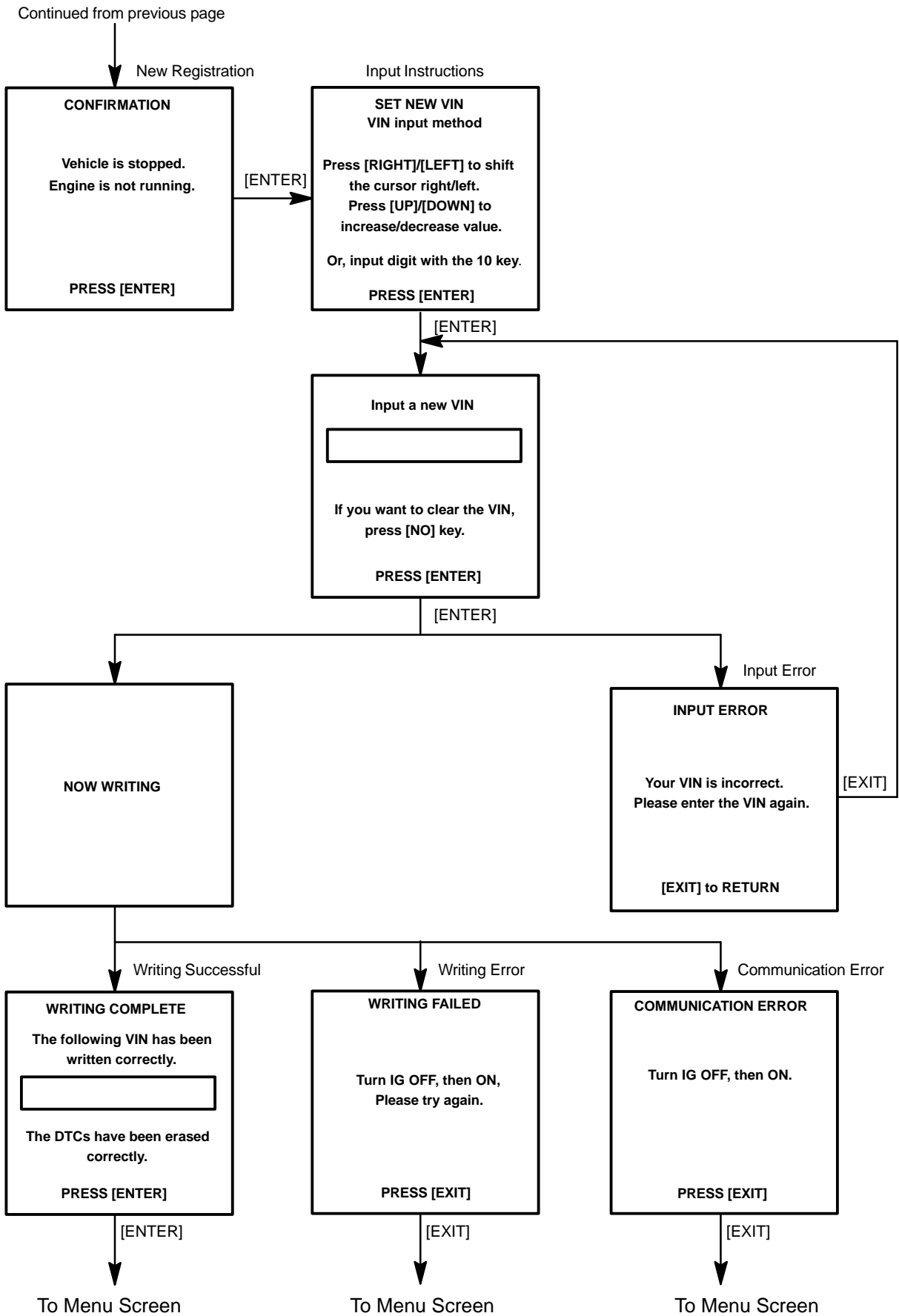
(a) Write VIN using the hand-held tester.

Write:



Menu Screen:





LIST OF DISABLE A MONITOR

HINT:

This table indicates ECM monitoring status for the items in the upper columns if the DTCs in each line on the left are being set.

As for the "X" mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

Monitor detected malfunction	Fault code		Component/system		Monitor disablement (X - disabled)																															
	Upper	Lower	Upper	Lower	P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0031,32,51,52	P0033,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308						
			VVT VSV1,2																																	
	P0010,P0020	P0010,P0020	VVT VSV1,2																																	
	P0011	P0011	VVT System1 - Advance																																	
	P0012	P0012	VVT System1 - Retard																																	
	P0016,P0018	P0016,P0018	VVT System - Misalignment																																	
	P0021	P0021	VVT System2 - Advance																																	
	P0022	P0022	VVT System2 - Retard																																	
	P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																																	
	P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																																	
	P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																																	
	P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																																	
	P0100,P0101	P0100-P0103	MAF sensor																																	
	P0105,P0106	P0105-P0108	MAP sensor																																	
	P0110	P0110-P0113	IAT sensor																																	
	P0115,P0116	P0115-P0118	ECT sensor																																	
	P0120,P0121	P0120-P0223,P2135	TP sensor																																	
	P0125	P0125	Insufficient ECT for Closed Loop																																	
	P0128	P0128	Thermostat																																	
	P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																																	
	P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1																																	
	P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																																	
	P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																																	
	P0171,P0172	P0171,P0172	Fuel system																																	
	P0300-P0308	P0300-P0308	Misfire																																	
	P0325,P0330	P0325-P0333	Knock sensor																																	
	P0335	P0335	CKP sensor																																	
	P0340, P0341	P0340, P0341	CMP sensor																																	
	P0340-P0346	P0340-P0346	VVT sensor1,2																																	
	P0351-P0358	P0351-P0358	Ignitor																																	
	P0385	P0385	CKP sensor 2																																	
	P0401	P0401	EGR system (closed)																																	
	P0402	P0402	EGR system (open)																																	
	P0405,P0409	P0405-P0409	Lift sensor																																	
	P0420,P0430	P0420,P0430	Catalyst																																	
	P0442-P0456	P0442-P0456	EVAP system																																	
	P0450,P0451	P0450-P0453	EVAP press sensor																																	

Monitor detected malfunction	Fault code		Component/system		Monitor disablement (X - disabled)																													
	Code 1	Code 2	Code 1	Code 2	P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
					VVT_VSV1,2	VVT System1 - Advance	VVT System1 - Retard	VVT System - Mismatch	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	P0125	P0128	O2 Sensor - Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
P0500	P0500	VSS																							X	X	X	X	X	X	X			
P0511	P0511	IAC valve																							X	X	X	X	X	X	X			
P0510	P0510	Idle switch														X	X							X	X	X	X	X	X	X	X			
P0560	P0560	System Voltage																						X	X									
P0617	P0617	Starter signal																																
P0705	P0705	Shift lever position switch																																
P0710	P0710-P0713	Trans fluid temp sensor																																
P0720-P0793	P0720-P0793	Output speed sensor																																
P0715-P0717	P0715-P0717	Input speed sensor																																
P0724	P0724	Stop lamp switch																																
P0741-P0796	P0741-P0796	Trans solenoid (function)																																
P0748-P0798	P0748-P0799	Trans solenoid (range)																																
P0850	P0850	PNP switch																															X	
P1010,P1020	P1010,P1020	VVTL																							X							X		
P1011,12,(21,22)	P1011,12,(21,22)	VVTL system1,(2)																							X							X		
P1126	P1126	Electronic magnet clutch																																
P1129	P1129	Electronic throttle system																																
P1430	P1430	HC adsorber ACT press sensor																																
P2004,6	P2004,6	Intake Manifold Runner Control																																
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																																
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																																
P2102,P2103	P2102,P2103	Throttle motor																																
P2120-P2138	P2120-P2138	Accel position sensor																																
P2196,P2198	P2196,P2198	A/F sensor (rationality)																							X			X	X					
P2226	P2226	BARO sensor																								X		X	X					
P2237,P2240	P2237,P2240	A/F sensor (open)																							X			X	X					
P2423,24	P2423,24	HC Adsorption Catalyst																																
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																																
P2431	P2431	AIR Pressure Sensor(Rationality)																																
P2440	P2440	AIR control valve stuck open																								X	X	X	X	X	X	X	X	X
P2441	P2441	AIR control valve stuck close																								X	X	X	X	X	X	X	X	X
P2444	P2444	AIP stuck On																								X	X	X	X	X	X	X	X	X
P2445	P2445	AIP stuck Off																								X	X	X	X	X	X	X	X	X
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																																
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																							X			X	X					

Monitor detected malfunction	Fault code		Monitor disablement (X - disabled)																									
	Fault code	Component/ system	P0325-P0330	P0335	P0340-P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420-P0430	P0440-P0446	P0450-P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796
			P0325-P0333	P0335	P0340-P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405-P0406	P0409	P0420-P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796
P0500	P0500	VSS						X	X			X	X					X						X	X		X	
P0511	P0511	IAC valve																	X									
P0510	P0510	Idle switch							X			X	X					X									X	
P0560	P0560	System Voltage																										
P0617	P0617	Starter signal																										
P0705	P0705	Shift lever position switch																										
P0710	P0710-P0713	Trans fluid temp sensor																										
P0720-P0793	P0720-P0793	Output speed sensor																									X	
P0715-P0717	P0715-P0717	Input speed sensor																										
P0724	P0724	Stop lamp switch																										
P0741-P0796	P0741-P0796	Trans solenoid (function)																										
P0748-P0798	P0748-P0798	Trans solenoid (range)																							X	X	X	
P0850	P0850	PNP switch																	X								X	
P1010,P1020	P1010,P1020	VVTL																										
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)							X	X		X	X					X										
P1126	P1126	Electronic magnet clutch																										
P1129	P1129	Electronic throttle system																										
P1430	P1430	HC adsorber ACT press sensor												X	X													
P2004,6	P2004,6	Intake Manifold Runner Control																										
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																										
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																										
P2102,P2103	P2102,P2103	Throttle motor																										
P2120-P2138	P2120-P2138	Accel position sensor																										
P2196,P2198	P2196,P2198	A/F sensor (rationality)							X	X		X						X									X	
P2226	P2226	BARO sensor																									X	
P2237,P2240	P2237,P2240	A/F sensor (open)							X	X		X						X									X	
P2423,24	P2423,24	HC Adsorption Catalyst																										
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																										
P2431	P2431	AIR Pressure Sensor(Rationality)																										
P2440	P2440	AIR control valve stuck open							X	X		X																
P2441	P2441	AIR control valve stuck close							X	X		X																
P2444	P2444	AIP stuck On							X	X		X																
P2445	P2445	AIP stuck Off							X	X		X																
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																									X	
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)							X	X		X						X									X	

DIAGNOSTICS - ENGINE (2UZ-FE)

Monitor disablement (X - disabled)

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																								
			P0741-P0796	P0748-P0999	P0850	P1010,P1020	P1011,12,(21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
			Trans solenoid (function)*2	Trans solenoid (range)	PNP switch	VVTL	VVTL system(1,2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	HC Adsorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1
P0010,P0020	P0010,P0020	VVT VSV1,2																									
P0011	P0011	VVT System1 - Advance																			X	X	X	X			
P0012	P0012	VVT System1 - Retard																			X	X	X	X			
P0016,P0018	P0016,P0018	VVT System - Misalignment																			X	X	X	X			
P0021	P0021	VVT System2 - Advance																			X	X	X	X			
P0022	P0022	VVT System2 - Retard																			X	X	X	X			
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																			X	X	X	X			
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1													X			X	X		X	X	X	X			X
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2													X			X	X								
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																X	X								
P0100,P0101	P0100-P0103	MAF sensor				X	X							X		X	X			X	X	X	X				X
P0105,P0106	P0105-P0108	MAP sensor				X	X							X		X	X			X	X	X	X				X
P0110	P0110-P0113	IAT sensor															X			X	X	X	X				X
P0115,P0116	P0115-P0118	ECT sensor	X			X	X				X			X		X	X			X	X	X	X				X
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X	X			X	X	X	X				X
P0125	P0125	Insufficient ECT for Closed Loop	X			X								X		X	X			X	X	X	X				X
P0128	P0128	Thermostat																									
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																X		X	X	X	X				
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1													X		X	X		X	X	X	X				X
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2													X		X			X	X	X	X				
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																X									
P0171,P0172	P0171,P0172	Fuel system													X		X	X		X	X	X	X				X
P0300-P0308	P0300-P0308	Misfire													X		X	X		X	X	X	X				X
P0325,P0330	P0325-P0333	Knock sensor																		X	X	X	X				
P0335	P0335	CKP sensor				X	X							X		X	X			X	X	X	X				X
P0340, P0341	P0340, P0341	CMP sensor				X	X							X		X	X			X	X	X	X				X
P0340-P0346	P0340-P0346	VVT sensor1,2																		X	X	X	X				
P0351-P0358	P0351-P0358	Ignitor																X		X	X	X	X				
P0385	P0385	CKP sensor 2				X	X							X		X	X			X	X	X	X				X
P0401	P0401	EGR system (closed)																		X	X	X	X				
P0402	P0402	EGR system (open)													X		X	X		X	X	X	X				X
P0405,P0409	P0405-P0409	Lift sensor																		X	X	X	X				
P0420,P0430	P0420,P0430	Catalyst																									
P0442-P0456	P0442-P0456	EVAP system													X		X			X	X	X	X				X
P0450,P0451	P0450-P0453	EVAP press sensor																		X	X	X	X				

Monitor detected malfunction	Fault code		Component/system		Monitor disablement (X - disabled)	
	Code 1	Code 2	Code 1	Code 2	Code 1	Code 2
P0500	P0500	VSS	X			
P0511	P0511	IAC valve				
P0510	P0510	Idle switch				
P0560	P0560	System Voltage				
P0617	P0617	Starter signal				
P0705	P0705	Shift lever position switch				
P0710	P0710-P0713	Trans fluid temp sensor				
P0720-P0793	P0720-P0793	Output speed sensor				
P0715-P0717	P0715-P0717	Input speed sensor				
P0724	P0724	Stop lamp switch				
P0741-P0796	P0741-P0796	Trans solenoid (function)				
P0748-P0798	P0748-P0798	Trans solenoid (range)	X			
P0850	P0850	PNP switch				
P1010,P1020	P1010,P1020	VVTL				
P1011,12,(21,22)	P1011,12,(21,22)	VVTL system1,(2)				
P1126	P1126	Electronic magnet clutch				
P1129	P1129	Electronic throttle system				
P1430	P1430	HC adsorber ACT press sensor				
P2004,6	P2004,6	Intake Manifold Runner Control				
P2009,10	P2009,10	Intake Manifold Runner Control Circuit				
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor				
P2102,P2103	P2102,P2103	Throttle motor				
P2120-P2138	P2120-P2138	Accel position sensor				
P2196,P2198	P2196,P2198	A/F sensor (rationality)				
P2226	P2226	BARO sensor				
P2237,P2240	P2237,P2240	A/F sensor (open)				
P2423,24	P2423,24	HC Adsorption Catalyst				
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)				
P2431	P2431	AIR Pressure Sensor(Rationality)				
P2440	P2440	AIR control valve stuck open				
P2441	P2441	AIR control valve stuck close				
P2444	P2444	AIP stuck On				
P2445	P2445	AIP stuck Off				
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)				
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)				

O2S TEST RESULT

INTRODUCTION

The O2S TEST RESULT refers to the results of the engine control module (ECM) when it monitors the oxygen sensor (O2S), and it can be read using the hand-held tester or the generic OBD II scan tool. Based on this, you can find the O2S's conditions.

The ECM monitors the O2S in the various items. You can read the monitor result (TEST DATA) of each monitor item using the O2S TEST RESULT. However, the output value of the TEST DATA is the latest "snapshot" value that is taken after monitoring and therefore it is not dynamic.

In this repair manual, the description of the O2S TEST RESULT (for O2S related DTCs) are written in a table.

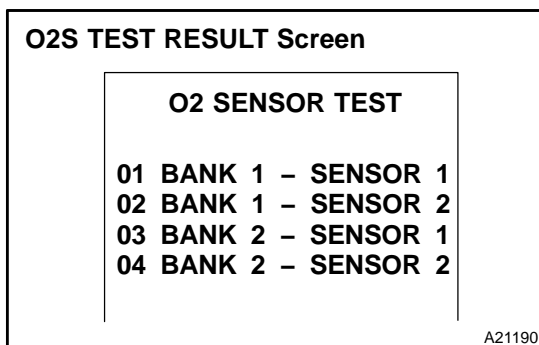
This table consists of 5 items:

- (1) TEST ID (a code applied to each TEST DATA)
- (2) Description of TEST DATA
- (3) Conversion Factor (When Conversion Factor has a value written in the table, multiply the TEST DATA value appearing on the scan tool by the Conversion Factor value. The result will be the required value.)
- (4) Unit
- (5) Standard Value

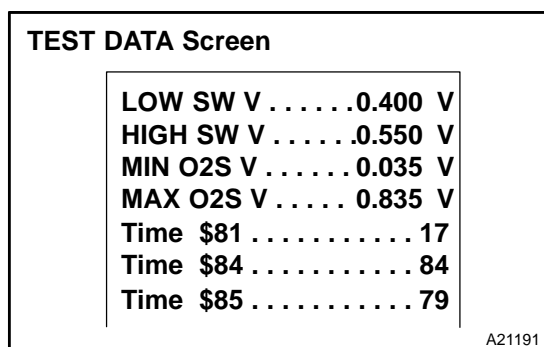
If the TEST DATA value appearing on the scan tool is out of the standard value, the O2S is malfunctioning. If it is within the standard value, the O2S is functioning normally. However, if the value is on the borderline of the standard value, the O2S may malfunction very soon.

HOW TO READ O2S TEST RESULT USING HAND-HELD TESTER

- (a) Connect the hand-held tester to the DLC3.



- (b) On the tester screen, select the following menus: DIAGNOSIS / CARB OBDII / O2S TEST RESULT. A list of the O2S equipped on the vehicle will be displayed.



- (c) Select the desired O2S and press ENTER. The following screen will appear.
- (d) Press HELP and * simultaneously. More information will appear.
- (e) Example:
 - (1) The hand-held tester displays "17" as a value of the "TIME \$81" (see the illustration on the left).
 - (2) Find the Conversion Factor value of "TIME \$81" in the O2S TEST RESULT chart below. 0.3906 is specified for \$81 in this chart.
 - (3) Multiply "17" in step (1) by 0.3906 (Conversion Factor) in the step (2).
 $17 \times 0.3906 = 6.6 \%$
 - (4) If the answer is within the standard value, the "TIME \$81" can be confirmed to be normal.

O2S TEST RESULT Chart

TEST ID	Description of TEST DATA	Conversion Factor	Unit	Standard Value
\$81	Percentage of monitoring time when the HO2S voltage is less than 0.05V	Multiply 0.3906	%	Within 60 %

CHECKING MONITOR STATUS

1. OUTLINE

The monitor results and the test values can be checked with the OBD II scan tool.

The engine control module (ECM) monitors the emissions-related components as the thermostat, catalyst converter and evaporative emissions (EVAP), and determines whether they are functioning normally or not. When finished and monitoring, the ECM stores the monitor results and the test values.

The monitor result indicates whether the component is functioning normally or not. The test value is the value that was used to determine the monitor result. If the test value is outside the test limit (malfunction criterion), the ECM determines the component is malfunctioning. Some emissions-related components have multiple test values to determine monitor result. If one of these test values is outside test limit, the ECM determines the component is determine monitor result. If one of these test values is outside test limit, the ECM determines the components is malfunctioning.

2. DESCRIPTION

The test value and test limit information are described as shown in the following table. This information is included under "MONITOR RESULT" in the emissions-related DTC sections.

Thermostat:

MID	TID	Scaling	Test Result	Minimum Test Limit	Maximum Test Limit
\$E1	\$E8	Multiply by 0.1 [°C]	ECT sensor output when estimated ECT reached to malfunction criteria	Malfunction criteria	Maximum test limit

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

3. PROCEDURE (USING HAND-HELD TESTER)

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch and hand-held tester ON.
- Clear DTCs.
- Allow the vehicle to drive, in accordance with the applicable drive pattern described in the READINESS MONITOR DRIVE PATTERN section (see page [DI-446](#)).
- Check the monitor result. Select the hand-held tester menus: DIAGNOSIS/ENHANCED OBDII/MONITOR INFO/MONITOR STATUS. The monitor result appears after the component name.
 - AVAIL indicates the component has not been monitored yet.
 - COMPL indicates the component is functioning normally.
 - INCMPL indicates the component is malfunctioning.
- Check the test value(s). Select the hand-held tester menus: DIAGNOSIS/ENHANCED OBDII/MONITOR INFO/TEST RESULT.
- Select the component and press ENTER. If the monitor result has been COMPL or INCMPL, the accuracy test value appears.
- Compare the test value with the test limits, MIN and MAX.
 - If the test value is outside of the test limit, the component is malfunctioning.
 - If the test value is on the borderline of the test limit, a malfunction is concealed in the component.

HINT:

The monitor result might on rare occasions be COMPL even if the malfunction indicator lamp (MIL) is illuminated. This indicates the system malfunctioned on a previous driving cycle. This might be caused by an intermittent problem.

READINESS MONITOR DRIVE PATTERN

1. PURPOSE OF THE READINESS TESTS

- The On-Board Diagnostic (OBD II) system is designed to monitor the performance of emission-related components and report any detected abnormalities in the form of Diagnostic Trouble Codes (DTCs). Since the various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called Readiness Monitors. Many state Inspection and Maintenance (I/M) programs require that vehicles complete their Readiness Monitors prior to beginning an emission test.
- The current status of the Readiness Monitors can be seen by using the hand-held tester with version 9.0 software (or newer), or a generic OBD II Scan tool.
- To view the Readiness Monitor status using the hand-held tester, select "Monitor Status" from the Enhanced OBD II Menu.
- A status of "complete" indicates that the necessary conditions have been met to run the performance tests for the related Readiness Monitor.
- The Readiness Monitor will be reset to "incomplete" if:
 - ECM has lost power (battery or fuse).
 - DTCs have been cleared.
 - The conditions for running the Readiness Monitor have not been met.
- In the event that any Readiness Monitor shows "incomplete," follow the appropriate Readiness Monitor Drive Pattern to activate the monitor and change the readiness status to "complete."

CAUTION:

Strictly observe the posted speed limits, traffic laws, and road conditions when performing these drive patterns.

NOTICE:

These drive patterns represent the fastest method to satisfy all necessary conditions which allow the specific readiness monitor to complete.

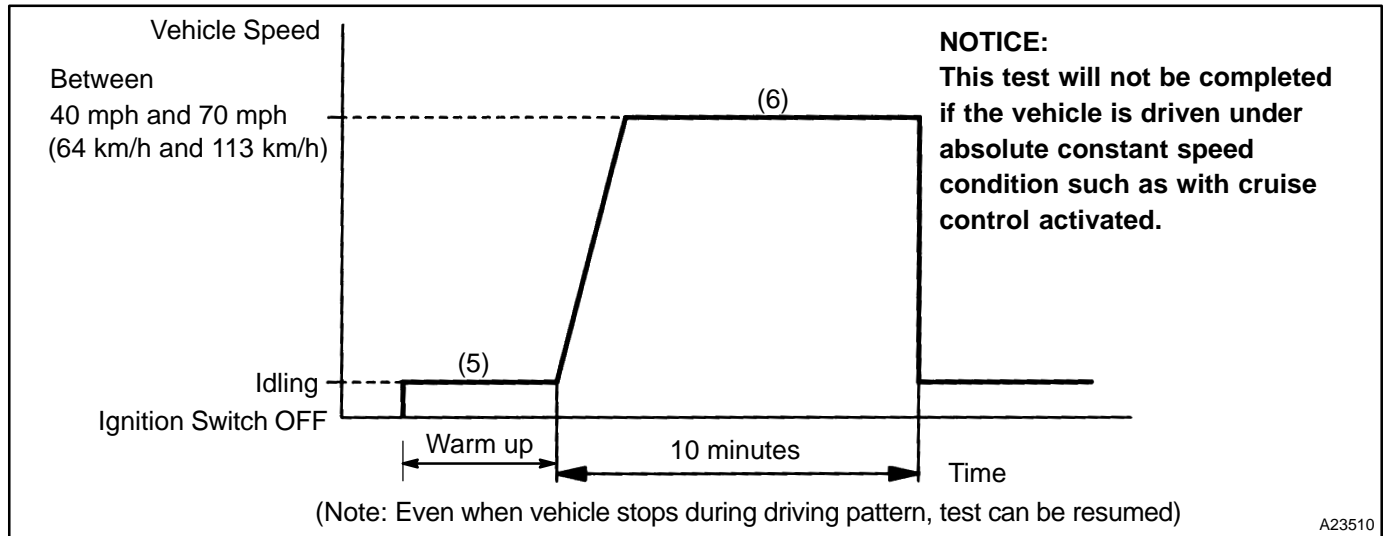
In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors) the drive pattern can be resumed, and in most cases, the readiness monitor will still set to "complete".

To ensure rapid completion of readiness monitors, avoid sudden changes in vehicle load and speed (driving up and down hills and/or sudden acceleration).

Contents:

TITLE	STEP(s)
CATALYST MONITOR	2
EVAP MONITOR	3, 4
AIR-FUEL RATIO (A/F) AND OXYGEN SENSOR (O ₂ S) MONITOR	5
OXYGEN SENOSR HEATER MONITOR	6

2. CATALYST MONITOR (ACTIVE AIR-FUEL RATIO CONTROL TYPE)



(a) Preconditions

The monitor will not run unless:

- The MIL is OFF

(b) Drive Pattern

- (1) Connect a hand-held tester or OBD II scan tool to the DLC3.
- (2) Turn the ignition switch to ON.
- (3) Turn the tester or scan tool ON.
- (4) Clear DTCs (where set) (see page [DI-462](#)).
- (5) Start the engine and warm it up.
- (6) Drive the vehicle at between 40 mph and 70 mph (64 km/h and 113 km/h) for at least 10 minutes.

(c) Monitor Status

- (1) Check the Readiness Monitor status displayed on the tester or scan tool.
- (2) If the status does not switch to COMPL (complete), extend the driving time.

3. EVAP MONITOR (VACUUM PRESSURE MONITOR)

NOTICE:

A cold soak must be performed prior to conducting the drive pattern to complete the Internal Pressure Readiness Monitor.

(a) Cold Soak Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400 m) or less

(b) Cold Soak Procedure

Let the vehicle cold soak for 8 hours or until the difference between IAT and ECT becomes less than 7°C (13°F)

HINT:

Examples:

- Scenario 1

ECT = 24°C (75°F)

IAT = 16°C (60°F)

Difference between ECT and IAT is 8°C (15°F)

→ The monitor will not run because difference between ECT and IAT is greater than 7°C (13°F)

- Scenario 2

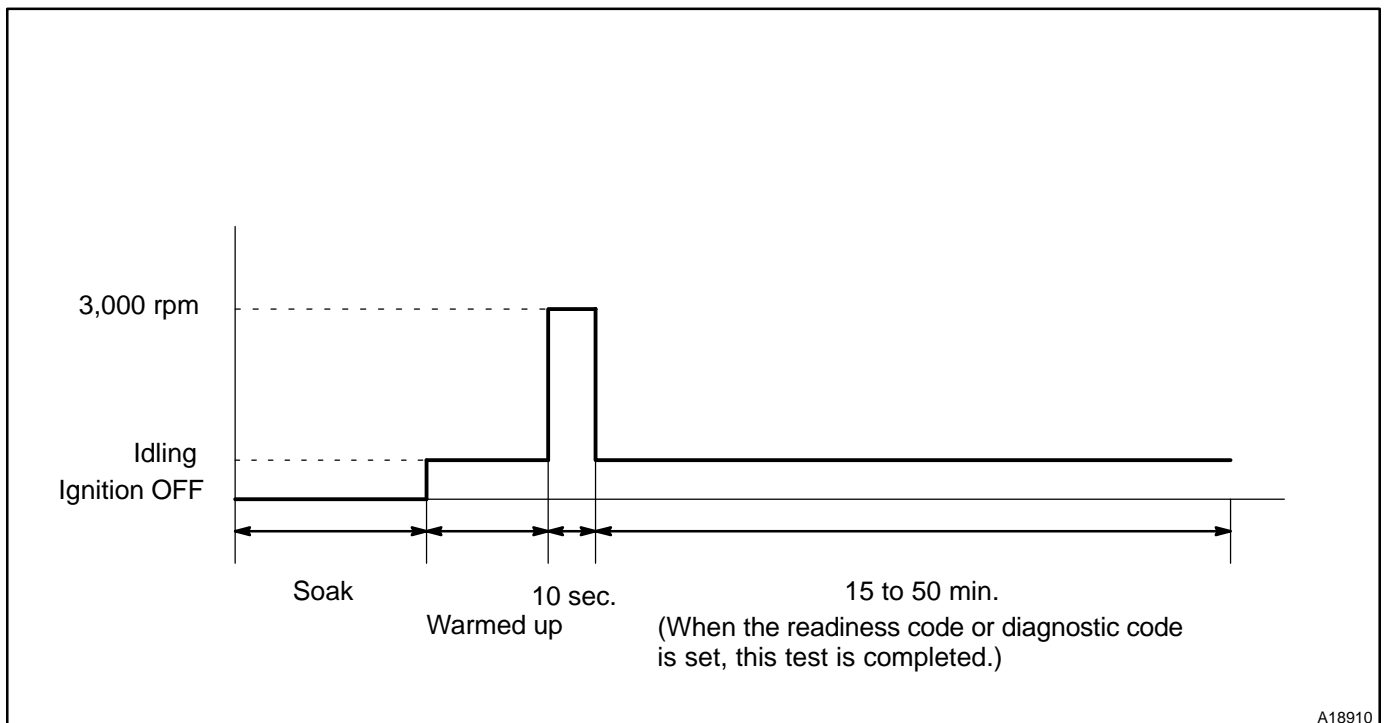
ECT = 21°C (70°F)

IAT = 20°C (68°F)

Difference between ECT and IAT is 1°C (2°F)

→ The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

4. EVAP MONITOR (VACUUM PRESSURE MONITOR) (CONTINUED)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400 m) or less
- Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F)
- Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95°F)
- Cold Soak Procedure has been completed
- Before starting the engine, the difference between ECT and IAT must be less than 7°C (13°F)

HINT:

Examples:

- Scenario 1
ECT = 24°C (75°F)
IAT = 16°C (60°F)
Difference between ECT and IAT is 8°C (15°F)
→ The monitor will not run because difference between ECT and IAT is higher than 7°C (13°F)
- Scenario 2
ECT = 21°C (70°F)
IAT = 20°C (68°F)
Difference between ECT and IAT is 1°C (2°F)
→ The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

The readiness test can be completed in cold ambient conditions (less than 40°F / 4.4°C) and/or at high altitudes (more than 7,800 feet / 2,400 m) if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

- (1) Connect the OBD II scan tool to DLC3 to check monitor status and preconditions (refer to (a)).
- (2) Release pressure in fuel tank by removing the fuel tank cap and then reinstall it.
- (3) Start the engine and allow it to idle until ECT becomes 75°C (167°F) or higher.
- (4) Run the engine at 3,000 rpm for approximately 10 seconds.
- (5) Allow the engine to idle with the A/C ON (to create slight load) for 15 to 50 minutes.

NOTICE:

If the vehicle is not equipped with A/C, put a slight load on the engine by doing the following :

- **Securely set the parking brake.**
- **Block the drive wheels with wheel chocks.**
- **Allow the vehicle to idle in drive for 15 to 50 minutes.**

5. AIR-FUEL RATIO (A/F) AND OXYGEN SENSOR (HO2) MONITOR (ACTIVE AIR-FUEL RATIO CONTROL TYPE)

(a) Preconditions

The monitor will not run unless:

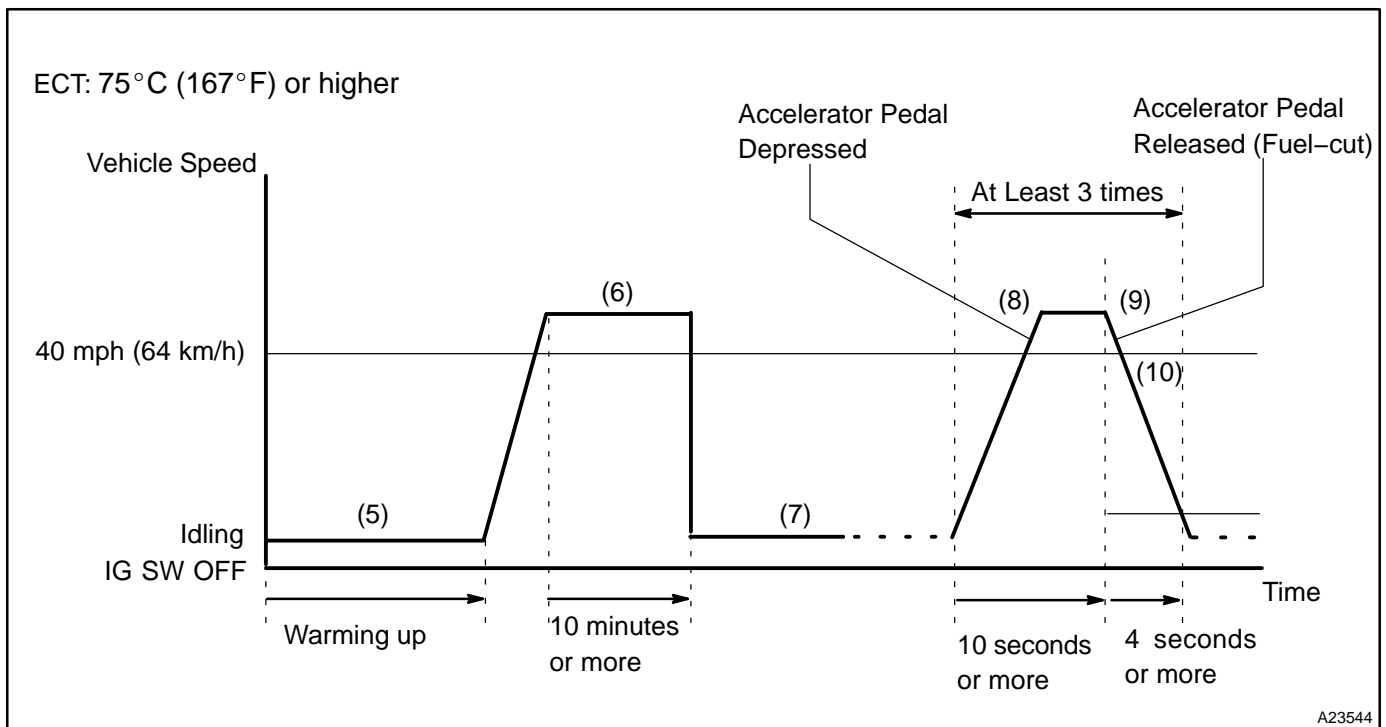
- 2 minutes or more have elapsed since the engine was started.
- The Engine Coolant Temperature (ECT) is 75°C (167°F) or higher.
- Air-fuel ratio feedback control is performed.
- Fuel-cut control is performed for 8 seconds or more.

(b) Drive Pattern

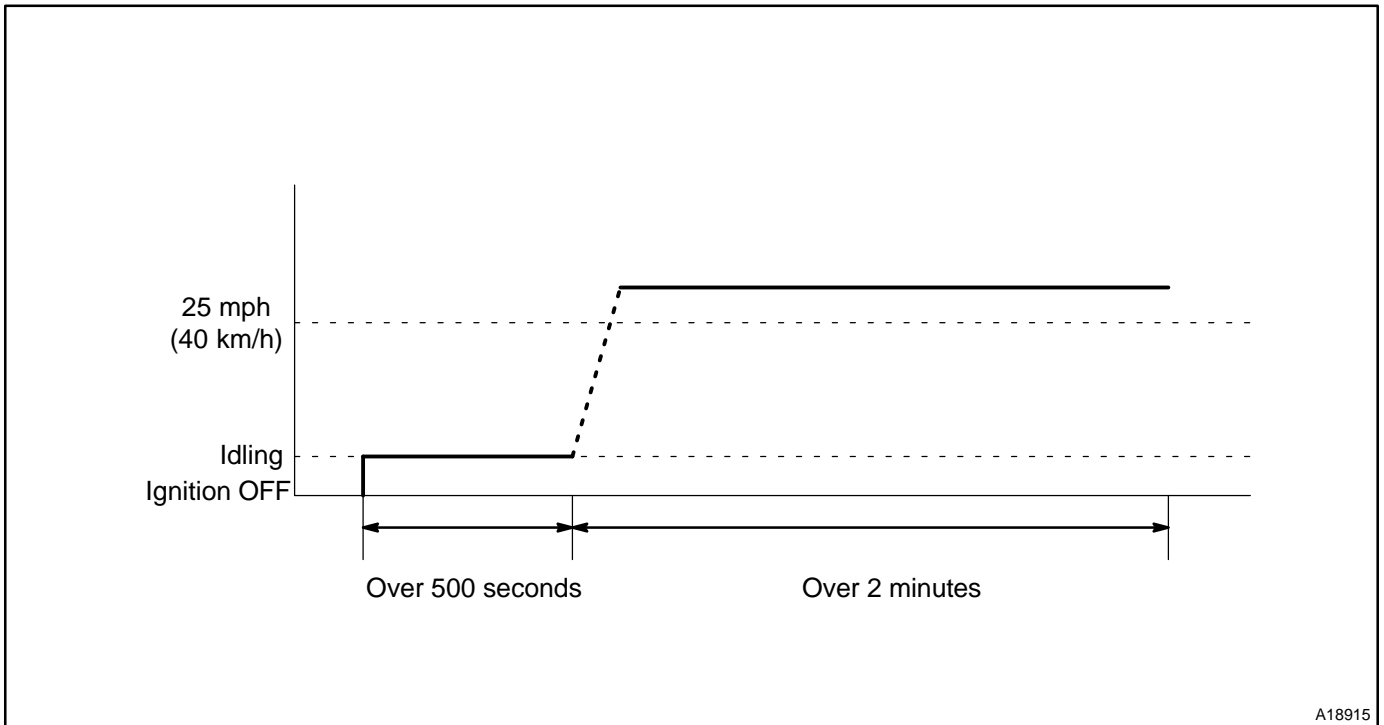
- (1) Connect the hand-held tester to DLC3.
- (2) Turn the ignition switch to ON.
- (3) Clear DTCs (see page [DI-462](#)).
- (4) Start the engine, and warm it up until the ECT reaches 75°C (167°F) or higher.
- (5) Drive the vehicle at 40 mph (64 km/h) or more for at least 10 minutes.
- (6) Change the transmission to 2nd gear.
- (7) Accelerate the vehicle to 30 mph (48 km/h) or more by depressing the accelerator pedal for at least 10 seconds.
- (8) Soon after performing step (8) above, release the accelerator pedal for at least 4 seconds without depressing the brake pedal, in order to execute fuel-cut control.
- (9) Stop the vehicle and allow the engine to idle for 10 seconds or more.
- (10) Allow the vehicle to decelerate until the vehicle speed declines to less than 6 mph (10 km/h).
- (11) Repeat steps from (8) through (10) above at least 3 times in one driving cycle.

(c) Monitor Status

- (1) Check the Readiness Monitor status displayed on the tester.
- (2) If the status does not switch to COMPL (complete), make sure that the preconditions have been met, and then perform steps from (5) through (11) in Drive Pattern above.



6. OXYGEN SENSOR HEATER MONITOR



A18915

(a) Preconditions

The monitor will not run unless:

- MIL is OFF

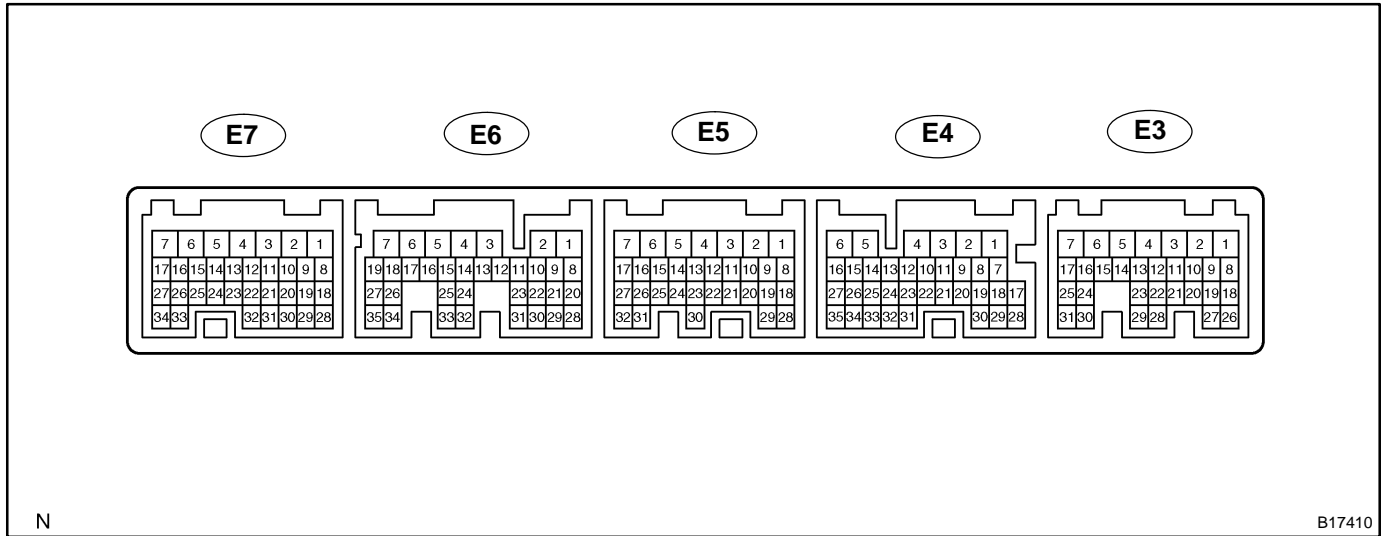
(b) Drive Pattern

- (1) Connect the OBD II scan tool to the DLC3 to check monitor status and preconditions (refer to (a)).
- (2) Start the engine and allow it to idle for 500 seconds or more.
- (3) Drive the vehicle at 25 mph (40 km/h) or more for at least 2 minutes.
- (4) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure the preconditions are met, turn the ignition off and then repeat steps (2) and (3).

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter 2. Starter relay 3. Park/neutral position switch	ST-1 ST-20 DI-1159
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. ECM	DI-918 DI-937 IN-30
No complete combustion (Does not start)	Fuel pump control circuit	DI-937
Engine cranks normally but difficult to start	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI-723 DI-937 EM-3
Difficult to start with cold engine	1. Starter signal circuit 2. Fuel pump control circuit	DI-723 DI-937
Difficult to start with hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI-723 DI-937
High engine idle speed (Poor idling)	1. A/C switch circuit 2. ECM power source circuit	- DI-918
Low engine idle speed (Poor idling)	1. A/C switch circuit 2. Fuel pump control circuit	- DI-937
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM-3 DI-937
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI-918 DI-937
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI-937 -
Surging (Poor driveability)	Fuel pump control circuit	DI-937
Engine stalls soon after starting	Fuel pump control circuit	DI-937
Engine stalls during A/C operation	1. A/C switch circuit 2. ECM	- IN-30

TERMINALS OF ECM



Each ECM terminals' standard voltage is shown in the table below. In the table, first follow the information under "Condition".

Look under "Symbols (Terminals No.)" for the terminals to be inspected.

The standard voltage between the terminals is shown under "STD Voltage".

Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
BATT (E3-3) - E1 (E5-1)	B-R - BR*2 B-Y - BR*3	Always	9 to 14 V
+BM (E3-7) - E1 (E5-1)	G-Y - BR*2 W-G - BR*3		
IGSW (E3-9) - E1 (E5-1)	B-O - BR	IG switch ON	9 to 14 V
+B (E3-1) - E1 (E5-1)	W-L - BR*2 B-R - BR*3		
+B2 (E3-2) - E1 (E5-1)	W-L - BR*2 B-R - BR*3		
MREL (E3-8) - E1 (E5-1)	GR-G - BR*2 B-W - BR*3	IG switch ON	9 to 14 V
VC (E7-23) - E2 (E7-28)	G-B - B-W	IG switch ON	4.5 to 5.5 V
VG (E7-30) - E2G (E7-29)	R-Y - B-Y	Idling, P or N position, A/C switch OFF	0.5 to 3.0 V
THA (E7-22) - E2 (E7-28)	Y-G - B-W	Idling, Intake air temp. 20°C (68°F)	0.5 to 3.4 V
THW (E7-21) - E2 (E7-28)	G - B-W	Idling, Engine coolant temp. 80°C (176°F)	0.2 to 1.0 V
VTA1 (E7-20) - E2 (E7-28)	GR - B-W	IG switch ON, Accelerator pedal released	0.5 to 1.2 V
		IG switch ON, Accelerator pedal depressed	3.2 to 4.8 V
VTA2 (E7-19) - E2 (E7-28)	P-L - B-W	IG switch ON, Accelerator pedal released	2.0 to 3.1 V
		IG switch ON, Accelerator pedal depressed	4.7 to 5.1 V
VPA (E3-18) - E2 (E7-28)	R-G - B-W	IG switch ON, Accelerator pedal released	0.3 to 0.9 V
		IG switch ON, Accelerator pedal depressed	3.2 to 4.8 V
VPA2 (E3-19) - E2 (E7-28)	L - B-W	IG switch ON, Accelerator pedal released	1.8 to 2.7 V
		IG switch ON, Accelerator pedal depressed	4.7 to 5.1 V
VCPA (E3-26) - EPA (E3-20)	P-G - V-R*2 P-G - V*3	IG switch ON	4.5 to 5.5 V

VCP2 (E3-27) - EPA2 (E3-21)	G-R - LG-R	IG switch ON	4.5 to 5.5 V
#10 (E5-2) - E01 (E7-7) #20 (E5-3) - E01 (E7-7) #30 (E5-4) - E01 (E7-7) #40 (E5-5) - E01 (E7-7) #50 (E5-6) - E01 (E7-7) #60 (E5-7) - E01 (E7-7) #70 (E7-3) - E01 (E7-7) #80 (E7-2) - E01 (E7-7)	R - W-B W - W-B G - W-B R-B - W-B L - W-B Y - W-B L-R - W-B R-W - W-B	IG switch ON Idling	9 to 14 V Pulse generation (See waveform 1)
KNK1 (E6-29) - EKNK (E6-28)	G - R	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See waveform 2)
KNK2 (E6-21) - EKN2 (E6-20)	W - B		
OC1+ (E5-17) - OC1- (E5-16)	G-B - L-Y	Accelerate slowly after engine warmed-up	Pulse generation (See waveform 3)
OC2+ (E5-15) - OC2- (E5-14)	P-L - W-R	Accelerate slowly after engine warmed-up	Pulse generation (See waveform 3)
VV1+ (E5-25) - VV1- (E5-24)	G - L	Idling	Pulse generation (See waveform 4)
VV2+ (E5-18) - VV2- (E5-28)	W - B	Idling	Pulse generation (See waveform 4)
G2+ (E5-19) - G2- (E5-29)	Y - L	Idling	Pulse generation (See waveform 5)
NE+ (E5-21) - NE- (E5-20)	G - L	Idling	Pulse generation (See waveform 5)
PRG (E7-34) - E1 (E5-1)	W-G - BR	IG switch ON	9 to 14 V
SPD (E4-8) - E1 (E5-1)	G-O - BR	IG switch ON, Rotate driving wheel slowly	Pulse generation (See waveform 6)
M+ (E7-5) - E1 (E5-1)	R - BR	Idling	Pulse generation (See waveform 7)
M- (E7-4) - E1 (E5-1)	W - BR	Idling	Pulse generation (See waveform 8)
FPR (E5-30) - E1 (E5-1)	R-G - BR	IG switch ON	0 to 3.0 V
FC (E3-10) - E1 (E5-1)	Y - BR	IG switch ON	9 to 14 V
IGT1 (E7-8) - E1 (E5-1) IGT2 (E7-15) - E1 (E5-1) IGT3 (E7-11) - E1 (E5-1) IGT4 (E7-10) - E1 (E5-1) IGT5 (E7-13) - E1 (E5-1) IGT6 (E7-12) - E1 (E5-1) IGT7 (E7-14) - E1 (E5-1) IGT8 (E7-9) - E1 (E5-1)	L-Y - BR LG-B - BR L - BR G-R - BR W-R - BR V - BR P - BR LG - BR	Idling	Pulse generation (See waveform 9)
IGF1 (E7-24) - E1 (E5-1) IGF2 (E7-25) - E1 (E5-1)	L-B - BR L-W - BR	IG switch ON Idling	4.5 to 5.5 V Pulse generation (See waveform 9)
A1A+ (E6-22) - E1 (E5-1)	G - BR	Always (Ignition switch ON)	3.3 V*1
A1A- (E6-30) - E1 (E5-1)	L - BR	Always (Ignition switch ON)	3.0 V*1
A2A+ (E6-23) - E1 (E5-1)	V - BR	Always (Ignition switch ON)	3.3 V*1
A2A- (E6-31) - E1 (E5-1)	P - BR	Always (Ignition switch ON)	3.0 V*1
HT1B (E7-1) - E1 (E5-1) HT2B (E6-5) - E1 (E5-1)	R-L - BR Y-B - BR	Idling IG switch ON	Below 3.0 V 9 to 14 V
OX1B (E7-18) - E2 (E7-28)	B - B-W	Idling	Pulse generation (See waveform 10)

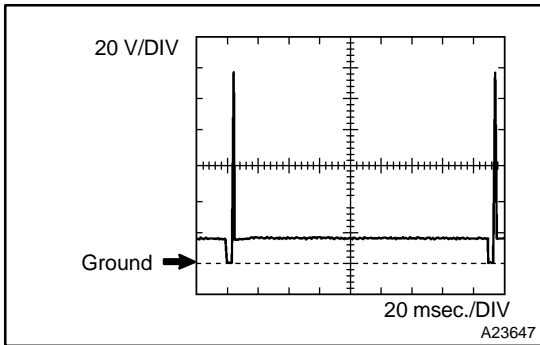
DIAGNOSTICS - ENGINE (2UZ-FE)

OX2B (E6-33) - E2 (E7-28)	W - B-W	Idling	Pulse generation (See waveform 10)
STP (E3-15) - E1 (E5-1)	G-W - BR*2 W-R - BR*3	Brake pedal is depressed	7.5 to 14 V
		Brake pedal is released	Below 1.5 V
ST1- (E3-16) - E1 (E5-1)	B - BR*2 G - BR*3	Brake pedal is depressed	Below 1.5 V
		Brake pedal is released	7.5 to 14 V
STA (E5-11) - E1 (E5-1)	P - BR	Shift lever position P or N, Ignition switch START	6.0 V or more
STSW (E5-12) - E1 (E5-1)	R-L - BR	Shift lever position P or N, ignition switch START	6.0 V or more
NSW (E6-8) - E1 (E5-1)	L-R - BR	IG switch ON, Other shift position in P, N	9 to 14 V
		IG switch ON, Shift position in P, N	0 to 3.0 V
W (E4-30) - E1 (E5-1)	V-G - BR	Idling	9 to 14 V
		IG switch ON	Below 3.0 V
TACH (E4-1) - E1 (E5-1)	L-W - BR*2 B - BR*3	Idling	Pulse generation (See waveform 11)
ACIS (E7-33) - E1 (E5-1)	G-W - BR	IG switch ON	9 to 14 V
VPMP (E3-5) - E1 (E5-1)	L-B - BR	Ignition switch ON	9 V to 14 V
MPMP (E3-6) - E1 (E5-1)	R-W - BR	• Vacuum pump OFF	0 V to 3 V
		• Vacuum pump ON	9 V to 14 V
PPMP (E3-22) - E1 (E5-1)	L-W - BR	Ignition switch ON	3 V to 3.6 V
AIV1 (E7-27) - E1 (E5-1)	B-L - BR	Ignition switch ON	9 to 14 V
AIV2 (E7-26) - E1 (E5-1)	G-Y - BR	Ignition switch ON	9 to 14 V
AIRV (E3-4) - E1 (E5-1)	G-B - BR	Ignition switch ON	9 to 14 V
AIRP (E3-25) - E1 (E5-1)	P - BR	Ignition switch ON	9 to 14 V
AIP (E7-32) - E1 (E5-1)	W-L - BR	Ignition switch ON	3 V to 3.6 V

*1: The ECM terminal voltage is constant regardless of the output voltage from the sensor.

*2: Access Cab, Standard Cab

*3: Double Cab



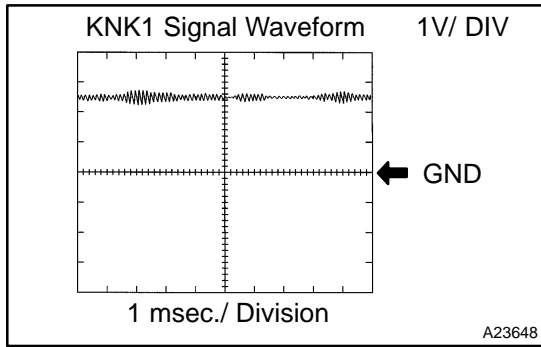
WAVEFORM 1

Fuel injector

ECM Terminal Names	Between #10 (to 40) and E01
Tester Ranges	20 V/DIV, 20 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



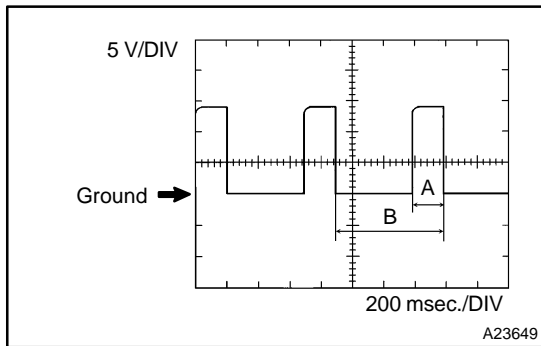
WAVEFORM 2

Knock sensor

ECM Terminal Name	Between KNK1 and EKNK Between KNK2 and EKN2
Tester Range	1 V/DIV, 1 msec./DIV
Condition	Maintain engine RPM at 2,000 rpm after engine warmed-up

HINT:

- The wavelength becomes shorter as engine rpm increases.
- The waveforms and amplitudes displayed differ slightly depending on the vehicle.



WAVEFORM 3

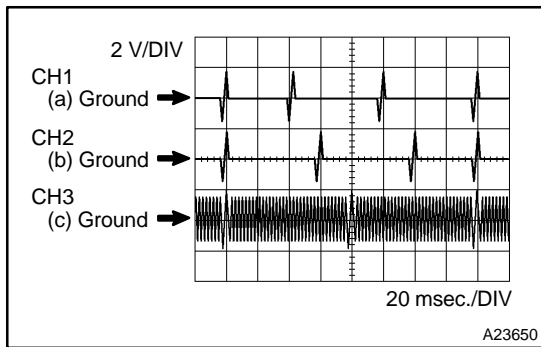
VVT OCV

ECM Terminal Name	Between OC1+ and OC1- Between OC2+ and OC2-
Tester Range	0.2 V/DIV, 200 msec./DIV
Condition	Accelerate slowly after engine warmed-up

HINT:

In the DATA LIST, the items VVT OCV DUTY B1 and B2 show the duty ratio of voltage flowing to the OCV (see illustration on left).

VVT OCV DUTY B1, B2 = $A/B \times 100$ (%)



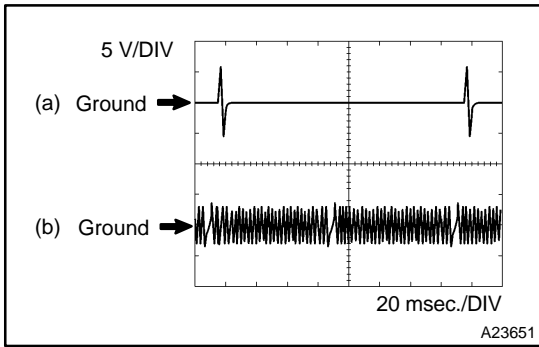
WAVEFORM 4

- (a) VVT sensor bank 1
- (b) VVT sensor bank 2
- (c) Crankshaft position sensor

ECM Terminal Name	(a) Between VV1+ and VV1- (b) Between VV2+ and VV2- (c) Between NE+ and NE-
Tester Range	2 V/DIV, 20 msec./DIV
Condition	Idle after engine warmed-up

HINT:

The wavelength becomes shorter as the engine rpm increases.



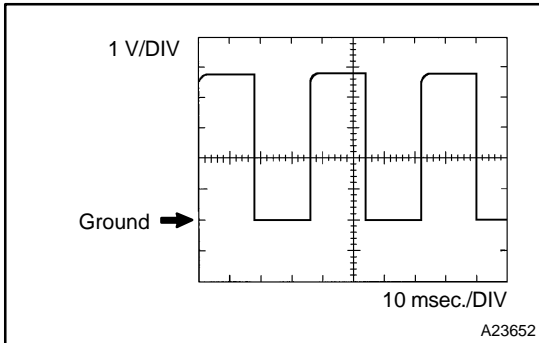
WAVEFORM 5

- (a) Camshaft position sensor
- (b) Crankshaft position sensor

ECM Terminal Name	(a) Between G2+ and G2- (b) Between NE+ and NE-
Tester Range	5 V/DIV, 20 msec./DIV
Condition	Idle after engine warmed-up

HINT:

The wavelength becomes shorter as the engine rpm increases.



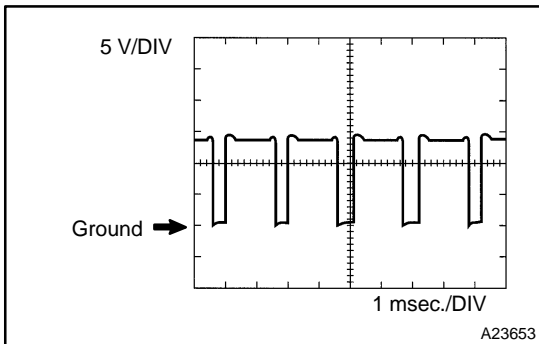
WAVEFORM 6

Vehicle speed signal

ECM Terminal Name	Between SP2+ and SP2-
Tester Range	5 V/DIV, 10 msec./DIV
Condition	Driving by 40 km/h (25 mph)

HINT:

The wavelength becomes shorter as vehicle speed increases.



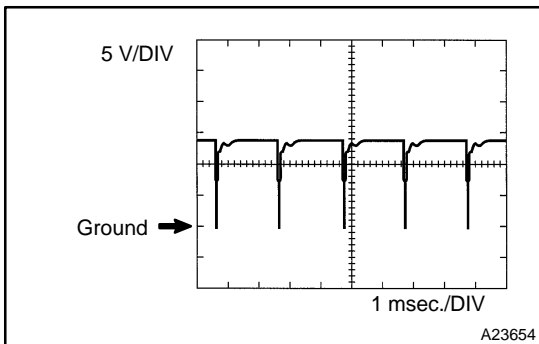
WAVEFORM 7

Throttle actuator positive terminal

ECM Terminal Name	Between M+ and ME01
Tester Range	5 V/DIV, 1 msec./DIV
Condition	Idle after engine warmed-up

HINT:

The duty ratio varies depending on the throttle opening operation.



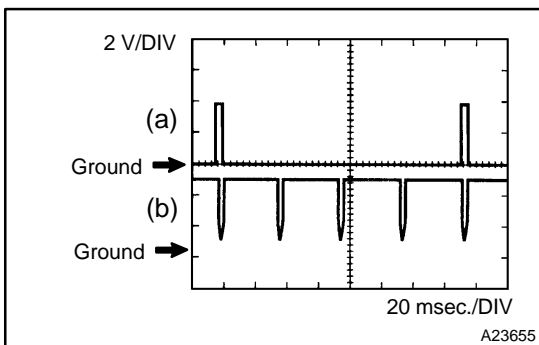
WAVEFORM 8

Throttle actuator negative terminal

ECM Terminal Name	Between M- and ME01
Tester Range	5 V/DIV, 1 msec./DIV
Condition	Idle after engine warmed-up

HINT:

The duty ratio varies depending on the throttle opening operation.



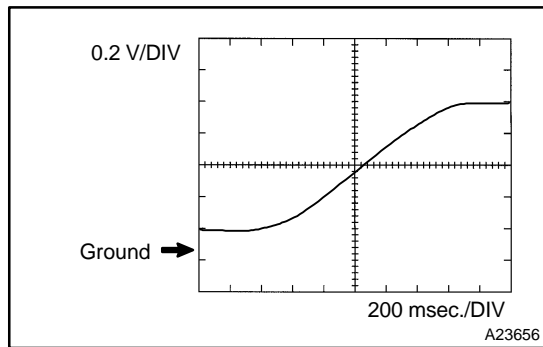
WAVEFORM 9

- (a) Igniter IGT signal (from ECM to igniter)
- (b) Igniter IGF signal (from igniter to ECM)

ECM Terminal Name	(a) Between IGT1 (to IGT8) and E1 (b) Between IGF1 (IGF2) and E1
Tester Range	2 V/DIV, 20 msec./DIV
Condition	Idling

HINT:

The wavelength becomes shorter as vehicle speed increases.

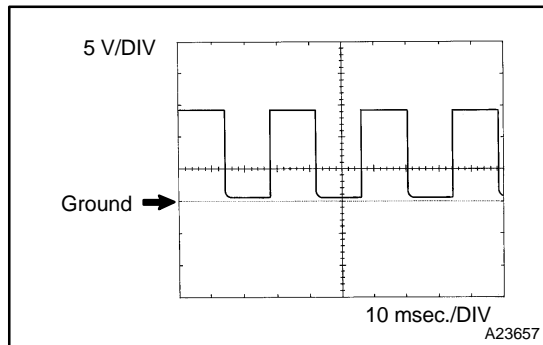
**WAVEFORM 10**

Heated oxygen sensor

ECM Terminal Names	Between OX1B and E2
Tester Ranges	0.2 V/DIV, 200 msec./DIV
Conditions	Engine speed maintained 2,500 rpm for 2 minutes after warming up sensor

HINT:

In the DATA LIST, item O2S B1S2 shows the ECM input values from the heated oxygen sensor.

**WAVEFORM 11**

Engine speed signal

ECM Terminal Names	Between TACH and E1
Tester Ranges	5 V/DIV, 10 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as vehicle speed increases.



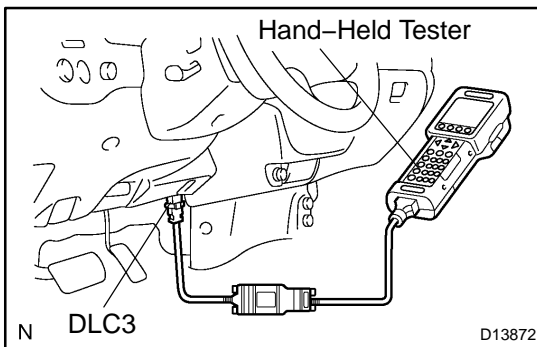
DIAGNOSIS SYSTEM

1. Description

- When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the hand-held tester. Various data output from the vehicle's ECM can then be read.
- OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Light (MIL) on the instrument panel when the computer detects a malfunction in: 1) the emission control system/components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the computer. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (See page [DI-477](#)).

If the malfunction does not reoccur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain recorded in the ECM memory.

To check the DTC, connect the hand-held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand-held tester or OBD II scan tool also enables you to erase the DTC and check the freeze frame data and various forms of engine data (See the instruction manual for the hand-held tester). The DTC includes SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set according to the SAE, while manufacturer controlled codes can be set by a manufacturer with certain restrictions (See the DTC chart on page [DI-477](#)).



2. NORMAL MODE AND CHECK MODE

The diagnosis system operates in "normal mode" during normal vehicle use. In "normal mode", 2 trip detection logic* is used to ensure accurate detection of malfunctions. A "check mode" is also available to technicians as an option. In "check mode", 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions (See page [DI-430](#)).

3. 2-TRIP DETECTION LOGIC

When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. This is known as 1st trip detection. If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate. This is known as 2nd trip detection.

- Freeze frame data:
The freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

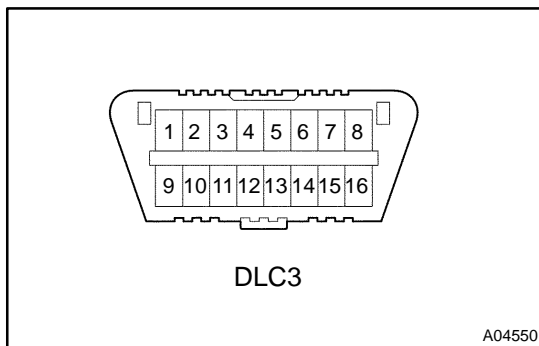
Priorities for troubleshooting:

When multiple DTCs occur, find out the order in which the DTCs should be inspected by checking the component's DTC chart. If no instructions are written in the DTC chart, check DTCs in the following order of priority:

- DTCs other than fuel trim malfunction DTCs (P0171, P0172, P0174 and P0175) and misfire DTCs (P0300 to P0308).
- Fuel trim malfunction DTCs (P0171, P0172, P0174 and P0175).
- Misfire DTCs (P0300 to P0308).

4. CHECK DLC3

The vehicle's ECM uses the ISO 9141–2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.



Symbol	Terminal Description	Condition	Specified Condition
SIL (7) – SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) – Body ground	Chassis ground	Always	Below 1 Ω
SG (5) – Body ground	Signal ground	Always	Below 1 Ω
BAT (16) – Body ground	Battery positive	Always	11 to 14 V
CANH (6) – CANL (14)	HIGH–level CAN bus line	Ignition switch OFF	54 to 69 Ω
CANH (6) – Battery positive	HIGH–level CAN bus line	Ignition switch OFF	1 M Ω or higher
CANH (6) – CG (4)	HIGH–level CAN bus line	Ignition switch OFF	1 k Ω or higher
CANL (14) – Battery positive	LOW–level CAN bus line	Ignition switch OFF	1 M Ω or higher
CANL (6) – CG (4)	LOW–level CAN bus line	Ignition switch OFF	1 k Ω or higher

HINT:

Connect the cable of the hand–held tester to the DLC3, turn the ignition switch ON and attempt to use the hand–held tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.

- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

5. INSPECT BATTERY VOLTAGE

Battery Voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

6. CHECK MIL

- (a) The MIL comes on when the ignition switch is turned ON and the engine is not running.

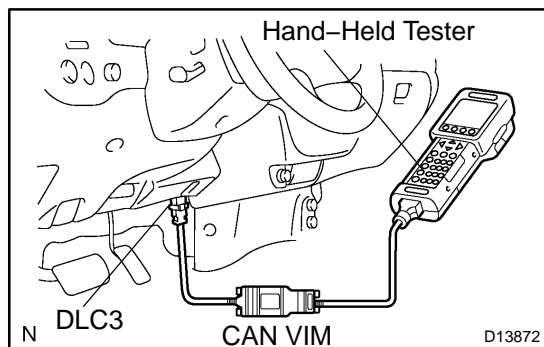
HINT:

If the MIL is not illuminated, troubleshoot the MIL circuit (See page [DI-940](#)).

- (b) When the engine is started, the MIL should not illuminate. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

7. ALL READINESS

For this vehicle, using the hand-held tester allows readiness codes corresponding to all DTCs to be read. When diagnosis (normal or malfunctioning) has been complete, readiness codes are set. Enter the following menus: ENHANCED OBD II / MONITOR STATUS on the hand-held tester.



DTC CHECK / CLEAR

1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the hand-held tester.

These scan tools can display pending DTCs and current DTCs. Some DTCs are not stored if the ECM does not detect a malfunction during consecutive driving. However, the detected malfunction during once driving is stored as pending DTC.

- (a) Connect the hand-held tester to the CAN VIM. Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (b) Turn the ignition switch to ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES (or PENDING CODE).
- (d) Confirm the DTCs and freeze frame data and then write them down.
- (e) See page [DI-477](#) to confirm the details of the DTCs.

NOTICE:

When simulating a symptom with the hand-held tester to check the DTCs, use the normal mode. For DTC chart subject to "2 trip detection logic", perform either of the following actions.

Turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL illuminates and the DTCs are recorded in the ECM.

2. CLEAR DTC

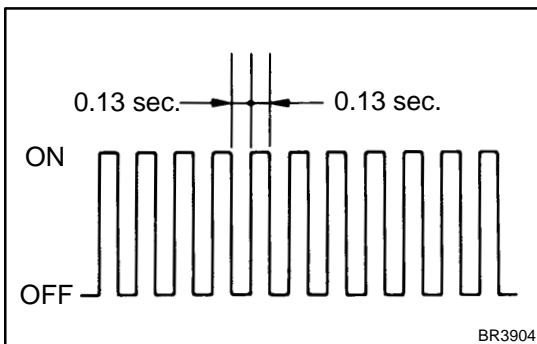
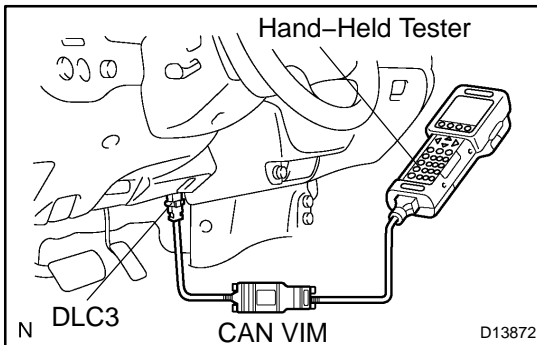
- (a) Connect the hand-held tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES and press YES.

CHECK MODE PROCEDURE

HINT:

Hand-held tester only:

Check mode has a higher sensitivity to detect malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect.



1. CHECK MODE PROCEDURE

- (a) Make sure that the items below are true.
 - (1) Battery positive voltage 11 V or more
 - (2) Throttle valve fully closed
 - (3) Transmission in the P or N position
 - (4) A/C switched OFF
- (b) Turn the ignition switch OFF.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch ON.
- (e) Change the ECM to check mode with the hand-held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All DTCs and freeze frame data recorded will be erased if:

- 1) the hand-held tester is used to change the ECM from normal mode to check mode or vice-versa; or
- 2) during check mode, the ignition switch is turned from ON to ACC or OFF.

- (f) Start the engine. The MIL should turn off after the engine starts.
- (g) Simulate the conditions of the malfunction described by the customer.
- (h) After simulating the malfunction conditions, use the hand-held tester diagnosis selector to check the DTC, freeze frame data and other data.
- (i) After checking the DTC, inspect the applicable circuit.

2. CLEAR DTC (Using the hand-held tester)

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand-held tester. For the hand-held tester: 1) enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES; and 2) press YES. For the OBD II scan tool, see its instruction manual.

3. CLEAR DTC (Not using the hand-held tester)

- (a) Remove the EFI No. 1 and ETCS fuses from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.

After disconnecting the battery terminal, perform the "INITIALIZE" procedure.

FAIL-SAFE CHART

If any of the following code is recorded, the ECM enters fail-safe mode.

DTC No.	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0031 P0032 P0037 P0038 P0051 P0052 P0057 P0058	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0100 P0102 P0103	Ignition timing is calculated from engine speed and throttle angle	"Pass" condition detected
P0110 P0112 P0113	Intake air temperature is fixed at 20°C (68°F)	"Pass" condition detected
P0115 P0117 P0118	Engine coolant temperature is fixed at 80°C (176°F)	"Pass" condition detected
P0120 P0121 P0122 P0123 P0220 P0222 P0223 P0606 P0607 P0657 P2102 P2103 P2111 P2112 P2118 P2119 P2135	If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly. If the accelerator pedal is depressed quickly, the vehicle may speed up and slow down erratically.	"Pass" condition is detected and then the ignition switch is turned OFF.
P0351 P0352 P0353 P0354 P0355 P0356 P0357 P0358	Fuel cut	"Pass" condition detected
P2120 P2121 P2122 P2123 P2125 P2127 P2128 P2138	The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.	"Pass" condition is detected and the ignition switch is turned OFF.

P2440 and P1441 and/or P1444	Restrict the throttle opening angle: $G_a \leq 30$ g/s	
P1441 and P1444	Restrict the throttle opening angle: $G_a \leq 50$ g/s	
P1441 P1444	Restrict the throttle opening angle: $G_a \leq 100$ g/s	
P2430 P2431 P2432 P2433	Restrict the throttle opening angle: $G_a \leq 50$ g/s	

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

By reading the DATA LIST displayed on a hand-held tester, you can check values, including those of the switches, sensors, and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening diagnostic time.

NOTICE:

In the table below, the values listed under Normal Conditions are for reference only. Do not depend solely on these values when determining whether or not a part is faulty.

- Warm up the engine.
- Turn the ignition switch to OFF.
- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON.
- Turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
- Check the values by referring to the table below.

Hand-Held Tester Display	Measurement Item:Range (Display)	Normal Condition *1	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder: Min.: 0 ms, Max.: 32.64 ms	2.3 to 3.8 ms: Idling	—
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: -64 deg., Max.: 63.5 deg.	BTDC 4 to 17°: Idling	—
CALC LOAD	Calculated load by ECM: Min.: 0 %, Max.: 100 %	• 11 to 21 %: Idling • 12 to 22 %: Running without load (2,500 rpm)	—
VEHICLE LOAD	Vehicle load: Min.: 0 %, Max.: 25700 %	Actual vehicle load	—
MAF	Air flow rate from MAF meter: Min.: 0 g/s, Max.: 655 g/s	2.0 to 3.9 g/s: Idling	If the value approximately 0.0 g/s: • Mass air flow meter power source circuit open • VG circuit open or short If the value 160.0 g/s or more: • E2G circuit open
ENGINE SPD	Engine speed: Min.: 0 rpm, Max.: 16,383 rpm	600 ± 50 rpm: Idling	—
VEHICLE SPD	Vehicle speed: Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
COOLANT TEMP	Engine coolant temperature: Min.: -40°C, Max.: 140°C	80 to 100°C (176 to 212°F): After warming up	• If the value -40°C (-40°F): sensor circuit open • If the value 140°C (284°F): sensor circuit shorted
INTAKE AIR	Intake air temperature: Min.: -40°C, Max.: 140°C	Equivalent to ambient air temperature	• If the value -40°C (-40°F): sensor circuit open • If the value 140°C (284°F): sensor circuit shorted
SECONDARY AIR	Second air system status: ON or OFF	ON: Secondary air system operation	—
AIR-FUEL RATIO	Air-fuel ratio: Min.: 0, Max.: 1.999	0.8 to 1.2: During idling	—
EVAP VAPOR PRES	EVAP vapor pressure: Min.: -8192 Pa, Max.: 8191 Pa	0 Pa: Fuel tank cap removed	—

PURGE DENSITY	Learning value of purge density/ Min.: -50, Max.: 350	Idling: -40 to 0 %	Service data
PURGE FLOW	Purge flow: Min.: 0 %, Max.: 102.4 %	0 to 100 %: Idling	—
EVAP PURGE VSV	EVAP (Purge) VSV control duty: Min.: 0 %, Max.: 100 %	0 to 100 %: During idling	Order signal from ECM
VAPOR PRESS	Vapor pressure: Min.: -4.125 kPa, Max.: 2.125 kPa	0 kPa: Fuel tank cap removed	Pressure inside fuel tank monitored by the vapor pressure sensor
KNOCK CRRT VAL	Correction learning value of knocking: Min.: -64 CA, Max.: 1,984 CA	0 to 22 °CA: Driving, 44 mph (70 km/h)	Service data
KNOCK FB VAL	Feedback value of knocking: Min.: -64 CA, Max.: 1,984 CA	-22 to 0 °CA Driving, 44 mph (70 km/h)	Service data
ACCEL POS #1	Absolute Accelerator Pedal Position (APP) No. 1: Min.: 0 %, Max.: 100 %	10 to 22 %: accelerator pedal is released 54 to 86 %: accelerator pedal is fully depressed	—
ACCEL POS #2	Absolute APP No. 2: Min.: 0 %, Max.: 100 %	12 to 42 %: accelerator pedal is released 66 to 98 %: The accelerator pedal is fully depressed	—
ACCEL POS #1	APP sensor No. 1 voltage: Min.: 0 V, Max.: 4.98 V	—	ETCS freeze data
ACCEL POS #2	APP sensor No. 2 voltage: Min.: 0 V, Max.: 4.98 V	—	ETCS freeze data
ACCEL POS #1	APP sensor No. 1 voltage: Min.: 0 V, Max.: 5 V	0.5 to 1.1 V: accelerator pedal is released. 2.6 to 4.5 V: or pedal is fully depressed.	—
ACCEL POS #2	APP sensor No. 2 voltage: Min.: 0 V, Max.: 5 V	1.2 to 2.0 V: accelerator pedal is released. 3.4 to 5.3 V: accelerator pedal is fully depressed.	—
ACCEL IDL POS	Whether or not accelerator pedal position sensor detecting idle: ON or OFF	ON: Idling	—
THRTL LEARN VAL	Throttle valve fully closed (learned value):	0.4 to 0.8 V	—
ACCEL SSR #1 AD	Accelerator fully closed value No.1 (AD): Min.: 0, Max.: 4.98 V	—	ETCS service data
ACCEL LRN VAL#1	Accelerator fully closed learning value No.1: Min.: 0, Max.: 124.512	—	ETCS service data
ACCEL LRN VAL#2	Accelerator fully closed learning value No.2: Min.: 0, Max.: 124.512	—	ETCS service data
FAIL #1	Whether or not fail safe function executed: ON or OFF	ON: ETCS has failed	—
FAIL #2	Whether or not fail safe function executed: ON or OFF	ON: ETCS has failed	—

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ST1	Starter signal: ON or OFF	ON: Cranking	—
SYSGUARD JUDGE	System guard: ON or OFF	—	ETCS service data
OPN MALFUNCTION	Open side malfunction: ON or OFF	—	ETCS service data
THROTTLE POS	Absolute throttle position sensor: Min.: 0 %, Max.: 100 %	• 10 to 24 %: Throttle fully closed • 64 to 96 %: Throttle fully open	Read the value with intrusive operation (active test)
THROTTL IDL POS	Whether or not throttle position sensor detecting idle: ON or OFF	ON: Idling	—
THRTL REQ POS	Throttle requirement position: Min.: 0 V, Max.: 5 V	0.5 to 1.0 V: Idling	—
THROTTLE POS	Throttle sensor positioning: Min.: 0 %, Max.: 100 %	10 to 18 %: Idling	Calculated value based on VTA1
THROTTLE POS #2	Throttle sensor positioning #2: Min.: 0 %, Max.: 100 %	—	Calculated value based on VTA2
THROTTLE POS #1	Throttle position sensor No. 1 output voltage: Min.: 0 V, Max.: 4.9 V	—	ETCS freeze data
THROTTLE POS #2	Throttle position sensor No.2 output voltage: Min.: 0 V, Max.: 4.9 V	—	ETCS freeze data
THROTTLE POS #1	Throttle position No. 1: Min.: 0 V, Max.: 5 V	• 0.5 to 1.2 V: Throttle fully closed • 3.2 to 4.8 V: Throttle fully opened	—
THROTTLE POS #2	Throttle position No. 2: Min.: 0 V, Max.: 5 V	• 2.0 to 2.9 V: Throttle fully closed • 4.6 to 5.5 V: Throttle fully open	Read the value with intrusive operation (active test)
THRTL COMND VAL	Throttle position command value: Min.: 0 V, Max.: 4.98 V	0.5 to 4.8 V	ETCS service data
THROTTLE SSR #1	Throttle sensor opener position No. 1: Min.: 0 V, Max.: 4.98 V	0.6 to 0.9 V	ETCS service data
THROTTLE SSR #2	Throttle sensor opener position No. 2: Min.: 0 V, Max.: 4.98 V	2.2 to 2.6 V	ETCS service data
THRTL SSR #1 AD	Throttle sensor opener position No.1 (AD): Min.: 0 V, Max.: 4.98 V	0.6 to 0.9 V	ETCS service data
THROTTLE MOT	Whether or not throttle motor control permitted: ON or OFF	ON: Idling	Read the value with the power switch ON (Do not start engine)
THROTTLE MOT	Throttle motor current: Min.: 0 A, Max.: 80 A	0 to 3.0 A: Idling	—
THROTTLE MOT	Throttle motor: Min.: 0 %, Max.: 100 %	0.5 to 40 %: Idling	—
THROTTLE MOT	Throttle motor current: Min.: 0 A, Max.: 19.92 A	0 to 3.0 A: Idling	—
THROTL OPN DUTY	Throttle motor opening duty ratio: Min.: 0 %, Max.: 100 %	0 to 40 %: During idling	When accelerator pedal depressed, duty ratio increased
THROTL CLS DUTY	Throttle motor closed duty ratio: Min.: 0 %, Max.: 100 %	0 to 40 %: During idling	When accelerator pedal released quickly, duty ratio increased
THRTL MOT (OPN)	Throttle motor duty ratio (open): Min.: 0 %, Max.: 100 %	—	ETCS service data

THRTL MOT (CLS)	Throttle motor duty ratio (close): Min.: 0 %, Max.: 100 %	—	ETCS service data
O2S B1 S2	Heated oxygen sensor output voltage for bank 1 sensor 2: Min.: 0 V, Max.: 1.275 V	0.1 to 0.9 V: Driving 44 mph (70 km/h)	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
O2S B2 S2	Heated oxygen sensor output voltage for bank 2 sensor 2: Min.: 0 V, Max.: 1.275 V	0.1 to 0.9 V: Driving 44 mph (70 km/h)	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
AFS B1 S1	A/F sensor output voltage for bank 1 sensor 1: Min.: 0 V, Max.: 7.999 V	2.8 to 3.8 V: Idling	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
AFS B2 S1	A/F sensor output voltage for bank 2 sensor 1: Min.: 0 V, Max.: 7.999 V	2.8 to 3.8 V: Idling	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
TOTAL FT #1	Total fuel trim of bank 1 Average value for fuel trim system of bank 1: Min.: -0.5, Max.: 1,496	-0.2 to 0.2: Idling	—
TOTAL FT #2	Total fuel trim of bank 2 Average value for fuel trim system of bank 2: Min.: -0.5, Max.: 1,496	-0.2 to 0.2: Idling	—
SHORT FT #1	Short-term fuel trim of bank 1: Min.: -100 %, Max.: 99.2%	0 ± 20 %	This item the short-term fuel compensation used to maintain the air-fuel ratio at stoichiometric air-fuel ratio
SHORT FT #2	Short-term fuel trim of bank 2: Min.: -100 %, Max.: 99.2%	0 ± 20 %	This item the short-term fuel compensation used to maintain the air-fuel ratio at stoichiometric air-fuel ratio
LONG FT #1	Long-term fuel trim of bank 1: Min.: -100 %, Max.: 99.2 %	0 ± 20 %	This item the overall fuel compensation carried out in long-term to compensate a continual deviation of the short-term fuel trim from the central value
LONG FT #2	Long-term fuel trim of bank 2: Min.: -100 %, Max.: 99.2 %	0 ± 20 %	This item the overall fuel compensation carried out in long-term to compensate a continual deviation of the short-term fuel trim from the central value
FUEL SYS #1	Fuel system status (Bank1): OL or CL or OL DRIVE or OL FAULT or CL FAULT	CL: Idling after warming up	<ul style="list-style-type: none"> • OL (Open Loop): Has not yet satisfied conditions to go closed loop • CL (Closed Loop): Using heated oxygen sensor as feedback for fuel control. • OL DRIVE: Open loop due to driving conditions (fuel enrichment) • OL FAULT: Open loop due to detected system fault • CL FAULT: Closed loop but heated oxygen sensor, which used for fuel control malfunctioning

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FUEL SYS #2	Fuel system status (Bank 2): OL or CL or OL DRIVE or OL FAULT or CL FAULT	CL: Idling after warming up	<ul style="list-style-type: none"> • OL (Open Loop): Has not yet satisfied conditions to go closed loop • CL (Closed Loop): Using heated oxygen sensor as feedback for fuel control. • OL DRIVE: Open loop due to driving conditions (fuel enrichment) • OL FAULT: Open loop due to detected system fault • CL FAULT: Closed loop but heated oxygen sensor, which used for fuel control malfunctioning
O2FT B1 S2	Short-term fuel trim associated with the bank 1 sensor 2: Min.: -100 %, Max.: 99.2 %	0 ± 20 %	Same as SHORT FT #1
O2FT B2 S2	Short-term fuel trim associated with the bank 2 sensor 2: Min.: -100 %, Max.: 99.2 %	0 ± 20 %	Same as SHORT FT #1
AF FT B1 S1	Short-term fuel trim associated with the bank 1 sensor 1: Min.: 0, Max.: 1.999	<ul style="list-style-type: none"> • Value less than 1 (0.000 to 0.999) = Lean • Stoichiometric air-fuel ratio=1 • Value greater than 1 (1.001 to 1.999) = RICH 	—
AF FT B2 S1	Short-term fuel trim associated with the bank 2 sensor 1: Min.: 0, Max.: 1.999	<ul style="list-style-type: none"> • Value less than 1 (0.000 to 0.999) = Lean • Stoichiometric air-fuel ratio=1 • Value greater than 1 (1.001 to 1.999) = RICH 	—
CAT TEMP B1S1	Catalyst temperature (Bank 1, Sensor 1): Min.: -40, Max.: 6,513.5 °C	—	—
CAT TEMP B2S1	Catalyst temperature (Bank 2, Sensor 1): Min.: -40, Max.: 6,513.5 °C	—	—
CAT TEMP B1S2	Catalyst temperature (Bank 1, Sensor 2): Min.: -40, Max.: 6,513.5 °C	—	—
CAT TEMP B2S2	Catalyst temperature (Bank 2, Sensor 2): Min.: -40, Max.: 6,513.5 °C	—	—
INI COOL TEMP	Initial engine coolant temperature: Min.: -40°C, Max.: 140°C	Close to ambient air temperature	Service data
INI INTAKE TEMP	Initial intake air temperature: Min.: -40°C, Max.: 140°C	Close to ambient air temperature	Service data
INJ VOL	Injection volume (cylinder 1): Min.: 0 ml, Max.: 2.048 ml	0 to 0.5 ml	Quantity of fuel injection volume for 10 times
STARTER SIG	Starter signal: ON or OFF	ON: Cranking	—
PS SW	Power steering signal: ON or OFF	ON: Power steering operation	—
PS SIGNAL	Power steering signal: ON or OFF	ON: When steering wheel first turned after ignition switch turned to ON	This signal status usually ON until ignition switch turned to OFF
CTP SW	Closed throttle position switch: ON or OFF	<ul style="list-style-type: none"> • ON: Throttle fully closed • OFF: Throttle open 	—

A/C SIG	A/C signal: ON or OFF	ON: A/C ON	—
ELECT LOAD SIG	Electrical load signal: ON or OFF	ON: Headlights or defogger is turned ON	—
STOP LIGHT SW	Stop lamp switch: ON or OFF	ON: brake pedal is depressed.	—
+BM	Whether or not electric throttle control system power inputted: ON or OFF	ON: Idling	—
+BM VOLTAGE	+BM voltage: Min.: 0, Max.: 19.92	10 to 15 V: Idling	ETCS service data
BATTERY VOLTAGE	Battery voltage: Min.: 0 V, Max.: 65.535 V	9 to 14 V: Idling	—
ACTUATOR POWER	Actuator power supply: ON or OFF	ON: Idling	ETCS service data
ATM PRESSURE	Atmospheric pressure: Min.: 0 kPa, Max.: 150 kPa	Equivalent to atmospheric pres- sure (absolute pressure)	—
SECOND AIR VSV	Secondary air injection system status	ON: Secondary air injection sys- tem operation	—
ACT VSV	A/C cut status for Active Test: ON or OFF	—	Active Test support data
EVAP (Purge) VSV	VSV status for EVAP control: ON or OFF	—	Active Test support data
FUEL PUMP / SPD	Fuel pump/speed status: ON or OFF	—	Active Test support data
VVT CTRL B1	VVT control status (Bank 1): ON or OFF	—	Active Test support data
VVT CTRL B2	VVT control status (Bank 2): ON or OFF	—	Active Test support data
VACUUM PUMP	Key-off EVAP system pump sta- tus: ON or OFF	—	Active Test support data
EVAP VENT VAL	Key-off EVAP system vent valve status: ON or OFF	—	Active Test support data
TC/TE1	TC and TE1 terminal of DLC3: ON or OFF	—	—
VVTL AIM ANGL #1	VVT aim angle (bank 1): Min.: 0 %, Max.: 100 %	0 %: Idling	VVT duty signal value during intru- sive operation
VVTL AIM ANGL #2	VVT aim angle (bank 2): Min.: 0 %, Max.: 100 %	0 %: Idling	VVT duty signal value during intru- sive operation
VVT CHNG ANGL #1	VVT change angle (Bank 1): Min.: 0°FR, Max.: 60°FR	0 to 5 °FR: Idling	Displacement angle during intru- sive operation
VVT CHNG ANGL #2	VVT change angle (Bank 2): Min.: 0°FR, Max.: 60°FR	0 to 5 °FR: Idling	Displacement angle during intru- sive operation
VVT OCV DUTY B1	VVT OCV operation duty (Bank 1): Min.: 0 %, Max.: 100 %	0 %: Idling	Requested duty value for intrusive operation
VVT OCV DUTY B2	VVT OCV operation duty (Bank 2): Min.: 0 %, Max.: 100 %	0 %: Idling	Requested duty value for intrusive operation
FC IDL	Fuel cut idle: ON or OFF	ON: Fuel cut operation	FC IDL = "ON" when throttle valve fully closed and engine speed over 2,800 rpm

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FC TAU	Fuel cut TAU: Fuel cut during very light load: ON or OFF	ON: Fuel cut operating	The fuel cut being performed under very light load to prevent the engine combustion from becoming incomplete
IGNITION	Ignition counter: Min.: 0, Max.: 800	0 to 800	—
CYL #1, #2, #3, #4, #5, #6, #7, #8	Misfire ratio of the cylinder 1 to 8: Min.: 0, Max.: 255	0 %	This item displayed in only idling
CYL ALL	All cylinders misfire rate: Min.: 0, Max.: 255	0 to 35	—
MISFIRE RPM	Engine RPM for first misfire range: Min.: 0 rpm, Max.: 6,375 rpm	0 rpm: Misfire 0	—
MISFIRE LOAD	Engine load for first misfire range: Min.: 0 g/rev, Max.: 3.98 g/rev	0 g/rev: Misfire 0	—
MISFIRE MARGIN	Misfire monitoring: Min.: -100 %, Max.: 99.22 %	-100 to 99.2 %	Misfire detecting margin
#CODES	#Codes: Min.: 0, Max.: 255	—	Number of detected DTCs
CHECK MODE	Check mode: 0: ON, 1: OFF	ON: Check mode ON	See page DI-463
SPD TEST	Check mode result for vehicle speed sensor: 0: COMPL, 1: INCOMPL	—	—
AS TEST	Check mode result for secondary air injection system: 0: COMPL, 1: INCOMPL	—	—
MISFIRE TEST	Check mode result for misfire monitor: 0: COMPL, 1: INCOMPL	—	—
OXS1 TEST	Check mode result for HO2 sensor (Bank 1): 0: COMPL, 1: INCOMPL	—	—
OXS2 TEST	Check mode result for HO2 sensor (Bank 2): 0: COMPL, 1: INCOMPL	—	—
A/F SSR TEST B1	Check mode result for air-fuel ratio sensor (Bank 1): 0: COMPL, 1: INCOMPL	—	—
A/F SSR TEST B2	Check mode result for air-fuel ratio sensor (Bank 2): 0: COMPL, 1: INCOMPL	—	—
MIL	MIL status: ON or OFF	ON: MIL ON	—
MIL ON RUN DIST	MIL ON Run Distance: Min.: 0 second, Max.: 65,535 seconds	Distance after DTC detected	—
MIL ON RUN TIME	Running time from MIL ON: Min.: 0 minute, Max.: 65,535 minutes	Equivalent to running time after MIL was ON	—
ENG RUN TIME	Engine run time: Min.: 0 second, Max.: 65,535 seconds	Time after engine start	Service data
TIME DTC CLEAR	Time after DTC cleared: Min.: 0 minute, Max.: 65,535 minutes	Equivalent to time after DTCs were erased	—

DIST DTC CLEAR	Distance after DTC cleared: Min.: 0 km/h, Max.: 65535 km/h	Equivalent to drive distance after DTCs were erased	—
WU CYC DTC CLEAR	Warm-up cycle after DTC cleared: Min.: 0, Max.: 255	—	Number of warm-up cycles after DTC cleared
MODEL CODE	Model code:	—	Identifying the model code: UCK30 (2WD), UCK40 (4WD)
ENGINE TYPE	Engine type:	—	Identifying the engine type: 2UZFE
CYLINDER NUMBER	Cylinder number: Min.: 0, Max.: 255	—	Identifying the cylinder number: 8
TRANSMISSION	Transmission type:	—	Identifying the transmission type: ECT(5AT)
DESTINATION	Destination	—	Identifying the destination: A (America)
MODEL YEAR	Model year: Min.: 0, Max.: 255	—	Identifying the model year: 200#
SYSTEM	System identification	—	Identifying the engine system: GASLIN (gasoline engine)
AI STATUS	AI operation prohibit: OK or NG	OK	

*1: If no idling conditions are specified, the transmission gear selector lever should be in the N or P position, and the A/C switch and all accessory switches should be OFF.

2. ACTIVE TEST

HINT:

Performing an ACTIVE TEST enables components including the relays, VSV (Vacuum Switching Valve), and actuators, to be operated without removing any parts. The ACTIVE TEST can be performed with a hand-held tester. Performing an ACTIVE TEST as the first step of troubleshooting is one method of shortening diagnostic time.

DATA LIST can be displayed during ACTIVE TESTS.

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Turn the tester ON.
- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
- (e) Perform the ACTIVE TEST by referring to the table below.

Hand-held Tester Displays	Test Details	Control Ranges	Diagnostic Notes
INJ VOL	Change injection volume	Between -12 % and 25 %	<ul style="list-style-type: none"> • All injectors tested at the same time • Perform test at less than 3,000 rpm • Injection volume can be changed in 1 % graduations within control range
A/F CONTROL	Change injection volume	Lower by 12.5 % or increase by 25 %	<ul style="list-style-type: none"> • Perform test at less than 3,000 rpm • A/F CONTROL enables checking and graphing of A/F (Air Fuel Ratio) sensor and Heated Oxygen (HO2) sensor voltage outputs • To conduct test, select following menu items: ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press YES and ENTER followed by F4
EVAP VSV (ALONE)	Activate EVAP VSV control	ON/OFF	–
VVT CTRL B1	Turn on and off OCV (Oil Control Valve)	ON/OFF	<ul style="list-style-type: none"> • Engine stalls or idles roughly when OCV turned ON • Normal engine running or idling when OCV off
VVT CTRL B2	Turn on and off OCV (Oil Control Valve)	ON/OFF	<ul style="list-style-type: none"> • Engine stalls or idles roughly when OCV turned ON • Normal engine running or idling when OCV off
A/C CUT SIG	Control A/C cut signal	ON/OFF	–
FUEL PUMP/SPD	Activate fuel pump (C/OPN Relay)	ON/OFF	–
TC/TE1	Turn on and off TC and TE1 connection	ON/OFF	<ul style="list-style-type: none"> • ON: TC and TE1 connected • OFF: TC and TE1 disconnected
FC IDL PROHBT	Prohibit idling fuel cut control	ON/OFF	–
ETCS OPEN SLOW	Throttle actuator	ON: throttle valve opens slowly	<p>This test is possible when the following conditions are met:</p> <ul style="list-style-type: none"> • Ignition switch ON • Engine does not start • Fully depressing accelerator pedal (APP: 58 degrees or more)
ETCS CLOSE SLOW	Throttle actuator	ON: throttle valve closes slowly	Same as above
ETCS OPEN FAST	Throttle actuator	ON: throttle valve opens fast	Same as above
ETCS CLOSE FAST	Throttle actuator	ON: throttle valve closes fast	Same as above

FUEL CUT #1	Cylinder #1 injector fuel cut	ON/OFF	This test is possible during vehicle stopping and engine idling.
FUEL CUT #2	Cylinder #2 injector fuel cut	ON/OFF	Same as above
FUEL CUT #3	Cylinder #3 injector fuel cut	ON/OFF	Same as above
FUEL CUT #4	Cylinder #4 injector fuel cut	ON/OFF	Same as above
FUEL CUT #5	Cylinder #5 injector fuel cut	ON/OFF	Same as above
FUEL CUT #6	Cylinder #6 injector fuel cut	ON/OFF	Same as above
FUEL CUT #7	Cylinder #7 injector fuel cut	ON/OFF	Same as above
FUEL CUT #8	Cylinder #8 injector fuel cut	ON/OFF	Same as above
VENT VALVE (ALONE)	Activate vent valve (built into pump module)	ON/OFF	–
VCUUM PUMP	Activate vacuum pump (built into pump module)	ON/OFF	–

3. SYSTEM CHECK

HINT:

Performing a SYSTEM CHECK enables the system, which consists of multiple actuators, to be operated without removing any parts. In addition, it can show whether or not any DTCs are set, and can detect potential malfunctions in the system. The SYSTEM CHECK can be performed with a hand-held tester.

- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON.
- Turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK.
- Perform the SYSTEM CHECK by referring to the table below.

Hand-held Tester Displays	Test Details	Recommended Fuel Temperatures	Diagnostic Notes
EVAP SYS CHECK (AUTO OPERATION)	Perform 5 steps in order to operate EVAP key-off monitor automatically	35°C (95°F) or less	<ul style="list-style-type: none"> If no DTCs in PENDING CODE after performing this test, system functioning normally Refer to EVAP Inspection Procedure on page DI-884
EVAP SYS CHECK (MANUAL OPERATION)	Perform 5 steps in order to operate EVAP key-off monitor manually	35°C (95°F) or less	<ul style="list-style-type: none"> Used to detect malfunctioning parts Refer to EVAP Inspection Procedure on page DI-884
AI INJ CHECK (AUTO OPERATION)	Perform 6 steps in order to operate air injection system automatically	–	<ul style="list-style-type: none"> If no DTCs in PENDING CODE after performing this test, system functioning normally
AI INJ CHECK (MANUAL OPERATION)	Perform 8 operations in order to operate air injection system monitor manually	–	<ul style="list-style-type: none"> Used to detect malfunctioning parts

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the listed in the table below. For details of each code, refer to the "See page" under the respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	MIL*1	Memory
P0010 (DI-492)	Camshaft Position "A" Actuator Circuit (Bank 1)	<ul style="list-style-type: none"> • Open or short in OCV circuit • OCV • ECM 	○	○
P0011 (DI-498)	Camshaft Position "A" –Timing Over– Advanced or System Performance (Bank 1)	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM 	○	○
P0012 (DI-498)	Camshaft Position "A" –Timing Over– Retarded (Bank 1)	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM 	○	○
P0016 (DI-504)	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	<ul style="list-style-type: none"> • Open or short in VVT sensor circuit • VVT sensor • ECM 	○	○
P0018 (DI-504)	Crankshaft Position – Camshaft Position Correlation (Bank 2 Sensor A)	<ul style="list-style-type: none"> • Open or short in VVT sensor circuit • VVT sensor • ECM 	○	○
P0020 (DI-492)	Camshaft Position "A" Actuator Circuit (Bank 2)	<ul style="list-style-type: none"> • Open or short in OCV circuit • OCV • ECM 	○	○
P0021 (DI-498)	Camshaft Position "A" –Timing Over– Advanced or System Performance (Bank 2)	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM 	○	○
P0022 (DI-498)	Camshaft Position "A" –Timing Over– Retarded (Bank 2)	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM 	○	○
P0031 (DI-507)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM 	○	○
P0032 (DI-507)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Short in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM 	○	○
P0037 (DI-512)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM 	○	○
P0038 (DI-512)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM 	○	○

P0051 (DI-507)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM 	○	○
P0052 (DI-507)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Short in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM 	○	○
P0057 (DI-512)	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM 	○	○
P0058 (DI-512)	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM 	○	○
P0100 (DI-522)	Mass or Volume Air Flow Circuit	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM 	○	○
P0101 (DI-531)	Mass or Volume Air Flow Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Mass air flow meter 	○	○
P0102 (DI-522)	Mass or Volume Air Flow Circuit Low Input	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM 	○	○
P0103 (DI-522)	Mass or Volume Air Flow Circuit High Input	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM 	○	○
P0110 (DI-534)	Intake Air Temperature Circuit	<ul style="list-style-type: none"> • Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM 	○	○
P0112 (DI-534)	Intake Air Temperature Circuit Low Input	<ul style="list-style-type: none"> • Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM 	○	○
P0113 (DI-534)	Intake Air Temperature Circuit High Input	<ul style="list-style-type: none"> • Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM 	○	○
P0115 (DI-540)	Engine Coolant Temperature Circuit	<ul style="list-style-type: none"> • Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM 	○	○
P0116 (DI-546)	Engine Coolant Temperature Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Engine coolant temperature sensor 	○	○
P0117 (DI-540)	Engine Coolant Temperature Circuit Low Input	<ul style="list-style-type: none"> • Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM 	○	○
P0118 (DI-540)	Engine Coolant Temperature Circuit High Input	<ul style="list-style-type: none"> • Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM 	○	○
P0120 (DI-548)	Throttle/Pedal Position Sensor/Switch "A" Circuit	<ul style="list-style-type: none"> • Open or short in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM 	○	○
P0121 (DI-558)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Throttle control motor and sensor 	○	○

DIAGNOSTICS – ENGINE (2UZ-FE)

P0122 (DI-548)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	<ul style="list-style-type: none"> • Short in throttle control motor and sensor circuit • Throttle control motor and sensor • Short in VTA1 circuit • Open in VC circuit • ECM 	○	○
P0123 (DI-548)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	<ul style="list-style-type: none"> • Open in throttle control motor and sensor circuit • Throttle control motor and sensor • Open in VTA1 circuit • Open in E2 circuit • VC and VTA1 circuit are short-circuited • ECM 	○	○
P0125 (DI-560)	Insufficient Coolant Temperature for Closed Loop Fuel Control	<ul style="list-style-type: none"> • Cooling system • Engine coolant temperature sensor • Thermostat 	○	○
P0128 (DI-563)	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<ul style="list-style-type: none"> • Thermostat • Cooling system • Engine coolant temperature sensor • ECM 	○	○
P0136 (DI-567)	Oxygen Sensor Circuit Malfunc- tion (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1) • EFI relay • Gas leakage from exhaust system 	○	○
P0137 (DI-567)	Oxygen Sensor Circuit Low Volt- age (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Open in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • EFI relay • Gas leakage from exhaust system 	○	○
P0138 (DI-567)	Oxygen Sensor Circuit High Volt- age (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • ECM internal circuit malfunction 	○	○
P0156 (DI-567)	Oxygen Sensor Circuit Malfunc- tion (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1) • EFI relay • Gas leakage from exhaust system 	○	○
P0157 (DI-567)	Oxygen Sensor Circuit Low Volt- age (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Open in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • EFI relay • Gas leakage from exhaust system 	○	○
P0158 (DI-567)	Oxygen Sensor Circuit High Volt- age (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • ECM internal circuit malfunction 	○	○

P0171 (DI-586)	System too Lean (Bank 1)	<ul style="list-style-type: none"> • Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater • EFI relay • PCV piping • ECM 	○	○
P0172 (DI-586)	System too Rich (Bank 1)	<ul style="list-style-type: none"> • Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • ECM 	○	○
P0174 (DI-586)	System too Lean (Bank 2)	<ul style="list-style-type: none"> • Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 2 sensor 1) circuit • Heated oxygen sensor (bank 2 sensor 1) • Heated oxygen sensor heater • EFI relay • PCV piping • ECM 	○	○
P0175 (DI-586)	System too Rich (Bank 2)	<ul style="list-style-type: none"> • Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 2 sensor 1) circuit • Heated oxygen sensor (bank 2 sensor 1) • ECM 	○	○
P0220 (DI-548)	Throttle/Pedal Position Sensor/ Switch "B" Circuit	<ul style="list-style-type: none"> • Throttle control motor and sensor • ECM 	○	○
P0222 (DI-548)	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	<ul style="list-style-type: none"> • Throttle control motor and sensor • Short in VTA2 circuit • Open in VC circuit • ECM 	○	○
P0223 (DI-548)	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	<ul style="list-style-type: none"> • Throttle control motor and sensor • Open in VTA2 circuit • Open in E2 circuit • VC and VTA2 circuit are short-circuited • ECM 	○	○

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P0230 (DI-600)	Fuel Pump Primary Circuit	<ul style="list-style-type: none"> • Open or short in fuel pump relay circuit • Fuel pump relay • Circuit opening relay • Fuel pump • ECM 	-	○
P0300 (DI-605)	Random/Multiple Cylinder Misfire Detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	○*2	○
P0301 (DI-605)	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	○*2	○
P0302 (DI-605)	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	○*2	○
P0303 (DI-605)	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	○*2	○

<p>P0304 (DI-605)</p>	<p>Cylinder 4 Misfire Detected</p>	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	<p>○*2</p>	<p>○</p>
<p>P0305 (DI-605)</p>	<p>Cylinder 5 Misfire Detected</p>	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	<p>○*2</p>	<p>○</p>
<p>P0306 (DI-605)</p>	<p>Cylinder 6 Misfire Detected</p>	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	<p>○*2</p>	<p>○</p>
<p>P0307 (DI-605)</p>	<p>Cylinder 7 Misfire Detected</p>	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	<p>○*2</p>	<p>○</p>

DIAGNOSTICS – ENGINE (2UZ-FE)

P0308 (DI-605)	Cylinder 8 Misfire Detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM 	○*2	○
P0327 (DI-626)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Short in knock sensor circuit • Knock sensor • ECM 	○	○
P0328 (DI-626)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Open in knock sensor circuit • Knock sensor • ECM 	○	○
P0332 (DI-626)	Knock Sensor 2 Circuit High Input (Bank 2)	<ul style="list-style-type: none"> • Open in knock sensor circuit • Knock sensor • ECM 	○	○
P0333 (DI-626)	Knock Sensor 2 Circuit High Input (Bank 2)	<ul style="list-style-type: none"> • Open in knock sensor circuit • Knock sensor • ECM 	○	○
P0335 (DI-632)	Crankshaft Position Sensor "A" Circuit	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM 	○	○
P0339 (DI-632)	Crankshaft Position Sensor "A" Circuit Intermittent	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM 	-	○
P0340 (DI-637)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • LH camshaft timing pulley • Jumping teeth of timing belt • ECM 	○	○
P0341 (DI-637)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • LH camshaft timing pulley • Jumping teeth of timing belt • ECM 	○	○
P0345 (DI-637)	Camshaft Position Sensor "A" Circuit (Bank 2)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • VVT sensor • ECM 	○	○
P0346 (DI-637)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 2)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • VVT sensor • ECM 	○	○
P0351 (DI-642)	Ignition Coil "A" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 1 circuit from No. 1 ignition coil with igniter to ECM • No. 1 ignition coil with igniter • Ignition system • ECM 	○	○

P0352 (DI-642)	Ignition Coil "B" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 2 and IGT 2 circuit from No. 2 ignition coil with igniter to ECM • No. 2 ignition coil with igniter • Ignition system • ECM 	○	○
P0353 (DI-642)	Ignition Coil "C" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 2 and IGT 3 circuit from No. 3 ignition coil with igniter to ECM • No. 3 ignition coil with igniter • Ignition system • ECM 	○	○
P0354 (DI-642)	Ignition Coil "D" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 4 circuit from No. 4 ignition coil with igniter to ECM • No. 4 ignition coil with igniter • Ignition system • ECM 	○	○
P0355 (DI-642)	Ignition Coil "E" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 2 and IGT 5 circuit from No. 5 ignition coil with igniter to ECM • No. 5 ignition coil with igniter • Ignition system • ECM 	○	○
P0356 (DI-642)	Ignition Coil "F" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 6 circuit from No. 6 ignition coil with igniter to ECM • No. 6 ignition coil with igniter • Ignition system • ECM 	○	○
P0357 (DI-642)	Ignition Coil "G" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 1 and IGT 7 circuit from No. 7 ignition coil with igniter to ECM • No. 7 ignition coil with igniter • Ignition system • ECM 	○	○
P0358 (DI-642)	Ignition Coil "H" Primary/Secondary Circuit	<ul style="list-style-type: none"> • Open or short in IGF 2 and IGT 8 circuit from No. 8 ignition coil with igniter to ECM • No. 8 ignition coil with igniter • Ignition system • ECM 	○	○
P0412 (DI-656)	Air Injection System Air Switching Valve Malfunction	<ul style="list-style-type: none"> • Open in air switching valve drive circuit • Short between air switching valve circuit and +B circuit • Air injection driver • ECM 	○	○
P0418 (DI-665)	Air Injection System Air Pump Malfunction	<ul style="list-style-type: none"> • Open in air pump drive circuit • Short between air pump circuit and +B circuit • Air injection driver • ECM 	○	○
P0420 (DI-672)	Catalyst System Efficiency Below Threshold (Bank 1)	<ul style="list-style-type: none"> • Gas leakage on exhaust system • Heated oxygen sensor (bank 1 sensor 1, 2) • Three-way catalytic converter 	○	○
P0430 (DI-672)	Catalyst System Efficiency Below Threshold (Bank 2)	<ul style="list-style-type: none"> • Gas leakage on exhaust system • Heated oxygen sensor (bank 2 sensor 1, 2) • Three-way catalytic converter 	○	○
P043E (DI-869)	Evaporate Emission System Reference Orifice Clog Up	<ul style="list-style-type: none"> • Pump module 	○	○
P043F (DI-869)	Evaporate Emission System Reference Orifice High Flow	<ul style="list-style-type: none"> • Pump module 	○	○

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P0441 (DI-680)	Evaporative Emission Control System Incorrect Purge Flow	<ul style="list-style-type: none"> • Purge valve • Purge valve circuit (between purge valve and ECM) • Leakage from EVAP line (between purge valve and intake manifold) • EVAP line (between purge valve and canister) clogged • ECM 	○	○
P0450 (DI-687)	Evaporative Emission Control System Pressure Sensor/Switch [Fuel Tank Pressure Sensor]	<ul style="list-style-type: none"> • Pump module (including pressure sensor) 	○	○
P0451 (DI-687)	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance	<ul style="list-style-type: none"> • Pump module (including pressure sensor) 	○	○
P0452 (DI-687)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	<ul style="list-style-type: none"> • Pump module (including pressure sensor) • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P0453 (DI-687)	Evaporative Emission Control System Pressure Sensor/Switch High Input	<ul style="list-style-type: none"> • Pump module (include pressure sensor) • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P0455 (DI-696)	Evaporative Emission Control System Leak Detected (Gross Leak)	<ul style="list-style-type: none"> • Fuel tank cap (loose) • Leakage from EVAP line (between canister and fuel tank) • Leakage from EVAP line (between purge valve and canister) • Leakage from pump module • Leakage from fuel tank • Leakage from canister 	○	○
P0456 (DI-696)	Evaporative Emission Control System Leak Detected (Very Small Leak)	<ul style="list-style-type: none"> • Same as DTC No. P0445 	○	○
P0500 (DI-701)	Vehicle Speed Sensor "A"	<ul style="list-style-type: none"> • Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM 	○	○
P0503 (DI-701)	Vehicle Speed Sensor "A" Intermittent/Erratic/High	<ul style="list-style-type: none"> • Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM 	-	○
P0504 (DI-706)	Brake Switch "A"/"B" Correlation	<ul style="list-style-type: none"> • Short in stop lamp switch signal circuit • STOP fuse • Stop lamp switch • ECM 	-	○
P0505 (DI-712)	Idle Air Control System	<ul style="list-style-type: none"> • Air induction system • Electric throttle control system • PCV hose connection 	○	○
P050A (DI-715-1)	Cold Start Idle Air Control System Performance	<ul style="list-style-type: none"> • ETCS (Electronic Throttle Control System) • Mass air flow meter • Air induction system • PCV hose connections • ECM 	○	○
P0560 (DI-716)	System Voltage	<ul style="list-style-type: none"> • Back-up power source circuit • EFI No. 1 fuse • ECM 	○	○
P0604 (DI-721)	Internal Control Module Random Access Memory (RAM) Error	<ul style="list-style-type: none"> • ECM 	○	○
P0606 (DI-721)	ECM/PCM Processor	<ul style="list-style-type: none"> • ECM 	○	○

P0607 (DI-721)	Control Module Performance	• ECM	○	○
P0617 (DI-723)	Starter Relay Circuit High	• Park/neutral position switch • Starter relay circuit • Ignition switch • ECM	○	○
P0630 (DI-728)	VIN not Programmed or Mismatch-ECM/PCM	• ECM	○	○
P0657 (DI-721)	Actuator Supply Voltage Circuit/Open	• ECM	○	○
P0705 (DI-1159)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Electronic Controlled Automatic Transaxle (ECT)	○	○
P0710 (DI-1166)	Transmission Fluid Temperature Sensor "A" Circuit	• Electronic control automatic transmission (ECT)	○	○
P0711 (DI-1172)	Transmission Fluid Temperature Sensor "A" Performance	• Electronic control automatic transmission (ECT)	○	○
P0712 (DI-1166)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	• Electronic control automatic transmission (ECT)	○	○
P0713 (DI-1166)	Transmission Fluid Temperature Sensor "A" Circuit High Input	• Electronic control automatic transmission (ECT)	○	○
P0717 (DI-1175)	Input/Turbine Speed Sensor "A" Circuit No Signal	• Electronic control automatic transmission (ECT)	○	○
P0722 (DI-1180)	Output Speed Sensor Circuit No Signal	• Electronic control automatic transmission (ECT)	○	○
P0724 (DI-1184)	Brake Switch "B" Circuit High	• Electronic control automatic transmission (ECT)	○	○
P0748 (DI-1188)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	• Electronic control automatic transmission (ECT)	○	○
P0751 (DI-1193)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	• Electronic control automatic transmission (ECT)	○	○
P0756 (DI-1199)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	• Electronic control automatic transmission (ECT)	○	○
P0771 (DI-1205)	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	• Electronic control automatic transmission (ECT)	○	○
P0776 (DI-1210)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	• Electronic control automatic transmission (ECT)	○	○
P0778 (DI-1216)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	• Electronic control automatic transmission (ECT)	○	○
P0781 (DI-1221)	1-2 Shift (1-2 Shift Valve)	• Electronic control automatic transmission (ECT)	○	○
P0973 (DI-1226)	Shift Solenoid "A" Control Circuit Low (Shift solenoid Valve S1)	• Electronic control automatic transmission (ECT)	○	○
P0974 (DI-1226)	Shift Solenoid "A" Control Circuit High (Shift solenoid Valve S1)	• Electronic control automatic transmission (ECT)	○	○
P0976 (DI-1231)	Shift Solenoid "B" Control Circuit Low (Shift solenoid Valve S2)	• Electronic control automatic transmission (ECT)	○	○
P0977 (DI-1231)	Shift Solenoid "B" Control Circuit High (Shift solenoid Valve S2)	• Electronic control automatic transmission (ECT)	○	○

DIAGNOSTICS – ENGINE (2UZ-FE)

P0985 (DI-1236)	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P0986 (DI-1236)	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P1340 (DI-730)	Camshaft Position Sensor "A" Circuit (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • LH camshaft timing pulley • ECM 	○	○
P1341 (DI-730)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • LH camshaft timing pulley • ECM 	○	○
P1440 (DI-735)	Secondary Air Injection System Control Valve Circuit Bank 1	<ul style="list-style-type: none"> • Open or short in VSV for air injection control circuit • ECM 	○	○
P1441 (DI-739)	Secondary Air Injection System Switching Valve No.2 Bank 1 Stuck Open	<ul style="list-style-type: none"> • VSV for air injection control circuit (Bank 1) • Air switching valve No.2 (Bank 1) • VSV for air injection system (Bank 1) • ECM 	○	○
P1442 (DI-754)	Secondary Air Injection System Switching Valve No.2 Bank 1 Stuck Close	<ul style="list-style-type: none"> • VSV for air injection control circuit (Bank 1) • Vacuum hose (VSV for air injection control – air switching valve No.2) • Air injector pipe (Air switching valve No.2 – exhaust manifold) • Air switching valve No.2 (Bank 1) • VSV for air injection control (Bank 1) • ECM 	○	○
P1443 (DI-735)	Secondary Air Injection System Control Valve Circuit Bank 2	<ul style="list-style-type: none"> • Open or short in VSV for air injection control circuit • ECM 	○	○
P1444 (DI-739)	Secondary Air Injection System Switching Valve No.2 Bank 2 Stuck Open	<ul style="list-style-type: none"> • VSV for air injection control circuit (Bank 2) • Air switching valve No.2 (Bank 2) • VSV for air injection system (Bank 2) • ECM 	○	○
P1445 (DI-754)	Secondary Air Injection System Switching Valve No.2 Bank 2 Stuck Closes	<ul style="list-style-type: none"> • VSV for air injection control circuit (Bank 2) • Vacuum hose (VSV for air injection control – air switching valve No.2) • Air injector pipe (Air switching valve No.2 – exhaust manifold) • Air switching valve No.2 (Bank 2) • VSV for air injection control (Bank 2) • ECM 	○	○
P1613 (DI-767)	Air Injection System Air Injection Driver	<ul style="list-style-type: none"> • Short between air pump circuit and body ground • Open in air pump drive circuit • Short between air pump circuit and +B circuit • Air injection driver • ECM 	○	○
P2102 (DI-778)	Throttle Actuator Control Motor Circuit Low	<ul style="list-style-type: none"> • Open in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM 	○	○
P2103 (DI-778)	Throttle Actuator Control Motor Circuit High	<ul style="list-style-type: none"> • Short in throttle control motor and sensor circuit • Throttle control motor and sensor • Throttle valve • Throttle body • ECM 	○	○
P2111 (DI-782)	Throttle Actuator Control System – Stuck Open	<ul style="list-style-type: none"> • Throttle control motor and sensor circuit • Throttle control motor and sensor • Throttle valve • Throttle body 	○	○

P2112 (DI-782)	Throttle Actuator Control System – Stuck Closed	<ul style="list-style-type: none"> • Throttle control motor and sensor circuit • Throttle control motor and sensor • Throttle valve • Throttle body 	○	○
P2118 (DI-786)	Throttle Actuator Control Motor Current Range/Performance	<ul style="list-style-type: none"> • Open in throttle control motor and sensor power source circuit • ETCS fuse • ECM 	○	○
P2119 (DI-791)	Throttle Actuator Control Throttle Body Range/Performance	<ul style="list-style-type: none"> • Electric throttle control system • Throttle body 	○	○
P2120 (DI-794)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	<ul style="list-style-type: none"> • Accelerator pedal position sensor • ECM 	○	○
P2121 (DI-803)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Perfor- mance	<ul style="list-style-type: none"> • Accelerator pedal position sensor 	○	○
P2122 (DI-794)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	<ul style="list-style-type: none"> • Accelerator pedal position sensor • VCPA circuit open • VPA circuit open or ground short • ECM 	○	○
P2123 (DI-794)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	<ul style="list-style-type: none"> • Accelerator pedal position sensor • EPA circuit open • ECM 	○	○
P2125 (DI-794)	Throttle/Pedal Position Sensor/ Switch "E" Circuit	<ul style="list-style-type: none"> • Accelerator pedal position sensor • ECM 	○	○
P2127 (DI-794)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	<ul style="list-style-type: none"> • Accelerator pedal position sensor • VCP2 circuit open • VPA2 circuit open or ground short • ECM 	○	○
P2128 (DI-794)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	<ul style="list-style-type: none"> • Accelerator pedal position sensor • EPA circuit open • ECM 	○	○
P2135 (DI-548)	Throttle Pedal Position Sensor/ Switch "A" / "B" Voltage Correla- tion	<ul style="list-style-type: none"> • Throttle control motor and sensor • VTA1 and VTA2 circuit are short-circuited • ECM 	○	○
P2138 (DI-794)	Throttle Pedal Position Sensor/ Switch "D" / "E" Voltage Correla- tion	<ul style="list-style-type: none"> • VPA and VPA2 circuit are short circuited • Accelerator pedal position sensor • ECM 	○	○
P2195 (DI-806)	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • ECM 	○	○
P2196 (DI-806)	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • ECM 	○	○

DIAGNOSTICS – ENGINE (2UZ-FE)

P2197 (DI-806)	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • ECM 	○	○
P2198 (DI-806)	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits • Air induction system • Fuel pressure • Injector • ECM 	○	○
P2238 (DI-826)	Oxygen Sensor Pumping Current Circuit Low (For A/F Sensor) (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2239 (DI-826)	Oxygen Sensor Pumping Current Circuit High (For A/F Sensor) (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2241 (DI-826)	Oxygen Sensor Pumping Current Circuit Low (For A/F Sensor) (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2242 (DI-826)	Oxygen Sensor Pumping Current Circuit High (For A/F Sensor) (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2252 (DI-826)	Oxygen Sensor Reference Ground Current Circuit Low (For A/F Sensor) (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2253 (DI-826)	Oxygen Sensor Reference Current Circuit High (For A/F Sensor) (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2255 (DI-826)	Oxygen Sensor Reference Ground Current Circuit Low (For A/F Sensor) (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○
P2256 (DI-826)	Oxygen Sensor Reference Current Circuit High (For A/F Sensor) (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater (sensor 1) • A/F relay • A/F sensor heater and EFI relay circuits 	○	○

P2401 (DI-834)	Evaporative Emission System Leak Detection Pump Control Circuit Low	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P2402 (DI-834)	Evaporative Emission System Leak Detection Pump Control Circuit High	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P2419 (DI-840)	Evaporative Emission System Switching Valve Control Circuit Low	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P2420 (DI-840)	Evaporative Emission System Switching Valve Control Circuit High	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (between pump module and ECM) • ECM 	○	○
P2430 (DI-846)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Bank 1	<ul style="list-style-type: none"> • Pressure sensor • Open or short in pressure sensor circuit • Vacuum hose • Check valve • ECM 	○	○
P2431 (DI-846)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1	<ul style="list-style-type: none"> • Pressure sensor • Open or short in pressure sensor circuit • Vacuum hose • Check valve • ECM 	○	○
P2432 (DI-846)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low Bank 1	<ul style="list-style-type: none"> • Pressure sensor • Open or short in pressure sensor circuit • Vacuum hose • Check valve • ECM 	○	○
P2433 (DI-846)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit High Bank 1	<ul style="list-style-type: none"> • Pressure sensor • Open or short in pressure sensor circuit • Vacuum hose • Check valve • ECM 	○	○
P2440 (DI-739)	Secondary Air Injection System Switching Valve Stuck Open Bank 1	<ul style="list-style-type: none"> • Electromagnetic air switching valve • Air switching valve No.2 (Bank 1 and/or 2) • VSV for air injection system (Bank 1 and/or 2) • Air injection driver • Air injection driver circuit • ECM 	○	○
P2441 (DI-754)	Secondary Air Injection System Switching Valve Stuck Close Bank 1	<ul style="list-style-type: none"> • Vacuum hoses (Throttle body – VSVs for air injection control) • Electromagnetic air switching valve • Air injector pipe (Air switching valve No.2 – exhaust manifold) • Air injection hose • Air switching valve No.2 (Bank 1 and/or 2) • VSV for air injection control (Bank 1 and/or 2) • Air injection driver • Air injection driver circuit • ECM 	○	○
P2444 (DI-850)	Secondary Air Injection System Pump Stuck On Bank 1	<ul style="list-style-type: none"> • Short in air pump circuit • Pressure sensor • Air pump assembly • Open or short in pressure sensor circuit • ECM 	○	○

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P2445 (DI-850)	Secondary Air Injection System Pump Stuck On Bank 1	<ul style="list-style-type: none"> • Air pump fuse • Vacuum hose • Air pump assembly • Open in air pump circuit • Air injection system piping • Pressure sensor • Open or short in pressure sensor circuit • ECM 	○	○
P2610 (DI-866)	ECM/PCM Internal Engine Off Timer Performance	<ul style="list-style-type: none"> • ECM 	○	○
P2714 (DI-1241)	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2716 (DI-1247)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2740 (DI-1251)	Transmission Fluid Temperature Sensor "B" Circuit	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2742 (DI-1251)	Transmission Fluid Temperature Sensor "B" Circuit Low Input	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
2743 (DI-1251)	Transmission Fluid Temperature Sensor "B" Circuit High Input	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2757 (DI-1257)	Torque Converter clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2759 (DI-1265)	Torque Converter clutch Pressure Control Solenoid Electrical (Shift Solenoid Valve SLU)	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2772 (DI-1270)	Transfer L4 SW Circuit	<ul style="list-style-type: none"> • Electronic control automatic transmission (ECT) 	○	○
P2A00 (DI-875)	A/F Sensor Circuit Slow Response (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • ECM 	○	○
P2A03 (DI-875)	A/F Sensor Circuit Slow Response (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • ECM 	○	○

*1: – MIL does not light up, ○ MIL lights up

*2: MIL lights up or blinks.

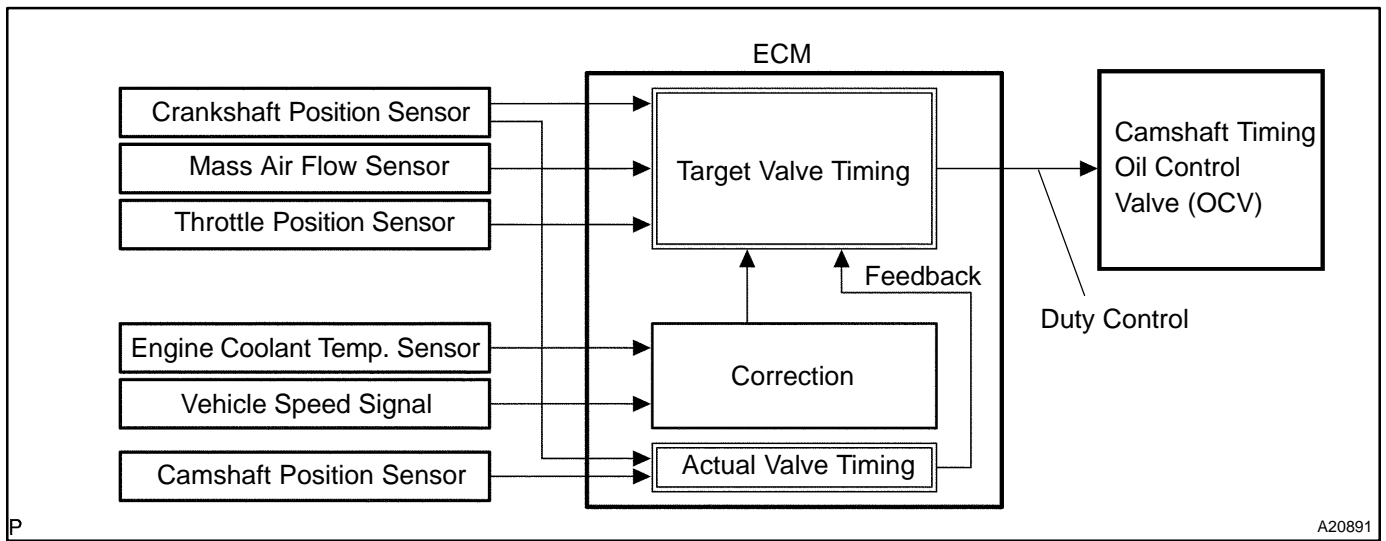
CIRCUIT INSPECTION

DTC	P0010	Camshaft Position "A" Actuator circuit (Bank 1)
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DTC	P0020	Camshaft Position "A" Actuator circuit (Bank 2)
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CIRCUIT DESCRIPTION

The Variable Valve Timing (VVT) system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target "duty-cycle" control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. Camshaft timing control is performed based on engine operation conditions such as intake air volume, throttle position and engine coolant temperature. The ECM controls the OCV, based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As a result, the relative position between the camshaft and the crankshaft is optimized, and the engine torque improves, fuel economy improves, and exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using signals from the camshaft position sensor and the crankshaft position sensor, and performs feedback control. This is how target valve timing is verified by the ECM.



DTC No.	DTC Detecting Condition	Trouble Area
P0010 P0020	Open or short in OCV circuit	<ul style="list-style-type: none"> • Open or short in OCV circuit • OCV • ECM

MONITOR DESCRIPTION

After the ECM sends the "target" duty-cycle signal to the OCV (Oil Control Valve), the ECM monitors the OCV current to establish an "actual" duty-cycle. When the actual duty-cycle ratio varies from the target duty-cycle, the ECM sets a DTC.

MONITOR STRATEGY

Related DTCs	P0010	VVT oil control valve bank 1 range check
	P0020	VVT oil control valve bank 2 range check
Required sensors/components	OCV	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC not present	See page DI-437	
All of the following conditions are met	-	
Starter	OFF	
Ignition switch	ON	
Time after ignition switch OFF to ON	0.5 seconds	-

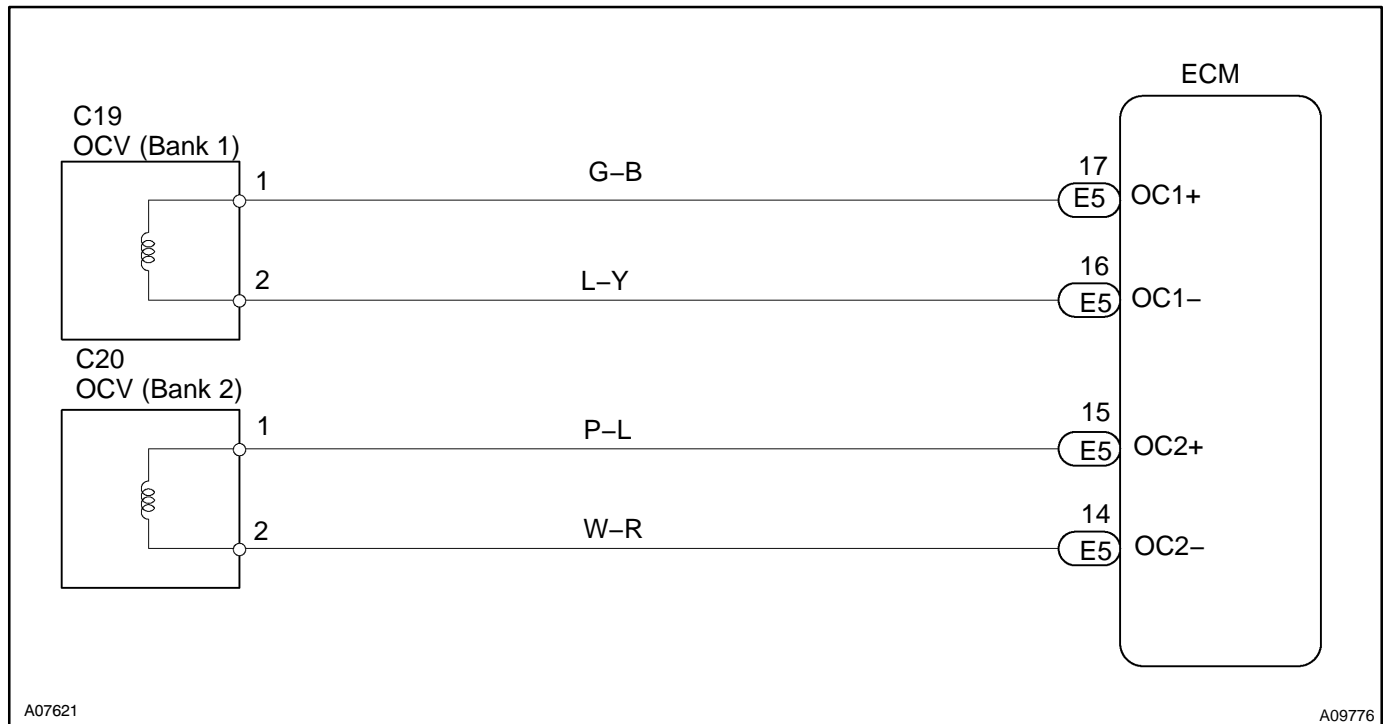
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
One of the following conditions is met:	Condition A, B or C
A. All of the following conditions are met:	Condition (a), (b) , and (c)
(a) Battery voltage	11 V or more, and less than 13 V
(b) Target duty ratio	Less than 70 %
(c) Output signal duty ratio	100 % or more
B. All of the following conditions are met:	Condition (a), (b) , and (c)
(a) Battery voltage	13 V or more
(b) Target duty ratio	Less than 80 %
(c) Output signal duty ratio	100 % or more
C. Both of the following conditions are met:	Condition (a) and (b)
(a) Current cut status	Not cut
(b) Output signal duty ratio	3% or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
OCV current	3 to 100 %

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0010 displayed, check left bank OCV circuit.
- If DTC P0020 displayed, check right bank OCV circuit.
- Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check OCV circuit.
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PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and warm it up.
- (c) Turn the ignition switch to ON and turn the hand-held tester ON.

CHECK:

- (a) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1 or VVT CTRL B2.
- (b) Using the hand-held tester, operate the OCV and check the engine speed.

OK:

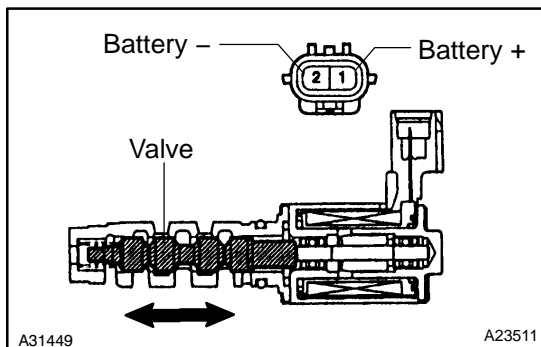
Standard:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK	Check for intermittent problems (See page DI-430).
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NG

2	Check operation of OCV.
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PREPARATION:

- (a) Start the engine and warmed it up.
- (b) Disconnect the OCV connector.
- (c) Apply battery positive voltage between the terminals of the OCV.

CHECK:

Check the engine speed.

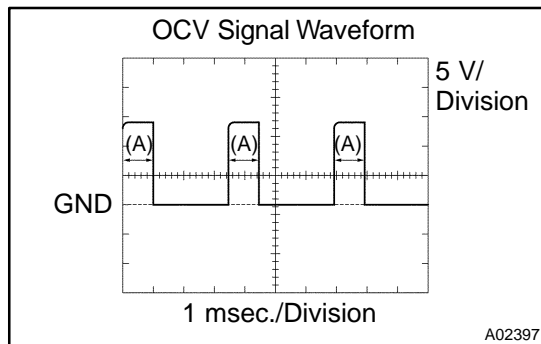
OK:

Rough idle or engine stalled.

NG	Replace OCV.
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OK

3 Check voltage between terminals OC1+ and OC1-, OC2+ and OC2- of ECM connector.

**CHECK:**

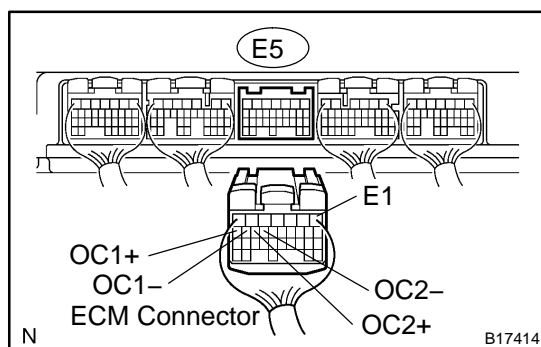
- Inspection using the oscilloscope.
- During idling, check the waveform between the specified terminals of the E5 ECM connector.

HINT:

The waveform frequency (A) is lengthened as the engine speed becomes higher.

OK:**Standard:**

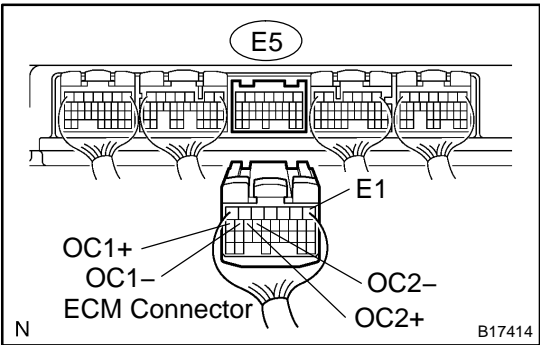
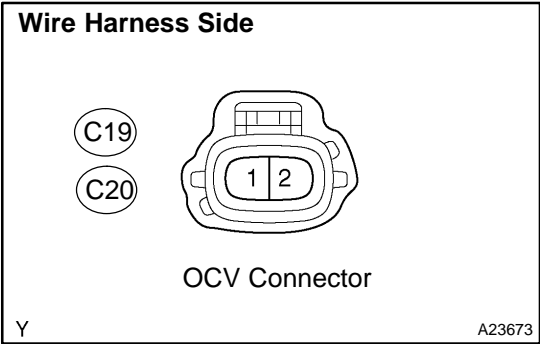
The correct waveform is as shown.

**NG**

Replace ECM (See page [SF-82](#)).

OK

4 Check for open and short in harness and connector between OCV and ECM.



PREPARATION:

- (a) Disconnect the C19 or C20 OCV connector.
- (b) Disconnect the E5 ECM connector.

CHECK:

- (a) Check for resistance between the wire harness side connectors.

OK:

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OCV (C19-1) - OC1+ (E5-17)	Below 1 Ω
OCV (C19-2) - OC1- (E5-16)	Below 1 Ω
OCV (C20-1) - OC2+ (E5-15)	Below 1 Ω
OCV (C20-2) - OC2- (E5-14)	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OCV (C19-1) or OC1+ (E5-17) - E1 (E5-1)	10 kΩ or higher
OCV (C19-2) or OC1- (E5-16) - E1 (E5-1)	10 kΩ or higher
OCV (C20-1) or OC2+ (E5-15) - E1 (E5-1)	10 kΩ or higher
OCV (C20-2) or OC2- (E5-14) - E1 (E5-1)	10 kΩ or higher

NG **Repair or replace harness or connector.**

OK

Check for intermittent problems (See page DI-430).

DTC	P0011	Camshaft Position "A" –Timing Over-Actuator or System Performance (Bank 1)
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DTC	P0012	Camshaft Position "A" –Timing Over-Retarded (Bank 1)
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DTC	P0021	Camshaft Position "A" –Timing Over-Actuator or System Performance (Bank 2)
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DTC	P0022	Camshaft Position "A" –Timing Over-Retarded (Bank 2)
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CIRCUIT DESCRIPTION

Refer to DTCs P0010 on page [DI-492](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0011 P0021	Advanced cam timing: After engine is warmed up and engine speed is at 400 to 4,000 rpm, condition (a) continues. (1 trip detection logic) (a) Valve timing does not change from current valve timing	<ul style="list-style-type: none"> • Valve timing • OCV • VVT controller assembly • ECM
P0012 P0022	Retarded cam timing: After engine is warmed up and engine speed is at 400 to 4,000 rpm, condition (a) continues. (2 trip detection logic) (a) Valve timing does not change from current valve timing	

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target "duty-cycle" control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.

Example:

A DTC will set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the crankshaft angle (CA) and the condition continues for more than 4.5 sec.; or 2) the OCV is forcibly activated 63 times or more.

Advanced cam DTCs are subject to "1 trip" detection logic.

Retarded cam DTCs are subject to "2 trip" detection logic.

MONITOR STRATEGY

Related DTCs	P0011	VVT system advance (Bank 1)
	P0012	VVT system retard (Bank 1)
	P0021	VVT system advance (Bank 2)
	P0022	VVT system retard (Bank 2)
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Crankshaft position sensor
Frequency of operation	Once per drive cycle	
Duration	10 sec.	
MIL operation	P0011, P0021: Immediate P0012, P0022: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Battery voltage	11 V	–
Engine RPM	400 rpm	4,000 rpm
Engine coolant temperature	75°C (167°F)	100°C (212°F)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0011, P0021 (advance)	
Duration of valve timing	More than 5°CA (Crankshaft angle)
Valve timing	No change at advanced valve timing
P0012, P0022 (retard)	
Duration of valve timing	More than 5°CA (Crankshaft angle)
Valve timing	No change at retarded valve timing

WIRING DIAGRAM

Refer to DTCs P0010 on page [DI-492](#).

INSPECTION PROCEDURE

HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Bank 2 refers to bank that does not include cylinder No. 1.
- If DTC P0011, P0012 is displayed, check the bank 1 VVT system.
- If DTC P0021, P0022 is displayed, check the bank 2 VVT system.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check operation of OCV.
----------	--------------------------------

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and warm it up.
- (c) Turn the ignition switch to ON and turn the hand-held tester ON.

CHECK:

- (a) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1 or VVT CTRL B2.
- (b) Using the hand-held tester, operate the OCV and check the engine speed.

OK:**Standard:**

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK**VVT system is OK.***

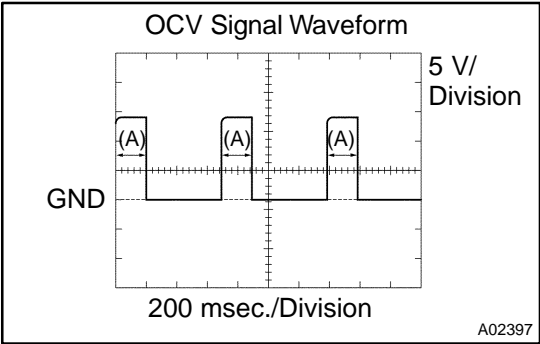
*: DTC P0011, P0012, P0021 or P0022 is also output when a foreign object is detected in some parts of the system in the engine oil, and then the system returns to normal in a short time. As ECM is controlled to eject a foreign object, there is no problem on the VVT. There is also no problem on the VVT as the oil filter should catch the foreign object in the engine oil.

NG

2	Check valve timing (See page EM-9).
----------	--

NG**Adjust valve timing.****OK**

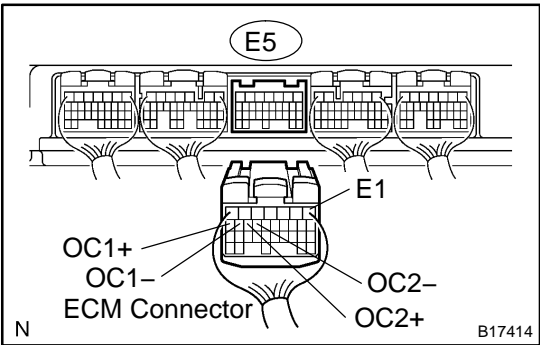
3 Check voltage between terminals OCV+ and OCV- of ECM connector.



- CHECK:**
- (a) Inspection using the oscilloscope.
 - (b) During idling, check the waveform between the specified terminals of the E5 ECM connector.

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

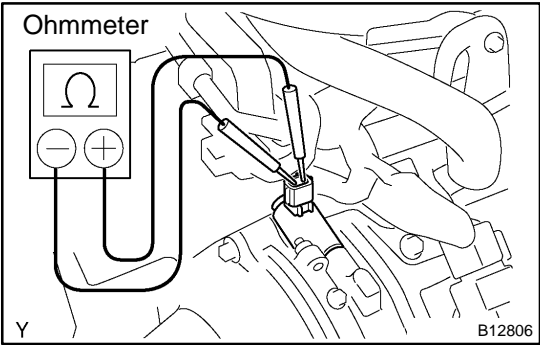
OK:
Standard:
The correct waveform is as shown.



NG → Replace ECM (See page [SF-82](#)).

OK

4 Check OCV.



- PREPARATION:**
- (a) Remove the V-bank cover.
 - (b) Remove the air cleaner inlet and intake air connector.
 - (c) Disconnect the oil control valve connector.

CHECK:

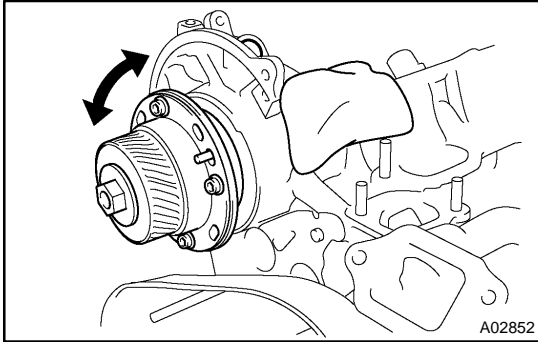
- (a) Using an Ohmmeter, measure the resistance between the terminals.

Resistance: 6.9 – 7.9 Ω at 20°C (68°F)

NG → Replace OCV, and then go to step 6.

OK

5 Check VVT controller assembly.



PREPARATION:

- (a) Remove the timing belt (See page [EM-16](#)).
- (b) Remove the cylinder head cover.
- (c) Remove the OCV (See page [SF-48](#)).
- (d) Drain the oil in the VVT controller assembly (See page [EM-46](#)).

CHECK:

Check whether the oil in VVT controller assembly is drained or not.

OK:

Standard:

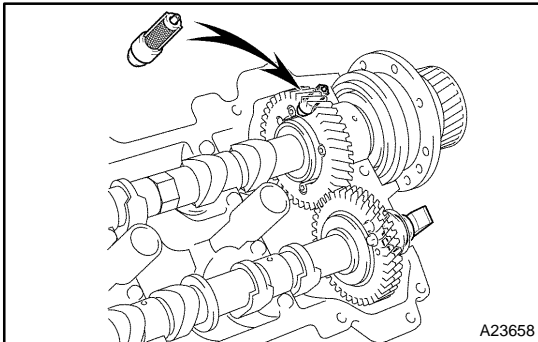
The oil in VVT controller assembly is drained.

NG

Replace VVT controller assembly, and then go to step 6.

OK

6 Check oil control valve filter.



PREPARATION:

- (a) Remove the cylinder head cover.
- (b) Remove the camshaft bearing cap and OCV filter.

CHECK:

Check that the filter is not clogged.

OK:

The filter is not clogged.

NG

Repair or replace.

OK

7	Check whether or not DTC P0010, P0012, P0021 or P0022 is stored.
----------	---

PREPARATION:

- (a) Clear DTCs (see page [DI-462](#)).
- (b) Perform simulation test.

CHECK:

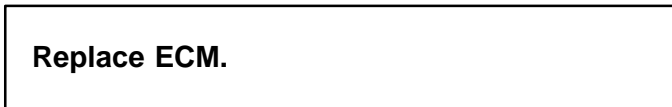
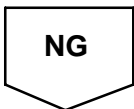
Check whether or not DTC P0011, P0012, P0021 or P0022 is stored (See page [DI-462](#)).

OK:

Standard: DTC P0011, P0012, P0021 or P0022 is not stored.



*: DTC P0011, P0012, P0021 or P0022 is also output when a foreign object is detected in some parts of the system in the engine oil, and then the system returns to normal in a short time. As ECM is controlled to eject a foreign object, there is no problem on the VVT. There is also no problem on the VVT as the oil filter should catch the foreign object in the engine oil.



DTC	P0016	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)
------------	--------------	--

DTC	P0018	Crankshaft Position – Camshaft Position Correlation (Bank 2 Sensor A)
------------	--------------	--

CIRCUIT DESCRIPTION

VVT sensor (VVL or VVR signal) consist of a signal plate and pickup coil.

The VVL or VVR signal plate has 1 tooth on its outer circumference and is mounted on the intake camshafts. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.

The actual camshaft angle is detected by the VVT sensor and it provides feedback to the ECM to control the intake valve timing in response to during condition.

DTC No.	DTC Detecting Condition	Trouble Area
P0016 P0018	No VVT sensor signal to ECM during cranking at 4 sec. or more	<ul style="list-style-type: none"> • Open or short in VVT sensor circuit • VVT sensor • ECM
	No VVT sensor signal to ECM with 5 sec. or more engine speed 600 rpm or more	
	While the crankshaft rotates twice, VVT sensor signal will be input to ECM 5 times	

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target duty-cycle control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft. The ECM calibrates the valve timing of the VVT system by setting the camshaft to the maximum retard angle when the engine is idle. The ECM closes the OCV to retard the cam. The ECM stores this value as VVT learning value (When the difference between the target valve timing and the actual valve timing is 5 degrees or less, the ECM stores this in its memory.).

If the learning value meets both of the following conditions ((a) and (b)), the ECM interprets this as a defect in the VVT system and sets a DTC.

- (a) VVT learning value is less than 20° CA (Crankshaft Angle) or more than 39° CA.
- (b) Above condition continues for more than 18 sec.

MONITOR STRATEGY

Related DTCs	P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (Bank 1)
	P0018	Deviation in crankshaft position sensor signal and camshaft position sensor signal (Bank 2)
Required sensors/components	Crankshaft position sensor, Camshaft position sensor	
Frequency of operation	Once per drive cycle	
Duration	within 60 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Engine RPM	400 rpm	1,400 rpm

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
One of the following conditions is met	Condition 1 or 2
1. VVT angle when camshaft is retarded maximum	Less than 22.5°CA
2. VVT angle when camshaft is retarded maximum	More than 44°CA (Bank 1) More than 47.5°CA (Bank 2)

INSPECTION PROCEDURE

HINT:

- If DTC P0016 is displayed, check left bank VVT sensor.
- If DTC P0018 is displayed, check right bank VVT sensor.
- Read freeze frame data using hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check valve timing (Check for loose and jumping teeth of timing belt) (See page EM-9).
----------	---

NG**Adjust valve timing (Repair or replace timing belt).****OK****Check and replace ECM (See page [SF-82](#)).**

DTC	P0031	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 1 Sensor 1)
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DTC	P0032	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 1 Sensor 1)
------------	--------------	--

DTC	P0051	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 2 Sensor 1)
------------	--------------	---

DTC	P0052	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 2 Sensor 1)
------------	--------------	--

HINT:

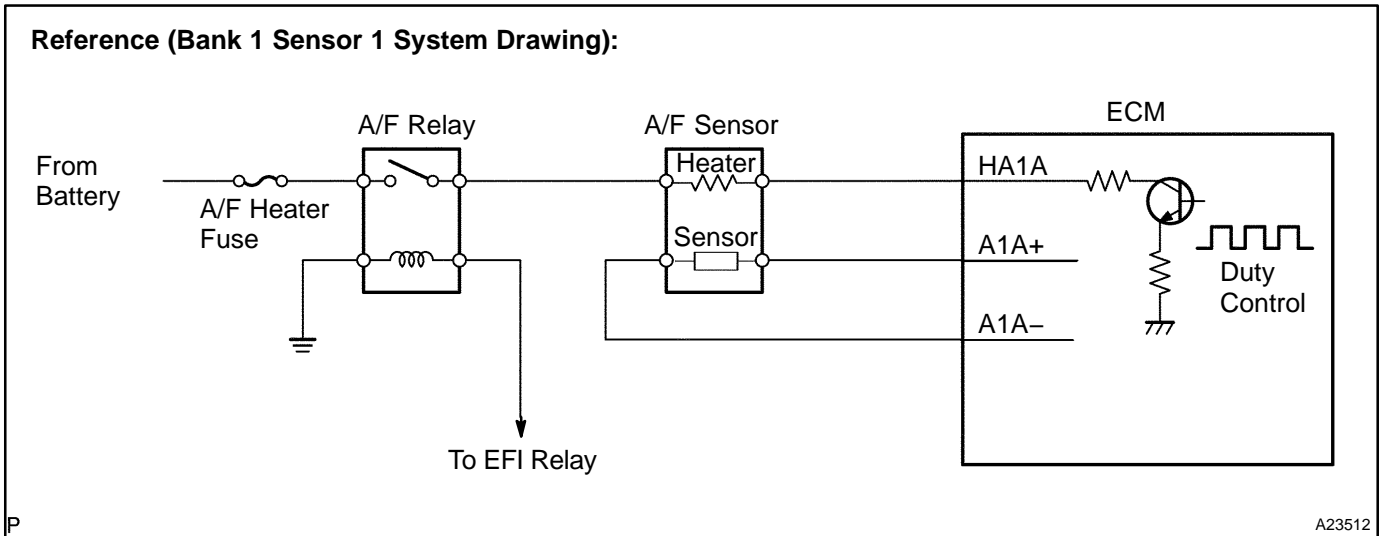
Although each DTC title (DTC description) says "oxygen sensor", these DTCs are related to the "A/F sensor".

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page [DI-806](#).

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The A/F sensor heater circuit uses a relay on the B+ side of the circuit.



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0051	Heated current is 0.8 A or less when heater operates (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in heater circuit of A/F sensor • A/F sensor heater
P0032 P0052	When the heater operates, heated current exceeds 19.7 A (1 trip detection logic)	<ul style="list-style-type: none"> • A/F sensor heater relay • ECM

HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

MONITOR DESCRIPTION

The ECM uses the Air–Fuel Ratio sensor (A/F sensor) information to regulate the air–fuel ratio close to the stoichiometric ratio. This maximizes the catalytic converter’s ability to purify exhaust gases. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM.

The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to exhaust gas. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The zirconia element generates a small voltage when there is a large difference in the oxygen concentrations of the exhaust and the outside air. The platinum coating amplifies the voltage generation. When heated, the sensor becomes very efficient. If the temperature of the exhaust is low, the sensor will not generate useful voltage signals without supplemental heating. The ECM regulates the supplemental heating using a duty–cycle approach to regulate the average current in the heater element. If the heater current is out of the normal range, the sensor’s output signals will be inaccurate and the ECM can not regulate the air–fuel ratio properly.

When the heater current is out of the normal operating range, the ECM interprets this as a malfunction and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0031	A/F sensor heater (Bank 1) range check (Low current)
	P0032	A/F sensor heater (Bank 1) range check (High current)
	P0051	A/F sensor heater (Bank 2) range check (Low current)
	P0052	A/F sensor heater (Bank 2) range check (High current)
Required sensors/components	Main sensors/components	A/F sensor heater
	Related sensors/components	–
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
P0031, P0051 (Low current):		
Battery voltage	10.5 V	–
A/F sensor heater duty ratio	50%	–
Time after engine start	10 sec.	–

P0032, P0052 (High current):		
Time after engine start	10 sec.	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0031, P0051 (Low current):	
A/F sensor heater current	Less than 0.8 A
P0032, P0052 (High current):	
A/F sensor heater current	More than 10 A

COMPONENT OPERATING RANGE

Parameter	Standard Value
A/F sensor heater current	1.8 to 3.4 A at 20°C (68°F)

WIRING DIAGRAM

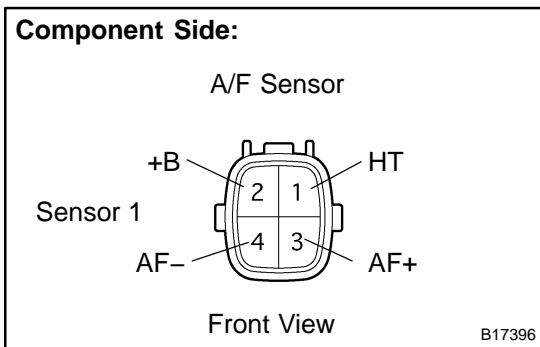
Refer to DTC P2195 on page [DI-806](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Check resistance of air-fuel ratio (A/F) sensor heater.
----------	--



PREPARATION:

Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

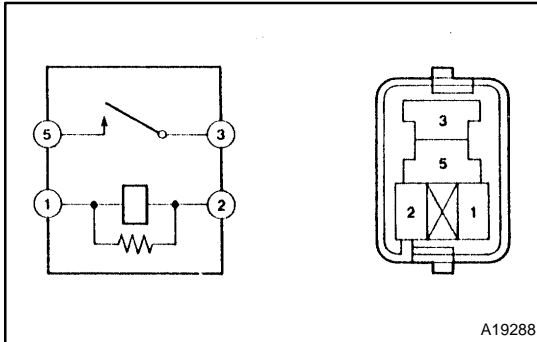
OK:

Standard:

Tester Connection	Specified Condition
HT (1) - +B (2)	1.8 Ω to 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 kΩ or higher

NG	Replace air-fuel ratio (A/F) sensor.
-----------	---



2 Check A/F relay.**PREPARATION:**

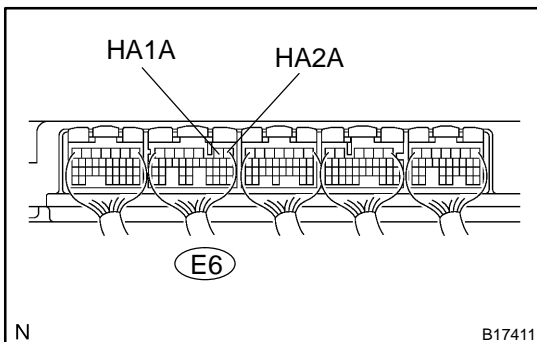
Remove the A/F relay from the engine room R/B No.2.

CHECK:

Inspect the A/F relay.

OK:**Standard:**

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 K Ω or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG**Replace A/F relay.****OK****3 Check voltage between terminals HA1A, HA2A of ECM connectors and body ground.****PREPARATION:**

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals of the ECM connectors and body ground.

HINT:

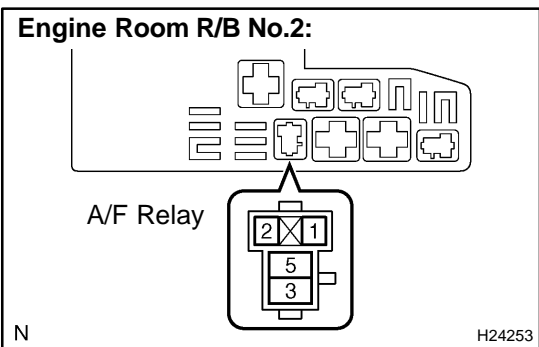
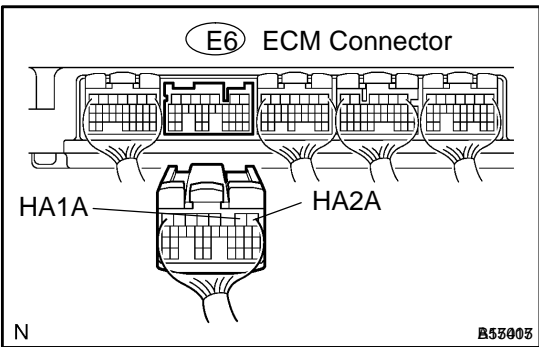
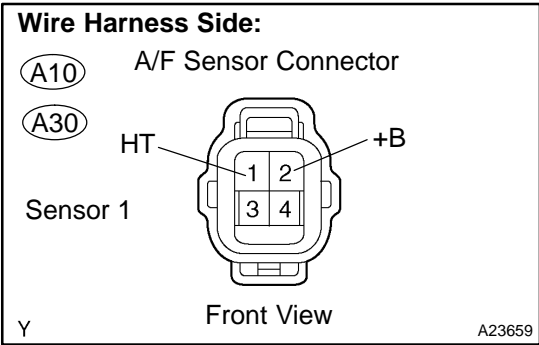
- Connect terminal HA1A to the bank 1 sensor 1.
- Connect terminal HA2A to the bank 2 sensor 1.

OK:**Standard:**

Tester Connection	Specified Condition
HA1A (E6-2) - Body ground	9 V to 14 V
HA2A (E6-1) - Body ground	9 V to 14 V

OK**Replace ECM (See page SF-82).****NG**

4 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the A10 or A30 A/F sensor connector.
- (c) Disconnect the E6 ECM connector.

CHECK:

Check the resistance.

OK:

Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher

PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the A10 or A30 A/F sensor connector.
- (c) Remove A/F relay from engine room R/B No.2.

CHECK:

Check the resistance.

OK:

Standard (Check for open):

Tester Connections	Specified Conditions
+B (A10-2) - A/F relay (3) +B (A30-2) - A/F relay (3)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
+B (A10-2) or A/F relay (3) - Body ground +B (A30-2) or A/F relay (3) - Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

Check for intermittent problems (See page DI-430).

DTC	P0037	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)
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DTC	P0038	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)
------------	--------------	--

DTC	P0057	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)
------------	--------------	---

DTC	P0058	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)
------------	--------------	--

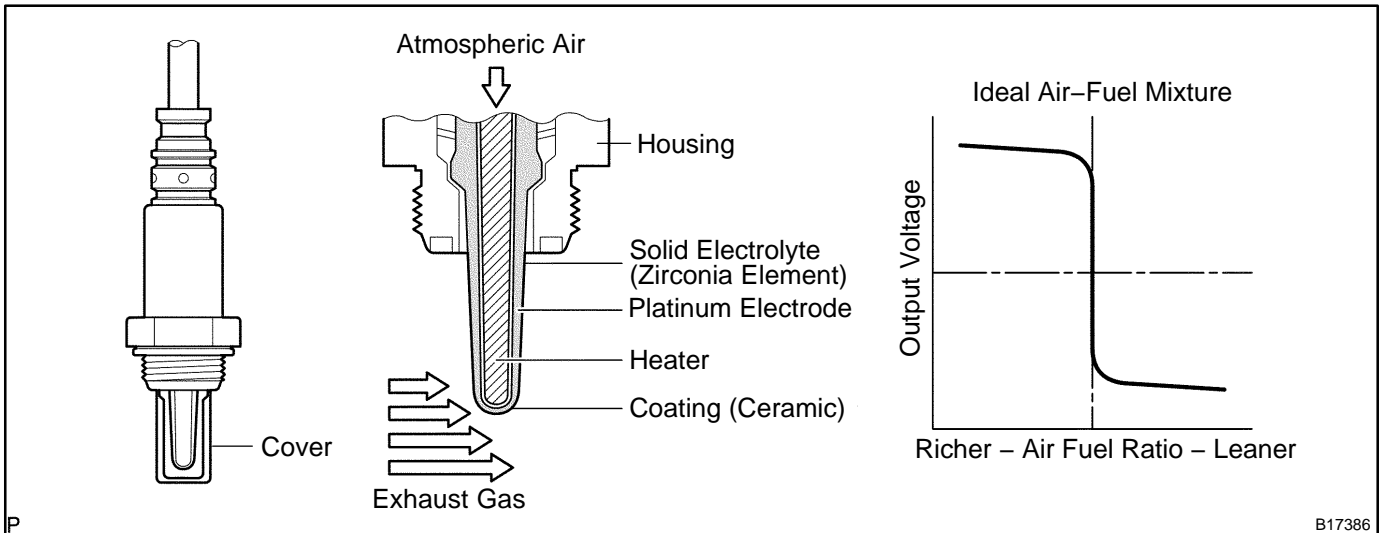
CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three-way catalytic converter is used, but for the most efficient use of the three-way catalytic converter, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric air-fuel ratio.

The heated oxygen sensor has the characteristic which its output voltage changes suddenly in the vicinity of the stoichiometric air-fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback to control the air-fuel ratio.

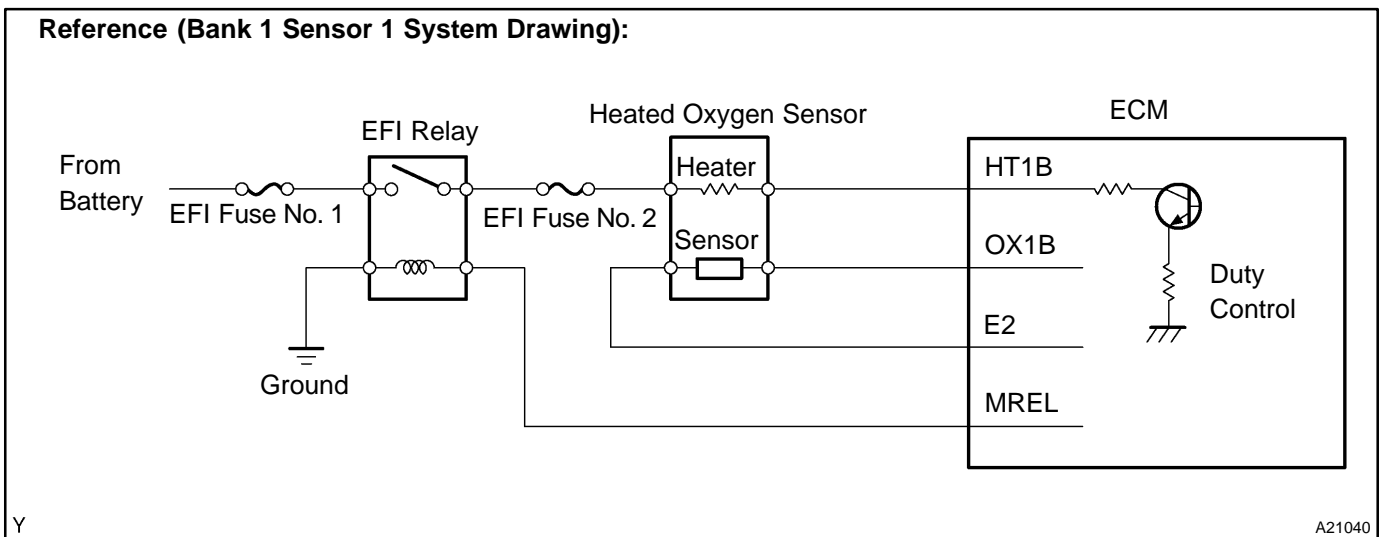
When the air-fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).

When the air-fuel ratio is RICHER than the stoichiometric air-fuel ratio, the oxygen concentration in the exhaust gas is reduced and the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V). The ECM judges by the voltage output from the heated oxygen sensor whether the air-fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the heated oxygen sensor causes output of abnormal voltage, this disables the ECM for performing an accurate air-fuel ratio control. The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.



HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.



Y

A21040

DTC No.	DTC Detecting Condition	Trouble Area
P0037 P0057	Heater current is 0.25 A or less when the heater operates with more than 10.5 V positive battery voltage	<ul style="list-style-type: none"> • Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM
P0038 P0058	When heater operates, heater current exceeds 2.0 A	<ul style="list-style-type: none"> • Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM

HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Bank 2 refers to bank that does not includes cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine assembly.
- Sensor 2 refers to the sensor farther away from the engine assembly.

MONITOR DESCRIPTION

The sensing portion of the heated oxygen sensor has a zirconia element which is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and difference of the oxygen concentration between the inside and outside surface of sensor is large, the zirconia element will generate voltage signals. In order to increase the oxygen concentration detecting capacity in the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When current in the sensor is out of the standard operating range, the ECM interprets this as a fault in the heated oxygen sensor and sets a DTC.

Example:

The ECM will set a high current DTC if the current in the sensor is more than 2.0 A when the heater is OFF. Similarly, the ECM will set a low current DTC if the current is less than 0.3 A when the heater is ON.

MONITOR STRATEGY

Related DTCs	P0037	Rear HO2S heater (Bank 1) range check (Low Current)
	P0038	Rear HO2S heater (Bank 1) range check (High Current)
	P0057	Rear HO2S heater (Bank 2) range check (Low Current)
	P0058	Rear HO2S heater (Bank 2) range check (High Current)
Required sensors/components	Main sensors/components	HO2S heater
	Related sensors/components	Vehicle speed sensor (VSS)
Frequency of operation	Continuous	
Duration	P0037, P0057: 0.5 seconds P0038, P0058: 0.3 seconds	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
All:		
Battery voltage	10.5 V	-
Engine	Running	
Starter	OFF	
Catalyst intrusive monitoring	Not operating	
Intrusive heating	Not operating	
P0037, P0057 (Low current):		
When the following conditions are met:	0.5 sec.	-
1. All of the following conditions are met:	Condition (a), (b), (c), (d) and (e)	
(a) Learned heater current during heater OFF	Completed	
(b) Intrusive heating	Not operating	
(c) Heating is OFF	-	0.1 sec.
(d) Heater current	-	0.3 A
(e) Intrusive heating for high current monitor	Not operating	
2. Following condition is met:	-	
Time after heaters are OFF	1 sec.	-
P0038, P0058 (High current):		
When the following conditions are met:	0.3 sec.	-
1. All of the following conditions are met:	Condition (a), (b), (c) and (d)	
(a) Learned heater current during heater OFF	Completed	
(b) Intrusive heating	Not operating	
(c) Heating is OFF	-	0.1 sec.
(d) Heater current	2 A	-
2. Following condition is met:	-	
Time after heaters are OFF	1 sec.	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0037, P0057 (Low current):	
Heater	ON
Heater current	Less than 0.3 A
Intrusive heating	Operating
P0038, P0058 (High current):	
Either of the following conditions is met:	Condition 1 or 2
1. All of the following conditions (a) and (b) are met:	With intrusive heating
(a) Heater	ON
(b) Heater current	2 A or more
2. All of the following conditions (c), (d) and (e) are met:	Without intrusive heating
(c) Intrusive heating of learned heater current	Operating
(d) Learned heater current during heater OFF	Operating
(e) Heater current	More than 2 A

COMPONENT OPERATING RANGE

Parameter	Standard Value
HO2S heater current	0.4 to 1 A (at idle, warmed-up engine and +B: 11 to 14 V)

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

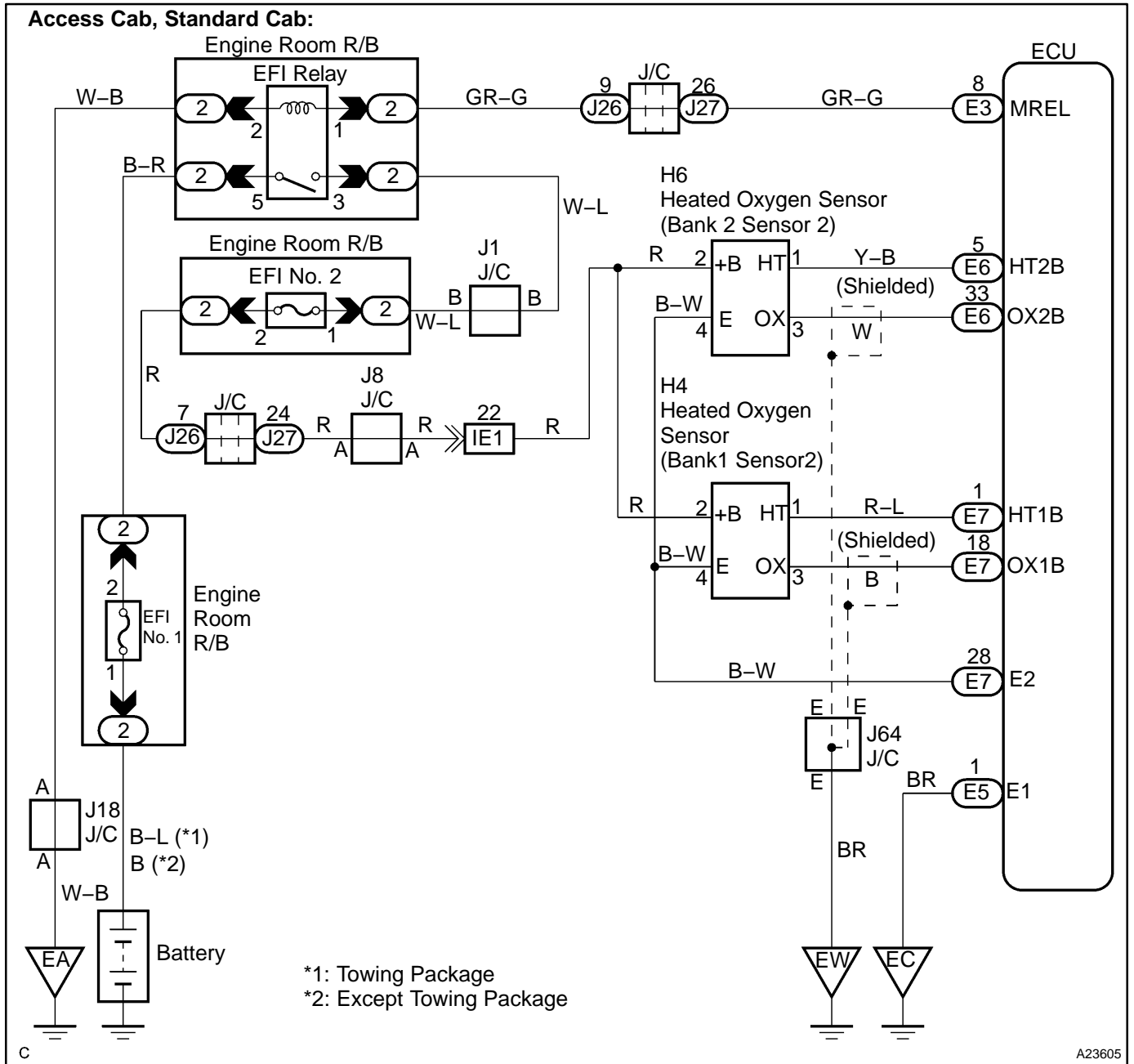
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page [DI-446](#)).

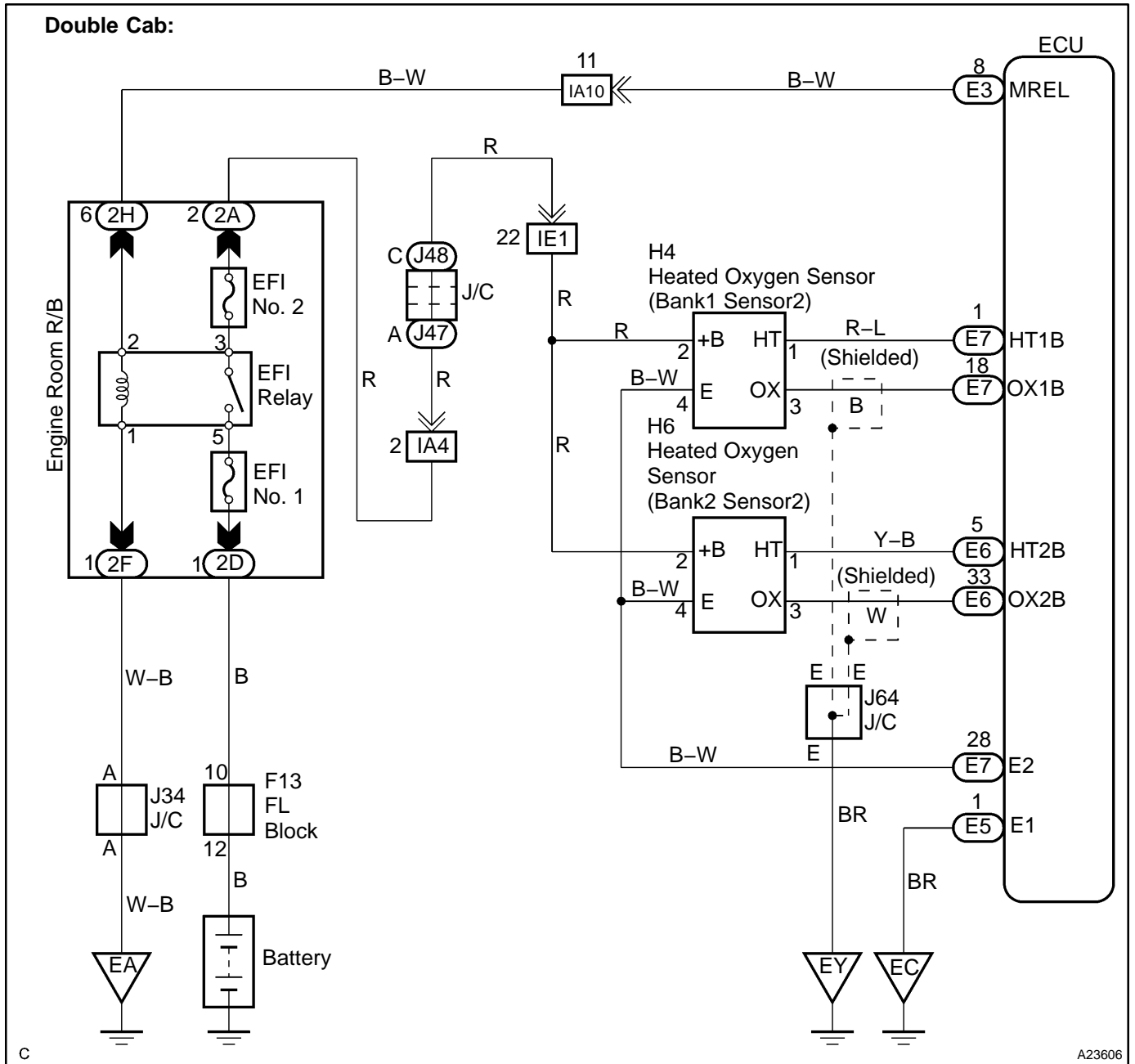
- TID (Test Identification Data) is assigned to each emissions-related component.
- TLT (Test Limit Type):
If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID \$04: HO2S heater

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	\$02	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 2)	Malfunction threshold for HO2S heater
1	\$20	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 2 Sensor 2)	Malfunction threshold for HO2S heater

WIRING DIAGRAM



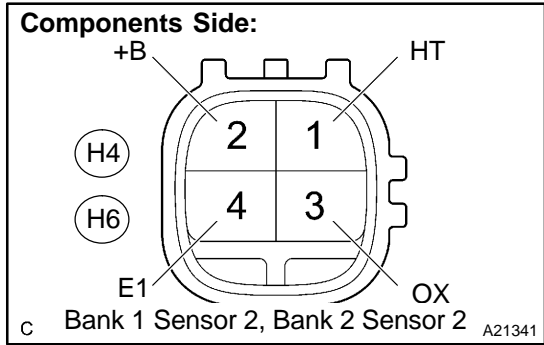


INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful to determine whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. when a malfunction occurred.

1 Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the H4 or H6 heated oxygen sensor connector.

CHECK:

Measure resistance between terminals of the heated oxygen sensor.

OK:

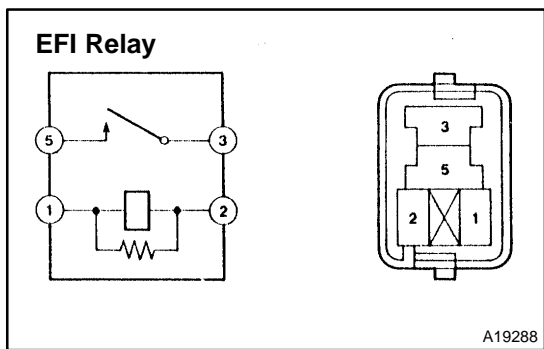
Standard:

Tester Connection	Specified Condition
HT (H4-1) - +B (H4-2)	11 to 16 Ω (20°C)
HT (H6-1) - +B (H6-2)	11 to 16 Ω (20°C)

NG Replace heated oxygen sensor.

OK

2 Check EFI relay.



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

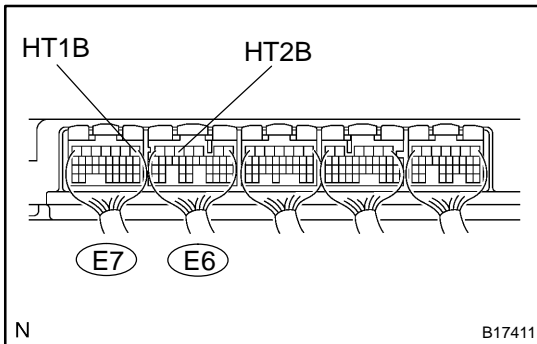
Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 KΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace EFI relay.

OK

3 Check voltage between terminals HT1B, HT2B of ECM connectors and body ground.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals of the ECM connectors and body ground.

HINT:

- Connect terminal HT1B to the bank 1 sensor 2.
- Connect terminal HT2B to the bank 2 sensor 2.

OK:

Standard:

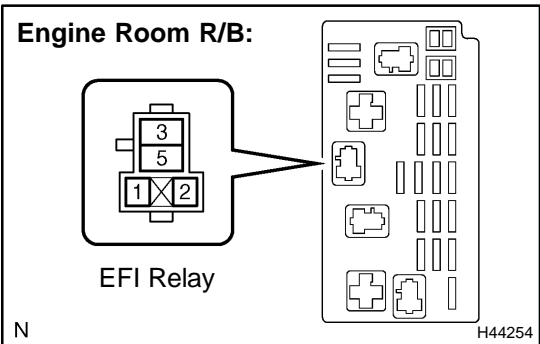
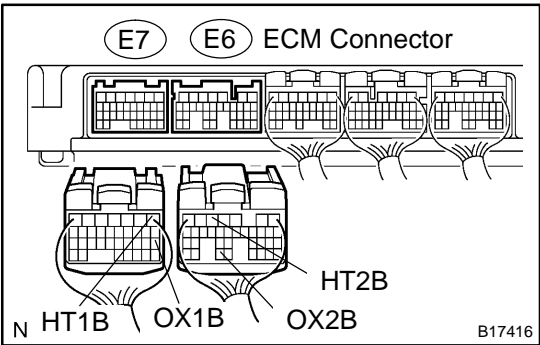
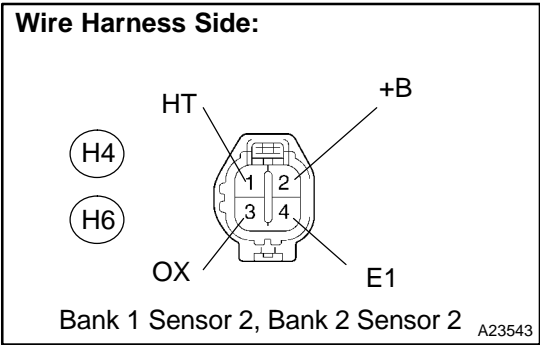
Tester Connection	Specified Condition
HT1B (E7-1) – Body ground	9 to 14 V
HT2B (E6-5) – Body ground	9 to 14 V

OK

Replace ECM (See page [SF-82](#)).

NG

4 Check for open and short in harness and connector between ECM and heated oxygen sensor, heated oxygen sensor - EFI relay.



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the H4 or H6 oxygen sensor connector.
- (c) Disconnect the E6 and E7 ECM connector.

CHECK:

Check the resistance.

OK:

Standard (Check for open):

Tester Connections	Specified Conditions
HT (H4-1) - HT1B (E7-1)	Below 1 Ω
HT (H6-1) - HT2B (E6-5)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (H4-1) or HT1B (E7-1) - Body ground	10 kΩ or higher
HT (H6-1) or HT2B (E6-5) - Body ground	10 kΩ or higher

PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the H4 or H6 oxygen sensor connector.
- (c) Remove EFI relay from engine room R/B.

CHECK:

Check the resistance.

OK:

Standard (Check for open):

Tester Connections	Specified Conditions
+B (H4-2) - EFI relay (3)	Below 1 Ω
+B (H6-2) - EFI relay (3)	

Standard (Check for short):

Tester Connections	Specified Conditions
+B (H4-2) or EFI relay (3) - Body ground	10 kΩ or higher
+B (H6-2) or EFI relay (3) - Body ground	

NG **Repair or replace harness or connector.**

OK

Check for intermittent problems (See page DI-430).

DTC	P0100	Mass or Volume Air Flow Circuit
------------	--------------	--

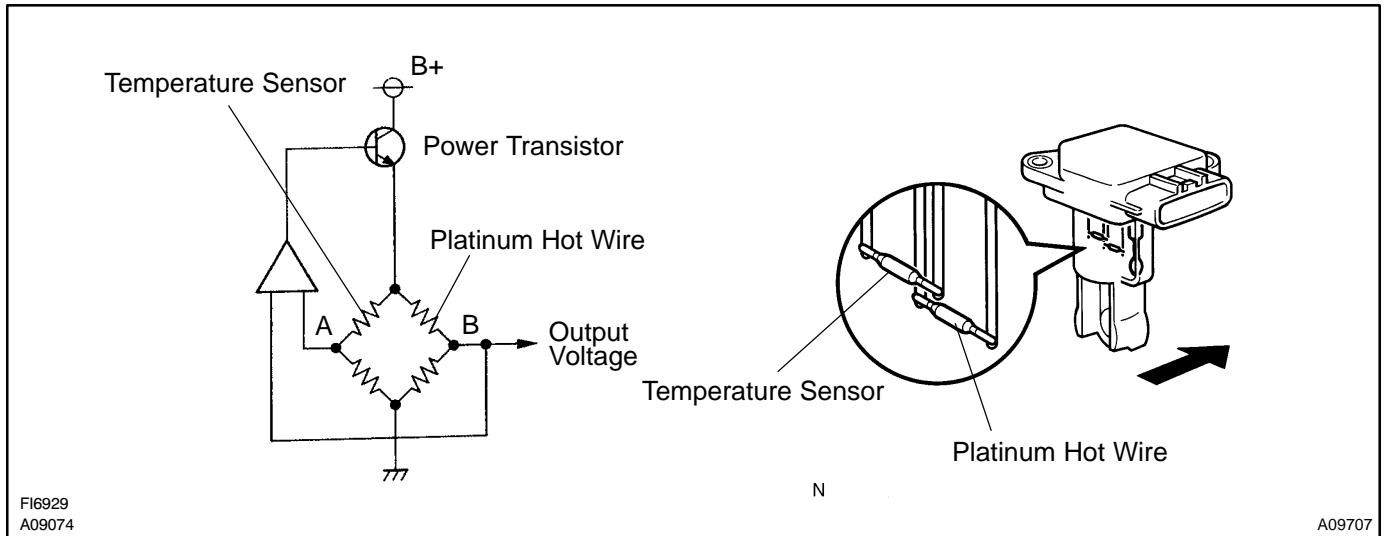
DTC	P0102	Mass or Volume Air Flow Circuit Low Input
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DTC	P0103	Mass or Volume Air Flow Circuit High Input
------------	--------------	---

CIRCUIT DESCRIPTION

The Mass Air Flow (MAF) meter measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.

By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the airflow through the sensor. The ECM interprets this voltage as the intake air amount. The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



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DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit for more than 3 sec.	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102	Open or short in mass air flow meter circuit for more than 3 sec.	
P0103	Open in mass air flow meter circuit for more than 3 sec. (EVG circuit) Short in mass air flow meter circuit for more than 3 sec. (+B circuit)	

HINT:

After confirming DTC P0100, P0102 or P0103, use the hand-held tester or the OBD II scan tool to confirm the MAF ratio from the ALL menu (to reach the ALL menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL).

Mass Air Flow Value (gm/sec.)	Malfunction
Approx. 0.0	<ul style="list-style-type: none"> • Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	<ul style="list-style-type: none"> • EVG circuit open

MONITOR DESCRIPTION

If there is a defect in the MAF (Mass Air Flow) meter or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.

Example:

When the MAF meter voltage output is less than 0.2 V, or more than 4.9 V, and if either the condition continues for more than 3 sec.

MONITOR STRATEGY

Related DTCs	P0100	Mass air flow meter circuit range check (Fluttering)
	P0102	Mass air flow meter circuit range check (Low voltage)
	P0103	Mass air flow meter circuit range check (High voltage)
Required sensors/components	Mass air flow meter	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (When engine speed is at less than 4,000 rpm) 2 driving cycles (When engine speed is at 4,000 rpm or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI-437
The typical enabling condition is not available	-

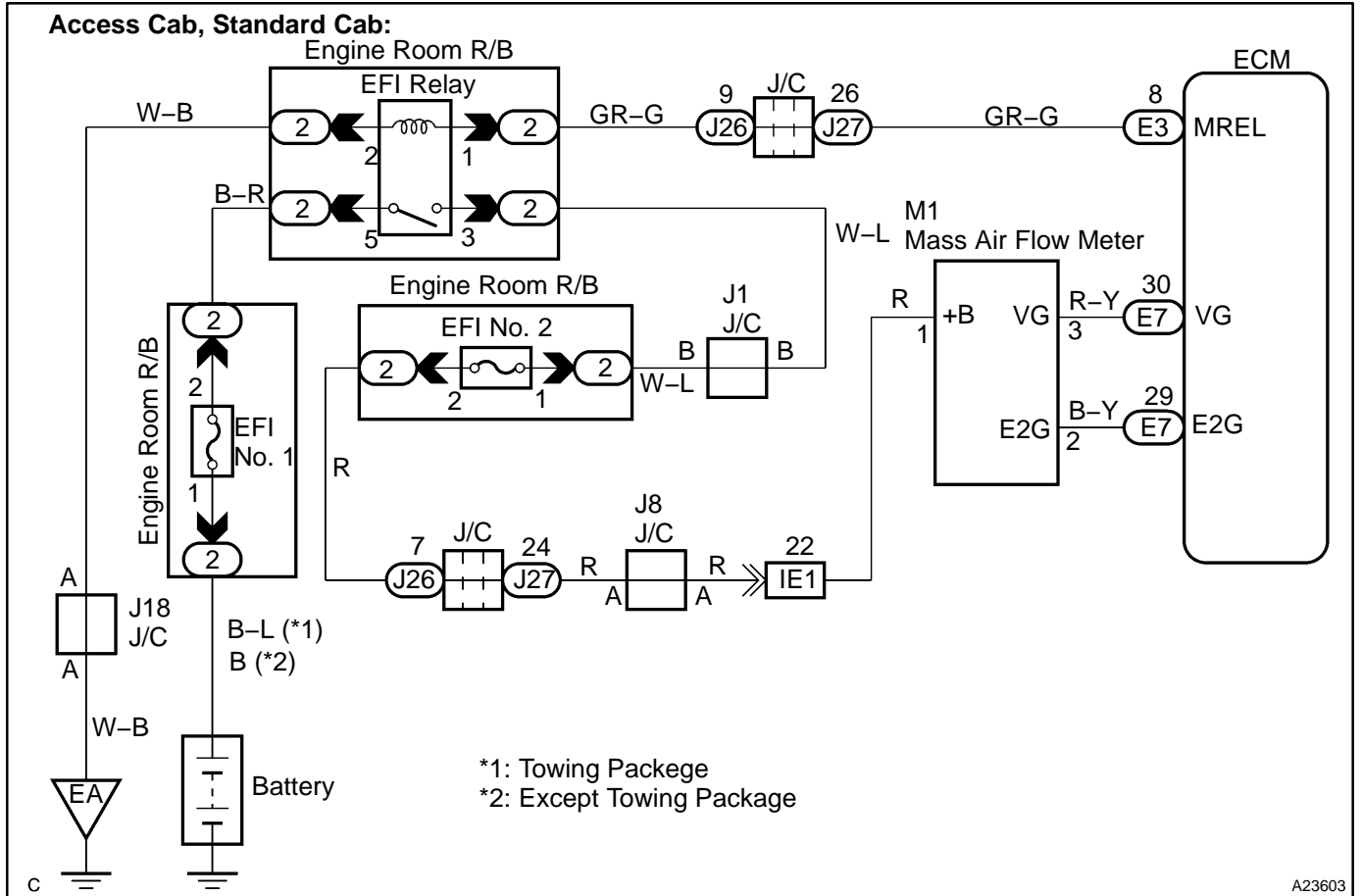
TYPICAL MALFUNCTION THRESHOLDS

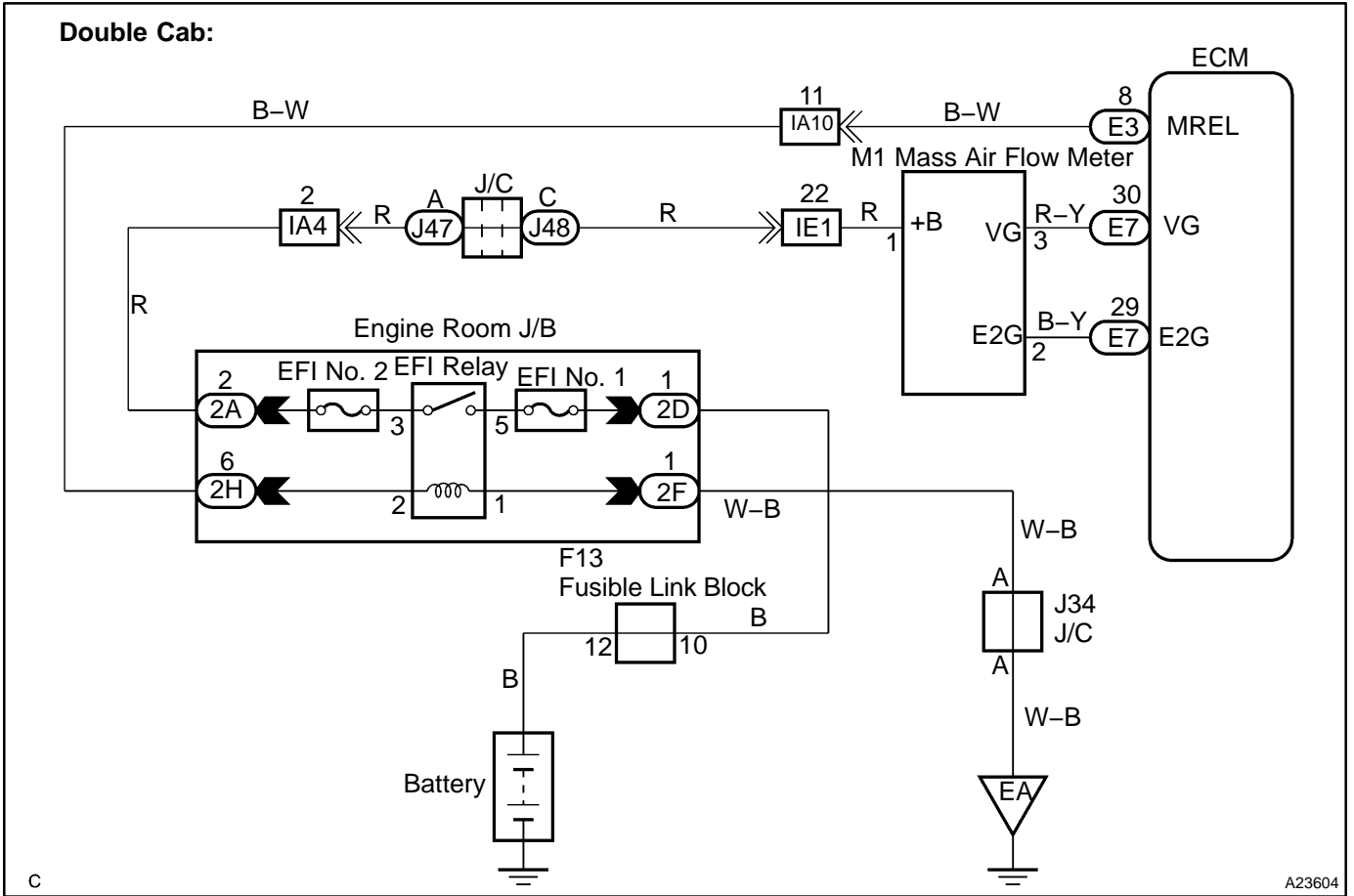
Detection Criteria	Threshold
P0100:	
Mass air flow meter voltage	Less than 0.2 V, or more than 4.9 V
P0102:	
Mass air flow meter voltage	Less than 0.2 V
P0103:	
Mass air flow meter voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Mass air flow meter voltage	0.4 to 2.2 V

WIRING DIAGRAM





C

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read value of mass air flow rate.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) Start the engine.
- (d) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.

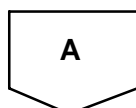
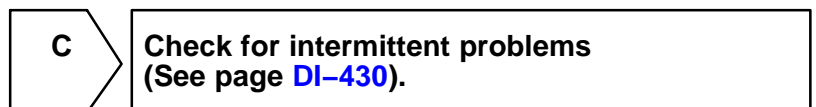
CHECK:

Read the mass air flow rate on the hand-held tester.

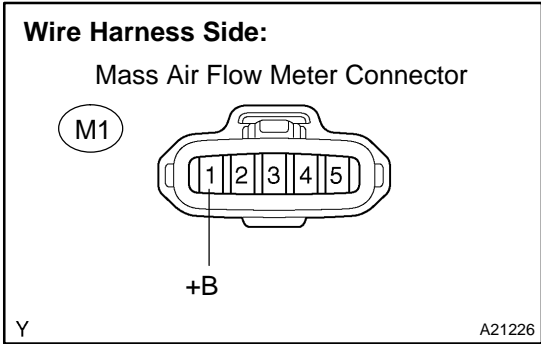
RESULT:

Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1 and 270.0 (*1)	C

*1: The value must change when the throttle valve is opened or closed.



2 Check voltage of mass air flow meter power source.



PREPARATION:

- (a) Disconnect the M1 mass air flow meter connector.
- (b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal 1 of the mass air flow meter connector and body ground.

OK:

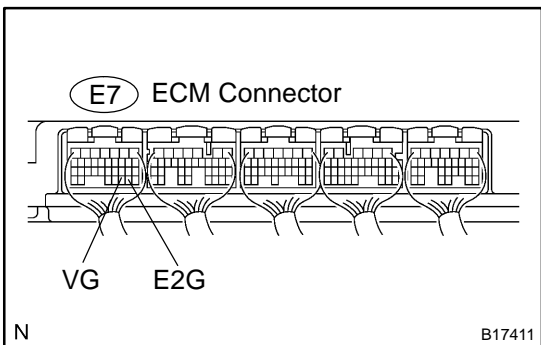
Standard:

Tester Connection	Specified Condition
+B (M1-1) - Body ground	9 to 14 V

NG Go to step 5.

OK

3 Check voltage between terminal VG of ECM connector and body ground.



PREPARATION:

Start the engine.

CHECK:

Measure the voltage between the specified terminal of the E7 ECM connector.

HINT:

The shift position should be P or N and the A/C switch should be turned OFF.

OK:

Standard:

Tester Connection	Condition	Specified Condition
VG (E7-30) - E2G (E7-29)	Engine is idling	0.5 to 3.0 V

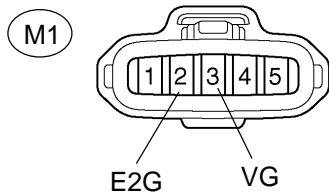
OK Replace ECM (See page [SF-82](#)).

NG

4 Check for open and short in harness and connector between mass air flow meter and ECM.

Wire Harness Side:

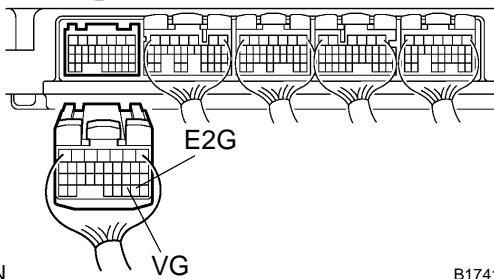
Mass Air Flow Meter Connector



Y

A21226

E7 ECM Connector



N

B17412

PREPARATION:

- Disconnect the M1 mass air flow meter connector.
- Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VG (M1-3) - VG (E7-30)	Below 1 Ω
E2G (M1-2) - E2G (E7-29)	Below 1 Ω
VG (M1-3) or VG (E7-30) - Body ground	10 k Ω or higher

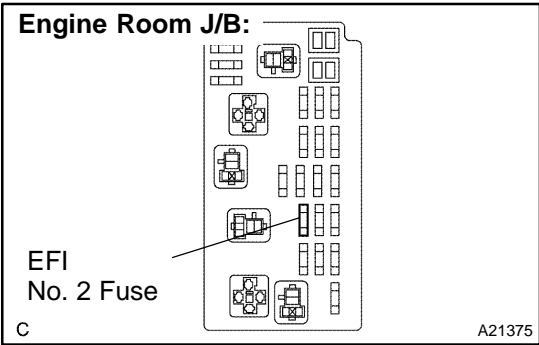
NG

Repair or replace harness or connector.

OK

Replace mass air flow meter.

5 Check for open and short in harness and connector between mass air flow meter and EFI relay.



PREPARATION:

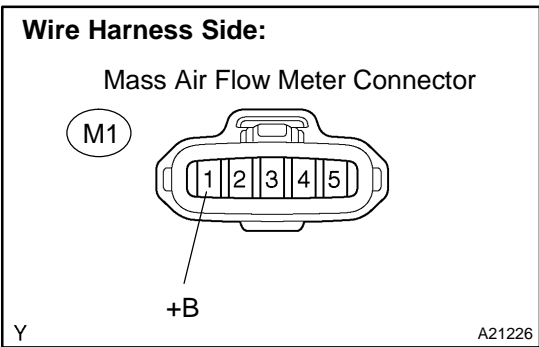
Remove the EFI No. 2 fuse from the engine room J/B.

CHECK:

Check the resistance in the EFI No. 2 fuse.

OK:

Standard:
Below 1 Ω



PREPARATION:

- (a) Install the EFI No. 2 fuse.
- (b) Disconnect the M1 mass air flow meter connector.
- (c) Remove the EFI relay from the engine room J/B.

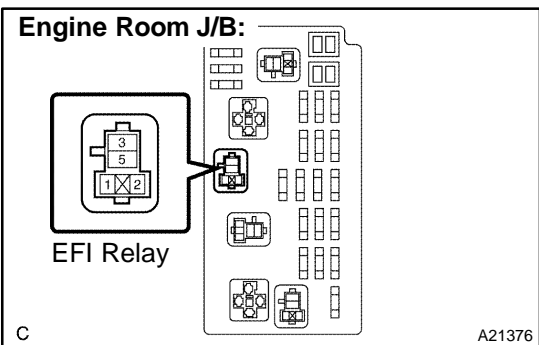
CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
+B (M1-1) – Engine Room J/B (EFI relay terminal 1)	Below 1 Ω
+B (M1-1) or Engine room J/B (EFI relay terminal 1) – Body ground	10 kΩ or higher

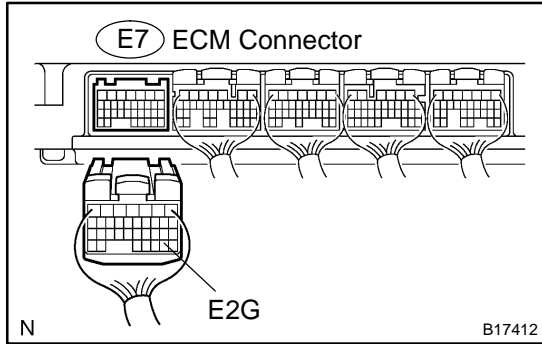


NG → **Repair or replace harness or connector.**

OK

Check ECM power source circuit (See page DI-918).

6 Check continuity between terminal E2G of ECM connector and body ground.



CHECK:

Check the resistance between terminal of the E7 ECM connector and body ground.

OK:

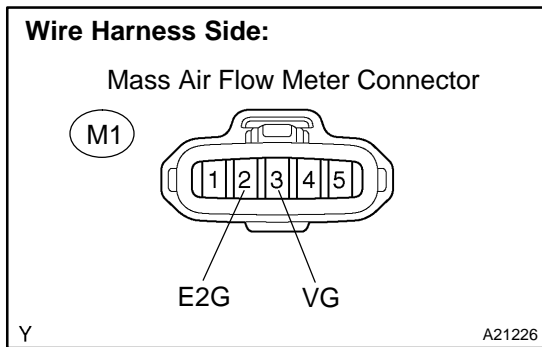
Standard:

Tester Connection	Specified Condition
E2G (E7-29) - Body ground	Below 1 Ω

NG Replace ECM (See page [SF-82](#)).

OK

7 Check for open in harness and connector between mass air flow meter and ECM.



PREPARATION:

- (a) Disconnect the M1 mass air flow meter connector.
- (b) Disconnect the E7 ECM connector.

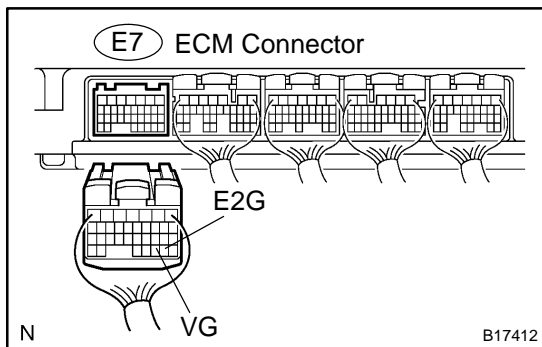
CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VG (M1-3) - VG (E7-30)	Below 1 Ω
E2G (M1-2) - E2G (E7-29)	Below 1 Ω
VG (M1-3) or VG (E7-30) - Body ground	10 kΩ or higher
E2G (M1-2) or E2G (E7-29) - Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

Replace mass air flow meter.

DTC	P0101	Mass or Volume Air Flow Circuit Range/ Performance Problem
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CIRCUIT DESCRIPTION

Refer to DTC P0100, P0102 and P0103 on page [DI-522](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0101	After engine is warmed up, conditions (a), (b), (c) and (d) continue for more than 10 seconds: (2 trip detection logic) (a) Throttle valve fully closed (b) Voltage output of the mass air flow meter is more than 2.2 V. (c) Engine coolant temperature is more than 70 °C (158 °F). (d) Engine speed is less than 2,000 rpm.	• Mass air flow meter
	Conditions (a), (b) and (c) continue for more than 10 seconds at engine speed: (2 trip detection logic) (a) Engine speed is more than 300 rpm. (b) Voltage output of the mass air flow meter is less than 1.0 V.	

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter helps the ECM calculate the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the air flow through the MAF meter. The ECM interprets this voltage as the intake air amount. If there is a defect in the MAF meter or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.

Example:

If the voltage is more than 2.2 V at idle or less than 1.0 V at idle OFF, the ECM interprets this as a defect in the MAF meter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101	Mass air flow meter rationality (Low voltage)
		Mass air flow meter rationality (High voltage)
Required sensors/components	Main sensors/components	Mass air flow meter
	Related sensors/components	Engine speed sensor, Engine coolant temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
High voltage:		
Engine speed	-	2,000 rpm
Engine coolant temperature	70°C (158°F)	-
Low voltage:		
Engine speed	300 rpm	-
Fuel cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Mass air flow meter voltage (High voltage)	More than 2.2 V (varies with throttle position sensor voltage)
Mass air flow meter voltage (Low voltage)	Less than 1.0 V (varies with throttle position sensor voltage)

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides DTC P0101) being output?
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES.

CHECK:

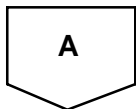
Read the DTC using the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
"P0101" and other DTCs	A
Only P0101	B

HINT:

If any other codes besides P0101 are output, perform the troubleshooting for those codes first.



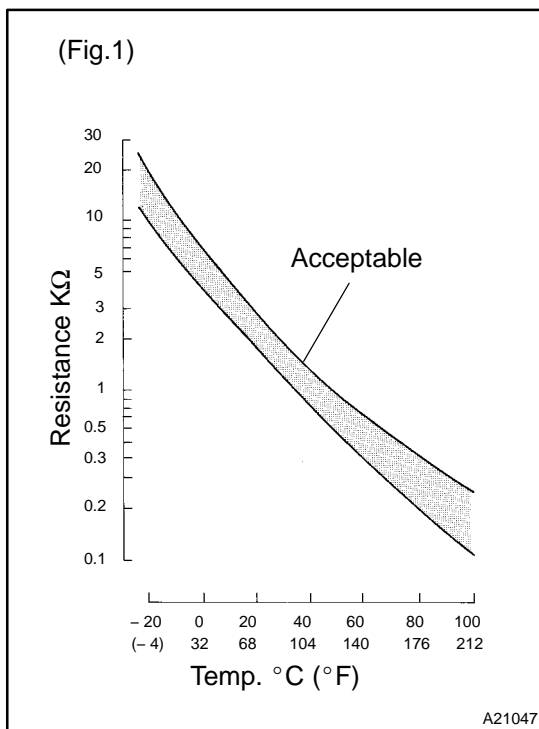
Go to relevant DTC chart (See page [DI-477](#)).

DTC	P0110	Intake Air Temperature Circuit
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DTC	P0112	Intake Air Temperature Circuit Low Input
------------	--------------	---

DTC	P0113	Intake Air Temperature Circuit High Input
------------	--------------	--

CIRCUIT DESCRIPTION



The intake air temperature (IAT) sensor, mounted on the mass air flow (MAF) meter, monitors the intake air temperature. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The resistance varies as voltage changes to the ECM terminal.

(See Fig. 1).

The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.

That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the voltage at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temperature sensor circuit for 0.5 sec.	<ul style="list-style-type: none"> • Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temperature sensor circuit for 0.5 sec.	
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 sec.	

HINT:

After confirming DTC "P0110, P0112 or P0113", use the hand-held tester to confirm the intake air temperature in the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL".

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F) or more	Short circuit

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the IAT (Intake Air Temperature) sensor and sets a DTC.

Example:

When the sensor voltage output is equal to -40°C (-40°F), or more than 140°C (284°F).

MONITOR STRATEGY

Related DTCs	P0110	Intake air temperature sensor range check (Fluttering)
	P0112	Intake air temperature sensor range check (Low voltage)
	P0113	Intake air temperature sensor range check (High voltage)
Required sensors/components	Intake air temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI-437
The typical enabling condition is not available	-

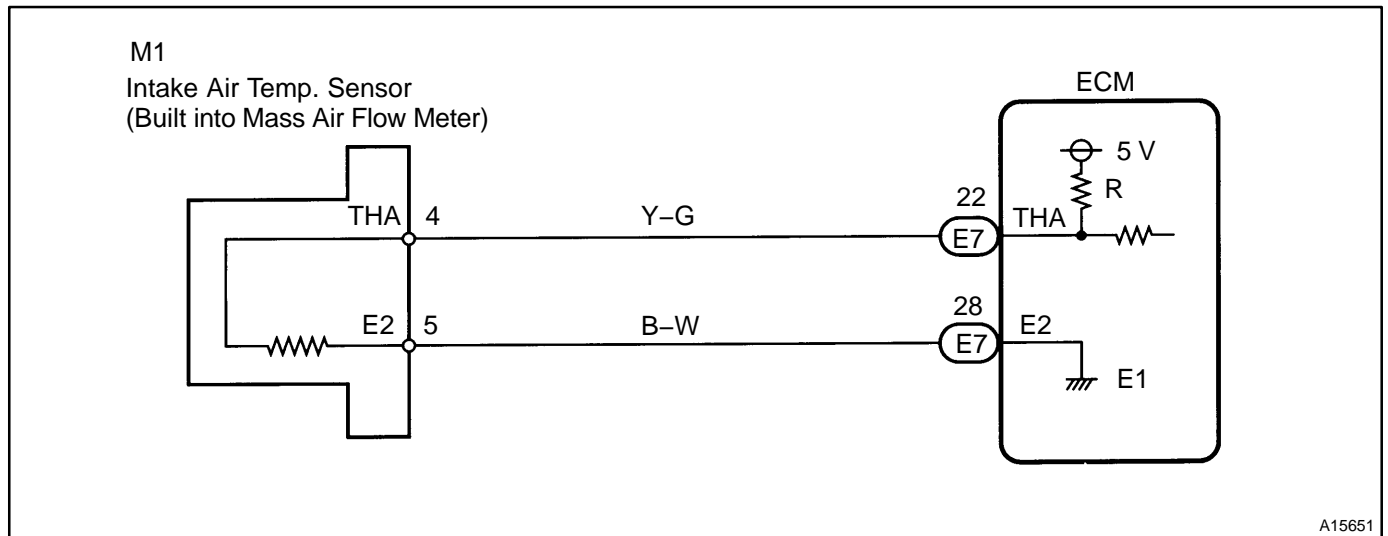
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0110:	
Intake air temperature sensor voltage (Intake air temperature)	Less than 0.18 V or more than 4.91 V (More than 140°C (284°F), or less than -40°C (-40°F))
P0112:	
Intake air temperature sensor voltage (Intake air temperature)	Less than 0.18 V (More than 140°C (284°F))
P0113:	
Intake air temperature sensor voltage (Intake air temperature)	More than 4.91 V (Less than -40°C (-40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Intake air temperature sensor voltage	0.18 V (140°C (284°F)) to 4.91 V (-40°C (-40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read value of intake air temperature.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

OK:

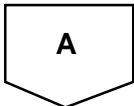
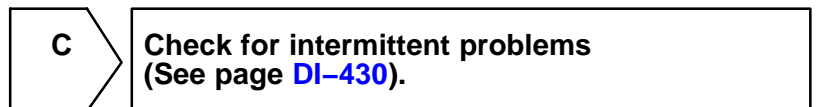
Same as actual intake air temperature.

RESULT:

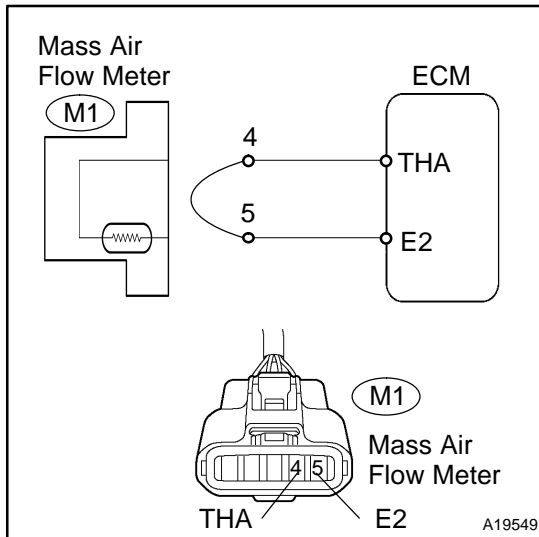
Displayed Temperature	Proceed to
-40°C (-40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

HINT:

- If there is an open circuit, the hand-held tester indicates -40°C (-40°F).
- If there is a short circuit, the hand-held tester indicates 140°C (284°F) or more.



2 Check for open in harness or ECM.



PREPARATION:

- Disconnect the M1 mass air flow meter connector.
- Connect terminals 4 and 5 of the mass air flow meter wire harness side connector.
- Turn the ignition switch ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

OK:

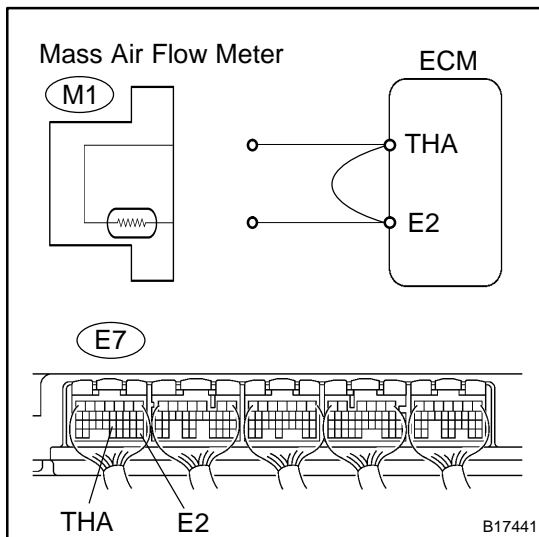
Standard: Temperature value: 140°C (284°F) or more

OK

Confirm good connection at sensor. If OK, replace mass air flow meter.

NG

3 Check for open in harness or ECM.



PREPARATION:

- Connect terminals THA and E2 of the E7 ECM connector.

HINT:

Before checking, do a visual and contact pressure check for the ECM connector.

- Turn the ignition switch ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

OK:

Standard: Temperature value: 140°C (284°F) or more

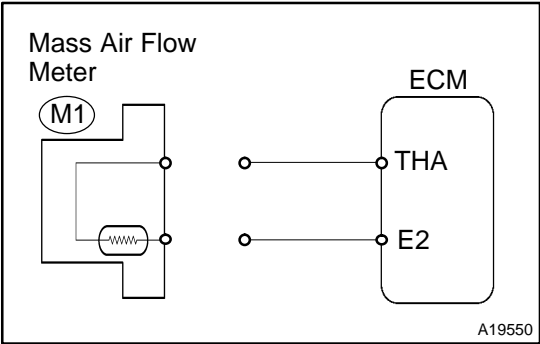
OK

Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF-82).

4 Check for short in harness and ECM.



PREPARATION:

- (a) Disconnect the M1 mass air flow meter connector.
- (b) Turn the ignition switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

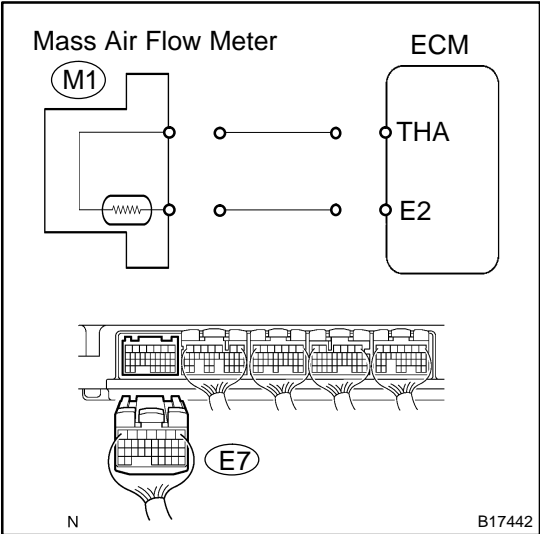
OK:

Standard: Temperature value: -40°C (-40°F)

OK → Replace mass air flow meter.

NG

5 Check for short in harness or ECM.



PREPARATION:

- (a) Disconnect the E7 ECM connector.
- (b) Turn the ignition switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand-held tester.

OK:

Standard: Temperature value: -40°C (-40°F)

OK → Repair or replace harness or connector.

NG

Replace ECM (See page SF-82).

DTC	P0115	Engine Coolant Temperature Circuit
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DTC	P0117	Engine Coolant Temperature Circuit Low Input
------------	--------------	---

DTC	P0118	Engine Coolant Temperature Circuit High Input
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CIRCUIT DESCRIPTION

A thermistor is built in the Engine Coolant Temperature (ECT) sensor and changes the voltage value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as the Intake Air Temperature (IAT) sensor.

HINT:

If the ECM detects the DTC "P0115, P0117 or P0118", it operates the fail-safe function in which the ECT is assumed to be 80°C (176°F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temperature sensor circuit for 0.5 sec.	<ul style="list-style-type: none"> • Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0117	Step 4	Short in engine coolant temperature sensor circuit for 0.5 sec.	
P0118	Step 2	Open in engine coolant temperature sensor circuit for 0.5 sec.	

HINT:

After confirming DTC "P0115, P0117 or P0118", use the OBD II scan tool or the hand-held tester to confirm the engine coolant temperature from the DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL.

Displayed Temperature	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F) or more	Short circuit

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its voltage depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the voltage drops. The voltage varies as output voltage from the sensor changes.

The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Example:

When the ECM calculates that the ECT is less than -40°C (-40°F), or more than 140°C (284°F), and if either the condition continues for 0.5 sec. or more, the ECM will set a DTC.

MONITOR STRATEGY

Related DTCs	P0115	Engine coolant temperature sensor range check (Fluttering)
	P0117	Engine coolant temperature sensor range check (Low voltage)
	P0118	Engine coolant temperature sensor range check (High voltage)
Required sensors/components	Engine coolant temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI-437
The typical enabling condition is not available	-

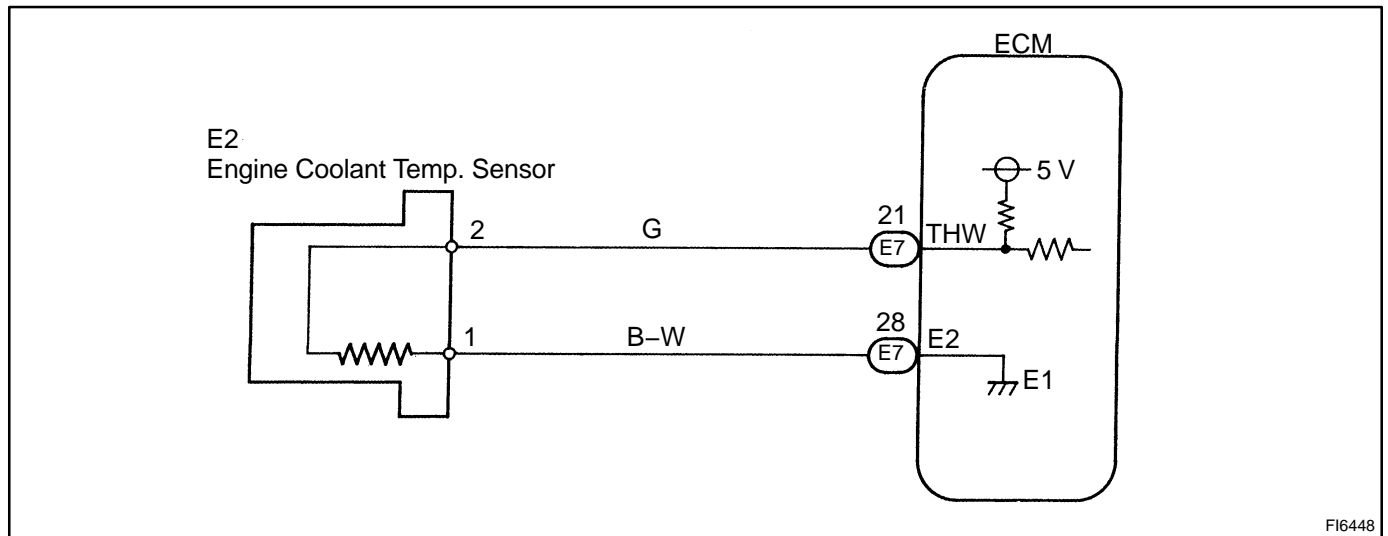
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0115:	
Engine coolant temperature sensor voltage (Coolant temperature)	Less than 0.14 V, or more than 4.91 V (More than 140°C (284°F), or less than -40°C (-40°F))
P0117:	
Engine coolant temperature sensor voltage (Coolant temperature)	Less than 0.14 V (More than 140°C (284°F))
P0118:	
Engine coolant temperature sensor voltage (Coolant temperature)	More than 4.91 V (Less than -40°C (-40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor voltage	0.14 V (140°C (284°F)) to 4.91 V (-40°C (-40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different system that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read value of engine coolant temperature.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the the hand-held tester.

OK:

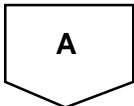
Same value as actual engine coolant temperature.

RESULT:

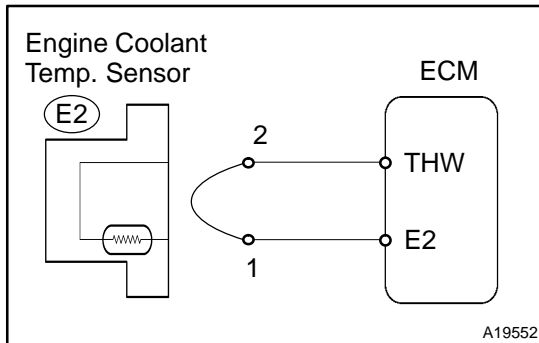
Displayed Temperature	Proceed to
-40°C (-40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

HINT:

- If there is an open circuit, hand-held tester indicates -40°C (-40°F).
- If there is a short circuit, hand-held tester indicates 140°C (284°F) or more.



2 Check for open in harness or ECM.



PREPARATION:

- Disconnect the E2 engine coolant temperature (ECT) sensor connector.
- Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
- Turn the ignition switch ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the hand-held tester.

OK:

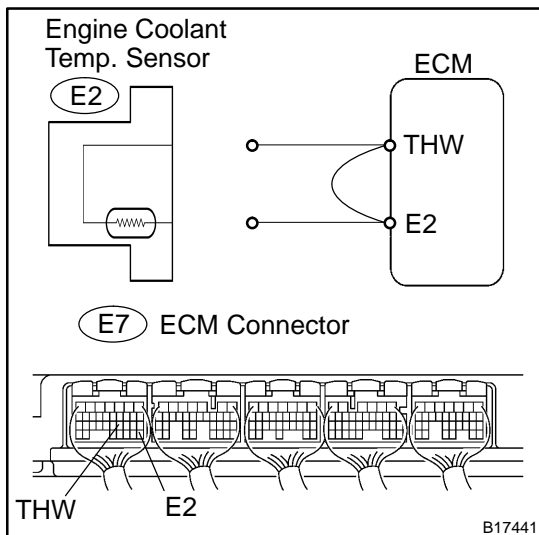
Standard: Temperature value: 140°C (284°F) or more

OK

Confirm good connection at sensor. If OK, replace engine coolant temperature sensor.

NG

3 Check for open in harness or ECM.



PREPARATION:

- Disconnect the E2 engine coolant temperature sensor connector.
 - Connect terminals THW and E2 of the E7 ECM connector.
- HINT:
Before checking, do a visual and contact pressure checks for the ECM connector.
- Turn the ignition switch ON.
 - When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or the hand-held tester.

OK:

Standard: Temperature value: 140°C (284°F) or more

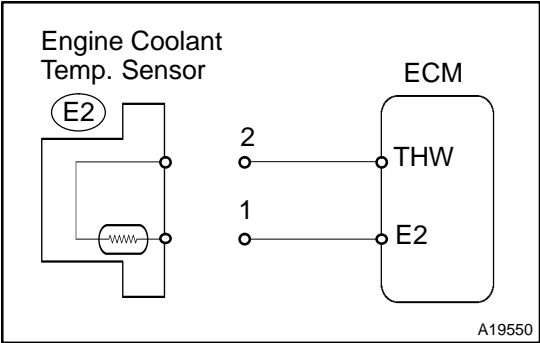
OK

Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF-82).

4 Check for short in harness and ECM.



PREPARATION:

- (a) Disconnect the E2 engine coolant temperature sensor connector.
- (b) Turn the ignition switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the hand-held tester.

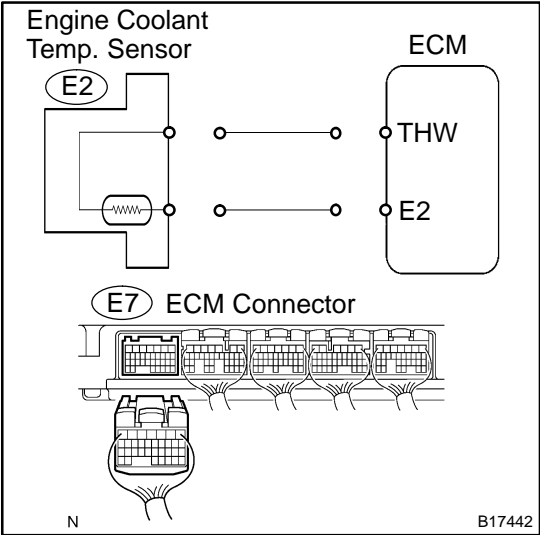
OK:

Standard: Temperature value: -40°C (-40°F)

OK → Replace engine coolant temperature sensor.

NG

5 Check for short in harness or ECM.



PREPARATION:

- (a) Disconnect the E7 ECM connector.
- (b) Turn the ignition switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read the temperature value on the hand-held tester.

OK:

Standard: Temperature value: -40°C (-40°F)

OK → Repair or replace harness or connector.

NG

Replace ECM (See page SF-82).

DTC	P0116	Engine Coolant Temperature Circuit Range/ Performance Problem
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page [DI-540](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0116	If the engine coolant temperature was 35°C (95°F) or more but less than 60°C (140°F) when the engine is started, and if conditions (a) and (b) are met: (a) Vehicle has accelerated and decelerated. (b) Engine coolant temperature remains within 3°C (5.4°F) of the initial engine coolant temperature (2 trip detection logic)	• Engine coolant temperature sensor
	If the engine coolant temperature is more than 60°C (140°F) when the engine is started, and if conditions (a) and (b) are met: (a) Vehicle has accelerated and decelerated. (b) If the engine coolant temperature sensor records a temperature variation below 1°C (1.8°F) successively 6 times (6 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Examples:

- (1) Upon starting the engine, the ECT is between 35°C (95°F) and 60°C (140°F). If after driving for 250 sec., the ECT still remains within 3°C (5.4°F) of the starting temperature, a DTC will be set (2 trip detection logic).
- (2) Upon starting the engine, the ECT is over 60°C (140°F). If after driving for 250 sec., the ECT still remains within 1°C (1.8°F) of the starting temperature, a DTC will be set (6 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0116	Engine coolant temperature sensor range check (Stuck)
Required sensors/components	Main sensors/components	Engine coolant temperature sensor
	Related sensors/components	Intake air temperature sensor, Crankshaft position sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	250 sec.	
MIL operation	2 driving cycles (When temperature is fixed between 35°C (95°F) and 60°C (140°F)) 6 driving cycles (When temperature is fixed at 60°C (140°F) or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Case 1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):		
Cumulative idle off period	250 sec.	–
Speed increase 18.6 mph (30 km/h) or more	10 times	–
Engine coolant temperature	35°C (95°F)	60°C (140°F)
Intake air temperature	–6.7°C (20°F)	–
Intake air temperature sensor circuit fail	Not detected	
Case 2 (When temperature is fixed at 60°C (140°F) or more):		
Engine coolant temperature at engine start	60°C (140°F)	–
Intake air temperature	–6.7°C (20°F)	–
Stop and go*1	Once or more	
Steady driving and stop*2	Once or more	
Engine running time after engine start	0.3 seconds or more	

*1: The vehicle is stopped for 20 seconds or more and accelerated to more than 43.5 mph (70 km/h) within 40 seconds.

*2: Following these steps: 1) the vehicle is driven at 40.4 mph (65 km/h) or more for 30 seconds or more and the vehicle speed reaches 43.5 mph (70 km/h); 2) the vehicle is decelerated from 40.4 mph (65 km/h) to 1.86 mph (3 km/h) or less within 35 seconds; and 3) the vehicle is stopped for 10 seconds.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):	
Change of engine coolant temperature value	Less than 3°C (5.4°F)
Case2 (When temperature is fixed at 60°C (140°F) or more):	
Change of engine coolant temperature value	1°C (1.8°F) or less

COMPONENT OPERATING RANGE

Standard Value
Engine coolant temperature changes with the actual engine coolant temperature.

INSPECTION PROCEDURE

HINT:

- If DTC P0115, P0116, P0117, P0118 and P0125 are output simultaneously, ECT sensor circuit may be open or shorted. Perform the troubleshooting of DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace engine coolant temperature sensor.

DTC	P0120	Throttle/Pedal Position Sensor/Switch "A" Circuit
DTC	P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input
DTC	P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input
DTC	P0220	Throttle/Pedal Position Sensor/Switch "B" Circuit
DTC	P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input
DTC	P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High Input
DTC	P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correction

HINT:

This is the purpose for the "throttle position sensor".

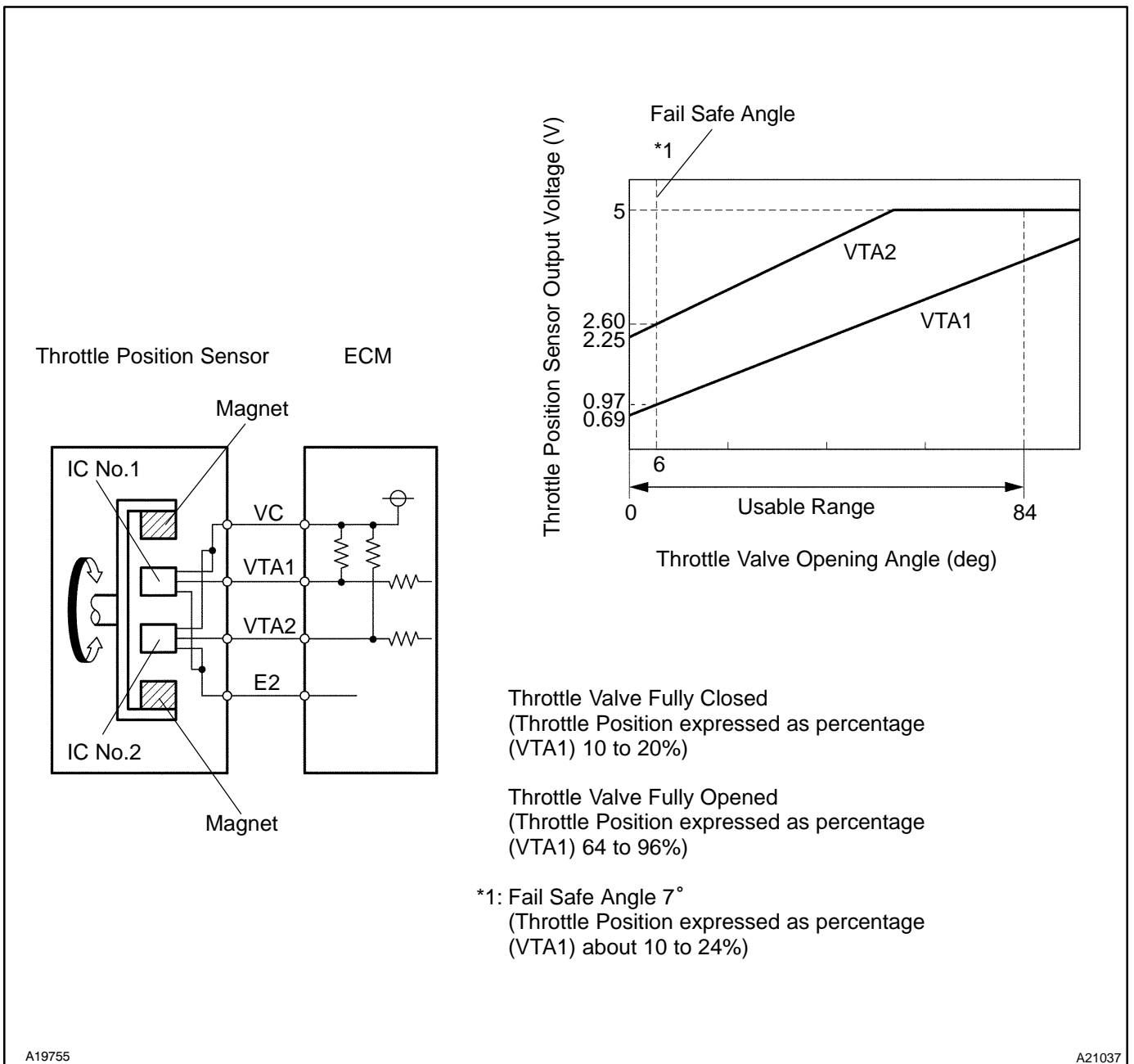
CIRCUIT DESCRIPTION

HINT:

- This Electrical Throttle Control System (ETCS) does not use a throttle cable.
- This throttle position sensor is a non-contact type.

The throttle position sensor is mounted on the throttle body. It detects the opening angle of the throttle valve. This sensor is electronically controlled and uses Hall-effect elements, so that accurate control and reliability can be obtained. The throttle position sensor has 2 sensor elements / signal outputs: VTA1 and VTA2. VTA1 used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. Voltage applied to VTA1 and VTA2 change between 0 V and 5 V in proportion to the opening angle of the throttle valve. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.

The ECM judges the current opening angle of the throttle valve from these signals input from terminals VTA1 and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to driver inputs.



DTC No.	DTC Detection Condition	Trouble Area
	Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 sec. (Open or short in the throttle control motor and sensor circuit)	
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA1 is "0.2 V or less" or VTA1 is "4.535 V or more"	<ul style="list-style-type: none"> • Open or short in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM
P0122	(a) VTA1 is 0.2 V or less	<ul style="list-style-type: none"> • Short in throttle control motor and sensor circuit • Throttle control motor and sensor • Short in VTA1 circuit • Open in VC circuit • ECM
P0123	(a) VTA1 is 4.535 V or more	<ul style="list-style-type: none"> • Open in throttle control motor and sensor circuit • Throttle control motor and sensor • Open in VTA1 circuit • Open in E2 circuit • VC and VTA1 circuit are short-circuited • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) VTA2 is "1.75 V or less" or VTA2 is "4.8 V or more"	<ul style="list-style-type: none"> • Throttle control motor and sensor • ECM
P0222	(a) VTA2 is 1.75 V or less	<ul style="list-style-type: none"> • Throttle control motor and sensor • Short in VTA2 circuit • Open in VC circuit • ECM
P0223	(a) VTA2 is "4.8 V or more" and VTA1 is "0.2 V or more" and VTA1 is "2.02 V or less"	<ul style="list-style-type: none"> • Throttle control motor and sensor • Open in VTA2 circuit • Open in E2 circuit • VC and VTA2 circuit are short-circuited • ECM
P2135	Condition (a) continues for 0.5 sec. or more, or condition (b) continues for 0.4 sec. or more: (a) Difference between VTA1 and VTA2 is 0.02 V or less (b) VTA1 is "0.2 V or less" and VTA2 is "1.75 V or less"	<ul style="list-style-type: none"> • VTA1 and VTA2 circuit are short-circuited • Throttle control motor and sensor • ECM

HINT:

- After confirming DTCs, use the hand-held tester or the OBD II scan tool to confirm the throttle valve opening percentage and closed throttle position switch condition.
- THROTTLE POS means the VTA1 signal and the THROTTLE POS #2 means the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal fully released	Accelerator pedal fully depressed
THROTTLE POS	10 to 24%	66 to 98%
THROTTLE POS #2	2.1 to 3.1 V	4.5 to 5.5 V

MONITOR DESCRIPTION

The ECM uses throttle position sensor to monitor the throttle valve opening angle.

- (a) There is an expected specific voltage difference between VTA1 and VTA2 for each throttle opening angle.
- If the difference between VTA1 and VTA2 is incorrect the ECM interprets this as a fault and will set a DTC.
- (b) VTA1 and VTA2 each have a specific voltage operating range.
- If VTA1 or VTA2 is out of the normal operating range the ECM interprets this as a fault and will set a DTC.
- (c) VTA1 and VTA2 should never be close to the same voltage levels.
- If VTA1 is within the range of ± 0.02 V of VTA2 the ECM interprets this as a short circuit in the throttle position sensor system and will set a DTC.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0120	Throttle position sensor (sensor 1) range check (Fluttering)
	P0122	Throttle position sensor (sensor 1) range check (Low voltage)
	P0123	Throttle position sensor (sensor 1) range check (High voltage)
	P0220	Throttle position sensor (sensor 2) range check (Fluttering)
	P0222	Throttle position sensor (sensor 2) range check (Low voltage)
	P0223	Throttle position sensor (sensor 2) range check (High voltage)
	P2135	Throttle position sensor range check (Correlation)
Required sensors/components	Throttle position sensor	
Frequency of operation	Continuous	
Duration	Accelerator pedal ON: 2 sec. Accelerator pedal OFF: 10 sec. P2135: 0.5 sec. or 0.4 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI-437
Electronic throttle actuator power	ON

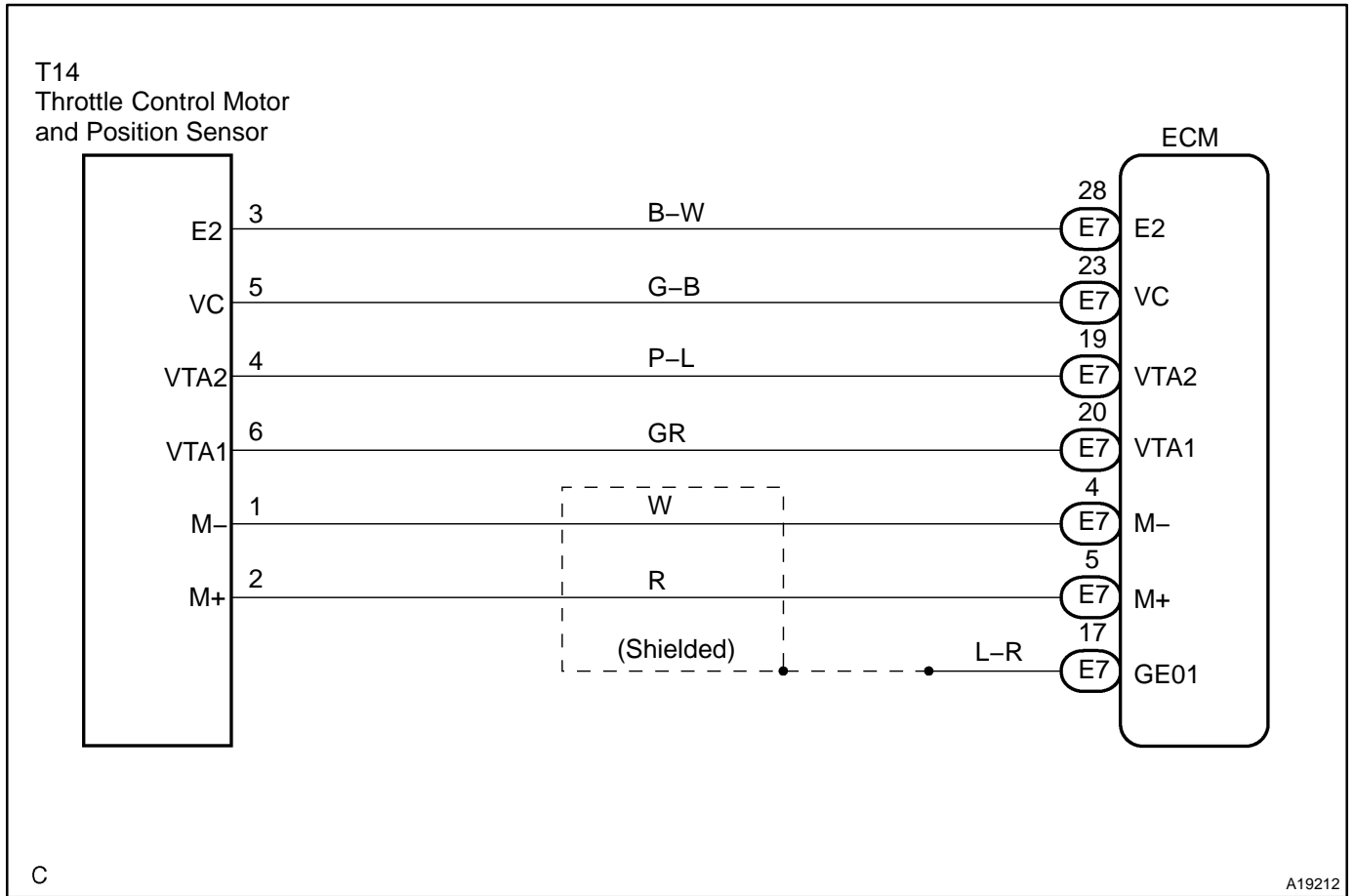
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0120:	
VTA1 voltage	0.2 V or less, or 4.535 V or more
P0122:	
VTA1 voltage	0.2 V or less
P0123:	
VTA1 voltage	4.535 V or more
P0220:	
VTA2 voltage	1.75 V or less, or 4.8 V or more
P0222:	
VTA2 voltage	1.75 V or less
P0223:	
Both of the following conditions are met:	Condition 1 and 2
1. VTA1 voltage	0.2 to 2.02 V
2. VTA2 voltage	4.8 V or more
P2135:	
Different between VTA1 and VTA2 voltage	0.02 V or less
Both of the following conditions are met:	Condition 1 and 2
1. VTA1 voltage	0.2 V or less
2. VTA2 voltage	1.75 V or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle position sensor VTA1 voltage	0.6 to 3.96 V
Throttle position sensor VTA2 voltage	2.25 to 5.0 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different system that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read the voltage for throttle position sensor data.
----------	--

PREPARATION:

(a) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / THROTTLE POS and THROTTLE POS #2.

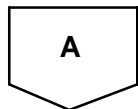
CHECK:

Read voltage value displayed on the hand-held tester.

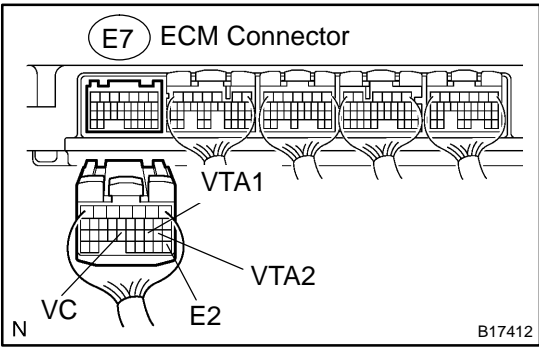
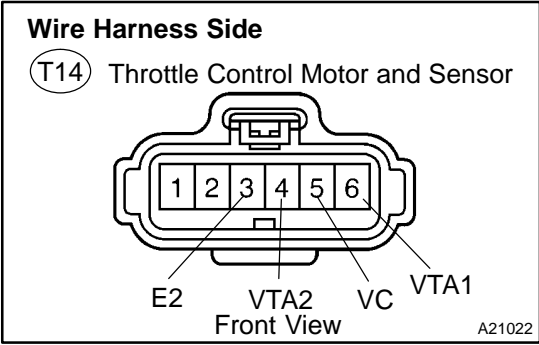
OK:**RESULT:**

Throttle position expressed as percentage and voltage				Trouble area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.5 V	100 %	4.5 to 5.5 V	E2 circuit open	
0 % or 100 %	2.1 to 3.1 V (Fail safe)	0 % or 100 %	2.1 to 3.1 V (Fail safe)	VTA1 circuit open or ground short	
about 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	about 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
10 to 24 %	2.15 to 3.05 V	64 to 96 % (Does not fail safe)	4.5 to 5.5 V (Does not fail safe)	Throttle position sensor circuit is normal	

B	Go to step 5.
----------	----------------------



2 Check for open and short in harness and connector between ECM and throttle position sensor.



PREPARATION:

- (a) Disconnect the T14 throttle control motor and sensor connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:

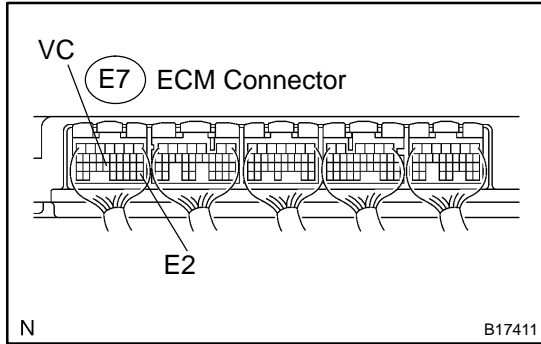
Standard:

Tester Connection	Specified Condition
VC (T14-5) – VC (E7-23)	Below 1 Ω
VTA1 (T14-6) – VTA1 (E7-20)	Below 1 Ω
VTA2 (T14-4) – VTA2 (E7-19)	Below 1 Ω
E2 (T14-3) – E2 (E7-28)	Below 1 Ω
VC (T14-5) or VC (E7-23) – Body ground	10 kΩ or higher
VTA1 (T14-6) or VTA1 (E7-20) – Body ground	10 kΩ or higher
VTA2 (T14-4) or VTA2 (E7-19) – Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

3 Check voltage between terminals VC and E2 of ECM connector.



PREPARATION:

- (a) Disconnect the T14 throttle control motor and sensor connector.
- (b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the specified terminals of the E7 ECM connector.

OK:

Standard:

Tester Connection	Specified Condition
VC (E7-23) - E2 (E7-28)	4.5 to 5.5 V

NG → Replace ECM (See page [SF-82](#)).

OK

4 Replace throttle body (See page [SF-43](#)).

Go

5 Check if DTC output recur.

PREPARATION:

- (a) Clear DTCs (see page [DI-462](#)).
- (b) Start the engine.
- (c) Run the engine at idle for 15 seconds or more.

CHECK:

Read the DTC.

RESULT:

Display (DTC Output)	Proceed to
"P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135" are output again	A
No DTC output	B

B → System is OK.

A

Replace ECM (See page [SF-82](#)).

DTC	P0121	Throttle Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem
------------	--------------	--

HINT:

This is the purpose of the "throttle position sensor".

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page [DI-548](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0121	Condition (a) continues for 2.0 sec.: (a) Difference between VTA1 and VTA2 deviates from the threshold	Throttle control motor and sensor

MONITOR DESCRIPTION

The ECM uses throttle position sensor to monitor the throttle valve opening angle.

This sensor includes two signals, VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. There are several checks that the ECM performs confirm proper operation of the throttle position sensor and VTA1.

There is a specific voltage difference expected between VTA1 and VTA2 for each throttle opening angle. If the voltage output difference of the VTA1 and VTA2 deviates from the normal operating range, the ECM interprets this as a malfunction of the throttle position sensor. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0121	Throttle position sensor rationality
Required sensors/components	Throttle position sensor	
Frequency of operation	Continuous	
Duration	Within 2 seconds	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Either of the following condition is met:	Condition 1 or 2	
1. Ignition switch	ON	
2. Electric throttle motor power	ON	
TP sensor malfunction (P0120, P0122, P0123, P0220, P0222, P0223, P2135)	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Different between VTA1 and VTA2 $ VTA1 - (VTA2 \times 0.8 \text{ to } 1.2) ^*$ * Corrected by learning value	Less than 0.8 V, or more than 1.6 V

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace throttle control motor and sensor (See page [SF-43](#)).

DTC	P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page [DI-540](#).

DTC No.	DTC Detection Condition	Trouble Area
P0125	If THW or THA is less than -19.45°C (-3°F) at engine start and 20 min. or more after starting engine, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	<ul style="list-style-type: none"> • Cooling system • Engine coolant temperature sensor • Thermostat
	If THW and THA is between -19.45°C (-3°F) and -8.34°C (17°F) at engine start, 129 sec. or more after starting engine and engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	
	If THW and THA greater than -8.34°C (17°F) at engine start and 77 sec. or more after starting engine, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the temperature of the engine coolant. The resistance of the sensor varies with the actual coolant temperature. The ECM applies a voltage to the sensor and the varying resistance of the sensor cause the signal voltage to vary. The ECM monitors the ECT signal voltage after engine start-up. If, after sufficient time has passed, the sensor still reports that the engine is not warmed up enough for closed-loop fuel control after sufficient time has passed, the ECM interprets this as a fault in the sensor or cooling system and sets a DTC.

Example:

The engine coolant temperature was 0°C (32°F) at engine start. After 5 min. running time, the ECT sensor still indicates that the engine is not warmed up enough to begin air fuel ratio feedback control of the air-fuel ratio. The ECM interprets this as a fault in the sensor or cooling system and will set a DTC.

MONITOR STRATEGY

Related DTCs	P0125	Insufficient coolant temperature for closed loop fuel control
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Cooling system, Thermostat
	Related sensors/components	Mass air flow meter
Frequency of operation	Continuous	
Duration	77 sec. (at engine start, engine coolant or intake air temperature of -8.34°C (17°F) or more) 129 sec. (at engine start, engine coolant or intake air temperature of -19.45 to -8.34°C (-3 to 17°F)) 20 min. (at engine start, engine coolant or intake air temperature of less than -19.45°C (-3°F))	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Fuel cut	OFF	
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Time until "engine coolant temperature" detection temperature reaches feedback start temperature	
When the temperature at the time of engine starting is -8.34°C (17°F) or more	Engine coolant temperature is less than "closed-loop enable temperature" when 77 sec. or more after engine start
When the temperature at the time of engine starting is -19.45 to -8.34°C (-3 to 17°F)	Engine coolant temperature is less than "closed-loop enable temperature" when 129 sec. or more after engine start
When the temperature at the time of engine starting is -19.45°C (-3°F) or less	Engine coolant temperature is less than "closed-loop enable temperature" when 20 min. or more after engine start

INSPECTION PROCEDURE

HINT:

- If DTC P0115, P0116, P0117, P0118 and P0125 are output simultaneously, engine coolant temperature sensor circuit may be open or short. Perform the troubleshooting of DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides DTC P0125) being output?
----------	--

PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and push the hand-held tester main switch ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs using the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
P0125	A
"P0125" and other DTCs	B

HINT:

If any other codes besides "P0125" are output, perform the troubleshooting for those DTCs first.

B
Go to relevant DTC chart (See page [DI-477](#)).

A

2 Inspect thermostat (See page CO-11).**CHECK:**

Check the valve opening temperature of the thermostat.

OK:

Valve opening temperature is 80 to 84°C (176 to 183°F)

HINT:

Also check that the valve is completely closed under opening temperature as above.

NG**Replace thermostat (See page CO-12).****OK****3 Check cooling system.****CHECK:**

Check that there is detect in the cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG**Repair or replace cooling system.****OK****Replace engine coolant temperature sensor.**

DTC	P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)
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HINT:

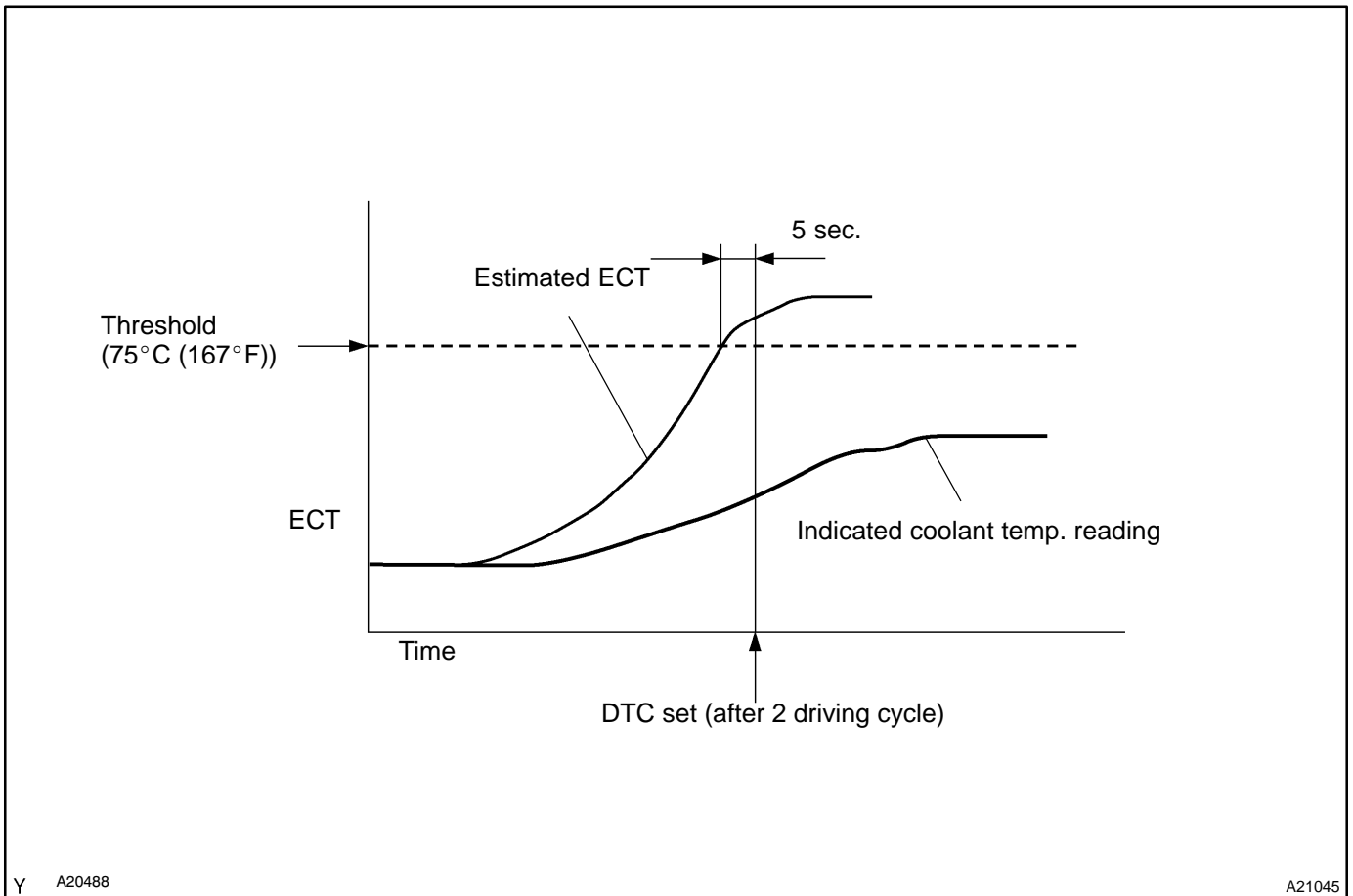
This is the purpose of "thermostat" malfunction detection.

CIRCUIT DESCRIPTION

If the engine coolant temperature does not reach 75°C (167°F) despite sufficient warm-up time has elapsed.

DTC No.	DTC Detection condition	Trouble Area
P0128	Condition (a), (b) and (c) are met: (a) Cold start (b) After sufficient warm-up time has elapsed (c) Engine coolant temperature greater than 75°C (167°F)	<ul style="list-style-type: none"> • Thermostat • Cooling system • Engine coolant temperature sensor • ECM

MONITOR DESCRIPTION



The ECM estimates the coolant temperature based on starting temperature, engine loads, and engine speeds. The ECM then compares the estimated temperature with the actual ECT (Engine Coolant Temperature). When the estimated coolant temperature reaches 75°C (167°F), the ECM checks the actual ECT. If the actual ECT is less than 75°C (167°F), the ECM will interpret this as a fault in the thermostat or engine cooling system and set a DTC.

MONITOR STRATEGY

Related DTCs	P0128	Thermostat
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Engine cooling system, Thermostat
	Related sensors/components	Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	15 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Battery voltage	11.0 V	–
Throttle position learning	Completed	
Either of the following conditions is met	Condition 1 or 2	
1. All of the following conditions are met	Condition (a), (b) and (c)	
(a) ECT at engine start – IAT at engine start	–15 to 7°C (–5 to 44.6°F)	
(b) ECT at engine start	–10 to 56°C (14 to 133°F)	
(c) IAT at engine start	–10 to 56°C (14 to 133°F)	
2. All of the following conditions are met	Condition (d), (e) and (f)	
(d) ECT at engine start – IAT at engine start	7°C (44.6°F)	–
(e) ECT at engine start	–	56°C (133°F)
(f) IAT at engine start	–10°C (14°F)	–
Accumulated time that vehicle speed is 80 mph (128 km/h) or more	–	20 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that both of following conditions 1 and 2 are met	5 sec. or more
1. Estimated engine coolant temperature	75°C (167°F) or more
2. Engine coolant temperature sensor output	Less than 75°C (167°F)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor output value after warm up	75°C (167°F) or more

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides DTC P0128) being output?
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTC using the hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
P0128	A
P0128 and other DTCs	B

HINT:

If any other codes besides P0128 are output, perform the troubleshooting for those DTCs first.

B

Check for intermittent problems (See page DI-430).

A

2	Check cooling system.
----------	------------------------------

CHECK:

- (a) Check for defects in the cooling system that might cause the system to be too cold, such as abnormal radiator fan operation or a modified cooling system.
- (b) Check the valve opening temperature of the thermostat.

OK:

Valve opening temperature is 80 to 84°C (176 to 183°F)

HINT:

Also check that the valve is completely closed under opening temperature as above.

NG

Repair or replace cooling system.

OK

3	Check thermostat (See page CO-12).
----------	---

CHECK:

Check the valve lift.

OK:

Valve lift: 10 mm (0.39 in.) or more at 95°C (203°F)

NG	Replace thermostat.
-----------	----------------------------



Replace ECM (See page SF-82).
--

DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)
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DTC	P0137	Oxygen Sensor Circuit Low Voltage (Bank 1 Sensor 2)
------------	--------------	--

DTC	P0138	Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)
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DTC	P0156	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)
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DTC	P0157	Oxygen Sensor Circuit Low Voltage (Bank 2 Sensor 2)
------------	--------------	--

DTC	P0158	Oxygen Sensor Circuit High Voltage (Bank 2 Sensor 2)
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HINT:

Sensor 2 refers to the sensor mounted behind the Three-Way Catalytic Converter (TWC) and located far from the engine assembly.

CIRCUIT DESCRIPTION

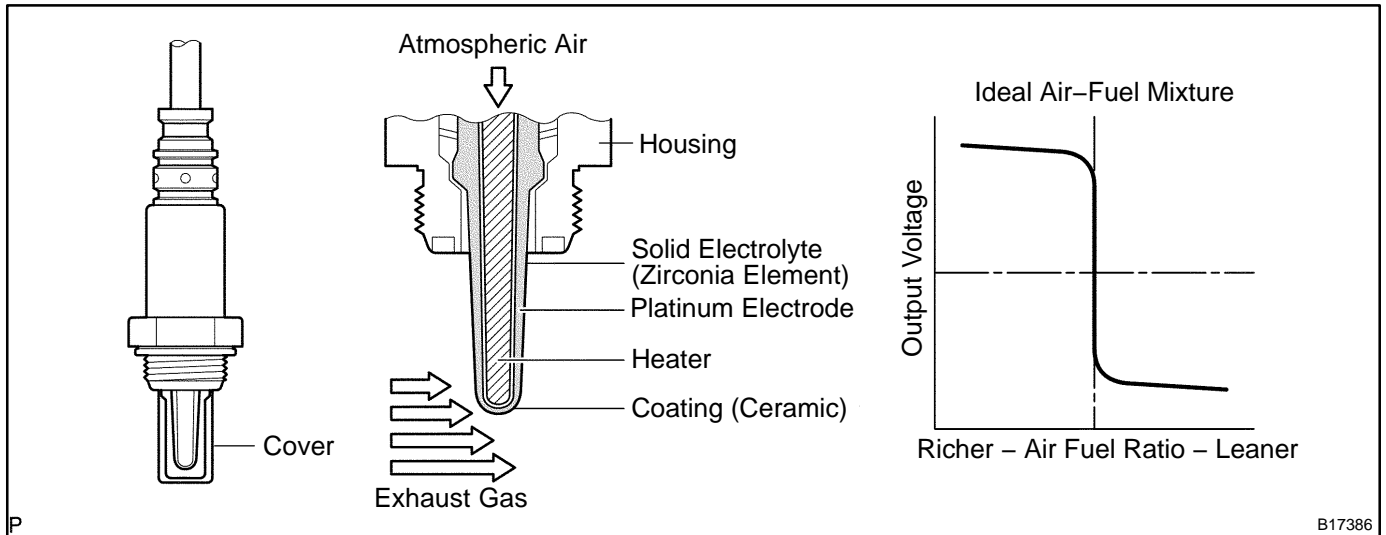
In order to obtain a high purification rate of the carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NOx) components in the exhaust gas, a TWC is used. For the most efficient use of the TWC, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric air-fuel level. For the purpose of helping the ECM to deliver accurate air-fuel ratio control, a Heated Oxygen (HO2) sensor is used.

The HO2 sensor is located behind the TWC, and detects the oxygen concentration in the exhaust gas. Since the sensor is integrated with the heater that heats the sensing portion, it is possible to detect the oxygen concentration even when the intake air volume is low (the exhaust gas temperature is low).

When the air-fuel ratio becomes lean, the oxygen concentration in the exhaust gas is rich. The HO2 sensor informs the ECM that the post-TWC air-fuel ratio is lean (low voltage, i.e. less than 0.45 V).

Conversely, when the air-fuel ratio is richer than the stoichiometric air-fuel level, the oxygen concentration in the exhaust gas becomes lean. The HO2 sensor informs the ECM that the post-TWC air-fuel ratio is rich (high voltage, i.e. more than 0.45 V). The HO2 sensor has the property of changing its output voltage drastically when the air-fuel ratio is close to the stoichiometric level.

The ECM uses the supplementary information from the HO2 sensor to determine whether the air-fuel ratio after the TWC is rich or lean, and adjusts the fuel injection time accordingly. Thus, if the HO2 sensor is working improperly due to internal malfunctions, the ECM is unable to compensate for deviations in the primary air-fuel ratio control.



B17386

DTC No.	DTC Detecting Condition	Trouble Area
P0136 P0156	During active air-fuel ratio control, following conditions (a) and (b) met for certain period of time (2 trip detection logic): (a) Heated Oxygen (HO2) sensor voltage does not decrease to less than 0.2 V (b) HO2 sensor voltage does not increase to more than 0.6 V	<ul style="list-style-type: none"> • Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • Air-Fuel Ratio (A/F) sensor (sensor 1)
P0136 P0156	Sensor impedance less than 5 Ω for more than 30 seconds when ECM presumes sensor to being warmed up and operating normally (1 trip detection logic)	<ul style="list-style-type: none"> • EFI relay • Gas leakage from exhaust system
P0137 P0157	During active air-fuel ratio control, following conditions (a) and (b) met for certain period of time (2 trip detection logic): (a) HO2 sensor voltage output less than 0.21 V (b) Target air-fuel ratio rich	<ul style="list-style-type: none"> • Open in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2)
P0137 P0157	High impedance: Sensor impedance 348.1 M Ω or more for more than 90 seconds when ECM presumes sensor to being warmed up and operating normally (1 trip detection logic)	<ul style="list-style-type: none"> • EFI relay • Gas leakage from exhaust system
P0138 P0158	During active air-fuel ratio control, following conditions (a) and (b) met for certain period of time (2 trip detection logic): (a) HO2 sensor voltage output 0.59 V or more (b) Target air-fuel ratio lean	<ul style="list-style-type: none"> • Short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2)
P0138 P0158	HO2 sensor voltage output exceeds 1.2 V for more than 30 seconds (1 trip detection logic)	<ul style="list-style-type: none"> • ECM internal circuit malfunction

MONITOR DESCRIPTION

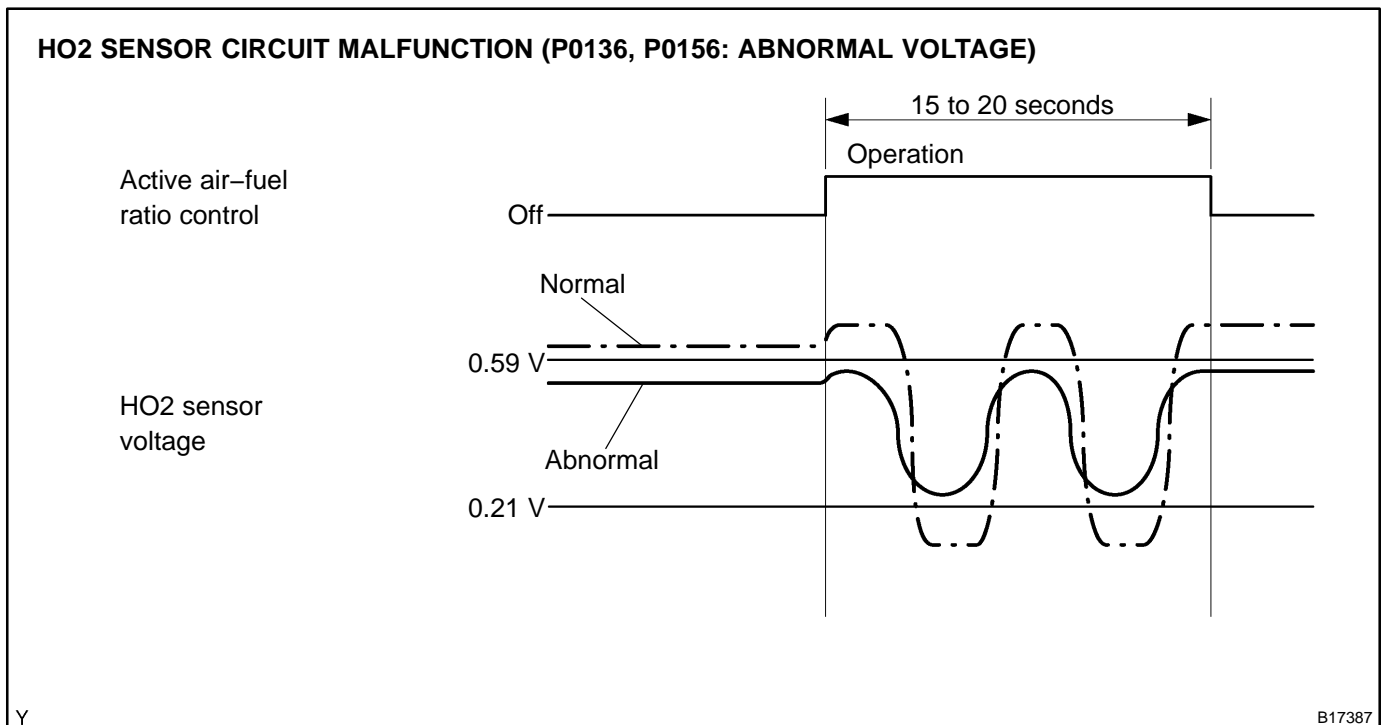
Active Air-Fuel Ratio Control

The ECM usually performs air-fuel ratio feedback control so that the Air-Fuel Ratio (A/F) sensor output indicates a near stoichiometric air-fuel level. This vehicle includes active air-fuel ratio control in addition to regular air-fuel ratio control. The ECM performs active air-fuel ratio control to detect any deterioration in the Three-Way Catalytic Converter (TWC) and Heated Oxygen (HO₂) sensor malfunctions (refer to the diagram below).

Active air-fuel ratio control is performed for approximately 15 to 20 seconds while driving with a warm engine. During active air-fuel ratio control, the air-fuel ratio is forcibly regulated to become lean or rich by the ECM. If the ECM detects a malfunction, one of the following DTCs is set: DTC P0136, P0156 (abnormal voltage output), P0137, P0157 (open circuit) and P0138, P0158 (short circuit).

Abnormal Voltage Output of HO₂ Sensor (DTC P0136, P0156)

While the ECM is performing active air-fuel ratio control, the air-fuel ratio is forcibly regulated to become rich or lean. If the sensor is not functioning properly, the voltage output variation is small. For example, when the HO₂ sensor voltage does not decrease to less than 0.21 V and does not increase to more than 0.59 V during active air-fuel ratio control, the ECM determines that the sensor voltage output is abnormal and sets DTC P0136.



Open or Short in the Heated Oxygen (HO2) Sensor Circuit (DTC P0137, P0157, P0138 or P0158)

During active air-fuel ratio control, the ECM calculates the Oxygen Storage Capacity (OSC)* of the Three-Way Catalytic Converter (TWC) by forcibly regulating the air-fuel ratio to become rich or lean.

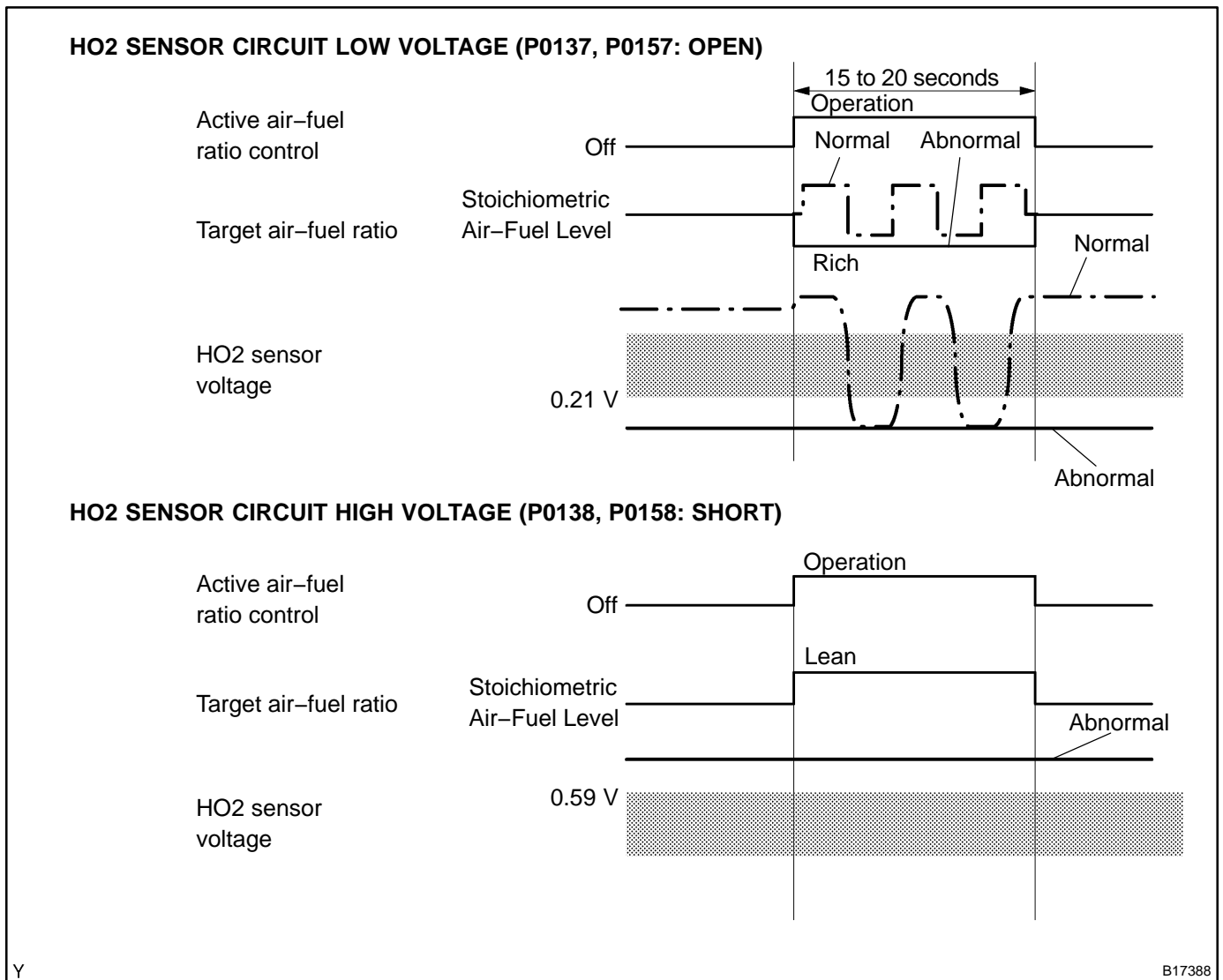
If the HO2 sensor has an open or short, or the voltage output of the sensor noticeably decreases, the OSC indicates an extraordinarily high value. Even if the ECM attempts to continue regulating the air-fuel ratio to become rich or lean, the HO2 sensor output does not change.

While performing active air-fuel ratio control, when the target air-fuel ratio is rich and the HO2 sensor voltage output is 0.21 V or less (lean), the ECM interprets this as an abnormally low sensor output voltage and sets DTC P0137 or P0157. When the target air-fuel ratio is lean and the voltage output is 0.59 V or more (rich) during active air-fuel ratio control, the ECM determines that the sensor voltage output is abnormally high, and sets DTC P0138 or P0158.

HINT:

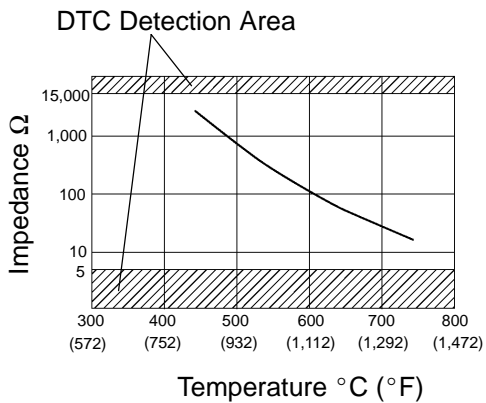
DTC P0138 or P0158 is also set if the HO2 sensor voltage output is more than 1.2 V for 30 seconds or more.

*: The TWC has the capability to store oxygen. The OSC and the emission purification capacity of the TWC are mutually related. The ECM determines whether the catalyst has deteriorated, based on the calculated OSC value (see page DI-672).



High or Low Impedance of Heated Oxygen (HO2) Sensor (DTC P0136, P0156, P0137 or P0157)

Interrelation between temperature of the element and impedance:



During normal air–fuel ratio feedback control, there are small variations in the exhaust gas oxygen concentration. In order to continuously monitor the slight variation of the HO2 sensor signal while the engine is running, the impedance* of the sensor is measured by the ECM. The ECM determines that there is a malfunction in the sensor when the measured impedance deviates from the standard range.

*: The effective resistance in an alternating current electrical circuit.

HINT:

- The impedance can not be measured using an ohmmeter.
- DTC P0136 or P0156 indicates the deterioration of the HO2 sensor. The ECM sets the DTC by calculating the impedance of the sensor when the typical enabling conditions are satisfied (1 driving cycle).
- DTC P0137 or P0157 indicates an open circuit in the HO2 sensor (1 driving cycle). The ECM sets this DTC when the impedance of the sensor exceeds the threshold 348.1 MΩ.

MONITOR STRATEGY

Related DTCs	P0136	Heated rear oxygen sensor (Bank 1) output voltage (Output voltage)	
		Heated rear oxygen sensor (Bank 1) impedance (Low)	
	P0137	Heated rear oxygen sensor (Bank 1) output voltage (Low voltage)	
		Heated rear oxygen sensor (Bank 1) impedance (High)	
	P0138	Heated rear oxygen sensor (Bank 1) output voltage (High voltage)	
		Heated rear oxygen sensor (Bank 1) output voltage (Extremely high)	
	P0156	Heated rear oxygen sensor (Bank 2) output voltage (Output voltage)	
		Heated rear oxygen sensor (Bank 2) impedance (Low)	
	P0157	Heated rear oxygen sensor (Bank 2) output voltage (Low voltage)	
		Heated rear oxygen sensor (Bank 2) impedance (High)	
	P0158	Heated rear oxygen sensor (Bank 2) output voltage (High voltage)	
		Heated rear oxygen sensor (Bank 2) output voltage (Extremely high)	
	Required sensors/components	Main sensors/components	Heated rear oxygen sensor
		Related sensors/components	Mass air flow meter
Frequency of operation	Once per driving cycle: Active air–fuel ratio control detection Continuous: Others		
Duration	20 sec.: Heated oxygen sensor output (Output voltage, High voltage, Low voltage) 30 sec.: Heated oxygen sensor impedance (Low) 90 sec.: Heated oxygen sensor impedance (High) 10 sec.: Heated oxygen sensor output (Extremely high)		
MIL operation	2 driving cycles Heated oxygen sensor output (Output voltage, High voltage, Low voltage, Extremely high) Immediate: Heated oxygen sensor impedance (Low, High)		
Sequence of operation	None		

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Heated oxygen sensor output voltage (Output voltage, High voltage and Low voltage):		
Active air–fuel ratio control	Performing	
Active air–fuel ratio control being when all of following conditions met	–	
Battery voltage	11 V	–
Engine coolant temperature	75°C (167°F)	–
Idle	OFF	

DIAGNOSTICS - ENGINE (2UZ-FE)

Engine RPM	-	3,200 rpm
A/F sensor status	Activated	
Fuel system status	Closed loop	
Fuel-cut	OFF	
Engine load	10 to 70%	
Shift position	4th	-
Heated oxygen sensor impedance (Low):		
Battery voltage	11 V	-
Estimated rear oxygen sensor temperature	-	700°C (1,292°F)
ECM monitor	Completed	
P0606	Not set	
Heated oxygen sensor impedance (High):		
Battery voltage	11 V	-
Estimated rear oxygen sensor temperature	450°C (842°F)	-
ECM monitor	Completed	
P0606	Not set	
Heated oxygen sensor output voltage (Extremely high):		
Battery voltage	11 V	-
Time after engine start	2 sec.	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Heated oxygen sensor output voltage (Output voltage):	
Either of the following conditions is met:	Condition 1 or 2
1. All of the following conditions are met:	Condition (a), (b) and (c)
(a) Commanded air-fuel ratio	14.3 or less
(b) Rear HO2S voltage	0.21 to 0.59 V
(c) OSC (Oxygen Storage Capacity of catalyst)	3 g or more
2. All of the following conditions are met:	Condition (d), (e) and (f)
(d) Commanded air-fuel ratio	14.9 or more
(e) Rear HO2S voltage	0.21 to 0.59 V
(f) OSC (Oxygen Storage Capacity of catalyst)	3 g or more
Heated oxygen sensor output voltage (Low voltage):	
All of the following conditions are met:	Condition 1, 2 and 3
1. Commanded air-fuel ratio	14.3 or less
2. Rear HO2S voltage	Less than 0.21 V
3. OSC (Oxygen Storage Capacity of catalyst)	3 g or more
Heated oxygen sensor output voltage (High voltage):	
All of the following conditions are met:	Condition 1, 2 and 3
1. Commanded air-fuel ratio	14.9 or more
2. Rear HO2S voltage	More than 0.59 V
3. OSC (Oxygen Storage Capacity of catalyst)	3 g or more

Heated oxygen sensor impedance (Low):	
Duration of following condition	30 sec. or more
Heated oxygen sensor impedance	Less than 5 Ω
Heated oxygen sensor impedance (High):	
Duration of following condition	90 sec. or more
Heated oxygen sensor impedance	15 k Ω or more
Heated oxygen sensor output voltage (Extremely high):	
Duration of following condition	10 sec. or more
Heated oxygen sensor voltage	1.2 V or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor voltage	Varies between 0.1 to 0.9 V

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page [DI-446](#)).

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.

HO2S bank 1 sensor 2

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$02	\$07	Multiply by 0.001 (V)	Minimum sensor voltage	Minimum test limit	Maximum test limit
\$02	\$08	Multiply by 0.001 (V)	Maximum sensor voltage	Minimum test limit	Maximum test limit
\$02	\$8F	Multiply by 0.001 (g)	Maximum oxygen storage capacity	0	Maximum test limit

HO2S bank 2 sensor 2

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$06	\$07	Multiply by 0.001 (V)	Minimum sensor voltage	Minimum test limit	Maximum test limit
\$06	\$08	Multiply by 0.001 (V)	Maximum sensor voltage	Minimum test limit	Maximum test limit
\$06	\$8F	Multiply by 0.001 (g)	Maximum oxygen storage capacity	0	Maximum test limit

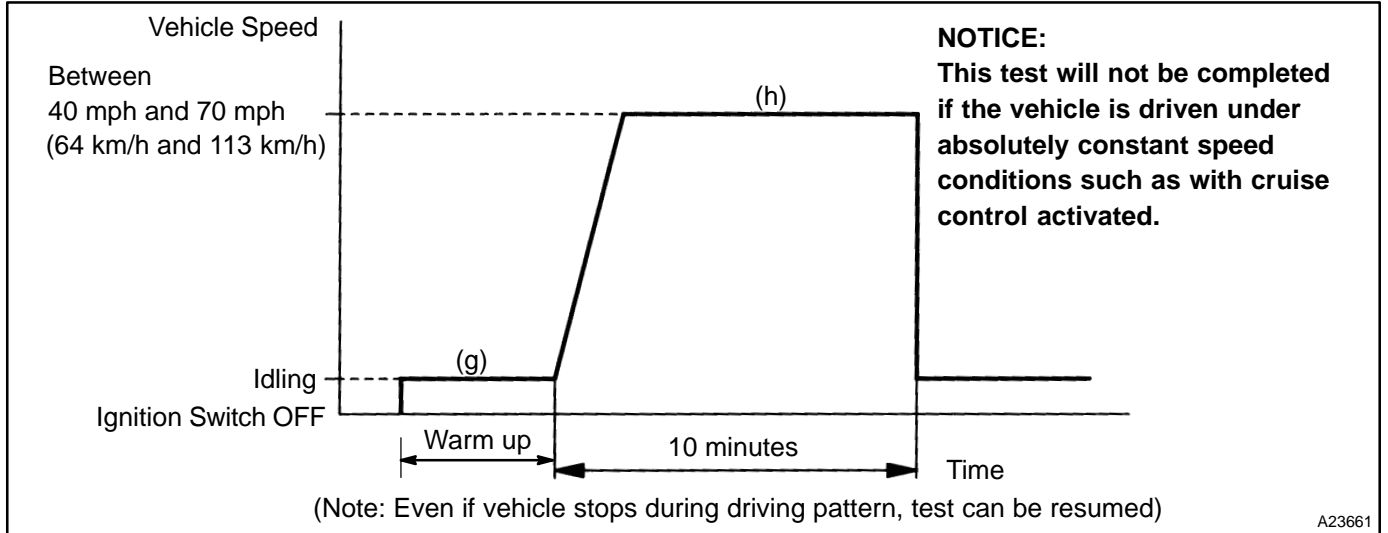
WIRING DIAGRAM

Refer to DTC P2195 on page [DI-806](#).

CONFIRMATION DRIVING PATTERN

HINT:

- This confirmation driving pattern is used in steps 5, 8 and 11 of the following diagnostic troubleshooting procedure when using either a hand-held tester.
- Performing this confirmation pattern will activate the Heated Oxygen (HO2) sensor monitor. (The catalyst monitor is performed simultaneously.) This is very useful for verifying the completion of a repair.



READINESS TESTS	
MISFIRE MON	AVAIL
FUEL SYS MON	AVAIL
COMP MON	AVAIL
CAT EVAL	INCMPL
HTD CAT EVAL	N/A
EVAP EVAL	INCMPL
2nd AIR EVAL	N/A
A/C EVAL	N/A
O2S EVAL	INCMPL
O2S HTR EVAL	INCMPL
EGR EVAL	N/A

A76855 A23660

- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON.
- Turn the tester or scan tool ON.
- Clear DTCs (where set) (see page DI-462).
- If using a hand-held tester, select the following menu items: DIAGNOSIS / CARB OBD II / READINESS TESTS.
- Check that O2S EVAL is INCMPL (incomplete).
- Start the engine and warm it up.
- Drive the vehicle at between 40 mph and 70 mph (64 km/h and 113 km/h) for at least 10 minutes.
- Note the state of the Readiness Tests items. Those items will change to COMPL (complete) as O2S EVAL monitor operates.
- On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES and check if any DTCs (any pending DTCs) are set.

HINT:

If O2S EVAL does not change to COMPL, and any pending DTCs fail to set, extend the driving time.

INSPECTION PROCEDURE

HINT:

Hand-held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following "A/F CONTROL" (Heated oxygen sensor or another can be distinguished).

(a) Perform ACTIVE TEST by hand-held tester (A/F CONTROL).

HINT:

"A/F CONTROL" is the ACTIVE TEST which changes the injection volume to -12.5 % or +25 %.

- (1) Connect the hand-held tester to the DLC3 on the vehicle.
- (2) Turn the ignition switch ON.
- (3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 seconds.
- (4) Select the menu "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL".
- (5) Perform "A/F CONTROL" with the engine in an idle condition (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume

+25 % → rich output: More than 0.5 V

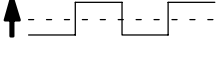

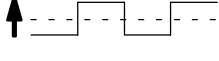
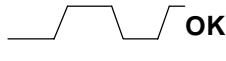
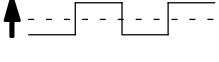
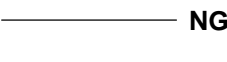
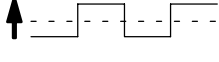
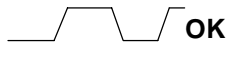
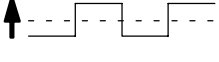

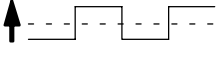
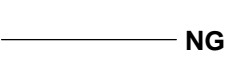
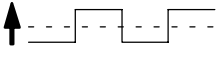
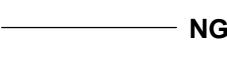
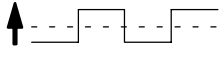
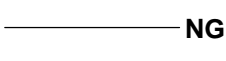
-12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few seconds delay in the sensor 1 (front sensor) output. And there is approximately 20 seconds delay in the sensor 2 (rear sensor).

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of the heated oxygen sensors.

For displaying the graph indication, first enter "ACTIVE TEST / A/F CONTROL / USER DATA," then select "A/F B1,2S1 and O2S B1,2S2" by pressing "YES" button, and push "ENTER" button before pressing "F4" button.

	Output voltage of A/F sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspected trouble area
Case 1	Injection volume +25 %  -12.5 % Output voltage More than 0.5 V  OK Less than 0.4 V	Injection volume +25 %  -12.5 % Output voltage More than 0.5 V  OK Less than 0.4 V	—
Case 2	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage More than 0.5 V  OK Less than 0.4 V	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 %  -12.5 % Output voltage More than 0.5 V  OK Less than 0.4 V	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Extremely rich or lean actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

HINT:

- If different DTCs that are related to different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. when a malfunction occurred.

1	Read output DTC.
----------	-------------------------

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

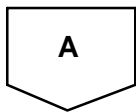
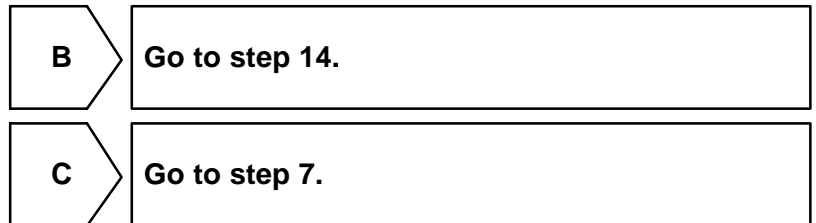
Read the DTC using the hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
P0138, P0158	A
P0137, P0157	B
P0136, P0156	C

HINT:

If any other codes besides P0136 are output, perform the troubleshooting for those DTCs first.



2	Check output voltage of heated oxygen sensor.
----------	--

PREPARATION:

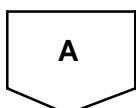
- (a) Connect the hand-held tester to the DLC3.
- (b) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S2 or B2S2.
- (d) Allow the engine to idle.

CHECK:

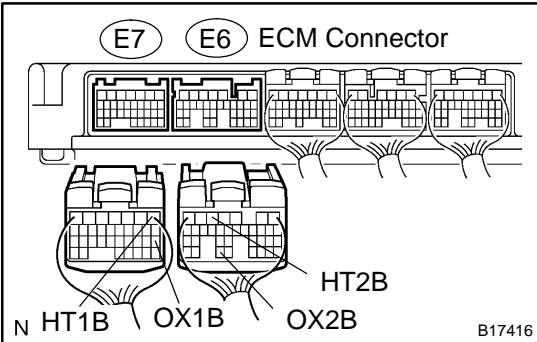
Read the Heated Oxygen (HO2) sensor output voltage while idling.

RESULT:

HO2 Sensor Output Voltages	Proceed To
More than 1.2 V	A
Less than 1.0 V	B



3 Check for short in harness and connector between terminal OX1B and HT1B, OX2B and HT2B of ECM.



PREPARATION:

- (a) Turn the ignition switch to OFF and wait for 5 minutes.
- (b) Disconnect the E6 and E7 ECM connector.

CHECK:

- (a) Check the resistance.

OK:

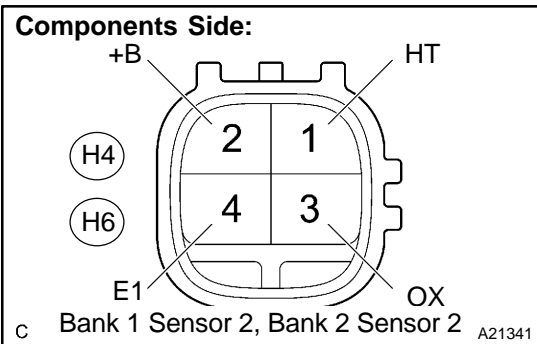
Standard:

Tester Connections	Specified Conditions
HT1B (E7-1) - OX1B (E7-18)	10 kΩ or higher
HT2B (E6-5) - OX2B (E6-33)	10 kΩ or higher

OK → Replace ECM (See page SF-82).

NG

4 Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between terminals of the heated oxygen sensor.

OK:

Standard:

Tester Connection	Specified Condition
HT (1) - +B (2)	11 to 16 Ω at 20°C (68°F)
+B (2) - OX (3)	10 kΩ or higher

NG → Replace heated oxygen sensor.

OK

Repair or replace harness or connector.

5 Perform confirmation driving pattern.

NEXT

6	Check whether DTC output recurs (DTC P0138, P0158)
----------	---

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
 (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P0138 or P0158	A
No output	B

B → **Check for intermittent problems (See page DI-430).**

A

Replace heated oxygen sensor.

7	Check output voltage of heated oxygen sensor.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
 (b) Turn the ignition switch to ON and turn the tester ON.
 (c) Start the engine.
 (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S2.
 (e) After warming up the engine, run the engine at an engine speed of 2,500 rpm for 3 minutes.

CHECK:

- (a) Read the output voltage of the HO2 sensor when the engine rpm is suddenly increased.

HINT:

Quickly accelerate the engine to 4,000 rpm 3 times using the accelerator pedal.

Standard: Fluctuates between 0.4 V or less and 0.5 V or more.

NG → **Go to step 14.**

OK

8	Perform confirmation driving pattern.
----------	--

NEXT

9	Check whether DTC output recurs (DTC P0136, P0156)
----------	---

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P0136 or P0156	A
No output	B

B → **Check for intermittent problems (See page DI-430).**

A

10	Replace heated oxygen sensor.
-----------	--------------------------------------

NEXT

11	Perform confirmation driving pattern.
-----------	--

NEXT

12	Check whether DTC output recurs (DTC P0136, P0156)
-----------	---

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P0136 or P0156	A
No output	B

B → **Repair completed.**

A

13	Perform active test (injection volume).
-----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and turn the tester ON.
- (c) Warm up the engine.
- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / INJ VOL.

CHECK:

- (a) Change the fuel injection volume using the tester, monitoring the voltage output of Air-Fuel Ratio (A/F) and HO2 sensors displayed on the tester.

HINT:

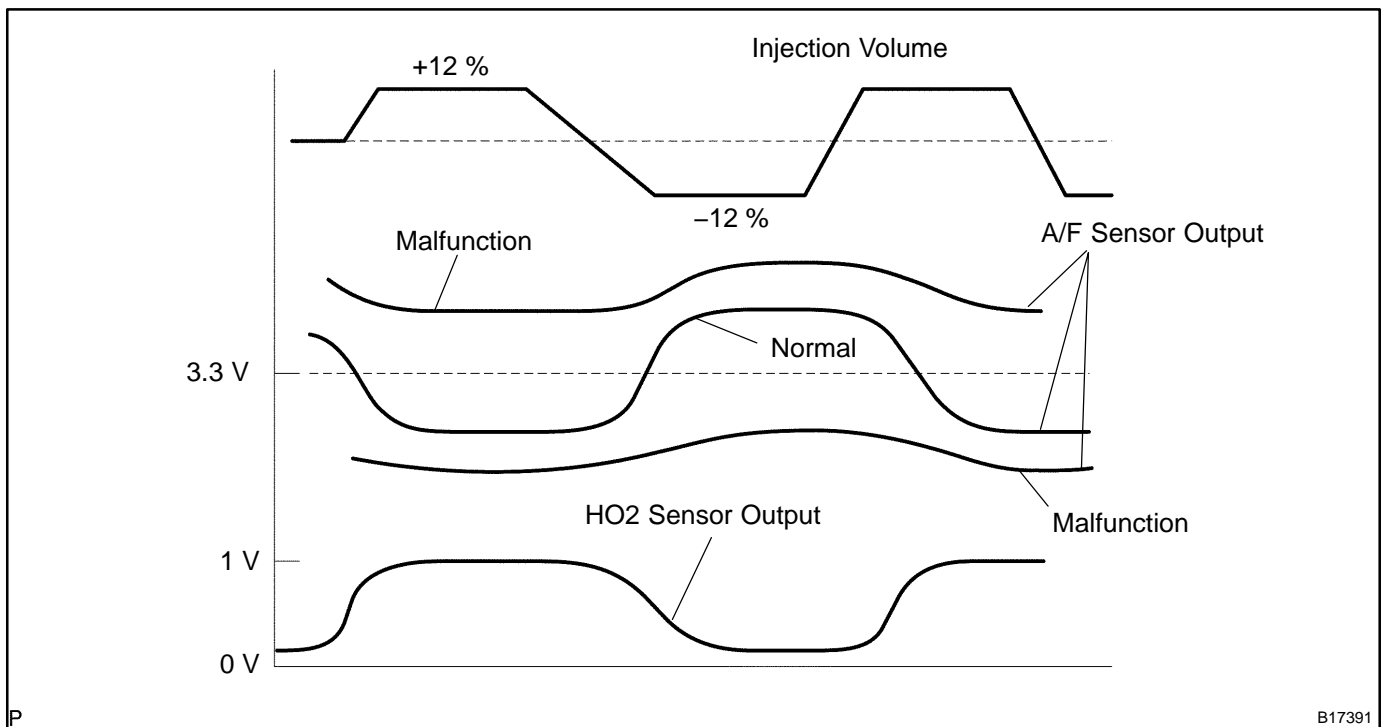
- Change the fuel injection volume within the range of -12 % and +12 %. The injection volume can be changed in 1 % graduations within the range.
- The A/F sensor is displayed as AFS B1S1 (AFS B2S1), and the HO2 sensor is displayed as O2S B1S2 (O2S B2S2), on hand-held testers.

RESULT:

Tester Display (Sensor)	Voltage Variations	Proceed To
AFS B1S1 (AFS B2S1) (A/F)	Alternates between more and less than 3.3 V	OK
AFS B1S1 (AFS B2S1) (A/F)	Remains at more than 3.3 V	NG
AFS B1S1 (AFS B2S1) (A/F)	Remains at less than 3.3 V	NG

HINT:

A normal HO2 sensor voltage (O2S B1S2) reacts in accordance with increases and decreases in fuel injection volumes. When the A/F sensor voltage remains at either less or more than 3.3 V despite the HO2 sensor indicating a normal reaction, the A/F sensor is malfunctioning.



NG	Replace air-fuel ratio (A/F) sensor.
-----------	---

OK

Check and repair extremely rich or lean actual air fuel ratio (injector, fuel pressure, gas leakages from exhaust system, etc.)

14 Check for exhaust gas leakage.

CHECK:

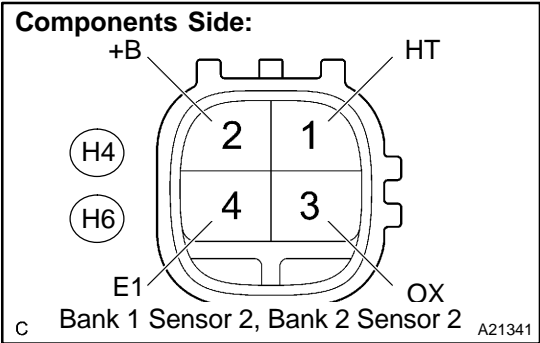
Check for exhaust gas leakage from the exhaust manifold and pipe.

OK: No exhaust gas leakage.

NG Repair or replace exhaust gas leakage point.

OK

15 Inspect heated oxygen sensor.



PREPARATION:

Disconnect the HO2 sensor connector.

CHECK:

Measure the resistance between the terminals of the HO2 sensor connector.

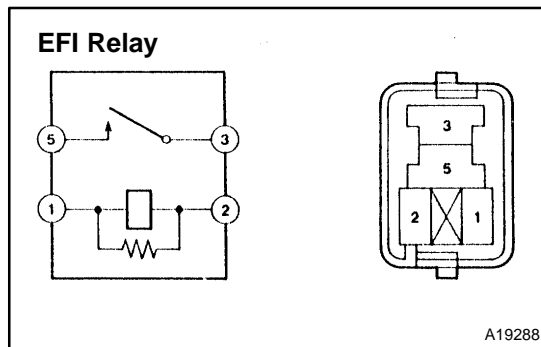
OK:

Standard:

Tester Connections	Specified Conditions
HT (2) - +B (1)	11 to 16 Ω at 20°C (68°F)
HT (2) - E (3)	10 kΩ or higher

NG Replace heated oxygen sensor.

OK

16 Check EFI relay.
**PREPARATION:**

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

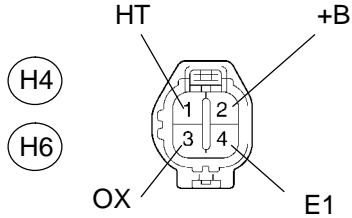
OK:**Standard:**

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 K Ω or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG**Replace EFI relay.****OK**

17 Check for open and short in harness and connector between ECM and heated oxygen sensor.

Wire Harness Side:



Bank 1 Sensor 2, Bank 2 Sensor 2 A23543

PREPARATION:

- (a) Disconnect the heated oxygen sensor connector.
- (b) Disconnect the E6 and E7 ECM connector.

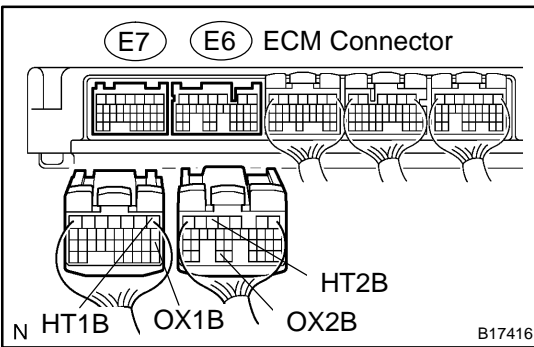
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

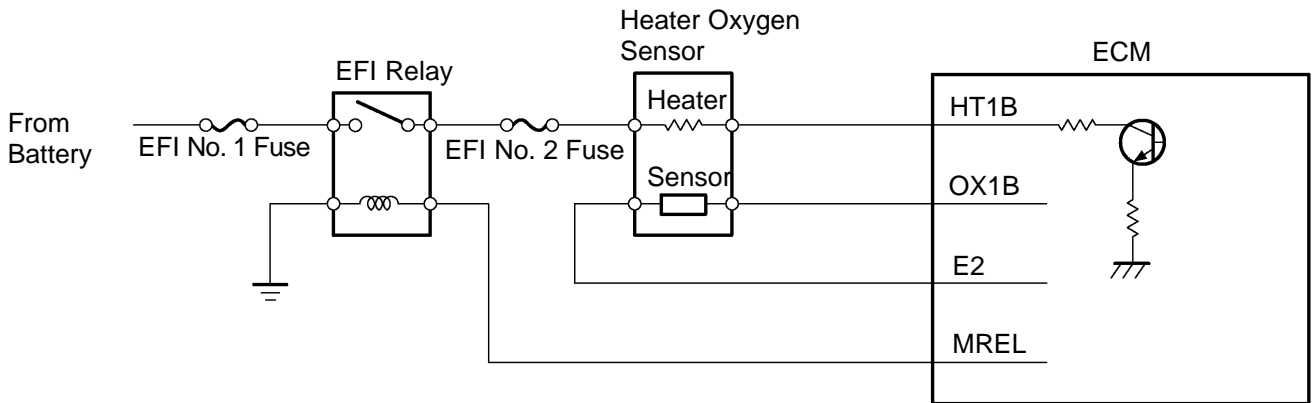
Standard:

Tester Connection	Specified Condition
OX (H4-3) - OX1B (E7-18)	Below 1 Ω
HT (H4-1) - HT1B (E7-1)	Below 1 Ω
OX (H6-3) - OX2B (E6-33)	Below 1 Ω
HT (H6-1) - HT2B (E6-5)	Below 1 Ω
OX (H4-3) or OX1B (E7-18) - Body ground	10 kΩ or higher
HT (H4-1) or HT1B (E7-1) - Body ground	10 kΩ or higher
OX (H6-3) or OX2B (E6-33) - Body ground	10 kΩ or higher
HT (H6-1) or HT2B (E6-5) - Body ground	10 kΩ or higher



B17416

Reference (Bank 1 Sensor 1 System Drawing):



Y

A21040

NG Repair or replace harness or connector.

OK

Replace heated oxygen sensor.

DTC	P0171	System too Lean (Bank 1)
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DTC	P0172	System too Rich (Bank 1)
------------	--------------	---------------------------------

DTC	P0174	System too Lean (Bank 2)
------------	--------------	---------------------------------

DTC	P0175	System too Rich (Bank 2)
------------	--------------	---------------------------------

CIRCUIT DESCRIPTION

The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim consists of both the short-term and long-term fuel trims.

The short-term fuel trim is fuel compensation that is used to constantly maintain the air-fuel ratio at stoichiometric levels. The signal from the Air-Fuel Ratio (A/F) sensor indicates whether the air-fuel ratio is rich or lean compared to the stoichiometric ratio. This triggers a reduction in the fuel injection volume if the air-fuel ratio is rich and an increase in the fuel injection volume if it is lean.

Factors such as individual engine differences, wear over time and changes in operating environment cause short-term fuel trim to vary from the central value. The long-term fuel trim, which controls overall fuel compensation, compensates for long-term deviations in the fuel trim from the central value caused by the short-term fuel trim compensation.

If both the short-term and long-term fuel trims are lean or rich beyond predetermined values, it is interpreted as a malfunction, and the ECM illuminates the MIL and sets a DTC.

DIAGNOSTICS – ENGINE (2UZ-FE)

DTC No.	DTC Detecting Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up the engine, fuel trim is considered to be in error on LEAN side (2 trip detection logic)	<ul style="list-style-type: none"> • Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • PCV piping • ECM
P0172 P0175	When air–fuel ratio feedback is stable after warming up the engine, fuel trim is considered to be in error on RICH side (2 trip detection logic)	<ul style="list-style-type: none"> • Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • ECM

HINT:

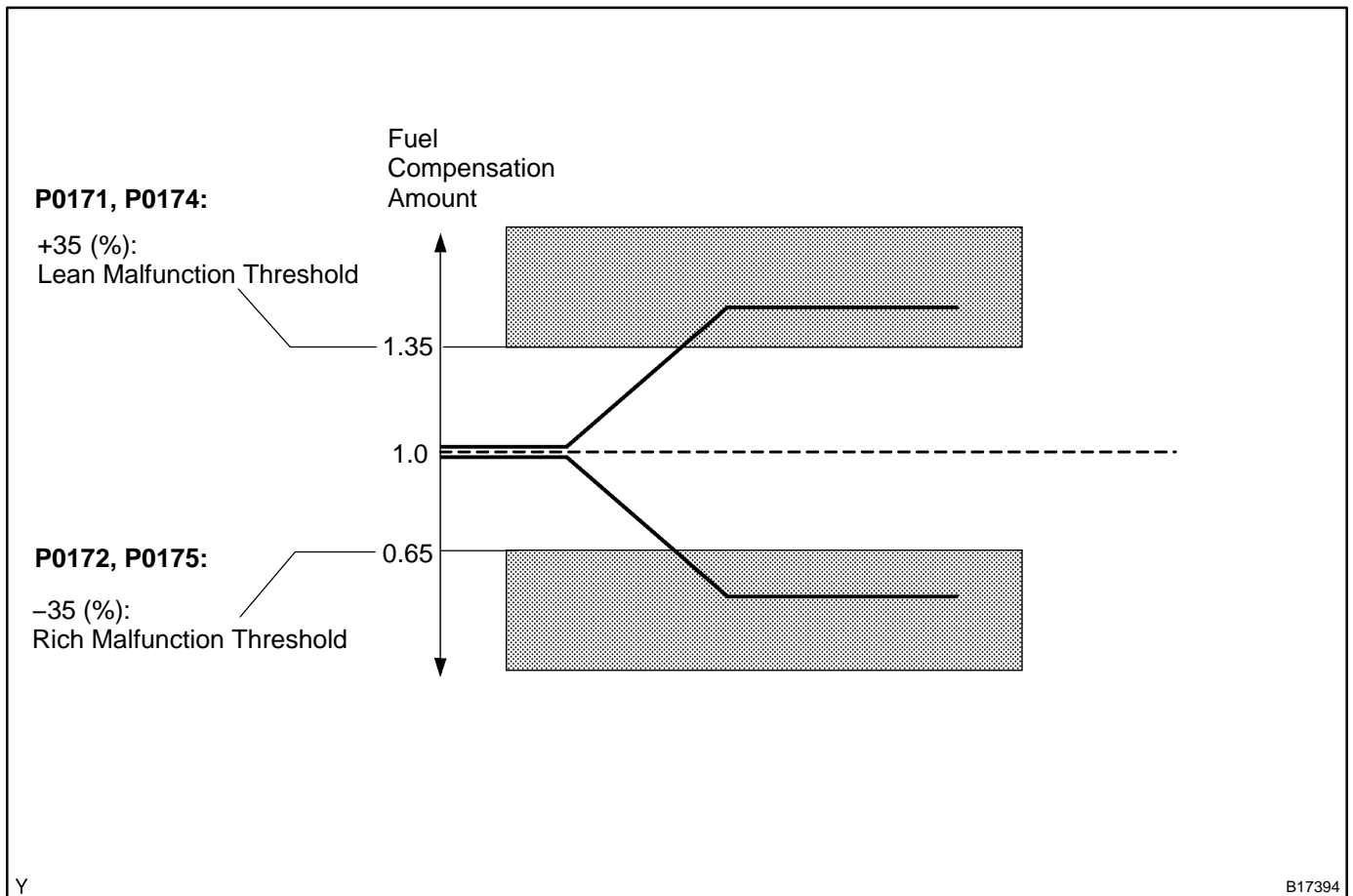
- When DTC P0171 or P0174 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 or P0175 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 or P0174 may be recorded. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within $\pm 35\%$ (engine coolant temperature is more than $75\text{ }^{\circ}\text{C}$ (167°F)), the system is functioning normally.

MONITOR DESCRIPTION

Under closed-loop fuel control, fuel injection volumes that deviate from those estimated by the ECM cause changes in the long-term fuel trim compensation value. The long-term fuel trim is adjusted when there are persistent deviations in the short-term fuel trim values. Deviations from the ECM's estimated fuel injection volumes also affect the average fuel trim learning value, which is a combination of the average short-term fuel trim (fuel feedback compensation value) and the average long-term fuel trim (learning value of the air-fuel ratio). If the average fuel trim learning value exceeds the malfunction thresholds, the ECM interprets this a fault in the fuel system and sets a DTC.

Example:

The average fuel trim leaning value is more than +35 % or less than -35 %, the ECM interprets this as a fuel system malfunction.



MONITOR STRATEGY

Related DTCs	P0171	Fuel system lean (Bank 1)
	P0172	Fuel system rich (Bank 1)
	P0174	Fuel system lean (Bank 2)
	P0175	Fuel system rich (Bank 2)
Required sensors/components	Main sensors/components	Front oxygen sensor
	Related sensors/components	Engine coolant temperature sensor, Mass air flow meter, Crankshaft position sensor
Frequency of operation	Continuous	
Duration	Within 10 seconds	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Battery voltage	11 V	-
Fuel system status	Closed-loop	
Either of the following conditions is met:	Condition 1 or 2	
1. Engine RPM	-	1,000 rpm
2. Intake air amount per revolution	0.26 g/sec.	-
Catalyst monitor	No executed	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
EVAP purge-cut	Executing
Either of the following conditions is met	Condition 1 or 2
1. Average between short-term fuel trim and long-term fuel trim	35% or more (varies with ECT)
2. Average between short-term fuel trim and long-term fuel trim	-35% or less (varies with ECT)

WIRING DIAGRAM

Refer to DTC P0031 on page [DI-507](#).

INSPECTION PROCEDURE

HINT:

Hand-held tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- (1) Connect a hand-held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 (AFS B2S1) and OS2 B1S2 (OS2 B2S2)) displayed on the tester.

HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

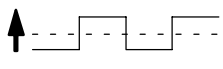

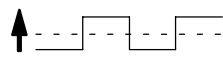
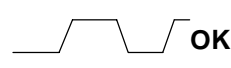
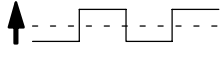

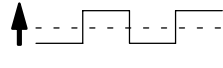
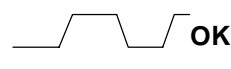
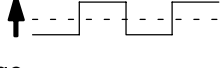
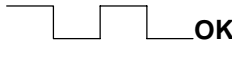
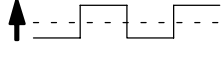
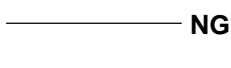
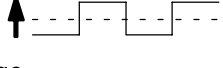

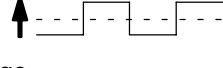

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 % ↑  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0 V	Injection volume +25 % ↑  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	—
2	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 % ↑  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 % ↑  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0V	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 % ↑  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

HINT:

- Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.
- A low A/F sensor voltage could be caused by a rich air-fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air-fuel mixture. Check for conditions that would cause the engine to run lean.

1	Check any other DTCs output (in addition to DTC P0171, P0172, P0174 or P0175).
----------	---

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

- (a) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0171, P0172, P0174 or P0175	A
P0171, P0172, P0174 or P0175 and other DTCs	B

HINT:

If any DTCs other than P0171, P0172, P0174 or P0175 are output, troubleshoot those DTCs first.

B	Go to relevant DTC chart (See page DI-477).
----------	--

A

2	Check connection of PCV piping.
----------	--

OK:

PCV hose is connected correctly and is not damaged.

NG	Repair or replace PCV piping.
-----------	--------------------------------------

OK

3	Check air induction system (See page SF-1).
----------	--

CHECK:

Check the air induction system for vacuum leaks.

NG

Repair or replace air induction system.

OK

4	Perform active test (A/F control).
----------	---

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and turn the tester ON.
- (c) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (d) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (e) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (f) Monitor the voltage outputs of A/F and HO2 sensors (AFS B1S1 (AFS B2S1) and O2S B1S2 (O2S B2S2)) displayed on the tester.

HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO2)	-12.5 %	Lean	Less than 0.4

Result:

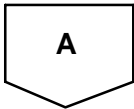
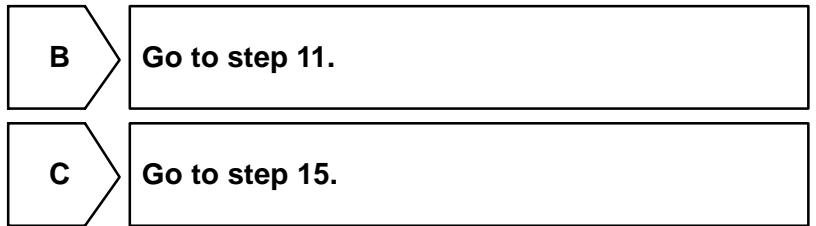
Status AFS B1S1 (AFS B2S1)	Status O2S B1S2 (O2S B2S2)	A/F Condition and A/F Sensor Condition	Misfires	Suspected Trouble Areas	Proceed To
Lean/Rich	Lean/Rich	Normal	—	—	C
Lean	Lean	Actual air-fuel ratio lean	May occur	<ul style="list-style-type: none"> • PCV valve and hose • PCV hose connections • Injector blockage • Gas leakage from exhaust system • Air induction system • Fuel pressure • Mass Air Flow (MAF) meter • Engine Coolant Temperature (ECT) sensor 	A

DIAGNOSTICS - ENGINE (2UZ-FE)

Rich	Rich	Actual air-fuel ratio rich	—	<ul style="list-style-type: none"> • Injector leakage or blockage • Gas leakage from exhaust system • Ignition system • Fuel pressure • MAF meter • ECT sensor 	A
Lean	Lean/Rich	A/F sensor malfunction	—	• A/F sensor	B
Rich	Lean/Rich	A/F sensor malfunction	—	• A/F sensor	B

Lean: During A/F CONTROL, the A/F sensor output voltage (AFS) is consistently more than 3.35 V, and the HO2 sensor output voltage (O2S) is consistently less than 0.4 V.

Rich: During A/F CONTROL, the AFS is consistently less than 3.0 V, and the O2S is consistently more than 0.55 V.



5	Read value of engine coolant temperature.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

- (a) Read the COOLANT TEMP twice, when the engine is cold and also when warmed up.

Standard:

With cold engine: Same as ambient air temperature.

With warm engine: Between 75°C and 95°C (167°F and 203°F)



6	Read value of mass air flow meter.
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF and COOLANT TEMP.
- (d) Allow the engine to idle until the COOLANT TEMP reaches 75°C (167°F) or more.

CHECK:

- (a) Read the MAF with the engine in an idling condition and at an engine speed of 2,500 rpm.

Standard:

MAF while engine idling: Between 1.4 gm/s and 2.3 gm/s (shift position: N, A/C: OFF).

MAF at engine speed of 2,500 rpm: Between 5.4 gm/s and 7.9 gm/s (shift position: N, A/C: OFF).

NG

Replace mass air flow meter.

OK

7	Check fuel pressure (See page SF-7).
----------	---

CHECK:

Check the fuel pressure (high or low pressure).

NGCheck and replace fuel pump, pressure regulator, fuel pipe line and filter (See page [SF-1](#)).**OK**

8	Check exhaust system for gas leakage.
----------	--

OK:

No exhaust gas leakage.

NG

Repair or replace exhaust gas leakage point.

OK

9 Check for spark and ignition (See page IG-1).

HINT:

If the spark plugs or ignition system malfunction, engine misfire may occur. The misfire counter can be read with the hand-held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / MISFIRE / CYL#1 (to CYL#8).

NG → **Repair or replace ignition system.**

OK

10 Check injector injection (See page SF-29).

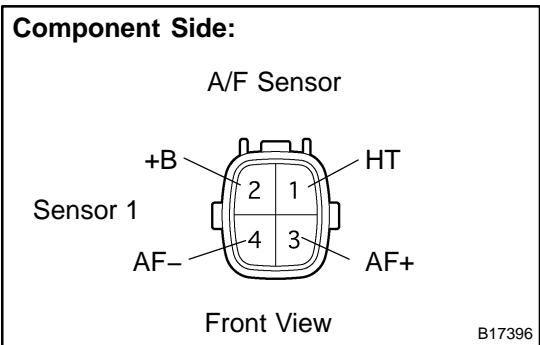
HINT:

If the injectors malfunction, engine misfires may occur. The misfire counter can be read with the hand-held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / MISFIRE / CYL#1 (to CYL#8).

NG → **Replace injector.**

OK

11 Check resistance of air-fuel ratio (A/F) sensor heater.



PREPARATION:
Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:
Measure resistance between the terminals of the A/F sensor connector.

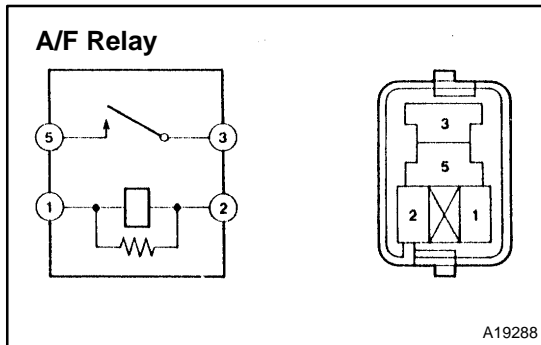
OK:
Standard:

Tester Connection	Specified Condition
HT (1) - +B (2)	1.8 to 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 kΩ or higher

NG → **Replace air-fuel ratio (A/F) sensor.**

OK

12 Check A/F relay.



PREPARATION:

Remove the A/F relay from the engine room J/B.

CHECK:

Inspect the A/F relay.

OK:

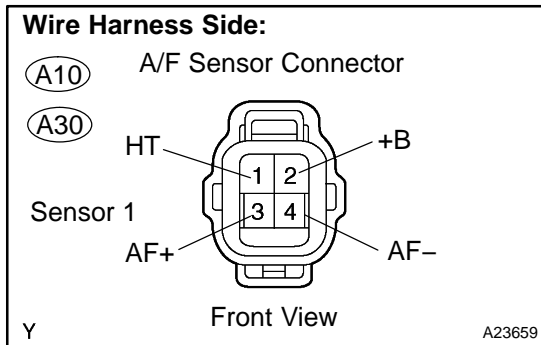
Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 K Ω or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace A/F relay.

OK

13 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Turn the ignition switch to ON.

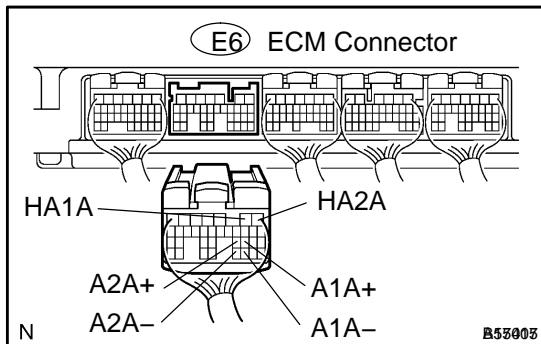
CHECK:

- (a) Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

OK:

Standard:

Tester Connections	Specified Conditions
+B (2) - Body ground	9 to 14 V



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E6 ECM connector.

CHECK:

- (a) Check the resistance.

OK:

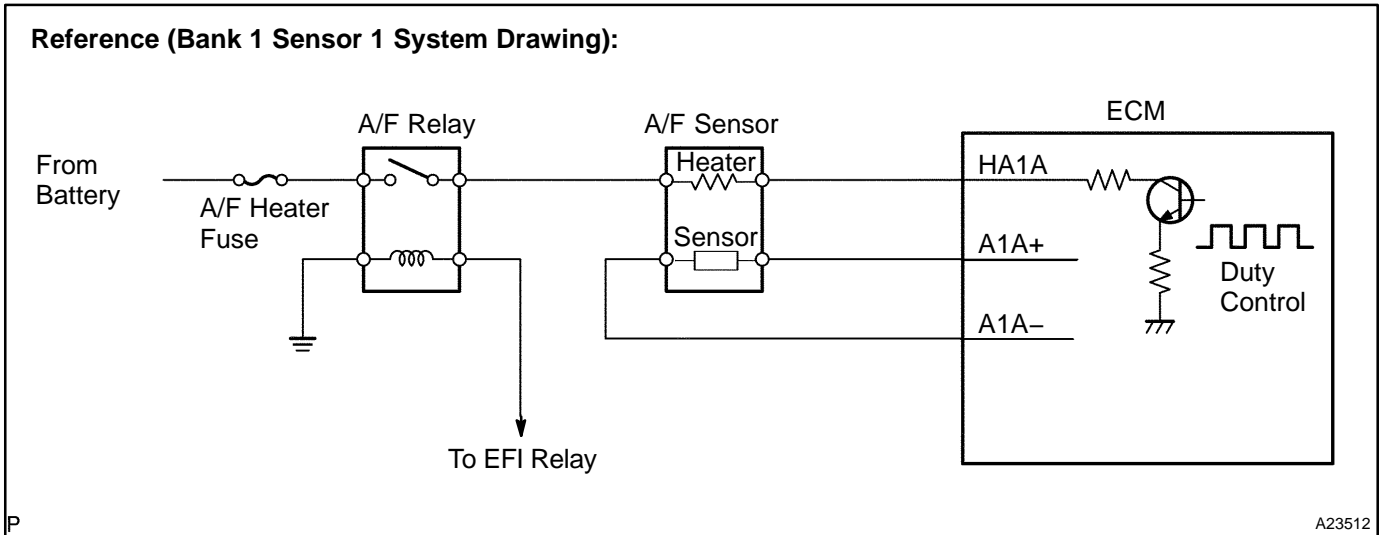
Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω
AF+ (A10-3) - A1A+ (E6-22) AF+ (A30-3) - A2A+ (E6-23)	Below 1 Ω
AF- (A10-4) - A1A- (E6-30) AF- (A30-4) - A2A- (E6-31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher
AF+ (A10-3) or A1A+ (E6-22) - Body ground AF+ (A30-3) or A2A+ (E6-23) - Body ground	10 kΩ or higher
AF- (A10-4) or A1A- (E6-30) - Body ground AF- (A30-4) or A2A- (E6-31) - Body ground	10 kΩ or higher

Reference (Bank 1 Sensor 1 System Drawing):



P

A23512

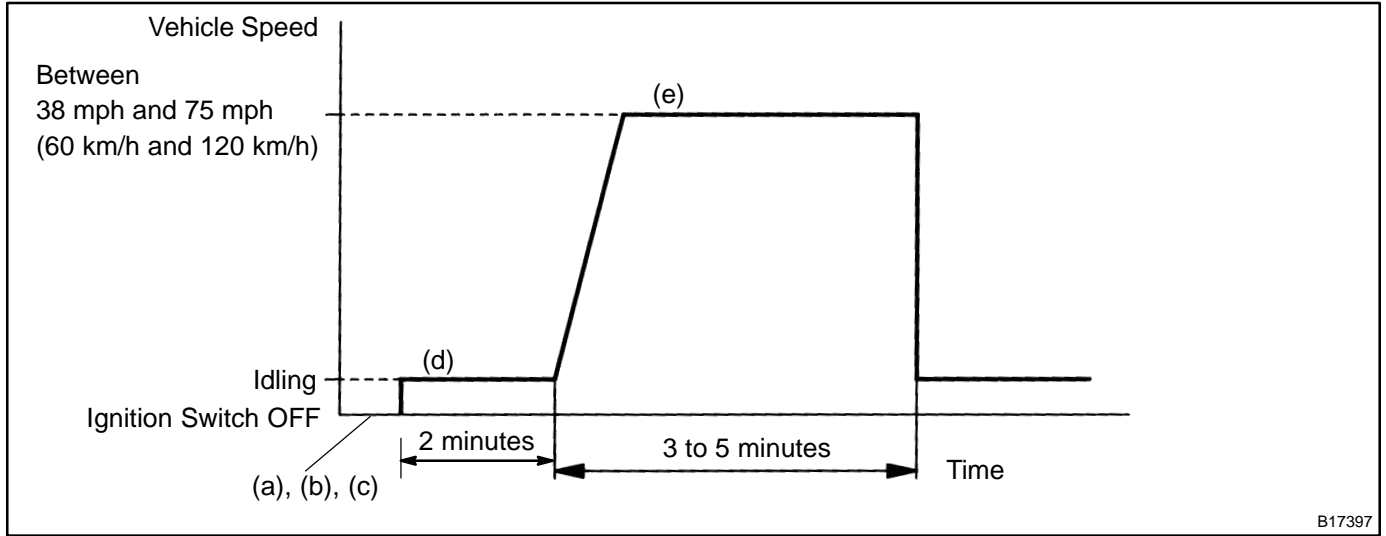
NG Replace or replace harness or connector.

OK

14 Replace air fuel ratio sensor.

NEXT

15 Perform confirmation driving pattern.



B17397

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Clear DTCs (see page [DI-462](#)).
- (d) Switch the ECM from normal mode to check mode using the tester (see page [DI-463](#)).
- (e) Start the engine and warm it up with all the accessories switched OFF.
- (f) Drive the vehicle at between 38 mph and 75 mph (60 km/h and 120 km/h) and at an engine speed of between 1,400 rpm and 3,200 rpm for 3 to 5 minutes.

HINT:

If the system is still malfunctioning, the MIL will be illuminated during step (e).

NOTICE:

If the conditions in this test are not strictly followed, no malfunction will be detected.

NEXT

16 Check whether DTC output recurs (DTC P0171, P0172, P0174 or P0175)

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P0171, P0172, P0174 or P0175	A
No output	B

B Go to step 5.

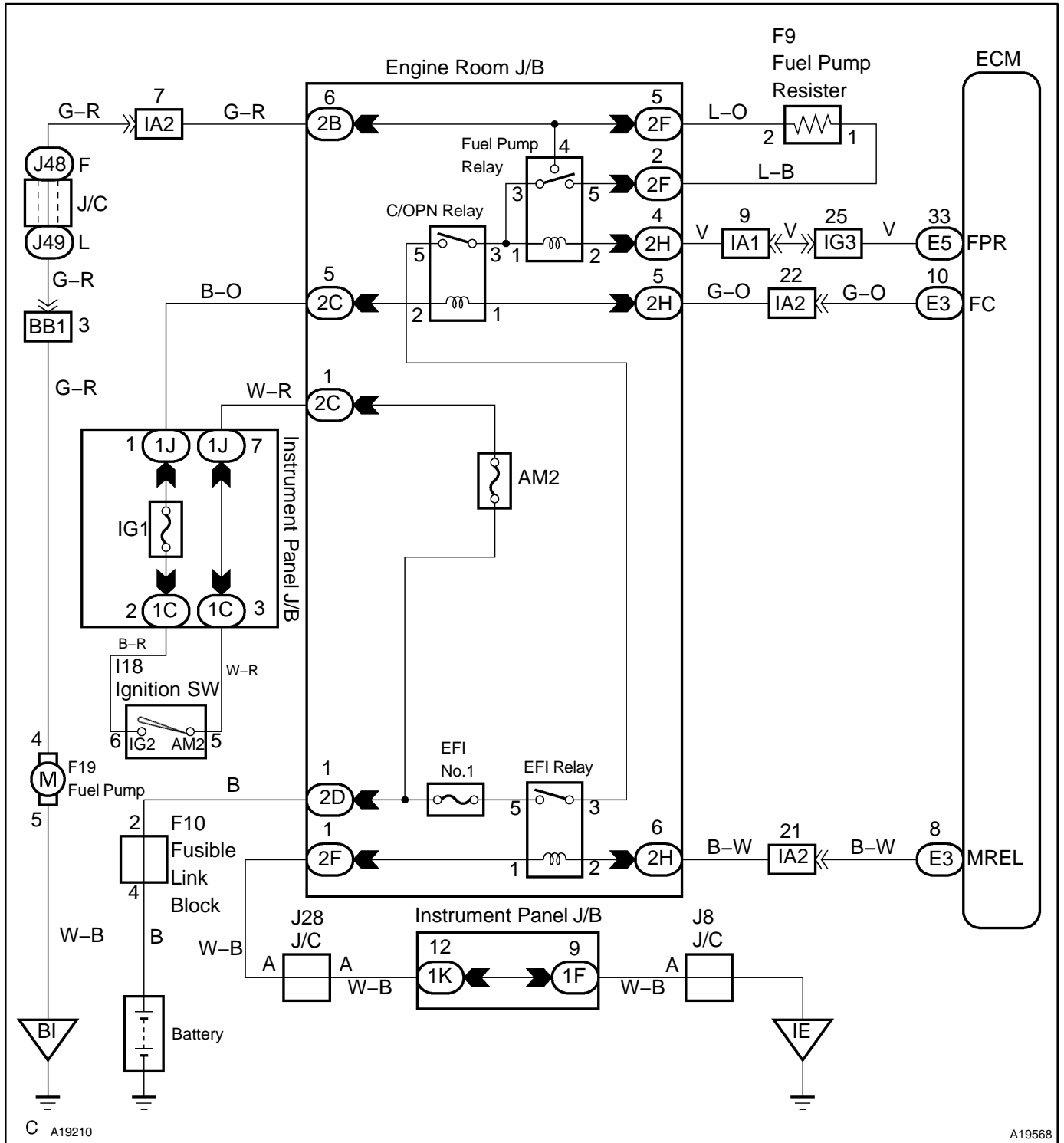
A

END

DIAGNOSTICS - ENGINE (2UZ-FE)

DTC No.	DTC Detecting Condition	Trouble Area
P0230	Open or short in fuel pump relay circuit	<ul style="list-style-type: none">• Open or short in fuel pump relay circuit• Fuel pump relay• Circuit opening relay• Fuel pump• ECM

WIRING DIAGRAM



HINT:

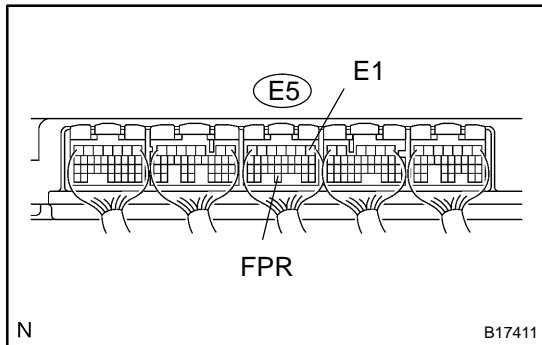
This diagnostic chart is based on premise that engine is started. If the engine is not started, proceed to problem symptoms table on [DI-452](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Check voltage between terminal FPR and E1 of ECM.



CHECK:

Measure the voltage between terminals of E5 and E5 ECM connectors.

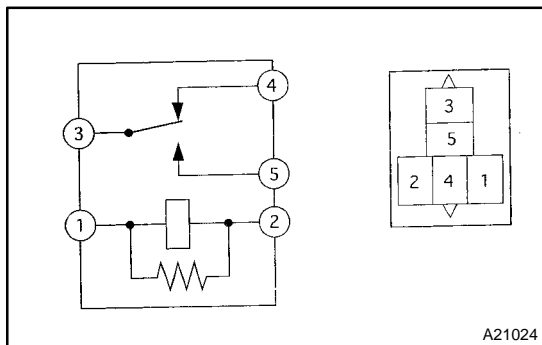
OK:

Tester Connection	Condition	Specified Condition
FPR (E5-30) - E1 (E5-1)	STA signal ON	9 to 14 V
FPR (E5-30) - E1 (E5-1)	STA signal OFF	0 to 3 V

OK Replace ECM (See page SF-82).

NG

2 Check fuel pump relay.



PREPARATION:

Remove the fuel pump relay from the engine room R/B.

CHECK:

Inspect the fuel pump relay.

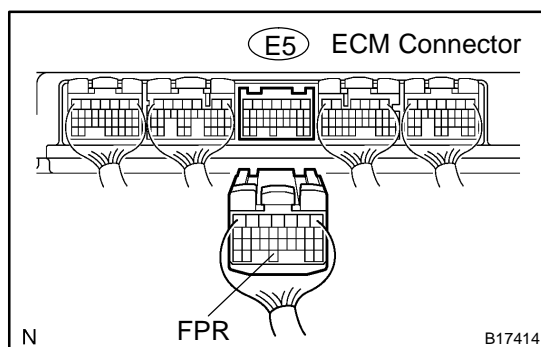
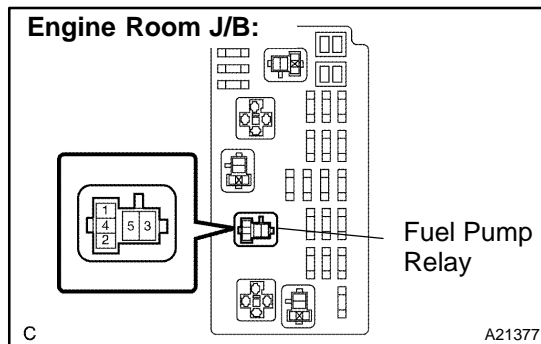
OK:

Terminal No.	Condition	Specified Condition
3 - 4	Apply B+ between terminals 1 and 2	No Continuity
3 - 4	Usually	Continuity
3 - 5	Usually	No Continuity
3 - 5	Apply B+ between terminals 1 and 2	Continuity

NG Replace fuel pump relay.

OK

3 Check for open and short in harness and connector between fuel pump relay and ECM.



PREPARATION:

- Remove the fuel pump relay from the engine room J/B.
- Disconnect the E5 ECM connector.

CHECK:

Measure the resistance between wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
Engine Room J/B (Fuel pump relay terminal 1) - FPR (E5-30)	Below 1 Ω
Engine Room J/B (Fuel pump relay terminal 1) or FPR (E5-30) - Body ground	10 k Ω or higher

NG

Repair or replace harness or connector.

OK

Replace ECM (See page SF-82).

DTC	P0300	Random/Multiple Cylinder Misfire Detected
DTC	P0301	Cylinder 1 Misfire Detected
DTC	P0302	Cylinder 2 Misfire Detected
DTC	P0303	Cylinder 3 Misfire Detected
DTC	P0304	Cylinder 4 Misfire Detected
DTC	P0305	Cylinder 5 Misfire Detected
DTC	P0306	Cylinder 6 Misfire Detected
DTC	P0307	Cylinder 7 Misfire Detected
DTC	P0308	Cylinder 8 Misfire Detected

CIRCUIT DESCRIPTION

When a misfire occurs in the engine, hydrocarbons (HC) enter the exhaust in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emission levels. High concentrations of HC can also cause the temperature of the catalyst to increase, possibly damaging the catalyst. To prevent this increase in emissions and limit the possibility of thermal damage, the ECM monitors the misfire rate. When the temperature of the catalyst reaches a point of thermal degradation, the ECM will blink the MIL. For monitoring misfire, the ECM uses both the camshaft position sensor and the crankshaft position sensor. The camshaft position sensor is used to identify misfiring cylinders and the crankshaft position sensor is used to measure variations in the crankshaft rotation speed. The misfire counter increments when crankshaft rotation speed variations exceed threshold values.

If the misfiring rate exceeds the threshold value, which could cause emissions deterioration, the ECM illuminates the MIL.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected	<ul style="list-style-type: none"> • Open or short in engine wire • Connector connection • Vacuum hose connection
P0301 P0302 P0303 P0304 P0305 P0306 P0307 P0308	Misfiring of each cylinder is detected	<ul style="list-style-type: none"> • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV piping • ECM

HINT:

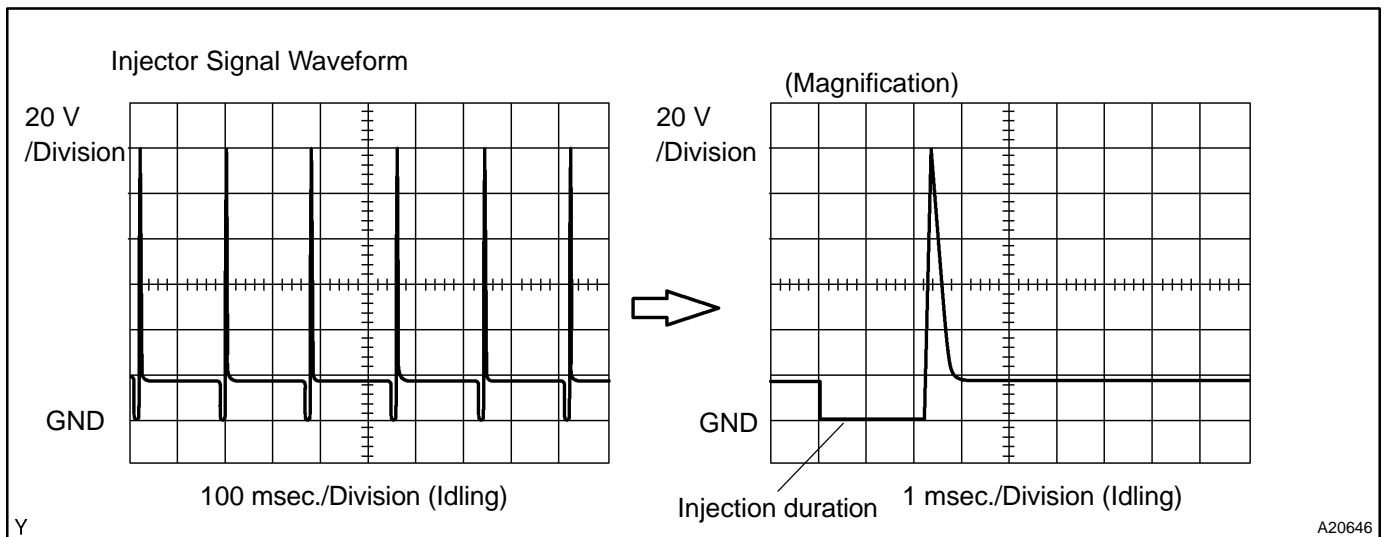
When several codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.

Reference: Inspection using the oscilloscope.

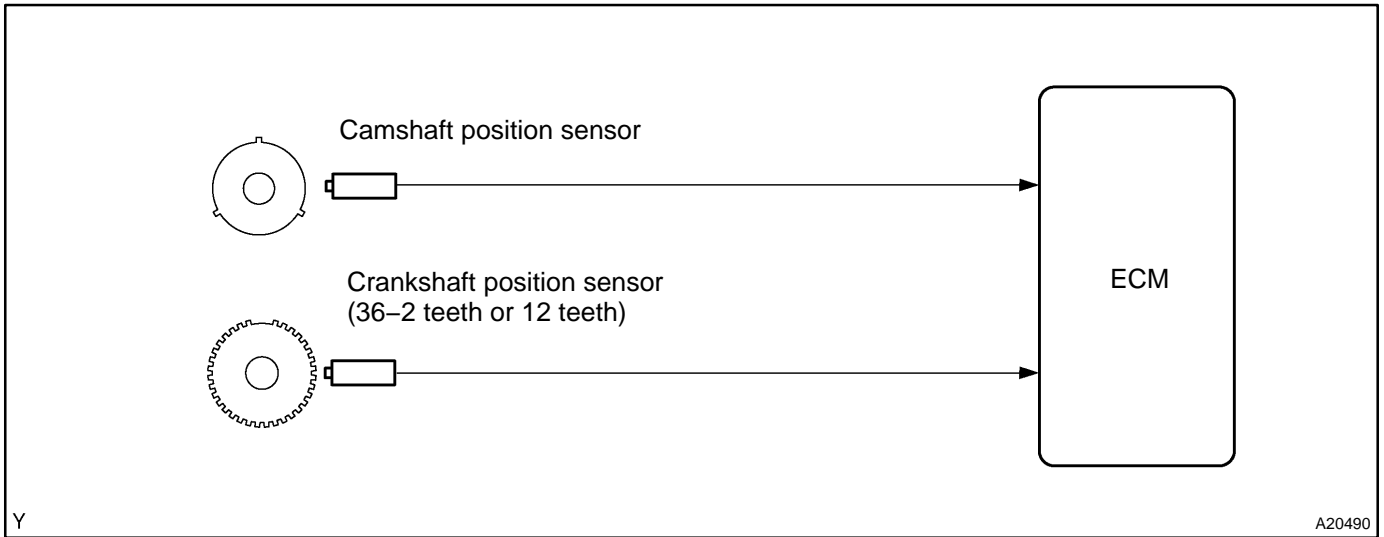
With the engine idling, check the waveform between terminals #1 to #8 and E01 of the ECM connectors.

HINT:

The correct waveform is as shown in the illustration.



MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:

The ECM will illuminate the MIL when the percentage of misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will set the MIL. Four occurrences are required to set the MIL 1,000 revolutions after engine start.

The ECM blinks the MIL (the MIL blinks immediately) if:

- Within 200 engine revolutions at a high rpm, the threshold for "percentage of misfire causing catalyst damage" is reached 1 time.
- Within 200 engine revolutions at a normal rpm, the threshold for "percentage of misfire causing catalyst damage" is reached 3 time.

MONITOR STRATEGY

Related DTCs	P0300	Random/Multiple cylinder misfire detected
	P0301	Cylinder 1 misfire detected
	P0302	Cylinder 2 misfire detected
	P0303	Cylinder 3 misfire detected
	P0304	Cylinder 4 misfire detected
	P0305	Cylinder 5 misfire detected
	P0306	Cylinder 6 misfire detected
	P0307	Cylinder 7 misfire detected
	P0308	Cylinder 8 misfire detected
Required sensors/components	Main sensors/components	Camshaft position sensor, Crankshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Intake air temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	Every 1,000 revolutions (soon after engine is started: 1 time, other: 4 times) (emission related misfire) Every 200 revolutions (1 or 3 times) (catalyst deteriorating misfire)	
MIL operation	2 driving cycles: MIL ON Immediate: MIL blinking (Catalyst deteriorating misfire)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Battery voltage	8 V	–
Throttle position learning	Completed	
VVT system	Normal operate by scan tool	
Engine RPM	400 rpm	5,700rpm
All of the following conditions are met:	Condition 1 and 2	
1. Engine coolant temperature	–10°C (14°F)	–
2. Either of the following conditions is met:	Condition (a) or (b)	
(a) Engine coolant temperature at engine start	–7°C (19°F)	–
(b) Engine coolant temperature	20°C (68°F)	–
Fuel-cut	OFF	
Emission-related-misfire:		
First 1,000 revolutions after engine start, or check mode	Crankshaft 1,000 revolutions	
Except above	Crankshaft 1,000 revolutions x 4	
Catalyst-damage-misfire (MIL blinks):		
All of the following conditions 1, 2 and 3 are met	Crankshaft 200 revolutions	
1. Driving cycle	1st	
2. Check mode	OFF	
3. Engine RPM	–	2,800 rpm
Except above	Crankshaft 200 revolutions x 3	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Emission-related-misfire:	
Misfire rate:	1.2 % or more
Catalyst-damage-misfire (MIL blinks):	
Number of misfire per 200 revolutions	93 or more (varies with intake air amount and RPM)
Multiple cylinders misfire	Detected

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

Misfire monitor – All cylinders

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A1	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A1	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

Misfire monitor – Cylinder 1

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A2	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A2	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

Misfire monitor – Cylinder 2

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A3	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A3	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

Misfire monitor – Cylinder 3

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A4	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A4	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

Misfire monitor – Cylinder 4

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A5	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A5	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

Misfire monitor – Cylinder 5

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A6	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A6	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

Misfire monitor – Cylinder 6

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A7	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A7	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

Misfire monitor – Cylinder 7

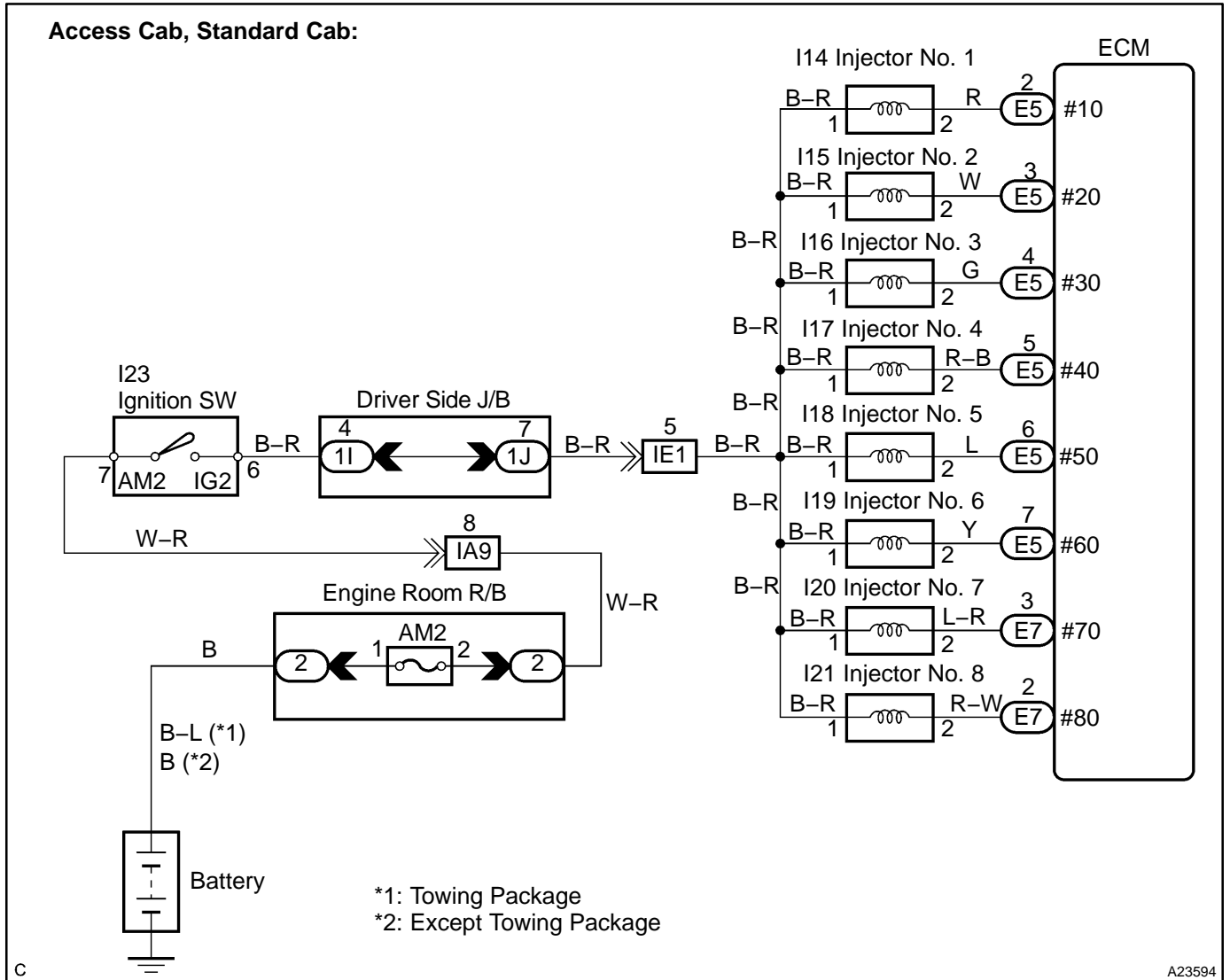
MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A8	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A8	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

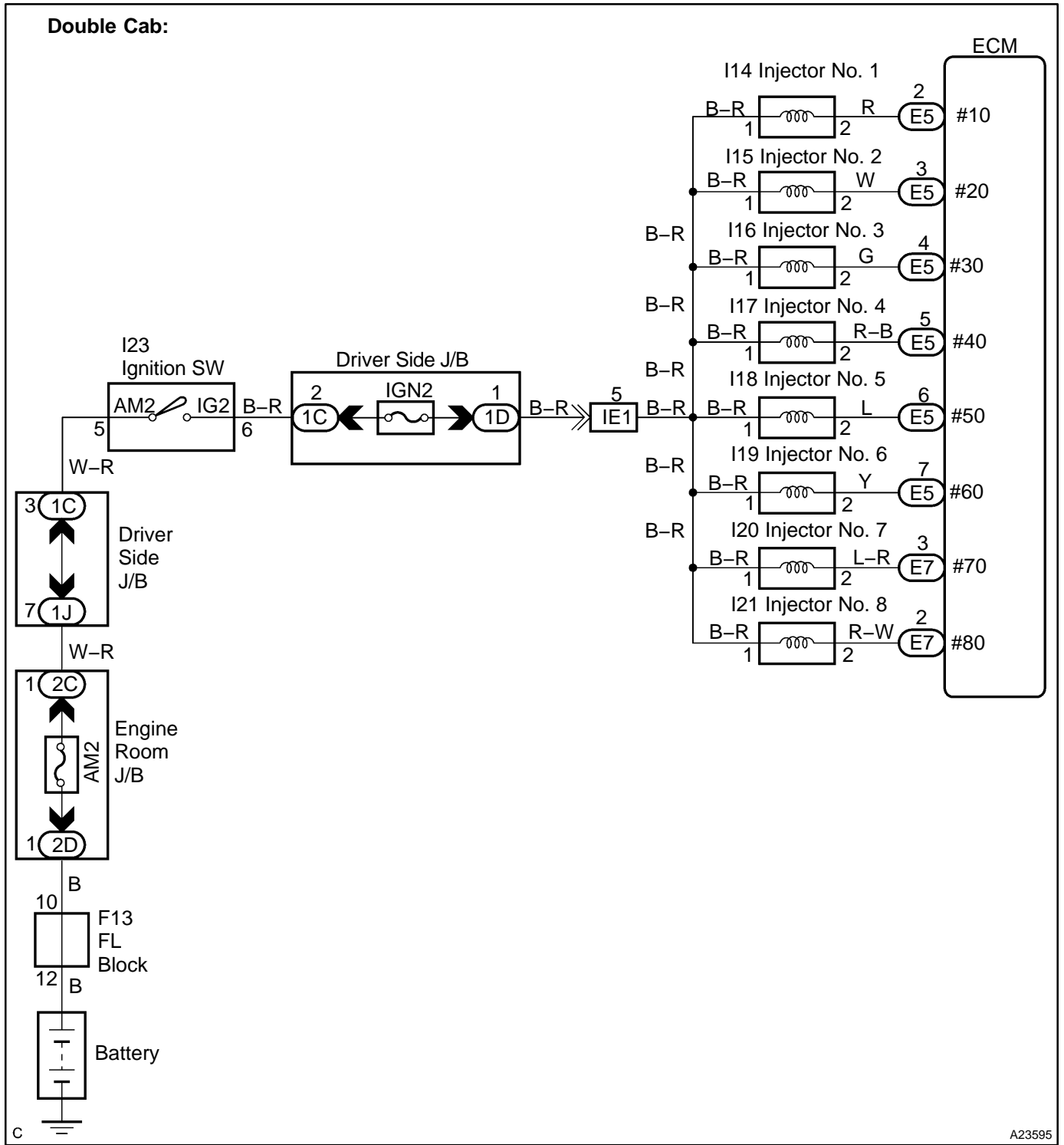
Misfire monitor – Cylinder 8

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$A9	\$0B	Multiply by 1 (time)	Exponential Weighted Moving Average misfire counts for last 10 driving cycles – total	0	65535
\$A9	\$0C	Multiply by 1 (time)	Misfire counts for last and current driv- ing cycles – total	0	65535

WIRING DIAGRAM

Refer to DTC P0351 on page [DI-642](#) for the wiring diagram of the ignition system.





CONFIRMATION DRIVING PATTERN

- (a) Connect the hand-held tester to the DLC3.
- (b) Record DTC and the freeze frame data.
- (c) Use the hand-held tester to set the check mode (See page [DI-463](#)).
- (d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
- (e) Drive the vehicle several times with the engine speed, load and surrounding range shown as ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the DATA LIST.

If you have no hand-held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:

In order to memorize the DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the DATA LIST for the following period of time. Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode, and all DTCs, etc., are erased.

Engine Speed	Time
Idling	3 minutes 30 seconds or more
1,000 rpm	3 minutes or more
2,000 rpm	1 minute 30 seconds or more
3,000 rpm	1 minute or more

- (f) Check if there is misfire, and the DTC and the freeze frame data. Record the DTC's, freeze frame data and misfire counter data.
- (g) Turn the ignition switch OFF and wait for at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire DTCs are memorized simultaneously, troubleshoot the non-misfire DTCs first.
- If the misfire does not occur when the vehicle is brought to the workshop, the misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (See confirmation driving pattern).
- On 6 or 8 cylinder engines, misfiring cylinder identification is disabled at high engine speed and only a general misfire fault code P0300 is stored instead of a cylinder specific misfire fault code (P0301 to P0308).

If the misfire starts in a high engine speed area or the misfire occurs only in a high engine speed area, only code P0300 may be stored.

When only a general misfire fault code like P0300 is stored:

- Erase the general misfire fault code using the hand-held tester
- Start the engine and drive the confirmation pattern.
- Read the value of the misfire ratio for each cylinder. Or read the DTC.
- Repair the cylinder that has a high misfire ratio. Or repair the cylinder indicated by the DTC.
- After finishing repairs, drive the confirmation pattern again and confirm that no misfire occurs.
- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is over the range of $\pm 20\%$, there is a possibility that the air-fuel ratio is becoming RICH (-20% or less) or LEAN ($+20\%$ or more).
- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during engine warm-up.
- If the misfire cannot be reproduced, the following reasons may apply: 1) the vehicle has low fuel, 2) improper fuel is being used, or 3) the ignition plug is contaminated.
- Be sure to check the value on the misfire counter after the repair.

1	Are there any other codes (besides DTC P0300, P0301, P0302, P0303, P0304 P0305, P0306, P0307 or P0308) being output?
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

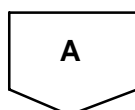
Read the DTCs using hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
"P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 and/or P0308"	A
"P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 or P0308" and other DTCs	B

HINT:

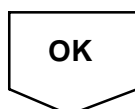
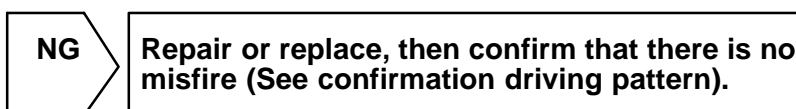
If any other codes besides "P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 or P0308" are output, perform the troubleshooting for those DTCs.



2	Check wire harness, connector and vacuum hose in engine room.
----------	--

CHECK:

- (a) Check the connection conditions of the wire harness and connector.
- (b) Check for the disconnection, piping and brake of the vacuum hose.



3	Check connection of PCV piping.
----------	--

OK:

PCV hose is connected correctly and is not damaged.

NG	Repair or replace PCV piping.
-----------	--------------------------------------

OK

4	Connect hand-held tester, and read the number of misfire.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) Start the engine.
- (d) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / CYL#1 to CYL#8.

CHECK:

Read the number of misfire on the hand-held tester.

HINT:

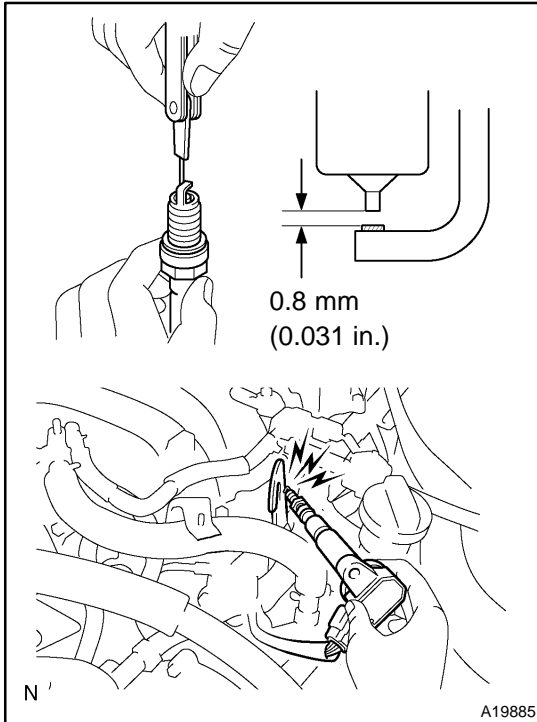
When a misfire is not reproduced, be sure to branch below based on the stored DTC.

RESULT:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B	Go to step 15.
----------	-----------------------

A

5 Check spark plug and spark of misfiring cylinder.
**PREPARATION:**

- Remove the ignition coil assembly.
- Remove the spark plug.

CHECK:

- Check the electrode for carbon deposits.
- Check the spark plug type (See page IG-1).
- Check electrode gap.

OK:

No large carbon deposit present.

Not wet with gasoline or oil.

Electrode gap: 0.8 mm (0.031 in.)

NOTICE:

If adjusting the gap of a new spark plug, bend only "the base / ground" electrode. Do not touch the tip. Never attempt to adjust the gap of a used plug.

PREPARATION:

- Install the spark plug to the ignition coil assembly.
- Disconnect the injector connector.
- Ground spark plug.

CHECK:

Check if spark occurs while engine is being cranked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

OK:

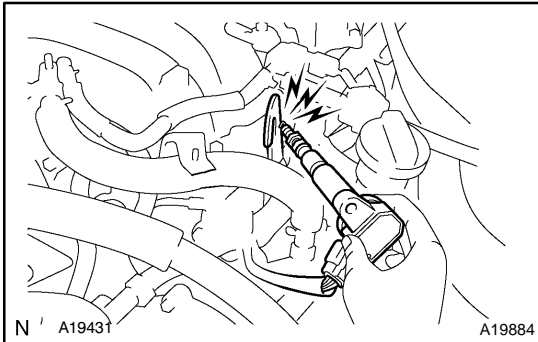
Spark occurs across electrode gap.

OK

Go to step 8.

NG

6	Change normal spark plug and check spark of misfiring cylinder.
----------	--

**PREPARATION:**

- (a) Change to the normal spark plug.
 - (1) Remove the spark plug that may be faulty from the ignition coil assembly.
 - (2) Install another spark plug to the ignition coil assembly.
- (b) Disconnect the injector connector.
- (c) Ground the spark plug.

CHECK:

Check if spark occurs while the engine is being cranked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

OK:

Spark jumps across electrode gap.

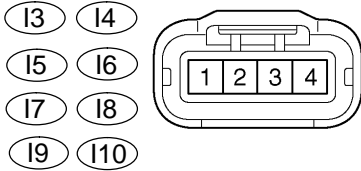
OK	Replace spark plug.
-----------	----------------------------

NG

7

Check for open and short in harness and connector between ignition coil and ECM.**Wire Harness Side:**

Ignition Coil Connector



Y

A21025

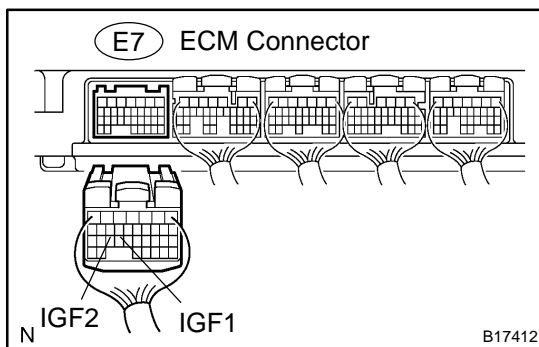
Check the harness and connector between the ignition coil and the ECM (IGF terminal) connectors:

PREPARATION:

- Disconnect the I3, I4, I5, I6, I7, I8, I9 or I10 ignition coil connector.
- Disconnect the E7 ECM connector.

CHECK:

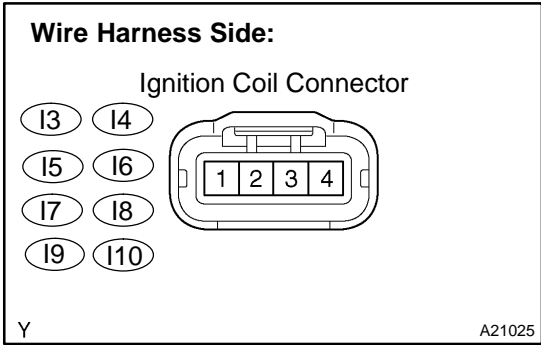
Check the resistance between the wire harness side connectors.

OK:**Standard:**

N

B17412

Tester Connection	Specified Condition
Ignition coil (I3-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I4-2) - IGF2 (E7-25)	Below 1 Ω
Ignition coil (I5-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I6-2) - IGF2 (E7-25)	Below 1 Ω
Ignition coil (I7-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I8-2) - IGF2 (E7-25)	Below 1 Ω
Ignition coil (I9-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I10-2) - IGF2 (E7-25)	Below 1 Ω
Ignition coil (I3-2) or IGF1 (E7-24) - Body ground	10 k Ω or higher
Ignition coil (I4-2) or IGF2 (E7-25) - Body ground	10 k Ω or higher
Ignition coil (I5-2) or IGF1 (E7-24) - Body ground	10 k Ω or higher
Ignition coil (I6-2) or IGF2 (E7-25) - Body ground	10 k Ω or higher
Ignition coil (I7-2) or IGF1 (E7-24) - Body ground	10 k Ω or higher
Ignition coil (I8-2) or IGF2 (E7-25) - Body ground	10 k Ω or higher
Ignition coil (I9-2) or IGF1 (E7-24) - Body ground	10 k Ω or higher
Ignition coil (I10-2) or IGF2 (E7-25) - Body ground	10 k Ω or higher



Check the harness and connector between the ignition coil and the ECM (IGT terminal) connectors:

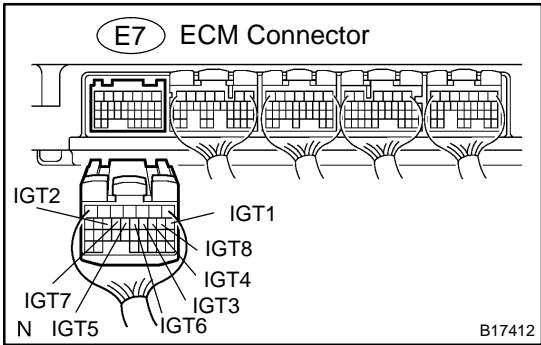
PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7, I8, I9 or I10 ignition coil connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:



Standard:

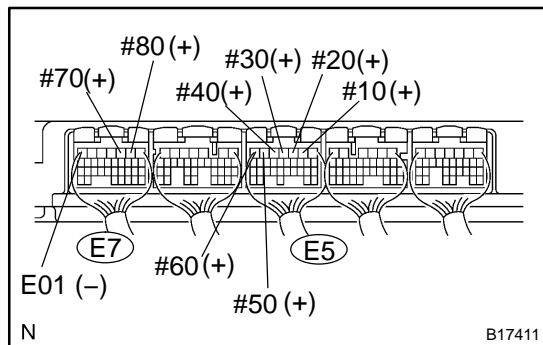
Tester Connection	Specified Condition
Ignition coil (I3-3) - IGT1 (E7-8)	Below 1 Ω
Ignition coil (I4-3) - IGT2 (E7-15)	Below 1 Ω
Ignition coil (I5-3) - IGT3 (E7-11)	Below 1 Ω
Ignition coil (I6-3) - IGT4 (E7-10)	Below 1 Ω
Ignition coil (I7-3) - IGT5 (E7-13)	Below 1 Ω
Ignition coil (I8-3) - IGT6 (E7-12)	Below 1 Ω
Ignition coil (I9-3) - IGT7 (E7-14)	Below 1 Ω
Ignition coil (I10-3) - IGT8 (E7-9)	Below 1 Ω
Ignition coil (I3-3) or IGT1 (E7-8) - Body ground	10 kΩ or higher
Ignition coil (I4-3) or IGT2 (E7-15) - Body ground	10 kΩ or higher
Ignition coil (I5-3) or IGT3 (E7-11) - Body ground	10 kΩ or higher
Ignition coil (I6-3) or IGT4 (E7-10) - Body ground	10 kΩ or higher
Ignition coil (I7-3) or IGT5 (E7-13) - Body ground	10 kΩ or higher
Ignition coil (I8-3) or IGT6 (E7-12) - Body ground	10 kΩ or higher
Ignition coil (I9-3) or IGT7 (E7-14) - Body ground	10 kΩ or higher
Ignition coil (I10-3) or IGT8 (E7-9) - Body ground	10 kΩ or higher

OK Replace ignition coil with igniter, then confirm that there is no misfire.

NG

Repair or replace harness or connector.

8 Check ECM terminal of misfiring cylinder.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals of the E5 and E7 ECM connectors.

OK:

Standard:

Tester Connection	Specified Condition
#10 (E5-2) – E01 (E7-7)	9 to 14 V
#20 (E5-3) – E01 (E7-7)	9 to 14 V
#30 (E5-4) – E01 (E7-7)	9 to 14 V
#40 (E5-5) – E01 (E7-7)	9 to 14 V
#50 (E5-6) – E01 (E7-7)	9 to 14 V
#60 (E5-7) – E01 (E7-7)	9 to 14 V
#70 (E7-3) – E01 (E7-7)	9 to 14 V
#80 (E7-2) – E01 (E7-7)	9 to 14 V

OK

Go to step 11.

NG

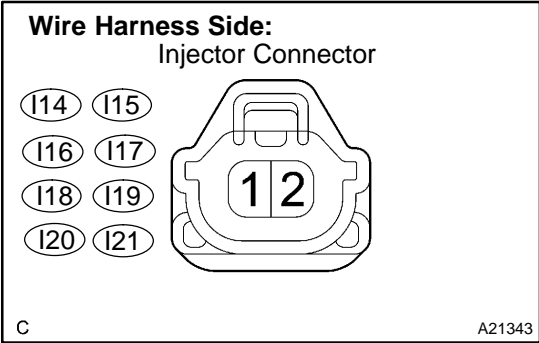
9 Check injector resistance of misfiring cylinder (See page [SF-24](#)).

NG

Replace injector.

OK

10 Check for open and short in harness and connector between ignition SW and injector, injector and ECM of misfiring cylinder.



PREPARATION:

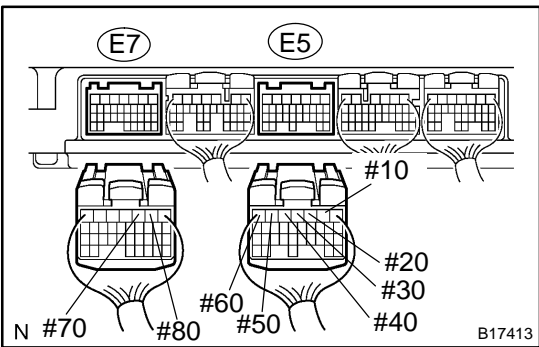
- (a) Disconnect the I14, I15, I16, I17, I18, I19, I20 or I21 injector connector.
- (b) Disconnect the E5 or E7 ECM connector.

CHECK:

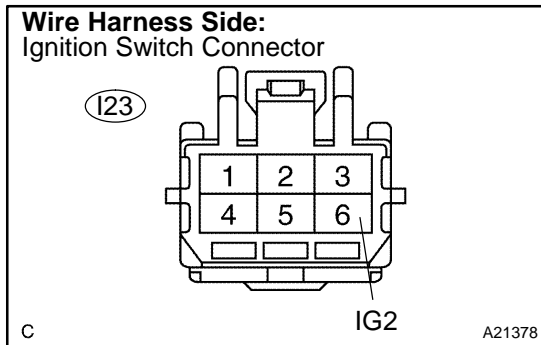
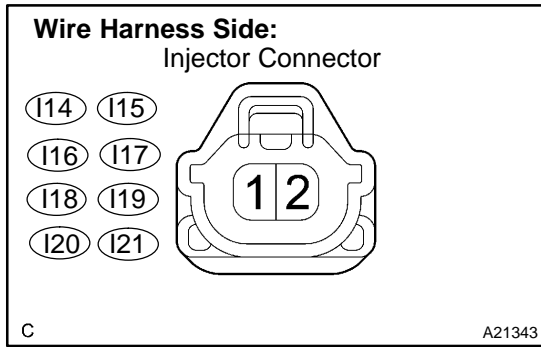
Measure the resistance of the wire harness side connectors between the ECM and injector.

OK:

Standard:



Tester Connection	Specified Condition
Injector (I14-2) - #10 (E5-2)	Below 1 Ω
Injector (I15-2) - #20 (E5-3)	Below 1 Ω
Injector (I16-2) - #30 (E5-4)	Below 1 Ω
Injector (I17-2) - #40 (E5-5)	Below 1 Ω
Injector (I18-2) - #50 (E5-6)	Below 1 Ω
Injector (I19-2) - #60 (E5-7)	Below 1 Ω
Injector (I20-2) - #70 (E7-3)	Below 1 Ω
Injector (I21-2) - #80 (E7-2)	Below 1 Ω
Injector (I14-2) or #10 (E5-2) - Body ground	10 kΩ or higher
Injector (I15-2) or #20 (E5-3) - Body ground	10 kΩ or higher
Injector (I16-2) or #30 (E5-4) - Body ground	10 kΩ or higher
Injector (I17-2) or #40 (E5-5) - Body ground	10 kΩ or higher
Injector (I18-2) or #50 (E5-6) - Body ground	10 kΩ or higher
Injector (I19-2) or #60 (E5-7) - Body ground	10 kΩ or higher
Injector (I20-2) or #70 (E7-3) - Body ground	10 kΩ or higher
Injector (I21-2) or #80 (E7-2) - Body ground	10 kΩ or higher



PREPARATION:

- (a) Disconnect the I14, I15, I16, I17, I18, I19, I20 or I21 injector connector.
- (b) Disconnect the I23 ignition switch connector.

CHECK:

Measure the resistance the wire harness side connectors between the injector and ignition switch.

OK:

Standard:

Tester Connection	Specified Condition
Injector (I14-1) – IG2 (I23-6)	Below 1 Ω
Injector (I15-1) – IG2 (I23-6)	Below 1 Ω
Injector (I16-1) – IG2 (I23-6)	Below 1 Ω
Injector (I17-1) – IG2 (I23-6)	Below 1 Ω
Injector (I18-1) – IG2 (I23-6)	Below 1 Ω
Injector (I19-1) – IG2 (I23-6)	Below 1 Ω
Injector (I20-1) – IG2 (I23-6)	Below 1 Ω
Injector (I21-1) – IG2 (I23-6)	Below 1 Ω
Injector (I14-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Injector (I15-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Injector (I16-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Injector (I17-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Injector (I18-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Injector (I19-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Injector (I20-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Injector (I21-1) or IG2 (I23-6) – Body ground	10 kΩ or higher

NG → **Repair or replace harness or connector.**

OK

11 Check injector injection of misfiring cylinder (See page [SF-29](#)).

NG → **Replace injector.**

OK

12 Check compression pressure of misfiring cylinder (See page [EM-3](#)).

NG Repair or replace.

OK

13 Check valve clearance of misfiring cylinder (See page [EM-4](#)).

NG Adjust valve clearance.

OK

14 Switch step by number of misfire cylinder (Refer to the result of step 4).

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B Check for intermittent problems (See page [DI-430](#)).

A

15 Check valve timing (Check for looseness or a jumped tooth of timing belt) (See page [EM-9](#)).

NG Adjust valve timing (Repair or replace timing belt).

OK

16 Check fuel pressure (See page [SF-7](#)).

NG

Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page [SF-1](#)).

OK

17 Check intake air temperature and mass air flow rate.

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON.

CHECK:

Check the intake air temperature.

- (1) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
- (2) Read its value displayed on the hand-held tester.

OK:

Equivalent to ambient temperature

CHECK:

Check the air flow rate.

- (1) When using hand-held tester, enter the following menu: DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL/MAF.
- (2) Read its value displayed on the hand-held tester.

OK:

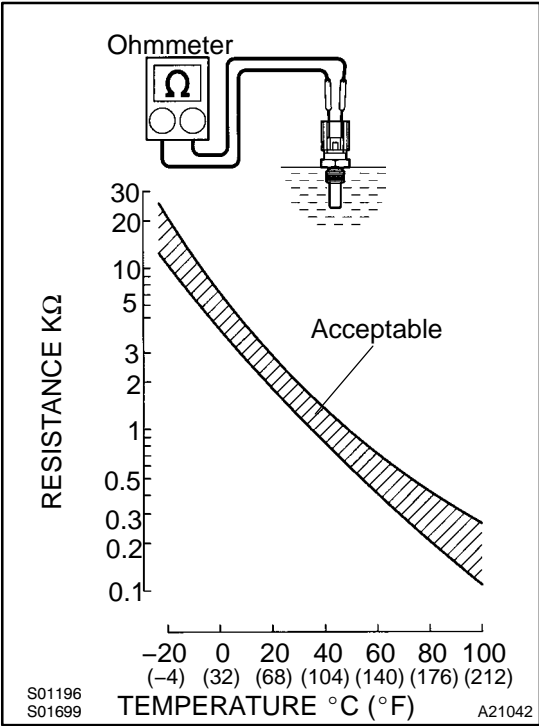
Condition	Air Flow Rate (gm/s)
Ignition switch ON (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
Idling to quickly accelerating	Air flow rate fluctuates

NG

Replace mass air flow meter.

OK

18 Check engine coolant temperature sensor.



PREPARATION:

Remove the engine coolant temperature sensor.

CHECK:

Measure the resistance between the terminals of the engine coolant temperature sensor.

Resistance:

Tester Connection	Specified Condition
1 - 2	2.32 to 2.59 kΩ (20°C (68°F))
1 - 2	0.310 to 0.326 kΩ (80°C (176°F))

NOTICE:

In case of checking the engine coolant temperature sensor in the water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (by warming up or cooling down) and repeat the test.

NG Replace engine coolant temperature sensor.

OK

19 Switch step by number of misfire cylinder (Refer to the result of step 4).

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B Go to step 5.

A

Check for intermittent problems (See page DI-430).

DTC	P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)
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DTC	P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)
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DTC	P0332	Knock Sensor 2 Circuit Low Input (Bank 2)
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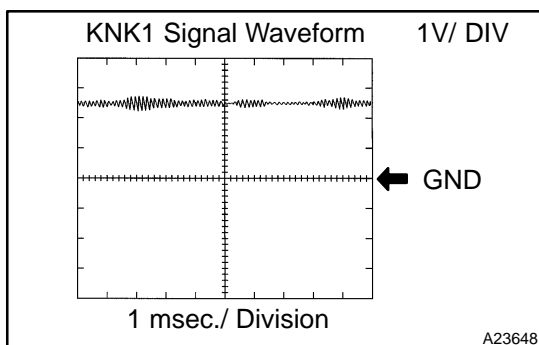
DTC	P0333	Knock Sensor 2 Circuit High Input (Bank 2)
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CIRCUIT DESCRIPTION

A flat type knock sensor (non-resonant type) has the structure that can detect the vibration in a wider band of frequency from about 6 kHz to 15 kHz and has the following features.

Knock sensors are fitted on the right bank and left bank of the cylinder block to detect engine knocking. Each knock sensor contains a piezoelectric element which generates voltage when it becomes deformed. Generation of the voltage occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded in order to suppress the knocking.

DTC No.	DTC Detection Condition	Trouble Area
P0327 P0332	Output voltage of the knock sensor 1 or 2 is 0.5 V or less (1 trip detection logic)	<ul style="list-style-type: none"> • Short in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM
P0328 P0333	Output voltage of the knock sensor 1 or 2 is 4.5 V or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM



Reference: Inspection using the oscilloscope.
The correct waveform is as shown.

Item	Details
Terminal	KNK1 - EKNK or KNK2 - EKN2
Equipment Settings	0.01 to 10 V/Division, 0.01 to 10 msec./Division
Condition	After warming up the engine, keep the engine speed at 4,000 rpm.

MONITOR DESCRIPTION

The knock sensor located on the cylinder block detects spark knock.

When spark knock occurs, the sensor pick-up vibrates in a specific frequency range. When the ECM detects the voltage in this frequency range, it retards the ignition timing to suppress the spark knock.

If there is a defect in the knock sensor or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the knock sensor and sets a DTC.

Example:

When the knock sensor voltage output is less than 0.5 V, or more than 4.5 V, and if either the condition continues for more than 3 sec.

MONITOR STRATEGY

Related DTCs	P0327	Knock sensor (Bank 1) range check (Low voltage)
	P0328	Knock sensor (Bank 1) range check (High voltage)
	P0332	Knock sensor (Bank 2) range check (Low voltage)
	P0333	Knock sensor (Bank 2) range check (High voltage)
Required sensors/components	Main sensors/components	Knock sensor
	Related sensors/components	Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

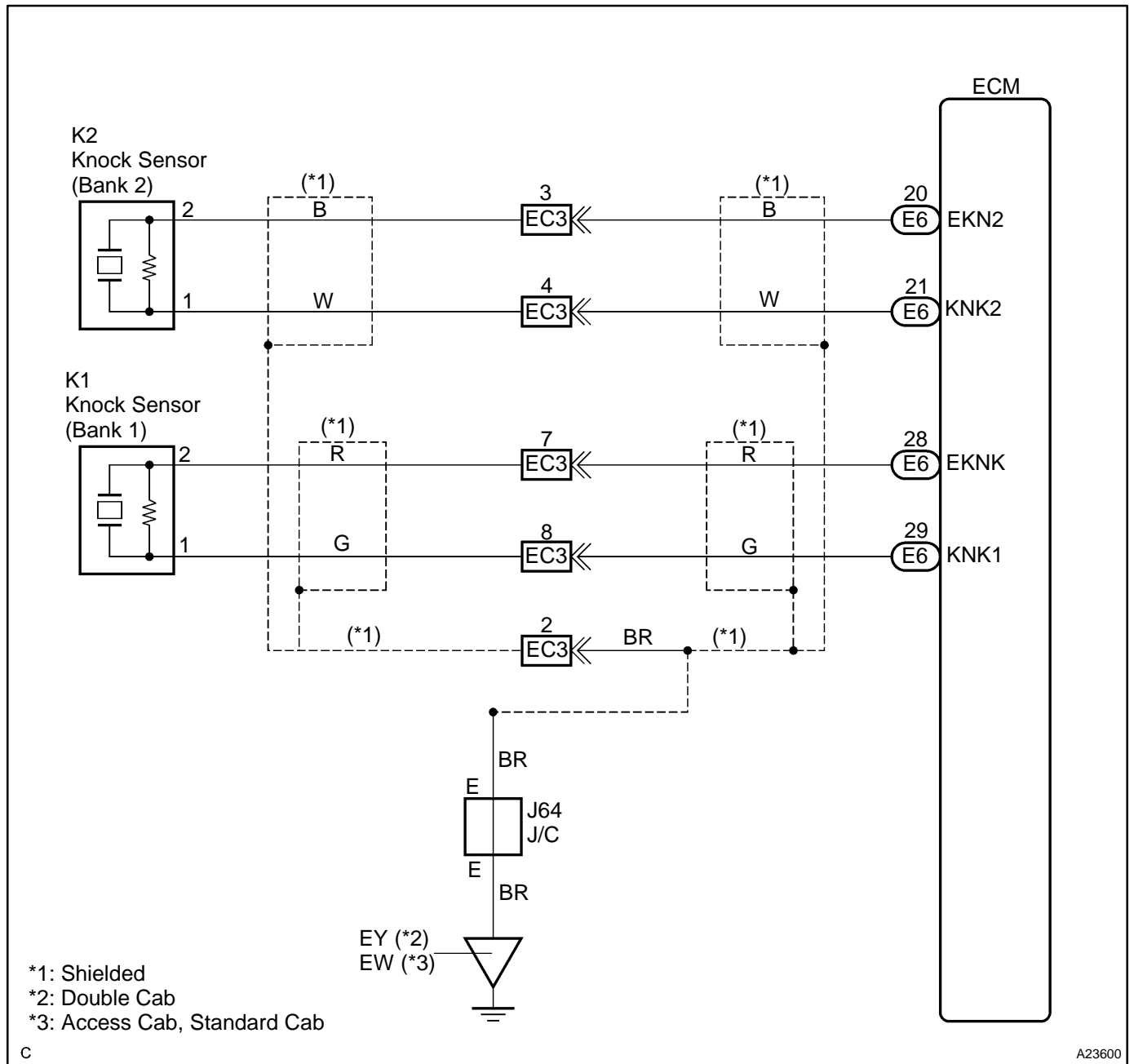
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Battery voltage	10.5 V	–
Time after engine start	5 sec.	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Knock sensor range check (Low voltage) P0327, P0332:	
Knock sensor voltage	Less than 0.5 V
Knock sensor range check (High voltage) P0328, P0333:	
Knock sensor voltage	More than 4.5 V

WIRING DIAGRAM

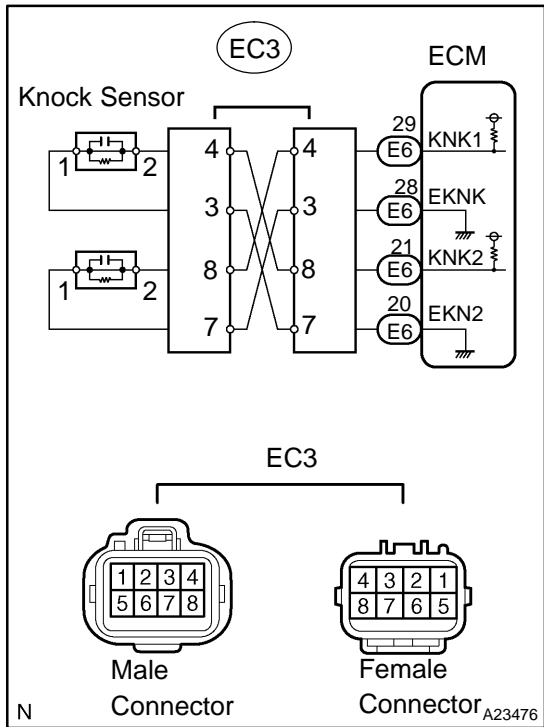


INSPECTION PROCEDURE

HINT:

- DTC P0325, P0327 and P0328 are for the bank 1 knock sensor circuit.
- DTC P0330, P0332 and P0333 are for the bank 2 knock sensor circuit.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 Connect hand-held tester, and check knock sensor circuit.



PREPARATION:

- (a) Disconnect the EC3 connector.
- (b) Using lead wires, connect the EC3 connectors as follows.

Male Connector – Female Connector
Terminal 4 – Terminal 8
Terminal 3 – Terminal 7
Terminal 8 – Terminal 4
Terminal 7 – Terminal 3

- (c) Warm up the engine.
- (d) Run the engine at 3,000 rpm for 10 seconds or more.

CHECK:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the hand-held tester ON.
- (c) Select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read DTCs.

Result :

Display	Proceed to
DTCs same as when vehicle brought in P0325, P0327, P0328 → P0325, P0327, P0328 or P0330, P0332, P0333 → P0330, P0332, P0333	A
DTC different from when vehicle brought in P0325 → P0330 or P0330 → P0325	B
DTCs different from when vehicle brought in P0327, P0328 → P0332, P0333 or P0332, P0333 → P0327, P0328	C

- (e) Reconnect the EC3 connector.

B Go to step 4.

C Go to step 5.

A

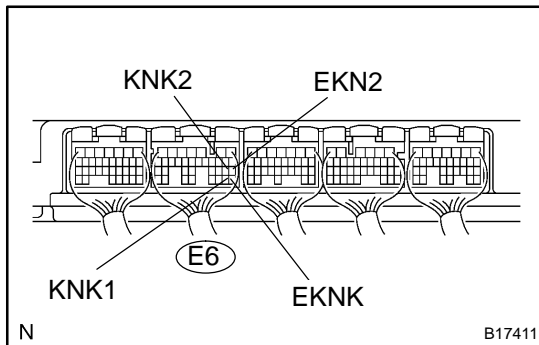
- 2 Check for open and short in harness and connector between EC3 connector and ECM (See page [IN-30](#)).

NG

Repair or replace harness or connector.

OK

- 3 Measure voltage between terminals KNK1 and EKNK, KNK2 and EKN2 of ECM.

**PREPARATION:**

- Disconnect the E6 ECM connector.
- Turn the ignition switch to ON.

CHECK:

- Measure the voltage between the specified ECM terminals.

OK:**Standard:**

Tester Connection	Specified Condition
KNK1 (E6-29) – EKNK (E6-28)	4.5 to 5.5 V
KNK2 (E6-21) – EKN2 (E6-20)	4.5 to 5.5 V

- Reconnect the ECM connector.

NG

Replace ECM (See page [SF-82](#)).

OK

Check for intermittent problems
(See page [DI-430](#)).

- 4 Check knock sensor installation.

CHECK:

Check the knock sensor installation.

OK:

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

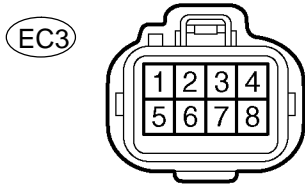
NG

Tighten the sensor.

OK

Replace knock sensor (See page [SF-68](#)).**5 Check knock sensor.****Wire Harness Side:**

Male Connector



Front View

A23513

PREPARATION:

(a) Disconnect the EC3 connector.

CHECK:

(a) Check the resistance between the terminals of the EC3 male connector.

OK:**Standard:**

Tester Connection	Specified Condition
EC3 male connector 3 - 4	120 to 280 kΩ
EC3 male connector 7 - 8	120 to 280 kΩ

(b) Reconnect the EC3 connector.

OK

Check for intermittent problems
(See page [DI-430](#)).

NG

6 Check for open and short in harness and connector between EC3 connector and knock sensor (See page [IN-30](#)).**HINT:**

- If DTC P0327 or P0328 has changed to P0332 or P0333, check the knock sensor circuit on the right bank side.
- If DTC P0332 or P0333 has changed to P0327 or P0328, check the knock sensor circuit on the left bank side.

NG

Repair or replace harness or connector.

OK

Replace knock sensor.

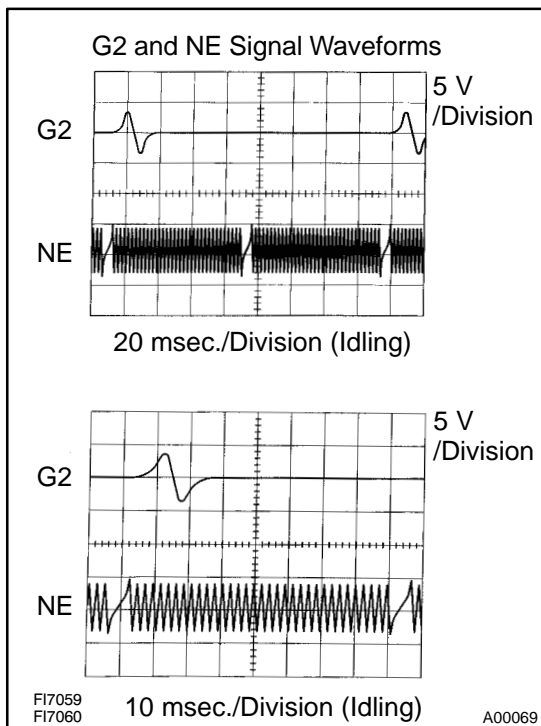
DTC	P0335	Crankshaft Position Sensor "A" Circuit
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DTC	P0339	Crankshaft Position Sensor "A" Circuit Intermittent
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CIRCUIT DESCRIPTION

The crankshaft position sensor system consists of a crankshaft position sensor plate and a pick-up coil. The sensor plate has 32 teeth and is installed on the crankshaft. The pick-up coil is made of an iron core and magnet. The sensor plate rotates and as each tooth passes through the pick-up coil, a pulse signal is created. The pick-up coil generates 32 signals for each engine revolution. Based on these signals, the ECM calculates the crankshaft position and engine RPM. Using these calculations, the fuel injection time and ignition timing are controlled.

DTC No.	DTC Detecting Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM
	No crankshaft position sensor signal to ECM with engine speed 450 rpm or more (1 trip detection logic)	
P0339	In condition (a), (b) and (c), when no crankshaft position sensor (NE) signal is input for 0.05 sec. or more. : (1 trip detection logic) (c) Engine revolution 1,000 rpm or more (d) STA signal is OFF (e) 3 sec. or more has lapsed after STA signal is switched from ON to OFF.	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM



Reference: Inspection using the oscilloscope.

The correct waveform is as shown in the illustration.

Tester Connection	Specified Condition
VV1+ (E5-25) - VV1- (E5-24)	Correct waveform is as shown
VV2+ (E5-18) - VV2- (E5-28)	
NE+ (E5-21) - NE- (E5-20)	

MONITOR DESCRIPTION

If there are no signals from the crankshaft sensor even though the engine is revolving, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0335	Crankshaft position sensor range check or ratio- nality
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Engine speed sensor
Frequency of operation	Continuous	
Duration	Case 1: 0.016 sec. Case 2: 3 times	
MIL operation	Immediate	
Sequence of operation	None	

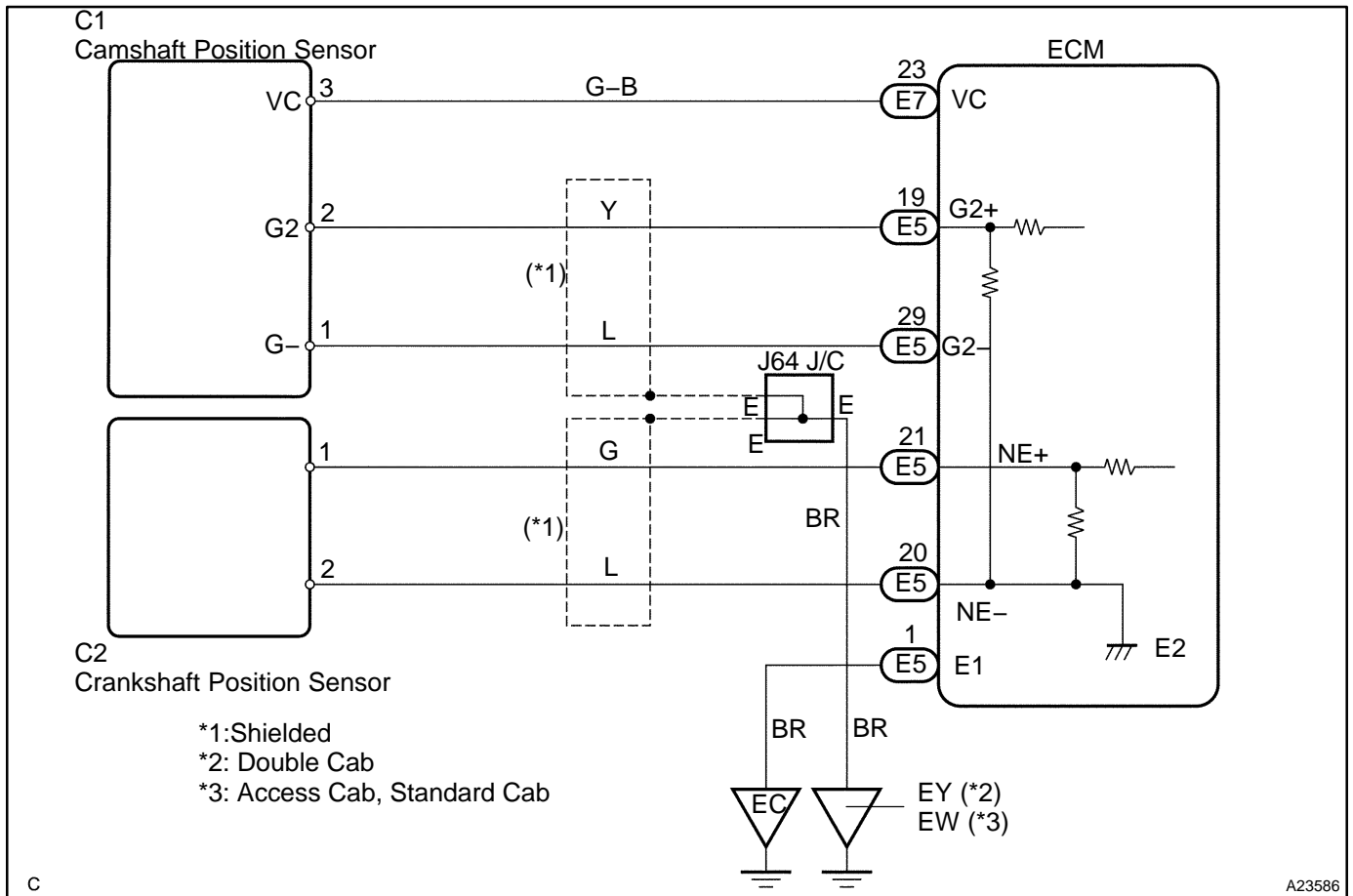
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Case 1:		
Engine speed	450 rpm	-
Starter	OFF	
Time after starter ON to OFF	3 sec.	-
Case 2:		
Time after starter OFF to ON	0.3 sec.	-
Number of camshaft position sensor signal pulse	6	-
Battery voltage	7 V	-
Ignition switch	ON	
Camshaft position sensor circuit fail	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1:	
Engine speed signal	No signal
Case 2:	
Number of crankshaft position sensor signal pulse	132 or less, or 174 or more

WIRING DIAGRAM

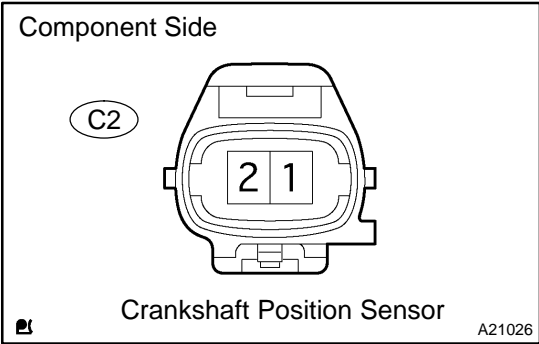


INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand-held tester. Freeze frame records the engine conditions when a malfunction is detected. When troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.
- READ VALUE ON HAND-HELD TESTER
 - (a) Connect the hand-held tester to the DLC3.
 - (b) Start the engine and push the hand-held tester tool main switch ON.
 - (c) When using hand-held tester, enter the following menu: "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / ENGINE SPD".
- The engine speed can be confirmed in DATA LIST using the hand-held tester. If there are no NE signals from the crankshaft position sensor despite the engine revolving, the engine speed will be indicated as zero. If voltage output of the crankshaft position sensor is insufficient, the engine speed will be indicated as lower RPM (than the actual RPM).

1 Check resistance of crankshaft position sensor.



PREPARATION:

Disconnect the C2 crankshaft position sensor connector.

CHECK:

Measure the resistance between terminals 1 and 2.

OK:

Standard:

Tester Connection	Specified Condition
1 - 2	985 to 1,600 Ω at cold
1 - 2	1,265 to 1,890 Ω at hot

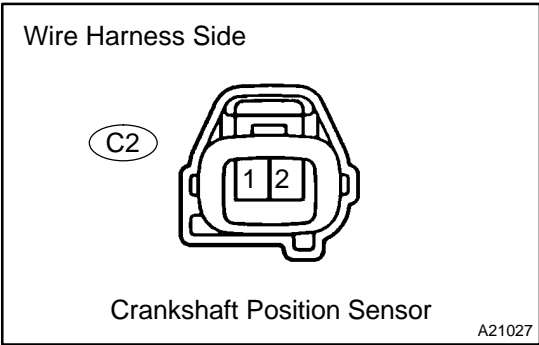
NOTICE:

” Cold” and ”Hot” shown above mean the temperature of the coils themselves. ”Cold” is from -10°C (14°F) to 50°C (122°F) and ”Hot” is from 50°C (122°F) to 100°C (212°F).

NG Replace crankshaft position sensor.

OK

2 Check for open and short in harness and connector between ECM and crankshaft position sensor.



PREPARATION:

- (a) Disconnect the C2 crankshaft position sensor connector.
- (b) Disconnect the E5 ECM connector.

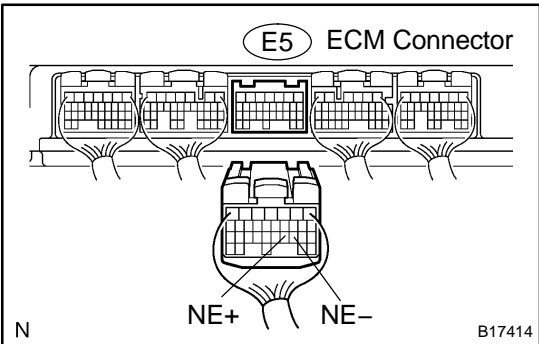
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

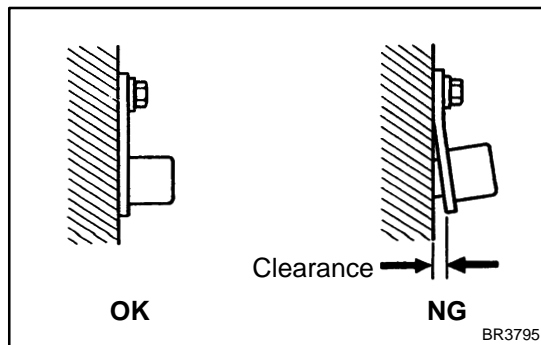
Tester Connection	Specified Condition
Crankshaft position sensor (C2-1) - NE+ (E5-21)	Below 1 Ω
Crankshaft position sensor (C2-2) - NE- (E5-20)	Below 1 Ω
Crankshaft position sensor (C2-1) or NE+ (E5-21) - Body ground	10 kΩ or higher
Crankshaft position sensor (C2-2) or NE- (E5-20) - Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

3 Check sensor installation (crankshaft position sensor).

**CHECK:**

Check the crankshaft position sensor installation.

OK:

The crankshaft position sensor is installed properly.

NG

Tighten sensor installation bolt.

OK

4 Inspect teeth of sensor plate.

PREPARATION:

Remove the crankshaft angle sensor plate (See page [EM-98](#)).

CHECK:

Check the teeth of sensor plate.

NG

Replace sensor plate.

OK

Replace ECM (See page [SF-82](#)).

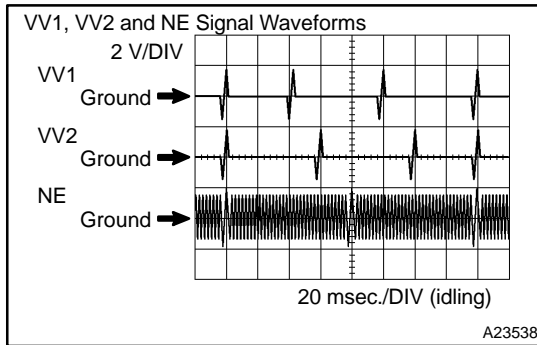
DTC	P0340	Camshaft Position Sensor "A" Circuit
DTC	P0341	Camshaft Position Sensor "A" Circuit Range/Performance
DTC	P0345	Camshaft Position Sensor "A" Circuit (Bank 2)
DTC	P0346	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 2)

CIRCUIT DESCRIPTION

The camshaft position sensor consists of a magnet, an iron core and a pick-up coil. This sensor monitors a timing rotor located on the camshaft and is used by the ECM to detect the camshaft angle. The camshaft rotation synchronizes with the crankshaft rotation, and this sensor communicates the rotation of the camshaft timing rotor as a pulse signal to the ECM. Based on the signal, the ECM controls fuel injection time and ignition timing.

If there is no signal from the camshaft position sensor even though the engine is turning or the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction in the sensor and sets a DTC.

DTC No.	DTC Detection Condition	Trouble Area
P0340 P0345	No camshaft position sensor signal to ECM during cranking (2 trip detection logic) No camshaft position sensor signal to ECM with engine speed 600 rpm or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • VVT sensor • Camshaft • Jumping teeth of timing belt • ECM
P0341 P0346	While crankshaft rotates twice, camshaft position sensor signal will be input to ECM 12 times or more (1 trip detection logic) • Hint: Under normal condition, the camshaft position signal is input into the ECM 3 times per 2 engine revolutions	

**Reference: Inspection using the oscilloscope.**

The correct waveform is as shown.

Tester Connection	Specified Condition
G2+ (E5-27) – G2- (E5-32)	Correct waveform is as shown
NE+ (E5-25) – NE- (E5-24)	

MONITOR DESCRIPTION

If there are no signals from the camshaft position sensor even though the engine is turning, or if the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0340	VVT sensor (Bank 1) range check or rationality
	P0341	VVT sensor (Bank 1) range check or rationality
	P0345	VVT sensor (Bank 2) range check or rationality
	P0346	VVT sensor (Bank 2) range check or rationality
Required sensors/components	Main sensors/components	VVT sensor
	Related sensors/components	Crankshaft position sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	P0340, P0345 case 1: 4 sec. P0340, P0345 case 2: 5 sec. P0341, P0346: 720° CA	
MIL operation	P0340, P0345 case 1: 2 driving cycles P0340, P0345 case 2, P0341, P0346: Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
P0340, P0345 Case 1:		
Starter	ON	
Minimum battery voltage while starter ON	–	11 V
P0340, P0345 Case 2:		
Engine RPM	600 rpm	–
Starter	OFF	
Battery voltage	8 V	–
Ignition switch	ON	
P0341, P0346:		
Starter	After OFF to ON timing	
Engine revolution	720° CA	

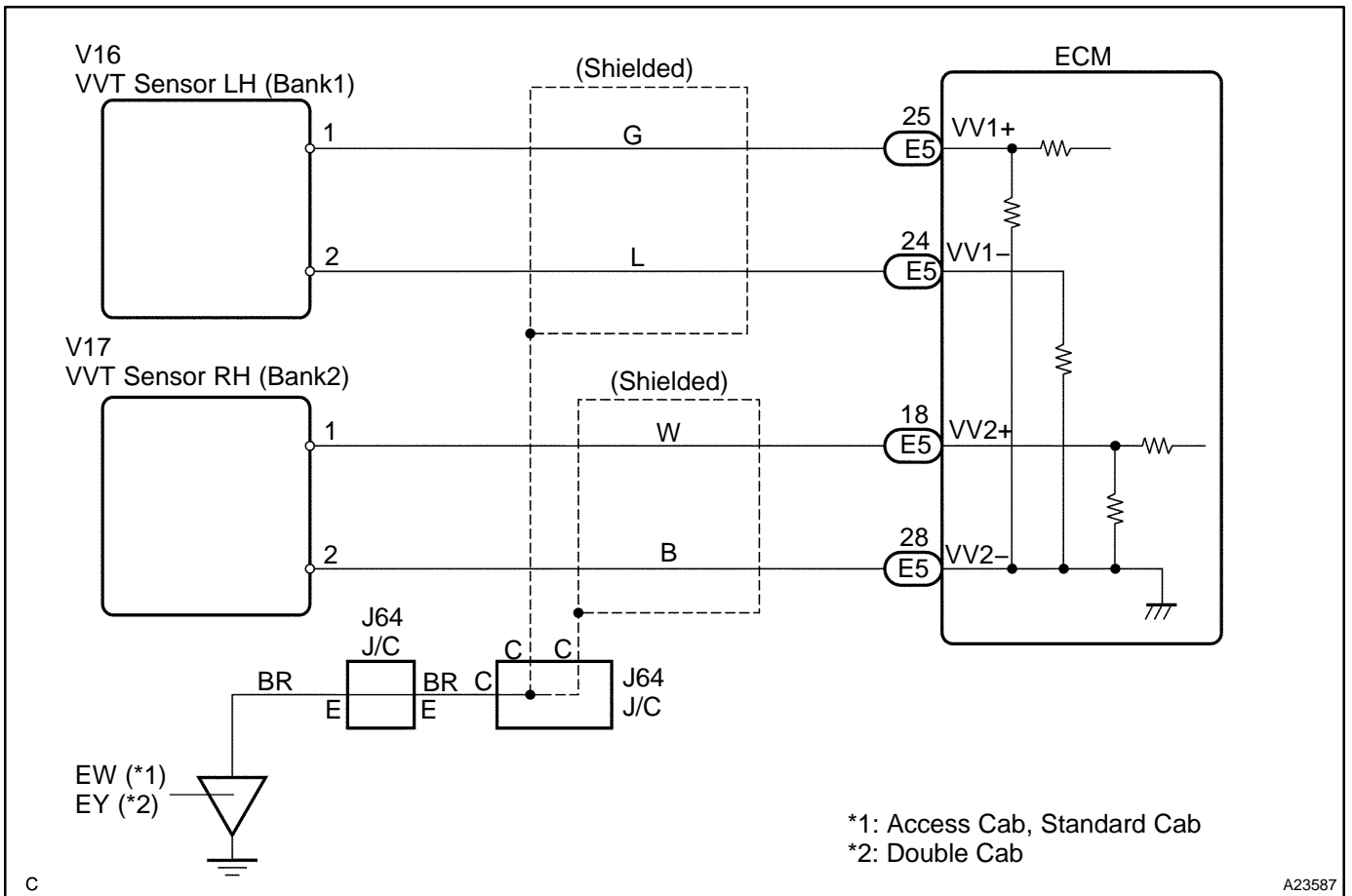
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0340, P0345 Case 1:	
VVT sensor signal	No signal
P0340, P0345 Case 2:	
VVT sensor signal	No signal
P0341, P0346:	
VVT sensor count	12 or more / 720°CA (= Engine 2 revolutions)

COMPONENT OPERATING RANGE

Parameter	Standard Value
VVT sensor signal input during every 720°CA	3

WIRING DIAGRAM



C

A23587

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Inspect resistance of VVT sensor (See page SF-78).

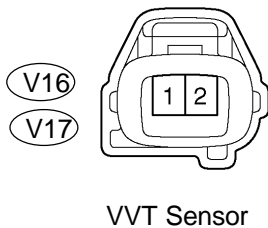
NG

Replace VVT sensor (See page SF-79).

OK

2 Check for open and short in harness and connector between ECM and VVT sensor.

Wire Harness Side



Y

A21029

PREPARATION:

- Disconnect the VVT sensor connector.
- Disconnect the E5 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

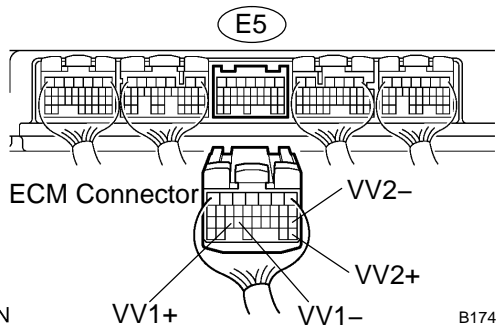
Standard:

Tester Connection	Specified Condition
VVT sensor (V16-1) - VV1+ (E5-25)	Below 1 Ω
VVT sensor (V16-2) - VV1- (E5-24)	Below 1 Ω
VVT sensor (V17-1) - VV2+ (E5-18)	Below 1 Ω
VVT sensor (V17-2) - VV2- (E5-28)	Below 1 Ω
VVT sensor (V16-1) or VV1+ (E5-25) - Body ground	10 k Ω or higher
VVT sensor (V16-2) or VV1- (E5-24) - Body ground	10 k Ω or higher
VVT sensor (V17-1) or VV2+ (E5-18) - Body ground	10 k Ω or higher
VVT sensor (V17-2) or VV2- (E5-28) - Body ground	10 k Ω or higher

NG

Repair or replace harness or connector.

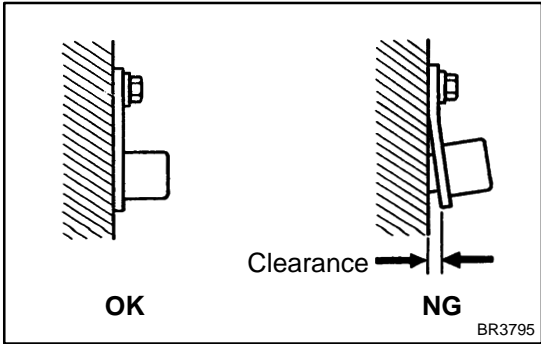
OK



N

B17414

3 Check sensor installation (VVT sensor).



CHECK:

Check the VVT sensor installation.

OK:

The VVT sensor is installed properly.

NG Tighten sensor installation bolt.

OK

4 Inspect teeth of camshaft.

PREPARATION:

Remove the cylinder head cover (See page [EM-36](#)).

CHECK:

Check the tooth of the camshaft.

NG Replace camshaft.

OK

Replace ECM.

DTC	P0351	Ignition Coil "A" Primary/Secondary Circuit
DTC	P0352	Ignition Coil "B" Primary/Secondary Circuit
DTC	P0353	Ignition Coil "C" Primary/Secondary Circuit
DTC	P0354	Ignition Coil "D" Primary/Secondary Circuit
DTC	P0355	Ignition Coil "E" Primary/Secondary Circuit
DTC	P0356	Ignition Coil "F" Primary/Secondary Circuit
DTC	P0357	Ignition Coil "G" Primary/Secondary Circuit
DTC	P0358	Ignition Coil "H" Primary/Secondary Circuit

HINT:

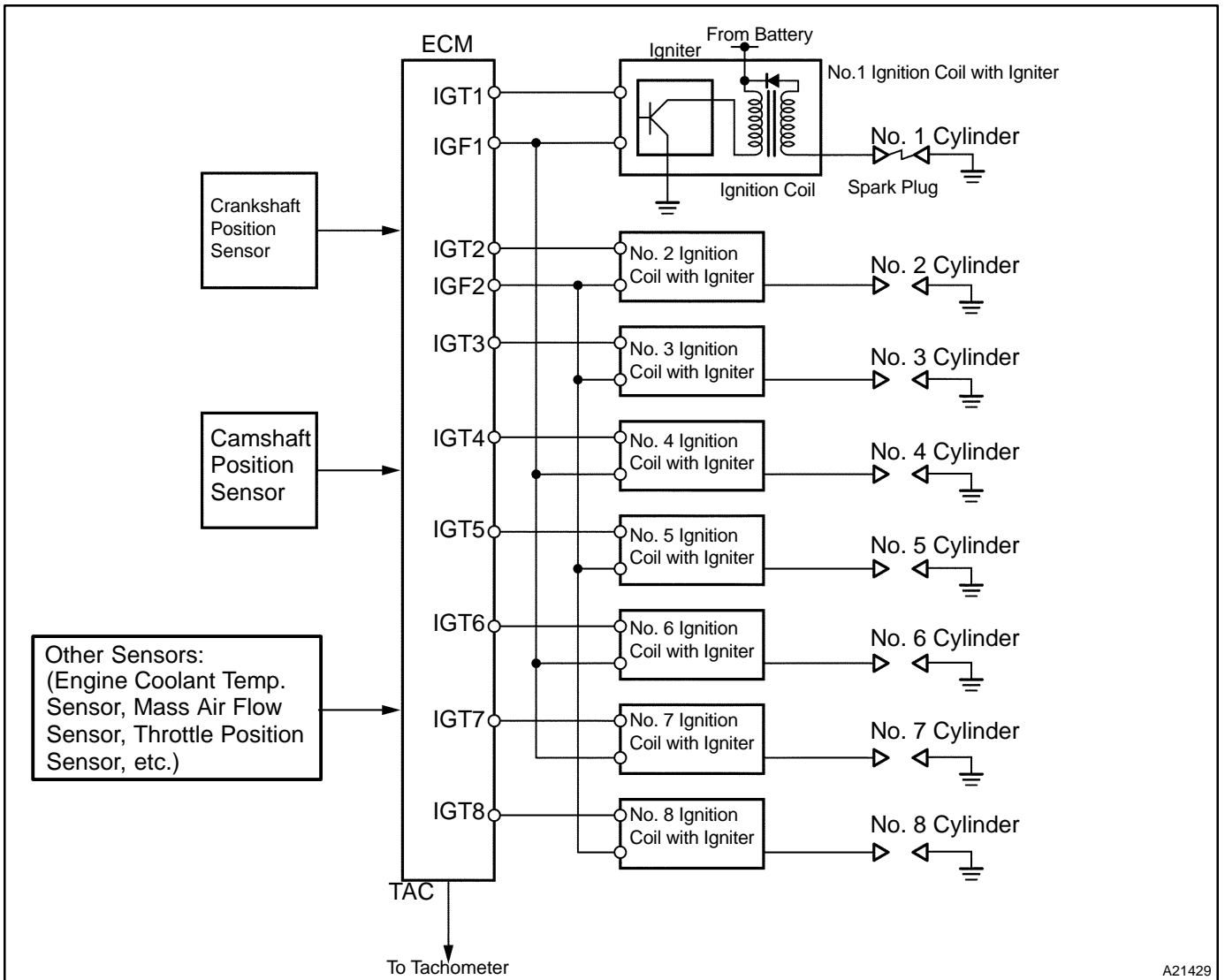
- These DTCs indicate a malfunction related to primary circuit.
- If DTC P0351 is displayed, check No. 1 ignition coil with igniter circuit.
- If DTC P0352 is displayed, check No. 2 ignition coil with igniter circuit.
- If DTC P0353 is displayed, check No. 3 ignition coil with igniter circuit.
- If DTC P0354 is displayed, check No. 4 ignition coil with igniter circuit.
- If DTC P0355 is displayed, check No. 5 ignition coil with igniter circuit.
- If DTC P0356 is displayed, check No. 6 ignition coil with igniter circuit.
- If DTC P0357 is displayed, check No. 7 ignition coil with igniter circuit.
- If DTC P0358 is displayed, check No. 8 ignition coil with igniter circuit.

CIRCUIT DESCRIPTION

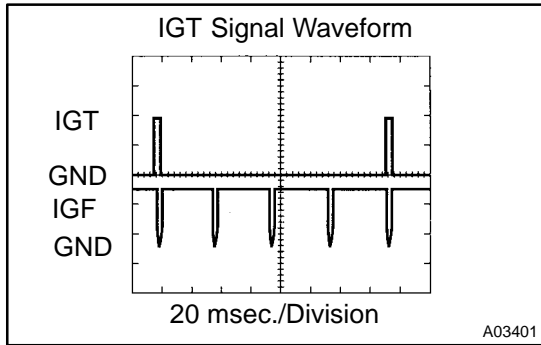
These DTCs indicate a malfunction related to primary circuit.

The DIS is a 1-cylinder ignition system which ignites one cylinder with one ignition coil. In the 1-cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition signals (IGTs) for each cylinder. Using the IGT, the ECM turns on and off the power transistor inside the igniter and this switches on and off the current to the primary coil. When the current to the primary coil is cut off, high-voltage is generated in the secondary coil and this voltage is applied to the spark plugs to create sparks inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation signal (IGF) for each cylinder ignition to the ECM.



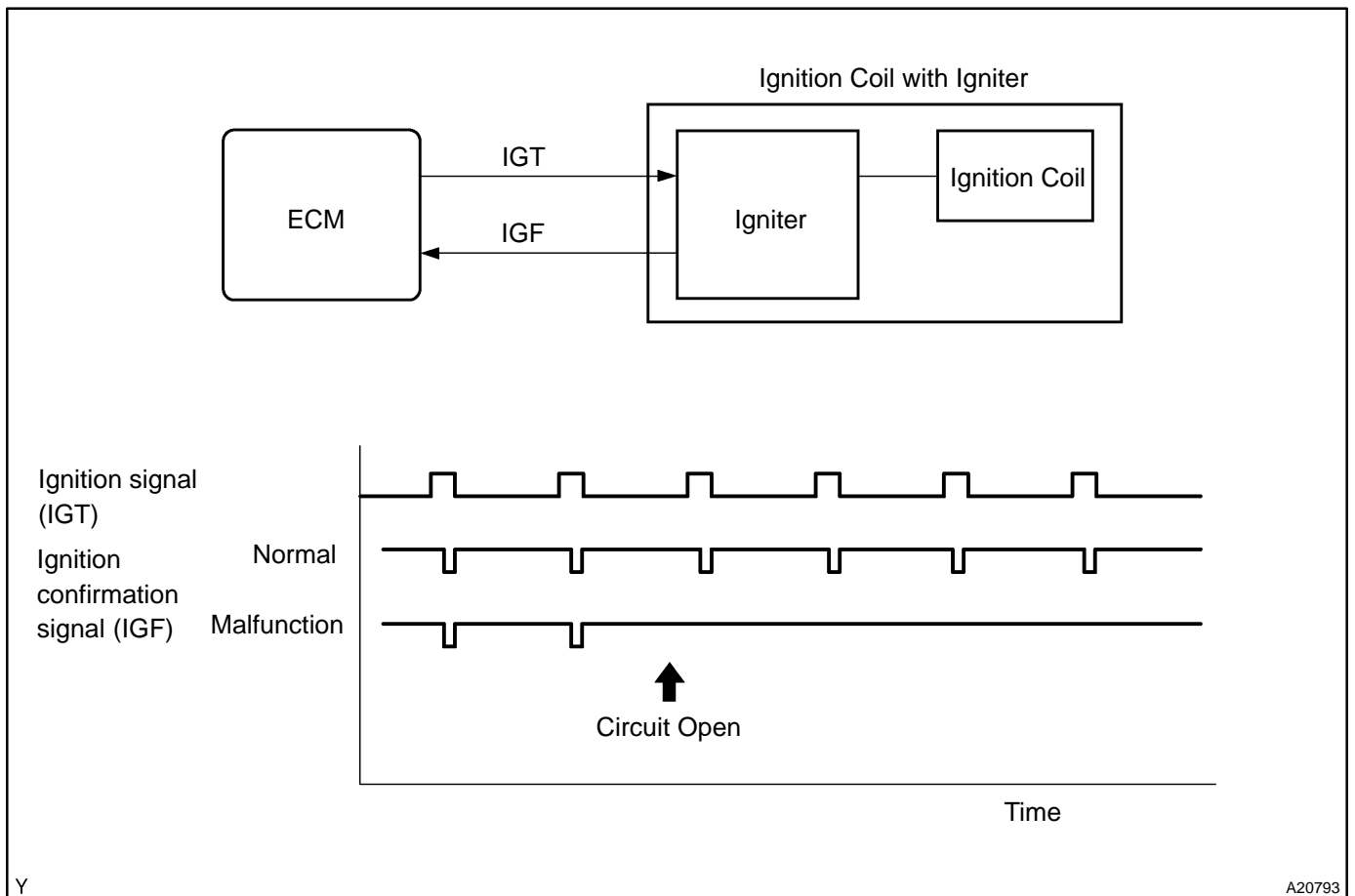
DTC No.	DTC Detecting Condition	Trouble Area
P0351 P0352 P0353 P0354 P0355 P0356 P0357 P0358	No IGF signal to ECM while engine is running	<ul style="list-style-type: none"> • Open or short in IGF1 or IGF2 and IGT1 to IGT8 circuit from ignition coil with igniter to ECM • No. 1 to No. 8 ignition coil with igniter (primary ignition) • Ignition system • ECM



Reference: Inspection using the oscilloscope.

During cranking or idling, check the waveform between terminals IG1 to IG8 and E1, and IGF1, IGF2 and E1 of the E5 and E7 ECM connectors.

MONITOR DESCRIPTION



If the ECM does not receive the IGF after sending the IGT it interprets this as a fault in the igniter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0351	No. 1 ignition coil with igniter circuit malfunction
	P0352	No. 2 ignition coil with igniter circuit malfunction
	P0353	No. 3 ignition coil with igniter circuit malfunction
	P0354	No. 4 ignition coil with igniter circuit malfunction
	P0355	No. 5 ignition coil with igniter circuit malfunction
	P0356	No. 6 ignition coil with igniter circuit malfunction
	P0357	No. 7 ignition coil with igniter circuit malfunction
	P0358	No. 8 ignition coil with igniter circuit malfunction
Required sensors/components	Igniter	
Frequency of operation	Continuous	
Duration	0.256 sec. + 4 sparks	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Either of the following conditions is met:	Condition 1 or 2	
1. Engine speed	–	1,500 rpm
2. Starter	OFF	
Either of the following conditions is met:	Condition (a) or (b)	
(a) All of the following conditions are met	–	
Engine speed	–	500 rpm
Battery voltage	6 V	–
(b) All of the following conditions are met	–	
Engine speed	500 rpm	–
Battery voltage	10 V	–
Number of sparks after CPU is reset	5 sparks	–

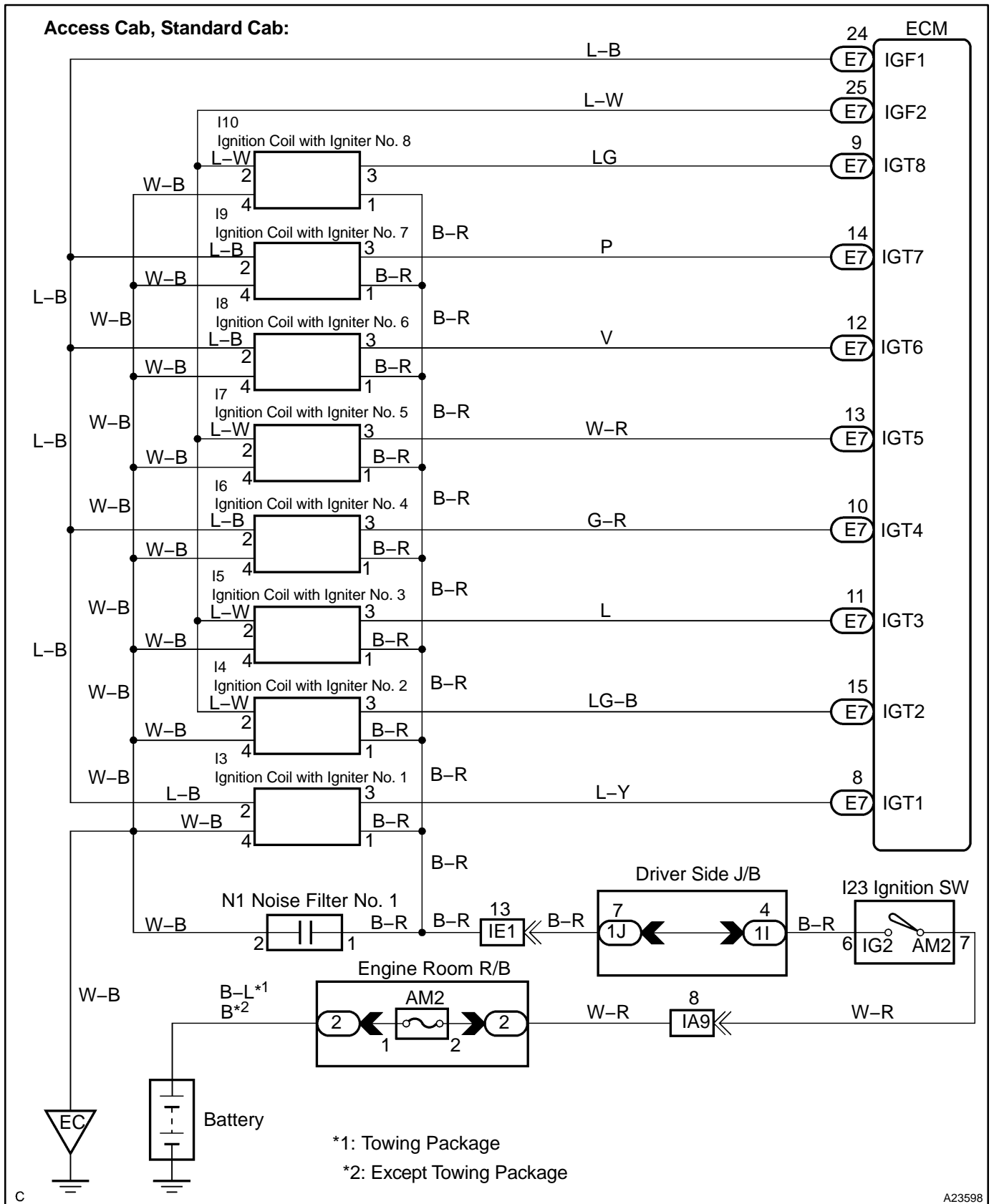
TYPICAL MALFUNCTION THRESHOLDS

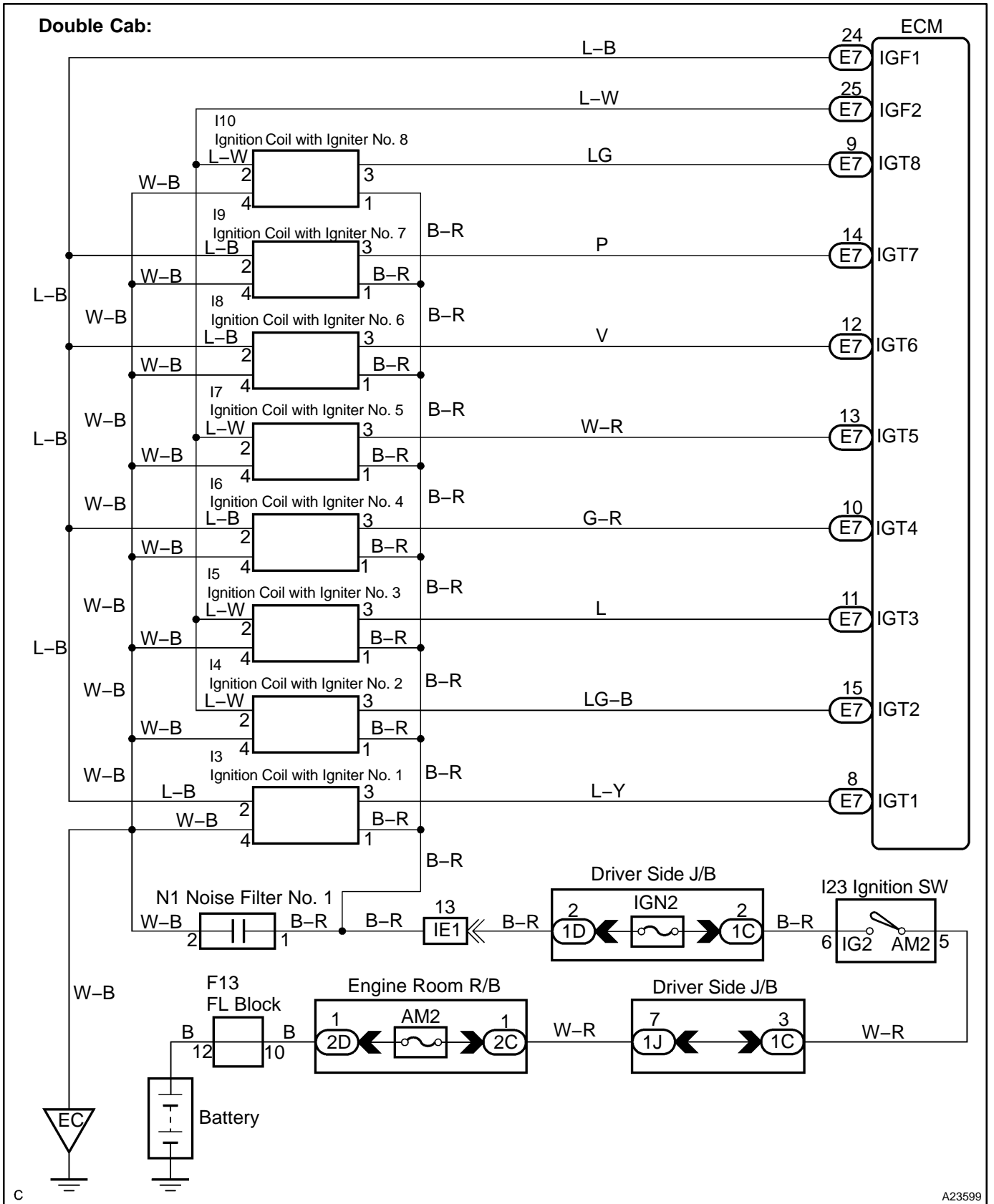
Detection Criteria	Threshold
"Ignition signal fail count"	More than 2 times
"Ignition signal fail count" is on the right:	When IGF does not return despite sending IGT.

COMPONENT OPERATING RANGE

Standard Value
Confirmed signal number = ignition signal number

WIRING DIAGRAM



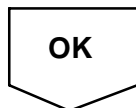
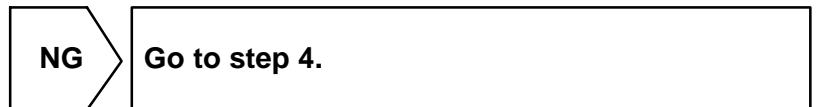


INSPECTION PROCEDURE

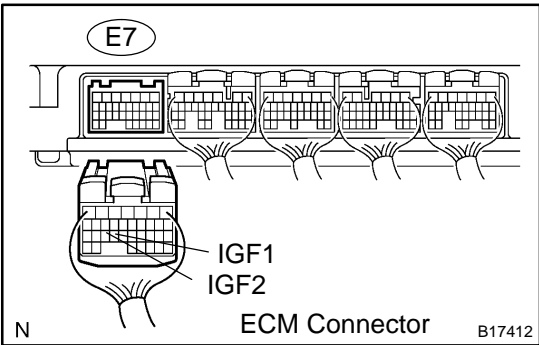
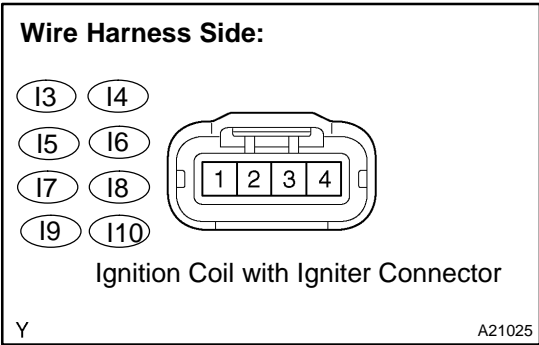
HINT:

- If DTCs P0351, P0354, P0356 and P0357 are output simultaneously, IGF1 circuit may be open or short.
- If DTCs P0352, P0353, P0355 and P0358 are output simultaneously, IGF2 circuit may be open or short.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check spark plug and spark (See page IG-1).
----------	--



2 Check for open and short in harness and connector in IGF signal circuits between ECM and ignition coil with igniter.



PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7, I8, I9 or I10 ignition coil with igniter connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:

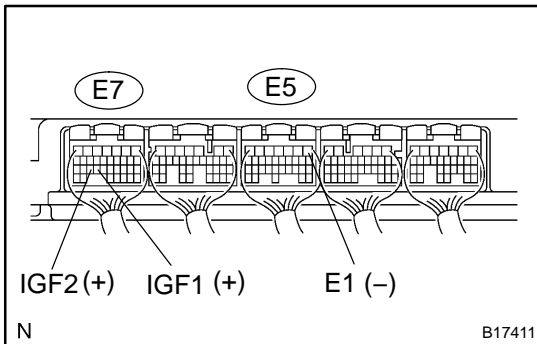
Standard:

Tester Connection	Specified Condition
Ignition coil (I3-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I4-2) - IGF2 (E7-25)	Below 1 Ω
Ignition coil (I5-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I6-2) - IGF2 (E7-25)	Below 1 Ω
Ignition coil (I7-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I8-2) - IGF2 (E7-25)	Below 1 Ω
Ignition coil (I9-2) - IGF1 (E7-24)	Below 1 Ω
Ignition coil (I10-2) - IGF2 (E7-25)	Below 1 Ω
Ignition coil (I3-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I4-2) or IGF2 (E7-25) - Body ground	10 kΩ or higher
Ignition coil (I5-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I6-2) or IGF2 (E7-25) - Body ground	10 kΩ or higher
Ignition coil (I7-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I8-2) or IGF2 (E7-25) - Body ground	10 kΩ or higher
Ignition coil (I9-2) or IGF1 (E7-24) - Body ground	10 kΩ or higher
Ignition coil (I10-2) or IGF2 (E7-25) - Body ground	10 kΩ or higher

NG **Repair or replace harness or connector.**

OK

- 3 Disconnect ignition coil with igniter connector, and check voltage between terminals IGF1, IGF2 and E1 of ECM connector.**

**PREPARATION:**

- (a) Disconnect the I3, I4, I5, I6, I7, I8, I9 or I10 ignition coil with igniter connector.
 (b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the E7 and E5 ECM connectors.

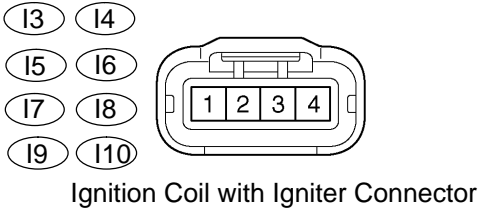
OK:**Standard:**

Tester Connection	Specified Condition
IGF1 (E7-24) - E1 (E5-1)	4.5 to 5.5 V
IGF2 (E7-25) - E1 (E5-1)	4.5 to 5.5 V

NG**Replace ECM (See page SF-82).****OK****Replace ignition coil with igniter.**

4 Check for open and short in harness and connector in IGT signal circuit between ECM and ignition coil with igniter.

Wire Harness Side:



Y A21025

PREPARATION:

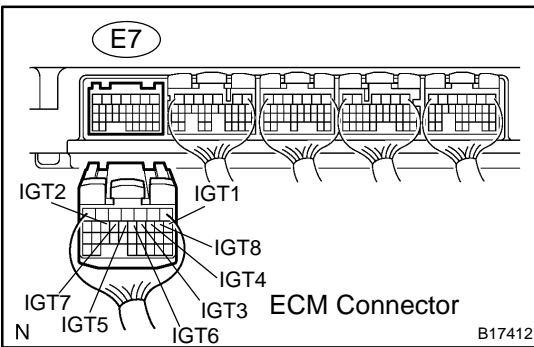
- (a) Disconnect the I3, I4, I5, I6, I7, I8, I9 or I10 ignition coil connector.
- (b) Disconnect the E7 ECM connector.

CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:



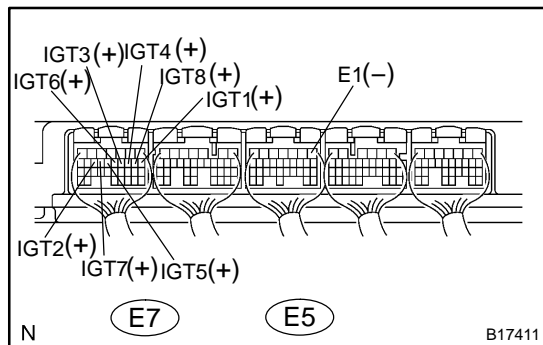
B17412

Tester Connection	Specified Condition
Ignition coil (I3-2) - IGT1 (E7-8)	Below 1 Ω
Ignition coil (I4-2) - IGT2 (E7-15)	Below 1 Ω
Ignition coil (I5-2) - IGT3 (E7-11)	Below 1 Ω
Ignition coil (I6-2) - IGT4 (E7-10)	Below 1 Ω
Ignition coil (I7-2) - IGT5 (E7-13)	Below 1 Ω
Ignition coil (I8-2) - IGT6 (E7-12)	Below 1 Ω
Ignition coil (I9-2) - IGT7 (E7-14)	Below 1 Ω
Ignition coil (I10-2) - IGT8 (E7-9)	Below 1 Ω
Ignition coil (I3-2) or IGT1 (E7-8) - Body ground	10 kΩ or higher
Ignition coil (I4-2) or IGT2 (E7-15) - Body ground	10 kΩ or higher
Ignition coil (I5-2) or IGT3 (E7-11) - Body ground	10 kΩ or higher
Ignition coil (I6-2) or IGT4 (E7-10) - Body ground	10 kΩ or higher
Ignition coil (I7-2) or IGT5 (E7-13) - Body ground	10 kΩ or higher
Ignition coil (I8-2) or IGT6 (E7-12) - Body ground	10 kΩ or higher
Ignition coil (I9-2) or IGT7 (E7-14) - Body ground	10 kΩ or higher
Ignition coil (I10-2) or IGT8 (E7-9) - Body ground	10 kΩ or higher

NG

Repair or replace harness or connector.

OK

5 Check voltage between terminals IGT1 – IGT8 and E1 of ECM connector.
**PREPARATION:**

Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminals the E7 and E5 ECM connectors when the engine is cranked.

OK:**Standard:**

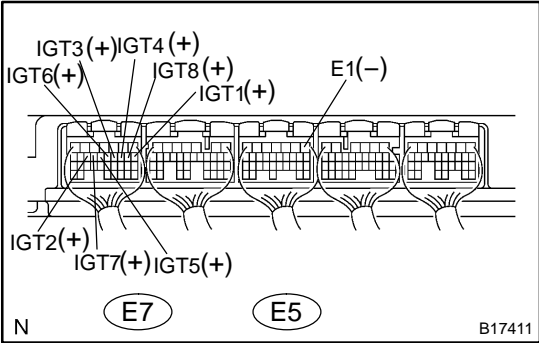
Tester Connection	Specified Condition
IGT1 (E7-8) – E1 (E5-1)	More than 0.1 V or less than 4.5 V
IGT2 (E7-15) – E1 (E5-1)	More than 0.1 V or less than 4.5 V
IGT3 (E7-11) – E1 (E5-1)	More than 0.1 V or less than 4.5 V
IGT4 (E7-10) – E1 (E5-1)	More than 0.1 V or less than 4.5 V
IGT5 (E7-13) – E1 (E5-1)	More than 0.1 V or less than 4.5 V
IGT6 (E7-12) – E1 (E5-1)	More than 0.1 V or less than 4.5 V
IGT7 (E7-14) – E1 (E5-1)	More than 0.1 V or less than 4.5 V
IGT8 (E7-9) – E1 (E5-1)	More than 0.1 V or less than 4.5 V

NG

Replace ECM (See page SF-82).

OK

6 Disconnect ignition coil with igniter connector, and check voltage between terminals IGT1 - IGT8 and E1 of ECM connector.



PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7, I8, I9 or I10 ignition coil with igniter connector.
- (b) Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminals the E5 and E7 ECM connectors when the engine is cranked.

OK:

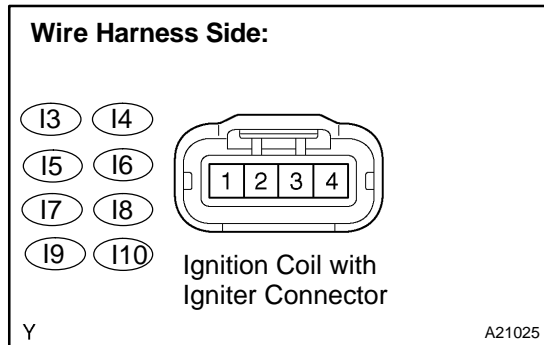
Standard:

Tester Connection	Specified Condition
IGT1 (E7-8) - E1 (E5-1)	4.5 V or more
IGT2 (E7-15) - E1 (E5-1)	4.5 V or more
IGT3 (E7-11) - E1 (E5-1)	4.5 V or more
IGT4 (E7-10) - E1 (E5-1)	4.5 V or more
IGT5 (E7-13) - E1 (E5-1)	4.5 V or more
IGT6 (E7-12) - E1 (E5-1)	4.5 V or more
IGT7 (E7-14) - E1 (E5-1)	4.5 V or more
IGT8 (E7-9) - E1 (E5-1)	4.5 V or more

NG Replace ECM (See page [SF-82](#)).

OK

7 Check ignition coil with igniter power source circuit.



PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7, I8, I9 or I10 ignition coil with igniter connector.
- (b) Turn the ignition switch to ON.

CHECK:

Measure the voltage between the terminal of the wire harness side connector and body ground.

OK:

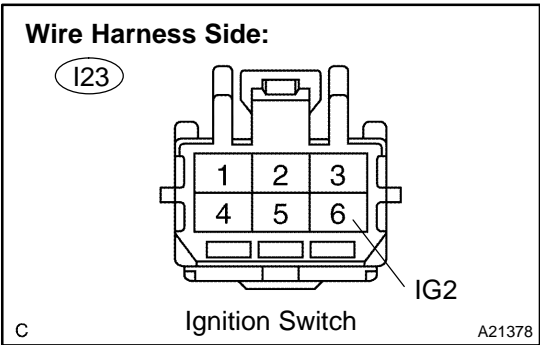
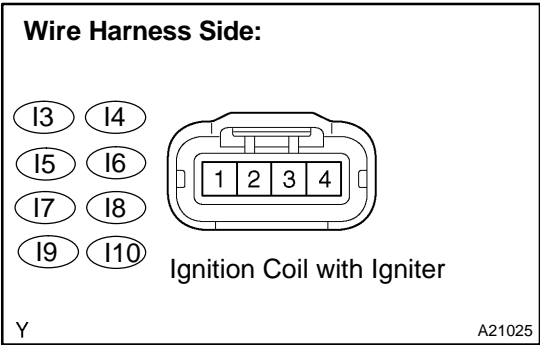
Standard:

Tester Connection	Specified Condition
I3-1 - Body ground	9 to 14 V
I4-1 - Body ground	
I5-1 - Body ground	
I6-1 - Body ground	
I7-1 - Body ground	
I8-1 - Body ground	
I9-1 - Body ground	
I10-1 - Body ground	

OK Repair ignition coil with igniter.

NG

8 Check for open and short in harness and connector between ignition switch and ignition coil with igniter.



PREPARATION:

- (a) Disconnect the I3, I4, I5, I6, I7, I8, I9 or I10 ignition coil with igniter connector.
- (b) Disconnect the I23 ignition switch connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
Ignition coil (I3-1) – IG2 (I23-6)	Below 1 Ω
Ignition coil (I4-1) – IG2 (I23-6)	Below 1 Ω
Ignition coil (I5-1) – IG2 (I23-6)	Below 1 Ω
Ignition coil (I6-1) – IG2 (I23-6)	Below 1 Ω
Ignition coil (I7-1) – IG2 (I23-6)	Below 1 Ω
Ignition coil (I8-1) – IG2 (I23-6)	Below 1 Ω
Ignition coil (I9-1) – IG2 (I23-6)	Below 1 Ω
Ignition coil (I10-1) – IG2 (I23-6)	Below 1 Ω
Ignition coil (I3-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Ignition coil (I4-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Ignition coil (I5-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Ignition coil (I6-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Ignition coil (I7-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Ignition coil (I8-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Ignition coil (I9-1) or IG2 (I23-6) – Body ground	10 kΩ or higher
Ignition coil (I10-1) or IG2 (I23-6) – Body ground	10 kΩ or higher

NG **Repair or replace harness or connector.**

OK

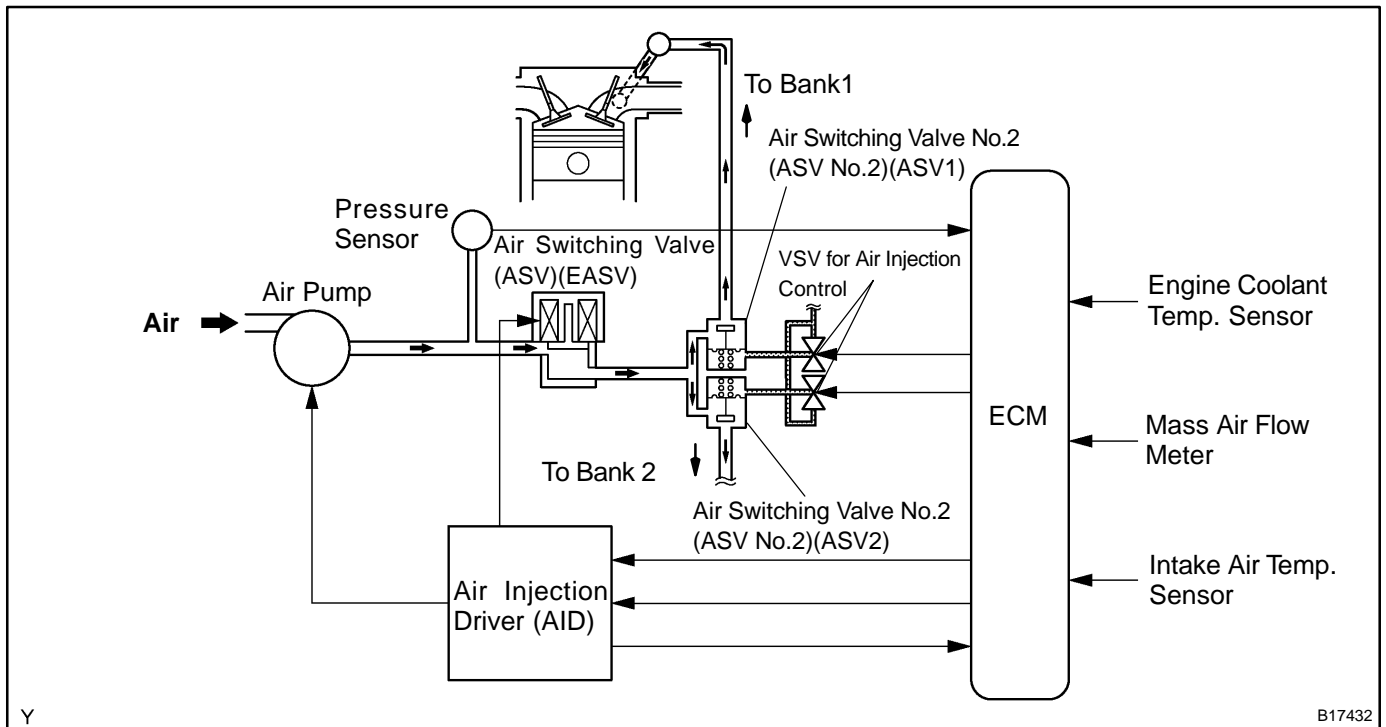
Replace ignition coil with igniter.

DTC	P0412	Secondary Air Injection System Air Switching Valve "A" Circuit
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CIRCUIT DESCRIPTION

The secondary air injection system pumps air to the exhaust port to accelerate the activation of the catalyst. The secondary air injection system consists of the ECM, air pump, Air Switching Valve (ASV) (EASV), Air Switching Valve No.2 (ASV No.2) (ASV1, 2), pressure sensor and air injection driver (AID). The Air Switching Valve (ASV)(EASV) is an electromagnetic type and Air Switching Valve No.2 (ASV No.2)(ASV1,2) is a vacuum type.

The secondary air injection system pumps pressurized air to the exhaust port by the air pump through the ASV and ASV No.2. The ASV assists the ASV No.2. The ASV No.2 also controls air supply. The ECM sends signals to the AID, and then the AID operates the air pump and ASV. The pressure sensor detects pressure and exhaust pulsation in the system when the system operates and when it does not operate, and sends the data to the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0412	All of the following conditions are met when engine is idling just after cold start (1 trip detection logic): (a) Air injection system does not operate (Air pump OFF and all ASVs OFF) (b) Air injection driver diagnostic signal duty is 40%.	<ul style="list-style-type: none"> • Open in air switching valve drive circuit • Short between air switching valve circuit and +B circuit • Air injection driver • Air switching valve • ECM
P0412	All of the following conditions are met when engine is idling just after cold start (1 trip detection logic): (a) Air injection system operates (Air pump ON and all ASVs ON) (b) Air injection driver diagnostic signal duty is 40%.	<ul style="list-style-type: none"> • Short between air switching valve circuit and body ground • Air injection driver • Air switching valve • ECM

MONITOR DESCRIPTION

The air injection driver (AID) detects an open or short in the circuit according to the voltage of the air pump terminal (VP) and electromagnetic air switching valve terminal (VV), and sends a signal as diagnostic information to the ECM.

The AID outputs the air switching valve terminal malfunction signal to the ECM if: 1) VV terminal voltage is low despite the AID receiving the command signal from the ECM to drive the air switching valve terminal or 2) VV terminal voltage is high despite the AID not receiving the command signal from the ECM.

The ECM stores the DTC based on the diagnostic signal from the AID and illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P0412	Air switching valve circuit malfunction (Secondary air injection system)
Required sensors/components	Air injection driver, Air switching valve	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Case 1:		
Air pump	Operating	
Air switching valve	Operating	
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	
Case 2:		
Air pump	Not operating	
Air switching valve	Not operating	
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1, 2:	
Diagnostic signal duty ratio from air injection driver	31 to 48 %

COMPONENT OPERATING RANGE

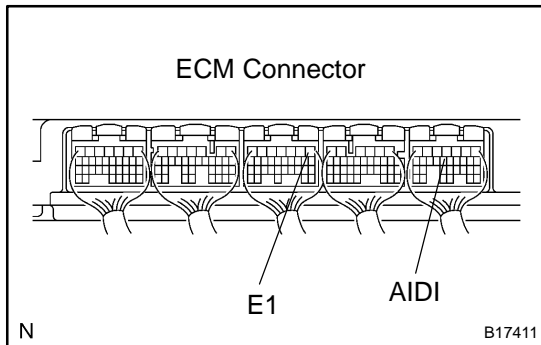
Parameter	Standard Value
Diagnostic signal duty ratio from air injection driver	70 to 90% when secondary air injection system operating and 0% when secondary air injection system not operating

INSPECTION PROCEDURE

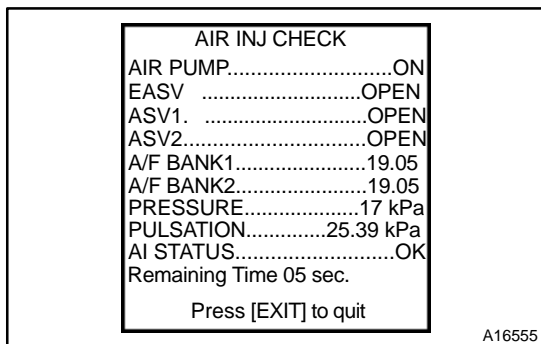
HINT:

The diagnostic information output from AID can be confirmed by connecting an oscilloscope to the diagnostic information terminal of the AID. It narrows a trouble area search to read the waveform on the oscilloscope when performing the AI system intrusive operation function provided in the SYSTEM CHECK.

- (1) Start the engine and warm it up.
- (2) Turn the ignition switch to OFF.
- (3) Connect a hand-held tester to the DLC3.



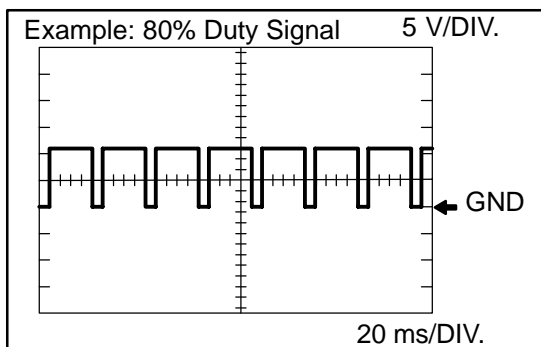
- (4) Connect an oscilloscope probe to the AIDI terminal of the ECM.
- (5) Start the engine and turn the tester ON.



- (6) On the tester, select the following menu items:
 DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / AIR INJ CHECK / MANUAL OPERATION / OPERATION 1 and 2.

HINT:

OPERATION 1: AP: OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE
 OPERATION 2: AP: ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN



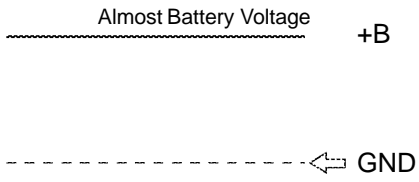
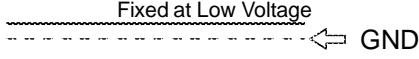
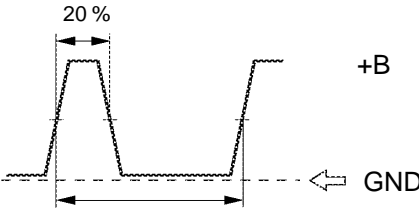
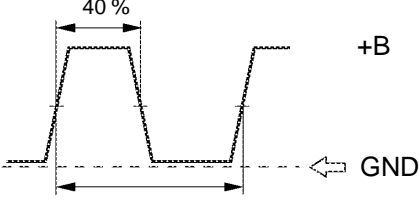
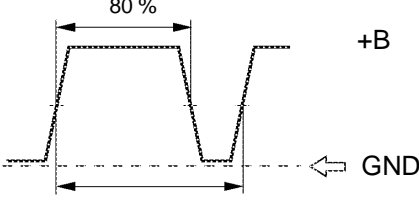
- (7) Monitor the voltage output of the AID (duty ratio signal).

Oscilloscope range:

Items	Contents
Terminals	CH1: AIDI - E1
Equipment Settings	5 V/Division, 20 to 40 ms/Division
Conditions	Idling

NOTICE:

- This AIR INJECTION CHECK only allows technicians to operate the AI system for 5 seconds. Furthermore, the check can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between checks.
 While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again.
- Performing the AIR INJ CHECK over and over again may cause the damage in the secondary air injection system. If necessary, put an interval of several minutes between tests to prevent overheating the system.

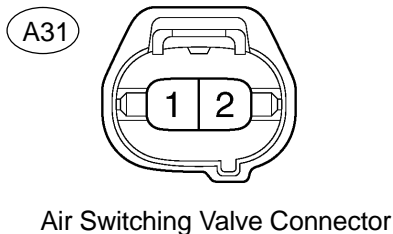
AID Diagnostic Signal Waveforms	ECM Commands	DTCs (ECM Output)	Suspected Trouble Areas
<p>100 % Duty ratio</p> 	<p>Any Air Injection (AI) System operation</p>	<p>P1613</p>	<ul style="list-style-type: none"> • Open in diagnostic signal circuit • Air Injection Control Driver (AID) • Open in AID+B circuit (AID power source) • Short between +B circuit and diagnostic signal circuit
<p>0 % Duty ratio</p> 	<p>AI System: ON (Air pump ON, ASV ON)</p>	<p>P1613</p>	<ul style="list-style-type: none"> • Open or short in air pump or Air Switching Valve (ASV) command signal circuit (ECM-AID) • Open in AID ground circuit • Short between diagnostic signal circuit and body ground • AID • ECM
	<p>AI System: OFF (Air pump OFF, ASV OFF)</p>	<p>—</p>	<p>Normal</p>
<p>20 % Duty ratio</p> 	<p>Air Pump: ON</p>	<p>P0418</p>	<p>Short between air pump drive circuit and body ground</p> <ul style="list-style-type: none"> • Harness & connector (AID-Pump) • Air Pump • AID • ECM
	<p>Air Pump: OFF</p>	<p>P0418</p>	<p>Open in air pump drive circuit (AID-Pump), or short between air pump drive circuit and +B</p> <ul style="list-style-type: none"> • Harness & connector (AID-Pump) • Air Pump • AID • ECM
<p>40 % Duty ratio</p> 	<p>ASV: ON</p>	<p>P0412</p>	<p>Short between ASV drive circuit and body ground</p> <ul style="list-style-type: none"> • Harness & connector (AID-ASV) • ASV • AID • ECM
	<p>ASV: OFF</p>	<p>P0412</p>	<p>Open in ASV drive circuit (AID-ASV), or short between ASV drive circuit and +B</p> <ul style="list-style-type: none"> • Harness & connector (AID-ASV) • AID • ASV • ECM
<p>80 % Duty ratio</p> 	<p>AI System: OFF (Air pump OFF, ASV OFF)</p>	<p>P1613</p>	<ul style="list-style-type: none"> • AID • ECM
	<p>AI System: ON (Air pump ON, ASV ON)</p>	<p>—</p>	<p>Normal</p>
<p>Excluding above (excluding 0, 20, 40, 80, 100 % duty)</p>	<p>—</p>	<p>P1613</p>	<ul style="list-style-type: none"> • AID • Open in AID ground circuit

HINT:

- Using the AIR INJ CHECK operation of the SYSTEM CHECK provided in the hand-held tester function, conditions for air-fuel ratio and pressure in the secondary air injection system passage can be checked while the secondary air injection system operating. It helps technicians to troubleshoot the system when it malfunctioning.
- Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Check voltage between terminal 1 of air switching valve connector and body ground.
----------	---

Wire Harness Side:

**PREPARATION:**

- Remove the intake manifold (see page EM-36).
- Disconnect the A31 air switching valve connector.
- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and turn the tester ON.

CHECK:

- When the air switching valve is operated using the hand-held tester, measure voltage between terminal A31-1 of the air switching valve connector and body ground.
- Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/ MANUAL OPERATION/OPERATION 1 and 4

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 4: AP:OFF, EASV:OPEN, ASV1:CLOSE, ASV2:CLOSE

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:**Standard:**

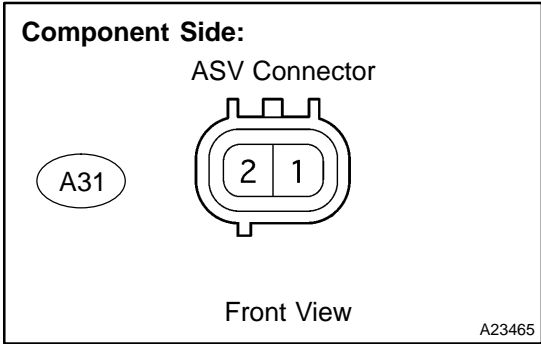
Tester operation	Tester Connection	Specified Condition
Operation 4	A31-1 – Body ground	10 V or more
Operation 1	A31-1 – Body ground	Below 1.0 V

NG

Go to step 4.

OK

2 Check air switching valve.



PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the ASV connector.

CHECK:

Measure the resistance of the ASV.

OK:

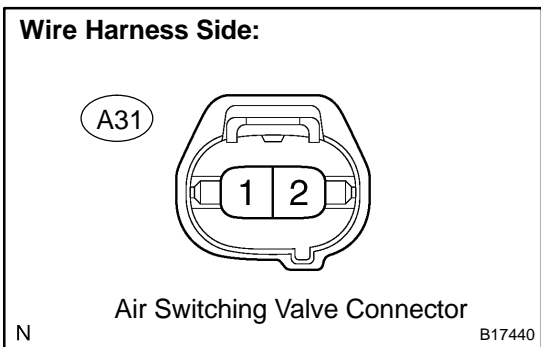
Standard:

Tester Connections	Specified Conditions
ASV (B13-1) – ASV (B13-2)	4.5 to 5.5 Ω

NG → **Replace air switching valve.**

OK

3 Check for open in harness and connector between air switching valve and body ground.



PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the A31 air switching valve connector.

CHECK:

Check the resistance between the wire harness side connectors and body ground.

OK:

Standard:

Tester Connection	Specified Condition
A31-2 – Body ground	Below 1 Ω

NG → **Repair or replace harness or connector.**

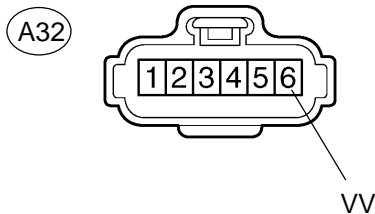
OK

Check for intermittent problems (See page [DI-430](#)).

4 Check for open and short in harness and connector between air injection driver and air switching valve.

Wire Harness Side:

Air Injection Driver Connector



N

B17444

PREPARATION:

- Remove the intake manifold (see page [EM-36](#)).
- Disconnect the A32 air injection driver connector.
- Disconnect the A31 air switching valve connector.

CHECK:

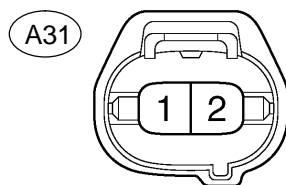
Check the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VV (A32-6) - A31-1	Below 1 Ω
VV (A32-6) or A31-1 - Body ground	10 k Ω or higher

Wire Harness Side:



Air Switching Valve Connector

N

B17440

NG

Repair or replace harness or connector.

OK

Replace air injection driver.

DTC	P0418	Air Injection System Air Pump Malfunction
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0412 on page [DI-656](#).

DTC No.	DTC Detection Condition	Trouble Area
P0418	All of the following conditions are met, when idling just after cold start. (1 trip detection logic): (a) Air injection system not operate (b) Air injection driver outputs air pump malfunction signal (20% duty signal)	<ul style="list-style-type: none"> • Open in air pump drive circuit • Short between air pump circuit and +B circuit • Air injection driver • ECM
P0418	All of the following conditions are met, when idling just after cold start. (1 trip detection logic): (a) Air injection system operates (b) Air injection driver outputs air pump malfunction signal (20% duty signal)	<ul style="list-style-type: none"> • Short between air pump circuit and body ground • Air injection driver • ECM

MONITOR DESCRIPTION

Air Injection Driver (AID) detects an open or short in the air pump and Air Switching Valve (ASV) circuit according to the terminal voltage and sends a signal as diagnostic information to the ECM.

When the air injection system operation is required while the engine is warming up, the ECM transmits command signals to the AID to drive the air pump and ASV.

The AID inputs the command signal from ECM if: 1) VP terminal voltage is low despite the AID inputting the command signal from the ECM to drive the ASV or 2) VP terminal voltage is high despite the AID not inputting the command signal from the ECM.

The ECM sets the DTC based on the diagnostic information from the AID.

MONITOR STRATEGY

Related DTCs	P0418	Air pump range check
Required sensors/components	Air injection driver, Air pump	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Case 1:		
Air pump	Operating	
Air switching valve	Operating	
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	
Case 2:		
Air pump	Not operating	
Air switching valve	Not operating	
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1, 2:	
Diagnostic signal duty ratio from air injection driver	11 to 29 %

COMPONENT OPERATING RANGE

Parameter	Standard Value
Diagnostic signal duty ratio from air injection driver	70 to 90% when secondary air injection system operating and 0% when secondary air injection system not operating

WIRING DIAGRAM

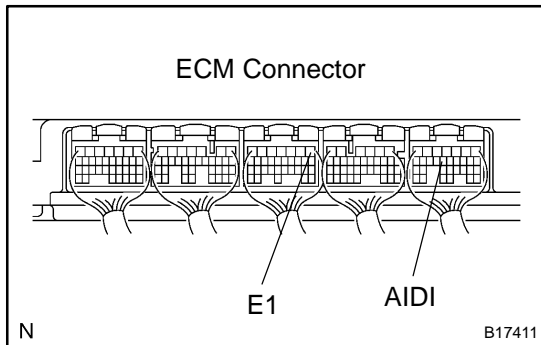
Refer to DTC P0412 on page [DI-656](#).

INSPECTION PROCEDURE

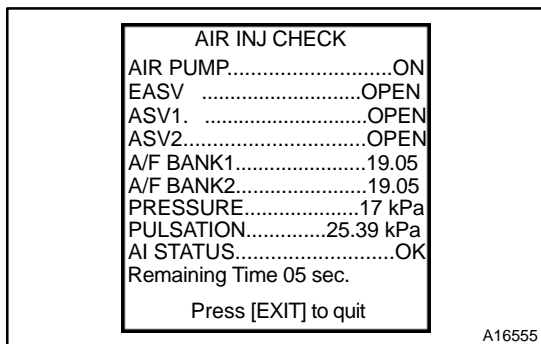
HINT:

The diagnostic information output from the AID can be confirmed by connecting an oscilloscope to the diagnostic information terminal of the AID. It narrows the trouble area search to read the waveform on the oscilloscope when performing the AI system intrusive operation function provided in the SYSTEM CHECK.

- (1) Start the engine and warm it up.
- (2) Turn the ignition switch to OFF.
- (3) Connect a hand-held tester to the DLC3.



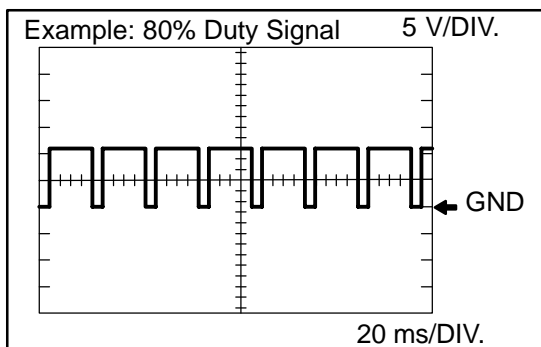
- (4) Connect an oscilloscope probe to the AIDI terminal of the ECM.
- (5) Start the engine and turn the tester ON.
- (6) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / AIR INJ SYSTEM.



- (7) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / AIR INJ CHECK / MANUAL OPERATION / OPERATION 1 and 2.

HINT:

OPERATION 1: AP: OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE
 OPERATION 2: AP: ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN



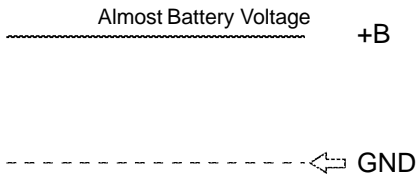
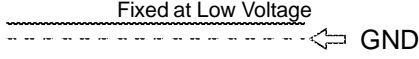
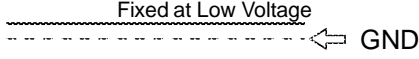
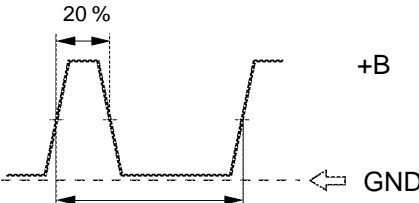
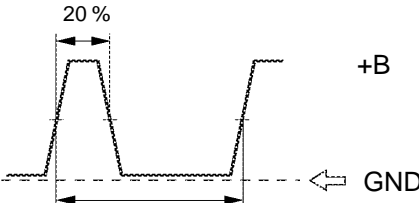
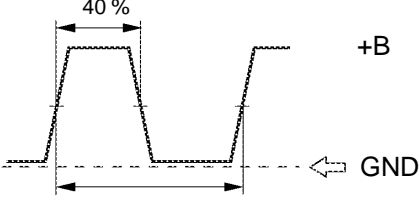
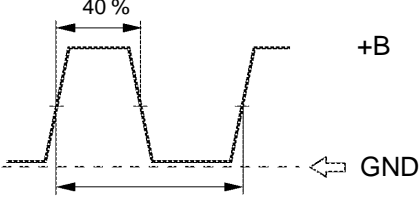
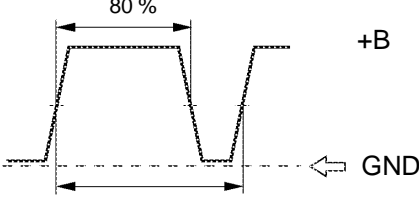
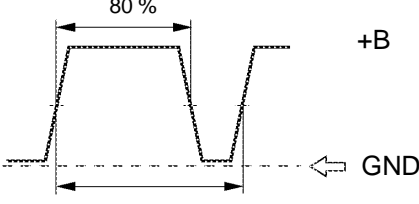
- (8) Monitor the voltage output of the AID (duty ratio signal).

Oscilloscope range:

Items	Contents
Terminals	CH1: AIDI - E1
Equipment Settings	5 V/Division, 20 to 40 ms/Division
Conditions	Idling

NOTICE:

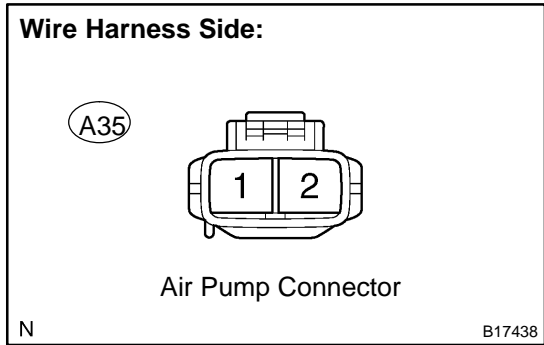
- This AIR INJECTION CHECK only allows technicians to operate the AI system for 5 seconds. Furthermore, the check can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between checks.
 While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (AI STATUS NG) or ERROR. At this time stop the engine for 10 minutes and then try again.
- Performing the AIR INJ CHECK over and over again may cause the damage in the secondary air injection system. If necessary, put an interval of several minutes between tests to prevent overheating the system.

AID Diagnostic Signal Waveforms	ECM Commands	DTCs (ECM Output)	Suspected Trouble Areas
<p>100 % Duty ratio</p> 	<p>Any Air Injection (AI) System operation</p>	<p>P1613</p>	<ul style="list-style-type: none"> • Open in diagnostic signal circuit • Air Injection Control Driver (AID) • Open in AID+B circuit (AID power source) • Short between +B circuit and diagnostic signal circuit
<p>0 % Duty ratio</p> 	<p>AI System: ON (Air pump ON, ASV ON)</p>	<p>P1613</p>	<ul style="list-style-type: none"> • Open or short in air pump or Air Switching Valve (ASV) command signal circuit (ECM-AID) • Open in AID ground circuit • Short between diagnostic signal circuit and body ground • AID • ECM
<p>Fixed at Low Voltage</p> 	<p>AI System: OFF (Air pump OFF, ASV OFF)</p>	<p>—</p>	<p>Normal</p>
<p>20 % Duty ratio</p> 	<p>Air Pump: ON</p>	<p>P0418</p>	<p>Short between air pump drive circuit and body ground</p> <ul style="list-style-type: none"> • Harness & connector (AID-Pump) • Air Pump • AID • ECM
<p>20 % Duty ratio</p> 	<p>Air Pump: OFF</p>	<p>P0418</p>	<p>Open in air pump drive circuit (AID-Pump), or short between air pump drive circuit and +B</p> <ul style="list-style-type: none"> • Harness & connector (AID-Pump) • Air Pump • AID • ECM
<p>40 % Duty ratio</p> 	<p>ASV: ON</p>	<p>P0412</p>	<p>Short between ASV drive circuit and body ground</p> <ul style="list-style-type: none"> • Harness & connector (AID-ASV) • ASV • AID • ECM
<p>40 % Duty ratio</p> 	<p>ASV: OFF</p>	<p>P0412</p>	<p>Open in ASV drive circuit (AID-ASV), or short between ASV drive circuit and +B</p> <ul style="list-style-type: none"> • Harness & connector (AID-ASV) • AID • ASV • ECM
<p>80 % Duty ratio</p> 	<p>AI System: OFF (Air pump OFF, ASV OFF)</p>	<p>P1613</p>	<ul style="list-style-type: none"> • AID • ECM
<p>80 % Duty ratio</p> 	<p>AI System: ON (Air pump ON, ASV ON)</p>	<p>—</p>	<p>Normal</p>
<p>Excluding above (excluding 0, 20, 40, 80, 100 % duty)</p>	<p>—</p>	<p>P1613</p>	<ul style="list-style-type: none"> • AID • Open in AID ground circuit

HINT:

- Using the AIR INJ CHECK operation of the SYSTEM CHECK provided in the hand-held tester function, conditions for air-fuel ratio and pressure in the secondary air injection system passage can be checked while the secondary air injection system operating. It helps technicians to troubleshoot the system when it malfunctioning.
- Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1 Check voltage between terminal 2 of air pump and body ground.



PREPARATION:

- Remove the intake manifold (see page EM-36).
- Disconnect the A35 air pump connector.
- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and turn the tester ON.

CHECK:

- When the air pump is operated using the hand-held tester, measure voltage between terminal A35-2 of the air injection driver connector and body ground.
- Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/ MANUAL OPERATION/OPERATION 1 and 3

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 3: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:

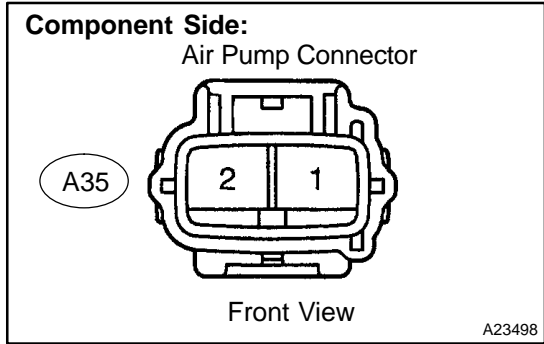
Standard:

Tester operation	Tester Connection	Specified Condition
Operation 3	A35-2 - Body ground	10 V or more
Operation 1	A35-2 - Body ground	Below 1.0 V

NG Go to step 4.

OK

2 Check air pump resistance.



PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the air pump connector.

CHECK:

Measure the resistance of the air pump.

OK:

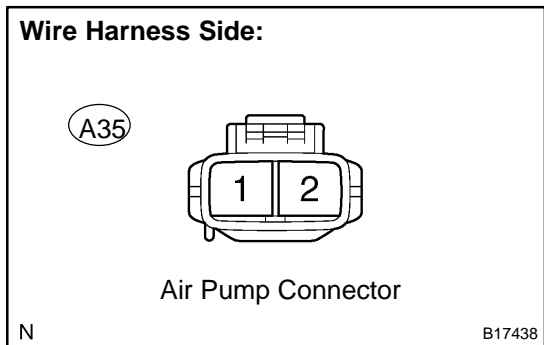
Standard:

Tester Connections	Specified Conditions
A35-1 - A35-2	0.4 to 1.0 Ω

NG → Replace air pump assembly.

OK

3 Check for open in harness and connector between air pump and body ground.



PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the A35 air pump connector.

CHECK:

Check the resistance between the wire harness side connectors and body ground.

OK:

Standard:

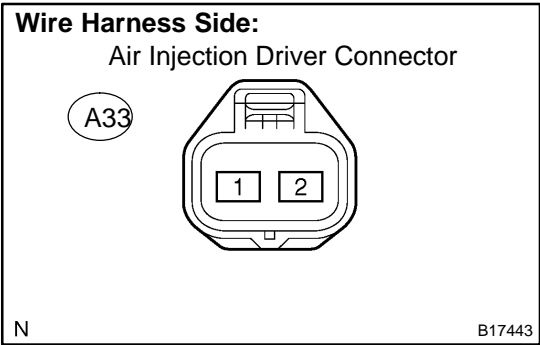
Tester Connection	Specified Condition
A35-1 - Body ground	Below 1 Ω

NG → Repair or replace harness or connector.

OK

Check for intermittent problems (See page [DI-430](#)).

4 Check for open and short in harness and connector between air injection driver and air pump.



PREPARATION:

- (a) Remove the intake manifold (see page EM-36).
- (b) Disconnect the A33 air injection driver connector.
- (c) Disconnect the A35 air pump connector.

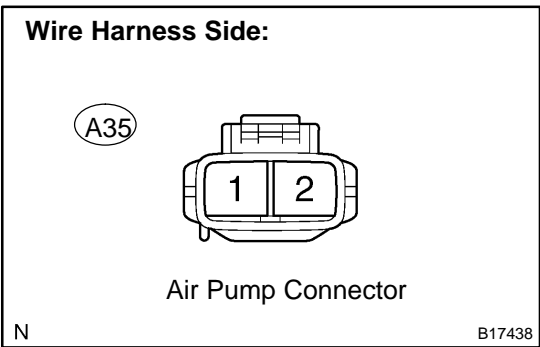
CHECK:

Check the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VP (A33-2) - A35-2	Below 1 Ω
VP (A33-2) or A35-2 - Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

Replace air injection driver.

DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)
------------	--------------	--

DTC	P0430	Catalyst System Efficiency Below Threshold (Bank 2)
------------	--------------	--

MONITOR DESCRIPTION

The ECM uses the two sensors, mounted in front of and behind the Three-way Catalytic Converter (TWC), to monitor its efficiency.

The first sensor, the Air-Fuel Ratio (A/F) sensor (sensor 1), sends pre-catalyst information to the ECM. The second sensor, the Heated Oxygen (HO2) sensor (sensor 2), sends post-catalyst information to the ECM. The ECM compares the information transmitted by these two sensors to determine the efficiency of the TWC performance and its ability to store oxygen.

When the TWC is functioning properly, the variation in the oxygen concentration in the exhaust gas, after it has passed through the TWC, is small. In this condition, the voltage output of sensor 2 slowly alternates between the rich and lean signal voltages (shown in the illustration below). As the TWC performance efficiency deteriorates, its oxygen storage capacity decreases, and the variation in the oxygen concentration in the exhaust gas increases. As a result, the sensor voltage output fluctuates frequently.

While the catalyst monitor is running, the ECM measures the signal lengths of both sensors 1 and 2, and calculates the ratio of the signal lengths to determine the extent of the TWC deterioration. If the deterioration level exceeds the preset threshold, the ECM interprets this as the TWC malfunction. The ECM then illuminates the MIL and sets the DTC.

DTC No.	DTC Detecting Condition	Trouble Area
P0420 P0430	OSC value smaller than standard value under active air-fuel ratio control (2 trip detection logic)	<ul style="list-style-type: none"> • Gas leakage on exhaust system • A/F sensor (Bank 1, 2 sensor 1) • Heated oxygen sensor (bank 1, 2 sensor 2) • Three-way catalytic converter

HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor mounted in front of the Three-Way Catalytic Converter (TWC) and located near the engine assembly.
- Sensor 2 refers to the sensor mounted behind the TWC and located far from the engine assembly.

MONITOR STRATEGY

Related DTCs	P0420	Bank 1 catalyst is deteriorated
	P0430	Bank 2 catalyst is deteriorated
Required sensors/components	Main sensors/components	Front and rear heated oxygen sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor, Engine speed sensor, Intake air temperature sensor
Frequency of operation	Once per driving cycle	
Duration	30 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Battery voltage	11 V	-
Intake air temperature	-10°C (14°F)	-
Engine coolant temperature	75°C (167°F)	-
Atmospheric pressure coefficient	0.75	-
Idle	OFF	
Engine RPM	-	3,200 rpm
A/F sensor	Activated	
Fuel system status	Closed loop	
Engine load	10 to 70 %	
All of the following conditions are met	Condition 1, 2 and 3	
1. MAF	6 to 75 g/sec	
2. Front catalyst temperature (estimated)	620 to 830°C (1,148 to 1,526°F)	
3. Rear catalyst temperature (estimated)	410 to 830°C (770 to 1,526°F)	
Rear HO2S monitor	Completed	
Shift position	4th	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Oxygen storage capacity (OSC) of catalyst	Less than 0.16 g

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

Catalyst bank 1 – Active A/F control method

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$21	\$A9	Multiply by 0.0003 (no dimension)	Oxygen storage capacity of catalyst	Minimum test limit for catalyst	Maximum test limit for catalyst

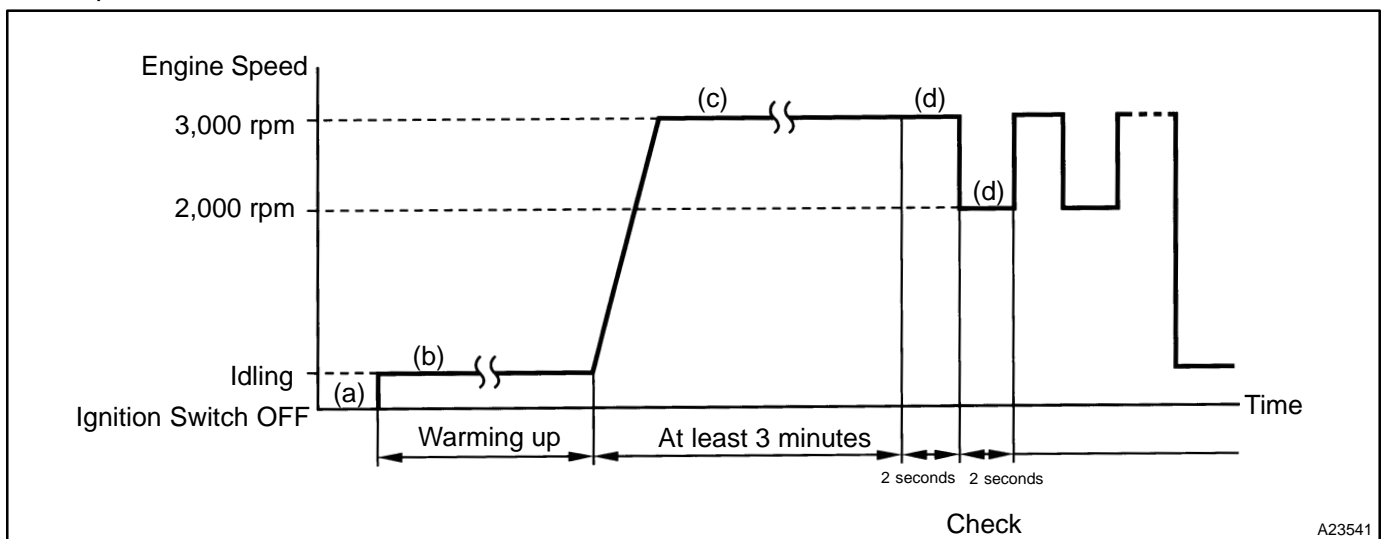
Catalyst bank 2 – Active A/F control method

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$22	\$A9	Multiply by 0.0003 (no dimension)	Oxygen storage capacity of catalyst	Minimum test limit for catalyst	Maximum test limit for catalyst

WAVEFORMS OF AIR-FUEL RATIO (A/F) AND HEATED OXYGEN (HO2) SENSORS

HINT:

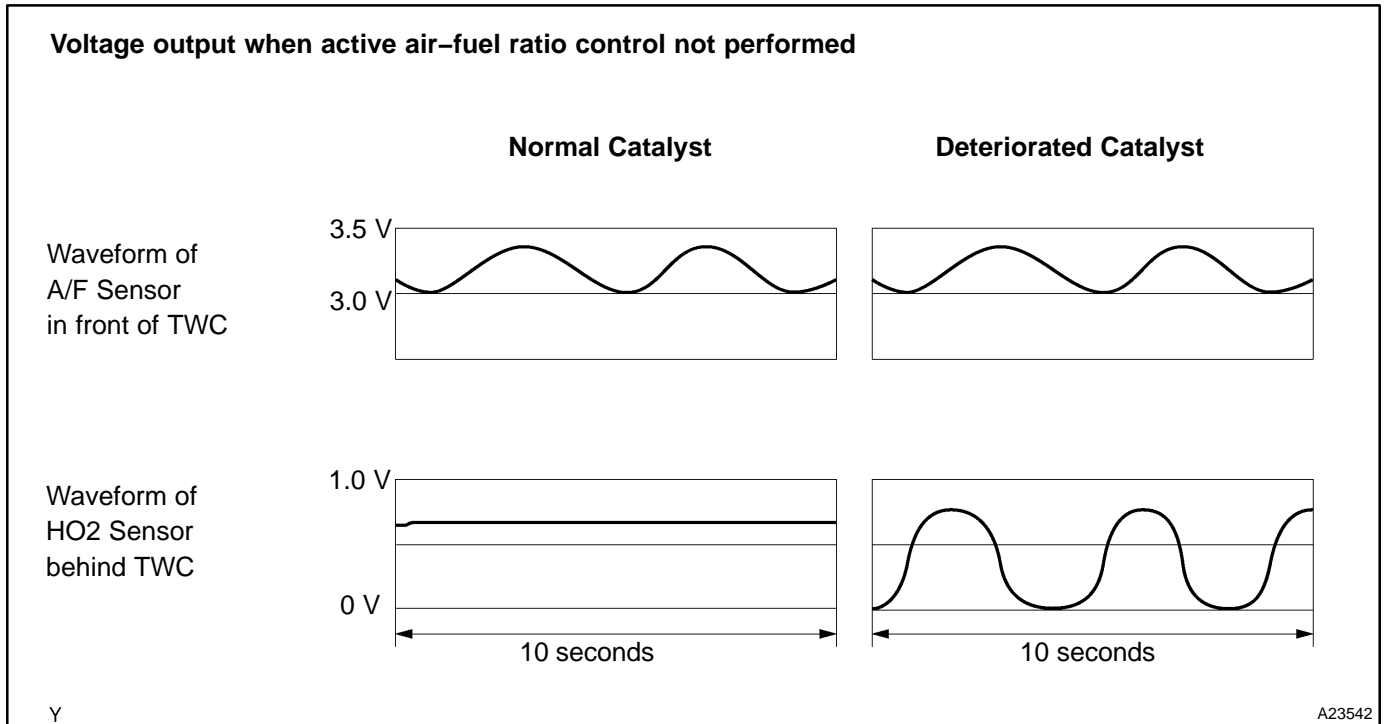
Perform the operation with the engine speeds and time durations described below prior to check the waveforms of the A/F and HO2 sensors. This is in order to activate the sensors sufficiently to obtain the appropriate inspection results.



- Connect the hand-held tester to the DLC3.
- Start the engine and warm it up with all the accessories switched OFF, until the engine coolant temperature stabilizes.
- Run the engine at an engine speed of between 2,500 rpm and 3,000 rpm for at least 3 minutes.
- After confirming that the waveform of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor (bank 1, 2 sensor 2 (OX1B, OX2B)).

HINT:

- If either of the voltage outputs of the Air-Fuel Ratio (A/F) or Heated Oxygen (HO2) sensors does not fluctuate, or either of the sensors makes a noise, the sensor may be malfunctioning.
- If the voltage outputs of both the sensors remain lean or rich, the air-fuel ratio may be extremely lean or rich. In such cases, perform the following A/F CONTROL using a hand-held tester.
- If the Three-Way Catalytic Converter (TWC) has deteriorated, the HO2 sensor (located behind the TWC) voltage output fluctuates up and down frequently, even under normal driving conditions (active air-fuel ratio control is not performed).

**A/F CONTROL**

HINT:

Hand-held tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- (1) Connect a hand-held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 and OS2 B1S2) displayed on the tester.

HINT:

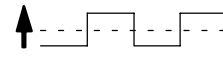
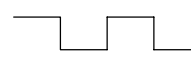
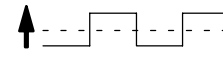
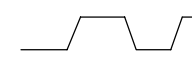
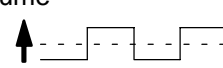

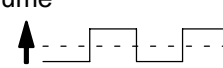
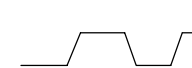
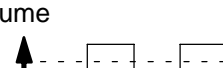

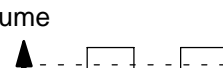

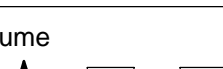

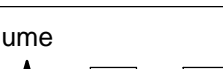

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 % ↑ -12.5 % ↓  Output voltage More than 3.35 V Less than 3.0 V  OK	Injection volume +25 % ↑ -12.5 % ↓  Output voltage More than 0.55 V Less than 0.4V  OK	—
2	Injection volume +25 % ↑ -12.5 % ↓  Output voltage Almost no reaction  NG	Injection volume +25 % ↑ -12.5 % ↓  Output voltage More than 0.55 V Less than 0.4V  OK	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 % ↑ -12.5 % ↓  Output voltage More than 3.35 V Less than 3.0V  OK	Injection volume +25 % ↑ -12.5 % ↓  Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 % ↑ -12.5 % ↓  Output voltage Almost no reaction  NG	Injection volume +25 % ↑ -12.5 % ↓  Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides DTC P0420 or P0430) being output?
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTC using the hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
"P0420 and/or P0430"	A
"P0420 or P0430" and other DTCs	B

HINT:

If any other codes besides "P0420 and/or P0430" are output, perform the troubleshooting for those DTCs first.

B
Go to relevant DTC chart (See page [DI-477](#)).

A

2	Check A/F sensor (bank 1, 2 sensor 1).
----------	---

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and turn the tester ON.
- (c) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 seconds.
- (d) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (e) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (f) Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 and O2S B1S2) displayed on the tester.

HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

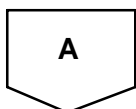
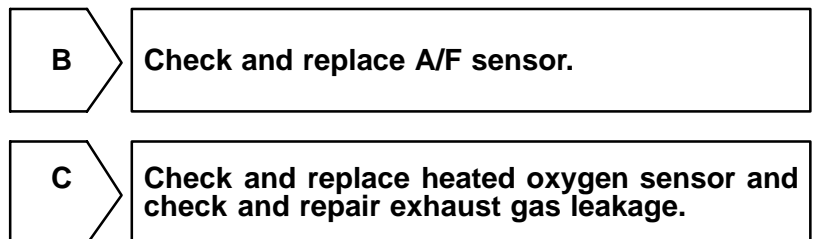
Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (HO2)	-12.5 %	Lean	Less than 0.4

RESULT:

Status A/F S1	Status O2S S2	A/F Condition and A/F and HO2 Sensors Condition	Misfires	Main Suspected Trouble Areas	Proceed To
Lean/Rich	Lean/Rich	Normal	–	<ul style="list-style-type: none"> • Three-way Catalytic Converter (TWC) • Gas leakage from exhaust system 	A
Lean	Lean/Rich	A/F sensor malfunction	–	<ul style="list-style-type: none"> • A/F sensor 	B
Rich	Lean/Rich	A/F sensor malfunction	–	<ul style="list-style-type: none"> • A/F sensor 	B
Lean/Rich	Lean	HO2 sensor malfunction	–	<ul style="list-style-type: none"> • HO2 sensor • Gas leakage from exhaust system 	C
Lean/Rich	Rich	HO2 sensor malfunction	–	<ul style="list-style-type: none"> • HO2 sensor • Gas leakage from exhaust system 	C
Lean	Lean	Actual air–fuel ratio lean	May occur	<ul style="list-style-type: none"> • Extremely rich or lean actual air–fuel ratio • Gas leakage from exhaust system 	A
Rich	Rich	Actual air–fuel ratio lean	–	<ul style="list-style-type: none"> • Extremely rich or lean actual air–fuel ratio • Gas leakage from exhaust system 	A

Lean: During A/F CONTROL, the A/F sensor output voltage (AFS) is consistently more than 3.35 V, and the HO2 sensor output voltage (O2S) is consistently less than 0.4 V.

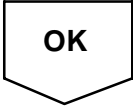
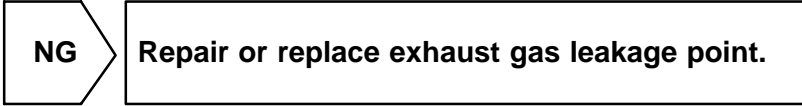
Rich: During A/F CONTROL, the AFS is consistently less than 3.0 V, and the O2S is consistently more than 0.55 V.



3	Check gas leakage on exhaust system.
----------	---

OK:

No exhaust gas leakage.



Replace front and rear three-way catalytic converter in the bank a malfunction is detected.

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow
------------	--------------	---

DTC SUMMARY

DTCs	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P0441	Purge VSV (Vacuum Switching Valve) stuck open	Vacuum pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If stabilized pressure higher than [second 0.02 inch leak pressure standard x 0.2], ECM determines that purge VSV stuck open	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (Purge VSV – ECM) • ECM • Pump module • Leakage from EVAP system 	While ignition Switch OFF	2 trip
P0441	Purge VSV stuck closed	After EVAP leak check performed, purge VSV turned ON (open), and atmospheric air introduced into EVAP system. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If pressure does not return to near atmospheric pressure, ECM determines that purge valve stuck closed	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (Purge VSV – ECM) • ECM • Pump module • Leakage from EVAP system 	While ignition Switch OFF	2 trip
P0441	Purge flow	While engine running, following conditions successively met: <ul style="list-style-type: none"> • Negative pressure not created in EVAP system when purge VSV turned ON (open) • EVAP system pressure change less than 0.5 kPa (3.75 mmHg) when vent valve turned ON (closed) • Atmospheric pressure change before and after purge flow monitor less than 0.1 kPa (0.75 mmHg) 	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (Purge VSV – ECM) • Leakage from EVAP line (Purge VSV – Intake manifold) • ECM 	While engine running	2 trip

CIRCUIT DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) Inspection Procedure (see page [DI-884](#)).

MONITOR DESCRIPTION

The two monitors, Key-Off and Purge Flow, are used to detect malfunctions relating to DTC P0441. The Key-Off monitor is initiated by the ECM internal timer, known as the soak timer, 5 hours* after the ignition switch is turned to OFF. The purge flow monitor runs while the engine is running.

1. KEY-OFF MONITOR

5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

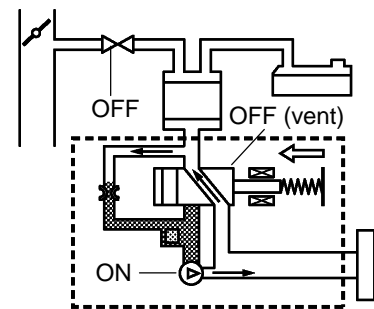
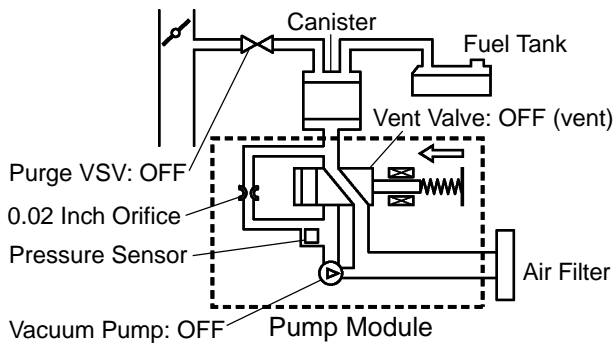
HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

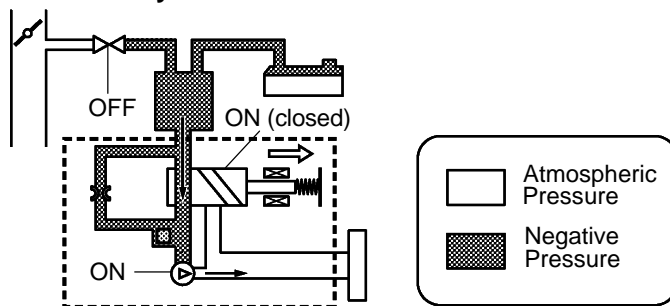
Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.

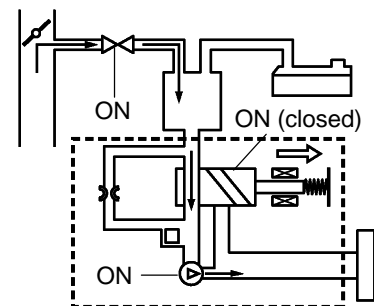
Operation A: Atmospheric Pressure Measurement Operation B, E: 0.02 Inch Leak Pressure Measurement



Operation C: EVAP System Pressure Measurement



Operation D: Purge VSV monitor



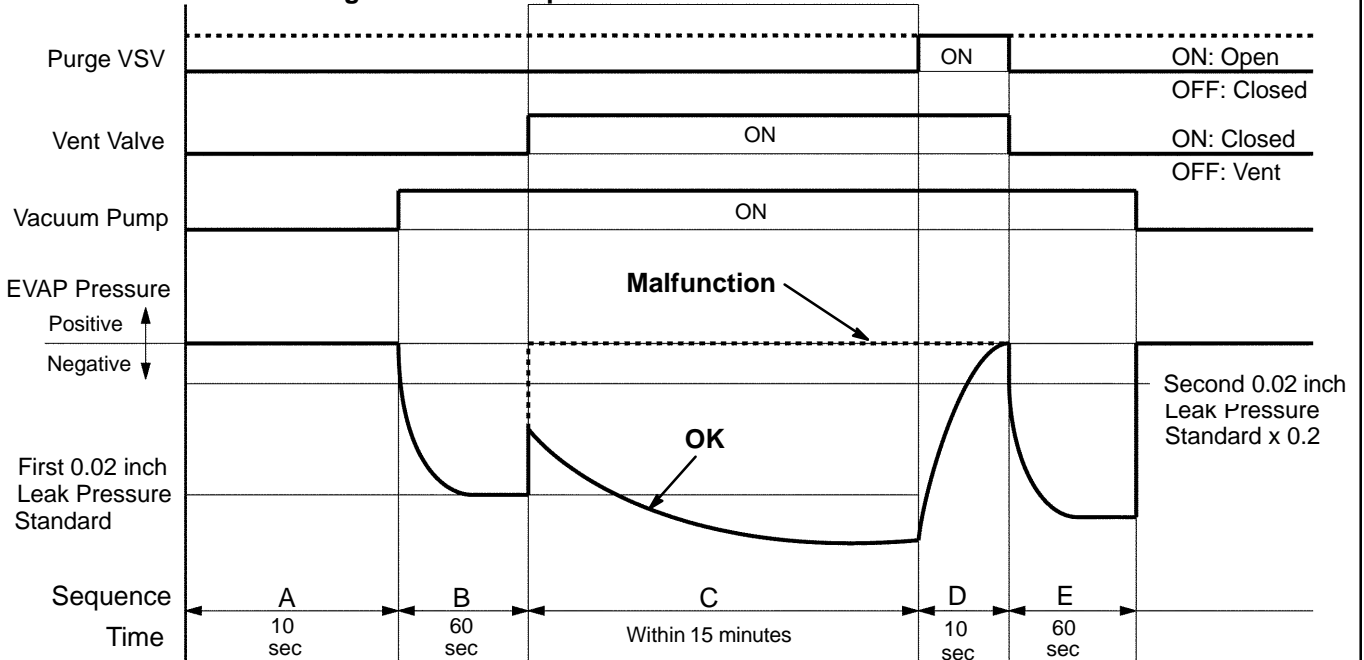
Y

A23480

(a) Purge VSV stuck open

In operation C, the vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The EVAP system pressure is then measured by the ECM using the pressure sensor. If the stabilized system pressure is higher than [second 0.02 inch leak pressure standard x 0.2], the ECM interprets this as the purge VSV (Vacuum Switching Valve) being stuck open. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).

EVAP Pressure when Purge VSV Stuck Open:

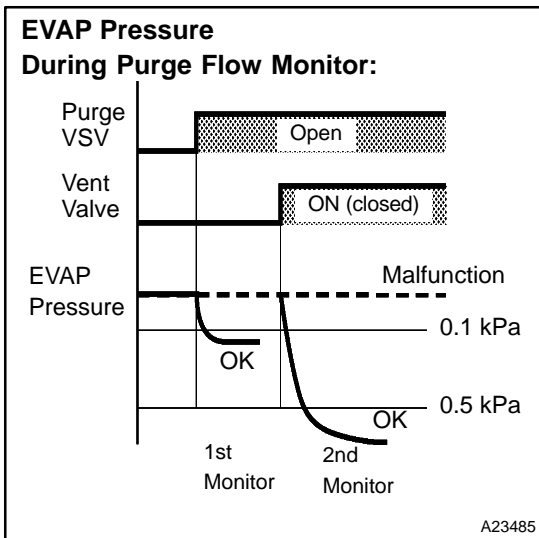
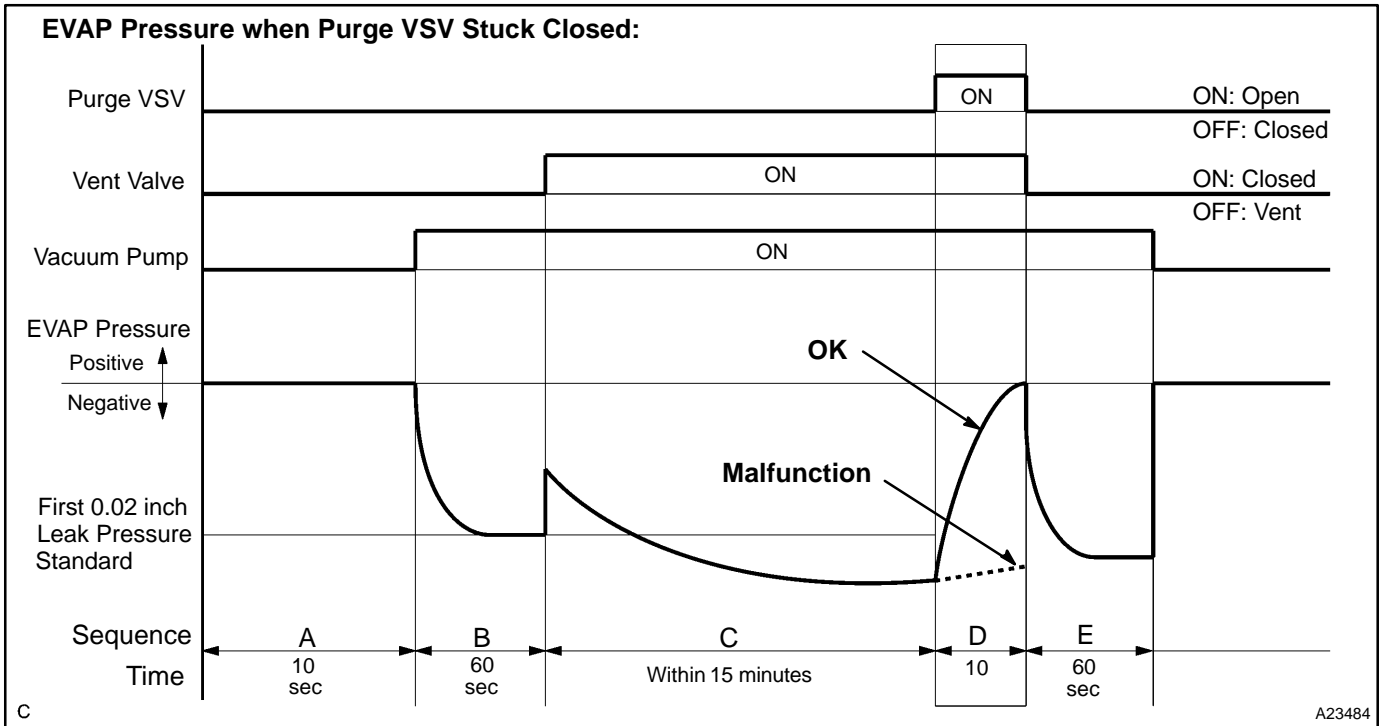


C

A23483

(b) Purge VSV stuck closed

In operation D, the pressure sensor measures the EVAP system pressure. The pressure measurement for purge VSV monitor is begun when the purge VSV is turned ON (open) after the EVAP leak check. When the measured pressure indicates an increase of 0.3 kPa (2.25 mmHg) or more, the purge VSV is functioning normally. If the pressure does not increase, the ECM interprets this as the purge VSV being stuck closed. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).



2. PURGE FLOW MONITOR

The purge flow monitor consists of the two step monitors. The 1st monitor is conducted every time and the 2nd monitor is activated if necessary.

- The 1st monitor
While the engine is running and the purge VSV (Vacuum Switching Valve) is ON (open), the ECM monitors the purge flow by measuring the EVAP pressure change. If negative pressure is not created, the ECM begins the 2nd monitor.
- The 2nd monitor
The vent valve is turned ON (closed) and the EVAP pressure is then measured. If the variation in the pressure is less than 0.5 kPa (3.75 mmHg), the ECM interprets this as the purge VSV being stuck closed, and illuminates the MIL and sets DTC P0441 (2 trip detection logic).

Atmospheric pressure check:

In order to ensure reliable malfunction detection, the variation between the atmospheric pressures, before and after conduction of the purge flow monitor, is measured by the ECM.

MONITOR STRATEGY

Related DTCs	P0441	Purge VSV stuck open
		Purge VSV stuck closed
		Purge flow
Required sensors/components	Purge VSV, Pump module	
Frequency of operation	Once per driving cycle	
Duration	Purge VSV stuck open and closed: Within 15 min. (varies with amount of fuel in tank) Purge flow: Within 10 min.	
MIL operation	2 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Purge VSV stuck open and closed:		
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	-
Vehicle speed	-	2.5 mph (4 km/h)
Ignition switch	OFF	
Time after key off	5 or 7 or 9.5 hours	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions 1 and 2 set before key off	-	
1. Duration that vehicle has been driven	5 min.	-
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Key-off monitor sequence	1 to 8	
1. Atmospheric pressure	-	
Next sequence is run if the following condition is set	-	
Atmospheric pressure change	-	0.3 kPa (2.25 mmHg)
2. First reference pressure measurement	-	
Next sequence is run if the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.38 to -7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	

DIAGNOSTICS – ENGINE (2UZ-FE)

3. EVAP canister vent valve close stuck check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	–
4. Vacuum introduction	–	
Next sequence is run if the following condition is set	–	
EVAP pressure	Saturated within 15 minutes	
5. EVAP canister purge valve close stuck check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	–
6. Second reference pressure measurement	–	
Next sequence is run if the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure	–	–1 kPa (–7.5 mmHg)
2. Reference pressure	–4.85 to –1.057 kPa (–36.38 to –7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	
4. Difference between first reference pressure and second reference pressure	–	0.7 kPa (5.25 mmHg)
7. Leak check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure when vacuum introduction is complete	–	Second reference pressure
8. Atmospheric pressure measurement	–	
EVAP monitor is complete if the following condition is set	–	
Atmospheric pressure difference between sequence 1 and 8	–	0.3 kPa (2.25 mmHg)
Purge flow:		
Engine condition	Running	
ECT	4.4°C (40°F)	–
IAT	4.4°C (40°F)	–
EVAP pressure sensor	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP system check	Not operated by scan tool	
Battery voltage	10 V	–
Purge duty cycle	8 %	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Purge VSV stuck open:	
EVAP pressure when vacuum introduction is complete	Higher than reference pressure x 0.2
Purge VSV stuck closed:	
EVAP pressure change after EVAP canister purge valve is open	Less than 0.3 kPa (2.25 mmHg)
Purge flow:	
Both of the following conditions are met	Condition 1 or 2
1. EVAP pressure change when purge flow is started	Less than 0.1 kPa (0.75 mmHg)
2. EVAP pressure change during purge flow when EVAP pressure switching valve is ON (closed)	Less than 0.5 kPa (3.75 mmHg)

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-445](#) for detailed information.

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

DTC	P0450	Evaporative Emission Control System Pressure Sensor/Switch
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DTC	P0451	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance
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DTC	P0452	Evaporative Emission Control System Pressure Sensor/Switch Low Input
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DTC	P0453	Evaporative Emission Control System Pressure Sensor/Switch High Input
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DTC SUMMARY

DTC	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P0450	Pressure sensor voltage abnormal fluctuation	Sensor output voltage rapidly fluctuates beyond upper and lower malfunction thresholds for 0.5 seconds.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (ignition OFF) • Ignition ON 	1 trip
P0451	Pressure sensor noising	Sensor output voltage fluctuates frequently in certain time period.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (ignition OFF) • Engine running 	2 trip
P0451	Pressure sensor stuck	Sensor output voltage does vary in certain time period.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (ignition OFF) 	2 trip
P0452	Pressure sensor voltage low	Sensor output voltage is less than 0.45 V for 0.5 seconds.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • Ignition ON • EVAP monitoring (ignition OFF) 	1 trip
P0453	Pressure sensor voltage high	Sensor output voltage is more than 4.9 V for 0.5 seconds.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	<ul style="list-style-type: none"> • Ignition ON • EVAP monitoring (ignition OFF) 	1 trip

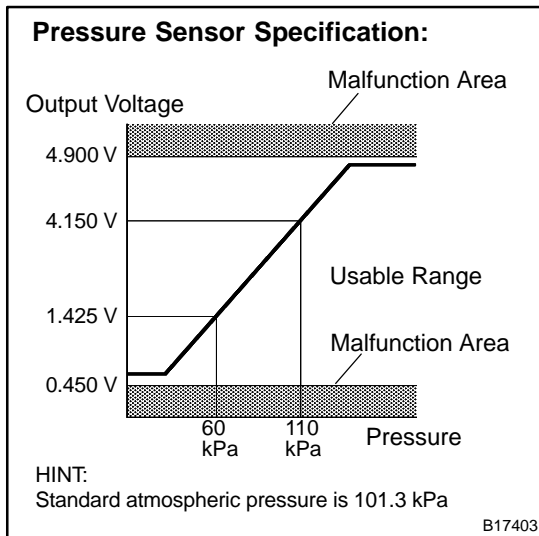
HINT:

The pressure sensor is built into the pump module.

CIRCUIT DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) Inspection Procedure (see page [DI-884](#)).

MONITOR DESCRIPTION



- (a) DTC P0450: Pressure sensor voltage abnormal fluctuation.
If the pressure sensor voltage output rapidly fluctuates between less than 0.45 V and more than 4.9 V, the ECM interprets this as an open or short circuit malfunction in the pressure sensor or its circuit, and stops the EVAP (Evaporative Emission) system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).
- (b) DTC P0451: Pressure sensor noising or stuck
If the pressure sensor voltage output fluctuates rapidly for 10 seconds, the ECM stops the EVAP system monitor. The ECM interprets this as noise from the pressure sensor, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC.
Alternatively, if the sensor voltage output does not change for 10 seconds, the ECM interprets this as the sensor being stuck, and stops the monitor. The ECM then illuminates the MIL and sets the DTC.
(Both the malfunctions are detected by 2 trip detection logic)
- (c) DTC P0452: Pressure sensor voltage low
If the pressure sensor voltage output is below 0.45 V, the ECM interprets this as an open or short circuit malfunction in the pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).
- (d) DTC P0453: Pressure sensor voltage high
If the pressure sensor voltage output is 4.9 V or more, the ECM interprets this as an open or short circuit malfunction in the pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0450	Evaporative emission control system pressure sensor/switch chattering
	P0451	Evaporative emission control system pressure sensor noise
		Evaporative emission control system pressure sensor stuck
	P0452	Evaporative emission control system pressure sensor/switch low input
	P0453	Evaporative emission control system pressure sensor/switch high input
Required sensors/components	Pump module	
Frequency of operation	Once per driving cycle	
Duration	0.5 sec.: P0450, P0452, P0453 15 sec.: P0451	
MIL operation	Immediate: P0450, P0452, P0453 2 driving cycles: P0451	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Pressure sensor noise:		
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	–
IAT	4.4 to 35°C (40 to 95°F)	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
Either of the following conditions is met	Condition 1 or 2	
1. Time after key off	5 or 7 or 9.5 hours	
2. Engine condition	Running	
Pressure sensor stuck:		
Battery voltage	10.5 V	–
IAT	4.4 to 35°C (40 to 95°F)	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
Atmospheric pressure	Less than 70 kPa (525 mmHg), or 110 kPa (825 mmHg) or more	
Time after engine stopped	5 or 7 or 9.5 hours	
Pressure sensor chattering, low/high voltage:		
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Pressure sensor noise:	
Frequency that EVAP pressure change is 0.3 kPa or more	10 times or more for 10 sec.
Pressure sensor stuck:	
EVAP pressure change during reference pressure measurement	Less than 0.65 kPa (4.9 mmHg)
Pressure sensor chattering:	
EVAP pressure	Less than 42.11 kPa (315.90 mmHg), or more than 123.761 kPa (928.440 mmHg)
Pressure sensor low voltage:	
EVAP pressure	Less than 42.11 kPa (315.90 mmHg)
Pressure sensor high voltage:	
EVAP pressure	More than 123.761 kPa (928.440 mmHg)

INSPECTION PROCEDURE

NOTICE:

- When a vehicle is brought into the workshop, leave it as it is. Do not change the vehicle condition. For example, do not tighten the fuel tank cap.
- Do not disassemble the pump module.
- A hand-held tester is required to conduct the following diagnostic troubleshooting procedure.

1	Confirm DTC and EVAP pressure.
----------	---------------------------------------

PREPARATION:

- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON (do not start the engine).
- Turn the tester ON.

CHECK:

- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Read DTCs.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / VAPOR PRESS.
- Read the EVAP (Evaporative Emission) pressure displayed on the tester.

RESULT:

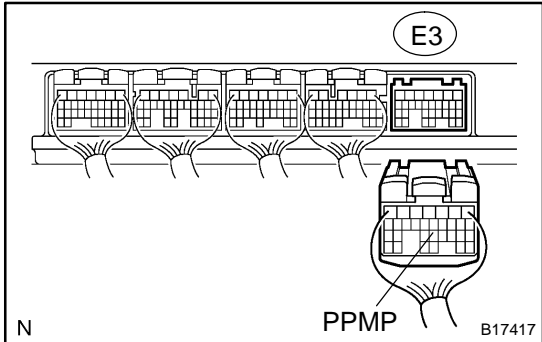
Display (DTC Output)	Test Results	Suspected Trouble Areas	Proceed To
P0451	—	• Pressure sensor	C
P0452	Less than 45 kpa (430 mmHg)	• Wire harness/connector (ECM – pressure sensor) • Pressure sensor • Short in ECM circuit	A
P0453	More than 120 kPa (900 mmHg)	• Wire harness/connector (ECM – pressure sensor) • Pressure sensor • Open in ECM circuit	B

B → **Go to step 4.**

C → **Go to EVAP inspection procedure (See page [DI-884](#)).**

A

2 Measure resistance between terminal PPMP of ECM and body ground.



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between PPMP terminal of the ECM connector and the body ground.

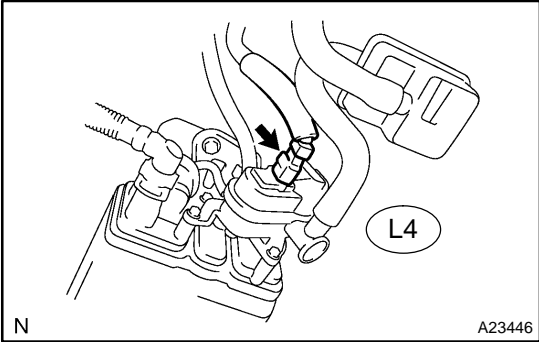
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
10 Ω or less	<ul style="list-style-type: none"> • Wire harness/connector (ECM – pressure sensor) • Short in pressure sensor circuit 	A
10 kΩ or more	<ul style="list-style-type: none"> • Wire harness/connector (ECM – pressure sensor) • Short in ECM circuit 	B

B Go to step 7.

A

3 Measure resistance between terminal PPMP of ECM and body ground.

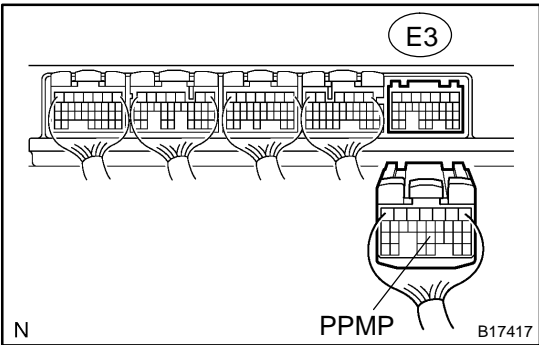


PREPARATION:

- (a) Disconnect the L4 canister connector.
- (b) Disconnect the E3 ECM connector.

CHECK:

Check the resistance between PPMP terminal of the ECM connector and the body ground.



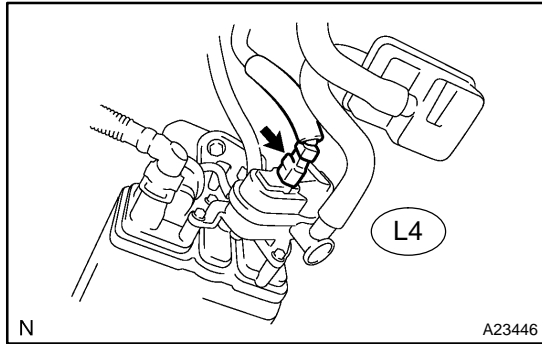
Result:

Test Results	Suspected Trouble Areas	Proceed To
10 kΩ or more	• Short in pressure sensor circuit	A
10 Ω or less	• Short in wire harness/connector (ECM – pressure sensor)	B

A → Go to step 5.

B → Go to step 6.

4 Measure voltage and resistance of pump module connector.



PREPARATION:

- (a) Disconnect the L4 canister connector.
- (b) Turn the ignition switch to ON.

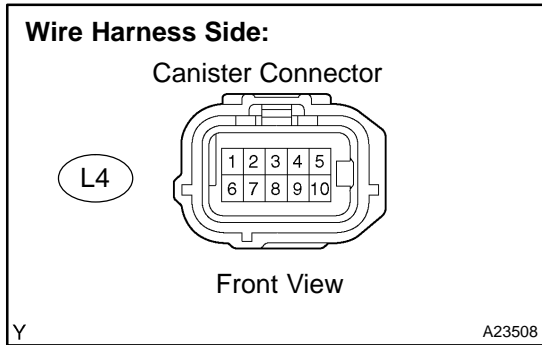
CHECK:

Measure the voltage and resistance of the L4 connector.

OK:

Standard:

Tester Connections	Specified Conditions
L4-4 - Body ground	Between 4.5 V and 5.5 V
L4-3 - Body ground	Between 4.5 V and 5.5 V
L4-2 - Body ground	100 Ω or less



RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Voltage and resistance within standard ranges	• Open in pressure sensor circuit	A
Voltage and resistance outside standard ranges	• Open in wire harness/connector (ECM - pressure sensor)	B

B Go to step 6.

A

5 Replace charcoal canister assembly.

NEXT Go to step 8.

6 Repair or replace wire harness and connectors.

HINT:

If the exhaust tail pipe has been removed, go to the next step before reinstalling it.

NEXT Go to step 8.

7	Replace ECM (See page SF-82).
----------	--

NEXT

8	Check whether DTC output recurs.
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Wait for at least 60 seconds.

CHECK:

- (a) On the tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/DTC INFO/PENDING CODES.

HINT:

If no pending DTC is displayed on the tester, the repair has been successfully completed.

NEXT

Completed

DTC	P0455	Evaporative Emission Control System Leak Detected (Gross Leak)
------------	--------------	---

DTC	P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)
------------	--------------	--

DTC SUMMARY

DTC	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P0455	EVAP gross leak	Vacuum pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If stabilized pressure higher than [second 0.02 inch leak pressure standard x 0.2], ECM determines that EVAP system has large leakage.	<ul style="list-style-type: none"> • Fuel tank cap (loose) • Leakage from EVAP line (Canister – Fuel tank) • Leakage from EVAP line (Purge VSV – Canister) • Pump module • Leakage from fuel tank • Leakage from canister 	While ignition switch OFF	2 trip
P0456	EVAP small leak	Vacuum pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If stabilized pressure larger than second 0.02 inch leak pressure, ECM determines that EVAP system has small leakage.	Same above	While ignition switch OFF	2 trip

CIRCUIT DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) Inspection Procedure (see page [DI-884](#)).

MONITOR DESCRIPTION

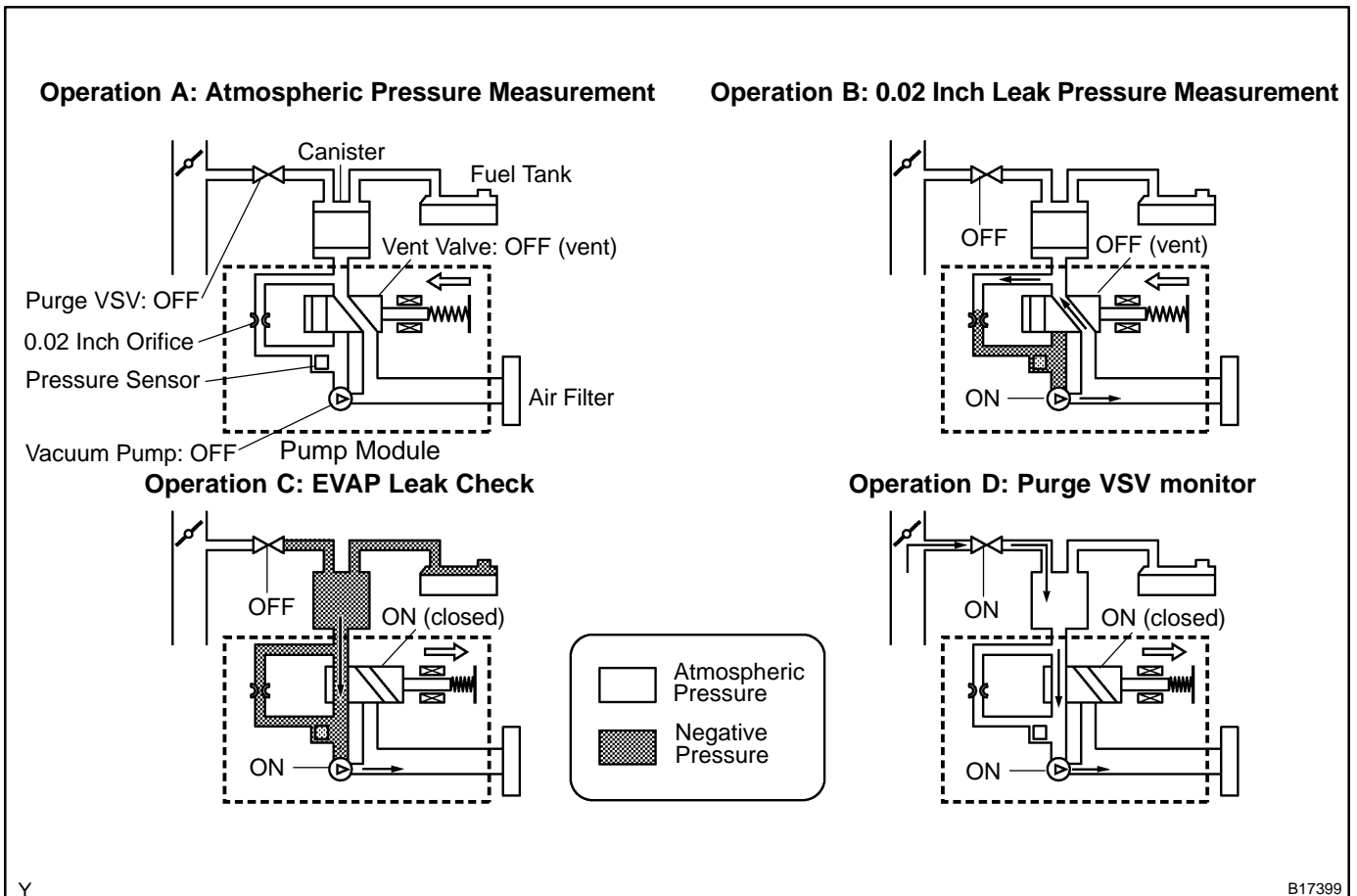
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.

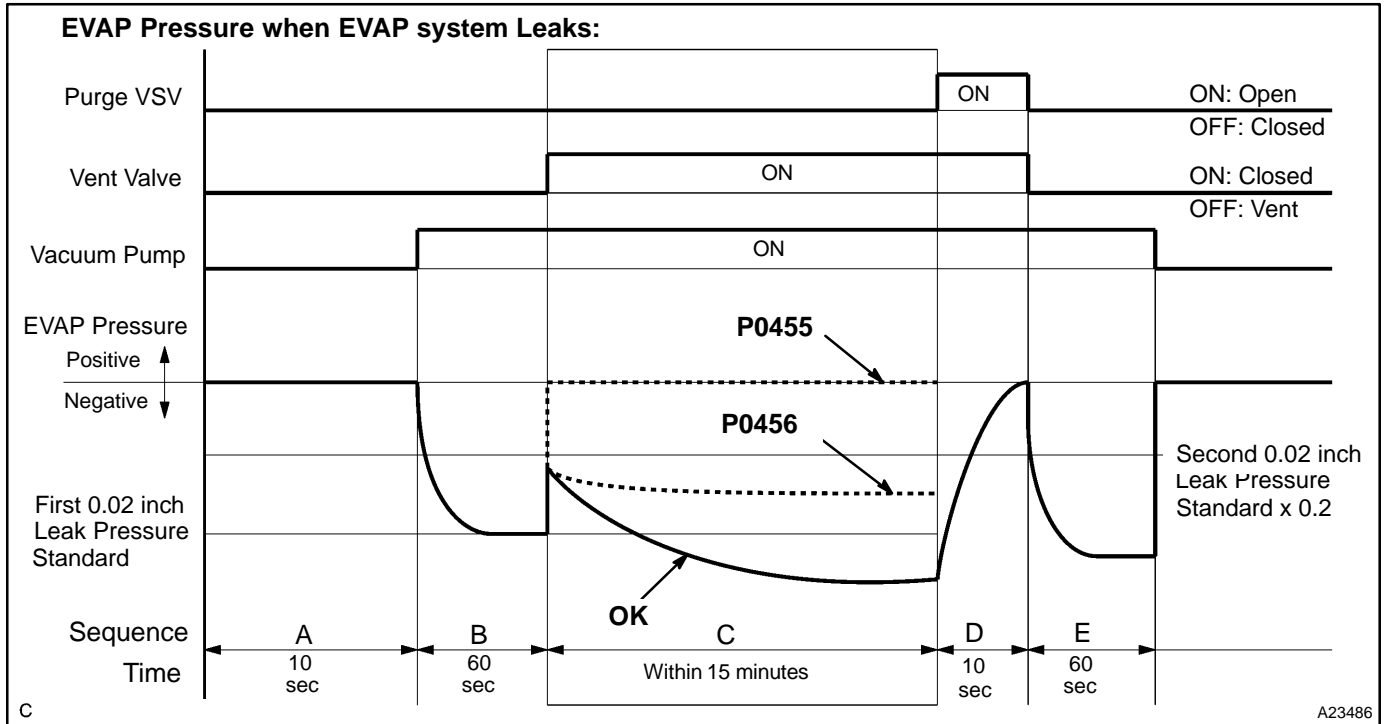


(a) P0455: EVAP (Evaporative Emission) gross leak

In operation C, the vacuum pump creates negative pressure (vacuum) in the EVAP system and the EVAP system pressure is measured. If the stabilized system pressure is higher than [second 0.02 inch leak pressure standard x 0.2] (near atmospheric pressure), the ECM determines that the EVAP system has a large leakage, illuminates the MIL and sets the DTC (2 trip detection logic).

(b) P0456: EVAP very small leak

In operation C, the vacuum pump creates negative pressure (vacuum) in the EVAP system and the EVAP system pressure is measured. If the stabilized system pressure is higher than second 0.02 inch leak pressure standard, the ECM determines that the EVAP system has a small leakage, illuminates the MIL and sets the DTC (2 trip detection logic).



MONITOR STRATEGY

Related DTCs	P0455	Gross leak detected
	P0456	Very small leak (0.020 inch hole) detected
Required sensors/components	Purge VSV, Pump module	
Frequency of operation	Once per driving cycles	
Duration	Within 15 min. (varies with amount of fuel in tank)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	-
Vehicle speed	-	2.5 mph (4 km/h)
Ignition switch	OFF	

DIAGNOSTICS – ENGINE (2UZ-FE)

Time after key off	5 or 7 or 9.5 hours	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions 1 and 2 set before key off	-	
1. Duration that vehicle has been driven	5 min.	-
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Key-off monitor sequence	1 to 8	
1. Atmospheric pressure	-	
Next sequence is run if the following condition is set	-	
Atmospheric pressure change	-	0.3 kPa (2.25 mmHg)
2. First reference pressure measurement	-	
Next sequence is run if the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.38 to -7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	
3. EVAP canister vent valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	-
4. Vacuum introduction	-	
Next sequence is run if the following condition is set	-	
EVAP pressure	Saturated within 15 minutes	
5. EVAP canister purge valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	-

6. Second reference pressure measurement	–	
Next sequence is run if the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure	–	–1 kPa (–7.5 mmHg)
2. Reference pressure	–4.85 to –1.057 kPa (–36.38 to –7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	
4. Difference between first reference pressure and second reference pressure	–	0.7 kPa (5.25 mmHg)
7. Leak check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure when vacuum introduction is complete	–	Second reference pressure
8. Atmospheric pressure measurement	–	
EVAP monitor is complete if the following condition is set	–	
Atmospheric pressure difference between sequence 1 and 8	–	0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Small leak (0.020 inch) malfunction detection:	
EVAP pressure when vacuum introduction is complete	Between reference pressure and reference pressure x 0.2
Gross leak detection:	
EVAP pressure when vacuum introduction is complete	Higher than reference pressure x 0.2

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-445](#) for detailed information.

INSPECTION PROCEDURE

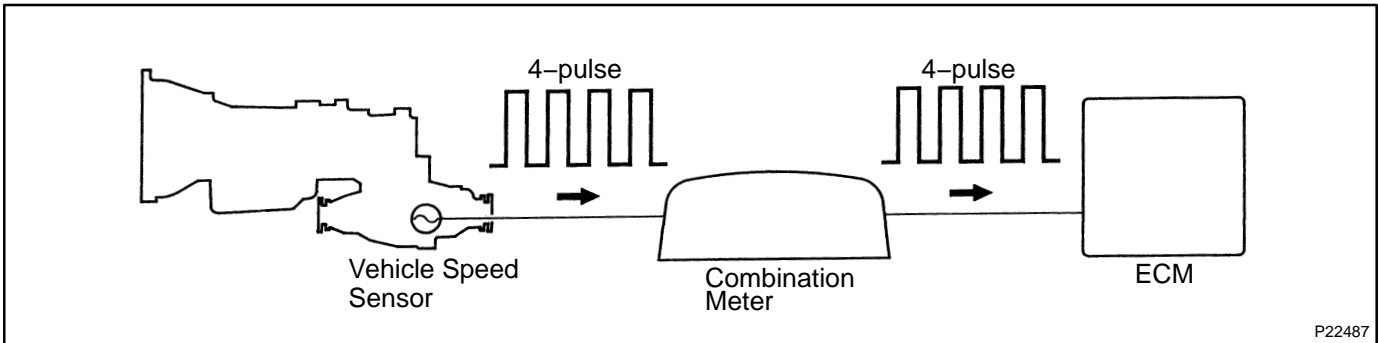
Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

DTC	P0500	Vehicle Speed Sensor "A"
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DTC	P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High
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CIRCUIT DESCRIPTION

The No.1 vehicle speed sensor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0500	Step 1	No vehicle speed sensor signal to ECM under following conditions: (2 trip detection logic) • Vehicle is being driven	<ul style="list-style-type: none"> • Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM
P0503	DI-430	Intermittent problem in the vehicle speed sensor circuit	

MONITOR DESCRIPTION

The ECM assumes that the vehicle is driven when the park/neutral position switch is OFF and it has been over 4 sec. since the actual vehicle speed was 5.59 mph (9 km/h) or more.

If there is no signal from the vehicle speed sensor when these conditions are satisfied, the ECM concludes that there is a fault in the vehicle speed sensor. The ECM will turn on the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0500	Vehicle speed sensor "A" pulse input error
Required sensors/components	Main sensors	Vehicle speed sensor
	Related sensors	Park/Neutral position switch, Engine coolant temperature sensor, Combination meter
Frequency of operation	Continuous	
Duration	500 times	
MIL operation	Immediate	
Sequence of operation	None	

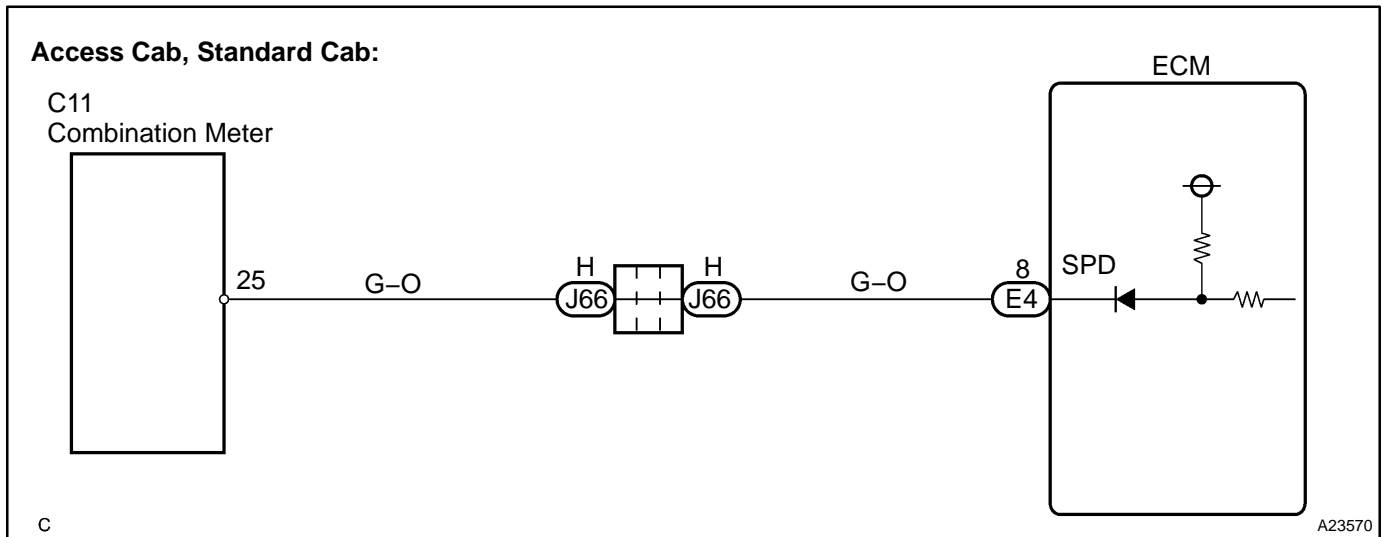
TYPICAL ENABLING CONDITIONS

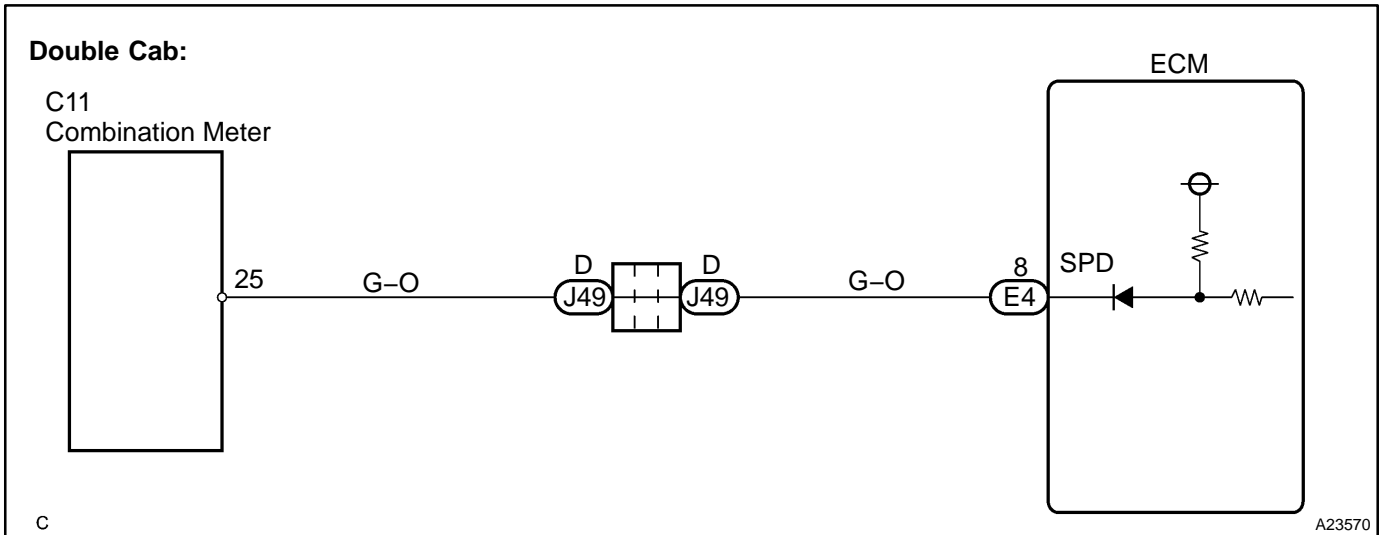
Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Vehicle speed is 5.59 mph (9 km/h) or more	4 sec.	-
Park/neutral position switch	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Sensor signal	No pulse input

WIRING DIAGRAM





INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check operation of speedometer.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (c) Start the engine.
- (d) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / VEHICLE SPD.

CHECK:

Read the mass air flow rate on the hand-held tester.

RESULT:

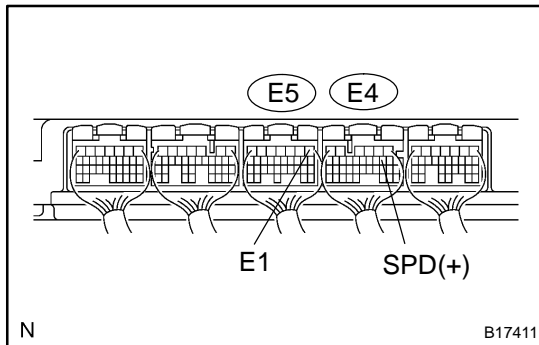
Vehicle speed	Proceed to
Vehicle speed remains 0 km/h (0 mph)	A
Vehicle speed is lower than actual speed	A
Vehicle speed is same as actual speed	B

B

Check for intermittent problems (See page DI-430).

A

2 Check voltage between terminal SPD and E1 of ECM connector.



PREPARATION:

- Shift the shift lever to neutral.
- Jack up the rear wheel on one side.
- Turn the ignition switch ON.

CHECK:

Measure the voltage between the specified terminal of the E4 and E5 ECM connector when the wheel is turned slowly.

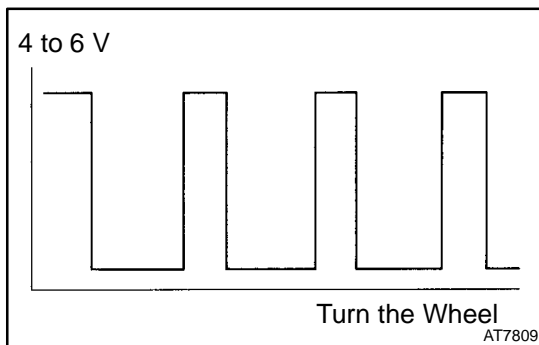
OK:

Standard:

Tester Connection	Specified Condition
SPD (E4-8) - E1 (E5-1)	Generated intermittently

HINT:

The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.



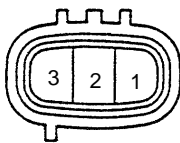
OK

Replace ECM (See page [SF-82](#)).

NG

3 Check vehicle speed sensor.

Component Side Connector:



Vehicle Speed Sensor

I25536

PREPARATION:

- Disconnect the vehicle speed sensor connector.
- Connect the battery positive (+) lead to terminal 1 and the battery negative (-) lead to terminal 2.
- Connect the tester positive (+) lead to terminal 3 and the tester negative (-) lead to terminal 2.
- Shift the shift lever to N position.
- Rotate the shaft.

CHECK:

Check that there is voltage change between terminals 2 and 3.

OK:

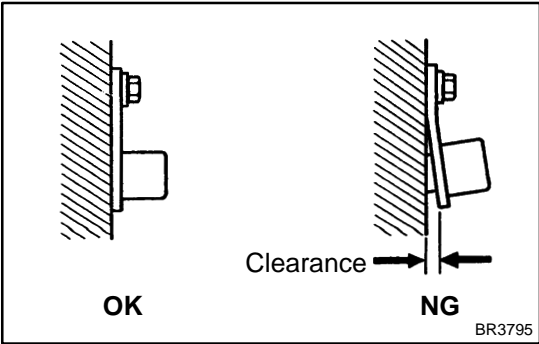
Standard: 0 V to 10 V or more

NG

Replace vehicle speed sensor.

OK

4 Check sensor installation (Vehicle speed sensor).



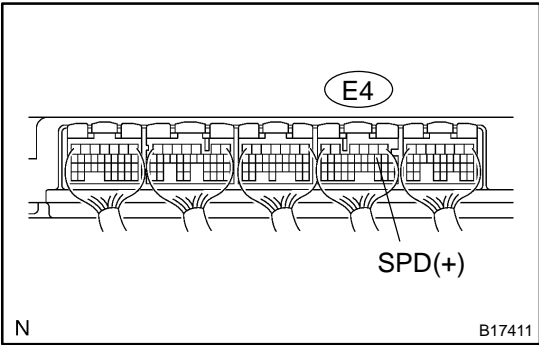
CHECK:
Check the vehicle speed sensor installation.

OK:
The vehicle speed sensor is installed properly.

NG → Tighten sensor installation bolt.

OK

5 Check for open and short in harness and connector between combination meter and ECM.



PREPARATION:
(a) Disconnect the C11 combination meter connector.
(b) Disconnect the E4 ECM connector.

CHECK:
Check for resistance between the wire harness side connectors.

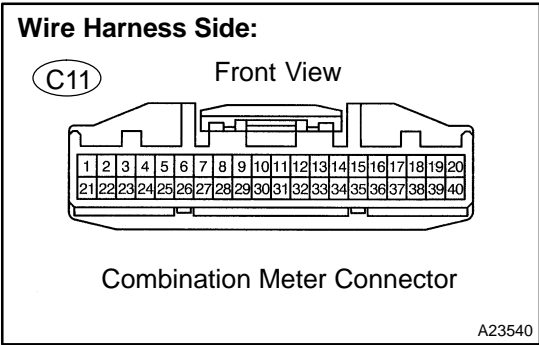
OK:

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
SPD (E4-8) - C11-23	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
SPD (E4-8) or C11-23 - Body ground	10 kΩ or higher



NG → Repair or replace harness or connector.

OK

Check combination meter circuit (See page [BE-86](#)).

DTC	P0504	Brake Switch "A"/"B" Correlation
------------	--------------	---

CIRCUIT DESCRIPTION

In addition to turning on the stop lamps, the stop lamp switch signals are used for a variety of engine, transmission, and suspension functions as well as being an input for diagnostic checks. It is important that the switch operates properly, therefore this switch is designed with two complementary signal outputs: STP and ST1-. The ECM analyzes these signal outputs to detect malfunctions in the stop lamp switch.

HINT:

Normal condition is as shown in the table.

Signal	Brake pedal released	In transition	Brake pedal depressed
STP	OFF	ON	ON
ST1-	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 sec. or more: (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1- signal is OFF	<ul style="list-style-type: none"> • Short in stop lamp switch signal circuit • Stop lamp fuse • Stop lamp switch • ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check operation of stop light.
----------	---------------------------------------

CHECK:

Check if the stop lights come on and go off normally when the brake pedal is operated and released.

NG	Check and repair stop light circuit.
-----------	---

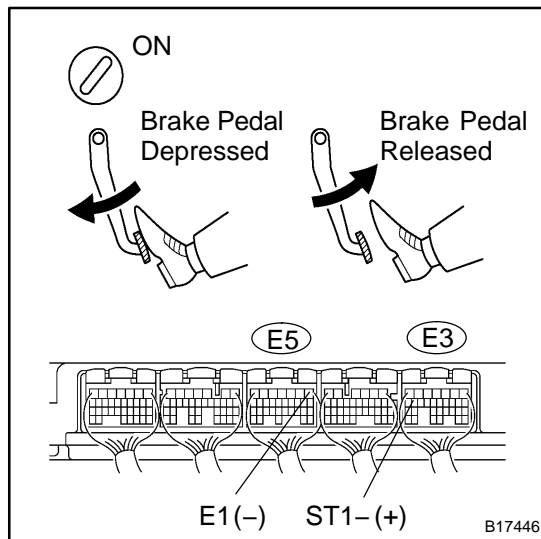
OK

2	Check stop light switch (See page BE-70).
----------	--

NG	Replace stop light switch.
-----------	-----------------------------------

OK

3 Check STP signal and ST1- voltage.



PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON.
- Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STOP LIGHT SW".

CHECK:

Read the signal displayed on the hand-held tester.

OK:

Standard:

Brake Pedal	Specified Condition
Depressed	STP Signal ON
Released	STP Signal OFF

CHECK:

Measure the voltage between the specified terminals of the E3 and E5 ECM connectors.

OK:

Standard:

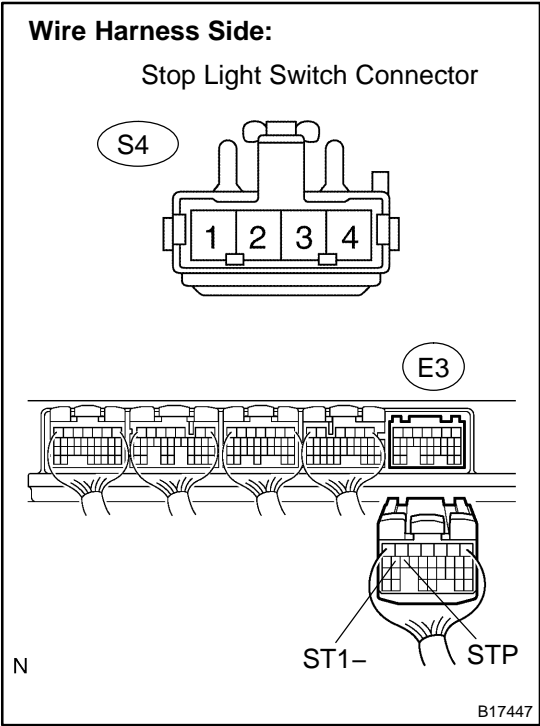
Tester Connection	Brake Pedal	Specified Condition
ST1- (E3-16) - E1 (E5-1)	Depressed	Below 1.5 V
ST1- (E3-16) - E1 (E5-1)	Released	7.5 to 14 V

OK

Check for intermittent problems
(See page [DI-430](#)).

NG

4 Check harness and connector between ECM and stop light switch.



PREPARATION:

- (a) Disconnect the S4 stop light switch connector.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
Stop light switch (S4-1) - STP (E3-15)	Below 1 Ω
Stop light switch (S4-3) - ST1- (E3-16)	Below 1 Ω
Stop light switch (S4-1) or STP (E3-15) - Body ground	10 kΩ or higher
Stop light switch (S4-3) or ST1- (E3-16) - Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

Replace ECM (See page [SF-82](#)).

DTC	P0505	Idle Air Control System
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CIRCUIT DESCRIPTION

The idle speed is controlled by the ETCS (Electronic Throttle Control System).

The ETCS is composed of the throttle motor which operates the throttle valve, and the throttle position sensor, which detects the opening angle of the throttle valve.

The ECM controls the throttle motor to provide the proper throttle valve opening angle to obtain the target idle speed.

DTC No.	DTC Detection Condition	Trouble Area
P0501	Idle speed continues to vary greatly from target speed (2 trip detection logic)	<ul style="list-style-type: none"> • ETCS • Air induction system • PCV hose connection • ECM

MONITOR DESCRIPTION

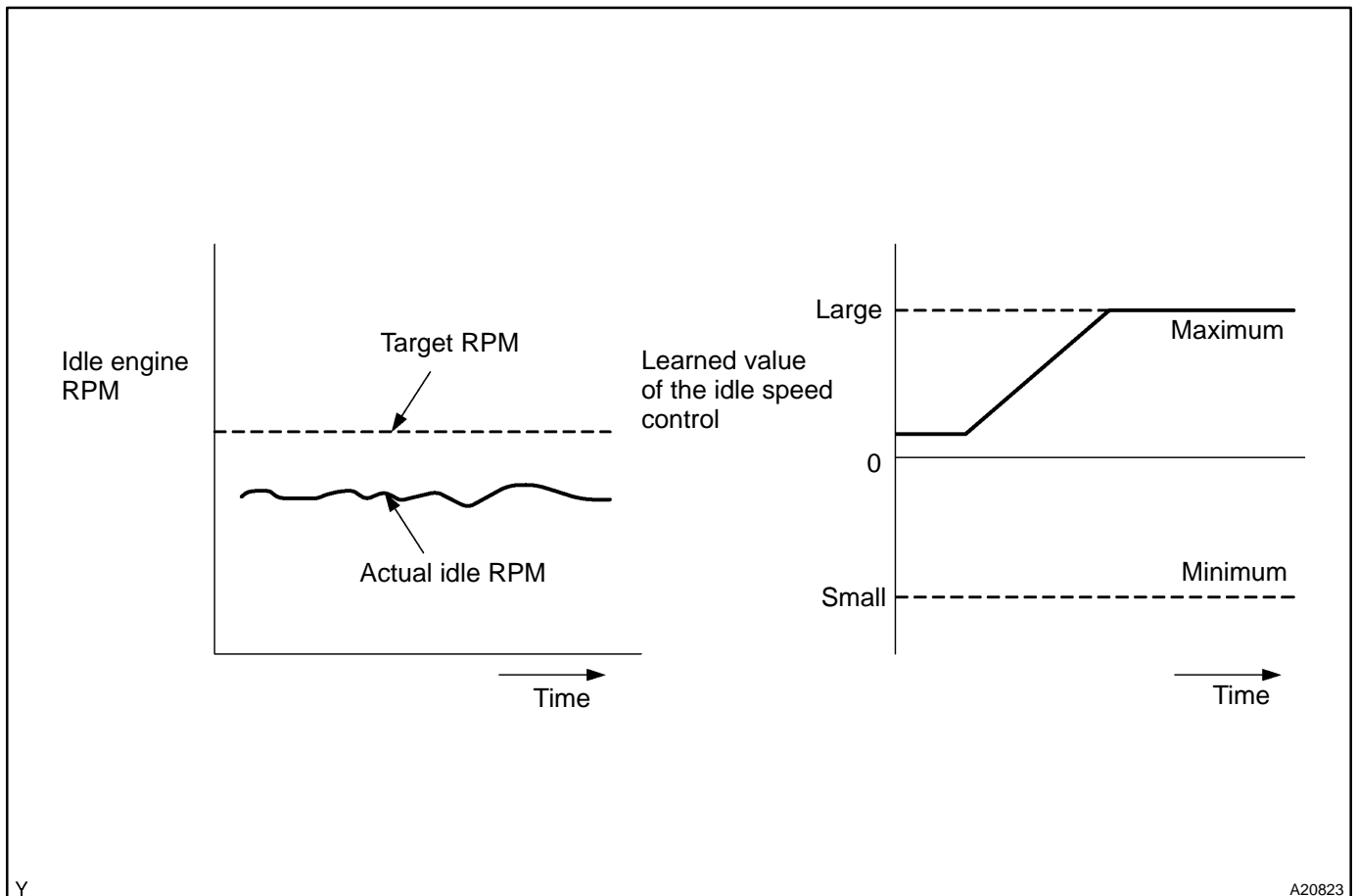
The ECM regulates the idle speed by opening and closing the throttle valve using the ETCS. The ECM concludes that the idle speed control ECM function is malfunctioning if: 1) the actual idle RPM varies more than the specified amount, or 2) a learning value of the idle speed control remains at the maximum or minimum five times or more during a driving cycle. The ECM will turn on the MIL and set a DTC.

Example:

If the actual idle RPM varies from the target idle RPM by more than 100 (*1) rpm five times during a driving cycle, the ECM will turn on the MIL and a DTC is set.

HINT:

*1: RPM threshold varies with engine load.



MONITOR STRATEGY

Related DTCs	P0505	Idle air control malfunction
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Vehicle speed sensor, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	10 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition 1 or 2
1. Frequency that both of the following conditions (a) and (b) are met:	5 times or more
(a) Engine RPM – target engine RPM	Less than –100 rpm or more than 150 rpm
(b) Vehicle condition	Stop after vehicle was driven by 6.25 mph (10 km/h) or more
2. Frequency that both of the following conditions (c) and (d) are met:	Once
(c) Engine RPM – target engine RPM	Less than –100 rpm or more than 150 rpm
(d) Intake air control flow rate learning value	2.48 L/sec. or less, or 11 L/sec. or more

INSPECTION PROCEDURE

HINT:

- When the throttle position is slightly opened (the accelerator pedal is slightly depressed) because a floor carpet is overlapped on the accelerator pedal, or if the accelerator pedal is not fully released, etc., DTC P0505 will possibly be detected.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Are there any other codes (besides P0505) being output?
----------	--

PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and push the hand-held tester main switch ON.
- When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

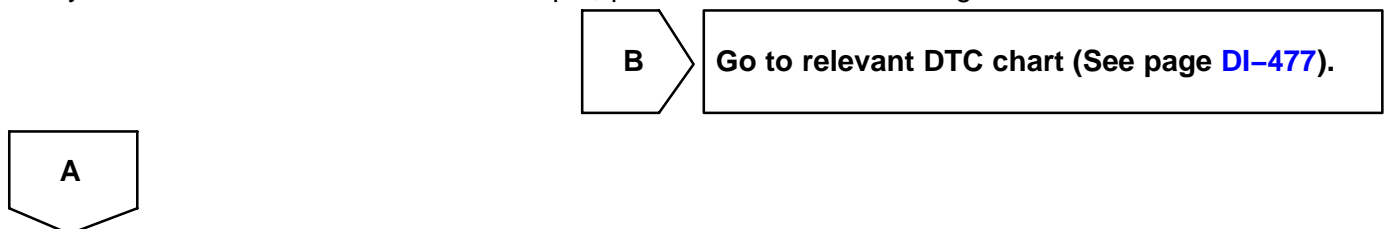
Read the DTC using the hand-held tester.

RESULT:

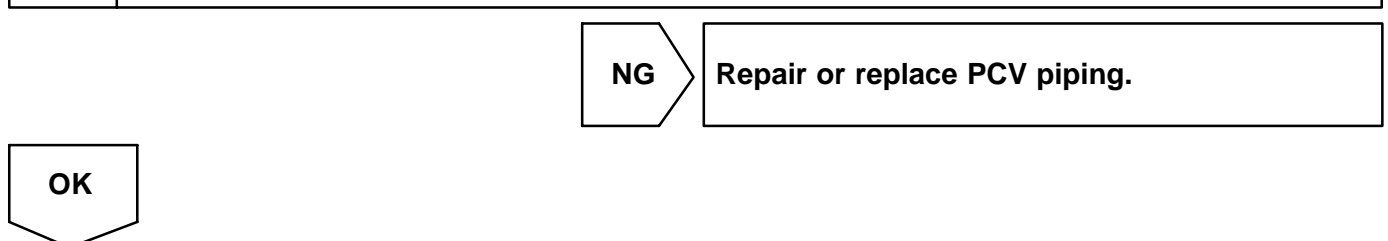
Display (DTC Output)	Proceed to
P0505	A
"P0505" and other DTCs	B

HINT:

If any other codes besides P0505 are output, perform the troubleshooting for those DTCs first.



2	Check connection of PCV piping.
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3	Check air induction system (See page SF-1).
----------	--

CHECK:

Check for vacuum leaks in air induction system.

OK:

No leakage.

NG	Repair or replace air induction system.
-----------	--

OK

Check electric throttle control system (See page SF-41).

DTC	P050A	Cold Start Idle Air Control System Performance
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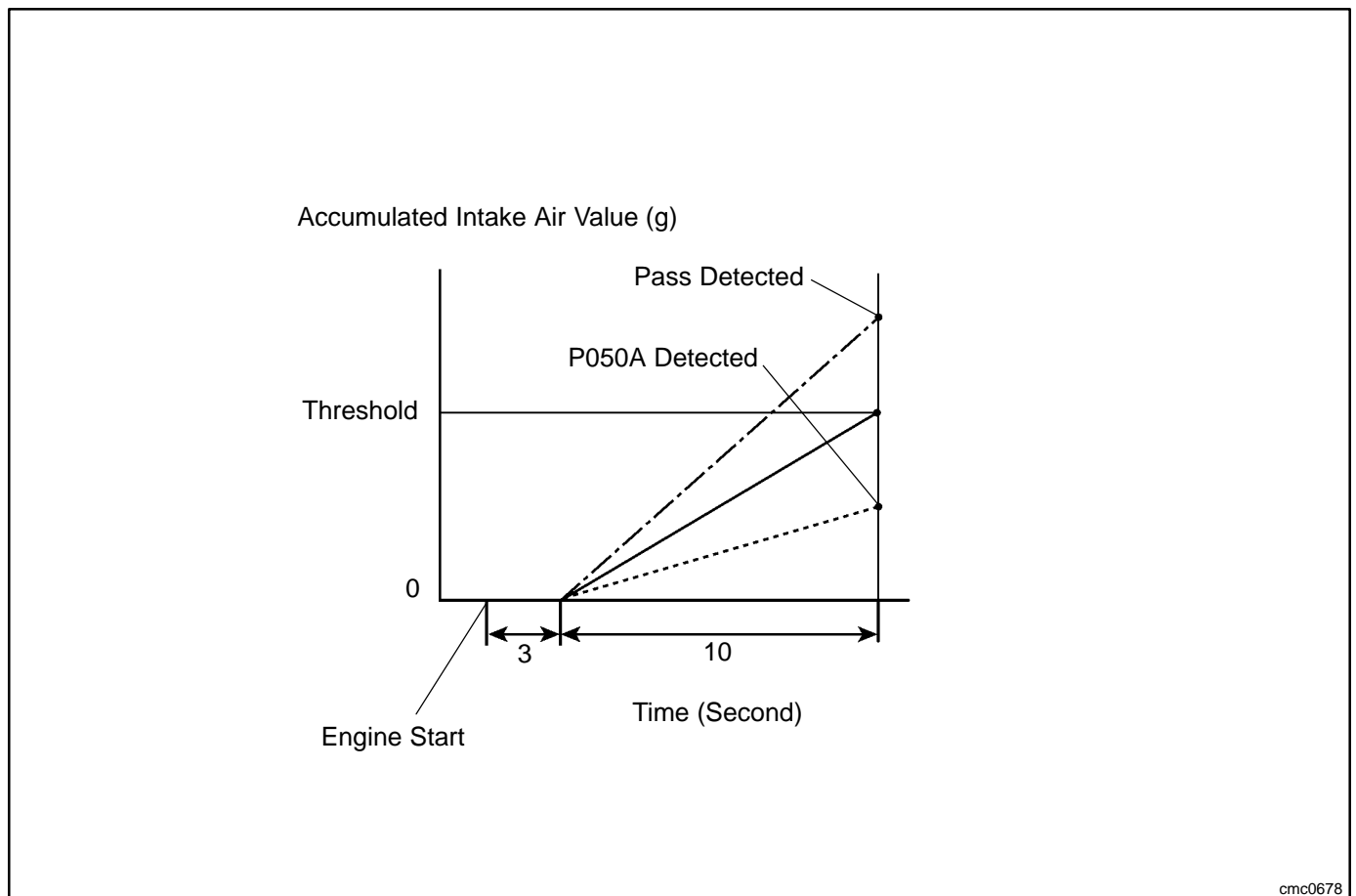
DESCRIPTION

The Electronic Throttle Control System (ETCS) controls the engine idling speed. The ETCS operates the throttle actuator to open and close the throttle valve, and adjusts the intake air amount to achieve the target idling speed.

In addition, the ECM retards the ignition timing and the ETCS increases the intake air amount to quickly increase the catalyst temperature at cold start.

DTC No.	DTC Detection Conditions	Trouble Areas
P050A	Accumulated intake air amount during 10 seconds of idling after cold start, less than threshold (2 trip detection logic)	<ul style="list-style-type: none"> • Throttle body assembly • Mass air flow meter • Air induction system • PCV hose connections • ECM

MONITOR DESCRIPTION



The ECM monitors the intake air amount during idling and the ignition timing.

When the engine coolant temperature is between -10°C and 50°C (14°F and 122°F), the ECM calculates the idling intake air amount for 10 seconds, beginning 3 seconds after the engine starts.

When the accumulated value is below the threshold, the ECM interprets this as a malfunction in the Idle Speed Control (ISC) system at cold start.

The ECM also monitors the ignition timing at cold start, and judges it to be incorrect when it is advanced to the same value for a warm engine for 5 seconds or more of the 10 second monitoring period.

Example:

P050A is detected when all conditions below are met (2 trip detection logic).

1. The engine coolant temperature is -10°C (14°F) or more when the engine starts.
2. The engine idles for 3 seconds after engine start.
3. The accumulated intake air amount is below the threshold.

If a malfunction is not repaired successfully, the ECM sets the DTC and illuminates the MIL 3 seconds after the engine is next started.

NOTICE:

When the negative battery terminal is disconnected during inspection or repairs, the ISC learning values are cleared. The ISC learning must be performed by warming up the engine and idling for 5 minutes with the engine coolant temperature at 75°C (167°F) or more because DTCs cannot be detected with the ISC learning values cleared.

MONITOR STRATEGY

Related DTCs	P050A	Idle speed control problem at cold
Required Sensors/Components (Main)	Mass air flow meter	
Required Sensors/Components (Related)	Engine Coolant Temperature (ECT) sensor, Throttle position sensor, Vehicle speed sensor	
Frequency of operation	Once per driving cycles	
Duration	10 seconds	
MIL Operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
P050A:		
Battery voltage	8 V	–
Time after engine start	3 seconds	–
Starter	OFF	
ECT at engine start	-10°C (14°F)	–
ECT	-10°C (14°F)	50°C (122°F)
Engine idling time	3 seconds	–
Fuel-cut	OFF	
Vehicle speed	–	1.86 mph (3 km/h)
Time after shift position changed	1 second	–

TYPICAL MALFUNCTION THRESHOLDS

P050A:

Accumulated air flow amount	Varies with ECT (Example: Less than 102 g)
-----------------------------	--

INSPECTION PROCEDURE

HINT:

Read the freeze frame data using the intelligent tester. The freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, the freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Check any other DTCs output (In addition to DTC P050A).
----------	--

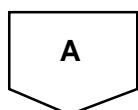
- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Select the following the menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (e) Read the DTC.

RESULT:

Display (DTC Output)	Proceed to
P050A	A
P050A and other DTCs	B

HINT:

If any DTC other than P050A is output, troubleshoot those DTC first.



2	Read value using intelligent tester (Fuel trim).
----------	---

HINT:

Calculate the total fuel trim values to check the characteristic deviation of the mass air flow meter.

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / SHORT FT #1 and LONG FT #1.
- (e) Read the values displayed on the tester.
- (f) Add together the SHORT FT #1 and LONG FT #1 values to obtain the total FUEL TRIM.

OK:

Total of the SHORT FT #1 and LONG FT #1 values is between -20 % and 20 %.

OK	Go to step 8.
-----------	----------------------

NG

3	Check PCV hose connections.
----------	------------------------------------

OK:

PCV hose is connected correctly and is not damaged.

NG	Go to step 5.
-----------	----------------------

OK

4	Check air induction system.
----------	------------------------------------

- (a) Check the air induction system for vacuum leakage.

OK:

No leakage from the air induction system.

OK	Go to step 6.
-----------	----------------------

NG	Go to step 7.
-----------	----------------------

5	Repair or replace PCV hose.
----------	------------------------------------

NEXT**Go to step 11.**

6	Replace mass air flow meter.
----------	-------------------------------------

NEXT**Go to step 11.**

7	Repair or replace air induction system.
----------	--

NEXT**Go to step 11.**

8	Check throttle valve.
----------	------------------------------

(a) Check for deposits around the throttle valve.

OK:**No deposits around the throttle valve.****OK****Go to step 9.****NG****Go to step 10.**

9	Replace ECM.
----------	---------------------

NEXT**Go to step 11.**

10	Replace throttle body assembly.
-----------	--

NEXT

11

Check whether DTC output recurs (DTC P050A).**NOTICE:**

In this operation, the engine must be cold (the same level as the engine coolant temperature recorded in the freeze frame data).

- (a) Connect the intelligent tester to the DTC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Clear DTCs (See page DI-462).
- (e) Switch the ECM from normal mode to check mode using the tester (See page DI-463).
- (f) Start the engine to idle for a minute.

OK:**Stable fast idling.**

- (g) Read DTCs.

OK:**No DTCs output.****NEXT****END**

DTC	P0560	System Voltage
------------	--------------	-----------------------

MONITOR DESCRIPTION

The battery supplies electricity to the ECM even when the ignition switch is OFF. This electricity allows the ECM to store data such as DTC history, freeze frame data, fuel trim values, and other data.

If the battery voltage falls below a minimum level, the ECM will conclude that there is a fault in the power supply circuit. The next time the engine starts, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detecting Condition	Trouble Area
P0560	Open in back up power source circuit	<ul style="list-style-type: none"> • Open in back-up power source circuit • EFI fuse • ECM

HINT:

If DTC P0560 present, the ECM will not store another DTC.

MONITOR STRATEGY

Related DTCs	P0560	System voltage malfunction
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (*1)	
Sequence of operation	None	

*1: The DTC is set immediate. The MIL will be illuminated after the engine starts in the next time.

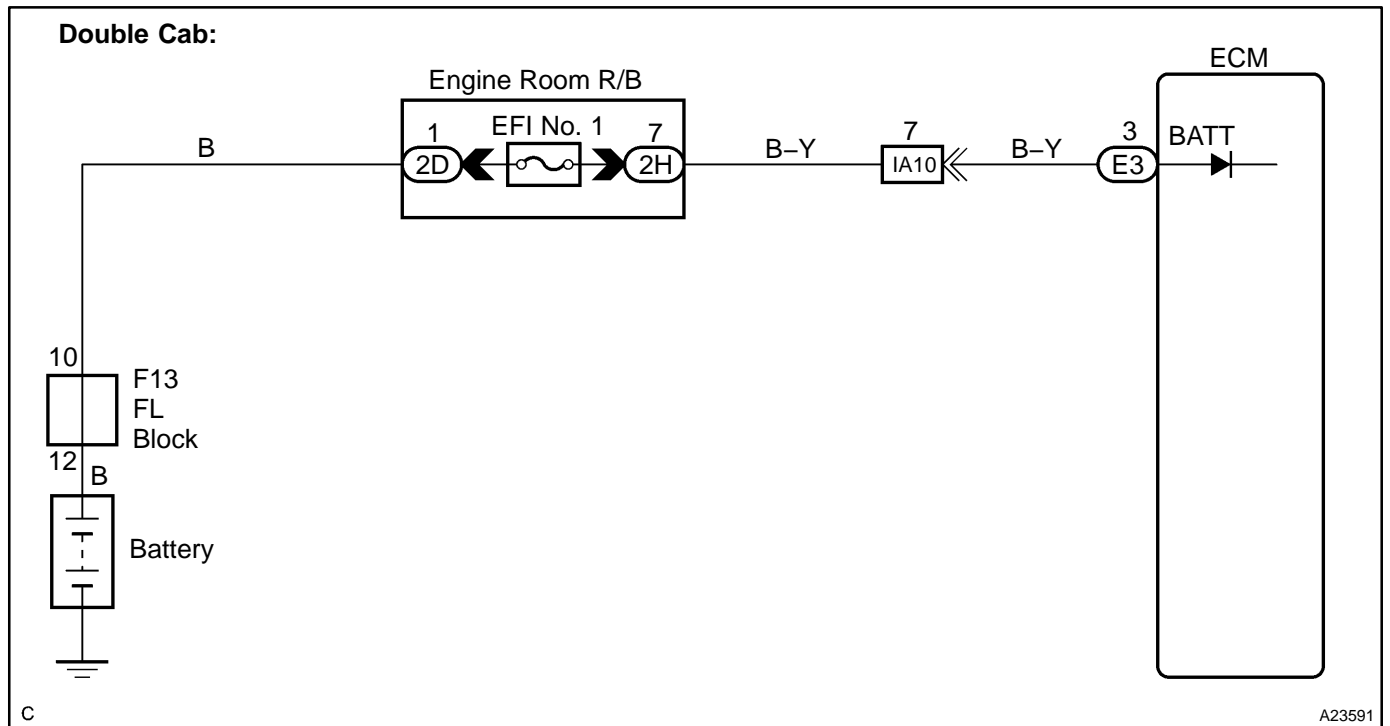
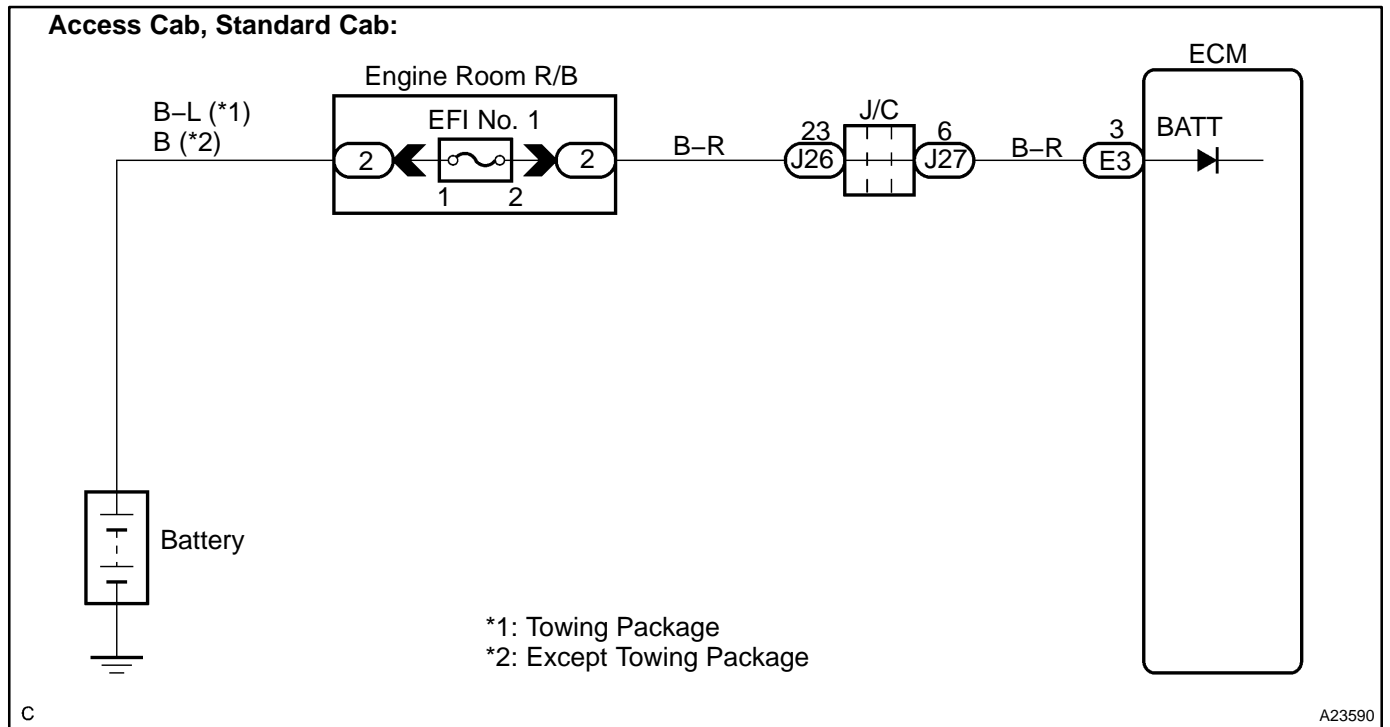
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Stand-by RAM	Initialized	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Battery voltage	Less than 3.5 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check battery voltage.
----------	-------------------------------

PREPARATION:

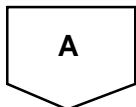
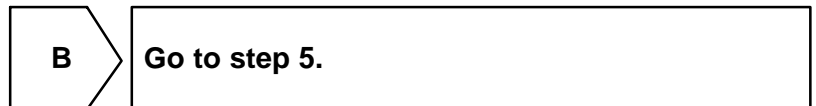
- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / BATTERY VOLTAGE.

CHECK:

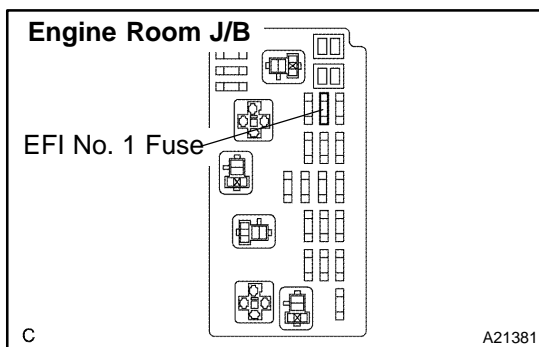
Read the battery voltage on the hand-held tester

RESULT:

Battery voltage	Proceed to
0 V	A
Except 0 V	B



2	Check EFI No. 1 fuse of engine room J/B.
----------	---



PREPARATION:

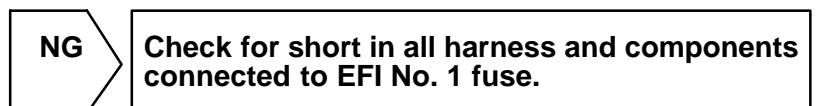
Remove the EFI No. 1 fuse from the engine room J/B.

CHECK:

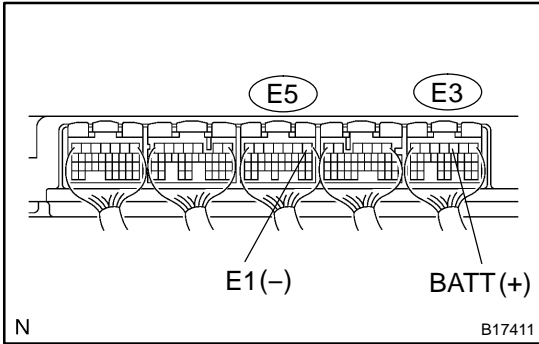
Check the resistance of the EFI No. 1 fuse.

OK:

Standard: Below 1 Ω



3 Check voltage between terminal BATT and E1 of ECM connector.



CHECK:

Measure the voltage between terminals of the E5 and E3 ECM connector.

OK:

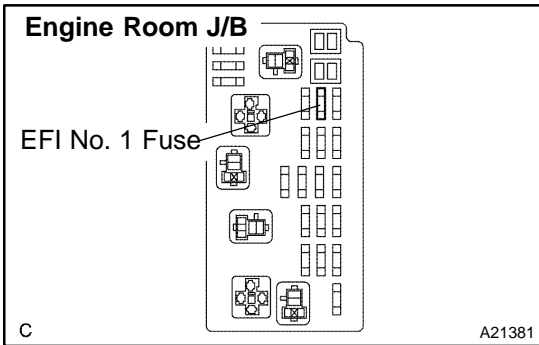
Standard:

Tester Connection	Specified Condition
BATT (E3-3) - E1 (E5-1)	9 to 14 V

OK Check for intermittent problems (See page [DI-430](#)).

NG

4 Check for open and short in harness and connector between ECM and EFI No. 1 fuse, EFI No. 1 fuse and battery.



PREPARATION:

- (a) Remove the EFI No. 1 fuse from the engine room J/B.
- (b) Disconnect the E3 ECM connector.

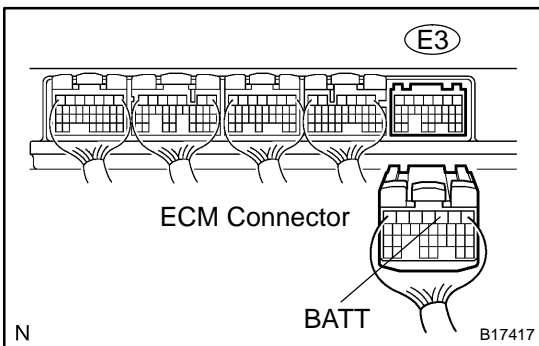
CHECK:

Measure the resistance between the wire harness side connector.

OK:

Standard:

Tester Connection	Specified Condition
Engine Room J/B (EFI No. 1 fuse terminal 2) - BATT (E3-3)	Below 1 Ω
Engine Room J/B (EFI No. 1 fuse terminal 2) or BATT (E3-3) - Body ground	10 k Ω or higher



NG Repair or replace harness or connector.

OK

5	Check the battery (See page CH-1).
---	---

NG	Replace battery.
----	------------------

OK

Check and replace engine room J/B.

DTC	P0604	Internal Control Module Random Access Memory (RAM) Error
------------	--------------	---

DTC	P0606	ECM/PCM Processor
------------	--------------	--------------------------

DTC	P0607	Control Module Performance
------------	--------------	-----------------------------------

DTC	P0657	Actuator Supply Voltage Circuit / Open
------------	--------------	---

MONITOR DESCRIPTION

The ECM continuously monitors its internal memory status, internal circuits, and output signals to the throttle actuator. This self-check insures that the ECM is functioning properly. If any malfunction is detected, the ECM will set the appropriate DTC and illuminate the MIL.

The ECM memory status is diagnosed by internal "mirroring" of the main CPU and the sub CPU to detect RAM (Random Access Memory) errors. The two CPUs also perform continuous mutual monitoring.

The ECM sets a DTC if: 1) outputs from the 2 CPUs are different and deviate from the standards, 2) the signals to the throttle actuator deviate from the standards, 3) a malfunction is found in the throttle actuator supply voltage, and 4) any other ECM malfunction is found.

DTC No.	DTC Detecting Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM malfunction	• ECM

MONITOR STRATEGY

Related DTCs	P0604	Random access memory (RAM) error
	P0606	CPU malfunction
	P0607	ECM range check
	P0657	ETCS power supply
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	Within 1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI-437
The typical enabling condition is not available	-

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0604:	
RAM	RAM mirror check fail
P0606:	
Either of the following conditions is met	Condition 1 or 2
1. Difference between TP of main CPU and TP of sub CPU	0.3 V or more
2. Difference between APP of main CPU and APP of sub CPU	0.3 V or more
P0607:	
Either of the following conditions is met	Condition 1 or 2
1. All of the following conditions are met	Condition (a), (b) and (c)
(a) CPU reset	1 time or more
(b) Difference between TP and APP learned	0.4 V or more
(c) Electronic throttle actuator	OFF
2. CPU reset	2 times or more
P0657:	
ECTS power supply when ignition switch OFF to ON	7 V or more

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace ECM (See page [SF-82](#)).

DTC	P0617	Starter Relay Circuit High
------------	--------------	-----------------------------------

MONITOR DESCRIPTION

While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. If the vehicle is being driven and the ECM detects the starter control signal (STA), the ECM concludes that the starter control circuit is malfunctioning. The ECM will turn on the MIL and a DTC is set.

DTC No.	DTC Detection Condition	Trouble Area
P0617	When all conditions (a), (b) and (c) are satisfied for 20 seconds with battery (+B) voltage 10.5 V or more (a) Vehicle speed \geq 12.4 mph (20 km/h) (b) Engine revolution \geq 1,000 rpm (c) STA signal ON	<ul style="list-style-type: none"> • Park/neutral position switch • Starter relay circuit • Ignition switch • ECM

MONITOR STRATEGY

Related DTCs	P0617	Starter signal error
Required sensors/components	Main sensors/components	Starter signal
	Related sensors/components	Vehicle speed sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	20 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

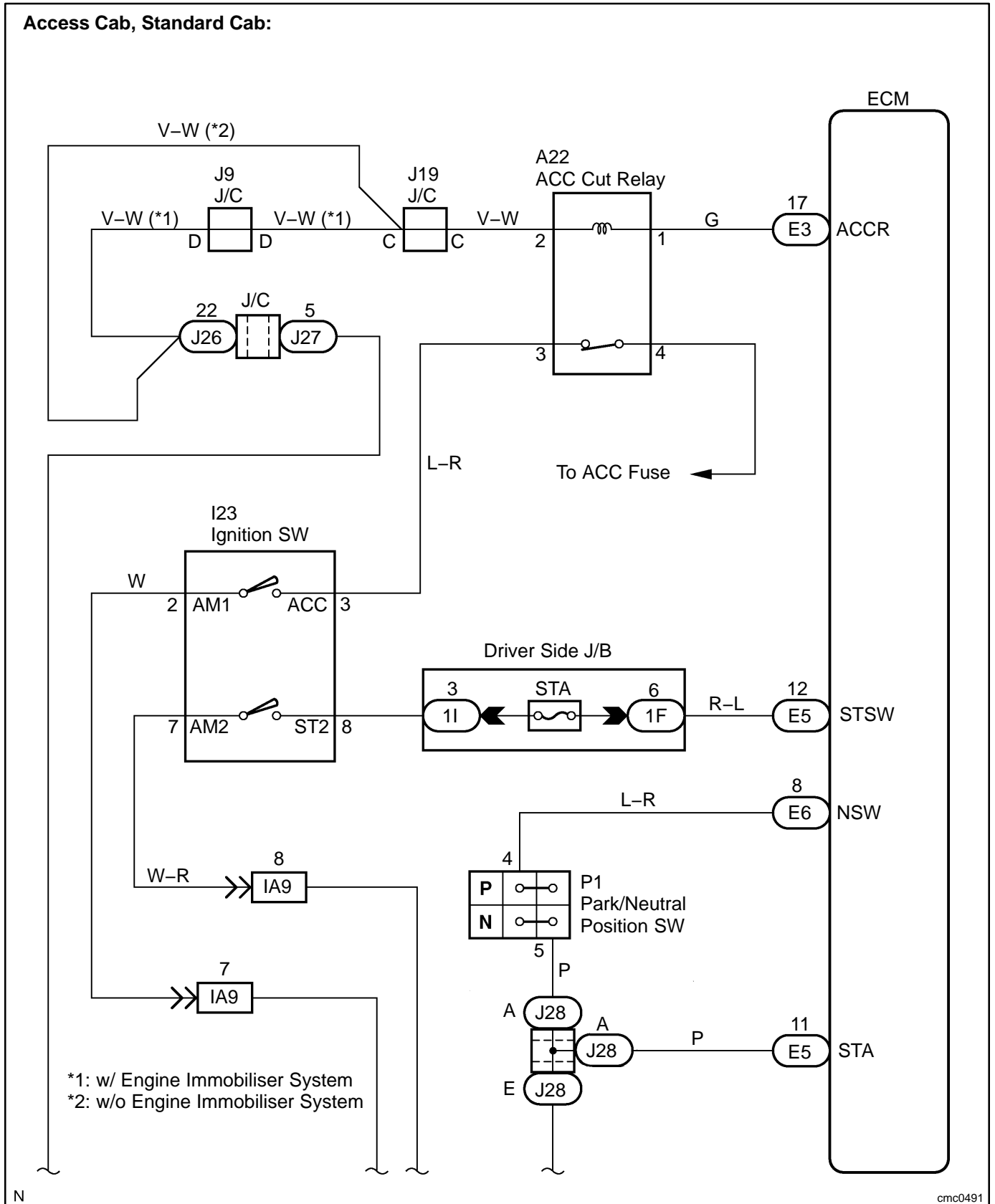
Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Battery voltage	10.5 V	-
Vehicle speed	12.4 mph (20 km/h)	-
Engine RPM	1,000 rpm	-

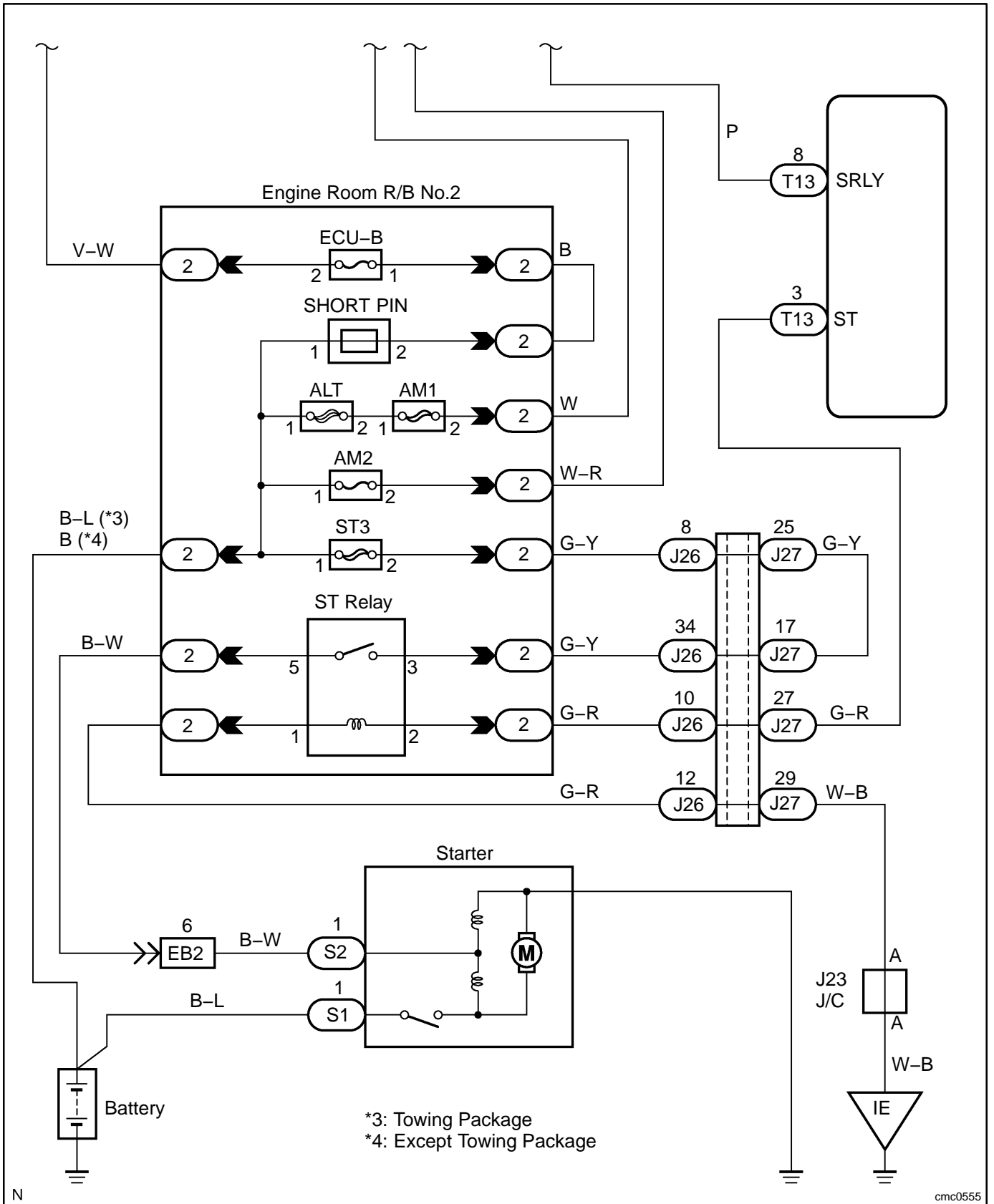
TYPICAL MALFUNCTION THRESHOLDS

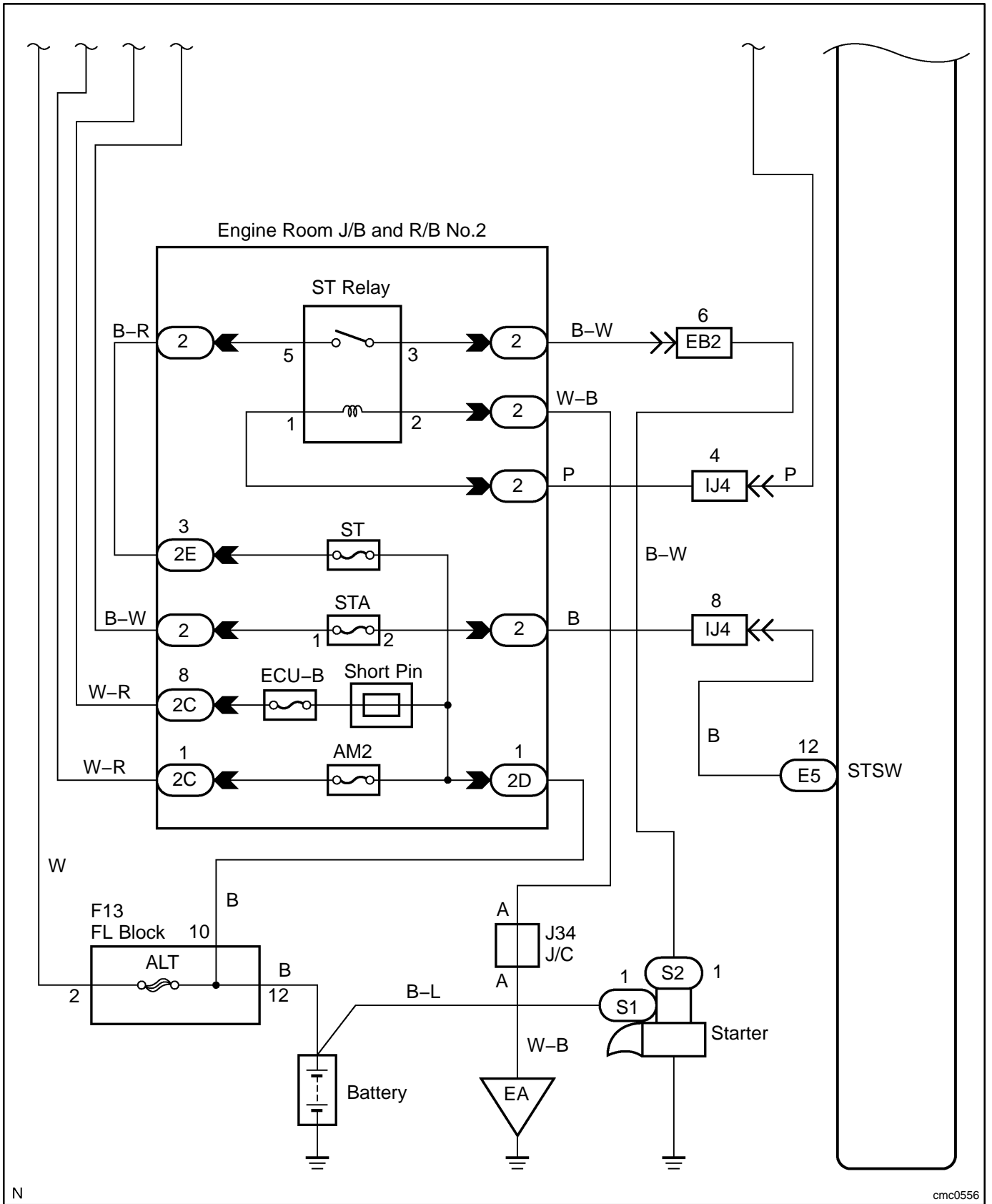
Detection Criteria	Threshold
Starter signal	ON

WIRING DIAGRAM

Access Cab, Standard Cab:







INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and check STA signal.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON, and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand-held tester while the starter operates.

OK:

Standard:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK →

Go to step 5.

NG

2	Check park/neutral position switch (See page DI-1159).
----------	---

NG →

**Replace park/neutral position switch.
Go to next step 5 after the replacement.**

OK

3	Check ignition switch (See page BE-37).
----------	--

NG →

**Replace ignition switch.
Go the next step 5 after the replacement.**

OK

4	Connect hand-held tester, and check STA signal.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON, and push the hand-held tester main switch ON.
- (c) On the hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand-held tester while the starter operates.

OK:**Standard:**

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

NG

Repair or replace harness or connector.

OK

5	Check DTC reoccur
----------	--------------------------

PREPARATION:

- (a) Connect the hand-held tester.
- (b) Turn the ignition switch ON and hand-held tester main switch ON.
- (c) Clear DTCs (see page [DI-462](#)).
- (d) Drive the vehicle more than 25 mph (40 km/h) for 20 seconds or more.

CHECK:

Check DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

A

Replace ECM (See page [SF-82](#)).

B

**Check for intermittent problems
(See page [DI-430](#)).**

DTC	P0630	VIN not Programmed or Mismatch ECM/PCM
------------	--------------	---

CIRCUIT DESCRIPTION

DTC P0630 is set when the Vehicle Identification Number (VIN) is not stored in the Engine Control Module (ECM) or the input VIN is not accurate. Input the VIN with the hand-held tester.

DTC No.	DTC Detecting Condition	Trouble Area
P0630	<ul style="list-style-type: none"> • VIN is not stored in ECM. • Input VIN in ECM is not accurate. 	ECM

MONITOR STRATEGY

Related DTCs	P0630	VIN not programmed
Required sensors/components	Main sensors/components	ECM
	Related sensors/components	-
Frequency of operation	Continuous	
Duration	0.325 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
VIN code	Not programmed

COMPONENT OPERATING RANGE

Parameter	Standard Value
VIN code	Programmed

INSPECTION PROCEDURE

1	Read current DTC.
----------	--------------------------

NOTICE:

If P0630 is present, the VIN must be input to the ECM using the hand-held tester. However, all DTCs are cleared automatically by the tester when inputting the VIN. If DTCs other than P0630 are present, check them first.

NEXT

2	Input VIN with hand-held tester (See page DI-433).
----------	---

NEXT

END

DTC	P1340	Camshaft Position Sensor "A" (Bank 1 Sensor 1)
------------	--------------	---

DTC	P1341	Camshaft Position Sensor "A" (Bank 1 Sensor 1)
------------	--------------	---

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consists of a magnet, iron core and pickup coil.

The camshaft drive gear (LH) has 3 teeth on its inner circumference. When the camshaft gear rotates, air gap changes between the protrusion on the gear and the pickup coil. The change affects the magnetic field and result in change in the resistance of the MRE element.

The crankshaft signal plate has 32 teeth and is mounted on the crankshaft. The crankshaft position sensor generates 32 signals at every engine revolution. The ECM detects the standard crankshaft angle based on the G signal and the actual crankshaft angle and the engine speed by the NE signal.

DTC No.	DTC Detecting Condition	Trouble Area
P1340	No camshaft position sensor signal to ECM during cranking (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • LH camshaft timing pulley • ECM
P1341	No camshaft position sensor signal to ECM with engine speed 600 rpm or more	

MONITOR DESCRIPTION

The camshaft position sensor (G signal) consists of a magnet and MRE element.

The camshaft drive gear has 5 teeth on its inner circumference. When the camshaft gear rotates, air gap changes between the protrusion on the gear and the pickup coil. The change affects the magnetic field and result in change in the resistance of the MRE element. The crankshaft angle sensor plate has 32 teeth and output 32 signals every engine revolution. The ECM detects the standard crankshaft angle based on the G signal and actual crankshaft angle and engine speed by NE signal.

MONITOR STRATEGY

Related DTCs	P1340	Camshaft position sensor (Bank 1) range check or rationality
	P1341	Camshaft position sensor (Bank 1) range check or rationality
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Crankshaft position sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	P1340 case 1 (no signal): 2 driving cycles P1340 case 2 (mis-aligned), P1341: Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
P1340 Case 1 (No signal):		
Starter	ON	
Minimum battery voltage while starter ON	-	11 V
P1340 Case 2 (Mis-aligned):		
Engine RPM	600 rpm	-
Starter	OFF	
P1341:		
Starter	After OFF to ON timing	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P1340 Case 1 (No signal):	
Camshaft position sensor signal	No signal
P1340 Case 2 (Mis-aligned):	
Crankshaft/camshaft alignment is mis-aligned (judged by comparing the crankshaft position to the camshaft position)	
Camshaft position sensor signal: No input in appropriate timing.	
P1341:	
Crankshaft/Camshaft alignment	Mis-aligned
Camshaft position sensor count	12 or more / 720° CA (= Engine 2 revolutions)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Camshaft position sensor signal input at every 720° CA	3

WIRING DIAGRAM

Refer to DTC P0335 on page [DI-632](#).

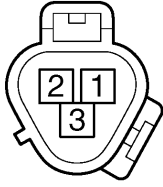
INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 Check voltage of camshaft position sensor power source circuit.

Wire Harness Side:



Camshaft Position Sensor

N

B17445

PREPARATION:

- Disconnect the Camshaft position sensor connector.
- Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminal 3 of the camshaft position sensor connector and body ground.

OK:

Standard: 4.5 to 5.5 V

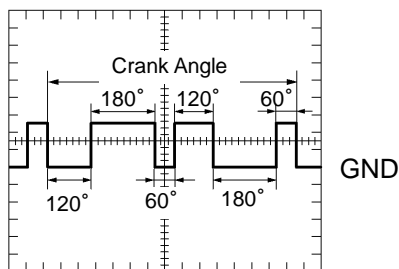
NG

Repair or replace harness or connector.

OK

2 Check camshaft position sensor signal.

2 V / DIV



Y

200 ms / DIV A23559

PREPARATION:

Start the engine.

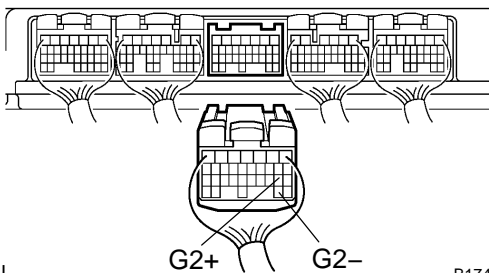
CHECK:

Check the waveform between the G2+ (E5-19) and G2- (E5-29) of the ECM connector.

OK:

Standard: Correct waveform is as shown.

(E5) ECM Connector



N

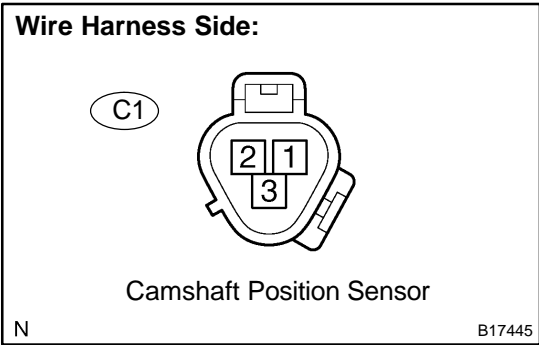
B17414

OK

Replace ECM (See page SF-82).

NG

3 Check for open and short in harness and connector between ECM and camshaft position sensor.



PREPARATION:

- (a) Disconnect the Camshaft position sensor connector.
- (b) Disconnect the E5 ECM connector.

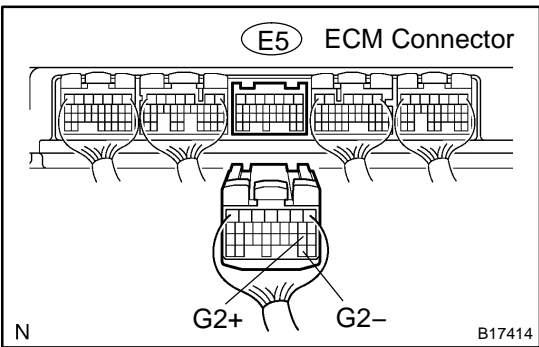
CHECK:

Measure the resistance between wire harness side connectors.

OK:

Standard:

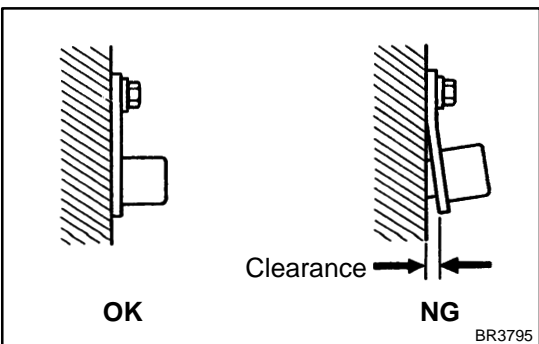
Tester Connection	Specified Condition
Camshaft position sensor (C1-2) – G2+ (E5-19)	Below 1 Ω
Camshaft position sensor (C1-1) – G2- (E5-29)	Below 1 Ω
Camshaft position sensor (C1-2) or G2+ (E5-19) – Body ground	10 kΩ or higher
Camshaft position sensor (C1-1) or G2- (E5-29) – Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

4 Inspect sensor installation and signal plate tooth of LH camshaft timing pulley.



CHECK:

Check the camshaft position sensor installation.

OK:

The camshaft position sensor is installed properly.

NG Tighten sensor installation bolt.

OK

5	Inspect signal plate tooth of LH camshaft timing pulley.
----------	---

NG	Replace LH camshaft timing pulley.
-----------	---

OK

Replace camshaft position sensor.
--

DTC	P1440	Secondary Air Injection System Control Valve Circuit Bank 1
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DTC	P1443	Secondary Air Injection System Control Valve Circuit Bank 2
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CIRCUIT DESCRIPTION

Refer to DTC P0412 on page [DI-656](#).

DTC No.	DTC Detection Condition	Trouble Area
P1440	AIV1 terminal voltage becomes less than half of the +B voltage while the VSV for air injection control is not operating. (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in VSV for air injection control circuit (Bank 1) • VSV power source • VSV for air injection control (Bank 1) • ECM
P1443	AIV2 terminal voltage becomes less than half of the +B voltage while the VSV for air injection control is not operating. (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in VSV for air injection control circuit (Bank 2) • VSV power source • VSV for air injection control (Bank 2) • ECM

MONITOR DESCRIPTION

The ECM detects an open or short in the circuit of the VSV for air injection control according to the AIV1 (AIV2) terminal voltage, stores the DTC, and then illuminates the MIL. When the AIV1 (AIV2) terminal voltage is less than half of the +B voltage while the VSV for air injection control is not operating, the ECM determines it as a malfunction.

MONITOR STRATEGY

Related DTCs	P1440	Secondary air injection system control valve circuit (Bank 1) range check
	P1443	Secondary air injection system control valve circuit (Bank 2) range check
Required sensors/components	VSV for air injection control	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
P1440:		
Engine	Running	
Air switching valve No. 2 (Bank 1)	Not operating	
P1443:		
Engine	Running	
Air switching valve No. 2 (Bank 2)	Not operating	

TYPICAL MALFUNCTION THRESHOLDS

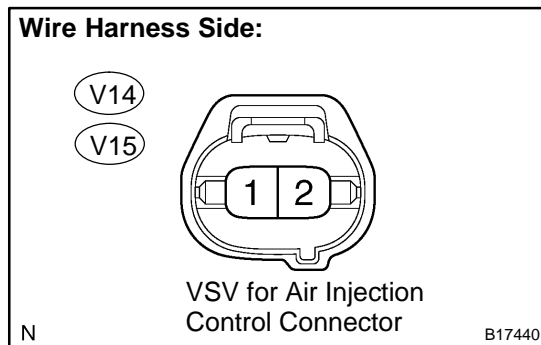
Detection Criteria	Threshold
P1440:	
Air switching valve No. 2 (Bank 1) output terminal level	Low
P1443:	
Air switching valve No. 2 (Bank 2) output terminal level	Low

WIRING DIAGRAM

Refer to DTC P0412 on page [DI-656](#).

INSPECTION PROCEDURE

1	Check VSV for air injection control power source.
----------	--



PREPARATION:

- (a) Disconnect the VSV for air injection control connector.
- (b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminal 1 of VSV connector and body ground.

OK:

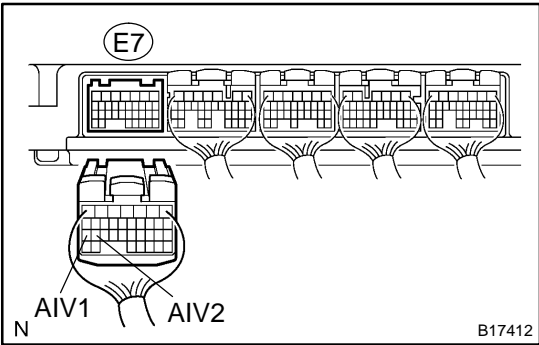
Standard: 9 V or more

NG

Check and replace harness and connector.

OK

2 Check for open and short circuit in harness and connector between ECM and VSV for air injection control



PREPARATION:

- (a) Disconnect the E7 ECM connector.
- (b) Disconnect the VSV for air injection control connector.

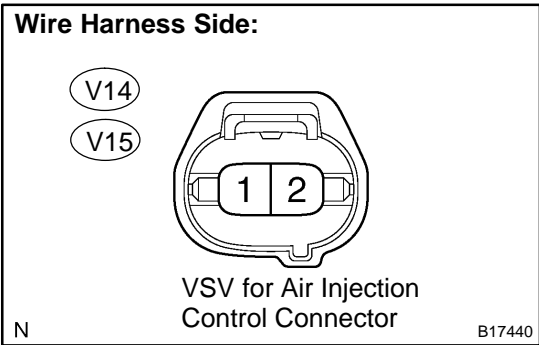
CHECK:

Measure the resistance between the VSV connector and ECM.

OK:

Standard:

Tester connection	Specified condition
E7-27 (AIV1) - V14-2	Below 1 Ω
E7-26 (AIV2) - V15-2	Below 1 Ω



CHECK:

Measure the resistance between the VSV connector and body ground.

OK:

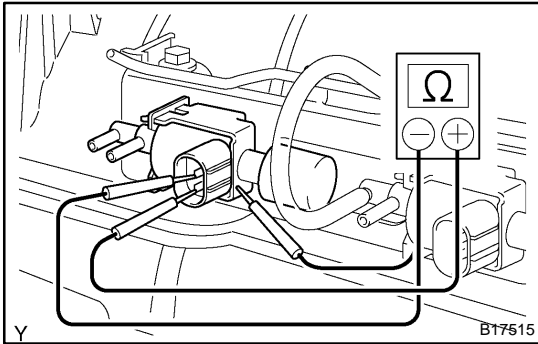
Standard:

Tester connection	Specified condition
E7-27 (AIV1) or V14-2 and Body ground	10 KΩ or higher
E7-26 (AIV2) or V15-2 and Body ground	10 KΩ or higher

NG **Repair or replace harness or connector.**

OK

3 Check resistance of VSV for air injection control.



PREPARATION:

- Disconnect the connector from the VSV.
- Disconnect the 2 vacuum hoses from the VSV.

CHECK:

Measure the resistance between the VSV terminals.

OK:

Standard:

Tester Connection	Specified Condition
1 - 2	33 to 39 Ω at 20 °C (68 °F)
1 - Body ground	10 k Ω or higher
2 - Body ground	10 k Ω or higher

NG

Replace VSV for air injection control.

OK

Replace ECM. (See page [SF-82](#))

DTC	P1441	Secondary Air Injection System Switching Valve No.2 Stuck Open Bank 1
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DTC	P1444	Secondary Air Injection System Switching Valve No.2 Stuck Open Bank 2
------------	--------------	--

DTC	P2440	Secondary Air Injection System Switching Valve Stuck Open Bank 1
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CIRCUIT DESCRIPTION

Refer to DTC P0412 on page [DI-656](#).

DTC No.	DTC Detection Condition	Trouble Area
P1441	Air switching valve No.2 (bank 1) stuck open: The pressure sensor detects exhaust pulsation, when both of air switching valve No.2 OFF (and air switching valve ON). (2 trip detection logic)	<ul style="list-style-type: none"> • VSV for air injection control circuit (Bank 1) • Air switching valve No.2 (Bank 1) • VSV for air injection system (Bank 1) • ECM
P1444	Air switching valve No.2 (bank 2) stuck open: The pressure sensor detects exhaust pulsation, when both of air switching valve No.2 OFF (and air switching valve ON). (2 trip detection logic)	<ul style="list-style-type: none"> • VSV for air injection control circuit (Bank 2) • Air switching valve No.2 (Bank 2) • VSV for air injection system (Bank 2) • ECM
P2440	Air switching valve stuck open: The pressure sensor detects exhaust pulsation when the system is not operate (both of air switching valve No.2 OFF, and air switching valve OFF and air pump OFF). This DTC means open stuck of air switching valve and "air switching valve No.2 bank 1 or bank 2" (1 trip detection logic)	<ul style="list-style-type: none"> • Electromagnetic air switching valve • Air switching valve No.2 (Bank 1 and/or 2) • VSV for air injection system (Bank 1 and/or 2) • Air injection driver • Air injection driver circuit • ECM

MONITOR DESCRIPTION

The ECM detects pressure change with the pressure sensor to determine malfunctioning parts in the system, and stores the DTCs. The ECM measures pressure and/or exhaust pulsation of the system at 6 points, A to F, when the air injection system is in operation or when not in operation. When the pressure is high, the ECM determines that the pump operates. When exhaust pulsation is detected, the ECM determines that the ASV is open. The ECM determines malfunction parts based on the measured value, and stores the DTCs.

Points A and B:

ECM detects pressure changes (decrease), and determines that the ASV No.2 is open.

Points C and F:

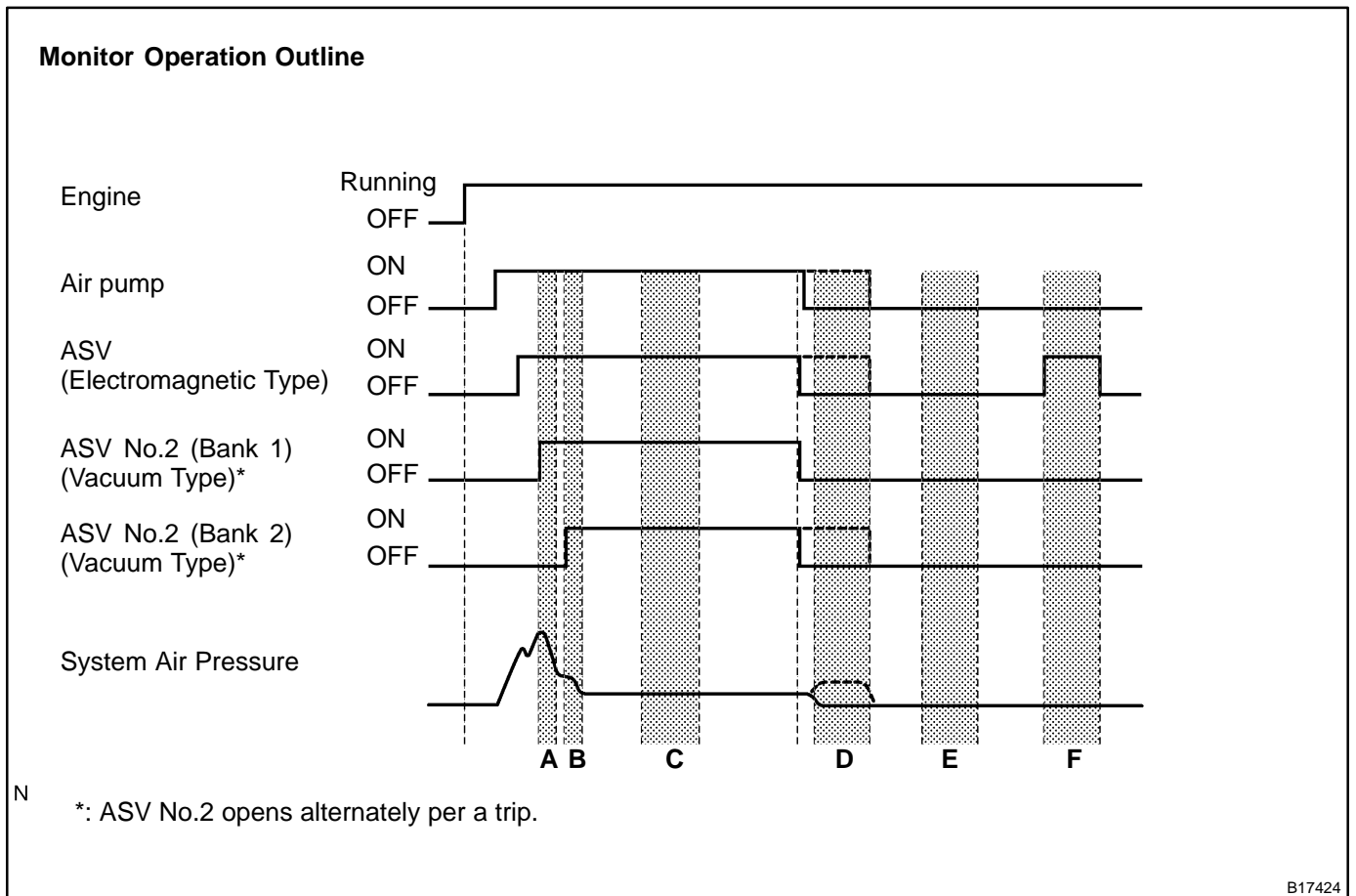
ECM detects pressure and exhaust pulsation, and determines the pressure pattern of the system.

Point D:

ECM operate the system, as indicated by the dashed lines, to determine which of the ASV No.2 is malfunctioning only when pressure changes cannot be detected at point B.

Point E:

ECM detects exhaust pulsation to determine the condition of the system.



Pressure condition in Secondary Air Injection System

Pattern 1:

Air Pump	ON
Air Switching Valve and Air Switching Valve No.2	Open
Pressure	2.5 kPa or more
Pulsation detection	Exhaust gas pulsation detected

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Pattern 2:

Air Pump	OFF
Air Switching Valve and Air Switching Valve No.2	Open
Pressure	Less than 2.5 kPa
Pulsation detection	Exhaust gas pulsation detected

Pattern 3:

Air Pump	ON
Air Switching Valve and Air Switching Valve No.2	Close
Pressure	2.5 kPa or more
Pulsation detection	Slight pulsation detected

Pattern 4:

Air Pump	OFF
Air Switching Valve and Air Switching Valve No.2	Close
Pressure	Less than 2.5 kPa
Pulsation detection	Not detected

Judgement and decision of failure mode:

Monitor						Judgement
C	F	A	B	D	E	DTCs where set
Pattern 1	Pattern 1	Pressure changed	Pressure changed	–	No pulsation detected	P2444, P1441 and P1443
Pattern 1	Pattern 1	No pressure changed	Pressure changed	–	No pulsation detected	P2444 and P1441
Pattern 1	Pattern 1	Pressure changed	No pressure changed	Pulsation detected	No pulsation detected	P2444 and P1443
Pattern 1	Pattern 1	No pressure changed	No pressure changed	Pulsation detected	No pulsation detected	P2444, P1441 and P1443
Pattern 1	Pattern 2	Pressure changed	Pressure changed	–	No pulsation detected	P1441 and P1443
Pattern 1	Pattern 2	No pressure changed	Pressure changed	–	No pulsation detected	P1441
Pattern 1	Pattern 2	Pressure changed	No pressure changed	Pulsation detected	No pulsation detected	P1443 and P1444
Pattern 1	Pattern 2	No pressure changed	No pressure changed	Pulsation detected	No pulsation detected	P1441, P1443 and P1444
Pattern 1	Pattern 3	Pressure changed	Pressure changed	–	No pulsation detected	P2444
Pattern 1	Pattern 3	No pressure changed	Pressure changed	–	No pulsation detected	P2444 and P1442
Pattern 1	Pattern 3	Pressure changed	No pressure changed	No pulsation detected	No pulsation detected	P2444 and P1442
Pattern 1	Pattern 3	No pressure changed	No pressure changed	No pulsation detected	No pulsation detected	P2444, P1442 and P1444
Pattern 1	Pattern 4	Pressure changed	Pressure changed	–	No pulsation detected	Normal
Pattern 1	Pattern 4	Pressure changed	No pressure changed	Pulsation detected	No pulsation detected	Normal
Pattern 1	Pattern 4	Pressure changed	No pressure changed	No pulsation detected	No pulsation detected	P1444
Pattern 1	Pattern 4	No pressure changed	Pressure changed	–	No pulsation detected	P1442
Pattern 1	Pattern 4	No pressure changed	No pressure changed	Pulsation detected	No pulsation detected	P1442
Pattern 1	Pattern 4	No pressure changed	No pressure changed	No pulsation detected	No pulsation detected	P1442 and P1444
Pattern 2	–	No pressure changed	No pressure changed	–	No pulsation detected	P2445
Pattern 3	Pattern 3	No pressure changed	No pressure changed	No pulsation detected	No pulsation detected	P2441, P2444, P1442 and P1444
Pattern 3	Pattern 4	No pressure changed	No pressure changed	No pulsation detected	No pulsation detected	P2441, P1442 and P1444
Pattern 4	–	No pressure changed	No pressure changed	–	–	P2445
–	–	–	–	–	Pulsation detected	P2440 and "P1441 or P1444"

MONITOR STRATEGY

Related DTCs	P1441	AIR VSV (Bank 1) is stuck open (case 1)
	P1444	AIR VSV (Bank 2) is stuck open (case 2)
	P1441, P1444	AIR VSVs stuck open (case 3)
	P2440	AIR valve stuck open (case 4)
	P2440	AIR valve and AIR VSVs stuck open (case 5)
Required sensors/components	AIR pressure sensor, AIR valve, AIR VSV (Bank 1), AIR VSV (Bank 2)	
Frequency of operation	Once per driving cycle	
Duration	Within 60 seconds	
MIL operation	P1441, P1444: 2 driving cycles P2440: 1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P1441, P1444: Air switching valve No. 2 bank 1 and/or bank 2 are stuck open

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Conditions for case 1, case 2, and case 4:		
Atmospheric pressure	45 kPa (338 mmHg)	–
Battery voltage	11.5 V	–
Sequence 1 to 6 are performed to monitor AIR	–	
Sequence 1	–	
AIR	In operation	
AIR pump	ON	
AIR valve (Electric type)	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Both of the following conditions are met:	Condition (a) and (b)	
(a) AIR valve (vacuum type) bank 1	ON	
(b) AIR valve (vacuum type) bank 2	OFF	
2. Both of the following conditions are met:	Condition (c) and (d)	
(c) AIR valve (vacuum type) bank 1	OFF	
(d) AIR valve (vacuum type) bank 2	ON	
Idle	ON	
Sequence 2	–	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	ON	
AIR valve (vacuum type) bank 2	ON	
Idle	ON	
Sequence 3	–	
AIR pump	ON	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	ON	
AIR valve (vacuum type) bank 2	ON	

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Engine RPM	-	3750 rpm
Sequence 4 (This sequence is run when AIR pressure is no change at monitor)	-	
AIR	Not operating	
AIR pump	ON	
AIR valve (Electric type)	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Both of the following conditions are met:	Condition (a) and (b)	
(a) AIR valve (vacuum type) bank 1	ON	
(b) AIR valve (vacuum type) bank 2	OFF	
2. Both of the following conditions are met:	Condition (c) and (d)	
(c) AIR valve (vacuum type) bank 1	OFF	
(d) AIR valve (vacuum type) bank 2	ON	
Engine RPM	-	3750 rpm
Sequence 5	-	
AIR	Not operating	
AIR pump	OFF	
AIR valve (Electric type)	OFF	
AIR valve (vacuum type) bank 1	OFF	
AIR valve (vacuum type) bank 2	OFF	
Engine RPM	-	3750 rpm
Sequence 6	-	
AIR status	Not operating	
AIR pump	OFF	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	OFF	
AIR valve (vacuum type) bank 2	OFF	
Engine RPM	-	3750 rpm
Conditions for case 3:		
Atmospheric pressure	45 kPa (338 mmHg)	-
Battery voltage	11.5 V	-
AIR pump	OFF	
Time after engine start	10 seconds	-
AIR VSV bank 1	OFF	
AIR VSV bank 2	OFF	
AIR status	OFF	
Engine load	0 %	-
Intake air amount	40 g/sec.	-
IAT at engine start	-15°C (5°F)	-
ECT at engine start	-	5°C (41°F)
AIR valve (Electric type)	ON	
Engine RPM	-	3750 rpm
Conditions for case 5:		
Cumulative intake air amount	172 g/sec.	-
AIR pump	OFF	
AIR valve	OFF	

AIR VSV bank 1	OFF	
AIR VSV bank 2	OFF	
Engine RPM	–	3750 rpm
AIR pressure sensor malfunction (open circuit, out of range)	Not detected	
AIR status	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Thresholds for case 1	
Both of the following conditions are met:	Condition 1 or 2
1. One of the following conditions is met:	Condition (a), (b) or (c)
(a) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is generated
AIR pressure during monitor sequence 6	Less than 5 kPa (37.5 mmHg) and pulse is generated
(b) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is generated
AIR pressure during monitor sequence 6	5 kPa (37.5 mmHg) or more and pulse is generated
(c) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg) and pulse is generated
AIR pressure during monitor sequence 6	Less than 5 kPa (37.5 mmHg) and pulse is generated
2. One of the following conditions is met:	Condition (d), (e) or (f)
(d) All of the following conditions are met:	–
AIR pressure during monitor sequence 1	Change
AIR pressure during monitor sequence 2	Change
(e) AIR pressure during monitor sequence 1 (when AIR VSV bank 1 is open)	No change
(f) AIR pressure during monitor sequence 2 (when AIR VSV bank 1 is open)	No change
Thresholds for case 2	
Both of the following conditions are met:	Condition 1 or 2
1. One of the following conditions is met:	Condition (a), (b) or (c)
(a) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is generated
AIR pressure during monitor sequence 6	Less than 5 kPa (37.5 mmHg) and pulse is generated
(b) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is generated
AIR pressure during monitor sequence 6	5 kPa (37.5 mmHg) or more and pulse is generated
(c) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg) and pulse is generated
AIR pressure during monitor sequence 6	Less than 5 kPa (37.5 mmHg) and pulse is generated
2. One of the following conditions is met:	Condition (d), (e) or (f)
(d) All of the following conditions are met:	–
AIR pressure during monitor sequence 1	Change
AIR pressure during monitor sequence 2	Change

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(e) AIR pressure during monitor sequence 1 (when AIR VSV bank 2 is open)	No change
(f) AIR pressure during monitor sequence 2 (when AIR VSV bank 1 is open)	No change
Thresholds for case 3	
AIR pressure	Pulse is generated
Thresholds for case 4	
Both of the following conditions are met:	–
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg) and pulse is generated
AIR pressure during monitor sequence 5	No pulse is generated
Thresholds for case 5	
AIR pressure change	Pulse is generated

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic tools.

Secondary air injection (AIR) system

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$71	\$E1	Multiply by 0.01 (g/s)	Test value of AIR amount insufficient	Minimum test limit	Maximum test limit
\$71	\$E2	Multiply by 0.01 (kPa)	Test value of AIR pump stuck ON	Minimum test limit	Maximum test limit
\$71	\$E3	Multiply by 0.01 (kPa)	Test value of AIR pump stuck OFF	Minimum test limit	Maximum test limit
\$71	\$E4	Multiply by 0.01 (kPa)	Test value of AIR control valve ON	Minimum test limit	Maximum test limit
\$71	\$E5	Multiply by 0.01 (kPa)	Test value of AIR control valve OFF	Minimum test limit	Maximum test limit
\$71	\$E6	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR valve	Minimum test limit	Maximum test limit
\$71	\$E7	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR VSV bank 1	Minimum test limit	Maximum test limit
\$71	\$E8	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR VSV bank 2	Minimum test limit	Maximum test limit
\$71	\$E9	Multiply by 0.01 (kPa)	Test value of AIR pressure pulsation for AIR VSV when AIR pressure is low	Minimum test limit	Maximum test limit

WIRING DIAGRAM

Refer to DTC P0412 on page [DI-656](#).

INSPECTION PROCEDURE

1	Check any other DTCs output (In addition to secondary air injection system DTCs).
----------	--

PREPARATION:

- (a) Connect hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

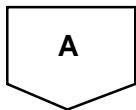
- (a) Read DTCs.

RESULT:

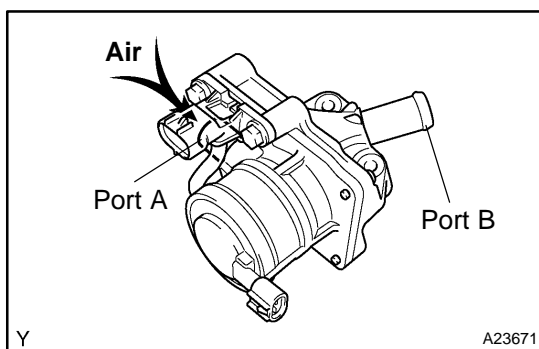
Display (DTC Output)	Proceed To
"P1441 and/or P1444" and P2440	A
P1441 and/or P1444	B
"P1441 and/or P1444 and/or P2440" and other DTCs	C

HINT:

If any DTCs other than P1441, P1444 or P2440 are output, troubleshoot those DTCs first.



2	Check air switching valve operation.
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PREPARATION:

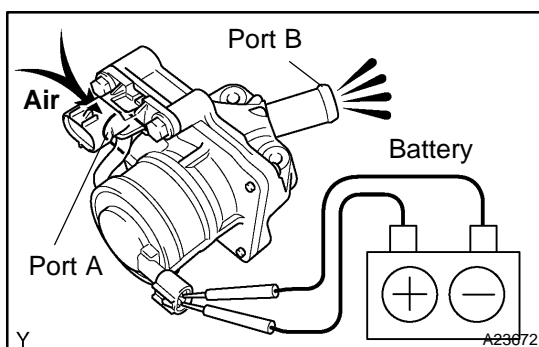
- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Remove the air switching valve.

CHECK:

Blow air into port A and check that air is not discharged from port B.

OK:

Not discharged



CHECK:

- (a) Apply battery positive across the terminals.
- (b) Blow air into port A and check that air is discharged from port B.

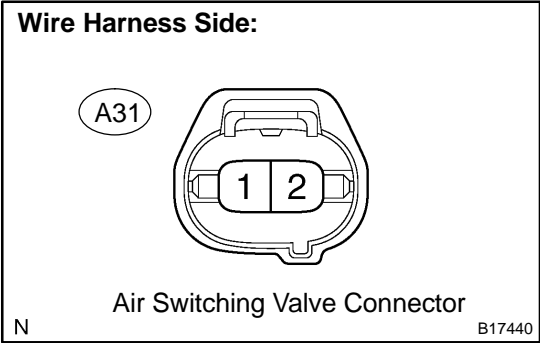
OK:

Discharged

NG Replace air switching valve and go to step 7.

OK

3 Check voltage between terminal 1 of air switching valve and body ground.



PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the A31 air switching valve connector.
- (c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal 1 of the air switching valve connector and body ground.

OK:

Standard:

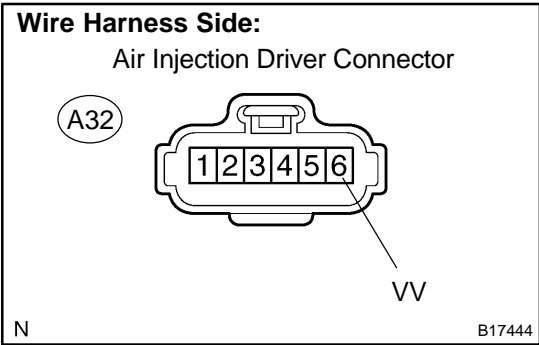
Tester Connection	Specified Condition
A31-1 - Body ground	Below 1.0 V

NG Go to step 4.

OK

Check for intermittent problems (See page [DI-430](#)) and go to step 7.

4 Check for open and short in harness and connector between air injection driver and air switching valve.



PREPARATION:

- (a) Remove the intake manifold (see page EM-36).
- (b) Disconnect the A32 air injection driver connector.
- (c) Disconnect the A31 air switching valve connector.
- (d) Disconnect the battery positive terminal cable.

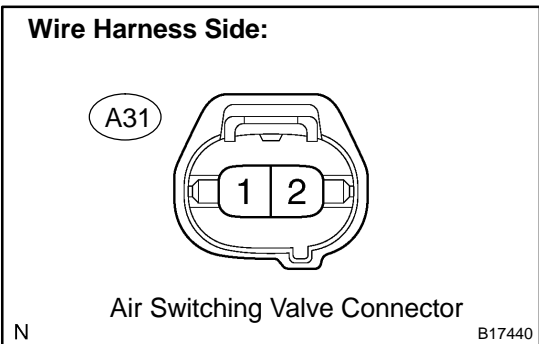
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

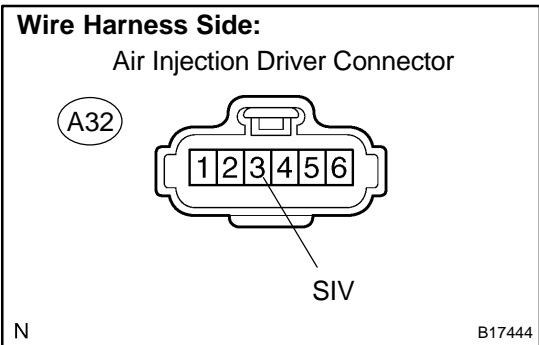
Tester Connection	Specified Condition
VV (A32-6) - A31-1	Below 1 Ω
VV (A32-6) or A31-1 - Battery positive terminal cable	10 kΩ or higher



NG Repair or replace harness or connector.

OK

5 Check voltage between SIV terminal of air injection driver and body ground.



PREPARATION:

- (a) Disconnect the A32 air injection driver connector.
- (b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal 3 (SIV) of the air injection driver connector and body ground.

OK:

Standard:

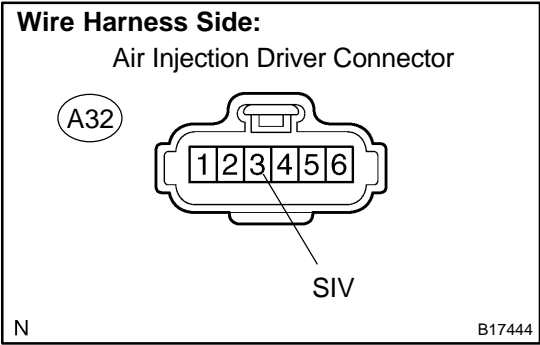
Tester Connection	Specified Condition
3 (SIV) - Body ground	10 V or more

NG Go to step 6.

OK

Replace air injection driver.

6 Check for open and short in harness and connector between air injection driver and ECM.



PREPARATION:

- (a) Disconnect the air injection driver connector.
- (b) Disconnect the E3 ECM connector.

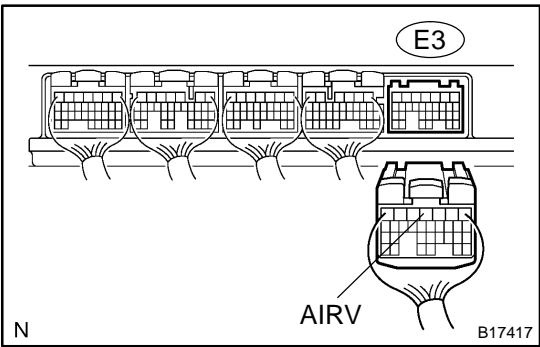
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
SIV (A32-3) – AIRV (E3-4)	Below 1 Ω
SIV (A32-3) or AIRV (E3-4) – Body ground	10 kΩ or higher

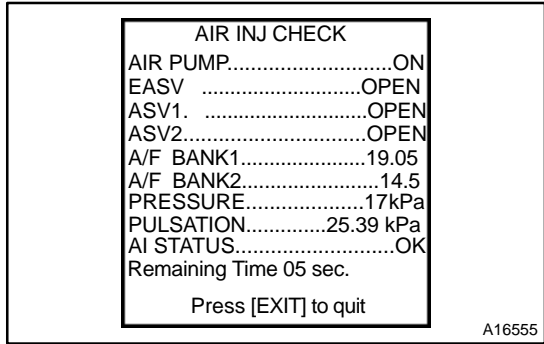


NG Repair or replace harness or connector.

OK

Replace ECM (See page SF-82).

7	Check air switching valve No.2 operation.
----------	--



PREPARATION:

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch to OFF.
- (c) Connect the hand-held tester to the DLC3.
- (d) Start the engine and push the hand-held tester main switch ON.

CHECK:

- (a) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/ MANUAL OPERATION/OPERATION 5 and 6

HINT:

OPERATION 5: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:CLOSE

OPERATION 6: AP:ON, EASV:OPEN, ASV1:CLOSE, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

- (b) Read values of the A/F BANK1 and BANK2 on the hand-held tester.

RESULT:

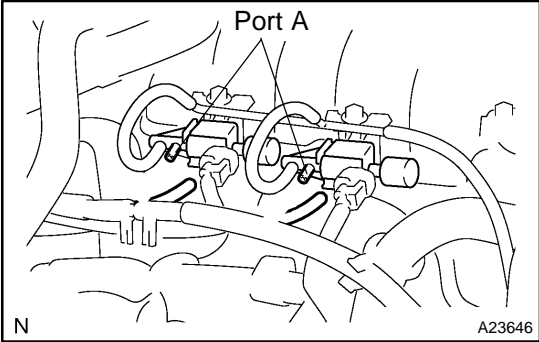
Air switching valve No.2 operation	Air-fuel ratio
Open	18 or more
Close	Approximately 14.5

HINT:

- When the ASV No.2 operates normally, the A/F value is 18 or more when the valve is open, and approximately 14.5 when the valve is closed.
- Perform the following procedures only on the bank of which the valve is not close.



8	Check VSV for air injection control operation.
----------	---



PREPARATION:

- (a) Turn the ignition switch OFF.
- (b) Disconnect the vacuum hose from the VSV for air injection control.
- (c) Connect the hand-held tester to the DLC3.
- (d) Start the engine and turn the tester ON.

CHECK:

- (a) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/MANUAL OPERATION/OPERATION 1
- (b) At this time, check that no negative pressure generates at port A of the VSV.

HINT:

OPERATION 1: AP: OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

NOTICE:

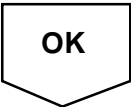
This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

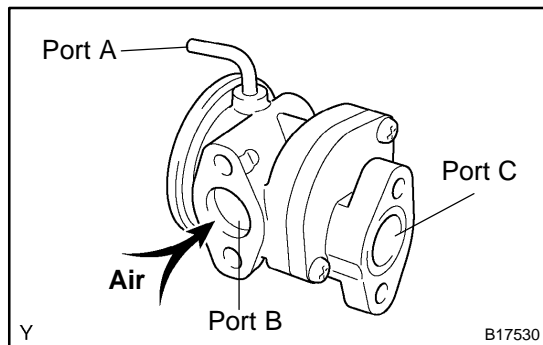
OK:

No negative pressure is generated.

NG	Go to step 10.
-----------	-----------------------



9 Check air switching valve No.2 operation.

**PREPARATION:**

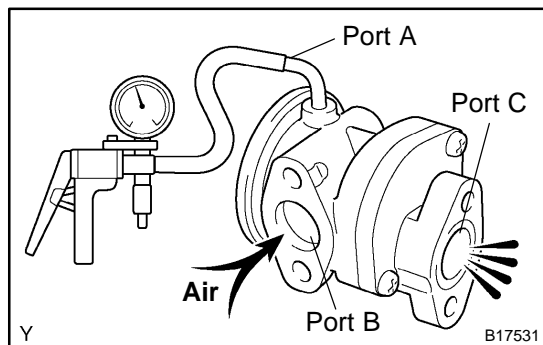
Remove the air switching valve No.2.

CHECK:

Blow air into port B and check that air is not discharged from port C.

OK:

Not discharged from port C

**CHECK:**

Apply vacuum 30 kPa (225 mmHg) to port A, blow air into port B and check that air is discharged from port C.

OK:

Discharged from port C

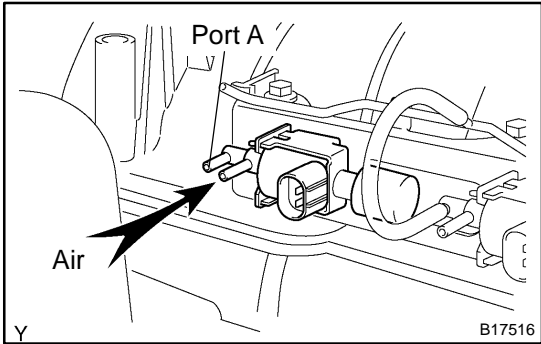
NG

Replace air switching valve No.2.

OK

**Check for intermittent problems
(See page [DI-430](#)).**

10 Check VSV for air injection control.



PREPARATION:

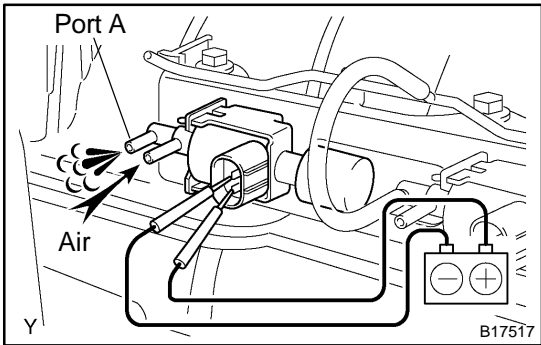
Disconnect the connector from the VSV for air injection control.

CHECK:

Check that air does not flow from the port as shown in the illustration.

OK:

Does not flow from port A



CHECK:

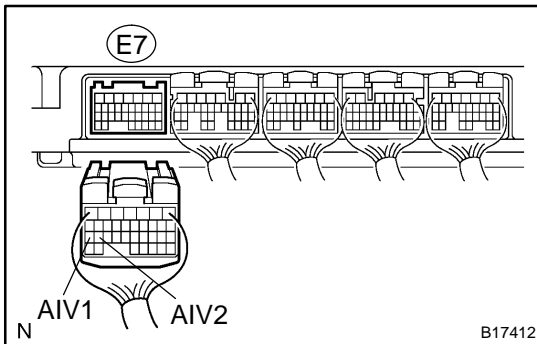
Apply battery positive across the terminals, check that air flows from the ports.

OK:

Flows from port A

NG Replace VSV for air injection control.

OK

11 Check for open and short circuit in harness and connector between ECM and VSV for air injection system control
**PREPARATION:**

- Remove the intake manifold (see page [EM-36](#)).
- Disconnect the E7 ECM connector.
- Disconnect the VSV for air injection system control connector.

CHECK:

Measure the resistance between the VSV connector and ECM.

OK:**Standard:**

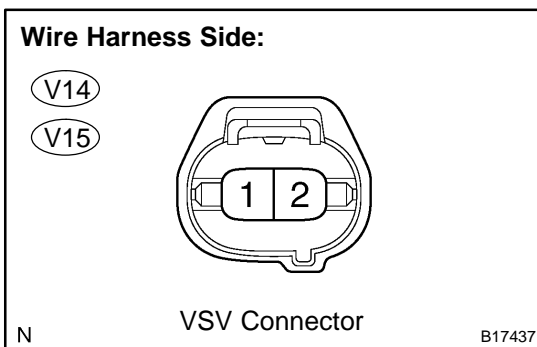
Tester connection	Specified condition
E7-27 (AIV1) – V14-2	Below 1 Ω
E7-26 (AIV2) – V15-2	Below 1 Ω

CHECK:

Measure the resistance between the VSV connector and body ground.

OK:**Standard:**

Tester connection	Specified condition
E7-27 (AIV1) or V14-2 and Body ground	10 K Ω or higher
E7-26 (AIV2) or V15-2 and Body ground	10 K Ω or higher

**NG****Repair or replace harness or connector.****OK**

Replace ECM (See page [SF-82](#)).

DTC	P1442	Secondary Air Injection System Switching Valve No.2 Stuck Close Bank 1
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DTC	P1445	Secondary Air Injection System Switching Valve No.2 Stuck Close Bank 2
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DTC	P2441	Secondary Air Injection System Switching Valve Stuck Close Bank 1
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CIRCUIT DESCRIPTION

Refer to DTC P0412 on page [DI-656](#).

DTC No.	DTC Detection Condition	Trouble Area
P1442	Air switching valve No.2 (bank 1) stuck close: No pressure change (decrease) after the ECM sends an open air switching valve No.2 (bank 1) signal. (2 trip detection logic)	<ul style="list-style-type: none"> • VSV for air injection control circuit (Bank 1) • Vacuum hose (VSV for air injection control – air switching valve No.2) • Air injector pipe (Air switching valve No.2 – exhaust manifold) • Air switching valve No.2 (Bank 1) • VSV for air injection control (Bank 1) • ECM
P1445	Air switching valve No.2 (bank 2) stuck close: No pressure change (decrease) after the ECM sends an open air switching valve No.2 (bank 2) signal. (2 trip detection logic)	<ul style="list-style-type: none"> • VSV for air injection control circuit (Bank 2) • Vacuum hose (VSV for air injection control – air switching valve No.2) • Air injector pipe (Air switching valve No.2 – exhaust manifold) • Air switching valve No.2 (Bank 2) • VSV for air injection control (Bank 2) • ECM
P2441	Air switching valve stuck close: The pressure sensor does not detect exhaust pulsation when system operates. (All of air switching valve ON) This DTC means either of following conditions. (a) Electromagnetic air switching valve stuck closed. (b) Both of "air switching valve No.2 bank 1" and "air switching valve No.2 bank 2" stuck closed. (2 trip detection logic)	<ul style="list-style-type: none"> • Vacuum hoses (Throttle body – VSVs for air injection control) • Air switching valve • Air injector pipe (Air switching valve No.2 – exhaust manifold) • Air injection hose • Air switching valve No.2 (Bank 1 and/or 2) • VSV for air injection control (Bank 1 and/or 2) • Air injection driver • Air injection driver circuit • ECM

MONITOR DESCRIPTION

Refer to DTC P1441, P1444 and P2440 on page [DI-739](#).

MONITOR STRATEGY

Related DTCs	P1442	AIR VSV (Bank 1) is stuck close (case 1)
	P1444	AIR VSV (Bank 2) is stuck close (case 2)
	P2441	AIR valve stuck close (case 3)
Required sensors/components	AIR pressure sensor, AIR valve, AIR VSV (Bank 1), AIR VSV (Bank 2)	
Frequency of operation	Once per driving cycle	
Duration	Within 60 seconds	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Atmospheric pressure	45 kPa (338 mmHg)	–
Battery voltage	11.5 V	–
Sequence 1 to 6 are performed to monitor AIR	–	
Sequence 1	–	
AIR	In operation	
AIR pump	ON	
AIR valve (Electric type)	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Both of the following conditions are met:	Condition (a) and (b)	
(a) AIR valve (vacuum type) bank 1	ON	
(b) AIR valve (vacuum type) bank 2	OFF	
2. Both of the following conditions are met:	Condition (c) and (d)	
(c) AIR valve (vacuum type) bank 1	OFF	
(d) AIR valve (vacuum type) bank 2	ON	
Idle	ON	
Sequence 2	–	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	ON	
AIR valve (vacuum type) bank 2	ON	
Idle	ON	
Sequence 3	–	
AIR pump	ON	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	ON	
AIR valve (vacuum type) bank 2	ON	
Engine RPM	–	3750 rpm
Sequence 4 (This sequence is run when AIR pressure is no change at monitor)	–	
AIR	Not operating	
AIR pump	ON	

AIR valve (Electric type)	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Both of the following conditions are met:	Condition (a) and (b)	
(a) AIR valve (vacuum type) bank 1	ON	
(b) AIR valve (vacuum type) bank 2	OFF	
2. Both of the following conditions are met:	Condition (c) and (d)	
(c) AIR valve (vacuum type) bank 1	OFF	
(d) AIR valve (vacuum type) bank 2	ON	
Engine RPM	–	3750 rpm
Sequence 5	–	
AIR	Not operating	
AIR pump	OFF	
AIR valve (Electric type)	OFF	
AIR valve (vacuum type) bank 1	OFF	
AIR valve (vacuum type) bank 2	OFF	
Engine RPM	–	3750 rpm
Sequence 6	–	
AIR status	Not operating	
AIR pump	OFF	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	OFF	
AIR valve (vacuum type) bank 2	OFF	
Engine RPM	–	3750 rpm

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Thresholds for case 1	
Both of the following conditions are met:	Condition 1 or 2
1. One of the following conditions is met:	Condition (a), (b), (c) or (d)
(a) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is NOT generated
AIR pressure during monitor sequence 6	5 kPa (37.5 mmHg) or more and pulse is NOT generated
(b) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is NOT generated
AIR pressure during monitor sequence 6	Less than 5 kPa (37.5 mmHg) and pulse is NOT generated
(c) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg) or more and pulse is NOT generated
AIR pressure during monitor sequence 6	5 kPa (37.5 mmHg) or more and pulse is NOT generated
(d) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg) or more and pulse is NOT generated
AIR pressure during monitor sequence 6	Less than 5 kPa (37.5 mmHg) and pulse is NOT generated
2. One of the following conditions is met:	Condition (e), (f) or (g)
(e) AIR pressure during monitor sequence 1 (when AIR VSV bank 1 is open)	No change
(f) AIR pressure during monitor sequence 2 (when AIR VSV bank 1 is open)	No change

DIAGNOSTICS – ENGINE (2UZ-FE)

(g) AIR pressure during monitor sequence 4 (when AIR VSV bank 1 is open)	No pulse is generated
Thresholds for case 2	
Both of the following conditions are met:	Condition 1 or 2
1. One of the following conditions is met:	Condition (a), (b), (c) or (d)
(a) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is NOT generated
AIR pressure during monitor sequence 6	5 kPa (37.5 mmHg) or more and pulse is NOT generated
(b) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is NOT generated
AIR pressure during monitor sequence 6	Less than 5 kPa (37.5 mmHg) and pulse is NOT generated
(c) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg) or more and pulse is NOT generated
AIR pressure during monitor sequence 6	5 kPa (37.5 mmHg) or more and pulse is NOT generated
(d) All of the following conditions are met:	–
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg) or more and pulse is NOT generated
AIR pressure during monitor sequence 6	Less than 5 kPa (37.5 mmHg) or more and pulse is NOT generated
2. One of the following conditions is met:	Condition (e), (f) or (g)
(e) AIR pressure during monitor sequence 1 (when AIR VSV bank 2 is open)	No change
(f) AIR pressure during monitor sequence 2 (when AIR VSV bank 2 is open)	No change
Thresholds for case 3	
AIR pressure during monitor sequence 3	1 kPa (7.5 mmHg) or more and pulse is NOT generated
(g) AIR pressure during monitor sequence 4 (when AIR VSV bank 2 is open)	No pulse is generated

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

Secondary air injection (AIR) system

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$71	\$E1	Multiply by 0.01 (g/s)	Test value of AIR amount insufficient	Minimum test limit	Maximum test limit
\$71	\$E2	Multiply by 0.01 (kPa)	Test value of AIR pump stuck ON	Minimum test limit	Maximum test limit
\$71	\$E3	Multiply by 0.01 (kPa)	Test value of AIR pump stuck OFF	Minimum test limit	Maximum test limit
\$71	\$E4	Multiply by 0.01 (kPa)	Test value of AIR control valve ON	Minimum test limit	Maximum test limit
\$71	\$E5	Multiply by 0.01 (kPa)	Test value of AIR control valve OFF	Minimum test limit	Maximum test limit
\$71	\$E6	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR valve	Minimum test limit	Maximum test limit
\$71	\$E7	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR VSV bank 1	Minimum test limit	Maximum test limit
\$71	\$E8	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR VSV bank 2	Minimum test limit	Maximum test limit
\$71	\$E9	Multiply by 0.01 (kPa)	Test value of AIR pressure pulsation for AIR VSV when AIR pressure is low	Minimum test limit	Maximum test limit

WIRING DIAGRAM

Refer to DTC P1441, P1444 and P2440 on page [DI-739](#).

INSPECTION PROCEDURE

1	Check any other DTCs output (In addition to secondary air injection system DTCs).
----------	--

PREPARATION:

- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON and turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

- Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
"P1442 and/or P1445" and P2441	A
P1442 and/or P1445	B
"P1442 and/or P1445 and/or P2441" and other DTCs	C

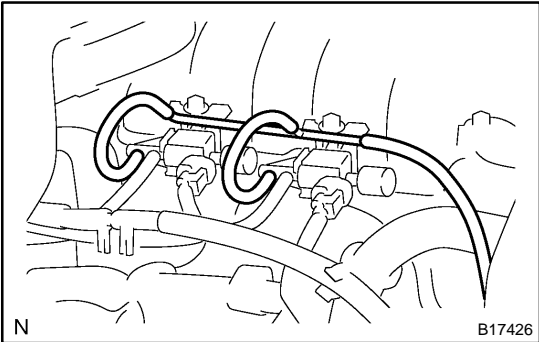
HINT:

If any DTCs other than P1441 and/or P1444 and P2440 are output, troubleshoot those DTCs first.

- B** Go to step 6.
- C** Go to DTC chart (See page [DI-462](#)).

A

2 Check vacuum hose between throttle body and VSV for air injection control.

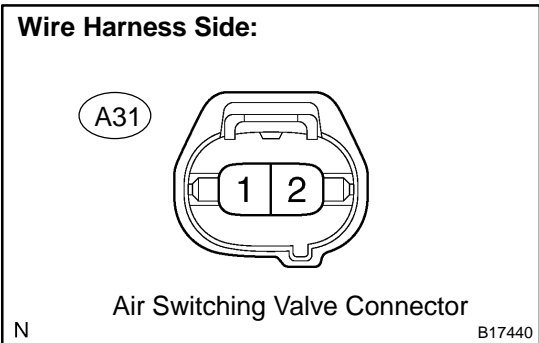


- CHECK:**
- (a) Check that the vacuum hoses between the throttle body and VSV for air injection control are securely connected.
- OK:**
The vacuum hoses are securely connected.
- CHECK:**
- (a) Inspect the vacuum hoses for blockages and damage.
- OK:**
The vacuum hoses no blockages and damages.

NG Repair or replace vacuum hoses.

OK

3 Check voltage between terminal 1 of air switching valve and body ground.



- PREPARATION:**
- (a) Remove the intake manifold (see page [EM-36](#)).
 - (b) Disconnect the A31 air switching valve connector.
 - (c) Connect the hand-held tester to the DLC3.
 - (d) Turn the ignition switch ON and turn the tester ON.
- CHECK:**
- (a) When the air switching valve is operated using the hand-held tester, measure voltage between terminal A31-1 of the air switching valve connector and body ground.
 - (b) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/MANUAL OPERATION/OPERATION 1 and 4

HINT:
OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE
OPERATION 4: AP:OFF, EASV:OPEN, ASV1:CLOSE, ASV2:CLOSE

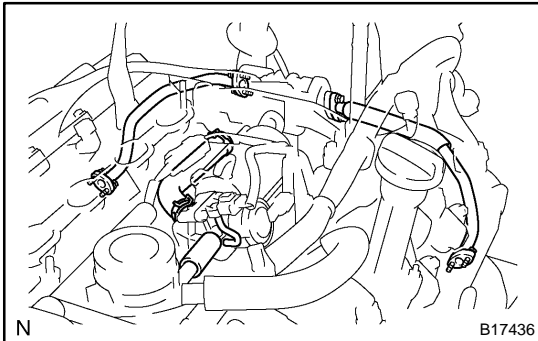
NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:**Standard:**

Tester operation	Tester Connection	Specified Condition
Operation 4	A31-1 – Body ground	10 V or more
Operation 1	A31-1 – Body ground	Below 1.0 V

NG**Go to step 12.****OK****4****Check all air injection pipes and hoses of air injection system.****CHECK:**

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Check all pipes and hoses of the air injection system.

OK:

All the air injection pipes and hoses are securely connected.

CHECK:

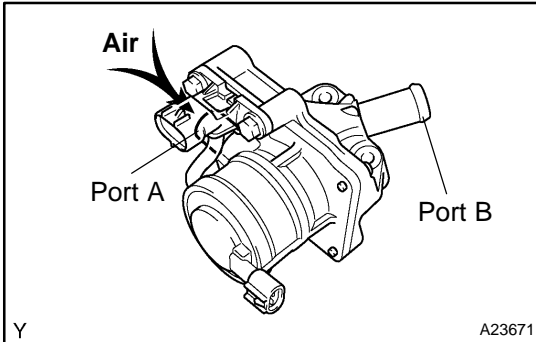
- (a) Check all pipes and hoses of the air injection system for blockage or damage.

OK:

The air injection system pipes and hoses have no blockage or damage.

NG**Repair or replace pipe or hose.****OK**

5 Check air switching valve operation.



PREPARATION:

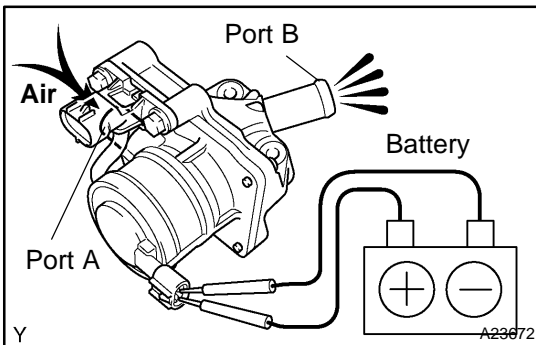
- Remove the intake manifold (see page [EM-36](#)).
- Remove the air switching valve.

CHECK:

Blow air into port A and check that air is not discharged from port B.

OK:

Not discharged



CHECK:

- Apply battery positive across the terminals.
- Blow air into port A and check that air is discharged from port B.

OK:

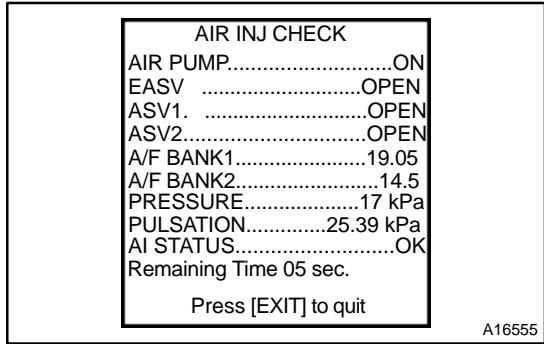
Discharged

NG

Replace air switching valve and go to step 6.

OK

6	Check air switching valve No.2 operation.
----------	--



PREPARATION:

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch to OFF.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to ON and push the hand-held tester main switch ON.

CHECK:

- (a) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/ MANUAL OPERATION/OPERATION 5 and 6

HINT:

OPERATION 5: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:CLOSE

OPERATION 6: AP:ON, EASV:OPEN, ASV1:CLOSE, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

- (b) Read value of the A/F BANK1 and BANK2 on the hand-held tester.

RESULT:

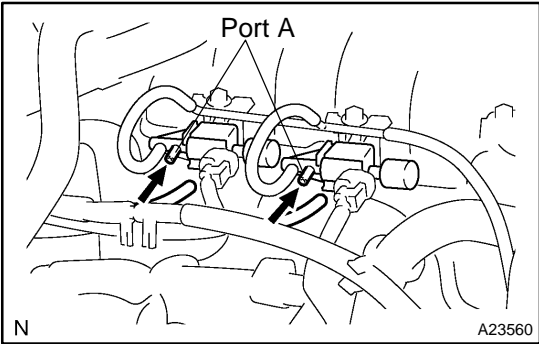
Air switching valve No.2 operation	Air-fuel ratio
Open	18 or more
Close	Approximately 14.5

HINT:

- When the ASV No.2 operates normally, the A/F value is 18 or more when the valve is open, and approximately 14.5 when the valve is closed.
- Perform the following procedures only on the bank of which the valve is not open.



7 Check VSV for air injection control operation.



PREPARATION:

- (a) Turn the ignition switch OFF.
- (b) Disconnect the vacuum hose from the VSV for air injection control.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to ON and turn the tester ON.

CHECK:

- (a) When the air switching valve is operated using the hand-held tester, check that negative pressure from the port A.
- (b) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/MANUAL OPERATION/OPERATION 2

HINT:

OPERATION 2: AP: ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

NOTICE:

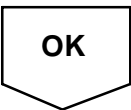
This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

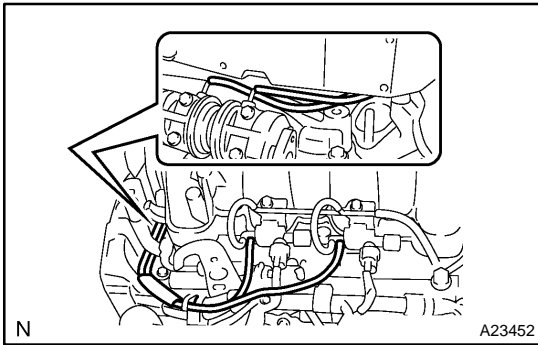
OK:

Negative pressure from port A

NG	Go to step 10.
-----------	-----------------------



8 Check vacuum hose between air switching valve(s) No.2 and VSV for air injection control.



CHECK:

- (a) Check that the vacuum hoses between the air switching valve(s) No.2 and VSV for air injection control are securely connected.

OK:

The vacuum hose(s) are securely connected.

CHECK:

- (a) Check the vacuum hoses for blockages and damage.

OK:

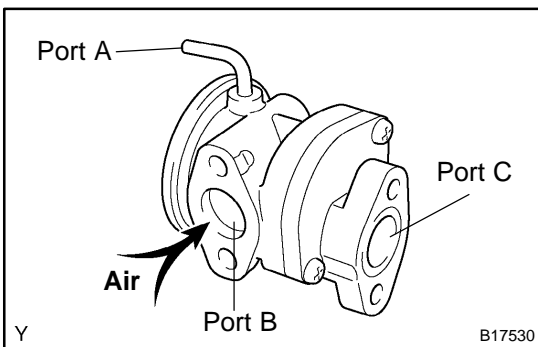
The vacuum hoses no blockages and damages.

NG

Repair or replace vacuum hose.

OK

9 Check air switching valve No.2 operation.



PREPARATION:

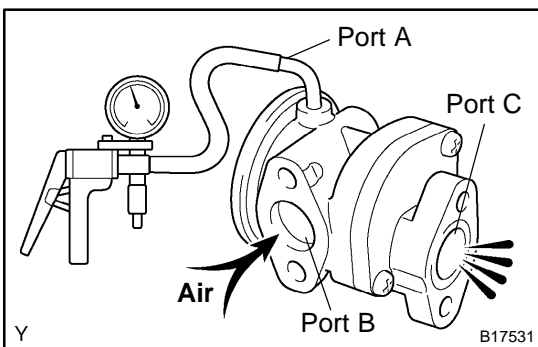
Remove the air switching valve No.2.

CHECK:

Blow air into port B and check that air is not discharged from the port C.

OK:

Not discharged from port C



CHECK:

Apply vacuum 30 kPa (225 mmHg) to port A, blow air into port B and check that air is discharged from the port C.

OK:

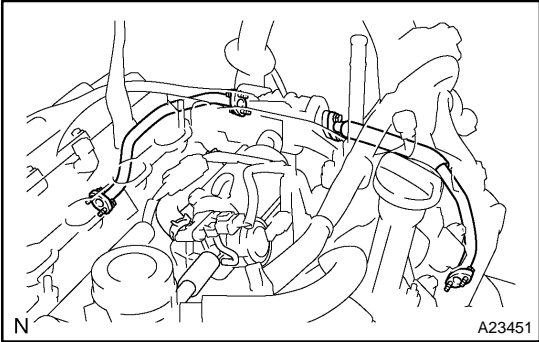
Discharged from port C

NG

Replace air switching valve No.2.

OK

10 Check air injection pipe between air switching valve No.2 and exhaust manifold.



CHECK:

- (a) Check that the air injection pipe between the air switching valve(s) No.2 and exhaust manifold are securely connected.

OK:

The air injection pipe is securely connected.

CHECK:

- (a) Check the air injection pipe for blockages and damage.

OK:

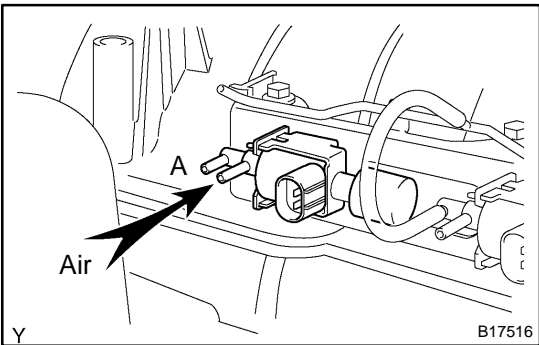
The air injection pipe no blockages and damages.

NG → **Repair or replace air injection pipe.**

OK

Check for intermittent problems (See page DI-430).

11 Check VSV for air injection control.



PREPARATION:

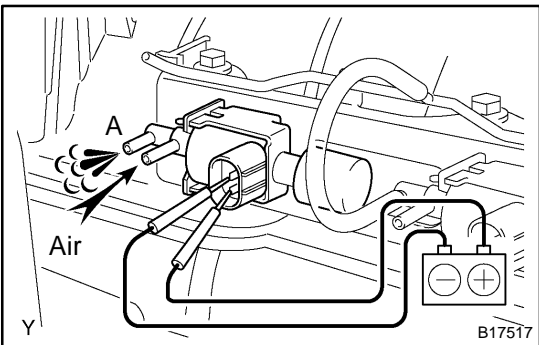
Disconnect the 2 vacuum hoses.

CHECK:

Check that air does not flow from the port A as shown in the illustration.

OK:

Not flow from port A



CHECK:

Apply battery positive across the terminals, check that air flows from the port A.

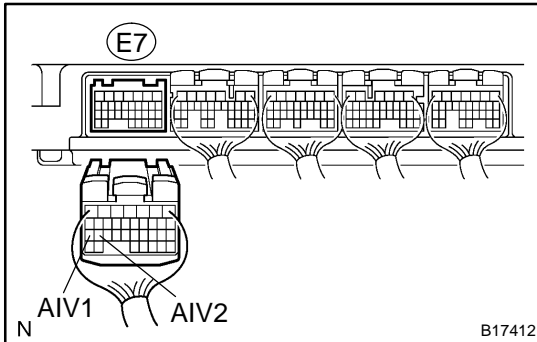
OK:

Flow from port A

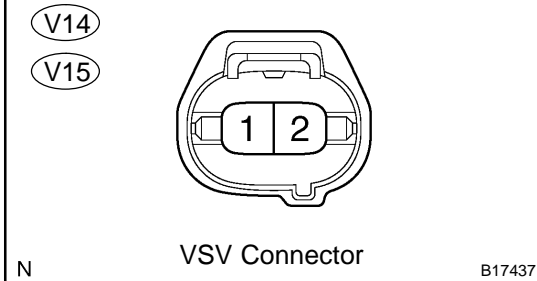
NG → **Replace VSV for air injection control.**

OK

12 Check for open and short circuit in harness and connector between ECM and VSV for air injection system control



Wire Harness Side:



PREPARATION:

- Remove the intake manifold (see page EM-36).
- Disconnect the E7 ECM connector.
- Disconnect the VSV for air injection system control connector.

CHECK:

Measure the resistance between the VSV connector and ECM.

OK:

Standard:

Tester connection	Specified condition
E7-27 (AIV1) - V14-2	Below 1 Ω
E7-26 (AIV2) - V15-2	Below 1 Ω

CHECK:

Measure the resistance between the VSV connector and body ground.

OK:

Standard:

Tester connection	Specified condition
E7-27 (AIV1) or V14-2 and Body ground	10 K Ω or higher
E7-26 (AIV2) or V15-2 and Body ground	10 K Ω or higher

NG

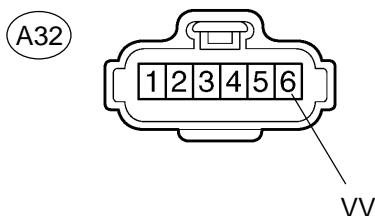
Repair or replace harness or connector.

OK

13 Check for open and short in harness and connector between air injection driver and air switching valve.

Wire Harness Side:

Air Injection Driver Connector



N

B17444

PREPARATION:

- Remove the intake manifold (see page [EM-36](#)).
- Disconnect the A32 air injection driver connector.
- Disconnect the A31 air switching valve connector.

CHECK:

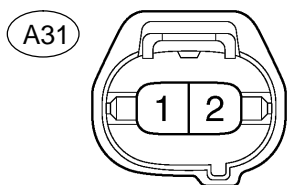
Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VV (A32-6) - A31-1	Below 1 Ω
VV (A32-6) or A31-1 - Body ground	10 k Ω or higher

Wire Harness Side:



N

B17440

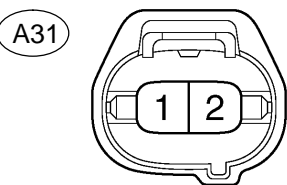
NG

Repair or replace harness or connector and go to step 6.

OK

14 Check for open in harness and connector between air switching valve and body ground.

Wire Harness Side:



N

B17440

PREPARATION:

- Remove the intake manifold (see page [EM-36](#)).
- Disconnect the A31 air switching valve connector.

CHECK:

Measure the resistance between the wire harness side connectors and body ground.

OK:

Standard:

Tester Connection	Specified Condition
A31-2 - Body ground	Below 1 Ω

NG

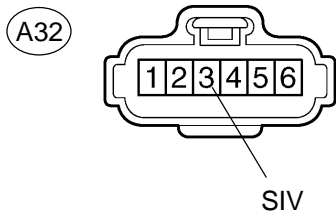
Repair or replace harness or connector and go to step 6.

OK

15 Check for open and short in harness and connector between air injection driver and ECM.

Wire Harness Side:

Air Injection Driver Connector



N

B17444

PREPARATION:

- Disconnect the air injection driver connector.
- Disconnect the E3 ECM connector.

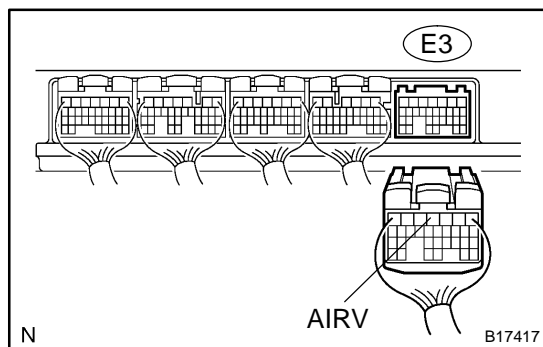
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
SIV (A32-3) - AIRV (E3-4)	Below 1 Ω
SIV (A32-3) or AIRV (E3-4) - Body ground	10 k Ω or higher



N

B17417

NG

Repair or replace harness or connector and go to step 6.

OK

Replace ECM (See page SF-82).

DTC	P1613	Air Injection System Air Injection Driver
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0412 on page [DI-656](#).

DTC No.	DTC Detection Condition	Trouble Area
P1613	Either of following condition (a) or (b) met: (a) All of following condition met (1 trip detection logic): <ul style="list-style-type: none"> • While either of air pump or air switching valve does not operate. • Air injection driver outputs normal signal (80% duty signal) (b) All of following condition met (1 trip detection logic): <ul style="list-style-type: none"> • Air injection driver outputs abnormal duty signal (duty signal excluding 0, 20, 40, 60, 80, 100%) 	<ul style="list-style-type: none"> • Air injection driver (AID) • Open in air injection driver ground circuit
P1613	All of following condition met (1 trip detection logic): (a) While air injection system operating (Air pump ON and all ASV ON) (b) Air injection driver outputs air pump malfunction signal (0% duty signal)	<ul style="list-style-type: none"> • Short in diagnostic information signal circuit (AID – ECM) • Open or short in air pump and air switching valve command signal circuit (AID – ECM) • Air injection driver (AID) • Open in air injection driver ground circuit • ECM
P1613	Air injection driver outputs abnormal duty signal (100% duty signal) (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in AID power source circuit • Open in diagnostic information signal circuit (AID – ECM) • Air injection driver (AID) • ECM

MONITOR DESCRIPTION

When the air injection system operation is required while the engine is warming up, the ECM transmits command signals to the Air Injection Driver (AID) to drive the air pump and air switching valve.

AID detects an open and short in the air pump and air switching valve circuit according to the terminal voltage and sends a signal as the diagnostic information to the ECM.

If the air injection system drive circuit or the AID itself has a malfunction, the AID sends a malfunction signal (duty signal) as a diagnostic information signal to the ECM (when the system is normal, a system normal signal is sent).

The ECM sets the DTC based on the diagnostic information from the AID.

Example:

- (1) The duty ratio of the diagnostic information signal output from AID is 0 or 100% (remains at 0 V or battery voltage).
- (2) The duty ratio output from AID is the ratio to output the impossible (excluding 0, 20, 40, 60, 80, 100%).
- (3) The AID outputs the normal signal (normal duty signal: 80%) while the system not operating.

MONITOR STRATEGY

Related DTCs	P1613	Secondary air injection system control module range check
Required sensors/components	Air injection driver	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Case 1:		
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	
Case 2:		
Either of following conditions is met	Condition 1 or 2	
1. Air pump	Not operating	
2. Air switching valve	Not operating	
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	
Case 3:		
Air pump	Operating	
Air switching valve	Operating	
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	
Case 4:		
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1:	
One of the following conditions is met:	Condition 1, 2, 3 or 4
1. Diagnostic signal duty ratio from air injection driver	1 to 10 %
2. Diagnostic signal duty ratio from air injection driver	30 %
3. Diagnostic signal duty ratio from air injection driver	49 %
4. Diagnostic signal duty ratio from air injection driver	91 to 99 %
Case 2:	
Diagnostic signal duty ratio from air injection driver	70 to 90 %

Case 3:	
Diagnostic signal duty ratio from air injection driver	0 %
Case 4:	
Diagnostic signal duty ratio from air injection driver	100 %

COMPONENT OPERATING RANGE

Parameter	Standard Value
Diagnostic signal duty ratio from air injection driver	70 to 90% when secondary air injection system operating and 0% when secondary air injection system not operating

WIRING DIAGRAM

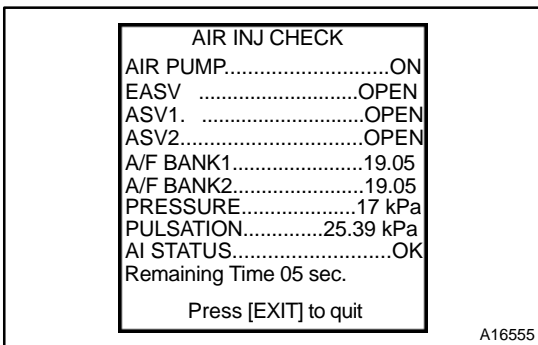
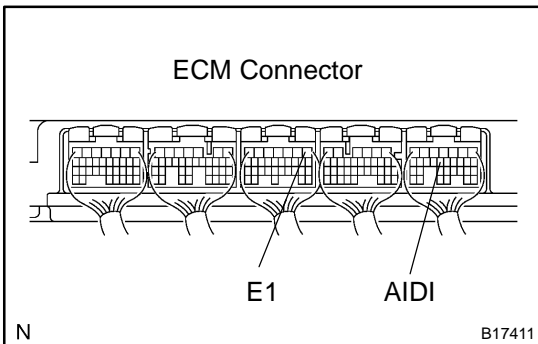
Refer to DTC P0412 on page [DI-656](#).

INSPECTION PROCEDURE

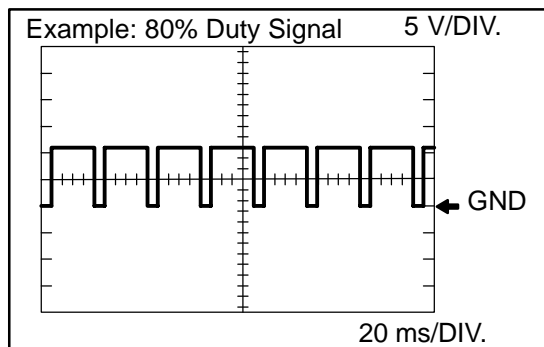
HINT:

The diagnostic information output from the AID can be confirmed by connecting an oscilloscope to the diagnostic information terminal of the AID. It narrows a trouble area search to read the waveform on the oscilloscope when performing the AI system intrusive operation function provided in the SYSTEM CHECK.

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch to OFF.
- (c) Connect a hand-held tester to the DLC3.
- (d) Connect an oscilloscope probe to the AIDI terminal of the ECM.
- (e) Start the engine and turn the tester ON.
- (f) On the tester, select the following menu items:
DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / AIR INJ SYSTEM.
- (g) On the tester, select the following menu items:
DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / AIR INJ CHECK / MANUAL OPERATION / OPERATION 1 and 2.



HINT:
OPERATION 1: AP: OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:OFF
OPERATION 2: AP: ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN



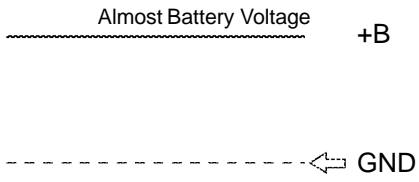
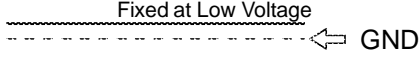
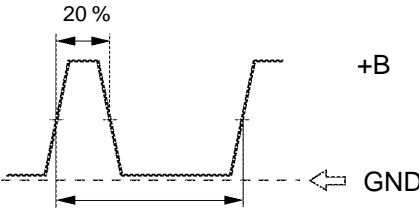
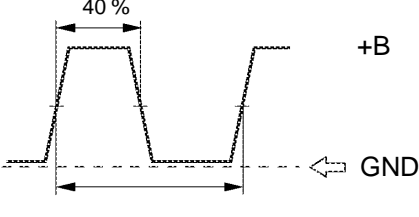
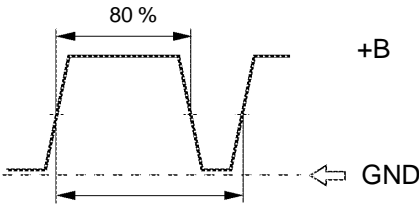
(1) Monitor the voltage output of the AID (duty ratio signal).

Oscilloscope range:

Items	Contents
Terminals	CH1: AIDI - E1
Equipment Settings	5 V/Division, 20 to 40 ms/Division
Conditions	Idling

NOTICE:

- This AIR INJECTION CHECK only allows technicians to operate the AI system for 5 seconds. Furthermore, the check can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between checks.
While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again.
- Performing the AIR INJ CHECK over and over again may cause the damage in the secondary air injection system. If necessary, put an interval of several minutes between tests to prevent overheating the system.

AID Diagnostic Signal Waveforms	ECM Commands	DTCs (ECM Output)	Suspected Trouble Areas
<p>100 % Duty ratio</p> 	<p>Any Air Injection (AI) System operation</p>	<p>P1613</p>	<ul style="list-style-type: none"> • Open in diagnostic signal circuit • Air Injection Control Driver (AID) • Open in AID+B circuit (AID power source) • Short between +B circuit and diagnostic signal circuit
<p>0 % Duty ratio</p> 	<p>AI System: ON (Air pump ON, ASV ON)</p>	<p>P1613</p>	<ul style="list-style-type: none"> • Open or short in air pump or Air Switching Valve (ASV) command signal circuit (ECM-AID) • Open in AID ground circuit • Short between diagnostic signal circuit and body ground • AID • ECM
	<p>AI System: OFF (Air pump OFF, ASV OFF)</p>	<p>—</p>	<p>Normal</p>
<p>20 % Duty ratio</p> 	<p>Air Pump: ON</p>	<p>P0418</p>	<p>Short between air pump drive circuit and body ground</p> <ul style="list-style-type: none"> • Harness & connector (AID-Pump) • Air Pump • AID • ECM
	<p>Air Pump: OFF</p>	<p>P0418</p>	<p>Open in air pump drive circuit (AID-Pump), or short between air pump drive circuit and +B</p> <ul style="list-style-type: none"> • Harness & connector (AID-Pump) • Air Pump • AID • ECM
<p>40 % Duty ratio</p> 	<p>ASV: ON</p>	<p>P0412</p>	<p>Short between ASV drive circuit and body ground</p> <ul style="list-style-type: none"> • Harness & connector (AID-ASV) • ASV • AID • ECM
	<p>ASV: OFF</p>	<p>P0412</p>	<p>Open in ASV drive circuit (AID-ASV), or short between ASV drive circuit and +B</p> <ul style="list-style-type: none"> • Harness & connector (AID-ASV) • AID • ASV • ECM
<p>80 % Duty ratio</p> 	<p>AI System: OFF (Air pump OFF, ASV OFF)</p>	<p>P1613</p>	<ul style="list-style-type: none"> • AID • ECM
	<p>AI System: ON (Air pump ON, ASV ON)</p>	<p>—</p>	<p>Normal</p>
<p>Excluding above (excluding 0, 20, 40, 80, 100 % duty)</p>	<p>—</p>	<p>P1613</p>	<ul style="list-style-type: none"> • AID • Open in AID ground circuit

HINT:

- Using the AIR INJ CHECK operation of the SYSTEM CHECK provided in the hand-held tester function, conditions for air-fuel ratio and pressure in the secondary air injection system passage can be checked while the secondary air injection system operating. It helps technicians to troubleshoot the system when it malfunctioning.
- Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Check any other DTCs output (In addition to air injection system DTCs).
----------	--

PREPARATION:

- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON and turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

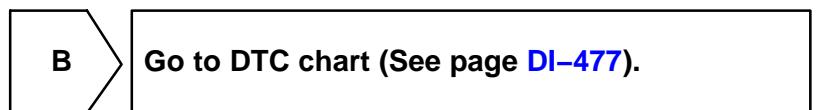
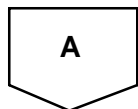
- Read DTCs.

RESULT:

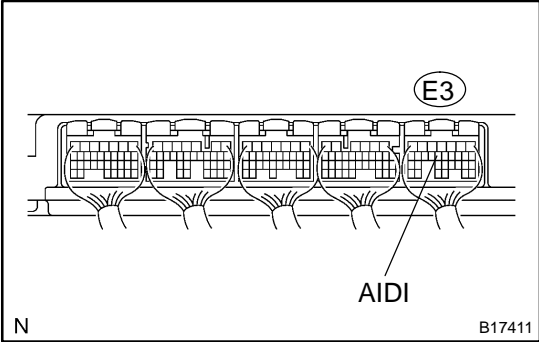
Display (DTC Output)	Proceed To
P1613	A
P1613 and other DTCs	B

HINT:

If any DTCs other than P1613 are output, troubleshoot those DTCs first.



2 Check voltage between AIDI terminal of ECM and body ground.



PREPARATION:

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch to OFF.
- (c) Connect a hand-held tester to the DLC3.
- (d) Turn the ignition switch ON and turn the tester ON.
- (e) Start the engine.
- (f) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/AUTOMATIC OPERATION

CHECK:

Measure voltage between terminal E3-13 (AIDI) of the ECM connector and body ground when the air injection system is ON and OFF.

RESULT:

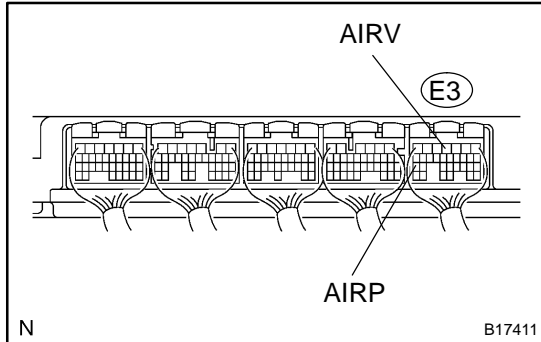
Results	Suspected Trouble Areas	Proceed To
Fixed at Low (1.6 V or less) even when AI system ON (Air pump ON, ASV ON)	<ul style="list-style-type: none"> • Short between air pump or air switching valve command signal circuit and body ground • Open in air pump command signal circuit (between ECM and AID) • Open in ASV command signal circuit (between ECM and AID) • Open in AID ground circuit (between AID and body ground) • Diagnostic signal circuit ground short • AID • ECM 	A
Fixed at High (12 V or more) even when AI system OFF (Air pump OFF, ASV OFF)	<ul style="list-style-type: none"> • Open in diagnostic signal circuit (ECM - AID) • Short between +B circuit and diagnostic signal circuit (ECM - AID) • Open in AID power source circuit • AID • ECM 	B
Other than above: • Fluctuating (duty signal excluding 20, 40, 80%)	<ul style="list-style-type: none"> • AID • Open in AID ground circuit (between AID and body ground) 	C

B Go to step 5.

C Go to step 8.

A

3 Check voltage between AIRP, AIRV terminals of ECM and body ground.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure voltage between terminal E3-25 (AIRP), E3-4 (AIRV) of the ECM connector and body ground.

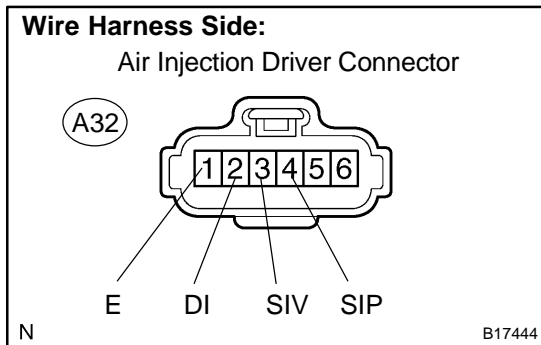
OK:

Tester Connection	Specified Condition
E3-25 (AIRP) - Body ground	10 V or more
E3-4 (AIRV) - Body ground	10 V or more

NG Replace ECM (See page SF-82).

OK

4 Check for short in harness and connector between SIP terminal of air injection driver and SIRP of ECM.



PREPARATION:

- (a) Disconnect the A32 air injection driver connector.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
SIP (A32-4) or AIRP (E3-25) - Body ground	10 kΩ or higher
SIV (A32-3) or AIRV (E3-4) - Body ground	10 kΩ or higher
E (A32-1) - Body ground	Below 1 Ω

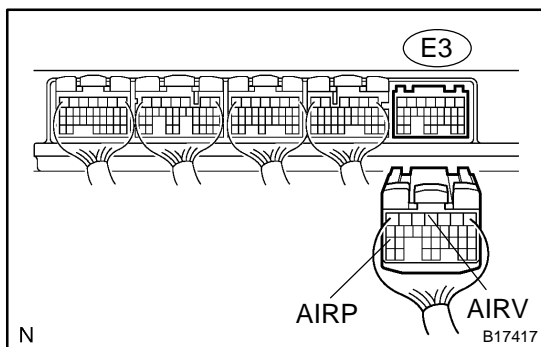
CHECK:

Measure the voltage between DI (A32-2) and E (A32-1) of the air injection driver wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
DI (A32-2) - E (A32-1)	9 V or more

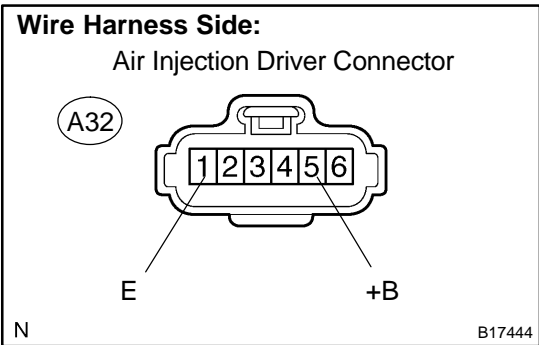


NG Repair or replace harness or connector.

OK

Replace air injection driver.

5 Inspect air injection driver power source circuit.



PREPARATION:

- (a) Disconnect the A32 air injection driver connector.
- (b) Turn the ignition switch to ON.

CHECK:

Measure the voltage between the terminal +B (A32-5) and E (A32-1) of the air injection driver connector.

OK:

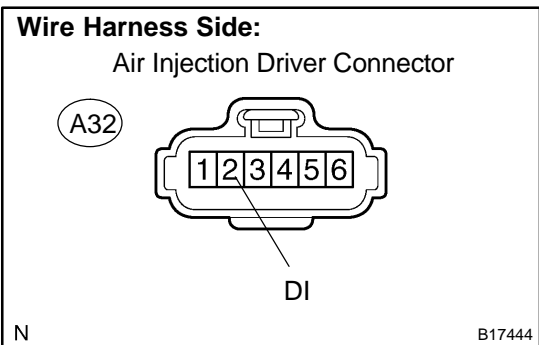
Standard:

Tester Connection	Specified Condition
A32-5 (+B) - E (A32-1)	10 V or more

NG Repair or replace harness or connector.

OK

6 Check voltage between DI terminals of air injection driver and body ground.



PREPARATION:

- (a) Disconnect the A32 air injection driver connector.
- (b) Turn the ignition switch to ON.

CHECK:

Measure the voltage between the terminal A32-2 (DI) of the air injection driver connector and body ground.

OK:

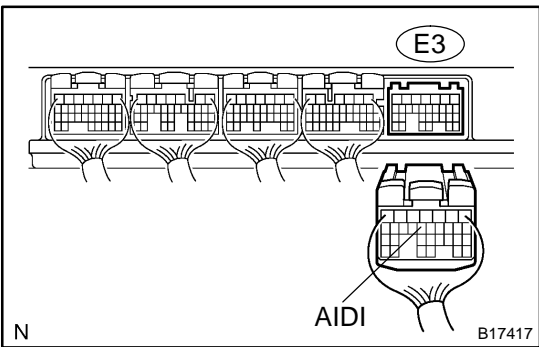
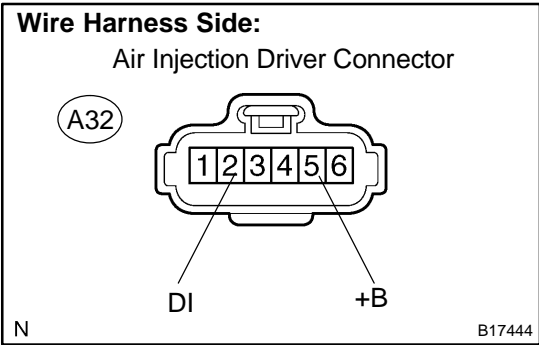
Standard:

Tester Connection	Specified Condition
A32-2 (DI) - Body ground	10 V or more

NG Go to step 7.

OK

7 Check for short in harness and connector between DI terminal of air injection driver and AIDI terminal of ECM.



PREPARATION:

- (a) Disconnect the A32 air injection driver connector.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

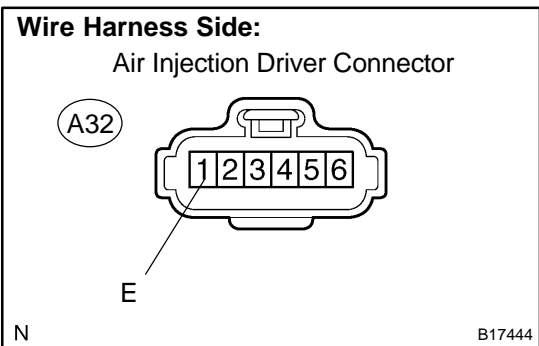
Tester Connection	Specified Condition
DI (A32-2) - AIDI (E3-13)	Below 1 Ω
DI (A32-2) or AIDI (E3-13) - +B (A32-5)	10 kΩ or higher

NG Repair or replace harness or connector.

OK

Replace ECM (See page [SF-82](#)).

8 Inspect air injection driver ground circuit.



PREPARATION:

Disconnect the A32 air injection driver connector.

CHECK:

Measure the resistance between the terminal E (A32-1) of the air injection driver connector and body ground.

OK:

Standard:

Tester Connection	Specified Condition
E (A32-1) - Body ground	10 V or more

NG Repair or replace harness or connector.

OK

9	Replace air injection driver.
----------	--------------------------------------

NEXT

10	Check whether DTC output recurs.
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PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Clear the DTCs (see page [DI-462](#)).
- (d) Start the engine.

CHECK:

- (a) Perform ACTIVE TEST to operate the air injection system.
Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/AUTOMATIC OPERATION
- (b) After operating the secondary air injection system, confirm the pending codes of the secondary air injection system by selecting the following menu items: DIAGNOSIS/ENHANCED OBD II/DTC INFO/PENDING CODES.

OK:

DTC P1613 for the secondary air injection system is not output.

NG	Go to DTC chart (See page DI-462).
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OK

END

DTC	P2102	Throttle Actuator Control Motor Circuit Low
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DTC	P2103	Throttle Actuator Control Motor Circuit High
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CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM. It opens and closes the throttle valve.

The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM. This feedback allows the ECM to control the throttle motor and monitor the throttle opening angle as the ECM responds to driver inputs.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2102	Conditions (a) and (b) continue for 2.0 seconds: (1 trip detection logic) (a) Throttle control motor output duty 80 % or more (b) Throttle control motor current less than 0.5 A or less	<ul style="list-style-type: none"> • Open in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM
P2103	Either of the following condition is met (a) Hybrid IC diagnosis met: (b) Hybrid IC current limiter port fail	<ul style="list-style-type: none"> • Short in throttle control motor and sensor circuit • Throttle control motor and sensor • Throttle valve • Throttle body • ECM

MONITOR DESCRIPTION

The ECM monitors the current through the electronic throttle motor and detects malfunctions or open circuit in the throttle motor based on the voltage of the current. When the current deviates from the standard, the ECM concludes that there is a fault in the throttle motor.

Or, if the throttle valve is not functioning properly (for example, stuck ON), the ECM concludes that there is a fault, turns on the MIL and sets a DTC is set.

Example:

When the current is more than 10 A. Or the current is less than 0.5 A when the motor driving duty ratio is exceeding 80%. The ECM concludes that the current is out of range, turns on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2102	Throttle actuator control motor current (Low current)
	P2103	Throttle actuator control motor current (High current)
Required sensors/components	Throttle actuator motor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
P2102:		
Throttle motor	ON	
Duty-cycle ratio to open throttle actuator	80%	-
Throttle actuator power supply	8 V	-
Current motor current - Motor current at 0.016 sec. before	-	0.2 A
P2103:		
Throttle motor	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Throttle actuator power supply	8 V	-
2. Throttle actuator power	ON	
Battery voltage	8 V	-
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2102:	
Throttle motor current	Less than 0.5 A (when motor drive duty 80% or more)
P2103:	
Either of the following condition is met	Condition (a) or (b)
(a) Hybrid IC diagnosis signal	Fail
(b) Hybrid IC current limiter port	fail

WIRING DIAGRAM

Refer to DTC P0120 on page [DI-548](#).

INSPECTION PROCEDURE

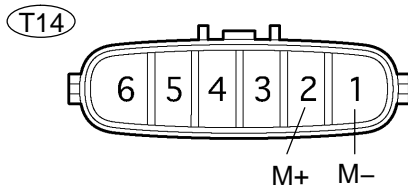
HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Check throttle control motor.

Component Side:

Throttle Control Motor and Sensor



A21034

PREPARATION:

Disconnect the throttle control motor and sensor connector.

CHECK:

Measure the resistance between terminals of the throttle control motor.

OK:

Standard:

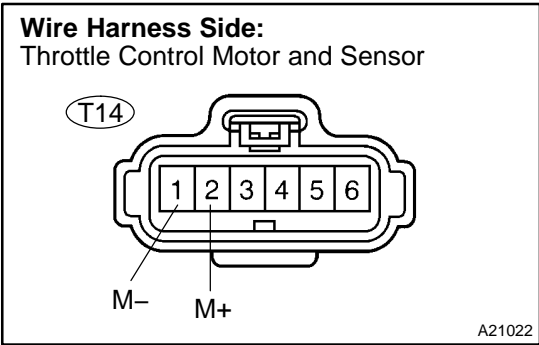
Tester Connection	Specified Condition
M+ (T14-2) - M- (T14-1)	0.3 to 100 Ω (20°C (68°F))

NG

Replace throttle body (See page [SF-44](#)).

OK

2 Check for open and short in harness and connector between throttle control motor and ECM.



PREPARATION:

- (a) Disconnect the T14 throttle control motor and sensor connector.
- (b) Disconnect the E7 ECM connector.

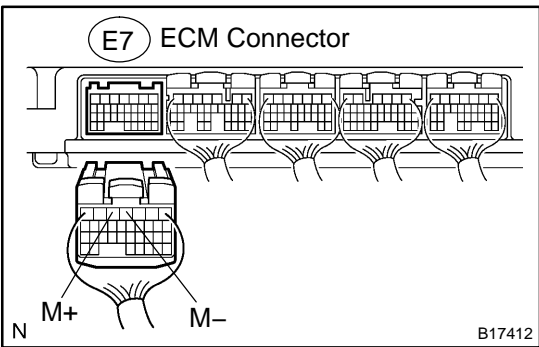
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
M+ (T14-2) - M+ (E7-5)	Below 1 Ω
M- (T14-1) - M- (E7-4)	Below 1 Ω
M+ (T14-2) or M+ (E7-5) - Body ground	10 kΩ or higher
M- (T14-1) or M- (E7-4) - Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

3 Visually check throttle valve.

CHECK:

Check the area between the throttle valve and the housing for foreign objects. Also, check if the valve can open and close smoothly.

OK:

The throttle valve is not contaminated by foreign objects and can move smoothly.

NG Remove foreign object and clean throttle body.

OK

Replace ECM (See page SF-82).

DTC	P2111	Throttle Actuator Control System –Stuck Open
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DTC	P2112	Throttle Actuator Control System –Stuck Closed
------------	--------------	---

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM. It opens and closes the throttle valve using gears. The opening angle of the throttle valve is detected by the throttle position sensor, which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM to control the throttle motor and set the throttle valve angle in response to driver input.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	Throttle motor locked during ECM order to close. (1 trip detection logic)	<ul style="list-style-type: none"> • Throttle control motor and sensor circuit • Throttle control motor and sensor
P2112	Throttle motor locked during ECM order to open. (1 trip detection logic)	<ul style="list-style-type: none"> • Throttle body • Throttle valve

MONITOR DESCRIPTION

The ECM concludes that there is a malfunction of the ETCS (Electronic Throttle Control System) when the throttle valve remains at a fixed angle despite high drive current from the ECM. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2111	Throttle motor actuator lock (Open)
	P2112	Throttle motor actuator lock (Closed)
Required sensors/components	Main sensors/components	Throttle actuator motor
	Related sensors/components	Throttle position sensor
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
P2111:		
System guard*	ON	
Throttle motor current	2 A	–
Throttle motor duty to close side	80%	–
P2112:		
System guard*	ON	
Throttle motor current	2 A	–
Throttle motor duty to open side	80%	–
*System guard is ON when the following conditions are set:	–	
Throttle actuator	ON	
Throttle actuator duty calculation	Executing	
Throttle position sensor	Fail determined	
Throttle actuator current–cut operation	Not executing	
Throttle actuator power supply	4 V	–
Throttle actuator	Fail determined	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
TP sensor voltage change	No change

WIRING DIAGRAM

Refer to DTC P0120 on page [DI-548](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Check any other DTC output (in addition to DTC P2111 or P2112).
----------	--

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

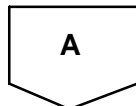
- (a) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2111 and/or P2112	A
P2111 and/or P2112 and other DTCs	B

HINT:

If any DTCs other than P2111 and/or P2112 are output, troubleshoot those DTCs first.



2	Visually check throttle valve.
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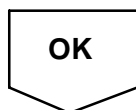
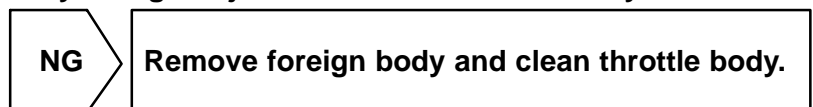
PREPARATION:

Remove the intake air connector.

CHECK:

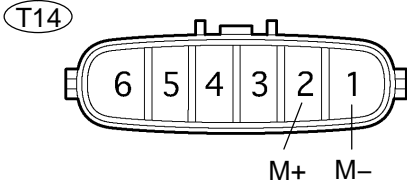
Check whether or not a foreign body is caught between the throttle valve and housing. Also, check if the valve can open and close smoothly.

OK: The throttle valve is not contaminated by foreign objects and can move smoothly.



3 Check throttle control motor.

Component Side:
Throttle Control Motor and Sensor



A21034

PREPARATION:

Disconnect the throttle control motor and sensor connector.

CHECK:

Measure the resistance between terminals of the throttle control motor.

OK:

Standard:

Tester Connection	Specified Condition
M+ (T14-2) - M- (T14-1)	0.3 to 100 Ω (20° C (68° F))

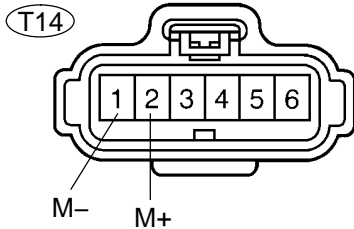
NG

Replace throttle body (See page SF-44).

OK

4 Check for open and short in harness and connector between ECM and throttle control motor.

Wire Harness Side:
Throttle Control Motor and Sensor



A21022

PREPARATION:

- (a) Disconnect the T14 throttle control motor and sensor connector.
- (b) Disconnect the E7 ECM connector.

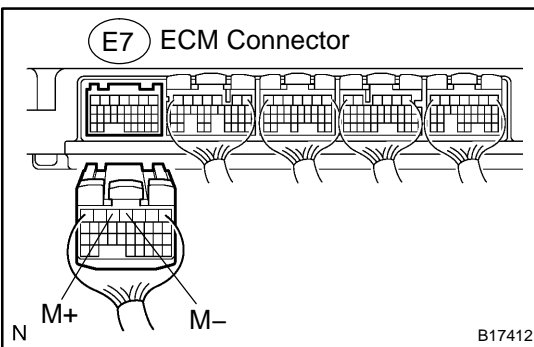
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
M+ (T14-2) - M+ (E7-5)	Below 1 Ω
M- (T14-1) - M- (E7-4)	Below 1 Ω
M+ (T14-2) or M+ (E7-5) - Body ground	10 kΩ or higher
M- (T14-1) or M- (E7-4) - Body ground	10 kΩ or higher



B17412

NG

Repair or replace harness or connector.

OK

Check for intermittent problems (See page DI-430).

DTC	P2118	Throttle Actuator Control Motor Current Range/Performance
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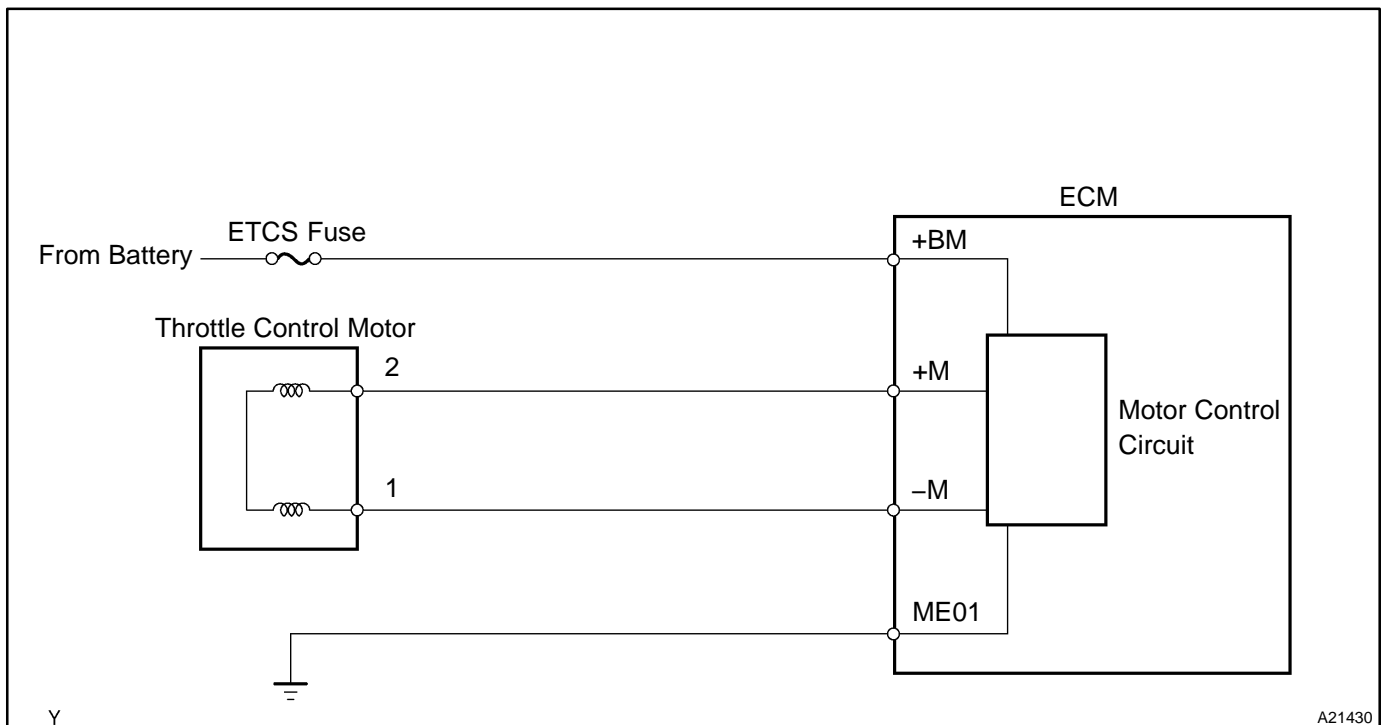
CIRCUIT DESCRIPTION

The Electronic Throttle Control System (ETCS) has a dedicated power supply circuit. The voltage (+BM) is monitored and when the voltage is low (less than 4V), the ECM concludes that the ETCS has a fault and current to the throttle control motor is cut.

When the voltage becomes unstable, the ETCS itself becomes unstable. For this reason, when the voltage is low, the current to the motor is cut. If repairs are made and the system has returned to normal, turn the ignition switch OFF. The ECM then allows current to flow to the motor and the motor can be restarted.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.



DTC No.	DTC Detection Condition	Trouble Area
P2118	Open in ETCS power source circuit (+BM)	<ul style="list-style-type: none"> • Open in ETCS power source circuit • ETCS fuse • ECM

MONITOR DESCRIPTION

The ECM monitors the battery supply voltage applied to the electronic throttle motor +BM. When the power supply voltage drops below the threshold, the ECM concludes that the power supply has an open circuit. The MIL is turned on and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2118	Throttle actuator motor power supply line range check (Low voltage)
Required sensors/components	Throttle actuator motor	
Frequency of operation	Continuous	
Duration	0.8 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Actuator power	ON	
Battery voltage	8 V	–

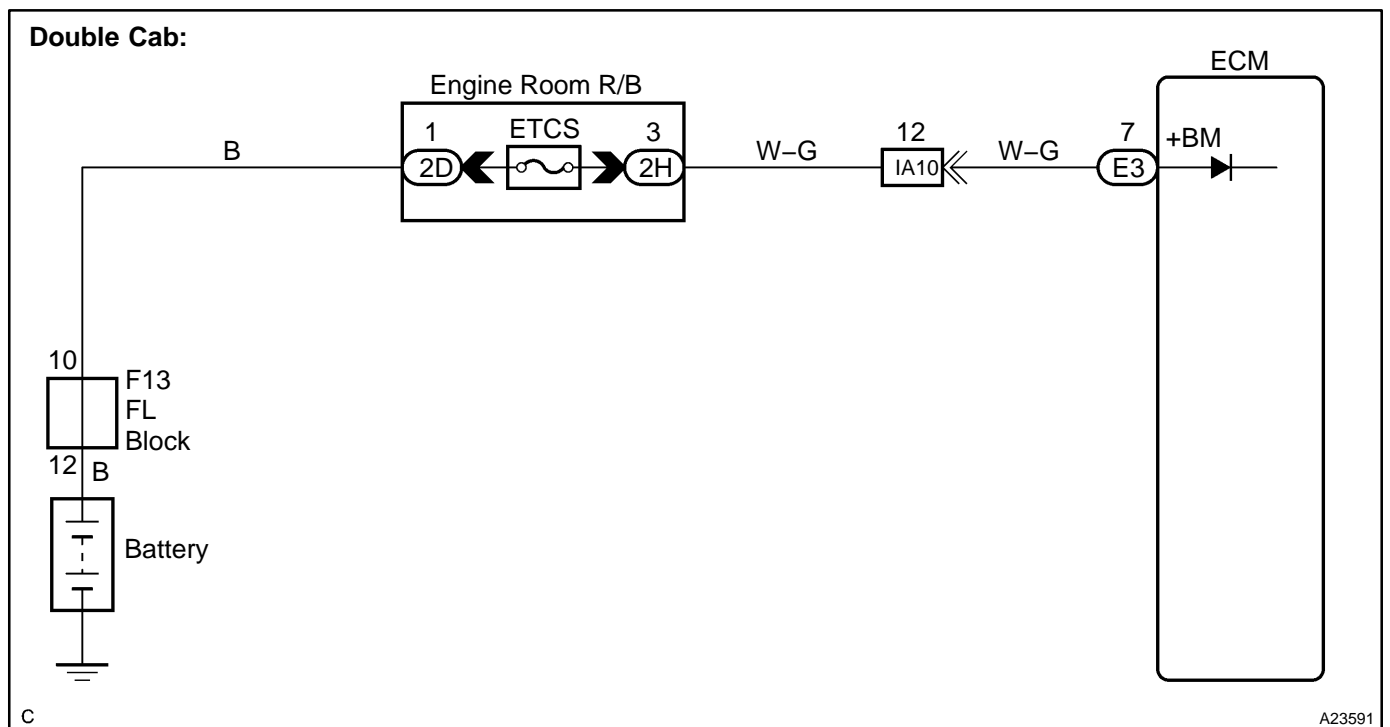
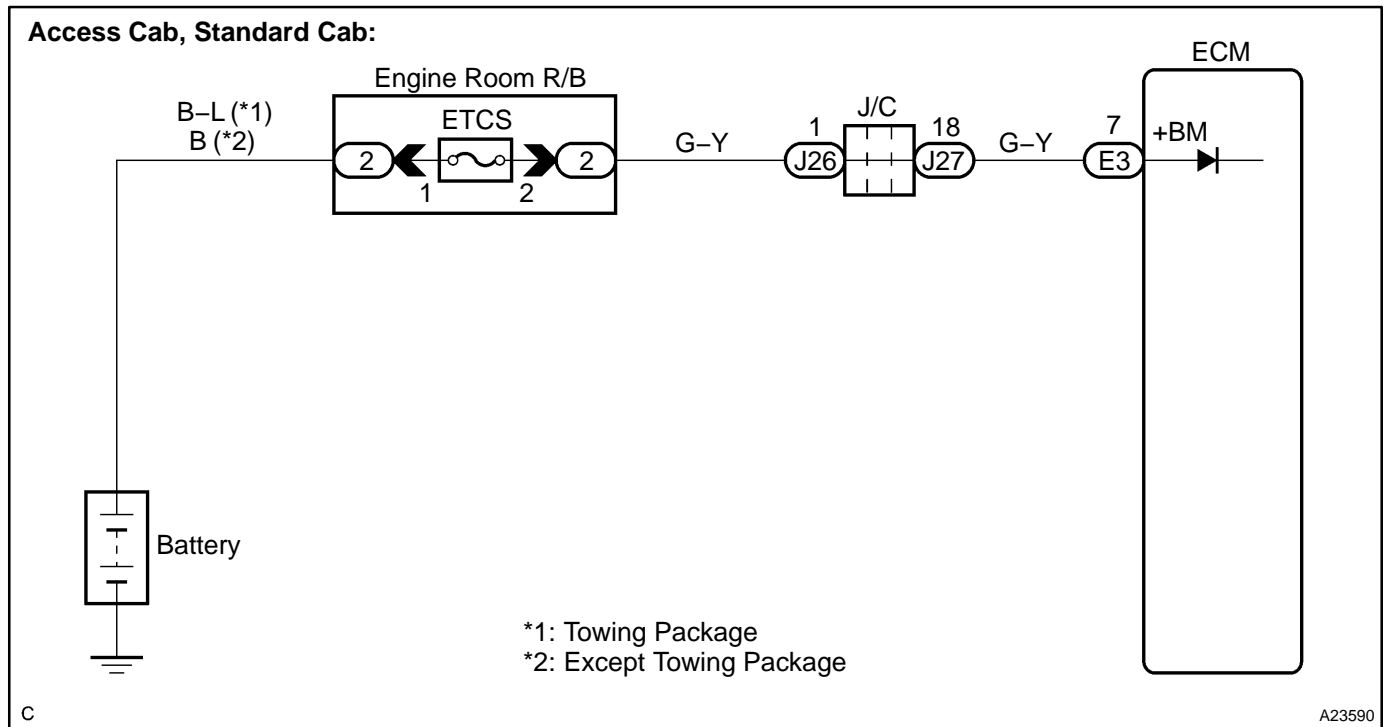
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Throttle actuator motor power supply voltage	Less than 4 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle actuator motor power supply voltage	9 to 14 V

WIRING DIAGRAM

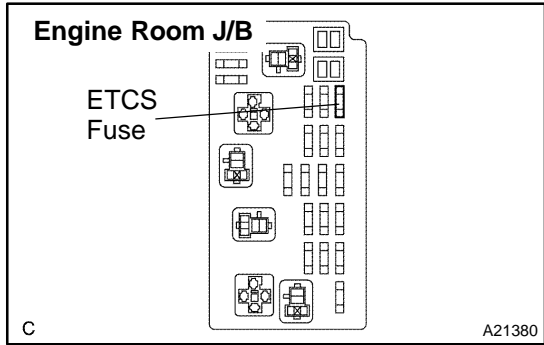


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Check ETCS fuse.



PREPARATION:

Remove the ETCS fuse from the engine room J/B.

CHECK:

Check the resistance of the ETCS fuse.

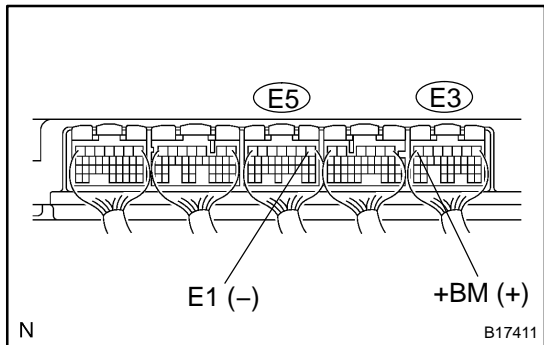
OK:

Below 1 Ω

NG Check for short in all harness and components connected to ETCS fuse.

OK

2 Check voltage between terminal +BM and E1 of ECM connector.



CHECK:

Measure the voltage between the specified terminals of the E5 and E3 ECM connector.

OK:

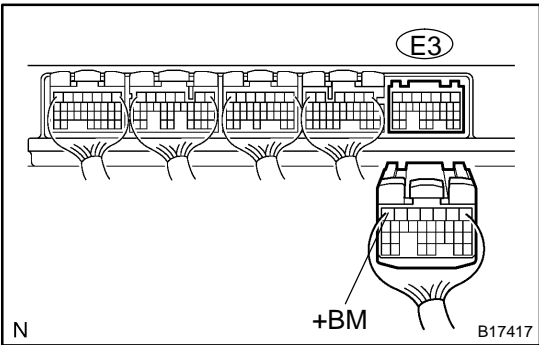
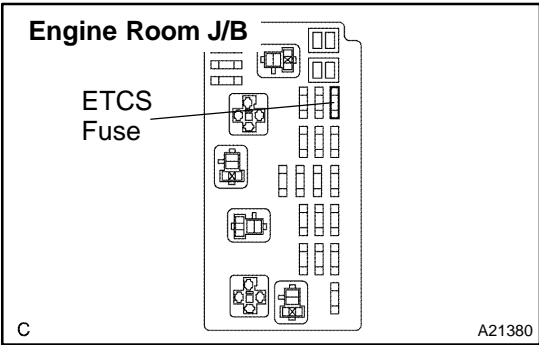
Standard:

Tester Connection	Specified Condition
+BM (E3-7) - E1 (E5-1)	9 to 14 V

C Check for intermittent problems (See page DI-430).

NG

3 Check for open or short in harness or connector between battery and ETCS fuse, ETCS fuse and ECM.



PREPARATION:

- (a) Remove the ETCS fuse from the engine room J/B.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance of the wire harness side connector between the ETCS fuse and ECM.

OK:

Standard:

Tester Connection	Specified Condition
Engine Room J/B (ETCS fuse terminal) - +BM (E3-7)	Below 1 Ω
Engine Room J/B (ETCS fuse terminal) or +BM (E3-7) - Body ground	10 k Ω or higher

PREPARATION:

- (a) Remove the ETCS fuse from the engine room J/B.
- (b) Disconnect the battery positive terminal.

CHECK:

Measure the resistance of the wire harness side connector between the ETCS fuse and battery.

OK:

Standard:

Tester Connection	Specified Condition
Engine Room J/B (ETCS fuse terminal) - Battery positive terminal	Below 1 Ω
Engine Room J/B (ETCS fuse terminal) or Battery positive terminal - Body ground	10 k Ω or higher

NG **Repair or replace harness or connector.**

OK

Check engine room J/B.

DTC	P2119	Throttle Actuator Control Throttle Body Range Performance
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CIRCUIT DESCRIPTION

The Electric Throttle Control System (ETCS) is composed of a throttle motor that operates the throttle valve, a throttle position sensor that detects the opening angle of the throttle valve, an accelerator pedal position sensor that detects the accelerator pedal position, and the ECM that controls the ETCS system.

The ECM operates the throttle motor to position the throttle valve for proper response to driver inputs. The throttle position sensor, mounted on the throttle body, detects the opening angle of the throttle valve and provides this signal to the ECM so that the ECM can regulate the throttle motor.

DTC No.	DTC Detection Condition	Trouble Area
P2119	Throttle opening angle continues to vary greatly from target throttle opening angle (1 trip detection logic)	<ul style="list-style-type: none"> • Electric throttle control system • Throttle body

MONITOR DESCRIPTION

The ECM determines the "actual" throttle angle based on the throttle position sensor signal. The "actual" throttle position is compared to the "target" throttle position commanded by the ECM. If the difference of these two values exceeds a specified limit, the ECM interprets this as a fault in the ETCS (Electronic Throttle Control System). The ECM turns on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2119	Electronic throttle control system failure
Required sensors/components	Main sensors	Throttle actuator motor
	Related sensors	Throttle position sensor
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI-437	
System guard*	ON	
*System guard is ON when the following conditions are set:	-	
Throttle actuator	ON	
Throttle actuator duty calculation	Executing	
Throttle position sensor	Fail determined	
Throttle actuator current-cut operation	Not executing	
Throttle actuator power supply	4 V	-
Throttle actuator	Fail determined	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition (a) or (b)
(a) Commanded closed throttle position-current closed throttle position	0.3 V or more
(b) Commanded open throttle position-current open throttle position	0.3 V or more

COMPONENT OPERATING RANGE

Standard Value
Commanded throttle position and current throttle position are nearly the same

WIRING DIAGRAM

Refer to DTC P0120 on page [DI-548](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 Are there any other codes (besides DTC P2119) being output?

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) When using hand-held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTC using the hand-held tester.

RESULT:

Display (DTC Output)	Proceed to
P2119	A
"P2119" and other DTC	B

HINT:

If any other codes besides P2119 are output, perform the troubleshooting for those DTCs first.

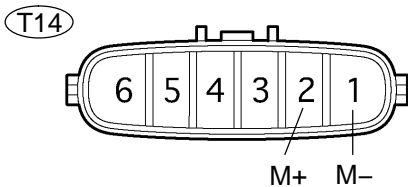
B Go to DTC chart (See page [DI-462](#)).

A

2 Check throttle control motor.

Component Side:

Throttle Control Motor and Sensor



A21034

PREPARATION:

Disconnect the throttle control motor and sensor connector.

CHECK:

Measure the resistance between terminals of the throttle control motor.

OK:

Standard:

Tester Connection	Specified Condition
M+ (T14-2) - M- (T14-1)	0.3 to 100 Ω (20°C (68°F))

NG Replace throttle body (See page [SF-44](#)).

OK

3	Replace ECM and check DTC (Check if DTC outputs reoccur).
----------	--

PREPARATION:

- (a) Replace ECM.
- (b) Clear DTCs (see page [DI-462](#)).
- (c) Start and warm up the engine.
- (d) Run the engine at idle for 15 seconds or more.

CHECK:

Read the DTC using the hand-held tester (See page [DI-462](#)).

OK:

No DTC output.

OK

System is normal.

NG

Replace throttle body (See page [SF-44](#)).

DTC	P2120	Throttle/Pedal Position Sensor/Switch "D" Circuit
DTC	P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input
DTC	P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input
DTC	P2125	Throttle/Pedal Position Sensor/Switch "E" Circuit
DTC	P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input
DTC	P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input
DTC	P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation

HINT:

This is the repair procedure for the "Accelerator Pedal Position (APP) sensor".

CIRCUIT DESCRIPTION

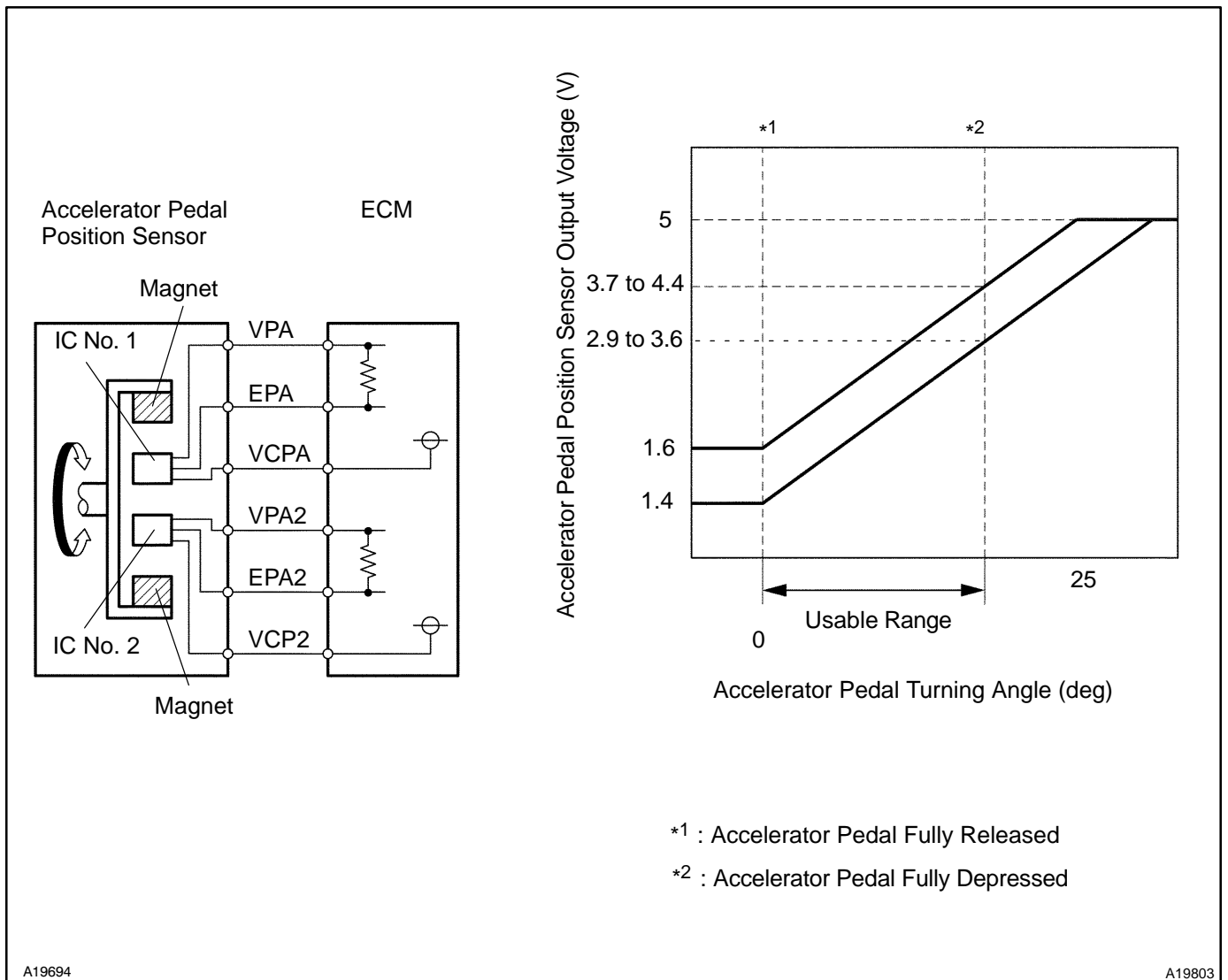
HINT:

- This electrical throttle control system does not use a throttle cable.
- This accelerator pedal position sensor is a non-contact type.

The accelerator pedal position sensor is mounted in the accelerator pedal to detect the angle of the accelerator pedal. This sensor is electronically controlled and uses Hall-effect elements.

In the accelerator pedal position sensor, the voltage applied to terminals VPA and VPA2 of the ECM changes between 0 V and 5 V in proportion to the angle of the accelerator pedal. The VPA is a signal to indicate the actual accelerator pedal angle and is used for the engine control. VPA2 is used to detect malfunctions of the sensor itself.

The ECM judges the current angle of the accelerator pedal from these signals input from terminals VPA and VPA2, and the ECM controls the throttle motor based on these signals.



DTC No.	DTC Detection Condition (Open or short in accelerator pedal position sensor circuit)	Main trouble Area
P2120	Condition (a) continues for 0.5 seconds or more: (a) $VPA \leq 0.4 \text{ V}$ or $VPA \geq 4.8 \text{ V}$	<ul style="list-style-type: none"> • Accelerator pedal position sensor • ECM
P2122	Condition (a) and (b) continues for 0.5 seconds or more: (a) $VPA \leq 0.4 \text{ V}$ (b) $VPA2 \geq 0.04 \text{ V}$	<ul style="list-style-type: none"> • Accelerator pedal position sensor • VCPA circuit open • VPA circuit open or ground short • ECM
P2123	Condition (a) continues for 2.0 seconds or more: (a) $VPA \geq 4.8 \text{ V}$	<ul style="list-style-type: none"> • Accelerator pedal position sensor • EPA circuit open • ECM
P2125	Condition (a) continues for 0.5 seconds or more: (a) $VPA2 \leq 1.2 \text{ V}$ or $VPA2 \geq 4.8 \text{ V}$ and $0.4 \text{ V} \leq VPA \leq 3.45 \text{ V}$	<ul style="list-style-type: none"> • Accelerator pedal position sensor • ECM
P2127	Condition (a) and (b) continues for 0.5 seconds or more: (a) $VPA2 \leq 1.2 \text{ V}$ (b) $VPA \geq 0.04 \text{ V}$	<ul style="list-style-type: none"> • Accelerator pedal position sensor • VCP2 circuit open • VPA2 circuit open or ground short • ECM
P2128	Condition (a) and (b) continues for 2.0 seconds or more: (a) $VPA2 \geq 4.8 \text{ V}$ (a) $0.4 \text{ V} \leq VPA \leq 3.45 \text{ V}$	<ul style="list-style-type: none"> • Accelerator pedal position sensor • EPA circuit open • ECM
P2138	Condition (a) or (b) continues for 2.0 seconds or more: (a) $ VPA - VPA2 \leq 0.02 \text{ V}$ (b) $VPA \leq 0.4 \text{ V}$ and $VPA2 \leq 1.2 \text{ V}$	<ul style="list-style-type: none"> • VPA and VPA2 circuit are short circuited • Accelerator pedal position sensor • ECM

HINT:

After confirming DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138 use the OBD II scan tool or the hand-held tester to confirm the accelerator pedal opening percentage.

Trouble area	Accelerator pedal position expressed as voltage			
	Accelerator pedal completely released		Accelerator pedal fully depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VC circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
E2 circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

MONITOR DESCRIPTION

When VPA or VPA2 deviates from the standard, or the difference between the voltage outputs of the two sensors is less than threshold, the ECM concludes that there is a defect in the accelerator pedal position sensor. The ECM turns on the MIL and a DTC is set.

Example:

When the voltage output of the VPA is below 0.2 V or exceeds 4.8 V.

FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving.

If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2120	Accelerator position sensor 1 (VPA) range check (Fluttering)
	P2122	Accelerator position sensor 1 (VPA) range check (Low voltage)
	P2123	Accelerator position sensor 1 (VPA) range check (High voltage)
	P2125	Accelerator position sensor 2 (VPA2) range check (Fluttering)
	P2127	Accelerator position sensor 2 (VPA2) range check (Low voltage)
	P2128	Accelerator position sensor 2 (VPA2) range check (High voltage)
	P2138	Accelerator position sensor correlation range check
Required sensors/components	Accelerator position sensor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Ignition switch	ON	
Throttle control motor power	ON	

TYPICAL MALFUNCTION THRESHOLDS

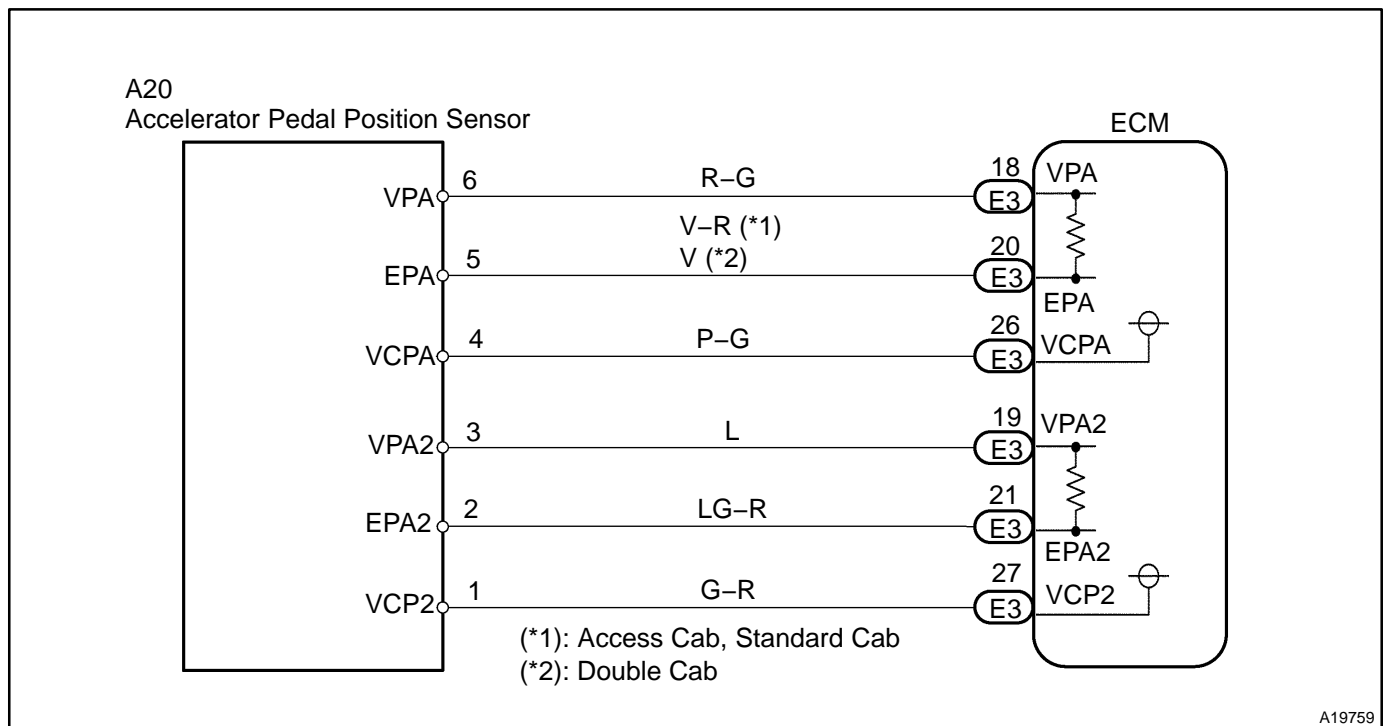
Detection Criteria	Threshold
P2120:	
Either of the following conditions is met	Condition 1 or 2
1. VPA1 voltage when VPA2 is 0.04 V or more	0.4 V or less
2. VPA1 voltage	4.8 V or more
P2122:	
VPA1 voltage when VPA2 is 0.04 V or more	0.4 V or less
P2123:	
VPA1 voltage	4.8 V or more
P2125:	
Either of the following conditions is met	Condition 1 or 2
1. VPA2 voltage when VPA1 is 0.04 V or more	1.2 V or less
2. VPA2 voltage when VPA1 is 0.4 to 3.45 V	4.8 V or more
P2127:	
VPA2 voltage when VPA1 is 0.04 V or more	1.2 V or less
P2128:	
VPA2 voltage when VPA1 is 0.4 to 3.45 V	4.8 V or more

P2138:	
Either of the following condition is met:	Condition 1 or 2
1. Difference between VPA1 and VPA2 voltage	0.02 V or less
2. Both of the following conditions are met:	(a) and (b)
(a) VPA1 voltage	0.4 V or less
(b) VPA2 voltage	1.2 V or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
VPA voltage	More than 0.4 V and less than 4.8 V
VPA2 voltage	More than 1.2 V and Less than 4.8 V
Difference between VPA and VPA2 voltages	More than 0.02 V

WIRING DIAGRAM

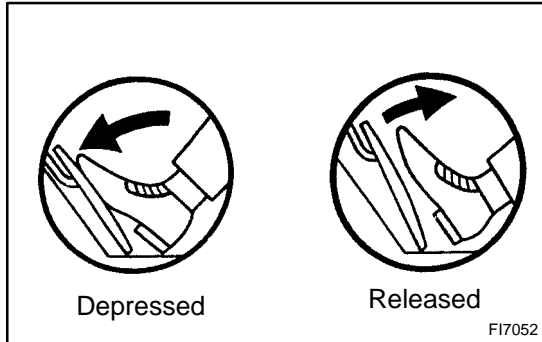


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1 **Connect hand-held tester, and read the voltage for accelerator pedal position sensor data.**



PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Standard:

Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

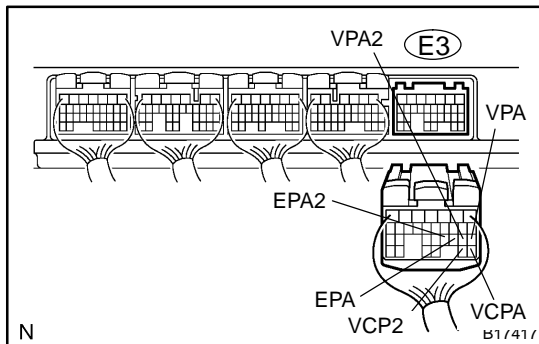
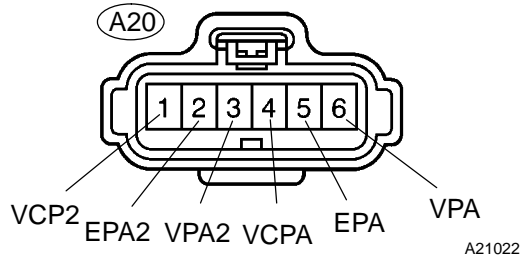
OK **Go to step 5.**

NG

2 Check for open and short in harness and connector in VCPA, VCP2, VPA, VPA2 EPA and EPA2 circuit between ECM and accelerator pedal position sensor.

Wire Harness Side:

Accelerator Pedal Position Sensor



PREPARATION:

- Disconnect the A20 accelerator pedal position sensor connector.
- Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

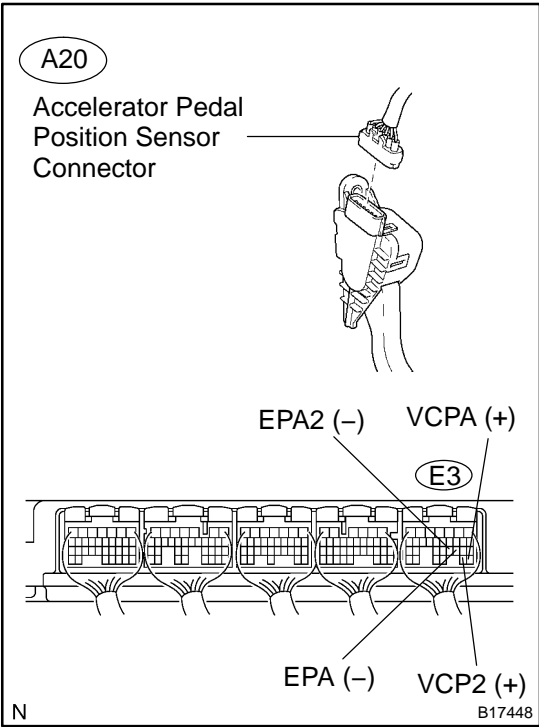
Tester Connection	Specified Condition
VPA (A20-6) – VPA (E3-18)	Below 1 Ω
EPA (A20-5) – EPA (E3-20)	Below 1 Ω
VCPA (A20-4) – VCPA (E3-26)	Below 1 Ω
VPA2 (A20-3) – VPA2 (E3-19)	Below 1 Ω
EPA2 (A20-2) – EPA2 (E3-21)	Below 1 Ω
VCP2 (A20-1) – VCP2 (E3-27)	Below 1 Ω
VPA (A20-6) or VPA (E3-18) – Body ground	10 k Ω or higher
EPA (A20-5) or EPA (E3-20) – Body ground	10 k Ω or higher
VCPA (A20-4) or VCPA (E3-26) – Body ground	10 k Ω or higher
VPA2 (A20-3) or VPA2 (E3-19) – Body ground	10 k Ω or higher
EPA2 (A20-2) or EPA2 (E3-21) – Body ground	10 k Ω or higher
VCP2 (A20-1) or VCP2 (E3-27) – Body ground	10 k Ω or higher

NG

Repair or replace harness and connector.

OK

3 Check voltage between terminals VCPA and EPA, and VCP2 and EPA2 of ECM terminals.



PREPARATION:

- (a) Turn the ignition switch ON.
- (b) Disconnect the A20 accelerator pedal position sensor connector.

CHECK:

Measure the voltage between the specified terminals of the E3 ECM connector.

OK:

Standard:

Tester Connection	Specified Condition
VCPA (E3-26) - EPA (E3-20)	4.5 to 5.5 V
VCP2 (E3-27) - EPA2 (E3-21)	4.5 to 5.5 V

NG Replace ECM (See page [SF-82](#)).

OK

4 Replace accelerator pedal assembly (See page [SF-80](#)).

Go

5	Check whether DTC output recurs (DTC P2120, P2122, P2123, P2125, P2127, P2128 or P2138)
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Disconnect the battery terminals or remove the EFI No. 1 fuse and ETCS fuse (Clear DTCs).
- (c) Start the engine.
- (d) Drive the engine at idle for 15 seconds or more.
- (e) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

CHECK:

Read the DTC output.

RESULT:

Display (DTC Output)	Proceed To
P2120, P2122, P2123, P2125, P2127, P2128 or P2138	A
No output	B

B

System is OK.

A

Replace ECM (See page [SF-82](#)).

DTC	P2121	Throttle/Pedal Position Sensor/Switch "D" Circuit Range/Performance
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HINT:

This is repair procedure for the "accelerator pedal position sensor".

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page [DI-794](#).

DTC No.	DTC Detecting Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 seconds: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	<ul style="list-style-type: none"> • Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

MONITOR DESCRIPTION

The accelerator pedal position sensor is mounted on the accelerator pedal bracket. The accelerator pedal position sensor has 2 sensor elements/signal outputs: VPA1 and VPA2. VPA1 is used to detect the actual accelerator pedal angle (used for engine control) and VPA2 is used to detect malfunctions in VPA1. When the difference between the voltage outputs of VPA1 and VPA2 deviates from the standard, the ECM concludes the accelerator pedal position sensor has a malfunction. The ECM turns on the MIL and a DTC is set.

FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving.

If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.

If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2121	Accelerator position sensor (rationality)
Required sensors/components	Accelerator position sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI-437	
Either of the following conditions is met	Condition 1 or 2	
1. Ignition switch	ON	
2. Throttle control motor power	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Difference between VPA1 voltage (learned value) and VPA2 voltage (learned value)	Less than 0.4 V, or more than 1.2 V

WIRING DIAGRAM

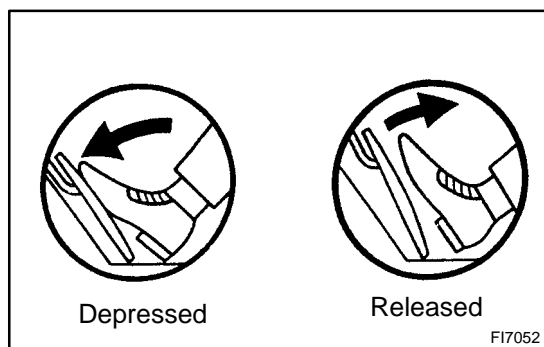
Refer to DTC P2120 on page [DI-794](#).

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Connect hand-held tester, and read the voltage for accelerator pedal position sensor data.
----------	---



PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and push the hand-held tester main switch ON.
- Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Standard:

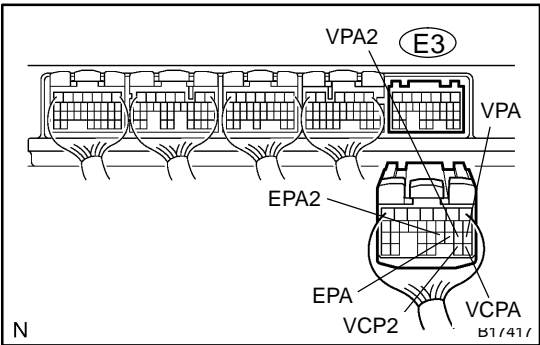
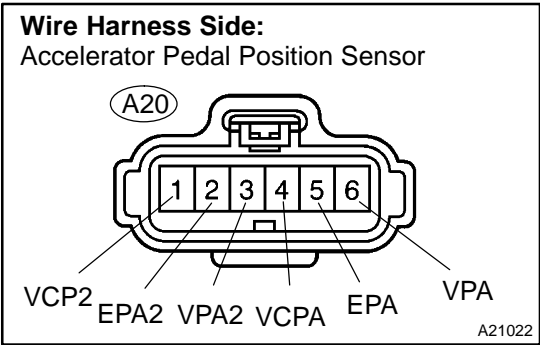
Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK

Replace ECM (See page [SF-82](#)).

NG

2 Check for open and short in harness and connector between accelerator pedal position sensor and ECM.



PREPARATION:

- (a) Disconnect the A20 accelerator pedal position sensor connector.
- (b) Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard (Check for open):

Tester Connection	Specified Condition
VPA (A20-6) – VPA (E3-18)	Below 1 Ω
EPA (A20-5) – EPA (E3-20)	Below 1 Ω
VCPA (A20-4) – VCPA (E3-26)	Below 1 Ω
VPA2 (A20-3) – VPA2 (E3-19)	Below 1 Ω
EPA2 (A20-2) – EPA2 (E3-21)	Below 1 Ω
VCP2 (A20-1) – VCP2 (E3-27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA (A20-6) or VPA (E3-18) – Body ground	10 kΩ or higher
EPA (A20-5) or EPA (E3-20) – Body ground	10 kΩ or higher
VCPA (A20-4) or VCPA (E3-26) – Body ground	10 kΩ or higher
VPA2 (A20-3) or VPA2 (E3-19) – Body ground	10 kΩ or higher
EPA2 (A20-2) or EPA2 (E3-21) – Body ground	10 kΩ or higher
VCP2 (A20-1) or VCP2 (E3-27) – Body ground	10 kΩ or higher

NG Repair or replace harness or connector.

OK

Replace accelerator pedal pedal assembly.

DTC	P2195	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 1 Sensor 1)
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DTC	P2196	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 1 Sensor 1)
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DTC	P2197	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 2 Sensor 1)
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DTC	P2198	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 2 Sensor 1)
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HINT:

- Although the DTC titles say oxygen sensor, these DTCs relate to the Air-Fuel Ratio (A/F) sensor.
- Sensor 1 refers to the sensor mounted in front of the Three-Way Catalytic Converter (TWC) and located near the engine assembly.

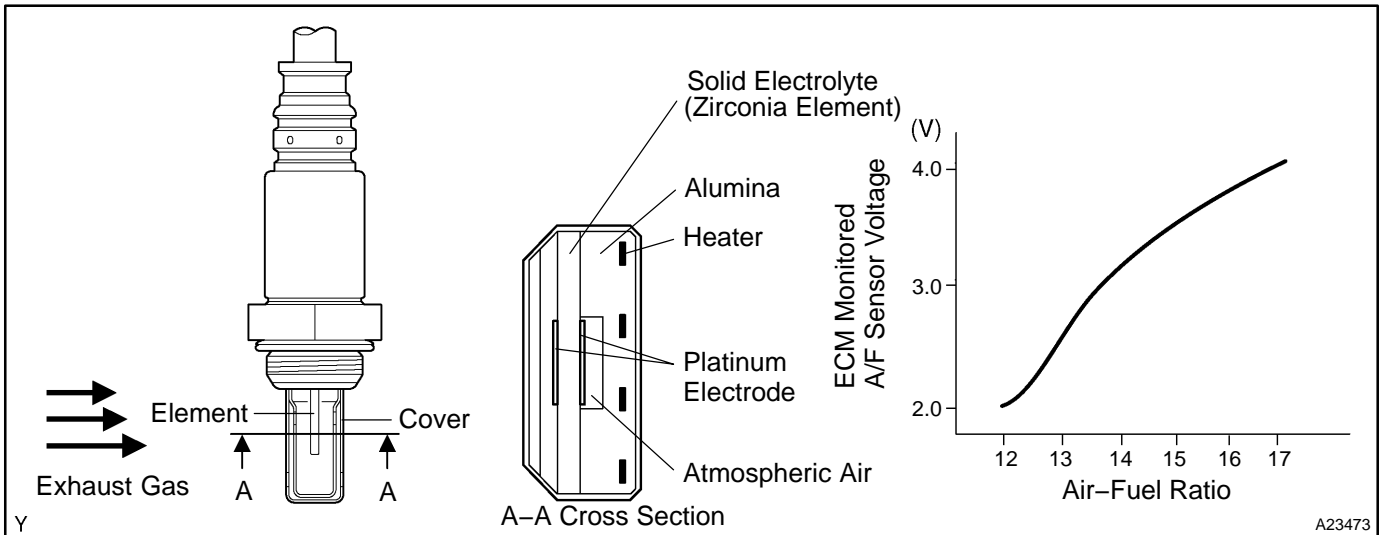
CIRCUIT DESCRIPTION

The A/F sensor generates a voltage* that corresponds to the actual air-fuel ratio. This sensor voltage is used to provide the ECM with feedback so that it can control the air-fuel ratio. The ECM determines the deviation from the stoichiometric air-fuel ratio level, and regulates the fuel injection time. If the A/F sensor malfunctions, the ECM is unable to control the air-fuel ratio accurately.

The A/F sensor is the planar type and is integrated with the heater, which heats the solid electrolyte (zirconia element). This heater is controlled by the ECM. When the intake air volume is low (the exhaust gas temperature is low), a current flows into the heater to heat the sensor, in order to facilitate accurate air-fuel ratio detection. In addition, the sensor and heater portions are narrower than the conventional type. The heat generated by the heater is conducted to the solid electrolyte through the alumina, therefore the sensor activation is accelerated.

In order to obtain a high purification rate of the carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NOx) components in the exhaust gas, a TWC is used. For the most efficient use of the TWC, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric level.

*: Value changes inside the ECM. Since the A/F sensor is the current output element, a current is converted to a voltage inside the ECM. Any measurements taken at the A/F sensor or ECM connectors will show a constant voltage.



DTC No.	DTC Detection Conditions	Trouble Areas
P2195 P2197	While fuel-cut operation (during vehicle deceleration), air-fuel ratio sensor current is 3.6 mA or more for 3 seconds.	<ul style="list-style-type: none"> • A/F sensor (sensor 1) • ECM
P2195	Conditions (a) and (b) continue for 2 seconds or more (2 trip detection logic): (a) Air-Fuel Ratio (A/F) sensor voltage more than 3.8 V (b) Heated Oxygen (HO2) sensor voltage 0.15 V or more	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor (sensor 1) heater • EFI relay • A/F sensor heater and relay circuits • Air induction system • Fuel pressure • Injector • ECM
P2196 P2198	While fuel-cut operation (during vehicle deceleration), air-fuel ratio sensor current is less than 1.4 mA for 3 seconds.	<ul style="list-style-type: none"> • A/F sensor (sensor 1) • ECM
P2196	Conditions (a) and (b) continue for 2 seconds or more (2 trip detection logic): (a) A/F sensor voltage less than 2.8 V (b) HO2 sensor voltage less than 0.85 V	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor (sensor 1) heater • EFI relay • A/F sensor heater and relay circuits • Air induction system • Fuel pressure • Injector • ECM

HINT:

- When any of these DTCs are set, check the A/F sensor voltage output by selecting the following menu items on a hand-held tester: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / AFS B1S1.
- Short-term fuel trim values can also be read using a hand-held tester.
- The ECM regulates the voltage at the A1A+ and A1A- terminals of the ECM at a constant level. Therefore, the A/F sensor voltage output cannot be confirmed without using a hand-held tester.
- If the A/F sensor functional malfunction is detected, the ECM sets this DTC.

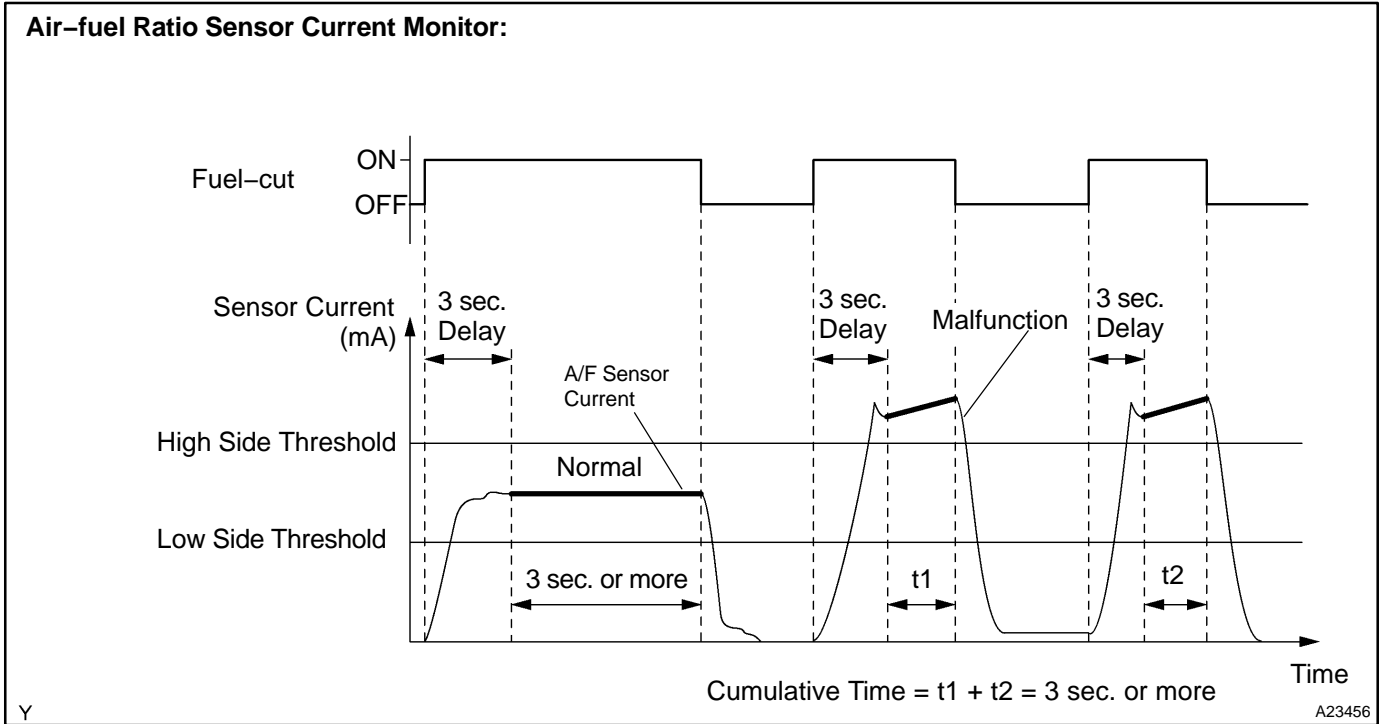
MONITOR DESCRIPTION

- Sensor voltage detection monitor:
Under the air-fuel ratio feedback control, if the A/F sensor voltage output indicates rich or lean for a certain period of time, the ECM determines that there is a malfunction in the A/F sensor. The ECM illuminates the MIL and sets a DTC.

Example:

If the A/F sensor voltage output is less than 2.8 V (very rich condition) for 10 seconds, despite the HO2 sensor voltage output being less than 0.85 V, the ECM sets DTC P2196. Alternatively, if the A/F sensor voltage output is more than 3.8 V (very lean condition) for 10 seconds, despite the HO2 sensor voltage output being 0.15 V or more, DTC P2195 or P2197 is set.

- Sensor current detection monitor:**
 A rich air-fuel mixture causes a low air-fuel ratio sensor current, and a lean air fuel mixture causes a high air-fuel ratio sensor current. Therefore, the sensor output becomes high during acceleration, and the sensor becomes low during deceleration.
 The ECM monitors the air-fuel ratio sensor current during fuel-cut and detects unusual current value. If the cumulative time the sensor output is out of range exceeds 3 seconds, the ECM interprets a malfunction in the air-fuel ratio sensor and sets a DTC.



MONITOR STRATEGY

Related DTCs	P2195	A/F sensor (Bank 1) signal stuck lean
		A/F sensor (Bank 1) current (high side)
	P2196	A/F sensor (Bank 1) signal stuck rich
		A/F sensor (Bank 1) current (low side)
	P2197	A/F sensor (Bank 2) signal stuck lean
		A/F sensor (Bank 2) current (high side)
P2198	A/F sensor (Bank 2) signal stuck rich	
	A/F sensor (Bank 2) current (low side)	
Required sensors/components	A/F sensor	
Frequency of operation	Once per driving cycle	
Duration	15 sec.: A/F sensor signal stuck lean/rich 3 sec.: A/F sensor current (high/low side)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
P2195, P2197 (A/F sensor signal stuck lean):		
Duration while all of following conditions met	2 sec.	-
Rear HO2S voltage	0.15 V	-
Time after engine start	30 sec.	-
A/F sensor status	Activated	
Fuel system status	Closed-loop	
Engine	Running	
P2196, P2198 (A/F sensor signal stuck rich):		
Duration while all of following conditions met	2 sec.	-
Rear HO2S voltage	-	0.6 V
Time after engine start	30 sec.	-
A/F sensor status	Activated	
Fuel system status	Closed-loop	
Engine	Running	
P2195, P2197 (A/F sensor current (High side)):		
Battery voltage	11 V	-
ECT	75°C (167°F)	-
Atmospheric pressure/760 mmHg	0.75	-
A/F sensor status	Activated	
Continuous time of fuel-cut	3 to 10 sec.	
P2196, P2198 (A/F sensor current (Low side)):		
Battery voltage	11 V	-
ECT	75°C (167°F)	-
Atmospheric pressure/760 mmHg	0.75	-
A/F sensor status	Activated	
Continuous time of fuel-cut	3 to 10 sec.	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2195, P2197 (A/F sensor signal stuck lean):	
A/F sensor voltage	More than 3.8 V
P2196, P2198 (A/F sensor signal stuck rich):	
A/F sensor voltage	Less than 2.8 V
P2195, P2197 (A/F sensor current (High side)):	
A/F sensor current	3.6 mA or more
P2196, P2198 (A/F sensor current (Low side)):	
A/F sensor current	Less than 1.4 mA

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.

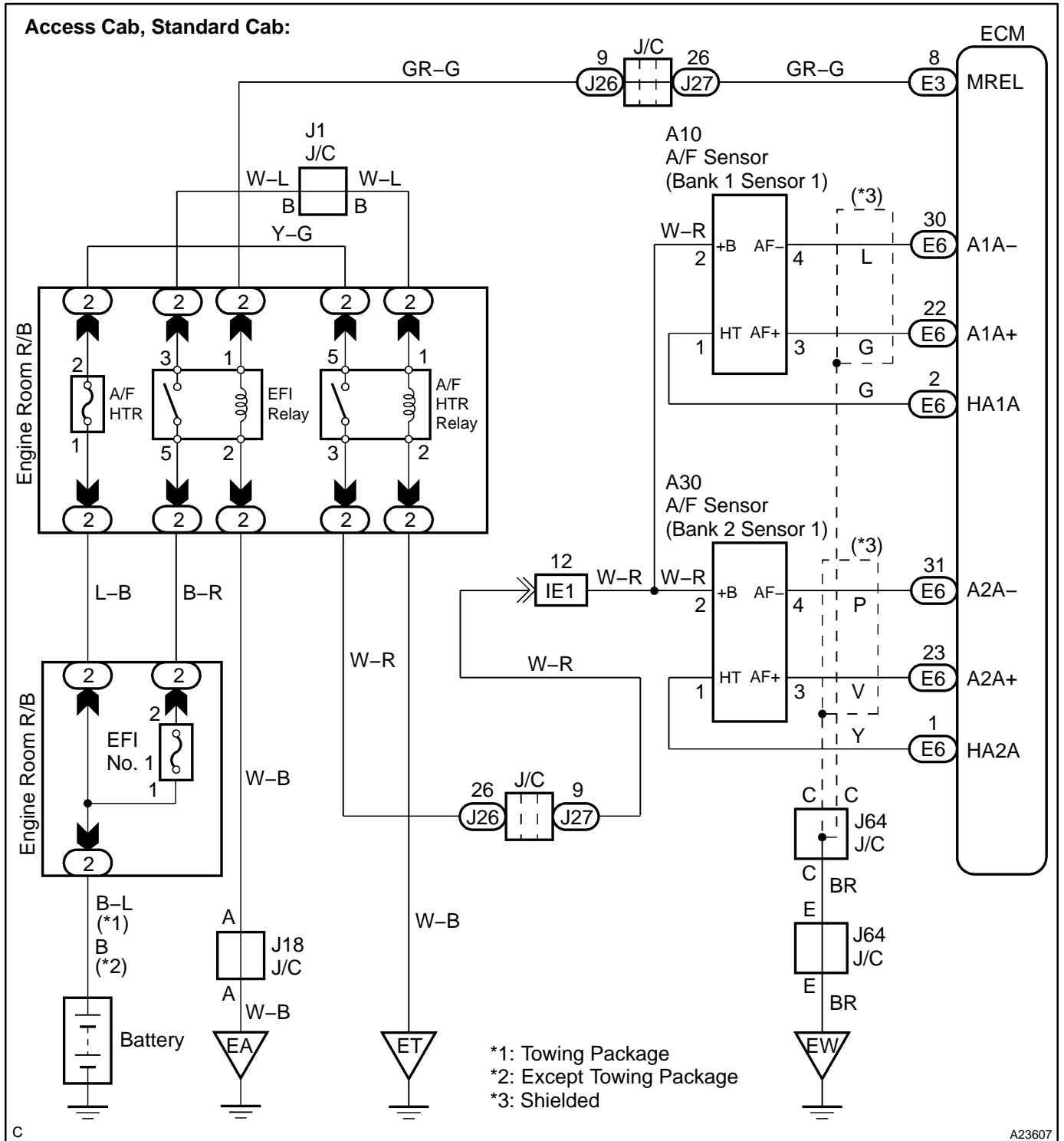
A/F sensor bank 1 sensor 1

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$01	\$91	Multiply by 0.003906 (mA)	A/F current	Minimum test limit	Maximum test limit

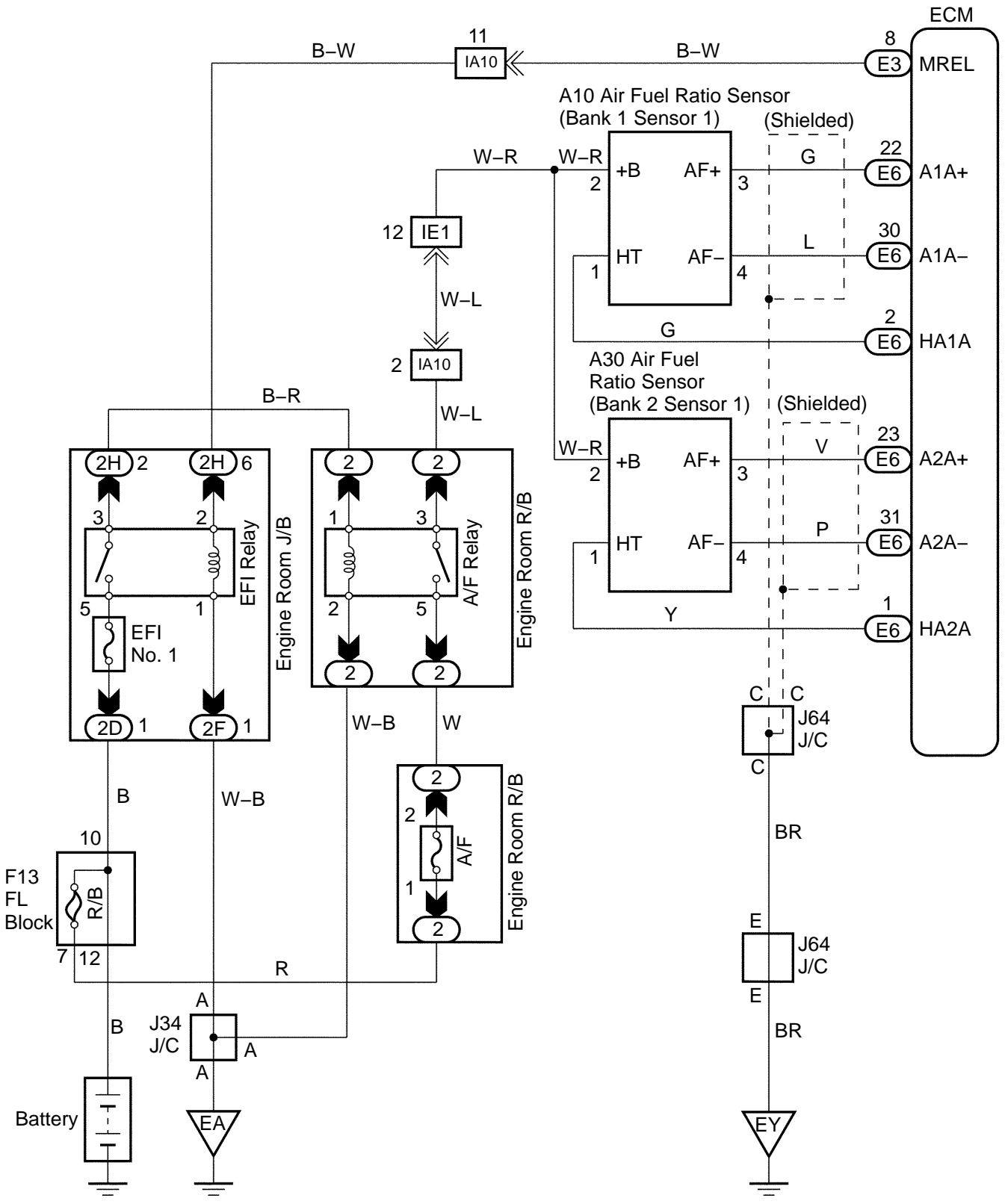
A/F sensor bank 2 sensor 1

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$05	\$91	Multiply by 0.003906 (mA)	A/F current	Minimum test limit	Maximum test limit

WIRING DIAGRAM



Double Cab:

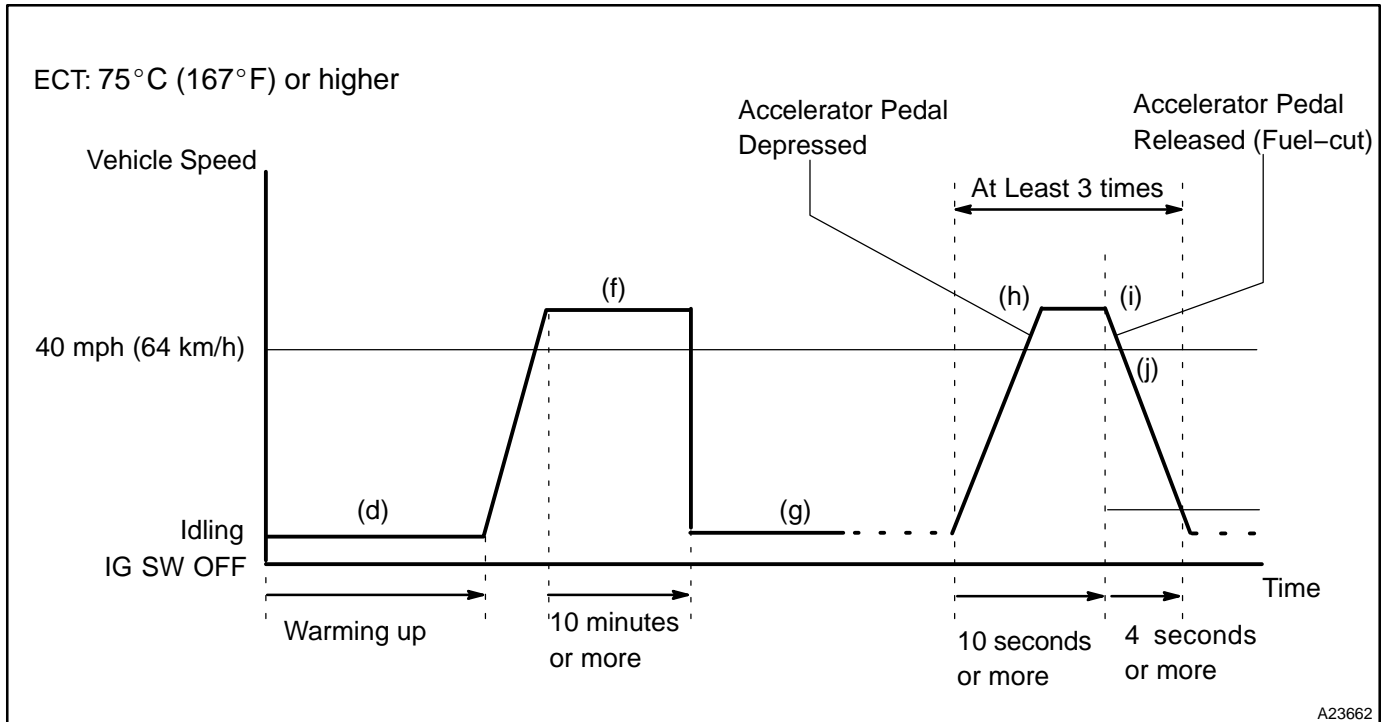


C

CONFIRMATION DRIVING PATTERN

HINT:

This confirmation driving pattern is used in steps 2, 4, 7, 17 and 21 of the following diagnostic troubleshooting procedure when using a hand-held tester.



- (a) Connect the hand-held tester to DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Clear DTCs (see page [DI-462](#)).
- (d) Start the engine, and warm it up until the ECT reaches 75°C (167°F) or higher.
- (e) On the hand-held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/DATA LIST/FC IDL.
- (f) Drive the vehicle at 40 mph (64 km/h) or more for at least 10 minutes.
- (g) Change the transmission to 2nd gear.
- (h) Drive the vehicle at an appropriate speed to perform fuel-cut operation.

HINT:

Fuel-cut is performed when the following conditions met:

- Accelerator pedal is fully released.
 - Engine speed is 2,500 rpm or more (fuel injection returns at 1,000 rpm).
- (i) Accelerate the vehicle to 30 mph (48 km/h) or more by depressing the accelerator pedal for at least 10 seconds.
 - (j) Soon after performing step (8) above, release the accelerator pedal for at least 4 seconds without depressing the brake pedal, in order to execute fuel-cut control.
 - (k) Stop the vehicle and allow the engine to idle for 10 seconds or more.
 - (l) Allow the vehicle to decelerate until the vehicle speed declines to less than 6 mph (10 km/h).
 - (m) Repeat steps from (8) through (10) above at least 3 times in one driving cycle.

HINT:

Completing all A/F sensor monitors are required to change the value in TEST RESULT.

CAUTION:

Strictly observe the posted speed limits, traffic laws, and road conditions when performing these driving patterns.

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air–Fuel Ratio (A/F) sensor, Heated Oxygen (HO₂) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand–held tester.

- (1) Connect a hand–held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO₂ sensors (AFS B1S1 (AFS B2S1) and OS2 B1S2 (O2S B2S2)) displayed on the tester.

HINT:

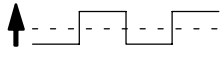

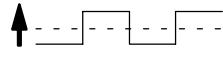
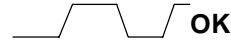
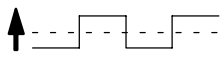

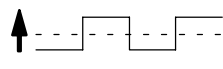
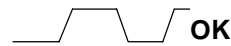
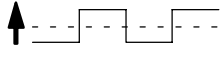
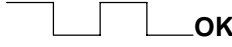
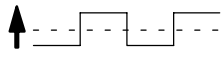
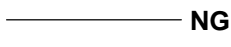
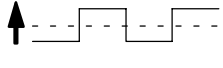
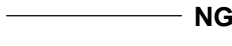
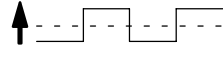
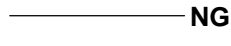
- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	–12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO ₂)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO ₂)	–12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0 V	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	—
2	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	<ul style="list-style-type: none"> ● A/F sensor ● A/F sensor heater ● A/F sensor circuit
3	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0V	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> ● HO2 sensor ● HO2 sensor heater ● HO2 sensor circuit
4	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> ● Injector ● Fuel pressure ● Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

HINT:

- Read freeze frame data using a hand-held tester or OBD II scan tool. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.
- A low A/F sensor voltage could be caused by a rich air-fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air-fuel mixture. Check for conditions that would cause the engine to run lean.

1 Check any other DTCs output (in addition to DTC P2195, P2196, P2197 or P2198).

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

- (a) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
P2195, P2196, P2197 or P2198 and other DTCs	B

HINT:

If any DTCs other than P2195, P2196, P2197 or P2198 are output, troubleshoot those DTCs first.

B Go to relevant DTC chart (See page [DI-477](#)).

A

2 Check A/F sensor output current.

PREPARATION:

- (a) Connect a hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the tester ON.
- (c) Clear DTCs (see page [DI-462](#)).
- (d) On the hand-held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/MONITOR INFO/MONITOR STATUS.
- (e) Check that the status of O2S MON is COMPL.
- (f) On the hand-held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/MONITOR INFO/TEST RESULT/RANGE B1S1 and B2S1.
- (g) Check the test value of the air-fuel ratio sensor output current during fuel-cut.

RESULT:

Test Value	Proceed to
Out of normal range (1.4 mA or more, and less than 3.6 mA)	A
Within normal range (Less than 1.4 mA, or 3.6 mA or more)	B

B Go to step 20.

A

3	Read value output voltage of A/F sensor.
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and turn the scan tool ON.
- (c) Warm up the Air-Fuel Ratio (A/F) sensor at an engine speed of 2,500 rpm for 90 seconds.

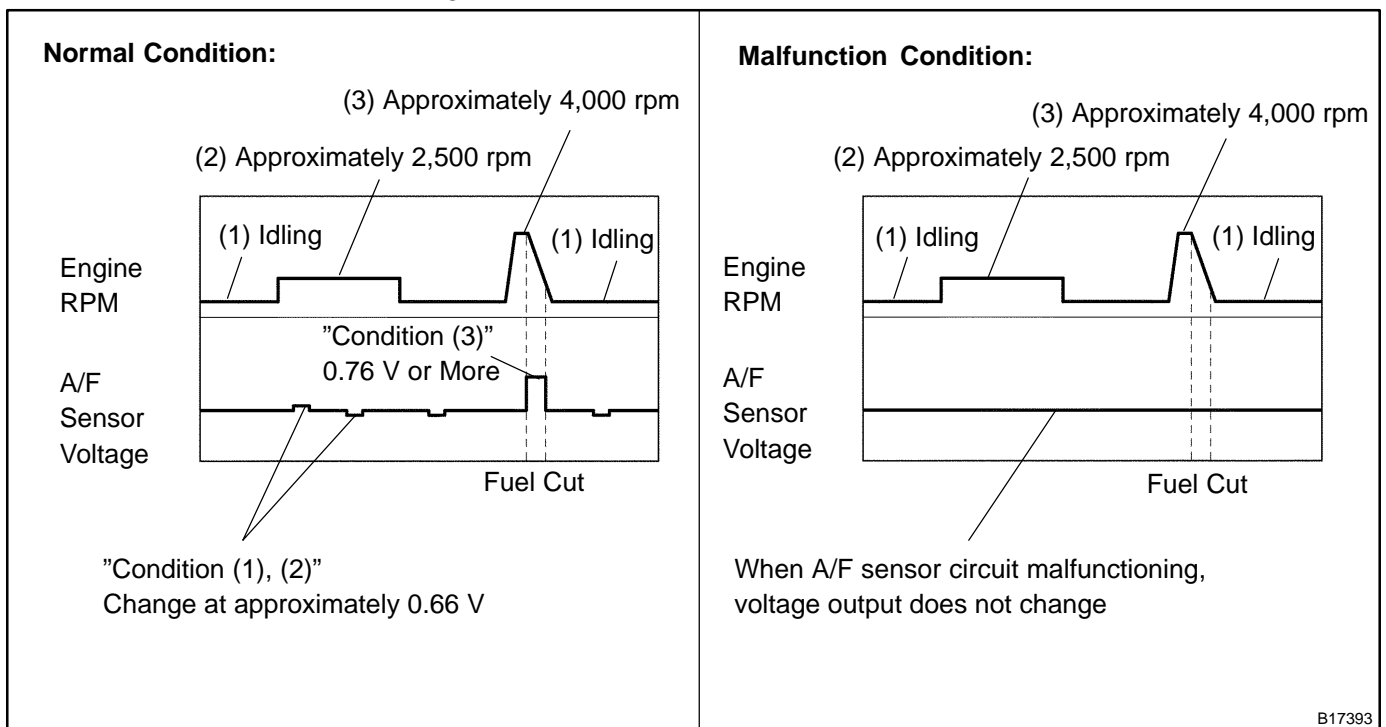
CHECK:

- (a) Using the scan tool, check the A/F sensor voltage 3 times, once when the engine is in each of the following conditions:
 - (1) While idling (check for at least 30 seconds)
 - (2) At an engine speed of approximately 2,500 rpm (without any sudden changes in engine speed)
 - (3) Raise the engine speed to 4,000 rpm and then quickly release the accelerator pedal so that the throttle valve is fully closed.

Standard:

Conditions	A/F Sensor Voltage Variations	Reference
(1) and (2)	Changes at approx 0.66 V	Between 0.62 V and 0.7 V
(3)	Increases to 0.76 V or more	This occurs during engine deceleration (when fuel-cut performed)

For more information, see the diagrams below.



B17393

HINT:

- If the output voltage of the A/F sensor remains at approximately 0.66 V (see Malfunction Condition diagram) under any conditions, including those above, the A/F sensor may have an open circuit. (This will also happen if the A/F sensor heater has an open circuit.)
- If the output voltage of the A/F sensor remains at either approximately 0.76 V or more, or 0.56 V or less (see Malfunction Condition diagram) under any conditions, including those above, the A/F sensor may have a short circuit.
- The ECM stops fuel injection (fuel cut) during engine deceleration. This causes a lean condition and results in a momentary increase in the A/F sensor output voltage.

- The ECM must establish a closed throttle valve position learning value to perform fuel cut. If the battery terminal has been reconnected, the vehicle must be driven over 10 mph (16 km/h) to allow the ECM to learn the closed throttle valve position.
- When the vehicle is driven:
The output voltage of the A/F sensor may be below 0.56 V during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element; therefore, the current is converted into a voltage inside the ECM. Measuring the voltage at the connectors of the A/F sensor or ECM will show a constant voltage result.

NG Go to step 9.

OK

4 Perform confirmation driving pattern.

NEXT

5 Check whether DTC output recurs (DTC P2195, P2196, P2197 or P2198)

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B Go to step 5.

A

6 Replace air fuel ratio sensor.

NEXT

7 Perform confirmation driving pattern.

NEXT

8 Check whether DTC output recurs (DTC P2195, P2196, P2197 or P2198)

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
 (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B

Go to step 5.

A

9 Confirm whether vehicle has run out of fuel in past.

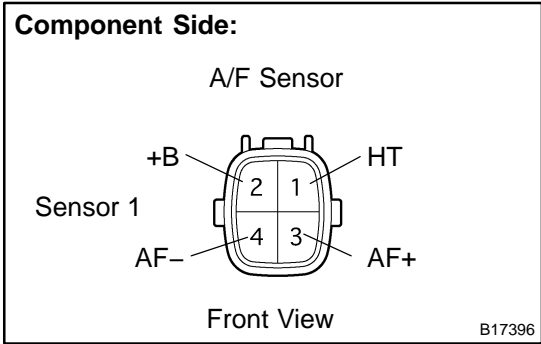
NO

Check for intermittent problems
(See page [DI-430](#)).

YES

DTC caused by running out of fuel.

10 Check resistance of air-fuel ratio (A/F) sensor heater.



PREPARATION:

Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

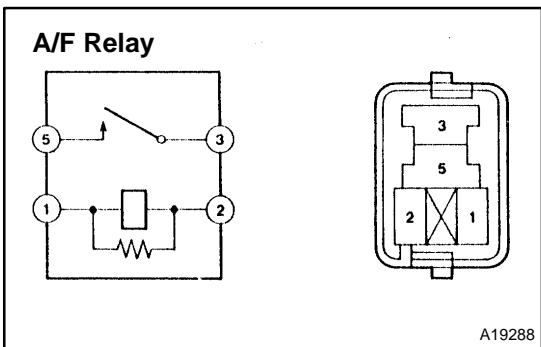
OK:

Tester Connection	Specified Condition
HT (1) - +B (2)	Between 1.8 Ω and 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 kΩ or higher

NG Replace air-fuel ratio (A/F) sensor.

OK

11 Check A/F relay.



PREPARATION:

Remove the A/F relay from the engine room J/B.

CHECK:

Inspect the A/F relay.

OK:

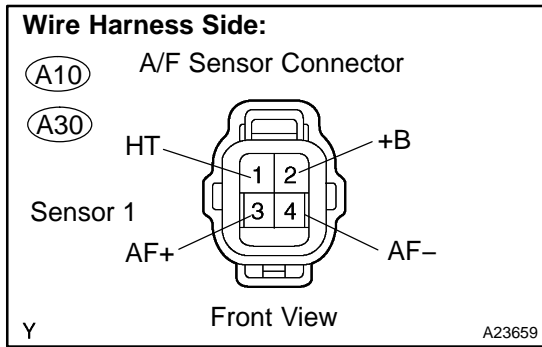
Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 KΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace EFI relay.

OK

12 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

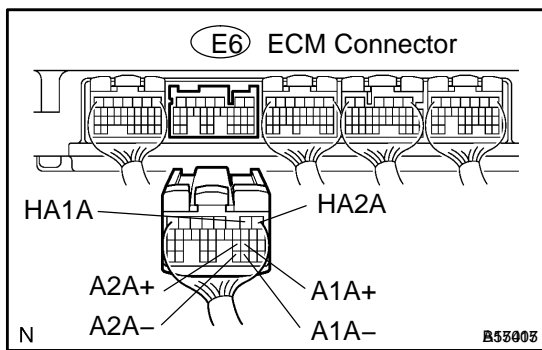
- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Turn the ignition switch to ON.

CHECK:

- (a) Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

Standard:

Tester Connections	Specified Conditions
+B (2) - Body ground	Between 9 V and 14 V



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E6 ECM connector.

CHECK:

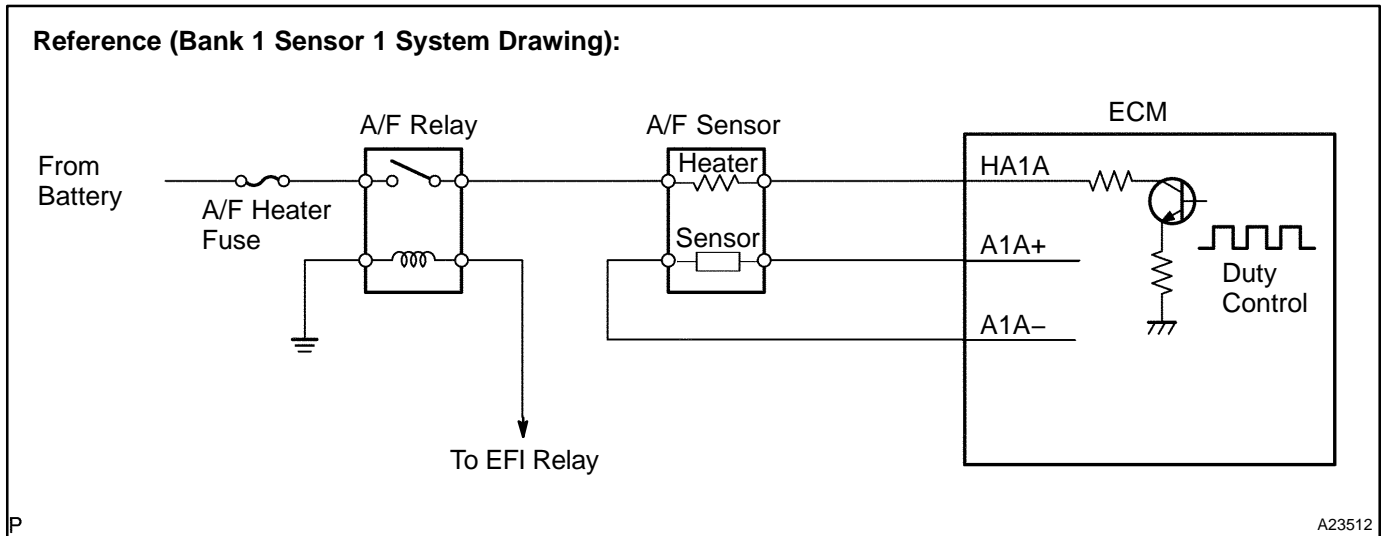
- (a) Check the resistance.

Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω
AF+ (A10-3) - A1A+ (E6-22) AF+ (A30-3) - A2A+ (E6-23)	Below 1 Ω
AF- (A10-4) - A1A- (E6-30) AF- (A30-4) - A2A- (E6-31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher
AF+ (A10-3) or A1A+ (E6-22) - Body ground AF+ (A30-3) or A2A+ (E6-23) - Body ground	10 kΩ or higher
AF- (A10-4) or A1A- (E6-30) - Body ground AF- (A30-4) or A2A- (E6-31) - Body ground	10 kΩ or higher



NG

Replace or replace harness or connector.

OK

13 Check air induction system (See page [SF-1](#)).**CHECK:**

Check the air induction system for vacuum leaks.

NG

Repair or replace air induction system.

OK

14 Check fuel pressure (See page [SF-7](#)).**CHECK:**

Check the fuel pressure (high or low pressure).

NG

Check and replace fuel pump, pressure regulator, fuel pipe line and filter (See page [SF-1](#)).

OK

15 Check injector injection (See page [SF-29](#)).

NG

Replace injector.

OK

16 **Replace air fuel ratio sensor.**

NEXT

17 **Perform confirmation driving pattern.**

NEXT

18 **Check whether DTC output recurs (DTC P2195, P2196, P2197 or P2198)**

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
 (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B

Replace ECM (See page [SF-82](#)) and perform confirmation driving pattern.

A

19 **Confirm whether vehicle has run out of fuel in past.**

NO

Check for intermittent problems (See page [DI-430](#)).

YES

DTC caused by running out of fuel.

20	Replace air fuel ratio sensor.
-----------	---------------------------------------

NEXT

21	Perform confirmation driving pattern.
-----------	--

NEXT

22	Check whether DTC output recurs (DTC P2195, P2196, P2197 or P2198)
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CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198 (A/F sensor pending DTCs)	A
No output	B

B → **Replace ECM (See page SF-82).**

A

END

DTC	P2238	Oxygen Sensor Pumping Current Circuit Low (For A/F Sensor)(Bank 1 Sensor1)
DTC	P2239	Oxygen Sensor Pumping Current Circuit High (For A/F Sensor)(Bank 1 Sensor1)
DTC	P2241	Oxygen Sensor Pumping Current Circuit Low (For A/F Sensor)(Bank 2 Sensor1)
DTC	P2242	Oxygen Sensor Pumping Current Circuit High (For A/F Sensor)(Bank 2 Sensor1)
DTC	P2252	Oxygen Sensor Reference Ground Circuit Low (For A/F Sensor)(Bank 1 Sensor1)
DTC	P2253	Oxygen Sensor Reference Ground Circuit High (For A/F Sensor)(Bank 1 Sensor1)
DTC	P2255	Oxygen Sensor Reference Ground Circuit Low (For A/F Sensor)(Bank 2 Sensor1)
DTC	P2256	Oxygen Sensor Reference Ground Circuit High (For A/F Sensor)(Bank 2 Sensor1)

HINT:

- Although the DTC titles say oxygen sensor, these DTCs relate to the Air-Fuel Ratio (A/F) sensor.
- Sensor 1 refers to the sensor mounted in front of the Three-Way Catalytic Converter (TWC) and located near the engine assembly.

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page [DI-806](#).

DTC No.	DTC Detection Conditions	Trouble Areas
P2238 P2241	<ul style="list-style-type: none"> • Case 1: Condition (a) or (b) continues for 5.0 seconds or more (1 trip detection logic): (a) AF+ voltage 0.5 V or less (b) (AF+) – (AF-) = 0.1 V or less • Case 2: A/F sensor admittance: Less than 0.022 1/Ω (1 trip detection logic) 	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater • EFI relay • A/F sensor heater and relay circuits • ECM
P2239 P2242	AF+ voltage more than 4.5 V for 5.0 seconds or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater • EFI relay • A/F sensor heater and relay circuits • ECM
P2252 P2255	AF- voltage 0.5 V or less for 5.0 seconds or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater • EFI relay • A/F sensor heater and relay circuits • ECM
P2253 P2256	AF- voltage more than 4.5 V for 5.0 seconds or more (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • A/F sensor heater • EFI relay • A/F sensor heater and relay circuits • ECM

MONITOR DESCRIPTION

The Air–Fuel Ratio (A/F) sensor varies its output voltage in proportion to the air–fuel ratio. If the A/F sensor impedance (alternating current resistance) or voltage output deviates greatly from the standard range, the ECM determines that there is an open or short malfunction in the A/F sensor circuit.

MONITOR STRATEGY

Related DTCs	P2238	A/F sensor (Bank 1) open circuit between AF+ and AF-
		A/F sensor (Bank 1) short circuit between AF+ and AF-
		A/F sensor (Bank 1) short circuit between AF+ and GND
	P2239	A/F sensor (Bank 1) short circuit between AF+ and +B
	P2241	A/F sensor (Bank 2) open circuit between AF+ and AF-
		A/F sensor (Bank 2) short circuit between AF+ and AF-
		A/F sensor (Bank 2) short circuit between AF+ and GND
	P2242	A/F sensor (Bank 2) short circuit between AF+ and +B
	P2252	A/F sensor (Bank 1) short circuit between AF- and GND
P2253	A/F sensor (Bank 1) short circuit between AF- and +B	
P2255	A/F sensor (Bank 2) short circuit between AF- and GND	
P2256	A/F sensor (Bank 2) short circuit between AF- and +B	
Required sensors/components	A/F sensor	
Frequency of operation	Once per driving cycle	
Duration	10 sec.: A/F sensor open circuit between AF+ and AF- 5 sec.: Others	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
P2238, P2241 (A/F sensor open circuit between AF+ and AF-):		
AF+ terminal voltage	0.5 to 4.5 V	
AF- terminal voltage	0.5 to 4.5 V	
Difference between AF+ terminal and AF- terminal voltage	0.1 to 0.8 V	
ECT	0°C (32°F)	-
Engine	Running	
Fuel-cut	OFF	
Time after fuel-cut OFF	5 sec.	-
A/F sensor heater	ON	
Battery voltage	11 V	-
Ignition switch	ON	

DIAGNOSTICS – ENGINE (2UZ-FE)

Time after ignition switch OFF to ON	5 sec.	–
Others:		
Battery voltage	11 V	–
Ignition switch		ON
Time after ignition switch OFF to ON	5 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2238, P2241 (A/F sensor open circuit between AF+ and AF-):	
A/F sensor admittance	Bellow 0.022 1/ohm
P2238, P2241 (A/F sensor short circuit between AF+ and GND):	
A/F+ terminal voltage	0.5 V or less
P2238, P2241 (A/F sensor short circuit between AF+ and AF-):	
Difference between A/F+ terminal and AF- terminal voltage	0.1 V or less
P2239, P2242 (A/F sensor short circuit between AF+ and +B):	
A/F+ terminal voltage	More than 4.5 V
P2252, P2255 (A/F sensor short circuit between AF- and GND):	
A/F- terminal voltage	0.5 V or less
P2253, P225+ (A/F sensor short circuit between AF- and +B):	
A/F- terminal voltage	More than 4.5 V

WIRING DIAGRAM

Refer to DTC P2195 on page [DI-806](#).

INSPECTION PROCEDURE

HINT:

Hand-held tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- (1) Connect a hand-held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 (AFS B2S1) and OS2 B1S2 (O2S B2S2)) displayed on the tester.

HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

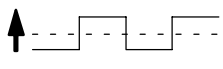

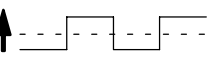
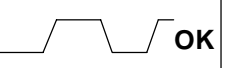
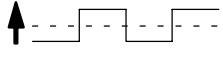

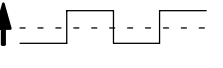
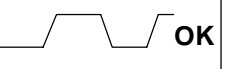
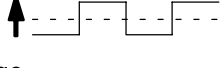
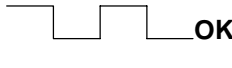
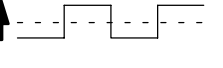
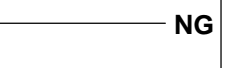
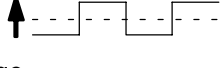

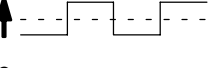

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

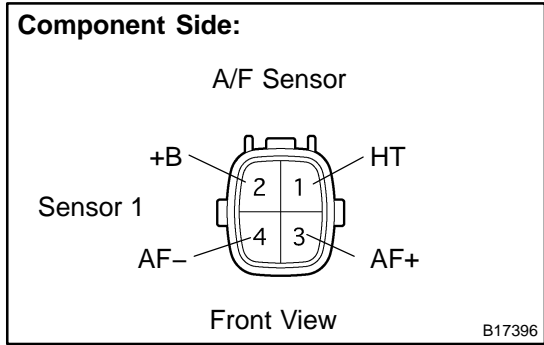
- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 % ↑ -12.5 %  Output voltage More than 3.35 V Less than 3.0 V  OK	Injection volume +25 % ↑ -12.5 %  Output voltage More than 0.55 V Less than 0.4V  OK	—
2	Injection volume +25 % ↑ -12.5 %  Output voltage Almost no reaction  NG	Injection volume +25 % ↑ -12.5 %  Output voltage More than 0.55 V Less than 0.4V  OK	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 % ↑ -12.5 %  Output voltage More than 3.35 V Less than 3.0V  OK	Injection volume +25 % ↑ -12.5 %  Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 % ↑ -12.5 %  Output voltage Almost no reaction  NG	Injection volume +25 % ↑ -12.5 %  Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

HINT:

Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1 Check resistance of air-fuel ratio (A/F) sensor heater.



PREPARATION:

Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

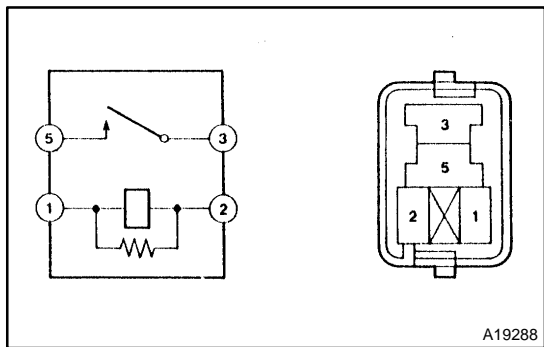
OK:

Tester Connection	Specified Condition
HT (1) - +B (2)	Between 1.8 Ω and 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 kΩ or higher

NG Replace air-fuel ratio (A/F) sensor.

OK

2 Check A/F relay.



PREPARATION:

Remove the A/F relay from the engine room J/B.

CHECK:

Inspect the A/F relay.

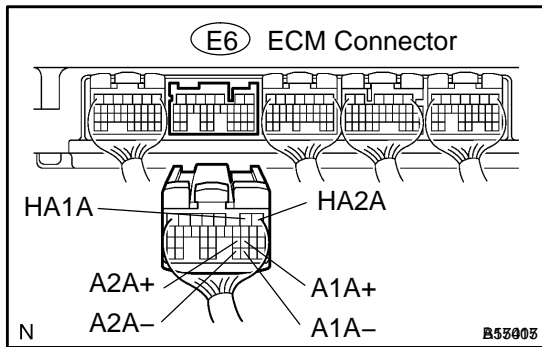
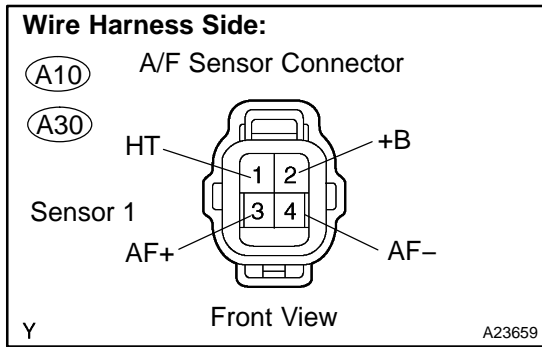
OK:

Terminal No.	Condition	Specified Condition
1 - 2	Constant	Continuity
	Usually	No Continuity
3 - 5	Apply B+ between terminals 1 and 2	Continuity

NG Replace EFI relay.

OK

3 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Turn the ignition switch to ON.

CHECK:

- (a) Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

OK:

Standard:

Tester Connections	Specified Conditions
+B (2) - Body ground	Between 9 V and 14 V

PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E6 ECM connector.

CHECK:

- (a) Check the resistance.

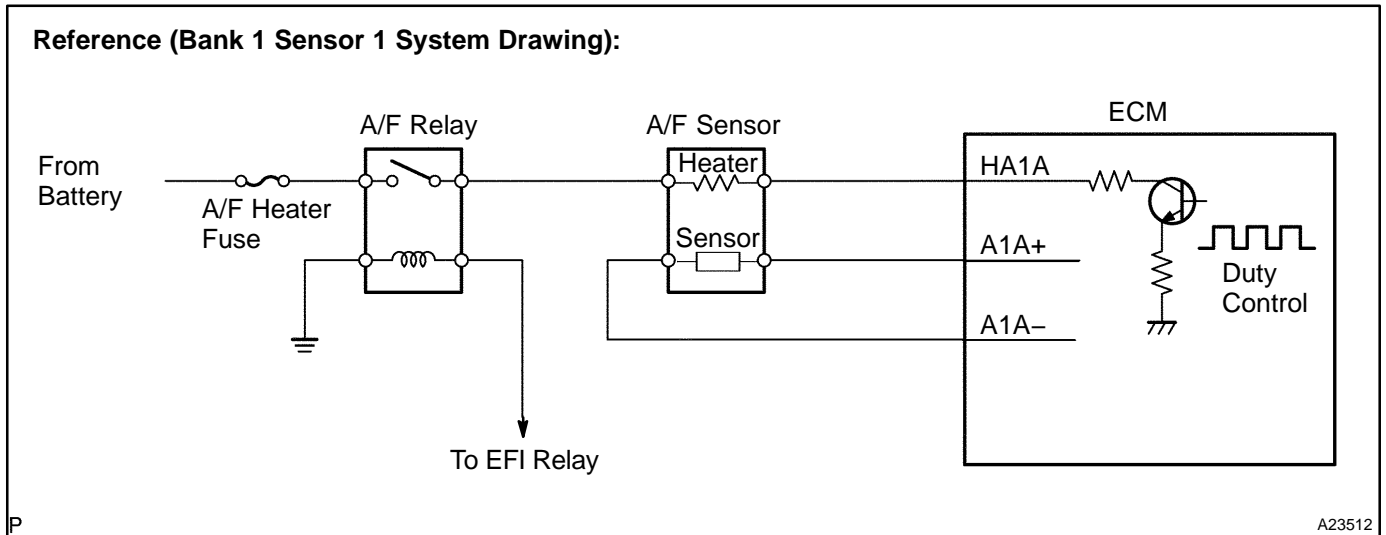
OK:

Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω
AF+ (A10-3) - A1A+ (E6-22) AF+ (A30-3) - A2A+ (E6-23)	Below 1 Ω
AF- (A10-4) - A1A- (E6-30) AF- (A30-4) - A2A- (E6-31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher
AF+ (A10-3) or A1A+ (E6-22) - Body ground AF+ (A30-3) or A2A+ (E6-23) - Body ground	10 kΩ or higher
AF- (A10-4) or A1A- (E6-30) - Body ground AF- (A30-4) or A2A- (E6-31) - Body ground	10 kΩ or higher



NG

Replace or replace harness or connector.

OK

Replace ECM (See page [SF-82](#)).

DTC	P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low
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DTC	P2402	Evaporative Emission System Leak Detection Pump Control Circuit High
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CIRCUIT DESCRIPTION

Refer to EVAP Inspection Procedure (see page [DI-884](#)).

DTCs	Monitoring Item	DTC Detection Condition	Trouble Areas	Detection Timing	Detection Logic
P2401	Vacuum pump stuck OFF	One of following conditions are met: <ul style="list-style-type: none"> • 0.02 inch orifice low-flow • 0.02 inch orifice high-low • Vacuum pump ON stuck • Vacuum pump OFF stuck • Vent valve ON (Closed) stuck 	<ul style="list-style-type: none"> • Pump module • Connector / Wire harness (Pump module – ECM) • ECM 	While ignition switch OFF	2 trips
P2402	Vacuum pump stuck ON	NOTE: P043E, P043F, P2401, P2402 and P2419 have same DTC detection conditions.			

WIRING DIAGRAM

Refer to EVAP Inspection Procedure (see page [DI-884](#)).

MONITOR DESCRIPTION

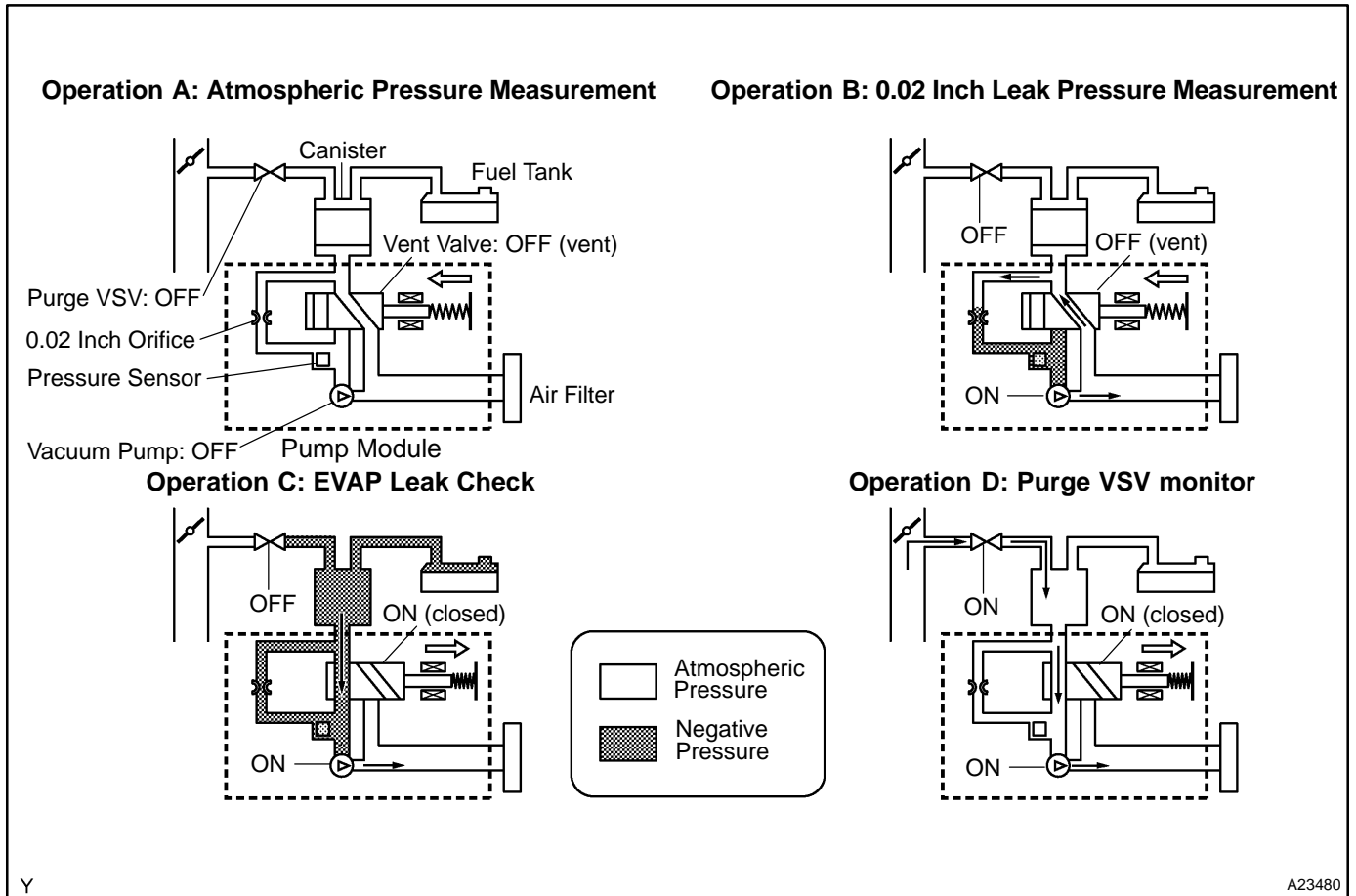
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

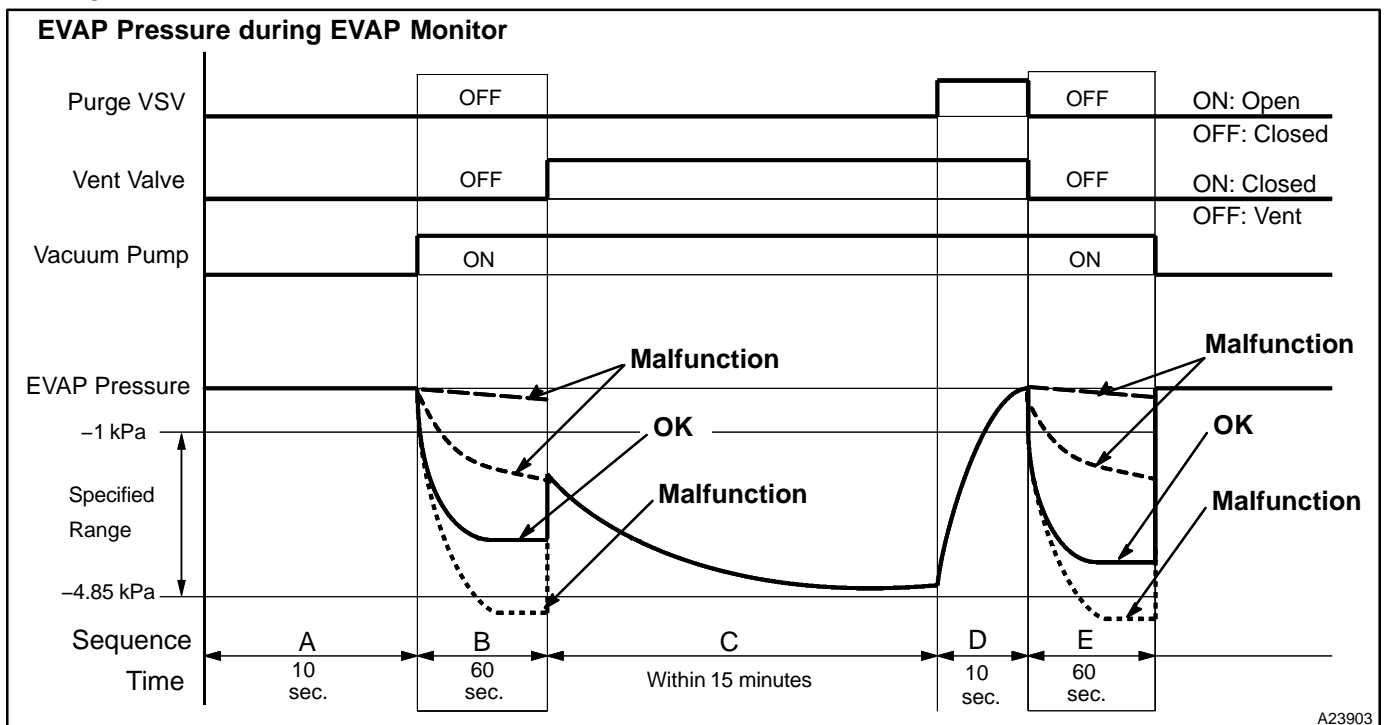
*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
–	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	–
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	–

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



In sequence B and E, to determine the leak criterion, the vacuum pump creates negative pressure in the canister pump module through the 0.02 inch orifice. If the pressure is out of specified range or is not saturated, the ECM illuminates the MIL and sets DTCs P043E, P043F, P2401, P2402 and P2419 (2-trip detection logic).



MONITOR STRATEGY

Related DTCs	P2401	Vacuum pump stuck OFF
	P2402	Vacuum pump stuck ON
Required sensors/components	Purge VSV and pump module	
Frequency of operation	Once per driving cycles	
Duration	Within 2 minutes (varies with amount of fuel in tank)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	–
Vehicle speed	–	2.5 mph (4 km/h)
Ignition switch	OFF	
Time after key off	5 or 7 or 9.5 hours	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions 1 and 2 set before key off	–	
1. Duration that vehicle has been driven	5 min.	–
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Key-off monitor sequence	1 to 8	
1. Atmospheric pressure	–	
Next sequence is run if the following condition is set	–	
Atmospheric pressure change	–	0.3 kPa (2.25 mmHg)
2. First reference pressure measurement	–	
Next sequence is run if the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	–	–1 kPa (–7.5 mmHg)
2. Reference pressure	–4.85 to –1.057 kPa (–36.38 to –7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	

3. EVAP canister vent valve close stuck check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	–
4. Vacuum introduction	–	
Next sequence is run if the following condition is set	–	
EVAP pressure	Saturated within 15 minutes	
5. EVAP canister purge valve close stuck check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	–
6. Second reference pressure measurement	–	
Next sequence is run if the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure	–	–1 kPa (–7.5 mmHg)
2. Reference pressure	–4.85 to –1.057 kPa (–36.38 to –7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	
4. Difference between first reference pressure and second reference pressure	–	0.7 kPa (5.25 mmHg)
7. Leak check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure when vacuum introduction is complete	–	Second reference pressure
8. Atmospheric pressure measurement	–	
EVAP monitor is complete if the following condition is set	–	
Atmospheric pressure difference between sequence 1 and 8	–	0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
One of the following conditions is set:	Condition 1, 2, 3, 4 or 5
1. EVAP pressure just after reference pressure measurement start	More than –1 kPa (–7.5 mmHg)
2. Reference pressure	Less than –4.85 kPa (–36.38 mmHg)
3. Reference pressure	–1.057 kPa (–7.93 mmHg) or more
4. Reference pressure	Not saturated
5. Difference between first reference pressure and second reference pressure	5.25 mmHg (0.7 kPa) or more

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-445](#) for detailed information.

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

DTC	P2419	Evaporate Emission System Switching Valve Control Circuit Low
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DTC	P2420	Evaporate Emission System Switching Valve Control Circuit High
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CIRCUIT DESCRIPTION

Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

DTCs	Monitoring Item	DTC Detection Conditions	Trouble Areas	Detection Timing	Detection Logic
P2419	Vent valve stuck ON (Closed)	One of following conditions are met: <ul style="list-style-type: none"> • 0.02 inch orifice low-flow • 0.02 inch orifice high-flow • Vacuum pump ON stuck • Vacuum pump OFF stuck • Vent valve ON (Closed) stuck NOTE: P043E, P043F, P2401, P2402 and P2419 have same DTC detection conditions.	<ul style="list-style-type: none"> • Pump module • Connector/Wire harness (Pump module – ECM) • ECM 	While Ignition switch OFF	2 trips
P2420	Vent valve stuck OFF (Vent)	Vent valve OFF (Vent) stuck			

WIRING DIAGRAM

Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

MONITOR DESCRIPTION

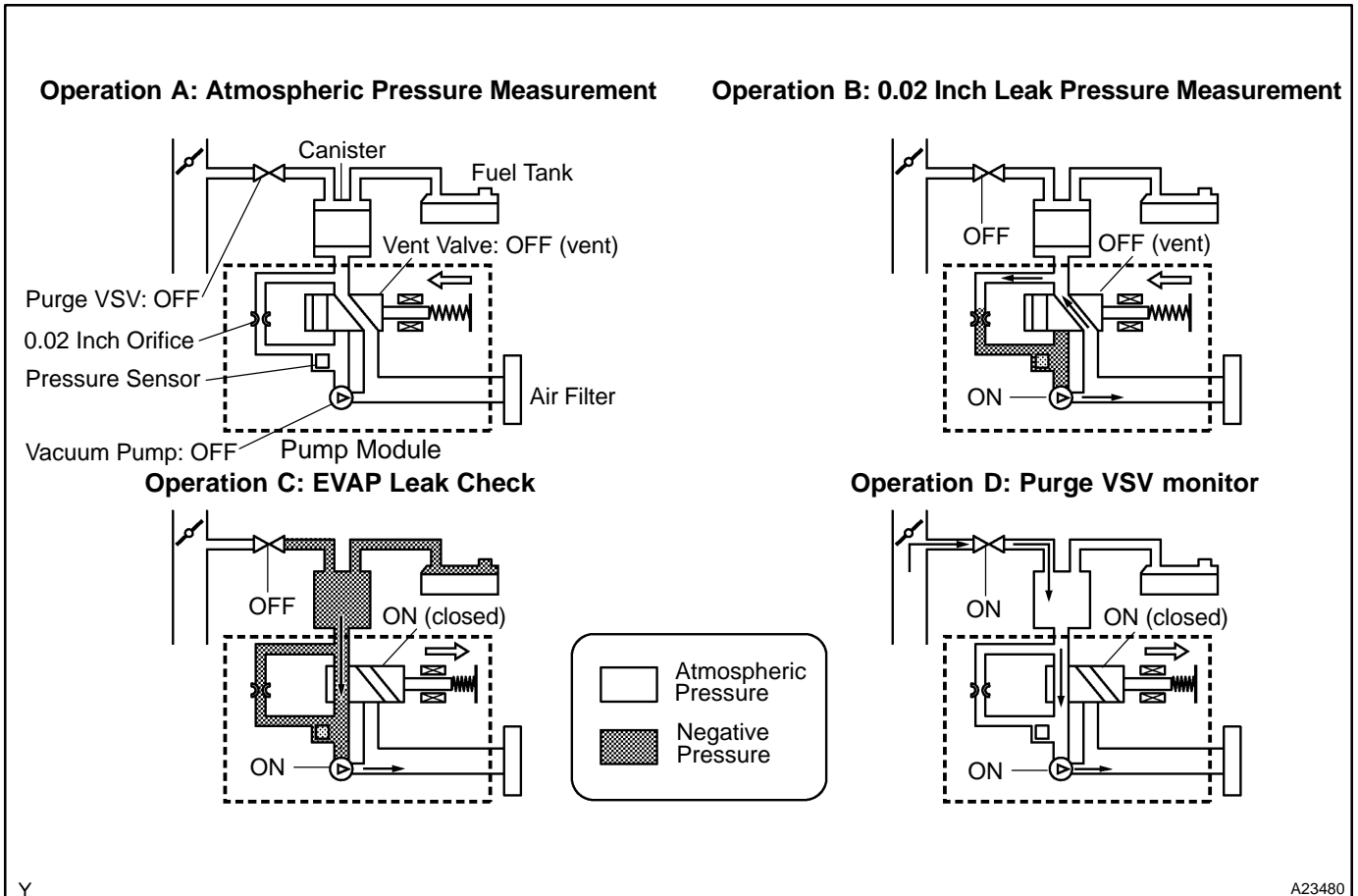
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

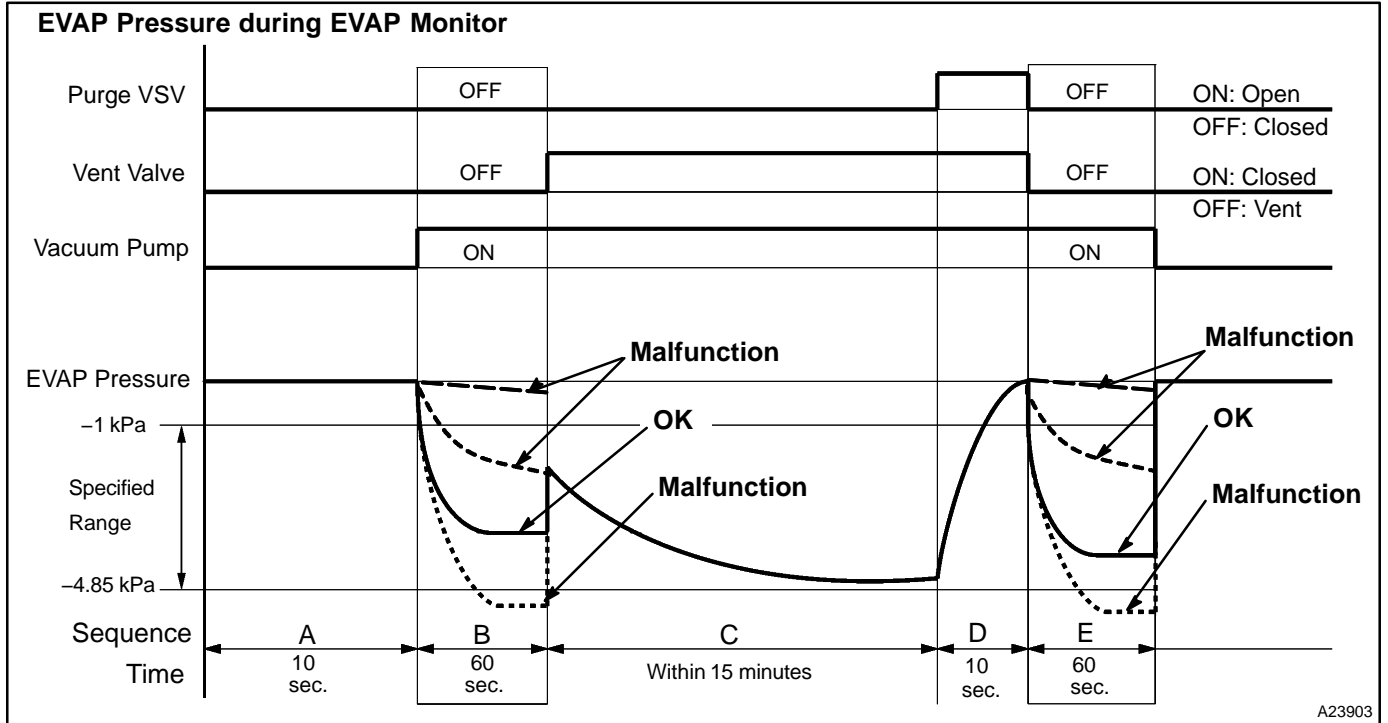
Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



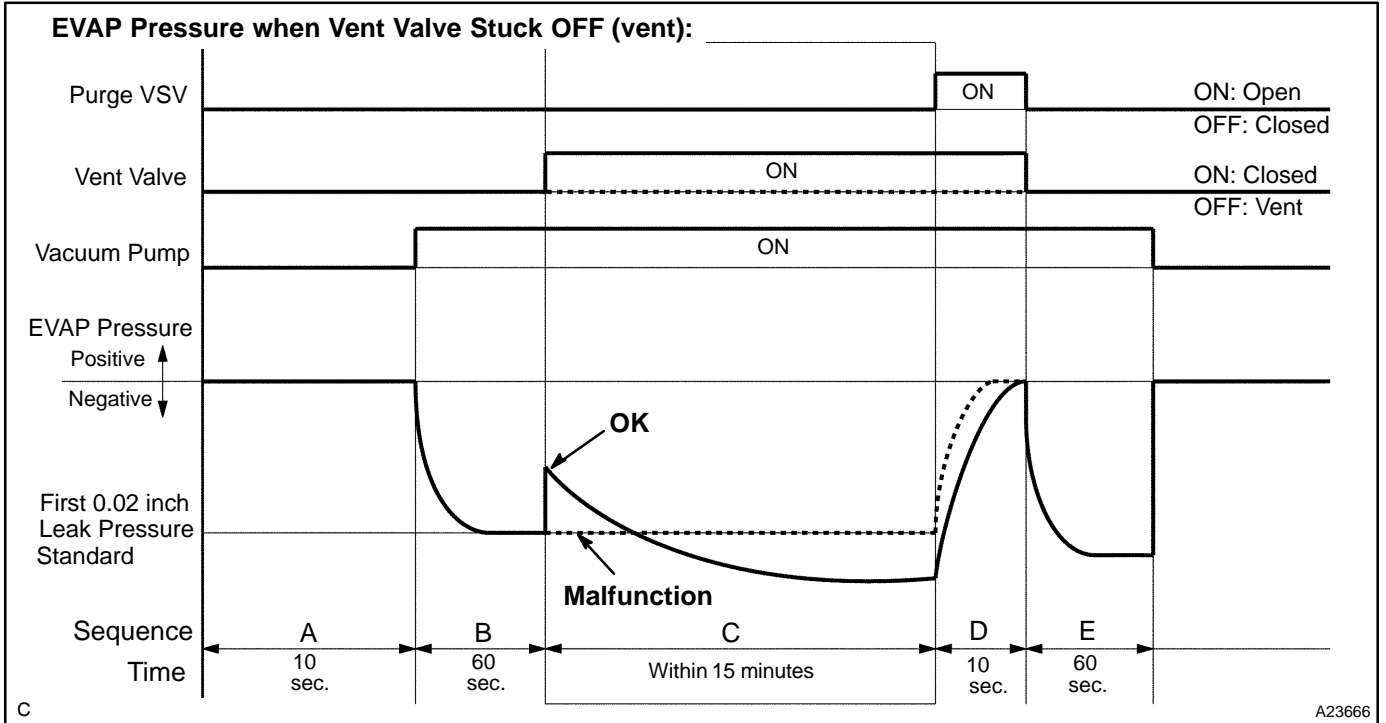
(a) P2419: Vent valve stuck ON (Closed)

In sequence B and E, to determine the leak criterion, the vacuum pump creates negative pressure in the canister pump module through the 0.02 inch orifice. If the pressure is out of specified range or is not saturated, the ECM illuminates the MIL and sets DTCs P043E, P043F, P2401, P2402 and P2419 (2-trip detection logic).



(b) P2420: Vent valve stuck OFF (vent)

In sequence C, the vent valve turns ON (closes) and the EVAP (Evaporative Emission) system pressure is then measured by the ECM, using the pressure sensor, to conduct an EVAP leak check. If the pressure does not increase when the vent valve turned ON (closed), the ECM interprets this as the vent valve being stuck OFF (vent). The ECM illuminates the MIL and sets the DTC.



MONITOR STRATEGY

Related DTCs	P2419	Vent valve stuck open
	P2420	Vent valve stuck closed
Required sensors/components	Vent valve	
Frequency of operation	Once per driving cycle	
Duration	Within 2 minutes (varies with amount of fuel in tank)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	-
Vehicle speed	-	2.5 mph (4 km/h)
Ignition switch	OFF	
Time after key off	5 or 7 or 9.5 hours	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	

EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions 1 and 2 set before key off	-	
1. Duration that vehicle has been driven	5 min.	-
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Key-off monitor sequence	1 to 8	
1. Atmospheric pressure	-	
Next sequence is run if the following condition is set	-	
Atmospheric pressure change	-	0.3 kPa (2.25 mmHg)
2. First reference pressure measurement	-	
Next sequence is run if the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.38 to -7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	
3. EVAP canister vent valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	-
4. Vacuum introduction	-	
Next sequence is run if the following condition is set	-	
EVAP pressure	Saturated within 15 minutes	
5. EVAP canister purge valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	-
6. Second reference pressure measurement	-	
Next sequence is run if the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.38 to -7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	
4. Difference between first reference pressure and second reference pressure	-	0.7 kPa (5.25 mmHg)

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7. Leak check	–	
Next sequence is run if the following condition is set	–	
EVAP pressure when vacuum introduction is complete	–	Second reference pressure
8. Atmospheric pressure measurement	–	
EVAP monitor is complete if the following condition is set	–	
Atmospheric pressure difference between sequence 1 and 8	–	0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Vent valve stuck open:	
One of the following conditions set	Condition 1, 2, 3, 4 or 5
1. EVAP pressure just after reference pressure measurement start	More than –1 kPa (–7.5 mmHg)
2. Reference pressure	Less than –4.85 kPa (–36.38 mmHg)
3. Reference pressure	–1.057 kPa (–7.93 mmHg) or more
4. Reference pressure	Not saturated
5. Difference between first reference pressure and second reference pressure	0.7 kPa (5.25 mmHg) or more
Vent valve stuck closed:	
EVAP pressure change after EVAP canister vent valve is ON	Less than 0.3 kPa (2.25 mmHg)

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-445](#) for detailed information.

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

DTC	P2430	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Bank 1
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DTC	P2431	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1
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DTC	P2432	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low Bank 1
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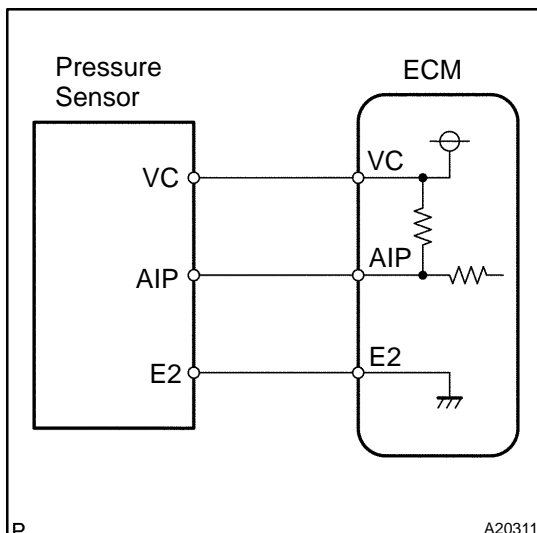
DTC	P2433	Secondary Air Injection System Air Flow/Pressure Sensor Circuit High Bank 1
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CIRCUIT DESCRIPTION

Refer to DTC P0412 on page [DI-656](#).

DTC No.	DTC Detecting Condition	Trouble Area
P2430	While the engine is running, if voltage output of the pressure sensor indicates 0.1V or less, or indicates 4.815V or more. (1 trip detection logic)	<ul style="list-style-type: none"> • Pressure sensor • Open or short in pressure sensor circuit • ECM
P2431	The pressure sensor indicates less than 45.63 kPa (342 mmHg), or more than 135 kPa (1013 mHg). (1 trip detection logic)	
P2432	While the engine is running, if voltage output of pressure sensor remains below 0.1 V. (1 trip detection logic)	
P2433	While the engine is running, if voltage output of the pressure sensor remains above 4.815 V. (1 trip detection logic)	

MONITOR DESCRIPTION



The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system.

If there is a defect in the sensor or the sensor circuit, the voltage level will deviate from the normal operating range, the ECM interprets this deviation as a defect in the pressure sensor circuit and sets a DTC.

MONITOR STRATEGY

Related DTCs	P2430	Air flow/Pressure sensor circuit range check (Fluctuating)
	P2431	Air flow/Pressure sensor circuit rationality
	P2432	Air flow/Pressure sensor circuit range check (Low voltage)
	P2433	Air flow/Pressure sensor circuit range check (High voltage)
Required sensors/components	Pressure sensor	
Frequency of operation	Continuous	
Duration	P2430, P2432, P2433: 0.5 sec. P2431: 5 sec.	
MIL operation	P2430, P2432, P2433: Immediate P2431: 2 driving cycles	
Sequence of operation	None	

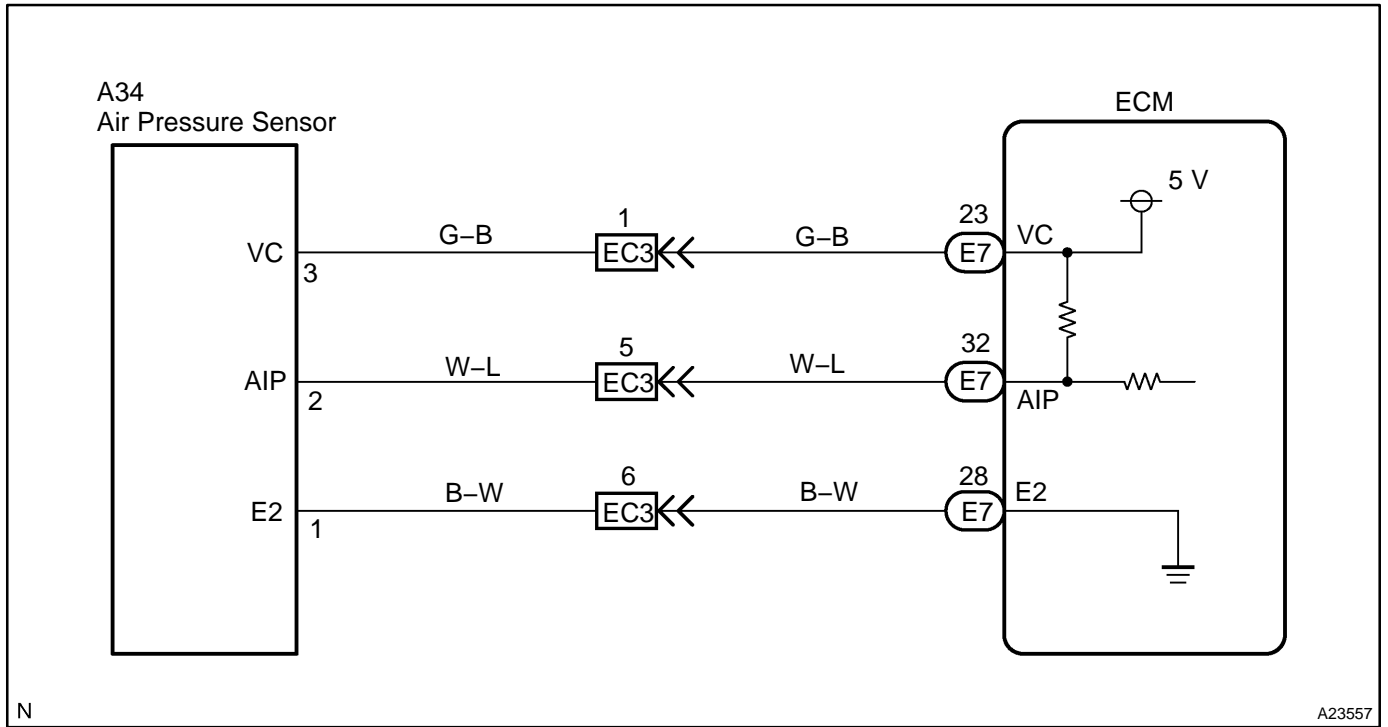
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Starter	OFF	
Time after starter turned from ON to OFF	2 sec.	-
Battery voltage	8 V	-
Ignition switch	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2430:	
Air pressure sensor voltage	Less than 0.1 V, or more than 4.815 V
P2431:	
Air pressure	Less than 45.63 kPa (342 mmHg), or more than 135 kPa (1013 mmHg)
P2432:	
Air pressure sensor voltage	Less than 0.1 V
P2433:	
Air pressure sensor voltage	More than 4.815 V

WIRING DIAGRAM

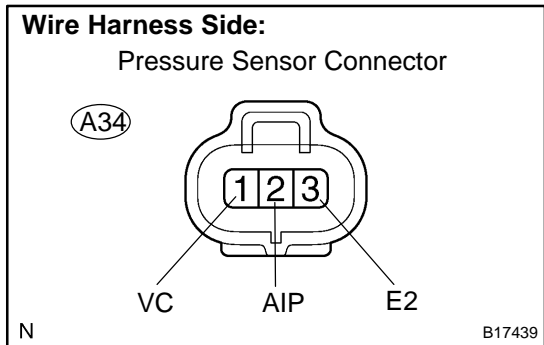


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A23557

INSPECTION PROCEDURE

- 1 Check for open and short in harness and connector between pressure sensor and ECM (See page IN-30).**



PREPARATION:

- Remove the intake manifold (see page EM-36).
- Disconnect the A34 pressure sensor connector.
- Disconnect the E7 ECM connector.

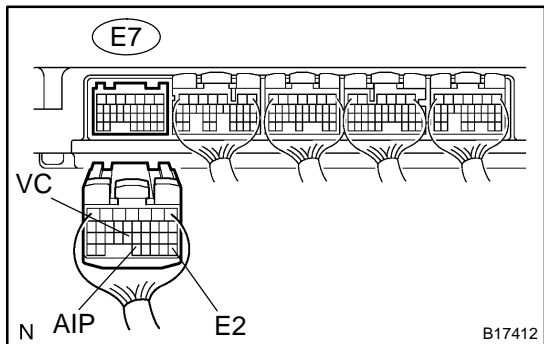
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

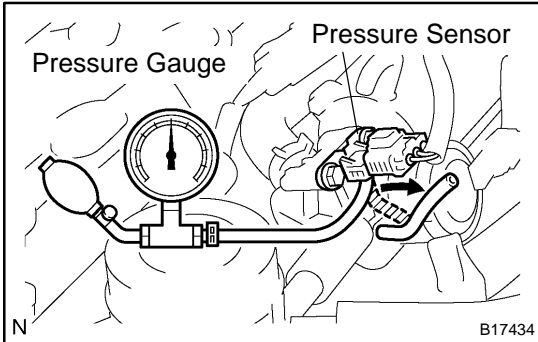
Tester Connection	Specified Condition
VC (A34-1) - VC (E7-23) AIP (A34-2) - AIP (E7-32) E2 (A34-3) - E2 (E7-28)	Below 1 Ω
VC (A34-1) or VC (E7-23) - Body ground AIP (A34-2) or AIP (E7-32) - Body ground	10 kΩ or higher



NG **Repair or replace harness and connector.**

OK

2 Inspect pressure sensor.



PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Connect the pressure gauge to the pressure sensor as shown in the illustration.
- (c) Connect the hand-held tester to the DLC3 on the vehicle.
- (d) Turn the ignition switch ON and push the hand-held tester main switch ON (Do not start engine).
- (e) Select the following items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / 2ND AIR PRESS.

CHECK:

Check that the pressure displayed on the hand-held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

OK:

Pressure fluctuates in response to the pressure applied with pressure gauge.

NG

Replace pressure sensor (See page [EC-20](#)).

OK

Replace ECM (See page [SF-82](#)).

DTC	P2444	Secondary Air Injection System Pump Stuck On Bank 1
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DTC	P2445	Secondary Air Injection System Pump Stuck Off Bank 1
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0412 on page [DI-656](#).

DTC No.	DTC Detection Condition	Trouble Area
P2444	<p>Air pump stuck ON.</p> <p>The secondary air pressure is more than 2.5 kPa (19 mmHg) despite the ECM ordering the air pump to turn off. (2 trip detection logic)</p>	<ul style="list-style-type: none"> • Short in air pump circuit • Air injection driver • Pressure sensor • Open or short in pressure sensor circuit • ECM
P2445	<p>Air pump stuck OFF or air injection volume is insufficient.</p> <p>The amount of air flow is below the criteria. (The secondary air pressure is less than specified value despite the ECM ordering the air pump turn ON.) (2 trip detection logic)</p>	<ul style="list-style-type: none"> • Air pump fuse • Vacuum hose • Air pump assembly • Air injection driver • Open in air pump circuit • Air injection system piping • Pressure sensor • Open or short in pressure sensor circuit • ECM

MONITOR DESCRIPTION

P2444:

The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system. The sensor measures the pressure in the secondary air passage and sends a signal to the ECM.

If the pressure level from the sensor exceed a certain level despite the ECM turning off the air pump, the ECM interprets this as a fault in the secondary air injection system and sets a DTC.

P2445:

The ECM calculates the amount of air flow within the secondary air system based on the output values of the pressure sensor and Mas air flow meter.

The ECM determines whether the amount of air flow is normal or not according to the calculated value. When the amount of air flow is below the criteria the ECM stores the DTC and illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P2444	Air pump is stuck ON (case 1)
	P2445	Air pump is stuck OFF (case 2)
	P2445	Air flow volume is insufficient (case 3)
	P2445	Air pressure sensor is stuck (case 4)
Required sensors/components	AIR pressure sensor, AIR valve, AIR VSV (Bank 1), AIR VSV (Bank 2)	
Frequency of operation	Once per driving cycle	
Duration	Within 60 seconds	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Conditions for case 1, case 2 and case 3:		
Atmospheric pressure	45 kPa (338 mmHg)	–
Battery voltage	11.5 V	–
Sequence 1 to 6 are performed to monitor AIR	–	
Sequence 1	–	
AIR	In operation	
AIR pump	ON	
AIR valve (Electric type)	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Both of the following conditions are met:	Condition (a) and (b)	
(a) AIR valve (vacuum type) bank 1	ON	
(b) AIR valve (vacuum type) bank 2	OFF	
2. Both of the following conditions are met:	Condition (c) and (d)	
(c) AIR valve (vacuum type) bank 1	OFF	
(d) AIR valve (vacuum type) bank 2	ON	
Idle	ON	
Sequence 2	–	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	ON	
AIR valve (vacuum type) bank 2	ON	
Idle	ON	
Sequence 3	–	
AIR pump	ON	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	ON	
AIR valve (vacuum type) bank 2	ON	
Engine RPM	–	3750 rpm
Sequence 4 (This sequence is run when AIR pressure is no change at monitor)	–	

AIR	Not operating	
AIR pump	ON	
AIR valve (Electric type)	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Both of the following conditions are met:	Condition (a) and (b)	
(a) AIR valve (vacuum type) bank 1	ON	
(b) AIR valve (vacuum type) bank 2	OFF	
2. Both of the following conditions are met:	Condition (c) and (d)	
(c) AIR valve (vacuum type) bank 1	OFF	
(d) AIR valve (vacuum type) bank 2	ON	
Engine RPM	-	3750 rpm
Sequence 5	-	
AIR	Not operating	
AIR pump	OFF	
AIR valve (Electric type)	OFF	
AIR valve (vacuum type) bank 1	OFF	
AIR valve (vacuum type) bank 2	OFF	
Engine RPM	-	3750 rpm
Sequence 6	-	
AIR status	Not operating	
AIR pump	OFF	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	OFF	
AIR valve (vacuum type) bank 2	OFF	
Engine RPM	-	3750 rpm
Conditions for case 4:		
ECT at engine start	-	5°C (41°F)
IAT at engine start	-15°C (5°F)	-
Time after ECT is 80°C (176°F) or more	10 to 60 minutes	
Cumulative intake air amount	172 g/sec.	-
Monitor sequence 3 (during AIR: ON)	Completed	
One of the following condition is met:	Condition (a), (b) or (c)	
(a) Vehicle speed	49.7 mph (80 km/h)	-
(b) Engine RPM	0 rpm	-
(c) Throttle position	0 deg	-
AIR valve	OFF	
AIR VSV bank 1	OFF	
AIR VSV bank 2	OFF	
AIR pressure sensor malfunction (open circuit, out of range)	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Thresholds for case 1	
AIR pressure during monitor sequence 6	5 kPa (37.5 mmHg) or more
Thresholds for case 2	
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg)
Thresholds for case 3	
AIR amount	100 L/min. or less
Thresholds for case 4	
AIR pressure change	5 kPa (37.5 mmHg) or more

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

Secondary air injection (AIR) system

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$71	\$E1	Multiply by 0.01 (g/s)	Test value of AIR amount insufficient	Minimum test limit	Maximum test limit
\$71	\$E2	Multiply by 0.01 (kPa)	Test value of AIR pump stuck ON	Minimum test limit	Maximum test limit
\$71	\$E3	Multiply by 0.01 (kPa)	Test value of AIR pump stuck OFF	Minimum test limit	Maximum test limit
\$71	\$E4	Multiply by 0.01 (kPa)	Test value of AIR control valve ON	Minimum test limit	Maximum test limit
\$71	\$E5	Multiply by 0.01 (kPa)	Test value of AIR control valve OFF	Minimum test limit	Maximum test limit
\$71	\$E6	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR valve	Minimum test limit	Maximum test limit
\$71	\$E7	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR VSV bank 1	Minimum test limit	Maximum test limit
\$71	\$E8	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR VSV bank 2	Minimum test limit	Maximum test limit
\$71	\$E9	Multiply by 0.01 (kPa)	Test value of AIR pressure pulsation for AIR VSV when AIR pressure is low	Minimum test limit	Maximum test limit

WIRING DIAGRAM

Refer to DTC P0412 on page [DI-656](#).

INSPECTION PROCEDURE

HINT:

To check the pressure condition in the secondary air passage, the hand-held tester is available.

1	Is the DTC P2444 and P2445 being output.
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) Enter the following menu: DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES.

CHECK:

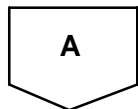
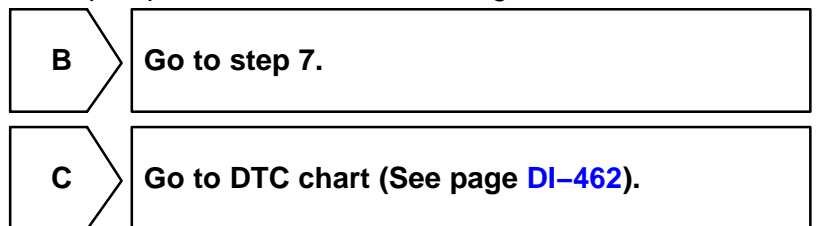
Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2445	A
P2444	B
P2444 and P2445	B
"P2444 and P2445" and other DTCs	C

HINT:

If any other codes besides P2444 or P2445 is output, perform the troubleshooting for those DTCs first.



2 Check air injection system pressure.

```

AIR INJ CHECK
AIR PUMP.....ON
EASV .....OPEN
ASV1. ....OPEN
ASV2.....OPEN
A/F BANK1.....19.05
A/F BANK2.....14.5
PRESSURE.....17 kPa
PULSATION.....25.39 kPa
AI STATUS.....OK
Remaining Time 05 sec.

Press [EXIT] to quit

```

A16555

PREPARATION:

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch to OFF.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to ON and push the hand-held tester main switch ON.
- (e) Start the engine.

CHECK:

- (a) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/ MANUAL OPERATION/OPERATION 1 and 6

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 2: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

- (b) Check that the PRESSURE on the hand-held tester.

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:

Tester operation	PRESSURE
Operation 1	Less than 2.5 kPa
Operation 2	5 to 8 kPa or more

NG → **Go to step 4.**

OK

3	Check whether DTC output recurs.
----------	---

PREPARATION:

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch OFF.
- (c) Connect a hand-held tester to the DLC3.
- (d) Turn the ignition switch to ON and turn the tester ON.
- (e) Clear the DTCs (see page [DI-462](#)).
- (f) Start the engine.

CHECK:

- (a) Perform ACTIVE TEST to operate the air injection system.
Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/AUTOMATIC OPERATION
- (b) After operating the secondary air injection system, confirm the pending codes for the secondary air injection system by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (c) Read DTC and check DTC.

OK:

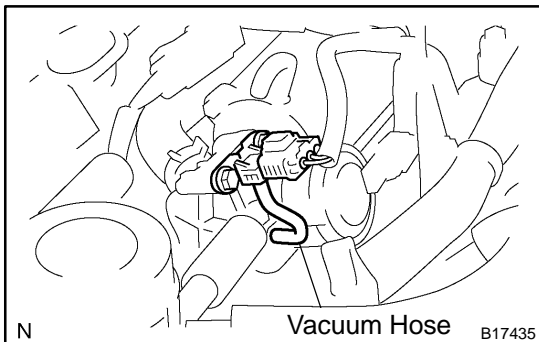
DTC P2444 or P2445 for the secondary air injection system is not output.

NG	Go to step 4.
-----------	----------------------

OK

Check for intermittent problems (See page DI-430).

4	Check vacuum hose.
----------	---------------------------

**CHECK:**

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Check the vacuum hose connection between the pressure sensor and air switching valve.

OK:

The vacuum hose is securely connected.

CHECK:

- (a) Inspect the vacuum hose for blockage or damage.

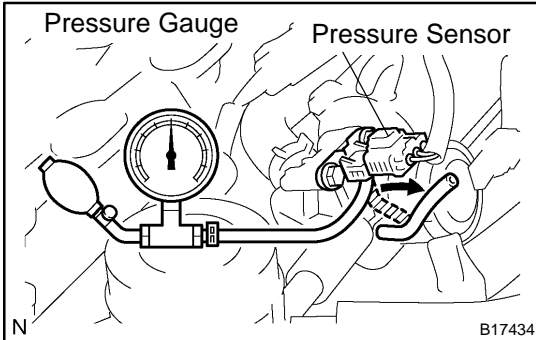
OK:

The vacuum hoses no blockages and damages.

NG	Repair or replace vacuum hose.
-----------	---------------------------------------

OK

5 Inspect ECM (air voltage).



PREPARATION:

- Remove the intake manifold (see page [EM-36](#)).
- Connect the pressure gauge to the pressure sensor as shown in the illustration.
- Connect the hand-held tester to the DLC3 on the vehicle.
- Turn the ignition switch ON and push the hand-held tester main switch ON (Do not start engine).
- Select the following items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / AIR PUMP PRS.

CHECK:

Check that the pressure displayed on the hand-held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

OK:

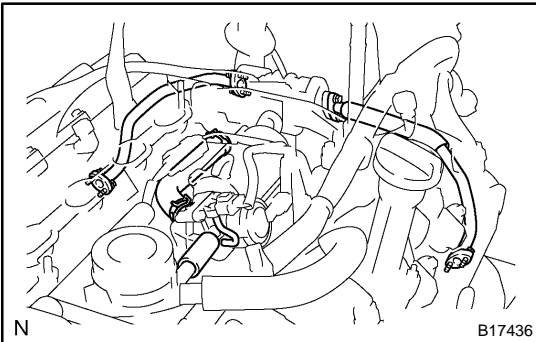
Pressure fluctuates in response to the pressure applied with pressure gauge.

NG

Replace pressure sensor.

OK

6 Check connection of all air injection system piping and hoses.



CHECK:

- Remove the intake manifold (see page [EM-36](#)).
- Check that all the pipes and hoses between the air pump and air switching valve are securely connected.

OK:

The all air injection pipes and hoses are securely connected.

CHECK:

- Check the pipe and hoses for blockage or damage.

OK:

The air injection system pipes and hoses has no blockages and damages.

NG

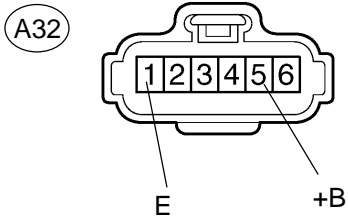
Repair or replace air injection system piping.

OK

7 Inspect air injection driver power source circuit.

Wire Harness Side:

Air Injection Driver Connector



N

B17444

PREPARATION:

- Remove the intake manifold (see page EM-36).
- Disconnect the A32 and A33 air injection driver connector.
- Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminals A32-5 (+B) and A33-1 (BATT) of the air injection driver and body ground.

OK:

Standard:

Tester Connection	Specified Condition
A32-5 (+B) - Body ground	10 V or more
A33-1 (BATT) - Body ground	10 V or more

CHECK:

Measure the resistance between the terminal A32-1 (E) of the air injection driver and body ground.

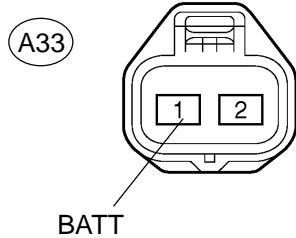
OK:

Standard:

Tester Connection	Specified Condition
A32-1 (E) - Body ground	Below 1 Ω

Wire Harness Side:

Air Injection Driver Connector



N

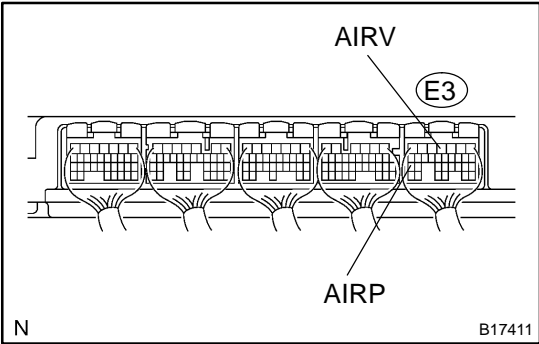
B17443

NG

Repair or replace harness or connector.

OK

8 Check voltage between AIRP and AIRV terminal of ECM and body ground.



PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and turn the tester ON.

CHECK:

- (a) When the air pump and air switching valve are operated using hand-held tester, measure voltage between terminal E3-25 (AIRP) and E3-4 (AIRV) of the air injection driver connector and body ground.
- (b) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/MANUAL OPERATION/OPERATION 1 and 2

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 2: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:

Standard:

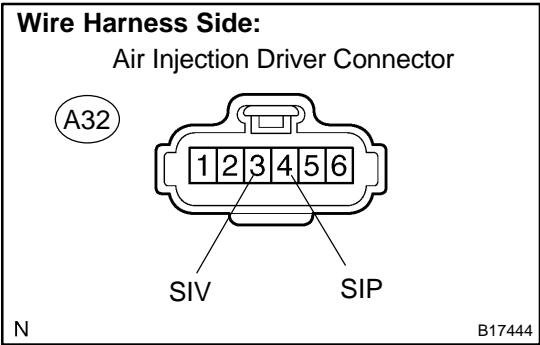
Air pump operation	Tester Connection	Specified Condition
ON	E3-25 (AIRP) – Body ground	10 V or more
OFF	E3-25 (AIRP) – Body ground	3.5 to 7.7 V*
ASV operation (EASV)	Tester Connection	Specified Condition
OPEN	E3-4 (AIRV) – Body ground	10 V or more
CLOSE	E3-4 (AIRV) – Body ground	3.5 to 7.7 V*

*: 35 to 55 % of the +B voltage.

NG Replace ECM (See page [SF-82](#)).

OK

9 Check voltage between SIV and SIP terminal of air injection driver and body ground.



PREPARATION:

- (a) Disconnect the A32 air injection driver connector.
- (b) Connect the hand-held tester to the DLC3.
- (c) Turn the ignition switch ON and turn the tester ON.

CHECK:

- (a) When the air pump and air switching valve are operated using hand-held tester, measure voltage between terminal A32-3 (SIV) and A32-4 (SIP) of the air injection driver connector and body ground.
- (b) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/MANUAL OPERATION/OPERATION 1 and 2

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 2: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again.

OK:

Standard:

Air pump operation	Tester Connection	Specified Condition
ON	A32-4 (SIP) - Body ground	10 V or more
OFF	A32-4 (SIP) - Body ground	3.5 to 7.7 V*
ASV operation (EASV)	Tester Connection	Specified Condition
OPEN	A32-3 (SIV) - Body ground	10 V or more
CLOSE	A32-3 (SIV) - Body ground	3.5 to 7.7 V*

*: 35 to 55 % of the +B voltage.

NG **Repair or replace harness or connector between air injection driver and ECM.**

OK

10 Check voltage between terminal 2 of air pump and body ground.

Wire Harness Side:

A35



Air Pump Connector

N

B17438

PREPARATION:

- (a) Remove the intake manifold (see page EM-36).
- (b) Disconnect the A35 air pump connector.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch ON and turn the tester ON.

CHECK:

- (a) When the air pump is operated using the hand-held tester, measure voltage between terminal A35-2 of the air injection driver connector and body ground.
- (b) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/ MANUAL OPERATION/OPERATION 1 and 2

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 2: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:

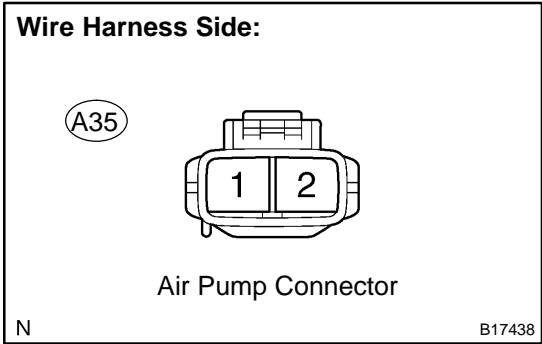
Standard:

Air pump operation	Tester Connection	Specified Condition
ON	A35-2 - Body ground	10 V or more
OFF	A35-2 - Body ground	Below 1.0 V

NG Go to step 14.



11 Check for open in harness and connector between air pump and body ground.



PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the A35 air pump connector.

CHECK:

Measure the resistance between the wire harness side connectors and body ground.

OK:

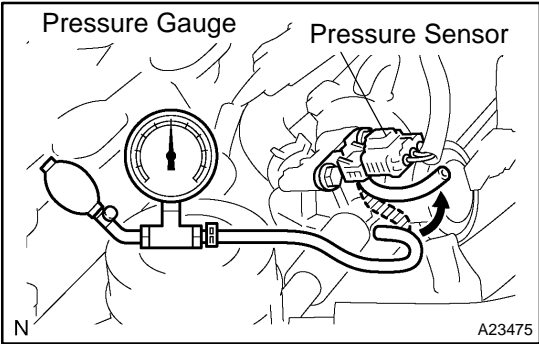
Standard:

Tester Connection	Specified Condition
A35-1 - Body ground	Below 1 Ω

NG **Repair or replace harness or connector.**

OK

12	Check air pump operation.
-----------	----------------------------------



PREPARATION:

- (a) Connect the pressure gauge to the air switching valve as shown in the illustration.
- (b) Connect the hand-held tester to the DLC3.
- (c) Turn the ignition switch ON and turn the tester ON.
- (d) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST/AIR INJ CHECK/MANUAL OPERATION/OPERATION 3

CHECK:

- (a) When the air pump is operated using the hand-held tester, measure the air injection system pressure.

HINT:

OPERATION 2: AP:ON, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:

Standard:

25 to 30 kPa or more

NG	Replace air pump.
-----------	--------------------------

OK

13	Check whether DTC output recurs.
-----------	---

PREPARATION:

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch OFF.
- (c) Connect a hand-held tester to the DLC3.
- (d) Turn the ignition switch to ON and turn the tester ON.
- (e) Clear the DTCs (see page [DI-462](#)).
- (f) Start the engine.

CHECK:

- (a) Perform ACTIVE TEST to operate the air injection system.
Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/AUTOMATIC OPERATION
- (b) After operating secondary air injection system, confirm the pending codes of the secondary air injection system by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (c) Read DTC and check no DTC.

OK:

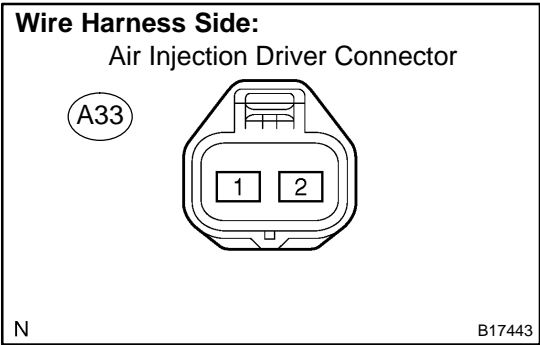
DTC P2444 or P2445 for the secondary air injection system is not output.

NG

Check for intermittent problems
(See page [DI-430](#)).

OK**END**

14 Check for open and short in harness and connector between air injection driver and air pump.



PREPARATION:

- (a) Remove the intake manifold (see page EM-36).
- (b) Disconnect the A33 air injection driver connector.
- (c) Disconnect the A35 air pump connector.

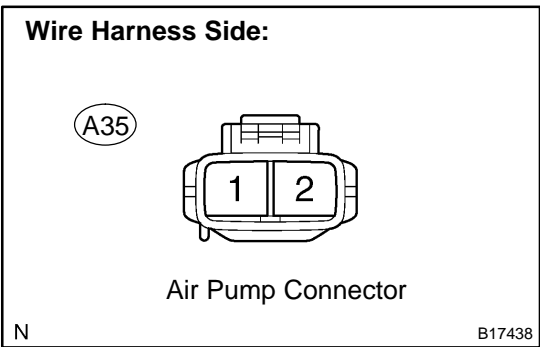
CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VP (A33-2) - A35-2	Below 1 Ω
VP (A33-2) or A35-2 - Body ground	10 kΩ or higher



NG Repair or replace harness or connector.

OK

Replace air injection driver.

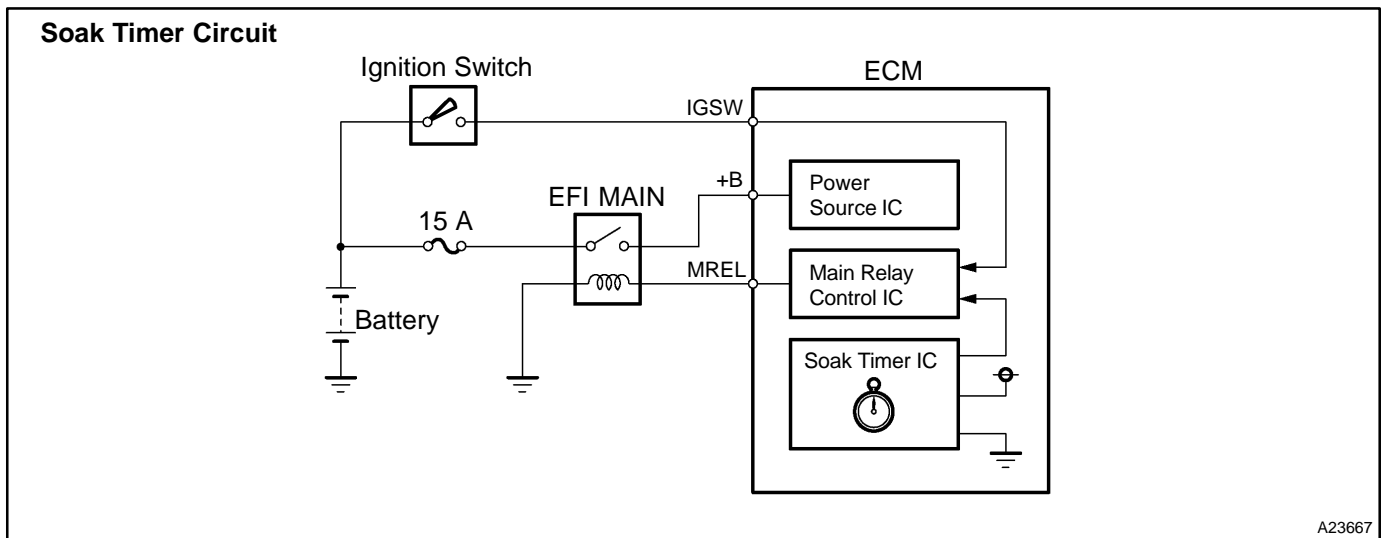
DTC	P2610	ECM/PCM Internal Engine OFF Timer Performance
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DTC SUMMARY

DTC	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P2610	Soak timer (built into ECM)	ECM internal malfunction	ECM	Engine running	2 trip

CIRCUIT DESCRIPTION

To ensure the accuracy of the EVAP (Evaporative Emission) monitor values, the soak timer, which is built into the ECM, measures 5 hours (± 15 minutes) from when the ignition switch is turned OFF, before the monitor is run. This allows the fuel to cool down, which stabilizes the Fuel Tank Pressure (FTP). When 5 hours have elapsed, the ECM turns on.



MONITOR DESCRIPTION

5 hours after the ignition switch is turned OFF, the soak timer activates the ECM to begin the EVAP system monitor. While the engine is running, the ECM monitors the synchronization of the soak timer and the CPU clock. If these two are not synchronized, the ECM interprets this as a malfunction, illuminates the MIL and sets the DTC (2 trip detection logic).

MONITOR STRATEGY

Related DTCs	P2610	Soak timer (built into ECM)
Required sensors/components	ECM	
Frequency of operation	Once per driving cycle	
Duration	10 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Battery voltage	8 V	-
Ignition switch	ON	
Starter	OFF	
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Soak time measurement when ECM CPU clock counts 10 min.	Less than 7 min., or more than 13 min.

INSPECTION PROCEDURE

HINT:

- DTC P2610 is set if an internal ECM problem is detected. Diagnostic procedures are not required. ECM replacement is required.
- Read freeze frame data using a hand-held tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Replace ECM (See page SF-82).
----------	--



Check whether DTC output recurs.

- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON.
- Clear DTCs (see page [DI-462](#)).
- Start the engine and wait for 10 minutes or more.
- On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- If no pending DTC is displayed, the repair has been successfully completed.

DTC	P043E	Evaporate Emission System Reference Orifice Clog Up
------------	--------------	--

DTC	P043F	Evaporate Emission System Reference Orifice High Flow
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

DTC	Monitoring Item	Detection Conditions	Trouble Areas	Detection Timing	Detection Logic
P043E	0.02 inch orifice clogged	One of following conditions are met: <ul style="list-style-type: none"> • 0.02 inch orifice low-flow • 0.02 inch orifice high-flow • Vacuum pump ON stuck • Vacuum pump OFF stuck • Vent valve ON (Closed) stuck 	<ul style="list-style-type: none"> • Pump module • Connector / Wire harness (Pump module – ECM) • ECM 	While ignition switch OFF	2 trips
P043F	0.02 inch orifice high-flow	NOTE: P043E, P043F, P2401, P2402 and P2419 have same DTC detection conditions.			

WIRING DIAGRAM

Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

MONITOR DESCRIPTION

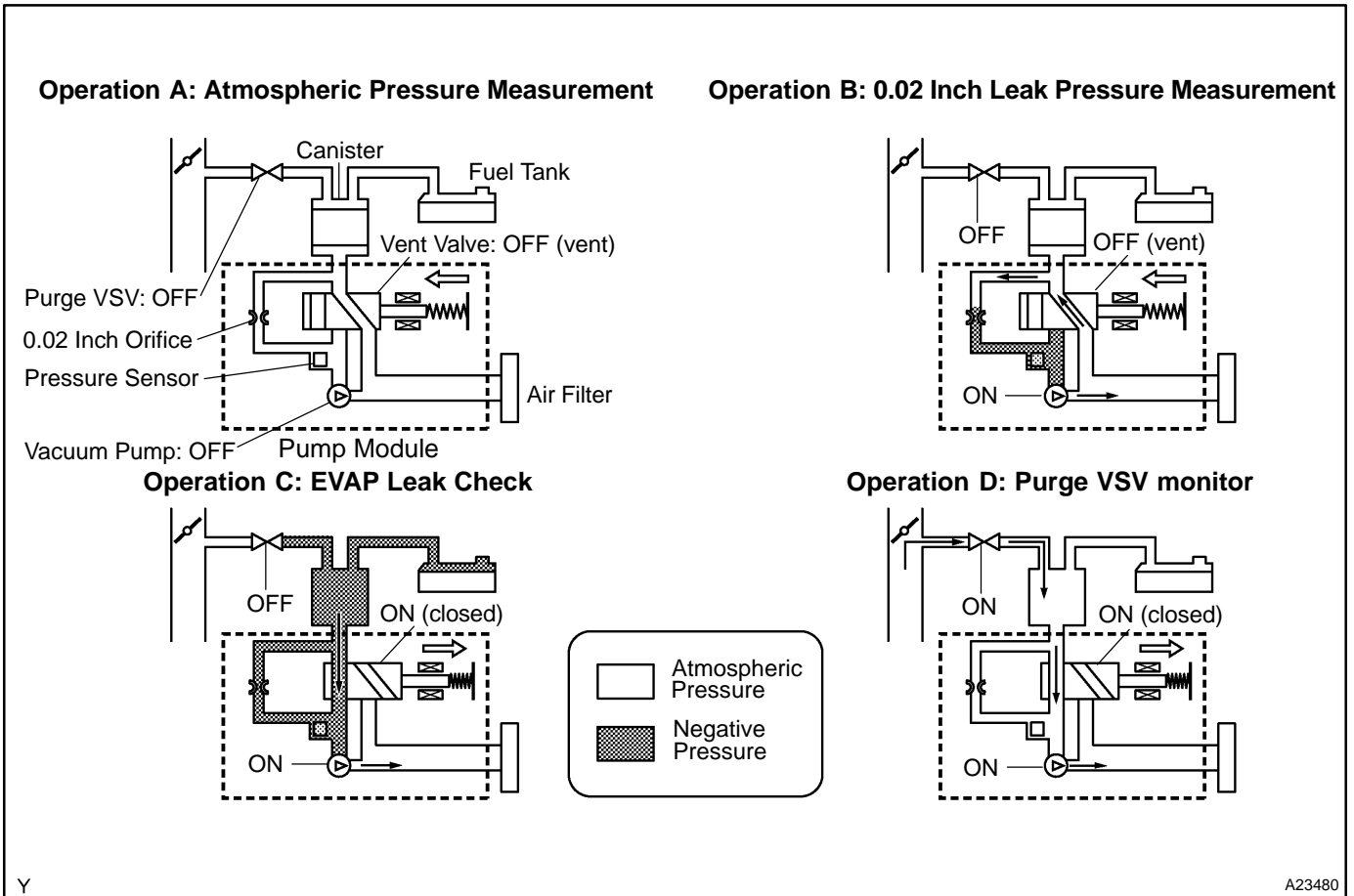
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

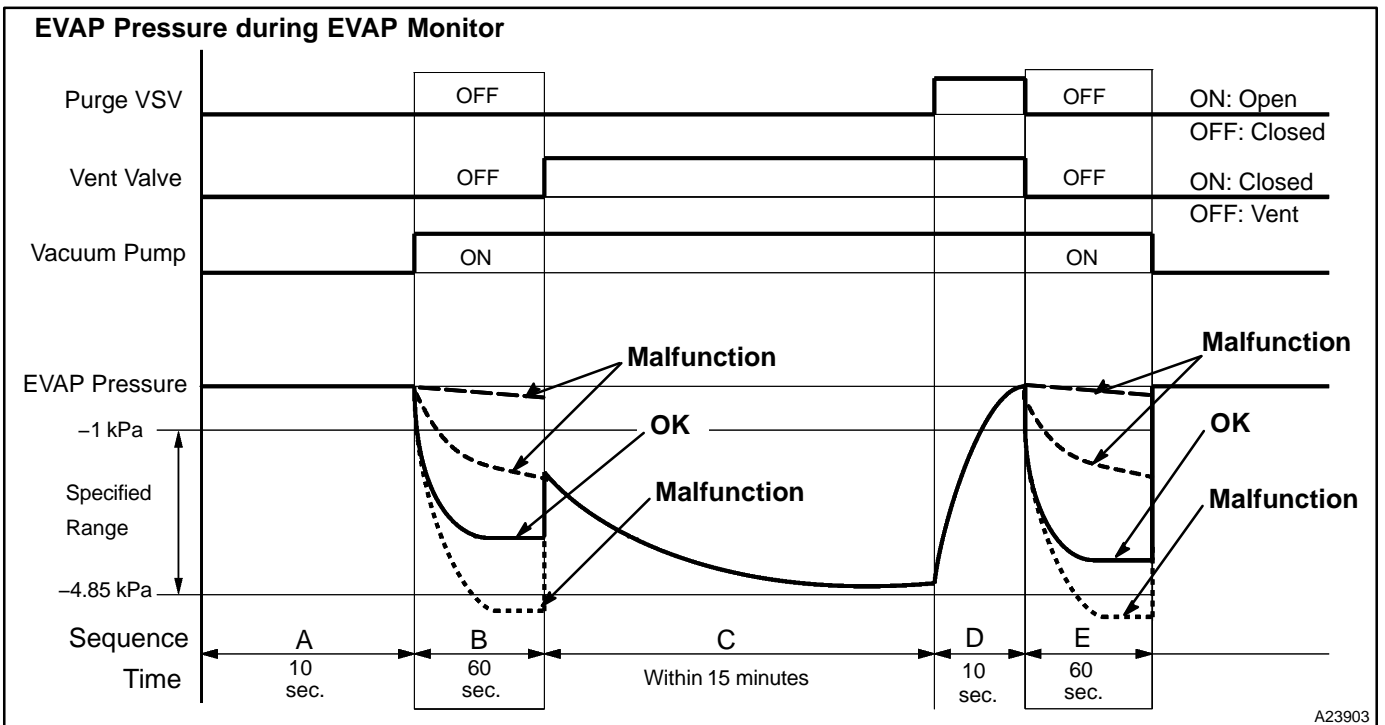
*: If the engine coolant temperature is not below 35°C (95°F) after 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
–	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	–
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If EVAP pressure is not between 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down the measured value as it will be used in the leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	–

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



In sequence B and E, to determine the leak criterion, the vacuum pump creates negative pressure in the canister pump module through the 0.02 inch orifice. If the pressure is out of specified range or is not saturated, the ECM illuminates the MIL and sets DTCs P043E, P043F, P2401, P2402 and P2419 (2-trip detection logic).



MONITOR STRATEGY

Related DTCs	P043E	0.02 inch orifice clog (built-in pump module)
	P043F	0.02 inch orifice high-flow (built-in pump module)
Required sensors/components	Pump module	
Frequency of operation	Once per driving cycle	
Duration	Within 2 min. (varies with amount of fuel in tank)	
MIL operation	2 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)	
Battery voltage	10.5 V	–
Vehicle speed	–	2.5 mph (4 km/h)
Ignition switch	OFF	
Time after key off	5 or 7 or 9.5 hours	
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected	
EVAP canister purge valve	Not operated by scan tool	
EVAP canister vent valve	Not operated by scan tool	
EVAP leak detection pump	Not operated by scan tool	
Both of the following conditions 1 and 2 set before key off	–	
1. Duration that vehicle has been driven	5 min.	–
2. EVAP purge operation	Performed	
ECT	4.4 to 35°C (40 to 95°F)	
IAT	4.4 to 35°C (40 to 95°F)	
Key-off monitor sequence	1 to 8	
1. Atmospheric pressure	–	
Next sequence is run if the following condition is set	–	
Atmospheric pressure change	–	0.3 kPa (2.25 mmHg)
2. First reference pressure measurement	–	
Next sequence is run if the following conditions are set	Condition 1, 2 and 3	
1. EVAP pressure just after reference pressure measurement start	–	–1 kPa (–7.5 mmHg)
2. Reference pressure	–4.85 to –1.057 kPa (–36.38 to –7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	

DIAGNOSTICS – ENGINE (2UZ-FE)

3. EVAP canister vent valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg)	-
4. Vacuum introduction	-	
Next sequence is run if the following condition is set	-	
EVAP pressure	Saturated within 15 minutes	
5. EVAP canister purge valve close stuck check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg)	-
6. Second reference pressure measurement	-	
Next sequence is run if the following conditions are set	Condition 1, 2, 3 and 4	
1. EVAP pressure just after reference pressure	-	-1 kPa (-7.5 mmHg)
2. Reference pressure	-4.85 to -1.057 kPa (-36.38 to -7.93 mmHg)	
3. Reference pressure	Saturated within 60 seconds	
4. Difference between first reference pressure and second reference pressure	-	0.7 kPa (5.25 mmHg)
7. Leak check	-	
Next sequence is run if the following condition is set	-	
EVAP pressure when vacuum introduction is complete	-	Second reference pressure
8. Atmospheric pressure measurement	-	
EVAP monitor is complete if the following condition is set	-	
Atmospheric pressure difference between sequence 1 and 8	-	0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
One of the following conditions is met	Condition 1, 2, 3, 4 or 5
1. EVAP pressure just after reference pressure measurement start	More than -1 kPa (-7.5 mmHg)
2. Reference pressure	Less than -4.85 kPa (-36.38 mmHg)
3. Reference pressure	-1.057 kPa (-7.93 mmHg) or more
4. Reference pressure	Not saturated
5. Difference between first reference pressure and second reference pressure	0.7 kPa (5.3 mmHg) or more

MONITOR RESULT (MODE 06 DATA)

Refer to page [DI-445](#) for detailed information.

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [DI-884](#)).

DTC	P2A00	A/F Sensor Circuit Slow Response (Bank 1 Sensor 1)
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DTC	P2A03	A/F Sensor Circuit Slow Response (Bank 2 Sensor 1)
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CIRCUIT DESCRIPTION

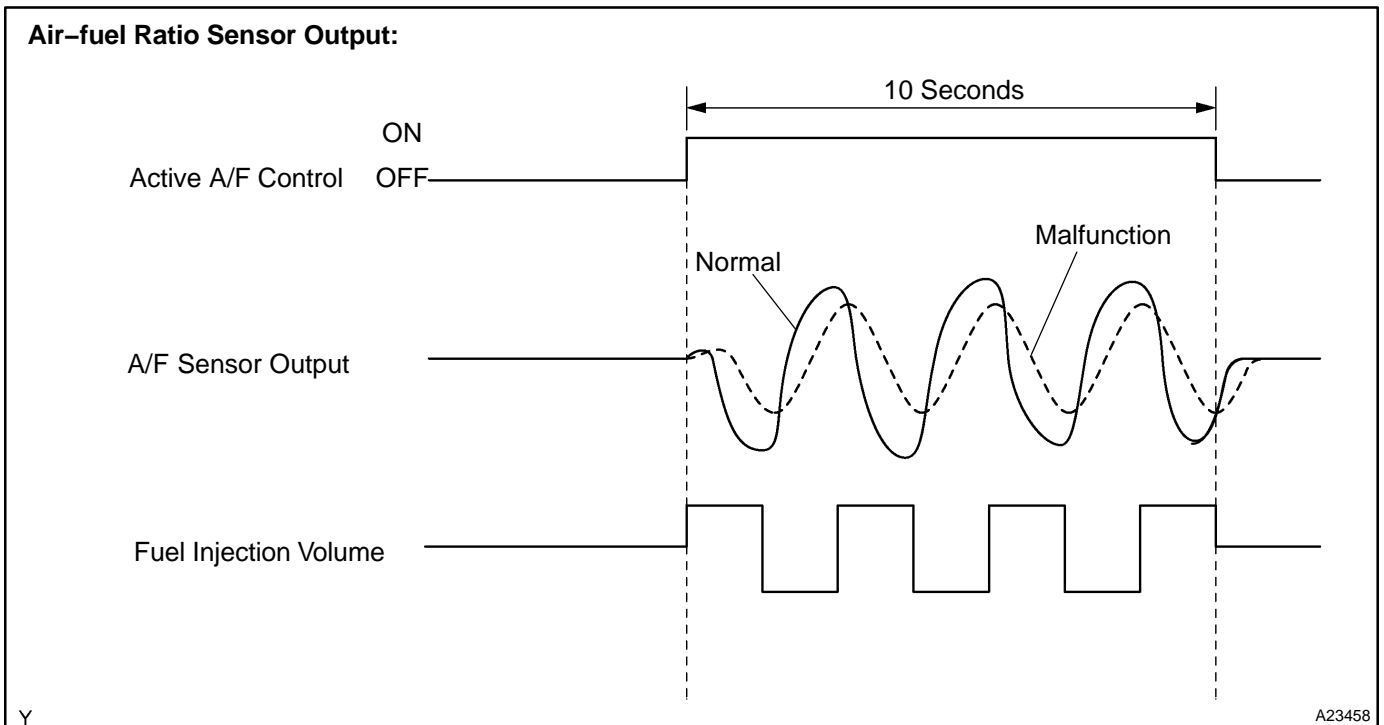
Refer to DTC P2195 on page [DI-806](#).

DTC No.	DTC Detection Conditions	Trouble Areas
P2A00 P2A03	Calculated test value for A/F sensor response rate deterioration level is less than threshold.	<ul style="list-style-type: none"> • Open or short in A/F sensor (sensor 1) circuit • A/F sensor (sensor 1) • ECM

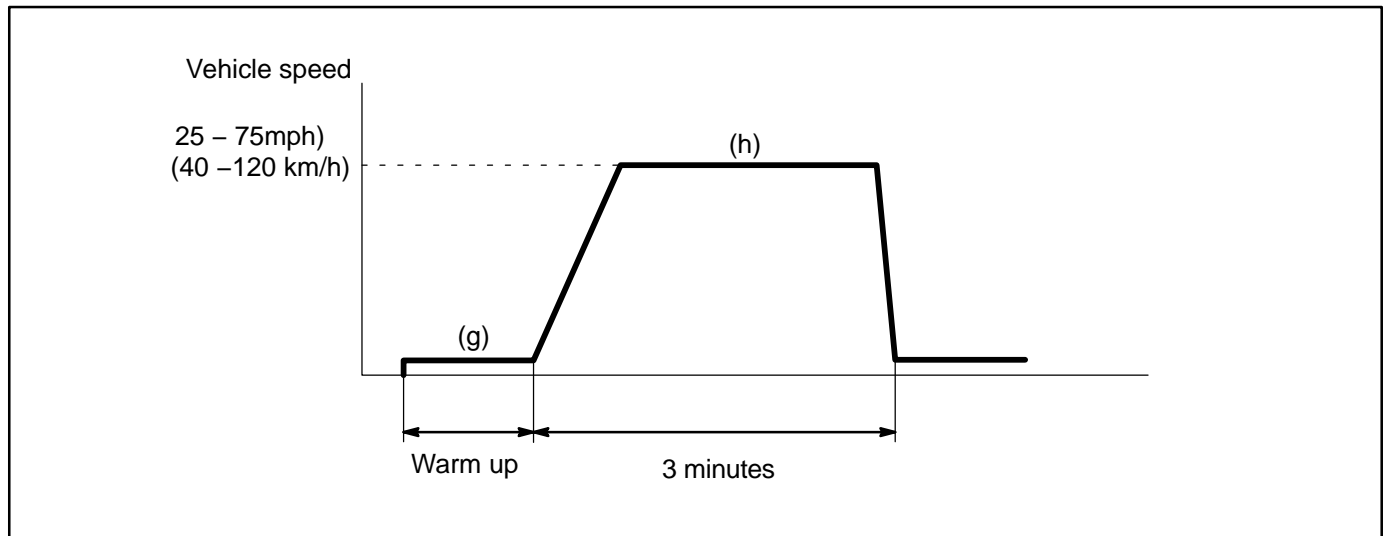
MONITOR DESCRIPTION

After engine is warmed up, the ECM performs air-fuel ratio feedback control to regulate the air-fuel ratio at stoichiometric ratio. In addition, this vehicle performs Active A/F Ratio Control for approximately 10 seconds after preconditions met in order to measure the A/F sensor response rate. During active air-fuel ratio control, the ECM forcibly increases and decreases the injection volume for certain amount based on learned stoichiometric air-fuel ratio during usual air-fuel feedback control, and measures the A/F sensor response rate. The ECM calculates the signal from the A/F sensor while value for A/F sensor response rate deterioration level.

If the test value for A/F sensor response rate deterioration level is less than threshold, ECM interprets this as a malfunction, and sets the DTC.



CONFIRMATION DRIVING PATTERN



- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to ON.
- (c) Turn the hand-held tester ON.
- (d) Clear DTCs.
- (e) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/MONITOR INFO/MONITOR RESULT.
- (f) Check that RES RATE B1 S1 is INCOMPL.
- (g) Start the engine and warm it up.
- (h) Drive the vehicle at between 25 mph and 75 mph (40 km/h and 120km/h) for 3 minutes. However, the vehicle should be driven at constant-speed.
- (i) When detection is complete, Response rate of MONITOR RESULT changes. If the value does not change, perform step (g) once more.
- (j) Notes the value of the Monitor Result.
- (k) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/DTC INFO/ PENDING CODES.
- (l) Check if any DTCs (any pending DTCs) are set.

MONITOR STRATEGY

Related DTCs	P2A00	A/F sensor (Bank 1) slow response
	P2A03	A/F sensor (Bank 2) slow response
Required sensors/components	A/F sensor	
Frequency of operation	Once per driving cycle	
Duration	10 to 15 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Active A/F control	Performing	
Active A/F control is performed when the following conditions are met:	-	
Battery voltage	11 V	-
ECT	75°C (167°F)	-
Idle	OFF	
Engine RPM	-	4,000 rpm
A/F sensor status	Activated	
Fuel cut	OFF	
Engine load	10 to 70%	
Shift position	2nd	-
Catalyst monitor	Not executing	
Intake air amount	2.5 to 12 g/sec	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Response rate deterioration level	Less than 0.2 V

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

A/F sensor bank 1 sensor 1

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$01	\$8E	Multiply by 0.0003 (no dimension)	Response rate deterioration level for A/F sensor	Malfunction criterion	FF

A/F sensor bank 2 sensor 1

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$05	\$8E	Multiply by 0.0003 (no dimension)	Response rate deterioration level for A/F sensor	Malfunction criterion	FF

WIRING DIAGRAM

Refer to DTC P2195 on page [DI-806](#).

INSPECTION PROCEDURE

HINT:

Hand-held tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using a hand-held tester.

- (1) Connect a hand-held tester to the DLC3.
- (2) Start the engine and turn the tester ON.
- (3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
- (5) Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
- (6) Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 (AFS B2S1) and OS2 B1S2 (O2S B2S2)) displayed on the tester.

HINT:

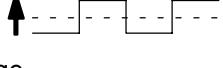
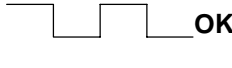
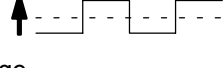
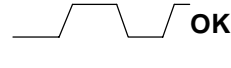
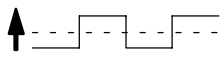
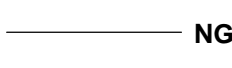
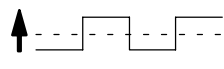
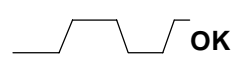
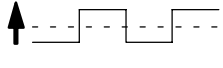
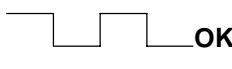
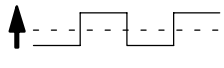

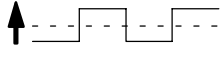

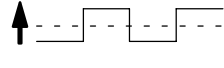

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (O2S B2S2) (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

Case	A/F Sensor (Sensor 1) Output Voltage	HO2 Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Areas
1	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0 V	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	—
2	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage More than 0.55 V  OK Less than 0.4V	<ul style="list-style-type: none"> • A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 %  -12.5 % Output voltage More than 3.35 V  OK Less than 3.0V	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	<ul style="list-style-type: none"> • Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich)

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

HINT:

- DTC P2A00 may be also set, when the air-fuel ratio is stuck rich or lean.
- A low A/F sensor voltage could be caused by a rich air-fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air-fuel mixture. Check for conditions that would cause the engine to run lean.
- Read freeze frame data using a hand-held tester or OBD II scan tool. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1 Check any other DTCs output (in addition to DTC P2A00 or P2A03).

PREPARATION:

- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON and turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

- Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2A00 and/or P2A03	A
P2A00 and/or P2A03 and other DTCs	B

HINT:

If any DTCs other than P2A00 and/or P2A03 are output, troubleshoot those DTCs first.

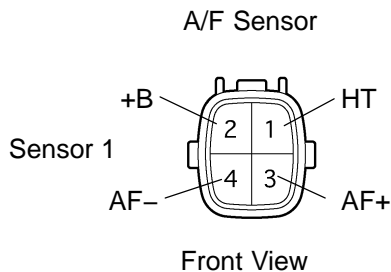
B

Go to relevant DTC chart (See page [DI-477](#)).

A

2 Check resistance of air-fuel ratio (A/F) sensor heater.

Component Side:



PREPARATION:

Disconnect the air-fuel ratio (A/F) sensor connector.

CHECK:

Measure resistance between the terminals of the A/F sensor connector.

OK:

Standard:

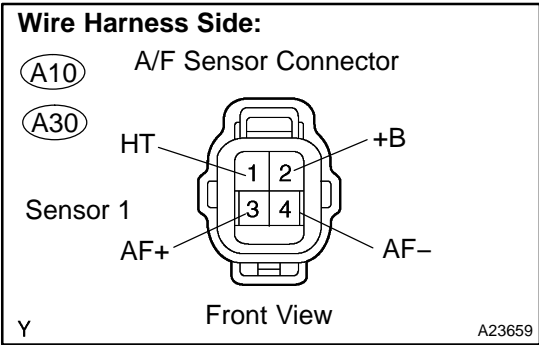
Tester Connection	Specified Condition
HT (1) - +B (2)	Between 1.8 Ω and 3.4 Ω at 20°C (68°F)
HT (1) - AF- (4)	10 k Ω or higher

NG

Replace air-fuel ratio (A/F) sensor.

OK

3 Check for open and short in harness and connector between ECM and A/F sensor.



PREPARATION:

- (a) Disconnect the A10 or A30 A/F sensor connector.
- (b) Turn the ignition switch to ON.

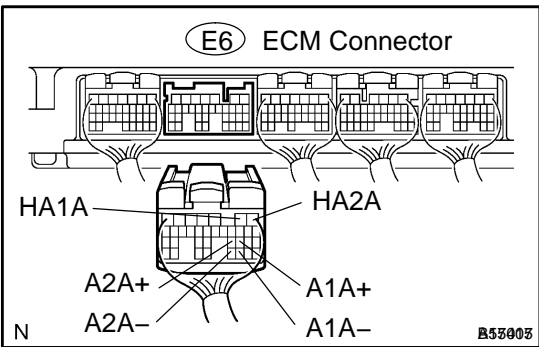
CHECK:

- (a) Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

OK:

Standard:

Tester Connections	Specified Conditions
+B (2) - Body ground	Between 9 V and 14 V



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the E6 ECM connector.

CHECK:

- (a) Check the resistance.

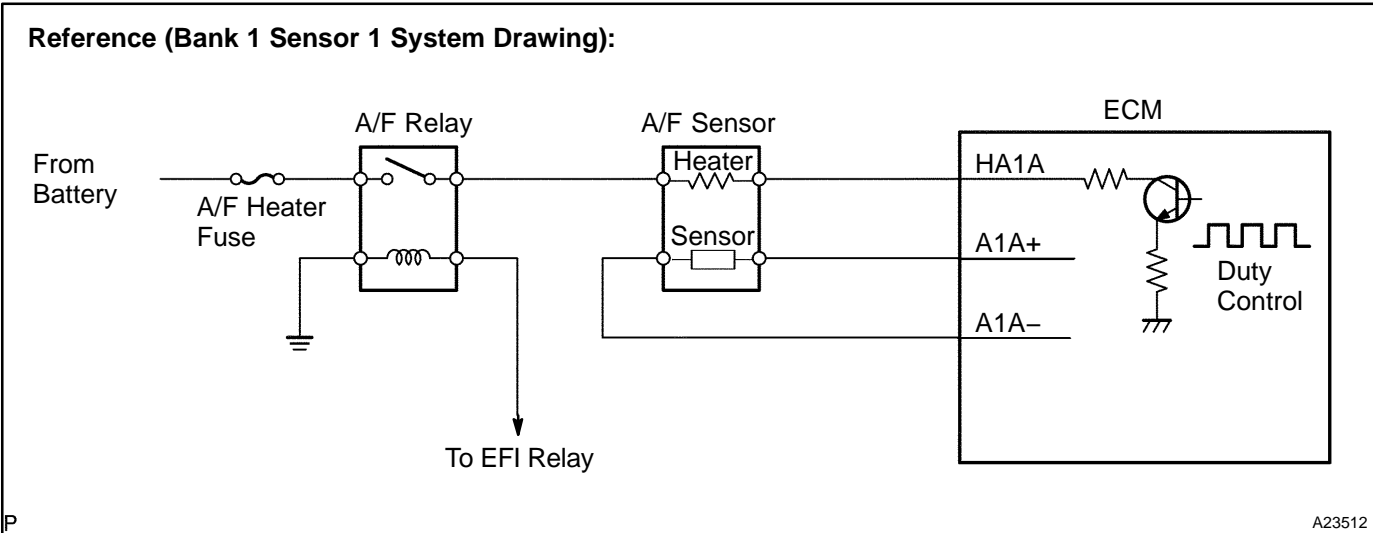
OK:

Standard (Check for open):

Tester Connections	Specified Conditions
HT (A10-1) - HA1A (E6-2) HT (A30-1) - HA2A (E6-1)	Below 1 Ω
AF+ (A10-3) - A1A+ (E6-22) AF+ (A30-3) - A2A+ (E6-23)	Below 1 Ω
AF- (A10-4) - A1A- (E6-30) AF- (A30-4) - A2A- (E6-31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A10-1) or HA1A (E6-2) - Body ground HT (A30-1) or HA2A (E6-1) - Body ground	10 kΩ or higher
AF+ (A10-3) or A1A+ (E6-22) - Body ground AF+ (A30-3) or A2A+ (E6-23) - Body ground	10 kΩ or higher
AF- (A10-4) or A1A- (E6-30) - Body ground AF- (A30-4) or A2A- (E6-31) - Body ground	10 kΩ or higher



NG

Replace or replace harness or connector.

OK

4 Perform confirmation driving pattern.

NEXT

5 Check whether DTC output recurs (DTC P2A00 or P2A03)

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2A00 or P2A03	A
No output	B

B

Check for intermittent problems
(See page [DI-430](#)).

A

6 Replace air fuel ratio sensor.

NEXT

7 Perform confirmation driving pattern.

NEXT

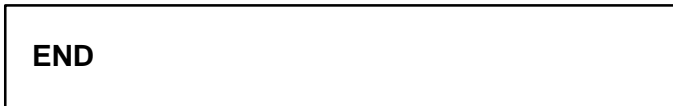
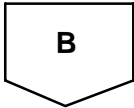
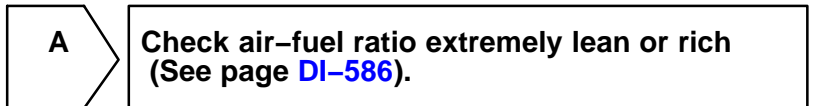
8	Check whether DTC output recurs (DTC P2A00 or P2A03)
----------	---

CHECK:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (b) Read DTCs.

RESULT:

Display (DTC Output)	Proceed To
P2A00 or P2A03	A
No output	B



EVAP (Evaporative Emission) Inspection Procedure

DTCS RELATING TO EVAP SYSTEM

DTCs	Monitoring Items	See Page
P043E	0.02 inch orifice clogged (built into pump module)	DI-869
P043F	0.02 inch orifice high-flow (built into pump module)	DI-869
P0441	<ul style="list-style-type: none"> Purge VSV (Vacuum Switching Valve) stuck closed Purge VSV stuck open Purge flow 	DI-680
P0450	Pressure sensor (built into pump module) voltage abnormal fluctuation	DI-687
P0451	<ul style="list-style-type: none"> Pressure sensor (built into pump module) noise Pressure sensor (built into pump module) signal becomes fixed/flat 	DI-687
P0452	Pressure sensor (built into pump module) voltage low	DI-687
P0453	Pressure sensor (built into pump module) voltage high	DI-687
P0455	EVAP gross leak	DI-696
P0456	EVAP small leak	DI-696
P2401	Vacuum pump stuck OFF (built into pump module)	DI-834
P2402	Vacuum pump stuck ON (built into pump module)	DI-834
P2419	Vent valve stuck closed (built into pump module)	DI-840
P2420	Vent valve stuck open (vent) (built into pump module)	DI-840
P2610	Soak timer (built into ECM)	DI-866

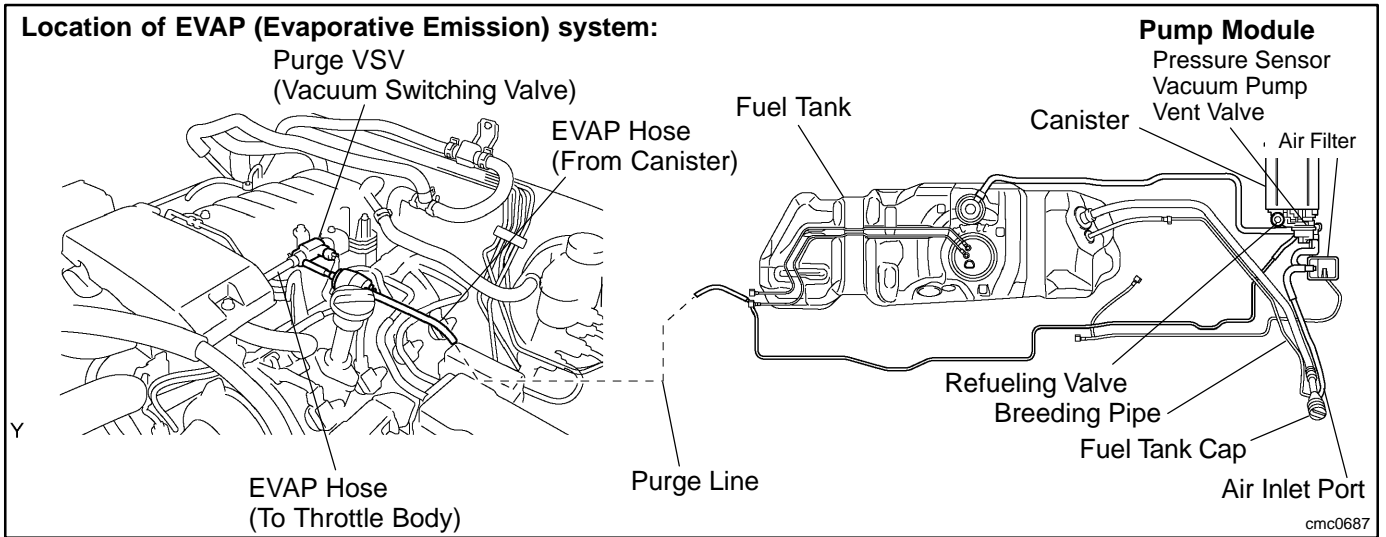
If any EVAP system DTCs are set, the malfunctioning area can be determined using the table below.

Malfunctioning Areas	DTCs										
	P043E P043F	P0441	P0450	P0451	P0452	P0453	P0455	P0456	P2401 P2402	P2419	P2420
0.02 inch orifice clogged	●								●	●	
0.02 inch orifice high-flow	●								●	●	
Purge VSV stuck open		●					●				
Purge VSV stuck closed		●									
Pressure sensor stuck				●							
Pressure sensor noise				●							
Pressure sensor low output			●		●						
Pressure sensor high output			●			●					
Gross leak		●					●				
Small leak								●			
Vacuum pump stuck OFF	●								●	●	
Vacuum pump stuck ON	●								●	●	
Vent valve stuck closed	●								●	●	
Vent valve stuck open (vent)											●

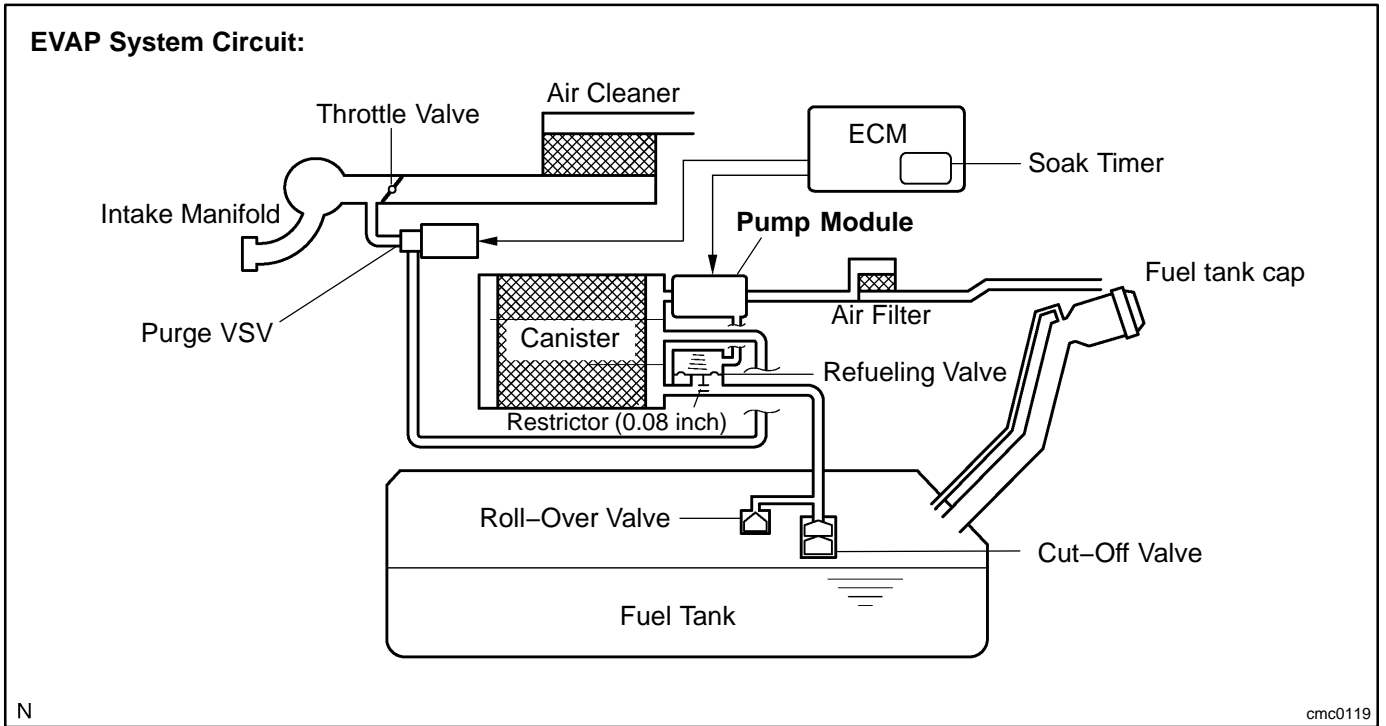
NOTICE:

If the 0.02 inch reference pressure difference between the first and second checks is greater than the specification, the DTCs corresponding to the reference pressure (P043E, P043F, P0441, P0455, P0456, P2401, P2420) will be all stored.

CIRCUIT DESCRIPTION



HINT:
 The canister is located near the fuel tank, underneath the body.



While the engine is running, if a predetermined condition (closed-loop, etc.) is met, the purge VSV is opened by the ECM and stored fuel vapors in the canister are purged to the intake manifold. The ECM changes the duty cycle ratio of the purge VSV to control purge flow volume. The purge flow volume is also determined by the intake manifold pressure. Atmospheric pressure is allowed into the canister through the vent valve to ensure that the purge flow is maintained when the negative pressure (vacuum) is applied to the canister. The following two monitors run to confirm appropriate EVAP system operation.

Key-off monitor

This monitor checks for EVAP (Evaporative Emission) system leaks and pump module malfunctions. The monitor starts 5 hours* after the ignition switch is turned OFF. More than 5 hours are required to allow enough time for the fuel to cool down to stabilize the Fuel Tank Pressure (FTP), thus making the EVAP system monitor more accurate.

The electric vacuum pump creates negative pressure (vacuum) in the EVAP system and the pressure is measured. Finally, the ECM monitors for leaks from the EVAP system, and malfunctions in both the pump module and purge VSV, based on the EVAP pressure.

HINT:

*:If the engine coolant temperature is not below 35°C 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

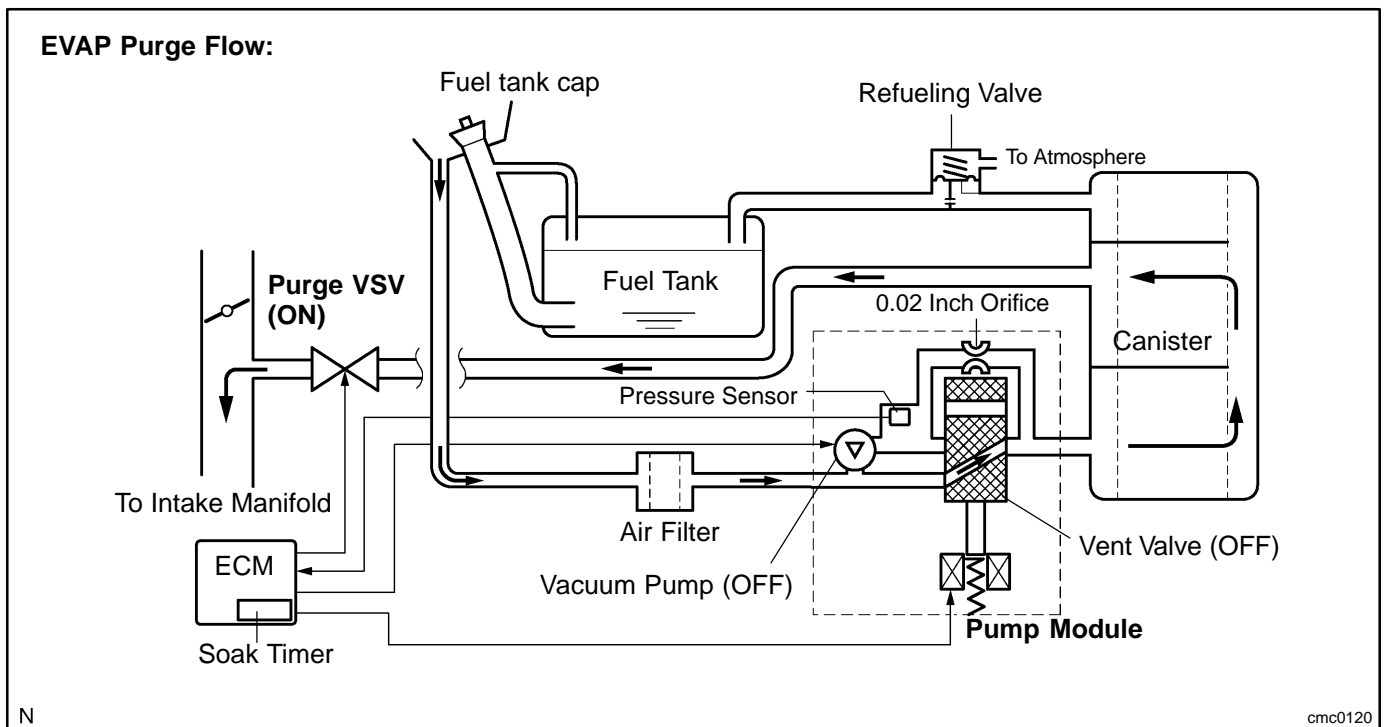
Purge flow monitor

The purge flow monitor consists of the two monitors. The 1st monitor is always conducted every time and the 2nd monitor is activated if necessary.

- The 1st monitor
While the engine is running and the purge VSV (Vacuum Switching Valve) is ON (open), the ECM monitors the purge flow by measuring the EVAP pressure change. If negative pressure is not created, the ECM begins the 2nd monitor.
- The 2nd monitor
The vent valve is turned ON (closed) and the EVAP pressure is then measured. If the variation in the pressure is less than 0.5 kpa (3.75 mmHg), the ECM interprets this as the purge VSV being stuck closed, and illuminates the MIL and sets DTC P0441 (2 trip detection logic).

Atmospheric pressure check:

In order to ensure reliable malfunction detection, the variation between the atmospheric pressures, before and after conduction of the purge flow monitor, is measured by the ECM.

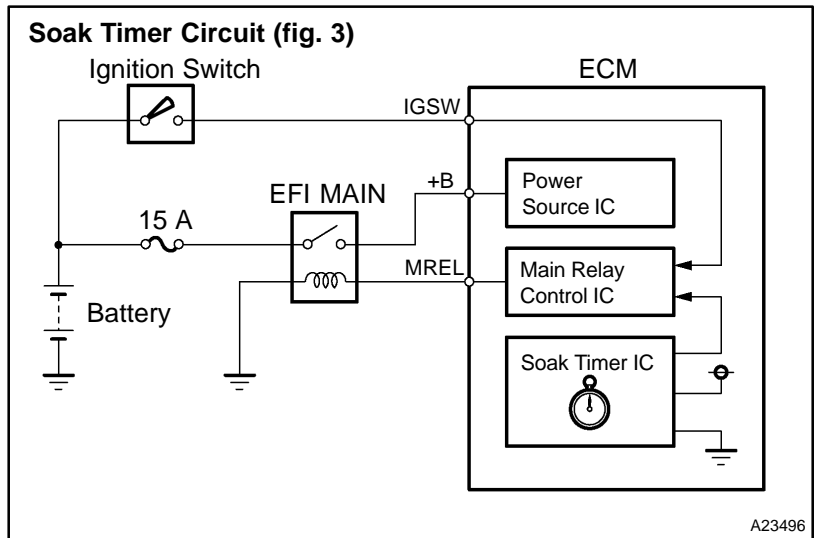
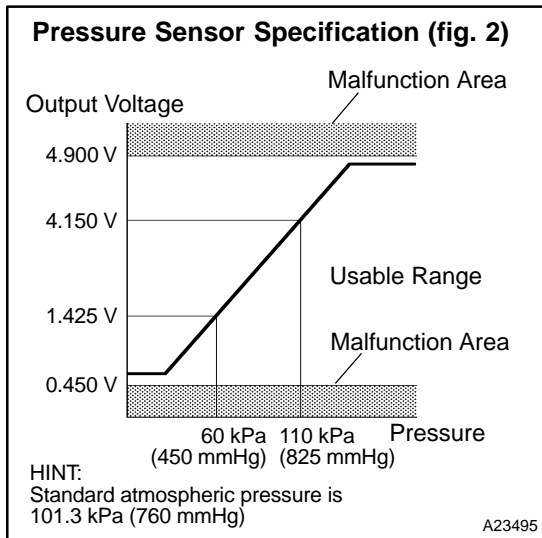
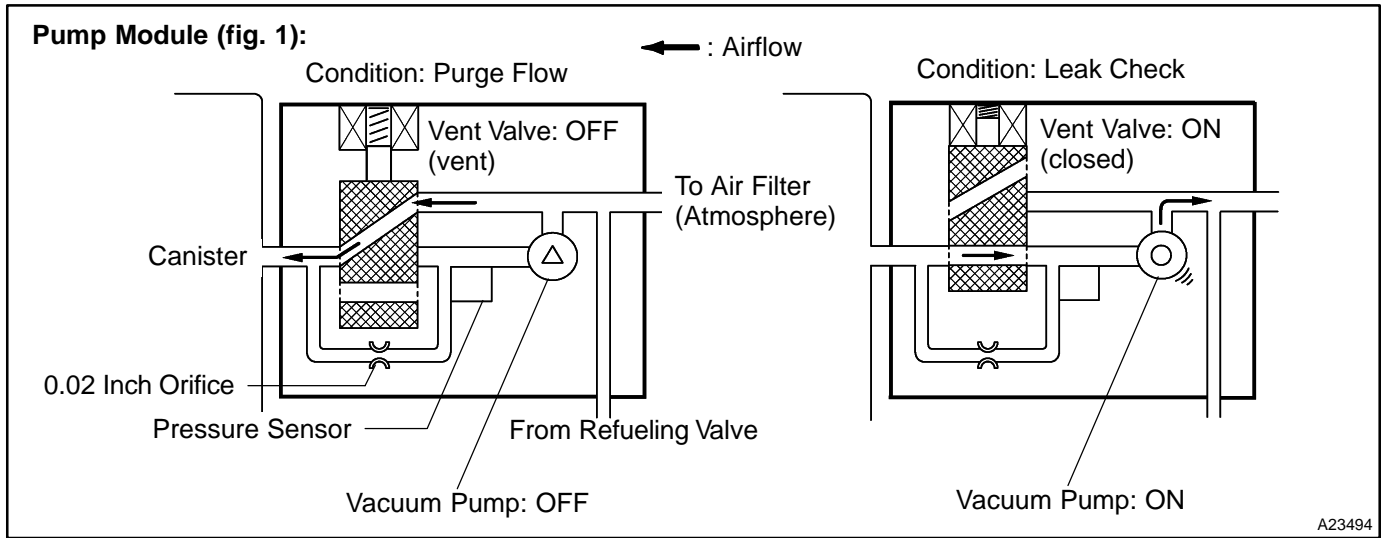


DIAGNOSTICS – ENGINE (2UZ-FE)

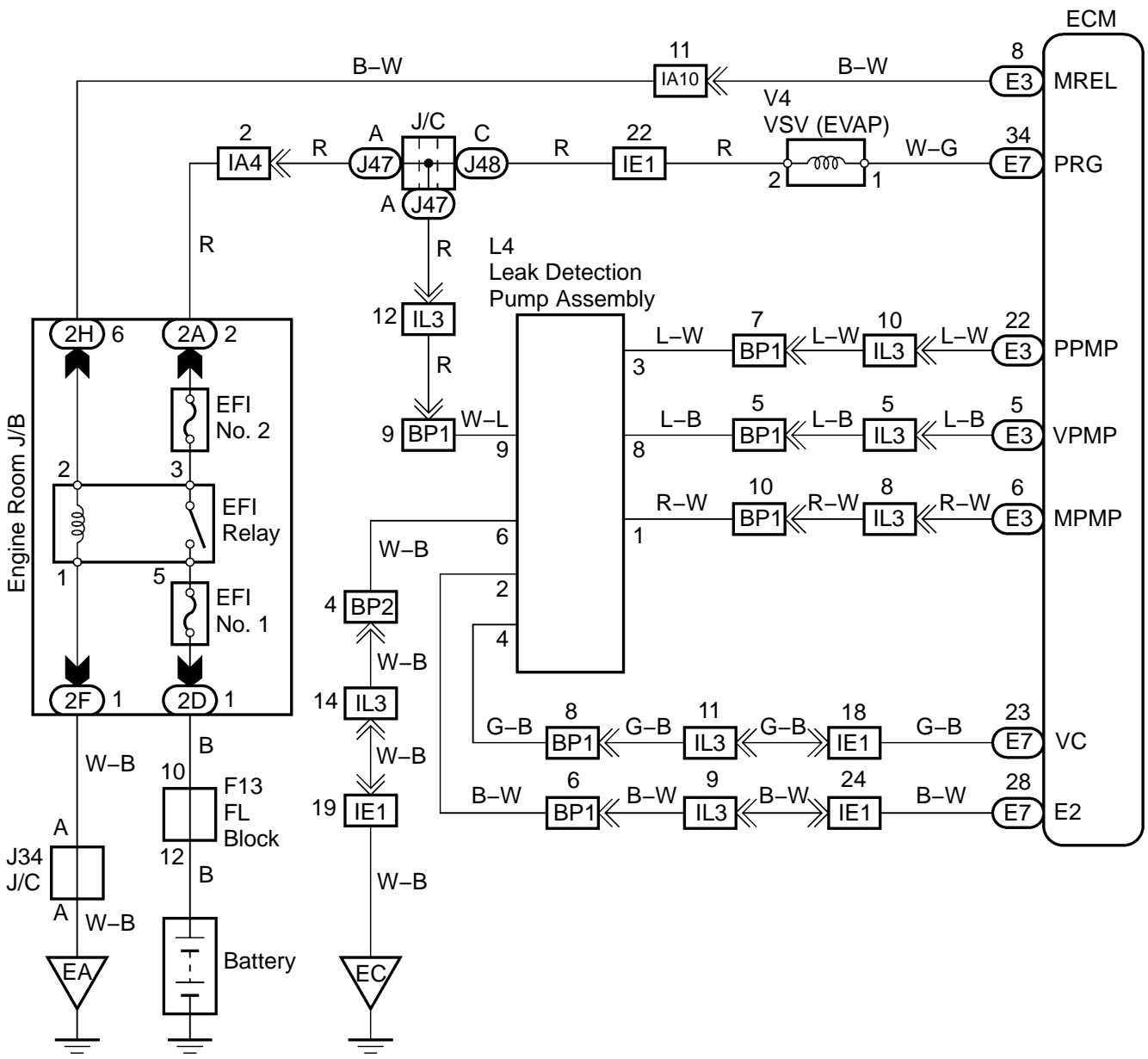
Components	Operations
Canister	Contains activated charcoal to absorb EVAP (Evaporative Emissions) generated in fuel tank.
Cut-off valve	Located in fuel tank. Valve floats and closes when fuel tank is 100 % full.
Purge VSV (Vacuum Switching Valve)	Opens or closes line between canister and intake manifold. ECM uses purge VSV to control EVAP purge flow. In order to discharge EVAP absorbed by canister to intake manifold, ECM opens purge VSV. EVAP discharge volume to intake manifold controlled by purge VSV duty cycle ratio (current-carrying time). (Open: ON, Close: OFF)
Refueling valve	Controls EVAP pressure from fuel tank to canister. Valve consists of diaphragm, spring and restrictor (diameter: 0.08 inch). When fuel vapor and pressure inside fuel tank increase, valve opens. While EVAP purged, valve closes and restrictor prevents large amount of vacuum from affecting pressure in fuel tank. Valve opened while refueling. When valve open, adding fuel into fuel tank possible.
Roll-over valve	Located in fuel tank. Valve closes by its own weight when vehicle overturns to prevent fuel from spilling out.
Service port	Used for connecting vacuum gauge for inspecting EVAP system.
Soak timer	Built into ECM. To ensure accurate EVAP monitor, measures 5 hours* after ignition switch turned to OFF. This allows fuel to cool down, stabilizing Fuel Tank Pressure (FTP). When approx. 5 hours* elapsed, ECM activates.
Pump module	Consists of (a) to (d) below. Pump module cannot be disassembled.
(a) Vent valve	Vents and closes EVAP system. When ECM turns valve ON, EVAP system closed. When, ECM turns valve OFF, EVAP system vented. Negative pressure (vacuum) created in EVAP system to check for EVAP leaks by closing purge VSV, turning on vent valve (closed) and operating vacuum pump (refer to fig. 1).
(b) Pressure sensor	Indicates pressure as voltages. ECM supplies regulated 5 V to pressure sensor, and uses feedback from sensor to monitor EVAP system pressure (refer to fig 2).
(c) Vacuum pump	Creates negative pressure (vacuum) in EVAP system for leak check.
(d) 0.02 inch orifice	Has opening with 0.02 inch diameter. Vacuum produced through orifice by closing purge VSV, turning off vent valve and operating vacuum pump, to monitor 0.02 inch leak pressure. 0.02 inch leak pressure indicates small leak of EVAP.

HINT:

*:If the engine coolant temperature is not below 35°C after 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.



Double Cab:



C

INSPECTION PROCEDURE

NOTICE:

A hand-held tester is required to conduct the following diagnostic troubleshooting procedure.

HINT:

- Using hand-held tester monitor results enables the EVAP (Evaporative Emission) system to be confirmed.
- Read freeze frame data using a hand-held tester Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	Confirm DTC.
----------	---------------------

- Turn the ignition switch to OFF and wait for 10 seconds.
- Turn the ignition switch to ON.
- Turn the ignition switch to OFF and wait for 10 seconds.
- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON and turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Confirm DTCs and freeze frame data.

If any EVAP system DTCs are set, the malfunctioning area can be determined using the table below.

Malfunctioning Areas	DTCs											
	P043E P043F	P0441	P0450	P0451	P0452	P0453	P0455	P0456	P2401 P2402	P2419	P2420	
0.02 inch orifice clogged	●								●	●		
0.02 inch orifice high-flow	●								●	●		
Purge VSV stuck open		●					●					
Purge VSV stuck closed		●										
Pressure sensor signal becomes fixed/flat				●								
Pressure sensor noise				●								
Pressure sensor voltage low			●		●							
Pressure sensor voltage high			●			●						
Gross leak		●					●					
Small leak								●				
Vacuum pump stuck OFF	●								●	●		
Vacuum pump stuck ON	●								●	●		
Vent valve stuck ON (closed)	●								●	●		
Vent valve stuck OFF (vent)											●	

NOTICE:

If the 0.02 inch reference pressure difference between the first and second checks is greater than the specification, the DTCs corresponding to the reference pressure (P043E, P043F, P0441, P0455, P0456, P2401, P2420) will be all stored.



2	Perform EVAP system check.
----------	-----------------------------------

NOTICE:

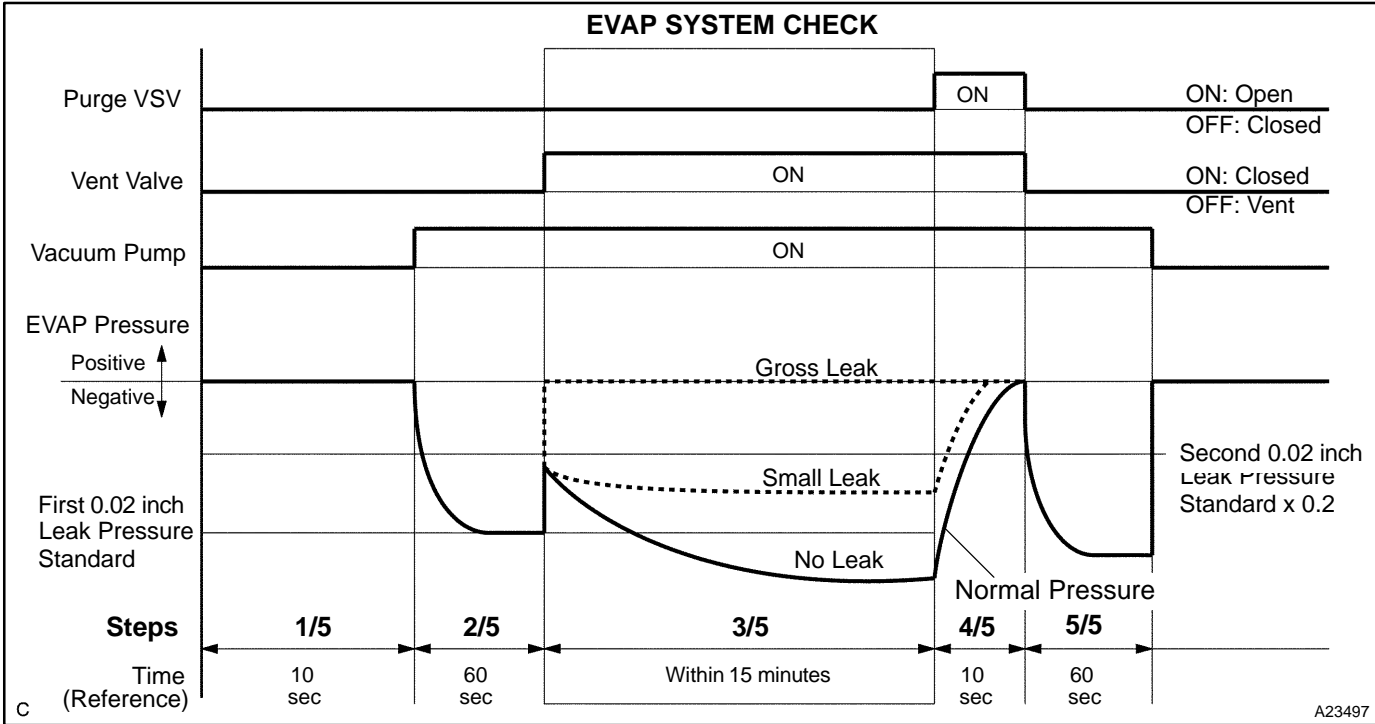
- In the EVAP SYSTEM CHECK (AUTO OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed automatically by the hand-held tester. It takes a maximum of approximately 18 minutes.
 - Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90% full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.
 - Do not run the engine in this step.
 - When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).
- (a) Clear DTCs (see page [DI-462](#)).
- (b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (c) After the EVAP SYSTEM CHECK is completed, check for pending DTCs by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

HINT:

If no pending DTC is displayed, perform the Monitor Confirmation after this repair is completed. After this confirmation, check for pending DTCs. If no DTC is displayed, the EVAP system is normal.



3 Perform EVAP system manual operation check.

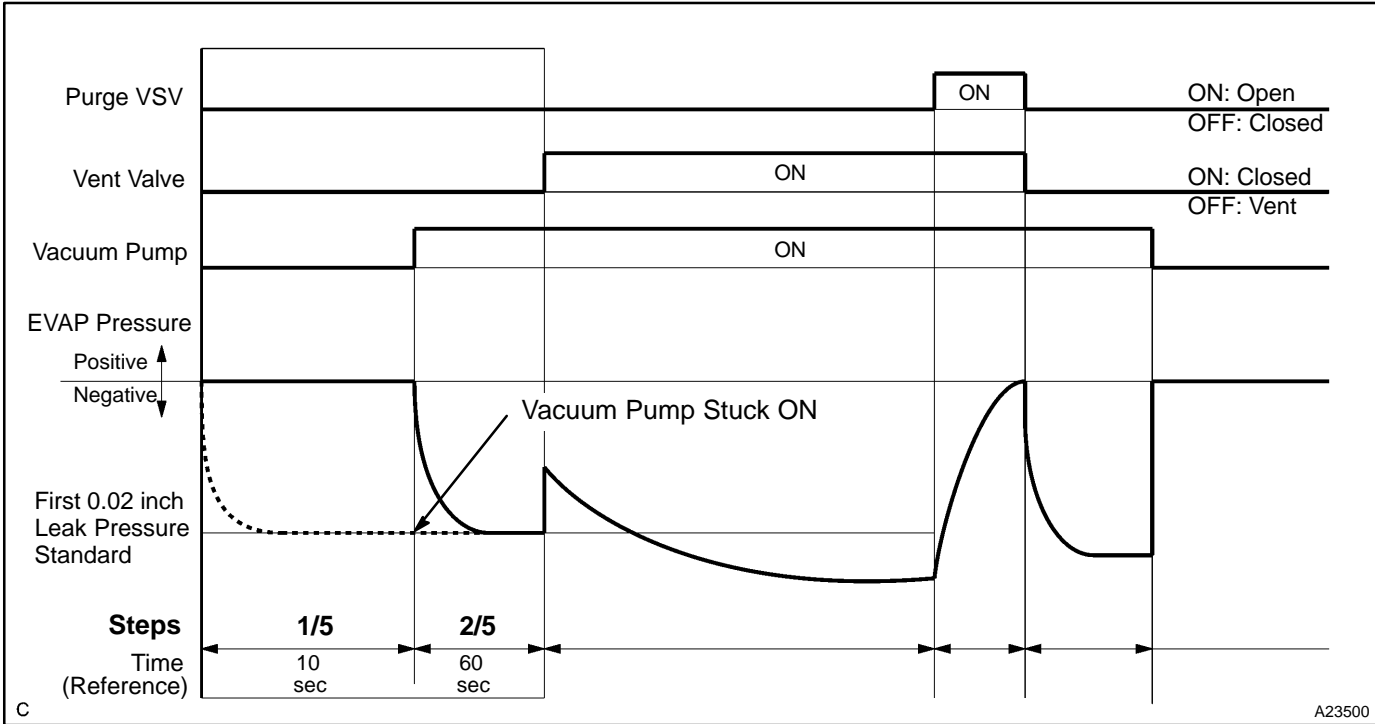


NOTICE:

- In the EVAP SYSTEM CHECK (MANUAL OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed manually by the hand-held tester.
 - Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90% full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.
 - Do not run the engine in this step.
 - When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).
- (a) Clear DTCs (see page DI-462).
 - (b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / MANUAL OPERATION.

NEXT

5 Perform EVAP system step 1/5 to 2/5 check.



(a) Check the EVAP pressure in step 1/5 and 2/5.

Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	Virtually no variation in EVAP pressure during step 1/5. Then decreases to 0.02 inch leak pressure standard*	Not yet determined	A
P2402	Small difference between EVAP pressures during steps 1/5 and 2/5	Vacuum pump stuck ON	B

*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

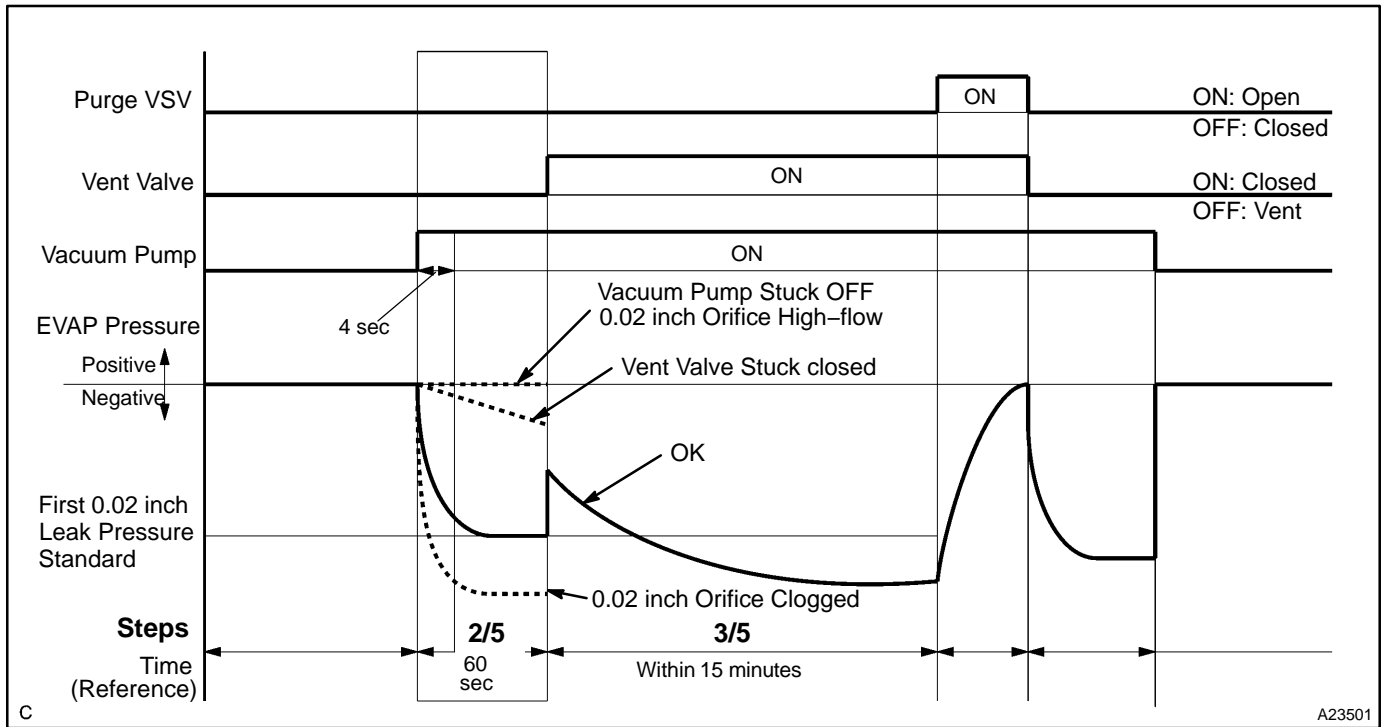
HINT:

The 0.02 inch leak pressure standard is the value determined in step 2/5.

B Go to step 23.

A

6 Perform EVAP system step 2/5 check.



HINT:

Make a note of the pressures checked in steps (a) and (b) below.

- (a) Check the EVAP pressure 4 seconds after the vacuum pump is activated*.
- (b) Check the EVAP pressure again when it has stabilized. This pressure is the 0.02 inch leak pressure standard.

*: The vacuum pump begins to operate as step 1/5 is proceeded to step 2/5.

Result:

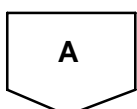
DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure in step (b) between -4.85 kPa and -1.06 kPa (-36.38 mmHg and -7.95 mmHg)	Not yet determined	A
P043F and P2401	EVAP pressure in step (b) -1.06 kPa (-7.95 mmHg) or more	<ul style="list-style-type: none"> • 0.02 inch orifice high-flow • Vacuum pump stuck OFF 	B
P043E	EVAP pressure in step (b) below -4.85 kPa (-36.38 mmHg)	0.02 inch orifice clogged	C
P2419	EVAP pressure in step (a) more than -1.06 kPa (-7.95 mmHg)	Vent valve stuck closed	D

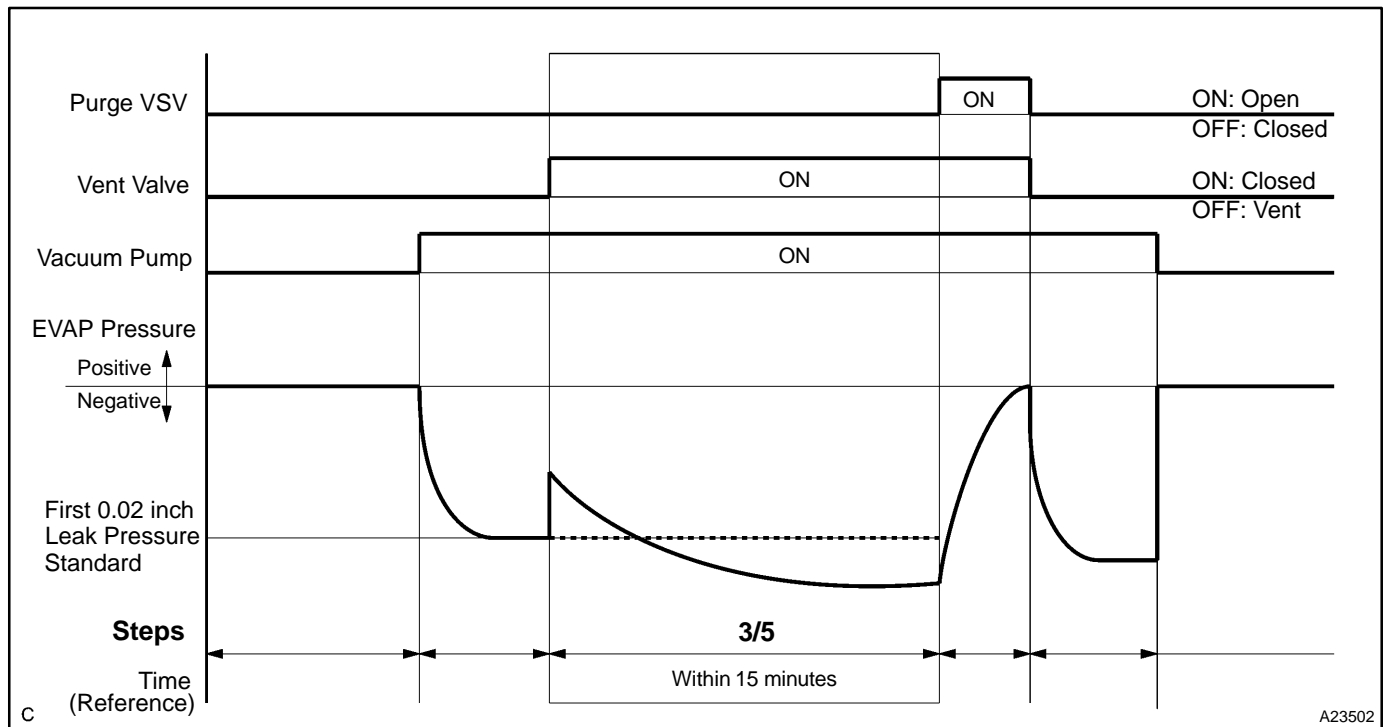
*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

B Go to step 11

C Go to step 30

D Go to step 19



8 Perform EVAP system step 3/5 check.


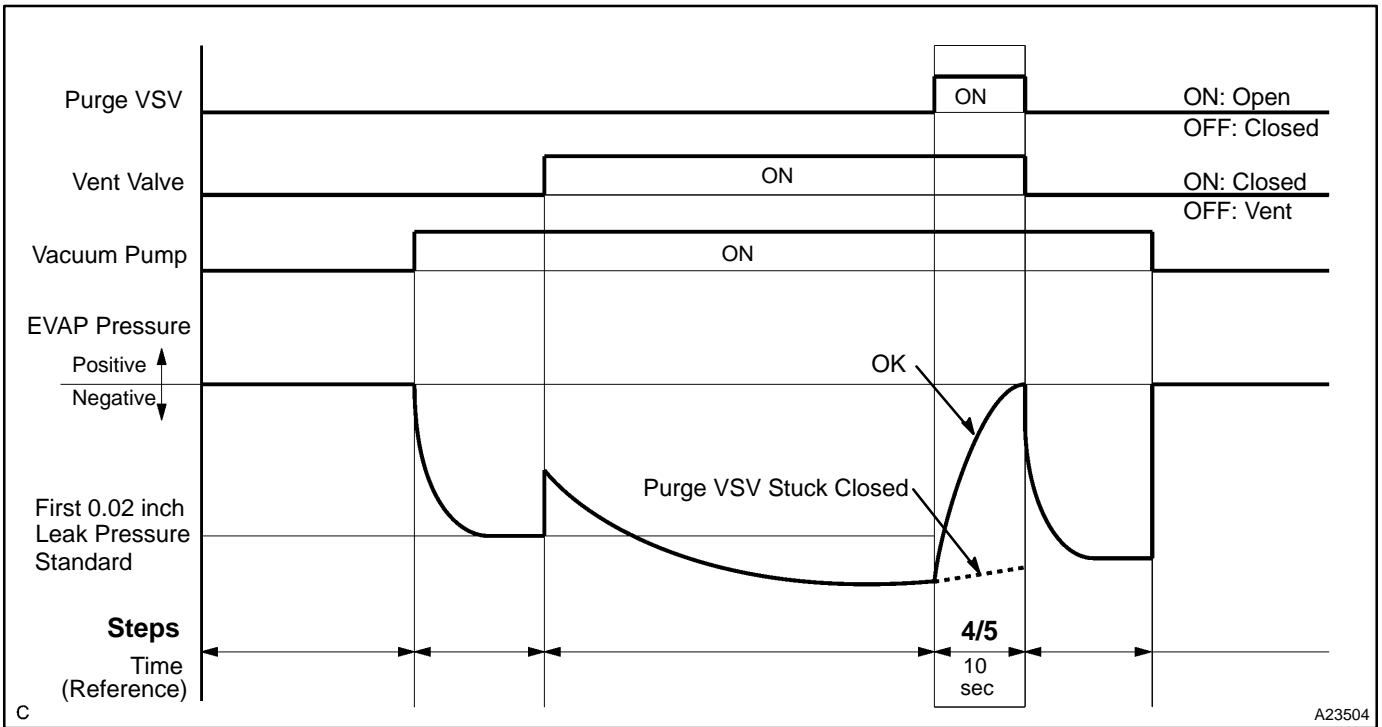
- (a) Wait until the EVAP pressure change is less than 0.1 kPa (0.75 mmHg) for 30 seconds.
 (b) Measure the EVAP pressure and record it.

HINT:

A few minutes are required for the EVAP pressure to become saturated. When there is little fuel in the fuel tank, it takes up to 12 minutes.

NEXT

9 Perform EVAP system step 4/5 check.



(a) Check the EVAP pressure in step 4/5.

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure increases by 0.3 kPa (2.25 mmHg) or more within 10 seconds of proceeding from step 3/5 to step 4/5	Not yet determined	A
P0441	EVAP pressure increases by 0.3 kPa (2.25 mmHg) or more within 10 seconds of proceeding from step 3/5 to step 4/5	Problems in EVAP hose between pure VSV and throttle body	B
P0441	Variation in EVAP pressure is less than 0.3 kPa (2.25 mmHg) for 10 seconds, after proceeding from step 3/5 to step 4/5	Purge VSV stuck closed	C

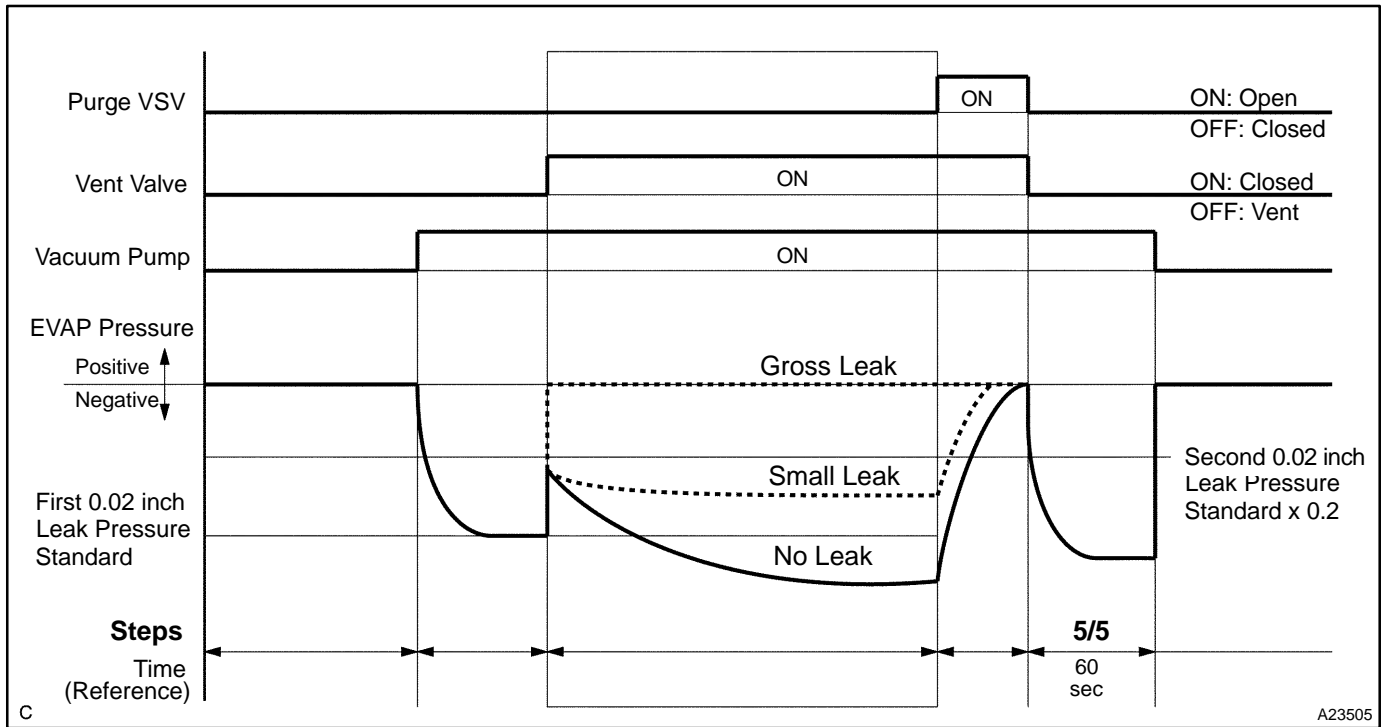
*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

B Go to step 15.

C Go to step 12.

A

10 Perform EVAP system step 5/5 check.

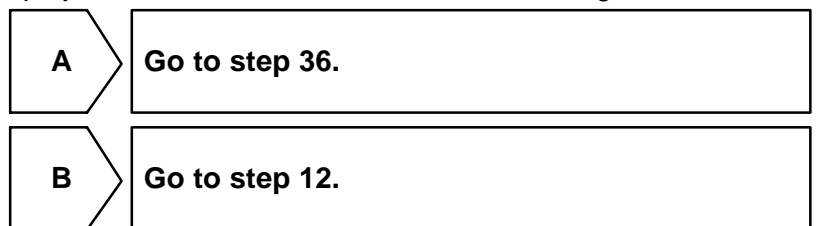


- (a) Check the EVAP pressure in step 5/5.
- (b) Compare the EVAP pressure in step 3/5 and the second 0.02 inch leak pressure standard (step 5/5).

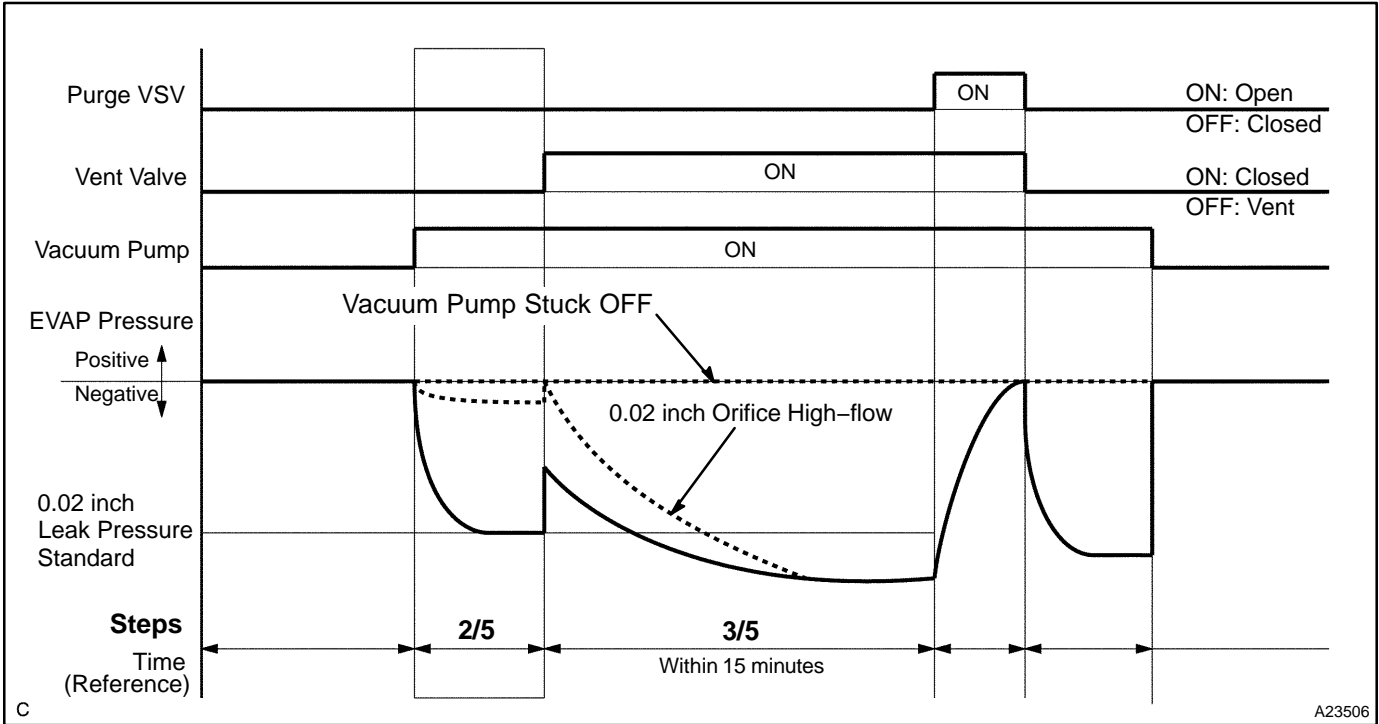
Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure (step 3/5) lower than the second 0.02 inch leak pressure standard (step 5/5)	Not yet determined (no leakage from EVAP system)	A
P0441 and P0455	EVAP pressure (step 3/5) higher than [second 0.02 inch leak pressure standard (step 5/5) x 0.2]	<ul style="list-style-type: none"> • Purge VSV stuck open • EVAP gross leak 	B
P0456	EVAP pressure (step 3/5) higher than second 0.02 inch leak pressure standard (step 5/5)	EVAP small leak	B

*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.



11 Perform EVAP system step 3/5 check.



(a) Check the EVAP pressure in step 3/5.

Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure less than [0.02 inch leak pressure standard x 0.2]	0.02 inch orifice high-flow	A
—	EVAP pressure more than [0.02 inch leak pressure standard x 0.2]	Vacuum pump stuck OFF	B

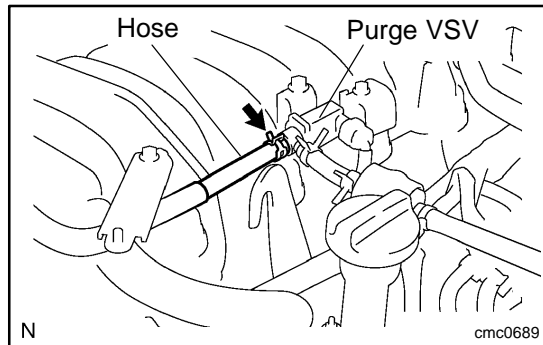
*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

HINT:

The 0.02 inch leak pressure standard is the value determined in step 2/5.

A	Go to step 30.
B	Go to step 23.

12 Perform active test of purge VSV.



PREPARATION:

- (a) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II/ ACTIVE TEST / EVAP VSV.
- (b) Disconnect the hose (connected to the canister) from the purge VSV.
- (c) Start the engine.

CHECK:

- (a) On the tester, turn off the purge VSV (EVAP VSV: OFF).
- (b) Use your finger to confirm that the purge VSV has no suction.
- (c) Using the tester, turn on the purge VSV (EVAP VSV: ON).
- (d) Use your finger to confirm that the purge VSV has suction.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
No suction when purge VSV turned OFF, and suction applied when tuned ON	Purge VSV normal	A
Suction applied when purge VSV turned OFF	Purge VSV stuck open	B
No suction when purge VSV turned ON	<ul style="list-style-type: none"> • Purge VSV stuck closed • Problems with EVAP hose between purge VSV and throttle body 	C

B Go to step 14.

C Go to step 15.

A

13	Check fuel tank cap.
-----------	-----------------------------

CHECK:

(a) Check that the fuel tank cap is correctly installed and confirm the fuel tank cap meets OEM specification.

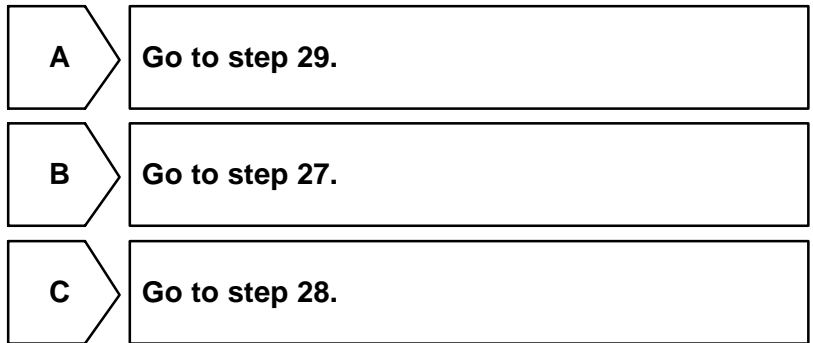
HINT:

If an EVAP tester is available, check the fuel tank cap using the tester.

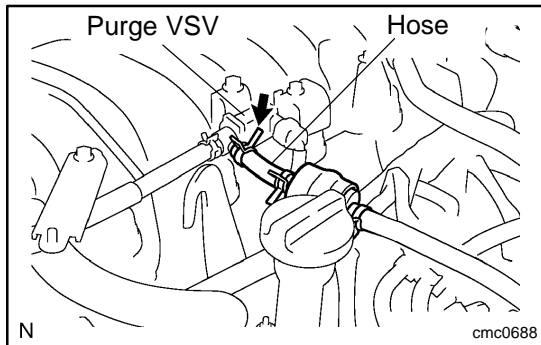
- (1) Tighten the fuel tank cap.
- (2) Remove the fuel tank cap and install it onto a fuel tank cap adaptor.
- (3) Connect an EVAP tester pump hose to the adaptor, and pressurize to 3.2 to 3.7 kPa (24 to 28 mmHg) using an EVAP tester pump.
- (4) Seal the adaptor and wait for 2 minutes.
- (5) Check the pressure. If the pressure is 2 kPa (15 mmHg) or more, the fuel tank cap is normal.

PREPARATION:

Test Results	Suspected Trouble Areas	Proceed To
Fuel tank cap correctly installed	—	A
Fuel tank cap loose	<ul style="list-style-type: none"> • Fuel tank cap improperly installed • Defective fuel tank cap • Fuel tank cap does not meet OEM specifications 	B
No fuel tank cap	—	C



14 Inspect EVAP VSV.



PREPARATION:

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the V4 purge VSV connector.
- (c) Disconnect the hose (connected to the canister) from the purge VSV.
- (d) Start the engine.

CHECK:

Use your finger to confirm that the purge VSV has no suction.

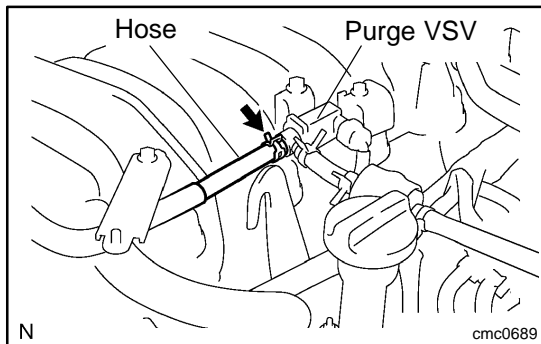
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
No suction	ECM	A
Suction applied	Purge VSV	B

A Go to step 34.

B Go to step 30.

15 Check EVAP hose between purge VSV and throttle body.



PREPARATION:

- (a) Disconnect the hose (connected to the throttle body) from the purge VSV.
- (b) Start the engine.

CHECK:

- (a) Use your finger to confirm that the hose has suction.

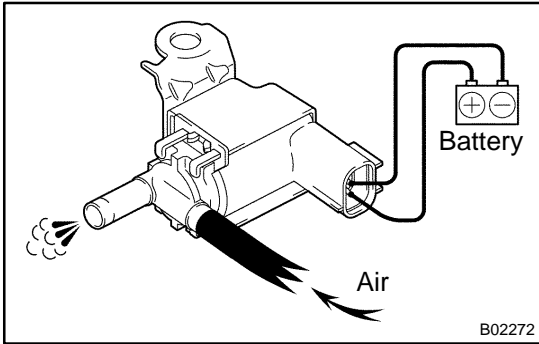
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between purge VSV and throttle body normal	A
No suction	<ul style="list-style-type: none"> • Throttle body • EVAP hose between purge VSV and throttle body 	B

B Go to step 26.

A

16 Inspect EVAP VSV.



PREPARATION:

- (a) Remove the purge VSV.
- (b) Apply battery voltage to the terminals of the purge VSV.

CHECK:

Using an air gun, confirm that air flows from port A to port B.

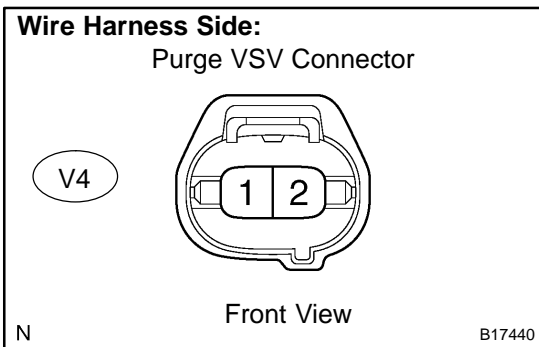
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between purge VSV and throttle body normal	A
No suction	<ul style="list-style-type: none"> • Throttle body • EVAP hose between purge VSV and throttle body 	B

B → **Go to step 31.**

A

17 Measure purge VSV terminal voltage.



PREPARATION:

- (a) Disconnect the V4 purge VSV connector.
- (b) Turn the ignition switch to ON.

CHECK:

- (a) Measure the voltage between terminal 1 of the purge VSV connector and the body ground.

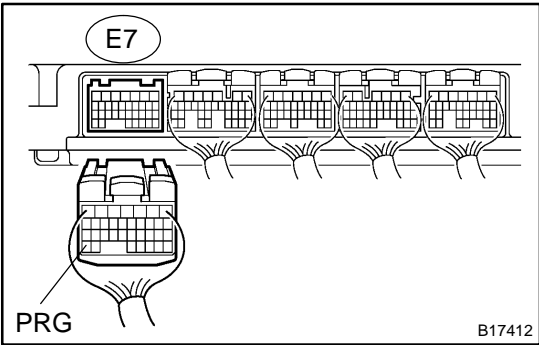
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Between 11 V and 14 V	Normal	A
Other than result above	Wire harness or connectors between purge VSV and ECM	B

B → **Go to step 32.**

A

18 Check for open and short circuit in harness and connector between purge VSV and ECM.

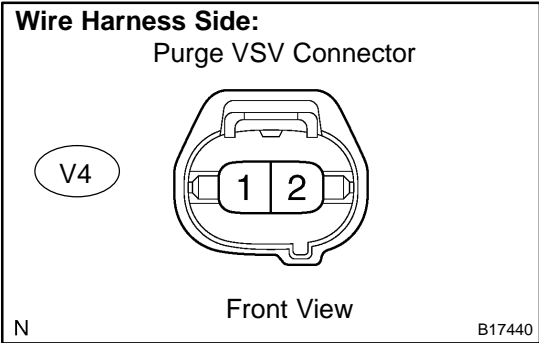


PREPARATION:
Disconnect the E7 ECM connector and the V4 purge VSV connector.

CHECK:
Check the resistance.

OK:
Standard:

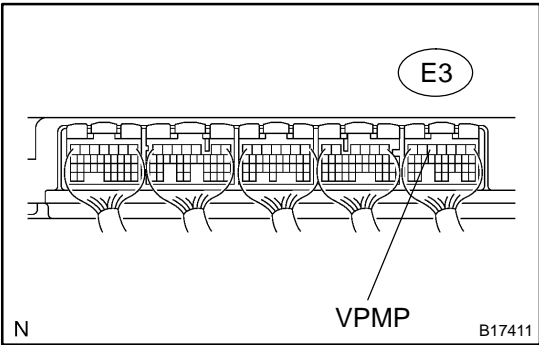
Tester Connections	Specified Conditions
E7-34 (PRG) - V4-1	Below 1 Ω
E7-34 (PRG) - Body ground	10 kΩ or higher
V4-1 - Body ground	10 kΩ or higher



OK → Go to step 35.

NG → Go to step 32.

19 Perform active test for vent valve.



PREPARATION:
(a) Turn the ignition switch to ON.
(b) On the hand-held tester, select the following menu items: DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ VENT VALVE (ALONE).

CHECK:
Measure the voltage between terminal VPMP of the ECM connector and the body ground when the vent valve is turned ON (close) and OFF (vent) using the tester.

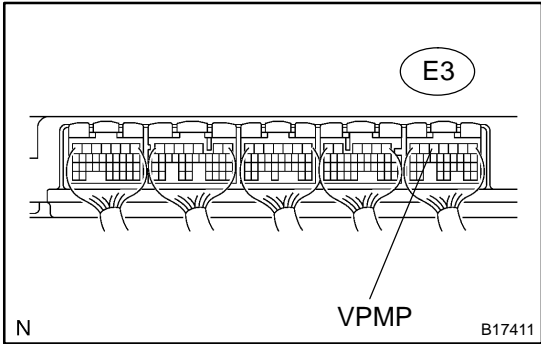
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V when OFF Below 3 V when ON	Vent valve	A
Below 3 V when OFF and ON	ECM	B

A → Go to step 22.

B → Go to step 35.

20 Perform active test for vent valve.



PREPARATION:

- (a) Turn the ignition switch to ON.
- (b) On the hand-held tester, select the following menu items:
DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ VENT VALVE (ALONE).

CHECK:

Measure the voltage between terminal VPMP of the ECM connector and the body ground when the vent valve is turned ON (close) and OFF (vent) using the tester.

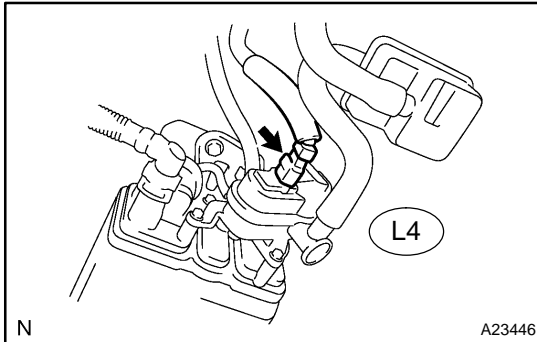
RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Below 3 V when OFF and ON	Power source of vent valve	A
Between 9 V and 14 V when OFF Below 3 V when ON	Vent valve	B
Between 9 V and 14 V when OFF and ON	ECM	C

B Go to step 24.

C Go to step 35.

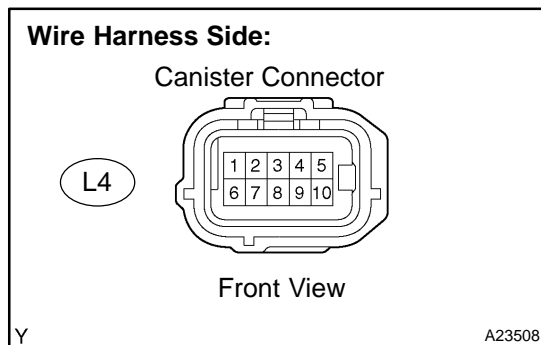
A

21 Inspect pump module power source circuit.

PREPARATION:

- Turn the ignition switch to OFF.
- Disconnect the L4 canister connector.
- Turn the ignition switch to ON.

CHECK:

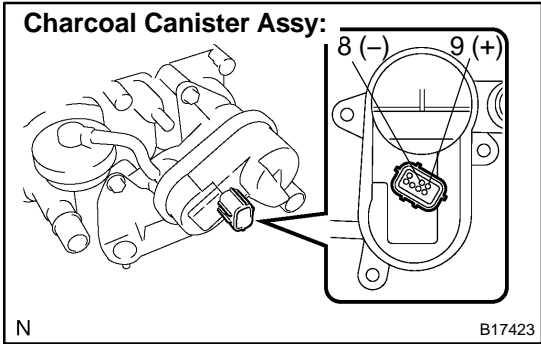
Measure the voltage between terminal 9 of the canister connector and the body ground.


RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V	Normal	A
Between 0 V and 3 V	Power source wire harness of vent valve	B

B
Go to step 32.
A

22 Inspect vent valve operation of pump module.



PREPARATION:

- (a) Disconnect the L4 canister connector.
- (b) Turn the ignition switch to OFF.
- (c) Apply the battery voltage to terminals 9 and 8 of the pump module.

CHECK:

Touch the pump module to confirm the vent valve operation.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Operating	Wire harness between vent valve and ECM	A
Not operating	Vent valve	B

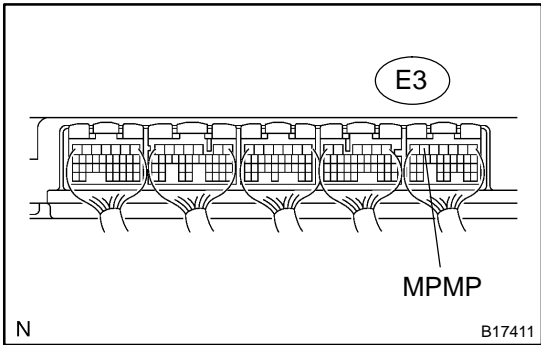
A

Go to step 32.

B

Go to step 30.

23 Perform active test for vacuum pump.



PREPARATION:

On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP (ALONE).

CHECK:

Measure the voltage between terminal MPMP of the ECM connector and the body ground when the vacuum pump is turned ON and OFF using the tester.

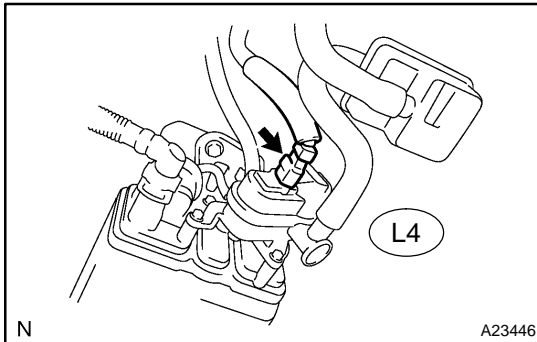
Result:

Tests Results	Suspected Trouble Areas	Proceed To
Between 0 V and 3 V when OFF Between 9 V and 14 V when ON	ECM normal	A
Between 9 V and 14 V when OFF Between 0 V and 3 V when ON	ECM	B

B

Go to step 35.

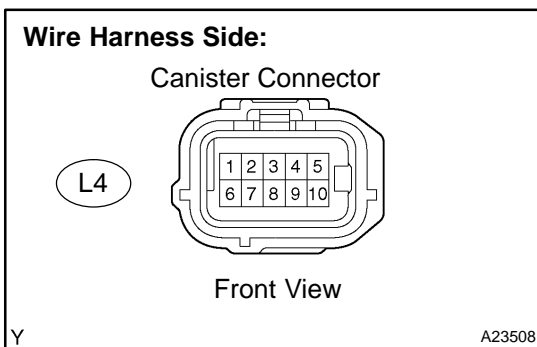
A

24 Check for open and short circuit in harness and connector between pump module and ECM.
**PREPARATION:**

- Turn the ignition switch to OFF.
- Disconnect the L4 canister connector.
- Turn the ignition switch to ON.
- On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP (ALONE).
- Turn the vacuum pump ON.

CHECK:

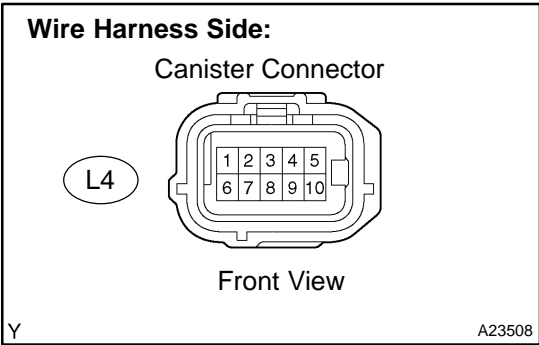
Measure the voltage between terminal 1 of the canister connector and the body ground.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V	Normal	A
Between 0 V and 3 V	Wire harness between ECM and vacuum pump	B

B**Go to step 32.****A**

25 Check for open and short in harness and connector between pump module and ECM.



PREPARATION:

- (a) Disconnect the L4 canister connector.
- (b) Turn the ignition switch to OFF.

CHECK:

Check the resistance between terminal 6 of the canister connector and the body ground.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Below 1 Ω	Vacuum pump	A
10 kΩ or more	Wire harness between vacuum pump and body ground	B

A

Go to step 30.

B

Go to step 32.

26 Inspect throttle body.

PREPARATION:

- (a) Stop the engine.
- (b) Disconnect the EVAP hose from the throttle body.
- (c) Start the engine.

CHECK:

- (a) Use your finger to confirm that the port of the throttle body has suction.

RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between throttle body and purge VSV	A
No suction	Throttle body	B

A

Go to step 33.

B

Go to step 34.

27 Correctly reinstall or replace fuel tank cap.

HINT:

- When reinstalling the fuel tank cap, tighten it until a few click sounds are heard.
- When replacing the fuel tank cap, use a fuel tank cap that meets OEM specifications, and install it until a few click sounds are heard.

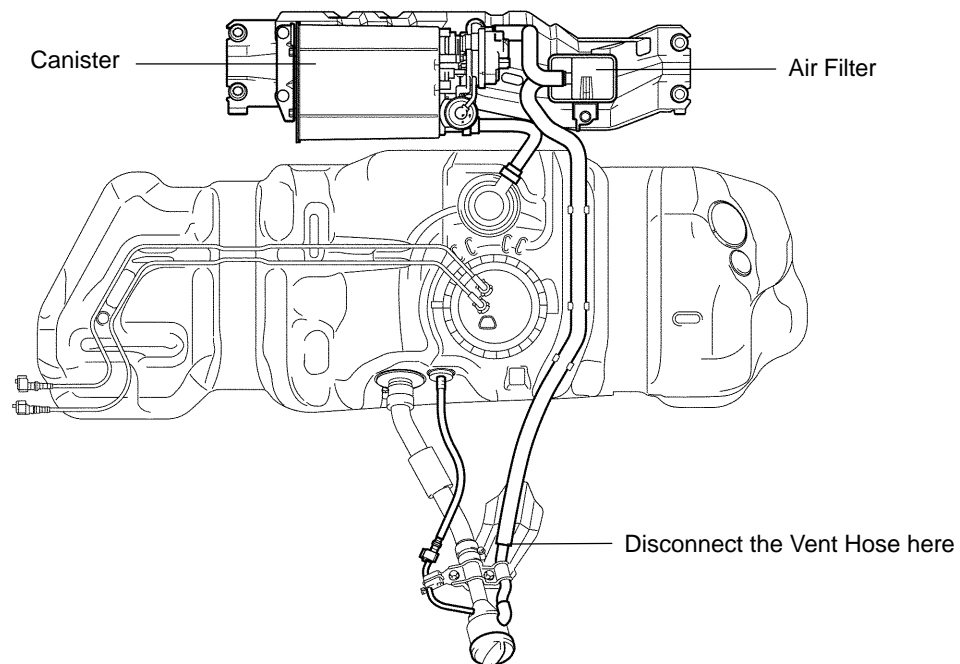
NEXT**Go to step 37.****28 Replace fuel tank cap.**

HINT:

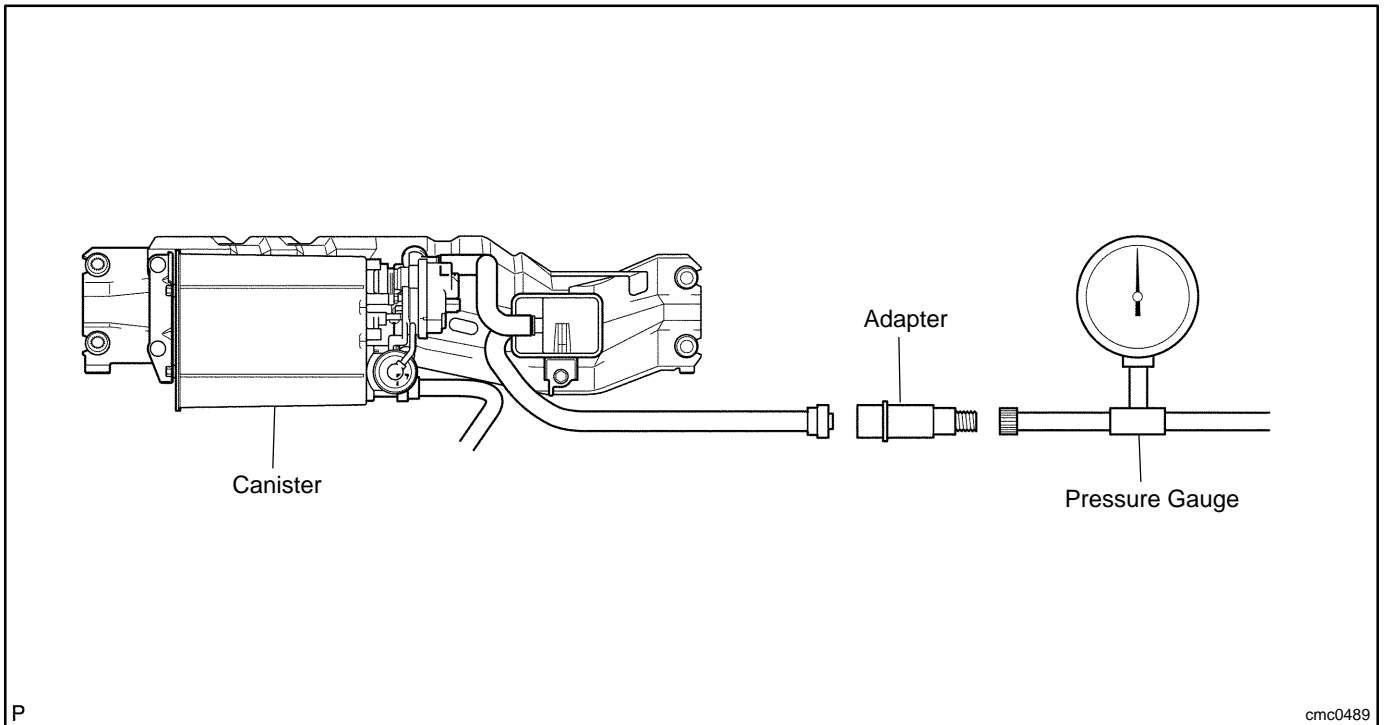
When installing the fuel tank cap, tighten it until a few click sounds are heard.

NEXT**Go to step 37.****29 Locate EVAP leak.**

(a) Disconnect the vent hose.



- (b) Connect the EVAP pressure tester tool to the canister with the adapter.



- (c) Pressurize the EVAP system by 3.2 to 3.7 kPa (24 to 28 mmHg).
 (d) Apply soapy water to the piping and the connecting parts of the EVAP system.
 (e) Look for areas where bubbles appear. This indicates leak point.
 (f) Repair or replace the leak point.

NEXT

Go to step 37.

30 Replace charcoal canister.

NEXT

Go to step 37.

31 Replace EVAP VSV (See page [SF-64](#)).

- (a) Disconnect the connector and the hoses from the purge VSV.
 (b) Remove the purge VSV.
 (c) Install a new purge VSV.
 (d) Reconnect the connector and hoses.

NEXT

Go to step 37.

32 Repair or replace wire harness or connector.

NEXT

Go to step 37.

33	Replace EVAP hose between EVAP VSV and throttle body.
-----------	--

NEXT **Go to step 37.**

34	Inspect throttle body.
-----------	-------------------------------

- (a) Remove the throttle body (see page [SF-44](#)).
- (b) Check that the EVAP purge port of the throttle body is not clogged. If necessary, replace the throttle body.

NEXT **Go to step 37.**

35	Replace ECM (See page SF-82)
-----------	---

NEXT **Go to step 37.**

36	Repair or replace parts and components indicated by output DTCs.
-----------	---

- (a) Repair the malfunctioning areas indicated by the DTCs that had been confirmed when the vehicle was brought in.

NEXT **Go to step 37.**

37	Perform EVAP system auto operation check.
-----------	--

NOTICE:

- In the EVAP SYSTEM CHECK (AUTO OPERATION), the series of 4 EVAP SYSTEM CHECK steps is performed automatically by the hand-held tester. It takes a maximum of approximately 15 minutes.
 - Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90 % full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.
 - Do not run the engine in this step.
 - When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing an EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).
- (a) Clear DTCs (see page [DI-462](#)).
 - (b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
 - (c) After the SYSTEM CHECK is completed, check for pending DTCs by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

HINT:

If no pending DTC is found, the repair has been successfully completed.

NEXT

Completed

Monitor Confirmation

HINT:

After a repair, check Monitor Status by performing the Key–Off Monitor Confirmation and Purge Flow Monitor Confirmation described below.

1. KEY–OFF MONITOR CONFIRMATION

(a) Preconditions

The monitor will not run unless:

- The vehicle has been driven for 10 minutes or more (in a city area or on a free way)
- The fuel tank is less than 90 % full
- The altitude is less than 8,000 ft (2,400 m)
- The Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F)
- The Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95°F)
- The vehicle remains stationary (the vehicle speed is 0 mph [0 km/h])

(b) Monitor Conditions

- (1) Allow the engine to idle for at least 5 minutes.
- (2) Turn the ignition switch to OFF and wait for 6 hours (8 or 10.5 hours).

HINT:

Do not start the engine until checking MONITOR STATUS. If the engine is started, the steps described above must be repeated.

(c) Monitor Status

- (1) Connect a hand–held tester to the DLC3.
- (2) Turn the ignition switch to ON and turn the tester ON.
- (3) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (4) Check the Monitor Status displayed on the tester.

HINT:

If INCMP is displayed, the monitor is not completed. Make sure that the preconditions have been met, and perform the Monitor Conditions again.

2. PURGE FLOW MONITOR CONFIRMATION (P0441)

HINT:

Perform this monitor confirmation after the Key–Off Monitor Confirmation shows COMPL (complete).

(a) Preconditions

The monitor will not run unless:

- The vehicle has been driven for 10 minutes or more (in a city area or on a free way)
- The ECT is between 4.4°C and 35°C (40°F and 95°F)
- The IAT is between 4.4°C and 35°C (40°F and 95°F)

(b) Monitor Conditions

- (1) Release the pressure from the fuel tank by removing and reinstalling the fuel tank cap.
- (2) Warm the engine up until the ECT reaches more than 75°C (167°F).
- (3) Increase the engine speed to 3,000 rpm once.
- (4) Allow the engine to idle and turn A/C ON for 1 minute.

(c) Monitor Status

- (1) Turn the ignition switch to OFF (where ON or the engine is running).
- (2) Connect a hand-held tester to the DLC3.
- (3) Turn the ignition switch to ON and turn the tester ON.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (5) Check the Monitor Status displayed on the tester.

HINT:

If INCMP is displayed, the monitor is not completed. Make sure that the preconditions have been met, and perform the Monitor Conditions again.

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

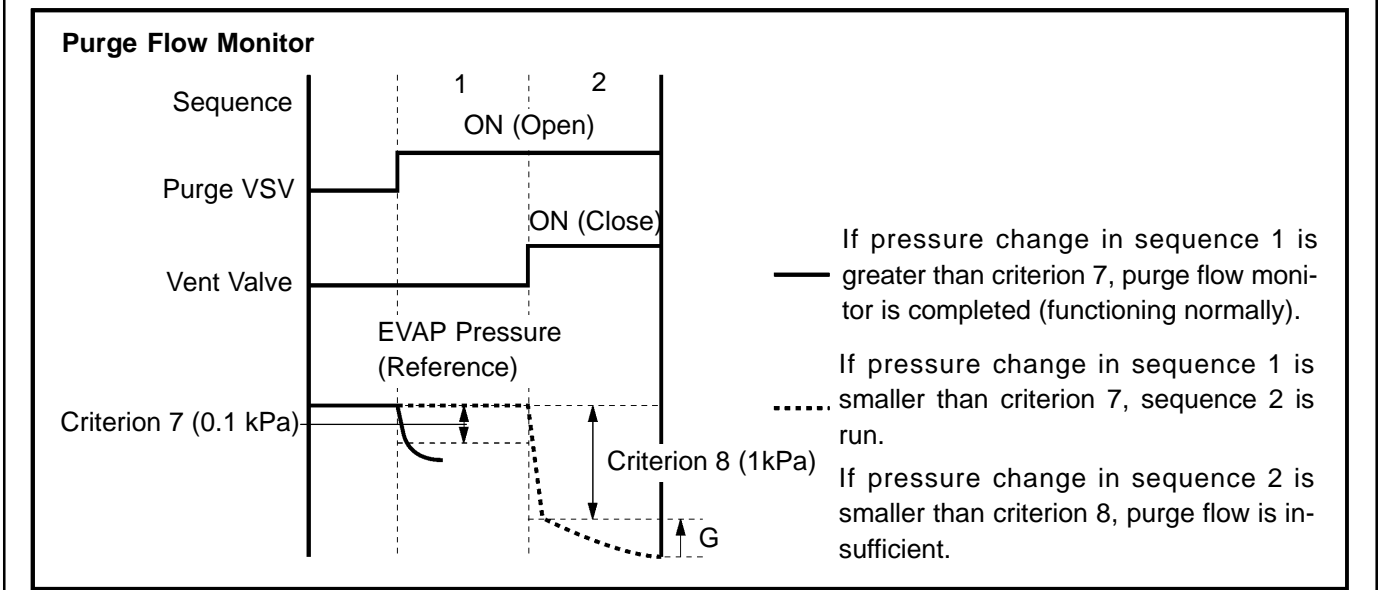
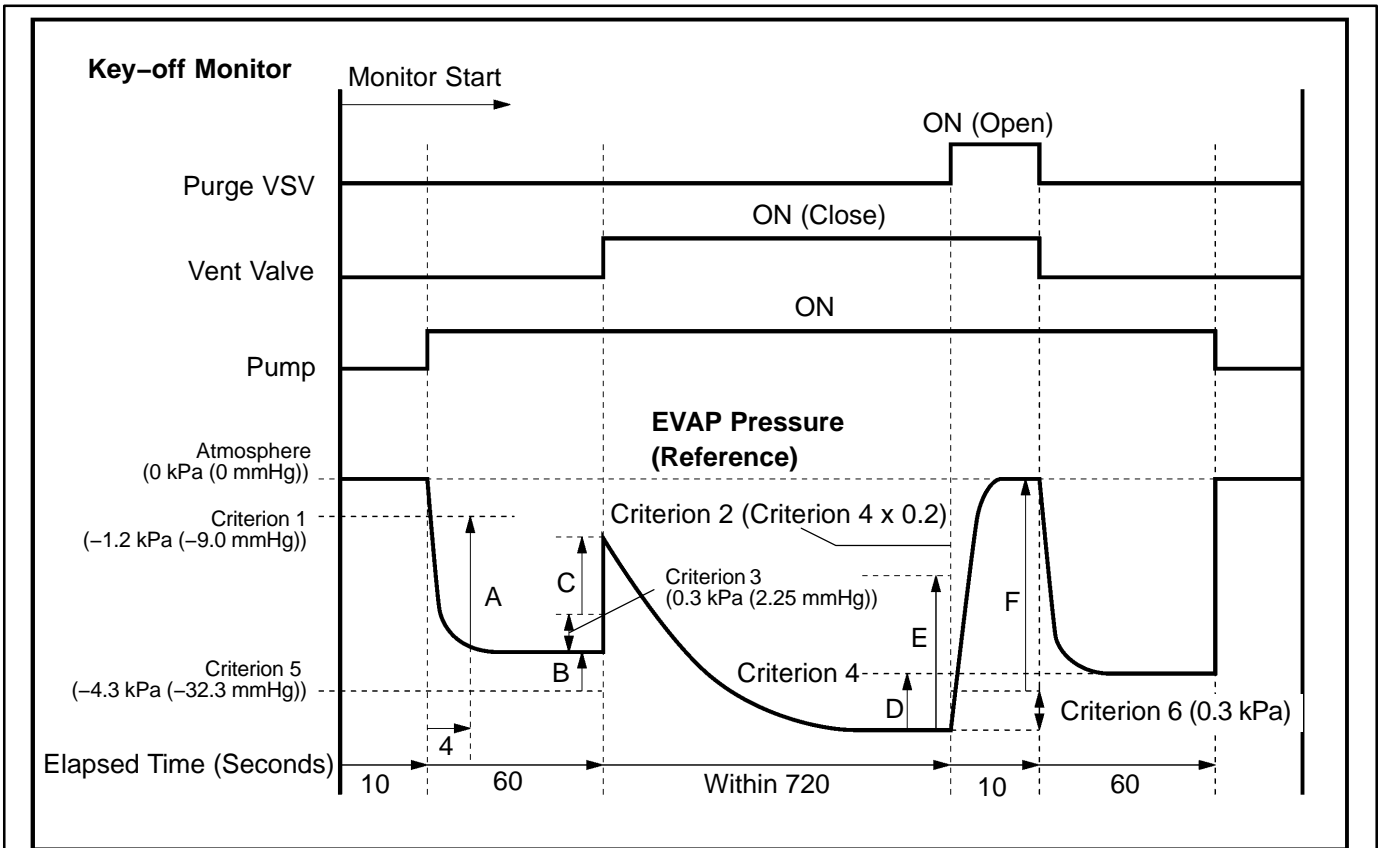
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

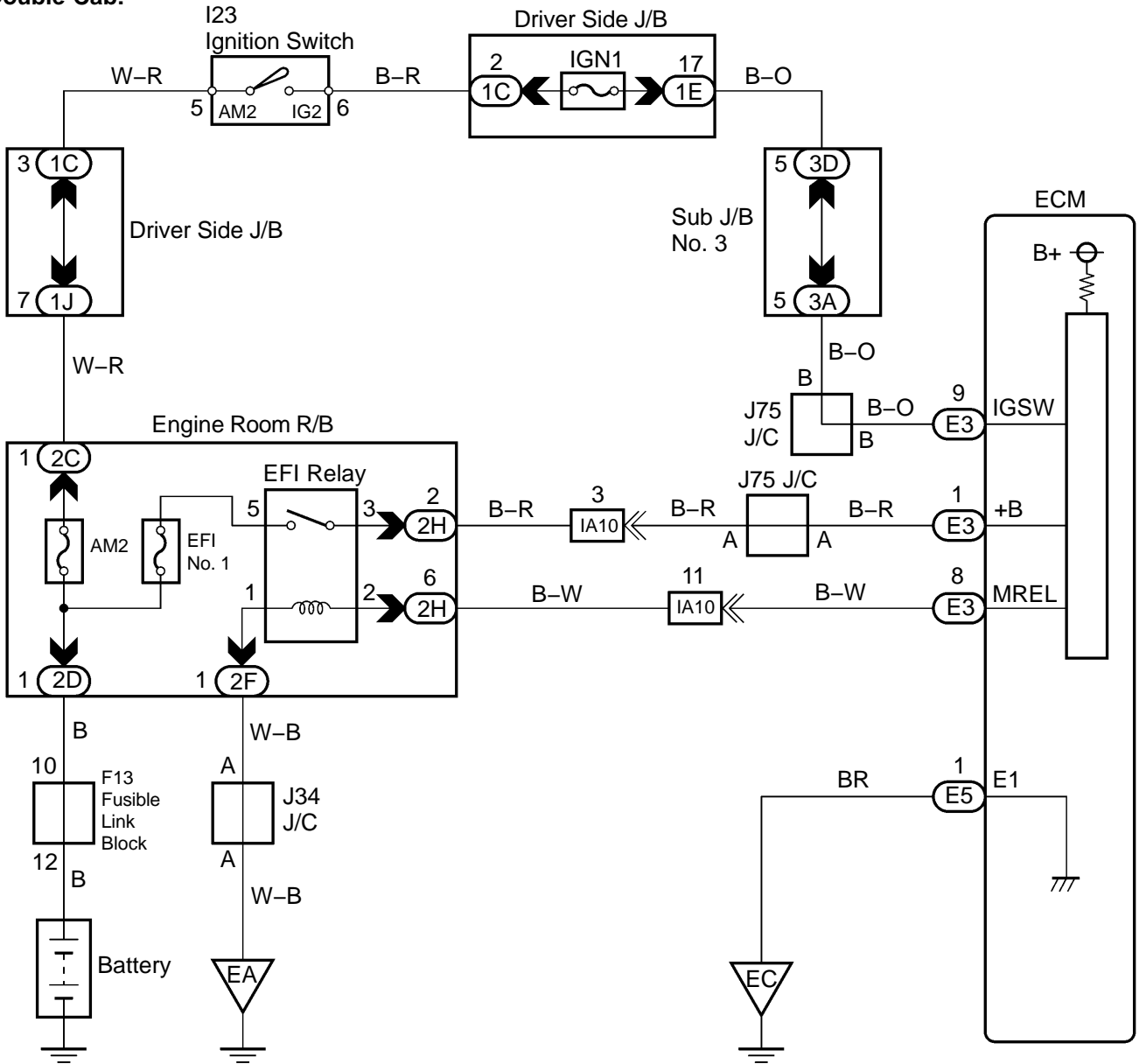
EVAP-Key-off monitor

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$3D	\$C9	Multiply by 0.01 (kPa)	Test value for small leak (P0456): Refer to pressure D*.	Minimum test limit for small leak	Maximum test limit for small leak
\$3D	\$CA	Multiply by 0.01 (kPa)	Test value for gross leak (P0455): Refer to pressure E*.	Minimum test limit for gross leak	Maximum test limit for gross leak
\$3D	\$CB	Multiply by 0.01 (kPa)	Test value for vacuum pump stuck OFF (P2401): Refer to pressure A*.	Minimum test limit for vacuum pump stuck OFF	Maximum test limit for vacuum pump stuck OFF
\$3D	\$CD	Multiply by 0.01 (kPa)	Test value for vacuum pump stuck ON (P2402): Refer to pressure A*.	Minimum test limit for vacuum pump stuck ON	Maximum test limit for vacuum pump stuck ON
\$3D	\$CE	Multiply by 0.01 (kPa)	Test value for vent valve stuck OFF (vent) (P2420): Refer to pressure C*.	Minimum test limit for vent valve stuck ON	Maximum test limit for vent valve stuck ON
\$3D	\$CF	Multiply by 0.01 (kPa)	Test value for vent valve stuck ON (closed) (P2419): Refer to pressure A*.	Minimum test limit for vent valve stuck OFF	Maximum test limit for vent valve stuck OFF
\$3D	\$D0	Multiply by 0.01 (kPa)	Test value for 0.02 inch orifice low flow (P043E): Refer to pressure B*.	Minimum test limit for 0.02 inch orifice low flow	Maximum test limit for 0.02 inch orifice low flow
\$3D	\$D1	Multiply by 0.01 (kPa)	Test value for 0.02 inch orifice high flow (P043F): Refer to pressure A*.	Minimum test limit for 0.02 inch orifice high flow	Maximum test limit for 0.02 inch orifice high flow
\$3D	\$D4	Multiply by 0.01 (kPa)	Test value for purge VSV stuck close (P0441): Refer to pressure F*.	Minimum test limit for purge VSV stuck close	Maximum test limit for purge VSV stuck close
\$3D	\$D5	Multiply by 0.01 (kPa)	Test value for purge VSV stuck open (P0441): Refer to pressure E*.	Minimum test limit for purge VSV stuck open	Maximum test limit for purge VSV stuck open
\$3D	\$D7	Multiply by 0.01 (kPa)	Test value for purge flow (P0441): Refer to pressure G*.	Minimum test limit for purge flow	Maximum test limit for purge flow

* Pressure A to G are indicated as shown in the diagram below.

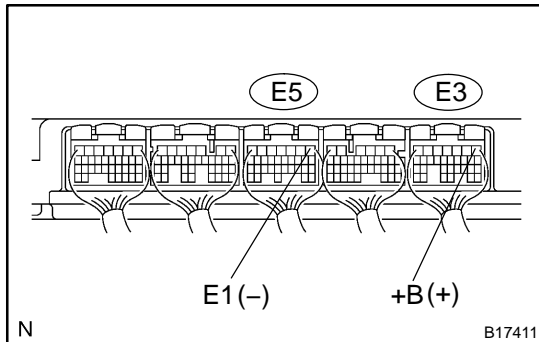


Double Cab:



INSPECTION PROCEDURE

- 1 Check voltage between terminals +B and E1 of ECM connector.

**PREPARATION:**

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals +B and E1 of the ECM connectors.

OK:

Standard: 9 to 14 V

OK

Proceed to next circuit inspection shown in the Problem symptoms table (See page [DI-452](#)).

NG

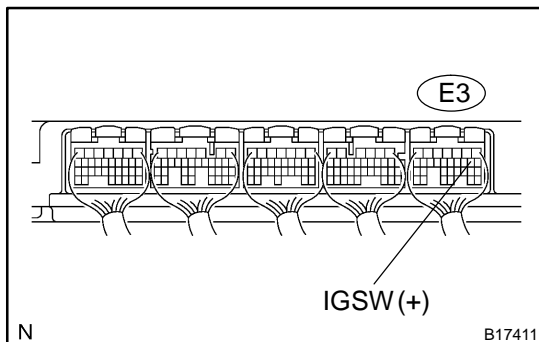
- 2 Check for open in harness and connector between terminal E1 of ECM and body ground (See page [IN-30](#)).

NG

Repair or replace harness or connector.

OK

- 3 Check voltage between terminal IGSW of ECM connector and body ground.

**PREPARATION:**

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal IGSW of the ECM connector and body ground.

OK:

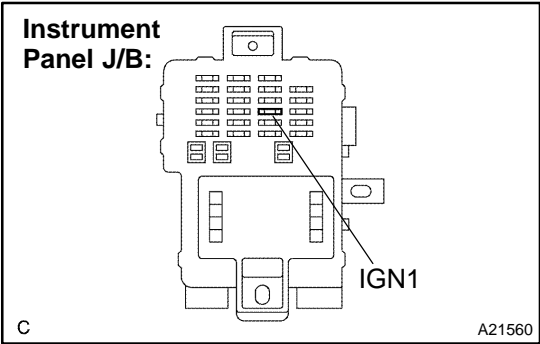
Standard: 9 to 14 V

OK

Go to step 6.

NG

4 Check IGN1 fuse.



PREPARATION:
Remove the IGN1 fuse from the instrument panel J/B.

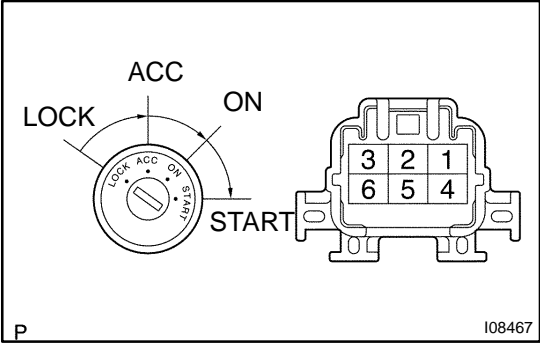
CHECK:
Check the resistance of the IGN1 fuse.

OK:
Below 1 Ω

NG Check for short in all harness and components connected to IGN1 fuse.

OK

5 Check ignition switch (See page BE-37).



PREPARATION:
(a) Remove the lower finish panel.
(b) Disconnect the ignition switch connector.

CHECK:
Check resistance between terminals.

OK:

Standard:

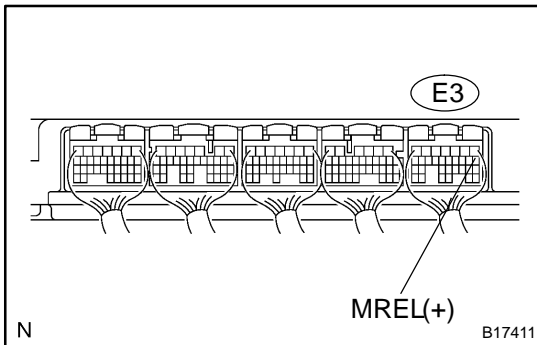
Switch Position	Terminal Condition	Specified Condition
LOCK	Always	10 kΩ or more
ACC	1 - 3	Below 1 Ω
ON	1 - 2 - 3 5 - 6	Below 1 Ω
START	1 - 2 4 - 5 - 6	Below 1 Ω

NG Replace ignition switch.

OK

Check and repair harness and connector between IGN fuse and ECM.

6 Check voltage between terminal MREL of ECM connector and body ground.

**PREPARATION:**

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal MREL of the ECM connector and body ground.

OK:

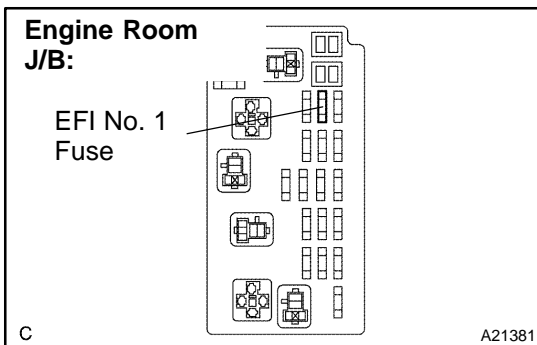
Standard: 9 to 14 V

NG

Replace ECM (See page [SF-82](#)).

OK

7 Check EFI No. 1 fuse of engine room J/B.

**PREPARATION:**

Remove the EFI No. 1 fuse from the engine room J/B.

CHECK:

Check resistance of EFI No. 1 fuse.

OK:

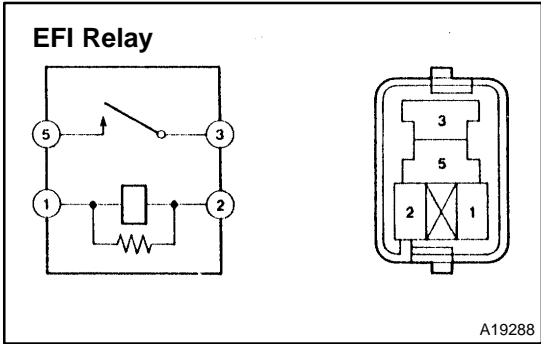
Below 1 Ω

NG

Check for short in all harness and components connected to EFI No. 1 fuse.

OK

8 Check EFI relay.



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

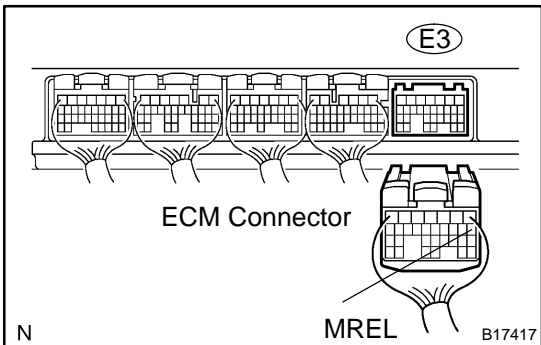
Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 K Ω or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG Replace EFI relay.

OK

9 Check for open and short in harness and connector between terminal MREL of ECM and body ground.



PREPARATION:

Disconnect the E3 ECM connector.

CHECK:

Measure the resistance between the wire harness side connector and body ground.

OK:

Standard:

Tester Connection	Specified Condition
MREL (E3-8) - Body ground	Below 1 Ω

NG Repair or replace harness or connector.

OK

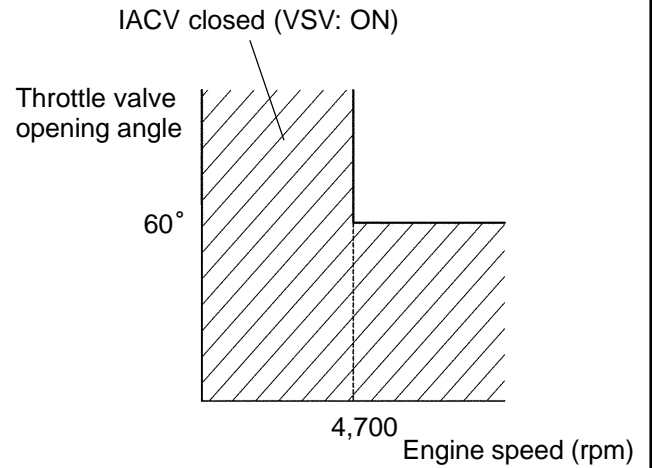
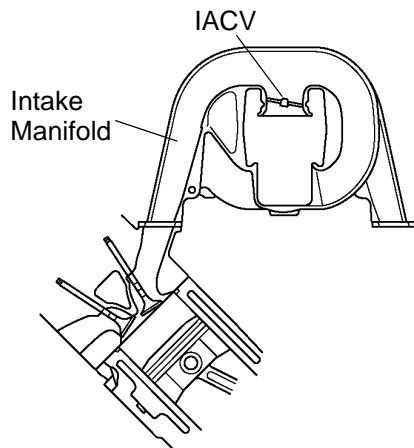
Check for intermittent problems (See page [DI-430](#)).

IACV Control Circuit

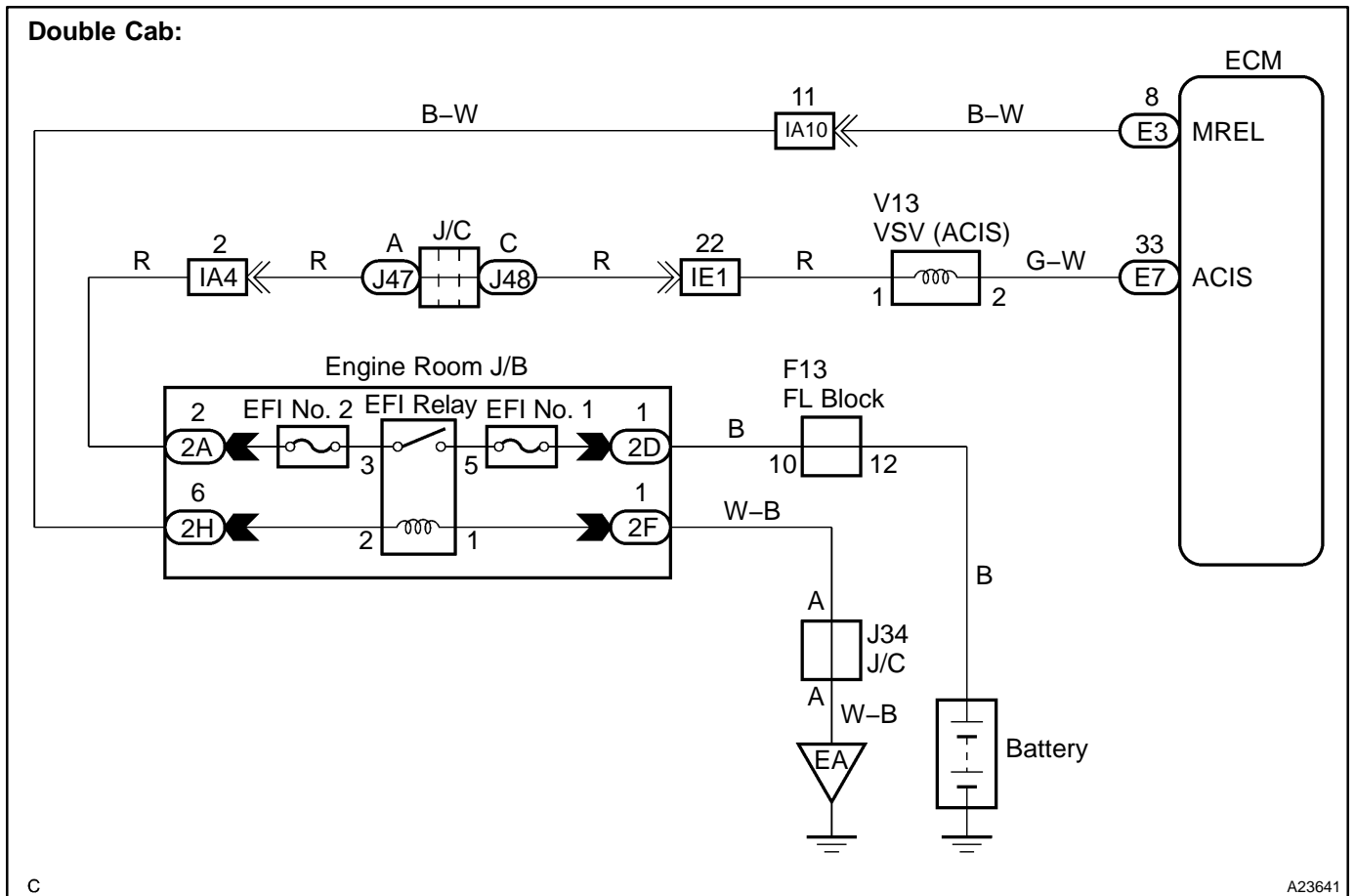
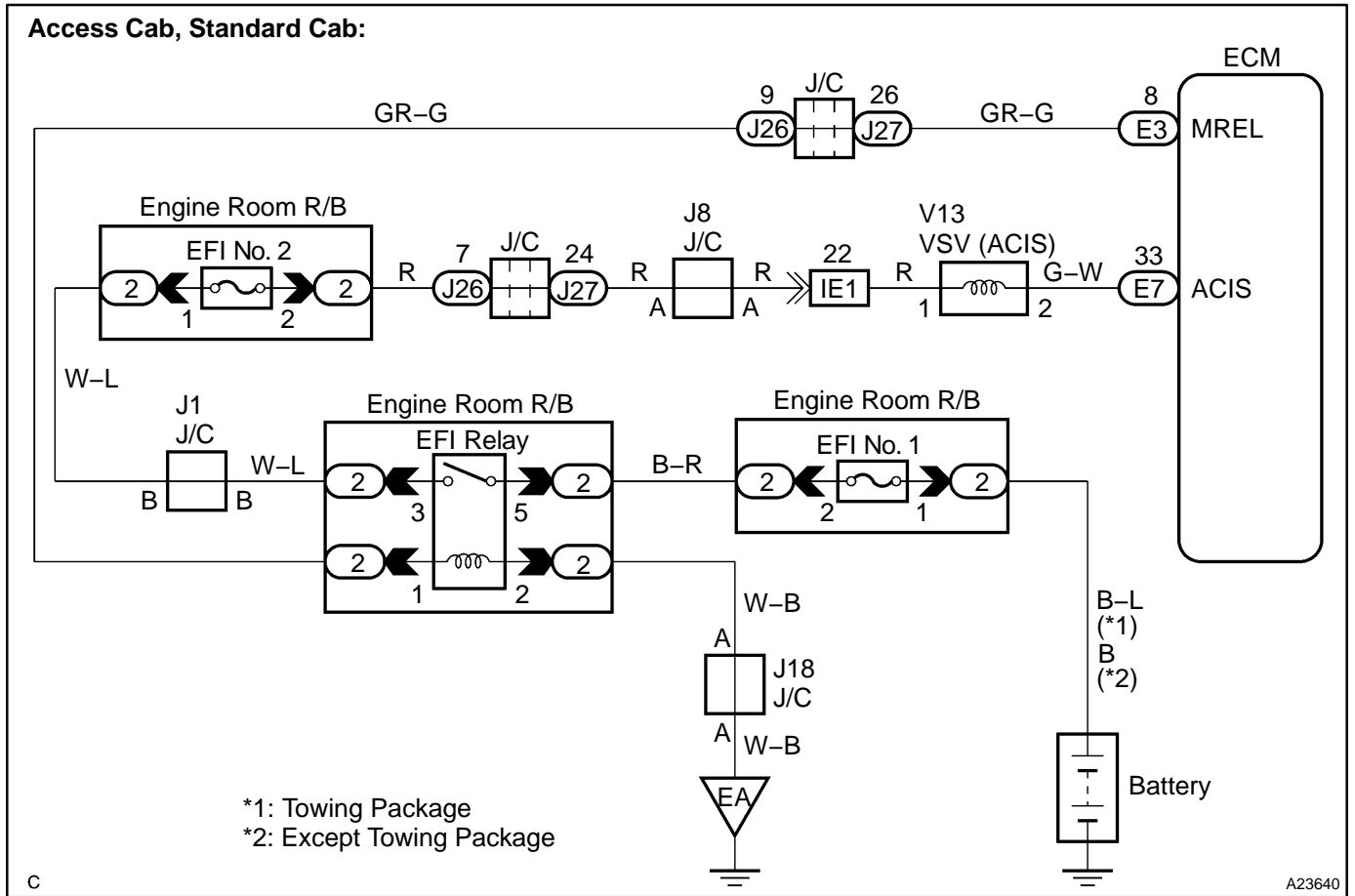
CIRCUIT DESCRIPTION

This circuit opens and closes the Intake Air Control Valve (IACV) in response to the engine load in order to increase the intake efficiency (ACIS: Acoustic Control Induction System).

When the engine speed is 4,700 rpm or more and the throttle valve opening angle is 60° or more, the VSV is OFF, so the IACV is open. All the other times, the ECM turns the VSV ON and closes the IACV.

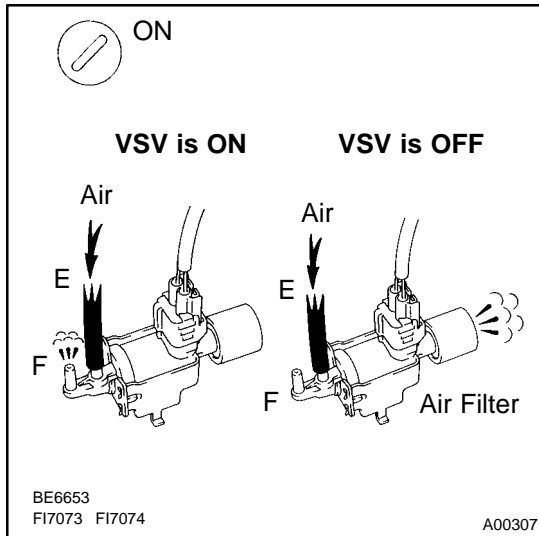


WIRING DIAGRAM



INSPECTION PROCEDURE

1 Connect hand-held tester, and check operation of VSV for ACIS.

**PREPARATION:**

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and push the hand-held tester main switch ON.
- Select the ACTIVE TEST mode on the hand-held tester.

CHECK:

Check the operation of the VSV when the VSV is operated by the hand-held tester.

OK:

VSV is ON:

Air from port E flows out through port F.

VSV is OFF:

Air from port E flows out through the air filter.

OK

Check for vacuum tank (See page [SF-56](#)).

NG

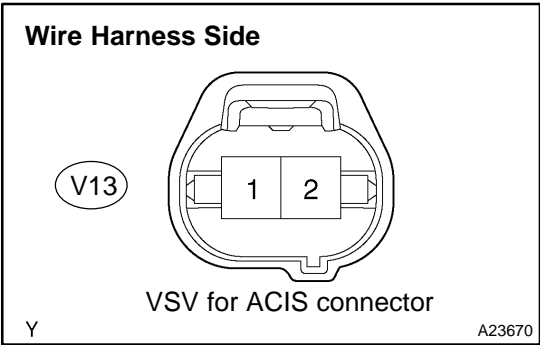
2 Check VSV for ACIS (See page [SF-51](#)).

NG

Replace VSV for ACIS.

OK

3 Check for open and short in harness and connector between EFI main relay (Marking: EFI) and ECM (See page IN-30).



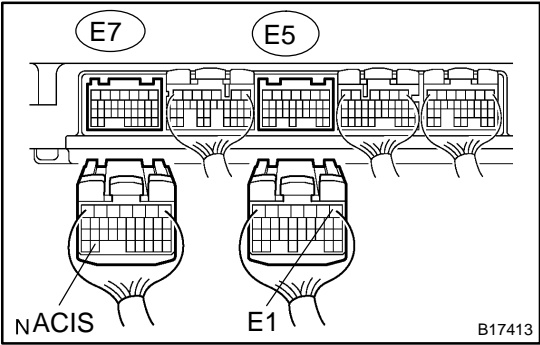
- (a) Check the wire harness between the VSV for ACIS and connector the ECM connector.
 - (1) Disconnect the VSV for ACIS connector.
 - (2) Disconnect the E5 and E7 ECM connector.
 - (3) Check for resistance between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for ACIS (V13-2) - ACIS (E7-33)	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VSV for ACIS (V13-2) or ACIS (E7-33) - E1 (E5-1)	10 kΩ or higher



- (b) Check the wire harness between the VSV for ACIS connector and the EFI relay.
 - (1) Disconnect the VSV for ACIS connector.
 - (2) Remove the EFI relay from the engine room R/B.
 - (3) Check for resistance between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for ACIS (V13-1) - EFI relay terminal 3 of R/B	Below 1 Ω

NG	Repair or replace harness or connector.
-----------	--

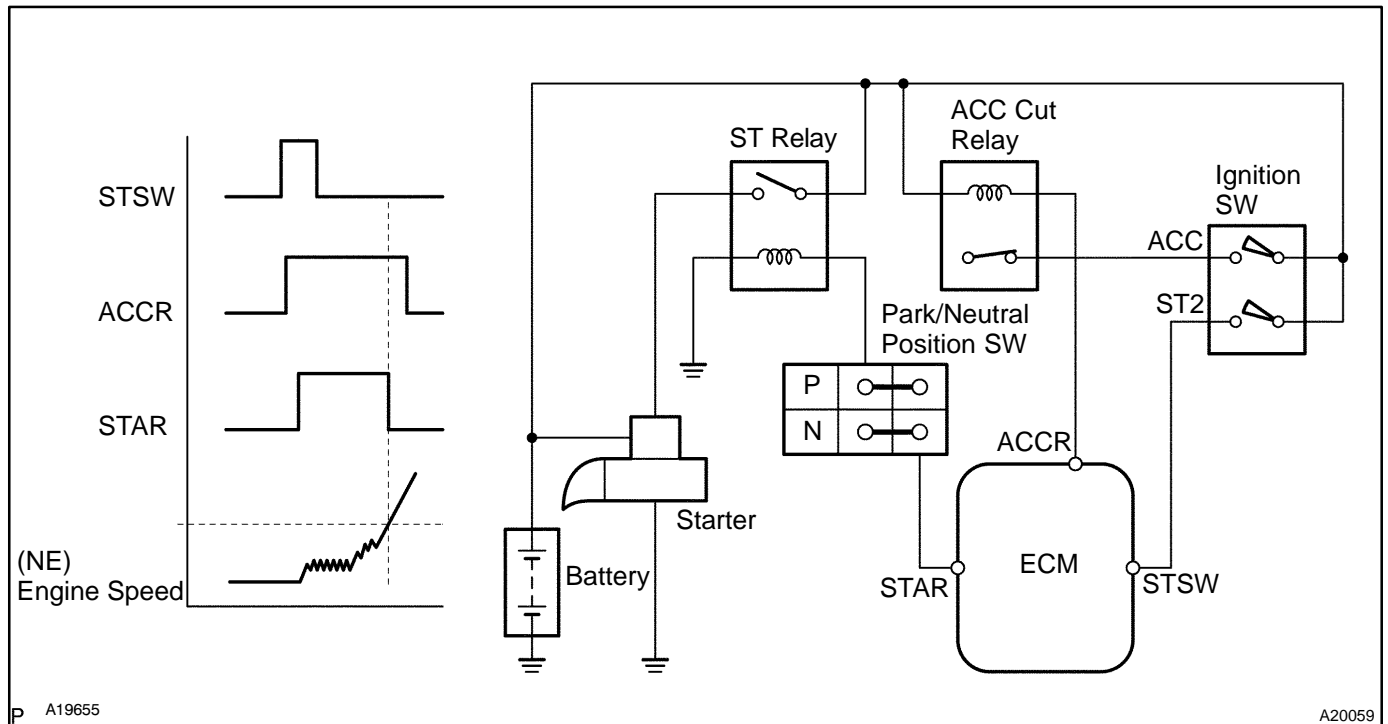
OK

Replace ECM (See page SF-82).

Cranking Hold Function Circuit

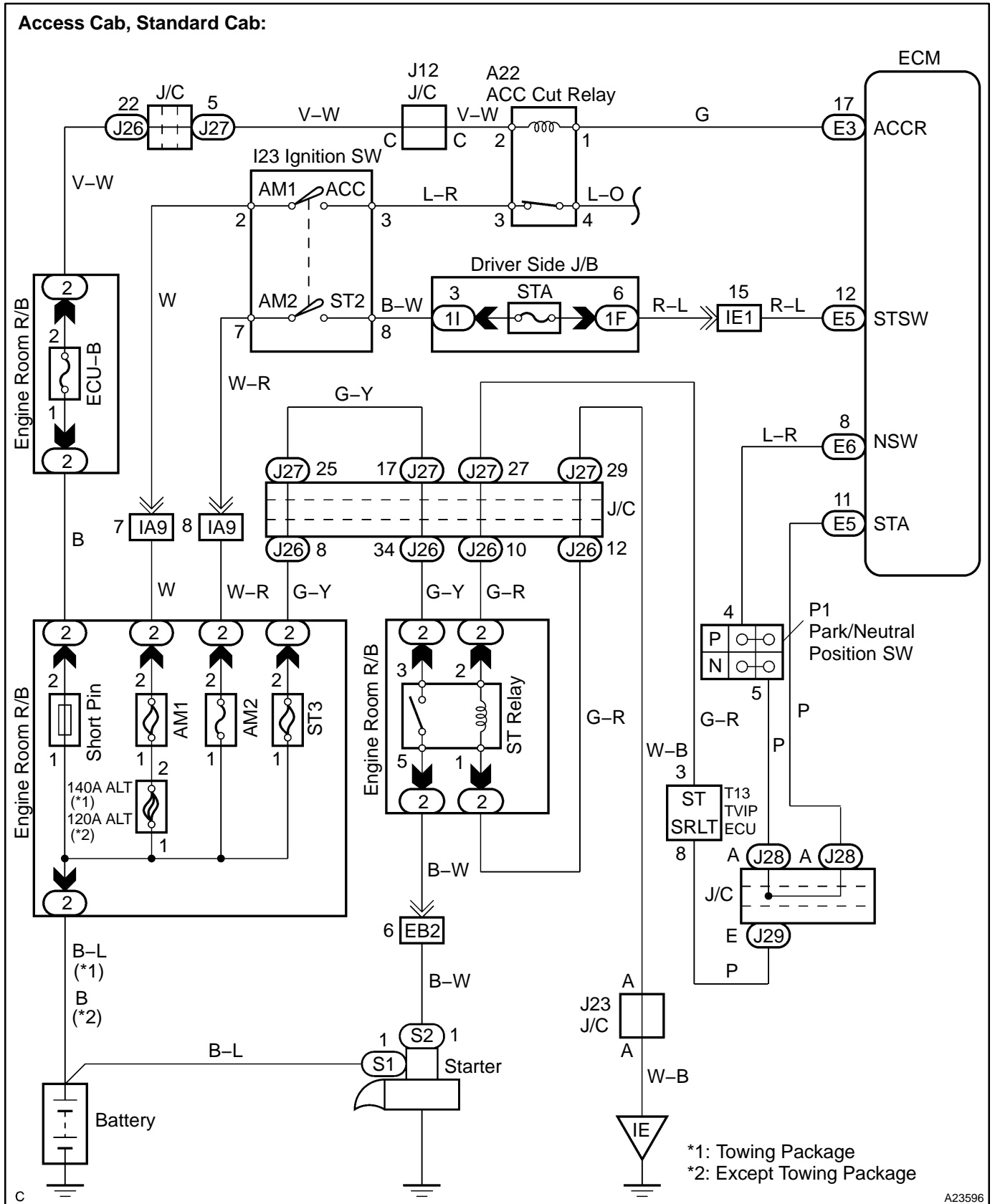
CIRCUIT DESCRIPTION

The starter is controlled by the ECM, when the ECM detects a start signal (STSW) from the ignition switch, this system monitors the engine speed (NE) and continues to operate the starter until it has determined that the engine has started (engine speed reaches approximately 500 rpm). If the engine is already running and the ignition switch is turned to START, the ECM will not operate the starter.

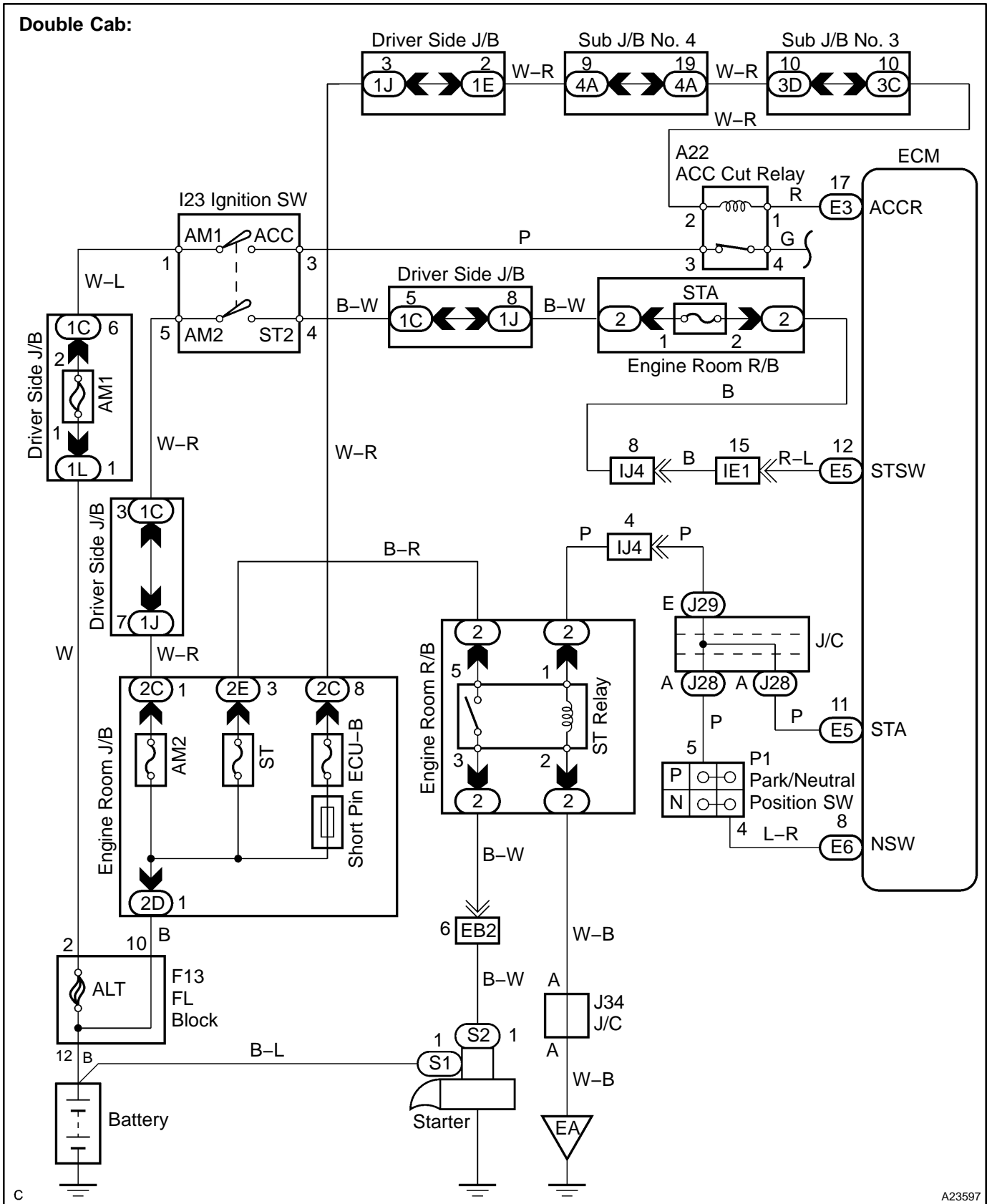


WIRING DIAGRAM

Access Cab, Standard Cab:



c



INSPECTION PROCEDURE

Hand-held tester:

1	Check operation of engine cranking.
----------	--

CHECK:

When turning the ignition switch to the START position, check whether the starter motor starts.

OK:

Starter motor starts.

OK	Check for intermittent problems (See page DI-430).
-----------	---

NG

2	Connect hand-held tester, and check STA signal.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON, and push the hand-held tester main switch ON.
- (c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand-held tester while the starter operates.

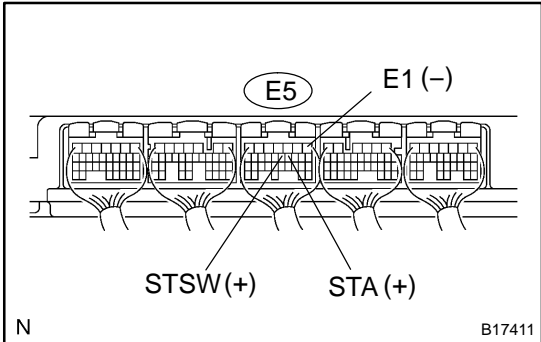
OK:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

NG	Go to step 5.
-----------	----------------------

OK

3 Check voltage between terminal STAR, STSW and E1 of ECM connector.



CHECK:

Measure the voltage between the terminals of the E5 ECM connectors, while cranking the engine (ignition switch START position).

OK:

Standard:

Tester Connection	Specified Condition
STA (E5-11) - E1 (E5-1)	9 to 14 V
STSW (E5-12) - E1 (E5-1)	9 to 14 V

RESULT:

Terminal STAR	Terminal STSW	Proceed to
9 to 14 V	9 to 14 V	A
0 V	9 to 14 V	B
0 V	0 V	C

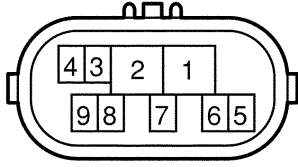
B Replace ECM (See page SF-82).

C Go to step 9.

A

4 Check park/neutral position switch.

Component Side:



P

D14154

PREPARATION:

Remove the P1 park/neutral position switch connector.

CHECK:

Check resistance between each terminal shown below when the shift lever is moved to each range.

Shift range	Terminal No. to continuity	
P	1 - 3	6 - 9
R	2 - 3	-
N	3 - 5	6 - 9
D	3 - 7	-
2	3 - 4	-
L	3 - 8	-

OK:

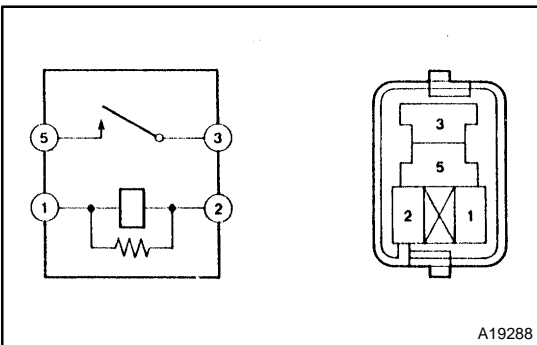
Below 1 Ω

NG → **Replace the park/neutral position switch.**

OK

Check and repair harness and connector between park/neutral position switch and ECM.

5 Check starter relay.



A19288

- (a) Remove the starter relay from the engine room R/B.
- (b) Inspect the starter relay.

Standard:

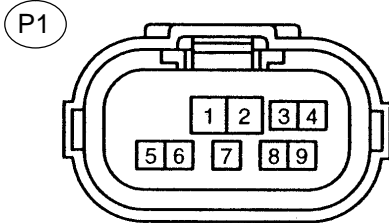
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (Apply battery voltage to terminals 1 and 2)

NG → **Replace starter relay.**

OK

6 Check for open and short in harness and connector between park/neutral position switch and starter relay.

Wire Harness Side



Park/Neutral position switch Connector
A23563

- (a) Check the harness and the connector between the park/neutral position switch connector and the starter relay.
- (1) Disconnect the park/neutral position switch connector.
 - (2) Remove the starter relay from the engine room R/B.
 - (3) Check for resistance between the wire harness side connectors.

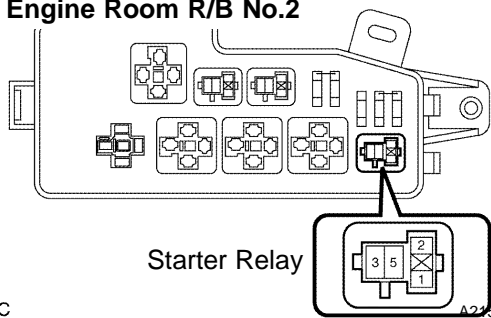
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Park/Neutral position switch (P1-6) – Starter relay (1)	Below 1 Ω

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Park/Neutral position switch (P1-6) or Starter relay (1) – Body ground	10 k Ω or higher

Engine Room R/B No.2



Starter Relay
A27559

- (b) Check the harness and the connector between the starter relay and the body ground.
- (1) Remove the starter relay from the engine room R/B.
 - (2) Check for resistance between the starter relay and the body ground.

Standard (Check for open):

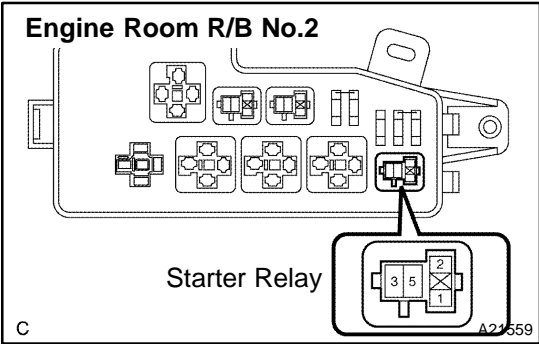
Symbols (Terminal No.)	Specified condition
Starter relay (2) – Body ground	Below 1 Ω

NG

Repair or replace harness or connector.

OK

7 Check engine room R/B No.2 (Starter relay voltage).



PREPARATION:

Remove the starter relay from the engine room R/B No.2.

CHECK:

Measure the voltage between the terminal of the engine room R/B and body ground.

OK:

Standard:

Tester Connection	Specified Condition
Starter relay (5) - Body ground	9 to 14 V

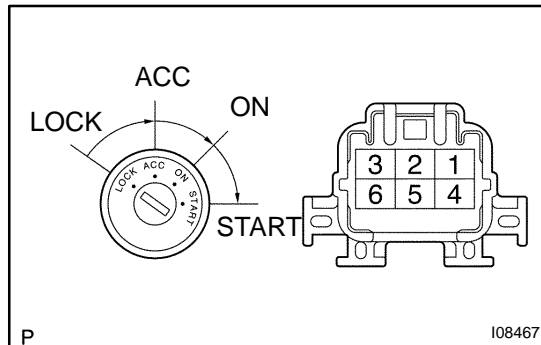
NG Check and repair harness and connector between starter relay and battery.

OK

8 Check starter (See page ST-18).

NG Repair or replace starter.

OK

9 Check ignition switch.**PREPARATION:**

- Remove the lower finish panel.
- Disconnect the ignition switch connector.

CHECK:

Check resistance between terminals.

OK:**Standard:**

Switch Position	Terminal Condition	Specified Condition
LOCK	Always	10 k Ω or more
ACC	1 - 3	Below 1 Ω
ON	1 - 2 - 3 5 - 6	Below 1 Ω
START	1 - 2 4 - 5 - 6	Below 1 Ω

NG**Replace ignition switch.****OK**

Check for open in harness and connector between ECM and ignition switch, ignition switch and battery (See page [IN-30](#)).

Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

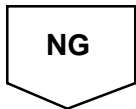
Refer to DTC P0230 on page [DI-600](#).

WIRING DIAGRAM

Refer to DTC P0230 on page [DI-600](#).

INSPECTION PROCEDURE

1	Check fuel pump operation (See page SF-7).
----------	---



2	Connect hand-held tester, and check operation of fuel pump relay.
----------	--

PREPARATION:

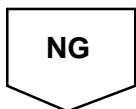
- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP SPD.

CHECK:

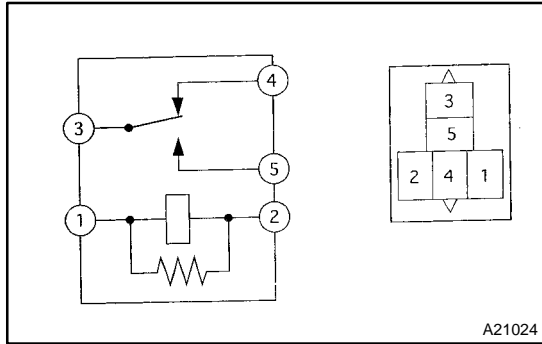
Check the operation of the fuel pump relay when it is switched ON and OFF by the hand-held tester.

OK:

Operating noise can be heard from the relay.



3 Check operation of fuel pump relay.



PREPARATION:

Remove the fuel pump relay from the engine room R/B.

CHECK:

Inspect the fuel pump relay.

OK:

Terminal No.	Condition	Specified Condition
3 - 4	Apply B+ between terminals 1 and 2	10 KΩ or higher
3 - 4	Always	Below 1 Ω
3 - 5	Always	10 KΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG → Replace fuel pump relay.

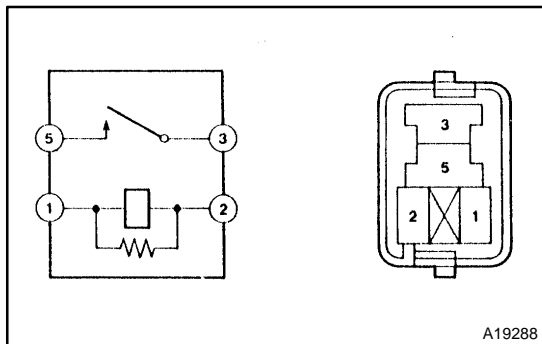
OK

4 Check fuel pump (See page SF-15).

NG → Repair or replace fuel pump.

OK

5 Check circuit opening relay).



PREPARATION:

Remove the C/OPN relay from the engine room J/B.

CHECK:

Inspect the C/OPN relay.

OK:

Standard:

Terminal No.	Condition	Specified Condition
3 - 5	Always	10 KΩ or higher
3 - 5	Apply B+ between terminals 1 and 2	Below 1 Ω

NG → Replace circuit opening relay.

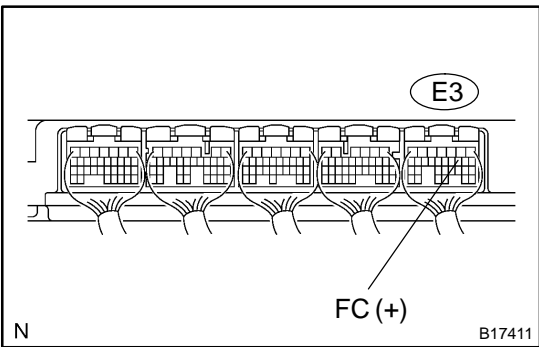
OK

6 Check for open in harness and connector between circuit opening relay and fuel pump, and fuel pump and body ground (See page [IN-30](#)).

NG Repair or replace harness or connector.

OK

7 Check voltage between terminal FC and E1 of ECM connector.



PREPARATION:
Turn the ignition switch ON.

CHECK:
Measure the voltage between terminal FC of the ECM connector and body ground.

OK:
Voltage: 9 to 14 V

NG Check for open in harness and connector between battery and FC terminal of ECM (See page [IN-30](#)).

OK

Proceed to problem symptoms table (See page [DI-452](#)).

8 Check fuel pump resistor (See page [SF-63](#)).

NG Replace fuel pump resistor.

OK

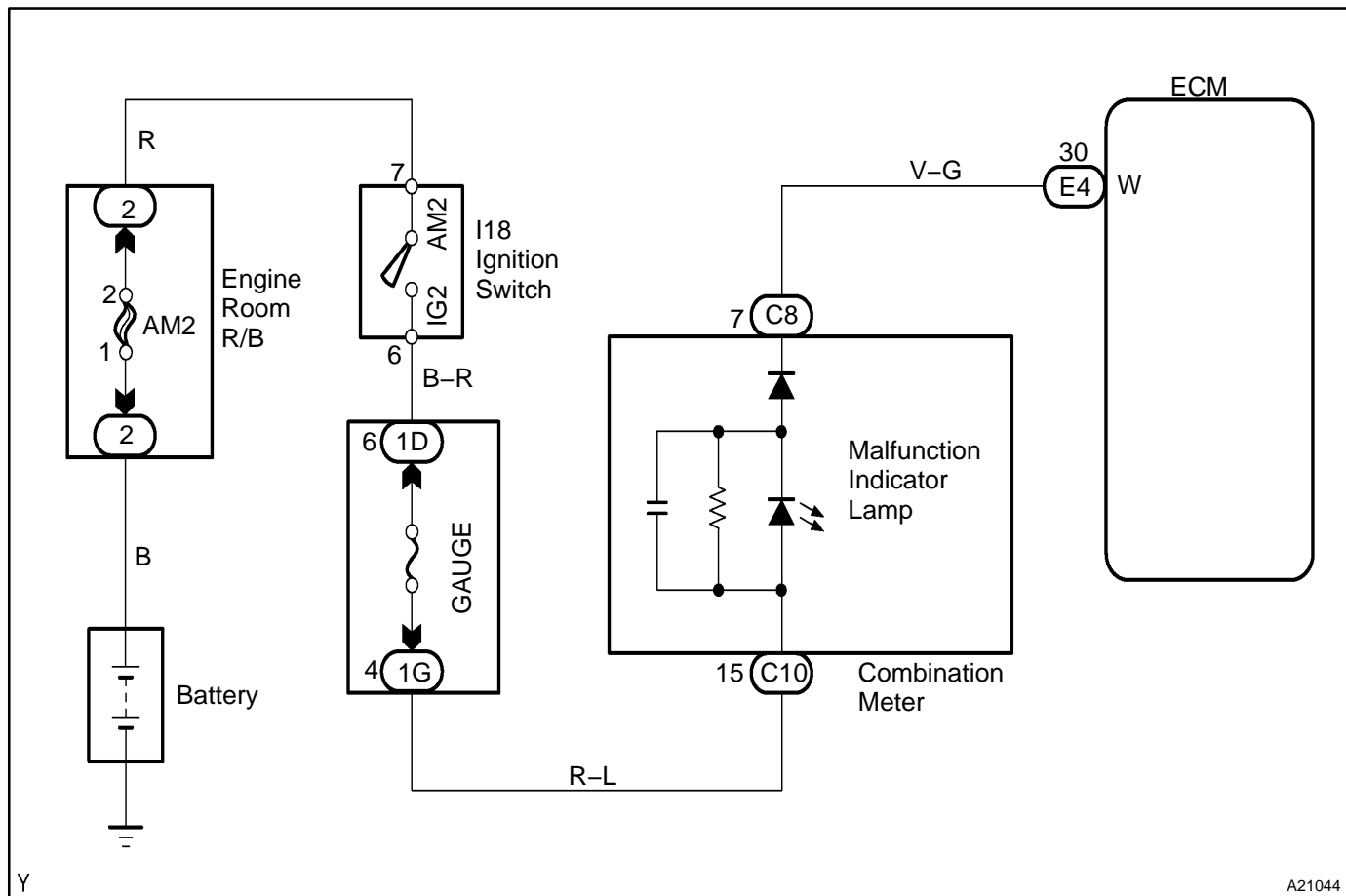
Check for open in harness and connector between circuit opening relay and fuel pump resistor, and fuel pump resistor and fuel pump (See page [IN-30](#)).

MIL Circuit

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the MIL lights up. At this time, the ECM records a DTC in the memory.

WIRING DIAGRAM



Y

A21044

INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

MIL remains on	Start inspection from step 1
MIL does not light up	Start inspection from step 3

1	Clear DTC.
----------	-------------------

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) Read the DTC (See page DI-462).
- (d) Clear DTCs (see page DI-462).

CHECK:

- (a) Check that MIL does not light up.

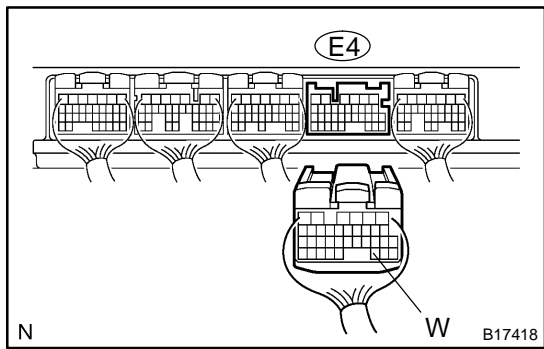
OK:

Standard: MIL does not light up

OK	Repair circuit indicated by output code (See page DI-477).
-----------	---

NG

2	Check Harness and connector (Check for short in wire harness).
----------	---



PREPARATION:

- (a) Disconnect the E4 ECM connector.
- (b) Turn the ignition switch ON.

CHECK:

- (a) Check that MIL does not light up.

OK:

Standard: MIL does not light up

OK	Replace ECM (See page SF-82).
-----------	--------------------------------------

NG

Check and repair harness and connector between combination meter and ECM.

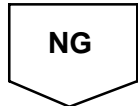
3	Check that MIL lights up.
----------	----------------------------------

CHECK:

Check that MIL lights up when turning the ignition switch ON.

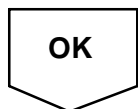
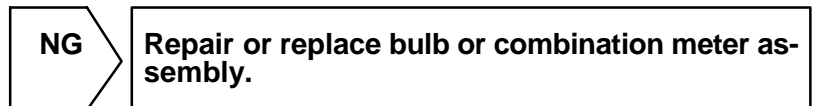
OK:

Standard: MIL lights up



4	Inspect combination meter assy (MIL circuit).
----------	--

See the combination meter troubleshooting on page [BE-86](#).



Check and repair harness and connector between combination meter and ECM.

AUTOMATIC TRANSMISSION (A750E for 1GR-FE)

DIDUK-01

PRECAUTION

NOTICE:

Perform the **RESET MEMORY (AT initialization)** when replacing the automatic transmission assy, engine assy or ECM (See page [DI-961](#)).

HINT:

RESET MEMORY cannot be completed by only disconnecting the battery terminal.

DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects malfunction every time when enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.
Component operating range	Normal operation range of sensors and solenoids under normal driving conditions. Use these ranges as a reference. They cannot be used to judge if a sensor or solenoid is defective or not.

TOYOTA PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

Part and system name	Definition
Toyota HCAC system, Hydrocarbon adsorptive Catalyst (HCAC) system, HC adsorptive three-way catalyst	HC adsorptive three-way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor "A"	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VAV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On-board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power-steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor "A"	Counter gear speed sensor

Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti-theft system

LOCATION

Combination Meter

- MIL
- AT Oil Temp Warning Light

Shift Lever
(O/D Main Switch)

ECM

Stop Light Switch

DLC3

Integration Control and Panel
(Shift Position L Switch)

Shift Solenoid Valve S1

Speed Sensor (NT)

Speed Sensor (SP2)

Shift Solenoid Valve SL1

Park/Neutral Position Switch

Shift Solenoid Valve SLT

Shift Solenoid Valve S2

ATF Temperature Sensor No. 2

ATF Temperature Sensor No.1

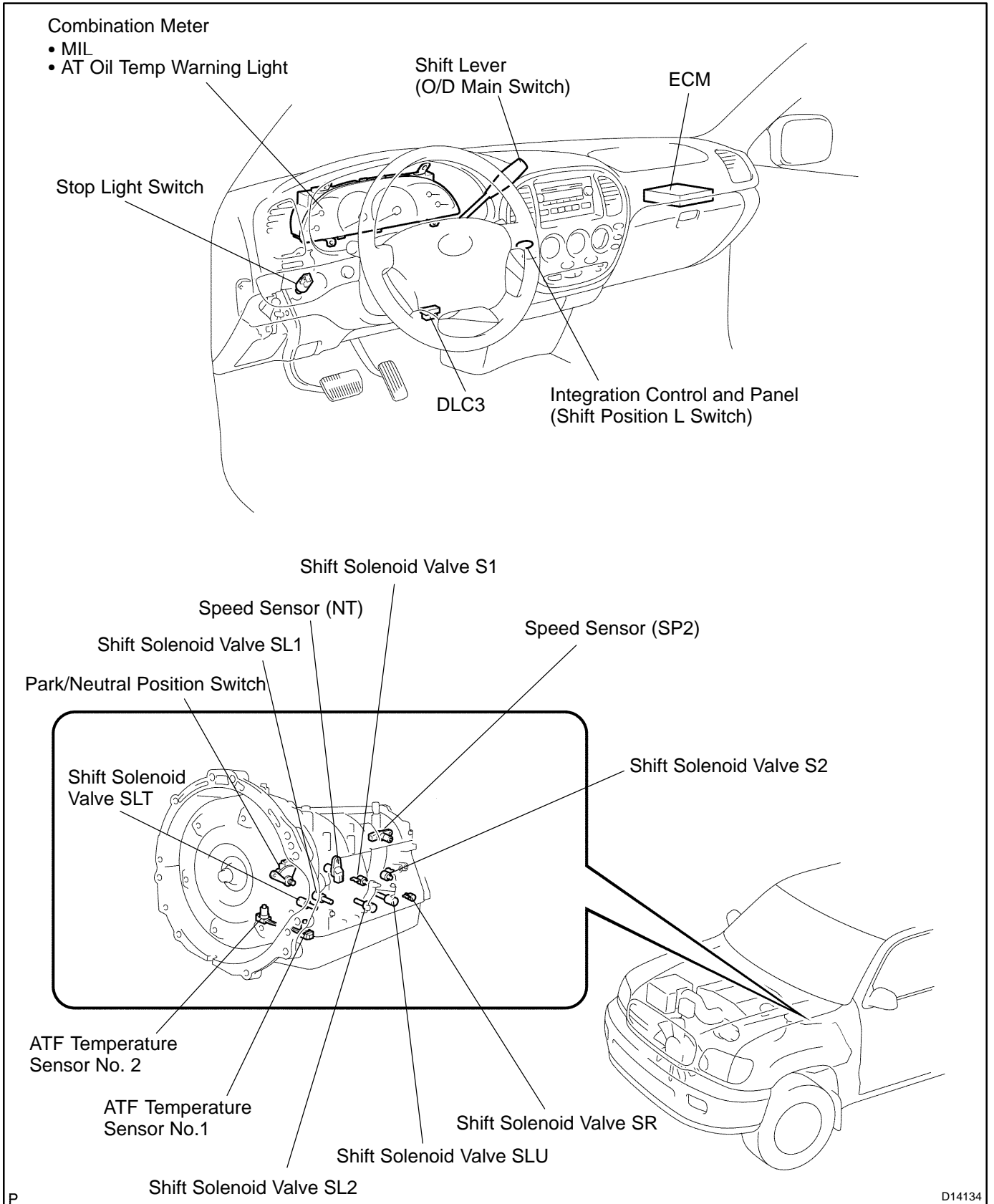
Shift Solenoid Valve SR

Shift Solenoid Valve SLU

Shift Solenoid Valve SL2

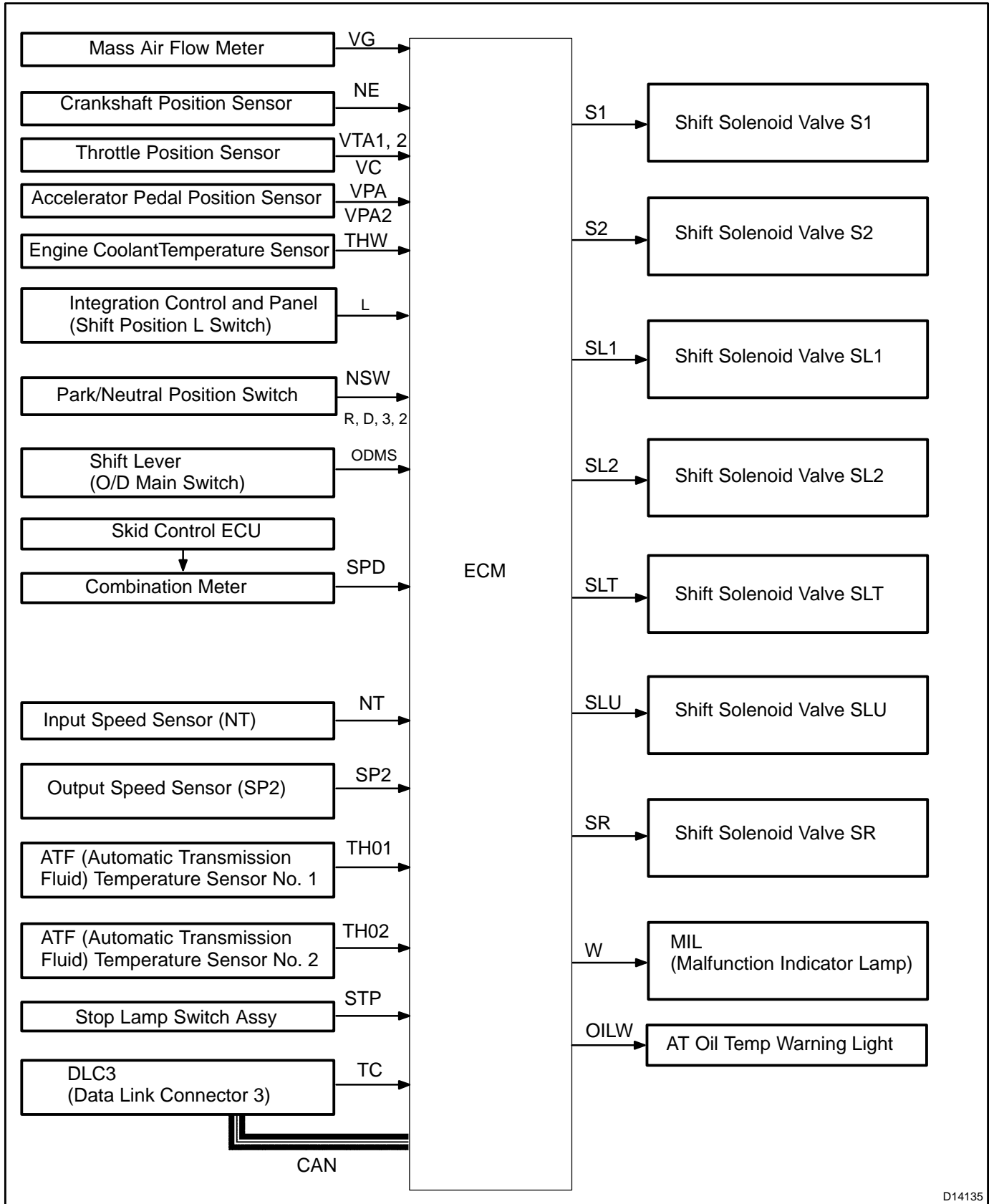
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D14134



SYSTEM DIAGRAM

The configuration of the electronic control system in the A750E automatic transmission is as shown in the following chart.



SYSTEM DESCRIPTION

SYSTEM DESCRIPTION


The ECT (Electronic controlled automatic transmission) is an automatic transmission that electronically controls shift timing using the ECM. The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point, based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.

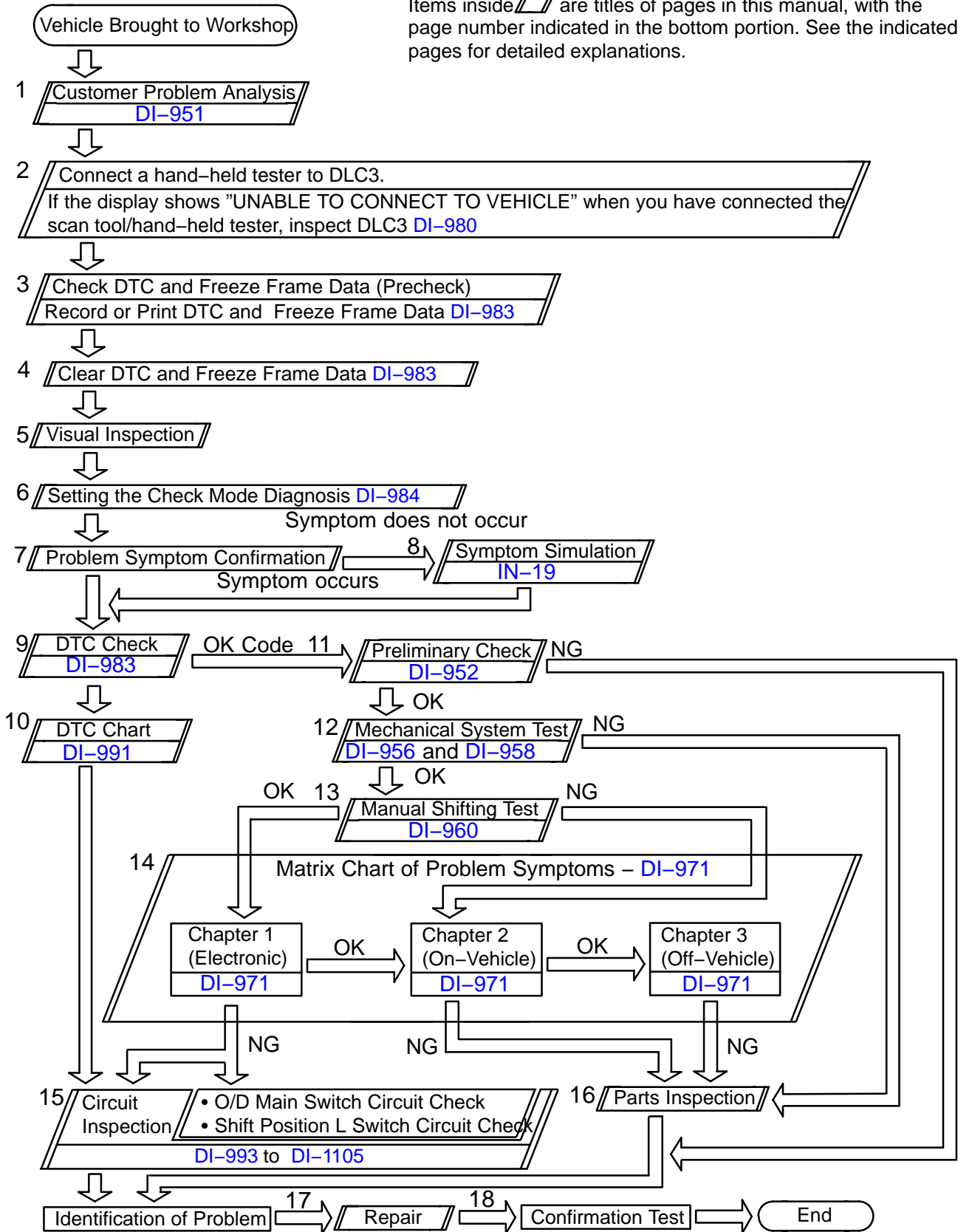
Shift shock has been reduced by controlling the engine and transmission simultaneously.

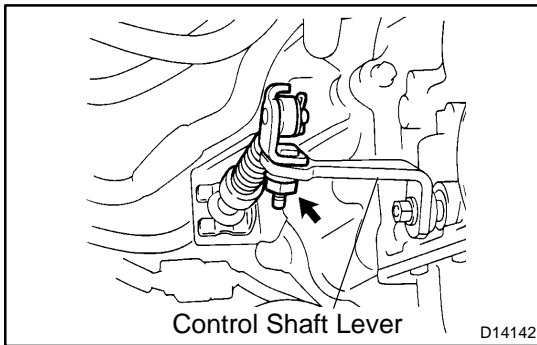
In addition, the ECT has features such as follows:

- Diagnostic function.
- Fail-safe function when a malfunction occurs.

HOW TO PROCEED WITH TROUBLESHOOTING

Items inside  are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.





BASIC INSPECTION

1. INSPECT AND ADJUST SHIFT LEVER POSITION

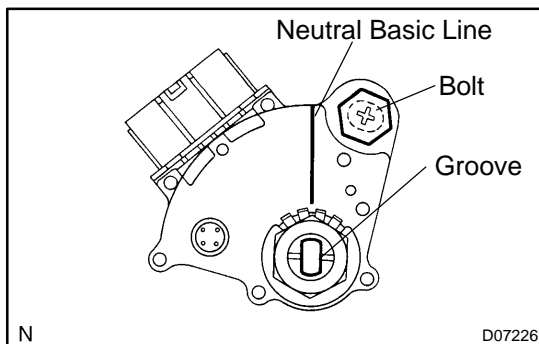
- (a) When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator comes on in accordance with the shift lever position.

If the indicator and shift lever position do not match, carry out the following adjustment procedures.

- (1) Remove the nut and disconnect the shift control cable from the control shaft lever.
- (2) Move the control shaft fully rearward.
- (3) Return the control shaft lever 2 notches to the N position.
- (4) Set the shift lever to the N position.
- (5) Connect the shift control cable and temporarily install the control shaft lever nut.
- (6) While holding the shift lever lightly toward the R position side, tighten the control shaft lever nut.

Torque: 14.5 N·m (148 kgf·cm, 11 ft·lbf)

- (7) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to the D position and reverses when shifting it to the R position.



2. INSPECT AND ADJUST PARK/NEUTRAL POSITION

- (a) Check that the engine can be started when the shift lever is in the N or P position, but cannot be started in other positions.

If operation cannot be done as stated above, carry out the following adjustment procedures.

- Loosen the park/neutral position switch bolt and set the shift lever to the N position.
- Align the groove with the neutral basic line.
- Hold in position and tighten the bolt.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (b) For continuity inspection of the park/neutral position switch, see page [DI-993](#).

3. CHECK IDLE SPEED

Idle speed (In N position and air conditioner OFF):
700 ± 50 rpm

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

2. ROAD TEST

NOTICE:

Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80 °C (122 to 176 °F).

(a) D position test:

Shift into the D position and fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.

Check that 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts take place, and that the shift points conform to the automatic shift schedule (See page [SS-50](#)).

HINT:

5th Gear Up-shift Prohibition Control

- Engine coolant temperature is 55 °C (131 °F) or less and vehicle speed is at 51 km/h (32 mph) or less.

4th Gear Up-shift Prohibition Control

- Engine coolant temperature is 47 °C (117 °F) or less and vehicle speed is at 49 km/h (30 mph) or less.

3rd Gear Up-shift Prohibition Control

- Engine coolant temperature is 40 °C (104 °F) or less and vehicle speed is at 45 km/h (28 mph) or less.

5th Gear Lock-up Prohibition Control

- Brake pedal is depressed.
- Accelerator pedal is released.
- Engine coolant temperature is 60 °C (140 °F) or less.

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts.

(3) Check for abnormal noise and vibration.

Check for abnormal noise and vibration when up-shifting from 1 → 2, 2 → 3, 3 → 4 and 4 → 5 while driving with the shift lever in the D position, and check while driving in the lock-up condition.

HINT:

The check for the cause of abnormal noise and vibration must be done thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick-down operation.

Check vehicle speeds when the 2nd to 1st, 3rd to 2nd, 4th to 3rd, and 5th to 4th kick-downs take place while driving with the shift lever in the D position. Confirm that each speed is within the applicable vehicle speed range indicated in the automatic shift schedule (See page [SS-50](#)).

(5) Check abnormal shock and slip at kick-down.

(6) Check the lock-up mechanism.

- Drive in the D position (5th gear), at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:

If there is a big jump in engine speed, there is no lock-up.

(b) 4 (O/D OFF) position test:

Shift into the 4 (O/D OFF) position and fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.

Check that the 1 → 2, 2 → 3 and 3 → 4 up-shifts take place and that the shift point conforms to the automatic shift schedule (See page [SS-50](#)).

HINT:

- There is no 5th up-shift in the 4 position.
- 4th Gear Lock-up Prohibition Control
 - Brake pedal is depressed.
 - Accelerator pedal is released.
 - Engine coolant temperature is 60 °C (140 °F) or less.
- (2) Check engine braking.
While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.
- (3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.
- (4) Check the lock-up mechanism.
 - Drive in 4 position 4th gear, at a steady speed (lock-up ON).
 - Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:

If there is a big jump in engine speed, there is no lock-up.

(c) 3 position test:

Shift into the 3 position and fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.

Check that the 1 → 2 and 2 → 3 up-shifts takes place and that the shift point conforms to the automatic shift schedule (See page [SS-50](#)).

HINT:

- There is no 4th up-shift and lock-up in the 3 position.
- When the 2nd start switch is ON, there is no 1 → 2 up-shift and 2 → 1 down-shift.
- (2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.
- (3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(d) 2 position test:

Shift into the 2 position and fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.

Check that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (See page [SS-50](#)).

HINT:

- There is no 3rd up-shift and lock-up in the 2 position.
- When the 2nd start switch is ON, there is no 1 → 2 up-shift and 2 → 1 down-shift.

- (2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
 - (3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.
- (e) L position test:
Shift into the L position and fully depress the accelerator pedal and check the following points.
- (1) Check no up-shift.
While running in the L position, check that there is no up-shift to 2nd gear.
 - (2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.
 - (3) Check for abnormal noises during acceleration and deceleration.
- (f) R position test:
Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.
- CAUTION:**
Before conducting this test, ensure that the test area is free from people and obstruction.
- (g) P position test:
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check that the parking lock pawl holds the vehicle in place.

MECHANICAL SYSTEM TESTS

1. PERFORM MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D positions.

NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature 50 to 80°C (122 to 176°F).**
- **Do not continuously run this test for longer than 5 seconds.**
- **To ensure safety, do this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
 - (1) Chock all 4 wheels.
 - (2) Connect a hand-held tester to DLC3.
 - (3) Fully apply the parking brake.
 - (4) Using your left foot, keep the brake pedal firmly depressed.
 - (5) Start the engine.
 - (6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot.
 - (7) Quickly read the stall speed at this time.

Stall speed: 2,400 ± 150 rpm

Evaluation:

Problem	Possible cause
(a) Stall engine speed is low in D position	<ul style="list-style-type: none"> • Engine power output may be insufficient • Stator one-way clutch is not operating properly <p>HINT: If the value is less than the specified value by 600 rpm or more, the torque converter could be faulty.</p>
(b) Stall engine speed is high in D position	<ul style="list-style-type: none"> • Line pressure is too low • Clutch No.1 (C₁) slipping • One-way clutch No.3 (F₃) is not operating properly • Improper fluid level

- (b) Measure the time lag.
 When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the direct clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).
- Be sure to allow for a 1 minute interval between tests.
- Perform the test three times, and measure the time lags. Calculate the average value of the three time lags.
 - (1) Connect a hand-held tester to DLC3.
 - (2) Fully apply the parking brake.
 - (3) Start and warm up the engine and check idle speed.

Idle speed: approx. 700 rpm (In N position and A/C OFF)

- (4) Shift the lever from the N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag:

N → D Less than 1.2 seconds

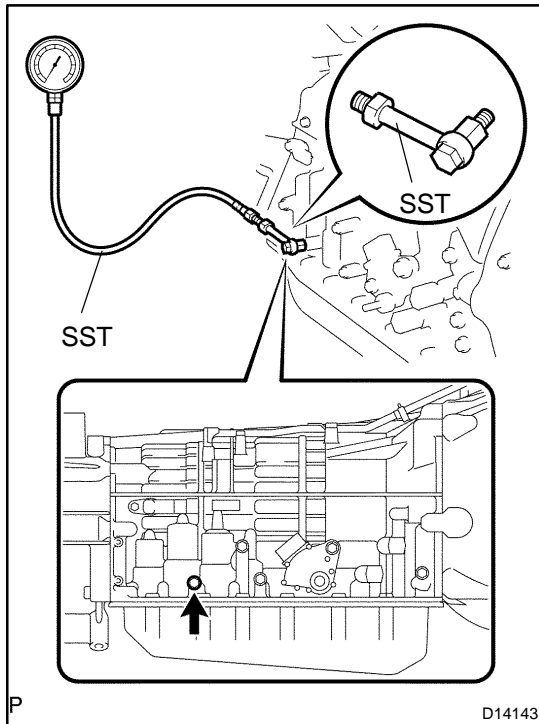
- (5) In the same manner, measure the time lag for N → R.

Time lag:

N → R Less than 1.5 seconds

Evaluation (If N → D time or N → R time lag is longer than the specified):

Problem	Possible cause
N → D time lag is longer than specified	<ul style="list-style-type: none"> • Line pressure is too low • Clutch No.1 (C₁) worn • One-way clutch No.3 (F₃) is not operating properly
N → R time lag is longer than specified	<ul style="list-style-type: none"> • Line pressure is too low • Clutch No.3 (C₃) worn • Brake No.4 (B₄) worn • One-way clutch No.1 (F₁) is not operating properly



HYDRAULIC TEST

1. PERFORM HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).
- The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.
- Be careful to prevent SST hose from interfering with the exhaust pipe.
- This check must be conducted after checking and adjusting engine.
- Perform under condition that A/C is OFF.
- When conducting stall test, do not continue more than 10 seconds.

- (1) Warm up the ATF (Automatic Transmission Fluid).
- (2) Lift the vehicle up.
- (3) Remove the test plug on the transmission case center right side and connect SST.

SST 09992-00095 (09992-00231, 09992-00271)

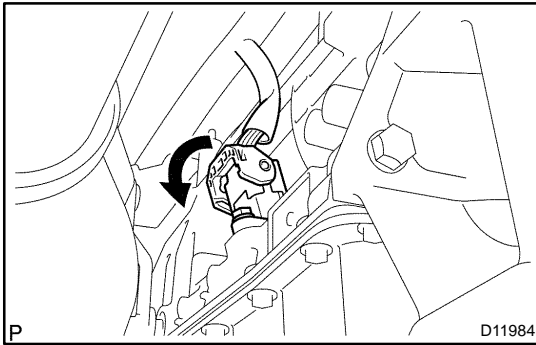
- (4) Fully apply the parking brake and chock the 4 wheels.
- (5) Start the engine and check idling speed.
- (6) Keep your left foot pressing firmly on the brake pedal and shift into D position.
- (7) Measure the line pressure when the engine is idling.
- (8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
- (9) In the same manner, do the test in R position.

Specified line pressure:

Condition	D position kPa (kgf / cm ² , psi)	R position kPa (kgf / cm ² , psi)
Idling	363 to 423 kPa (3.7 to 4.3 kgf/cm ² , 53 to 61 psi)	484 to 564 kPa (4.9 to 5.8 kgf/cm ² , 70 to 82 psi)
Stall test	1,282 to 1,381 kPa (13.1 to 14.1 kgf/cm ² , 186 to 200 psi)	1,218 to 1,338 kPa (12.4 to 13.6 kgf/cm ² , 177 to 194 psi)

Evaluation

Problem	Possible cause
Measured values are higher than specified in all positions	<ul style="list-style-type: none"> • Shift solenoid valve (SLT) defective • Regulator valve defective
Measured values are lower than specified in all positions	<ul style="list-style-type: none"> • Shift solenoid valve (SLT) defective • Regulator valve defective • Oil pump defective
Pressure is low in the D position only	<ul style="list-style-type: none"> • D position circuit fluid leak • Clutch No.1 (C₁) defective
Pressure is low in the R position only	<ul style="list-style-type: none"> • R position circuit fluid leak • Clutch No.3 (C₃) defective • Brake No.4 (B₄) defective



MANUAL SHIFTING TEST

1. MANUAL SHIFTING TEST

HINT:

- With this test, it can be determined whether the trouble occurs in the electrical circuit or is a mechanical problem in the transmission.
- If any abnormalities are found in the following test, the problem is in the transmission itself.

(a) Disconnect the connector of the transmission wire.

(b) Drive with the transmission wire disconnected.

Shifting the shift lever to the L, 2, 3, 4 and D position to check whether the shifting condition changes the table below.

Shift Position	Shifting Condition
L ↔ 2	No Shift (Not Change)
2 ↔ 3	Down Shift ↔ Up Shift
3 ↔ 4	Down Shift ↔ Up Shift
4 ↔ D	No Shift (Not Change)

HINT:

When driving with the transmission wire disconnected, the gear position will be as follows:

- When the shift lever is in the L or the 2 position, the gear is held in the 1st position.
- When the shift lever is in the 3rd position, the gear is held in the 3rd position.
- When the shift lever is in the 4 or the D position, the gear is held in the 4th position.
- When the shift lever is in the R or the P position, the gear is also in the R or the P position respectively.

(c) Connect the connector of the transmission wire.

(d) Clear the DTC (See page [DI-983](#)).

INITIALIZATION

1. RESET MEMORY

NOTICE:

- **Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assy or ECM.**
- **The RESET MEMORY can be performed only with the Hand-held tester.**

HINT:

The ECM memorizes the condition that the ECT controls the automatic transmission assy and engine assy according to those characteristics. Therefore, when the automatic transmission assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

Reset procedure is as follows.

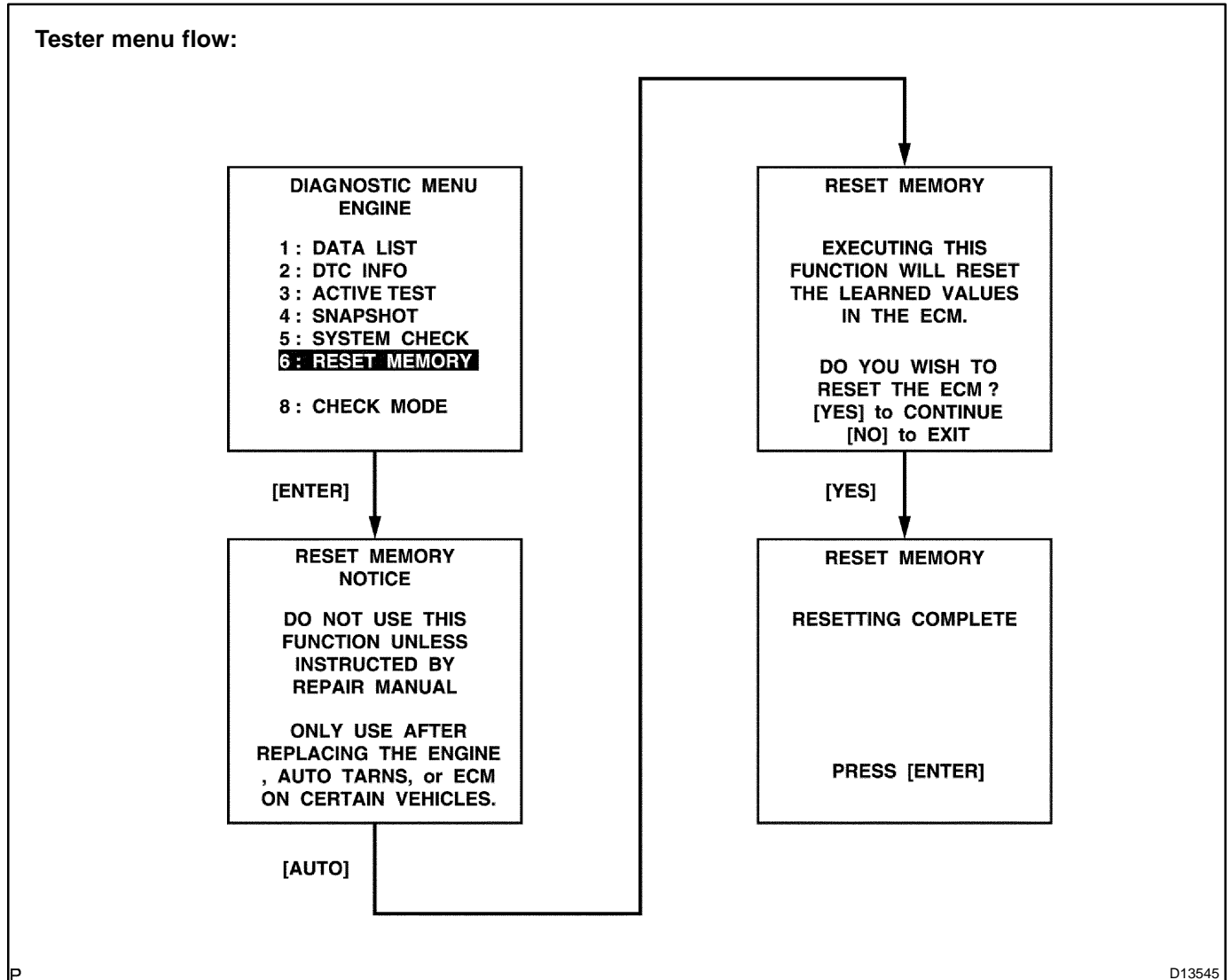
- (a) Turn the ignition switch off.
- (b) Connect the hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn the hand-held tester main switch on.
- (e) Select the item "DIAGNOSIS/ENHANCED OBD II".
- (f) Perform the reset memory procedure from the ENGINE menu.

NOTICE:

After performing the RESET MEMORY, be sure to perform the ROAD TEST (See page [DI-953](#)) described earlier.

HINT:

The ECM learns through use of the ROAD TEST.



LIST OF DISABLE A MONITOR

HINT:

This table indicates ECM monitoring status for the items in the upper columns if the DTCs in each line on the left are being set.

As for the "X" mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

Monitor detected malfunction	Fault code		Component/system		Monitor disablement (X - disabled)																																
	Upper	Lower	Upper	Lower	P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0031,32,51,52	P0033,56	P0037,38,57,58	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308						
			VVT VSV1,2	VVT System1 - Advance																																	
			VVT System1 - Retard																																		
			VVT System - Misalignment																																		
			VVT System2 - Advance																																		
			VVT System2 - Retard																																		
			O2 Sensor Heater - Sensor1																																		
			A/F Sensor Heater - Sensor1																																		
			O2 Sensor Heater - Sensor2																																		
			O2 Sensor Heater - Sensor3																																		
			MAF sensor																																		
			MAP sensor																																		
			IAT sensor																																		
			ECT sensor																																		
			TP sensor																																		
			Insufficient ECT for Closed Loop																																		
			Thermostat																																		
			O2 Sensor - Sensor1																																		
			O2 Sensor, A/F Sensor(No Activity) - Sensor1																																		
			O2 Sensor - Sensor2																																		
			O2 Sensor - Sensor3																																		
			Fuel system																																		
			Misfire																																		
			Knock sensor																																		
			CKP sensor																																		
			CMP sensor																																		
			VVT sensor1,2																																		
			Ignitor																																		
			CKP sensor 2																																		
			EGR system (closed)																																		
			EGR system (open)																																		
			Lift sensor																																		
			Catalyst																																		
			EVAP system																																		
			EVAP press sensor																																		

DIAGNOSTICS - AUTOMATIC TRANSMISSION (A750E for 1GR-FE)

Monitor detected malfunction	Fault code		Component/ system		Monitor disablement (X - disabled)																											
	Code 1	Code 2	Code 1	Code 2	P0325-P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796		
					Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1		
P0010,P0020	P0010,P0020	VVT VSV1,2																													X	
P0011	P0011	VVT System1 - Advance								X	X				X	X					X											
P0012	P0012	VVT System1 - Retard								X	X				X	X					X											
P0016,P0018	P0016,P0018	VVT System - Misalignment																														
P0021	P0021	VVT System2 - Advance								X	X				X	X					X											
P0022	P0022	VVT System2 - Retard								X	X				X	X					X											
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1								X	X				X						X										X	
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1								X	X				X						X											
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2													X																	
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																														
P0100,P0101	P0100-P0103	MAF sensor								X	X				X	X					X	X									X	
P0105,P0106	P0105-P0108	MAP sensor								X	X				X	X					X	X									X	
P0110	P0110-P0113	IAT sensor								X	X				X																X	
P0115,P0116	P0115-P0118	ECT sensor								X	X		X	X	X	X					X	X									X	
P0120,P0121	P0120-P0223,P2135	TP sensor								X	X				X	X		X			X	X									X	
P0125	P0125	Insufficient ECT for Closed Loop								X	X		X	X	X	X					X	X									X	
P0128	P0128	Thermostat																														
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1								X	X				X						X										X	
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X	X				X						X										X	
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2													X																	
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																														
P0171,P0172	P0171,P0172	Fuel system								X	X				X	X					X										X	
P0300-P0308	P0300-P0308	Misfire													X	X					X										X	
P0325,P0330	P0325-P0333	Knock sensor								X	X				X	X															X	
P0335	P0335	CKP sensor								X	X				X	X					X										X	
P0340, P0341	P0340, P0341	CMP sensor								X	X				X	X					X										X	
P0340-P0346	P0340-P0346	VVT sensor1,2								X	X				X	X					X											
P0351-P0358	P0351-P0358	Ignitor								X	X				X	X					X										X	
P0385	P0385	CKP sensor 2								X	X				X	X					X											
P0401	P0401	EGR system (closed)								X	X				X	X					X										X	
P0402	P0402	EGR system (open)								X	X				X	X					X										X	
P0405,P0409	P0405-P0409	Lift sensor													X	X					X											
P0420,P0430	P0420,P0430	Catalyst													X	X																
P0442-P0456	P0442-P0456	EVAP system													X	X					X											
P0450,P0451	P0450-P0453	EVAP press sensor													X	X					X											

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Monitor detected malfunction	Fault code		Monitor disablement (X - disabled)	
	Fault code	Component/ system	Fault code	Component/ system
P0500	P0500	VSS		
P0511	P0511	IAC valve		
P0510	P0510	Idle switch		
P0560	P0560	System Voltage		
P0617	P0617	Starter signal		
P0705	P0705	Shift lever position switch		
P0710	P0710-P0713	Trans fluid temp sensor		
P0720-P0793	P0720-P0793	Output speed sensor		
P0715-P0717	P0715-P0717	Input speed sensor		
P0724	P0724	Stop lamp switch		
P0741-P0796	P0741-P0796	Trans solenoid (function)		
P0748-P0798	P0748-P0798	Trans solenoid (range)		
P0850	P0850	PNP switch		
P1010,P1020	P1010,P1020	VVTL		
P1011,12,(21,22)	P1011,12,(21,22)	VVTL system1,(2)		
P1126	P1126	Electronic magnet clutch		
P1129	P1129	Electronic throttle system		
P1430	P1430	HC adsorber ACT press sensor		
P2004,6	P2004,6	Intake Manifold Runner Control		
P2009,10	P2009,10	Intake Manifold Runner Control Circuit		
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor		
P2102,P2103	P2102,P2103	Throttle motor		
P2120-P2138	P2120-P2138	Accel position sensor		
P2196,P2198	P2196,P2198	A/F sensor (rationality)		
P2226	P2226	BARO sensor		
P2237,P2240	P2237,P2240	A/F sensor (open)		
P2423,24	P2423,24	HC Adsorption Catalyst		
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)		
P2431	P2431	AIR Pressure Sensor(Rationality)		
P2440	P2440	AIR control valve stuck open		
P2441	P2441	AIR control valve stuck close		
P2444	P2444	AIP stuck On		
P2445	P2445	AIP stuck Off		
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)		
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)		

DIAGNOSTICS - AUTOMATIC TRANSMISSION (A750E for 1GR-FE)

Monitor detected malfunction	Fault code		Component/ system		Monitor disablement (X - disabled)																									
	Fault code	Fault code	Component/ system		P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12,(21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03	
					P0741-P0796	P0748-P0999	P0850	P1010,P1020	P1011,12,(21,22)	P1126	P1129	P1430	P2004,6	P2009,10	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03	
	Trans solenoid (function)2	Trans solenoid (range)	PNP switch	VVTL	VVTL system1,(2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT, press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	Hc Adsorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1					
P0010,P0020	P0010,P0020	VVT VSV1,2																												
P0011	P0011	VVT System1 - Advance																						X	X	X	X			
P0012	P0012	VVT System1 - Retard																						X	X	X	X			
P0016,P0018	P0016,P0018	VVT System - Misalignment																						X	X	X	X			
P0021	P0021	VVT System2 - Advance																						X	X	X	X			
P0022	P0022	VVT System2 - Retard																						X	X	X	X			
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																						X	X	X	X			
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																						X	X	X	X			
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																						X	X	X	X			
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																						X	X	X	X			
P0100,P0101	P0100-P0103	MAF sensor					X	X									X							X	X	X	X			
P0105,P0106	P0105-P0108	MAP sensor					X	X									X							X	X	X	X			
P0110	P0110-P0113	IAT sensor															X							X	X	X	X			
P0115,P0116	P0115-P0118	ECT sensor		X			X	X									X							X	X	X	X			
P0120,P0121	P0120-P0223,P2135	TP sensor															X							X	X	X	X			
P0125	P0125	Insufficient ECT for Closed Loop		X			X										X							X	X	X	X			
P0128	P0128	Thermostat																												
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																						X	X	X	X			
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1															X							X	X	X	X			
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2															X							X	X	X	X			
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																						X	X	X	X			
P0171,P0172	P0171,P0172	Fuel system															X							X	X	X	X			
P0300-P0308	P0300-P0308	Misfire															X							X	X	X	X			
P0325,P0330	P0325-P0333	Knock sensor																						X	X	X	X			
P0335	P0335	CKP sensor					X	X									X							X	X	X	X			
P0340, P0341	P0340, P0341	CMP sensor					X	X									X							X	X	X	X			
P0340-P0346	P0340-P0346	VVT sensor1,2																						X	X	X	X			
P0351-P0358	P0351-P0358	Ignitor																						X	X	X	X			
P0385	P0385	CKP sensor 2					X	X									X							X	X	X	X			
P0401	P0401	EGR system (closed)																												
P0402	P0402	EGR system (open)															X							X	X	X	X			
P0405,P0409	P0405-P0409	Lift sensor																						X	X	X	X			
P0420,P0430	P0420,P0430	Catalyst																												
P0442-P0456	P0442-P0456	EVAP system															X							X	X	X	X			
P0450,P0451	P0450-P0453	EVAP press sensor																						X	X	X	X			

C

Monitor detected malfunction	Fault code		Component/ system		Monitor disablement (X - disabled)	
	Fault code	Component/ system	Fault code	Component/ system	Fault code	Component/ system
P0500	P0500	VSS	X	Trans solenoid (function) ²	P0741-P0796	Trans solenoid (function) ²
P0511	P0511	IAC valve		Trans solenoid (range)	P0748-P0798	Trans solenoid (range)
P0510	P0510	Idle switch		PNP switch	P0850	PNP switch
P0560	P0560	System Voltage		VVTL	P1010,P1020	VVTL
P0617	P0617	Starter signal		VVTL system1,(2)	P1011,12,(21,22)	VVTL system1,(2)
P0705	P0705	Shift lever position switch		Electronic magnet clutch	P1126	Electronic magnet clutch
P0710	P0710-P0713	Trans fluid temp sensor		Electronic throttle system	P1129	Electronic throttle system
P0720-P0793	P0720-P0793	Output speed sensor		HC adsorber ACT press sensor	P1430	HC adsorber ACT press sensor
P0715-P0717	P0715-P0717	Input speed sensor		Intake Manifold Runner Control	P2004,6	Intake Manifold Runner Control
P0724	P0724	Stop lamp switch		Intake Manifold Runner Control Circuit	P2009,10	Intake Manifold Runner Control Circuit
P0741-P0796	P0741-P0796	Trans solenoid (function)	X	Intake Manifold Runner Position Sensor	P2014,16,17	Intake Manifold Runner Position Sensor
P0748-P0798	P0748-P0798	Trans solenoid (range)	X	Throttle motor	P2102,P2103	Throttle motor
P0850	P0850	PNP switch		Accel position sensor	P2120-P2138	Accel position sensor
P1010,P1020	P1010,P1020	VVTL		A/F Sensor(Rationality) - Sensor1	P2196,P2198	A/F Sensor(Rationality) - Sensor1
P1011,12,(21,22)	P1011,12,(21,22)	VVTL system1,(2)		BARO sensor	P2226	BARO sensor
P1126	P1126	Electronic magnet clutch		A/F Sensor(Open) - Sensor1	P2237,P2240	A/F Sensor(Open) - Sensor1
P1129	P1129	Electronic throttle system		HC Adsorption Catalyst	P2423,24	HC Adsorption Catalyst
P1430	P1430	HC adsorber ACT press sensor		AIR Pressure Sensor(Low/High)	P2430,2,3	AIR Pressure Sensor(Low/High)
P2004,6	P2004,6	Intake Manifold Runner Control		AIR Pressure Sensor(Rationality)	P2431	AIR Pressure Sensor(Rationality)
P2009,10	P2009,10	Intake Manifold Runner Control Circuit		AIR control valve stuck open	P2440	AIR control valve stuck open
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor		AIR control valve stuck close	P2441	AIR control valve stuck close
P2102,P2103	P2102,P2103	Throttle motor		AIP stuck On	P2444	AIP stuck On
P2120-P2138	P2120-P2138	Accel position sensor		AIP stuck Off	P2445	AIP stuck Off
P2196,P2198	P2196,P2198	A/F sensor (rationality)		Trans solenoid(SLU-SLD)	P2714-P2759	Trans solenoid(SLU-SLD)
P2226	P2226	BARO sensor		A/F Sensor (Slow response) - Sensor1	P2A00,P2A03	A/F Sensor (Slow response) - Sensor1
P2237,P2240	P2237,P2240	A/F sensor (open)				
P2423,24	P2423,24	HC Adsorption Catalyst				
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)				
P2431	P2431	AIR Pressure Sensor(Rationality)				
P2440	P2440	AIR control valve stuck open				
P2441	P2441	AIR control valve stuck close				
P2444	P2444	AIP stuck On				
P2445	P2445	AIP stuck Off				
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)				
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)				

MONITOR DRIVE PATTERN

1. MONITOR DRIVE PATTERN FOR ECT TEST

- (a) Perform this drive pattern as one method to simulate the detection conditions of the ECT malfunctions. (The DTCs may not be detected due to the actual driving conditions. And some codes may not be detected through this drive pattern.)

HINT:

Preparation for driving

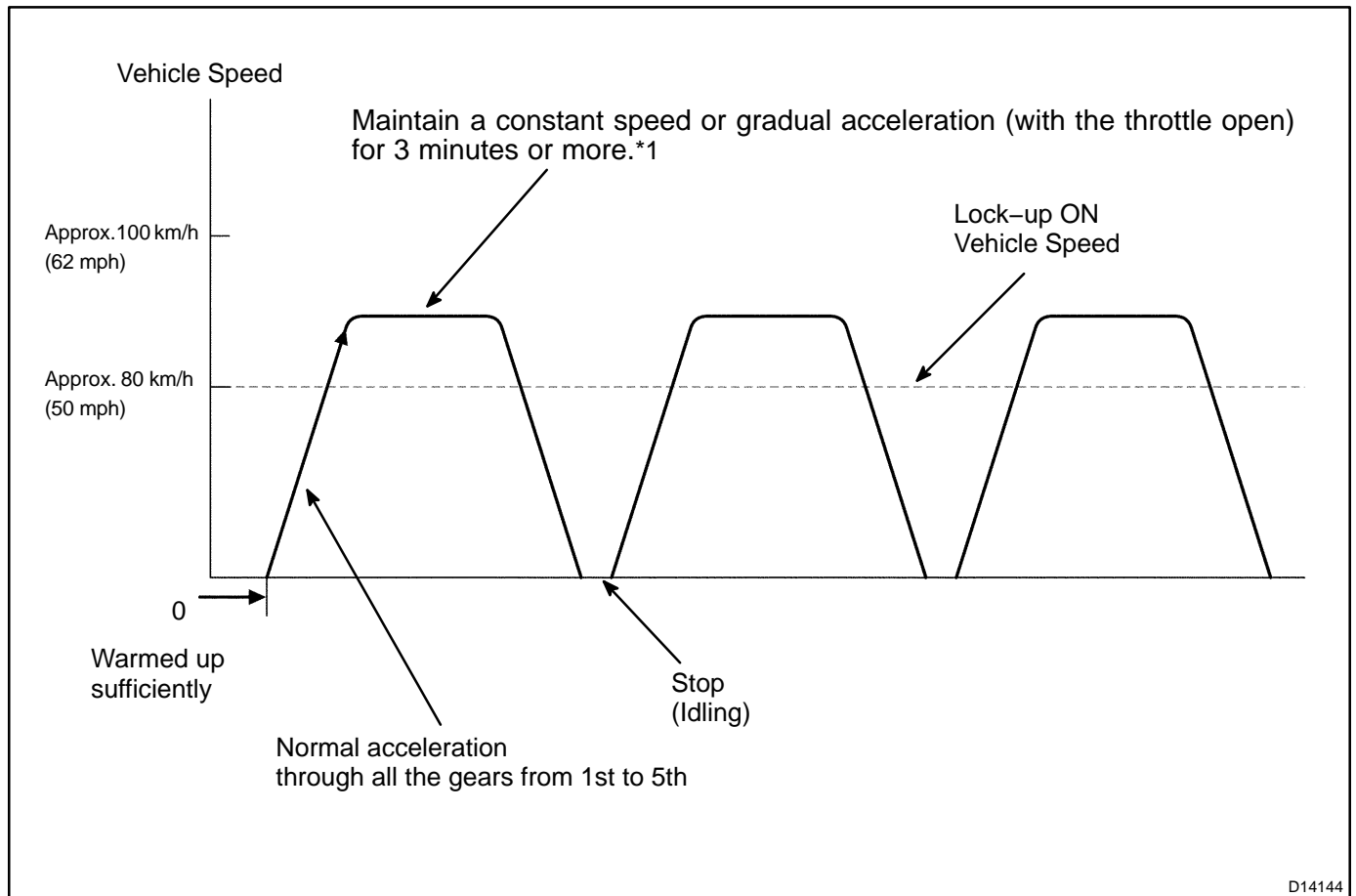
- Warm up the engine sufficiently. (Engine coolant temperature is 60 °C (140 °F) or higher).
- Drive the vehicle when the atmospheric temperature is –10 °C (14 °F) or higher. (Malfunction is not detected when the atmospheric temperature is –10 °C (14 °F) or less).

Notice in driving

- Drive the vehicle through all gears.
Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON).
- Repeat the above driving pattern three times or more.

NOTICE:

- **The monitor status can be checked using the OBD II scan tool. When using the hand-held tester, monitor status can be found in the "ENHANCED OBD II / DATA LIST" or under "CARB OBD II".**
- **In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**
- **Perform this drive pattern on a level road as much as possible and strictly observe the posted speed limits and traffic laws while driving.**

**HINT:**

*1: Drive at such a speed in the uppermost gear, to engage lock-up. The vehicle can be driven at a speed lower than that in the above diagram under the lock-up condition.

NOTICE:

It is necessary to drive the vehicle for approximately 30 minutes to detect DTC P0711 (ATF temperature sensor malfunction).

PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the diagnostic trouble code check although the trouble still occurs, check the electrical circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

1. Chapter 1: Electronic Circuit Matrix Chart

- Refer to the table below when the trouble cause is considered to be electrical.
- If the instruction "Proceed to next circuit inspection shown on matrix chart" is given in the flow chart of each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

HINT:

*1: When the circuit on which mark *1 is attached is defective, DTC could be output (see page [DI-991](#)).

Symptom	Suspect Area	See page
No up-shift (A particular gear, from 1st to 4th gear, is not up-shifted)	1. Shift solenoid valve (S1) circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-1058 DI-1063 IN-30
No up-shift (4th → 5th)	1. O/D main switch circuit 2. Engine coolant temp. sensor circuit *1 3. Speed sensor NT circuit *1 4. Shift solenoid valve (SL1) circuit *1 5. Shift solenoid valve (SL2) circuit *1 6. Shift solenoid valve (SR) circuit *1 7. ECM	DI-1102 DI-57 DI-1008 DI-1020 DI-1048 DI-1068 IN-30
No up-shift (3rd → 4th)	1. Engine coolant temp. sensor circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-57 DI-1063 IN-30
No up-shift (1st → 2nd)	1. Shift position L switch circuit 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-1105 DI-1063 IN-30
No down-shift (5th → 4th)	1. O/D main switch circuit 2. Shift solenoid valve (SL1) circuit *1 3. Shift solenoid valve (SL2) circuit *1 4. Shift solenoid valve (SR) circuit *1 5. ECM	DI-1102 DI-1020 DI-1048 DI-1068 IN-30
No down-shift (2nd → 1st)	1. Shift position L switch circuit 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-1105 DI-1063 IN-30
No down-shift (A particular gear, from 1st to 4th gear, is not down-shifted)	1. Shift solenoid valve (S1) circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-1058 DI-1063 IN-30
No lock-up	1. ATF temperature sensor circuit *1 2. Stop light switch circuit *1 3. Speed sensor NT circuit *1 4. Shift solenoid valve (SLU) circuit *1 5. Engine coolant temp. sensor circuit *1 6. ECM	DI-999 DI-1017 DI-1008 DI-1097 DI-57 IN-30
No lock-up off	1. Shift solenoid valve (SLU) circuit *1 2. ECM	DI-1097 IN-30

Shift point too high or too low	1. Shift solenoid valve (SLT) circuit *1 2. Speed sensor NT circuit *1 3. Speed sensor SP2 circuit *1 4. Throttle position sensor circuit *1 5. ATF temperature sensor circuit *1 7. ECM	DI-1079 DI-1008 DI-1013 DI-57 DI-999 IN-30
Up-shift to 5th from 4th while shift lever is in 4 position	1. O/D main switch circuit 2. ECM	DI-1102 IN-30
Up-shift to 5th from 4th while engine is cold	1. Engine coolant temp. sensor circuit *1 2. ECM	DI-57 IN-30
Up-shift to 4th from 3rd while shift lever is in 3 position	1. Park/neutral position switch circuit *1 2. ECM	DI-993 IN-30
Up-shift to 3rd from 2nd while shift lever is in 2 position	1. Park/neutral position switch circuit *1 2. ECM	DI-993 IN-30
Up-shift to 2nd from 1st while shift lever is in L position	1. Shift position L switch circuit 2. ECM	DI-1105 IN-30
Harsh engagement (N → D)	1. Speed sensor NT circuit *1 2. Shift solenoid valve (SL1) circuit *1 3. Shift solenoid valve (SLT) circuit *1 4. ECM	DI-1008 DI-1020 DI-1079 IN-30
Harsh engagement (Lock-up)	1. Speed sensor NT circuit *1 2. Speed sensor SP2 circuit *1 3. Shift solenoid valve (SLU) circuit *1 4. ECM	DI-1008 DI-1013 DI-1097 IN-30
Harsh engagement (Any driving position)	ECM	IN-30
Poor acceleration	1. ATF temperature sensor No.2 circuit *1 2. Engine coolant temp. sensor circuit *1 3. Shift solenoid valve (SLT) circuit *1 4. ECM	DI-1083 DI-57 DI-1079 IN-30
No engine braking	ECM	IN-30
No kick-down	ECM	IN-30
Engine stalls when starting off or stopping	1. Shift solenoid valve (SLU) circuit *1 2. ECM	DI-1079 IN-30
AT Oil Temp. warning light remains on	1. ATF temperature sensor No.2 circuit *1	DI-1083
Lock-up at 3rd gear	2. Engine coolant temp. sensor circuit *1	DI-57
Shift point too high	3. ECM	IN-30
Malfunction in shifting	1. Park/neutral position switch circuit *1 2. ECM	DI-993 IN-30

Chapter 2: On-Vehicle Repair**(★: A750E, A750F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM999U)**

Symptom	Suspect Area	See page
Vehicle does not move with shift lever in any forward position and reverse position	1. Transmission control cable 2. Manual valve 3. Parking lock pawl 4. Off-vehicle repair matrix chart	DI-952 ★ ★ -
Vehicle does not move with shift lever in R position	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No up-shift (1st → 2nd)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No up-shift (2nd → 3rd)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No up-shift (3rd → 4th)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No up-shift (4th → 5th)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No down-shift (5th → 4th)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No down-shift (4th → 3rd)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No down-shift (3rd → 2nd)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No down-shift (2nd → 1st)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No lock-up or No lock-up off	1. Shift solenoid valve (SLU) 2. Valve body assy 3. Off-vehicle repair matrix chart	DI-1089 AT-12 -
Harsh engagement (N → D)	1. Shift solenoid valve (SL1) 2. Valve body assy 3. C ₁ accumulator 4. Off-vehicle repair matrix chart	DI-1020 AT-12 ★ -
Harsh engagement (Lock-up)	1. Shift solenoid valve (SLU) 2. Valve body assy 3. Off-vehicle repair matrix chart	DI-1089 AT-12 -
Harsh engagement (N → R)	1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SLU) 3. Valve body assy 4. C ₃ accumulator 5. Off-vehicle repair matrix chart	DI-1073 DI-1089 AT-12 ★ -
Harsh engagement (1st → 2nd → 3rd → 4th → 5th)	1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SL1) 3. Valve body assy	DI-1073 DI-1020 AT-12
Harsh engagement (1st → 2nd)	1. Valve body assy 2. B ₃ accumulator 3. Off-vehicle repair matrix chart	AT-12 ★ -
Harsh engagement (2nd → 3rd)	1. Valve body assy 2. C ₃ accumulator 3. Off-vehicle repair matrix chart	AT-12 ★ -
Harsh engagement (3rd → 4th)	1. Valve body assy 2. C ₂ accumulator 3. Off-vehicle repair matrix chart	AT-12 ★ -

Harsh engagement (4th → 5th)	<ol style="list-style-type: none"> 1. Shift solenoid valve (SL1) 2. Shift solenoid valve (SL2) 3. Valve body assy 4. Off-vehicle repair matrix chart 	DI-1020 DI-1042 AT-12 –
Harsh engagement (5th → 4th)	<ol style="list-style-type: none"> 1. Shift solenoid valve (SL1) 2. Shift solenoid valve (SL2) 3. Valve body assy 4. Off-vehicle repair matrix chart 	DI-1020 DI-1042 AT-12 –
Slip or shudder (Forward and reverse)	<ol style="list-style-type: none"> 1. Transmission control cable 2. Valve body assy 3. Oil strainer 4. Off-vehicle repair matrix chart 	DI-952 AT-12 AT-12 –
No engine braking (1st: L position)	<ol style="list-style-type: none"> 1. Valve body assy 2. Off-vehicle repair matrix chart 	AT-12 –
No engine braking (2nd: 2 position)	<ol style="list-style-type: none"> 1. Valve body assy 2. Off-vehicle repair matrix chart 	AT-12 –
No kick-down	Valve body assy	AT-12
Shift point too high or too low	<ol style="list-style-type: none"> 1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SL1) 3. Valve body assy 	DI-1073 DI-1020 AT-12
Poor acceleration	<ol style="list-style-type: none"> 1. Shift solenoid valve (SLT) 2. Valve body assy 	DI-1073 AT-12
Engine stalls when starting off or stopping	<ol style="list-style-type: none"> 1. Shift solenoid valve (SLU) 2. Valve body assy 	DI-1089 AT-12

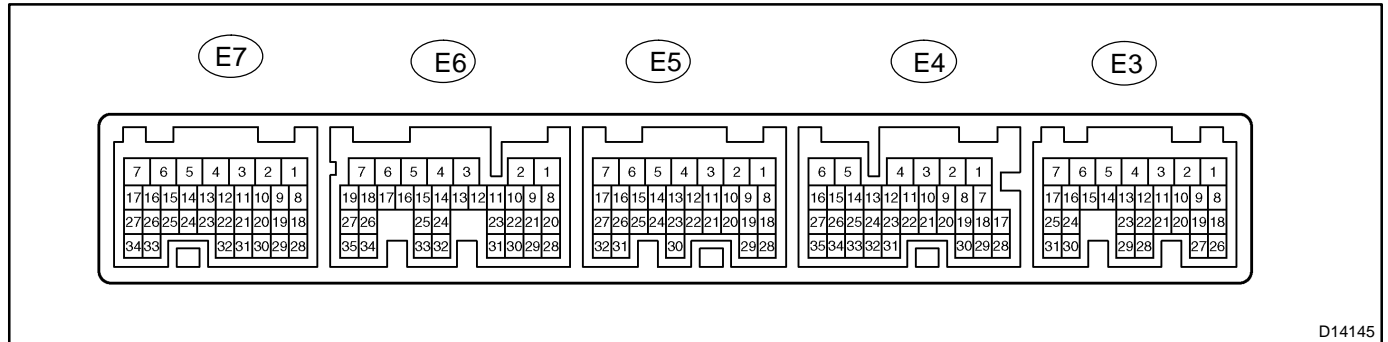
Chapter 3: Off-Vehicle Repair**(★: A750E, A750F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM999U)**

Symptom	Suspect Area	See page
Vehicle does not move with shift lever in any forward position and reverse position	1. Rear planetary gear unit 2. Torque converter clutch	★ AT-39
Vehicle does not move with shift lever in R position	1. Brake No. 4 (B ₄) 2. Clutch No. 3 (C ₃) 3. One-way clutch No.4 (F ₁)	★ ★ ★
No up-shift (1st → 2nd)	1. Brake No. 3 (B ₃) 2. One-way clutch No.1 (F ₁) 3. One-way clutch No. 2 (F ₂)	★ ★ ★
No up-shift (2nd → 3rd)	Clutch No. 3 (C ₃)	★
No up-shift (3rd → 4th)	Clutch No. 2 (C ₂)	★
No up-shift (4th → 5th)	1. Brake No. 1 (B ₁) 2. Clutch No. 1 (C ₁)	★ ★
No lock-up or No lock-up off	Torque converter clutch	AT-39
Harsh engagement (N → D)	1. Clutch No. 1 (C ₁) 2. One-way clutch No.3 (F ₃)	★ ★
Harsh engagement (N → R)	1. Clutch No. 3 (C ₃) 2. Brake No. 4 (B ₄) 3. One-way clutch No.1 (F ₁)	★ ★ ★
Harsh engagement (1 → 2)	1. Brake No. 3 (B ₃) 2. One-way clutch No.1 (F ₁) 3. One-way clutch No. 2 (F ₂)	★ ★ ★
Harsh engagement (2 → 3)	Clutch No. 3 (C ₃)	★
Harsh engagement (3 → 4)	Clutch No. 2 (C ₂)	★
Harsh engagement (4 → 5th)	1. Brake No. 1 (B ₁) 2. Clutch No. 1 (C ₁)	★ ★
Harsh engagement (Lock-up)	Torque converter clutch	AT-39
Slip or shudder (Forward and reverse: After warm-up)	1. One-way clutch No.1 (F ₁) 2. Clutch No. 3 (C ₃) 3. Torque converter clutch	★ ★ ★
Slip or shudder (Particular position: Just after engine starts)	Torque converter clutch	AT-39
Slip or shudder (R position)	1. Brake No. 4 (B ₄) 2. One-way clutch No.1 (F ₁) 3. Clutch No. 3 (C ₃)	★ ★ ★
Slip or shudder (1st)	1. Clutch No. 1 (C ₁) 2. One-way clutch No.3 (F ₃)	★ ★
Slip or shudder (2nd)	1. Clutch No. 1 (C ₁) 2. Brake No. 3 (B ₃) 3. One-way clutch No.1 (F ₁) 4. One-way clutch No.2 (F ₂)	★ ★ ★ ★
Slip or shudder (3rd)	1. Clutch No. 1 (C ₁) 2. Clutch No. 3 (C ₃) 3. One-way clutch No.1 (F ₁)	★ ★ ★
Slip or shudder (4th)	1. Clutch No. 1 (C ₁) 2. Clutch No. 2 (C ₂)	★ ★
Slip or shudder (5th)	1. Clutch No. 2 (C ₂) 2. Clutch No. 3 (C ₃) 3. Brake No. 1 (B ₁)	★ ★ ★
No engine braking (1st – 4th: D position)	Clutch No. 1 (C ₁)	★

No engine braking (1st: L position)	Brake No. 4 (B ₄)	★
No engine braking (2nd: 2 position)	Brake No. 2 (B ₂)	★
No engine braking (3rd: 3 position)	Brake No. 1 (B ₁)	★
Poor acceleration (All positions)	Torque converter clutch	AT-39
Poor acceleration (5th)	1. Clutch No. 1 (C ₁)	★
	2. Clutch No. 3 (C ₃)	★
	3. Brake No. 1 (B ₁)	★
	4. Front planetary gear unit	★
Engine stalls when starting off or stopping	Torque converter clutch	AT-39

TERMINALS OF ECM

1. ECM



D14145

HINT:

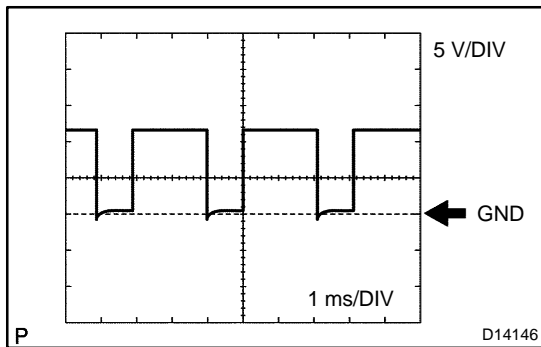
Each ECM terminal's standard voltage is shown in the table below.

In the table, first follow the information under "Condition". Look under "Symbols (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specific Condition".

Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
LMS (E4-9) – E1 (E5-1)	V-W – BR	L shift position switch signal	IG switch ON	10 to 14 V
↑	↑	↑	IG switch ON and Press continuously shift position L switch	Below 1 V
2 (E4-10) – E1 (E5-1)	P-L – BR	2 shift position switch signal	IG switch ON and shift lever 2 and L position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except 2 and L position	Below 1 V
R (E4-11) – E1 (E5-1)	G-R – BR	R shift position switch signal	IG switch ON and shift lever R position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except R position	Below 1 V
D (E4-21) – E1 (E5-1)	W-R – BR	D shift position switch signal	IG switch ON and shift lever D position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except D position	Below 1 V
3 (E4-19) – E1 (E5-1)	G-W – BR	3 shift position switch signal	IG switch ON and shift lever 3 position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except 3 position	Below 1 V
ODMS (E3-12) – E1 (E5-1)	R – BR	O/D main switch signal	IG switch ON	10 to 14 V
↑	↑	↑	IG switch ON and press continuously O/D main switch	Below 1 V
STP (E3-15) – E1 (E5-1)	G-W – BR	Stop lamp switch signal	Brake pedal is depressed	7.5 to 14 V
↑	↑	↑	Brake pedal is released	Below 1.5 V
SLU+ (E6-15) – SLU- (E6-14)	G – L-B	SLU solenoid signal	5th (lock-up) gear	Pulse generation (See waveform 2)
S2 (E6-10) – E1 (E5-1)	W-L – BR	S2 solenoid signal	2nd or 3rd gear	10 to 14 V
↑	↑	↑	1st, 4th or 5th gear	Below 1 V
S1 (E6-11) – E1 (E5-1)	P-L – BR	S1 solenoid signal	1st or 2nd gear	10 to 14 V
↑	↑	↑	3rd, 4th or 5th gear	Below 1 V

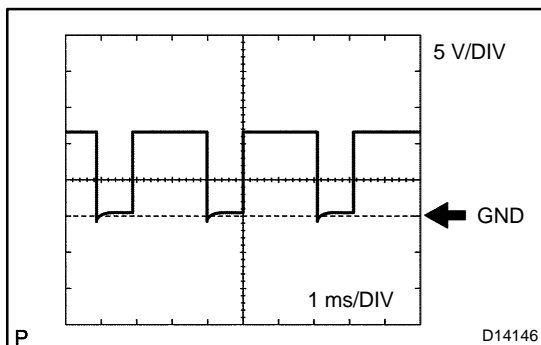
SLT+ (E6-13) – SLT- (E6-12)	B-R – G-W	SLT solenoid signal	Engine idle speed	Pulse generation (See waveform 1)
SR (E6-9) – E1 (E5-1)	W-G – BR	SR solenoid signal	5th gear	10 to 14 V
↑	↑	↑	1st gear	Below 1 V
SL2+ (E6-17) – SL2- (E6-16)	B – W	SL2 solenoid signal	Engine idle speed	Pulse generation (See waveform 3)
SL1+ (E6-19) – SL1- (E6-18)	R-W – GR	SL1 solenoid signal	Engine idle speed	Pulse generation (See waveform 4)
THO1 (E6-24) – E2 (E7-28)	R-L – B-W	No.1 ATF temperature sensor signal	No.1 ATF temperature: 115 °C (239 °F) or more	Below 1.5 V
THO2 (E6-32) – E2 (E7-28)	V – B-W	No.2 ATF temperature sensor signal	No.2 ATF temperature: 115 °C (239 °F) or more	Below 1.5 V
SP2+ (E6-34) – SP2- (E6-26)	Y-R – W-R	Speed sensor (SP2) signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (See waveform 6)
NT+ (E6-35) – NT- (E6-27)	G – R	Speed sensor (NT) signal	Engine idle speed	Pulse generation (See waveform 5)
STAR/NSW (E6-8) – E1 (E5-1)	L-R – BR	Park neutral switch signal	IG switch ON and shift lever P and N position	Below 2 V
↑	↑	↑	IG switch ON and shift lever except P and N position	10 to 14 V



Waveform 1

Reference:

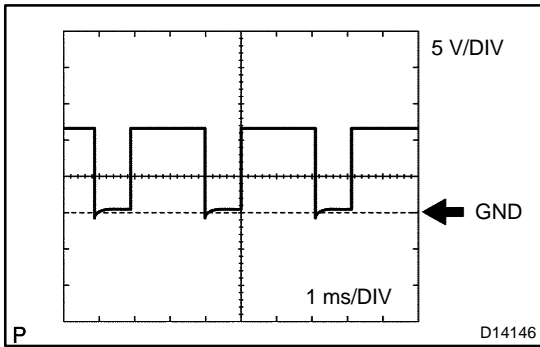
Terminal	SLT+ – SLT-
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



Waveform 2

Reference:

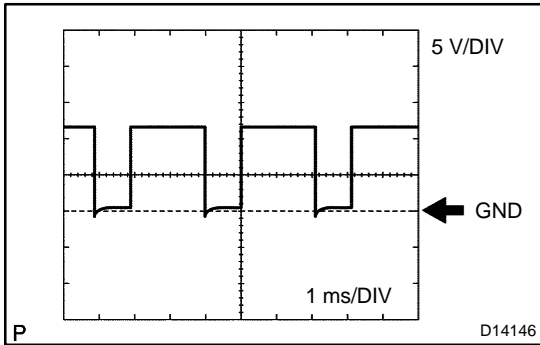
Terminal	SLU+ – SLU-
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	5th (lock-up) or 6th (lock-up) gear



Waveform 3

Reference:

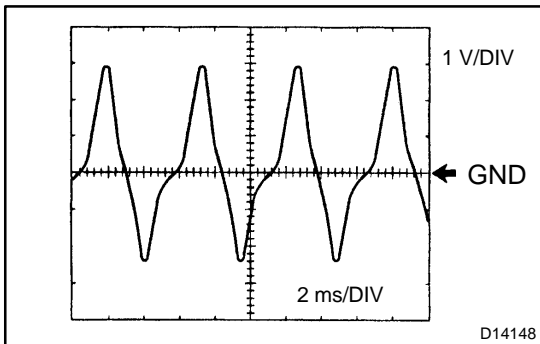
Terminal	SL2+ - SL2-
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



Waveform 4

Reference:

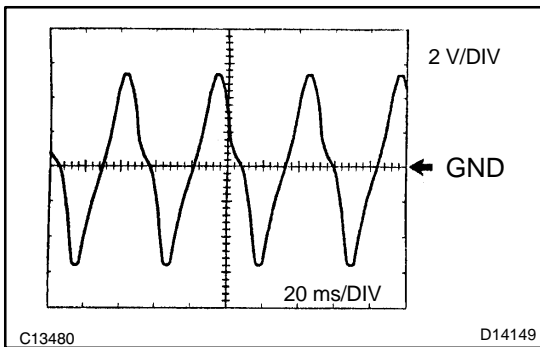
Terminal	SL1+ - SL1-
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



Waveform 5

Reference:

Terminal	NT+ - NT-
Tool setting	1V/DIV, 2ms/DIV
Vehicle condition	Engine idle speed (P or N position)



Waveform 6

Reference:

Terminal	SP2+ - SP2-
Tool setting	2V/DIV, 20ms/DIV
Vehicle condition	Vehicle speed 20 km/h (12 mph)

DIAGNOSIS SYSTEM

DESCRIPTION

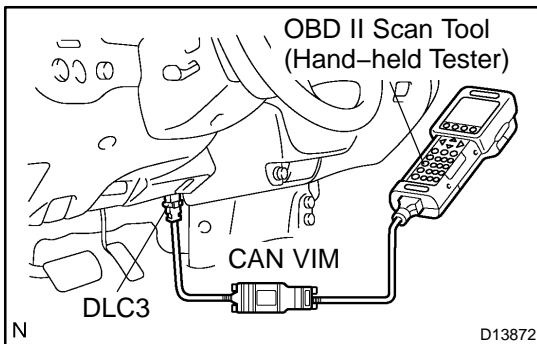
When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (complying with SAE J1987). Various data output from the vehicle's ECM can then be read.



OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:

- 1) The emission control system/components
- 2) The powertrain control components (which affect vehicle emissions)
- 3) The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory. If the malfunction does not reoccur in 3 consecutive trips, the MIL turns off automatically but the DTCs remain recorded in the ECM memory.



To check DTCs, connect the scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The scan tool displays DTCs, the freeze frame data and a variety of the engine data.

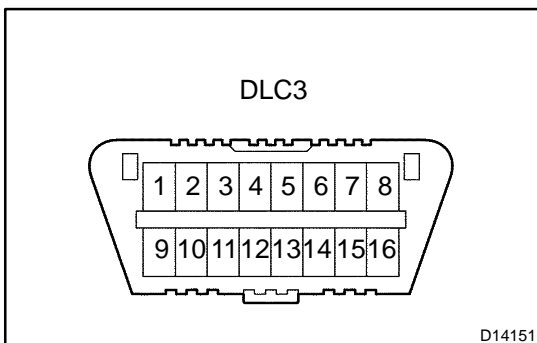
The DTCs and freeze frame data can be erased with the scan tool (See page [DI-983](#)).

NORMAL MODE AND CHECK MODE

The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2-trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1-trip detection logic" is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions.

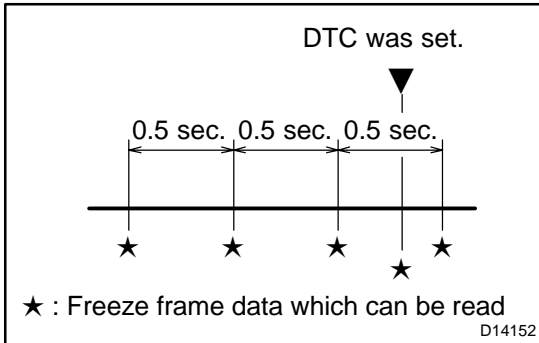
2-TRIP DETECTION LOGIC

When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate.

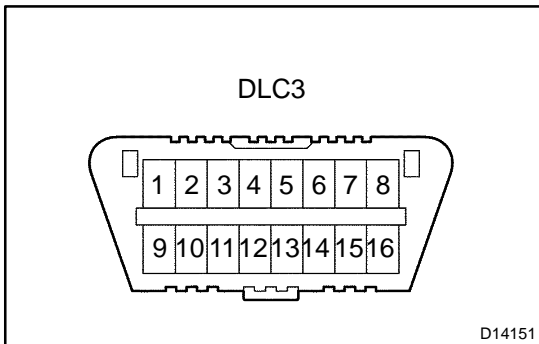


FREEZE FRAME DATA

Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air/fuel ratio was Lean or Rich, and other data from the time the malfunction occurred.



The hand-held tester records freeze frame data in five different instances: 1) 3 times before the DTC is set, 2) once when the DTC is set, and 3) once after the DTC is set. These data can be used to simulate the vehicle's condition around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by a temporary malfunction or not.



DLC3 (Data Link Connector 3)

The vehicle's ECM uses the ISO 15765-4 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.

HINT:

Connect the cable of the hand-held tester to the DLC3, turn the ignition switch ON and attempt to use the hand-held tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.

If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 – Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 Ω	Always
SG	5	Signal ground	Body ground	Below 1 Ω	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	CANL	54 to 69 Ω	IG switch OFF
CANH	6	HIGH-level CAN bus line	Battery positive	1 MΩ or higher	IG switch OFF
CANH	6	HIGH-level CAN bus line	CG	1 kΩ or higher	IG switch OFF
CANL	14	LOW-level CAN bus line	Battery positive	1 MΩ or higher	IG switch OFF
CANL	14	LOW-level CAN bus line	CG	1 kΩ or higher	IG switch OFF

CHECK BATTERY VOLTAGE**Battery voltage: 11 to 14 V**

If voltage is below 11 V, replace the battery before proceeding.

CHECK MIL

- (a) Check that the MIL illuminates when turning the ignition switch ON.

If the MIL does not illuminate, there is a problem in the MIL circuit (refer to MIL CIRCUIT on page [DI-417](#))

- (b) When the engine is started, the MIL should turn off.

ALL READINESS

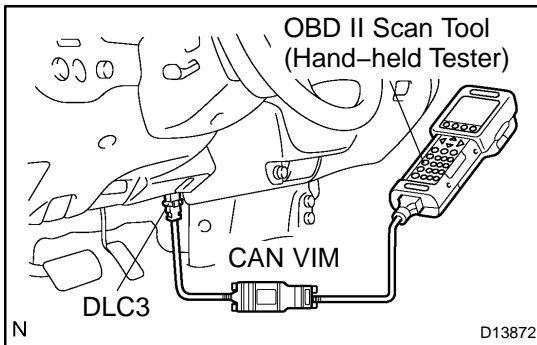
For this vehicle, using the hand-held tester allows readiness codes corresponding to all DTCs to be read. When diagnosis (normal or malfunctioning) has been complete, readiness codes are set. Enter the following menus: ENHANCED OBD II / MONITOR STATUS on the hand-held tester.

DTC CHECK / CLEAR

1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the hand-held tester or generic OBD II scan tool.

These scan tools can display pending DTCs and current DTCs. Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving. However, the detected malfunction during once driving is stored as pending DTC.



- (a) Connect the hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (b) Turn the ignition switch ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES (or PENDING CODE).
- (d) Confirm the DTCs and freeze frame data and then write them down.
- (e) See page [DI-991](#) to confirm the details of the DTCs.

NOTICE:

When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on DIAGNOSTIC TROUBLE CODE CHART subject to "2-trip detection logic", perform the following actions.

Turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL illuminates and the DTCs are recorded in the ECM.

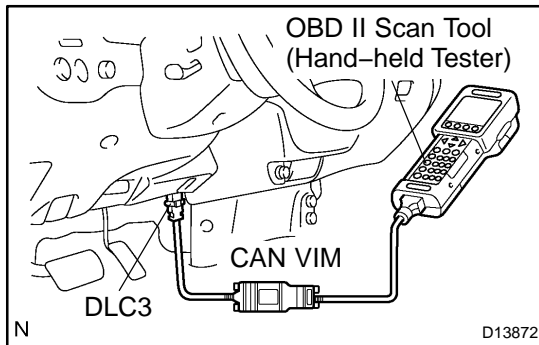
2. CLEAR DTC

- (a) Connect the hand-held tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES and press YES.

CHECK MODE PROCEDURE

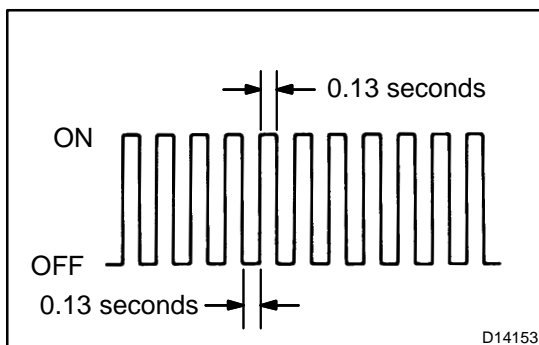
DESCRIPTION

Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are detected with 1-trip detection logic.



CHECK MODE PROCEDURE

- (a) Make sure that the items below are true:
 - (1) Battery positive voltage 11 V or more
 - (2) Throttle valve fully closed
 - (3) Transmission in the P or N position
 - (4) A/C switched OFF
- (b) Turn the ignition switch OFF.
- (c) Connect the hand-held tester together with the Controller Area Network Vehicle Interface Module (CAN VIM) to the DLC3.
- (d) Turn the ignition switch ON.
- (e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE.



- (f) Change the ECM to check mode. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All DTCs and freeze frame data recorded will be erased if:

- 1) the hand-held tester is used to change the ECM from normal mode to check mode or vice-versa; or
- 2) during check mode, the ignition switch is turned from ON to ACC or LOCK.

Before check mode, make notes of the DTCs and freeze frame data.

- (g) Start the engine. The MIL should turn off after the engine starts.
- (h) Perform "MONITOR DRIVE PATTERN" for the ECT test (See page [DI-969](#)).
(Or, simulate the conditions of the malfunction described by the customer).
- (i) After simulating the malfunction conditions, use the hand-held tester diagnosis selector to check the DTC and freeze frame data.

FAIL-SAFE CHART

1. FAIL-SAFE

This function minimizes the loss of the ECT functions when any malfunction occurs in a sensor or solenoid.

Malfunction Part	Function
Output Speed Sensor (SP2)	During an output speed sensor malfunction, shift control is effected through the input speed sensor signal (NT).
ATF Temp. Sensor No. 1	During an ATF temperature sensor No. 1 malfunction, up-shift to the 5th and flex lock-up clutch control are prohibited.
Shift Solenoid Valve S1, S2 and SR	The current to the failed solenoid valve is cut off and control is effected by operating the other solenoid valves with normal operation. Shift control is effected depending on the failed solenoid as described in the table on the next page.
Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to the 5th is prohibited.
Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, fuel economy decreases.
Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, the shift shock increases. However, shifting is effected through normal clutch pressure control.

Fail Safe Function:

If either of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid "ON" and "OFF" in order to shift into the gear positions shown in the table below.

In case of a short circuit, the ECM stops sending current to the short circuited solenoid.

Even if starting the engine again in the fail-safe mode, the gear position remains in the same position.

○: ON

X: OFF

→: Condition in the electrical malfunction is shown on the left of "→".

Condition in the fail-safe mode is shown on the right of "→".

E/B: Engine brake.

Position	NORMAL						S1 OFF						S2 OFF						SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
"R"	R	○	X	X	X	○	R	X	X	X	X	○	R	○	X	X	X	○	R	○	X	X	X	○
"D"	1 st	○	X	X	X	○	4 th ↓ 3 rd	X	X	X	X	○	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd	○	○	X	X	○	3 rd	X	○	X	X	○	1 st ↓ 4 th	○ ↓ X	X	X	X	○	2 nd	○	○	X	X	○
	3 rd	X	○	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○	3 rd	X	○	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	4 th	X	X	X	○	X
"3"	1 st	○	X	X	X	○	3 rd ↓ 3 rd E/B	X	X	X	X	○	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd	○	○	X	X	○	3 rd ↓ 3 rd E/B	X	○	X	X	○	1 st ↓ 3 rd E/B	○ ↓ X	X	X	X	○	2 nd	○	○	X	X	○
	3 rd E/B	X	○	X	X	X	3 rd E/B	X	○	X	X	X	3 rd E/B	X	X	X	X	X	3 rd E/B ↓ 3 rd	X	○	X	X	X
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	3 rd	X	○	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	3 rd E/B ↓ 3 rd	X	○	X	○	X
"2"	1 st	○	X	X	X	○	1 st	X	X	X	X	○	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd E/B	○	○	○	X	X	3 rd E/B	X	○	○	X	X	2 nd E/B ↓ 4 th	○ ↓ X	X	○	X	○	2 nd	○	○	X	X	X
	3 rd E/B	X	○	○	X	X	3 rd E/B	X	○	○	X	X	Fail 4th	X	X	○	X	○	2 nd	X	○	X	X	X
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	1 st ↓ 2 nd	X	○	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	1 st E/B ↓ 2 nd	X	○	X	○	X
"L"	1 st E/B	○	X	X	X	X	1 st E/B	X	X	X	X	X	1 st E/B	○	X	X	X	X	1 st E/B	○	X	X	X	X
	2 nd E/B	○	○	○	X	X	3 rd E/B	X	○	○	X	X	2 nd E/B ↓ 4 th	○ ↓ X	X	○	X	○	2 nd	○	○	X	X	X
	3 rd E/B	X	○	○	X	X	3 rd E/B	X	○	○	X	X	Fail 4 th	X	X	○	X	○	2 nd	X	○	X	X	X
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	1 st ↓ 2 nd	X	○	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	1 st E/B ↓ 2 nd	X	○	X	○	X

DIAGNOSTICS - AUTOMATIC TRANSMISSION (A750E for 1GR-FE)

○: ON

X: OFF

→: Condition in the electrical malfunction is shown on the left of "→".

Condition in the fail-safe mode is shown on the right of "→".

E/B: Engine brake.

Position	S1 S2 OFF						S2 SR OFF						S1 SR OFF						S1 S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
"R"	R	X	X	X	X	○	R	○	X	X	X	○	R	X	X	X	X	○	R	X	X	X	X	○
"D"	4 th	X	X	X	X	○	1 st	○	X	X	X	○	4 th ↓ 3 rd	X	X	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	1 st ↓ 4 th	○	X	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○
	5 th	X	X	○	○	X	4 th	X	X	X	○	X	○	4 th	X	X	X	○	X	○	4 th	X	X	X
"3"	3 rd ↓ 3 rd E/B	X	X	X	X	○	1 st	○	X	X	X	○	3 rd	X	X	X	X	○	3 rd	X	X	X	X	○
	3 rd ↓ 3 rd E/B	X	X	X	X	○	1 st ↓ 3 rd	○	X	X	X	○	3 rd	X	○	X	X	○	3 rd	X	X	X	X	○
	3 rd E/B	X	X	X	X	X	3 rd E/B ↓ 3 rd	X	X	X	X	○	3 rd E/B ↓ 3 rd	X	○	X	X	○	3 rd E/B ↓ 3 rd	X	X	X	X	○
	4 th	X	X	○	X	○	3 rd	X	X	X	X	○	3 rd	X	X	X	X	○	3 rd	X	X	X	X	○
	5 th	X	X	○	○	X	1 st E/B ↓ 3 rd	X	X	X	○	X	○	3 rd E/B ↓ 3 rd	X	X	X	○	X	○	3 rd E/B ↓ 3 rd	X	X	X
"2"	1 st	X	X	X	X	○	1 st	○	X	X	X	○	1 st	X	X	X	X	○	1 st	X	X	X	X	○
	Fail 4 th	X	X	○	X	X	1 st E/B ↓ 1 st	○	X	X	X	○	2 nd	X	○	X	X	X	1 st E/B ↓ 1 st	X	X	X	X	○
	Fail 4 th	X	X	○	X	X	1 st E/B ↓ 1 st	X	○	X	X	○	2 nd	X	○	X	X	X	1 st E/B ↓ 1 st	X	X	X	X	○
	4 th	X	X	○	X	○	1 st	○	X	X	X	○	1 st ↓ 2nd	X	X	X	X	○	1 st	X	X	X	X	○
	5 th	X	X	○	○	X	1 st E/B ↓ 1 st	X	X	X	○	X	○	1 st E/B ↓ 2nd	X	X	X	○	X	○	1 st E/B ↓ 1 st	X	X	X
"L"	1 st E/B	X	X	X	X	X	1 st E/B	○	X	X	X	X	1 st E/B	X	X	X	X	X	1 st E/B	X	X	X	X	X
	Fail 4 th	X	X	○	X	X	1 st E/B ↓ 1 st	○	X	X	X	○	2 nd	X	○	X	X	X	1 st E/B ↓ 1 st	X	X	X	X	○
	Fail 4 th	X	X	○	X	X	1 st E/B ↓ 1 st	X	○	X	X	○	2 nd	X	○	X	X	X	1 st E/B ↓ 1 st	X	X	X	X	○
	4 th	X	X	○	X	○	1 st	○	X	X	X	○	1 st ↓ 2nd	X	X	X	X	○	1 st	X	X	X	X	○
	5 th	X	X	○	○	X	1 st E/B ↓ 1 st	X	X	X	○	X	○	1 st E/B ↓ 2nd	X	X	X	○	X	○	1 st E/B ↓ 1 st	X	X	X

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	<ul style="list-style-type: none"> • Brake Pedal is depressed: ON • Brake Pedal is released: OFF 	–
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P and N: ON Except P and N: OFF	When the shift lever position displayed on the hand-held tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect. HINT: When the failure still occurs even after adjusting these parts, See page DI-993 .
LOW	PNP SW Status/ ON or OFF	<ul style="list-style-type: none"> • Shift lever position is 2: OFF <li style="text-align: center;">↓ • Shift position L switch Push: ON <li style="text-align: center;">↓ • Shift position L switch Push: OFF 	↑
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	↑
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	↑
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D: ON Except D: OFF	↑
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	↑
OVERDRV CUT SW2	O/D SW Status/ ON or OFF	<ul style="list-style-type: none"> • IG SW ON: ON <li style="text-align: center;">↓ • O/D SW Push: OFF <li style="text-align: center;">↓ • O/D SW Push: ON 	–
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th or 5th	Shift lever position is; <ul style="list-style-type: none"> • L: 1st • 2: 1st or 2nd • 3: 1st, 2nd or 3rd • 4(O/D OFF): 1st, 2nd, 3rd or 4th • D: 1st, 2nd, 3rd, 4th or 5th 	–

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LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	<ul style="list-style-type: none"> • Lock Up: ON • Except Lock Up: OFF 	–
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	<ul style="list-style-type: none"> • Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON 	–
SOLENOID (SLU)	Shift Solenoid SLU Status/ ON or OFF	<ul style="list-style-type: none"> • Lock Up: ON • Except Lock Up: OFF 	–
AT FLUID TEMP 1	ATF Temp. Sensor No.1 Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak 	If the value is "–40°C (–40°F)" or "215°C (419°F)", ATF temp. sensor No.1 circuit is open or shorted.
AT FLUID TEMP 2	ATF Temp. Sensor No.2 Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak 	If the value is "–40°C (–40°F)" or "215°C (419°F)", ATF temp. sensor No.2 circuit is open or shorted.
SPD (SP2)	Output shaft Speed/ min.: 0 km/h (0 mph) max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) [HINT] Equal to vehicle speed	–
SPD (NT)	Input Turbine Speed/ display: 50 r/min	[HINT] <ul style="list-style-type: none"> • Lock-up ON (After warming up the engine); Input Turbine speed (NT) equal to the engine speed. • Lock-up OFF (Idling at N posi- tion); Input Turbine speed (NT) nearly equal to the engine speed. 	–

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.
LOCK UP	[Test Details] Control the shift solenoid SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] • Throttle valve opening angle: Less than 35 % • Vehicle Speed: 60 km/h (37 mph) or more	Possible to check the SLU operation.
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [HINT] OFF: Line pressure up (When the active test of "Control the Line Pressure Up" is performed, the ECM commands the SLT solenoid to turn off). ON: No action (normal operation)	–

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting the SST to the automatic transaxle, which is used in the HYDRAULIC TEST (See page [DI-958](#)) as well.

HINT:

The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the parts listed in the table below and proceed to the page given.

HINT:

- *1 : ● ... The MIL (Malfunction Indicator Lamp) lights up
- *2 : ○ ... The ECM memorizes the trouble code if the ECM detects the DTC detection condition.
- This DTC may be output when the clutch, brake and gear components etc. inside the automatic transmission are damaged.

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Memory *2
P0500 (DI-257)	Vehicle Speed Sensor "A"	<ul style="list-style-type: none"> • Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM 	●	○
P0705 (DI-993)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	<ul style="list-style-type: none"> • Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM 	●	○
P0710 (DI-999)	Transmission Fluid Temperature Sensor "A" Circuit	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM 	●	○
P0711 (DI-1005)	Transmission Fluid Temperature Sensor "A" Performance	<ul style="list-style-type: none"> • Transmission wire (ATF temperature sensor No.1) 	●	○
P0712 (DI-999)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	<ul style="list-style-type: none"> • Short in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM 	●	○
P0713 (DI-999)	Transmission Fluid Temperature Sensor "A" Circuit High Input	<ul style="list-style-type: none"> • Open in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM 	●	○
P0717 (DI-1008)	Input Speed Sensor Circuit No Signal	<ul style="list-style-type: none"> • Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0722 (DI-1013)	Output Speed Sensor Circuit No Signal	<ul style="list-style-type: none"> • Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0724 (DI-1017)	Brake Switch "B" Circuit High	<ul style="list-style-type: none"> • Short in stop light switch signal circuit • Stop light switch • ECM 	●	○
P0748 (DI-1020)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM 	●	○
P0751 (DI-1025)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	<ul style="list-style-type: none"> • Shift solenoid valve S1 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0756 (DI-1031)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	<ul style="list-style-type: none"> • Shift solenoid valve S2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0771 (DI-1037)	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Shift solenoid valve SR remains open or closed • Shift solenoid valve SL1 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○

P0776 (DI-1042)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	<ul style="list-style-type: none"> • Shift solenoid valve SL2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0778 (DI-1048)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM 	●	○
P0781 (DI-1053)	1-2 Shift (1-2 Shift Valve)	<ul style="list-style-type: none"> • Valve body is blocked up or stuck (1-2 shift valve) • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0973 (DI-1058)	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	<ul style="list-style-type: none"> • Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM 	●	○
P0974 (DI-1058)	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	<ul style="list-style-type: none"> • Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM 	●	○
P0976 (DI-1063)	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	<ul style="list-style-type: none"> • Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM 	●	○
P0977 (DI-1063)	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	<ul style="list-style-type: none"> • Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM 	●	○
P0985 (DI-1068)	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM 	●	○
P0986 (DI-1068)	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM 	●	○
P2714 (DI-1073)	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	<ul style="list-style-type: none"> • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P2716 (DI-1079)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM 	●	○
P2740 (DI-1083)	Transmission Fluid Temperature Sensor "B" Circuit	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM 	●	○
P2742 (DI-1083)	Transmission Fluid Temperature Sensor "B" Circuit Low Input	<ul style="list-style-type: none"> • Short in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM 	●	○
P2743 (DI-1083)	Transmission Fluid Temperature Sensor "B" Circuit High Input	<ul style="list-style-type: none"> • Open in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM 	●	○
P2757 (DI-1089)	Torque Converter Clutch Pres- sure Control Solenoid Perfor- mance (Shift Solenoid Valve SLU)	<ul style="list-style-type: none"> • Shift solenoid valve SLU remains open or closed • Valve body is blocked • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low 	●	○
P2759 (DI-1097)	Torque Converter Clutch Pres- sure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM 	●	○

CIRCUIT INSPECTION

DTC	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)
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CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0705	(2-trip detection logic) • All switches are OFF simultaneously for NSW, R, N, D, 3 and 2 positions. • 2 or more switches are ON simultaneously for NSW, R, D, 3 and 2 positions.	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM

MONITOR DESCRIPTION

These DTCs indicate a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.

The park/neutral position switch detects the shift lever position and sends a signal to the ECM.

For security, the park/neutral position switch detects the shift lever position so that engine can be started only when the shift lever is in the P or N position.

The park/neutral position switch sends a signal to the ECM according to the shift position (NSW, R, D, 3 or 2).

The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0705	Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch	
Frequency of operation	Continuous	
Duration	Condition (A)	2 sec.
	Condition (B)	60 sec.
MIL operation	2 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-963	
Ignition switch	ON	
Battery voltage	10.5 V or more	

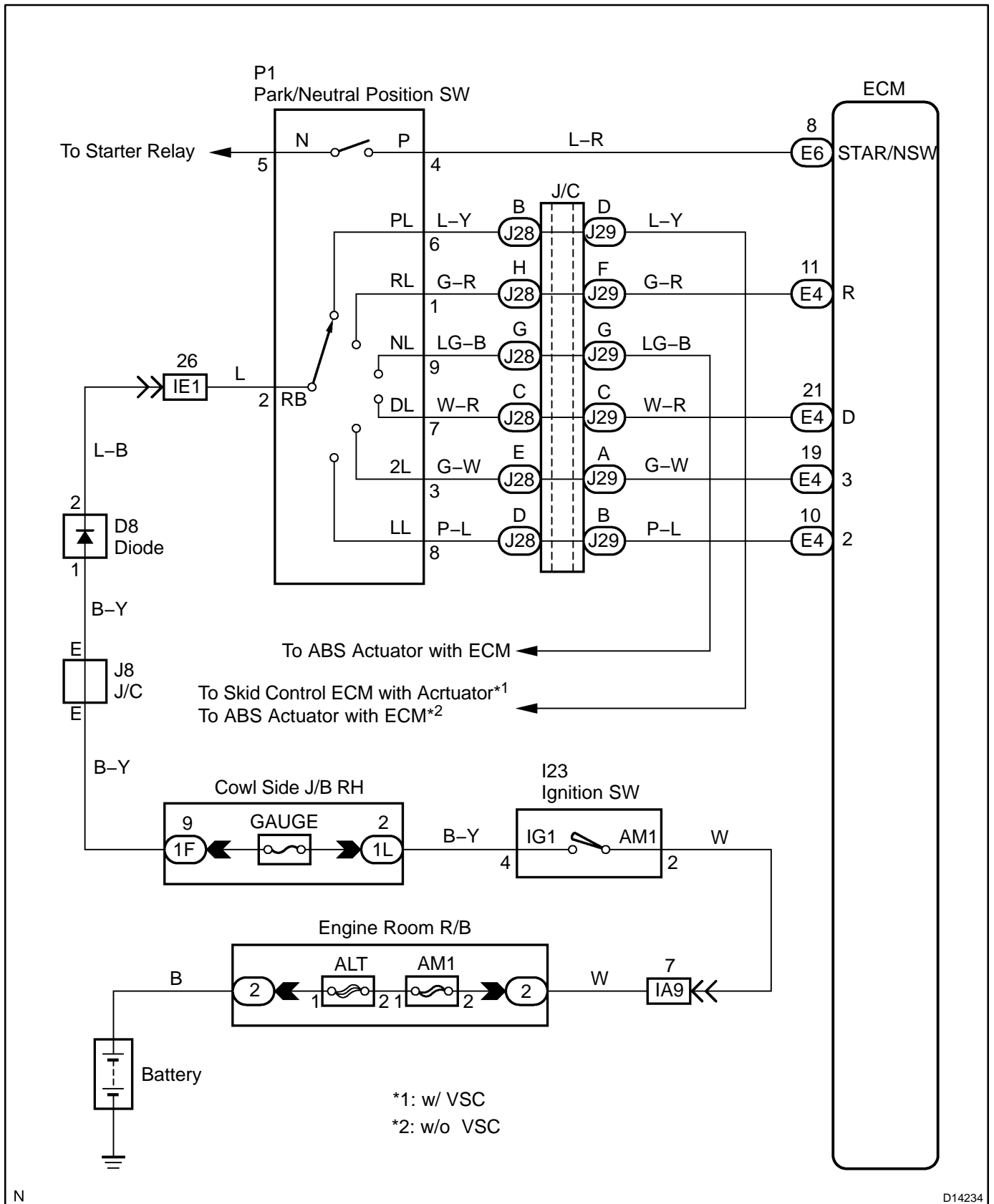
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
One of the following conditions is met: Condition (A) or (B)	
Condition (A)	
Number of the following signal input at the same time	2 or more
NSW switch	ON
R switch	
D switch	
3 switch	
2 switch	
Condition (B)	
All of following conditions are met	
NSW switch	OFF
R switch	
D switch	
3 switch	
2 switch	

COMPONENT OPERATING RANGE

Parameter	Standard value
Park/neutral position switch	The park/neutral position switch sends only one signal to the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

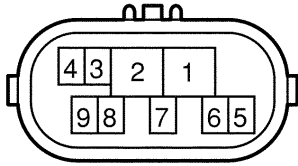
According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P and N: ON Except P and N: OFF	When the shift lever position displayed on the hand-held tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect.
LOW	PNP SW Status/ ON or OFF	• Shift lever position is 2: OFF ↓ • Shift position L switch Push: ON ↓ • Shift position L switch Push: OFF	↑
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	↑
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	↑
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D: ON Except D: OFF	↑
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	↑

1 Inspect park/neutral position switch.

Switch Side:
(Connector Front View):



P

D14154

PREPARATION:

- Jack up the vehicle.
- Disconnect the park/neutral position switch connector.

CHECK:

Measure the resistance according to the value(s) in the table below when the shift lever is moved to each position.

OK:

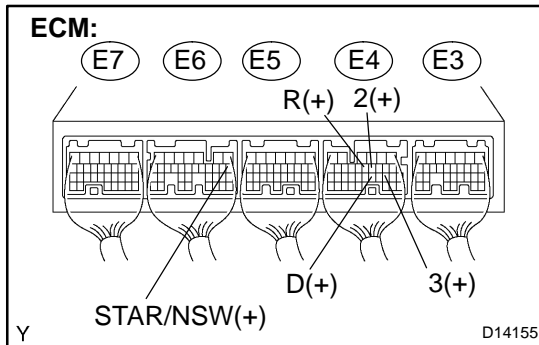
Shift Position	Tester Connection	Specified Condition
P	2 - 6 and 4 - 5	Below 1 Ω
Except P	\uparrow	10 k Ω or higher
R	2 - 1	Below 1 Ω
Except R	\uparrow	10 k Ω or higher
N	2 - 9 and 4 - 5	Below 1 Ω
Except N	\uparrow	10 k Ω or higher
D	2 - 7	Below 1 Ω
Except D	\uparrow	10 k Ω or higher
3	2 - 3	Below 1 Ω
Except 3	\uparrow	10 k Ω or higher
2	2 - 8	Below 1 Ω
Except 2	\uparrow	10 k Ω or higher

NG

Replace park/neutral position switch
(See page [AT-11](#)).

OK

2 Check harness and connector (Park/neutral position switch – ECM).



PREPARATION:

- (a) Connect the park/neutral position switch connector.
- (b) Turn the ignition switch ON.

CHECK:

Measure the voltage according to the value(s) in the table below when the shift lever is moved to each position.

OK:

Shift Position	Tester connection	Specified condition
P and N	E6 – 8 (STAR/NSW) – Body ground	Below 2 V
Except P and N	↑	10 to 14 V
R	E4 – 11 (R) – Body ground	10 to 14 V*
Except R	↑	Below 1 V
D	E4 – 21 (D) – Body ground	10 to 14 V
Except D	↑	Below 1 V
3	E4 – 19 (3) – Body ground	10 to 14 V
Except 3	↑	Below 1 V
2 and L	E4 – 10 (2) – Body ground	10 to 14 V
Except 2 and L	↑	Below 1 V

HINT:

*: The voltage will drop slightly due to lighting up of the back up light.

NG

Repair or replace the harness or connector (See page IN-30).

OK

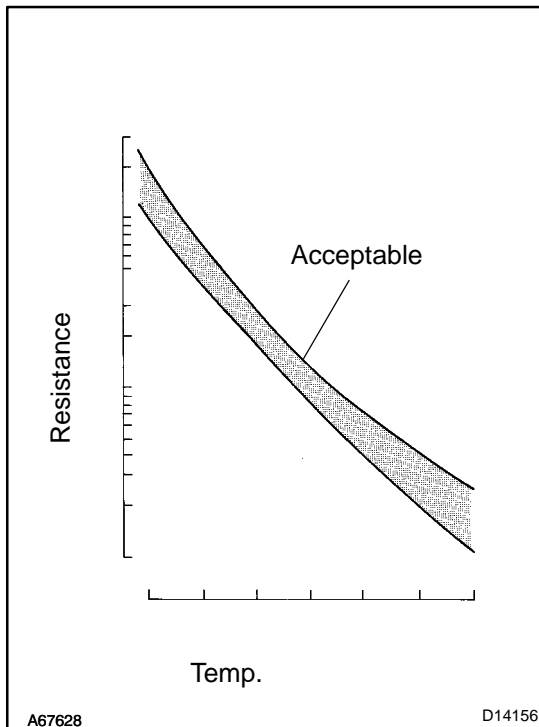
Replace the ECM (See page SF-66).

DTC	P0710	Transmission Fluid Temperature Sensor "A" Circuit
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DTC	P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input
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DTC	P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input
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CIRCUIT DESCRIPTION



The ATF (Automatic Transmission Fluid) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

The ECM applies a voltage to the temperature sensor through ECM terminal THO1.

The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.

One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.

The ECM calculates the fluid temperature based on the voltage signal.

DTC No.	DTC Detection Condition	Trouble Area
P0710	(a) and (b) are detected momentarily within 0.5 sec. when neither P0712 nor P0713 is detected (1-trip detection logic) (a) ATF temperature sensor No.1 resistance is less than 79 Ω . (b) ATF temperature sensor No.1 resistance is more than 156 k Ω . HINT: Within 0.5 sec., the malfunction switches from (a) to (b) or from (b) to (a)	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM
P0712	ATF temperature sensor No.1 resistance is less than 79 Ω for 0.5 sec. or more (1-trip detection logic)	<ul style="list-style-type: none"> • Short in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM
P0713	ATF temperature No.1 sensor resistance is more than 156 k Ω when 15 minutes or more have elapsed after the engine start DTC is detected for 0.5 sec. or more (1-trip detection logic)	<ul style="list-style-type: none"> • Open in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the automatic transmission fluid (ATF) temperature sensor circuit. The automatic transmission fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω ^{*1} or more than 156k Ω ^{*2}, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

*1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.

*2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.

HINT:

The ATF temperature can be checked on the OBD II scan tool or hand-held tester display.

MONITOR STRATEGY

Related DTCs	P0710	ATF temperature sensor/Range check (Fluttering)
	P0712	ATF temperature sensor/Range check (Low resistance)
	P0713	ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-963	
Range check (Fluttering, Low resistance)		
The typical enabling condition is not available.	-	
Range check (High resistance)		
Time after engine start	15 min. or more	-

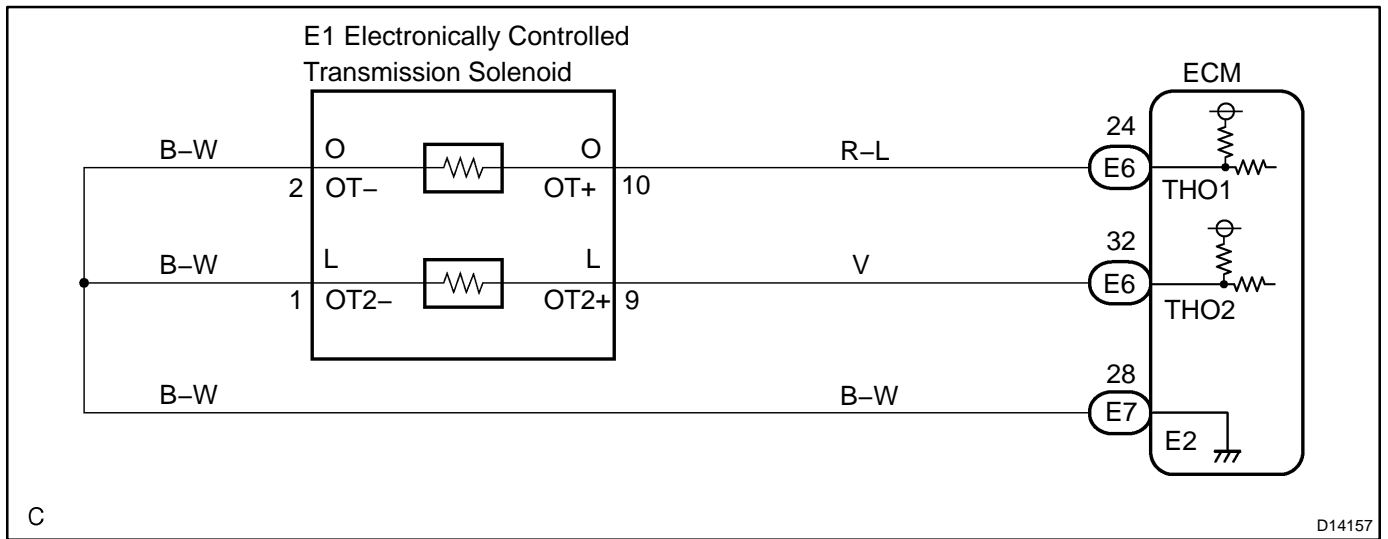
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Fluttering)	
TFT (transmission fluid temperature) sensor resistance	Less than 79 Ω or More than 156 k Ω
Range check (Low resistance)	
TFT (transmission fluid temperature) sensor resistance	Less than 79 Ω
Range check (High resistance)	
TFT (transmission fluid temperature) sensor resistance	More than 156 k Ω

COMPONENT OPERATING RANGE

Parameter	Standard value
TFT (transmission fluid temperature) sensor	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT FLUID TEMP 1	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak

HINT:

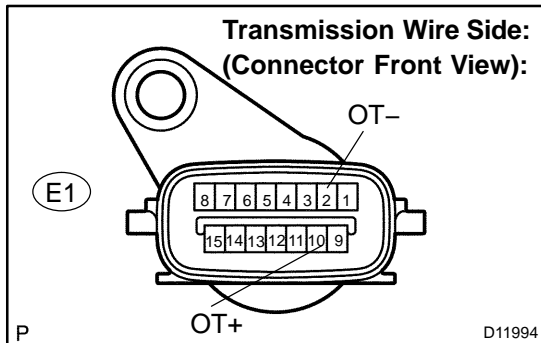
When DTC P0712 is output and hand-held tester output is 150°C (302°F) or more, there is a short circuit. When DTC P0713 is output and hand-held tester output is -40°C (-40°F), there is an open circuit. Measure the resistance between terminal THO1 (OT) and body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

HINT:

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 second). When P0713 is set, P0711 cannot be detected. It is not necessary to inspect the circuit when P0711 is set.

1 Inspect transmission wire (ATF temperature sensor No.1).

**PREPARATION:**

Disconnect the transmission wire connector from the transmission.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
2 (OT-) – 10 (OT+)	79 Ω to 156 k Ω
2 (OT-) – Body ground	10 k Ω or higher
10 (OT+) – Body ground	10 k Ω or higher

HINT:

If the resistance is out of the specified range with either the ATF temperature shown in the table below, the driveability of the vehicle may decrease.

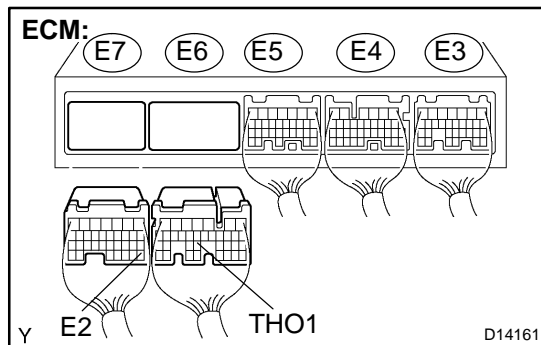
ATF Temperature	Specified Condition
20°C (68°F)	3 to 4 k Ω
110°C (230°F)	0.22 to 0.28 k Ω

NG

**Repair or replace the transmission wire (ATF temperature sensor No.1)
(See page [AT-9](#)).**

OK

2 Check harness and connector (Transmission wire – ECM).



PREPARATION:

- Connect the transmission wire connector.
- Disconnect the connector of the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 24 (THO1) – E7 – 28 (E2)	79 Ω to 156 k Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 24 (THO1) – Body ground	10 k Ω or higher
E7 – 28 (E2) – Body ground	↑

NG

Repair or replace the harness or connector (See page IN-30).

OK

Replace the ECM (See page SF-66).

DTC	P0711	Transmission Fluid Temperature Sensor "A" Performance
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CIRCUIT DESCRIPTION

See page [DI-999](#).

DTC No.	DTC Detection Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2-trip detection logic) (a) Intake air and engine coolant temps. are more than -20°C (5°F) at engine start (b) After normal driving for over 22 min. and 9 km (6 mile) or more, ATF temp. is less than 10°C (68°F)	• Transmission wire (ATF temperature sensor No.1)

MONITOR DESCRIPTION

This DTC indicates that there is a problem with output from the automatic transmission fluid (ATF) temperature sensor and that the sensor itself is defective. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault in the ATF temperature sensor. After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.

MONITOR STRATEGY

Related DTCs	P0711	ATF temperature sensor/Rationality check
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-963	
TFT (transmission fluid temperature) sensor circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
IAT (Intake air temperature) sensor circuit	Not circuit malfunction	
Time after engine start	21 min. and 40 sec.	
Driving distance after engine start	9 km (5.6 mile) or more	–
IAT (12 sec. after engine start)	-10°C (14°F) or more	–
ECT (12 sec. after engine start)	-10°C (14°F) or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
TFT (transmission fluid temperature)	Less than 20°C (68°F) (varies with TFT (transmission fluid temperature) at engine start)

WIRING DIAGRAM

See page [DI-999](#).

INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- Warm up the engine.
- Turn the ignition switch off.
- Connect the OBD II scan tool or hand-held tester to the DLC3.
- Turn the ignition switch to the ON position.
- Push the "ON" button of the OBD II scan tool or the hand-held tester.
- When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT FLUID TEMP 1	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak

HINT:

When DTC P0712 is output and hand-held tester output is 150°C (302°F) or more, there is a short circuit.
When DTC P0713 is output and hand-held tester output is -40°C (-40°F), there is an open circuit.
Measure the resistance between terminal THO1 (OT) and body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

HINT:

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 second).
When P0713 is set, P0711 cannot be detected.

It is not necessary to inspect the circuit when P0711 is set.

1	Check other DTCs output (in addition to DTC P0711).
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PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

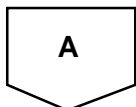
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0711" is output	A
"P0711" and other DTCs	B

HINT:

If any other codes besides "P0711" are output, perform troubleshooting for those DTCs first.



2	Check transmission fluid level (See page DI-952).
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OK:

Automatic transmission fluid level is correct.

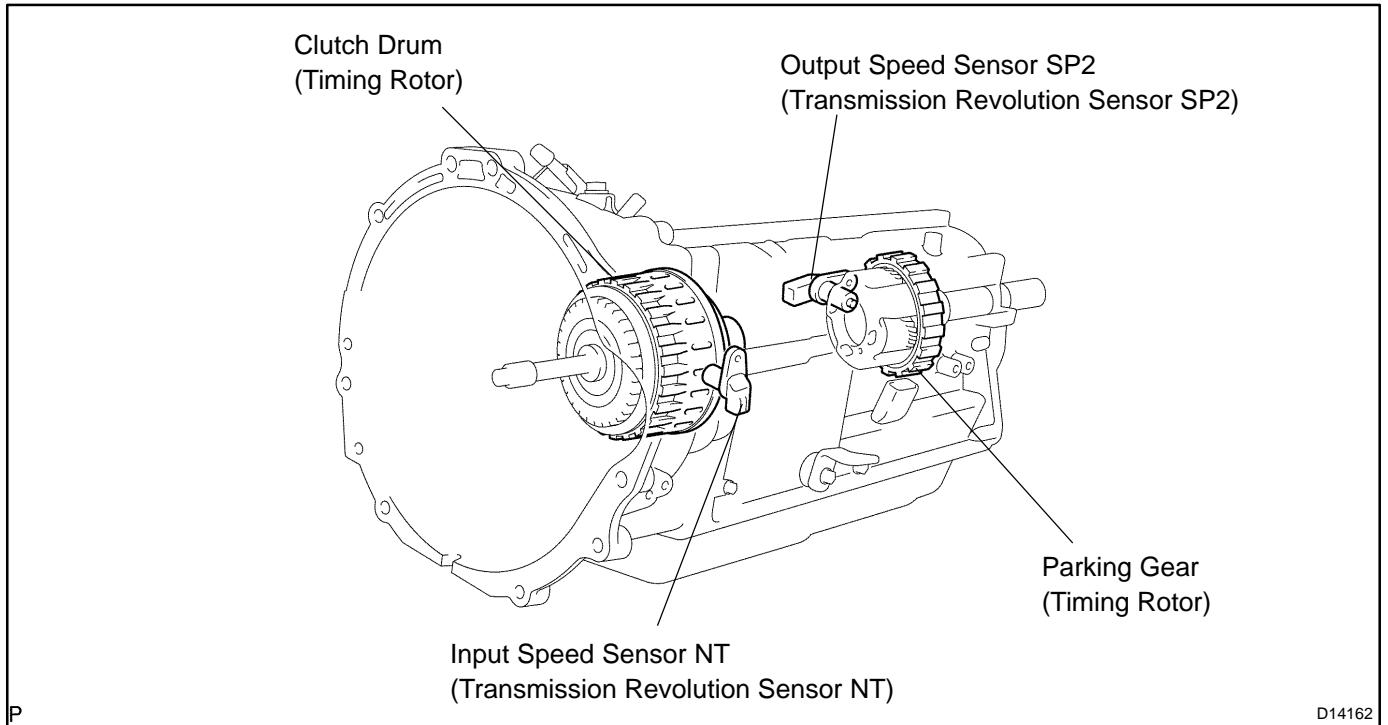


**Replace the transmission wire
(ATF temperature sensor)
(See page AT-9).**

DTC	P0717	Input Speed Sensor Circuit No Signal
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CIRCUIT DESCRIPTION

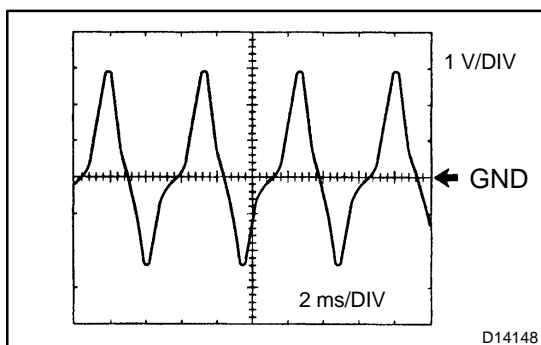
This sensor detects the rotation speed of the turbine which shows the input revolution of transmission. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (SP2), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions, thus, providing smooth gear shift.



P

D14162

DTC No.	DTC Detection Condition	Trouble Area
P0717	All conditions below are detected for 5 secs. or more (1-trip detection logic) (a) Gear change is not performed (b) Gear position: 4th or 5th (c) T/M input shaft rpm: 300 rpm or less (d) T/M output shaft rpm: 1,000 rpm or more (e) Park/neutral position switch: • NSW input signal is OFF • R input signal is OFF • L input signal is OFF (f) Shift solenoid valves and park/neutral position switch are in normal operation	<ul style="list-style-type: none"> • Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transmission (clutch, brake or gear, etc.)



Reference (Using an oscilloscope):

Check the waveform between terminals NT+ and NT- of the ECM connector.

Standard: Refer to the illustration.

Terminal	NT+ - NT-
Tool setting	1V/DIV, 2ms/DIV
Vehicle condition	Engine idle speed (P or N position)

MONITOR DESCRIPTION

This DTC indicates that pulse is not output from the speed sensor NT (Turbine (input) speed sensor) or is output only little. The NT terminal of the ECM detects the revolving signal from the speed sensor (NT) (input RPM). The ECM outputs a gearshift signal comparing the input speed sensor (NT) with the output speed sensor (SP2).

While the vehicle is operating in the 4th or 5th gear position in the shift position of D, if the input shaft revolution is less than 300 rpm^{*1} although the output shaft revolution is more than 1000 rpm or more^{*2}, the ECM detects the trouble, illuminates the MIL and stores the DTC.

*1: Pulse is not output or is irregularly output.

*2: The vehicle speed is approx. 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0717	Speed sensor (NT)/Verify pulse input
Required sensors/Components	Main	Speed sensor (NT)
	Sub	Speed sensor (NO)
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-963	
Shift change	Shift change is completed and before starting next shift change operation	
ECM selected gear	4th or 5th	
Output shaft rpm	1,000 rpm or more	–
NSW switch	OFF	
R switch	OFF	
L switch	OFF	
Engine	Running	
Ignition switch	ON	
Starter	OFF	
NSW switch fail	Not detected	
Battery voltage	8 V or more	

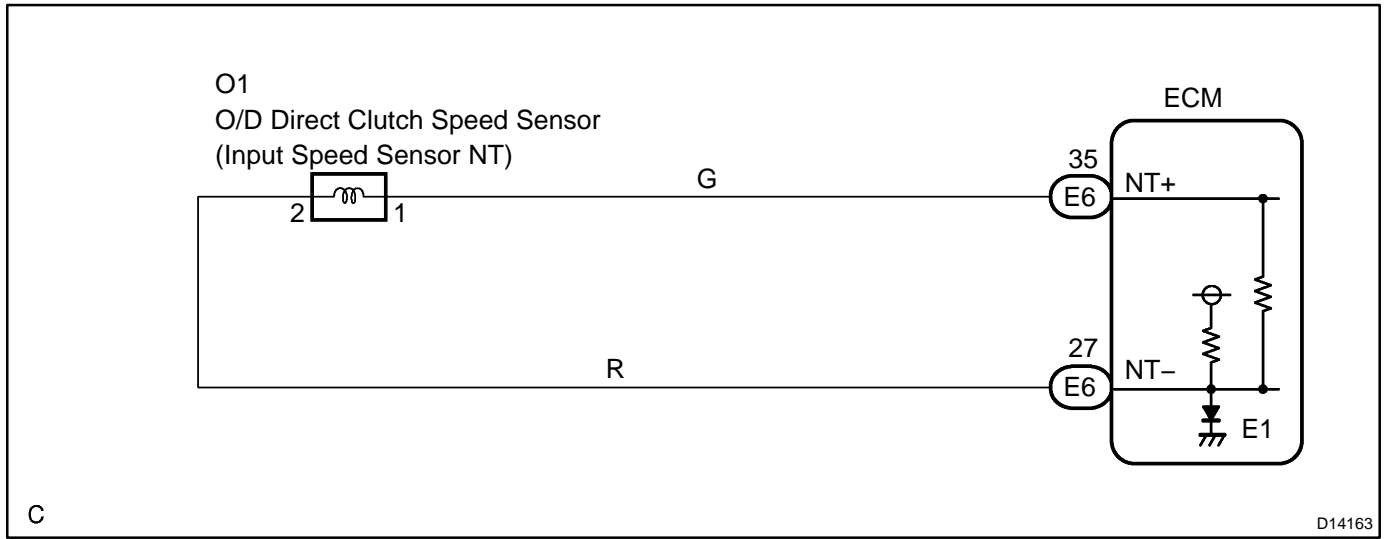
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Parameter	Standard value
Speed sensor (NT)	Input speed is equal to engine speed when lock-up ON.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

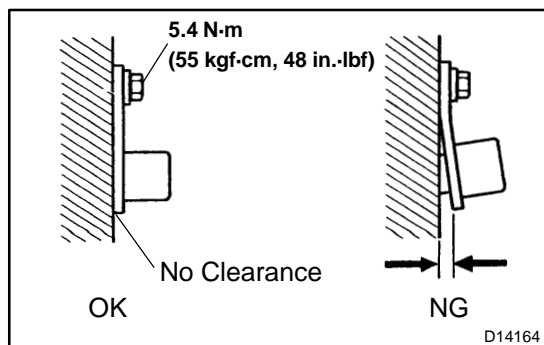
- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (NT)	Input Turbine Speed/ display: 50 r/min	[HINT] • Lock-up ON (After warming up the engine); Input Turbine speed (NT) equal to the engine speed. • Lock-up OFF (Idling at N position); Input Turbine speed (NT) nearly equal to the engine speed.

HINT:

- SPD (NT) is always 0 while driving:
Open or short in the sensor or circuit.
- SPD (NT) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:
Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1 Inspect speed sensor installation.



PREPARATION:

Jack up the vehicle.

CHECK:

Check the speed sensor (NT) installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

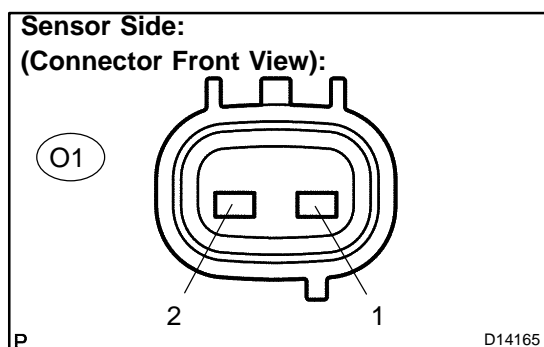
Torque: 5.4 N·m (55 kgf-cm, 48 in.-lbf)

NG

Replace speed sensor NT (See page [AT-8](#)).

OK

2 Inspect speed sensor NT.



PREPARATION:

Disconnect the speed sensor connector from the transmission.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

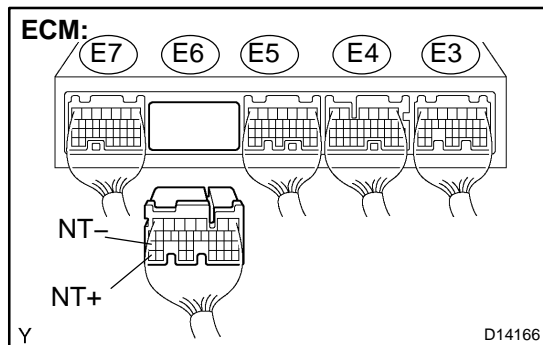
Tester Connection	Specified Condition 20 °C (68 °F)
1 - 2	560 to 680 Ω

NG

Replace speed sensor NT (See page [AT-8](#)).

OK

3 Check harness and connector (ECM – speed sensor NT).



PREPARATION:

- Connect the speed sensor connector.
- Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 35 (NT+) – E6 – 27 (NT-)	560 to 680 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 35 (NT+) – Body ground	10 kΩ or higher
E6 – 27 (NT-) – Body ground	↑

NG

**Repair or replace harness or connector
(See page IN-30).**

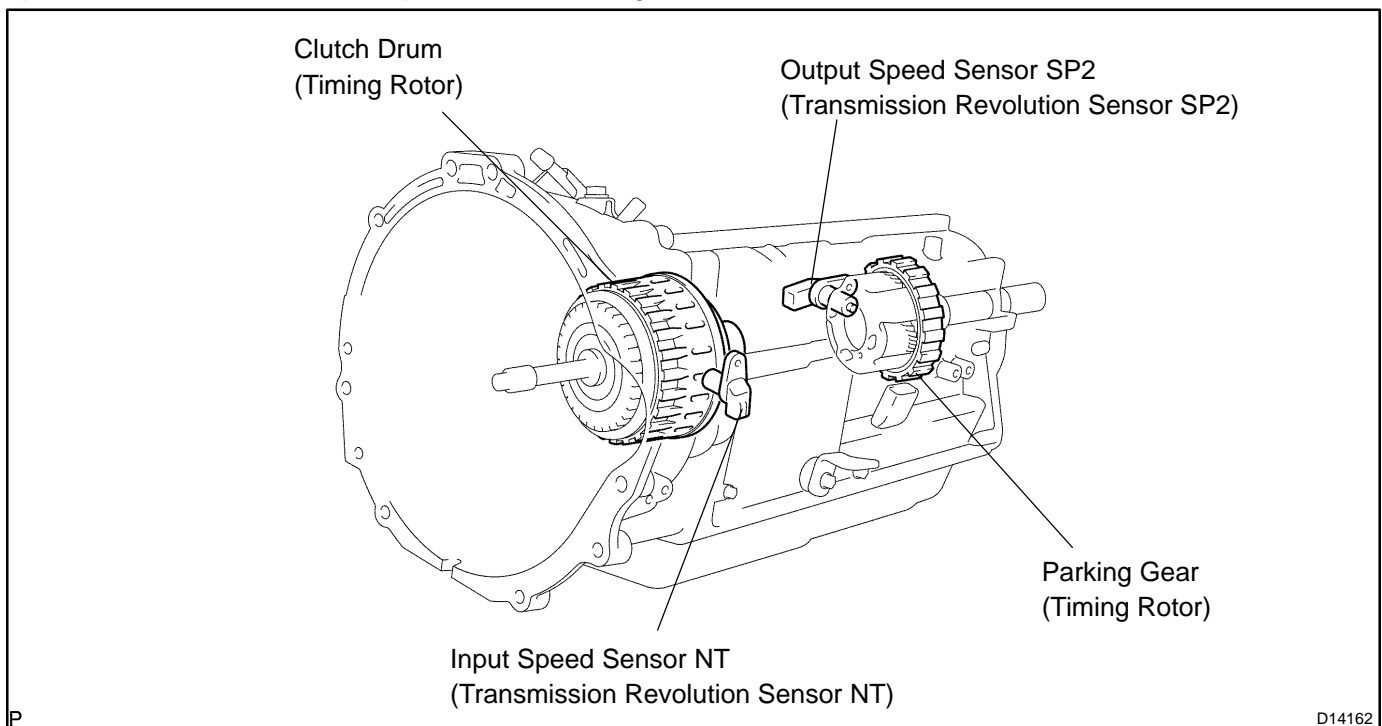
OK

Replace the ECM (See page SF-66).

DTC	P0722	Output Speed Sensor Circuit No Signal
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CIRCUIT DESCRIPTION

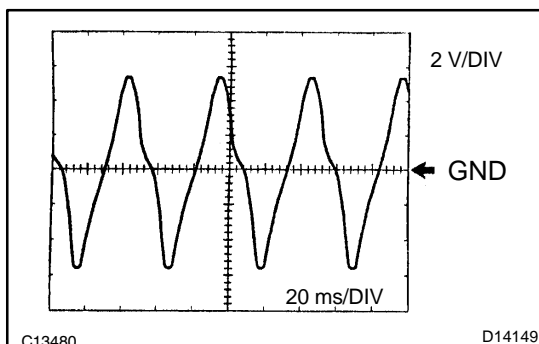
The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor. The gear shift point and lock-up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.



P

D14162

DTC No.	DTC Detection Condition	Trouble Area
P0722	<p>All conditions below are detected 500 times or more continuously (1-trip detection logic)</p> <p>(a) No signal from speed sensor (SP2) is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal are sent</p> <p>(b) Vehicle speed is 9 km/h (6 mph) or more for at least 4 sec.</p> <p>(c) Park/neutral position switch is OFF.</p> <p>(d) Transfer position is except neutral (4WD).</p>	<ul style="list-style-type: none"> • Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM • Automatic transmission (clutch, brake or gear, etc.)



C13480

D14149

Reference (Using an oscilloscope):

Check the waveform between terminals SP2+ and SP2- of the ECM connector.

Standard: Refer to the illustration.

Terminal	SP2+ - SP2-
Tool setting	2V/DIV, 20ms/DIV
Vehicle condition	Vehicle speed 20 km/h (12 mph)

MONITOR DESCRIPTION

The output speed sensor SP2 monitors the output shaft speed. The ECM controls the gearshift point and the lock up timing based on the signals from the output speed sensor SP2 and throttle position sensor. If the ECM detects no signal from the output shaft speed sensor SP2 even while the vehicle is moving, it will conclude that is a malfunction of the output speed sensor SP2. The ECM will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0722	Speed sensor SP2/Verify pulse input
Required sensors/Components	Speed sensor SP2	
Frequency of operation	Continuous	
Duration	500 output shaft revolution	
MIL operation	Immediate	
Sequence of operation	None	

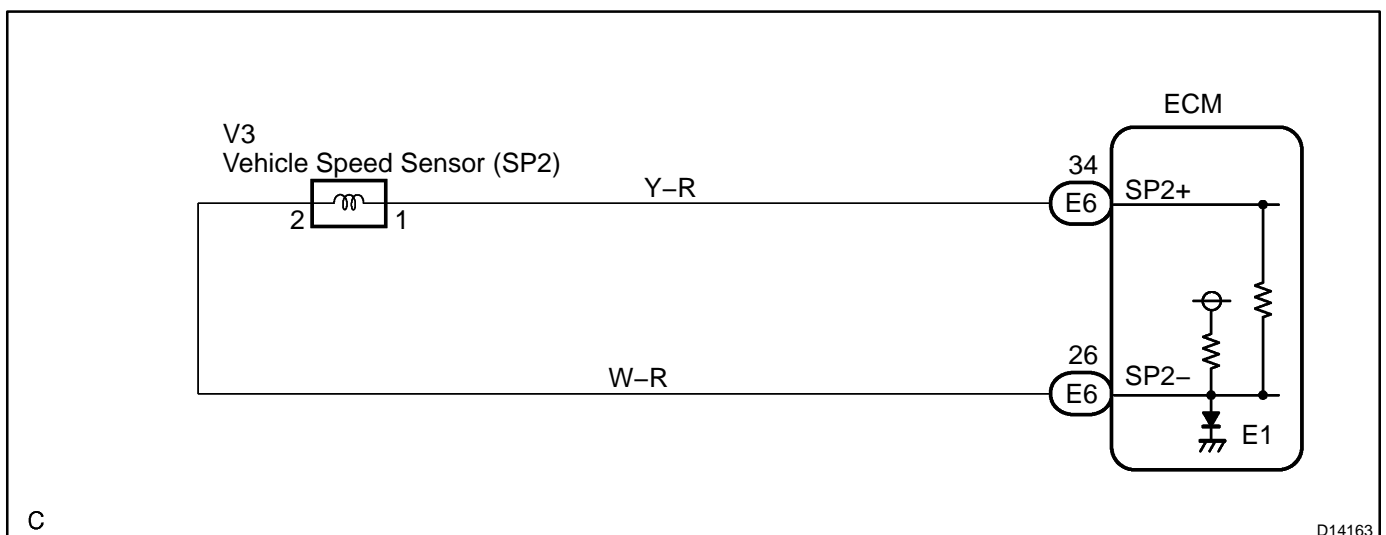
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-963	
Vehicle speed sensor pulse input	4	
Vehicle speed range (4 sec. or more)	9 km/h (5.59 mph) or more	–
NSW switch	OFF	
Battery voltage	8 V or more	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Output speed sensor pulse input	No input

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

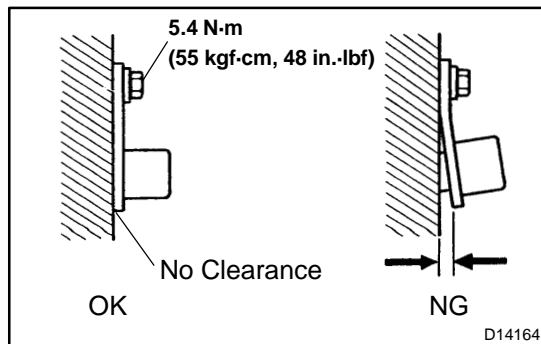
- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (SP2)	Output shaft Speed/ min.: 0 km/h (0 mph) max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) [HINT] Equal to vehicle speed

HINT:

- SPD (SP2) is always 0 while driving:
Open or short in the sensor or circuit.
- SPD (SP2) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:
Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1	Inspect speed sensor installation.
----------	---



PREPARATION:

Jack up the vehicle.

CHECK:

Check the speed sensor (SP2) installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

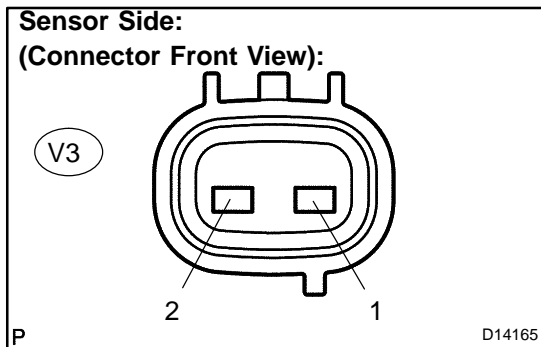
Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)

NG

Replace speed sensor SP2 (See page AT-8).

OK

2 Inspect speed sensor SP2.



PREPARATION:

Disconnect the speed sensor connector from the transmission.

CHECK:

Measure the resistance according to the value(s) in the table below.

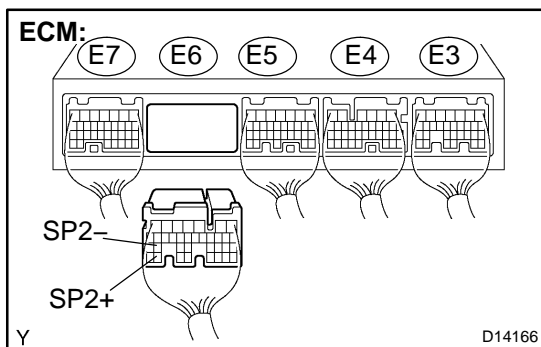
OK:

Tester Connection	Specified Condition 20 °C (68 °F)
1 – 2	560 to 680 Ω

NG → Replace speed sensor SP2 (See page [AT-8](#)).

OK

3 Check harness and connector (ECM – speed sensor SP2).



PREPARATION:

- (a) Connect the speed sensor connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 34 (SP2+) – E6 – 26 (SP2-)	560 to 680 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 34 (SP2+) – Body ground	10 kΩ or higher
E6 – 26 (SP2-) – Body ground	↑

NG → Repair or replace harness or connector (See page [IN-30](#)).

OK

Replace the ECM (See page [SF-66](#)).

DTC	P0724	Brake Switch "B" Circuit High
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CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock-up condition when brakes are suddenly applied.

When the brake pedal is depressed, this switch sends a signal to the ECM. Then the ECM cancels the operation of the lock-up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	The stop light switch remains ON even when the vehicle is driven in a STOP (less than 3 km/h (2 mph)) and GO (30 km/h (19 mph) or more) fashion 5 times. (2-trip detection logic).	<ul style="list-style-type: none"> • Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch remains on. When the stop light switch remains ON during "stop and go" driving, the ECM interprets this as a fault in the stop light switch and the MIL comes on and the ECM stores the DTC. The vehicle must stop (less than 3 km/h (2 mph)) and go (30 km/h (19 mph) or more) ten times for two driving cycles in order to detect a malfunction.

MONITOR STRATEGY

Related DTCs	P0724	Stop light switch/Range check/Rationality
Required sensors/Components	Main	Stop light switch
	Sub	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	GO and STOP 5 times	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-963	
Battery voltage	8 V or more	-
Ignition switch	ON	
Starter	OFF	
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once	
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Brake switch	Remain ON during GO and STOP 5 times

WIRING DIAGRAMSee page [DI-261](#).**INSPECTION PROCEDURE**

1	Read value of DATA LIST (STP signal).
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HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Standard:

Item	Measurement Item/ Range (display)	Normal Condition
Stop Light Switch	Stop light SW Status/ ON or OFF	<ul style="list-style-type: none"> • Brake Pedal is depressed: ON • Brake Pedal is released: OFF

NOTICE:

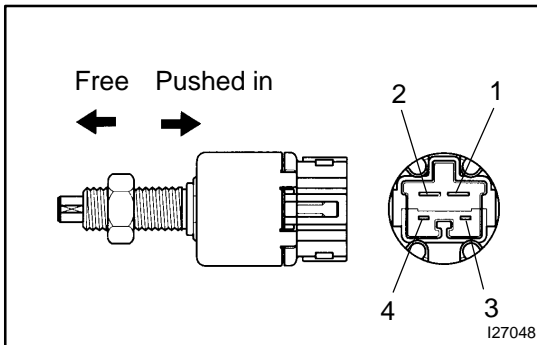
In the table above, the conditions listed under "Normal Condition" are reference conditions. Do not depend solely on these reference conditions when deciding whether a part is faulty or not.

OK:

Brake Pedal Condition	Specified Condition
Depressed	ON
Released	OFF

NG**Go to step 2.****OK****Go to step 3.**

2 Inspect stop light switch.



PREPARATION:

Remove the stop lamp switch assy.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

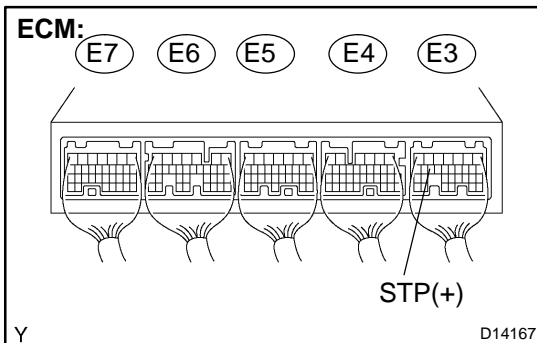
Switch position	Tester Connection	Specified Condition
Switch pin free	1 – 2	Below 1 Ω
Switch pin pushed in	↑	10 k Ω or higher
Switch pin free	3 – 4	10 k Ω or higher
Switch pin pushed in	↑	Below 1 Ω

NG

Replace stop light switch.

OK

3 Check harness and connector (ECM – stop light switch).



PREPARATION:

Install the stop lamp switch assy.

CHECK:

Measure the voltage according to the value(s) in the table below when the brake pedal is depressed and released.

OK:

Condition	Tester Connection	Specified Condition
Brake pedal is depressed	E3 – 15 (STP) – Body ground	10 to 14 V
Brake pedal is released	↑	Below 1 V

NG

Repair or replace harness or connector
(See page [IN-30](#)).

OK

Replace the ECM (See page [SF-66](#)).

DTC	P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)
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CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-985](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0748	ECM checks for an open or short circuit in shift solenoid valves SL1 (1-trip detection logic) (a) When solenoid, duty ratio equal to 100% (b) When solenoid is not energized, duty ratio is less than 3%	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM commands gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF". (In case of an open or short circuit, the ECM stops sending current to the circuit.)

While driving and shifting between 4th and 5th gears, if the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines there is a malfunction (See page [DI-985](#)).

MONITOR STRATEGY

Related DTCs	P0748	Shift solenoid valve SL1/Range check
Required sensors/Components	Shift solenoid valve SL1	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-963	
Battery voltage	10 V or more	–
CPU commanded duty	–	Less than 75%
Ignition switch	ON	
Switch	OFF	

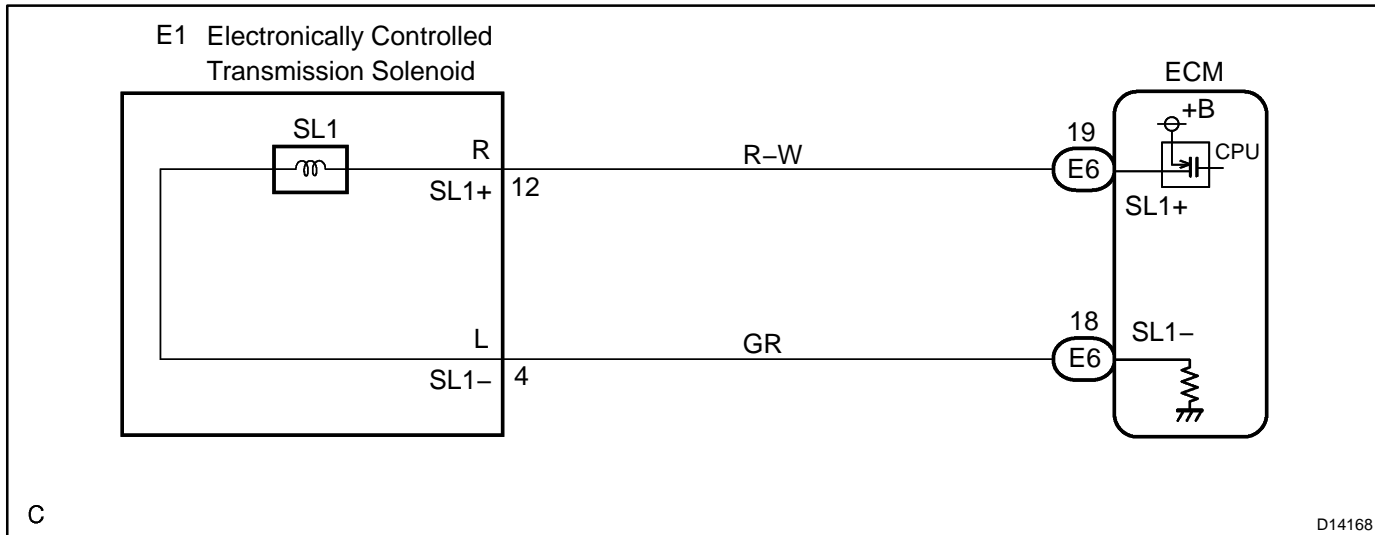
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Output signal duty	100%

COMPONENT OPERATING RANGE

Parameter	Standard value
Output signal duty	Less than 100%

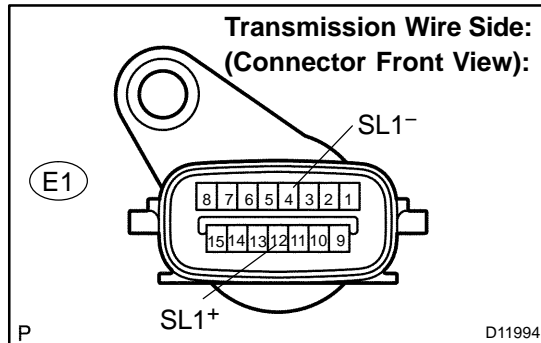
WIRING DIAGRAM



INSPECTION PROCEDURE**HINT:**

- The shift solenoid valve SL1 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

1 Inspect transmission wire.**PREPARATION:**

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
12 (SL1+) – 4 (SL1-)	5.0 to 5.6 Ω

CHECK:

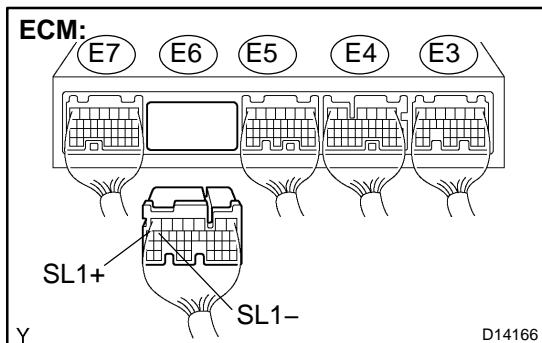
Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
12 (SL1+) – Body ground	10 kΩ or higher
4 (SL1-) – Body ground	↑

NG**Go to step 3.****OK**

2

Check harness and connector (Transmission wire - ECM)**PREPARATION:**

- Connect the transmission wire connector.
- Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 - 19 (SL1+) - E6 - 18 (SL1-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 - 19 (SL1+) - Body ground	10 kΩ or higher
E6 - 18 (SL1-) - Body ground	↑

NG

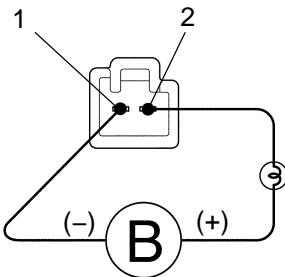
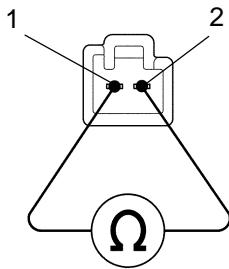
Repair or replace the harness or connector (See page IN-30).

OK

Replace the ECM (See page SF-66).

3 Inspect shift solenoid valve SL1.

Shift Solenoid Valve SL1:



D12795

PREPARATION:

Remove the shift solenoid valve SL1 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG

**Replace the shift solenoid valve SL1
(See page [AT-12](#)).**

OK

**Repair or replace the transmission wire
(See page [AT-9](#)).**

DTC	P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)
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SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0751	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve S1 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0751	Shift solenoid valve S1/OFF malfunction
		Shift solenoid valve S1/ON malfunction
Required sensors/Components	Main	Shift solenoid valve S1
	Sub	Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous	
Duration	OFF malfunction (A) and (B)	0.4 sec.
	OFF malfunction (C)	Immediate
	ON malfunction (A), (B) and (C)	0.4 sec.
	ON malfunction (D)	3 sec.
	ON malfunction (E)	0.5 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40° C (104° F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOt (Transfer input speed/Transfer output speed)	0.9 to 1.1	
OFF malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	
Throttle valve opening angle	8% or more 6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
OFF malfunction (B)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Continuous time for ECM selecting 4th gear	2 sec. or more	–
Actual gear when ECM selected 4th gear	4th	
OFF malfunction (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
ON malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	

DIAGNOSTICS – AUTOMATIC TRANSMISSION (A750E for 1GR-FE)

Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (B)		
ECM selected gear	4th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (C)		
ECM selected gear	3rd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (D)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Vehicle speed (During transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)
ON malfunction (E)		
ECM selected gear	5th	
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	–	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
[OFF malfunction]	
All of the following conditions are met: Conditions (A), (B) and (C)	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction (A)	
Turbine speed/Output speed	0.93 to 1.07
OFF malfunction (B)	
Turbine speed/Output speed	0.65 to 0.79
OFF malfunction (C)	
Output record from ECM for 4th → 5th upshifting	Recorded
[ON malfunction]	
Either of the following conditions is met:	
<ul style="list-style-type: none"> • ON malfunction (A) and (B) • ON malfunction (B) or (C), and ON malfunction (D) or (E) 	
ON malfunction (A) and (B)	
Turbine speed/Output speed	3.30 to 7.50
ON malfunction (C)	
Turbine speed/Output speed	1.91 to 2.35
ON malfunction (D)	
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more

ON malfunction (E)	
Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- Warm up the engine.
- Turn the ignition switch off.
- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to the ON position.
- Turn on the tester.
- Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-985](#)).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.
- The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1	Check other DTCs output (in addition to DTC P0751).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

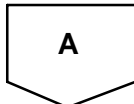
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0751" is output	A
"P0751" and other DTCs	B

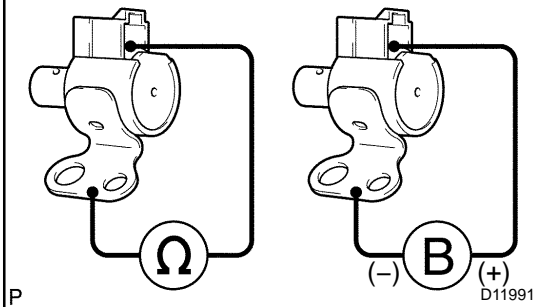
HINT:

If any other codes besides "P0751" are output, perform troubleshooting for those DTCs first.



2 Check shift solenoid valve S1 operation.

Shift solenoid S1:



PREPARATION:

Remove the shift solenoid valve S1 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S1) – Solenoid Body (S1)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG

Replace shift solenoid valve S1
(See page [AT-12](#)).

OK

3 Inspect valve body (See page [AT-12](#)).

OK:

There are no foreign objects on each valve.

NG

Repair or replace valve body.

OK

Repair or replace transmission (See page [AT-26](#)).

DTC	P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)
------------	--------------	---

SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0756	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve S2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S2. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0756	Shift solenoid valve S2/OFF malfunction
		Shift solenoid valve S2/ON malfunction
Required sensors/Components	Main	Shift solenoid valve S2
	Sub	Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous	
Duration	OFF malfunction (A), (B), (C)	0.4 sec.
	OFF malfunction (D)	Immediate
	ON malfunction (A) and (B)	0.4 sec.
	ON malfunction (C)	3 sec.
	ON malfunction (D)	0.5 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40° C (104° F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 to 1.1	
OFF malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
OFF malfunction (B)		
ECM selected gear	2nd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Output speed	2nd → 1st down shift point or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
OFF malfunction (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Continuous time for ECM selecting 4th gear	2 sec. or more	–
Actual gear when ECM selected 4th gear	4th	

OFF malfunction (D)		
Current ECM selected gear		5th
Last ECM selected gear		4th
ON malfunction (A)		
ECM selected gear		1st
Vehicle speed		2 to 40 km/h (1.2 to 24.9 mph)
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (B)		
ECM selected gear		4th
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (C)		
Current ECM selected gear		5th
Last ECM selected gear		4th
Vehicle speed (During transition from 4th to 5th gear)	–	Less than 100 km/h (62 mph)
ON malfunction (D)		
ECM selected gear		5th
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	–	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	–	Less than 100 km/h (62 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
[OFF malfunction]	
All of the following conditions are met: Conditions (A), (B), (C) and (D)	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction (A) and (B)	
Turbine speed/Output speed	3.30 to 7.50
OFF malfunction (C)	
Turbine speed/Output speed	0.65 to 0.79
OFF malfunction (D)	
Output record from ECM for 4th → 5th upshifting	Recorded
[ON malfunction]	
Both of the following conditions are met: ON malfunction (A) or (B), and ON malfunction (C) or (D)	
ON malfunction (A)	
Turbine speed/Output speed	1.91 to 2.35
ON malfunction (B)	
Turbine speed/Output speed	1.28 to 1.53
ON malfunction (C)	
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more

ON malfunction (E)	
Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-985](#)).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.
- The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1	Check other DTCs output (in addition to DTC P0756).
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PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

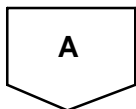
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0756" is output	A
"P0756" and other DTCs	B

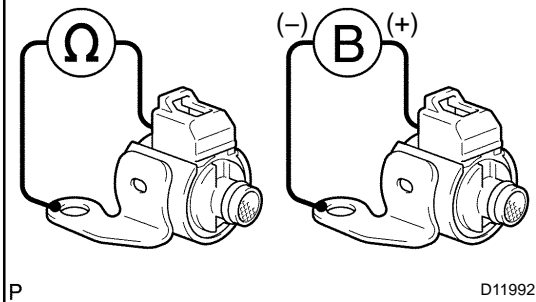
HINT:

If any other codes besides "P0756" are output, perform troubleshooting for those DTCs first.



2 Inspect shift solenoid valve S2 operation.

Shift solenoid S2:



PREPARATION:

Remove the shift solenoid valve S2 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S2) – Solenoid Body (S2)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG

Replace shift solenoid valve S2
(See page [AT-12](#)).

OK

3 Inspect valve body (See page [AT-12](#)).

OK:

There are no foreign objects on each valve.

NG

Repair or replace valve body.

OK

Repair or replace transmission (See page [AT-26](#)).

DTC	P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)
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SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0771	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve SR remains open or closed • Shift solenoid valve SL1 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve SR or SL1. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0771	Shift solenoid valve SR/Rationality check
Required sensors/Components	Main	Shift solenoid valve SR
	Sub	Speed sensor (NT), Speed sensor (NO), Crankshaft position sensor (NE)
Frequency of operation	Continuous	
Duration	OFF malfunction (A)	0.4 sec.
	OFF malfunction (B) and (C)	Immediate
	ON malfunction	0.15 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	

ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40°C (104°F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 to 1.1	
OFF malfunction (A)		
ECM selected gear	5th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
OFF malfunction (B)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Continuous time for ECM selecting 4th gear	2 sec. or more	–
OFF malfunction (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
ON malfunction		
Current ECM selected gear	2th	
Last ECM selected gear	1st	
Throttle valve opening angle (During transition from 1st to 2nd gear)	5.5% or more at 3,000 rpm (Conditions vary with engine speed)	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
[OFF malfunction]	
All of the following conditions are met: OFF malfunctions (A), (B) and (C)	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; temporary pending fault code ON	
OFF malfunction (A)	
Turbine speed/Output speed	0.93 to 1.07
OFF malfunction (B)	
Turbine speed/Output speed	Not change as follow 0.93 to 1.07 ↓ 0.65 to 0.79

OFF malfunction (C)	
Output record from ECM for 4th → 5th upshifting	Recorded
[ON malfunction]	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; temporary pending fault code ON	
Turbine speed – Output speed x 1st gear ratio (NT – NO x 1st gear ratio)	150 rpm or more

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-985](#)).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.
- The shift solenoid valve SR and SL1 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

1 Check other DTCs output (in addition to DTC P0771).

PREPARATION:

- Turn the ignition switch off.
- Connect the OBD II scan tool or hand-held tester to the DLC3.
- Turn the ignition switch to the ON position.
- Turn on the tester.
- Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0771" is output	A
"P0771" and other DTCs	B

HINT:

If any other codes besides "P0771" are output, perform troubleshooting for those DTCs first.

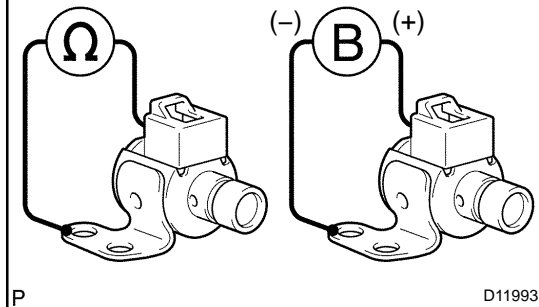
B

Go to DTC chart (See page [DI-991](#)).

A

2 Inspect shift solenoid valve SR operation.

Shift Solenoid Valve SR:



PREPARATION:

Remove the shift solenoid valve SR (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (SR) – Solenoid Body (SR)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

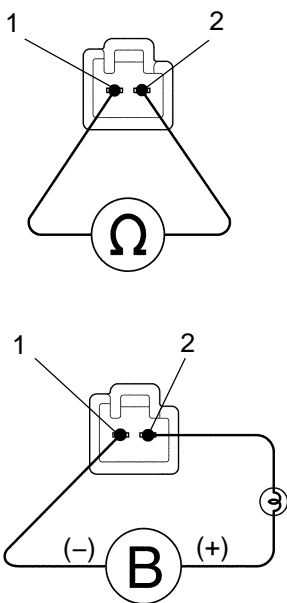
NG

Replace shift solenoid valve SR
(See page [AT-12](#)).

OK

3 Inspect shift solenoid valve SL1.

Shift Solenoid Valve SL1:



D12795

PREPARATION:

Remove the shift solenoid valve SL1 (See page AT-12).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 - 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG Replace the shift solenoid valve SL1 (See page AT-12).

OK

4 Inspect valve body (See page AT-12).

OK:

There are no foreign objects on each valve.

NG Repair or replace valve body.

OK

Repair or replace transmission (See page AT-26).

DTC	P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)
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SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0776	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve SL2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve SL2. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0776	Shift solenoid valve SL2/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SL2
	Sub	Speed sensor (NT), Speed sensor (NO), Crankshaft position sensor (NE)
Frequency of operation	Continuous	
Duration	ON malfunctions (A), (B) and (C)	0.4 sec.
	ON malfunction (D)	3 sec.
	ON malfunction (E)	0.5 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40° C (104° F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 to 1.1	
ON malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (B)		
ECM selected gear	3rd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (C)		
ECM selected gear	4th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (D)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	

Vehicle speed (During transition from 4th to 5th gear)	-	Less than 100 km/h (62.2 mph)
ON malfunction (E)		
ECM selected gear	5th	
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	-	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	-	Less than 100 km/h (62.2 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Both of the following conditions are met:	
<ul style="list-style-type: none"> • ON malfunctions (A) and (B), or ON malfunction (C) • ON malfunction (D) or (E) 	
ON malfunction (A)	
Turbine speed/Output speed	3.30 to 7.50
ON malfunction (B)	
Turbine speed/Output speed	1.28 to 1.53
ON malfunction (C)	
Turbine speed/Output speed	0.93 to 1.07
ON malfunction (D)	
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more
ON malfunction (E)	
Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-985](#)).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.
- The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

1	Check other DTCs output (in addition to DTC P0776).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

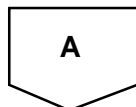
Read the DTCs using the OBD II scan tool or the hand-held tester.

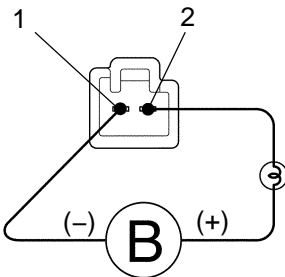
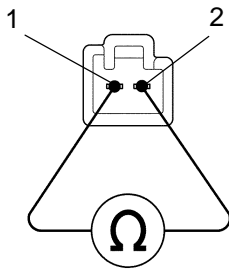
RESULT:

Display (DTC output)	Proceed to
Only "P0776" is output	A
"P0776" and other DTCs	B

HINT:

If any other codes besides "P0776" are output, perform troubleshooting for those DTCs first.



2 Inspect shift solenoid valve SL2.**Shift Solenoid Valve SL2:**

D12795

PREPARATION:

Remove the shift solenoid valve SL2 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 - 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG

Replace the shift solenoid valve SL2 (See page [AT-12](#)).

OK**3 Inspect valve body (See page [AT-12](#)).****OK:**

There are no foreign objects on each valve.

NG

Repair or replace valve body.

OK

Repair or replace transmission (See page [AT-26](#)).

DTC	P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)
------------	--------------	--

CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-985](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0778	The ECM checks for an open or short in the shift solenoid valve SL2 circuit while driving and shifting gears. (1-trip detection logic) • Output signal duty equals to 100%. (NOTE: SL2 output signal duty is less than 100% under normal condition.)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM commands gear shift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF". (In case of an open or short circuit, the ECM stops sending current to the circuit.)

While driving and shifting gears, if the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines there is a malfunction (See page [DI-985](#)).

MONITOR STRATEGY

Related DTCs	P0778	Shift solenoid valve SL2/Range check
Required sensors/Components	Shift solenoid valve SL2	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-963	
Battery voltage	10 V or more	–
CPU commanded duty	–	Less than 75%
Ignition switch	ON	
Starter	OFF	

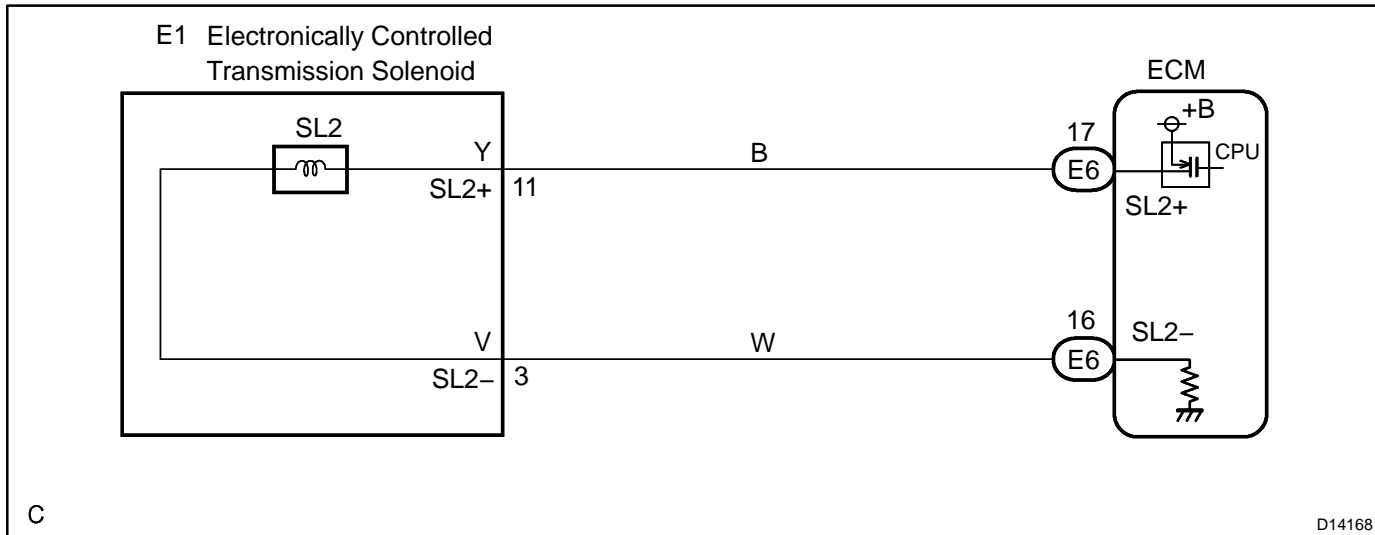
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Output signal duty	100%

COMPONENT OPERATING RANGE

Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



C

D14168

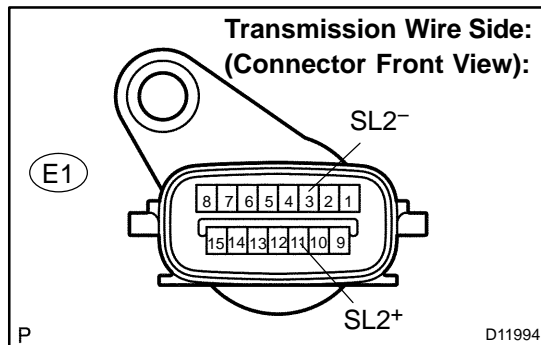
INSPECTION PROCEDURE

HINT:

- The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

1	Inspect transmission wire.
----------	-----------------------------------



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
11 (SL2+) – 3 (SL2-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

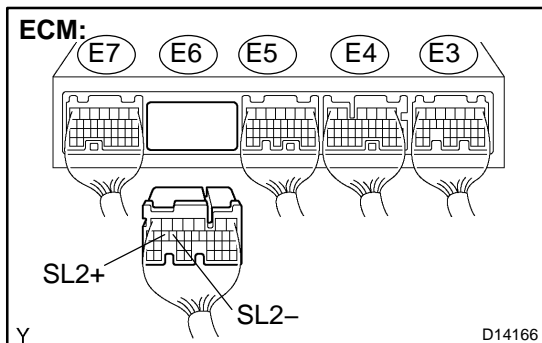
Tester Connection	Specified Condition
11 (SL2+) – Body ground	10 kΩ or higher
3 (SL2-) – Body ground	↑

NG

Go to step 3.

OK

2

Check harness and connector (Transmission wire - ECM)**PREPARATION:**

- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 - 17 (SL2+) - E6 - 16 (SL2-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 - 17 (SL2+) - Body ground	10 kΩ or higher
E6 - 16 (SL2-) - Body ground	↑

NG

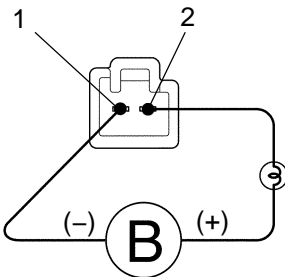
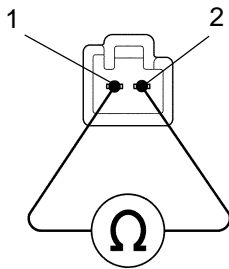
Repair or replace the harness or connector (See page IN-30).

OK

Replace the ECM (See page SF-66).

3 Check shift solenoid valve SL2.

Shift Solenoid Valve SL2:



D12795

PREPARATION:

Remove the shift solenoid valve SL2 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

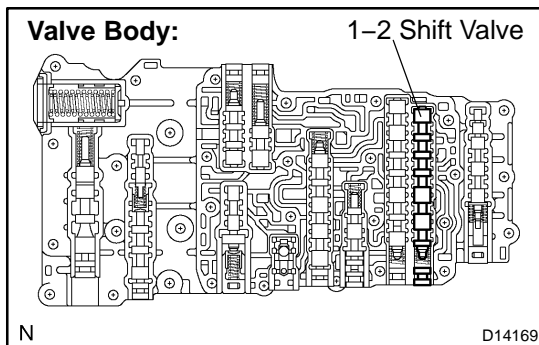
NG

**Replace the shift solenoid valve SL2
(See page [AT-12](#)).**

OK

**Repair or replace the transmission wire
(See page [AT-9](#)).**

DTC	P0781	1-2 Shift (1-2 Shift Valve)
------------	--------------	------------------------------------



SYSTEM DESCRIPTION

The 1-2 shift valve performs shifting to 1st gear and other gears.

DTC No.	DTC Detection Condition	Trouble Area
P0781	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Valve body is blocked up or stuck (1-2 shift valve) • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the direction the spring compresses. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF" and switching oil pressure to the valves in the valve body.

The ECM calculates the "actual" transmission gear by comparing the signals from the input speed sensor (NCO) and the output speed sensor (SP2). The ECM can detect many mechanical problems in the shift solenoids, valve body, and the transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and store the DTC .

MONITOR STRATEGY

Related DTCs	P0781	Valve body/Rationality check
Required sensors/Components	Main	Valve body
	Sub	Automatic transmission assembly, Speed sensor (NT), Speed sensor (NO), Vehicle speed sensor, Throttle speed sensor
Frequency of operation	Continuous	
Duration	Conditions (A) and (B)	0.4 sec.
	Condition (C)	3 sec.
	Condition (D)	0.5 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40° C (104° F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOt (Transfer input speed/Transfer output speed)	0.9 to 1.1	
Condition (A)		
ECM selected gear	2nd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Output speed	2nd → 1st down shift point or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
Condition (B)		
ECM selected gear	4th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
Condition (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Vehicle speed (During transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)

Condition (D)		
ECM selected gear		5th
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	–	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Both of the following conditions are met: Condition (A), and Condition (B), (C) or (D)	
Condition (A)	
Turbine speed/Output speed	3.30 to 7.50
Condition (B)	
Turbine speed/Output speed	1.28 to 1.53
Condition (C)	
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more
Condition (D)	
Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

1	Check other DTCs output (in addition to DTC P0781).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

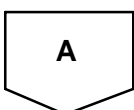
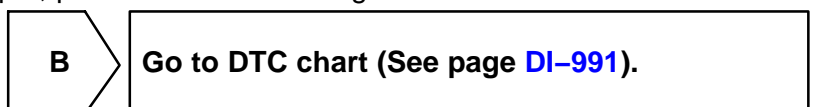
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0781" is output	A
"P0781" and other DTCs	B

HINT:

If any other codes besides "P0781" are output, perform troubleshooting for those DTCs first.



2	Perform active test
----------	----------------------------

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-985](#)).

Standard:

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.

OK:

Gear position changes in accordance with the tester command.

NG

**Repair or replace valve body
(See page [AT-12](#)).**

OK

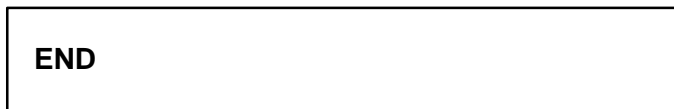
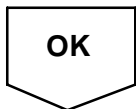
3	Clear the DTC and running test.
----------	--

CHECK:

Clear the DTC, and check DTC again after conducting the "MONITOR DRIVE PATTERN FOR ECT TEST" (See page [DI-969](#)).

OK:

No DTC code



DTC	P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)
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DTC	P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)
------------	--------------	--

CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-985](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0973	ECM detects short in solenoid valve S1 circuit 2 times when solenoid valve S1 is operated (1-trip detection logic)	<ul style="list-style-type: none"> • Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	ECM detects open in solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated (1-trip detection logic)	<ul style="list-style-type: none"> • Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is on, if resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.

When the shift solenoid valve S1 is off, if resistance is 100 k Ω or more, the ECM determines there is an open in the shift solenoid valve S1 circuit (See page [DI-985](#)).

MONITOR STRATEGY

Related DTCs	P0973	Shift solenoid valve S1/Range check (Low resistance)
	P0974	Shift solenoid valve S1/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S1	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-963	
Range check (Low resistance)		
Shift solenoid valve S1	ON	
Range check (High resistance)		
Shift solenoid valve S1	OFF	

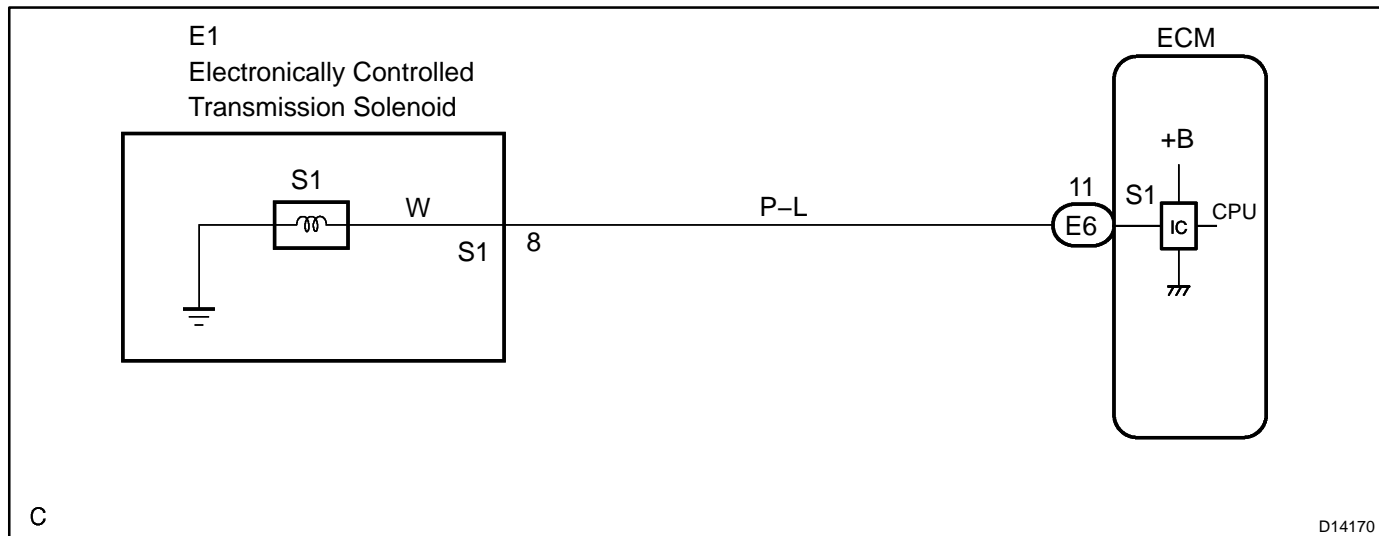
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve S1 resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve S1 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Shift solenoid valve S1	Resistance: 11 to 15 Ω at 20°C (68°F)

WIRING DIAGRAM



C

D14170

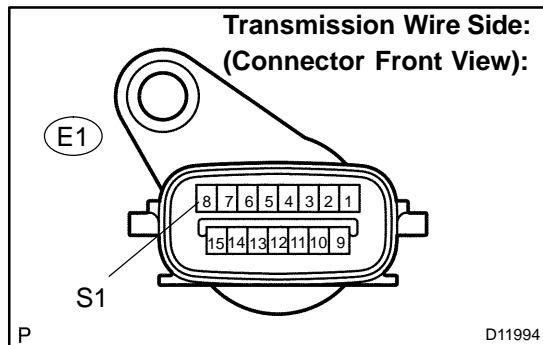
INSPECTION PROCEDURE

HINT:

- The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1	Check transmission wire.
----------	---------------------------------



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

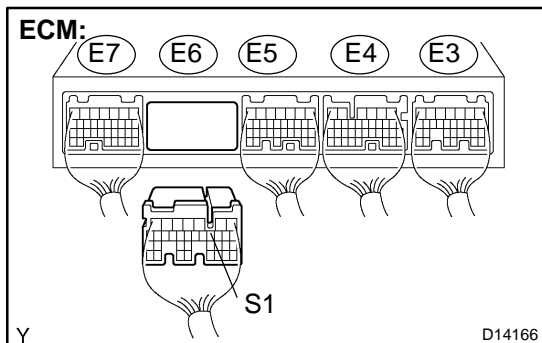
Tester Connection	Specified Condition 20°C (68°F)
8 – Body ground	11 to 15 Ω

NG

Go to step 3.

OK

2

Check harness and connector (Transmission wire - ECM)**PREPARATION:**

- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 - 11 (S1) - Body ground	11 to 15 Ω

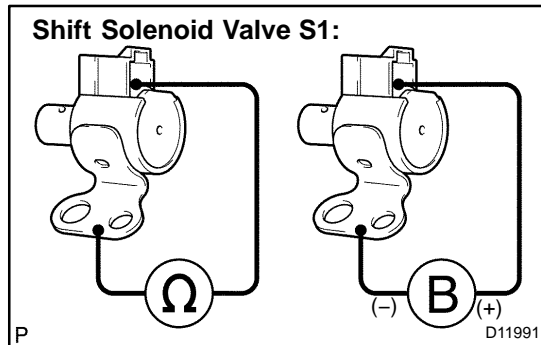
NG

**Repair or replace the harness or connector
(See page [IN-30](#)).**

OK

Replace the ECM (See page [SF-66](#)).

3 Check shift solenoid valve S1.



PREPARATION:

Remove the shift solenoid valve S1 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S1) – Solenoid Body (S1)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG

Replace the shift solenoid valve S1 (See page [AT-12](#)).

OK

Repair or replace the transmission wire (See page [AT-9](#)).

DTC	P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)
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DTC	P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)
------------	--------------	--

CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-985](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0976	ECM detects short in solenoid valve S2 circuit 2 times when solenoid valve S2 is operated (1-trip detection logic)	<ul style="list-style-type: none"> • Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	ECM detects open in solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated (1-trip detection logic)	<ul style="list-style-type: none"> • Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is on, if resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.

When the shift solenoid valve S2 is off, if resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S2 circuit (See page [DI-985](#)).

MONITOR STRATEGY

Related DTCs	P0976	Shift solenoid valve S2/Range check (Low resistance)
	P0977	Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S2	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-963	
Range check (Low resistance)		
Shift solenoid valve S2	ON	
Range check (High resistance)		
Shift solenoid valve S2	OFF	

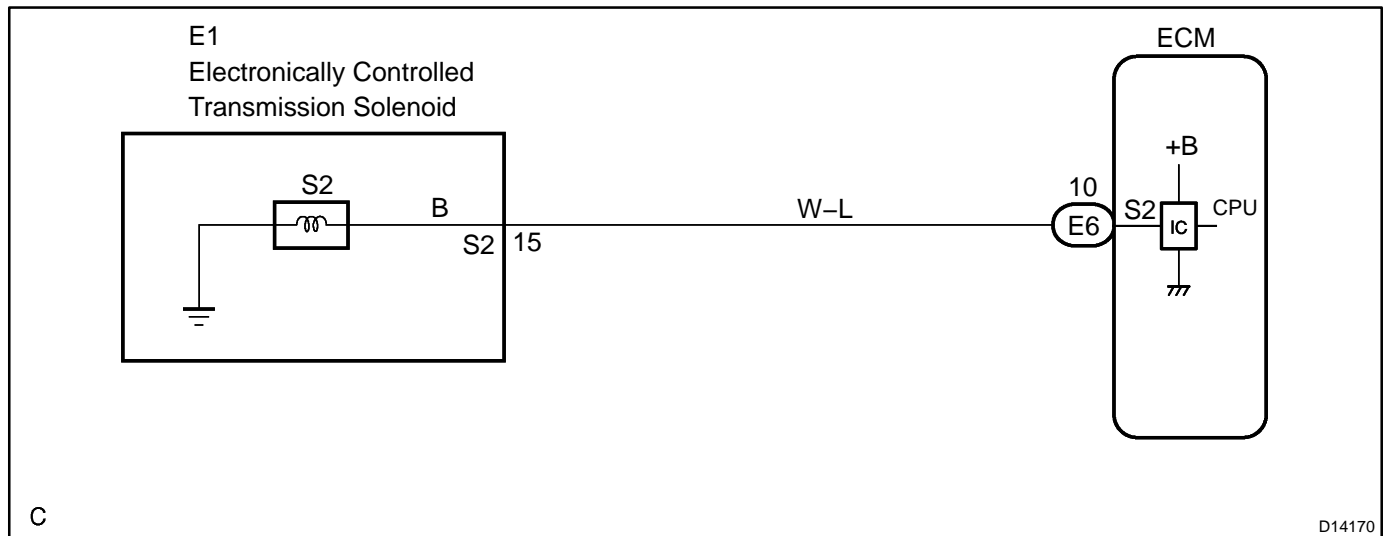
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve S2 resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve S2 resistance	100 k Ω or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Shift solenoid valve S2	Resistance: 11 to 15 Ω at 20°C (68°F)

WIRING DIAGRAM



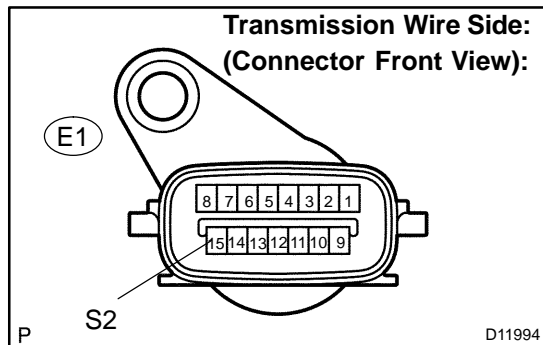
INSPECTION PROCEDURE

HINT:

- The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1 Check transmission wire.



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

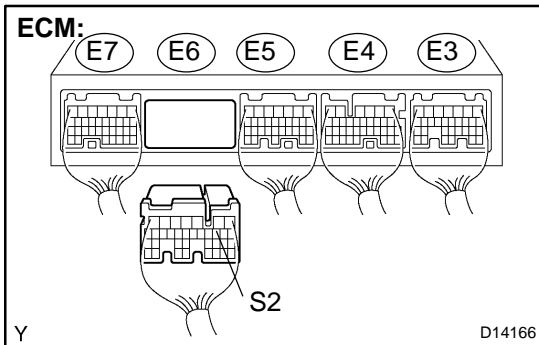
Tester Connection	Specified Condition 20°C (68°F)
15 - Body ground	11 to 15 Ω

NG

Go to step 3.

OK

2 Check harness and connector (Transmission wire – ECM)



PREPARATION:

- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 10 (S2) – Body ground	11 to 15 Ω

NG

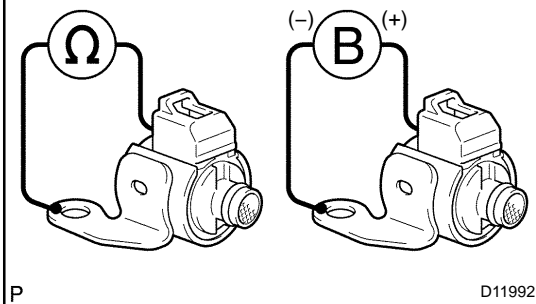
**Repair or replace the harness or connector
(See page [IN-30](#)).**

OK

Replace the ECM (See page [SF-66](#)).

3 Check shift solenoid valve S2.

Shift Solenoid Valve S2:



PREPARATION:

Remove the shift solenoid valve S2 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S2) – Solenoid Body (S2)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG

Replace the shift solenoid valve S2
(See page [AT-12](#)).

OK

Repair or replace the transmission wire
(See page [AT-9](#)).

DTC	P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)
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DTC	P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)
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CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-985](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0985	ECM detects short in solenoid valve SR circuit 2 times when solenoid valve SR is operated (1-trip detection logic)	<ul style="list-style-type: none"> • Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	ECM detects open in solenoid valve SR circuit 2 times when solenoid valve SR is not operated (1-trip detection logic)	<ul style="list-style-type: none"> • Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve SR is on, if resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.

When the shift solenoid valve SR is off, if resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve SR circuit (See page [DI-985](#)).

MONITOR STRATEGY

Related DTCs	P0985	Shift solenoid valve SR/Range check (Low resistance)
	P0986	Shift solenoid valve SR/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SR	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-963	
Range check (Low resistance)		
Shift solenoid valve SR	ON	
Battery voltage	8 V or more	-
Ignition switch	ON	
Starter	OFF	
Range check (High resistance)		
Shift solenoid valve SR	OFF	
Battery voltage	8 V or more	-
Ignition switch	ON	
Starter	OFF	

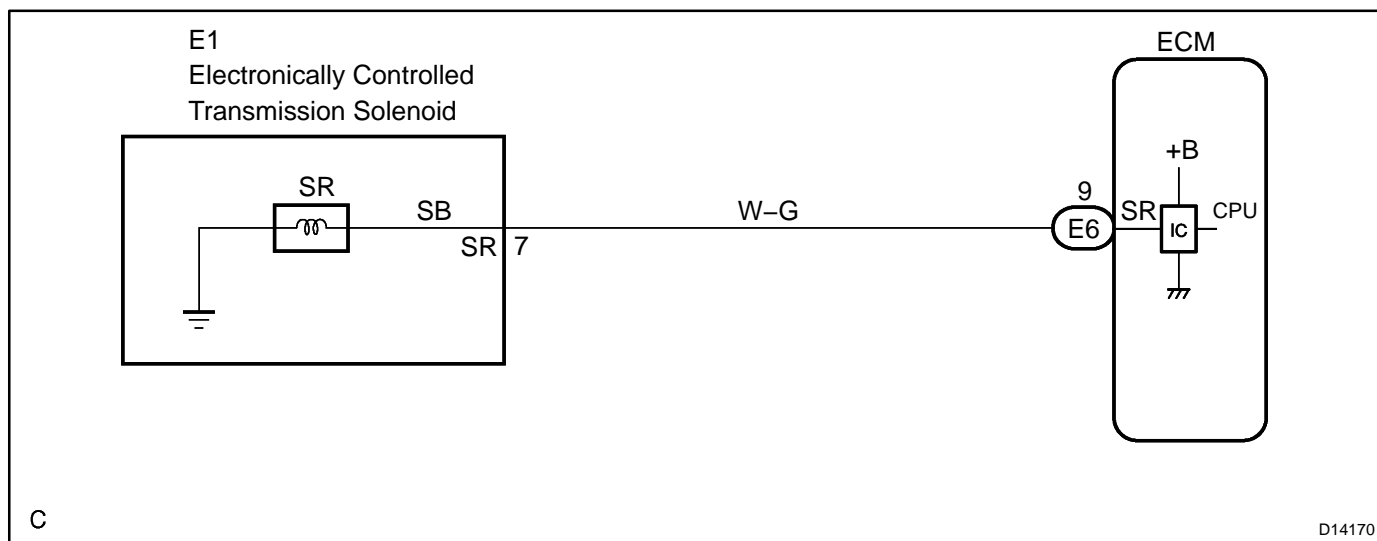
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve SR resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve SR resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Shift solenoid valve SR	Resistance: 11 to 15 at 20°C (68°F)

WIRING DIAGRAM

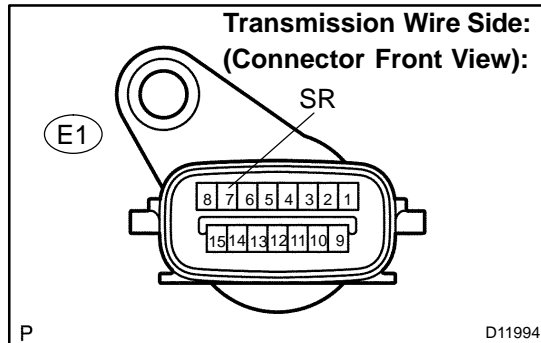


INSPECTION PROCEDURE**HINT:**

- The shift solenoid valve SR is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON

1	Check transmission wire.
----------	---------------------------------

**PREPARATION:**

Disconnect the transmission wire connector.

CHECK:

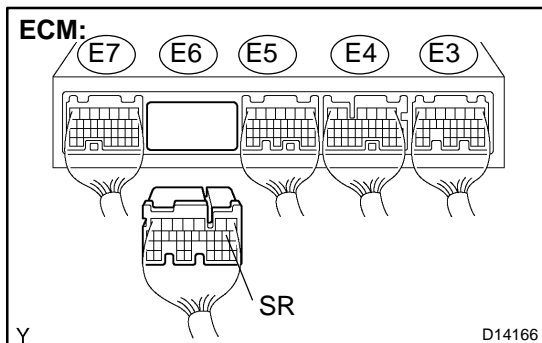
Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
7 – Body ground	11 to 15 Ω

NG**Go to step 3.****OK**

2

Check harness and connector (Transmission wire - ECM)**PREPARATION:**

- Connect the transmission wire connector.
- Disconnect the connector of the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

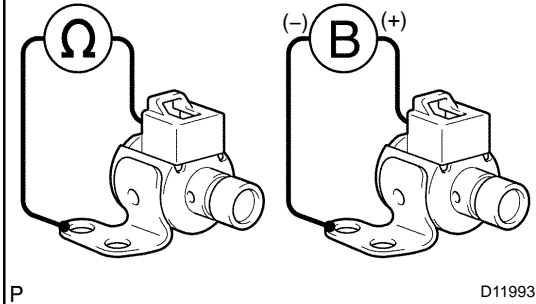
Tester Connection	Specified Condition 20°C (68°F)
E6 - 9 (SR) - Body ground	11 to 15 Ω

NG

**Repair or replace the harness or connector
(See page [IN-30](#)).**

OK

Replace the ECM (See page [SF-66](#)).

3 Check shift solenoid valve SR.
Shift Solenoid Valve SR:

PREPARATION:

Remove the shift solenoid valve SR (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (SR) – Solenoid Body (SR)	11 to 15 Ω

CHECK:

Connect the battery positive lead to the solenoid connector terminal and the battery negative lead to the solenoid body ground.

OK:

Solenoid sounds an operation noise.

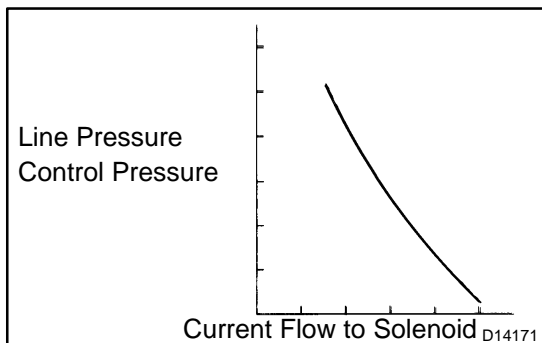
NG

Replace the shift solenoid valve SR (See page [AT-12](#)).

OK

Repair or replace the transmission wire (See page [AT-9](#)).

DTC	P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)
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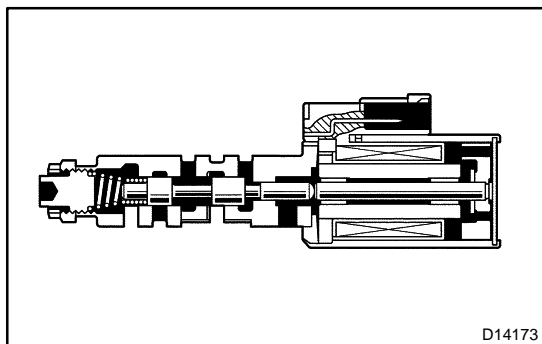
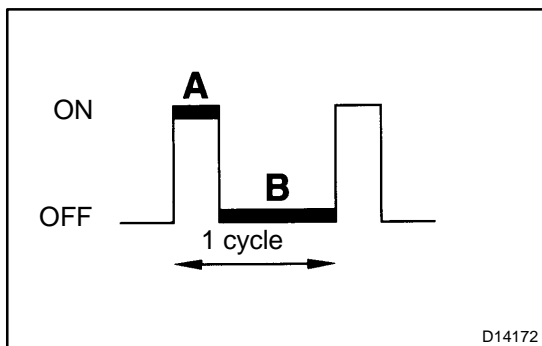
SYSTEM DESCRIPTION

The linear solenoid valve (SLT) controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the duty cycle of the SLT solenoid valve to control hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100 (\%)$$



DTC No.	DTC Detection Condition	Trouble Area
P2714	ECM detects a malfunction on SLT (ON side) according to the revolution difference of the turbine and the output shaft, and also by the oil pressure. (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM turns on the MIL and outputs this DTC when the amount of heat absorption exceeds the specified value.

When the shift solenoid valve SLT remains on, oil pressure goes down and clutch engagement force decreases.

NOTE: If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

MONITOR STRATEGY

Related DTCs	P2714	Shift solenoid valve SLT/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SLT
	Sub	Valve body, ATF temperature sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous	
Duration	Immediate	
MIL operation	2 driving cycles	
Sequence of operation	None	

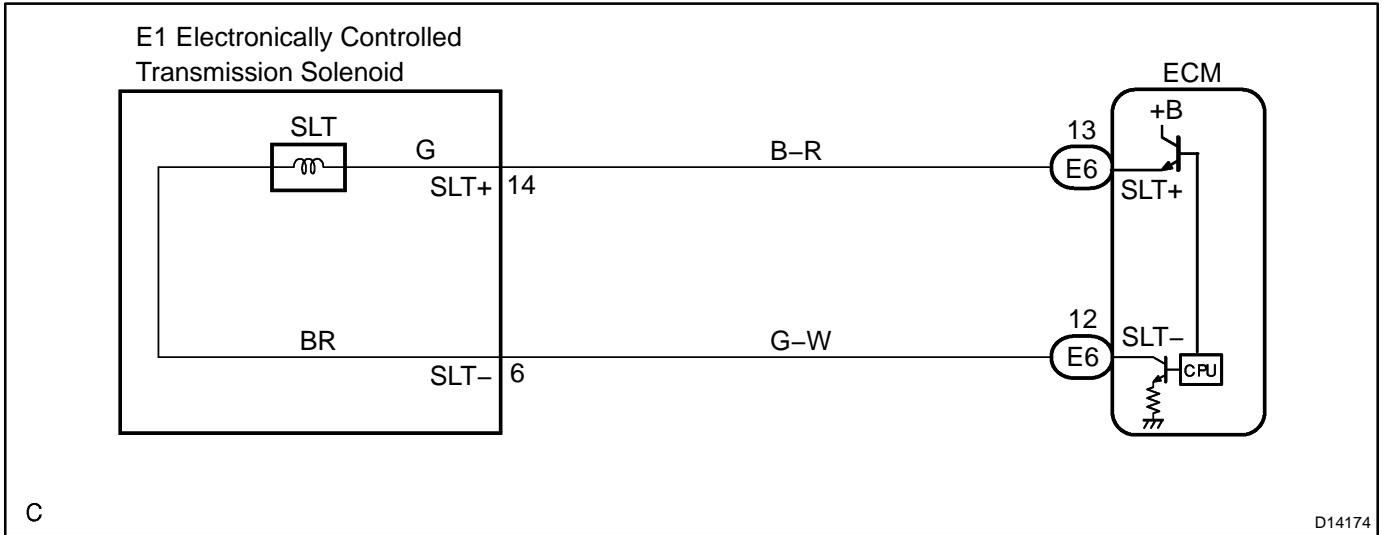
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Transmission Fluid Temperature Sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
Shift solenoid valve SLT circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40°C (104°F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
TFT (transmission fluid temperature)	10°C (50°F) or more	–
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 to 1.1	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Summation of C1 clutch heat generations = Σ (Turbine speed - Output speed x Temporary ratio)	Specified value

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [HINT] OFF: Line pressure up (When the active test of "Control the Line Pressure Up" is performed, the ECM commands the SLT solenoid to turn off). ON: No action (normal operation)	-

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting the SST to the automatic transaxle, which is used in the HYDRAULIC TEST (See page [DI-958](#)) as well.

HINT:

- The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.
- Normally, the line pressure detected in the ACTIVE TEST is approximately half of the value detected in the HYDRAULIC TEST's stall test.

1	Check other DTCs output (in addition to DTC P2714).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

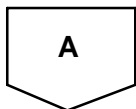
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P2714" is output	A
"P2714" and other DTCs	B

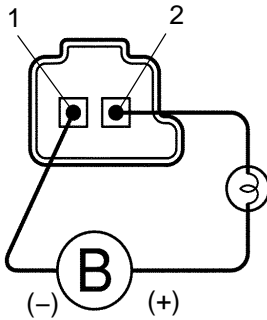
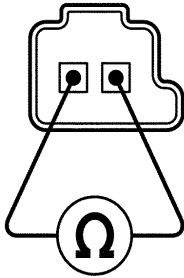
HINT:

If any other codes besides "P2714" are output, perform troubleshooting for those DTCs first.



2 Inspect shift solenoid valve SLT operation.

Shift Solenoid Valve SLT:



P

D11987

PREPARATION:

Remove the shift solenoid valve SLT (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG

Replace the shift solenoid valve SLT
(See page [AT-12](#)).

OK

3 Inspect valve body (See page [AT-12](#)).

OK:

There are no foreign objects on each valve.

NG

Repair or replace valve body.

OK

Repair or replace transmission (See page [AT-26](#)).

DTC	P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)
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CIRCUIT DESCRIPTION

See page [DI-1073](#)

DTC No.	DTC Detection Condition	Trouble Area
P2716	Open or short is detected in shift solenoid valve SLT circuit for 1 second or more while driving (1-trip detection logic).	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

MONITOR DESCRIPTION

When an open or short in the linear solenoid valve (SLT) circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2716	Shift solenoid valve SLT/Range check
Required sensors/Components	Shift solenoid valve SLT	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-963	
Case 1:		
Battery voltage	10 V or more	Less than 12 V
Ignition switch	ON	
CPU commanded duty	–	Less than 75%
Starter	OFF	
Case 2:		
Battery voltage	12 V or more	–
Ignition switch	ON	
Starter	OFF	

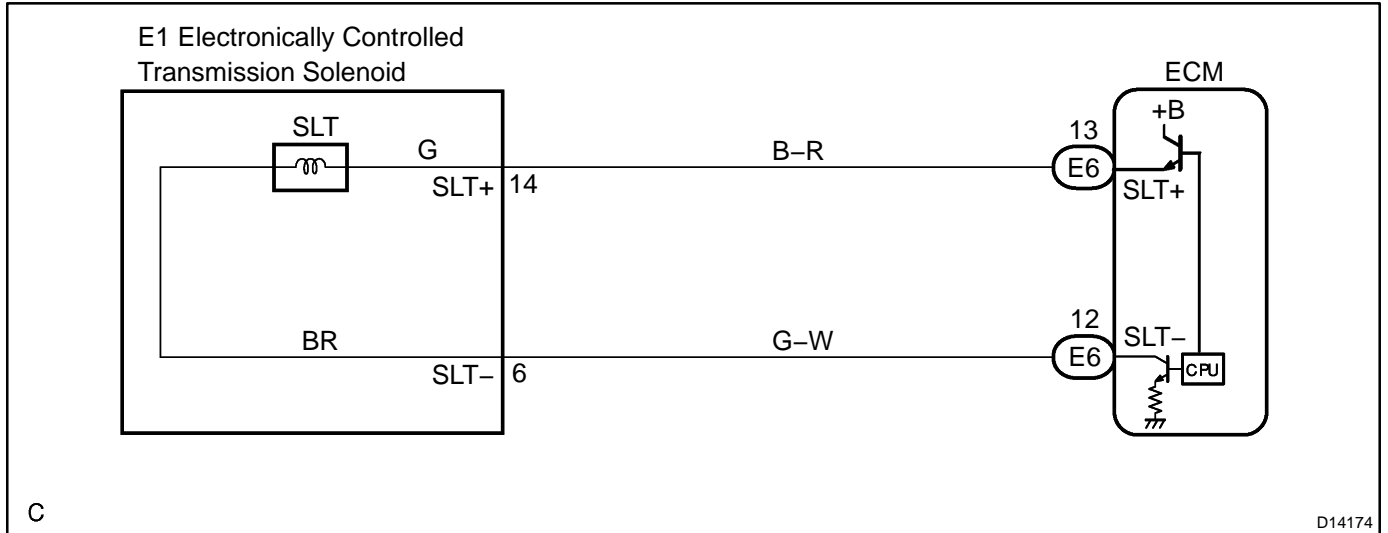
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Case 1:	
Output signal duty	100%
Case 2:	
Output signal duty	100%

COMPONENT OPERATING RANGE

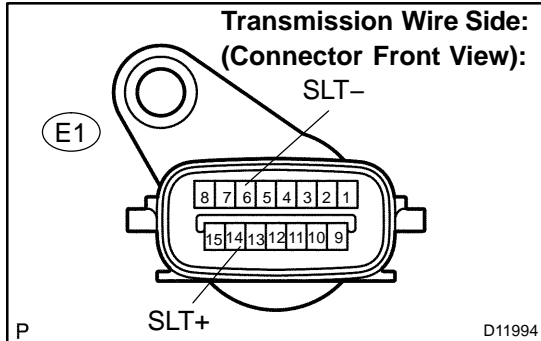
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check transmission wire.
----------	---------------------------------



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
14 (SLT+) - 6 (SLT-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

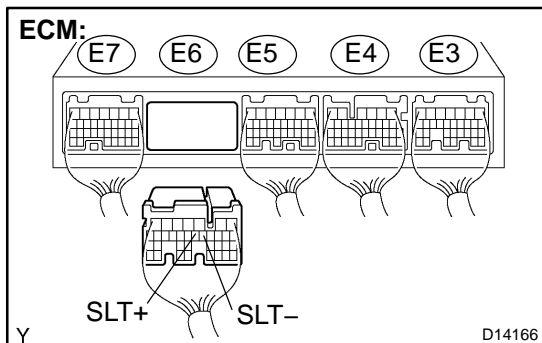
OK:

Tester Connection	Specified Condition
14 (SLT+) - Body ground	10 kΩ or higher
6 (SLT-) - Body ground	↑

NG	Go to step 3.
-----------	----------------------

OK

2

Check harness and connector (Transmission wire - ECM)**PREPARATION:**

- Connect the transmission wire connector.
- Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 - 13 (SLT+) - E6 - 12 (SLT-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

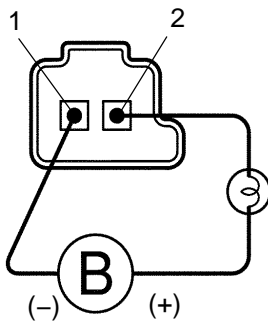
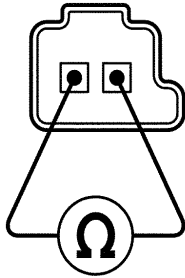
Tester Connection	Specified Condition
E6 - 13 (SLT+) - Body ground	10 kΩ or higher
E6 - 12 (SLT-) - Body ground	↑

NG

**Repair or replace harness or connector
(See page IN-30).**

OK

Replace the ECM (See page SF-66).

3 Inspect shift solenoid valve SLT.
Shift Solenoid Valve SLT:


P

D11987

PREPARATION:

Remove the shift solenoid valve SLT (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG

**Replace the shift solenoid valve SLT
(See page [AT-12](#)).**

OK

**Repair or replace the transmission wire
(See page [AT-9](#)).**

DTC	P2740	Transmission Fluid Temperature Sensor "B" Circuit
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DTC	P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input
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DTC	P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input
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CIRCUIT DESCRIPTION

ATF (Automatic Transmission Fluid) temperature sensor No.2 is on the transmission and just in front of the oil cooler inlet pipeline.

If ECM detects the abnormally high temperature of ATF by this sensor, it draws driver's attention by illuminating the warning lamp.

HINT:

- The temperature of ATF easily rises when towing, climbing hills and in traffic, etc.
- If the ATF temperature sensor No.2 becomes short-circuited, the signal that indicates the ATF temperature is 150°C (302°F) or higher is input in ECM.

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

ATF temperature Sensor No.2 State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	• AT fluid temp. more than 150°C (302°F).	• AT Oil Temp. warning light remains on	• AT fluid temp. less than 135°C (275°F). *2
	• AT fluid temp. more than 130°C (266°F).	• Shift point too high.	• AT fluid temp. less than 110°C (230°F).
	When the conditions (a) and (b) are satisfied. (a) AT fluid temp. more than 130°C (266°F). (b) Engine coolant temp. more than 95°C (203°F).	• Lock-up at 3rd gear. *1	• AT fluid temp. less than 110°C (230°F) *2 and engine coolant temp. less than 95°C (203°F).
Sensor is short-circuited	• Any conditions.	• AT Oil Temp. warning light remains on • Shift point too high.	• Symptoms still occur
	• Engine coolant temp. more than 95°C (203°F).	• Lock-up at 3rd gear. *1	• Symptoms still occur

HINT:

*1: When AT fluid temperature is normal, transmission locks up at 5th gear with the shift lever in D position and at 4th gear with the shift lever in 4 position.

*2: When AT fluid temperature is in normal range, it decreases to less than 135°C (275°F) within 5 minutes with the shift lever in P or N position in an idling state.

DTC No.	DTC Detecting Condition	Trouble Area
P2740	(a) and (b) are detected momentarily within 0.5 sec. when neither P2742 nor P2743 is detected (1-trip detection logic) (a) ATF temperature sensor No.2 resistance is less than 25 Ω (0.046 V) (b) ATF temperature sensor No.2 resistance is more than 156 k Ω (4.915 V) HINT: Within 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM
P2742	ATF temperature sensor No.2 resistance is less than 25 Ω (0.046 V) for 0.5 sec. or more (1-trip detection logic)	<ul style="list-style-type: none"> • Short in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM
P2743	ATF temperature No.2 sensor resistance is more than 156 k Ω (4.915 V) when 15 minutes or more after the engine start DTC is detected for 0.5 sec. or more (1-trip detection logic)	<ul style="list-style-type: none"> • Open in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM

MONITOR DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the AFT temperature circuit. If the resistance value of the ATF temperature is less than 25 Ω (0.046 V) or more than 156 k Ω (4.915 V), the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2740	ATF temperature sensor/Range check (Fluttering)
	P2742	ATF temperature sensor/Range check (Low voltage)
	P2743	ATF temperature sensor/Range check (High voltage)
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-963	
Range check (Fluttering, Low voltage)		
The typical enabling condition is not available.	-	
Range check (High voltage)		
Time after engine start	15 min. or more	-

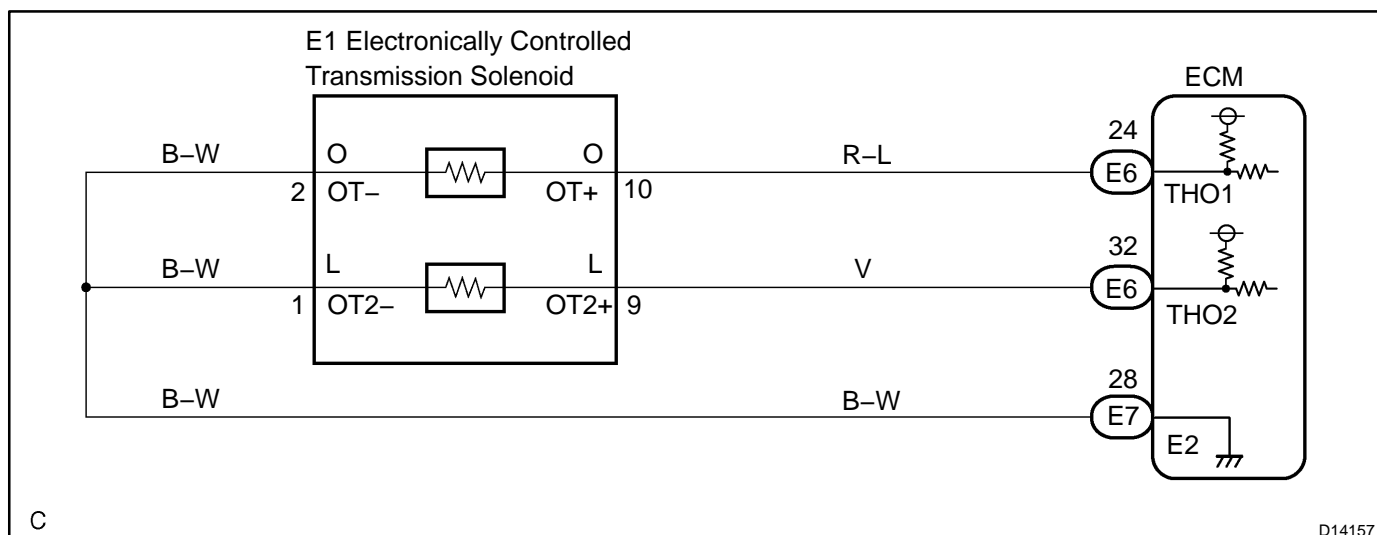
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Fluttering)	
TFT (transmission fluid temperature) sensor voltage	Less than 0.046 V or More than 4.915 V
Range check (Low voltage)	
TFT (transmission fluid temperature) sensor voltage	Less than 0.046 V
Range check (High voltage)	
TFT (transmission fluid temperature) sensor voltage	More than 4.915 V

COMPONENT OPERATING RANGE

Parameter	Standard value
TFT (transmission fluid temperature) sensor	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT FLUID TEMP 2	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak

HINT:

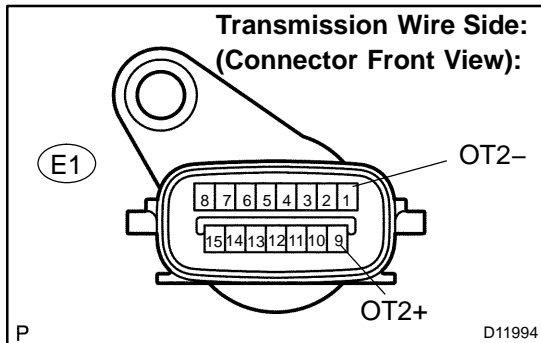
When DTC P2742 is output and hand-held tester output is 150°C (302°F) or more, there is a short circuit.

When DTC P2743 is output and hand-held tester output is -40°C (-40°F), there is an open circuit.

Measure the resistance between terminal THO2 (OT2) and body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

1 Inspect transmission wire (ATF temperature sensor No.2)



PREPARATION:

Disconnect the transmission wire connector from the transmission.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
1 (OT2-) – 9 (OT2+)	25 Ω to 156 k Ω
1 (OT2-) – Body ground	10 k Ω or higher
9 (OT2+) – Body ground	10 k Ω or higher

HINT:

If the resistance is out of the specified range with either the ATF temperature shown in the table below, the driveability of the vehicle may decrease.

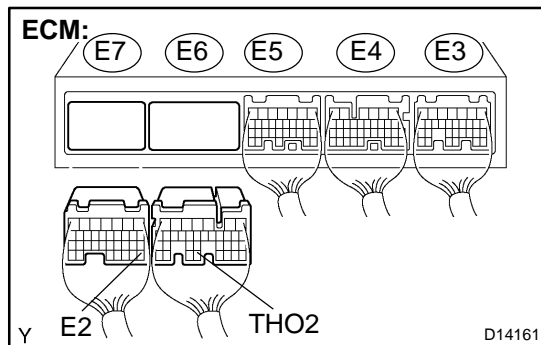
ATF Temperature	Specified Condition
20°C (68°F)	3 to 4 k Ω
110°C (230°F)	0.22 to 0.28 k Ω

NG

**Repair or replace the transmission wire (ATF temperature sensor No.2)
(See page [AT-9](#)).**

OK

2 Check harness and connector (Transmission wire – ECM)



PREPARATION:

- Connect the transmission wire connector.
- Disconnect the connector of the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 32 (THO2) – E7 – 28 (E2)	25 Ω to 156 k Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 32 (THO2) – Body ground	10 k Ω or higher
E7 – 28 (E2) – Body ground	↑

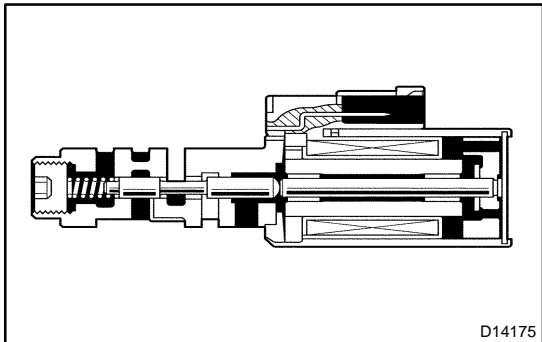
NG

Repair or replace the harness or connector (See page IN-30).

OK

Replace the ECM (See page SF-66).

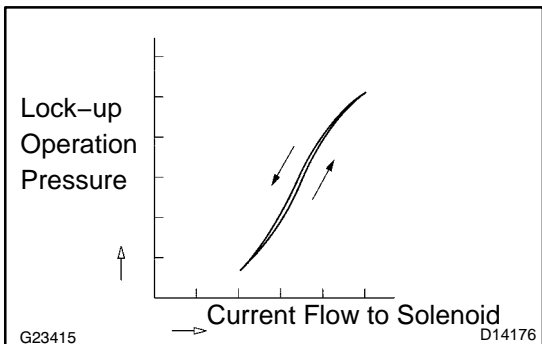
DTC	P2757	Torque Converter Clutch Pressure Control Solenoid Performance(Shift Solenoid Valve SLU)
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SYSTEM DESCRIPTION

The ECM uses the signals from the throttle position sensor, Air-flow meter, turbine (input) speed sensor, output speed sensor and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.

Then the ECM compares the engagement condition of the lock-up clutch with the lock-up schedule in the ECM memory to detect a mechanical problems of the shift solenoid valve SLU, valve body and torque converter clutch.



DTC No.	DTC Detection Condition	Trouble Area
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 80 km/h [50 mph]), or lock-up remains ON in the lock-up OFF range. (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve SLU remains open or closed • Valve body is blocked • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on the turbine (input) speed sensor NT, output speed sensor SP2, engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to output shaft rpm (SP2). When conditions are appropriate, the ECM requests "lock-up" by applying control voltage to the shift solenoid SLU. When the SLU is turned on, it applies pressure to the lock-up relay valve and locks the torque converter clutch.

If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve SLU or lock-up system performance. The ECM will turn on the MIL and store the DTC.

Example:

When any of the following is met, the system judges it as a malfunction.

- (a) There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up.
(Engine speed is at least 70 rpm greater than input turbine speed.)
- (b) There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up off.
(The difference between engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P2757	Shift solenoid valve SLU/OFF malfunction
		Shift solenoid valve SLU/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SLU
	Sub	Valve body, Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous	
Duration	OFF malfunction (A)	2 sec.
	OFF malfunction (B)	0.4 sec.
	ON malfunction	1.8 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Torque converter clutch pressure control solenoid circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT (Engine coolant temperature)	40°C (104°F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
ECM selected gear	4th or 5th	
Vehicle speed	25 km/h (15.5 mph) or more	–
Shift solenoid valve S1 circuit	Not on malfunction	
Shift solenoid valve S2 circuit	Not on malfunction	
Shift solenoid valve SL2 circuit	Not on malfunction	
1–2 Shift valve	Not on malfunction	
Transfer neutral position switch	OFF	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOt (Transfer input speed/Transfer output speed)	0.9 to 1.1	
OFF malfunction (A)		
ECM lock-up command	ON (SLU pressure: 513kpa or more)	
Vehicle speed	–	Less than 100 km/h (62.2 mph)
OFF malfunction (B)		
ECM selected gear	2nd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Output speed	2nd → 1st down shift point or more	–
Throttle valve opening angle	6.5% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction		
ECM lock-up command	OFF (SLU pressure: less than 4kPa)	

Throttle valve opening angle	7% or more	–
Vehicle speed	–	Less than 60 km/h (37.3 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Both of the following conditions are met: OFF malfunctions (A) and (B)	
OFF malfunction (A)	
Engine speed – Turbine speed	70 rpm or more
OFF malfunction (B)	
Turbine speed/Output speed	Not 3.30 to 7.50
ON malfunction	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; pending fault code ON	
Vehicle speed must be under 10 km/h (6.2 mph) once before 2nd detection	
Difference between engine speed and turbine speed	Less than 35 rpm

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- Warm up the engine.
- Turn the ignition switch off.
- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to the ON position.
- Turn on the tester.
- Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- According to the display on the tester, perform the "ACTIVE TEST".

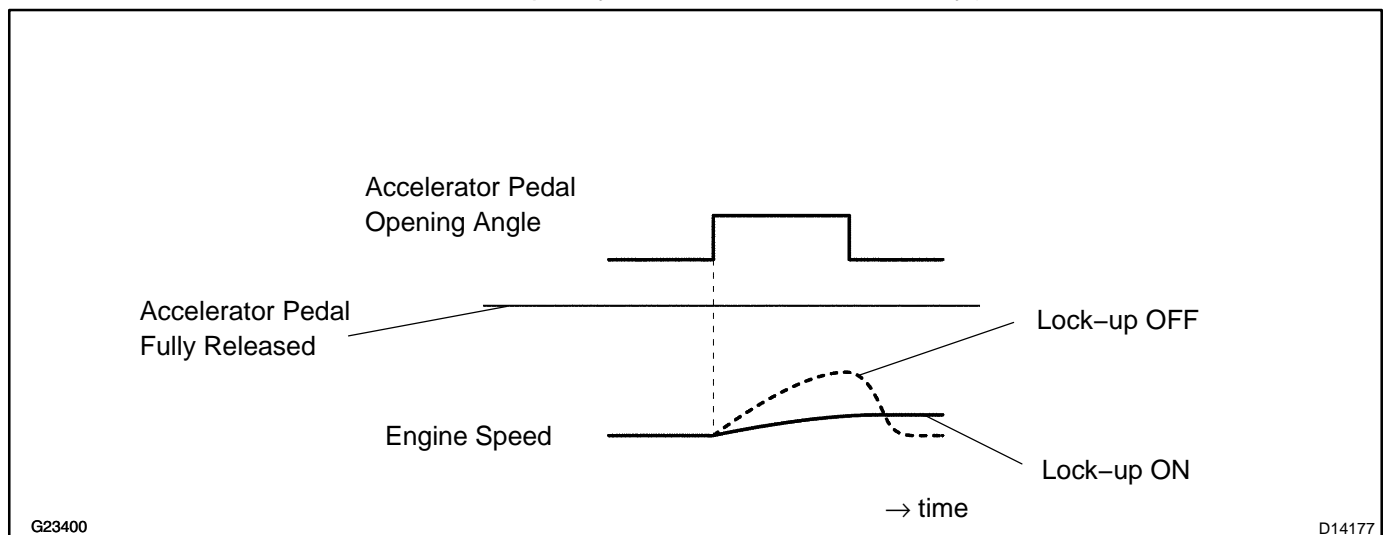
Item	Test Details	Diagnostic Note
LOCK UP	[Test Details] Control the shift solenoid SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] <ul style="list-style-type: none"> • Throttle valve opening angle: Less than 35 % • Vehicle Speed: 60 km/h (37 mph) or more 	Possible to check the SLU operation.

HINT:

- This test can be conducted when the vehicle speed is 60 km/h (37 mph) or more.
- This test can be conducted in the 5th gear.
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:

- When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is on.
- Slowly release, but not fully, the accelerator pedal in order to decelerate. (Fully releasing the pedal will close the throttle valve and lock-up may be turned off automatically.)



1	Check other DTCs output (in addition to DTC P2757).
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PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

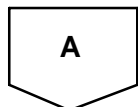
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P2757" is output	A
"P2757" and other DTCs	B

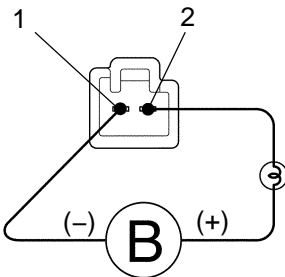
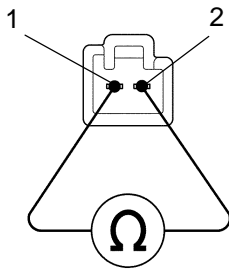
HINT:

If any other codes besides "P2757" are output, perform troubleshooting for those DTCs first.



2 Check shift solenoid valve SLU operation.

Shift Solenoid Valve SLU:



D12795

PREPARATION:

Remove the shift solenoid valve SLU (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 - 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG

Replace the shift solenoid valve SLU
(See page [AT-12](#)).

OK

3 Inspect valve body (See page [AT-12](#)).

OK:

There are no foreign objects on each valve.

NG

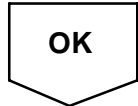
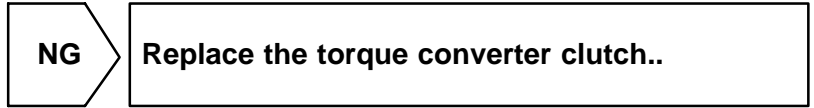
Repair or replace valve body.

OK

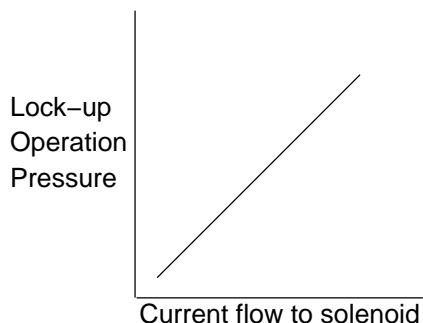
4	Check torque converter clutch (See page AT-39).
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OK:

The torque converter clutch operates normally.



DTC	P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical(Shift Solenoid Valve SLU)
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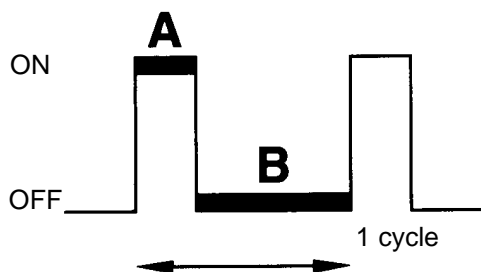
CIRCUIT DESCRIPTION

The amount of current flow to the solenoid is controlled by the (*) duty ratio of the ECM output signal. The higher the duty ratio becomes, the higher the lock-up hydraulic pressure becomes during the lock-up operation.

(*) Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100 (\%)$$



BE4056

D00160

DTC No.	DTC detection condition	Trouble Area
P2759	Open or short is detected in shift solenoid valve SLU circuit for 1 second or more while driving (1-trip detection logic).	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short in a shift solenoid valve (SLU) circuit is detected, the ECM determines there is a malfunction. The ECM will turn on the MIL and store this DTC.

MONITOR STRATEGY

Related DTCs	P2759	Shift solenoid valve SLU/Range check
Required sensors/Components	Shift solenoid valve SLU	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-973	
Case 1:		
Battery voltage	12 V or more	-
Ignition switch	ON	
Starter	OFF	
Case 2:		
Battery voltage	10 V or more	Less than 12 V
CPU commanded duty	-	Less than 75%
Ignition switch	ON	
Starter	OFF	

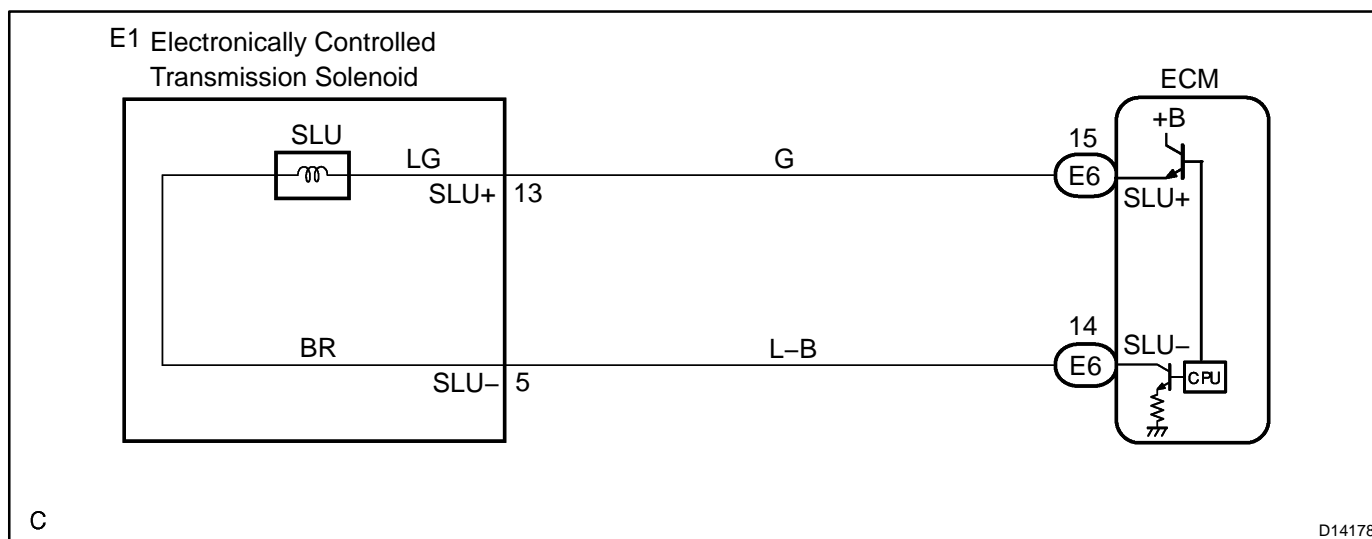
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Case 1:	
Output signal duty	100%
Case 2:	
Output signal duty	100%

COMPONENT OPERATING RANGE

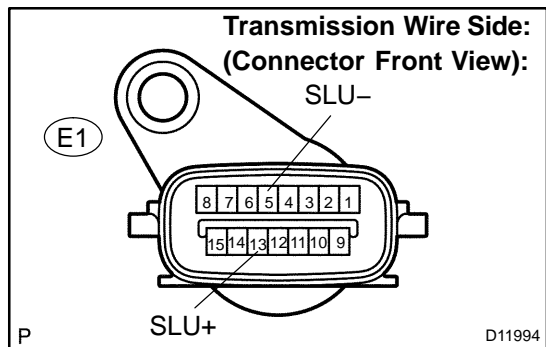
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Inspect transmission wire.**



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
13 (SLU+) - 5 (SLU-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

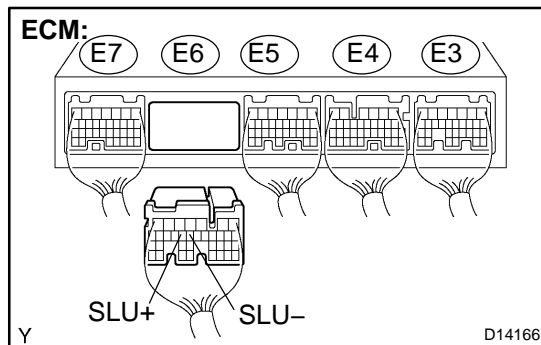
OK:

Tester Connection	Specified Condition
13 (SLU+) - Body ground	10 kΩ or higher
5 (SLU-) - Body ground	↑

NG **Go to step 3.**

OK

2 Check harness and connector (Transmission wire – ECM)



PREPARATION:

- Connect the transmission wire connector.
- Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 15 (SLU+) – E6 – 14 (SLU-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 15 (SLU+) – Body ground	10 kΩ or higher
E6 – 14 (SLU-) – Body ground	↑

NG

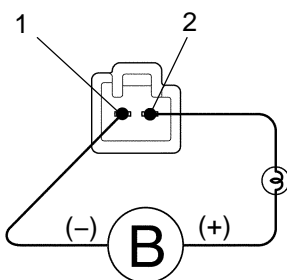
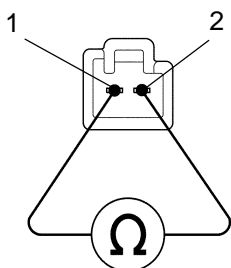
**Repair or replace the harness or connector
(See page IN-30).**

OK

Replace the ECM (See page SF-66).

3 Inspect shift solenoid valve SLU.

Shift Solenoid Valve SLU:



D12795

PREPARATION:

Remove the shift solenoid valve SLU (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 - 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG

**Replace the shift solenoid valve SLU
(See page [AT-12](#)).**

OK

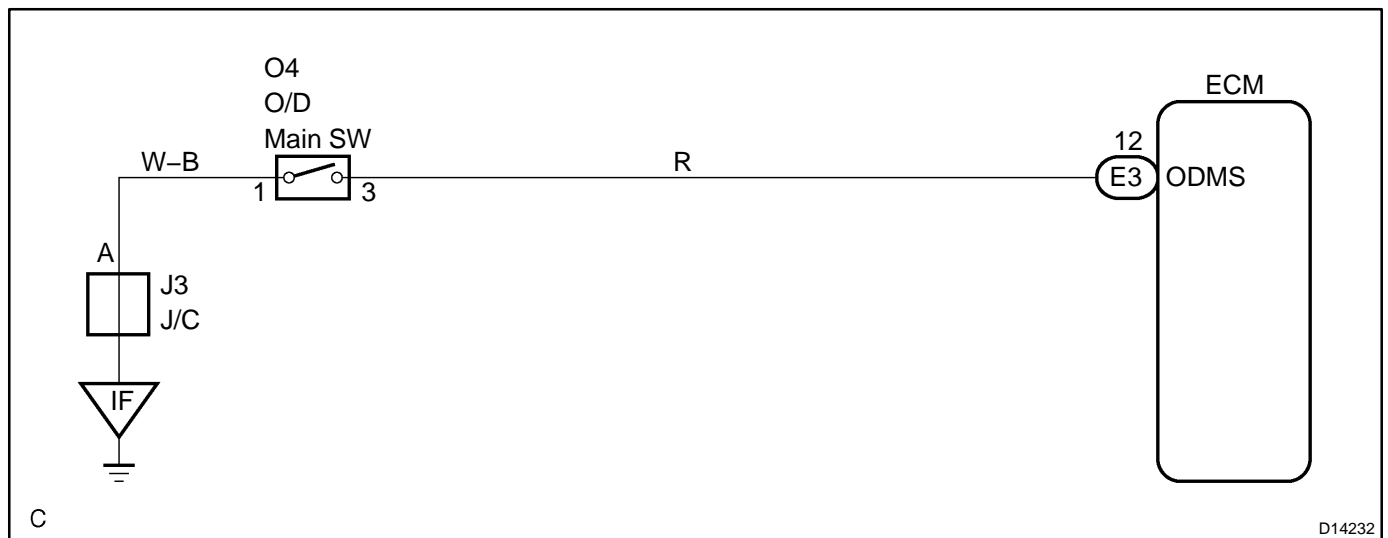
**Repair or replace the transmission wire
(See page [AT-9](#)).**

O/D Main Switch Circuit

CIRCUIT DESCRIPTION

The O/D main switch (transmission control switch) is a momentary type switch. When pressing the O/D main switch once, the O/D OFF indicator light comes on and the ECM prohibits shifting into O/D. When pressing it once again, the O/D OFF indicator light goes off and the ECM allows shifting into O/D. Turning the IG switch OFF will reset the O/D OFF indicator light.

WIRING DIAGRAM

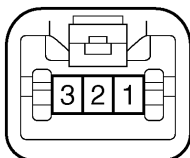


INSPECTION PROCEDURE

1 Check harness and connector (O/D main switch – body ground)

Wire Harness Side:
(Connector Front View):

O4



N

D14181

PREPARATION:

Disconnect the O/D main switch connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
1 – Body ground	Below 1 Ω

NG

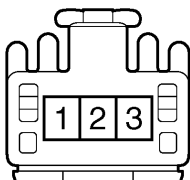
Repair or replace the harness or connector
(See page [IN-30](#)).

OK

2 Inspect O/D main switch.

Switch Side:
(Connector Front View):

O4



N

D14182

CHECK:

Measure the resistance according to the value(s) in the table below.

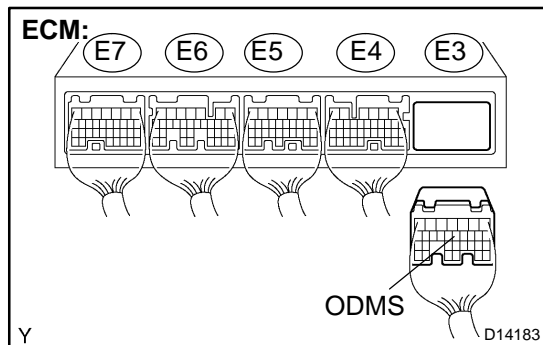
OK:

Switch Condition	Tester Connection	Specified Condition
O/D main switch pressed and held	1 – 3	Below 1 Ω
O/D main switch released	\uparrow	10 k Ω or higher

NG

Replace O/D main switch (See page [AT-19](#)).

OK

3 Check harness and connector (O/D main switch – ECM).
**PREPARATION:**

- Connect the O/D main switch connector.
- Disconnect the connector from the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Switch Condition	Tester Connection	Specified Condition
O/D main switch pressed and held	E3 – 12 (ODMS) – Body ground	Below 1 Ω
O/D main switch released	\uparrow	10 k Ω or higher

NG

Repair or replace the harness or connector (See page IN-30).

OK

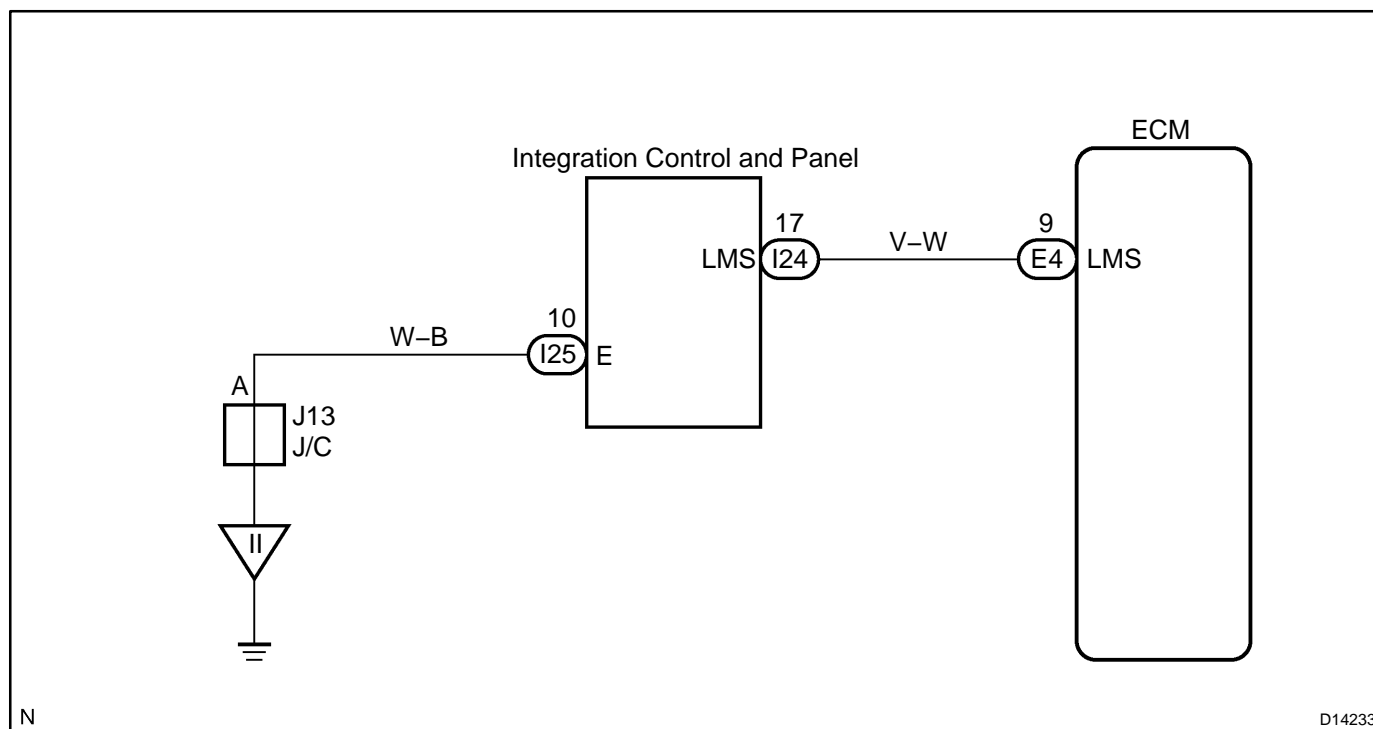
Proceed to next circuit inspection shown on matrix chart (See page DI-971).

Shift Position L Switch Circuit

CIRCUIT DESCRIPTION

The shift position L switch is a momentary type switch. When the shift position L switch is pressed while driving with the shift lever in the 2 position, the L position indicator on the combination meter comes on and the transmission is locked in 1st gear. When the switch is pressed again, the indicator goes off and the transmission is released.

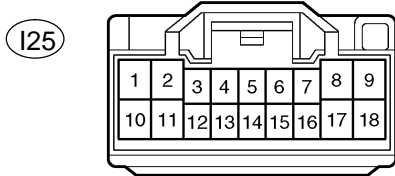
WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check harness and connector (shift position L switch – body ground).

**Wire Harness Side:
(Connector Front View):**



N

D14179

PREPARATION:

Remove the center cluster integration panel assembly (shift position L switch).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

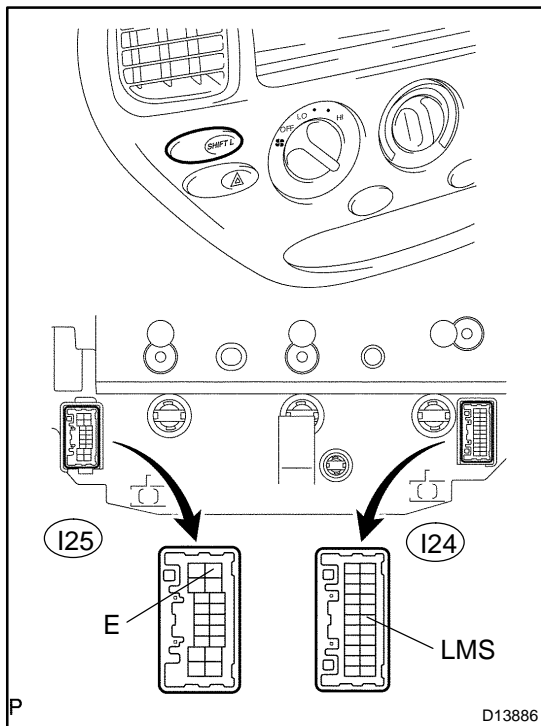
Tester Connection	Specified Condition
10 – Body ground	Below 1 Ω

NG

Repair or replace the harness or connector (See page IN-30).

OK

2 Inspect center cluster integration panel (shift position L switch).



P

D13886

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

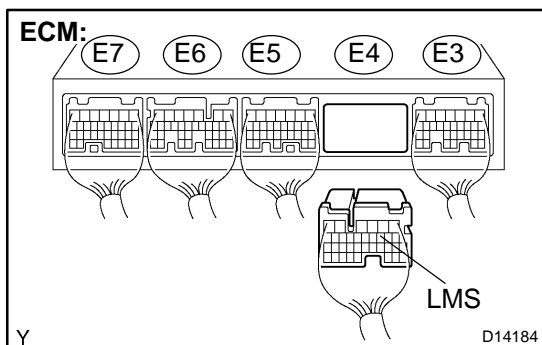
Switch Condition	Tester Connection	Specified Condition
Shift position L switch pressed and held	I24 – 17 (LMS) – I25 – 10 (E)	Below 1 Ω
Shift position L switch released	↑	10 kΩ or higher

NG

Replace center cluster integration panel (shift position L switch).

OK

3 Check harness and connector (shift position L switch - ECM).



PREPARATION:

- Install the center cluster integration panel assembly (shift position L switch).
- Disconnect the connector from the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Switch Condition	Tester Connection	Specified Condition
Shift position L switch pressed and held	E4 - 9 (LMS) - Body ground	Below 1 Ω
Shift position L switch released	↑	10 k Ω or higher

NG

Repair or replace the harness or connector (See page IN-30).

OK

Proceed to next circuit inspection shown on matrix chart (See page DI-971).

AUTOMATIC TRANSMISSION (A750E/A750F for 2UZ-FE)

DIDVV-01

PRECAUTION

NOTICE:

Perform the **RESET MEMORY (AT initialization)** when replacing the automatic transmission assy, engine assy or ECM (See page [DI-1126](#)).

HINT:

RESET MEMORY cannot be completed by only disconnecting the battery terminal.

DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects malfunction every time when enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.
Component operating range	Normal operation range of sensors and solenoids under normal driving conditions. Use these ranges as a reference. They cannot be used to judge if a sensor or solenoid is defective or not.

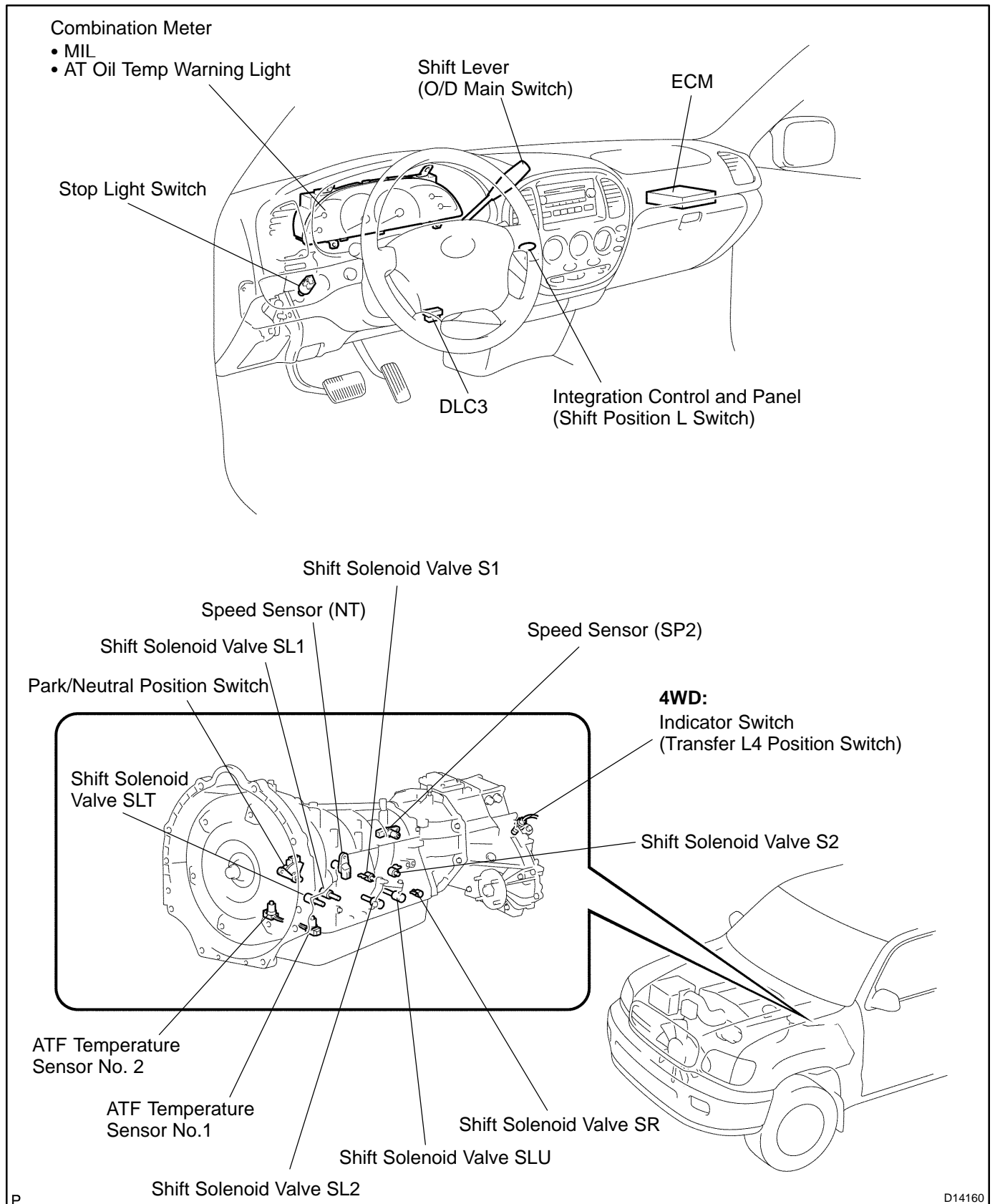
TOYOTA PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

Part and system name	Definition
Toyota HCAC system, Hydrocarbon adsorptive Catalyst (HCAC) system, HC adsorptive three-way catalyst	HC adsorptive three-way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor "A"	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VAV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On-board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power-steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor "A"	Counter gear speed sensor

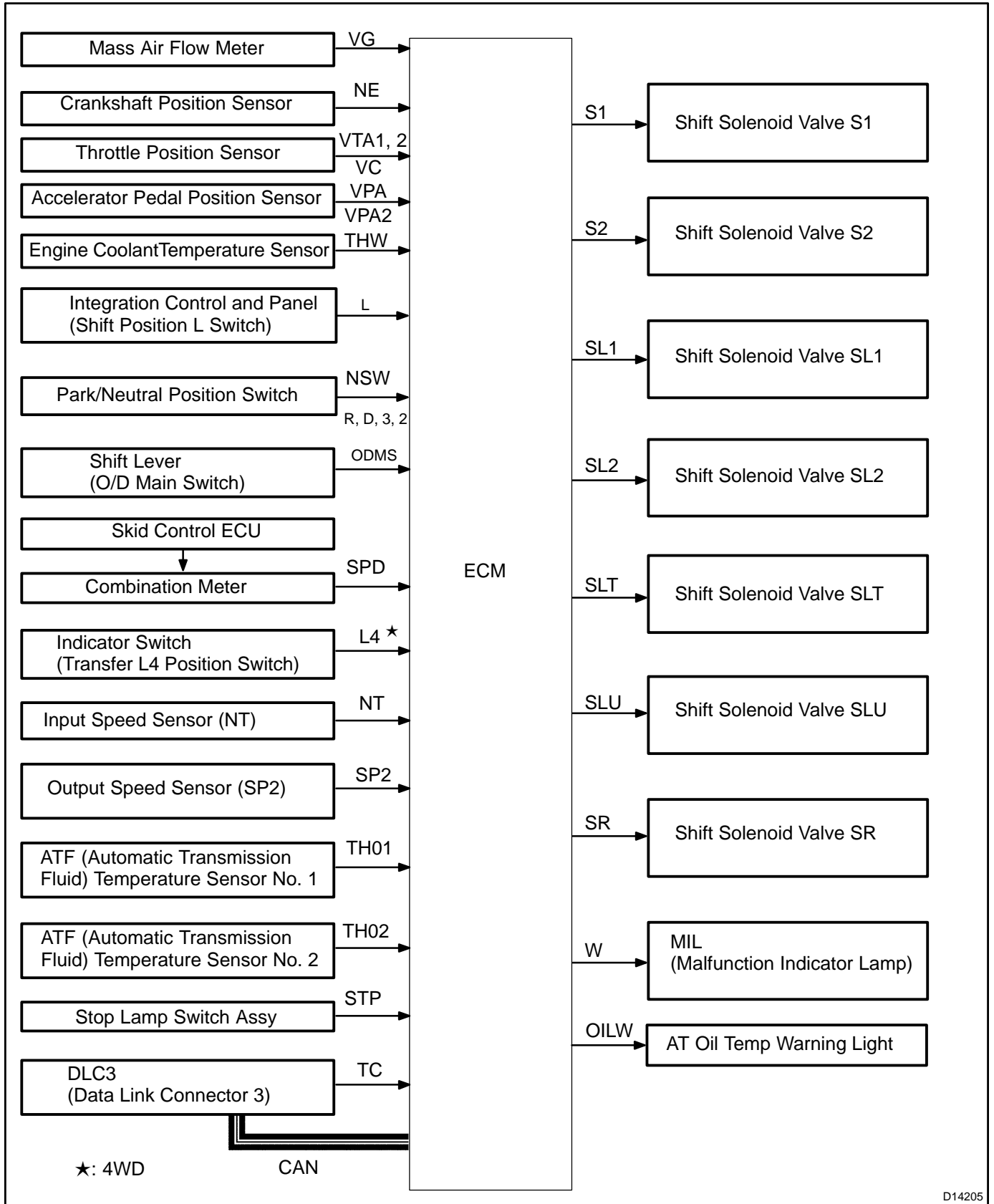
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti-theft system

LOCATION



SYSTEM DIAGRAM

The configuration of the electronic control system in the A750E/A750F automatic transmission is as shown in the following chart.



SYSTEM DESCRIPTION

SYSTEM DESCRIPTION


The ECT (Electronic controlled automatic transmission) is an automatic transmission that electronically controls shift timing using the ECM. The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point, based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.

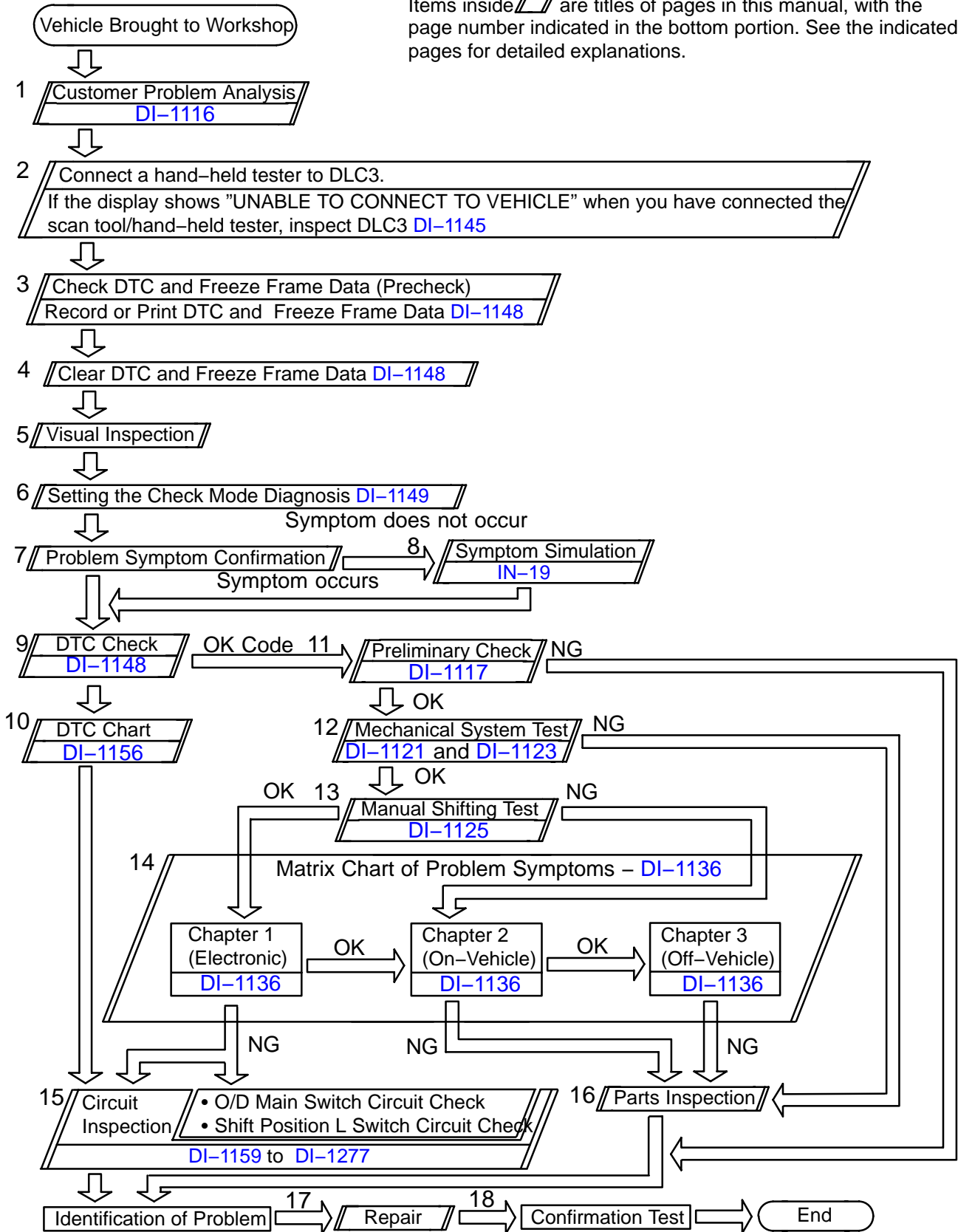
Shift shock has been reduced by controlling the engine and transmission simultaneously.

In addition, the ECT has features such as follows:

- Diagnostic function.
- Fail-safe function when a malfunction occurs.

HOW TO PROCEED WITH TROUBLESHOOTING

Items inside  are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



CUSTOMER PROBLEM ANALYSIS CHECK

Automatic Transmission System Check Sheet

Inspector's Name _____ :

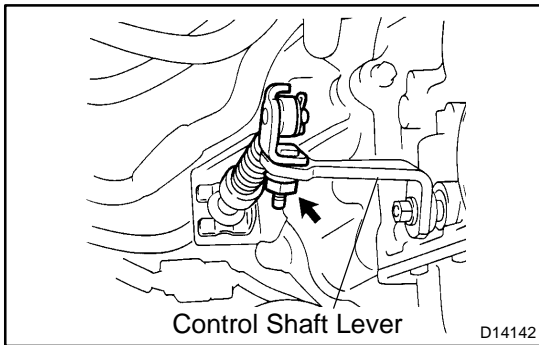
Customer's Name		VIN	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent (times a day)

Symptoms	<input type="checkbox"/> Vehicle does not move (<input type="checkbox"/> Any position <input type="checkbox"/> Particular position)
	<input type="checkbox"/> No up-shift (<input type="checkbox"/> 1st → 2nd <input type="checkbox"/> 2nd → 3rd <input type="checkbox"/> 3rd → 4th <input type="checkbox"/> 4th → 5th)
	<input type="checkbox"/> No down-shift (<input type="checkbox"/> 5th → 4th <input type="checkbox"/> 4th → 3rd <input type="checkbox"/> 3rd → 2nd <input type="checkbox"/> 2nd → 1st)
	<input type="checkbox"/> Lock-up malfunction
	<input type="checkbox"/> Shift point too high or too low
	<input type="checkbox"/> Harsh engagement (<input type="checkbox"/> N → D <input type="checkbox"/> Lock-up <input type="checkbox"/> Any drive position)
	<input type="checkbox"/> Slip or shudder
	<input type="checkbox"/> No kick-down
	<input type="checkbox"/> Others ()

Check Item	Malfunction Indicator Lamp	<input type="checkbox"/> Normal <input type="checkbox"/> Remains ON
------------	----------------------------	---

DTC Check	1st Time	<input type="checkbox"/> Normal system code <input type="checkbox"/> Trouble code (DTC)
	2nd Time	<input type="checkbox"/> Normal system code <input type="checkbox"/> Trouble code (DTC)



BASIC INSPECTION

1. INSPECT AND ADJUST SHIFT LEVER POSITION

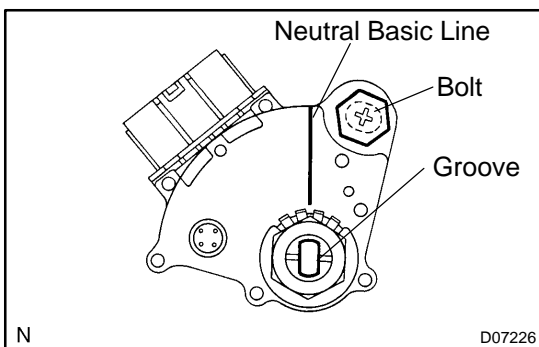
- (a) When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator comes on in accordance with the shift lever position.

If the indicator and shift lever position do not match, carry out the following adjustment procedures.

- (1) Remove the nut and disconnect the shift control cable from the control shaft lever.
- (2) Move the control shaft fully rearward.
- (3) Return the control shaft lever 2 notches to the N position.
- (4) Set the shift lever to the N position.
- (5) Connect the shift control cable and temporarily install the control shaft lever nut.
- (6) While holding the shift lever lightly toward the R position side, tighten the control shaft lever nut.

Torque: 14.5 N·m (148 kgf·cm, 11 ft·lbf)

- (7) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to the D position and reverses when shifting it to the R position.



2. INSPECT AND ADJUST PARK/NEUTRAL POSITION

- (a) Check that the engine can be started when the shift lever is in the N or P position, but cannot be started in other positions.

If operation cannot be done as stated above, carry out the following adjustment procedures.

- Loosen the park/neutral position switch bolt and set the shift lever to the N position.
- Align the groove with the neutral basic line.
- Hold in position and tighten the bolt.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (b) For continuity inspection of the park/neutral position switch, see page [DI-1159](#).

3. CHECK IDLE SPEED

Idle speed (In N position and air conditioner OFF):

700 ± 50 rpm

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

2. ROAD TEST

NOTICE:

Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80 °C (122 to 176 °F).

(a) D position test:

Shift into the D position and fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.

Check that 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts take place, and that the shift points conform to the automatic shift schedule (See page [SS-50](#)).

HINT:

5th Gear Up-shift Prohibition Control

- Engine coolant temperature is 55 °C (131 °F) or less and vehicle speed is at 51 km/h (32 mph) or less.

4th Gear Up-shift Prohibition Control

- Engine coolant temperature is 40 °C (104 °F) or less and vehicle speed is at 45 km/h (28 mph) or less.

5th Gear Lock-up Prohibition Control

- Brake pedal is depressed.
- Accelerator pedal is released.
- Engine coolant temperature is 60 °C (140 °F) or less.

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts.

(3) Check for abnormal noise and vibration.

Check for abnormal noise and vibration when up-shifting from 1 → 2, 2 → 3, 3 → 4 and 4 → 5 while driving with the shift lever in the D position, and check while driving in the lock-up condition.

HINT:

The check for the cause of abnormal noise and vibration must be done thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick-down operation.

Check vehicle speeds when the 2nd to 1st, 3rd to 2nd, 4th to 3rd, and 5th to 4th kick-downs take place while driving with the shift lever in the D position. Confirm that each speed is within the applicable vehicle speed range indicated in the automatic shift schedule (See page [SS-50](#)).

(5) Check abnormal shock and slip at kick-down.

(6) Check the lock-up mechanism.

- Drive in the D position (5th gear), at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:

If there is a big jump in engine speed, there is no lock-up.

(b) 4 (O/D OFF) position test:

Shift into the 4 (O/D OFF) position and fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.

Check that the 1 → 2, 2 → 3 and 3 → 4 up-shifts take place and that the shift point conforms to the automatic shift schedule (See page [SS-50](#)).

HINT:

- There is no 5th up-shift in the 4 position.
- 4th Gear Lock-up Prohibition Control
 - Brake pedal is depressed.
 - Accelerator pedal is released.
 - Engine coolant temperature is 60 °C (140 °F) or less.
- (2) Check engine braking.
While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.
- (3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.
- (4) Check the lock-up mechanism.
 - Drive in 4 position 4th gear, at a steady speed (lock-up ON).
 - Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:

If there is a big jump in engine speed, there is no lock-up.

(c) 3 position test:

Shift into the 3 position and fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.

Check that the 1 → 2 and 2 → 3 up-shifts takes place and that the shift point conforms to the automatic shift schedule (See page [SS-50](#)).

HINT:

- There is no 4th up-shift and lock-up in the 3 position.
- When the 2nd start switch is ON, there is no 1 → 2 up-shift and 2 → 1 down-shift.
- (2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.
- (3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(d) 2 position test:

Shift into the 2 position and fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.

Check that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (See page [SS-50](#)).

HINT:

- There is no 3rd up-shift and lock-up in the 2 position.
- When the 2nd start switch is ON, there is no 1 → 2 up-shift and 2 → 1 down-shift.

- (2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
 - (3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.
- (e) L position test:
Shift into the L position and fully depress the accelerator pedal and check the following points.
- (1) Check no up–shift.
While running in the L position, check that there is no up–shift to 2nd gear.
 - (2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.
 - (3) Check for abnormal noises during acceleration and deceleration.
- (f) R position test:
Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.
- CAUTION:**
Before conducting this test, ensure that the test area is free from people and obstruction.
- (g) P position test:
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check that the parking lock pawl holds the vehicle in place.

MECHANICAL SYSTEM TESTS

1. PERFORM MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D positions.

NOTICE:

- Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature 50 to 80°C (122 to 176°F).
- Do not continuously run this test for longer than 5 seconds.
- To ensure safety, do this test in a wide, clear level area which provides good traction.
- The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.
 - (1) Chock all 4 wheels.
 - (2) Connect a hand-held tester to DLC3.
 - (3) Fully apply the parking brake.
 - (4) Using your left foot, keep the brake pedal firmly depressed.
 - (5) Start the engine.
 - (6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot.
 - (7) Quickly read the stall speed at this time.

Stall speed: 2,200 ± 150 rpm

Evaluation:

Problem	Possible cause
(a) Stall engine speed is low in D position	<ul style="list-style-type: none"> • Engine power output may be insufficient • Stator one-way clutch is not operating properly HINT: If the value is less than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall engine speed is high in D position	<ul style="list-style-type: none"> • Line pressure is too low • Clutch No.1 (C₁) slipping • One-way clutch No.3 (F₃) is not operating properly • Improper fluid level

(b) Measure the time lag.

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the direct clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).**
- **Be sure to allow for a 1 minute interval between tests.**
- **Perform the test three times, and measure the time lags. Calculate the average value of the three time lags.**

(1) Connect a hand-held tester to DLC3.

(2) Fully apply the parking brake.

(3) Start and warm up the engine and check idle speed.

Idle speed: approx. 700 rpm (In N position and A/C OFF)

(4) Shift the lever from the N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag:

N → D Less than 1.2 seconds

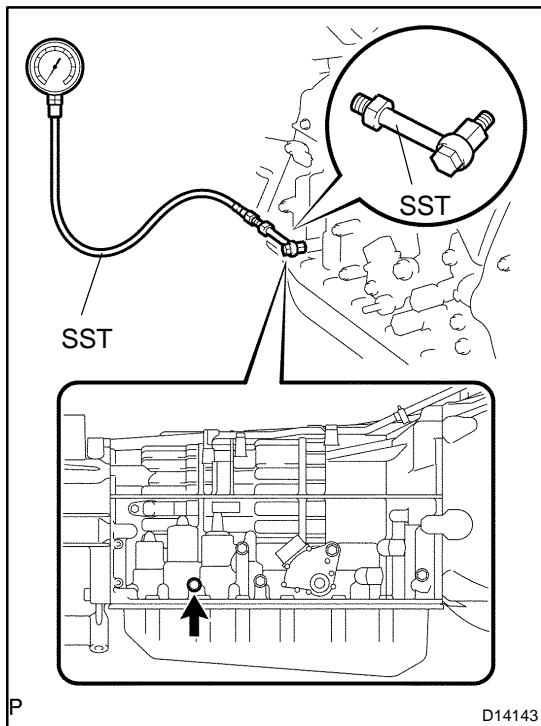
(5) In the same manner, measure the time lag for N → R.

Time lag:

N → R Less than 1.5 seconds

Evaluation (If N → D time or N → R time lag is longer than the specified):

Problem	Possible cause
N → D time lag is longer than specified	<ul style="list-style-type: none"> • Line pressure is too low • Clutch No.1 (C₁) worn • One-way clutch No.3 (F₃) is not operating properly
N → R time lag is longer than specified	<ul style="list-style-type: none"> • Line pressure is too low • Clutch No.3 (C₃) worn • Brake No.4 (B₄) worn • One-way clutch No.1 (F₁) is not operating properly



HYDRAULIC TEST

1. PERFORM HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).
- The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.
- Be careful to prevent SST hose from interfering with the exhaust pipe.
- This check must be conducted after checking and adjusting engine.
- Perform under condition that A/C is OFF.
- When conducting stall test, do not continue more than 10 seconds.

- (1) Warm up the ATF (Automatic Transmission Fluid).
- (2) Lift the vehicle up.
- (3) Remove the test plug on the transmission case center right side and connect SST.

SST 09992-00095 (09992-00231, 09992-00271)

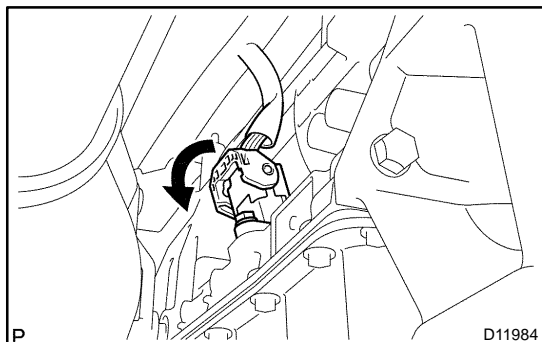
- (4) Fully apply the parking brake and chock the 4 wheels.
- (5) Start the engine and check idling speed.
- (6) Keep your left foot pressing firmly on the brake pedal and shift into D position.
- (7) Measure the line pressure when the engine is idling.
- (8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
- (9) In the same manner, do the test in R position.

Specified line pressure:

Condition	D position kPa (kgf / cm ² , psi)	R position kPa (kgf / cm ² , psi)
Idling	361 to 421 kPa (3.7 to 4.3 kgf/cm ² , 52 to 61 psi)	495 to 576 kPa (5.0 to 5.9 kgf/cm ² , 72 to 84 psi)
Stall test	1,236 to 1,332 kPa (12.6 to 13.6 kgf/cm ² , 179 to 193 psi)	1,229 to 1,349 kPa (12.5 to 13.8 kgf/cm ² , 178 to 196 psi)

Evaluation

Problem	Possible cause
Measured values are higher than specified in all positions	<ul style="list-style-type: none"> • Shift solenoid valve (SLT) defective • Regulator valve defective
Measured values are lower than specified in all positions	<ul style="list-style-type: none"> • Shift solenoid valve (SLT) defective • Regulator valve defective • Oil pump defective
Pressure is low in the D position only	<ul style="list-style-type: none"> • D position circuit fluid leak • Clutch No.1 (C₁) defective
Pressure is low in the R position only	<ul style="list-style-type: none"> • R position circuit fluid leak • Clutch No.3 (C₃) defective • Brake No.4 (B₄) defective



MANUAL SHIFTING TEST

1. MANUAL SHIFTING TEST

HINT:

- With this test, it can be determined whether the trouble occurs in the electrical circuit or is a mechanical problem in the transmission.
 - If any abnormalities are found in the following test, the problem is in the transmission itself.
- (a) Disconnect the connector of the transmission wire.
 (b) Drive with the transmission wire disconnected.
 Shifting the shift lever to the L, 2, 3, 4 and D position to check whether the shifting condition changes the table below.

Shift Position	Shifting Condition
L ↔ 2	No Shift (Not Change)
2 ↔ 3	Down Shift ↔ Up Shift
3 ↔ 4	Down Shift ↔ Up Shift
4 ↔ D	No Shift (Not Change)

HINT:

When driving with the transmission wire disconnected, the gear position will be as follows:

- When the shift lever is in the L or the 2 position, the gear is held in the 1st position.
 - When the shift lever is in the 3rd position, the gear is held in the 3rd position.
 - When the shift lever is in the 4 or the D position, the gear is held in the 4th position.
 - When the shift lever is in the R or the P position, the gear is also in the R or the P position respectively.
- (c) Connect the connector of the transmission wire.
 (d) Clear the DTC (See page [DI-1148](#)).

INITIALIZATION

1. RESET MEMORY

NOTICE:

- **Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assy or ECM.**
- **The RESET MEMORY can be performed only with the Hand-held tester.**

HINT:

The ECM memorizes the condition that the ECT controls the automatic transmission assy and engine assy according to those characteristics. Therefore, when the automatic transmission assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

Reset procedure is as follows.

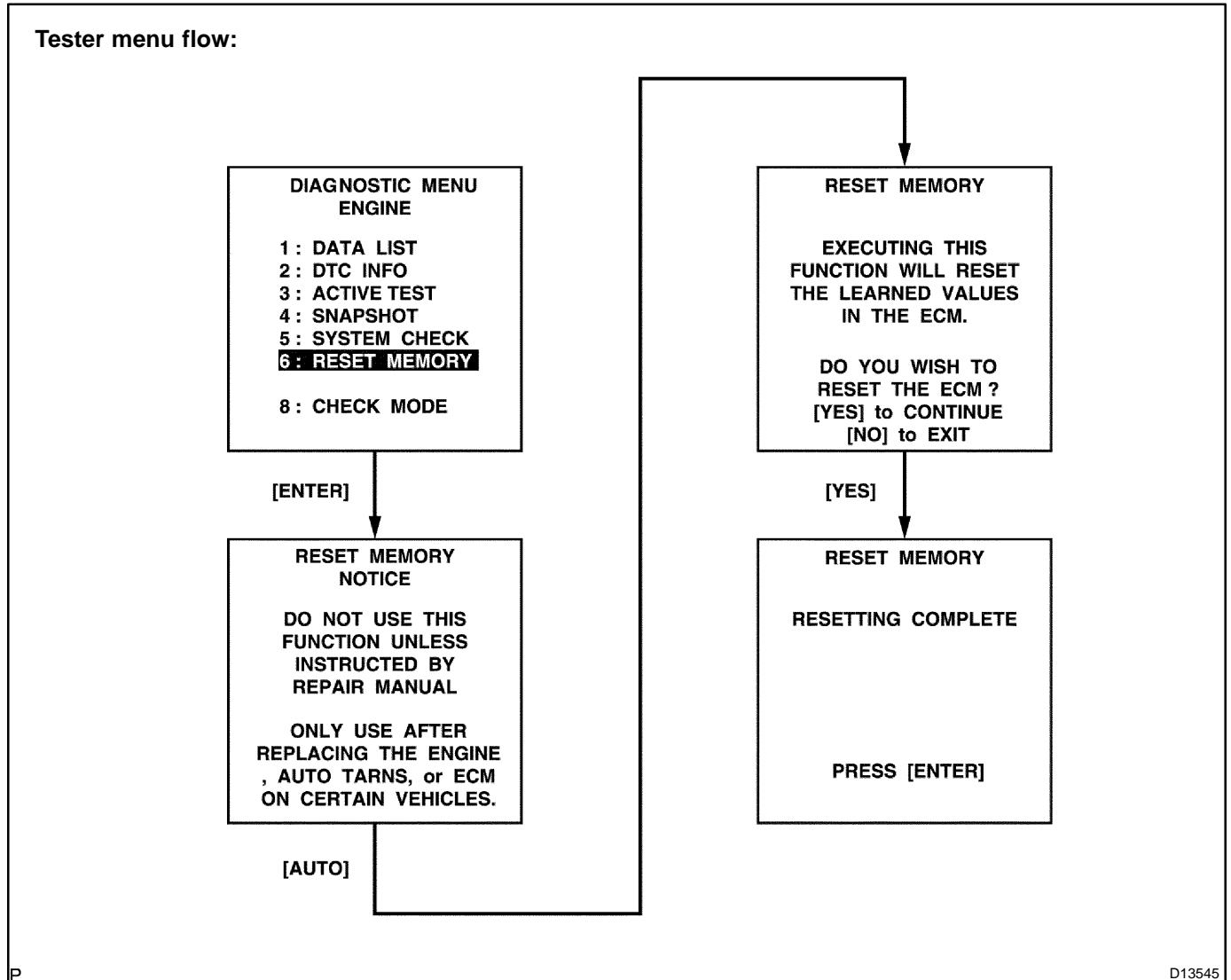
- (a) Turn the ignition switch off.
- (b) Connect the hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn the hand-held tester main switch on.
- (e) Select the item "DIAGNOSIS/ENHANCED OBD II".
- (f) Perform the reset memory procedure from the ENGINE menu.

NOTICE:

After performing the RESET MEMORY, be sure to perform the ROAD TEST (See page DI-1118) described earlier.

HINT:

The ECM learns through use of the ROAD TEST.



LIST OF DISABLE A MONITOR

HINT:

This table indicates ECM monitoring status for the items in the upper columns if the DTCs in each line on the left are being set.

As for the "X" mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

Monitor detected malfunction	Fault code		Component/system		Monitor disablement (X - disabled)																																		
	Upper	Lower	Upper	Lower	P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0031,32,51,52	P0033,56	P0037,38,57,58	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308								
			VVT VSV1,2	VVT VSV1,2																																			
	P0010,P0020	P0010,P0020	VVT System1 - Advance	VVT System1 - Retard																																			
	P0011	P0011	VVT System1 - Advance	VVT System1 - Retard																																			
	P0012	P0012	VVT System1 - Advance	VVT System1 - Retard																																			
	P0016,P0018	P0016,P0018	VVT System - Misalignment	VVT System - Misalignment																																			
	P0021	P0021	VVT System2 - Advance	VVT System2 - Retard																																			
	P0022	P0022	VVT System2 - Advance	VVT System2 - Retard																																			
	P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1	O2 Sensor Heater - Sensor1																																			
	P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1																																			
	P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor2																																			
	P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3	O2 Sensor Heater - Sensor3																																			
	P0100,P0101	P0100-P0103	MAF sensor	MAF sensor																																			
	P0105,P0106	P0105-P0108	MAP sensor	MAP sensor																																			
	P0110	P0110-P0113	IAT sensor	IAT sensor																																			
	P0115,P0116	P0115-P0118	ECT sensor	ECT sensor																																			
	P0120,P0121	P0120-P0223,P2135	TP sensor	TP sensor																																			
	P0125	P0125	Insufficient ECT for Closed Loop	Insufficient ECT for Closed Loop																																			
	P0128	P0128	Thermostat	Thermostat																																			
	P0130-P0153	P0130-P0153	O2 Sensor - Sensor1	O2 Sensor - Sensor1																																			
	P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1																																			
	P0136,P0156	P0136,P0156	O2 Sensor - Sensor2	O2 Sensor - Sensor2																																			
	P0142,P0162	P0142,P0162	O2 Sensor - Sensor3	O2 Sensor - Sensor3																																			
	P0171,P0172	P0171,P0172	Fuel system	Fuel system																																			
	P0300-P0308	P0300-P0308	Misfire	Misfire																																			
	P0325,P0330	P0325-P0333	Knock sensor	Knock sensor																																			
	P0335	P0335	CKP sensor	CKP sensor																																			
	P0340, P0341	P0340, P0341	CMP sensor	CMP sensor																																			
	P0340-P0346	P0340-P0346	VVT sensor1,2	VVT sensor1,2																																			
	P0351-P0358	P0351-P0358	Ignitor	Ignitor																																			
	P0385	P0385	CKP sensor 2	CKP sensor 2																																			
	P0401	P0401	EGR system (closed)	EGR system (closed)																																			
	P0402	P0402	EGR system (open)	EGR system (open)																																			
	P0405,P0409	P0405-P0409	Lift sensor	Lift sensor																																			
	P0420,P0430	P0420,P0430	Catalyst	Catalyst																																			
	P0442-P0456	P0442-P0456	EVAP system	EVAP system																																			
	P0450,P0451	P0450-P0453	EVAP press sensor	EVAP press sensor																																			

Monitor detected malfunction	Fault code		Monitor disablement (X - disabled)	
	Fault code	Component/ system	Fault code	
			P0325-P0333	P0335
P0500	P0500	VSS	X	X
P0511	P0511	IAC valve		
P0510	P0510	Idle switch		X
P0560	P0560	System Voltage		
P0617	P0617	Starter signal		
P0705	P0705	Shift lever position switch		
P0710	P0710-P0713	Trans fluid temp sensor		
P0720-P0793	P0720-P0793	Output speed sensor		X
P0715-P0717	P0715-P0717	Input speed sensor		X
P0724	P0724	Stop lamp switch		
P0741-P0796	P0741-P0796	Trans solenoid (function)		X
P0748-P0798	P0748-P0798	Trans solenoid (range)		X
P0850	P0850	PNP switch		X
P1010,P1020	P1010,P1020	VVTL		
P1011,12,(21,22)	P1011,12,(21,22)	VVTL system1,(2)	X	X
P1126	P1126	Electronic magnet clutch		
P1129	P1129	Electronic throttle system		
P1430	P1430	HC adsorber ACT press sensor		X
P2004,6	P2004,6	Intake Manifold Runner Control		
P2009,10	P2009,10	Intake Manifold Runner Control Circuit		
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor		
P2102,P2103	P2102,P2103	Throttle motor		
P2120-P2138	P2120-P2138	Accel position sensor		
P2196,P2198	P2196,P2198	A/F sensor (rationality)	X	X
P2226	P2226	BARO sensor		X
P2237,P2240	P2237,P2240	A/F sensor (open)	X	X
P2423,24	P2423,24	HC Adsorption Catalyst		
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)		
P2431	P2431	AIR Pressure Sensor(Rationality)		
P2440	P2440	AIR control valve stuck open	X	X
P2441	P2441	AIR control valve stuck close	X	X
P2444	P2444	AIP stuck On	X	X
P2445	P2445	AIP stuck Off	X	X
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)		X
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)	X	X

Monitor detected malfunction	Fault code		Component/ system		Monitor disablement (X - disabled)																								
	Fault code		Component/ system		P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12,(21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
	Fault code		Component/ system		Trans solenoid (function)2	Trans solenoid (range)	PNP switch	VVTL	VVTL system1,(2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT, press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	HC Adsorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1
	Fault code		Component/ system																										
P0010,P0020	P0010,P0020	VVT VSV1,2																											
P0011	P0011	VVT System1 - Advance																											
P0012	P0012	VVT System1 - Retard																											
P0016,P0018	P0016,P0018	VVT System - Misalignment																											
P0021	P0021	VVT System2 - Advance																											
P0022	P0022	VVT System2 - Retard																											
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																											
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																											
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																											
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																											
P0100,P0101	P0100-P0103	MAF sensor																											
P0105,P0106	P0105-P0108	MAP sensor																											
P0110	P0110-P0113	IAT sensor																											
P0115,P0116	P0115-P0118	ECT sensor																											
P0120,P0121	P0120-P0223,P2135	TP sensor																											
P0125	P0125	Insufficient ECT for Closed Loop																											
P0128	P0128	Thermostat																											
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																											
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1																											
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																											
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																											
P0171,P0172	P0171,P0172	Fuel system																											
P0300-P0308	P0300-P0308	Misfire																											
P0325,P0330	P0325-P0333	Knock sensor																											
P0335	P0335	CKP sensor																											
P0340, P0341	P0340, P0341	CMP sensor																											
P0340-P0346	P0340-P0346	VVT sensor1,2																											
P0351-P0358	P0351-P0358	Ignitor																											
P0385	P0385	CKP sensor 2																											
P0401	P0401	EGR system (closed)																											
P0402	P0402	EGR system (open)																											
P0405,P0409	P0405-P0409	Lift sensor																											
P0420,P0430	P0420,P0430	Catalyst																											
P0442-P0456	P0442-P0456	EVAP system																											
P0450,P0451	P0450-P0453	EVAP press sensor																											

Monitor detected malfunction	Fault code		Monitor disablement (X - disabled)	
	Fault code		Component/system	
	Component/system		Fault code	
	Component/system	Fault code	Component/system	Fault code
P0500	P0500	VSS	X	P0741-P0796 Trans solenoid (function) ²
P0511	P0511	IAC valve		P0748-P0798 Trans solenoid (range)
P0510	P0510	Idle switch		P0850 PNP switch
P0560	P0560	System Voltage		P1010,P1020 VVTL
P0617	P0617	Starter signal		P1011,12,(21,22) VVTL system1,(2)
P0705	P0705	Shift lever position switch		P1126 Electronic magnet clutch
P0710	P0710-P0713	Trans fluid temp sensor		P1129 Electronic throttle system
P0720-P0793	P0720-P0793	Output speed sensor		P1430 HC adsorber ACT press sensor
P0715-P0717	P0715-P0717	Input speed sensor		P2004,6 Intake Manifold Runner Control
P0724	P0724	Stop lamp switch		P2009,10 Intake Manifold Runner Control Circuit
P0741-P0796	P0741-P0796	Trans solenoid (function)	X	P2014,16,17 Intake Manifold Runner Position Sensor
P0748-P0798	P0748-P0798	Trans solenoid (range)	X	P2102,P2103 Throttle motor
P0850	P0850	PNP switch		P2120-P2138 Accel position sensor
P1010,P1020	P1010,P1020	VVTL		P2196,P2198 A/F Sensor(Rationality) - Sensor1
P1011,12,(21,22)	P1011,12,(21,22)	VVTL system1,(2)		P2226 BARO sensor
P1126	P1126	Electronic magnet clutch		P2237,P2240 A/F sensor (open) - Sensor1
P1129	P1129	Electronic throttle system		P2423,24 HC Adsorption Catalyst
P1430	P1430	HC adsorber ACT press sensor		P2430,2,3 AIR Pressure Sensor(Low/High)
P2004,6	P2004,6	Intake Manifold Runner Control		P2431 AIR Pressure Sensor(Rationality)
P2009,10	P2009,10	Intake Manifold Runner Control Circuit		P2440 AIR control valve stuck open
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor		P2441 AIR control valve stuck close
P2102,P2103	P2102,P2103	Throttle motor		P2444 AIP stuck On
P2120-P2138	P2120-P2138	Accel position sensor		P2445 AIP stuck Off
P2196,P2198	P2196,P2198	A/F sensor (rationality)		P2714-P2759 Trans solenoid(SLU-SLD)
P2226	P2226	BARO sensor		P2A00,P2A03 A/F sensor (slow response)
P2237,P2240	P2237,P2240	A/F sensor (open)		
P2423,24	P2423,24	HC Adsorption Catalyst		
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)		
P2431	P2431	AIR Pressure Sensor(Rationality)		
P2440	P2440	AIR control valve stuck open		
P2441	P2441	AIR control valve stuck close		
P2444	P2444	AIP stuck On		
P2445	P2445	AIP stuck Off		
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)		
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)		

MONITOR DRIVE PATTERN

1. MONITOR DRIVE PATTERN FOR ECT TEST

- (a) Perform this drive pattern as one method to simulate the detection conditions of the ECT malfunctions. (The DTCs may not be detected due to the actual driving conditions. And some codes may not be detected through this drive pattern.)

HINT:

Preparation for driving

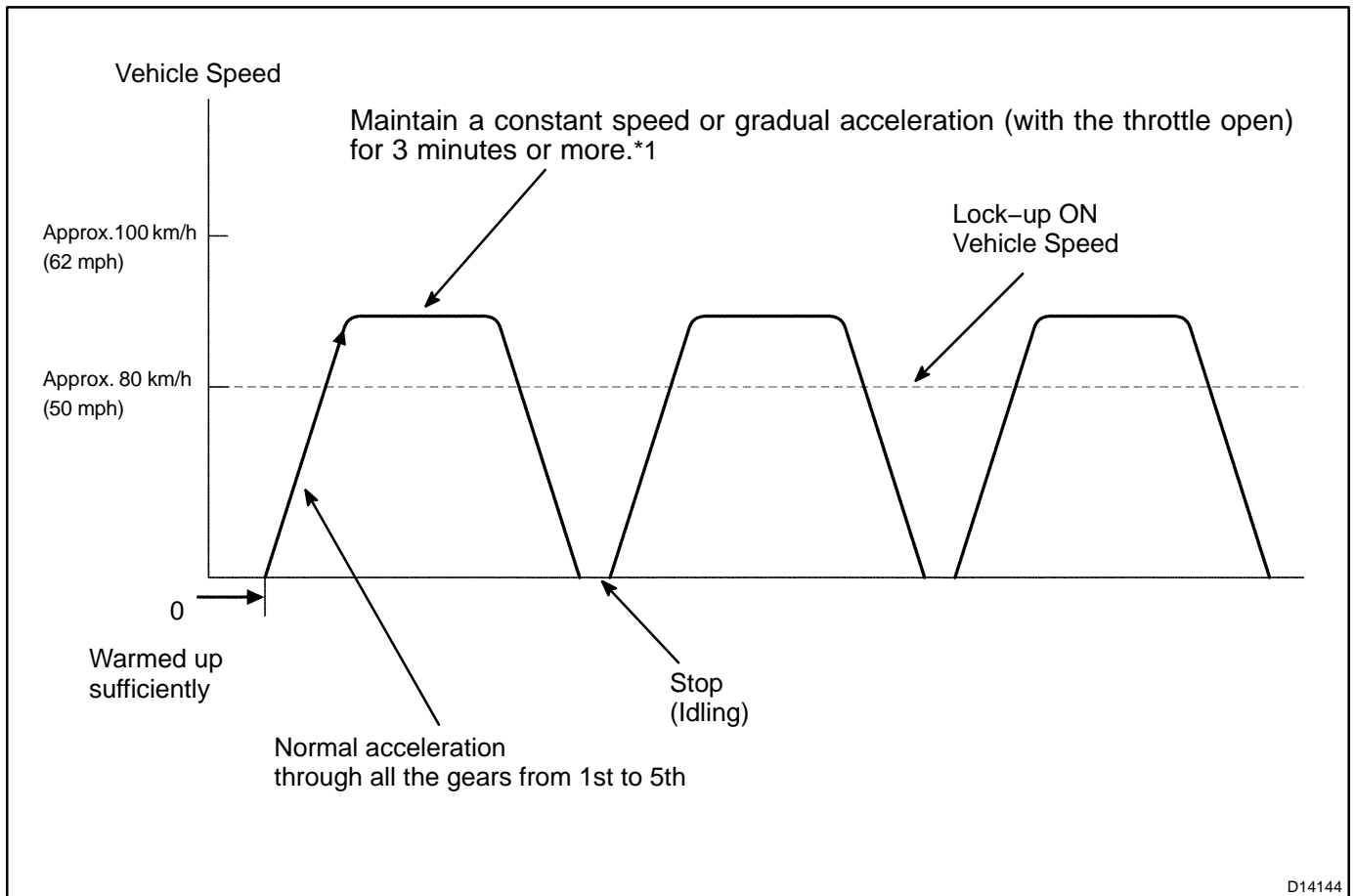
- Warm up the engine sufficiently. (Engine coolant temperature is 60 °C (140 °F) or higher).
- Drive the vehicle when the atmospheric temperature is –10 °C (14 °F) or higher. (Malfunction is not detected when the atmospheric temperature is –10 °C (14 °F) or less).

Notice in driving

- Drive the vehicle through all gears.
Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON).
- Repeat the above driving pattern three times or more.

NOTICE:

- **The monitor status can be checked using the OBD II scan tool. When using the hand-held tester, monitor status can be found in the "ENHANCED OBD II / DATA LIST" or under "CARB OBD II".**
- **In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**
- **Perform this drive pattern on a level road as much as possible and strictly observe the posted speed limits and traffic laws while driving.**



D14144

HINT:

*1: Drive at such a speed in the uppermost gear, to engage lock-up. The vehicle can be driven at a speed lower than that in the above diagram under the lock-up condition.

NOTICE:

It is necessary to drive the vehicle for approximately 30 minutes to detect DTC P0711 (ATF temperature sensor malfunction).

PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the diagnostic trouble code check although the trouble still occurs, check the electrical circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

1. Chapter 1: Electronic Circuit Matrix Chart

- Refer to the table below when the trouble cause is considered to be electrical.
- If the instruction "Proceed to next circuit inspection shown on matrix chart" is given in the flow chart of each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

HINT:

*1: When the circuit on which mark *1 is attached is defective, DTC could be output (see page [DI-1156](#)).

Symptom	Suspect Area	See page
No up-shift (A particular gear, from 1st to 4th gear, is not up-shifted)	1. Shift solenoid valve (S1) circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-1226 DI-1231 IN-30
No up-shift (4th → 5th)	1. O/D main switch circuit 2. Engine coolant temp. sensor circuit *1 3. Speed sensor NT circuit *1 4. Shift solenoid valve (SL1) circuit *1 5. Shift solenoid valve (SL2) circuit *1 6. Shift solenoid valve (SR) circuit *1 7. ECM	DI-1274 DI-477 DI-1175 DI-1188 DI-1216 DI-1236 IN-30
No up-shift (3rd → 4th)	1. Engine coolant temp. sensor circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-477 DI-1231 IN-30
No up-shift (1st → 2nd)	1. Shift position L switch circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-1277 DI-1231 IN-30
No down-shift (5th → 4th)	1. O/D main switch circuit 2. Shift solenoid valve (SL1) circuit *1 3. Shift solenoid valve (SL2) circuit *1 4. Shift solenoid valve (SR) circuit *1 5. ECM	DI-1274 DI-1188 DI-1216 DI-1236 IN-30
No down-shift (2nd → 1st)	1. Shift position L switch circuit 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-1277 DI-1231 IN-30
No down-shift (A particular gear, from 1st to 4th gear, is not down-shifted)	1. Shift solenoid valve (S1) circuit *1 2. Shift solenoid valve (S2) circuit *1 3. ECM	DI-1226 DI-1231 IN-30
No lock-up	1. ATF temperature sensor circuit *1 2. Stop light switch circuit *1 3. Speed sensor NT circuit *1 4. Shift solenoid valve (SLU) circuit *1 5. Engine coolant temp. sensor circuit *1 6. ECM	DI-1166 DI-1184 DI-1175 DI-1265 DI-477 IN-30
No lock-up off	1. Shift solenoid valve (SLU) circuit *1 2. ECM	DI-1265 IN-30

Shift point too high or too low	<ol style="list-style-type: none"> 1. Shift solenoid valve (SLT) circuit *1 2. Speed sensor NT circuit *1 3. Speed sensor SP2 circuit *1 4. Throttle position sensor circuit *1 5. ATF temperature sensor circuit *1 7. ECM 	<p>DI-1247 DI-1175 DI-1180 DI-477 DI-1166 IN-30</p>
Up-shift to 5th from 4th while shift lever is in 4 position	<ol style="list-style-type: none"> 1. O/D main switch circuit 2. ECM 	<p>DI-1274 IN-30</p>
Up-shift to 5th from 4th while engine is cold	<ol style="list-style-type: none"> 1. Engine coolant temp. sensor circuit *1 2. ECM 	<p>DI-477 IN-30</p>
Up-shift to 4th from 3rd while shift lever is in 3 position	<ol style="list-style-type: none"> 1. Park/neutral position switch circuit *1 2. ECM 	<p>DI-1159 IN-30</p>
Up-shift to 3rd from 2nd while shift lever is in 2 position	<ol style="list-style-type: none"> 1. Park/neutral position switch circuit *1 2. ECM 	<p>DI-1159 IN-30</p>
Up-shift to 2nd from 1st while shift lever is in L position	<ol style="list-style-type: none"> 1. Shift position L switch circuit 2. ECM 	<p>DI-1277 IN-30</p>
Harsh engagement (N → D)	<ol style="list-style-type: none"> 1. Speed sensor NT circuit *1 2. Shift solenoid valve (SL1) circuit *1 3. Shift solenoid valve (SLT) circuit *1 4. ECM 	<p>DI-1175 DI-1188 DI-1247 IN-30</p>
Harsh engagement (Lock-up)	<ol style="list-style-type: none"> 1. Speed sensor NT circuit *1 2. Speed sensor SP2 circuit *1 3. Shift solenoid valve (SLU) circuit *1 4. ECM 	<p>DI-1175 DI-1180 DI-1265 IN-30</p>
Harsh engagement (Any driving position)	ECM	<p>IN-30</p>
Poor acceleration	<ol style="list-style-type: none"> 1. ATF temperature sensor No.2 circuit *1 2. Engine coolant temp. sensor circuit *1 3. Shift solenoid valve (SLT) circuit *1 4. ECM 	<p>DI-1251 DI-477 DI-1247 IN-30</p>
No engine braking	ECM	<p>IN-30</p>
No kick-down	ECM	<p>IN-30</p>
Engine stalls when starting off or stopping	<ol style="list-style-type: none"> 1. Shift solenoid valve (SLU) circuit *1 2. ECM 	<p>DI-1265 IN-30</p>
AT Oil Temp. warning light remains on	<ol style="list-style-type: none"> 1. ATF temperature sensor No.2 circuit *1 	<p>DI-1251</p>
Lock-up at 3rd gear	<ol style="list-style-type: none"> 2. Engine coolant temp. sensor circuit *1 	<p>DI-477</p>
Shift point too high	<ol style="list-style-type: none"> 3. ECM 	<p>IN-30</p>
Malfunction in shifting	<ol style="list-style-type: none"> 1. Park/neutral position switch circuit *1 2. ECM 	<p>DI-1159 IN-30</p>

Chapter 2: On-Vehicle Repair**(★: A750E, A750F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM999U)**

Symptom	Suspect Area	See page
Vehicle does not move with shift lever in any forward position and reverse position	1. Transmission control cable 2. Manual valve 3. Parking lock pawl 4. Off-vehicle repair matrix chart	DI-1117 ★ ★ -
Vehicle does not move with shift lever in R position	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No up-shift (1st → 2nd)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No up-shift (2nd → 3rd)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No up-shift (3rd → 4th)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No up-shift (4th → 5th)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No down-shift (5th → 4th)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No down-shift (4th → 3rd)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No down-shift (3rd → 2nd)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No down-shift (2nd → 1st)	1. Valve body assy 2. Off-vehicle repair matrix chart	AT-12 -
No lock-up or No lock-up off	1. Shift solenoid valve (SLU) 2. Valve body assy 3. Off-vehicle repair matrix chart	DI-1257 AT-12 -
Harsh engagement (N → D)	1. Shift solenoid valve (SL1) 2. Valve body assy 3. C ₁ accumulator 4. Off-vehicle repair matrix chart	DI-1205 AT-12 ★ -
Harsh engagement (Lock-up)	1. Shift solenoid valve (SLU) 2. Valve body assy 3. Off-vehicle repair matrix chart	DI-1257 AT-12 -
Harsh engagement (N → R)	1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SLU) 3. Valve body assy 4. C ₃ accumulator 5. Off-vehicle repair matrix chart	DI-1241 DI-1257 AT-12 ★ -
Harsh engagement (1st → 2nd → 3rd → 4th → 5th)	1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SL1) 3. Valve body assy	DI-1241 DI-1205 AT-12
Harsh engagement (1st → 2nd)	1. Valve body assy 2. B ₃ accumulator 3. Off-vehicle repair matrix chart	AT-12 ★ -
Harsh engagement (2nd → 3rd)	1. Valve body assy 2. C ₃ accumulator 3. Off-vehicle repair matrix chart	AT-12 ★ -
Harsh engagement (3rd → 4th)	1. Valve body assy 2. C ₂ accumulator 3. Off-vehicle repair matrix chart	AT-12 ★ -

Harsh engagement (4th → 5th)	<ol style="list-style-type: none"> 1. Shift solenoid valve (SL1) 2. Shift solenoid valve (SL2) 3. Valve body assy 4. Off-vehicle repair matrix chart 	DI-1205 DI-1210 AT-12 –
Harsh engagement (5th → 4th)	<ol style="list-style-type: none"> 1. Shift solenoid valve (SL1) 2. Shift solenoid valve (SL2) 3. Valve body assy 4. Off-vehicle repair matrix chart 	DI-1205 DI-1210 AT-12 –
Slip or shudder (Forward and reverse)	<ol style="list-style-type: none"> 1. Transmission control cable 2. Valve body assy 3. Oil strainer 4. Off-vehicle repair matrix chart 	DI-1117 AT-12 AT-12 –
No engine braking (1st: L position)	<ol style="list-style-type: none"> 1. Valve body assy 2. Off-vehicle repair matrix chart 	AT-12 –
No engine braking (2nd: 2 position)	<ol style="list-style-type: none"> 1. Valve body assy 2. Off-vehicle repair matrix chart 	AT-12 –
No kick-down	Valve body assy	AT-12
Shift point too high or too low	<ol style="list-style-type: none"> 1. Shift solenoid valve (SLT) 2. Shift solenoid valve (SL1) 3. Valve body assy 	DI-1241 DI-1205 AT-12
Poor acceleration	<ol style="list-style-type: none"> 1. Shift solenoid valve (SLT) 2. Valve body assy 	DI-1241 AT-12
Engine stalls when starting off or stopping	<ol style="list-style-type: none"> 1. Shift solenoid valve (SLU) 2. Valve body assy 	DI-1257 AT-12

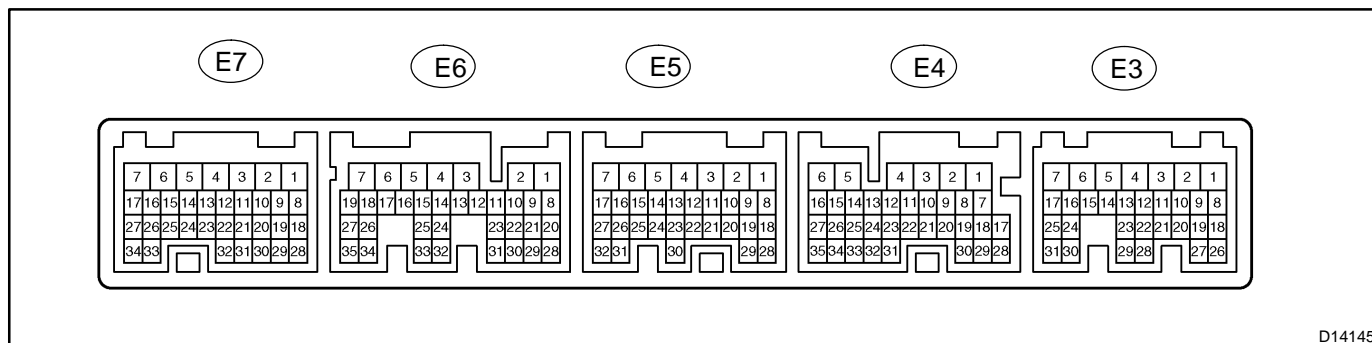
Chapter 3: Off-Vehicle Repair**(★: A750E, A750F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM999U)**

Symptom	Suspect Area	See page
Vehicle does not move with shift lever in any forward position and reverse position	1. Rear planetary gear unit 2. Torque converter clutch	★ AT-39
Vehicle does not move with shift lever in R position	1. Brake No. 4 (B ₄) 2. Clutch No. 3 (C ₃) 3. One-way clutch No.4 (F ₁)	★ ★ ★
No up-shift (1st → 2nd)	1. Brake No. 3 (B ₃) 2. One-way clutch No.1 (F ₁) 3. One-way clutch No. 2 (F ₂)	★ ★ ★
No up-shift (2nd → 3rd)	Clutch No. 3 (C ₃)	★
No up-shift (3rd → 4th)	Clutch No. 2 (C ₂)	★
No up-shift (4th → 5th)	1. Brake No. 1 (B ₁) 2. Clutch No. 1 (C ₁)	★ ★
No lock-up or No lock-up off	Torque converter clutch	AT-39
Harsh engagement (N → D)	1. Clutch No. 1 (C ₁) 2. One-way clutch No.3 (F ₃)	★ ★
Harsh engagement (N → R)	1. Clutch No. 3 (C ₃) 2. Brake No. 4 (B ₄) 3. One-way clutch No.1 (F ₁)	★ ★ ★
Harsh engagement (1 → 2)	1. Brake No. 3 (B ₃) 2. One-way clutch No.1 (F ₁) 3. One-way clutch No. 2 (F ₂)	★ ★ ★
Harsh engagement (2 → 3)	Clutch No. 3 (C ₃)	★
Harsh engagement (3 → 4)	Clutch No. 2 (C ₂)	★
Harsh engagement (4 → 5th)	1. Brake No. 1 (B ₁) 2. Clutch No. 1 (C ₁)	★ ★
Harsh engagement (Lock-up)	Torque converter clutch	AT-39
Slip or shudder (Forward and reverse: After warm-up)	1. One-way clutch No.1 (F ₁) 2. Clutch No. 3 (C ₃) 3. Torque converter clutch	★ ★ ★
Slip or shudder (Particular position: Just after engine starts)	Torque converter clutch	AT-39
Slip or shudder (R position)	1. Brake No. 4 (B ₄) 2. One-way clutch No.1 (F ₁) 3. Clutch No. 3 (C ₃)	★ ★ ★
Slip or shudder (1st)	1. Clutch No. 1 (C ₁) 2. One-way clutch No.3 (F ₃)	★ ★
Slip or shudder (2nd)	1. Clutch No. 1 (C ₁) 2. Brake No. 3 (B ₃) 3. One-way clutch No.1 (F ₁) 4. One-way clutch No.2 (F ₂)	★ ★ ★ ★
Slip or shudder (3rd)	1. Clutch No. 1 (C ₁) 2. Clutch No. 3 (C ₃) 3. One-way clutch No.1 (F ₁)	★ ★ ★
Slip or shudder (4th)	1. Clutch No. 1 (C ₁) 2. Clutch No. 2 (C ₂)	★ ★
Slip or shudder (5th)	1. Clutch No. 2 (C ₂) 2. Clutch No. 3 (C ₃) 3. Brake No. 1 (B ₁)	★ ★ ★
No engine braking (1st – 4th: D position)	Clutch No. 1 (C ₁)	★

No engine braking (1st: L position)	Brake No. 4 (B ₄)	★
No engine braking (2nd: 2 position)	Brake No. 2 (B ₂)	★
No engine braking (3rd: 3 position)	Brake No. 1 (B ₁)	★
Poor acceleration (All positions)	Torque converter clutch	AT-39
Poor acceleration (5th)	1. Clutch No. 1 (C ₁)	★
	2. Clutch No. 3 (C ₃)	★
	3. Brake No. 1 (B ₁)	★
	4. Front planetary gear unit	★
Engine stalls when starting off or stopping	Torque converter clutch	AT-39

TERMINALS OF ECM

1. ECM



D14145

HINT:

Each ECM terminal's standard voltage is shown in the table below.

In the table, first follow the information under "Condition". Look under "Symbols (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specific Condition".

Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
LMS (E4-9) – E1 (E5-1)	V-W – BR	L shift position switch signal	IG switch ON	10 to 14 V
↑	↑	↑	IG switch ON and Press continuously shift position L switch	Below 1 V
2 (E4-10) – E1 (E5-1)	P-L*1 – BR L*2 – BR	2 shift position switch signal	IG switch ON and shift lever 2 and L position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except 2 and L position	Below 1 V
R (E4-11) – E1 (E5-1)	G-R*1 – BR R-B*2 – BR	R shift position switch signal	IG switch ON and shift lever R position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except R position	Below 1 V
D (E4-21) – E1 (E5-1)	W-R – BR	D shift position switch signal	IG switch ON and shift lever D position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except D position	Below 1 V
3 (E4-19) – E1 (E5-1)	G-W*1 – BR L-W*2 – BR	3 shift position switch signal	IG switch ON and shift lever 3 position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except 3 position	Below 1 V
ODMS (E3-12) – E1 (E5-1)	R*1 – BR B*2 – BR	O/D main switch signal	IG switch ON	10 to 14 V
↑	↑	↑	IG switch ON and press continuously O/D main switch	Below 1 V
STP (E3-15) – E1 (E5-1)	G-W – BR	Stop lamp switch signal	Brake pedal is depressed	7.5 to 14 V
↑	↑	↑	Brake pedal is released	Below 1.5 V
SLU+ (E6-15) – SLU- (E6-14)	G – L-B	SLU solenoid signal	5th (lock-up) gear	Pulse generation (See waveform 2)
S2 (E6-10) – E1 (E5-1)	W-L – BR	S2 solenoid signal	2nd or 3rd gear	10 to 14 V
↑	↑	↑	1st, 4th or 5th gear	Below 1 V
S1 (E6-11) – E1 (E5-1)	L – BR	S1 solenoid signal	1st or 2nd gear	10 to 14 V
↑	↑	↑	3rd, 4th or 5th gear	Below 1 V

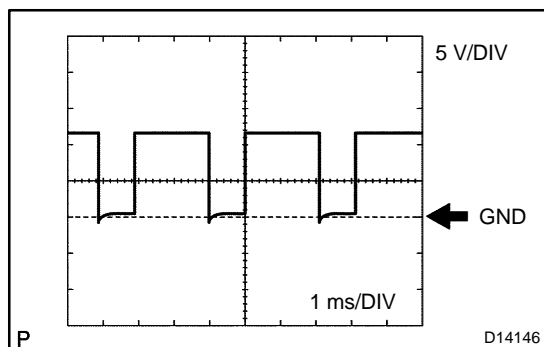
SLT+ (E6-13) – SLT- (E6-12)	B-R – G-W	SLT solenoid signal	Engine idle speed	Pulse generation (See waveform 1)
SR (E6-9) – E1 (E5-1)	W-G – BR	SR solenoid signal	5th gear	10 to 14 V
↑	↑	↑	1st gear	Below 1 V
SL2+ (E6-17) – SL2- (E6-16)	B – W	SL2 solenoid signal	Engine idle speed	Pulse generation (See waveform 3)
SL1+ (E6-19) – SL1- (E6-18)	R-W – GR	SL1 solenoid signal	Engine idle speed	Pulse generation (See waveform 4)
THO1 (E6-24) – E2 (E7-28)	R-L – B-W	No.1 ATF temperature sensor signal	No.1 ATF temperature: 115 °C (239 °F) or more	Below 1.5 V
THO2 (E6-32) – E2 (E7-28)	V – B-W	No.2 ATF temperature sensor signal	No.2 ATF temperature: 115 °C (239 °F) or more	Below 1.5 V
SP2+ (E6-34) – SP2- (E6-26)	Y-R – W-R	Speed sensor (SP2) signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (See waveform 6)
NT+ (E6-35) – NT- (E6-27)	G – R	Speed sensor (NT) signal	Engine idle speed	Pulse generation (See waveform 5)
STAR/NSW (E6-8) – E1 (E5-1)	L-R – BR	Park neutral switch signal	IG switch ON and shift lever P and N position	Below 2 V
↑	↑	↑	IG switch ON and shift lever except P and N position	10 to 14 V
L4* (E5-13) – E1 (E6-1)	L-R – BR	Transfer L position switch signal	IG switch ON and transfer L position	Below 1 V
↑	↑	↑	IG switch ON and transfer except L position	10 to 14 V

HINT:

*: 4WD

*1: Except Double Cab

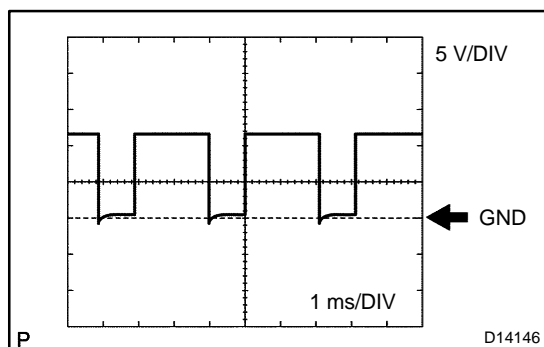
*2: Double Cab



Waveform 1

Reference:

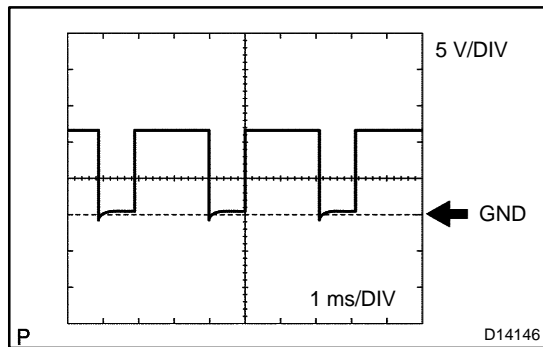
Terminal	SLT+ – SLT-
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



Waveform 2

Reference:

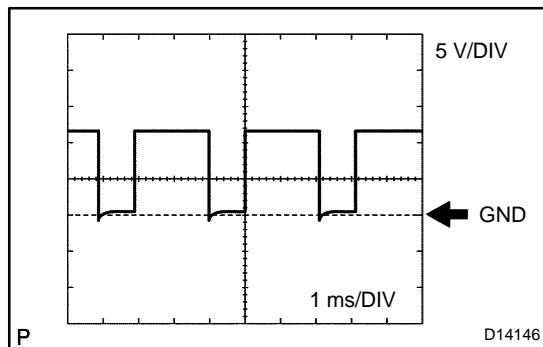
Terminal	SLU+ – SLU-
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	5th (lock-up) or 6th (lock-up) gear



Waveform 3

Reference:

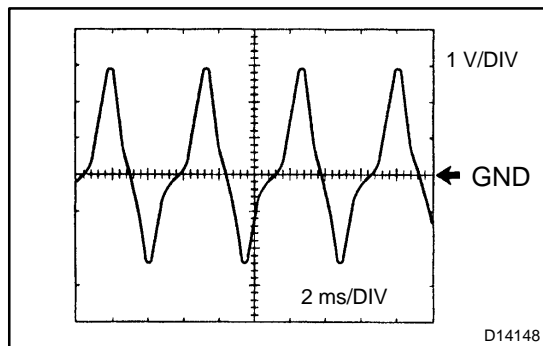
Terminal	SL2+ - SL2-
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



Waveform 4

Reference:

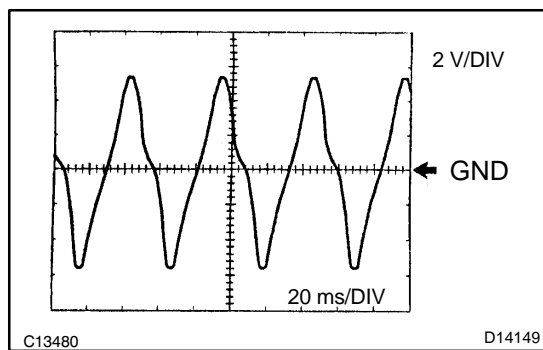
Terminal	SL1+ - SL1-
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



Waveform 5

Reference:

Terminal	NT+ - NT-
Tool setting	1V/DIV, 2ms/DIV
Vehicle condition	Engine idle speed (P or N position)



Waveform 6

Reference:

Terminal	SP2+ - SP2-
Tool setting	2V/DIV, 20ms/DIV
Vehicle condition	Vehicle speed 20 km/h (12 mph)

DIAGNOSIS SYSTEM

DESCRIPTION

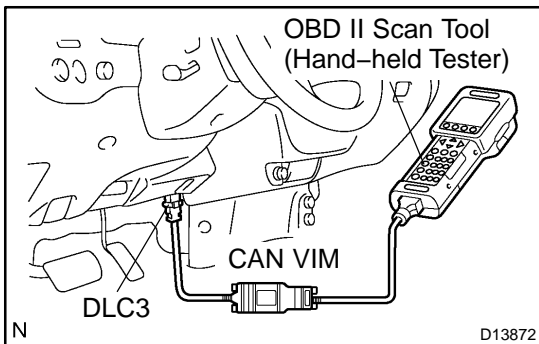
When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (complying with SAE J1987). Various data output from the vehicle's ECM can then be read.



OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:

- 1) The emission control system/components
- 2) The powertrain control components (which affect vehicle emissions)
- 3) The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory. If the malfunction does not reoccur in 3 consecutive trips, the MIL turns off automatically but the DTCs remain recorded in the ECM memory.



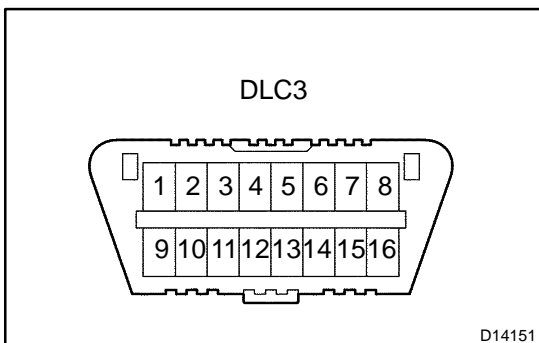
To check DTCs, connect the scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The scan tool displays DTCs, the freeze frame data and a variety of the engine data. The DTCs and freeze frame data can be erased with the scan tool (See page [DI-1148](#)).

NORMAL MODE AND CHECK MODE

The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2-trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1-trip detection logic" is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions.

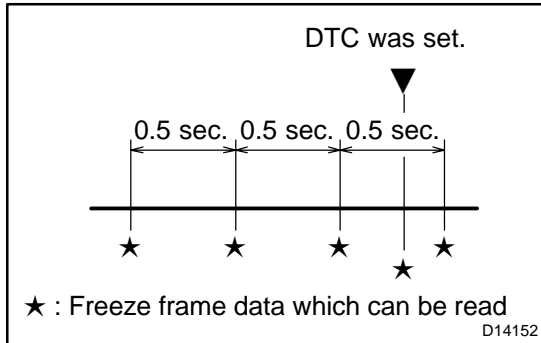
2-TRIP DETECTION LOGIC

When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate.

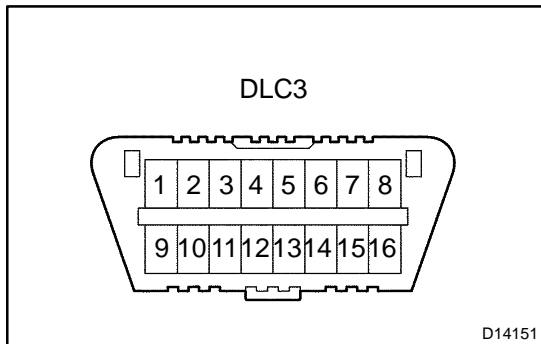


FREEZE FRAME DATA

Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air/fuel ratio was Lean or Rich, and other data from the time the malfunction occurred.



The hand-held tester records freeze frame data in five different instances: 1) 3 times before the DTC is set, 2) once when the DTC is set, and 3) once after the DTC is set. These data can be used to simulate the vehicle's condition around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by a temporary malfunction or not.



DLC3 (Data Link Connector 3)

The vehicle's ECM uses the ISO 15765-4 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.

HINT:

Connect the cable of the hand-held tester to the DLC3, turn the ignition switch ON and attempt to use the hand-held tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.

If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 – Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 Ω	Always
SG	5	Signal ground	Body ground	Below 1 Ω	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	CANL	54 to 69 Ω	IG switch OFF
CANH	6	HIGH-level CAN bus line	Battery positive	1 MΩ or higher	IG switch OFF
CANH	6	HIGH-level CAN bus line	CG	1 kΩ or higher	IG switch OFF
CANL	14	LOW-level CAN bus line	Battery positive	1 MΩ or higher	IG switch OFF
CANL	14	LOW-level CAN bus line	CG	1 kΩ or higher	IG switch OFF

CHECK BATTERY VOLTAGE

Battery voltage: 11 to 14 V

If voltage is below 11 V, replace the battery before proceeding.

CHECK MIL

- (a) Check that the MIL illuminates when turning the ignition switch ON.

If the MIL does not illuminate, there is a problem in the MIL circuit (refer to MIL CIRCUIT on page [DI-940](#))

- (b) When the engine is started, the MIL should turn off.

ALL READINESS

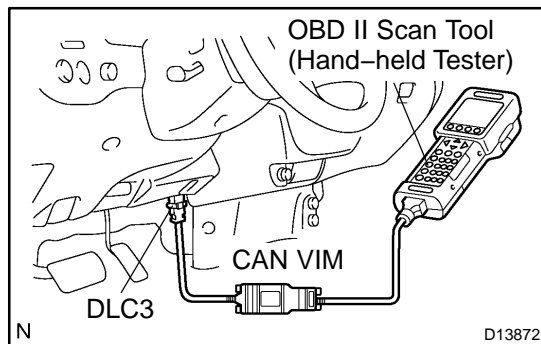
For this vehicle, using the hand-held tester allows readiness codes corresponding to all DTCs to be read. When diagnosis (normal or malfunctioning) has been complete, readiness codes are set. Enter the following menus: ENHANCED OBD II / MONITOR STATUS on the hand-held tester.

DTC CHECK / CLEAR

1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the hand-held tester or generic OBD II scan tool.

These scan tools can display pending DTCs and current DTCs. Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving. However, the detected malfunction during once driving is stored as pending DTC.



- (a) Connect the hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (b) Turn the ignition switch ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES (or PENDING CODE).
- (d) Confirm the DTCs and freeze frame data and then write them down.
- (e) See page [DI-1156](#) to confirm the details of the DTCs.

NOTICE:

When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on DIAGNOSTIC TROUBLE CODE CHART subject to "2-trip detection logic", perform the following actions.

Turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL illuminates and the DTCs are recorded in the ECM.

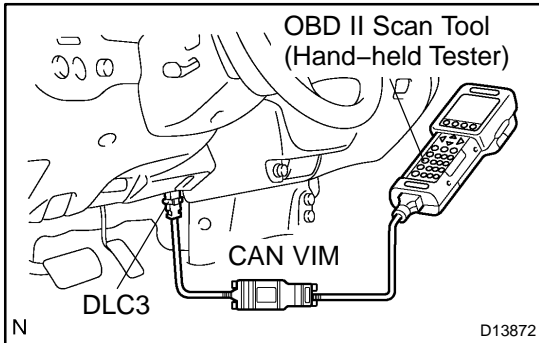
2. CLEAR DTC

- (a) Connect the hand-held tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES and press YES.

CHECK MODE PROCEDURE

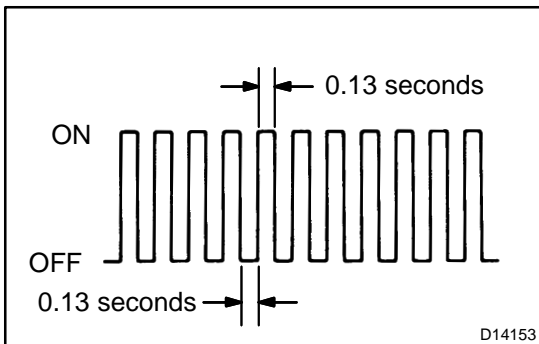
DESCRIPTION

Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are detected with 1-trip detection logic.



CHECK MODE PROCEDURE

- (a) Make sure that the items below are true:
 - (1) Battery positive voltage 11 V or more
 - (2) Throttle valve fully closed
 - (3) Transmission in the P or N position
 - (4) A/C switched OFF
- (b) Turn the ignition switch OFF.
- (c) Connect the hand-held tester together with the Controller Area Network Vehicle Interface Module (CAN VIM) to the DLC3.
- (d) Turn the ignition switch ON.
- (e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE.



- (f) Change the ECM to check mode. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All DTCs and freeze frame data recorded will be erased if:

- 1) the hand-held tester is used to change the ECM from normal mode to check mode or vice-versa; or
- 2) during check mode, the ignition switch is turned from ON to ACC or LOCK.

Before check mode, make notes of the DTCs and freeze frame data.

- (g) Start the engine. The MIL should turn off after the engine starts.
- (h) Perform "MONITOR DRIVE PATTERN" for the ECT test (See page [DI-1134](#)).
(Or, simulate the conditions of the malfunction described by the customer).
- (i) After simulating the malfunction conditions, use the hand-held tester diagnosis selector to check the DTC and freeze frame data.

FAIL-SAFE CHART

1. FAIL-SAFE

This function minimizes the loss of the ECT functions when any malfunction occurs in a sensor or solenoid.

Malfunction Part	Function
Output Speed Sensor (SP2)	During an output speed sensor malfunction, shift control is effected through the input speed sensor signal (NT).
ATF Temp. Sensor No. 1	During an ATF temperature sensor No. 1 malfunction, up-shift to the 5th and flex lock-up clutch control are prohibited.
Shift Solenoid Valve S1, S2 and SR	The current to the failed solenoid valve is cut off and control is effected by operating the other solenoid valves with normal operation. Shift control is effected depending on the failed solenoid as described in the table on the next page.
Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to the 5th is prohibited.
Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, fuel economy decreases.
Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, the shift shock increases. However, shifting is effected through normal clutch pressure control.

Fail Safe Function:

If either of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid "ON" and "OFF" in order to shift into the gear positions shown in the table below.

In case of a short circuit, the ECM stops sending current to the short circuited solenoid.

Even if starting the engine again in the fail-safe mode, the gear position remains in the same position.

○: ON

X: OFF

→: Condition in the electrical malfunction is shown on the left of "→".

Condition in the fail-safe mode is shown on the right of "→".

E/B: Engine brake.

Position	NORMAL						S1 OFF						S2 OFF						SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
"R"	R	○	X	X	X	○	R	X	X	X	X	○	R	○	X	X	X	○	R	○	X	X	X	○
"D"	1 st	○	X	X	X	○	4 th ↓ 3 rd	X	X	X	X	○	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd	○	○	X	X	○	3 rd	X	○	X	X	○	1 st ↓ 4 th	○	X	X	X	○	2 nd	○	○	X	X	○
	3 rd	X	○	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○	3 rd	X	○	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	4 th	X	X	X	○	X
"3"	1 st	○	X	X	X	○	3 rd ↓ 3 rd E/B	X	X	X	X	○	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd	○	○	X	X	○	3 rd ↓ 3 rd E/B	X	○	X	X	○	1 st ↓ 3 rd E/B	○	X	X	X	○	2 nd	○	○	X	X	○
	3 rd E/B	X	○	X	X	X	3 rd E/B	X	○	X	X	X	3 rd E/B	X	X	X	X	X	3 rd E/B ↓ 3 rd	X	○	X	X	X
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	3 rd	X	X	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	3 rd E/B ↓ 3 rd	X	X	X	○	X
"2"	1 st	○	X	X	X	○	1 st	X	X	X	X	○	1 st	○	X	X	X	○	1 st	○	X	X	X	○
	2 nd E/B	○	○	○	X	X	3 rd E/B	X	○	○	X	X	2 nd E/B ↓ 4 th	○	X	○	X	X	2 nd	○	○	X	X	X
	3 rd E/B	X	○	○	X	X	3 rd E/B	X	○	○	X	X	Fail 4th	X	X	○	X	X	2 nd	X	○	X	X	X
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	1 st ↓ 2 nd	X	X	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	1 st E/B ↓ 2 nd	X	○	X	○	X
"L"	1 st E/B	○	X	X	X	X	1 st E/B	X	X	X	X	X	1 st E/B	○	X	X	X	X	1 st E/B	○	X	X	X	X
	2 nd E/B	○	○	○	X	X	3 rd E/B	X	○	○	X	X	2 nd E/B ↓ 4 th	○	X	○	X	X	2 nd	○	○	X	X	X
	3 rd E/B	X	○	○	X	X	3 rd E/B	X	○	○	X	X	Fail 4 th	X	X	○	X	X	2 nd	X	○	X	X	X
	4 th	X	X	○	X	○	4 th	X	X	○	X	○	4 th	X	X	○	X	○	1 st ↓ 2 nd	X	X	X	X	○
	5 th	X	X	○	○	X	5 th	X	X	○	○	X	5 th	X	X	○	○	X	1 st E/B ↓ 2 nd	X	○	X	○	X

○: ON

X: OFF

→: Condition in the electrical malfunction is shown on the left of "→".

Condition in the fail-safe mode is shown on the right of "→".

E/B: Engine brake.

Position	S1 S2 OFF						S2 SR OFF						S1 SR OFF						S1 S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
"R"	R	X	X	X	X	○	R	○	X	X	X	○	R	X	X	X	X	○	R	X	X	X	X	○
"D"	4 th	X	X	X	X	○	1 st	○	X	X	X	○	4 th ↓ 3 rd	X	○	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	1 st ↓ 4 th	○	X	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	3 rd	X	○	X	X	○	4 th	X	X	X	X	○
	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○	4 th	X	X	X	X	○
	5 th	X	X	○	○	X	4 th	X	X	X	○	X	○	4 th	X	X	X	○	X	X	X	X	○	X
"3"	3 rd ↓ 3 rd E/B	X	X	X	X	○	1 st	○	X	X	X	○	3 rd	X	○	X	X	○	3 rd	X	X	X	X	○
	3 rd ↓ 3 rd E/B	X	X	X	X	○	1 st ↓ 3 rd	○	X	X	X	○	3 rd	X	○	X	X	○	3 rd	X	X	X	X	○
	3 rd E/B	X	X	X	X	X	3 rd E/B ↓ 3 rd	X	X	X	X	○	3 rd E/B ↓ 3 rd	X	○	X	X	○	3 rd E/B ↓ 3 rd	X	X	X	X	○
	4 th	X	X	○	X	○	3 rd	X	X	X	X	○	3 rd	X	○	X	X	○	3 rd	X	X	X	X	○
	5 th	X	X	○	○	X	1 st E/B ↓ 3 rd	X	X	X	○	X	○	3 rd E/B ↓ 3 rd	X	○	X	○	X	3 rd E/B ↓ 3 rd	X	X	X	○
"2"	1 st	X	X	X	X	○	1 st	○	X	X	X	○	1 st	X	X	X	X	○	1 st	X	X	X	X	○
	Fail 4 th	X	X	○	X	○	1 st E/B ↓ 1 st	○	X	X	X	○	2 nd	X	○	X	X	○	1 st E/B ↓ 1 st	X	X	X	X	○
	Fail 4 th	X	X	○	X	○	1 st E/B ↓ 1 st	X	X	X	X	○	2 nd	X	○	X	X	○	1 st E/B ↓ 1 st	X	X	X	X	○
	4 th	X	X	○	X	○	1 st	○	X	X	X	○	1 st ↓ 2nd	X	○	X	X	○	1 st	X	X	X	X	○
	5 th	X	X	○	○	X	1 st E/B ↓ 1 st	X	X	X	○	X	○	1 st E/B ↓ 2nd	X	○	X	○	X	1 st E/B ↓ 1 st	X	X	X	○
"L"	1 st E/B	X	X	X	X	X	1 st E/B	○	X	X	X	X	1 st E/B	X	X	X	X	X	1 st E/B	X	X	X	X	X
	Fail 4 th	X	X	○	X	○	1 st E/B ↓ 1 st	○	X	X	X	○	2 nd	X	○	X	X	○	1 st E/B ↓ 1 st	X	X	X	X	○
	Fail 4 th	X	X	○	X	○	1 st E/B ↓ 1 st	X	X	X	X	○	2 nd	X	○	X	X	○	1 st E/B ↓ 1 st	X	X	X	X	○
	4 th	X	X	○	X	○	1 st	○	X	X	X	○	1 st ↓ 2nd	X	○	X	X	○	1 st	X	X	X	X	○
	5 th	X	X	○	○	X	1 st E/B ↓ 1 st	X	X	X	○	X	○	1 st E/B ↓ 2nd	X	○	X	○	X	1 st E/B ↓ 1 st	X	X	X	○

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	<ul style="list-style-type: none"> • Brake Pedal is depressed: ON • Brake Pedal is released: OFF 	–
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P and N: ON Except P and N: OFF	When the shift lever position displayed on the hand-held tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect. HINT: When the failure still occurs even after adjusting these parts, See page DI-1159 .
LOW	PNP SW Status/ ON or OFF	<ul style="list-style-type: none"> • Shift lever position is 2: OFF <li style="text-align: center;">↓ • Shift position L switch Push: ON <li style="text-align: center;">↓ • Shift position L switch Push: OFF 	↑
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	↑
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	↑
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D: ON Except D: OFF	↑
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	↑
OVERDRV CUT SW2	O/D SW Status/ ON or OFF	<ul style="list-style-type: none"> • IG SW ON: ON <li style="text-align: center;">↓ • O/D SW Push: OFF <li style="text-align: center;">↓ • O/D SW Push: ON 	–
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th or 5th	Shift lever position is; <ul style="list-style-type: none"> • L: 1st • 2: 1st or 2nd • 3: 1st, 2nd or 3rd • 4(O/D OFF): 1st, 2nd, 3rd or 4th • D: 1st, 2nd, 3rd, 4th or 5th 	–

LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	<ul style="list-style-type: none"> • Lock Up: ON • Except Lock Up: OFF 	–
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	<ul style="list-style-type: none"> • Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON 	–
SOLENOID (SLU)	Shift Solenoid SLU Status/ ON or OFF	<ul style="list-style-type: none"> • Lock Up: ON • Except Lock Up: OFF 	–
AT FLUID TEMP 1	ATF Temp. Sensor No.1 Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak 	If the value is "–40°C (–40°F)" or "215°C (419°F)", ATF temp. sensor No.1 circuit is open or shorted.
AT FLUID TEMP 2	ATF Temp. Sensor No.2 Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak 	If the value is "–40°C (–40°F)" or "215°C (419°F)", ATF temp. sensor No.2 circuit is open or shorted.
SPD (SP2)	Output shaft Speed/ min.: 0 km/h (0 mph) max.: 255 km/h (158 mph)	<p>Vehicle stopped: 0 km/h (0 mph)</p> <p>[HINT]</p> <p>Equal to vehicle speed</p>	–
SPD (NT)	Input Turbine Speed/ display: 50 r/min	<p>[HINT]</p> <ul style="list-style-type: none"> • Lock-up ON (After warming up the engine); Input Turbine speed (NT) equal to the engine speed. • Lock-up OFF (Idling at N position); Input Turbine speed (NT) nearly equal to the engine speed. 	–

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.
LOCK UP	[Test Details] Control the shift solenoid SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] • Throttle valve opening angle: Less than 35 % • Vehicle Speed: 60 km/h (37 mph) or more	Possible to check the SLU operation.
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [HINT] OFF: Line pressure up (When the active test of "Control the Line Pressure Up" is performed, the ECM commands the SLT solenoid to turn off). ON: No action (normal operation)	-

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting the SST to the automatic transaxle, which is used in the HYDRAULIC TEST (See page [DI-1123](#)) as well.

HINT:

The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the parts listed in the table below and proceed to the page given.

HINT:

- *1 : ● ... The MIL (Malfunction Indicator Lamp) lights up
- *2 : ○ ... The ECM memorizes the trouble code if the ECM detects the DTC detection condition.
- This DTC may be output when the clutch, brake and gear components etc. inside the automatic transmission are damaged.

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Memory *2
P0500 (DI-701)	Vehicle Speed Sensor "A"	<ul style="list-style-type: none"> • Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM 	●	○
P0705 (DI-1159)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	<ul style="list-style-type: none"> • Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM 	●	○
P0710 (DI-1166)	Transmission Fluid Temperature Sensor "A" Circuit	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM 	●	○
P0711 (DI-1172)	Transmission Fluid Temperature Sensor "A" Performance	<ul style="list-style-type: none"> • Transmission wire (ATF temperature sensor No.1) 	●	○
P0712 (DI-1166)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	<ul style="list-style-type: none"> • Short in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM 	●	○
P0713 (DI-1166)	Transmission Fluid Temperature Sensor "A" Circuit High Input	<ul style="list-style-type: none"> • Open in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM 	●	○
P0717 (DI-1175)	Input Speed Sensor Circuit No Signal	<ul style="list-style-type: none"> • Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0722 (DI-1180)	Output Speed Sensor Circuit No Signal	<ul style="list-style-type: none"> • Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0724 (DI-1184)	Brake Switch "B" Circuit High	<ul style="list-style-type: none"> • Short in stop light switch signal circuit • Stop light switch • ECM 	●	○
P0748 (DI-1188)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM 	●	○
P0751 (DI-1193)	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	<ul style="list-style-type: none"> • Shift solenoid valve S1 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0756 (DI-1199)	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	<ul style="list-style-type: none"> • Shift solenoid valve S2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0771 (DI-1205)	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Shift solenoid valve SR remains open or closed • Shift solenoid valve SL1 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○

P0776 (DI-1210)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	<ul style="list-style-type: none"> • Shift solenoid valve SL2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0778 (DI-1216)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM 	●	○
P0781 (DI-1221)	1-2 Shift (1-2 Shift Valve)	<ul style="list-style-type: none"> • Valve body is blocked up or stuck (1-2 shift valve) • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P0973 (DI-1226)	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	<ul style="list-style-type: none"> • Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM 	●	○
P0974 (DI-1226)	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	<ul style="list-style-type: none"> • Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM 	●	○
P0976 (DI-1231)	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	<ul style="list-style-type: none"> • Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM 	●	○
P0977 (DI-1231)	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	<ul style="list-style-type: none"> • Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM 	●	○
P0985 (DI-1236)	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM 	●	○
P0986 (DI-1236)	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	<ul style="list-style-type: none"> • Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM 	●	○
P2714 (DI-1241)	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	<ul style="list-style-type: none"> • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) 	●	○
P2716 (DI-1247)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM 	●	○
P2740 (DI-1251)	Transmission Fluid Temperature Sensor "B" Circuit	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM 	●	○
P2742 (DI-1251)	Transmission Fluid Temperature Sensor "B" Circuit Low Input	<ul style="list-style-type: none"> • Short in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM 	●	○
P2743 (DI-1251)	Transmission Fluid Temperature Sensor "B" Circuit High Input	<ul style="list-style-type: none"> • Open in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM 	●	○
P2757 (DI-1257)	Torque Converter Clutch Pres- sure Control Solenoid Perfor- mance (Shift Solenoid Valve SLU)	<ul style="list-style-type: none"> • Shift solenoid valve SLU remains open or closed • Valve body is blocked • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low 	●	○
P2759 (DI-1265)	Torque Converter Clutch Pres- sure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM 	●	○

P2772* (DI-1270)	Transfer L4 SW Circuit	<ul style="list-style-type: none">• Short in transfer L4 position switch circuit• Transfer L4 position switch• ECM	●	○
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HINT:

*: 4WD

CIRCUIT INSPECTION

DTC	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)
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CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0705	(2-trip detection logic) <ul style="list-style-type: none"> • All switches are OFF simultaneously for NSW, R, N, D, 3 and 2 positions. • 2 or more switches are ON simultaneously for NSW, R, D, 3 and 2 positions. 	<ul style="list-style-type: none"> • Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM

MONITOR DESCRIPTION

These DTCs indicate a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.

The park/neutral position switch detects the shift lever position and sends a signal to the ECM.

For security, the park/neutral position switch detects the shift lever position so that engine can be started only when the shift lever is in the P or N position.

The park/neutral position switch sends a signal to the ECM according to the shift position (NSW, R, D, 3 or 2).

The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0705	Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch	
Frequency of operation	Continuous	
Duration	Condition (A)	2 sec.
	Condition (B)	60 sec.
MIL operation	2 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
Ignition switch	ON	
Battery voltage	10.5 V or more	

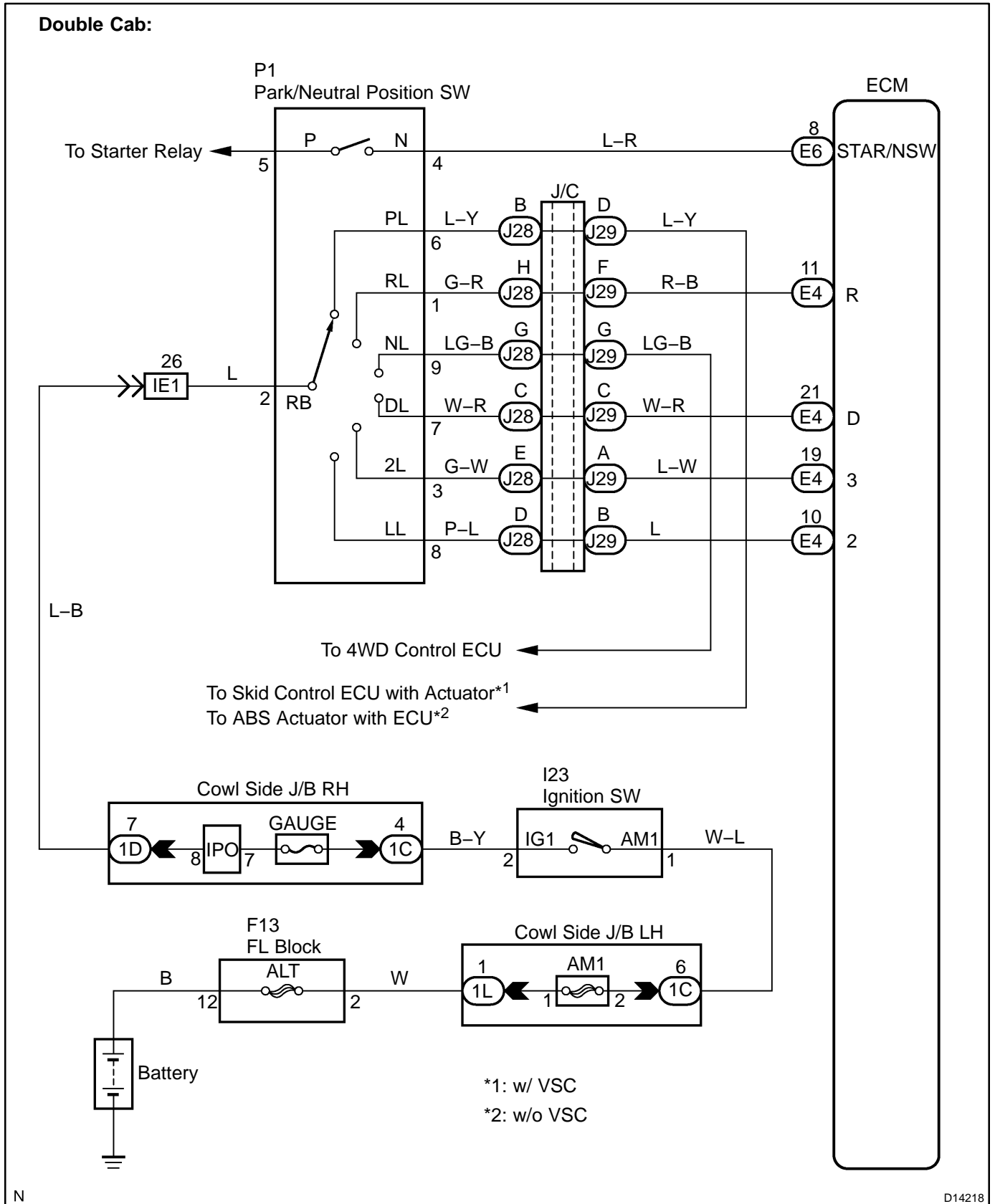
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
One of the following conditions is met: Condition (A) or (B)	
Condition (A)	
Number of the following signal input at the same time	2 or more
NSW switch	ON
R switch	
D switch	
3 switch	
2 switch	
Condition (B)	
All of following conditions are met	
N switch	OFF
NSW switch	
R switch	
D switch	
3 switch	
2 switch	

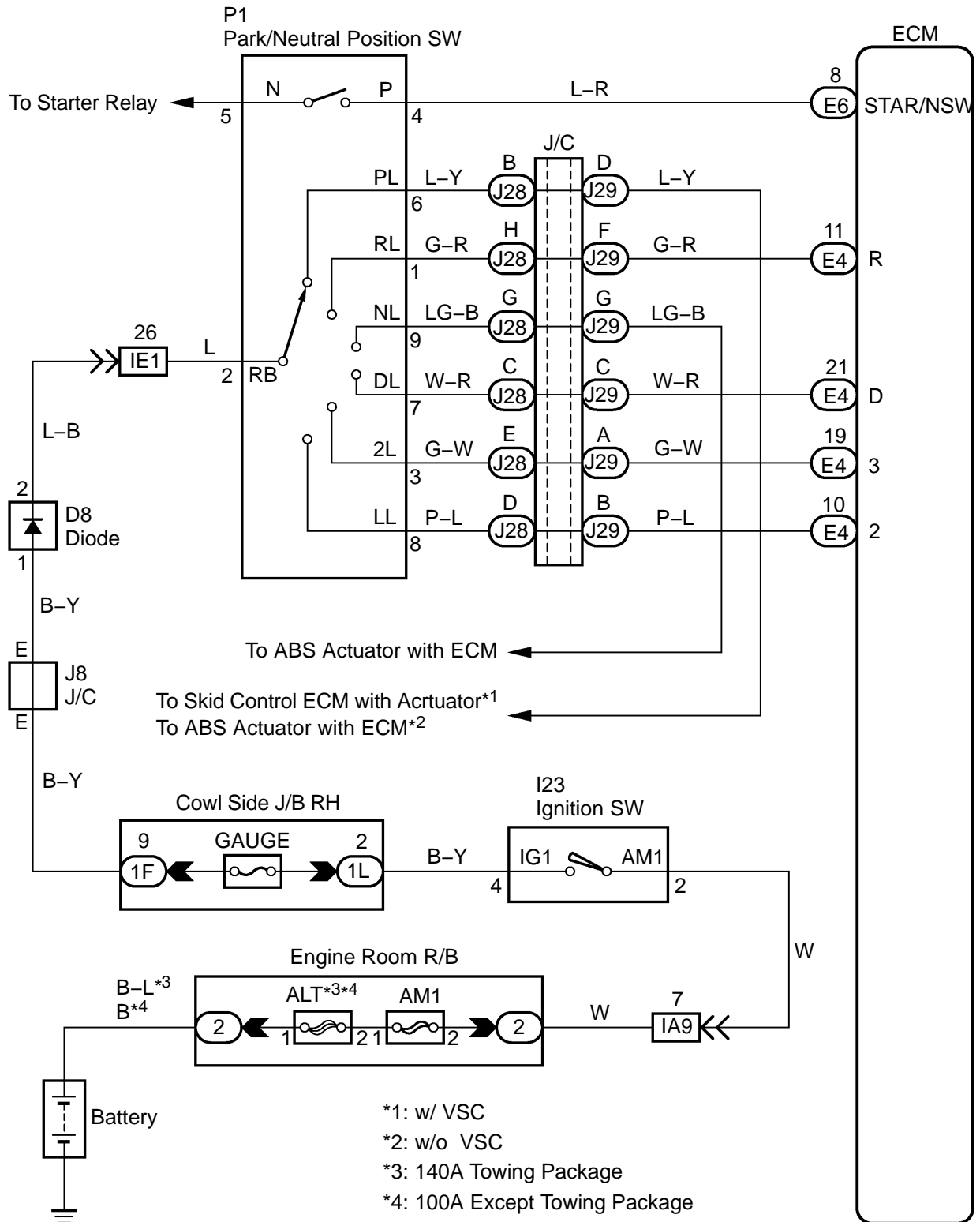
COMPONENT OPERATING RANGE

Parameter	Standard value
Park/neutral position switch	The park/neutral position switch sends only one signal to the ECM.

WIRING DIAGRAM



Except Double Cab:



INSPECTION PROCEDURE

HINT:

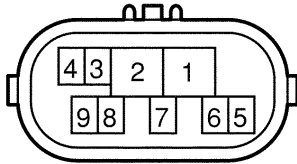
According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P and N: ON Except P and N: OFF	When the shift lever position displayed on the hand-held tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect.
LOW	PNP SW Status/ ON or OFF	• Shift lever position is 2: OFF ↓ • Shift position L switch Push: ON ↓ • Shift position L switch Push: OFF	↑
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	↑
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	↑
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D: ON Except D: OFF	↑
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	↑

1 Inspect park/neutral position switch.

Switch Side:
(Connector Front View):



P

D14154

PREPARATION:

- (a) Jack up the vehicle.
- (b) Disconnect the park/neutral position switch connector.

CHECK:

Measure the resistance according to the value(s) in the table below when the shift lever is moved to each position.

OK:

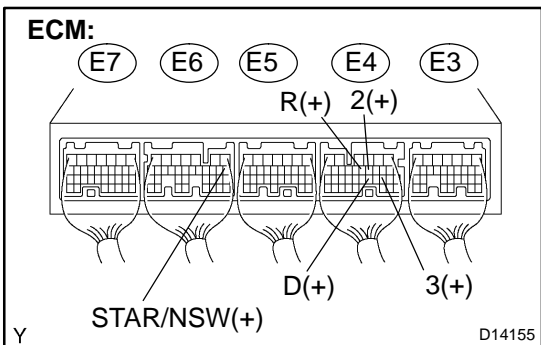
Shift Position	Tester Connection	Specified Condition
P	2 - 6 and 4 - 5	Below 1 Ω
Except P	\uparrow	10 k Ω or higher
R	2 - 1	Below 1 Ω
Except R	\uparrow	10 k Ω or higher
N	2 - 9 and 4 - 5	Below 1 Ω
Except N	\uparrow	10 k Ω or higher
D	2 - 7	Below 1 Ω
Except D	\uparrow	10 k Ω or higher
3	2 - 3	Below 1 Ω
Except 3	\uparrow	10 k Ω or higher
2	2 - 8	Below 1 Ω
Except 2	\uparrow	10 k Ω or higher

NG

Replace park/neutral position switch
(See page [AT-11](#)).

OK

2 Check harness and connector (Park/neutral position switch – ECM).



PREPARATION:

- (a) Connect the park/neutral position switch connector.
- (b) Turn the ignition switch ON.

CHECK:

Measure the voltage according to the value(s) in the table below when the shift lever is moved to each position.

OK:

Shift Position	Tester connection	Specified condition
P and N	E6 – 8 (STAR/NSW) – Body ground	Below 2 V
Except P and N	↑	10 to 14 V
R	E4 – 11 (R) – Body ground	10 to 14 V*
Except R	↑	Below 1 V
D	E4 – 21 (D) – Body ground	10 to 14 V
Except D	↑	Below 1 V
3	E4 – 19 (3) – Body ground	10 to 14 V
Except 3	↑	Below 1 V
2 and L	E4 – 10 (2) – Body ground	10 to 14 V
Except 2 and L	↑	Below 1 V

HINT:

*: The voltage will drop slightly due to lighting up of the back up light.

NG Repair or replace the harness or connector (See page [IN-30](#)).

OK

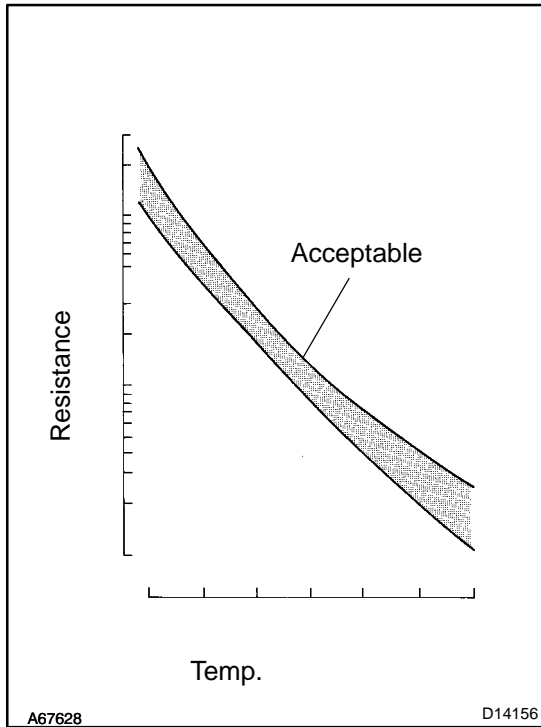
Replace the ECM (See page [SF-82](#)).

DTC	P0710	Transmission Fluid Temperature Sensor "A" Circuit
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DTC	P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input
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DTC	P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input
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CIRCUIT DESCRIPTION



The ATF (Automatic Transmission Fluid) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

The ECM applies a voltage to the temperature sensor through ECM terminal THO1.

The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.

One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.

The ECM calculates the fluid temperature based on the voltage signal.

DTC No.	DTC Detection Condition	Trouble Area
P0710	(a) and (b) are detected momentarily within 0.5 sec. when neither P0712 nor P0713 is detected (1-trip detection logic) (a) ATF temperature sensor No.1 resistance is less than 79 Ω. (b) ATF temperature sensor No.1 resistance is more than 156 kΩ. HINT: Within 0.5 sec., the malfunction switches from (a) to (b) or from (b) to (a)	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM
P0712	ATF temperature sensor No.1 resistance is less than 79 Ω for 0.5 sec. or more (1-trip detection logic)	<ul style="list-style-type: none"> • Short in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM
P0713	ATF temperature No.1 sensor resistance is more than 156 kΩ when 15 minutes or more have elapsed after the engine start DTC is detected for 0.5 sec. or more (1-trip detection logic)	<ul style="list-style-type: none"> • Open in ATF temperature sensor No.1 circuit • Transmission wire (ATF temperature sensor No.1) • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the automatic transmission fluid (ATF) temperature sensor circuit. The automatic transmission fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79Ω^{*1} or more than 156kΩ^{*2}, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

*1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.

*2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.

HINT:

The ATF temperature can be checked on the OBD II scan tool or hand-held tester display.

MONITOR STRATEGY

Related DTCs	P0710	ATF temperature sensor/Range check (Fluttering)
	P0712	ATF temperature sensor/Range check (Low resistance)
	P0713	ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-1128	
Range check (Fluttering, Low resistance)		
The typical enabling condition is not available.	–	
Range check (High resistance)		
Time after engine start	15 min. or more	–

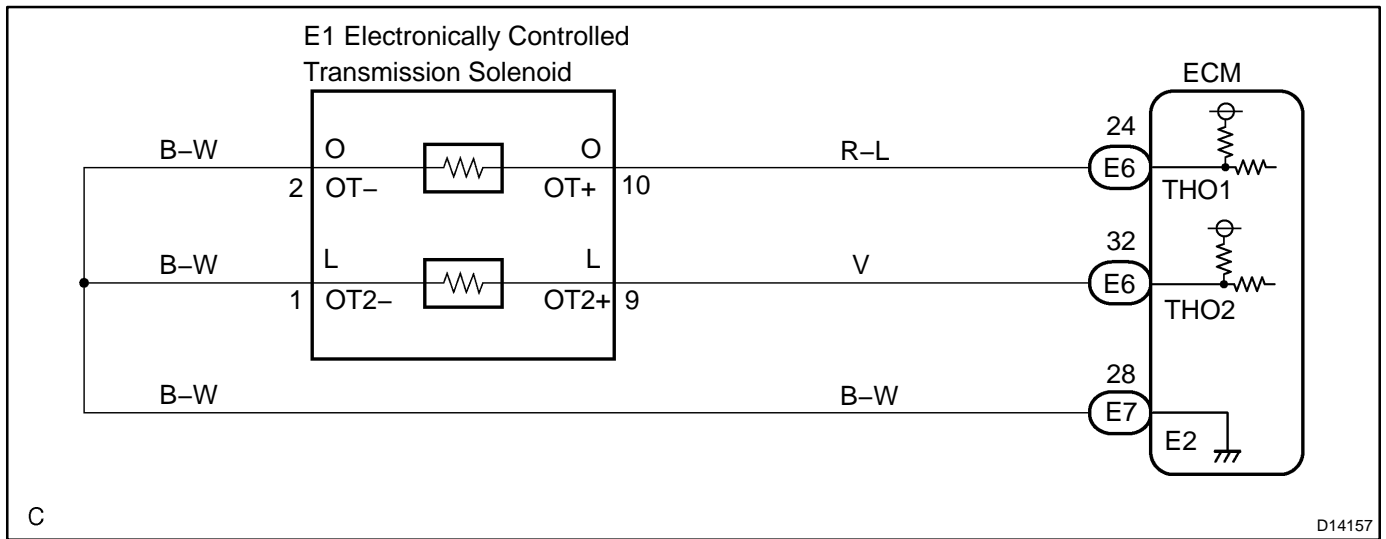
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Fluttering)	
TFT (transmission fluid temperature) sensor resistance	Less than 79 Ω or More than 156 k Ω
Range check (Low resistance)	
TFT (transmission fluid temperature) sensor resistance	Less than 79 Ω
Range check (High resistance)	
TFT (transmission fluid temperature) sensor resistance	More than 156 k Ω

COMPONENT OPERATING RANGE

Parameter	Standard value
TFT (transmission fluid temperature) sensor	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT FLUID TEMP 1	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak

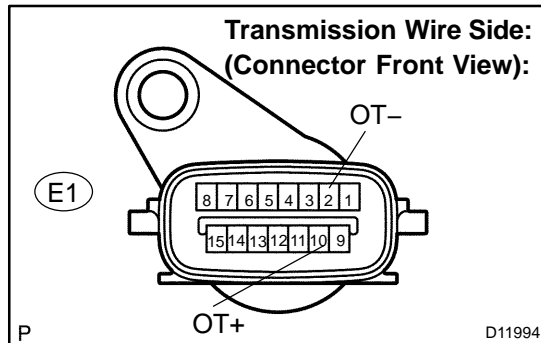
HINT:

When DTC P0712 is output and hand-held tester output is 150°C (302°F) or more, there is a short circuit. When DTC P0713 is output and hand-held tester output is -40°C (-40°F), there is an open circuit. Measure the resistance between terminal THO1 (OT) and body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

HINT:

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 second). When P0713 is set, P0711 cannot be detected. It is not necessary to inspect the circuit when P0711 is set.

1 Inspect transmission wire (ATF temperature sensor No.1).
**PREPARATION:**

Disconnect the transmission wire connector from the transmission.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
2 (OT-) – 10 (OT+)	79 Ω to 156 k Ω
2 (OT-) – Body ground	10 k Ω or higher
10 (OT+) – Body ground	10 k Ω or higher

HINT:

If the resistance is out of the specified range with either the ATF temperature shown in the table below, the driveability of the vehicle may decrease.

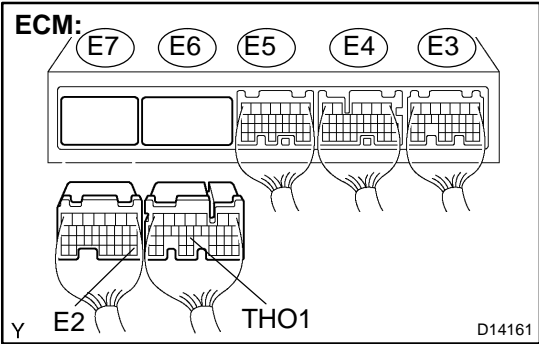
ATF Temperature	Specified Condition
20°C (68°F)	3 to 4 k Ω
110°C (230°F)	0.22 to 0.28 k Ω

NG

Repair or replace the transmission wire (ATF temperature sensor No.1)
(See page [AT-9](#)).

OK

2 Check harness and connector (Transmission wire – ECM).



PREPARATION:

- (a) Connect the transmission wire connector.
- (b) Disconnect the connector of the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 24 (THO1) – E7 – 28 (E2)	79 Ω to 156 kΩ

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 24 (THO1) – Body ground	10 kΩ or higher
E7 – 28 (E2) – Body ground	↑

NG → **Repair or replace the harness or connector (See page IN-30).**

OK

Replace the ECM (See page SF-82).

DTC	P0711	Transmission Fluid Temperature Sensor "A" Performance
------------	--------------	--

CIRCUIT DESCRIPTION

See page [DI-1166](#).

DTC No.	DTC Detection Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2-trip detection logic) (a) Intake air and engine coolant temps. are more than -15°C (-4°F) at engine start (b) After normal driving for over 22 min. and 9 km (6 mile) or more, ATF temp. is less than 20°C (50°F)	• Transmission wire (ATF temperature sensor No.1)

MONITOR DESCRIPTION

This DTC indicates that there is a problem with output from the automatic transmission fluid (ATF) temperature sensor and that the sensor itself is defective. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault in the ATF temperature sensor. After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.

MONITOR STRATEGY

Related DTCs	P0711	ATF temperature sensor/Rationality check
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
TFT (transmission fluid temperature) sensor circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
IAT (Intake air temperature) sensor circuit	Not circuit malfunction	
Time after engine start	21 min. and 40 sec.	
Driving distance after engine start	9 km (5.6 mile) or more	–
IAT (12 sec. after engine start)	-10°C (14°F) or more	–
ECT (12 sec. after engine start)	-10°C (14°F) or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
TFT (transmission fluid temperature)	Less than 20°C (68°F) (varies with TFT (transmission fluid temperature) at engine start)

WIRING DIAGRAM

See page [DI-1166](#).

INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT FLUID TEMP 1	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak

HINT:

When DTC P0712 is output and hand-held tester output is 150°C (302°F) or more, there is a short circuit.
When DTC P0713 is output and hand-held tester output is -40°C (-40°F), there is an open circuit.
Measure the resistance between terminal THO1 (OT) and body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

HINT:

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 second).
When P0713 is set, P0711 cannot be detected.
It is not necessary to inspect the circuit when P0711 is set.

1	Check other DTCs output (in addition to DTC P0711).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0711" is output	A
"P0711" and other DTCs	B

HINT:

If any other codes besides "P0711" are output, perform troubleshooting for those DTCs first.

B	Go to DTC chart (See page DI-1156).
----------	--

A

2	Check transmission fluid level (See page DI-1117).
----------	---

OK:

Automatic transmission fluid level is correct.

NG	Add fluid (See page DI-1117).
-----------	--

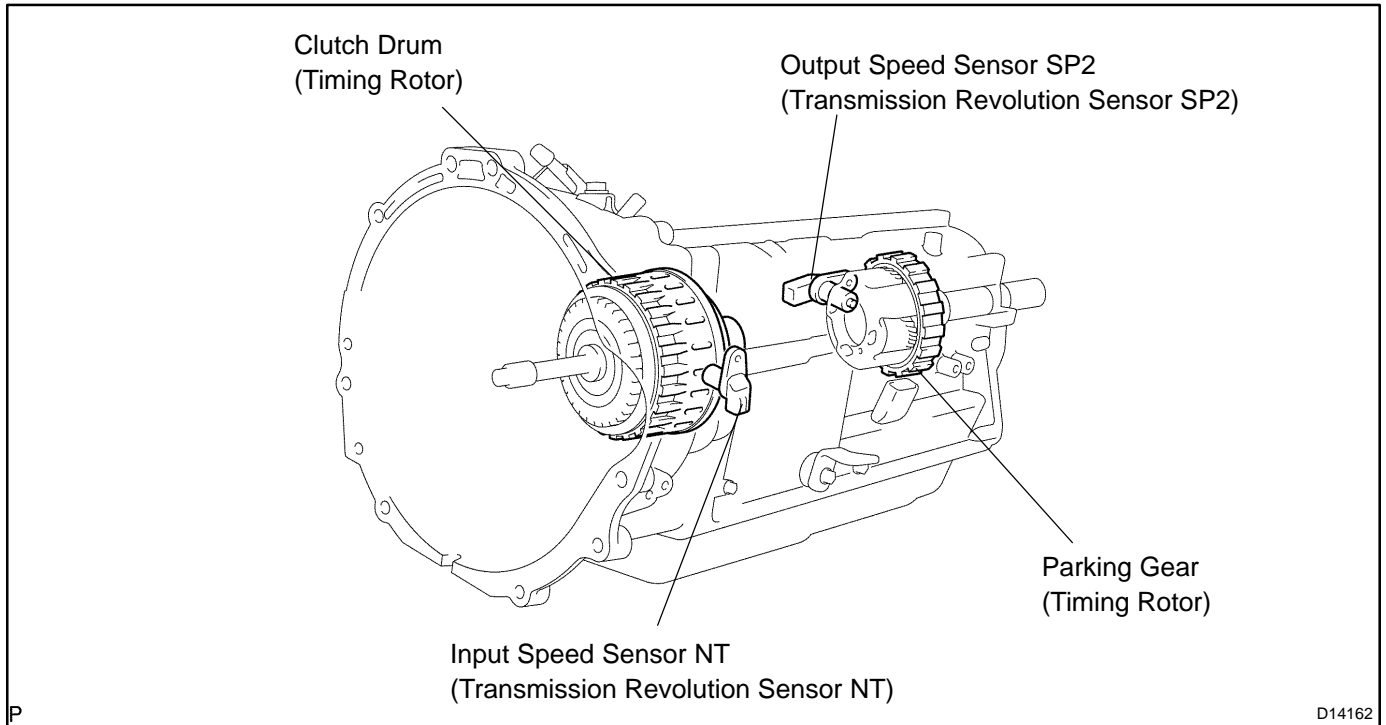
OK

Replace the transmission wire (ATF temperature sensor) (See page AT-9).
--

DTC	P0717	Input Speed Sensor Circuit No Signal
------------	--------------	---

CIRCUIT DESCRIPTION

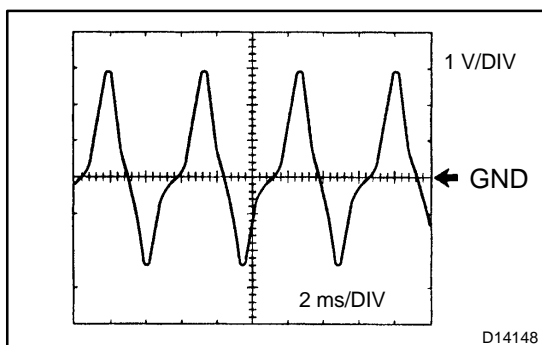
This sensor detects the rotation speed of the turbine which shows the input revolution of transmission. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (SP2), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions, thus, providing smooth gear shift.



P

D14162

DTC No.	DTC Detection Condition	Trouble Area
P0717	<p>All conditions below are detected for 5 secs. or more (1-trip detection logic)</p> <p>(a) Gear change is not performed</p> <p>(b) Gear position: 4th or 5th</p> <p>(c) T/M input shaft rpm: 300 rpm or less</p> <p>(d) T/M output shaft rpm: 1,000 rpm or more</p> <p>(e) Park/neutral position switch:</p> <ul style="list-style-type: none"> • NSW input signal is OFF • R input signal is OFF • L input signal is OFF <p>(f) Shift solenoid valves, park/neutral position switch and vehicle speed sensor are in normal operation</p>	<ul style="list-style-type: none"> • Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transmission (clutch, brake or gear, etc.)



Reference (Using an oscilloscope):

Check the waveform between terminals NT+ and NT- of the ECM connector.

Standard: Refer to the illustration.

Terminal	NT+ – NT-
Tool setting	1V/DIV, 2ms/DIV
Vehicle condition	Engine idle speed (P or N position)

MONITOR DESCRIPTION

This DTC indicates that pulse is not output from the speed sensor NT (Turbine (input) speed sensor) or is output only little. The NT terminal of the ECM detects the revolving signal from the speed sensor (NT) (input RPM). The ECM outputs a gearshift signal comparing the input speed sensor (NT) with the output speed sensor (SP2).

While the vehicle is operating in the 4th or 5th gear position in the shift position of D, if the input shaft revolution is less than 300 rpm^{*1} although the output shaft revolution is more than 1000 rpm or more^{*2}, the ECM detects the trouble, illuminates the MIL and stores the DTC.

*1: Pulse is not output or is irregularly output.

*2: The vehicle speed is approx. 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0717	Speed sensor (NT)/Verify pulse input
Required sensors/Components	Main	Speed sensor (NT)
	Sub	Speed sensor (NO)
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
Shift change	Shift change is completed and before starting next shift change operation	
ECM selected gear	4th or 5th	
Output shaft rpm	1,000 rpm or more	–
NSW switch	OFF	
R switch	OFF	
L switch	OFF	
Engine	Running	
Ignition switch	ON	
Starter	OFF	

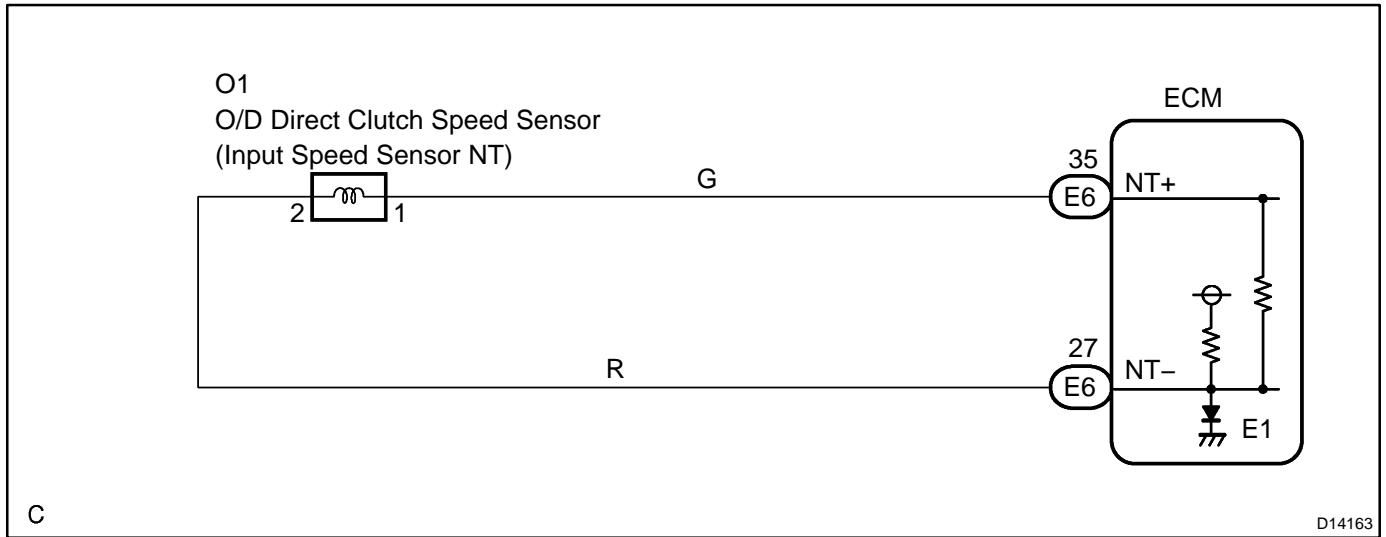
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Parameter	Standard value
Speed sensor (NT)	Input speed is equal to engine speed when lock-up ON.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

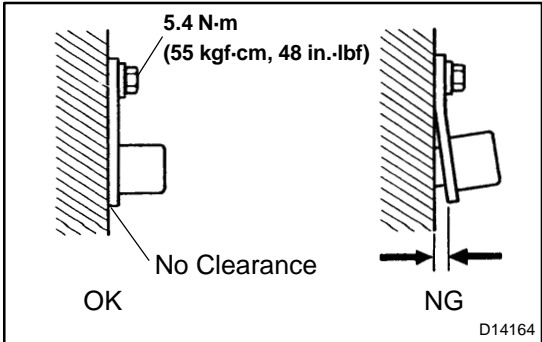
- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (NT)	Input Turbine Speed/ display: 50 r/min	[HINT] • Lock-up ON (After warming up the engine); Input Turbine speed (NT) equal to the engine speed. • Lock-up OFF (Idling at N position); Input Turbine speed (NT) nearly equal to the engine speed.

HINT:

- SPD (NT) is always 0 while driving:
Open or short in the sensor or circuit.
- SPD (NT) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:
Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1 Inspect speed sensor installation.



PREPARATION:

Jack up the vehicle.

CHECK:

Check the speed sensor (NT) installation.

OK:

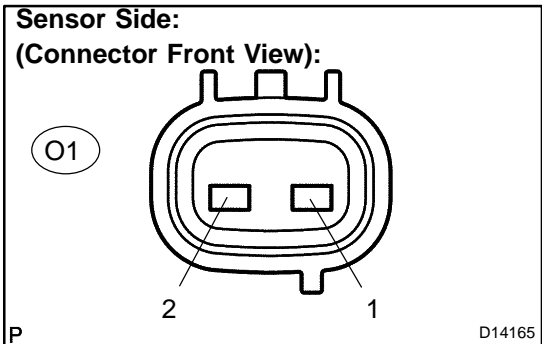
The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

NG → Replace speed sensor NT (See page AT-8).

OK

2 Inspect speed sensor NT.



PREPARATION:

Disconnect the speed sensor connector from the transmission.

CHECK:

Measure the resistance according to the value(s) in the table below.

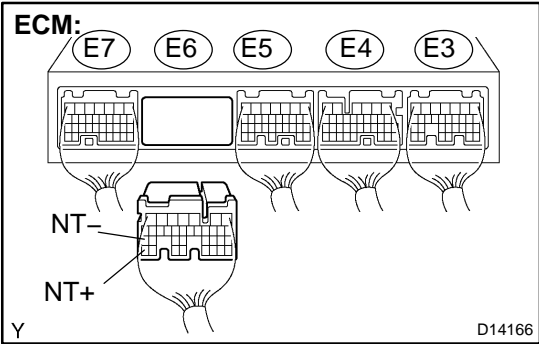
OK:

Tester Connection	Specified Condition 20 °C (68 °F)
1 – 2	560 to 680 Ω

NG → Replace speed sensor NT (See page AT-8).

OK

3 Check harness and connector (ECM – speed sensor NT).



PREPARATION:

- (a) Connect the speed sensor connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 35 (NT+) – E6 – 27 (NT-)	560 to 680 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 35 (NT+) – Body ground	10 kΩ or higher
E6 – 27 (NT-) – Body ground	↑

NG → **Repair or replace harness or connector (See page IN-30).**

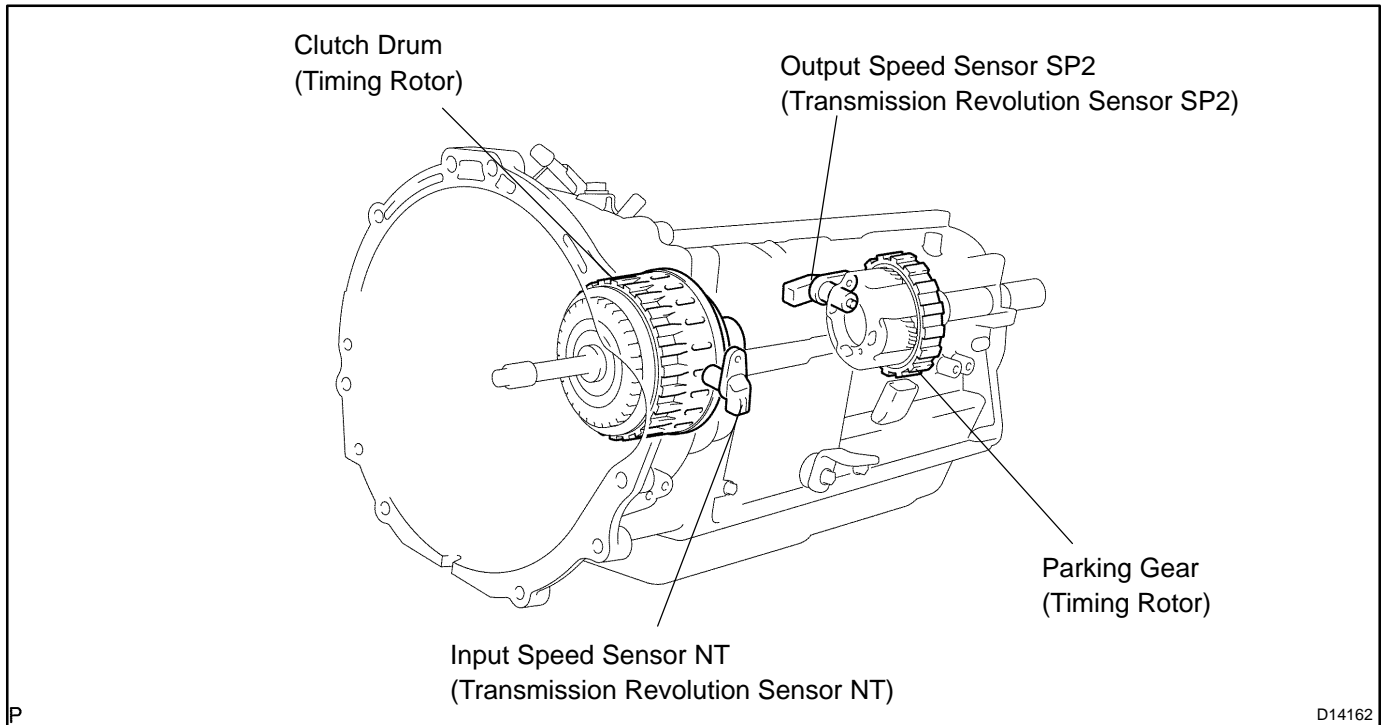
OK

Replace the ECM (See page SF-82).

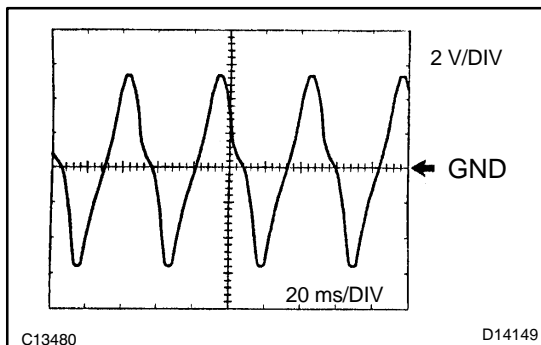
DTC	P0722	Output Speed Sensor Circuit No Signal
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CIRCUIT DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assy rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor. The gear shift point and lock-up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.



DTC No.	DTC Detection Condition	Trouble Area
P0722	All conditions below are detected 500 times or more continuously (1-trip detection logic) (a) No signal from speed sensor (SP2) is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal are sent (b) Vehicle speed is 9 km/h (6 mph) or more for at least 4 sec. (c) Park/neutral position switch is OFF. (d) Transfer position is except neutral (4WD).	<ul style="list-style-type: none"> • Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM • Automatic transmission (clutch, brake or gear, etc.)



Reference (Using an oscilloscope):

Check the waveform between terminals SP2+ and SP2- of the ECM connector.

Standard: Refer to the illustration.

Terminal	SP2+ - SP2-
Tool setting	2V/DIV, 20ms/DIV
Vehicle condition	Vehicle speed 20 km/h (12 mph)

MONITOR DESCRIPTION

The output speed sensor SP2 monitors the output shaft speed. The ECM controls the gearshift point and the lock up timing based on the signals from the output speed sensor SP2 and throttle position sensor. If the ECM detects no signal from the output shaft speed sensor SP2 even while the vehicle is moving, it will conclude that is a malfunction of the output speed sensor SP2. The ECM will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0722	Speed sensor SP2/Verify pulse input
Required sensors/Components	Speed sensor SP2	
Frequency of operation	Continuous	
Duration	500 output shaft revolution	
MIL operation	Immediate	
Sequence of operation	None	

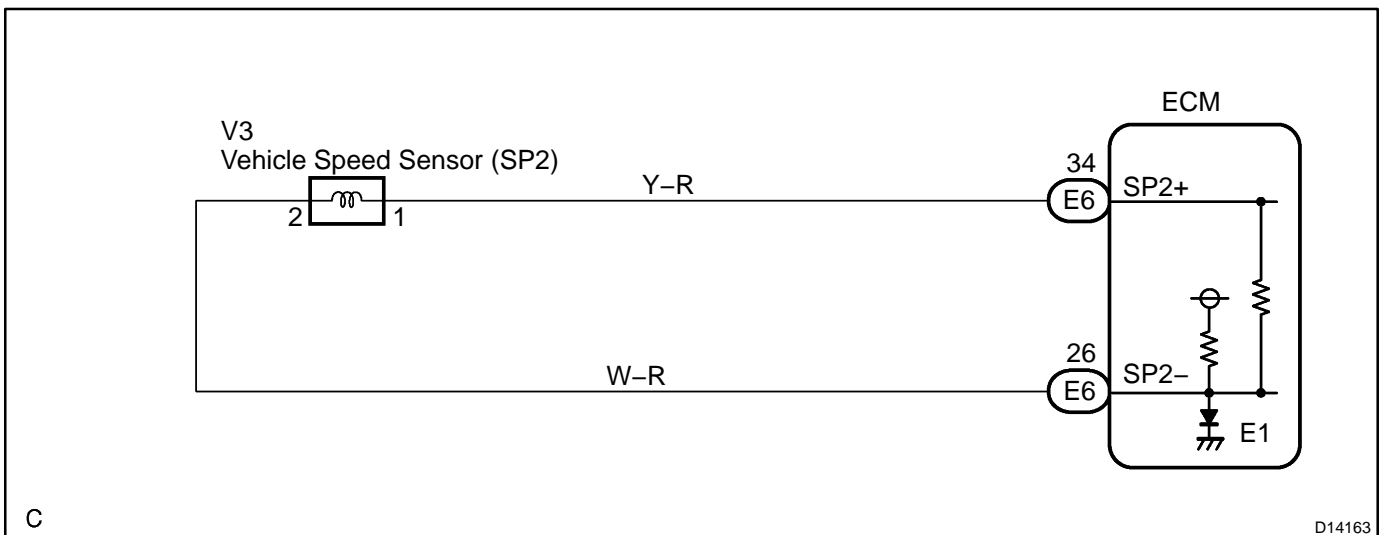
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
Vehicle speed sensor pulse input	4	
Vehicle speed range (4 sec. or more)	9 km/h (5.59 mph) or more	-
NSW switch	OFF	
Battery voltage	8 V or more	-
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Output speed sensor pulse input	No input

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

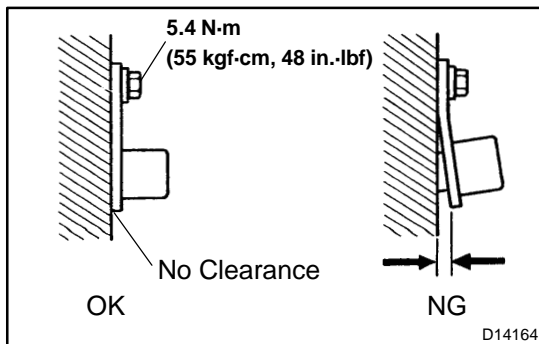
- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (SP2)	Output shaft Speed/ min.: 0 km/h (0 mph) max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) [HINT] Equal to vehicle speed

HINT:

- SPD (SP2) is always 0 while driving:
Open or short in the sensor or circuit.
- SPD (SP2) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:
Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1	Inspect speed sensor installation.
----------	---



PREPARATION:

Jack up the vehicle.

CHECK:

Check the speed sensor (SP2) installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

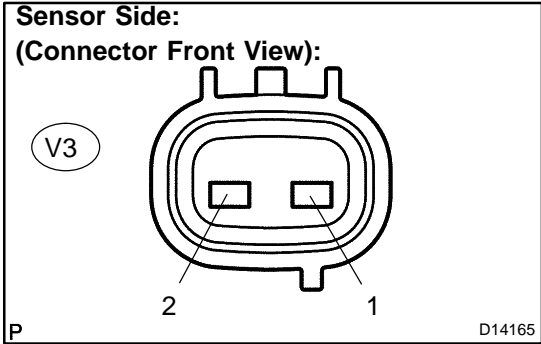
Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)

NG

Replace speed sensor SP2 (See page AT-8).

OK

2 Inspect speed sensor SP2.



PREPARATION:

Disconnect the speed sensor connector from the transmission.

CHECK:

Measure the resistance according to the value(s) in the table below.

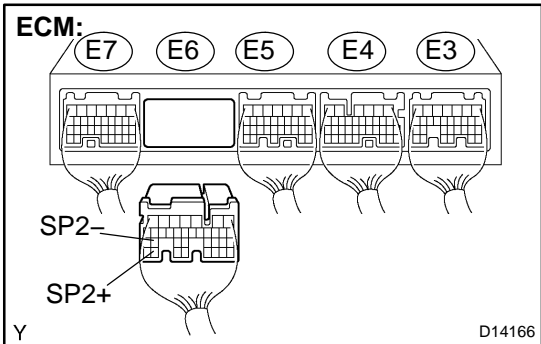
OK:

Tester Connection	Specified Condition 20 °C (68 °F)
1 – 2	560 to 680 Ω

NG → **Replace speed sensor SP2 (See page AT-8).**

OK

3 Check harness and connector (ECM – speed sensor SP2).



PREPARATION:

- (a) Connect the speed sensor connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 34 (SP2+) – E6 – 26 (SP2-)	560 to 680 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 34 (SP2+) – Body ground	10 kΩ or higher
E6 – 26 (SP2-) – Body ground	↑

NG → **Repair or replace harness or connector (See page IN-30).**

OK

Replace the ECM (See page SF-82).

DTC	P0724	Brake Switch "B" Circuit High
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CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock-up condition when brakes are suddenly applied.

When the brake pedal is depressed, this switch sends a signal to the ECM. Then the ECM cancels the operation of the lock-up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	The stop light switch remains ON even when the vehicle is driven in a STOP (less than 3 km/h (2 mph)) and GO (30 km/h (19 mph) or more) fashion 5 times. (2-trip detection logic).	<ul style="list-style-type: none"> • Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch remains on. When the stop light switch remains ON during "stop and go" driving, the ECM interprets this as a fault in the stop light switch and the MIL comes on and the ECM stores the DTC. The vehicle must stop (less than 3 km/h (2 mph)) and go (30 km/h (19 mph) or more) ten times for two driving cycles in order to detect a malfunction.

MONITOR STRATEGY

Related DTCs	P0724	Stop light switch/Range check/Rationality
Required sensors/Components	Main	Stop light switch
	Sub	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	GO and STOP 5 times	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
Battery voltage	8 V or more	-
Ignition switch	ON	
Starter	OFF	
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once	
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Brake switch	Remain ON during GO and STOP 5 times

WIRING DIAGRAM

See page [DI-706](#).

INSPECTION PROCEDURE

1	Read value of DATA LIST (STP signal).
---	--

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Standard:

Item	Measurement Item/ Range (display)	Normal Condition
Stop Light Switch	Stop light SW Status/ ON or OFF	<ul style="list-style-type: none"> • Brake Pedal is depressed: ON • Brake Pedal is released: OFF

NOTICE:

In the table above, the conditions listed under "Normal Condition" are reference conditions. Do not depend solely on these reference conditions when deciding whether a part is faulty or not.

OK:

Brake Pedal Condition	Specified Condition
Depressed	ON
Released	OFF

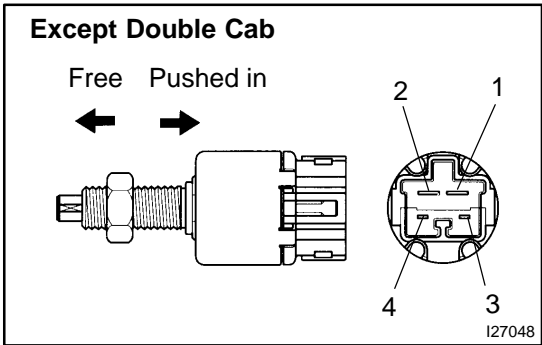
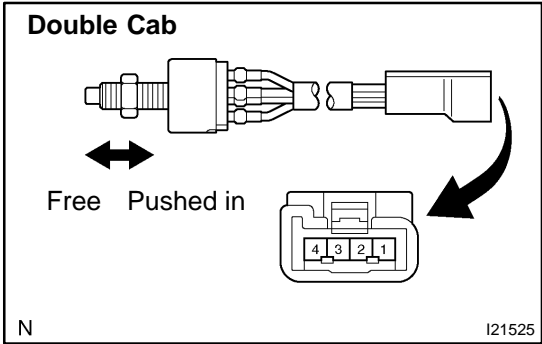
NG

Go to step 2.

OK

Go to step 3.

2 Inspect stop light switch.



PREPARATION:

Remove the stop lamp switch assy.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Double Cab:

Switch position	Tester Connection	Specified Condition
Switch pin free	1 - 4	Below 1 Ω
Switch pin pushed in	↑	10 kΩ or higher

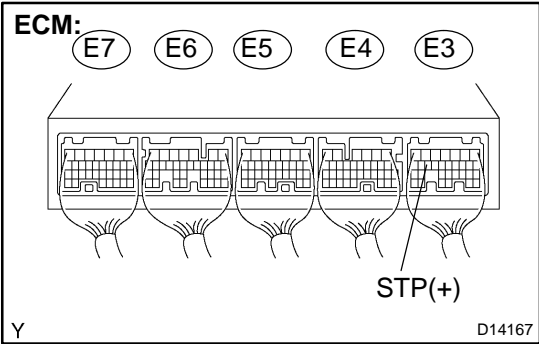
Except Double Cab:

Switch position	Tester Connection	Specified Condition
Switch pin free	1 - 2	Below 1 Ω
Switch pin pushed in	↑	10 kΩ or higher
Switch pin free	3 - 4	10 kΩ or higher
Switch pin pushed in	↑	Below 1 Ω

NG Replace stop light switch.

OK

3 Check harness and connector (ECM – stop light switch).



PREPARATION:

Install the stop lamp switch assy.

CHECK:

Measure the voltage according to the value(s) in the table below when the brake pedal is depressed and released.

OK:

Condition	Tester Connection	Specified Condition
Brake pedal is depressed	E3 – 15 (STP) – Body ground	10 to 14 V
Brake pedal is released	↑	Below 1 V

NG → **Repair or replace harness or connector (See page IN-30).**

OK

Replace the ECM (See page SF-82).

DTC	P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)
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CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-1150](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0748	ECM checks for an open or short circuit in shift solenoid valves SL1 (1-trip detection logic) (a) When solenoid, duty ratio equal to 100% (b) When solenoid is not energized, duty ratio is less than 3%	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM commands gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF". (In case of an open or short circuit, the ECM stops sending current to the circuit.)

While driving and shifting between 4th and 5th gears, if the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines there is a malfunction (See page [DI-1150](#)).

MONITOR STRATEGY

Related DTCs	P0748	Shift solenoid valve SL1/Range check
Required sensors/Components	Shift solenoid valve SL1	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
Battery voltage	10 V or more	–
CPU commanded duty	–	Less than 75%
Ignition switch	ON	
Switch	OFF	

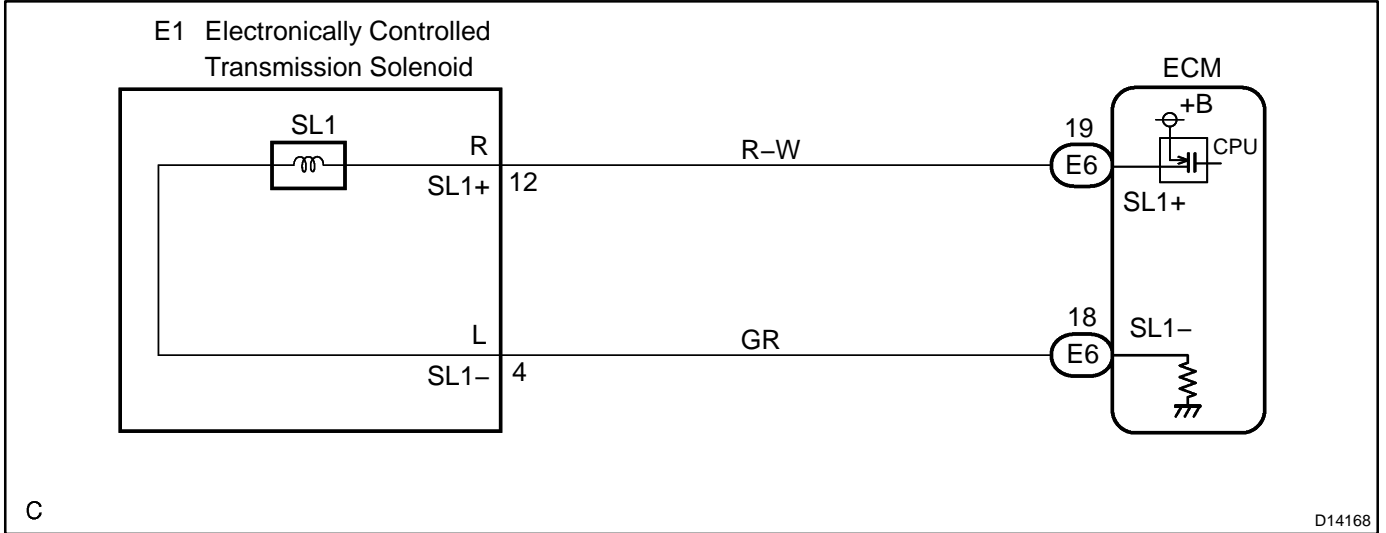
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Output signal duty	100%

COMPONENT OPERATING RANGE

Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



C

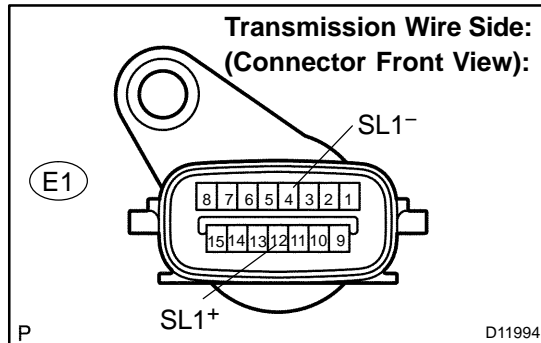
D14168

INSPECTION PROCEDURE**HINT:**

- The shift solenoid valve SL1 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

1	Inspect transmission wire.
----------	-----------------------------------

**PREPARATION:**

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
12 (SL1+) – 4 (SL1-)	5.0 to 5.6 Ω

CHECK:

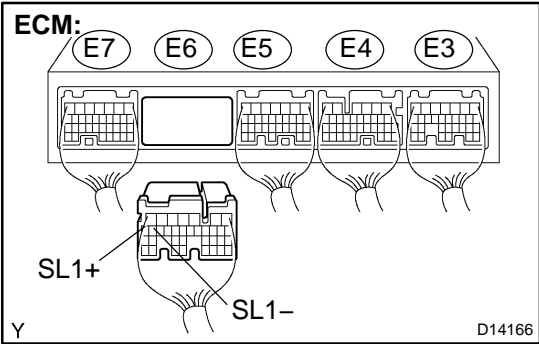
Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
12 (SL1+) – Body ground	10 kΩ or higher
4 (SL1-) – Body ground	↑

NG**Go to step 3.****OK**

2 Check harness and connector (Transmission wire – ECM)



PREPARATION:

- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 19 (SL1+) – E6 – 18 (SL1-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 19 (SL1+) – Body ground	10 kΩ or higher
E6 – 18 (SL1-) – Body ground	↑

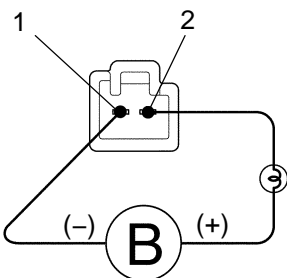
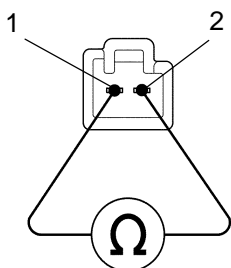
NG → **Repair or replace the harness or connector (See page IN-30).**

OK

Replace the ECM (See page SF-82).

3 Inspect shift solenoid valve SL1.

Shift Solenoid Valve SL1:



D12795

PREPARATION:

Remove the shift solenoid valve SL1 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG

**Replace the shift solenoid valve SL1
(See page [AT-12](#)).**

OK

**Repair or replace the transmission wire
(See page [AT-9](#)).**

DTC	P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)
------------	--------------	---

SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0751	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve S1 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0751	Shift solenoid valve S1/OFF malfunction
		Shift solenoid valve S1/ON malfunction
Required sensors/Components	Main	Shift solenoid valve S1
	Sub	Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous	
Duration	OFF malfunction (A) and (B)	0.4 sec.
	OFF malfunction (C)	Immediate
	ON malfunction (A), (B) and (C)	0.4 sec.
	ON malfunction (D)	3 sec.
	ON malfunction (E)	0.5 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	

Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40°C (104°F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 to 1.1	
OFF malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	
Throttle valve opening angle	8% or more and 7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
OFF malfunction (B)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Continuous time for ECM selecting 4th gear	2 sec. or more	–
Actual gear when ECM selected 4th gear	4th	
OFF malfunction (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
ON malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (B)		
ECM selected gear	4th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (C)		
ECM selected gear	3rd	
Vehicle speed	2 km/h (1.2 mph) or more	–

Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (D)		
Current ECM selected gear		5th
Last ECM selected gear		4th
Vehicle speed (During transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)
ON malfunction (E)		
ECM selected gear		5th
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	–	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
[OFF malfunction]	
All of the following conditions are met: Conditions (A), (B) and (C)	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction (A)	
Turbine speed/Output speed	0.93 to 1.07
OFF malfunction (B)	
Turbine speed/Output speed	0.65 to 0.79
OFF malfunction (C)	
Output record from ECM for 4th → 5th upshifting	Recorded
[ON malfunction]	
Either of the following conditions is met:	
<ul style="list-style-type: none"> • ON malfunction (A) and (B) • ON malfunction (B) or (C), and ON malfunction (D) or (E) 	
ON malfunction (A) and (B)	
Turbine speed/Output speed	3.30 to 7.50
ON malfunction (C)	
Turbine speed/Output speed	1.91 to 2.35
ON malfunction (D)	
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more
ON malfunction (E)	
Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-1150](#)).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.
- The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1	Check other DTCs output (in addition to DTC P0751).
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PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0751" is output	A
"P0751" and other DTCs	B

HINT:

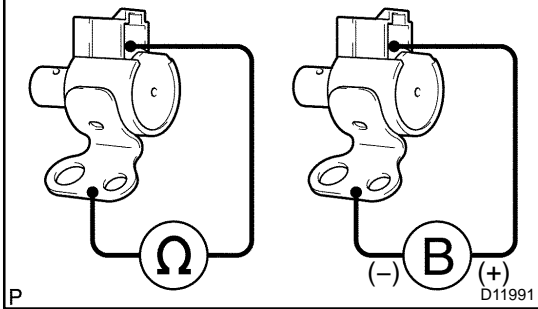
If any other codes besides "P0751" are output, perform troubleshooting for those DTCs first.

B	Go to DTC chart (See page DI-1156).
----------	--

A

2 Check shift solenoid valve S1 operation.

Shift solenoid S1:



PREPARATION:

Remove the shift solenoid valve S1 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S1) – Solenoid Body (S1)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG

Replace shift solenoid valve S1
(See page [AT-12](#)).

OK

3 Inspect valve body (See page [AT-12](#)).

OK:

There are no foreign objects on each valve.

NG

Repair or replace valve body.

OK

Repair or replace transmission (See page [AT-34](#)).

DTC	P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)
------------	--------------	---

SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0756	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve S2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S2.

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0756	Shift solenoid valve S2/OFF malfunction
		Shift solenoid valve S2/ON malfunction
Required sensors/Components	Main	Shift solenoid valve S2
	Sub	Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous	
Duration	OFF malfunction (A), (B), (C)	0.4 sec.
	OFF malfunction (D)	Immediate
	ON malfunction (A) and (B)	0.4 sec.
	ON malfunction (C)	3 sec.
	ON malfunction (D)	0.5 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40° C (104° F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOt (Transfer input speed/Transfer output speed)	0.9 to 1.1	
OFF malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
OFF malfunction (B)		
ECM selected gear	2nd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Output speed	2nd → 1st down shift point or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
OFF malfunction (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Continuous time for ECM selecting 4th gear	2 sec. or more	–
Actual gear when ECM selected 4th gear	4th	
OFF malfunction (D)		
Current ECM selected gear	5th	

Last ECM selected gear	4th	
ON malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (B)		
ECM selected gear	4th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Vehicle speed (During transition from 4th to 5th gear)	–	Less than 100 km/h (62 mph)
ON malfunction (D)		
ECM selected gear	5th	
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	–	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	–	Less than 100 km/h (62 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
[OFF malfunction]	
All of the following conditions are met: Conditions (A), (B), (C) and (D)	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction (A) and (B)	
Turbine speed/Output speed	3.30 to 7.50
OFF malfunction (C)	
Turbine speed/Output speed	0.65 to 0.79
OFF malfunction (D)	
Output record from ECM for 4th → 5th upshifting	Recorded
[ON malfunction]	
Both of the following conditions are met: ON malfunction (A) or (B), and ON malfunction (C) or (D)	
ON malfunction (A)	
Turbine speed/Output speed	1.91 to 2.35
ON malfunction (B)	
Turbine speed/Output speed	1.28 to 1.53
ON malfunction (C)	
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more

ON malfunction (D)	
Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- Warm up the engine.
- Turn the ignition switch off.
- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to the ON position.
- Turn on the tester.
- Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-1150](#)).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.
- The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1	Check other DTCs output (in addition to DTC P0756).
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PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

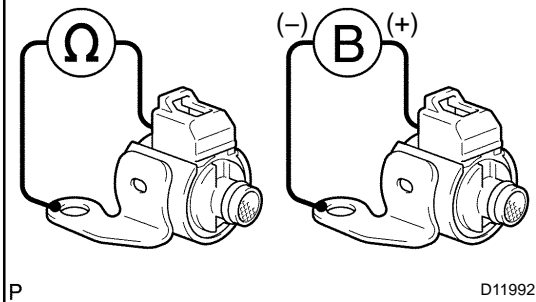
Display (DTC output)	Proceed to
Only "P0756" is output	A
"P0756" and other DTCs	B

HINT:

If any other codes besides "P0756" are output, perform troubleshooting for those DTCs first.

B
Go to DTC chart (See page [DI-1156](#)).

A

2 Inspect shift solenoid valve S2 operation.**Shift solenoid S2:****PREPARATION:**

Remove the shift solenoid valve S2 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S2) – Solenoid Body (S2)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG

**Replace shift solenoid valve S2
(See page [AT-12](#)).**

OK**3 Inspect valve body (See page [AT-12](#)).****OK:**

There are no foreign objects on each valve.

NG

Repair or replace valve body.

OK

Repair or replace transmission (See page [AT-34](#)).

DTC	P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)
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SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0771	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve SR remains open or closed • Shift solenoid valve SL1 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve SR or SL1. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0771	Shift solenoid valve SR/Rationality check
Required sensors/Components	Main	Shift solenoid valve SR
	Sub	Speed sensor (NT), Speed sensor (NO), Crankshaft position sensor (NE)
Frequency of operation	Continuous	
Duration	OFF malfunction (A)	0.4 sec.
	OFF malfunction (B) and (C)	Immediate
	ON malfunction	0.15 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	

ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40°C (104°F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 to 1.1	
OFF malfunction (A)		
ECM selected gear	5th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
OFF malfunction (B)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Continuous time for ECM selecting 4th gear	2 sec. or more	–
OFF malfunction (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
ON malfunction		
Current ECM selected gear	2th	
Last ECM selected gear	1st	
Throttle valve opening angle (During transition from 1st to 2nd gear)	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
[OFF malfunction]	
All of the following conditions are met: OFF malfunctions (A), (B) and (C)	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; temporary pending fault code ON	
OFF malfunction (A)	
Turbine speed/Output speed	0.93 to 1.07
OFF malfunction (B)	
Turbine speed/Output speed	Not change as follow 0.93 to 1.07 ↓ 0.65 to 0.79

OFF malfunction (C)	
Output record from ECM for 4th → 5th upshifting	Recorded
[ON malfunction]	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; temporary pending fault code ON	
Turbine speed – Output speed x 1st gear ratio (NT – NO x 1st gear ratio)	150 rpm or more

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-1150](#)).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.
- The shift solenoid valve SR and SL1 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

1	Check other DTCs output (in addition to DTC P0771).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0771" is output	A
"P0771" and other DTCs	B

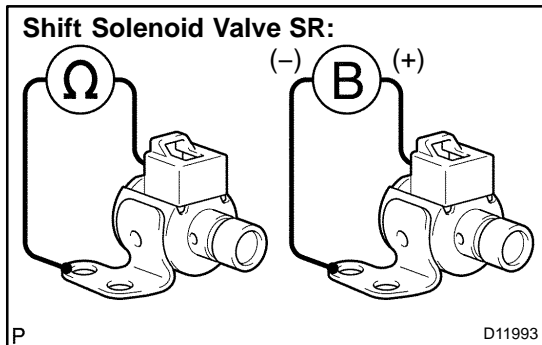
HINT:

If any other codes besides "P0771" are output, perform troubleshooting for those DTCs first.

B	Go to DTC chart (See page DI-1156).
----------	--

A

2	Inspect shift solenoid valve SR operation.
----------	---



PREPARATION:

Remove the shift solenoid valve SR (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (SR) – Solenoid Body (SR)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

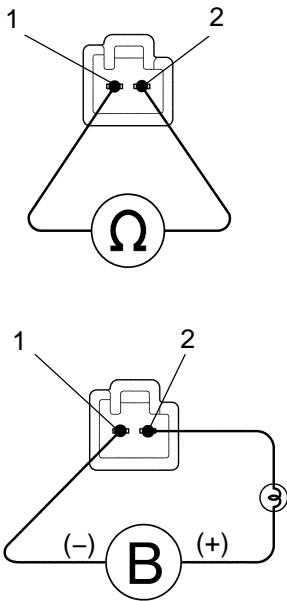
The solenoid makes an operating sound.

NG	Replace shift solenoid valve SR (See page AT-12).
-----------	--

OK

3 Inspect shift solenoid valve SL1.

Shift Solenoid Valve SL1:



D12795

PREPARATION:

Remove the shift solenoid valve SL1 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG Replace the shift solenoid valve SL1 (See page [AT-12](#)).

OK

4 Inspect valve body (See page [AT-12](#)).

OK:

There are no foreign objects on each valve.

NG Repair or replace valve body.

OK

Repair or replace transmission (See page [AT-34](#)).

DTC	P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)
------------	--------------	---

SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0776	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve SL2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve SL2. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0776	Shift solenoid valve SL2/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SL2
	Sub	Speed sensor (NT), Speed sensor (NO), Crankshaft position sensor (NE)
Frequency of operation	Continuous	
Duration	ON malfunctions (A), (B) and (C)	0.4 sec.
	ON malfunction (D)	3 sec.
	ON malfunction (E)	0.5 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40° C (104° F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 to 1.1	
ON malfunction (A)		
ECM selected gear	1st	
Vehicle speed	2 to 40 km/h (1.2 to 24.9 mph)	
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (B)		
ECM selected gear	3rd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (C)		
ECM selected gear	4th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction (D)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	

Vehicle speed (During transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)
ON malfunction (E)		
ECM selected gear		5th
Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	–	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	–	Less than 100 km/h (62 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Both of the following conditions are met:	
<ul style="list-style-type: none"> • ON malfunctions (A) and (B), or ON malfunction (C) • ON malfunction (D) or (E) 	
ON malfunction (A)	
Turbine speed/Output speed	3.30 to 7.50
ON malfunction (B)	
Turbine speed/Output speed	1.28 to 1.53
ON malfunction (C)	
Turbine speed/Output speed	0.93 to 1.07
ON malfunction (D)	
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more
ON malfunction (E)	
Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-1150](#)).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.
- The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

1	Check other DTCs output (in addition to DTC P0776).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

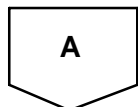
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0776" is output	A
"P0776" and other DTCs	B

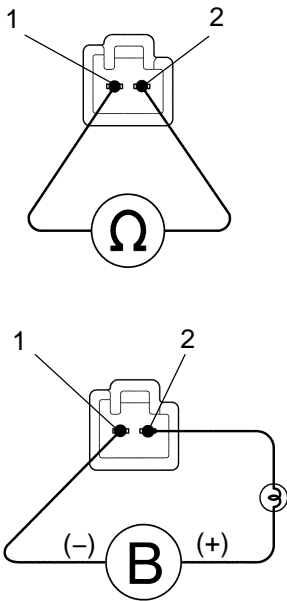
HINT:

If any other codes besides "P0776" are output, perform troubleshooting for those DTCs first.



2 Inspect shift solenoid valve SL2.

Shift Solenoid Valve SL2:



D12795

PREPARATION:

Remove the shift solenoid valve SL2 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG Replace the shift solenoid valve SL2 (See page [AT-12](#)).

OK

3 Inspect valve body (See page [AT-12](#)).

OK:

There are no foreign objects on each valve.

NG Repair or replace valve body.

OK

Repair or replace transmission (See page [AT-34](#)).

DTC	P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)
------------	--------------	--

CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-1150](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0778	The ECM checks for an open or short in the shift solenoid valve SL2 circuit while driving and shifting gears. (1-trip detection logic) • Output signal duty equals to 100%. (NOTE: SL2 output signal duty is less than 100% under normal condition.)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM commands gear shift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF". (In case of an open or short circuit, the ECM stops sending current to the circuit.)

While driving and shifting gears, if the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines there is a malfunction (See page [DI-1150](#)).

MONITOR STRATEGY

Related DTCs	P0778	Shift solenoid valve SL2/Range check
Required sensors/Components	Shift solenoid valve SL2	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
Battery voltage	10 V or more	–
CPU commanded duty	–	Less than 75%
Ignition switch	ON	
Starter	OFF	

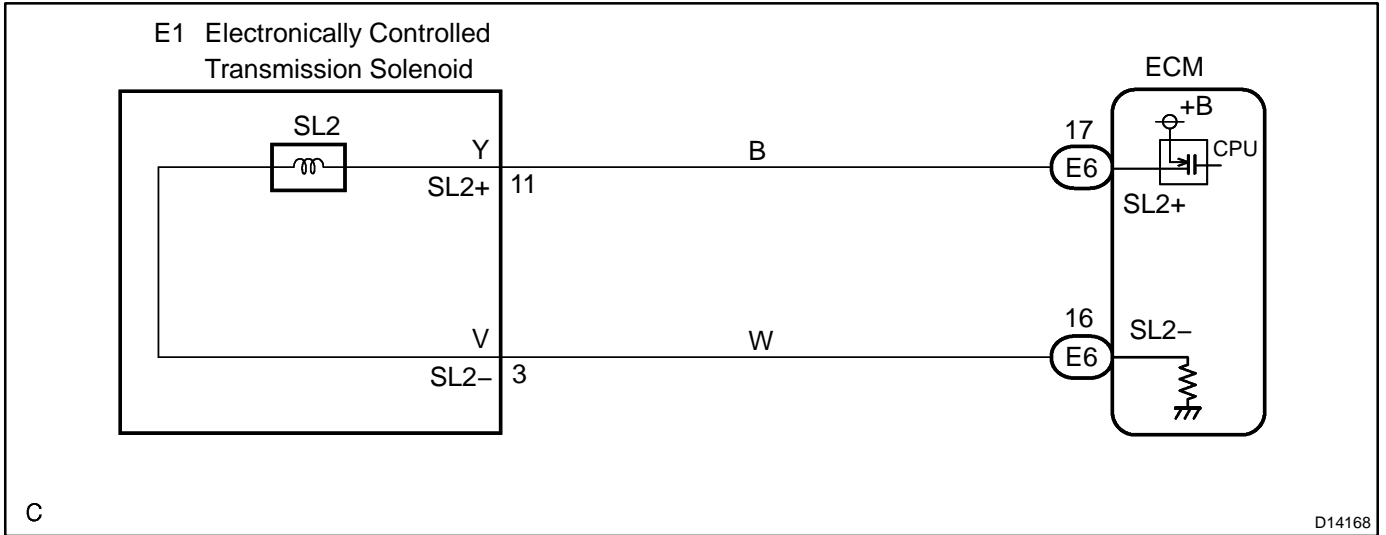
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Output signal duty	100%

COMPONENT OPERATING RANGE

Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



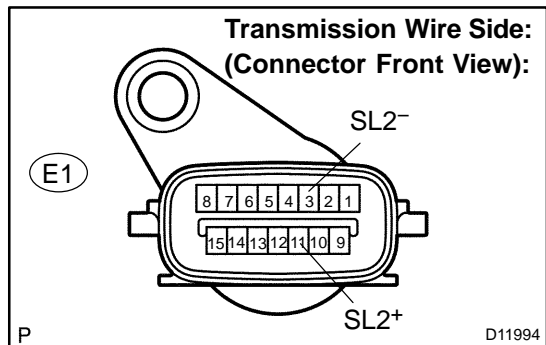
INSPECTION PROCEDURE

HINT:

- The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

1 Inspect transmission wire.



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
11 (SL2+) - 3 (SL2-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

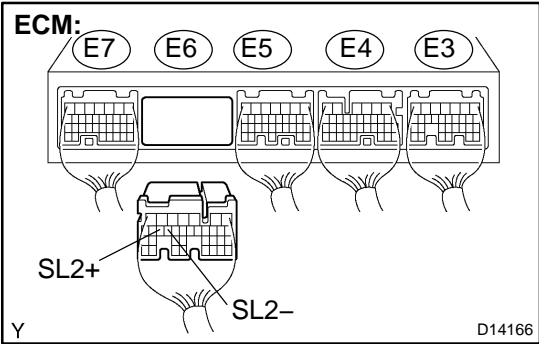
OK:

Tester Connection	Specified Condition
11 (SL2+) - Body ground	10 kΩ or higher
3 (SL2-) - Body ground	↑

NG Go to step 3.

OK

2 Check harness and connector (Transmission wire – ECM)



PREPARATION:

- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 17 (SL2+) – E6 – 16 (SL2-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 17 (SL2+) – Body ground	10 kΩ or higher
E6 – 16 (SL2-) – Body ground	↑

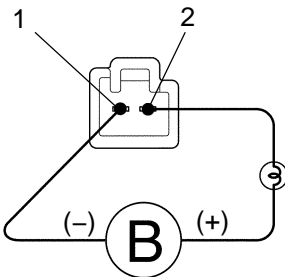
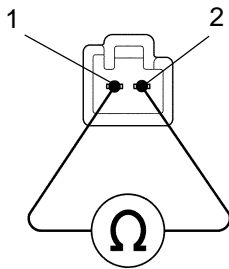
NG → **Repair or replace harness or connector (See page IN-30).**

OK

Replace the ECM (See page SF-82).

3 Check shift solenoid valve SL2.

Shift Solenoid Valve SL2:



D12795

PREPARATION:

Remove the shift solenoid valve SL2 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

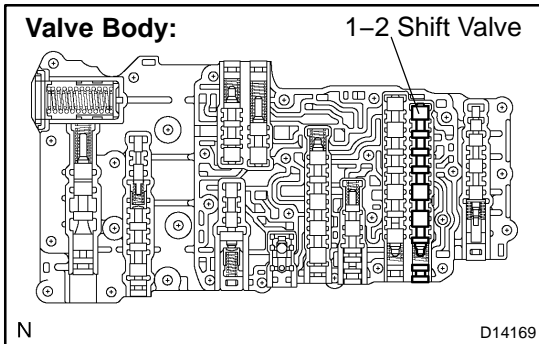
NG

**Replace the shift solenoid valve SL2
(See page [AT-12](#)).**

OK

**Repair or replace the transmission wire
(See page [AT-9](#)).**

DTC	P0781	1-2 Shift (1-2 Shift Valve)
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SYSTEM DESCRIPTION

The 1-2 shift valve performs shifting to 1st gear and other gears.

DTC No.	DTC Detection Condition	Trouble Area
P0781	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	<ul style="list-style-type: none"> • Valve body is blocked up or stuck (1-2 shift valve) • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the direction the spring compresses. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF" and switching oil pressure to the valves in the valve body.

The ECM calculates the "actual" transmission gear by comparing the signals from the input speed sensor (NCO) and the output speed sensor (SP2). The ECM can detect many mechanical problems in the shift solenoids, valve body, and the transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and store the DTC .

MONITOR STRATEGY

Related DTCs	P0781	Valve body/Rationality check
Required sensors/Components	Main	Valve body
	Sub	Automatic transmission assembly, Speed sensor (NT), Speed sensor (NO), Vehicle speed sensor, Throttle speed sensor
Frequency of operation	Continuous	
Duration	Conditions (A) and (B)	0.4 sec.
	Condition (C)	3 sec.
	Condition (D)	0.5 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40°C (104°F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOt (Transfer input speed/Transfer output speed)	0.9 to 1.1	
Condition (A)		
ECM selected gear	2nd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Output speed	2nd → 1st down shift point or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
Condition (B)		
ECM selected gear	4th	
Vehicle speed	2 km/h (1.2 mph) or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
Condition (C)		
Current ECM selected gear	5th	
Last ECM selected gear	4th	
Vehicle speed (During transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)
Condition (D)		
ECM selected gear	5th	

Engine speed – Turbine speed (NE – NT) (After transition from 4th to 5th gear)	–	Less than 150 rpm
Vehicle speed (After transition from 4th to 5th gear)	–	Less than 100 km/h (62.2 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Both of the following conditions are met: Condition (A), and Condition (B), (C) or (D)	
Condition (A)	
Turbine speed/Output speed	3.30 to 7.50
Condition (B)	
Turbine speed/Output speed	1.28 to 1.53
Condition (C)	
Turbine speed – Output speed x 4th gear ratio (NT – NO x 4th gear ratio)	1,000 rpm or more
Condition (D)	
Turbine speed – Output speed x 5th gear ratio (NT – NO x 5th gear ratio)	1,000 rpm or more

INSPECTION PROCEDURE

1	Check other DTCs output (in addition to DTC P0781).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

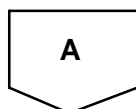
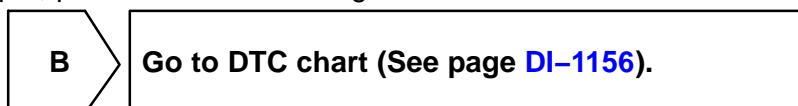
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

Display (DTC output)	Proceed to
Only "P0781" is output	A
"P0781" and other DTCs	B

HINT:

If any other codes besides "P0781" are output, perform troubleshooting for those DTCs first.



2	Perform active test
----------	----------------------------

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

While driving, the shift position can be forcibly changed with the hand-held tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page [DI-1150](#)).

Standard:

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th up-shiftings must be performed with the accelerator pedal released.
- The 5th to 4th down-shiftings must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the hand-held tester.

OK:

Gear position changes in accordance with the tester command.

NG

Repair or replace valve body (See page [AT-12](#)).

OK

3	Clear the DTC and running test.
----------	--

CHECK:

Clear the DTC, and check DTC again after conducting the "MONITOR DRIVE PATTERN FOR ECT TEST" (See page [DI-1134](#)).

OK:

No DTC code

NG	Repair or replace valve body (See page AT-12).
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OK

END

DTC	P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)
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DTC	P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)
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CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-1150](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0973	ECM detects short in solenoid valve S1 circuit 2 times when solenoid valve S1 is operated (1-trip detection logic)	<ul style="list-style-type: none"> • Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	ECM detects open in solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated (1-trip detection logic)	<ul style="list-style-type: none"> • Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is on, if resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.

When the shift solenoid valve S1 is off, if resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S1 circuit (See page [DI-1150](#)).

MONITOR STRATEGY

Related DTCs	P0973	Shift solenoid valve S1/Range check (Low resistance)
	P0974	Shift solenoid valve S1/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S1	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-1128	
Range check (Low resistance)		
Shift solenoid valve S1	ON	
Range check (High resistance)		
Shift solenoid valve S1	OFF	

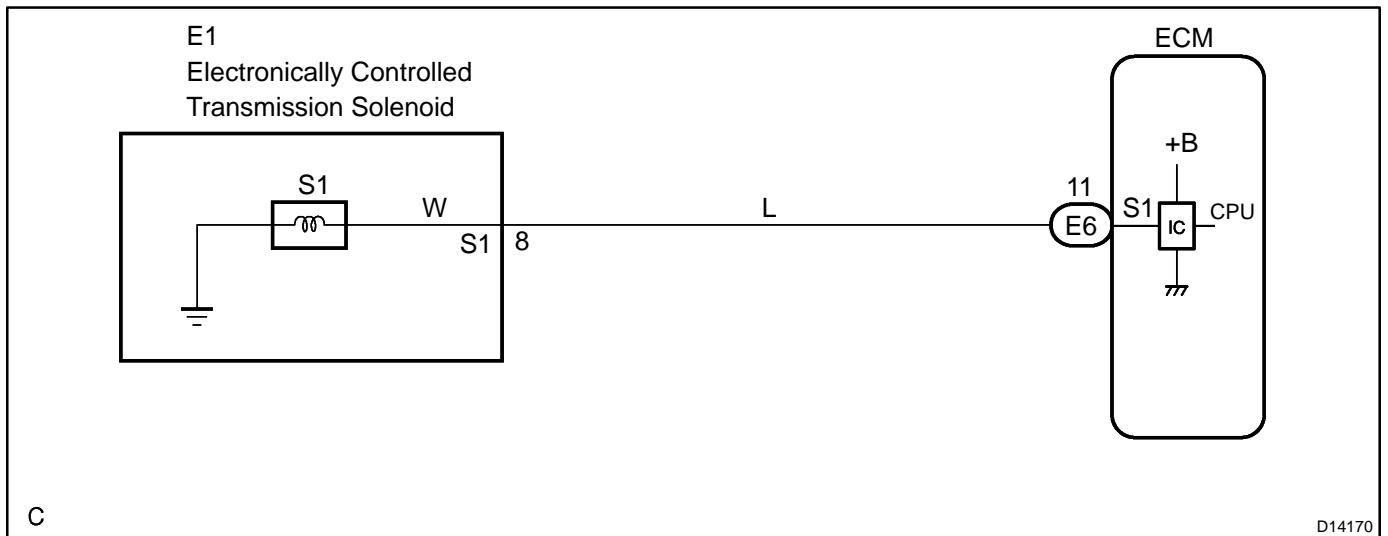
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve S1 resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve S1 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Shift solenoid valve S1	Resistance: 11 to 15 Ω at 20°C (68°F)

WIRING DIAGRAM

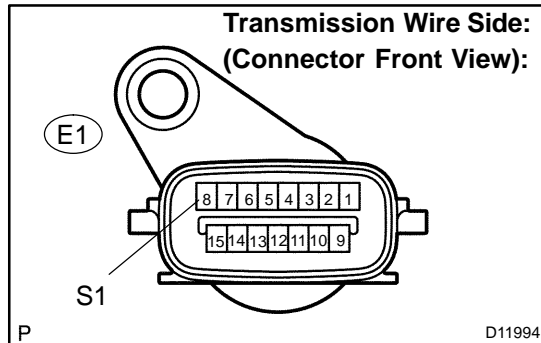


INSPECTION PROCEDURE**HINT:**

- The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1	Check transmission wire.
----------	---------------------------------

**PREPARATION:**

Disconnect the transmission wire connector.

CHECK:

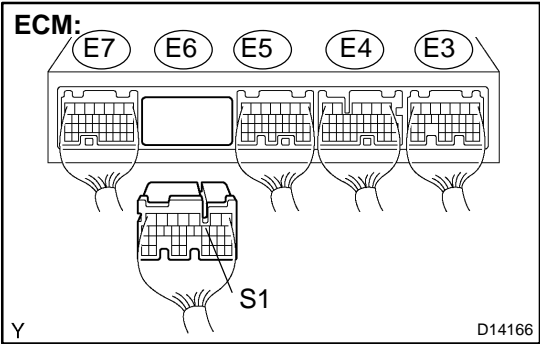
Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
8 – Body ground	11 to 15 Ω

NG**Go to step 3.****OK**

2 Check harness and connector (Transmission wire – ECM)



PREPARATION:

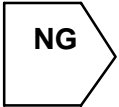
- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

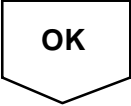
Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 11 (S1) – Body ground	11 to 15 Ω

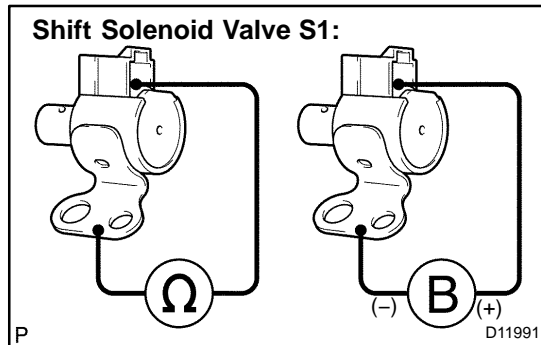


Repair or replace the harness or connector (See page IN-30).



Replace the ECM (See page SF-82).

3 Check shift solenoid valve S1.



PREPARATION:

Remove the shift solenoid valve S1 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S1) – Solenoid Body (S1)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG

Replace the shift solenoid valve S1 (See page [AT-12](#)).

OK

Repair or replace the transmission wire (See page [AT-9](#)).

DTC	P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)
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DTC	P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)
------------	--------------	--

CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-1150](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0976	ECM detects short in solenoid valve S2 circuit 2 times when solenoid valve S2 is operated (1-trip detection logic)	<ul style="list-style-type: none"> • Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	ECM detects open in solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated (1-trip detection logic)	<ul style="list-style-type: none"> • Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is on, if resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.

When the shift solenoid valve S2 is off, if resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S2 circuit (See page [DI-1150](#)).

MONITOR STRATEGY

Related DTCs	P0976	Shift solenoid valve S2/Range check (Low resistance)
	P0977	Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S2	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-1128	
Range check (Low resistance)		
Shift solenoid valve S2	ON	
Range check (High resistance)		
Shift solenoid valve S2	OFF	

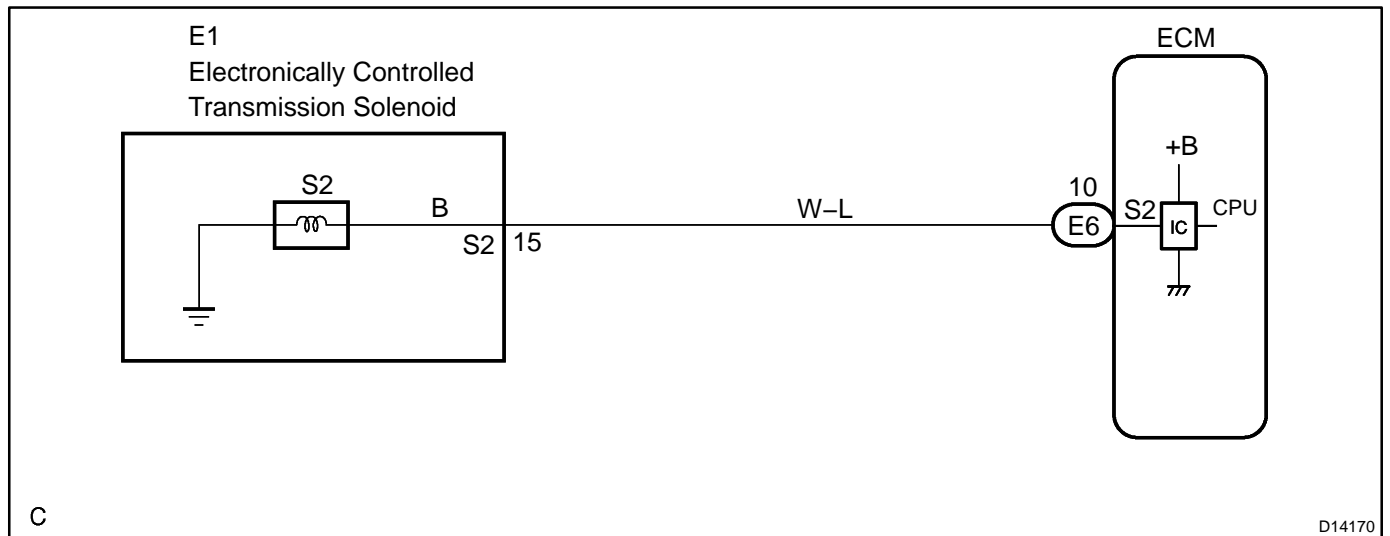
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve S2 resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve S2 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Shift solenoid valve S2	Resistance: 11 to 15 Ω at 20°C (68°F)

WIRING DIAGRAM



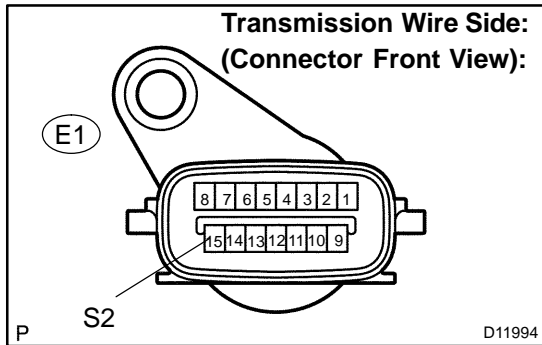
INSPECTION PROCEDURE

HINT:

- The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1	Check transmission wire.
----------	---------------------------------



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

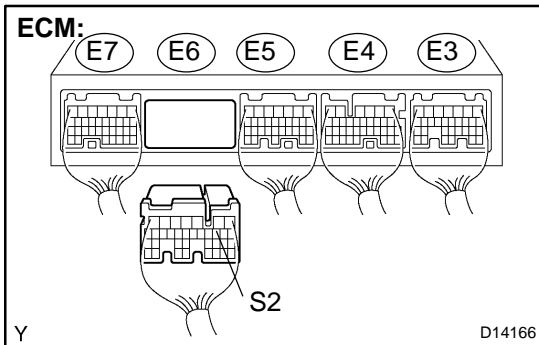
OK:

Tester Connection	Specified Condition 20°C (68°F)
15 – Body ground	11 to 15 Ω

NG	Go to step 3.
-----------	----------------------

OK

2 Check harness and connector (Transmission wire - ECM)



PREPARATION:

- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 - 10 (S2) - Body ground	11 to 15 Ω

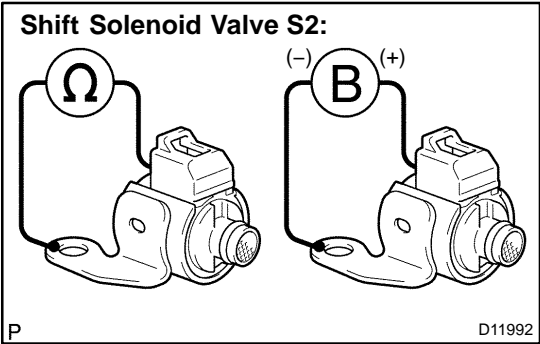
NG

**Repair or replace the harness or connector
(See page [IN-30](#)).**

OK

Replace the ECM (See page [SF-82](#)).

3 Check shift solenoid valve S2.



PREPARATION:

Remove the shift solenoid valve S2 (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S2) – Solenoid Body (S2)	11 to 15 Ω

CHECK:

Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG → **Replace the shift solenoid valve S2 (See page [AT-12](#)).**

OK

Repair or replace the transmission wire (See page [AT-9](#)).

DTC	P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)
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DTC	P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)
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CIRCUIT DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (See page [DI-1150](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0985	ECM detects short in solenoid valve SR circuit 2 times when solenoid valve SR is operated (1-trip detection logic)	<ul style="list-style-type: none"> • Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	ECM detects open in solenoid valve SR circuit 2 times when solenoid valve SR is not operated (1-trip detection logic)	<ul style="list-style-type: none"> • Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve SR is on, if resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.

When the shift solenoid valve SR is off, if resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve SR circuit (See page [DI-1150](#)).

MONITOR STRATEGY

Related DTCs	P0985	Shift solenoid valve SR/Range check (Low resistance)
	P0986	Shift solenoid valve SR/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SR	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-1128	
Range check (Low resistance)		
Shift solenoid valve SR	ON	
Battery voltage	8 V or more	–
Ignition switch	ON	
Starter	OFF	
Range check (High resistance)		
Shift solenoid valve SR	OFF	
Battery voltage	8 V or more	–
Ignition switch	ON	
Starter	OFF	

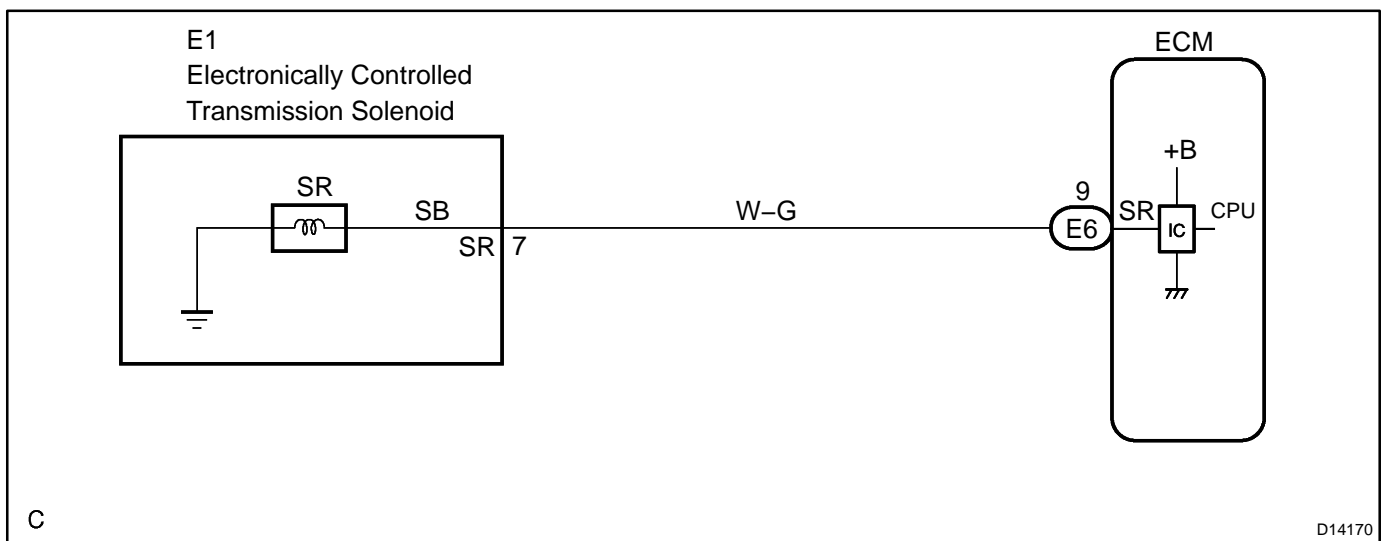
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve SR resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve SR resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Shift solenoid valve SR	Resistance: 11 to 15 at 20°C (68°F)

WIRING DIAGRAM

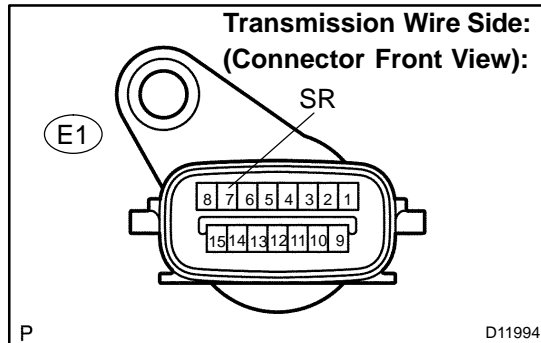


INSPECTION PROCEDURE**HINT:**

- The shift solenoid valve SR is turned on/off normally when the shift lever is in the D position:

ECM command gearshift	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON

1	Check transmission wire.
----------	---------------------------------

**PREPARATION:**

Disconnect the transmission wire connector.

CHECK:

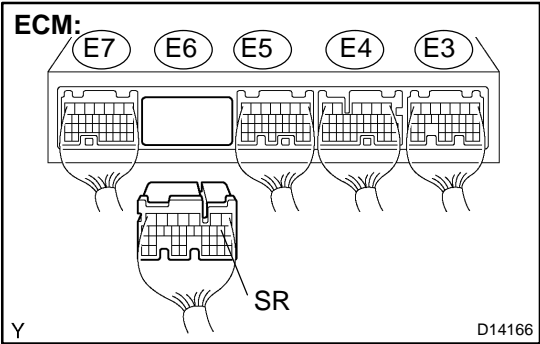
Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
7 – Body ground	11 to 15 Ω

NG**Go to step 3.****OK**

2 Check harness and connector (Transmission wire – ECM)



PREPARATION:

- (a) Connect the transmission wire connector.
- (b) Disconnect the connector of the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 9 (SR) – Body ground	11 to 15 Ω

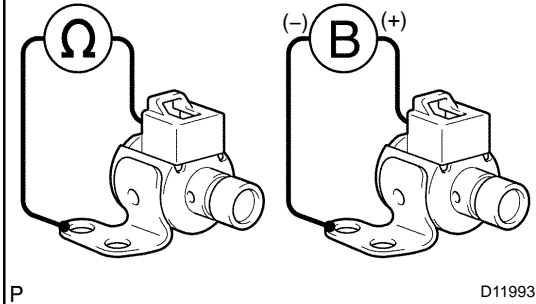
NG Repair or replace the harness or connector (See page [IN-30](#)).

OK

Replace the ECM (See page [SF-82](#)).

3 Check shift solenoid valve SR.

Shift Solenoid Valve SR:



PREPARATION:

Remove the shift solenoid valve SR (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (SR) – Solenoid Body (SR)	11 to 15 Ω

CHECK:

Connect the battery positive lead to the solenoid connector terminal and the battery negative lead to the solenoid body ground.

OK:

Solenoid sounds an operation noise.

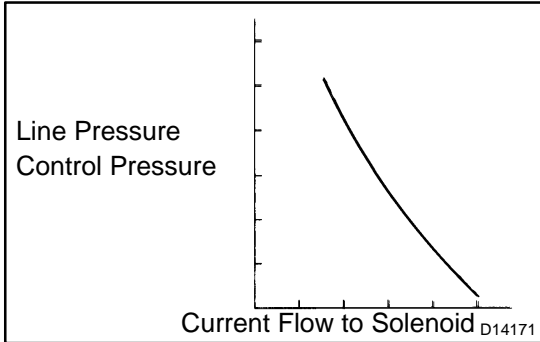
NG

Replace the shift solenoid valve SR (See page [AT-12](#)).

OK

Repair or replace the transmission wire (See page [AT-9](#)).

DTC	P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)
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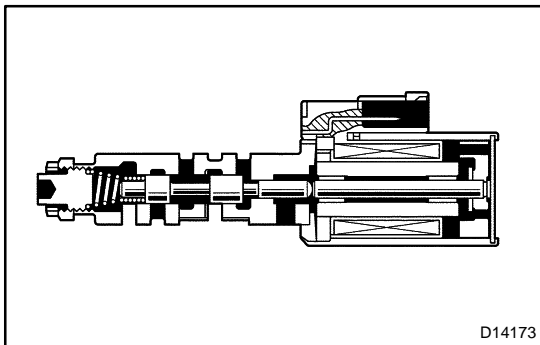
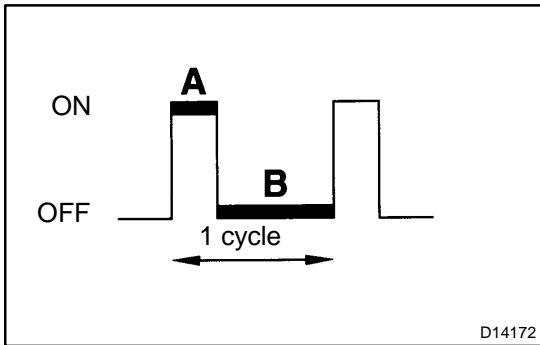
SYSTEM DESCRIPTION

The linear solenoid valve (SLT) controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the duty cycle of the SLT solenoid valve to control hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100 (\%)$$



DTC No.	DTC Detection Condition	Trouble Area
P2714	ECM detects a malfunction on SLT (ON side) according to the revolution difference of the turbine and the output shaft, and also by the oil pressure. (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM turns on the MIL and outputs this DTC when the amount of heat absorption exceeds the specified value.

When the shift solenoid valve SLT remains on, oil pressure goes down and clutch engagement force decreases.

NOTE: If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

MONITOR STRATEGY

Related DTCs	P2714	Shift solenoid valve SLT/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SLT
	Sub	Valve body, ATF temperature sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous	
Duration	Immediate	
MIL operation	2 driving cycles	
Sequence of operation	None	

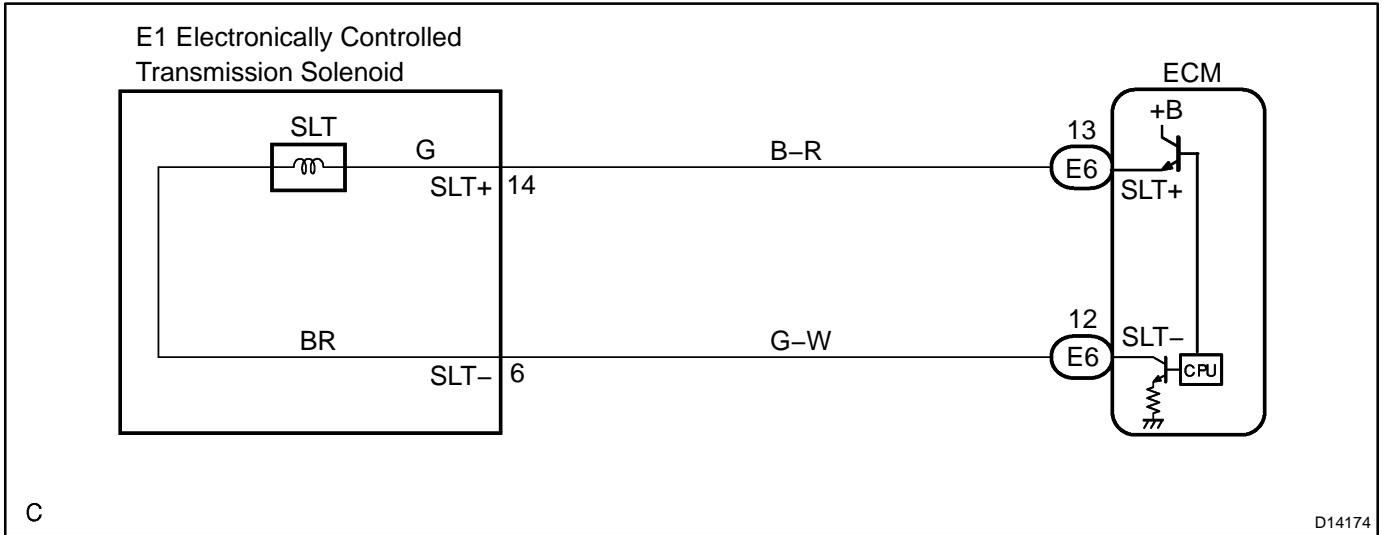
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Transmission Fluid Temperature Sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
Shift solenoid valve SLT circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	
ECT	40°C (104°F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
Transfer range	"HIGH"*1	
TFT (transmission fluid temperature)	10°C or more	–
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOtf (Transfer input speed/Transfer output speed)	0.9 to 1.1	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Summation of C1 clutch heat generations = Σ (Turbine speed - Output speed x Temporary ratio)	Specified value

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [HINT] OFF: Line pressure up (When the active test of "Control the Line Pressure Up" is performed, the ECM commands the SLT solenoid to turn off). ON: No action (normal operation)	-

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting the SST to the automatic transaxle, which is used in the HYDRAULIC TEST (See page [DI-1123](#)) as well.

HINT:

- The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.
- Normally, the line pressure detected in the ACTIVE TEST is approximately half of the value detected in the HYDRAULIC TEST's stall test.

1	Check other DTCs output (in addition to DTC P2714).
----------	--

PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

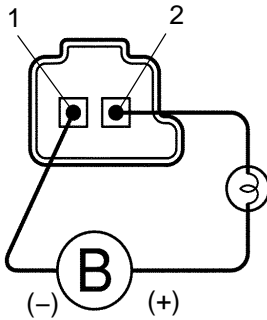
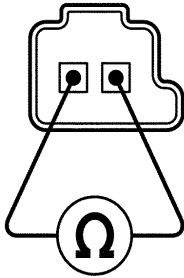
Display (DTC output)	Proceed to
Only "P2714" is output	A
"P2714" and other DTCs	B

HINT:

If any other codes besides "P2714" are output, perform troubleshooting for those DTCs first.

B
Go to DTC chart (See page [DI-1156](#)).

A

2 Inspect shift solenoid valve SLT operation.**Shift Solenoid Valve SLT:**

P

D11987

PREPARATION:Remove the shift solenoid valve SLT (See page [AT-12](#)).**CHECK:**

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:**The solenoid makes an operating sound.****NG****Replace the shift solenoid valve SLT (See page [AT-12](#)).****OK****3 Inspect valve body (See page [AT-12](#)).****OK:**

There are no foreign objects on each valve.

NG**Repair or replace valve body.****OK****Repair or replace transmission (See page [AT-34](#)).**

DTC	P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)
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CIRCUIT DESCRIPTION

See page [DI-1241](#)

DTC No.	DTC Detection Condition	Trouble Area
P2716	Open or short is detected in shift solenoid valve SLT circuit for 1 second or more while driving (1-trip detection logic).	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

MONITOR DESCRIPTION

When an open or short in the linear solenoid valve (SLT) circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2716	Shift solenoid valve SLT/Range check
Required sensors/Components	Shift solenoid valve SLT	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
Solenoid current cut status	Not cut	
Battery voltage	11 V or more	–
CPU command duty ratio to SLT	19% or more	–
Ignition switch	ON	
Starter	OFF	

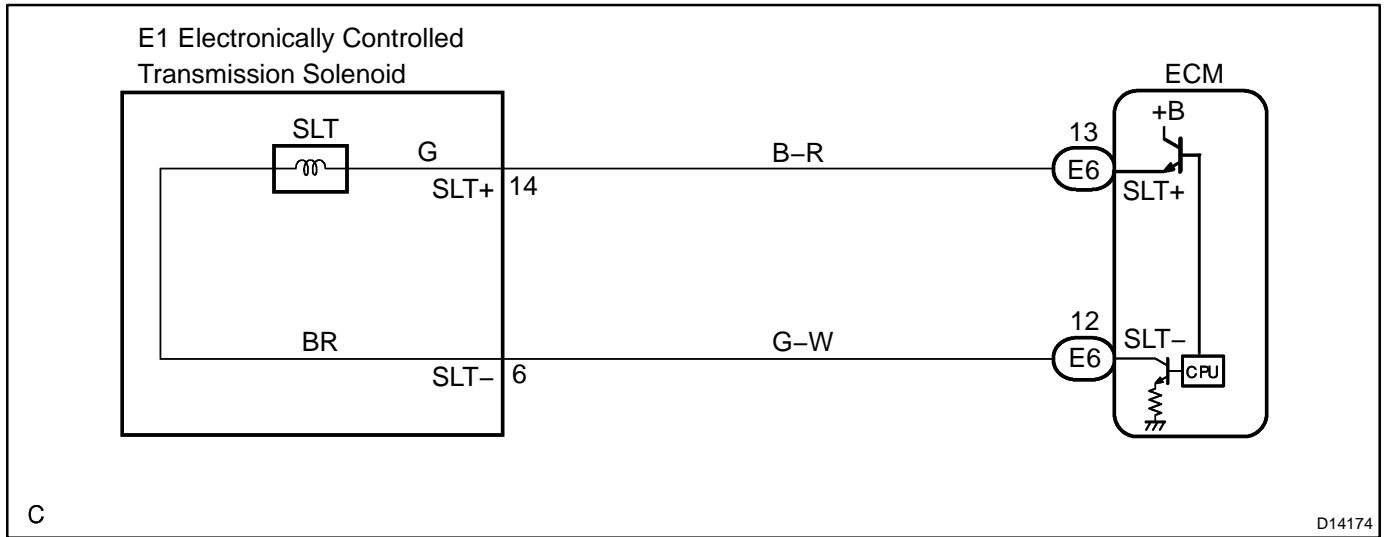
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Solenoid status from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

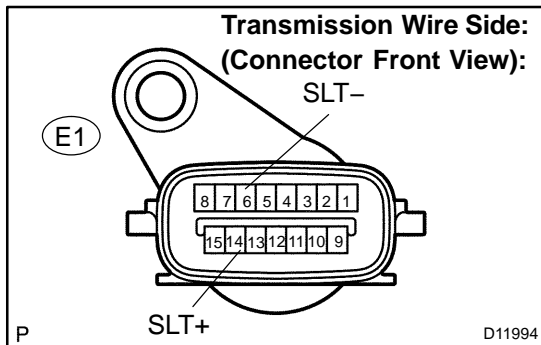
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

- 1 Check transmission wire.



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
14 (SLT+) - 6 (SLT-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

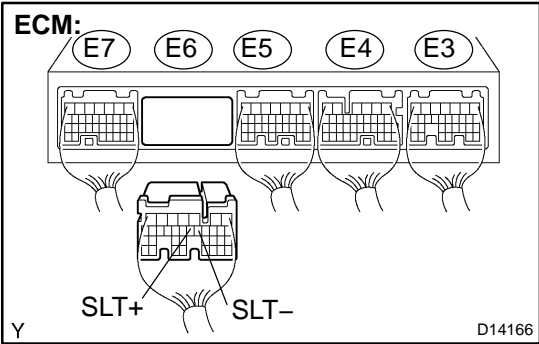
OK:

Tester Connection	Specified Condition
14 (SLT+) - Body ground	10 kΩ or higher
6 (SLT-) - Body ground	↑

NG Go to step 3.



2 Check harness and connector (Transmission wire – ECM)



PREPARATION:

- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 – 13 (SLT+) – E6 – 12 (SLT-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 – 13 (SLT+) – Body ground	10 kΩ or higher
E6 – 12 (SLT-) – Body ground	↑

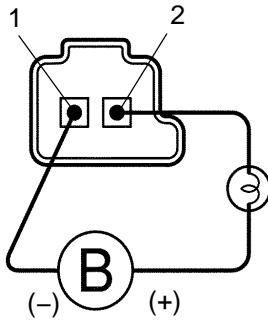
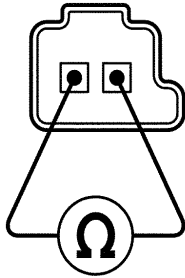
NG → **Repair or replace the harness or connector (See page IN-30).**

OK

Replace the ECM (See page SF-82).

3 Inspect shift solenoid valve SLT.

Shift Solenoid Valve SLT:



P

D11987

PREPARATION:

Remove the shift solenoid valve SLT (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG

Replace the shift solenoid valve SLT
(See page [AT-12](#)).

OK

Repair or replace the transmission wire
(See page [AT-9](#)).

DTC	P2740	Transmission Fluid Temperature Sensor "B" Circuit
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DTC	P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input
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DTC	P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input
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CIRCUIT DESCRIPTION

ATF (Automatic Transmission Fluid) temperature sensor No.2 is on the transmission and just in front of the oil cooler inlet pipeline.

If ECM detects the abnormally high temperature of ATF by this sensor, it draws driver's attention by illuminating the warning lamp.

HINT:

- The temperature of ATF easily rises when towing, climbing hills and in traffic, etc.
- If the ATF temperature sensor No.2 becomes short-circuited, the signal that indicates the ATF temperature is 150°C (302°F) or higher is input in ECM.

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

ATF temperature Sensor No.2 State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	• AT fluid temp. more than 150°C (302°F).	• AT Oil Temp. warning light remains on	• AT fluid temp. less than 135°C (275°F). *2
	• AT fluid temp. more than 130°C (266°F).	• Shift point too high.	• AT fluid temp. less than 110°C (230°F).
	When the conditions (a) and (b) are satisfied. (a) AT fluid temp. more than 130°C (266°F). (b) Engine coolant temp. more than 95°C (203°F).	• Lock-up at 3rd gear. *1	• AT fluid temp. less than 110°C (230°F) *2 and engine coolant temp. less than 95°C (203°F).
Sensor is short-circuited	• Any conditions.	• AT Oil Temp. warning light remains on • Shift point too high.	• Symptoms still occur
	• Engine coolant temp. more than 95°C (203°F).	• Lock-up at 3rd gear. *1	• Symptoms still occur

HINT:

*1: When AT fluid temperature is normal, transmission locks up at 5th gear with the shift lever in D position and at 4th gear with the shift lever in 4 position.

*2: When AT fluid temperature is in normal range, it decreases to less than 135°C (275°F) within 5 minutes with the shift lever in P or N position in an idling state.

DTC No.	DTC Detecting Condition	Trouble Area
P2740	(a) and (b) are detected momentarily within 0.5 sec. when neither P2742 nor P2743 is detected (1-trip detection logic) (a) ATF temperature sensor No.2 resistance is less than 25 Ω (0.046 V) (b) ATF temperature sensor No.2 resistance is more than 156 k Ω (4.915 V) HINT: Within 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM
P2742	ATF temperature sensor No.2 resistance is less than 25 Ω (0.046 V) for 0.5 sec. or more (1-trip detection logic)	<ul style="list-style-type: none"> • Short in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM
P2743	ATF temperature No.2 sensor resistance is more than 156 k Ω (4.915 V) when 15 minutes or more after the engine start DTC is detected for 0.5 sec. or more (1-trip detection logic)	<ul style="list-style-type: none"> • Open in ATF temperature sensor No.2 circuit • Transmission wire (ATF temperature sensor No.2) • ECM

MONITOR DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 25 Ω (0.046 V) or more than 156 k Ω (4.915 V), the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2740	ATF temperature sensor/Range check (Fluttering)
	P2742	ATF temperature sensor/Range check (Low voltage)
	P2743	ATF temperature sensor/Range check (High voltage)
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI-1128	
Range check (Fluttering, Low voltage)		
The typical enabling condition is not available.	-	
Range check (High voltage)		
Time after engine start	15 min. or more	-

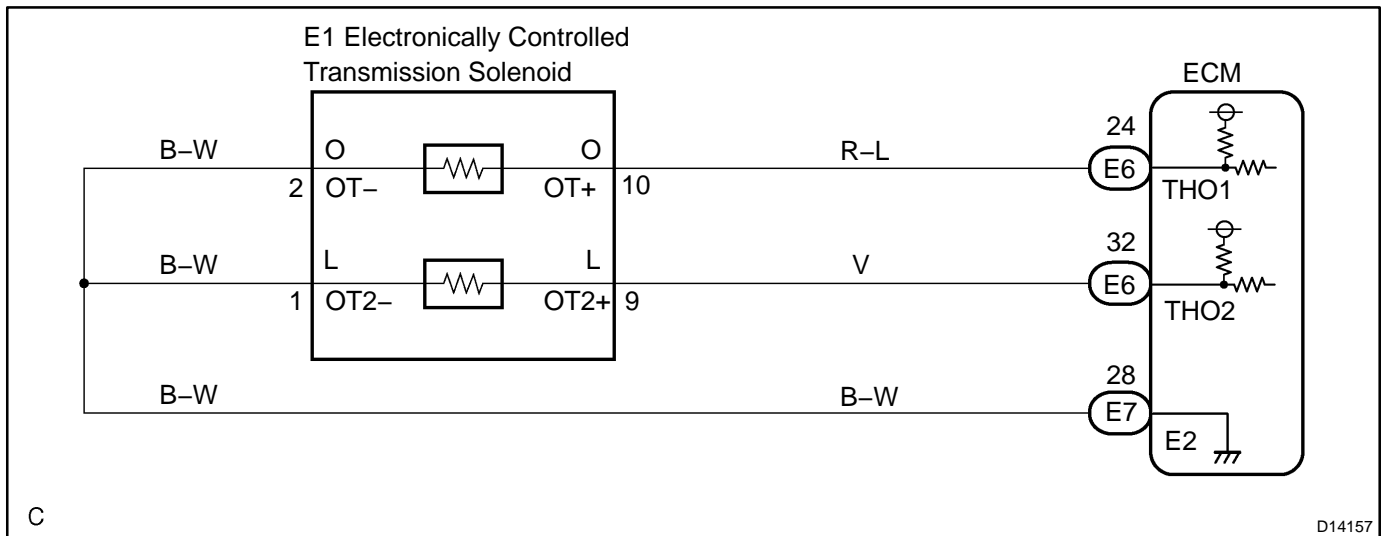
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Fluttering)	
TFT (transmission fluid temperature) sensor voltage	Less than 0.046 V or More than 4.915 V
Range check (Low voltage)	
TFT (transmission fluid temperature) sensor voltage	Less than 0.046 V
Range check (High voltage)	
TFT (transmission fluid temperature) sensor voltage	More than 4.915 V

COMPONENT OPERATING RANGE

Parameter	Standard value
TFT (transmission fluid temperature) sensor	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Push the "ON" button of the OBD II scan tool or the hand-held tester.
- (f) When you use the hand-held tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- (g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT FLUID TEMP 2	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	<ul style="list-style-type: none"> • After Stall Test; Approx. 80°C (176°F) • Equal to ambient temperature when cold soak

HINT:

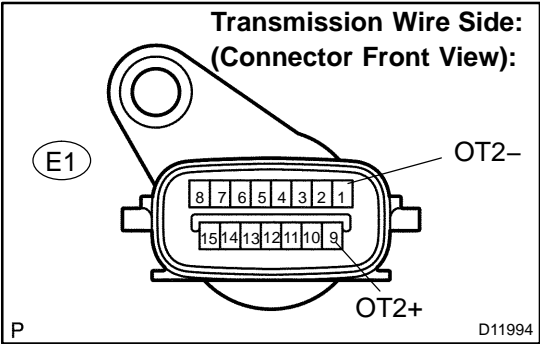
When DTC P2742 is output and hand-held tester output is 150°C (302°F) or more, there is a short circuit.

When DTC P2743 is output and hand-held tester output is -40°C (-40°F), there is an open circuit.

Measure the resistance between terminal THO2 (OT2) and body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

1 Inspect transmission wire (ATF temperature sensor No.2)



PREPARATION:

Disconnect the transmission wire connector from the transmission.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
1 (OT2-) – 9 (OT2+)	25 Ω to 156 kΩ
1 (OT2-) – Body ground	10 kΩ or higher
9 (OT2+) – Body ground	10 kΩ or higher

HINT:

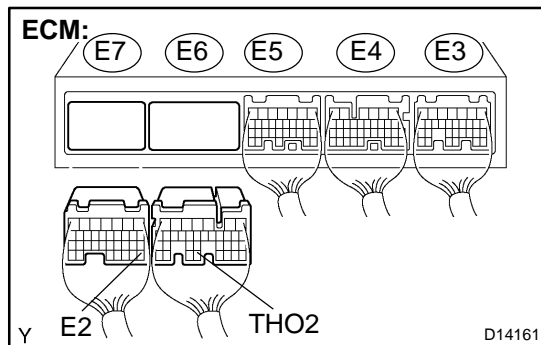
If the resistance is out of the specified range with either the ATF temperature shown in the table below, the driveability of the vehicle may decrease.

ATF Temperature	Specified Condition
20°C (68°F)	3 to 4 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

NG **Repair or replace the transmission wire (ATF temperature sensor No.2) (See page AT-9).**

OK

2 Check harness and connector (Transmission wire - ECM)



PREPARATION:

- Connect the transmission wire connector.
- Disconnect the connector of the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 - 32 (THO2) - E7 - 28 (E2)	25 Ω to 156 k Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E6 - 32 (THO2) - Body ground	10 k Ω or higher
E7 - 28 (E2) - Body ground	↑

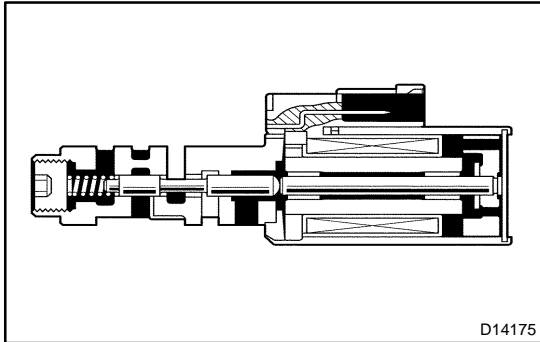
NG

Repair or replace the harness or connector (See page IN-30).

OK

Replace the ECM (See page SF-82).

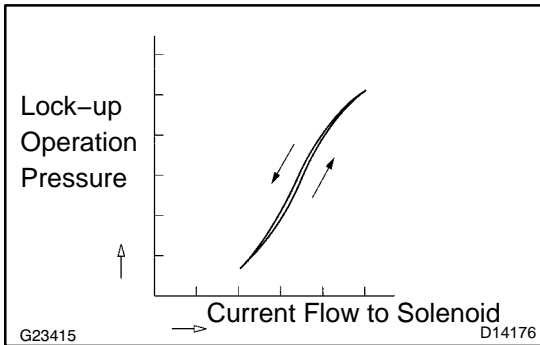
DTC	P2757	Torque Converter Clutch Pressure Control Solenoid Performance(Shift Solenoid Valve SLU)
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SYSTEM DESCRIPTION

The ECM uses the signals from the throttle position sensor, Air-flow meter, turbine (input) speed sensor, output speed sensor and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.

Then the ECM compares the engagement condition of the lock-up clutch with the lock-up schedule in the ECM memory to detect a mechanical problems of the shift solenoid valve SLU, valve body and torque converter clutch.



DTC No.	DTC Detection Condition	Trouble Area
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 80 km/h [50 mph]), or lock-up remains ON in the lock-up OFF range. (2-trip detection logic)	<ul style="list-style-type: none"> • Shift solenoid valve SLU remains open or closed • Valve body is blocked • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on the turbine (input) speed sensor NT, output speed sensor SP2, engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to output shaft rpm (SP2). When conditions are appropriate, the ECM requests "lock-up" by applying control voltage to the shift solenoid SLU. When the SLU is turned on, it applies pressure to the lock-up relay valve and locks the torque converter clutch.

If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve SLU or lock-up system performance. The ECM will turn on the MIL and store the DTC.

Example:

When any of the following is met, the system judges it as a malfunction.

- (a) There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up.
(Engine speed is at least 70 rpm greater than input turbine speed.)
- (b) There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up off.
(The difference between engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P2757	Shift solenoid valve SLU/OFF malfunction
		Shift solenoid valve SLU/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SLU
	Sub	Valve body, Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (NO)
Frequency of operation	Continuous	
Duration	OFF malfunction (A)	2 sec.
	OFF malfunction (B)	0.4 sec.
	ON malfunction	1.8 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Turbine speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SR circuit	Not circuit malfunction	
Torque converter clutch pressure control solenoid circuit	Not circuit malfunction	
KCS sensor circuit	Not circuit malfunction	
ETCS (Electric throttle control system)	Not system down	
Transmission range	"D"	

ECT (Engine coolant temperature)	40°C (104°F) or more	–
Spark advance from Max. retard timing by KCS control	0° CA or more	–
Engine	Starting	
ECM selected gear	4th or 5th	
Vehicle speed	25 km/h (15.5 mph) or more	–
Shift solenoid valve S1 circuit	Not on malfunction	
Shift solenoid valve S2 circuit	Not on malfunction	
Shift solenoid valve SL2 circuit	Not on malfunction	
1–2 Shift valve	Not on malfunction	
Transfer neutral position switch	OFF	
Transfer range	"HIGH"*1	
Transfer range "HIGH" *1 (This condition is applied only 4WD)		
*1 Following conditions met		
Vehicle speed sensor circuit	Not circuit malfunction	
Output shaft speed sensor circuit	Not circuit malfunction	
Transfer output speed	143 rpm or more	–
NO/NOt (Transfer input speed/Transfer output speed)	0.9 to 1.1	
OFF malfunction (A)		
ECM lock-up command	ON (SLU pressure: 513kpa or more)	
Vehicle speed	–	Less than 100 km/h (62.2 mph)
OFF malfunction (B)		
ECM selected gear	2nd	
Vehicle speed	2 km/h (1.2 mph) or more	–
Output speed	2nd → 1st down shift point or more	–
Throttle valve opening angle	7.0% or more at 2,000 rpm (Conditions vary with engine speed)	–
ON malfunction		
ECM lock-up command	OFF (SLU pressure: less than 4kpa)	
Throttle valve opening angle	9% or more	–
Vehicle speed	–	Less than 60 km/h (37.3 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Both of the following conditions are met: OFF malfunctions (A) and (B)	
OFF malfunction (A)	
Engine speed – Turbine speed	70 rpm or more
OFF malfunction (B)	
Turbine speed/Output speed	Not 3.30 to 7.50
ON malfunction	
2 detections are necessary per driving cycle 1st detection; temporary flag ON 2nd detection; pending fault code ON	
Vehicle speed must be under 8 km/h (5 mph) once before 2nd detection	
Difference between engine speed and turbine speed	Less than 35 rpm

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- (a) Warm up the engine.
- (b) Turn the ignition switch off.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch to the ON position.
- (e) Turn on the tester.
- (f) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- (g) According to the display on the tester, perform the "ACTIVE TEST".

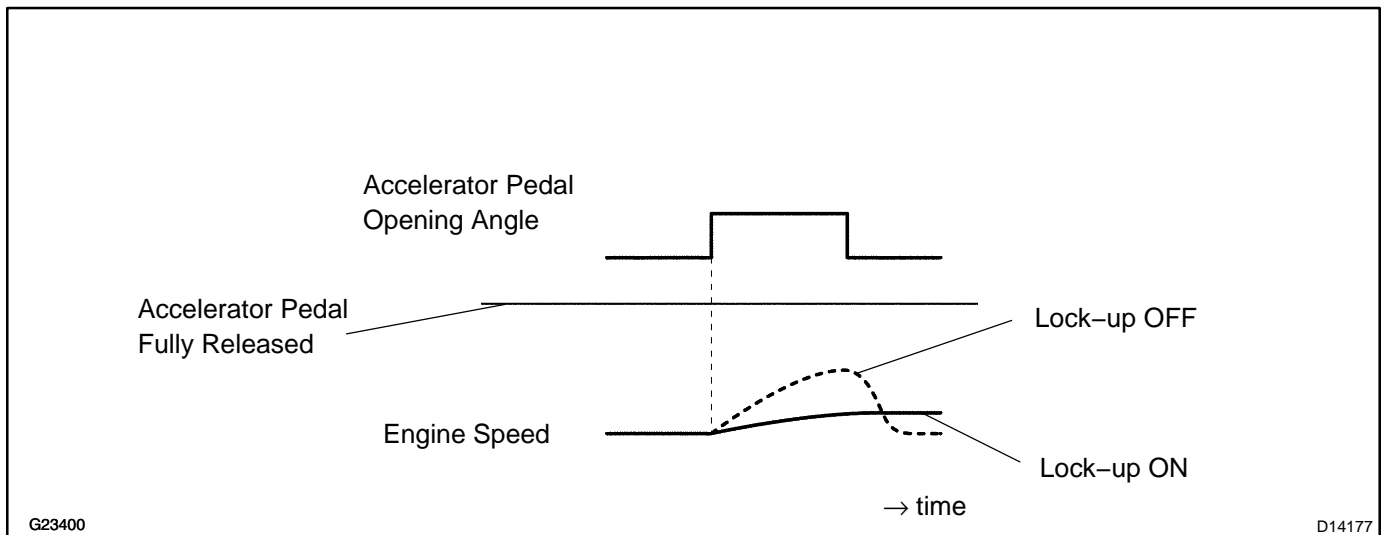
Item	Test Details	Diagnostic Note
LOCK UP	[Test Details] Control the shift solenoid SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] <ul style="list-style-type: none"> • Throttle valve opening angle: Less than 35 % • Vehicle Speed: 60 km/h (37 mph) or more 	Possible to check the SLU operation.

HINT:

- This test can be conducted when the vehicle speed is 60 km/h (37 mph) or more.
- This test can be conducted in the 5th gear.
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:

- When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is on.
- Slowly release, but not fully, the accelerator pedal in order to decelerate. (Fully releasing the pedal will close the throttle valve and lock-up may be turned off automatically.)



1	Check other DTCs output (in addition to DTC P2757).
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PREPARATION:

- (a) Turn the ignition switch off.
- (b) Connect the OBD II scan tool or hand-held tester to the DLC3.
- (c) Turn the ignition switch to the ON position.
- (d) Turn on the tester.
- (e) Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

CHECK:

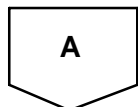
Read the DTCs using the OBD II scan tool or the hand-held tester.

RESULT:

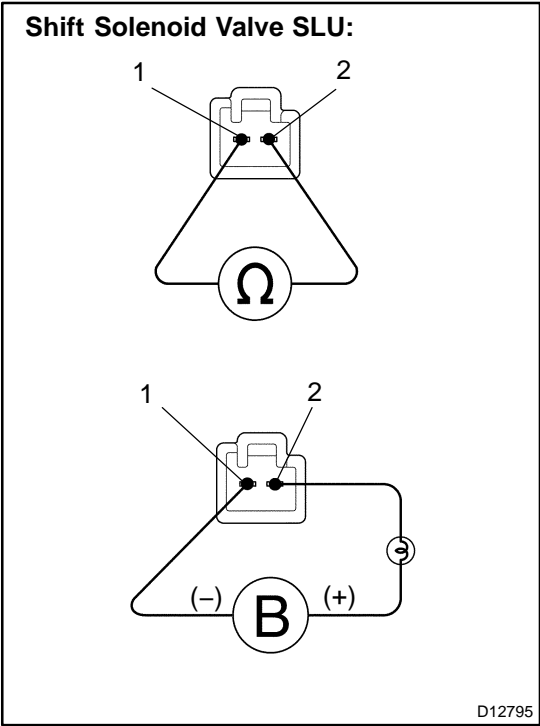
Display (DTC output)	Proceed to
Only "P2757" is output	A
"P2757" and other DTCs	B

HINT:

If any other codes besides "P2757" are output, perform troubleshooting for those DTCs first.



2 Check shift solenoid valve SLU operation.



PREPARATION:

Remove the shift solenoid valve SLU (See page AT-12).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG Replace the shift solenoid valve SLU (See page AT-12).

OK

3 Inspect valve body (See page AT-12).

OK:

There are no foreign objects on each valve.

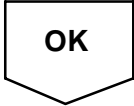
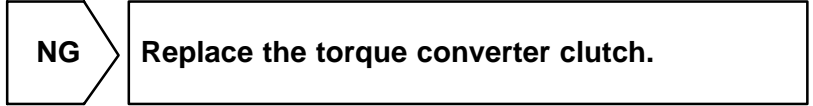
NG Repair or replace valve body.

OK

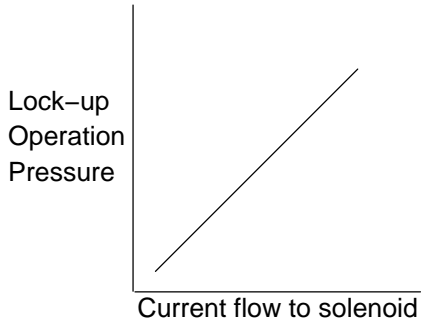
4	Check torque converter clutch (See page AT-39).
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OK:

The torque converter clutch operates normally.



DTC	P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical(Shift Solenoid Valve SLU)
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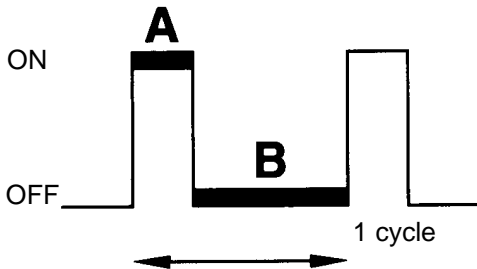
CIRCUIT DESCRIPTION

The amount of current flow to the solenoid is controlled by the (*) duty ratio of the ECM output signal. The higher the duty ratio becomes, the higher the lock-up hydraulic pressure becomes during the lock-up operation.

(*) Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100 (\%)$$



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DTC No.	DTC detection condition	Trouble Area
P2759	Open or short is detected in shift solenoid valve SLU circuit for 1 second or more while driving (1-trip detection logic).	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short in a shift solenoid valve (SLU) circuit is detected, the ECM determines there is a malfunction. The ECM will turn on the MIL and store this DTC.

MONITOR STRATEGY

Related DTCs	P2759	Shift solenoid valve SLU/Range check
Required sensors/Components	Shift solenoid valve SLU	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI-1128	
Solenoid current cut status	Not cut	
CPU commanded duty	19% or more	-
Battery voltage	11 V or more	-
Ignition switch	ON	
Starter	OFF	

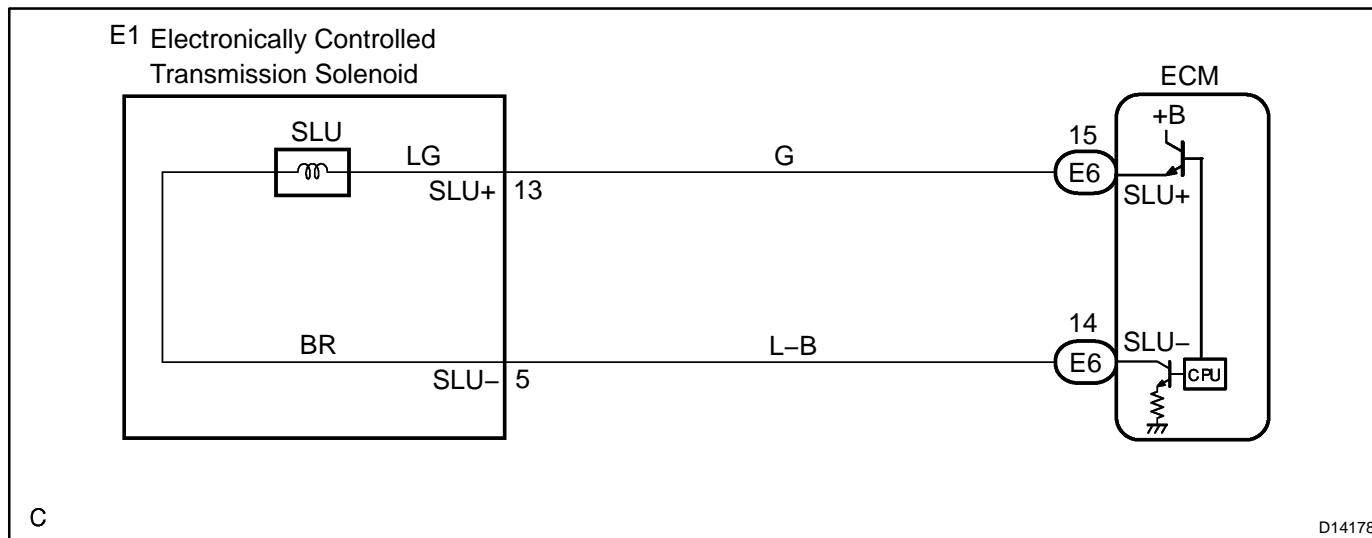
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Solenoid status from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

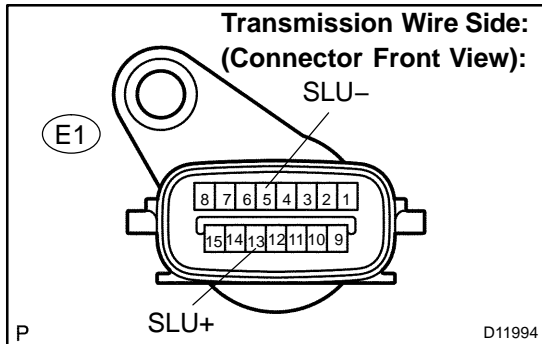
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Inspect transmission wire.
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PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
13 (SLU+) – 5 (SLU-)	5.0 to 5.6 Ω

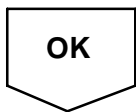
CHECK:

Measure the resistance according to the value(s) in the table below.

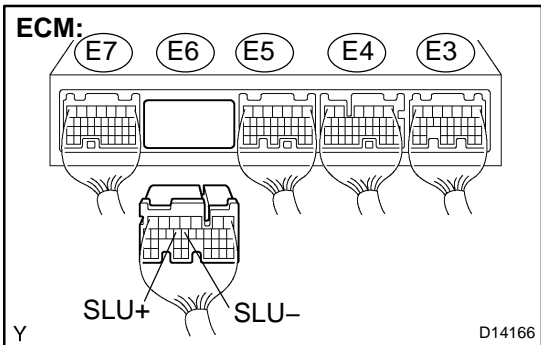
OK:

Tester Connection	Specified Condition
13 (SLU+) – Body ground	10 kΩ or higher
5 (SLU-) – Body ground	↑

NG	Go to step 3.
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2 Check harness and connector (Transmission wire - ECM)



PREPARATION:

- (a) Connect the transmission wire connector.
- (b) Disconnect the ECM connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
E6 - 15 (SLU+) - E6 - 14 (SLU-)	5.0 to 5.6 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

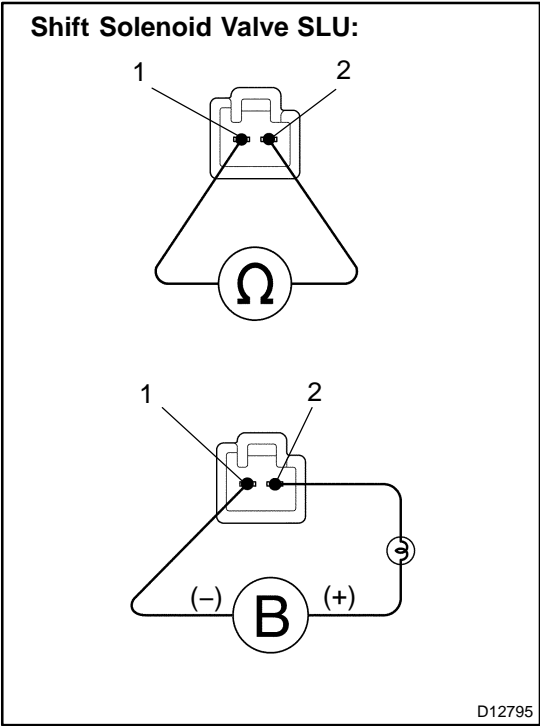
Tester Connection	Specified Condition
E6 - 15 (SLU+) - Body ground	10 kΩ or higher
E6 - 14 (SLU-) - Body ground	↑

NG → **Repair or replace the harness or connector (See page IN-30).**

OK

Replace the ECM (See page SF-82).

3 Inspect shift solenoid valve SLU.



PREPARATION:

Remove the shift solenoid valve SLU (See page [AT-12](#)).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition 20°C (68°F)
1 – 2	5.0 to 5.6 Ω

CHECK:

Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG Replace the shift solenoid valve SLU (See page [AT-12](#)).

OK

Repair or replace the transmission wire (See page [AT-9](#)).

DTC	P2772	Transfer L4 SW Circuit
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CIRCUIT DESCRIPTION

The ECM detects the signal from the transfer L4 position switch.
This DTC indicates that the transfer L4 position switch remains ON.

DTC No.	DTC Detecting Condition	Trouble Area
P2772	Transfer L4 position switch remains ON while vehicle running under conditions for 1.8 seconds or more (1-trip detection logic) (a) Output shaft speed 3000 rpm or less (b) Transfer shift position is H	<ul style="list-style-type: none"> • Short in transfer L4 position switch circuit • Transfer L4 position switch • ECM

MONITOR DESCRIPTION

The ECM monitors the transfer-case L4 position switch to determine when the transfer-case L4 gear is engaged. If the transfer-case L4 gears remain engaged under the following conditions, the ECM will conclude that there is a malfunction of the L4 position switch:

- L4 switch indicated that the L4 transfer-case gears are engaged.
- Transfer-case shifter is in the "H" position.
- Transfer-case output shaft rpm is between 750 and 3,000 rpm.
- The specified time period has elapsed.

If all of the above conditions are detected, the ECM will conclude that there is a malfunction of the L4 switch, and illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2772	Transfer L4 position switch/ON malfunction
Required sensors/Components	Transfer L4 position switch	
Frequency of operation	Continuous	
Duration	ON malfunction (A)	1.8 sec.
	ON malfunction (B)	0.5 sec.
MIL operation	1 driving cycle	
Sequence of operation	None	

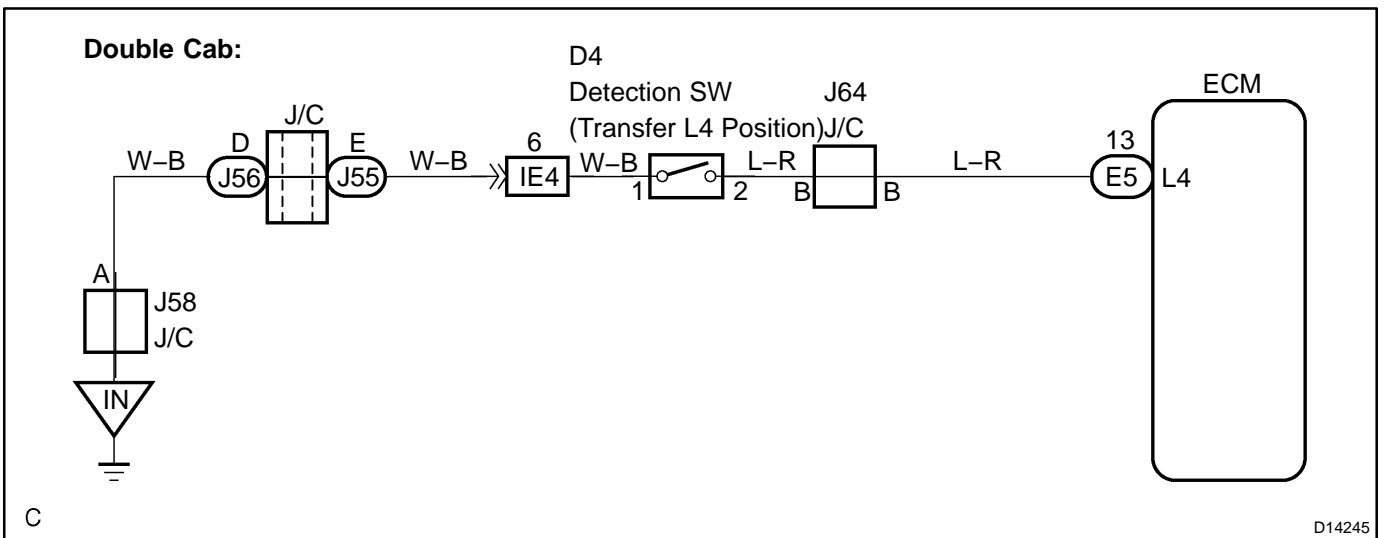
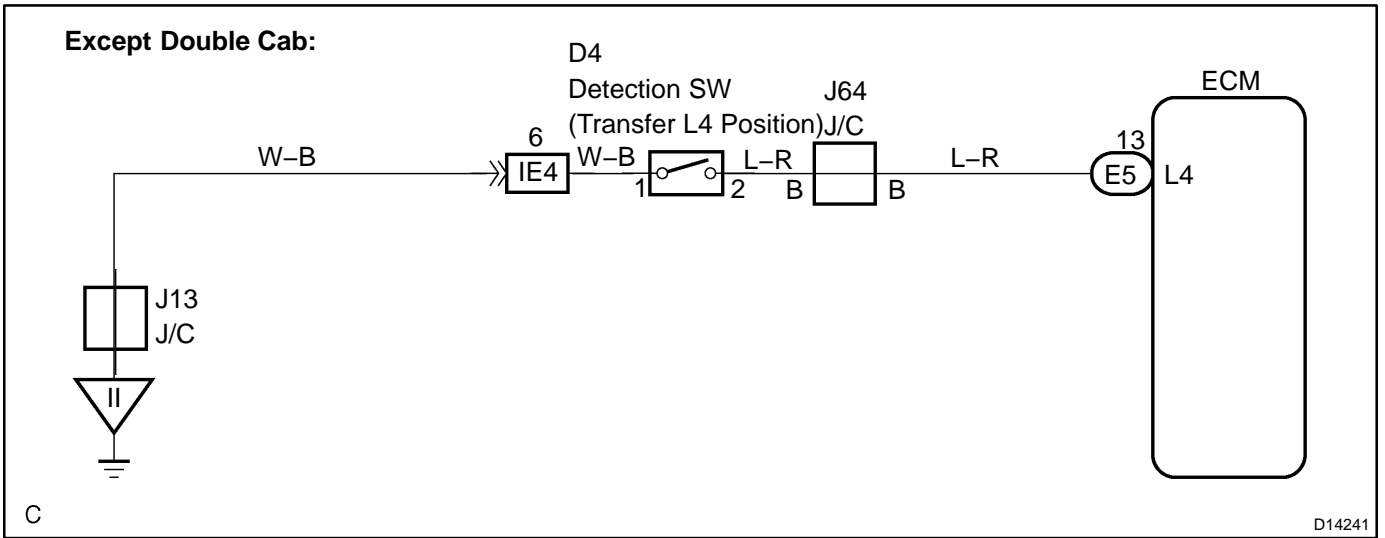
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
All:		
Output speed sensor circuit	Not circuit malfunction	
Vehicle speed sensor circuit	Not circuit malfunction	
Transfer neutral position switch	OFF	
ON malfunction (A)		
Output speed (Transfer output speed)	1,000 to 3,000 rpm	
ON malfunction (B)		
Output speed (Transfer output speed)	143 rpm or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Both of the following conditions is met: ON malfunctions (A) and (B)	
ON malfunction (A)	
L4 switch	ON
ON malfunction (B)	
Actual Transfer gear ratio Transfer input speed/Transfer output speed	0.9 to 1.1

WIRING DIAGRAM

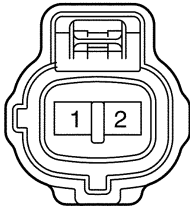


INSPECTION PROCEDURE

1 Check harness and connector (transfer L4 position switch – body ground).

Wire Harness Side:
(Connector Front View):

D4



D14209

PREPARATION:

Disconnect the transfer position L4 switch connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

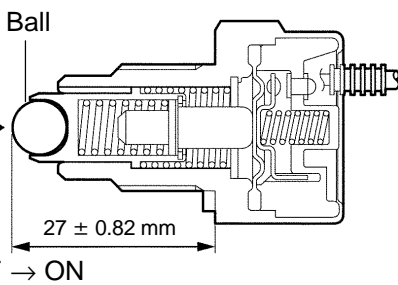
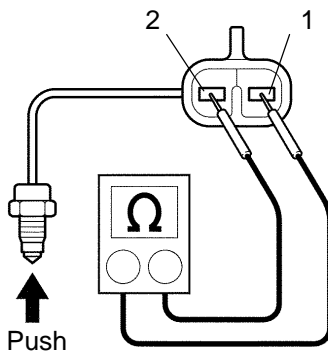
Tester Connection	Specified Condition
1 – Body ground	Below 1 Ω

NG

Repair or replace the harness or connector
(See page IN-30).

OK

2 Inspect transfer L4 position switch.



P

D14208

PREPARATION:

Remove the transfer position L4 switch.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

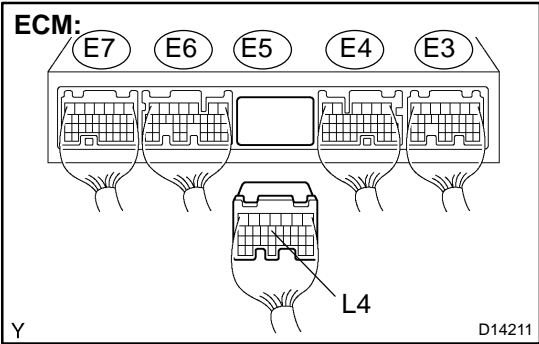
Switch position	Tester Connection	Specified Condition
Free	1 – 2	10 k Ω or higher
Pushed in	↑	Below 1 Ω

NG

Replace the transfer L4 position switch.

OK

3 Check harness and connector (transfer L4 position switch – ECM).



PREPARATION:

Disconnect the connector from the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

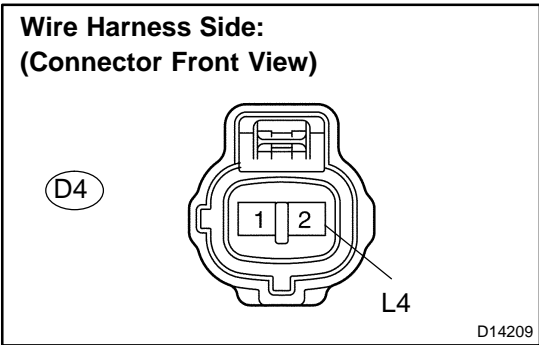
Tester Connection	Specified Condition
E5 – 13 (L4) – D4 – 2 (L4)	Below 1 Ω

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
E5 – 13 (L4) – Body ground	10 kΩ or higher



NG Repair or replace the harness or connector (See page [IN-30](#)).

OK

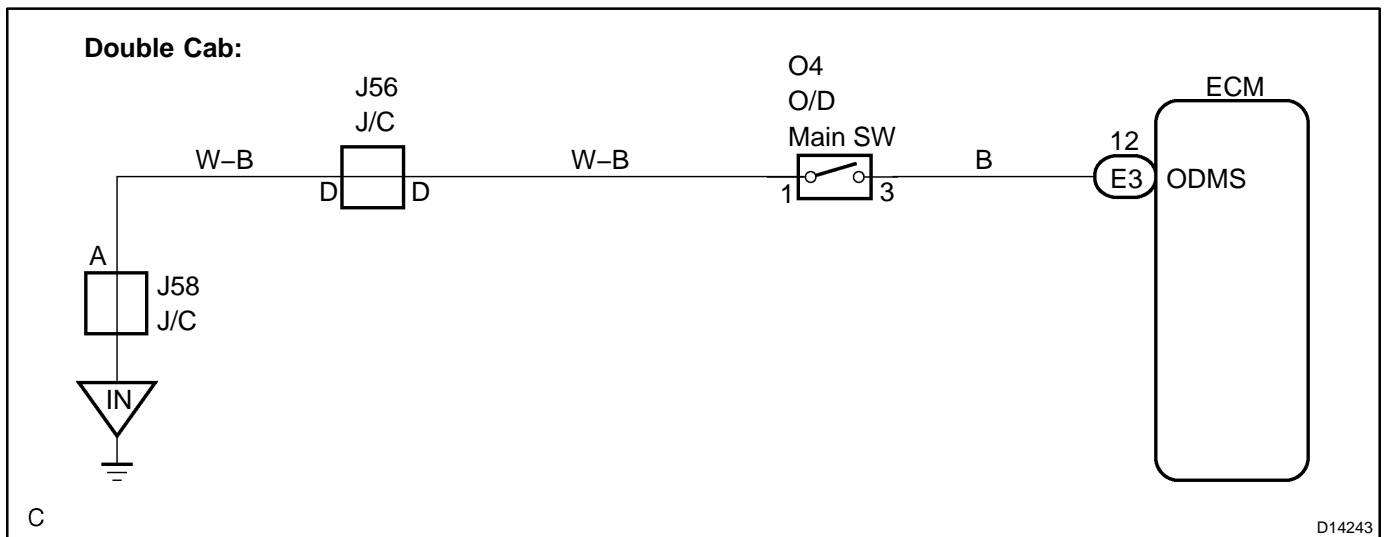
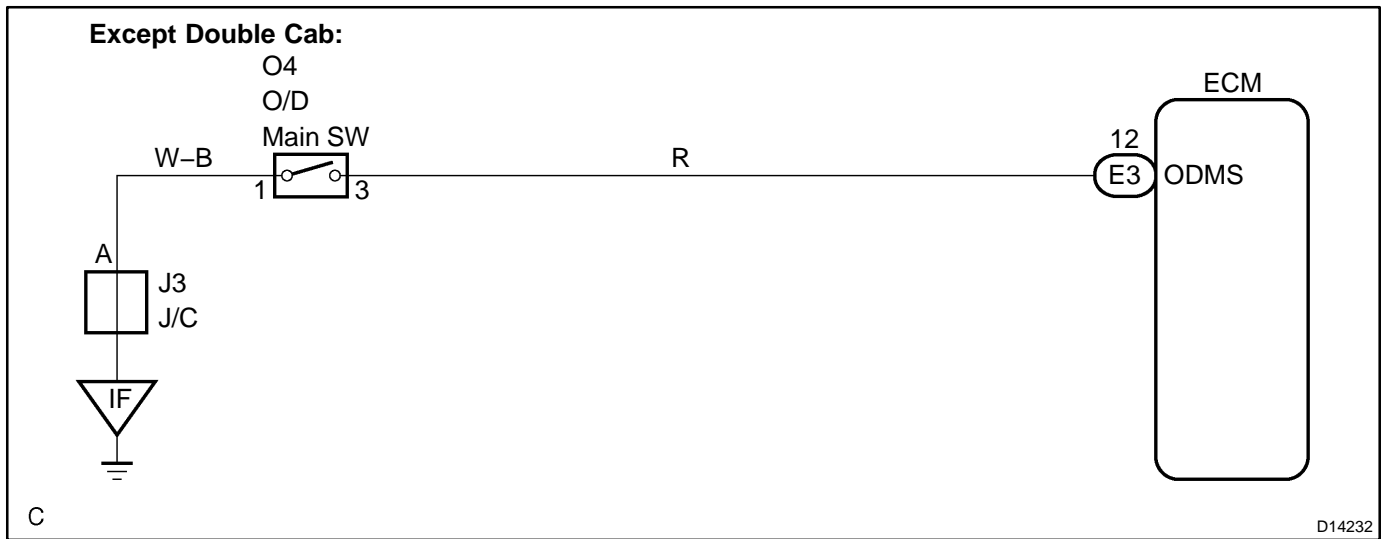
Replace the ECM (See page [SF-82](#)).

O/D Main Switch Circuit

CIRCUIT DESCRIPTION

The O/D main switch (transmission control switch) is a momentary type switch. When pressing the O/D main switch once, the O/D OFF indicator light comes on and the ECM prohibits shifting into O/D. When pressing it once again, the O/D OFF indicator light goes off and the ECM allows shifting into O/D. Turning the IG switch OFF will reset the O/D OFF indicator light.

WIRING DIAGRAM

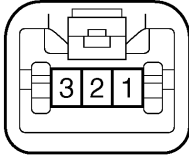


INSPECTION PROCEDURE

1 Check harness and connector (O/D main switch – body ground)

Wire Harness Side:
(Connector Front View):

O4



N

D14181

PREPARATION:

Disconnect the O/D main switch connector.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Tester Connection	Specified Condition
1 – Body ground	Below 1 Ω

NG

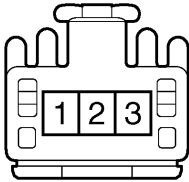
Repair or replace the harness or connector (See page [IN-30](#)).

OK

2 Inspect O/D main switch.

Switch Side:
(Connector Front View):

O4



N

D14182

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

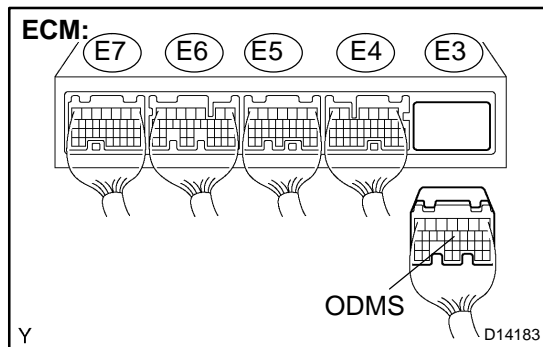
Switch Condition	Tester Connection	Specified Condition
O/D main switch pressed and held	1 – 3	Below 1 Ω
O/D main switch released	↑	10 kΩ or higher

NG

Replace O/D main switch (See page [AT-19](#)).

OK

3 Check harness and connector (O/D main switch - ECM).



PREPARATION:

- Connect the O/D main switch connector.
- Disconnect the connector from the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Switch Condition	Tester Connection	Specified Condition
O/D main switch pressed and held	E3 - 12 (ODMS) - Body ground	Below 1 Ω
O/D main switch released	\uparrow	10 k Ω or higher

NG

Repair or replace the harness or connector (See page IN-30).

OK

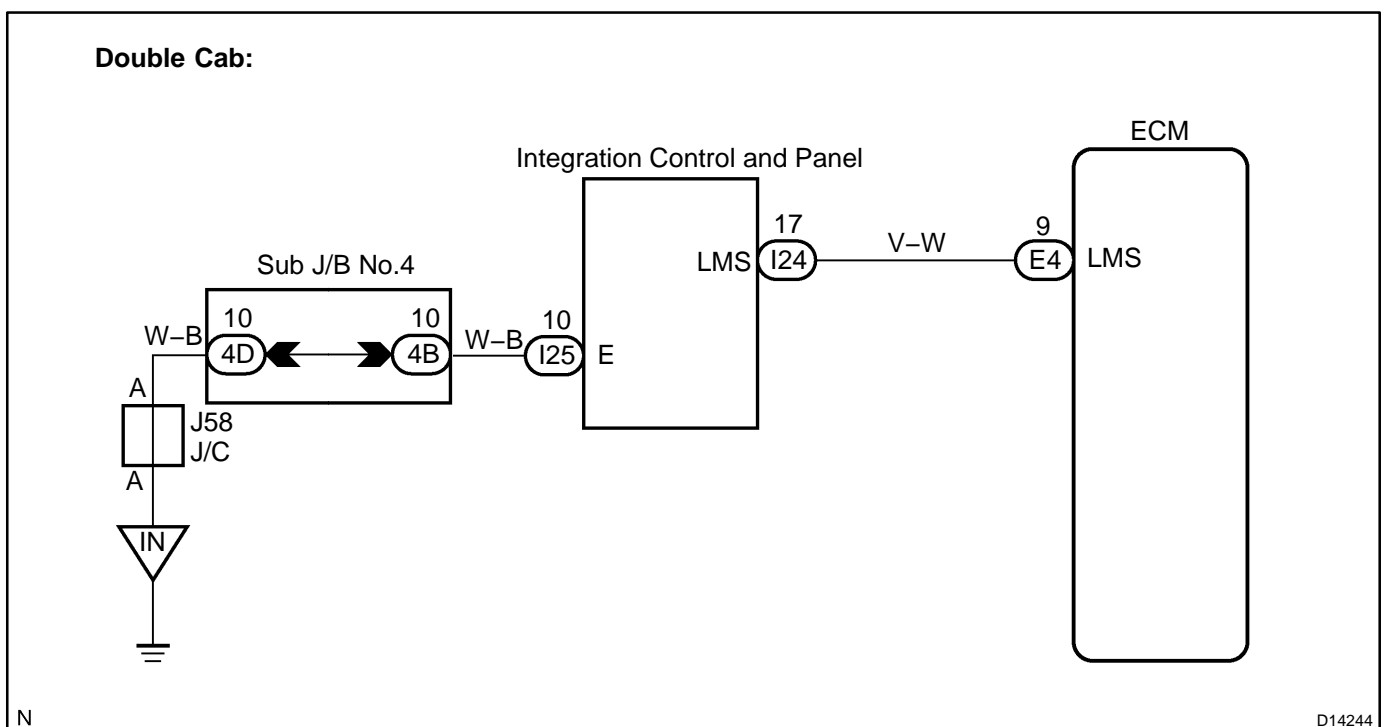
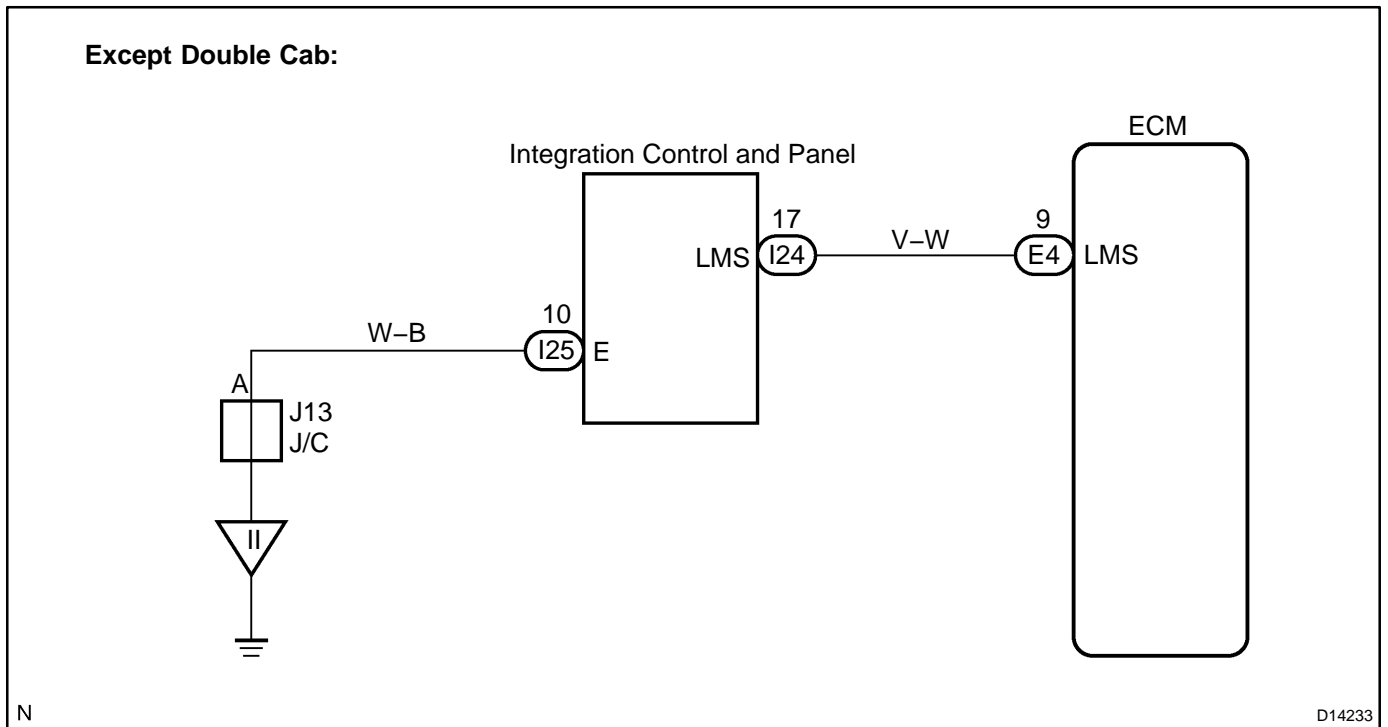
Proceed to next circuit inspection shown on matrix chart (See page DI-1136).

Shift Position L Switch Circuit

CIRCUIT DESCRIPTION

The shift position L switch is a momentary type switch. When the shift position L switch is pressed while driving with the shift lever in the 2 position, the L position indicator on the combination meter comes on and the transmission is locked in 1st gear. When the switch is pressed again, the indicator goes off and the transmission is released.

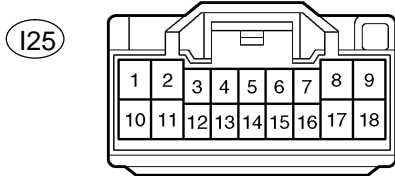
WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check harness and connector (shift position L switch – body ground).

**Wire Harness Side:
(Connector Front View):**



N

D14179

PREPARATION:

Remove the center cluster integration panel assembly (shift position L switch).

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

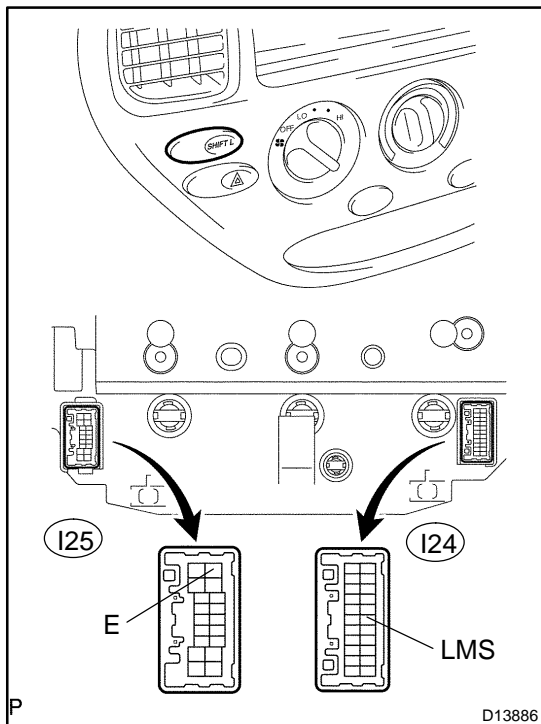
Tester Connection	Specified Condition
10 – Body ground	Below 1 Ω

NG

Repair or replace the harness or connector (See page IN-30).

OK

2 Inspect center cluster integration panel (shift position L switch).



P

D13886

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

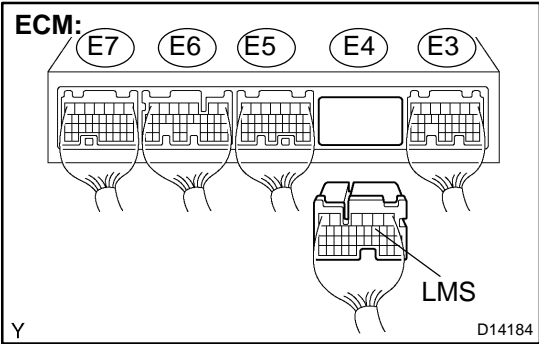
Switch Condition	Tester Connection	Specified Condition
Shift position L switch pressed and held	I24 – 17 (LMS) – I25 – 10 (E)	Below 1 Ω
Shift position L switch released	↑	10 kΩ or higher

NG

Replace center cluster integration panel (shift position L switch).

OK

3 Check harness and connector (shift position L switch – ECM).



PREPARATION:

- (a) Install the center cluster integration panel assembly (shift position L switch).
- (b) Disconnect the connector from the ECM.

CHECK:

Measure the resistance according to the value(s) in the table below.

OK:

Switch Condition	Tester Connection	Specified Condition
Shift position L switch pressed and held	E4 – 9 (LMS) – Body ground	Below 1 Ω
Shift position L switch released	↑	10 kΩ or higher

NG Repair or replace the harness or connector (See page [IN-30](#)).

OK

Proceed to next circuit inspection shown on matrix chart (See page [DI-1136](#)).

CO/HC INSPECTION

EMOKG-10

HINT:

This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All accessories switched OFF
- (e) All vacuum lines properly connected
- (f) SFI system wiring connectors fully plugged
- (g) Correct ignition timing
- (h) Transmission in neutral position
- (i) Tachometer and CO/HC meter calibrated by hand

2. START ENGINE

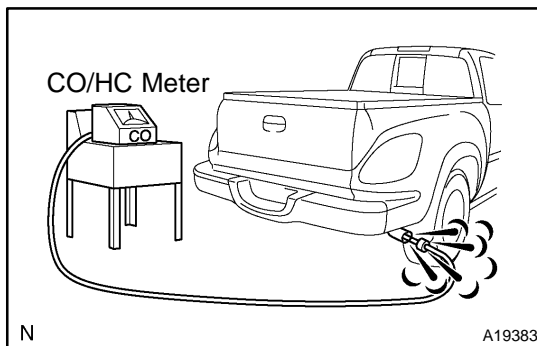
3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS

4. INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT:

When performing the 2 mode (2,500 rpm and idle) test, follow the measurement orders prescribed by the applicable local regulations.



If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below.

- (1) Check the A/F sensors and heated oxygen sensors operation (See page [DI-84](#) and [DI-90](#)).
- (2) See the table below for possible causes, and then inspect and correct the corresponding causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: <ul style="list-style-type: none"> • Incorrect timing • Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaky intake and exhaust valves 4. Leaky cylinders
Low	High	Rough idle (fluctuating HC reading)	1. Vacuum leaks: <ul style="list-style-type: none"> • PCV hose • Intake manifold • Throttle body 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty SFI system: <ul style="list-style-type: none"> • Faulty pressure regulator • Defective ECT sensor • Faulty ECM • Faulty injectors • Faulty throttle position sensor • Faulty MAF meter

COMPRESSION INSPECTION

EM06C-06

HINT:

If there is a lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. REMOVE SPARK PLUGS

- (a) Remove the V-bank cover.
- (b) Remove the air cleaner.
- (c) Remove the intake air surge tank (See page [EM-62](#)).
- (d) Remove the 6 ignition coils.
- (e) Remove the 6 spark plugs.
- (f) Disconnect the 6 injector connectors.

3. CHECK CYLINDER COMPRESSION PRESSURE

- (a) Insert a compression gauge into the spark plug hole.
- (b) Fully open the throttle.
- (c) While cranking the engine, measure the compression pressure.

HINT:

Always use a fully charged battery to obtain an engine speed of 250 rpm or more.

- (d) Repeat steps (a) through (c) for each cylinder.

NOTICE:

This measurement must be done in the shortest possible time.

Compression pressure:

1.3 MPa (13.3 kgf/cm², 189 psi) or more

Minimum pressure: 1.0 MPa (10.2 kgf/cm², 145 psi)

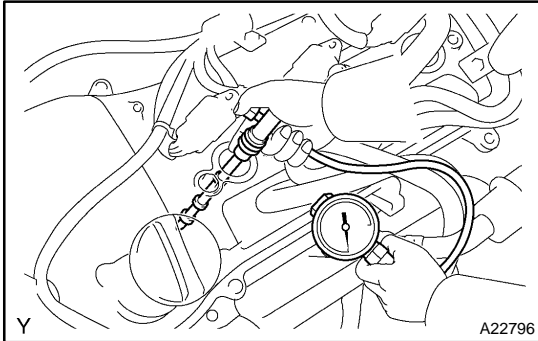
Difference between each cylinder:

0.1 MPa (1.0 kgf/cm², 15 psi) or less

- (e) If the cylinder compression pressure in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression pressure.
 - If adding oil improves the compression pressure, it is likely that the piston rings and/or cylinder bore are worn or damaged.
 - If compression pressure stays low, a valve may be sticking, seating may be improper, or there may be a leak past the gasket.

4. REINSTALL SPARK PLUGS

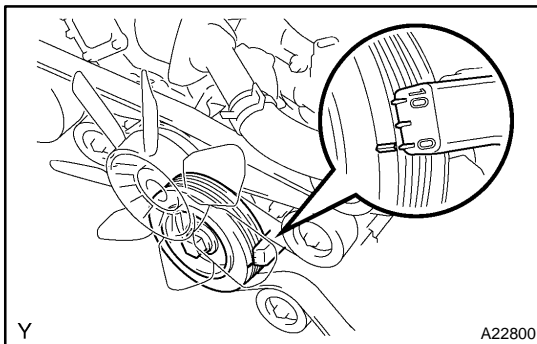
- (a) Connect the 6 injector connectors.
- (b) Install the 6 spark plugs.
Torque: 20 N·m (200 kgf-cm, 15 ft-lbf)
- (c) Install the 6 ignition coils.
- (d) Install the intake air surge tank (See page [EM-89](#)).
- (e) Install the air cleaner.
- (f) Install the V-bank cover.



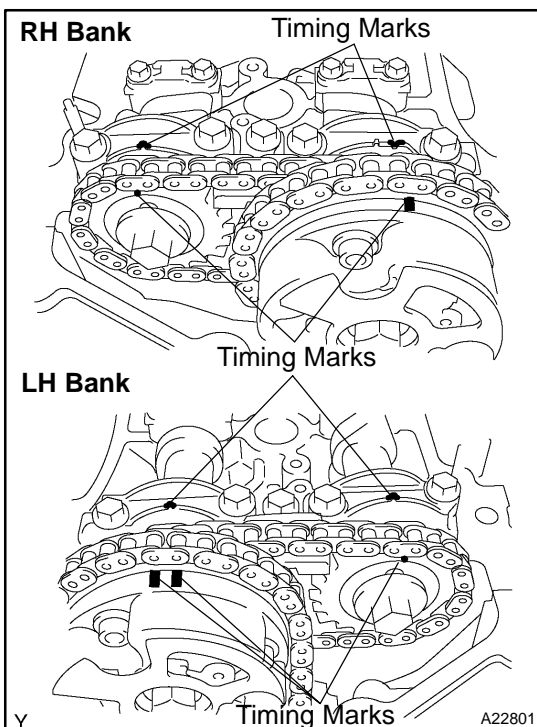
VALVE CLEARANCE INSPECTION

EM1XG-01

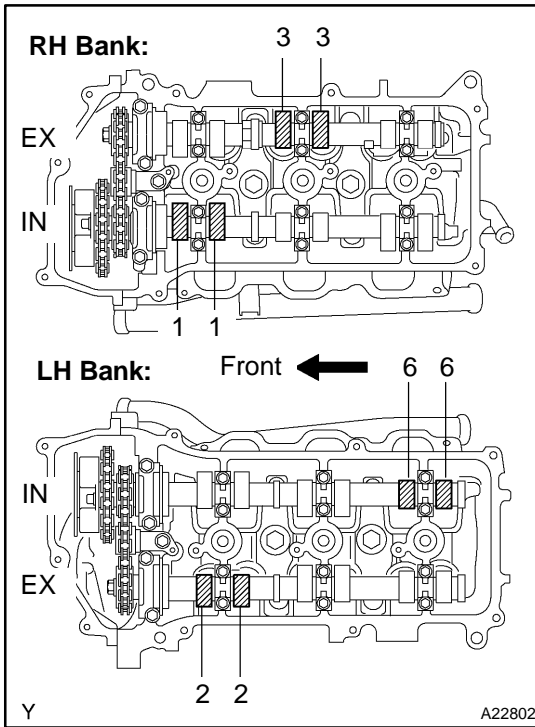
1. DRAIN ENGINE COOLANT (See page [CO-2](#))
2. REMOVE V-BANK COVER
3. REMOVE AIR CLEANER (See page [EM-62](#))
4. REMOVE INTAKE AIR SURGE TANK
(See page [EM-62](#))
5. REMOVE IGNITION COIL
6. REMOVE CYLINDER HEAD COVER
(See page [EM-62](#))



7. SET NO. 1 CYLINDER TO TDC/COMPRESSION
 - (a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover.



- (b) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing caps as shown in the illustration. If not, turn the crankshaft 1 complete revolution (360 °) and align the timing marks as above.



8. INSPECT VALVE CLEARANCE

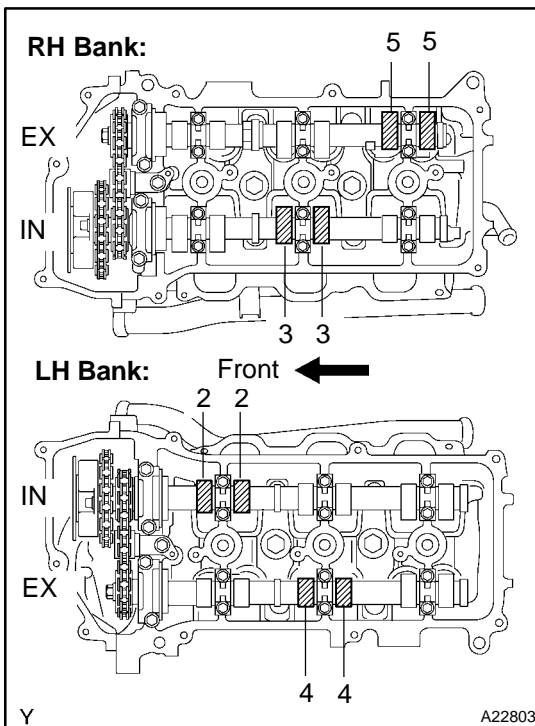
- (a) Check the valves indicated in the illustration.
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Valve clearance (Cold):

Intake: 0.15 to 0.25 mm (0.006 to 0.010 in.)

Exhaust: 0.29 to 0.39 mm (0.011 to 0.015 in.)

- (2) Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.



- (b) Turn the crankshaft $2/3$ of a revolution (240°), and check the valves indicated in the illustration.

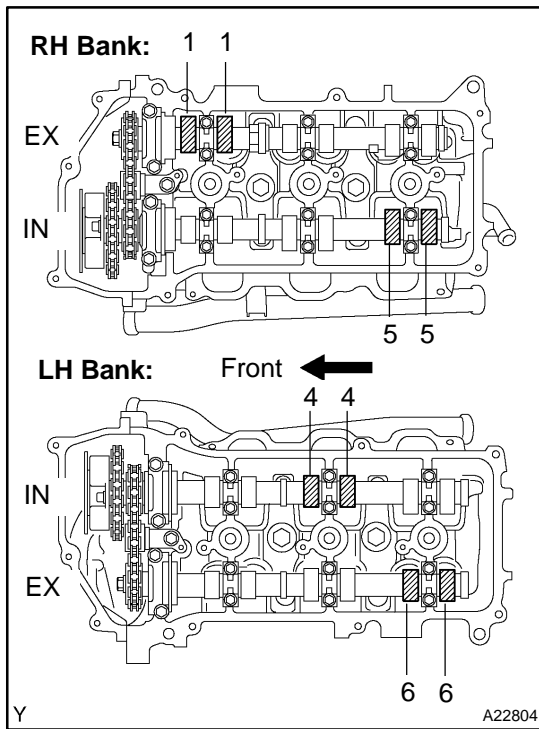
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Valve clearance (Cold):

Intake: 0.15 to 0.25 mm (0.006 to 0.010 in.)

Exhaust: 0.29 to 0.39 mm (0.011 to 0.015 in.)

- (2) Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.



(c) Turn the crankshaft $2/3$ of a revolution (240°), and check the valves indicated in the illustration.

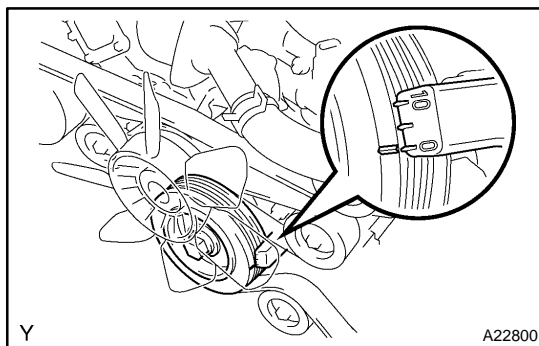
(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Valve clearance (Cold):

Intake: 0.15 to 0.25 mm (0.006 to 0.010 in.)

Exhaust: 0.29 to 0.39 mm (0.011 to 0.015 in.)

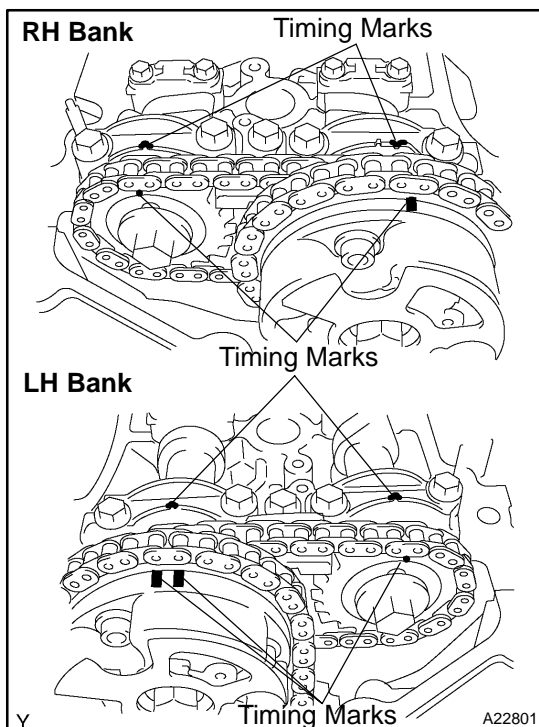
(2) Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.



9. ADJUST VALVE CLEARANCE

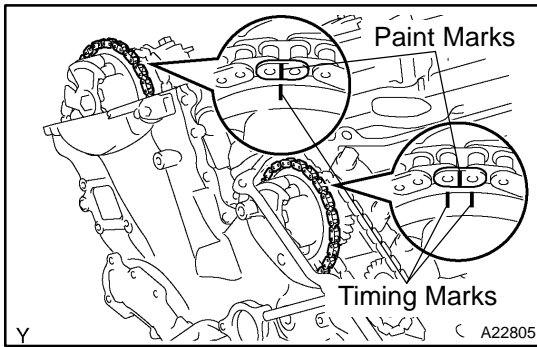
(a) Set the No. 1 cylinder to the TDC/compression.

(1) Turn the crankshaft pulley, and align the notch with the timing mark "0" of the timing chain cover.



(2) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing caps as shown in the illustration.

If not, turn the crankshaft 1 complete revolution (360°) and align the timing marks as above.



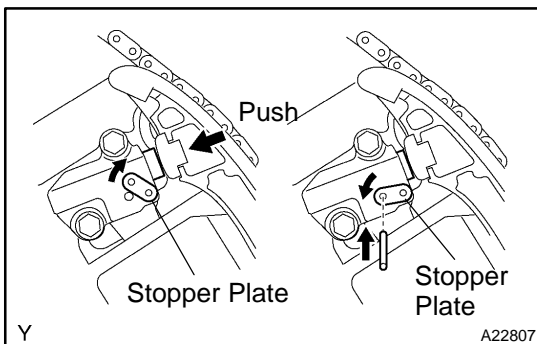
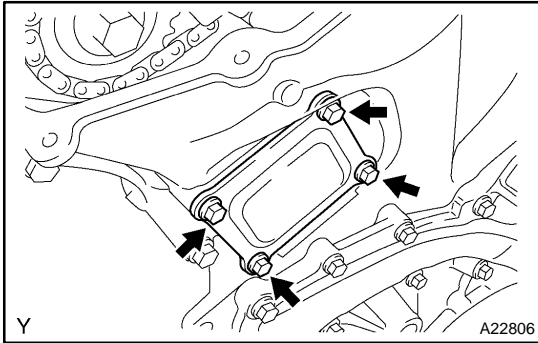
- (3) Place paint marks on the No. 1 chain links that correspond with the timing marks of the camshaft timing gears.

- (b) Remove the chain tensioner No. 1.

NOTICE:

- **Never rotate the crankshaft with the chain tensioner removed.**
- **When rotating the camshaft with the timing chain removed, turn the crankshaft counterclockwise 40 ° from the TDC first.**

- (1) Remove the 4 bolts, timing chain cover plate and gasket.



- (2) While rotating the stopper plate of the tensioner upward, push in the plunger of the chain tensioner as shown in the illustration.

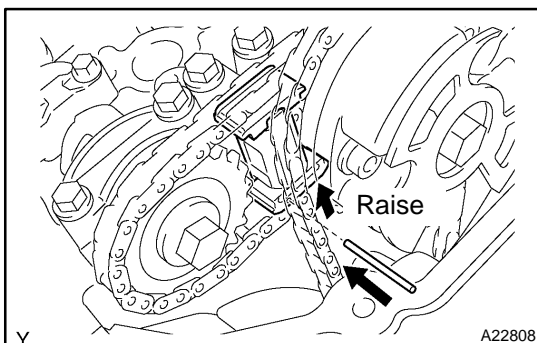
- (3) While rotating the stopper plate of the tensioner downward, insert a bar of ϕ 3.5 mm (0.138 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.

- (4) Remove the 2 bolts and chain tensioner No.1.

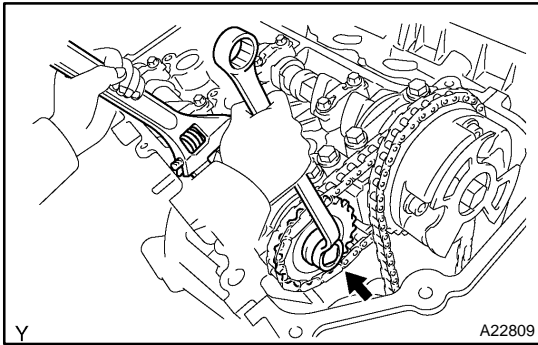
- (c) Remove the No. 2 camshaft.

NOTICE:

As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



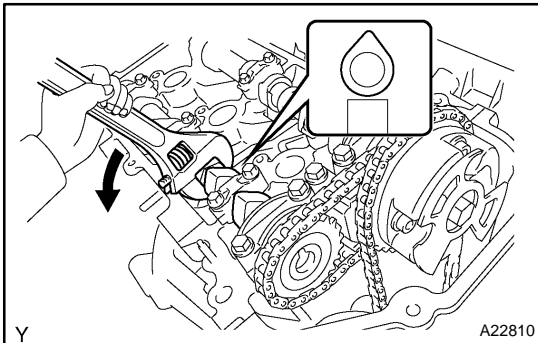
- (1) While raising up the chain tensioner No. 2, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.



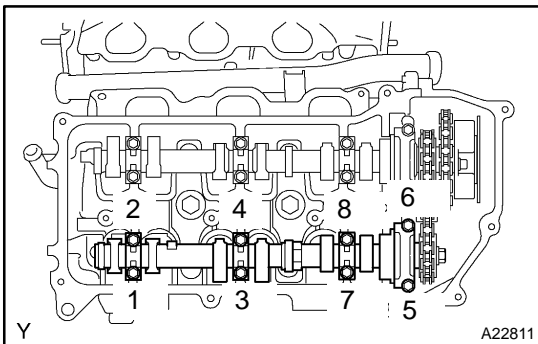
- (2) Hold the hexagonal portion of the No. 2 camshaft with a wrench, and remove the camshaft timing sprocket set bolt.

NOTICE:

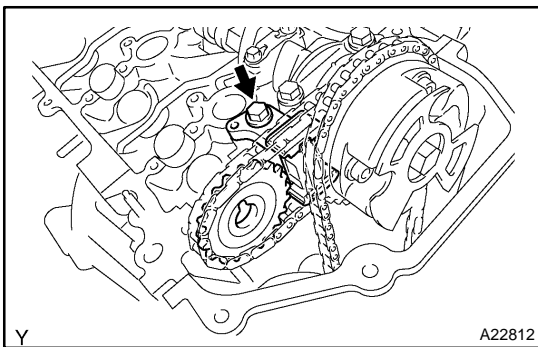
Be careful not to damage the cylinder head and valve lifter with the wrench.



- (3) Separate the camshaft timing sprocket from the No. 2 camshaft.
- (4) Rotate the camshaft counterclockwise using the wrench so that the cam lobes of the No. 1 cylinder face upward as shown in the illustration.



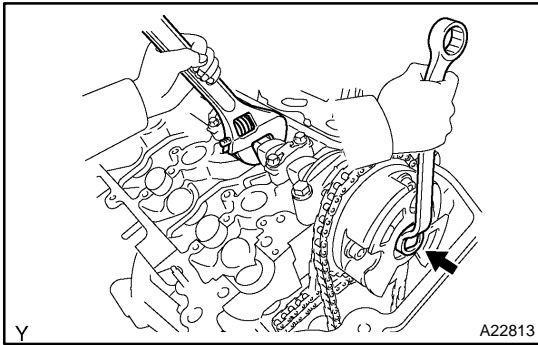
- (5) Using several steps, loosen and remove the 8 bearing cap bolts uniformly in the sequence as shown in the illustration.
- (6) Remove the 4 bearing caps and No. 2 camshaft.



- (d) Remove the chain tensioner No. 2.
 - (1) Remove the chain tensioner No. 2 bolt, and then remove the chain tensioner No. 2 and camshaft timing sprocket.
- (e) Remove the camshaft.

NOTICE:

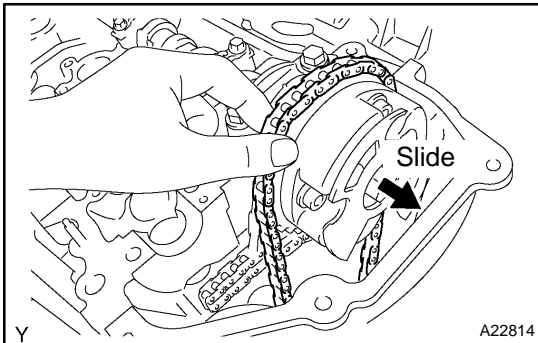
As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



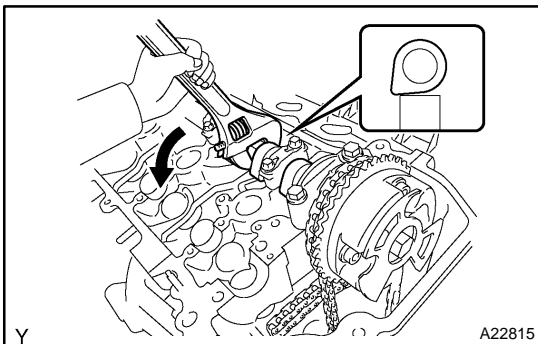
- (1) Hold the hexagonal portion of the No. 1 camshaft with a wrench, and loosen the camshaft timing gear assembly set bolt.

NOTICE:

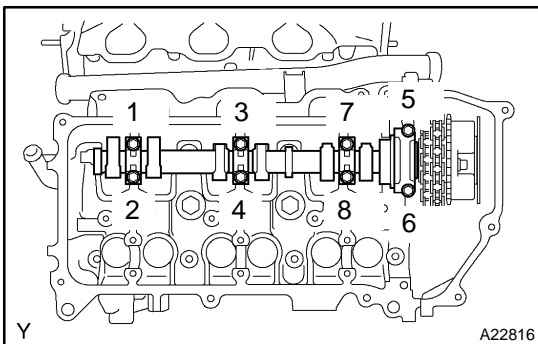
- **Be careful not to damage the cylinder head and valve lifter with the wrench.**
- **Do not disassemble the camshaft timing gear assembly.**



- (2) Slide the camshaft timing gear assembly and separate the No. 1 chain from the camshaft timing gear sprocket.

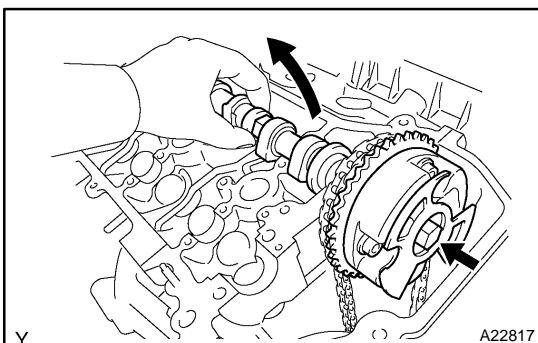


- (3) Rotate the No. 1 camshaft counterclockwise using a wrench so that the cam lobes of No. 1 cylinder face upward as shown in the illustration.

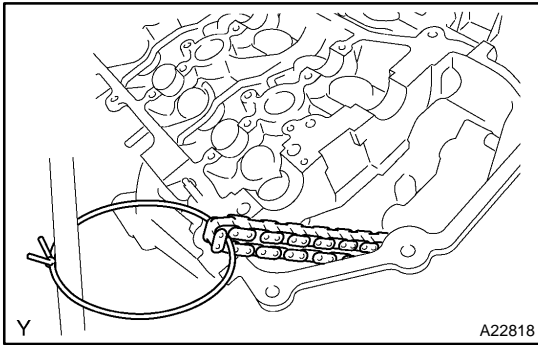


- (4) Using several steps, loosen and remove the 8 bearing cap bolts uniformly in the sequence as shown in the illustration.

- (5) Remove the 4 bearing caps.



- (6) Remove the camshaft timing gear assembly set bolt with the No. 1 camshaft lifted up, and then remove the No. 1 camshaft and camshaft timing gear assembly w/ No. 2 chain.



- (7) Tie the No. 1 chain with a string as shown in the illustration.

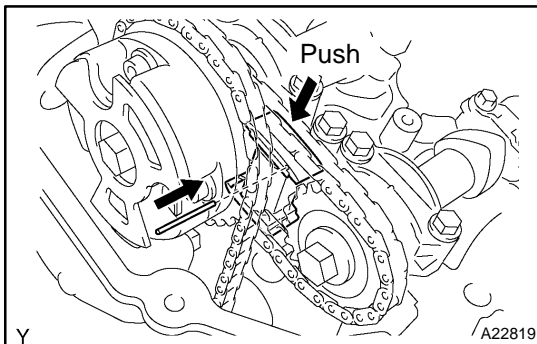
NOTICE:

Be careful not to drop anything inside the timing chain cover.

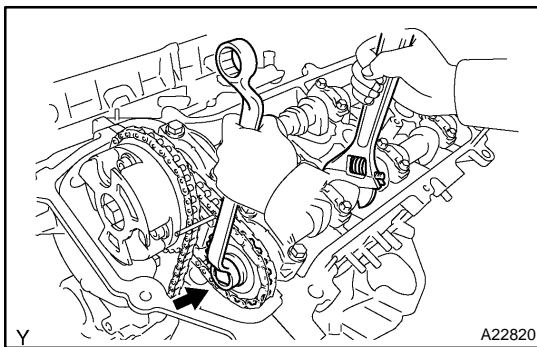
- (f) Remove the No. 4 camshaft.

NOTICE:

As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



- (1) While pushing down the chain tensioner No. 2, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.

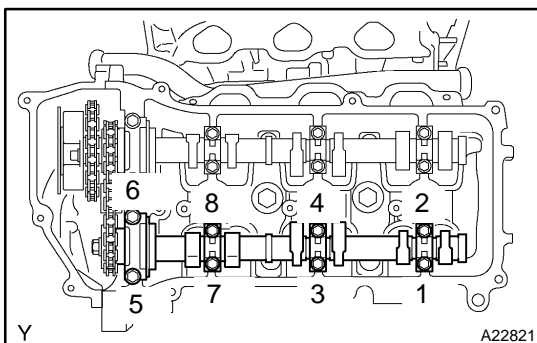


- (2) Hold the hexagonal portion of the No. 4 camshaft with a wrench, and remove the camshaft timing sprocket set bolt.

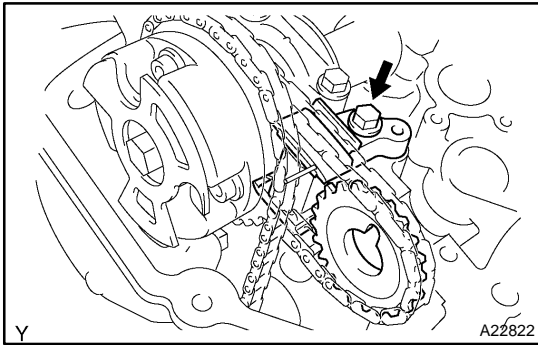
NOTICE:

Be careful not to damage the cylinder head and valve lifter with the wrench.

- (3) Separate the camshaft timing sprocket from the No. 4 camshaft.



- (4) Using several steps, loosen and remove the 8 bearing cap bolts uniformly in the sequence as shown in the illustration.
- (5) Remove the 4 bearing caps and No. 4 camshaft.

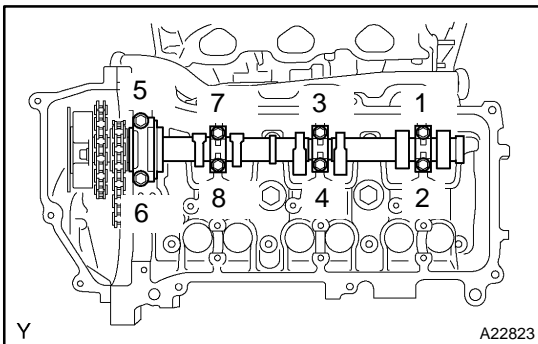


- (g) Remove the chain tensioner No. 2.
 (1) Remove the chain tensioner No. 3 bolt, and then remove the chain tensioner No. 3 and camshaft timing sprocket.

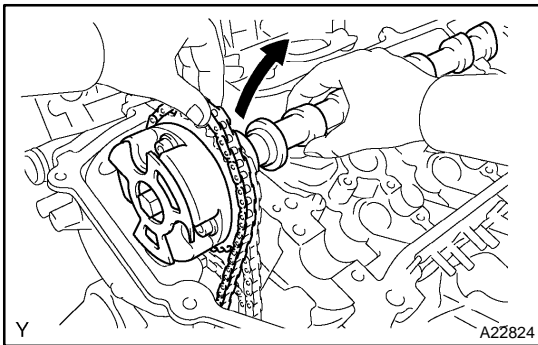
- (h) Remove the No. 3 camshaft.

NOTICE:

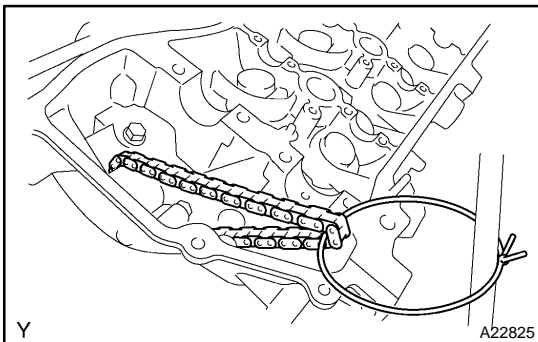
As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



- (1) Using several steps, loosen and remove the 8 bearing cap bolts uniformly in the sequence as shown in the illustration.
 (2) Remove the 4 bearing caps.



- (3) Hold the No. 1 chain, and remove the No. 3 camshaft, camshaft timing gear assembly and No. 2 chain.

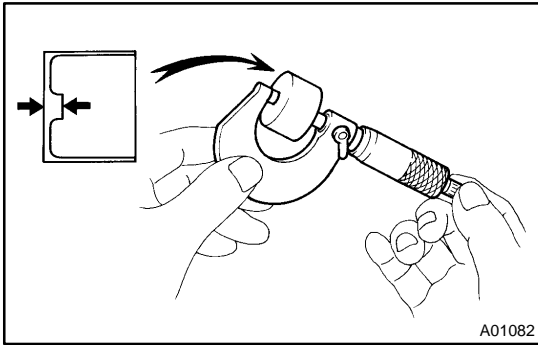


- (4) Tie the No. 1 chain with a string as shown in the illustration.

NOTICE:

Be careful not to drop anything inside the timing chain cover.

- (i) Remove the valve lifters.



- (j) Determine the size of the valve lifter to be installed according to the following formulas or charts:
- (1) Using a micrometer, measure the thickness of the removed lifter.
 - (2) Calculate the thickness of a new lifter so that the valve clearance comes within the specified value.

T: Thickness of removed lifter

A: Measured valve clearance

N: Thickness of new lifter

Intake:

$$N = T + (A - 0.20 \text{ mm (0.008 in.)})$$

Exhaust:

$$N = T + (A - 0.30 \text{ mm (0.012 in.)})$$

- (3) Select a new lifter with a thickness as close as possible to the calculated value.

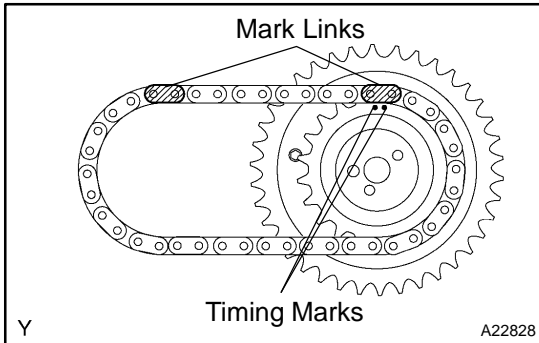
HINT:

Lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).

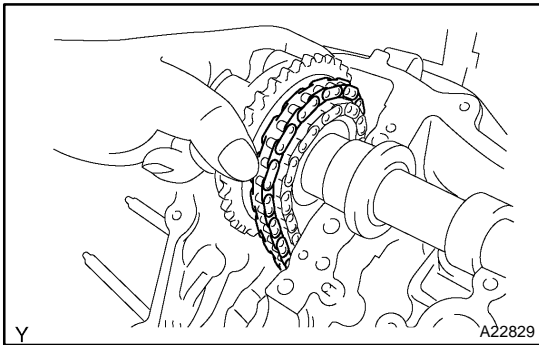
(k) Install the No. 3 camshaft.

NOTICE:

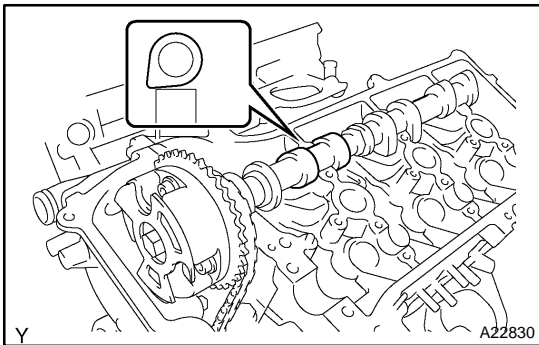
As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



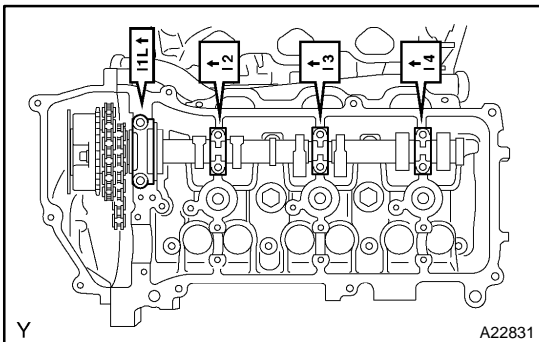
- (1) Align the mark link (yellow) with the timing mark (2-dot mark) of the camshaft timing gear assembly as shown in the illustration.
- (2) Apply new engine oil to the thrust portions and journals of the camshafts.



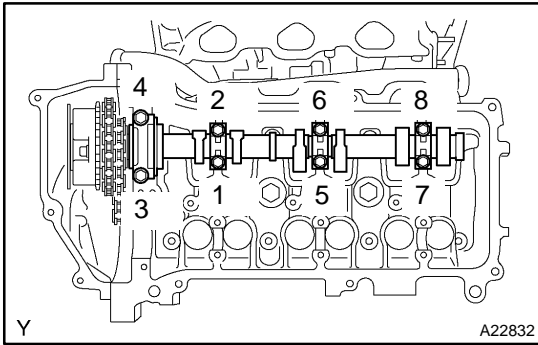
- (3) Temporarily put the No. 1 chain on the No. 2 chain of the camshaft timing gear assembly.



- (4) Set the No. 3 camshaft onto the LH cylinder head with the cam lobes of the No. 2 cylinder facing downward as shown in the illustration.



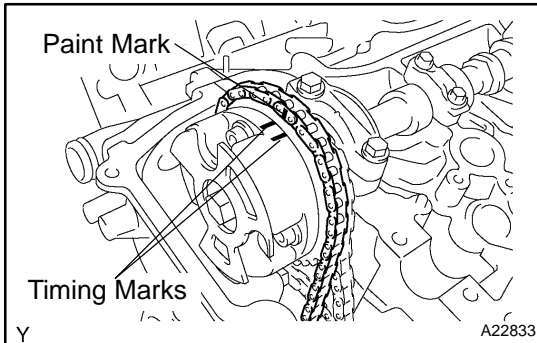
- (5) Install the 4 bearing caps in their proper locations.
- (6) Apply a light coat of engine oil to the threads of the bearing cap bolts.



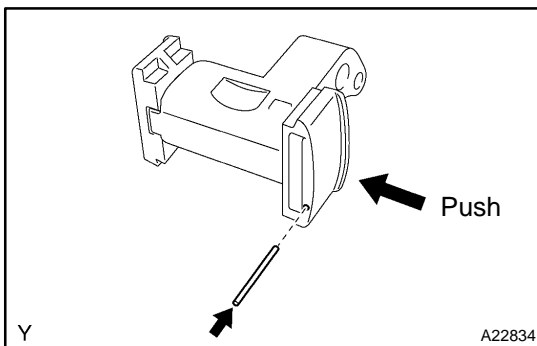
- (7) Install the 8 bearing cap bolts. Using several steps, tighten the bolts uniformly in the sequence as shown in the illustration.

Torque:

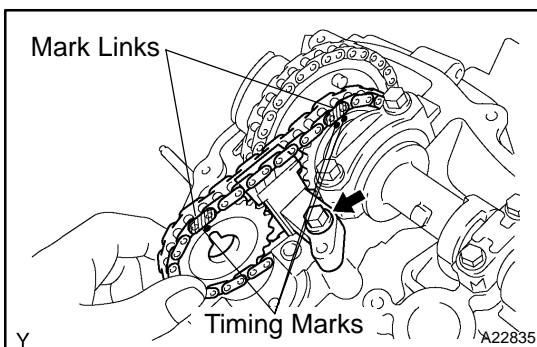
9.0 N·m (92 kgf·cm, 80 in.-lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft.-lbf) for 12 mm (0.47 in.) head



- (8) Set the paint mark of the No. 1 chain between the timing marks of the camshaft timing gear assembly.



- (l) Install the chain tensioner No. 2.
 (1) While pushing in the tensioner, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.



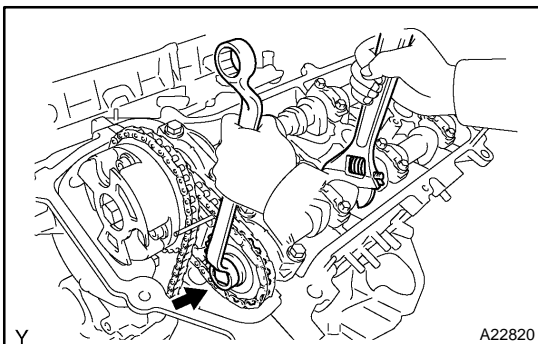
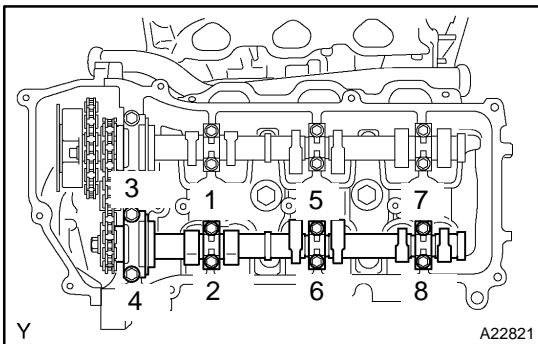
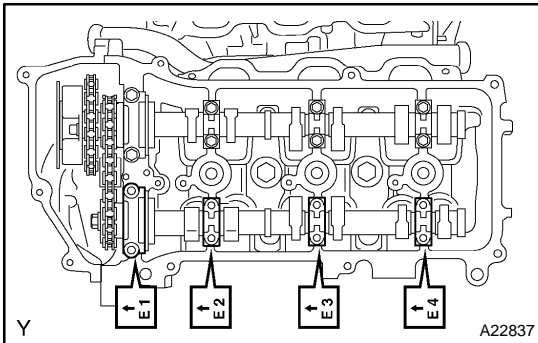
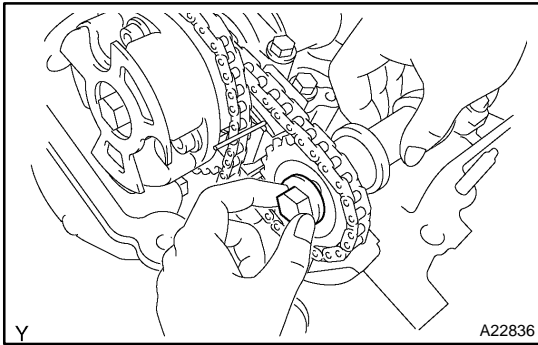
- (2) Temporarily install the camshaft timing assembly and chain tensioner No. 2 and align the mark links (yellow) with the timing marks (1-dot mark and 2-dot mark) of the camshaft timing sprocket and camshaft timing gear assembly.
 (3) Tighten the chain tensioner No. 3 bolt.

Torque: 19 N·m (194 kgf·cm, 14 ft.-lbf)

- (m) Install the No. 4 camshaft.

NOTICE:

As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



- (1) Align the knock pin hole on the camshaft timing sprocket with the knock pin of the No. 4 camshaft, and insert the No. 4 camshaft into the camshaft timing sprocket.
- (2) Temporarily install the camshaft timing sprocket set bolt.

- (3) Install the 4 bearing caps in their proper locations.
- (4) Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

- (5) Install the 8 bearing cap bolts. Using several steps, tighten the bolts uniformly in the sequence as shown in the illustration.

Torque:

9.0 N·m (92 kgf·cm, 80 in·lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head

- (6) Hold the hexagonal portion of the No. 4 camshaft with a wrench, and tighten the camshaft timing sprocket set bolt.

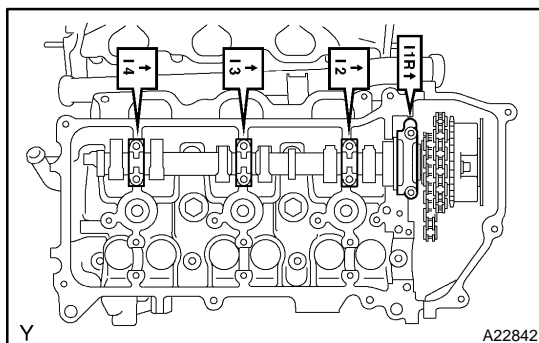
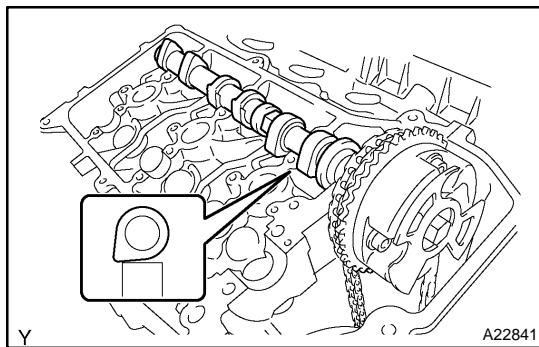
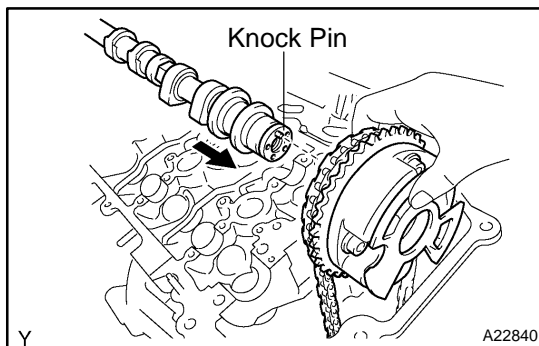
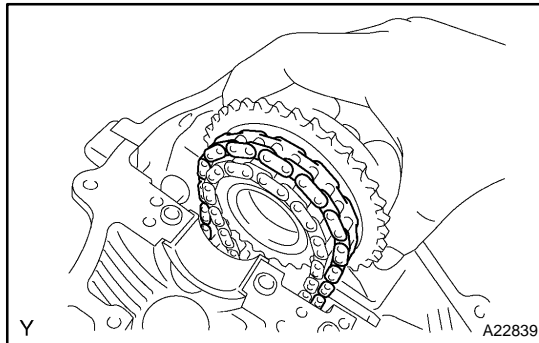
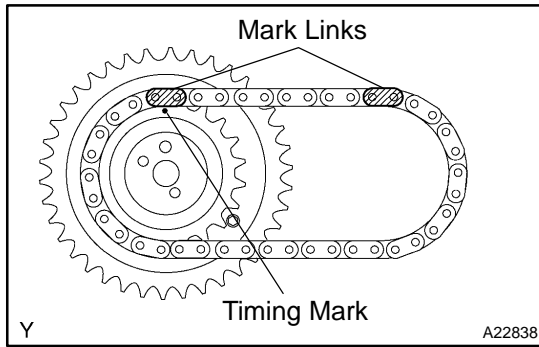
Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)

- (7) Remove the pin from the chain tensioner No. 2.

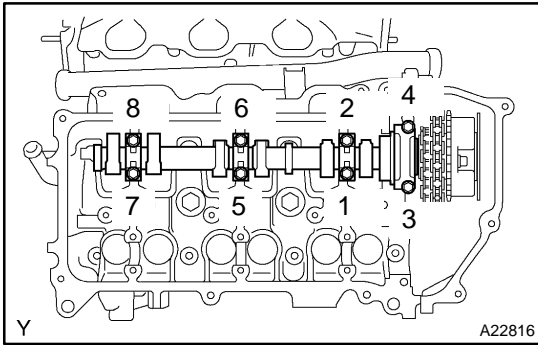
- (n) Install the camshaft.

NOTICE:

As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



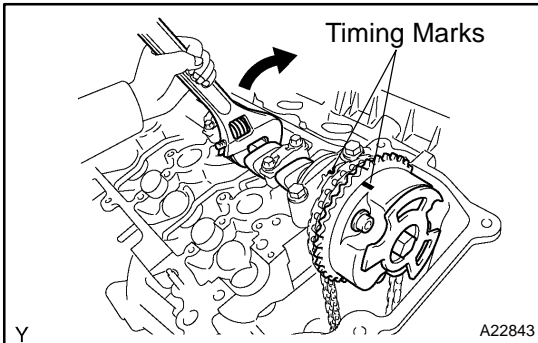
- (1) Align the mark link (yellow) with the timing mark (1-dot mark) of the camshaft timing gear assembly as shown in the illustration.
- (2) Apply new engine oil to the thrust portions and journals of the camshafts.
- (3) Temporarily put the No. 1 chain on the No. 2 chain of the camshaft timing gear assembly.
- (4) Align the knock pin hole on the camshaft timing gear assembly with the knock pin of the No. 1 camshaft, and insert the No. 1 camshaft into the camshaft timing gear assembly.
- (5) Temporarily install the camshaft timing gear assembly set bolt.
- (6) Set the No. 1 camshaft onto the RH cylinder head with the cam lobes of the No. 1 cylinder facing downward as shown in the illustration.
- (7) Install the 4 bearing caps in their proper locations.
- (8) Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.



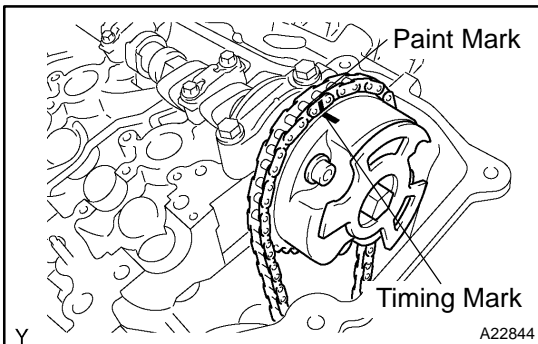
- (9) Install the 8 bearing cap bolts. Using several steps, tighten the bolts uniformly in the sequence as shown in the illustration.

Torque:

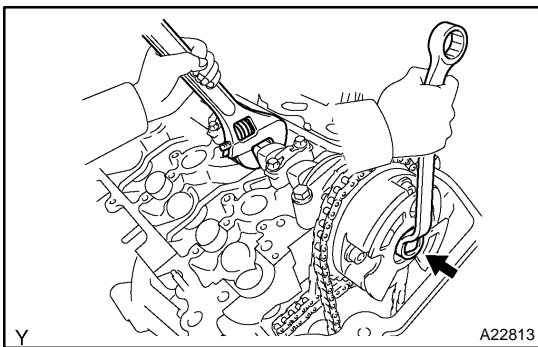
9.0 N·m (92 kgf·cm, 80 in.-lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head



- (10) Rotate the No. 1 camshaft clockwise using the hexagonal portion of the No. 1 camshaft so that the timing mark of the camshaft timing gear assembly is aligned with the timing mark of the camshaft bearing cap.

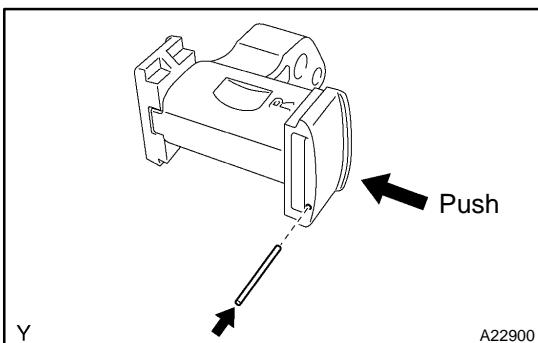


- (11) Align the paint mark of the No. 1 chain with the timing mark of the camshaft timing gear assembly.

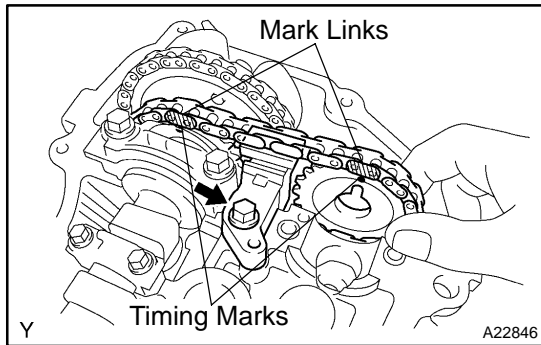


- (12) Hold the hexagonal portion of the No. 1 camshaft with a wrench, and tighten the camshaft timing gear assembly set bolt.

Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)



- (o) Install the chain tensioner No. 2.
 (1) While pushing in the tensioner, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.



- (2) Temporarily install the camshaft timing gear and chain tensioner No. 2 and align the mark links (yellow) with the timing marks (1-dot mark) of the camshaft timing gear assembly and camshaft timing sprocket.

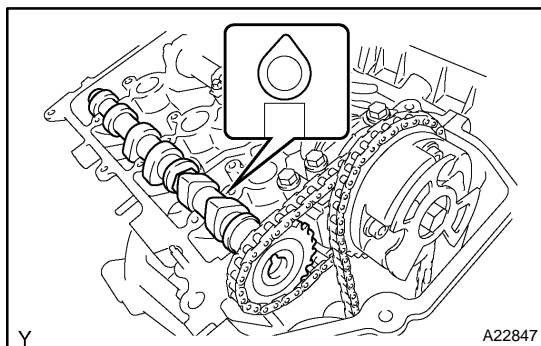
- (3) Tighten the chain tensioner No. 2 bolt.

Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

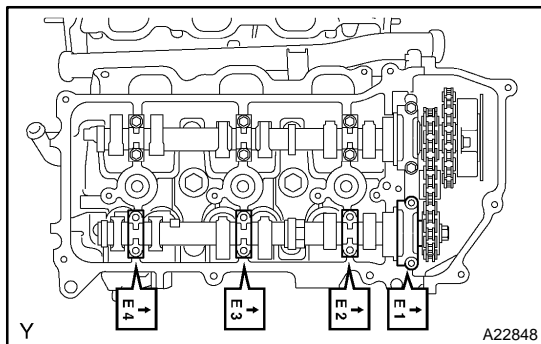
- (p) Install the No. 2 camshaft.

NOTICE:

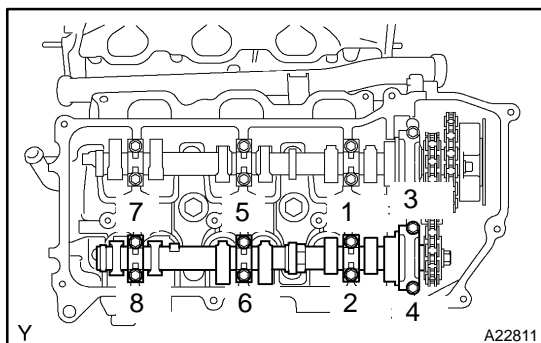
As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



- (1) Set the No. 2 camshaft onto the RH cylinder head with the cam lobes of No. 1 cylinder facing upward as shown in the illustration.



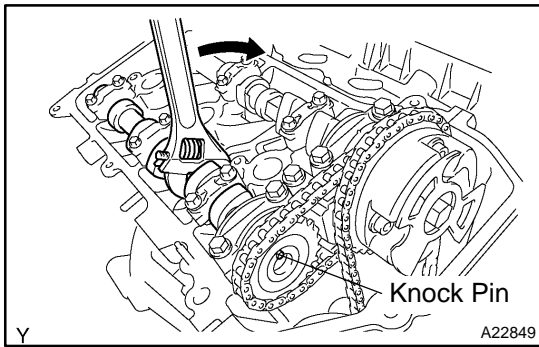
- (2) Install the 4 bearing caps in their proper locations.
- (3) Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.



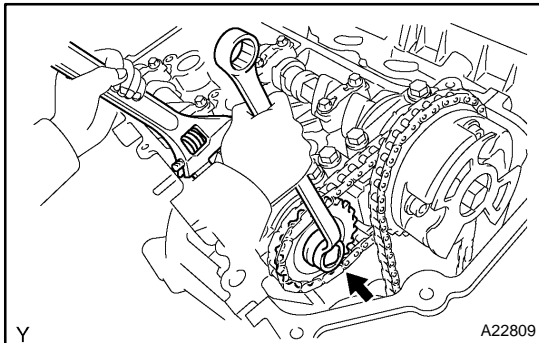
- (4) Install the 8 bearing cap bolts. Using several steps, tighten the bolts uniformly in the sequence as shown in the illustration.

Torque:

9.0 N·m (92 kgf·cm, 80 in·lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head



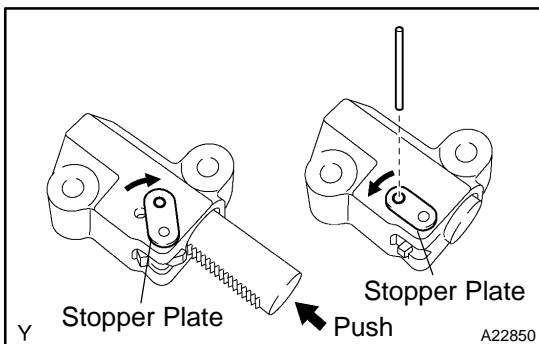
- (5) Rotate the No. 2 camshaft clockwise using a wrench so that the knock pin of the No. 2 camshaft is aligned with the knock pin hole of the camshaft timing sprocket.



- (6) Hold the hexagonal portion of the No. 2 camshaft with a wrench, and install the camshaft timing sprocket set bolt.

Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)

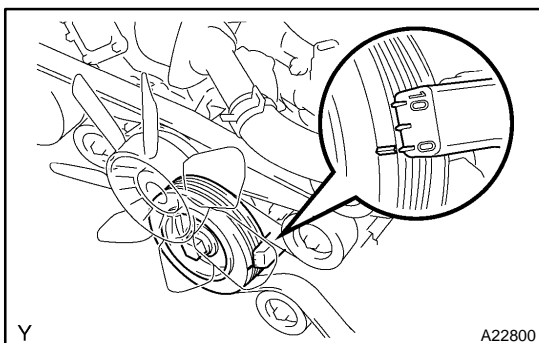
- (7) Remove the pin from the chain tensioner No. 2.



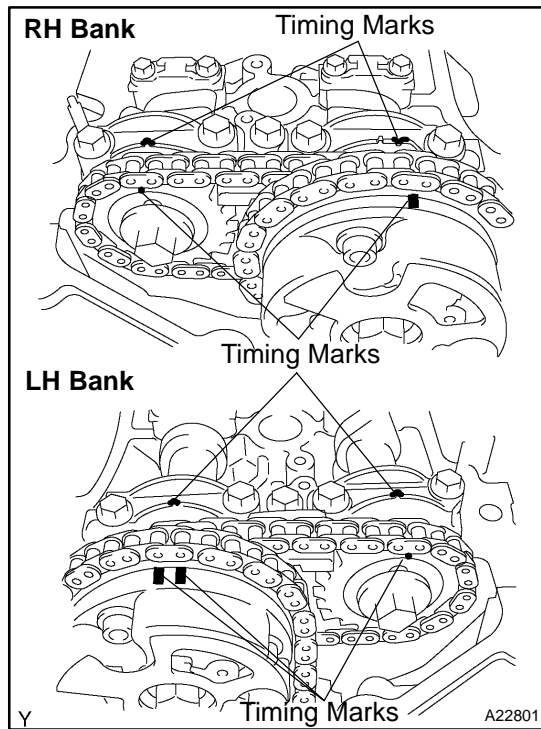
- (q) Install the chain tensioner No. 1.
- (1) While turning the stopper plate of the tensioner clockwise, push in the plunger of the tensioner as shown in the illustration.
 - (2) While turning the stopper plate of the tensioner counterclockwise, insert a bar of ϕ 3.5 mm (0.138 in.) into the holes on the stopper plate and tensioner to fix the stopper plate.
 - (3) Install the chain tensioner with the 2 bolts.
 - (4) Remove the bar from the chain tensioner.
 - (5) Install a new gasket and the timing chain cover plate with the 4 bolts.

Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)



- (6) Turn the crankshaft pulley 2 complete revolutions slowly, and align the notch with the timing mark "0" of the timing chain cover.



(7) Check that the timing marks of the camshaft timing gear assembly and camshaft timing sprocket are aligned with the timing marks of the bearing caps as shown in the illustration.

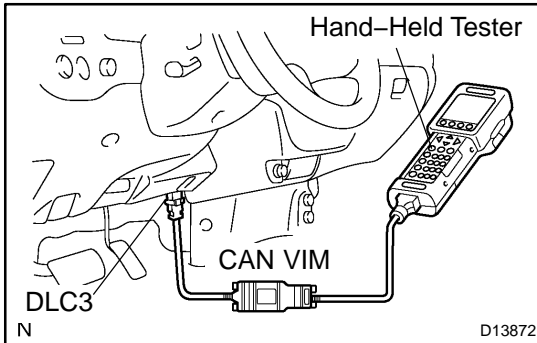
10. **INSTALL CYLINDER HEAD COVER** (See page [EM-89](#))
11. **INSTALL IGNITION COIL**
12. **INSTALL INTAKE AIR SURGE TANK**
(See page [EM-89](#))
13. **INSTALL AIR CLEANER** (See page [EM-89](#))
14. **ADD ENGINE COOLANT** (See page [CO-2](#))
15. **INSTALL V-BANK COVER**
16. **INSPECT IGNITION TIMING** (See page [EM-23](#))

IGNITION TIMING INSPECTION

EM1XH-01

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

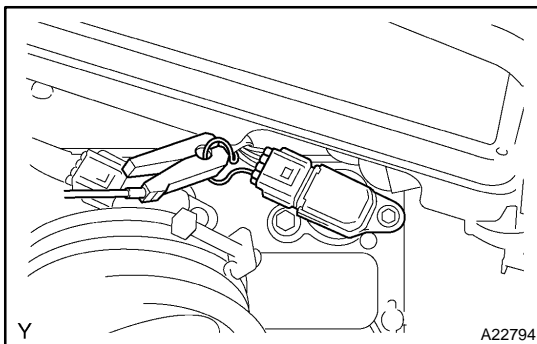


2. INSPECT IGNITION TIMING

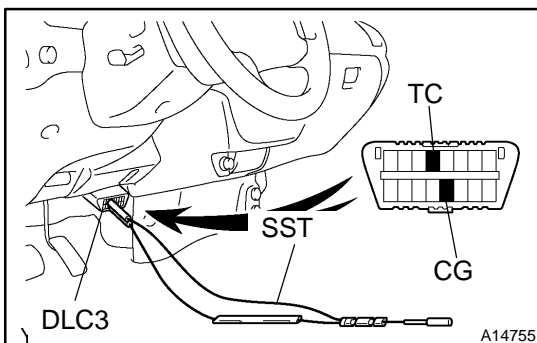
- (a) When using a hand-held tester or OBD II scan tool.
- (1) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
 - (2) Please refer to the hand-held tester operator's manual for further details.

**Ignition timing: 7 to 24° BTDC at idle
(Transmission in neutral)**

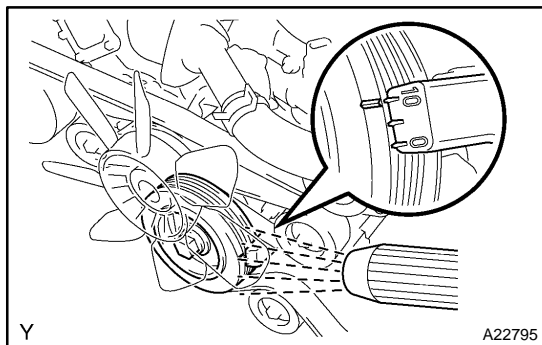
- (3) Disconnect the hand-held tester or OBD II scan tool from the DLC3.



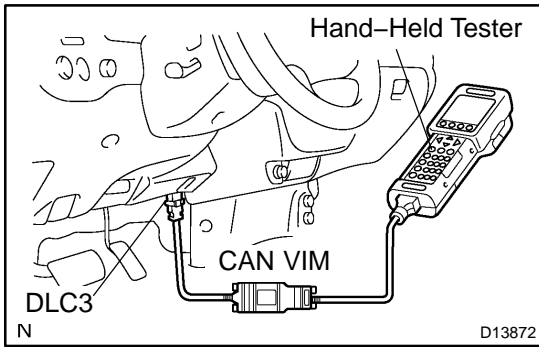
- (b) When not using a hand-held tester or OBD II scan tool.
- (1) Remove the air cleaner cap.
 - (2) Connect the tester probe of a timing light to the wire of the ignition coil connector for the No. 1 cylinder.



- (3) Using SST, connect terminals TC and CG of the DLC3.
SST 09843-18040



- (4) Using the timing light, check the ignition timing.
**Ignition timing: 8 to 12° BTDC at idle
(Transmission in neutral position)**
- (5) Remove the SST from the DLC3.
- (6) Check the ignition timing.
**Ignition timing: 7 to 24° BTDC at idle
(Transmission in neutral position)**
- (7) Disconnect the timing light from the engine.
- (8) Install the air cleaner cap.



IDLE SPEED INSPECTION

EM1XI-01

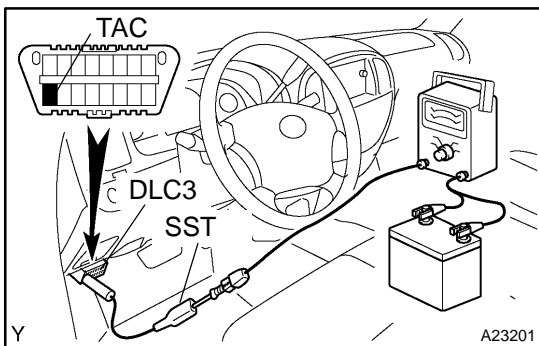
1. **When using a hand-held tester or OBD II scan tool.**
 - (a) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
 - (b) Please refer to the hand-held tester operator's manual for further details.
 - (c) Switch the air conditioning OFF.
 - (d) Race the engine at 2,500 rpm for approx. 90 seconds.
 - (e) Check the idle speed.

Idle speed: 650 to 750 rpm

(Transmission in neutral position)

If the idle speed is not as specified, check the air intake system.

- (f) Disconnect the hand-held tester or OBD II scan tool from the DLC3.



2. **When not using a hand-held tester or OBD II scan tool.**

- (a) Using SST, connect the tachometer probe to terminal TAC of the DLC3.
SST 09843-18030
- (b) Switch the air conditioning OFF.
- (c) Race the engine at 2,500 rpm for approx. 90 seconds.
- (d) Check the idle speed.

Idle speed: 650 to 750 rpm

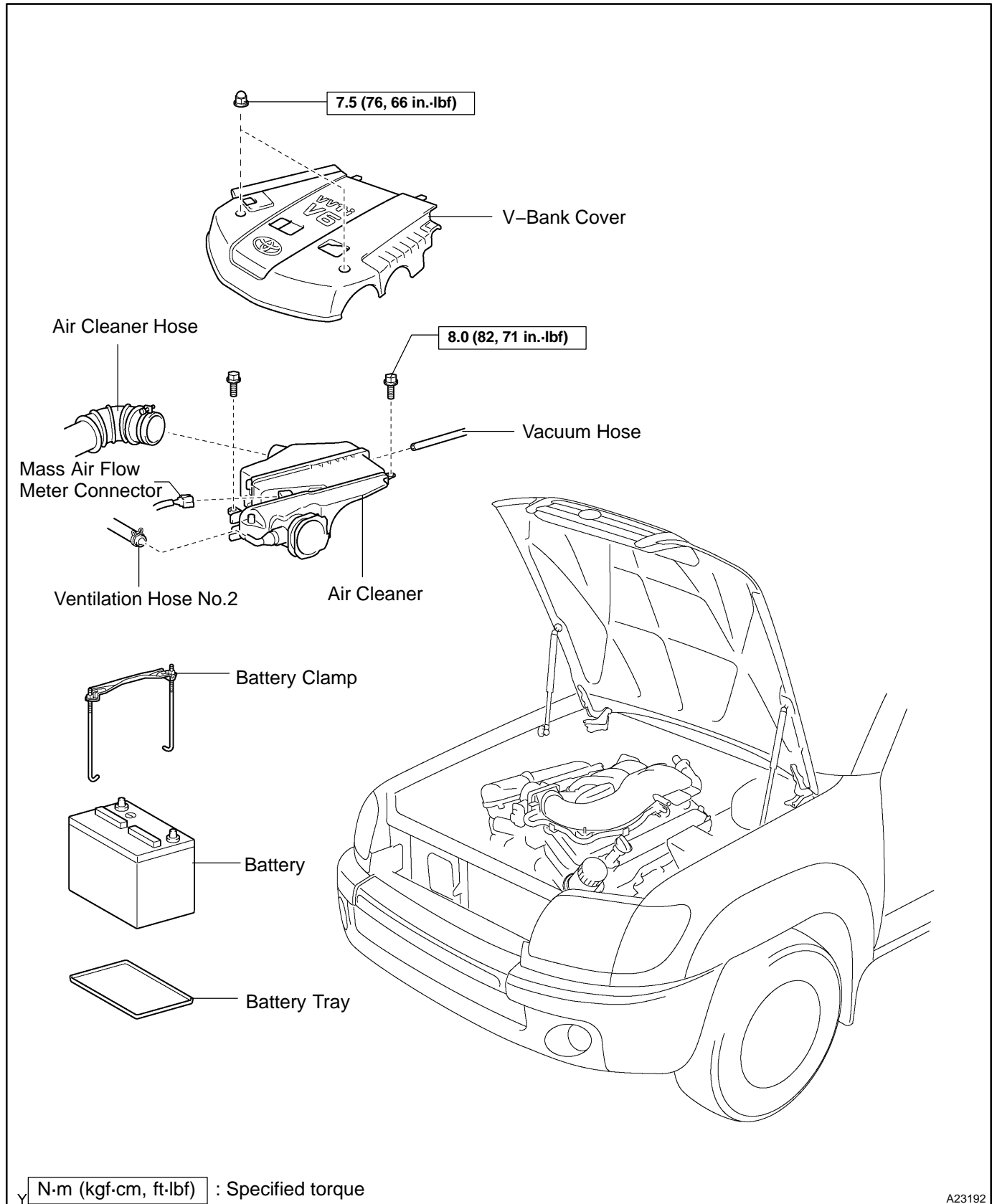
(Transmission in neutral position)

If the idle speed is not as specified, check the air intake system.

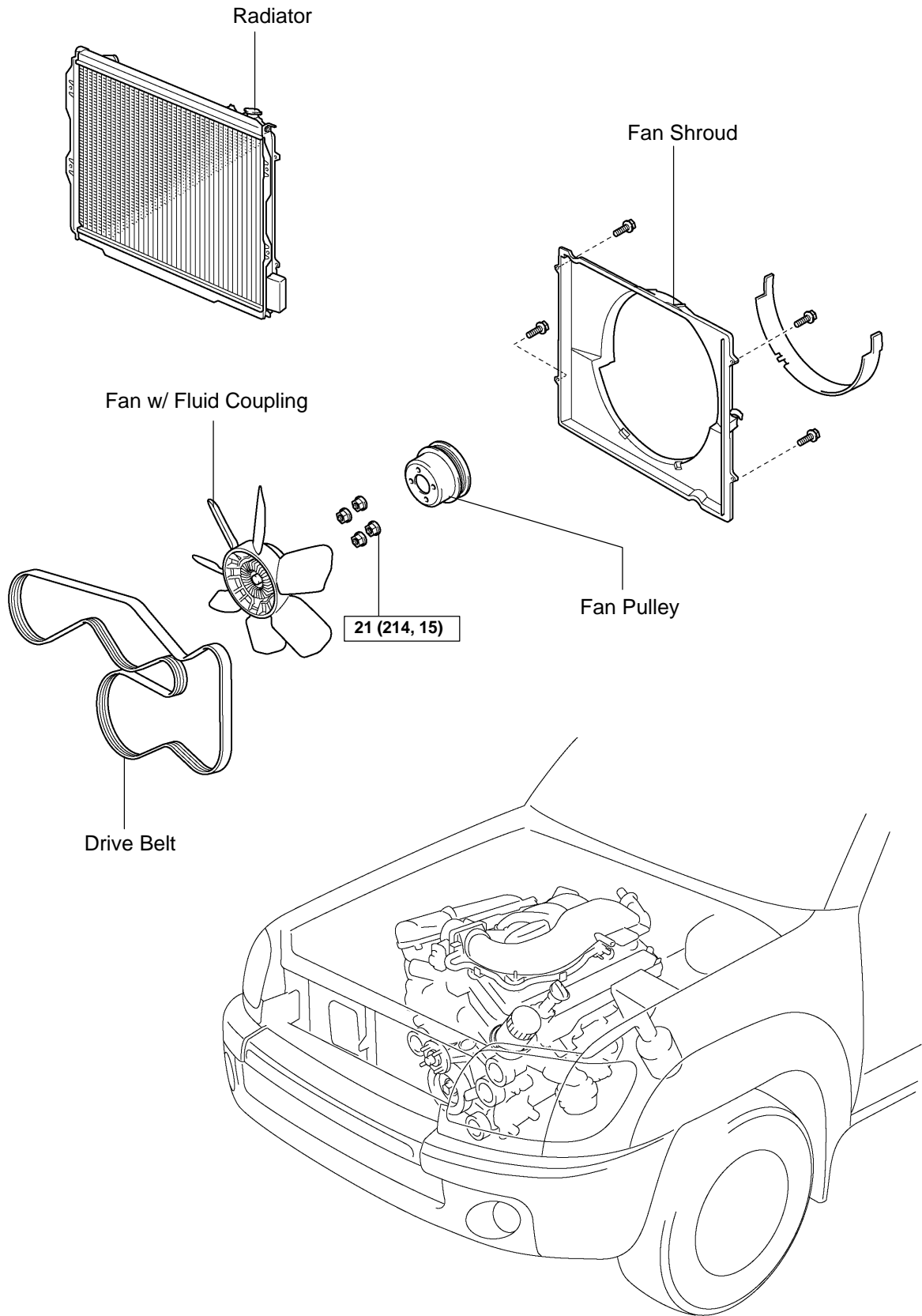
- (e) Disconnect the tachometer from the DLC3.

TIMING CHAIN COMPONENTS

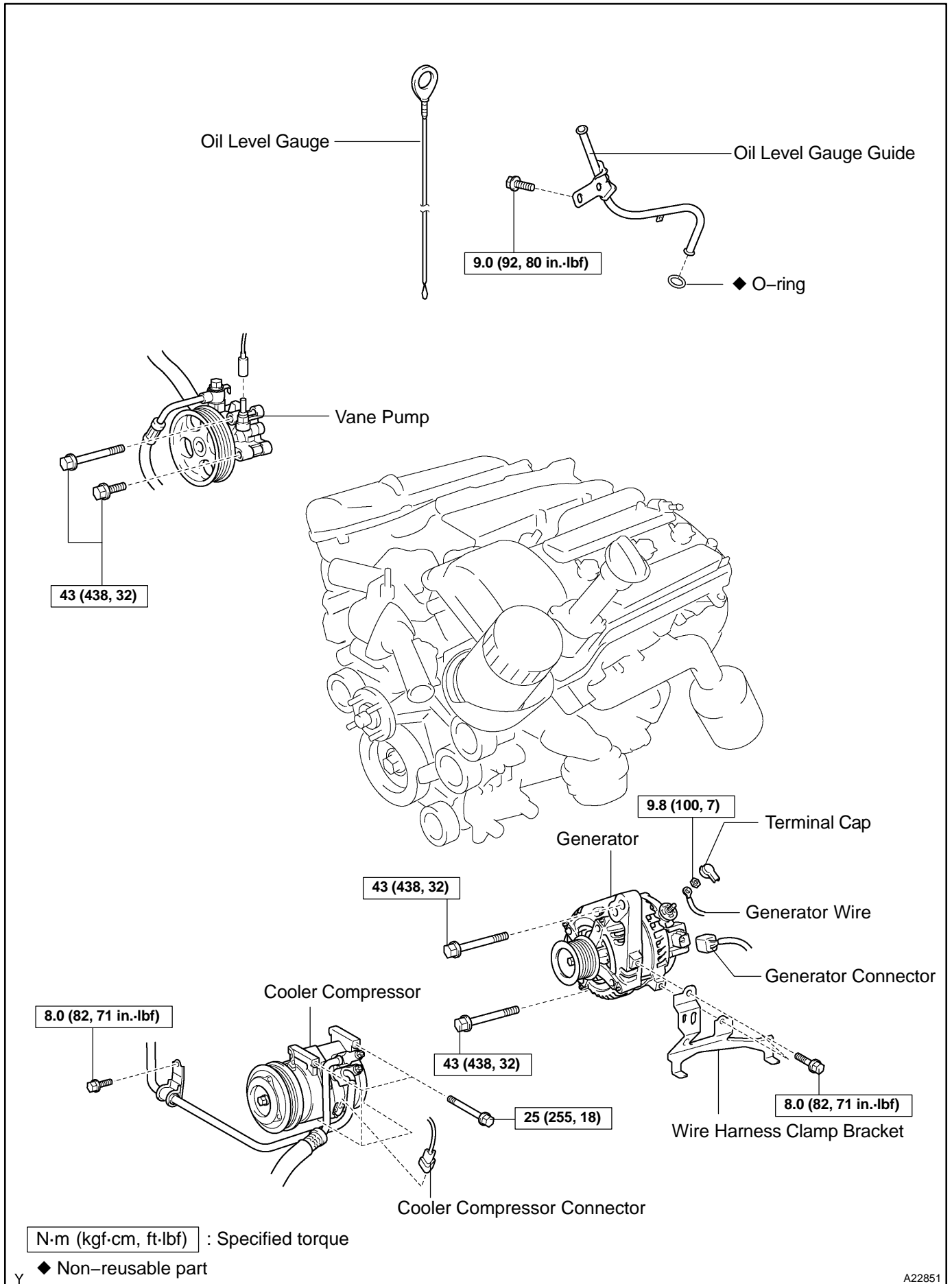
EM1XJ-01



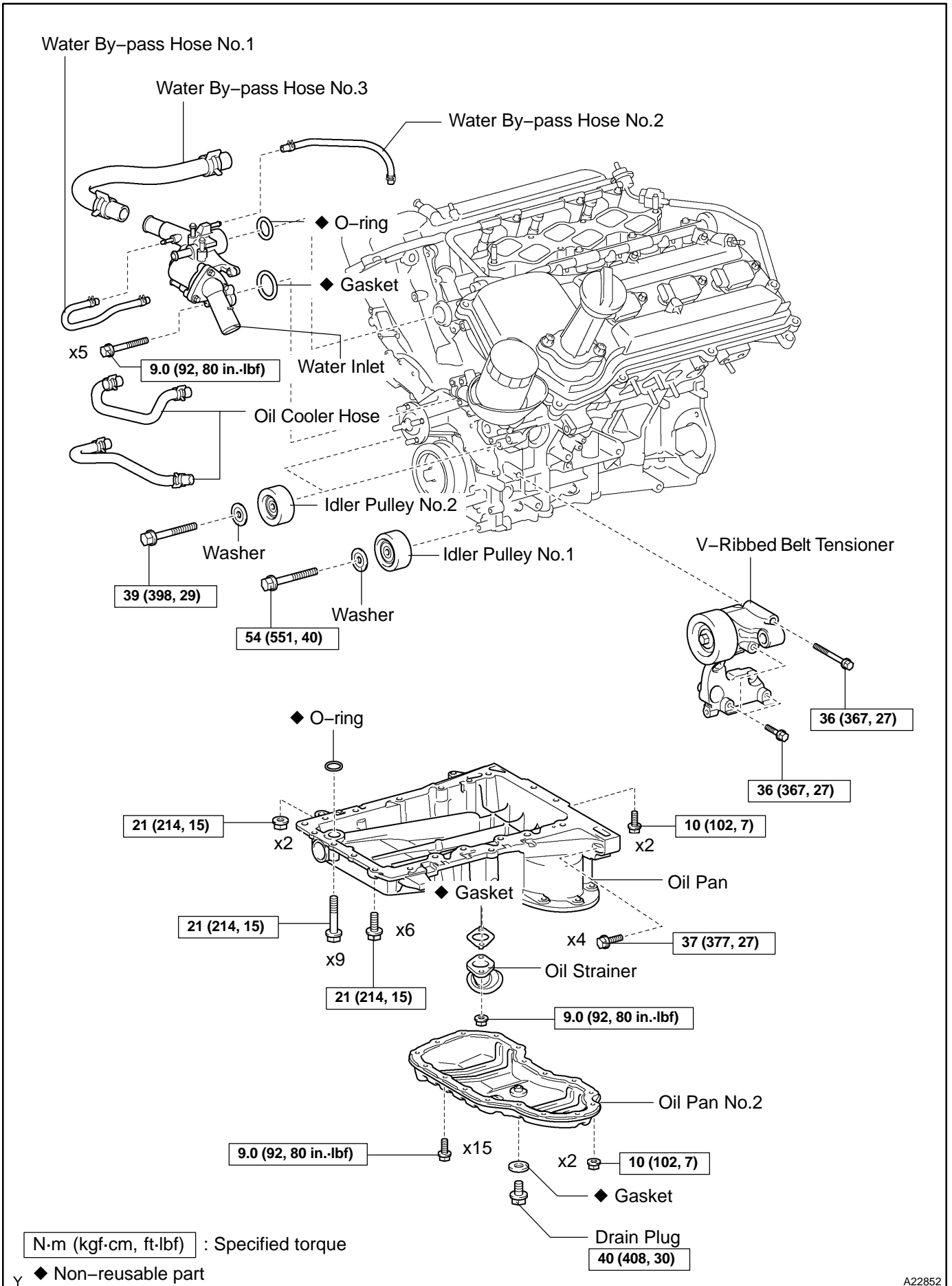
γ N·m (kgf·cm, ft·lbf) : Specified torque

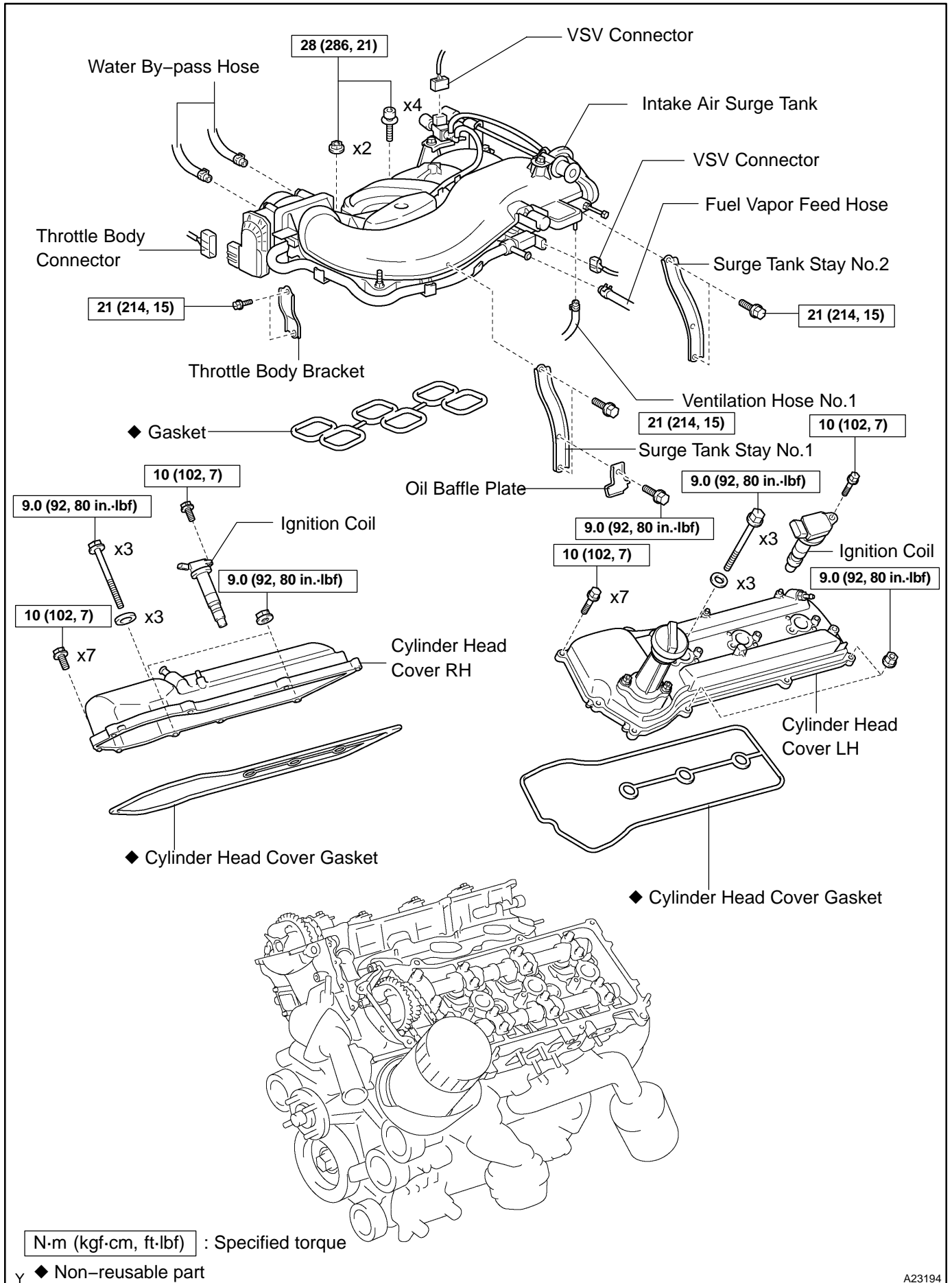


γ N·m (kgf·cm, ft·lbf) : Specified torque

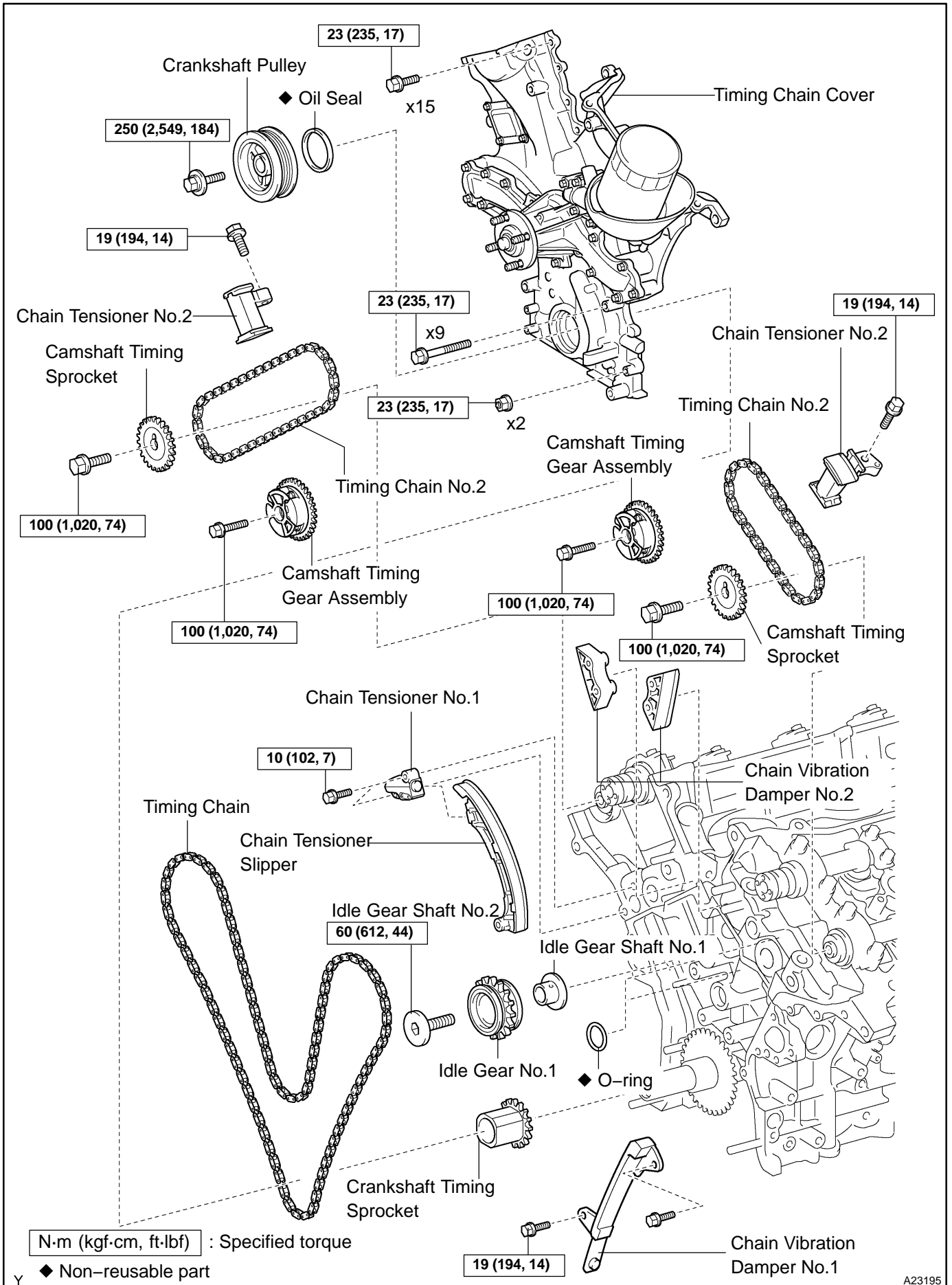


ENGINE MECHANICAL (1GR-FE) - TIMING CHAIN



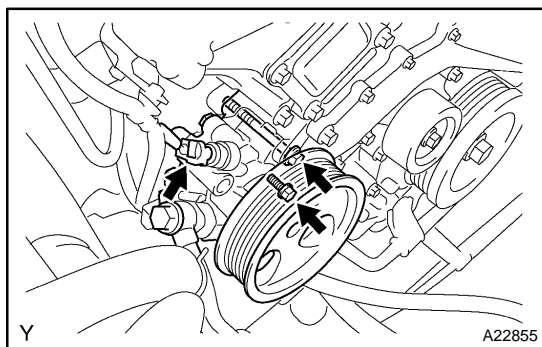


ENGINE MECHANICAL (1GR-FE) - TIMING CHAIN



REMOVAL

1. DRAIN ENGINE COOLANT (See page [CO-2](#))
2. DRAIN ENGINE OIL
3. REMOVE BATTERY
4. REMOVE V-BANK COVER
5. REMOVE RADIATOR (See page [CO-17](#))
6. LOOSEN FAN W/FLUID COUPLING
(See page [EM-62](#))
7. REMOVE DRIVE BELT (See page [EM-62](#))
8. REMOVE FAN W/FLUID COUPLING
9. REMOVE AIR CLEANER (See page [EM-62](#))
10. REMOVE INTAKE AIR SURGE TANK
(See page [EM-62](#))
11. REMOVE CYLINDER HEAD COVER
(See page [EM-62](#))
12. REMOVE VVT SENSOR
13. REMOVE OIL LEVEL GAUGE GUIDE
 - (a) Remove the oil level gauge.
 - (b) Remove the bolt and pull out the oil level gauge guide.
 - (c) Remove the O-ring from the oil level gauge guide.



14. SEPARATE VANE PUMP

- (a) Disconnect the P/S oil pressure switch connector.
- (b) Remove the 2 bolts, and separate the vane pump.

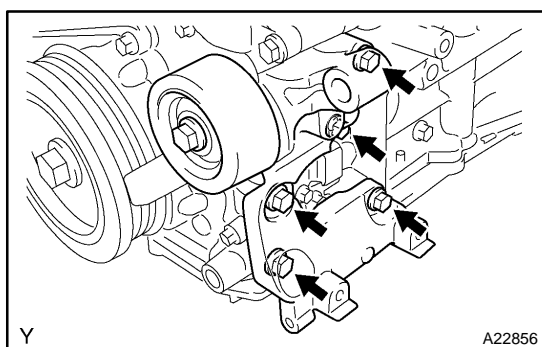
NOTICE:

Do not hit the pulley to other parts when separating the vane pump.

HINT:

The vane pump is suspended securely.

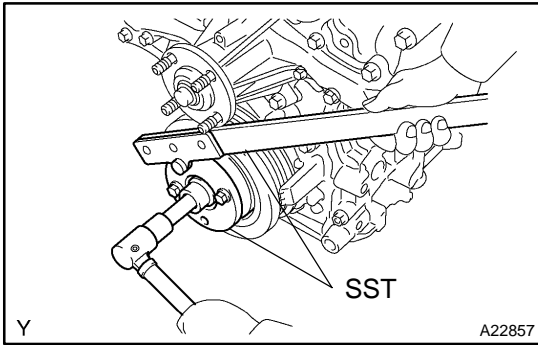
15. REMOVE GENERATOR (See page [CH-7](#))
16. SEPARATE COOLER COMPRESSOR
(See page [AC-54](#))



17. REMOVE V-RIBBED BELT TENSIONER

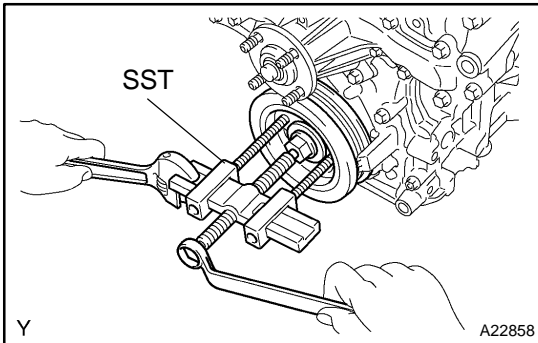
Remove the 5 bolts and V-ribbed belt tensioner.

18. REMOVE IDLER PULLEY NO.1 AND NO.2

**19. REMOVE CRANKSHAFT PULLEY**

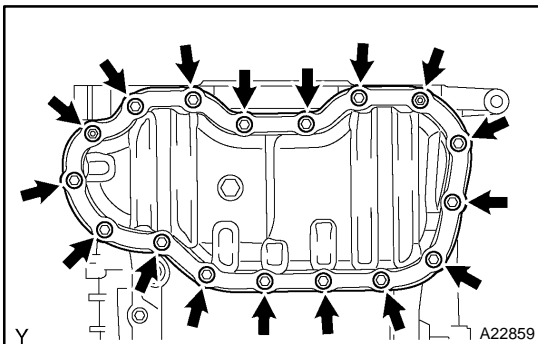
- (a) Using SST, hold the crankshaft pulley and loosen the pulley set bolt.

SST 09213-54015 (91651-60855), 09330-00021

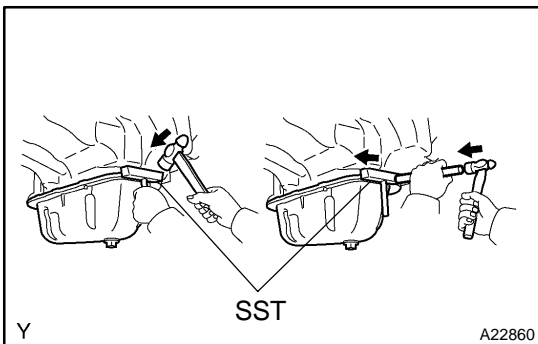


- (b) Using the pulley set bolt and SST, remove the crankshaft pulley.

SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)

**20. REMOVE OIL PAN NO.2**

- (a) Remove the 15 bolts and 2 nuts.

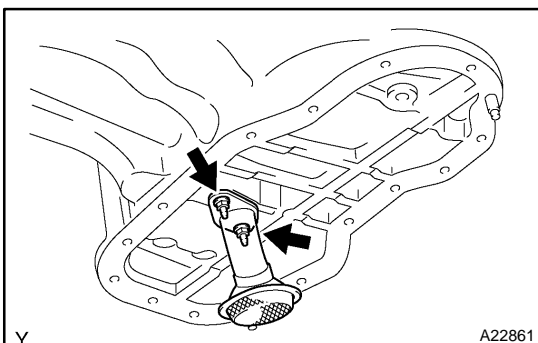


- (b) Insert the blade of SST between the oil pan and oil pan No. 2, cut off applied sealer and remove the oil pan No. 2.

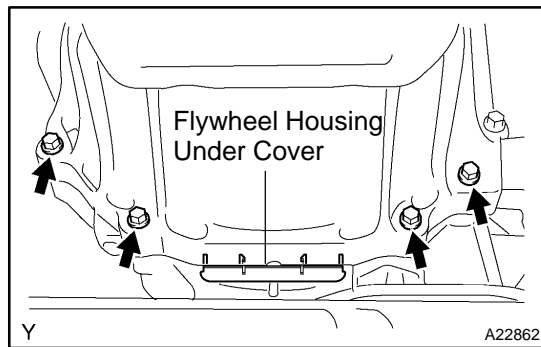
SST 09032-00100

NOTICE:

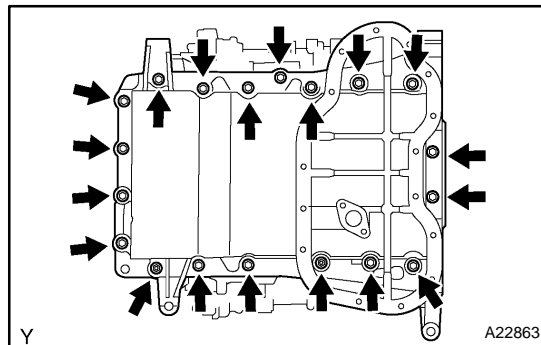
- Be careful not to damage the contact surface of the oil pan and oil pan No. 2.
- Be careful not to damage the oil pan No. 2 flange.

**21. REMOVE OIL STRAINER**

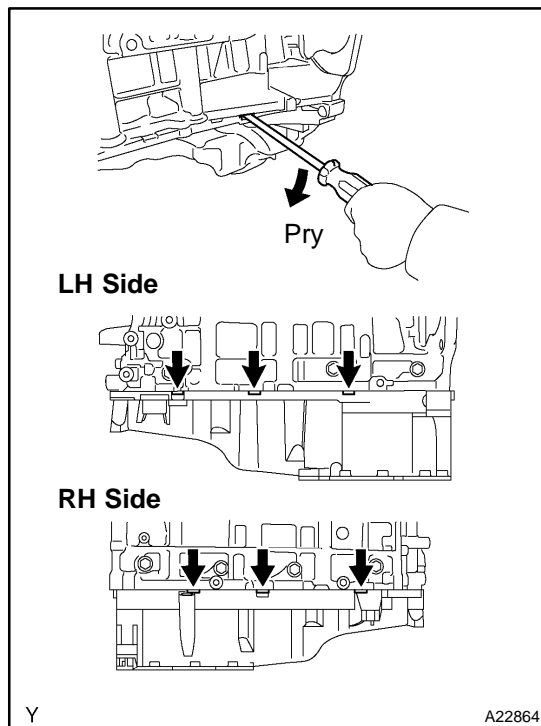
Remove the 2 nuts, oil strainer and gasket.

**22. REMOVE OIL PAN**

- (a) Remove the 4 housing bolts.
- (b) Remove the flywheel housing under cover.



- (c) Remove 17 bolts and 2 nuts.

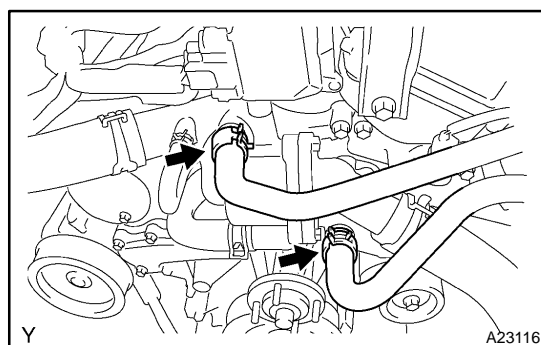


- (d) Using a screwdriver, remove the oil pan by prying between the oil pan and cylinder block in the sequence shown.

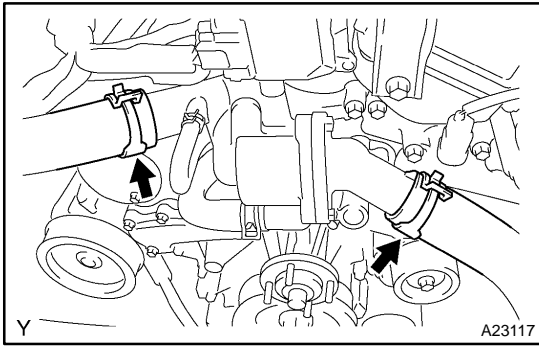
NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and oil pan.

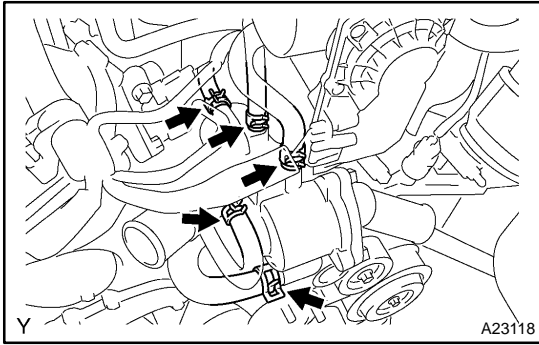
- (e) Remove the O-ring from the oil pump.

**23. REMOVE WATER INLET**

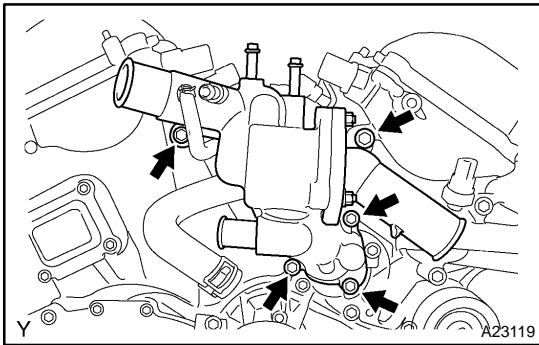
- (a) Disconnect the 2 oil cooler hoses (w/ oil cooler).



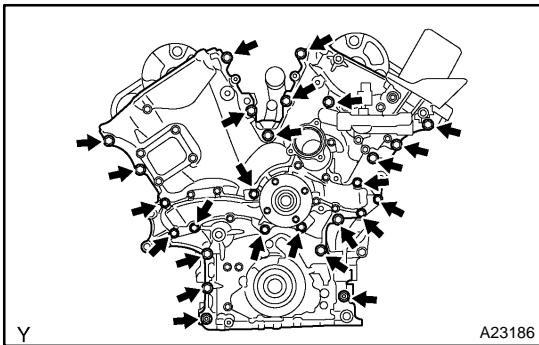
(b) Disconnect the 2 radiator hoses.



(c) Disconnect the 5 water by-pass hoses.

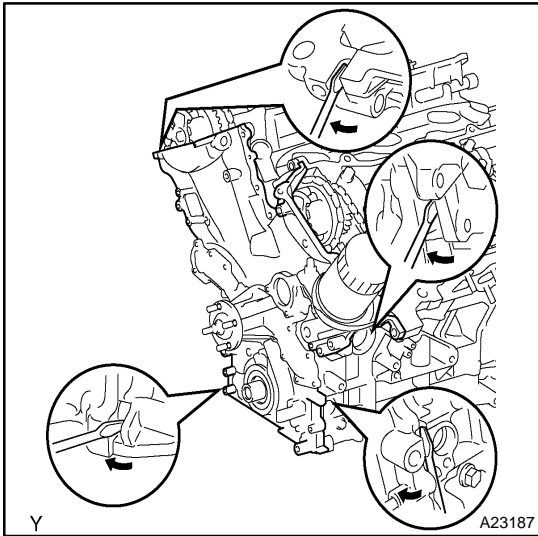


- (d) Remove the 5 bolts and water inlet.
- (e) Remove the O-ring from the water outlet pipe.
- (f) Remove the gasket from the water pump.



24. REMOVE TIMING CHAIN COVER

(a) Remove the 24 bolts and 2 nuts.

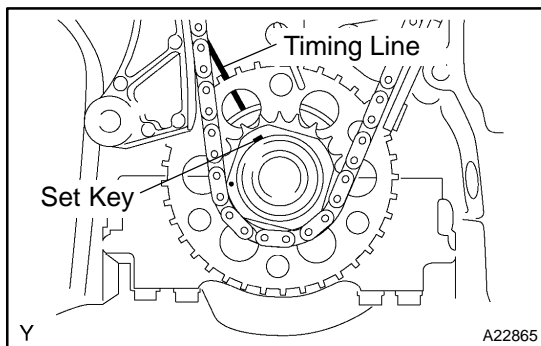


- (b) Remove the timing chain cover by prying between the timing chain cover and cylinder head or cylinder block with a screwdriver.

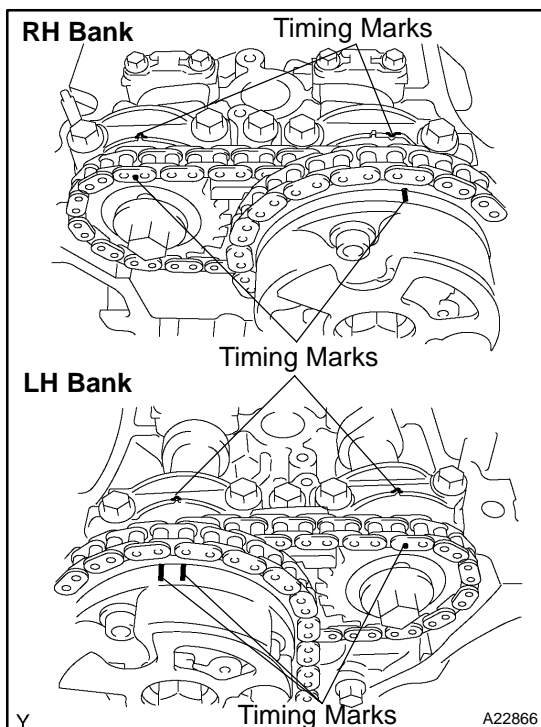
NOTICE:

Be careful not to damage the contact surfaces of the timing chain cover, cylinder block and cylinder head.

- (c) Remove the O-ring from the LH cylinder head.

**25. SET NO.1 CYLINDER TO TDC/COMPRESSION**

- (a) Install the crankshaft pulley set bolt, and turn the crankshaft to align the crankshaft set key with the timing line of the cylinder block.

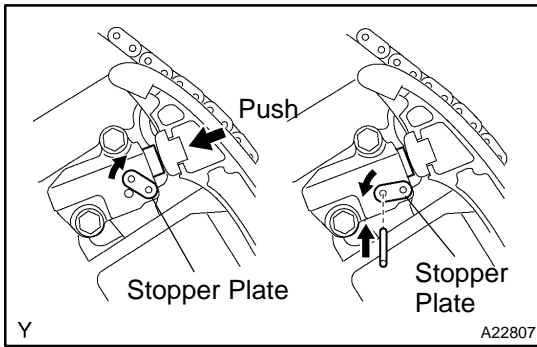


- (b) Check that the timing marks of the camshaft timing gear assembly and camshaft timing sprocket are aligned with the timing marks of the bearing caps as shown in the illustration.

If not, turn the crankshaft 1 complete revolution (360 °) and align the timing marks as above.

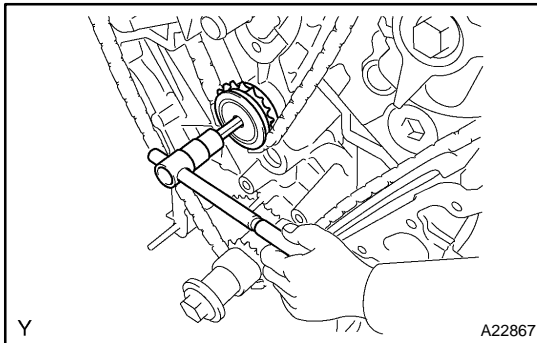
26. REMOVE CHAIN TENSIONER NO.1**NOTICE:**

- **Never rotate the crankshaft with the chain tensioner removed.**
- **When rotating the camshaft with the timing chain removed, rotate the crankshaft counterclockwise 40° from the TDC first.**



- (a) While turning the stopper plate of the tensioner clockwise, push in the plunger of the chain tensioner as shown in the illustration.
- (b) While turning the stopper plate of the tensioner counter-clockwise, insert a bar of ϕ 3.5 mm (0.138 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.
- (c) Remove the 2 bolts and chain tensioner.

27. REMOVE CHAIN TENSIONER SLIPPER



28. REMOVE IDLE GEAR NO.1

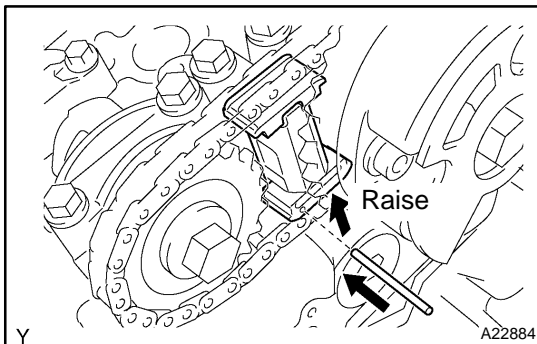
Using a 10 mm hexagon wrench, remove the idle gear shaft No. 2, idle gear No. 1 and idle gear shaft No. 1.

29. REMOVE CHAIN VIBRATION DAMPER NO.2

Remove the 2 chain vibration damper No.2.

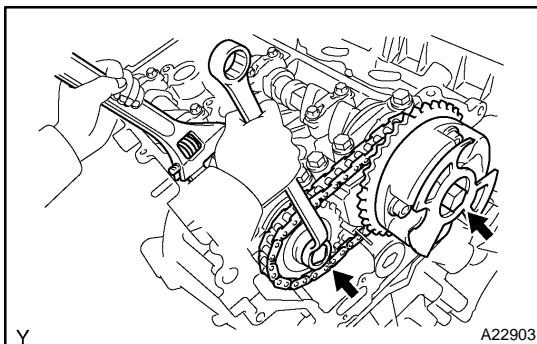
30. REMOVE NO.1 TIMING CHAIN

31. REMOVE CRANKSHAFT TIMING SPROCKET



32. REMOVE NO.2 TIMING CHAIN

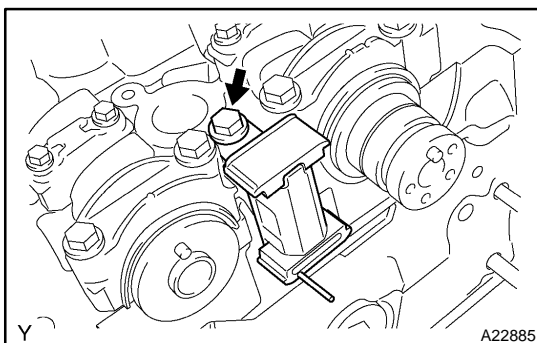
- (a) While raising the chain tensioner No. 2, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.



- (b) Hold the hexagonal portion of the camshaft with a wrench, and remove the 2 bolts, camshaft timing sprocket, camshaft timing gear assembly and timing chain No.2.

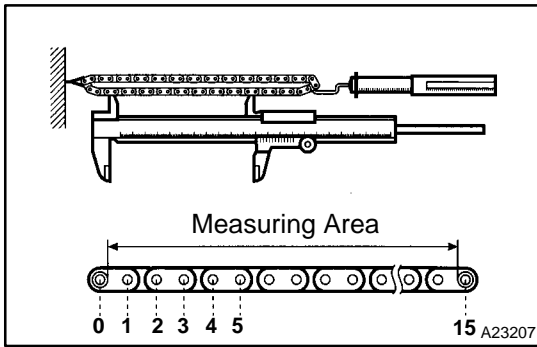
NOTICE:

- Be careful not to damage the cylinder head and valve lifter with the wrench.
- Do not disassemble the camshaft timing gear assembly.



33. REMOVE CHAIN TENSIONER NO.2

Remove the bolt and chain tensioner No.2.



INSPECTION

1. INSPECT NO.1 AND NO.2 TIMING CHAINS

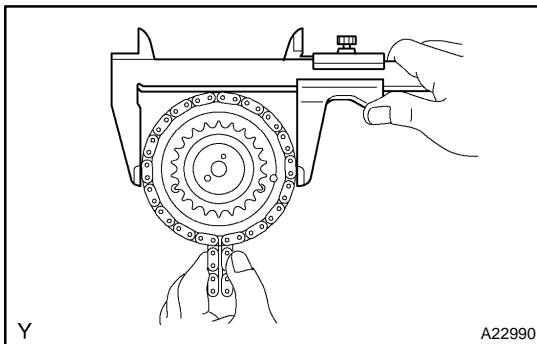
Using a spring scale, pull the chain sub assembly with 147 N (15.0 kgf, 33.1 lbf) of force and measure the length of the chain sub assembly using a vernier caliper.

Maximum chain elongation: 146.8 mm (5.780 in.)

NOTICE:

Perform the same measurements by pulling at random in 3 or more places to obtain an average length.

If the elongation is greater than the maximum, replace the chain.



2. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

- Put the No. 1 chain on the larger gear of the camshaft timing gear assembly.
- Using a vernier caliper, measure the timing gear with the chain.

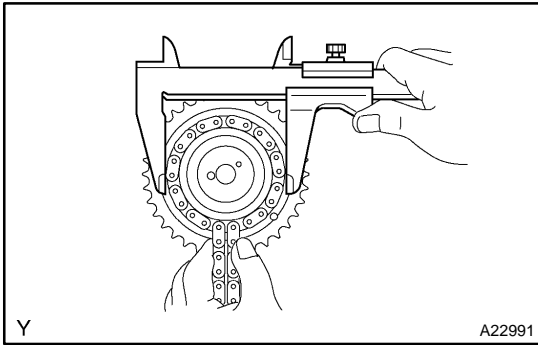
Minimum gear diameter (w/ chain):

115.5 mm (4.547 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measuring.

If the diameter is less than the minimum, replace the No. 1 chain and camshaft timing gear assembly.



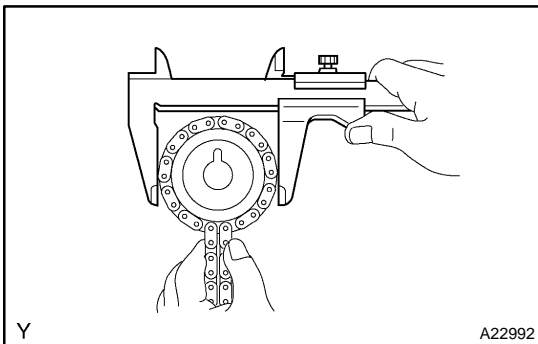
- (c) Put the No. 2 chain on the smaller gear of the camshaft timing gear assembly.
- (d) Using a vernier caliper, measure the timing gear with the chain.

Minimum gear diameter (w/ chain):
73.1 mm (2.878 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measuring.

If the diameter is less than the minimum, replace the No. 2 chain and camshaft timing gear assembly.



3. INSPECT CAMSHAFT TIMING SPROCKET

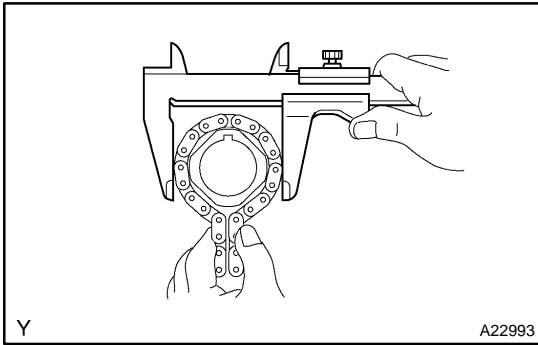
- (a) Put the No. 2 chain on the camshaft timing sprocket.
- (b) Using a vernier caliper, measure the camshaft timing sprocket diameter with the chain .

Minimum gear diameter (w/ chain):
73.1 mm (2.878 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measuring.

If the diameter is less than the minimum, replace the No. 2 chain and the camshaft timing sprocket.



4. INSPECT CRANKSHAFT TIMING SPROCKET

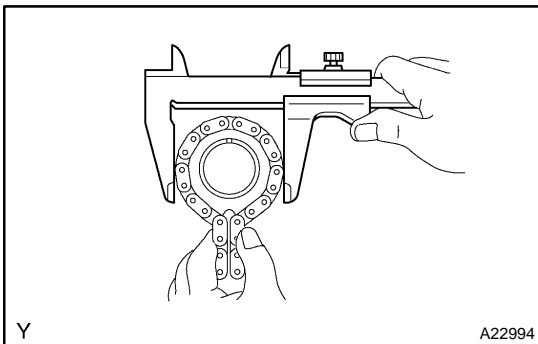
- (a) Put the No. 1 chain on the crankshaft timing sprocket.
- (b) Using a vernier caliper, measure the crankshaft timing gear diameter with the chain.

Minimum gear diameter (w/ chain):
61.0 mm (2.402 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measuring.

If the diameter is less than the minimum, replace the No. 1 chain and crankshaft timing sprocket.



5. INSPECT IDLE GEAR NO.1

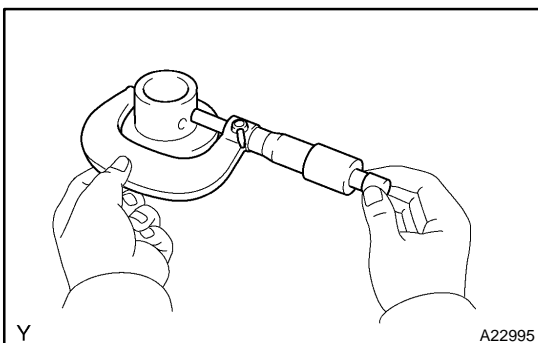
- (a) Put the No. 1 chain on the idle gear.
- (b) Using a vernier caliper, measure the idle gear with the chain.

Minimum gear diameter (w/ chain):
61.0 mm (2.402 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measuring.

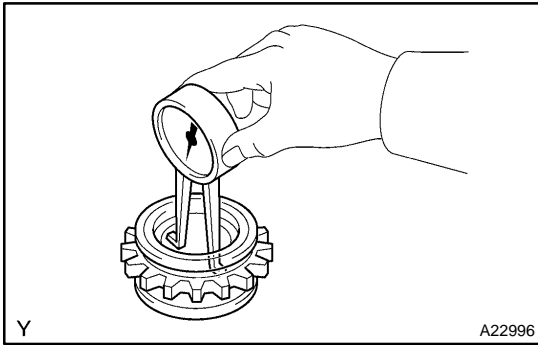
If the diameter is less than the minimum, replace the No. 1 chain and idle gear.



6. INSPECT IDLE GEAR SHAFT OIL CLEARANCE

- (a) Using a micrometer, measure the idle gear shaft diameter.

Idle gear shaft diameter:
22.987 to 23.000 mm (0.9050 to 0.9055 in.)



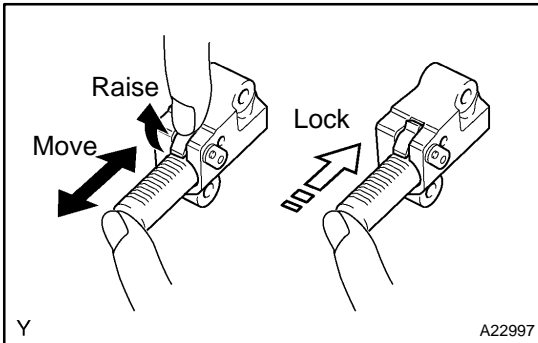
- (b) Using a caliper gauge, measure the inside diameter of the idle gear.

Idle gear inside diameter:
23.02 to 23.03 mm (0.9063 to 0.9067 in.)

- (c) Subtract the idle gear shaft diameter measurement from the idle gear inside diameter measurement.

Standard oil clearance:
0.020 to 0.043 mm (0.0008 to 0.0017 in.)

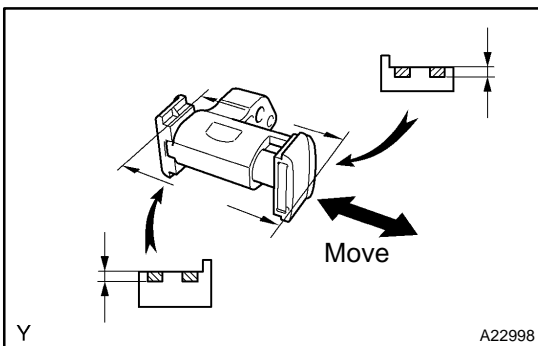
Maximum oil clearance:
0.093 mm (0.0037 in.)



7. INSPECT CHAIN TENSIONER NO.1

- (a) Check that the plunger moves smoothly when the ratchet pawl is raised with a finger.

- (b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushing with a finger.

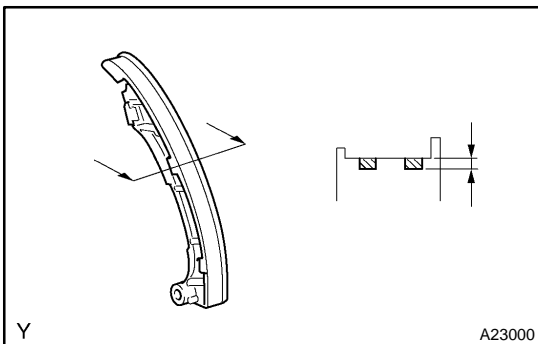


8. INSPECT CHAIN TENSIONER NO.2

- (a) Check that the plunger moves smoothly.

- (b) Measure the worn depth of the chain tensioner slipper.
Maximum depth: 1.0 mm (0.039 in.)

If the depth is greater than the maximum, replace the chain tensioner No. 2.

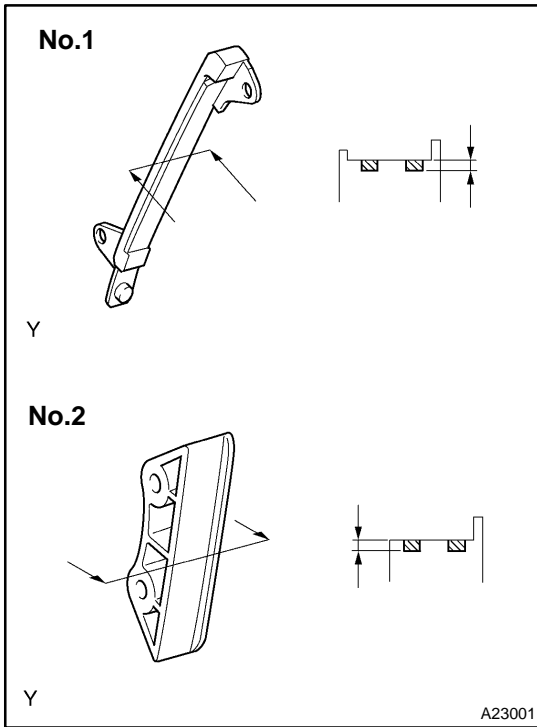


9. INSPECT CHAIN TENSIONER SLIPPER

Measure the worn depth of the chain tensioner slipper.

Maximum depth: 1.0 mm (0.039 in.)

If the depth is greater than the maximum, replace the chain tensioner slipper.

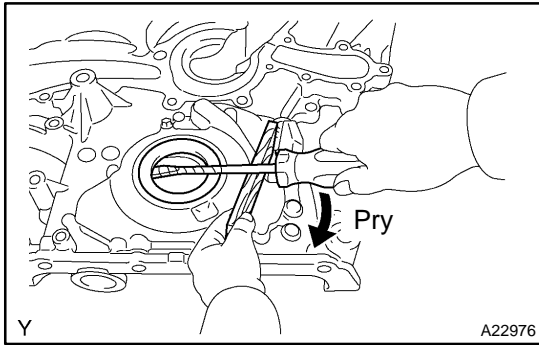


10. INSPECT CHAIN VIBRATION DAMPER NO.1 AND NO.2

Measure the worn depth of the chain vibration damper No. 1 and No. 2.

Maximum depth: 1.0 mm (0.039 in.)

If the depth is greater than the maximum, replace the chain vibration damper No. 1 or No.2.



REPLACEMENT

HINT:

There are 2 methods ((a) and (b)) to replace the oil seal.

REPLACE TIMING CHAIN COVER OIL SEAL

(a) If the rear timing chain cover is removed:

- (1) Using a screwdriver, pry out the oil seal.

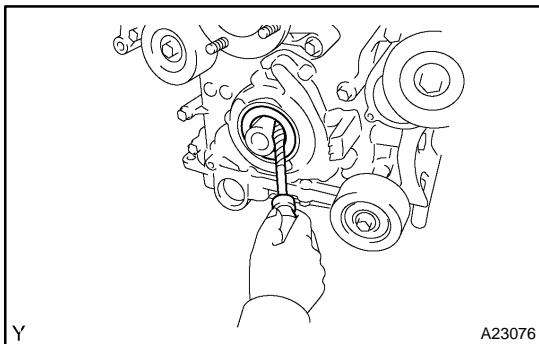
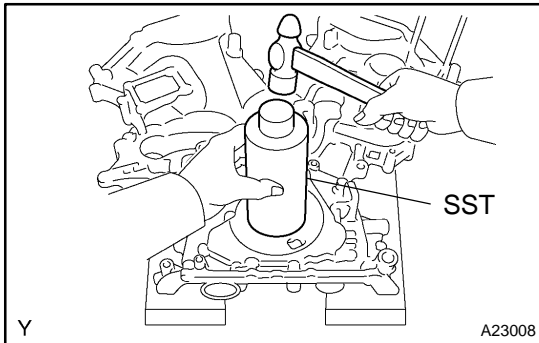
NOTICE:

Be careful not to damage the oil pump. Wrap the tip of the screwdriver with tape.

- (2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.

SST 09226-10010

- (3) Apply MP grease to the oil seal lip.



(b) If the rear timing chain cover is installed:

- (1) Using a screwdriver, pry out the oil seal.

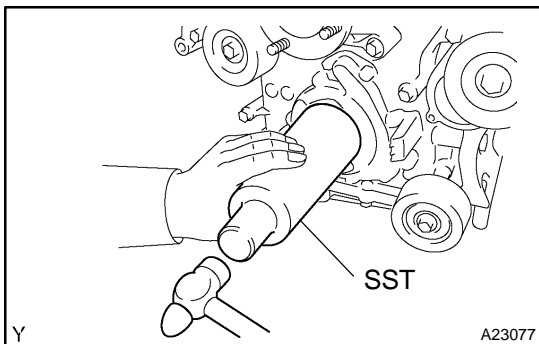
NOTICE:

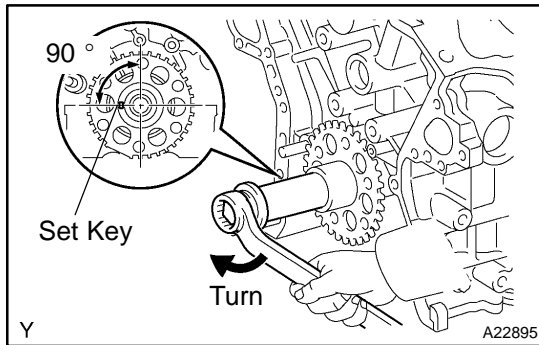
Be careful not to damage the crankshaft. Wrap the tip of the screwdriver with tape.

- (2) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.

SST 09226-10010

- (3) Apply MP grease to a new oil seal lip.





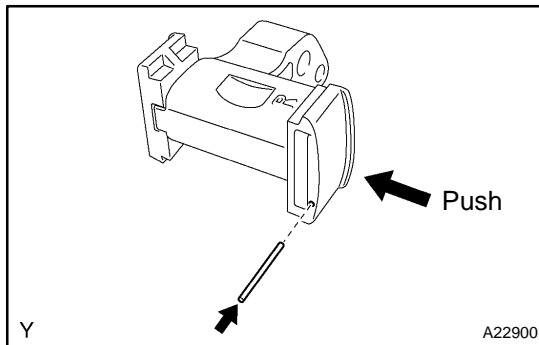
INSTALLATION

1. SET CRANKSHAFT POSITION

Using the crankshaft pulley set bolt, turn the crankshaft, and set the crankshaft set key into the left horizontal position.

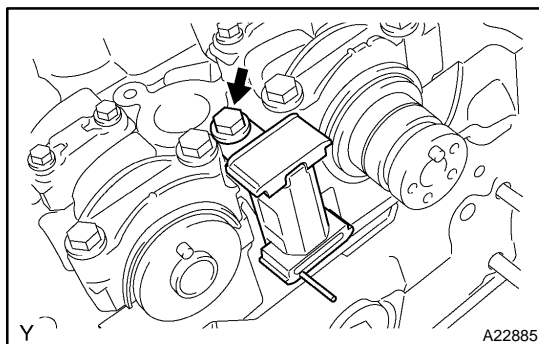
NOTICE:

Having the crankshaft at the wrong angle can cause the piston head and valve head to come into contact with each other when you install the camshaft, causing damage. So always set the crankshaft at the correct angle.

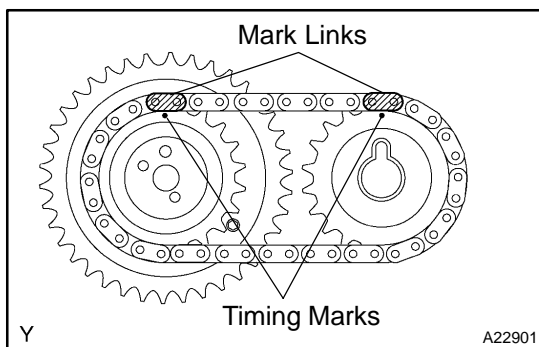


2. INSTALL CHAIN TENSIONER NO.2

- (a) While pushing in the tensioner, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.

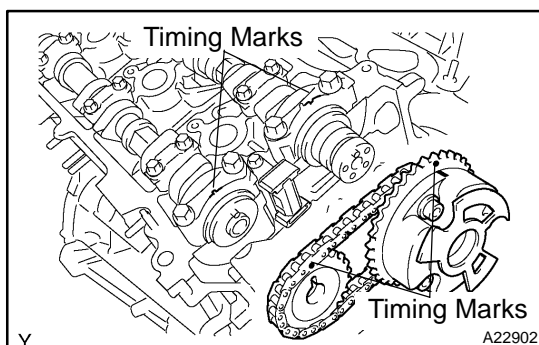


- (b) Install the chain tensioner No. 2 with the bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



3. INSTALL NO.2 TIMING CHAIN

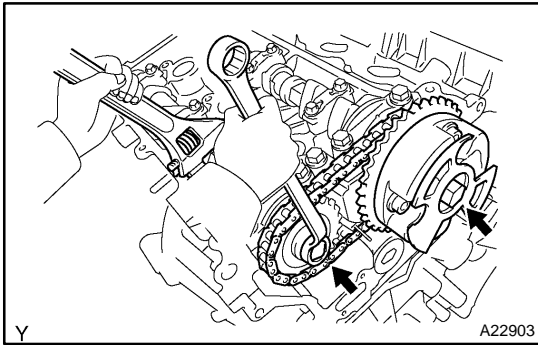
- (a) Align the mark links (yellow) with the timing marks (1-dot mark) of the camshaft timing gear assembly and camshaft timing sprocket as shown in the illustration.



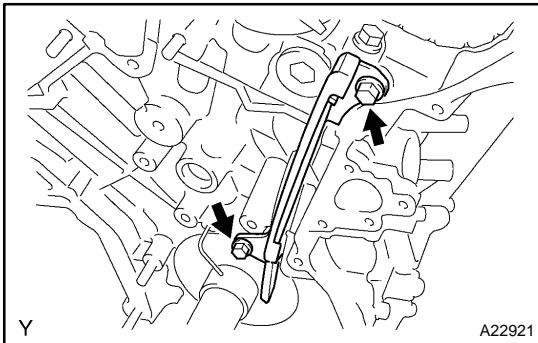
- (b) Align the timing marks on the camshaft timing gear assembly and camshaft timing sprocket with the timing marks on the bearing caps, and install the camshaft timing gears with the chain to the RH camshafts.
- (c) Temporarily install the 2 camshaft timing gear bolts.

NOTICE:

Do not push camshaft timing gear assembly to the camshaft forcibly when installing it.

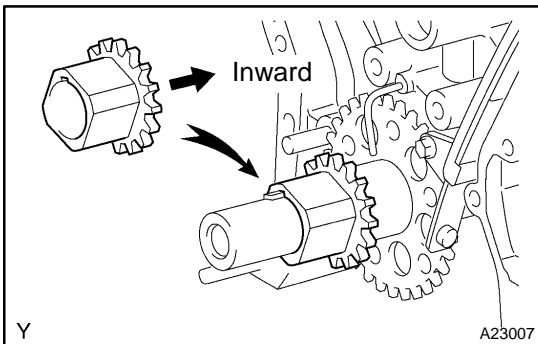


- (d) Hold the hexagonal portion of the camshaft with a wrench, and tighten the 2 bolts.
Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)
- (e) Remove the pin from the chain tensioner No. 2.



4. INSTALL CHAIN VIBRATION DAMPER NO.1

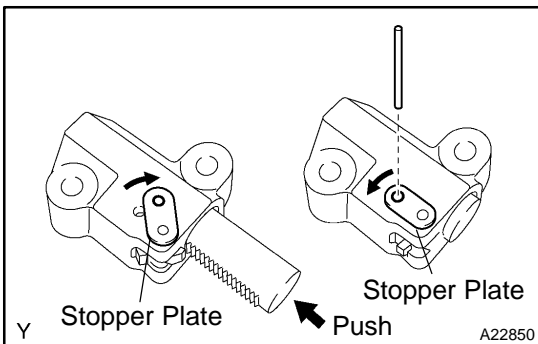
- (a) Install the chain vibration damper No. 1 with the 2 bolts.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



5. INSTALL CRANKSHAFT TIMING SPROCKET

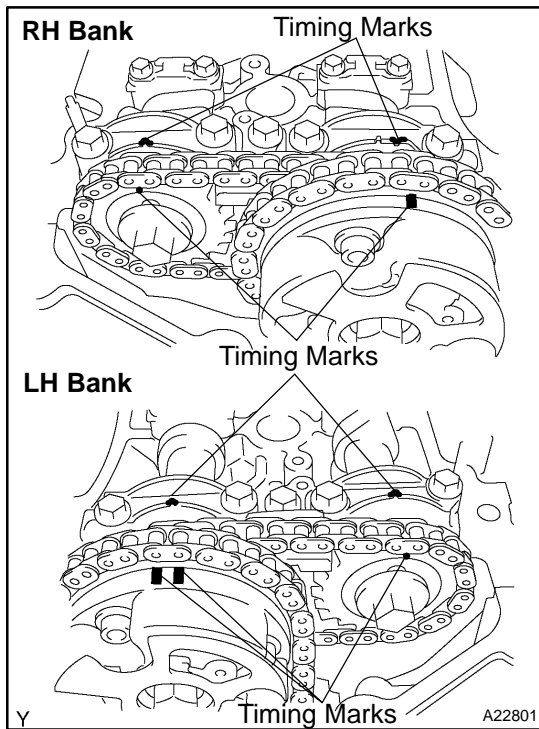
- (a) Align the timing gear set key with the key groove of the timing sprocket.
- (b) Install the timing gear onto the crankshaft with the sprocket side facing inward.

6. INSTALL CHAIN TENSIONER SLIPPER



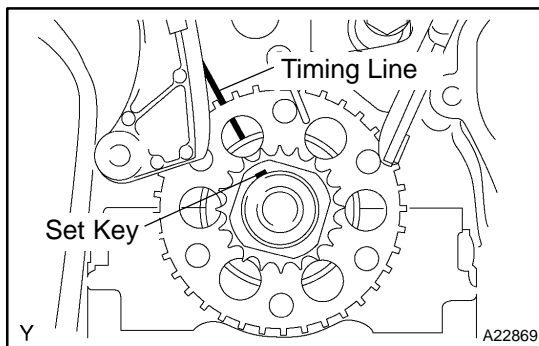
7. INSTALL CHAIN TENSIONER NO.1

- (a) While turning the stopper plate of the tensioner clockwise, push in the plunger of the tensioner as shown in the illustration.
- (b) While turning the stopper plate of the tensioner counter-clockwise, insert a bar of ϕ 3.5 mm (0.138 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.
- (c) Install the chain tensioner with the 2 bolts.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

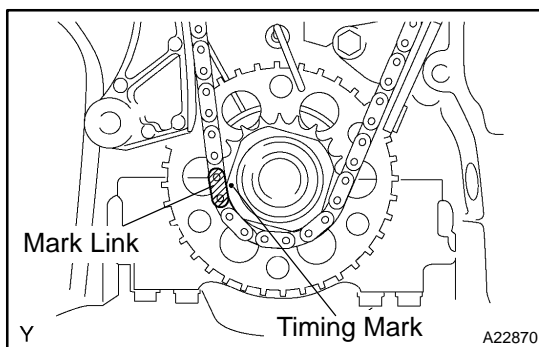


8. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (a) Align the timing marks of the camshaft timing gear assembly, camshaft timing sprocket and bearing caps.

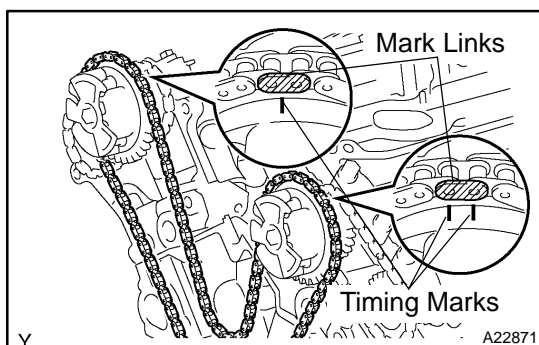


- (b) Using the crankshaft pulley set bolt, turn the crankshaft to align the crankshaft set key with the timing line of the cylinder block.



9. INSTALL TIMING CHAIN NO.1

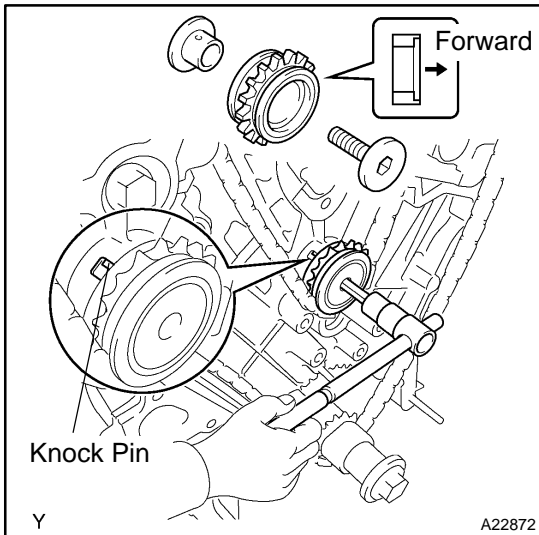
- (a) Align the mark link (yellow) with the timing mark of the crankshaft timing sprocket.



- (b) Align the mark links (orange) with the timing marks of the camshaft timing gear assembly and camshaft timing sprocket, and install the chain.

10. INSTALL CHAIN VIBRATION DAMPER NO.2

- Install the 2 chain vibration damper No.2.

**11. INSTALL IDLE GEAR NO.1**

- (a) Apply a light coat of engine oil to the rotating surface of the idle gear shaft No. 1.
- (b) Temporarily install the idle gear shaft No. 1 and idle gear No. 1 with the idle gear shaft No. 2 while aligning the knock pin of the idle gear shaft No. 1 with the knock pin groove of the cylinder block.

NOTICE:

Be careful of the idle gear direction.

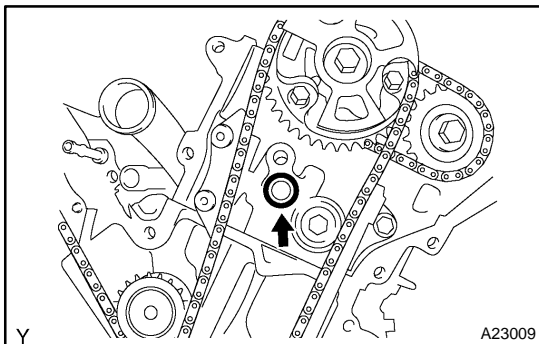
- (c) Using a 10 mm hexagon wrench, tighten the idle gear shaft No. 2.

Torque: 60 N·m (612 kgf·cm, 44 ft·lbf)

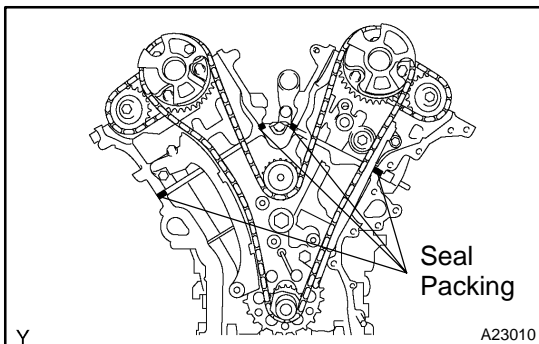
- (d) Remove the bar from the chain tensioner.

12. INSTALL TIMING CHAIN COVER

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.

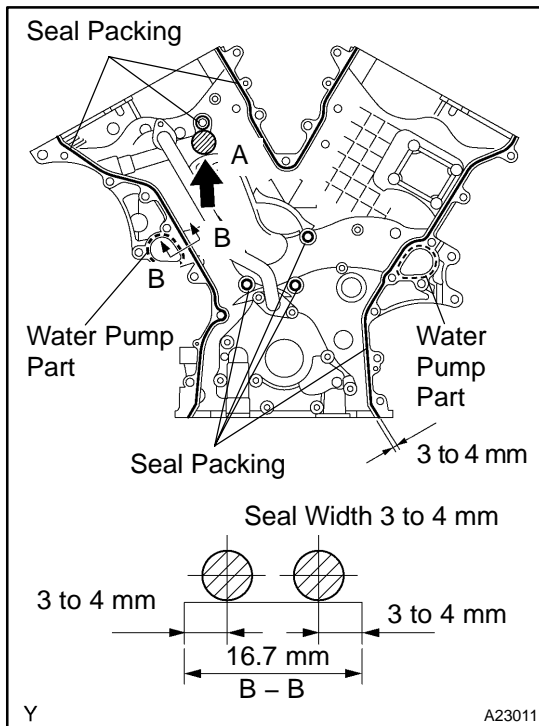


- (b) Install a new O-ring to the LH cylinder head as shown in the illustration.



- (c) Apply a continuous bead of seal packing (diameter 3 to 4 mm (0.12 to 0.16 in.)) to 4 locations as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent



- (d) Apply a continuous bead of seal packing (diameter 3 to 4 mm (0.12 to 0.16 in.)) to the timing chain cover as shown in the illustration.

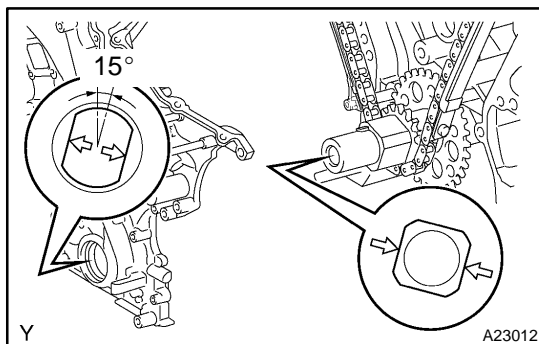
Seal packing:

Water pump part: Part No. 08826-00100 or equivalent

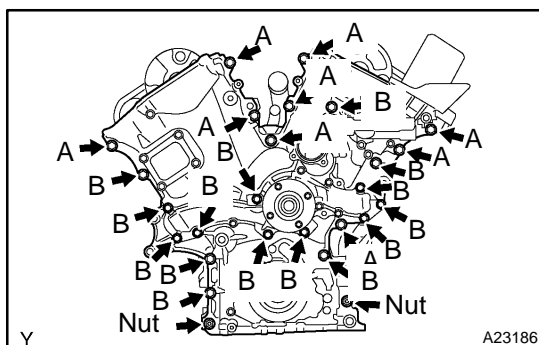
Other part: Part No. 08826-00080 or equivalent

NOTICE:

- Install the timing chain cover within 3 minutes after applying seal packing. After installing it, the timing chain cover bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.
- Do not apply seal packing to the "A" as shown in the illustration.



- (e) Align the key way of the oil pump drive rotor with the rectangular portion of the crankshaft timing gear, and slide the timing chain cover into place.



- (f) Install the timing chain cover with the 24 bolts and 2 nuts. Tighten the bolts and nuts uniformly in several steps.
Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

NOTICE:

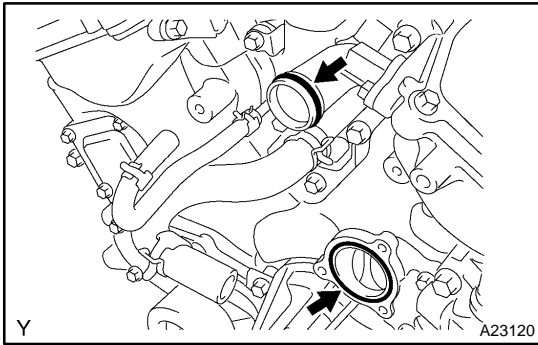
- Pay attention not to wrap the chain and slipper over the timing chain cover seal line.
- Install the water pump within 15 minutes after installing the timing chain cover.

HINT:

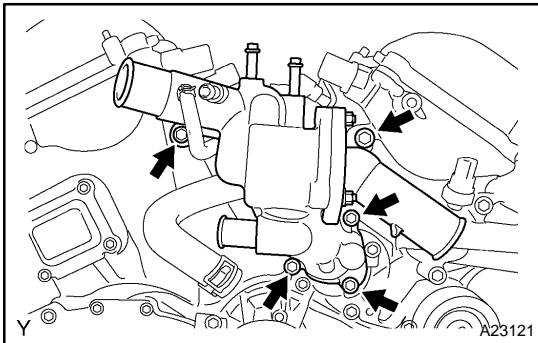
Each bolt length is as follows:

A: 25 mm (0.98 in.)

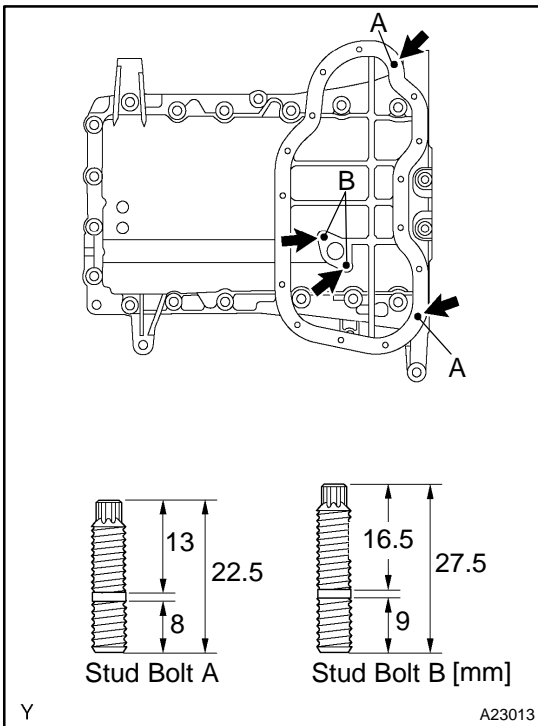
B: 55 mm (2.17 in.)

**13. INSTALL WATER INLET**

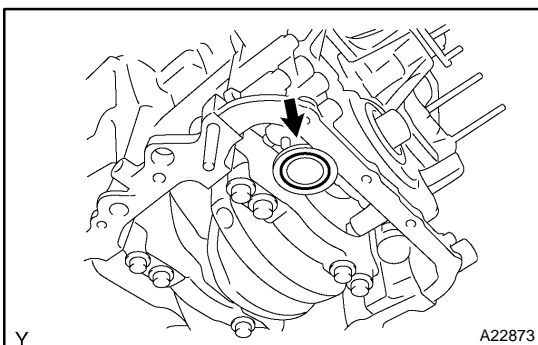
- (a) Install a new O-ring to the water outlet pipe.
- (b) Install a new gasket to the water pump.
- (c) Apply soapy water to the O-ring.



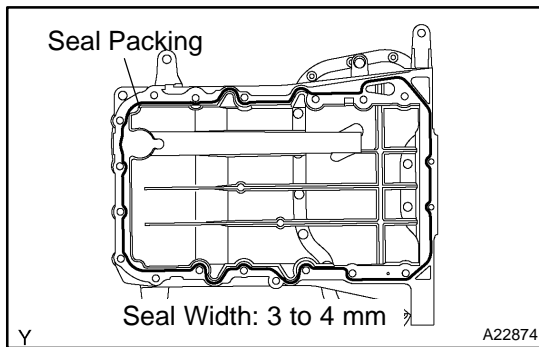
- (d) Install the water inlet with the 5 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)
- (e) Connect the 5 water by-pass hoses.
- (f) Connect the 2 radiator hoses.
- (g) Connect the 2 oil cooler hoses (w/ oil cooler).

**14. INSTALL OIL PAN**

- (a) Install the 4 stud bolts.
Torque: 4.0 N·m (41 kgf·cm, 35 in.-lbf)
- (b) Remove any old packing material (FIPG) and be careful not to drop any oil on the contact surfaces of the cylinder block, rear oil seal retainer and oil pan.



- (c) Install a new O-ring to the oil pump.

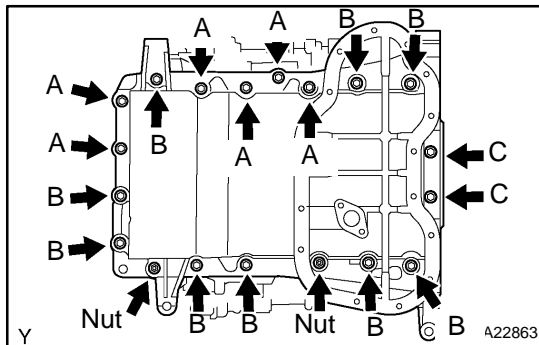


- (d) Apply a continuous bead of seal packing (diameter 3 to 4 mm (0.12 to 0.16 in.)) to the oil pan as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Install the oil pan within 3 minutes after applying seal packing. After installing it, the oil pan bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.



- (e) Install the oil pan with the 17 bolts and 2 nuts. Tighten the bolts and nuts uniformly in several steps.

Torque:

Bolt A, B, Nut: 21 N·m (214 kgf·cm, 15 ft·lbf)

Bolt C: 10 N·m (102 kgf·cm, 7 ft·lbf)

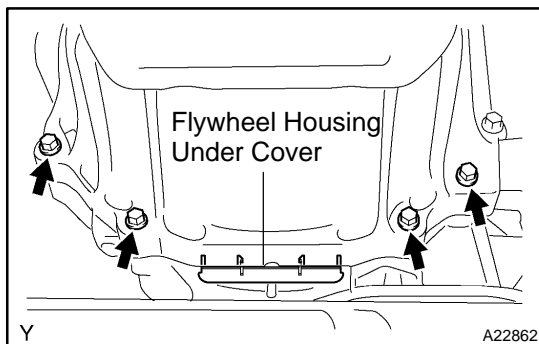
HINT:

Each bolt length is as follows:

A: 25 mm (0.98 in.)

B: 45 mm (1.77 in.)

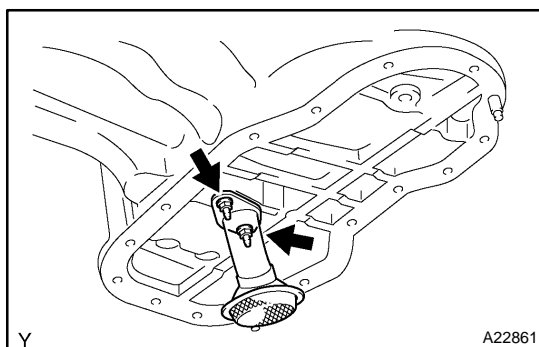
C: 14 mm (0.55 in.)



- (f) Install the 4 housing bolts.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

- (g) Install the flywheel housing under cover.



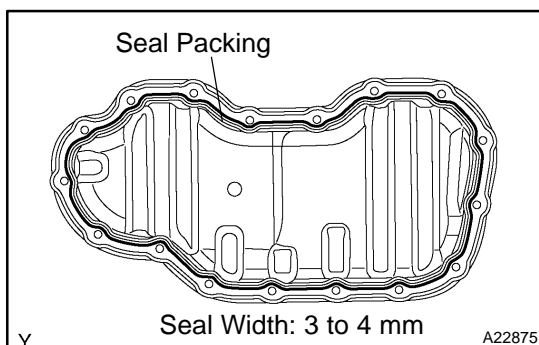
15. INSTALL OIL STRAINER

- (a) Install a new gasket and the oil strainer with the 2 nuts.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

16. INSTALL OIL PAN NO.2

- (a) Remove any old packing material (FIPG) and be careful not to drop any oil on the contact surfaces of the oil pan and oil pan No. 2.

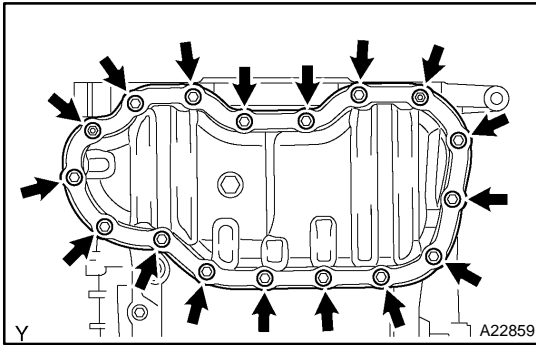


- (b) Apply a continuous bead of the seal packing (diameter 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Install the oil pan No. 2 within 3 minutes after applying seal packing. After installing it, the oil pan No. 2 bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.

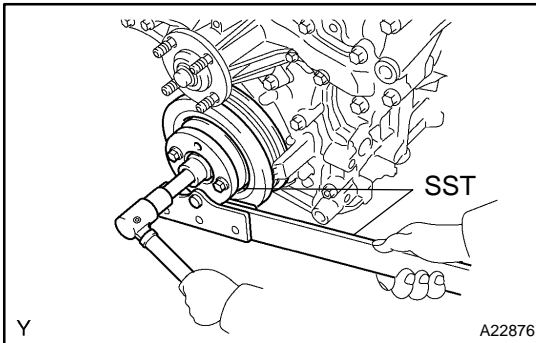


- (c) Install the oil pan No. 2 with the 15 bolts and 2 nuts. Tighten the bolts and nuts uniformly in several steps.

Torque:

Bolt: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

Nut: 10 N·m (102 kgf·cm, 7 ft·lbf)

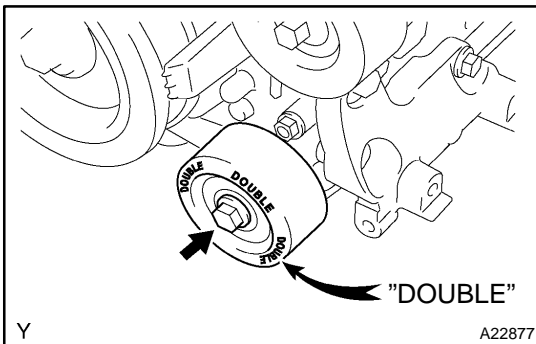


17. INSTALL CRANKSHAFT PULLEY

Using SST, install the pulley set bolt.

SST 09213-54015 (91651-60855), 09330-00021

Torque: 250 N·m (2,549 kgf·cm, 184 ft·lbf)



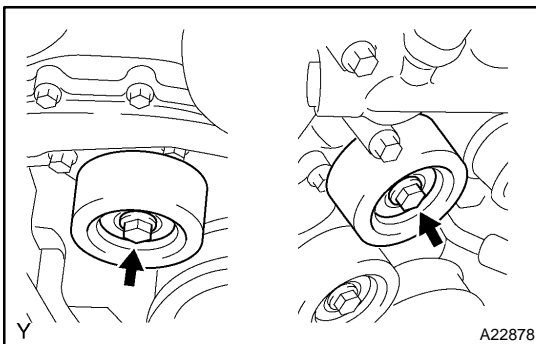
18. INSTALL IDLER PULLEY NO.1

Install the idler pulley with the bolt.

Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

HINT:

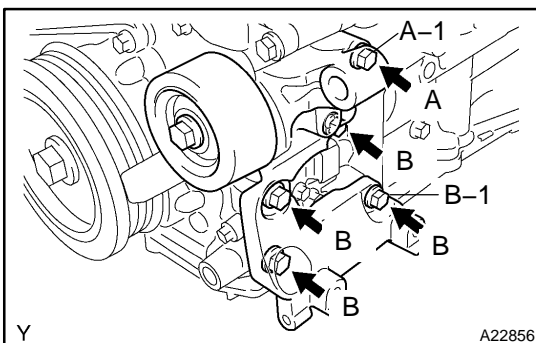
"DOUBLE" is marked on the idler pulley No. 1 to distinguish it from the idler pulley No. 2.



19. INSTALL IDLER PULLEY NO.2

Install the 2 idler pulleys with the 2 bolts.

Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)



20. INSTALL V-RIBBED BELT TENSIONER ASSY

Tighten bolts A-1 and B-1 in order first, then tighten the remaining bolts.

Torque: 36 N·m (367 kgf·cm, 27 ft·lbf)

HINT:

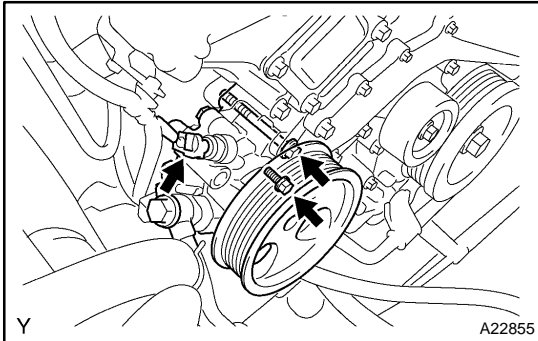
Each bolt length is as follows:

A: 70 mm (2.76 in.)

B: 33 mm (1.30 in.)

21. INSTALL COOLER COMPRESSOR

(See page [AC-58](#))

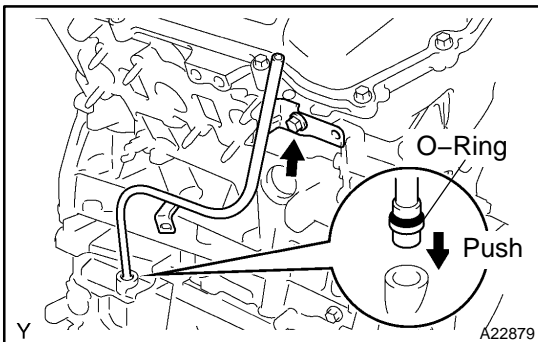
22. INSTALL GENERATOR (See page CH-15)**23. INSTALL VANE PUMP**

- (a) Install the vane pump with the 2 bolts.
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)

NOTICE:

Do not hit the pulley to other parts when installing the vane pump.

- (b) Connect the P/S oil pressure switch connector.

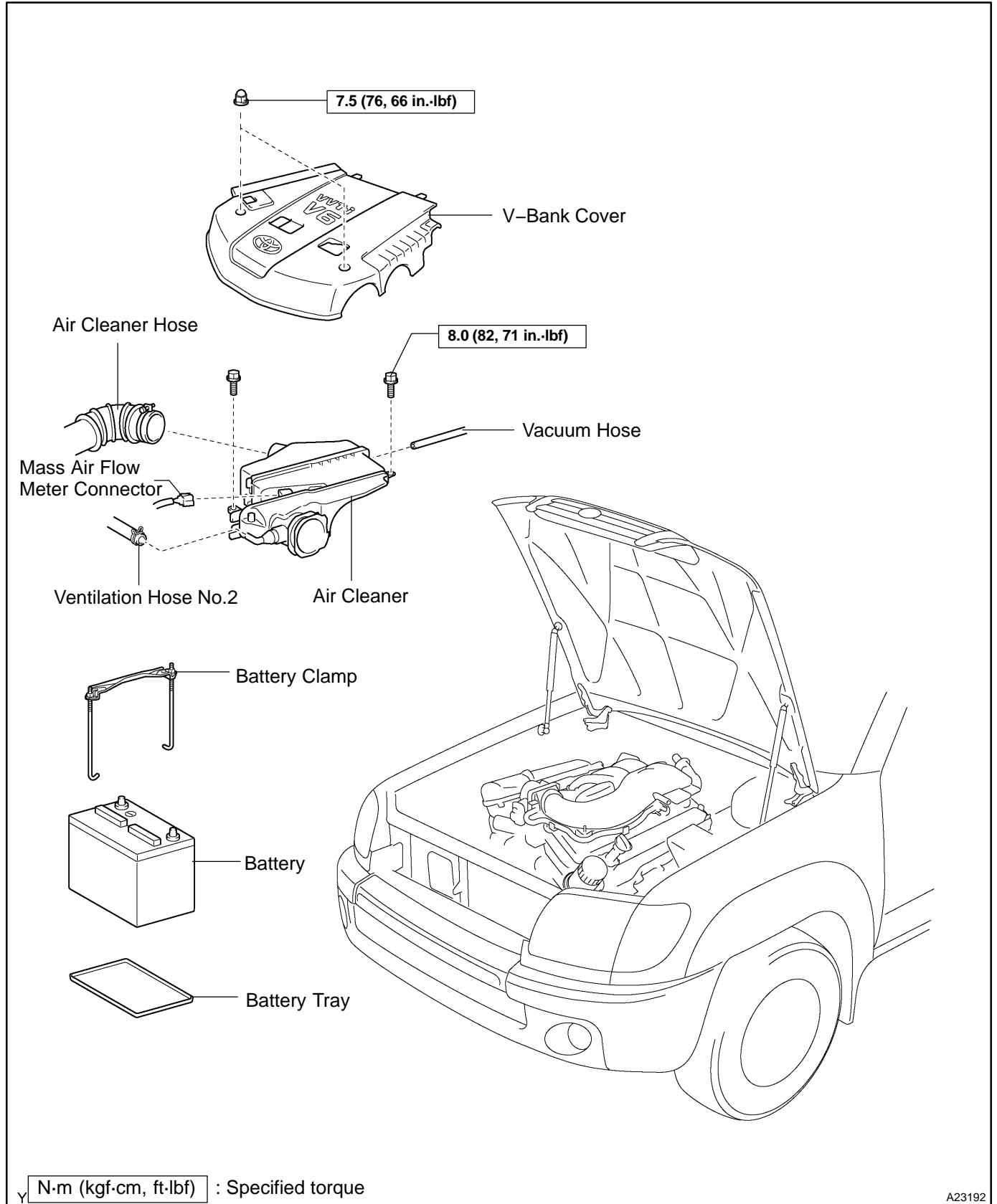
24. INSTALL WATER INLET (See page EM-89)**25. INSTALL OIL LEVEL GAUGE GUIDE**

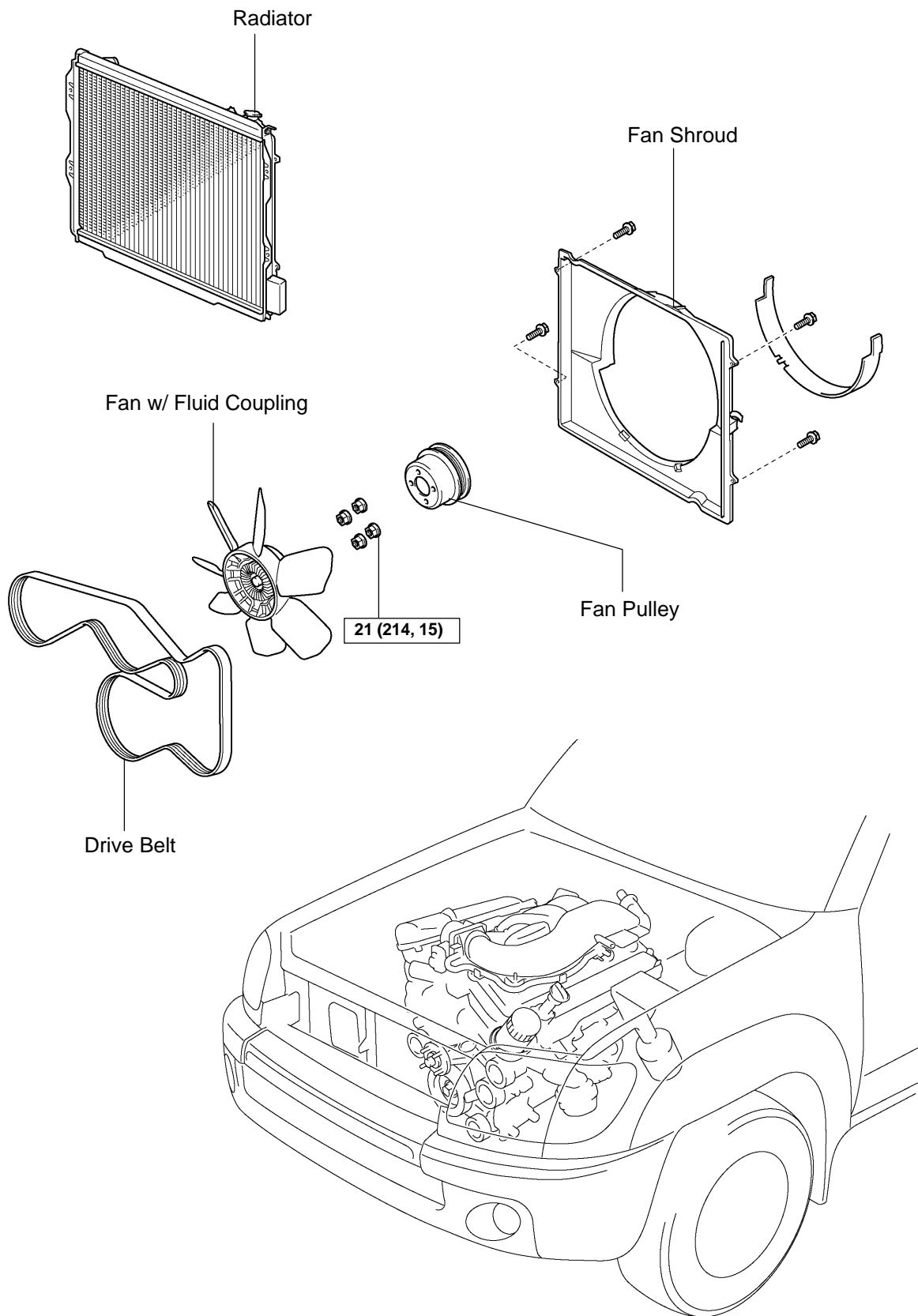
- (a) Install a new O-ring to the oil level gauge guide.
 (b) Apply a light coat of engine oil to the O-ring.
 (c) Push in the oil level gauge guide end into the guide hole of the oil pan.
 (d) Install the oil level gauge guide with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)
 (e) Install the oil level gauge.

26. INSTALL CYLINDER HEAD COVER (See page EM-89)**27. INSTALL INTAKE AIR SURGE TANK (See page EM-89)****28. INSTALL AIR CLEANER (See page EM-89)****29. INSTALL FAN W/FLUID COUPLING (See page EM-89)****30. INSTALL DRIVE BELT (See page EM-89)****31. FULLY TIGHTEN FAN W/FLUID COUPLING****32. INSTALL RADIATOR (See page CO-18)****33. INSTALL V-BANK COVER****34. INSTALL BATTERY****35. ADD ENGINE OIL (See page LU-3)****36. ADD ENGINE COOLANT (See page CO-2)****37. CHECK FOR LEAKS****38. CHECK IGNITION TIMING (See page EM-23)****39. CHECK IDLE SPEED (See page EM-25)**

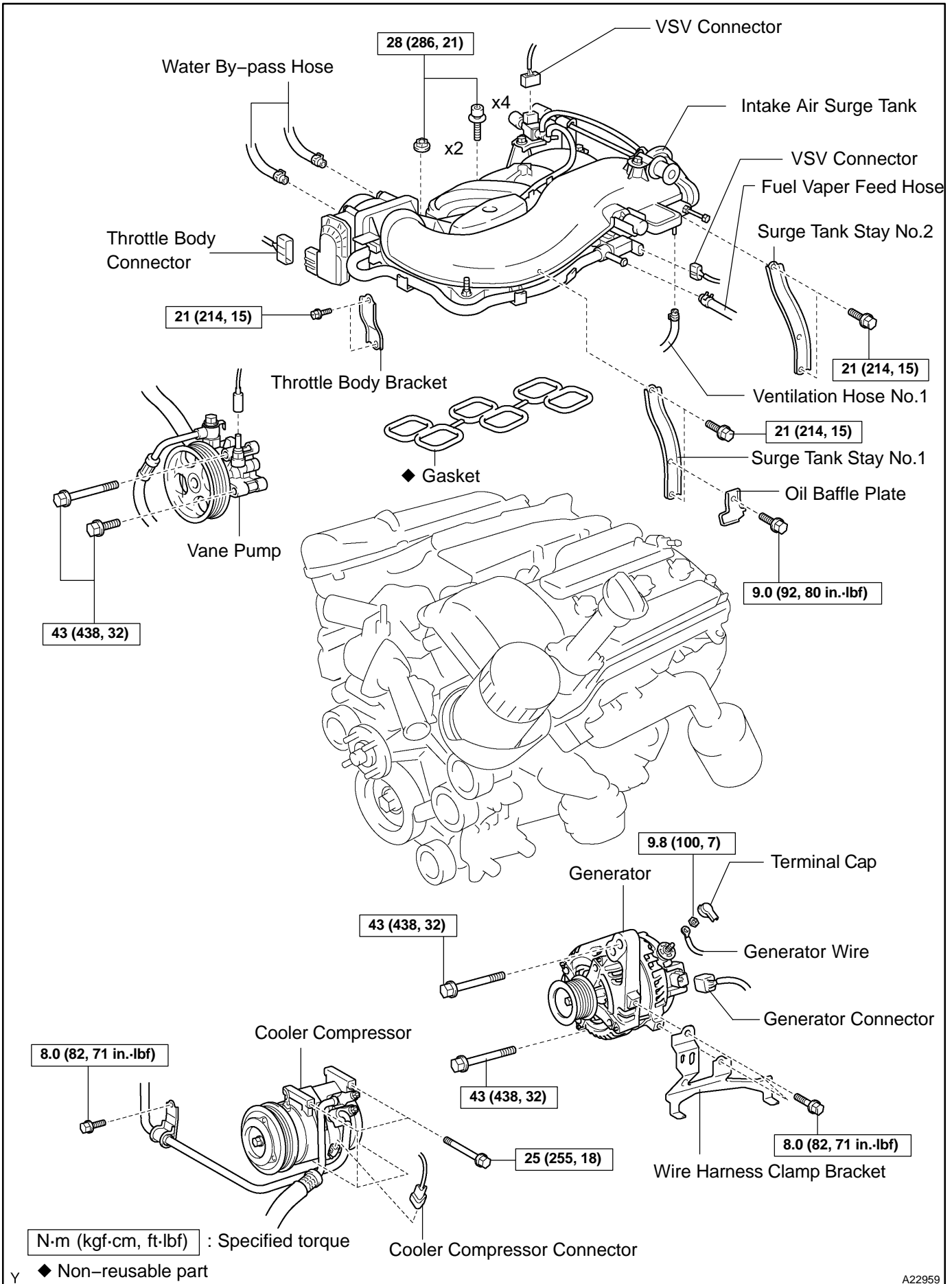
CYLINDER HEAD COMPONENTS

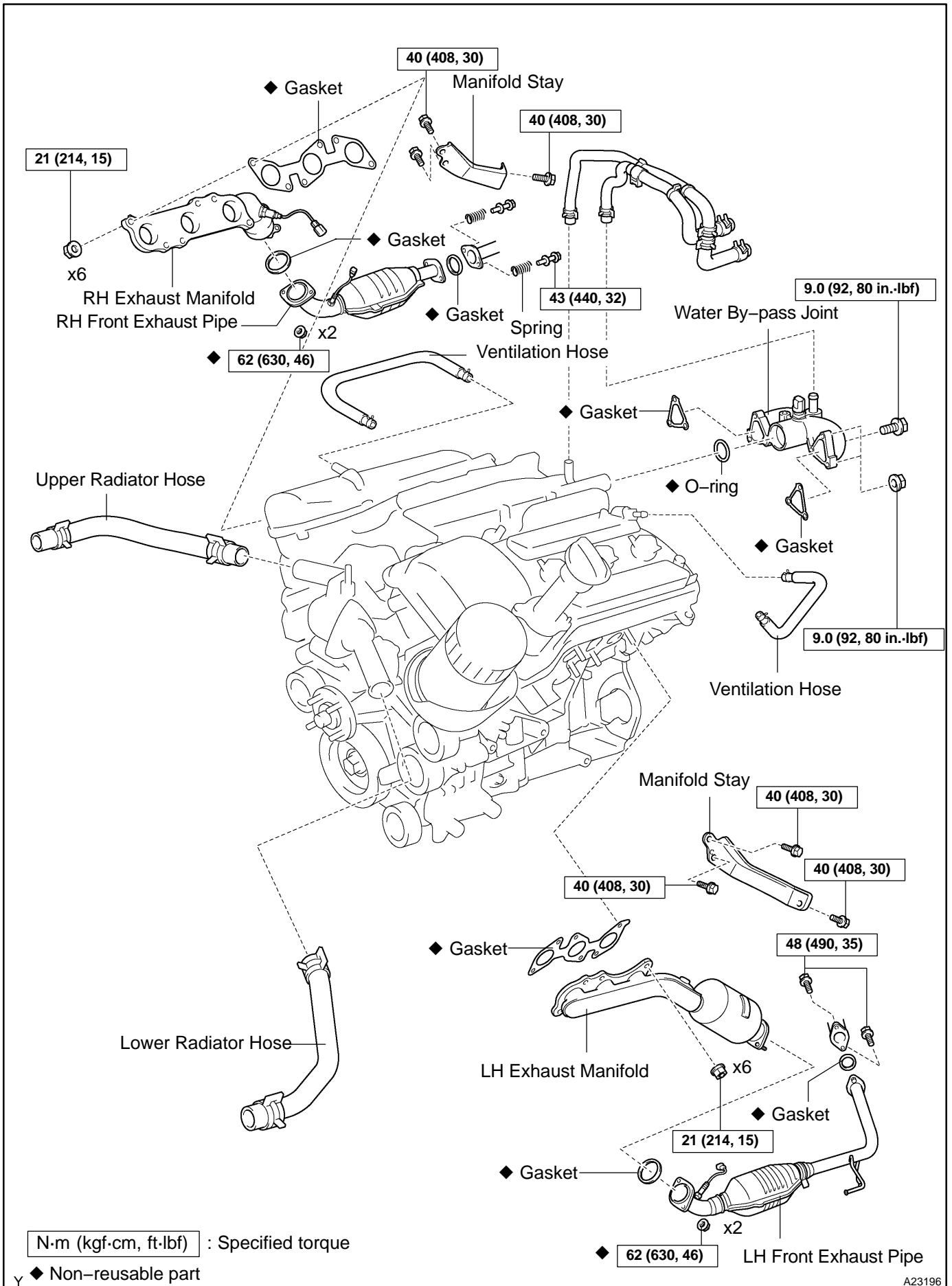
EM1X0-01



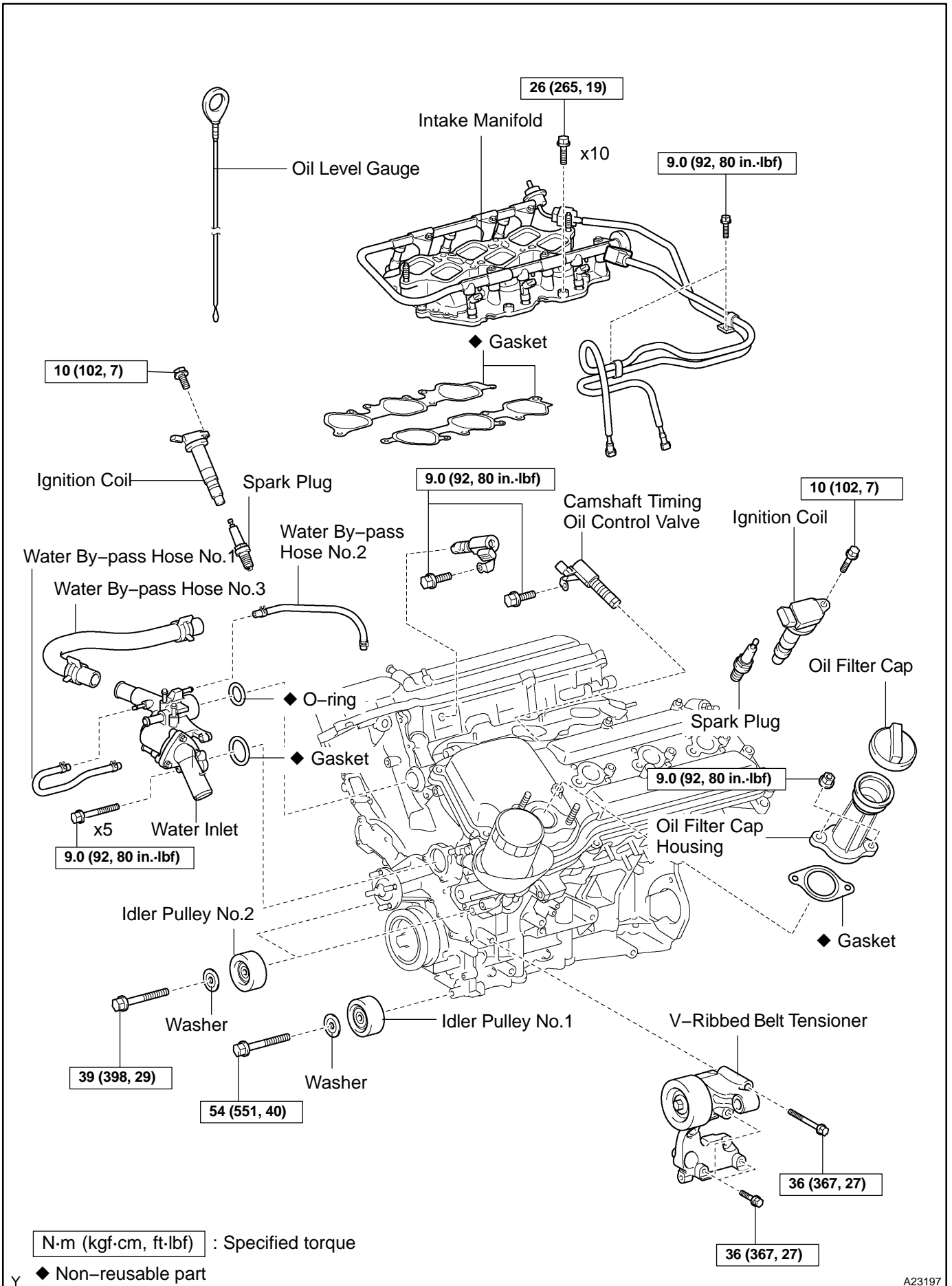


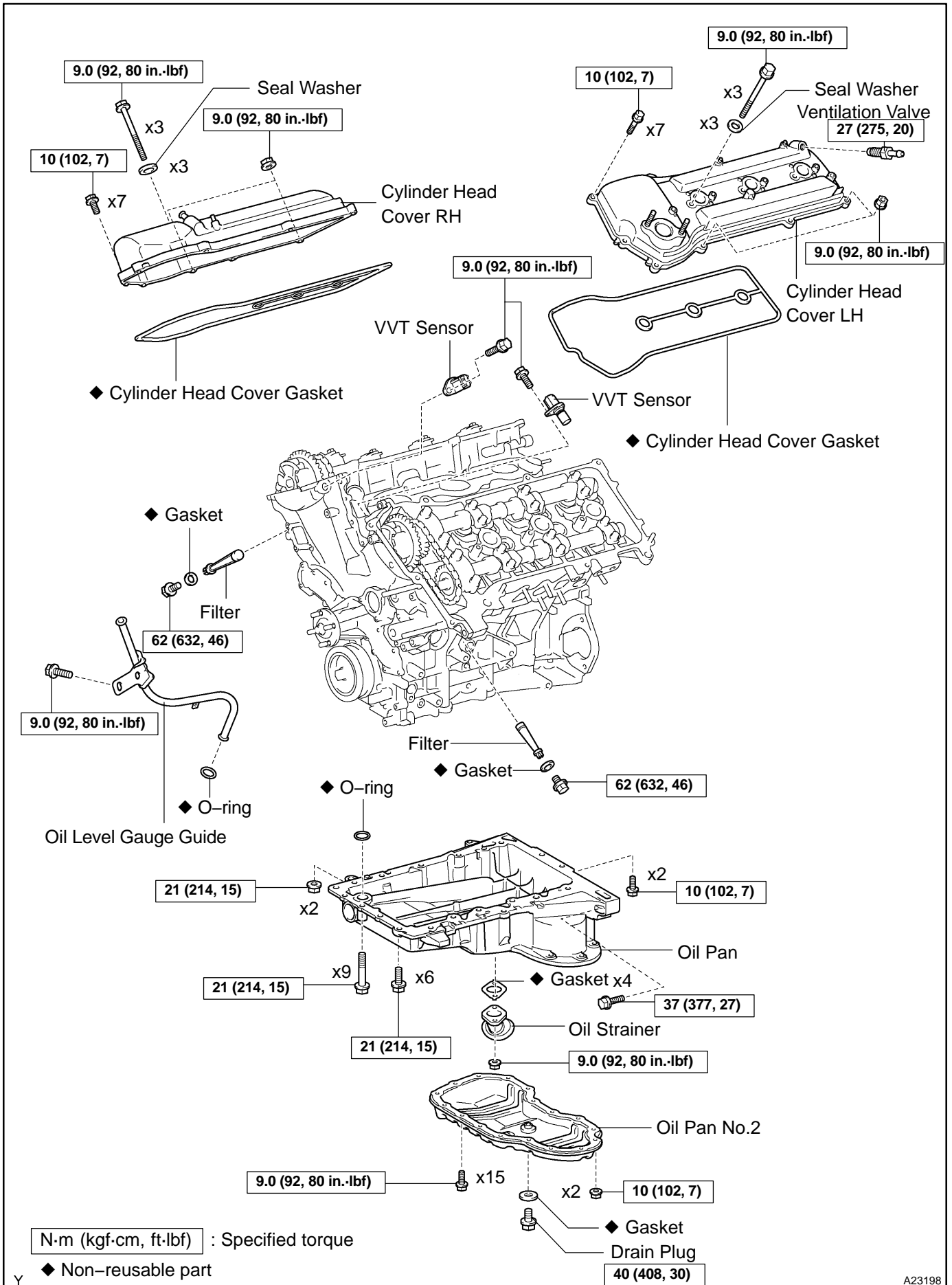
γ N·m (kgf·cm, ft·lbf) : Specified torque

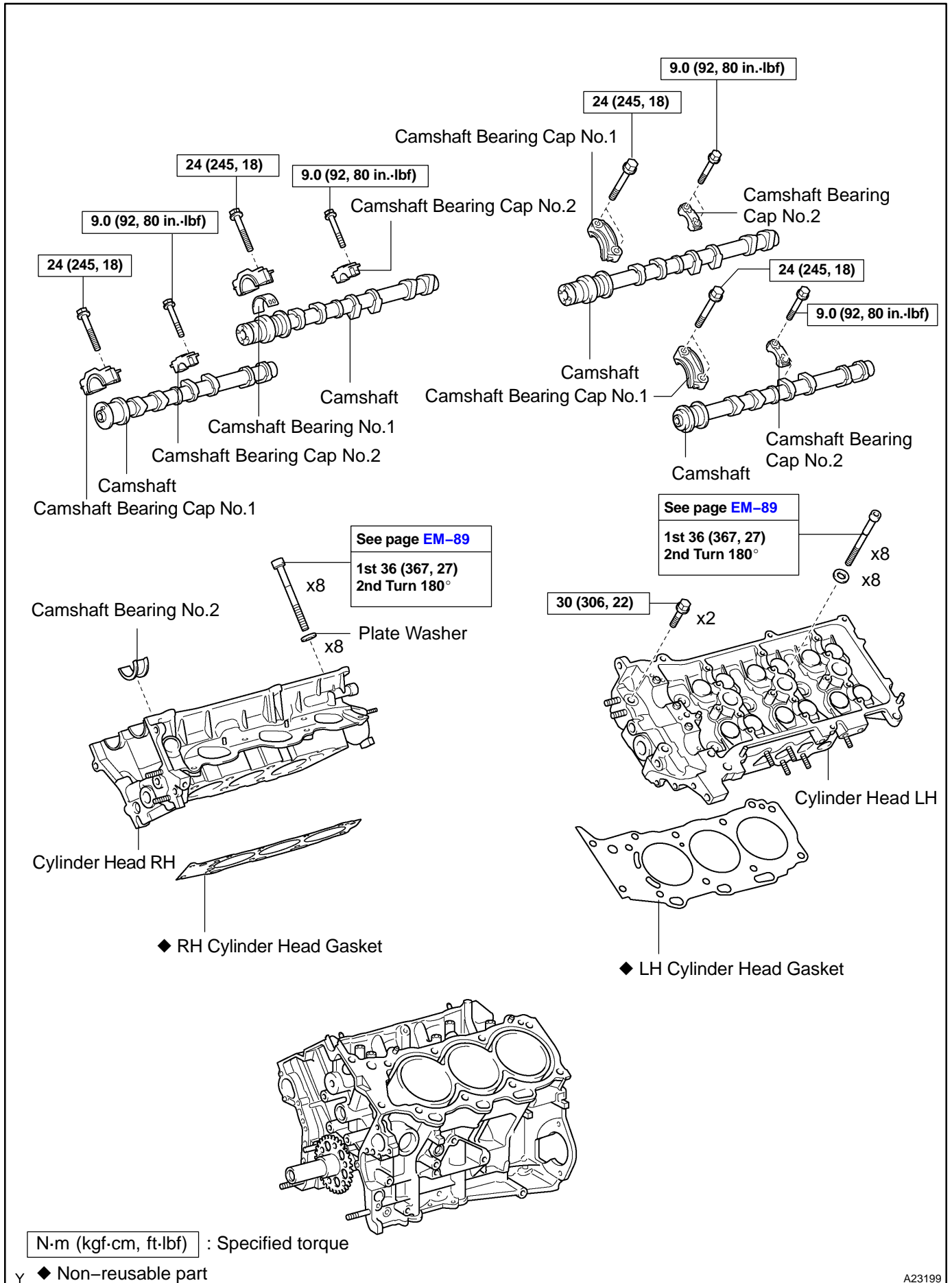


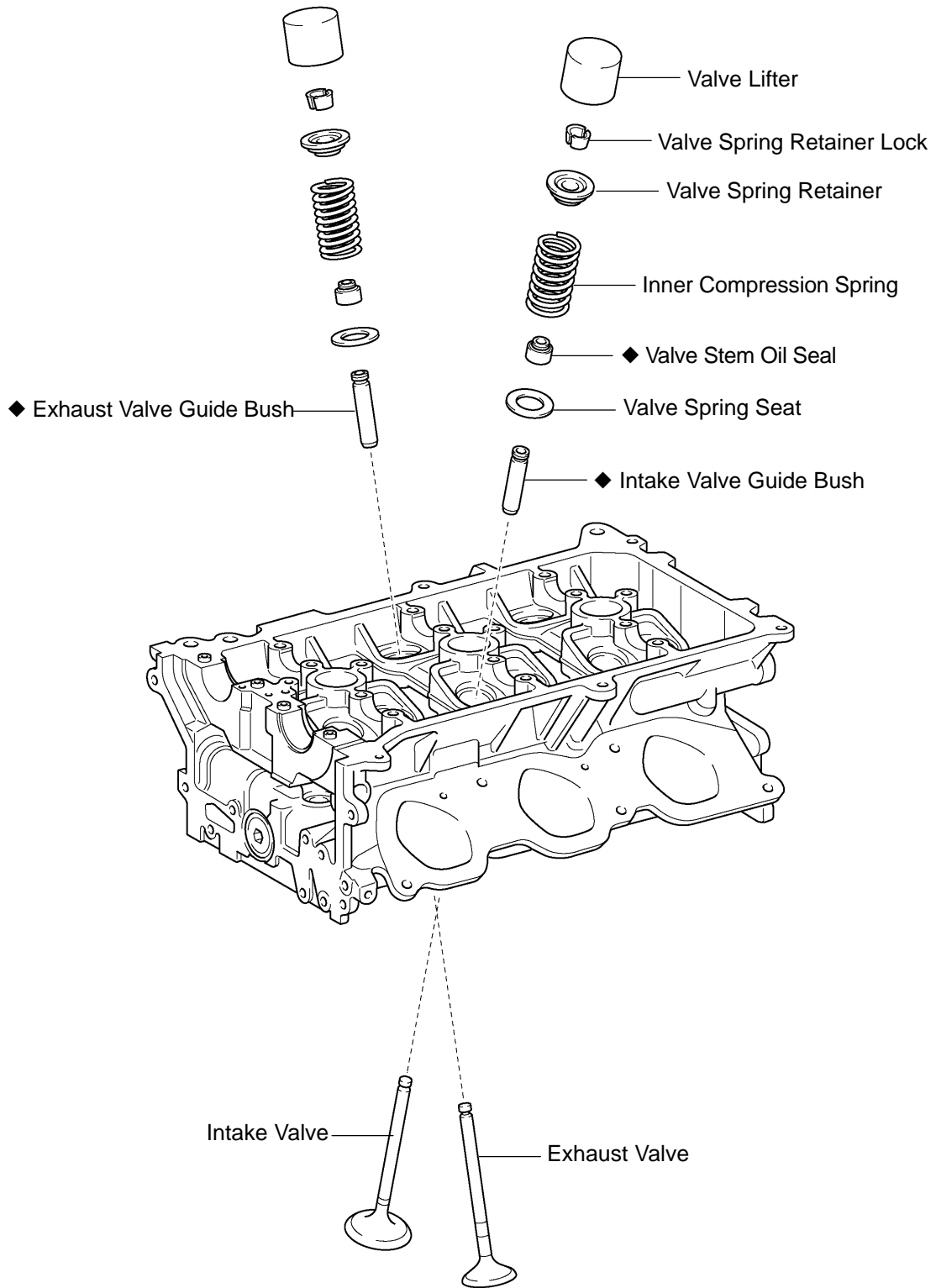


ENGINE MECHANICAL (1GR-FE) - CYLINDER HEAD







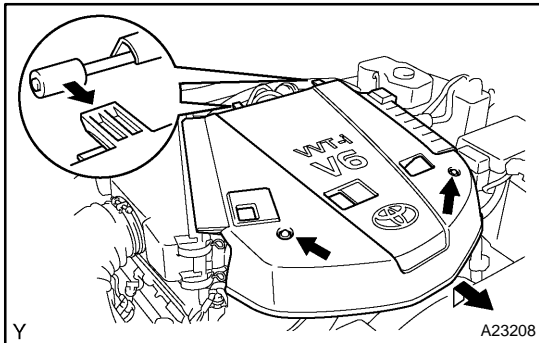


Y

◆ Non-reusable part

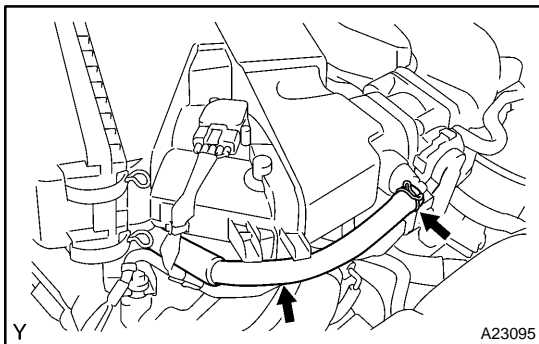
REMOVAL

1. PREVENT GASOLINE FROM SPILLING OUT
2. DRAIN ENGINE COOLANT (See page [CO-2](#))
3. DRAIN ENGINE OIL (See page [LU-3](#))



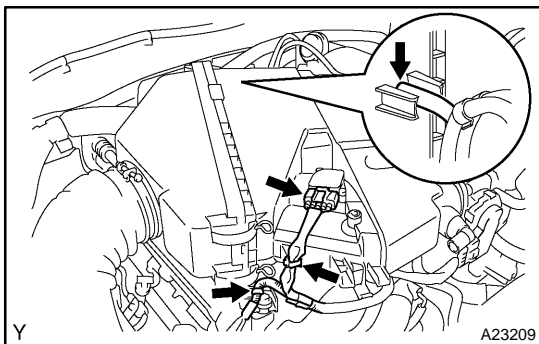
4. REMOVE V-BANK COVER

Remove the 2 nuts and V-bank cover.

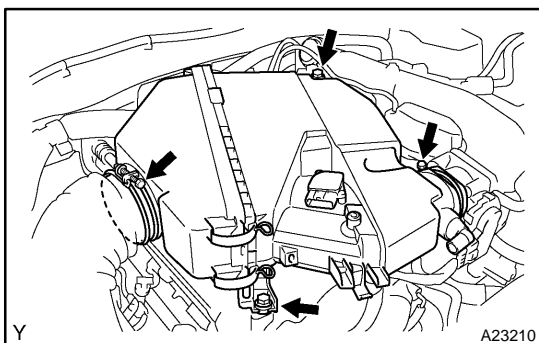


5. REMOVE AIR CLEANER

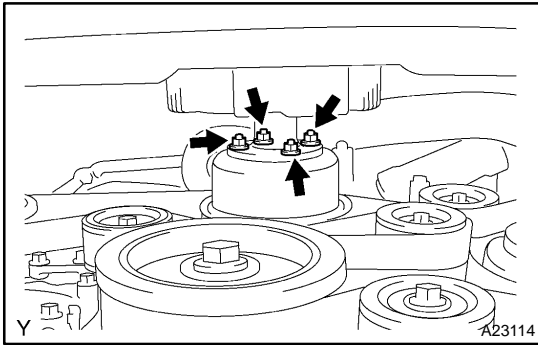
- (a) Disconnect the ventilation hose No.2.



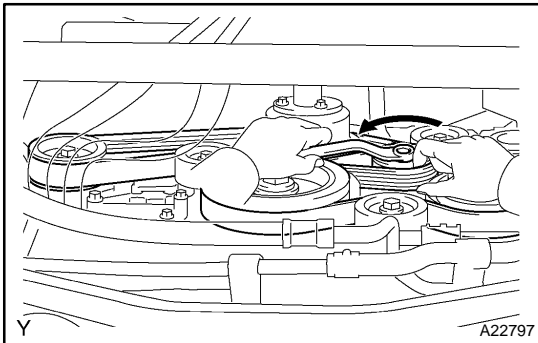
- (b) Disconnect the vacuum hose.
- (c) Disconnect the mass air flow meter connector.
- (d) Remove the 2 wire harness clamps.



- (e) Loosen the 2 hose clamps.
- (f) Remove the 2 bolts and air cleaner
6. DISCONNECT FUEL PIPE (See page [SF-1](#))
7. REMOVE FAN SHROUD
8. REMOVE RADIATOR (See page [CO-17](#))

**9. LOOSEN FAN W/FLUID COUPLING**

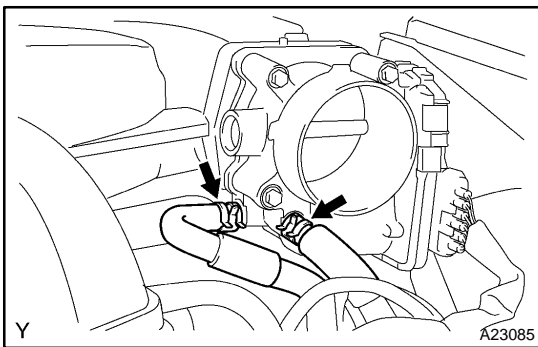
Loosen the 4 nuts of the fan w/ fluid coupling.

**10. REMOVE DRIVE BELT**

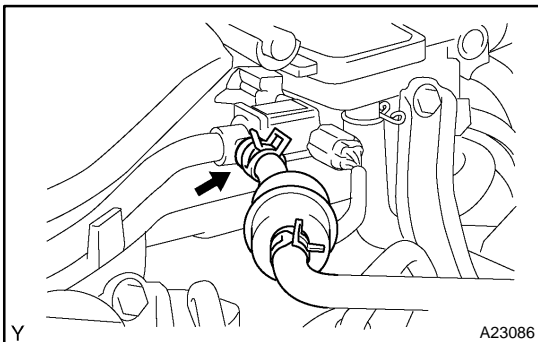
Release the belt tension by turning the belt tensioner counter-clockwise. Remove the V-ribbed belt from the belt tensioner.

11. REMOVE FAN W/FLUID COUPLING**12. SEPARATE VANE PUMP (See page [SR-47](#))****13. REMOVE GENERATOR (See page [CH-7](#))****14. SEPARATE COOLER COMPRESSOR**

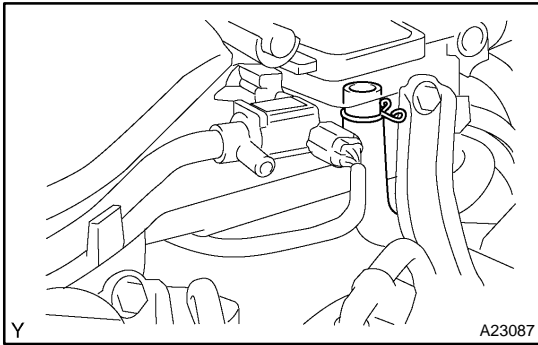
(See page [AC-54](#))

15. DISCONNECT HEATER WATER OUTLET AND INLET HOSE**16. REMOVE INTAKE AIR SURGE TANK**

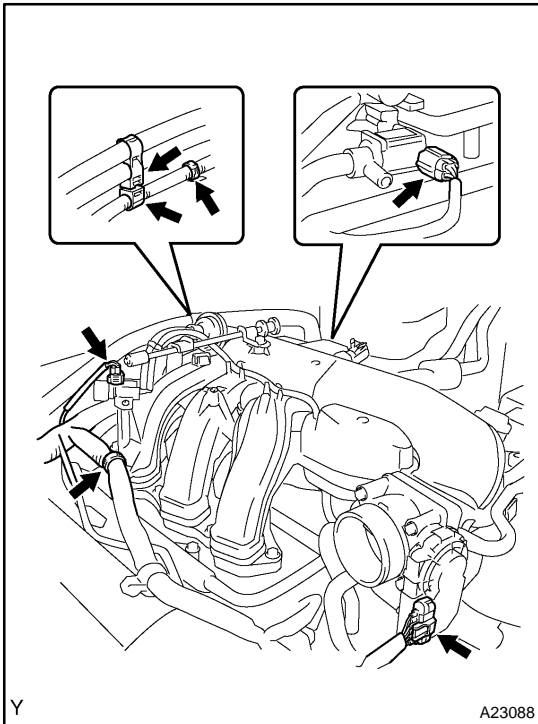
(a) Disconnect the 2 water by-pass hoses.



(b) Disconnect the fuel vapor feed hose.



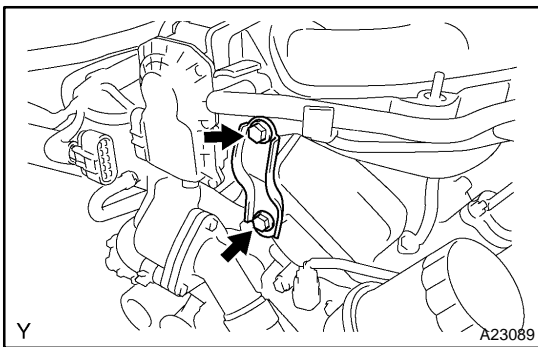
(c) Disconnect the ventilation hose.



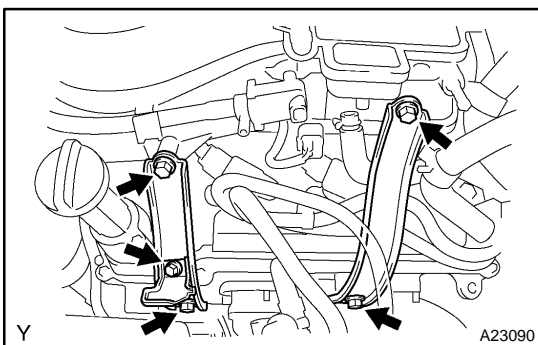
(d) Disconnect the 2 VSV connectors.

(e) Disconnect the throttle body w/ motor connector.

(f) Separate the 3 wire harness clamps and hose clamp.

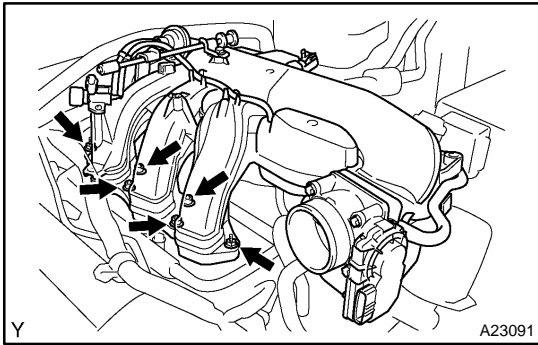


(g) Remove the 2 bolts and throttle body bracket.



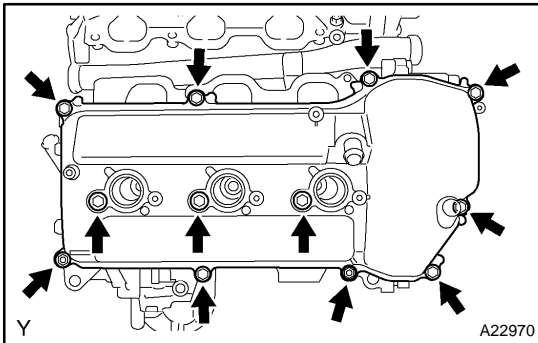
(h) Remove the bolt and oil baffle plate.

(i) Remove the 4 bolts and 2 surge tank stays.



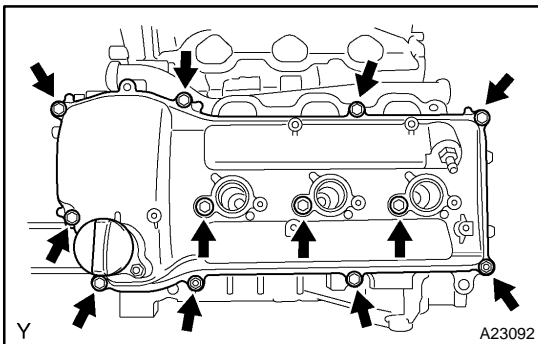
- (j) Remove the 2 nuts.
- (k) Using a socket hexagon wrench 8, remove the 4 bolts, intake air surge tank and gasket.

17. REMOVE IGNITER (See page IG-6)



18. REMOVE CYLINDER HEAD COVER

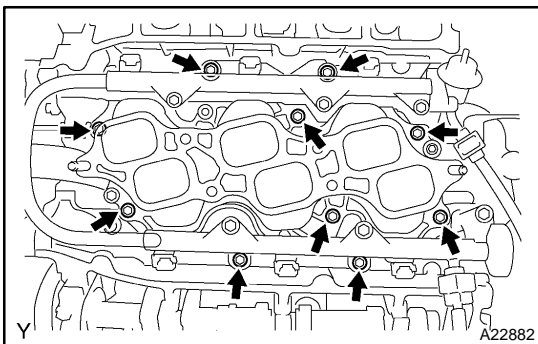
- (a) Remove the 10 bolts, 3 seal washers, 2 nuts, cylinder head cover RH and gasket.
- (b) Remove the 2 nuts, oil filter cap housing and gasket.



- (c) Remove the 10 bolts, 3 seal washers, 2 nuts, cylinder head cover LH and gasket.

19. REMOVE INTAKE MANIFOLD

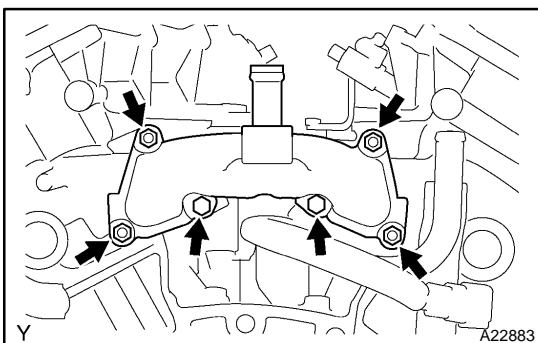
- (a) Disconnect the 6 fuel injector connectors.



- (b) Remove the 10 bolts, intake manifold and 2 gaskets.

20. REMOVE WATER BY-PASS JOINT

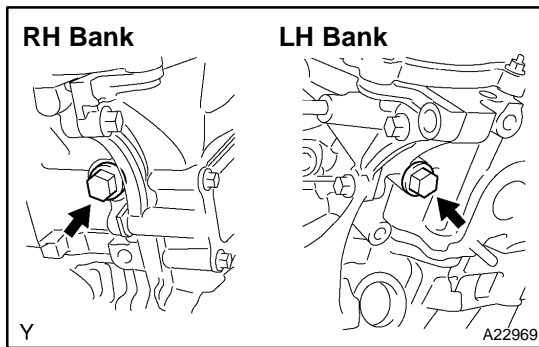
- (a) Disconnect the engine coolant temperature sensor connector.
- (b) Disconnect the heater hose.



- (c) Remove the 2 bolts, 4 nuts, water by-pass joint RR and 2 gaskets.

- (d) Remove the O-ring from the water outlet pipe.

21. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE

**22. REMOVE OIL CONTROL VALVE FILTER**

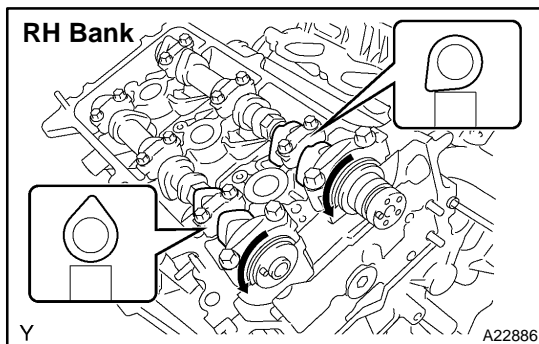
Remove the plug, filter and gasket from each cylinder head.

23. REMOVE VVT SENSOR**24. REMOVE RH AND LH FRONT EXHAUST PIPE****25. REMOVE RH AND LH EXHAUST MANIFOLD**

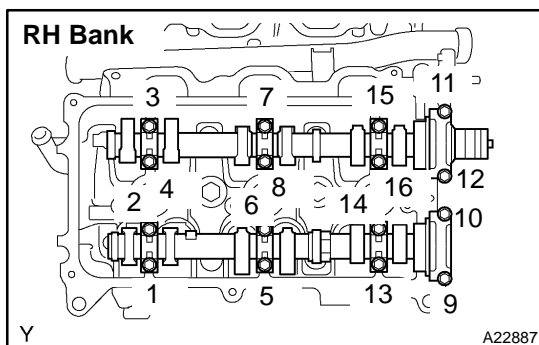
- (a) Remove the 6 bolts and 2 exhaust manifold stays.
- (b) Remove the 12 nuts, RH and LH exhaust manifold and 2 gaskets.

26. REMOVE OIL PAN (See page EM-32)**27. REMOVE TIMING CHAIN COVER (See page EM-32)****28. REMOVE TIMING CHAIN (See page EM-32)****29. REMOVE CAMSHAFT****NOTICE:**

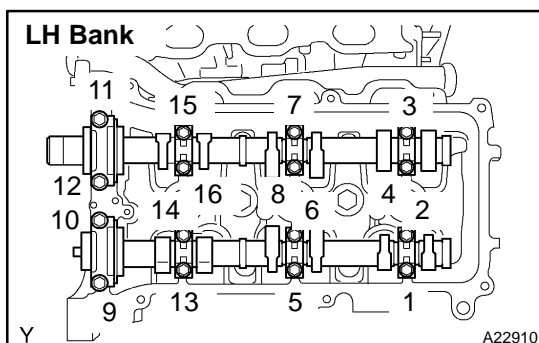
As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



- (a) Remove the camshafts of the RH bank.
 - (1) Rotate the camshafts counterclockwise using the wrench so that the cam lobes of the No. 1 cylinder face each direction as shown in the illustration.

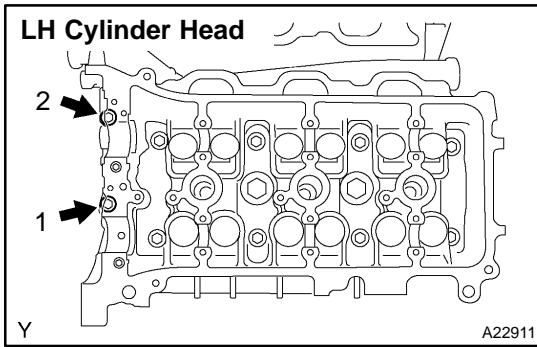


- (2) Using several steps, uniformly loosen and remove the 16 bearing cap bolts in the sequence as shown in the illustration.
- (3) Remove the 8 bearing caps and 2 camshafts.



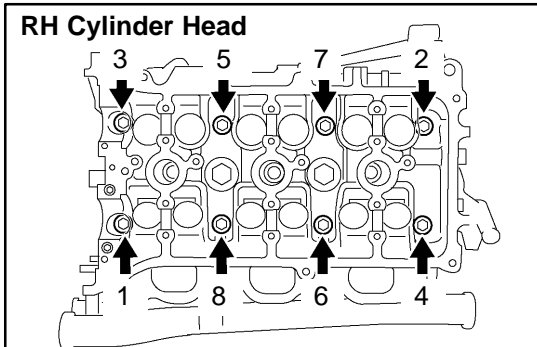
- (b) Remove the camshafts of the LH bank.
 - (1) Using several steps, uniformly loosen and remove the 16 bearing cap bolts in the sequence as shown in the illustration.
 - (2) Remove the 8 bearing caps and 2 camshafts.

30. REMOVE CAMSHAFT BEARING NO.1 AND NO.2



31. REMOVE CYLINDER HEAD

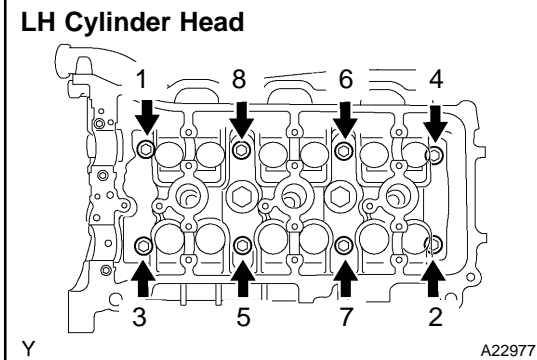
(a) Using several steps, remove the 2 cylinder head bolts on the LH cylinder head in the sequence as shown in the illustration.



(b) Using several steps, loosen the 8 cylinder head bolts on each cylinder head with a 10 mm bi-hexagon wrench in the sequence as shown in the illustration. Remove the 16 cylinder head bolts and plate washers.

NOTICE:

- **Be careful not to drop the plate washers into the cylinder head.**
- **Cylinder head warpage or cracking could result from removing the bolts in the incorrect order.**



(c) Lift the cylinder head from the dowels on the cylinder block, and place the 2 cylinder heads on wooden blocks on a bench.

NOTICE:

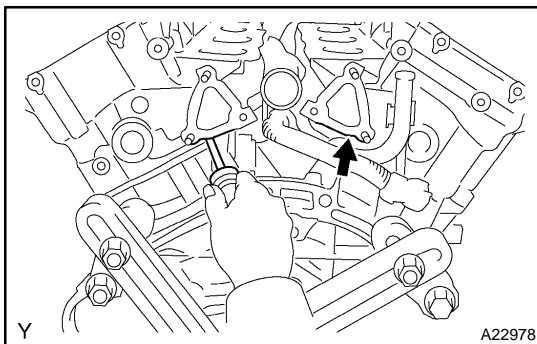
Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

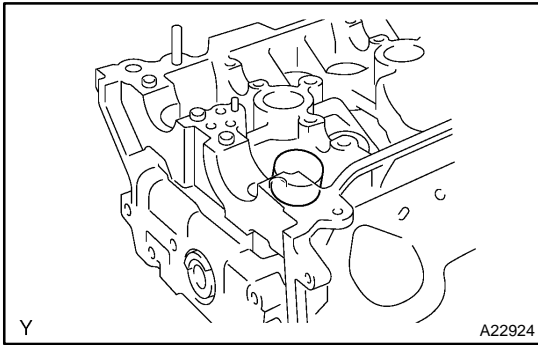
HINT:

If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

(d) Remove the RH and LH cylinder head gaskets.

32. REMOVE CYLINDER HEAD GASKET



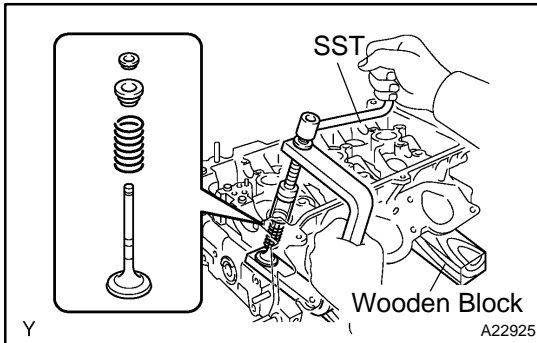


DISASSEMBLY

1. REMOVE VALVE LIFTER

HINT:

Arrange the valve lifter in the correct order.

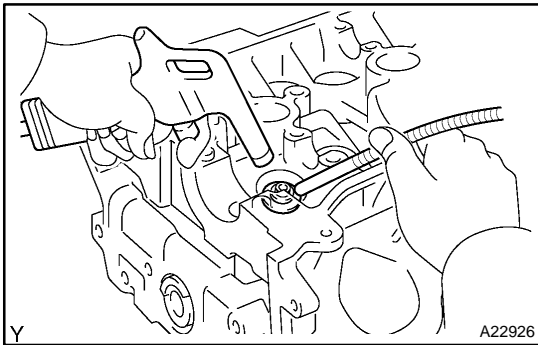


2. REMOVE VALVE

HINT:

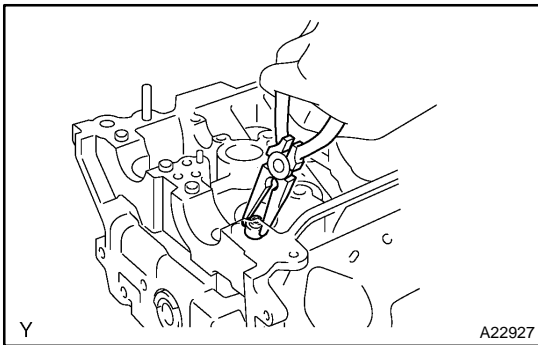
Arrange the valves, inner compression springs, valve spring retainers and valve spring retainer locks in the correct order.

- (a) Place the cylinder head on a wooden block.
- (b) Using SST, compress the inner compression spring and remove the 2 valve spring retainer locks.
SST 09202-70020 (09202-00010)
- (c) Remove the valve, inner compression spring, valve spring and valve spring retainer.



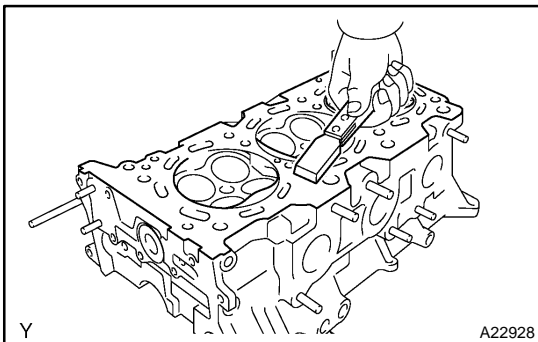
3. REMOVE VALVE SPRING SEAL

Using compressed air and a magnetic finger, remove the valve spring seal by blowing air.



4. REMOVE VALVE STEM OIL SEAL

Using needle-nose pliers, remove the valve stem oil seal.

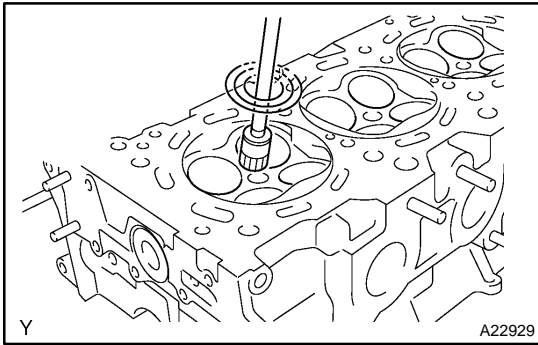


5. CLEAN CYLINDER HEAD

- (a) Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

NOTICE:

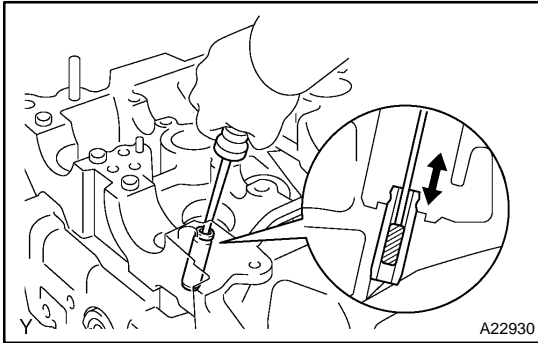
Be careful not to scratch the cylinder block contact surface.



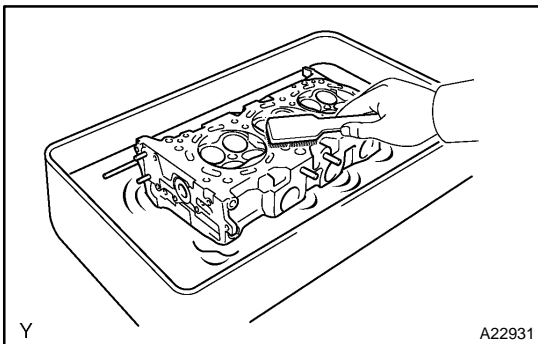
- (b) Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

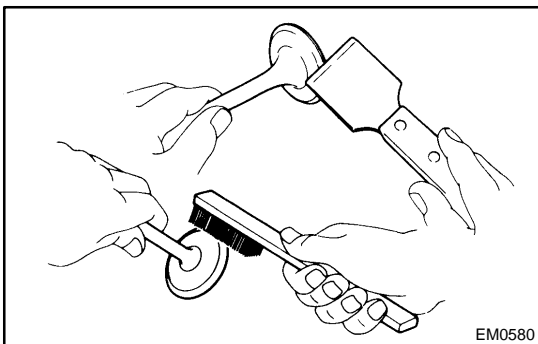
Be careful not to scratch the combustion chambers.



- (c) Using a valve guide bushing brush and solvent, clean all the valve guide bushes.

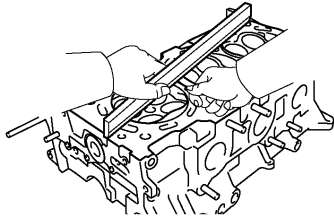


- (d) Using a soft brush and solvent, thoroughly clean the cylinder head.

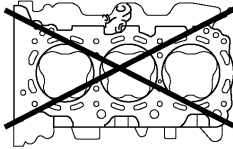


6. CLEAN VALVE

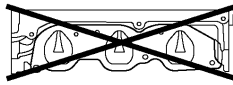
- (a) Using a gasket scraper, chip off any carbon from the valve head.
- (b) Using a wire brush, thoroughly clean the valve.



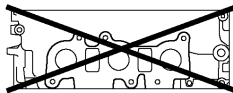
Cylinder Block Side:



Intake Manifold Side:



Exhaust Manifold Side:



Y

A22932

INSPECTION

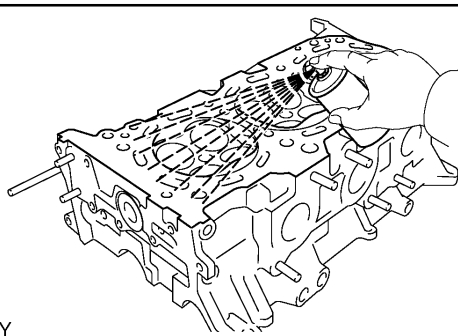
1. INSPECT CYLINDER HEAD

(a) Inspect flatness.

Using a precision straight edge and feeler gauge, measure the flatness of the contact surfaces of the cylinder block and manifolds.

Maximum warpage: 0.10 mm (0.0039 in.)

If warpage is greater than the maximum, replace the cylinder head.



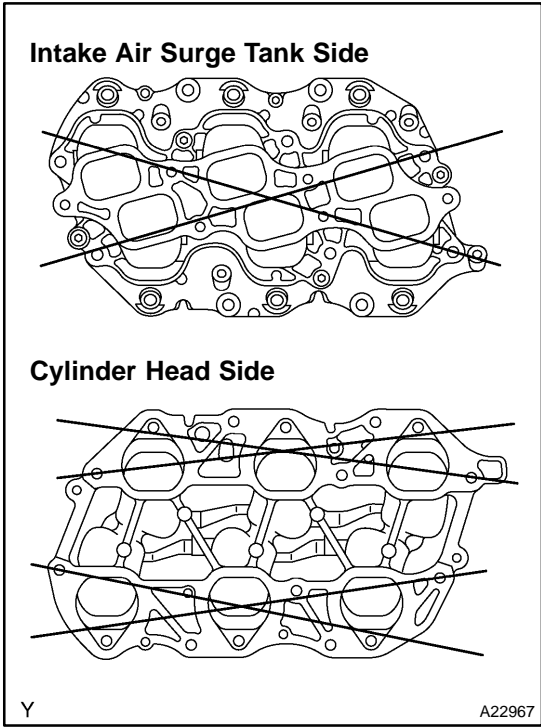
Y

A22933

(b) Inspect cranks.

Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



2. INSPECT INTAKE MANIFOLD FOR FLATNESS

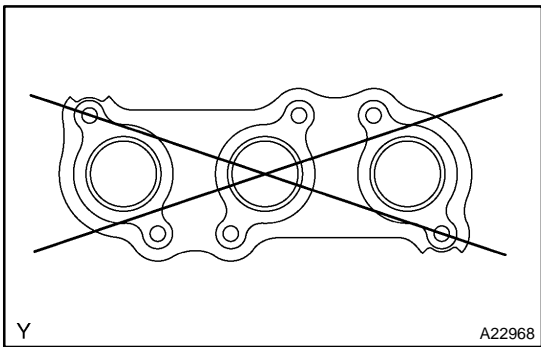
Using a precision straight edge and feeler gauge, measure the flatness of the contact surfaces of the cylinder head and intake air surge tank.

Maximum warpage:

Intake air surge tank side: 0.8 mm (0.031 in.)

Cylinder head side: 0.2 mm (0.008 in.)

If warpage is greater than the maximum, replace the intake manifold.



3. INSPECT EXHAUST MANIFOLD FOR FLATNESS

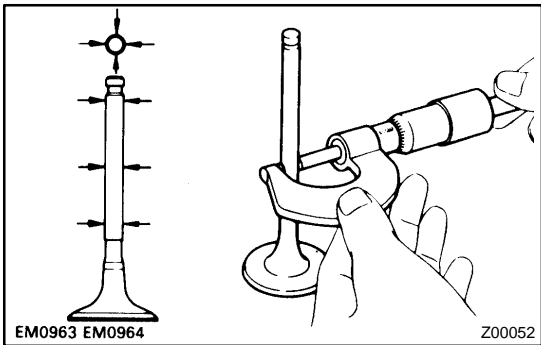
Using a precision straight edge and feeler gauge, measure the flatness of the contact surface the cylinder head.

Maximum warpage: 0.7 mm (0.028 in.)

If warpage is greater than the maximum, replace the exhaust manifold.

HINT:

Maximum warpage of each installation surface:
0.3 mm (0.012 in.)



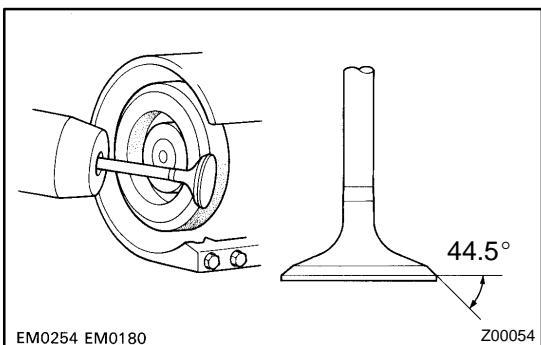
4. INSPECT VALVE

(a) Inspect valve stem diameter.

Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

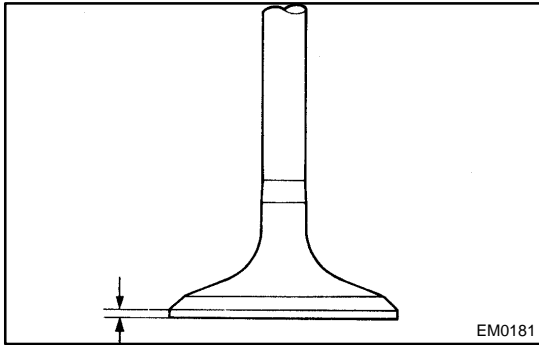
Intake	5.470 to 5.485 mm (0.2154 to 0.2159 in.)
Exhaust	5.465 to 5.480 mm (0.2152 to 0.2158 in.)



(b) Inspect valve face angle.

- (1) Grind the valve enough to remove pits and carbon.
- (2) Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°

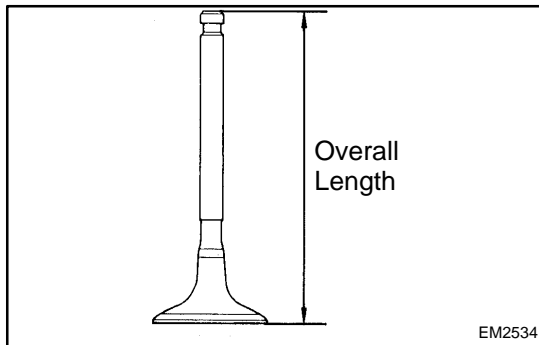


- (c) Inspect valve head margin thickness.
Using vernier calipers, check the valve head margin thickness.

Standard margin thickness: 1.0 mm (0.039 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)

If the margin thickness is less than the minimum, replace the valve.



- (d) Inspect overall length.
Using vernier calipers, check the overall length.

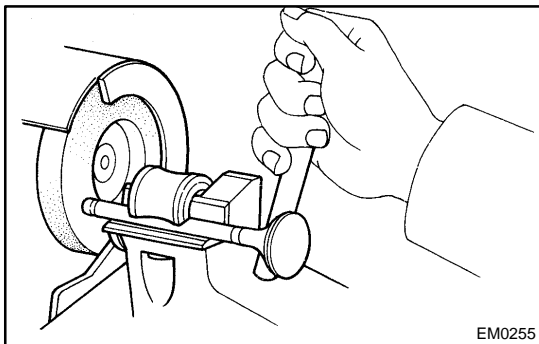
Standard overall length:

Intake	106.95 mm (4.2106 in.)
Exhaust	105.80 mm (4.1654 in.)

Minimum overall length:

Intake	106.40 mm (4.1890 in.)
Exhaust	105.30 mm (4.1457 in.)

If the overall length is less than the minimum, replace the valve.

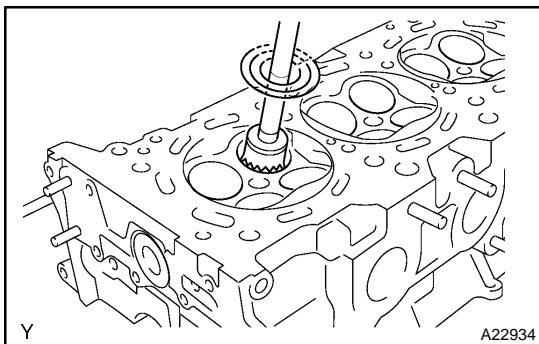


- (e) Inspect valve stem tip.
Check the surface of the valve stem tip for wear.

NOTICE:

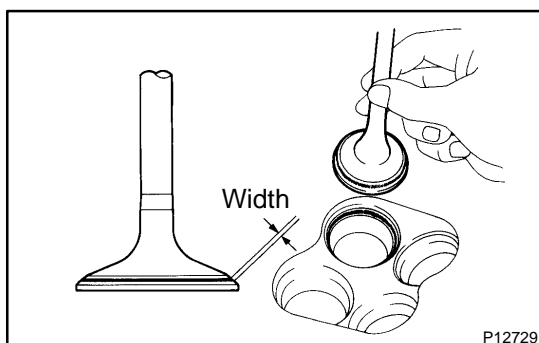
Do not grind off more than the minimum length.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.



5. CLEAN VALVE SEAT

- (a) Using a 45° carbide cutter, resurface the valve seats.
(b) Clean the valve seats.



6. INSPECT VALVE SEAT

- (a) Apply a light coat of prussian blue (or white lead) to the valve face.
(b) Lightly press the valve against the valve seat.

NOTICE:

Do not rotate the valve.

- (c) Check the valve face and seat according to the following procedure.
(1) If prussian blue (or white lead) appears around the entire face, the valve is centered.

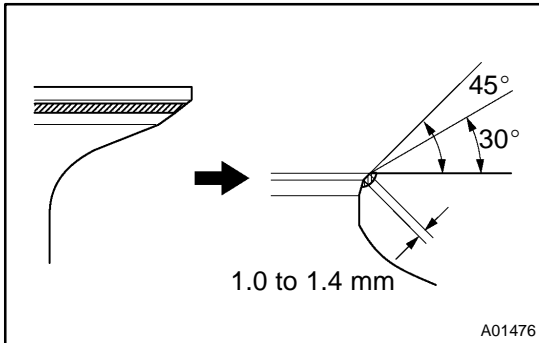
If not, replace the valve.

- (2) If the prussian blue (or white lead) appears around the entire valve seat, the guide and face are centered.

If not, resurface the valve seat.

- (3) Check that the seat contacts the middle of the valve face with the width below.

Standard width: 1.0 to 1.4 mm (0.039 to 0.055 in.)

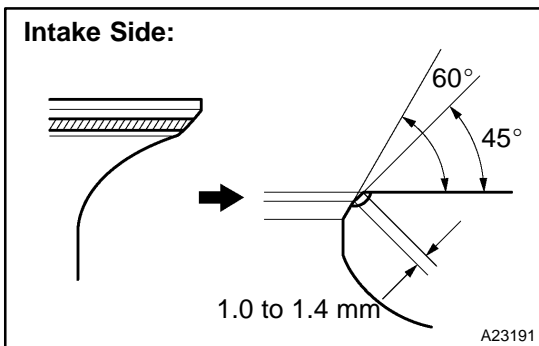


7. REPAIR VALVE SEAT

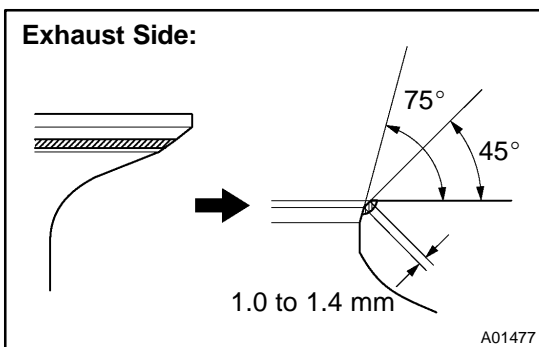
NOTICE:

Take off a cutter gradually to make the intake valve seat smooth.

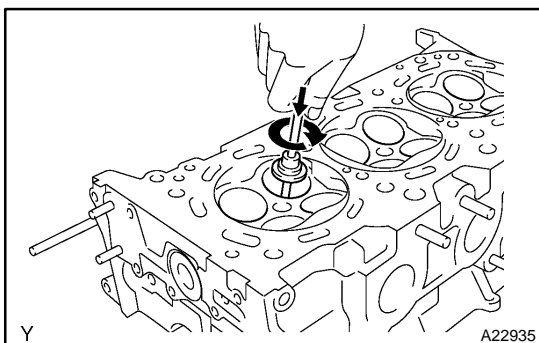
- (a) If the seating is too high to the valve face, use 30° and 45° cutters to correct the seat.



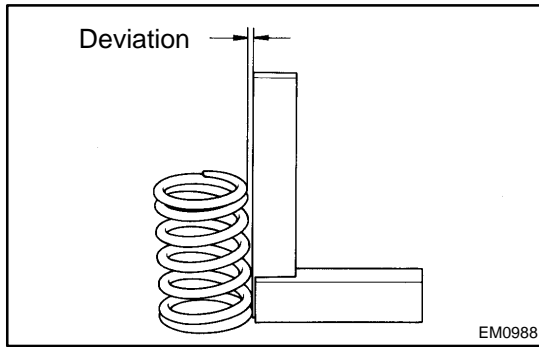
- (b) Intake side:
If the seating is too low to the valve face, use 60° and 45° cutters to correct the seat.



- (c) Exhaust side:
If the seating is too low to the valve face, use 75° and 45° cutters to correct the seat.



- (d) Handrub the valve and valve seat with an abrasive compound.
(e) After handrubbing, clean the valve and valve seat.



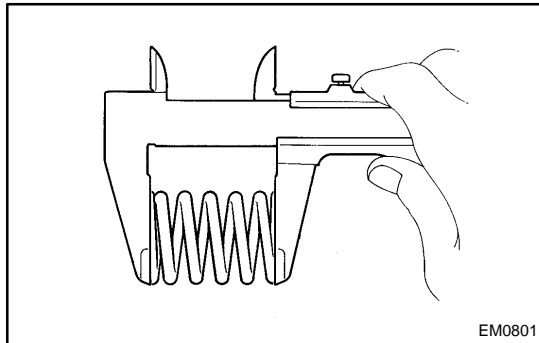
8. INSPECT INNER COMPRESSION SPRING

- (a) Inspect squareness.

Using a steel square, measure the squareness of the inner compression spring.

Maximum deviation: 2.0 mm (0.079 in.)

If the deviation is greater than the maximum, replace the inner compression spring.

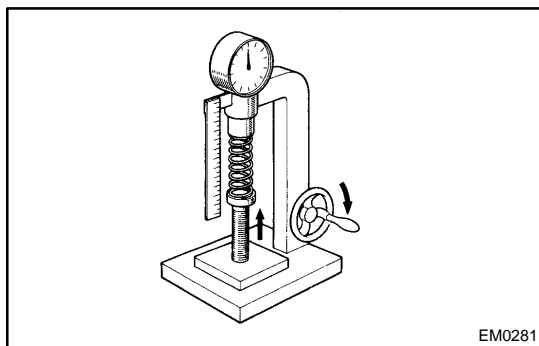


- (b) Inspect free length.

Using vernier calipers, measure the free length of the inner compression spring.

Free length: 47.80 mm (1.8819 in.)

If the free length is not as specified, replace the inner compression spring.



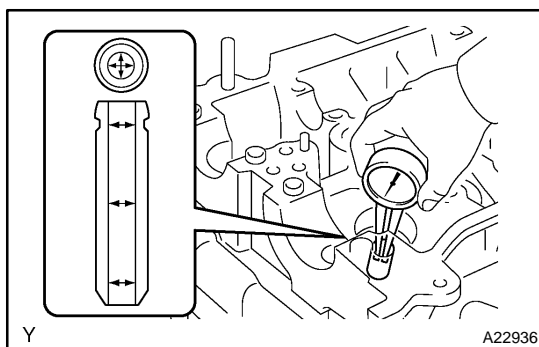
- (c) Inspect tension.

Using a spring tester, measure the tension of the inner compression spring at the specified installed length.

Installed tension:

186.2 to 205.8 N (19.0 to 21.0 kgf, 41.9 to 46.3 lbf) at 33.3 mm (1.311 in.)

If the installed tension is not as specified, replace the inner compression spring.



9. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

- (a) Using a caliper gauge, measure the inside diameter of the valve guide bush.

Inside diameter:

5.51 to 5.53 mm (0.2169 to 0.2177 in.)

- (b) Subtract the valve stem diameter measurement (Step 8) from the valve guide bush inside diameter measurement.

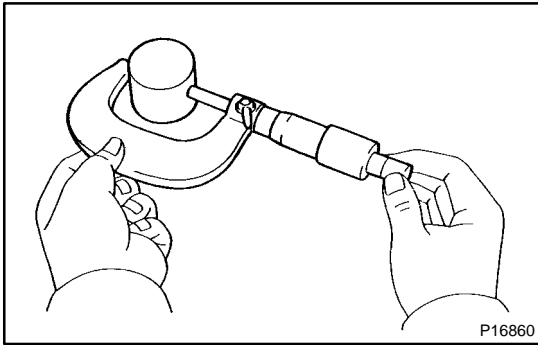
Standard oil clearance:

Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

Maximum oil clearance:

Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

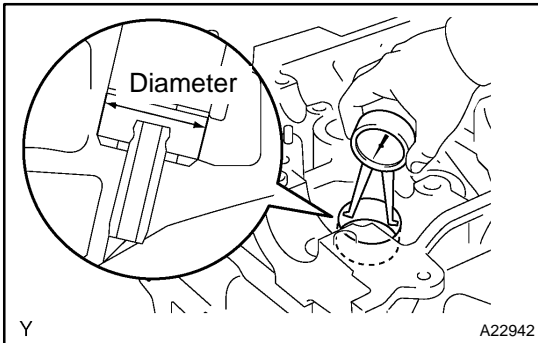
If the oil clearance is greater than the maximum, replace the valve and valve guide bush.

**10. INSPECT VALVE LIFTER**

Using a micrometer, measure the valve lifter diameter.

Valve lifter diameter:

30.966 to 30.976 mm (1.2191 to 1.2195 in.)

**11. INSPECT VALVE LIFTER OIL CLEARANCE**

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter:

31.009 to 31.025 mm (1.2208 to 1.2215 in.)

(b) Subtract the valve lifter diameter measurement (Step 10) from the lifter bore diameter measurement.

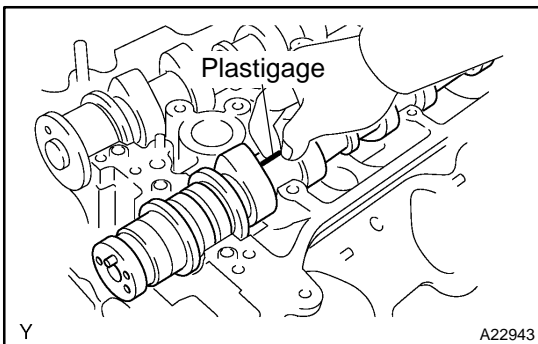
Standard oil clearance:

0.033 to 0.059 mm (0.0013 to 0.0023 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than the maximum, replace the valve lifter.

If necessary, replace the cylinder head.

**12. INSPECT CAMSHAFT OIL CLEARANCE**

(a) Clean the camshaft bearing caps, camshaft bearings and camshaft journals.

(b) Install the camshaft bearing (See page [EM-89](#)).

(c) Place the camshaft on the cylinder head.

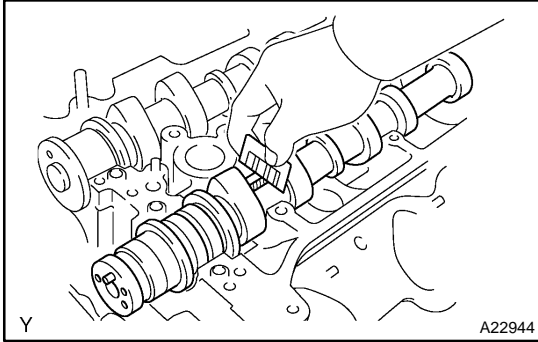
(d) Lay a strip of Plastigage across each of the camshaft journals.

(e) Install the camshaft bearing caps (See page [EM-89](#)).

NOTICE:

Do not turn the camshafts.

(f) Remove the camshaft bearing caps (See page [EM-62](#)).



- (g) Measure the Plastigage at its widest point.
Standard oil clearance (Cylinder head RH):

No. 1 (Intake)	0.008 to 0.038 mm (0.0003 to 0.0015 in.)
No. 1 (Exhaust)	0.040 to 0.079 mm (0.0016 to 0.0031 in.)
Others	0.025 to 0.062 mm (0.0010 to 0.0024 in.)

Standard oil clearance (Cylinder head LH):

No. 1	0.040 to 0.079 mm (0.0016 to 0.0031 in.)
Others	0.025 to 0.062 mm (0.0010 to 0.0024 in.)

Maximum oil clearance (Cylinder head RH):

No. 1 (Intake)	0.07 mm (0.0028 in.)
Others	0.10 mm (0.0039 in.)

Maximum oil clearance (Cylinder head LH):

0.10 mm (0.0039 in.)

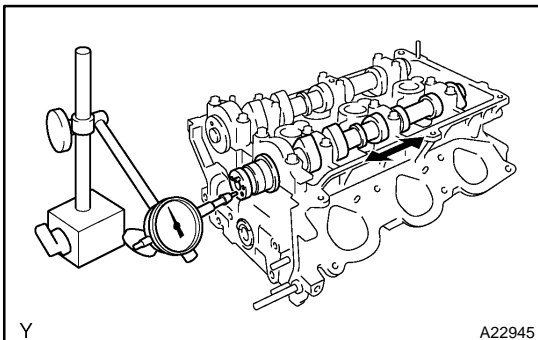
If the oil clearance is greater than the maximum, replace the camshaft bearings and/or camshaft.

If necessary, replace the camshaft bearing caps and cylinder head together.

Reference:

Cylinder head journal bore diameter	40.009 to 40.017 mm (1.5752 to 1.5755 in.)
Camshaft bearing center wall thickness (Mark "2")	2.004 to 2.008 mm (0.0789 to 0.0791 in.)
Camshaft journal diameter	35.971 to 35.985 mm (1.4165 to 1.4167 in.)

- (h) Remove the Plastigage completely.
 (i) Remove the camshafts.
 (j) Remove the camshaft bearing.



13. INSPECT CAMSHAFT THRUST CLEARANCE

- (a) Install the camshafts (See page [EM-89](#)).
 (b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

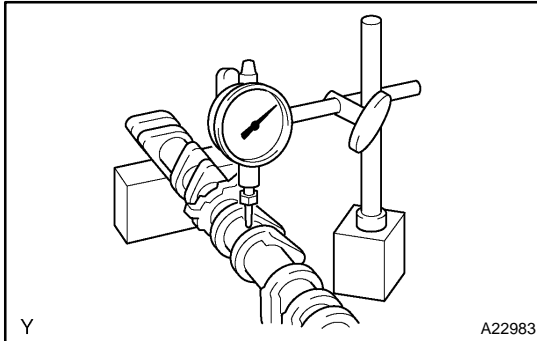
Standard thrust clearance:

0.04 to 0.09 mm (0.0016 to 0.0035 in.)

Maximum thrust clearance: 0.11 mm (0.0043 in.)

If the thrust clearance is greater than the maximum, replace the camshafts.

If necessary, replace the camshaft bearing caps and cylinder head as a set.

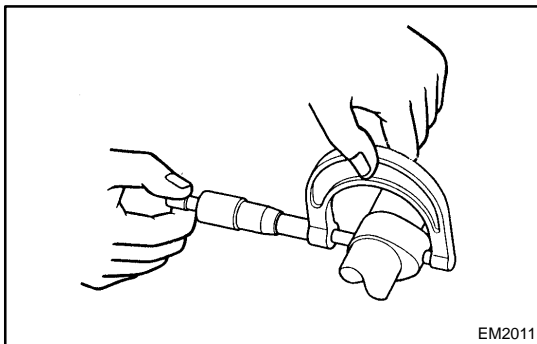


14. INSPECT CAMSHAFT

- (a) Inspect the camshaft for runout.
- (1) Place the camshaft on V-blocks.
 - (2) Using a dial indicator, measure the runout at the center journal.

Maximum runout: 0.06 mm (0.0024 in.)

If the runout is greater than the maximum, replace the camshaft



- (b) Inspect the cam lobes.
Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake: 44.168 to 44.268 mm (1.7389 to 1.7428 in.)

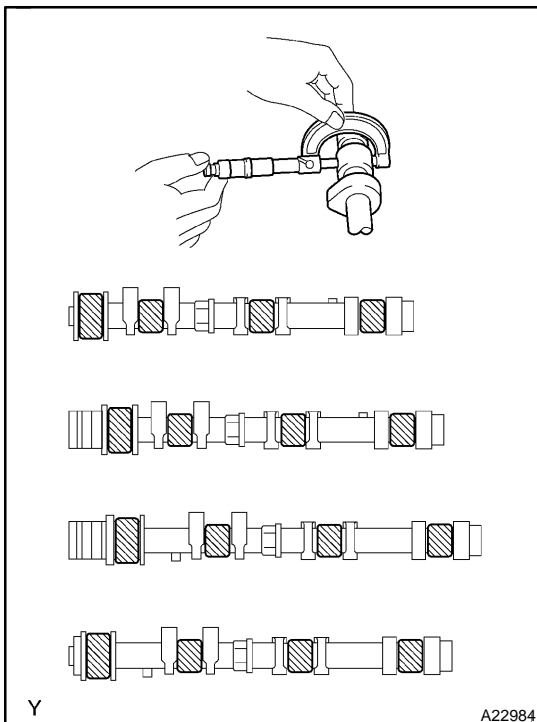
Exhaust: 44.580 to 44.680 mm (1.7551 to 1.7591 in.)

Minimum cam lobe height:

Intake: 44.018 mm (1.7330 in.)

Exhaust: 44.430 mm (1.7492 in.)

If the cam lobe height is less than the minimum, replace the camshaft.



- (c) Inspect the camshaft journals.
Using a micrometer, measure the journal diameter.

No. 1 journal diameter:

35.971 to 35.985 mm (1.4162 to 1.4167 in.)

Other journal diameter:

22.959 to 22.975 mm (0.9039 to 0.9045 in.)

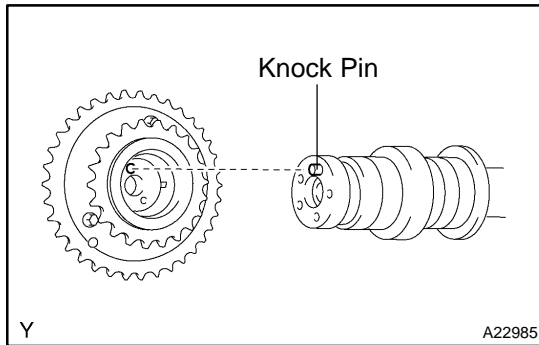
If the journal diameter is not as specified, check the oil clearance.

15. INSPECT CAMSHAFT TIMING GEAR

- (a) Fix the intake camshaft with a vise.

NOTICE:

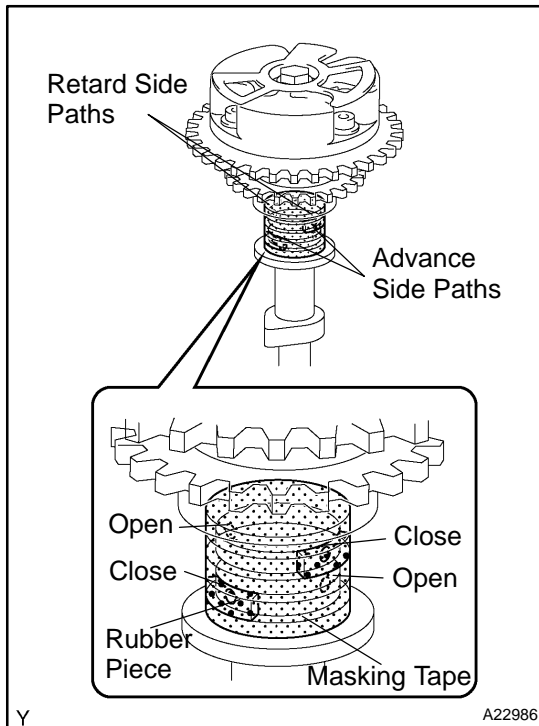
Be careful not to damage the camshaft.



- (b) Align the knock pin hole in the camshaft timing gear assembly with the knock pin of the camshaft, and install the camshaft timing gear assembly with the bolt.

Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)

- (c) Confirm that the camshaft timing gear assembly is locked.



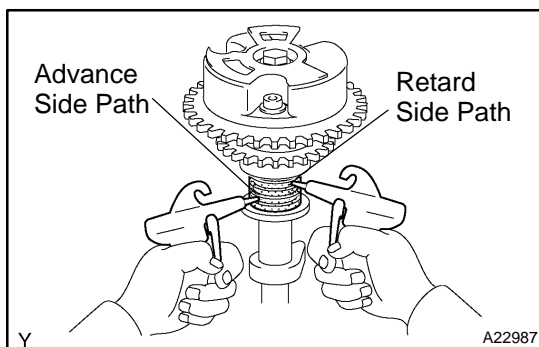
- (d) Release the lock pin.

- (1) Cover the 4 oil paths of the cam journal with masking tape as shown in the illustration.

HINT:

One of the 2 grooves on the cam journal is for retards (upper) and the other is for advances (lower). Each groove has 2 oil paths. Plug one of the oil paths for each groove with rubber pieces before wrapping the cam journal with tape.

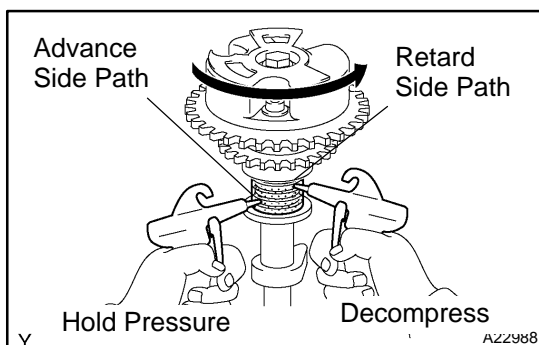
- (2) Prick a hole in the tape placed on the advance side path. Prick a hole in the retard side path, on the opposite side to that of the advance side path, as shown in the illustration.



- (3) Apply about 200 kPa (2.0 kgf/cm²) of air pressure to the two broken paths (the advance side path and the retard side path).

NOTICE:

Cover the paths with a shop rag to avoid oil splashing.



- (4) Confirm that the camshaft timing gear assembly rotates in the advance direction when reducing the air pressure applied to the retard path.

HINT:

When the lock pin is released, the camshaft timing gear rotates in the advance direction.

- (5) When the camshaft timing gear comes to the most advanced position, release the air pressure from the retard side path, and then release the air pressure from the advance side path.

NOTICE:

The camshaft timing assembly gear occasionally shifts to the retard side abruptly if the air pressure of the advanced side path is released first. This often results in breakage of the lock pin.

- (e) Check for smooth revolution.

Allow the camshaft timing gear assembly to turn back and forth at any position, except where the lock pin meets at the most retarded angle. Check the movable range and that there is no disturbance.

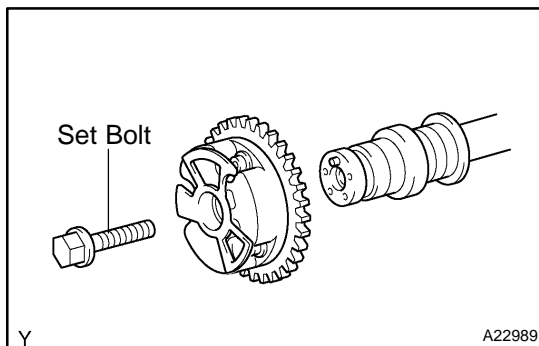
Standard: Moves smoothly in a range of about 31 °

NOTICE:

Be sure to perform this check by hand, instead of air pressure.

- (f) Check the lock in the most retarded position.

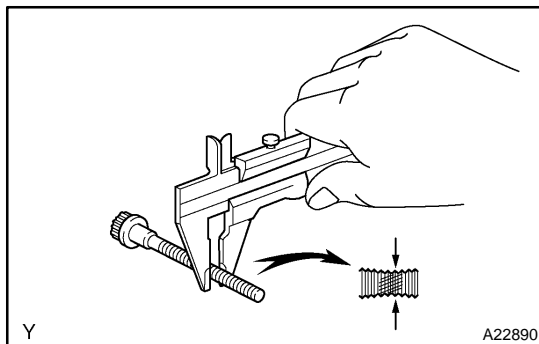
Confirm that the camshaft timing gear assembly is locked at the most retarded position.



- (g) Remove the set bolt and camshaft timing gear assembly.

NOTICE:

Be sure not to remove the other 3 bolts.

**16. INSPECT CYLINDER HEAD SET BOLT**

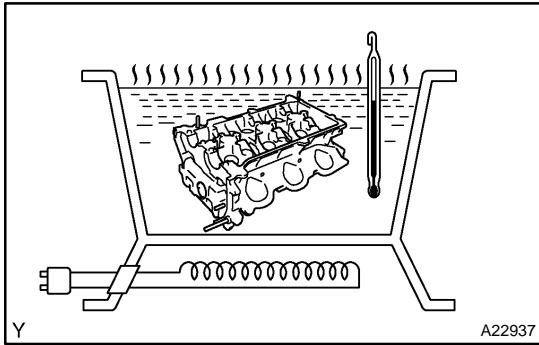
Using a vernier caliper, measure the outside thread diameter of the bolt.

Standard outside diameter:

10.85 to 11.00 mm (0.4272 to 0.4331 in.)

Minimum outside diameter:

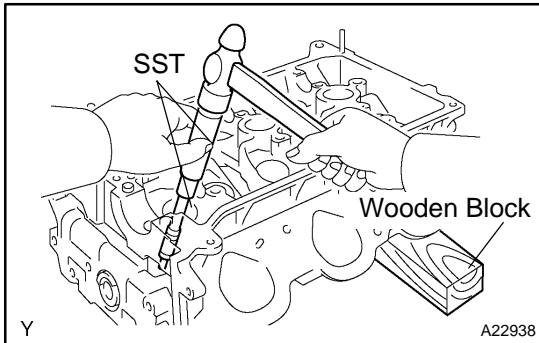
10.7 mm (0.421 in.)



REPLACEMENT

1. REPLACE VALVE GUIDE BUSH

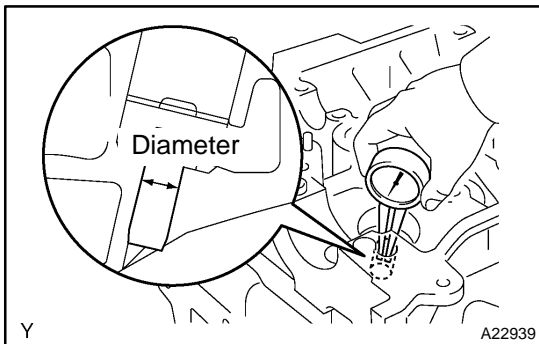
- (a) Gradually heat the cylinder head to between 80 and 100°C (176 to 212°F).



- (b) Place the cylinder head on a wooden block.

- (c) Using SST, tap out the valve guide bush.

SST 09201-10000, 09201-01055, 09950-70010
(09951-07100)



- (d) Using a caliper gauge, measure the bush bore diameter of the cylinder head.

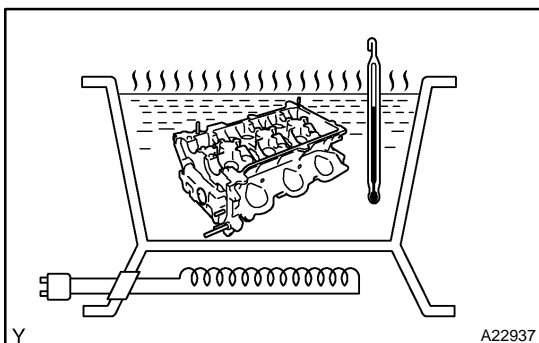
Bush bore diameter:

10.295 to 10.315 mm (0.4053 to 0.4061 in.)

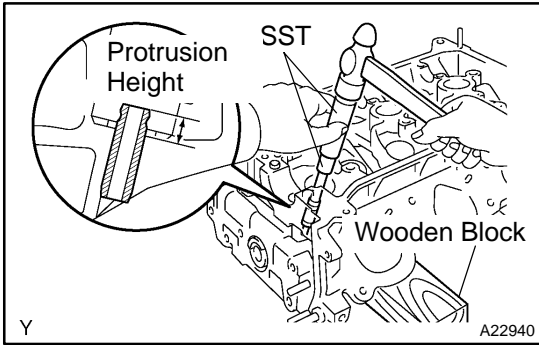
If the bush bore diameter of the cylinder head is greater than 10.315 mm (0.4061 in.), machine the bush bore to dimensions of 10.345 to 10.365 mm (0.4073 to 0.4081 in.).

Valve guide bush diameter

STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
O/S 0.05	10.383 to 10.394 mm (0.4088 to 0.4092 in.)



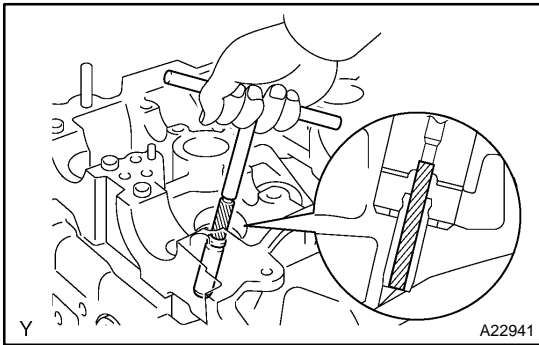
- (e) Gradually heat the cylinder head to between 80 and 100°C (176 to 212°F).



- (f) Place the cylinder head on a wooden block.
- (g) Using SST, tap in a new valve guide bush to the specified protrusion height.

SST 09201-10000, 09201-01055, 09950-70010
(09951-07100)

Protrusion height: 9.3 to 9.7 mm (0.366 to 0.382 in.)



- (h) Using a sharp 5.5 mm reamer, ream the valve guide bush to obtain the standard specified clearance between the valve guide bush and valve stem.

Standard oil clearance:

Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

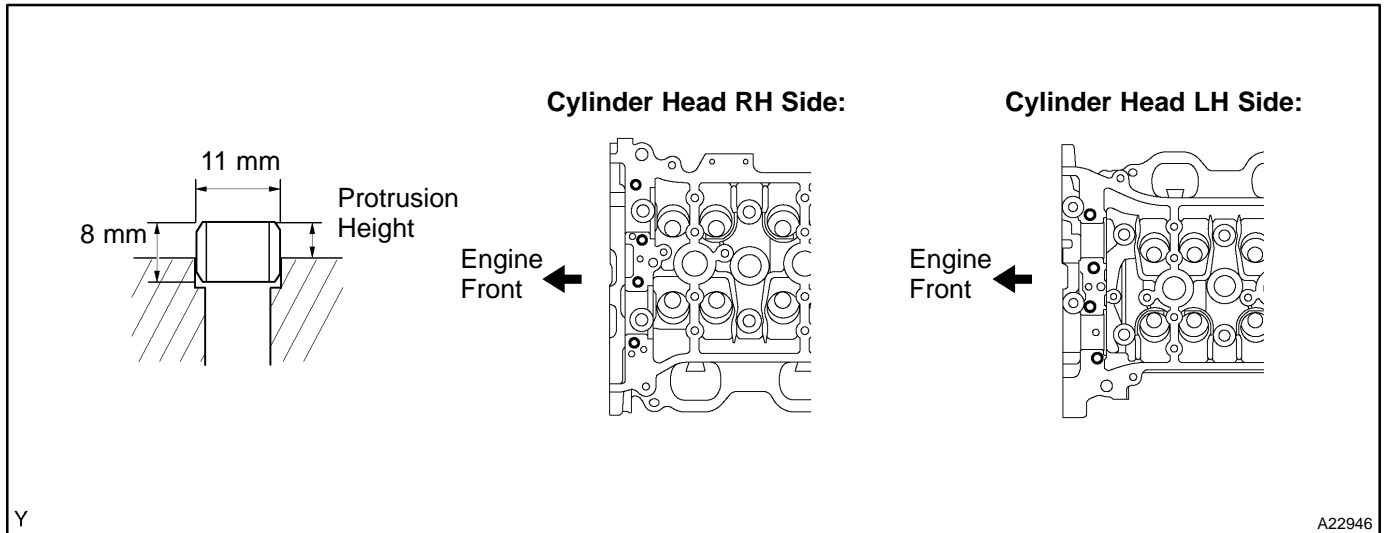
REASSEMBLY

1. INSTALL RING PIN

Using a plastic-faced hammer, tap in the new ring pins until they reach the specified protrusion height.

Specified protrusion height:

2.7 to 3.3 mm (0.106 to 0.130 in.)



2. INSTALL STRAIGHT PIN

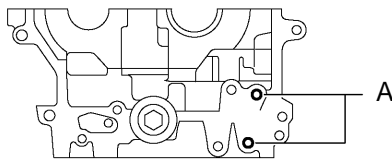
Using a plastic-faced hammer, tap in the new straight pins until they reach the specified protrusion height.

Specified protrusion height:

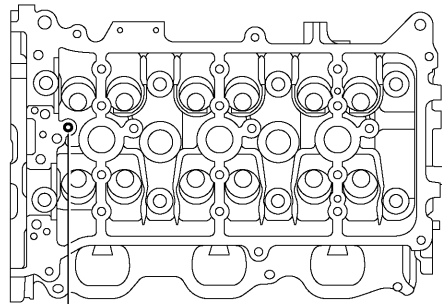
A	17.5 to 19.5 mm (0.689 to 0.768 in.)
B	7.5 to 8.5 mm (0.295 to 0.335 in.)
C	7.0 to 9.0 mm (0.276 to 0.354 in.)

Cylinder Head RH Side:

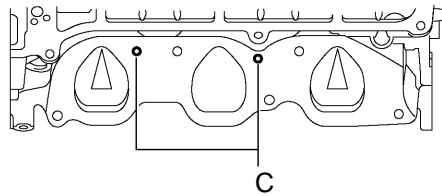
Front Side:



Upper Side:

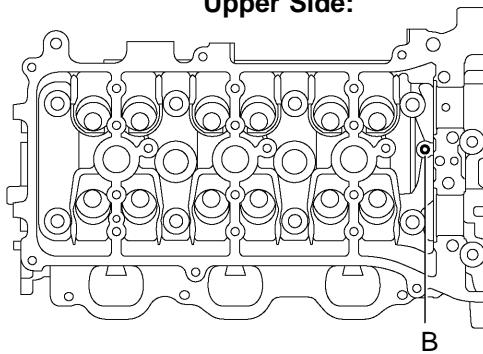


Intake Manifold Side:

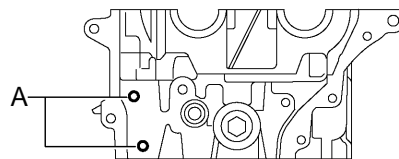


Cylinder Head LH Side:

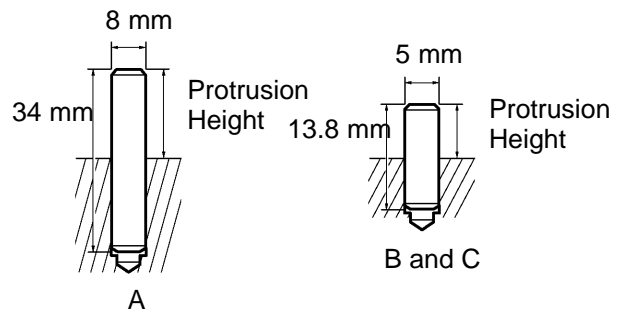
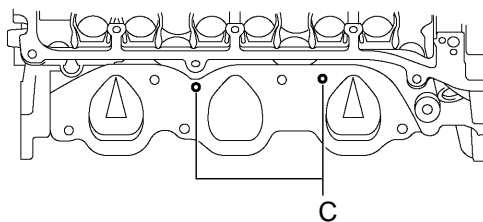
Upper Side:



Front Side:



Intake Manifold Side:



3. INSTALL STUD BOLT

Using the Torx® socket wrench E5 and E7, install the stud bolts.

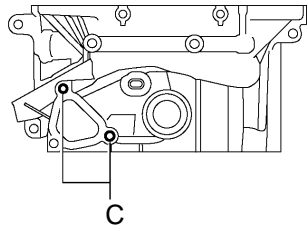
Torque:

4.0 N·m (41 kgf·cm, 35 in·lbf) for stud bolt A, C

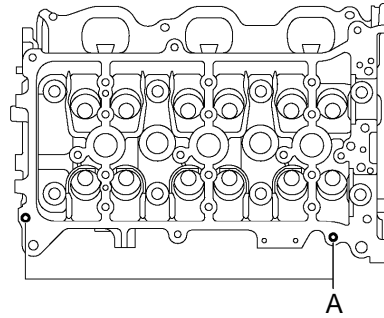
19.5 N·m (199 kgf·cm, 14 ft·lbf) for stud bolt B

Cylinder Head RH Side:

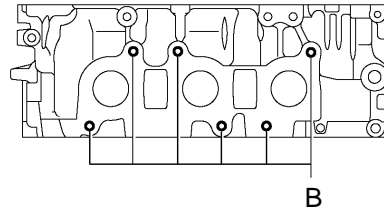
Rear Side:



Upper Side:

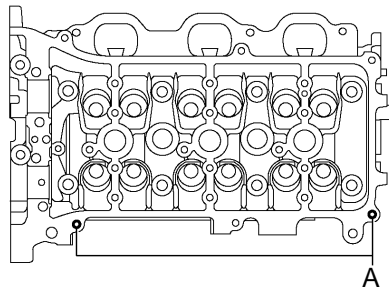


Exhaust Manifold Side:

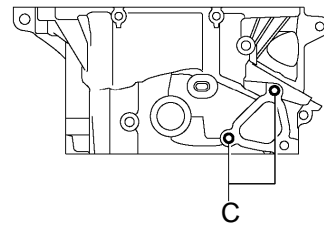


Cylinder Head LH Side:

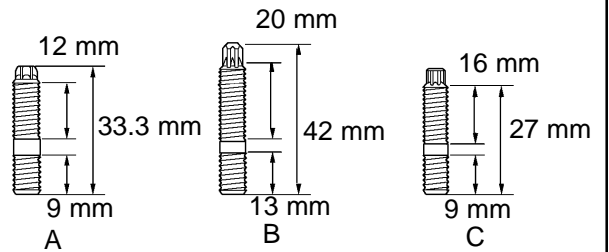
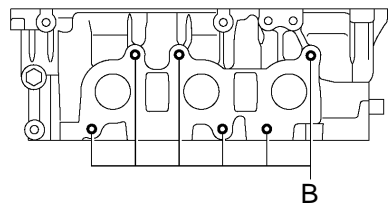
Upper Side:

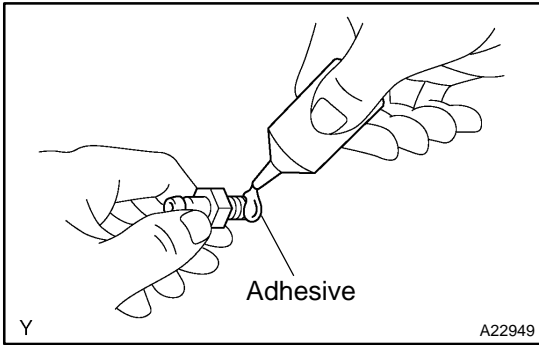


Rear Side:



Exhaust Manifold Side:





4. INSTALL UNION

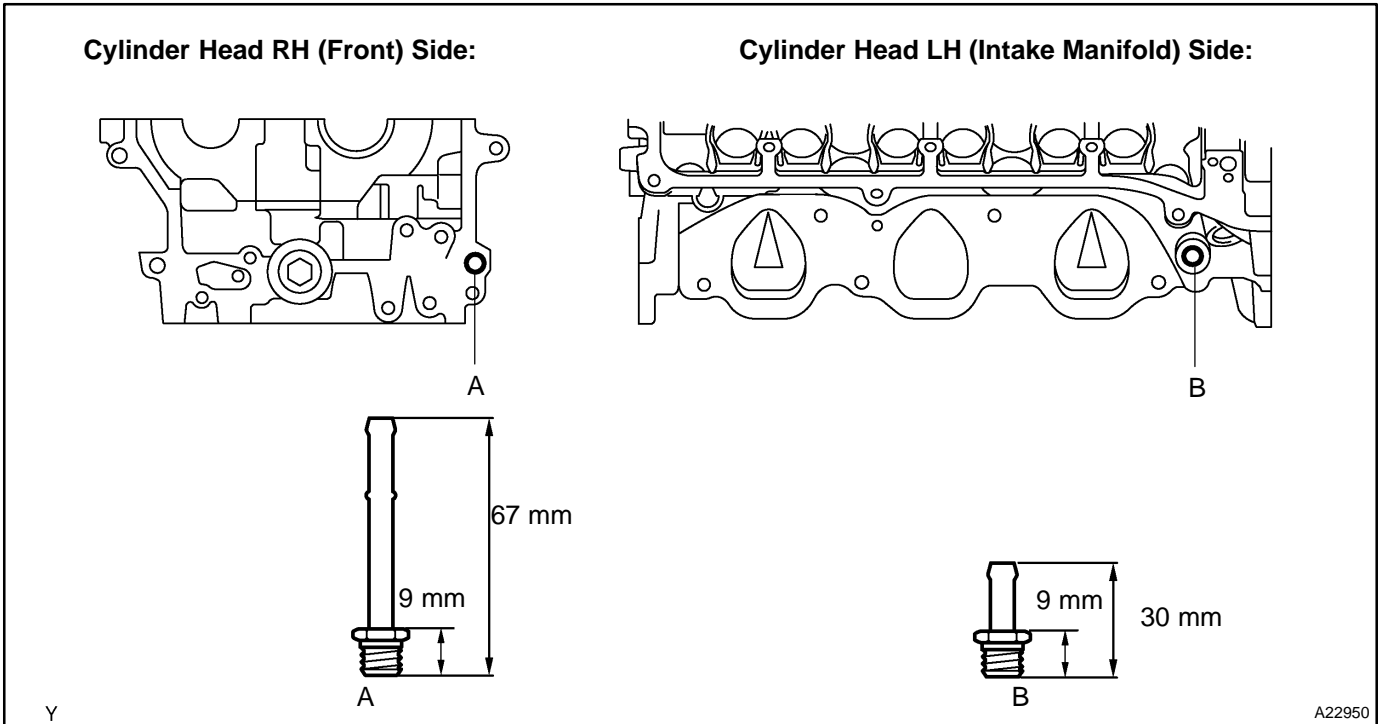
- (a) Apply adhesive to 2 or 3 threads of the bolt end.

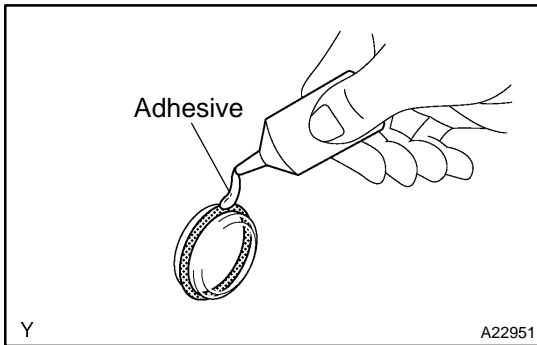
Adhesive:

Part No. 08833-00070, THREE BOND 1324 or equivalent

- (b) Using a deep socket wrench 12, install the unions.

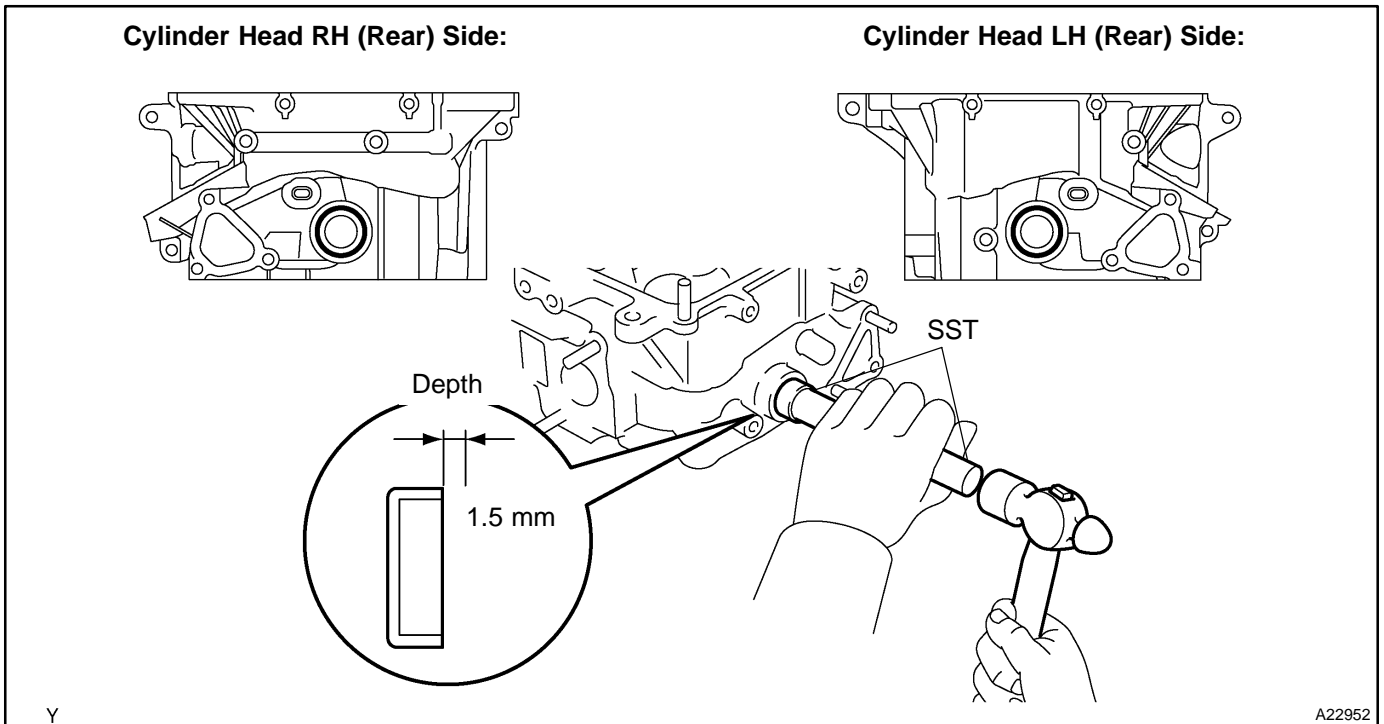
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)



**5. INSTALL TIGHT PLUG**

- (a) Apply adhesive around the tight plugs.
- (b) Using SST, tap in the tight plugs to the specified depth.
SST 09950-60010 (09951-00250), 09950-70010 (09951-07150)

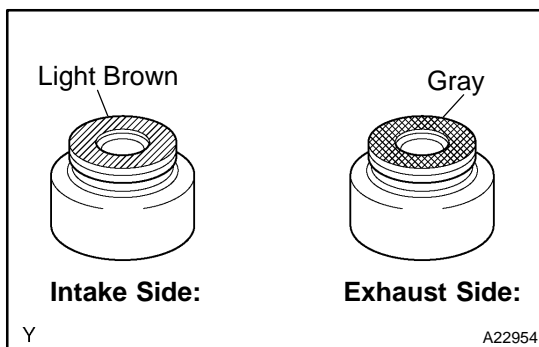
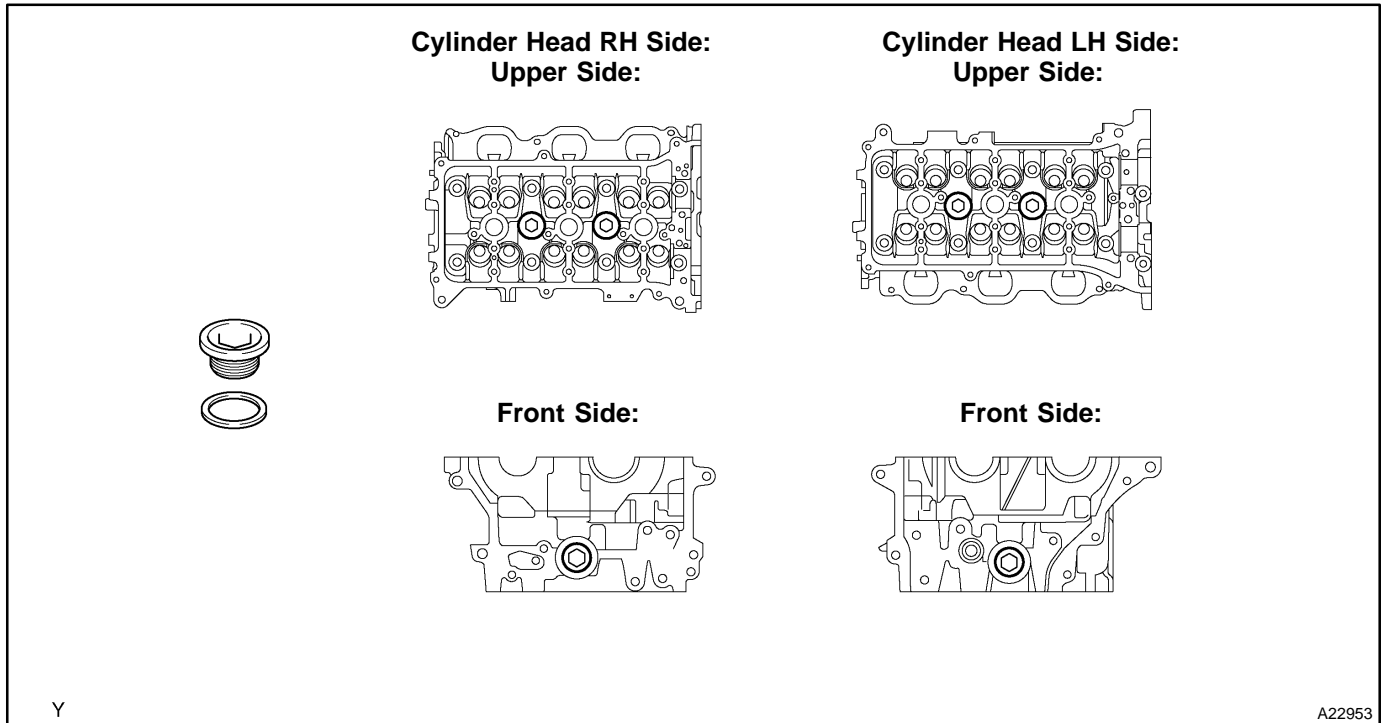
Specified depth: 1.5 mm (0.059 in.)



6. INSTALL STRAIGHT SCREW PLUG

- (a) Using a straight hexagon wrench 14, install a new gasket and straight screw plug.

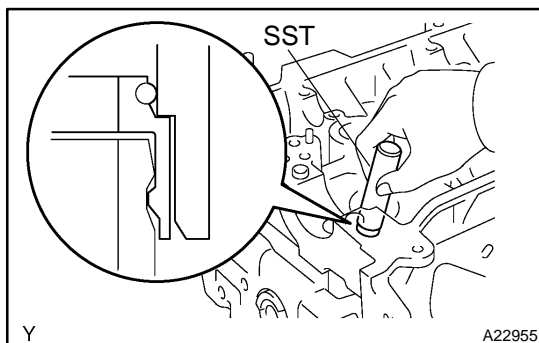
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)

**7. INSTALL VALVE STEM OIL SEAL**

HINT:

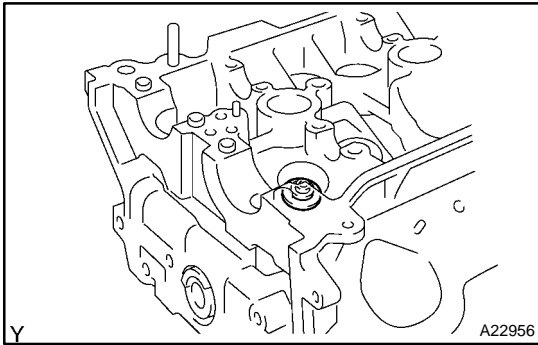
The intake valve stem oil seal is light brown and the exhaust valve stem oil seal is gray.

- (a) Apply a light coat of engine oil to the valve guide bush.

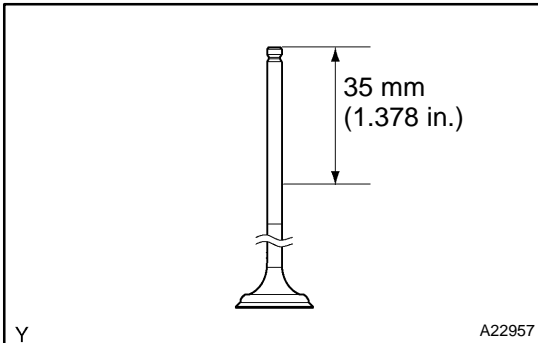


- (b) Using SST, push in a new valve stem oil seal.

SST 09201-41020

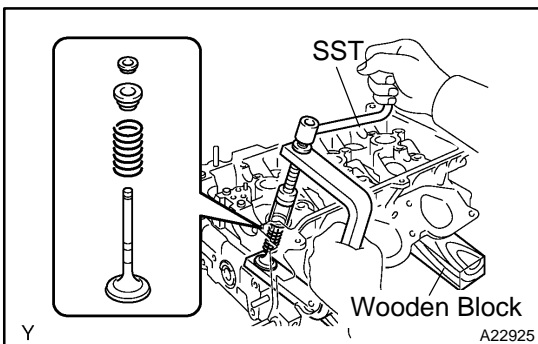


8. INSTALL VALVE SPRING SEAT



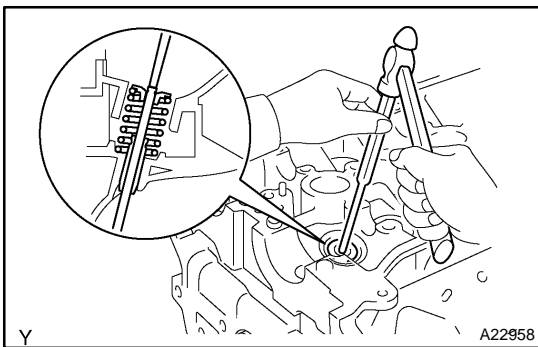
9. INSTALL VALVE

- (a) Apply engine oil to the valve as shown in the illustration.



- (b) Place the cylinder head on a wooden block.
 (c) Install the valve, inner compression spring and valve spring retainer.
 (d) Using SST, compress the inner compression spring and place the 2 valve spring retainer locks around the valve stem.

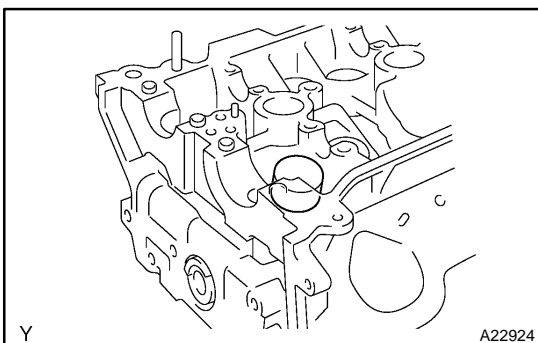
SST 09202-70020 (09202-00010)



- (e) Using a pin punch 5, lightly tap the valve stem tip to ensure a proper fit.

NOTICE:

Be careful not to damage the valve stem tip.



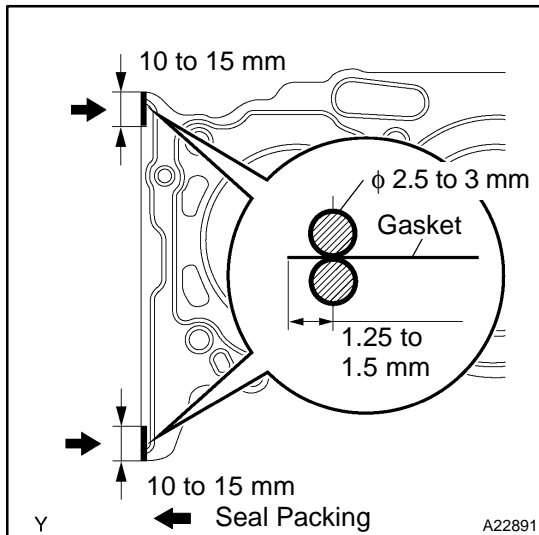
10. INSTALL VALVE LIFTER

- (a) Apply engine oil to the valve stem end and valve lifter, and install the valve lifter to the valve stem.
 (b) Check that the valve lifter rotates smoothly by hand.

INSTALLATION

1. INSTALL CYLINDER HEAD GASKET

- (a) Remove any old packing material (FIPG) and be careful not to drop any oil on the contact surfaces of the cylinder head and cylinder block.
- (b) Install the RH cylinder head gasket.

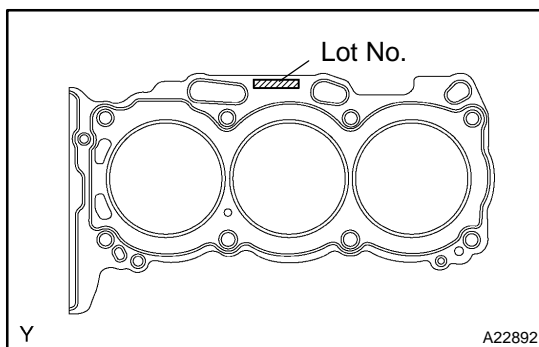


- (1) Apply a continuous bead of seal packing (diameter 2.5 to 3 mm (0.098 to 0.118 in.)) to a new cylinder head gasket as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

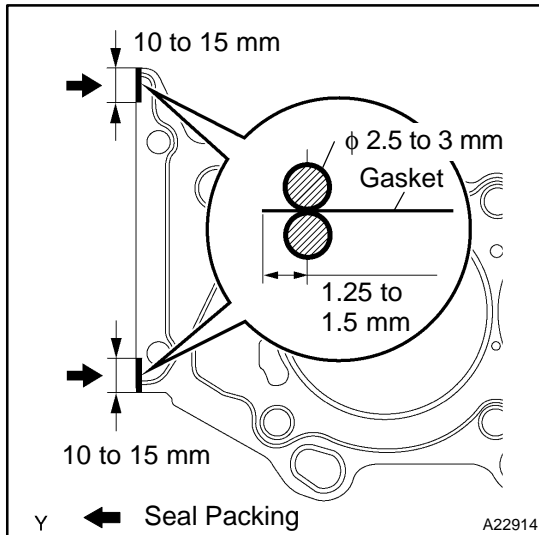
Install the cylinder head within 3 minutes after applying seal packing. After installing it, the cylinder head bolts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.



- (2) Place the cylinder head gasket on the cylinder block surface with the Lot No. stamp upper side facing upward.

NOTICE:

- **Be careful of the installation direction.**
- **Place the cylinder head carefully in order not to damage the gasket with the bottom part of the head.**

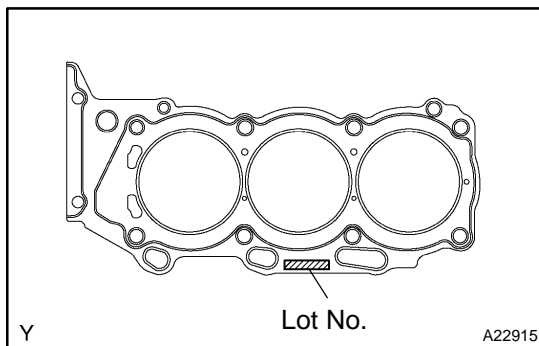


- (c) Install the LH cylinder head gasket.
- (1) Apply a continuous bead of seal packing (diameter 2.5 to 3 mm (0.098 to 0.118 in.)) to a new cylinder head gasket as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Install the cylinder head within 3 minutes after applying seal packing. After installing it, the cylinder head bolts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.



- (2) Place the cylinder head gasket on the cylinder block surface with the Lot No. stamp upper side facing upward.

NOTICE:

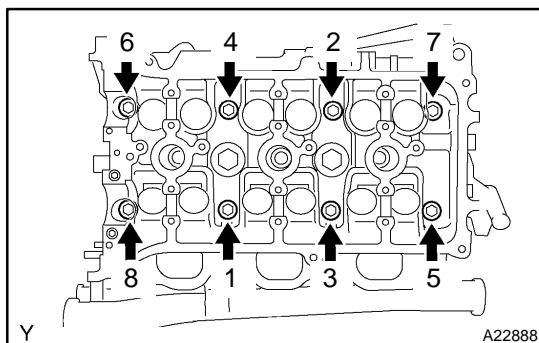
- **Be careful of the installation direction.**
- **Place the cylinder head carefully in order not to damage the gasket with the bottom part of the head.**

2. INSTALL CYLINDER HEAD

- (a) Place the RH cylinder head on the cylinder head gasket.
- (b) Install the 8 cylinder head bolts.

HINT:

- The cylinder head bolts are tightened in 2 successive steps (steps (3) and (5)).
 - If any cylinder head bolt is broken or deformed, replace it.
- (1) Apply a light coat of engine oil to the threads of the cylinder head bolts.
- (2) Install the plate washer to the cylinder head bolt.



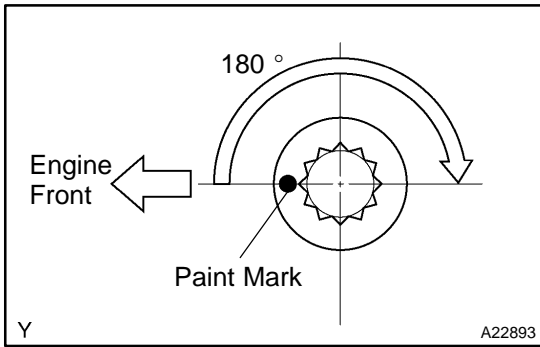
- (3) Using several steps, tighten each bolt with a 10 mm bi-hexagon wrench uniformly in the sequence as shown in the illustration.

Torque: 36 N·m (367 kgf·cm, 27 ft·lbf)

If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

NOTICE:

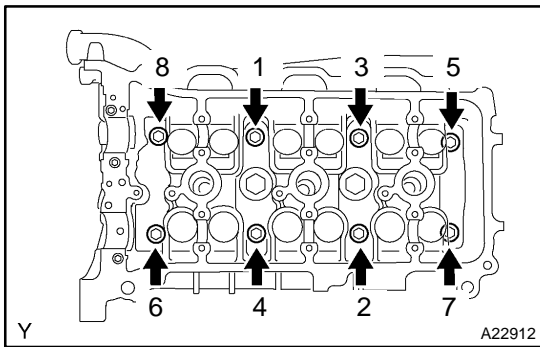
Do not drop the washers into the cylinder head.



- (4) Mark the front side of each cylinder head bolt with paint.
 - (5) Retighten the cylinder head bolts by 180° as shown.
 - (6) Check that the painted marks are now at 180° opposite to the engine front.
- (c) Place the LH cylinder head on the cylinder head gasket.
 (d) Install the 8 cylinder head bolts.

HINT:

- The cylinder head bolts are tightened in 2 successive steps (steps (3) and (5)).
 - If any cylinder head bolt is broken or deformed, replace it.
- (1) Apply a light coat of engine oil to the threads of the cylinder head bolts.
 - (2) Install the plate washer to the cylinder head bolt.



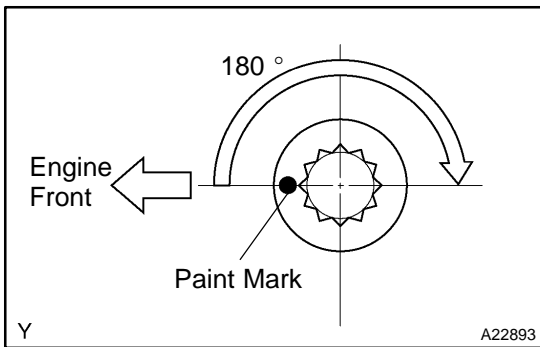
- (3) Using several steps, tighten each bolt with a 10 mm bi-hexagon wrench uniformly in the sequence as shown in the illustration.

Torque: 36 N·m (367 kgf·cm, 27 ft·lbf)

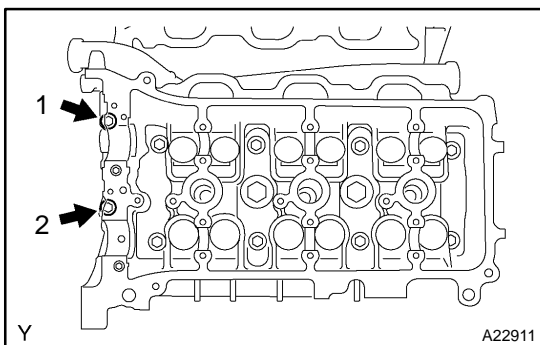
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

NOTICE:

Do not drop the washers into the cylinder head.

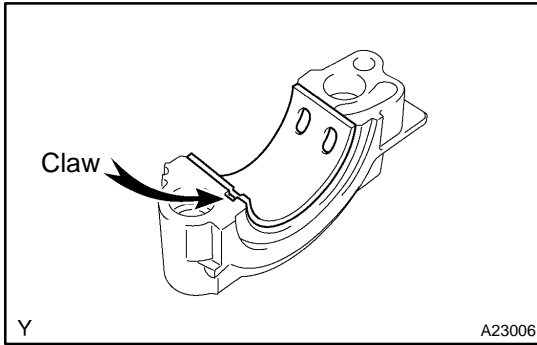


- (4) Mark the front side of each cylinder head bolt with paint.
- (5) Retighten the cylinder head bolts by 180° as shown.
- (6) Check that the painted marks are now at 180° opposite to the engine front.



- (e) Install the 2 cylinder head bolts.
- (1) Apply a light coat of engine oil to the threads of the cylinder head bolts.
 - (2) Install the 2 cylinder head bolts. Using several steps, tighten the bolts uniformly in the sequence as shown in the illustration.

Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

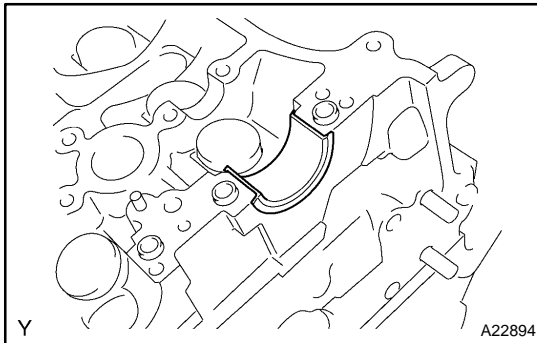


3. INSTALL CAMSHAFT BEARING NO.1

Align the bearing claw with the claw groove of the bearing cap, and push in the camshaft bearing.

NOTICE:

- Install the bearing while aligning it with the oil hole in the bearing cap.
- Clean the backside of the bearing and the bearing surface of the bearing cap and prevent oil from adhering to them.



4. INSTALL CAMSHAFT BEARING NO.2

Install the camshaft bearing No. 2 to the cylinder head.

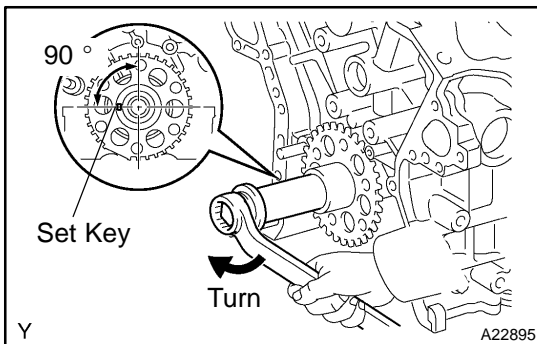
NOTICE:

Clean the backside of the bearing and the bearing surface of the cylinder head and prevent oil from adhering to them.

5. INSTALL CAMSHAFT

NOTICE:

As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head which receives the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



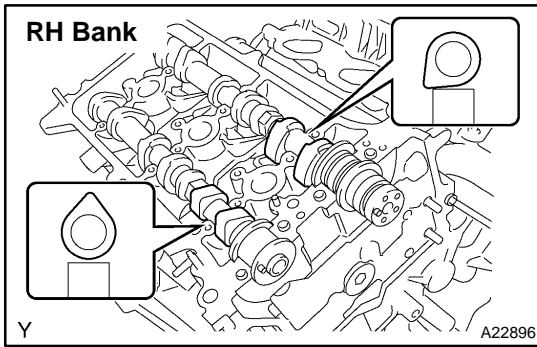
(a) Set the crankshaft position.

Using the crankshaft pulley set bolt, turn the crankshaft, and set the crankshaft set key into the left horizontal position.

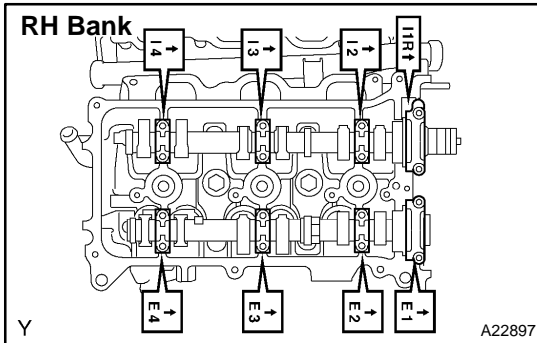
NOTICE:

Having the crankshaft at the wrong angle can cause the piston head and valve head to come into contact with each other when you install the camshaft, causing damage. So always set the crankshaft at the correct angle.

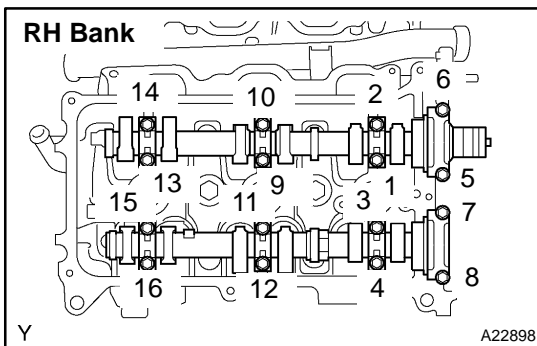
(b) Apply new engine oil to the thrust portion and journal of the camshafts.



- (c) Install the camshaft of the RH bank.
- (1) Place the 2 camshafts onto the RH cylinder head with the cam lobes of No. 1 cylinder facing each direction as shown in the illustration.



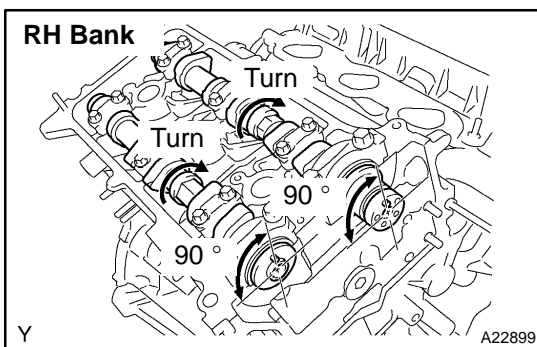
- (2) Install the 8 bearing caps in their proper locations.
- (3) Apply a light coat of engine oil to the threads of the bearing cap bolts.



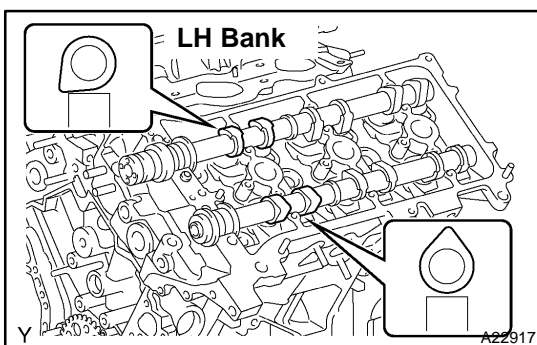
- (4) Install the 16 bearing cap bolts. Using several steps, tighten the bolts uniformly in the sequence as shown in the illustration.

Torque:

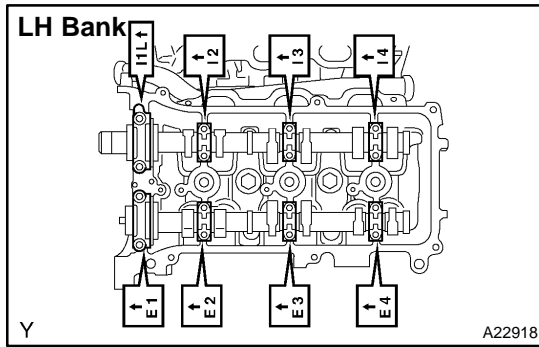
9.0 N·m (92 kgf·cm, 80 in.-lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft.-lbf) for 12 mm (0.47 in.) head



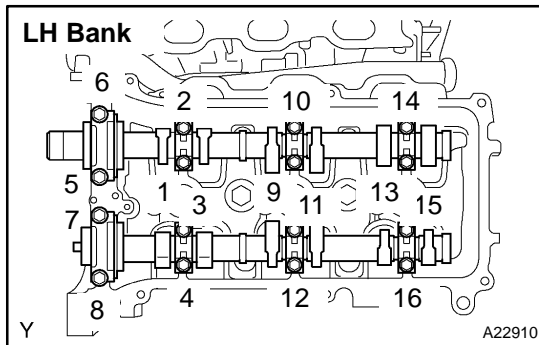
- (5) Turn the camshafts clockwise with a wrench until the camshaft knock pin comes 90° position to the cylinder head.



- (d) Install the camshafts of the LH bank.
- (1) Place the 2 camshafts onto the LH cylinder head with the cam lobes of No. 2 cylinder facing as shown in the illustration.



- (2) Install the 8 bearing caps in their proper locations.
- (3) Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.



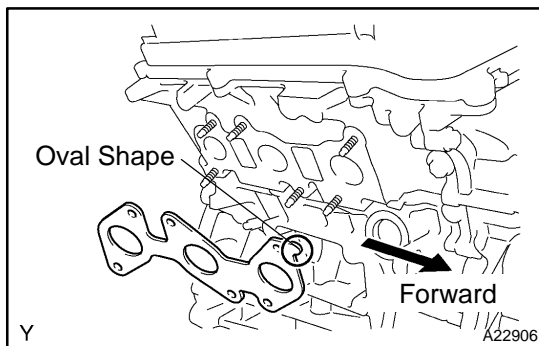
- (4) Install the 16 bearing cap bolts. Using several steps, tighten the bolts uniformly in the sequence as shown in the illustration.

Torque:

9.0 N·m (92 kgf·cm, 80 in.-lbf) for 10 mm (0.39 in.) head

24 N·m (245 kgf·cm, 18 ft.-lbf) for 12 mm (0.47 in.) head

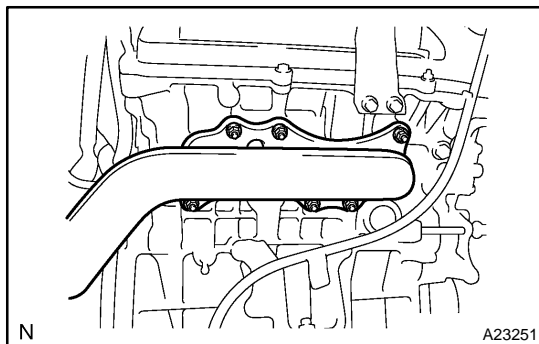
- 6. INSTALL TIMING CHAIN (See page EM-44)**
- 7. INSTALL TIMING CHAIN COVER (See page EM-44)**
- 8. INSTALL OIL PAN (See page EM-44)**

**9. INSTALL EXHAUST MANIFOLD**

- (a) Install the RH exhaust manifold.
 - (1) Set a new gasket to the RH cylinder head with the oval shape facing forward.

NOTICE:

Be careful of the installation direction.



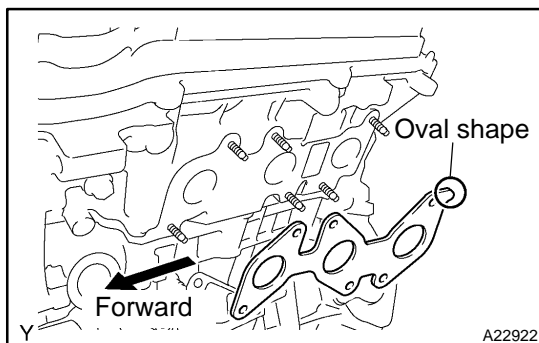
- (2) Install the exhaust manifold with the 6 nuts. Tighten the nuts uniformly in several steps.

Torque: 21 N·m (214 kgf·cm, 15 ft.-lbf)

- (3) Connect the A/F sensor connector.

- (4) Install the manifold stay with the 3 bolts.

Torque: 40 N·m (408 kgf·cm, 30 ft.-lbf)

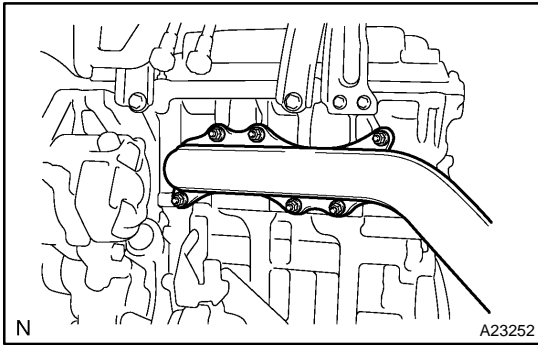


- (b) Install the LH exhaust manifold.

- (1) Set a new gasket to the LH cylinder head with the oval shape facing backward.

NOTICE:

Be careful of the installation direction.



- (2) Install the exhaust manifold with the 6 nuts. Tighten the nuts uniformly in several steps.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

- (3) Connect the A/F sensor connector.

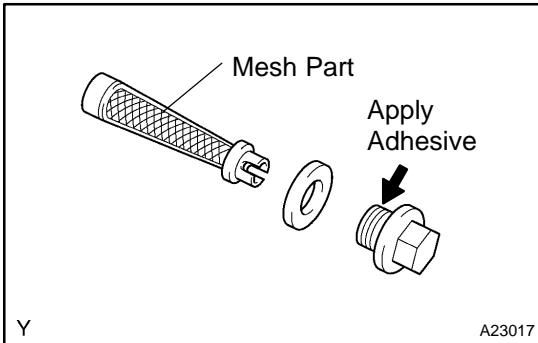
- (4) Install the manifold stay with the 3 bolts.

Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)

10. INSTALL RH AND LH FRONT EXHAUST PIPE

(See page [EM-138](#))

11. INSTALL VVT SENSOR (See page [IG-12](#))



12. INSTALL OIL CONTROL VALVE FILTER

- (a) Check that no foreign objects on the mesh part of the 2 filters.

- (b) Install 2 new gaskets to each new plug.

- (c) Insert the filters to the plugs.

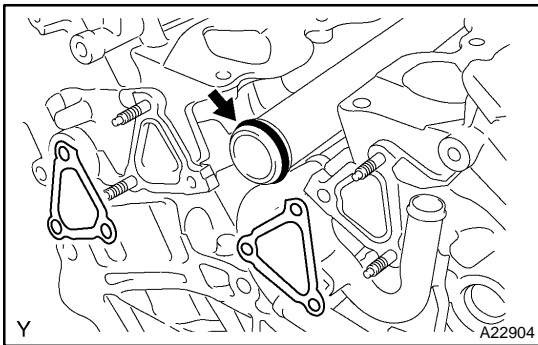
- (d) Apply adhesive to 2 or 3 threads of the plugs.

**Adhesive: Part No. 08833-00080, THREE BOND 1344
LOCTITE 242 or equivalent**

- (e) Install the plugs to each cylinder head.

Torque: 62 N·m (632 kgf·cm, 46 ft·lbf)

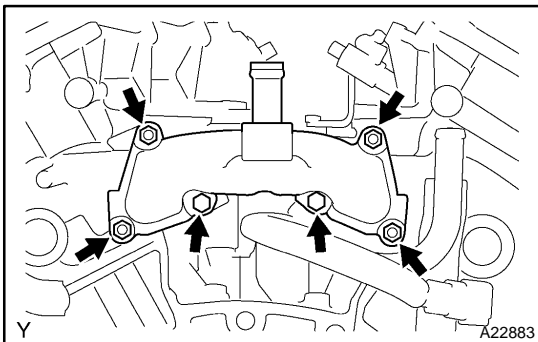
13. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE



14. INSTALL WATER BY-PASS JOINT

- (a) Install a new O-ring to the water outlet pipe.

- (b) Apply soapy water to the O-ring.

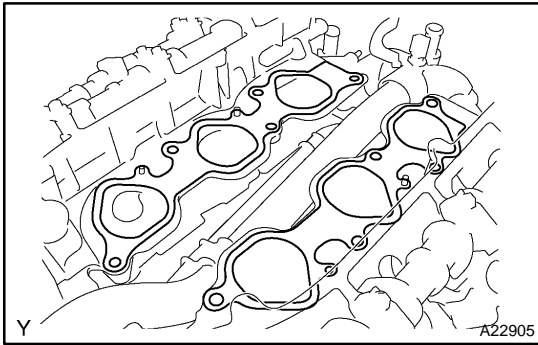


- (c) Install 2 new gaskets and water by-pass joint with the 2 bolts and 4 nuts.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

- (d) Connect the heater hose.

- (e) Connect the engine coolant temperature sensor connector.

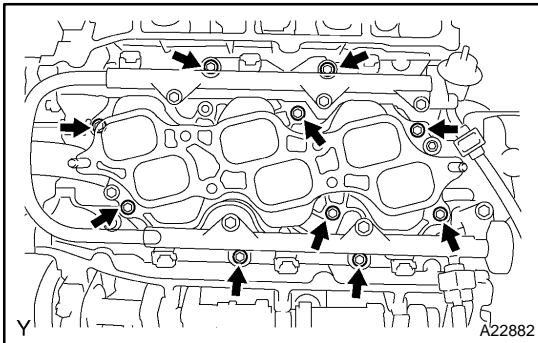


15. INSTALL INTAKE MANIFOLD

- (a) Set a new gasket on each cylinder head.

NOTICE:

- **Align the port holes of the gasket and cylinder head.**
 - **Be careful of the installation direction.**
- (b) Set the intake manifold on the cylinder heads.



- (c) Install and tighten the 10 bolts uniformly in several steps.

Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

- (d) Connect the 6 fuel injector connectors.

16. INSTALL CYLINDER HEAD COVER

- (a) Install the RH cylinder head cover.

- (1) Remove any old packing material (FIPG) and be careful not to drop any oil on the contact surfaces of the cylinder head, timing chain cover and cylinder head cover.

- (2) Apply a continuous bead of seal packing (diameter 2 to 3 mm (0.08 to 0.12 in.)) to the cylinder head and timing chain cover as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Install the cylinder head cover within 3 minutes after applying seal packing. After installing it, cylinder head cover bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.

- (3) Install the seal washers to the bolts.

- (4) Install the cylinder head cover with the 10 bolts and 2 nuts. Tighten the bolts and nuts uniformly in several steps.

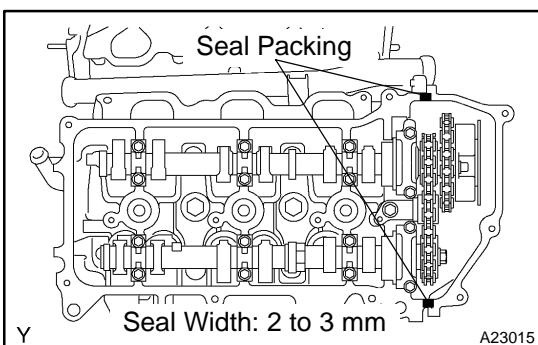
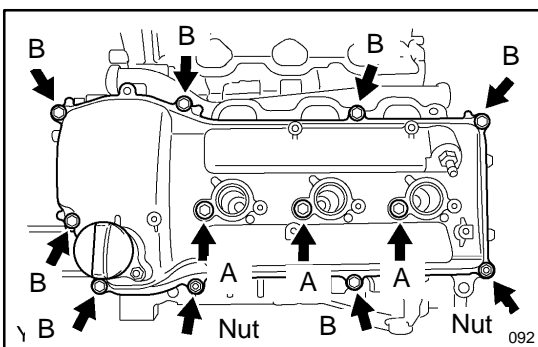
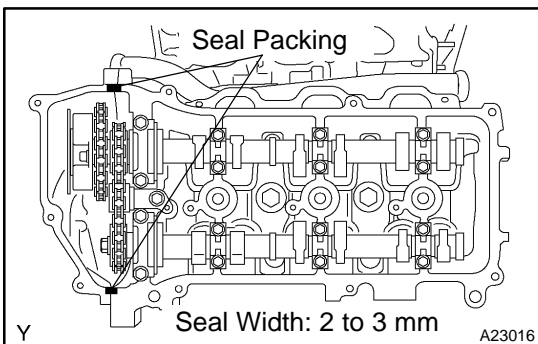
Torque:

Bolt A, Nut: 9.0 N·m (92 kgf·cm, 80 in·lbf)

Bolt B: 10 N·m (102 kgf·cm, 7 ft·lbf)

- (b) Install a new gasket and oil filler cap housing with the 2 nuts.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)



- (c) Install the LH cylinder head cover.

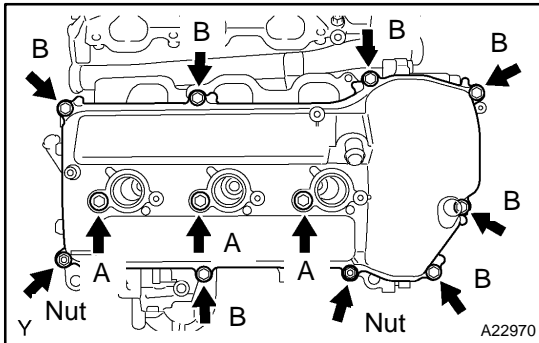
- (1) Apply a continuous bead of seal packing (diameter 2 to 3 mm (0.08 to 0.12 in.)) to the cylinder head and timing chain cover as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Install the cylinder head cover within 3 minutes after applying seal packing. After installing it, cylinder head cover bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.

- (2) Install the seal washers to the bolts.



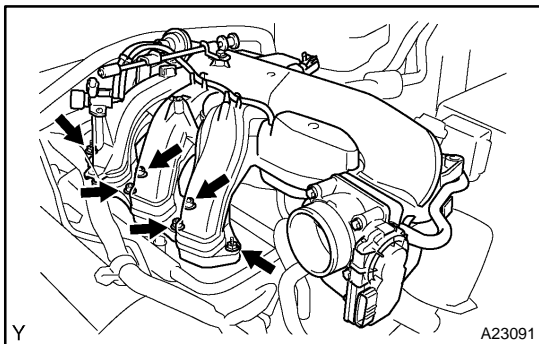
- (3) Install the cylinder head cover with the 10 bolts and 2 nuts. Tighten the bolts and nuts uniformly in several steps.

Torque:

Bolt A, Nut: 9.0 N·m (92 kgf·cm, 80 in·lbf)

Bolt B: 10 N·m (102 kgf·cm, 7 ft·lbf)

17. INSTALL IGNITER



18. INSTALL INTAKE AIR SURGE TANK

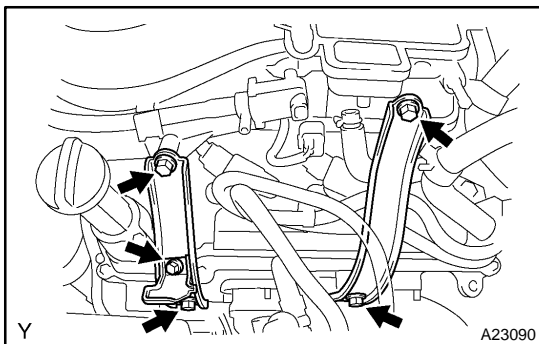
- (a) Install a new gasket to the intake air surge tank.

- (b) Using the socket hexagon wrench 8, install the intake air surge tank with the 4 bolts.

Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

- (c) Install the 2 intake air surge tank nuts.

Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

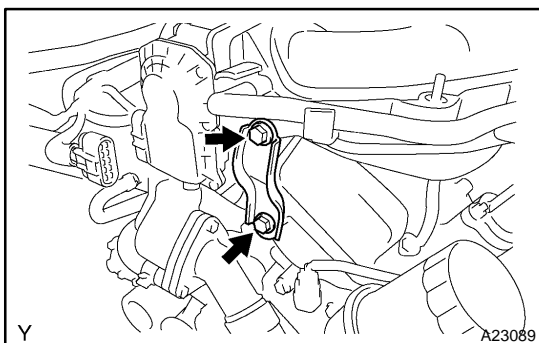


- (d) Install the 2 surge tank stays with the 4 bolts.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

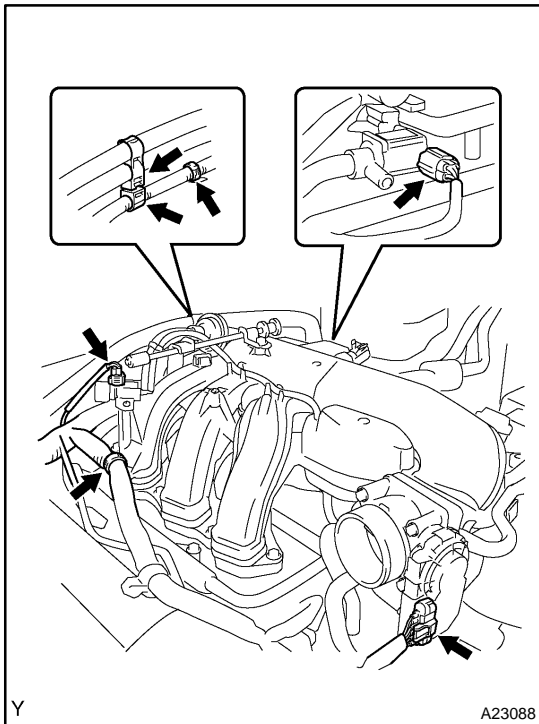
- (e) Install the oil baffle plate with the bolt.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

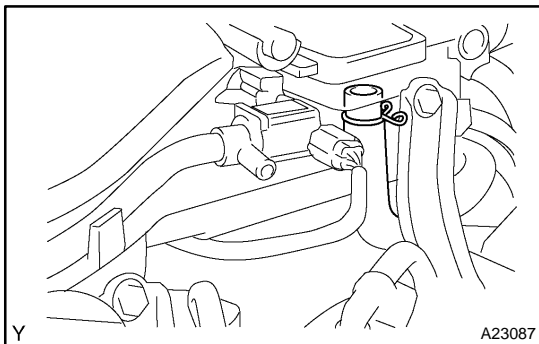


- (f) Install the throttle body bracket with the 2 bolts.

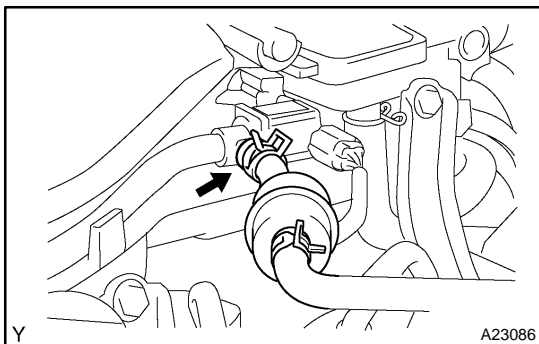
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)



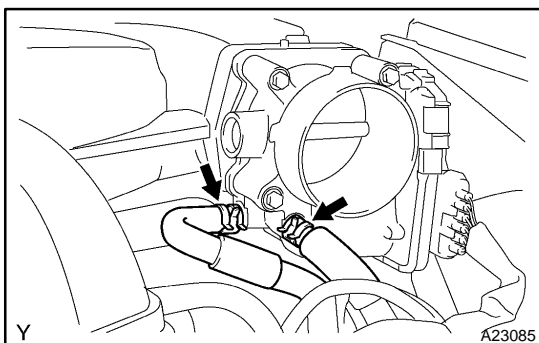
- (g) Install the 3 wire harness clamps and hose clamp.
- (h) Connect the throttle body w/ motor connector.
- (i) Connect the 2 VSV connectors.



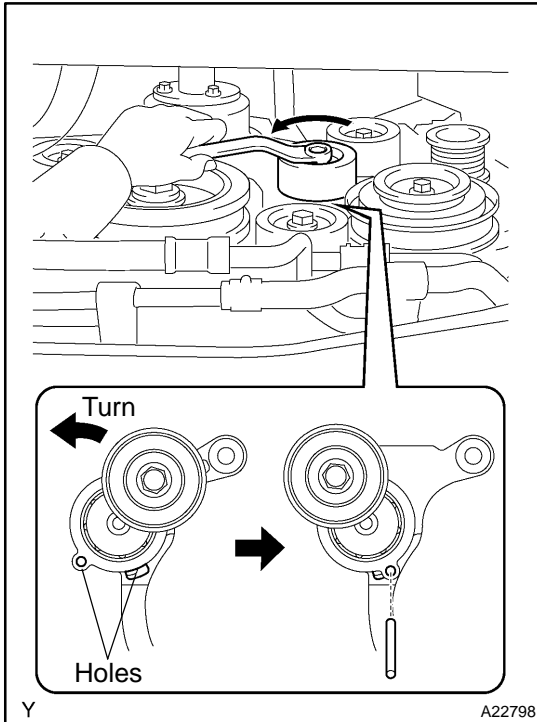
- (j) Connect the ventilation hose.



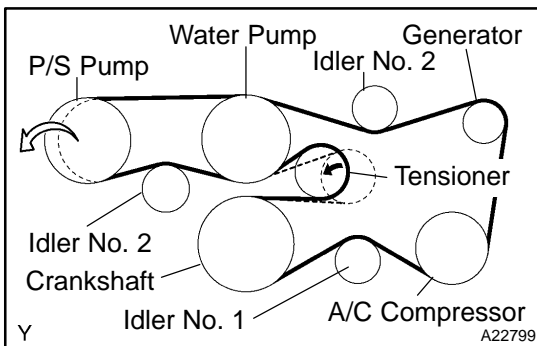
- (k) Connect the fuel vapor feed hose.



- (l) Connect the 2 water by-pass hoses.
19. **CONNECT HEATER WATER OUTLET AND INLET HOSE**
 20. **INSTALL COOLER COMPRESSOR**
(See page [AC-58](#))
 21. **INSTALL GENERATOR** (See page [CH-15](#))
 22. **INSTALL VANE PUMP** (See page [SR-57](#))
 23. **INSTALL FAN W/FLUID COUPLING**

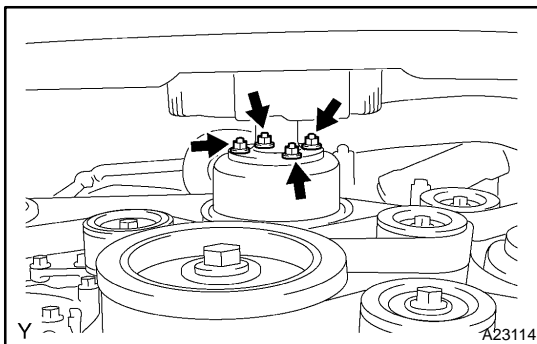
**24. INSTALL DRIVE BELT**

- (a) While turning the belt tensioner counterclockwise, align with the holes. Insert a bar of 6 mm (0.24 in.) into the holes to fix the belt tensioner.
- (b) Install the V-ribbed belt.
- (c) While turning the belt tensioner counterclockwise, remove the bar.



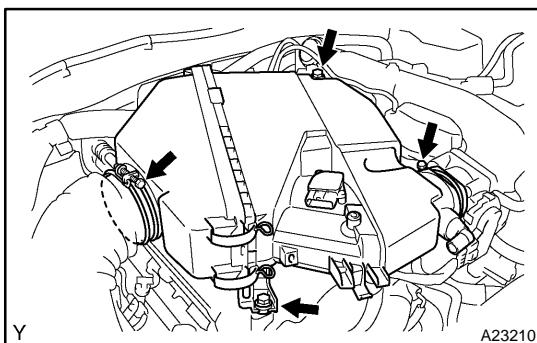
- (d) If it is hard to install the V-ribbed belt, perform the following procedure.

- (1) Put the V-ribbed belt on every parts except the P/S pump as shown in the illustration.
- (2) While releasing the belt tension by turning the belt tensioner counterclockwise, put the V-ribbed belt on the P/S pump.

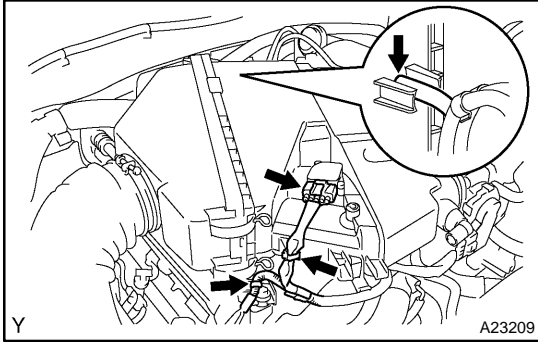
**25. TIGHTEN FAN W/FLUID COUPLING**

Tighten the 4 fluid coupling bolts.

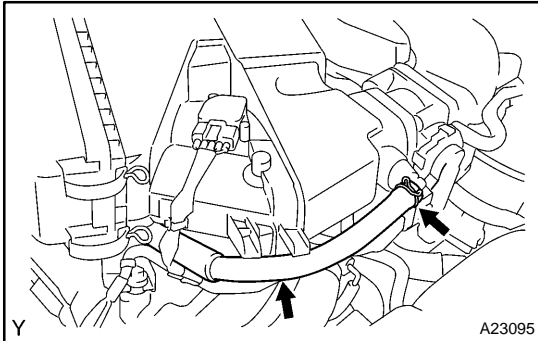
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

26. INSTALL RADIATOR (See page CO-18)**27. INSTALL FAN SHROUD****28. CONNECT FUEL PIPE (See page SF-1)****29. INSTALL AIR CLEANER**

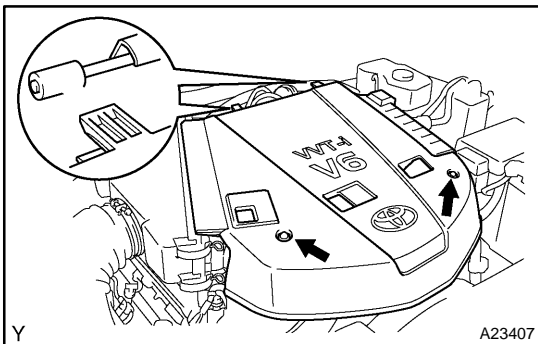
- (a) Install the air cleaner with the 2 bolts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)
- (b) Tighten the 2 hose clamps.



- (c) Install the 2 wire harness clamps.
- (d) Connect the mass air flow meter connector.
- (e) Connect the vacuum hose.



- (f) Connect the ventilation hose No.2.
- 30. ADD ENGINE COOLANT**
31. ADD ENGINE OIL
32. CHECK FOR LEAK



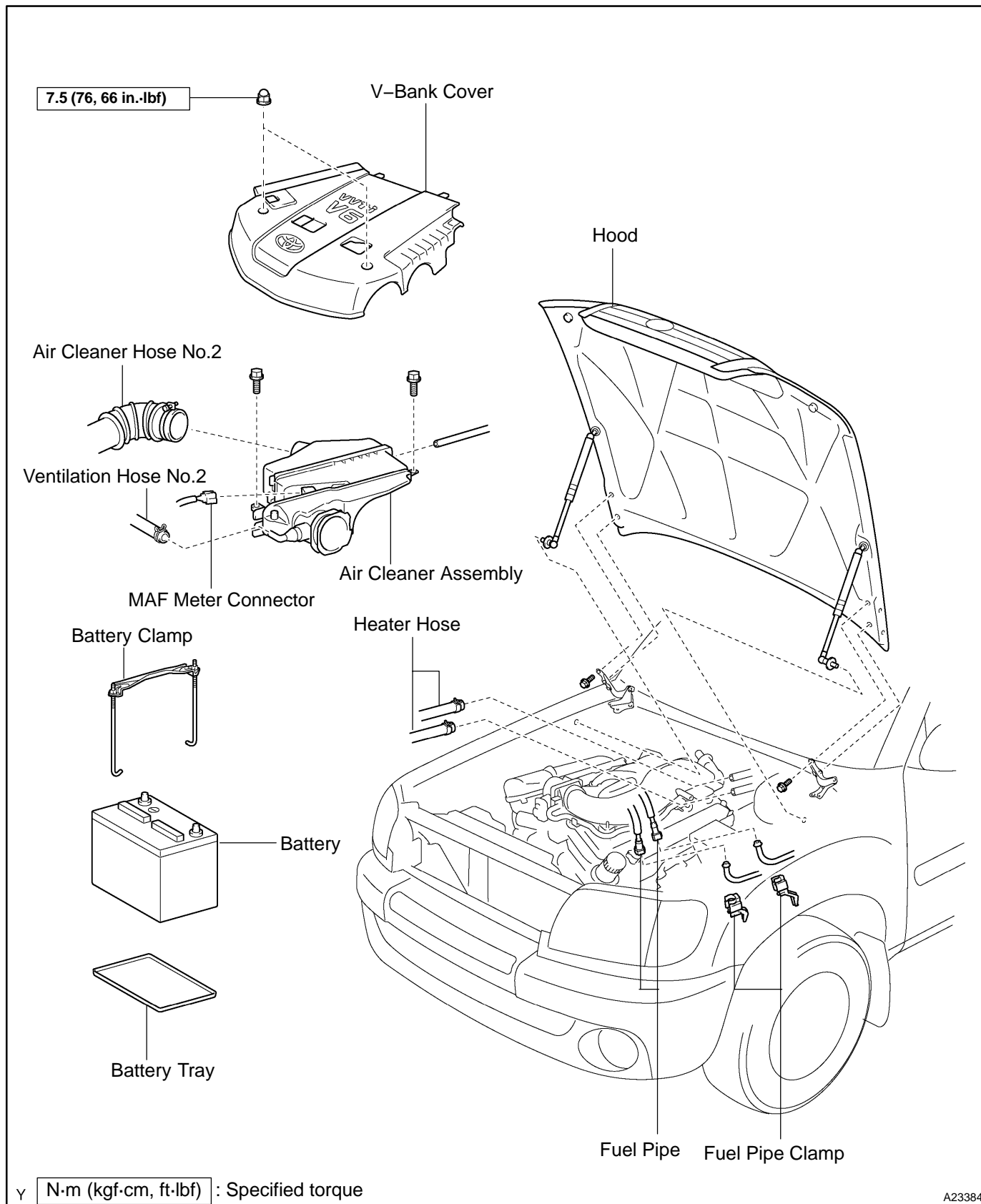
33. INSTALL V-BANK COVER

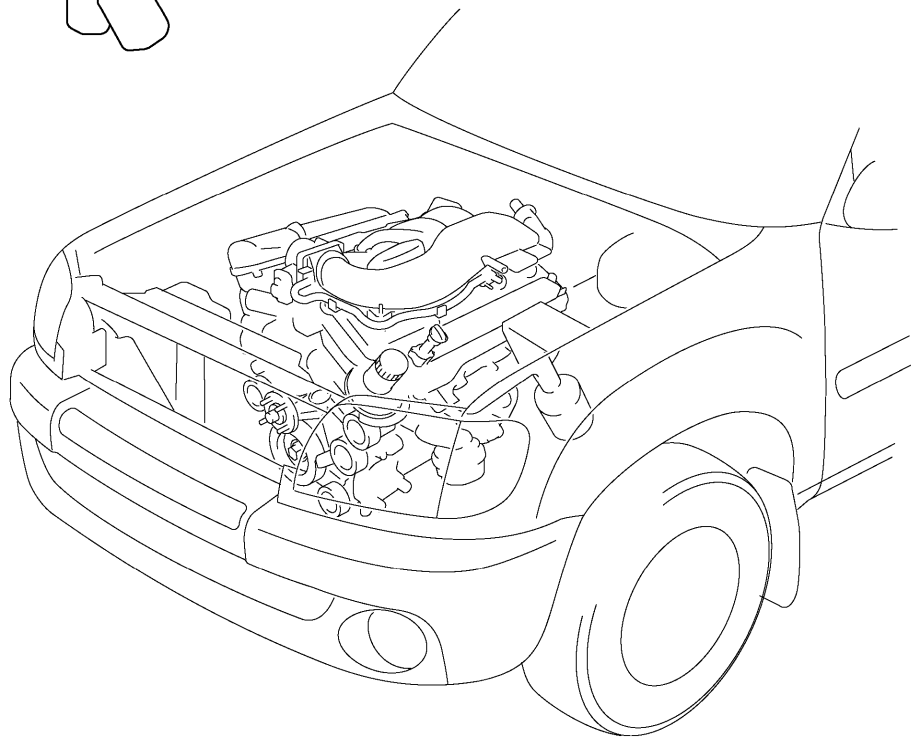
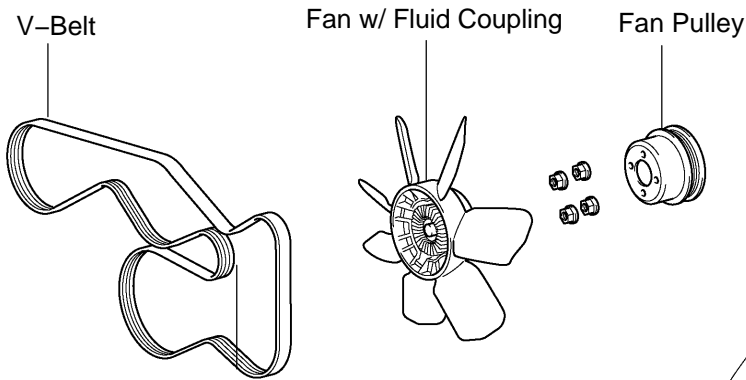
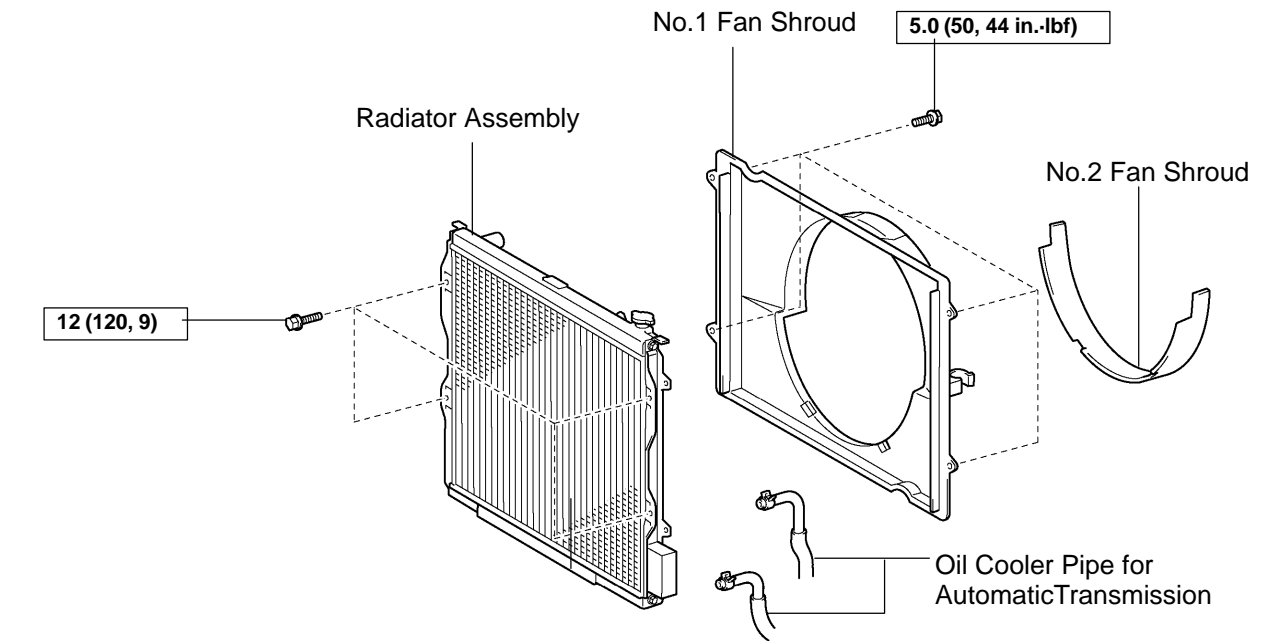
Install the V-bank cover with the 2 nuts.

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

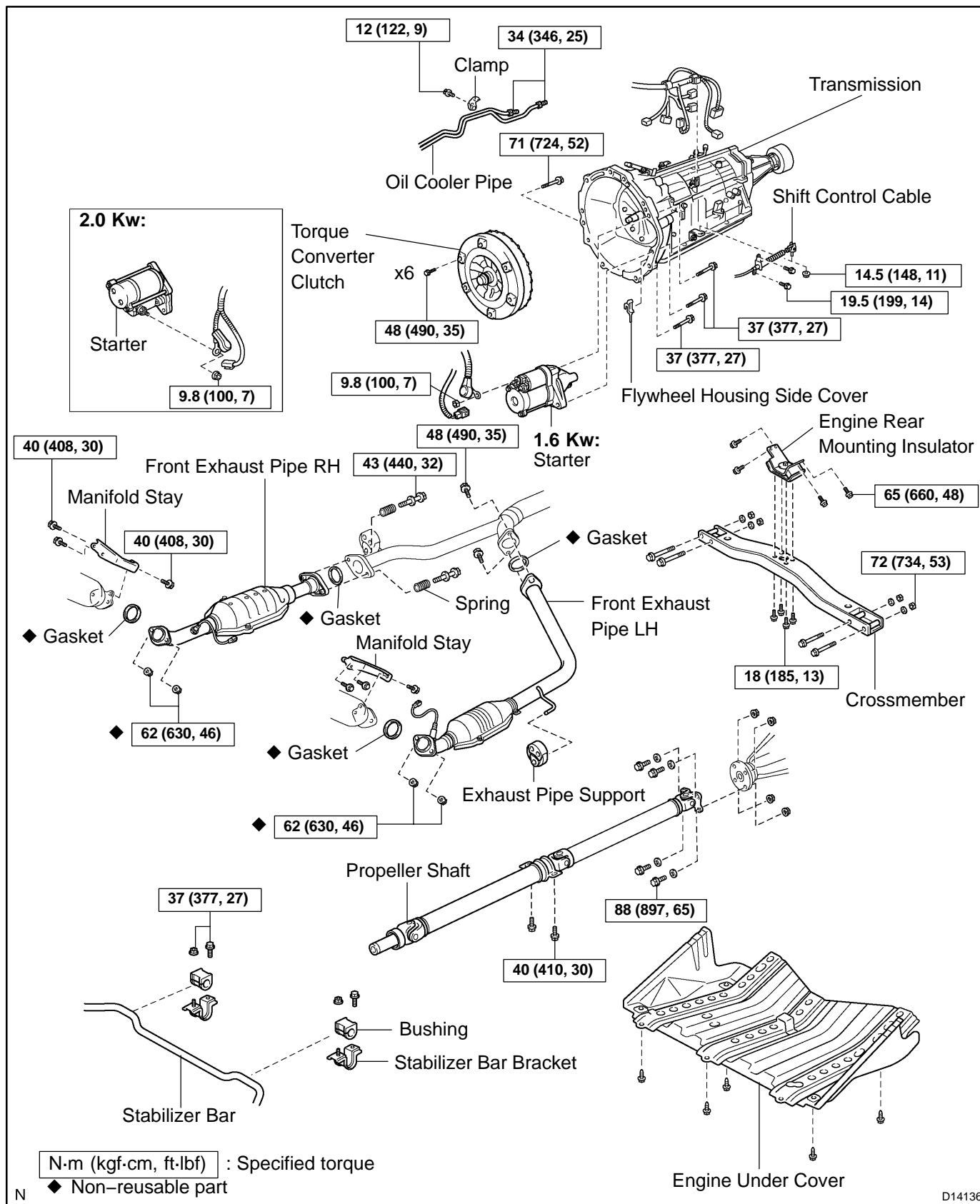
ENGINE UNIT COMPONENTS

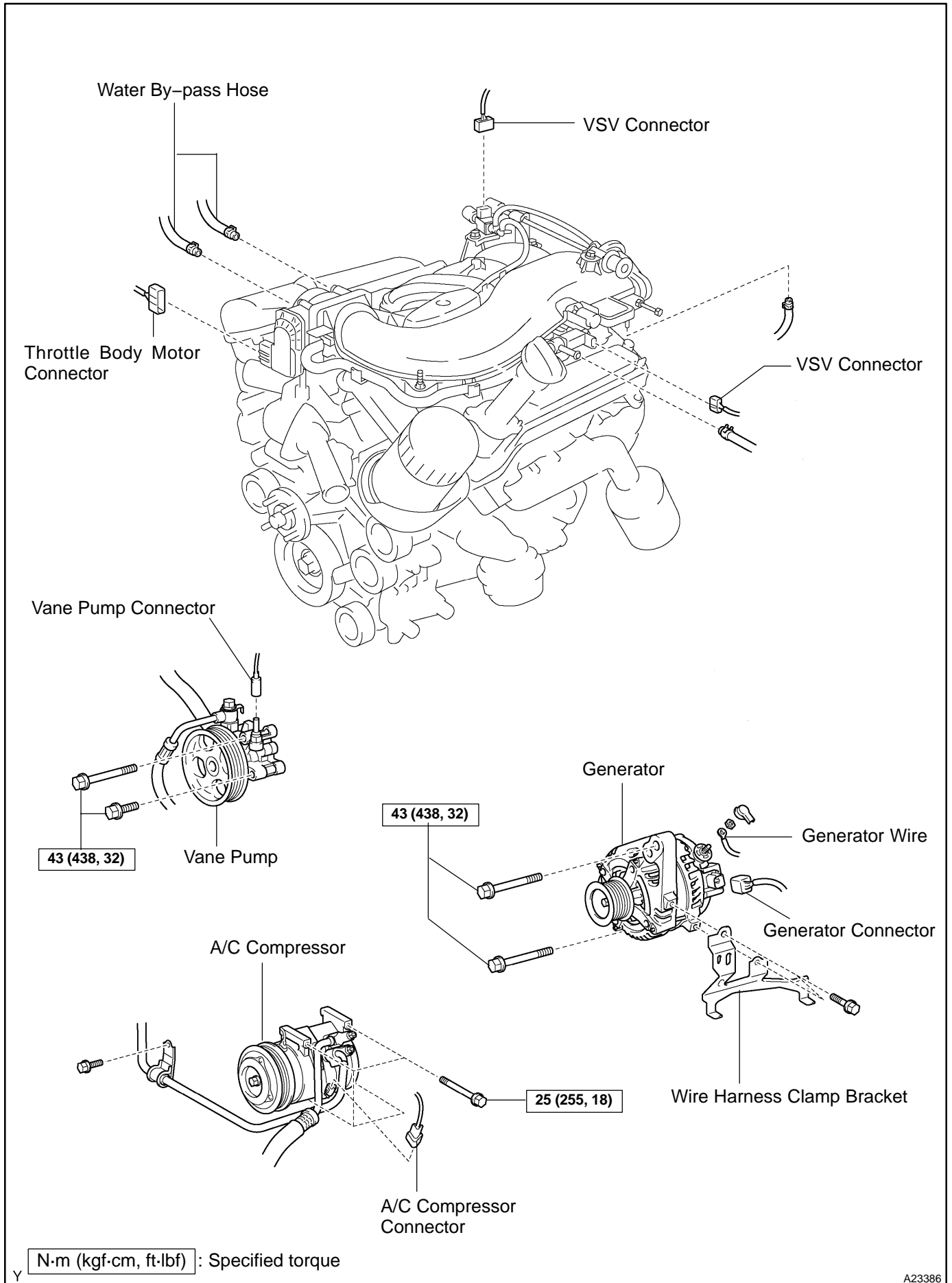
EM1XV-01





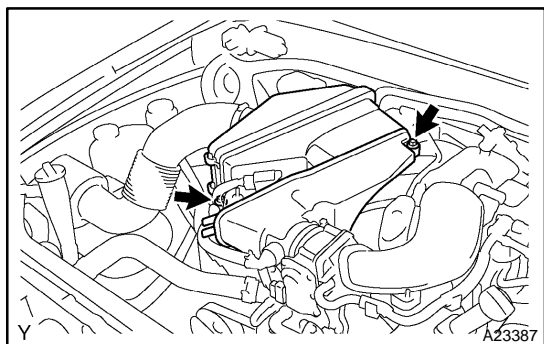
γ N·m (kgf·cm, ft·lbf) : Specified torque



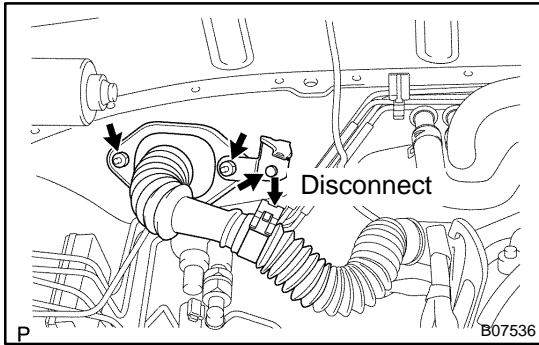


REMOVAL

1. PREVENT GASOLINE FROM SPILLING OUT
(See page [SF-1](#))
2. REMOVE ENGINE HOOD
3. REMOVE ENGINE V-BANK COVER
4. REMOVE ENGINE UNDER COVER
5. REMOVE AUTOMATIC TRANSMISSION
(See page [AT-27](#))
6. REMOVE MANUAL TRANSMISSION
(See page [MT-4](#))
7. REMOVE FRONT EXHAUST PIPES
(See page [EM-139](#))
8. REMOVE RADIATOR ASSEMBLY (See page [CO-17](#))
9. REMOVE BATTERY



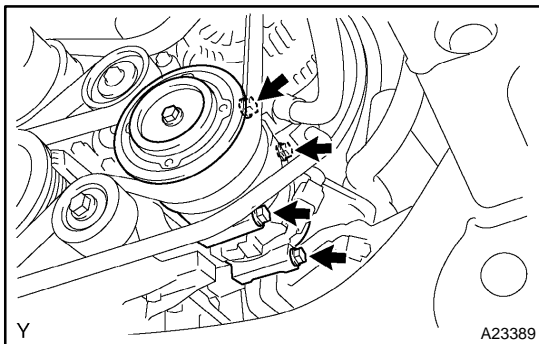
10. REMOVE AIR CLEANER ASSEMBLY
 - (a) Disconnect the air cleaner hose No.2 from the air cleaner case.
 - (b) Disconnect the MAF meter connector.
 - (c) Disconnect the PCV hose from the air cleaner case.
 - (d) Disconnect the 2 wire clamps from the air cleaner case.
 - (e) Disconnect the air cleaner case from the air cleaner hose No.1.
 - (f) Remove the 2 bolts and air cleaner assembly.
11. REMOVE DRIVE BELT, FAN, FLUID COUPLING AND FAN PULLEY
 - (a) Loosen the 4 nuts holding the fluid coupling to the fan bracket.
 - (b) Remove the drive belt. (See page [CH-7](#))
 - (c) Remove the 4 nuts, fan, fluid coupling assembly and fan pulley.
12. DISCONNECT ENGINE WIRE FROM CABIN
 - (a) Remove the glove compartment door.
 - (b) Remove the lower No.2 finish panel.
 - (c) Remove the heater to register duct.
 - (d) Remove the 3 screws, and disconnect the ECM from the body bracket.
 - (e) Disconnect the 3 wire harness connectors from the ECM.



- (f) Disconnect the engine wire from the engine wire bracket and remove the 2 nuts, bolt and bracket.
- (g) Pull out the engine wire from the cowl panel.

13. DISCONNECT HOSES, WIRES, CONNECTORS, CLAMPS, GROMMET AND CABLES

- (a) Disconnect the generator connector.
- (b) Disconnect the 2 heater hoses.
- (c) Disconnect the ground strap from the cowl panel.
- (d) Disconnect the fuel inlet hose and clamps.
- (e) Disconnect the fuel return hose and clamp.
- (f) Disconnect the air inlet hose from the charcoal canister.
- (g) Disconnect the EVAP hose from the charcoal canister.

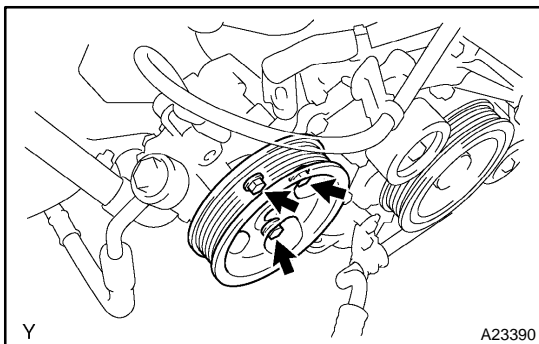


14. DISCONNECT A/C COMPRESSOR FROM ENGINE

- (a) Disconnect the A/C compressor connector.
- (b) Remove the 3 bolts, and disconnect the A/C compressor from the engine.

HINT:

Suspend the A/C compressor securely.

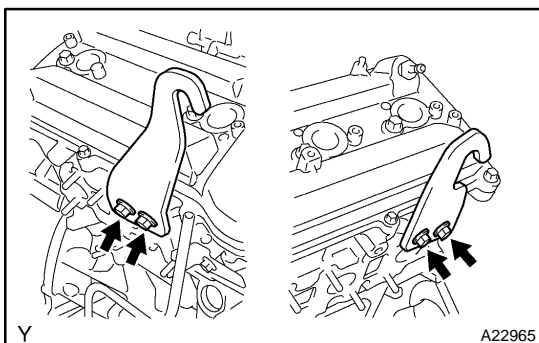


15. DISCONNECT PS PUMP FROM ENGINE

Remove the 3 bolts, and disconnect the PS pump from the engine.

HINT:

Suspend the PS pump securely.



16. REMOVE ENGINE ASSEMBLY FROM VEHICLE

- (a) Install the 2 engine hangers with the 4 bolts as shown in the illustration.

Part No. :

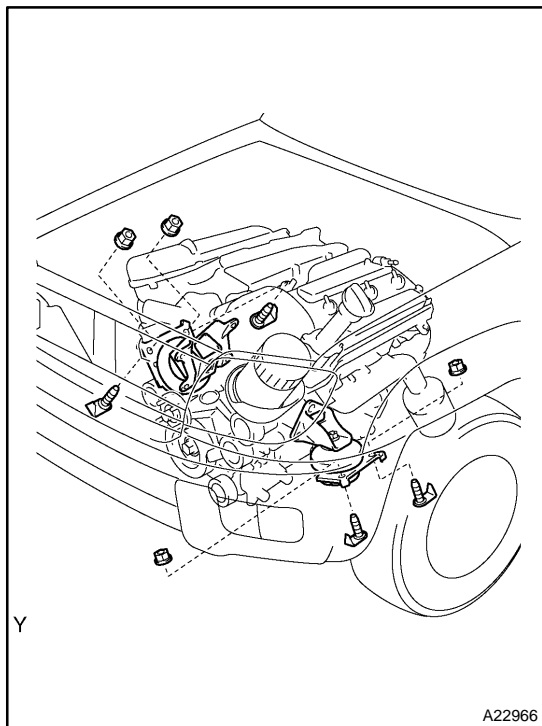
Engine hanger No. 1 12281-31060

Engine hanger No. 2 12282-31040

Bolt 90119-08177

Torque: 33 N·m (336 kgf·cm, 24 ft·lbf)

- (b) Attach the engine sling device and suspend the engine using a chain block.

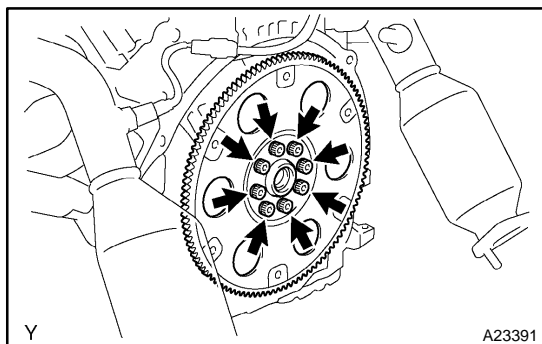


- (c) Remove the 4 bolts and 4 nuts, and separate the engine mounting brackets from the frame brackets.
- (d) Lift the engine out of the vehicle carefully.

NOTICE:

Make sure the engine is clear of all wiring and hoses.

- (e) Place the engine onto a working bench.



17. REMOVE DRIVE PLATE

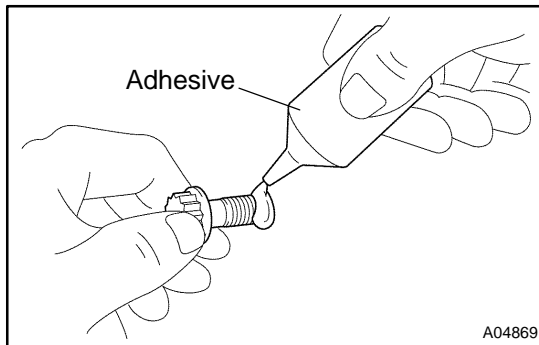
Remove the 8 bolts, front spacer, drive plate and rear spacer.

INSTALLATION

1. INSTALL DRIVE PLATE

HINT:

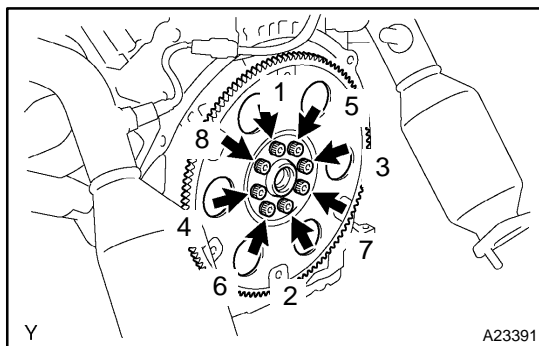
- The mounting bolts are tightened in 2 progressive steps (steps (c) and (e)).
- If any of the mounting bolts is broken or deformed, replace it.



- (a) Apply adhesive to 2 or 3 threads of the mounting bolt end.

Adhesive:

Part No. 08833-00070, THREE BOND 1324 or equivalent

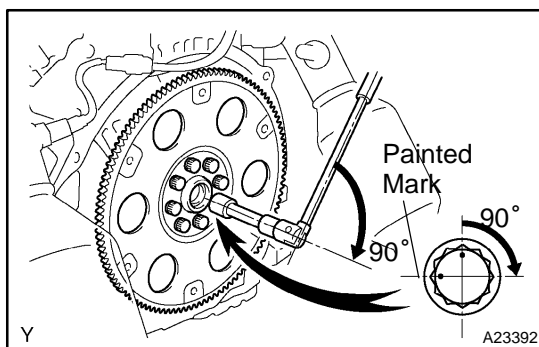


- (b) Install the front spacer, drive plate and rear spacer on the crankshaft.

- (c) Install and uniformly tighten the 8 mounting bolts in several steps, in the sequence shown in the illustration.

Torque: 49 N·m (500 kgf-cm, 36 ft-lbf)

If any of the mounting bolts do not meet the torque specification, replace it.



- (d) Mark the mounting bolt with paint.

- (e) Retighten the mounting bolts 90° in the order shown in the illustration.

- (f) Check that the painted mark is now at a 90° angle to what it was in step (e).

2. INSTALL ENGINE ASSEMBLY IN VEHICLE

- (a) Attach the engine chain hoist to the engine hangers.

- (b) Slowly lower the engine assembly into the engine compartment.

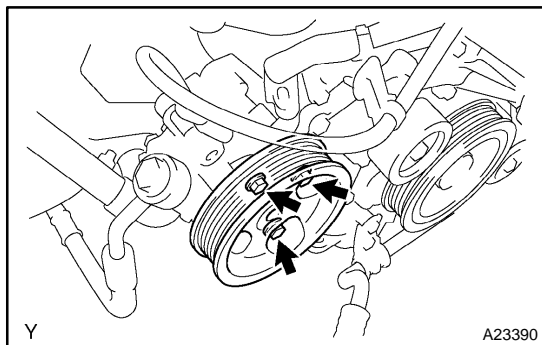
- (c) Attach the engine mounting brackets to the frame brackets.

- (d) Install the engine mounting brackets to the frame brackets with the 2 nuts and 4 bolts.

Torque: 38 N·m (388 kgf-cm, 28 ft-lbf)

- (e) Remove the engine chain hoist.

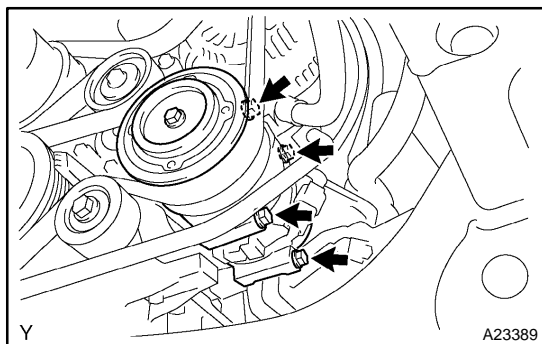
- (f) Remove the 4 bolts and 2 engine hangers.



3. INSTALL PS PUMP

Install the PS pump with the 3 bolts.

Torque: 17 N·m (175 kgf·cm, 13 ft·lbf)



4. INSTALL A/C COMPRESSOR

(a) Install the A/C compressor with the 3 bolts.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Connect the A/C compressor connector.

5. CONNECT HOSES, WIRES, CONNECTORS, CLAMPS, GROMMET AND CABLES

(a) Connect the generator wire and connector.

(b) Connect the 2 heater hoses.

(c) Connect the ground strap to the cowl panel.

(d) Connect the fuel inlet hose and clamps.

(e) Connect the fuel return hose and clamp.

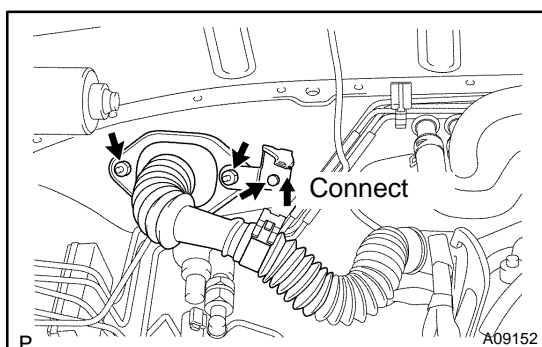
(f) Connect the air inlet hose to the charcoal canister.

(g) Connect the EVAP hose to the charcoal canister.

(h) Connect the brake booster tube.

6. CONNECT ENGINE WIRE TO CABIN

(a) Push the engine wire through the cowl panel.



(b) Install the engine wire bracket with the 2 nuts and bolt and connect the engine wire to the bracket.

(c) Connect the 3 connectors to the ECM.

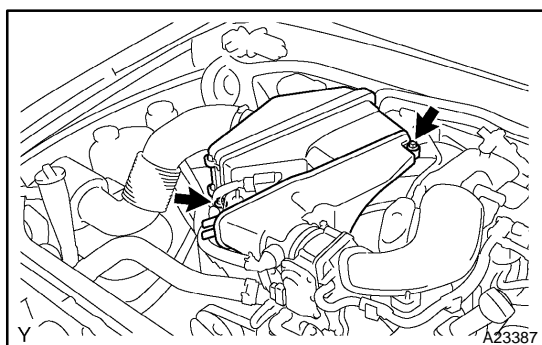
(d) Connect the 2 wire harness connectors (cassette connector).

(e) Install the ECM with the 3 screws.

(f) Install the heater to register duct.

(g) Install the lower No.2 finish panel.

(h) Install the glove compartment door.



7. INSTALL AIR CLEANER ASSEMBLY

(a) Install the air cleaner assembly with the 2 bolts.

(b) Connect the air cleaner case to the air cleaner hose No.1.

(c) Connect the air cleaner case with the 2 wire clamps.

(d) Connect the PCV hose to the air cleaner case.

(e) Connect the MAF meter connector.

(f) Connect the air cleaner hose No.2 to the air cleaner case.

8. INSTALL BATTERY

9. INSTALL RADIATOR ASSEMBLY (See page [CO-18](#))

10. INSTALL FRONT EXHAUST PIPES

(See page [EM-139](#))

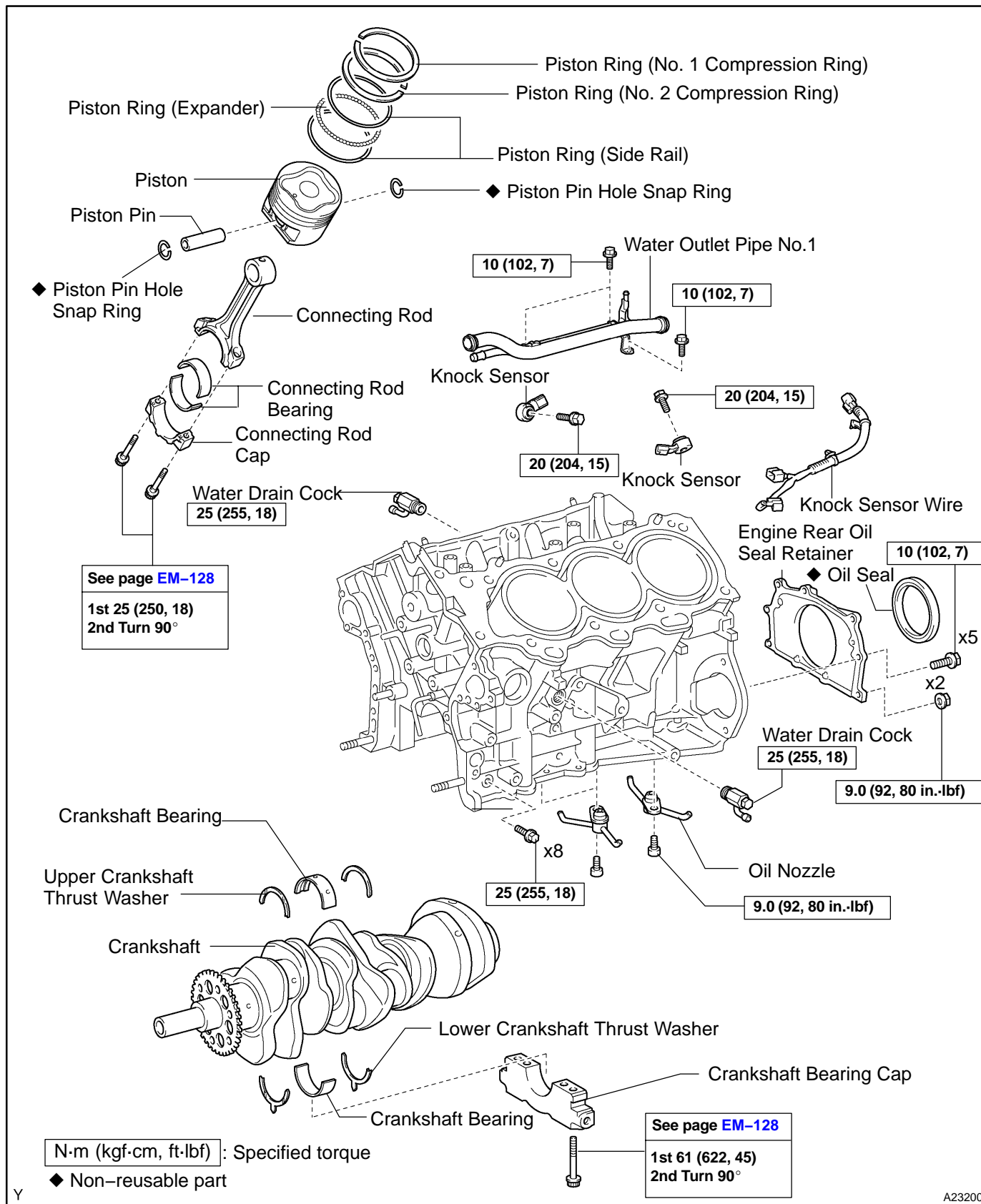
11. **INSTALL AUTOMATIC TRANSMISSION**
(See page [AT-31](#))
12. **INSTALL MANUAL TRANSMISSION**
(See page [MT-7](#))
13. **FILL WITH ENGINE COOLANT** (See page [CO-2](#))
14. **FILL WITH ENGINE OIL** (See page [LU-3](#))
15. **START ENGINE AND CHECK FOR LEAKS**
16. **INSTALL ENGINE UNDER COVERS**
17. **INSTALL V-BANK COVER**
18. **INSTALL HOOD**
19. **PERFORM ROAD TEST**

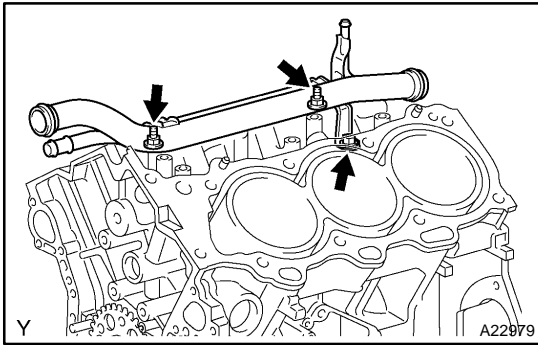
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

20. **RECHECK ENGINE COOLANT AND OIL LEVELS**

CYLINDER BLOCK COMPONENTS

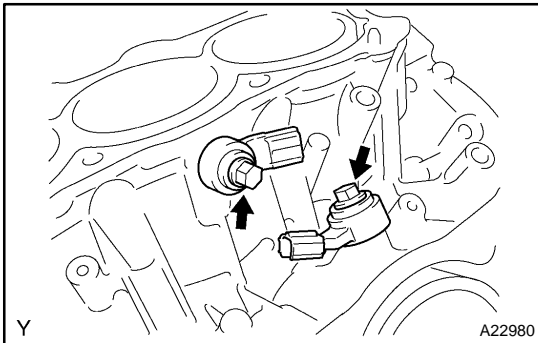
EM1XY-01



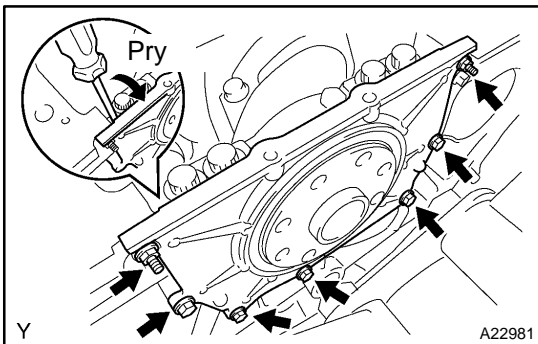


DISASSEMBLY

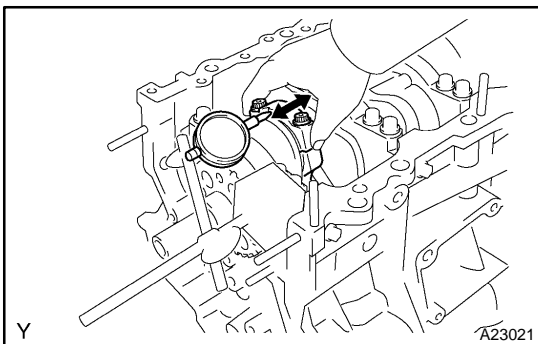
1. **REMOVE WATER OUTLET PIPE NO.1**
 - (a) Separate the knock sensor wire.
 - (b) Remove the 3 bolts and water outlet pipe.



2. **REMOVE KNOCK SENSOR**
 - (a) Disconnect the knock sensor connectors.
 - (b) Remove the 2 bolts and 2 knock sensors.
3. **REMOVE WATER DRAIN COCK**



4. **REMOVE ENGINE REAR OIL SEAL RETAINER**
 - (a) Remove the 5 bolts and 2 nuts.
 - (b) Using a screwdriver, remove the oil seal retainer by prying between the oil seal retainer and crankshaft bearing cap.



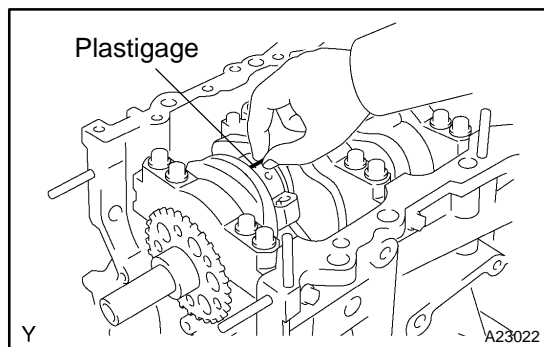
5. **INSPECT CONNECTING ROD THRUST CLEARANCE**
Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

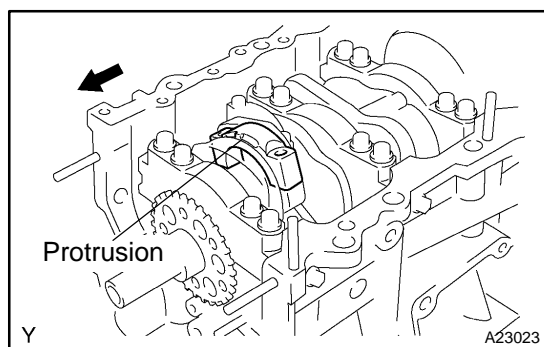
0.15 to 0.30 mm (0.0059 to 0.0118 in.)

Maximum thrust clearance: 0.35 mm (0.0138 in.)

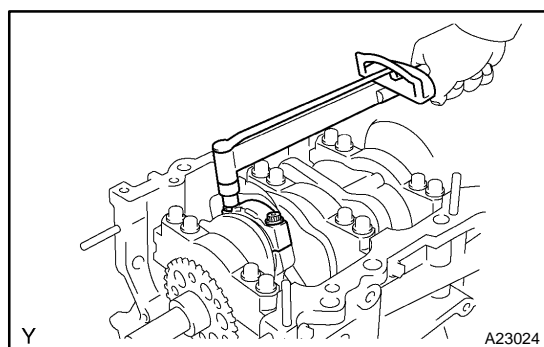
6. **INSPECT CONNECTING ROD OIL CLEARANCE**
 - (a) Check that the matchmarks on the connecting rod and cap are aligned to ensure correct reassembling.
 - (b) Using SST, remove the 2 connecting rod cap bolts.
SST 09011-38121
 - (c) Clean the crank pin, bearing and connecting rod.
 - (d) Check the crank pin and bearing for pits and scratches.



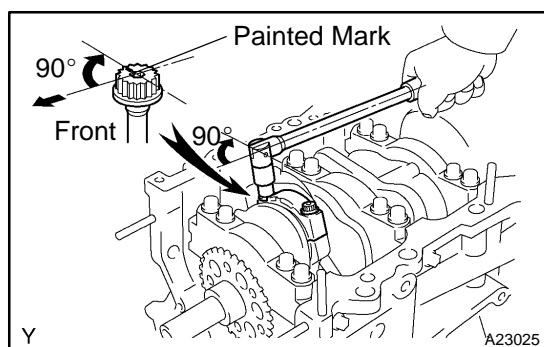
- (e) Lay a strip of Plastigage across the crank pin.



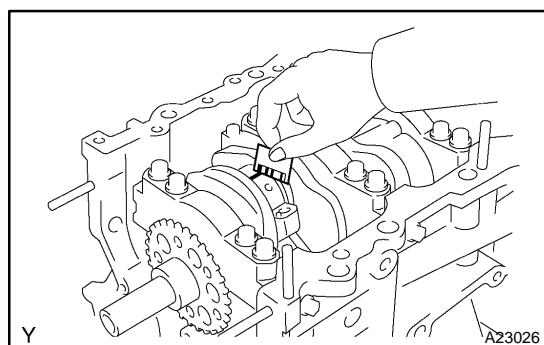
- (f) Check that the protrusion of the connecting rod cap is facing the correct direction.
 (g) Apply a light coat of engine oil to the threads of the connecting rod cap bolts.



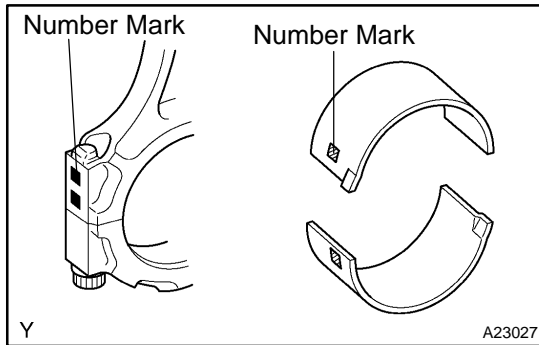
- (h) Using SST, tighten the bolts alternately to the specified torque.
 SST 09011-38121
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



- (i) Mark the front side of each connecting cap bolt with paint.
 (j) Retighten the cap bolts 90° as shown in the illustration.
NOTICE:
Do not turn the crankshaft.
 (k) Remove the 2 bolts, connecting rod cap and lower bearing.



- (l) Measure the Plastigage at its widest point.
Standard oil clearance:
0.026 to 0.046 mm (0.0010 to 0.0018 in.)
Maximum oil clearance: 0.066 mm (0.0025 in.)
NOTICE:
Completely remove the Plastigage.

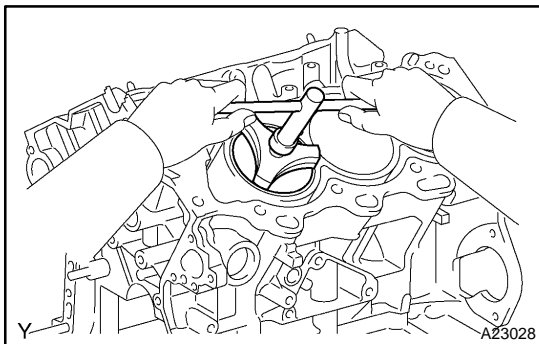


- (m) If replacing a bearing, replace it with one that has the same number marked on the connecting rod. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

HINT:

Standard bearing center wall thickness

Mark	mm (in.)
"1"	1.484 to 1.487 (0.0584 to 0.0585)
"2"	1.487 to 1.490 (0.0585 to 0.0587)
"3"	1.490 to 1.493 (0.0587 to 0.0588)
"4"	1.493 to 1.496 (0.0588 to 0.0589)



7. REMOVE PISTON W/CONNECTING ROD

- Using a ridge reamer, remove all the carbon from the top of the cylinder.
- Push in the piston w/ connecting rod and upper bearing through the top of the cylinder block.

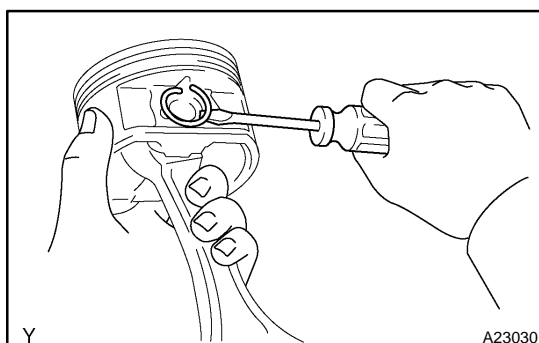
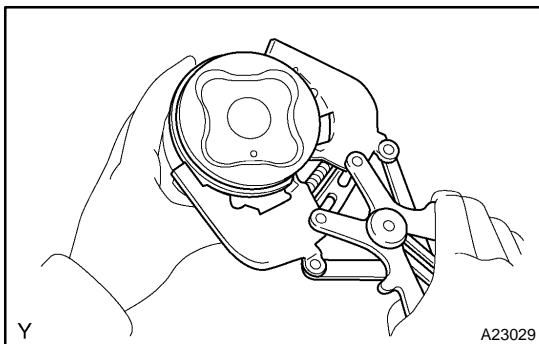
HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.

8. REMOVE CONNECTING ROD BEARING

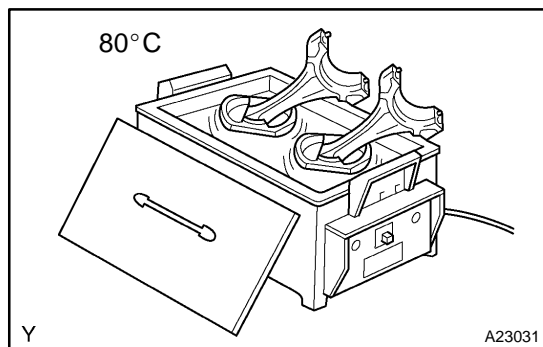
9. REMOVE PISTON RING SET

- Using a piston ring expander, remove the 2 compression rings.
- Remove the 2 side rails and oil ring by hand.

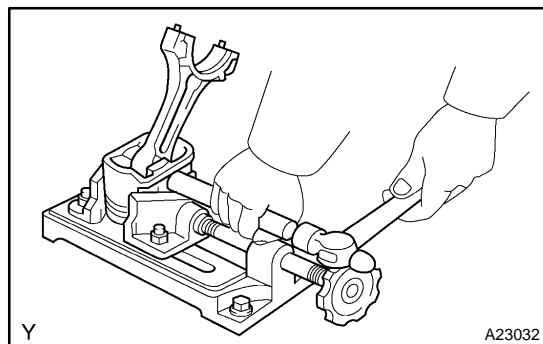


10. REMOVE PISTON PIN HOLE SNAP RING

Using a screwdriver, pry out the 2 snap rings.

**11. REMOVE PISTON PIN**

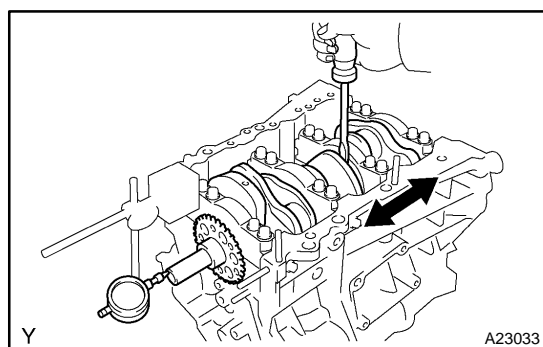
- (a) Gradually heat the piston to approx. 80°C (176°F).



- (b) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

**12. INSPECT CRANKSHAFT THRUST CLEARANCE**

- (a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

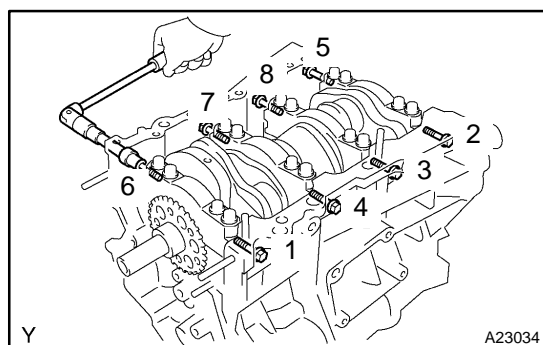
0.04 to 0.24 mm (0.0016 to 0.0094 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

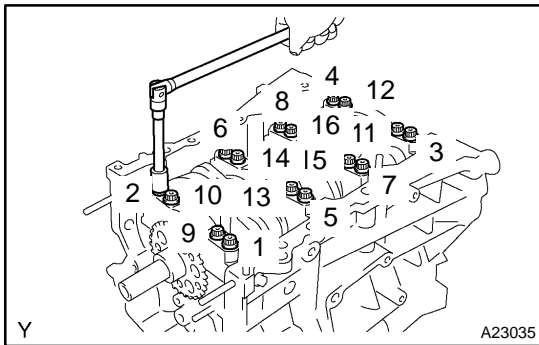
If the thrust clearance is greater than the maximum, replace the pair of the thrust washers or the crankshaft.

HINT:

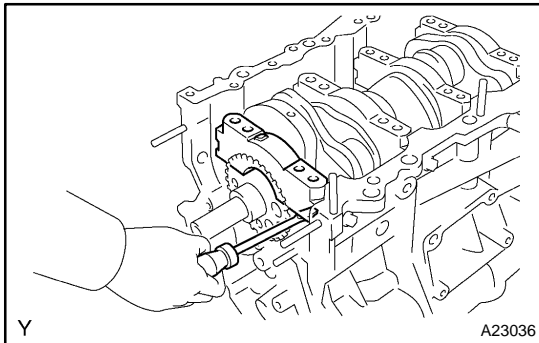
Thrust washer thickness is 1.93 to 1.98 mm (0.0760 to 0.0780 in.)

**13. REMOVE CRANKSHAFT**

- (a) Using several steps, uniformly loosen and remove the 8 main bearing cap bolts and seal washers in the sequence as shown in the illustration.



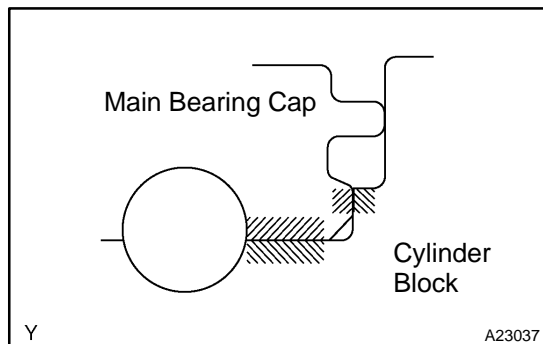
- (b) Using several steps, uniformly loosen and remove the 16 main bearing cap bolts in the sequence as shown in the illustration.



- (c) Using a screwdriver, pry out the main bearing caps. Remove the 4 main bearing caps and lower bearings.

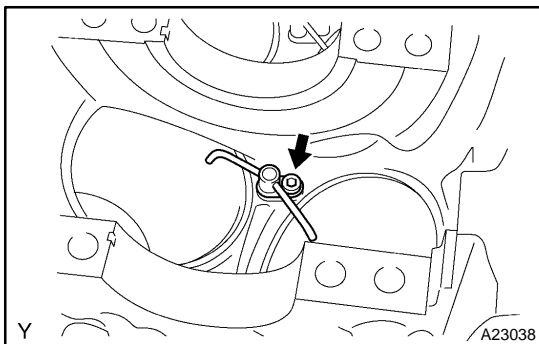
NOTICE:

- Pull up the main bearing cap while turning it little by little to the right and the left.



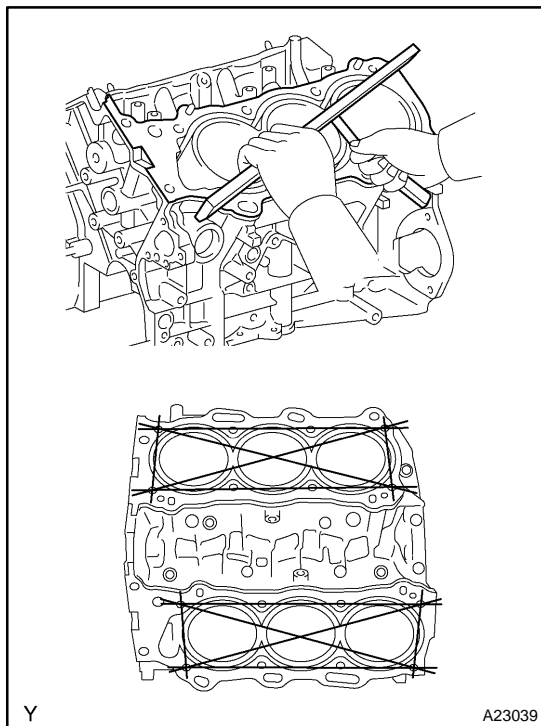
- Be careful not to damage the joint surface of the cylinder block and the main bearing cap.

14. REMOVE CRANKSHAFT THRUST WASTER SET
15. REMOVE CRANKSHAFT BEARING



16. REMOVE OIL NOZZLE

- Using a 5 mm socket hexagon wrench, remove the 3 oil nozzles.



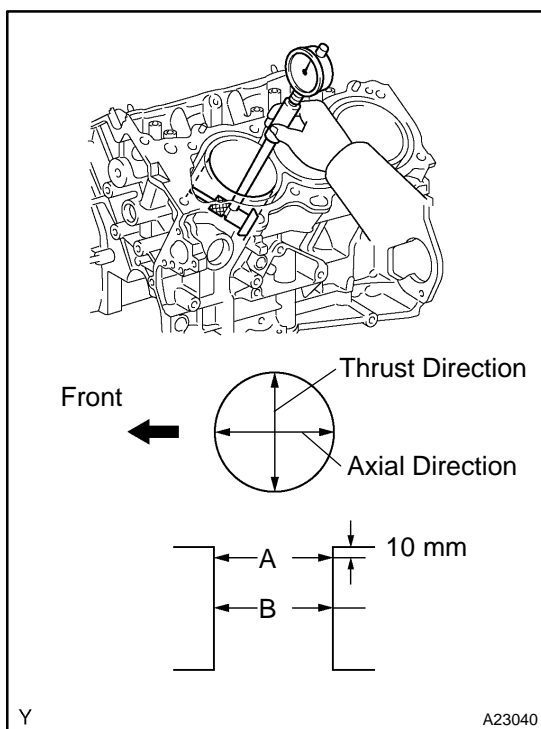
INSPECTION

1. INSPECT CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the flatness of the surface that is in contact with the cylinder head gasket.

Maximum warpage: 0.05 mm (0.0020 in.)

If warpage is greater than the maximum, replace the cylinder block.



2. INSPECT CYLINDER BORE

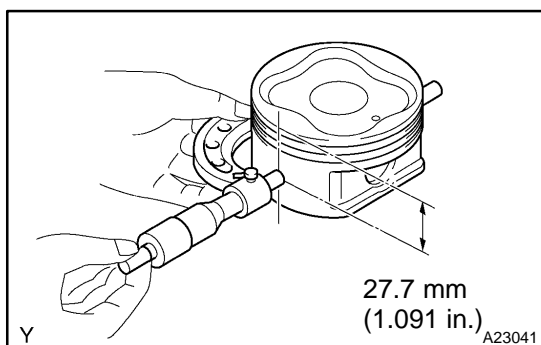
Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

Standard diameter:

94.000 to 94.012 mm (3.7008 to 3.7013 in.)

Maximum diameter: 94.132mm (3.7060 in.)

If the average diameter of the 4 positions is greater than the maximum, replace the cylinder block.



3. INSPECT PISTON

Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 27.7 mm (1.091 in.) from the piston head.

Piston diameter:

93.910 to 93.940 mm (3.6972 to 3.6984 in.)

4. INSPECT PISTON OIL CLEARANCE

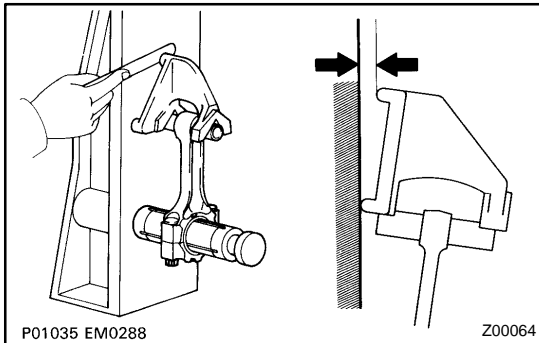
Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.060 to 0.102 mm (0.0024 to 0.0040 in.)

Maximum oil clearance: 0.13 mm (0.0051 in.)

If the oil clearance is greater than the maximum, replace all the 6 pistons. If necessary, replace the cylinder block.



P01035 EM0288

Z00064

5. INSPECT CONNECTING ROD

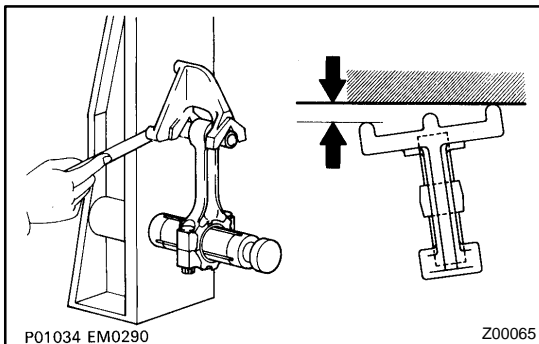
Using a rod aligner and feeler gauge, check the connecting rod alignment.

(1) Check for misalignment.

Maximum misalignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If misalignment is greater than the maximum, replace the connecting rod assembly.



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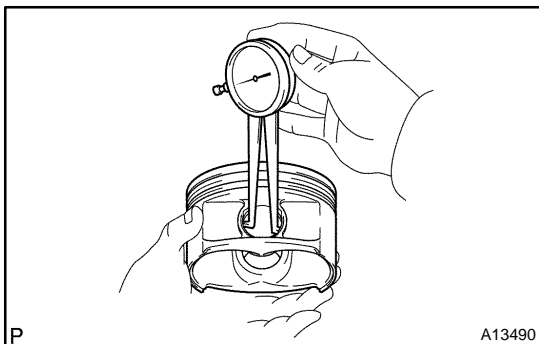
Z00065

(2) Check twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than the maximum, replace the connecting rod assembly.



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6. INSPECT PISTON PIN OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the piston pin hole.

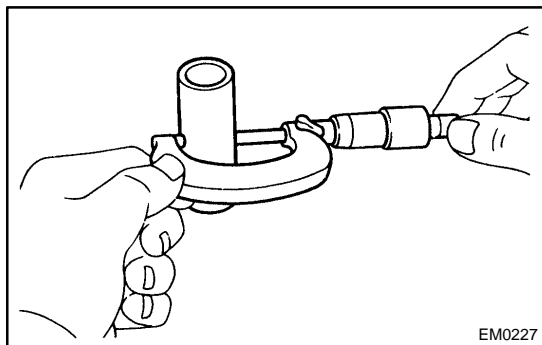
Piston pin hole inside diameter:

22.001 to 22.010 mm (0.8662 to 0.8665 in.)

HINT:

Piston pin hole inside diameter

Mark	mm (in.)
A	22.001 to 22.004 (0.8662 to 0.8663)
B	22.005 to 22.007 (0.8663 to 0.8664)
C	22.008 to 22.010 (0.8665 to 0.8665)

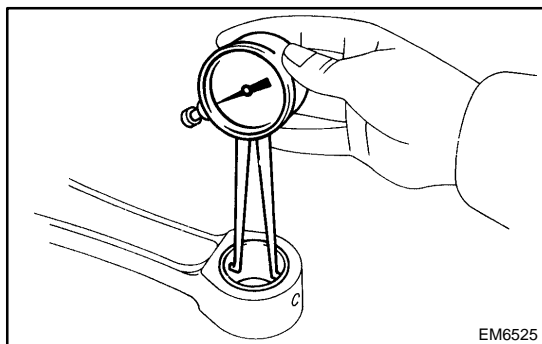


- (b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
21.997 to 22.006 mm (0.8660 to 0.8664 in.)

HINT:

Piston pin diameter

Mark	mm (in.)
A	21.997 to 22.000 (0.8660 to 0.8661)
B	22.001 to 22.003 (0.8661 to 0.8663)
C	22.004 to 22.006 (0.8663 to 0.8664)



- (c) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:
22.005 to 22.014 mm (0.8663 to 0.8667 in.)

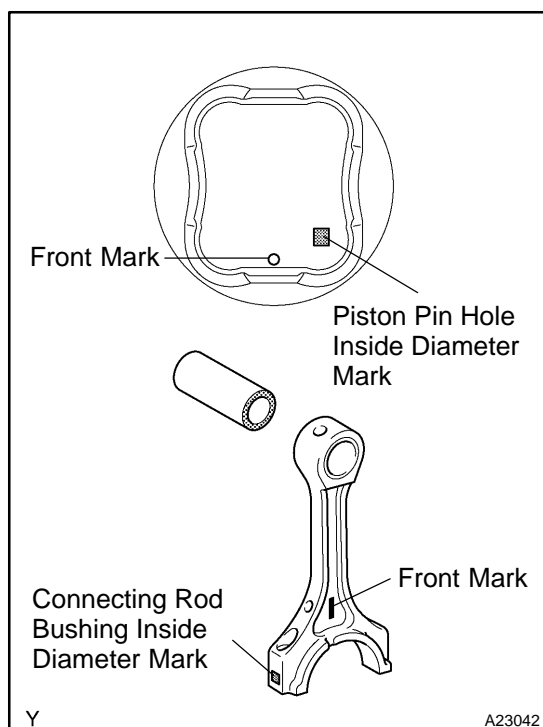
HINT:

Bushing inside diameter

Mark	mm (in.)
A	22.005 to 22.008 (0.8663 to 0.8665)
B	22.009 to 22.011 (0.8665 to 0.8666)
C	22.012 to 22.014 (0.8666 to 0.8667)

- (d) Subtract the piston pin diameter measurement from the piston pin hole diameter measurement.

Standard oil clearance:
0.001 to 0.007 mm (0.00004 to 0.00028 in.)
Maximum oil clearance: 0.040 mm (0.0016 in.)

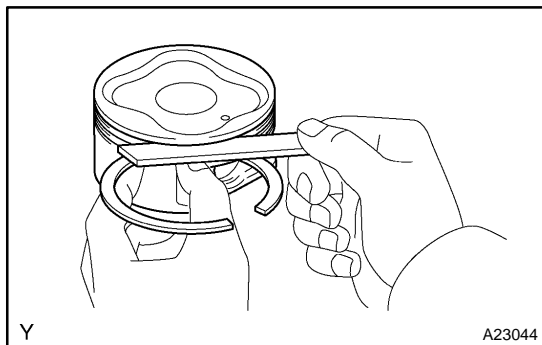


- (e) If the oil clearance is greater than the maximum, replace the bushing. If necessary, replace the piston and piston pin together.

- (f) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance:
0.005 to 0.011 mm (0.0002 to 0.0004 in.)
Maximum oil clearance: 0.050 mm (0.0020 in.)

- (g) If the oil clearance is greater than the maximum, replace the bushing. If necessary, replace the connecting rod and piston pin together.



7. INSPECT RING GROOVE CLEARANCE

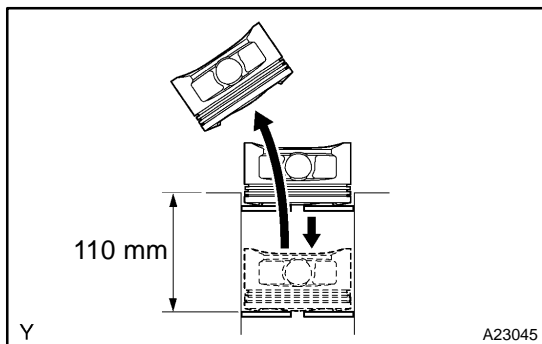
Using a feeler gauge, measure the clearance between the new piston ring and the wall of the ring groove.

Ring groove clearance:

No.1: 0.02 to 0.07 mm (0.0008 to 0.0028 in.)

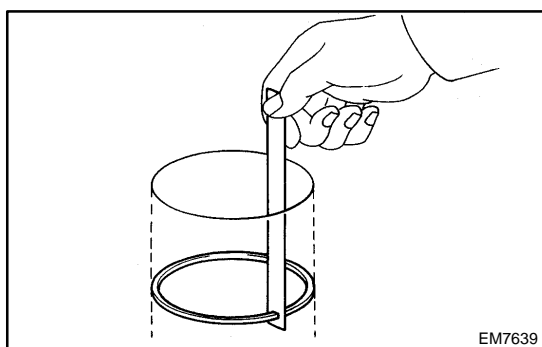
No.2: 0.02 to 0.06 mm (0.0008 to 0.0024 in.)

Oil: 0.07 to 0.15 mm (0.0028 to 0.0060 in.)



8. INSPECT PISTON RING END GAP

(a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



(b) Using a feeler gauge, measure the end gap.

Standard end gap:

No. 1: 0.30 to 0.40 mm (0.0118 to 0.0157 in.)

No. 2: 0.40 to 0.50 mm (0.0157 to 0.0197 in.)

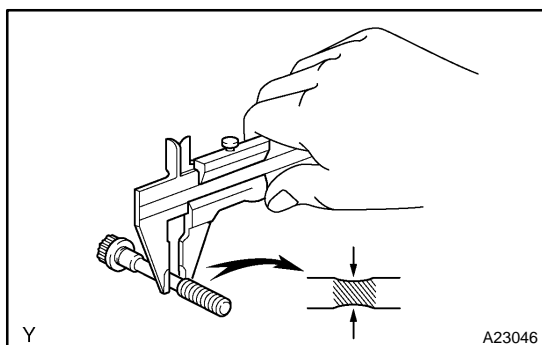
Oil (Side rail): 0.10 to 0.40 mm (0.0039 to 0.0157 in.)

Maximum end gap:

No. 1: 1.0 mm (0.039 in.)

No. 2: 1.1 mm (0.043 in.)

Oil (Side rail): 1.0 mm (0.039 in.)



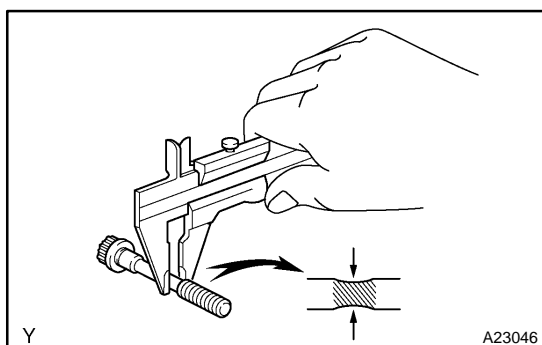
9. INSPECT CONNECTING ROD BOLT

Using a vernier caliper, measure the tension portion diameter of the bolt.

Standard diameter: 7.2 to 7.3 mm (0.283 to 0.287 in.)

Minimum diameter: 7.0 mm (0.276 in.)

If the diameter is less than the minimum, replace the bolt.



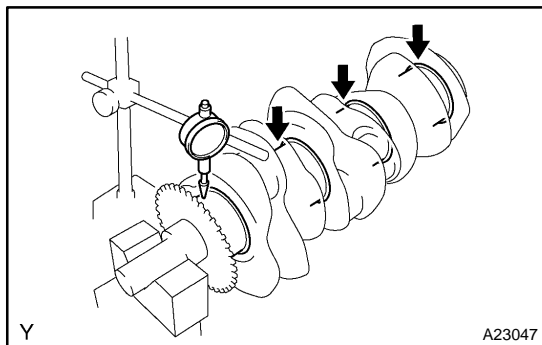
10. INSPECT CRANKSHAFT BEARING CAP SET BOLT

Using a vernier caliper, measure the tension portion diameter of the bolt.

Standard diameter:

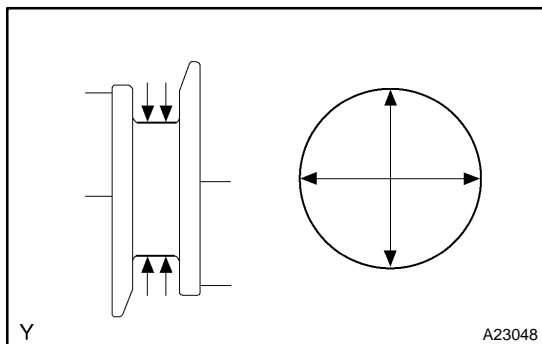
10.0 to 10.2 mm (0.393 to 0.402 in.)

If the diameter is less than the minimum, replace the bolt.

**11. INSPECT CRANKSHAFT**

- (a) Using a dial indicator and V-blocks, measure the runout as shown in the illustration.

Maximum circle runout: 0.06 mm (0.0024 in.)

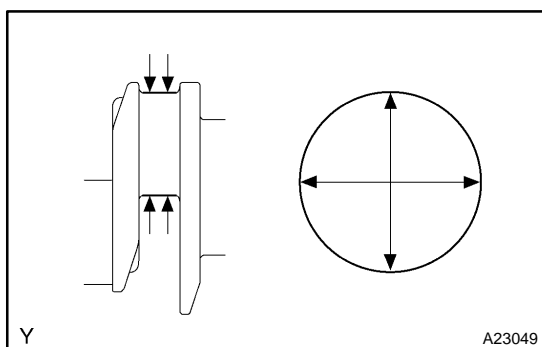


- (b) Using a micrometer, measure the diameter of each main journal.

Diameter: 71.988 to 72.000 mm (2.8342 to 2.8346 in.)

- (c) Check each main journal for taper and out-of-round as shown in the illustration.

**Maximum taper and out-of-round:
0.02 mm (0.0008 in.)**

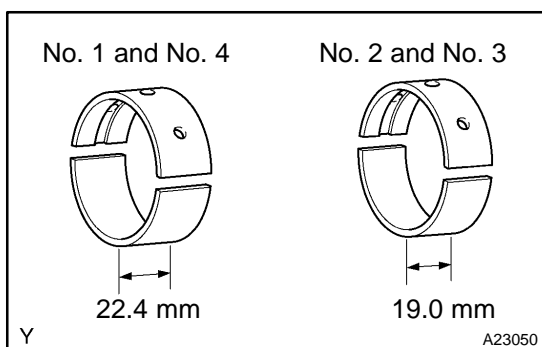


- (d) Using a micrometer, measure the diameter of each crank pin.

Diameter: 55.992 to 56.000 mm (2.2044 to 2.2047 in.)

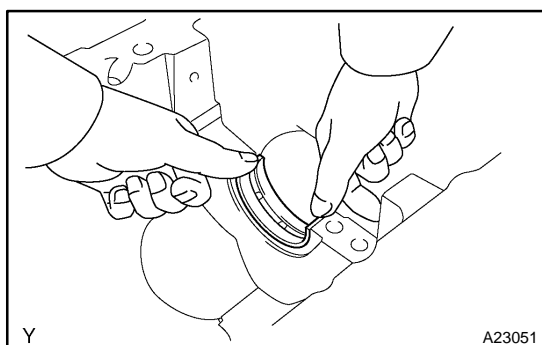
- (e) Check each crank pin for taper and out-of-round as shown in the illustration.

**Maximum taper and out-of-round:
0.02 mm (0.0008 in.)**

**12. INSPECT CRANKSHAFT OIL CLEARANCE****HINT:**

Main bearings come in widths of 19.0 mm (0.748 in.) and 22.4 mm (0.882 in.). Install the 22.4 mm (0.882 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing cap. Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No. 3 positions.

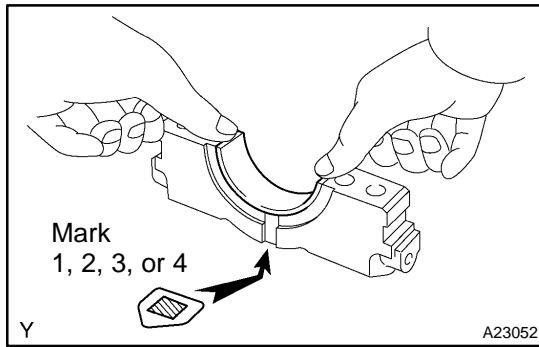
- (a) Clean each main journal and bearing.



- (b) Align the bearing claw with the claw groove of the cylinder block, and push in the 4 upper bearings.

NOTICE:

Do not apply engine oil to the bearing and its contact surface.



- (c) Align the bearing claw with the claw groove of the main bearing cap, and push in the 4 bottom bearings.

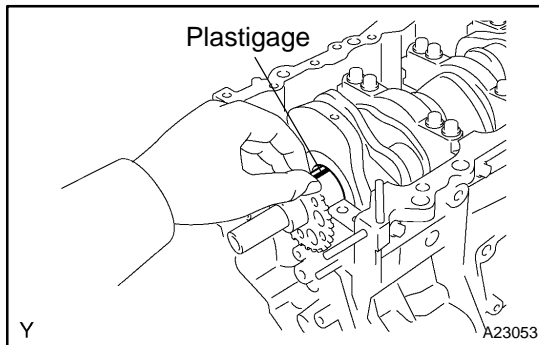
NOTICE:

Do not apply engine oil to the bearing or its contact surface.

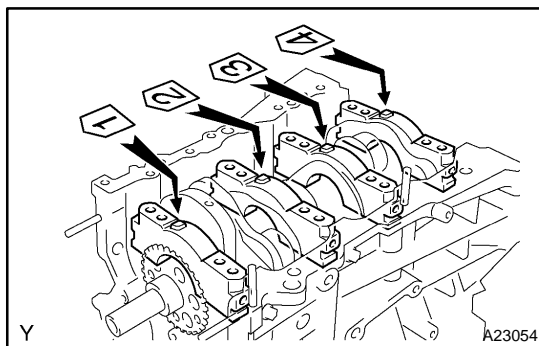
HINT:

A number marked on each main bearing cap indicates the installation position.

- (d) Place the crankshaft on the cylinder block.



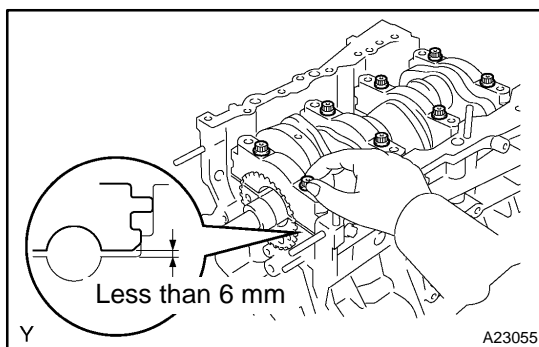
- (e) Lay a strip of Plastigage across each journal.



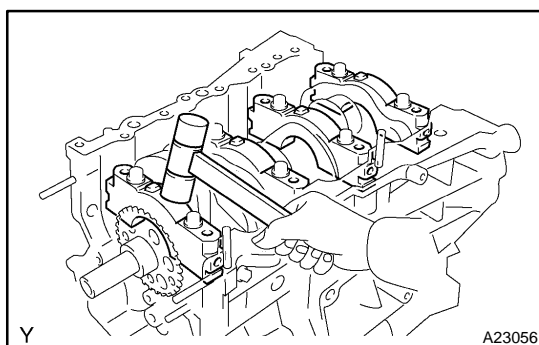
- (f) Examine the front marks and numbers and install the bearing caps on the cylinder block.

- (g) Apply a light coat of engine oil to the threads of the bearing cap bolts.

- (h) Temporarily install the 8 main bearing cap bolts to the inside positions.

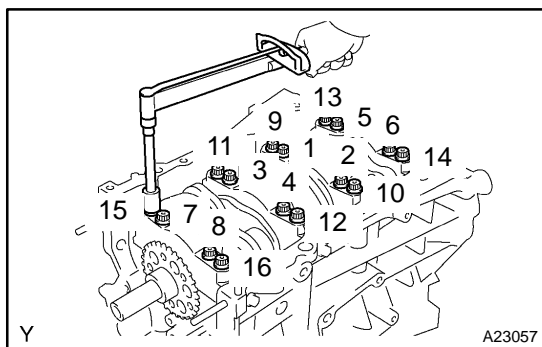


- (i) Install the main bearing caps. Tighten the 2 bolts for each bearing cap until the clearance between the bearing cap and the cylinder block becomes less than 6 mm (0.23 in.).



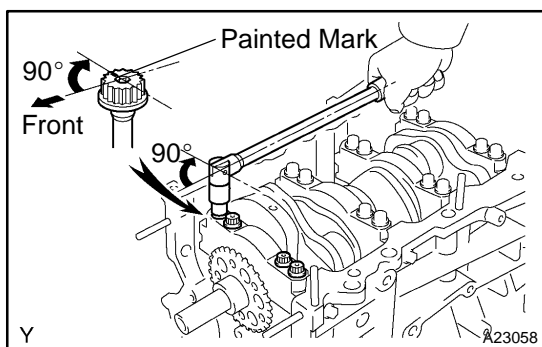
- (j) Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.

- (k) Apply a light coat of engine oil to the threads of the main bearing cap bolts.



- (l) Install the 16 main bearing cap bolts. Using several steps, uniformly tighten the bolts in the sequence as shown in the illustration.

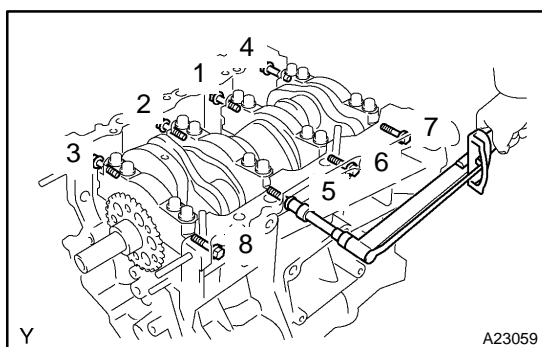
Torque: 61 N·m (622 kgf·cm, 45 ft·lbf)



- (m) Mark the front side of the bearing cap bolts with paint.
 (n) Retighten the bearing cap bolts until 90° in the sequence as shown in the illustration.
 (o) Check that the painted mark is now at a 90° angle to the front.

NOTICE:

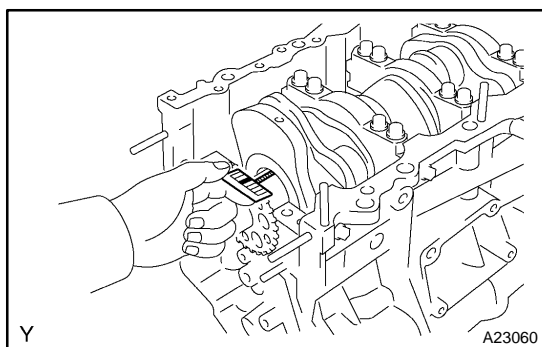
Do not turn the crankshaft.



- (p) Install the 8 main bearing cap bolts. Using several steps, uniformly tighten the bolts in the sequence as shown in the illustration.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

- (q) Remove the main bearing caps.



- (r) Measure the Plastigage at its widest point.

Standard oil clearance:

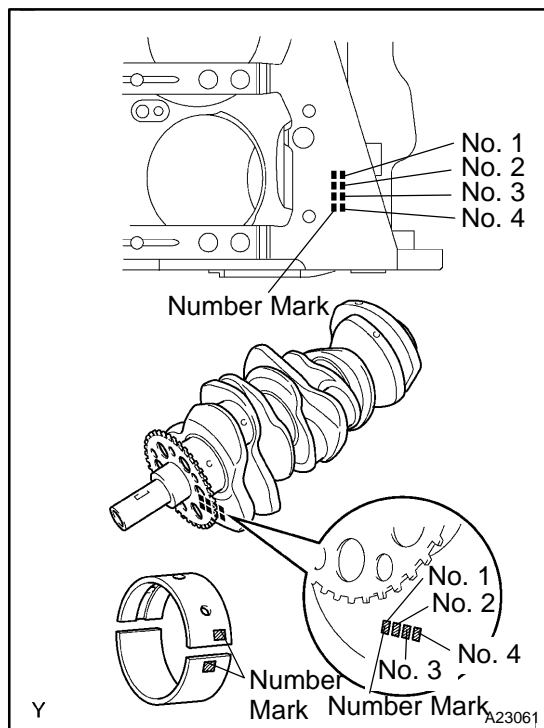
0.018 to 0.030 mm (0.0007 to 0.0012 in.)

Maximum clearance: 0.046 mm (0.0018 in.)

If the oil clearance is greater than the maximum, replace the bearings. If necessary, replace the crankshaft.

NOTICE:

Completely remove the Plastigage.



- (s) If replacing a bearing, replace it with one that has the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then refer to the table below for the appropriate bearing number. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly

Journal bearings

Cylinder block (A) + Crankshaft	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Use Bearing	"1"	"2"	"3"	"4"	"5"

HINT:

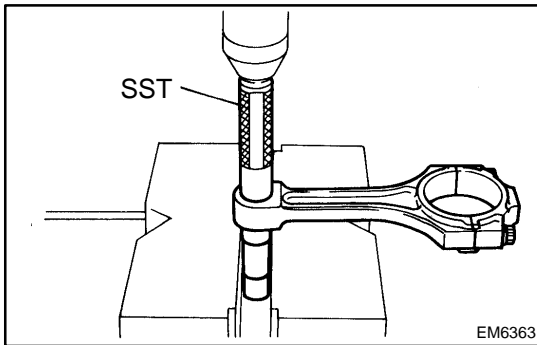
EXAMPLE

Cylinder block "11" (A) + Crankshaft "06" (B)
= Total number 17 (Use bearing "3")

Item	Mark	mm (in.)
Cylinder block main journal bore diameter (A)	"00"	77.000 (3.0315)
	"01"	77.001 (3.0315)
	"02"	77.002 (3.0316)
	"03"	77.003 (3.0316)
	"04"	77.004 (3.0317)
	"05"	77.005 (3.0317)
	"06"	77.006 (3.0317)
	"07"	77.007 (3.0318)
	"08"	77.008 (3.0318)
	"09"	77.009 (3.0319)
	"10"	77.010 (3.0319)
	"11"	77.011 (3.0319)
	"12"	77.012 (3.0320)
	"13"	77.013 (3.0320)
	"14"	77.014 (3.0320)
	"15"	77.015 (3.0321)
	"16"	77.016 (3.0321)

ENGINE MECHANICAL (1GR-FE) - CYLINDER BLOCK

Crankshaft main journal diameter (B)	"00"	71.999 to 72.000 (2.8346 to 2.8346)
	"01"	71.998 to 71.999 (2.8346 to 2.8346)
	"02"	71.997 to 71.998 (2.8345 to 2.8346)
	"03"	71.996 to 71.997 (2.8345 to 2.8346)
	"04"	71.995 to 71.996 (2.8344 to 2.8345)
	"05"	71.994 to 71.995 (2.8344 to 2.8344)
	"06"	71.993 to 71.994 (2.8343 to 2.8344)
	"07"	71.992 to 71.993 (2.8343 to 2.8343)
	"08"	71.991 to 71.992 (2.8343 to 2.8343)
	"09"	71.990 to 71.991 (2.8343 to 2.8343)
	"10"	71.989 to 71.990 (2.8342 to 2.8343)
"11"	71.988 to 71.989 (2.8342 to 2.8342)	
Standard bearing center wall thickness	"1"	2.488 to 2.491 (0.0980 to 0.0981)
	"2"	2.491 to 2.494 (0.0981 to 0.0982)
	"3"	2.494 to 2.497 (0.0982 to 0.0983)
	"4"	2.497 to 2.500 (0.0982 to 0.0984)
	"5"	2.500 to 2.503 (0.0984 to 0.0985)

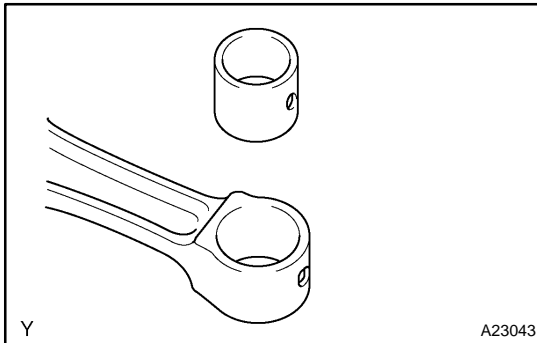


REPLACEMENT

1. REPLACE CONNECTING ROD SMALL END BUSH

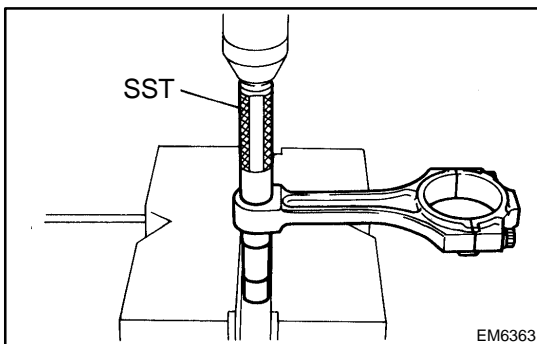
Using SST and a press, press out the bushing.

SST 09222-30010



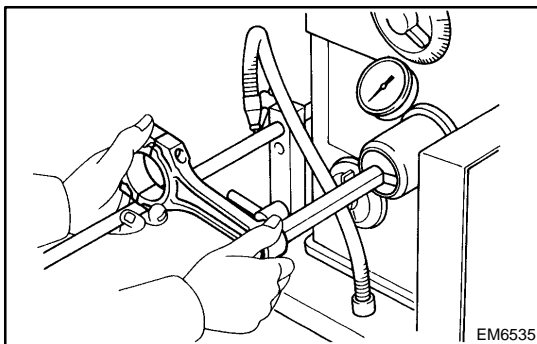
2. INSTALL CONNECTING ROD SMALL END BUSH

(a) Align the oil holes of a new bushing and the connecting rod.



(b) Using SST and a press, press in the bushing.

SST 09222-30010



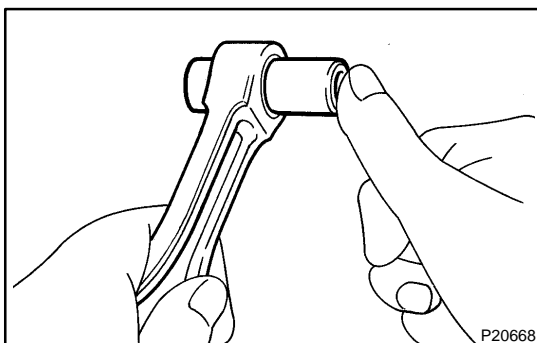
(c) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance between the bushing and piston pin.

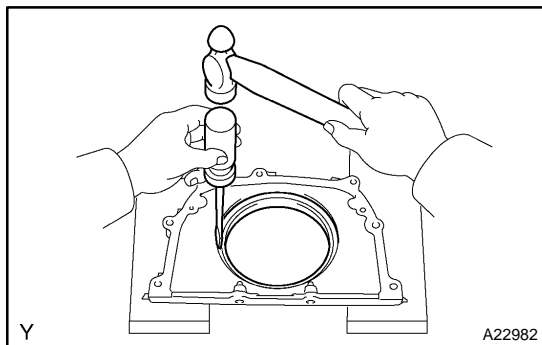
Standard oil clearance:

0.005 to 0.011 mm (0.0002 to 0.0004 in.)

HINT:

Check that the piston pin fits at a normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with a thumb.





3. REPLACE ENGINE REAR OIL SEAL

HINT:

There are 2 methods ((a) and (b)) to replace the oil seal.

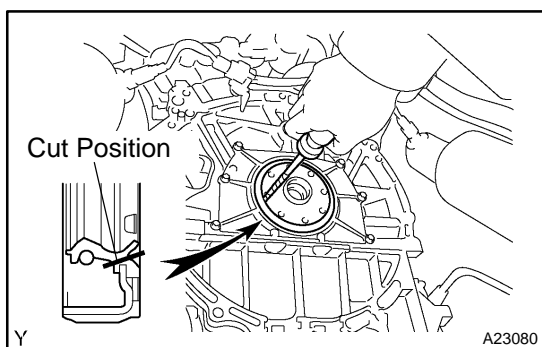
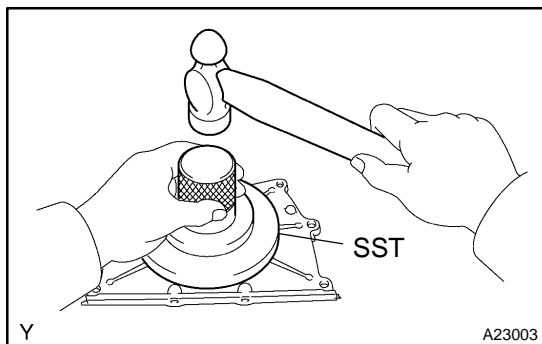
(a) If the rear oil seal retainer is removed from the cylinder block:

(1) Using a screwdriver and hammer, tap out the oil seal.

(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-78010

(3) Apply MP grease to the oil seal lip.



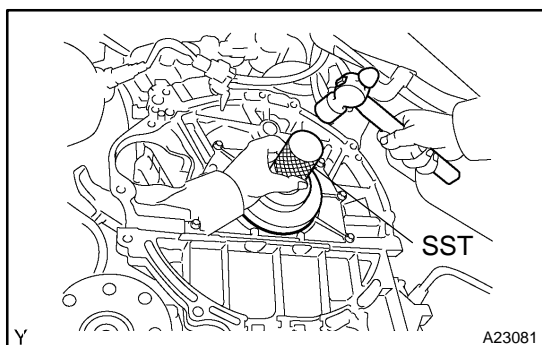
(b) If the rear oil seal retainer is installed to the cylinder block:

(1) Using a knife, cut off the oil seal lip.

(2) Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the crankshaft. Tape the screwdriver tip.



(3) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-78010

(4) Apply MP grease to a new oil seal lip.

REASSEMBLY

1. INSTALL STUD BOLT

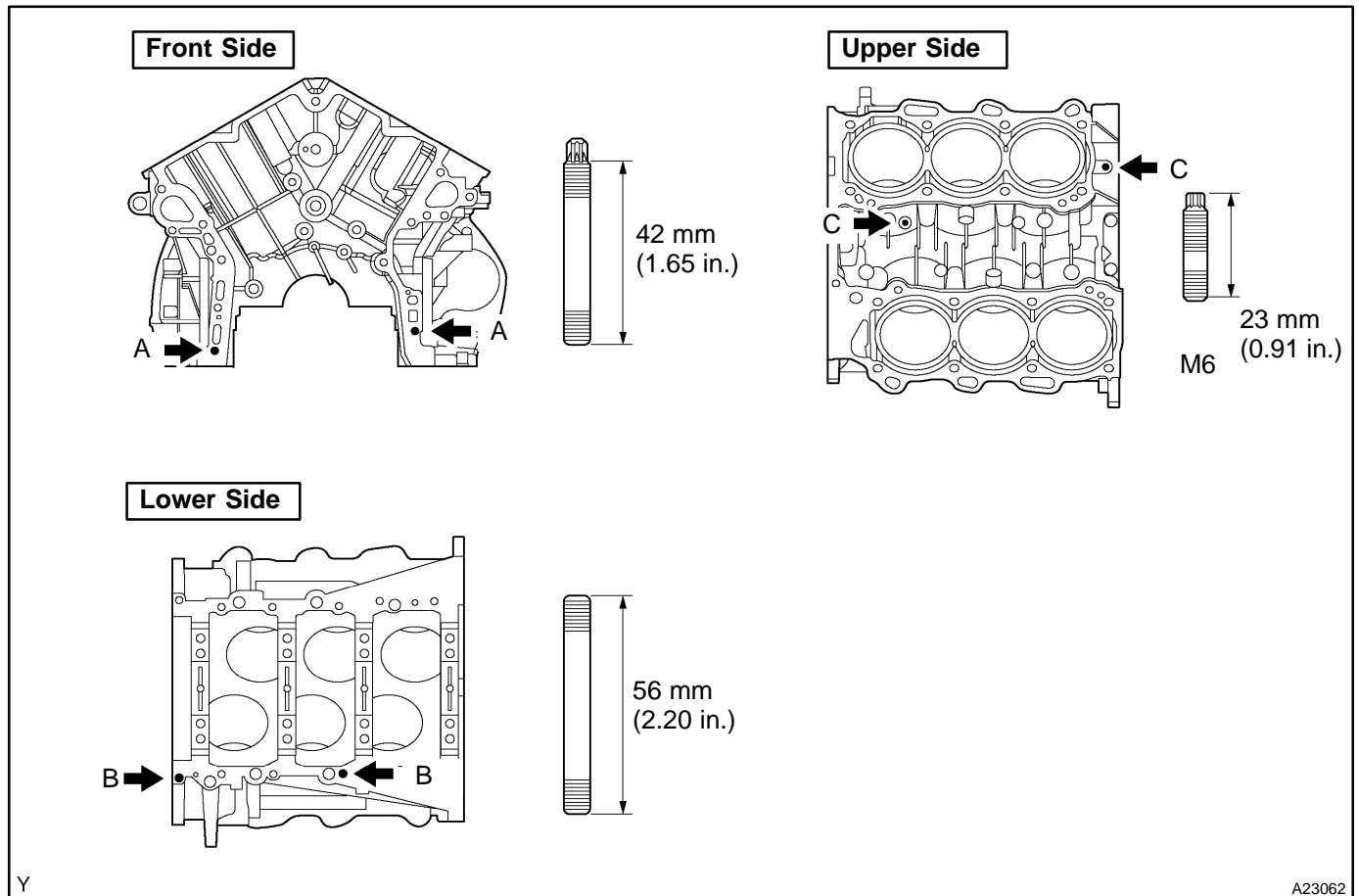
- (a) Install the stud bolts as shown in the illustration.

Torque:

Stud bolt A: 11 N·m (112 kgf·cm, 8.1 ft·lbf)

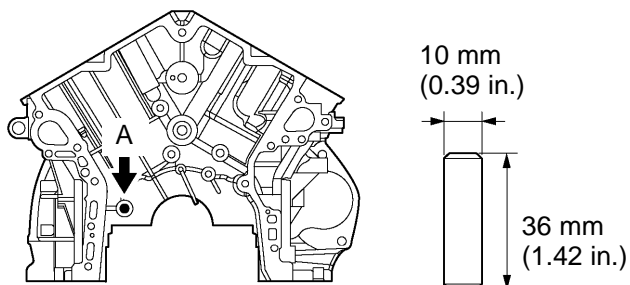
Stud bolt B: 4.5 N·m (46 kgf·cm, 40 in·lbf)

Stud bolt C: 4.0 N·m (41 kgf·cm, 35 in·lbf)

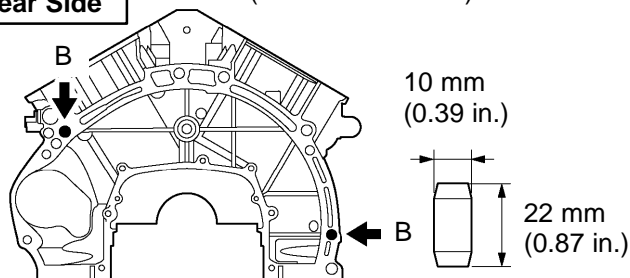


2. INSTALL STRAIGHT PIN

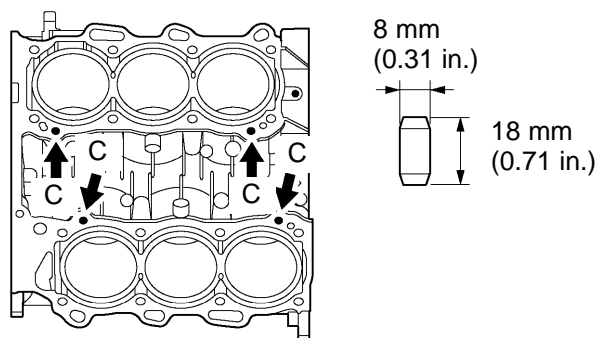
- (a) Using a plastic-faced hammer, tap in the straight pin.

Standard protrusion:**Pin A: 22.5 to 23.5 mm (0.886 to 0.925 in.)****Pin B: 10.5 to 11.5 mm (0.413 to 0.453 in.)****Pin C: 8.5 to 9.5 mm (0.335 to 0.374 in.)****Pin D: 5.5 to 6.5 mm (0.217 to 0.256 in.)****Front Side**

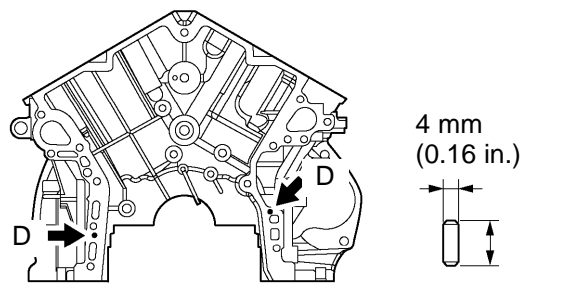
Protrusion Height: 22.5 to 23.5 mm
(0.886 to 0.925 in.)

Rear Side

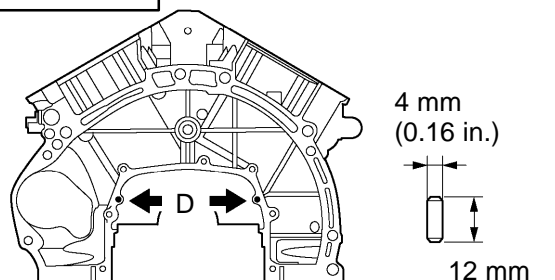
Protrusion Height: 10.5 to 11.5 mm
(0.413 to 0.453 in.)

Upper Side

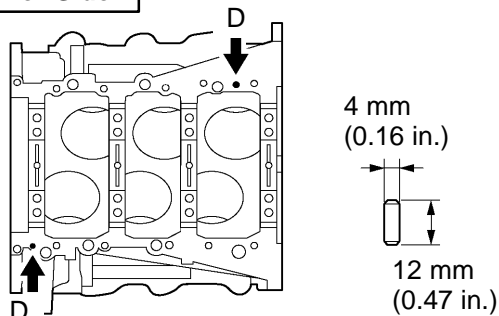
Protrusion Height: 8.5 to 9.5 mm (0.335 to 0.374 in.)

Front Side

Protrusion Height: 5.5 to 6.5 mm (0.217 to 0.256 in.)

Rear Side

Protrusion Height: 5.5 to 6.5 mm (0.217 to 0.256 in.)

Lower Side

Protrusion Height: 5.5 to 6.5 mm
(0.217 to 0.256 in.)

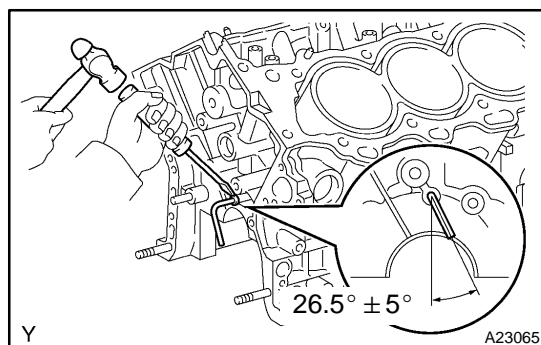
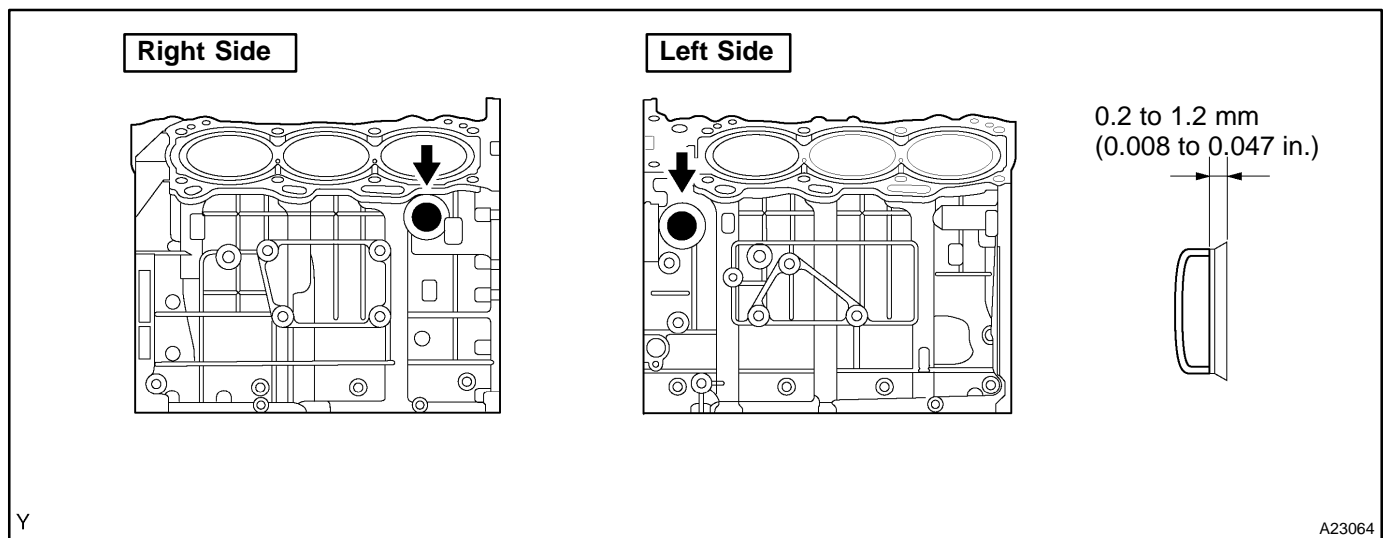
3. INSTALL TIGHT PLUG

- (a) Apply adhesive around the tight plugs.

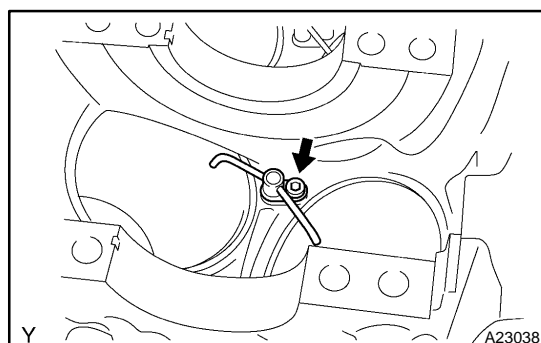
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent.

- (b) Using SST, install the tight plugs as shown in the illustration.

SST 09950-60010 (09951-00350), 09950-70010 (09951-07150)

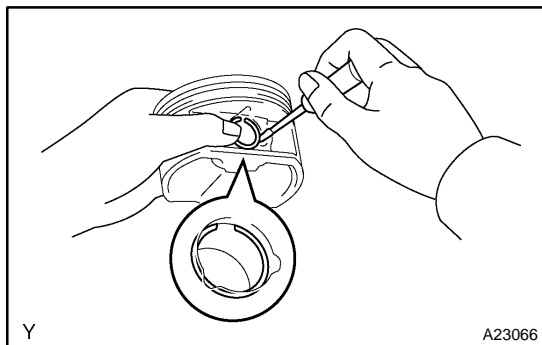
Standard depth: 0.2 to 1.2 mm (0.008 to 0.047 in.)**4. INSTALL OIL JET**

Using a screwdriver and hammer, tap in an oil jet.

**5. INSTALL OIL NOZZLE**

Using a 5 mm socket hexagon wrench, install the 3 oil nozzles.

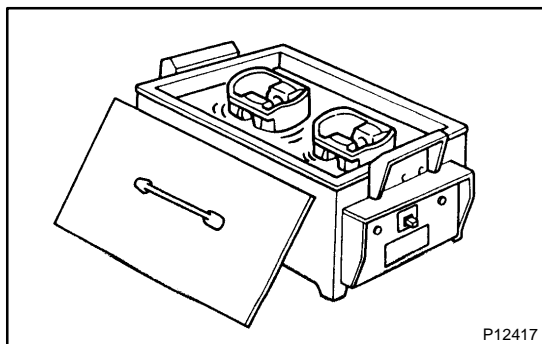
Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)

**6. INSTALL PISTON PIN HOLE SNAP RING**

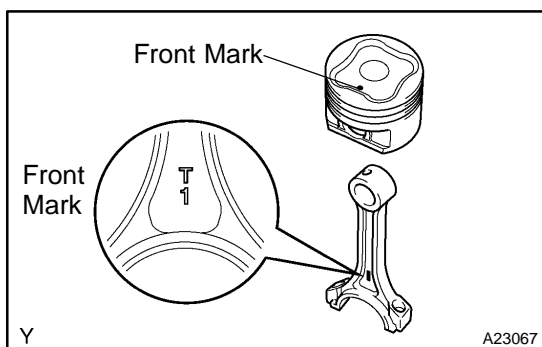
Using a screwdriver, install a new snap ring at one side of the piston pin hole.

HINT:

Check that the end gap of the snap ring does not overlap the pin hole cutout portion of the piston.

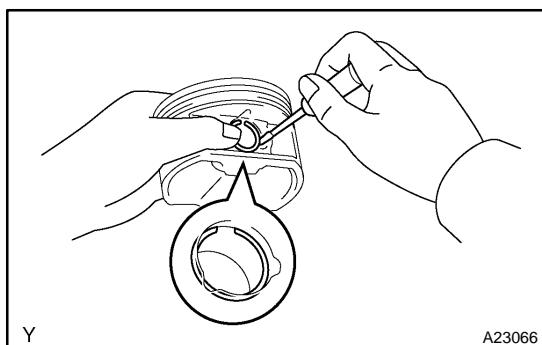
**7. INSTALL PISTON**

(a) Gradually heat the piston to about 80°C (176°F).



(b) Coat the piston pin with engine oil.

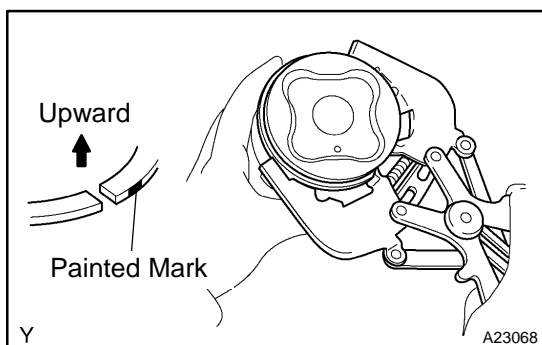
(c) Align the front marks of the piston and connecting rod, and push in the piston pin with a thumb.

**8. INSTALL PISTON PIN HOLE SNAP RING**

Using a screwdriver, install a new snap ring on the other side of the piston pin hole.

HINT:

Be sure that the end gap of the snap ring does not overlap the pin hole cutout portion of the piston.

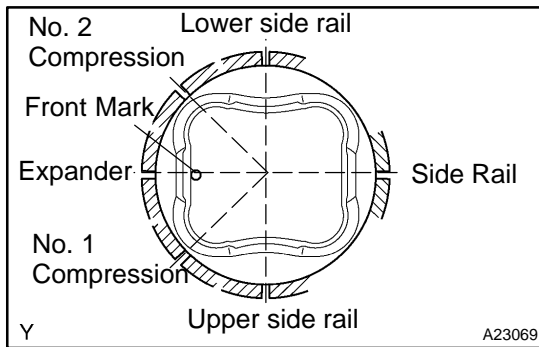
**9. INSTALL PISTON RING SET**

(a) Install the oil ring expander and 2 side rails by hand.

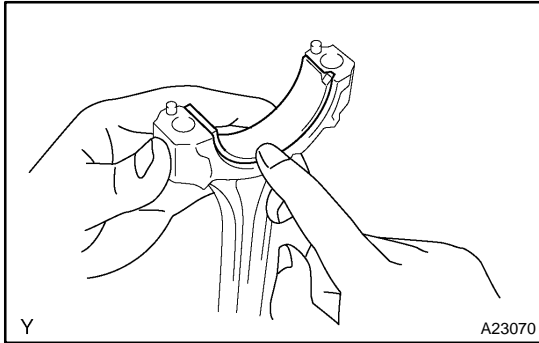
(b) Using a piston ring expander, install the 2 compression rings.

NOTICE:

Install the compression ring No. 2 with the painted mark facing upward.



- (c) Position the piston rings so that the ring ends are as shown in the illustration.

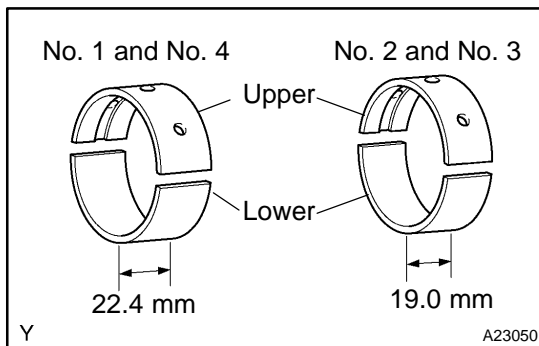


10. INSTALL CONNECTING ROD BEARING

Align the bearing claw with the groove of the connecting rod or connecting cap.

NOTICE:

Clean the backside of the bearing and the bearing surface of the connecting rod and prevent oil from adhering to them.

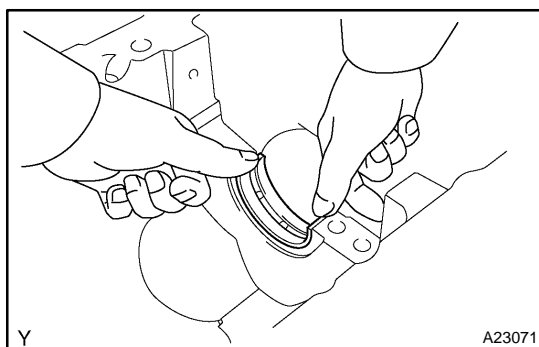


11. INSTALL CRANKSHAFT BEARING

HINT:

Main bearings come in widths of 19.0 mm (0.748 in.) and 22.4 mm (0.882 in.). Install the 22.4 mm (0.882 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing cap. Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No. 3 positions.

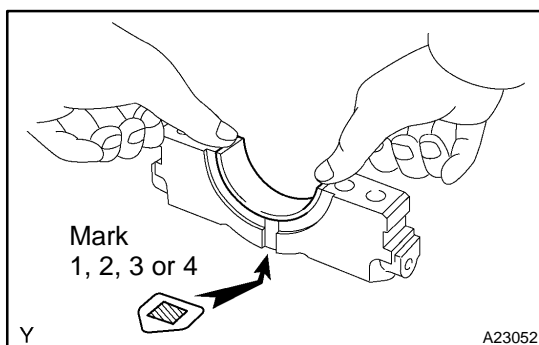
- (a) Clean each main journal and bearing.



- (b) Align the bearing claw with the claw groove of the cylinder block, and push in the 4 upper bearings.

NOTICE:

Do not apply engine oil to the bearing or its contact surface.



- (c) Align the bearing claw with the claw groove of the main bearing cap, and push in the 4 lower bearings.

NOTICE:

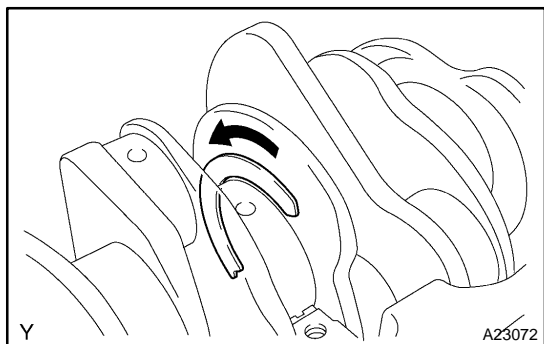
Do not apply engine oil to the bearing or its contact surface.

HINT:

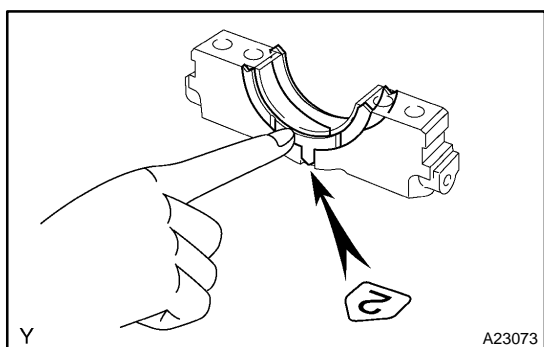
The number marked on each main bearing cap indicates the installation position.

12. INSTALL CRANKSHAFT

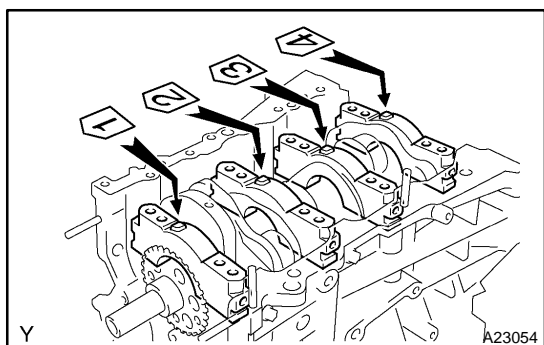
- (a) Apply engine oil to the upper bearing and install the crankshaft on the cylinder block.



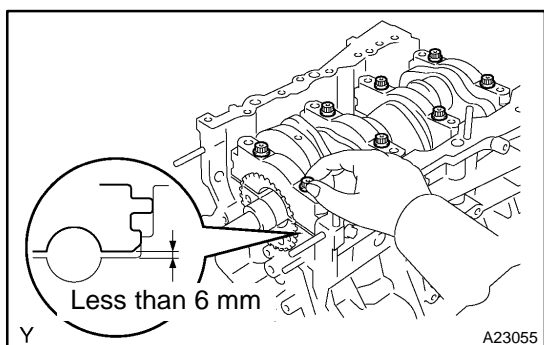
- (b) Install the 2 upper thrust washers to the No. 2 journal position of the cylinder block.
- (1) Push the crankshaft toward the front (rear) side.
 - (2) Install the 2 upper thrust washers with the oil grooves facing outward.



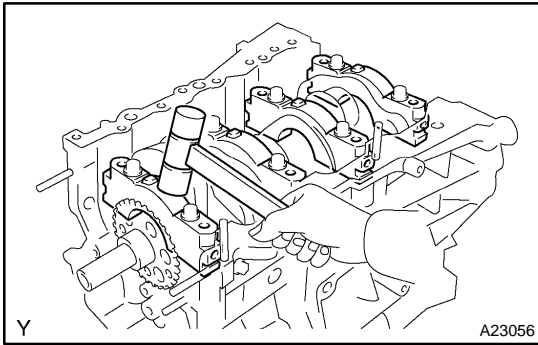
- (c) Install the 2 lower thrust washers on the No. 2 bearing cap with the grooves facing outward.



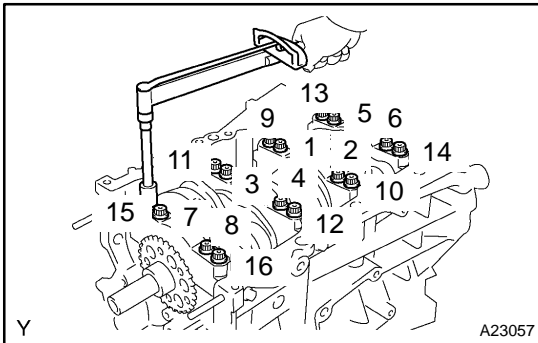
- (d) Examine the front marks and numbers and install the bearing caps on the cylinder block.
- (e) Apply a light coat of engine oil to the threads of the bearing cap bolts.
- (f) Temporarily install the 8 main bearing cap bolts to the inside positions.



- (g) Install the main bearing caps. Tighten the 2 bolts for each bearing cap until the clearance between the bearing cap and the cylinder block becomes less than 6 mm (0.23 in.).

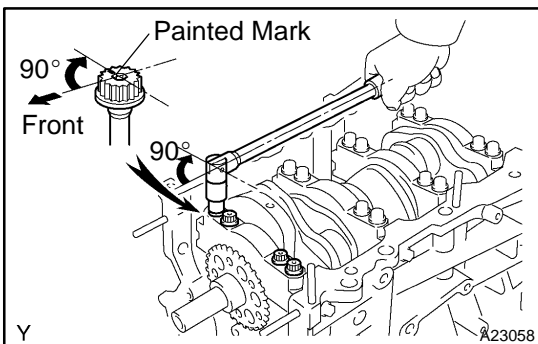


- (h) Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.
- (i) Apply a light coat of engine oil to the threads of the main bearing cap bolts.

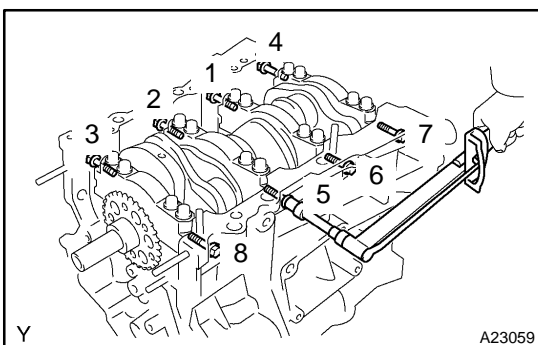


- (j) Install the 16 main bearing cap bolts. Using several steps, uniformly tighten the bolts in the sequence shown in the illustration.

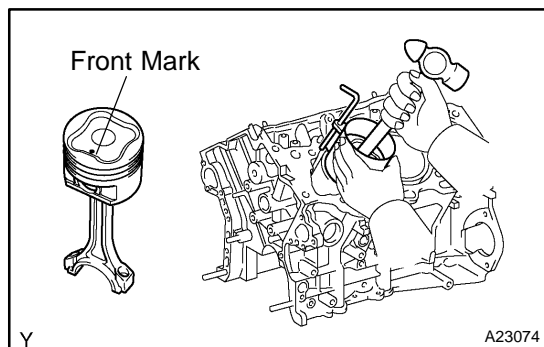
Torque: 61 N·m (622 kgf·cm, 45 ft·lbf)



- (k) Mark the front side of the bearing cap bolts with paint.
- (l) Retighten the bearing cap bolts 90° in the sequence as shown in the illustration.
- (m) Check that the painted mark is now at a 90° angle to the front.
- (n) Check that the crankshaft turns smoothly.



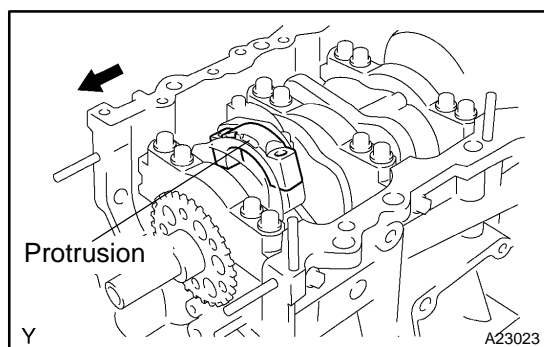
- (o) Using several steps, uniformly tighten the 8 main bearing cap bolts in the sequence as shown in the illustration.
- Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)**

**13. INSTALL PISTON W/CONNECTING ROD**

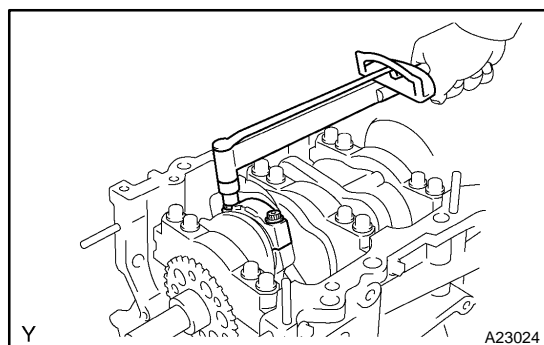
- Apply engine oil to the cylinder walls, the pistons, and the surfaces of the connecting rod bearings.
- Check the position of the piston ring ends.
- Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

NOTICE:

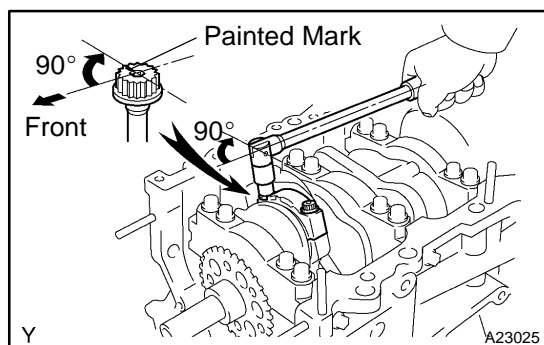
- **Clean the backside of the bearing and the bearing surface of the connecting rod cap and prevent oil from adhering to them.**
- **Match the numbered connecting rod cap with the connecting rod.**



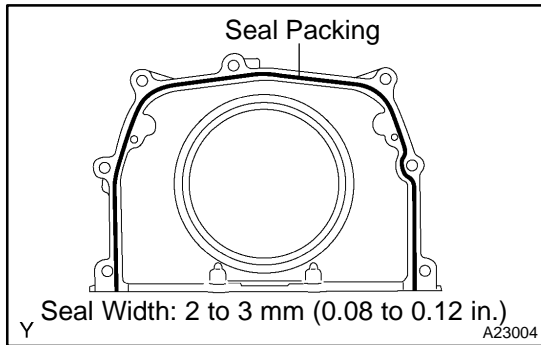
- Check that the protrusion of the connecting rod cap is facing the correct direction.
- Apply a light coat of engine oil to the threads of the connecting rod cap bolts.



- Using SST, tighten the bolts alternately to the specified torque.
SST 09011-38121
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



- Mark the front side of each connecting cap bolt with paint.
 - Retighten the cap bolts 90° as shown.
 - Check that the crankshaft turns smoothly.
- 14. INSTALL ENGINE REAR OIL SEAL RETAINER**
- Remove any old packing material (FIPG) and be careful not to drop any oil on the contact surfaces of the oil seal retainer and cylinder block.



- (b) Apply a continuous bead of seal packing (diameter 2 to 3 mm (0.08 to 0.12 in.)) to the oil seal retainer as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

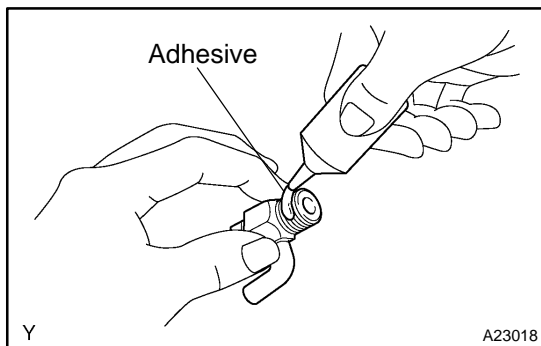
Parts must be assembled within 3 minutes of application. Otherwise the seal packing must be removed and reapplied.

- (c) Install the oil seal retainer with the 5 bolts and 2 nuts.

Torque:

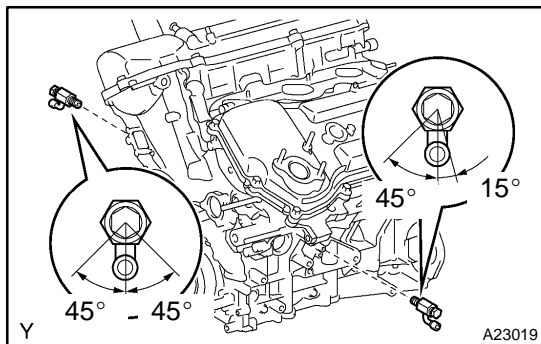
Bolt: 10 N·m (102 kgf·cm, 7 ft·lbf)

Nut: 9.0 N·m (92 kgf·cm, 80 in·lbf)



15. INSTALL WATER DRAIN COCK

- (a) Apply adhesive to 2 or 3 threads of the drain cock ends.
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

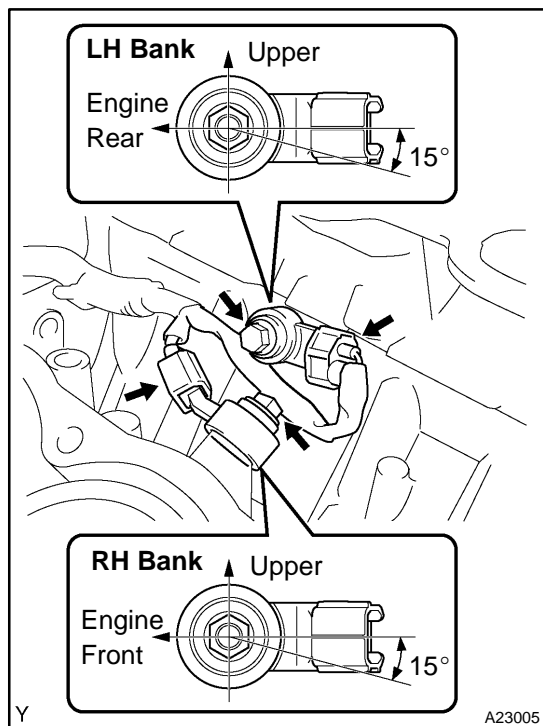


- (b) After tightening the drain cocks to the specified torque, rotate them clockwise as shown in the illustration.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

NOTICE:

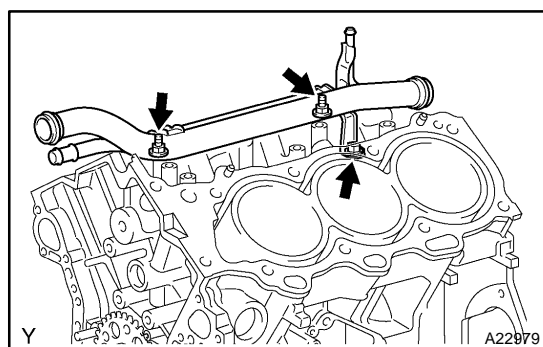
- Do not rotate the drain cocks more than 1 complete revolution (360°) after tightening the drain cocks to the specified torque.
- Do not loosen the drain cocks after setting them correctly.

**16. INSTALL KNOCK SENSOR**

- (a) Install the 2 knock sensors with the 2 bolts within a 15° angle as shown in the illustration.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

- (b) Connect the knock sensor connectors.

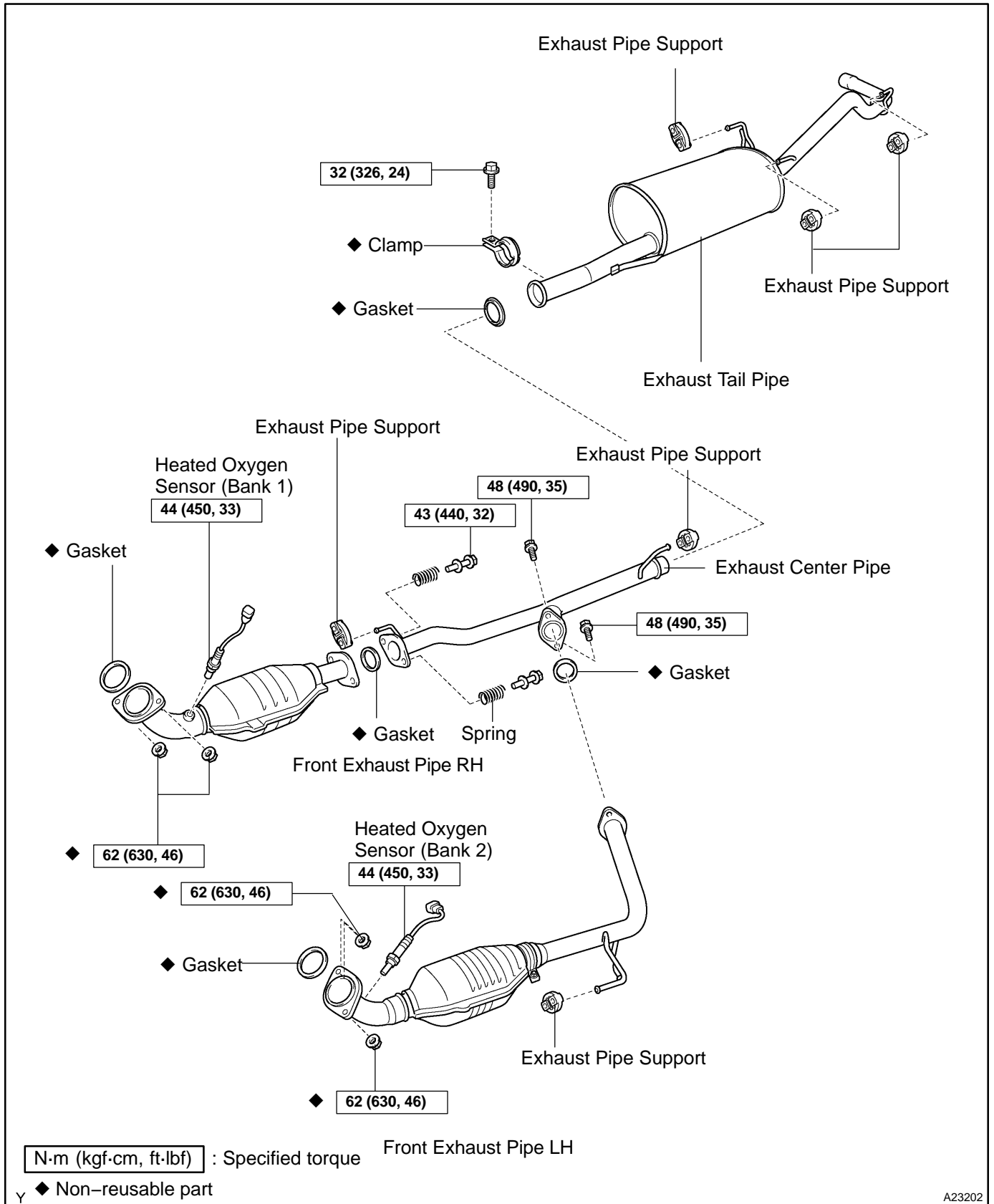
**17. INSTALL WATER OUTLET PIPE NO.1**

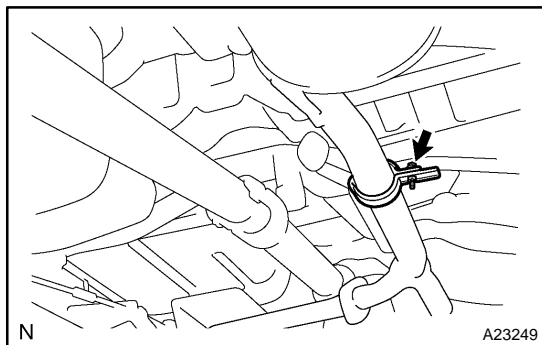
Install the water outlet pipe with the 3 bolts.

Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

EXHAUST SYSTEM COMPONENTS

EM1Y3-01

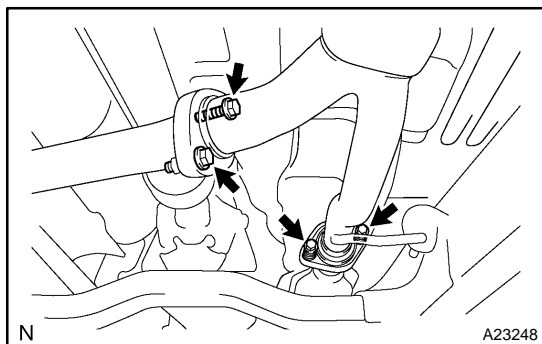




REPLACEMENT

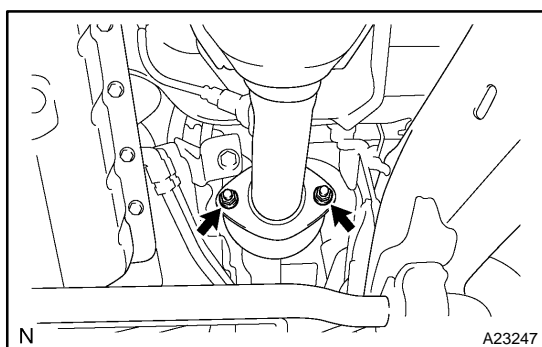
1. REMOVE EXHAUST TAIL PIPE

- (a) Remove the bolt and clamp.
- (b) Remove the 3 exhaust pipe supports and exhaust tail pipe.



2. REMOVE EXHAUST CENTER PIPE

- (a) Remove the 2 bolts and springs.
- (b) Remove the 2 bolts.
- (c) Remove the 2 exhaust pipe support and exhaust center pipe.
- (d) Remove the gasket from the exhaust tail pipe.



3. REMOVE HEATED OXYGEN SENSOR (BANK 1 OXYGEN SENSOR)

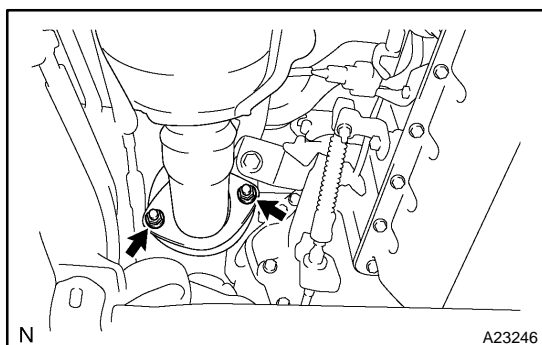
- (a) Disconnect the heated oxygen sensor.
- (b) Remove the heated oxygen sensor.

4. REMOVE RH FRONT EXHAUST PIPE

- (a) Remove the 2 nuts and RH front exhaust pipe.
- (b) Remove the 2 gaskets from the RH front exhaust pipe.

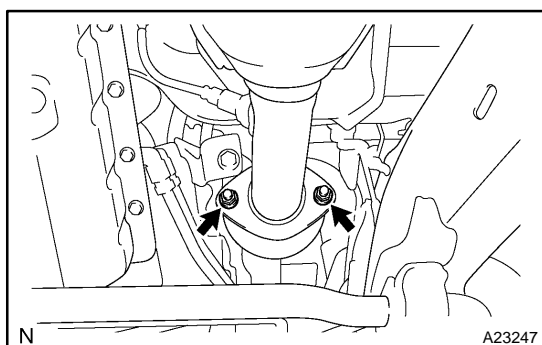
5. REMOVE HEATED OXYGEN SENSOR (BANK 2 OXYGEN SENSOR)

- (a) Disconnect the heated oxygen sensor connector.
- (b) Remove the heated oxygen sensor.



6. REMOVE LH FRONT EXHAUST PIPE

- (a) Remove the 2 nuts, exhaust pipe support and LH front exhaust pipe.
- (b) Remove the 2 gaskets from the LH front exhaust pipe.



7. INSTALL RH FRONT EXHAUST PIPE

- (a) Install 2 new gaskets to the LH front exhaust pipe.
- (b) Install the LH front exhaust pipe with the 2 new nuts.

Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

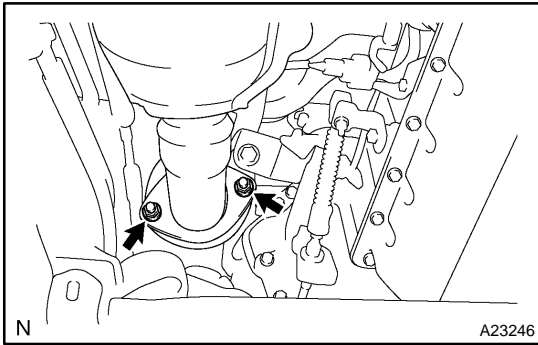
- (c) Install the exhaust pipe support.

8. INSTALL HEATED OXYGEN SENSOR (BANK 1 OXYGEN SENSOR)

- (a) Install the heated oxygen sensor.

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

- (b) Connect the heated oxygen sensor connector.

**9. INSTALL RH FRONT EXHAUST PIPE**

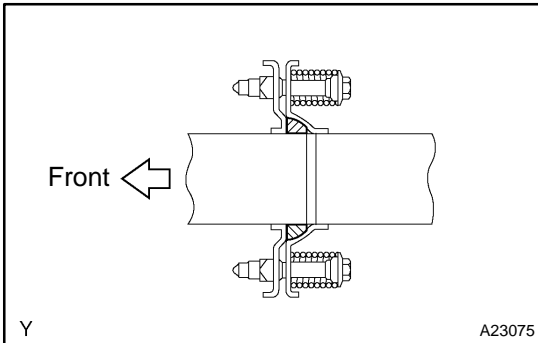
- (a) Install 2 new gaskets to the RH front exhaust pipe.
- (b) Install the RH front exhaust pipe with the 2 new nuts.

Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

10. INSTALL HEATED OXYGEN SENSOR (BANK2 OXYGEN SENSOR)

- (a) Install the heated oxygen sensor.
- (b) Connect the heated oxygen sensor connector.

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

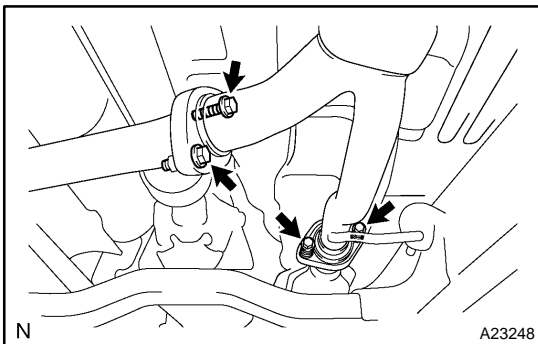
**11. INSTALL EXHAUST CENTER PIPE**

- (a) Using a vernier caliper, measure the free length of the spring.

Minimum length: 40.5 mm (1.5945 in.)

If the free length is less than minimum, replace the spring.

- (b) Install the 2 exhaust pipe supports.

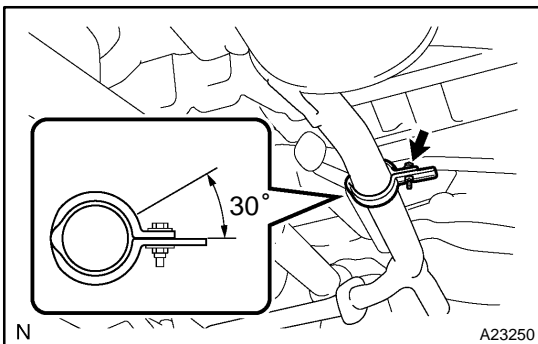


- (c) Install the 2 bolts.

Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)

- (d) Install the 2 bolts and springs.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

**12. INSTALL EXHAUST TAIL PIPE**

- (a) Install a new gasket to the exhaust center pipe.
- (b) Install the 3 exhaust pipe supports.
- (c) Install a new clamp and bolt.

Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)

CO/HC INSPECTION

EMOKQ-09

HINT:

This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All accessories switched OFF
- (e) All vacuum lines properly connected
- (f) SFI system wiring connectors fully plugged
- (g) Ignition timing checked correctly
- (h) Transmission in neutral position
- (i) Tachometer and CO/HC meter calibrated by hand

2. START ENGINE

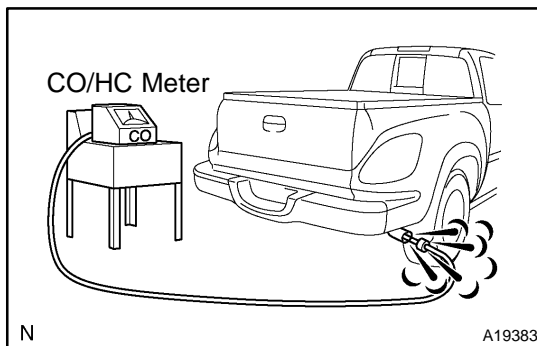
3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS

4. INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT:

When performing the 2 mode (2,500 rpm and idle) test, follow the measurement orders are prescribed by the applicable local regulations.



If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below.

- (1) Check the air–fuel ratio sensors and heated oxygen sensors operation (see page [DI-507](#) and [DI-512](#)).
- (2) See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: <ul style="list-style-type: none"> • Incorrect timing • Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaky intake and exhaust valves 4. Leaky cylinders
Low	High	Rough idle (fluctuating HC reading)	1. Vacuum leaks: <ul style="list-style-type: none"> • PCV hose • Intake manifold • Throttle body • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty SFI system: <ul style="list-style-type: none"> • Faulty pressure regulator • Defective ECT sensor • Faulty ECM • Faulty injectors • Faulty throttle position sensor • Faulty MAF meter

COMPRESSION INSPECTION

EMOKR-11

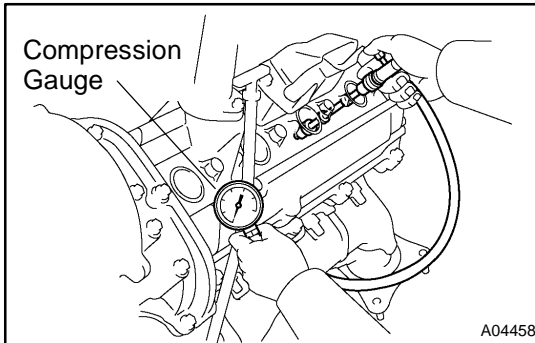
HINT:

If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. REMOVE SPARK PLUGS (See page IG-1)



3. CHECK CYLINDER COMPRESSION PRESSURE

- (a) Insert a compression gauge into the spark plug hole.
- (b) Fully open the throttle.
- (c) While cranking the engine, measure the compression pressure.

HINT:

Always use a fully charged battery to obtain engine speed of 250 rpm or more.

- (d) Repeat steps (a) through (c) for each cylinder.

NOTICE:

This measurement must be done in as short a time as possible.

Compression pressure:

1,373 kPa (14.0 kgf/cm², 199 psi) or more

Minimum pressure:

1,030 kPa (10.5 kgf/cm², 149 psi)

Difference between each cylinder:

98 kPa (1.0 kgf/cm², 14 psi) or less

- (e) If the cylinder compression in one or more cylinders is low, pour small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.
 - If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damaged.
 - If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

4. REINSTALL SPARK PLUGS (See page IG-1)

VALVE CLEARANCE INSPECTION

EMOKS-10

HINT:

Inspect and adjust the valve clearance when the engine is cold.

1. REMOVE BATTERY CLAMP COVER
2. REMOVE THROTTLE BODY COVER
3. REMOVE AIR CLEANER AND INTAKE AIR CONNECTOR ASSEMBLY
4. REMOVE NO.3 TIMING BELT COVERS
(See page [EM-16](#))

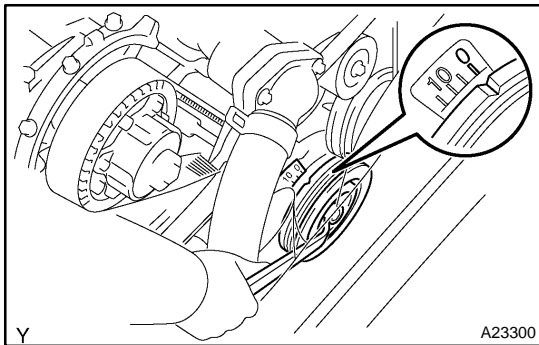
5. REMOVE IGNITION COILS (See page [IG-5](#))

6. REMOVE RH CYLINDER HEAD COVER

Remove the 9 bolts, seal washers and cylinder head cover.

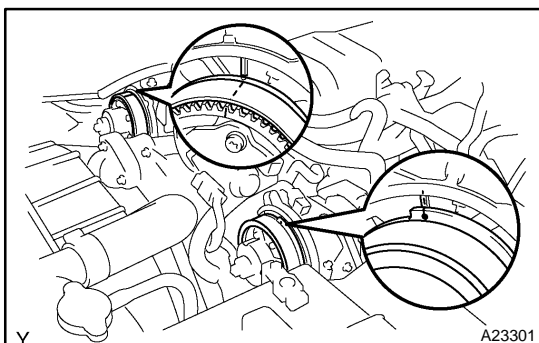
7. REMOVE LH CYLINDER HEAD COVER

- (a) Remove the oil dipstick for the transmission.
- (b) Disconnect the PCV hose.
- (c) Disconnect the engine wire clamp from the wire bracket on the cylinder head cover.
- (d) Remove the 9 bolts, 9 seal washers and cylinder head cover.

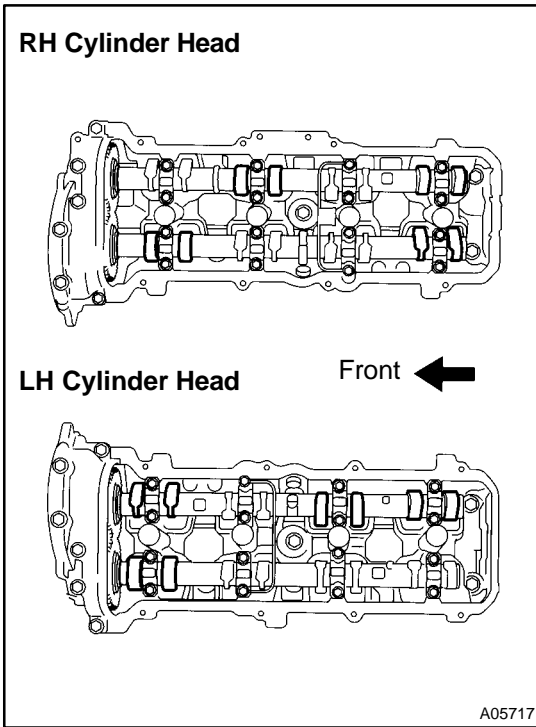


8. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (a) Turn the crankshaft pulley, and align its groove with timing mark "0" of the No.1 timing belt cover.



- (b) Check that the timing marks of the camshaft timing pulleys and timing belt rear plates are aligned.
If not, turn the crankshaft 1 revolution (360°) and align the mark as above.

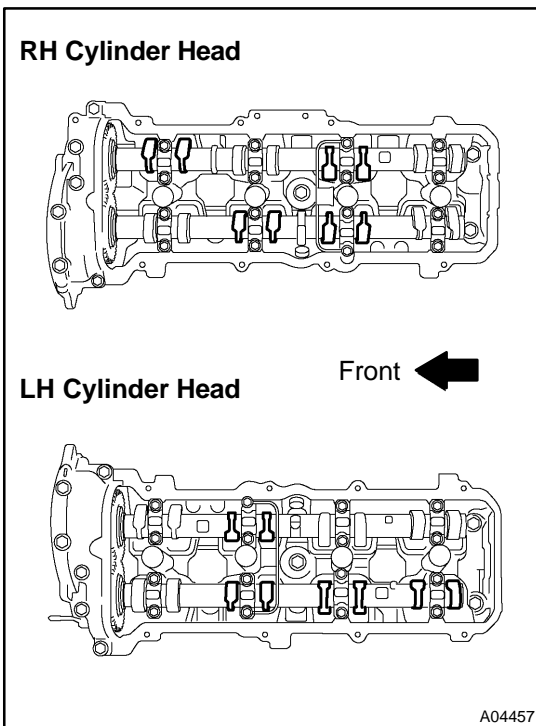


9. INSPECT VALVE CLEARANCE

- (a) Check only the valves indicated.
- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
 - Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

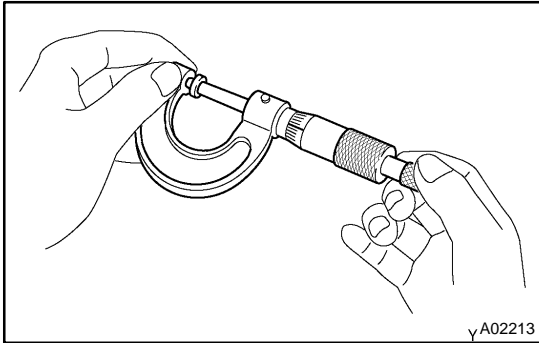
Intake	0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust	0.25 – 0.35 mm (0.010 – 0.014 in.)



- (b) Turn the crankshaft 1 revolution (360°) and align the mark as above. (See procedure in step 8)
- (c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))

10. ADJUST VALVE CLEARANCE

- (a) Remove the timing belt. (See page [EM-16](#))
- (b) Remove the camshafts. (See page [EM-36](#))
- (c) Remove the valve lifter and adjusting shim.



- (d) Determine the replacement adjusting shim size according to these Formula or Charts:
 - (1) Using a micrometer, measure the thickness of the removed shim.
 - (2) Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

T Thickness of removed shim

A Measured valve clearance

N Thickness of new shim

Intake: $N = T + (A - 0.20 \text{ mm (0.008 in.)})$

Exhaust: $N = T + (A - 0.30 \text{ mm (0.012 in.)})$

- (3) Select a new shim with thickness as close as possible to the calculated value.

HINT:

Shims are available in 41 increments of 0.020 mm (0.0008 in.), from 2.00 mm (0.0787 in.) to 2.80 mm (0.1102 in.).

- (e) Place a new adjusting shim on the valve.
- (f) Place the valve lifter.
- (g) Reinstall the camshafts. (See page [EM-60](#))
- (h) Reinstall the timing belt. (See page [EM-23](#))
- (i) Recheck the valve clearance.

11. REINSTALL CYLINDER HEAD COVERS**12. REINSTALL IGNITION COILS****13. REINSTALL NO.3 TIMING BELT COVERS**

(See page [EM-23](#))

14. REINSTALL AIR CLEANER AND INTAKE AIR CONNECTOR ASSEMBLY**15. REINSTALL THROTTLE BODY COVER****16. REINSTALL BATTERY CLAMP COVER**

Adjusting Shim Selection Chart (Intake)

Installed shim thickness mm (in.)																													
	Measured clearance mm (in.)																												
0.000-0.030 (0.0000-0.0012)																													
0.031-0.050 (0.0012-0.0020)																													
0.051-0.070 (0.0020-0.0028)																													
0.071-0.090 (0.0028-0.0035)																													
0.091-0.110 (0.0036-0.0043)																													
0.111-0.130 (0.0044-0.0051)																													
0.131-0.149 (0.0052-0.0059)																													
0.150-0.250 (0.0059-0.0098)																													
0.251-0.270 (0.0099-0.0106)	06	08	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62
0.271-0.290 (0.0107-0.0114)	08	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64
0.291-0.310 (0.0115-0.0122)	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66
0.311-0.330 (0.0122-0.0130)	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68
0.331-0.350 (0.0130-0.0138)	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
0.351-0.370 (0.0138-0.0146)	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72
0.371-0.390 (0.0146-0.0154)	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
0.391-0.410 (0.0154-0.0161)	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
0.411-0.430 (0.0162-0.0169)	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
0.431-0.450 (0.0170-0.0177)	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
0.451-0.470 (0.0178-0.0185)	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82
0.471-0.490 (0.0185-0.0193)	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
0.491-0.510 (0.0193-0.0201)	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86
0.511-0.530 (0.0201-0.0209)	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88
0.531-0.550 (0.0209-0.0217)	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90
0.551-0.570 (0.0217-0.0224)	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92
0.571-0.590 (0.0225-0.0232)	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94
0.591-0.610 (0.0233-0.0240)	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96
0.611-0.630 (0.0241-0.0248)	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98
0.631-0.650 (0.0248-0.0256)	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100
0.651-0.670 (0.0256-0.0264)	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102
0.671-0.690 (0.0264-0.0272)	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104
0.691-0.710 (0.0272-0.0280)	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106
0.711-0.730 (0.0280-0.0287)	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108
0.731-0.750 (0.0288-0.0295)	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
0.751-0.770 (0.0296-0.0303)	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112
0.771-0.790 (0.0304-0.0311)	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114
0.791-0.810 (0.0311-0.0319)	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116
0.811-0.830 (0.0319-0.0327)	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118
0.831-0.850 (0.0327-0.0335)	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120
0.851-0.870 (0.0335-0.0343)	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122
0.871-0.890 (0.0343-0.0350)	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124
0.891-0.910 (0.0351-0.0358)	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126
0.911-0.930 (0.0359-0.0366)	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128
0.931-0.950 (0.0367-0.0374)	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130
0.951-0.970 (0.0374-0.0382)	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132
0.971-0.990 (0.0382-0.0390)	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134
0.991-1.010 (0.0390-0.0398)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136
1.011-1.030 (0.0398-0.0406)	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
1.031-1.050 (0.0406-0.0413)	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

**Intake valve clearance (Cold):
0.15 – 0.25 mm (0.006 – 0.010 in.)**

EXAMPLE:

The 2.300 mm (0.0906 in.) shim is installed, and the measured clearance is 0.440 mm (0.0173 in.). Replace the 2.300 mm (0.0906 in.) shim with a No. 54 shim.

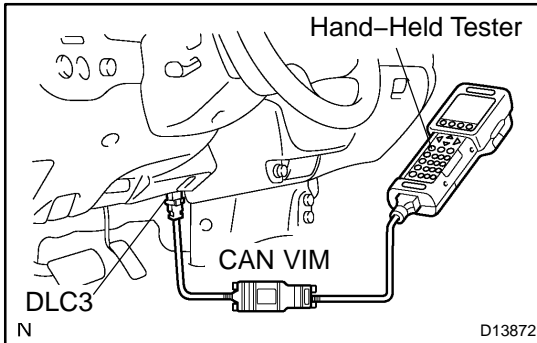
New shim thickness mm (in.)					
Shim No.	Thickness	Shim No.	Thickness	Shim No.	Thickness
00	2.000 (0.0787)	28	2.280 (0.0898)	56	2.560 (0.1008)
02	2.020 (0.0795)	30	2.300 (0.0906)	58	2.580 (0.1016)
04	2.040 (0.0803)	32	2.320 (0.0913)	60	2.600 (0.1024)
06	2.060 (0.0811)	34	2.340 (0.0921)	62	2.620 (0.1031)
08	2.080 (0.0819)	36	2.360 (0.0929)	64	2.640 (0.1039)
10	2.100 (0.0827)	38	2.380 (0.0937)	66	2.660 (0.1047)
12	2.120 (0.0835)	40	2.400 (0.0945)	68	2.680 (0.1055)
14	2.140 (0.0843)	42	2.420 (0.0953)	70	2.700 (0.1063)
16	2.160 (0.0850)	44	2.440 (0.0961)	72	2.720 (0.1071)
18	2.180 (0.0858)	46	2.460 (0.0969)	74	2.740 (0.1079)
20	2.200 (0.0866)	48	2.480 (0.0976)	76	2.760 (0.1087)
22	2.220 (0.0874)	50	2.50		

IGNITION TIMING INSPECTION

EMOKT-12

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



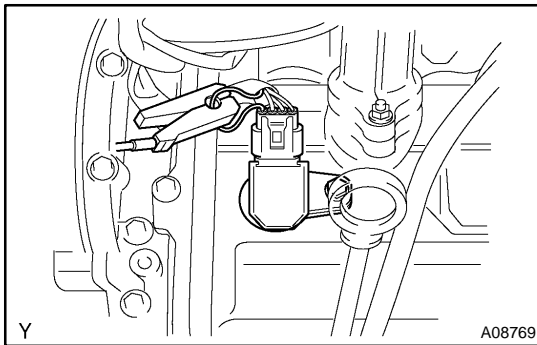
2. INSPECT IGNITION TIMING

(a) When using a hand-held tester.

- (1) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (2) Please refer to the hand-held tester operator's manual for further details.

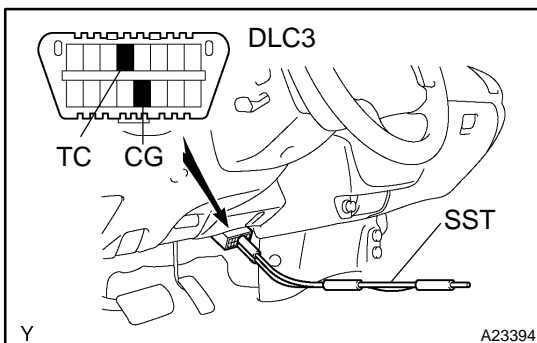
**Ignition timing: 5 to 15° BTDC at idle
(Transmission in neutral)**

- (3) Disconnect the hand-held tester and CAN VIM from the DLC3.



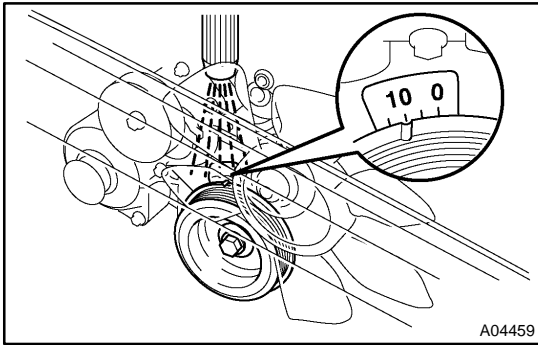
(b) When not using a hand-held tester.

- (1) Connect the tester probe of a timing light to the wire (black - red) of the ignition coil connector for the No.1 cylinder.



- (2) Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040



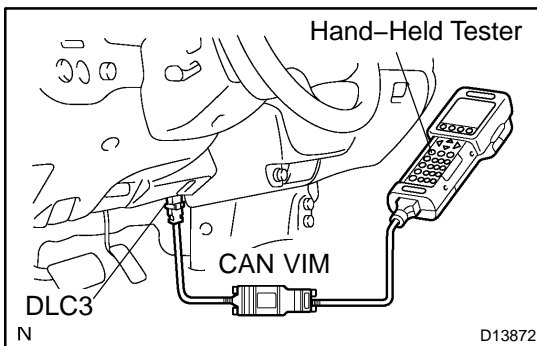
- (3) Using a timing light, check the ignition timing.
**Ignition timing: 5 to 15° BTDC at idle
(Transmission in neutral)**
- (4) Remove the SST from the DLC3.
SST 09843-18040
- (5) Disconnect the timing light from the engine.

IDLE SPEED INSPECTION

EM1X3-02

1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All accessories switched OFF
- (e) All vacuum lines properly connected
- (f) SFI system wiring connectors fully plugged
- (g) iCorrect ignition timing
- (h) Transmission in neutral
- (i) Air conditioning switched OFF



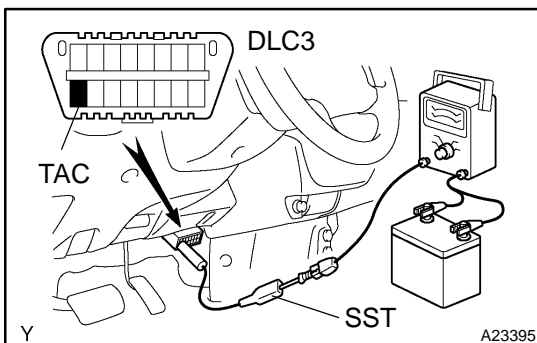
2. INSPECT ENGINE IDLE SPEED

- (a) When using a hand-held tester.
 - (1) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
 - (2) Please refer to the hand-held tester operator's manual for further details.
 - (3) Race the engine speed at 2,500 rpm for approx. 90 seconds.
 - (4) Check the idle speed.

**Idle speed: 700 ± 50 rpm
(Transmission in neutral)**

If the idle speed is not as specified, check the air intake system.

- (5) Disconnect the hand-held tester and CAN VIM from the DLC3.



- (b) When not using a hand-held tester.
 - (1) Using SST, connect the tachometer probe to terminal TAC of the DLC3.
SST 09843-18030
 - (2) Race the engine at 2,500 rpm for approx. 90 seconds.
 - (3) Check the idle speed.

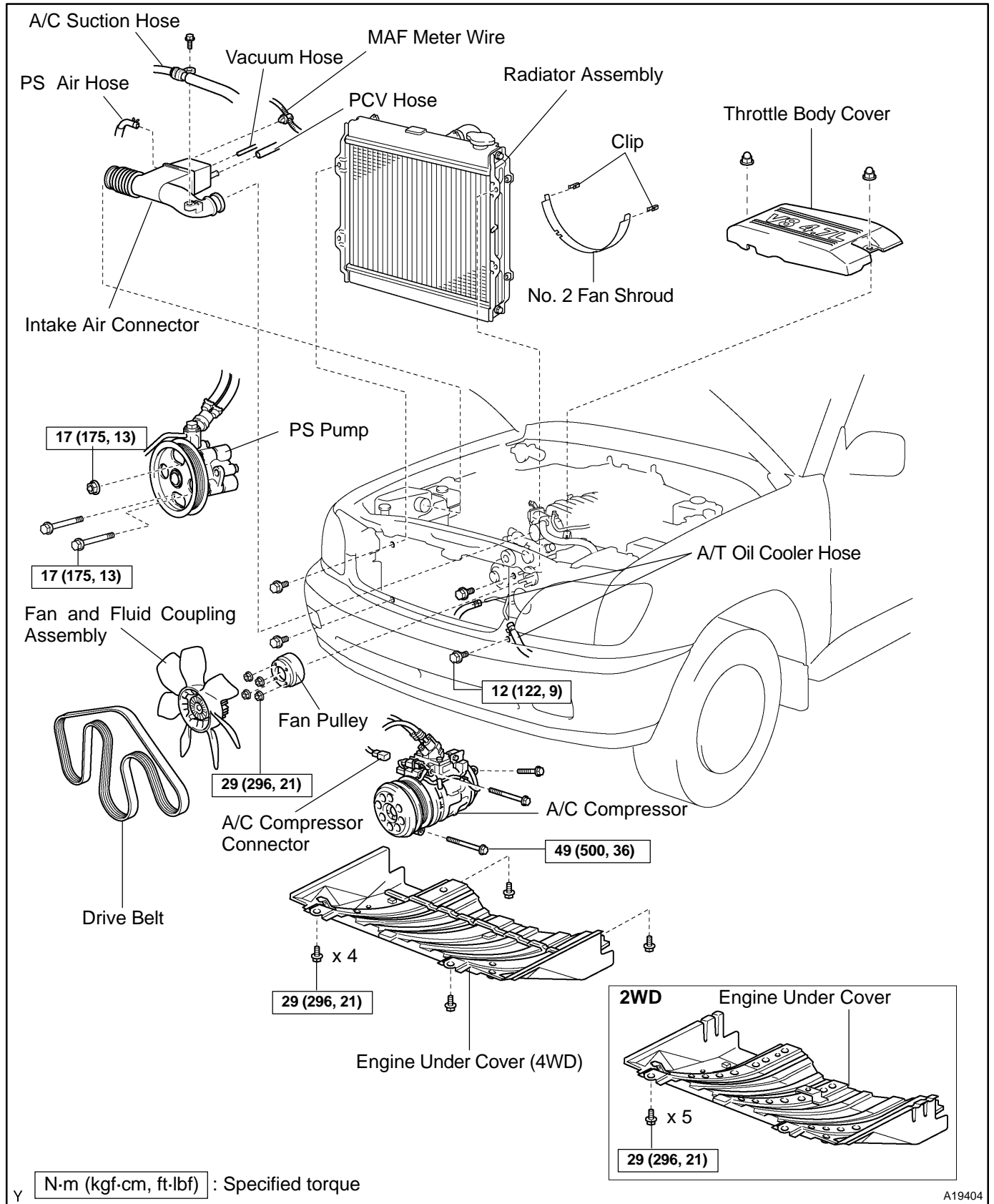
**Idle speed: 700 ± 50 rpm
(Transmission in neutral)**

If the idle speed is not as specified, check the air intake system.

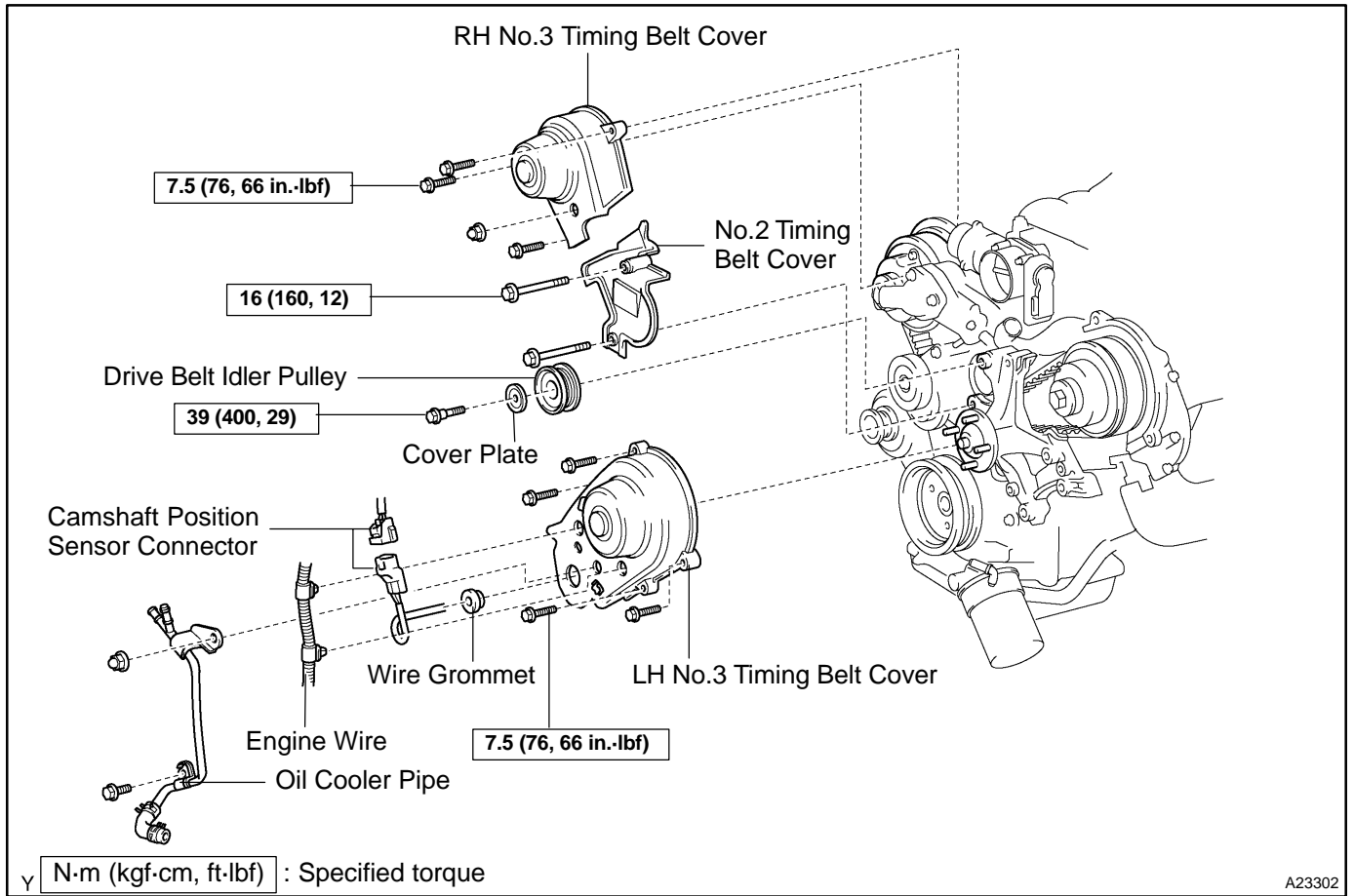
- (4) Disconnect the tachometer from the DLC3.

TIMING BELT COMPONENTS

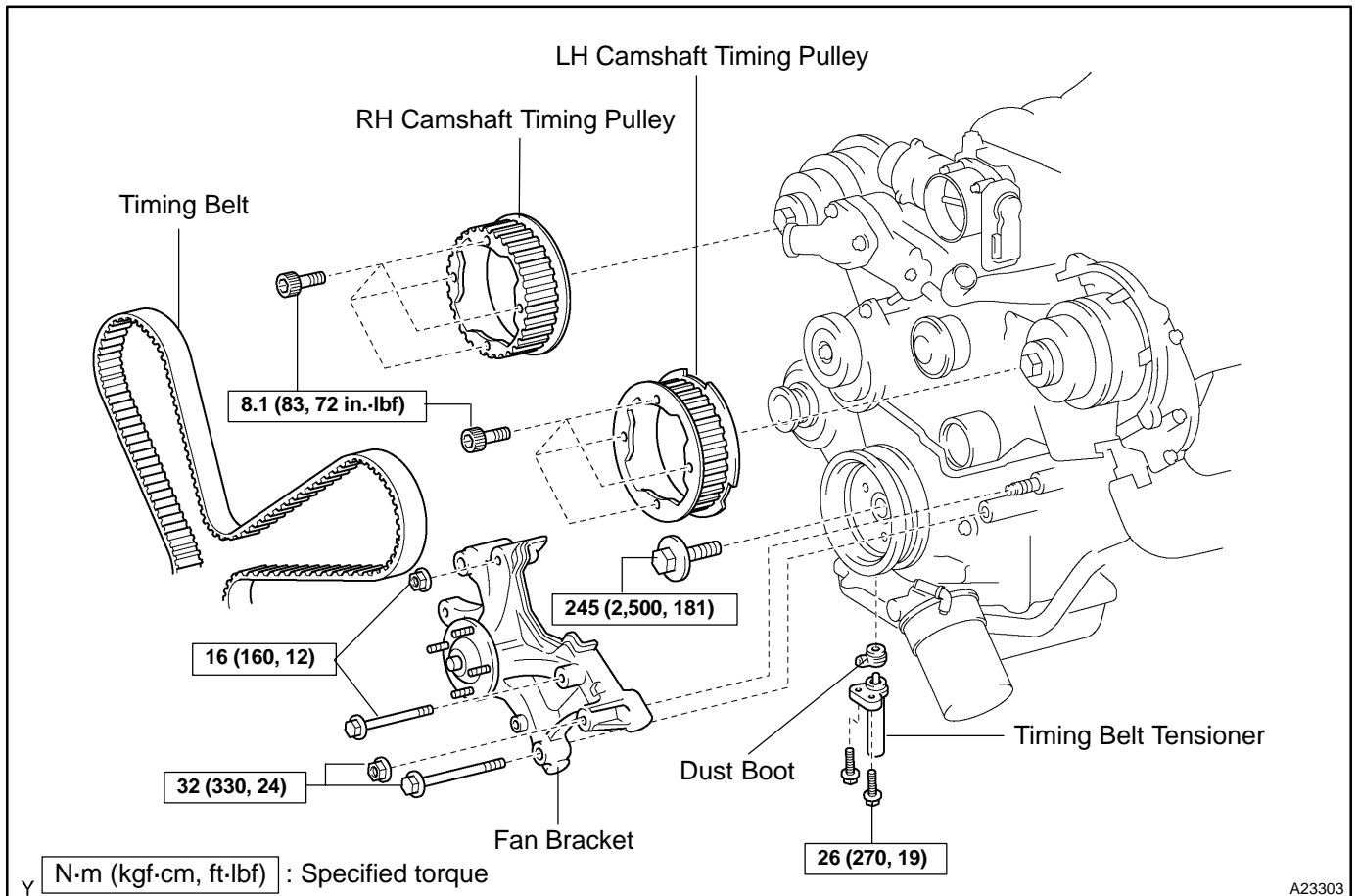
EMOKV-12



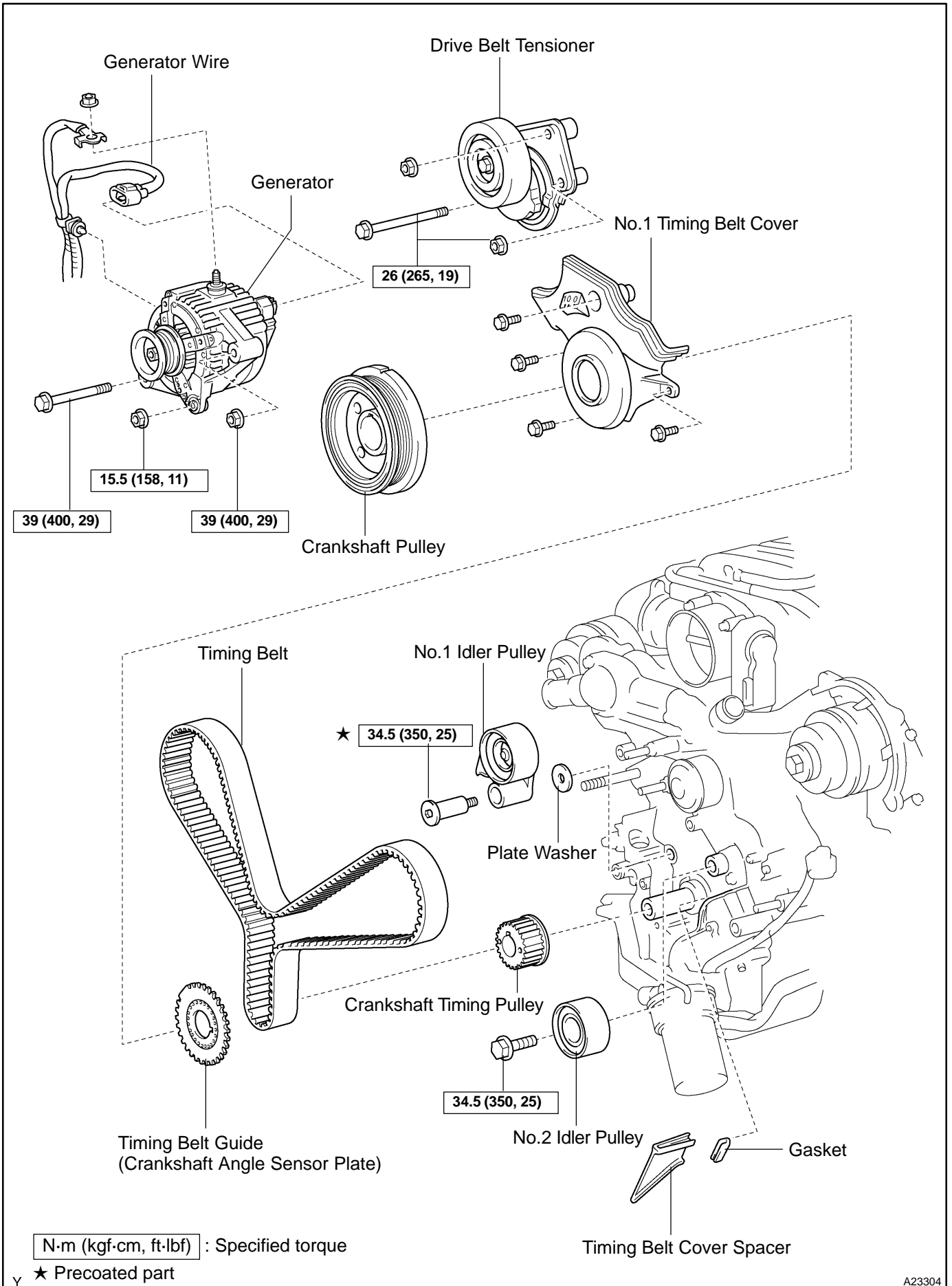
N·m (kgf·cm, ft·lbf) : Specified torque



A23302

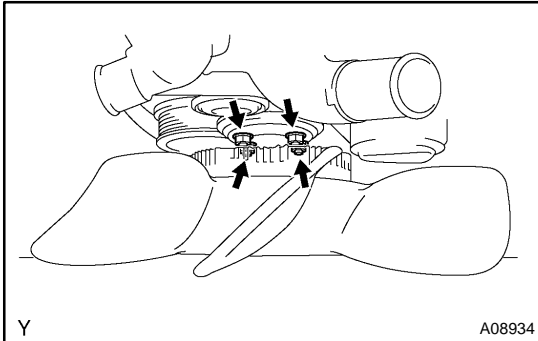


A23303



REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE RADIATOR ASSEMBLY (See page [CO-17](#))
4. REMOVE THROTTLE BODY COVER
5. REMOVE INTAKE AIR CONNECTOR ASSEMBLY



6. REMOVE DRIVE BELT, FAN, FLUID COUPLING AND FAN PULLEY
 - (a) Loosen the 4 nuts holding the fluid coupling to the fan bracket.
 - (b) Remove the drive belt. (See page [CH-7](#) and [CH-19](#))
 - (c) Remove the 4 nuts, the fan, fluid coupling assembly and fan pulley.

7. DISCONNECT PS PUMP

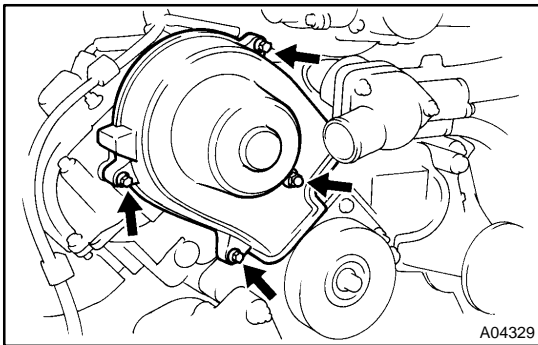
Remove the 3 bolts, and disconnect the PS pump from the engine.

HINT:

Suspend the PS pump securely.

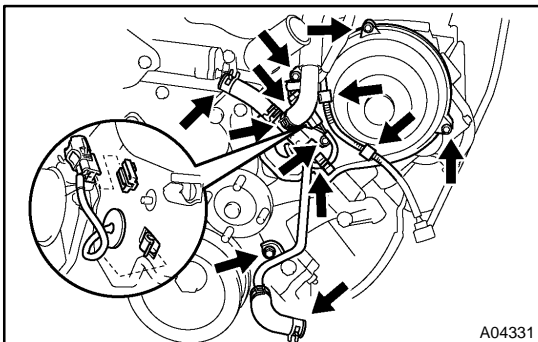
8. REMOVE DRIVE BELT IDLER PULLEY

Remove the pulley bolt, cover plate and idler pulley.



9. REMOVE RH NO.3 TIMING BELT COVER

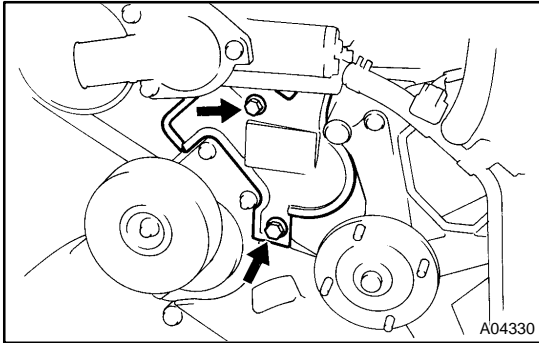
Remove the 3 bolts, nut and RH No.3 timing belt cover.



10. REMOVE LH NO.3 TIMING BELT COVER

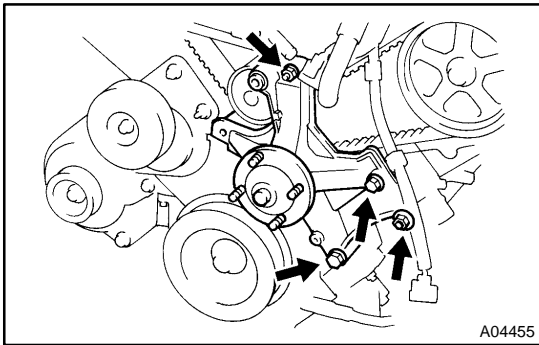
- (a) Disconnect the engine wire from the 2 wire clamps.
- (b) Remove the 4 bolts and nut.
- (c) Disconnect the camshaft position sensor wire from the wire clamp on the LH No.3 timing belt cover.
- (d) Disconnect the camshaft position sensor connector from the connector bracket.
- (e) Disconnect the camshaft position sensor connector.
- (f) Remove the wire grommet from the LH No.3 timing belt cover.

- (g) Remove the LH No.3 timing belt cover.
- (h) Remove the bolt, nut and oil cooler pipe.

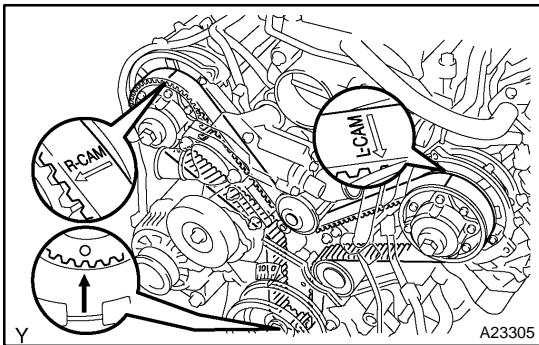


- 11. REMOVE NO.2 TIMING BELT COVER**
Remove the 2 bolts and No.2 timing belt cover.

- 12. DISCONNECT A/C COMPRESSOR FROM ENGINE**
(See page [EM-79](#))



- 13. REMOVE FAN BRACKET**
Remove the 2 bolts, 2 nuts and fan bracket.

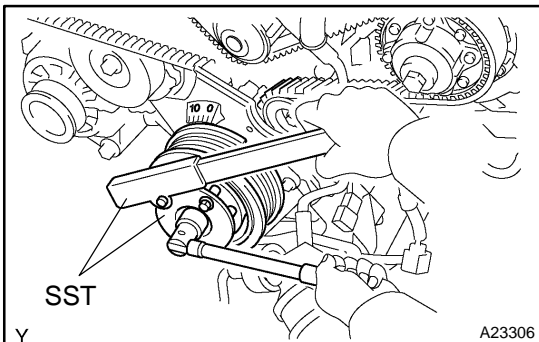


- 14. IF RE-USING TIMING BELT, CHECK INSTALLATION MARKS ON TIMING BELT**

Check that there are 3 installation marks on the timing belt by turning the crankshaft pulley as shown in the illustration.

HINT:

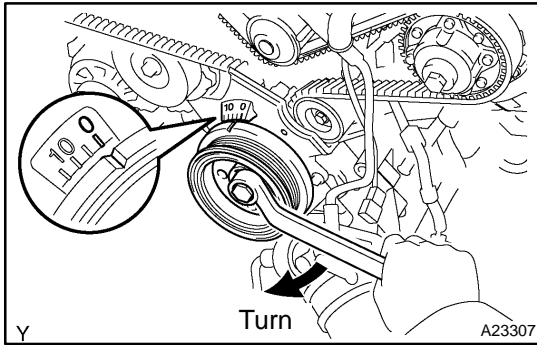
If the installation marks have disappeared, place a new installation mark on the timing belt before removing each part.



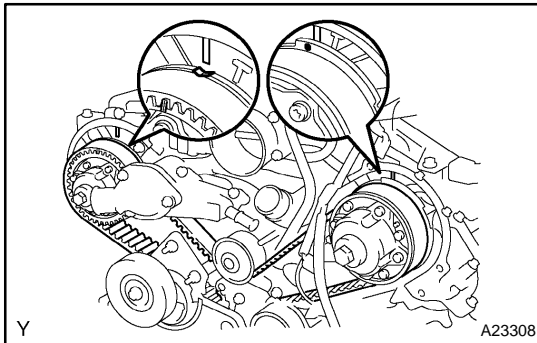
- 15. LOOSEN CRANKSHAFT PULLEY BOLT**

Using SST, loosen the pulley bolt.

SST 09213-70011 (90105-08076), 09330-00021

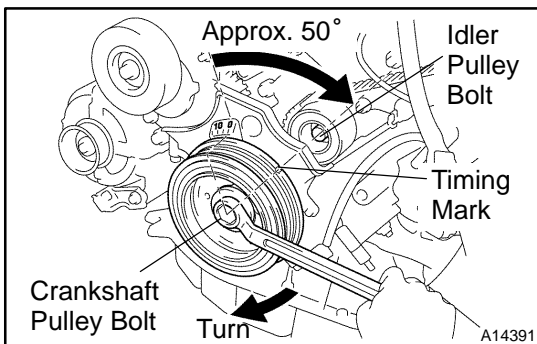
**16. SET NO.1 CYLINDER TO TDC/COMPRESSION**

- (a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.



- (b) Check that the timing marks of the camshaft timing pulleys and timing belt rear plates are aligned.

If not, turn the crankshaft 1 revolution (360°).



- (c) Turn the crankshaft pulley approx. 50° clockwise, and align the timing mark of the crankshaft pulley with the centers of the crankshaft pulley bolt and the No.2 timing belt idler pulley bolt.

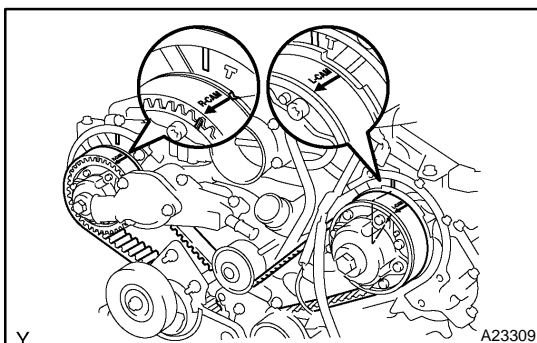
NOTICE:

If the timing belt is disengaged, having the crankshaft pulley at the wrong angle can cause the piston head and valve head to come into contact with each other when you remove the camshaft timing pulley (step 15), causing damage. So always set the crankshaft pulley at the correct angle.

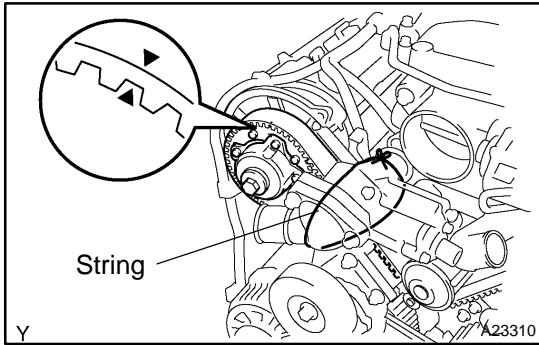
- (d) Remove the crankshaft pulley bolt.

NOTICE:

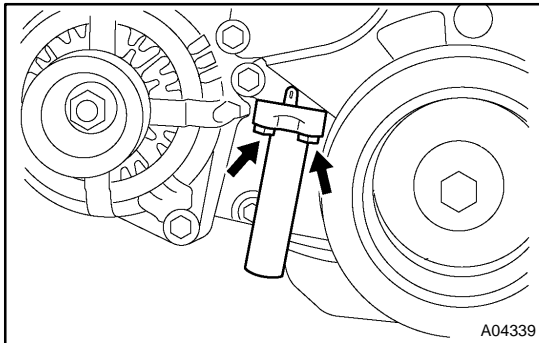
Do not turn the crankshaft pulley.

**17. REMOVE TIMING BELT TENSIONER****HINT:**

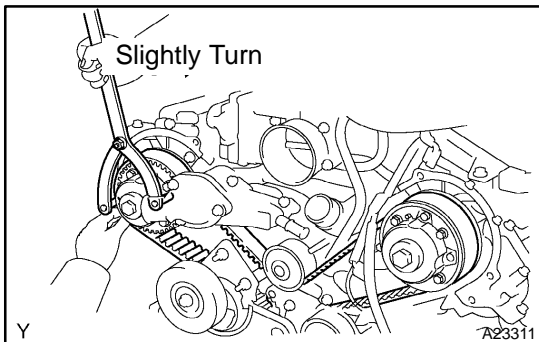
- When re-using the timing belt:
If the installation marks have disappeared, before remove the timing belt, place 2 new installation marks on the timing belt to match the timing marks of the camshaft timing pulleys.



- When replacing the timing belt tensioner only:
To avoid meshing of the timing pulley and timing belt, secure one of them with string. And place matchmarks on the timing belt and RH camshaft timing pulley.



Alternately loosen the 2 bolts, and remove them, the belt tensioner and dust boot.



18. DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEYS

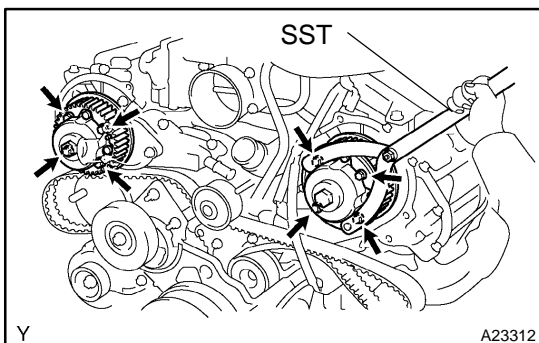
- Hold the camshaft timing pulley with SST, and loosen the tension spring between the LH and RH camshaft timing pulleys by slightly turning the LH camshaft timing pulley clockwise.

SST 09960-10010 (09962-01000, 09963-01000)

HINT:

Set the SST so that the claw comes in contact with the camshaft timing pulley bolt, and tighten the lock nut of the SST.

- Disconnect the timing belt from the camshaft timing pulleys.



19. REMOVE CAMSHAFT TIMING PULLEYS

- Hold the camshaft timing pulley with SST, loosen the 4 bolts of the timing pulley.

SST 09960-10010 (09962-01000, 09963-01000)

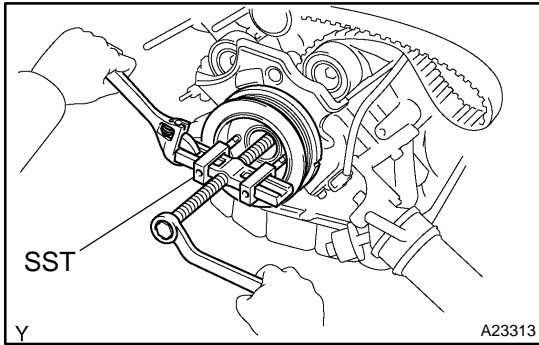
- Remove the 2 timing pulleys.

20. REMOVE GENERATOR

(See page [CH-7](#) and [CH-19](#))

21. REMOVE DRIVE BELT TENSIONER

Remove the bolt, 2 nuts and belt tensioner.

**22. REMOVE CRANKSHAFT PULLEY**

Using SST, remove the crankshaft pulley.

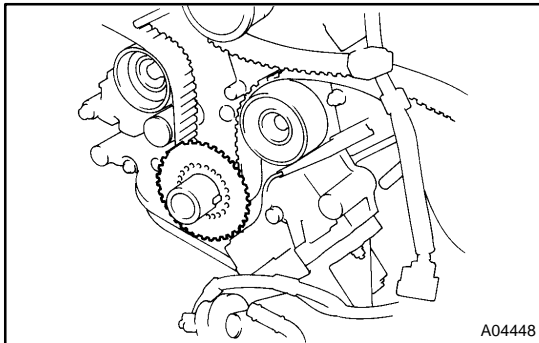
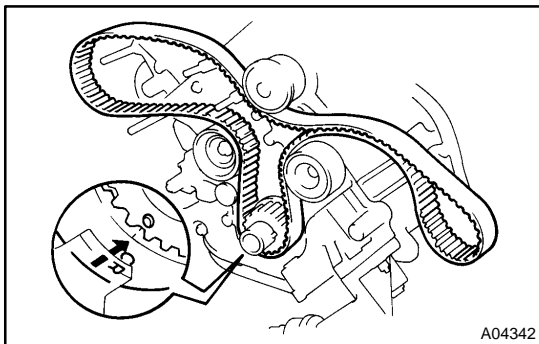
SST 09950-50013 (09951-05010, 09952-05010,
09953-05010, 09953-05020, 09954-05021)

NOTICE:

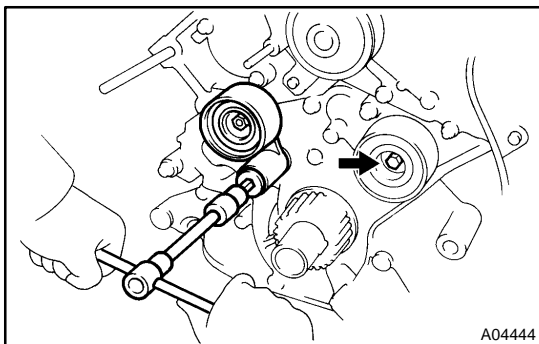
Do not turn the crankshaft pulley.

23. REMOVE NO.1 TIMING BELT COVER

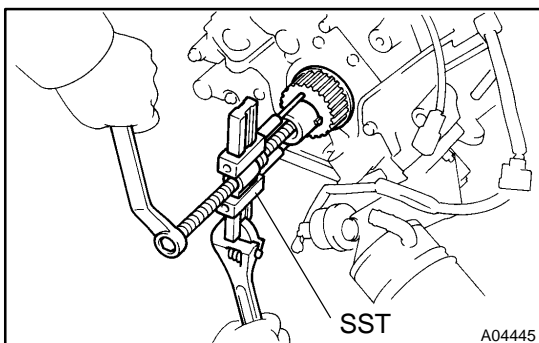
Remove the 4 bolts and timing belt cover.

**24. REMOVE TIMING BELT GUIDE****25. REMOVE TIMING BELT COVER SPACER****26. REMOVE TIMING BELT****HINT:**

If re-using the belt and the installation mark has disappeared from it, place a new installation mark on the timing belt to the match the dot mark of the crankshaft timing pulley.

**27. REMOVE NO.1 IDLER PULLEY AND NO.2 IDLER PULLEY**

- (a) Using a 10 mm hexagon wrench, remove the bolt, No.1 idler pulley and plate washer.
- (b) Remove the bolt and No.2 idler pulley.

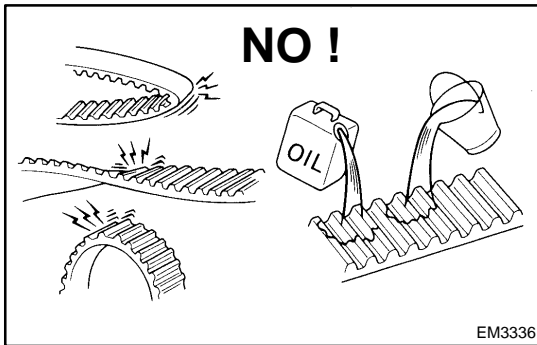
**28. REMOVE CRANKSHAFT TIMING PULLEY**

Using SST, remove the timing pulley.

SST 09950-50013 (09951-05010, 09952-05010,
09953-05010, 09953-05020, 09954-05011)

NOTICE:

Do not turn the timing pulley.



INSPECTION

1. INSPECT TIMING BELT

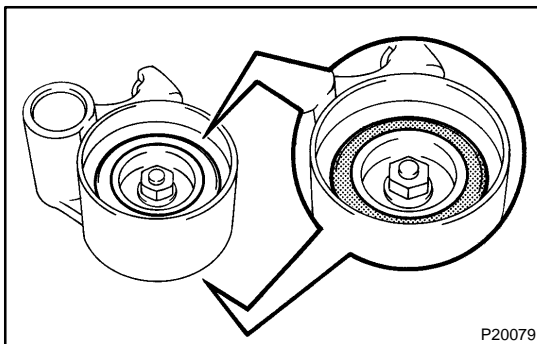
NOTICE:

- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water or steam.
- Do not utilize timing belt tension when installing or removing the mount bolt of the camshaft timing pulley.

If there is any defect, as shown in the illustration, check these points:

- Premature parting
 - Check for proper installation.
 - Check the timing cover gasket for damage and proper installation.
- If the belt teeth are cracked or damaged, check to see if either camshaft is locked.
- If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.
- If there is wear or damage on even one side of the belt, check the belt guide and the alignment of each pulley.
- If there is noticeable wear on the belt teeth, check timing cover for damage and for foreign material on the pulley teeth.

If necessary, replace the timing belt.



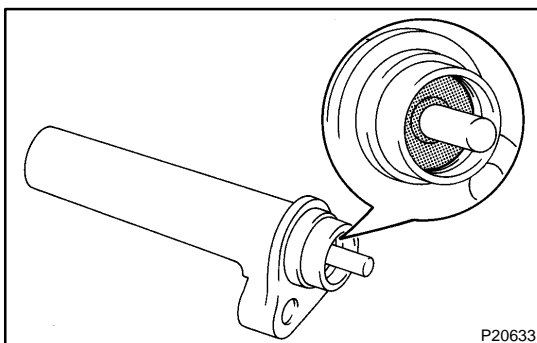
2. INSPECT IDLER PULLEYS

- Visually check the seal portion of the idler pulley for oil leakage.

If leakage is found, replace the idler pulley.

- Check that the idler pulley turns smoothly.

If necessary, replace the idler pulley.



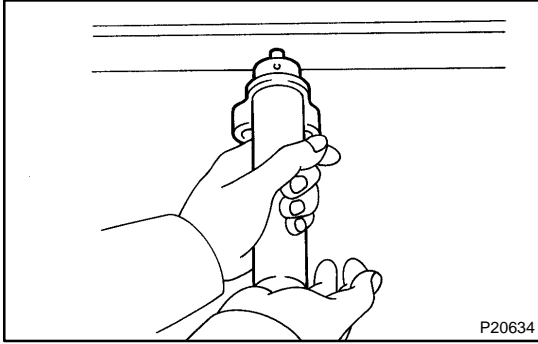
3. INSPECT TIMING BELT TENSIONER

- Visually check the seal portion of the tensioner for oil leakage.

HINT:

If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right.

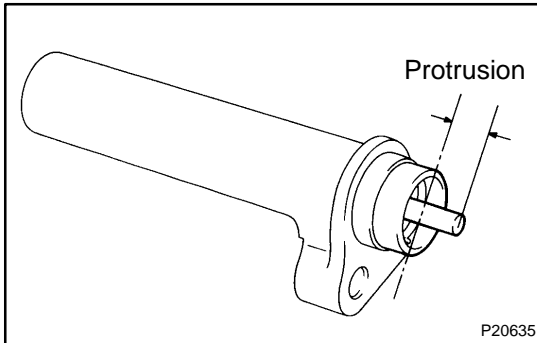
If leakage is found, replace the tensioner.



- (b) Hold the tensioner with both hands and push the push rod strongly as shown to check that it doesn't move. If the push rod moves, replace the tensioner.

NOTICE:

Never hold the tensioner push rod facing downward.

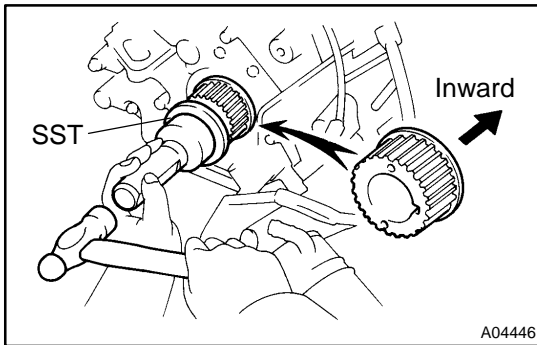


- (c) Measure the protrusion of the push rod from the housing end.

Protrusion: 10.5 to 11.5 mm (0.413 to 0.453 in.)

If the protrusion is not as specified, replace the tensioner.

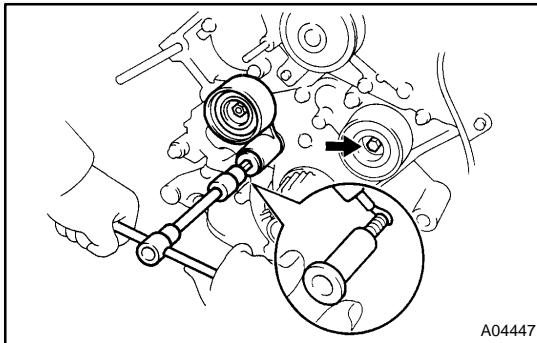
4. INSPECT WATER PUMP (See page [CO-7](#))



INSTALLATION

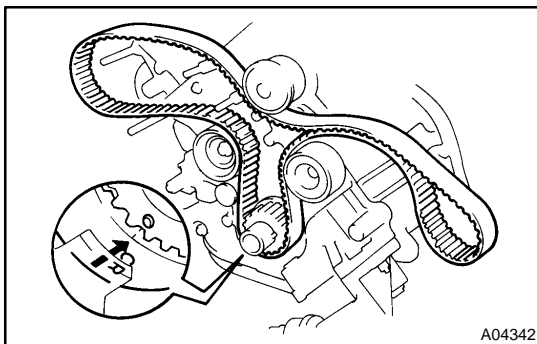
1. INSTALL CRANKSHAFT TIMING PULLEY

- (a) Align the timing pulley set key with the key groove of the pulley.
- (b) Using SST and a hammer, tap in the timing pulley, facing the flange side inward.
SST 09223-46011



2. INSTALL NO.1 IDLER PULLEY AND NO.2 IDLER PULLEY

- (a) Apply adhesive 2 or 3 threads of the pivot bolt.
Adhesive:
Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent
- (b) Using a 10 mm hexagon wrench, install the plate washer and No.1 idler pulley with the pivot bolt.
Torque: 34.5 N·m (350 kgf·cm, 25 ft·lbf)
- (c) Install the No.2 idler pulley with the bolt.
Torque: 34.5 N·m (350 kgf·cm, 25 ft·lbf)
- (d) Check that the No.1 and No.2 idler pulleys moves smoothly.



3. TEMPORARILY INSTALL TIMING BELT

NOTICE:

The engine should be cold.

- (a) Remove any oil or water on the crankshaft pulley, oil pump pulley, water pump pulley, No.1 idler pulley and No.2 idler pulley, and keep them clean.

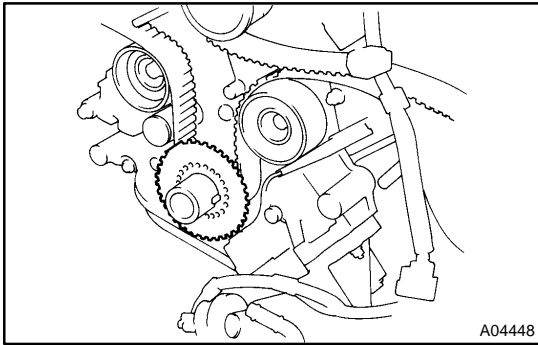
NOTICE:

Only wipe the pulleys; do not use any cleansing agent.

- (b) Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.
- (c) Install the timing belt on the crankshaft timing pulley, No.1 idler pulley and No.2 idler pulley.

4. INSTALL TIMING BELT COVER SPACER

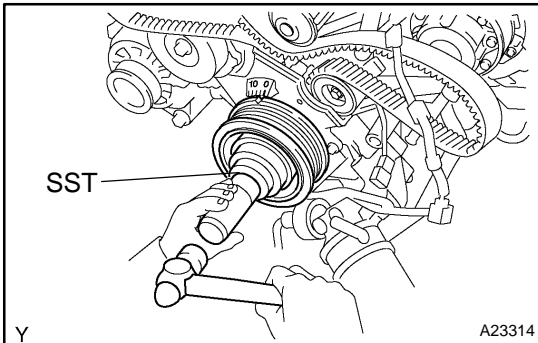
- (a) Install the gasket to the cover spacer.
- (b) Install the cover spacer.

**5. INSTALL TIMING BELT GUIDE**

Install the belt guide with the cup side facing outward.

6. INSTALL NO.1 TIMING BELT COVER

Install the timing belt cover with the 4 bolts.

**7. INSTALL CRANKSHAFT PULLEY**

(a) Align the pulley set key with the key groove of the crankshaft pulley.

(b) Using SST and a hammer, tap in the crankshaft pulley.
SST 09223-46011

8. INSTALL DRIVE BELT TENSIONER

Install the belt tensioner with the bolt and 2 nuts.

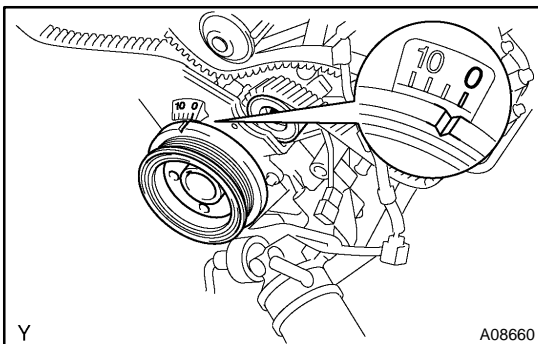
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

HINT:

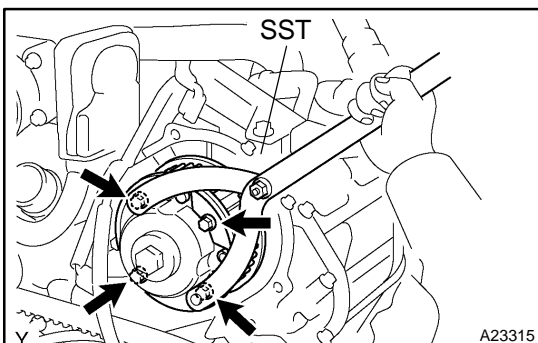
Use a bolt of 106 mm (4.18 in.) in length.

9. INSTALL GENERATOR

(See page [CH-16](#) and [CH-28](#))

**10. CHECK CRANKSHAFT PULLEY POSITION**

Check that the timing mark of the crankshaft pulley is aligned with timing mark "0" of the No.1 timing belt cover.

**11. INSTALL, LH CAMSHAFT TIMING PULLEY**

(a) Align the camshaft knock pin with the knock pin groove of the timing pulley, and slide the timing pulley.

(b) Temporarily install the 4 bolts of the camshaft timing pulley.

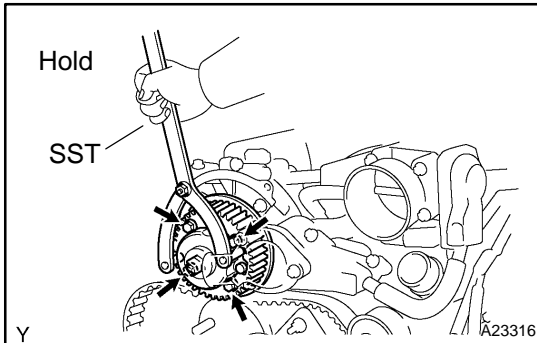
(c) Hold the camshaft timing pulley with SST, and tighten the pulley bolt.

SST 09960-10010 (09962-01000, 09963-01000)

Torque: 8.1 N·m (83 kgf·cm, 72 in.-lbf)

HINT:

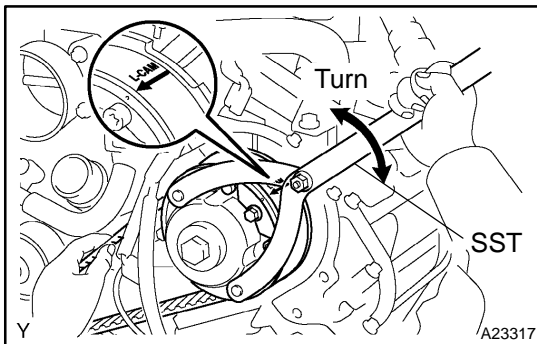
Set the SST so that the claw comes in contact with the camshaft timing pulley bolt, and tighten the lock nut of the SST.

**12. INSTALL RH CAMSHAFT TIMING PULLEY**

- (a) Align the camshaft timing tube knock pin with the knock pin groove of the timing pulley.
- (b) Temporarily install the 4 bolts of the camshaft timing pulley.
- (c) Hold the camshaft timing pulley with SST, and tighten the pulley bolt.

SST 09960-10010 (09962-01000, 09963-01000)

Torque: 8.1 N·m (83 kgf·cm, 72 in.-lbf)

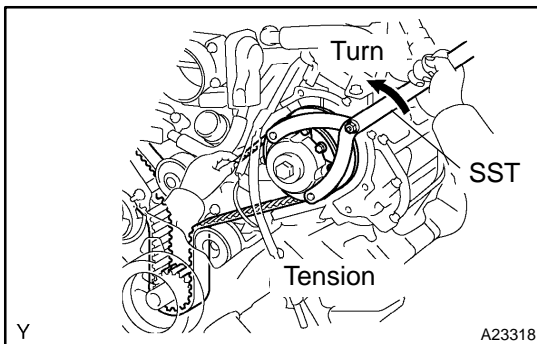
**13. CONNECT TIMING BELT TO LH CAMSHAFT TIMING PULLEY**

- (a) Remove any oil or water on the timing pulley, and keep it clean.

NOTICE:

Only wipe the pulleys; do not use any cleansing agent.

- (b) Using SST, turn the timing pulley. Align the installation mark on the timing belt with the timing mark of the timing pulley, and hang the timing belt on the timing pulley.
SST 09960-10010 (09962-01000, 09963-01000)
- (c) Using SST, turn the LH camshaft timing pulley counter-clockwise until there is tension between the crankshaft timing pulley and LH camshaft timing pulley.
SST 09960-10010 (09962-01000, 09963-01000)

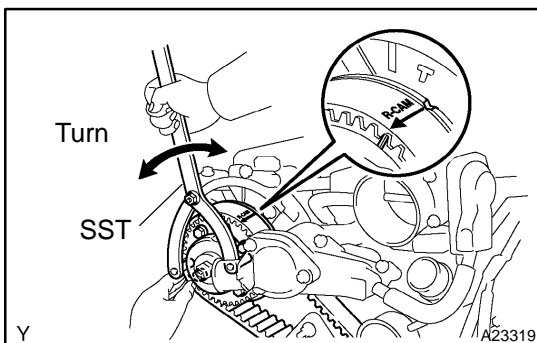
**14. CONNECT TIMING BELT TO RH CAMSHAFT TIMING PULLEY**

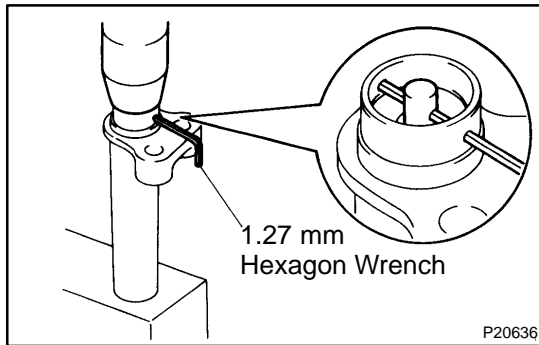
- (a) Remove any oil or water on the camshaft timing pulley and water pump pulley, and keep them clean.

NOTICE:

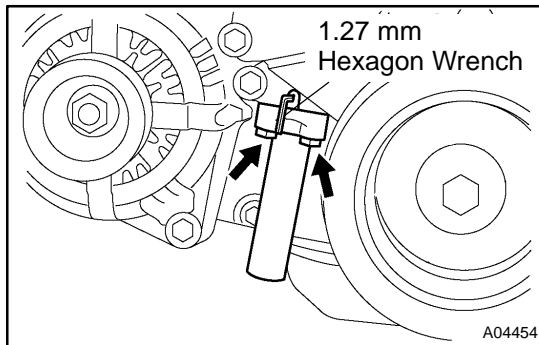
Only wipe the pulleys; do not use any cleansing agent.

- (b) Using SST, turn the timing pulley. Align the installation mark on the timing belt with the timing mark of the timing pulley, and hang the timing belt on the timing pulley.
SST 09960-10010 (09962-01000, 09963-01000)

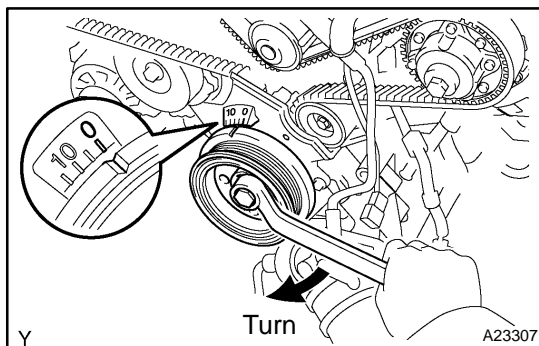


**15. SET TIMING BELT TENSIONER**

- (a) Using a press, slowly press in the push rod using 981 – 9,807 N (100 – 1,000 kgf, 220 – 2,205 lbf) of pressure.
- (b) Align the holes of the push rod and housing, and pass a 1.27 mm hexagon wrench through the holes to keep the setting position of the push rod.
- (c) Remove the belt tensioner from the press.
- (d) Install the dust boot to the belt tensioner.

**16. INSTALL TIMING BELT TENSIONER**

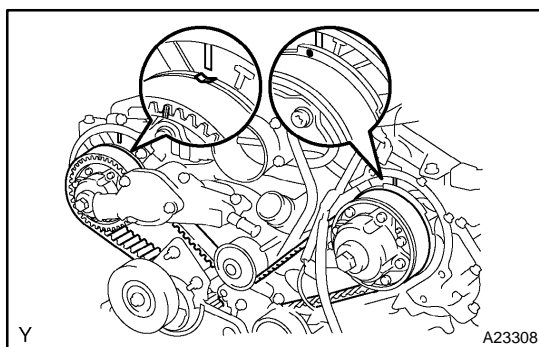
- (a) Temporarily install the belt tensioner with the 2 bolts.
- (b) Alternately tighten the 2 bolts.
Torque: 26 N·m (270 kgf·cm, 19 ft·lbf)
- (c) Using pliers, remove the 1.27 mm hexagon wrench from the belt tensioner.

**17. CHECK VALVE TIMING**

- (a) Temporarily install the crankshaft pulley bolt.
- (b) Slowly turn the crankshaft pulley 2 revolutions from the TDC to TDC.

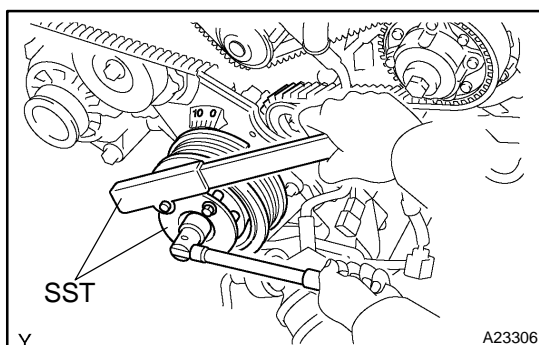
NOTICE:

Always turn the crankshaft pulley clockwise.



- (c) Check that each pulley aligns with the timing marks as shown in the illustration.

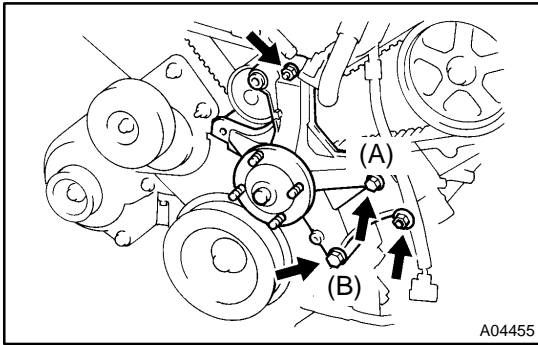
If the timing marks do not align, remove the timing belt and reinstall it.

**18. TIGHTEN CRANKSHAFT PULLEY BOLT**

Using SST, install the pulley bolt.

SST 09213-70011 (90119-08216), 09330-00021

Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)

**19. INSTALL FAN BRACKET**

Install the fan bracket with the 2 bolts and 2 nuts.

Torque:

12 mm head

16 N·m (160 kgf·cm, 12 ft·lbf) for (A)

14 mm head

32 N·m (330 kgf·cm, 24 ft·lbf) for (B)

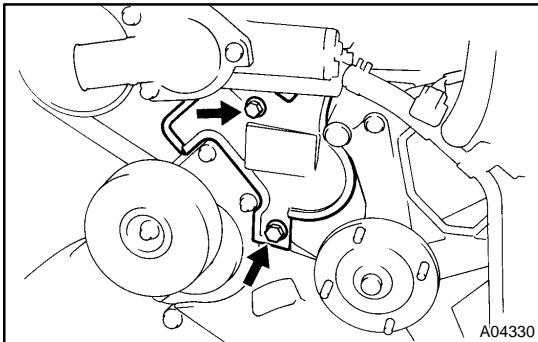
HINT:

Each bolt length is indicated in the illustration.

Bolt Length:

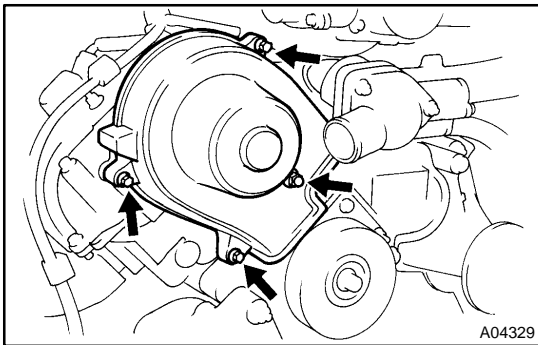
106 mm (4.17 in.) for 12 mm head (A)

114 mm (4.49 in.) for 14 mm head (B)

20. INSTALL A/C COMPRESSOR (See page [EM-83](#))**21. INSTALL NO.2 TIMING BELT COVER**

Install the No.2 timing belt cover with the 2 bolts.

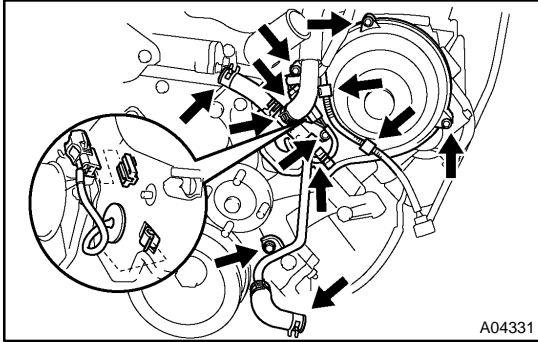
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

**22. INSTALL RH NO.3 TIMING BELT COVER**

(a) Fit the RH No.3 timing belt cover, matching it with the fan bracket.

(b) Install the RH No.3 timing belt cover with the 3 bolts and nut.

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

**23. INSTALL LH NO.3 TIMING BELT COVER**

- (a) Install the oil cooler pipe with the bolt and nut.
- (b) Run the camshaft position sensor wire through the LH No.3 timing belt cover hole.
- (c) Fit the LH No.3 timing belt cover, matching it with the fan bracket.
- (d) Install the LH No.3 timing belt cover with the 4 bolts and nut.

Torque: 7.5 N·m (76 kgf-cm, 66 in.-lbf)

- (e) Install the wire grommet to the LH No.3 timing belt cover.
- (f) Install the camshaft position sensor connector to the connector bracket.
- (g) Connect the camshaft position sensor connector.
- (h) Install the sensor wire to the wire clamp on the LH No.3 timing belt cover.
- (i) Install the engine wire to the 2 wire clamps on the LH No.3 timing belt cover.

24. INSTALL DRIVE BELT IDLER PULLEY

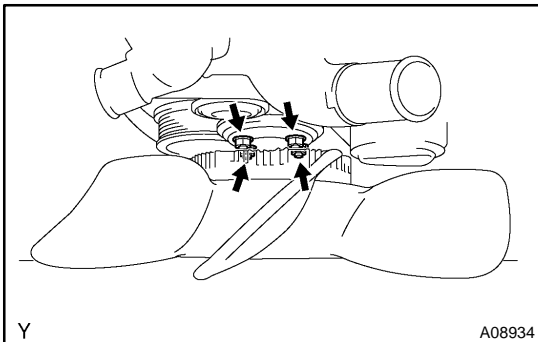
Install the idler pulley and cover plate with the bolt.

Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)

25. INSTALL PS PUMP

Install the PS pump with the 3 bolts.

Torque: 17 N·m (175 kgf-cm, 13 ft-lbf)

**26. INSTALL FAN PULLEY, FAN, FLUID COUPLING AND DRIVE BELT**

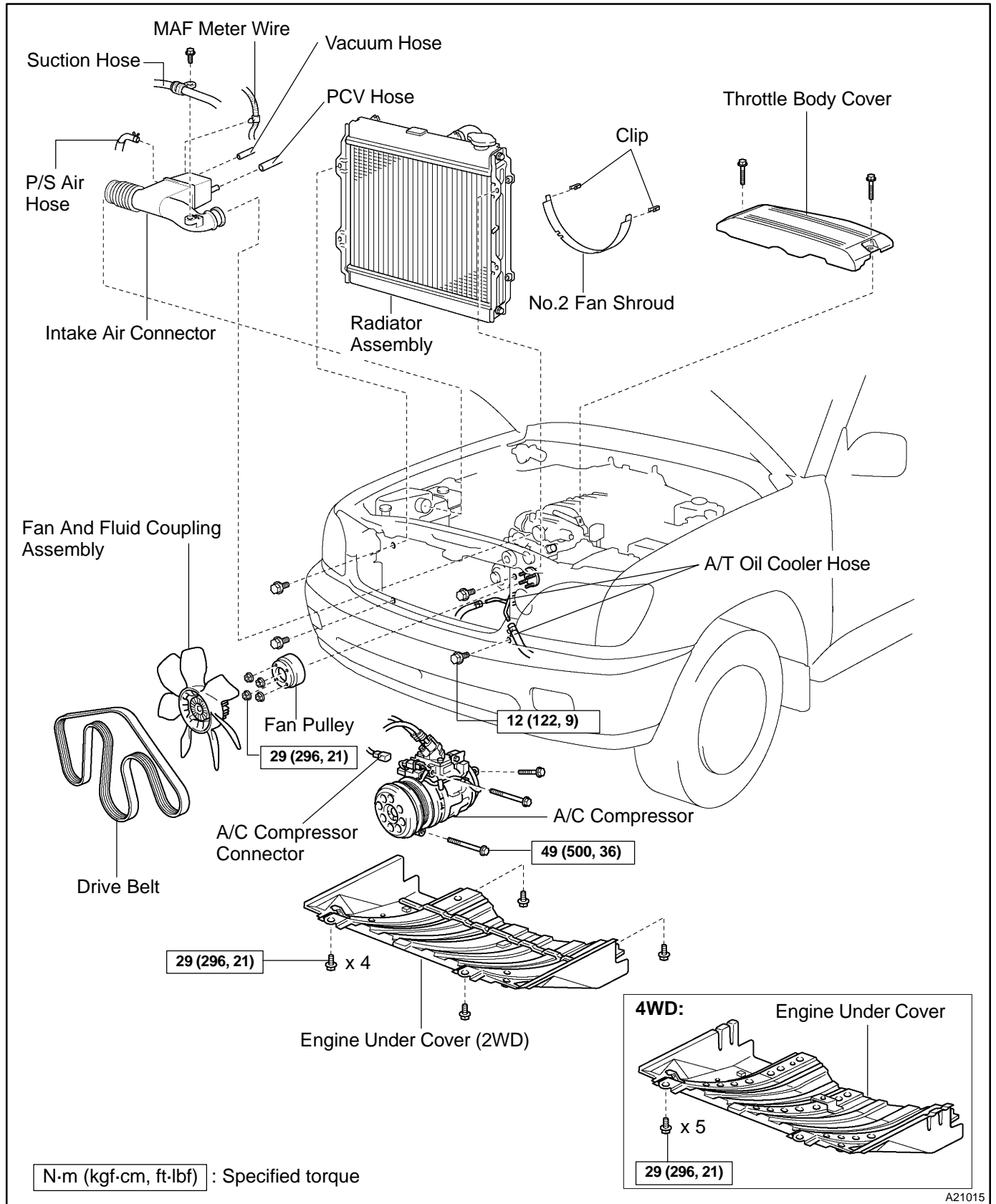
- (a) Temporarily install the fan pulley, the fan, fluid coupling assembly with the 4 nuts.
- (b) Install the drive belt. (See page [CH-16](#) and [CH-28](#))
- (c) Tighten the 4 nuts holding the fluid coupling to the fan bracket.

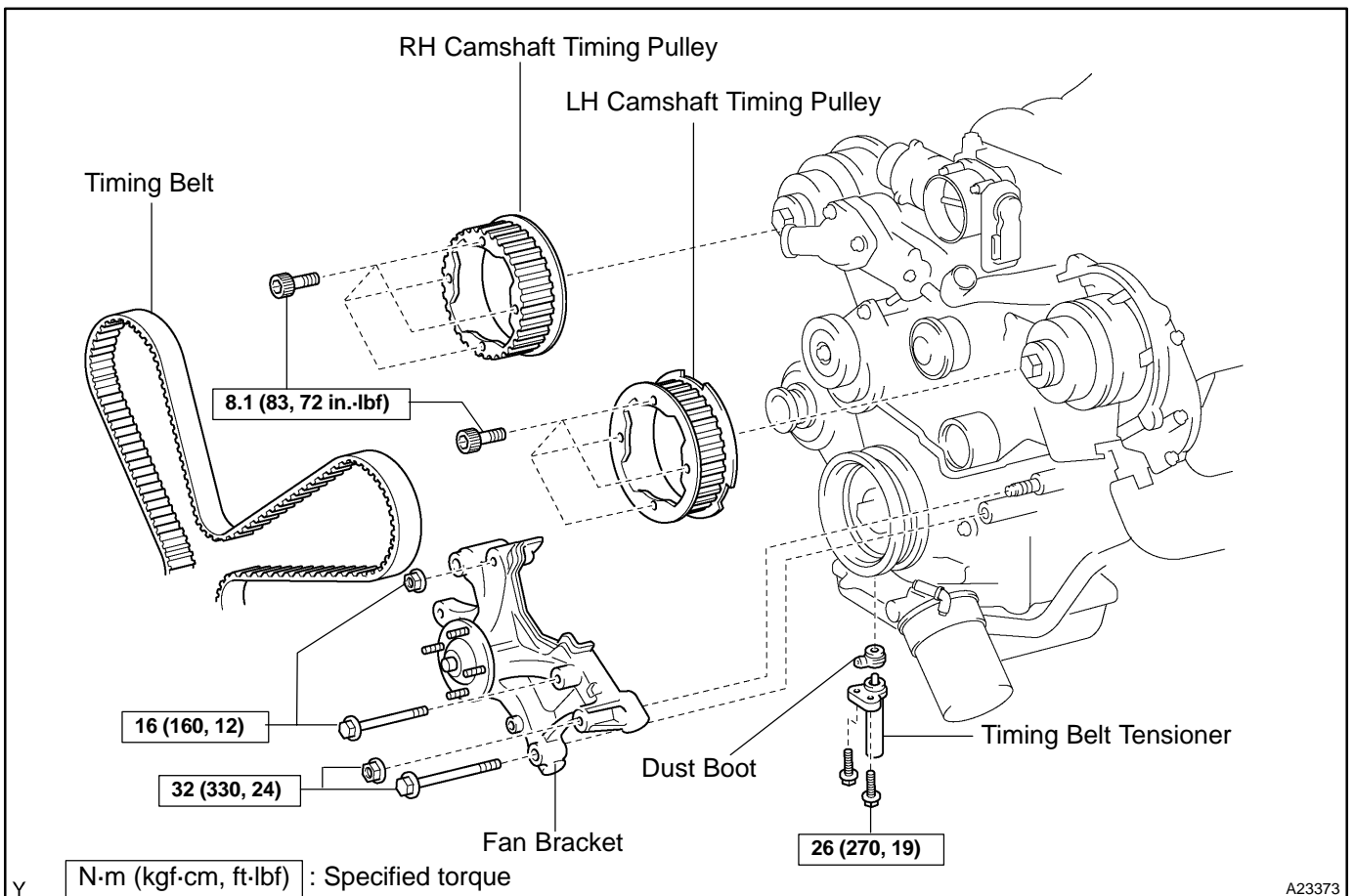
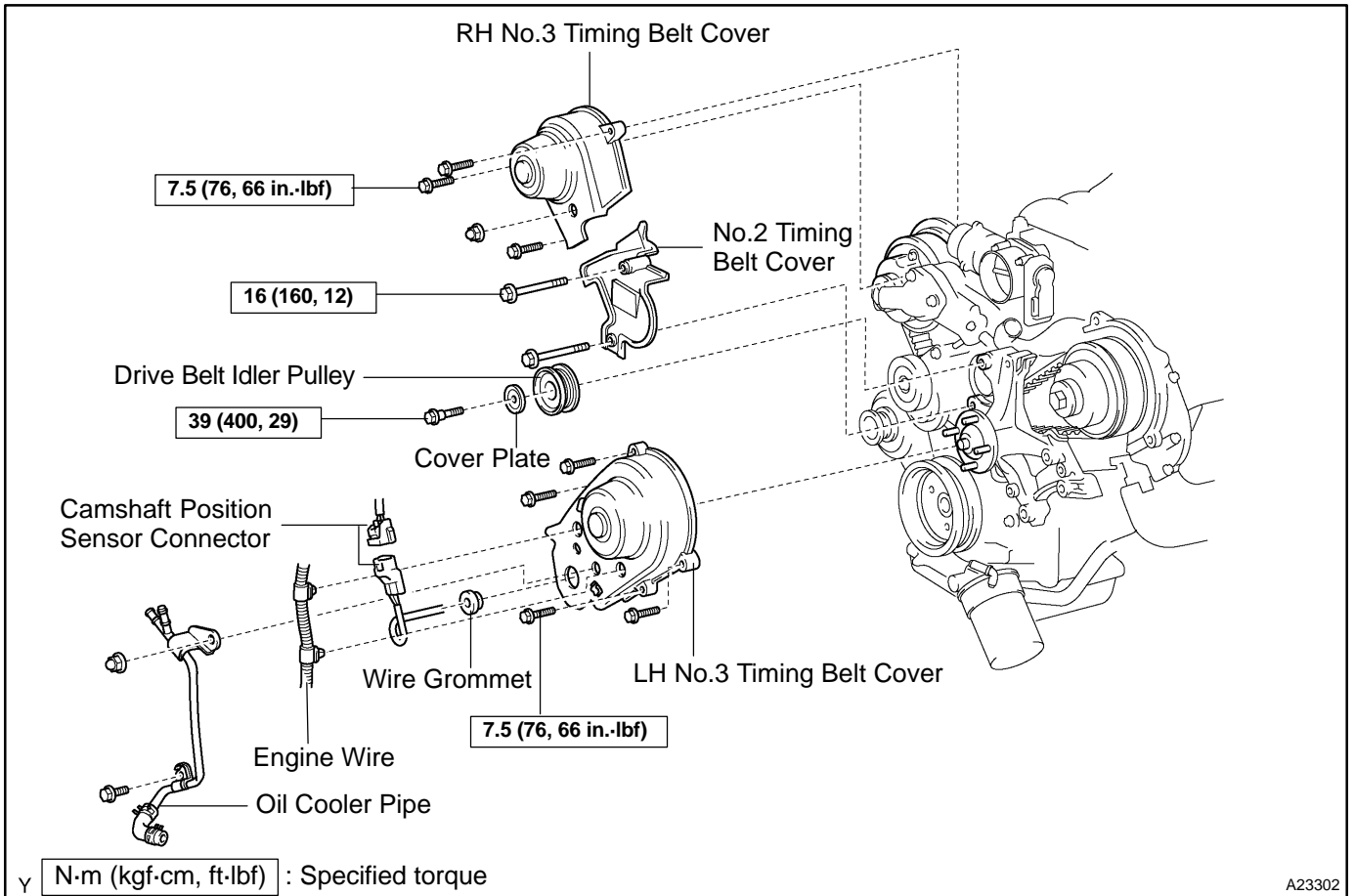
Torque: 29 N·m (296kgf-cm, 21 ft-lbf)

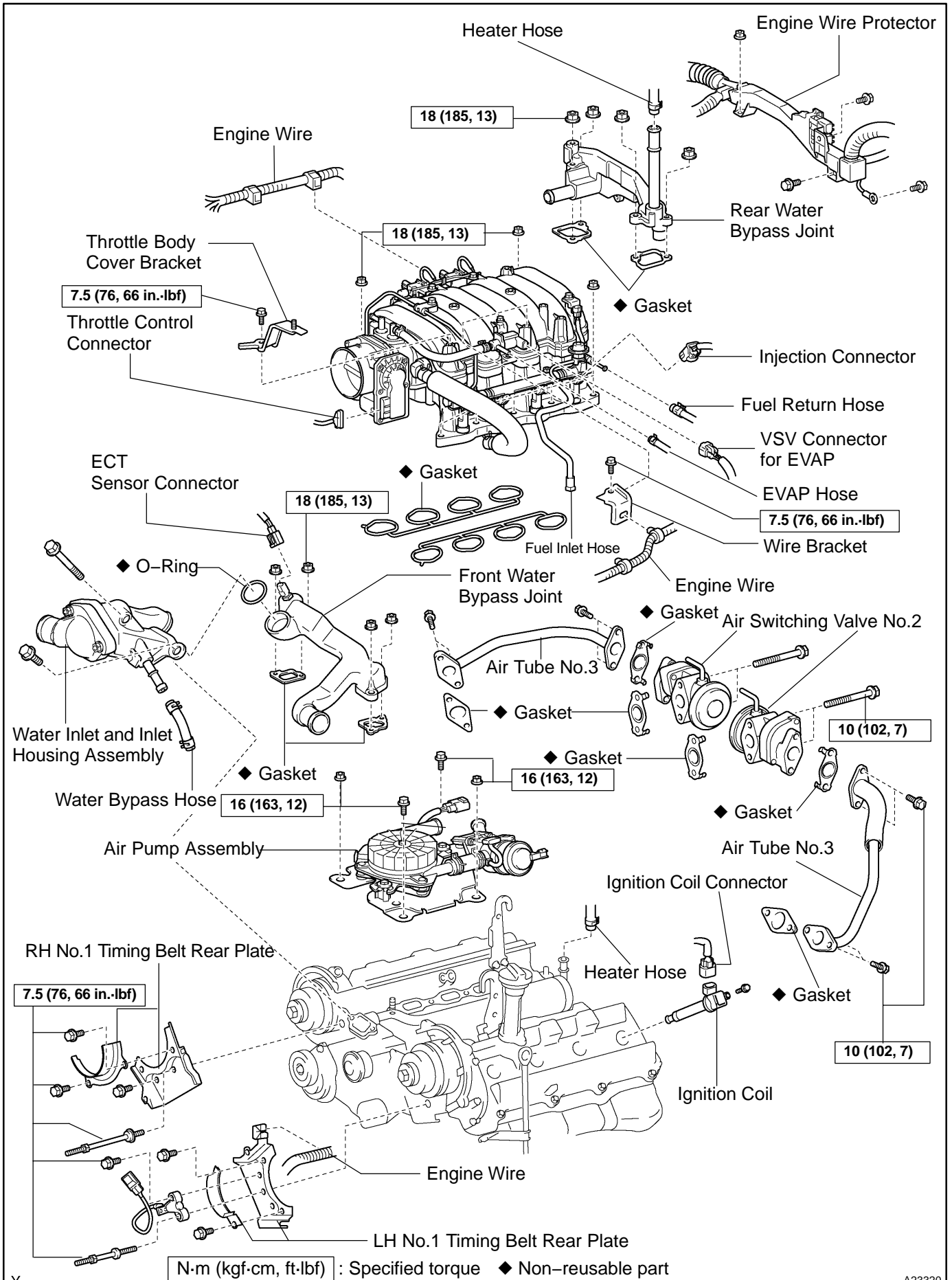
27. INTAKE AIR CONNECTOR ASSEMBLY**28. INSTALL THROTTLE BODY COVER****29. INSTALL RADIATOR ASSEMBLY (See page [CO-18](#))****30. FILL WITH ENGINE COOLANT****31. START ENGINE AND CHECK FOR LEAKS****32. RECHECK ENGINE COOLANT LEVEL****33. INSTALL ENGINE UNDER COVER**

CYLINDER HEAD COMPONENTS

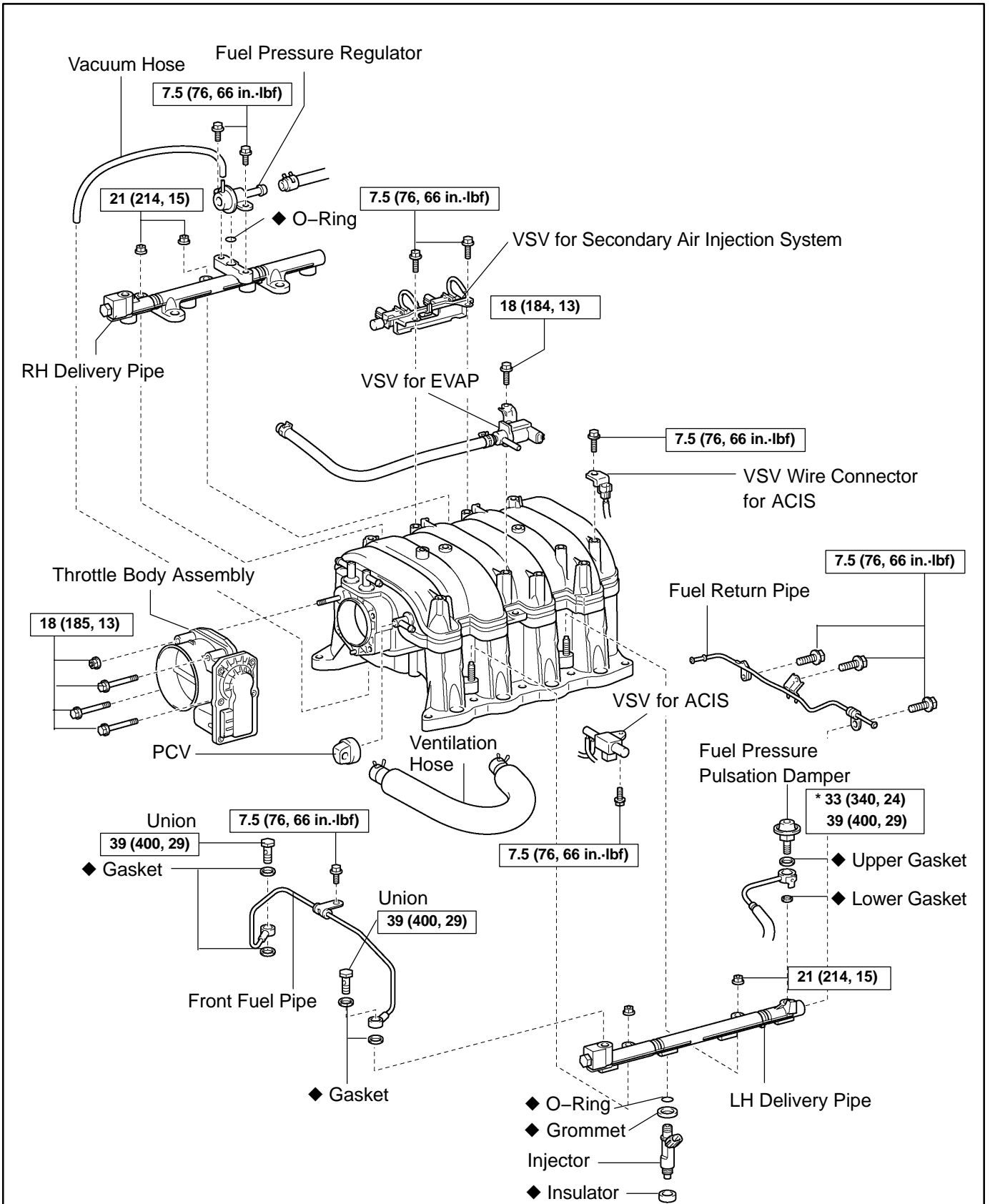
EM1WZ-02





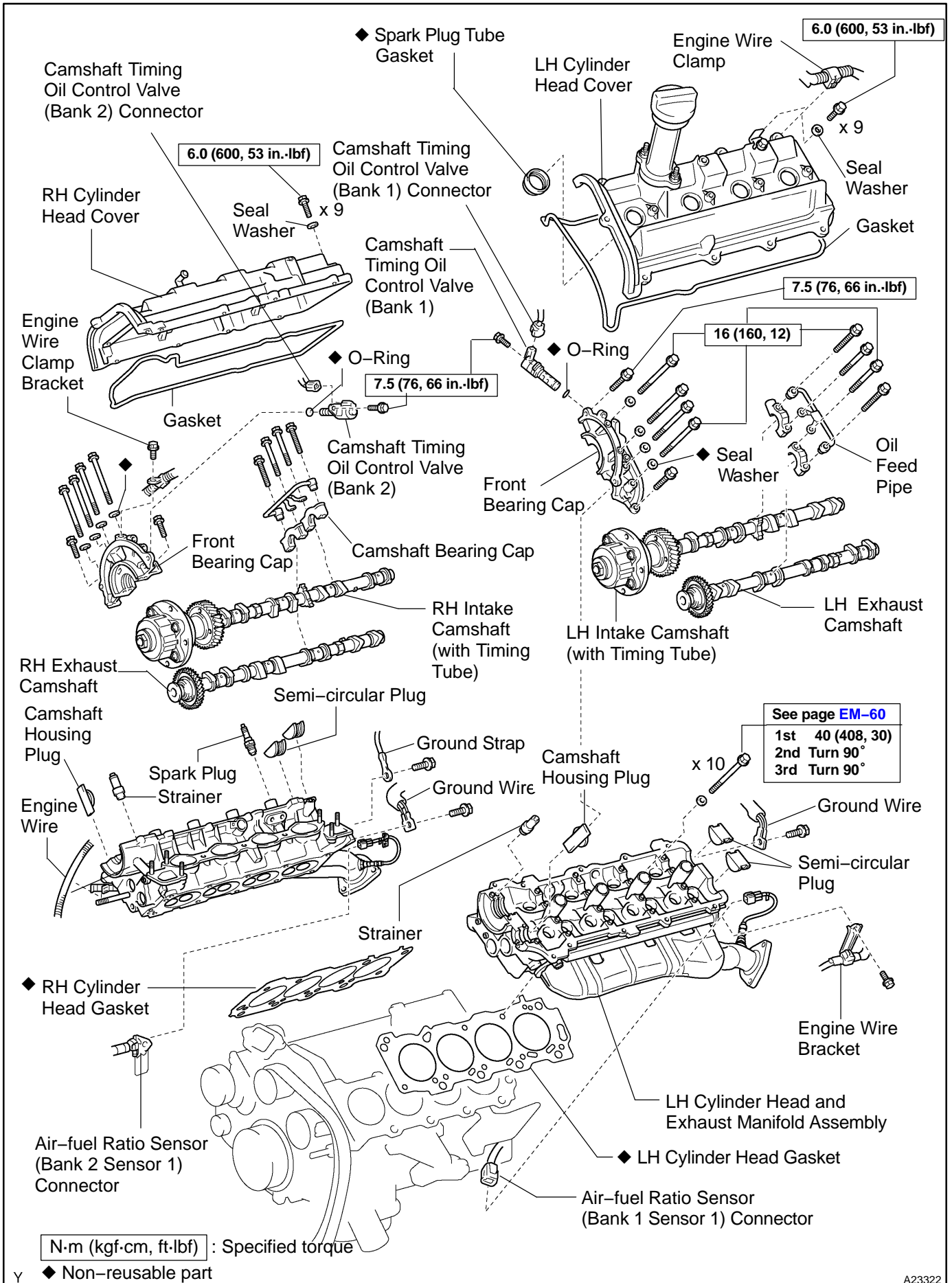


Y

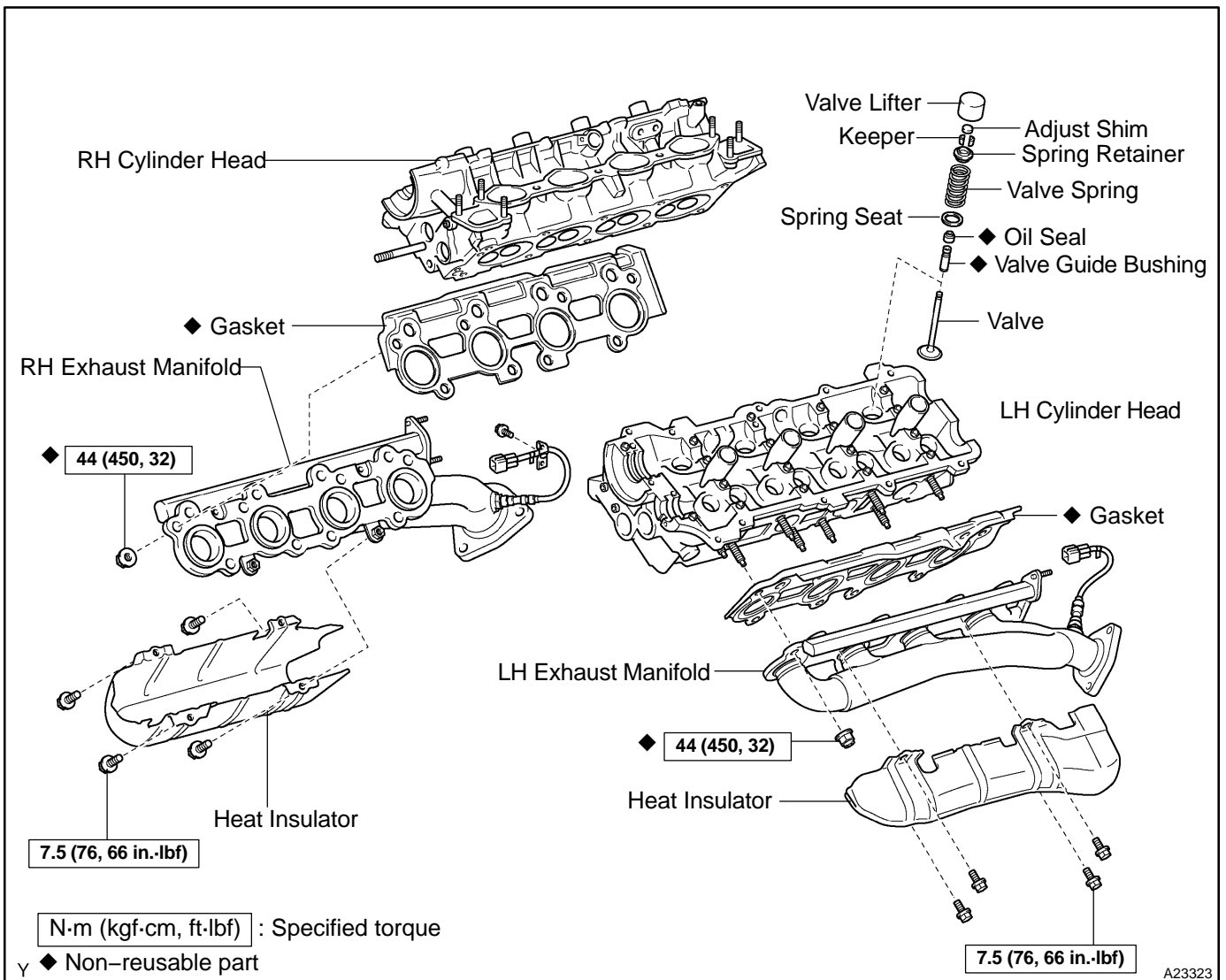
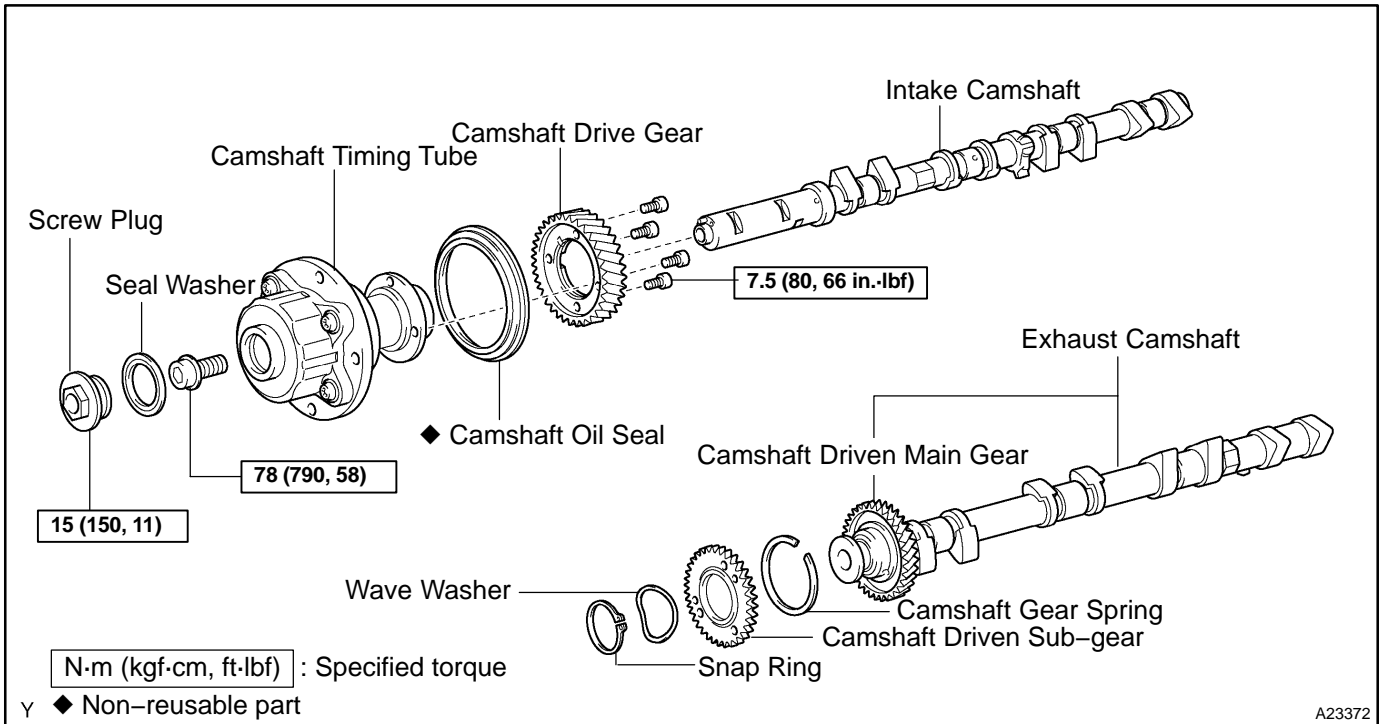


N·m (kgf·cm, ft·lbf) : Specified torque
 ◆ Non-reusable part
 * For use with SST

Y

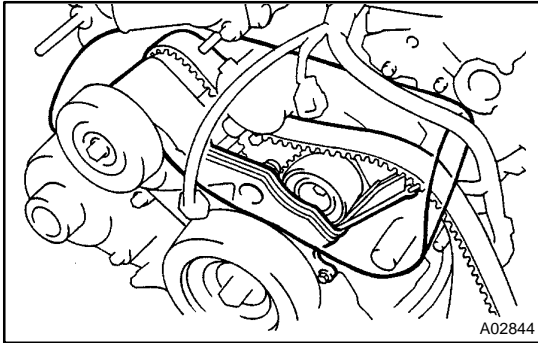


ENGINE MECHANICAL (2UZ-FE) - CYLINDER HEAD



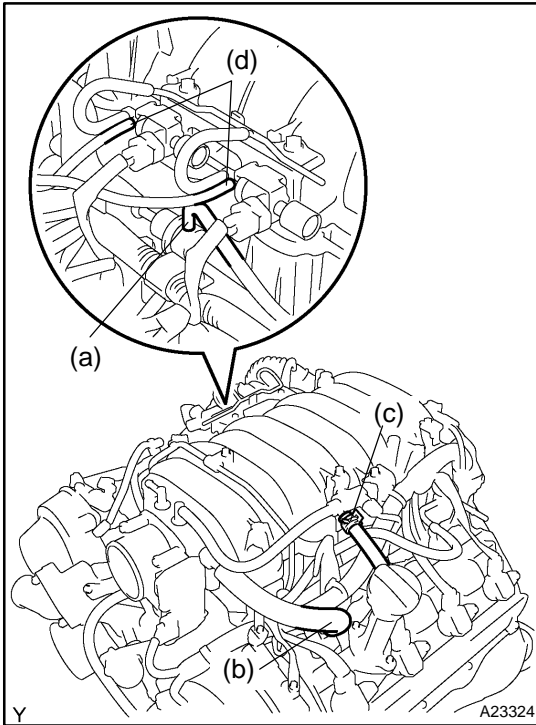
REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE THROTTLE BODY COVER
3. DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEYS (See page [EM-16](#))

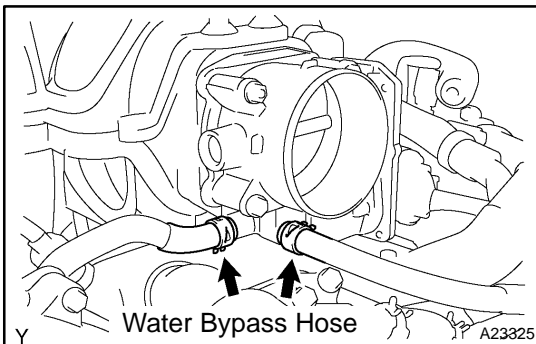


NOTICE:

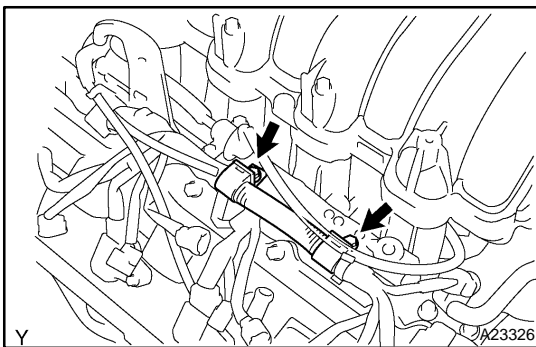
- Be careful not to drop anything inside the timing belt cover.
 - Do not allow the belt to come into contact with oil, water or dust.
4. REMOVE CAMSHAFT TIMING PULLEYS (See page [EM-16](#))
 5. REMOVE CAMSHAFT POSITION SENSOR (See page [IG-8](#))
 6. DISCONNECT PS PUMP FROM ENGINE (See page [EM-79](#))
 7. REMOVE FRONT EXHAUST PIPE (See page [EM-126](#))
 8. REMOVE OIL DIPSTICK AND GUIDE FOR A/T
 9. REMOVE IGNITION COILS (See page [IG-5](#))
 10. REMOVE TIMING BELT REAR PLATES
 - (a) Remove the 3 bolts, stud bolt and RH No.1 timing belt rear plates.
 - (b) Disconnect the wire clamp from the LH timing belt rear plate.
 - (c) Remove the 3 bolts, stud bolt and LH No.1 timing belt rear plates.
 11. DISCONNECT FUEL INLET HOSE (See page [SF-27](#)) AND FUEL RETURN HOSE
 12. DISCONNECT CONNECTORS FROM INTAKE MANIFOLD
 - (a) Disconnect the throttle control connector.
 - (b) Disconnect the VSV connector for EVAP.
 - (c) Disconnect the 8 injector connectors.
 - (d) Disconnect the ECT sensor connector.
 - (e) Disconnect the 2 VSV connectors for the air injection system.
 - (f) Disconnect the 8 ignition coil connectors.
 - (g) Disconnect the 2 air fuel ratio sensor connectors.



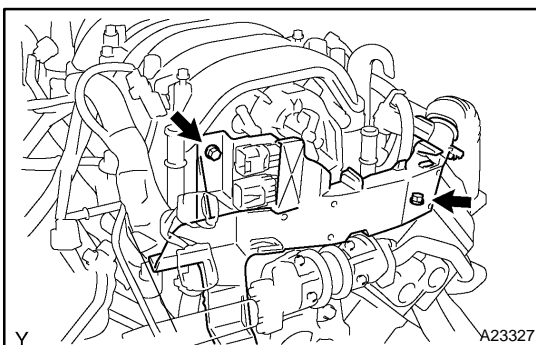
- 13. DISCONNECT HOSES FROM INTAKE MANIFOLD**
- Disconnect the vacuum hose from the fuel pressure regulator.
 - Disconnect the PCV hose from the PCV valve on the LH cylinder head.
 - Disconnect the EVAP hose (from charcoal canister) from the VSV for the EVAP.
 - Disconnect the 2 vacuum hoses from the VSV for the air injection system.



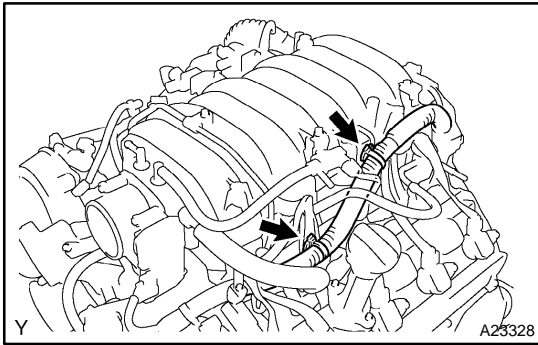
- 14. REMOVE INTAKE MANIFOLD ASSEMBLY**
- Disconnect the 2 water bypass hoses from the throttle body.



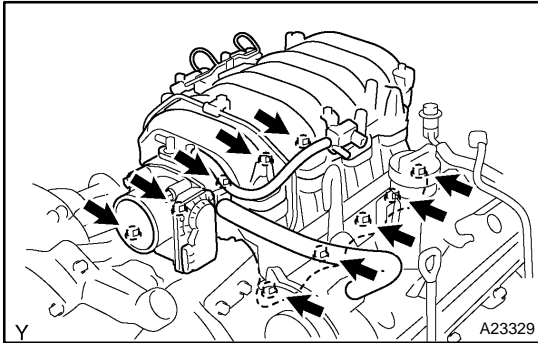
- Disconnect the 2 wire clamps from the wire clamp bracket on the RH delivery pipe.



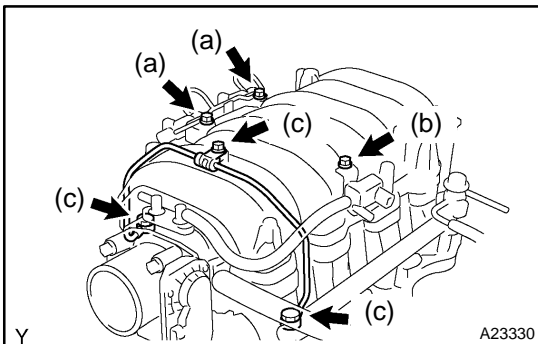
- Remove the 2 bolts holding the engine wire protector from the intake manifold and cylinder head.
- Remove the 2 bolts and ground cables from the RH and LH cylinder heads.
- Remove the bolt and throttle body cover bracket from the intake manifold.



- (f) Disconnect the engine wire from the engine hanger and wire bracket.
- (g) Remove the wire bracket from the intake manifold.

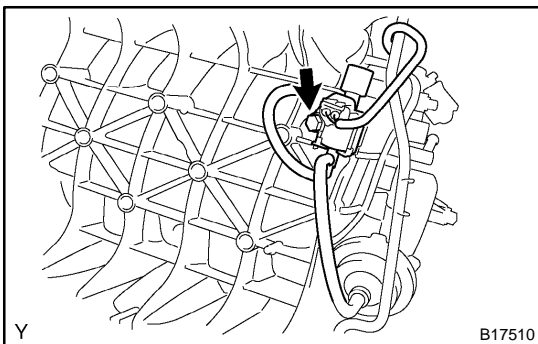


- (h) Remove the 6 bolts, 4 nuts, intake manifold assembly and 2 gaskets.

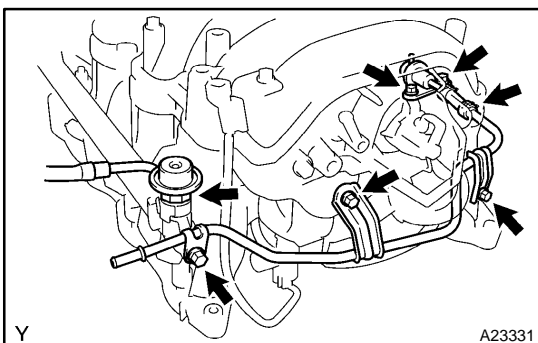


15. DISASSEMBLE INTAKE MANIFOLD

- (a) Remove the 2 bolts and VSVs for the air injection system.
- (b) Disconnect the EVAP hose from the upper intake manifold, and remove the VSV for EVAP.
- (c) Remove the bolt, 2 unions, 4 gaskets and front fuel pipe from the intake manifold.
- (d) Remove the throttle body (see page [SF-44](#)).

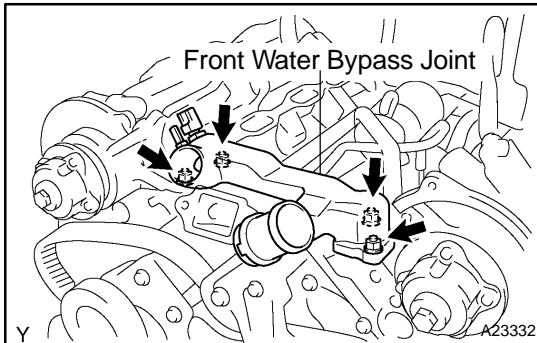


- (e) Remove the bolt and VSV for ACIS from the intake manifold.

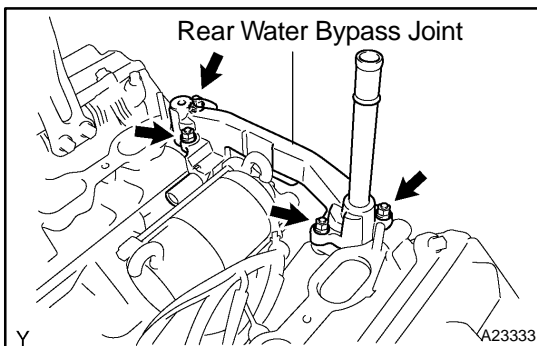


- (f) Disconnect the fuel return hose from the fuel pressure regulator.
- (g) Remove the 3 bolts and fuel return pipe from the intake manifold.
- (h) Remove the 2 bolts, fuel pressure regulator and O-ring.
- (i) Remove the fuel pressure pulsation damper and 2 gaskets.
- (j) Remove the 2 delivery pipes and 8 injectors (see page [SF-27](#)).

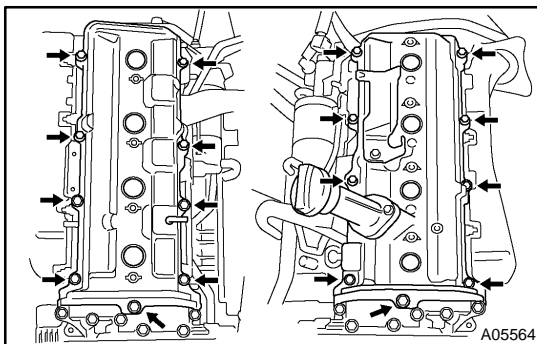
16. REMOVE WATER INLET AND INLET HOUSING ASSEMBLY (See page [CO-6](#))
17. REMOVE AIR PUMP ASSEMBLY (See page [EC-23](#))
18. REMOVE NO.2 AIR SWITCHING VALVES
(See page [EC-23](#))



19. REMOVE FRONT WATER BYPASS JOINT
Remove the 4 nuts, water bypass joint and 2 gaskets.



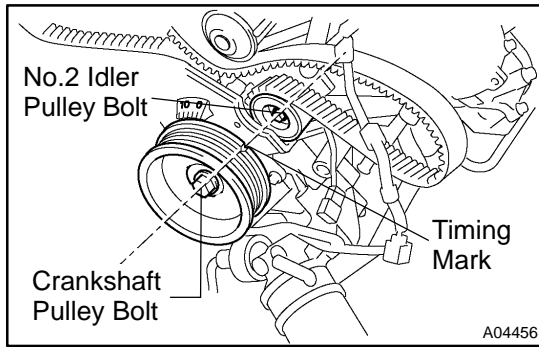
20. REMOVE REAR WATER BYPASS JOINT
Remove the 4 nuts, water bypass joint and 2 gaskets.
21. REMOVE ENGINE HANGERS



22. REMOVE CYLINDER HEAD COVERS
Remove the 18 bolts, seal washers, RH and LH cylinder head covers and 2 gaskets.
23. IF NECESSARY, REMOVE SEMI-CIRCULAR PLUGS AND CAMSHAFT HOUSING PLUGS
24. REMOVE CAMSHAFTS

NOTICE:

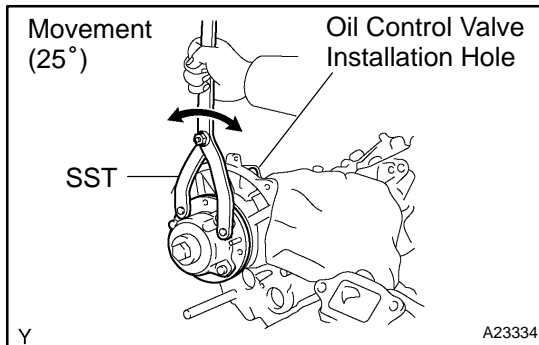
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



- (a) Check the crankshaft pulley position.
Check that the timing mark of the crankshaft pulley is aligned with the centers of the crankshaft pulley bolt and idler pulley bolt.

NOTICE:

Having the crankshaft pulley at the wrong angle can cause the piston head and valve head to come into contact with each other when you remove the camshaft, causing damage. So always set the crankshaft pulley at the correct angle.

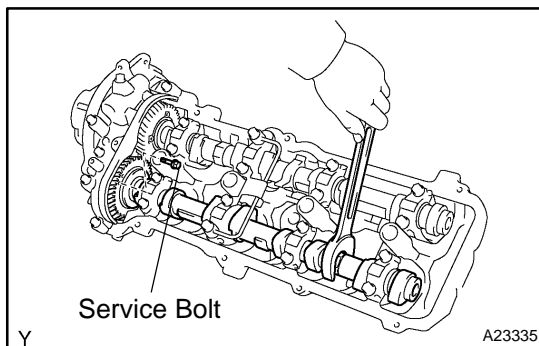


- (b) Release the oil from the front bearing caps.
Using SST, rotate the camshaft timing tube from left to right 2 to 3 times within its VVT-i range (25°) and use a waste cloth to collect the oil from the camshaft timing oil control valve installation hole.

SST 09960-10010 (09962-01000, 09963-00400)

NOTICE:

Approximately 20 cc (1.2 cu in.) of oil will be ejected. Take care not to spill it.



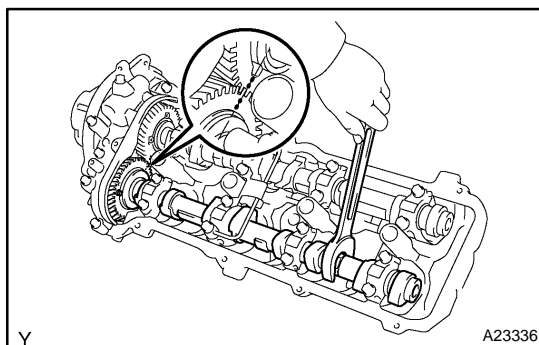
- (c) Remove the LH camshafts.
(1) Bring the service bolt hole of the sub-gear upward by turning the hexagon head portion of the exhaust camshaft with a wrench.
(2) Secure the sub-gear to the main gear with a service bolt.

Recommended service bolt:

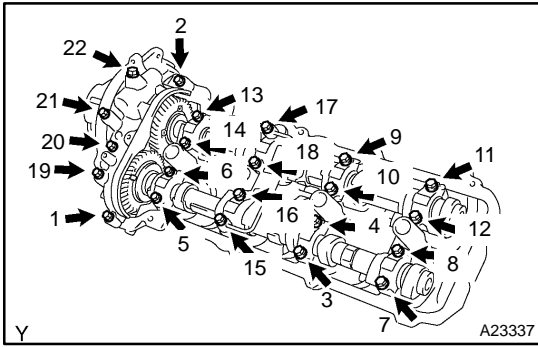
Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm (0.63 to 0.79 in.)

HINT:

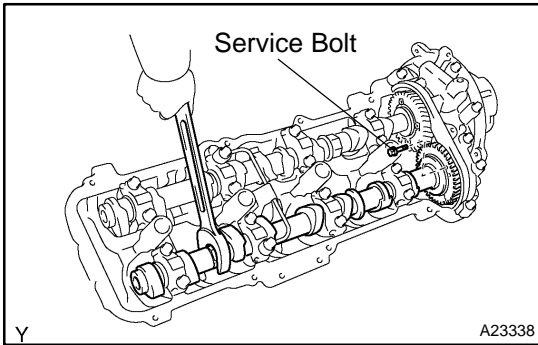
When removing the camshaft, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.



- (3) Align the timing mark (2-dot mark) of the camshaft drive gear by turning the hexagon head portion of the exhaust camshaft with a wrench.



- (4) Uniformly loosen the 22 bearing cap bolts in several steps, in the sequence shown.
- (5) Remove the 22 bearing cap bolts, 4 seal washers, oil feed pipe, 9 bearing caps, camshaft housing plug, oil control valve filter and 2 camshafts.



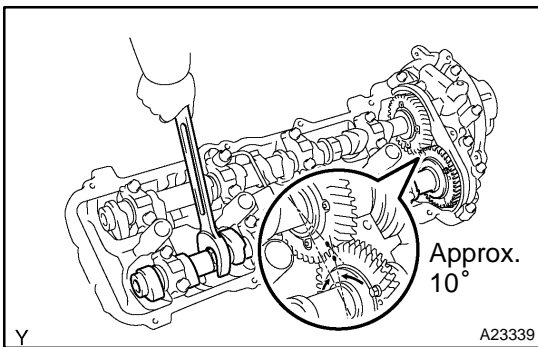
- (d) Remove the RH camshafts.
 - (1) Bring the service bolt hole of the sub-gear upward by turning the hexagon head portion of the exhaust camshaft with a wrench.
 - (2) Secure the sub-gear to the main gear with a service bolt.

Recommended service bolt:

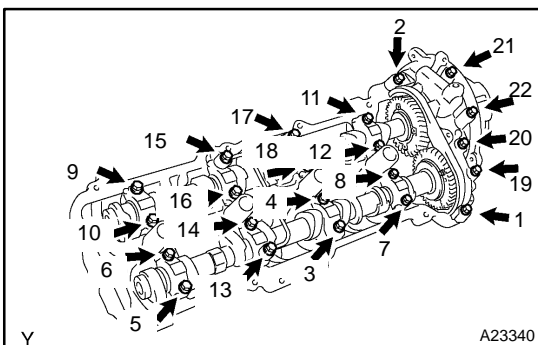
Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm (0.63 to 0.79 in.)

HINT:

When removing the camshafts, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.



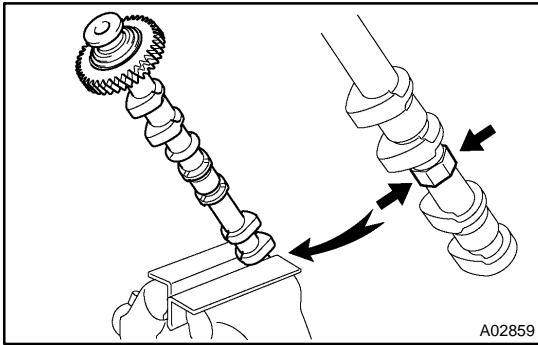
- (3) Set the timing mark (1-dot mark) of the camshaft main gear at approx. 10° angle by turning the hexagon head portion of the exhaust camshaft with a wrench.



- (4) Uniformly loosen the 22 bearing cap bolts in several steps, in the sequence shown.
- (5) Remove the 22 bearing cap bolts, 4 seal washers, oil feed pipe, 9 bearing caps, camshaft housing plug, strainer and 2 camshafts.

HINT:

Arrange the bearing caps for RH and LH sides.

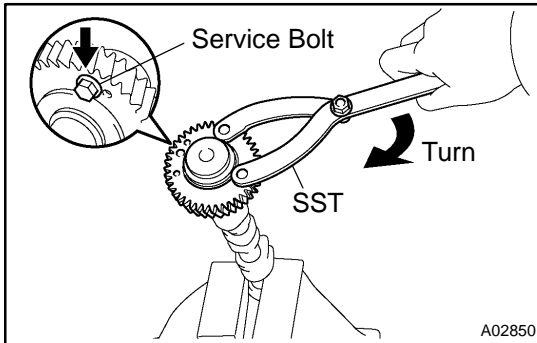


25. DISASSEMBLE EXHAUST CAMSHAFTS

(a) Mount the hexagon head portion of the camshaft in a vise.

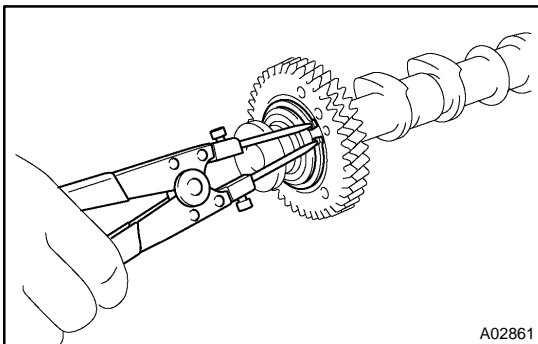
NOTICE:

Be careful not to damage the camshaft.



(b) Using SST, turn the sub-gear clockwise, and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)



(c) Using snap ring pliers, remove the snap ring.

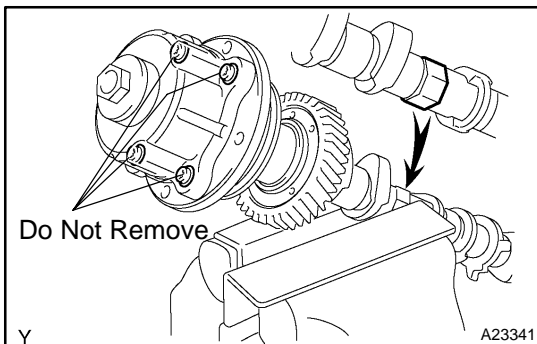
(d) Remove the wave washer.

(e) Remove the camshaft sub-gear.

(f) Remove the camshaft gear spring.

NOTICE:

Be careful not to damage the camshaft.



26. REMOVE CAMSHAFT TIMING TUBE FROM INTAKE CAMSHAFT

(a) Mount the hexagon head portion of the intake camshaft in a vise.

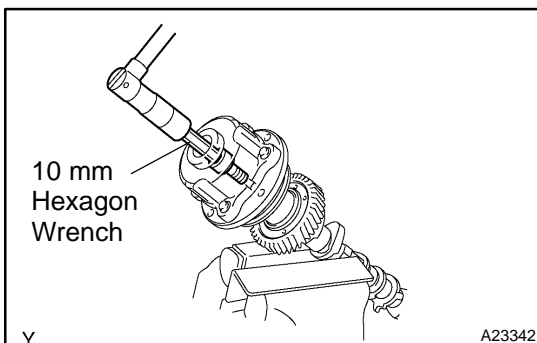
NOTICE:

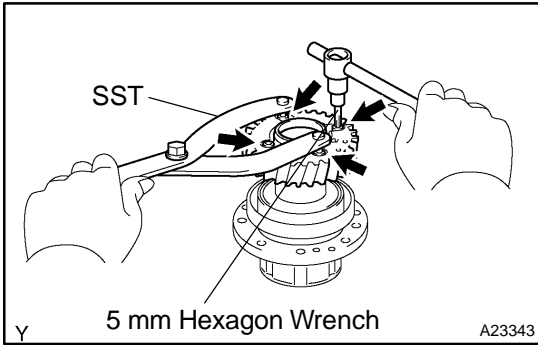
- **Be careful not to damage the camshaft.**
- **The 4 bolts shown in the illustration determine backlash of the gear in the timing tube, so do not remove them. If any of the 4 bolts are removed, install a new timing tube assembly.**

(b) Remove the screw plug and seal washer.

(c) Using a 10 mm hexagon wrench, and remove the bolt.

(d) Pull out the timing tube and drive gear assembly from the camshaft.



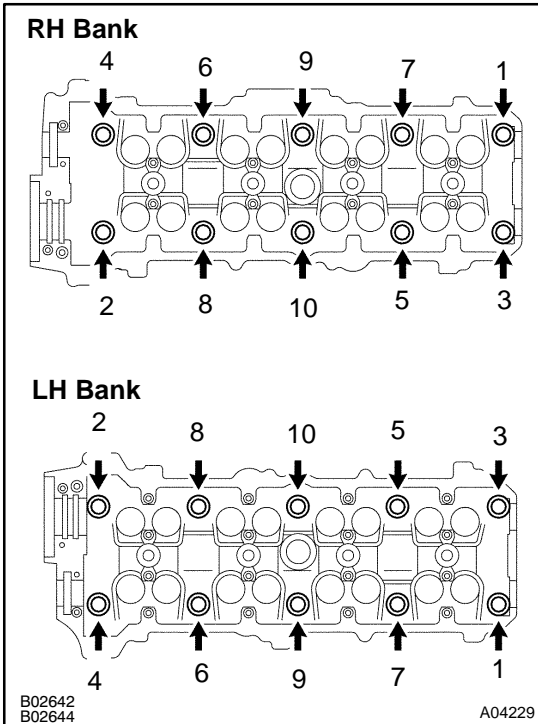


- (e) Using SST and a 5 mm hexagon wrench, remove the 4 bolts, drive gear and oil seal.
 SST 09960-10010 (09962-01000, 09963-00500)

NOTICE:

Be careful not to damage the timing tube.

27. REMOVE SPARK PLUGS

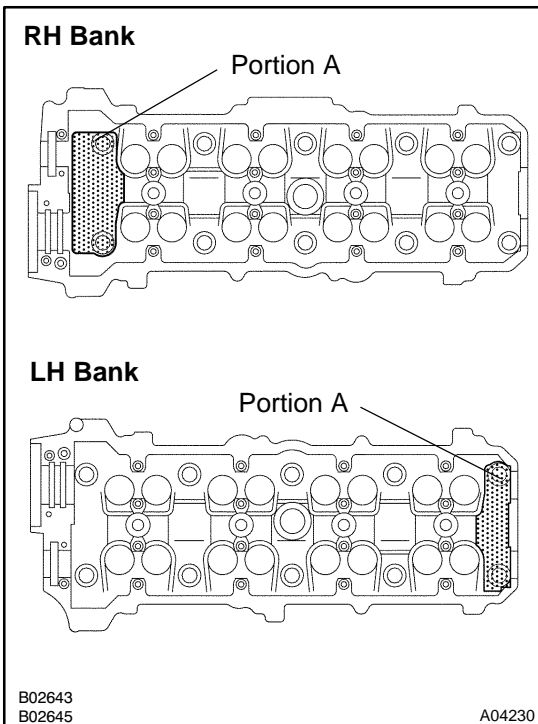


28. REMOVE CYLINDER HEAD AND EXHAUST MANIFOLD ASSEMBLIES

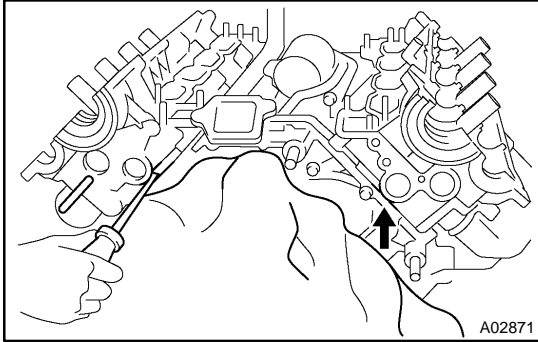
- (a) Uniformly loosen the 10 cylinder head bolts on one side of each cylinder head in several steps, in the sequence shown, then perform the same procedure to the other side as shown. Remove the 20 cylinder head bolts and plate washers.

NOTICE:

- **Cylinder head warpage or cracking could result from removing bolts in incorrect order.**



- **Do not drop the plate washer for cylinder head bolt into portion A of the cylinder head. If dropped into portion A, the plate washer will pass through the cylinder head and cylinder block into the oil pan.**



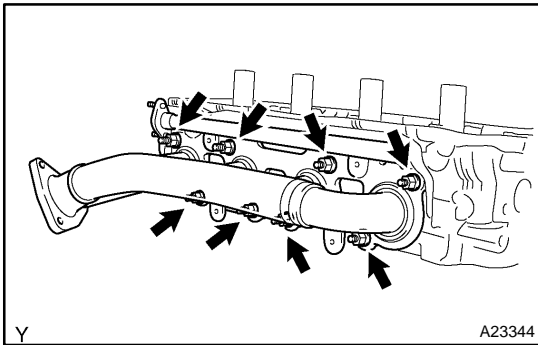
- (b) Lift the cylinder head from the dowels on the cylinder block, and place the 2 cylinder heads on wooden blocks on a bench.

HINT:

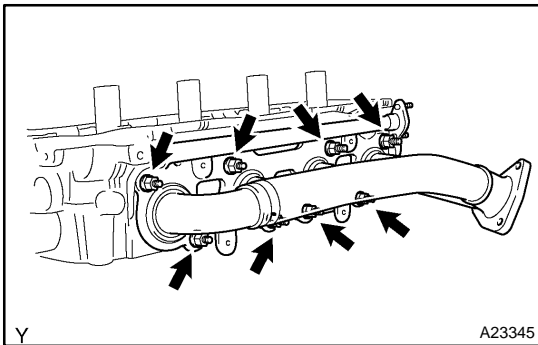
If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

NOTICE:

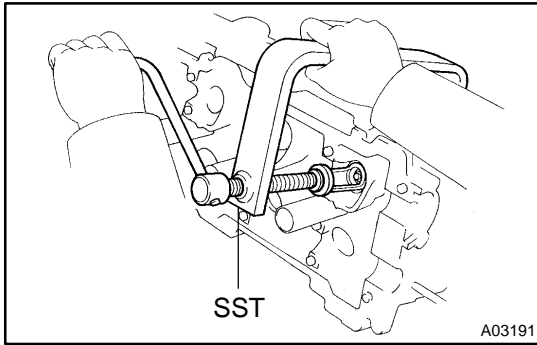
- Be careful not to damage the contact surfaces of the cylinder head and cylinder block.
- The cylinder head should not be tilted so as to secure the valve lifter. If the cylinder head is tilted, remove the valve lifter and check that the adjusting shim is set correctly.

**29. REMOVE RH EXHAUST MANIFOLD FROM CYLINDER HEAD**

- (a) Remove the 4 bolts and heat insulator.
 (b) Remove the 8 nuts, exhaust manifold and gasket.

**30. REMOVE LH EXHAUST MANIFOLD FROM CYLINDER HEAD**

- (a) Remove the 4 bolts and heat insulator.
 (b) Remove the 8 nuts, exhaust manifold and gasket.



DISASSEMBLY

1. REMOVE VALVE LIFTERS AND SHIMS

HINT:

Arrange the valve lifters and shims in correct order.

2. REMOVE VALVES

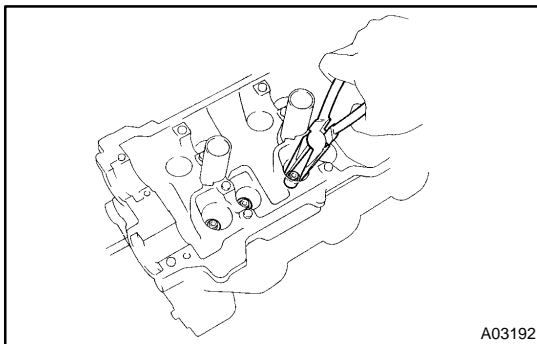
- (a) Using SST, compress the valve spring and remove the 2 keepers.

SST 09202-70020 (09202-00010)

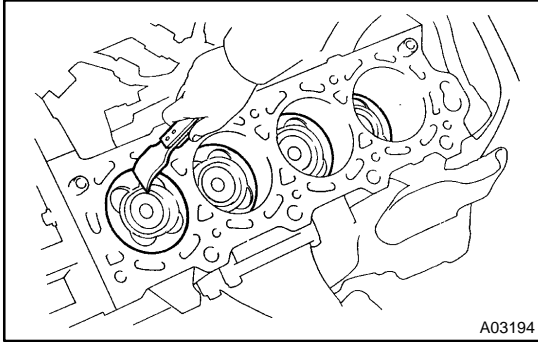
- (b) Remove the spring retainer, the valve spring, the valve and the spring seat.

HINT:

Arrange the valves, valve springs, spring seats and spring retainers incorrect order.



- (c) Using needle-nose pliers, remove the oil seal.

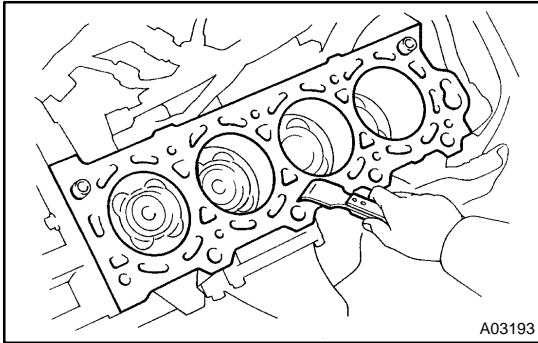


A03194

INSPECTION

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



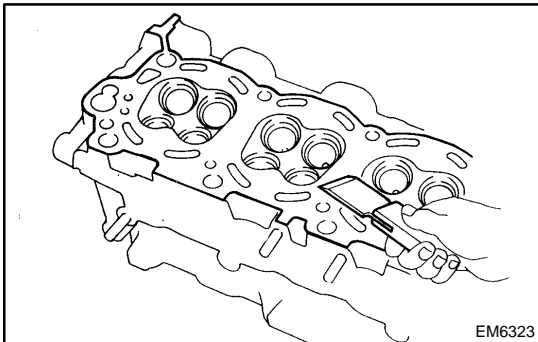
A03193

- (b) Using a surface contacting gasket scraper, remove all the gasket materials from the cylinder block.

- (c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION:

Protect your eyes when using high pressure compressed air.



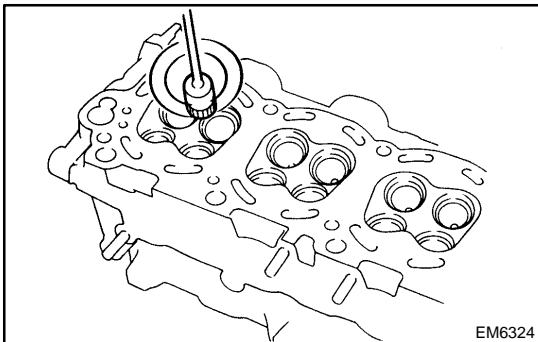
EM6323

2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

NOTICE:

Be careful not to scratch the surface contacting the cylinder block.



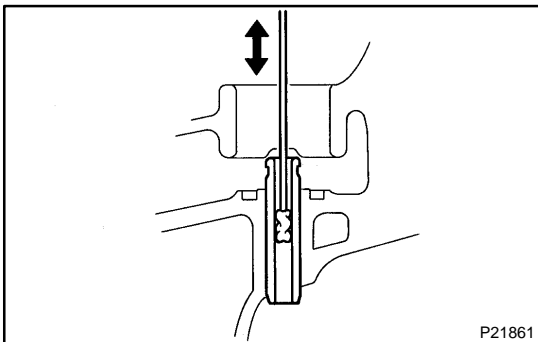
EM6324

3. CLEAN COMBUSTION CHAMBERS

Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

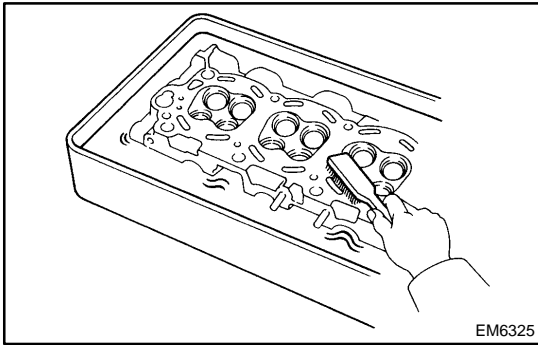
Be careful not to scratch the surface contacting the cylinder block.



P21861

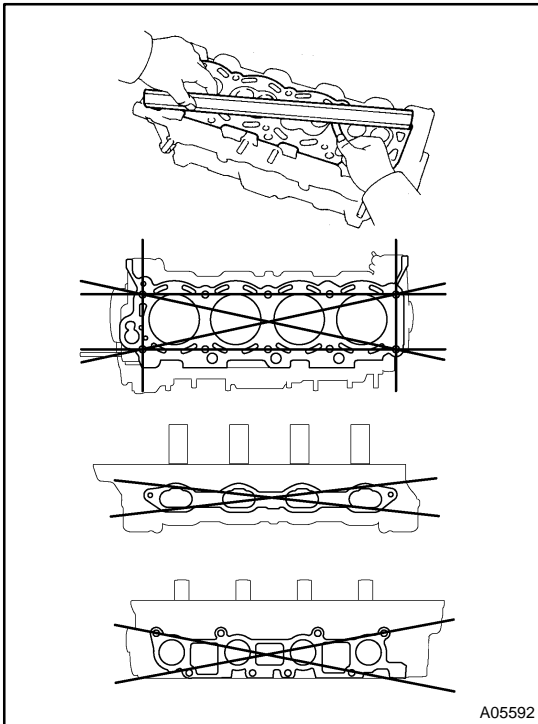
4. CLEAN VALVE GUIDE BUSHINGS

Using a valve guide bushing brush and solvent, clean all the guide bushings.



5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, thoroughly clean the cylinder head.

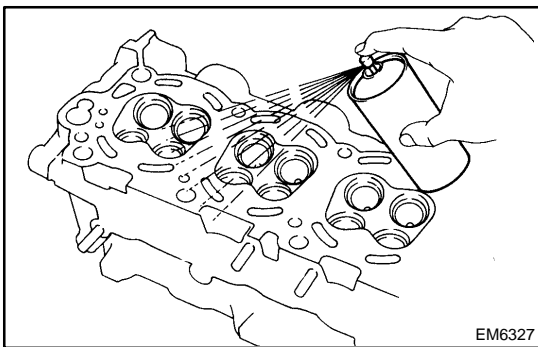


6. INSPECT FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

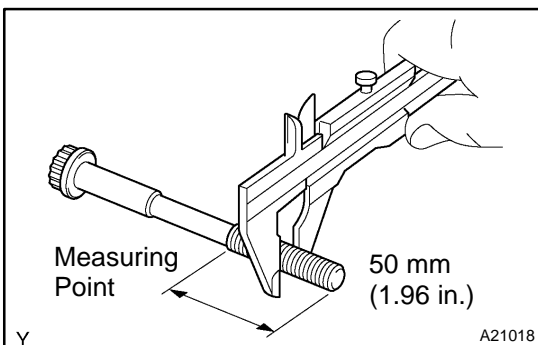
Maximum warpage: 0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the cylinder head.



7. INSPECT FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.



8. INSPECT CYLINDER HEAD BOLT

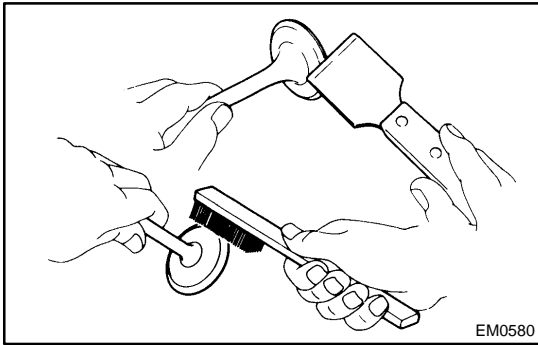
Using vernier calipers, measure the thread outside diameter of the cylinder head bolt.

Standard outside diameter:

9.810 to 9.960 mm (0.3862 to 0.3921 in.)

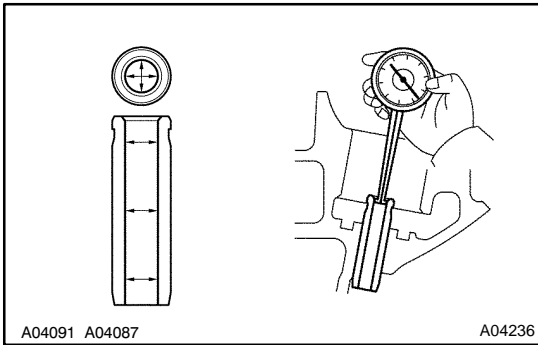
Minimum outside diameter: 9.70 mm (0.3819 in.)

If the diameter is less than minimum, replace the bolt.



9. CLEAN VALVES

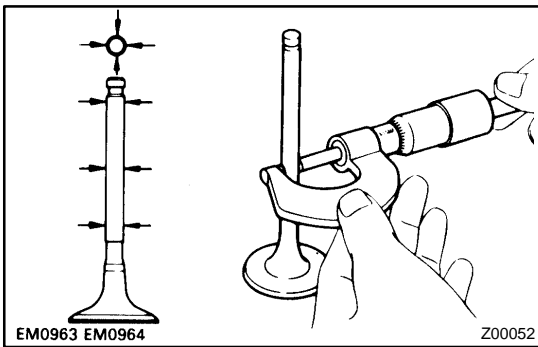
- (a) Using a gasket scraper, chip off any carbon from the valve head.
- (b) Using a wire brush, thoroughly clean the valve.



10. INSPECT VALVE STEMS AND GUIDE BUSHINGS

- (a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:
5.510 to 5.530 mm (0.2169 to 0.2177 in.)



- (b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake	5.470 to 5.485 mm (0.2154 to 0.2159 in.)
Exhaust	5.465 to 5.480 mm (0.2152 to 0.2157 in.)

- (c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

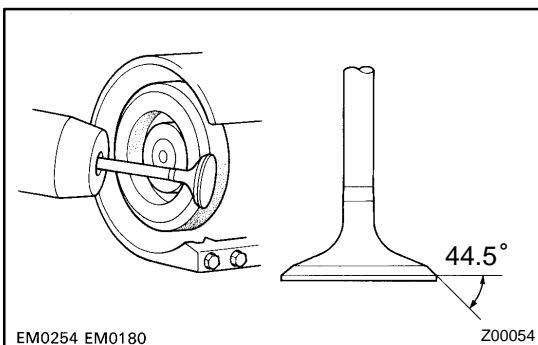
Standard oil clearance:

Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

Maximum oil clearance:

Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

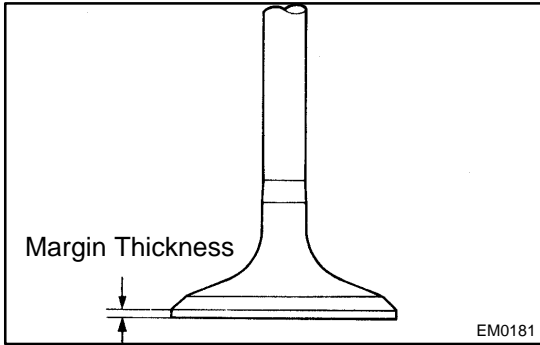
If the clearance is greater than maximum, replace the valve and guide bushing. (See page [EM-56](#))



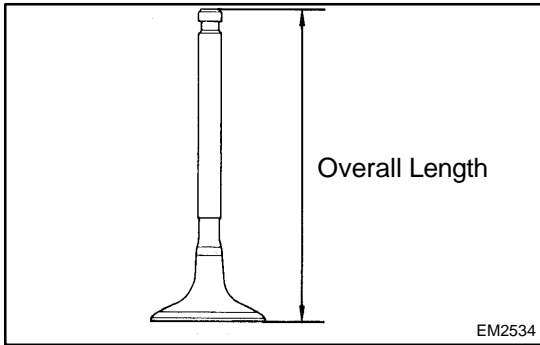
11. INSPECT AND GRIND VALVES

- (a) Grind the valve enough to remove pits and carbon.
- (b) Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°



- (c) Check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.5 mm (0.020 in.)
 If the margin thickness is less than minimum, replace the valve.



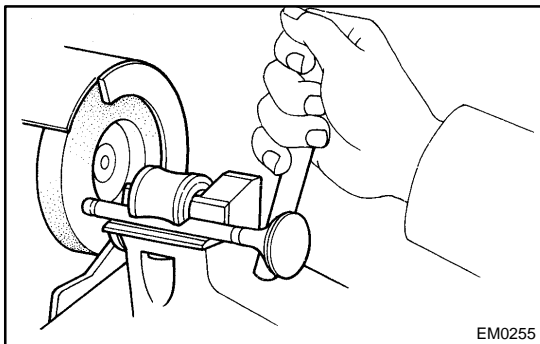
- (d) Check the valve overall length.
Standard overall length:

Intake	95.05 mm (3.7421 in.)
Exhaust	95.10 mm (3.7441 in.)

Minimum overall length:

Intake	94.55 mm (3.7224 in.)
Exhaust	94.60 mm (3.7244 in.)

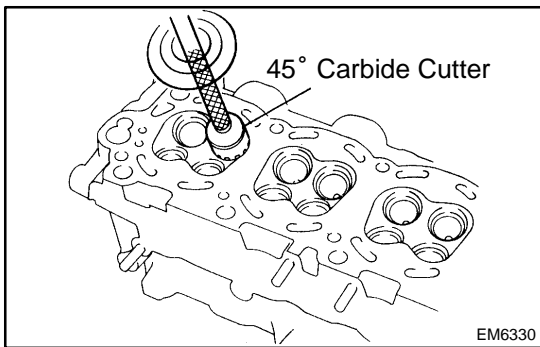
If the overall length is less than minimum, replace the valve.



- (e) Check the surface of the valve stem tip for wear.
 If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

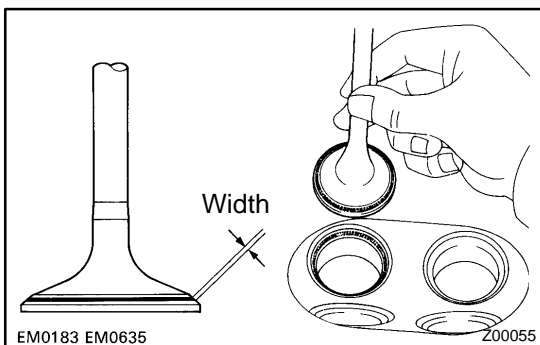
NOTICE:

Do not grind off more than minimum.

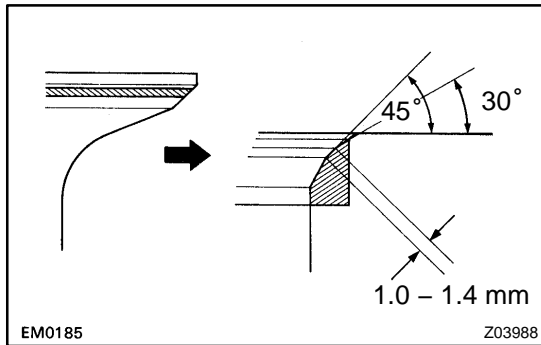


12. INSPECT AND CLEAN VALVE SEATS

- (a) Using a 45° carbide cutter, resurface the valve seats. Remove only metal enough to clean the seats.



- (b) Check the valve seating position.
 Apply a light coat of Prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

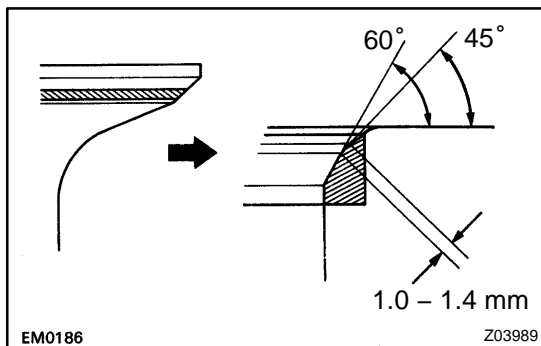


- (c) Check the valve face and seat for the following:
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
 - If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
 - Check that the seat contact is in the middle of the valve face with the following width:

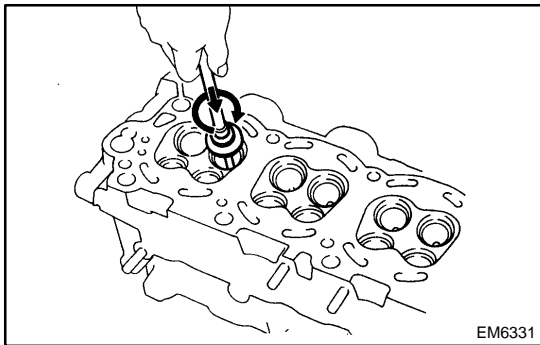
1.0 to 1.4 mm (0.039 to 0.055 in.)

If not, correct the valve seats as follows:

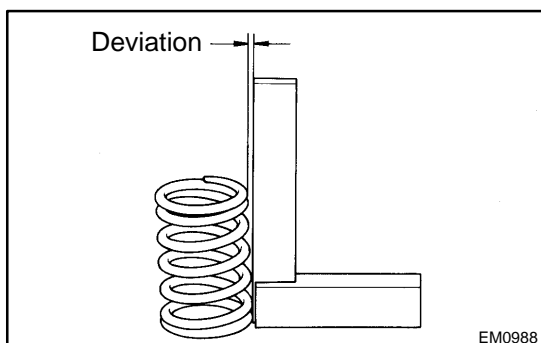
- If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



- If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



- (d) Hand-lap the valve and valve seat with an abrasive compound.
- (e) After hand-lapping, clean the valve and valve seat.

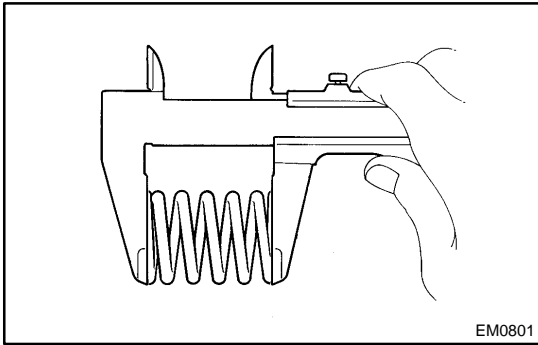


13. INSPECT VALVE SPRINGS

- (a) Using a steel square, measure the deviation of the valve spring.

Maximum deviation: 2.0 mm (0.079 in.)

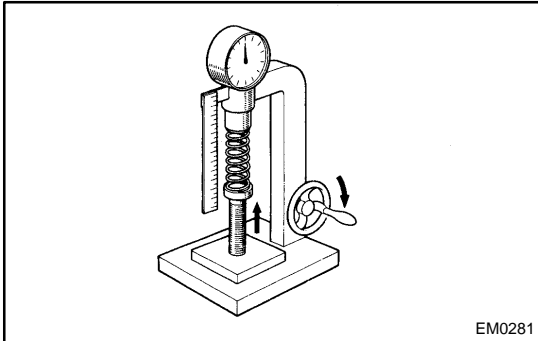
If the deviation is greater than maximum, replace the valve spring.



- (b) Using vernier calipers, measure the free length of the valve spring.

Free length: 54.1 mm (2.130 in.)

If the free length is not as specified, replace the valve spring.



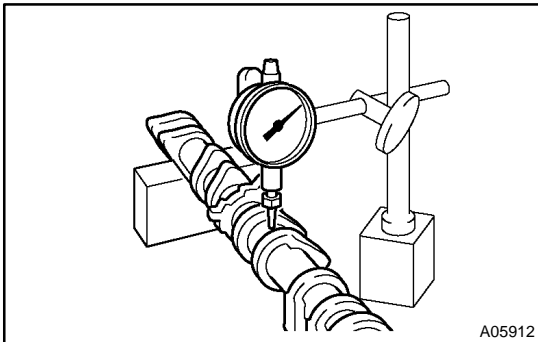
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

210 to 226 N (21.4 to 23.0 kgf, 47.2 to 50.7 lbf)

at 35.0 mm (1.378 in.)

If the installed tension is not as specified, replace the valve spring.



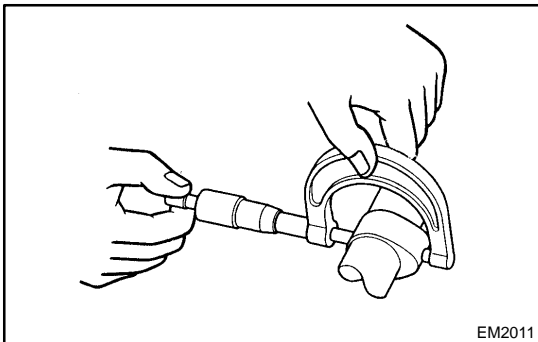
14. INSPECT CAMSHAFT FOR RUNOUT

- (a) Place the camshaft on V-blocks.

- (b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, replace the camshaft.



15. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

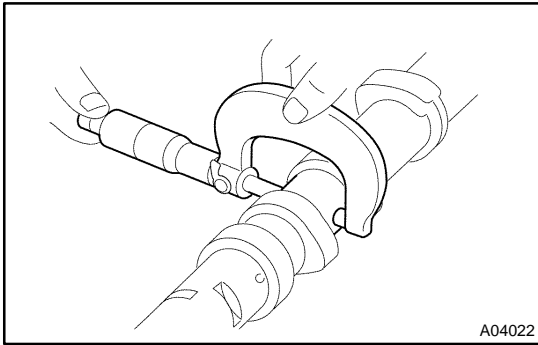
Standard cam lobe height:

Intake	42.61 to 42.71 mm (1.6776 to 1.6815 in.)
Exhaust	42.63 to 42.73 mm (1.6783 to 1.6823 in.)

Minimum cam lobe height:

Intake	42.46 mm (1.6717 in.)
Exhaust	42.48 mm (1.6724 in.)

If the cam lobe height is less than minimum, replace the camshaft.

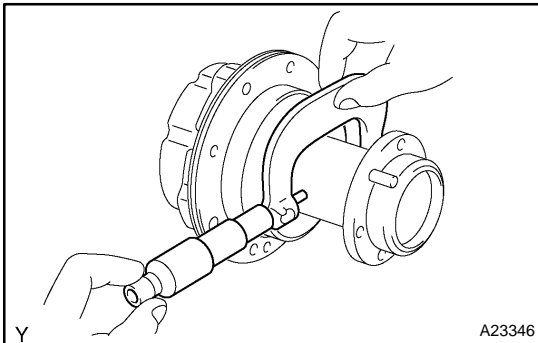
**16. INSPECT CAMSHAFT JOURNALS**

Using a micrometer, measure the journal diameter.

Journal diameter:

26.954 to 26.970 mm (1.0612 to 1.0618 in.)

If the journal diameter is not as specified, check the oil clearance (see step 20).

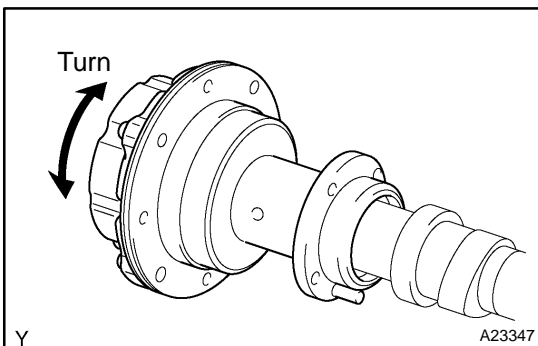
**17. INSPECT CAMSHAFT TIMING TUBE**

(a) Using a micrometer, measure the journal diameter.

Journal diameter:

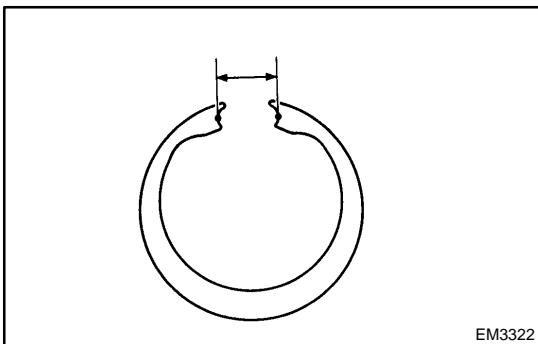
39.955 to 39.964 mm (1.5730 to 1.5734 in.)

If the journal diameter is not as specified, check the oil clearance.



(b) Install the timing tube to the intake camshaft, and check the timing tube turns smoothly.

If necessary, replace the timing tube and intake camshaft.

**18. INSPECT CAMSHAFT GEAR SPRING**

Using vernier calipers, measure the free distance between the spring ends.

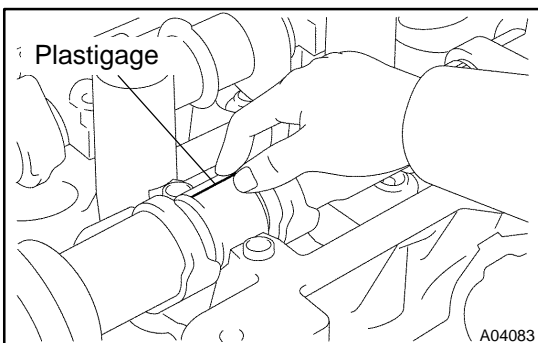
Free distance: 18.2 to 18.8 mm (0.717 to 0.740 in.)

If the free distance is not as specified, replace the gear spring.

19. INSPECT CAMSHAFT BEARINGS

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

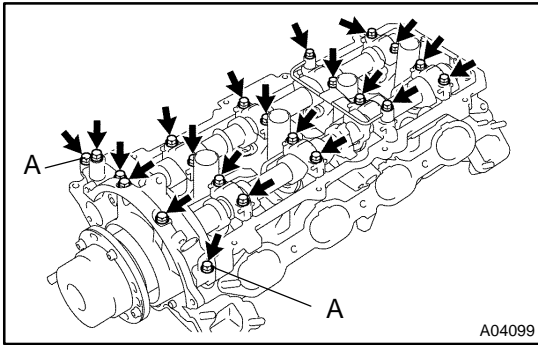
**20. INSPECT CAMSHAFT JOURNAL OIL CLEARANCE**

(a) Install the camshaft timing tube to the intake camshaft (see page [EM-58](#)).

(b) Clean the bearing caps and camshaft journals.

(c) Place the camshafts on the cylinder head.

(d) Lay a strip of Plastigage across each of the camshaft journals.



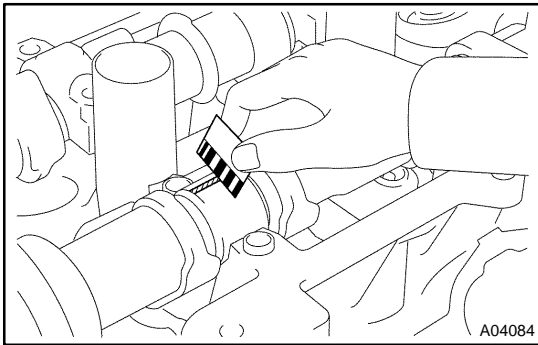
(e) Install the bearing caps (see page EM-60).

Torque:
7.5 N·m (76 kgf·cm, 66 in.-lbf) for bolt A
16 N·m (160 kgf·cm, 12 ft-lbf) for others

NOTICE:

Do not turn the camshaft.

(f) Remove the bearing caps.



(g) Measure the Plastigage at its widest point.

Standard oil clearance:

Camshaft journal	0.030 to 0.071 mm (0.0012 to 0.0028 in.)
Camshaft timing tube journal	0.036 to 0.057 mm (0.0014 to 0.0022 in.)

Maximum oil clearance:

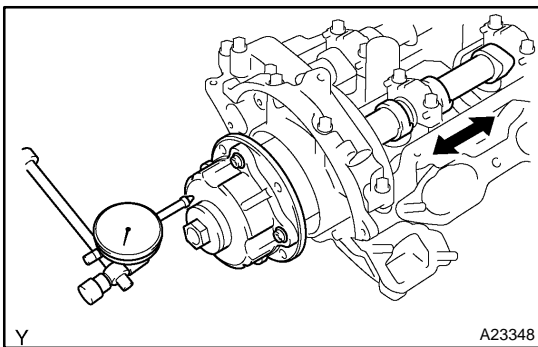
Camshaft journal	0.100 mm (0.0039 in.)
Camshaft timing tube journal	0.075 mm (0.0030 in.)

If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(h) Completely remove the Plastigage.

(i) Remove the camshafts.

(j) Remove the camshaft timing tube from the intake camshaft.



21. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshaft timing tube to the intake camshaft (see page EM-58).

(b) Install the camshaft (see page EM-58).

(c) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:

Intake	0 to 0.040 mm (0 to 0.0016 in.)
Exhaust	0.030 to 0.070 mm (0.0012 to 0.0028 in.)

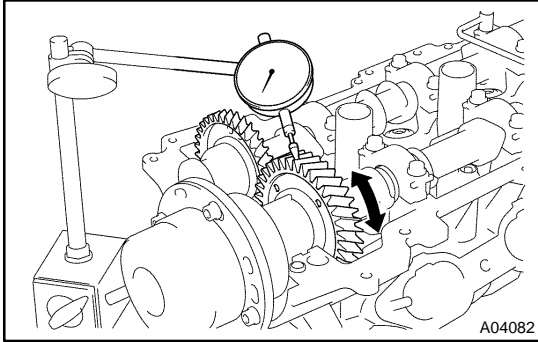
Maximum thrust clearance:

Intake	0.12 mm (0.0047 in.)
Exhaust	0.10 mm (0.0039 in.)

If the thrust clearance is greater than the maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(d) Remove the camshafts.

(e) Remove the camshaft timing tube from the intake camshaft.

**22. INSPECT CAMSHAFT GEAR BACKLASH**

- (a) Install the drive gear to the camshaft timing tube (See page EM-58).
- (b) Install the camshaft timing tube to the intake camshaft (See page EM-58).
- (c) Install the camshafts without installing the exhaust camshaft sub-gear and front bearing cap (See page EM-58).
- (d) Using a dial indicator, measure the backlash.

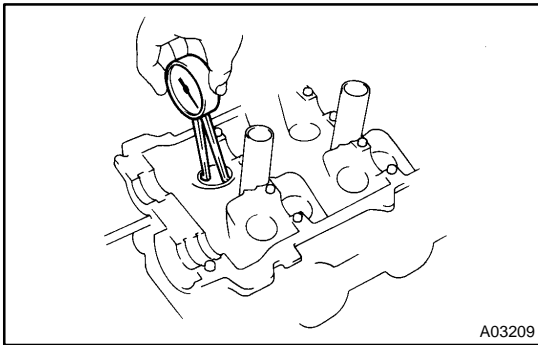
Standard backlash:

0.020 to 0.200 mm (0.0008 to 0.0079 in.)

Maximum backlash: 0.30 mm (0.0118 in.)

If the backlash is greater than the maximum, replace the intake camshaft drive gear and exhaust camshaft.

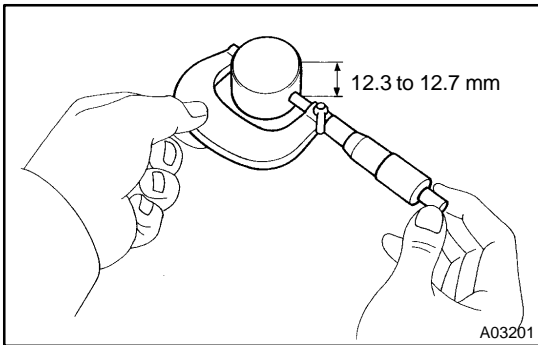
- (e) Remove the camshafts.
- (f) Remove the camshaft timing tube from the intake camshaft.
- (g) Remove the drive gear from the camshaft timing tube.

**23. INSPECT VALVE LIFTERS AND LIFTER BORES**

- (a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter:

31.000 to 31.016 mm (1.2205 to 1.2211 in.)



- (b) Using a micrometer, measure the lifter diameter at the valve lifter center line, 12.3 to 12.7 mm (0.484 to 0.500 in.) from the valve lifter head.

Lifter diameter:

30.968 to 30.976 mm (1.2192 to 1.2195 in.)

- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

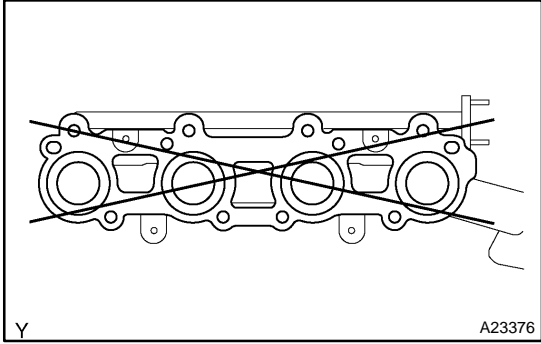
Standard oil clearance:

0.024 to 0.050 mm (0.0009 to 0.0020 in.)

Maximum oil clearance:

0.07 mm (0.0028 in.)

If the oil clearance is greater than the maximum, replace the lifter. If necessary, replace the cylinder head.

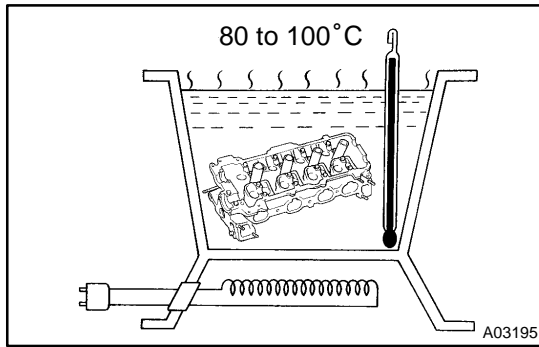


24. INSPECT EXHAUST MANIFOLDS

Using a precision straight edge and feeler gauge, measure the warpage of the surface that is in contact with the cylinder head.

Maximum warpage: 0.10 mm (0.0394 in.)

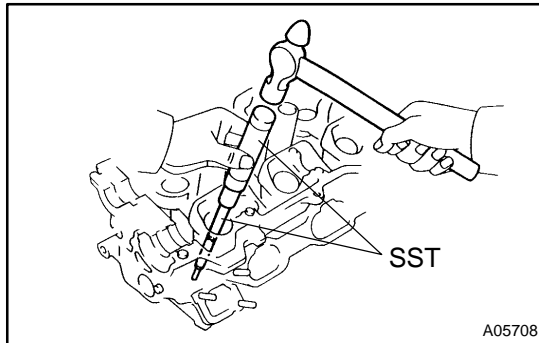
If warpage is greater than maximum, replace the manifold.



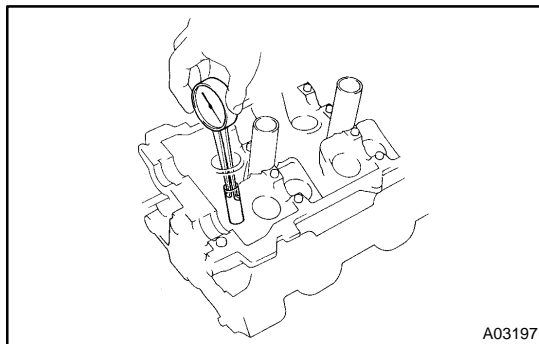
REPLACEMENT

1. REPLACE VALVE GUIDE BUSHINGS

- (a) Gradually heat the cylinder head to 80 to 100°C (176 to 212°F).



- (b) Using SST and a hammer, tap out the guide bushing.
SST 09201-01055, 09950-70010 (09951-07100)



- (c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Both intake and exhaust

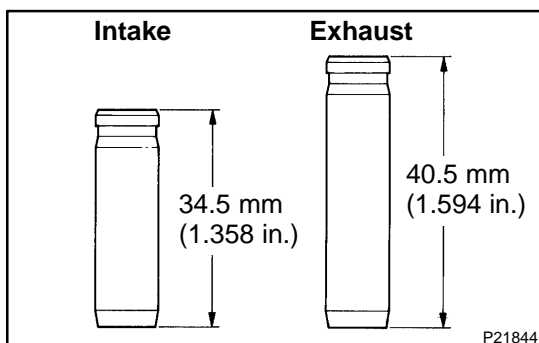
Bushing bore diameter mm (in.)	Bushing size
10.285 to 10.306 (0.4049 to 0.4057)	Use STD
10.335 to 10.356 (0.4069 to 0.4077)	Use O/S STD

- (d) Select a new guide bushing (STD or O/S 0.05).

If the bushing bore diameter of the cylinder head is greater than 10.306 mm (0.4057 in.), machine the bushing bore to the following dimension:

10.335 to 10.356 mm (0.4069 to 0.4077 in.)

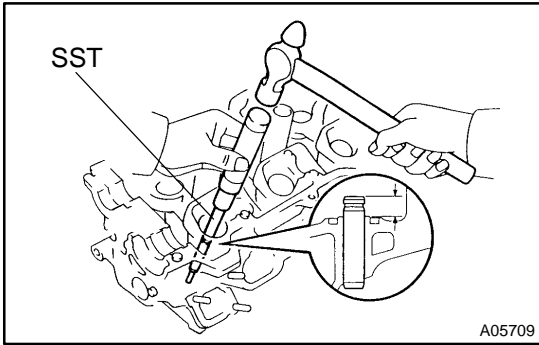
If the bushing bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.



HINT:

Different the bushings are used for the intake and exhaust.

- (e) Gradually heat the cylinder head to 80 to 100°C (176 to 212°F).

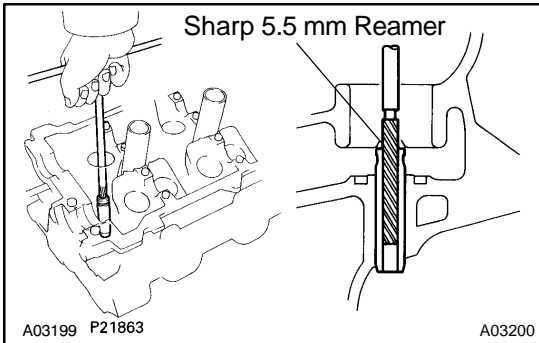


- (f) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.

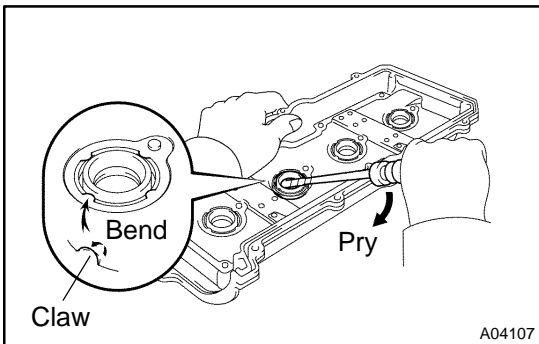
Protrusion height:

Intake	9.2 to 9.8 mm (0.362 to 0.386 in.)
Exhaust	8.2 to 8.8 mm (0.323 to 0.346 in.)

SST 09201-01055, 09950-70010 (09951-07100)



- (g) Using a sharp 5.5 mm reamer, ream the guide bushing to obtain the standard specified clearance (see page EM-46) between the guide bushing and valve stem.

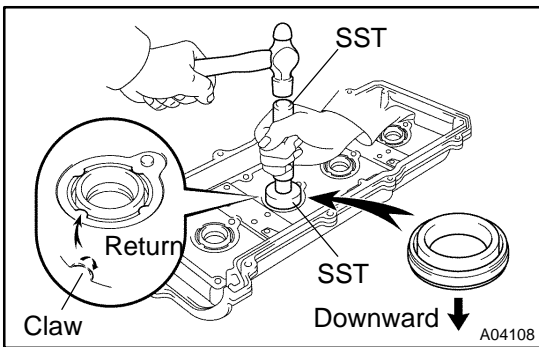


2. REPLACE SPARK PLUG TUBE GASKETS

- (a) Bend the 4 ventilation case claws installed on the cylinder head cover to an angle of 90° or more.
 (b) Using a screwdriver, pry out the gasket.

NOTICE:

Be careful not to damage the cylinder head cover. Tape the screwdriver tip.



- (c) Using SST and a hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.

SST 09950-60010 (09951-00240, 09951-00440, 09952-06010), 09950-70010 (09951-07100)

NOTICE:

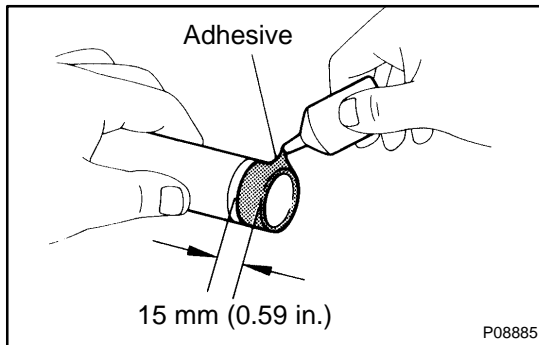
Be careful of the installation direction.

- (d) Apply a light coat of MP grease to the gasket lip.
 (e) Return the 4 ventilation case claws to its original position.

REASSEMBLY

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



1. INSTALL SPARK PLUG TUBES

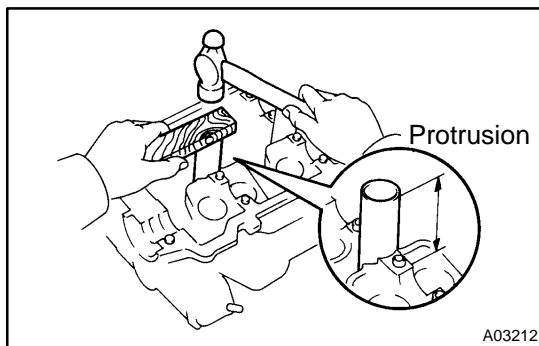
HINT:

When using a new cylinder head, spark plug tubes must be installed.

- (a) Apply adhesive to the end of the spark plug tube.

Adhesive:

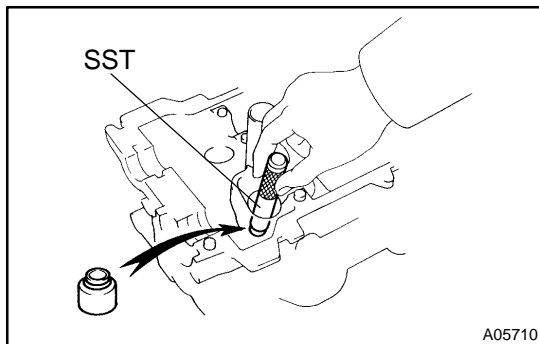
Part No. 08833-00070, THREE BOND 1324 or equivalent



- (b) Using a wooden block and hammer, tap in a new spark tube until there is 40.9 – 42.1 mm (1.610 – 1.658 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.

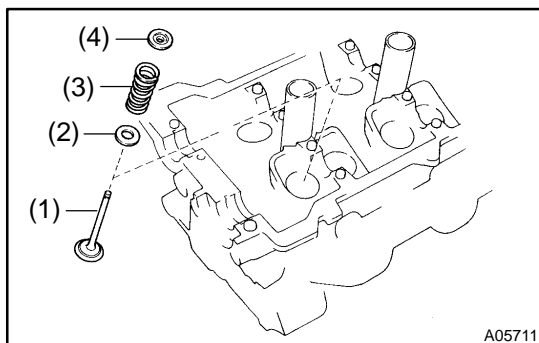
NOTICE:

Avoid tapping a new spark plug tube too far for measuring the amount of the protrusion while tapping.

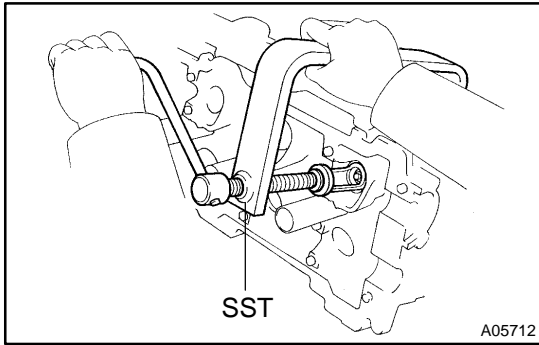


2. INSTALL VALVES

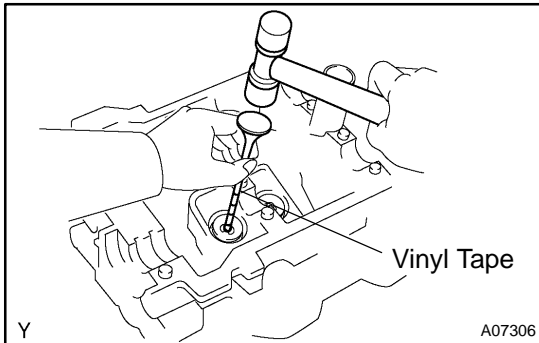
- (a) Using SST, push in a new oil seal.
SST 09201-41020



- (b) Install the valve (1), spring seat (2), valve spring (3) and spring retainer (4).



- (c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202-70020 (09202-00010)



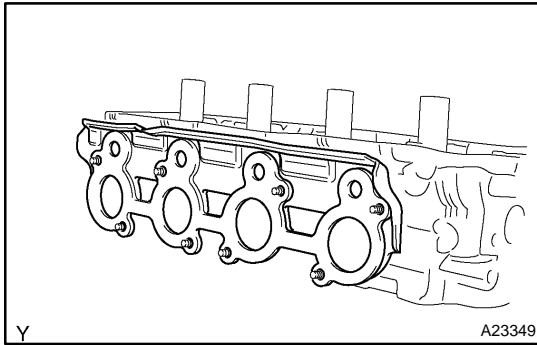
- (d) Using a plastic-faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to assure proper fit.

NOTICE:

Be careful not to damage the valve stem tip.

3. INSTALL SHIMS AND VALVE LIFTERS

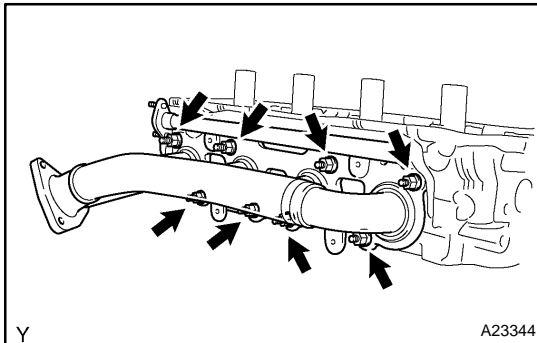
- (a) Install the shim and valve lifter.
(b) Check that the valve lifter rotates smoothly by hand.



INSTALLATION

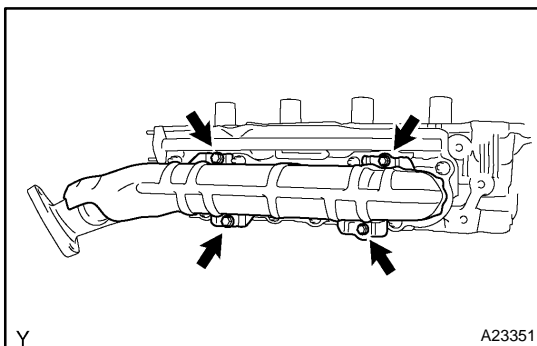
1. INSTALL RH EXHAUST MANIFOLD TO CYLINDER HEAD

- (a) Place a new gasket on the cylinder head.



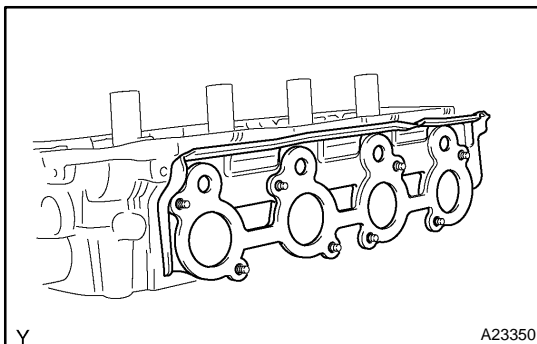
- (b) Install the exhaust manifold with 8 new nuts. Uniformly tighten the nuts in several steps.

Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)



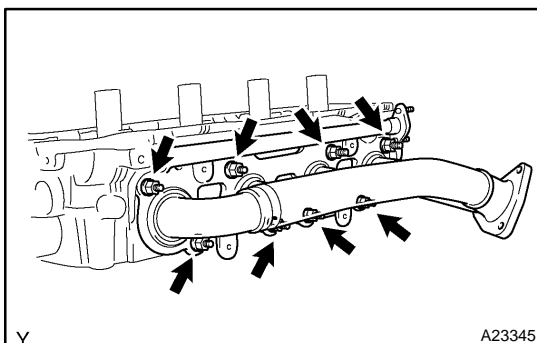
- (c) Install the heat insulator with the 4 bolts.

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)



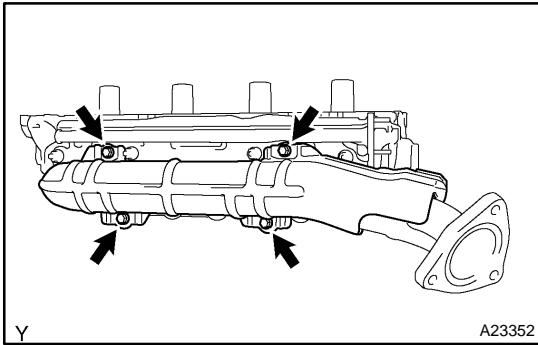
2. INSTALL LH EXHAUST MANIFOLD TO CYLINDER HEAD

- (a) Place a new gasket on the cylinder head.

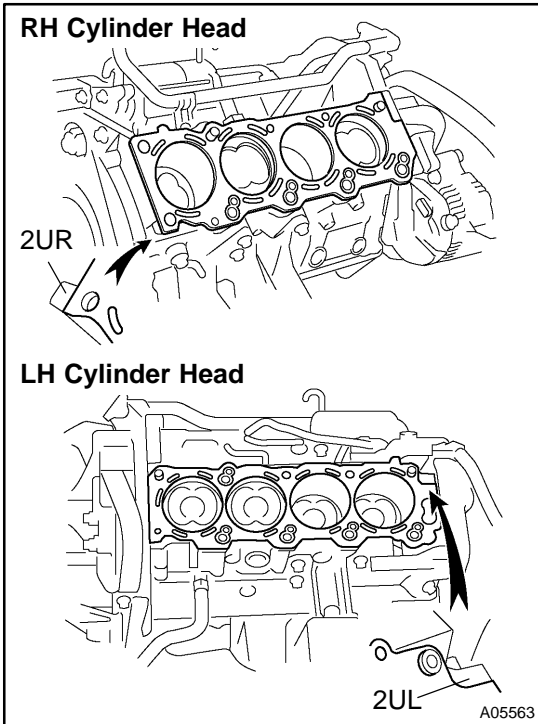


- (b) Install the exhaust manifold with 8 new nuts. Uniformly tighten the nuts in several steps.

Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)



- (c) Install the heat insulator with the 4 bolts.
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)



- 3. PLACE CYLINDER HEADS ON CYLINDER BLOCK**
 (a) Place 2 new cylinder head gaskets in the positions on the cylinder block.

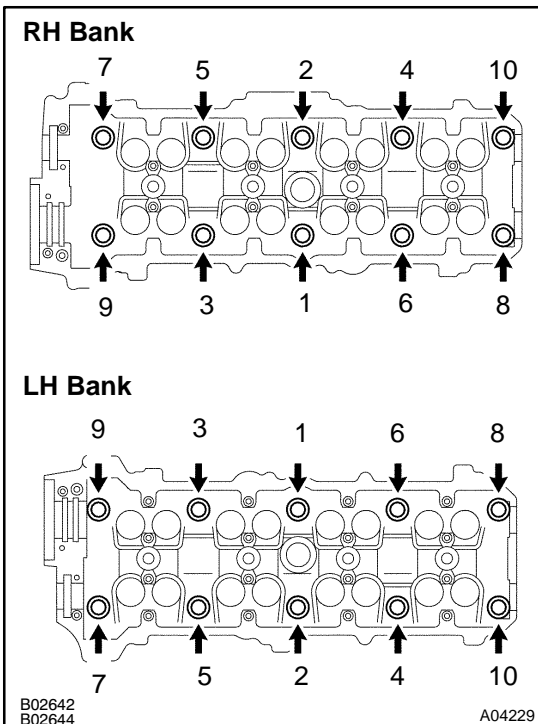
HINT:

On the rear side of the cylinder head gasket are marked to distinguish the LH and RH banks, a "2UR" mark for the RH bank and a "2UL" mark for the LH bank.

NOTICE:

Be careful of the installation direction.

- (b) Place the 2 cylinder heads in the positions on the cylinder head gaskets.



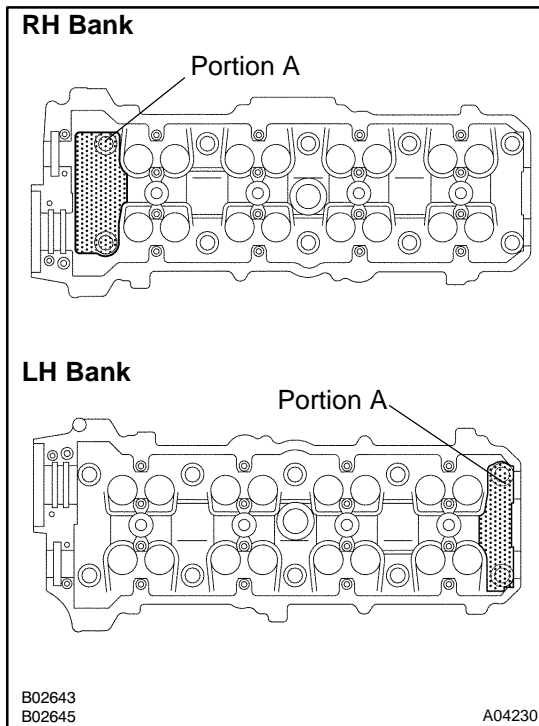
4. INSTALL CYLINDER HEAD BOLTS

HINT:

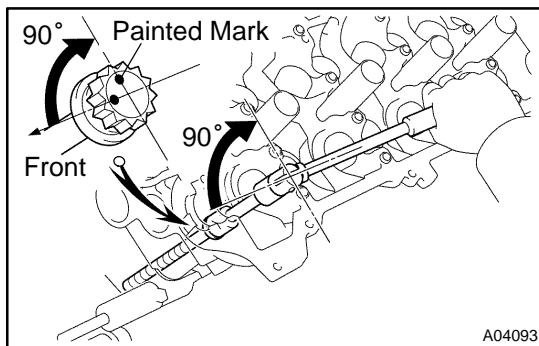
- The cylinder head bolts are tightened in 2 progressive steps (steps (c) and (e)).
 - If any cylinder head bolt is broken or deformed, replace it.
- (a) Apply a light coat of engine oil to the threads and under the heads of the cylinder head bolts.
 (b) Install the plate washer to the cylinder head bolt.
 (c) Install and uniformly tighten the 10 cylinder head bolts on one side of the cylinder head in several steps in the sequence shown, then perform the same procedure to the other side as shown.

Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)

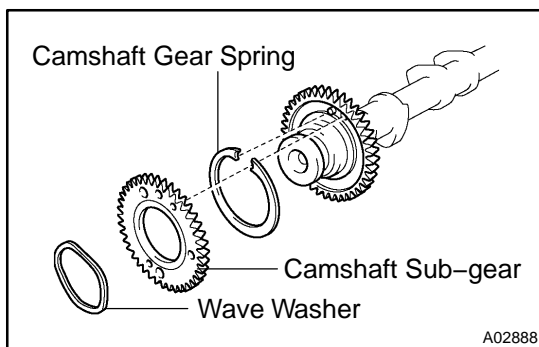
If any of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

**NOTICE:**

Do not drop the plate washer for cylinder head bolt into portion A of the cylinder head. If dropped into portion A, the plate washer will pass through the cylinder head and cylinder block into the oil pan.



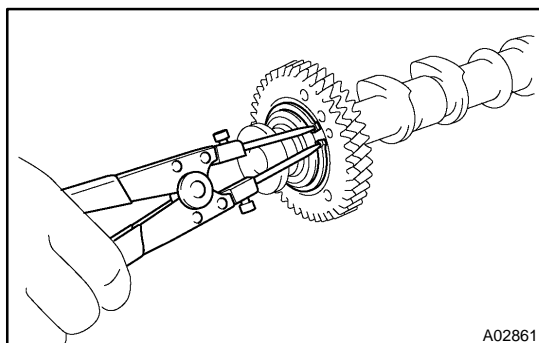
- (d) Mark the front of the cylinder head bolt with paint.
- (e) Retighten the cylinder head bolts by 90° in the numerical order shown.
- (f) Check that the painted mark is now at a 90° angle to front.

5. INSTALL SPARK PLUGS**6. ASSEMBLE EXHAUST CAMSHAFT**

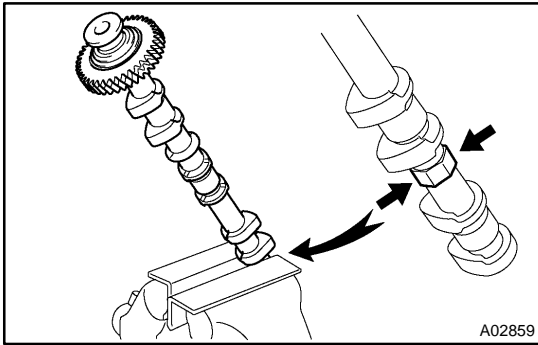
- (a) Install the camshaft gear spring, camshaft sub-gear and wave washer.

HINT:

Attach the pin on the gear to the gear spring end.



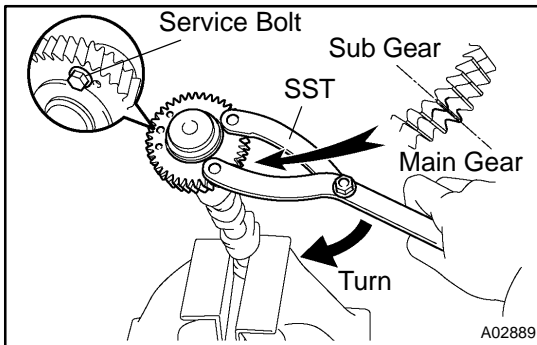
- (b) Using snap ring pliers, install the snap ring.



- (c) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE:

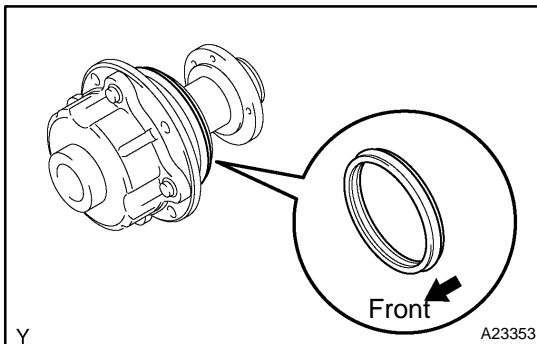
Be careful not to damage the camshaft.



- (d) Using SST, align the holes of the camshaft main gear and sub-gear by turning the camshaft sub-gear counter-clockwise, and temporarily install a service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

- (e) Align the gear teeth of the main gear and sub-gear, and tighten the service bolt.

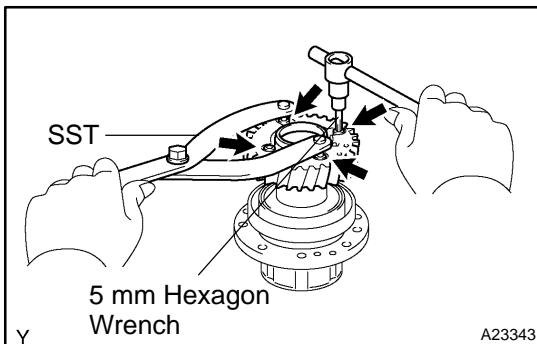


7. INSTALL CAMSHAFT TIMING TUBE TO INTAKE CAM-SHAFT

- (a) Place a new oil seal to the timing tube.

NOTICE:

Be careful of the installation direction.



- (b) Align the timing tube knock pin with the knock pin groove of the drive gear, and temporarily install the drive gear with the 4 bolts.

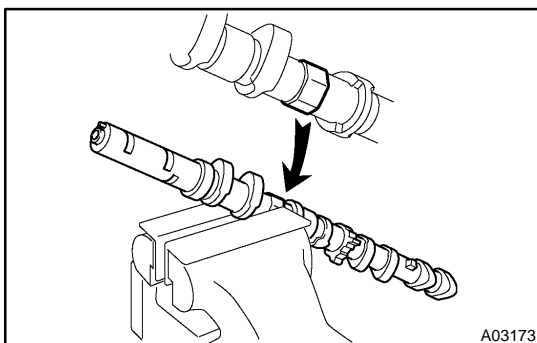
- (c) Using SST and a 5 mm hexagon wrench, uniformly tighten the 4 bolts in several steps.

SST 09960-10010 (09962-01000, 09963-00500)

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

NOTICE:

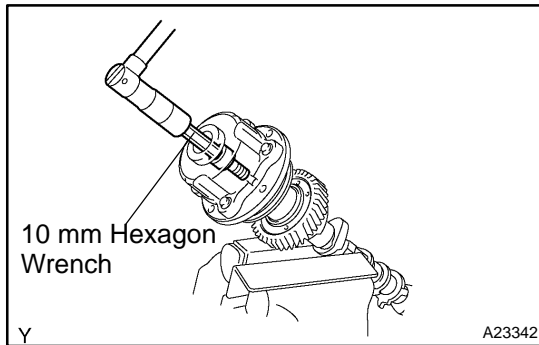
Be careful not to damage the timing tube.



- (d) Mount the hexagon head portion of the camshaft in a vise.

NOTICE:

Be careful not to damage the camshaft.

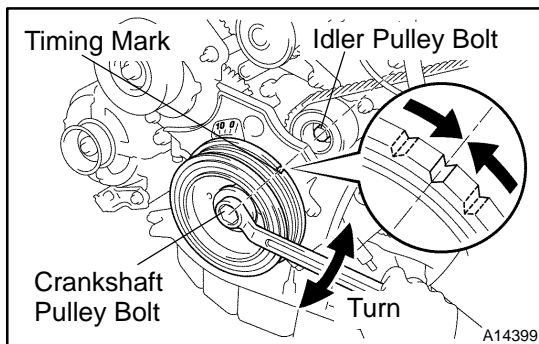


- (e) Align the camshaft knock pin with the knock pin groove of the timing tube, and push the timing tube by hand until you it touches the bottom.
- (f) Using a 10 mm hexagon wrench, install the bolt.
Torque: 78 N·m (790 kgf-cm, 58 ft-lbf)
- (g) Install the seal washer and screw plug.
Torque: 15 N·m (150 kgf-cm, 11 ft-lbf)

8. INSTALL CAMSHAFTS

NOTICE:

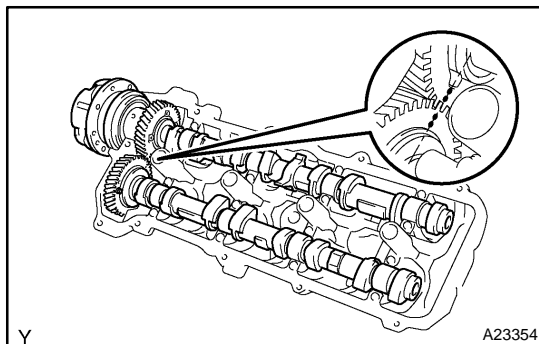
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



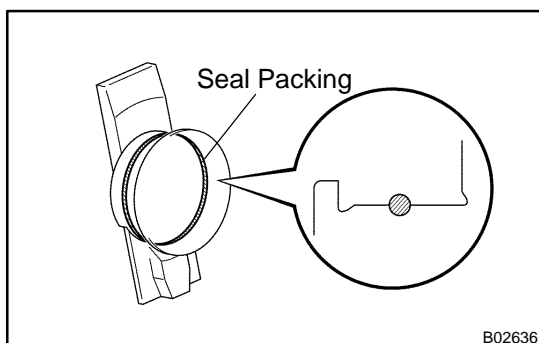
- (a) Set the crankshaft pulley position.
Turn the pulley clockwise or counterclockwise, and align the timing mark of the crankshaft pulley with the centers of the crankshaft pulley bolt and idler pulley bolt.

NOTICE:

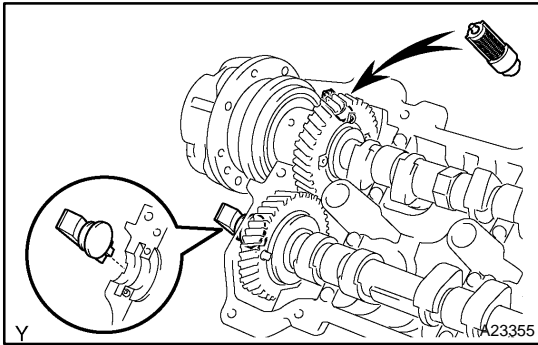
Having the crankshaft pulley at the wrong angle can cause the piston head and valve head to come into contact with each other when you install the camshaft, causing damage. So always set the crankshaft pulley at the correct angle.



- (b) Install the LH camshafts.
 - (1) Apply MP grease to the thrust portion of the intake and exhaust camshafts.
 - (2) Align the timing marks (2-dot mark) of the camshaft drive and driven main gears, and place the intake and exhaust camshafts.



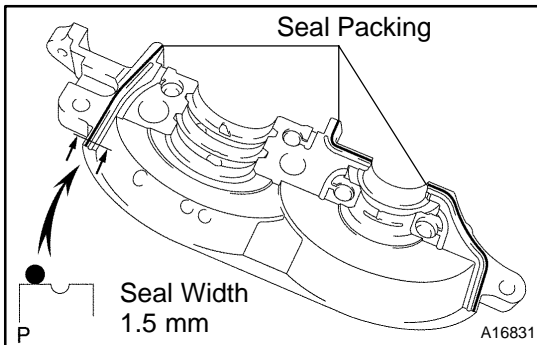
- (3) Apply seal packing to the camshaft housing plug.
 - Remove the old packing material (FIPG).
 - Apply seal packing to the housing plug.**Seal packing: Part No. 08826-00080 or equivalent**



- (4) Install the camshaft housing plug to the cylinder head as shown in the illustration.
- (5) Install the strainer to the cylinder head.

NOTICE:

Be careful of the installation direction.



- (6) Apply seal packing to the front bearing cap.
 - Remove any old packing material (FIPG) and be careful not to drop any oil on the contact surfaces of the bearing cap and cylinder head.

Using a razor blade and gasket scraper, remove all the old packing material (FIPG) from the gasket surfaces and groove.

Thoroughly clean all components to remove all the loose material.

Using a non-residue solvent, clean both sealing surfaces.
 - Apply seal packing to the bearing cap as shown in the illustration.

Install a nozzle that has been cut to a 1.5 mm (0.059 in.) opening.

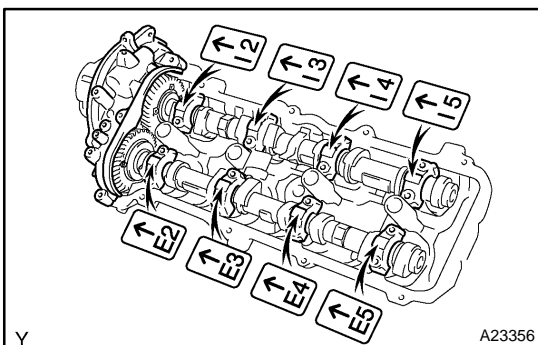
Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.

Immediately remove the nozzle from the tube and reinstall cap.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Do not apply seal packing to the front bearing cap grooves.

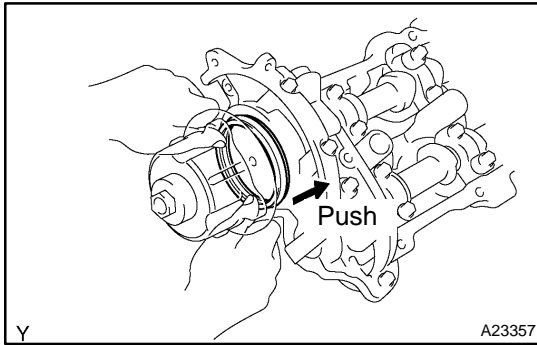


- (7) Install the front bearing cap.

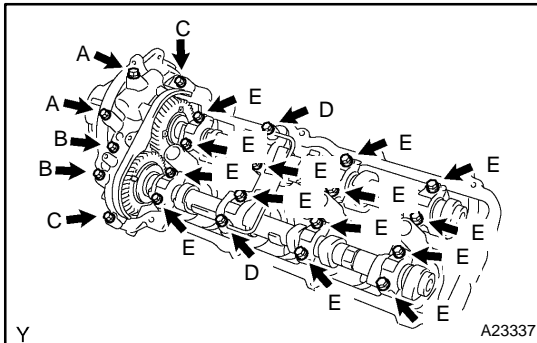
HINT:

Installing the front bearing cap will determine the thrust portion of the camshaft.

- (8) Install the other bearing caps in the sequence shown with the arrow mark facing forward.



(9) Push in the camshaft oil seal.



(10) Install 4 new seal washers to the bearing cap bolts (A and B).

(11) Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts (D and E).

NOTICE:

Do not apply engine oil under the heads of the bearing cap bolts (A), (B) and (C).

HINT:

Each bolt length is indicated in the illustration.

Bolt length:

94 mm (3.70 in.) for A with seal washer

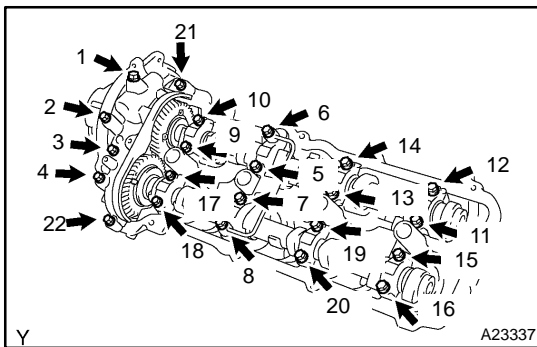
72 mm (2.83 in.) for B with seal washer

25 mm (0.98 in.) for C

52 mm (2.05 in.) for D

38 mm (1.50 in.) for E

(12) Install the oil feed pipe and the 22 bearing cap bolts as shown in the illustration.

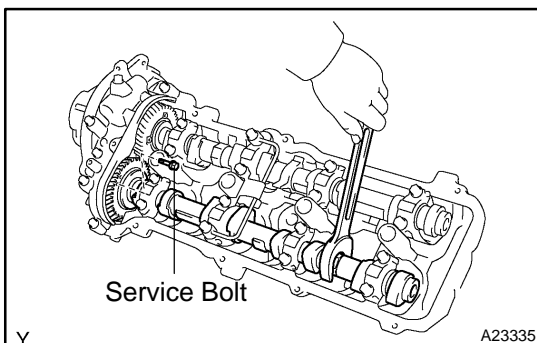


(13) Uniformly tighten the 22 bearing cap bolts in several steps, in the sequence shown.

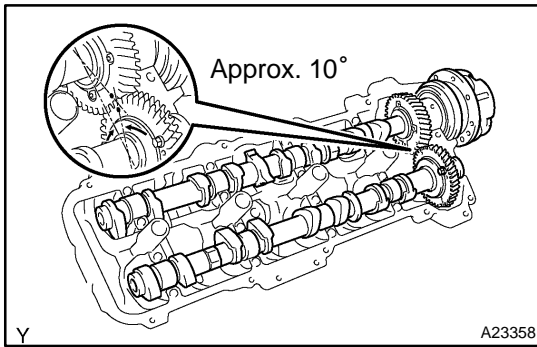
Torque:

7.5 N·m (76 kgf·cm, 66 in.-lbf) for bolt C

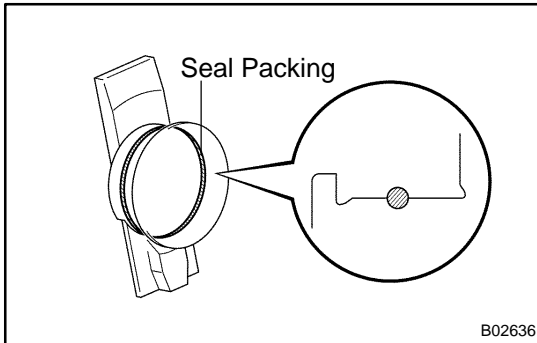
16 N·m (160 kgf·cm, 12 ft-lbf) for others



(14) Remove the service bolt.

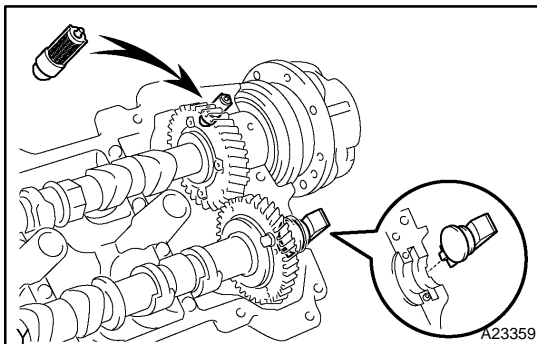


- (c) Install the RH camshafts.
- (1) Apply MP grease to the thrust portions of the intake and exhaust camshafts.
 - (2) Align the timing marks (1-dot mark) of the camshaft drive and driven main gears, and place the intake and exhaust camshafts.
 - (3) Set the timing mark (1-dot mark) of the camshaft drive and driven main gears at approx. 10° angle.



- (4) Apply seal packing to the camshaft housing plug.
 - Remove the old packing material (FIPG).
 - Apply seal packing to the housing plug.

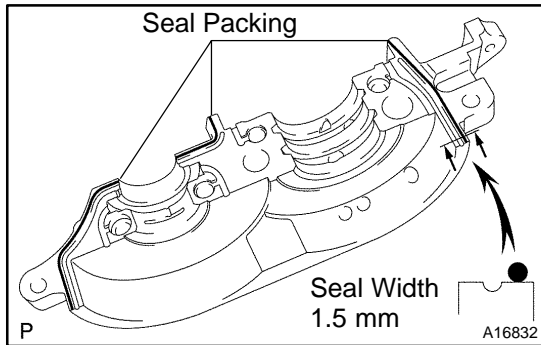
Seal packing: Part No. 08826-00080 or equivalent



- (5) Install the camshaft housing plug to the cylinder head as shown in the illustration.
- (6) Install the strainer to the cylinder head.

NOTICE:

Be careful of the installation direction.

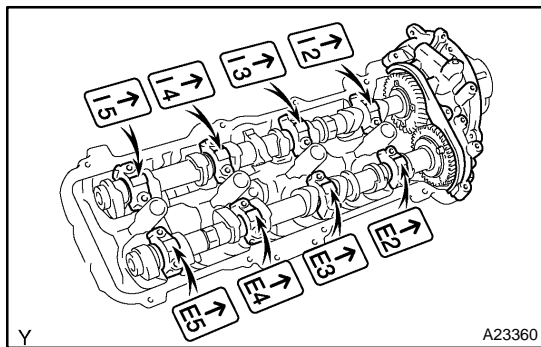


- (7) Apply seal packing to the front bearing cap.
- Remove any old packing material (FIPG) and be careful not to drop any oil on the contact surfaces of the bearing cap and cylinder head. Using a razor blade and gasket scraper, remove all the old packing material (FIPG) from the gasket surfaces and groove. Thoroughly clean all components to remove all the loose material. Using a non-residue solvent, clean both sealing surfaces.
 - Apply seal packing to the bearing cap as shown in the illustration. Install a nozzle that has been cut to a 1.5 mm (0.059 in.) opening. Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied. Immediately remove the nozzle from the tube and reinstall cap.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Do not apply seal packing to the front bearing cap grooves.

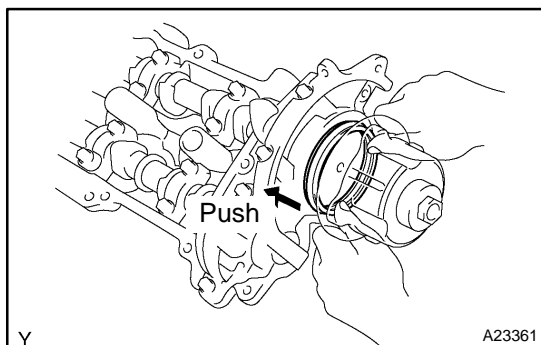


- (8) Install the front bearing cap.

HINT:

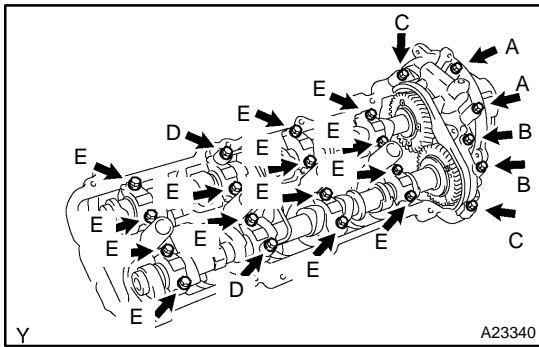
Installing the front bearing cap will determine the thrust portion of the camshaft.

- (9) Install the other bearing caps in the sequence shown with the arrow mark facing forward.



- (10) Push in the camshaft oil seal.

ENGINE MECHANICAL (2UZ-FE) - CYLINDER HEAD



- (11) Install 4 new seal washers to the bearing cap bolts (A and B).
- (12) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts (D and E).

NOTICE:

Do not apply engine oil under the heads of the bearing cap bolts (A), (B) and (C).

HINT:

Each bolt length is indicated in the illustration.

Bolt length:

94 mm (3.70 in.) for A with seal washer

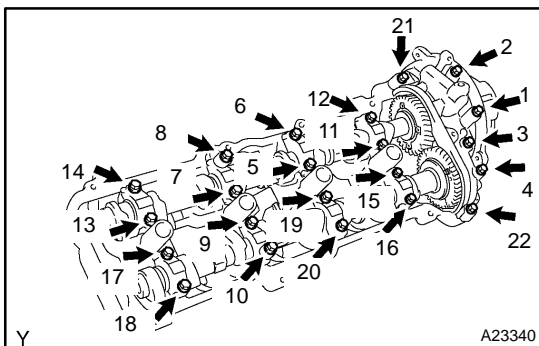
72 mm (2.83 in.) for B with seal washer

25 mm (0.98 in.) for C

52 mm (2.05 in.) for D

38 mm (1.50 in.) for E

- (13) Install the oil feed pipe and the 22 bearing cap bolts as shown in the illustration.

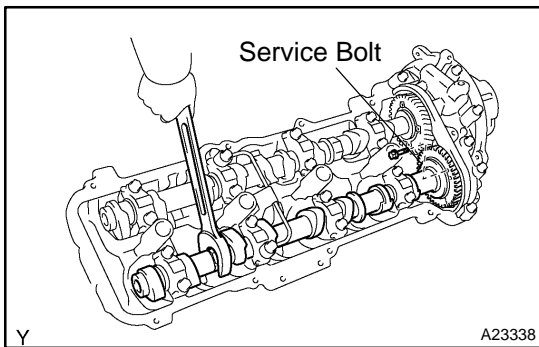


- (14) Uniformly tighten the 22 bearing cap bolts in several steps, in the sequence shown.

Torque:

7.5 N·m (76 kgf-cm, 66 in.-lbf) for bolt C

16 N·m (160 kgf-cm, 12 ft-lbf) for others

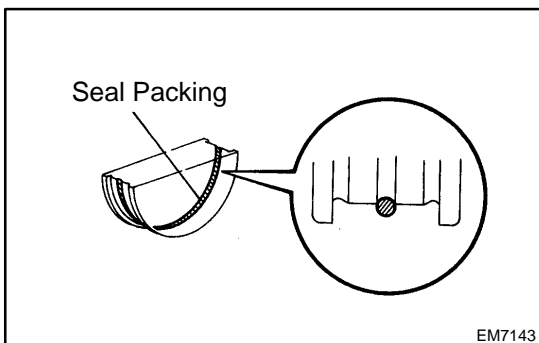


- (15) Remove the service bolt.

9. CHECK AND ADJUST VALVE CLEARANCE
(See page [EM-4](#))

Turn the camshaft so that the cam lobe faces upward, and check and adjust the valve clearance.

10. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE
(See page [SF-50](#))

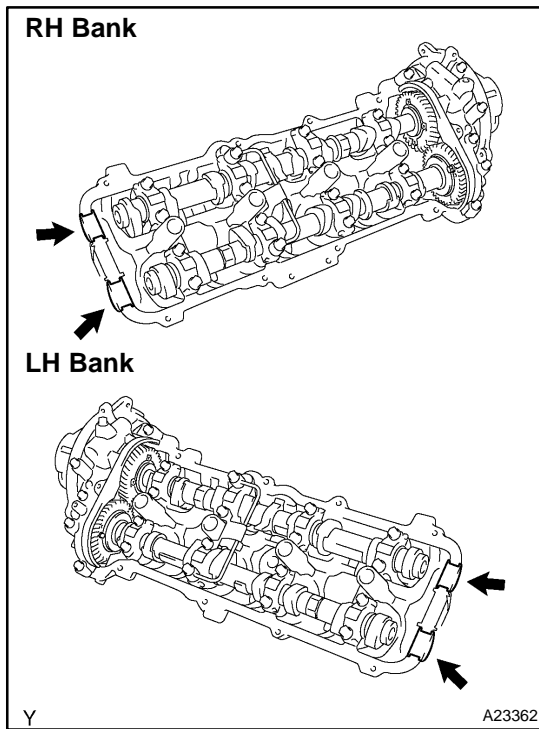
**11. INSTALL SEMI-CIRCULAR PLUGS**

(a) Remove any old packing material (FIPG).

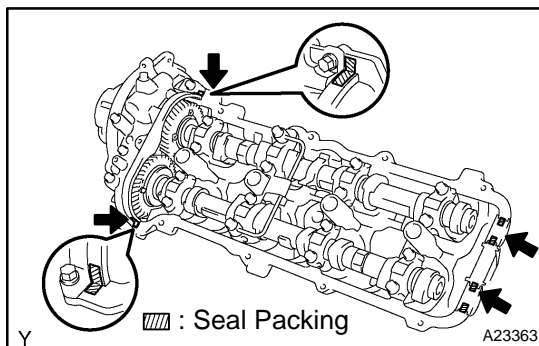
(b) Apply seal packing to the semi-circular plug grooves.

Seal packing:

Part No. 08826-00080 or equivalent



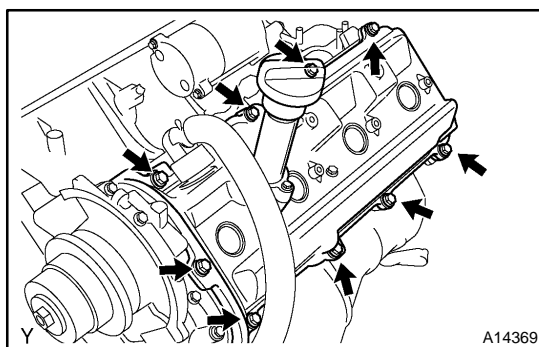
- (c) Install the 4 semi-circular plugs to the cylinder heads as shown in the illustration.



12. INSTALL LH CYLINDER HEAD COVER

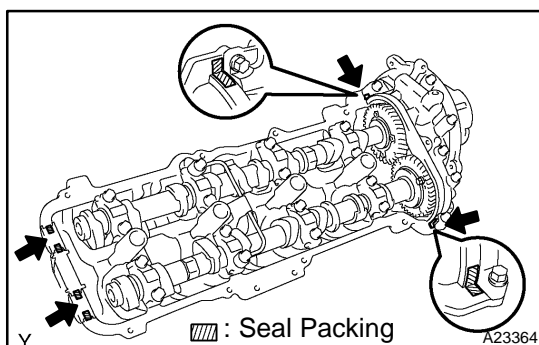
- (a) Remove any old packing material (FIPG).
 (b) Apply seal packing to the cylinder heads as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent



- (c) Install the gasket to the cylinder head cover.
 (d) Install the seal washer to the bolt.
 (e) Install the cylinder head cover with the 9 bolts. Uniformly tighten the bolts in several steps.

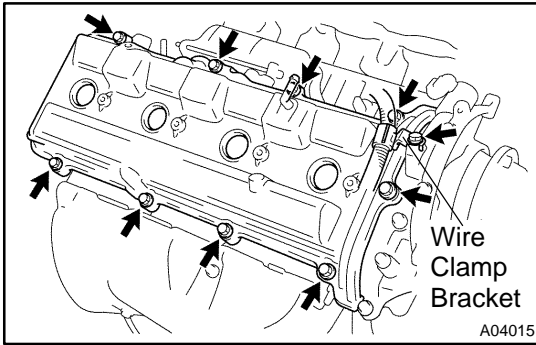
Torque: 6.0 N·m (60 kgf·cm, 53 in.-lbf)



13. INSTALL RH CYLINDER HEAD COVER

- (a) Remove any old packing material (FIPG).
 (b) Apply seal packing to the cylinder heads as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent



- (c) Install the gasket to the cylinder head cover.
- (d) Install the seal washer to the bolt.
- (e) Install the cylinder head cover with the 9 bolts. Uniformly tighten the bolts in several steps. Install the 2 cylinder head covers.

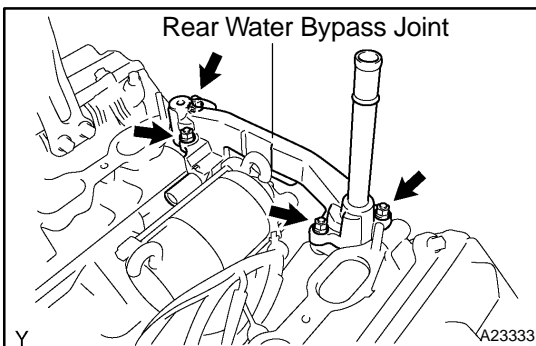
Torque: 6.0 N·m (60 kgf·cm, 53 in.-lbf)

- (f) Install the wire clamp bracket on the engine wire to the camshaft bearing cap.

14. INSTALL ENGINE HANGERS

Torque: 37 N·m (380 kgf·cm, 27 ft-lbf)

- 15. INSTALL VVT SENSORS (See page [SF-79](#))
- 16. INSTALL OIL DIPSTICK AND GUIDE FOR ENGINE
- 17. INSTALL OIL DIPSTICK AND GUIDE FOR A/T
- 18. INSTALL IGNITION COILS (See page [IG-6](#))



19. INSTALL REAR WATER BYPASS JOINT

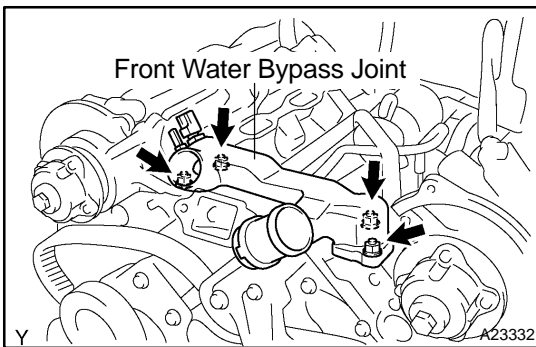
- (a) Install 2 new gaskets to the cylinder head.
- (b) Install the the water bypass joint with the 4 nuts to the cylinder heads. Alternately tighten the nuts.

Torque: 18 N·m (185 kgf·cm, 13 ft-lbf)

20. INSTALL NO.2 AIR SWITCHING VALVES

(See page [EC-27](#))

21. INSTALL AIR PUMP ASSEMBLY (See page [EC-27](#))

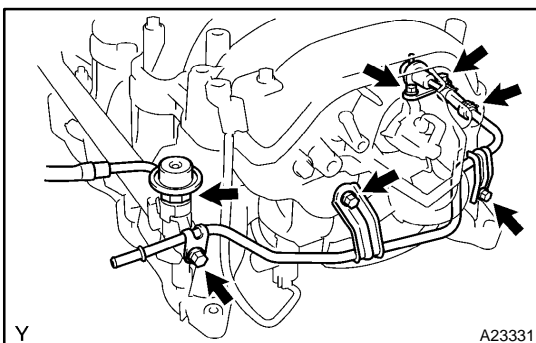


22. INSTALL FRONT WATER BYPASS JOINT

Install 2 new gaskets and the water bypass joint with the 4 nuts. Alternately tighten the nuts.

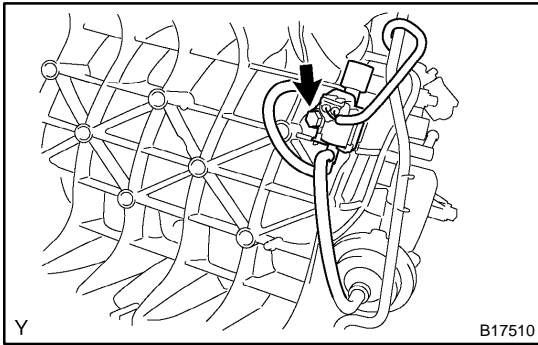
Torque: 18 N·m (185 kgf·cm, 13 ft-lbf)

23. INSTALL WATER INLET AND INLET HOUSING ASSEMBLY (See page [CO-8](#))

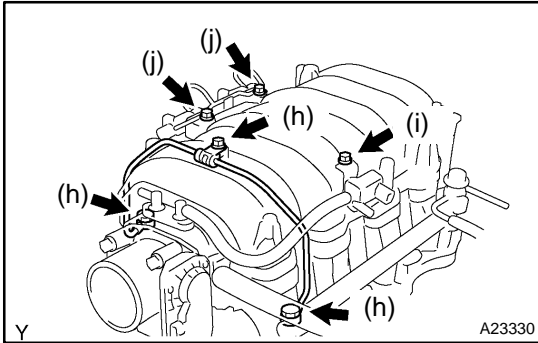


24. ASSEMBLE INTAKE MANIFOLDS

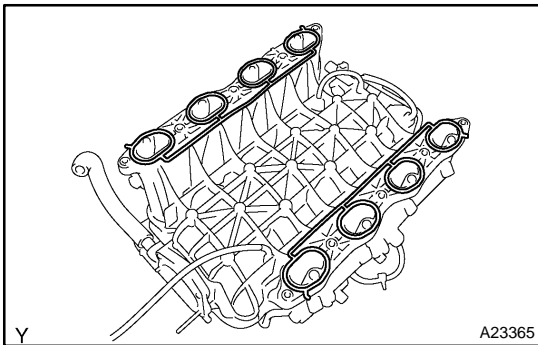
- (a) Install the 2 delivery pipes and 8 injectors (see page [SF-31](#)).
- (b) Install 2 new gaskets and fuel pulsation damper.
- (c) Install a new O-ring and fuel pressure regulator with the 2 bolts.
- (d) Install the fuel return pipe to the intake manifold with the 3 bolts.
- (e) Connect the fuel return hose to the fuel pressure regulator.



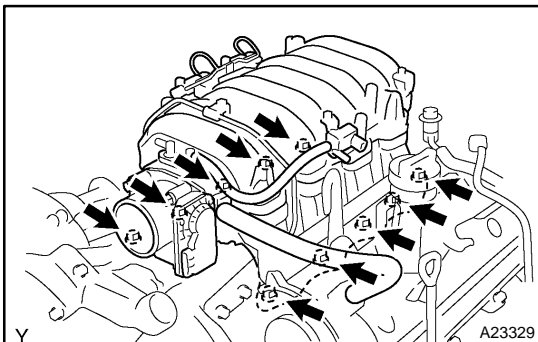
- (f) Install the VSV for ACIS with the bolt.
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)
- (g) Install the throttle body (See page [SF-45](#)).



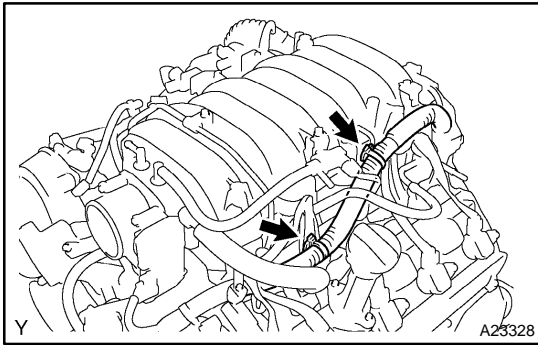
- (h) Install 4 new gaskets and front fuel pipe with the bolt and 2 unions to the intake manifold.
Torque:
39 N·m (400 kgf·cm, 29 ft·lbf) for union bolts
7.5 N·m (80 kgf·cm, 66 in.-lbf) for bolt
- (i) Install the VSV for EVAP with the bolt to the intake manifold and connect the EVAP hose.
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)
- (j) Install the 2 VSVs for air injection system with the 2 bolts.
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)



- 25. INSTALL INTAKE MANIFOLD ASSEMBLY**
- (a) Place 2 new gaskets on the intake manifold.



- (b) Place the intake manifold assembly on the cylinder heads.
- (c) Install and uniformly tighten the 6 bolts and 4 nuts in several steps.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



- (d) Install the throttle body cover bracket to the intake manifold.

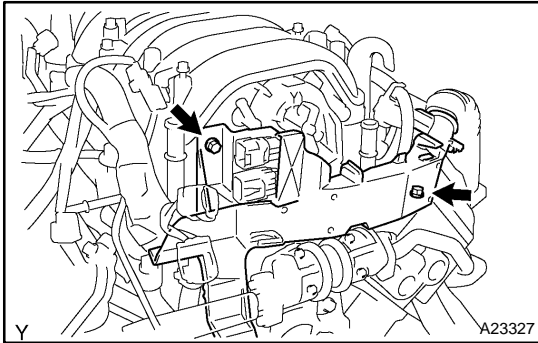
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

- (e) Install the wire bracket to the intake manifold with the bolt.

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

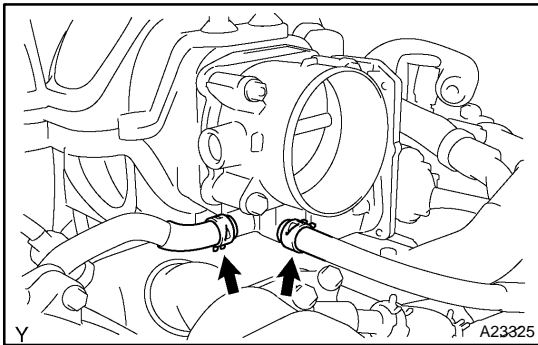
- (f) Connect the engine wire to the engine hanger and wire bracket.

- (g) Install the engine wire to the LH No.1 timing belt rear plate.

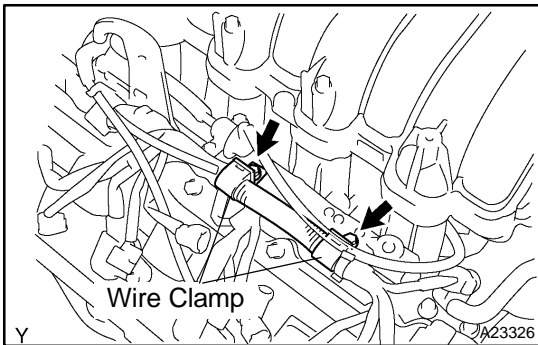


- (h) Connect the wire protector to the intake manifold and cylinder heads with the 2 bolts.

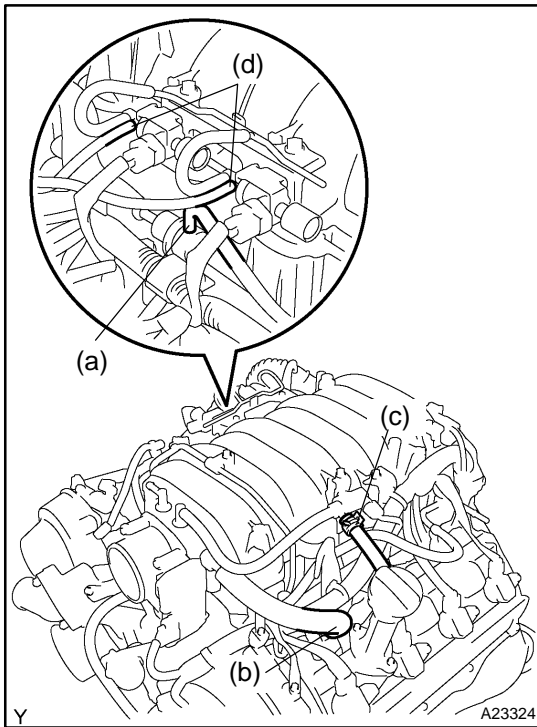
- (i) Install the 2 ground cables with the 2 bolts to the RH and LH cylinder heads.



- (j) Connect the 2 water bypass hoses to the throttle body.



- (k) Connect the 2 wire clamps to the wire clamp bracket on the RH delivery pipe.

**26. CONNECT HOSES TO INTAKE MANIFOLD**

- (a) Connect the vacuum hose to the fuel pressure regulator.
- (b) Connect the PCV hose to the PCV valve on the LH the cylinder head.
- (c) Connect the EVAP hose (from charcoal canister) to the VSV for EVAP.
- (d) Connect the 2 vacuum hoses to the VSV for the air injection system.
- (e) Connect the brake booster tube.

27. CONNECT CONNECTORS TO INTAKE MANIFOLD

- (a) Connect the throttle control connector.
- (b) Connect the 2 VSV connectors for the air injection system.
- (c) Connect the VSV connector for the EVAP.
- (d) Connect the 8 injector connectors.
- (e) Connect the ECT sensor connector.
- (f) Connect the 2 air fuel ratio sensor connectors.

28. CONNECT FUEL INLET HOSE (See page SF-31) AND FUEL RETURN HOSE**29. INSTALL TIMING BELT REAR PLATES**

- (a) Install the RH No.1 timing belt rear plates.
Install the RH No.1 timing belt rear plates to the cylinder head with the 3 bolts and stud bolt.

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

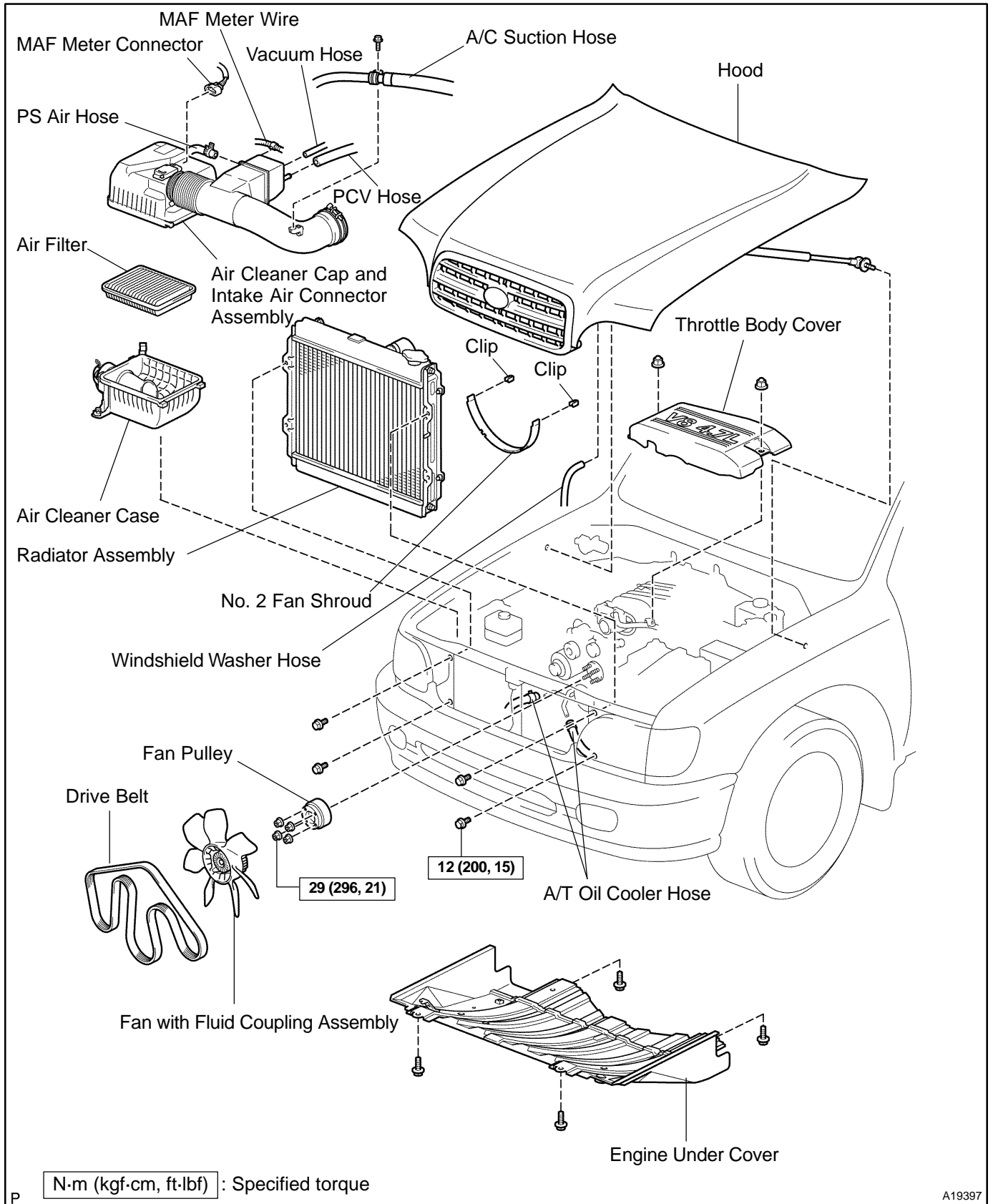
- (b) Install the LH No.1 timing belt rear plates.
 - (1) Connect the wire clamp to the No.1 timing belt rear plate.
 - (2) Install the LH No.1 timing belt rear plates to the cylinder head with the 3 bolts and stud bolt.

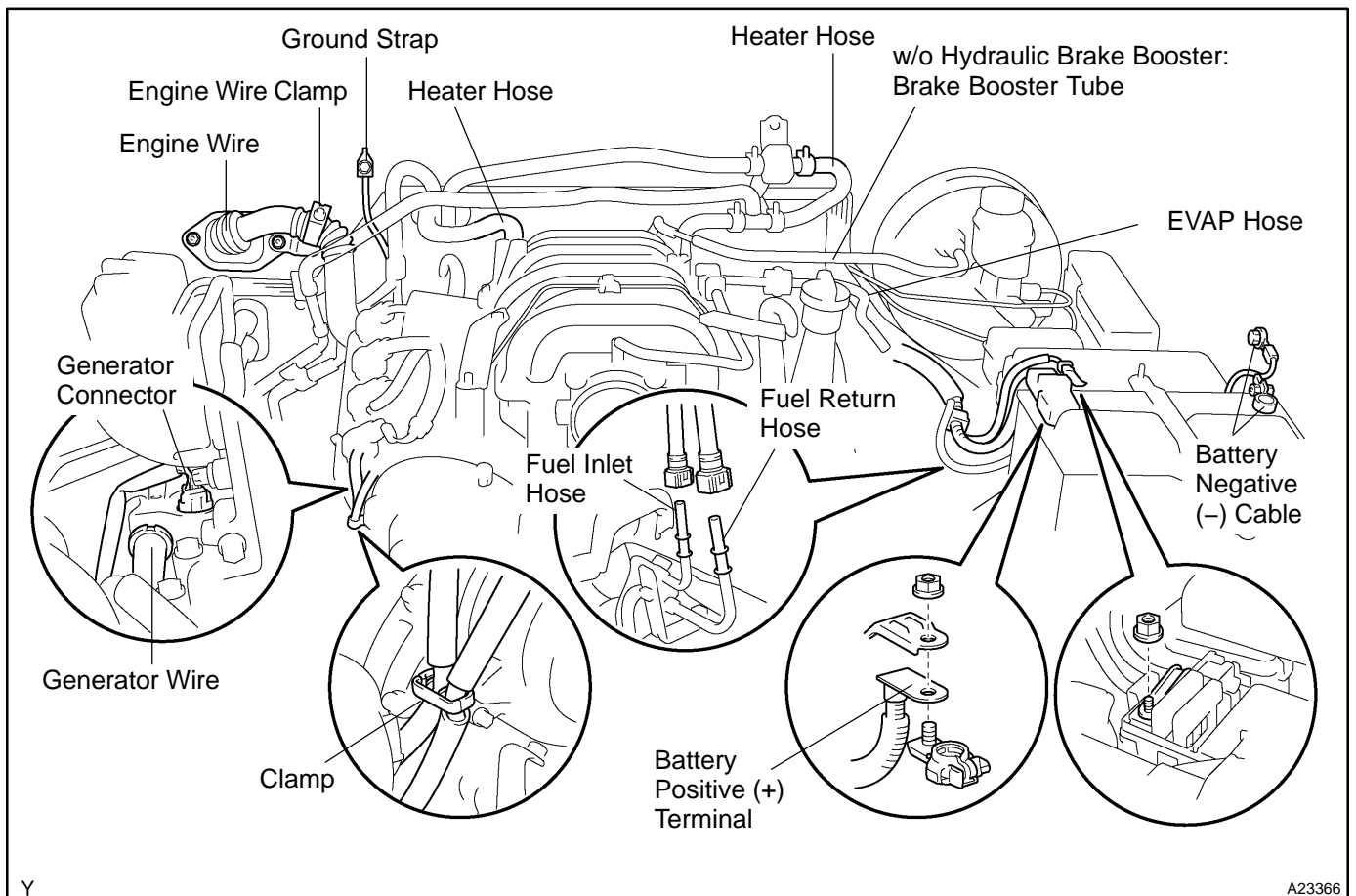
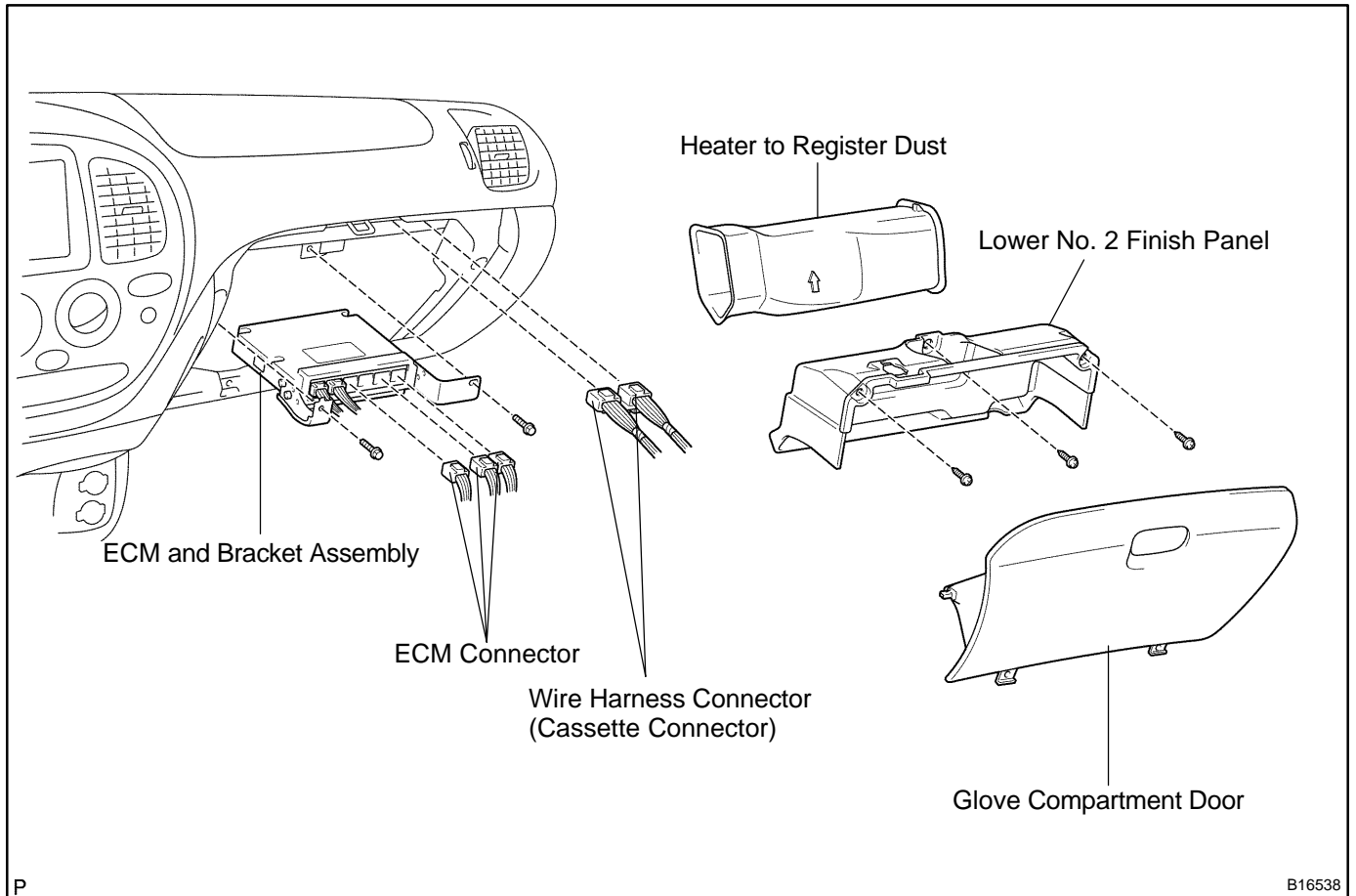
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

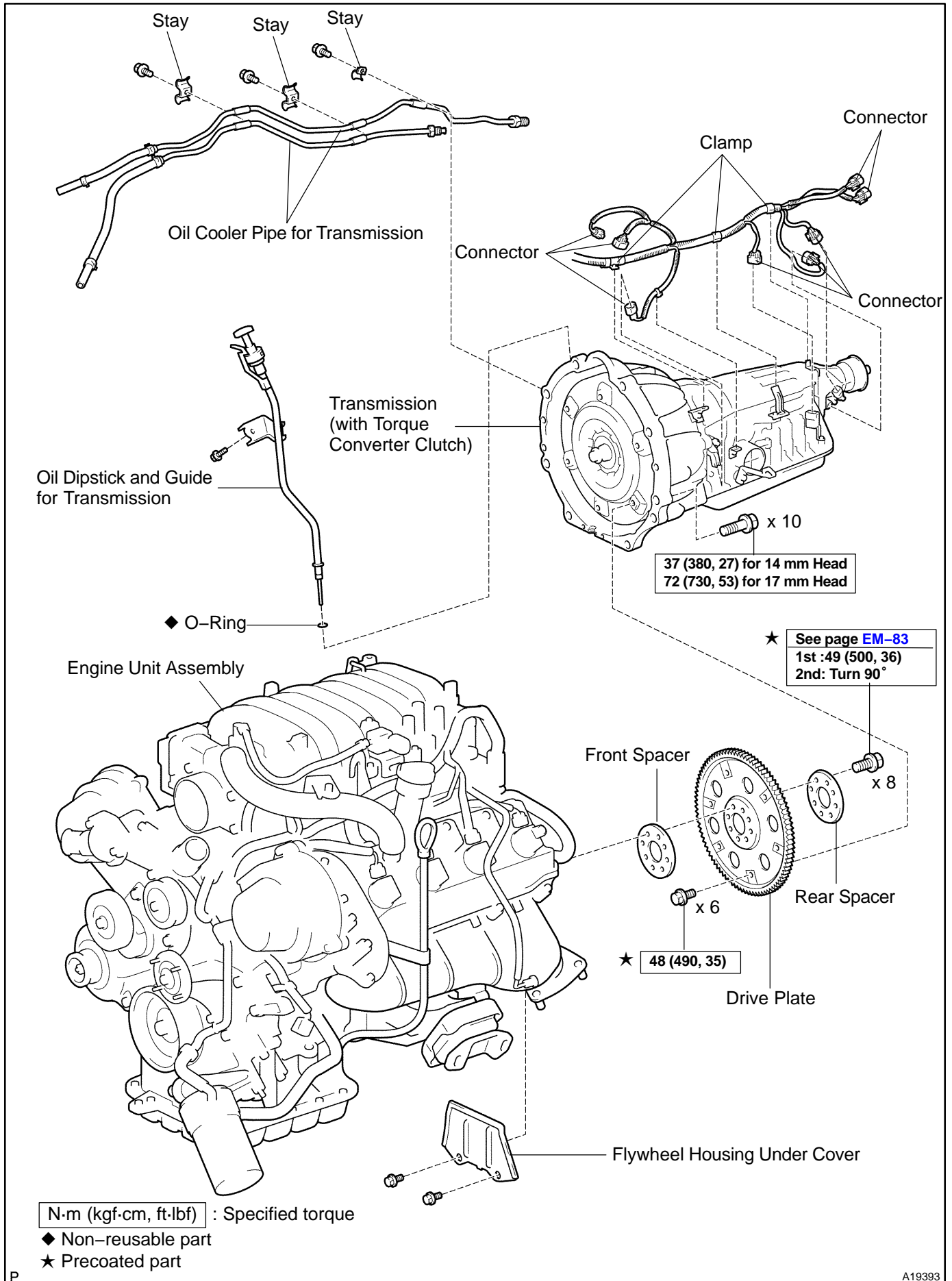
30. INSTALL THROTTLE BODY COVER**31. INSTALL IGNITION COILS (See page IG-6)****32. INSTALL OIL DIPSTICK AND GUIDE FOR A/T****33. INSTALL FRONT EXHAUST PIPE (See page EM-127)****34. INSTALL PS PUMP (See page EM-83)****35. INSTALL CAMSHAFT POSITION SENSOR (See page IG-9)****36. INSTALL CAMSHAFT TIMING PULLEYS (See page EM-23)****37. CONNECT TIMING BELT TO CAMSHAFT TIMING PULLEYS (See page EM-23)****38. CHECK ENGINE OIL LEVEL**

ENGINE UNIT (2WD) COMPONENTS

EM11Z-08

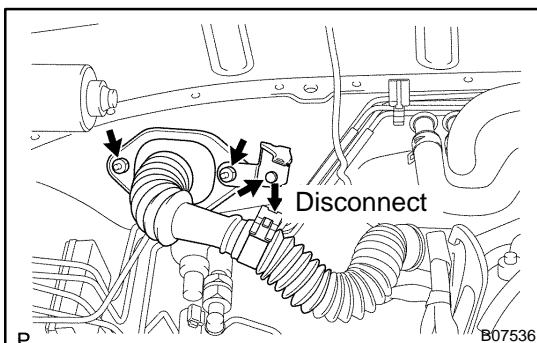






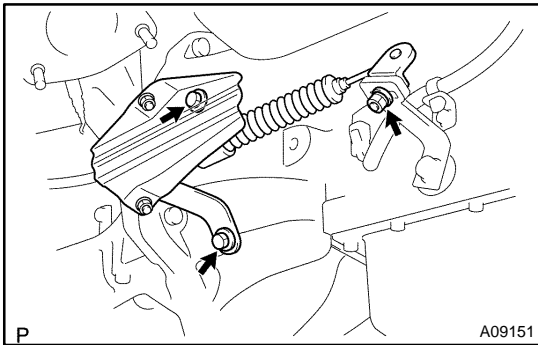
REMOVAL

1. REMOVE ENGINE HOOD
2. REMOVE ENGINE UNDER COVER
3. DRAIN ENGINE COOLANT
4. REMOVE RADIATOR ASSEMBLY (See page [CO-17](#))
5. REMOVE THROTTLE BODY COVER
6. REMOVE AIR CLEANER AND INTAKE AIR CONNECTOR ASSEMBLY
 - (a) Disconnect the MAF meter connector.
 - (b) Loosen the 3 bolts, and remove the air cleaner case.
 - (c) Remove the A/C suction hose from the intake air connector.
 - (d) Disconnect the PS air hose, air inlet hose for EVAP, PCV hose and MAF meter wire from the air intake connector.
 - (e) Disconnect the intake air connector from the throttle body.
7. DISCONNECT BATTERY CABLES
 - (a) Disconnect the clamp on battery negative (-) cable from the No. 2 relay box.
 - (b) Disconnect the battery positive (+) terminal cable.
 - (c) Disconnect battery negative (-) cable from the left fender apron.
8. REMOVE DRIVE BELT, FAN, FLUID COUPLING AND FAN PULLEY
 - (a) Loosen the 4 nuts holding the fluid coupling to the fan bracket.
 - (b) Remove the drive belt (See page [CH-7](#) or [CH-19](#)).
 - (c) Remove the 4 nuts, the fan, fluid coupling assembly and fan pulley.
9. DISCONNECT ENGINE WIRE FROM CABIN
 - (a) Remove the glove compartment door.
 - (b) Remove the lower No. 2 panel.
 - (c) Remove the 3 screws, and disconnect the ECM from the body bracket.
 - (d) Disconnect the 3 wire harness connectors from the ECM.
 - (e) Disconnect the 2 wire harness connectors (cassette connector).

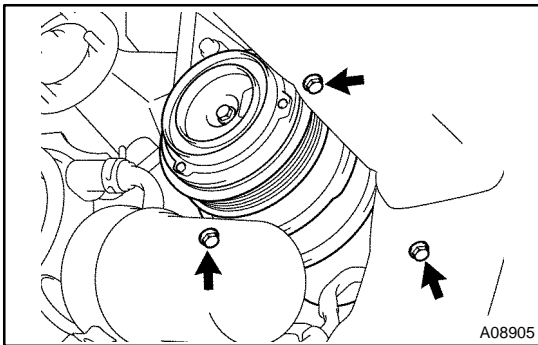


- (f) Disconnect the engine wire from the engine wire bracket and remove the bolt, 2 nuts and bracket.
- (g) Pull out the engine wire from the cowl panel.
10. DISCONNECT HOSES, WIRES, CONNECTORS, CLAMPS, GROMMET AND CABLES
 - (a) Disconnect the 2 PS air hoses from hose clamp on the No. 3 RH timing belt cover.
 - (b) Disconnect the generator wire.
 - (c) Disconnect the generator connector.
 - (d) Disconnect the hose clamp for the PS air hose.

- (e) Disconnect the PS air hose from the upper intake manifold.
 - (f) Disconnect the 2 heater hoses.
 - (g) Disconnect the ground strap from the cowl panel.
 - (h) Disconnect the fuel inlet hose and clamps.
 - (i) Disconnect the fuel return hose and clamp.
 - (j) Disconnect the air inlet hose from the charcoal canister.
 - (k) Disconnect the EVAP hose from the VSV for EVAP.
 - (l) w/o Hydraulic brake booster:
Disconnect the brake booster tube.
11. **REMOVE FRONT EXHAUST PIPES** (See page [EM-125](#))
 12. **REMOVE PROPELLER SHAFT** (See page [PR-3](#))
 13. **REMOVE FRONT STABILIZER BAR** (See page [SA-89](#))
 14. **DISCONNECT POWER STEERING GEAR PIPES**
Disconnect the pressure feed tube, turn tube and pressure tubes from the PS gear assembly (See page [SR-73](#)).



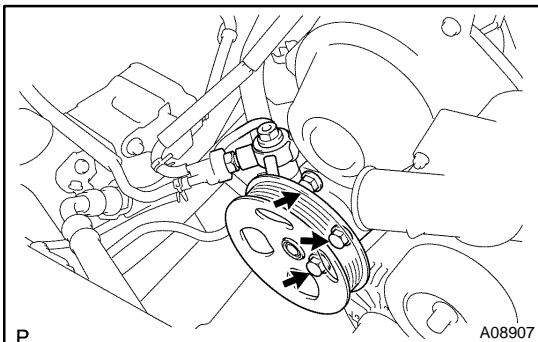
15. **REMOVE TRANSMISSION CONTROL CABLE**
 - (a) Remove the 2 bolts and control cable bracket from the transmission.
 - (b) Remove the control cable from the control shift lever.



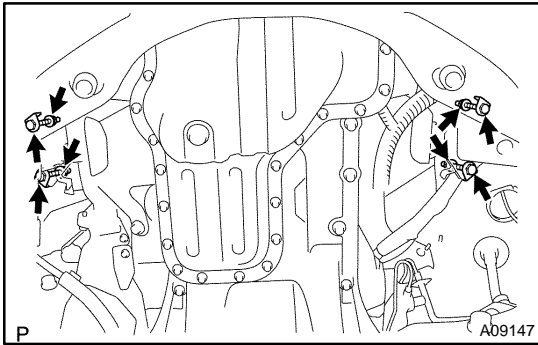
16. **DISCONNECT A/C COMPRESSOR FROM ENGINE**
 - (a) Disconnect the A/C compressor connector.
 - (b) Remove the 3 bolts, and disconnect the A/C compressor from the engine.

HINT:

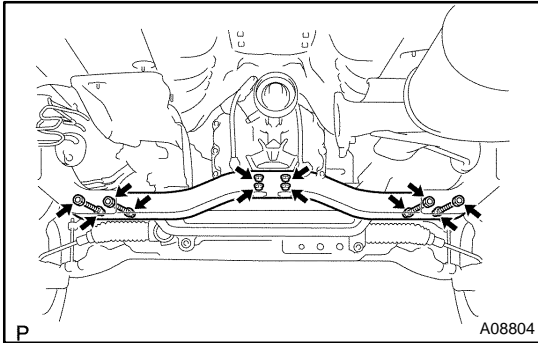
Suspend the A/C compressor securely.



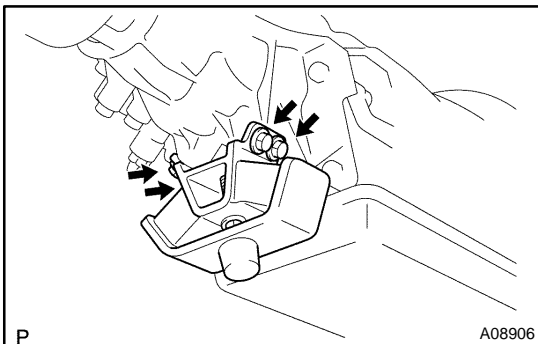
17. **DISCONNECT PS PUMP FROM ENGINE**
Remove the 3 bolts, and disconnect the PS pump from the engine.
HINT:
Suspend the PS pump securely.

**18. REMOVE ENGINE MOUNTING BRACKETS**

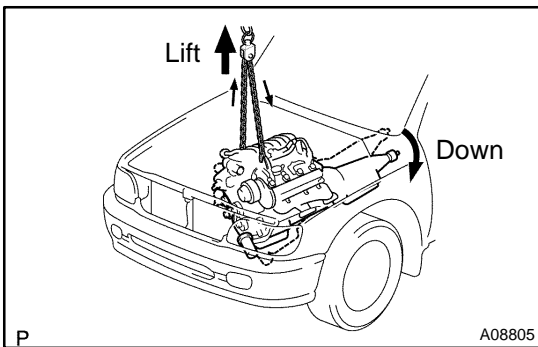
- (a) Attach the engine chain hoist to the engine hangers.
- (b) Remove the 4 nuts and 4 bolts holding the engine mounting brackets to the frame brackets.

19. PLACE JACK UNDER TRANSMISSION**20. REMOVE ENGINE REAR MOUNTING BRACKET**

- (a) Remove the 8 bolts, 2 nuts and frame crossmember.



- (b) Remove the 4 bolts and engine rear mounting bracket from the transmission.

**21. REMOVE ENGINE AND TRANSMISSION ASSEMBLY FROM VEHICLE**

- (a) Lift the engine out of the vehicle slowly and carefully.

HINT:

Make sure the engine is clear of all wiring, hoses and cables.

- (b) Place the engine and transmission assembly onto the stand.

22. DISCONNECT ENGINE WIRE FROM TRANSMISSION

- (a) Disconnect the 5 connectors.
- (b) Disconnect the 2 wire clamps.

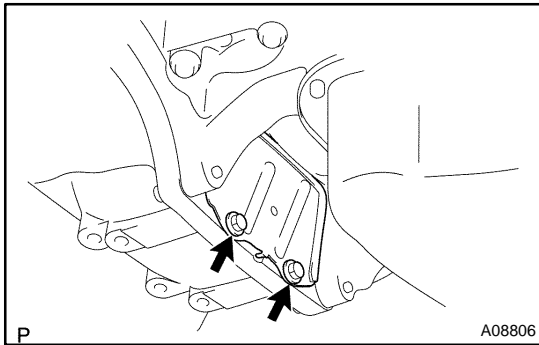
23. REMOVE OIL DIPSTICK GUIDE AND DIPSTICK FOR TRANSMISSION

- (a) Disconnect the 2 breather hoses from the dipstick guide.
- (b) Remove the 2 bolts.
- (c) Pull out the dipstick guide and dipstick from the dipstick tube of transmission.
- (d) Remove the O-ring from the dipstick guide.

24. REMOVE OIL COOLER PIPES FOR TRANSMISSION

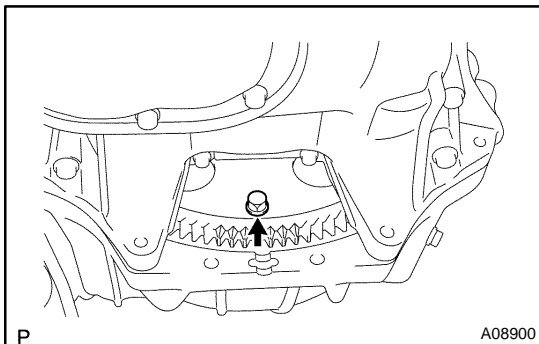
- (a) Remove the 3 bolts and 3 stays.

- (b) Loosen the 2 union nuts, and remove the 2 oil cooler pipes.

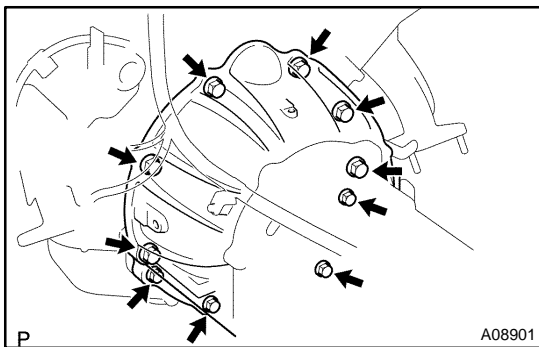


25. REMOVE TORQUE CONVERTER CLUTCH BOLTS

- (a) Remove the 2 bolts and flywheel housing under cover.

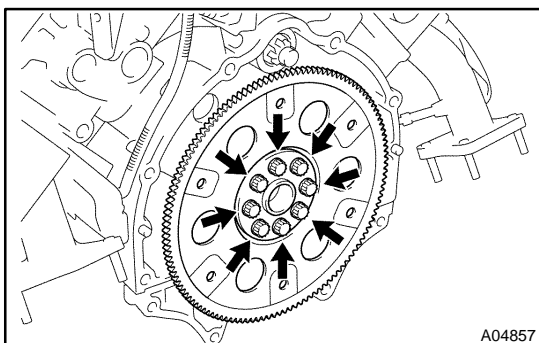


- (b) Turn the crankshaft pulley bolt to gain access to each bolt.
 (c) Hold the crankshaft pulley bolt with a wrench, and remove the 6 bolts.



26. REMOVE TRANSMISSION

- (a) Remove the 10 bolts.
 (b) Remove the transmission together with the torque converter clutch from the engine.



27. REMOVE DRIVE PLATE

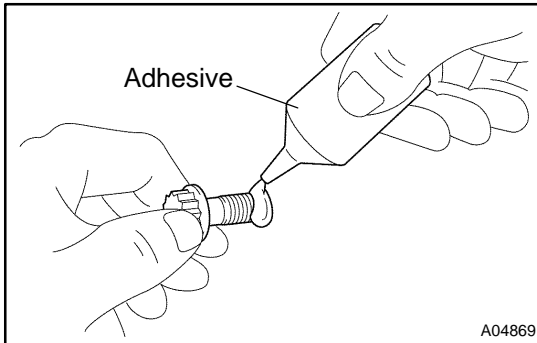
- Remove the 8 bolts, front spacer, drive plate and rear spacer.

INSTALLATION

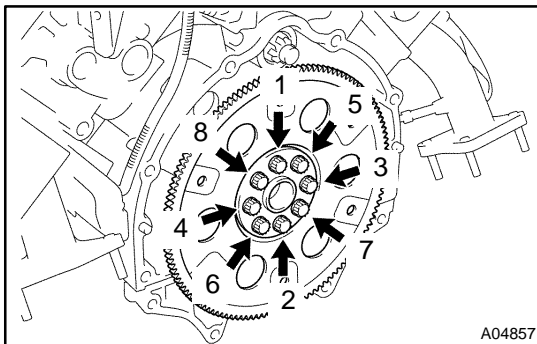
1. INSTALL DRIVE PLATE

HINT:

- The mounting bolts are tightened in 2 progressive steps (steps (c) and (e)).
- If any one of the mounting bolts is broken or deformed, replace it.

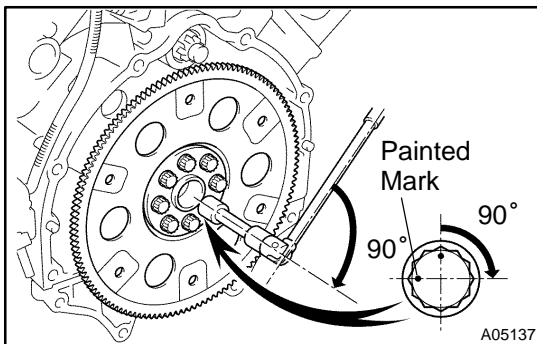


- (a) Apply adhesive to 2 or 3 threads of the mounting bolt end.
Adhesive:
Part No. 08833-00070, THREE BOND 1324 or equivalent

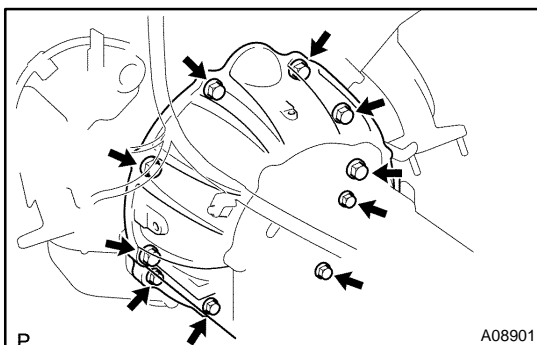


- (b) Install the front spacer, drive plate and rear spacer on the crankshaft.
 (c) Install and uniformly tighten the 8 mounting bolts in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf-cm, 36 ft-lbf)

If any one of the mounting bolts does not meet the torque specification, replace the mounting bolt.



- (d) Mark the mounting bolt with paint.
 (e) Retighten the mounting bolts by 90° in the numerical order shown.
 (f) Check that the painted mark is now at a 90° angle to (e).



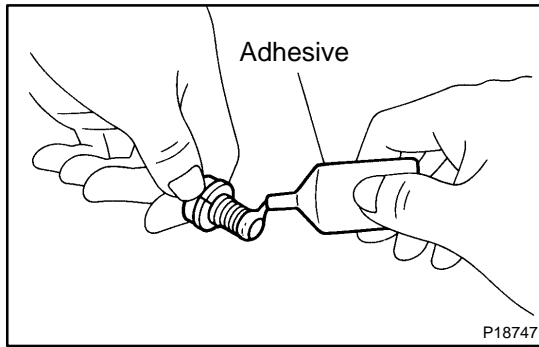
2. INSTALL TRANSMISSION TO ENGINE

- (a) Check the torque converter clutch installation (See page [AT-38](#)).
 (b) Attach the transmission to the engine.
 (c) Install the 10 bolts.

Torque:

37 N·m (380 kgf-cm, 27 ft-lbf) for 14 mm head

72 N·m (730 kgf-cm, 53 ft-lbf) for 17 mm head

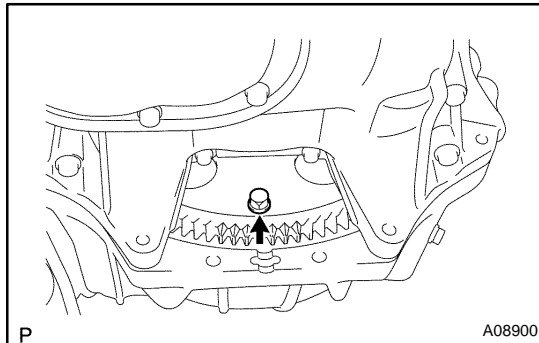


3. INSTALL TORQUE CONVERTER CLUTCH BOLTS

- (a) Apply adhesive to 2 or 3 threads of the bolt end.

Adhesive:

Part No. 08833-00070, THREE BOND 1324 or equivalent

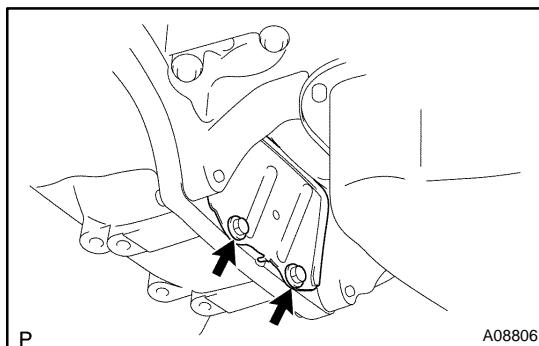


- (b) Hold the crankshaft pulley bolt with a wrench, and install the 6 bolts evenly.

Torque: 48 N·m (490 kgf-cm, 35 ft-lbf)

HINT:

First install the black colored bolt, install the other bolts.



- (c) Install the flywheel housing under cover with the 2 bolts.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

4. INSTALL OIL COOLER PIPE FOR TRANSMISSION

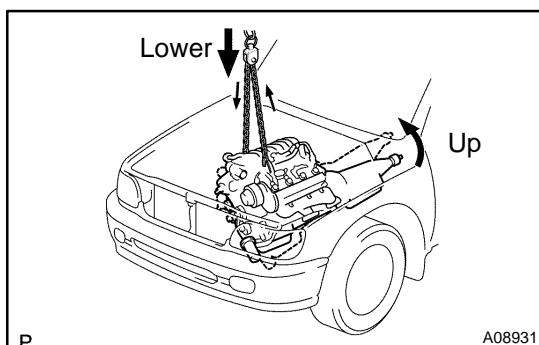
5. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK FOR TRANSMISSION

- (a) Install a new O-ring to the dipstick guide.
 (b) Apply soapy water to the O-ring.
 (c) Connect the dipstick guide end to the dipstick tube of the oil pan.
 (d) Install the dipstick guide with the bolt.
 (e) Install the dipstick.

- (f) Connect the 2 breather hoses to the dipstick guide.

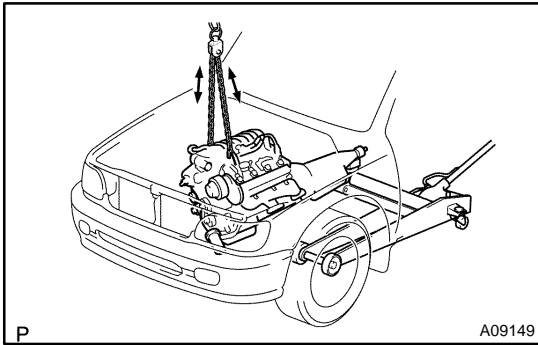
6. CONNECT ENGINE WIRE TO TRANSMISSION

- (a) Connect the 5 connectors.
 (b) Connect the 2 wire clamps.

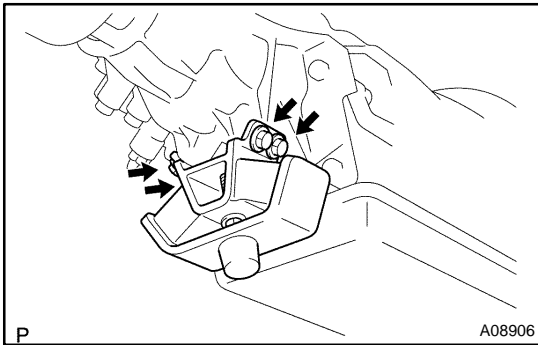


7. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

- (a) Attach the engine chain hoist to the engine hangers.
 (b) Slowly lower the engine and transmission assembly into the engine compartment.
 (c) Attach the engine mounting brackets to the frame brackets.



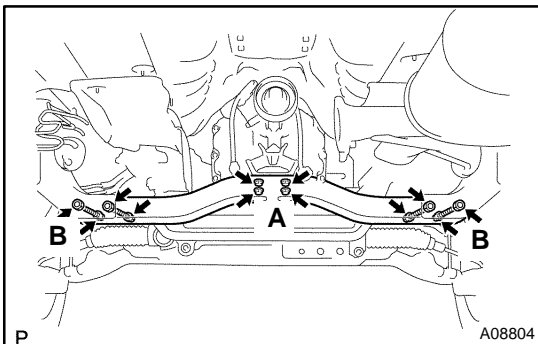
- (d) Keep the engine level with a jack.



8. INSTALL ENGINE REAR MOUNTING BRACKET

- (a) Install the engine rear mounting bracket to the transmission with the 4 bolts.

Torque: 65 N·m (663 kgf·cm, 48 ft·lbf)

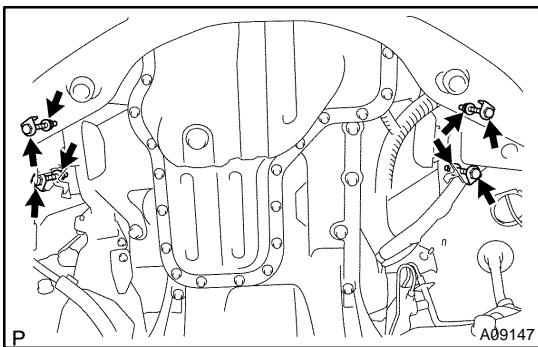


- (b) Install the frame crossmember with the 8 bolts and 4 nuts.

Torque:

18 N·m (183 kgf·cm, 13 ft·lbf) for bolts (A)

72 N·m (730 kgf·cm, 53 ft·lbf) for nuts (B)

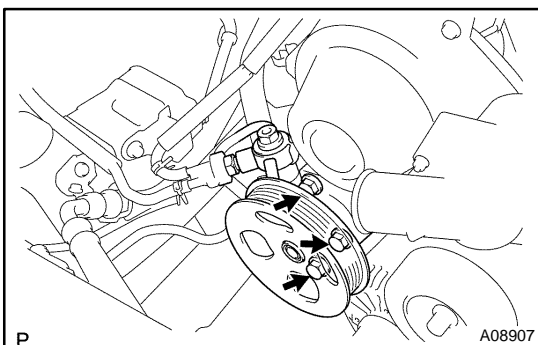


9. INSTALL ENGINE MOUNTING BRACKETS

- (a) Install the engine mounting brackets to the frame brackets with the 2 nuts and 4 bolts.

Torque: 38 N·m (388 kgf·cm, 28 ft·lbf)

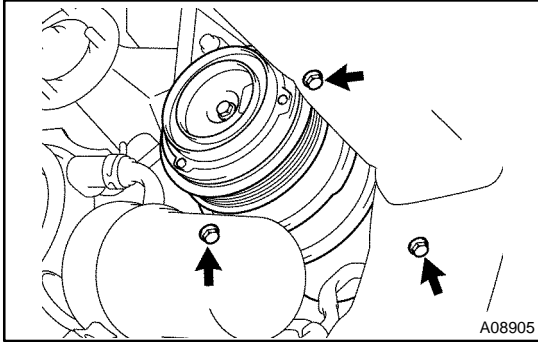
- (b) Remove the engine chain hoist.



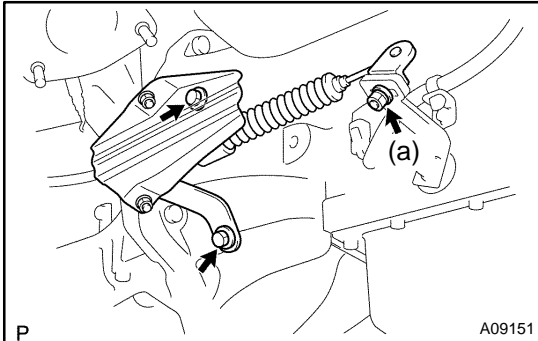
10. INSTALL PS PUMP

Install the PS pump with the 3 bolts.

Torque: 17 N·m (175 kgf·cm, 13 ft·lbf)

**11. INSTALL A/C COMPRESSOR**

- (a) Install the A/C compressor with the 3 bolts.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)
 (b) Connect the A/C compressor connector.

**12. INSTALL TRANSMISSION CONTROL CABLE**

- (a) Install the control cable to the control shift lever.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
 (b) Install the control cable bracket to the transmission with the 2 bolts.

13. CONNECT POWER STEERING GEAR PIPES

Connect the pressure feed tube, turn tube and turn pressure tubes to the PS gear assembly (See page [SR-88](#)).

14. INSTALL FRONT STABILIZER BAR

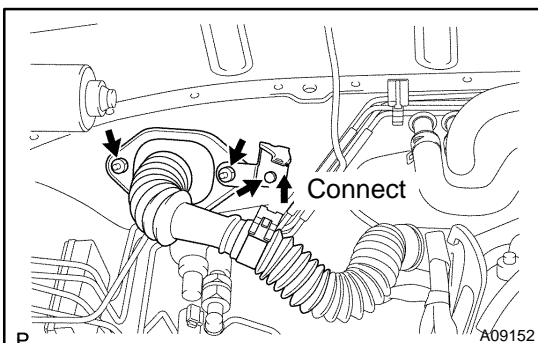
(See page [SA-91](#))

15. INSTALL PROPELLER SHAFT (See page [PR-8](#))**16. INSTALL FRONT EXHAUST PIPES**

(See page [EM-125](#))

17. CONNECT HOSES, WIRES, CONNECTORS, CLAMPS, GROMMET AND CABLES

- (a) Connect the 2 PS air hoses to hose clamp on the No. 3 RH timing belt cover.
 (b) Connect the generator wire.
 (c) Connect the generator connector.
 (d) Connect the hose clamp for the PS air hose.
 (e) Connect the PS air hose to the upper intake manifold.
 (f) Connect the 2 heater hoses.
 (g) Connect the ground strap connector.
 (h) Connect the fuel inlet hose and clamps.
 (i) Connect the fuel return hose and clamp.
 (j) Connect the air inlet hose to the charcoal canister.
 (k) Connect the EVAP hose to the VSV for EVAP.
 (l) w/o Hydraulic brake booster:
 Connect the brake booster tube.

**18. CONNECT ENGINE WIRE TO CABIN**

- (a) Push into the engine wire through the cowl panel.
 (b) Install the engine wire bracket with the 2 nuts and bolt and connect the engine wire to the bracket.
 (c) Connect the 2 wire harness connectors (cassette connector).
 (d) Connect the 3 connectors to the ECM.
 (e) Install the ECM with the 3 screws.
 (f) Install the lower No. 2 panel.
 (g) Install the glove compartment door.

19. INSTALL FAN PULLEY, FAN, FLUID COUPLING AND DRIVE BELT

- (a) Temporarily install the fan pulley, the fan and fluid coupling assembly with the 4 nuts.
- (b) Install the drive belt (See page [CH-16](#) or [CH-28](#)).
- (c) Tighten the 4 nuts holding the fluid coupling to the fan bracket.

20. INSTALL BATTERY CABLES

- (a) Connect the clamp on battery negative (-) cable to No.2 relay box.
- (b) Connect the battery positive (+) terminal cable.
- (c) Connect the battery negative cable to the left fender apron.

21. INSTALL AIR CLEANER AND INTAKE AIR CONNECTOR ASSEMBLY

- (a) Install the air cleaner with the 3 bolt.
Torque: 5 N·m (51 kgf·cm, 44 in.-lbf)
- (b) Connect the intake air connector to the throttle body.
- (c) Connect the MAF meter connector.
- (d) Install the A/C suction hose to the intake air connector.
- (e) Connect the PS air hose, air inlet hose for EVAP, PCV hose and MAF meter wire to the air intake connector.

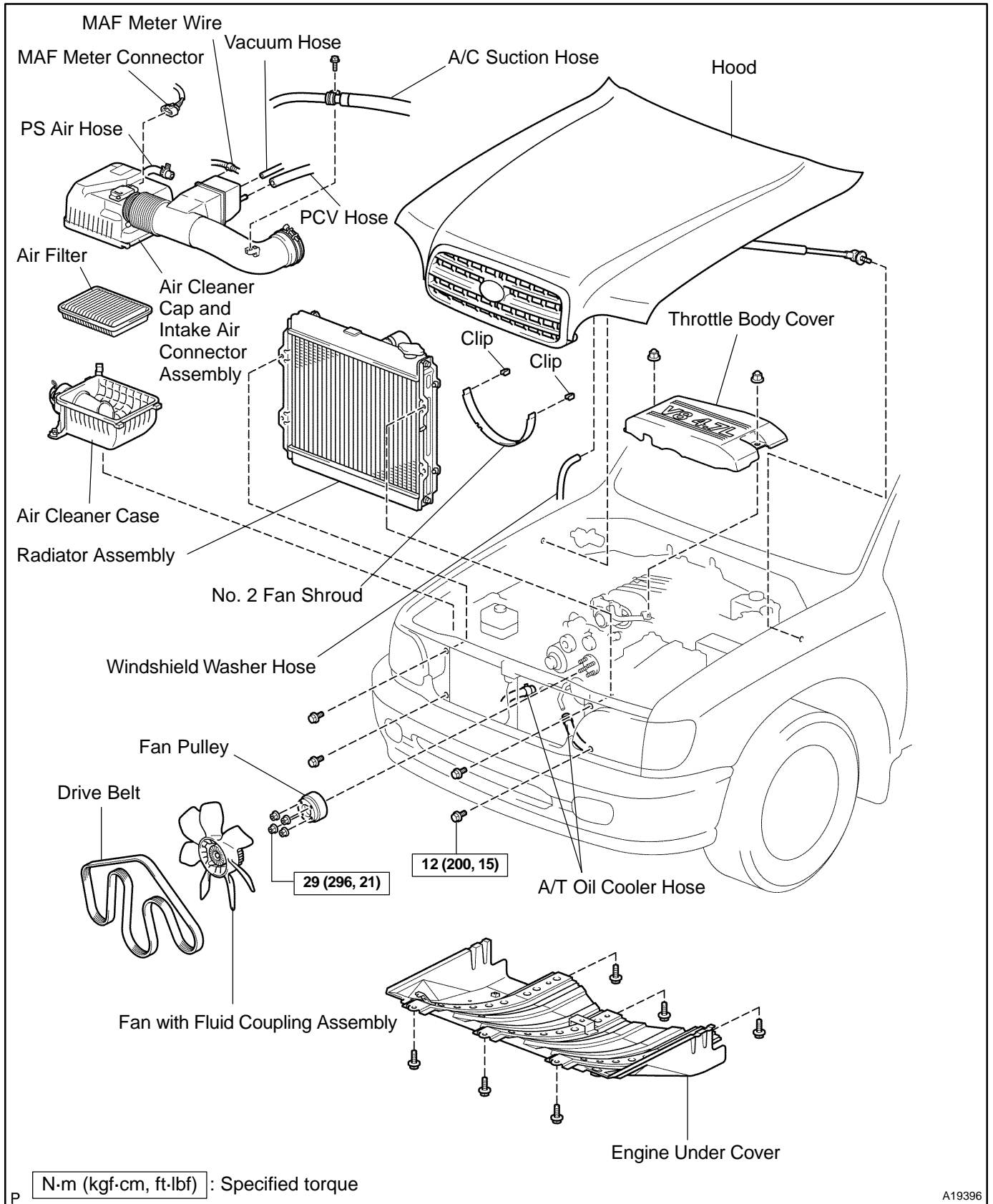
22. INSTALL THROTTLE BODY COVER**23. INSTALL RADIATOR ASSEMBLY (See page [CO-18](#))****24. FILL WITH ENGINE COOLANT (See page [CO-2](#))****25. FILL WITH ENGINE OIL (See page [LU-2](#))****26. START ENGINE AND CHECK FOR LEAKS****27. INSTALL ENGINE UNDER COVER****28. INSTALL HOOD****29. PERFORM ROAD TEST**

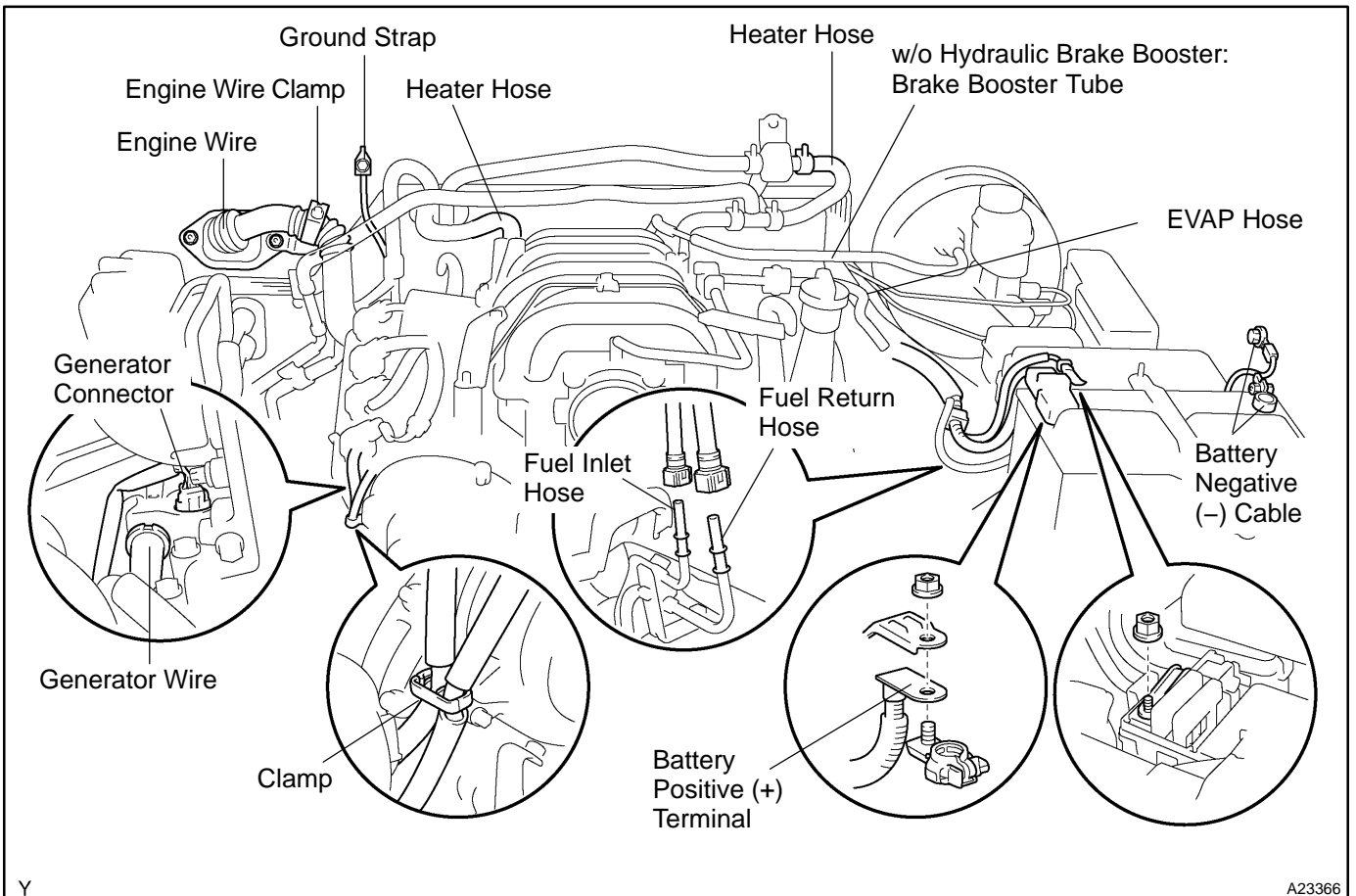
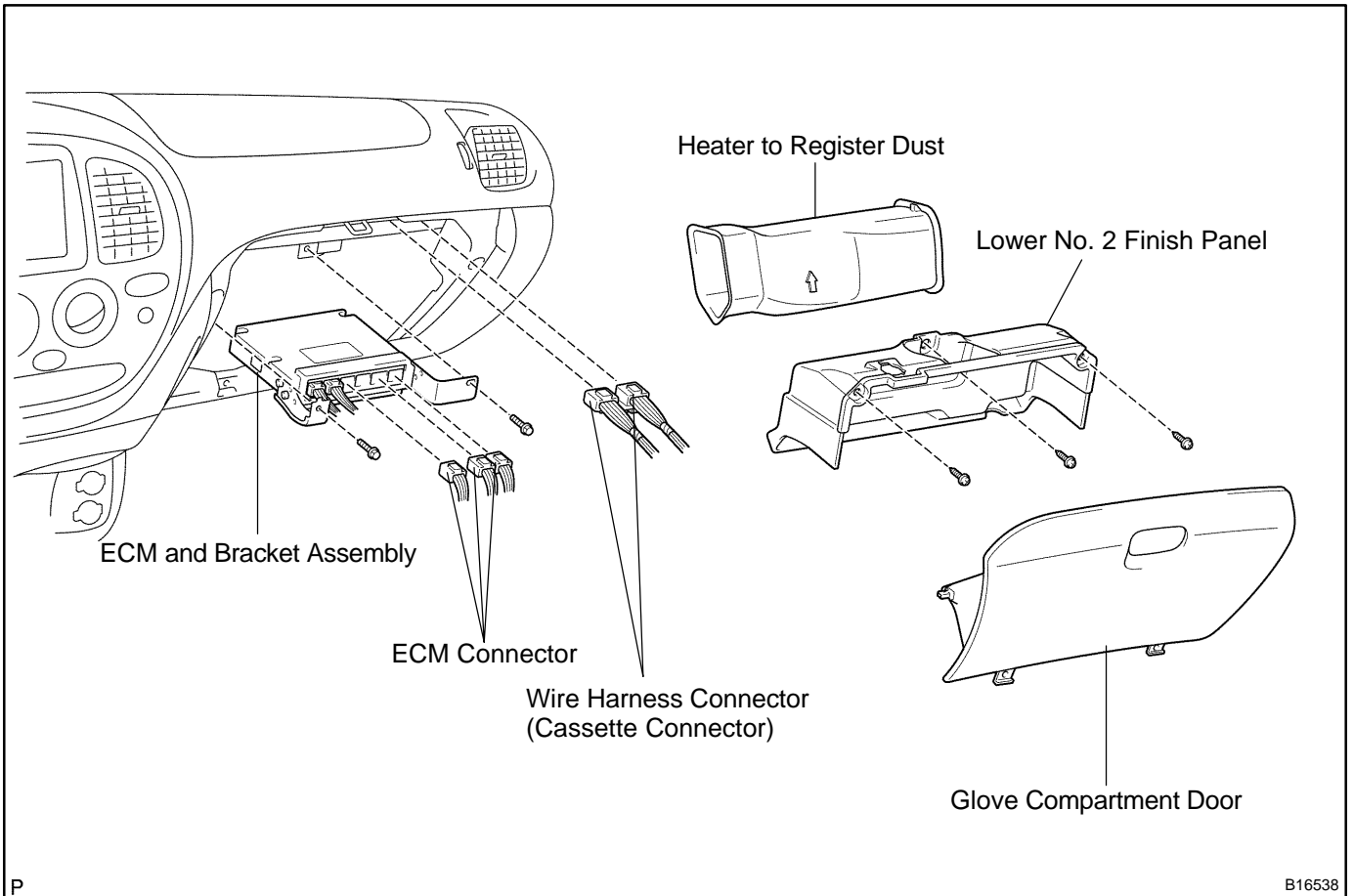
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

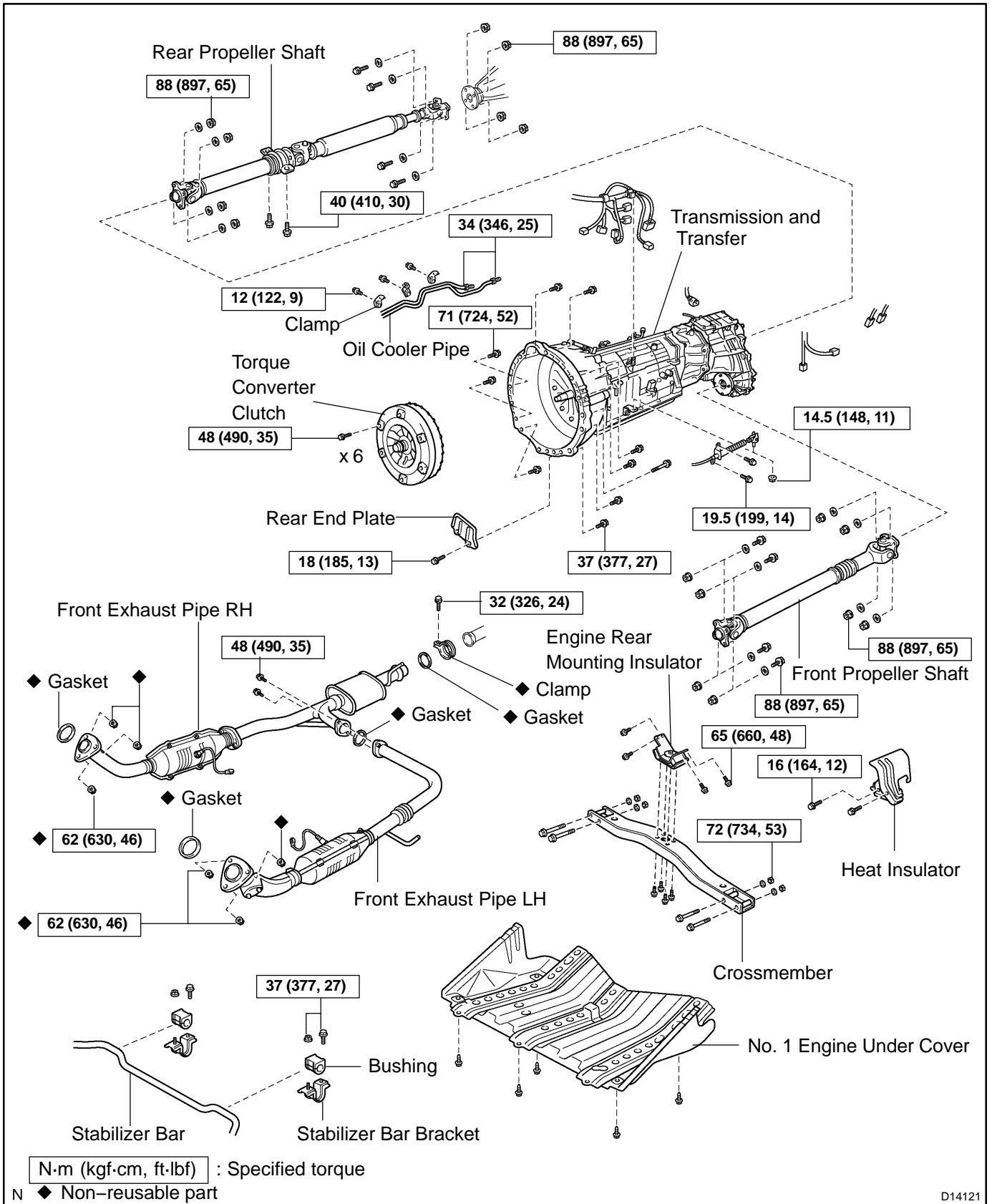
30. RECHECK ENGINE COOLANT AND OIL LEVELS

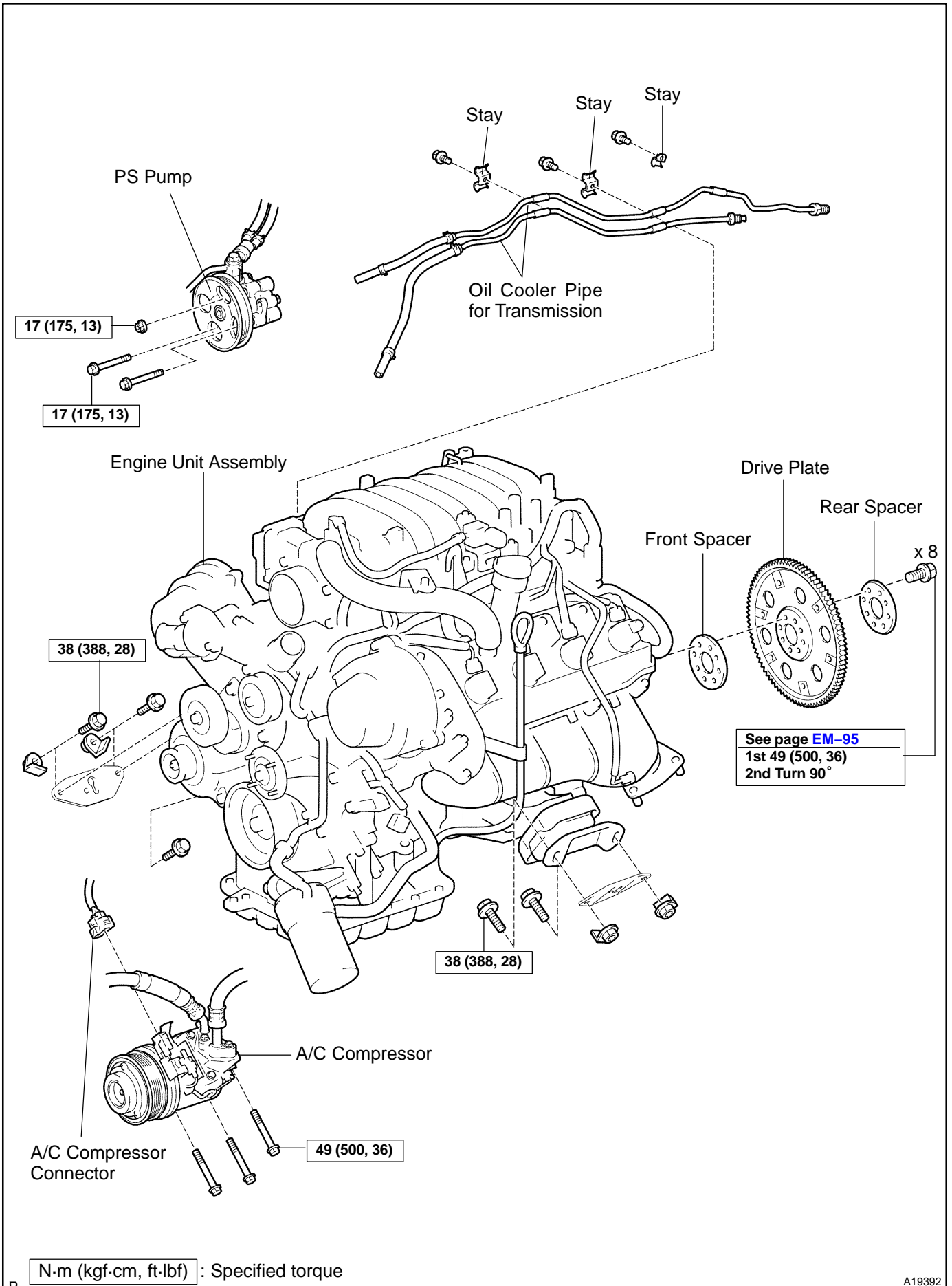
ENGINE UNIT (4WD) COMPONENTS

EM1XC-01



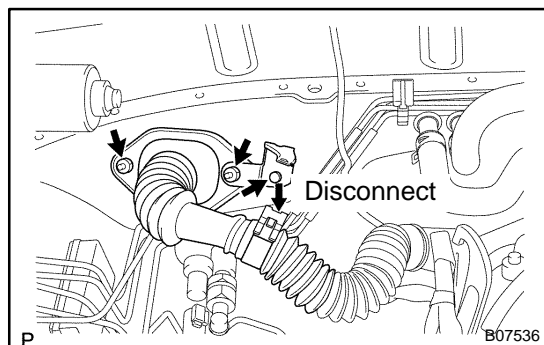






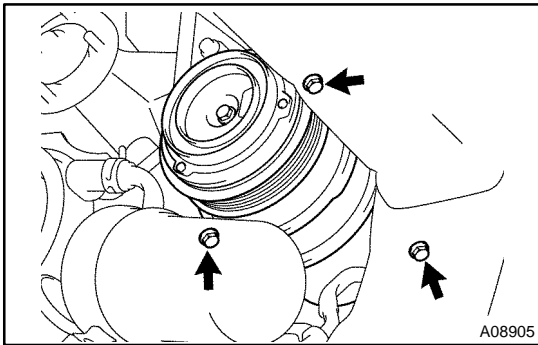
REMOVAL

1. REMOVE FRONT EXHAUST PIPES
(See page [EM-125](#))
2. REMOVE FRONT AND REAR PROPELLER SHAFTS
(See page [PR-10](#))
3. REMOVE FRONT STABILIZER BAR
(See page [SA-89](#))
4. REMOVE TRANSMISSION (See page [AT-34](#))
5. REMOVE ENGINE HOOD
6. REMOVE ENGINE UNDER COVER
7. DRAIN ENGINE COOLANT
8. REMOVE RADIATOR ASSEMBLY (See page [CO-17](#))
9. REMOVE THROTTLE BODY COVER
10. REMOVE AIR CLEANER AND INTAKE AIR CONNECTOR ASSEMBLY
 - (a) Disconnect the MAF meter connector.
 - (b) Loosen the 3 bolts, and remove the air cleaner case.
 - (c) Remove the A/C suction hose from the intake air connector.
 - (d) Disconnect the PS air hose, air inlet hose for EVAP, PCV hose and MAF meter wire from the air intake connector.
 - (e) Disconnect the intake air connector from the throttle body.
11. DISCONNECT BATTERY CABLES
 - (a) Disconnect the clamp on battery negative (-) cable from the No. 2 relay box.
 - (b) Disconnect the battery positive (+) terminal cable.
 - (c) Disconnect the battery negative (-) cable from the left fender apron.
12. REMOVE DRIVE BELT, FAN, FLUID COUPLING AND FAN PULLEY
 - (a) Loosen the 4 nuts holding the fluid coupling to the fan bracket.
 - (b) Remove the drive belt (See page [CH-7](#) or [CH-19](#)).
 - (c) Remove the 4 nuts, the fan, fluid coupling assembly and fan pulley.



13. DISCONNECT ENGINE WIRE FROM CABIN
 - (a) Remove the glove compartment door.
 - (b) Remove the lower No. 2 panel.
 - (c) Remove the 3 screws, and disconnect the ECM from the body bracket.
 - (d) Disconnect the 3 wire harness connectors from the ECM.
 - (e) Disconnect the 2 wire harness connectors (cassette connector).
 - (f) Disconnect the engine wire from the engine wire bracket and remove the 2 nuts, bolt and bracket.

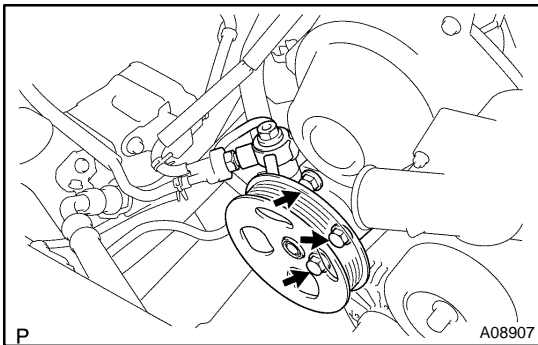
- (g) Pull out the engine wire from the cowl panel.
- 14. DISCONNECT HOSES, WIRES, CONNECTORS, CLAMPS, GROMMET AND CABLES**
- (a) Disconnect the accelerator cable from the engine.
- (b) Disconnect the 2 PS air hoses from hose clamp on the No. 3 RH timing belt cover.
- (c) Disconnect the generator wire.
- (d) Disconnect the generator connector.
- (e) Disconnect the hose clamp for the PS air hose.
- (f) Disconnect the PS air hose from the upper intake manifold.
- (g) Disconnect the 2 heater hoses.
- (h) Disconnect the ground strap from the cowl panel.
- (i) Disconnect the fuel inlet hose and clamps.
- (j) Disconnect the fuel return hose and clamp.
- (k) Disconnect the air inlet hose from the charcoal canister.
- (l) Disconnect the EVAP hose from the VSV for EVAP.
- (m) w/o Hydraulic brake booster:
Disconnect the brake booster tube.



- 15. DISCONNECT A/C COMPRESSOR FROM ENGINE**
- (a) Disconnect the A/C compressor connector.
- (b) Remove the 3 bolts, and disconnect the A/C compressor from the engine.

HINT:

Suspend the A/C compressor securely.

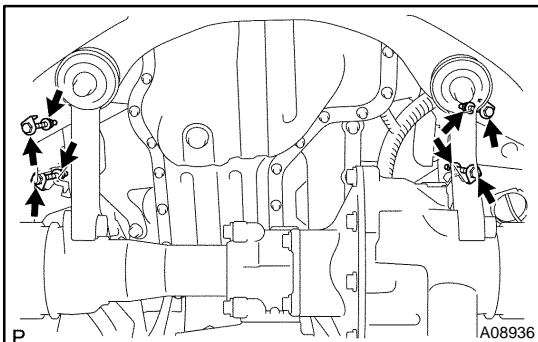


- 16. DISCONNECT PS PUMP FROM ENGINE**
- Remove the 3 bolts, and disconnect the PS pump from the engine.

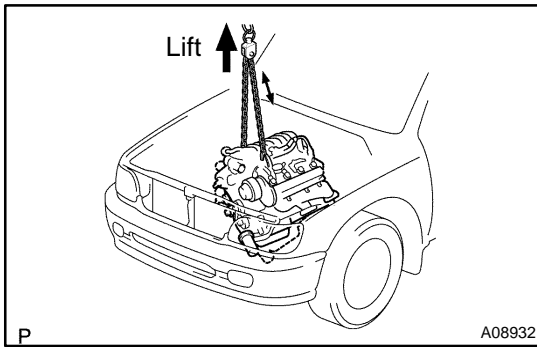
HINT:

Suspend the PS pump securely.

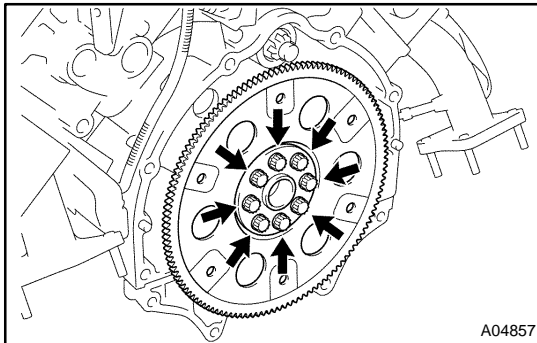
- 17. REMOVE OIL COOLER PIPES FOR TRANSMISSION**
- (a) Remove the 3 bolts and 3 stays.
- (b) Loosen the 2 union nuts, and remove the 2 oil cooler pipes.



- 18. REMOVE ENGINE ASSEMBLY FROM VEHICLE**
- (a) Attach the engine chain hoist to the engine hangers.
- (b) Remove the 4 bolts holding the engine mounting brackets to the frame brackets.

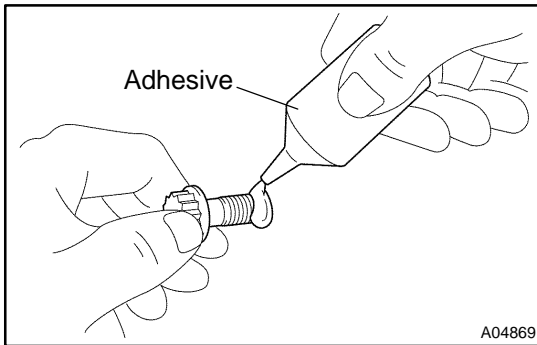


- (c) Lift the engine out of the vehicle slowly and carefully.
HINT:
Make sure the engine is clear of all wiring, hoses and cables.
- (d) Place the engine and transmission assembly onto the stand.



19. REMOVE DRIVE PLATE

Remove the 8 bolts, front spacer, drive plate and rear spacer.



INSTALLATION

1. INSTALL DRIVE PLATE

HINT:

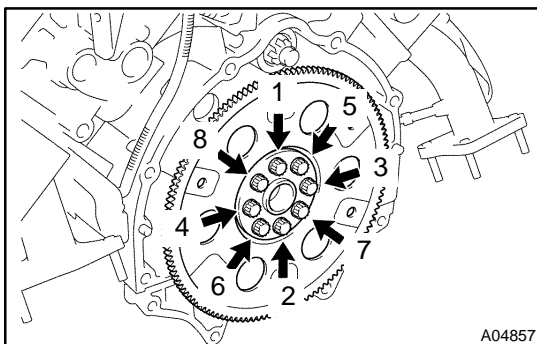
- The mounting bolts are tightened in 2 progressive steps (steps (c) and (e)).
- If any one of the mounting bolts is broken or deformed, replace it.

(a) Apply adhesive to 2 or 3 threads of the mounting bolt end.

Adhesive:

Part No. 08833-00070, THREE BOND 1324 or equivalent

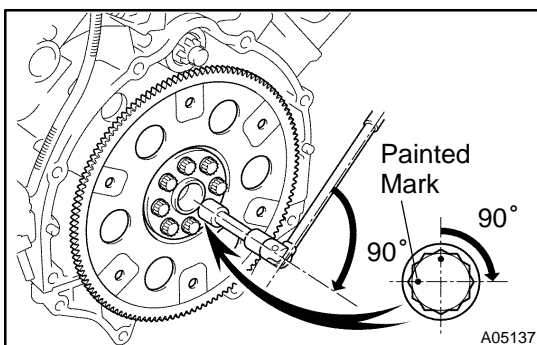
(b) Install the front spacer, drive plate and rear spacer on the crankshaft.



(c) Install and uniformly tighten the 8 mounting bolts in several passes, in the sequence shown.

Torque: 49 N·m (500 kgf-cm, 36 ft-lbf)

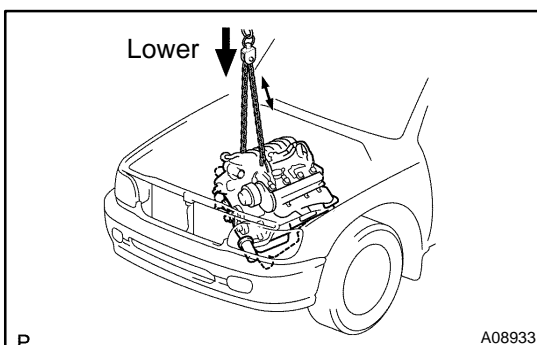
If any one of the mounting bolts does not meet the torque specification, replace the mounting bolt.



(d) Mark the mounting bolt with paint.

(e) Retighten the mounting bolts by 90° in the numerical order shown.

(f) Check that the painted mark is now at a 90° angle to (e).

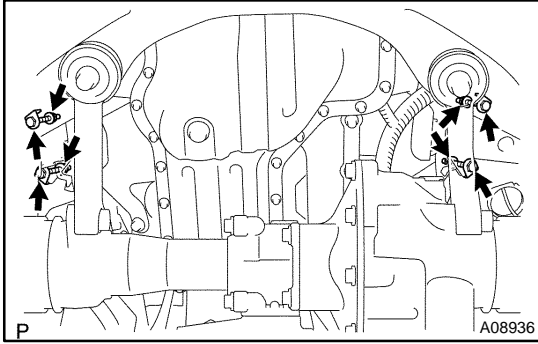


2. INSTALL ENGINE ASSEMBLY IN VEHICLE

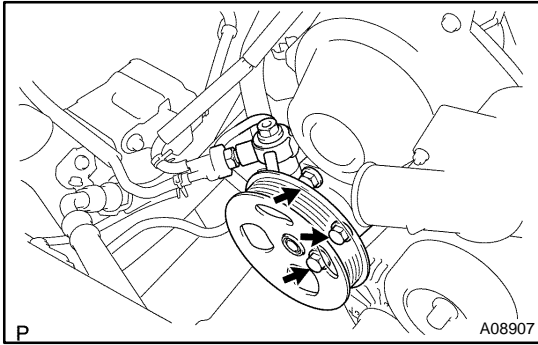
(a) Attach the engine chain hoist to the engine hangers.

(b) Slowly lower the engine assembly into the engine compartment.

(c) Attach the engine mounting brackets to the frame brackets.



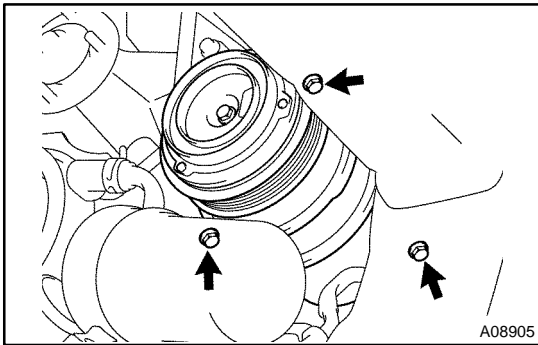
- (d) Install the engine mounting brackets to the frame brackets with the 2 nuts and 4 bolts.
Torque: 38 N·m (388 kgf-cm, 28 ft-lbf)
- (e) Remove the engine chain hoist.



3. INSTALL PS PUMP

Install the PS pump with the 3 bolts.

Torque: 17 N·m (175 kgf-cm, 13 ft-lbf)



4. INSTALL A/C COMPRESSOR

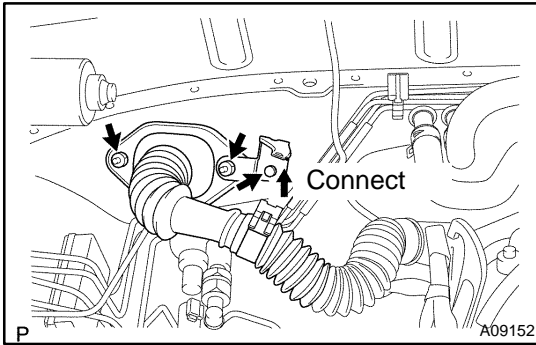
- (a) Install the A/C compressor with the 3 bolts.

Torque: 49 N·m (500 kgf-cm, 36 ft-lbf)

- (b) Connect the A/C compressor connector.

5. CONNECT HOSES, WIRES, CONNECTORS, CLAMPS, GROMMET AND CABLES

- (a) Connect the accelerator cable to the engine.
- (b) Connect the 2 PS air hoses to hose clamp on the No.3 RH timing belt cover.
- (c) Connect the generator wire.
- (d) Connect the generator connector.
- (e) Connect the hose clamp for the PS air hose.
- (f) Connect the PS air hose to the upper intake manifold.
- (g) Connect the 2 heater hoses.
- (h) Connect the ground strap to the cowl panel.
- (i) Connect the fuel inlet hose and clamps.
- (j) Connect the fuel return hose and clamp.
- (k) Connect the air inlet hose to the charcoal canister.
- (l) Connect the EVAP hose to the VSV for EVAP.
- (m) w/o Hydraulic brake booster:
 Connect the brake booster tube.



6. CONNECT ENGINE WIRE TO CABIN

- (a) Push into the engine wire through the cowl panel.
- (b) Install the engine wire bracket with the 2 nuts and bolt and connect the engine wire to the bracket.
- (c) Connect the 3 connectors to the ECM.
- (d) Connect the 2 wire harness connectors (cassette connector).
- (e) Install the ECM with the 3 screws.
- (f) Install the lower No. 2 panel.
- (g) Install the glove compartment door.

7. INSTALL FAN PULLEY, FAN, FLUID COUPLING AND DRIVE BELT

- (a) Temporarily install the fan pulley, the fan and fluid coupling assembly with the 4 nuts.
- (b) Install the drive belt (See page [CH-16](#) or [CH-28](#)).
- (c) Tighten the 4 nuts holding the coupling to the fan bracket.

8. INSTALL BATTERY CABLES

- (a) Connect the battery positive (+) terminal cable.
- (b) Connect the battery negative (-) cable to the battery and left fender apron.
- (c) Connect the clamp on battery negative (-) cable to No. 2 relay box.

9. INSTALL AIR CLEANER AND INTAKE AIR CONNECTOR PIPE ASSEMBLY

- (a) Install the air cleaner case with the 3 bolts.
Torque: 5 N·m (51 kgf·cm, 44 in·lbf)
- (b) Connect the intake air connector to the throttle body.
- (c) Connect the MAF meter connector.
- (d) Install the A/C suction hose to the intake air connector.
- (e) Connect the PS air hose, air inlet hose for EVAP, PCV hose and MAF meter connector to the intake air connector.

10. INSTALL THROTTLE BODY COVER

11. INSTALL TRANSMISSION (See page [AT-38](#))

12. INSTALL RADIATOR ASSEMBLY (See page [CO-18](#))

13. INSTALL FRONT STABILIZER BAR

(See page [SA-91](#))

14. INSTALL FRONT AND REAR PROPELLER SHAFTS

(See page [PR-15](#))

15. INSTALL FRONT EXHAUST PIPES

(See page [EM-125](#))

16. FILL WITH ENGINE COOLANT (See page [CO-2](#))

17. FILL WITH ENGINE OIL (See page [LU-2](#))

18. START ENGINE AND CHECK FOR LEAKS

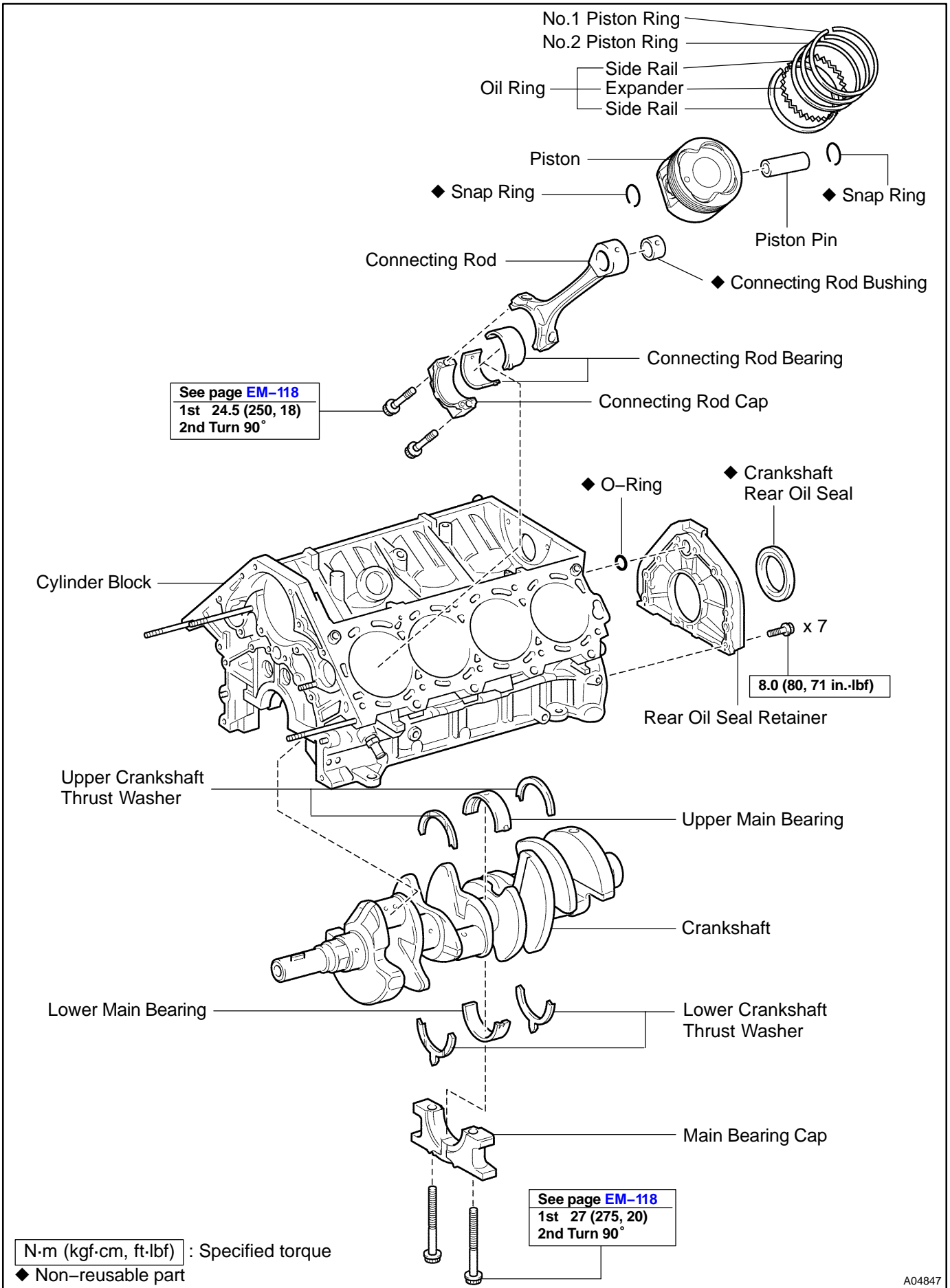
19. INSTALL ENGINE UNDER COVERS

20. INSTALL HOOD

21. PERFORM ROAD TEST

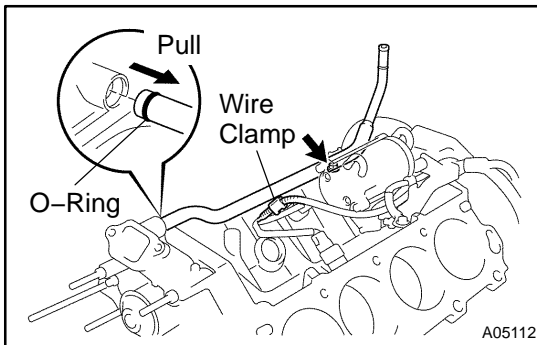
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

22. RECHECK ENGINE COOLANT AND OIL LEVELS

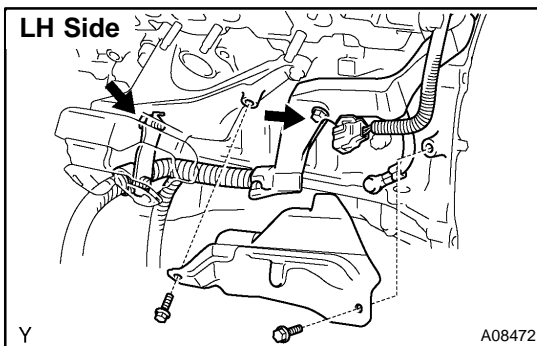


DISASSEMBLY

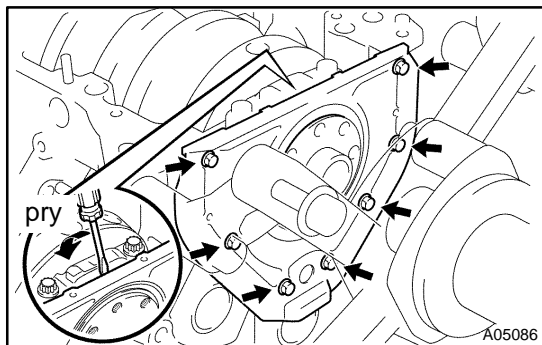
1. **INSTALL ENGINE TO ENGINE STAND**
2. **REMOVE TIMING BELT AND PULLEYS**
(See page [EM-16](#))
3. **REMOVE CYLINDER HEAD** (See page [EM-36](#))



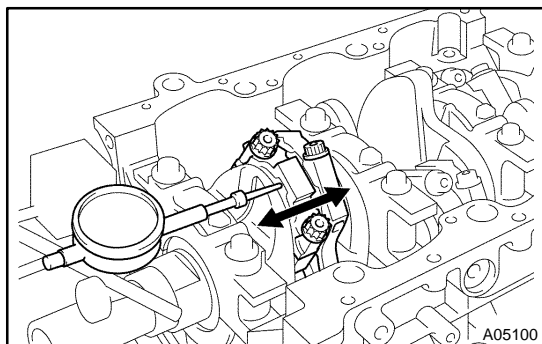
4. **REMOVE WATER BYPASS PIPE**
 - (a) Disconnect the wire clamp (for knock sensor 1, 2) from bracket of the water bypass pipe.
 - (b) Remove the bolt.
 - (c) Pull out the water bypass pipe from the water pump.
 - (d) Remove the O-ring from the water bypass pipe.
5. **REMOVE STARTER** (See page [ST-6](#))
6. **REMOVE KNOCK SENSORS** (See page [SF-70](#))
7. **REMOVE VVT SENSORS** (See page [SF-79](#))



8. **DISCONNECT ENGINE WIRE FROM LH SIDE OF CYLINDER BLOCK**
 - (a) Remove the 2 bolts and engine wire cover from the LH side of the cylinder block.
 - (b) Remove the 2 bolts, disconnect the brackets on the engine wire from the cylinder block and engine mounting bracket.
9. **REMOVE OIL COOLER PIPE BRACKET FOR A/T**
Remove the bolt and bracket.
10. **REMOVE ENGINE MOUNTING BRACKETS**
Remove the 4 bolts and mounting bracket. Remove the 2 mounting brackets.
11. **REMOVE WATER PUMP** (See page [CO-6](#))
12. **REMOVE NO.2 OIL PAN** (See page [LU-8](#))
13. **REMOVE OIL PAN BAFFLE PLATE**
14. **REMOVE NO.1 OIL PAN** (See page [LU-8](#))
15. **REMOVE OIL STRAINER**
16. **REMOVE OIL PUMP** (See page [LU-8](#))
17. **REMOVE ENGINE COOLANT DRAIN UNIONS**
Remove the 2 drain unions.

**18. REMOVE REAR OIL SEAL RETAINER**

- (a) Remove the 7 bolts.
- (b) Using a screwdriver, remove the oil seal retainer by prying the portion between the oil seal retainer and main bearing cap.
- (c) Remove the O-ring.

**19. CHECK CONNECTING ROD THRUST CLEARANCE**

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

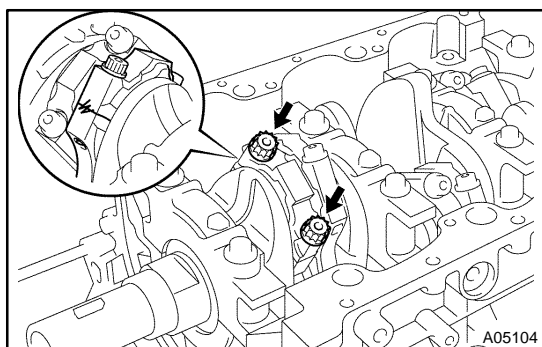
0.160 to 0.290 mm (0.0063 to 0.0114 in.)

Maximum thrust clearance: 0.35 mm (0.0138 in.)

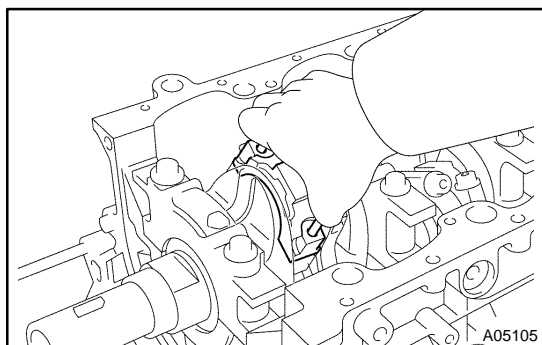
If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

Connecting rod thickness:

22.880 to 22.920 mm (0.9008 to 0.9024 in.)

**20. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE**

- (a) Check the matchmarks on the connecting rod and see it cap to ensure correct reassembly.
- (b) Remove the 2 connecting rod cap bolts.



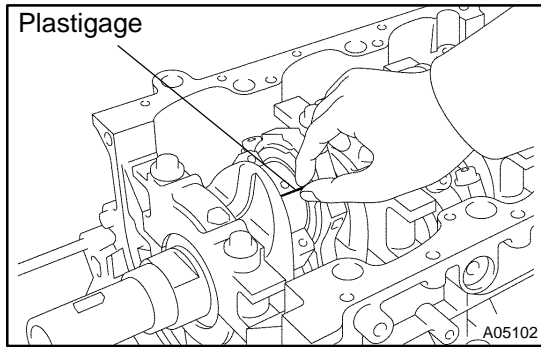
- (c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:

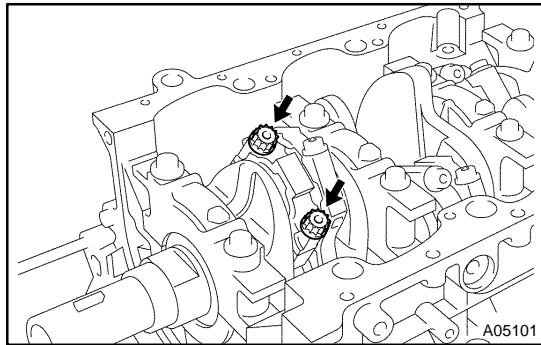
Keep the lower bearing inserted with the connecting rod cap.

- (d) Clean the crank pin and bearing.
- (e) Check the crank pin and bearing for peeling and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



(f) Lay a strip of Plastigage across the crank pin.

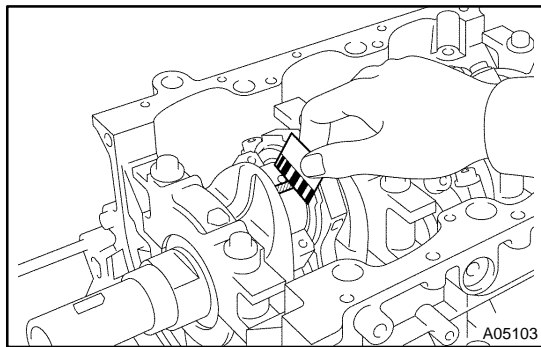


(g) Install the connecting rod cap with the 2 bolts.
(see page EM-118)

NOTICE:

Do not turn the crankshaft.

(h) Remove the 2 bolts, connecting rod cap and lower bearing. (See procedure (b) and (c) above)



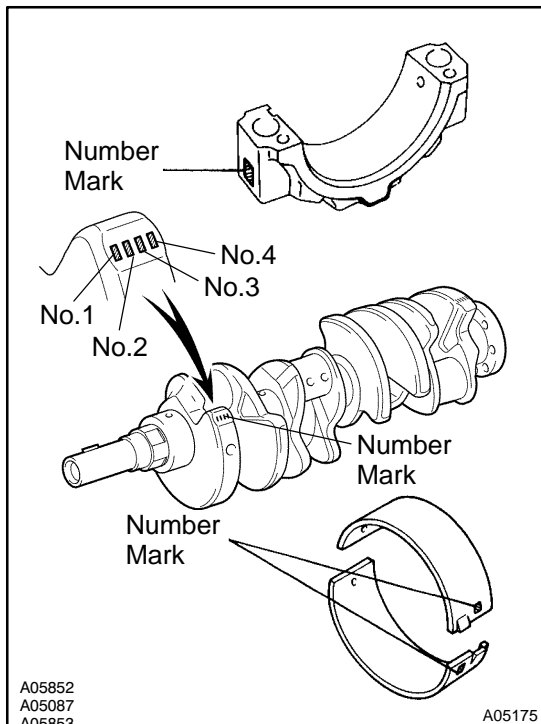
(i) Measure the Plastigage at its widest point.

Standard oil clearance:

0.021 to 0.047 mm (0.0008 to 0.0019 in.)

Maximum oil clearance: 0.059 mm (0.0023 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.



HINT:

If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the connecting rod cap and crankshaft, then selecting the bearing with the same number as the total. There are 6 sizes of standard bearings, marked "2", "3", "4", "5", "6" and "7".

	Number mark											
Connecting rod cap	1	1	2	1	2	3	2	3	4	3	4	4
Crankshaft	1	2	1	3	2	1	3	2	1	3	2	3
Use bearing	2		3		4			5		6		7

EXAMPLE:

Connecting rod cap "3" + Crankshaft "1"
= Total number 4 (Use bearing "4")

Reference**Connecting rod big end inside diameter:**

Mark "1"	55.000 to 55.006 mm (2.1654 to 2.1656 in.)
Mark "2"	55.006 to 55.012 mm (2.1656 to 2.1658 in.)
Mark "3"	55.012 to 55.018 mm (2.1658 to 2.1661 in.)
Mark "4"	55.018 to 55.024 mm (2.1661 to 2.1663 in.)

Crankshaft crank pin diameter:

Mark "1"	51.994 to 52.000 mm (2.0470 to 2.0472 in.)
Mark "2"	51.988 to 51.994 mm (2.0468 to 2.0470 in.)
Mark "3"	51.982 to 51.988 mm (2.0465 to 2.0468 in.)

Standard sized bearing center wall thickness:

Mark "2"	1.487 to 1.490 mm (0.0585 to 0.0587 in.)
Mark "3"	1.490 to 1.493 mm (0.0587 to 0.0588 in.)
Mark "4"	1.493 to 1.496 mm (0.0588 to 0.0589 in.)
Mark "5"	1.496 to 1.499 mm (0.0589 to 0.0590 in.)
Mark "6"	1.499 to 1.502 mm (0.0590 to 0.0591 in.)
Mark "7"	1.502 to 1.505 mm (0.0591 to 0.0593 in.)

(j) Completely remove the Plastigage.

21. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

- Using a ridge reamer, remove all the carbon from the top of the cylinder.
- Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.

22. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.020 to 0.220 mm (0.0008 to 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

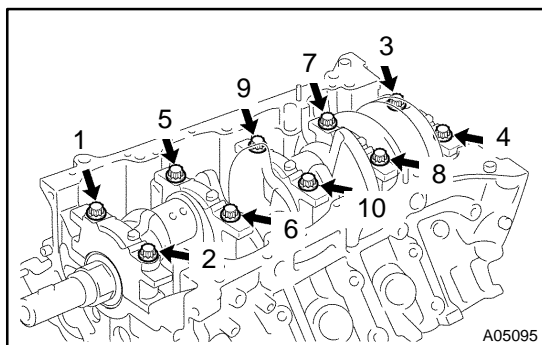
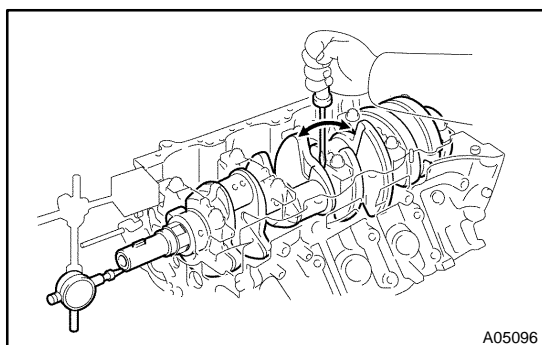
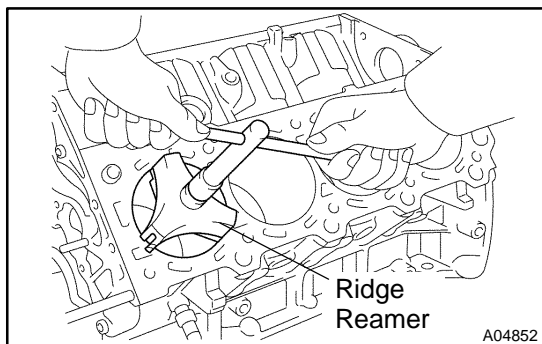
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

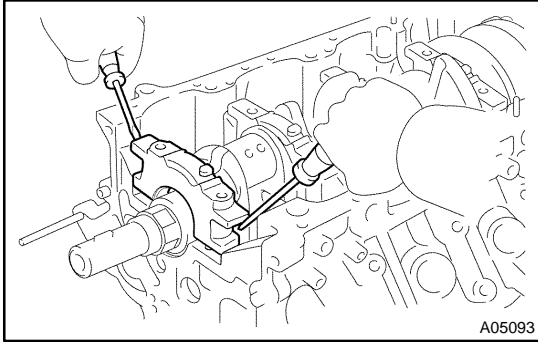
Thrust washer thickness:

2.440 to 2.490 mm (0.0961 to 0.0980 in.)

23. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

- Uniformly loosen and remove the 10 main bearing cap bolts in several passes, in the sequence shown.





- (b) Using 2 screwdrivers, pry out the main bearing cap, and remove the 5 main bearing caps, 5 lower bearings and 2 lower thrust washers (No.3 main bearing cap only).

NOTICE:

Be careful not to damage the cylinder block.

HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.

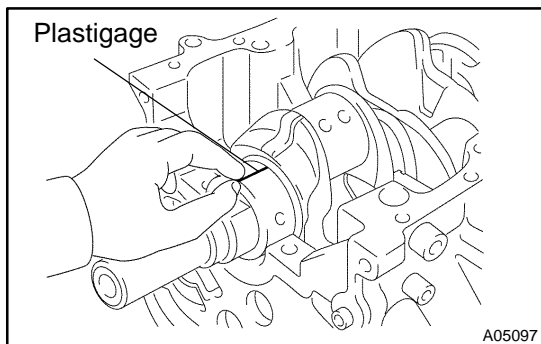
- (c) Lift out the crankshaft.

HINT:

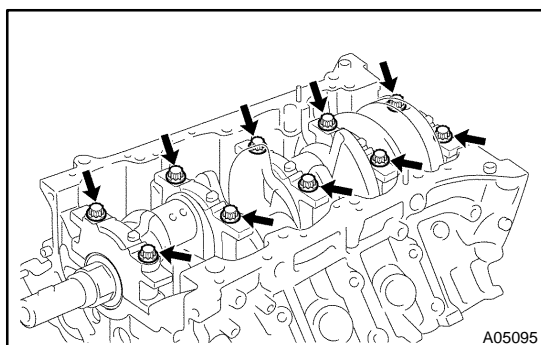
Keep the upper bearings and upper thrust washers together with the cylinder block.

- (d) Clean each main journal and bearing.
 (e) Check each main journal and bearing for peelings and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



- (f) Place the crankshaft on the cylinder block.
 (g) Lay a strip of Plastigage across each journal.

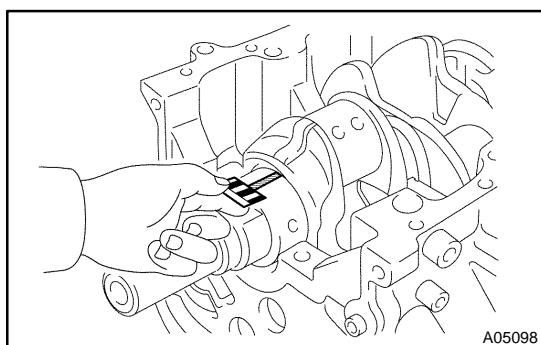


- (h) Install the main bearing caps. (See page [EM-118](#))

NOTICE:

Do not turn the crankshaft.

- (i) Remove the main bearing caps.
 (See procedure (a) and (b) above)



- (j) Measure the Plastigage at its widest point.

Standard clearance:**No.1, No.5**

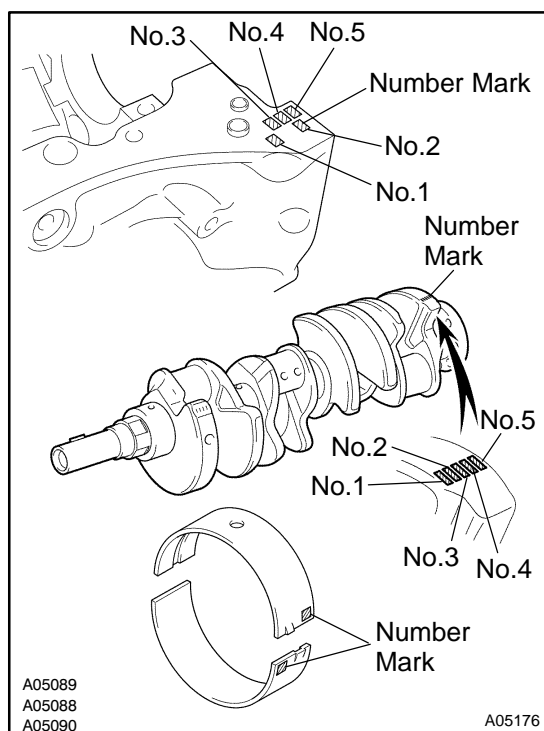
0.028 to 0.046 mm (0.0011 to 0.0018 in.)

Others

0.040 to 0.058 mm (0.0016 to 0.0023 in.)

Maximum clearance: 0.065 mm (0.0026 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.

**HINT:**

If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then refer to the table below for the appropriate bearing number. There are 5 sizes of the standard bearings. For No.1 and No.5 position bearings, use bearings marked "3", "4", "5", "6" and "7". For others position bearings, use bearings marked "1", "2", "3", "4" and "5".

No.1, No.5

	Mark	Use bearing
Cylinder block (A) + Crankshaft (B)	0 to 5	3
	6 to 11	4
	12 to 17	5
	18 to 23	6
	24 to 28	7

EXAMPLE:

Cylinder block "08" + Crankshaft "06"
= Total number 14 (Use bearing "5")

Others

	Mark	Use bearing
Cylinder block (A) + Crankshaft (B)	0 to 5	1
	6 to 11	2
	12 to 17	3
	18 to 23	4
	24 to 28	5

EXAMPLE:

Cylinder block "08" + Crankshaft "06"
= Total number 14 (Use bearing "3")

Reference**Cylinder block main journal bore diameter (A):**

Mark "00"	72.000 mm (2.8346 in.)
Mark "01"	72.001 mm (2.8347 in.)
Mark "02"	72.002 mm (2.8347 in.)
Mark "03"	72.003 mm (2.8348 in.)
Mark "04"	72.004 mm (2.8348 in.)
Mark "05"	72.005 mm (2.8348 in.)
Mark "06"	72.006 mm (2.8349 in.)
Mark "07"	72.007 mm (2.8349 in.)
Mark "08"	72.008 mm (2.8350 in.)
Mark "09"	72.009 mm (2.8350 in.)
Mark "10"	72.010 mm (2.8350 in.)
Mark "11"	72.011 mm (2.8351 in.)
Mark "12"	72.012 mm (2.8351 in.)
Mark "13"	72.013 mm (2.8352 in.)
Mark "14"	72.014 mm (2.8352 in.)

Mark "15"	72.015 mm (2.8352 in.)
Mark "16"	72.016 mm (2.8353 in.)

Crankshaft main journal diameter (B):

Mark "00"	67.000 mm (2.6378 in.)
Mark "01"	66.999 mm (2.6378 in.)
Mark "02"	66.998 mm (2.6377 in.)
Mark "03"	66.997 mm (2.6377 in.)
Mark "04"	66.996 mm (2.6376 in.)
Mark "05"	66.995 mm (2.6376 in.)
Mark "06"	66.994 mm (2.6376 in.)
Mark "07"	66.993 mm (2.6375 in.)
Mark "08"	66.992 mm (2.6375 in.)
Mark "09"	66.991 mm (2.6374 in.)
Mark "10"	66.990 mm (2.6374 in.)
Mark "11"	66.989 mm (2.6374 in.)
Mark "12"	66.988 mm (2.6373 in.)

**Standard bearing center wall thickness:
No.1 and No.5**

Mark "3"	2.487 to 2.490 mm (0.0979 – 0.0980 in.)
Mark "4"	2.490 to 2.493 mm (0.0980 – 0.0981 in.)
Mark "5"	2.493 to 2.496 mm (0.0981 – 0.0983 in.)
Mark "6"	2.496 to 2.499 mm (0.0983 – 0.0984 in.)
Mark "7"	2.499 to 2.502 mm (0.0984 – 0.0985 in.)

Others

Mark "1"	2.481 to 2.484 mm (0.0977 – 0.0978 in.)
Mark "2"	2.484 to 2.487 mm (0.0978 – 0.0979 in.)
Mark "3"	2.487 to 2.490 mm (0.0979 – 0.0980 in.)
Mark "4"	2.490 to 2.493 mm (0.0980 – 0.0981 in.)
Mark "5"	2.493 to 2.496 mm (0.0981 – 0.0983 in.)

(k) Completely remove the Plastigage.

24. REMOVE CRANKSHAFT

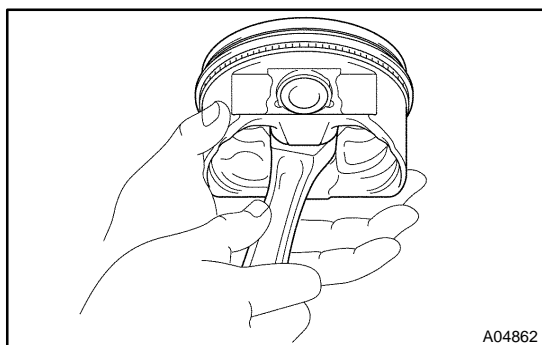
- (a) Lift up the crankshaft.
- (b) Remove the 5 upper main bearings and 2 upper thrust washers from the cylinder block.

HINT:

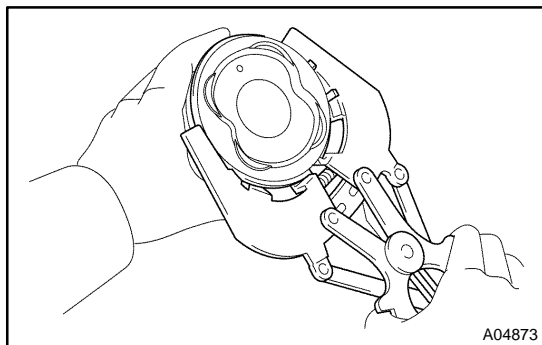
Arrange the main bearing caps, bearings and thrust washers in correct order.

25. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.



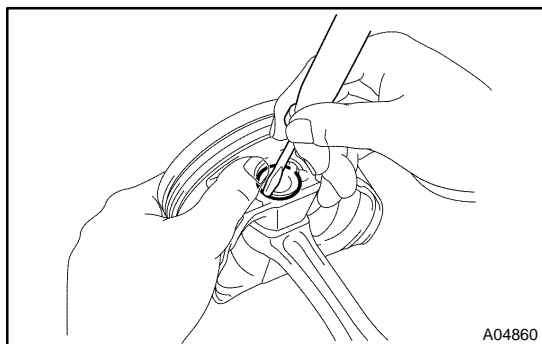
A04862

**26. REMOVE PISTON RINGS**

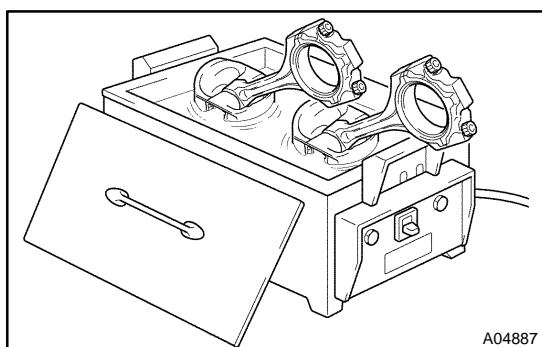
- (a) Using a piston ring expander, remove the 2 compression rings.
- (b) Remove the 2 side rails and oil ring by hand.

HINT:

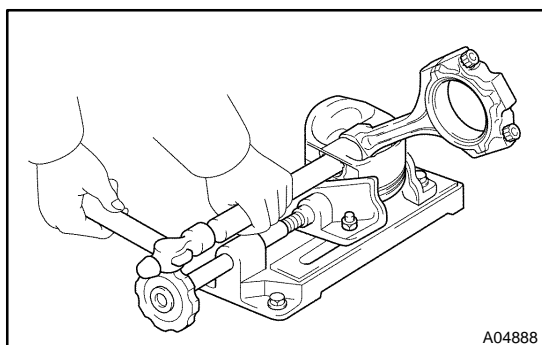
Arrange the piston rings in correct order only.

**27. DISCONNECT CONNECTING ROD FROM PISTON**

- (a) Using a small screwdriver, pry out the 2 snap rings.



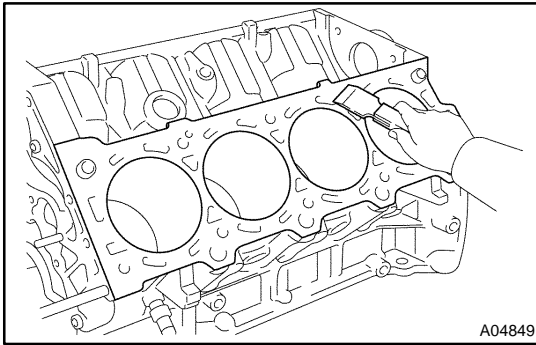
- (b) Gradually heat the piston to approx. 60°C (140°F).



- (c) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and pin and remove the connecting rod.

HINT:

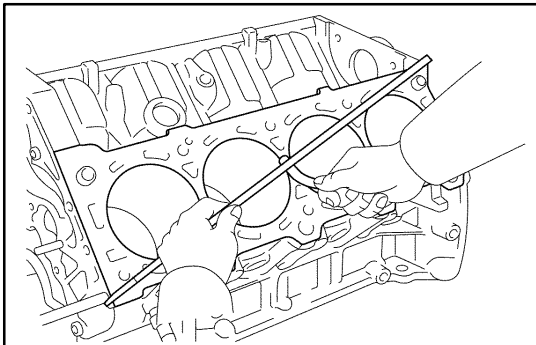
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.



INSPECTION

1. CLEAN CYLINDER BLOCK

- (a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
- (b) Using a soft brush and solvent, thoroughly clean the cylinder block.



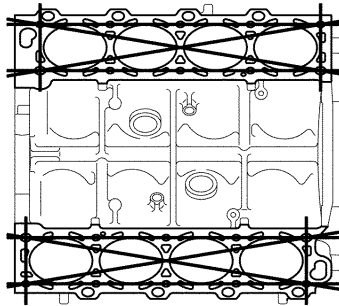
2. INSPECT CYLINDER BLOCK

- (a) Inspect for flatness.
Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head and main bearing cap for warpage.

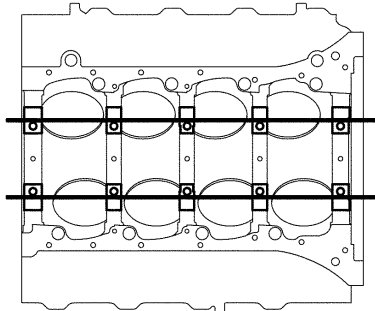
Maximum warpage: 0.07 mm (0.0028 in.)

If warpage is greater than maximum, replace the cylinder block.

Cylinder Block Side

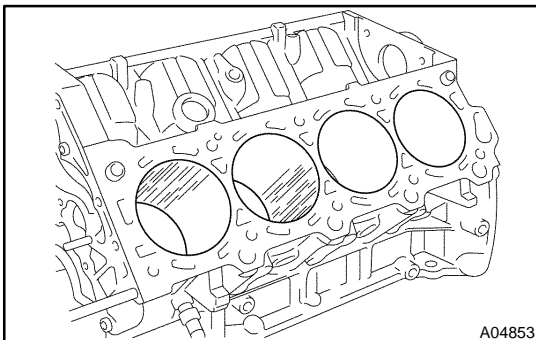


Main Bearing Cap Side

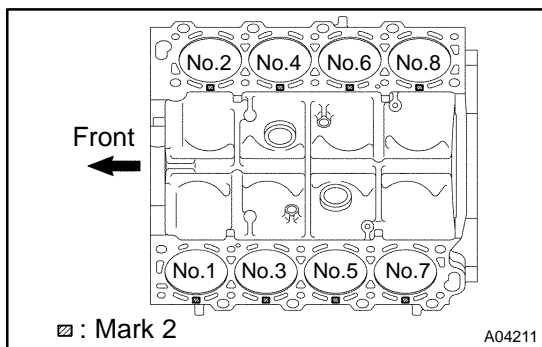


A04850
A04210
A04212

A05178



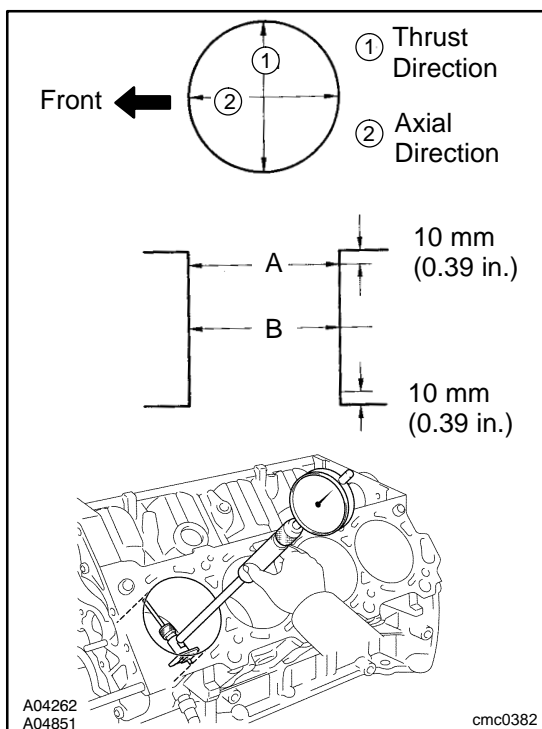
- (b) Visually check the cylinder for vertical scratches.
If deep scratches are present, rebore all the 8 cylinders and replace all the 8 pistons. (See page [EM-115](#)) If necessary, replace the cylinder block.



(c) Inspect the cylinder bore diameter.

HINT:

There is 1 size of the standard cylinder bore diameter, marked "2" accordingly. The mark is stamped on the top of the cylinder block.



Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

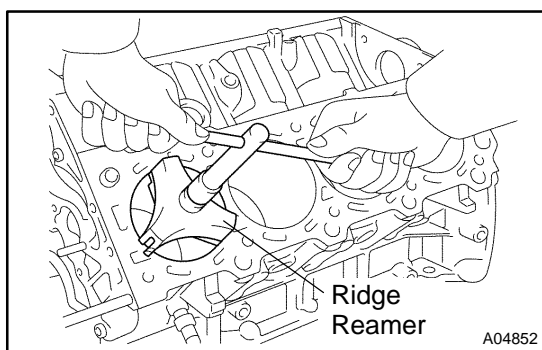
Standard diameter:

94.010 to 94.023 mm (3.7012 to 3.7017 in.)

Maximum diameter:

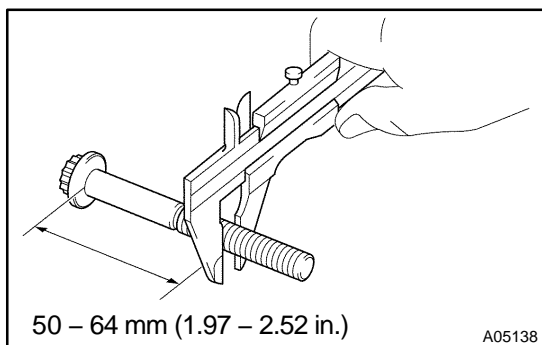
STD	94.223 mm (3.7096 in.)
O/S 0.50	94.723 mm (3.7292 in.)

If the diameter is greater than maximum, rebore all the 8 cylinders and replace all the 8 pistons. (See page [EM-115](#)) If necessary, replace the cylinder block.



(d) Remove the cylinder ridge.

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



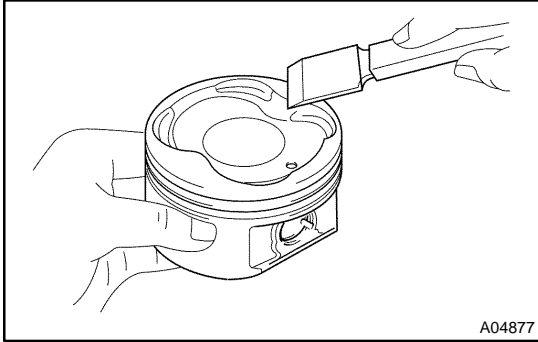
(e) Using vernier calipers, measure the thread outside diameter of the main bearing cap bolt.

Standard diameter:

10.760 to 10.970 mm (0.4236 to 0.4319 in.)

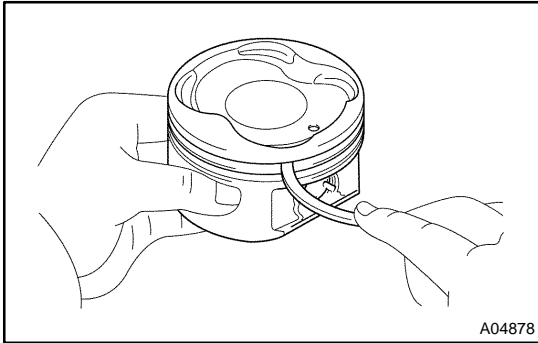
Minimum diameter: 10.40 mm (0.4094 in.)

If the diameter is less than minimum, replace the cap bolt.

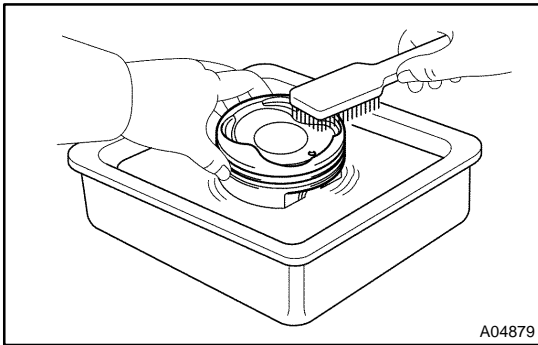


3. CLEAN PISTON

- (a) Using a gasket scraper, remove the carbon from the piston top.



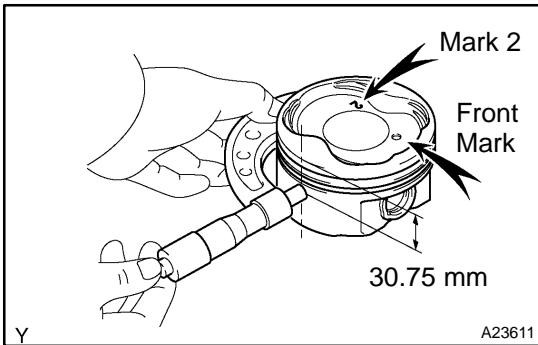
- (b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



- (c) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.



4. INSPECT PISTON AND CONNECTING ROD

- (a) Inspect the piston oil clearance.

HINT:

There is 1 size of the standard piston diameter, marked "2" accordingly. The mark is stamped on the piston top.

- (1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 30.75 mm (1.2106 in.) from the piston head.

Piston diameter:

STD	Mark "2"	93.912 to 93.940 mm (3.6973 to 3.6984 in.)
O/S 0.50		94.392 to 94.440 mm (3.7162 to 3.7181 in.)

- (2) Measure the cylinder bore diameter in the thrust directions (see step 2 above).

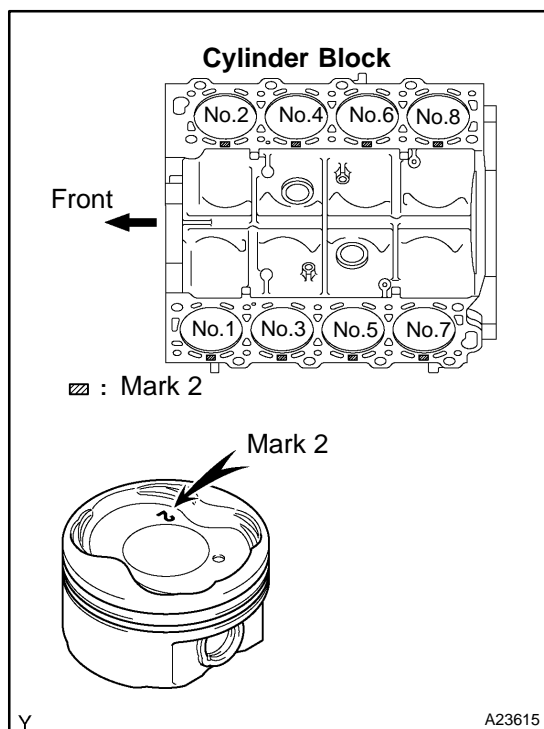
- (3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.030 to 0.071 mm (0.0012 to 0.0028 in.)

Maximum oil clearance: 0.13 mm (0.0051 in.)

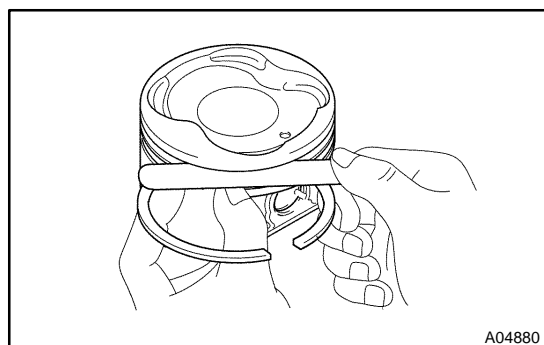
If the oil clearance is greater than maximum, replace all the 8 pistons and rebore all the 8 cylinders. (See page [EM-115](#)) If necessary, replace the cylinder block.



HINT

Use a new cylinder block:

- Use a piston with the same number mark as the cylinder diameter number marked on the cylinder block.

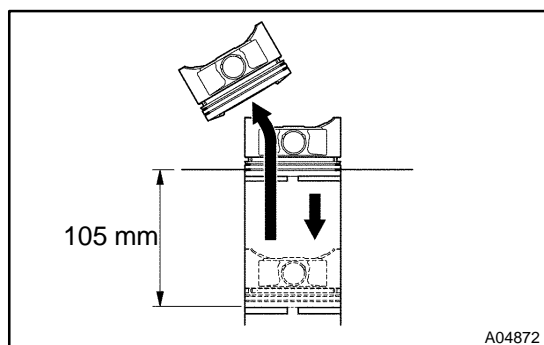


- (b) Inspect the piston ring groove clearance.
Using a feeler gauge, measure the clearance between the new piston ring and the wall of the ring groove.

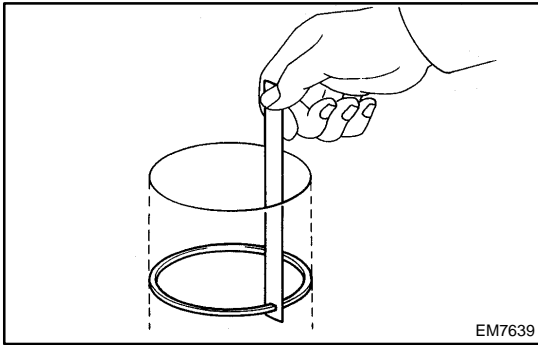
Ring groove clearance:

No.1	0.030 to 0.080 mm (0.0012 to 0.0031 in.)
No.2	0.020 to 0.060 mm (0.0008 to 0.0024 in.)

If the clearance is not as specified, replace the piston.



- (c) Inspect the piston ring end gap.
- Insert the piston ring into the cylinder bore.
 - Using a piston, push the piston ring a little to the bottom of the ring travel, 105 mm (4.13 in.) from the top of the cylinder block.



(3) Using a feeler gauge, measure the end gap.

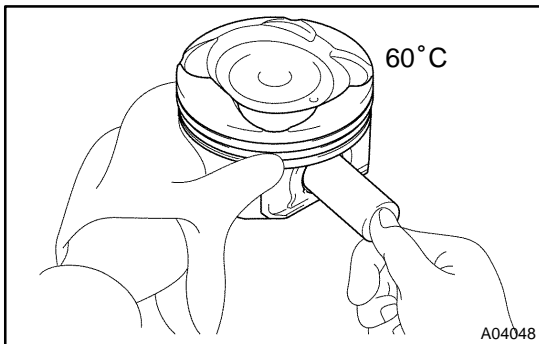
Standard end gap:

No.1	0.300 to 0.400 mm (0.0118 to 0.0157 in.)
No.2	0.450 to 0.600 mm (0.0177 to 0.0236 in.)
Oil (Side rail)	0.100 to 0.350 mm (0.0039 to 0.0138 in.)

Maximum end gap:

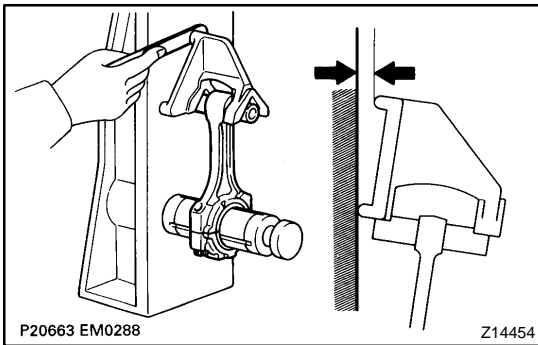
No.1	1.10 mm (0.0433 in.)
No.2	1.30 mm (0.0512 in.)
Oil (Side rail)	0.75 mm (0.0295 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the 8 cylinders (See page EM-115) or replace the cylinder block.



(d) Inspect the piston pin fit.

At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.



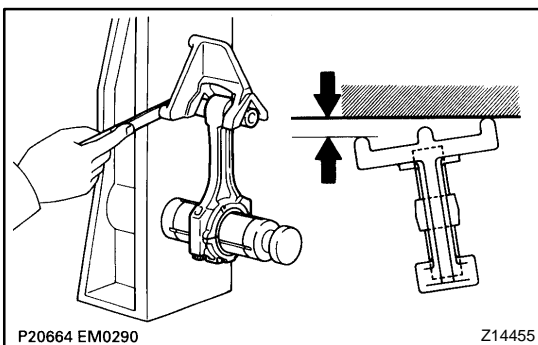
(e) Using a rod aligner and feeler gauge, check the connecting rod alignment.

(1) Check for bend.

Maximum bend:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bend is greater than maximum, replace the connecting rod assembly.

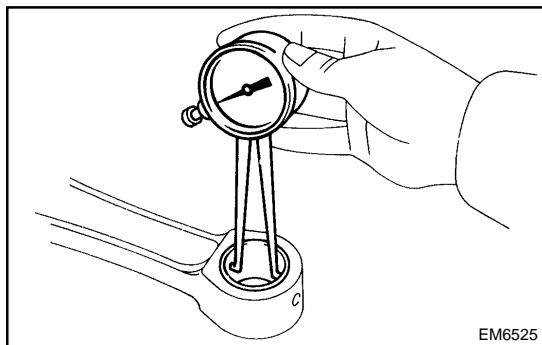


(2) Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

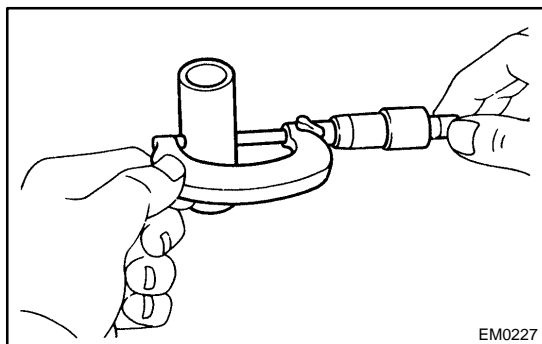
If twist is greater than maximum, replace the connecting rod assembly.



- (f) Inspect the piston pin oil clearance.
- (1) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

22.005 to 22.014 mm (0.8663 to 0.8667 in.)



- (2) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:

21.997 to 22.009 mm (0.8660 to 0.8664 in.)

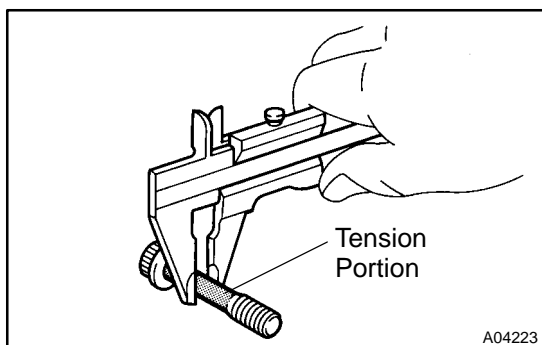
- (3) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance:

0.005 to 0.011 mm (0.0002 to 0.0004 in.)

Maximum oil clearance: 0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.



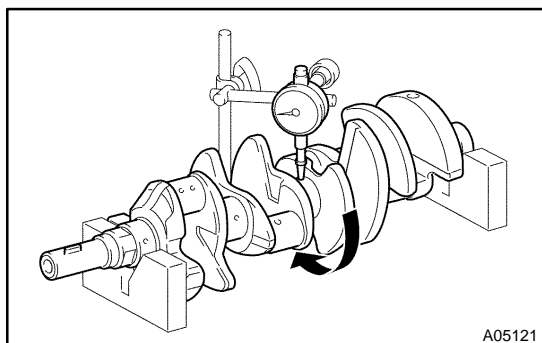
- (g) Using vernier calipers, measure the tension portion of the connecting rod bolt.

Standard diameter:

7.200 to 7.300 mm (0.2835 to 0.2874 in.)

Minimum diameter: 7.00 mm (0.2756 in.)

If the diameter is less than the minimum, replace the bolt.

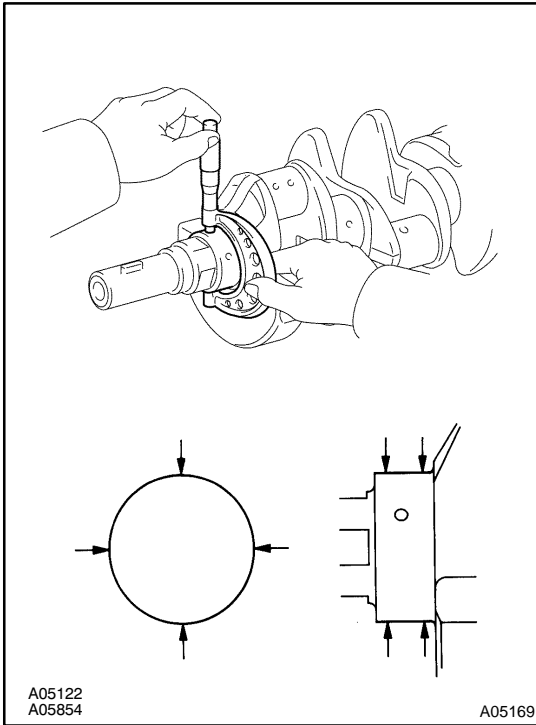


5. INSPECT CRANKSHAFT

- (a) Inspect for circle runout.
- (1) Place the crankshaft on V-blocks.
 - (2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.04 mm (0.0016 in.)

If the circle runout is greater than maximum, replace the crankshaft.



- (b) Inspect the main journals and crank pins.
- (1) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

66.988 to 67.000 mm (2.6373 to 2.6378 in.)

Crank pin diameter:

51.982 to 52.000 mm (2.0465 to 2.0472 in.)

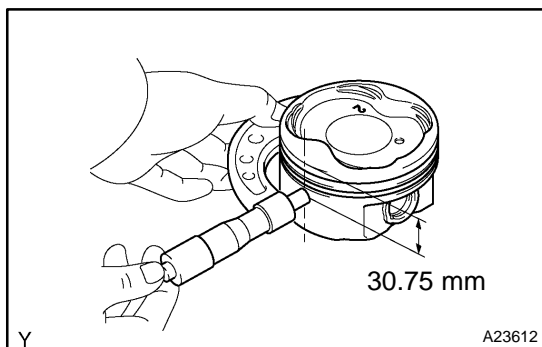
If the diameter is not as specified, check the oil clearance (See page [EM-100](#)). If necessary, replace the crankshaft.

- (2) Check each main journal and crank pin for taper and out-of-round as shown.

Maximum taper and out-of-round:

0.02 mm (0.0008 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.



REPLACEMENT

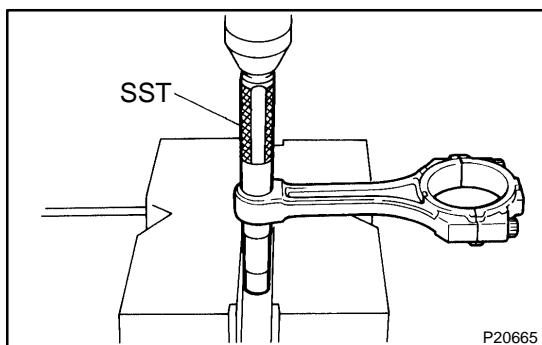
1. REPLACE OVERSIZED (O/S) PISTONS FOR CYLINDER BORING

HINT:

- Bore all the 8 cylinders to match the oversized piston outside diameter.
 - Replace all the piston rings with ones to match the oversized pistons.
- (a) Keep 8 new oversized pistons.
**O/S 0.50 piston diameter:
 94.392 to 94.440 mm (3.7162 to 3.7181 in.)**
 - (b) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 30.75 mm (1.2106 in.) from the piston head.
 - (c) Calculate the size to be rebored for each cylinder as follows:
Size to be rebored = P + C - H
P = Piston diameter
**C = Piston clearance:
 0.030 to 0.071 mm (0.0012 to 0.0028 in.)**
H = Allowance for honing: 0.02 mm (0.0008 in.) or less
 - (d) Bore and hone the cylinders to calculated dimensions.
Maximum honing: 0.02 mm (0.0008 in.)

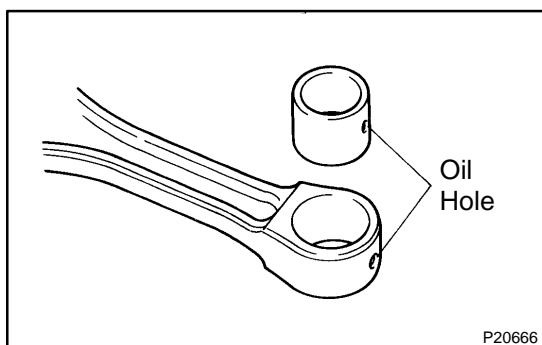
NOTICE:

Excess honing will destroy the finished roundness.

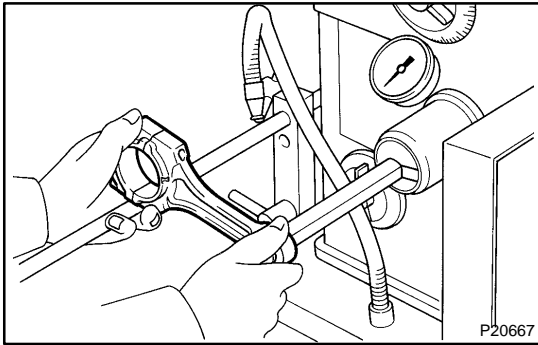


2. REPLACE CONNECTING ROD BUSHINGS

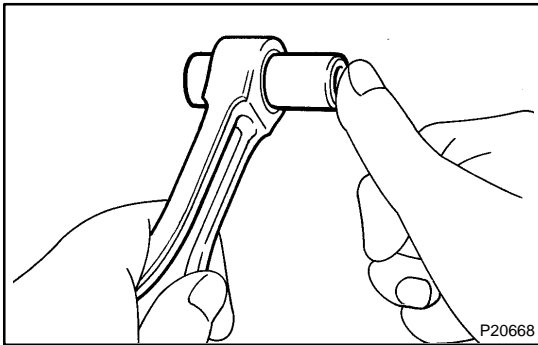
- (a) Using SST and a press, press out the bushing.
 SST 09222-30010



- (b) Align the oil holes of a new bushing and the connecting rod.
- (c) Using SST and a press, press in the bushing.
 SST 09222-30010

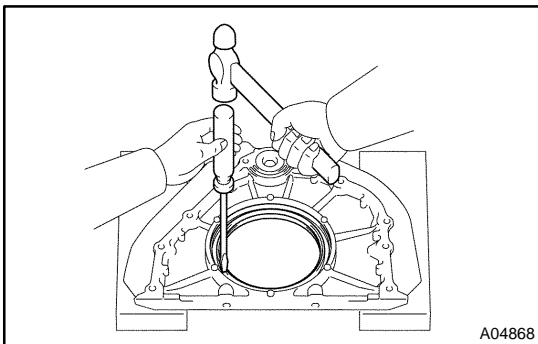


- (d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (See page [EM-100](#)) between the bushing and piston pin.



- (e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

3. REPLACE CRANKSHAFT FRONT OIL SEAL (See page [LU-13](#))



4. REPLACE CRANKSHAFT REAR OIL SEAL

HINT:

There are 2 methods ((a) and (b)) to replace the oil seal.

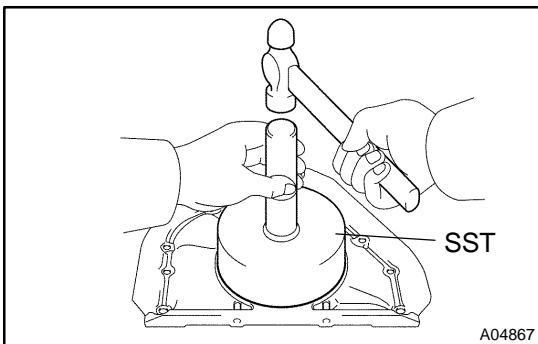
- (a) If the rear oil seal retainer is removed from the cylinder block:

- (1) Using a screwdriver and hammer, tap out the oil seal.

- (2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-56010

- (3) Apply MP grease to the oil seal lip.



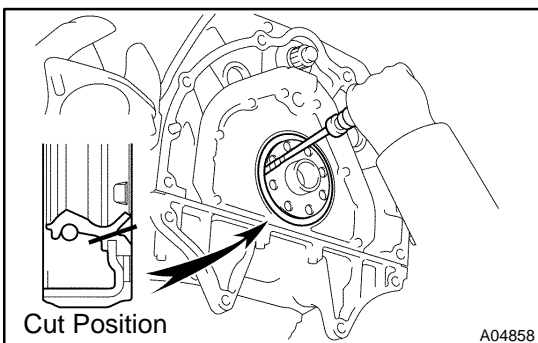
- (b) If the rear oil seal retainer is installed to the cylinder block:

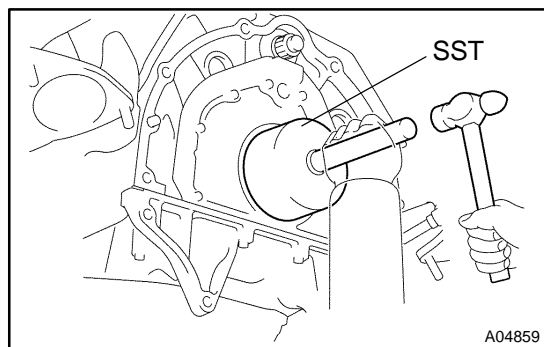
- (1) Using a knife, cut off the oil seal lip.

- (2) Using a screwdriver, pry out the oil seal.

NOTICE:

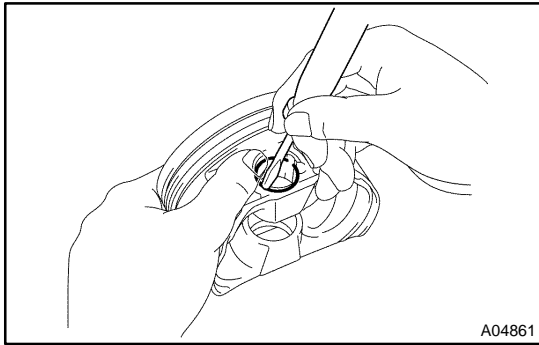
Be careful not to damage the crankshaft. Tape the screwdriver tip.





- (3) Apply MP grease to a new oil seal lip.
- (4) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-56010



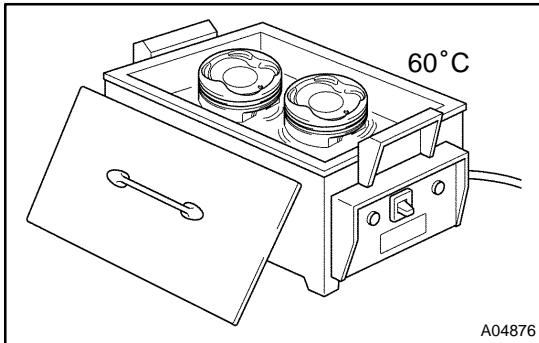
REASSEMBLY

HINT:

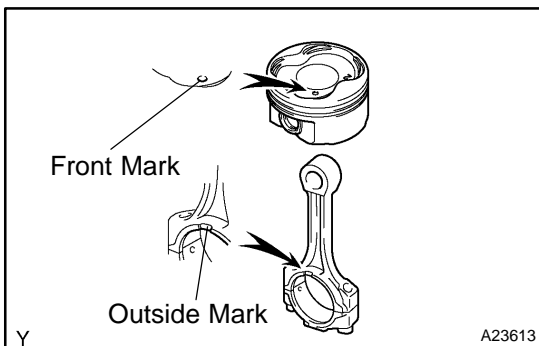
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new ones.

1. ASSEMBLE PISTON AND CONNECTING ROD

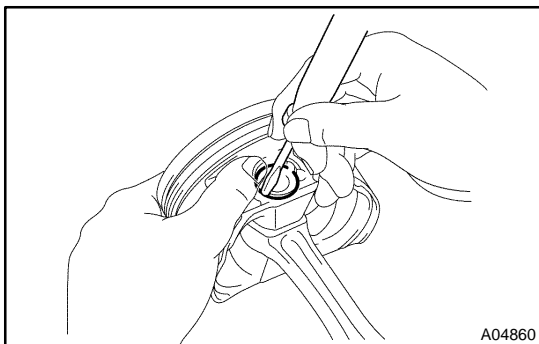
- (a) Using a screwdriver, install a new snap ring on one side of the piston pin hole.



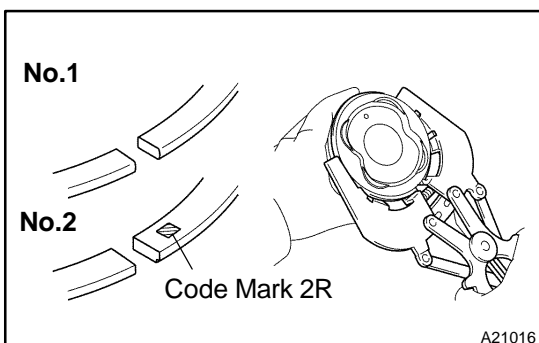
- (b) Gradually heat the piston to about 60°C (140°F).



- (c) Coat the piston pin with engine oil.
- (d) Position the piston so that the front mark and to the outside mark on the connecting rod face in the same direction as shown in the illustration.
- (e) Align the piston pin holes of the piston and connecting rod, and push in the piston pin with your thumb.



- (f) Using a screwdriver, install a new snap ring on the other side of the piston pin hole.

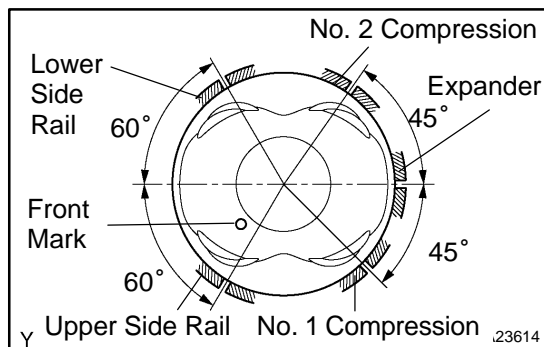


2. INSTALL PISTON RINGS

- (a) Install the oil ring expander and 2 side rails by hand.
- (b) Using a piston ring expander, install the 2 compression rings.

Code mark:

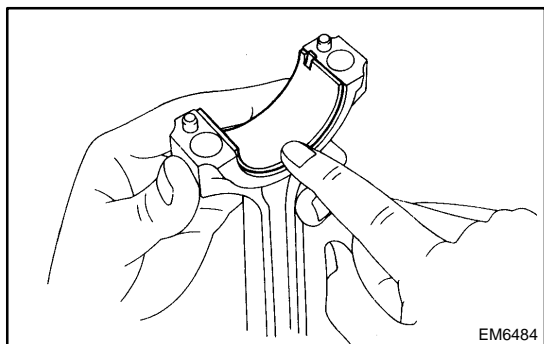
No.1	None
No.2	2R



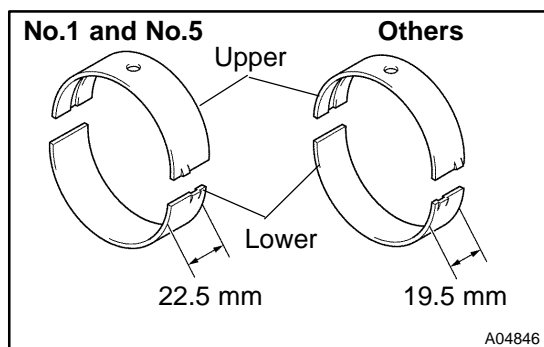
- (c) Position the piston rings so that the ring ends are as shown.

NOTICE:

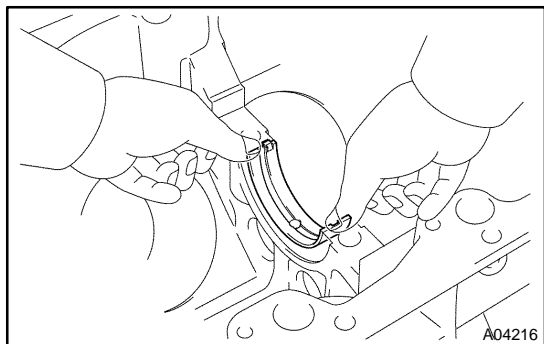
Do not align the ring ends.

**3. INSTALL BEARINGS**

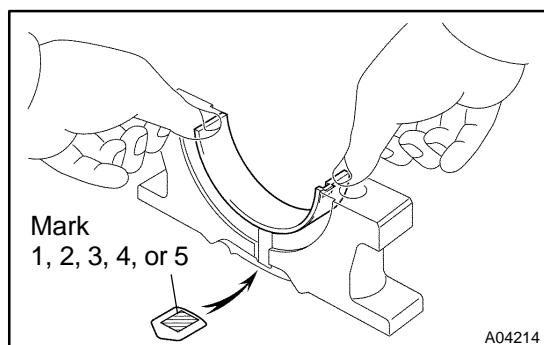
- (a) Align the bearing claw with the groove of the connecting rod or connecting cap.
 (b) Install the bearings in the connecting rod and connecting rod cap.

**4. INSTALL MAIN BEARINGS****HINT:**

- Main bearings are of 19.5 mm (0.768 in.) and 22.5 mm (0.886 in.) in width. Install the 22.5 mm (0.886 in.) bearings in the No.1 and No.5 cylinder block journal positions with the main bearing cap. Install the 19.5 mm (0.768 in.) bearings in the other positions.
- Upper bearings have an oil groove and oil holes, but lower bearings do not.



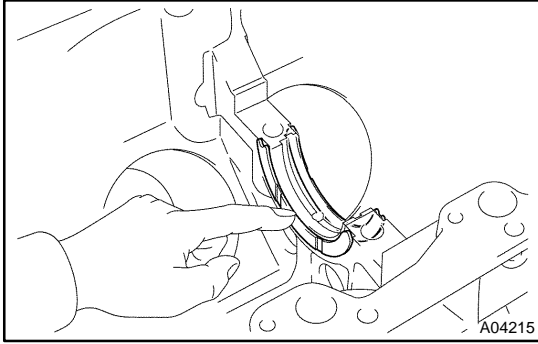
- (a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.



- (b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

HINT:

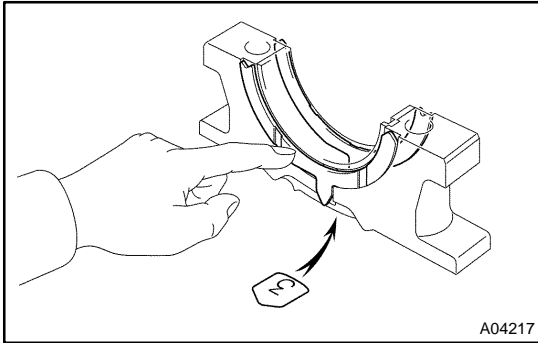
A number is marked on each main bearing cap to indicate the installation position.



5. INSTALL UPPER THRUST WASHERS

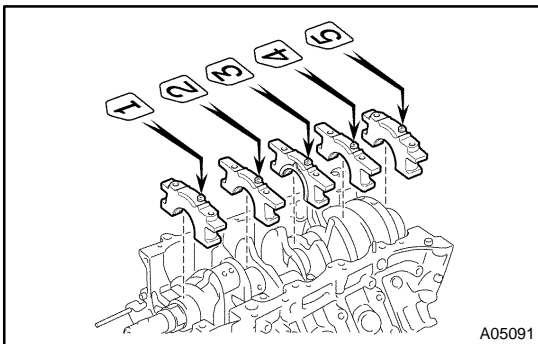
Install the 2 thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.

6. PLACE CRANKSHAFT ON CYLINDER BLOCK



7. PLACE MAIN BEARING CAPS AND LOWER THRUST WASHERS ON CYLINDER BLOCK

(a) Install the 2 thrust washers on the No.3 bearing cap with the grooves facing outward.

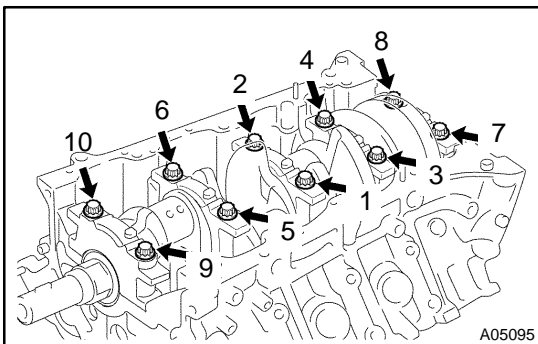


(b) Install the 5 main bearing caps in their proper locations.

8. INSTALL MAIN BEARING CAP BOLTS

HINT:

- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any one of the main bearing cap bolts is broken or deformed, replace it.

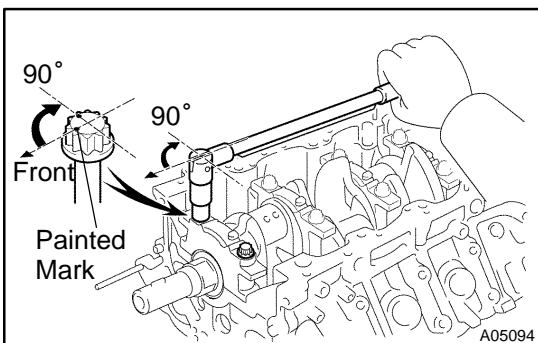


(a) Apply a light coat of engine oil to the threads and under the main bearing cap bolts.

(b) Install and uniformly tighten the 10 main bearing cap bolts in several steps, in the sequence shown.

Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

If any of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.



(c) Mark the front of the main bearing cap bolt with paint.

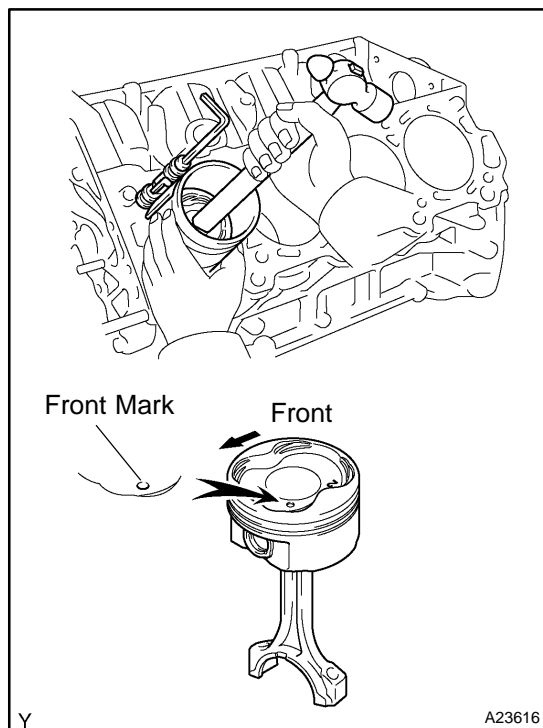
(d) Retighten the main bearing cap bolts by 90° in the numerical order shown.

(e) Check that the painted mark is now at a 90° angle to the front.

(f) Check that the crankshaft turns smoothly.

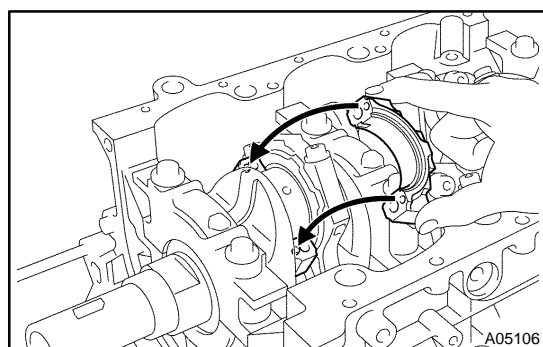
9. CHECK CRANKSHAFT THRUST CLEARANCE

(See page [EM-100](#))



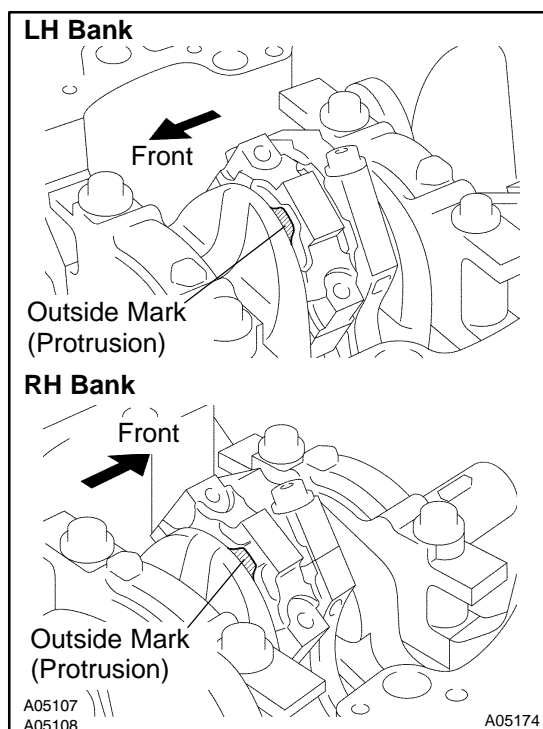
10. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

Using a piston ring compressor, push correctly the numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



11. PLACE CONNECTING ROD CAP ON CONNECTING ROD

- Match the numbered connecting rod cap with the connecting rod.
- Align the pin groove of the connecting rod cap with the pins of the connecting rod, and install the connecting rod cap.

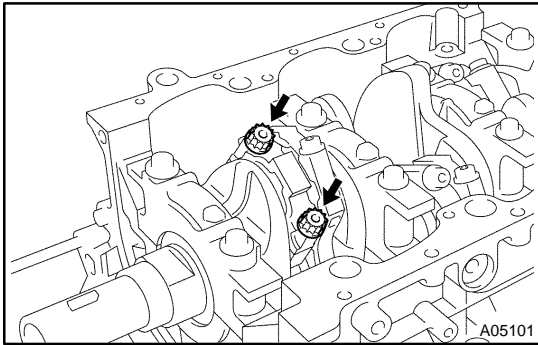


- Check that the outside mark of the connecting rod cap is facing in correct direction.

12. INSTALL CONNECTING ROD CAP BOLTS

HINT:

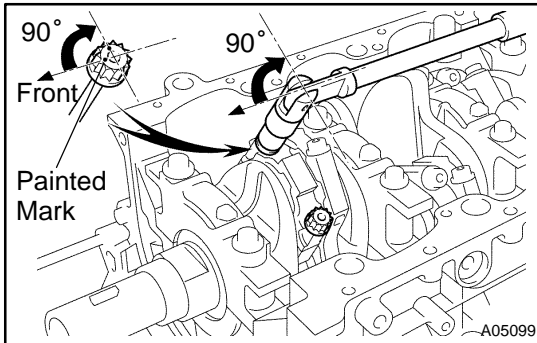
- The connecting rod cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any one of the connecting rod cap bolts is broken or deformed, replace it.



- (a) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.
- (b) Install and alternately tighten the 2 connecting rod cap bolts in several passes.

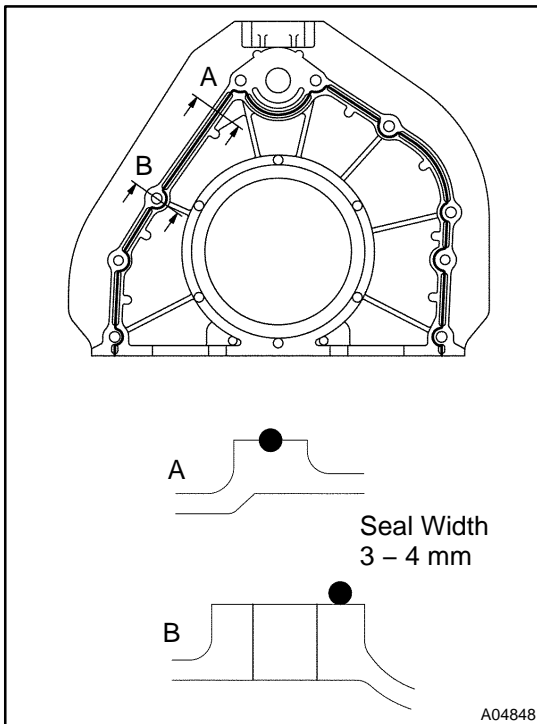
Torque: 24.5 N·m (250 kgf·cm, 18 ft·lbf)

If any one of the connecting rod cap bolts does not meet the torque specification, replace the connecting rod cap bolts.



- (c) Mark the front of the connecting cap bolt with paint.
- (d) Retighten the cap bolts by 90° as shown.
- (e) Check that the painted mark is now at a 90° angle to the front.
- (f) Check that the crankshaft turns smoothly.

13. CHECK CONNECTING ROD THRUST CLEARANCE (See page EM-100)

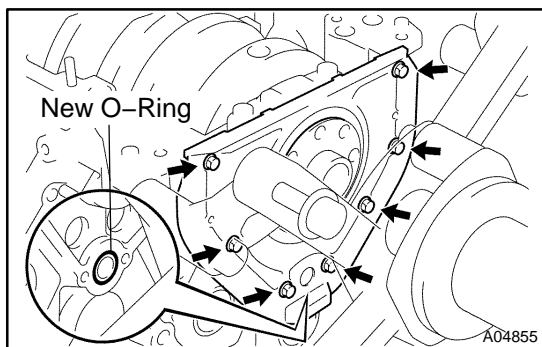


14. INSTALL REAR OIL SEAL RETAINER

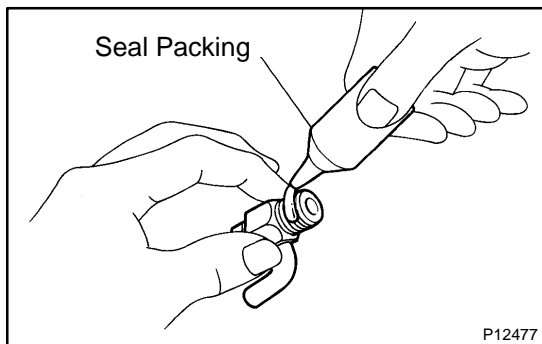
- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contacting surfaces of the oil seal retainer and cylinder block.
 - Using a razor blade and gasket scraper, remove all the old packing (FIPG) materials from the gasket surfaces and sealing grooves.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.
- (b) Apply seal packing to the oil seal retainer as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

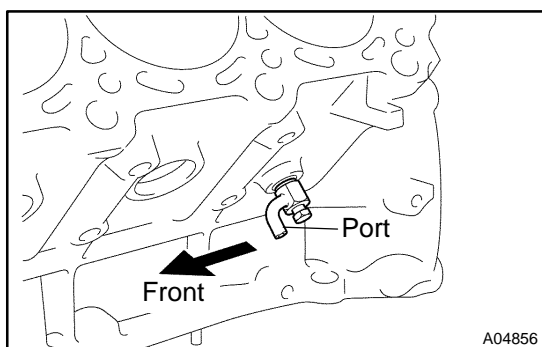


- (c) Install a new O-ring to the cylinder block.
 - (d) Install the oil seal retainer with the 7 bolts.
- Torque: 8.0 N-m (80 kgf-cm, 71 in.-lbf)**



15. INSTALL ENGINE COOLANT DRAIN UNIONS

- (a) Apply seal packing to 2 or 3 threads.
- Seal packing: Part No. 08826-00100 or equivalent**



- (b) Install the 2 drain unions.
- Torque: 49 N-m (500 kgf-cm, 36 ft-lbf)**

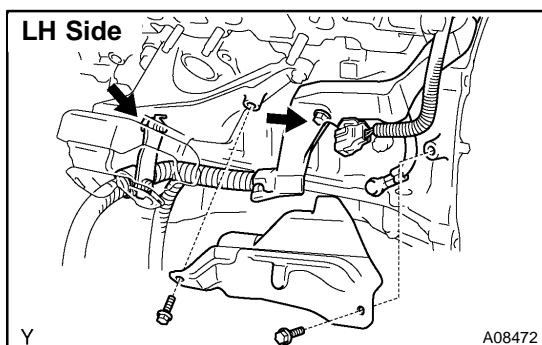
HINT:

After applying the specified torque, rotate the drain union clockwise until its drain port is facing forward.

- 16. **INSTALL OIL PUMP** (See page [LU-15](#))
- 17. **INSTALL OIL STRAINER** (See page [LU-15](#))
- 18. **INSTALL NO.1 OIL PAN** (See page [LU-15](#))
- 19. **INSTALL OIL PAN Baffle PLATE**
(See page [LU-15](#))
- 20. **INSTALL NO.2 OIL PAN** (See page [LU-15](#))
- 21. **INSTALL WATER PUMP** (See page [CO-8](#))
- 22. **INSTALL ENGINE MOUNTING BRACKETS**

Install the mounting bracket with the 4 bolts. Install the 2 mounting brackets.

Torque: 36 N-m (370 kgf-cm, 27 ft-lbf)



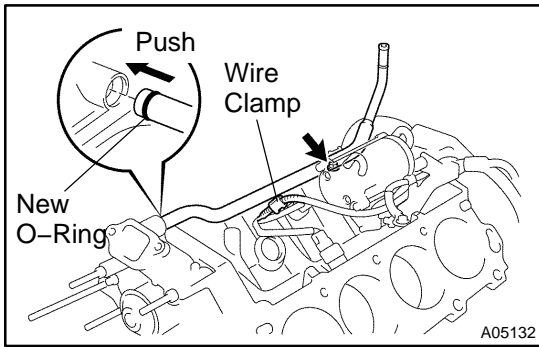
23. INSTALL ENGINE WIRE TO LH SIDE OF CYLINDER BLOCK

- (a) Install the brackets on the engine wire with the 2 bolts.
- (b) Install the engine wire cover with the 2 bolts.

24. INSTALL OIL COOLER PIPE BRACKET FOR A/T

Install the bracket with the bolt.

- 25. **INSTALL VVT SENSORS** (See page [SF-79](#))
- 26. **INSTALL KNOCK SENSORS** (See page [SF-70](#))
- 27. **INSTALL STARTER** (See page [ST-19](#))

**28. INSTALL WATER BYPASS PIPE**

- (a) Install a new O-ring to the water bypass pipe.
- (b) Apply soapy water to the O-ring.
- (c) Push in the water bypass pipe end into the pipe hole of the water pump.
- (d) Install the water bypass pipe with the bolt.
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)
- (e) Install the wire clamp to the bracket of the water bypass pipe.

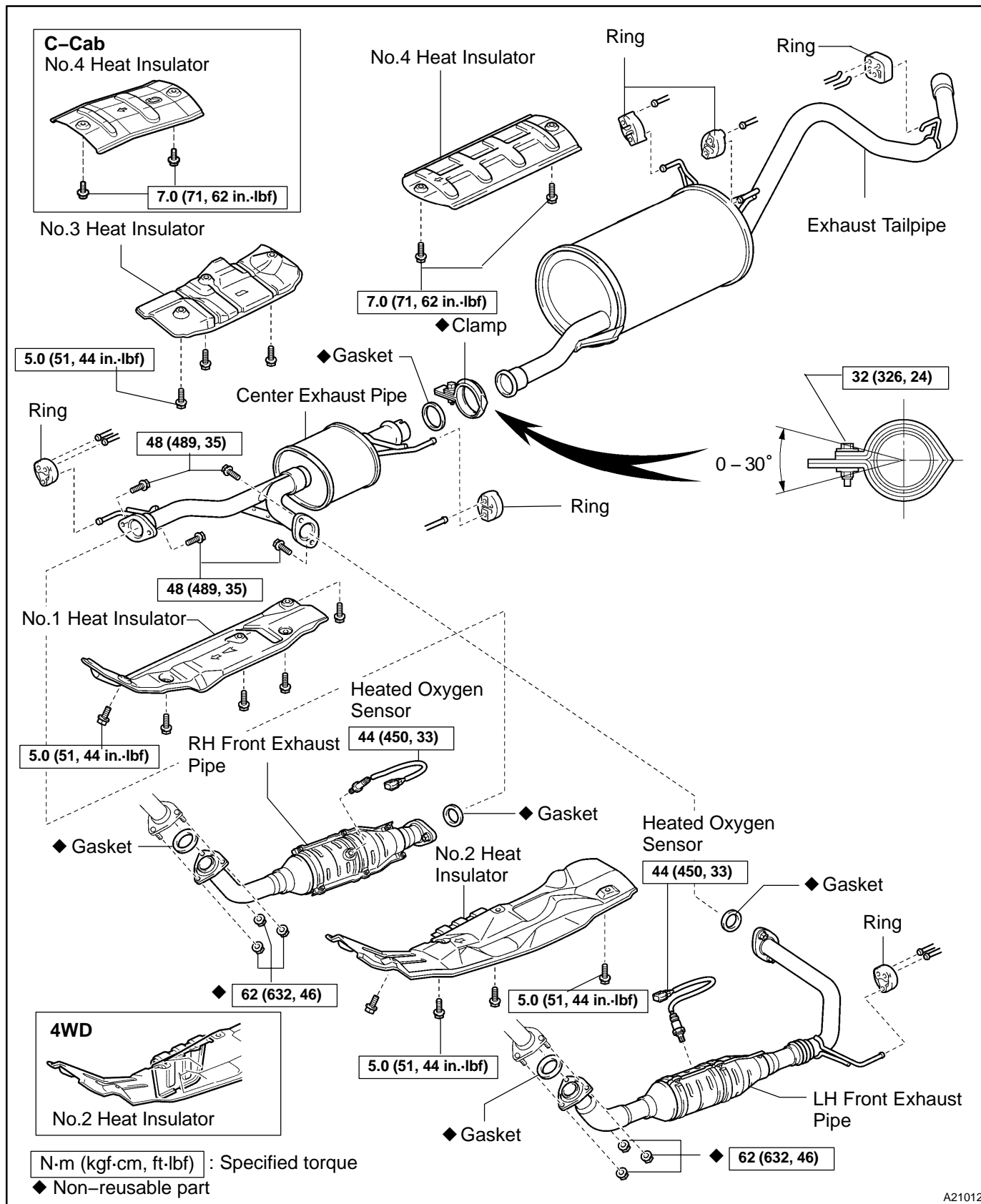
29. INSTALL CYLINDER HEADS (See page [EM-60](#))**30. INSTALL TIMING BELT AND PULLEYS**

(See page [EM-23](#))

31. DISCONNECT ENGINE FROM ENGINE STAND

EXHAUST SYSTEM COMPONENTS

EMOEE-21



REMOVAL

1. REMOVE HEATED OXYGEN SENSOR (BANK 1)

- (a) Disconnect the heated oxygen sensor.
- (b) Remove the heated oxygen sensor.

2. REMOVE HEATED OXYGEN SENSOR (BANK2)

- (a) Disconnect the heated oxygen sensor connector.
- (b) Remove the heated oxygen sensor.

3. SEPARATE EXHAUST CENTER PIPE

Remove the 4 bolts and 2 gasket from the exhaust center pipe.

4. REMOVE RH FRONT EXHAUST PIPE

Remove the 3 nuts, gasket, and front exhaust pipe from the exhaust manifold.

5. REMOVE LH FRONT EXHAUST PIPE

Remove the 3 nuts, gasket, ring and front exhaust pipe from the exhaust manifold.

6. REMOVE CENTER EXHAUST PIPE

- (a) Loosen the clamp bolt, disconnect the center exhaust pipe and remove the gasket from the exhaust tailpipe.
- (b) Remove the 2 rings and center exhaust pipe.

7. REMOVE EXHAUST TAILPIPE

- (a) Remove the 3 rings and exhaust tailpipe.

8. REMOVE HEAT INSULATOR

- (a) Remove the 5 bolts and No.1 heat insulator.
- (b) Remove the 4 bolts and No.2 heat insulator.
- (c) Remove the 3 bolts and No.3 heat insulator.
- (d) Remove the 2 bolts and No.4 heat insulator.

INSTALLATION

1. REMOVE HEAT INSULATOR

- (a) Install the No.1 heat insulator with the 5 bolts.

Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

- (b) Install the No.2 heat insulator with the 4 bolts.

Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

- (c) Install the No.3 heat insulator with the 3 bolts.

Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

- (d) Install the No.4 heat insulator with the 2 bolts.

Torque: 7.0 N·m (71 kgf·cm, 62 in.-lbf)

2. INSTALL EXHAUST TAIL PIPE

Install the 3 rings and exhaust tailpipe.

3. INSTALL CENTER EXHAUST PIPE

- (a) Install the 2 rings and center exhaust pipe.

- (b) Install a new gasket and connect the center exhaust pipe to the exhaust tailpipe with a new clamp.

Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)

4. INSTALL LH FRONT EXHAUST PIPE

- (a) Install a new gasket and ring to the LH front exhaust pipe.

- (b) Install the LH front exhaust pipe to the exhaust manifold with 3 new nuts.

Torque: 62 N·m (632 kgf·cm, 46 ft·lbf)

5. INSTALL RH FRONT EXHAUST PIPE

- (a) Install a new gasket to the RH front exhaust pipe.

- (b) Install the RH front exhaust pipe to the exhaust manifold with 3 new nuts.

Torque: 62 N·m (632 kgf·cm, 46 ft·lbf)

6. CONNECT EXHAUST CENTER PIPE

- (a) Install a new gasket and connect the RH front exhaust pipe with the 2 bolts.

Torque: 48 N·m (489 kgf·cm, 35 ft·lbf)

- (b) Install a new gasket and connect the LH front exhaust pipe with the 2 bolts.

Torque: 48 N·m (489 kgf·cm, 35 ft·lbf)

7. INSTALL HEATED OXYGEN SENSOR (BANK2)

- (a) Install the heated oxygen sensor.

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

- (b) Connect the heated oxygen sensor connector.

8. INSTALL HEATED OXYGEN SENSOR (BANK1)

- (a) Install the heated oxygen sensor.

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

- (b) Connect the heated oxygen sensor connector.

EMISSION CONTROL SYSTEM

EC007-01

PURPOSE

The emission control systems are installed to reduce the amount of HC, CO and NO_x exhausted from the engine ((3) and (4)), to prevent the atmospheric release of blow-by gas containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).

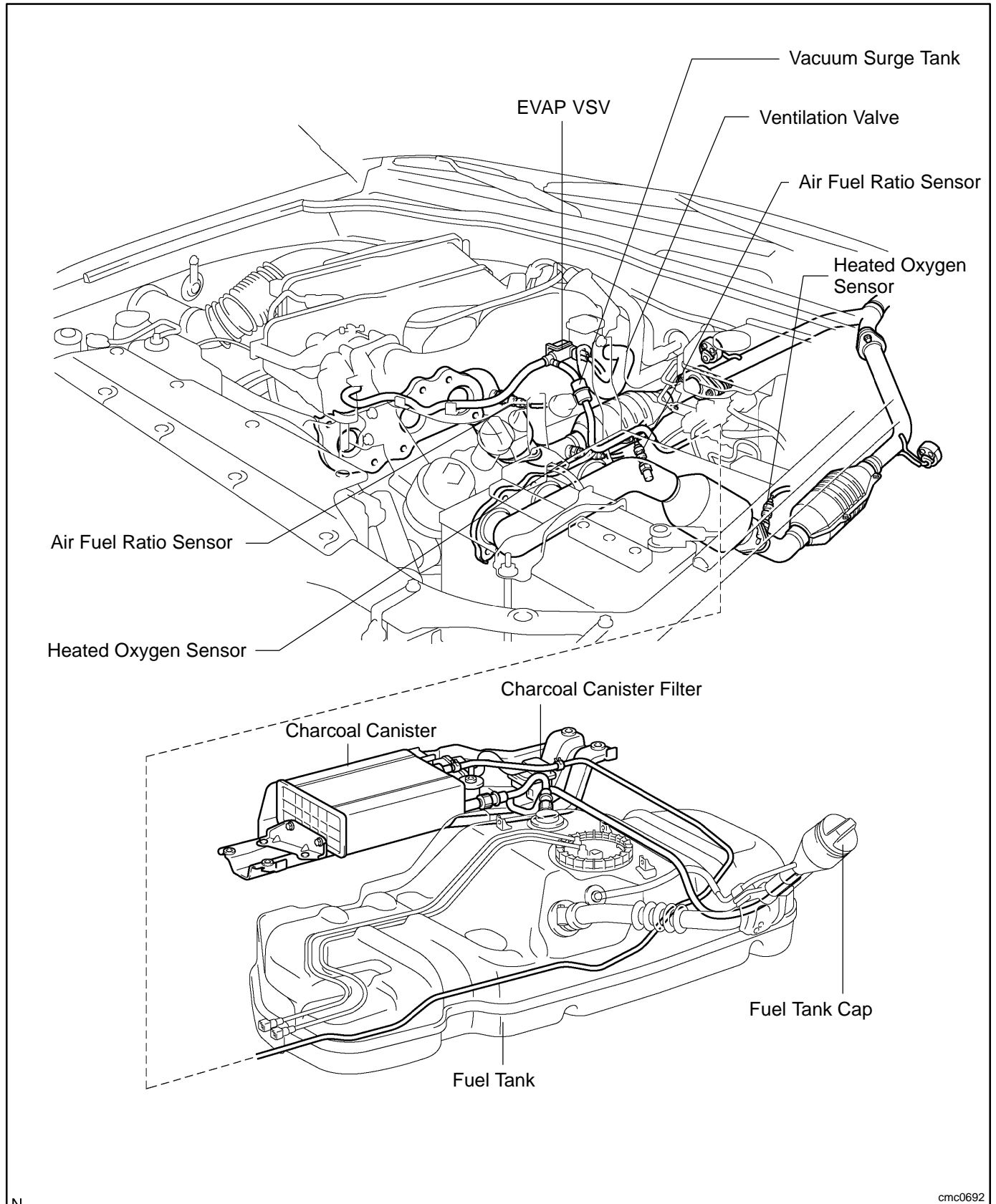
The function of each system is shown in the table below:

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces HC
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Three-way Catalytic Converter	TWC	Reduces HC, CO and NO _x
(4) Sequential Multiport Fuel Injection*	SFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

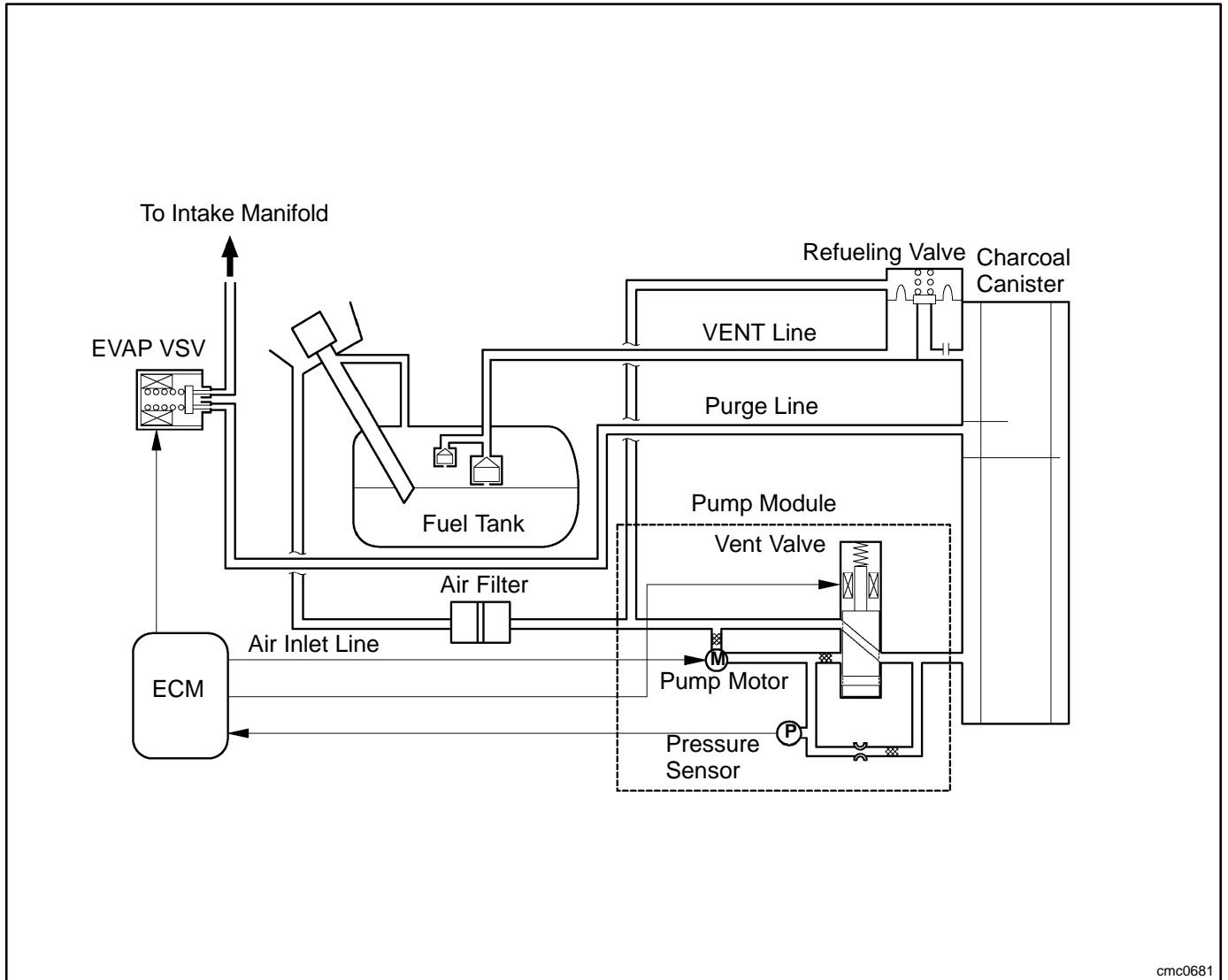
Remark: * For inspection and repair of the SFI system, refer to the SF section in this manual.

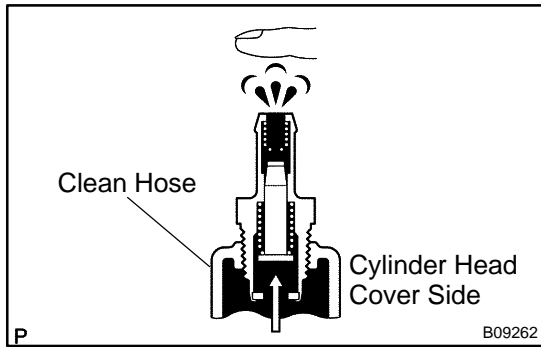
PARTS LAYOUT AND SCHEMATIC DRAWING LOCATION

EC008-01



DRAWING





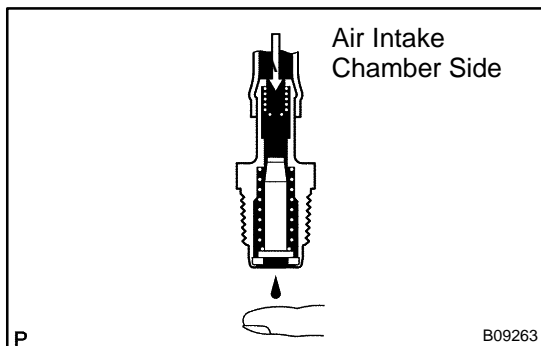
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM INSPECTION

EC00A-01

1. REMOVE V-BANK COVER
2. REMOVE VENTILATION VALVE
3. INSPECT VENTILATION VALVE
 - (a) Install a clean hose to the ventilation valve.
 - (b) Inspect ventilation valve operation.
 - (1) Blow air into the cylinder head side, and check that air passes through smoothly.

CAUTION:

Do not suck air through the valve. Petroleum substances inside the valve are harmful.



- (2) Blow air into the intake manifold side, and check that air does not pass through smoothly.

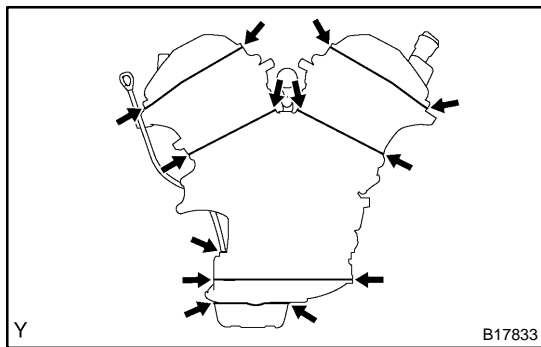
If operation is not as specified, replace the ventilation valve.

- (c) Remove the clean hose from the ventilation valve.

4. INSTALL VENTILATION VALVE

Install the ventilation valve to the LH cylinder head cover.

Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)



5. VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

- (a) Check for cracks, leaks or damage.

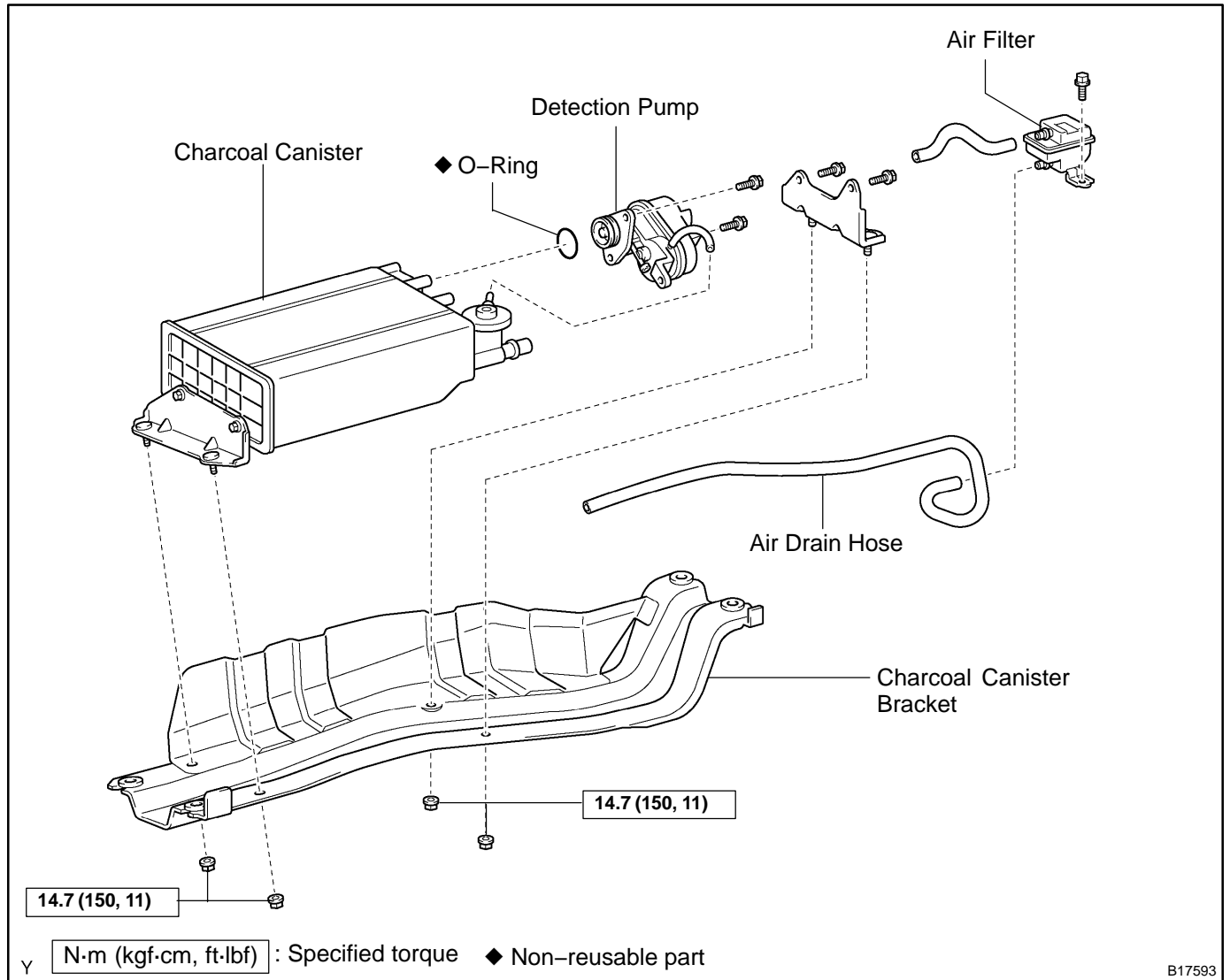
HINT:

Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause engine failure or malfunctions. Disconnection, looseness or cracks in parts of the air induction system between the throttle body and cylinder head will allow air suction and cause an engine failure or malfunctions.

6. INSTALL V-BANK COVER

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM COMPONENTS

EC00B-01



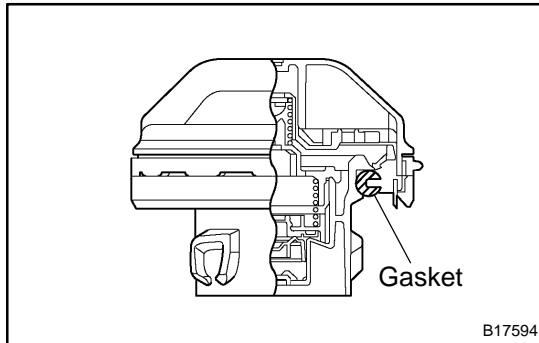
INSPECTION

1. INSPECT LINES AND CONNECTIONS

Visually check for loose connections, sharp bends or damage.

2. INSPECT FUEL TANK

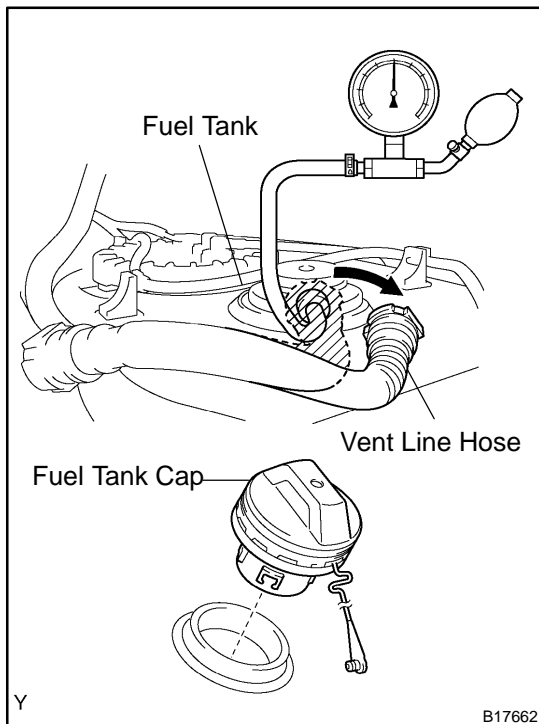
Visually check for deformation, cracks or fuel leakage.



3. INSPECT FUEL TANK CAP

Visually check if the cap and/or gasket are deformed or damaged.

If necessary, repair or replace the cap.



4. INSPECT FUEL CUTOFF VALVE AND FILL CHECK VALVE

- (a) Disconnect the vent line hose from the fuel tank.
- (b) Connect the pressure gauge to the fuel tank.
- (c) Fill the fuel tank with fuel.
- (d) Apply pressure of 4 kPa (41 gf/cm², 0.58 psi) to the vent port of the fuel tank.

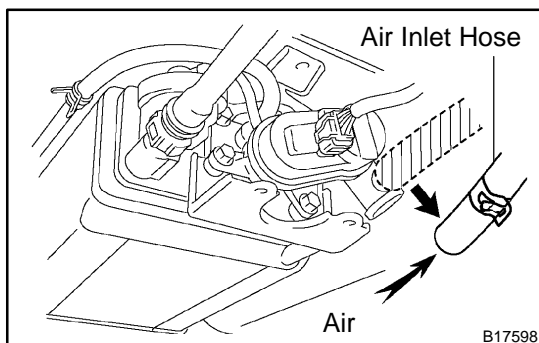
HINT:

It is necessary to check the amount of fuel in the fuel tank. When the fuel tank is full, the float valve of the fill check valve is closed and no air can pass through.

- (e) Remove the fuel tank cap, and check that the pressure drops.

If the pressure does not drop, replace the fuel tank assembly.

- (f) Reconnect the vent line hose to the fuel tank.



5. CHECK AIR INLET LINE

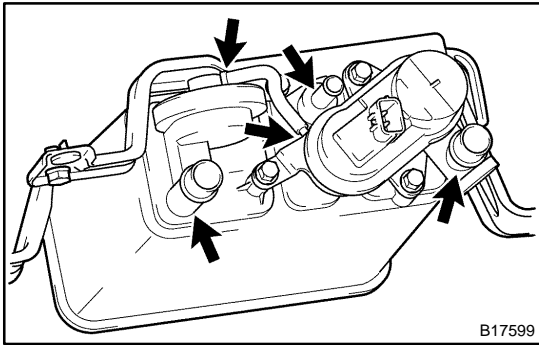
- (a) Disconnect the air inlet line hose from the charcoal canister.

- (b) Check that air can flow freely into the air inlet line.

If air cannot flow freely into the air inlet line, repair or replace it.

- (c) Reconnect the air inlet line hose to the charcoal canister.

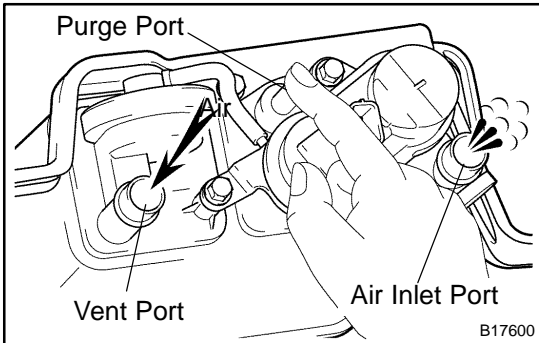
6. REMOVE CHARCOAL CANISTER ASSEMBLY



7. INSPECT CHARCOAL CANISTER ASSEMBLY

(a) Visually check the charcoal canister for cracks or damage.

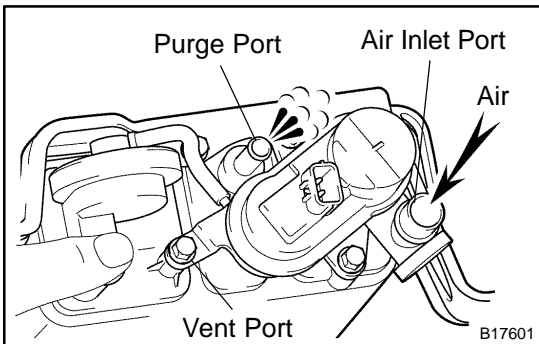
If cracks or damage are found, replace the charcoal canister assembly.



(b) Check charcoal canister operation.

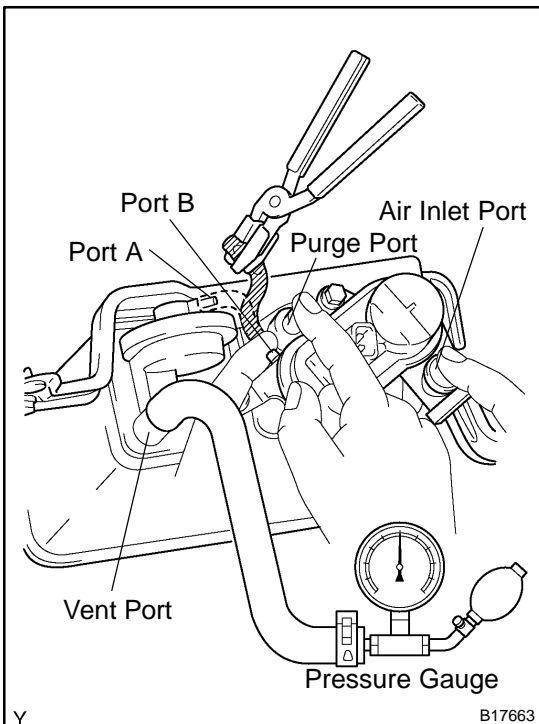
(1) With the purge port closed, blow 1.67 kPa (17.0 gf/cm², 0.24 psi) of air into the vent port, and check that air flows from the air inlet port.

If the result is not as specified, replace the charcoal canister assembly.



(2) With the vent port closed, blow 1.10 kPa (11.2 gf/cm², 0.16 psi) of air to the air inlet port, and check that air flows from the purge port.

If the result is not as specified, replace the charcoal canister assembly.



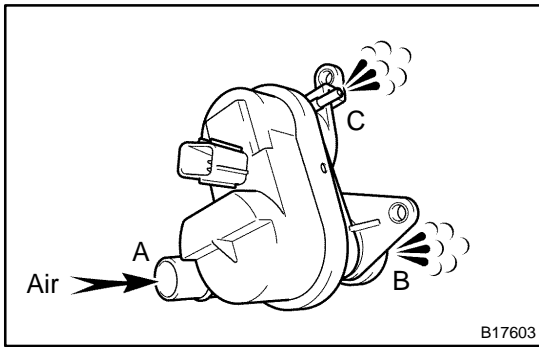
(c) Check for air leakage.

(1) Remove the air hose between ports A and B.

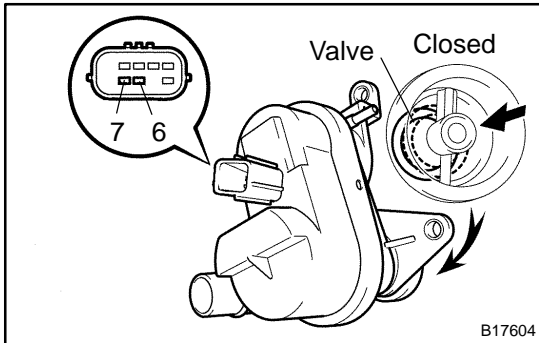
(2) Connect the pressure gauge to the vent port of the charcoal canister.

(3) While holding port B, with the purge port and the air inlet port closed and port A open, apply 19.6 kPa (0.2 kgf/cm², 2.81 psi) of pressurized air into the vent port, then confirm that pressure is retained for 1 minute.

If the result is not as specified, replace the charcoal canister assembly.



- (d) Check leak detection pump.
- (1) Remove the detection pump from the charcoal canister.
 - (2) Check that air flows from port A to B and then to C.
- If the result is not as specified, replace the charcoal canister assembly.



- (3) Connect the positive (+) lead of the battery to terminal 7 and the negative (-) lead to terminal 6.
 - (4) Check that the valve is closed.
- If the result is not as specified, replace the charcoal canister assembly.
- (5) Install the detection pump.

8. **INSPECT VSV FOR EVAP (See page [SF-65](#))**
9. **REINSTALL CHARCOAL CANISTER ASSEMBLY**

EC-10

EMISSION CONTROL (1GR-FE) - EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

- MEMO -

- MEMO -

THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM

ON-VEHICLE INSPECTION

EC00D-01

1. CHECK EXHAUST PIPE ASSEMBLY

- (a) Check the connections for looseness or damage.
- (b) Check the clamps for weakness, cracks or damage.

2. INSPECT TWC

Check for dents or damage.

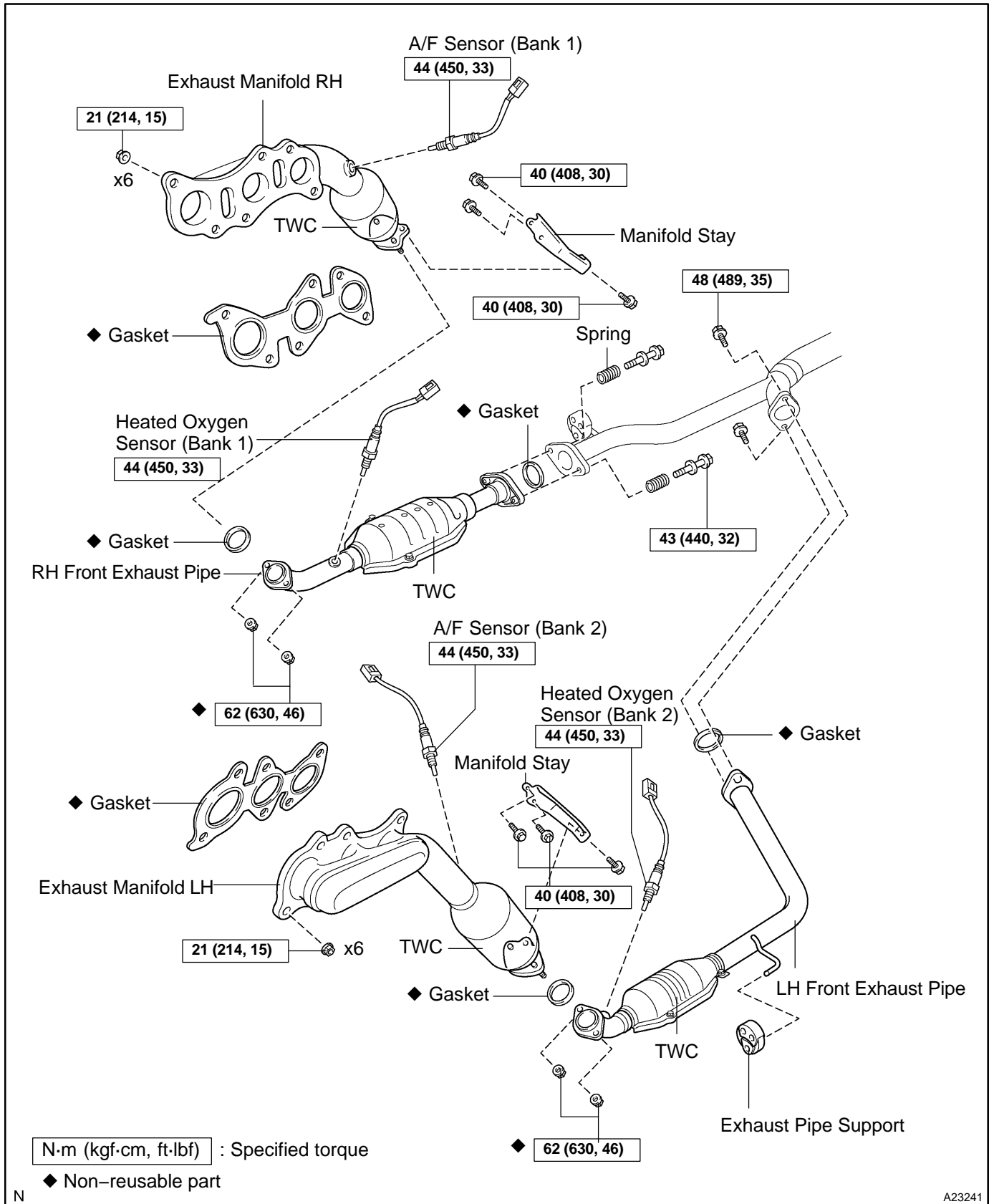
If any part of the protector is damaged or dented to the extent that it contacts the TWC, repair or replace it.

3. INSPECT HEAT INSULATOR

- (a) Check the heat insulator for damage.
- (b) Check for adequate clearance between the TWC and heat insulator.

THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM COMPONENTS

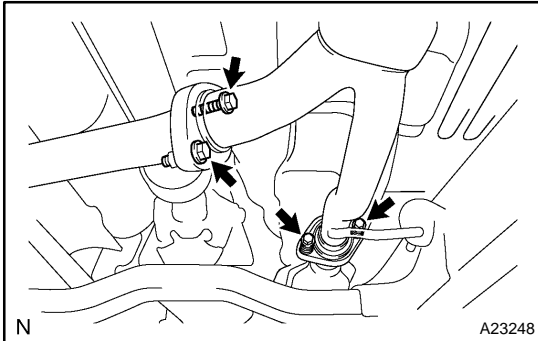
EC00E-01



REPLACEMENT

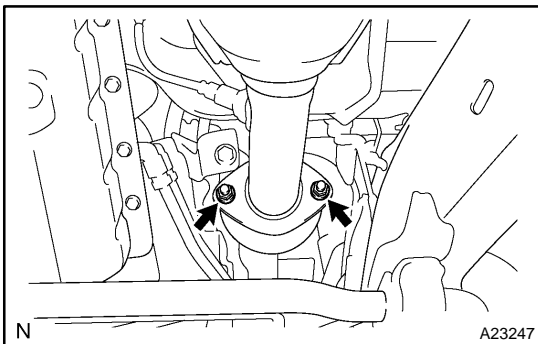
1. REMOVE HEATED OXYGEN SENSOR (BANK 1)

- (a) Disconnect the heated oxygen sensor.
- (b) Remove the heated oxygen sensor.



2. SEPARATE EXHAUST CENTER PIPE

Remove the 4 bolts and 2 springs from the exhaust center pipe.

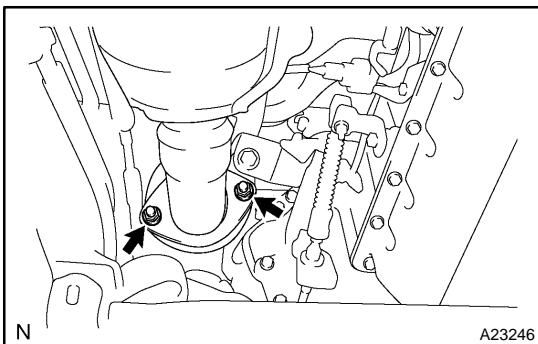


3. REMOVE RH FRONT EXHAUST PIPE

- (a) Remove the 2 nuts and RH front exhaust pipe.
- (b) Remove the 2 gaskets from the RH front exhaust pipe.

4. REMOVE HEATED OXYGEN SENSOR (BANK 2 OXYGEN SENSOR)

- (a) Disconnect the heated oxygen sensor connector.
- (b) Remove the heated oxygen sensor.



5. REMOVE LH FRONT EXHAUST PIPE

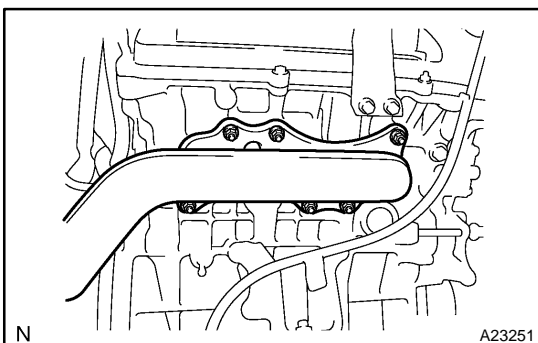
- (a) Remove the 2 nuts, exhaust pipe support and LH front exhaust pipe.
- (b) Remove the 2 gaskets from the LH front exhaust pipe.

6. REMOVE MANIFOLD STAY

Remove the 6 bolts and 2 manifold stays.

7. REMOVE A/F SENSOR (BANK 1)

- (a) Disconnect the A/F sensor connector.
- (b) Remove the A/F sensor.

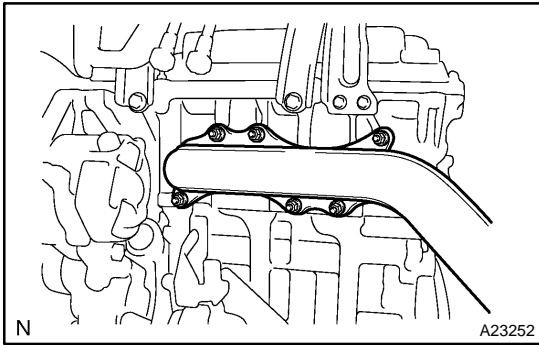


8. REMOVE EXHAUST MANIFOLD RH

Remove the 6 nuts, exhaust manifold RH and gasket.

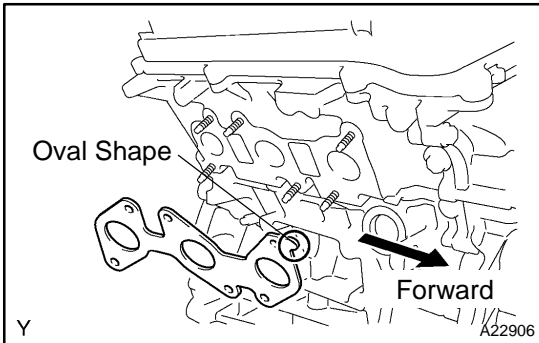
9. REMOVE A/F SENSOR (BANK 2)

- (a) Disconnect the A/F sensor connector.
- (b) Remove the A/F sensor.



10. REMOVE EXHAUST MANIFOLD LH

Remove the 6 nuts, exhaust manifold LH and gasket.

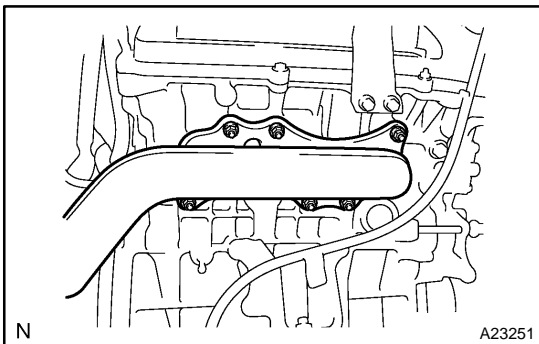


11. INSTALL EXHAUST MANIFOLD RH

(a) Set a new gasket to the RH cylinder head with the oval shape facing forward.

NOTICE:

Be careful of the installation direction.



(b) Install the exhaust manifold with the 6 nuts. Tighten the nuts uniformly in several steps.

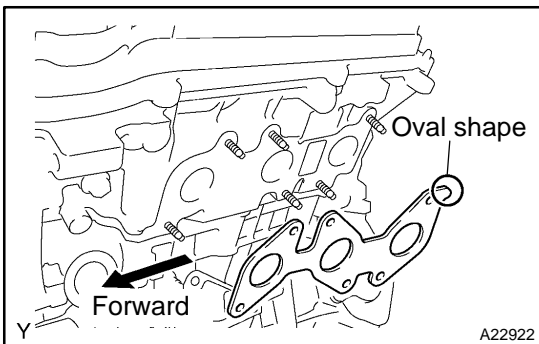
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

12. INSTALL A/F SENSOR (BANK 1)

(a) Install the A/F sensor.

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(b) Connect the A/F sensor connector.

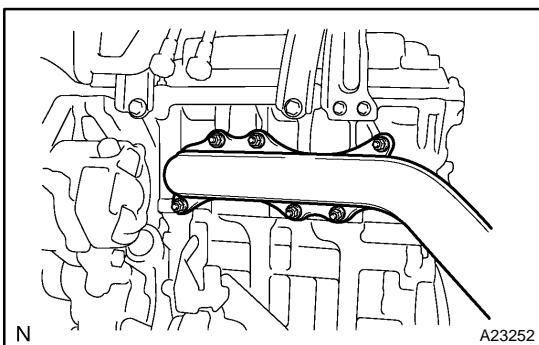


13. INSTALL EXHAUST MANIFOLD LH

(a) Set a new gasket to the LH cylinder head with the oval shape facing backward.

NOTICE:

Be careful of the installation direction.



(b) Install the exhaust manifold with the 6 nuts. Tighten the nuts uniformly in several steps.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

14. INSTALL A/F SENSOR (BANK 2)

(a) Install the A/F sensor.

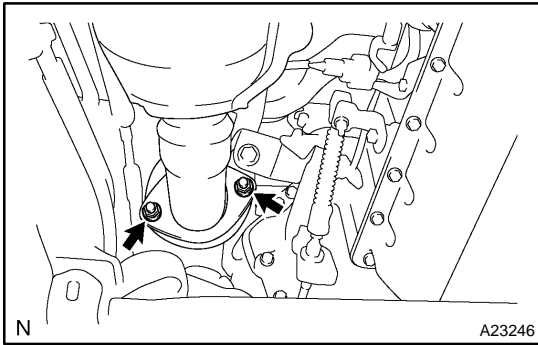
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(b) Connect the A/F sensor connector.

15. INSTALL MANIFOLD STAY

Install the 2 manifold stays with the 6 bolts.

Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)



16. INSTALL LH FRONT EXHAUST PIPE

- (a) Install 2 new gaskets to the LH front exhaust pipe.
- (b) Install the LH front exhaust pipe with 2 new nuts.

Torque: 62 N·m (630 kgf-cm, 46 ft-lbf)

- (c) Install the exhaust pipe support.

17. INSTALL HEATED OXYGEN SENSOR (BANK 2 OXYGEN SENSOR)

- (a) Install the heated oxygen sensor.

Torque: 44 N·m (450 kgf-cm, 33 ft-lbf)

- (b) Connect the heated oxygen sensor connector.

18. INSTALL RH FRONT EXHAUST PIPE

- (a) Install 2 new gaskets to the RH front exhaust pipe.
- (b) Install the RH front exhaust pipe with 2 new nuts.

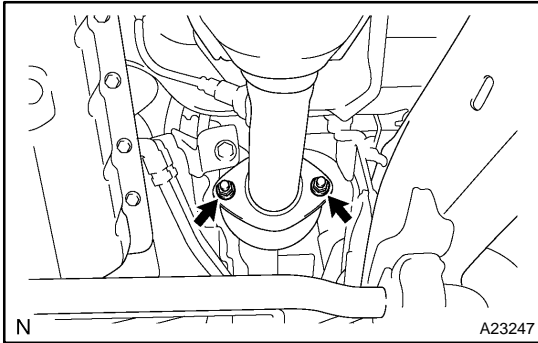
Torque: 62 N·m (630 kgf-cm, 46 ft-lbf)

19. INSTALL HEATED OXYGEN SENSOR (BANK 1 OXYGEN SENSOR)

- (a) Install the heated oxygen sensor.

Torque: 44 N·m (450 kgf-cm, 33 ft-lbf)

- (b) Connect the heated oxygen sensor connector.



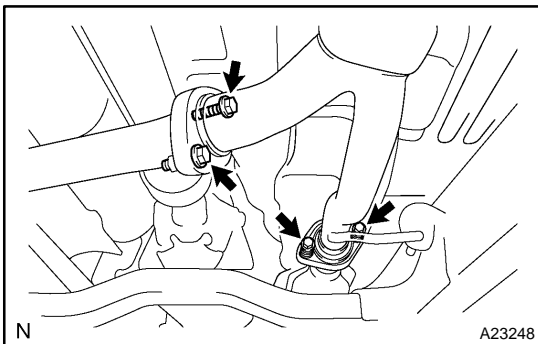
20. CONNECT EXHAUST CENTER PIPE

- (a) Install the 2 bolts.

Torque: 48 N·m (489 kgf-cm, 35 ft-lbf)

- (b) Install the 2 bolts and springs.

Torque: 43 N·m (440 kgf-cm, 32 ft-lbf)



EMISSION CONTROL SYSTEM

EC087-03

PURPOSE

The emission control systems are installed to reduce the amount of HC, CO and NOx exhausted from the engine ((3) and (4)), to prevent the atmospheric release of blow-by gas-containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).

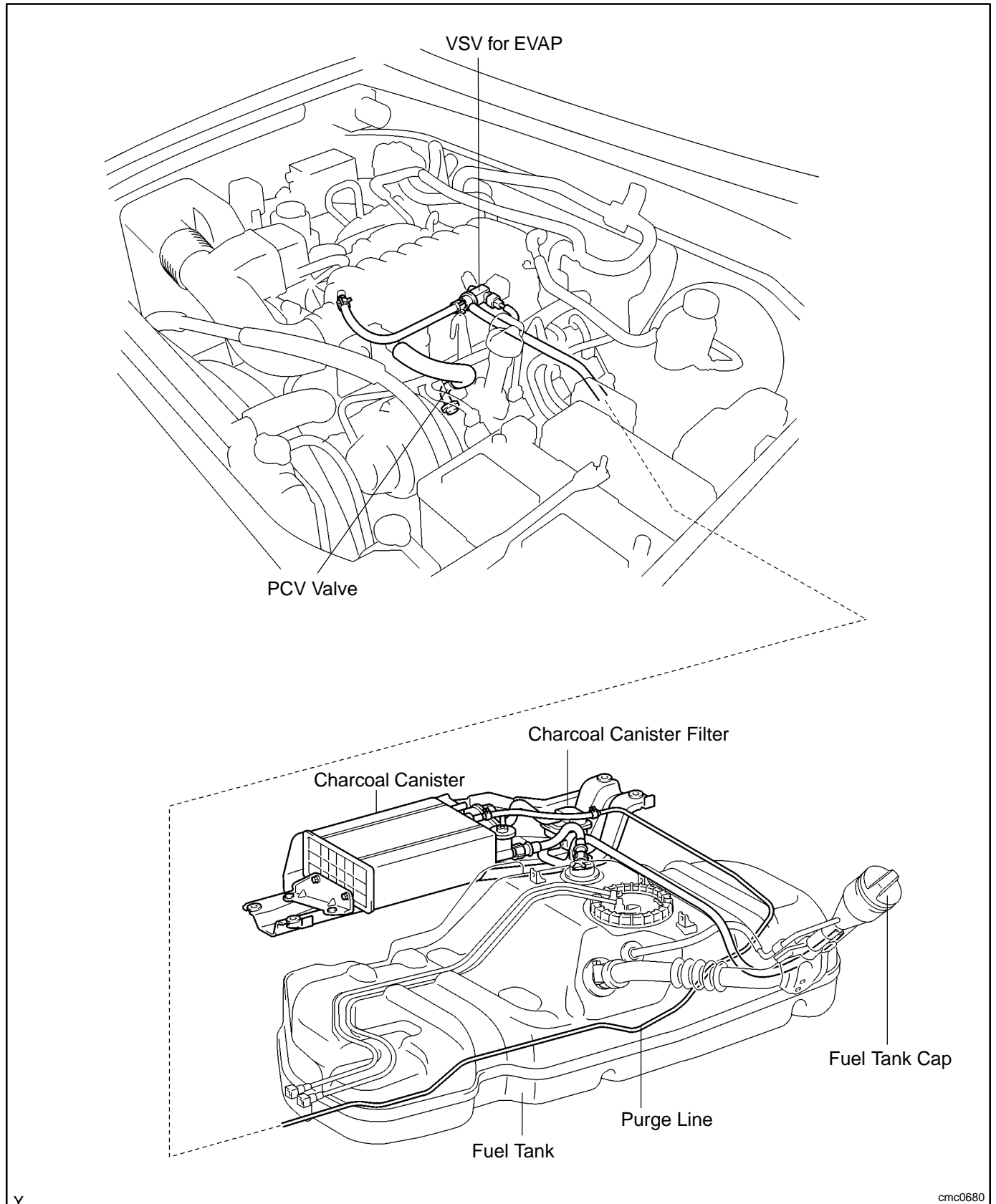
The function of each system is shown in these table:

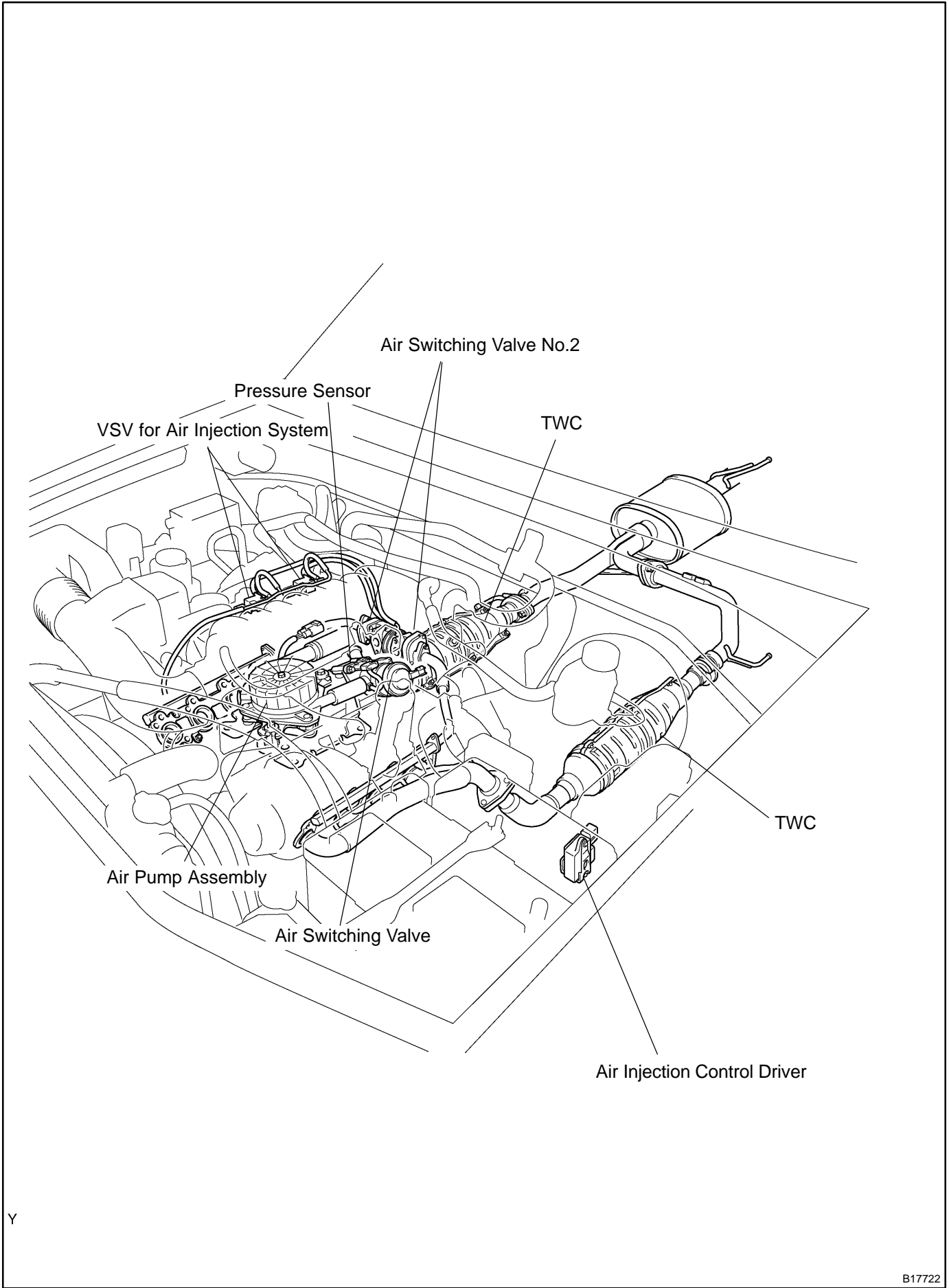
System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces HC
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Three-Way Catalytic Converter	TWC	Reduces HC, CO and NOx
(4) Sequential Multiport Fuel Injection*	SFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

Remark: * For inspection and repair of the SFI system, refer to the SF section in this manual.

PARTS LAYOUT AND SCHEMATIC DRAWING LOCATION

EC0NO-02

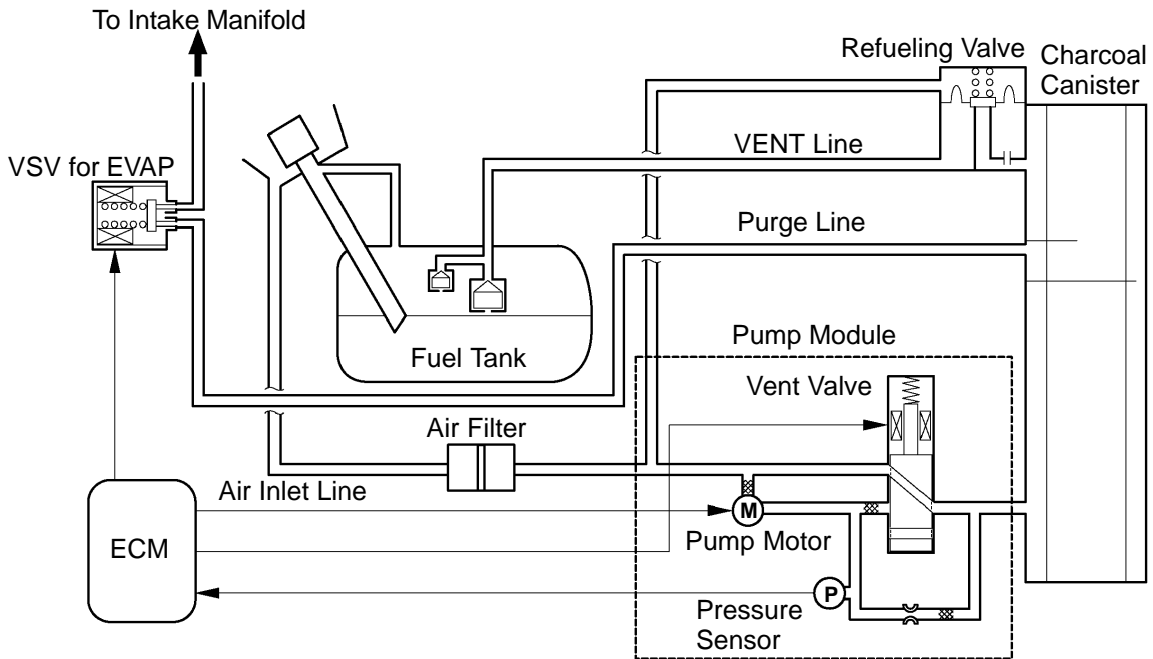




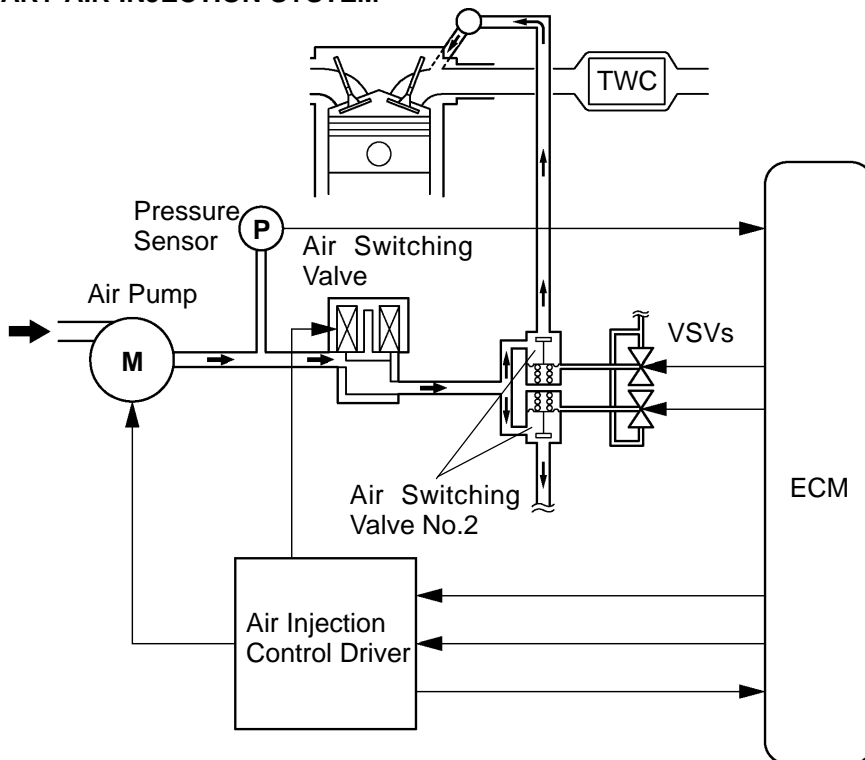
Y

DRAWING

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

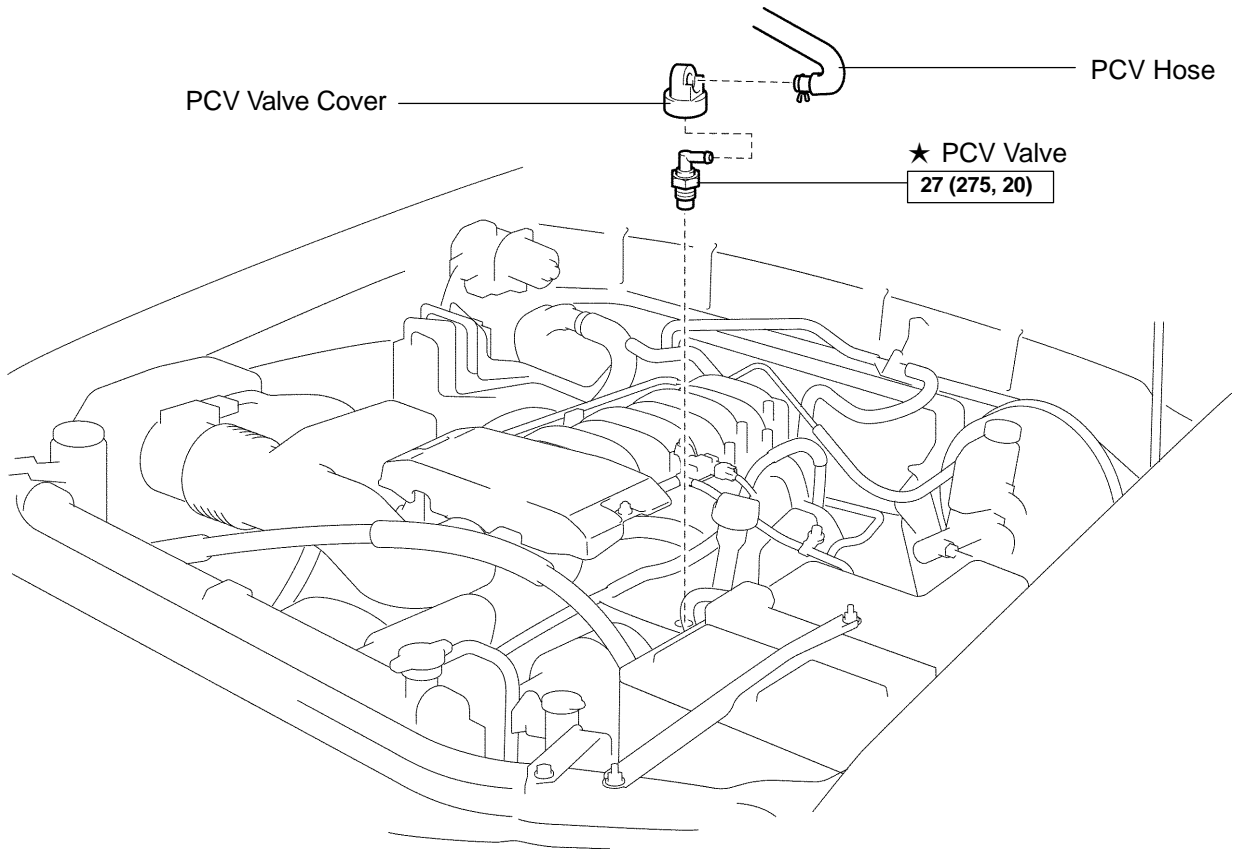


SECONDARY AIR INJECTION SYSTEM



POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM COMPONENTS

ECOMB-01

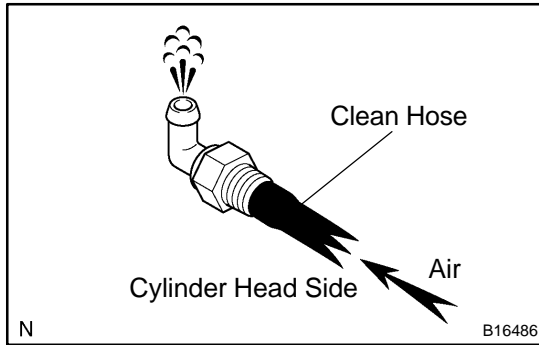


N·m (kgf·cm, ft·lbf) : Specified torque

★ Precoated part

INSPECTION

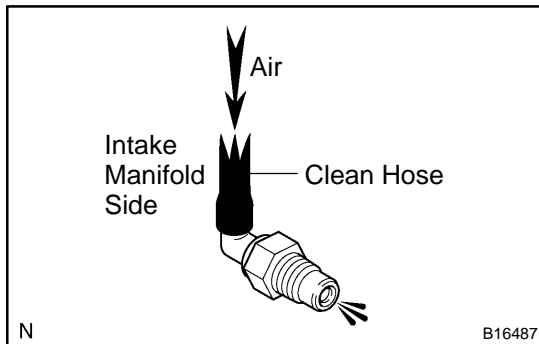
1. REMOVE V-BANK COVER
2. INSPECT PCV VALVE
 - (a) Remove the PCV valve.



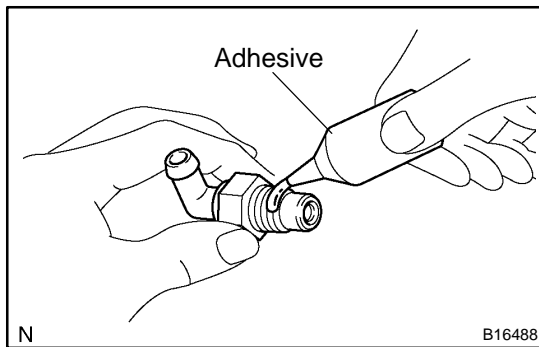
- (b) Install a clean hose to the PCV valve.
- (c) Inspect the PCV valve operation.
 - (1) Blow air into the cylinder head side, and check that air passes through easily.

CAUTION:

Do not suck air through the valve. Petroleum substances inside the valve are harmful.

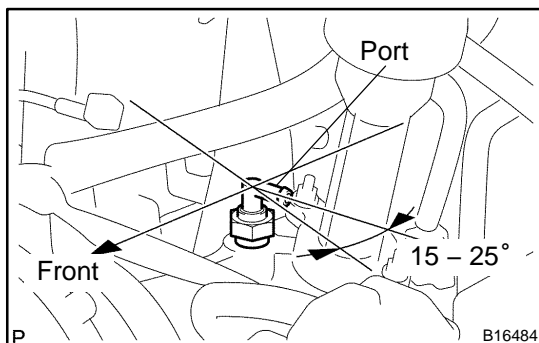


- (2) Blow air into the intake manifold side, and check that air passes through with difficulty.
- If operation is not as specified, replace the PCV valve.
- (d) Remove the clean hose from the PCV valve.

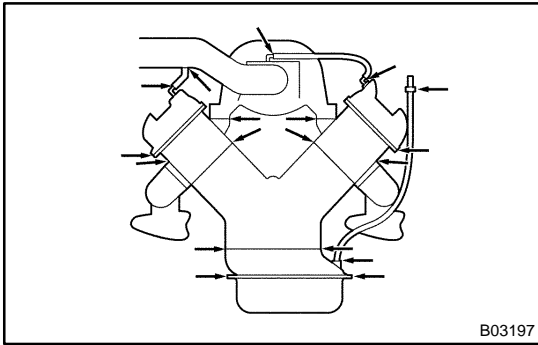


- (e) Reinstall the PCV valve.
 - (1) Apply adhesive to 2 or 3 threads.

Adhesive:
Part No. 08833-00070, THREE BOND 1324 or equivalent



- (2) Reinstall the PCV valve.
- Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)**
- HINT:**
 After applying the specified torque, rotate the PCV valve clockwise with the port faced in the direction indicated in the illustration.
- (3) Install the PCV valve cover to the PCV valve.
 - (4) Connect the PCV hose to the PCV valve.



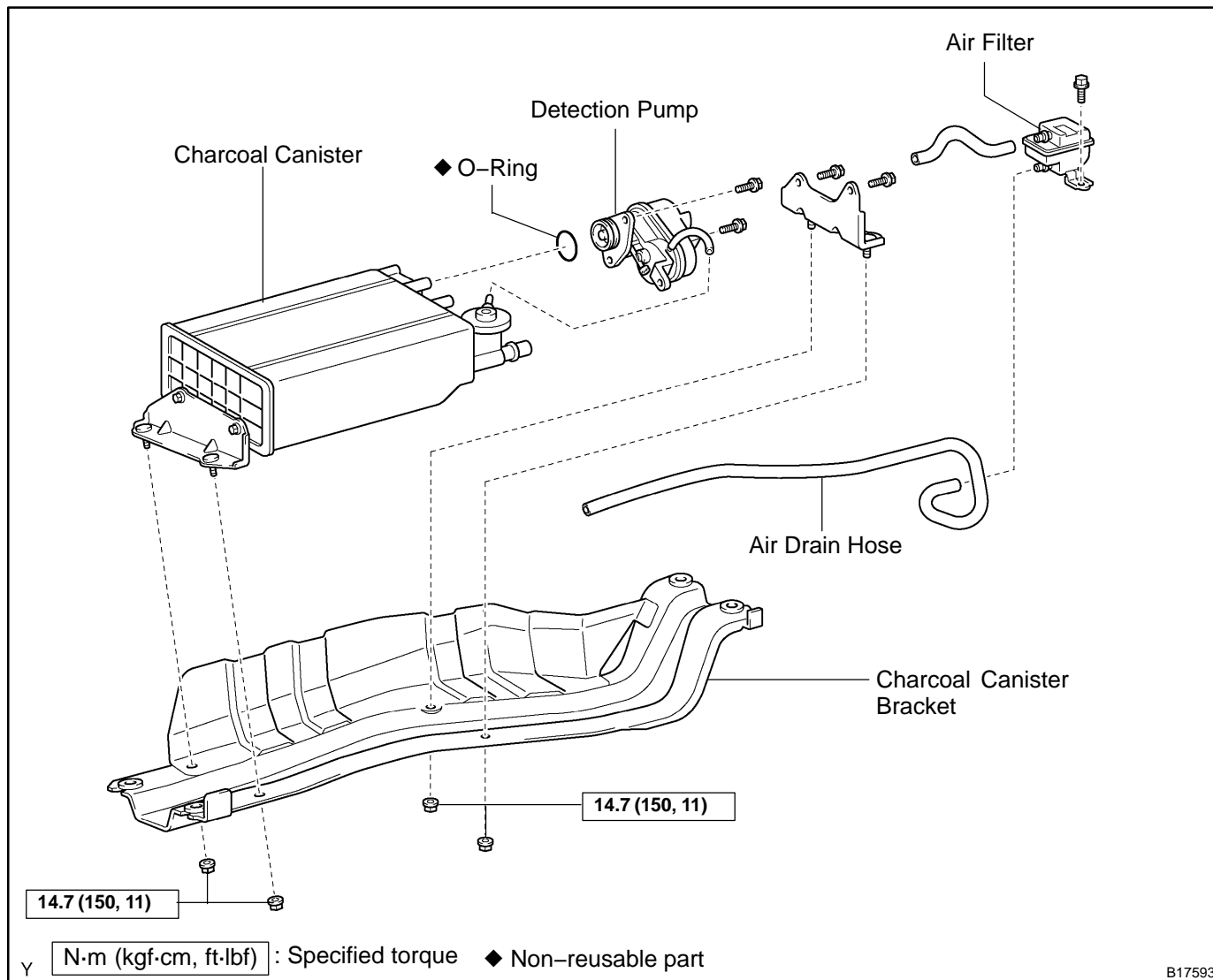
3. INSPECT HOSES, CONNECTIONS AND GASKETS

Visually for cracks, leaks or damage.

4. REINSTALL V-BANK COVER

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM COMPONENTS

EC0JK-04



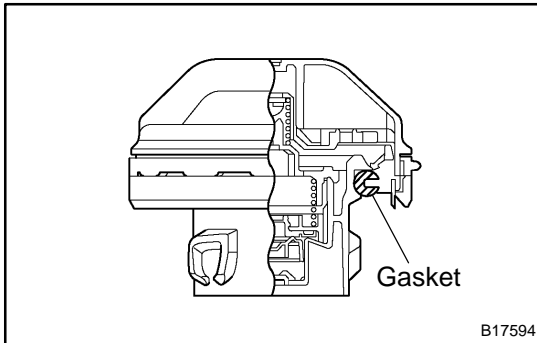
INSPECTION

1. INSPECT LINES AND CONNECTIONS

Visually check for loose connections, sharp bends or damage.

2. INSPECT FUEL TANK

Visually check for deformation, cracks or fuel leakage.

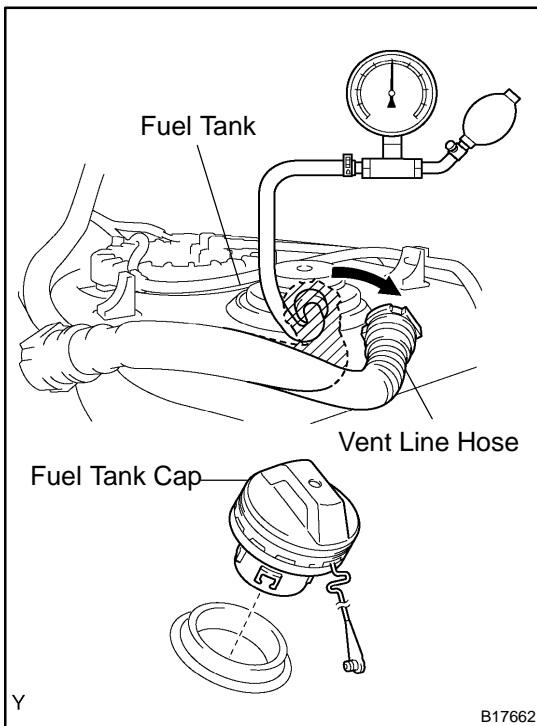


B17594

3. INSPECT FUEL TANK CAP

Visually check if the cap and/or gasket are deformed or damaged.

If necessary, repair or replace the cap.



B17662

4. INSPECT FUEL CUTOFF VALVE AND FILL CHECK VALVE

- (a) Disconnect the vent line hose from the fuel tank.
- (b) Connect the pressure gauge to the fuel tank.
- (c) Fill the fuel tank with fuel.
- (d) Apply pressure of 4 kPa (41 gf/cm², 0.58 psi) to the vent port of the fuel tank.

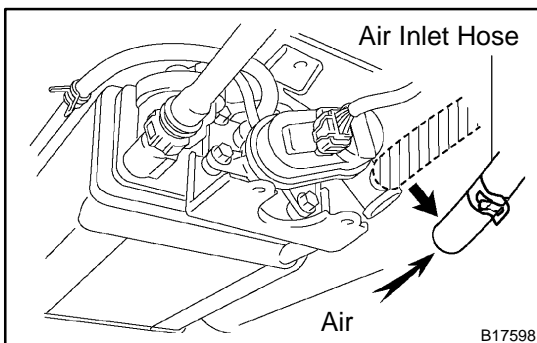
HINT:

It is necessary to check the amount of fuel in the fuel tank. When the fuel tank is full, the float valve of the fill check valve is closed and no air can pass through.

- (e) Remove the fuel tank cap, and check that the pressure drops.

If the pressure does not drop, replace the fuel tank assembly.

- (f) Reconnect the vent line hose to the fuel tank.



B17598

5. CHECK AIR INLET LINE

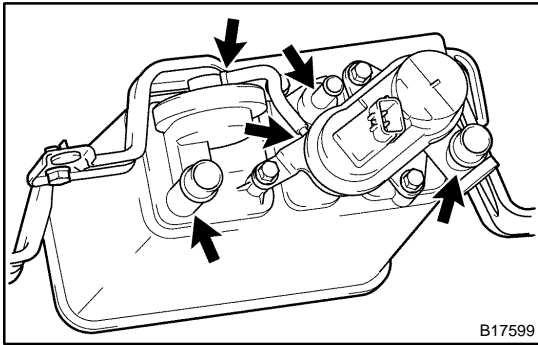
- (a) Disconnect the air inlet line hose from the charcoal canister.

- (b) Check that air can flow freely into the air inlet line.

If air cannot flow freely into the air inlet line, repair or replace it.

- (c) Reconnect the air inlet line hose to the charcoal canister.

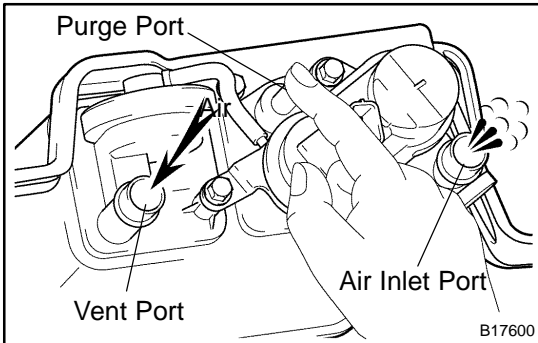
6. REMOVE CHARCOAL CANISTER ASSEMBLY



7. INSPECT CHARCOAL CANISTER ASSEMBLY

(a) Visually check the charcoal canister for cracks or damage.

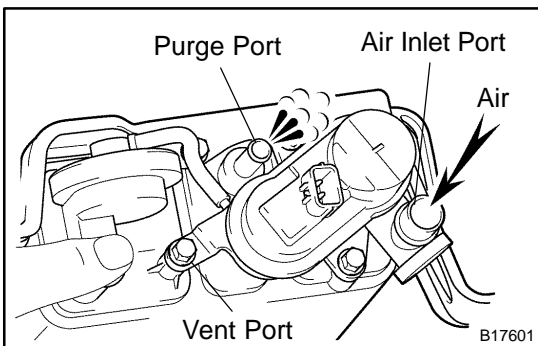
If cracks or damage are found, replace the charcoal canister assembly.



(b) Check charcoal canister operation.

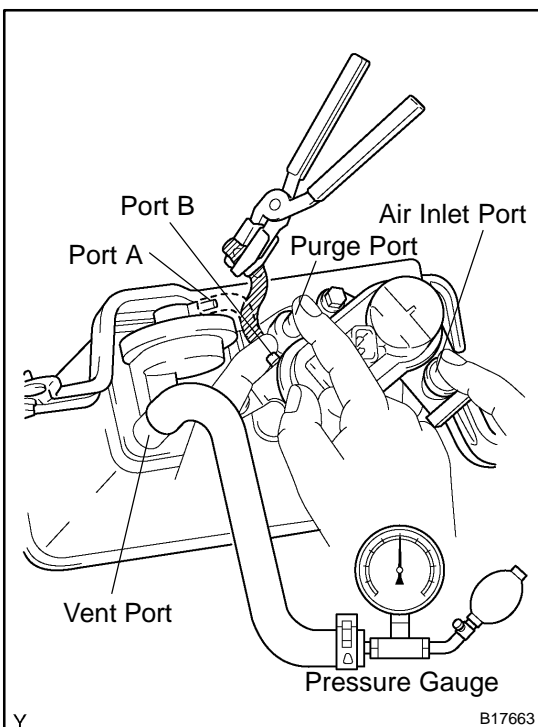
(1) With the purge port closed, blow 1.67 kPa (17.0 gf/cm², 0.24 psi) of air into the vent port, and check that air flows from the air inlet port.

If the result is not as specified, replace the charcoal canister assembly.



(2) With the vent port closed, blow 1.10 kPa (11.2 gf/cm², 0.16 psi) air to the air inlet port, and check that air flows from the purge port.

If the result is not as specified, replace the charcoal canister assembly.



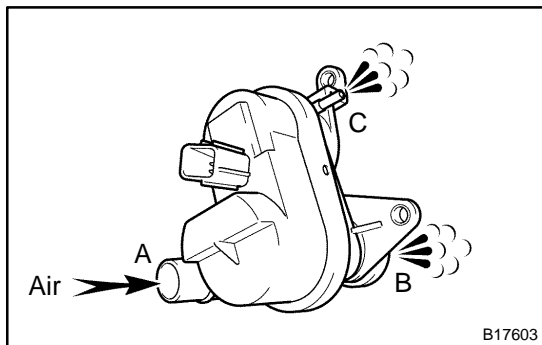
(c) Check for air leakage.

(1) Remove the air hose between ports A and B.

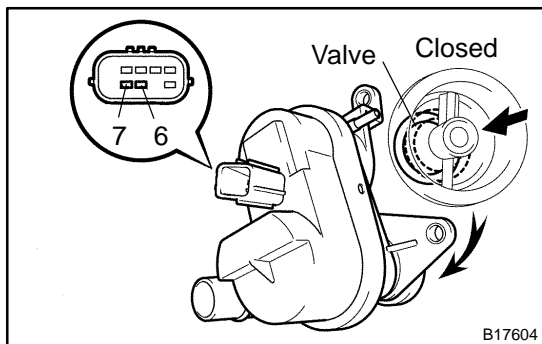
(2) Connect the pressure gauge to the vent port of the charcoal canister.

(3) While holding port B, with the purge port and the air inlet port closed and port A open, apply pressurized air 19.6 kPa (0.2 kgf/cm², 2.81 psi) of pressurized air into the vent port, then confirm that the pressure is retained for 1 minute.

If the result is not as specified, replace the charcoal canister assembly.



- (d) Check leak detection pump.
- (1) Remove the detection pump from the charcoal canister.
 - (2) Check that air flows from port A to B and then C.
- If the result is not as specified, replace the charcoal canister assembly.



- (3) Connect the positive (+) lead to terminal 7 and the negative (-) lead to terminal 6.
 - (4) Check that the valve is closed.
- If the result is not as specified, replace the charcoal canister assembly.
- (5) Install the detection pump.

8. **INSPECT VSV FOR EVAP (See page [SF-65](#))**
9. **REINSTALL CHARCOAL CANISTER ASSEMBLY**

- MEMO -

- MEMO -

THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM

ON-VEHICLE INSPECTION

ECQJM-02

1. CHECK EXHAUST PIPE ASSEMBLY

- (a) Check the connections for looseness or damage.
- (b) Check the clamps for weakness, cracks or damage.

2. INSPECT TWC

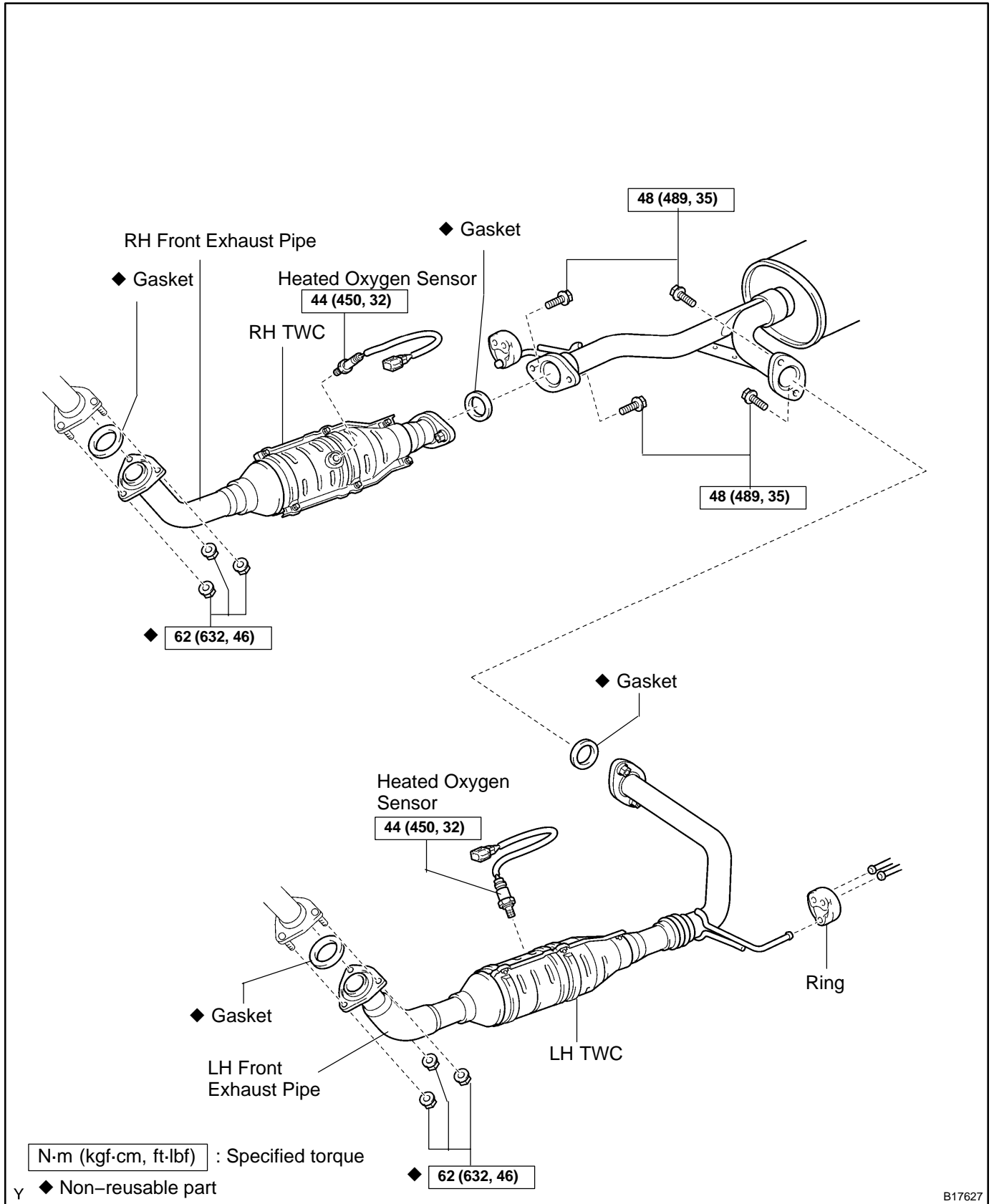
Check for dents or damage.

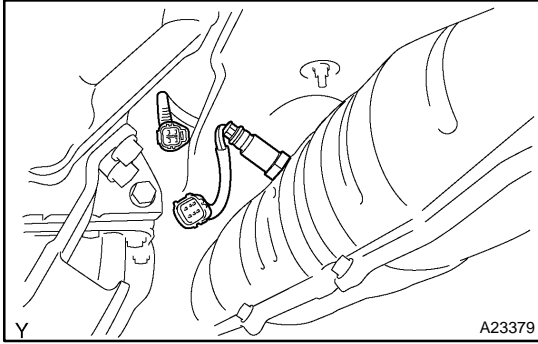
If any part of protector is damaged or dented to the extent that it contacts the TWC, repair or replace it.

3. INSPECT HEAT INSULATOR

- (a) Check the heat insulator for damage.
- (b) Check for adequate clearance between the TWC and heat insulator.

COMPONENTS





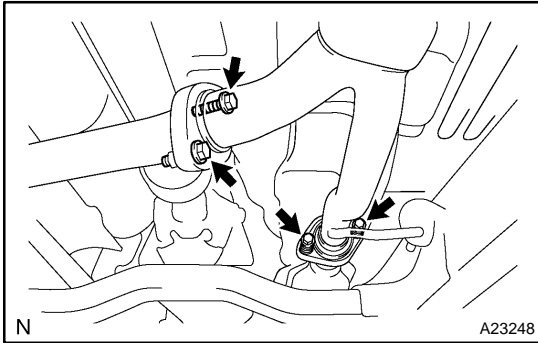
REPLACEMENT

1. REMOVE HEATED OXYGEN SENSOR (BANK 1)

- (a) Disconnect the heated oxygen sensor.
- (b) Remove the heated oxygen sensor.

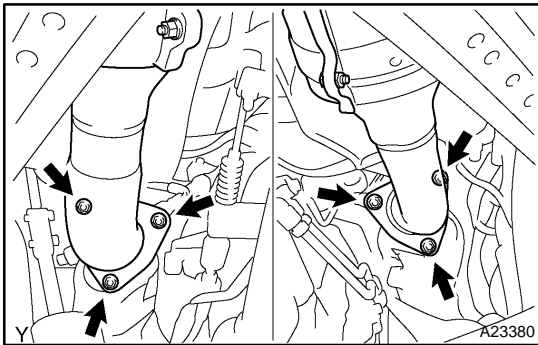
2. REMOVE HEATED OXYGEN SENSOR(BANK2)

- (a) Disconnect the heated oxygen sensor connector.
- (b) Remove the heated oxygen sensor.



3. SEPARATE EXHAUST CENTER PIPE

Remove the 4 bolts and 2 gasket from the exhaust center pipe.



4. REMOVE RH FRONT EXHAUST PIPE

- (a) Remove the 3 nuts and RH front exhaust pipe.
- (b) Remove the gasket from the RH front exhaust pipe.

5. REMOVE LH FRONT EXHAUST PIPE

- (a) Remove the 3 nuts and LH front exhaust pipe.
- (b) Remove the gasket from the LH front exhaust pipe.

6. INSTALL LH FRONT EXHAUST PIPE

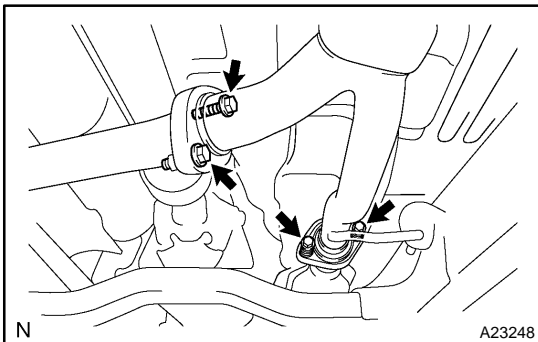
- (a) Install a new gasket to the LH front exhaust pipe.
- (b) Install the LH front exhaust pipe with 3 new nuts.

Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

7. INSTALL RH FRONT EXHAUST PIPE

- (a) Install a new gasket to the RH front exhaust pipe.
- (b) Install the RH front exhaust pipe with 3 new nuts.

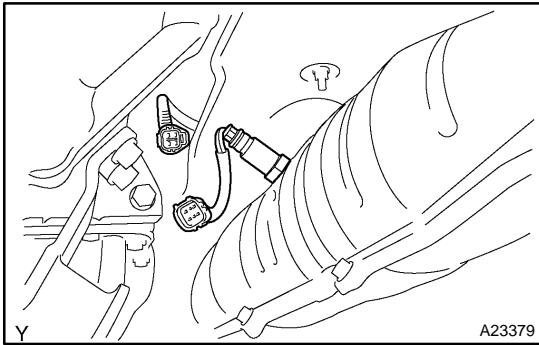
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)



8. CONNECT EXHAUST CENTER PIPE

Install the 4 bolts.

Torque: 48 N·m (489 kgf·cm, 35 ft·lbf)



9. INSTALL HEATED OXYGEN SENSOR (BANK2)

- (a) Install the heated oxygen sensor.

Torque: 44 N·m (450 kgf-cm, 33 ft-lbf)

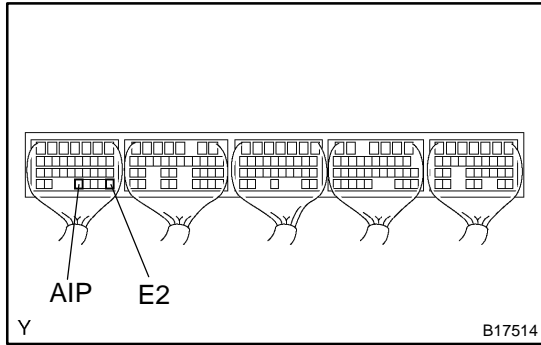
- (b) Connect the heated oxygen sensor connector.

10. INSTALL HEATED OXYGEN SENSOR (BANK1)

- (a) Install the heated oxygen sensor.

Torque: 44 N·m (450 kgf-cm, 33 ft-lbf)

- (b) Connect the heated oxygen sensor connector.



SECONDARY AIR INJECTION SYSTEM

ECONY-02

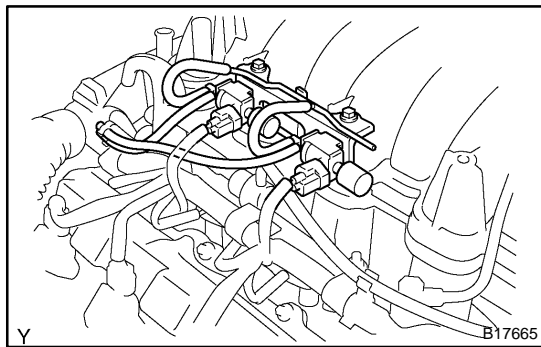
ON-VEHICLE INSPECTION

1. INSPECT PRESSURE SENSOR

- (a) Turn the ignition switch to the ON position.
- (b) Measure the voltage between terminals AIP and E2 of the ECM connector.

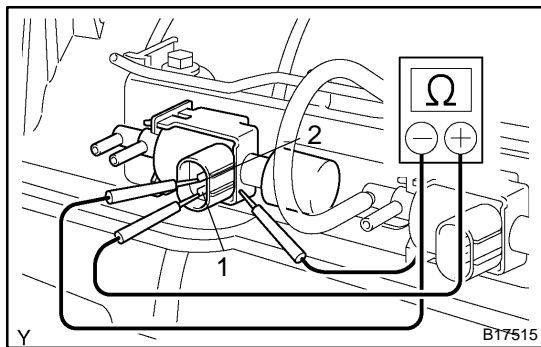
Voltage: 1.0 to 2.2 V

If the voltage is not as specified, replace the pressure sensor.



2. INSPECT VSV FOR AIR INJECTION SYSTEM

- (a) Disconnect the connector from the VSV.
- (b) Disconnect the 2 vacuum hoses from the VSV.

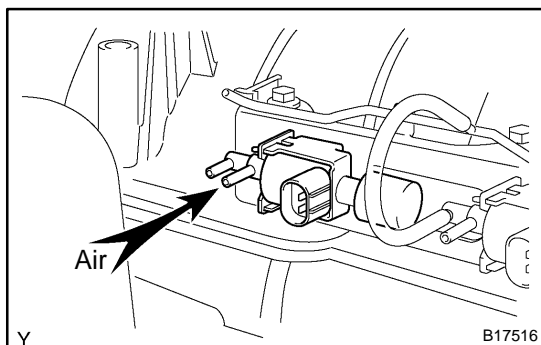


- (c) Using an ohmmeter, measure the resistance between the terminals.

Standard:

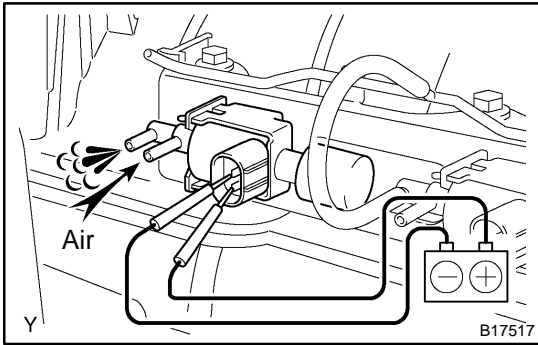
Tester Connection	Specified Condition
1 – 2	33 to 39 Ω at 20°C (68°F)
1 – Body ground	10 MΩ or higher
2 – Body ground	10 MΩ or higher

If the resistance is not as specified, replace the VSV.



- (d) Check that air does not flow from the port as shown in the illustration.

If the result is not as specified, replace the VSV.



(e) Apply positive battery between the terminals, check that air flows from the ports.

If the result is not as specified, replace the VSV.

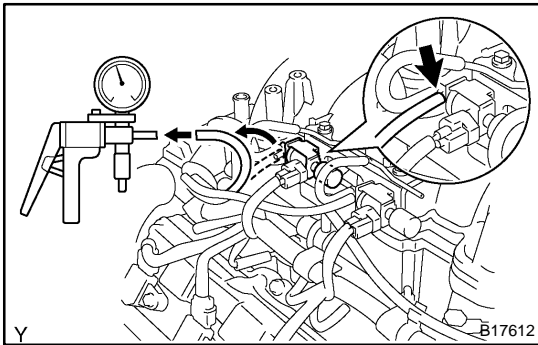
(f) Connect the 2 vacuum hoses to the VSV.

NOTICE:

Be sure to connect the vacuum hoses correctly.

(g) Connect the connector to the VSV.

(h) Perform procedures (a) to (g) to the other VSV.

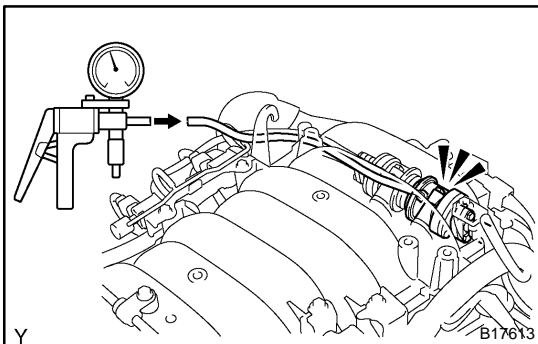


3. INSPECT NO. 2 AIR SWITCHING VALVE

(a) Disconnect the vacuum hose from the VSV for the air injection system.

(b) Apply vacuum (30 kPa (306 gf/cm², 4.35 psi) to vacuum hose, check that the vacuum does not decrease.

If operation is not as specified, replace the No.2 air switching valve.

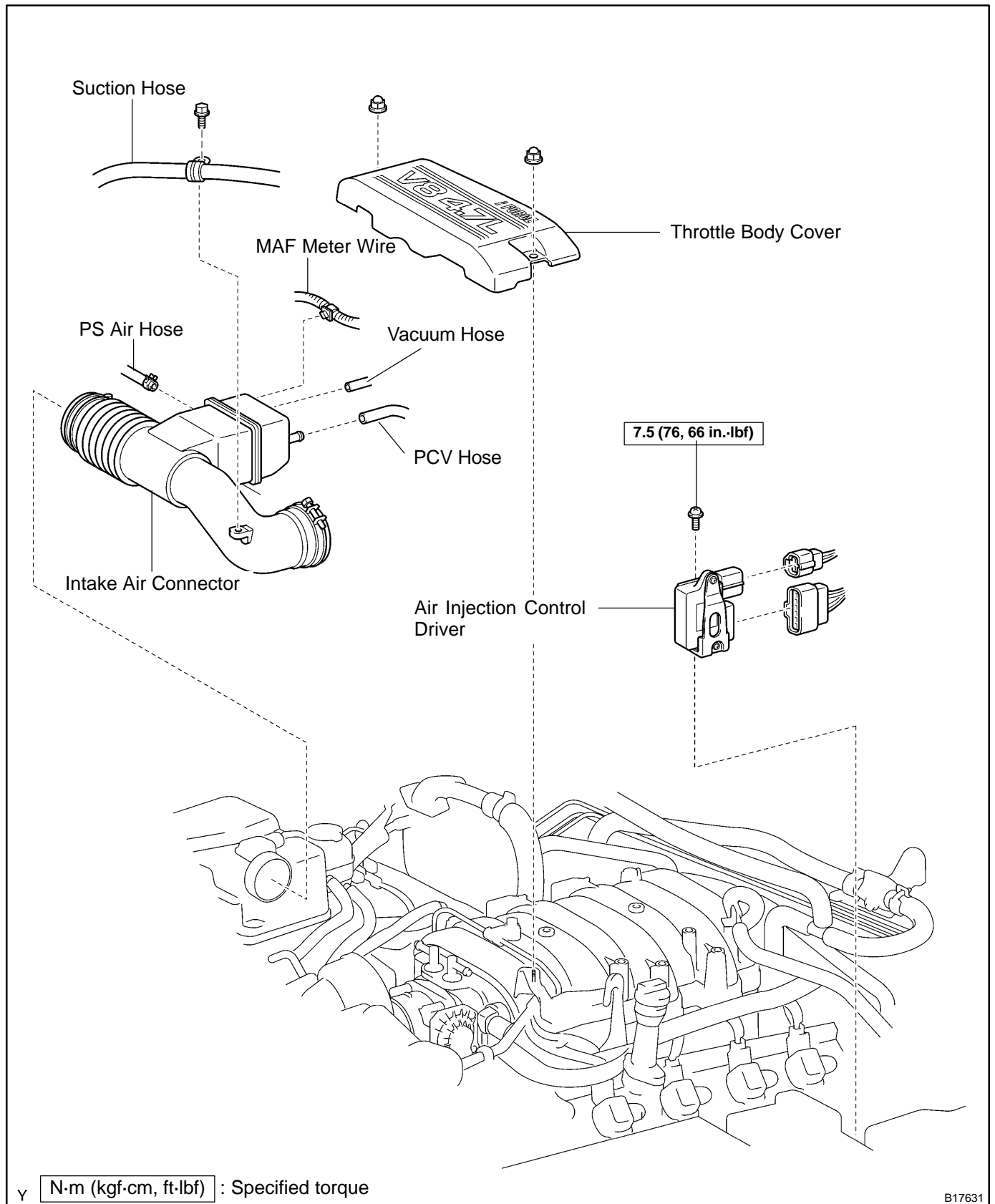


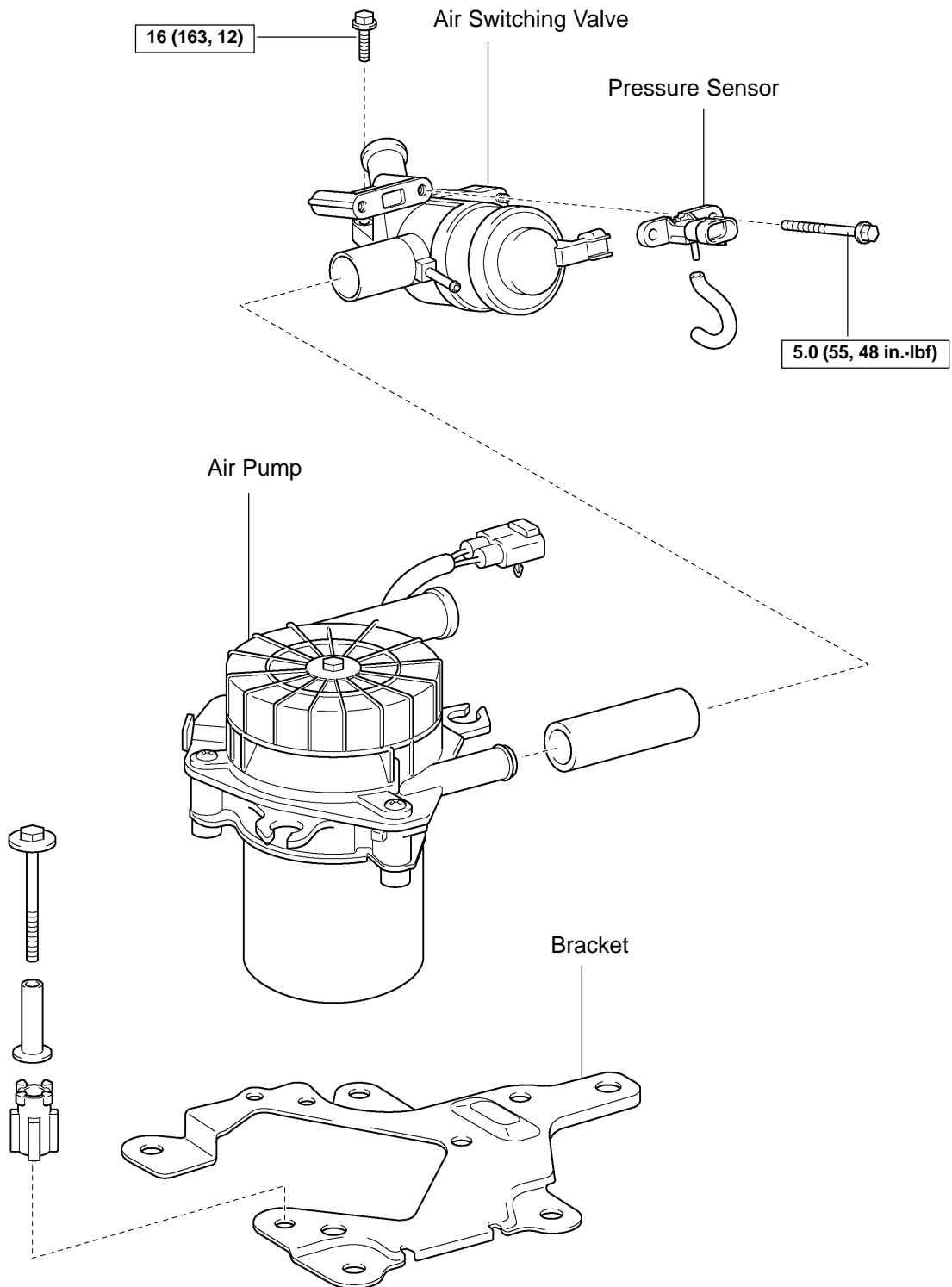
(c) Release the vacuum, and check that the operation sound is emitted from the No.2 air switching valve.

If operation is not as specified, replace the No.2 air switching valve.

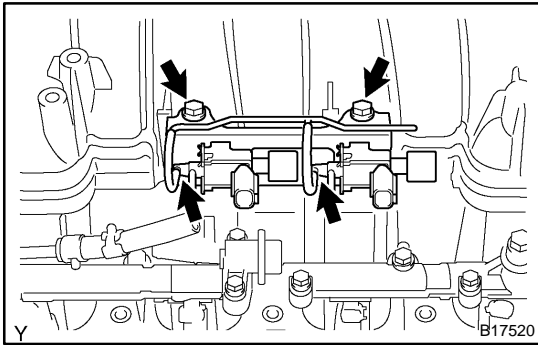
(d) Perform procedures (a) to (c) to the other No.2 air switching valve.

COMPONENTS



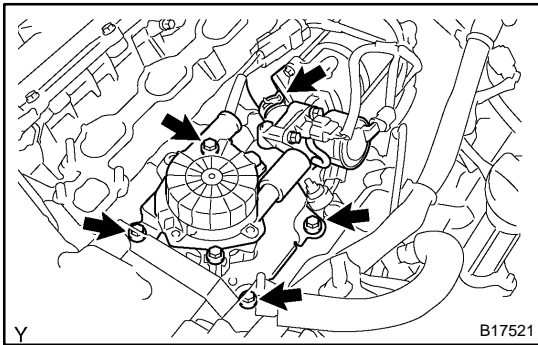


γ N·m (kgf·cm, ft·lbf) : Specified torque

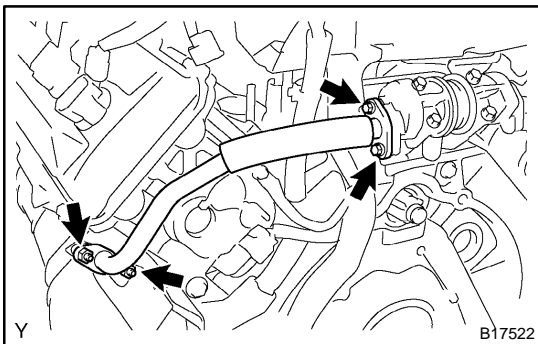


REMOVAL

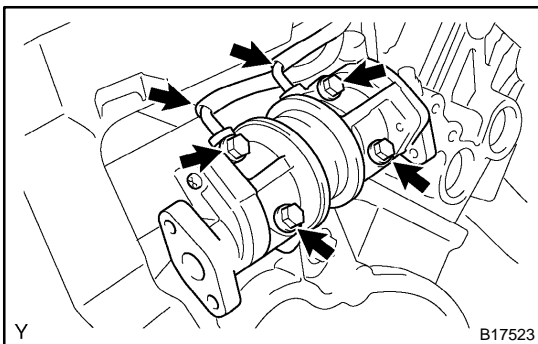
1. REMOVE THROTTLE BODY COVER
2. REMOVE INTAKE MANIFOLD (See page EM-36)
3. REMOVE VSV FOR AIR INJECTION SYSTEM
 - (a) Remove the 2 bolts and 2 VSVs from the intake manifold.
 - (b) Remove the 2 vacuum hoses from the 2 VSVs.



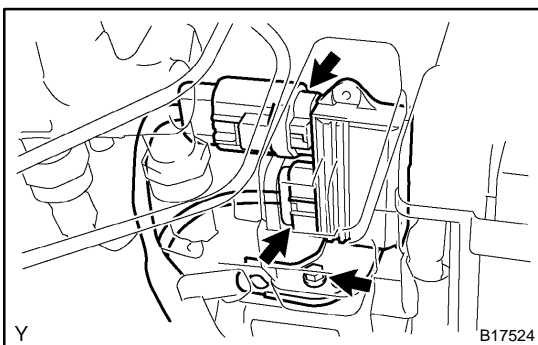
4. REMOVE AIR PUMP ASSEMBLY
 - (a) Disconnect the air hose No.2 from the air switching valve.
 - (b) Disconnect the air switching valve connector.
 - (c) Disconnect the pressure sensor connector for the air injection system.
 - (d) Remove the 4 bolts and air pump assembly.



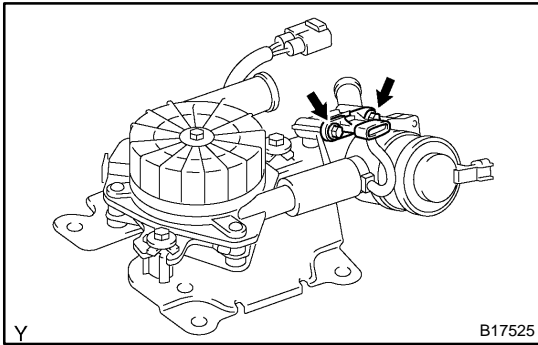
5. REMOVE NO. 2 AIR SWITCHING VALVE
 - (a) Remove the 4 nuts and 2 gaskets, and disconnect the 2 No.3 air tubes from the exhaust manifolds.
 - (b) Remove the 4 bolts, 2 gaskets and the 2 No.3 air tubes from the 2 No.2 air switching valves.



- (c) Remove the 4 bolts, 2 gaskets and the 2 No.2 air switching valves from the rear water by-pass joint.
- (d) Remove the 2 vacuum hoses from the No.2 air switching valves.



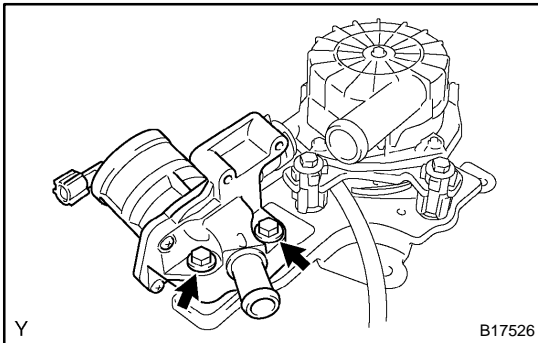
6. REMOVE AIR INJECTION CONTROL DRIVER
 - (a) Disconnect the 2 connectors from the air injection control driver.
 - (b) Remove the 2 bolts and air injection control driver from the body.



DISASSEMBLY

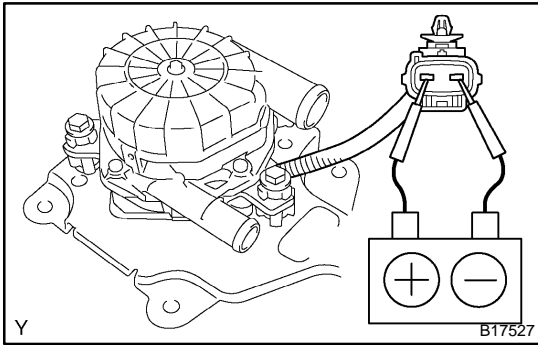
1. REMOVE PRESSURE SENSOR

- (a) Remove the vacuum hose from the pressure sensor and air switching valve.
- (b) Remove the 2 bolts and pressure sensor from the air switching valve.



2. REMOVE AIR SWITCHING VALVE

- (a) Remove the 2 bolts and air switching valve from the air pump bracket.
- (b) Remove the No.1 air hose from the air switching valve and air pump.

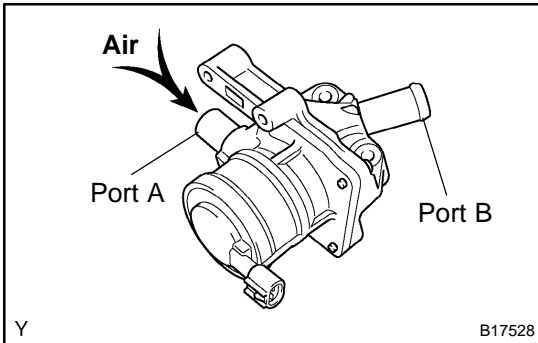


INSPECTION

1. INSPECT AIR PUMP

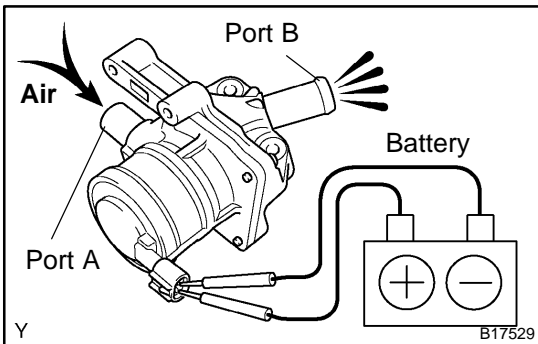
- (a) Connect the positive (+) lead from the battery to terminal 1 and negative (-) lead to terminal 2, and check that air flows.

If operation is not as specified, replace the air pump.



2. INSPECT AIR SWITCHING VALVE

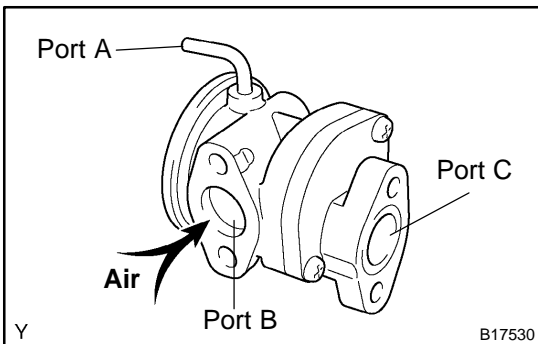
- (a) Blow air into port A and check that air is not discharged from port B.



- (b) Apply positive battery between the terminals.

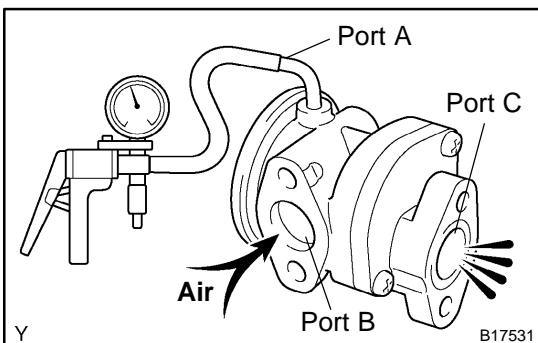
- (c) Blow air into port A and check that air is discharged from port B.

If operation is not as specified, replace the air switching valve.



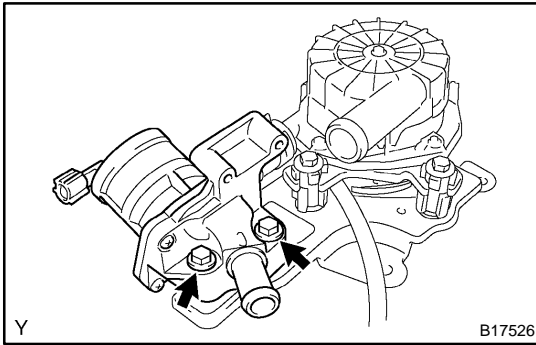
3. INSPECT NO. 2 AIR SWITCHING VALVE

- (a) Blow air into port B and check that air is not discharged from port C.



- (b) Apply vacuum (30 kPa (306 gf/cm², 4.35 psi) to port A, blow air into port B and check that air is discharged from port C.

If operation is not as specified, replace the No.2 air switching valve.

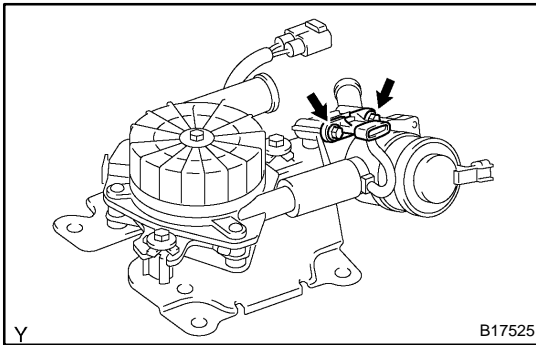


REASSEMBLY

1. INSTALL AIR SWITCHING VALVE

- (a) Install the No.1 air hose to the air switching valve and air pump.
- (b) Install the air switching valve with the 2 bolts to the air pump bracket.

Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

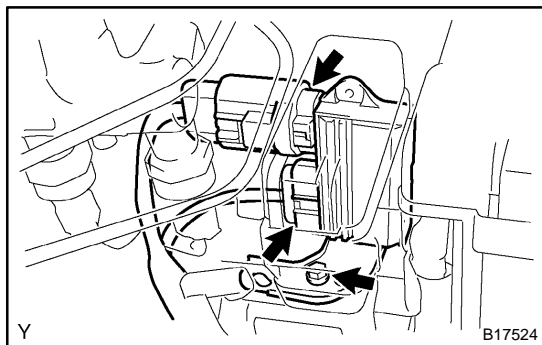


2. INSTALL PRESSURE SENSOR

- (a) Install the pressure sensor with the 2 bolts to the air switching valve.

Torque: 5.0 N·m (55 kgf·cm, 48 in.-lbf)

- (b) Install the vacuum hose to the pressure sensor and air switching valve.



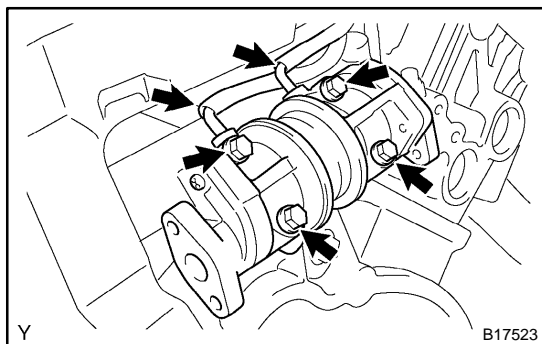
INSTALLATION

1. INSTALL AIR INJECTION CONTROL DRIVER

- (a) Install the air injection control driver with the 2 bolts to the body.

Torque: 18 N·m (184 kgf-cm, 13 ft-lbf)

- (b) Connect the 2 connectors to the air injection control driver.

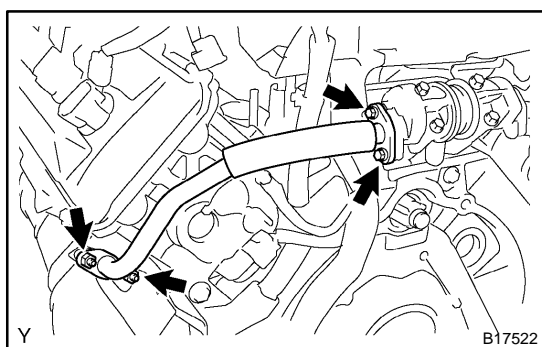


2. INSTALL NO. 2 AIR SWITCHING VALVE

- (a) Connect the 2 vacuum hoses to the No.2 air switching valves.

- (b) Install 2 new gaskets and 2 No.2 air switching valves with the 4 bolts to the rear water by-pass joint.

Torque: 10 N·m (102 kgf-cm, 7 ft-lbf)

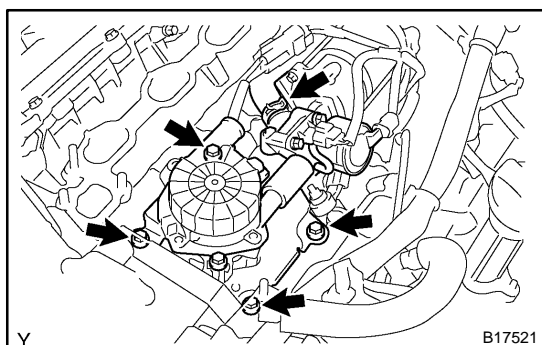


- (c) Install 2 new gaskets, and connect the 2 No.3 air tubes with the 4 bolts to the No.2 air switching valve.

Torque: 10 N·m (102 kgf-cm, 7 ft-lbf)

- (d) Install the 2 new gaskets, and connect the 2 No.3 air tubes with the 4 nuts to the exhaust manifold.

Torque: 10 N·m (102 kgf-cm, 7 ft-lbf)



3. INSTALL AIR PUMP ASSEMBLY

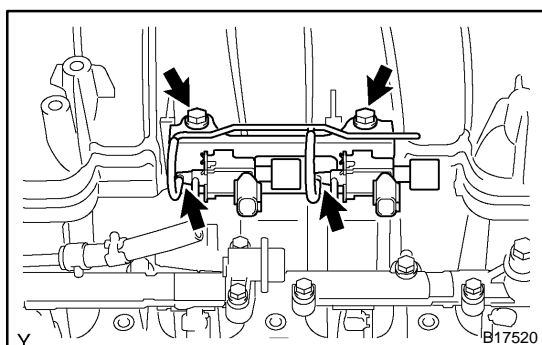
- (a) Install the air pump assembly with the 4 bolts.

Torque: 16 N·m (163 kgf-cm, 12 ft-lbf)

- (b) Connect the pressure sensor connector for the air injection system.

- (c) Connect the air switching valve connector.

- (d) Connect the air hose No.2 to the air switching valve.



4. INSTALL VSV FOR AIR INJECTION SYSTEM

- (a) Install the 2 VSVs with the 2 bolts to the intake manifold.

Torque: 7.5 N·m (76 kgf-cm, 66 in.-lbf)

- (b) Connect the 2 vacuum hoses to the 2 VSVs.

5. INSTALL INTAKE MANIFOLD (See page [EM-60](#))

6. INSTALL THROTTLE BODY COVER

SFI SYSTEM PRECAUTION

SF1Y5-01

HINT:

All DTCs output from the computer will be erased when the negative (-) terminal cable is removed from the battery. Therefore, if necessary, read the DTCs before removing the negative (-) terminal cable from the battery.

1. **BEFORE WORKING ON FUEL SYSTEM, DISCONNECT NEGATIVE (-) TERMINAL CABLE FROM BATTERY**
2. **DO NOT SMOKE OR WORK NEAR FLAME WHEN WORKING ON THE FUEL SYSTEM**
3. **KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS**
4. **MAINTENANCE PRECAUTIONS**

(a) In the event of engine misfire, these precautions should be taken.

- (1) Check that the battery terminals are properly connected.
- (2) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
- (3) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

(b) Precautions when handling the oxygen sensor and A/F sensor.

- (1) Do not drop the oxygen sensor or A/F sensor or hit them against another object.
- (2) Do not allow the sensor to come into contact with water.

5. **IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)**

If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

6. **AIR INDUCTION SYSTEM**

- (a) Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to be out of tune.
- (b) Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will result in air suction and cause the engine to be out of tune.

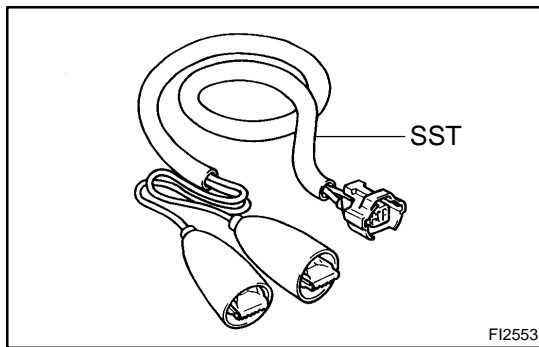
7. **ELECTRONIC CONTROL SYSTEM**

- (a) Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch off or disconnecting the negative (-) terminal cable from the battery.

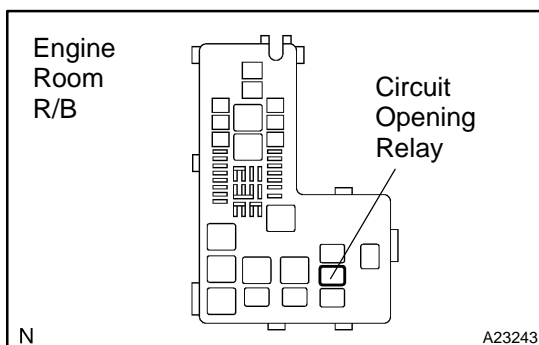
HINT:

Always check for diagnostic trouble codes before disconnecting the negative (-) terminal cable from the battery.

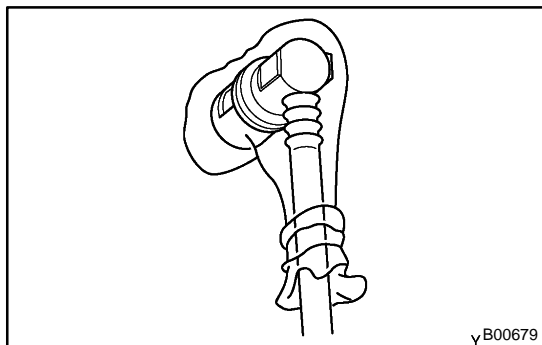
- (b) When installing the battery, be especially careful to correctly connect the positive (+) and negative (-) cables.
- (c) Do not apply severe impact to the parts during removal or installation. Handle all SFI parts carefully, especially the ECM.
- (d) Be careful during troubleshooting as there are numerous transistor circuits, and even slight terminal contact can cause further trouble.
- (e) Do not open the ECM cover.
- (f) When inspecting in rainy weather, take care to prevent an intrusion of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.
- (g) Parts should be replaced as an assembly.
- (h) Care should be taken when pulling out and inserting wiring connectors.
 - (1) Release the lock and pull out the connector, pulling on the connectors.
 - (2) Fully insert the connector and check that it is locked.



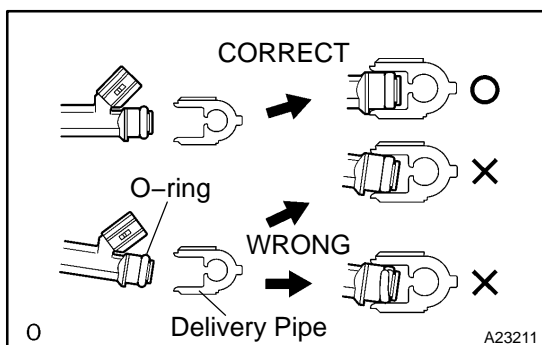
- (i) Use SST for inspection or test of the injector or its wiring connector.
SST 09842-30070

**8. FUEL SYSTEM**

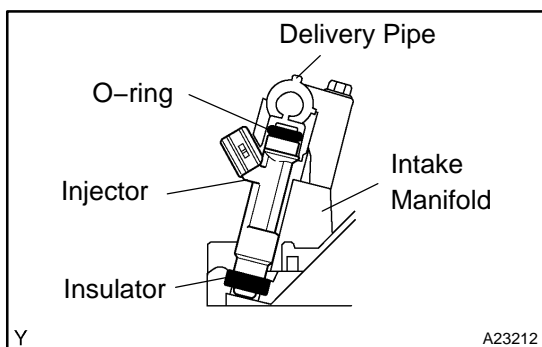
- (a) When disconnecting the high fuel pressure line, a large amount of gasoline will spill out. Be sure to observe the following procedures:
 - (1) Remove the circuit opening relay.
 - (2) Start the engine. After the engine has stopped on its own, turn the ignition switch off.



- (3) Put a container under the connecting part of the pressure line.
- (4) Slowly loosen the connection.
- (5) Disconnect the connection.
- (6) Plug the connection with a rubber plug.
- (7) Install the circuit opening relay.



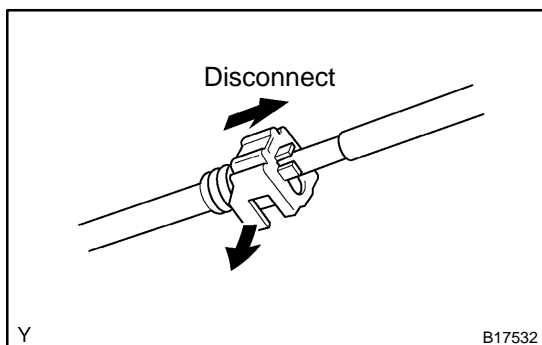
- (b) Observe the following precautions when removing and installing the injectors.
 - (1) Never reuse the O-ring.
 - (2) When placing a new O-ring on the injector, take care not to damage it in any way.
 - (3) Coat a new O-ring with spindle oil or gasoline before installing. Never use engine oil, gear oil or brake fluid.



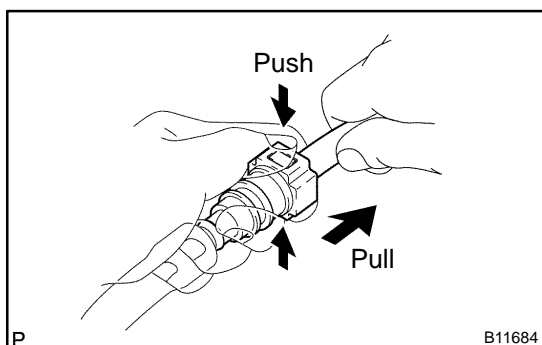
- (c) Install the injector to the delivery pipe and lower intake manifold as shown in the illustration.

NOTICE:

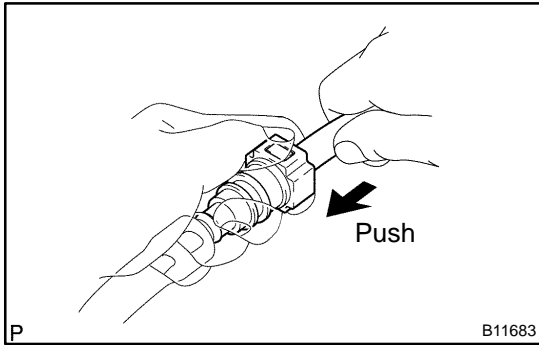
Before installing the injector, apply spindle oil or gasoline where the delivery pipe or cylinder head contacts the O-ring of the injector.



- (d) Observe the following when disconnecting the fuel tube connector:
 - (1) Check if there is any dirt in the pipe and around the connector before disconnecting the fuel tube connector. If necessary, clean the dirt away.
 - (2) Disconnect the fuel pipe clamp from the connector.

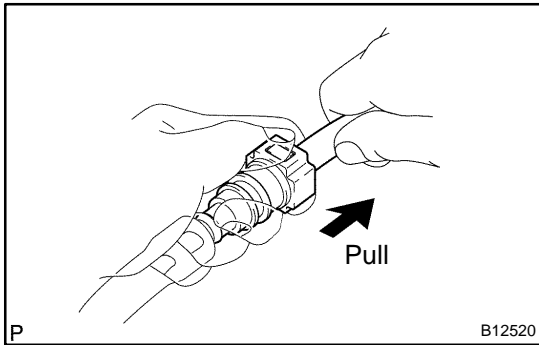


- (3) Be sure to disconnect them by hand.
- (4) When the connector and the pipe are stuck, push and pull the connector. Then disconnect and pull it out. Do not use any tools at this time.
- (5) Check if there is any dirt or other foreign matter on the seal surface of the disconnected pipe. If necessary, clean the dirt away.
- (6) Do not damage the disconnected pipe and connector and prevent intrusion of foreign objects by covering them with a plastic bag.



(e) Observe the following when connecting the fuel tube connector:

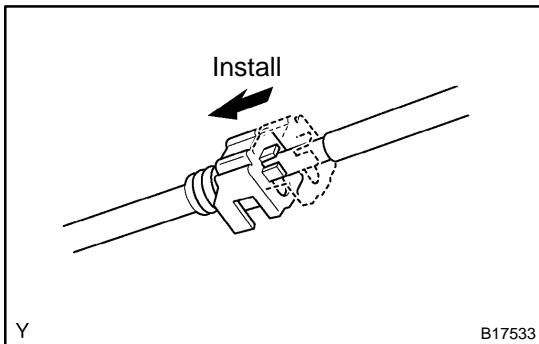
- (1) Check if there is any damage or foreign objects in the connected part of the pipe.
- (2) Match the axis of the connector with the axis of the pipe, and push into the connector until a "click" sound is heard. If the connection is tight, apply a small amount of fresh engine oil on the tip of the pipe.



(3) After finishing the connection, pull the pipe and the connector to ensure it is secure.

(4) Check to make sure no fuel leak is present.

If the result is not as specified, repair or replace.



(5) Install the fuel pipe clamp to the connector.

(6) Check to make sure no fuel leak is present.

If the result is not as specified, repair or replace.

FUEL PUMP

ON-VEHICLE INSPECTION

SF1Y6-01

1. CHECK FUEL PUMP OPERATION AND FUEL LEAK

- (a) When using the hand-held tester:
- (1) Connect the hand-held tester to the DLC3.
 - (2) Turn the ignition switch to the ON position and the hand-held tester main switch ON.

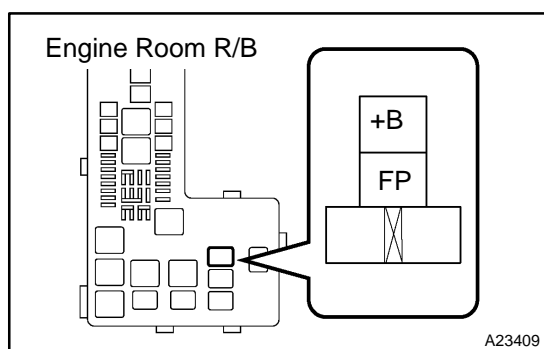
NOTICE:

Do not start the engine.

- (3) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD

HINT:

Please refer to the hand-held tester operator's manual for further details.



- (b) When not using the hand-held tester:
- (1) Remove the circuit opening relay.
 - (2) Using a service wire, connect terminals FP and +B of the relay block.

NOTICE:

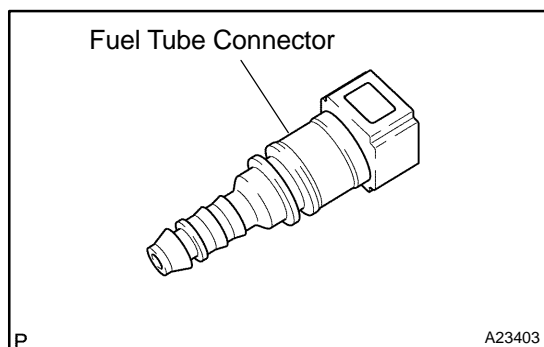
Pay careful attention to the terminal connecting position to avoid a malfunction.

- (3) Turn the ignition switch to the ON position, and check that the fuel pump operates.

NOTICE:

Do not start the engine.

- (c) Check that there are no fuel leaks after performing maintenance of the fuel system.
- (d) Turn the ignition switch off.
- (e) Disconnect the hand-held tester from the DLC3.



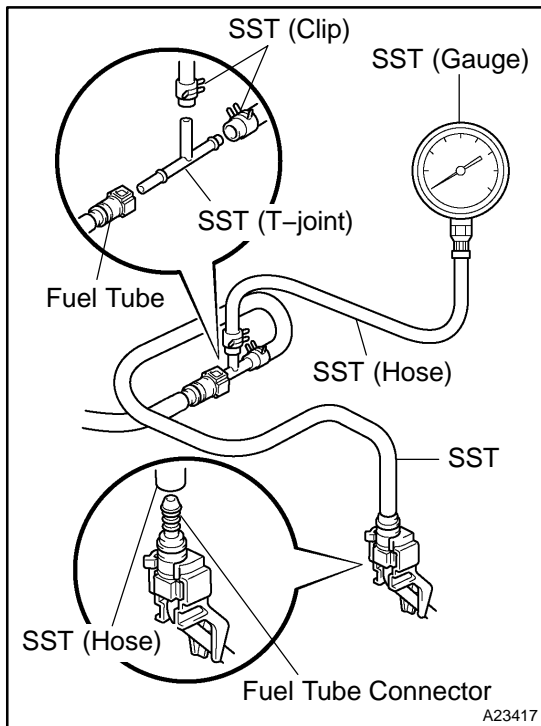
2. CHECK FUEL PRESSURE

- (a) Prepare for inspection.
- (1) Prepare a new fuel tube, and take the fuel tube connector out of the tube.

HINT:

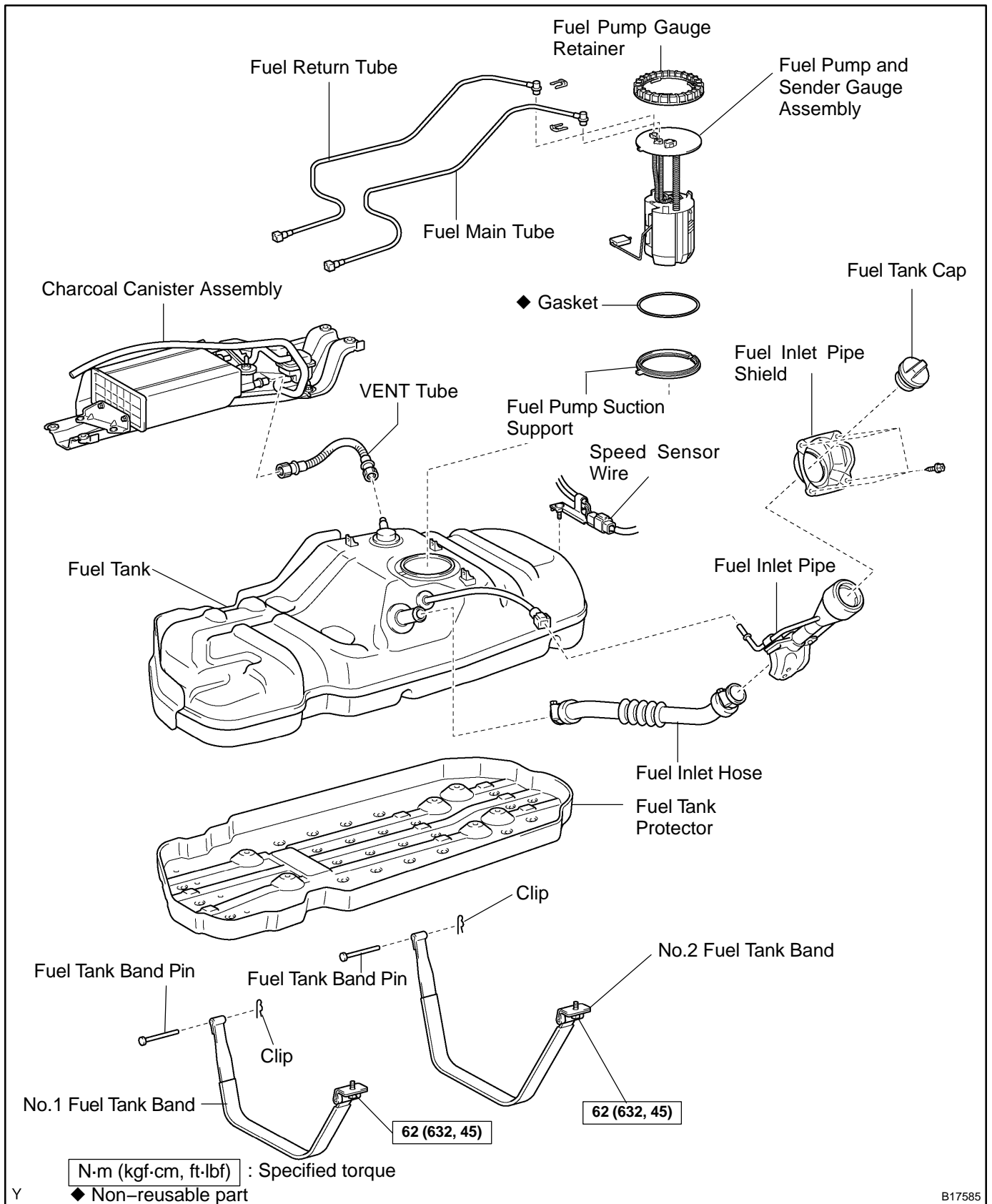
Part No. 23801-31070

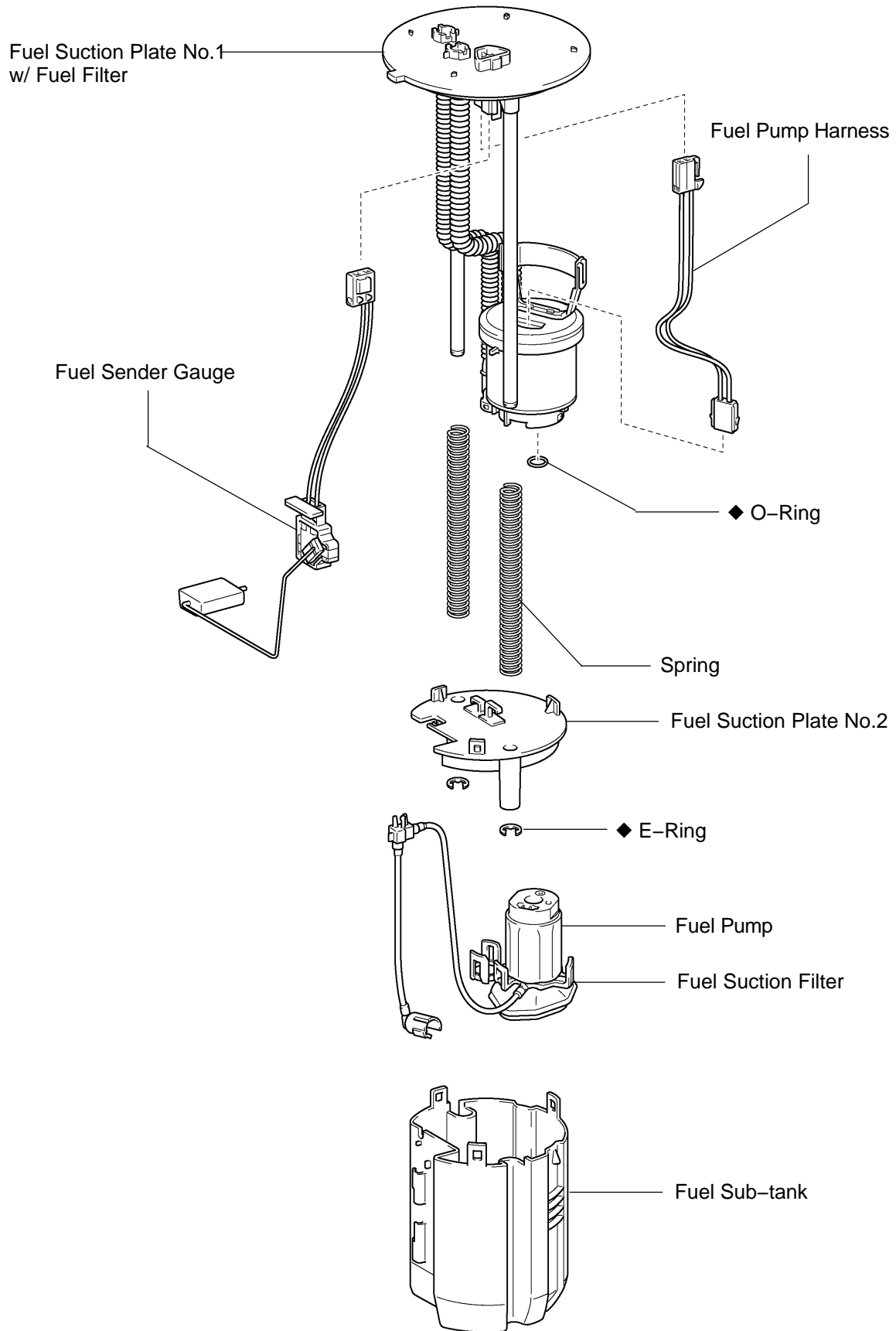
- (b) Prevent gasoline from spilling out (See page SF-1).
- (c) Disconnect the fuel pipe clamp (See page SF-1).
- (d) Disconnect the fuel pipe No. 1 from the fuel main tube.



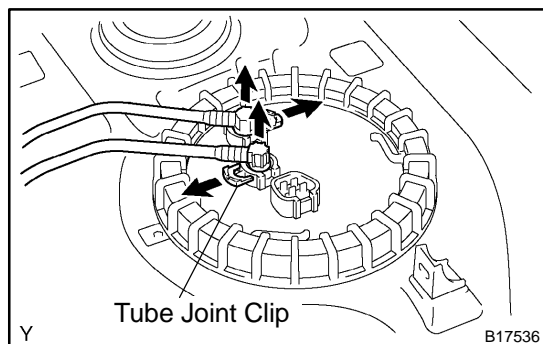
- (e) Install SST (pressure gauge) as shown in the illustration by using SSTs and a fuel tube connector.
 SST 09268-41047 (90467-13001, 95336-08070),
 09268-45014 (09268-41200, 09268-41220,
 09268-41250, 90467-13001)
- (f) Wipe off any spattered gasoline.
- (g) Start the engine.
- (h) Measure the fuel pressure at idle.
Fuel pressure:
281 to 287 kPa (2.87 to 2.93 kgf·cm², 40.8 to 41.7 psi)
- (i) Stop the engine.
- (j) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.
Fuel pressure:
147 kPa (1.5 kgf·cm², 21 psi) or more
- If pressure is not as specified, check the fuel pump, pressure regulator and/or injectors.
- (k) After checking the fuel pressure, disconnect the negative (-) terminal cable from the battery carefully, and remove the SST and fuel tube connector to prevent gasoline from splashing.
- (l) Reconnect the fuel tube to the fuel main tube.
- (m) Install the EFI fuel pipe clamp.
- (n) Check for fuel leak.

COMPONENTS





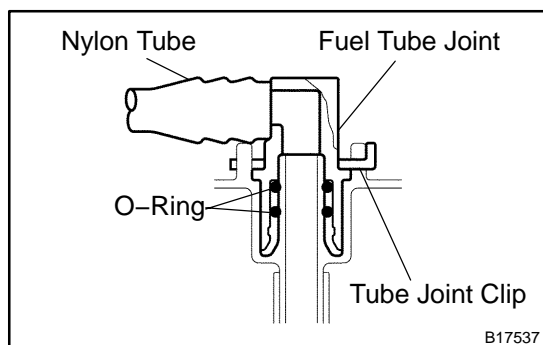
◆ Non-reusable part



REMOVAL

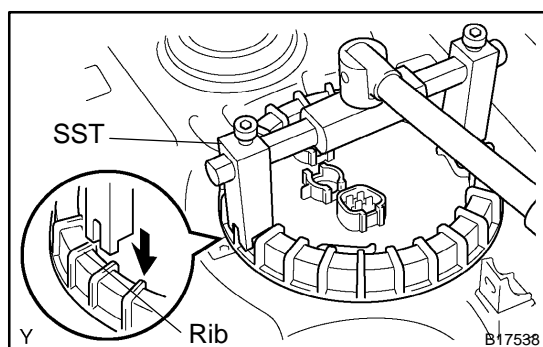
1. REMOVE FUEL TANK ASSEMBLY (See page SF-33)
2. DISCONNECT FUEL SUCTION TUBE

Remove the 2 tube clips, and pull out the 2 fuel tubes.



NOTICE:

- Before this operation, check the connector for dirt, mud or other contamination. Clean if necessary.
- Be careful of mud. The connector's O-ring, which seals the pipe and connector, is easily contaminated.
- Do not use any tool in this operation.
- Do not bend or twist the nylon tube. Protect the connector by covering it with a plastic bag.
- When the pipe and connector are stuck, push and pull the connector to release and pull the connector out carefully.



3. REMOVE FUEL PUMP ASSEMBLY

- (a) Using SST, loosen the fuel pump gauge retainer.
SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

HINT:

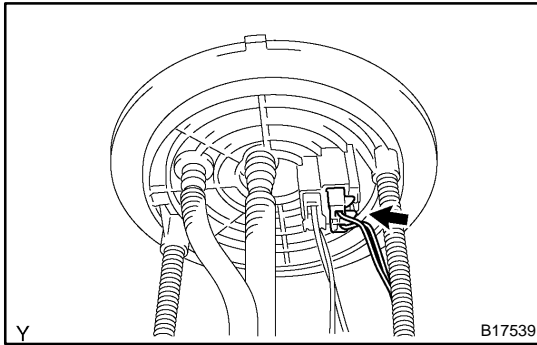
A rib on the fuel pump gauge retainer fits into a tip of the SST.

- (b) Remove the fuel pump gauge retainer.
- (c) Remove the fuel suction tube.

NOTICE:

Be careful not to bend the arm of the fuel sender gauge.

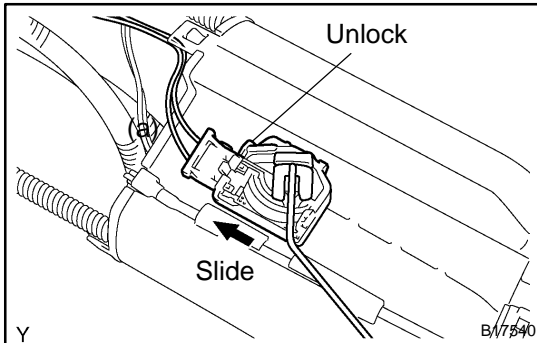
- (d) Remove the gasket from the fuel tank.



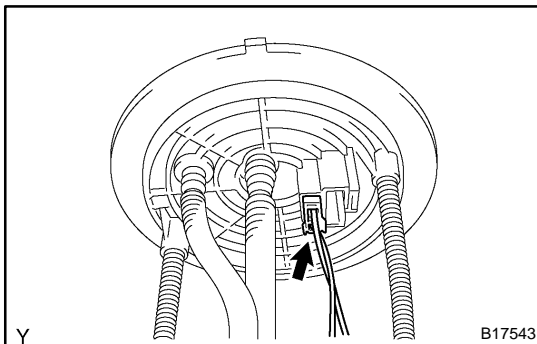
DISASSEMBLY

1. REMOVE FUEL SENDER GAUGE

- (a) Disconnect the sender gauge connector from the fuel suction plate No.1.

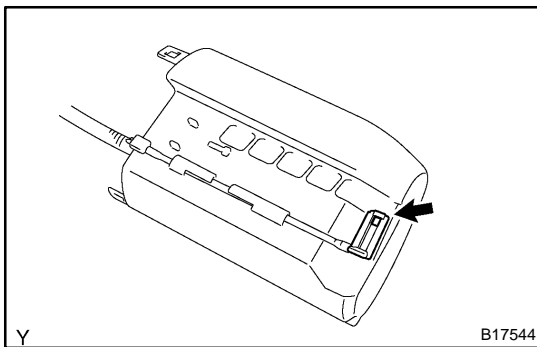


- (b) Unlock the fuel sender gauge and slide to remove.

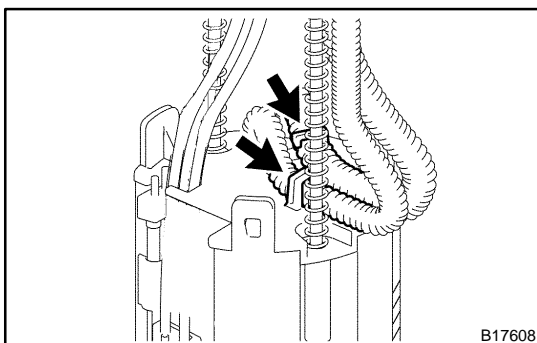


2. REMOVE FUEL SUB-TANK

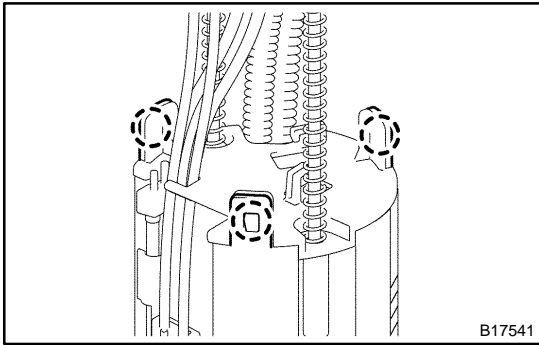
- (a) Disconnect the fuel pump harness connector from the fuel suction plate No.1.



- (b) Disconnect the suction filter hose from the fuel sub-tank.



- (c) Disconnect the 2 tubes from the tube clamps.

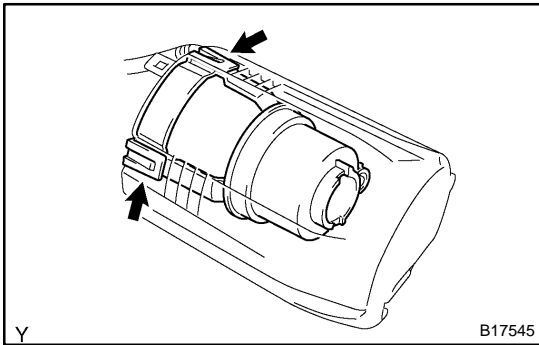


- (d) Using a screwdriver with the tip wrapped in tape, disconnect the 3 snap-claws from the fuel suction support No.2.

NOTICE:

Do not damage the fuel suction plate No.2 and fuel sub-tank.

- (e) Disconnect the fuel suction plate No.1 with the fuel filter assembly from the fuel sub-tank.



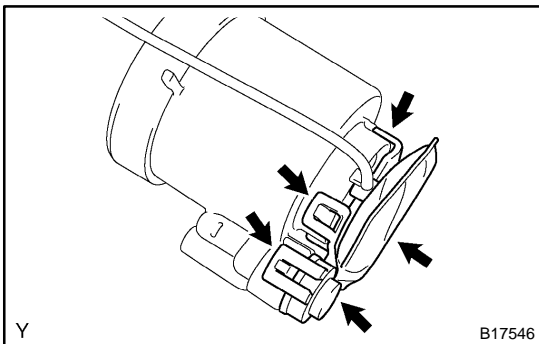
3. REMOVE FUEL FILTER WITH FUEL PUMP

- (a) Using a screwdriver with the tip wrapped in tape, disconnect the 2 snap-claws from the fuel suction support.

NOTICE:

Do not damage the fuel filter assembly and fuel suction support.

- (b) Remove the fuel filter assembly with fuel pump from the fuel suction support.



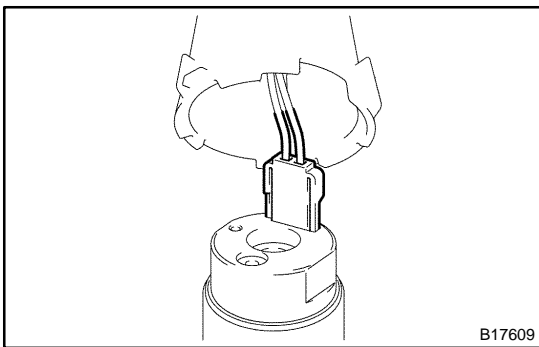
4. REMOVE FUEL PUMP

- (a) Using a screwdriver with the tip wrapped in tape, disconnect the 5 snap-claws from the suction filter.

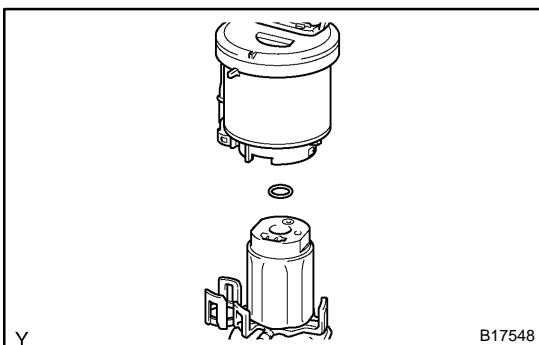
NOTICE:

Do not damage the fuel filter assembly and suction filter.

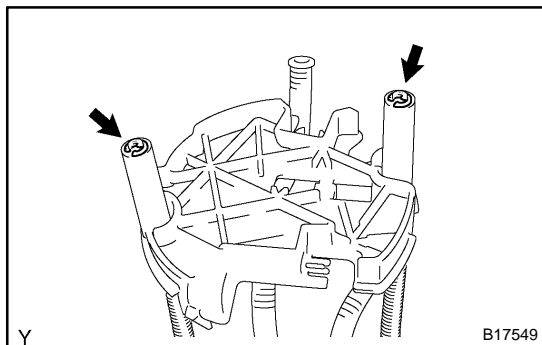
- (b) Remove the fuel suction filter with fuel pump from the fuel filter.



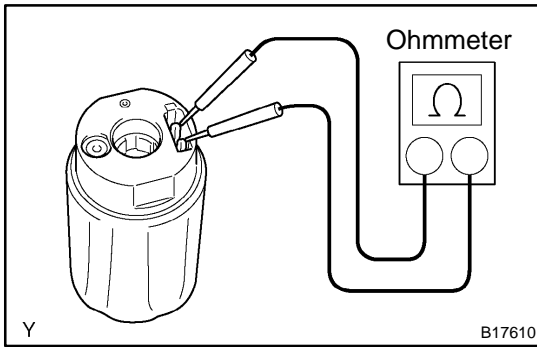
- (c) Disconnect the fuel pump harness from the fuel pump.



- (d) Remove the O-ring from the fuel filter or fuel pump.

**5. REMOVE FUEL SUCTION PLATE NO.2**

- (a) Using a screwdriver, remove the 2 E-rings from the suction plate No.2.
- (b) Remove the suction plate No.2 and 2 springs from the fuel suction plate No.1.



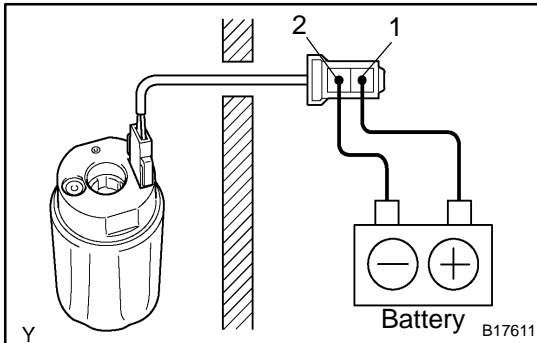
INSPECTION

1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance: 0.2 to 0.3 Ω at 20 °C (68 °F)

If the resistance is not as specified, replace the fuel pump.



2. INSPECT FUEL PUMP OPERATION

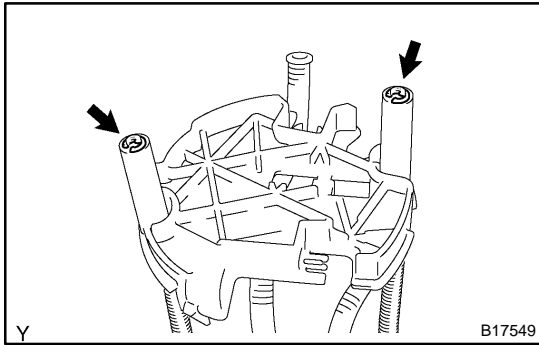
- (a) Connect the lead wire to the fuel pump.
- (b) Connect the positive (+) lead from the battery to terminal 1 of the connector, and the negative (-) lead to terminal 2. Check that the fuel pump operates.

NOTICE:

- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always do switching on the battery side.**

If operation is not as specified, replace the fuel pump and/or read wire.

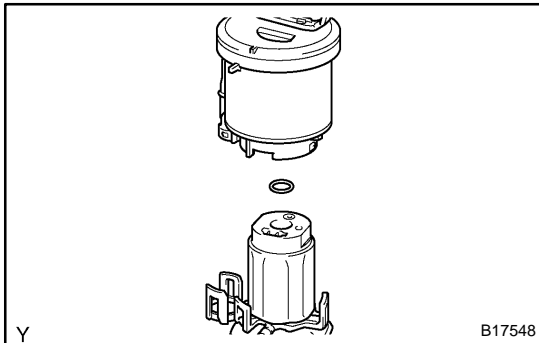
- (c) Disconnect the lead wire from the fuel pump.



REASSEMBLY

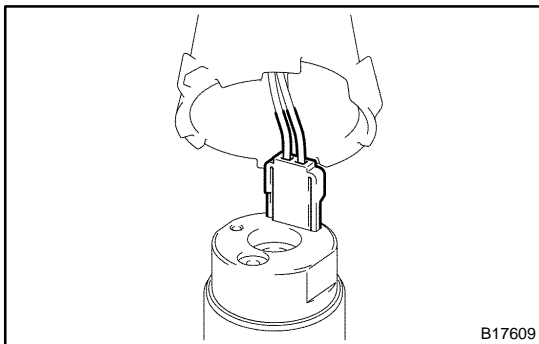
1. REMOVE FUEL SUCTION PLATE NO.2

- (a) Install the 2 springs and suction plate No.2 to the suction plate No.1.
- (b) Using needle-nose pliers, install 2 new E-rings to the suction plate No.2.

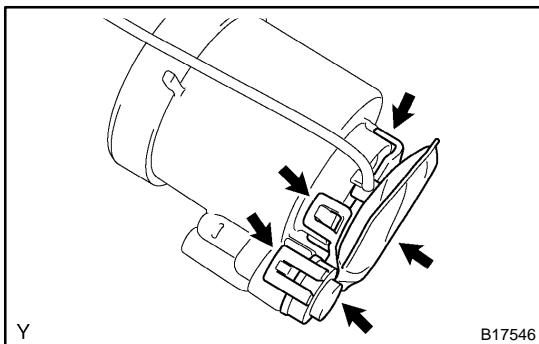


2. INSTALL FUEL PUMP

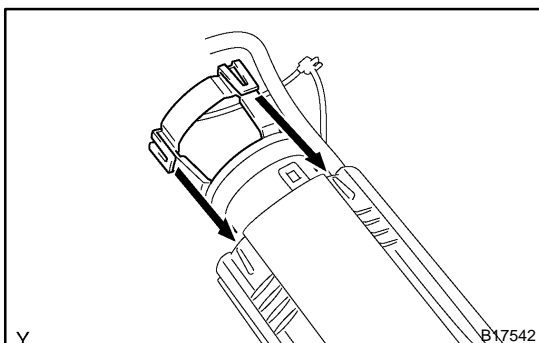
- (a) Apply a light coat of gasoline or spindle oil to a new O-ring, and install it to the fuel pump.



- (b) Connect the fuel pump harness connector to the fuel pump.

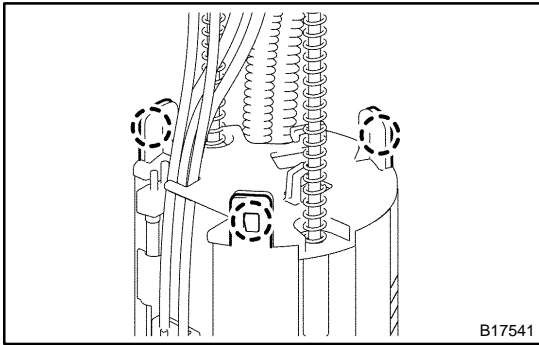


- (c) Install the fuel pump with the suction filter to the fuel filter.



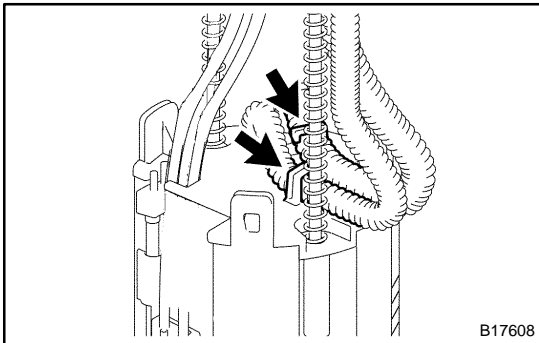
3. INSTALL FUEL FILTER

Install the fuel filter to the fuel sub-tank.

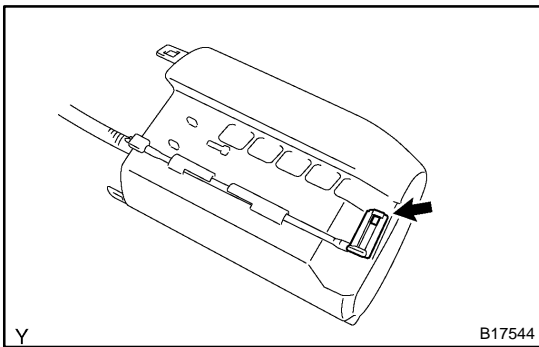


4. INSTALL FUEL SUB-TANK

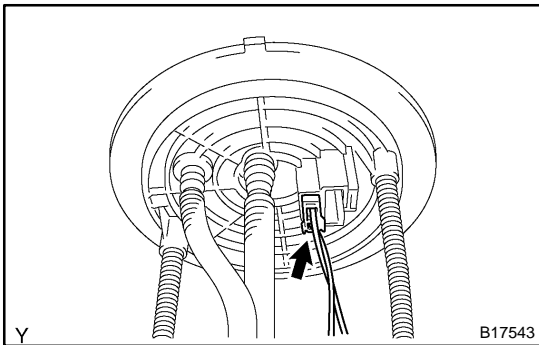
- (a) Connect the fuel suction plate No.2 to the fuel sub-tank with the 3 snap-claws engaged.



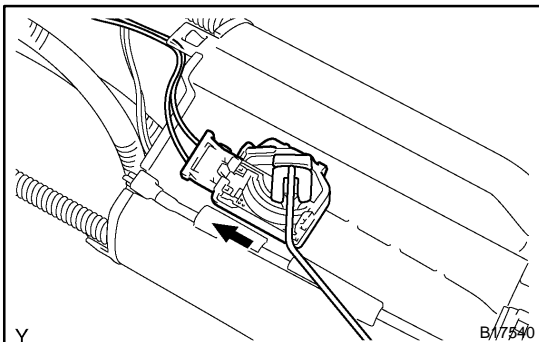
- (b) Connect the 2 tubes to the tube clamps.



- (c) Connect the suction filter hose to the fuel sub-tank.

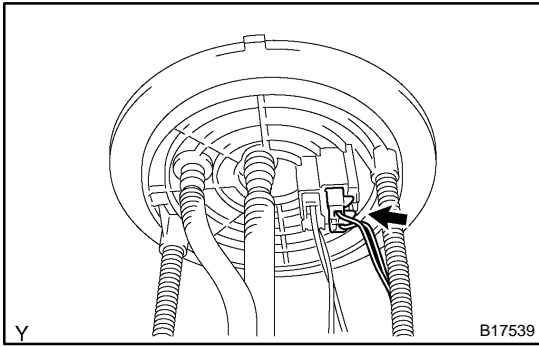


- (d) Connect the fuel pump harness connector to the fuel suction plate No.1.

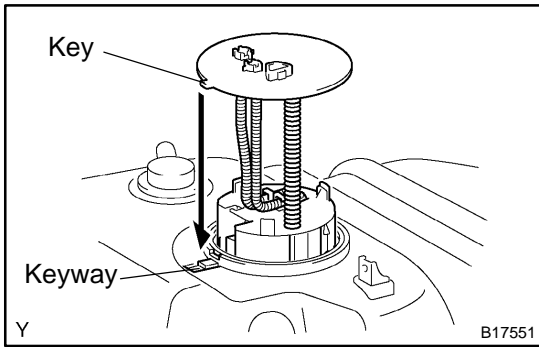


5. INSTALL FUEL SENDER GAUGE

- (a) Install the fuel sender gauge to the fuel suction support.



- (b) Connect the sender gauge connector to the fuel suction plate No.1.



INSTALLATION

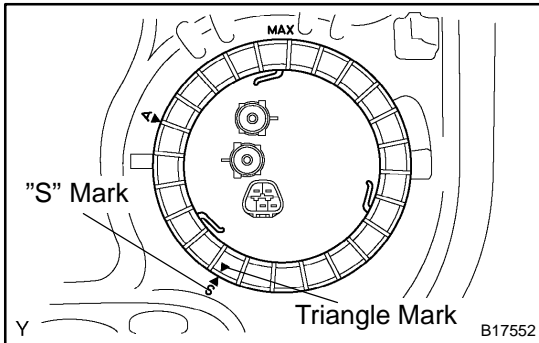
1. INSTALL FUEL PUMP ASSEMBLY

- (a) Install a new gasket to the fuel tank.
- (b) Install the fuel pump assembly to the fuel tank.

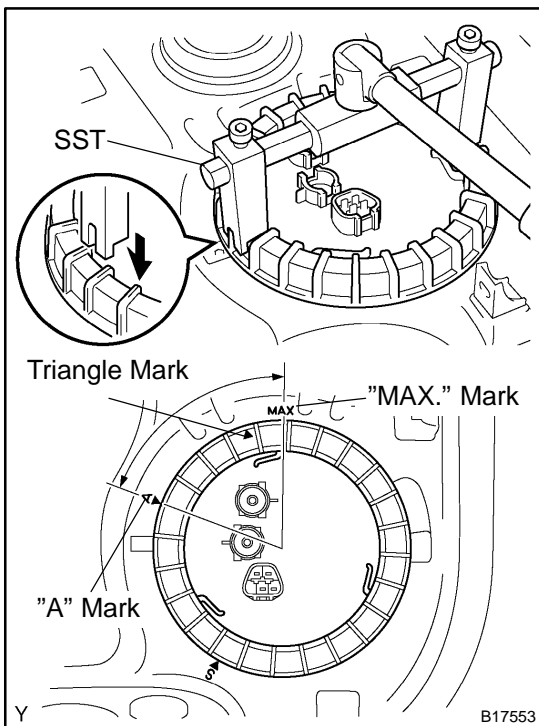
NOTICE:

Be careful not to bend the arm of the fuel sender gauge.

- (c) Align the keyway of the fuel suction tube support with the key of the fuel suction plate No.1.



- (d) Apply MP grease to the entire interior surface of the fuel pump gage retainer.
- (e) Align the triangle mark on new fuel pump gauge retainer with the "S" mark on the fuel tank while pushing down the fuel suction tube. Attach the fuel pump gauge retainer to the fuel tank.



- (f) Rotate the fuel pump gage retainer by hand. Use an SST to tighten the fuel pump gage retainer by turning it one and a half times. The triangle mark on the fuel pump gage retainer must be positioned between the "A" and "MAX." marks on the fuel tank.

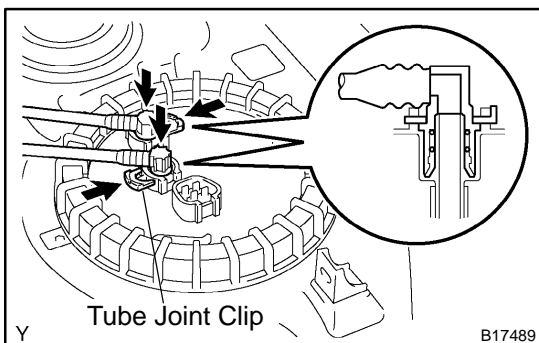
SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

NOTICE:

Do not use other tools in this operation. Damage to the fuel pump gauge retainer and the fuel tank may result.

HINT:

A rib on the fuel pump gauge retainer fits into a tip of the SST.



2. CONNECT FUEL SUCTION TUBE

Connect the fuel pump tube and return tube to the fuel tank with the tube joint clips.

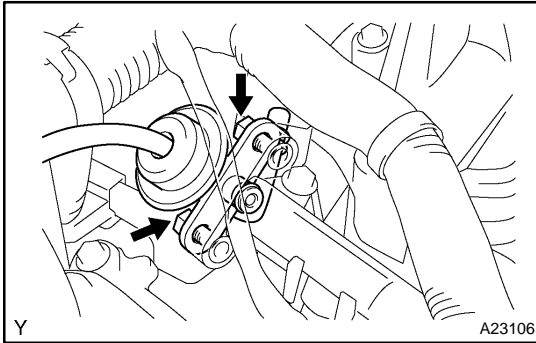
NOTICE:

- Check that there are no scratches or foreign objects on the connecting part.
 - Check that the fuel tube joint is inserted securely.
 - Check that the tube joint clip is on the collar of the fuel tube joint.
 - After installing the tube joint clip, check that the fuel tube joint has not been pulled off.
3. CHECK FOR FUEL LEAKS
 4. INSTALL FUEL TANK ASSEMBLY (See page [SF-36](#))

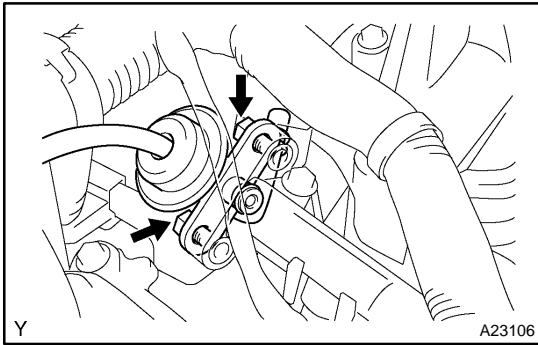
FUEL PRESSURE REGULATOR REMOVAL

SF1YD-01

1. PREVENT GASOLINE FROM SPILLING OUT
(See page [SF-1](#))
2. REMOVE V-BANK COVER
3. REMOVE AIR CLEANER (See page [EM-62](#))
4. DISCONNECT FUEL PIPE NO.2



5. REMOVE FUEL PRESSURE REGULATOR
 - (a) Remove the 2 bolts and fuel pressure regulator.
 - (b) Remove the vacuum hose.



INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR

- (a) Install the vacuum hose.
- (b) Apply a light coat of spindle oil or gasoline to a new O-ring and install it to the fuel pressure regulator.
- (c) Install the fuel pressure regulator with the 2 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)

2. CONNECT FUEL PIPE NO.2

3. INSTALL AIR CLEANER (See page [EM-89](#))

4. INSTALL V-BANK COVER

5. CHECK FOR FUEL LEAKS

INJECTOR

SF1YF-01

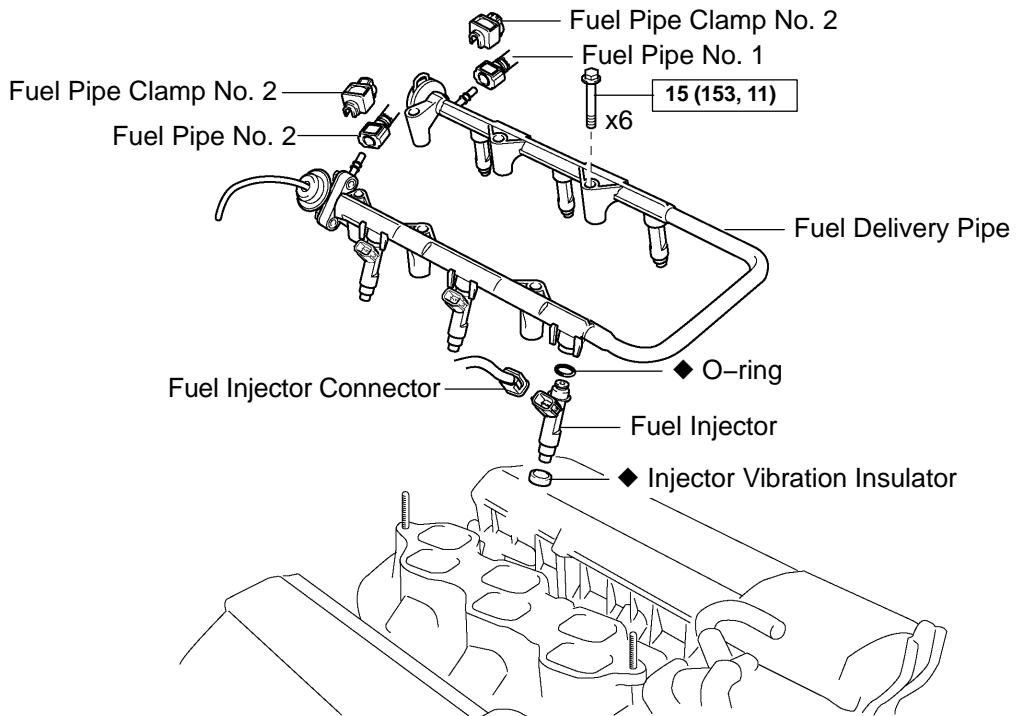
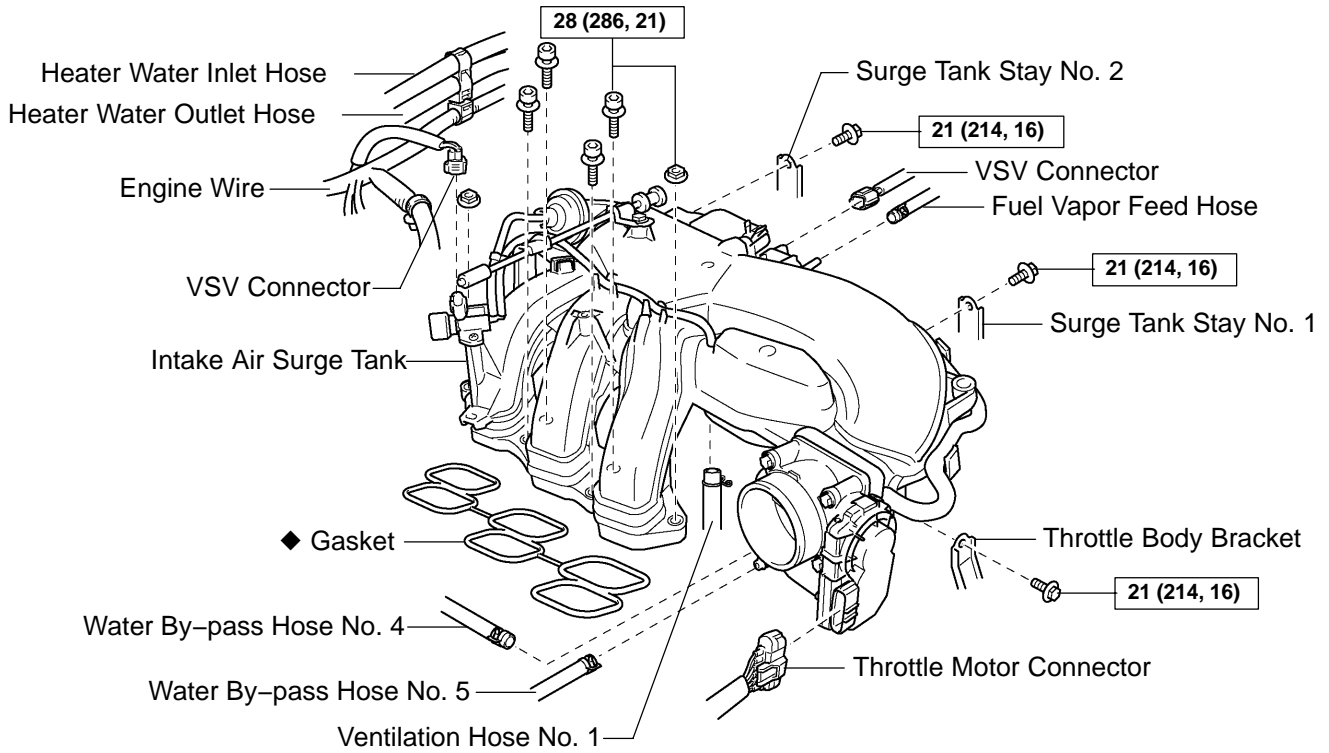
ON-VEHICLE INSPECTION

1. REMOVE V-BANK COVER
2. REMOVE AIR CLEANER (See page [EM-62](#))
3. REMOVE INTAKE AIR SURGE TANK (See page [EM-62](#))
4. INSPECT INJECTOR RESISTANCE
 - (a) Disconnect the 6 injector connectors.
 - (b) Using an ohmmeter, measure the resistance between the terminals.
Resistance: 11.6 to 12.4 Ω at 20°C (68°F)

If the resistance is not as specified, replace the injector.

- (c) Reconnect the 6 injector connectors.
5. INSTALL INTAKE AIR SURGE TANK (See page [EM-89](#))
6. INSTALL AIR CLEANER (See page [EM-89](#))
7. INSTALL V-BANK COVER

SFI (1GR-FE) - INJECTOR



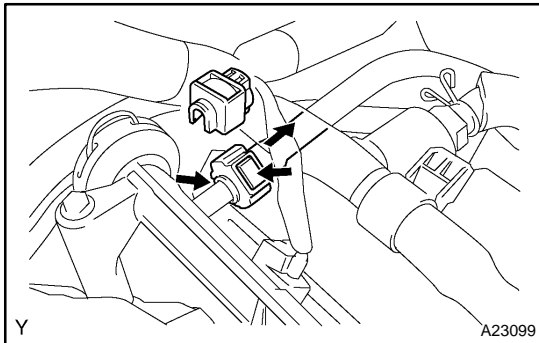
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

Y

REMOVAL

1. PREVENT GASOLINE FROM SPILLING OUT
(See page [SF-1](#))
2. DRAIN ENGINE COOLANT
3. REMOVE V-BANK COVER
4. REMOVE AIR CLEANER (See page [EM-62](#))
5. REMOVE INTAKE AIR SURGE TANK
(See page [EM-89](#))

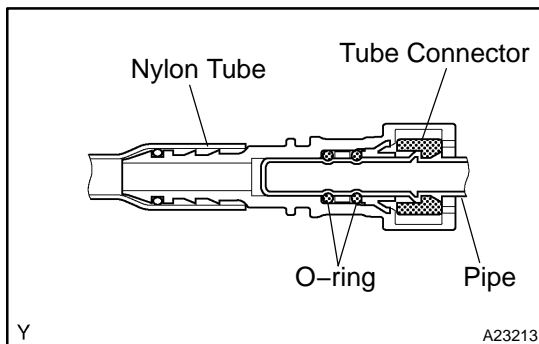


6. DISCONNECT FUEL PIPE NO.1

- (a) Remove the fuel pipe clamp.
- (b) Pinch the tube connector then pull out the fuel pipe.

NOTICE:

- Check if there is any dirt around the connector before this work, because the quick connector has an O-ring to seal the fuel pipe and fuel delivery pipe. Clean dirt away if necessary.
- Do not use any tool in this work.
- Do not bend or twist the nylon tube.
- Keep the plug free from foreign objects.
- To protect the fuel pipe, cover it with a plastic bag after checking.
- When the fuel pipe and fuel delivery pipe are stuck, pinch the nylon tube with fingers, and turn it carefully to free and then disconnect the fuel pipe.

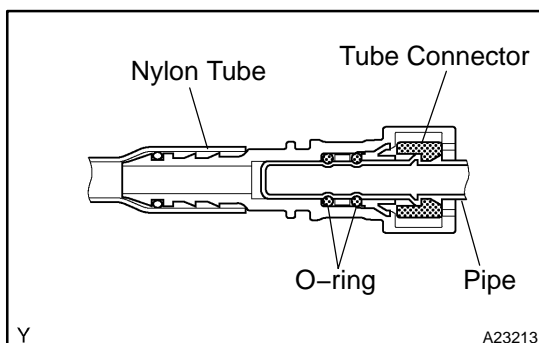
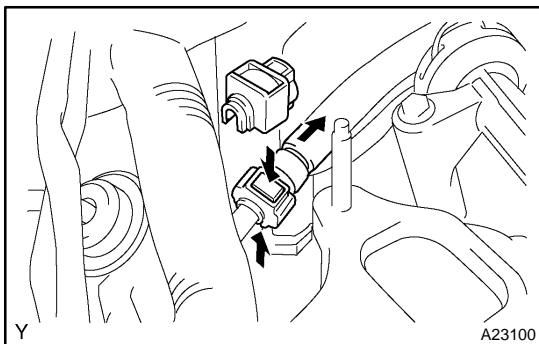


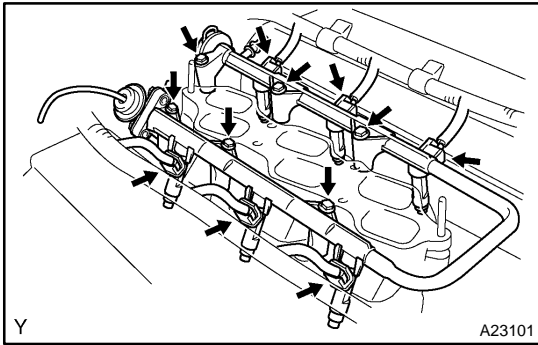
7. DISCONNECT FUEL PIPE NO.2

- (a) Remove the fuel pipe clamp.
- (b) Pinch the tube connector and then pull out the fuel pipe.

NOTICE:

- Check if there is any dirt around the connector before this work, because the quick connector has an O-ring to seal the fuel pipe and fuel delivery pipe. Clean dirt away if necessary.
- Do not use any tool in this work.
- Do not bend or twist the nylon tube.
- Keep the plug free from foreign objects.
- To protect the fuel pipe, cover it with a plastic bag after checking.
- When the fuel pipe and fuel pressure regulator are stuck, pinch the nylon tube with fingers, and turn it carefully to free and then disconnect the fuel pipe.

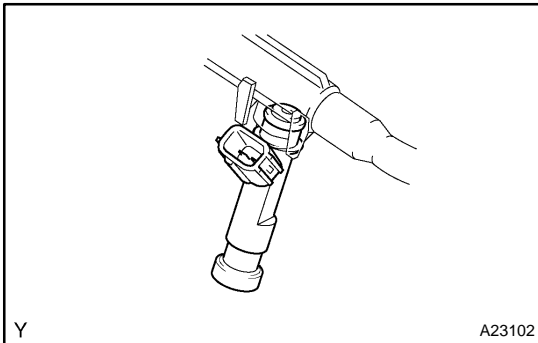


**8. REMOVE FUEL DELIVERY PIPE**

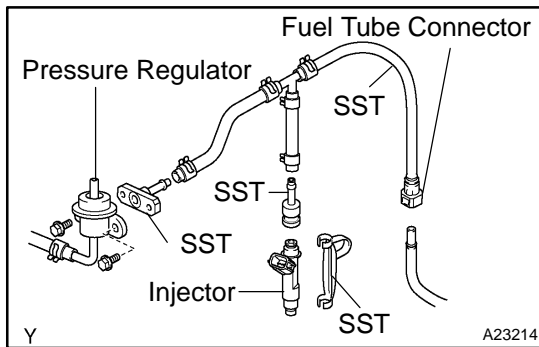
- (a) Disconnect the 6 fuel injector connectors.
- (b) Remove the 6 bolts and fuel delivery pipe together with the 6 fuel injectors.

NOTICE:

Be careful not to drop the injectors when removing the fuel delivery pipe.

**9. REMOVE FUEL INJECTOR**

- (a) Remove the 6 fuel injectors from the fuel delivery pipe.
- (b) Remove the O-ring and injector vibration insulator from each fuel injector.

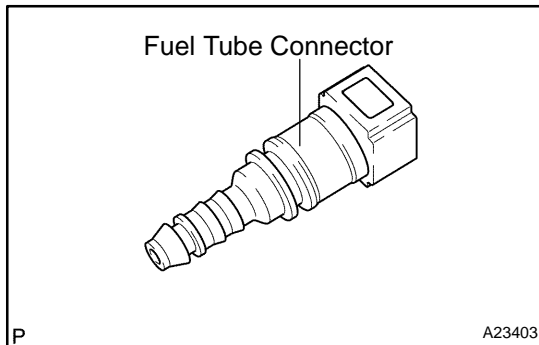


INSPECTION

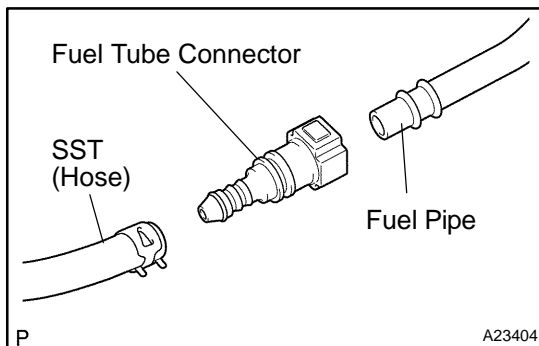
1. INSPECT INJECTOR INJECTION

CAUTION:

Keep the injector clear of sparks during the test.



- (a) Obtain a new No.1 fuel pipe (part No. 23801-31070) and take the fuel tube connector out of the pipe.

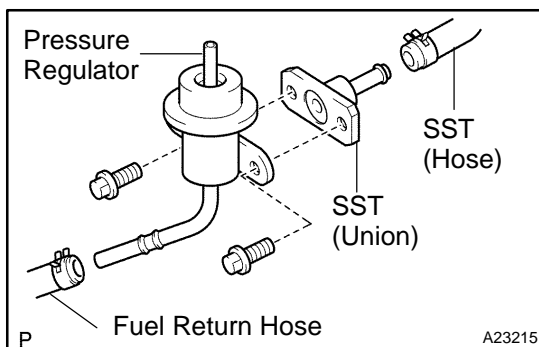


- (b) Install the fuel tube connector to the SST (hose), then connect the tube connector and fuel pipe.
SST 09268-41047 (95336-08070)

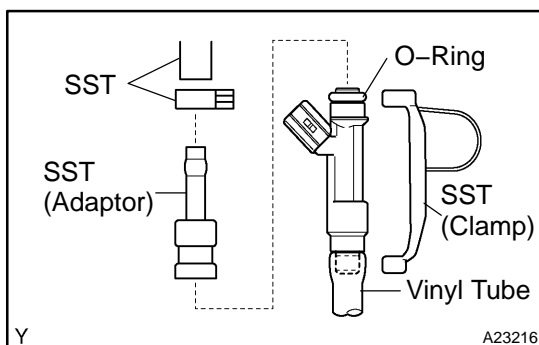
CAUTION:

Connect the fuel tube connector (quick type) after observing the precautions.

- (c) Remove the pressure regulator from the delivery pipe.
(d) Install the O-ring to the fuel inlet of the pressure regulator.



- (e) Connect the SST (hose) to the fuel inlet of the pressure regulator with another SST (union) and the 2 bolts.
SST 09268-41047 (95336-08070, 09268-41091)
Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)
(f) Connect the fuel return hose to the fuel outlet of the pressure regulator.



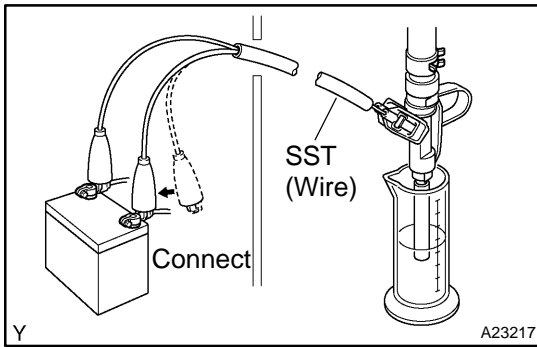
- (g) Install the O-ring to the injector.
(h) Connect SSTs (adaptor and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268-41047 (09268-41140, 09268-41400, 95336-08070)

- (i) Put the injector into a graduated cylinder.

CAUTION:

Install a suitable vinyl tube onto the injector to prevent gasoline from splashing out.

- (j) Operate the fuel pump (see page SF-5).



- (k) Connect the SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.

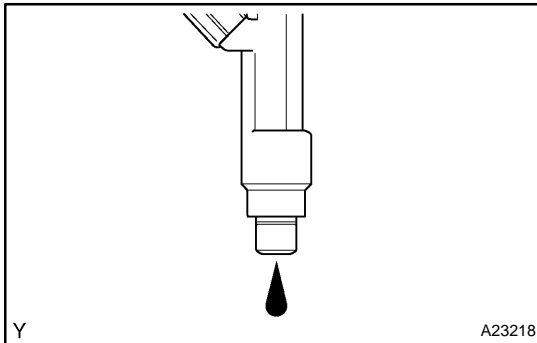
SST 09842-30080

Volume: 76 to 91 cm³ (4.6 to 5.5 cu in.) per 15 seconds

Difference between each injector:

15 cm³ (0.9 cu in.) or less

If the injection volume is not as specified, replace the injector.

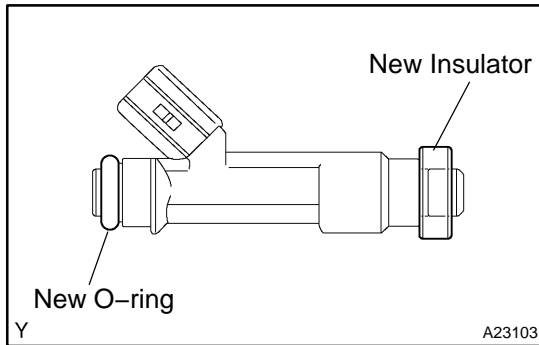


2. INSPECT LEAKAGE

Under the above conditions, disconnect the tester probes of the SST (wire) from the battery and check the fuel leakage from the injector.

SST 09842-30080

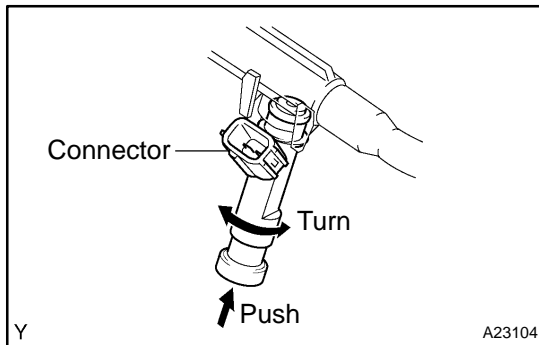
Fuel drop: 1 drop or less per 12 minutes



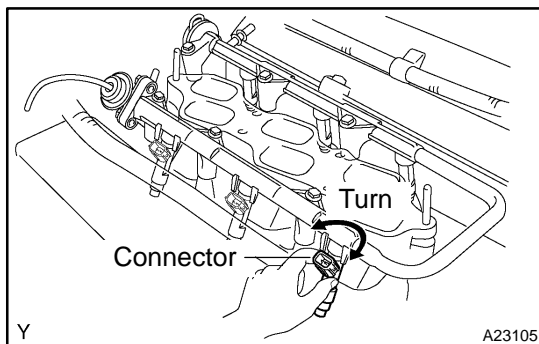
INSTALLATION

1. INSTALL FUEL INJECTOR

- (a) Install a new insulator to the fuel injector.
- (b) Apply a light coat of spindle oil or gasoline to a new O-ring and install it to the fuel injector.



- (c) While turning the fuel injector to the left and right, install it to the fuel delivery pipe.
- (d) Position the fuel injector connector facing out from the fuel delivery pipe.
- (e) Apply the above procedures to the other fuel injectors.



2. INSTALL FUEL DELIVERY PIPE

- (a) Place the fuel delivery pipe together with the 6 fuel injectors on the intake manifold.
- (b) Temporarily install the 6 bolts which are used to hold the fuel delivery pipe to the intake manifold.
- (c) Check that the fuel injectors rotate smoothly.

HINT:

If the fuel injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings. Replace the O-ring of the injector that does not rotate smoothly.

- (d) Position the fuel injector connector facing out from the fuel delivery pipe.
- (e) Tighten the 6 bolts which are used to hold the fuel delivery pipe to the intake manifold.

Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

- (f) Connect the 6 fuel injector connectors.

3. CONNECT FUEL PIPE NO.2

- (a) Push in the tube connector to the pipe, then tube connector makes a "click" sound.

NOTICE:

- Check if there is any damage or foreign objects on the connected part of the fuel pipe.
- After connecting, check if the pipe and connector are securely connected by pulling them.

- (b) Install the fuel pipe clamp.

4. CONNECT FUEL PIPE NO.1

- (a) Push in the tube connector to the pipe, then tube connector makes a "click" sound.

NOTICE:

- **Check if there is any damage or foreign objects on the connected part of the fuel pipe.**
- **After connecting, check if the pipe and connector are securely connected by pulling them.**

- (b) Install the fuel pipe clamp.

5. INSTALL INTAKE AIR SURGE TANK

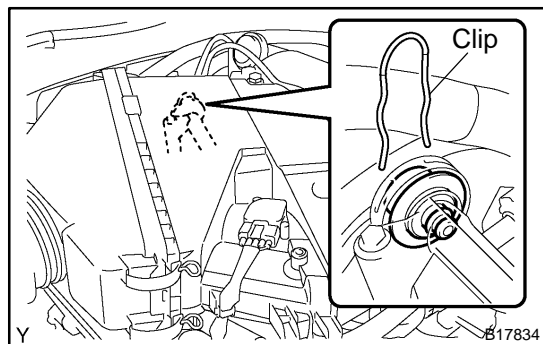
(See page [EM-62](#))

6. INSTALL AIR CLEANER (See page [EM-89](#))**7. INSTALL V-BANK COVER****8. ADD ENGINE COOLANT****9. CHECK FOR FUEL LEAKS**

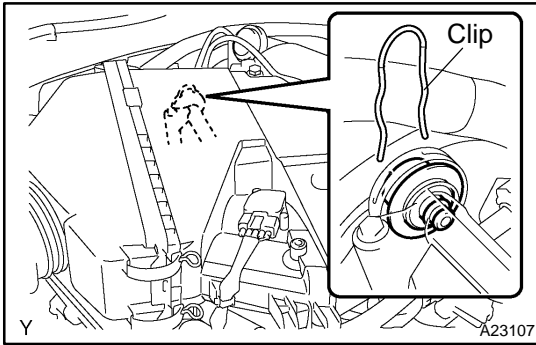
FUEL PRESSURE PULSATION DAMPER REMOVAL

SF1YL-01

1. PREVENT GASOLINE FROM SPILLING OUT
(See page [SF-1](#))
2. REMOVE V-BANK COVER



3. REMOVE FUEL PRESSURE PULSATION DAMPER
 - (a) Remove the clip.
 - (b) Pull out the fuel pressure pulsation damper from the fuel delivery pipe.



INSTALLATION

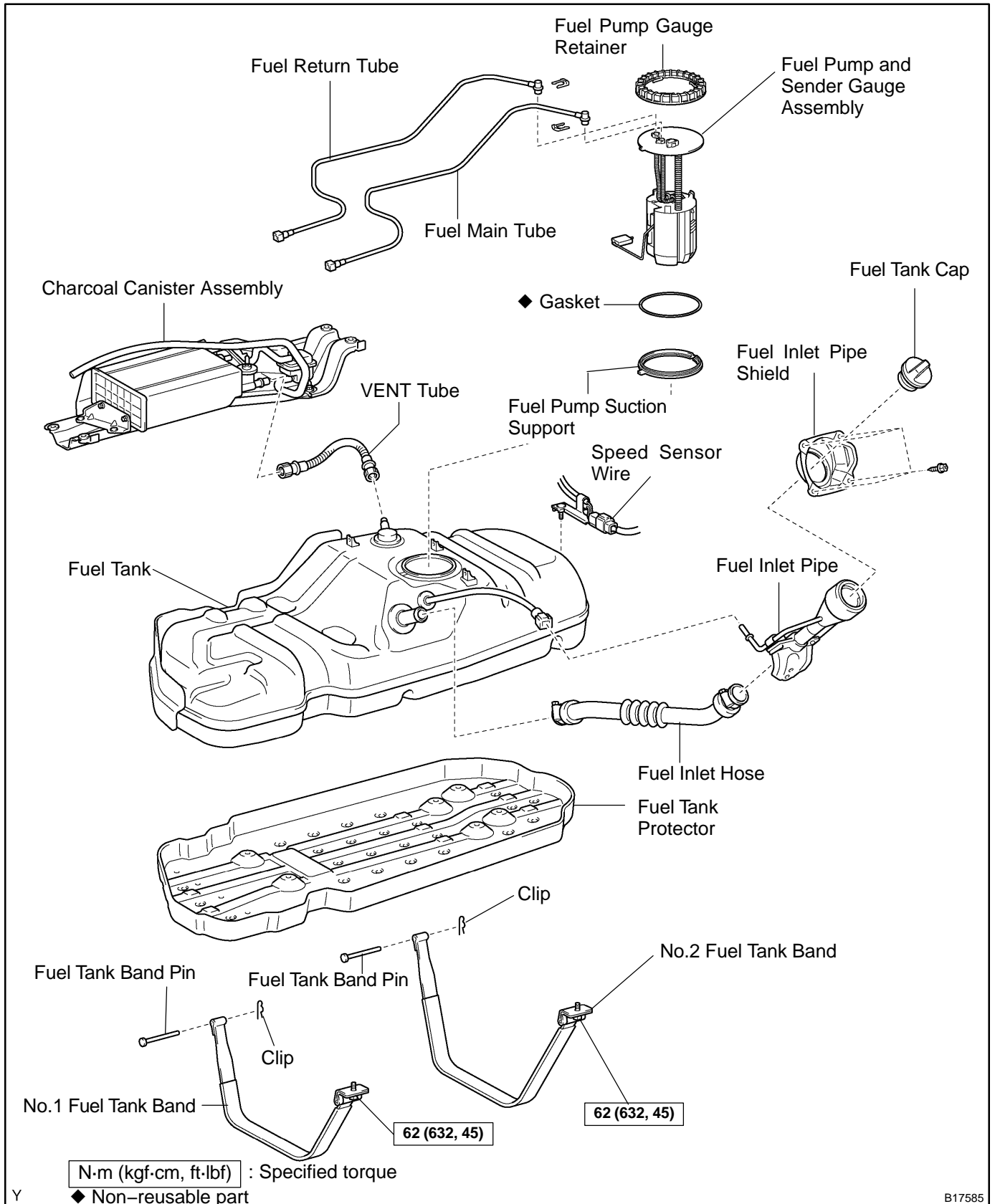
1. **INSTALL FUEL PRESSURE PULSATION DAMPER**
 - (a) Apply a light coat of spindle oil or gasoline to a new O-ring and install it to the fuel pressure pulsation damper.
 - (b) Install the fuel pressure pulsation damper to the fuel delivery pipe.
 - (c) Install the clip.
2. **INSTALL V-BANK COVER**
3. **CHECK FOR FUEL LEAKS**

FUEL TANK AND LINE COMPONENTS

SF1YM-01

CAUTION:

- Always use new gaskets when replacing the fuel tank or component parts.
- Apply the proper torque to all parts tightened.

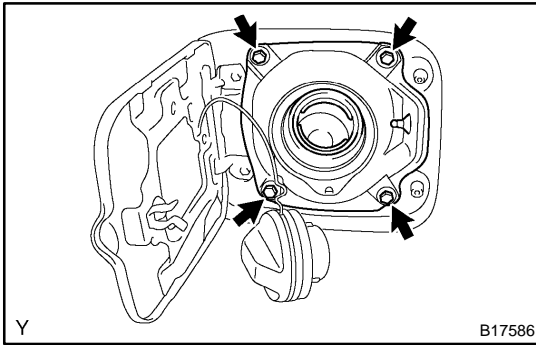


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

Y

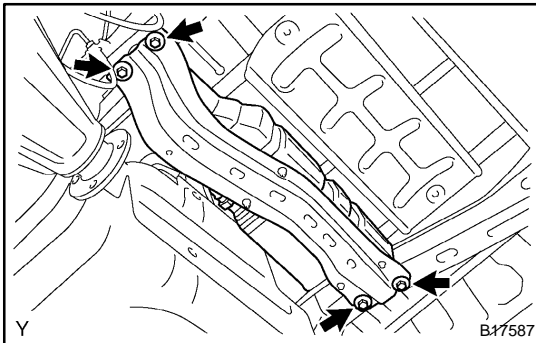
B17585



REMOVAL

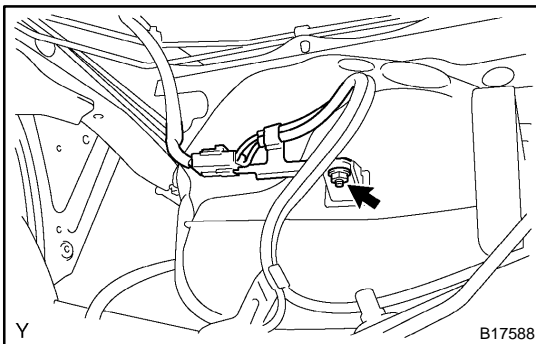
1. **PREVENT GASOLINE FROM SPILLING OUT**
(See page [SF-1](#))
2. **REMOVE FUEL TANK CAP**
3. **REMOVE FUEL INLET PIPE SHIELD**

Remove the 4 bolts and fuel inlet pipe shield.



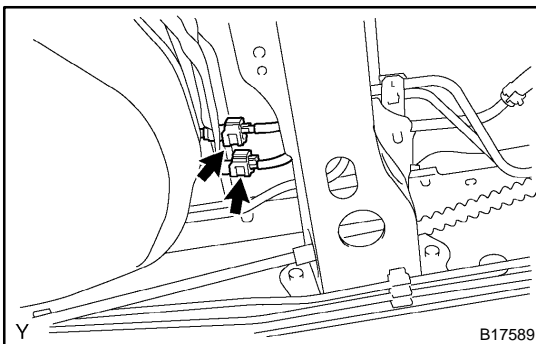
4. REMOVE CHARCOAL CANISTER ASSEMBLY

- (a) Remove the 4 bolts and charcoal canister assembly.
- (b) Disconnect the pump module connector, vent hose and purge line hose from the charcoal canister.

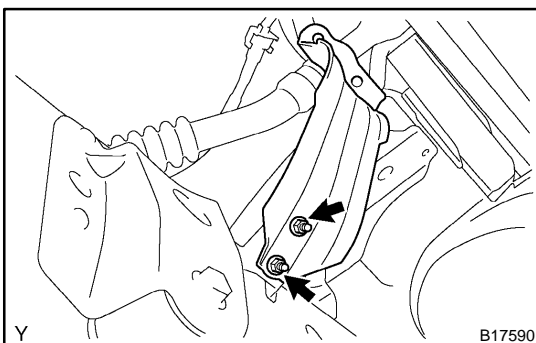


5. DISCONNECT SPEED SENSOR WIRE

Remove the nut and disconnect the speed sensor wire from the fuel tank.

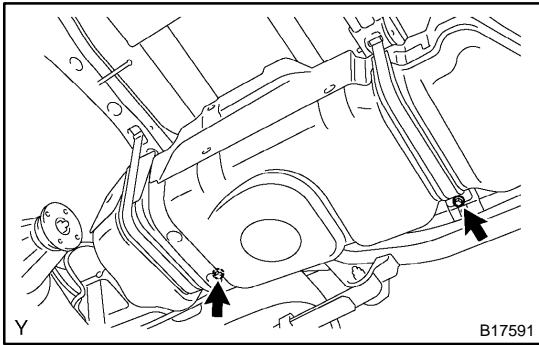


6. DISCONNECT FUEL MAIN TUBE AND RETURN TUBE (See page [SF-1](#))

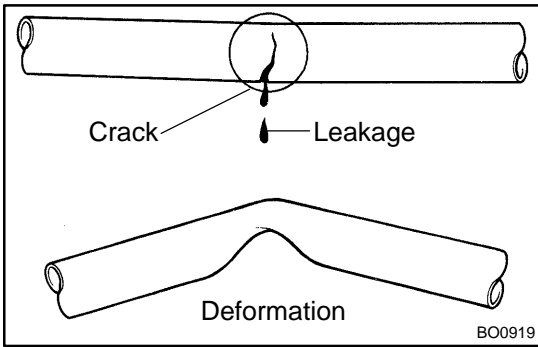


7. REMOVE FUEL TANK ASSEMBLY

- (a) Set up a transmission jack under the fuel tank.
- (b) Remove the 2 nuts and disconnect the fuel pipe bracket from the body.



- (c) Remove the 2 bolts and disconnect the 2 fuel tank bands from the fuel tank.
 - (d) Operate the transmission jack and remove the fuel tank.
- 8. REMOVE FUEL PUMP ASSEMBLY**
(See page [SF-9](#))

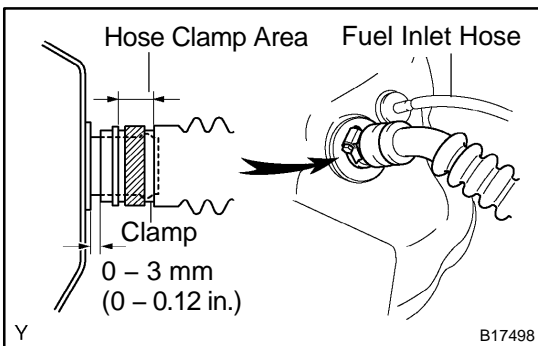
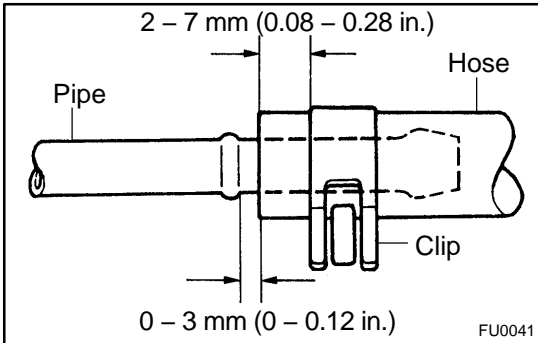


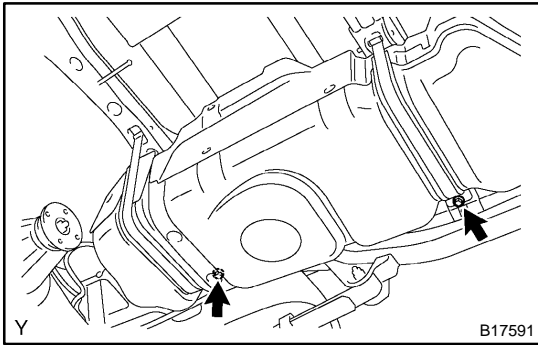
INSPECTION

INSPECT FUEL TANK AND LINE

- (a) Check the fuel lines for cracks or leakage, and all connections for deformation.
- (b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
- (c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
- (d) Check the filler neck for damage or fuel leakage.
- (e) Hose and pipe connections are as shown in the illustration.

If a problem is found, repair or replace the parts as necessary.

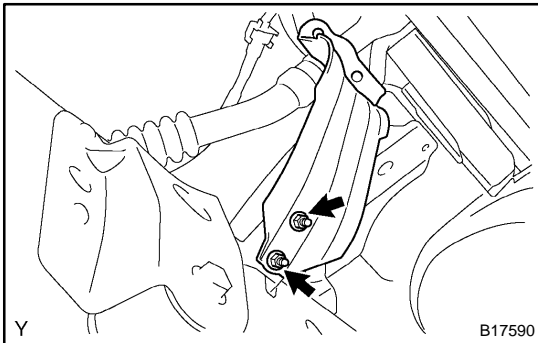




INSTALLATION

1. **INSTALL FUEL PUMP ASSEMBLY** (See page [SF-17](#))
2. **INSTALL FUEL TANK ASSEMBLY**
 - (a) Set up the fuel tank on the transmission jack.
 - (b) Operate the transmission jack and install the fuel tank.
 - (c) Install the 2 fuel tank bands with the 2 bolts.

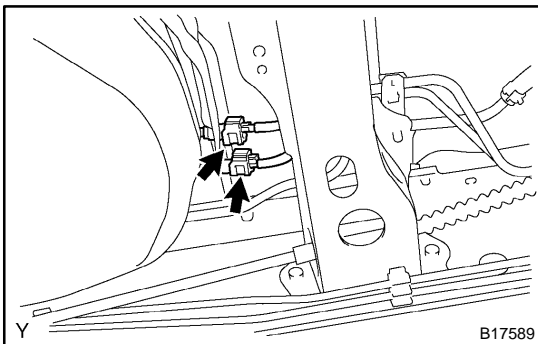
Torque: 62 N·m (632 kgf·cm, 45 ft·lbf)



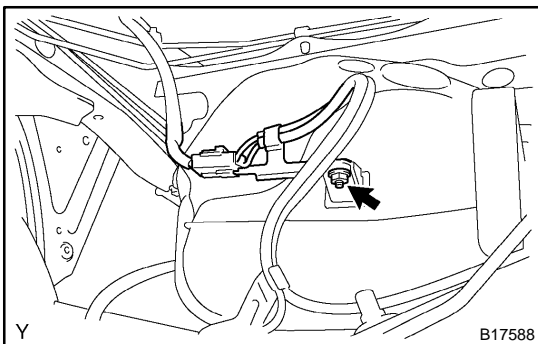
- (d) Install the fuel pipe bracket to the body with the 2 nuts.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

3. **CONNECT FUEL PUMP CONNECTOR**

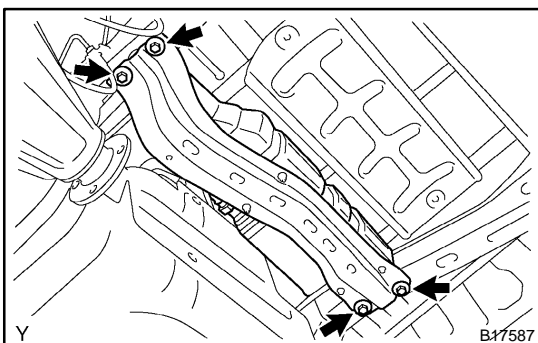


4. **CONNECT FUEL MAIN TUBE AND RETURN TUBE**
(See page [SF-1](#))



5. **CONNECT SPEED SENSOR WIRE**

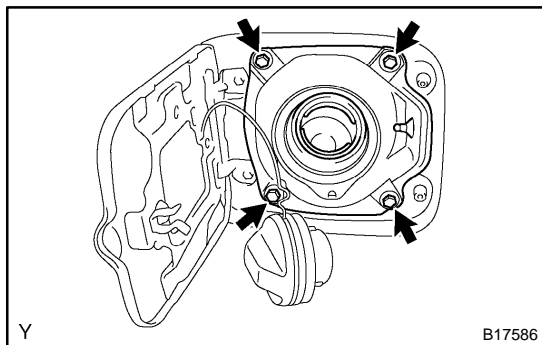
Connect the speed sensor wire to the fuel tank with the nut.



6. **INSTALL CHARCOAL CANISTER ASSEMBLY**

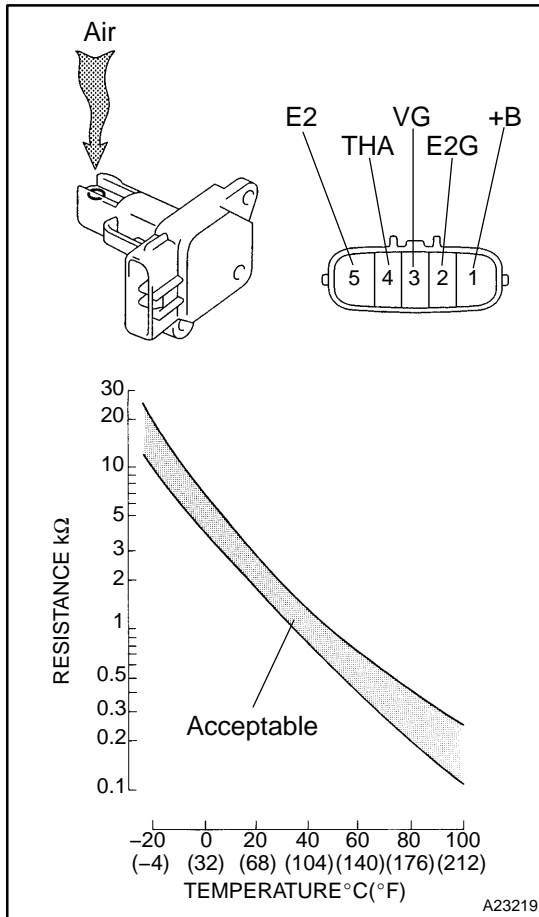
- (a) Connect the pump module connector, vent hose and purge line hose to the charcoal canister.
- (b) Install the charcoal canister assembly with the 4 bolts.

Torque: 14.7 N·m (150 kgf·cm, 11 ft·lbf)

**7. INSTALL FUEL INLET PIPE SHIELD**

- (a) Install the fuel inlet pipe shield with the 4 bolts.
- (b) Install the fuel tank cap.

8. CHECK FOR FUEL LEAKS**9. INSTALL SPARE TIRE**



MASS AIR FLOW (MAF) METER INSPECTION

SF1YQ-01

1. INSPECT OUTPUT VOLTAGE

- Apply battery voltage across terminals 1 (+B) and 2 (E2G).
- Connect the positive (+) tester probe to terminal 3 (VG), and the negative (-) tester probe to terminal 2 (E2G).
- Blow air into the MAF meter, and check if the voltage fluctuates.

2. INSPECT RESISTANCE

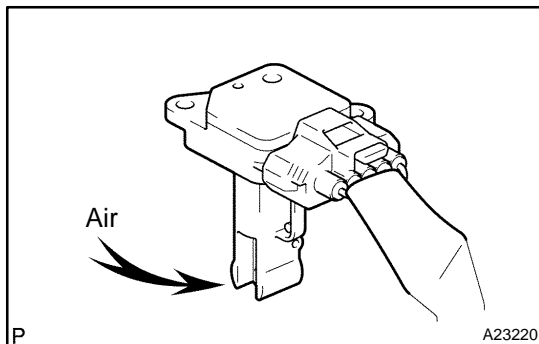
Using an ohmmeter, measure the resistance between terminals 4 (THA) and 5 (E2).

Resistance:

13.6 to 18.4 kΩ at -20°C (-4°F)

2.21 to 2.69 kΩ at 20°C (68°F)

0.49 to 0.67 kΩ at 60°C (140°F)



3. INSPECT MASS AIR FLOW METER

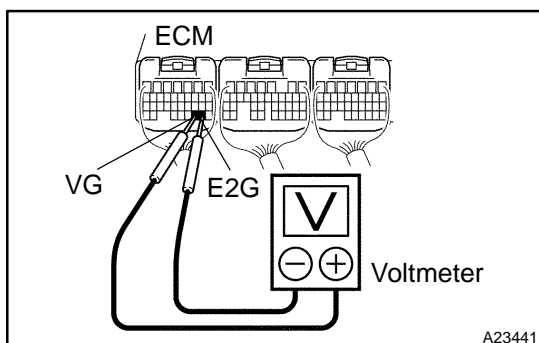
- If using a hand-held tester:
 - Connect the hand-held tester to the DLC3.
 - Turn the ignition switch to the ON position.
 - Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / MAF
 - Blow air into the MAF meter, and check that the air flow value of the CURRENT DATA changes.

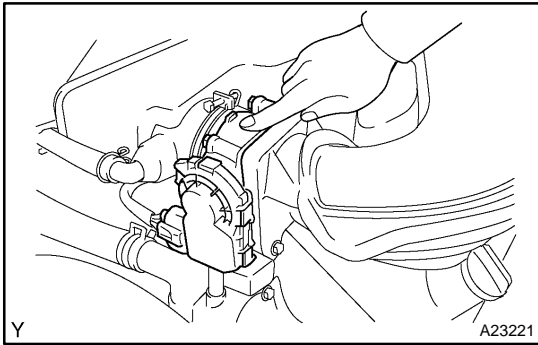
If operation is not as specified, check the MAF meter (see page [DI-98](#)) as well as the wiring and the ECM.

- If not using a hand-held tester:

- Turn the ignition switch to the ON position.
- Connect the positive tester probe of the voltmeter to terminal VG of the ECM and the negative tester probe of the voltmeter to terminal E2G of the ECM.
- Blow air into the air flow meter, and check if the voltage fluctuates.

If operation is not as specified, check the MAF meter (see page [DI-98](#)), the wiring and the ECM.





THROTTLE BODY ON-VEHICLE INSPECTION

SF1YR-01

1. CHECK FOR OPERATING SOUND

- Turn the ignition switch to the ON position.
- When turning the accelerator pedal position sensor lever, listen to the running sound of the motor. Also, check that there is no friction sound.

If operation is not as specified, check the throttle control motor (see page [DI-283](#)), wiring and ECM.

2. INSPECT THROTTLE POSITION SENSOR

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to the ON position.
- When turning the accelerator pedal position sensor lever to the full-open position, check the percentage of the throttle valve opening angle (THROTTLE POS) of the CURRENT DATA.

**Standard percentage of the valve opening angle:
60 % or more**

If operation is not as specified, check the accelerator pedal position sensor (see page [DI-299](#)), the wiring and the ECM.

If not using a hand-held tester, measure the voltage between the terminals (VTA1 - E2, VTA2 - E2) of the ECM connector (see page [DI-34](#)).

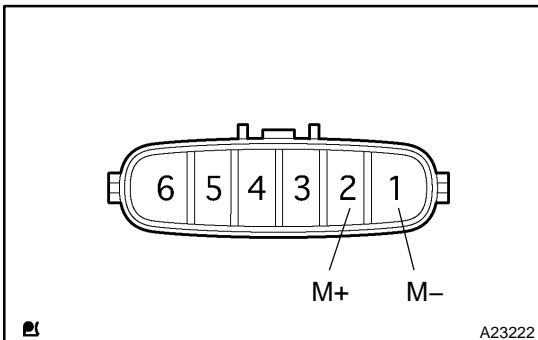
3. INSPECT AIR ASSIST SYSTEM

- Start the engine and check that the MIL does not illuminate.
- Let the engine warm up to the normal operating temperature.
- Switch the A/C compressor from ON to OFF, and check the idle speed.

Idle speed (Transmission in neutral): 650 to 750 rpm

NOTICE:

Perform inspection without an electrical load.

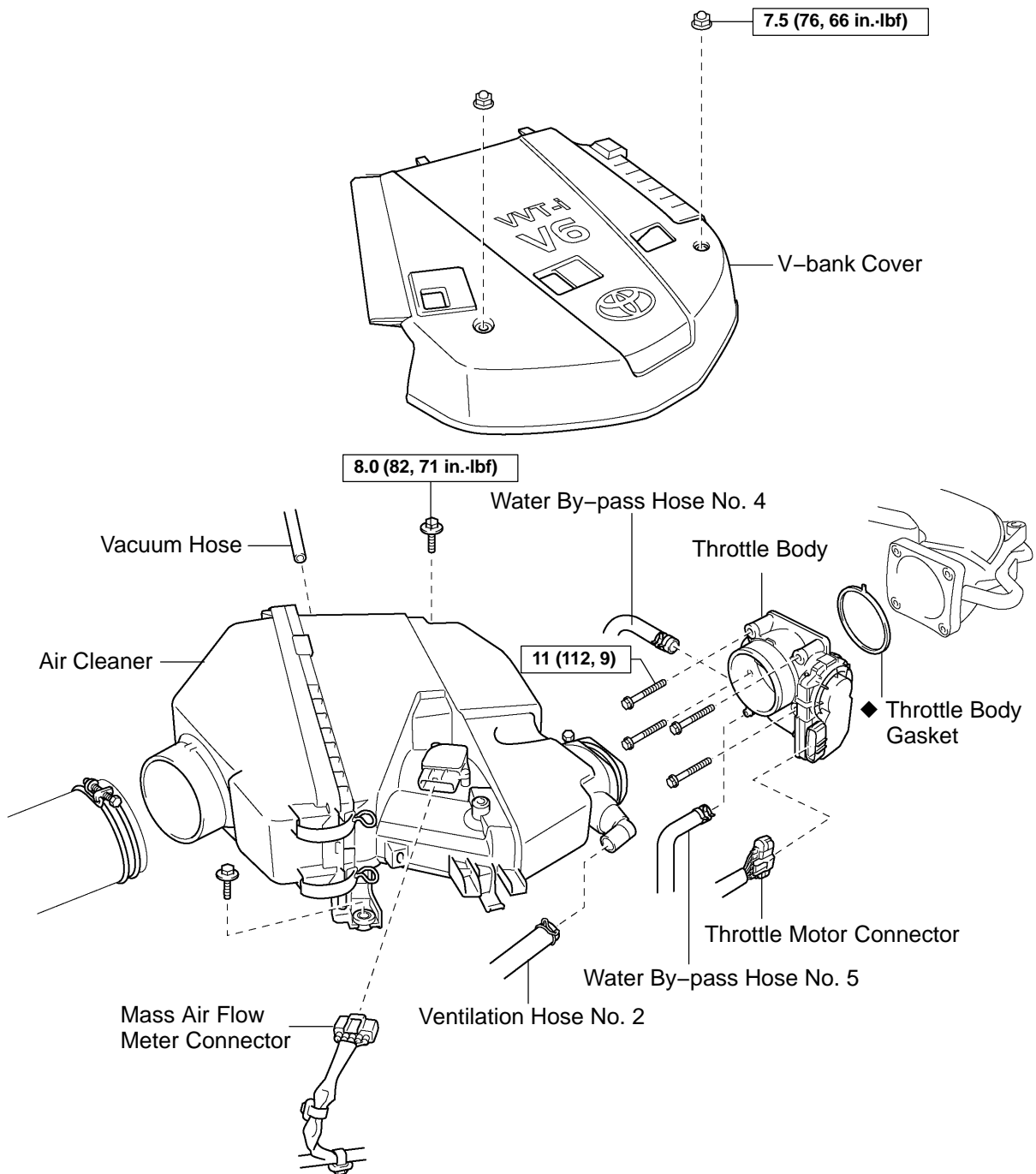


4. INSPECT THROTTLE BODY RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Terminal No.	Resistance
2 (M+) ↔ 1 (M-)	0.3 to 100 Ω at 20 °C (68 °F)

COMPONENTS

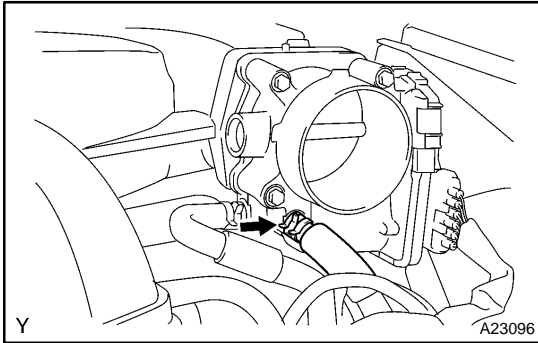


N·m (kgf·cm, ft·lbf) : Specified torque

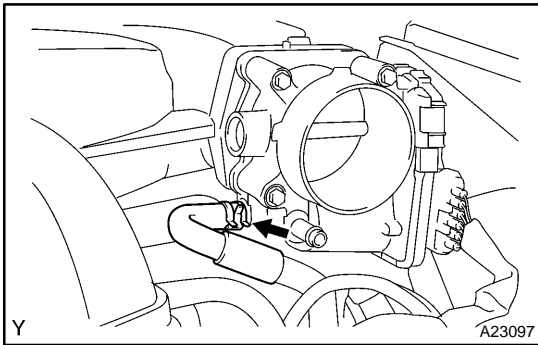
◆ Non-reusable part

REMOVAL

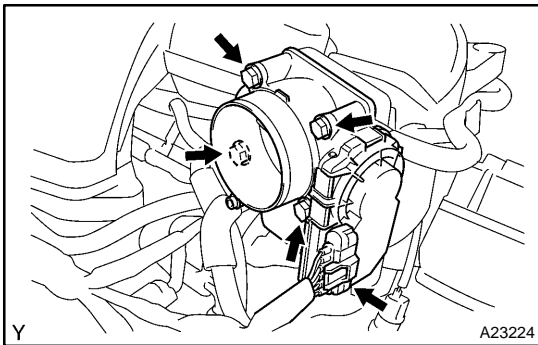
1. DRAIN ENGINE COOLANT
2. REMOVE V-BANK COVER
3. REMOVE AIR CLEANER (See page [EM-62](#))



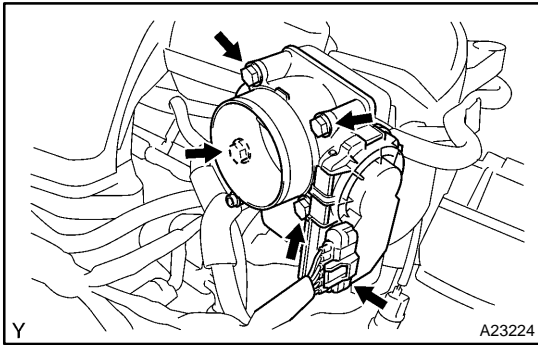
4. DISCONNECT WATER BY-PASS HOSE NO.5



5. DISCONNECT WATER BY-PASS HOSE NO.4



6. REMOVE THROTTLE BODY
 - (a) Disconnect the throttle motor connector.
 - (b) Remove the 4 bolts, throttle body and gasket.



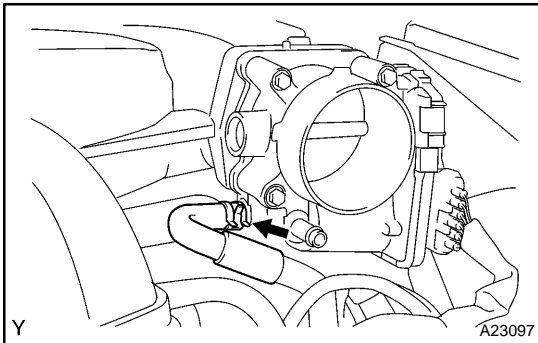
INSTALLATION

1. INSTALL THROTTLE BODY

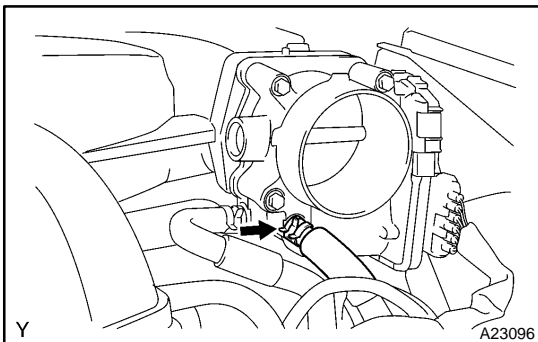
- (a) Install a new gasket and the throttle body w/ motor with the 4 bolts.

Torque: 11 N·m (112 kgf·cm, 9 ft·lbf)

- (b) Connect the throttle motor connector.



2. CONNECT WATER BY-PASS HOSE NO.4



3. CONNECT WATER BY-PASS HOSE NO.5

4. INSTALL AIR CLEANER (See page [EM-89](#))

5. INSTALL V-BANK COVER

6. ADD ENGINE COOLANT

7. CHECK FOR ENGINE COOLANT LEAKS

CAMSHAFT TIMING OIL CONTROL VALVE

SF1YV-01

ON-VEHICLE INSPECTION

1. INSPECT CAMSHAFT TIMING OIL CONTROL VALVE

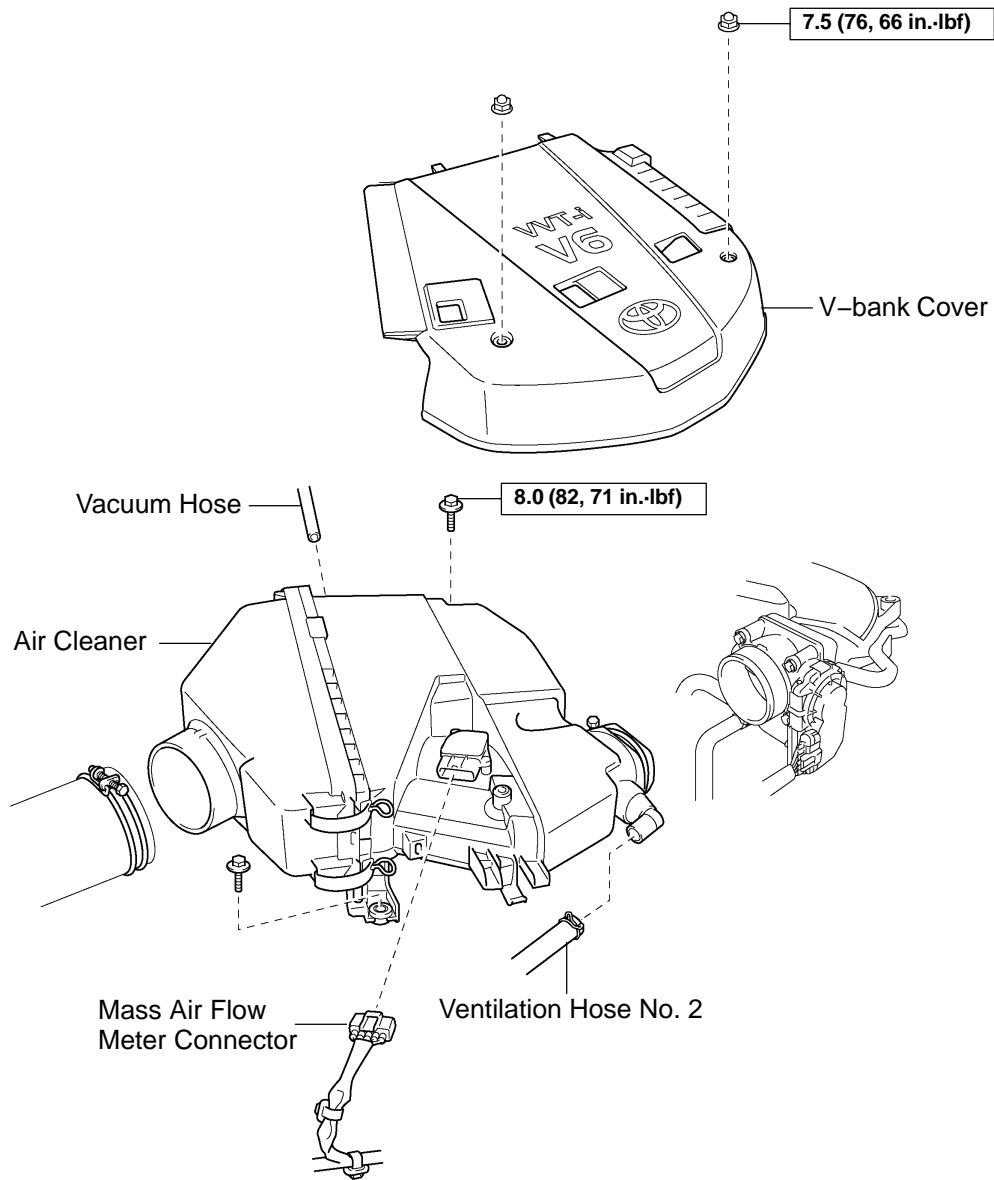
- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to the ON position.
- (c) Start the engine and warm it up.
- (d) Connect the hand-held tester and select the VVT from the ACTIVE TEST menu.
- (e) Check the engine speed when the OCV is operated by the hand-held tester.

Standard:

VVT system is OFF (OCV is OFF): Normal engine speed

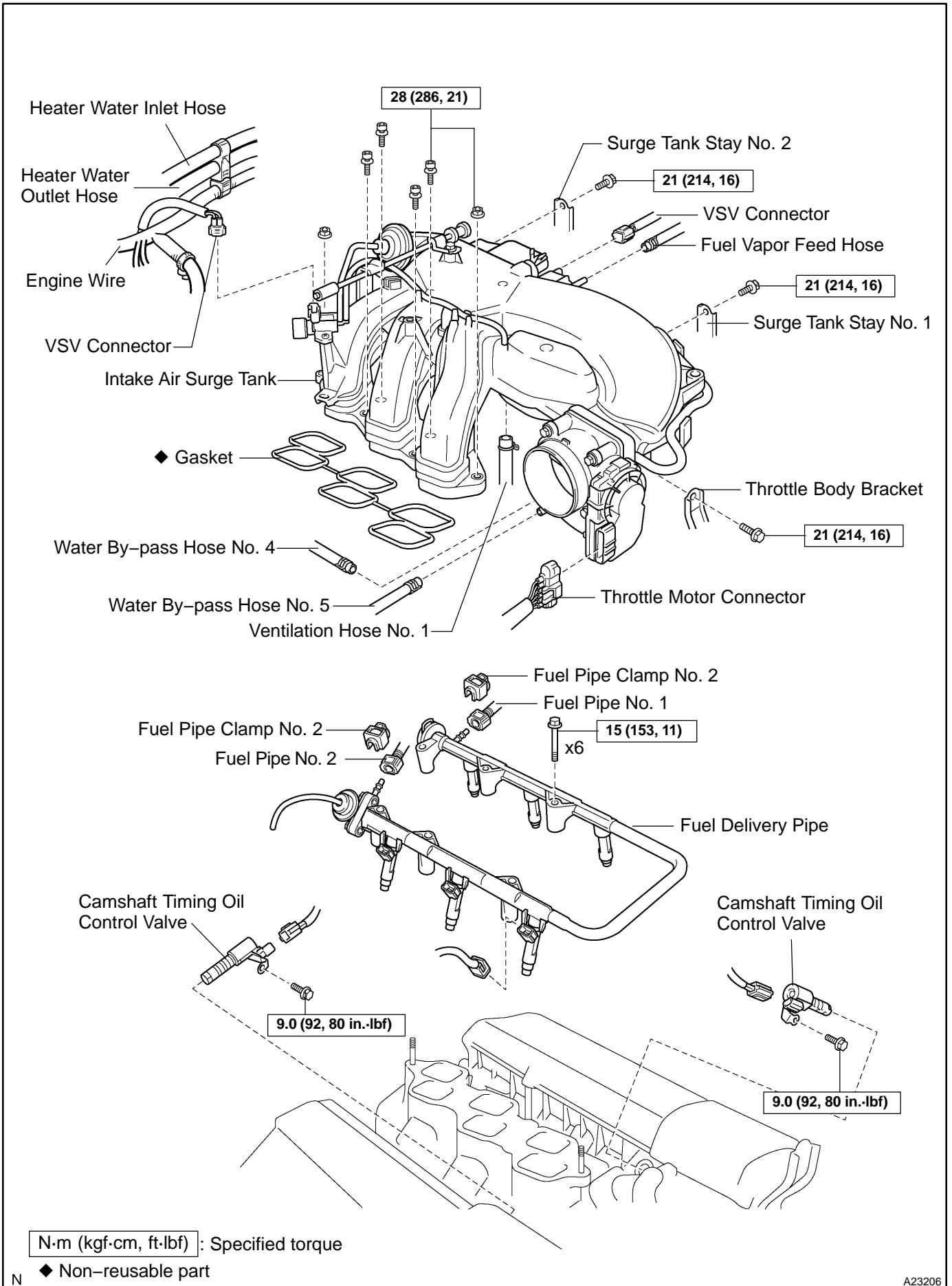
VVT system is ON (OCV is ON): Rough idle or engine stalled

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

Y



REMOVAL

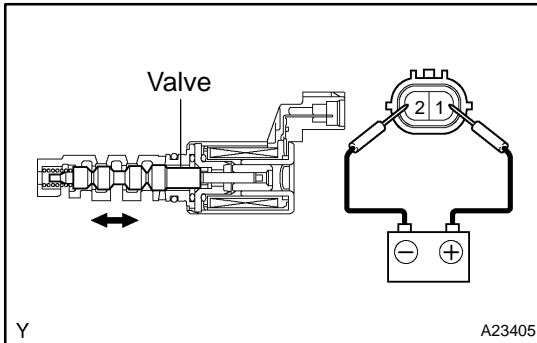
1. REMOVE V-BANK COVER
2. REMOVE AIR CLEANER (See page [EM-62](#))
3. REMOVE INTAKE AIR SURGE TANK (See page [EM-62](#))
4. REMOVE FUEL DELIVERY PIPE
5. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE
 - (a) Disconnect the 2 oil control valve connectors.
 - (b) Remove the 2 bolts and 2 camshaft timing oil control valves.

INSPECTION

1. INSPECT CAMSHAFT TIMING OIL CONTROL VALVE RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance: 6.9 to 7.9 Ω at 20°C (68°F)



2. INSPECT VALVE MOVEMENT

Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check the movement of the valve.

NOTICE:

Confirm that the valve does not catch.

HINT:

Bad returning of the valve by catching foreign objects causes subtle pressure leak in the advanced direction. DTCs could be detected.

INSTALLATION

1. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE

- (a) Install the 2 camshaft timing oil control valves to each cylinder head, and tighten the 2 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)

- (b) Connect the 2 oil control valve connectors.

2. INSTALL FUEL DELIVERY PIPE

3. INSTALL INTAKE AIR SURGE TANK (See page [EM-89](#))

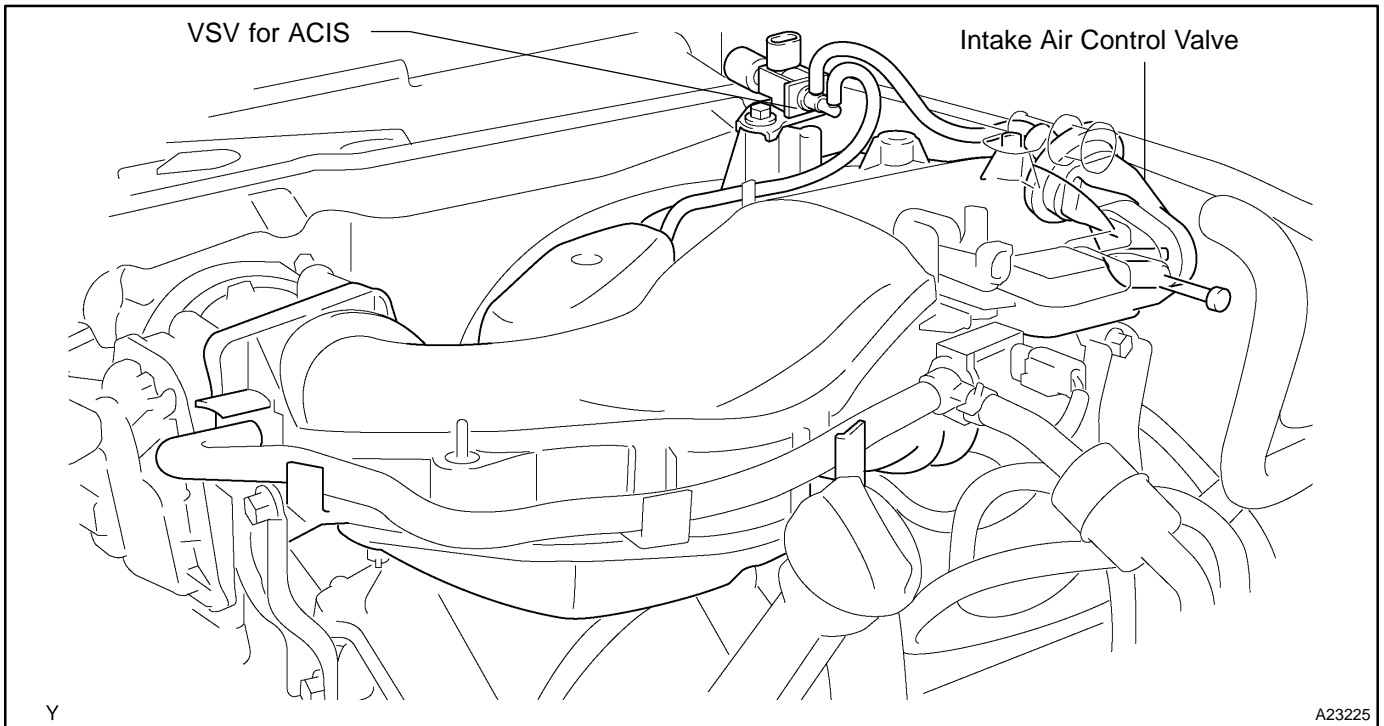
4. INSTALL AIR CLEANER (See page [EM-89](#))

5. INSTALL V-BANK COVER

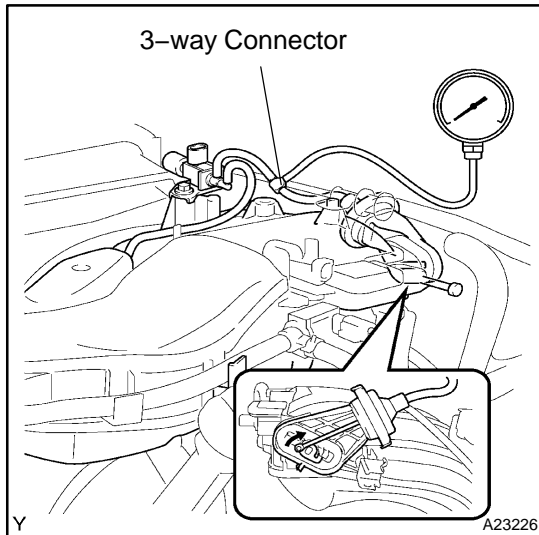
ACOUSTIC CONTROL INDUCTION SYSTEM (ACIS) ON-VEHICLE INSPECTION

SF120-01

1. INSPECT INTAKE AIR CONTROL FUNCTION

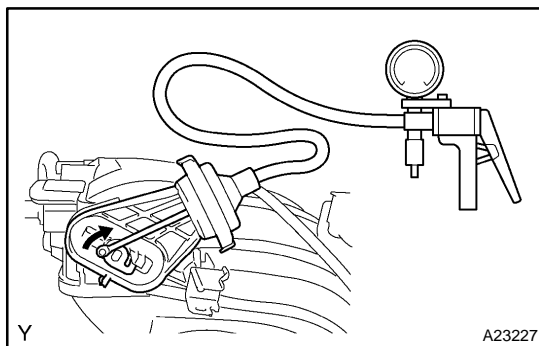


- (a) Remove the V-bank cover.
- (b) Connect the hand-held tester to the DLC3.
- (c) Perform the ACTIVE TEST, then check that the actuator rod operates.
- (d) Start the engine.
- (e) Check that the VSV for ACIS is ON under the following conditions:
 - Depressing the accelerator pedal to 60% accelerator opening angle.
 - Racing the engine above 4,700 rpm.
- (f) Check that the VSV for ACIS is OFF under the following conditions:
 - The engine idling.
 - Release the accelerator pedal from the condition of step (e).



2. INSPECT INTAKE AIR CONTROL VALVE

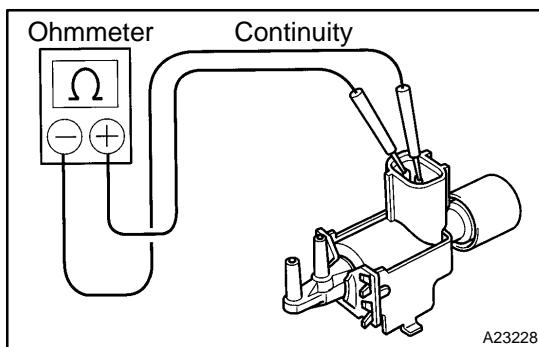
- (a) Remove the V-bank cover.
- (b) Using a 3-way connector, connect the vacuum gauge to the actuator hose.
- (c) Start the engine.
- (d) While the engine is idling, check that the vacuum gauge needle momentarily fluctuates up to approx. 39.9 kPa (300 mmHg, 11.8 in.Hg). (The actuator rod is pulled out.)
- (e) Rapidly and fully depress the accelerator pedal and check that the vacuum gauge needle points to 0 kPa (0 mmHg, 0 in.Hg). (The actuator rod is returned.)
- (f) Remove the vacuum gauge, and connect the vacuum hose to the actuator.
- (g) Reinstall the V-bank cover.



3. INSPECT INTAKE AIR SURGE TANK

Inspect the diaphragm.

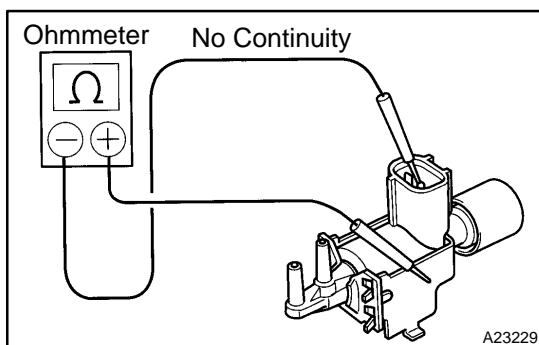
- (1) Check that the lever moves when a vacuum of 26.6 kPa (200 mmHg, 7.9 in.Hg) is applied with the MI-TYVAC (hand-held vacuum pump) on.
- (2) Check that the vacuum of 26.6 kPa (200 mmHg, 7.9 in.Hg) is sustained for 1 minute in the above state.



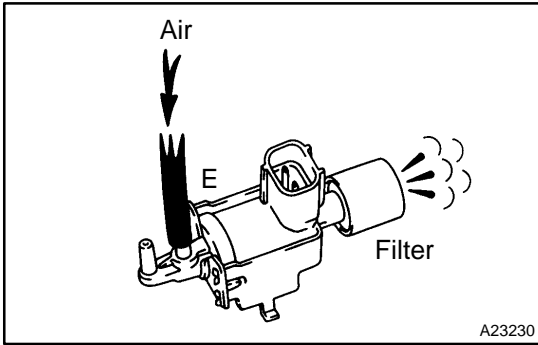
4. INSPECT VSV FOR ACIS

- (a) Inspect the VSV for an open circuit. Using an ohmmeter, check that there is continuity between each terminal.

Resistance: 33 to 39 Ω at 20°C (68°F)

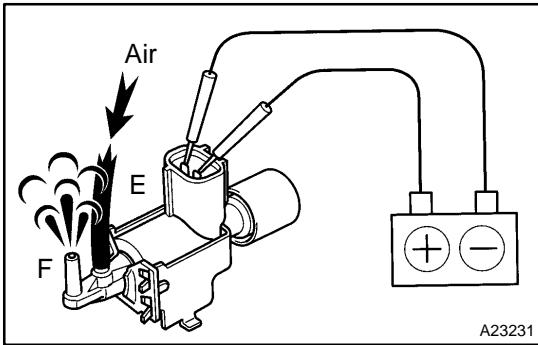


- (b) Inspect the VSV for ground. Using an ohmmeter, check that there is no continuity between each terminal and the body.



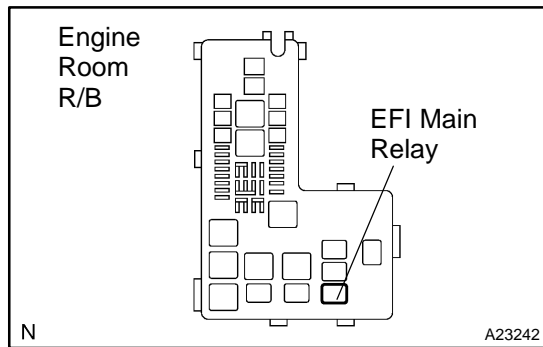
(c) Inspect VSV operation.

- (1) Check that air flows from port E to the filter.



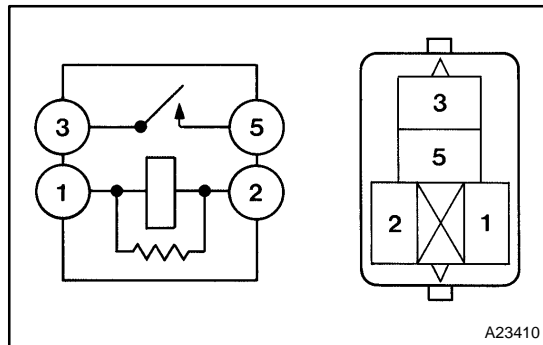
- (2) Apply battery voltage across the terminals.

- (3) Check that air flows from port E to port F.



EFI MAIN RELAY INSPECTION

1. REMOVE EFI MAIN RELAY



2. INSPECT EFI MAIN RELAY

- (a) Using an ohmmeter, check for continuity between each terminal.

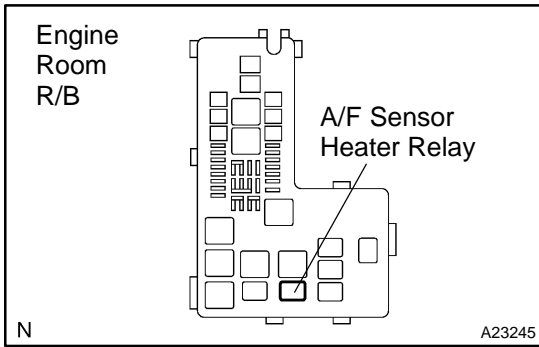
Specified condition:

Terminal No.	Specified condition
1 - 2	Continuity
3 - 5	No continuity

- (b) Using an ohmmeter, check for continuity between terminals 3 and 5 when the battery voltage is applied across terminals 1 and 2.

Specified condition: Continuity

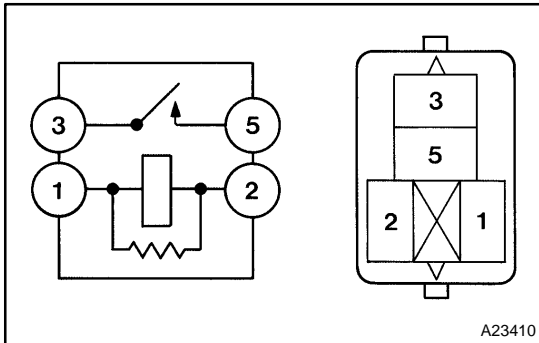
3. INSTALL EFI MAIN RELAY



A/F SENSOR HEATER RELAY INSPECTION

SF122-01

1. REMOVE A/F SENSOR HEATER RELAY



2. INSPECT A/F SENSOR HEATER RELAY

- (a) Using an ohmmeter, check for continuity between each terminal.

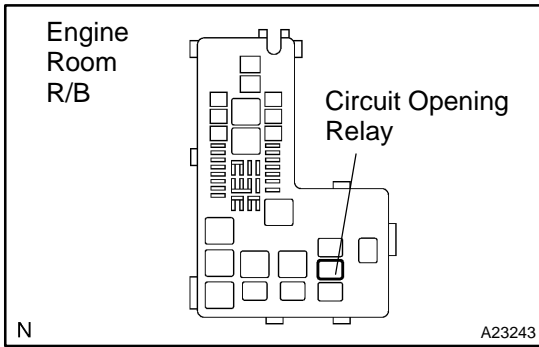
Specified condition:

Terminal No.	Specified condition
1 - 2	Continuity
3 - 5	No continuity

- (b) Using an ohmmeter, check for continuity between terminals 3 and 5 when the battery voltage is applied across terminals 1 and 2.

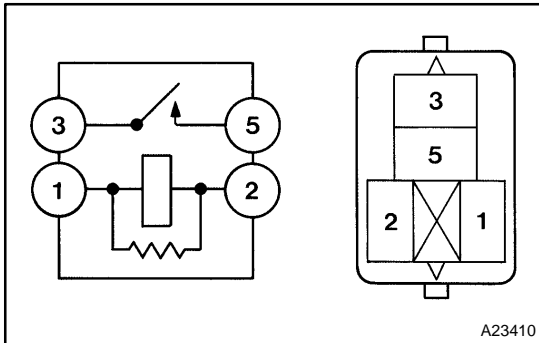
Specified condition: Continuity

3. INSTALL A/F SENSOR HEATER RELAY



CIRCUIT OPENING RELAY INSPECTION

1. REMOVE CIRCUIT OPENING RELAY



2. INSPECT CIRCUIT OPENING RELAY

- (a) Using an ohmmeter, check for continuity between each terminal.

Specified condition:

Terminal No.	Specified condition
1 - 2	Continuity
3 - 5	No continuity

- (b) Using an ohmmeter, check for continuity between terminals 3 and 5 when the battery voltage is applied across terminals 1 and 2.

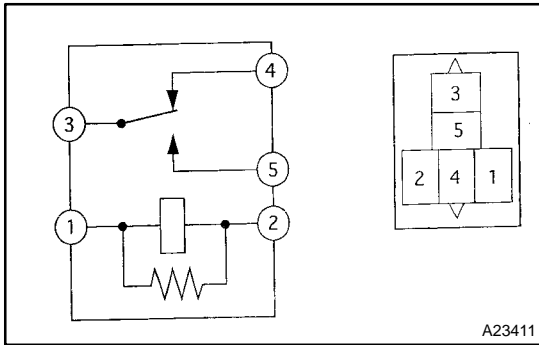
Specified condition: Continuity

3. INSTALL CIRCUIT OPENING RELAY

ACC CUT RELAY INSPECTION

SF125-01

1. REMOVE ACC CUT RELAY



2. INSPECT ACC CUT RELAY

- (a) Using an ohmmeter, check for continuity between each terminal.

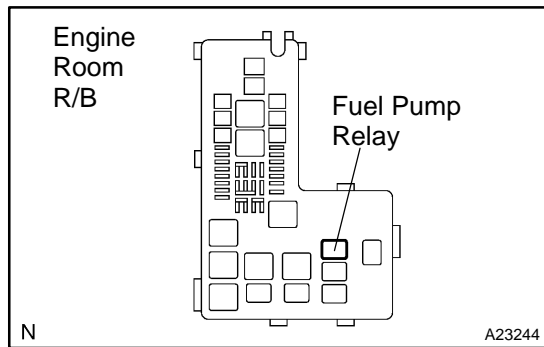
Specified condition:

Terminal No.	Specified condition
1 - 2	Continuity
3 - 4	
3 - 5	No continuity

- (b) Using an ohmmeter, check for continuity between terminals 3 and 5 when the battery voltage is applied across terminals 1 and 2.

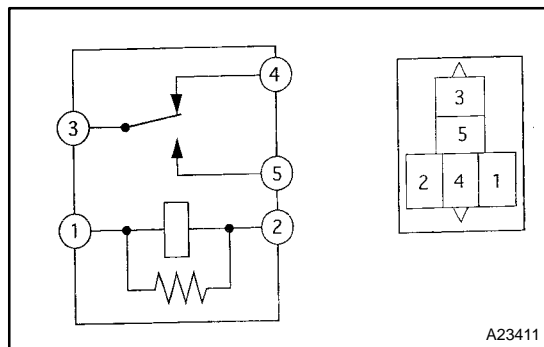
Specified condition: Continuity

3. INSTALL ACC CUT RELAY



FUEL PUMP RELAY INSPECTION

1. REMOVE FUEL PUMP RELAY



2. INSPECT FUEL PUMP RELAY

- (a) Using an ohmmeter, check for continuity between each terminal.

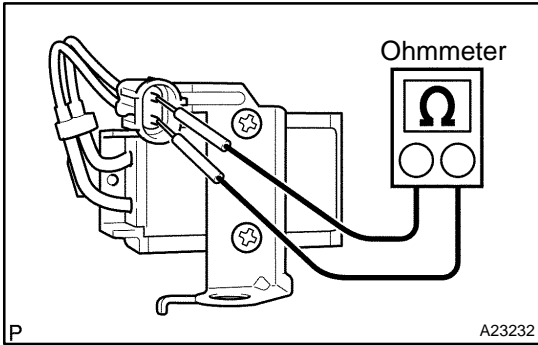
Specified condition:

Terminal No.	Specified condition
1 - 2	Continuity
3 - 4	
3 - 5	No continuity

- (b) Using an ohmmeter, check for continuity between terminals 3 and 5 when the battery voltage is applied across terminals 1 and 2.

Specified condition: Continuity

3. INSTALL FUEL PUMP RELAY



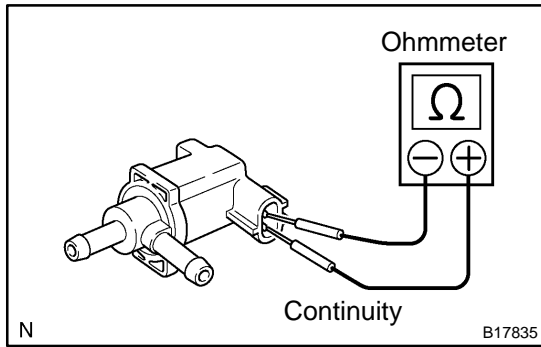
FUEL PUMP RESISTOR INSPECTION

SF126-01

INSPECT FUEL PUMP RESISTOR

Using an ohmmeter, measure the resistance between terminals.

Resistance: 0.70 to 0.76 Ω at 20°C (68°F)



VSV FOR EVAPORATIVE EMISSION (EVAP) INSPECTION

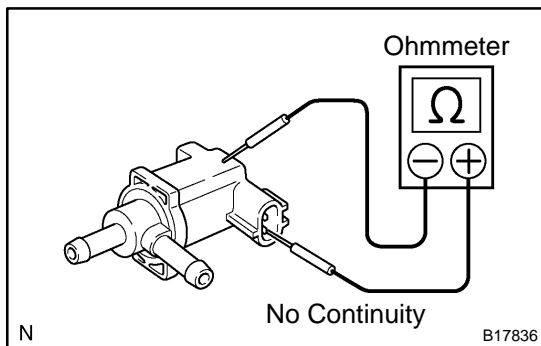
SF1Z7-01

1. REMOVE VSV
2. INSPECT VSV
 - (a) Inspect the VSV for an open circuit.

Using an ohmmeter, measure the resistance between the terminals.

Resistance: 26 to 30 Ω at 20 °C (68 °F)

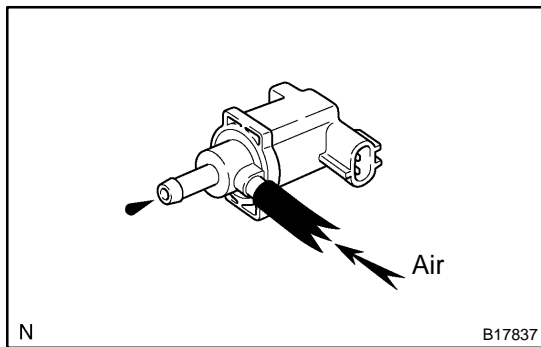
If the resistance is not as specified, replace the VSV.



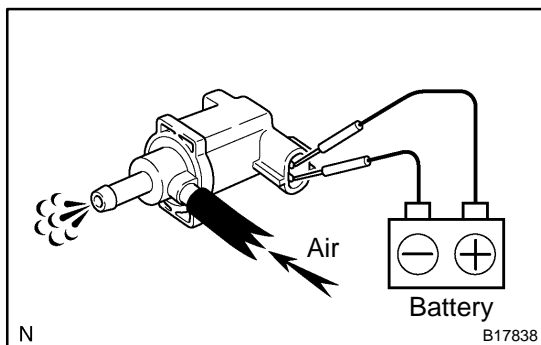
- (b) Inspect the VSV for ground.

Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



- (c) Inspect VSV operation.
 - (1) Check that air does not flow from the ports.



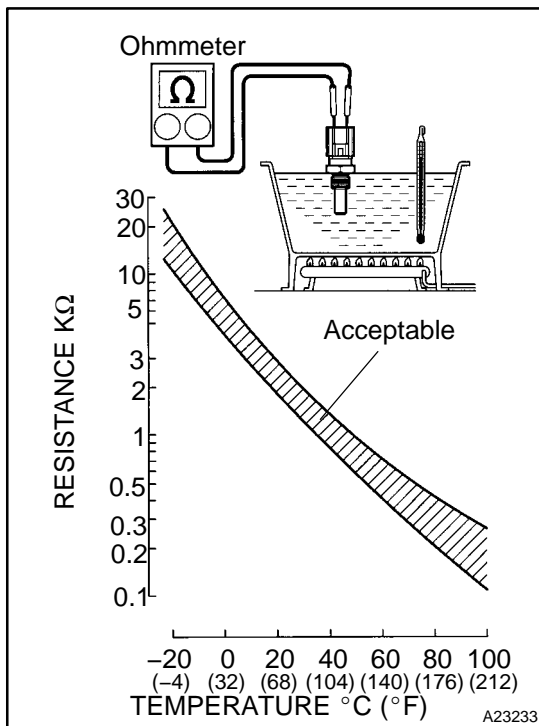
- (2) Apply battery voltage across the terminals.
 - (3) Check that air flows from the ports.
- If operation is not as specified, replace the VSV.

3. REINSTALL VSV

ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

SF128-01

1. DRAIN ENGINE COOLANT
2. REMOVE V-BANK COVER
3. REMOVE ENGINE COOLANT TEMPERATURE SENSOR
 - (a) Disconnect the engine coolant temperature sensor connector.
 - (b) Remove the engine coolant temperature sensor and gasket from the water by-pass joint.



4. INSPECT ENGINE COOLANT TEMPERATURE SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Resistance:

2.32 to 2.59 kΩ at 20 °C (68 °F)

0.310 to 0.326 kΩ at 80 °C (176 °F)

NOTICE:

When inspecting the water temperature sensor in water, prevent water flow into the terminals. After inspection, wipe the water off from the sensor.

5. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

- (a) Install a new gasket and engine coolant temperature sensor to the water by-pass joint.

Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)

- (b) Connect the engine coolant temperature connector.

6. ADD ENGINE COOLANT

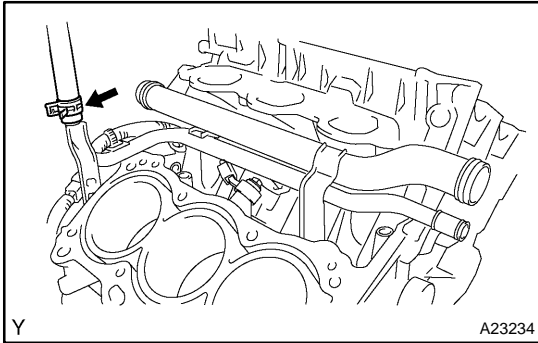
7. CHECK FOR COOLANT LEAKS

8. INSTALL V-BANK COVER

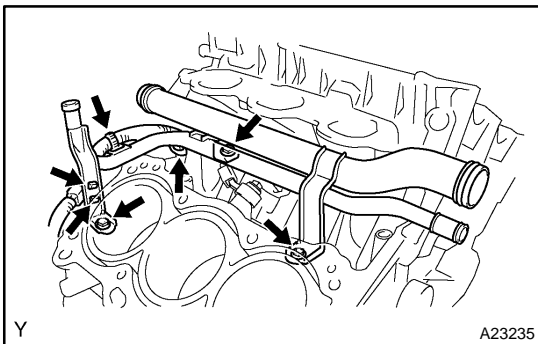
KNOCK SENSOR REMOVAL

SF129-01

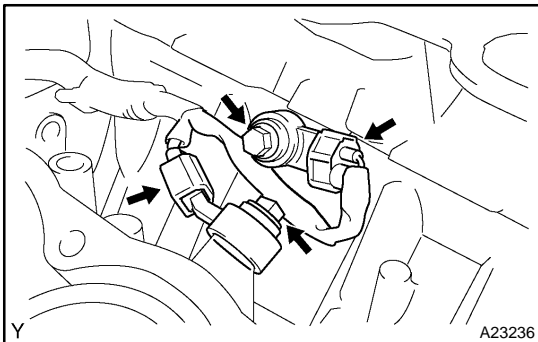
1. REMOVE CYLINDER HEAD (See page [EM-62](#))



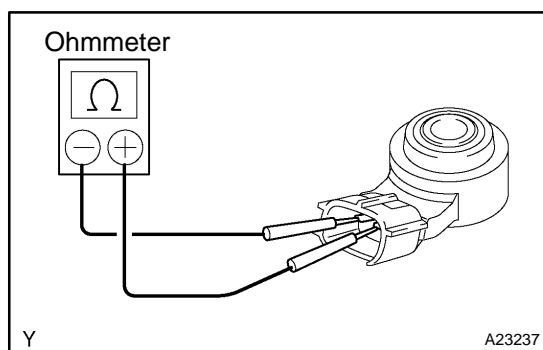
2. DISCONNECT HEATER WATER INLET HOSE



3. REMOVE WATER OUTLET PIPE NO.1
 - (a) Remove the 4 wire harness clamps.
 - (b) Remove the 3 bolts and water outlet pipe.



4. REMOVE KNOCK SENSOR
 - (a) Disconnect the 2 knock sensor connectors.
 - (b) Remove the 2 bolts and 2 knock sensors.



INSPECTION

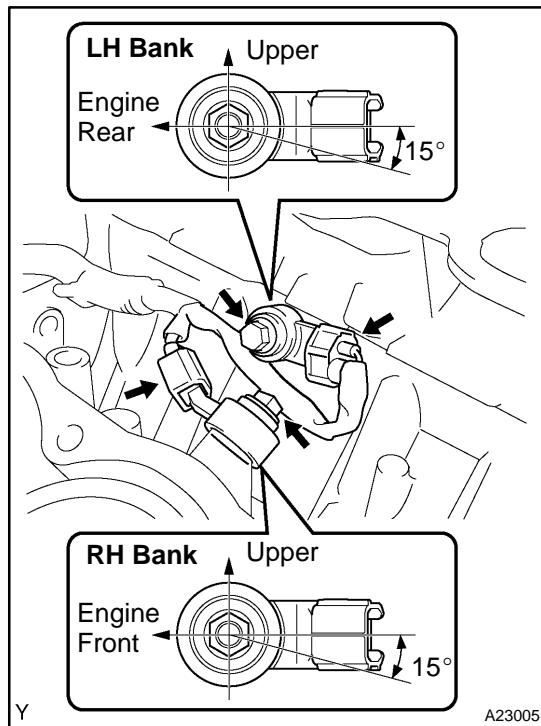
1. INSPECT KNOCK SENSOR

Using an ohmmeter, measure the resistance between terminals.

Resistance: 120 to 280 k Ω at 20 °C (68 °F)

HINT:

If the resistance is not as specified, replace the sensor.



INSTALLATION

1. INSTALL KNOCK SENSOR

- (a) Install the 2 knock sensors with the 2 bolts so that the center of the sensor comes within the range of 15° from the bolt center as shown in the illustration.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

- (b) Connect the 2 knock sensor connectors.

2. INSTALL WATER OUTLET PIPE NO.1

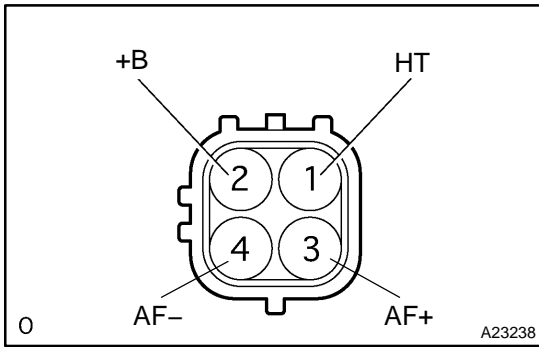
- (a) Install the water outlet pipe with the 3 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

- (b) Install the 4 wire harness clamps.

3. CONNECT HEATER WATER INLET HOSE

4. **INSTALL CYLINDER HEAD (See page [EM-89](#))**



AIR-FUEL RATIO (A/F) SENSOR INSPECTION

SF1ZC-01

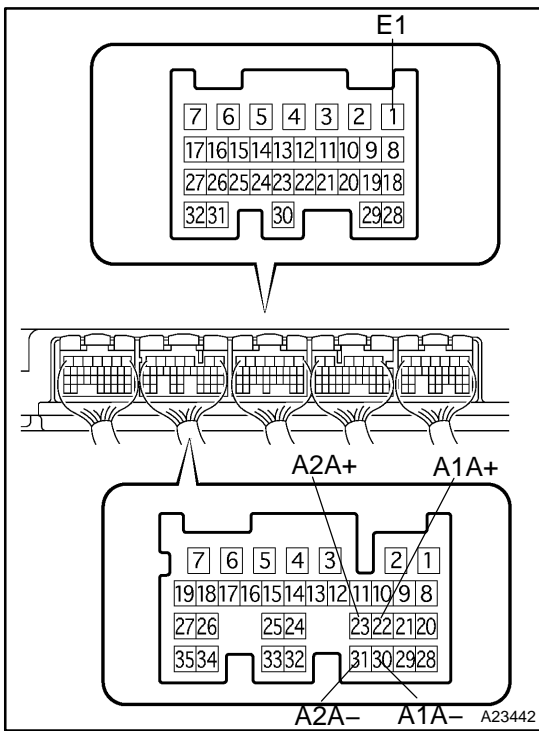
1. INSPECT AIR FUEL RATIO SENSOR (BANK1, BANK2 AIR FUEL RATIO SENSOR)

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Terminal No.	Resistance
1 (HT) ⇔ 2 (+B)	1.8 to 3.4 Ω at 20 °C (68 °F)
1 (HT) ⇔ 2 (+B)	5.0 to 7.5 Ω at 500 °C (932 °F)
1 (HT) ⇔ 4 (AF-)	No Continuity

If the resistance is not as specified, replace the sensor.



2. INSPECT AIR-FUEL RATIO COMPENSATION SYSTEM

(a) Measure the voltage between terminals of the ECM.

Standard voltage:

Terminal No.	Condition	Voltage
A1A+ ⇔ E1	IG switch ON	3.3V
A1A- ⇔ E1	IG switch ON	3.0V
A2A+ ⇔ E1	IG switch ON	3.3V
A2A- ⇔ E1	IG switch ON	3.0V

NOTICE:

Connect test leads from the back side of the ECM connector.

HINT:

The voltage between terminals of the ECM is kept constant regardless of the voltage of the A/F sensor.

- (b) Connect the hand-held tester to the DLC3.
- (c) Select "DATA MONITOR" - "A/FS B1 S1", "A/FS B2 S1" and "O2S B1 S2" to display the monitor.
- (d) Warm up the A/F sensor by running the engine at 2,500 rpm for approx. 2 minutes.
- (e) Keep the engine speed at 2,500 rpm and confirm that the displays of the "A/FS B1 S1" and "A/FS B2 S1" are similar to the illustration on the left.

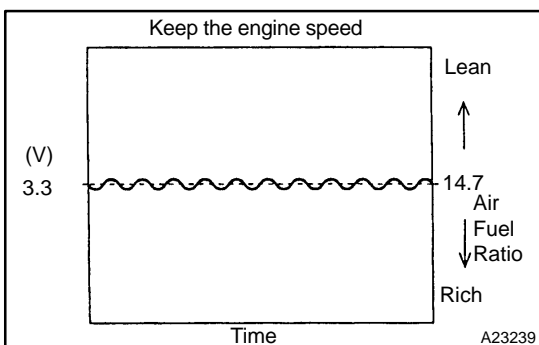
NOTICE:

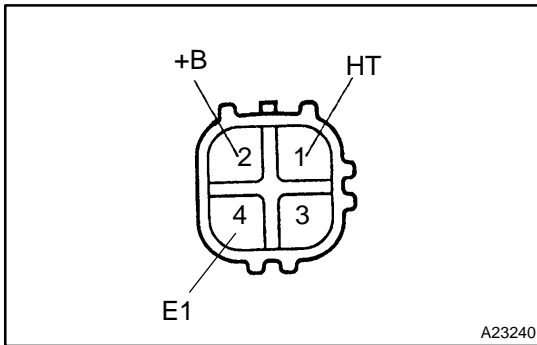
The illustration differs from the real display.

HINT:

The waveform of the A/F sensor is displayed only on the hand-held tester.

- (f) Confirm that the display of the "O2S B1 S2" changes between 0V to 1V with the engine speed at 2,500 rpm.





HEATED OXYGEN SENSOR INSPECTION

SF1ZD-01

INSPECT HEATED OXYGEN SENSOR (BANK1, BANK2 OXYGEN SENSOR)

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Terminal No.	Resistance
1 (HT) \leftrightarrow 2 (+B)	5 to 10 Ω at 20 °C (68 °F)
1 (HT) \leftrightarrow 4 (E1)	No Continuity

If the resistance is not as specified, replace the sensor.

ACCELERATOR PEDAL POSITION SENSOR INSPECTION

SF1ZE-01

1. INSPECT ACCELERATOR PEDAL POSITION SENSOR

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch to the ON position.
- (c) Check if the voltage (ACCEL POS) of the CURRENT DATA indicates the standard value.

Accelerator pedal released: 0.5 to 1.1 V

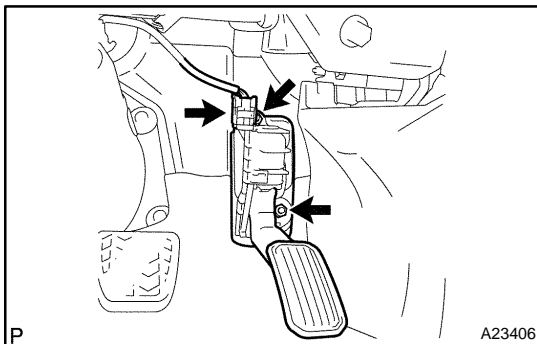
Accelerator pedal depressed: 2.6 to 4.5 V

- (d) Check if the voltage (ACCEL POS #2) of the CURRENT DATA indicates the standard value.

Accelerator pedal released: 1.2 to 2.0 V

Accelerator pedal depressed: 3.4 to 5.3 V

If not using a hand-held tester, measure the voltage between terminals (VPA – EPA, VPA2 – EPA2) of the ECM connector (see page [DI-34](#)).



2. REMOVE ACCELERATOR PEDAL ROD

- (a) Disconnect the accelerator pedal connector.
- (b) Remove the 2 nuts and the accelerator pedal assy.

3. INSTALL ACCELERATOR PEDAL ROD

NOTICE:

- **Avoid physical shock to the accelerator pedal assy.**
- **Do not disassemble the accelerator pedal assy.**

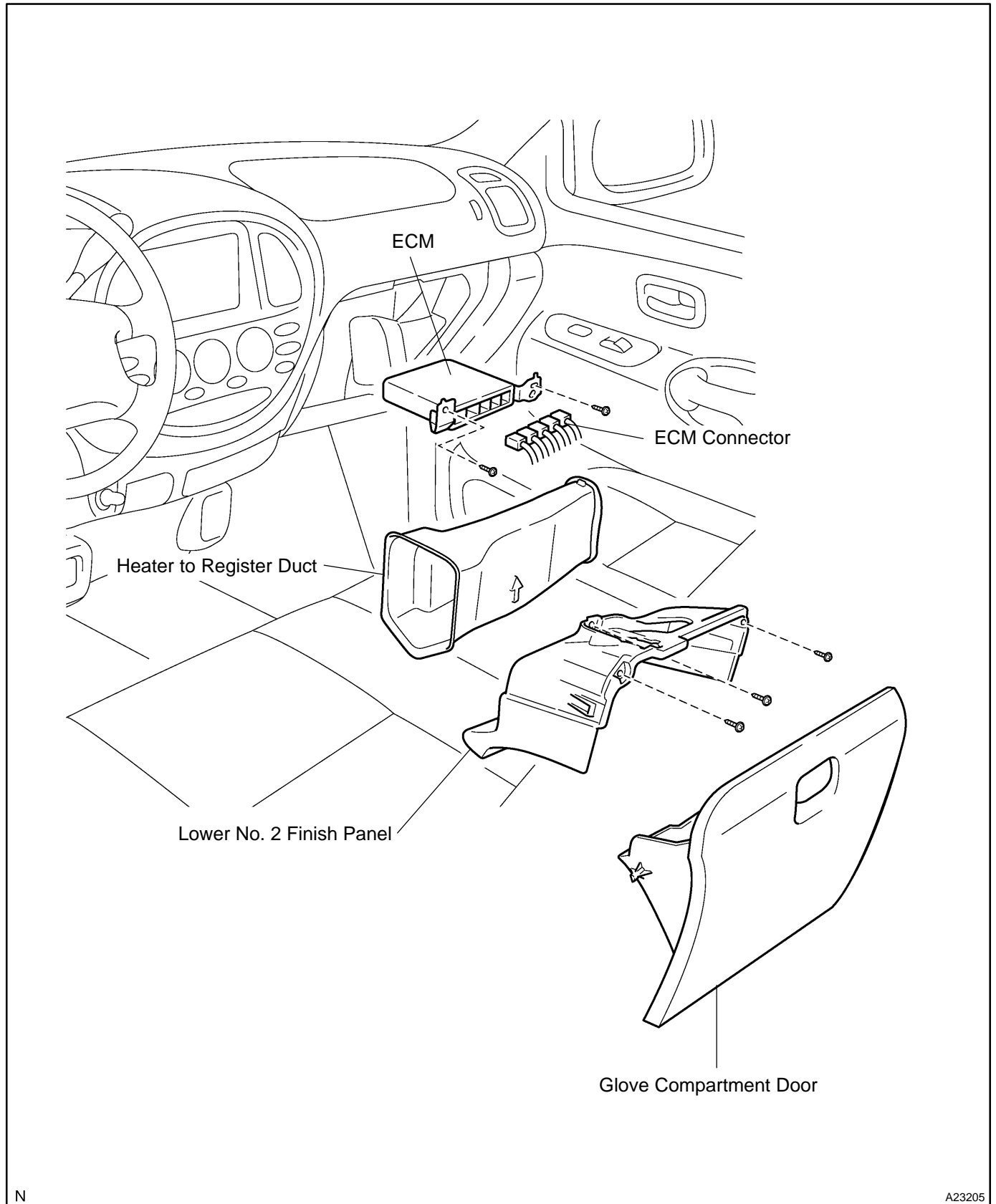
- (a) Install the accelerator pedal assy with the 2 nuts.

Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

- (b) Connect the accelerator pedal connector.

ENGINE CONTROL MODULE (ECM) COMPONENTS

SF1ZF-01



INSPECTION

INSPECT ECM (See page [DI-1](#))

FUEL CUT RPM

SF12H-01

INSPECTION

INSPECT FUEL CUT OFF RPM

- (a) Increase the engine speed to at least 3,500 rpm.
- (b) Use a sound scope to check for injector operating noise.
- (c) Check that the injector operation noise stops momentarily and then resumes when the accelerator pedal is released.

Fuel cut off rpm: 2,500 rpm

Fuel return rpm: 1,200 rpm

SFI SYSTEM PRECAUTION

SF1XD-02

HINT:

All DTCs retained in the ECM will be erased when the negative (-) terminal cable is removed from the battery.

If necessary, read the DTC before removing the negative (-) terminal cable from the battery.

- 1. BEFORE WORKING ON FUEL SYSTEM, DISCONNECT CABLE FROM NEGATIVE (-) BATTERY TERMINAL**
- 2. DO NOT SMOKE OR WORK NEAR AN OPEN FLAME WHEN WORKING ON FUEL SYSTEM**
- 3. KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS**
- 4. MAINTENANCE PRECAUTIONS**
 - (a) To prevent engine misfire, these precautions should be taken.
 - (1) Check the battery terminals are proper connected.
 - (2) After repair, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
 - (3) When cleaning the engine compartment, be especially careful to protect the electrical system from water.
 - (b) Observe the following when handling the air fuel ratio sensors and oxygen sensor.
 - (1) Do not drop the sensor or hit it against another object.
 - (2) The sensor should be free from any contact with water.
- 5. IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)**

If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

6. AIR INDUCTION SYSTEM

- (a) Removal of the engine oil dipstick, oil filler cap, PCV hose, may break the engine.
- (b) Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head may result in air suction and break the engine.

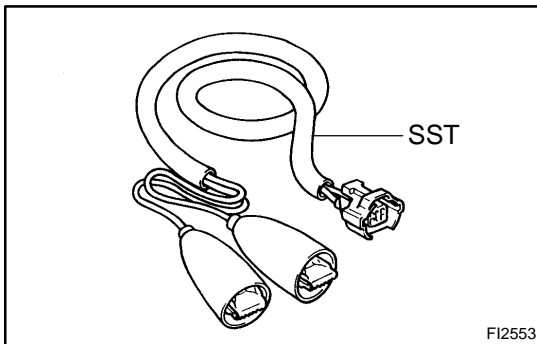
7. ELECTRONIC CONTROL SYSTEM

- (a) Before removing SFI wiring connectors, terminals, first disconnect the power by turning the ignition switch off or disconnecting the negative (-) terminal cable from the battery.

HINT:

Be sure to check DTCs before disconnecting the negative (-) terminal cable from the battery.

- (b) When installing the battery, be especially careful to correctly connect the positive (+) and negative (-) cables.
- (c) Do not give a severe impact to the SFI parts during removal or installation. Handle all SFI parts carefully, especially the ECM.
- (d) Be careful during troubleshooting. Numerous transistor circuits are used and even slight terminal contact can cause further trouble.
- (e) Do not open the ECM cover.
- (f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting into the SFI parts and wiring connectors.
- (g) Parts should be replaced as an assembly.
- (h) Care should be taken when pulling out and inserting wiring connectors.
 - (1) Release the lock and pull out the connector, pulling on the connectors.
 - (2) Fully insert the connector and check that it is locked.

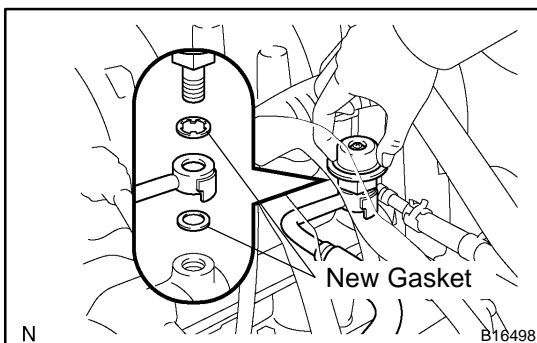


- (i) Use SST for inspection or test of the injector or its wiring connector.

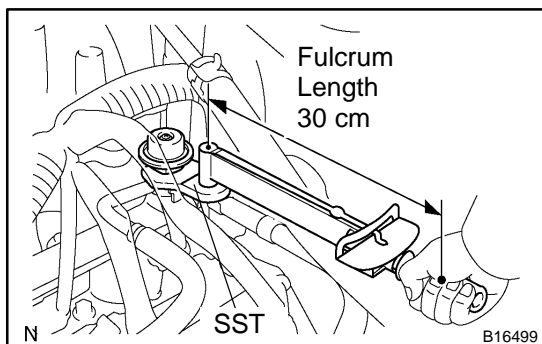
SST 09842-30070

8. FUEL SYSTEM

- (a) When disconnecting the high fuel pressure line, a large amount of gasoline will spill out. Observe the following procedures:
 - (1) Disconnect the circuit opening relay.
 - (2) Start the engine. After the engine has stopped on its own, turn the ignition switch off.
 - (3) Put a container under the connecting part of the pressure line.
 - (4) Slowly loosen the connection.
 - (5) Disconnect the high fuel pressure line.
 - (6) Reconnect the fuel pump connector.



- (b) When connecting the union bolt (fuel pressure pulsation damper) on the high pressure pipe union, observe the following procedures:
 - (1) Always use 2 new gaskets.
 - (2) Tighten the union bolt by hand.



- (3) Using SST, tighten the union bolt to the specified torque.

SST 09612-24014 (09617-24011)

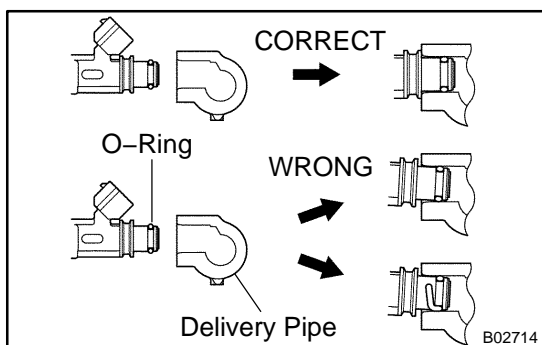
Torque:

33 N-m (340 kgf-cm, 24 ft-lbf) for use with SST

39 N-m (400 kgf-cm, 29 ft-lbf)

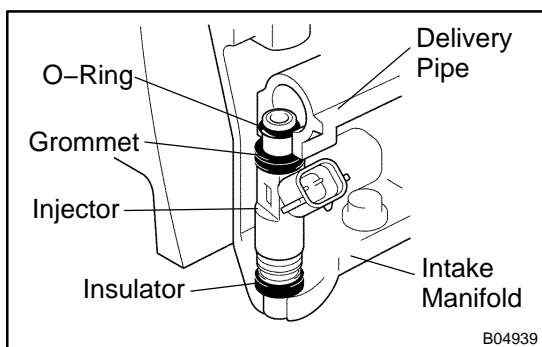
HINT:

Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).



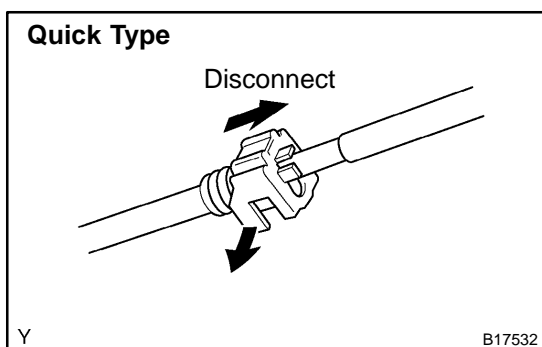
- (c) Observe the following precautions when removing or installing the injectors.

- (1) Never reuse the O-ring.
- (2) When placing a new O-ring on the injector, take care not to damage it in any way.
- (3) Coat a new O-ring with spindle oil or gasoline before installing. Never use engine, gear or brake oil.



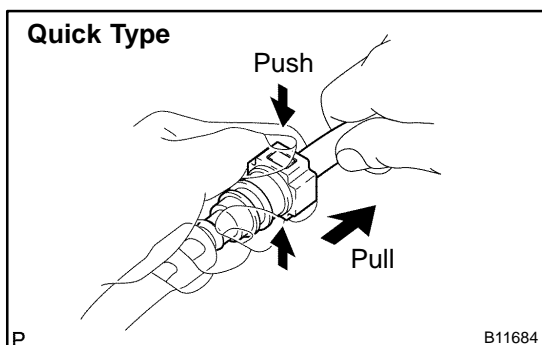
- (d) Install the injector to the delivery pipe and intake manifold as shown in the illustration.

Before installing the injector, apply spindle oil or gasoline on the place where the delivery pipe or the intake manifold touches the O-ring of the injector.

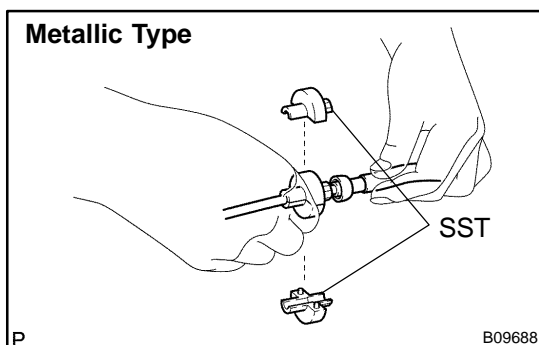
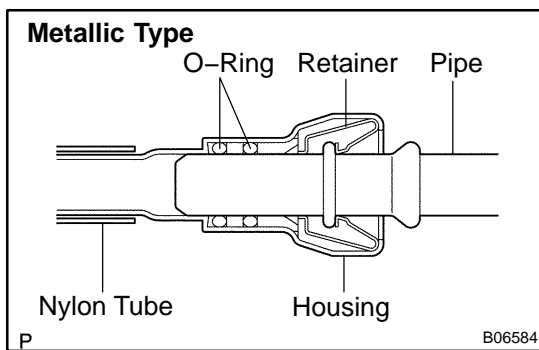
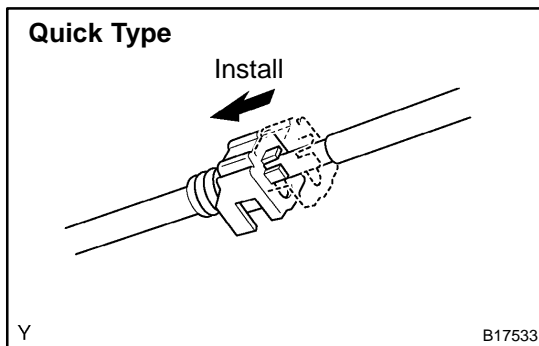
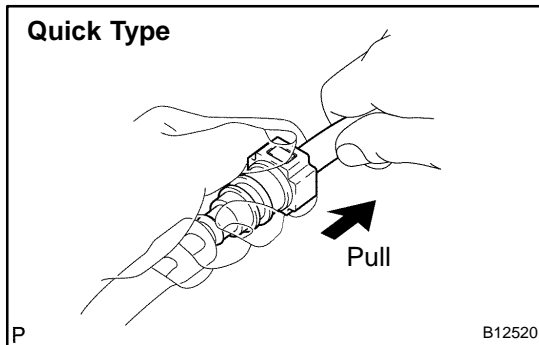
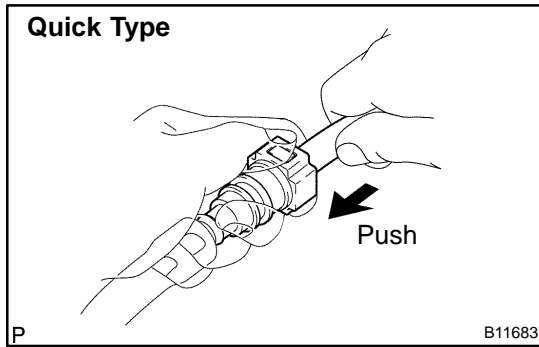


- (e) Observe the following when disconnecting the fuel tube connector (quick type):

- (1) Check if there is any dirt in the pipe and around the connector before disconnecting the fuel tube connector. If necessary, clean the dirt away.
- (2) Disconnect the fuel pipe clamp from the connector.



- (3) Be sure to disconnect them by hand.
- (4) When the connector and the pipe are stuck, push and pull the connector. Then disconnect and pull it out. Do not use any tools at this time.
- (5) Check if there is any dirt or other foreign matter on the seal surface of the disconnected pipe. If necessary, clean the dirt away.
- (6) Do not damage the disconnected pipe and connector and prevent intrusion of foreign objects by covering them with a plastic bag.



(f) Observe the following when connecting the fuel tube connector (quick type):

- (1) Check if there is any damage or foreign objects in the connected part of the pipe.
- (2) Match the axis of the connector with the axis of the pipe, and push into the connector until a "click" sound is heard. If the connection is tight, apply a small amount of fresh engine oil on the tip of the pipe.

(3) After finishing the connection, pull the pipe and the connector to ensure it is secure.

(4) Check to make sure no fuel leak is present.

If the result is not specified, repair or replace.

(5) Install the fuel pipe clamp to the connector.

(6) Check to make sure no fuel leak is present.

If the result is not specified, repair or replace.

(g) Observe the following when disconnecting the fuel tube connector (metallic type):

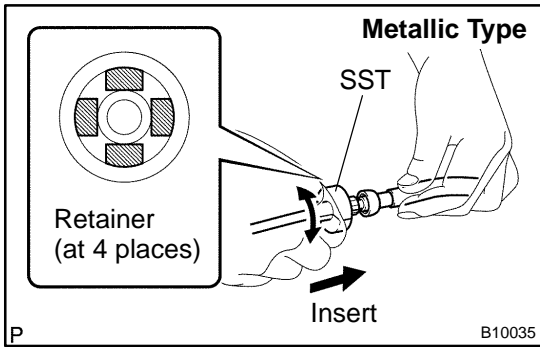
HINT:

The structure of the metallic connector is shown on the left.

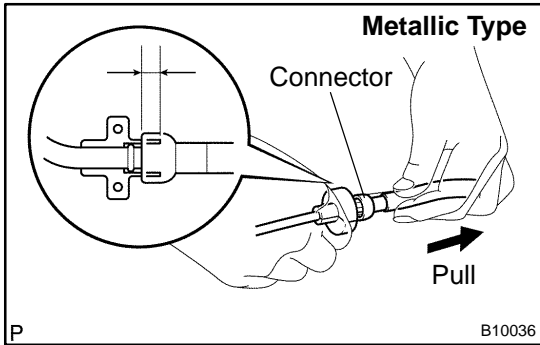
- (1) Check if there is any dirt in the pipe and around the connector before disconnecting the fuel tube connector. If necessary, clean the dirt away.

(2) Assemble SST to the connecting part, as shown in the illustration.

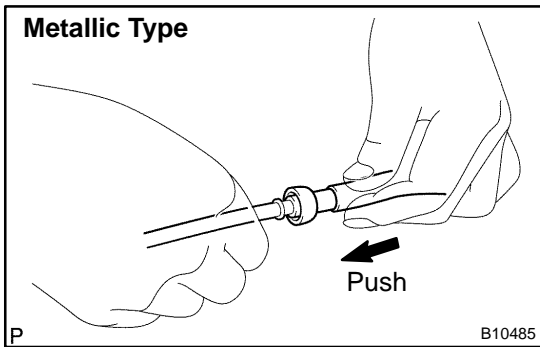
SST 09268-21010



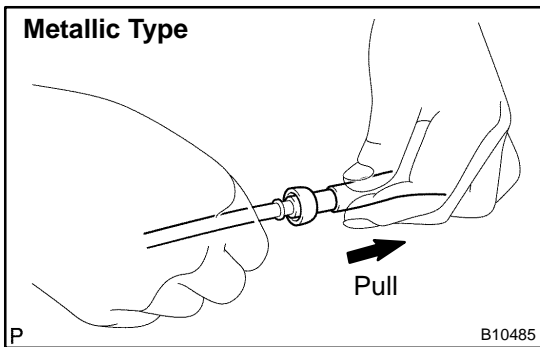
- (3) Turn the SST, align the retainers inside the connector with the SST chamfered parts and insert the SST into the connector.



- (4) While holding the SST, pull the connector towards the SST to put the retainers on the SST chamfered parts.
- (5) Slide the SST and connector together towards the fuel tube assembly.



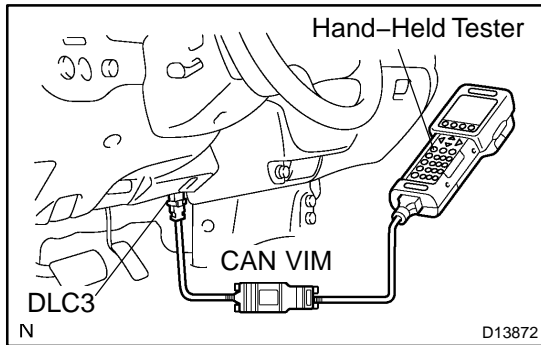
- (h) Observe the following when connecting the fuel tube connector (metallic type):
 - (1) Check if there is any damage or foreign objects in the connected part of the pipe.
 - (2) Match the axis of the connector with the axis of the pipe, and push into the connector until a "click" sound is heard. If the connection is tight, apply a small amount of fresh engine oil on the tip of the pipe.



- (3) After finishing the connection, pull the pipe and the connector to ensure it is secure.
- (4) Check to make sure no fuel leak is present.

If the result is not specified, repair or replace.

- (i) Observe the following when handling the nylon tube:
 - (1) Pay attention not to turn the connected part of the nylon tube and the quick connector with tube when connecting them.
 - (2) Pay attention not to kink the nylon tube.
 - (3) Do not remove the nylon tube.
 - (4) Do not close the piping with the nylon tube by bending it.

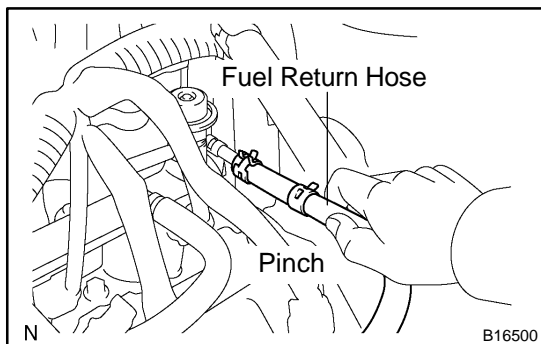


- (j) Check that there is any fuel leak after maintenance anywhere on the fuel system.
- (1) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
 - (2) Turn the ignition switch ON and push the hand-held tester main switch ON.

NOTICE:

Do not start the engine.

- (3) Enter the following menus: DIAGNOSIS / ENHANCED OBDII / ACTIVE TEST / FUEL PUMP / SPD.
- (4) Please refer to the hand-held tester operator's manual for further details.

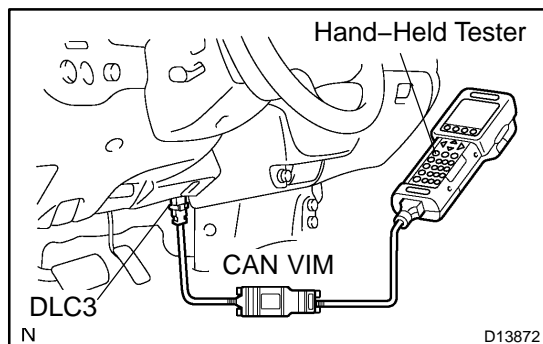


- (5) Pinch the fuel return hose. The pressure in the high pressure line will rise to approx. 392 kPa (4 kgf/cm², 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.

NOTICE:

Always pinch the hose. Avoid bending as it may cause the hose to crack.

- (6) Turn the ignition switch OFF.
- (7) Disconnect the hand-held tester and CAN VIM from the DLC3.



FUEL PUMP ON-VEHICLE INSPECTION

SF12Y-06

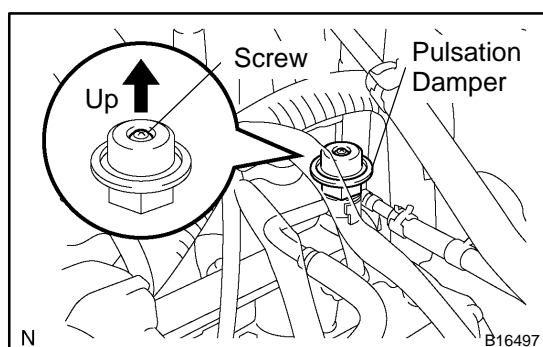
1. CHECK FUEL PUMP OPERATION

- (a) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (b) Turn the ignition switch ON, and push the hand-held tester main switch ON.

NOTICE:

Do not start the engine.

- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD.
- (d) Please refer to the hand-held tester operator's manual for further details.



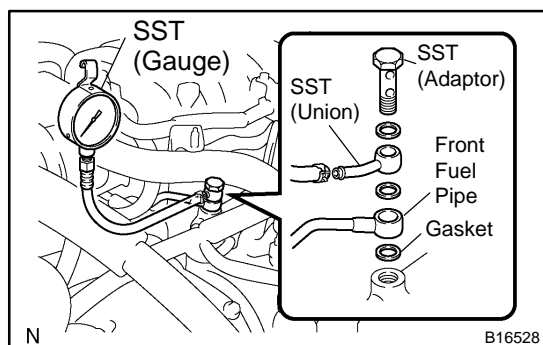
- (e) Check that the pulsation damper screw rises up when the fuel pump operates.

If operation is not as specified, check the fusible link, fuses, EFI main relay, fuel pump, ECM and wiring connections.

- (f) Turn the ignition switch OFF.
- (g) Disconnect the hand-held tester and CAN VIM from the DLC3.

2. CHECK FUEL PRESSURE

- (a) Check the battery positive voltage is above 12 V.
- (b) Disconnect the negative (-) terminal cable from the battery.
- (c) Remove the front fuel pipe from the LH delivery pipe (see page SF-27).



- (d) Install the front fuel pipe and SST (pressure gauge) to the delivery pipe with 3 lower gaskets and SST (adaptor).
SST 09268-45014 (09268-41190, 90405-06167)

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

- (e) Wipe off any splattered gasoline.
- (f) Reconnect the negative (-) terminal cable to the battery.
- (g) Connect a hand-held tester to the DLC3. (See step 1 in check fuel pump operation (a) to (e))

- (h) Measure the fuel pressure.

Fuel pressure:

265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)

If pressure is high, replace the fuel pressure regulator.

If pressure is low, check the fuel hoses and connections, fuel pump, fuel filter and fuel pressure regulator.

- (i) Disconnect the hand-held tester from the DLC3.

- (j) Start the engine.

- (k) Measure the fuel pressure at idle.

Fuel pressure:

265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)

- (l) Stop the engine.

- (m) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.

Fuel pressure: 147 kPa (1.5 kgf/cm², 21 psi) or more

If pressure is not as specified, check the fuel pump, pressure regulator and/or injectors.

- (n) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully remove the SST to prevent gasoline from splashing.

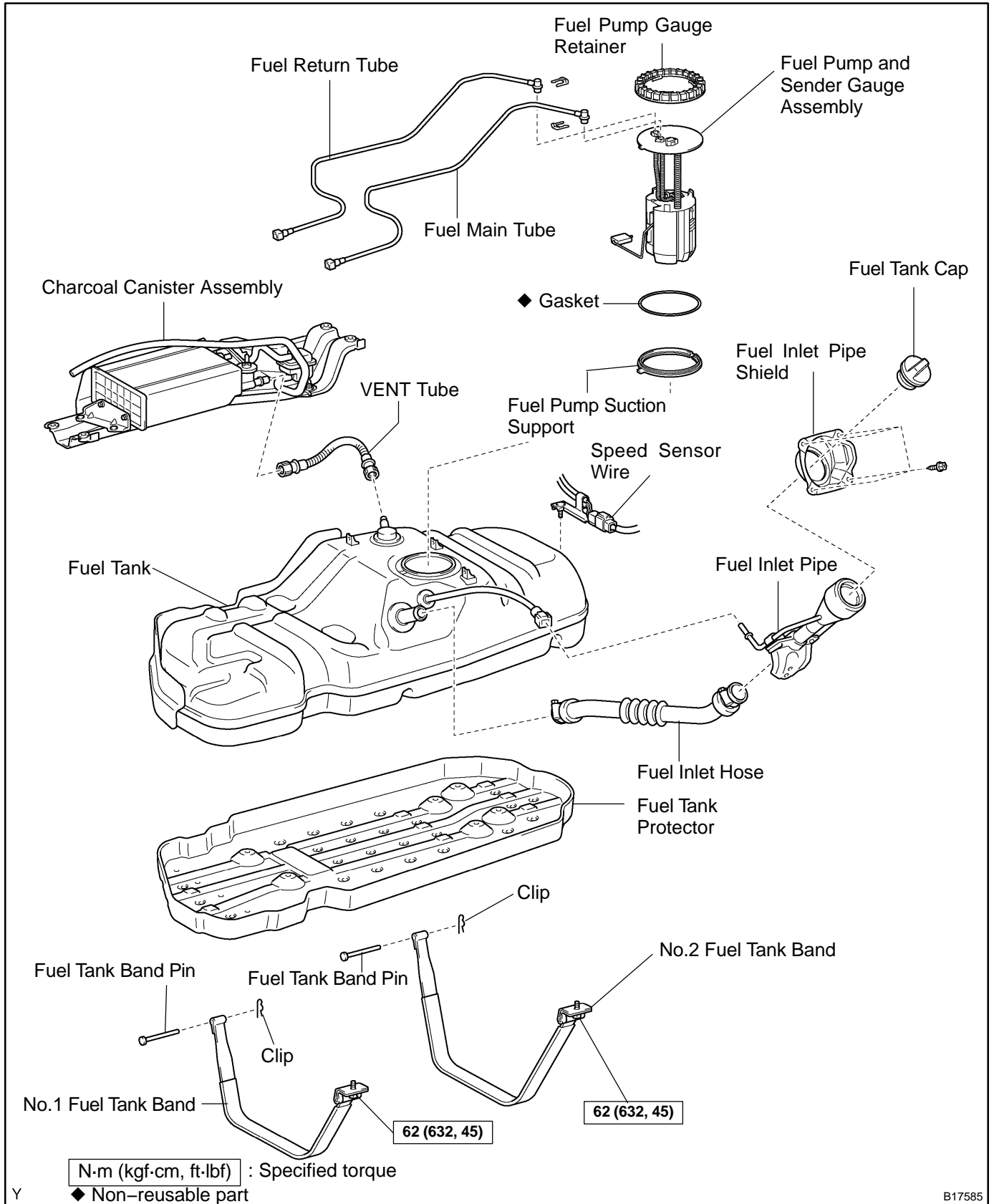
SST 09268–45014

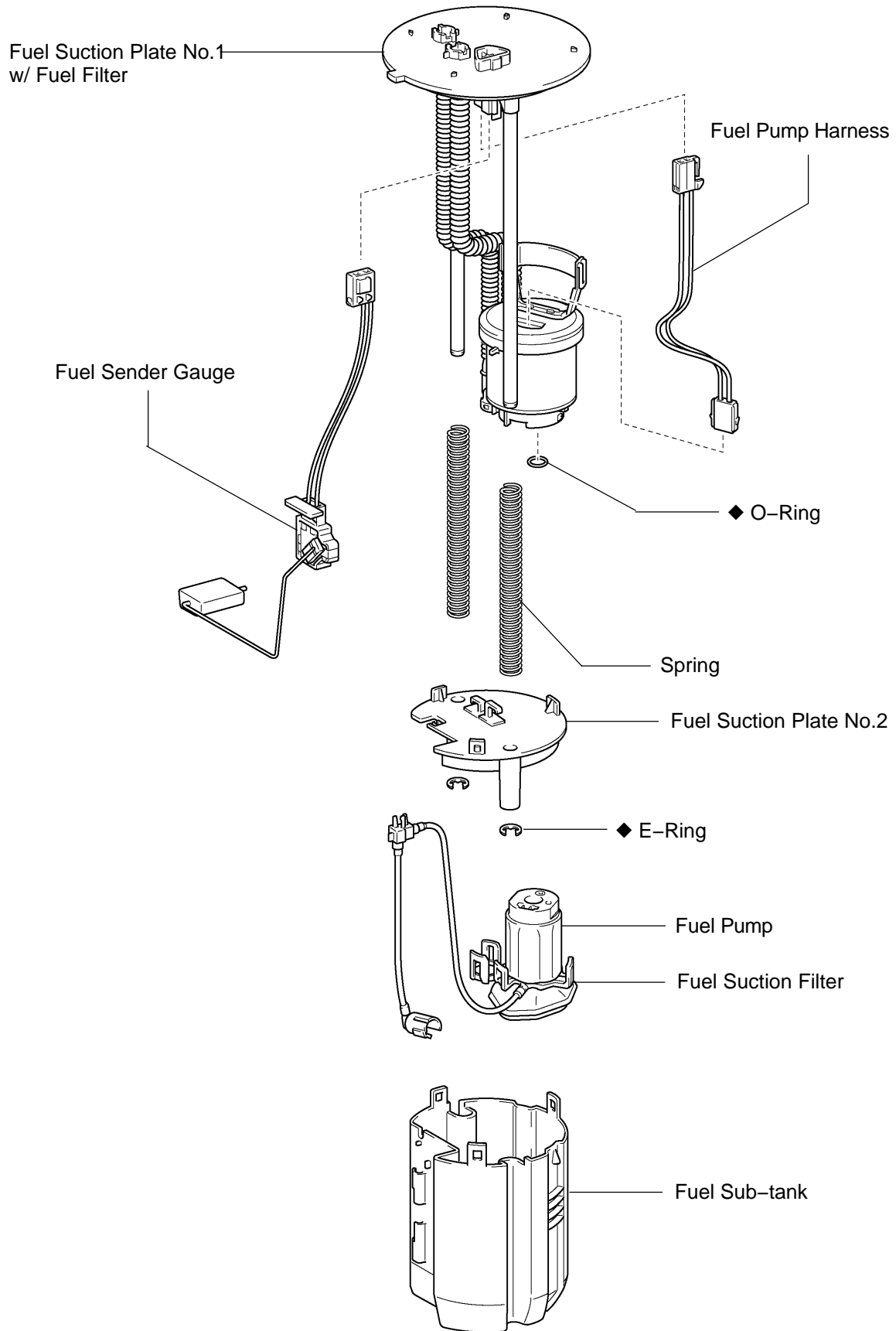
- (o) Reinstall the front fuel pipe to the LH delivery pipe. (see page [SF-31](#))

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

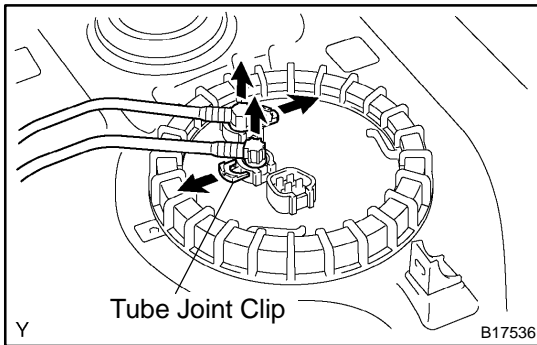
4. INSPECT FOR FUEL LEAKS (See page [SF-1](#))

COMPONENTS





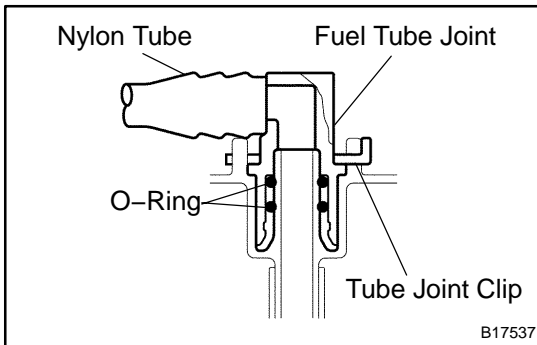
◆ Non-reusable part



REMOVAL

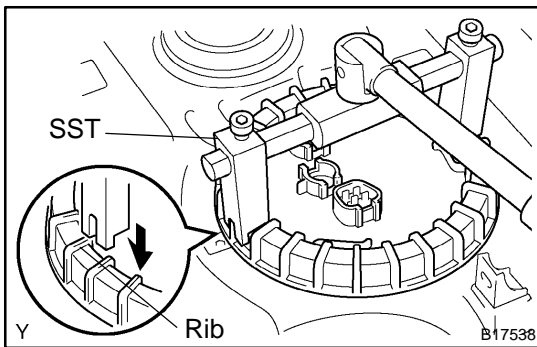
1. REMOVE FUEL TANK ASSEMBLY (See page SF-34)
2. DISCONNECT FUEL SUCTION TUBE

Remove the 2 tube clips, and pull out the 2 fuel tubes.



NOTICE:

- Before this operation, check the connector for dirt, mud or other contamination. Clean if necessary.
- Be careful of mud. The connector's O-ring, which seals the pipe and connector, becomes contaminated easily.
- Do not use any tool in this operation.
- Do not bend or twist the nylon tube. Protect the connector by covering it with a vinyl or plastic bag.
- When the pipe and connector are stuck, push and pull the connector to release and pull the connector out carefully.



3. REMOVE FUEL PUMP ASSEMBLY

- (a) Using SST, loosen the fuel pump gage retainer.
SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

HINT:

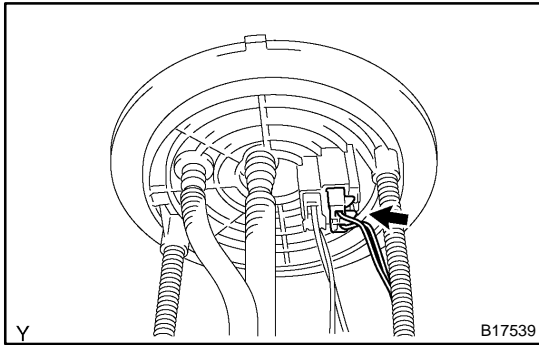
A rib on the fuel pump gage retainer can be fitted into a tip of the SST.

- (b) Remove the fuel pump gage retainer.
- (c) Remove the fuel suction tube.

NOTICE:

Be careful not to bend the arm of the fuel sender gage.

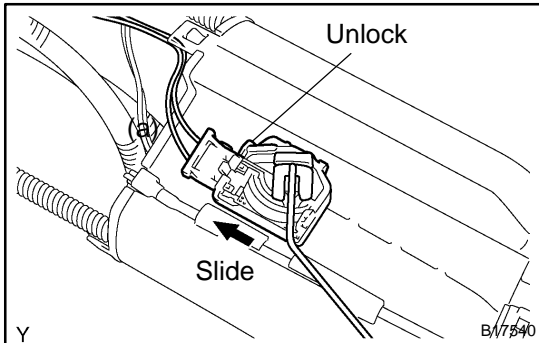
- (d) Remove the gasket from the fuel tank.



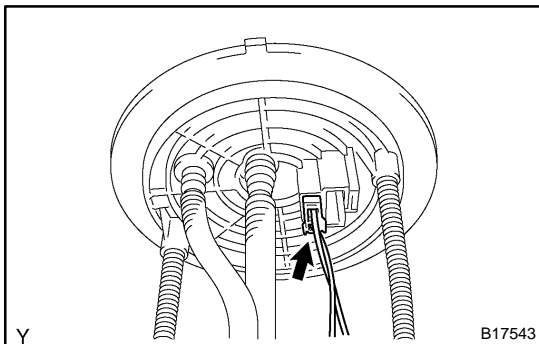
DISASSEMBLY

1. REMOVE FUEL SENDER GAGE

- (a) Disconnect the sender gage connector from the fuel suction plate No.1.

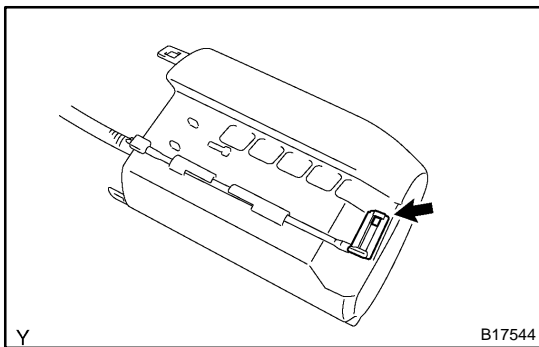


- (b) Unlock the fuel sender gage and slide the remove.

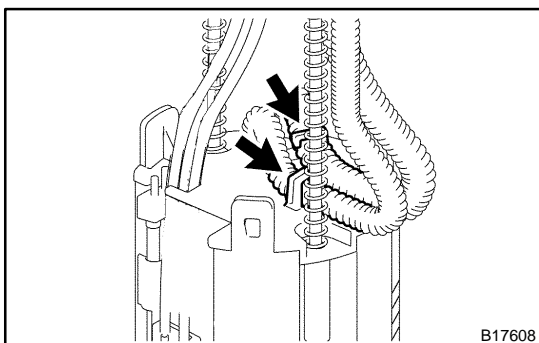


2. REMOVE FUEL SUB-TANK

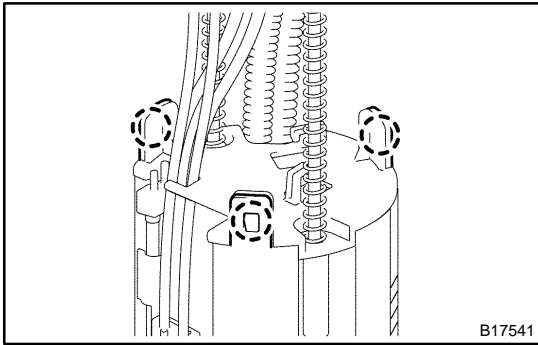
- (a) Disconnect the fuel pump harness connector from the fuel suction plate No.1.



- (b) Disconnect the suction filter hose from the fuel sub-tank.



- (c) Disconnect the 2 tubes from the tube clamps.

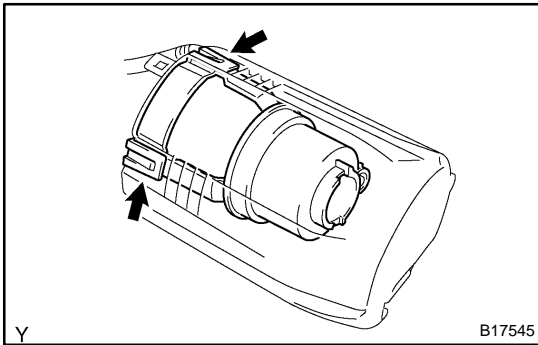


- (d) Using a screwdriver with the tip wrapped in tape, disconnect the 3 snap-claws from the fuel suction support No.2.

NOTICE:

Do not damage the fuel suction plate No.2 or fuel sub-tank.

- (e) Disconnect the fuel suction plate No.1 with the fuel filter assembly from the fuel sub-tank.



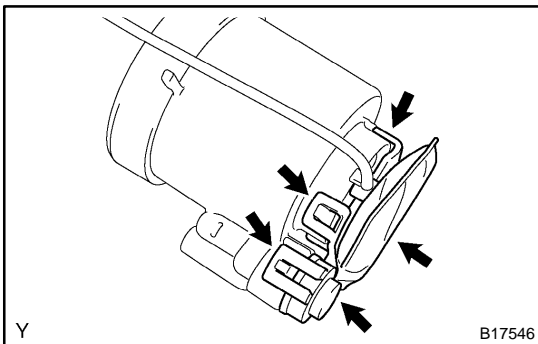
3. REMOVE FUEL FILTER WITH FUEL PUMP

- (a) Using a screwdriver with the tip wrapped in tape, disconnect the 2 snap-claws from the fuel suction support.

NOTICE:

Do not damage the fuel filter assembly or fuel suction support.

- (b) Remove the fuel filter assembly with fuel pump from the fuel suction support.



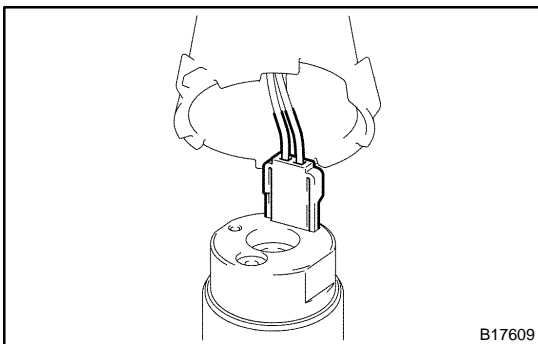
4. REMOVE FUEL PUMP

- (a) Using a screwdriver with the tip wrapped in tape, disconnect the 5 snap-claws from the suction filter.

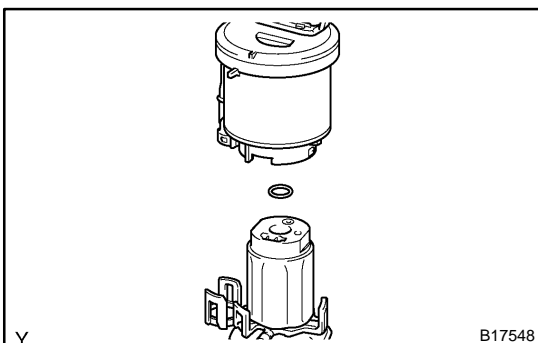
NOTICE:

Do not damage the fuel filter assembly or suction filter.

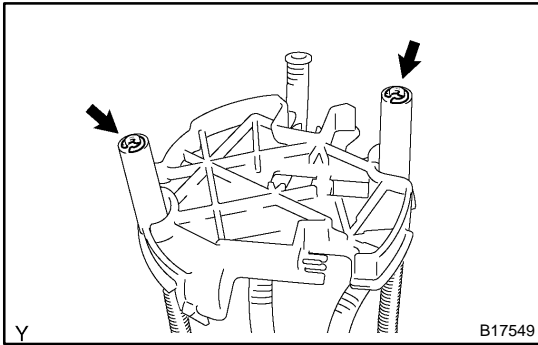
- (b) Remove the fuel suction filter with fuel pump from the fuel filter.



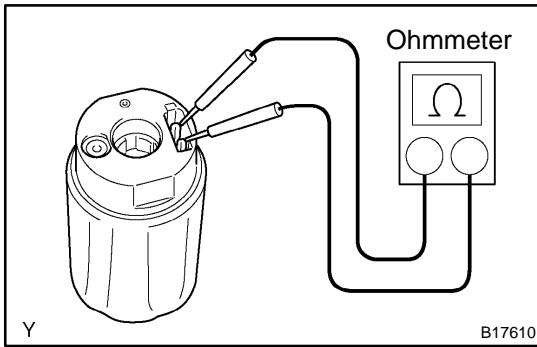
- (c) Disconnect the fuel pump harness from the fuel pump.



- (d) Remove the O-ring from the fuel filter or fuel pump.

**5. REMOVE FUEL SUCTION PLATE NO.2**

- (a) Using a screwdriver, remove the 2 E-rings from the suction plate No.2.
- (b) Remove the suction plate No.2 and 2 springs from the fuel suction plate No.1.



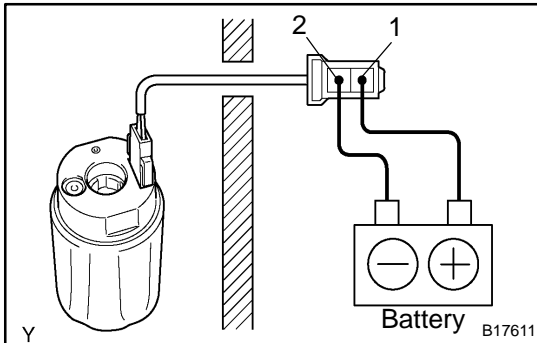
INSPECTION

1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance: 0.2 – 3.0 Ω at 20°C (68°F)

If the resistance is not as specified, replace the fuel pump.



2. INSPECT FUEL PUMP OPERATION

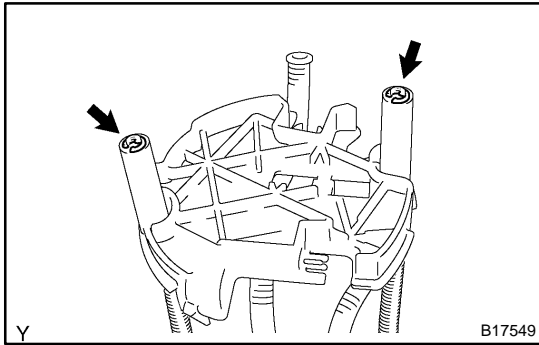
- (a) Connect the lead wire to the fuel pump.
- (b) Connect the positive (+) lead from the battery to terminal 1 of the connector, and the negative (-) lead to terminal 2. Check that the fuel pump operates.

NOTICE:

- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always do switching at the battery side.**

If operation is not as specified, replace the fuel pump and/or read wire.

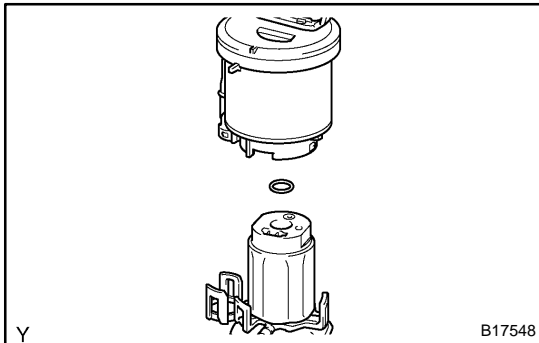
- (c) Disconnect the lead wire to the fuel pump.



REASSEMBLY

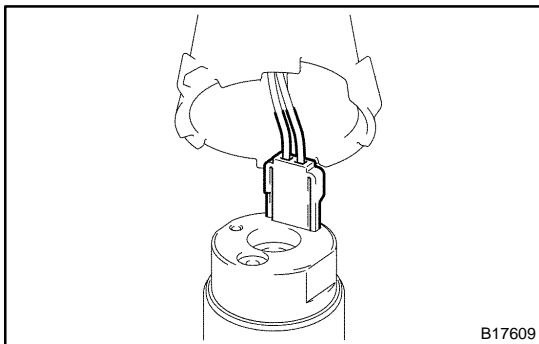
1. REMOVE FUEL SUCTION PLATE NO.2

- (a) Install the 2 springs and suction plate No.2 to the suction plate No.1.
- (b) Using a needle-nose pliers, install the 2 new E-rings to the suction plate No.2.

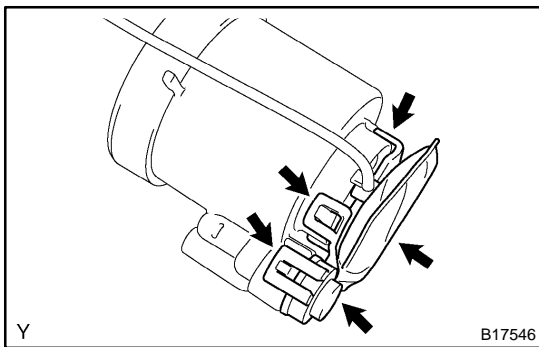


2. INSTALL FUEL PUMP

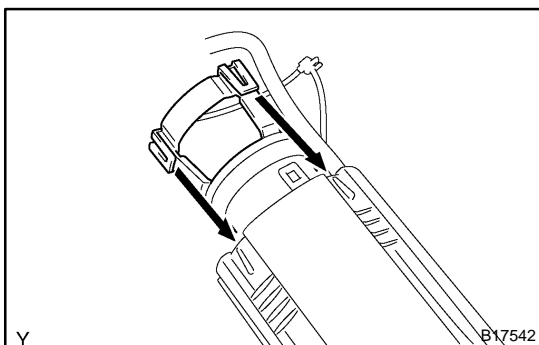
- (a) Apply a light coat of gasoline or spindle oil to a new O-ring, and install it to the fuel pump.



- (b) Connect the fuel pump harness connector to the fuel pump.

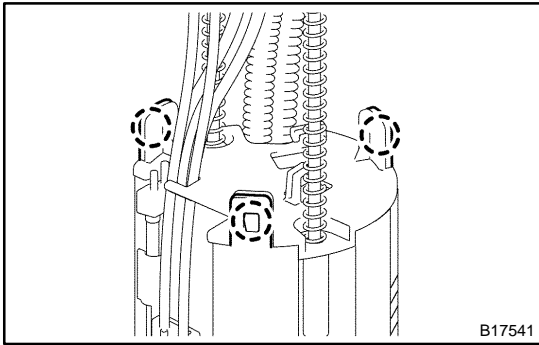


- (c) Install the fuel pump with the suction filter to the fuel filter.



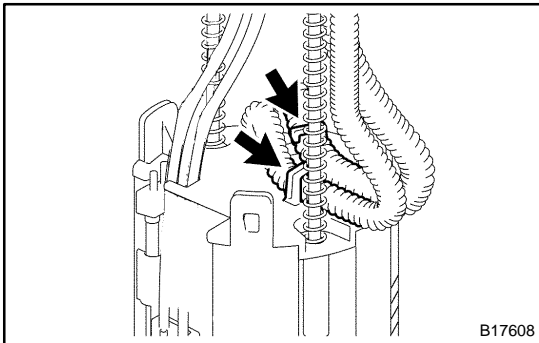
3. INSTALL FUEL FILTER

Install the fuel filter to the fuel sub-tank.

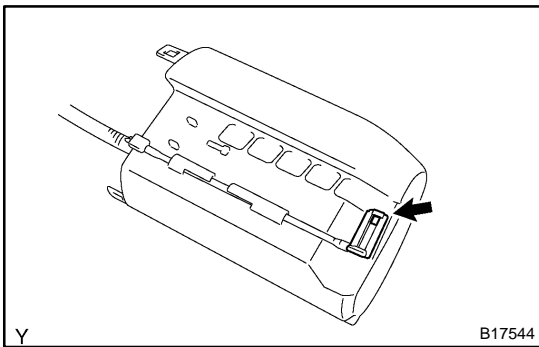


4. INSTALL FUEL SUB-TANK

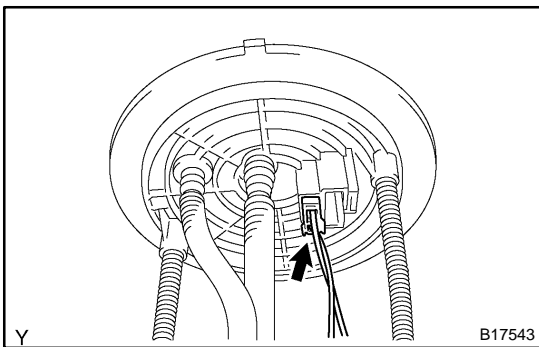
- (a) Connect the fuel suction plate No.2 to the fuel sub-tank with the 3 snap-claws engaged.



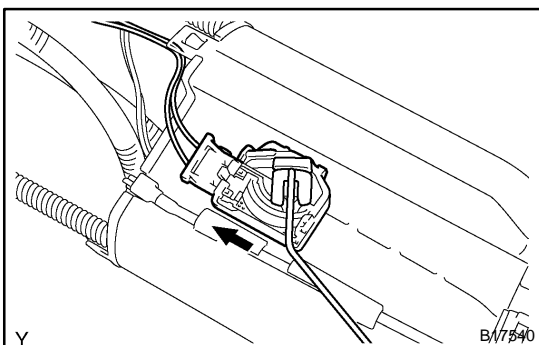
- (b) Connect the 2 tubes to the tube clamps.



- (c) Connect the suction filter hose to the fuel sub-tank.

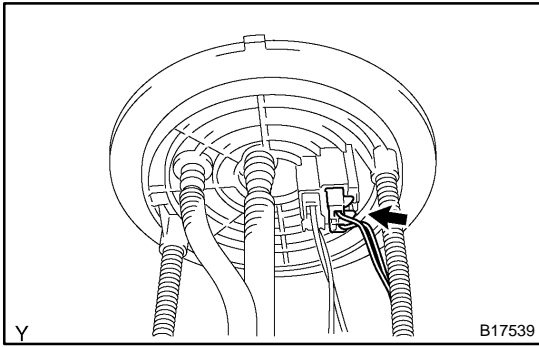


- (d) Connect the fuel pump harness connector to the fuel suction plate No.1.

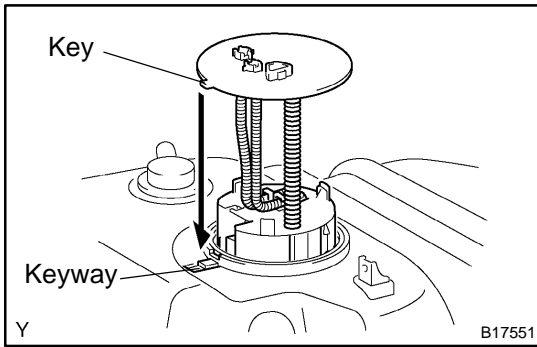


5. INSTALL FUEL SENDER GAGE

- (a) Install the fuel sender gage to the fuel suction support.



- (b) Connect the sender gage connector to the fuel suction plate No.1.



INSTALLATION

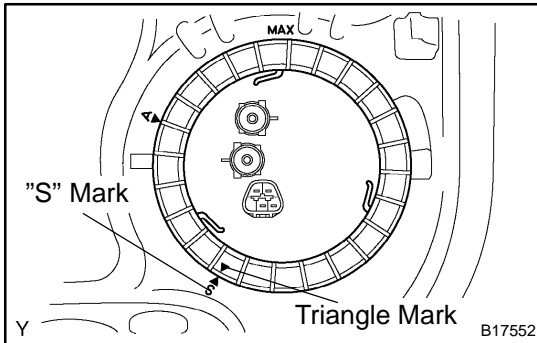
1. INSTALL FUEL PUMP ASSEMBLY

- (a) Install a new gasket to the fuel tank.
- (b) Install the fuel pump assembly to the fuel tank.

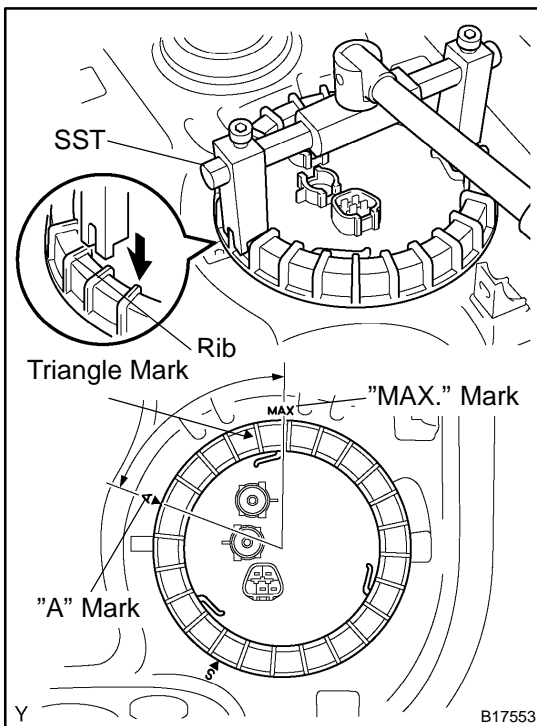
NOTICE:

Be careful not to bend the arm of the fuel sender gage.

- (c) Align the keyway of the fuel suction tube support with the key of the fuel suction plate No.1.



- (d) Apply MP grease to the entire interior surface of the fuel pump gage retainer.
- (e) Align the triangle mark on new fuel pump gage retainer with the "S" mark on the fuel tank while pushing down the fuel suction tube, attach the fuel pump gage retainer.



- (f) Rotate the fuel pump gage retainer by hand, then tighten it one complete turn and half using SST. Triangle mark on the fuel pump gage retainer must be positioned between "A" and "MAX." indications on the fuel tank.

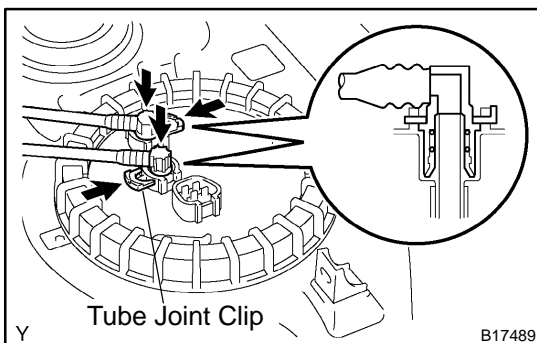
SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

NOTICE:

Do not use other tools in this operation. Damage to the fuel pump gage retainer and the fuel tank may result.

HINT:

A rib on the fuel pump gage retainer can be fitted into a tip of the SST.



2. CONNECT FUEL SUCTION TUBE

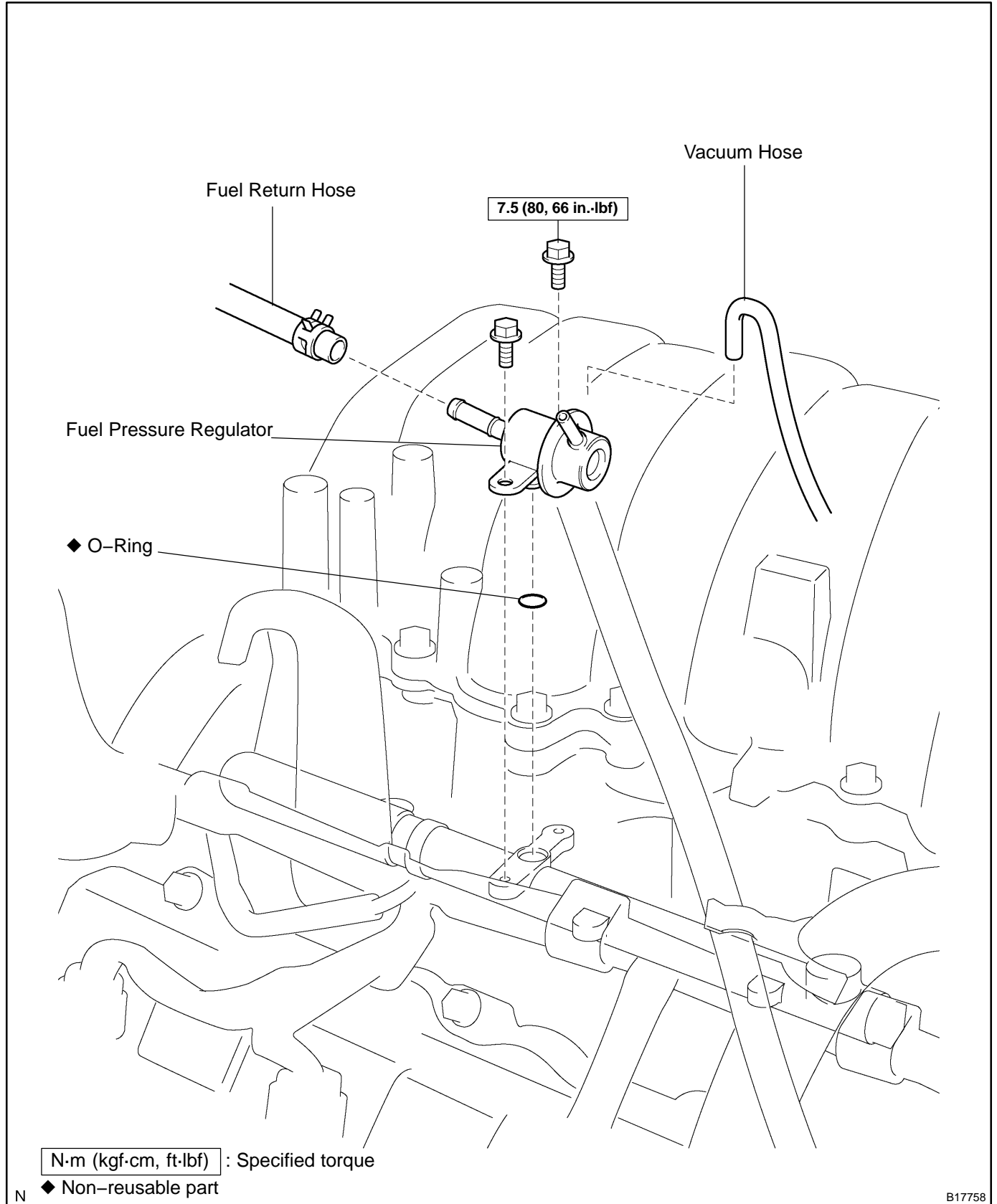
Connect the fuel pump tube and return tube to the fuel tank with the tube joint clips.

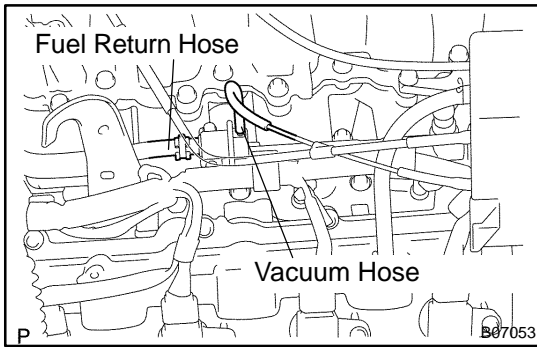
NOTICE:

- Check that there are no scratches or foreign objects on the connecting part.
 - Check that the fuel tube joint is inserted securely.
 - Check that the tube joint clip is on the collar of the fuel tube joint.
 - After installing the tube join clip, check that the fuel tube joint has not been pulled off.
3. CHECK FOR FUEL LEAKS
 4. INSTALL FUEL TANK ASSEMBLY (See page [SF-37](#))

FUEL PRESSURE REGULATOR COMPONENTS

SFOXZ-13





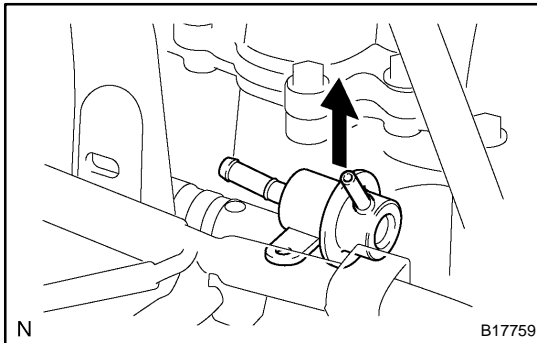
REMOVAL

REMOVE FUEL PRESSURE REGULATOR

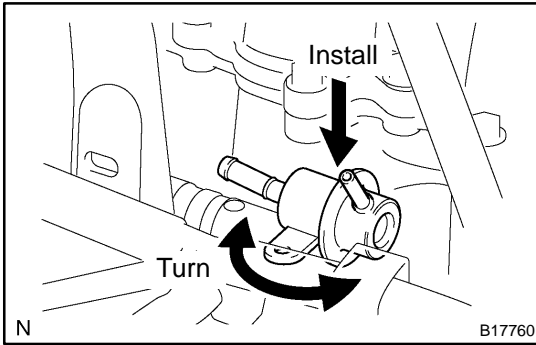
- (a) Disconnect the vacuum hose from intake air resonator.
- (b) Disconnect the fuel return hose from the pressure regulator.

CAUTION:

Put a shop towel under the pressure regulator.



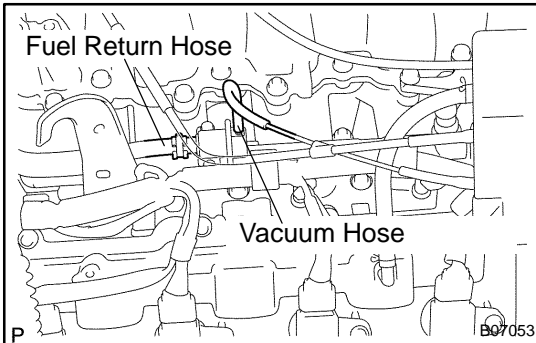
- (c) Remove the 2 bolts, and pull out the pressure regulator.
- (d) Remove the O-ring from the pressure regulator.



INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR

- (a) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.
- (b) While turning the pressure regulator left and right, install it to the delivery pipe.
- (c) Install the pressure regulator with the 2 bolts.
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)



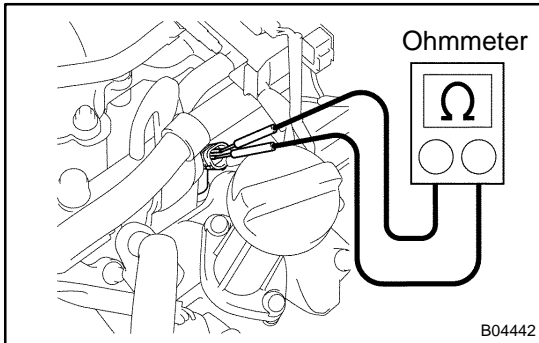
- (d) Connect the vacuum hose to intake air resonator.
 - (e) Connect the fuel return hose to the pressure regulator.
- ### 2. CHECK FOR FUEL LEAKS (See page [SF-1](#))

INJECTOR

ON-VEHICLE INSPECTION

SF00R-12

1. REMOVE THROTTLE BODY COVER
2. REMOVE INTAKE AIR CONNECTOR



3. INSPECT INJECTOR RESISTANCE

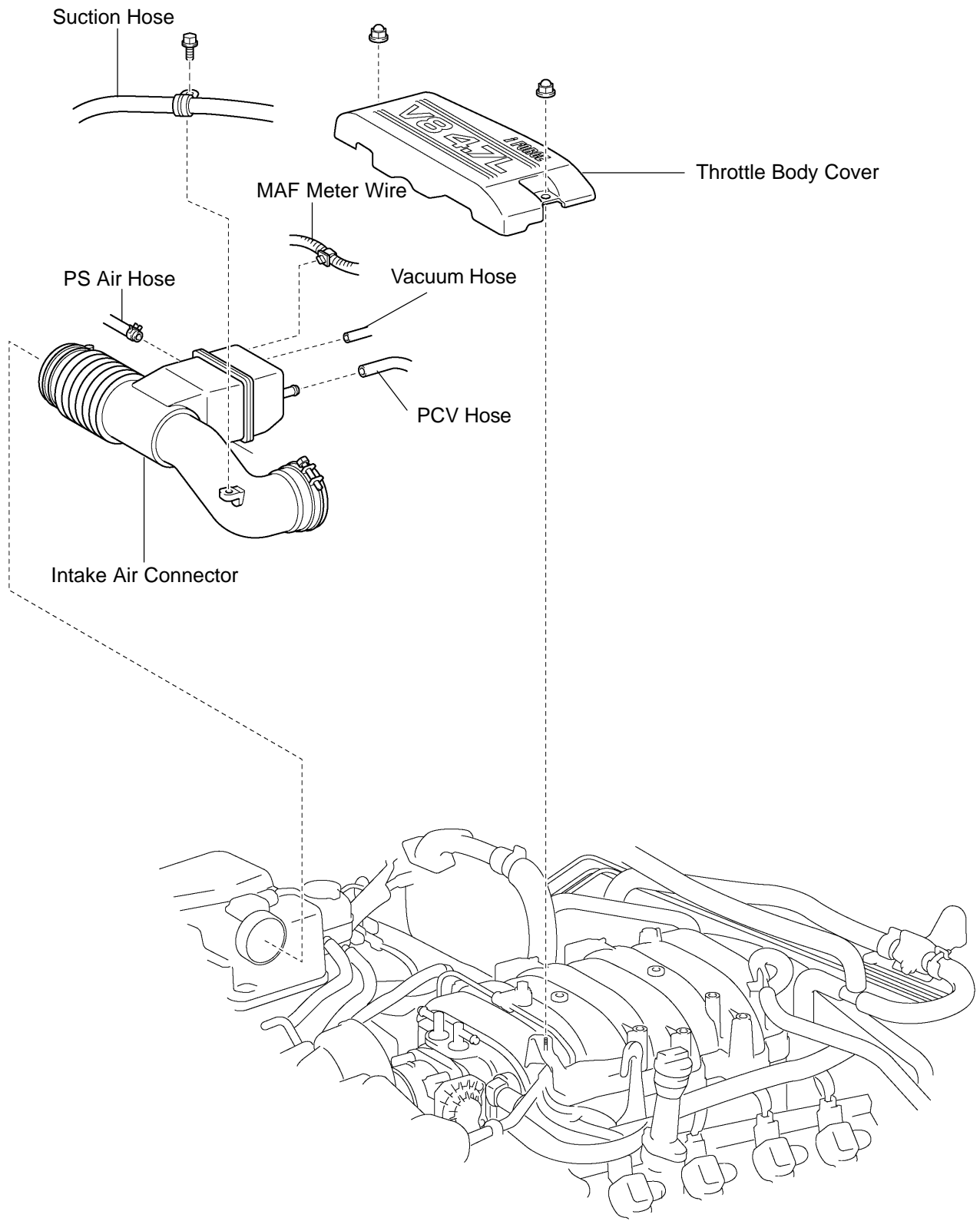
- (a) Disconnect the 8 injector connectors.
- (b) Using an ohmmeter, measure the resistance between the terminals.

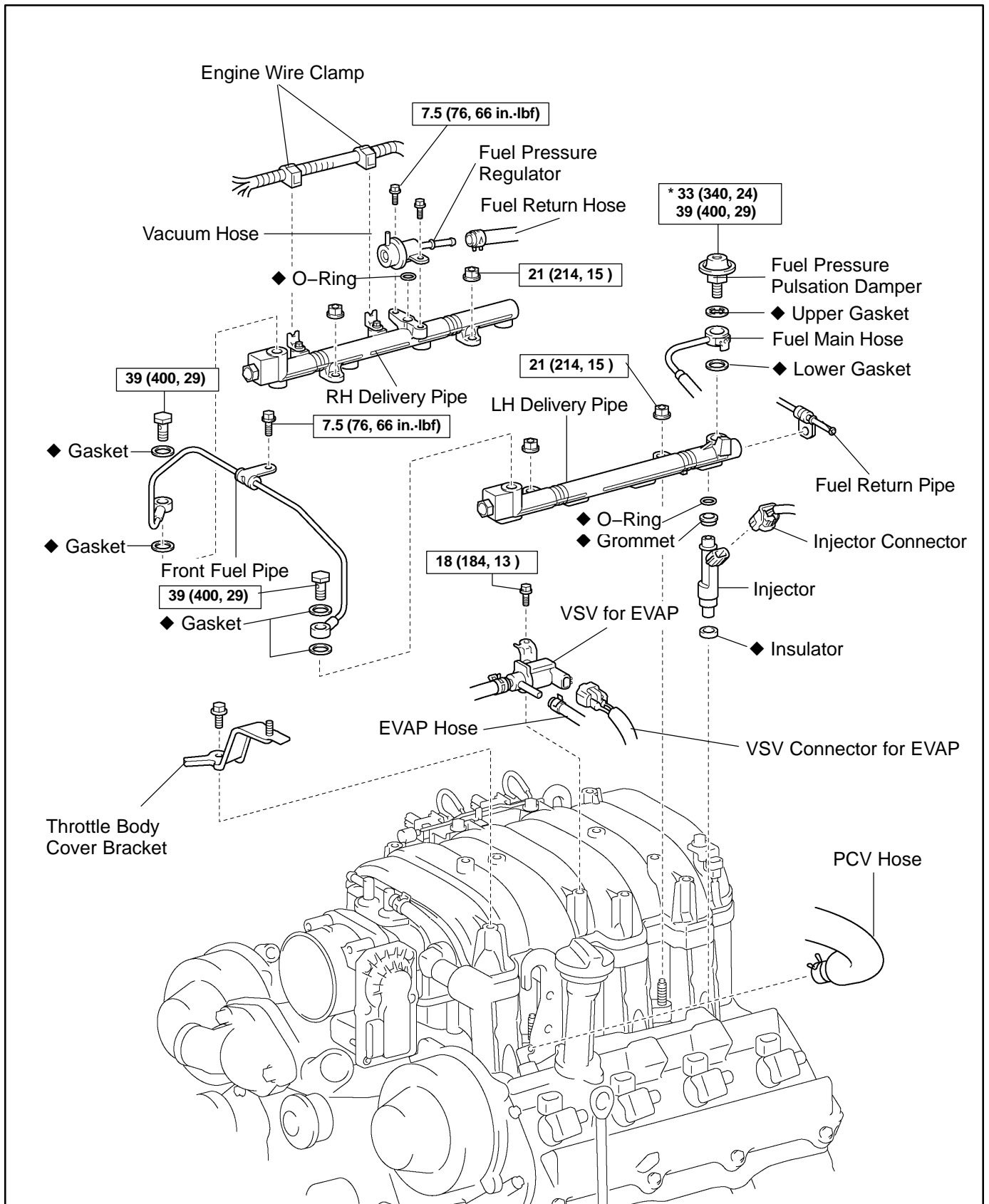
Resistance: 13.4 to 14.2 Ω at 20°C (68°F)

If the resistance is not as specified, replace the injector.

- (c) Reconnect the 8 injector connectors.
4. REINSTALL INTAKE AIR CONNECTOR
 5. REINSTALL THROTTLE BODY COVER

COMPONENTS





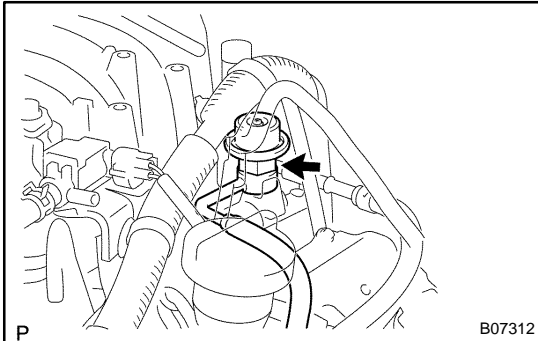
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

γ * For use with SST

REMOVAL

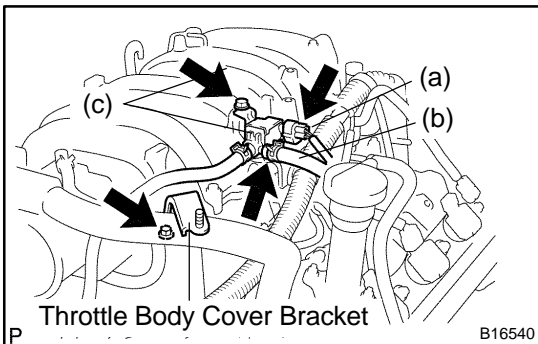
1. DISCHARGE FUEL SYSTEM PRESSURE
(See page SF-1)
2. REMOVE THROTTLE BODY COVER
3. REMOVE INTAKE AIR CONNECTOR



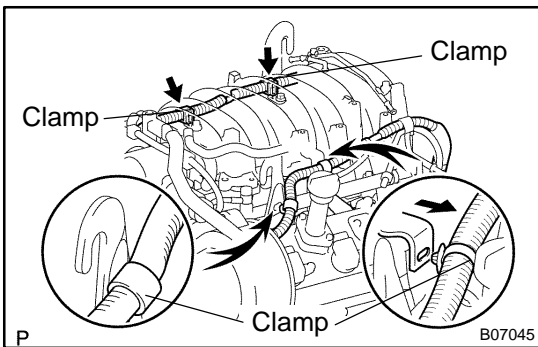
4. REMOVE FUEL PRESSURE PULSATION DAMPER
Remove the pulsation damper, upper gasket, fuel main hose and lower gasket.

NOTICE:

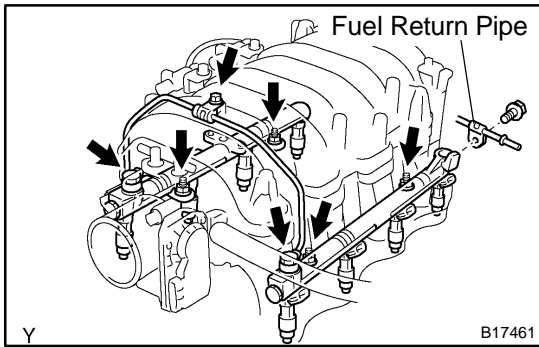
- Put a shop rag under the delivery pipe.
 - Slowly loosen the pulsation damper.
5. DISCONNECT PCV HOSE FROM PCV VALVE



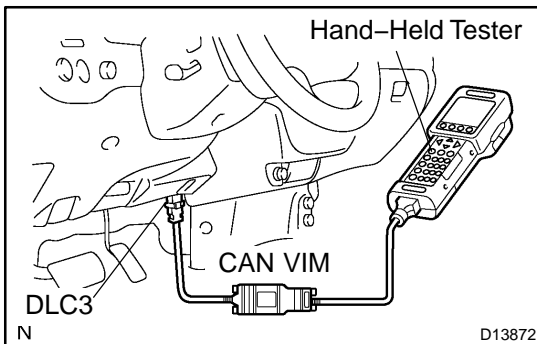
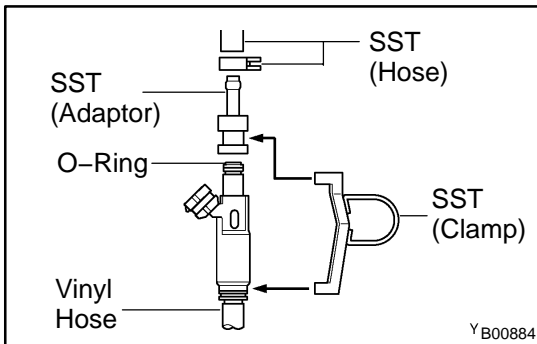
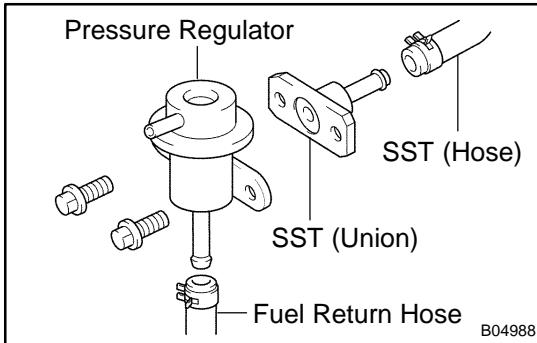
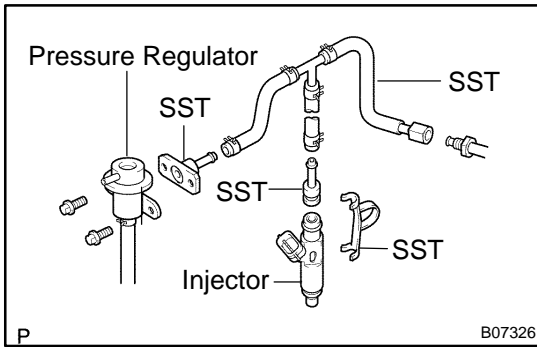
6. DISCONNECT VSV FOR EVAP
 - (a) Disconnect the VSV connector for EVAP.
 - (b) Disconnect the EVAP hose.
 - (c) Remove the VSV for EVAP from the intake manifold.
7. REMOVE THROTTLE BODY COVER BRACKET
Remove the bolt and throttle body cover bracket.



8. DISCONNECT ENGINE WIRES
 - (a) Disconnect the engine wire clamps from the No.1 engine hanger and engine wire bracket.
 - (b) Disconnect the 2 wire clamps on the engine wire from the brackets on the RH delivery pipe.
9. REMOVE DELIVERY PIPES AND INJECTORS
NOTICE:
 - Be careful not to drop the injectors when removing the delivery pipes.
 - Do not apply any load to the injector in horizontal direction.



- (a) Remove the bolt holding the clamp on the fuel return pipe to the LH delivery pipe.
- (b) Remove the bolt, 2 union bolts, 4 gaskets and front fuel pipe.
- (c) Disconnect the 8 injector connectors.
- (d) Remove the 4 nuts holding the delivery pipes to the lower intake manifold.
- (e) Remove the 2 delivery pipes, 8 injectors, and 8 insulators.
- (f) Remove the O-ring and grommet from each injector.



INSPECTION

1. INSPECT INJECTOR INJECTION

CAUTION:

Keep the injector clean of sparks during the test.

- (a) Disconnect the fuel inlet hose (fuel tube connector) from the fuel filter.
- (b) Connect SST (attachment and hose) to the fuel tube.
SST 09268-41047 (09268-52011)

- (c) Remove the pressure regulator from the delivery pipe.
- (d) Install the O-ring to the fuel inlet of the pressure regulator.
- (e) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union) and the 2 bolts.
SST 09268-41047 (09268-41091)

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

- (f) Connect the fuel return hose to the fuel outlet of the pressure regulator.

- (g) Install the O-ring to the injector.
- (h) Connect SST (adaptor and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268-41047 (09268-41110, 09268-41300)

- (i) Put the injector into the graduated cylinder.

CAUTION:

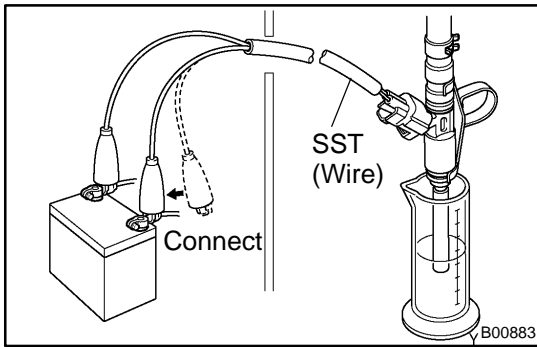
Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

- (j) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (k) Connect the battery negative (-) cable to the battery.
- (l) Turn the ignition switch ON, and push the hand-held tester main switch ON.

NOTICE:

Do not start the engine.

- (m) Enter the following menus: DIAGNOSIS / ENHANCED OBDII / ACTIVE TEST / FUEL PUMP / SPD
- (n) Please refer to the hand-held tester operator's manual for further details.



- (o) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.

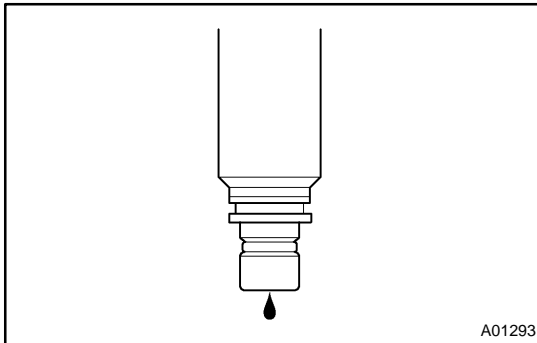
SST 09842-30070

Volume: 56 to 69 cm³ (3.4 to 4.2 cu in.) per 15 seconds

Difference between each injector:

13 cm³ (0.8 cu in.) or less

If the injection volume is not as specified, replace the injector.



2. INSPECT LEAKAGE

- (a) Under the above conditions, disconnect the tester probes of SST (wire) from the battery and check fuel leakage from the injector.

SST 09842-30070

Fuel drop: 1 drop or less per 12 minutes

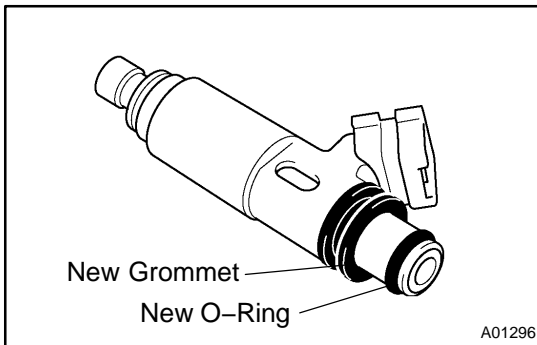
- (b) Turn the ignition switch off.
 (c) Disconnect the negative (-) terminal cable from the battery.
 (d) Remove the SST and fuel tube connector.
 SST 09268-41047, 09842-30070
 (e) Disconnect the hand-held tester and CAN VIM from the DLC3.
 (f) Reconnect the fuel inlet pipe to the fuel tube.

INSTALLATION

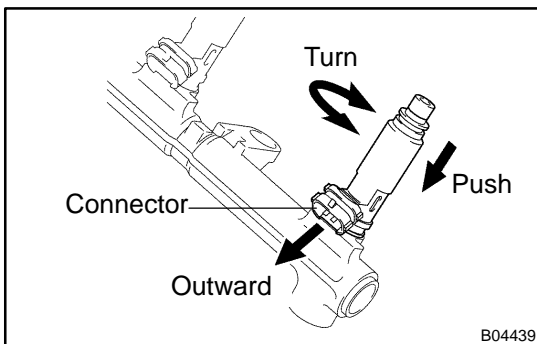
1. INSTALL INJECTORS AND DELIVERY PIPES

NOTICE:

- Be careful not to drop the injectors when installing the delivery pipes.
- Do not apply any load to the injector on horizontal direction.



- (a) Install a new grommet to each injector.
 (b) Apply a light coat of gasoline to a new O-ring and install it to each injector.



- (c) While turning the injector clockwise and counterclockwise, push it to the delivery pipes. Install the 8 injectors.
 (d) Position the injector connector outward.
 (e) Place the 8 new insulators on the intake manifold.
 (f) Place the 2 delivery pipes and injectors assemblies on the lower intake manifold.
 (g) Temporarily install the 4 nuts.
 (h) Install the front fuel pipe with the bolt, 4 new gaskets and 2 union bolts.

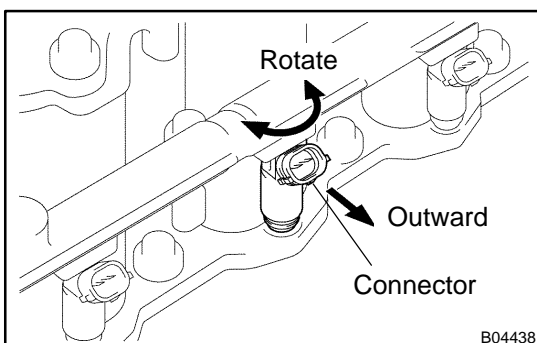
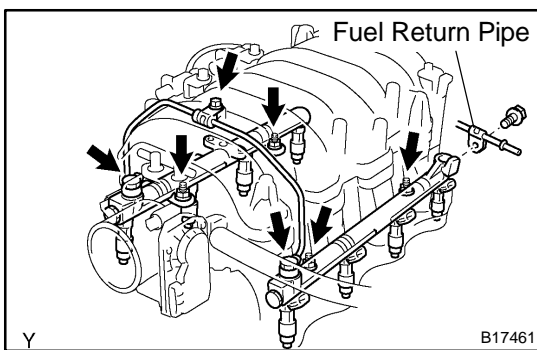
Torque:

39 N·m (400 kgf·cm, 29 ft·lbf) for union bolts

7.5 N·m (76 kgf·cm, 66 in.-lbf) for bolt

- (i) Install the bolt holding the clamp on the fuel return pipe to the LH delivery pipe.

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)



- (j) Check that the injectors rotate smoothly.

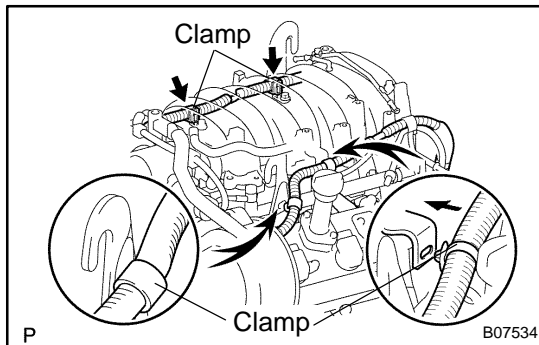
HINT:

If the injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings. Replace the O-ring of the injector that does not rotate smoothly.

- (k) Position injector connector outward.
 (l) Tighten the 4 nuts holding the delivery pipes to the lower intake manifold.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

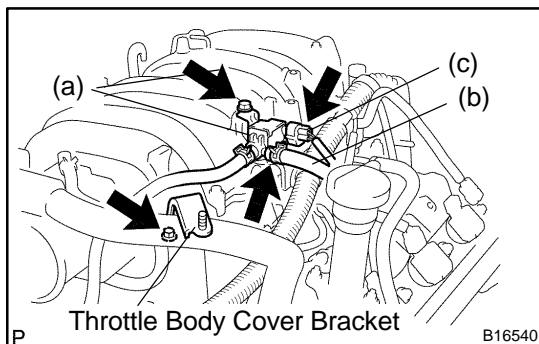
- (m) Connect the 8 injector connectors.



2. INSTALL ENGINE WIRES

- (a) Install the 2 wire clamps on the engine wire to the brackets on the RH delivery pipe.
- (b) Connect the engine wire clamps to the No.1 engine hanger and engine wire bracket.
- (c) Install the engine wire protector with the 2 bolts.

3. CONNECT PCV HOSE TO PCV VALVE



4. CONNECT VSV FOR EVAP TO UPPER INTAKE MANIFOLD

- (a) Install the VSV for the EVAP to the upper intake manifold.
- (b) Connect the EVAP hose.
- (c) Connect the VSV connector for the EVAP.

5. INSTALL THROTTLE BODY COVER BRACKET

Install the throttle body cover bracket with the bolt.

6. INSTALL FUEL PRESSURE PULSATION DAMPER (See page SF-1)

7. INSTALL INTAKE AIR CONNECTOR

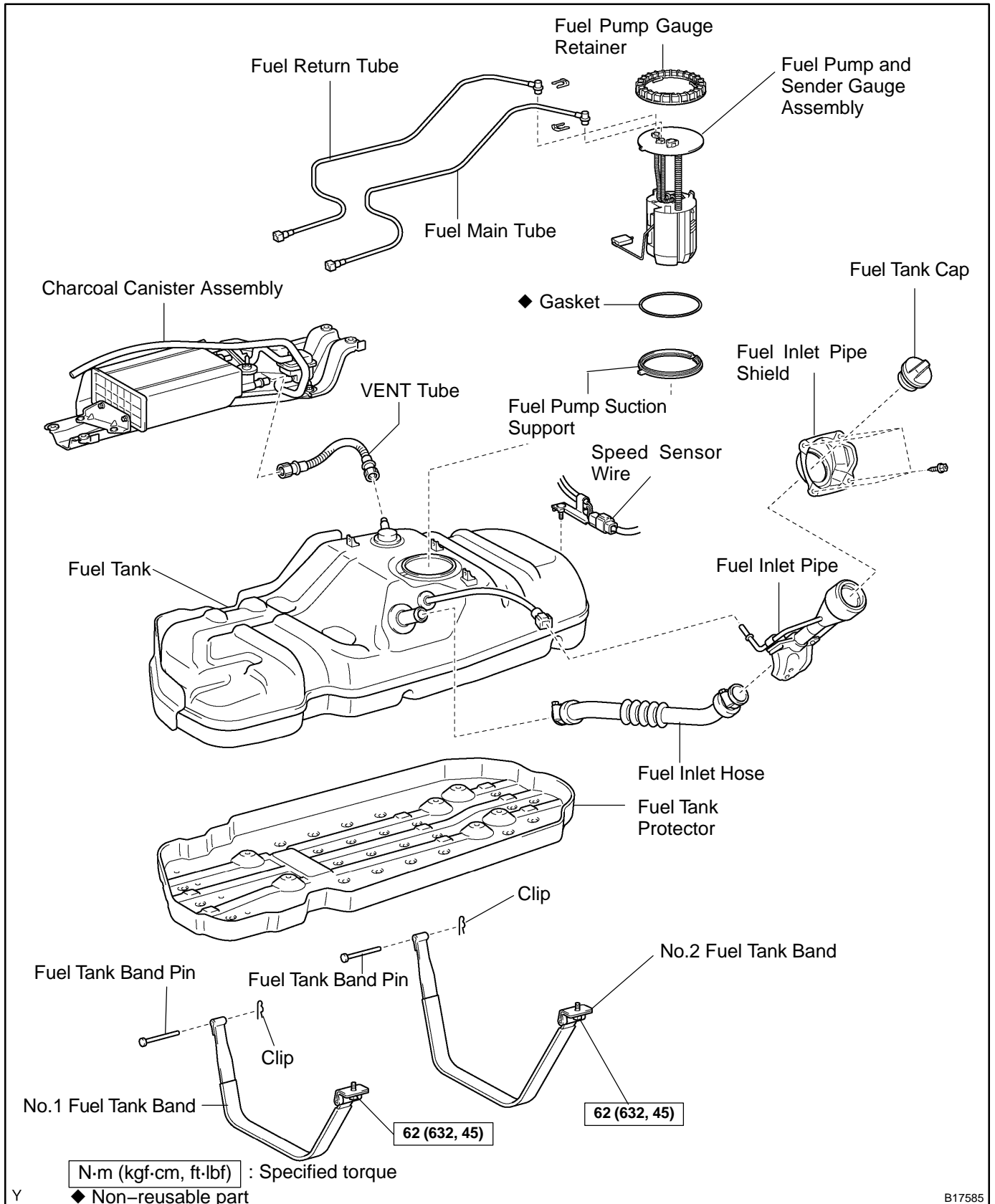
8. INSTALL THROTTLE BODY COVER

FUEL TANK AND LINE COMPONENTS

SFO0Z-18

CAUTION:

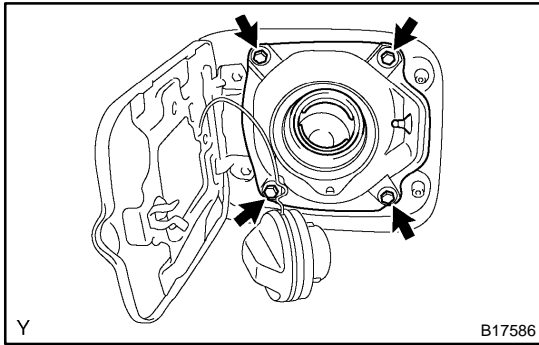
- Always use new gaskets when replacing the fuel tank or component parts.
- Apply the proper torque to all parts tightened



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

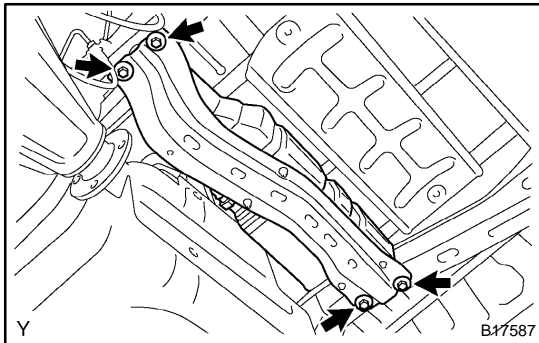
Y



REMOVAL

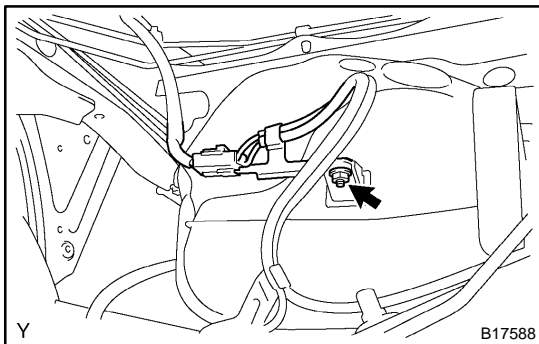
1. **PREVENT GASOLINE FROM SPILLING OUT**
(See page [SF-1](#))
2. **REMOVE FUEL TANK CAP**
3. **REMOVE FUEL INLET PIPE SHIELD**

Remove the 4 bolts and fuel inlet pipe shield.



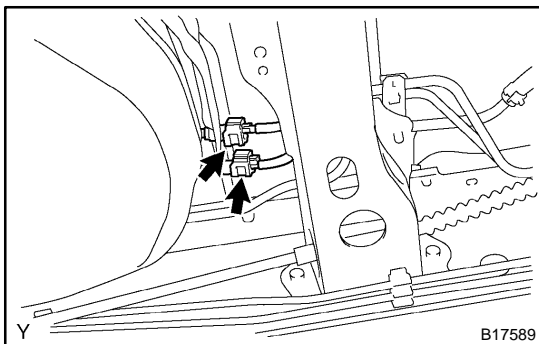
4. **REMOVE CHARCOAL CANISTER ASSEMBLY**

- (a) Remove the 4 bolts and charcoal canister assembly.
- (b) Disconnect the pump module connector, vent hose and purge line hose from the charcoal canister.

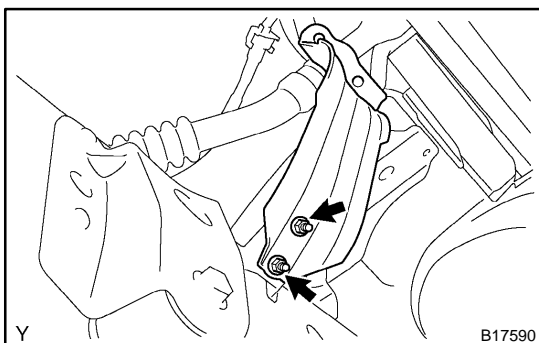


5. **DISCONNECT SPEED SENSOR WIRE**

Remove the nut and disconnect the speed sensor wire from the fuel tank.

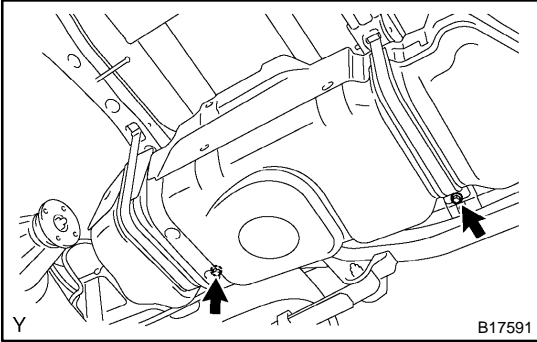


6. **DISCONNECT FUEL MAIN TUBE AND RETURN TUBE**
(See page [SF-1](#))

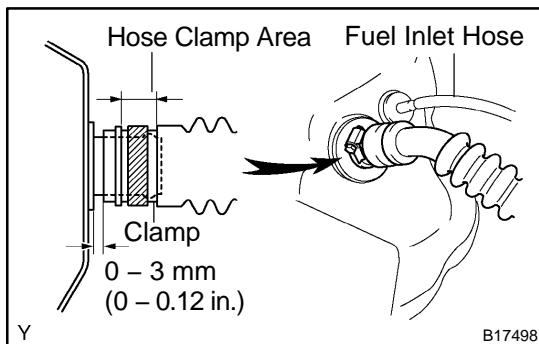
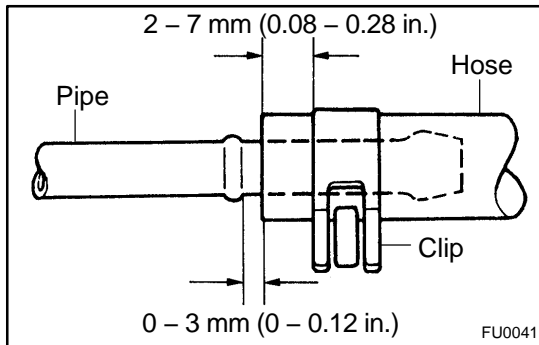
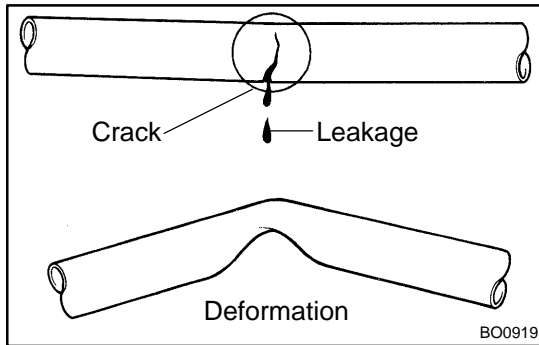


7. **REMOVE FUEL TANK ASSEMBLY**

- (a) Set up a transmission jack under the fuel tank.
- (b) Remove the 2 nuts and disconnect the fuel pipe bracket from the body.



- (c) Remove the 2 bolts and disconnect the 2 fuel tank bands from the fuel tank.
 - (d) Operate the transmission jack and remove the fuel tank.
- 8. REMOVE FUEL PUMP ASSEMBLY**
(See page [SF-11](#))

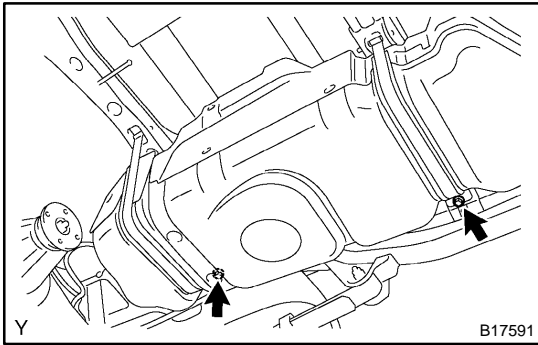


INSPECTION

INSPECT FUEL TANK AND LINE

- Check the fuel lines for cracks or leakage, and all connections for deformation.
- Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
- Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
- Check the filler neck for damage or fuel leakage.
- Hose and pipe connections are as shown in the illustration.

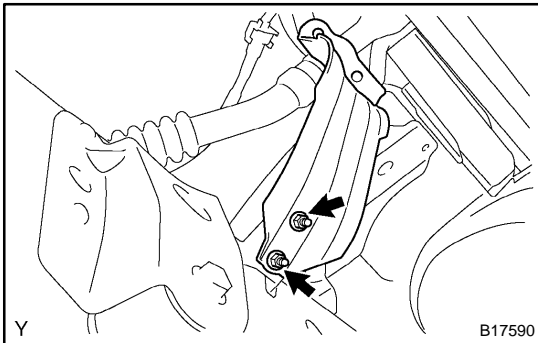
If a problem is found, repair or replace the parts as necessary.



INSTALLATION

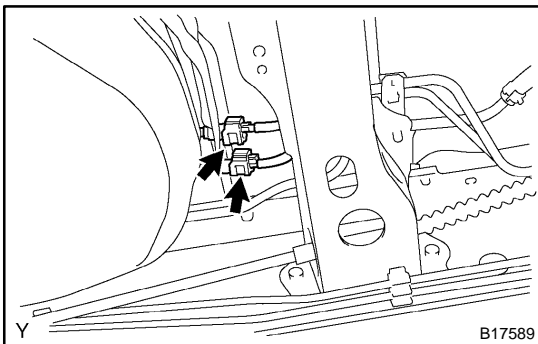
1. **INSTALL FUEL PUMP ASSEMBLY** (See page [SF-19](#))
2. **INSTALL FUEL TANK ASSEMBLY**
 - (a) Set up the fuel tank on the transmission jack.
 - (b) Operate the transmission jack and install the fuel tank.
 - (c) Install the 2 fuel tank bands with the 2 bolts.

Torque: 62 N·m (632 kgf·cm, 45 ft·lbf)

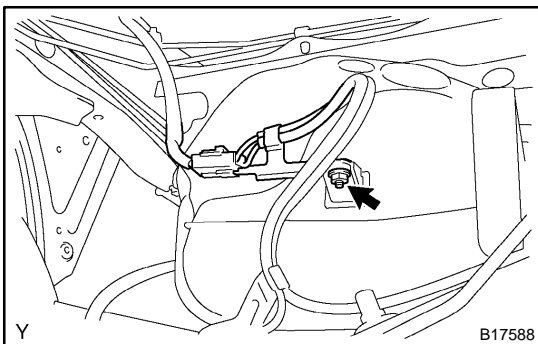


- (d) Install the fuel pipe bracket to the body with the 2 nuts.
- Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)**

3. CONNECT FUEL PUMP CONNECTOR

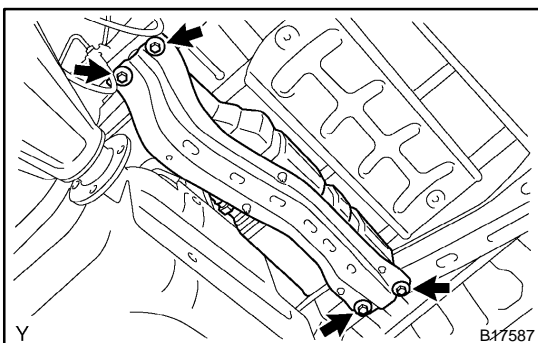


4. **CONNECT FUEL MAIN TUBE AND RETURN TUBE**
(See page [SF-1](#))



5. CONNECT SPEED SENSOR WIRE

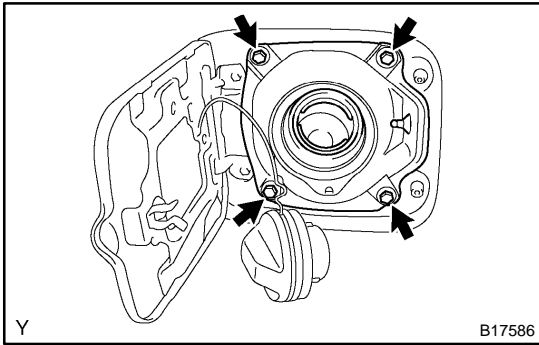
Connect the speed sensor wire to the fuel tank with the nut.



6. INSTALL CHARCOAL CANISTER ASSEMBLY

- (a) Connect the pump module connector, vent hose and purge line hose to the charcoal canister.
- (b) Install the charcoal canister assembly with the 4 bolts.

Torque: 14.7 N·m (150 kgf·cm, 11 ft·lbf)

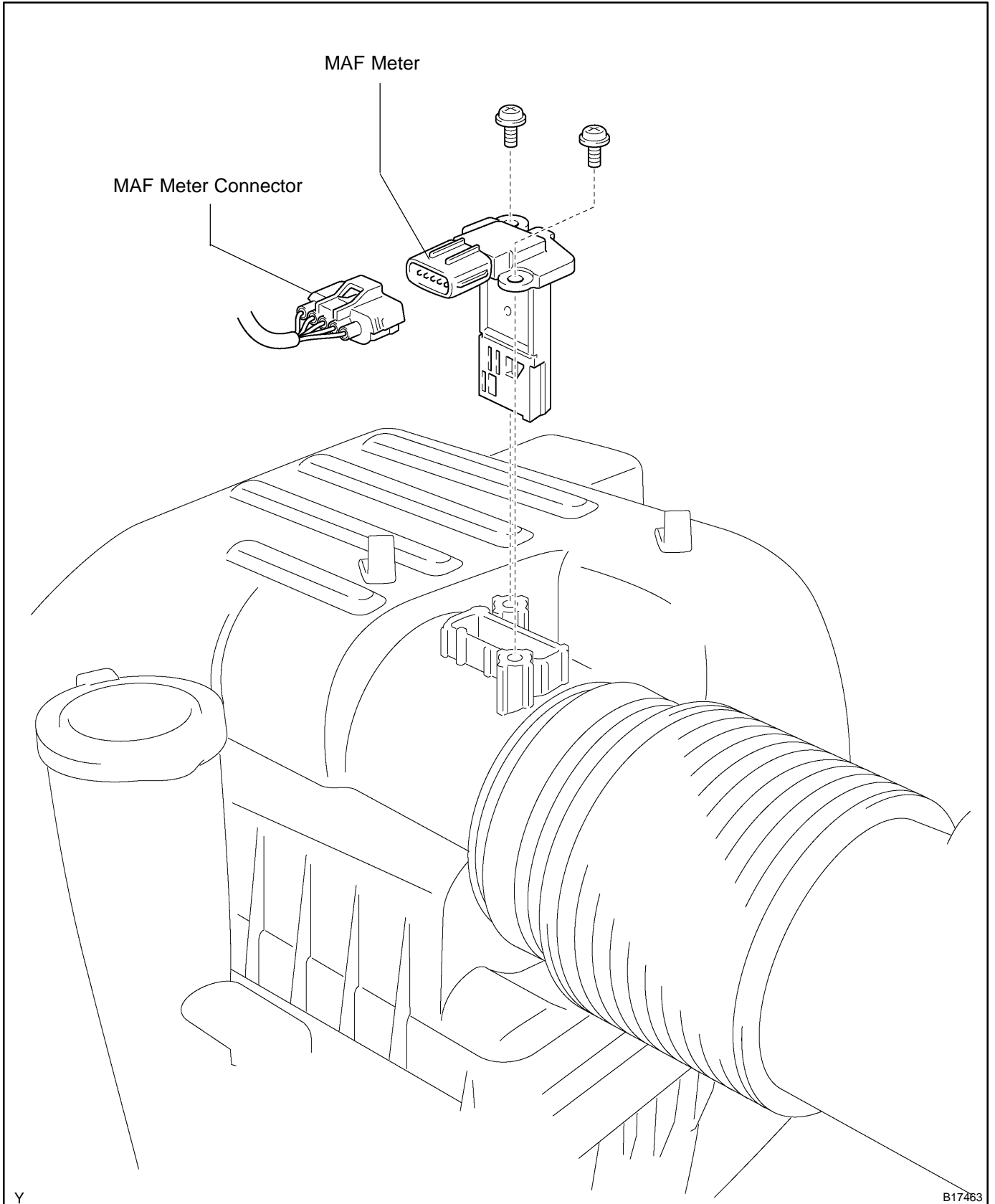
**7. INSTALL FUEL INLET PIPE SHIELD**

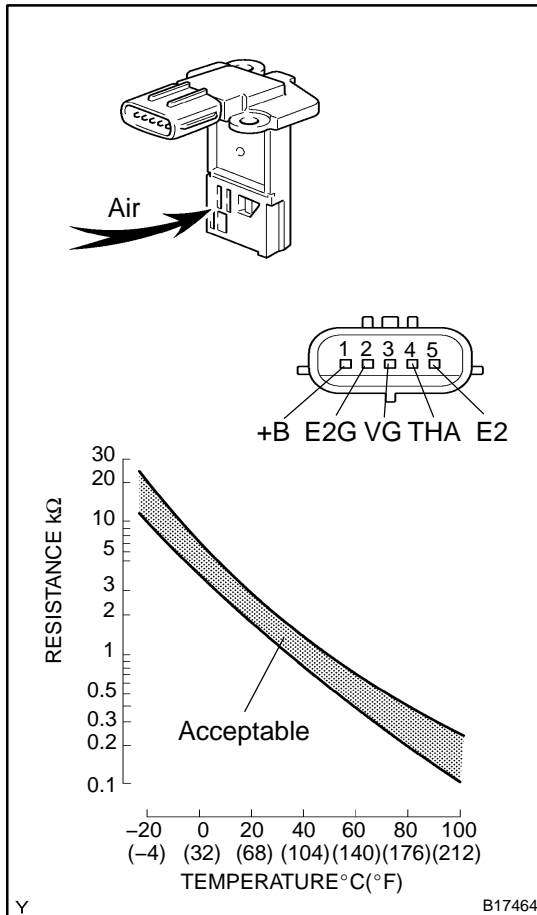
- (a) Install the fuel inlet pipe shield with the 4 bolts.
- (b) Install the fuel tank cap.

8. CHECK FOR FUEL LEAKS**9. INSTALL SPARE TIRE**

MASS AIR FLOW (MAF) METER COMPONENTS

SF0P1-12





INSPECTION

1. INSPECT OUTPUT VOLTAGE

- Apply battery voltage across terminals 1 (+B) and 2 (E2G).
- Connect the positive (+) tester probe to terminal 3 (VG), and the negative (-) tester probe to terminal 2 (E2G).
- Blow air into the MAF meter, and check if the voltage fluctuates.

2. INSPECT RESISTANCE

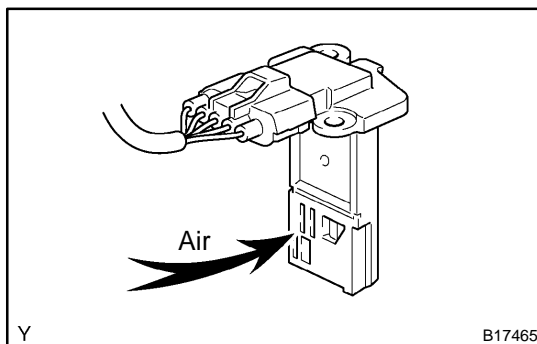
Using an ohmmeter, measure the resistance between terminals 4 (THA) and 5 (E2).

Resistance:

12.5 to 16.9 kΩ at -20°C (-4°F)

2.19 to 2.67 kΩ at 20°C (68°F)

0.50 to 0.68 kΩ at 60°C (140°F)



3. INSPECT MASS AIR FLOW METER

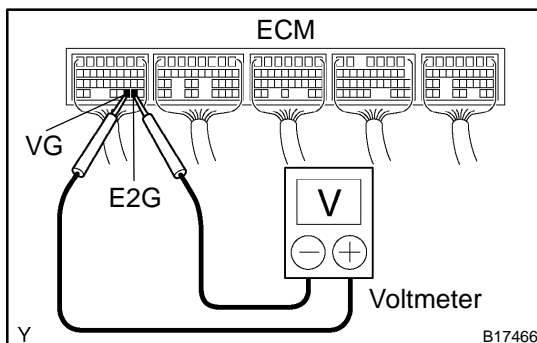
- If using a hand-held tester:
 - Connect the hand-held tester to the DLC3.
 - Turn the ignition switch to the ON position.
 - Blow air into the MAF meter, and check that the air flow value of the CURRENT DATA changes.

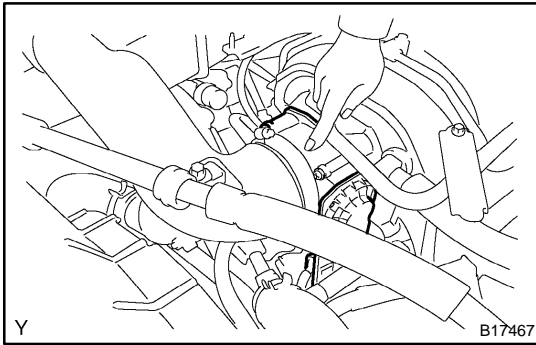
If operation is not as specified, check the MAF meter (see page [DI-531](#) and [DI-534](#)) as well as the wiring and the ECM.

- If not using a hand-held tester:

- Turn the ignition switch to the ON position.
- Connect the positive tester probe of the voltmeter to terminal VG of the ECM and the negative tester probe of the voltmeter to terminal E2G of the ECM.
- Blow air into the air flow meter, and check if the voltage fluctuates.

If operation is not as specified, check the MAF meter (see page [DI-531](#) and [DI-534](#)), the wiring and the ECM.





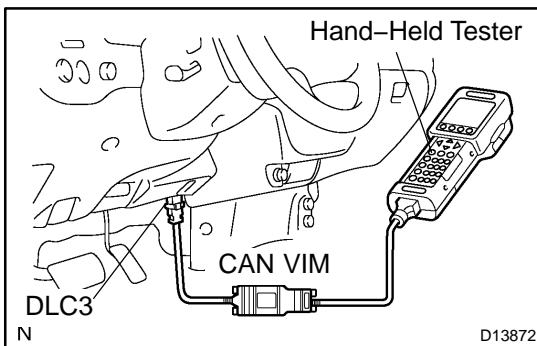
THROTTLE BODY ON-VEHICLE INSPECTION

SF1XJ-02

1. REMOVE THROTTLE BODY COVER
2. INSPECT SYSTEM OPERATION

- (a) Inspect the throttle control motor for operating sound.
 - (1) Turn the ignition switch ON.
 - (2) When depressing the accelerator pedal, check the running sound of the motor. Also, check that there is no friction sound.

If operation is not as specified, check the throttle control motor (see step 3), wiring and ECM.



- (b) Inspect the accelerator pedal position sensor.
 - (1) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
 - (2) Check that the MIL does not light up.
 - (3) When turning the accelerator pedal position sensor lever to the full-open position, check that the throttle valve opening percentage (THROTTLE POS) of the CURRENT DATA shows the standard value.

Standard throttle valve opening percentage: 60% or more

If operation is not as specified, check that the accelerator pedal position sensor (see page [DI-794](#)), wiring and ECM.

If not using a hand-held tester, measure the voltage between terminals (VTA1-E2, VTA2-E2) of the ECM connector (See page [DI-548](#)).

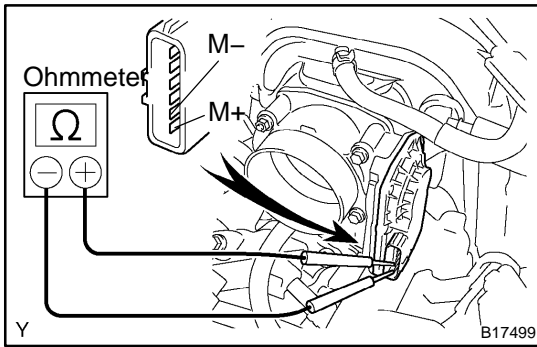
- (c) Inspect the idle speed.
 - (1) Start the engine and check that the MIL does not light up.
 - (2) Allow the engine to warm up to normal operating temperature.
 - (3) Turn the A/C compressor ON to OFF, and check the idle speed.

Idle speed (Transmission in neutral): 700 ± 50 rpm

NOTICE:

Perform inspection without an electrical load.

- (d) After checking the above (a) to (c), perform the driving test and check that there is no sense of incongruity.



3. INSPECT THROTTLE CONTROL MOTOR

- (a) Disconnect the throttle control motor connector.
- (b) Using an ohmmeter, measure the motor resistance between terminals M+ and M-.

Motor resistance: 0.3 to 100 Ω at 20°C (68°F)

If the resistance is not as specified, replace the throttle body assembly (see page [SF-44](#)).

- (c) Reconnect the throttle control motor connector.

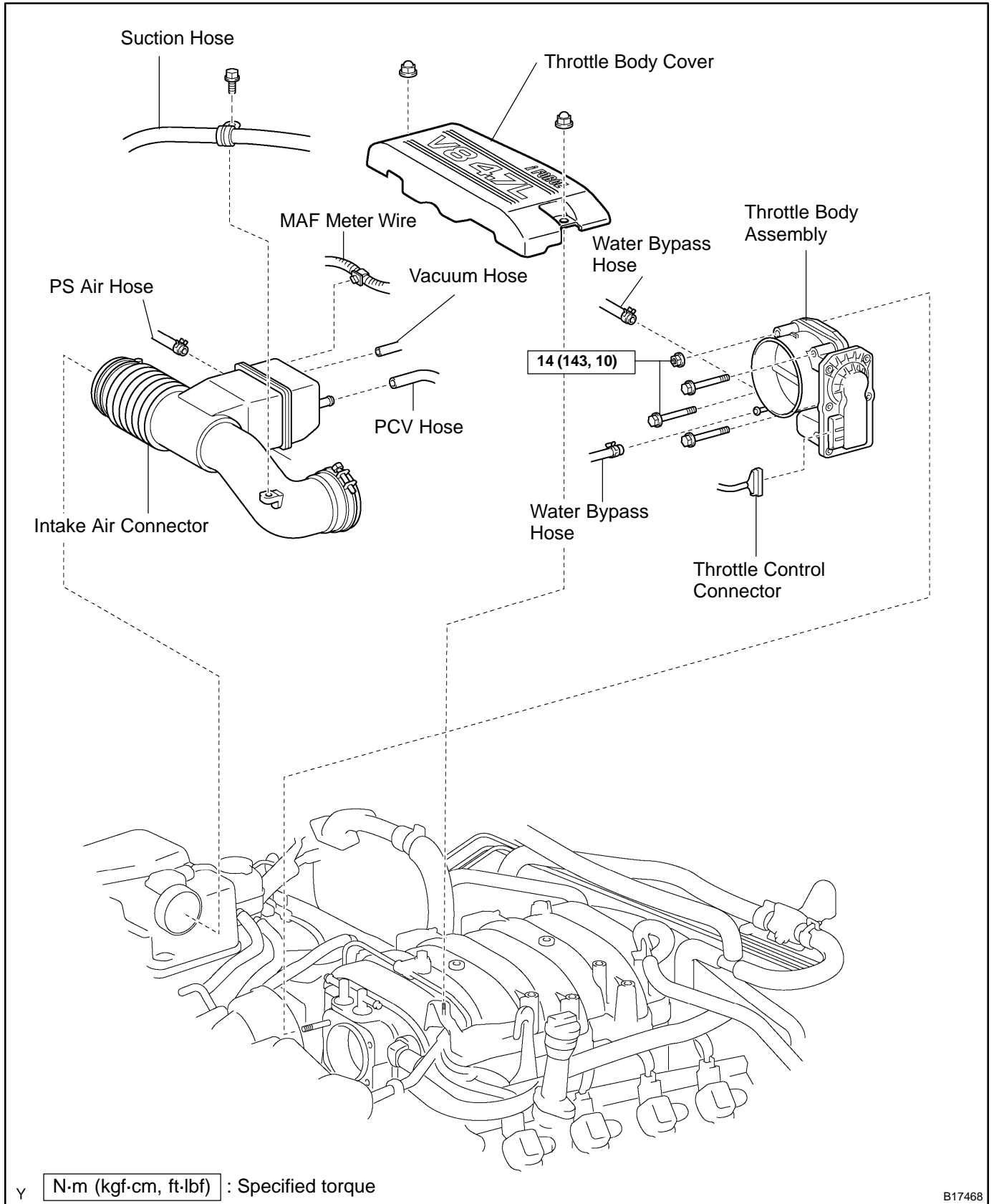
4. INSPECT THROTTLE POSITION SENSOR

(See page [DI-548](#))

If necessary, replace the throttle body assembly (see page [SF-44](#)).

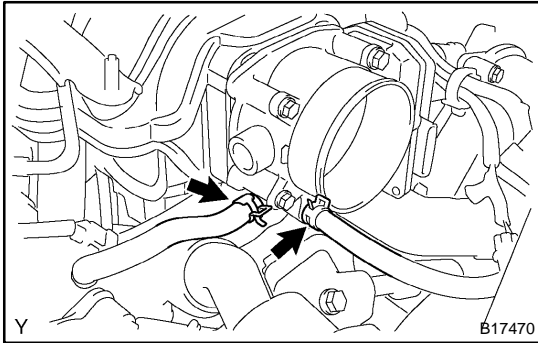
5. REINSTALL THROTTLE BODY COVER

COMPONENTS

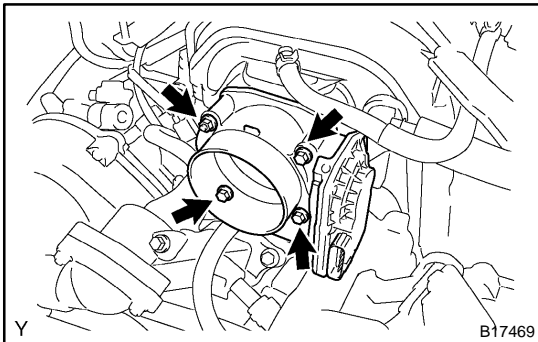


REMOVAL

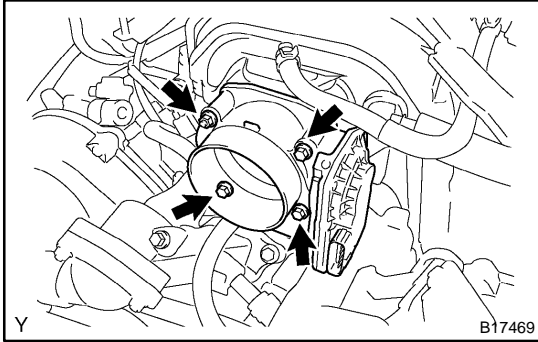
1. REMOVE THROTTLE BODY COVER
2. DRAIN ENGINE COOLANT
3. REMOVE INTAKE AIR CONNECTOR
4. REMOVE THROTTLE BODY
 - (a) Disconnect the throttle control connector.



- (b) Disconnect the 2 water bypass hoses from the throttle body.



- (c) Remove the nut and 3 bolts, and remove the throttle body from the intake manifold.

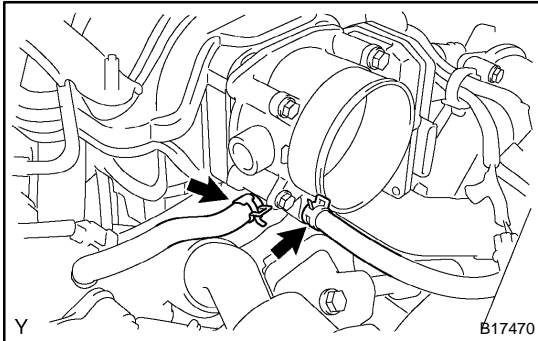


INSTALLATION

1. INSTALL THROTTLE BODY

- (a) Install the throttle body with the nut and 3 bolts.

Torque: 14 N·m (143 kgf·cm, 10 ft·lbf)



- (b) Connect the 2 water bypass hoses to the throttle body.

- (c) Connect the throttle control connector.

2. INSTALL INTAKE AIR CONNECTOR

3. **FILL WITH ENGINE COOLANT (See page [CO-2](#))**

4. **START ENGINE AND CHECK FOR ENGINE COOLANT LEAKS**

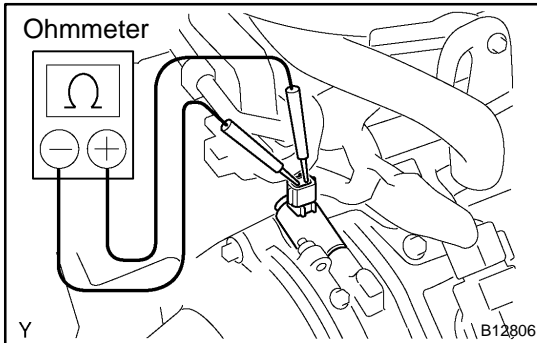
5. **INSTALL THROTTLE BODY COVER**

CAMSHAFT TIMING OIL CONTROL VALVE

ON-VEHICLE INSPECTION

SF0P8-03

- (a) Remove the throttle body cover.
- (b) Remove the intake air connector.
- (c) Disconnect the oil control valve connector.



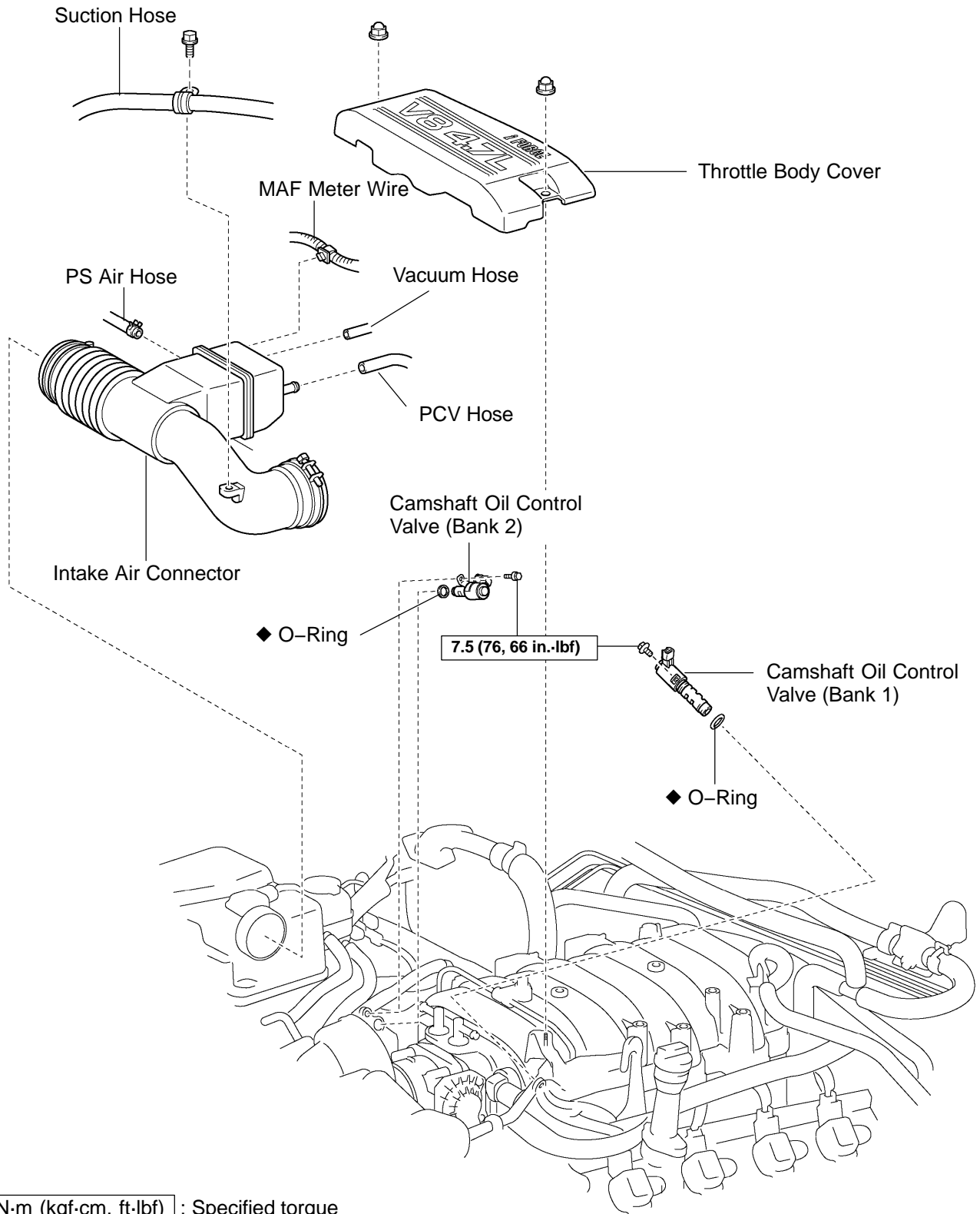
- (d) Using an ohmmeter, measure the resistance between the terminals.

Resistance: 6.9 to 7.9 Ω at 20°C (68°F)

If the resistance is not as specified, replace the valve.

- (e) Reconnect the oil control valve connector.
- (f) Reinstall the intake air connector.
- (g) Reinstall the throttle body cover.

COMPONENTS

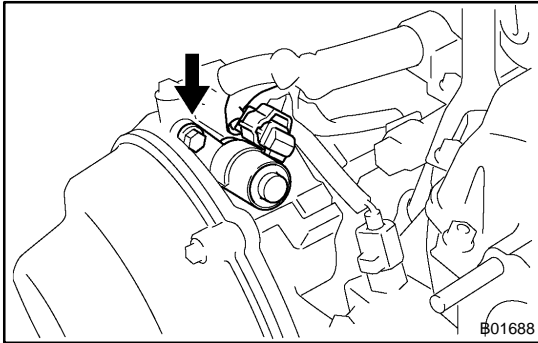


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

REMOVAL

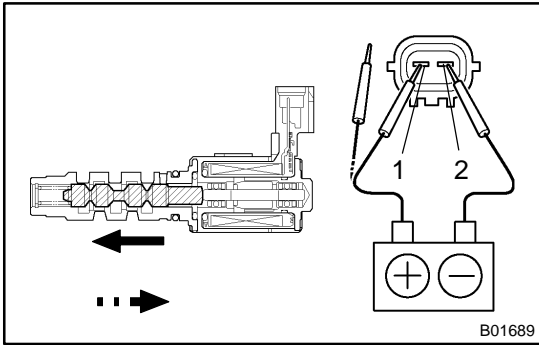
1. REMOVE THROTTLE BODY COVER
2. REMOVE INTAKE AIR CONNECTOR



3. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE
 - (a) Disconnect the 2 camshaft oil control valve connectors.
 - (b) Remove the bolt, camshaft oil control valve and O-ring.
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)
 - (c) Remove the O-ring from the each camshaft oil control valve.

HINT:



At the time of installation, please refer to the following items.
Use a new O-rings.



INSPECTION

INSPECT OIL CONTROL VALVE OPERATION

Connect the positive ⊕ lead to terminal 1 of the connector and the negative ⊖ lead to terminal 2, then check the movement of the valve.

When battery positive voltage is applied.	Valve moves in  direction.
When battery positive voltage is cut off.	Valve moves in  direction.

If operation is not as specified, replace the oil control valve.

INSTALLATION

Installation is in the reverse order of removal. (See page [SF-48](#))

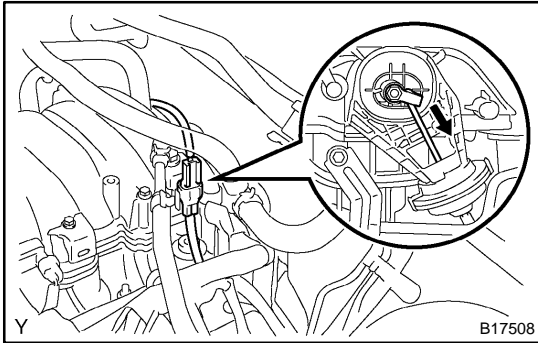
ACOUSTIC CONTROL INDUCTION SYSTEM (ACIS)

SFOPD-04

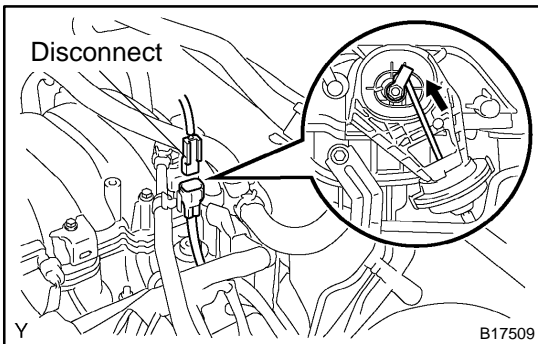
ON-VEHICLE INSPECTION

INSPECT INTAKE AIR CONTROL VALVE OPERATION

(a) Start the engine.



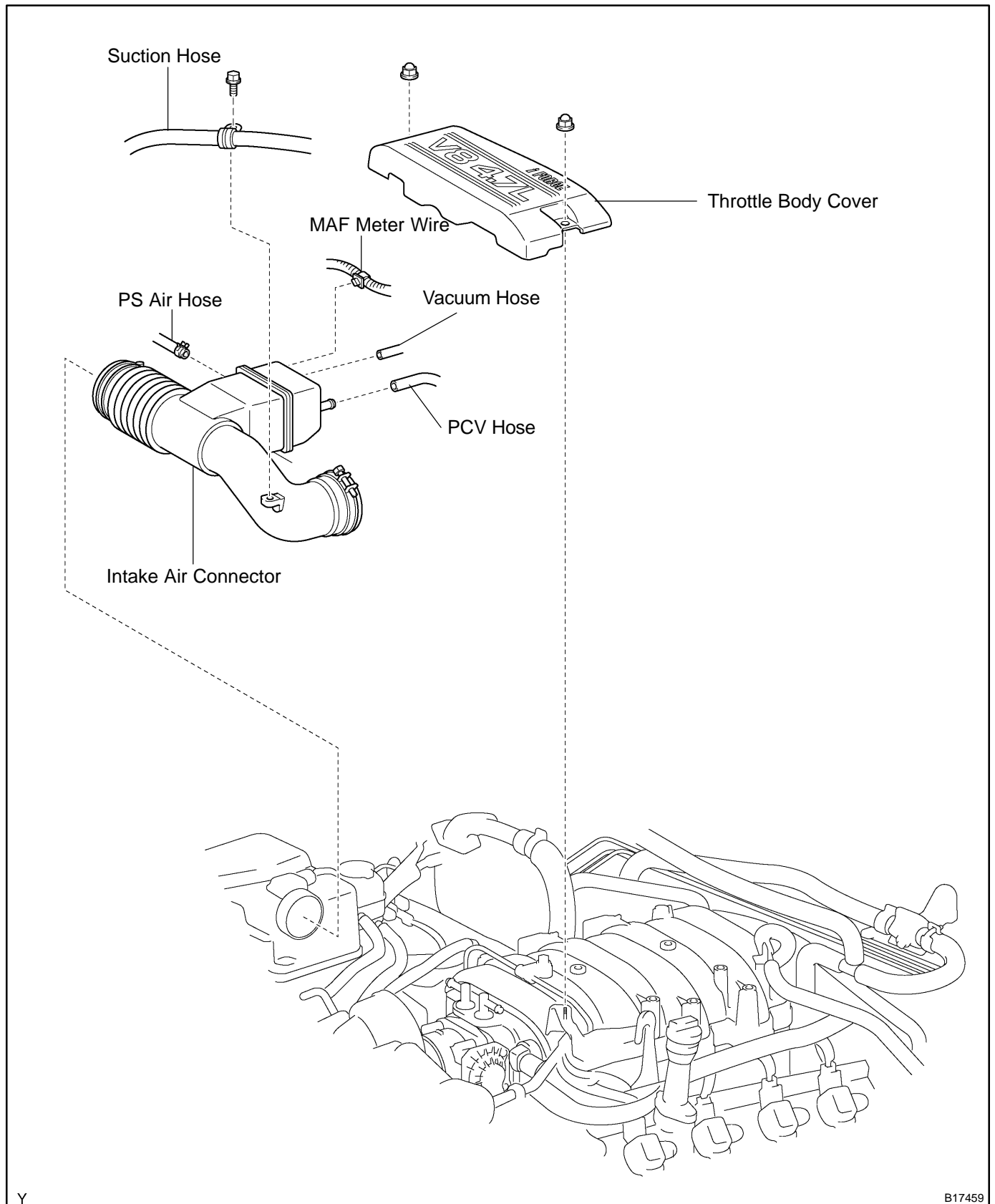
(b) While the engine idling, check that the actuator rod moves.

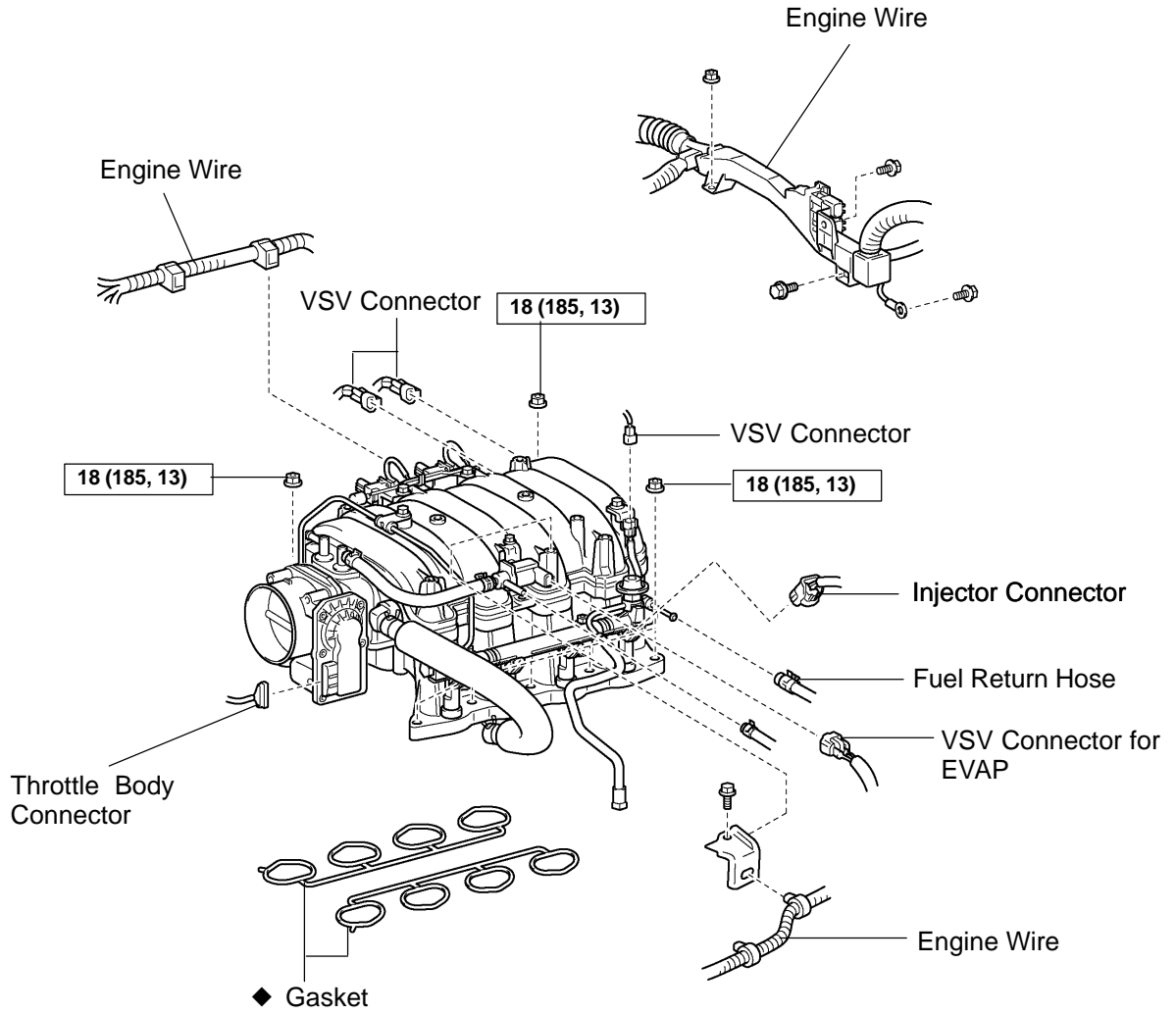


(c) Disconnect the VSV connector, and check that the actuator rod is returned.

If the operation is not as specified, inspect the intake air control valve, VSV and ECM.

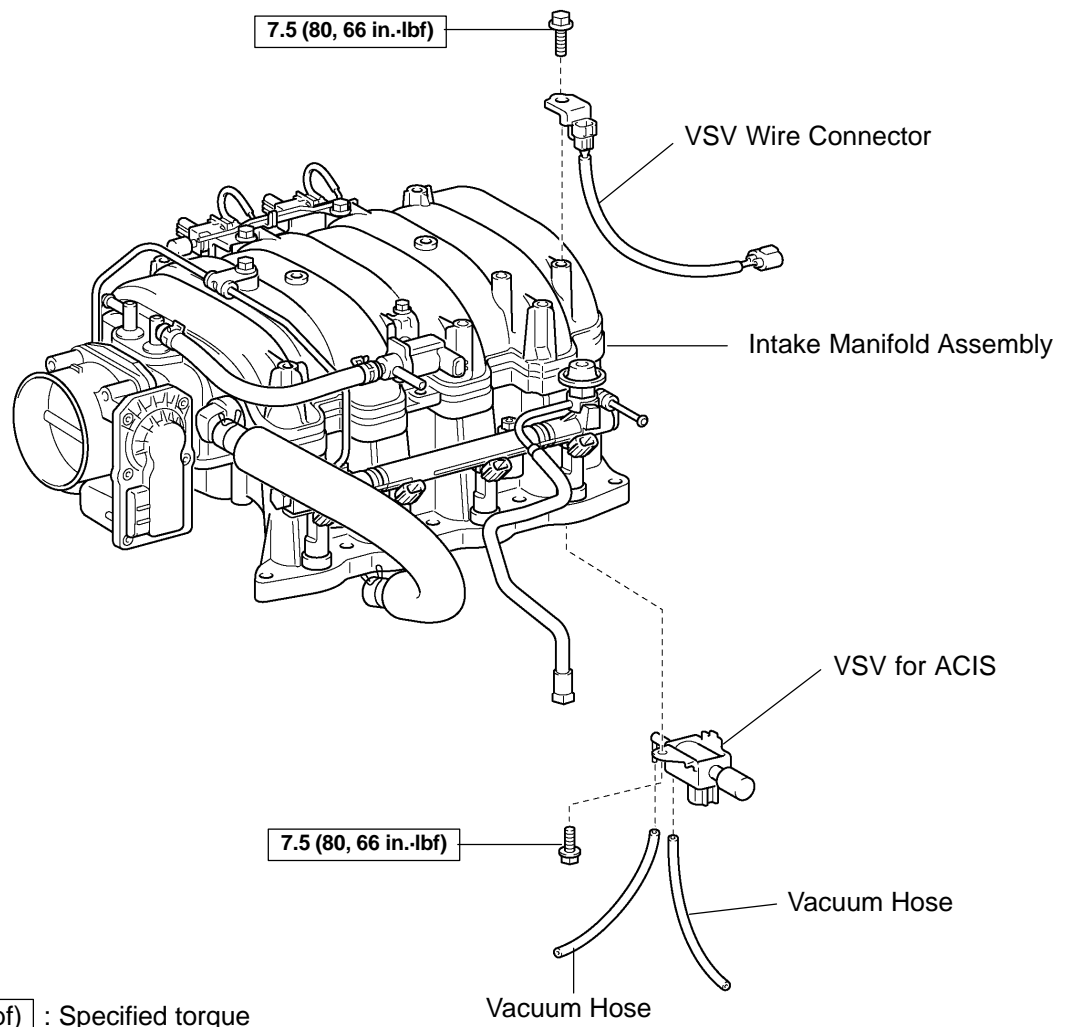
COMPONENTS





N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

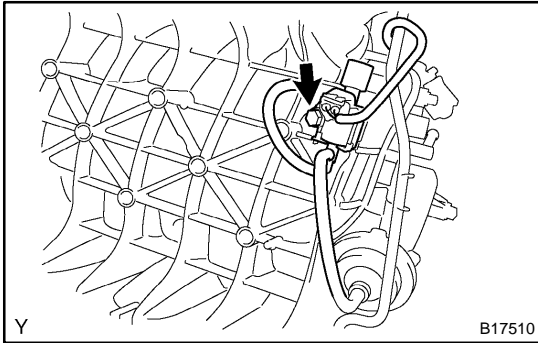


N·m (kgf·cm, ft·lbf) : Specified torque

Y

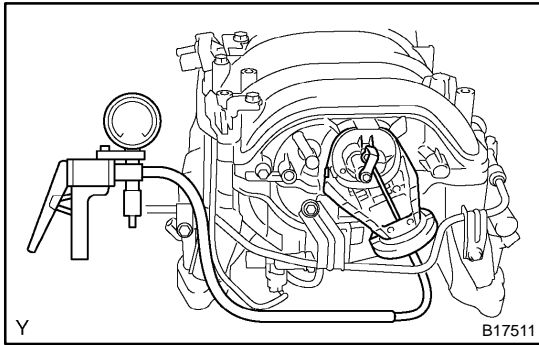
REMOVAL

1. REMOVE THROTTLE BODY COVER
2. REMOVE INTAKE MANIFOLD ASSEMBLY
(See page [EM-36](#))



3. REMOVE VSV FOR ACIS

- (a) Remove the 2 vacuum hoses from the VSV.
- (b) Remove the bolt and VSV from the intake manifold.

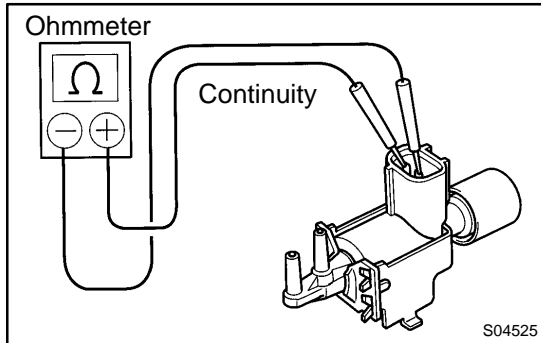


INSPECTION

1. INSPECT INTAKE AIR CONTROL VALVE

- With 39.9 kPa (300 mmHg, 11.8 in.Hg) of vacuum applied to the actuator, check that the actuator rod moves.
- One minute after applying the vacuum in step (a), check that the actuator rod does not return.

If the operation is not as specified, replace the intake manifold.

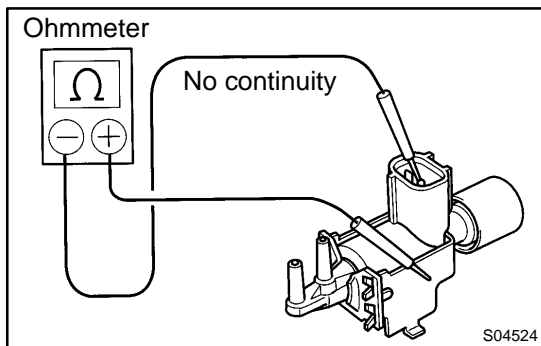


2. INSPECT VSV

- Using an ohmmeter, check that there is continuity between each terminal.

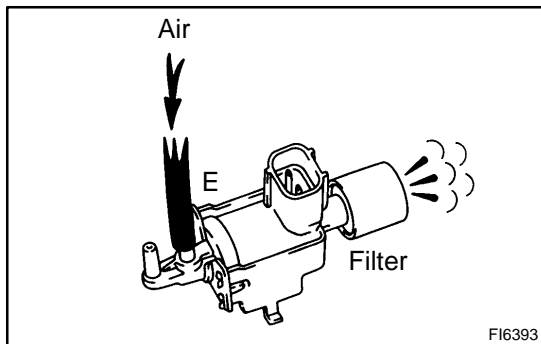
Resistance: 33 to 39 Ω at 20°C (68°F)

If there is no continuity, replace the VSV.

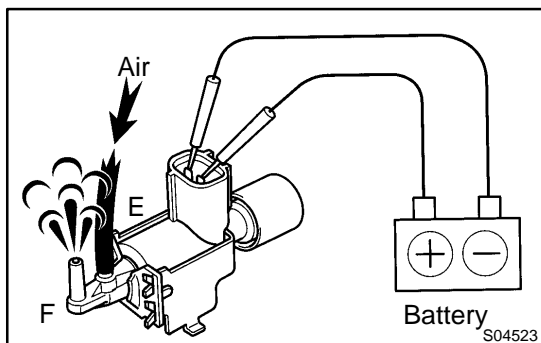


- Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



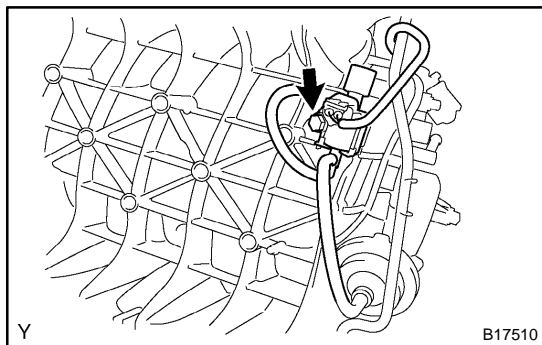
- Check that air flows from port E to the filter.



- Apply battery voltage across the terminals.

- Check that air flows from port E to port F.

If operation is not as specified, replace the VSV.

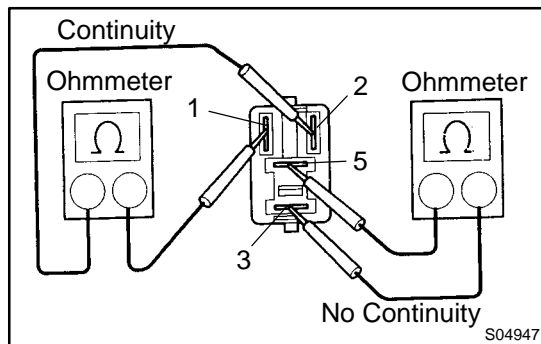


INSTALLATION

1. **INSTALL VSV FOR ACIS**
 - (a) Install the VSV to the intake manifold with the bolt.
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)
 - (b) Connect the 2 vacuum hoses to the VSV.
2. **INSTALL INTAKE MANIFOLD ASSEMBLY**
(See page [EM-60](#))
3. **INSTALL THROTTLE BODY COVER**

EFI MAIN RELAY INSPECTION

1. REMOVE RELAY BOX COVER
2. REMOVE EFI MAIN RELAY (Marking: EFI)



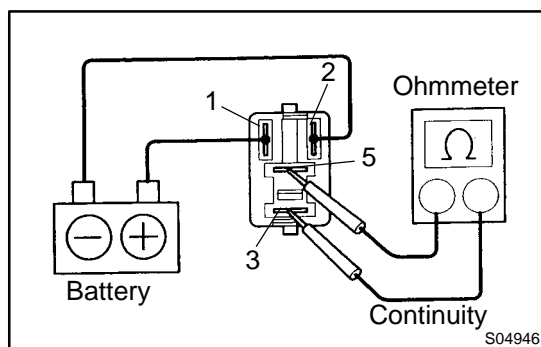
3. INSPECT EFI MAIN RELAY CONTINUITY

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

- (b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



4. INSPECT EFI MAIN RELAY OPERATION

- (a) Apply battery voltage across terminals 1 and 2.

- (b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

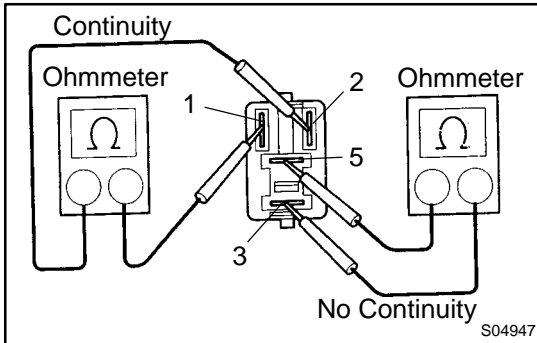
5. REINSTALL EFI MAIN RELAY

6. REINSTALL RELAY BOX COVER

A/F SENSOR HEATER RELAY INSPECTION

SF1XR-01

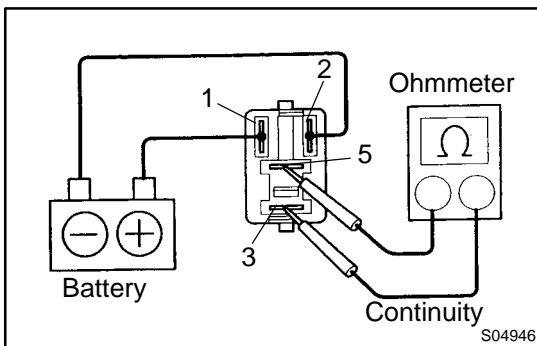
1. REMOVE RELAY BOX COVER
2. REMOVE A/F SENSOR HEATER RELAY (Marking: A/F HTR)



3. **INSPECT A/F SENSOR HEATER RELAY CONTINUITY**
 - (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
 - (b) Check that there is no continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

If there is continuity, replace the relay.



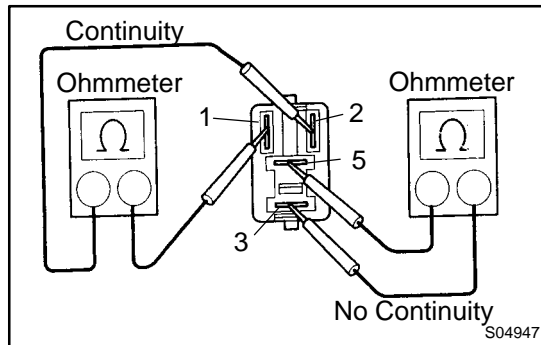
4. **INSPECT A/F SENSOR HEATER RELAY OPERATION**
 - (a) Apply battery voltage across terminals 1 and 2.
 - (b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.
5. **REINSTALL A/F SENSOR HEATER RELAY**
6. **REINSTALL RELAY BOX COVER**

If there is no continuity, replace the relay.

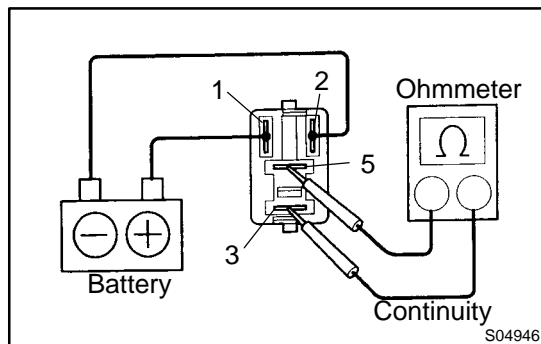
CIRCUIT OPENING RELAY INSPECTION

SF1XS-01

1. REMOVE RELAY BOX COVER
2. REMOVE CIRCUIT OPENING RELAY
(Marking: C/O)



3. **INSPECT CIRCUIT OPENING RELAY CONTINUITY**
 - (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
If there is no continuity, replace the relay.
 - (b) Check that there is no continuity between terminals 3 and 5.
If there is continuity, replace the relay.

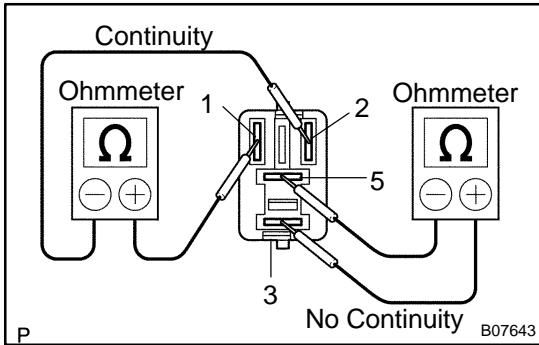


4. **INSPECT CIRCUIT OPENING RELAY OPERATION**
 - (a) Apply battery positive voltage across terminals 1 and 2.
 - (b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.
If there is no continuity, replace the relay.
5. **REINSTALL CIRCUIT OPENING RELAY**
6. **REINSTALL RELAY BOX COVER**

FUEL PUMP RELAY INSPECTION

SF1XT-01

1. REMOVE RELAY BOX COVER
2. REMOVE FUEL PUMP RELAY (Marking: F/P)

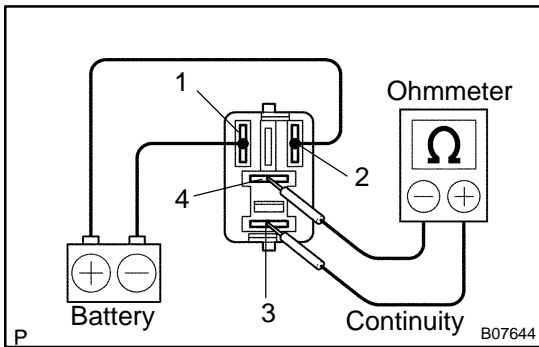


3. INSPECT FUEL PUMP RELAY CONTINUITY

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

- (b) Check that there is continuity between terminals 3 and 4.
- If there is no continuity, replace the relay.



4. INSPECT FUEL PUMP RELAY OPERATION

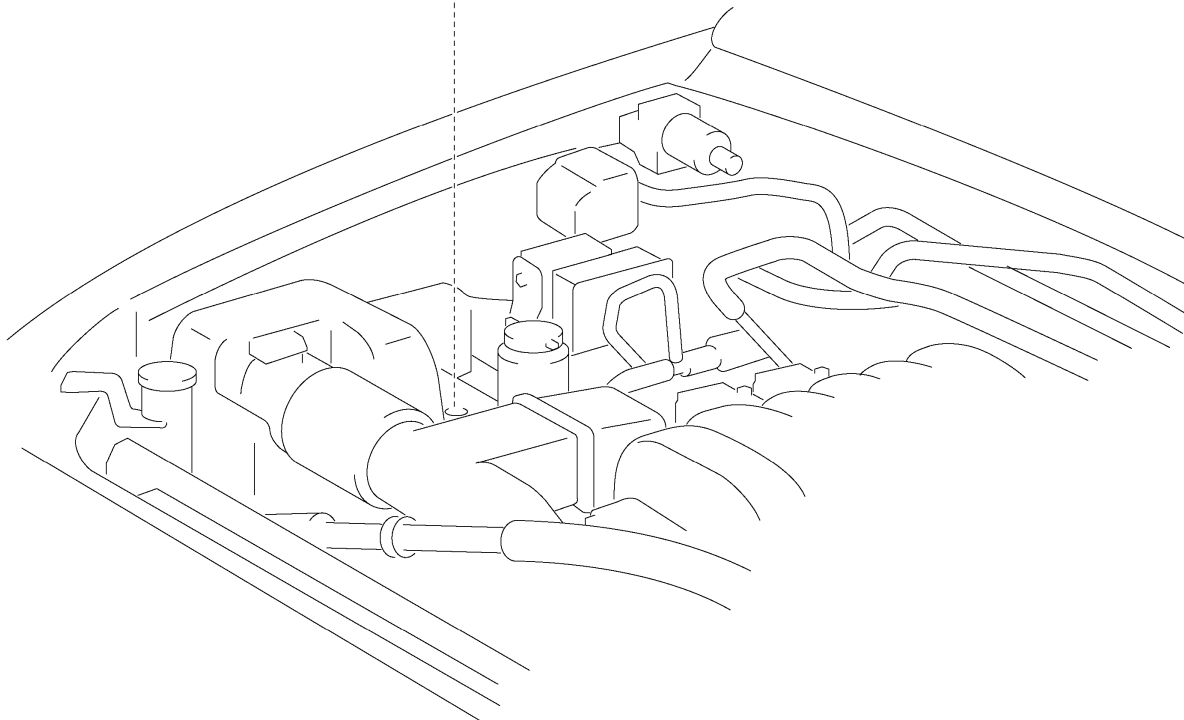
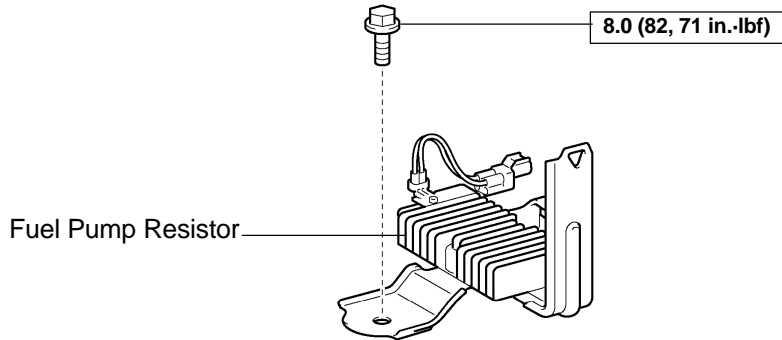
- (a) Apply battery positive voltage across terminals 1 and 2.
- (b) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.

5. REINSTALL FUEL PUMP RELAY
6. REINSTALL RELAY BOX COVER

FUEL PUMP RESISTOR COMPONENTS

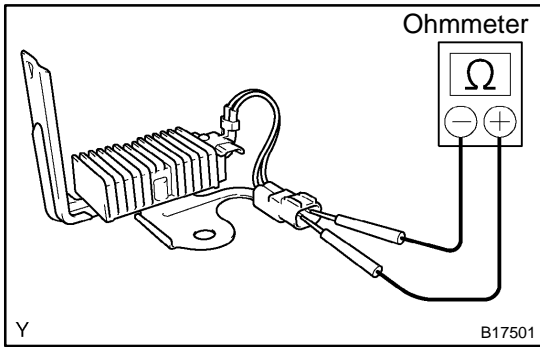
SF138-05



N·m (kgf·cm, ft·lbf) : Specified torque

Y

B17500



INSPECTION

1. REMOVE FUEL PUMP RESISTOR
2. INSPECT FUEL PUMP RESISTOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: 0.70 to 0.76 Ω at 20°C (68°F)

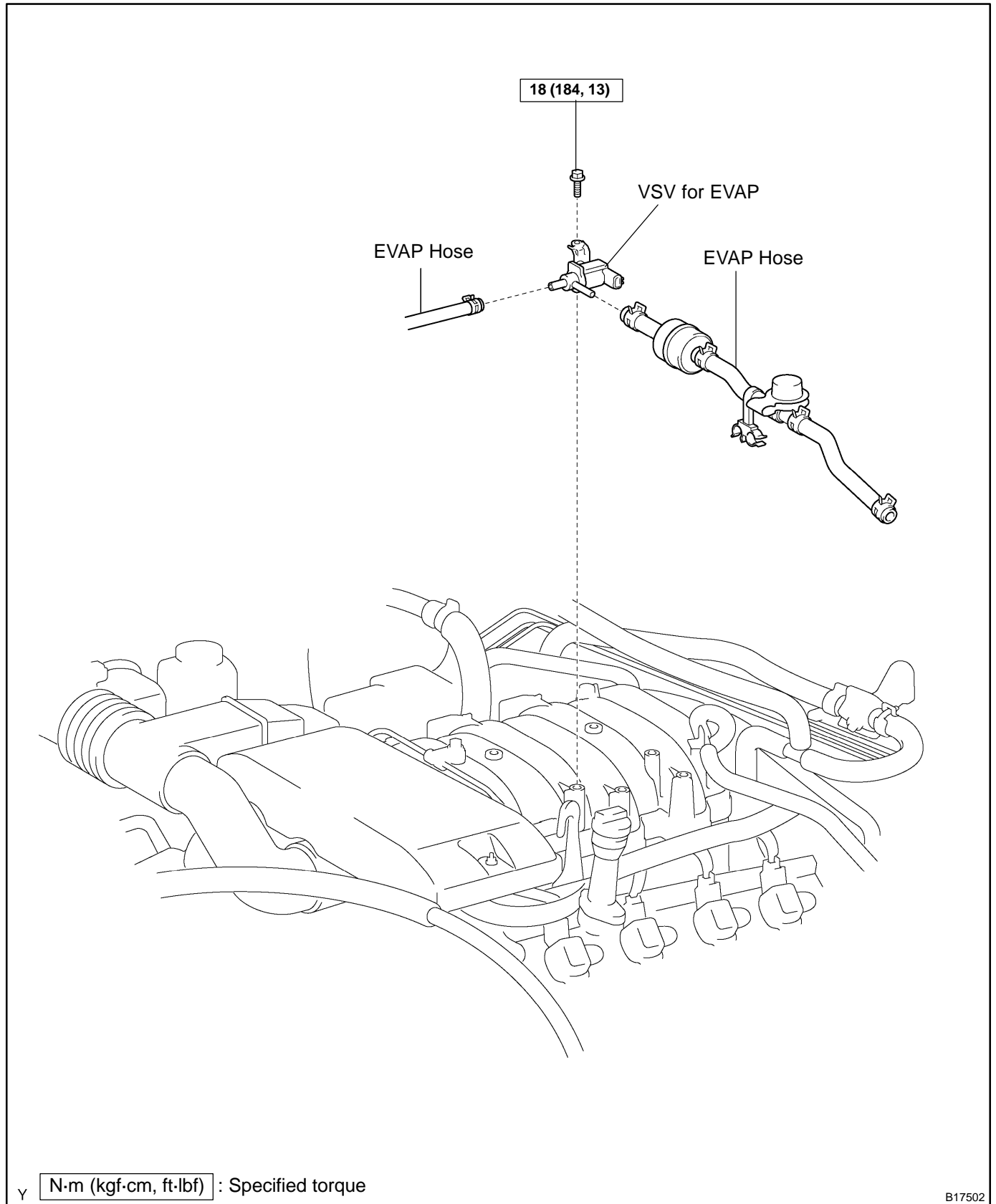
If the resistance is not as specified, replace the resistor.

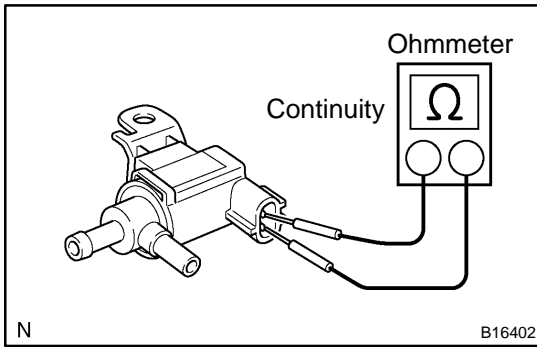
3. REINSTALL FUEL PUMP RESISTOR

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

VSV FOR EVAPORATIVE EMISSION (EVAP) COMPONENTS

SF0Y7-10





INSPECTION

1. REMOVE VSV

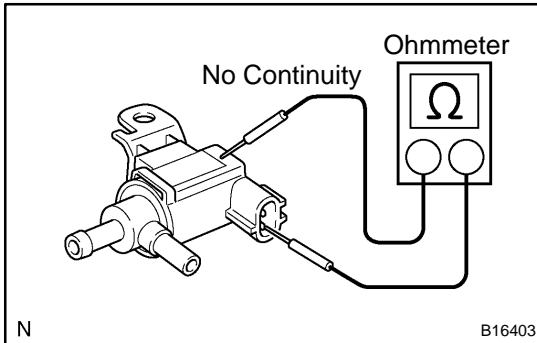
2. INSPECT VSV

- (a) Inspect the VSV for open circuit.

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 30 to 34 Ω at 20°C (68°F)

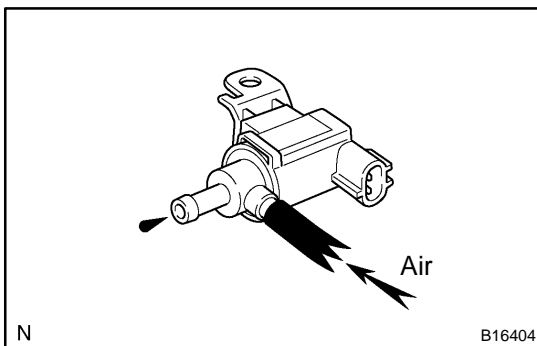
If there is no continuity, replace the VSV.



- (b) Inspect the VSV for ground.

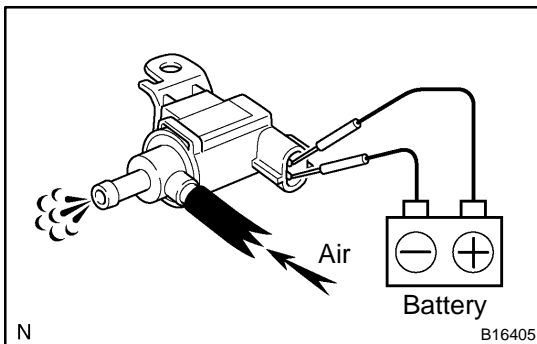
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



- (c) Inspect the VSV operation.

- (1) Check that air does not flow from port.



- (2) Apply battery positive voltage across the terminals.

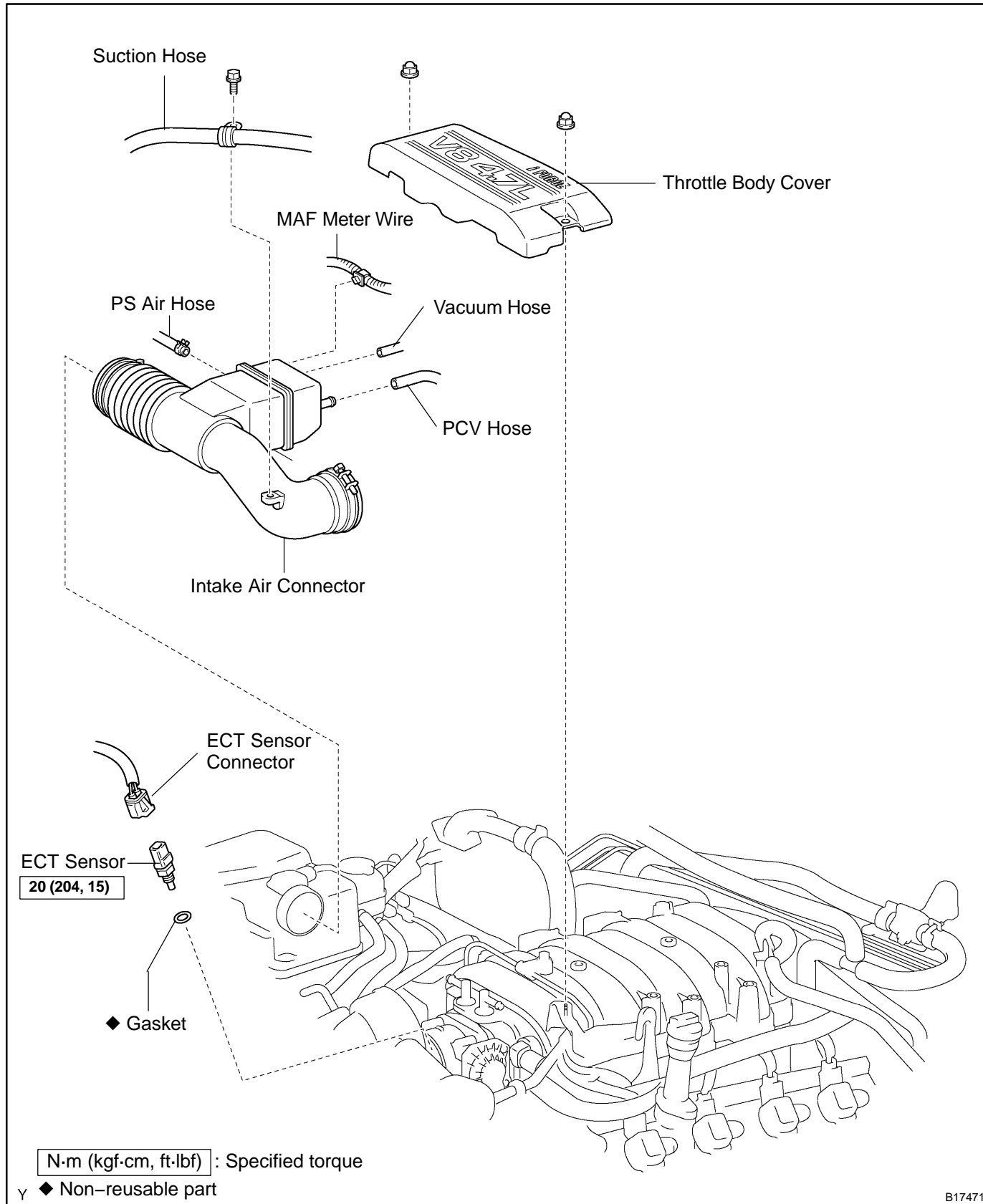
- (3) Check that air flows from port.

If operation is not as specified, replace the VSV.

3. REINSTALL VSV

ENGINE COOLANT TEMPERATURE (ECT) SENSOR COMPONENTS

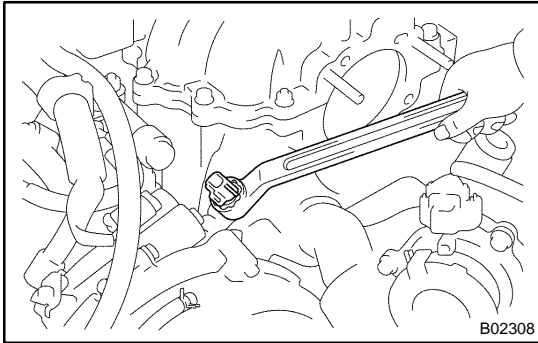
SF0PN-13



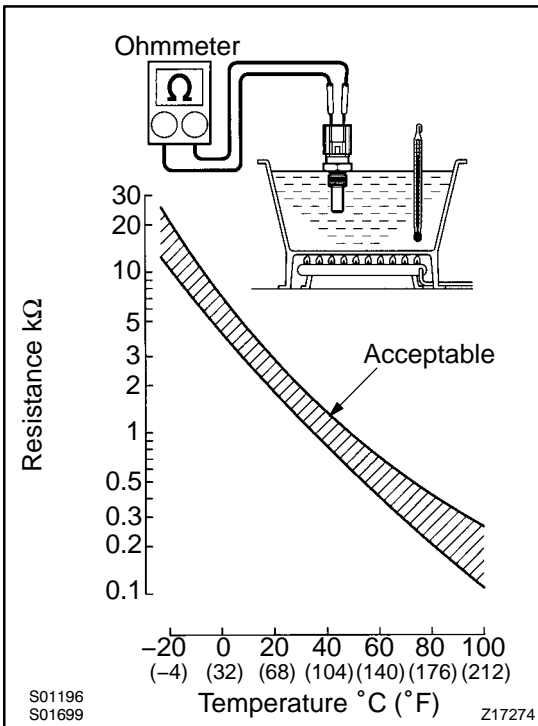
INSPECTION

1. DRAIN ENGINE COOLANT
2. REMOVE THROTTLE BODY COVER
3. REMOVE INTAKE AIR CONNECTOR
4. DISCONNECT THROTTLE BODY FROM INTAKE MANIFOLDS

Remove the nut and 3 bolts, and disconnect the throttle body from the intake manifold.



5. REMOVE ECT SENSOR
 - (a) Disconnect the ECT sensor connector.
 - (b) Remove the ECT sensor and gasket.



6. INSPECT ECT SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the graph

If the resistance is not as specified, replace the ECT sensor.

7. REINSTALL ECT SENSOR

- (a) Install a new gasket and the ECT sensor.
Torque: 19.6 N·m (200 kgf·cm, 14 ft·lbf)
- (b) Connect the ECT sensor connector.

8. REINSTALL THROTTLE BODY TO INTAKE MANIFOLDS

Install a new gasket and the throttle body with the 2 bolts and 2 nuts.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

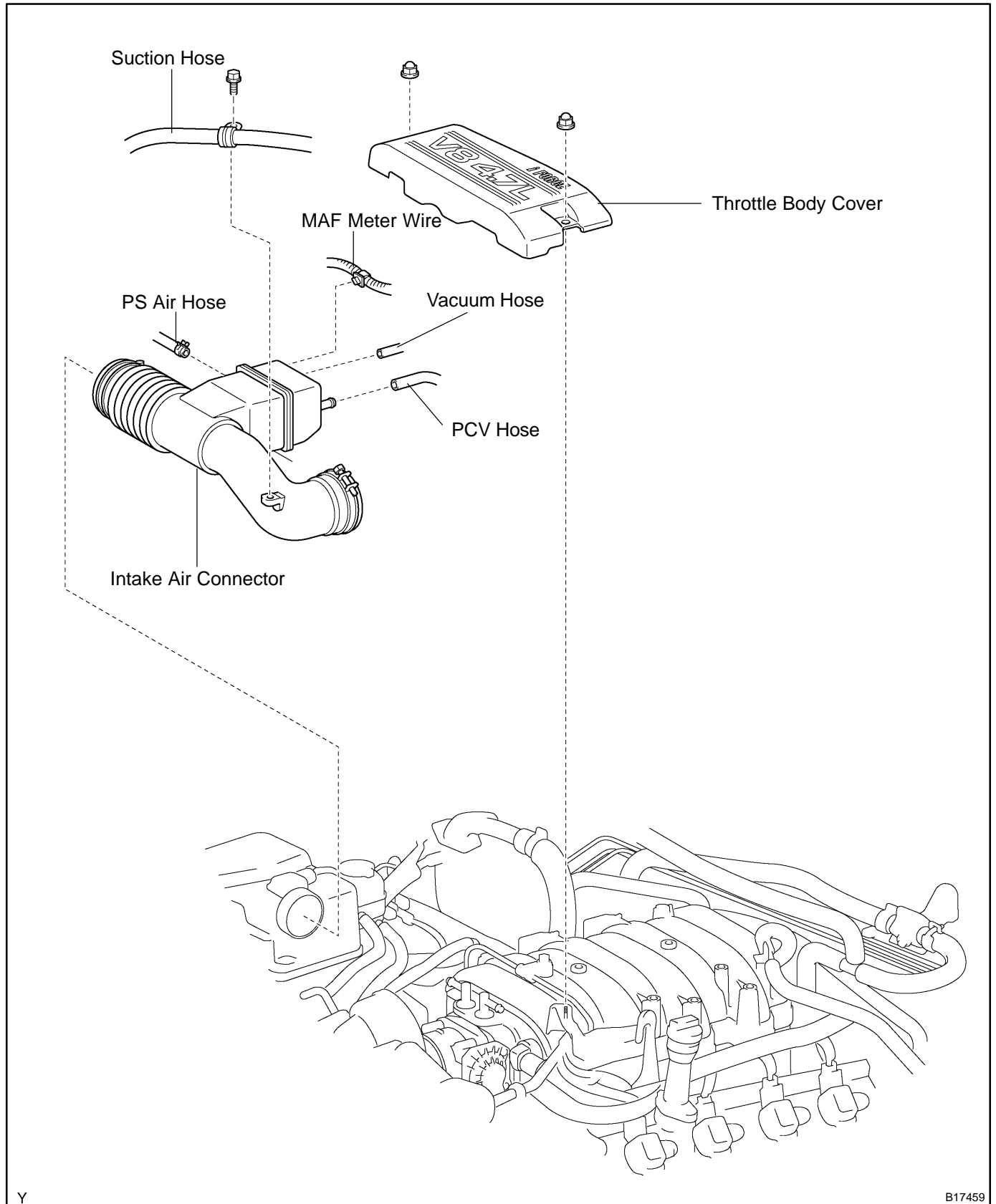
9. REINSTALL INTAKE AIR CONNECTOR

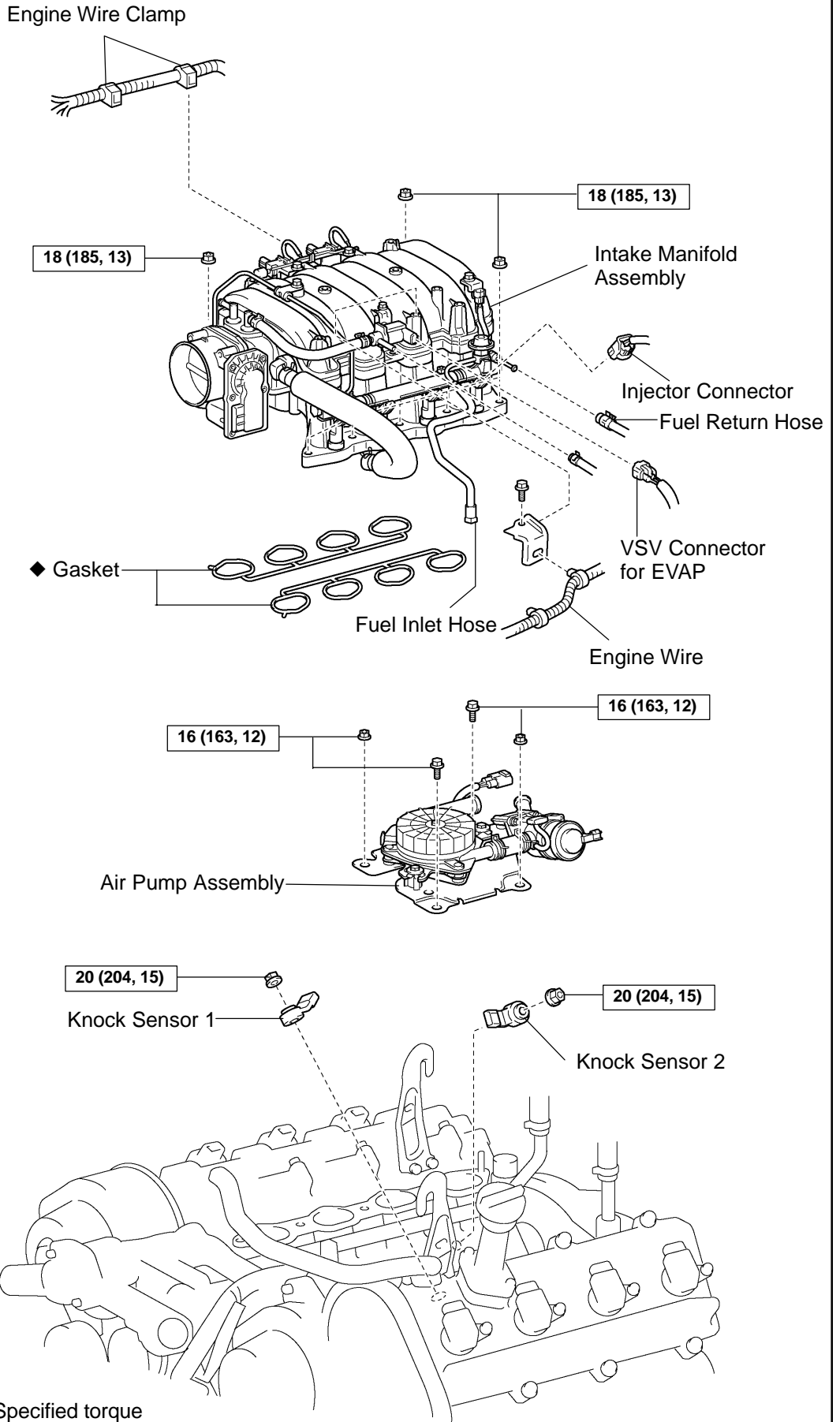
10. REFILL WITH ENGINE COOLANT (See page CO-2)

11. REINSTALL THROTTLE BODY COVER

KNOCK SENSOR COMPONENTS

SFOPR-16





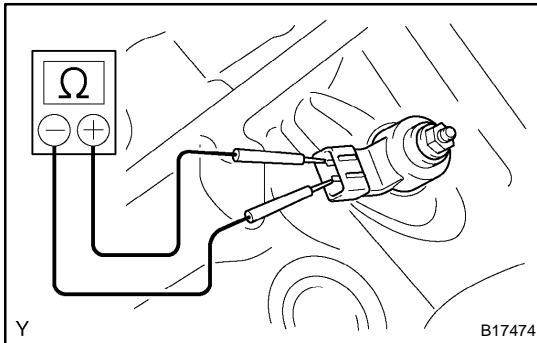
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

γ

INSPECTION

1. REMOVE THROTTLE BODY COVER
2. REMOVE INTAKE AIR CONNECTOR
3. REMOVE INTAKE MANIFOLDS ASSEMBLY
(See page [EM-36](#))

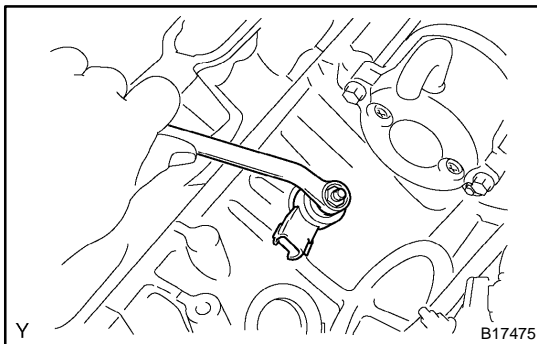


4. **INSPECT KNOCK SENSORS 1 AND 2**
 - (a) Disconnect the knock sensor connectors.
 - (b) Using an ohmmeter, measure the resistance between terminals.

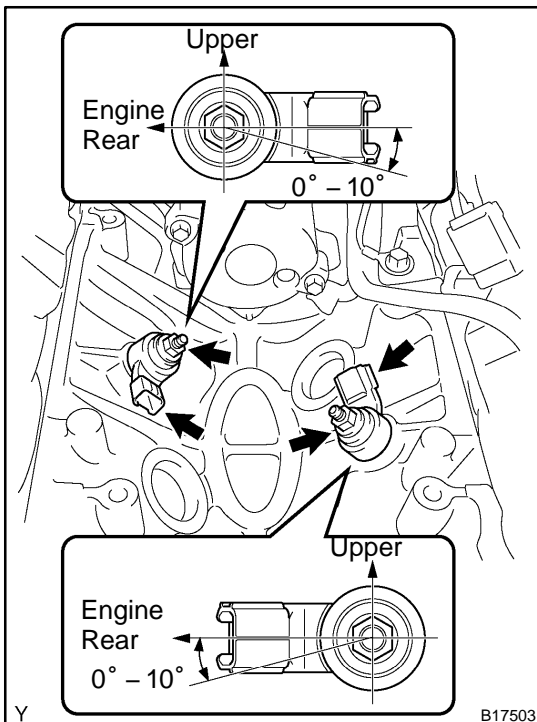
Resistance: 120 to 280 k Ω at 20°C (68°F)

HINT:

If the resistance is not as specified, replace the sensor.



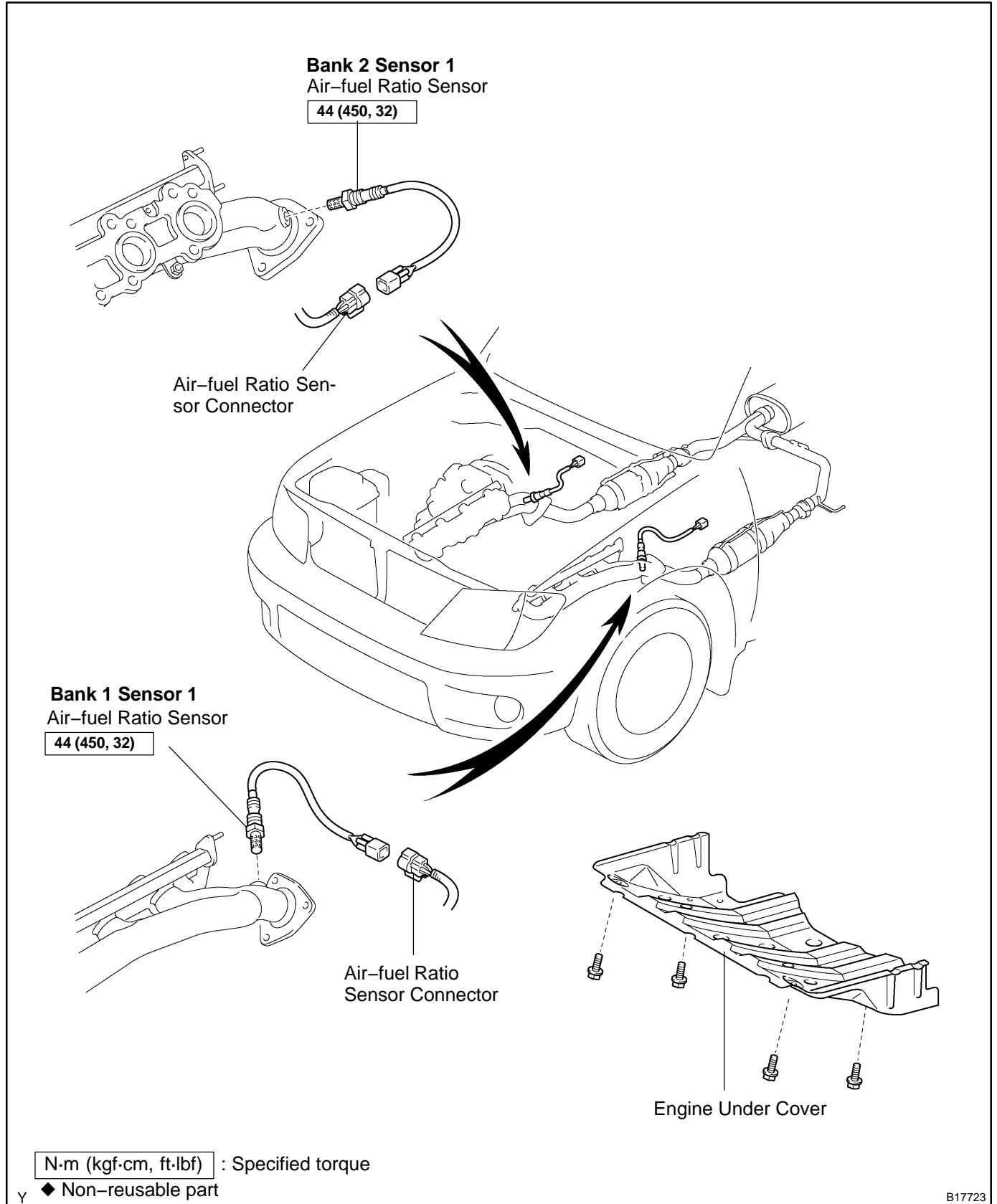
5. **REMOVE KNOCK SENSOR**
 - (a) Disconnect the 2 knock sensor connectors.
 - (b) Remove the 2 nuts and 2 knock sensors.

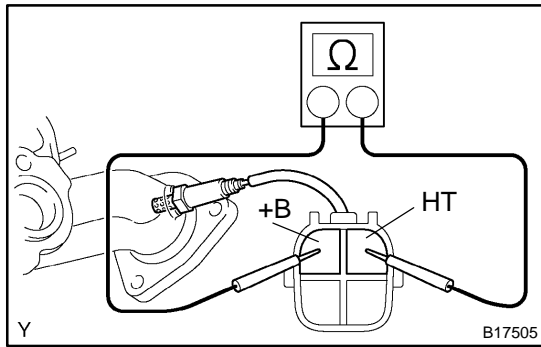


6. **INSTALL KNOCK SENSOR**
 - (a) Install the 2 knock sensors with the 2 nuts as shown in the illustration.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
 - (b) Connect the 2 knock sensor connectors.
7. **INSTALL INTAKE MANIFOLD ASSEMBLY**
(See page [EM-60](#))
8. **INSTALL INTAKE AIR CONNECTOR**
9. **INSTALL THROTTLE BODY COVER**

AIR-FUEL RATIO (A/F) SENSOR COMPONENTS

SF1XV-02





INSPECTION

1. INSPECT HEATER RESISTANCE OF AIR FUEL RATIO SENSOR

- (a) Disconnect the air fuel ratio sensor connector.
- (b) Using an ohmmeter, measure the resistance between terminals +B and HT.

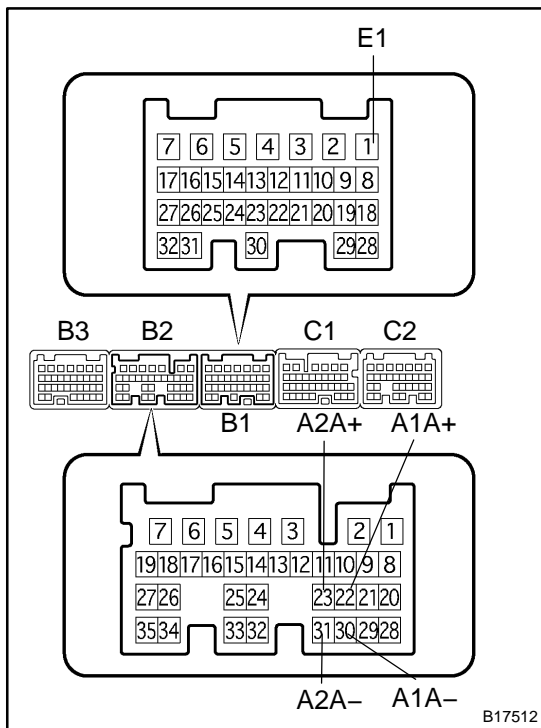
Resistance 11 to 16 kΩ at 20°C (68°F)

If the resistance is not as specified, replace the sensor.

Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)

- (c) Reconnect the air fuel ratio sensor connector.

2. INSPECT OPERATION OF AIR FUEL RATIO SENSOR (See page [DI-507](#))



3. INSPECT AIR-FUEL RATIO COMPENSATION SYSTEM

- (a) Measure the voltage between the terminals of the ECM connectors.

Standard:

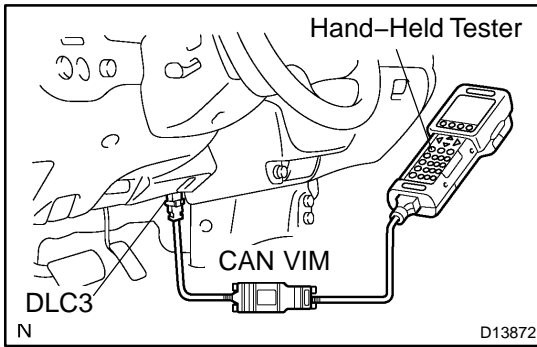
Tester Connection	Condition	Specified Condition
B2-22 (A1A+) - B1-1 (E1)	Ignition switch ON	3.3 V
B2-30 (A1A-) - B1-1 (E1)	Ignition switch ON	2.9 V
B2-23 (A2A+) - B1-1 (E1)	Ignition switch ON	3.3 V
B2-31 (A2A-) - B1-1 (E1)	Ignition switch ON	2.9 V

NOTICE:

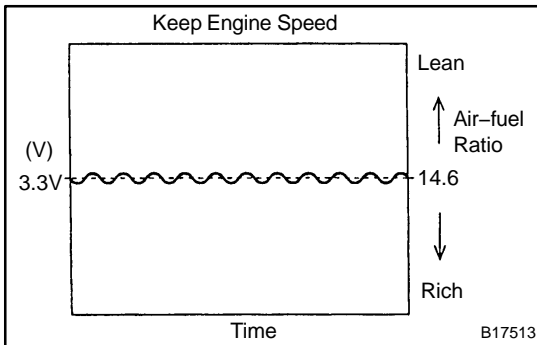
Connect test leads from the back side of the connector. The connectors should not be disconnected from the ECM.

HINT:

The voltage between the terminals of the ECM is kept constant regardless of the voltage of the A/F sensor.



- (b) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (c) Turn the ignition switch ON.
- (d) Select the following menu items : Data List / A/FS B1 S1 and O2S B1 S2.
- (e) Warm up the A/F sensor by running the engine at 2,500 rpm for approximately 2 minutes.



- (f) Keep the engine speed at 2,500 rpm and confirm that the display of the "A/FS B1 S1" is as shown in the illustration.

HINT:

- The illustration may slightly differ from the display on the hand-held tester.
 - The waveform of the A/F sensor is displayed only on the hand-held tester.
- (g) Confirm that the display of the "O2S B1 S2" changes between 0 and 1 V with the engine speed at 2,500 rpm.

OK:

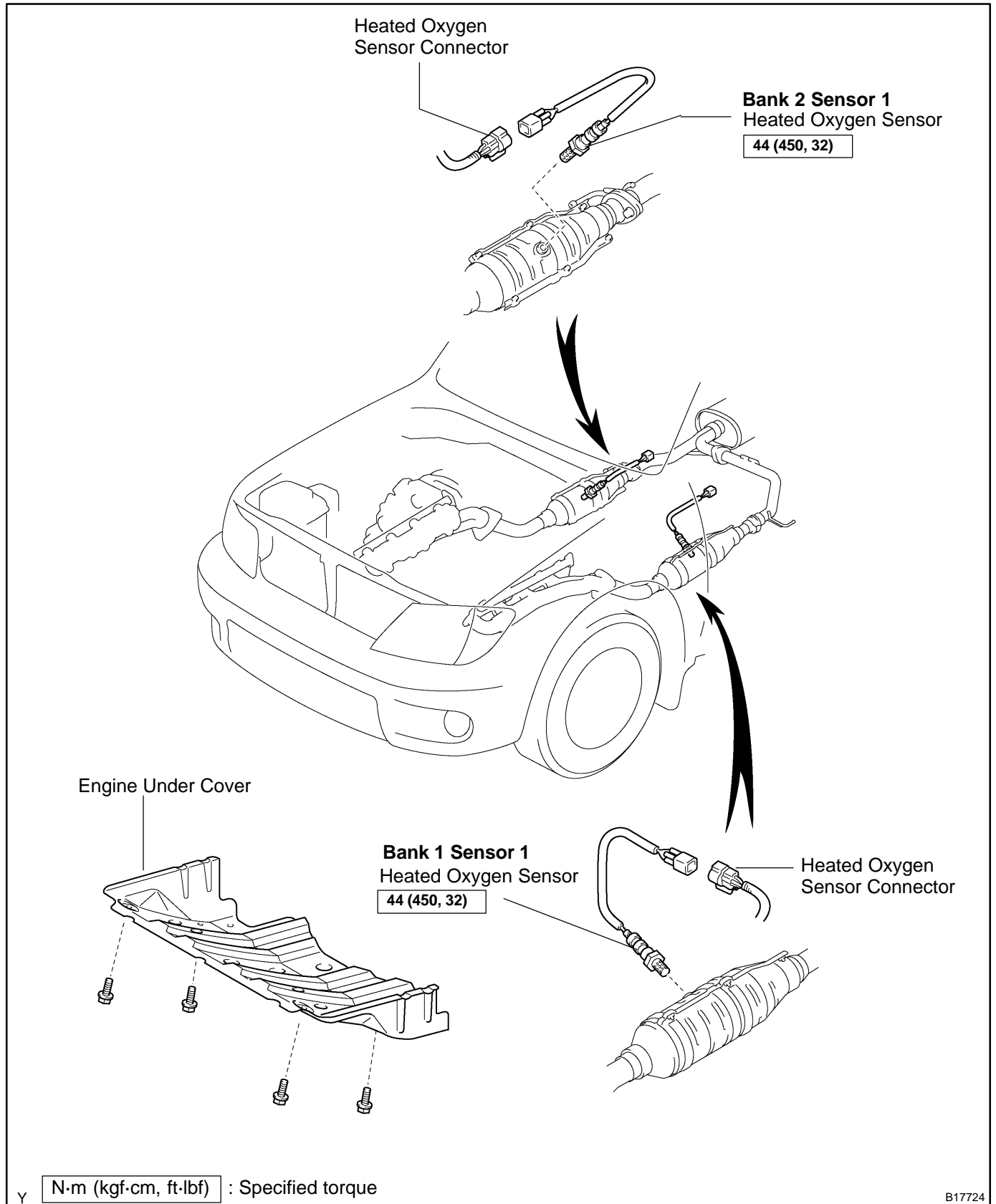
The voltage output oscillates more than 8 times in 10 seconds.

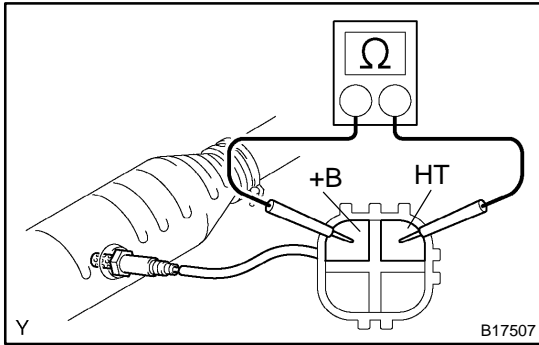
CAUTION:

- Perform the check immediately after warming up the engine.
- If the voltage variation could not be verified, warm up the heated oxygen sensor again. If it could not be verified even after warming up the sensor again, check the DTC No. (See page [DI-507](#))

HEATED OXYGEN SENSOR COMPONENTS

SFOY9-12





INSPECTION

1. INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSOR

- Disconnect the oxygen sensor connector.
- Using an ohmmeter, measure the resistance between terminals +B and HT.

Resistance: 11 to 16 Ω at 20°C (68°F)

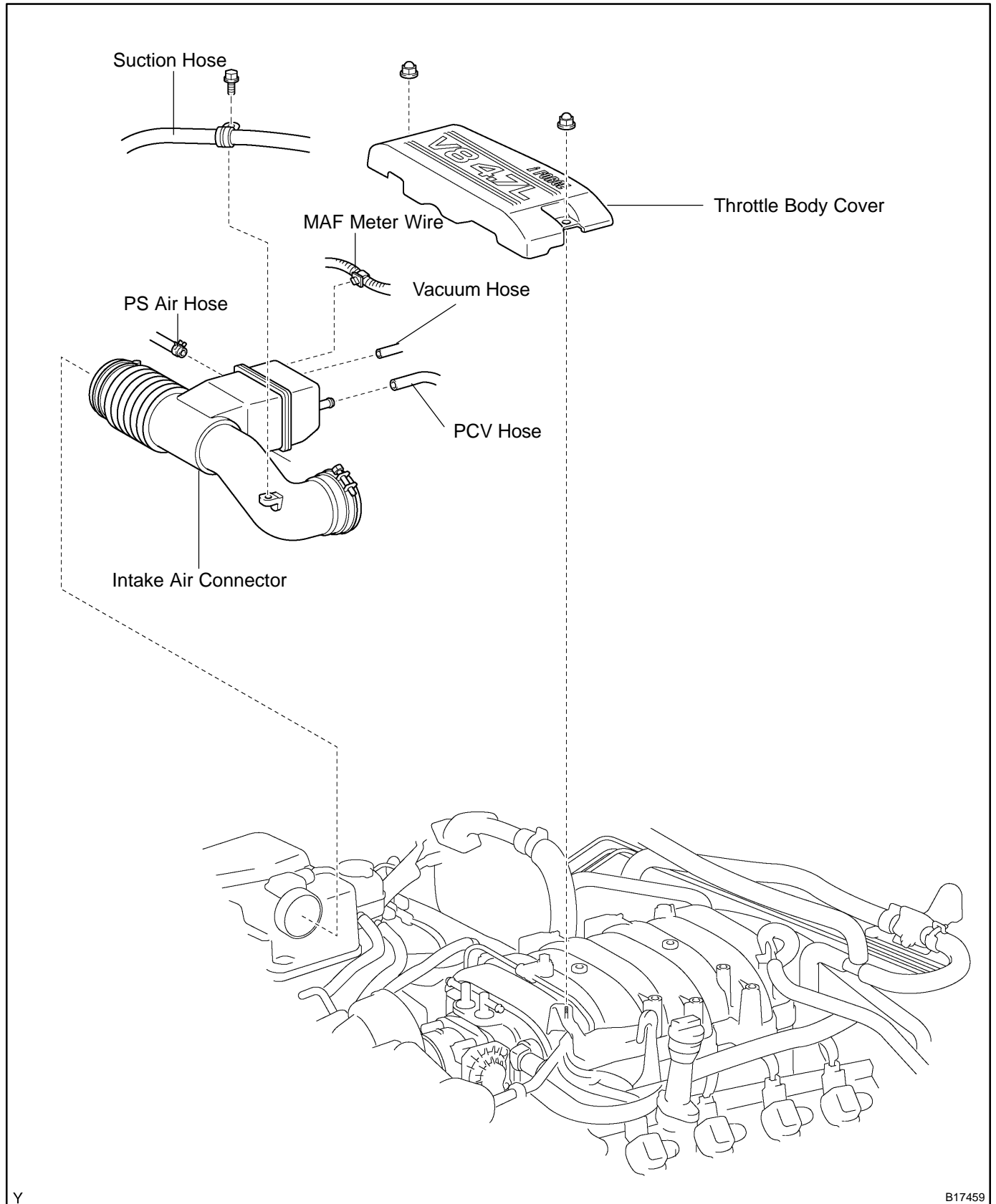
If the resistance is not as specified, replace the sensor.

Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)

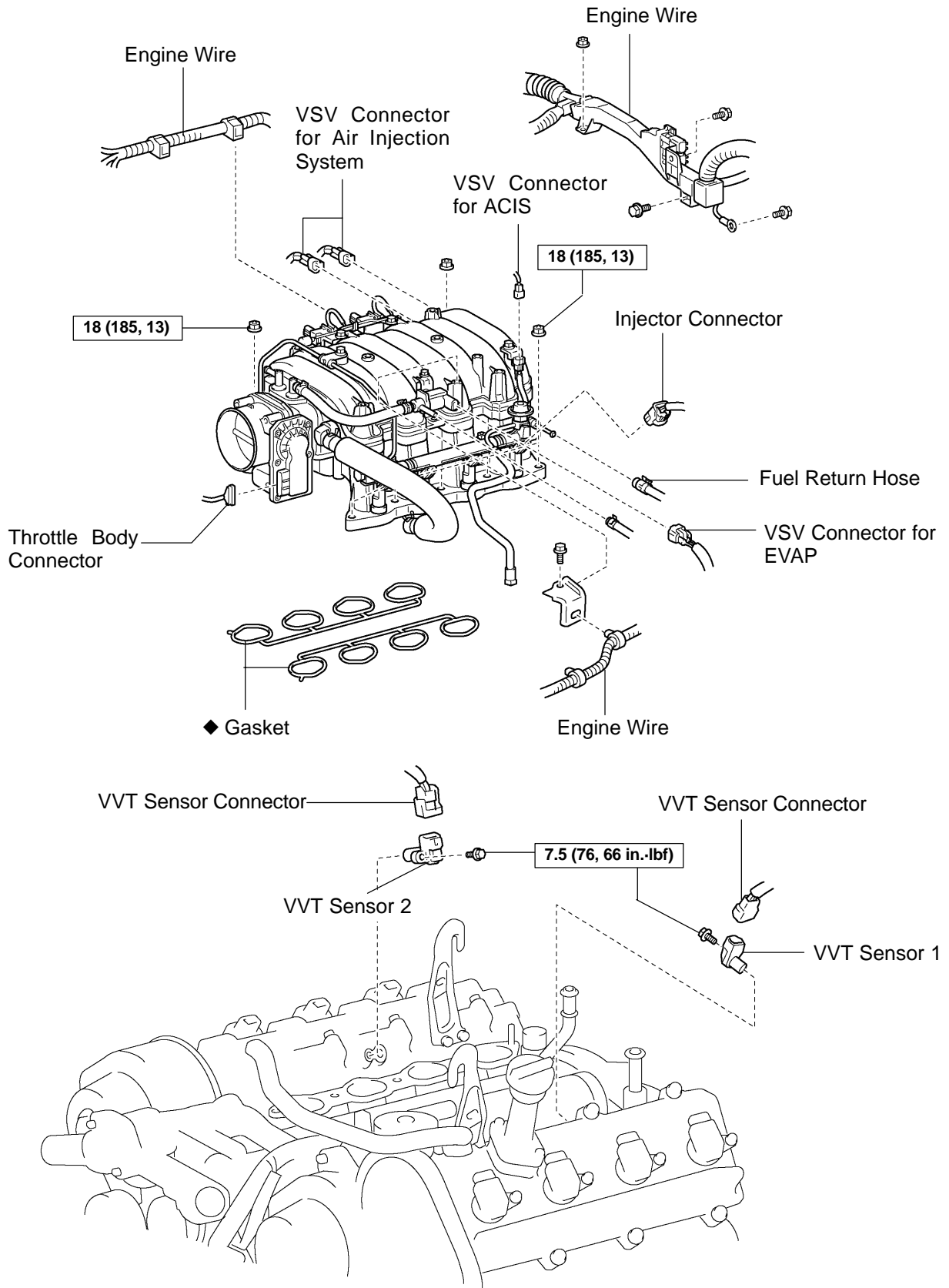
- Reconnect the oxygen sensor connector.
- ### 2. INSPECT OPERATION OF HEATED OXYGEN SENSOR (See page [DI-512](#))

VVT SENSOR COMPONENTS

SF1XX-01



SFI (2UZ-FE) - VVT SENSOR



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

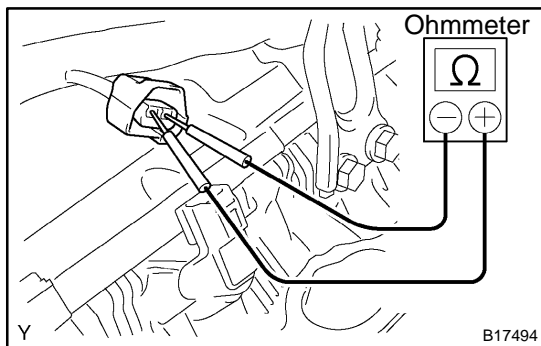
Y

INSPECTION

NOTICE:

”Cold” and ”Hot in these sentences express the temperature of the sensors themselves. ”Cold” is from -10°C (14°F) to 50°C (122°F) and ”Hot” is from 50°C (122°F) to 100°C (212°F).

1. REMOVE THROTTLE BODY COVER
2. REMOVE INTAKE MANIFOLD ASSEMBLY
(See page [EM-36](#))
3. INSPECT VVT SENSOR RESISTANCE
 - (a) Disconnect the VVT sensor connector.



- (b) Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Cold	835 to 1,400 Ω
Hot	1,060 to 1,645 Ω

If the resistance is not as specified, replace the sensor.

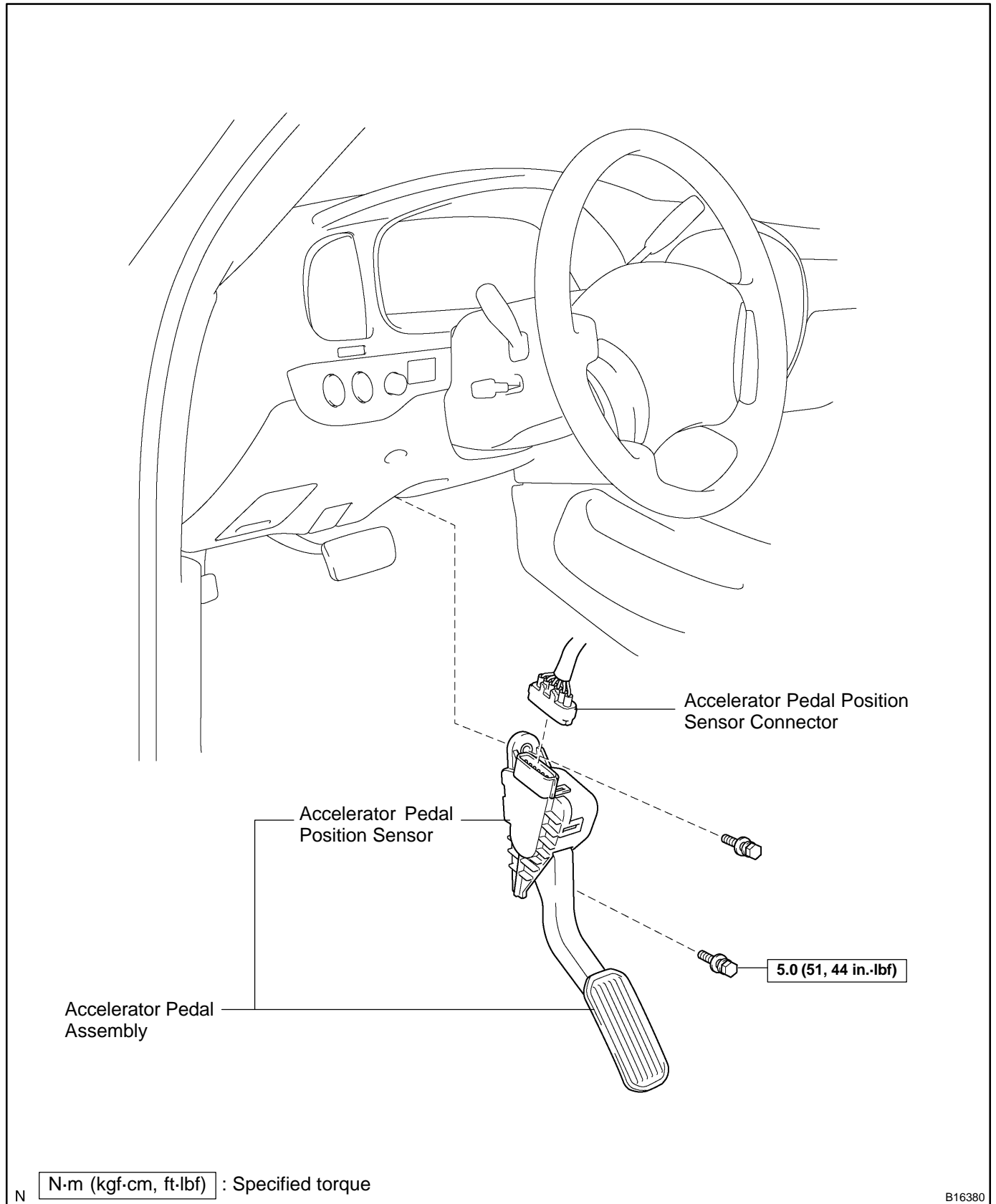
- (c) Reconnect the VVT sensor connector.
- (d) Connect the VVT sensor connector.
4. REINSTALL INTAKE MANIFOLD ASSEMBLY
(See page [EM-60](#))
5. REINSTALL THROTTLE BODY COVER

REPLACEMENT

1. REMOVE THROTTLE BODY COVER
2. REMOVE INTAKE MANIFOLD ASSEMBLY
(See page [EM-36](#))
3. REMOVE VVT SENSOR
 - (a) Disconnect the VVT sensor connector.
 - (b) Remove the bolt and VVT sensor.
4. INSTALL VVT SENSOR
 - (a) Attach a new VVT sensor to the cylinder head.
 - (b) Install the VVT sensor with the bolt.
Torque: 6.5 N·m (65 kgf·cm, 58 in.-lbf)
5. REINSTALL INTAKE MANIFOLD ASSEMBLY
(See page [EM-60](#))
6. REINSTALL THROTTLE BODY COVER

ACCELERATOR PEDAL POSITION SENSOR COMPONENTS

SF1UM-05



INSPECTION

INSPECT ACCELERATOR PEDAL POSITION SENSOR (See page [DI-794](#))

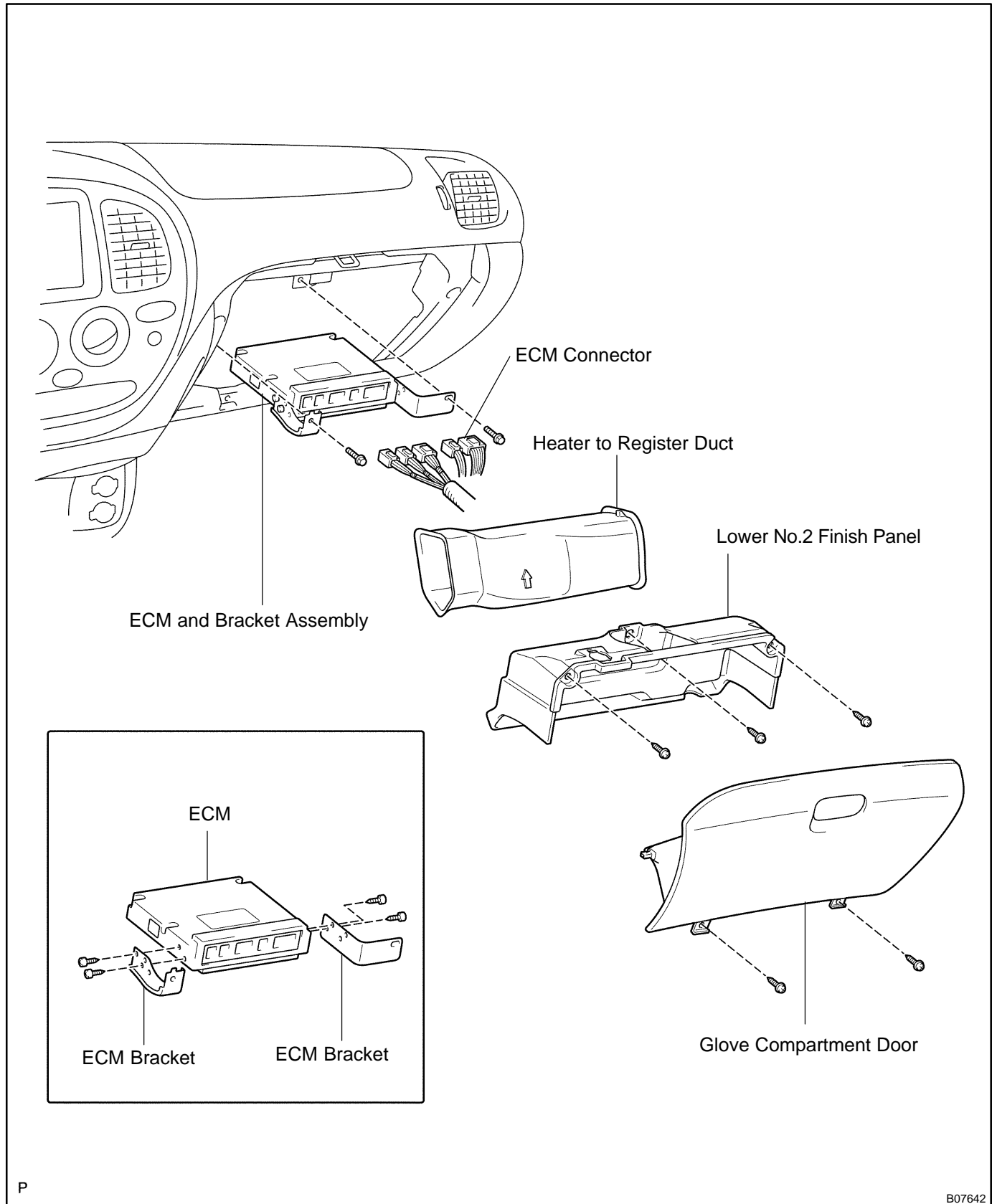
If necessary, replace the accelerator pedal assembly.

NOTICE:

- Be care not to give a shock to the accelerator pedal assembly.
- Be care not to disassemble the accelerator pedal assembly.

ENGINE CONTROL MODULE (ECM) COMPONENTS

SFO00-14



INSPECTION

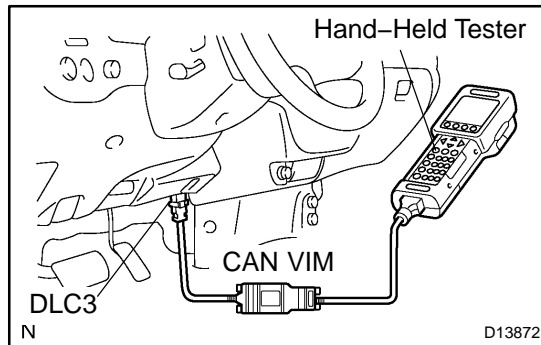
1. **DISCONNECT CABLE FROM NEGATIVE (-) BATTERY TERMINAL**
2. **REMOVE REMOVE GLOVE COMPARTMENT**
 - (a) Remove the 2 screws and glove compartment door.
 - (b) Remove the 3 screws and lower No.2 finish panel.
3. **REMOVE HEATER TO REGISTER DUCT**
4. **REMOVE ECM**
 - (a) Disconnect the 5 connectors.
 - (b) Remove the 2 bolts and ECM.
5. **INSPECT ECM (See page [DI-453](#))**
6. **REINSTALL ECM**
 - (a) Install the ECM with the 2 bolts.
 - (b) Connect the 5 connectors.
7. **INSTALL HEATER TO REGISTER DUCT**
8. **INSTALL GLOVE COMPARTMENT**
 - (a) Install the lower No.2 finish panel with 3 screws.
 - (b) Install the glove compartment door with the 2 screws.
9. **CONNECT CABLE TO NEGATIVE (-) BATTERY TERMINAL**

FUEL CUT RPM INSPECTION

SFO02-16

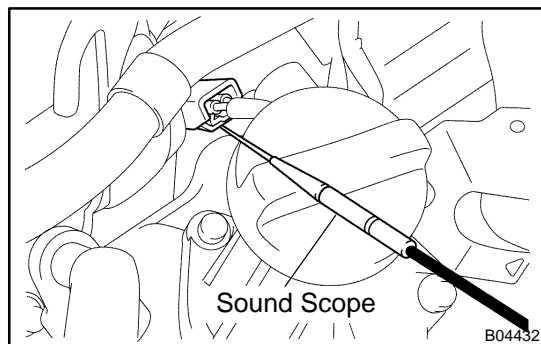
1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT HAND-HELD TESTER

- (a) Connect a hand-held tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).
- (b) Please refer to the hand-held tester operator's manual for further details.



3. INSPECT FUEL CUTOFF RPM OPERATION

- (a) Increase the engine speed to at least 2,500 rpm.
- (b) Check for injector operating noise.
- (c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT:

- The vehicle should be stopped.
- Measure with the A/C OFF.

Fuel return speed: 1,400 rpm

- (d) Disconnect the hand-held tester and CAN VIM from the DLC3.

COOLANT INSPECTION

CO1D4-01

HINT:

Check the coolant level when the engine is cold.

1. CHECK ENGINE COOLANT LEVEL AT RADIATOR RESERVOIR

The engine coolant level should be between the "LOW" and "FULL" lines at normal temperature (20°C(68°F)).

If low, check for leaks and add "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology up to the "FULL" line.

2. CHECK ENGINE COOLANT QUALITY

(a) Remove the radiator cap.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) There should not be any excessive deposits of rust or scale around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, clean the coolant passages and replace the coolant.

(c) Reinstall the radiator cap.

REPLACEMENT

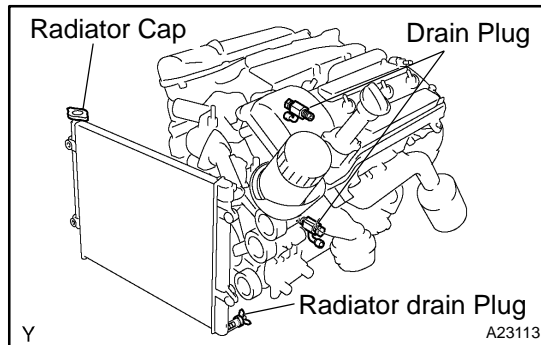
CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot as fluid and steam can be blown out under pressure.

1. REMOVE ENGINE UNDER COVER

2. DRAIN ENGINE COOLANT

(a) Remove the radiator cap.



(b) Remove the 3 drain plugs on the engine and radiator, and drain the coolant.

(c) Close the 3 drain plugs.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf) for engine

3. REFILL WITH ENGINE COOLANT

(a) Slowly fill the system with coolant.

Capacity: 11.6 liters (12.3 US qts, 10.2 Imp. qts)

NOTICE:

Do not use plain water alone.

HINT:

- Use of improper coolants may damage the engine cooling system.
- Use "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology.
- New Toyota vehicles are filled with Toyota Super Long Life Coolant (color is pink, premixed ethylene glycol concentration is approximately 50 % and freezing temperature is -35°C (-31°F)). When replacing the coolant, Toyota Super long Life Coolant is recommended.
- Observe the coolant level inside the radiator by pressing the inlet and outlet radiator hoses several times by hand. if the coolant level goes down, add the coolant.

(b) Install the radiator cap.

(c) Bleed the cooling system.

(1) Start the engine, and open the heater water valve.

(2) Maintain the engine speed at 2,000 – 2,500 rpm, and warm up the engine.

(d) Stop the engine, and wait until the engine coolant cools down.

(e) Refill coolant into the reservoir until it is "FULL".

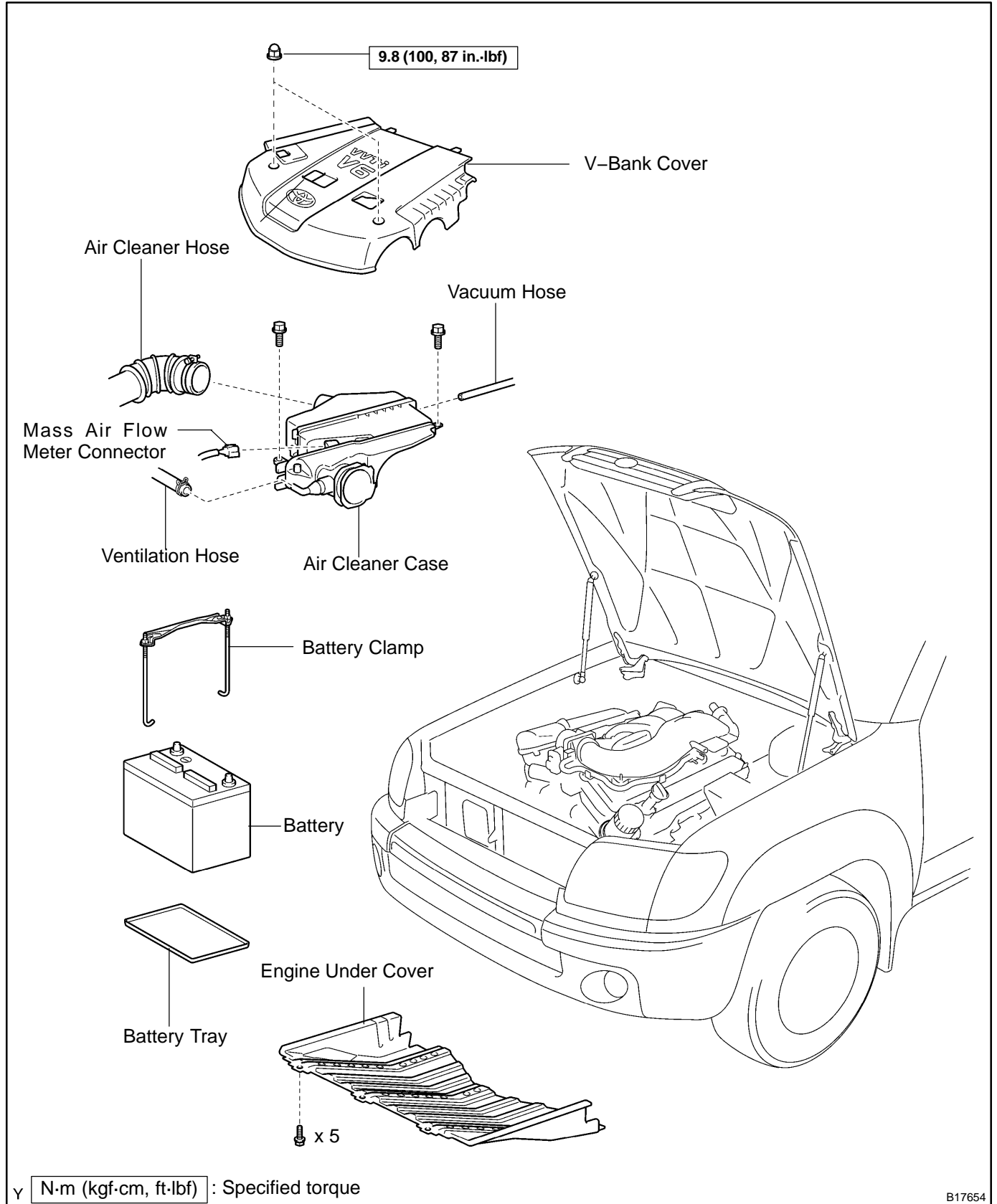
4. CHECK FOR ENGINE COOLANT LEAKS

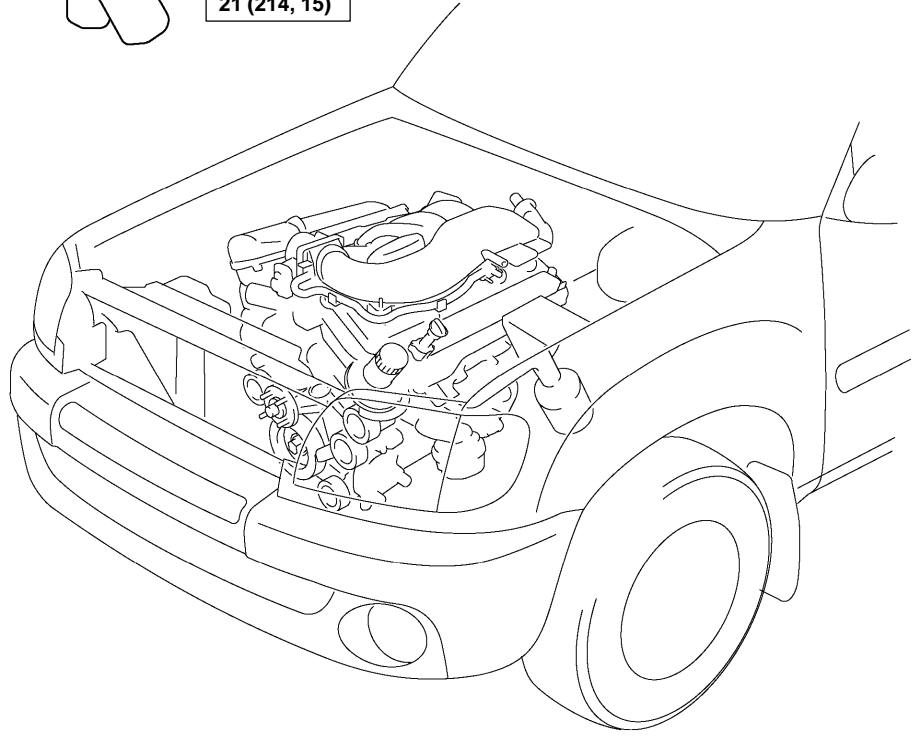
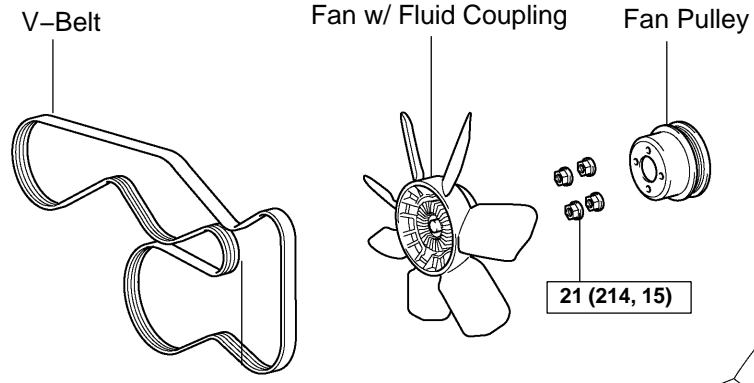
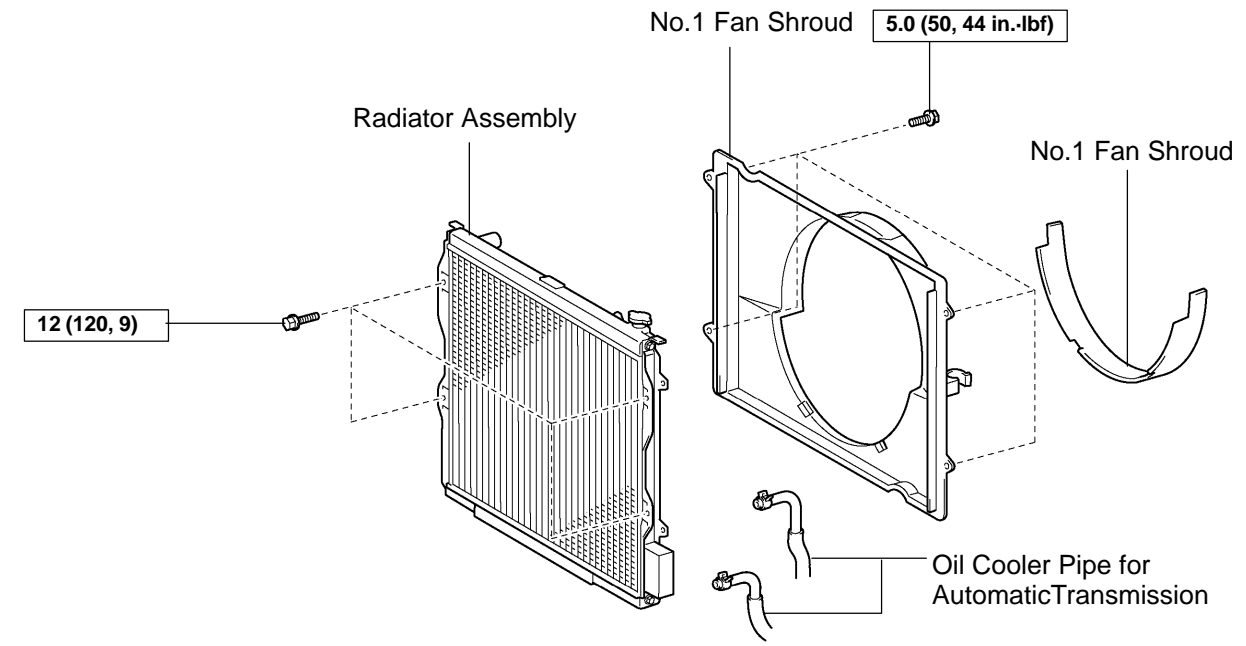
5. CHECK ENGINE COOLANT SPECIFIC GRAVITY CORRECTLY

6. REINSTALL ENGINE UNDER COVER

WATER PUMP COMPONENTS

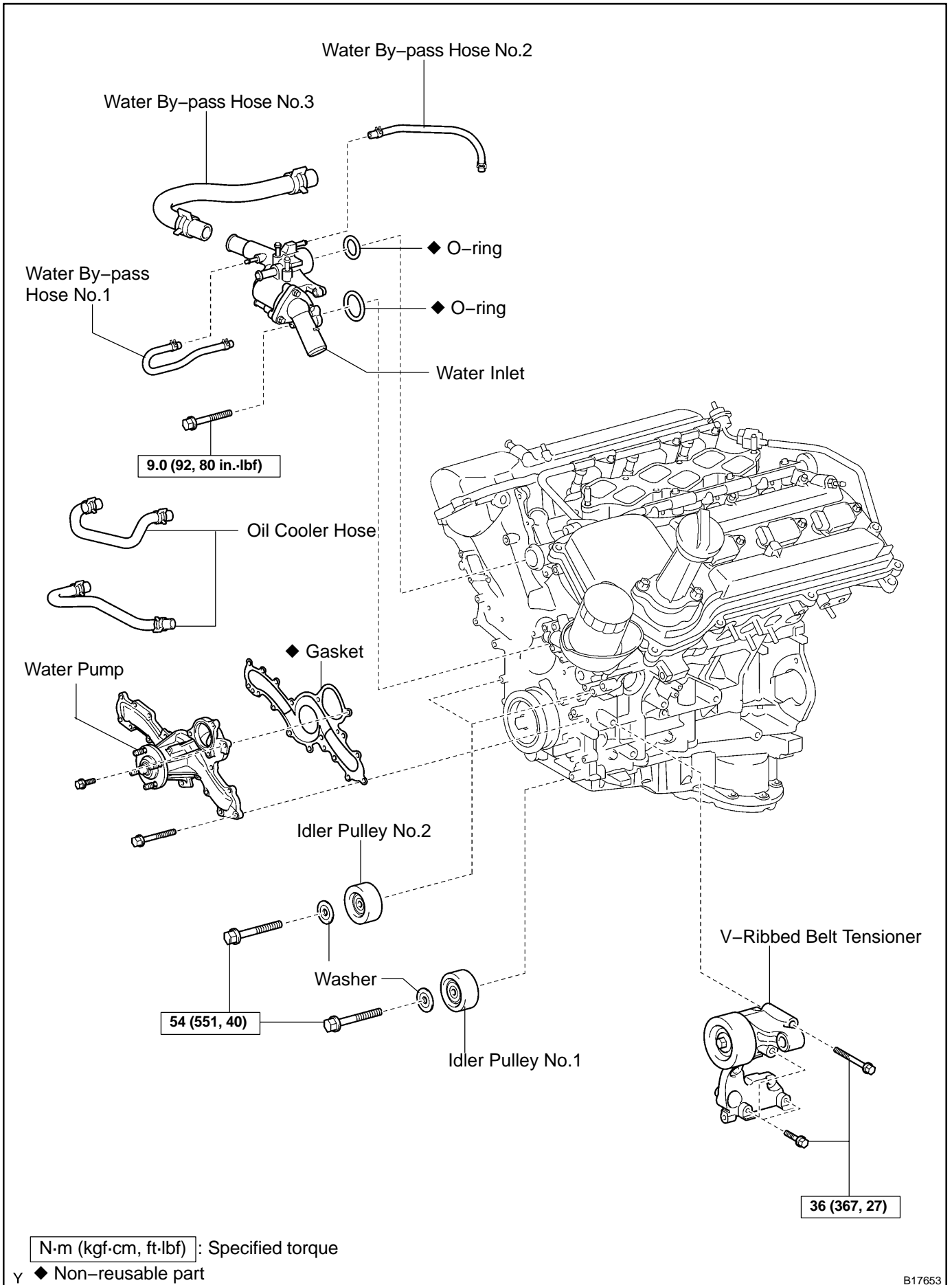
CO1D6-01





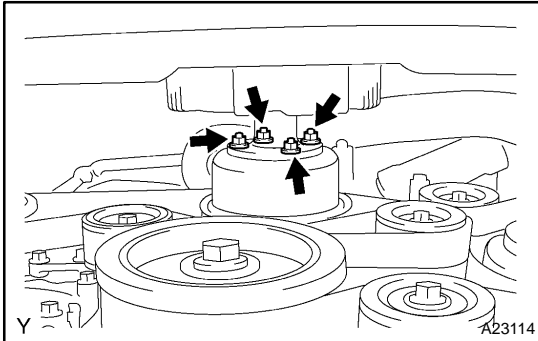
Y **N·m (kgf·cm, ft·lbf)** : Specified torque

COOLING (1GR-FE) - WATER PUMP

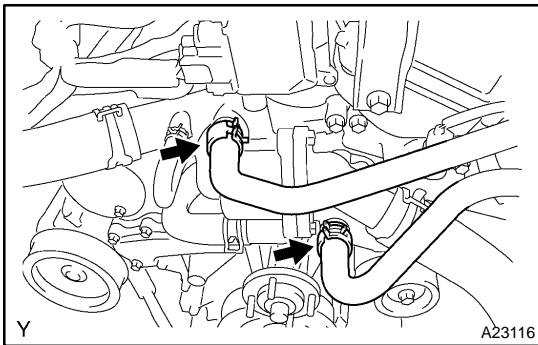


REMOVAL

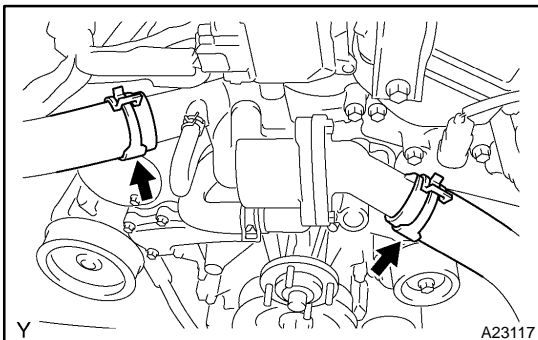
1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE V-BANK COVER



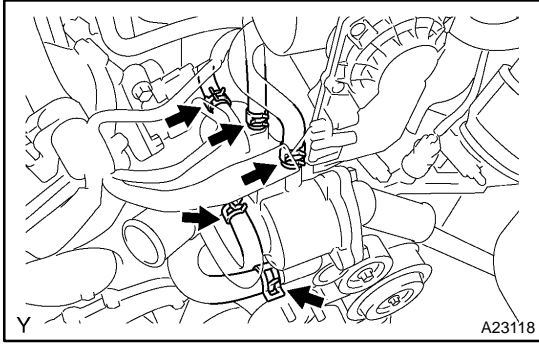
4. **LOOSEN FAN W/ FLUID COUPLING**
 - (a) Loosen the 4 fluid coupling bolts.
5. **REMOVE FAN AND GENERATOR V BELT**
(See page [EM-62](#))
6. **REMOVE FAN W/ FLUID COUPLING**
 - (a) Disconnect the radiator reserve tank hose.
 - (b) Remove the 4 fan shroud bolts.
 - (c) Remove the 4 fluid coupling nuts, and then remove the fan w/ fluid coupling and fan shroud together.
 - (d) Remove the fan pulley.
7. **DISCONNECT VENTILATION HOSE NO.2**
8. **REMOVE AIR CLEANER**



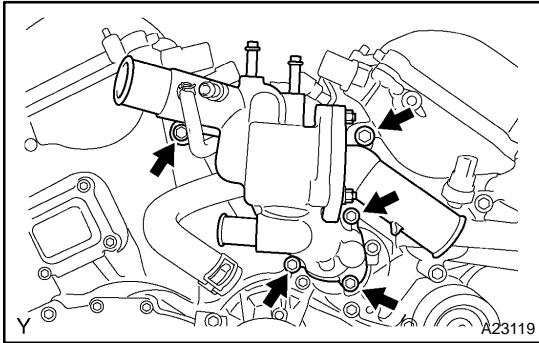
9. **REMOVE WATER INLET**
 - (a) Disconnect the 2 oil cooler hoses (w/ oil cooler).



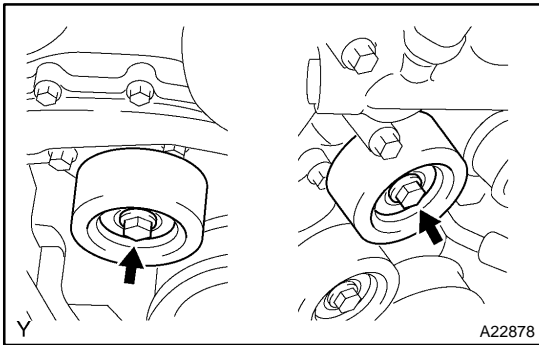
- (b) Disconnect the 2 radiator hoses.



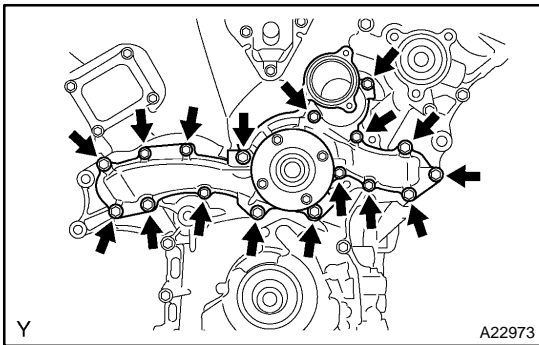
(c) Disconnect the 5 water by-pass hoses.



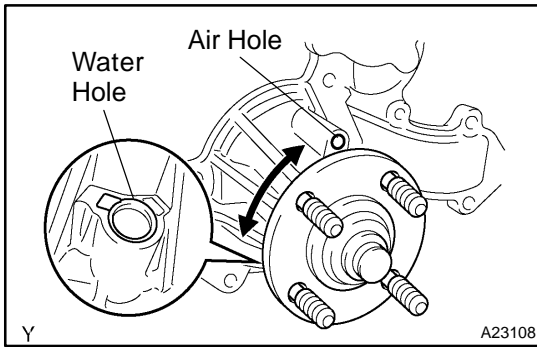
(d) Remove the 5 bolts and water inlet.
 (e) Remove the O-ring from the water outlet pipe.
 (f) Remove the gasket from the water pump.



10. REMOVE IDLER PULLEY NO.2
 (a) Remove the 2 bolts and 2 idler pulleys.
11. REMOVE GENERATOR (See page CH-7)
12. SEPARATE COOLER COMPRESSOR (See page EM-105)
13. REMOVE V-RIBBED BELT TENSIONER (See page EM-32)



14. REMOVE WATER PUMP
 (a) Remove the 17 bolts, water pump and gasket.



INSPECTION

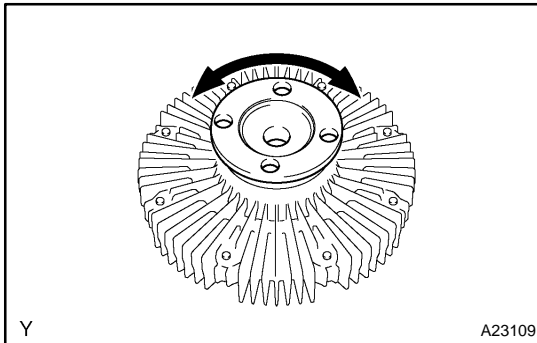
1. INSPECT WATER PUMP

- (a) Visually check the air hole and water hole for coolant leakage.

If leakage is found, replace the water pump and timing belt.

- (b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.

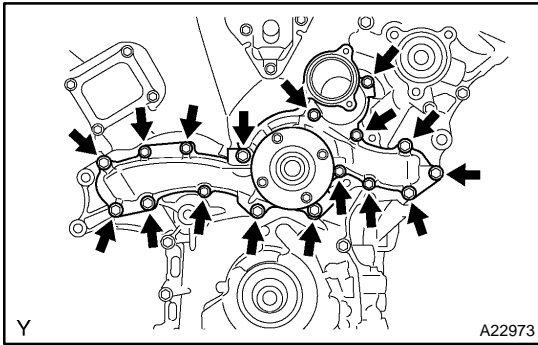
If necessary, replace the water pump.



2. INSPECT FLUID COUPLING

- (a) Check that the fluid coupling is not damaged and that no silicon oil leaks.

If necessary, replace the fluid coupling.



INSTALLATION

1. INSTALL WATER PUMP

- (a) Install a new gasket and the water pump with the 17 bolts.

Torque:

9.0 N·m (92 kgf·cm, 80 in.-lbf) for 10 mm (0.39 in.) head

23 N·m (235 kgf·cm, 17 ft.-lbf) for 12 mm (0.47 in.) head

2. INSTALL V-RIBBED BELT TENSIONER ASSY

(See page [EM-44](#))

3. INSTALL COOLER COMPRESSOR

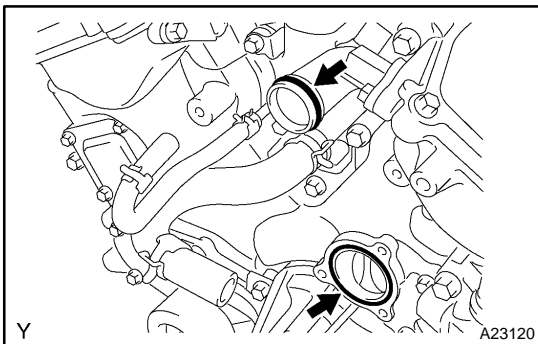
(See page [EM-108](#))

4. INSTALL GENERATOR (See page [CH-15](#))

5. INSTALL IDLER PULLEY

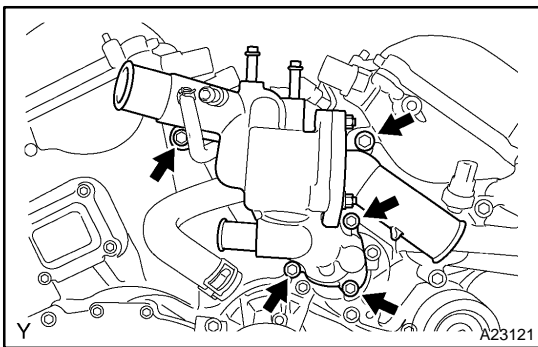
- (a) Install the 2 idler pulleys with the 2 bolts.

Torque: 39 N·m (398 kgf·cm, 29 ft.-lbf)



6. INSTALL WATER INLET

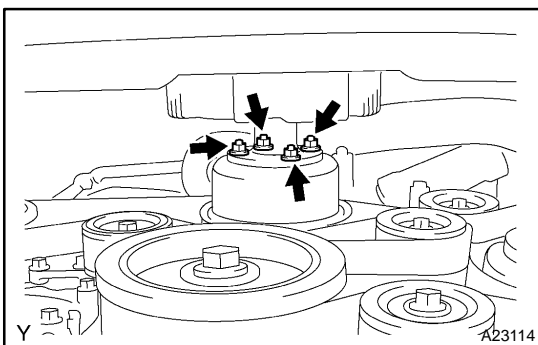
- (a) Install a new O-ring to the water outlet pipe.
 (b) Install a new gasket to the water pump.
 (c) Apply soapy water to the O-ring.



- (d) Install the water inlet with the 5 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)
 (e) Connect the 5 water by-pass hoses.
 (f) Connect the 2 radiator hoses.
 (g) Connect the 2 oil cooler hoses (w/ oil cooler).

7. INSTALL AIR CLEANER

8. CONNECT VENTILATION HOSE NO.2



9. INSTALL FAN W/ FLUID COUPLING

- (a) Put the fan pulley to the water pump.
 (b) Put the fan w/ fluid coupling and fan shroud together.
 (c) Temporarily install the 4 fluid coupling nuts.
 (d) Tighten the 4 fan shroud bolts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)
 (e) Connect the reserve tank hose.
 (f) Fasten the 2 oil cooler hoses with the hose clamp.

10. **INSTALL FAN AND GENERATOR V BELT**
(See page [EM-89](#))
11. **FULLY TIGHTEN FAN W/ FLUID COUPLING**
 - (a) Tighten the 4 fluid coupling bolts.
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)
12. **ADD ENGINE COOLANT (See page [CO-2](#))**
13. **CHECK FOR ENGINE COOLANT LEAKS**
14. **INSTALL ENGINE UNDER COVER**
 - (a) Install the engine under cover with the 4 bolts.
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)
15. **INSTALL V-BANK COVER**
 - (a) Install the V-bank cover with the 2 nuts.
Torque: 9.8 N·m (100 kgf·cm, 87 in·lbf)
16. **RECHECK ENGINE COOLANT LEVEL**
17. **FILL WITH ENGINE COOLANT**
18. **START ENGINE AND CHECK FOR ENGINE COOLANT LEAKS**
19. **RECHECK ENGINE COOLANT LEVEL**

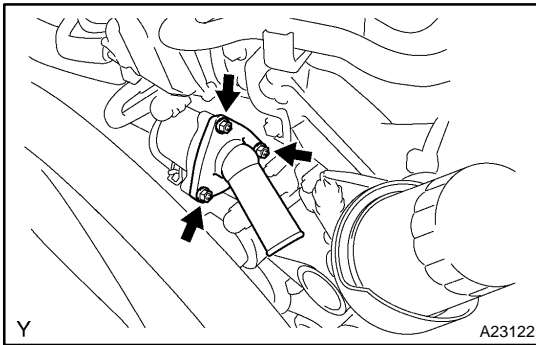
THERMOSTAT REMOVAL

CO1DA-01

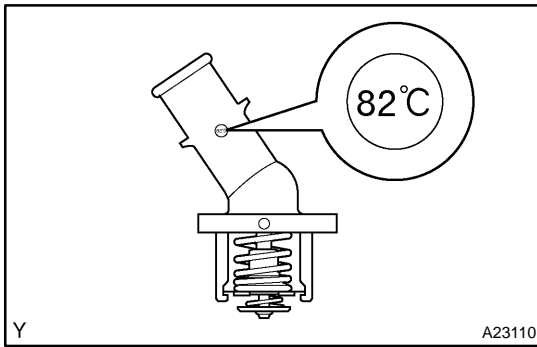
HINT:

If the thermostat was not installed, cooling efficiency would be harmed. If the engine should tend to overheat, do not remove the thermostat.

1. **DRAIN ENGINE COOLANT (See page CO-2)**
2. **REMOVE V-BANK COVER**
3. **DISCONNECT RADIATOR OUTLET, NO.2 HOSE CLAMP OR CLIP**



4. **REMOVE WATER INLET W/THERMOSTAT**
 - (a) Remove the 3 nuts, water inlet w/ thermostat and gasket.

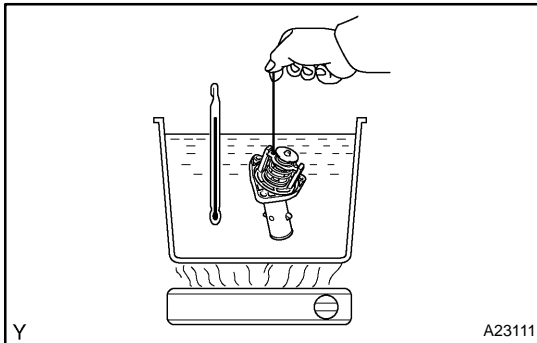


INSPECTION

INSPECT THERMOSTAT

HINT:

The valve opening temperature is inscribed on the thermostat.



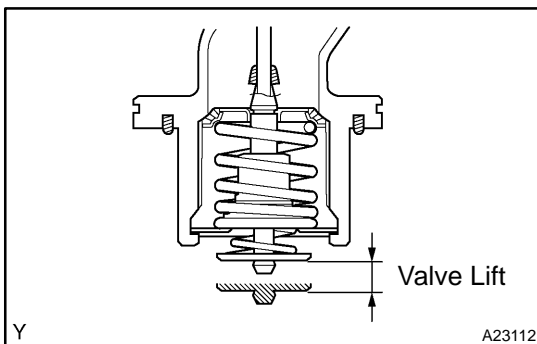
(a) Immerse the thermostat in the water, then heat the water gradually.

(b) Check the valve opening temperature of the thermostat.

Valve opening temperature:

80 to 84°C (176 to 183°F)

If the valve opening temperature is not as specified, replace the thermostat.



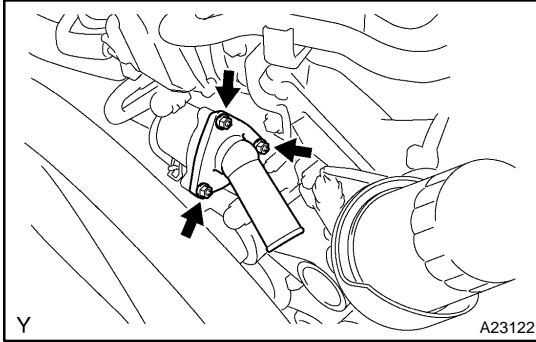
(c) Check the valve lift.

Valve lift: 8 mm (0.31 in.) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperature (below 40 °C (104 °F)).

If not fully closed, replace the thermostat.



INSTALLATION

1. INSTALL WATER INLET W/THERMOSTAT

- (a) Install a new gasket to the water inlet w/ thermostat.
- (b) Install the water inlet w/ thermostat with the 3 nuts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)

2. CONNECT RADIATOR OUTLET, NO.2 HOSE CLAMP OR CLIP

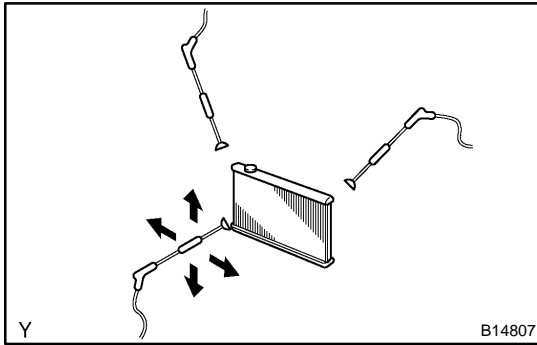
3. ADD ENGINE COOLANT (See page [CO-2](#))

4. CHECK FOR ENGINE COOLANT LEAKS

5. INSTALL V-BANK COVER

Install the V-bank cover with the 2 nuts.

Torque: 9.8 N·m (100 kgf·cm, 87 in.-lbf)



RADIATOR ON-VEHICLE CLEANING

CO1DD-01

INSPECT FINS FOR BLOCKAGE

If fins are clogged, wash them with water or a steam cleaner and dry with compressed air.

NOTICE:

- If the distance between the steam cleaner and the core is too close, there is a possibility of damaging the fin, so keep the following injection distance.

Injection Pressure	Injection Distance
2,942 to 4,903 kpa (30 to 50 kg/cm ² , 427 to 711 psi)	300 mm (11.811 in)
4,903 to 7,845 kpa (50 to 80 kg/cm ² , 711 to 1,138 psi)	500 mm (19.685 in)

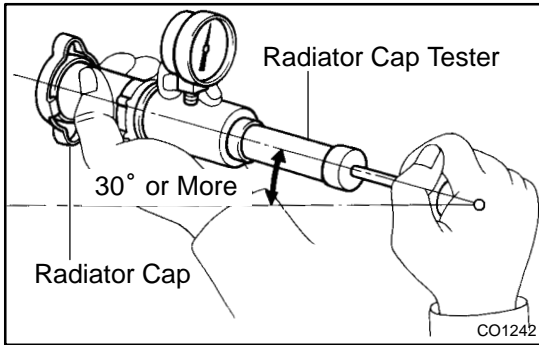
- If the fins are bent, straighten them with a screwdriver or pliers.
- Never apply water directly onto the electronic components.

ON-VEHICLE INSPECTION

1. REMOVE RADIATOR CAP

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



2. INSPECT RADIATOR CAP

NOTICE:

- If the radiator cap has contaminations, always rinse it with water.
 - Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.
 - When performing steps (a) and (b) below, keep the tester at an angle of over 30° above the horizontal.
- (a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the vacuum valve.

Pump speed: 1 push/(3 seconds or more)

NOTICE:

Push the pump at a constant speed.

If air is not coming from the vacuum valve, replace the radiator cap.

- (b) Pump the radiator cap tester, and measure the relief valve opening pressure.

Pump speed: 1 push within 1 second

NOTICE:

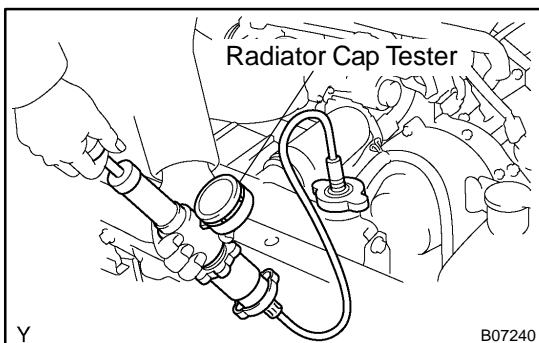
This pump speed is for the first pump only (in order to close the vacuum valve). After this, the pump speed can be reduced.

Opening pressure:

Standard	93 to 123 kPa (0.95 to 1.25 kgf/cm ² , 13.5 to 17.8 psi)
Minimum	78 kPa (0.8 kgf/cm ² , 11.4 psi)

HINT:

Use the tester's maximum reading as the opening pressure. If the opening pressure is less than minimum, replace the radiator cap.



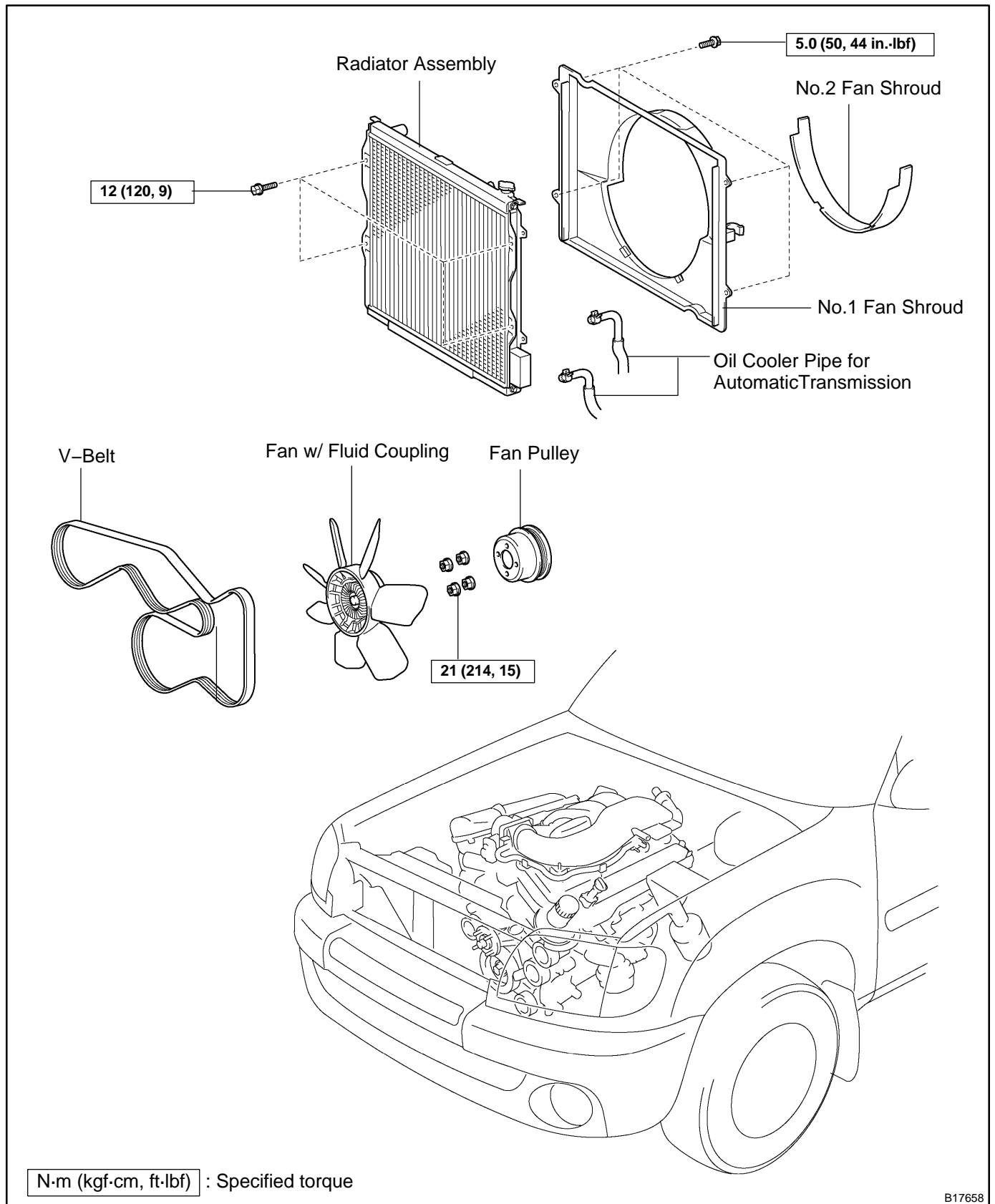
3. INSPECT COOLING SYSTEM FOR LEAKS

- (a) Fill the radiator with coolant and attach a radiator cap tester.
- (b) Warm up the engine.
- (c) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. REINSTALL RADIATOR CAP

COMPONENTS

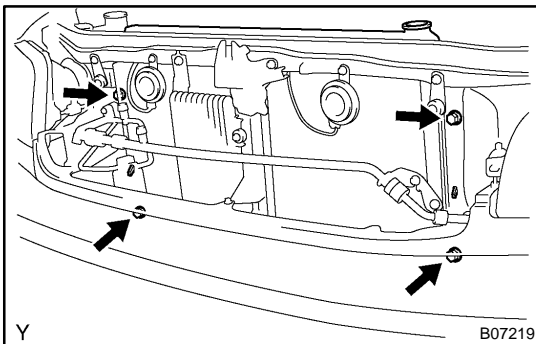


N·m (kgf·cm, ft·lbf) : Specified torque

REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. DISCONNECT RADIATOR RESERVOIR HOSE FROM RADIATOR
4. DISCONNECT UPPER RADIATOR HOSE FROM RADIATOR
5. DISCONNECT LOWER RADIATOR HOSE FROM RADIATOR
6. DISCONNECT A/T OIL COOLER HOSES FROM RADIATOR
7. REMOVE NO.2 FAN SHROUD

Remove the 2 clips and No.2 fan shroud.



8. REMOVE RADIATOR ASSEMBLY

Remove the 4 bolts and radiator assembly.

9. REMOVE NO.1 FAN SHROUD

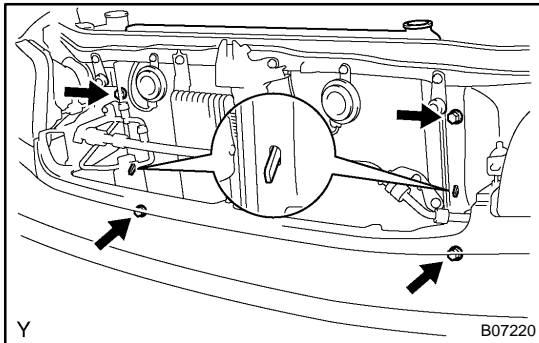
Remove the 4 bolts and No.1 fan shroud.

INSTALLATION

1. INSTALL NO.1 FAN SHROUD

Install the No.1 fan shroud with the 4 bolts.

Torque: 5.0 N·m (50 kgf·cm, 44 in.-lbf)



2. INSTALL RADIATOR ASSEMBLY

(a) Set the radiator bracket hooks to the radiator support holes.

(b) Install the 4 bolts.

Torque: 12 N·m (120 N·m, 9 ft·lbf)

3. INSTALL NO.2 FAN SHROUD

Install the No.2 fan shroud with the 2 clips.

4. CONNECT A/T OIL COOLER HOSES TO RADIATOR
5. CONNECT UPPER RADIATOR HOSE TO RADIATOR
6. CONNECT LOWER RADIATOR HOSE TO RADIATOR
7. CONNECT RADIATOR RESERVOIR HOSE TO RADIATOR
8. FILL WITH ENGINE COOLANT
9. START ENGINE AND CHECK FOR ENGINE COOLANT LEAKS
10. RECHECK ENGINE COOLANT LEVEL
11. INSTALL ENGINE UNDER COVER

COOLANT INSPECTION

COO10-03

HINT:

Check the coolant level when the engine is cold.

1. CHECK ENGINE COOLANT LEVEL AT RADIATOR RESERVOIR

The engine coolant level should be between the "LOW" and "FULL" lines at normal temperature (20°C(68°F)).

If low, check for leaks and add "TOYOTA Long Life Coolant" or equivalent up to the "FULL" line.

2. CHECK ENGINE COOLANT QUALITY

(a) Remove the radiator cap.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) There should not be any excessive deposits of rust or scale around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, clean the coolant passages and replace the coolant.

(c) Reinstall the radiator cap.

REPLACEMENT

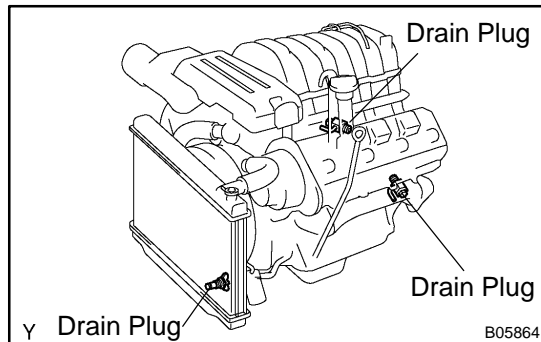
CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

1. REMOVE ENGINE UNDER COVER

2. DRAIN ENGINE COOLANT

(a) Remove the radiator cap.



(b) Remove the 3 drain plugs on the engine and radiator, and drain the coolant.

(c) Close the 3 drain plugs.

Torque: 12.7 N·m (130 kgf·cm, 9 ft·lbf) for engine

3. REFILL WITH ENGINE COOLANT

(a) Slowly fill the system with coolant.

Capacity: 11.6 liters (12.3 US qts, 10.2 Imp. qts)

NOTICE:

Do not use plain water alone.

HINT:

- Use of improper coolants may damage the engine cooling system.
- Use "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology.
- New Toyota vehicles are filled with Toyota Super Long Life Coolant (color is pink, premixed ethylene glycol concentration is approximately 50 % and freezing temperature is -35°C (-31°F)). When replacing the coolant, Toyota Super long Life Coolant is recommended.
- Observe the coolant level inside the radiator by pressing the inlet and outlet radiator hoses several times by hand. If the coolant level goes down, add the coolant.

(b) Install the radiator cap.

(c) Bleed the cooling system.

(1) Start the engine, and open the heater water valve.

(2) Maintain the engine speed at 2,000 – 2,500 rpm, and warm up the engine.

(d) Stop the engine, and wait until the engine coolant cools down.

(e) Refill coolant into the reservoir until it is "FULL".

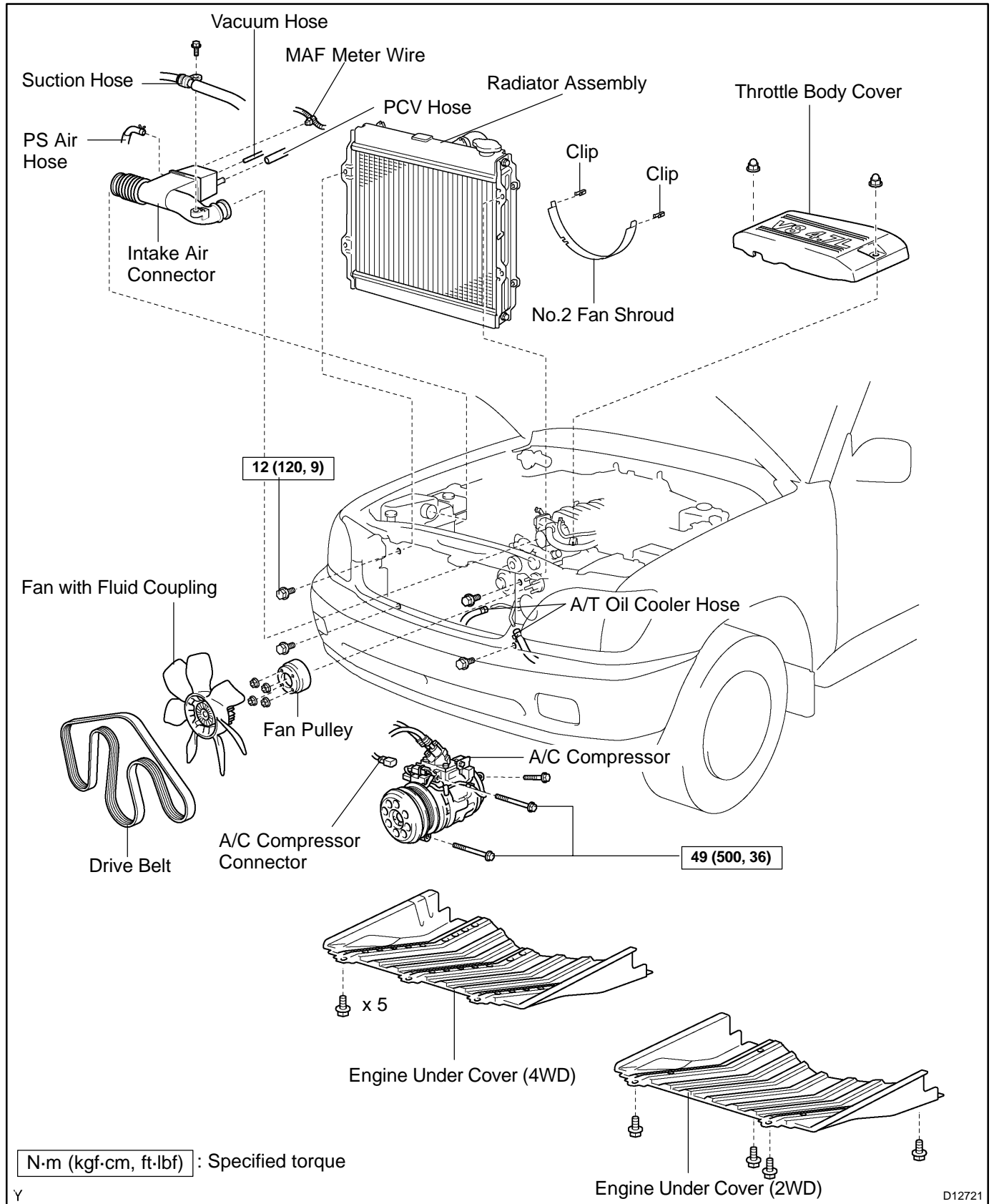
4. CHECK FOR ENGINE COOLANT LEAKS

5. CHECK ENGINE COOLANT SPECIFIC GRAVITY CORRECTLY

6. REINSTALL ENGINE UNDER COVER

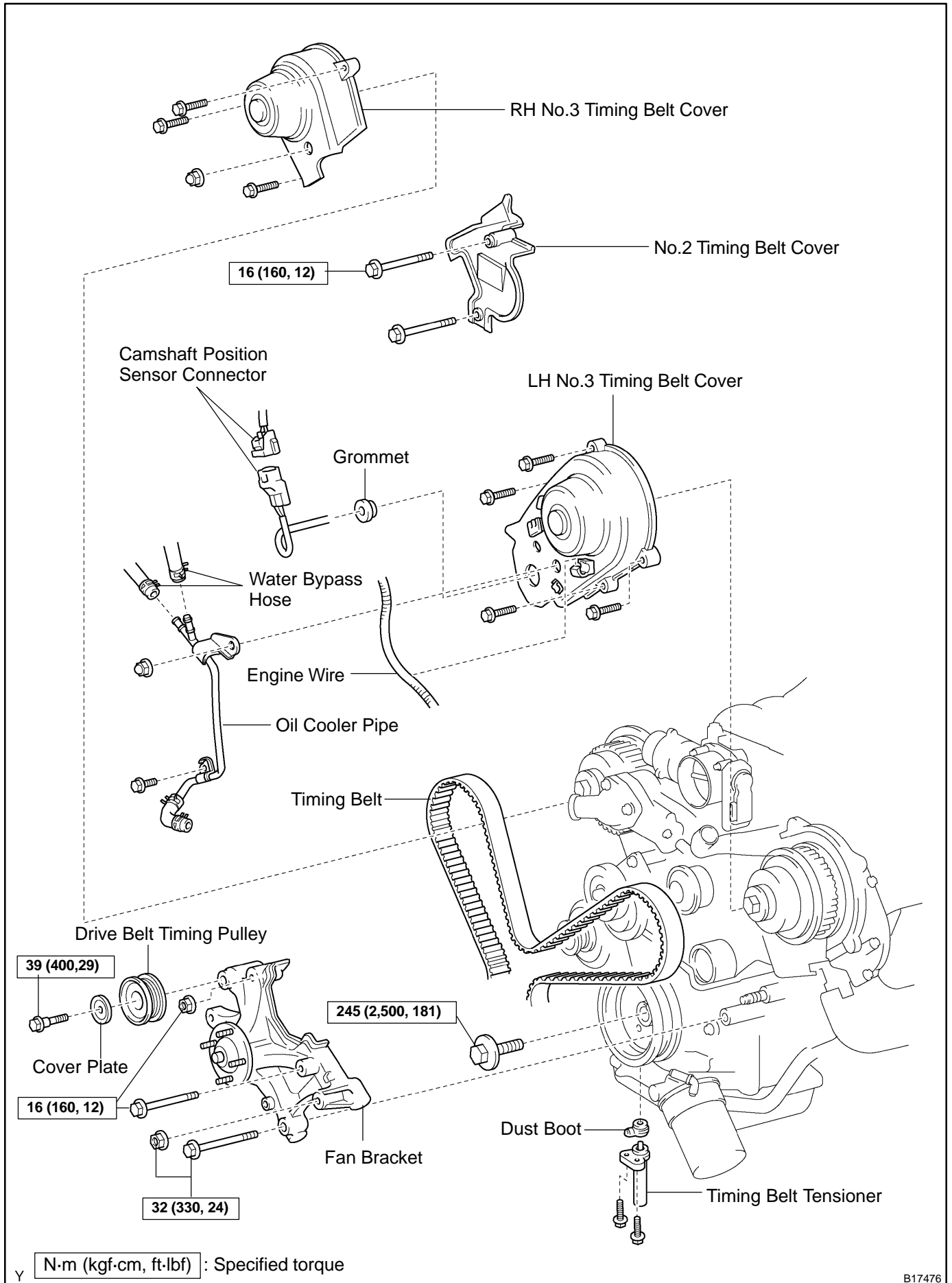
WATER PUMP COMPONENTS

CO01Q-11

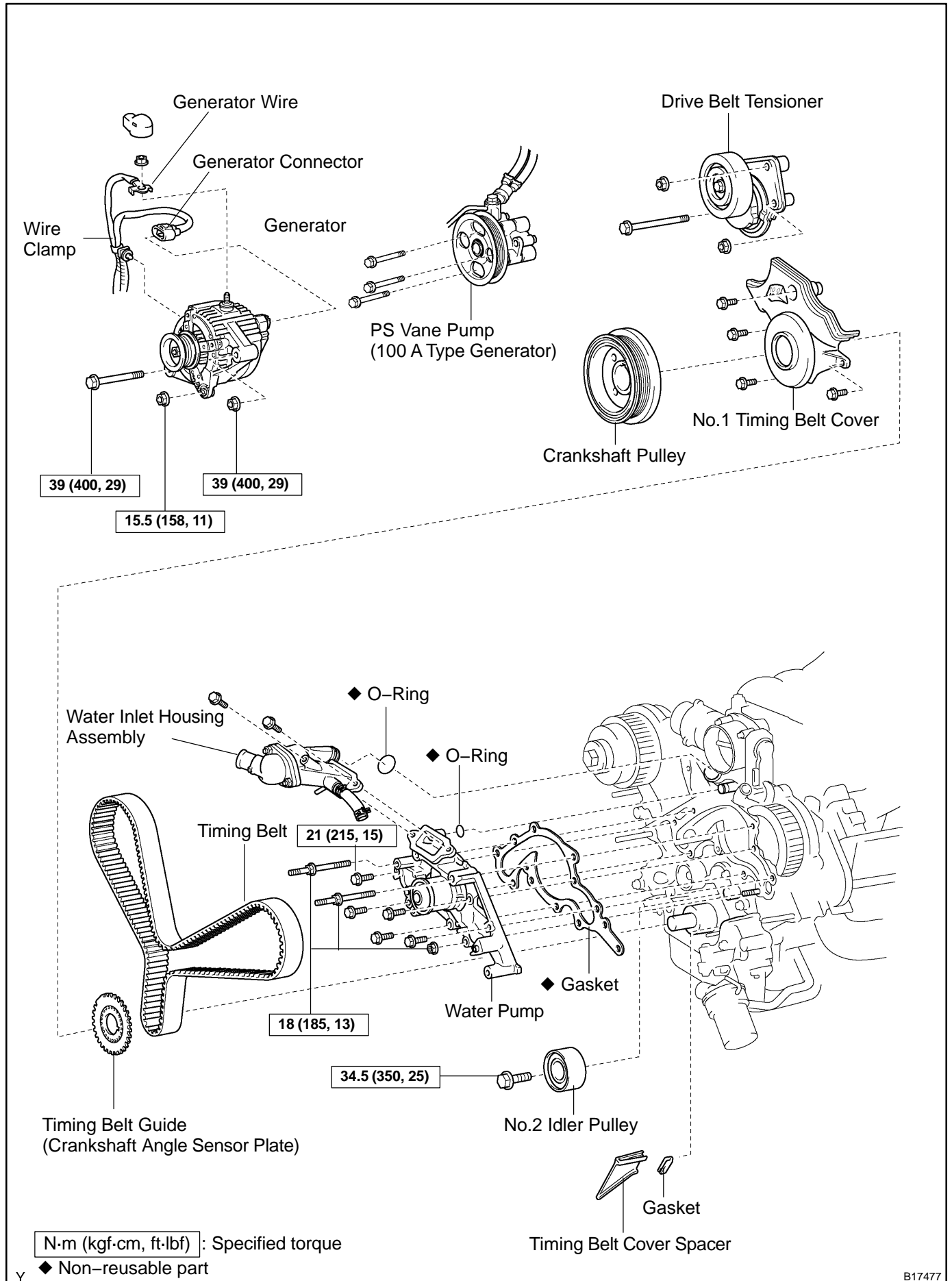


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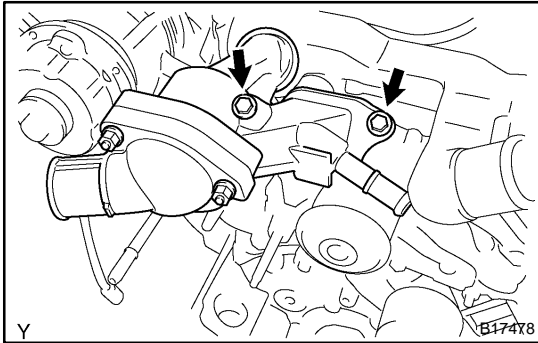


COOLING (2UZ-FE) - WATER PUMP



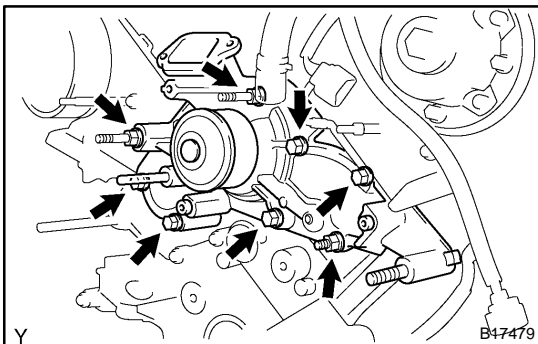
REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE TIMING BELT (See page [EM-16](#))
3. REMOVE NO.2 IDLER PULLEY (See page [EM-16](#))



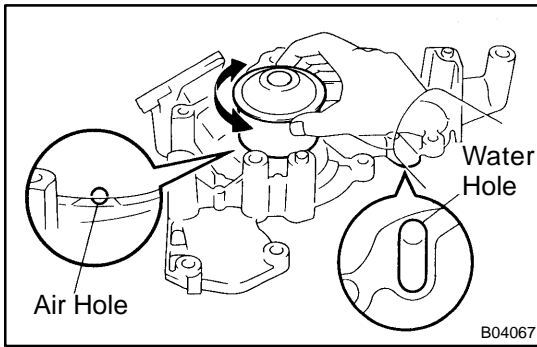
4. REMOVE WATER INLET AND INLET HOUSING ASSEMBLY

- (a) Disconnect the water bypass hose from the water inlet housing.
- (b) Remove the 2 bolts holding the water inlet housing to the water pump.
- (c) Disconnect the water inlet housing from the front water bypass joint, and remove the water inlet and inlet housing assembly.
- (d) Remove the O-ring from the water inlet housing.



5. REMOVE WATER PUMP

- (a) Remove the 5 bolts, 2 stud bolts, nut, water pump and gasket.
- (b) Remove the O-ring from the water bypass pipe.



INSPECTION

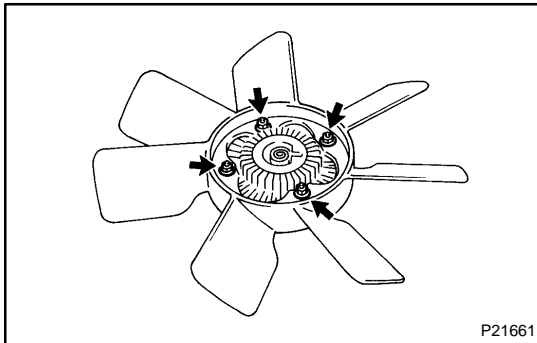
1. INSPECT WATER PUMP

- (a) Visually check the air hole and water hole for coolant leakage.

If leakage is found, replace the water pump and timing belt.

- (b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the water pump.



2. INSPECT FLUID COUPLING

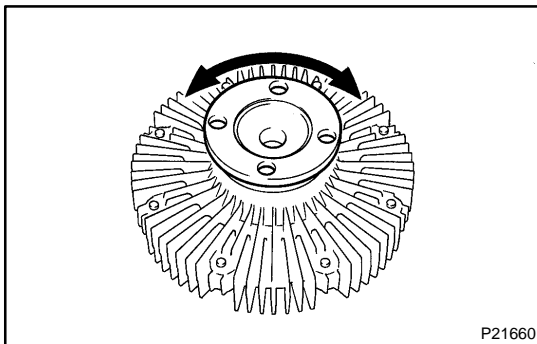
- (a) Remove the 4 nuts and fan from the fluid coupling.

- (b) Check that the fluid coupling is not damaged and that no silicon oil leaks.

If necessary, replace the fluid coupling.

- (c) Reinstall the fan to the fluid coupling with the 4 nuts.

Torque: 5.4 N·m (55 kgf·cm, 47 in.-lbf)



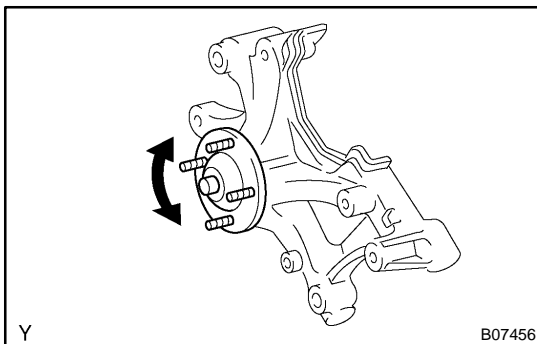
3. INSPECT FAN PULLEY BRACKET

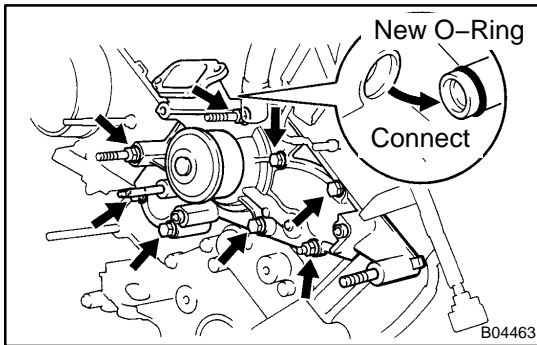
Check the turning smoothness of the fan pulley.

If necessary, replace the pulley bracket.

4. INSPECT TIMING BELT COMPONENTS

(See page [EM-21](#))





INSTALLATION

1. INSTALL WATER PUMP

- Install a new O-ring to the water bypass pipe end.
- Apply soapy water to the O-ring.
- Connect the water pump to the water bypass pipe end.
- Install the water pump and a new gasket with the 5 bolts, 2 stud bolts and nut. Uniformly tighten the bolts, stud bolts and nut in several passes.

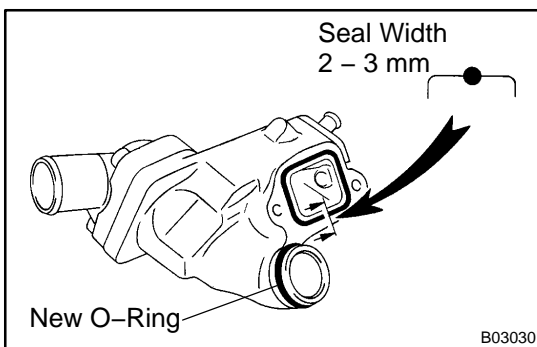
Torque:

Bolt: 21 N·m (215 kgf·cm, 15 ft·lbf)

Stud bolt and nut: 18 N·m (185 kgf·cm, 13 ft·lbf)

2. INSTALL WATER INLET AND INLET HOUSING ASSEMBLY

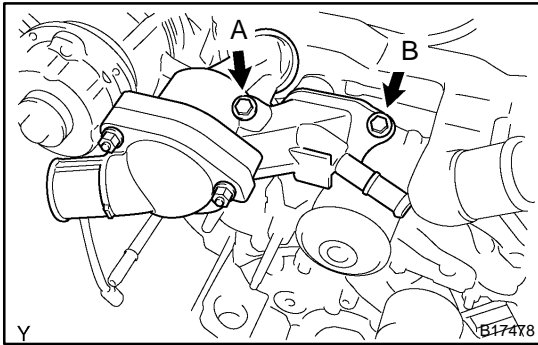
- Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water inlet housing and water pump.
 - Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.



- Apply seal packing to the sealing groove of water inlet housing as shown in the illustration.

Seal packing: Part No. 08826-00100 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
 - Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
 - Immediately remove nozzle from the tube and reinstall cap.
- Install a new O-ring to the water inlet housing.
 - Apply soapy water on the O-ring.
 - Attach the water inlet housing end to the front water bypass joint hole.



- (f) Install the water inlet and housing assembly with the 2 bolts. Alternately tighten the bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

HINT:

Each bolt length is indicated in the illustration.

Bolt length:

76 mm (3.00 in.) for A

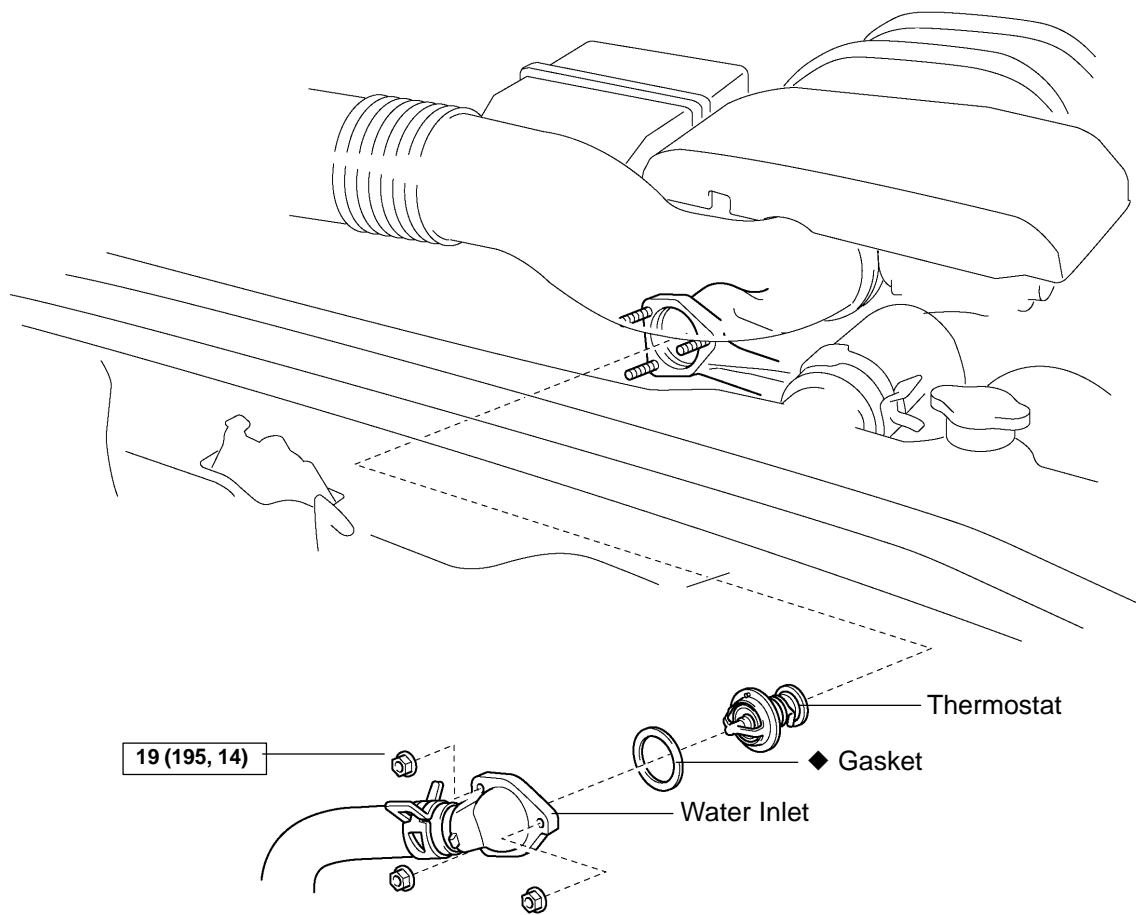
22 mm (0.87 in.) for B

- (g) Connect the water bypass hose to the water inlet housing.

3. **INSTALL NO.2 IDLER PULLEY (See page [EM-23](#))**
4. **INSTALL TIMING BELT (See page [EM-23](#))**
5. **FILL WITH ENGINE COOLANT**
6. **START ENGINE AND CHECK FOR ENGINE COOLANT LEAKS**
7. **RECHECK ENGINE COOLANT LEVEL**

THERMOSTAT COMPONENTS

CO0IU-08



N·m (kgf·cm, ft·lbf) : Specified torque

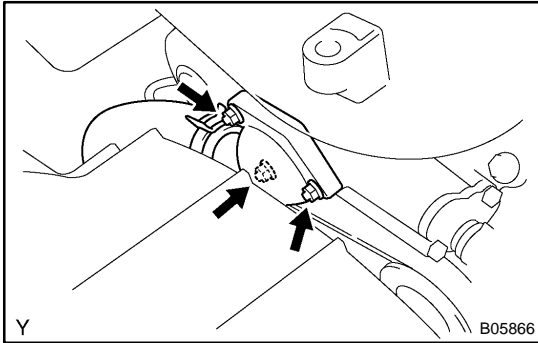
◆ Non-reusable part

REMOVAL

HINT:

Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. DRAIN ENGINE COOLANT

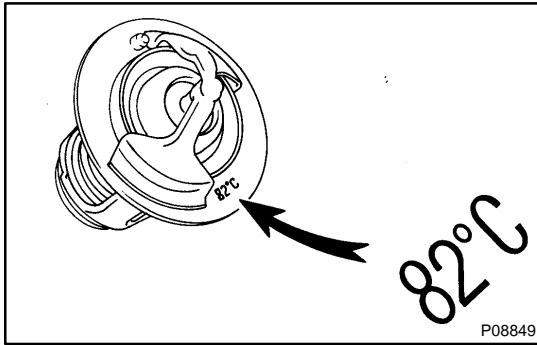


2. DISCONNECT WATER INLET FROM WATER INLET HOUSING

Remove the 3 nuts and disconnect the water inlet from the water inlet housing.

3. REMOVE THERMOSTAT

- (a) Remove the thermostat.
- (b) Remove the gasket from the thermostat.

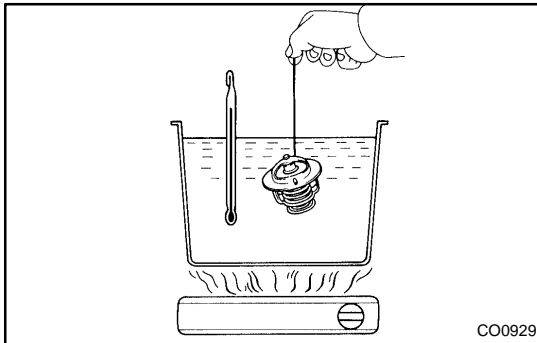


INSPECTION

INSPECT THERMOSTAT

HINT:

The thermostat is numbered with the valve opening temperature.

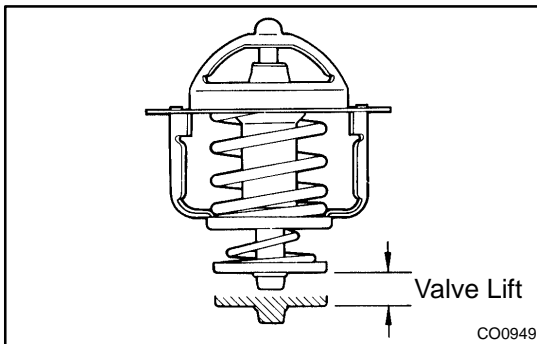


(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

Valve opening temperature: 80 to 84 °C (176 to 183 °F)

If the valve opening temperature is not as specified, replace the thermostat.



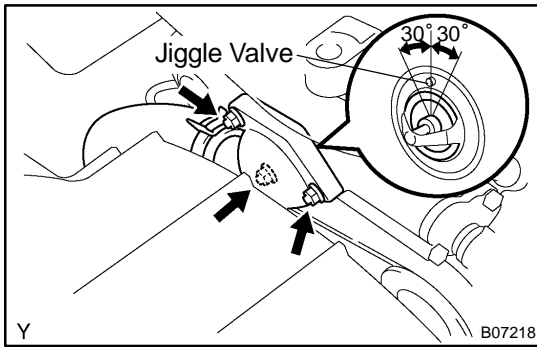
(c) Check the valve lift.

Valve lift: 10 mm (0.39 in.) or more at 95 °C (203 °F)

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40 °C (104 °F)).

If not closed, replace the thermostat.



INSTALLATION

1. PLACE THERMOSTAT IN WATER INLET HOUSING

- (a) Install a new gasket to the thermostat.
- (b) Insert the thermostat into the water inlet housing with the jiggle valve facing straight upward.

HINT:

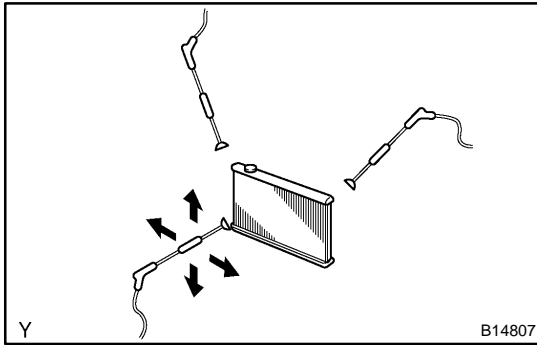
The jiggle valve may be set within 30° of either side of the prescribed position.

2. INSTALL WATER INLET

Install the water inlet with the 3 nuts.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

3. **FILL WITH ENGINE COOLANT**
4. **START ENGINE AND CHECK FOR COOLANT LEAKS**
5. **RECHECK ENGINE COOLANT LEVEL**



RADIATOR ON-VEHICLE CLEANING

CO1C6-02

INSPECT FINS FOR BLOCKAGE

If fins are clogged, wash them with water or a steam cleaner and dry with compressed air.

NOTICE:

- If the distance between the steam cleaner and the core is too close, there is a possibility of damaging the fin, so keep the following injection distance.

Injection Pressure	Injection Distance
2,942 to 4,903 kPa (30 to 80 kgf·cm ² , 427 to 711 psi)	300 mm (11.81 in.)
4,903 to 7,845 kPa (50 to 80 kgf·cm ² , 711 to 1,138 psi)	500 mm (19.69 in.)

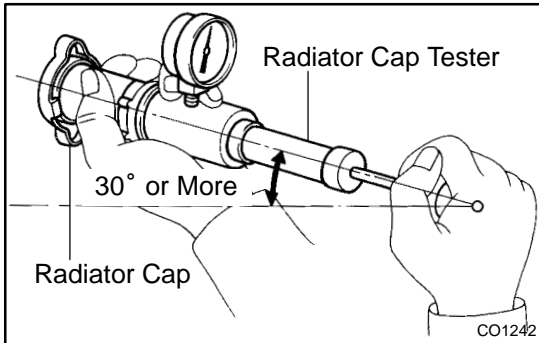
- If the fins are bent, straighten them with a screwdriver or pliers.
- Never apply water directly onto the electronic components.

ON-VEHICLE INSPECTION

1. REMOVE RADIATOR CAP

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



2. INSPECT RADIATOR CAP

NOTICE:

- If the radiator cap has contaminations, always rinse it with water.
 - Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.
 - When performing steps (a) and (b) below, keep the tester at an angle of over 30° above the horizontal.
- (a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the vacuum valve.

Pump speed: 1 push/(3 seconds or more)

NOTICE:

Push the pump at a constant speed.

If air is not coming from the vacuum valve, replace the radiator cap.

- (b) Pump the radiator cap tester, and measure the relief valve opening pressure.

Pump speed: 1 push within 1 second

NOTICE:

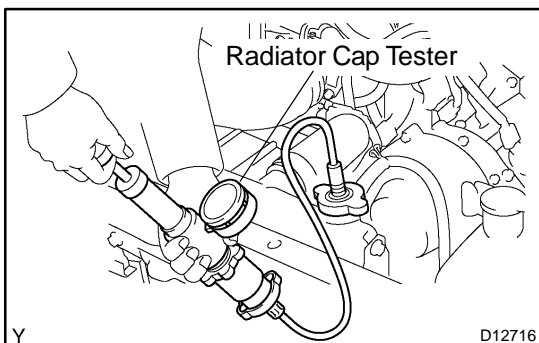
This pump speed is for the first pump only (in order to close the vacuum valve). After this, the pump speed can be reduced.

Opening pressure:

Standard	74 to 103 kPa (0.75 to 1.05 kgf/cm ² , 10.7 to 14.9 psi)
Minimum	59 kPa (0.6 kgf/cm ² , 8.6 psi)

HINT:

Use the tester's maximum reading as the opening pressure. If the opening pressure is less than minimum, replace the radiator cap.



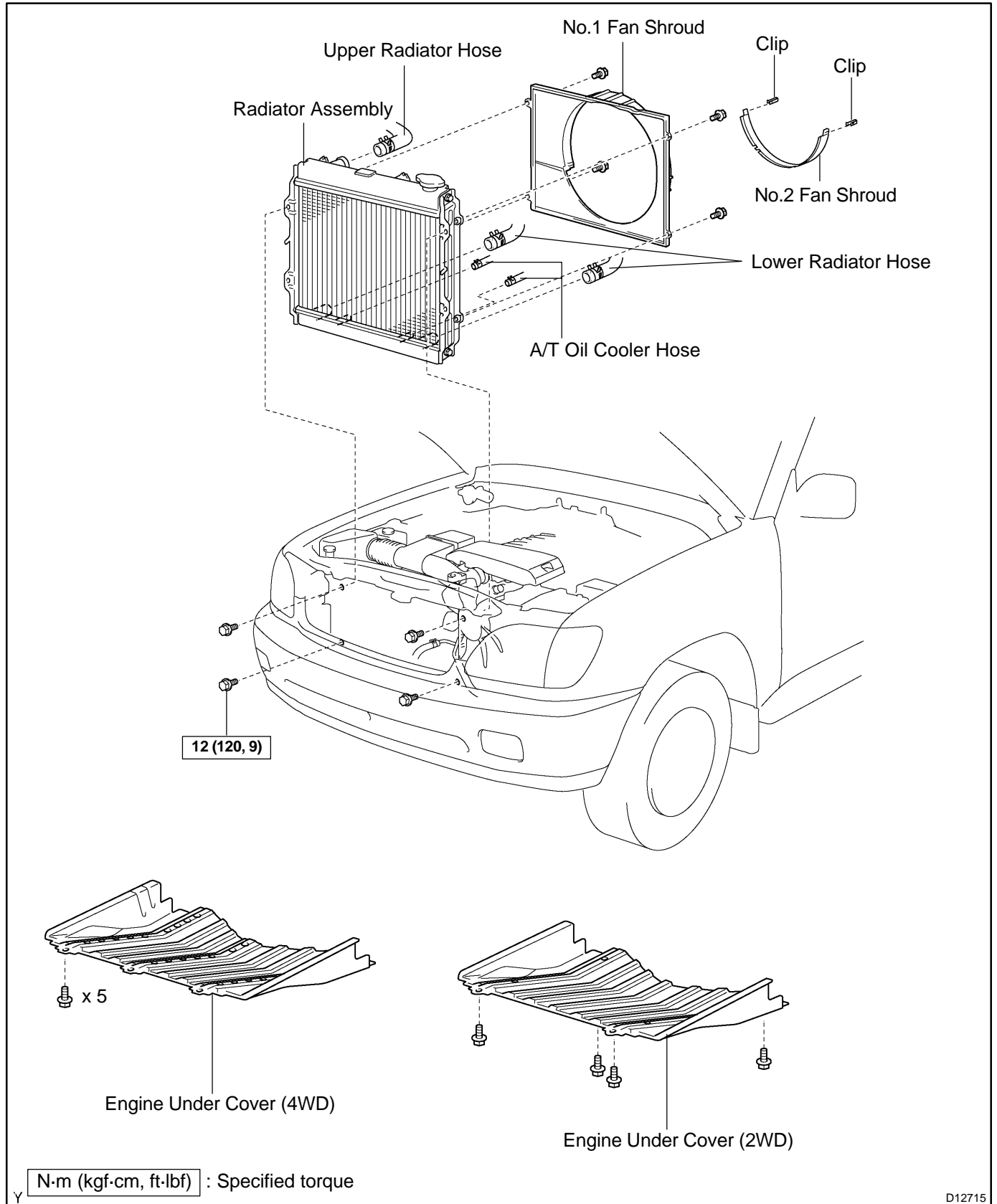
3. INSPECT COOLING SYSTEM FOR LEAKS

- (a) Fill the radiator with coolant and attach a radiator cap tester.
- (b) Warm up the engine.
- (c) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. REINSTALL RADIATOR CAP

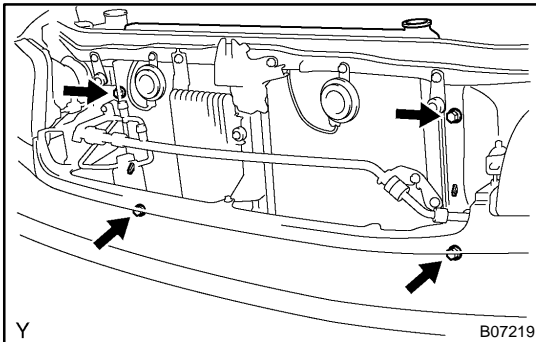
COMPONENTS



REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. DISCONNECT RADIATOR RESERVOIR HOSE FROM RADIATOR
4. DISCONNECT UPPER RADIATOR HOSE FROM RADIATOR
5. DISCONNECT LOWER RADIATOR HOSE FROM RADIATOR
6. DISCONNECT A/T OIL COOLER HOSES FROM RADIATOR
7. REMOVE NO.2 FAN SHROUD

Remove the 2 clips and No.2 fan shroud.



8. REMOVE RADIATOR ASSEMBLY

Remove the 4 bolts and radiator assembly.

9. REMOVE NO.1 FAN SHROUD

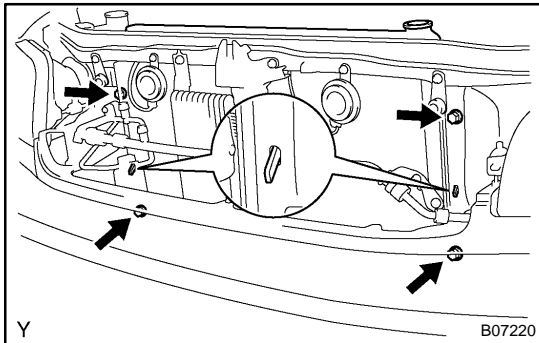
Remove the 4 bolts and No.1 fan shroud.

INSTALLATION

1. INSTALL NO.1 FAN SHROUD

Install the No.1 fan shroud with the 4 bolts.

Torque: 5.0 N·m (50 kgf·cm, 44 in.-lbf)



2. INSTALL RADIATOR ASSEMBLY

(a) Set the radiator bracket hooks to the radiator support holes.

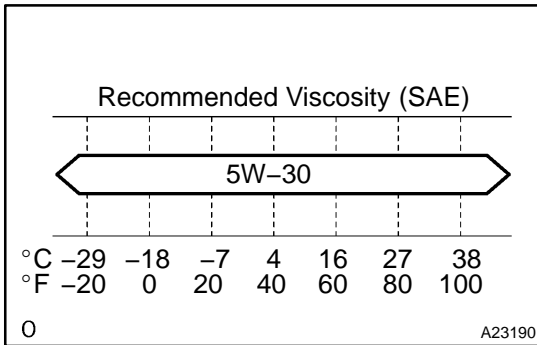
(b) Install the 4 bolts.

Torque: 12 N·m (120 N·m, 9 ft-lbf)

3. INSTALL NO.2 FAN SHROUD

Install the No.2 fan shroud with the 2 clips.

4. CONNECT A/T OIL COOLER HOSES TO RADIATOR
5. CONNECT UPPER RADIATOR HOSE TO RADIATOR
6. CONNECT LOWER RADIATOR HOSE TO RADIATOR
7. CONNECT RADIATOR RESERVOIR HOSE TO RADIATOR
8. FILL WITH ENGINE COOLANT
9. START ENGINE AND CHECK FOR ENGINE COOLANT LEAKS
10. RECHECK ENGINE COOLANT LEVEL
11. INSTALL ENGINE UNDER COVER



OIL AND FILTER INSPECTION

LU008-01

1. CHECK ENGINE OIL QUALITY

- (a) Check the oil for deterioration, water mixing, discoloring or thinning.
- (b) If the oil quality is visibly poor, replace it.

Oil grade:

ILSAC multigrade engine oil.

SAE 5W-30 is the best choice for good fuel economy, and good starting in cold weather.

If SAE 5W-30 is not available, SAE 10W-30 may be used. However, it should be replaced with SAE 5W-30 at the next oil replacement.

2. CHECK ENGINE OIL LEVEL

Check the engine oil level 5 minutes or more after the engine has stopped.

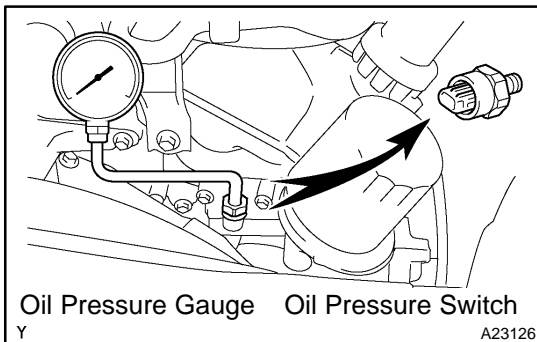
If the engine is too hot, a false level will be read. The oil level should be between the low and full level marks of the dipstick. If it is below the low level mark, check for leakage and add oil up to the full level mark.

NOTICE:

Do not fill with engine oil over the full level mark.

3. REMOVE OIL PRESSURE SWITCH ASSY

- (a) Disconnect the oil pressure switch connector.
- (b) Using a 24 mm deep socket wrench, remove the oil pressure switch.



4. INSTALL OIL PRESSURE GAUGE

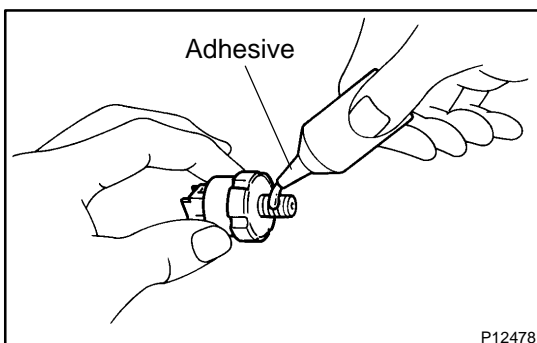
- (a) Install the oil pressure gauge.

5. WARM UP ENGINE

6. CHECK OIL PRESSURE

Oil pressure:

At idle	29 kPa (0.3 kgf·cm ² , 4.3 psi) or more
At 3,000 rpm	294 to 588 kPa (3.0 to 6.0 kgf·cm ² , 43 to 85 psi)



7. INSTALL OIL PRESSURE SWITCH

- (a) Remove the oil pressure gauge.
- (b) Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive:

Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

- (c) Using a 24 mm deep socket wrench, install the oil pressure switch.

Torque: 15 N·m (152 kgf·cm, 11 ft·lbf)

HINT:

Do not start the engine for 1 hour after installation.

- (d) Connect the oil pressure switch connector.

8. START ENGINE AND CHECK FOR LEAKS

REPLACEMENT

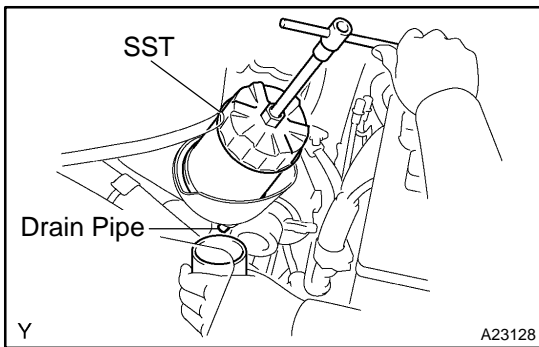
CAUTION:

- Prolonged and repeated contact with engine oil will result in the removal of natural oils from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Precautions should be taken when replacing engine oil to minimize the risk of contact with used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be washed with soap and water, or use water-less hand cleaner, to remove any used engine oil thoroughly. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filters must be disposed of at designated disposal sites.

1. DRAIN ENGINE OIL

- (a) Remove the engine under cover seal No. 3.
- (b) Remove the oil pan drain plug and drain the engine oil.
- (c) Clean the oil pan drain plug and install it and a new gasket.

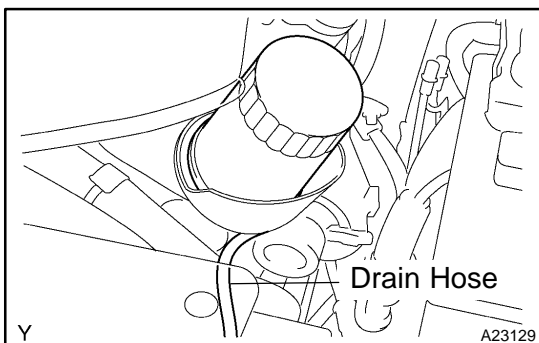
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)



2. REMOVE OIL FILTER

When using a container:

- (a) Remove the drain pipe cap.
- (b) While removing the oil filter with SST, catch the oil from the oil filter with a container.
SST 09228-07501
- (c) Install the drain pipe cap.
- (d) Clean the oil catch plate.

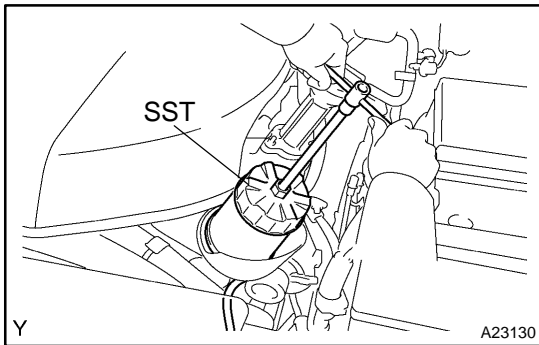


When using a drain hose:

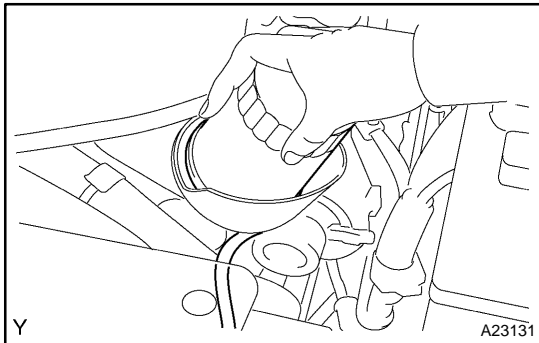
- (e) Remove the drain pipe cap.
- (f) Connect a drain hose to the oil filter bracket.

HINT:

- Drain hose inside diameter: 8 mm (0.31 in.)
 - Drain hose length: 900 mm (35.43 in.)
- (g) Pass the drain hose down through the engine under cover, and put the drain oil container beneath the drain hose in order to catch the oil from the oil filter.

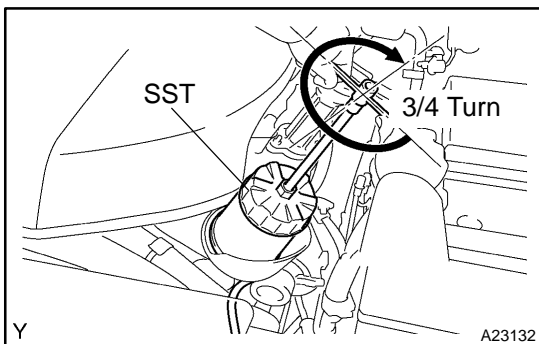


- (h) Using SST, remove the oil filter.
SST 09228-07501
- (i) Remove the drain hose and install the drain pipe cap.
- (j) Clean the oil catch plate.



3. INSTALL OIL FILTER

- (a) Clean the oil filter contact surface on the oil filter bracket.
- (b) Lubricate the rubber gasket of a new oil filter with clean engine oil.
- (c) Tighten the oil filter by hand until the rubber gasket contacts the seat of the filter bracket.



- (d) Using SST, give it an additional 3/4 turn to set the filter.
SST 09228-07501

4. ADD ENGINE OIL

- (a) Fill with new engine oil.

Capacity:

Drain and refill:

w/ Oil filter change: 4.5 liters (4.8 US qts, 4.0 Imp. qts)

w/o Oil filter change: 4.2 liters (4.4 US qts, 3.7 Imp. qts)

Dry fill: 5.6 liters (5.9 US qts, 4.9 Imp. qts)

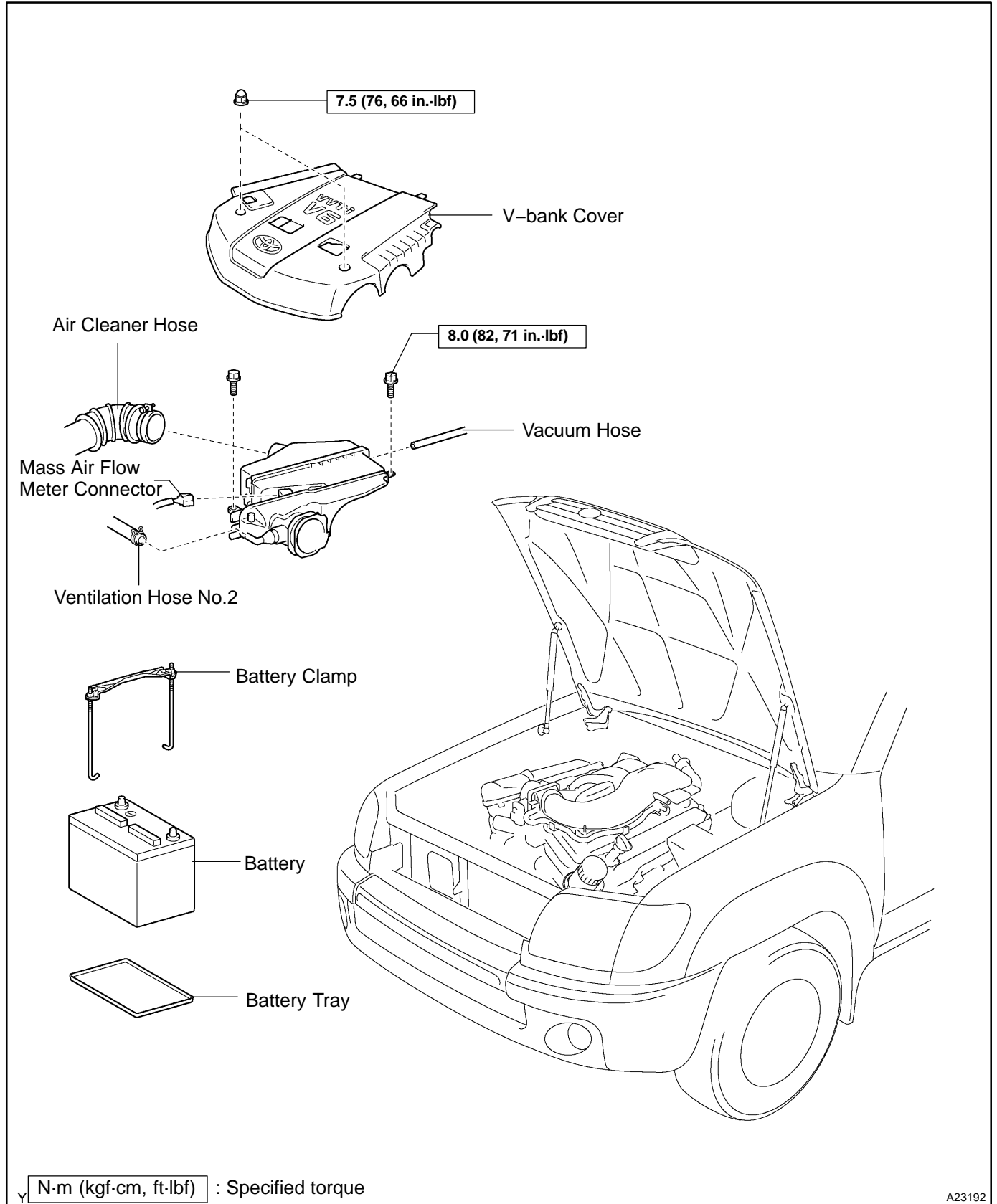
- (b) Reinstall the oil filler cap.

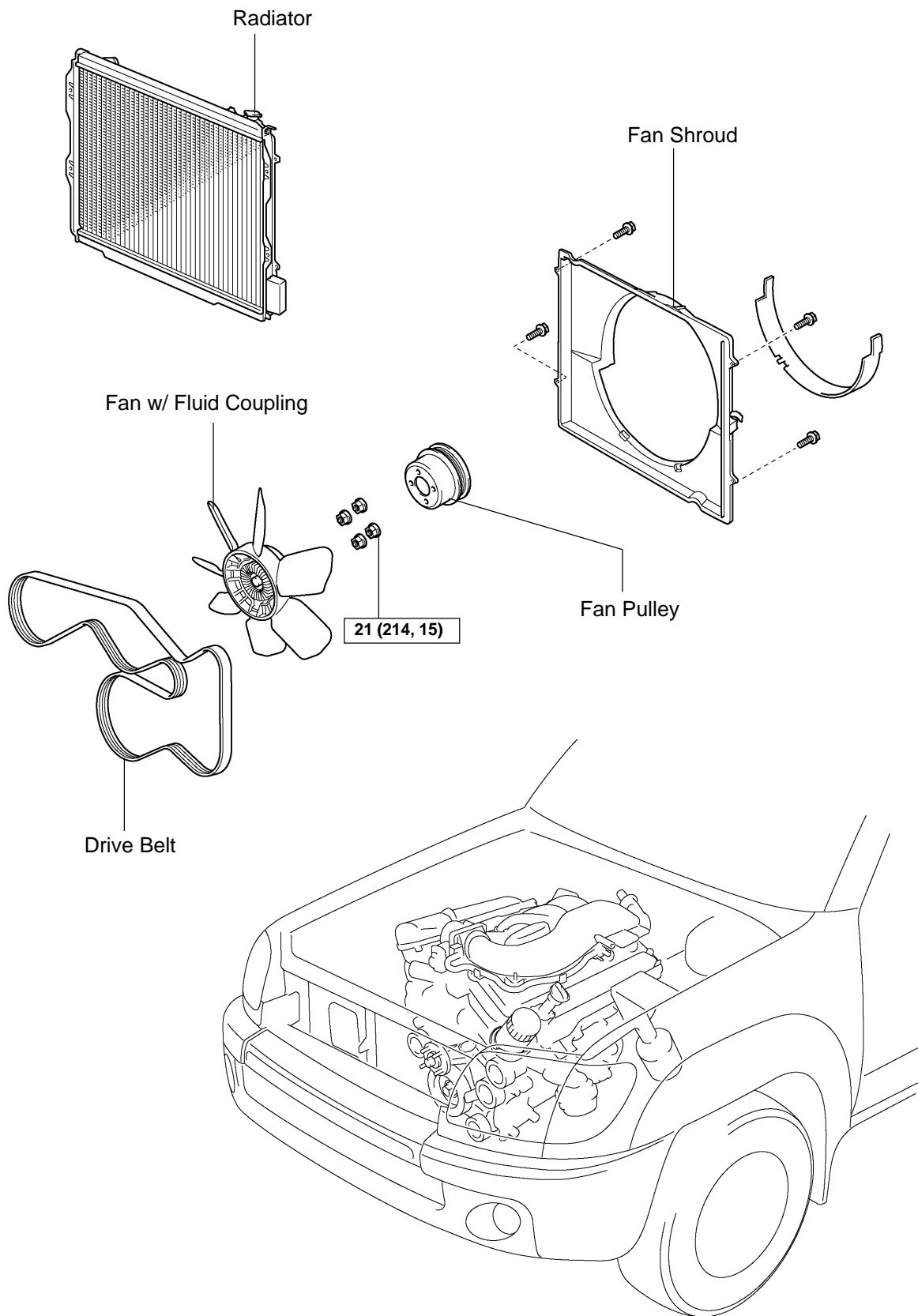
5. CHECK FOR ENGINE OIL LEAKS

6. CHECK ENGINE OIL LEVEL

OIL PUMP COMPONENTS

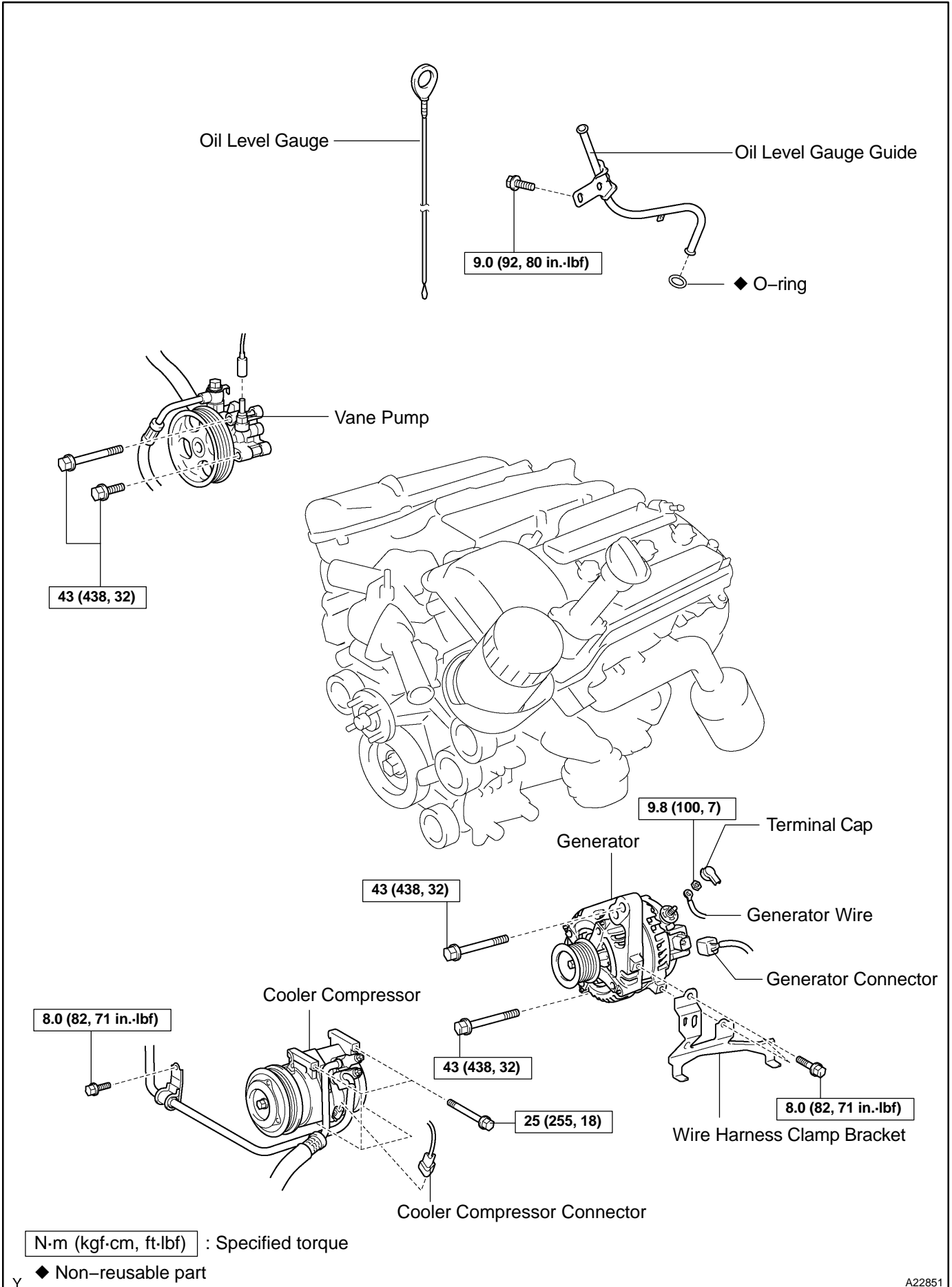
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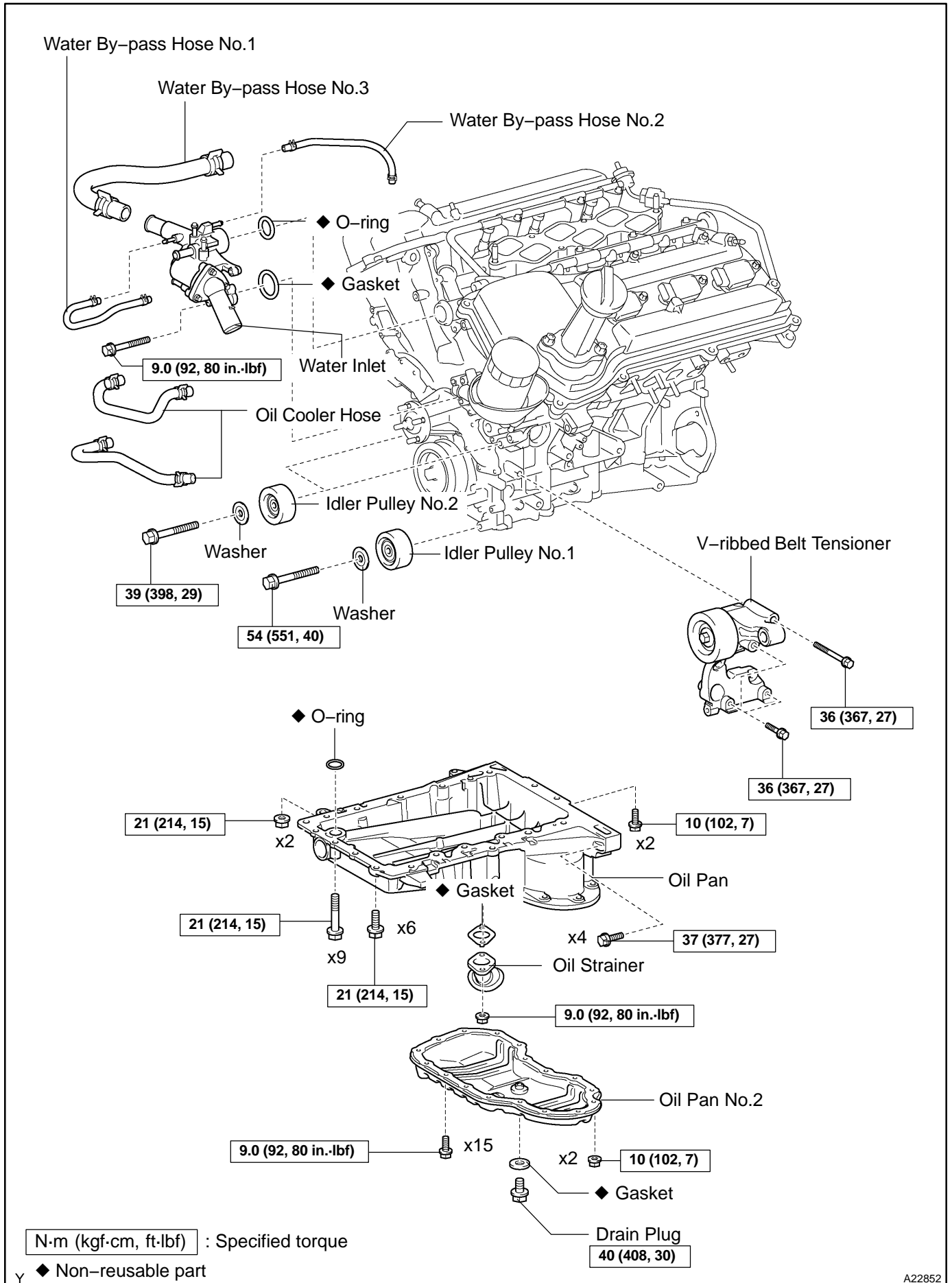




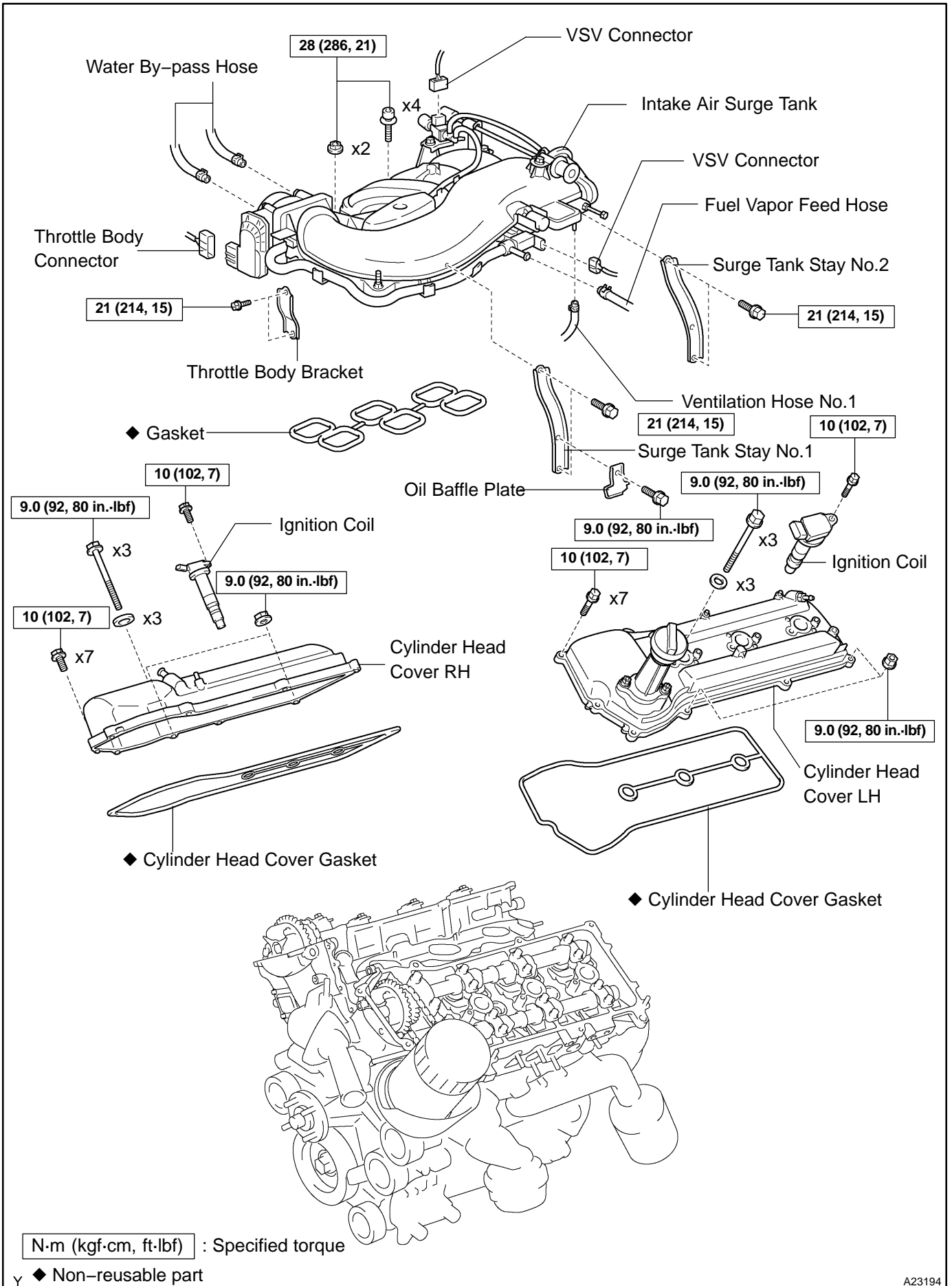
γ N·m (kgf·cm, ft·lbf) : Specified torque

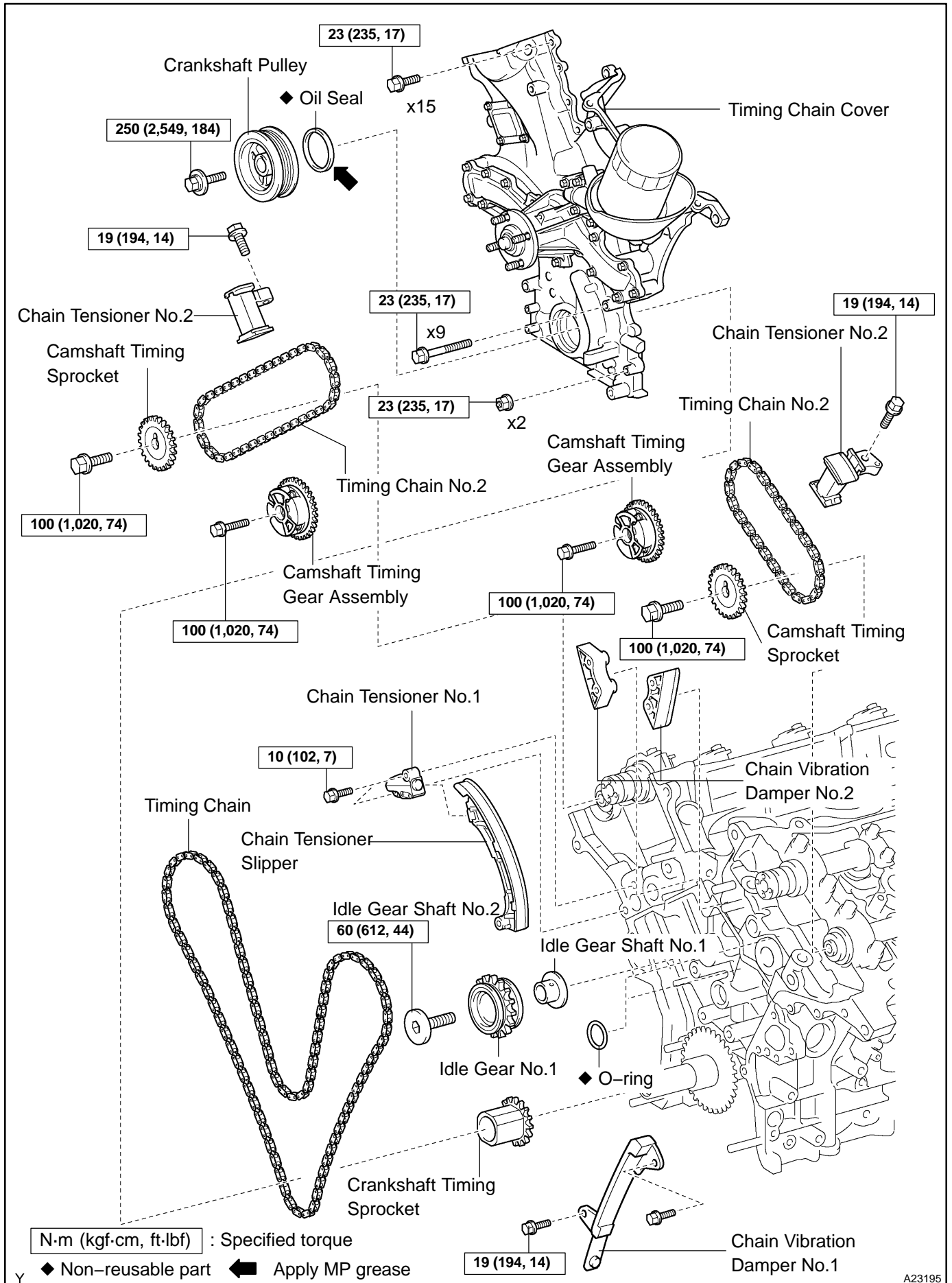
LUBRICATION (1GR-FE) - OIL PUMP

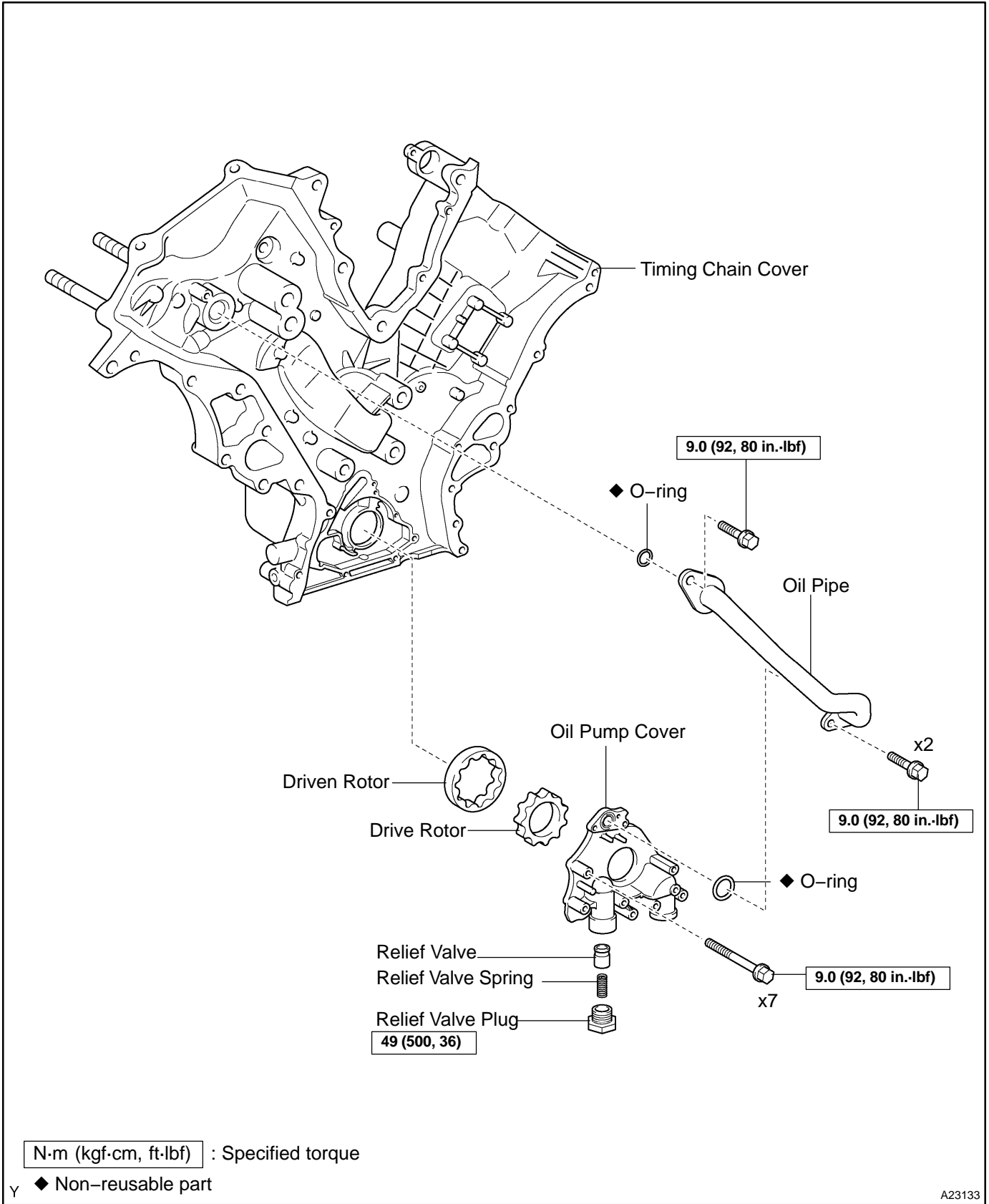




LUBRICATION (1GR-FE) - OIL PUMP

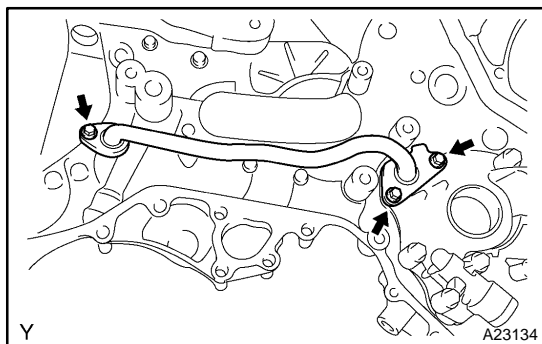






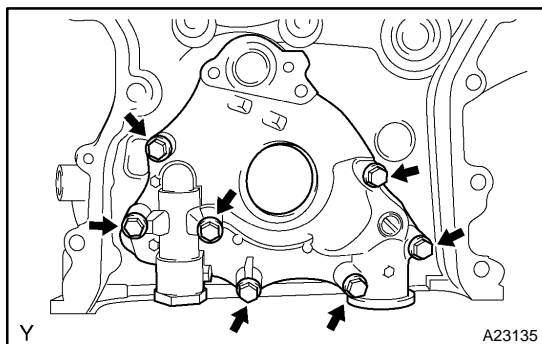
REMOVAL

1. REMOVE TIMING CHAIN COVER (See page [EM-32](#))



2. REMOVE OIL PUMP COVER

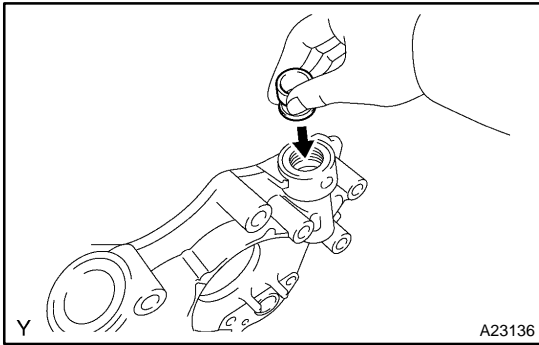
- (a) Remove the 3 bolts and oil pipe.
- (b) Remove the 2 O-rings.



- (c) Remove the 7 bolts, oil pump cover, drive rotor and driven rotor.

3. REMOVE OIL PUMP RELIEF VALVE

Remove the plug, spring and relief valve.

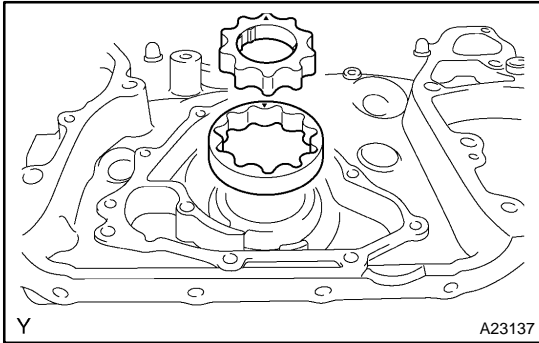


INSPECTION

1. INSPECT OIL PUMP RELIEF VALVE

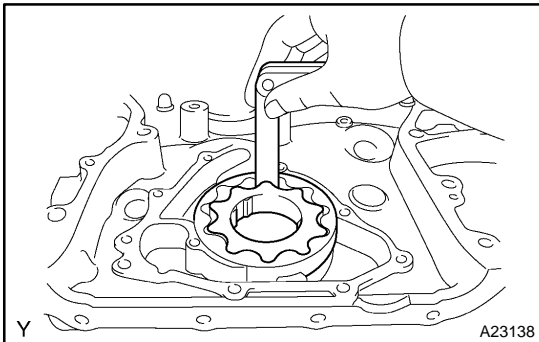
Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If it does not, replace the relief valve. If necessary, replace the oil pump assembly.



2. INSPECT OIL PUMP ROTOR SET

(a) Place the drive and driven rotors into the timing chain cover with the marks facing upward.



(b) Inspect rotor tip clearance.

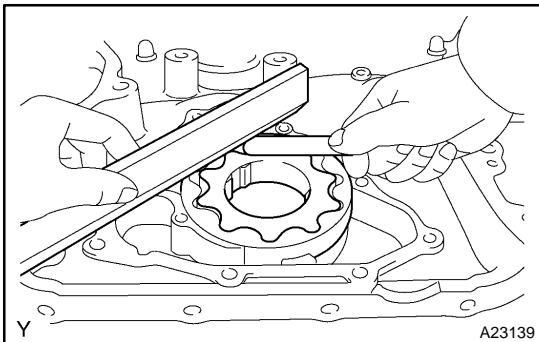
Using a feeler gauge, measure the clearance between each drive and driven rotor tip.

Standard clearance:

0.06 to 0.16 mm (0.0024 to 0.0063 in.)

Maximum tip clearance: 0.16 mm (0.0063 in.)

If the clearance is greater than the maximum, replace the rotors as a set.



(c) Inspect rotor side clearance.

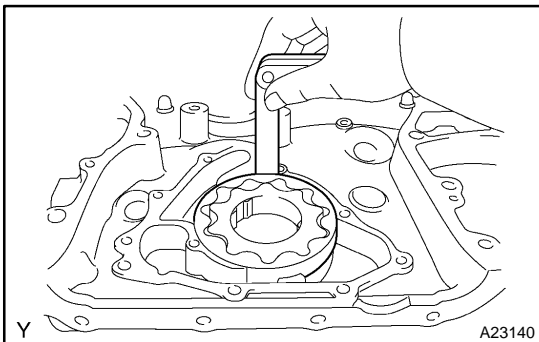
Using a feeler gauge and precision straight edge, measure the clearance between the rotors and the precision straight edge.

Standard clearance:

0.03 to 0.09 mm (0.0012 to 0.0035 in.)

Maximum side clearance: 0.09 mm (0.0035 in.)

If the clearance is greater than the maximum, replace the drive and driven rotors. If necessary, replace the timing chain cover assembly.



(d) Inspect rotor body clearance.

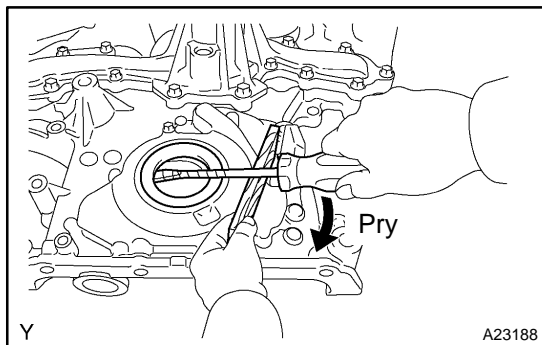
Using a feeler gauge, measure the clearance between the driven rotor and the body.

Standard clearance:

0.250 to 0.325 mm (0.0098 to 0.0128 in.)

Maximum body clearance: 0.325 mm (0.0128 in.)

If the clearance is greater than the maximum, replace the drive and driven rotors. If necessary, replace the timing chain cover assembly.



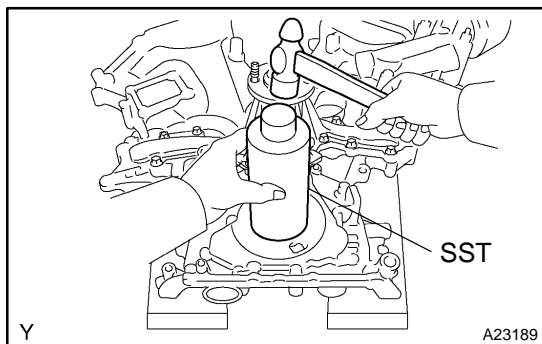
REPLACEMENT

REPLACE TIMING CHAIN COVER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the oil pump assembly. Wrap the tip of the screwdriver with tape.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.

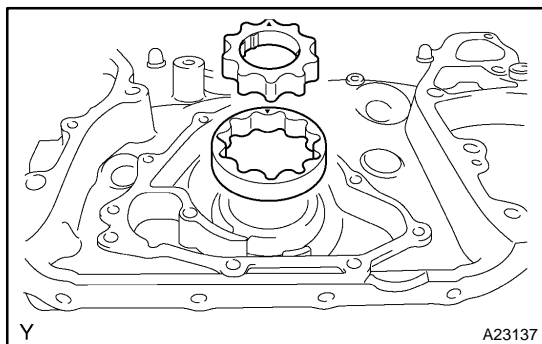
SST 09226-10010

(c) Apply MP grease to the oil seal lip.

INSTALLATION

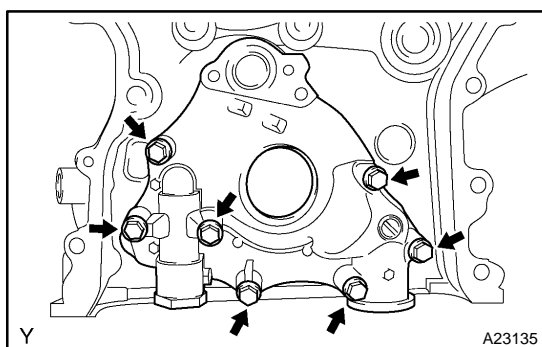
1. INSTALL OIL PUMP RELIEF VALVE

- (a) Coat the relief valve with engine oil and insert the relief valve and spring into the valve hole.
- (b) Install the relief valve plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

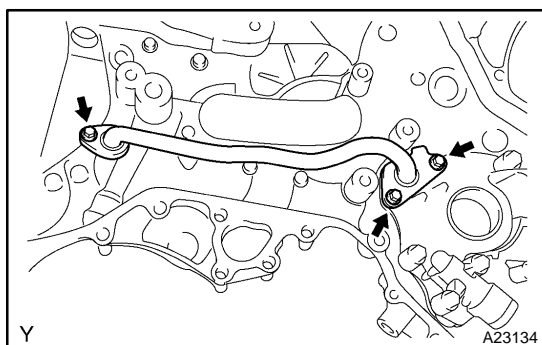


2. INSTALL OIL PUMP COVER

- (a) Apply new engine oil to the drive and driven rotors.
- (b) Place the drive and driven rotors into the timing chain cover with the marks facing upward.



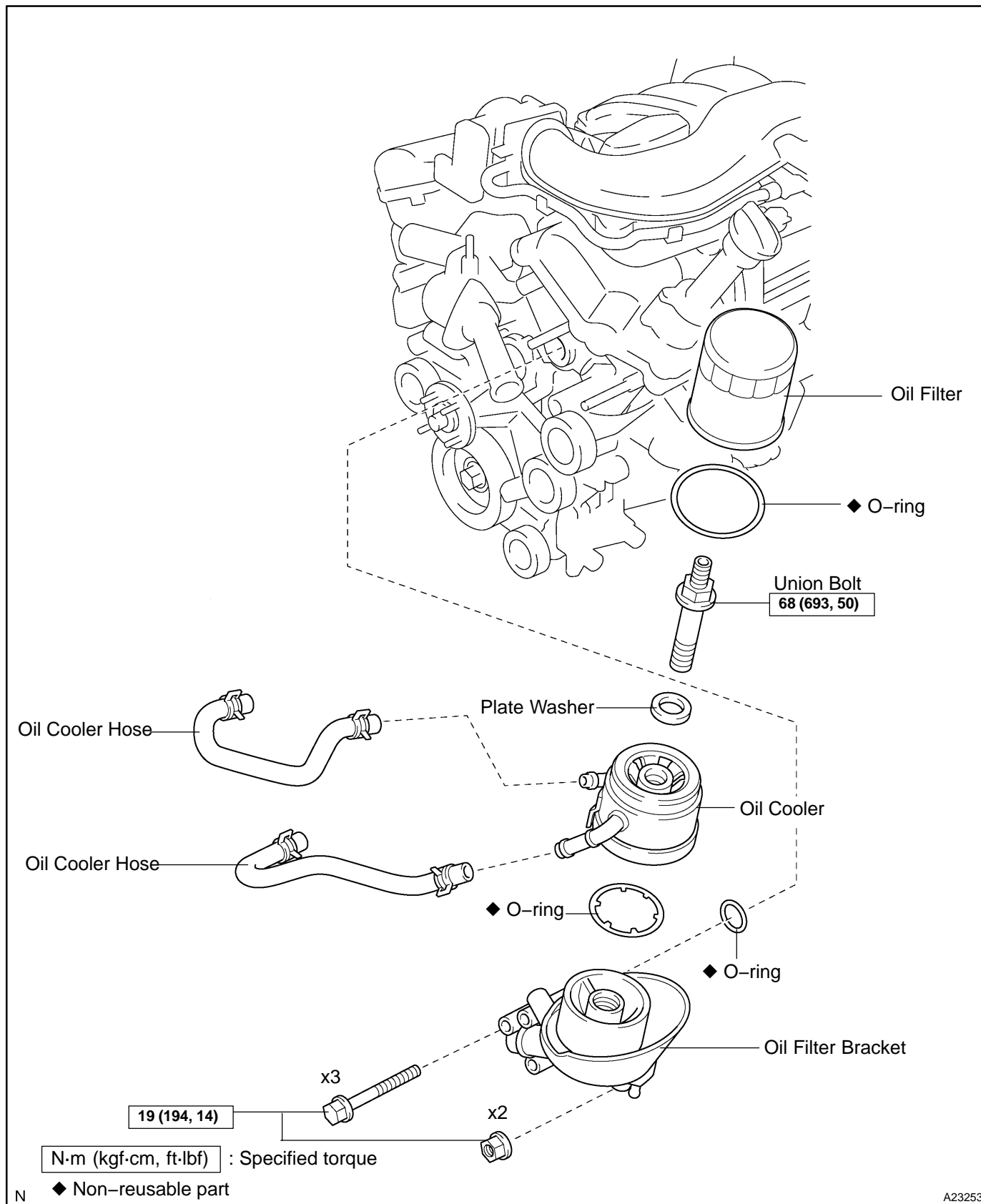
- (c) Install the oil pump cover with the 7 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)
- (d) Install a new O-ring to the oil pump cover.
- (e) Install a new O-ring to the oil pipe.



- (f) Install the oil pipe with the 3 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)
- ### 3. INSTALL TIMING CHAIN COVER (See page [EM-44](#))

OIL COOLER COMPONENTS

LU00F-01

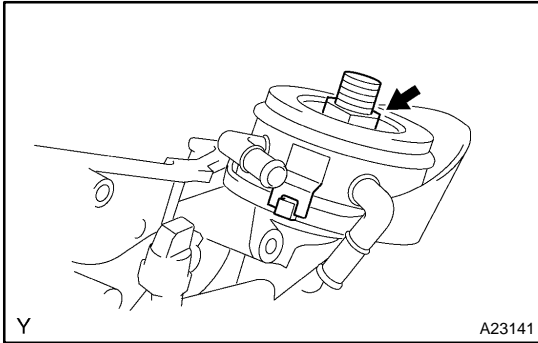


N

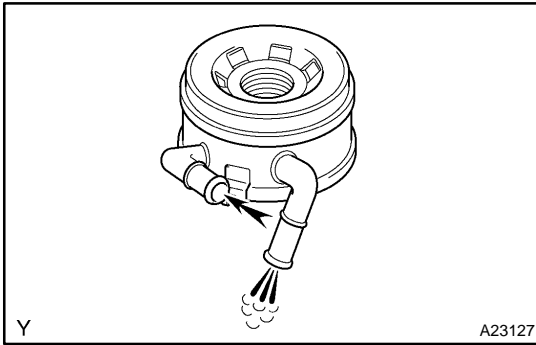
A23253

REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE OIL FILTER
3. REMOVE V-BANK COVER
4. REMOVE OIL COOLER
 - (a) Disconnect the 2 oil cooler hoses from the oil cooler.



- (b) Remove the union bolt, plate washer and oil cooler.
 - (c) Remove the O-ring from the oil cooler.
5. REMOVE OIL FILTER BRACKET
 - (a) Disconnect the lower radiator hose.
 - (b) Remove the 2 nuts, 3 bolts, oil filter bracket and O-ring.



INSPECTION

INSPECT OIL COOLER

Check the oil cooler for damage or clogging.
If necessary, replace the oil cooler.

INSTALLATION

1. INSTALL OIL FILTER BRACKET

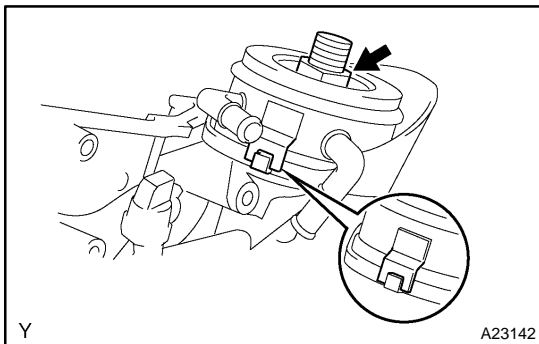
- (a) Install a new O-ring and oil filter bracket with the 2 nuts and 3 bolts.

Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

- (b) Connect the lower radiator hose.

2. INSTALL OIL COOLER

- (a) Clean the contact surface of the oil filter bracket with the cooler mounting.
- (b) Place a new O-ring on the oil cooler.
- (c) Apply a light coat of engine oil to the threads of the union bolt.



- (d) Install the oil cooler and plate washer with the union bolt.

Torque: 68 N·m (693 kgf·cm, 50 ft·lbf)

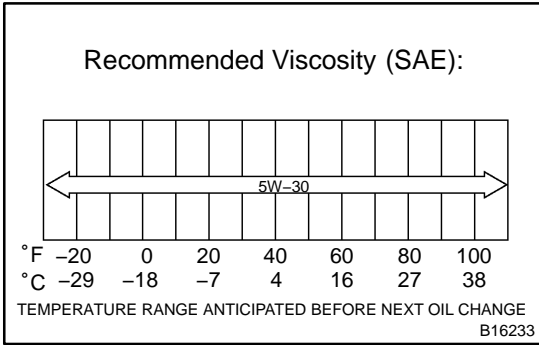
- (e) Connect the 2 oil cooler hoses to the oil cooler.

3. INSTALL OIL FILTER

4. ADD ENGINE COOLANT

5. ADD ENGINE OIL

6. INSTALL V-BANK COVER



OIL AND FILTER INSPECTION

LU0GV-05

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

ILSAC multigrade engine oil.

2. CHECK ENGINE OIL LEVEL

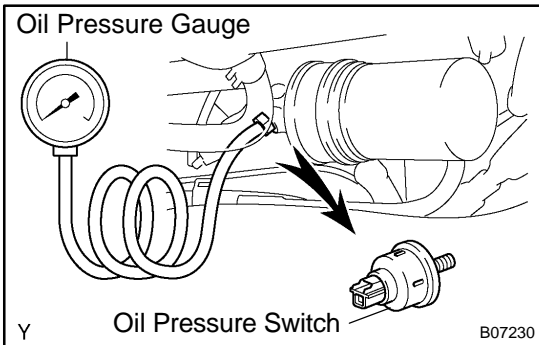
The oil level should be between the "L" and "F" marks on the dipstick.

If low, check for leakage and add oil up to the "F" mark.

NOTICE:

Do not fill with engine oil above the "F" mark.

3. REMOVE ENGINE UNDER COVER



4. REMOVE OIL PRESSURE SWITCH

5. INSTALL OIL PRESSURE GAUGE

6. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

7. CHECK OIL PRESSURE

Oil pressure:

At idle	29 kPa (0.3 kgf/cm ² , 4.2 psi) or more
At 3,000 rpm	294 - 588 kPa (3.0 - 6.0 kgf/cm ² , 43 - 85 psi)

8. REMOVE OIL PRESSURE GAUGE

9. REINSTALL OIL PRESSURE SWITCH

(a) Apply adhesive to 2 or 3 threads of the oil pressure switch.

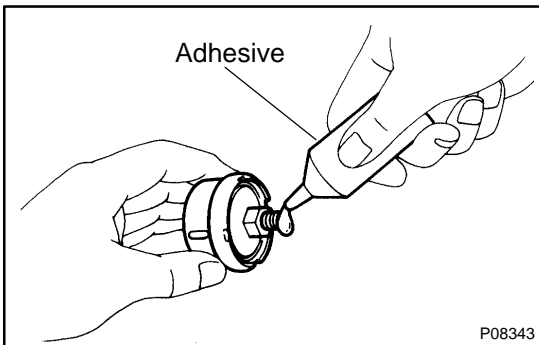
Adhesive:

Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Reinstall the oil pressure switch.

10. START ENGINE, AND CHECK FOR ENGINE OIL LEAKS

11. REINSTALL ENGINE UNDER COVER

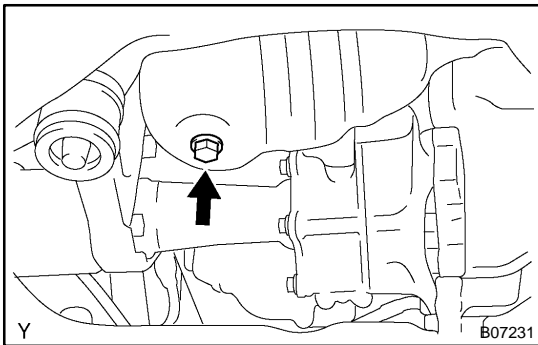


REPLACEMENT

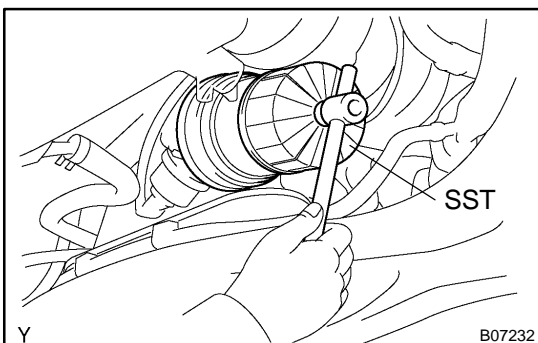
CAUTION:

- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Care should be taken, therefore, when changing engine oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed with soap and water, or use water-less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.

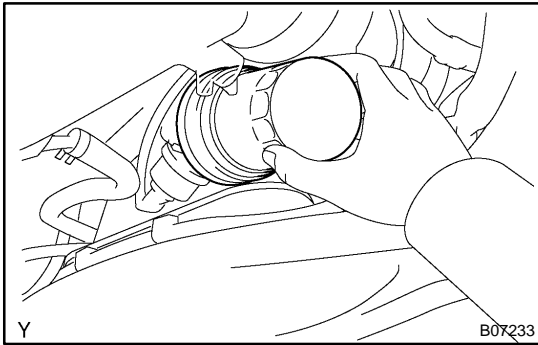
1. **w/ Oil filter change:**
REMOVE ENGINE UNDER COVER
2. **DRAIN ENGINE OIL**
 - (a) Remove the oil filler cap.



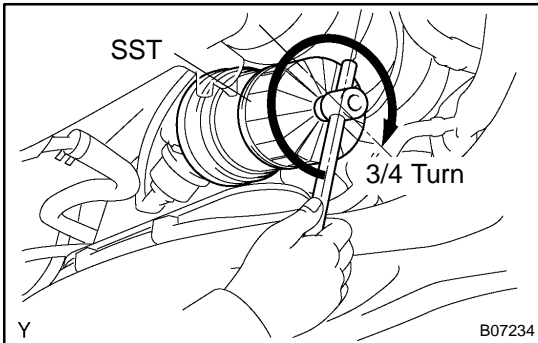
- (b) Remove the oil drain plug and gasket, and drain the oil into a container.



3. **REPLACE OIL FILTER**
 - (a) Using SST, remove the oil filter.
SST 09228-07501
 - (b) Clean the oil filter contact surface on the oil filter mounting.
 - (c) Lubricate the filter rubber gasket with clean engine oil.



- (d) Tighten the oil filter by hand until the rubber gasket contacts the seat of the filter mounting.



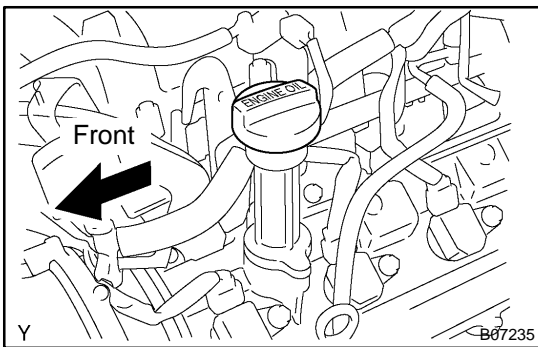
- (e) Using SST, give it an additional 3/4 turn to seat the filter.
SST 09228-07501

4. REFILL WITH ENGINE OIL

- (a) Clean and install the oil drain plug with a new gasket.
Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)
- (b) Fill with fresh engine oil.

Capacity:

Drain and refill	w/ Oil filter change	6.2 liters (6.6 Us qts, 5.5 Imp. qts)
	w/o Oil filter change	5.7 liters (6.0 Us qts, 5.0 Imp. qts)
Dry fill		7.1 liters (7.5 Us qts, 6.2 Imp. qts)



- (c) Reinstall the oil filler cap.

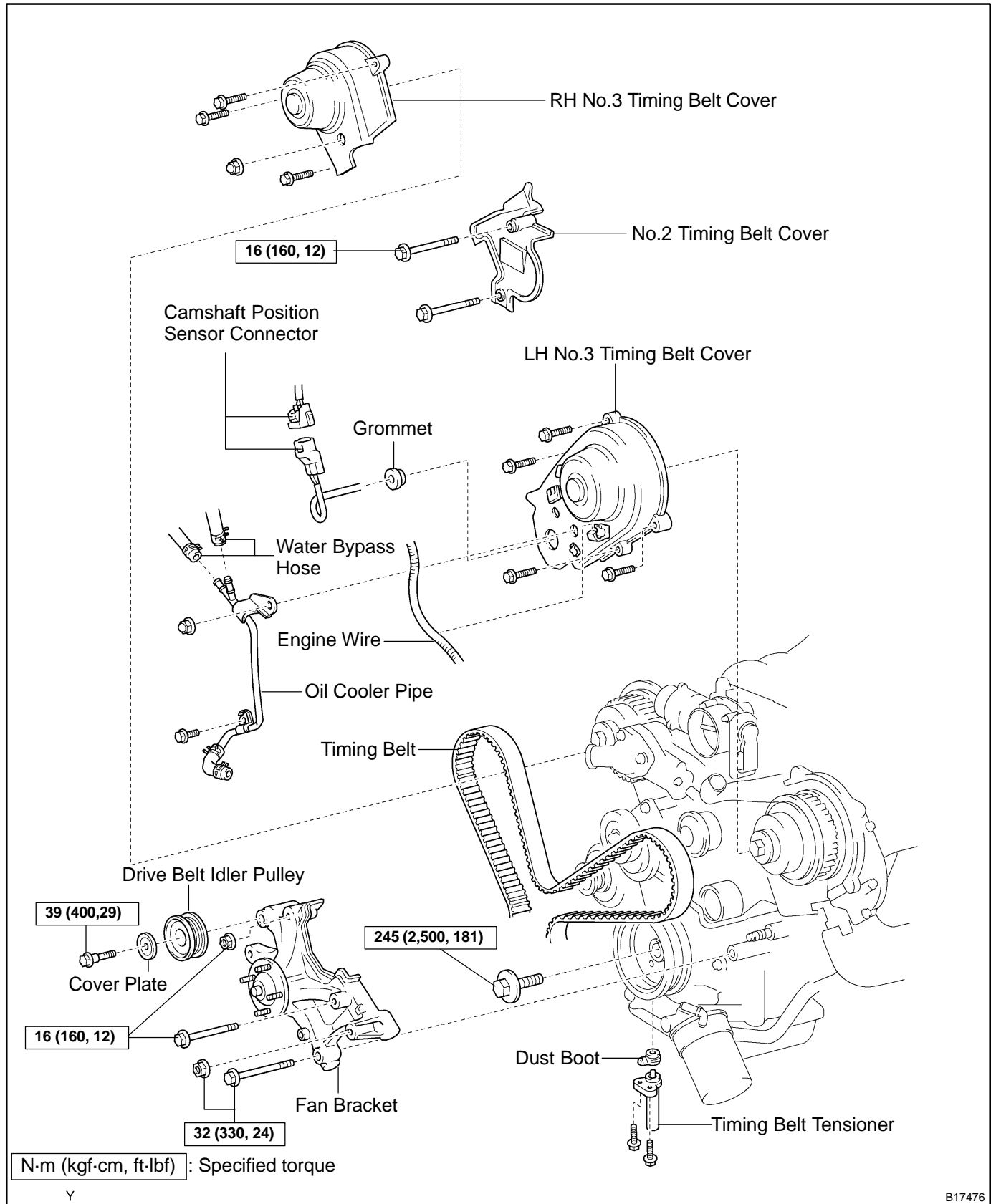
HINT:

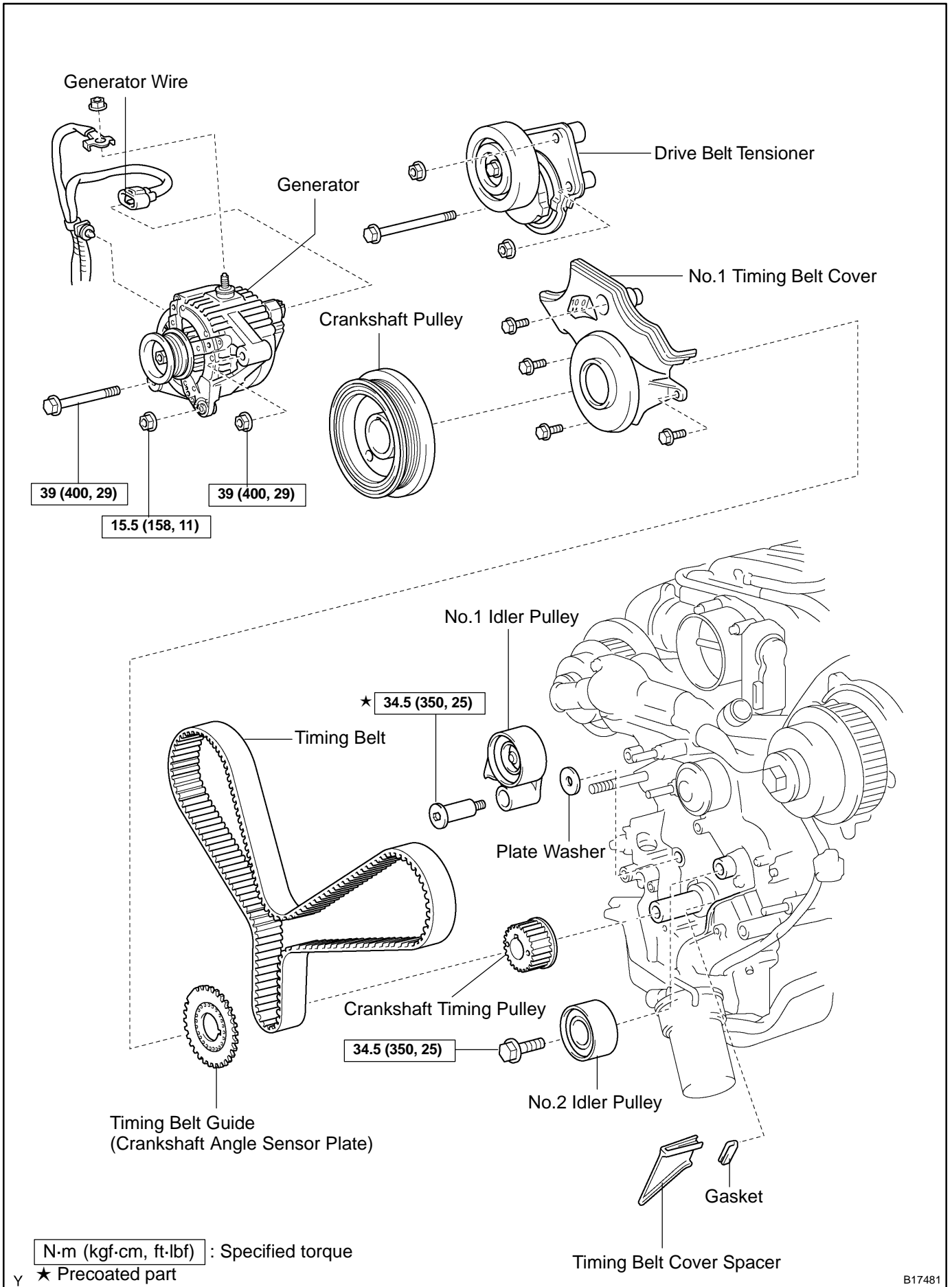
Install the oil filler cap facing the direction as shown in the illustration.

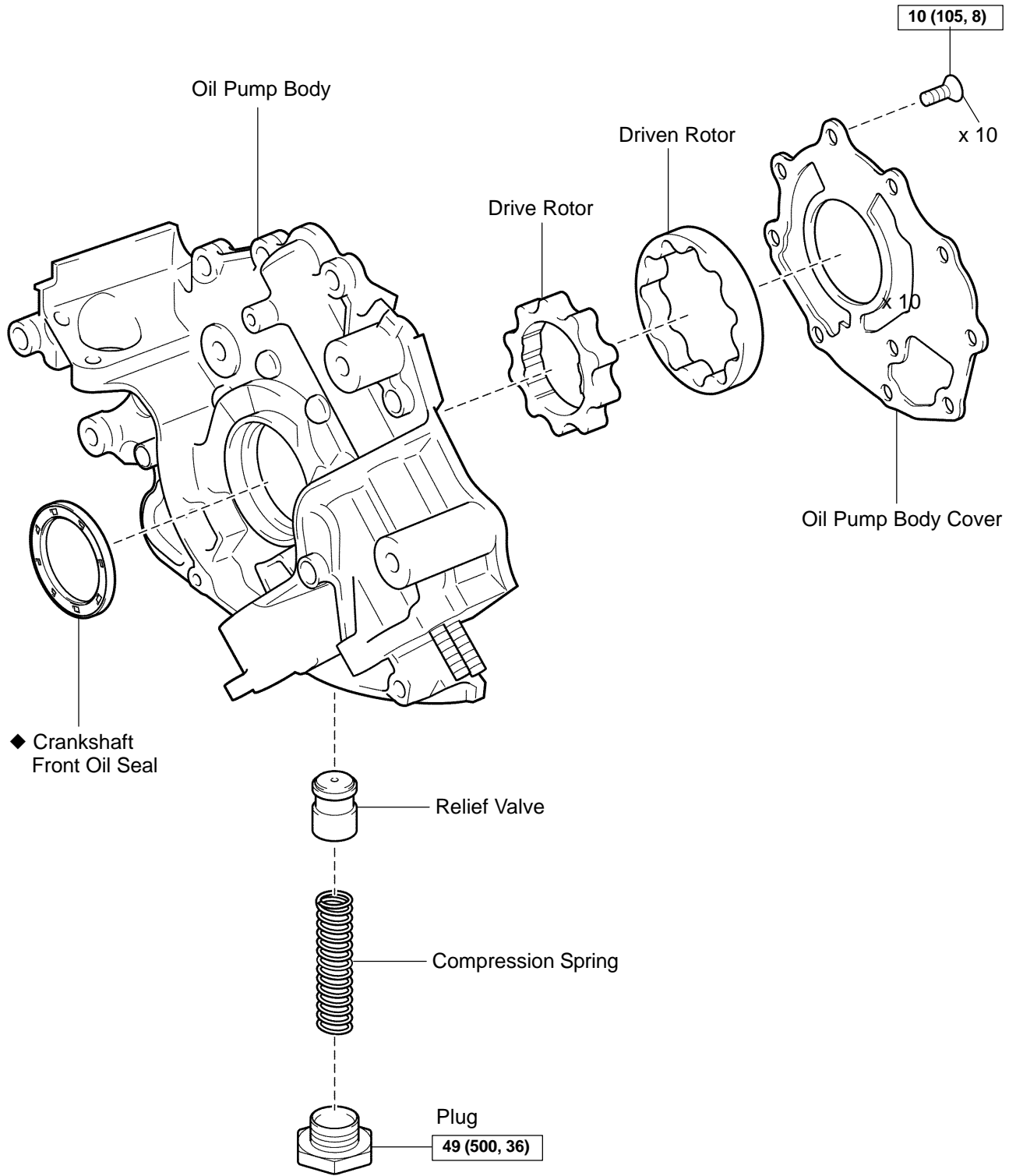
- 5. START ENGINE AND CHECK FOR ENGINE OIL LEAKS**
- 6. RECHECK ENGINE OIL LEVEL**
- 7. w/ Oil filter change:
REINSTALL ENGINE UNDER COVER**

OIL PUMP COMPONENTS

LU08P-09







N·m (kgf·cm, ft·lbf) : Specified torque

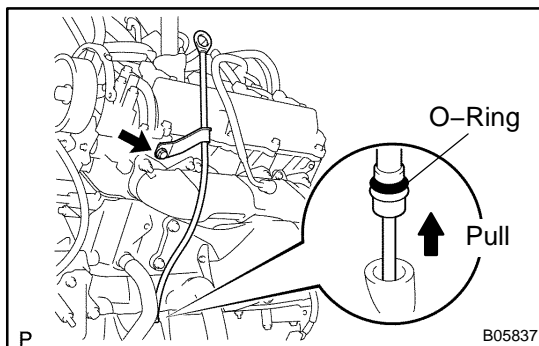
◆ Non-reusable part

REMOVAL

HINT:

When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

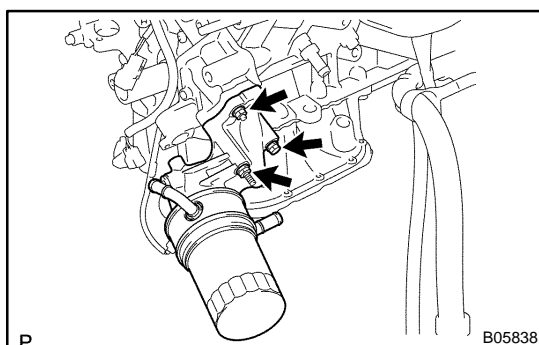
1. **REMOVE ENGINE FROM VEHICLE**
(2WD: See page [EM-79](#))
(4WD: See page [EM-92](#))
2. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
3. **REMOVE TIMING BELT** (See page [EM-16](#))
4. **REMOVE NO.1 IDLER PULLEY** (See page [EM-16](#))
5. **REMOVE NO.2 IDLER PULLEY** (See page [EM-16](#))
6. **REMOVE CRANKSHAFT TIMING PULLEY**
(See page [EM-16](#))
7. **REMOVE CRANKSHAFT POSITION SENSOR**
(See page [IG-11](#))



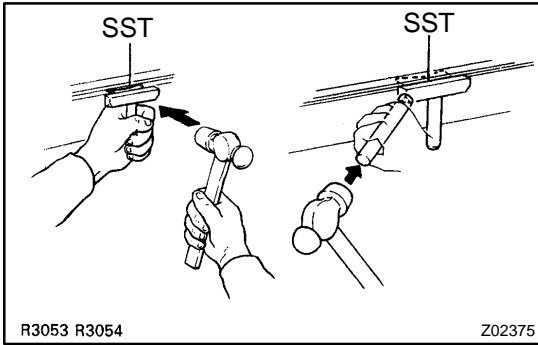
8. **REMOVE OIL DIPSTICK AND GUIDE**
 - (a) Remove the bolt holding the oil dipstick to the LH cylinder head.
 - (b) Pull out the dipstick guide together with the dipstick from the No.1 oil pan.
 - (c) Remove the O-ring from the dipstick guide.

9. REMOVE OIL FILTER, OIL COOLER AND FILTER BRACKET ASSEMBLY

- (a) Disconnect the oil pressure switch connector.
- (b) Take out the vinyl tape, and disconnect the wire from the clamp.
- (c) Turn the clamp counterclockwise, and remove the clamp from the oil filter bracket.
- (d) Disconnect the oil cooler hose from the oil cooler.



- (e) Remove the 2 bolts, nut, the oil filter, oil cooler and filter bracket assembly.
- (f) Remove the gasket from the filter bracket.

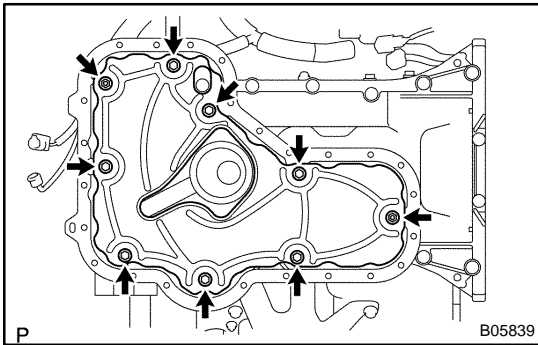


10. REMOVE NO.2 OIL PAN

- (a) Remove the 24 bolts and 2 nuts.
- (b) Insert the blade of SST between the No.1 and No.2 oil pans, cut off applied sealer and remove the No.2 oil pan.
SST 09032-00100

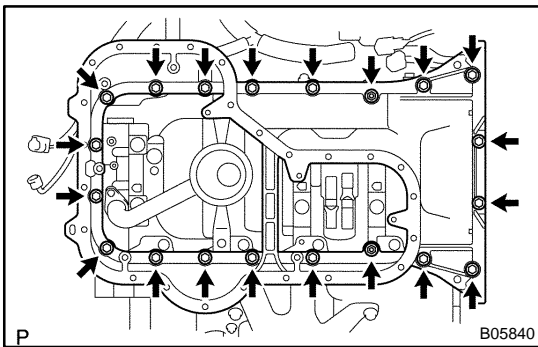
NOTICE:

- Be careful not to damage the No.2 oil pan contact surface of the No.1 oil pan.
- Be careful not to damage the No.2 oil pan flange.



11. REMOVE OIL PAN Baffle PLATE

Remove the 7 bolts, 2 nuts and baffle plate.



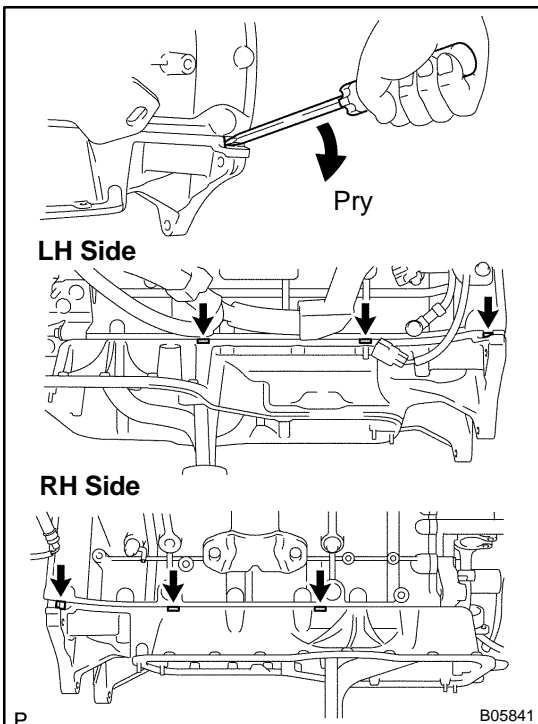
12. REMOVE NO.1 OIL PAN

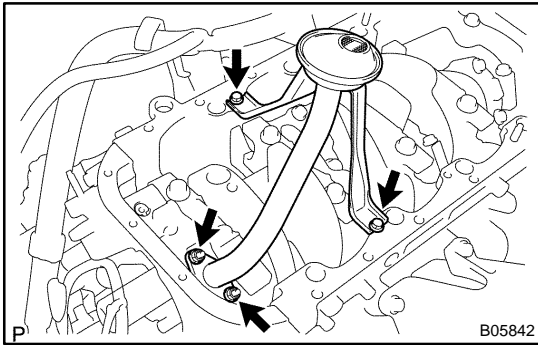
- (a) Remove the 18 bolts and 2 nuts.

- (b) Using a screwdriver, remove the No.1 oil pan by prying between the oil pan and cylinder block in the sequence shown.

NOTICE:

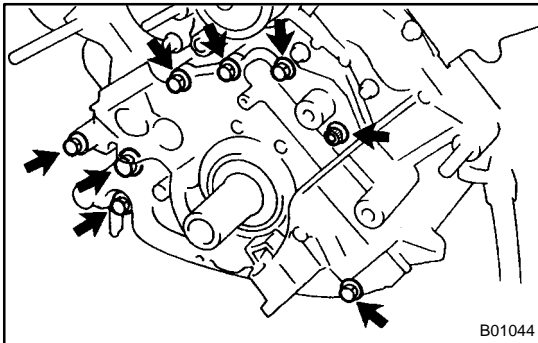
Be careful not to damage the contact surface of the cylinder block and No.1 oil pan.





13. REMOVE OIL STRAINER

Remove the 2 bolt, 2 nuts, oil strainer and gasket.

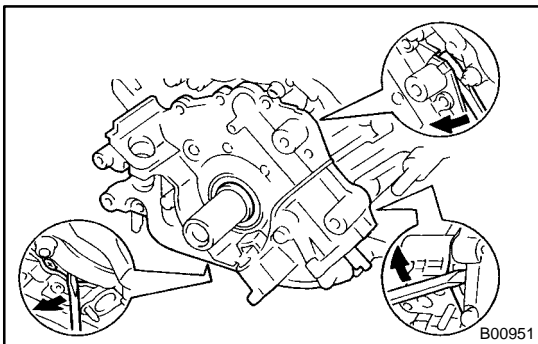


14. REMOVE OIL PUMP

(a) Remove the 8 bolts.

HINT:

Use a 6 mm hexagon wrench for the hexagon head bolt.

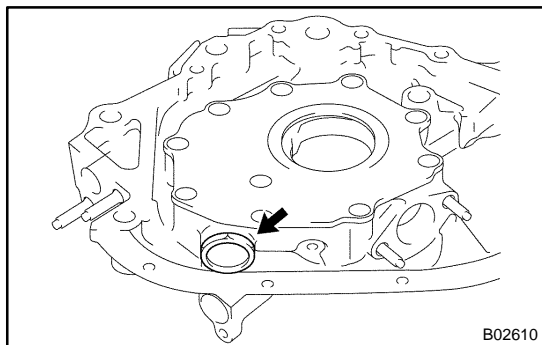


(b) Using a screwdriver, remove the oil pump by prying the portions between the oil pump and cylinder block.

NOTICE:

Be careful not to damage the contact surface of the cylinder block and oil pump.

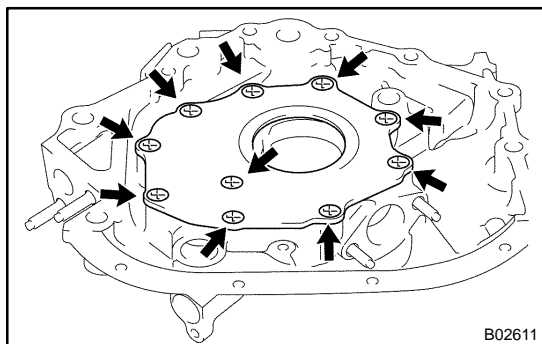
(c) Remove the O-ring from the cylinder block.



DISASSEMBLY

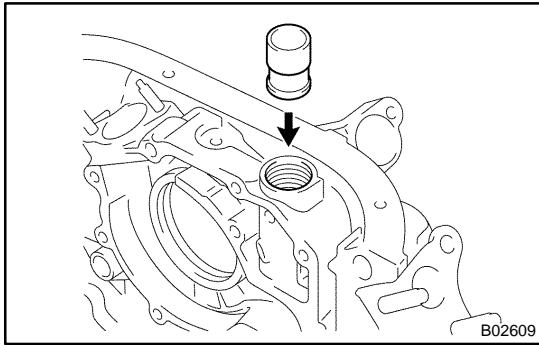
1. REMOVE RELIEF VALVE

Remove the plug, compression spring and relief valve.



2. REMOVE DRIVE AND DRIVEN ROTORS

Remove the 10 screws, pump body cover, the drive and driven rotors.



INSPECTION

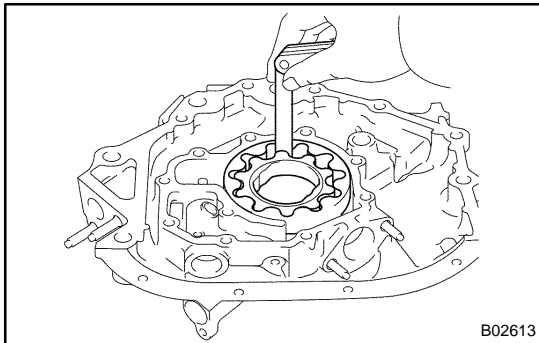
1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If it doesn't, replace the relief valve. If necessary, replace the oil pump assembly.

2. INSPECT DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into the oil pump body. (see page [LU-14](#))



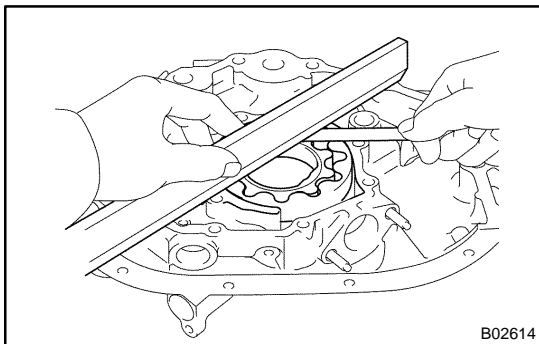
(b) Inspect the rotors for the body clearance. Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:

0.060 to 0.180 mm (0.0024 to 0.0071 in.)

Maximum tip clearance: 0.18 mm (0.0071 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.



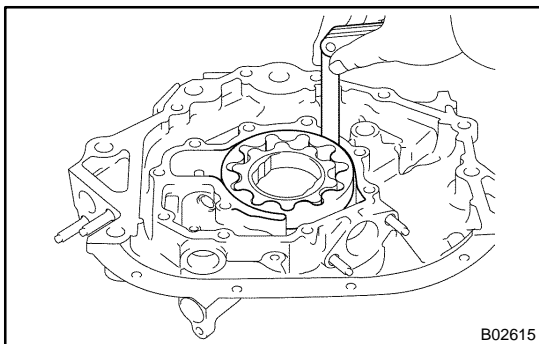
(c) Inspect the rotors for the side clearance. Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Side clearance:

0.030 to 0.090 mm (0.0012 to 0.0035 in.)

Maximum body clearance: 0.09 mm (0.0035 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



(d) Inspect the rotor for the body clearance. Using a feeler gauge, measure the clearance between the driven rotor and body.

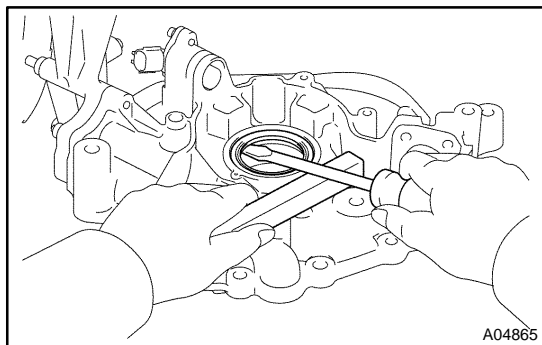
Standard body clearance:

0.250 to 0.325 mm (0.0098 to 0.0128 in.)

Maximum body clearance: 0.325 mm (0.0128 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

(e) Remove the drive and drive rotors.



REPLACEMENT

REPLACE CRANKSHAFT FRONT OIL SEAL

HINT:

There are 2 methods ((a) and (b)) to replace the oil seal.

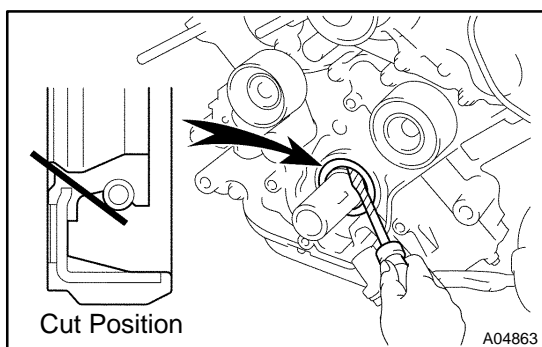
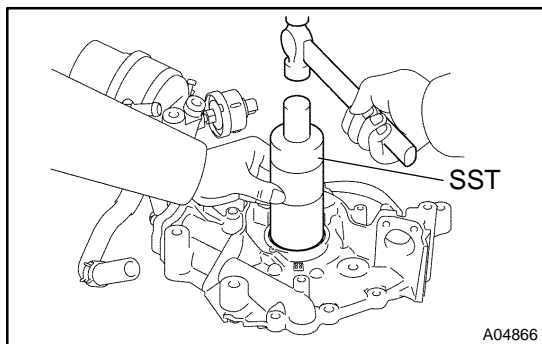
(a) If the oil pump is removed from the cylinder block:

(1) Using a screwdriver, pry out the oil seal.

(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.

SST 09316-60011 (09316-00011)

(3) Apply MP grease to the oil seal lip.



(b) If the oil pump is installed to the cylinder block:

(1) Using a knife, cut off the oil seal lip.

(2) Using a screwdriver, pry out the oil seal.

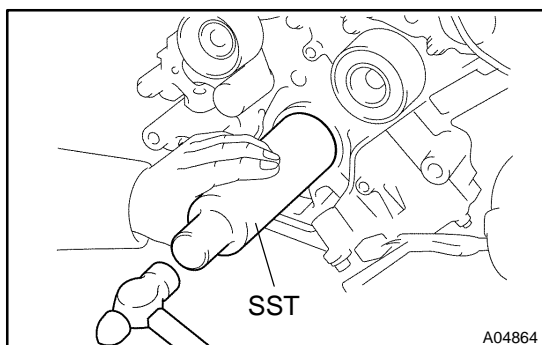
NOTICE:

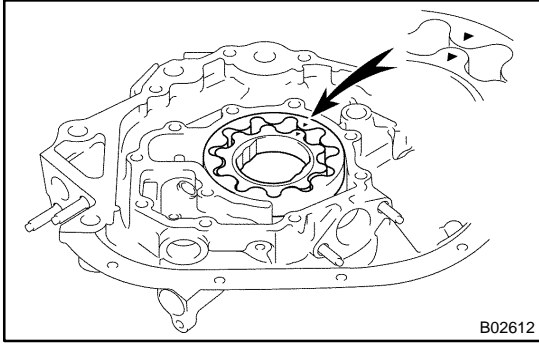
Be careful not to damage the crankshaft. Tape the screwdriver tip.

(3) Apply MP grease to a new oil seal lip.

(4) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.

SST 09316-60011 (09316-00011)

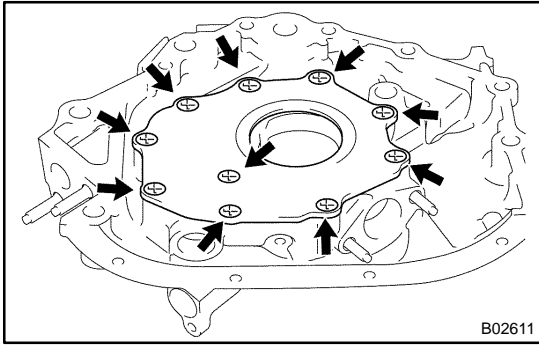




REASSEMBLY

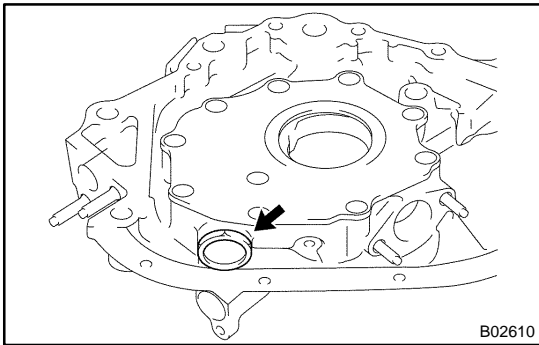
1. INSTALL DRIVE AND DRIVEN ROTORS

- (a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side.



- (b) Install the pump body cover with the 10 screws.

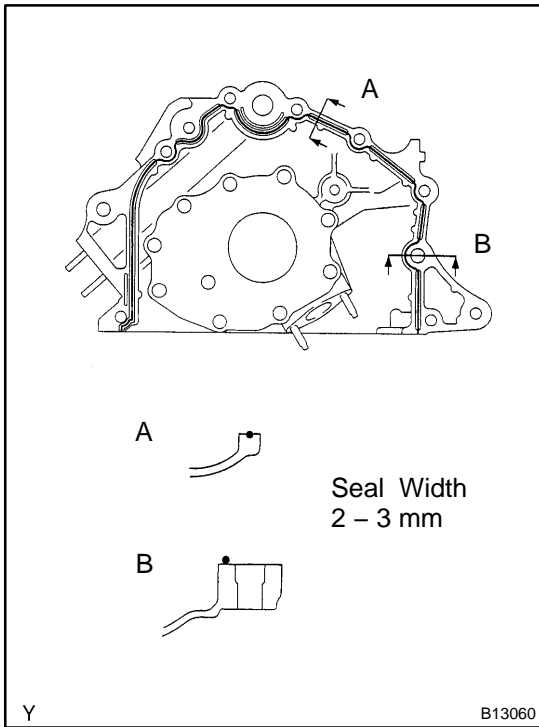
Torque: 10 N·m (105 kgf-cm, 7 ft-lbf)



2. INSTALL RELIEF VALVE

- (a) Insert the relief valve and compression spring into the oil pump body hole.
- (b) Install the plug.

Torque: 49 N·m (500 kgf-cm, 36 ft-lbf)



INSTALLATION

1. INSTALL OIL PUMP

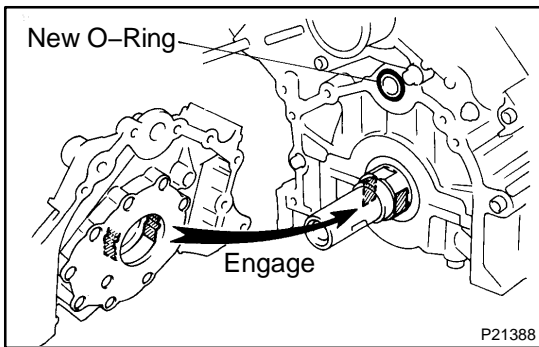
- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.
 - Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.
- (b) Apply seal packing to the oil pump as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

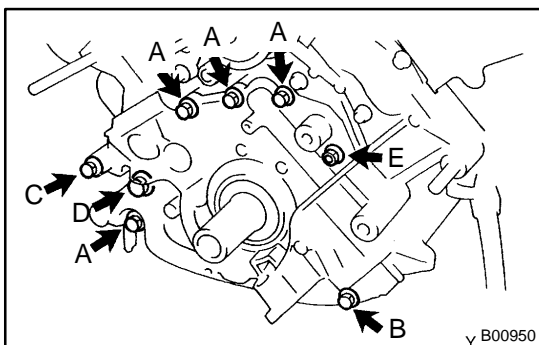
NOTICE:

Avoid applying an excessive amount to the surface. Be particularly careful near oil passage.

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



- (c) Install a new O-ring to the cylinder block.
- (d) Engage the spline teeth of the oil pump drive gear with the large teeth of the crankshaft, and slide the oil pump on the crankshaft.



- (e) Install the oil pump with the 8 bolts. Uniformly tighten the bolts in several passes.

Torque:

30.5 N·m (310 kgf·cm, 22 ft·lbf) for 14 mm head

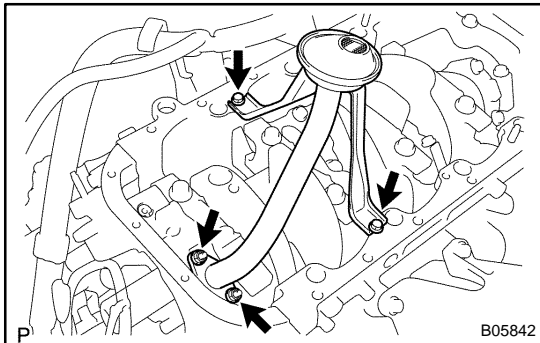
15.5 N·m (160 kgf·cm, 11 ft·lbf) for others

HINT:

- Use a 6 mm hexagon wrench for the hexagon head bolt.
- Each bolt length is indicated in the illustration.

Bolt length:

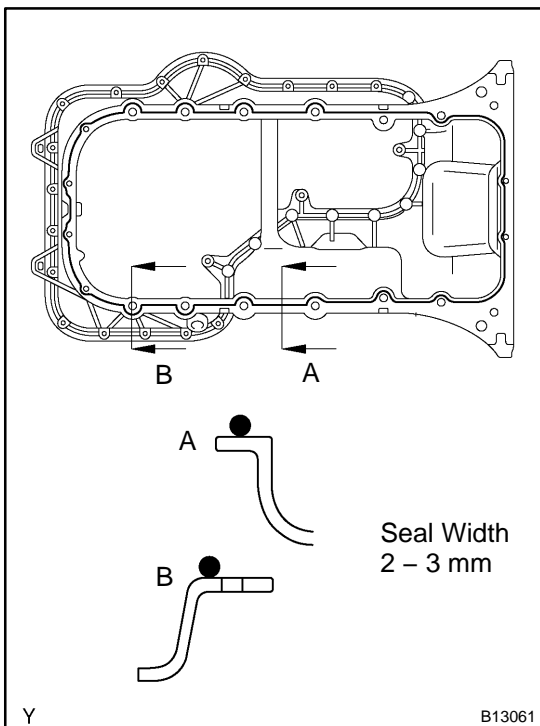
- 35 mm (1.38 in.) for A of 12 mm head
- 50 mm (1.97 in.) for B of 12 mm head
- 106 mm (4.17 in.) for C of 12 mm head
- 40 mm (1.57 in.) for D of 14 mm head
- 30 mm (1.18 in.) for E of 6 mm hexagon head



2. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the 2 bolts and 2 nuts.

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

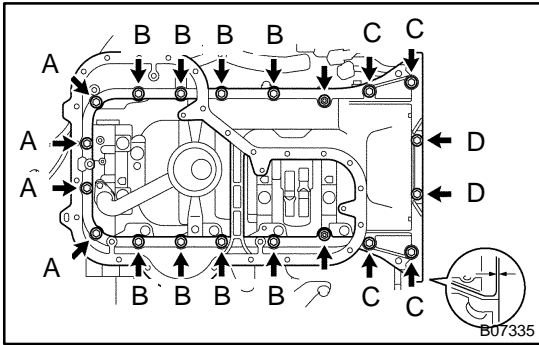


3. INSTALL NO.1 OIL PAN

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the No.1 oil pan, cylinder block, oil pump and rear oil seal retainer.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.
- (b) Apply seal packing to the No.1 oil pan as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Temporarily install the No.1 oil pan with the 18 bolts, stud bolt and 2 nuts.

HINT:

Each bolt length is indicated in the illustration.

Bolt length:

20 mm (0.79 in.) for A of 10 mm head

25 mm (0.98 in.) for B of 12 mm head

60 mm (2.36 in.) for C of 12 mm head

35 mm (1.38 in.) for D of 10 mm head

(d) Set the No.1 oil pan as shown in the illustration.

NOTICE:

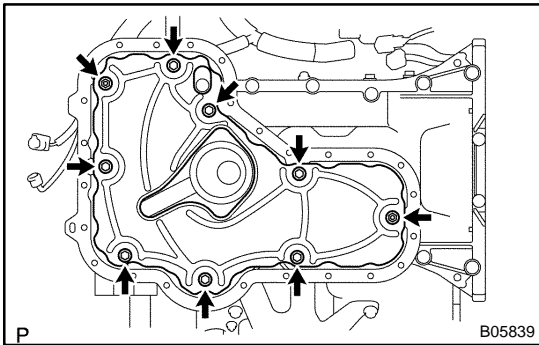
Make sure the clearance between the rear ends of the No.1 oil pan and cylinder block is 0.2 mm (0.008 in.) or less. If the clearance is more than 0.2 mm (0.008 in.), the No.1 oil pan will be stretched.

(e) Uniformly tighten the bolts, and nuts in several passes.

Torque:

7.5 N·m (76 kgf·cm, 66 in.-lbf) for 10 mm head

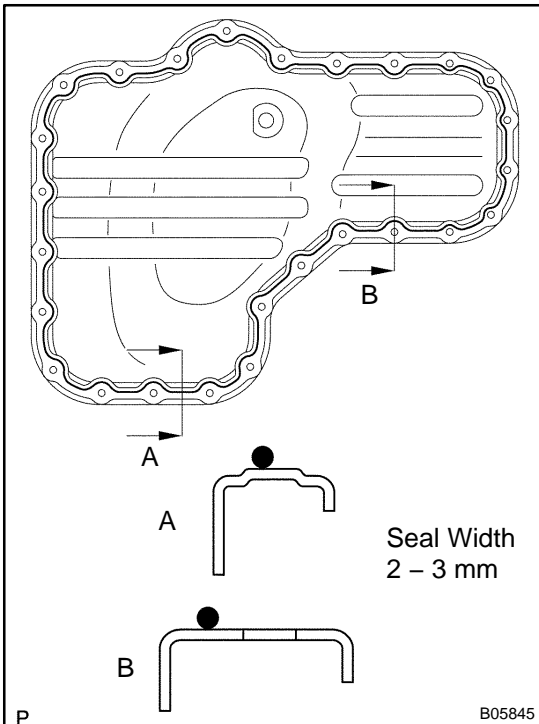
28 N·m (290 kgf·cm, 21 ft·lbf) for 12 mm head



4. INSTALL OIL PAN Baffle PLATE

Install the baffle plate with the 7 bolts and 2 nuts.

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)



5. INSTALL NO.2 OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the No.1 and No.2 oil pans.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non-residue solvent, clean both sealing surfaces.

NOTICE:

Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the No.2 oil pan as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the No.2 oil pan with the 24 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

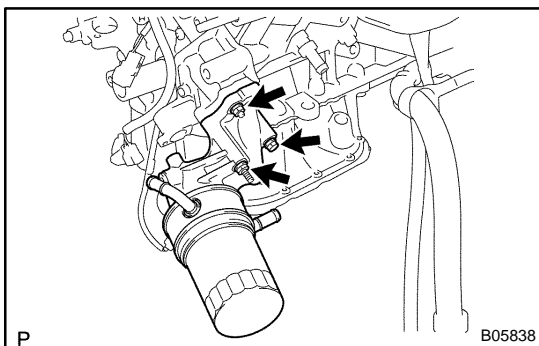
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

6. INSTALL CRANKSHAFT POSITION SENSOR

(See page [IG-13](#))

7. INSTALL OIL FILTER, OIL COOLER AND FILTER BRACKET ASSEMBLY

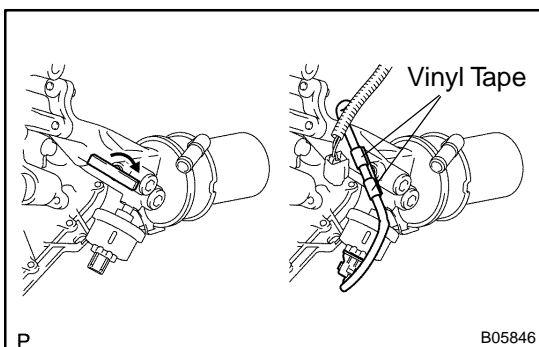
(a) Install a new gasket to the oil filter bracket.



(b) Install the oil filter, oil cooler and filter bracket assembly with the 2 bolts and nut.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(c) Connect the oil cooler hose to the oil cooler.

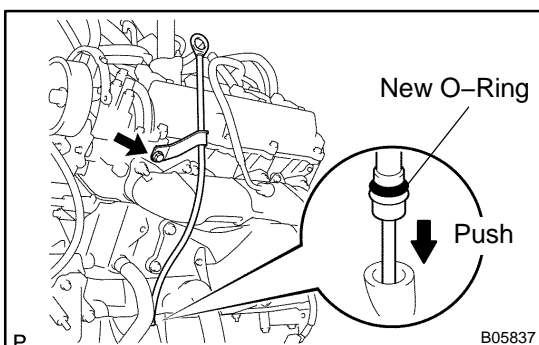


(d) Install the clamp.

Turn the clamp clockwise, and install the clamp to the oil filter bracket.

(e) Install the wire to the clamp with a vinyl tape.

(f) Connect the oil pressure switch connector.



8. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK

(a) Install a new O-ring to the dipstick guide.

(b) Apply soapy water to the O-ring.

(c) Push in the oil dipstick guide end into the guide hole of the No.1 oil pan.

(d) Install the oil dipstick guide with the bolt.

Torque: 15 N·m, (155 kgf·cm, 11 ft·lbf)

(e) Install the oil dipstick.

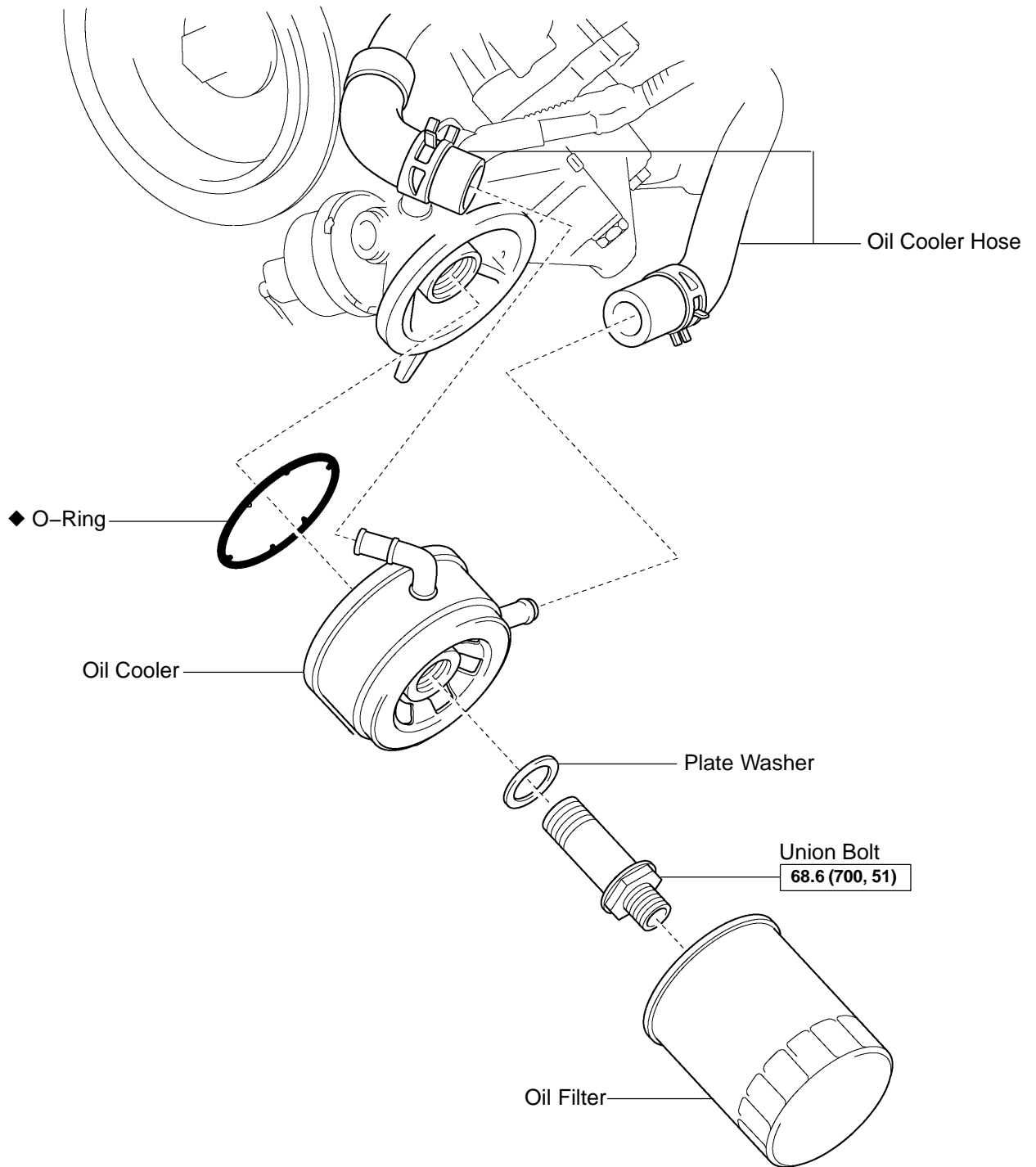
9. INSTALL CRANKSHAFT TIMING PULLEY

(See page [EM-23](#))

10. **INSTALL NO.1 IDLER PULLEY** (See page [EM-23](#))
11. **INSTALL NO.2 IDLER PULLEY** (See page [EM-23](#))
12. **INSTALL TIMING BELT** (See page [EM-23](#))
13. **DISCONNECT ENGINE FROM ENGINE STAND**
14. **INSTALL ENGINE TO VEHICLE**
(2WD: See page [EM-83](#))
(4WD: See page [EM-95](#))

OIL COOLER COMPONENTS

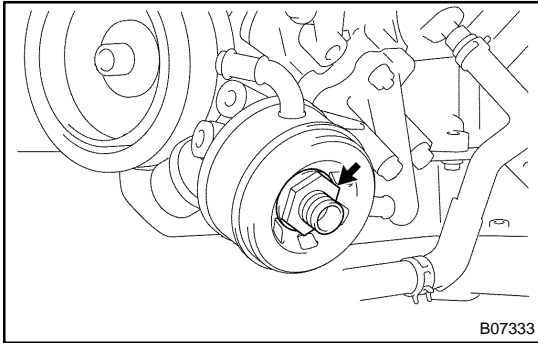
LU08W-10



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

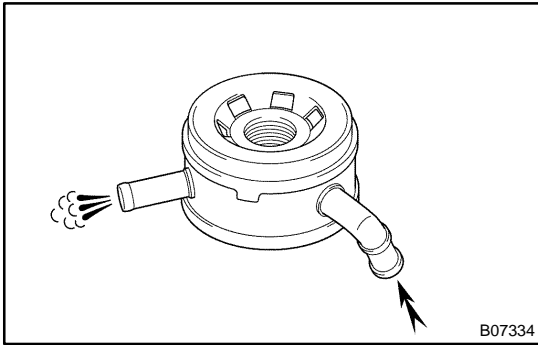
REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE OIL FILTER (See page [LU-2](#))



3. REMOVE OIL COOLER

- (a) Disconnect the 2 oil cooler hoses from the oil cooler.
- (b) Remove the union bolt, plate washer and oil cooler.
- (c) Remove the O-ring from the oil cooler.



INSPECTION

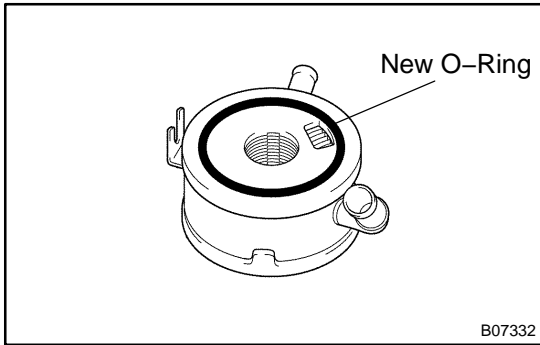
INSPECT OIL COOLER

Check the oil cooler for damage or clogging.
If necessary, replace the oil cooler.

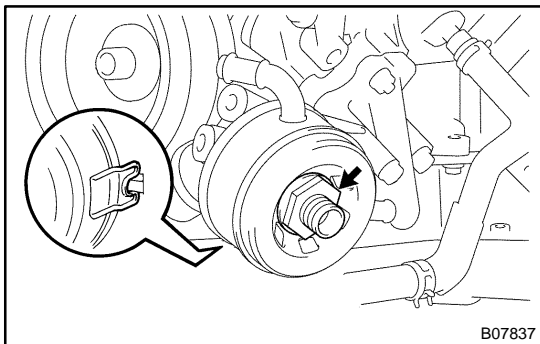
INSTALLATION

1. INSTALL OIL COOLER

- (a) Clean the oil cooler contact surface on the cooler mounting.



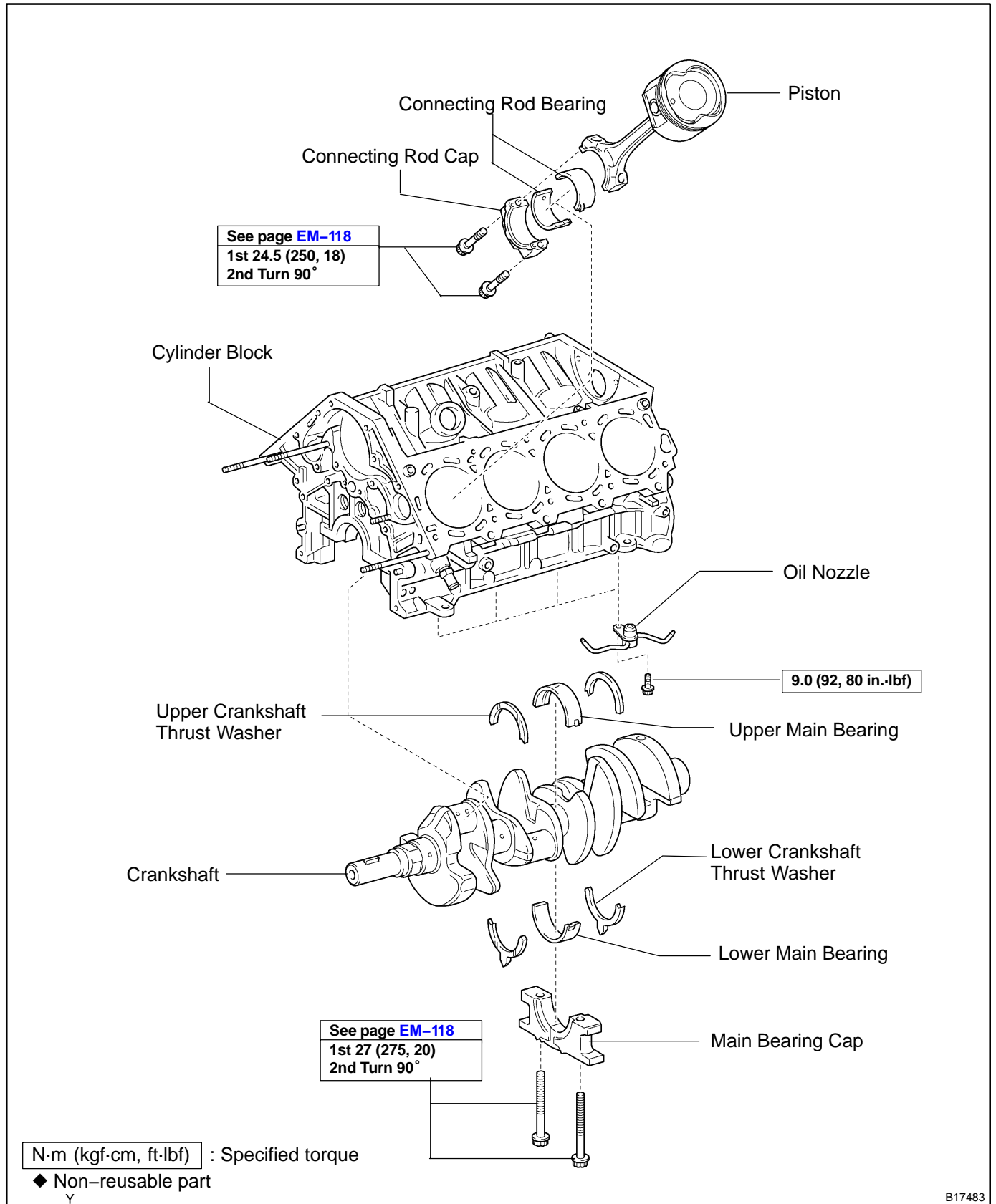
- (b) Place a new O-ring to the oil cooler.
- (c) Apply a light coat of engine oil on the threads and under the head of the union bolt.

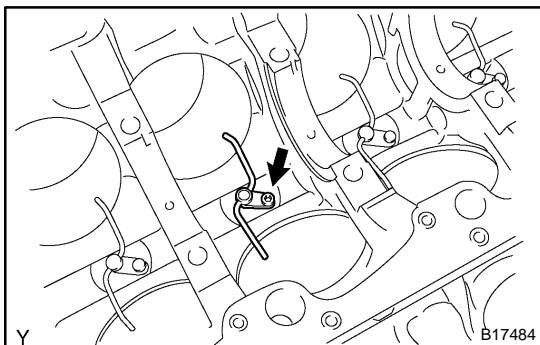


- (d) Install the oil cooler and plate washer with the union bolt.
Torque: 68.6 N·m (700 kgf·cm, 51 ft·lbf)
 - (e) Connect the 2 oil cooler hoses to the oil cooler.
2. **INSTALL OIL FILTER (See page [LU-2](#))**
 3. **FILL WITH ENGINE COOLANT**
 4. **START ENGINE AND CHECK FOR ENGINE OIL LEAKS**
 5. **CHECK ENGINE OIL LEVEL**

OIL NOZZLE COMPONENTS

LU01H-08

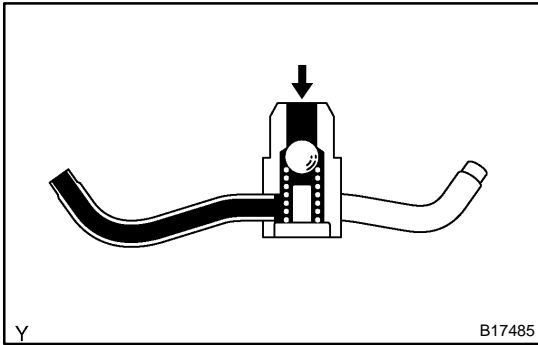




REMOVAL

1. REMOVE CRANKSHAFT (See page [EM-100](#))
2. REMOVE OIL NOZZLE (WITH RELIEF VALVE)

Using a 5 mm hexagon wrench, remove the bolt and oil nozzle.

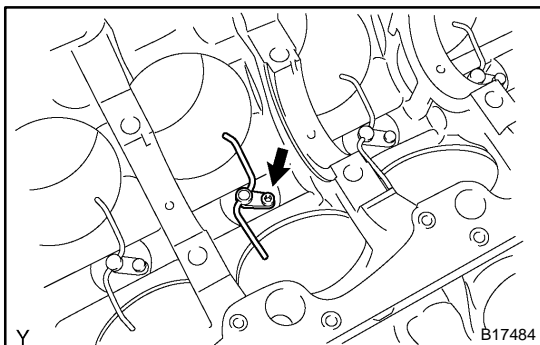


INSPECTION

INSPECT RELIEF VALVE (OIL NOZZLE)

Push the valve with a wooden stick to check if it is stuck.

If stuck, replace the relief valve.



INSTALLATION

1. INSTALL OIL NOZZLE (WITH RELIEF VALVE)

Using a 5 mm hexagon wrench, install the oil nozzle with the bolt.

Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)

2. INSTALL CRANKSHAFT (See page [EM-118](#))

IGNITION SYSTEM

ON-VEHICLE INSPECTION

IGOMI-01

NOTICE:

”Cold” and ”Hot” in this section mean the temperature of the coils themselves. ”Cold” is from -10°C (14°F) to 50°C (122°F) and ”Hot” is from 50°C (122°F) to 100°C (212°F).

1. INSPECT IGNITION COIL AND SPARK TEST

(a) Confirm DTCs.

NOTICE:

If a DTC is present, perform troubleshooting in accordance with the procedure for that DTC.

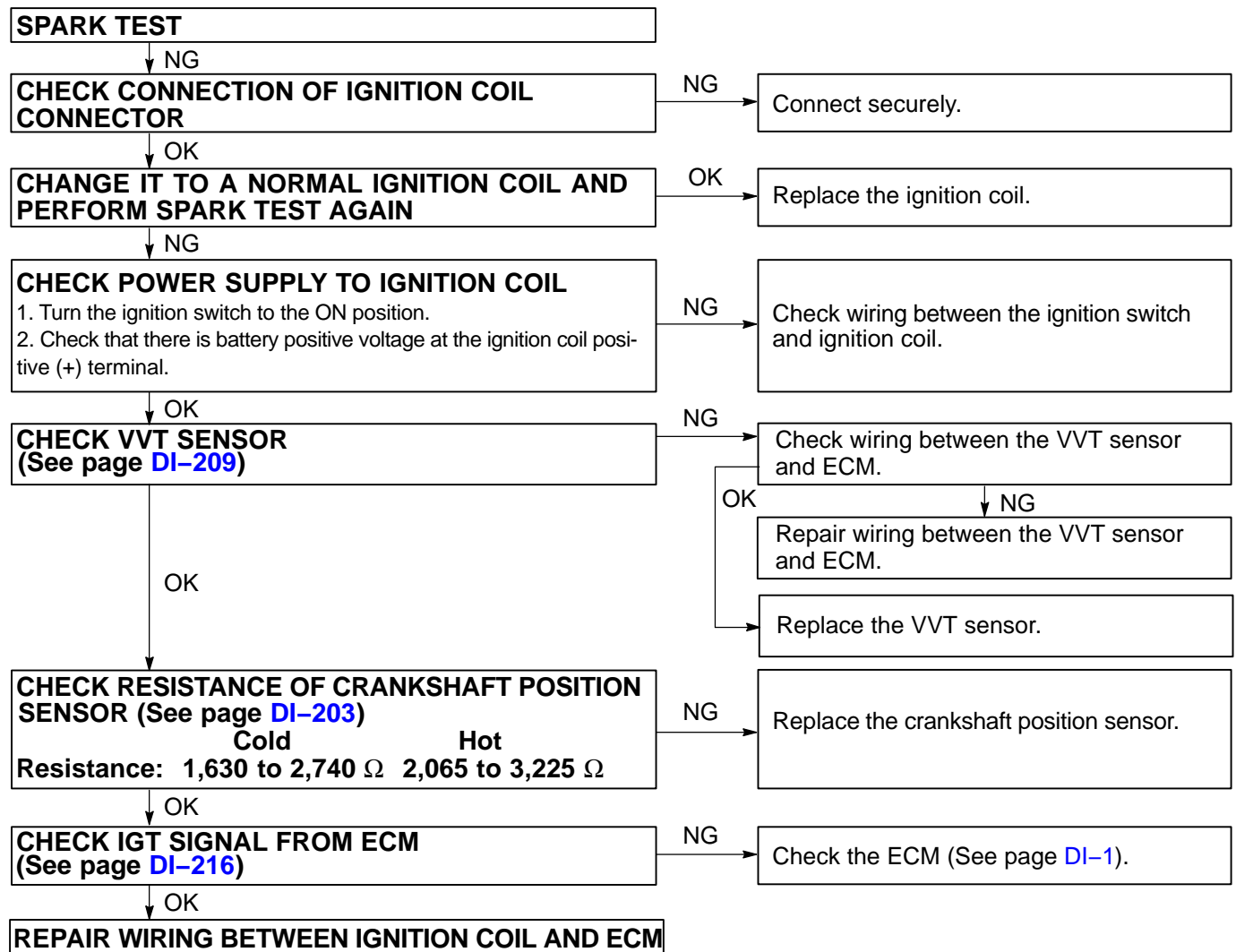
(b) Check that spark occurs.

- (1) Remove the ignition coils.
- (2) Using a 16 mm (0.63 in) plug wrench, remove the spark plugs.
- (3) Install the spark plugs to each ignition coil, and connect the ignition coil connectors.
- (4) Disconnect the 6 injector connectors.
- (5) Ground the spark plugs.
- (6) Check if spark occurs while the engine is being cranked.

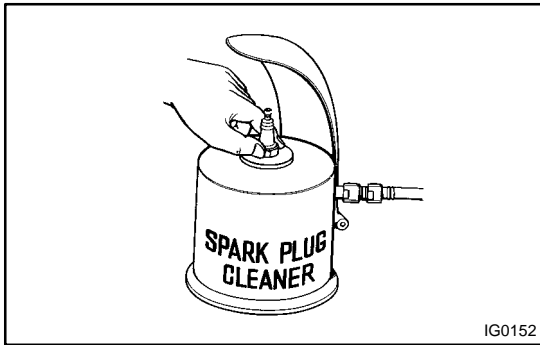
NOTICE:

- Be sure to ground the spark plugs when checking.
- Replace the ignition coil when subjected to an impact.
- Do not crank the engine for more than 2 seconds.

If spark does not occur, do the test as follows:



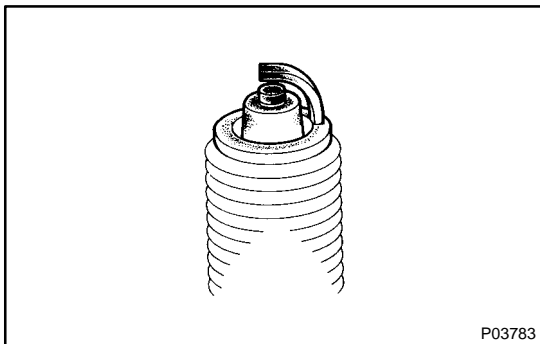
- (c) Using a 16 mm (0.63 in.) plug wrench, install the spark plugs.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)
- (d) Install the ignition coils.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)



IG0152

2. INSPECT SPARK PLUGS

- (a) Clean the spark plugs.
Air pressure: Below 588 kPa (6 kg/cm², 85 psi)
Duration: 20 seconds or less



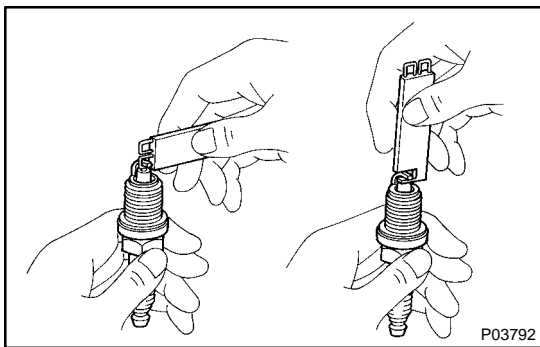
P03783

- (b) Check the spark plug for any damage to its thread and insulator.

If there is damage, replace the spark plug.

Recommended spark plug:

NGK made	LFR6C-11
DENSO made	K20HR-U11



P03792

- (c) Adjust electrode gap.
Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)
Maximum electrode gap: 1.46 mm (0.057 in.)

3. CHECK VVT SENSOR OUTPUT VOLTAGE

- (a) Turn the ignition switch to the ON position.
- (b) Check that the voltage between terminal VC1 of the ECM and ground is 5 V.

HINT:

For the terminal arrangement of the ECM, see page [DI-34](#).

- (c) While turning the crankshaft pulley by hand, measure the voltage between each terminal. Check that the voltage changes between the Hi range and Lo range as shown in the table below.

HINT:

For the terminal arrangement of the ECM, see page [DI-34](#).

Sensor position	Terminal No.	Voltage (Hi)	Voltage (Lo)
Bank 1	VV1+ ↔ VV1-	3.75 to 4.5 V	0.5 to 1.25 V
Bank 2	VV2+ ↔ VV2-	3.75 to 4.5 V	0.5 to 1.25 V

4. INSPECT CRANKSHAFT POSITION SENSOR

- (a) Using an ohmmeter, measure the resistance between the terminals.

RESISTANCE:

1630 to 2740 Ω at cold

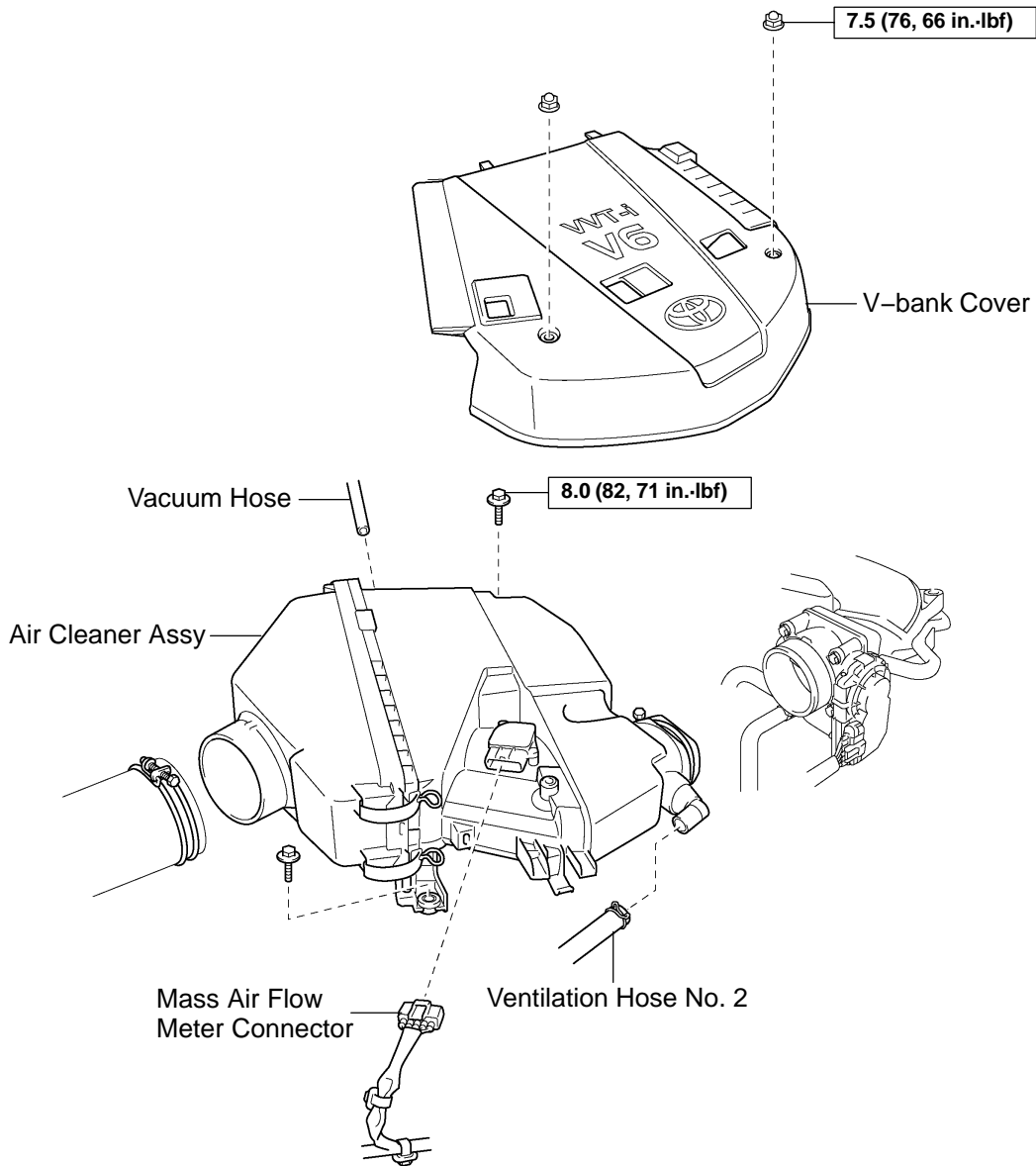
2065 to 3225 Ω at hot

NOTICE:

”Cold” and ”Hot” mean the temperature of the coils themselves. ”Cold” is from -10°C (14°F) to 50°C (122°F) and ”Hot” is from 50°C (122°F) to 100°C (212°F).

IGNITION COIL COMPONENTS

IG0MJ-01

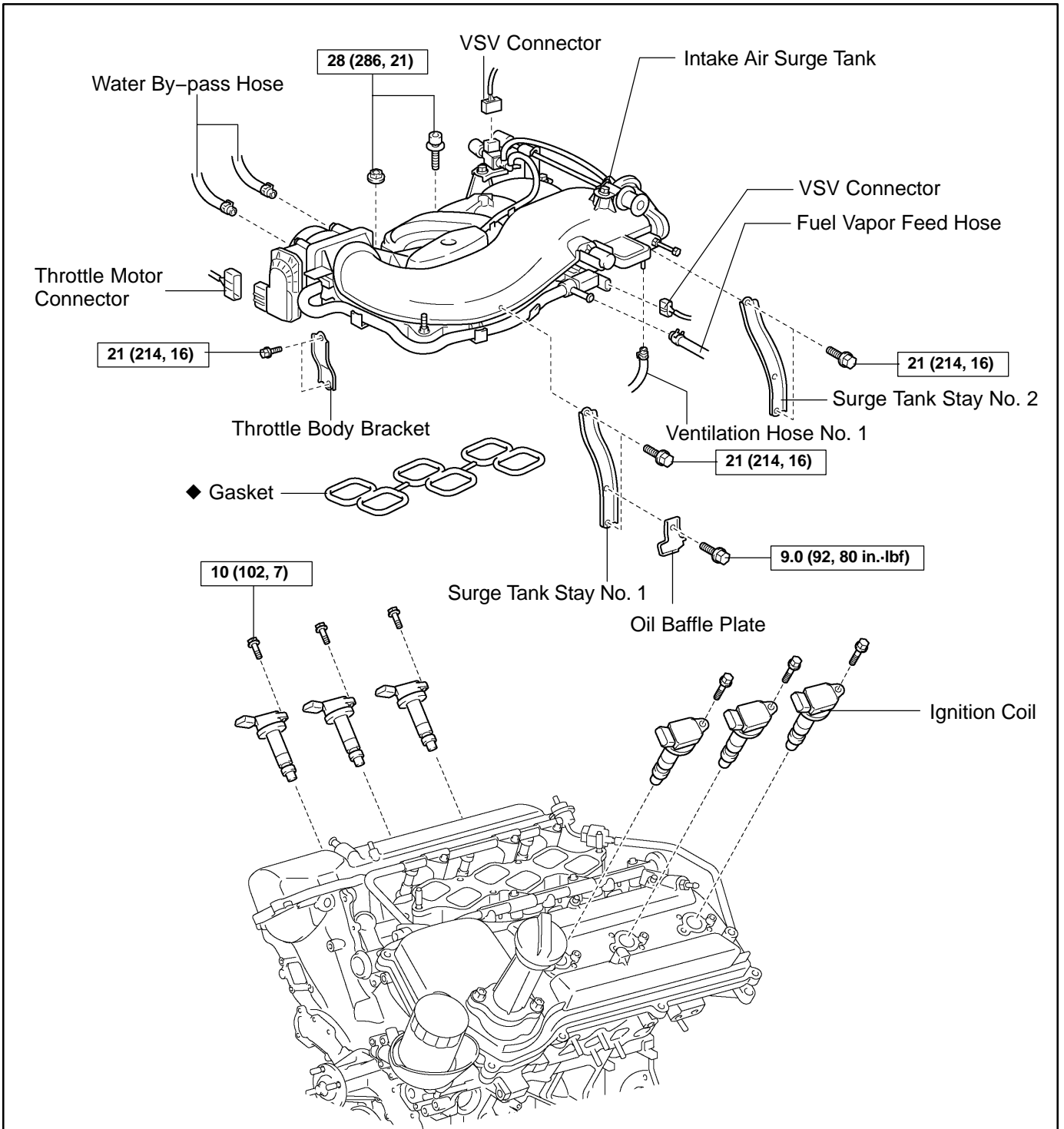


N·m (kgf·cm, ft·lbf) : Specified torque

Y

A23082

IGNITION (1GR-FE) - IGNITION COIL



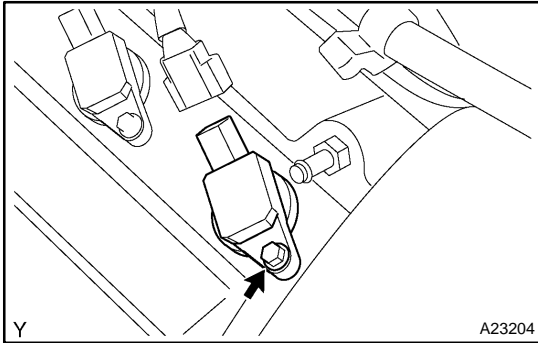
N·m (kgf·cm, ft·lbf) : Specified torque

◆: Non-reusable part

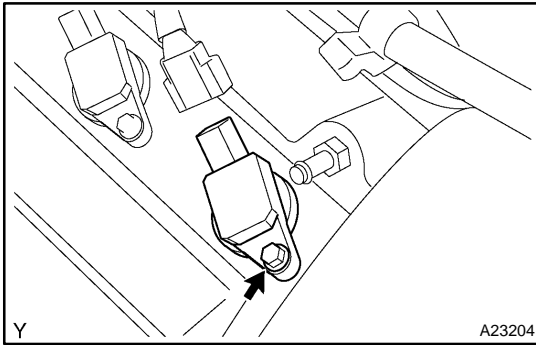
Y

REMOVAL

1. REMOVE V-BANK COVER
2. REMOVE AIR CLEANER (See page [EM-62](#))
3. REMOVE INTAKE AIR SURGE TANK
(See page [EM-62](#))
4. REMOVE IGNITION COIL
 - (a) Disconnect the ignition coil connector.



- (b) Remove the bolt and ignition coil.



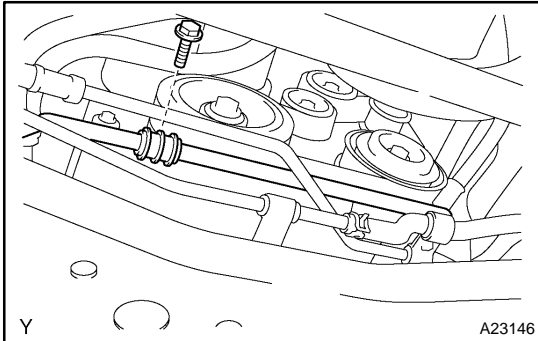
INSTALLATION

1. **INSTALL IGNITION COIL**
 - (a) Install the ignition coil with the bolt.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)
 - (b) Connect the ignition coil connector.
2. **INSTALL INTAKE AIR SURGE TANK**
(See page [EM-89](#))
3. **INSTALL AIR CLEANER** (See page [EM-89](#))
4. **INSTALL V-BANK COVER**

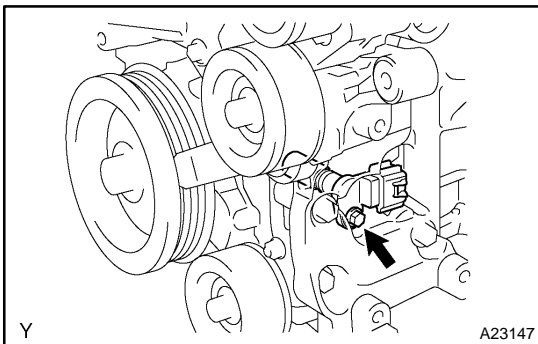
CRANKSHAFT POSITION SENSOR REMOVAL

IG0MM-01

1. REMOVE ENGINE UNDER COVER
2. REMOVE GENERATOR (See page [CH-7](#))



3. **SEPARATE COOLER COMPRESSOR**
 - (a) Remove the bolt and separate the suction hose sub-assy.
 - (b) Disconnect the cooler compressor assy connector.
 - (c) Remove the 4 bolts, and separate the cooler compressor from the V-ribbed belt tensioner.



4. **REMOVE CRANKSHAFT POSITION SENSOR**
 - (a) Disconnect the crankshaft position sensor connector.
 - (b) Remove the bolt and crankshaft position sensor.

INSPECTION

INSPECT CRANKSHAFT POSITION SENSOR

Using an ohmmeter, measure the resistance between the terminals.

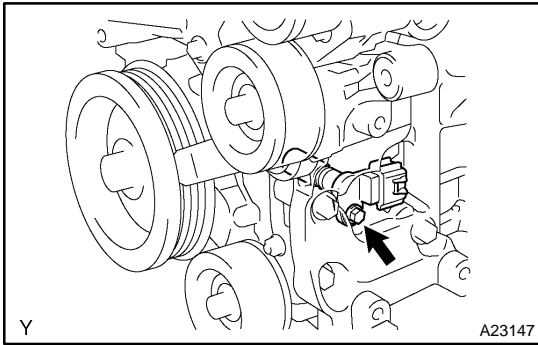
RESISTANCE:

1,630 to 2,740 Ω at cold

2,065 to 3,225 Ω at hot

NOTICE:

"Cold" and "Hot" mean the temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).



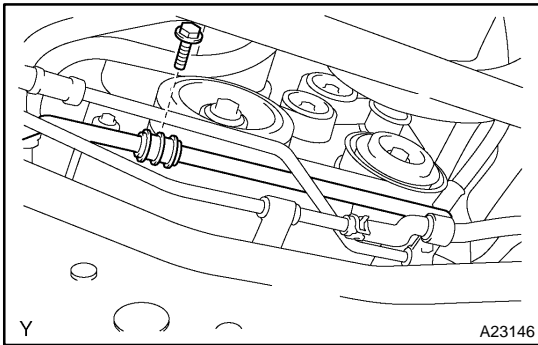
INSTALLATION

1. INSTALL CRANKSHAFT POSITION SENSOR

- (a) Apply a light coat of engine oil to an O-ring of the crankshaft position sensor.
- (b) Install the crankshaft position sensor with the bolt.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)
- (c) Connect the crankshaft position sensor connector.

2. INSTALL COOLER COMPRESSOR

- (a) Install the cooler compressor assy with the 4 bolts.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)
- (b) Connect the cooler compressor assy connector.



- (c) Install the suction hose sub-assy with the bolt.

Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)

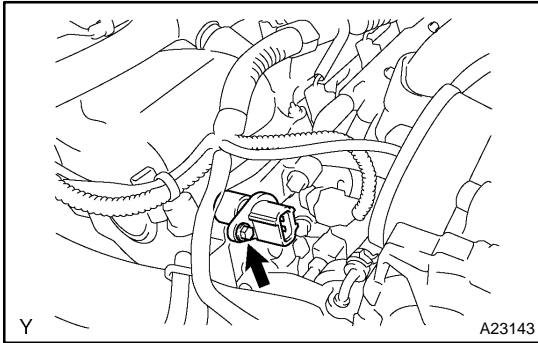
3. INSTALL GENERATOR (See page [CH-15](#))

4. INSTALL ENGINE UNDER COVER

VVT SENSOR REMOVAL

IGOMP-01

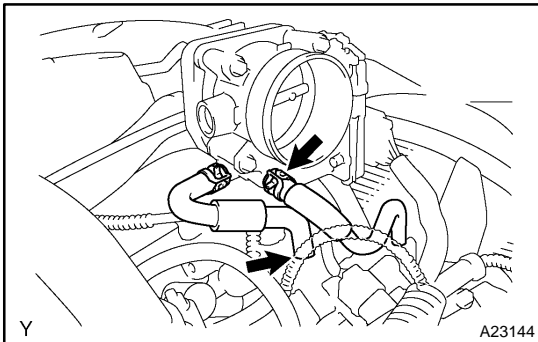
1. DRAIN ENGINE COOLANT
2. REMOVE V-BANK COVER
3. REMOVE AIR CLEANER (See page [EM-62](#))



4. REMOVE VVT SENSOR

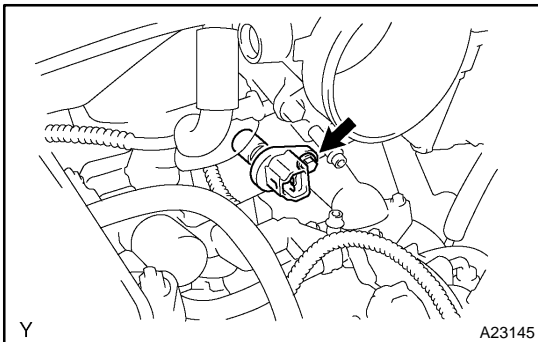
(a) RH bank side VVT sensor.

- (1) Disconnect the VVT sensor connector.
- (2) Remove the bolt and VVT sensor.

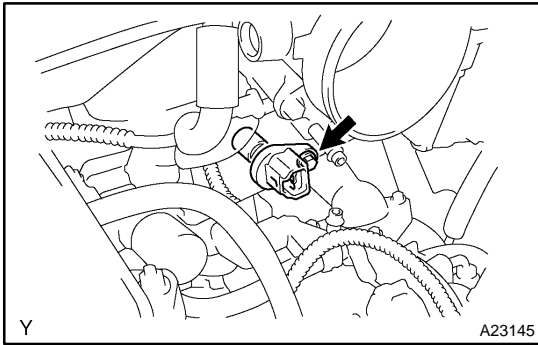


(b) LH bank side VVT sensor.

- (1) Disconnect the water by-pass hose No. 4 and No. 5.
- (2) Disconnect the VVT sensor connector.



- (3) Remove the bolt and VVT sensor.



INSTALLATION

1. INSTALL VVT SENSOR

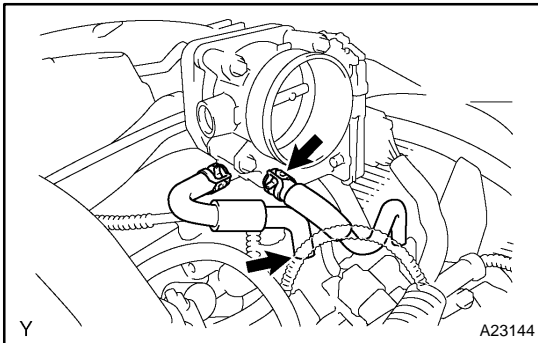
(a) LH bank side VVT sensor.

- (1) Apply a light coat of engine oil to an O-ring of the VVT sensor.
- (2) Install the VVT sensor with the bolt.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

- (3) Connect the VVT sensor connector.

- (4) Connect the water by-pass hose No. 4 and No. 5.



(b) RH bank side VVT sensor.

- (1) Apply a light coat of engine oil to an O-ring of the VVT sensor.
- (2) Install the VVT sensor with the bolt.

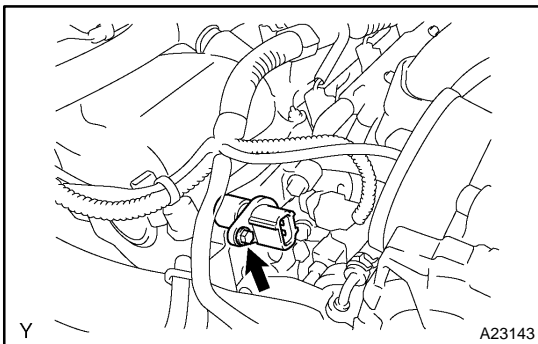
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

- (3) Connect the VVT sensor connector.

2. INSTALL AIR CLEANER (See page [EM-89](#))

3. INSTALL V-BANK COVER

4. ADD ENGINE COOLANT



IGNITION SYSTEM

ON-VEHICLE INSPECTION

IGOMF-02

NOTICE:

"Cold" and "Hot" in these sentences express the temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

1. INSPECT IGNITION COIL (WITH IGNITER) AND SPARK TEST

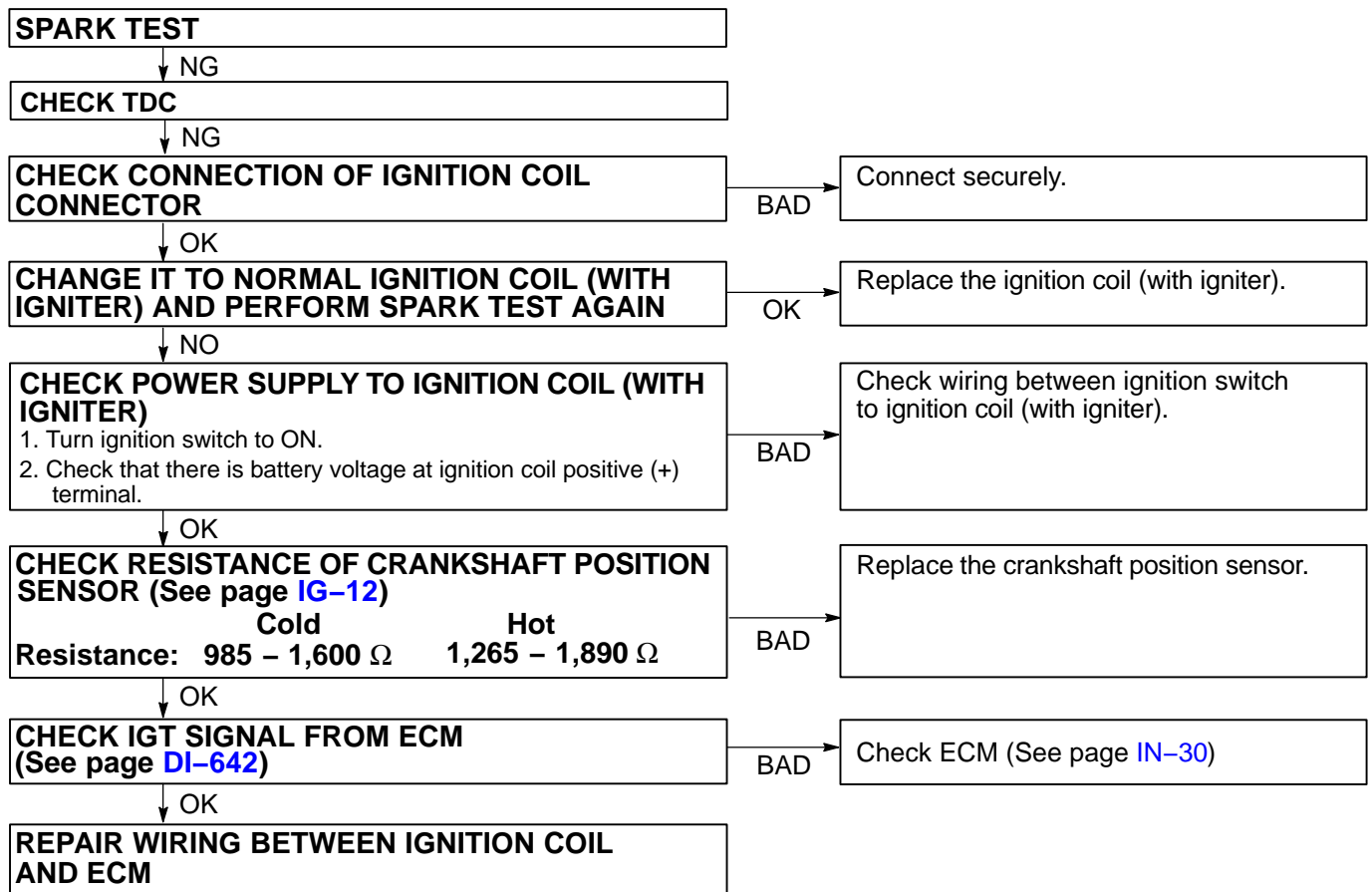
Check that the spark occurs.

- (1) Remove the ignition coils (with igniter).
(see page [IG-5](#))
- (2) Remove the spark plugs.
- (3) Install the spark plugs to each ignition coil (with igniter), and connect the ignition coil (with igniter) connector.
- (4) Disconnect the 8 injector connectors.
- (5) Ground the spark plug.
- (6) Check that spark occurs while engine is being cranked.

NOTICE:

To prevent gasoline from being injected out of injectors during this test, crank the engine for no more than 5 to 10 seconds at a time.

If the spark does not occur, do the test as follows:



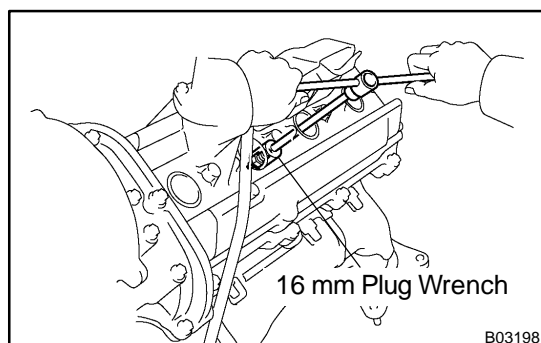
(7) Using a 16 mm plug wrench, install the spark plugs.

Torque: 17.5 N·m (180 kgf·cm, 13 ft·lbf)

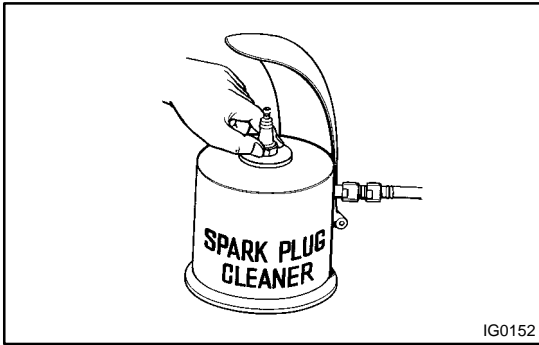
(8) Reinstall the ignition coils (with igniter).
(see page IG-6)

2. INSPECT SPARK PLUGS

(a) Remove the ignition coils (with igniter).
(see page IG-5)



(b) Using a 16 mm plug wrench, remove the spark plugs.



IG0152

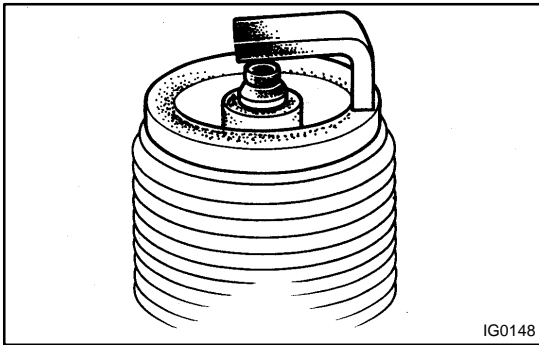
- (c) Clean the spark plugs.
If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

Air pressure: Below 588 kPa (6 kgf/cm², 85 psi)

Duration: 20 seconds or less

HINT:

If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



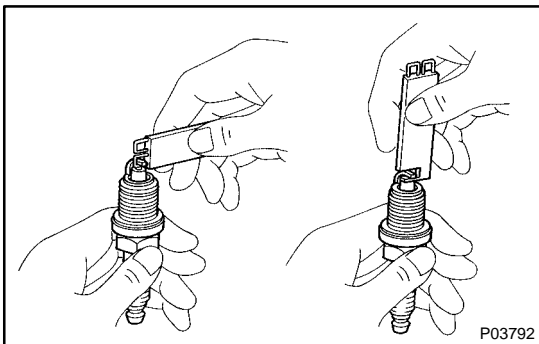
IG0148

- (d) Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

DENSO made	SK20R11
NGK made	IFR6A11

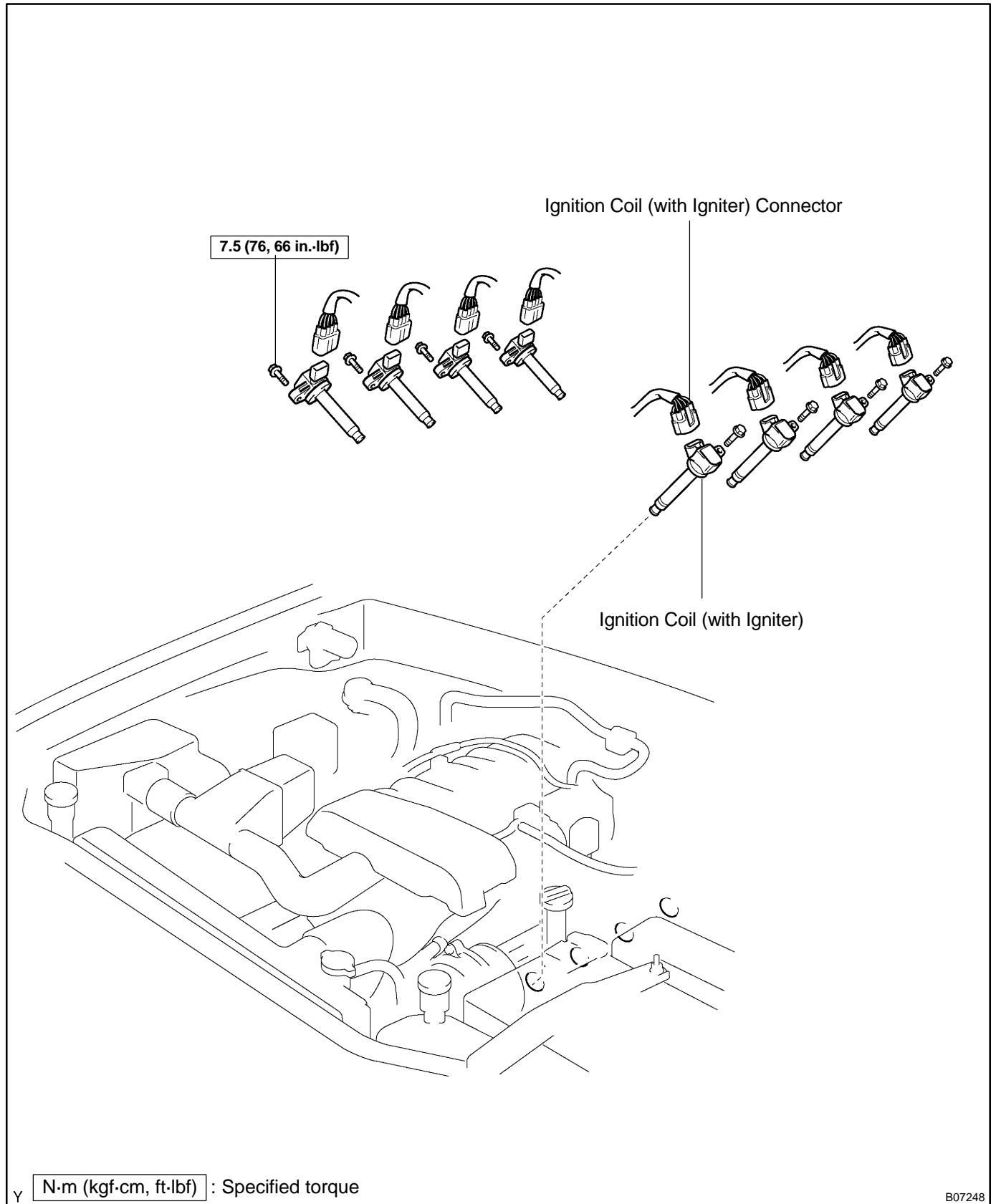


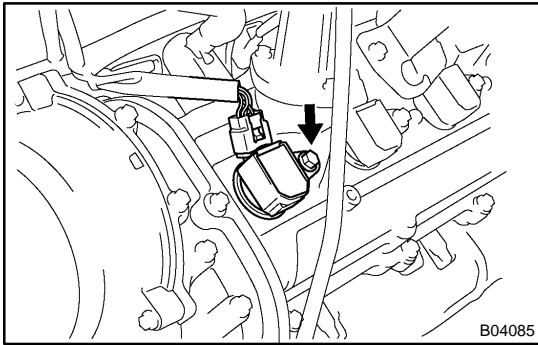
P03792

- (e) Adjust the spark plug electrode gap.
Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)
- (f) Using a 16 mm plug wrench, install the spark plugs.
Torque: 17.5 N·m (180 kgf·cm, 13 ft·lbf)
- (g) Reinstall the ignition coils (with igniter).
(see page [IG-6](#))

IGNITION COIL COMPONENTS

IG08Q-06



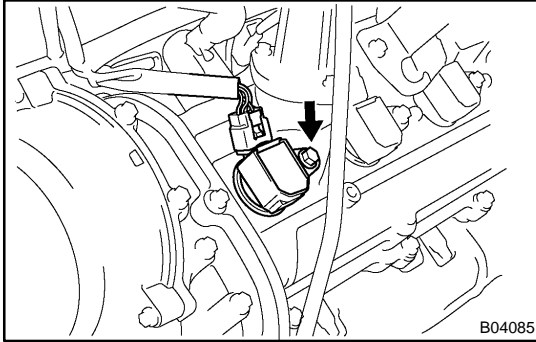


REMOVAL

1. DISCONNECT IGNITION COIL (WITH IGNITER) CONNECTORS

2. REMOVE IGNITION COILS (WITH IGNITER)

Remove the bolt, and pull out the ignition coil (with igniter). Remove the 8 ignition coils (with igniter).



INSTALLATION

1. INSTALL IGNITION COILS (WITH IGNITER)

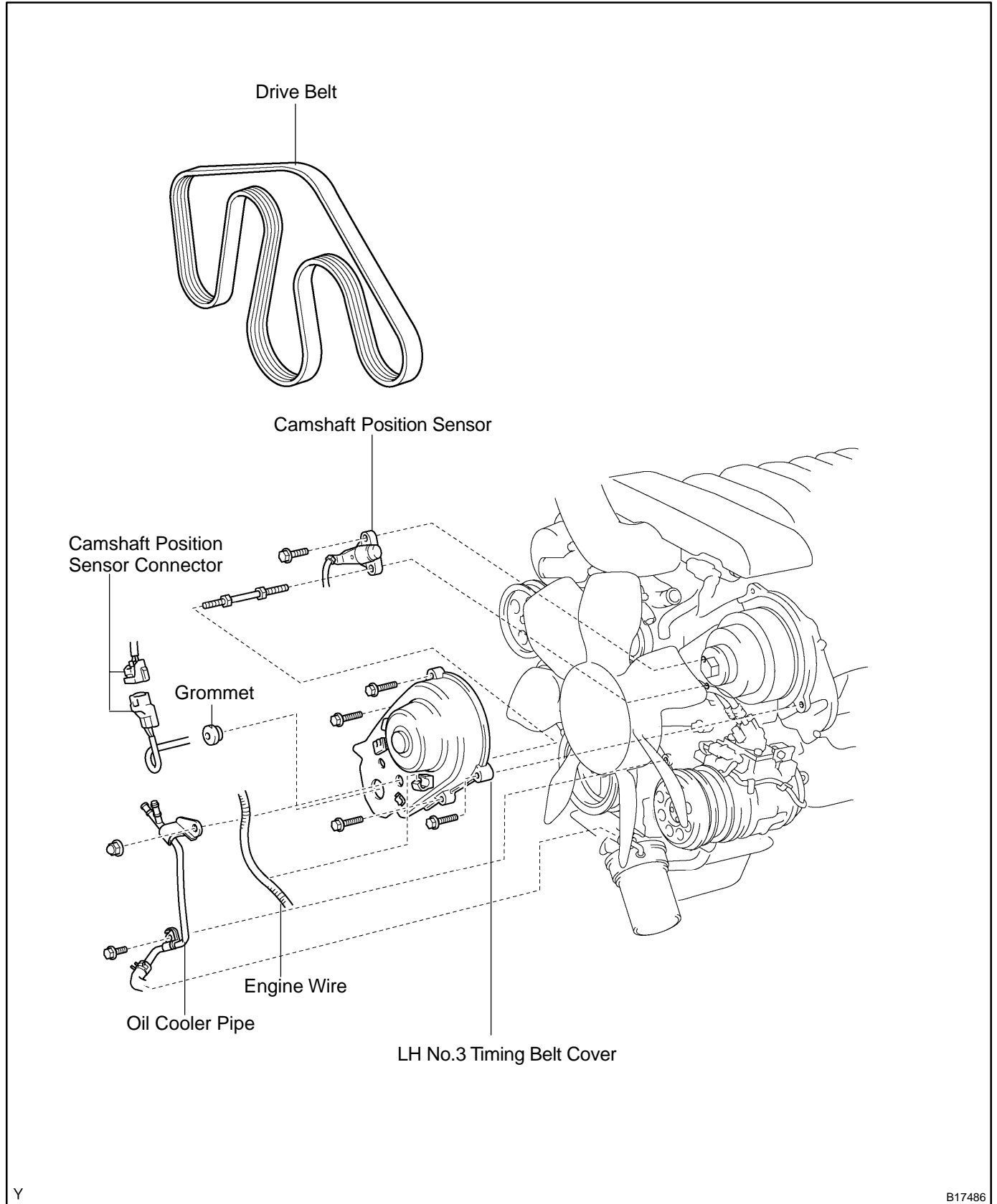
Install the ignition coil (with igniter) with the bolt. Install the 8 ignition coils (with igniter).

Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)

2. CONNECT IGNITION COIL (WITH IGNITER) CONNECTORS

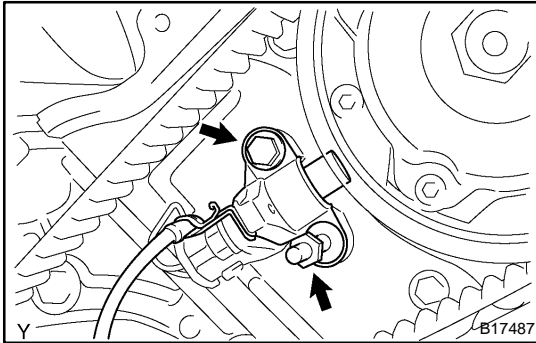
CAMSHAFT POSITION SENSOR COMPONENTS

IG08T-08

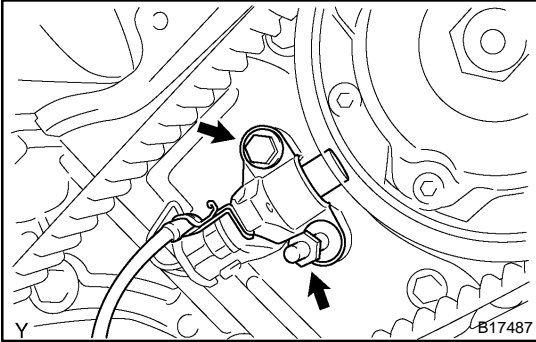


REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE DRIVE BELT
(See page [CH-7](#) and [CH-19](#))
3. REMOVE LH NO.3 TIMING BELT COVER
(See page [EM-16](#))



4. REMOVE CAMSHAFT POSITION SENSOR
Remove the bolt, stud bolt and camshaft position sensor.



INSTALLATION

1. INSTALL CAMSHAFT POSITION SENSOR

Install the camshaft position sensor with the bolt and stud bolt

Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)

2. INSTALL LH NO.3 TIMING BELT COVER

(See page [EM-23](#))

3. INSTALL DRIVE BELT

(See page [CH-16](#) and [CH-28](#))

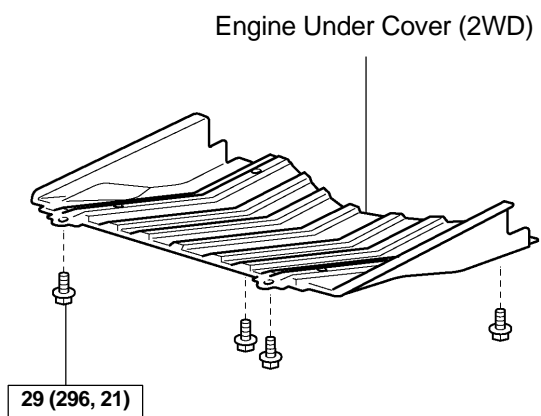
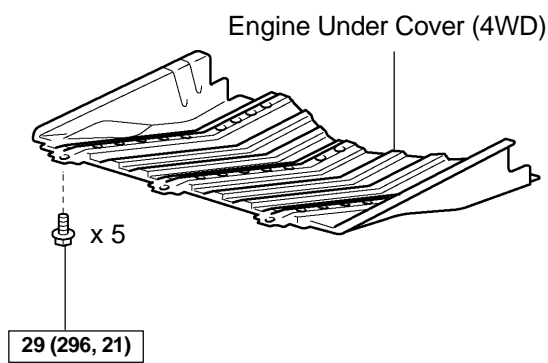
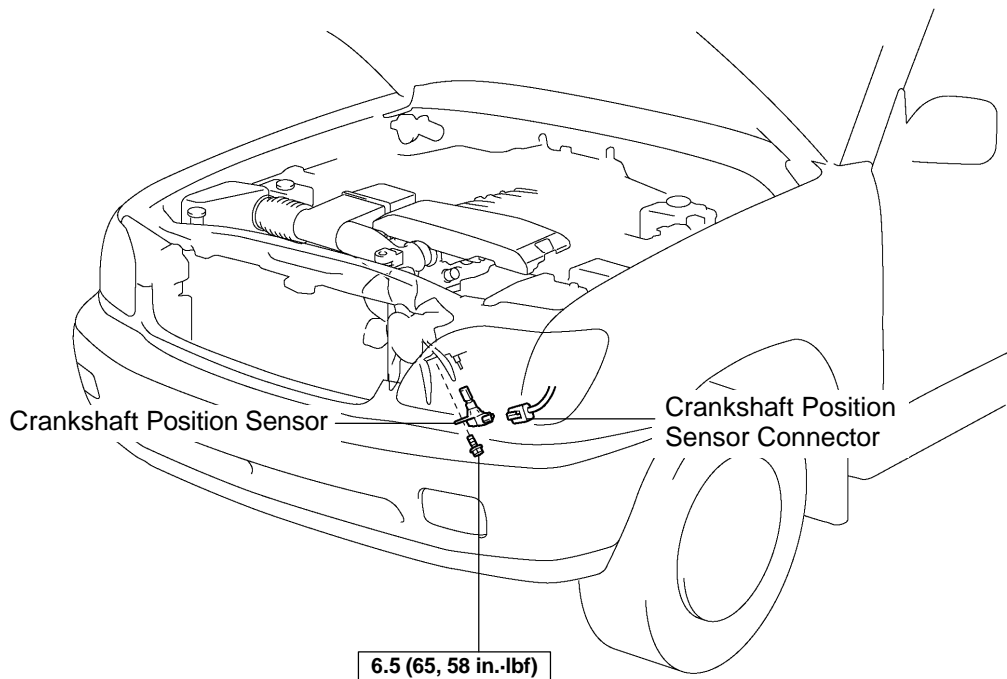
4. FILL ENGINE COOLANT (See page [CO-2](#))

5. CHECK ENGINE COOLANT FOR LEAKS

6. CHECK IGNITION TIMING (See page [EM-9](#))

CRANKSHAFT POSITION SENSOR COMPONENTS

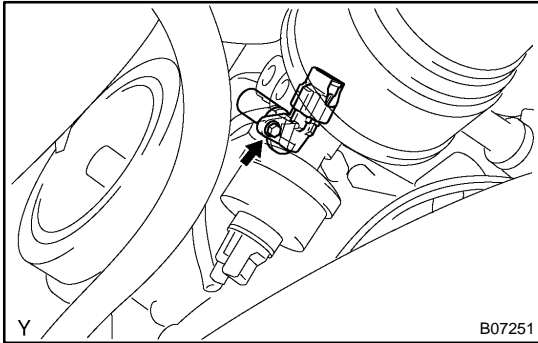
IG08W-06



γ N·m (kgf·cm, ft·lbf) : Specified torque

REMOVAL

1. REMOVE ENGINE UNDER COVER



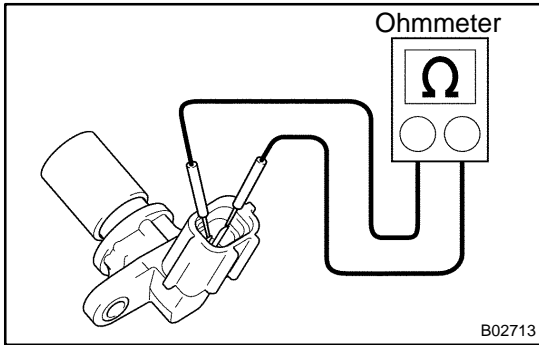
2. REMOVE CRANKSHAFT POSITION SENSOR

- (a) Disconnect the crankshaft position sensor connector.
- (b) Remove the bolt and crankshaft position sensor.

INSPECTION

NOTICE:

”Cold” and ”Hot” in these sentences express the temperature of the coils themselves. ”Cold” is from -10°C (14°F) to 50°C (122°F) and ”Hot” is from 50°C (122°F) to 100°C (212°F).



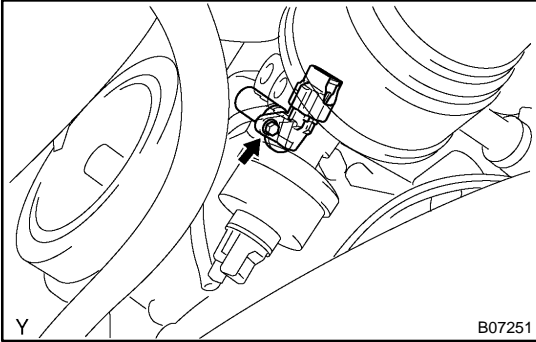
INSPECT CRANKSHAFT POSITION SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Cold	1,630 to 2,740 Ω
Hot	2,065 to 3,225 Ω

If the resistance is not as specified, replace the crankshaft position sensor.



INSTALLATION

1. **INSTALL CRANKSHAFT POSITION SENSOR**
 - (a) Install the crankshaft position sensor with the bolt.
Torque: 6.5 N·m (65 kgf·cm, 58 in.-lbf)
 - (b) Connect the crankshaft position sensor connector.
2. **INSTALL ENGINE UNDER COVER**

STARTING SYSTEM

ON-VEHICLE INSPECTION

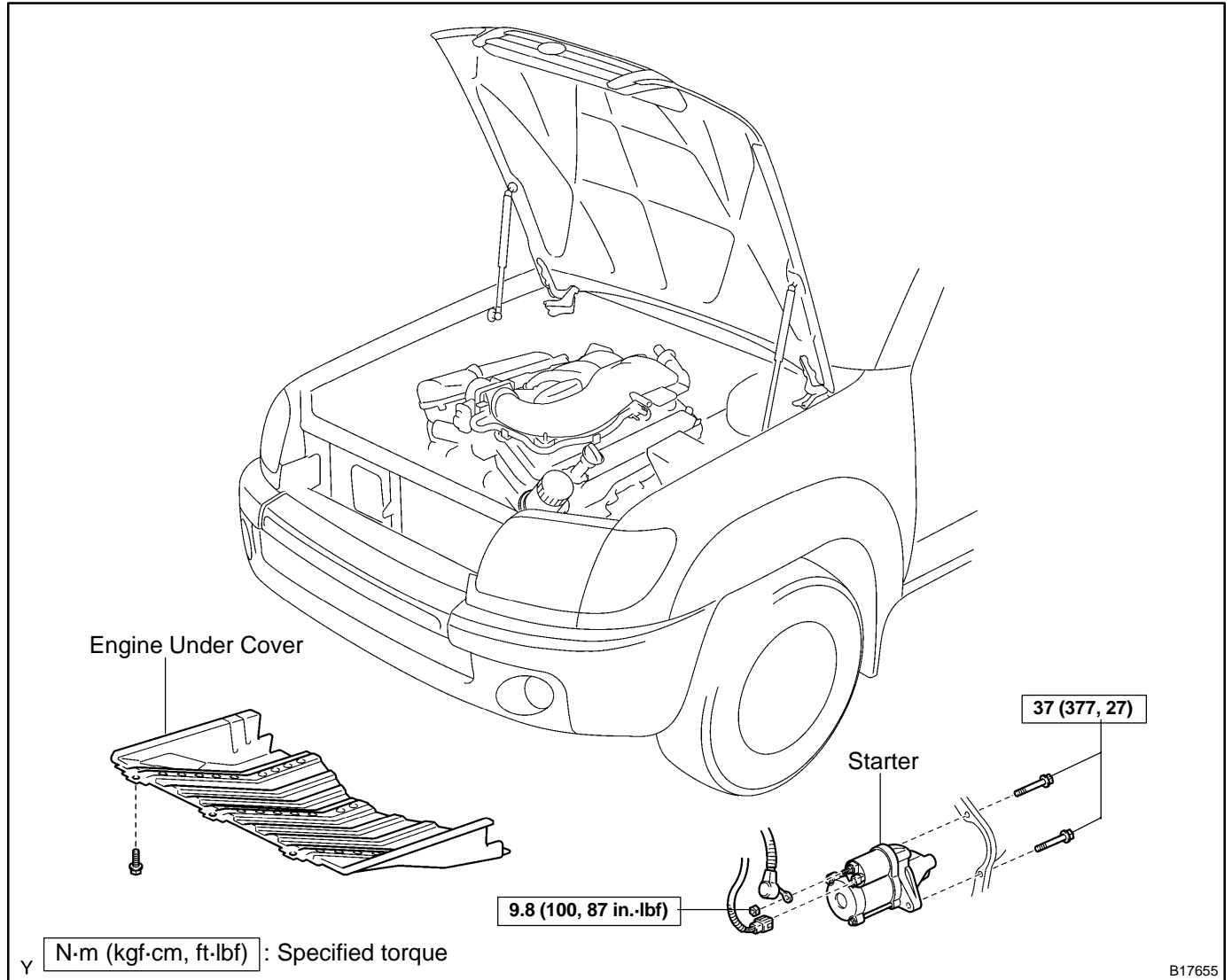
STOPL-01

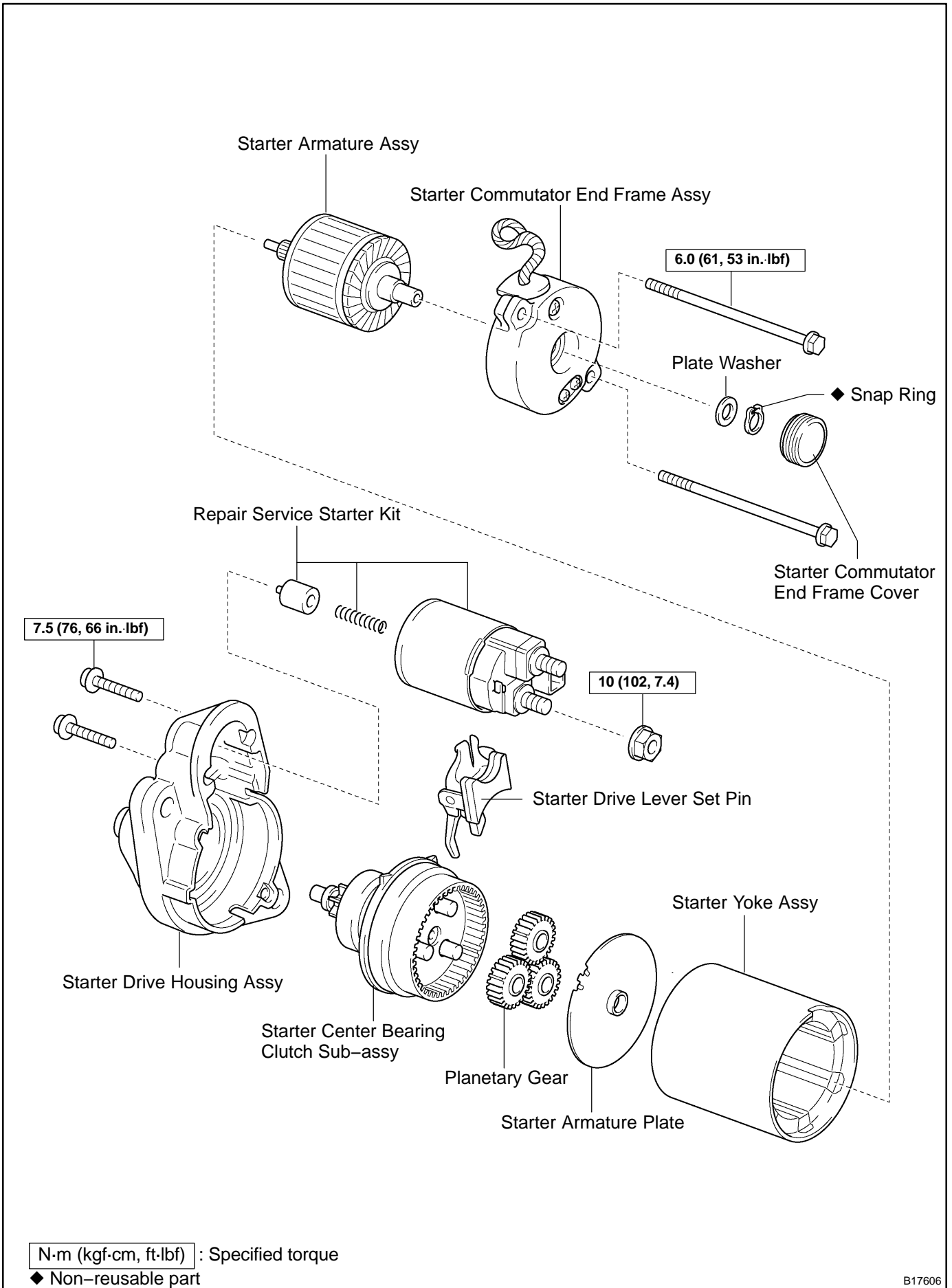
NOTICE:**Before changing the starter, check these items again:**

- Connector connection
- Accessory installation, e.g.: engine immobilizer system

STARTER (1.6 kW) COMPONENTS

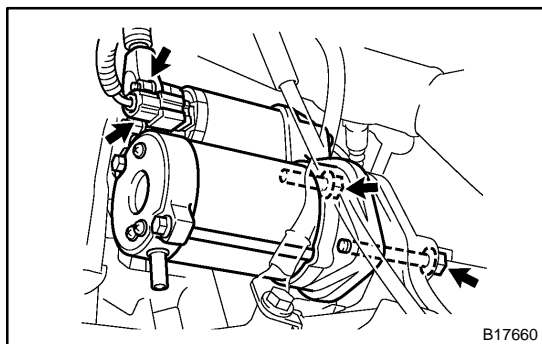
ST0PM-01



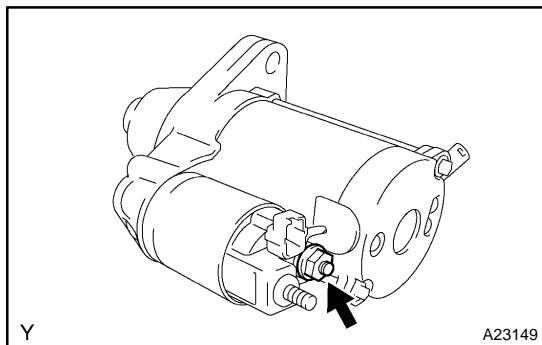


REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DISCONNECT CABLE FROM NEGATIVE (-) BATTERY TERMINAL



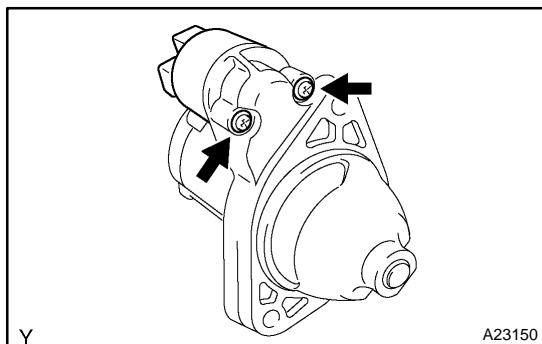
3. REMOVE STARTER ASSEMBLY
 - (a) Disconnect the terminal 50 connector from the starter.
 - (b) Remove the nut and disconnect the wire harness from terminal 30.
 - (c) Remove the 2 bolts and the starter.



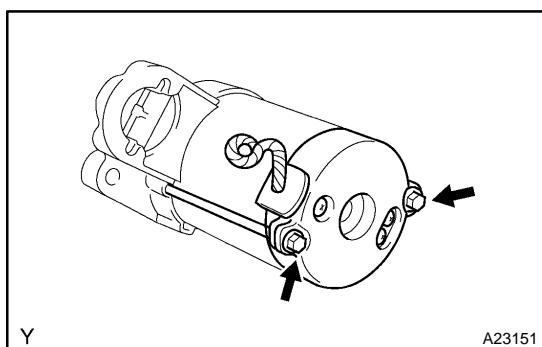
DISASSEMBLY

1. REMOVE REPAIR SERVICE STARTER KIT

- (a) Remove the nut, and disconnect the lead wire from the repair service starter kit.



- (b) Remove the 2 screws which are used to secure the repair service starter kit to the starter drive housing.
- (c) Remove the repair service starter kit.
- (d) Remove the return spring and plunger.



2. REMOVE STARTER YOKE ASSY

- (a) Remove the 2 through bolts, and pull out the starter yoke assy together with the commutator end frame assy.

3. REMOVE STARTER COMMUTATOR END FRAME ASSY

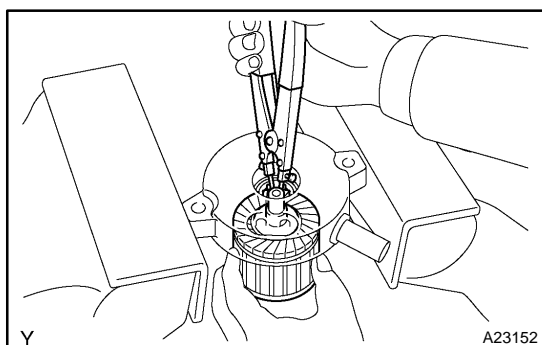
- (a) Remove the commutator end frame assy from the starter yoke assy.

4. REMOVE STARTER ARMATURE PLATE

- (a) Remove the starter armature plate from the starter yoke assy.

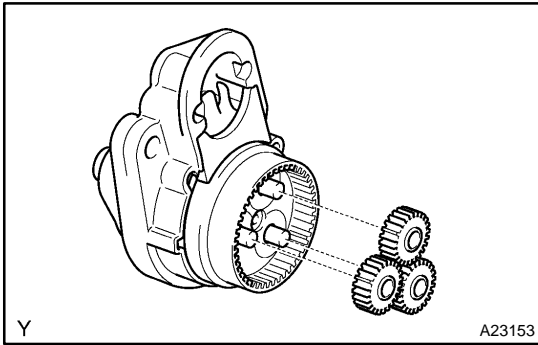
5. REMOVE STARTER COMMUTATOR END FRAME COVER

- (a) Using a screwdriver, remove the cover.

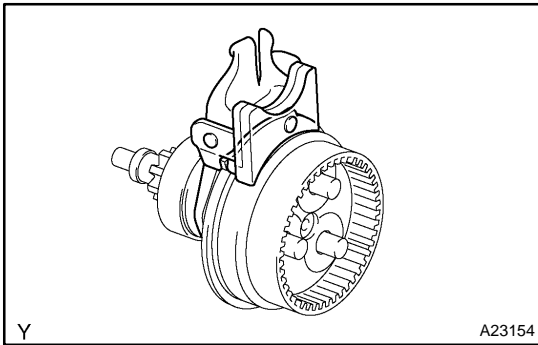


6. REMOVE STARTER ARMATURE ASSY

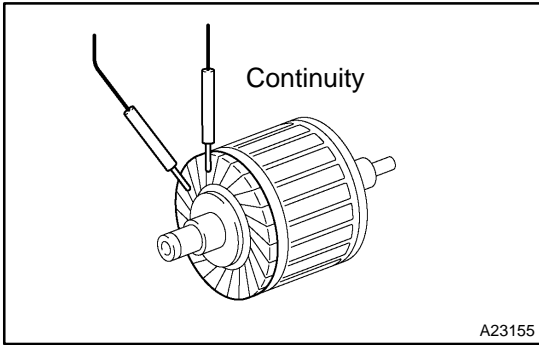
- (a) Using snap ring pliers, remove the snap ring and plate washer.
- (b) Remove the starter armature assy from commutator end frame assy.

**7. REMOVE PLANETARY GEAR**

- (a) Remove the 3 planetary gears.

**8. REMOVE STARTER CENTER BEARING CLUTCH SUB-ASSY**

- (a) Remove the starter center bearing clutch and drive lever set pin together from the starter drive housing.
- (b) Remove the drive lever set pin from the starter center bearing clutch.

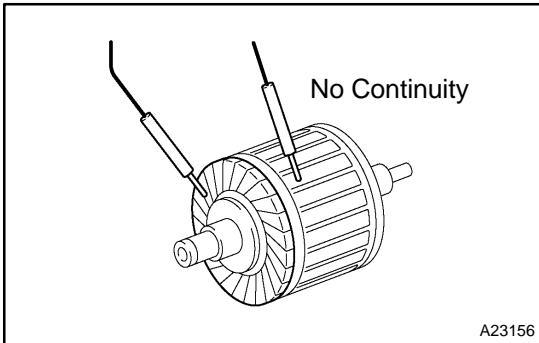


INSPECTION

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.

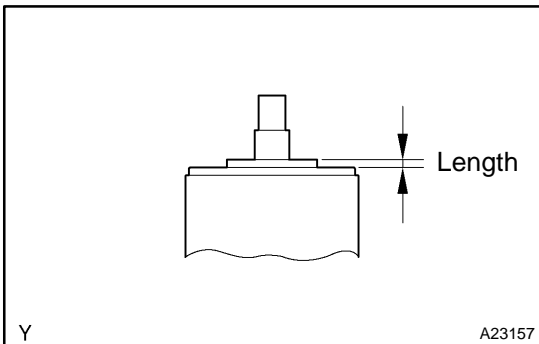


2. INSPECT COMMUTATOR FOR GROUND

(a) Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

(b) Check that the commutator for dirty and burm on surface. If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a lathe.



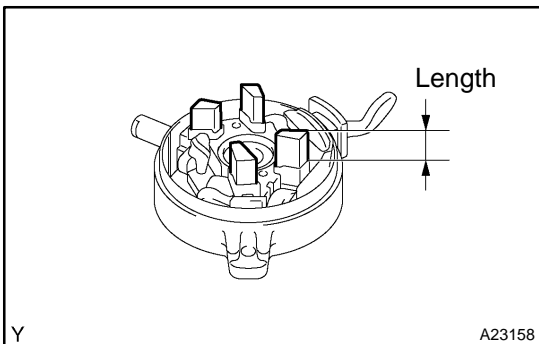
3. INSPECT COMMUTATOR LENGTH

(a) Using vernier calipers, measure the commutator length.

Standard length: 3.1 mm (0.122 in.)

Maximum length: 3.8 mm (0.150 in.)

If the length is greater than maximum, replace the armature.



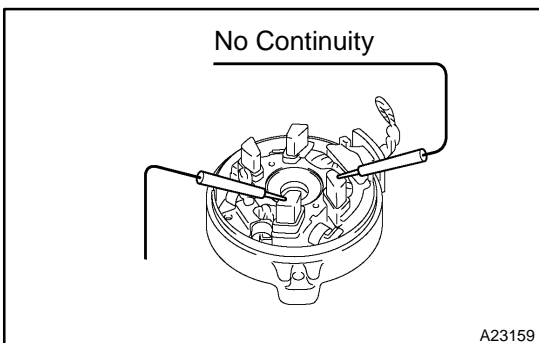
4. INSPECT STARTER COMMUTATOR END FRAME ASSY

(a) Using vernier calipers, measure the brush holder length.

Standard length: 9.0 mm (0.354 in.)

Maximum length: 4.0 mm (0.158 in.)

If the length is less than minimum, replace the starter commutator end frame assy.

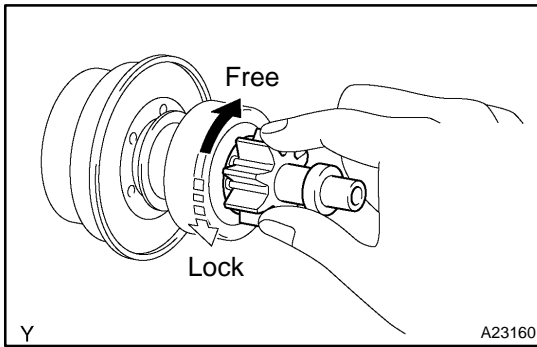


(b) Check the brush holder.

(1) Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.

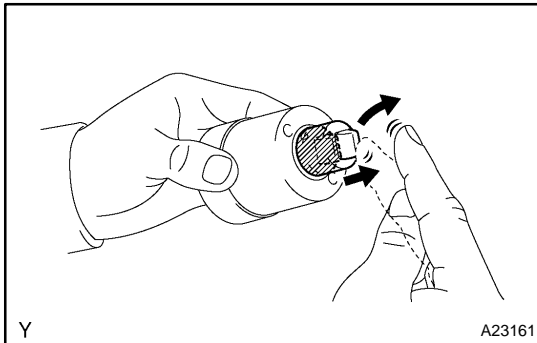
If the there is continuity, repair or replace the starter commutator end frame assy.

If there is no continuity, repair or replace the field frame.



5. INSPECT CLUTCH PINION GEAR

Rotate the pinion gear clockwise, and check that it turns freely. Check that it locks by rotating the pinion gear counterclockwise. If necessary, replace the clutch assembly.

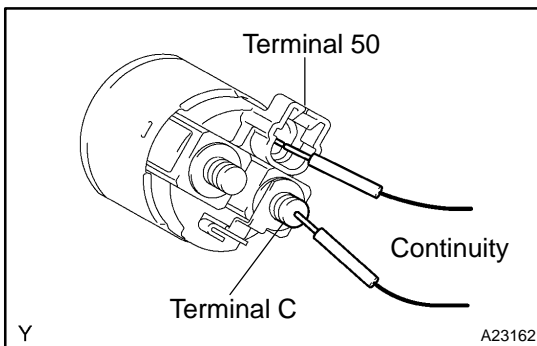


6. INSPECT REPAIR SERVICE STARTER KIT

(a) Check the plunger.

- (1) Push in the plunger and check that it returns quickly to its original position.

If necessary, replace the repair service starter kit.

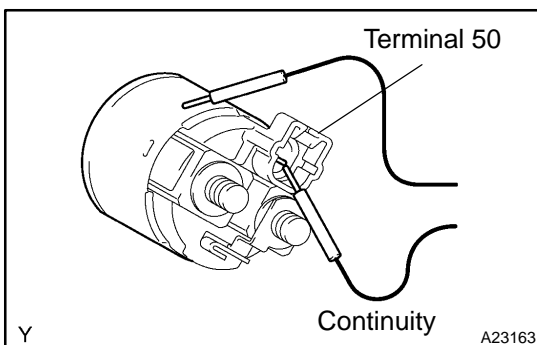


7. INSPECT MAGNET STATER SWITCH

(a) Check the pull-in coil for open circuit.

- (1) Using an ohmmeter, check that there is continuity between terminal 50 and C.

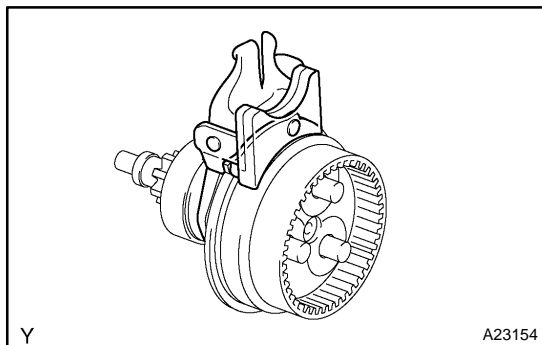
If there is no continuity, replace the repair service starter kit.



(b) Check whether or not the hold-in coil has an open circuit.

- (1) Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

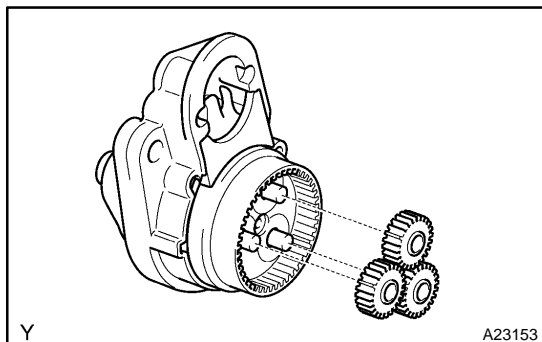
If there is no continuity, replace the repair service starter kit.



REASSEMBLY

1. INSTALL STARTER CENTER BEARING CLUTCH SUB-ASSY

- Install the drive lever set pin to the starter center bearing clutch.
- Install the starter center bearing clutch and drive lever set pin together to the starter drive housing.

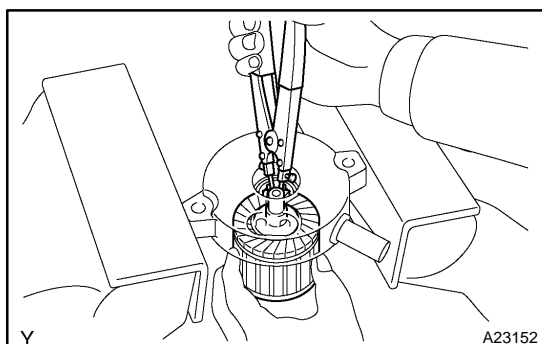


2. INSTALL PLANETARY GEAR

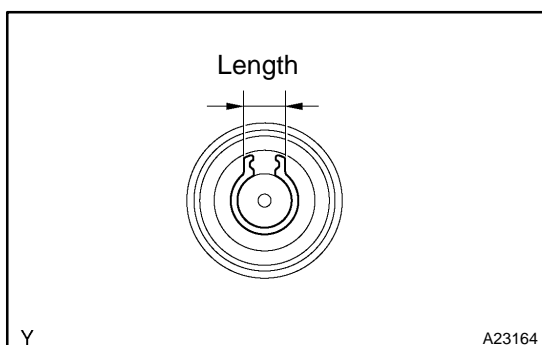
- Apply grease to the planetary gears and pin parts of the planetary shaft.
- Install the 3 planetary gears.

3. INSTALL STARTER ARMATURE ASSY

- Apply grease to the plate washer and armature shaft.
- Install the armature shaft to the starter commutator end frame assy.



- Using snap ring pliers, install the plate washer and new snap ring.



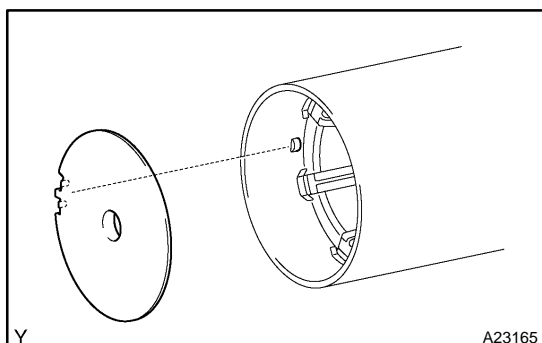
- Using vernier calipers, measure the snap ring.
Maximum length: 5.0 mm (0.197 in.)

If the length is greater than maximum, replace the new snap ring.

4. INSTALL STARTER COMMUTATOR END FRAME COVER

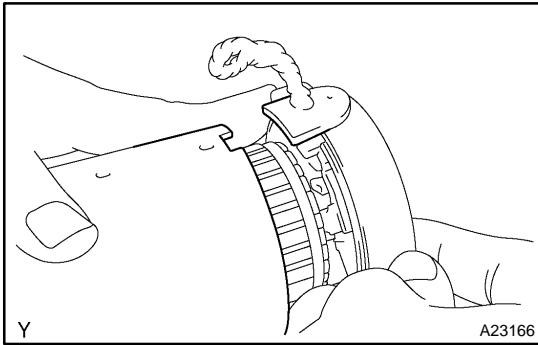
5. INSTALL STARTER ARMATURE PLATE

- Insert the starter armature plate to the starter yoke assy.

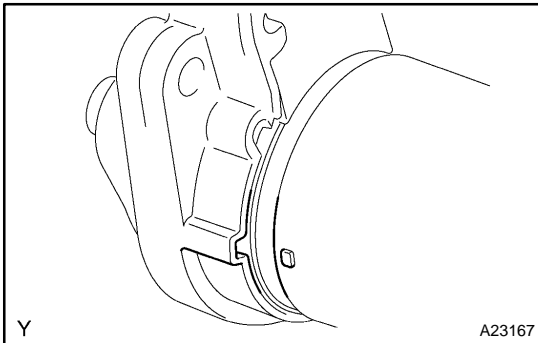


- Align the keyway of the plate with the key inside the starter yoke, and install the plate.

6. INSTALL STARTER COMMUTATOR END FRAME ASSY

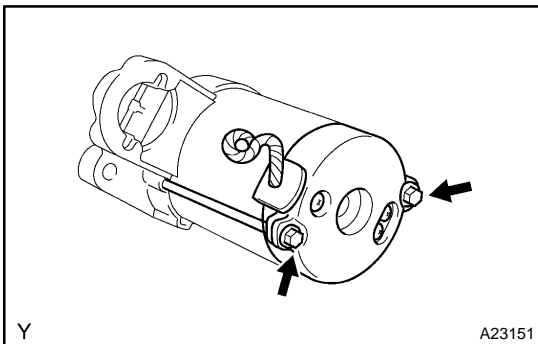


- (a) Align the starter-commutator-rubber-end frame with the convex cutout of starter yoke.
- (b) Install starter-commutator-end-frame to starter yoke assy.



7. INSTALL STARTER YOKE ASSY

- (a) Align the key of the starter yoke assy with the keyway of starter drive housing.

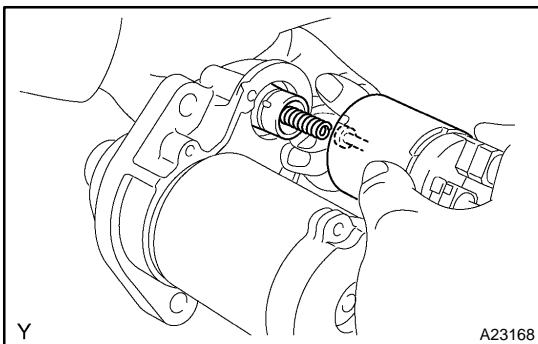


- (b) Install the starter yoke assy with the 2 through bolts.

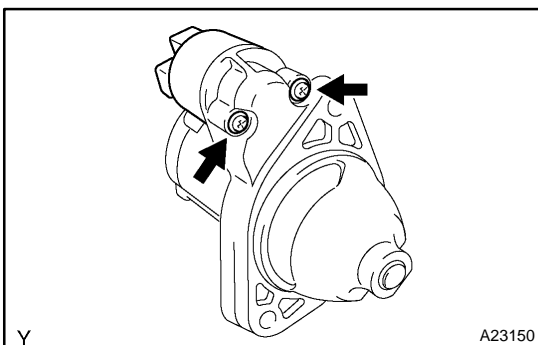
Torque: 6.0 N·m (61 kgf·cm, 53 in·lbf)

8. INSTALL REPAIR SERVICE STARTER KIT

- (a) Apply grease to the plunger and hook.



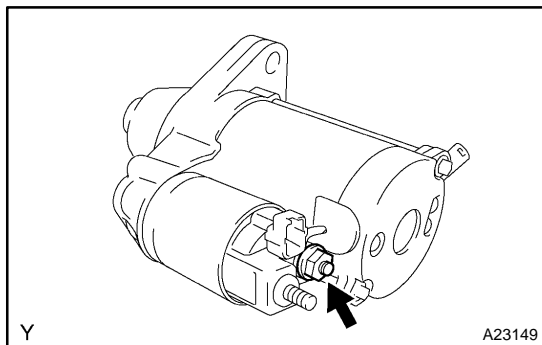
- (b) Hang the plunger hook of the repair service starter kit to the drive lever.
- (c) Install the plunger and return spring.



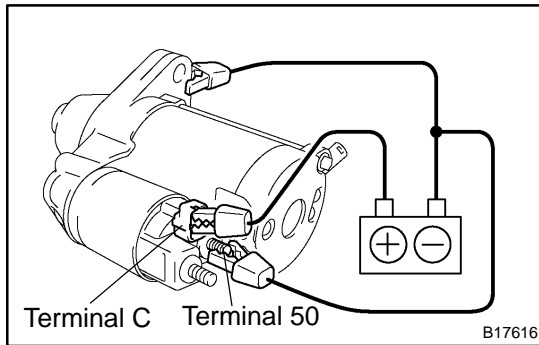
- (d) Install the repair service starter kit with the 2 screws.

Torque: 7.5 N·m (76 kgf·cm, 66 in·lbf)

STARTING (1GR-FE) - STARTER (1.6 kW)



- (e) Connect the lead wire to the terminal with the nut.
Torque: 10 N·m (102 kgf·cm, 7.4 ft·lbf)



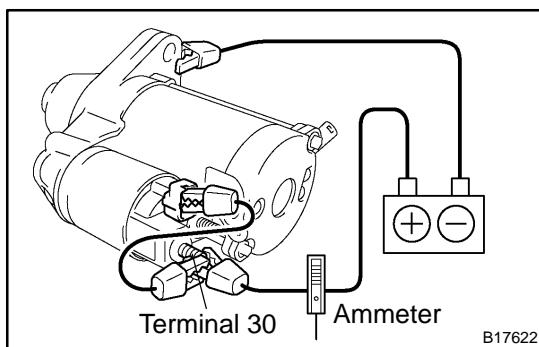
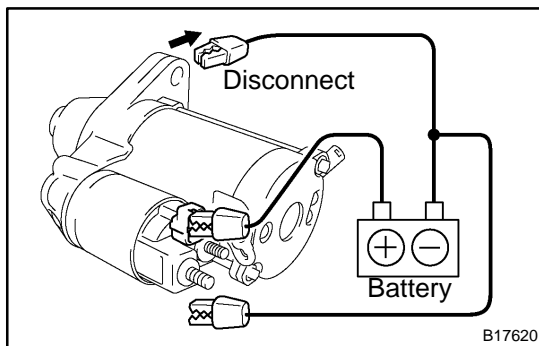
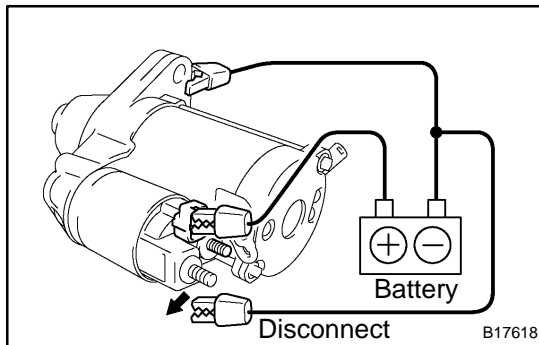
TEST

NOTICE:

These tests must be done within 3 to 5 seconds to avoid the coil to be burned – out.

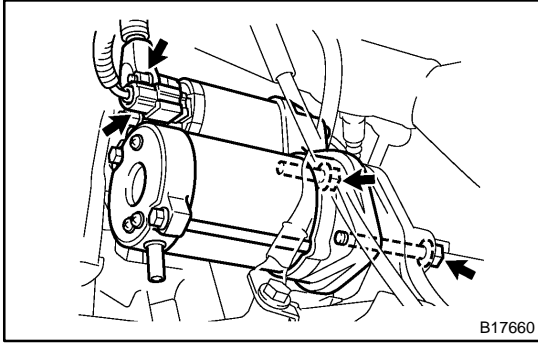
1. INSPECT STARTER ASSY

- (a) Do pull-in test.
 - (1) Disconnect the field coil lead wire from terminal C.
 - (2) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear protrudes.
- (b) Do holding test.
 - (1) Disconnect the negative (-) lead from the terminal C with the above condition (a) is being sustained. Check that the pinion gear remains protruded.
- (c) Inspect clutch pinion gear return.
 - (1) Disconnect the negative (-) lead from the switch body. Check that the clutch pinion gear returns inward.



- (d) Perform the operation test without load.
 - (1) Connect the field coil lead wire to terminal C.
 - (2) Hold the starter with a vise.
 - (3) Connect the battery and ammeter to the starter as shown.
 - (4) Check that the ammeter indicates the specified current.

Specified current: 90 A or less at 11.5 V



INSTALLATION

1. INSTALL STARTER

Install the starter with the 2 bolts.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

- (a) Connect the wire harness to the terminal 30 and install the nut.

Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)

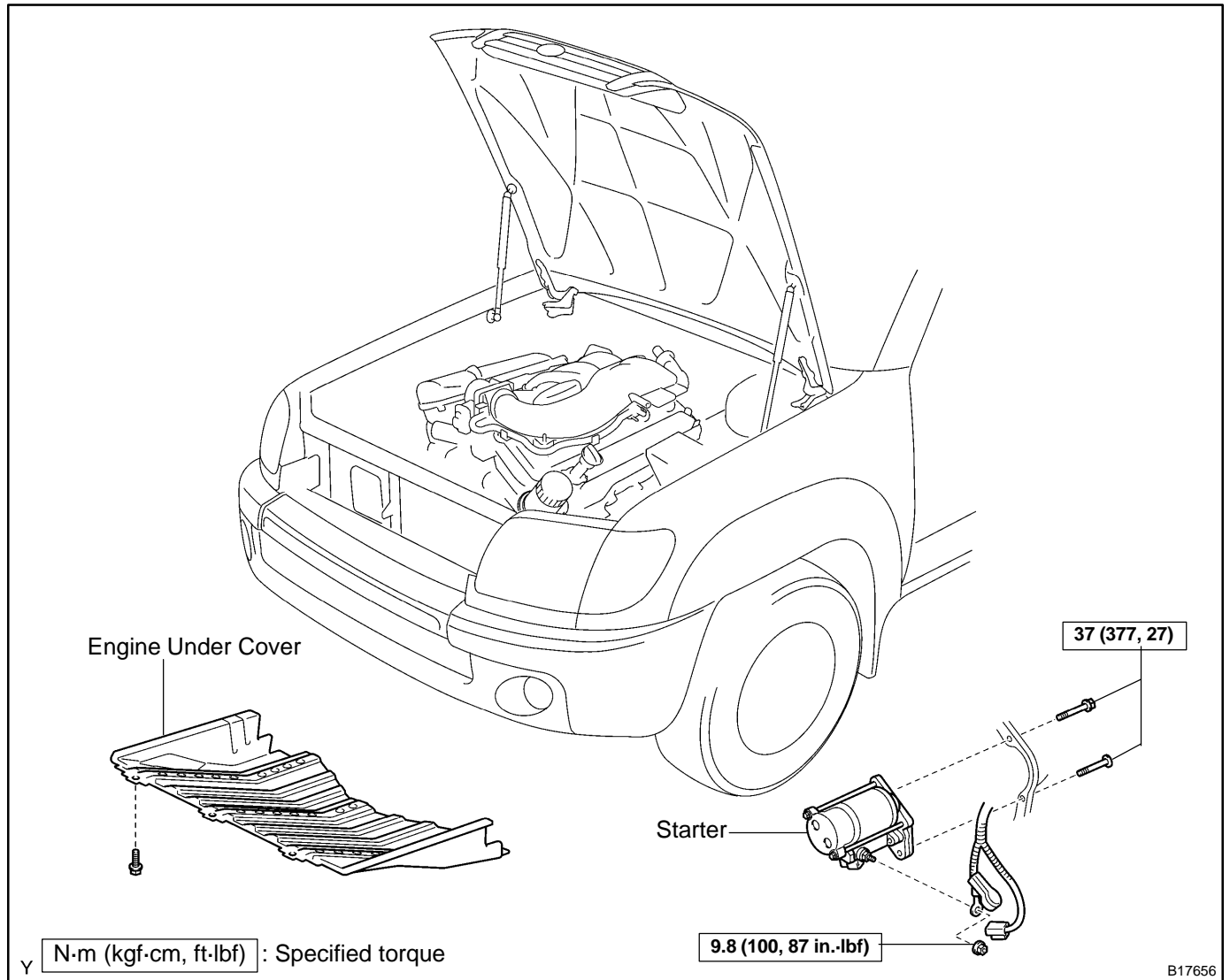
- (b) Connect the terminal 50 to the starter.

2. INSTALL ENGINE UNDER COVER ASSY REAR

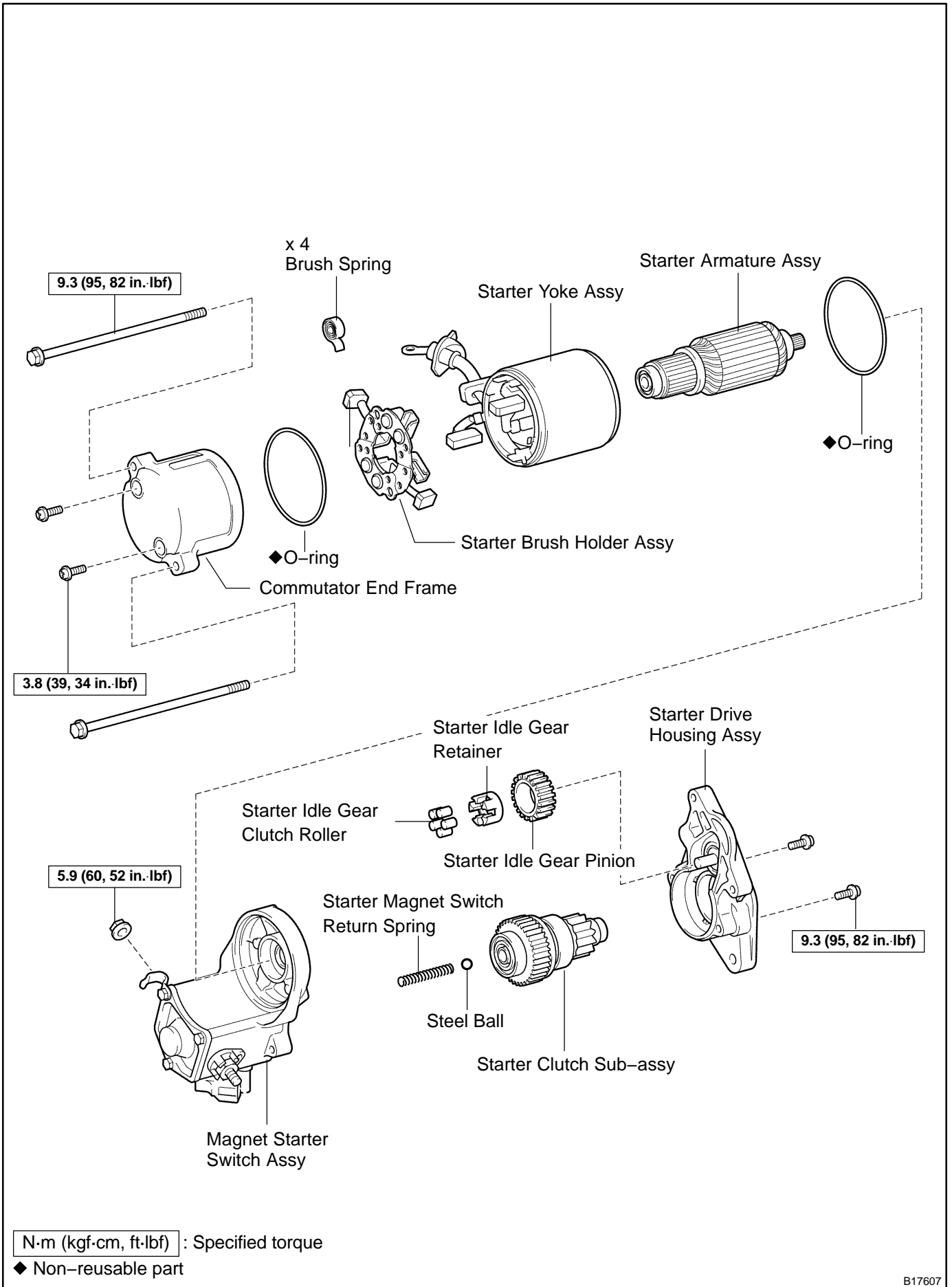
3. CONNECT CABLE TO NEGATIVE (-) BATTERY TERMINAL

STARTER (2.0 kW) COMPONENTS

STOPT-01

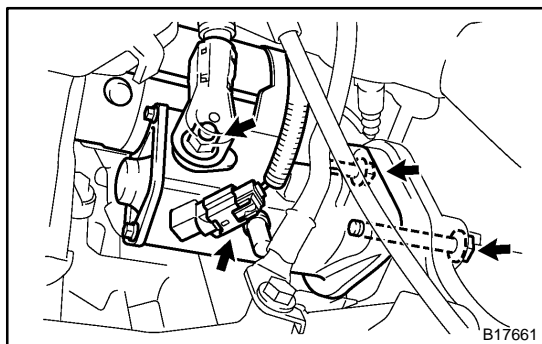


STARTING (1GR-FE) - STARTER (2.0 kW)

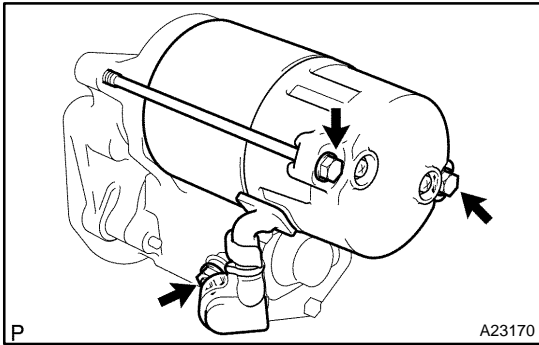


REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DISCONNECT CABLE FROM NEGATIVE (-) BATTERY TERMINAL



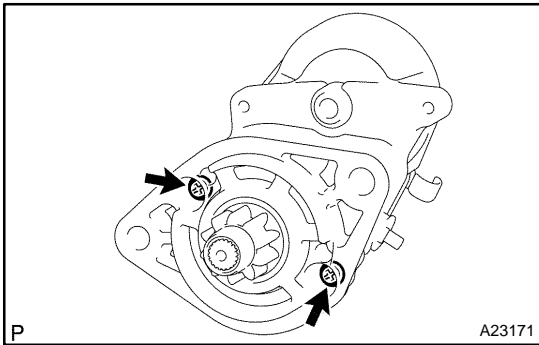
3. REMOVE STARTER ASSEMBLY
 - (a) Disconnect the terminal 50 connector from the starter.
 - (b) Remove the nut and disconnect the wire harness from terminal 30.
 - (c) Remove the 2 bolts and the starter.



DISASSEMBLY

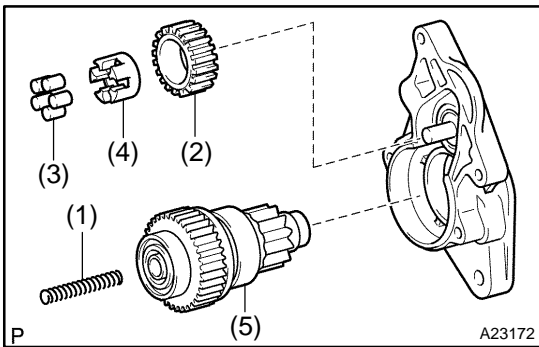
1. REMOVE STARTER YOKE ASSY

- (a) Remove the nut, and disconnect the lead wire from the C terminal.
- (b) Remove the 2 through bolts.
- (c) Pull out the starter yoke and the armature together.
- (d) Remove the O-ring from the starter yoke.



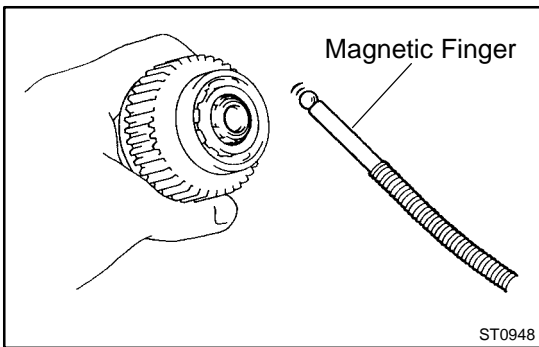
2. REMOVE MAGNET STARTER SWITCH ASSY

- (a) Remove the 2 screws and magnet starter switch.

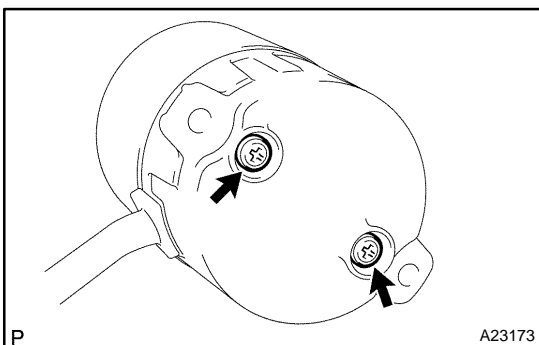


- (b) Remove these parts from the starter drive housing.

(1)	Starter magnet switch return spring
(2)	Starter idle gear pinion
(3)	Starter idle gear clutch roller
(4)	Starter idle gear retainer
(5)	Starter clutch

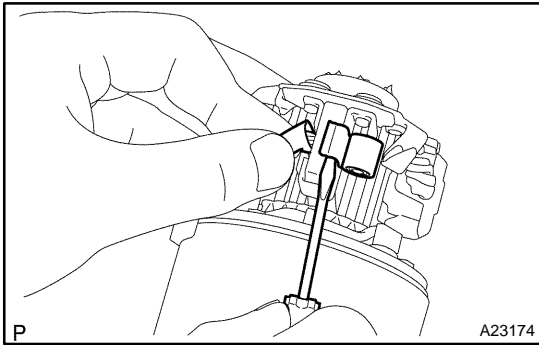


- (c) Using a magnetic finger, remove the steel ball from the clutch shaft hole.

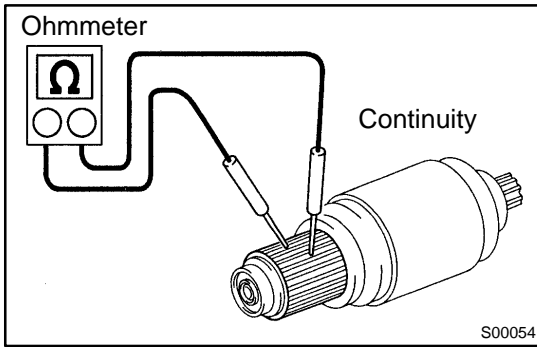


3. REMOVE STARTER BRUSH HOLDER ASSY

- (a) Remove the 2 screws and end cover from the starter yoke.
- (b) Remove the O-ring from the starter yoke.



- (c) Using a screwdriver, hold the spring back and disconnect the 4 brushes from the brush holder.
 - (d) Remove the brush holder from the armature.
- 4. REMOVE STARTER ARMATURE ASSY**

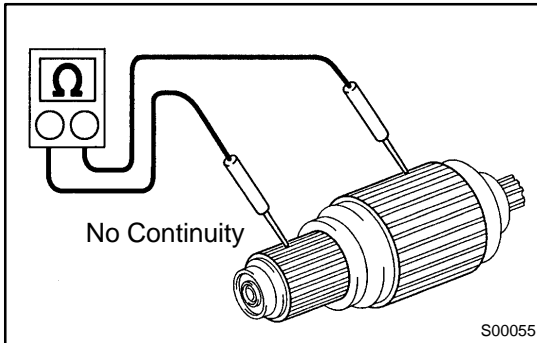


INSPECTION

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.

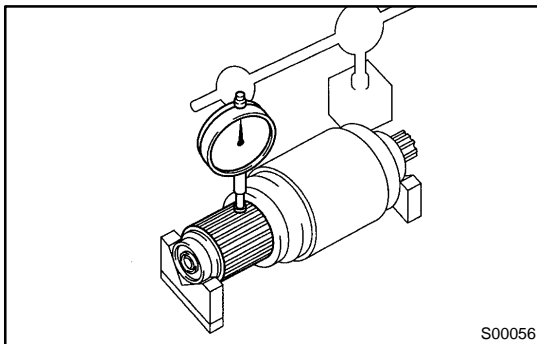


2. INSPECT COMMUTATOR FOR GROUND

(a) Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

(b) Check that the commutator for dirty and burm on surface. If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a lathe.



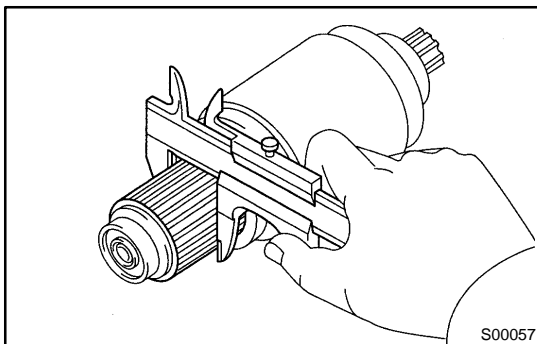
3. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V-blocks.

(b) Using a dial indicator, measure the circle runout.

Maximum circle runout: 0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.



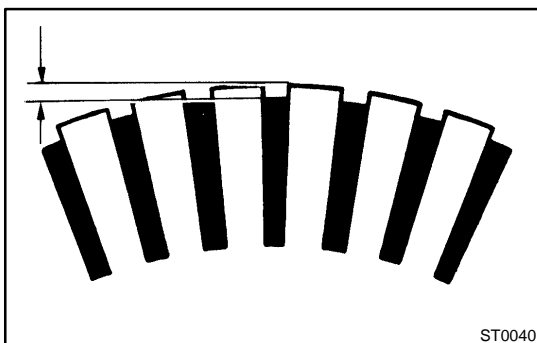
4. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.

Standard diameter: 35.0 mm (1.378 in.)

Minimum diameter: 34.0 mm (1.339 in.)

If the diameter is less than minimum, replace the armature.



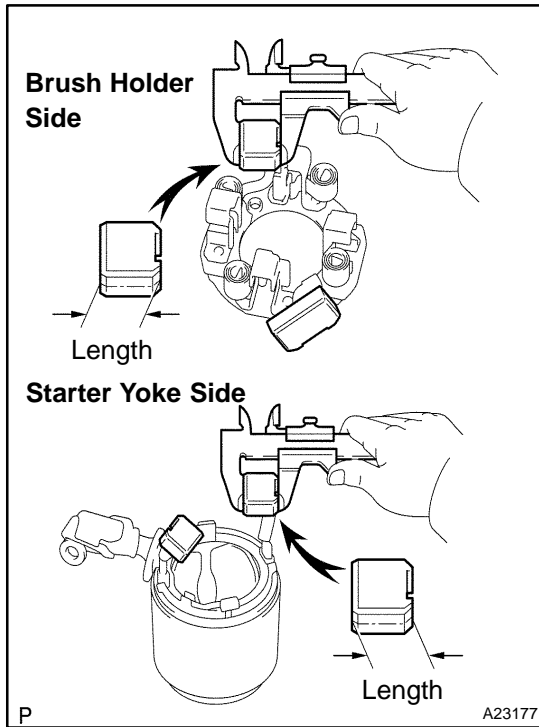
5. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

Standard undercut depth: 0.7 mm (0.028 in.)

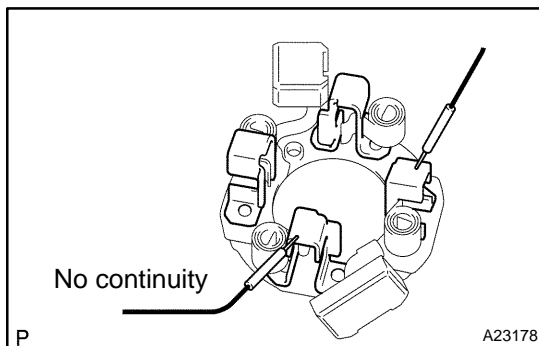
Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.



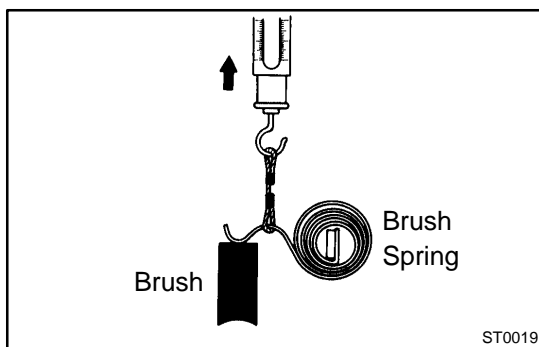
6. INSPECT BRUSH

- (a) Check the brushes length
- (1) Using vernier calipers, measure the brush length.
- Standard length: 15.0 mm (0.591 in.)**
- Minimum length: 9.0 mm (0.354 in.)**
- If the length is less than minimum, replace the brush holder and starter yoke.

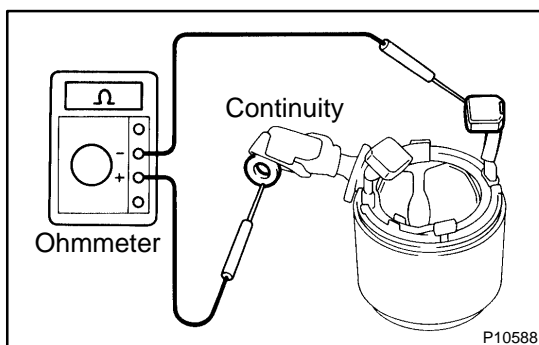


7. INSPECT STARTER BRUSH HOLDER ASSY

- (a) Check the brush holder insulation
- (1) Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.
- If there is continuity, repair or replace the brush holder.

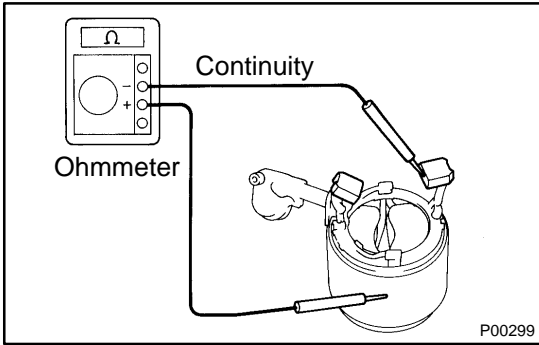


- (b) Check the brush spring load.
- (1) Take a pull scale reading at the instant the brush spring separates from the brush.
- Standard spring load:**
- 21.5 to 27.5 N (2.2 to 2.8 kgf, 4.8 to 6.2 lbf)**
- Minimum spring load: 12.7 N (1.3 kgf, 2.9 lbf)**
- If the spring load is less than the minimum, replace the brush holder.



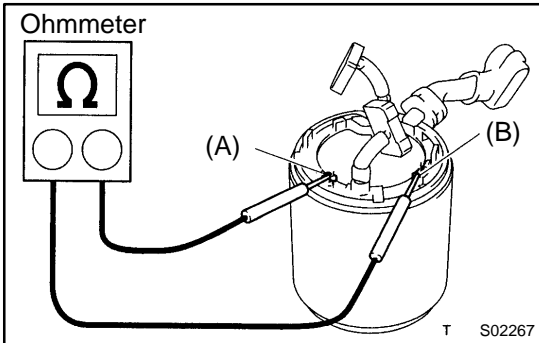
8. INSPECT FIELD COIL FOR OPEN CIRCUIT

- Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.
- If there is no continuity, replace the field frame.



9. INSPECT SHUNT COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the field coil end and field frame.
If there is no continuity, repair or replace the field frame.

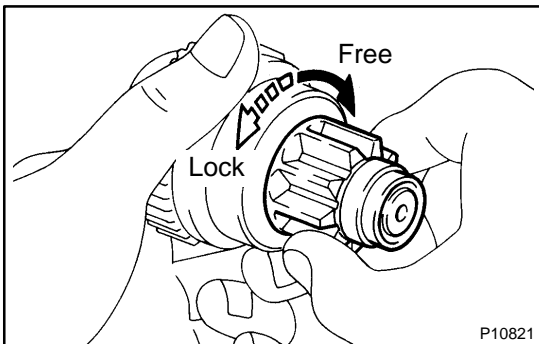


10. INSPECT SHUNT COIL FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between shunt coil terminals (A) and (B).

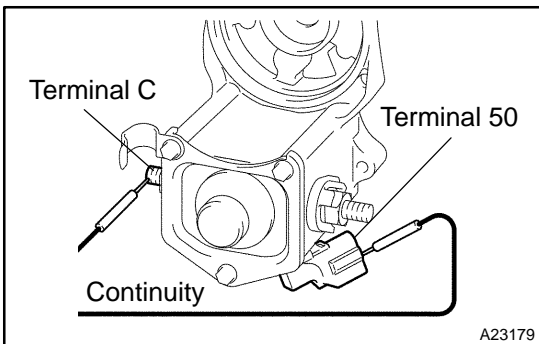
Resistance: 1.5 to 1.9 Ω at 20 °C (68 °F)

If the resistance is not as specified, replace the field frame.



11. INSPECT CLUTCH PINION GEAR

Rotate the pinion gear clockwise, and check that it turns freely.
Check that it locks by rotating the pinion gear counterclockwise.
If necessary, replace the clutch assembly.

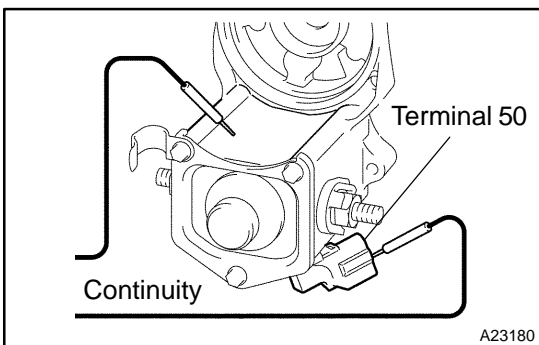


12. INSPECT MAGNET STATER SWITCH

(a) Check the pull-in coil for open circuit.

(1) Using an ohmmeter, check that there is continuity between terminal 50 and C.

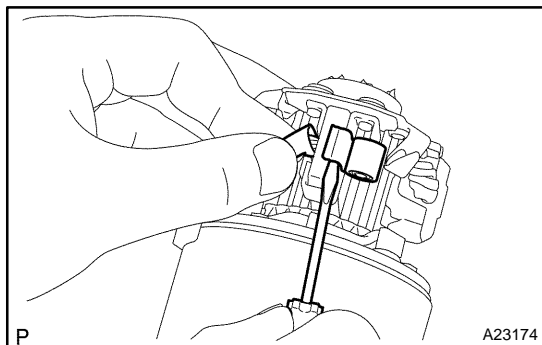
If there is no continuity, replace the magnet starter switch.



(b) Check whether or not the hold-in coil has an open circuit.

(1) Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

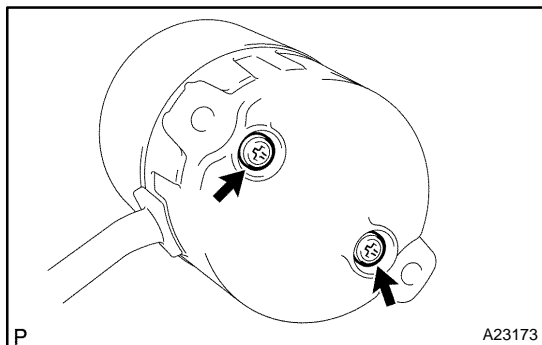
If there is no continuity, replace the magnet starter switch.



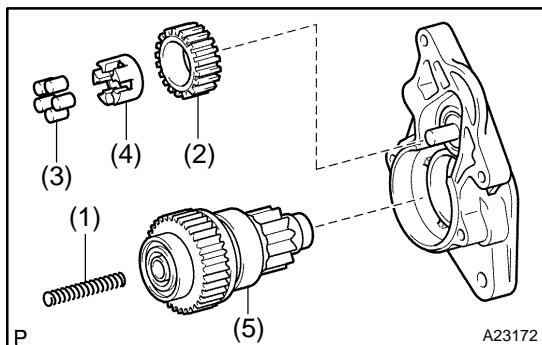
REASSEMBLY

1. INSTALL STARTER BRUSH HOLDER ASSY

- (a) Apply grease to the bearings, and install it to the starter yoke.
- (b) Place the brush holder on the armature.
- (c) Using a screwdriver, install the 4 brushes.
- (d) Install a new O-ring to the groove of the field frame.



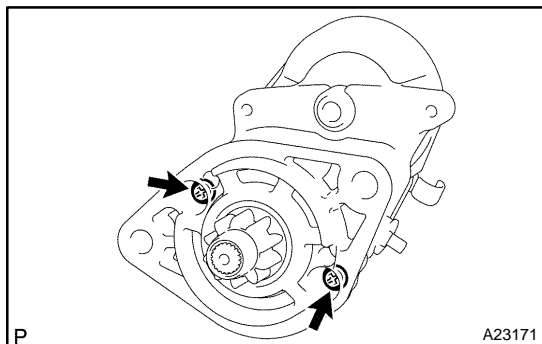
- (e) Install the end frame with the 2 screws.
Torque: 3.8 N·m (39 kgf·cm, 34 in·lbf)



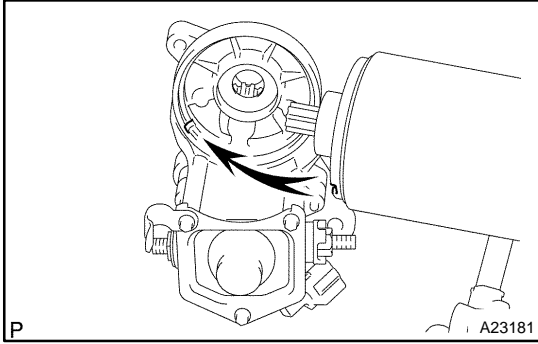
2. INSTALL MAGNET STARTER SWITCH ASSY

- (a) Apply grease to the steel ball, and install it to the clutch shaft hole.
- (b) Apply grease to the these parts (2) – (5), and install them to the starter drive housing.

(1)	Starter magnet switch return spring
(2)	Starter idle gear pinion
(3)	Starter idle gear clutch roller
(4)	Starter idle gear retainer
(5)	Starter clutch

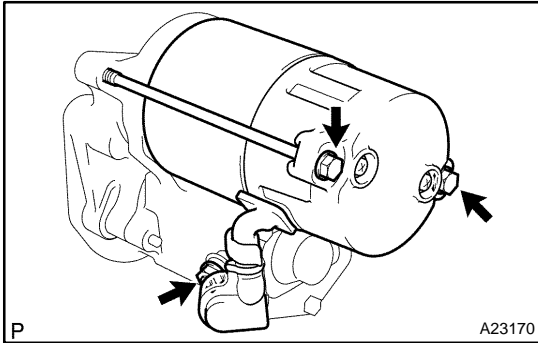


- (c) Install the magnet starter switch with the 2 screws.
Torque: 9.3 N·m (95 kgf·cm, 82 in·lbf)



3. INSTALL STARTER YOKE ASSY

- (a) Install a new O-ring to the groove of the starter yoke.
- (b) Align the key of the starter yoke with the groove of the magnet starter switch.

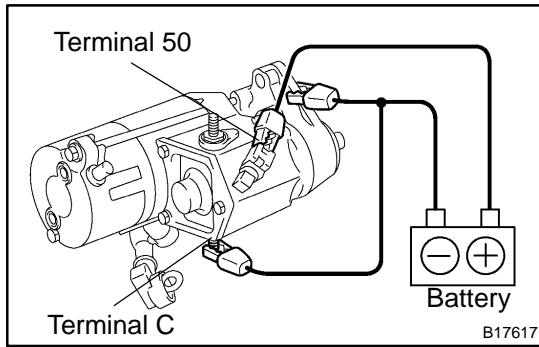


- (c) Install the starter yoke and armature with the 2 through bolts.

Torque: 9.3 N·m (95 kgf·cm, 82 in.-lbf)

- (d) Connect the lead wire to the C terminal with the nut.

Torque: 5.9 N·m (60 kgf·cm, 52 in.-lbf)



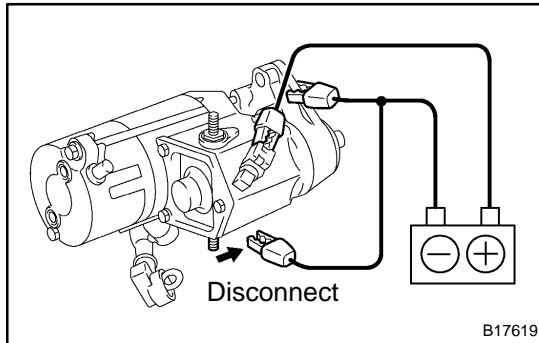
TEST

NOTICE:

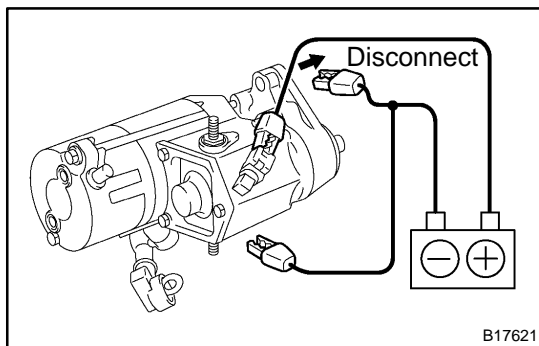
These tests must be done within 3 to 5 seconds to avoid the coil to be burned – out.

1. INSPECT STARTER ASSY

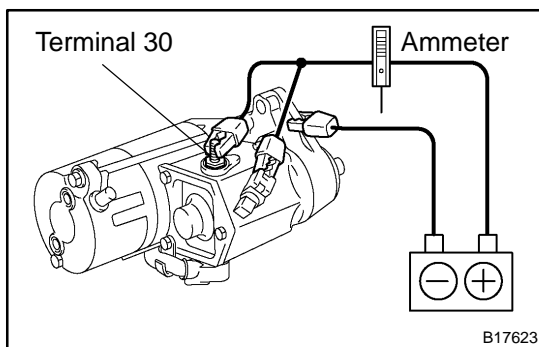
- (a) Do pull-in test.
- (1) Disconnect the field coil lead wire from terminal C.
 - (2) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear protrudes.



- (b) Do holding test.
- (1) Disconnect the negative (-) lead from the terminal C with the above condition (a) is being sustained. Check that the pinion gear remains protruded.

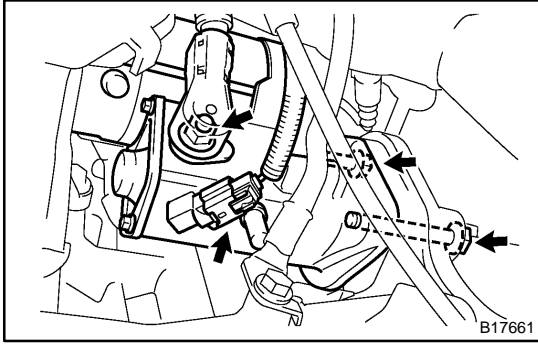


- (c) Inspect clutch pinion gear return.
- (1) Disconnect the negative (-) lead from the switch body. Check that the clutch pinion gear returns inward.



- (d) Perform the operation test without load.
- (1) Connect the field coil lead wire to terminal C.
 - (2) Hold the starter with a vise.
 - (3) Connect the battery and ammeter to the starter as shown.
 - (4) Check that the ammeter indicates the specified current.

Specified current: 100 A or less at 11.5 V



INSTALLATION

1. INSTALL STARTER

Install the starter with the 2 bolts.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

- (a) Connect the wire harness to the terminal 30 and install the nut.

Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)

- (b) Connect the terminal 50 to the starter.

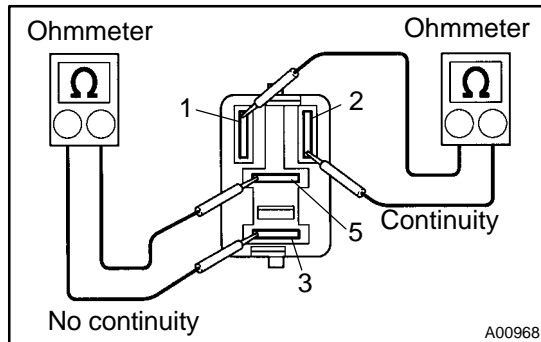
2. INSTALL ENGINE UNDER COVER ASSY REAR

3. CONNECT CABLE TO NEGATIVE (-) BATTERY TERMINAL

STARTER RELAY INSPECTION

1. REMOVE STARTER RELAY

Remove the relay box cover and starter relay.



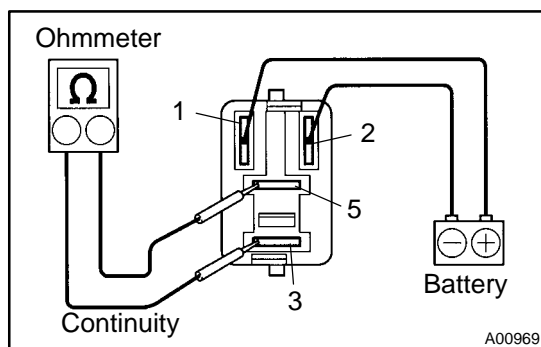
2. INSPECT STARTER RELAY CONTINUITY

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

- (b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



3. INSPECT STARTER RELAY OPERATION

- (a) Apply battery positive voltage across terminals 1 and 2.

- (b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

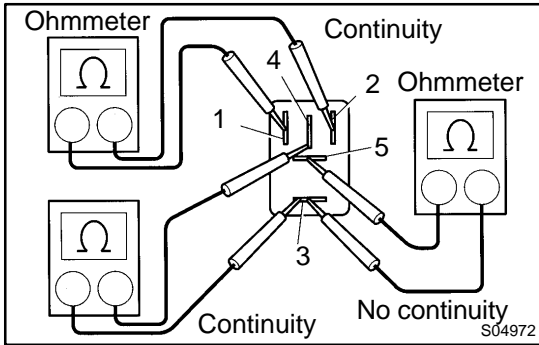
4. REINSTALL STARTER RELAY

ACC CUT RELAY INSPECTION

ST001-01

1. REMOVE ACC CUT RELAY

Remove the cowl side trim board LH and ACC cut relay.



2. INSPECT ACC CUT RELAY CONTINUITY

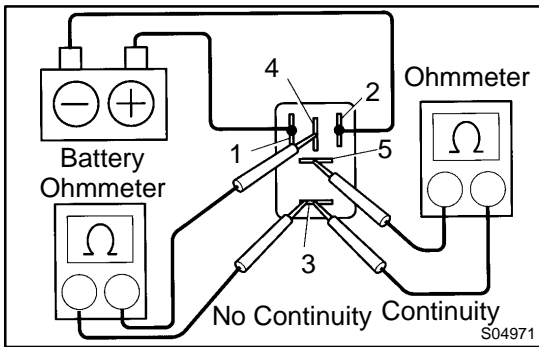
(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.

(c) Check that there is continuity between terminals 3 and 4. If there is no continuity, replace the relay.



3. INSPECT ACC CUT RELAY OPERATION

(a) Apply battery positive voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.

(c) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL ACC CUT RELAY

STARTING SYSTEM

ON-VEHICLE INSPECTION

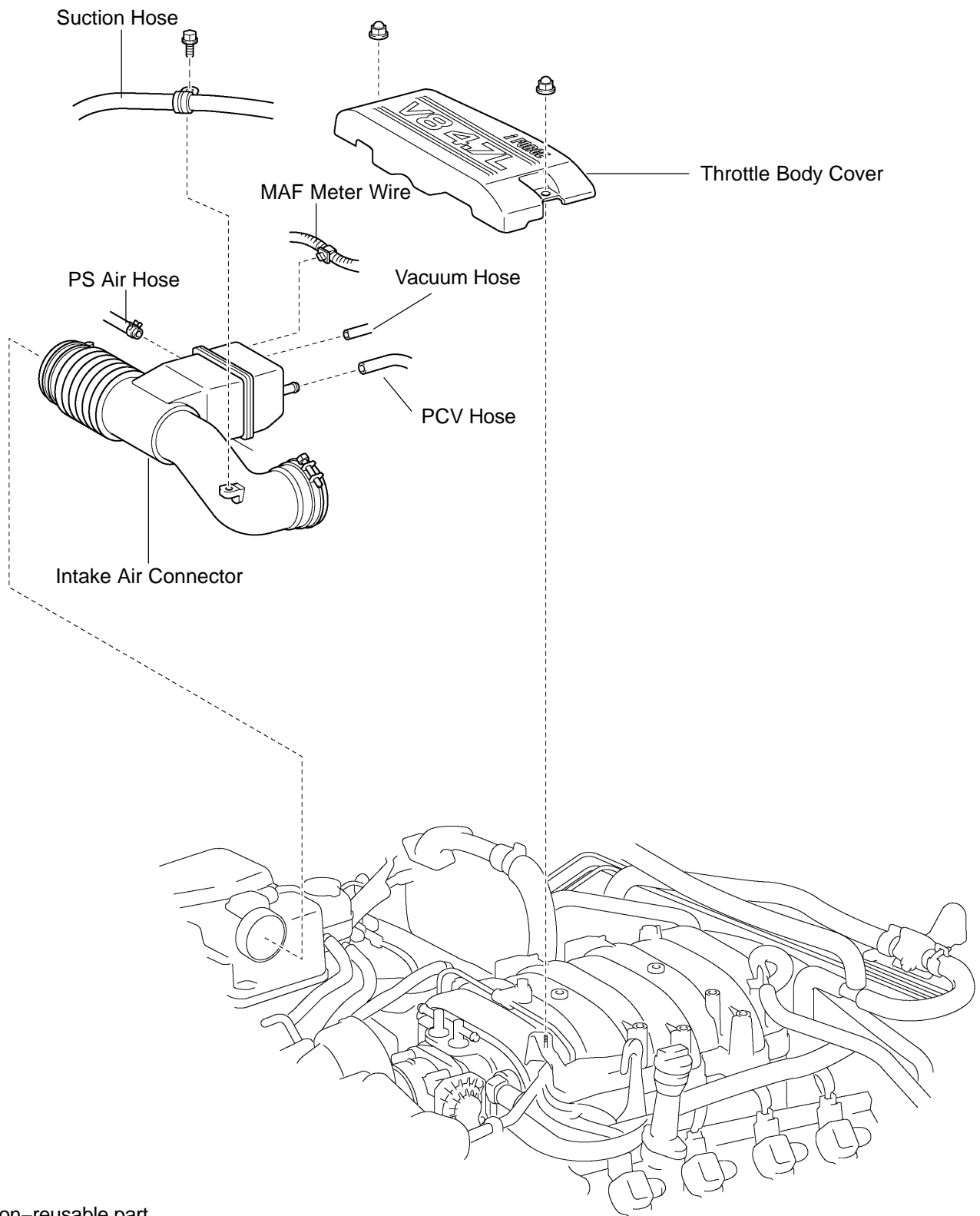
ST08A-04

NOTICE:**Before changing the starter, check these items again:**

- Connector connection
- Accessory installation, e.g.: engine immobilizer system

STARTER COMPONENTS

ST0GK-03

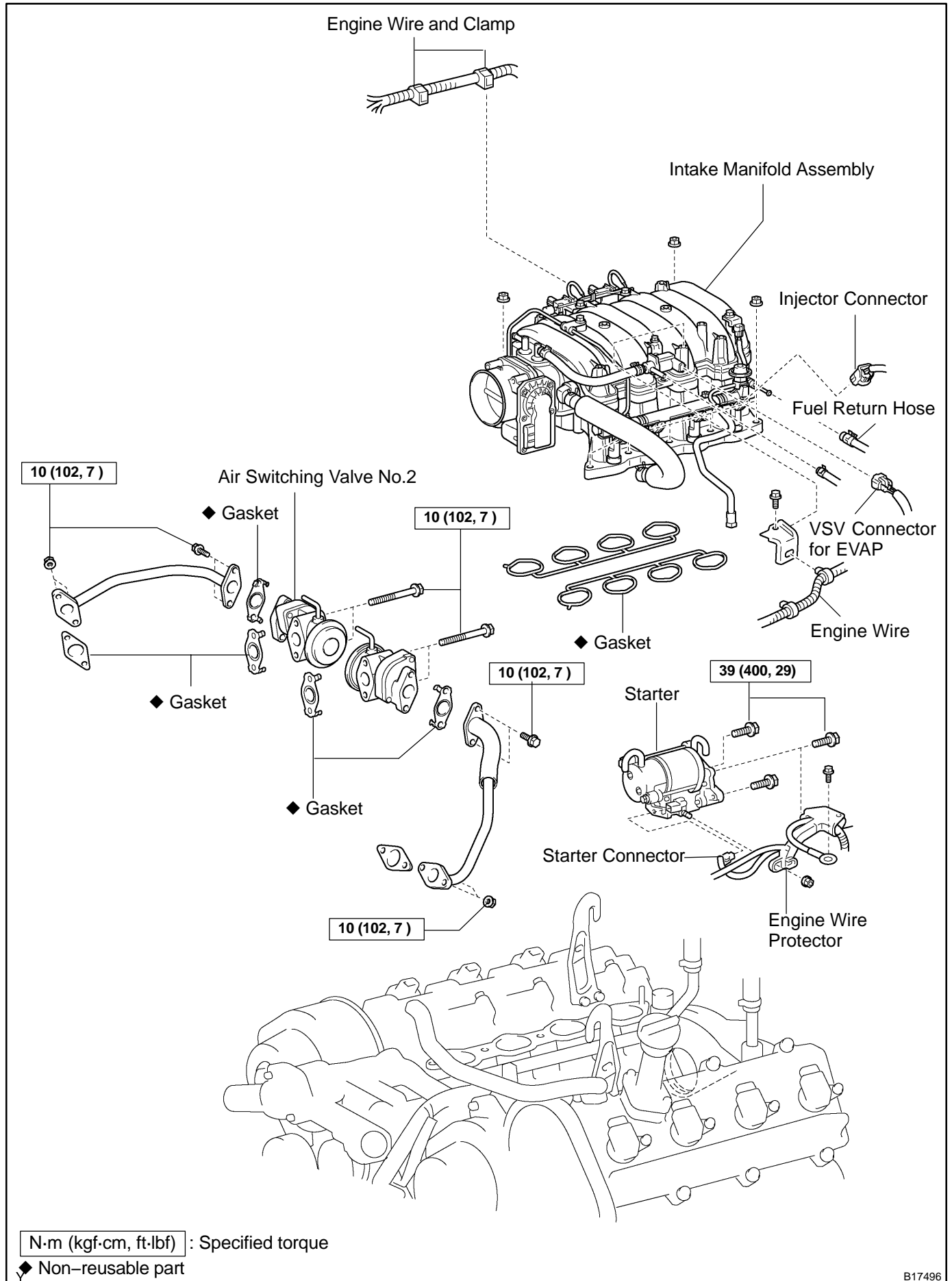


◆ Non-reusable part

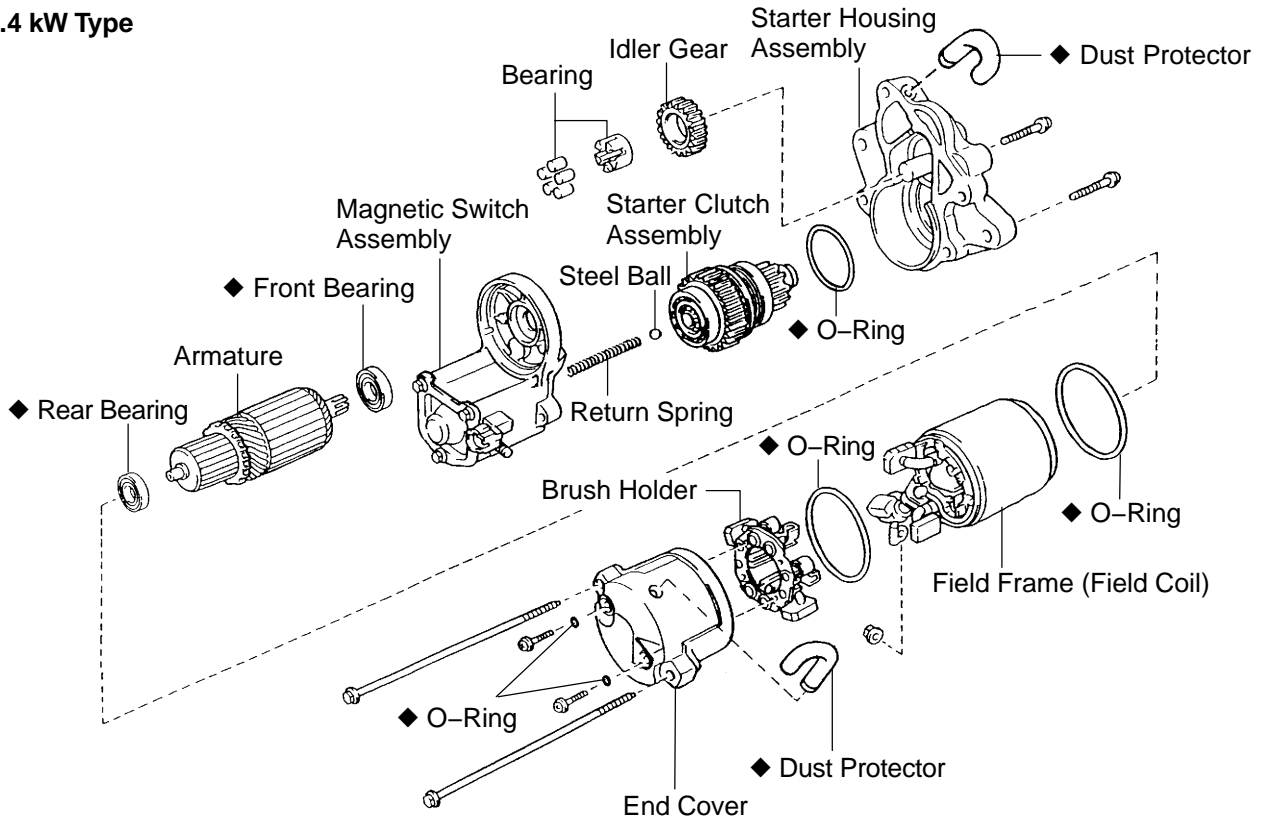
Y

B17459

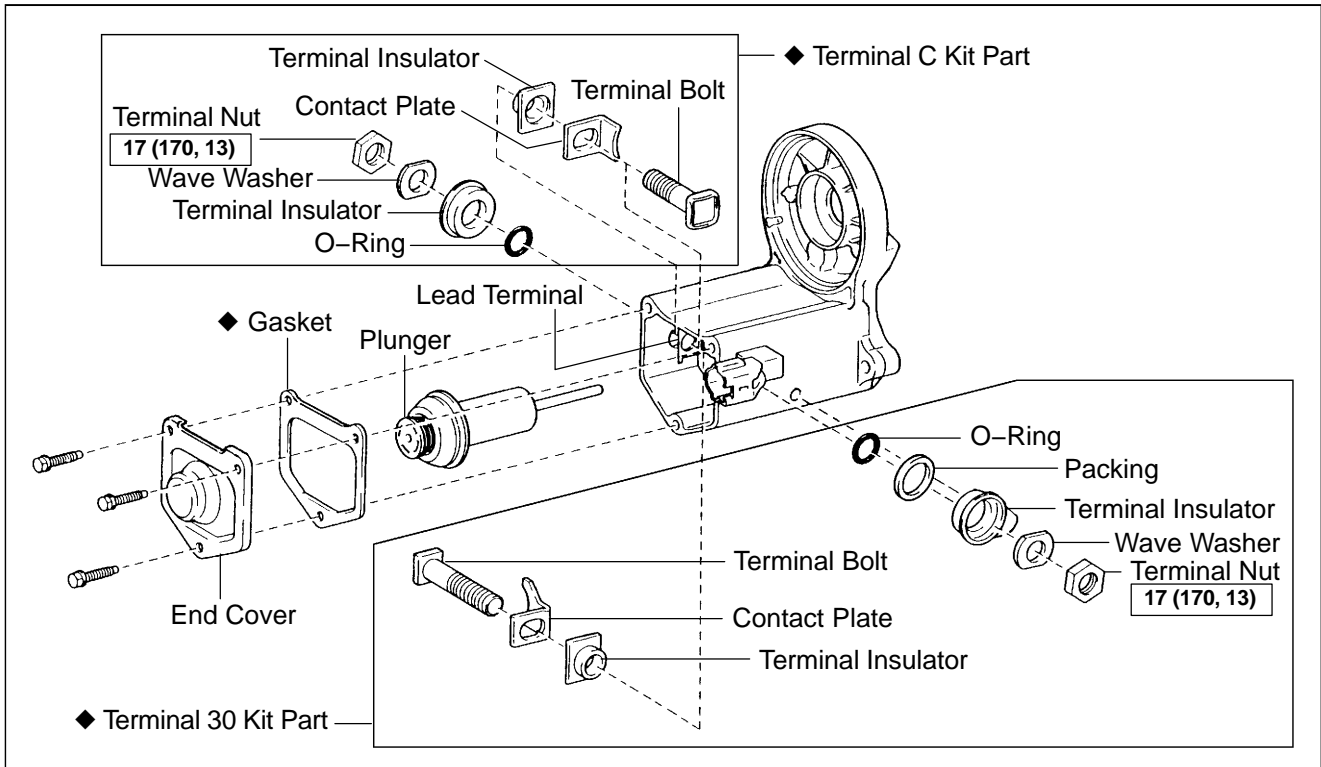
STARTING (2UZ-FE) - STARTER



1.4 kW Type



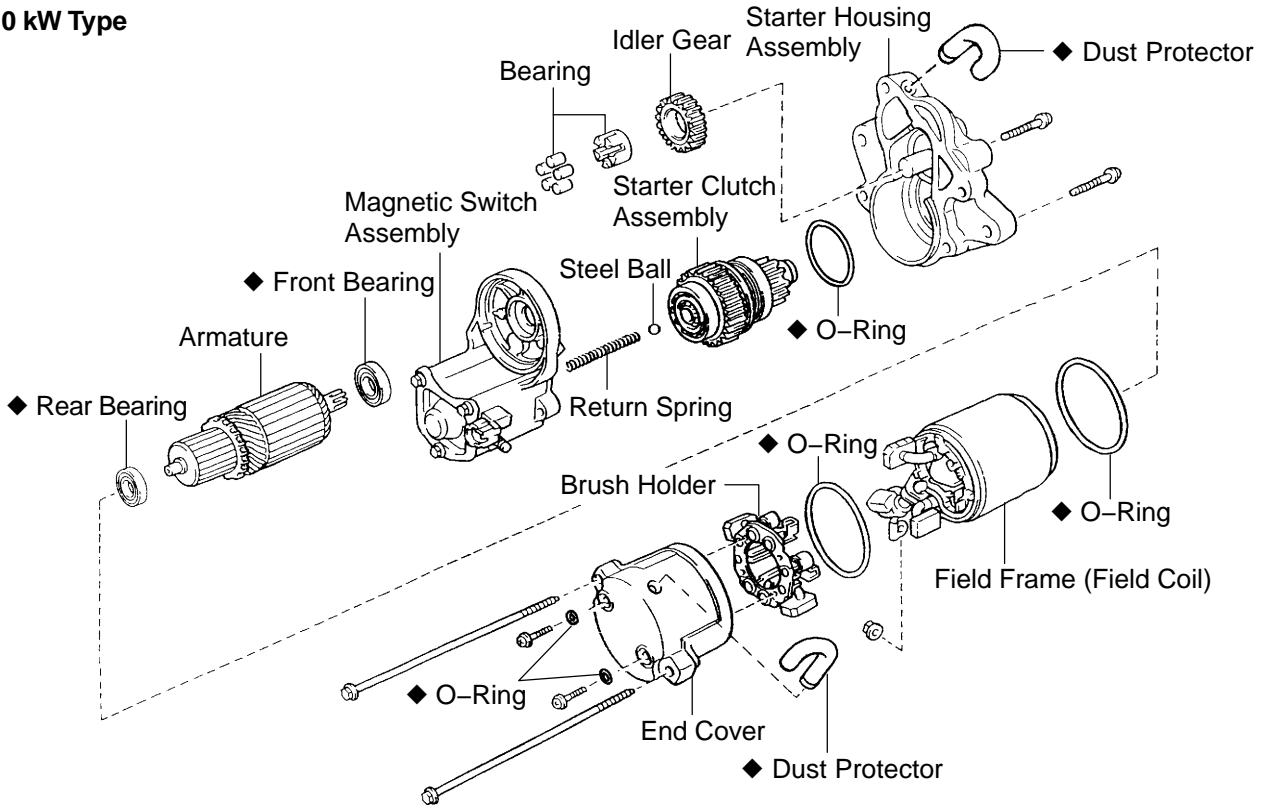
Magnetic Switch Assembly



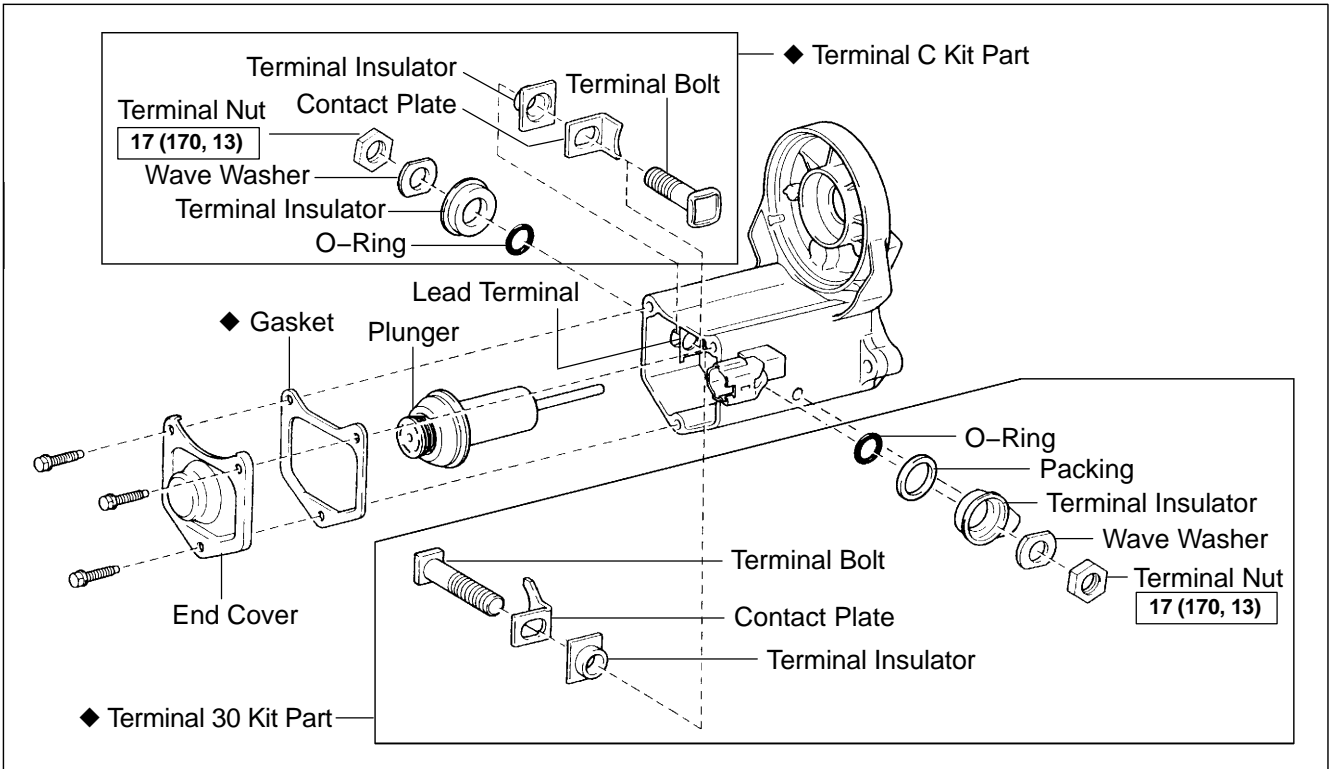
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

2.0 kW Type



Magnetic Switch Assembly

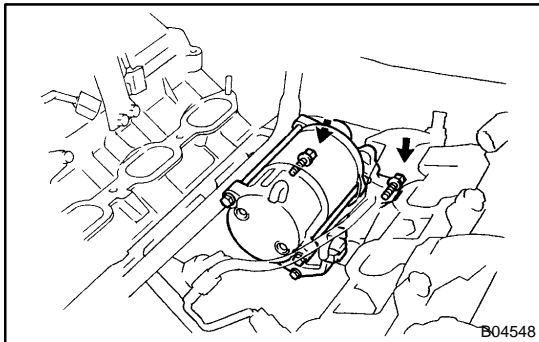


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

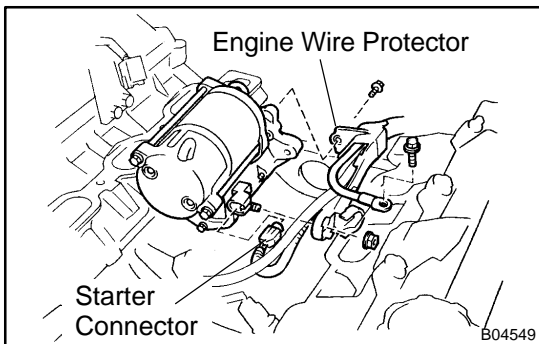
REMOVAL

1. REMOVE THROTTLE BODY COVER
2. DISCONNECT CABLE FROM NEGATIVE (-) BATTERY TERMINAL
3. REMOVE INTAKE AIR CONNECTOR
4. DISCONNECT THROTTLE BODY ASSEMBLY FROM INTAKE MANIFOLD (See page [SF-44](#))
5. REMOVE INTAKE MANIFOLD ASSEMBLY (See page [EM-36](#))
6. REMOVE AIR PUMP ASSEMBLY (See page [EC-23](#))

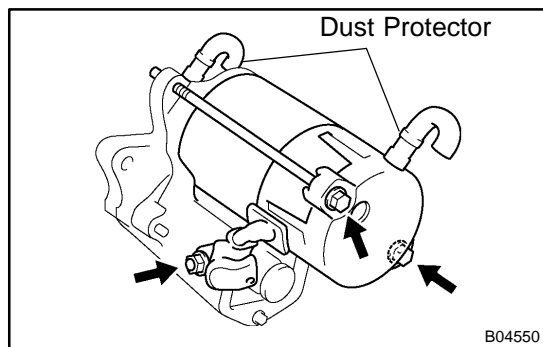


7. REMOVE STARTER

- (a) Remove the 2 bolts holding the starter to the cylinder block.
- (b) Disconnect the starter from the cylinder block.



- (c) Disconnect the starter connector.
- (d) Remove the nut, bolt and disconnect the starter wire.
- (e) Remove the bolt, and disconnect the engine wire protector from the starter.
- (f) Remove the starter.



DISASSEMBLY

1. REMOVE 2 DUST PROTECTORS

2. REMOVE FIELD FRAME AND ARMATURE

- (a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.

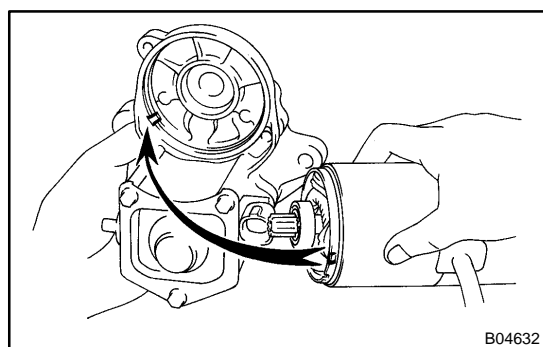
Torque: 5.9 N·m (60 kgf·cm, 52 in.-lbf)

- (b) Remove the 2 through bolts.

Torque:

1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.-lbf)

2.0 kW type: 9.3 N·m (95 kgf·cm, 82 in.-lbf)



- (c) Pull out the field frame together with the armature from the magnetic switch assembly.

NOTICE:

At the time of notice, please refer to the following items.

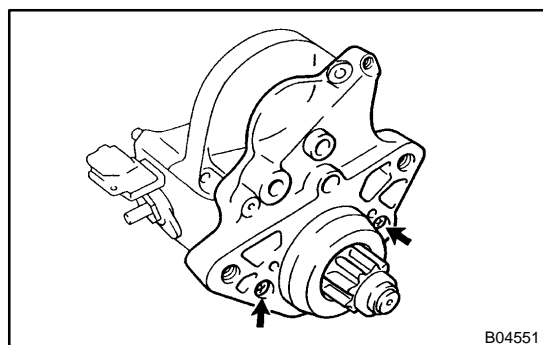
Align the protrusion of the field frame with the groove of the magnetic switch.

- (d) Remove the O-ring from the field frame.

HINT:

At the time of assembly, please refer to the following items.

Use a new O-ring.



3. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

- (a) 1.4 kW type:

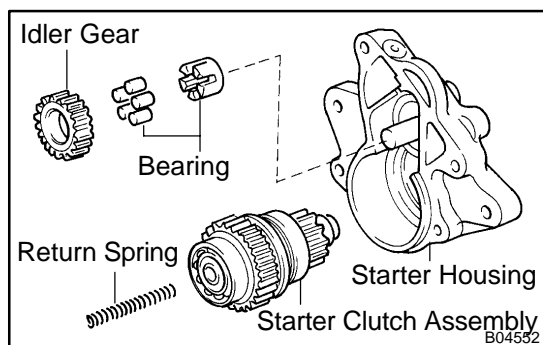
Remove the 2 bolts.

Torque: 5.9 N·m (60 kgf·cm, 52 in.-lbf)

- (b) 2.0 kW type:

Remove the 2 screws.

Torque: 9.3 N·m (95 kgf·cm, 82 in.-lbf)

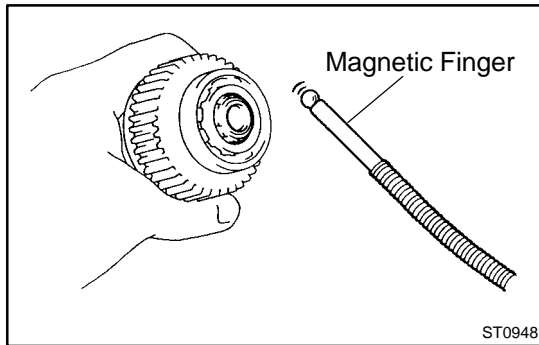


- (c) Remove the starter housing, return spring, idler gear, bearing and starter clutch assembly.

HINT:

At the time of assembly, please refer to the following item.

Apply grease to the return spring and insert the return spring into the clutch shaft hole.

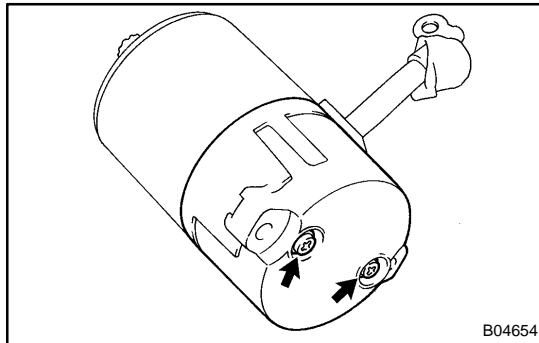


4. REMOVE STEEL BALL

Using a magnetic finger, remove the steel ball from the clutch shaft hole.

HINT:

At the time of assembly, please refer to the following item.
Apply grease to the steel ball and insert the steel ball into the clutch shaft hole.



5. REMOVE BRUSH HOLDER

(a) Remove the 2 screws w/ O-ring and end cover from the field frame.

Torque:

1.4 kW type: 1.5 N·m (15 kgf·cm, 13 in.-lbf)

2.0 kW type: 3.8 N·m (39 kgf·cm, 34 in.-lbf)

(b) Remove the O-ring from the field frame.

HINT:

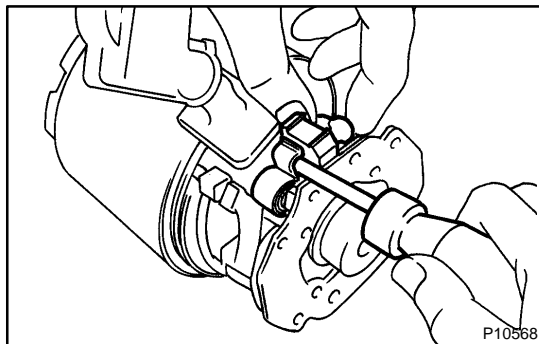
At the time of assembly, please refer to the following item.
Use a new O-ring.

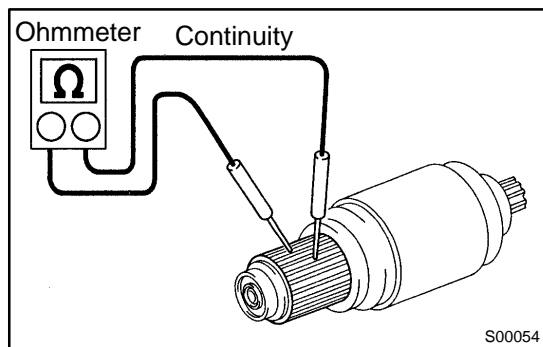
(c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the 4 brushes, and remove the brush holder.

NOTICE:

Check that the positive (+) lead wires are not grounded.

6. REMOVE ARMATURE FROM FIELD FRAME



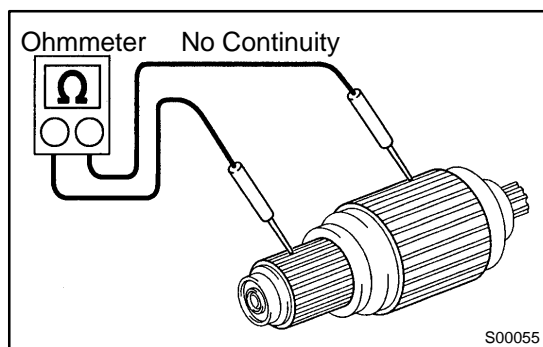


INSPECTION

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.



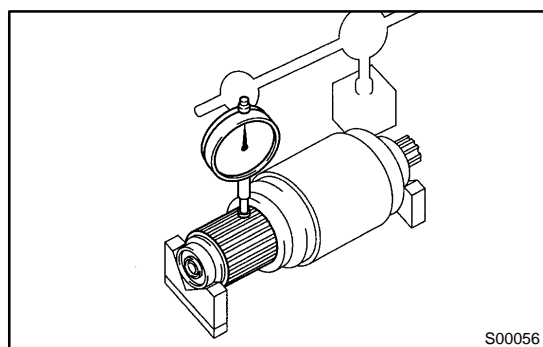
2. INSPECT COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

3. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACE

If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a lathe.



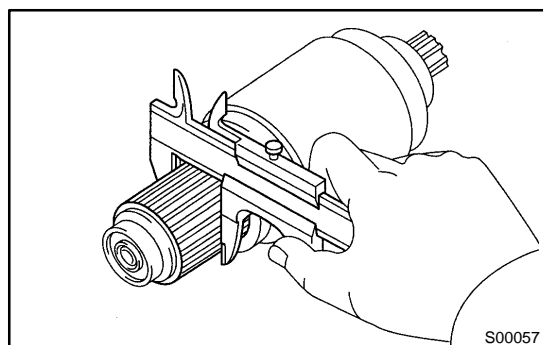
4. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V-blocks.

(b) Using a dial indicator the circle runout.

Maximum circle runout: 0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.



5. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.

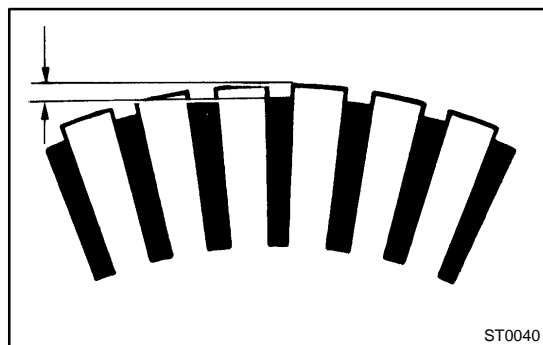
Standard diameter:

1.4 kW type	30.0 mm (1.181 in.)
2.0 kW type	35.0 mm (1.378 in.)

Minimum diameter:

1.4 kW type	29.0 mm (1.142 in.)
2.0 kW type	34.0 mm (1.339 in.)

If the diameter is less than minimum, replace the armature.



6. INSPECT UNDERCUT DEPTH

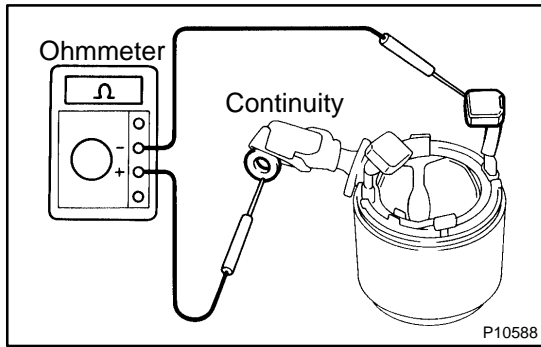
Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

Standard undercut depth:

1.4 kW type	0.6 mm (0.024 in.)
2.0 kW type	0.7 mm (0.028 in.)

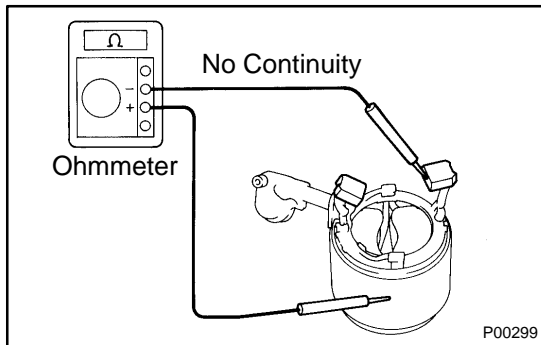
Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.



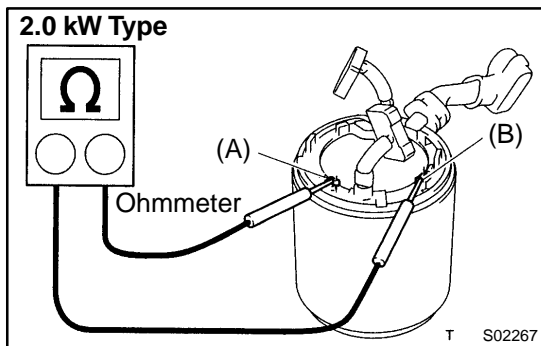
7. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.
If there is no continuity, replace the field frame.



8. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.
If there is continuity, repair or replace the field frame.

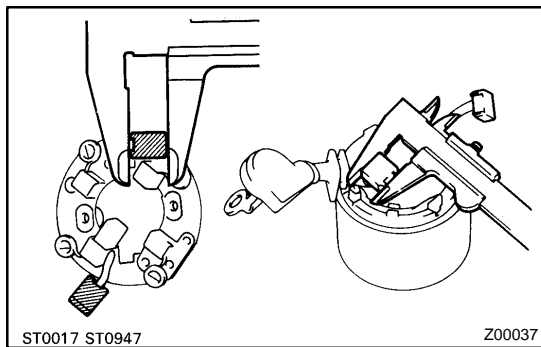


**9. 2.0 kW type:
INSPECT SHUNT COIL FOR OPEN CIRCUIT**

Using an ohmmeter, measure the resistance between shunt coil terminals (A) and (B).

Resistance: 1.5 to 1.9 Ω at 20°C (68°F)

If the resistance is not as specified, replace the field frame.



10. INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

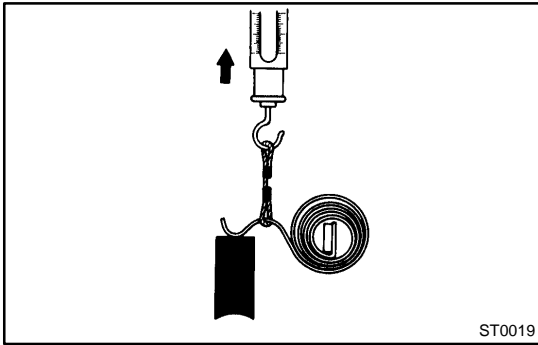
Standard length:

1.4 kW type	15.5 mm (0.610 in.)
2.0 kW type	15.0 mm (0.591 in.)

Minimum length:

1.4 kW type	10.0 mm (0.394 in.)
2.0 kW type	9.0 mm (0.354 in.)

If the length is less than minimum, replace the brush holder and field frame.



11. INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

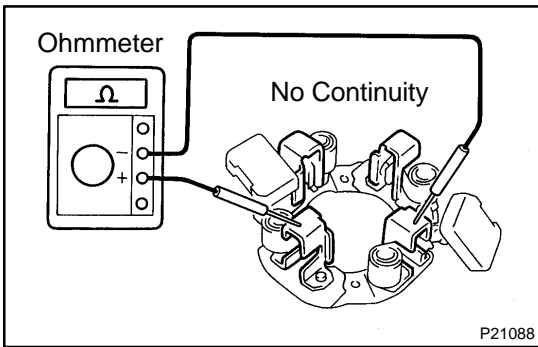
Standard spring installed load:

1.4 kW type	17.6 to 23.5 N (1.8 to 2.4 kgf, 4.0 to 5.3 lbf)
2.0 kW type	21.5 to 27.5 N (2.2 to 2.8 kgf, 4.8 to 6.2 lbf)

Minimum spring installed load:

1.4 kW type	11.8 N (1.2 kgf, 2.7 lbf)
2.0 kW type	12.7 N (1.3 kgf, 2.9 lbf)

If the installed load is less than minimum, replace the brush springs.



12. INSPECT BRUSH HOLDER INSULATION

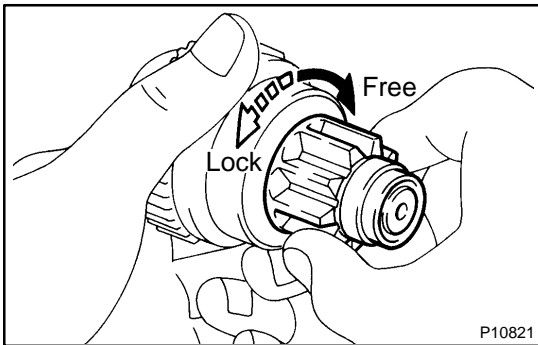
Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders. If there is continuity, repair or replace the brush holder.

13. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idle gear and the clutch assembly for wear or damage.

If damaged, replace the gear or clutch assembly.

If damaged, also check the drive plate ring gear for wear or damage.



14. INSPECT CLUTCH PINION GEAR

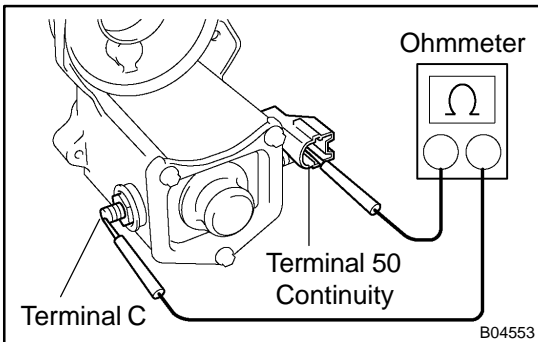
Rotate the pinion gear clockwise, and check that it turns freely. Try to rotate the pinion gear counterclockwise and check that it locks.

If necessary, replace the clutch assembly.

15. INSPECT FRONT AND REAR BEARING

Turn the bearing by hand while applying inward force.

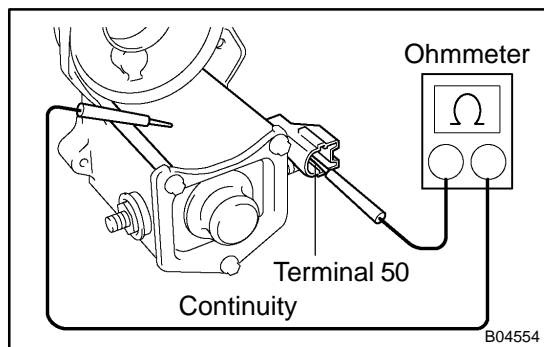
If resistance is felt or the bearing sticks, replace the bearing.



16. DO PULL-IN COIL OPEN CIRCUIT TEST

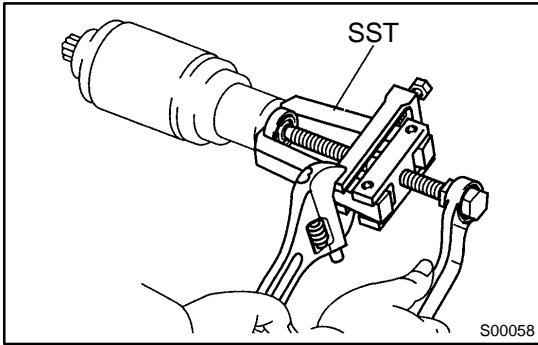
Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, check and replace the magnetic switch.

**17. DO HOLD-IN COIL OPEN CIRCUIT TEST**

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

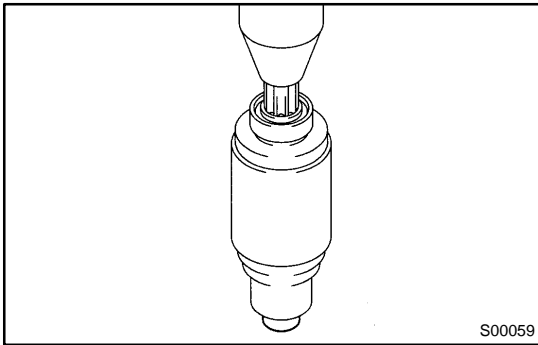
If there is no continuity, replace the magnetic switch.



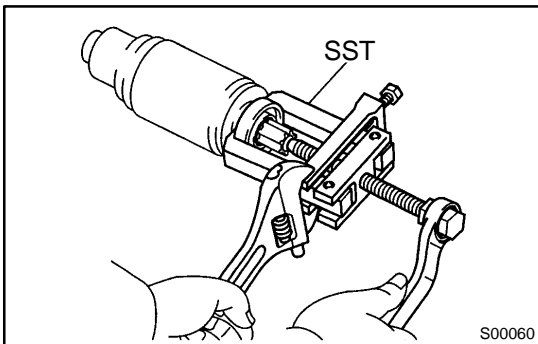
REPLACEMENT

1. REPLACE REAR BEARING

- (a) Using SST, remove the bearing.
SST 09286-46011

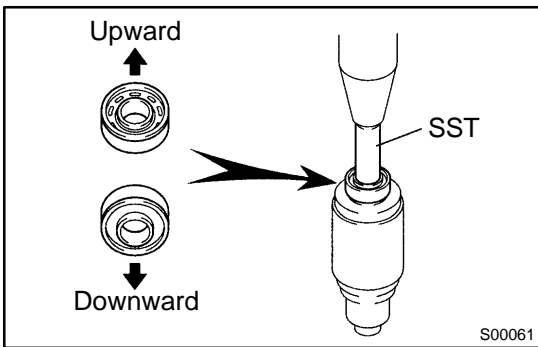


- (b) Using a press, press in a new bearing.



2. REPLACE FRONT BEARING

- (a) Using SST, remove the bearing.
SST 09286-46011

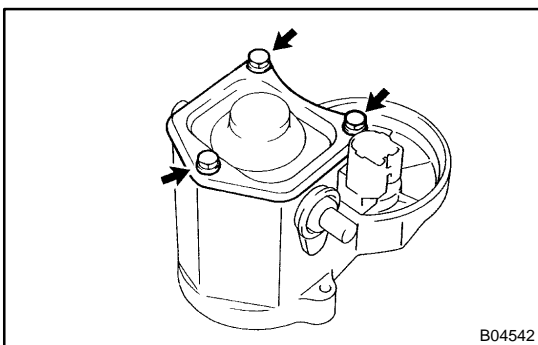


- (b) Using SST and a press, press in a new bearing.

NOTICE:

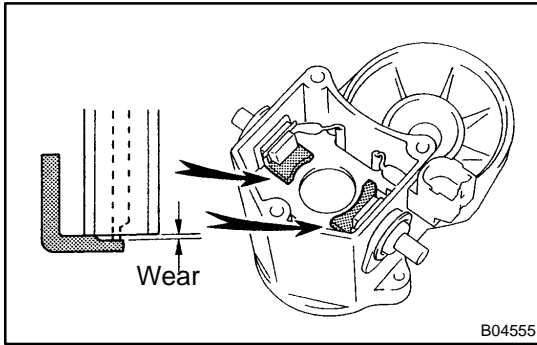
Be careful of the bearing installation direction.

SST 09820-00031



3. REPLACE MAGNETIC SWITCH TERMINAL KIT PARTS

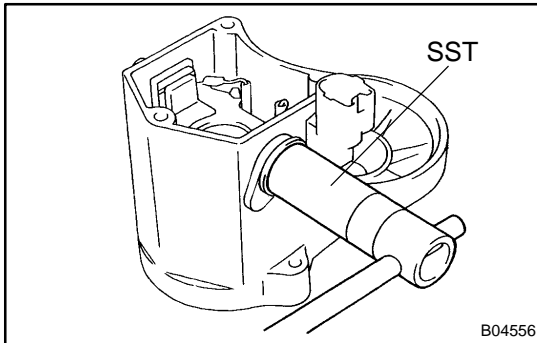
- (a) Remove magnetic switch end cover.
Remove the 3 bolts, end cover, gasket and plunger.



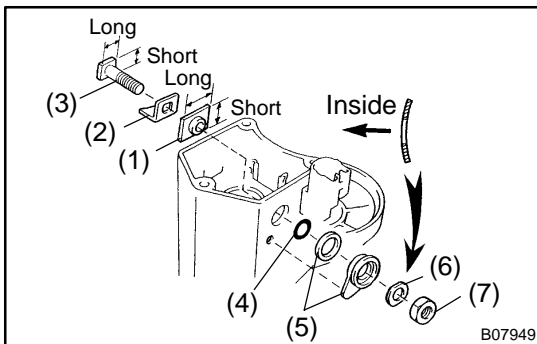
- (b) Inspect contact plate for wear.
Using vernier calipers, measure the contact plate for depth of wear.

Maximum wear: 0.9 mm (0.035 in.)

If the depth of wear is greater than the maximum, replace the contact plate.



- (c) Remove terminal kit parts.
- (1) Using SST, loosen the terminal nuts.
SST 09810-38140
 - (2) Terminal C:
Remove the terminal nut, wave washer, terminal insulator (outside), O-ring, terminal bolt, contact plate and terminal insulator (inside).
 - (3) Terminal 30:
Remove the terminal nut, wave washer, terminal insulator (outside), O-ring, terminal bolt, contact plate, terminal insulator (inside) and insulation paper.



- (d) Install new terminal 30 kit parts.
- (1) Temporarily install a new terminal insulator (inside).
 - (2) Temporarily install a new contact plate.
 - (3) Temporarily install a new terminal bolt.
 - (4) Temporarily install a new O-ring.
 - (5) Temporarily install a new packing and new terminal insulator (outside).
Install a new packing to a new terminal insulator, and install them.

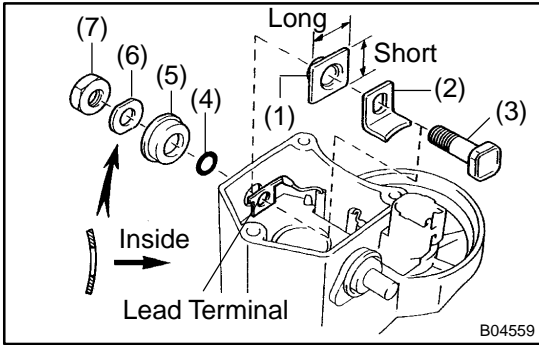
HINT:

Match the protrusion of the insulator with the indentation of the housing.

- (6) Temporarily install a new wave washer.
- (7) Temporarily install a new terminal nut.

NOTICE:

Be careful to install the terminal insulator (inside) and wave washer in the correct direction.

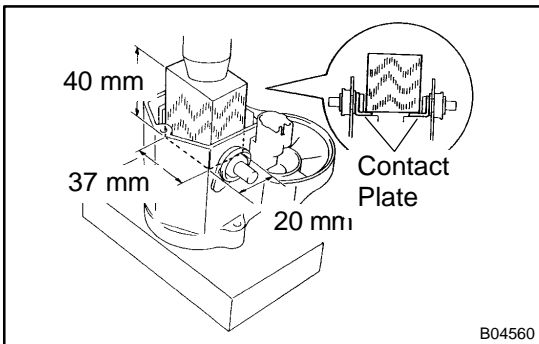


- (e) Install new terminal C kit parts.
 - (1) Temporarily install a new terminal insulator (inside).
 - (2) Temporarily install a new contact plate.
 - (3) Temporarily install a new terminal bolt.
 - (4) Temporarily install a new O-ring.
 - (5) Temporarily install a new terminal insulator (outside).
 - (6) Temporarily install a new wave washer.
 - (7) Temporarily install a new terminal nut.

NOTICE:

Be careful to install the terminal insulator (inside) and wave washer in the correct direction.

- (f) Temporarily tighten the terminal nuts.



- (g) Tighten terminal nuts.
 - (1) Put a wooden block on the contact plate and press it down with a hand press.

Dimensions of wooden block:

20 x 37 x 40 mm (0.79 x 1.46 x 1.57 in.)

Press force:

981 N (100 kgf, 221 lbf)

NOTICE:

- **Check the diameter of the hand press ram. Then calculate the gauge pressure of the press when 981 N (100 kgf, 221 lbf) of force is applied.**

Gauge pressure:

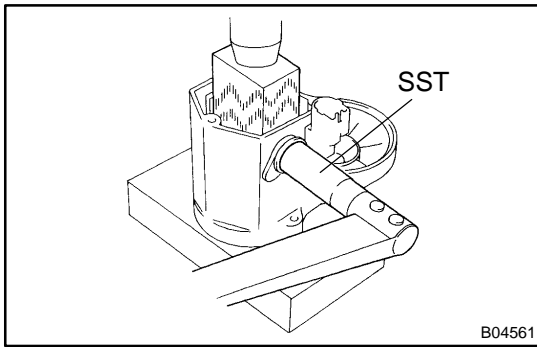
$$(\text{kgf/cm}^2) = \frac{100 \text{ kgf}}{\left(\frac{\text{Ram diameter (cm)}}{2}\right)^2 \times 3.14 (\pi)}$$

$$(\text{psi}) = \frac{221 \text{ lbf}}{\left(\frac{\text{Ram diameter (in.)}}{2}\right)^2 \times 3.14 (\pi)}$$

$$(\text{kPa}) = (\text{kgf/cm}^2) \times 98.1$$

$$(\text{kPa}) = (\text{psi}) \times 6.9$$

- **If the contact plate is not pressed down with the specified pressure, the contact plate may tilt due to coil deformation or the tightening of the nut.**

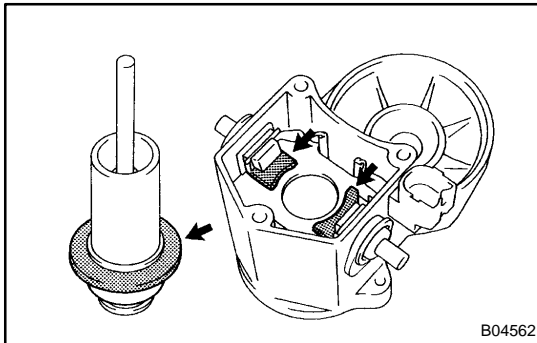


- (2) Using SST, tighten the nuts to the specified torque.
SST 09810-38140

Torque: 17 N·m (170 kgf·cm, 13 ft·lbf)

NOTICE:

If the nut is over tightened, it may cause cracks on the inside of the insulator.



- (h) Clean contact surfaces of contact plate and plunger. Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag.
- (i) Reinstall magnetic switch end cover. Install the plunger, new gasket, end cover and lead clamp with the 3 bolts.

Torque:

1.4 kW type: 2.5 N·m (25 kgf·cm, 22 in·lbf)

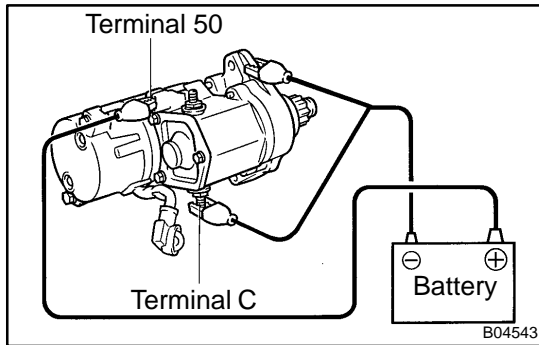
2.0 kW type: 3.6 N·m (37 kgf·cm, 32 in·lbf)

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [ST-7](#)).

HINT:

At the time of assembly, use high-temperature grease to lubricate the bearing and gears when assembling the starter.



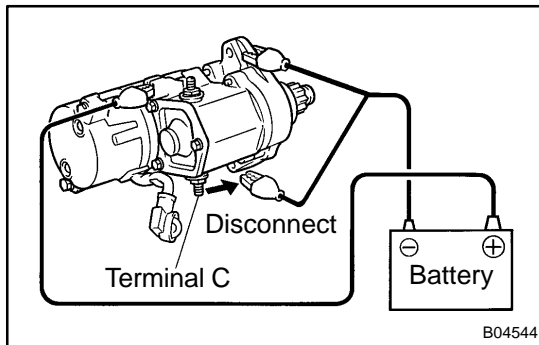
TEST

NOTICE:

These tests must be done within 3 to 5 seconds to avoid burning out the coil.

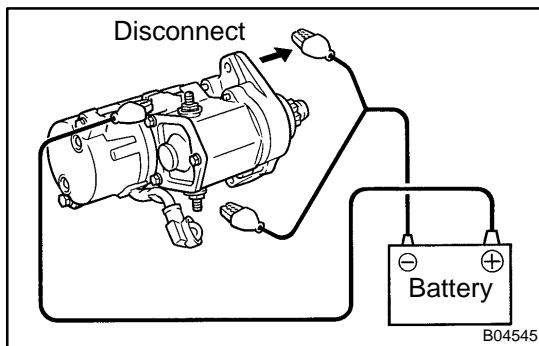
1. DO PULL-IN TEST

- Disconnect the field coil lead wire from terminal C.
- Connect the battery to the magnetic switch as shown. Check that the pinion gear moves outward.



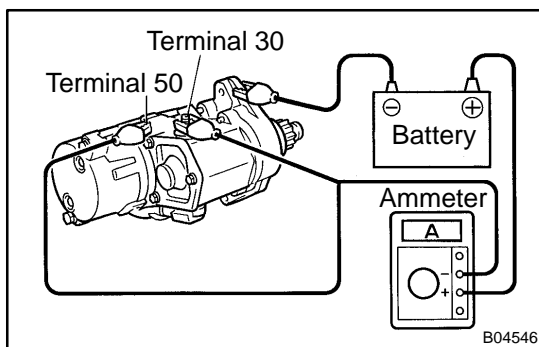
2. DO HOLD-IN TEST

While connected as above with the pinion gear out, disconnect the negative (-) lead from terminal C. Check that the pinion gear remains out.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (-) lead from the starter body. Check that the pinion gear returns inward.

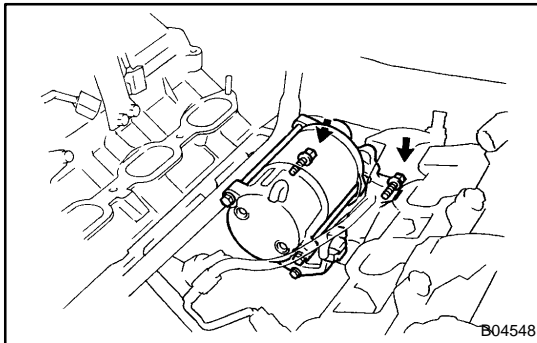
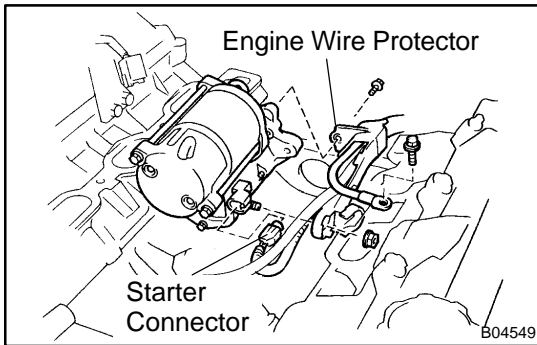


4. DO NO-LOAD PERFORMANCE TEST

- Connect the battery and ammeter to the starter as shown.
- Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter shows the specified current.

Specified current:

1.4 kW type	90 A or less at 11.5 V
2.0 kW type	100 A or less at 11.5 V



INSTALLATION

1. INSTALL STARTER

- (a) Install the engine wire protector to the starter with the bolt.
Torque: 9.81 N·m (100 kgf·cm, 84 in.-lbf)
- (b) Connect the starter wire with the nut.
Torque: 9.81 N·m (100 kgf·cm, 84 in.-lbf)
- (c) Connect the starter connector.
- (d) Connect the starter to the cylinder block.
- (e) Connect the engine wire with the bolt.

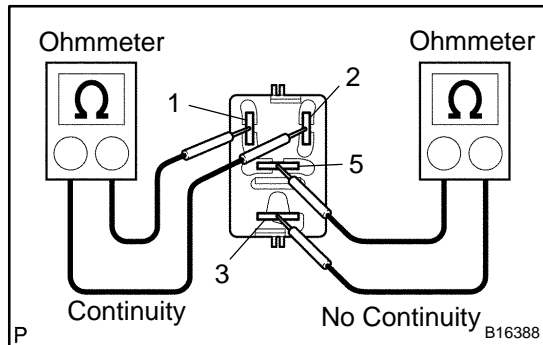
- (f) Install the starter with the 2 bolts.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

2. **INSTALL AIR PUMP ASSEMBLY (See page [EC-27](#))**
3. **INSTALL INTAKE MANIFOLD ASSEMBLY (See page [EM-60](#))**
4. **CONNECT THROTTLE BODY ASSEMBLY TO INTAKE MANIFOLD (See page [SF-45](#))**
5. **INSTALL INTAKE AIR CONNECTOR**
6. **INSTALL THROTTLE BODY COVER**
7. **CONNECT CABLE TO NEGATIVE (-) BATTERY TERMINAL**

STARTER RELAY INSPECTION

1. REMOVE RELAY BOX COVER
2. REMOVE STARTER RELAY (Marking: ST)



3. INSPECT STARTER RELAY

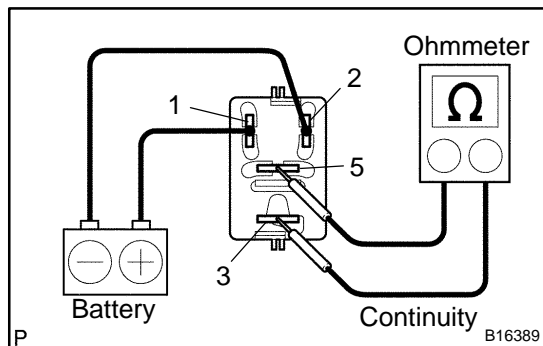
(a) Inspect the relay continuity.

- (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

- (2) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



(b) Inspect the relay operation.

- (1) Apply battery voltage across terminals 1 and 2.
- (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

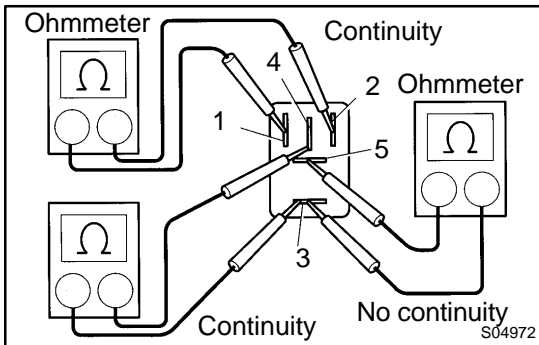
4. REINSTALL RELAY BOX COVER
5. REINSTALL STARTER RELAY

ACC CUT RELAY INSPECTION

ST001-02

1. REMOVE ACC CUT RELAY

Remove the cowl side trim board LH and ACC cut relay.



2. INSPECT ACC CUT RELAY CONTINUITY

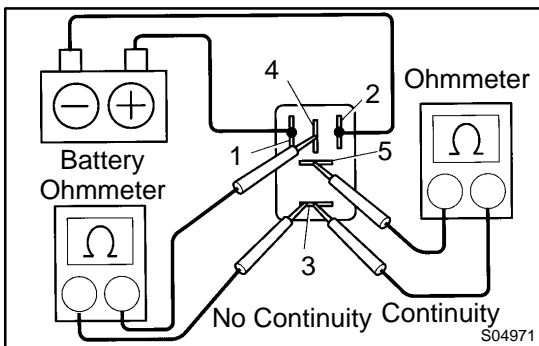
(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.

(c) Check that there is continuity between terminals 3 and 4. If there is no continuity, replace the relay.



3. INSPECT ACC CUT RELAY OPERATION

(a) Apply battery positive voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.

(c) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL ACC CUT RELAY

CHARGING SYSTEM

ON-VEHICLE INSPECTION

CH0N5-01

CAUTION:

- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Do not perform tests with a high voltage insulation resistance tester.
- Never disconnect the battery while the engine is running.

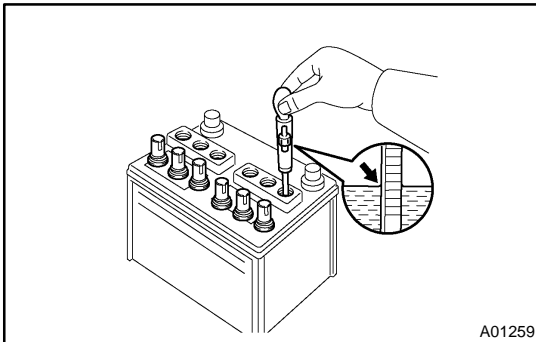
1. CHECK BATTERY ELECTROLYTE LEVEL

- (a) Check the electrolyte quantity of each cell (Maintenance-Free Battery).

If under the lower level, replace the battery (or add distilled water if possible) and check the charging system.

- (b) Check the electrolyte quantity of each cell (Except Maintenance-Free Battery).

If under the lower level, add distilled water.



A01259

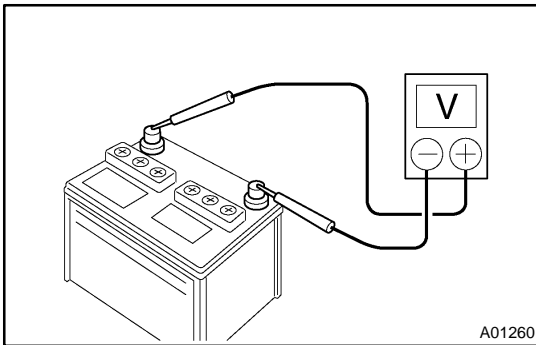
2. CHECK BATTERY SPECIFIC GRAVITY (Except Maintenance-Free Battery)

- (a) Check the specific gravity of each cell.

Standard specific gravity: 1.25 to 1.29 at 20°C (68°F)

HINT:

If the specific gravity is less than specification, charge the battery.



A01260

3. CHECK BATTERY VOLTAGE

- (a) After having driven the vehicle and in the case that 20 minutes have not passed after having stopped the engine, turn the ignition switch ON and turn on the electrical system (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.

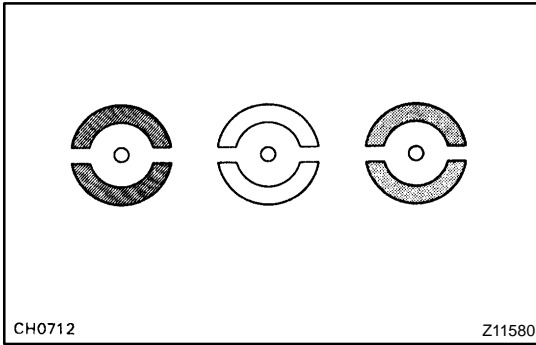
- (b) Turn the ignition switch OFF and turn off the electrical systems.

- (c) Measure the battery voltage between the negative (-) and positive (+) terminals of the battery.

Standard voltage: 12.5 to 12.9 V at 20°C (68°F)

HINT:

If the voltage is less than specification, charge the battery.



(d) Check the indicator as shown in the illustration.

HINT:

- Blue: OK
- White: Charging Necessary
- Red: Insufficient Water

4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

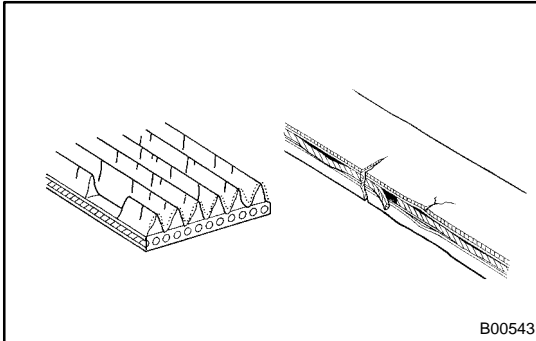
(b) Check the fusible link, H-fuses and fuses for continuity.

5. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

- If any defect has been found, replace the drive belt.
- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Check that it fits properly in the ribbed grooves.

HINT:

Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.

6. VISUALLY CHECK GENERATOR WIRING

(a) Check that the wiring is in good condition.

7. LISTEN FOR ABNORMAL NOISES FROM GENERATOR

(a) Check that there is no abnormal noise from the generator while the engine is running.

8. INSPECT CHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch ON. Check that the charge warning light comes on.

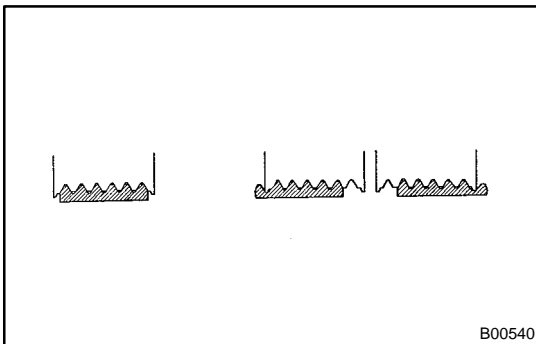
(b) Start the engine. Check that the light goes off.

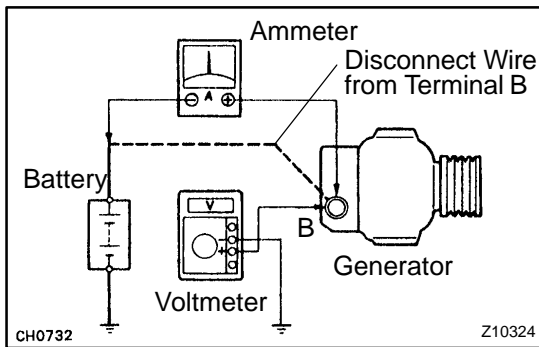
HINT:

If the light does not operate as specified, troubleshoot the charge warning light circuit.

9. INSPECT CHARGING CIRCUIT WITHOUT LOAD

(a) If a battery/generator tester is available, connect the tester to the charging circuit as per manufacturer's instructions.





- (b) If a tester is not available, connect a voltmeter to the charging circuit as follows.
- (1) Disconnect the wire from terminal B of the generator and connect it to the negative (-) lead of the ammeter.
 - (2) Connect the positive (+) lead of the ammeter to terminal B of the generator.
 - (3) Connect the positive (+) lead of the voltmeter to terminal B of the generator.
 - (4) Ground the negative (-) lead of the voltmeter.
- (c) Check the charging circuit.
- (1) With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.2 to 14.8 V

HINT:

- If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- If the voltmeter reading is less than the standard voltage, check the voltage regulator and generator as follows:

10. INSPECT CHARGING CIRCUIT WITH LOAD

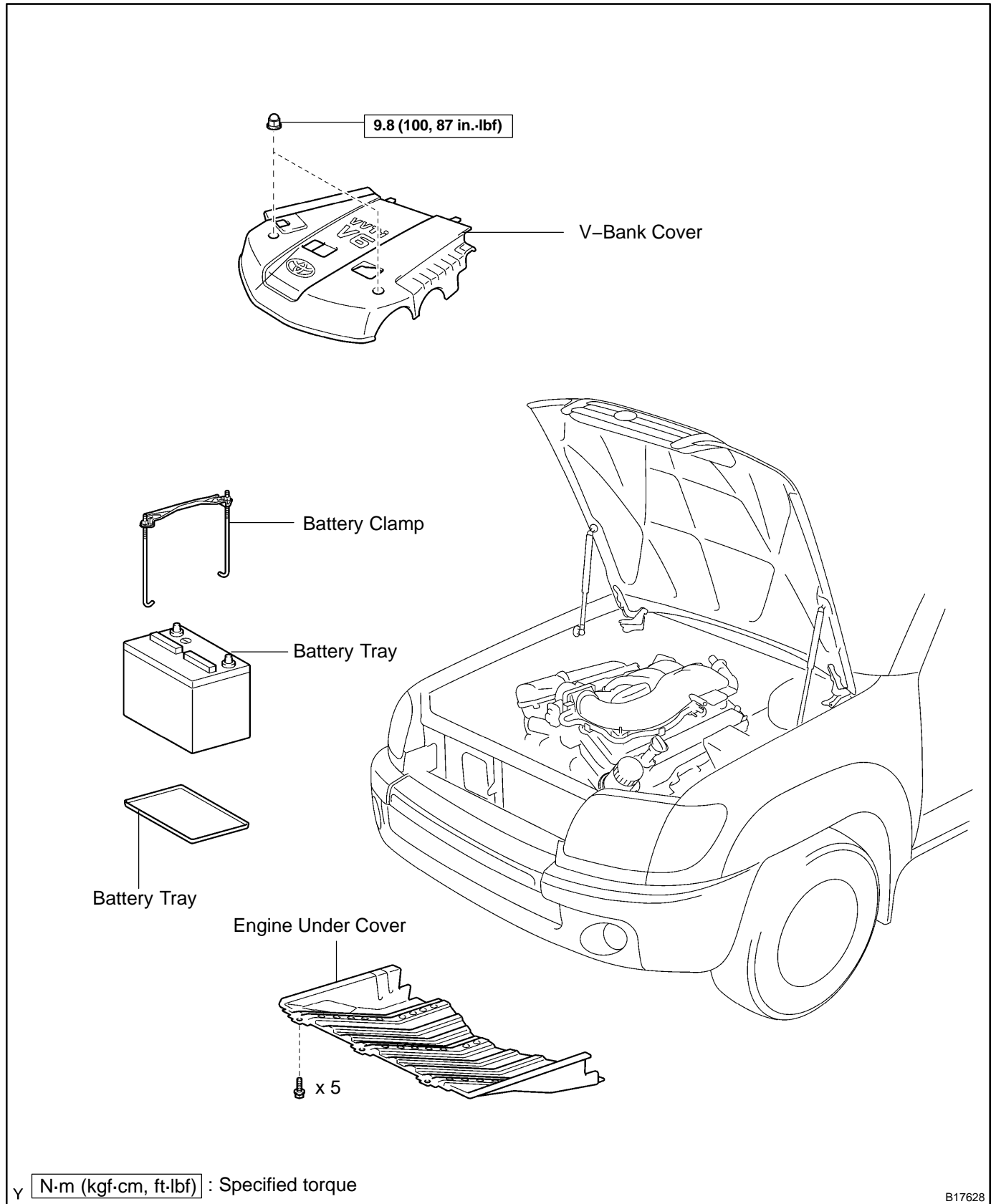
- (a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "HI".
 - (b) Check the reading on the ammeter.
- Standard amperage: 30 A or more**

HINT:

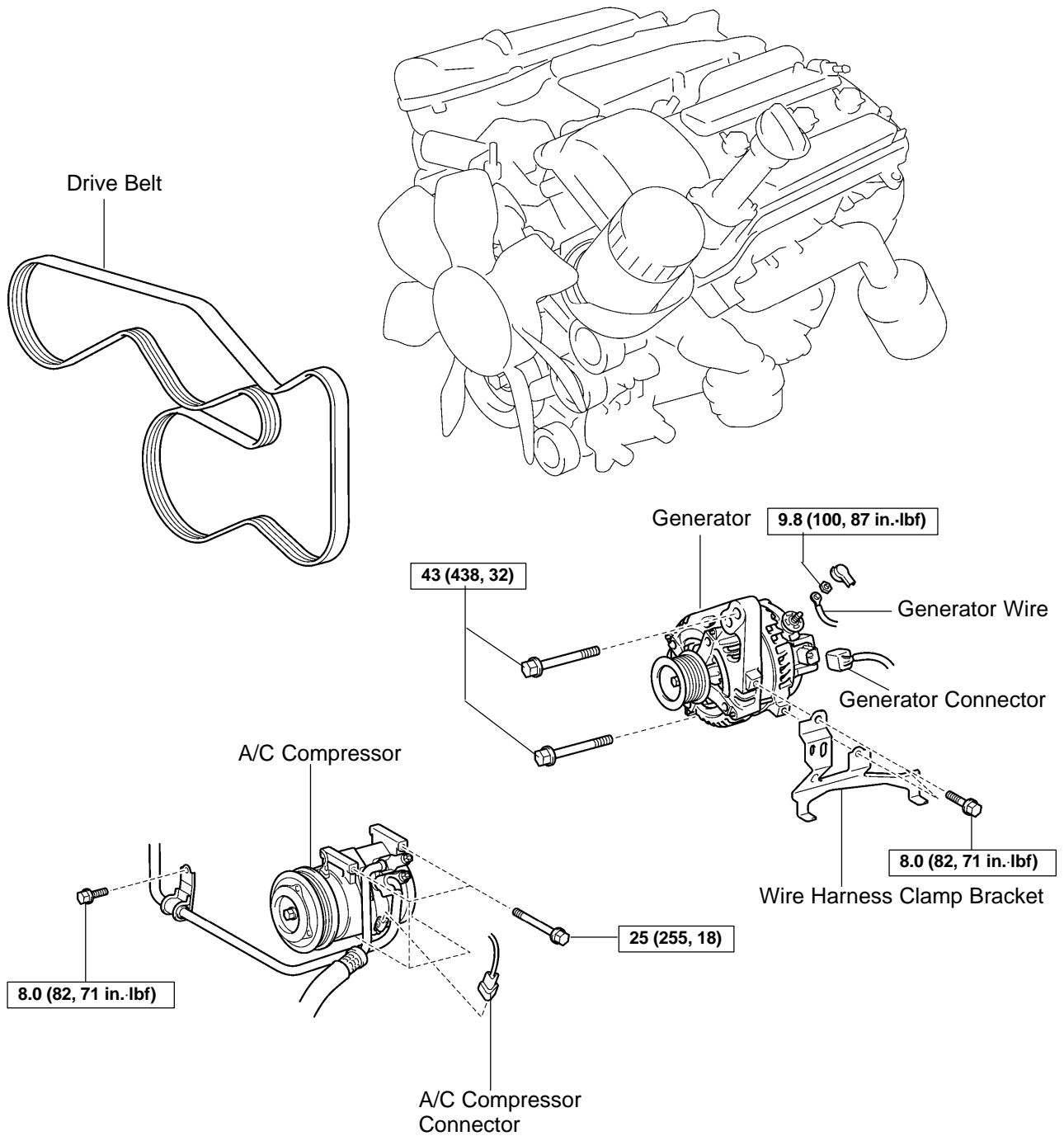
- If the ammeter reading is less than standard amperage, repair the generator.
- If the battery is fully charged, the indication will sometimes be less than standard amperage.

GENERATOR COMPONENTS

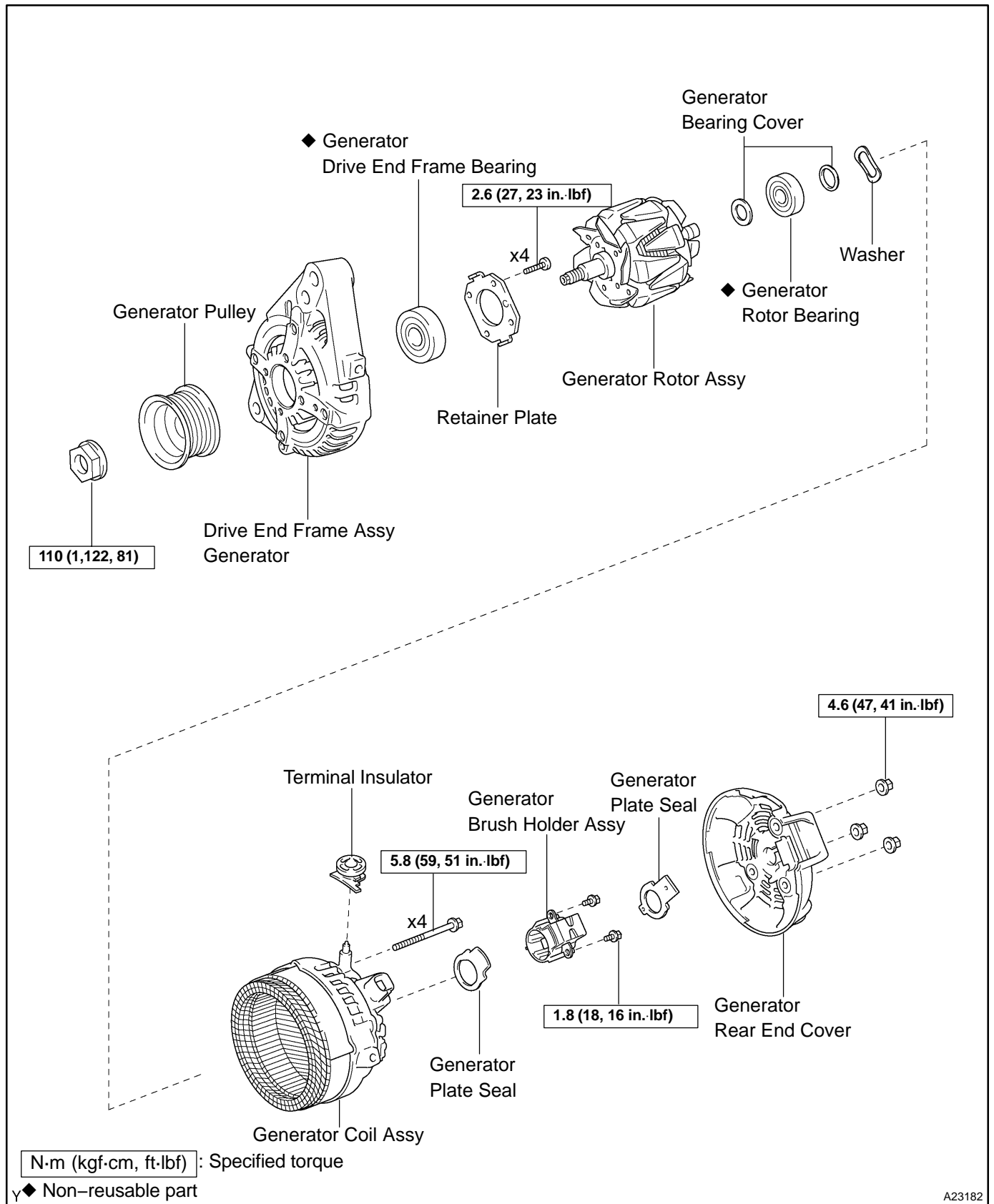
CH0N6-01



CHARGING (1GR-FE) - GENERATOR

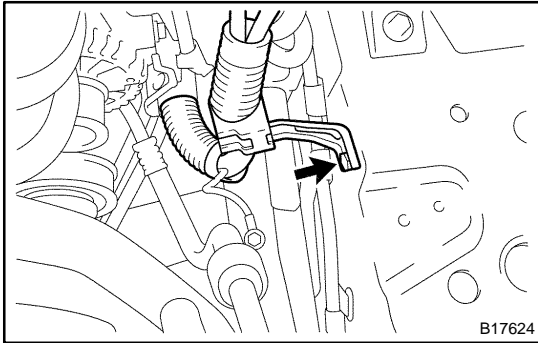


Y N·m (kgf·cm, ft·lbf) : Specified torque



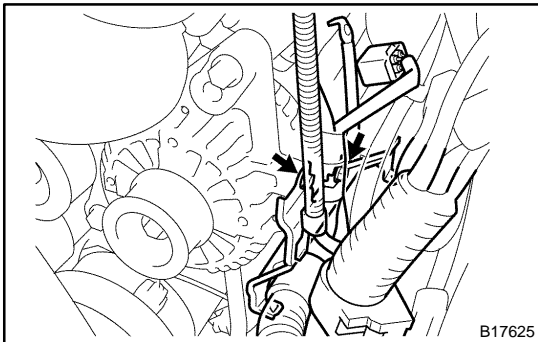
REMOVAL

1. REMOVE V-BANK COVER
2. REMOVE ENGINE UNDER COVER
Remove the 4 bolts and engine under cover.
3. REMOVE FAN AND GENERATOR V BELT
(See page [EM-62](#))
4. REMOVE BATTERY

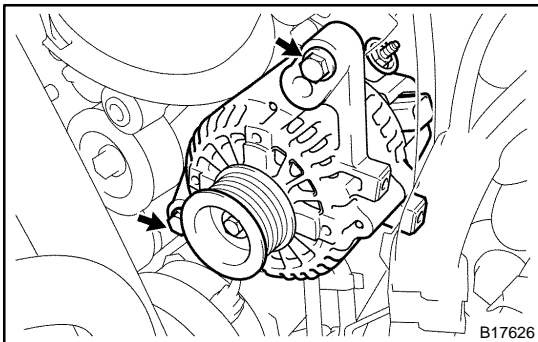


5. REMOVE GENERATOR

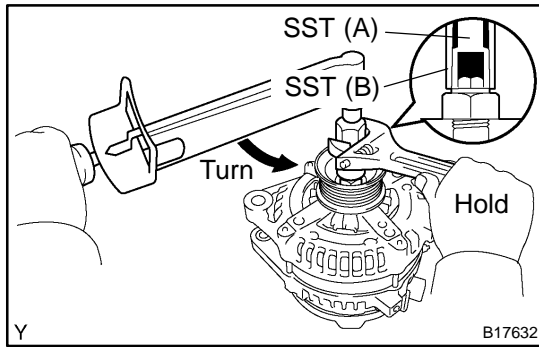
- (a) Disconnect the wire harness.
 - (1) Remove the bolt and wire harness stay.
 - (2) Disconnect the connector from the generator.
 - (3) Remove the terminal cap and nut.
 - (4) Disconnect the wire harness from the terminal B.



- (b) Remove the 2 bolts and wire harness clamp bracket from the generator assy.



- (c) Remove the 2 bolts and generator.



DISASSEMBLY

1. REMOVE GENERATOR PULLEY

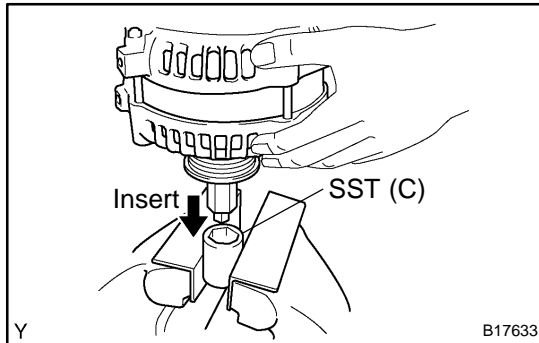
SST 09820-63011

- (a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise with the specified torque.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

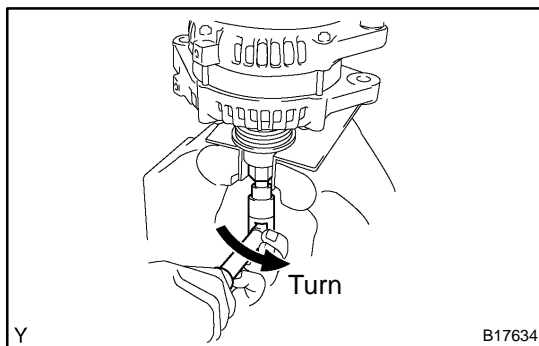
NOTICE:

Check that SST is secured to the rotor shaft.



- (b) Mount SST 2 in a vise.

- (c) Insert SST (A) and (B) into SST (C), and attach the pulley nut to SST (C).

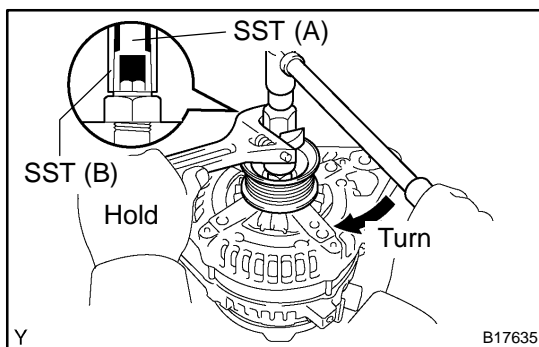


- (d) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

NOTICE:

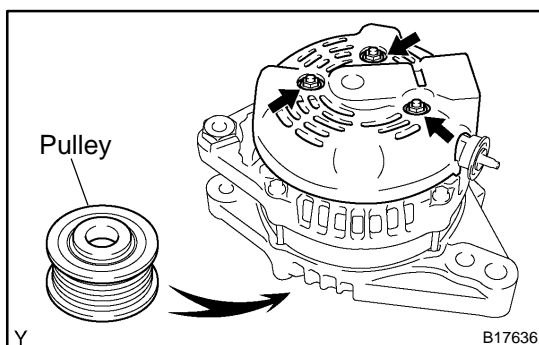
To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half turn.

- (e) Remove the generator from SST (C).



- (f) Turn SST (B), and remove SST (A) and (B).

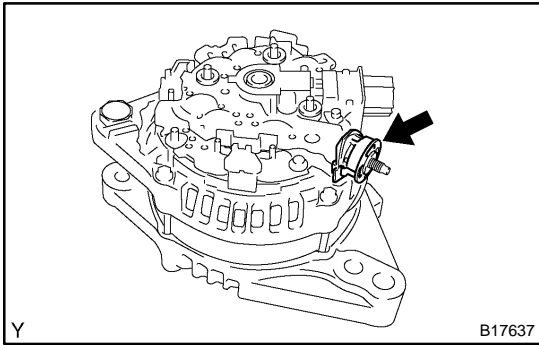
- (g) Remove the pulley nut and pulley.



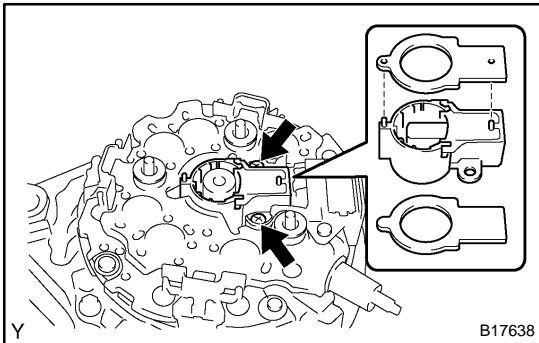
2. REMOVE GENERATOR REAR END COVER

- (a) Place the generator on the pulley.

- (b) Remove the 3 nuts and rear end cover.

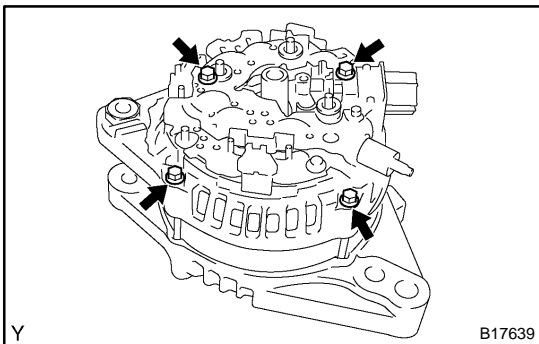


3. REMOVE TERMINAL INSULATOR



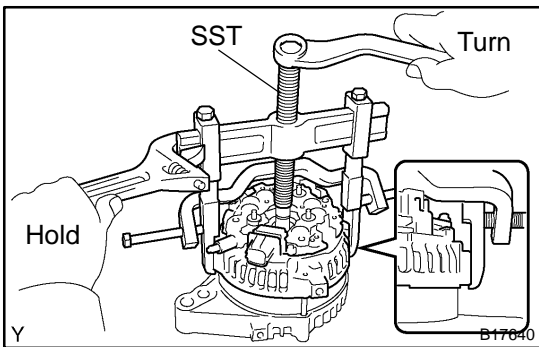
4. REMOVE GENERATOR BRUSH HOLDER ASSY

- (a) Remove the plate seal.
- (b) Remove the 2 nuts and brush holder.
- (c) Remove the plate seal.

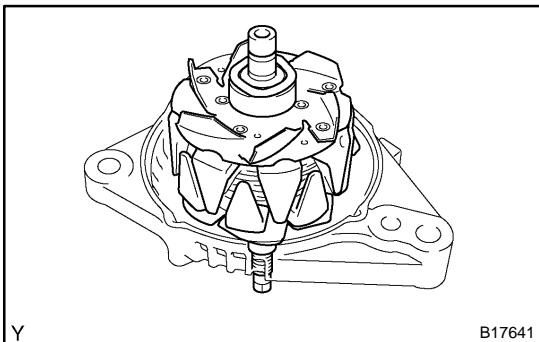


5. REMOVE GENERATOR COIL ASSY

- (a) Remove the 4 bolts.

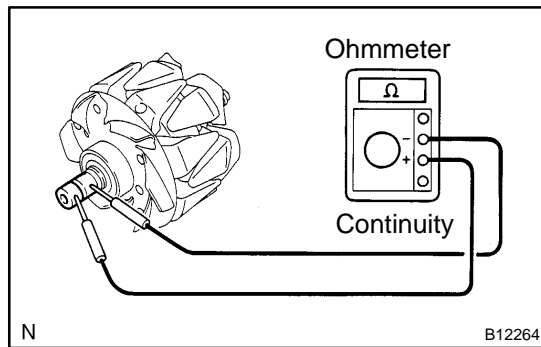


- (b) Using SST, remove the coil.
 SST 09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04071, 09957-04010, 09958-04011)



6. REMOVE GENERATOR ROTOR ASSY

- (a) Remove the washer and rotor.



INSPECTION

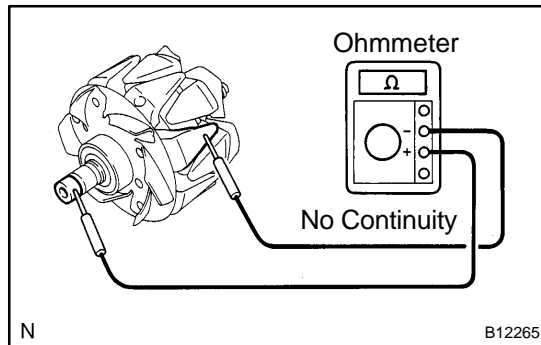
1. INSPECT ROTOR

- (a) Check the rotor for open circuit.

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance: 2.3 to 2.7 Ω at 20°C (68°F)

If there is no continuity, replace the rotor.



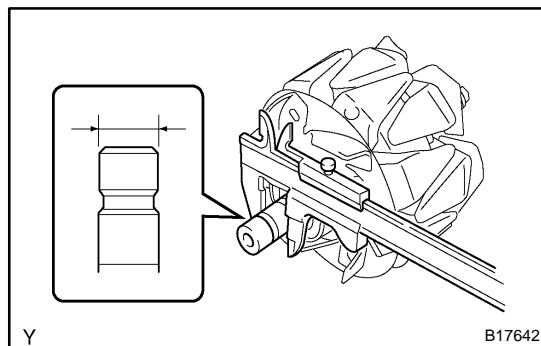
- (b) Check the rotor for ground.

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.

- (c) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

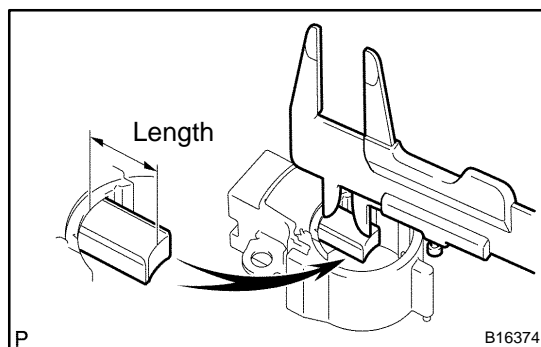


- (d) Using vernier calipers, measure the slip ring diameter.

Standard diameter: 14.2 to 14.4 mm (0.559 to 0.567 in.)

Minimum diameter: 14.0 mm (0.551 in.)

If the diameter is less than the minimum, replace the rotor.



2. INSPECT BRUSHES

Using vernier caliper, measure the exposed brush length.

Standard exposed length: 10.5 mm (0.413 in.)

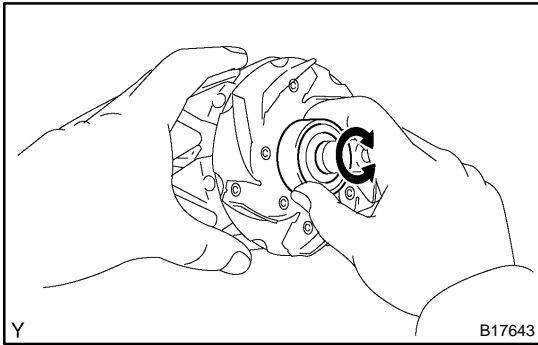
Minimum exposed length: 4.5 mm (0.177 in.)

If the exposed length is less than the minimum, replace the brushes and the brush holder assembly.

3. INSPECT BEARING

Check the bearing is not rough or worn.

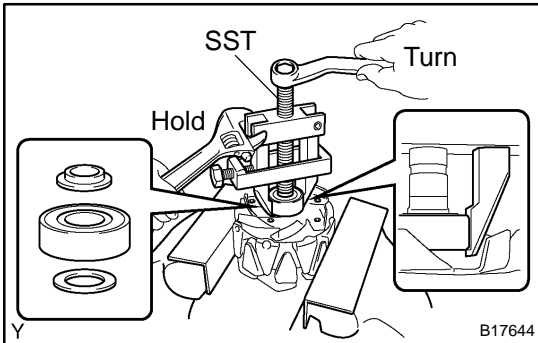
If necessary, replace the bearing (See page [CH-11](#)).



REPLACEMENT

1. INSPECT GENERATOR ROTOR BEARING

- (a) Check the bearing is not rough or worn.
If necessary, replace the bearing.



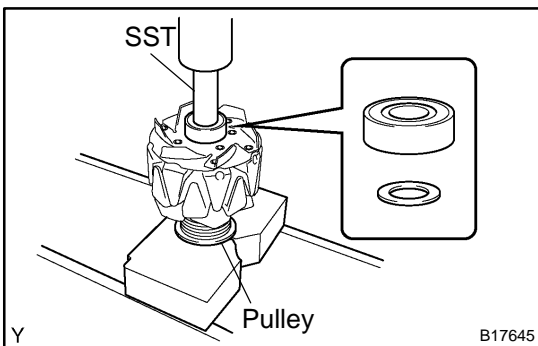
2. REMOVE GENERATOR ROTOR BEARING

SST 09820-00021

NOTICE:

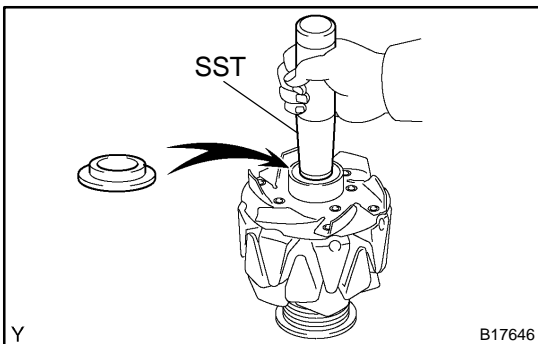
Be careful not to damage the fan.

- (a) Remove the bearing cover (Inside).

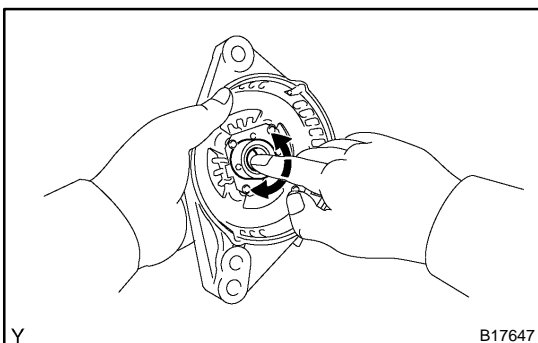


3. INSTALL GENERATOR ROTOR BEARING

- (a) Place the rotor on the pulley.
- (b) Install the bearing cover (Inside).
- (c) Using SST and a press, press in a new bearing.
SST 09820-00031

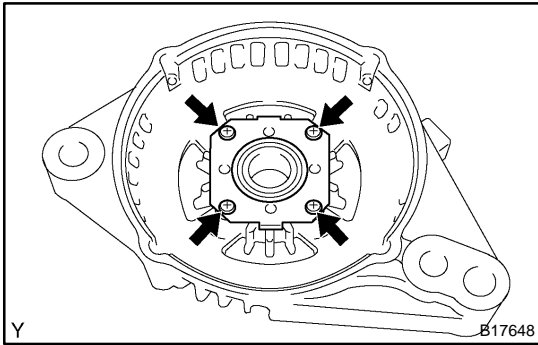


- (d) Using SST, push in the bearing cover (outside).
SST 09285-76010

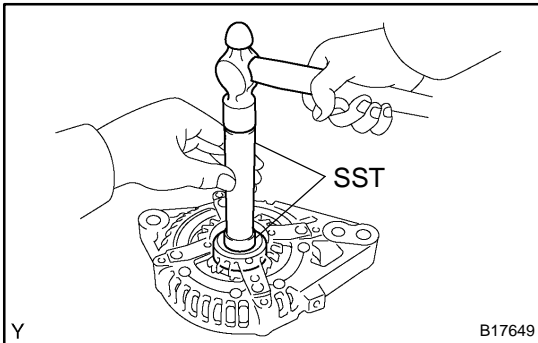


4. INSPECT GENERATOR DRIVE END FRAME BEARING

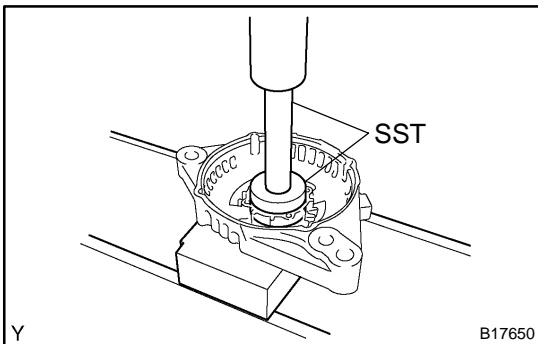
- (a) Check the bearing is not rough or worn.
If necessary, replace the bearing.

**5. REMOVE GENERATOR DRIVE END FRAME BEARING**

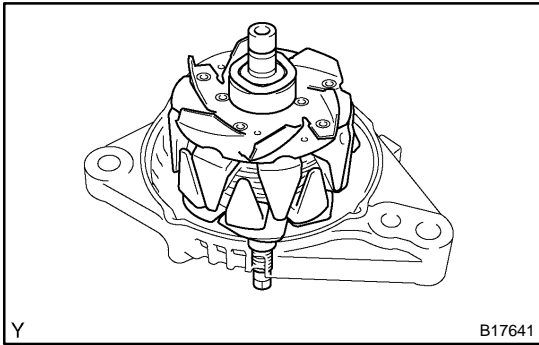
- (a) Remove the 4 screws and retainer plate.



- (b) Using SST, tap out the bearing.
SST 09950-60010 (09951-00250), 09950-70010
(09951-07100)

**6. INSTALL GENERATOR DRIVE END FRAME BEARING**

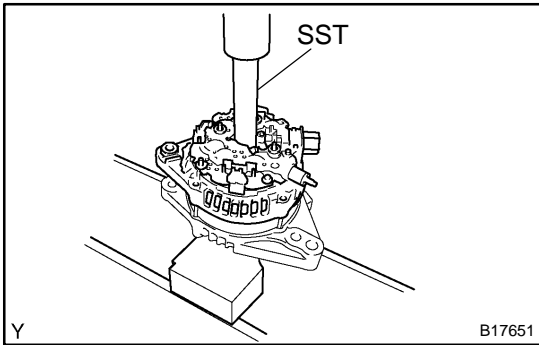
- (a) Using SST and a press, press in a new bearing.
SST 09950-60010 (09951-00470), 09950-70010
(09951-07100)
- (b) Install the retainer plate with the 4 screws.
Torque: 2.6 N·m (27 kgf·cm, 23 in.-lbf)



REASSEMBLY

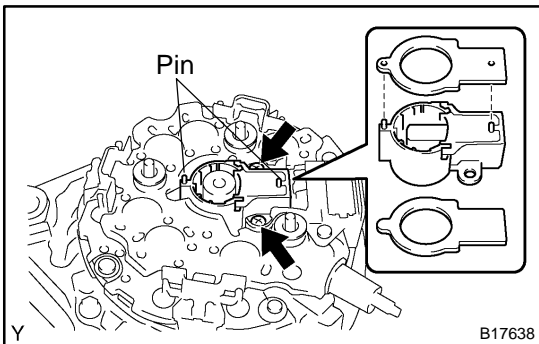
1. INSTALL GENERATOR ROTOR ASSY

- (a) Place the drive end frame on the rotor.
- (b) Install the rotor and washer.



2. INSTALL GENERATOR COIL ASSY

- (a) Using SST and a press, press in the coil carefully.
SST 09285-76010
- (b) Install the 4 bolts.
Torque: 5.8 N·m (59 kgf·cm, 51 in.-lbf)



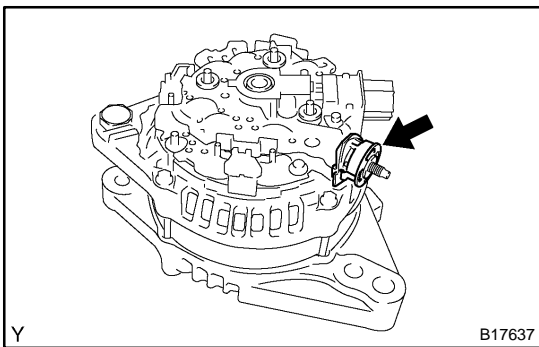
3. INSTALL GENERATOR BRUSH HOLDER ASSY

- (a) Install the plate seal (Inside).
- (b) Place the brush holder with the pin facing upward.

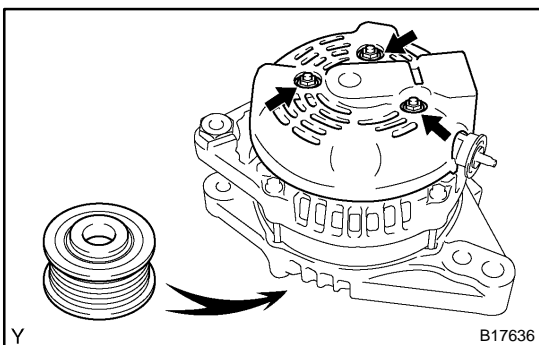
NOTICE:

Be careful of the brush holder installing direction.

- (c) Install the 2 screws.
Torque: 1.8 N·m (18 kgf·cm, 16 in.-lbf)
- (d) Align the pins of the brush holder with the holes of the plate seal (outside), and install the plate seal (outside).

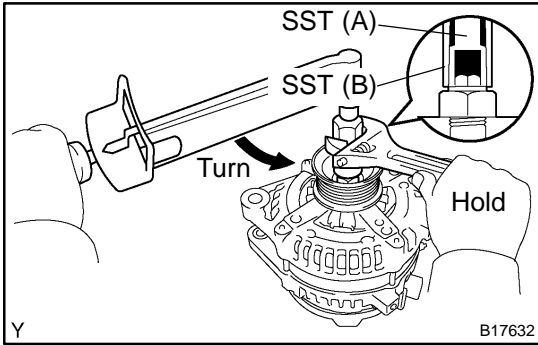


4. INSTALL TERMINAL INSULATOR



5. INSTALL GENERATOR REAR END COVER

- (a) Install the rear end cover with the 3 nuts.
Torque: 4.6 N·m (47 kgf·cm, 41 in.-lbf)



6. INSTALL GENERATOR PULLEY

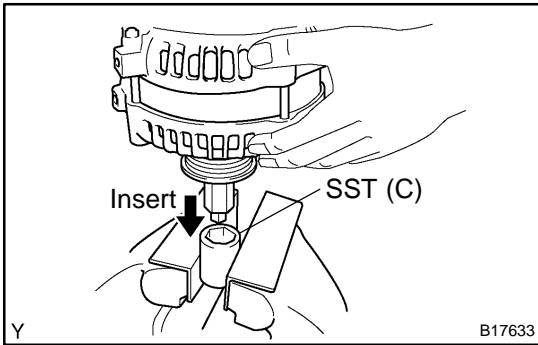
SST 09820-63011

- (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
- (b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise with the specified torque.

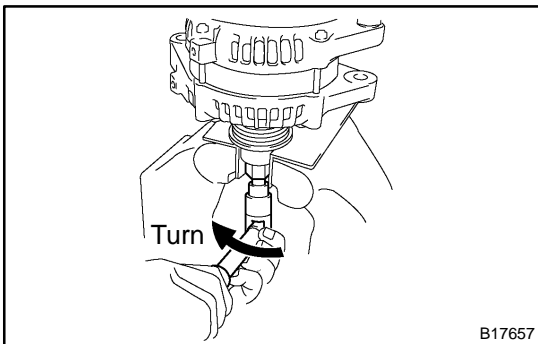
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

NOTICE:

Check that SST is secured to the rotor shaft.



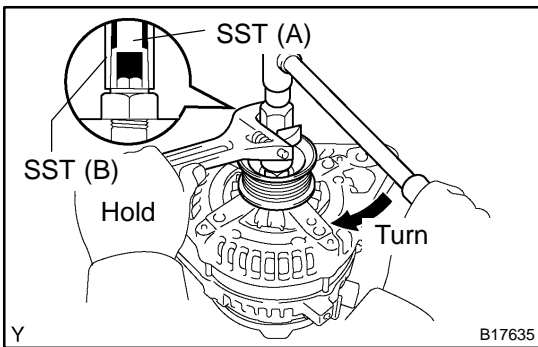
- (c) Mount SST (C) in a vise.
- (d) Insert SST (A) and (B) into SST (C), and attach the pulley nut to SST (C)



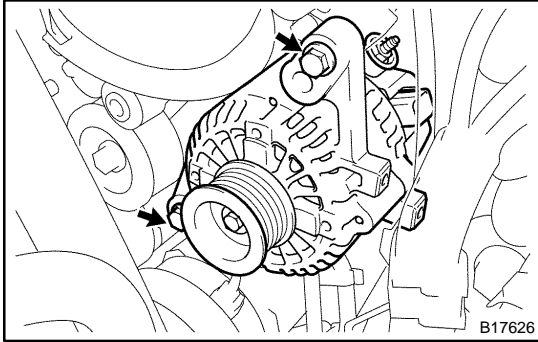
- (e) Tighten the pulley nut by turning SST (A) in the direction shown in the illustration.

Torque: 111 N·m (1,125 kgf·cm, 81 ft·lbf)

- (f) Remove the generator from SST (C).



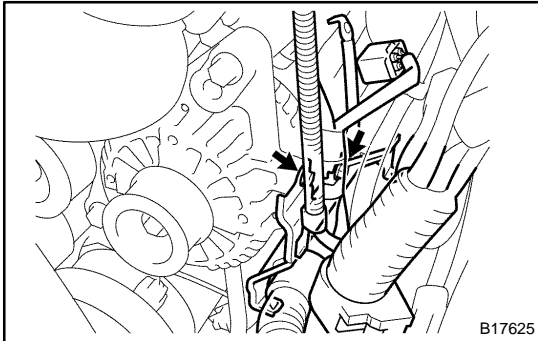
- (g) Turn SST (B), and remove SST (A), (B).
- (h) Turn the pulley, and check that the pulley moves smoothly.



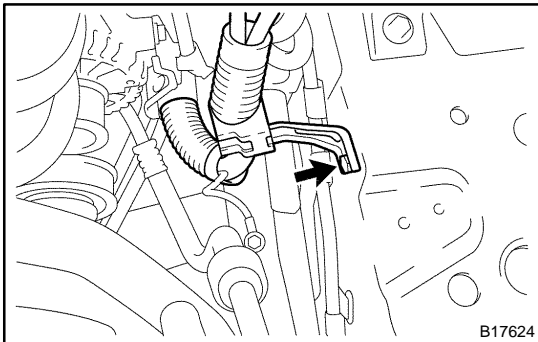
INSTALLATION

1. INSTALL GENERATOR

- (a) Install the generator with the 2 bolts.
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)



- (b) Install the wire harness clamp bracket with the 2 bolts.
Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)



- (c) Connect the wire harness.
 (1) Connect the wire harness to the terminal B and install the nut.
Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)
 (2) Connect the connector to the generator assy.
 (3) Install the wire harness stay with the bolt.

Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)

2. INSTALL BATTERY

3. INSTALL FAN AND GENERATOR V BELT

(See page [EM-89](#))

4. INSTALL ENGINE UNDER COVER SUB-ASSY NO.1

Install the engine under cover sub-assy No. 1 with the 4 bolts.

Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)

5. INSTALL V-BANK COVER

Install the V-bank cover with the 2 nuts.

Torque: 9.8 N·m (100 kgf·cm, 87 in·lbf)

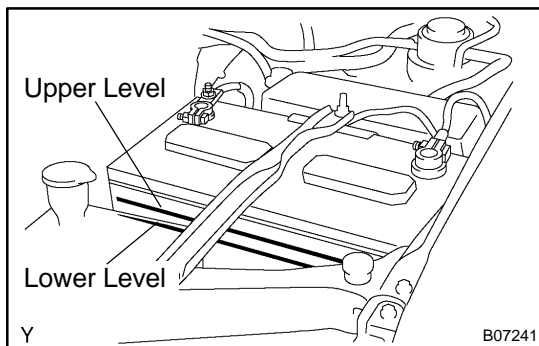
CHARGING SYSTEM

ON-VEHICLE INSPECTION

CH0J6-03

CAUTION:

- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Do not perform tests with a high voltage insulation resistance tester.
- Never disconnect the battery while the engine is running.



1. CHECK BATTERY ELECTROLYTE LEVEL

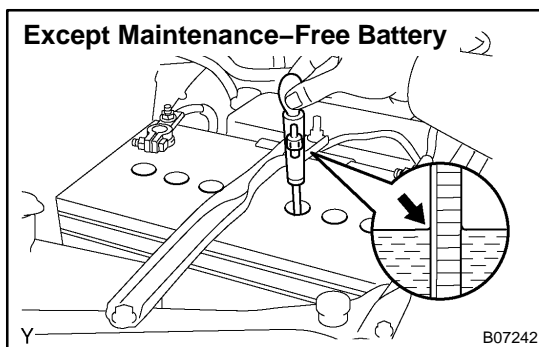
Check the electrolyte quantity of each cell.

Maintenance-Free Battery:

If under the lower level, replace the battery (or add distilled water if possible) and check the charging system.

Except Maintenance-Free Battery:

If under the lower level, add distilled water.



2. Except Maintenance-Free Battery: CHECK BATTERY SPECIFIC GRAVITY

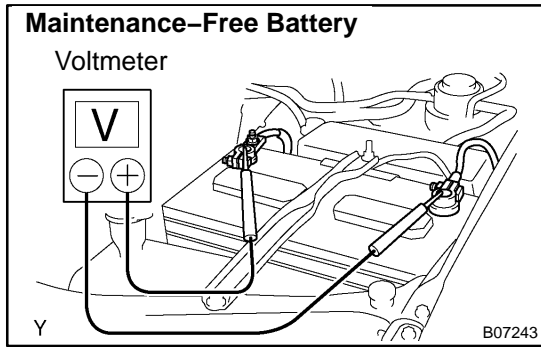
Check the specific gravity of each cell.

Standard specific gravity: 1.25 to 1.29 at 20°C (68°F)

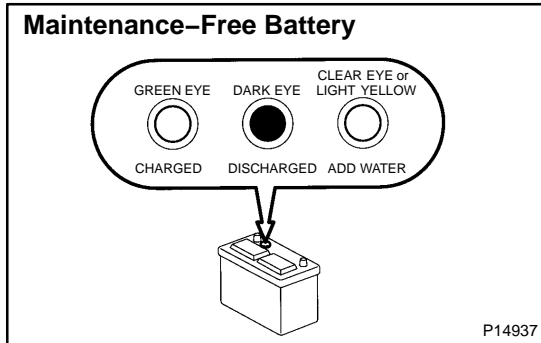
If the specific gravity is less than specification, charge the battery.

3. Maintenance-Free Battery: CHECK BATTERY VOLTAGE

- After having driven the vehicle and in the case that 20 minutes have not passed after having stopped the engine, turn the ignition switch ON and turn on the electrical system (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
- Turn the ignition switch OFF and turn off the electrical systems.



- (c) Measure the battery voltage between the negative (-) and positive (+) terminals of the battery.
Standard voltage: 12.5 to 12.9 V at 20°C (68°F)
 If the voltage is less than specification, charge the battery.



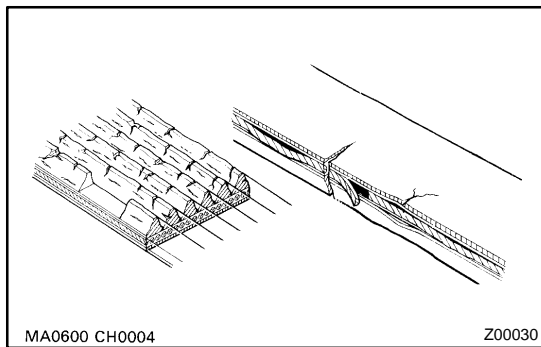
HINT:
 Check the indicator as shown in the illustration.

4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

- (a) Check that the battery terminals are not loose or corroded.
 (b) Check the fusible link and fuses for continuity.

5. INSPECT DRIVE BELT

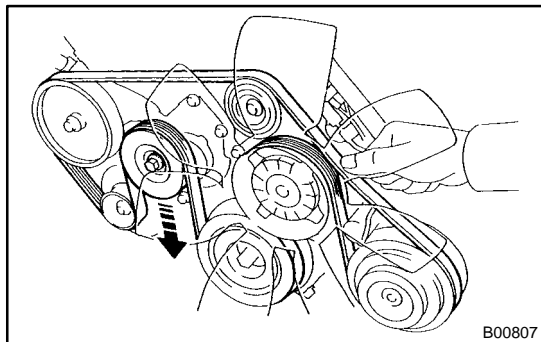
HINT:
 A belt tensioner is used, so checking the belt tension is not necessary.



- (a) Visually check the drive belt for excessive wear, frayed cords etc.
 If necessary, replace the drive belt.

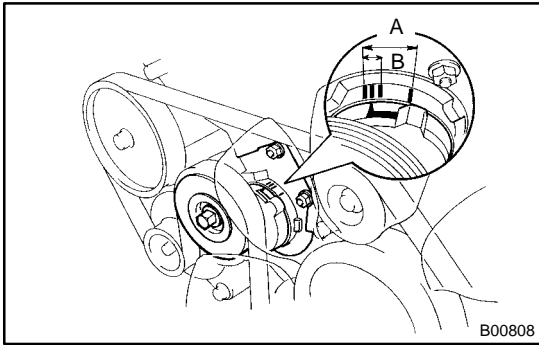
HINT:

- Cracks on the rib side of a drive belt are considered acceptable. If the drive belt has chunks missing from the ribs, it should be replaced.
- The drive belt tension can be released by turning the belt tensioner counterclockwise. The pulley bolt for the belt tensioner has a left-hand thread.



- (b) Check the belt tensioner operation.
- Check that the belt tensioner moves downward when the drive belt is pressed down at the points indicated in the illustration with approx. 98 N (10 kgf, 22.0 lbf) of force.
 - Check the alignment of the belt tensioner pulley to make sure the drive belt has not slipped off the pulley.

If necessary, replace the belt tensioner.

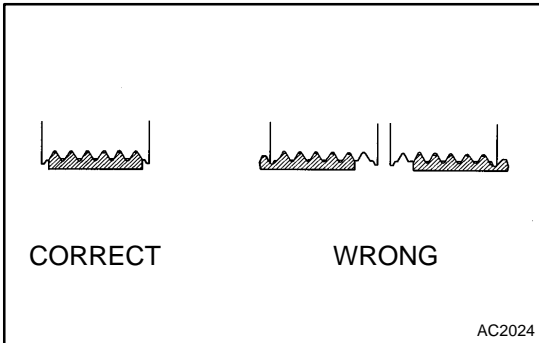


- Check that the arrow mark on the belt tensioner falls within area A of the scale.

If it is outside area A, replace the drive belt.

HINT:

- When a new belt is installed, it should lie within area B. If not, the drive belt is not correct.



- After installing a belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.

6. REMOVE ENGINE UNDER COVER

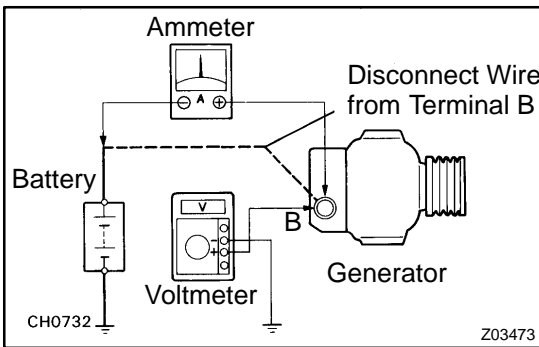
7. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

- Check that the wiring is in good condition.
- Check that there is no abnormal noise from the generator while the engine is running.

8. CHECK CHARGE WARNING LIGHT CIRCUIT

- Warm up the engine and then turn it off.
- Switch off all accessories.
- Turn the ignition switch ON, and check that the charge warning light is lit.
- Start the engine, and check that the light goes off.

If the light does not go off as specified, troubleshoot the charge light circuit.



9. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT:

If a battery/generator tester is available, connect the tester to the charging circuit as per manufacturer's instructions.

- If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:
 - Disconnect the wire from terminal B of the generator, and connect it to the negative (-) tester probe of the ammeter.
 - Connect the positive (+) tester probe of the ammeter to terminal B of the generator.
 - Connect the positive (+) tester probe of the voltmeter to terminal B of the generator.
 - Ground the negative (-) tester probe of the voltmeter.

- Check the charging circuit as follows: With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.2 - 14.8 V

If the voltmeter reading is more than standard voltage, replace the voltage regulator.

If the voltmeter reading is less than standard voltage, check the voltage regulator and generator.

10. INSPECT CHARGING CIRCUIT WITH LOAD

- (a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at HI.
- (b) Check the reading on the ammeter.

Standard amperage: 30 A or more

If the ammeter reading is less than the standard amperage, repair the generator.

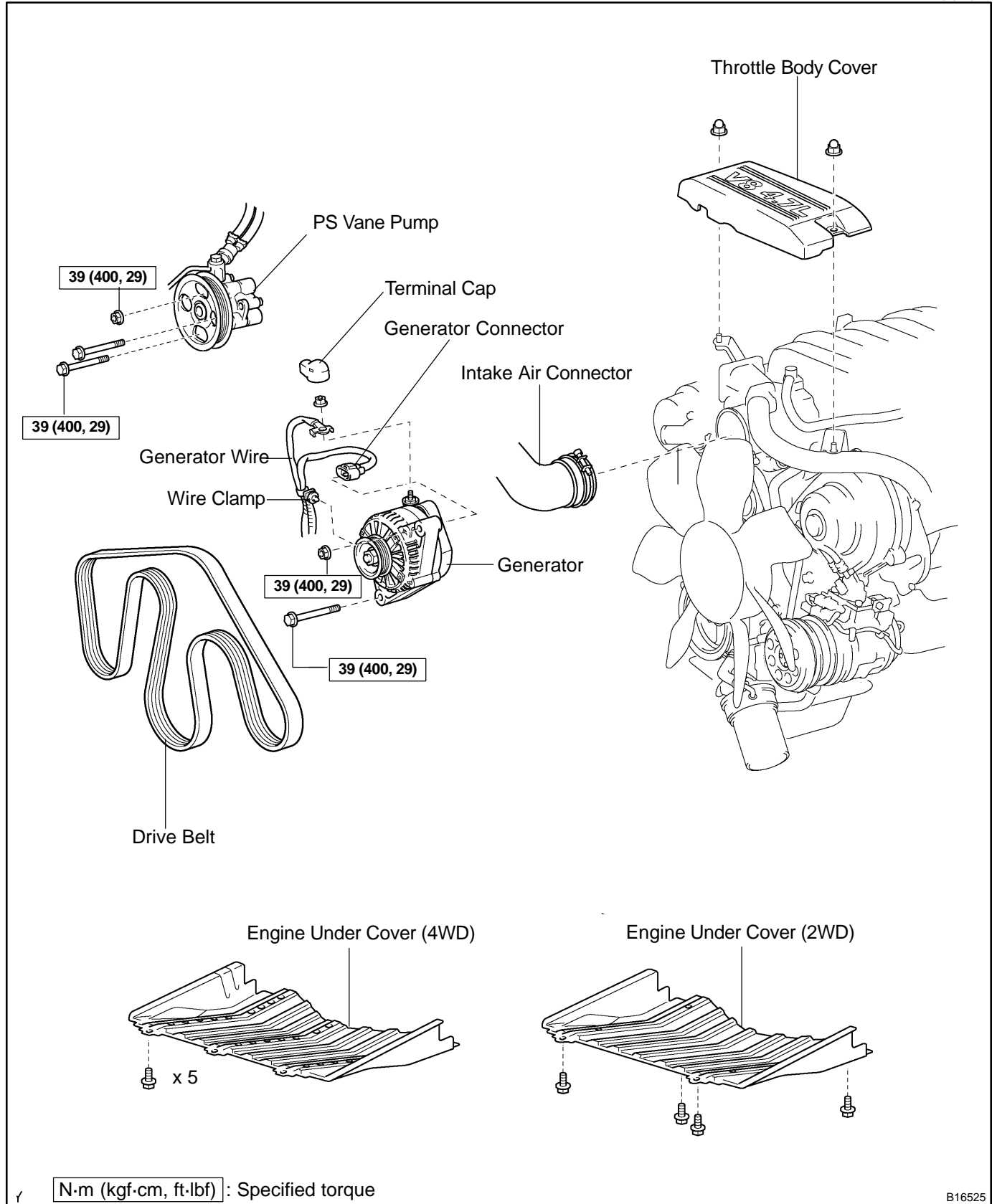
HINT:

If the battery is fully charged, the indication will sometimes be less than standard amperage.

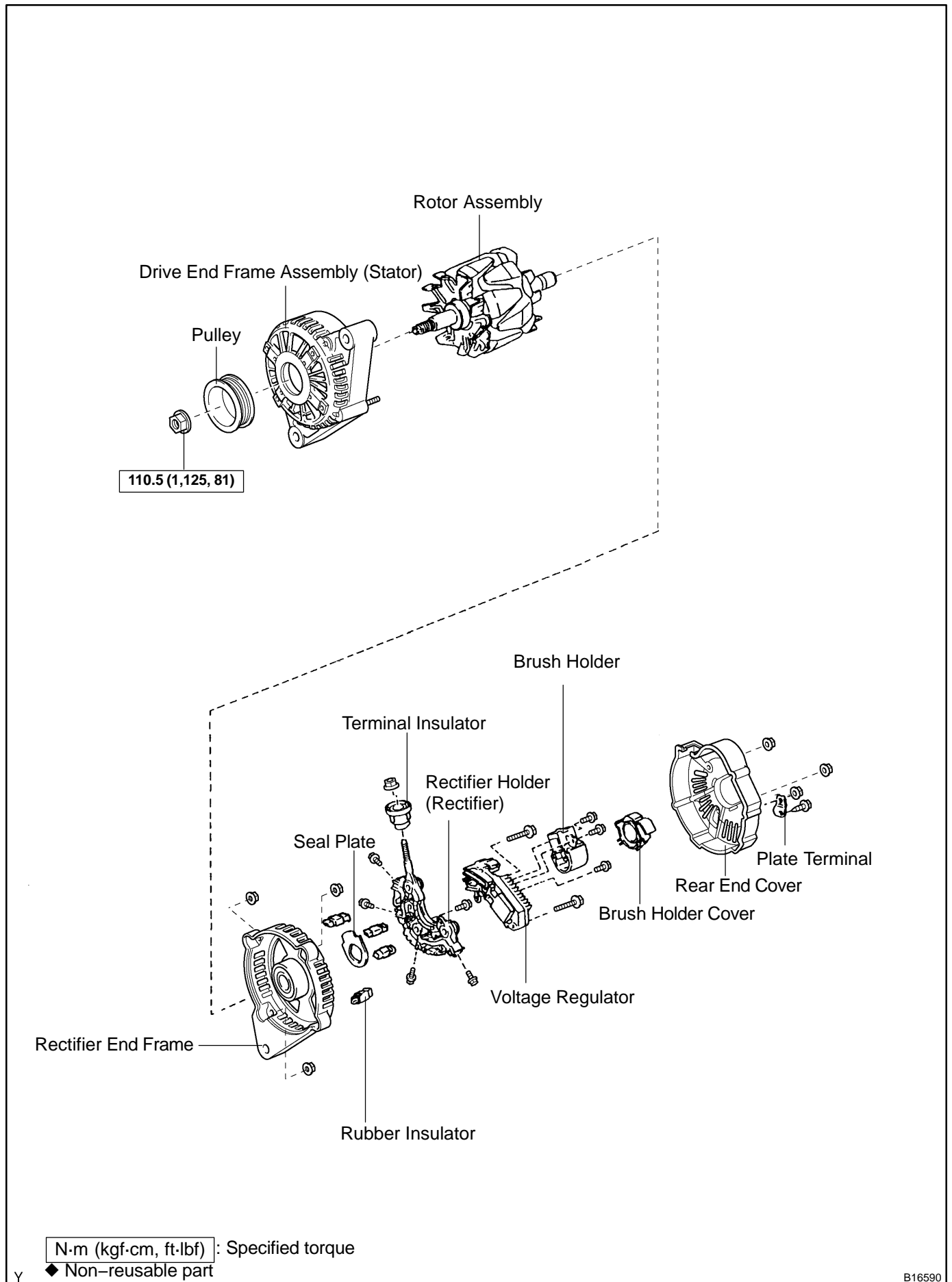
11. REINSTALL ENGINE UNDER COVER

GENERATOR (Standard Spec.) COMPONENTS

CH0LL-02

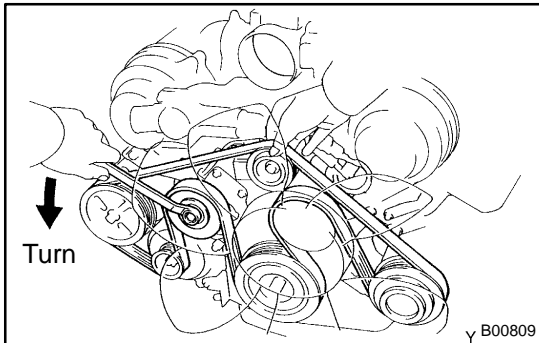


N·m (kgf·cm, ft·lbf) : Specified torque



REMOVAL

1. REMOVE ENGINE UNDER COVER
2. REMOVE THROTTLE BODY COVER
3. DISCONNECT CABLE FROM NEGATIVE (-) BATTERY TERMINAL
4. DISCONNECT INTAKE AIR CONNECTOR FROM THROTTLE BODY



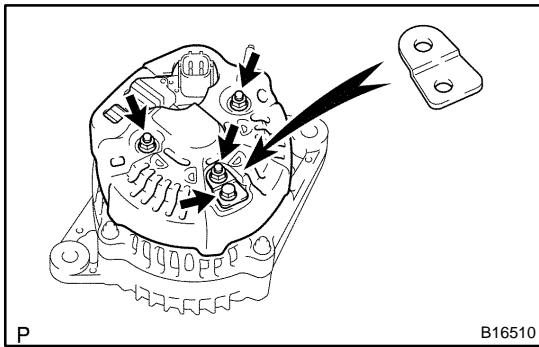
5. REMOVE GENERATOR DRIVE BELT

Loosen the belt tension by turning the belt tensioner counter-clockwise, and remove the drive belt.

HINT:

The pulley bolt for the belt tensioner has a left hand thread.

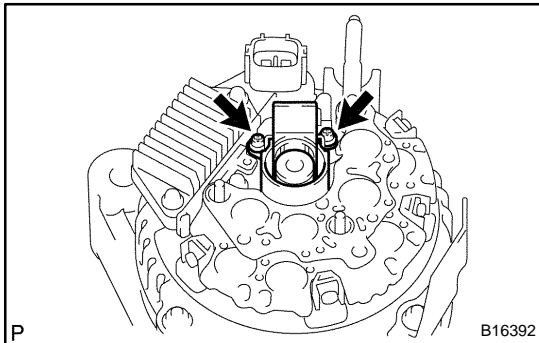
6. REMOVE PS VANE PUMP FROM ENGINE (See page [SR-61](#))
7. REMOVE GENERATOR
 - (a) Disconnect the generator connector.
 - (b) Remove the terminal cap and nut, and disconnect the generator wire.
 - (c) Disconnect the wire clamp from the cord clip on the generator.
 - (d) Remove the bolt, nut and generator.



DISASSEMBLY

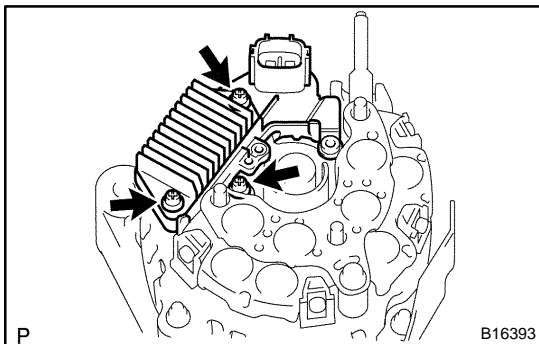
1. REMOVE REAR END COVER

- Remove the nut and terminal insulator.
- Remove the bolt 3 nuts, plate terminal and end cover.
- Remove the brush holder cover from the brush holder.



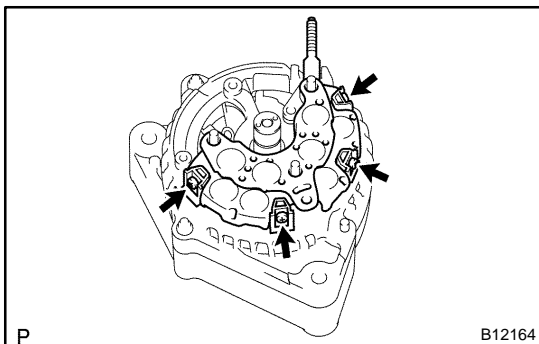
2. REMOVE BRUSH HOLDER

- Remove the 2 screws and brush holder.
- Remove the seal plate from the rectifier end frame.

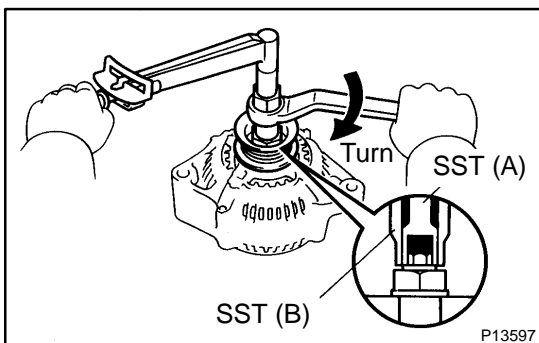


3. REMOVE VOLTAGE REGULATOR AND RECTIFIER HOLDER

- Remove the 3 screws and voltage regulator.



- Remove the 4 screws and rectifier holder.
- Remove the 4 rubber insulators.



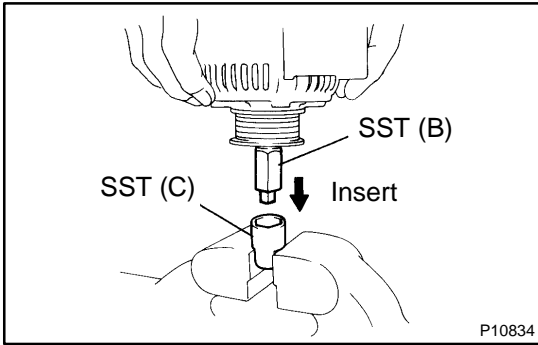
4. REMOVE PULLEY

- Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

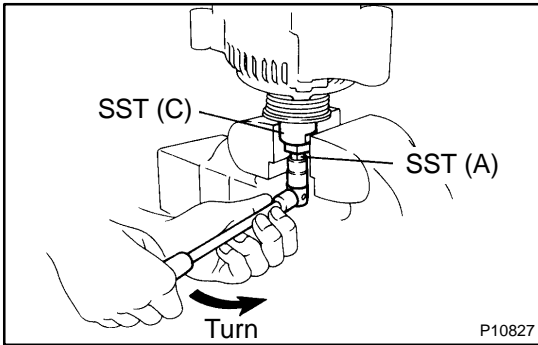
SST 09820-63011

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

- Check that SST (A) is secured to the rotor shaft.



- (c) Mount SST (C) in a vise.
- (d) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).

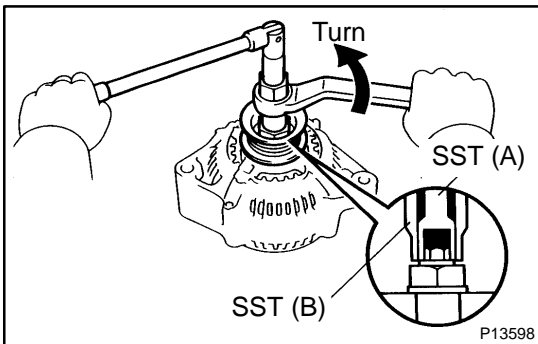


- (e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

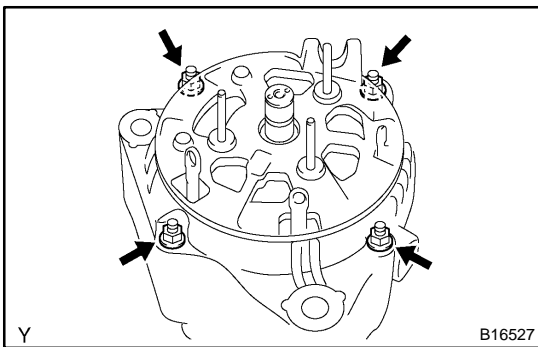
NOTICE:

To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

- (f) Remove the generator from SST (C).

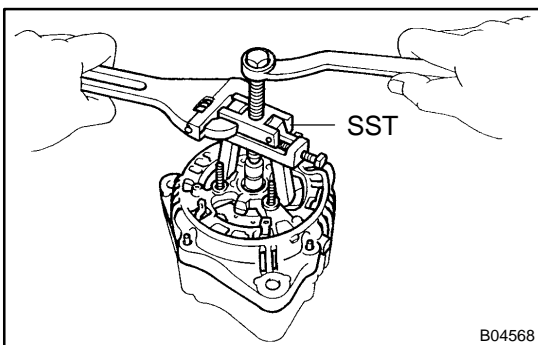


- (g) Turn SST (B), and remove SST (A and B).
- (h) Remove the pulley nut and pulley.



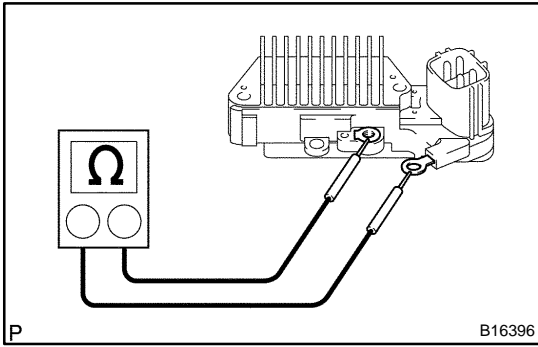
5. REMOVE RECTIFIER END FRAME

- (a) Remove the 4 nuts.



- (b) Using SST, remove the rectifier end frame.
SST 09286-46011
- (c) Remove the generator washer from the rectifier end frame.

6. REMOVE ROTOR FROM DRIVE END FRAME



INSPECTION

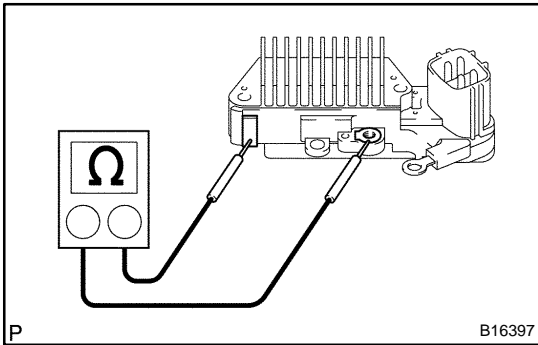
1. INSPECT VOLTAGE REGULATOR

- (a) Using an ohmmeter, check the continuity between terminals F and B.

Standard:

When the positive and negative poles between terminals F and B are exchanged, there is continuity in one way but no continuity in another way.

If the continuity is not as specified, replace the regulator.

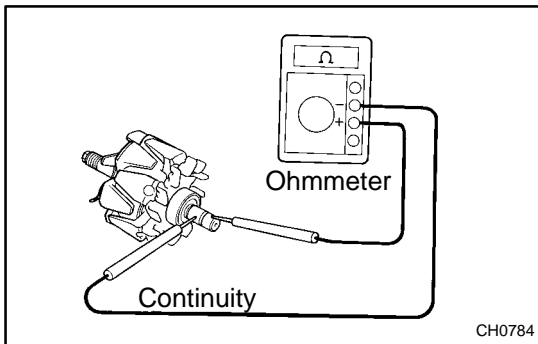


- (b) Using an ohmmeter, check the continuity between terminals F and E.

Standard:

When the positive and negative poles between terminals F and E are exchanged, there is continuity in one way but no continuity in another way.

If the continuity is not as specified, replace the regulator.



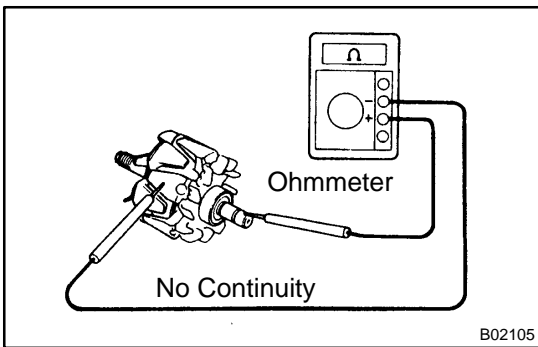
2. INSPECT ROTOR FOR OPEN CIRCUIT

- (a) Check the rotor for open circuit.

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance: 2.1 to 2.5 Ω at 20°C (68°F)

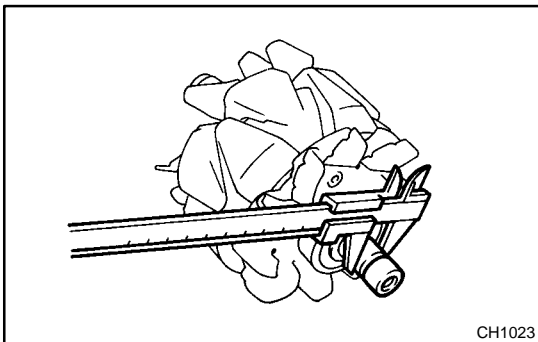
If there is no continuity, replace the rotor.



- (b) Check the rotor for ground.

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.



- (c) Check that the slip rings are not rough or scored.

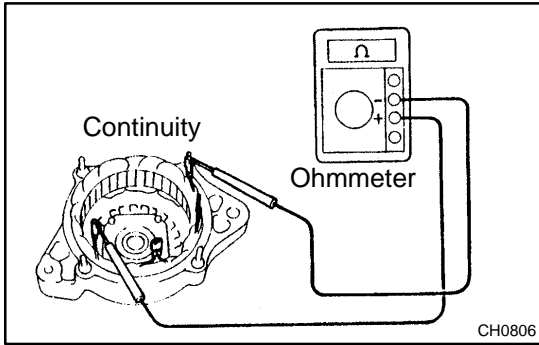
If rough or scored, replace the rotor.

- (d) Using vernier calipers, measure the slip ring diameters.

Standard diameter: 14.2 to 14.4 mm (0.559 to 0.567 in.)

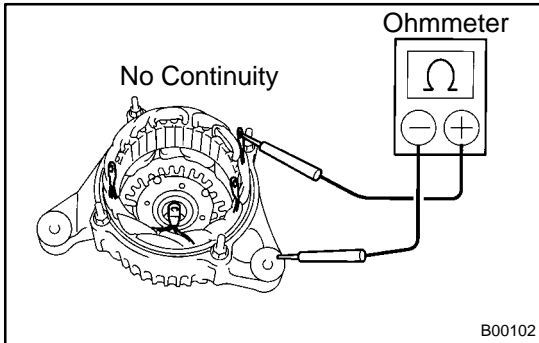
Minimum diameter: 12.8 mm (0.504 in.)

If the diameter is less than minimum, replace the rotor.

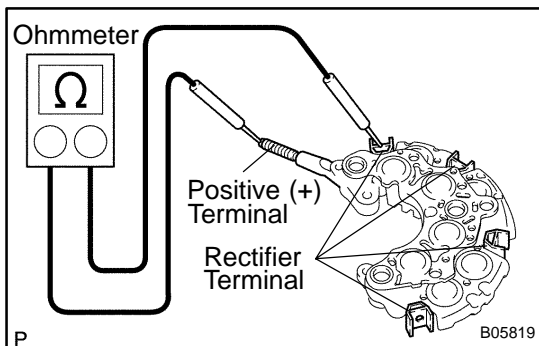


3. INSPECT STATOR FOR OPEN CIRCUIT

- (a) Check the stator for open circuit.
Using an ohmmeter, check that there is continuity between the coil leads.
If there is no continuity, replace the drive end frame assembly.



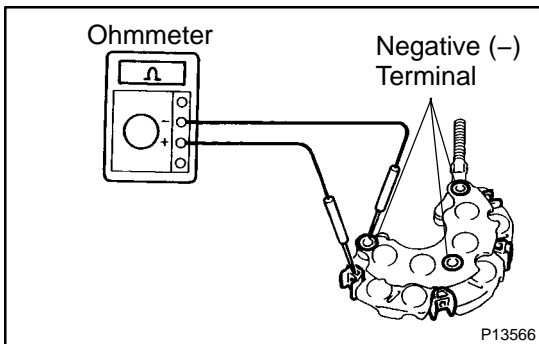
- (b) Check the stator for ground.
Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.
If there is continuity, replace the drive end frame assembly.



4. INSPECT POSITIVE RECTIFIER

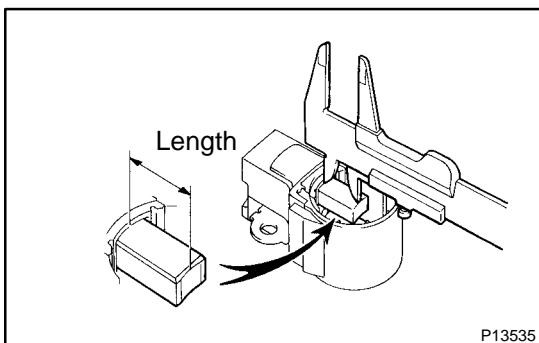
- (a) Check the positive (+) rectifier.
- (1) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.
 - (2) Reverse the polarity of the tester probes and repeat step (a).
 - (3) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.



- (b) Check the negative (-) rectifier.
- (1) Using an ohmmeter, connect one tester probe to each negative (-) terminal and the other to each rectifier terminal.
 - (2) Reverse the polarity of the tester probes and repeat step (a).
 - (3) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.



5. INSPECT EXPOSED BRUSH LENGTH

Using vernier calipers, measure the exposed brush length.

Standard exposed length:

9.5 to 11.5 mm (0.374 to 0.453 in.)

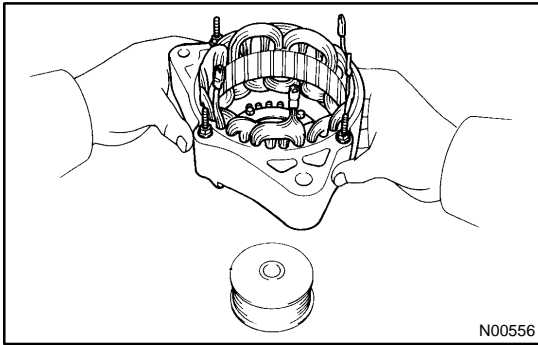
Minimum exposed length: 1.5 mm (0.059 in.)

If the exposed length is less than minimum, replace the brush holder assembly.

6. INSPECT BEARING

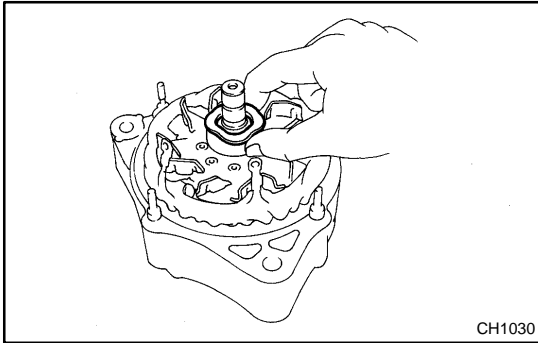
Check that the bearing is not rough or worn.

If necessary, replace the drive end frame assembly (front bearing) or rotor assembly (rear bearing).

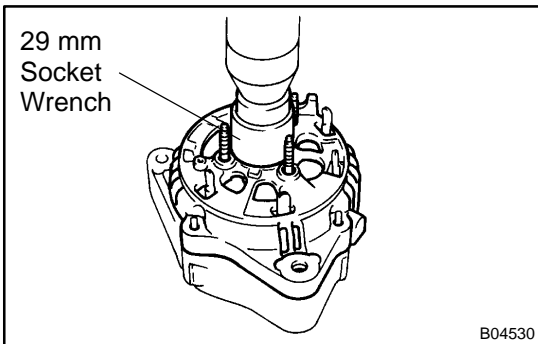


REASSEMBLY

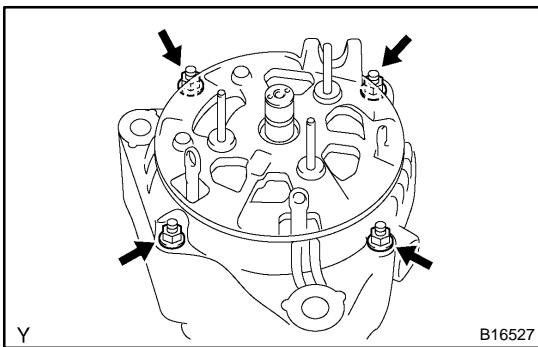
1. PLACE RECTIFIER END FRAME ON PULLEY
2. INSTALL ROTOR TO DRIVE END FRAME



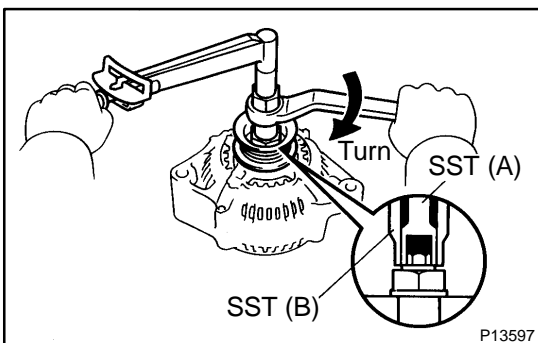
3. INSTALL RECTIFIER END FRAME
 - (a) Place the generator washer on the rotor.



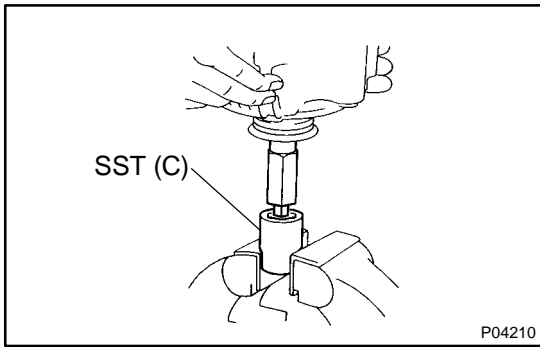
- (b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.



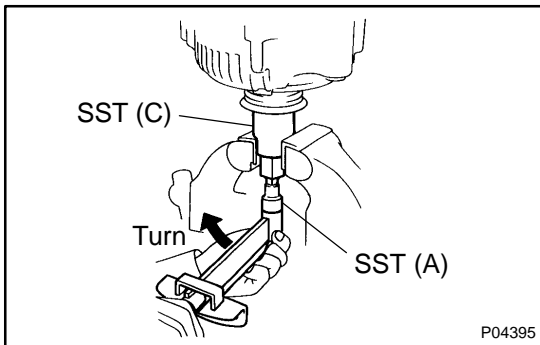
- (c) Install the 4 nuts.
Torque: 4.5 N·m (46 kgf·cm, 39 in.-lbf)



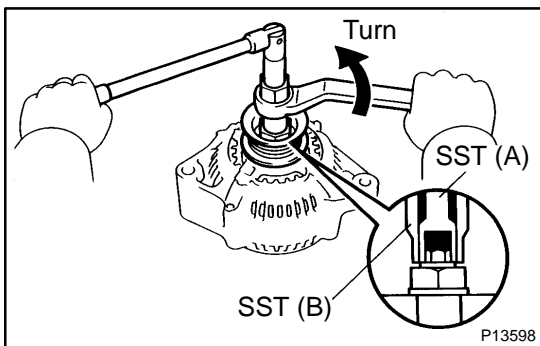
4. INSTALL PULLEY
 - (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
 - (b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820-63011
Torque: 39 N·m (400 kgf·cm, 29 ft-lbf)
 - (c) Check that SST (A) is secured to the pulley shaft.



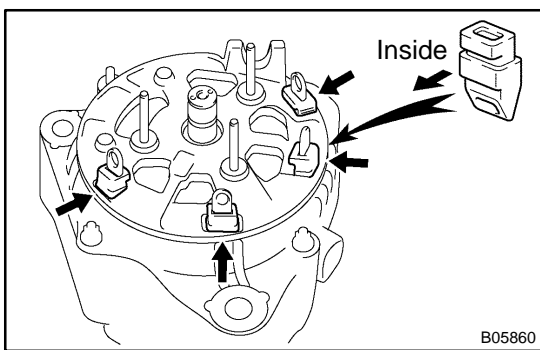
- (d) Mount SST (C) in a vise.
- (e) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



- (f) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.
Torque: 110.5 N·m (1,125 kgf·cm, 81 ft·lbf)
- (g) Remove the generator from SST (C).



- (h) Turn SST (B), and remove SST (A and B).

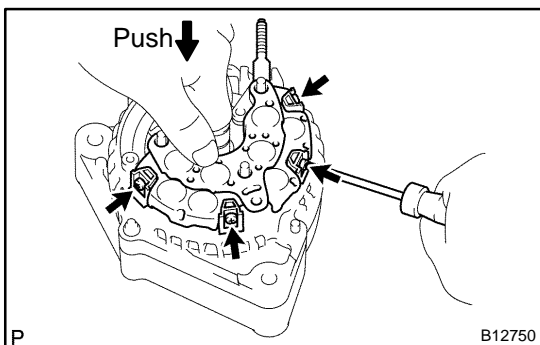


5. INSTALL RECTIFIER HOLDER

- (a) Install the 4 rubber insulators on the lead wires.

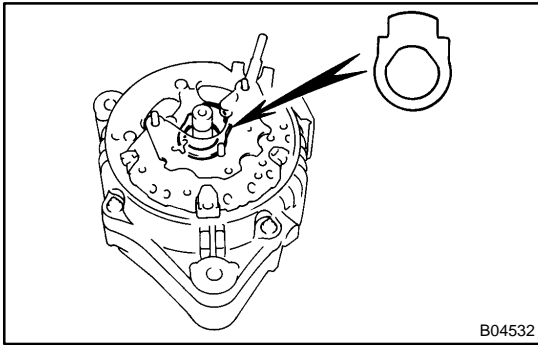
NOTICE:

Be careful of the rubber insulators installation direction.



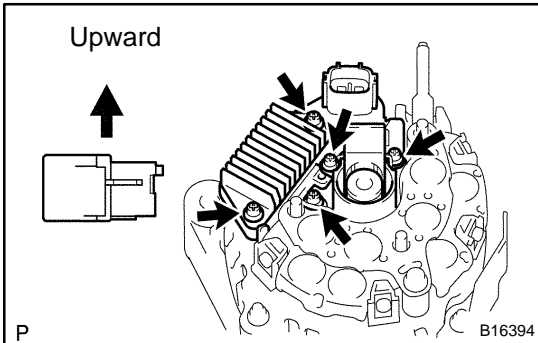
- (b) Install the rectifier while pushing it with the 4 screws.

Torque: 1.96 N·m (20 kgf·cm, 17 in.-lbf)



6. INSTALL BRUSH HOLDER AND VOLTAGE REGULATOR

- (a) Place the seal plate on the rectifier end frame.



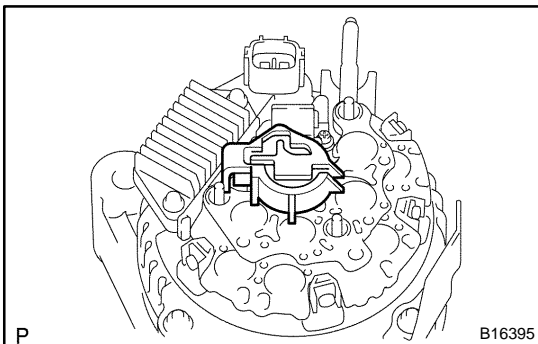
- (b) Place the voltage regulator and brush holder on the rectifier end frame.

NOTICE:

Be careful of the brush holder installation direction.

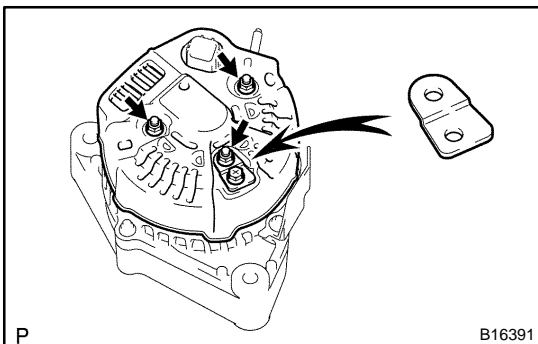
- (c) Install the 5 screws.

Torque: 1.96 N·m (20 kgf·cm, 17 in.-lbf)



7. INSTALL REAR END COVER

- (a) Place the brush holder cover on the brush holder.

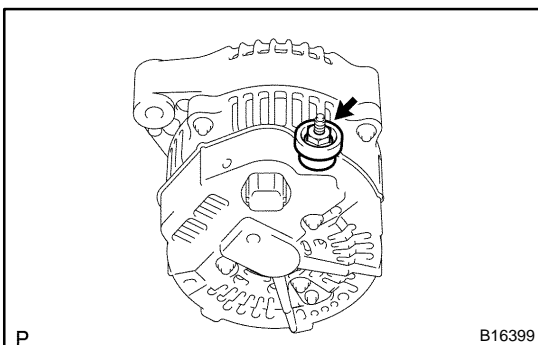


- (b) Install the end cover and plate terminal with the bolt and 3 nuts.

Torque:

Bolt: 3.85 N·m (39 kgf·cm, 34 in.-lbf)

Nut: 4.4 N·m (46 kgf·cm, 39 in.-lbf)



- (c) Install the terminal insulator with the nut.

Torque: 4.1 N·m (41.5 kgf·cm, 36 in.-lbf)

8. CHECK THAT ROTOR ROTATES SMOOTHLY

INSTALLATION

1. INSTALL GENERATOR

- (a) Install the generator with the bolt and nut.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

- (b) Connect the generator connector.
(c) Connect the generator wire with the nut and rubber.
(d) Install the terminal cap.
(e) Install the wire clamp to the cord clip on the generator.

2. INSTALL PS VANE PUMP (See page [SR-69](#))

3. INSTALL DRIVE BELT

Install the belt by turning the belt tensioner counterclockwise.

HINT:

The pulley bolt for the belt tensioner has a left-hand thread.

4. CONNECT INTAKE AIR CONNECTOR TO THROTTLE BODY

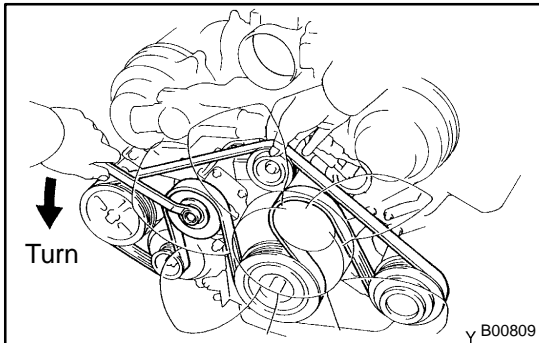
5. PERFORM ON-VEHICLE INSPECTION

(See page [CH-1](#))

6. INSTALL THROTTLE BODY COVER

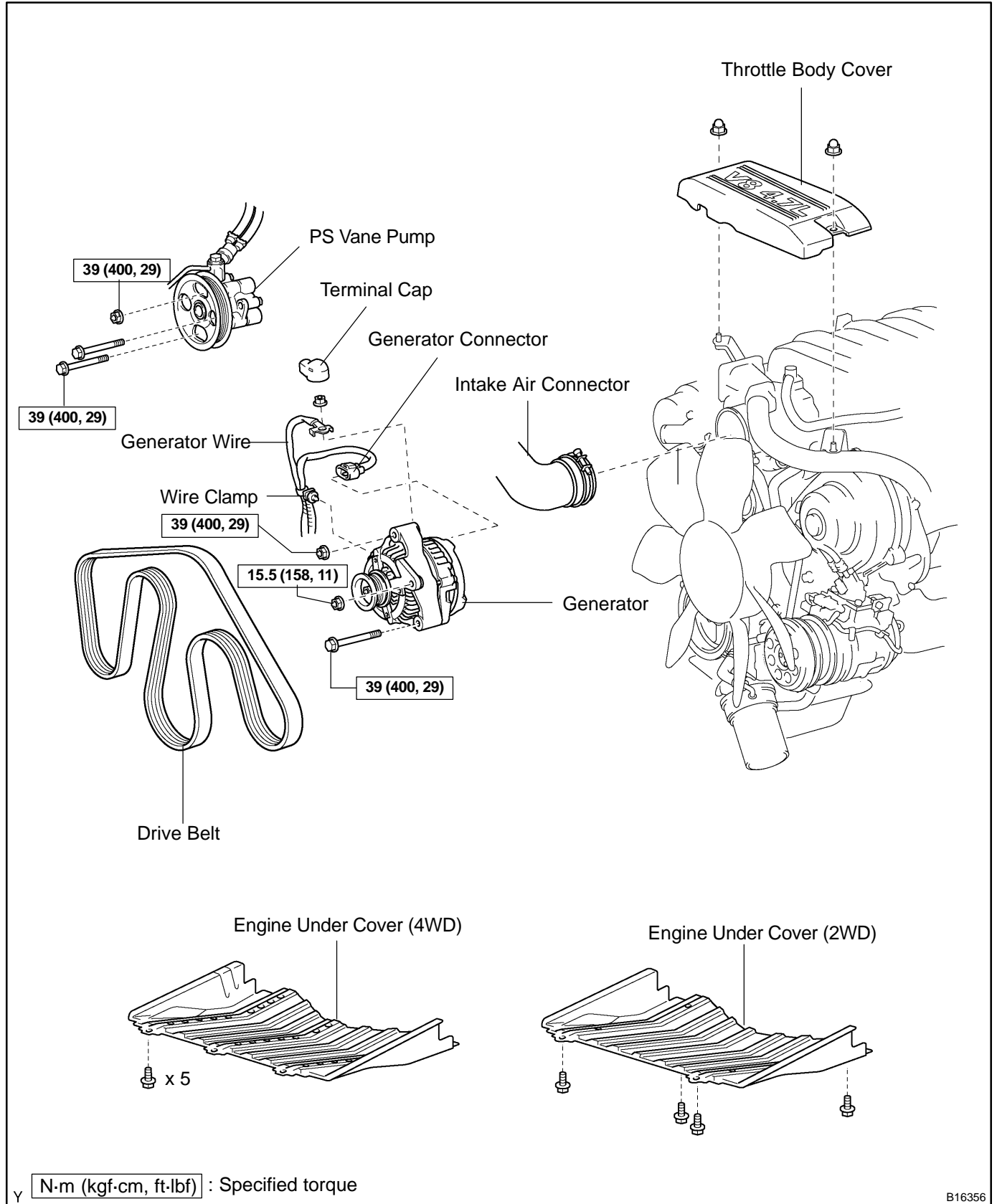
7. INSTALL ENGINE UNDER COVER

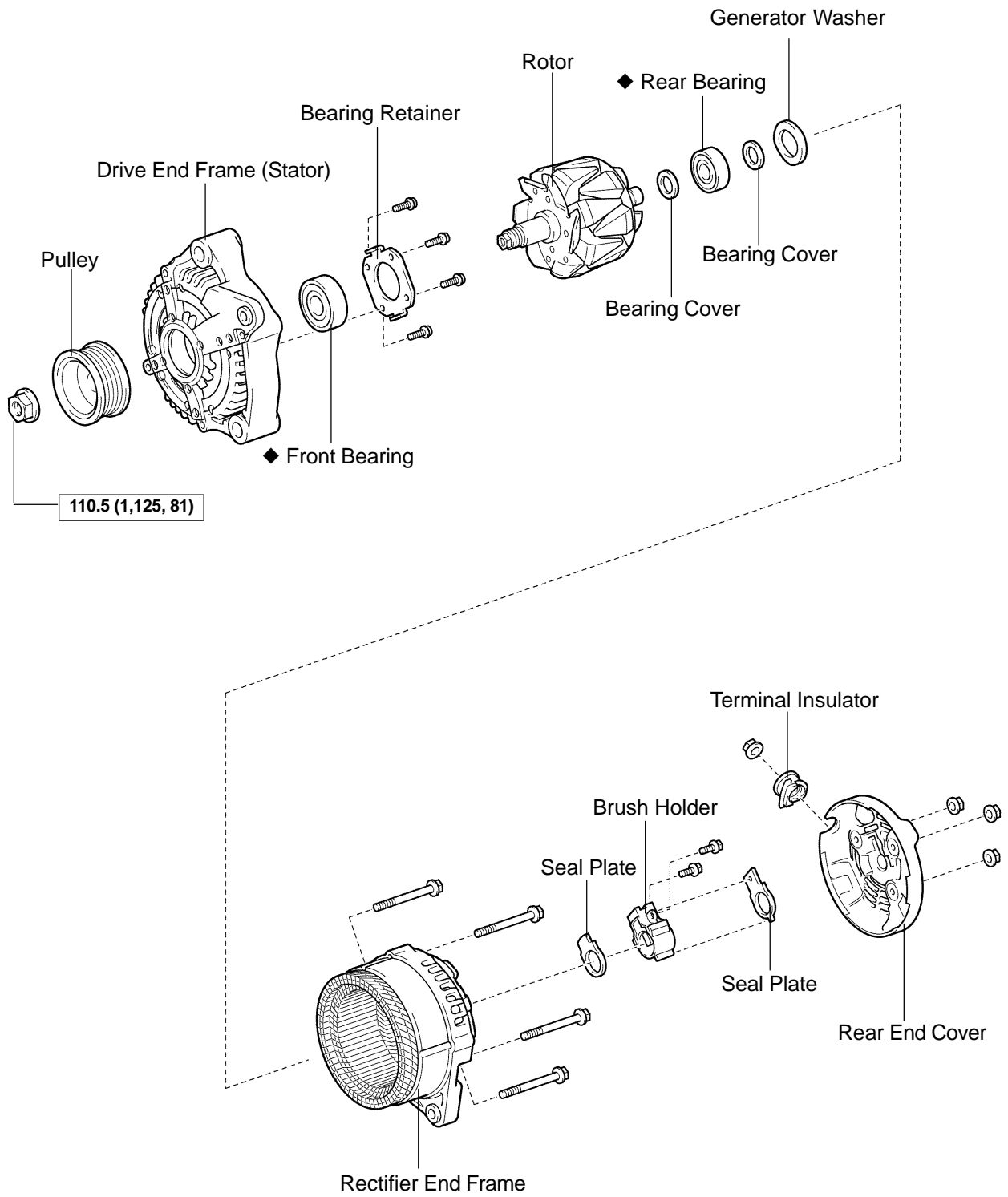
8. CONNECT CABLE TO NEGATIVE (-) BATTERY TERMINAL



GENERATOR (Towing Package Spec.) COMPONENTS

CH0LR-02



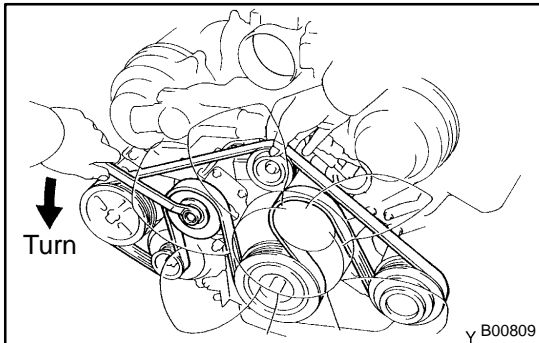


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

REMOVAL

1. REMOVE ENGINE UNDER COVER
2. REMOVE THROTTLE BODY COVER
3. DISCONNECT CABLE FROM NEGATIVE (-) BATTERY TERMINAL
4. DISCONNECT INTAKE AIR CONNECTOR FROM THROTTLE BODY



5. REMOVE GENERATOR DRIVE BELT

Loosen the belt tension by turning the belt tensioner counter-clockwise, and remove the drive belt.

HINT:

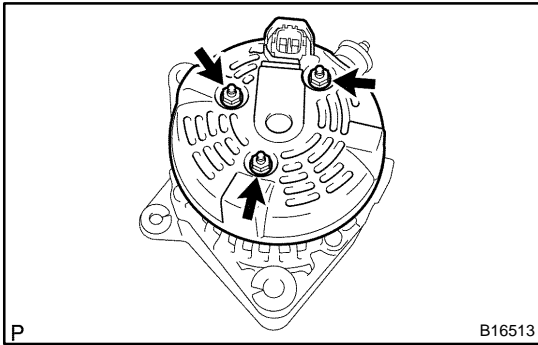
The pulley bolt for the belt tensioner has a left-hand thread.

6. REMOVE PS VANE PUMP FROM ENGINE

(See page [SR-61](#))

7. REMOVE GENERATOR

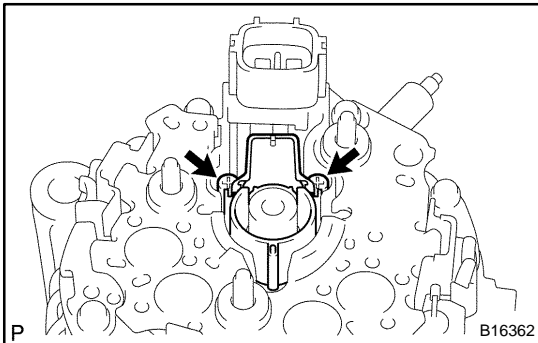
- (a) Disconnect the generator connector.
- (b) Remove the terminal cap and nut, and disconnect the generator wire.
- (c) Disconnect the wire clamp from the cord clip on the generator.
- (d) Remove the bolt, 2 nuts and generator.



DISASSEMBLY

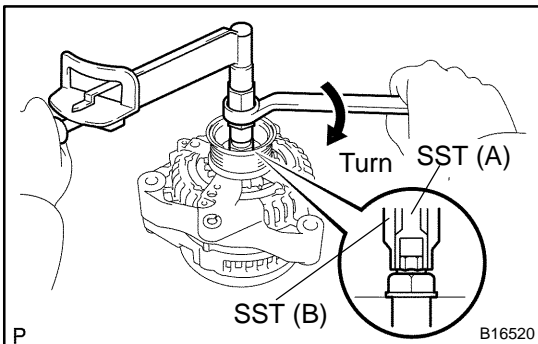
1. REMOVE REAR END COVER

- (a) Remove the 3 nuts and end cover.
- (b) Remove the terminal insulator.



2. REMOVE BRUSH HOLDER

- (a) Remove the rear seal plate from the brush holder.
- (b) Remove the 2 screws and brush holder.
- (c) Remove the front seal plate from the coil assembly.



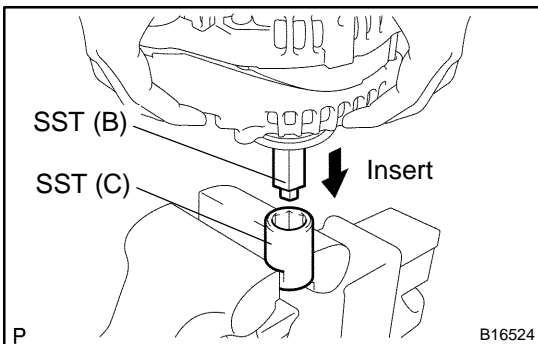
3. REMOVE PULLEY

- (a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820-63011

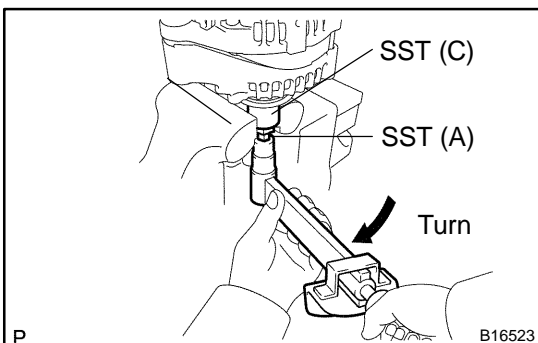
Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)

- (b) Check that SST (A) is secured to the rotor shaft.



- (c) Mount SST (C) in a vise.

- (d) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).

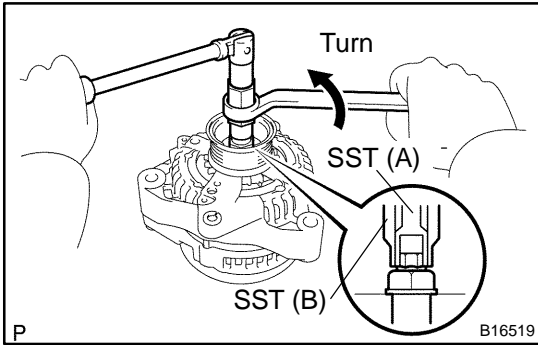


- (e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

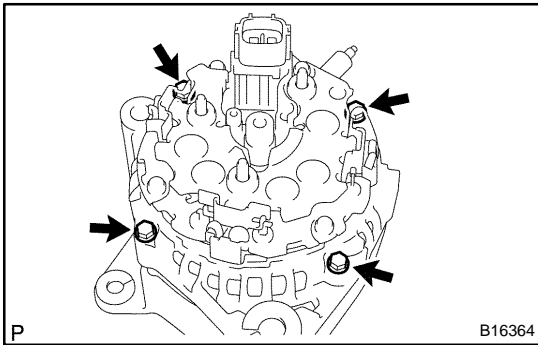
NOTICE:

To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

- (f) Remove the generator from SST (C).

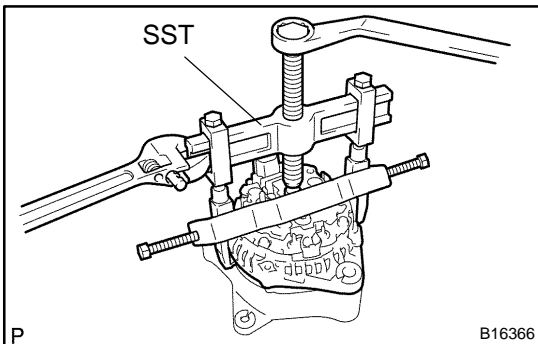


- (g) Turn SST (B), and remove SST (A and B).
- (h) Remove the pulley nut and pulley.



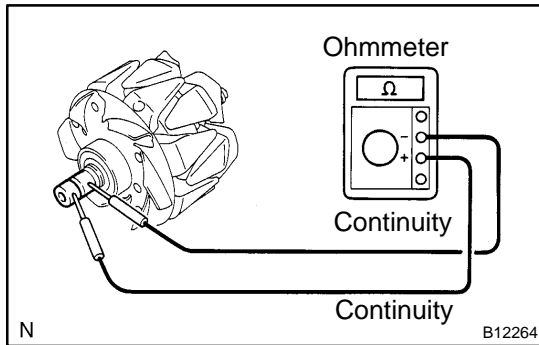
4. REMOVE COIL ASSEMBLY

- (a) Remove the 4 bolts.



- (b) Using SST, remove the coil assembly.
 SST 09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04071, 09957-04010, 09958-04011)
- (c) Remove the generator washer.

5. REMOVE ROTOR FROM DRIVE END FRAME



INSPECTION

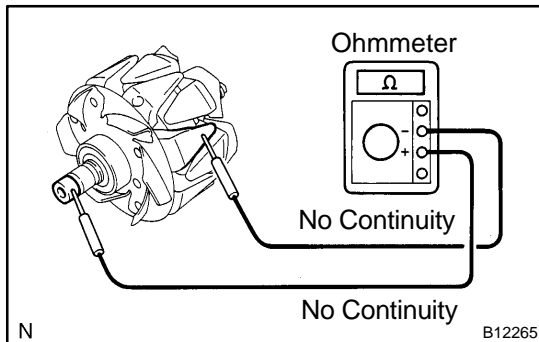
1. INSPECT ROTOR

- (a) Check the rotor for open circuit.

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance: 2.3 to 2.7 Ω at 20°C (68°F)

If there is no continuity, replace the rotor.



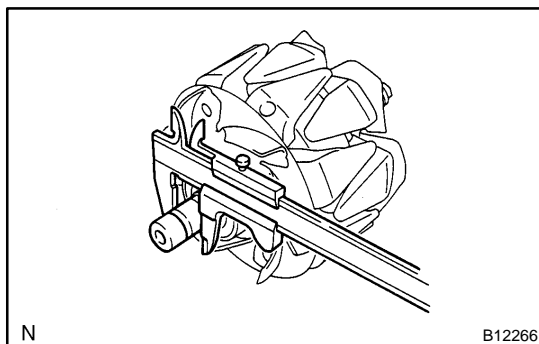
- (b) Check the rotor for ground.

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.

- (c) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

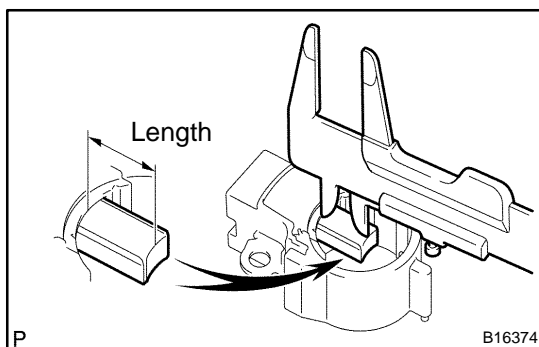


- (d) Using vernier calipers, measure the slip ring diameter.

Standard diameter: 14.2 to 14.4 mm (0.559 to 0.567 in.)

Minimum diameter: 14.0 mm (0.551 in.)

If the diameter is less than minimum, replace the rotor.



2. INSPECT BRUSHES

Using vernier caliper, measure the exposed brush length.

Standard exposed length: 10.5 mm (0.413 in.)

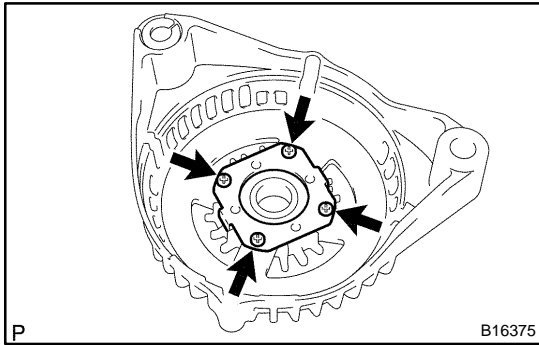
Minimum exposed length: 4.5 mm (0.177 in.)

If the exposed length is less than minimum, replace the brushes and brush holder assembly.

3. INSPECT BEARING

Check the bearing is not rough or worn.

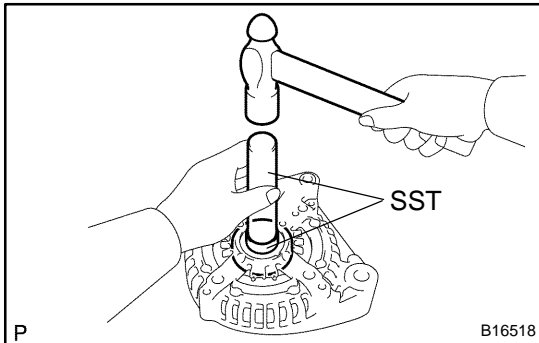
If necessary, replace the bearing (See page [CH-23](#)).



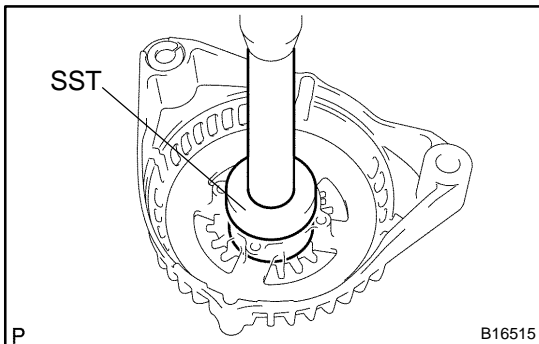
REPLACEMENT

1. REPLACE FRONT BEARING

- (a) Remove the 4 screws, bearing retainer and bearing.

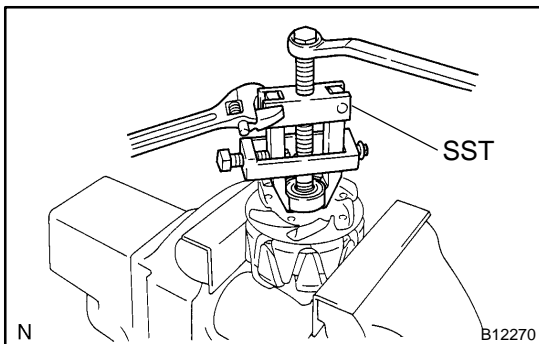


- (b) Using SST and a hammer, tap out the bearing.
SST 09950-60010 (09951-00250), 09950-70010 (09951-07100)



- (c) Using SST and a press, press in a new bearing.
SST 09950-60010 (09951-00470), 09950-70010 (09951-07100)

- (d) Install the bearing retainer with the 4 screws.
Torque: 2.6 N·m (27 kgf·cm, 23 in.-lbf)



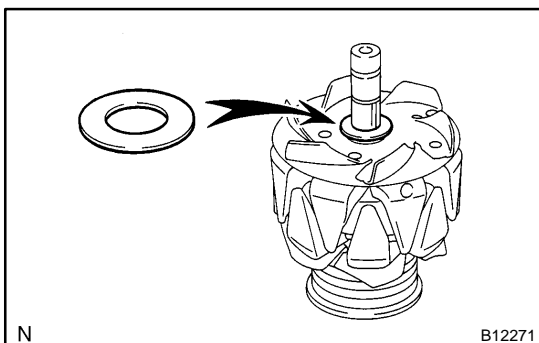
2. REPLACE REAR BEARING

- (a) Using SST, remove the bearing cover (outside) and bearing.
SST 09820-00021

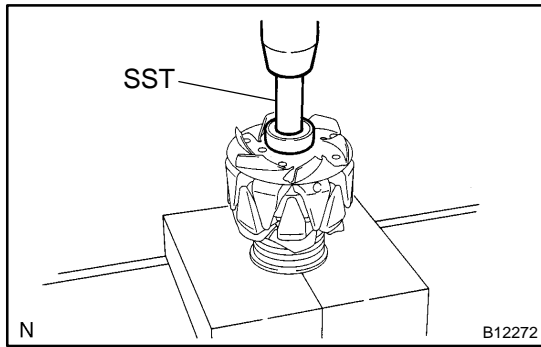
NOTICE:

Be careful not to damage the fan.

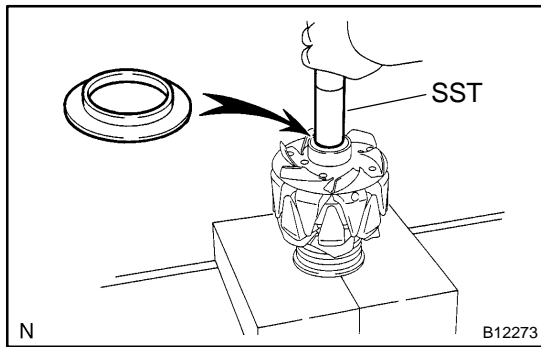
- (b) Remove the bearing cover (inside).



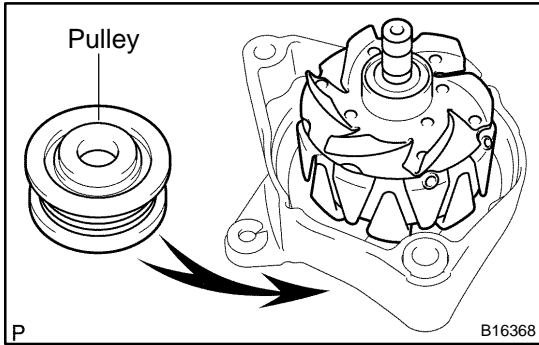
- (c) Place the bearing cover (inside) on the rotor.



- (d) Using SST and a press, press in a new bearing.
SST 09820-00031



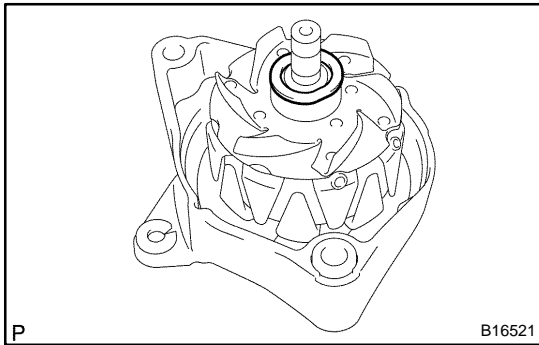
- (e) Using SST, push in the bearing cover (outside).
SST 09285-76010



REASSEMBLY

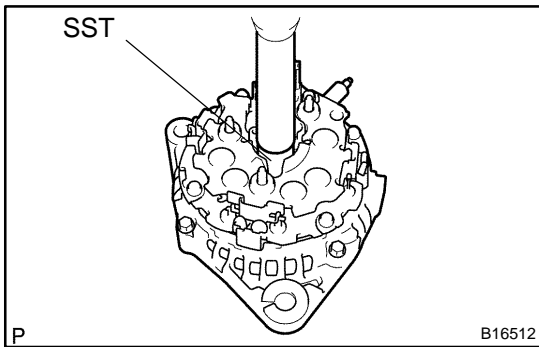
1. INSTALL ROTOR TO DRIVE END FRAME

- (a) Place the drive end frame on the pulley.
- (b) Install the rotor to the drive end frame.

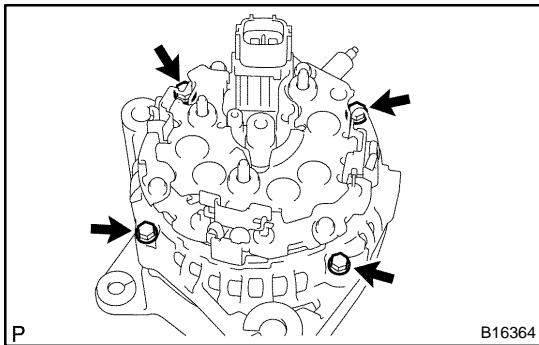


2. INSTALL COIL ASSEMBLY

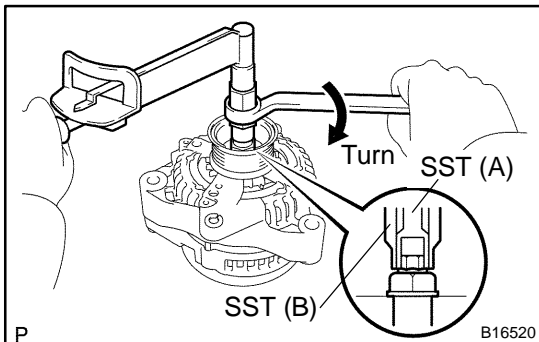
- (a) Place the generator washer on the rotor.



- (b) Using SST and a press, slowly press in the coil assembly.
SST 09285-76010

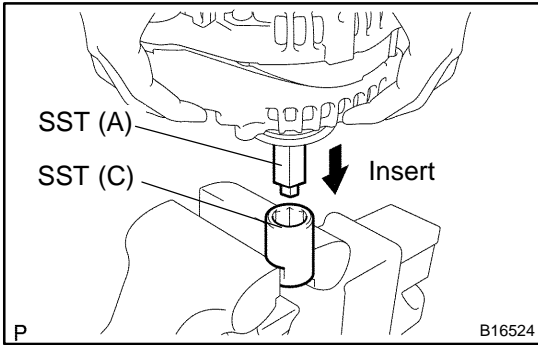


- (c) Install the coil assembly with the 4 bolts.
Torque: 5.8 N·m (59 kgf·cm, 51 in.-lbf)

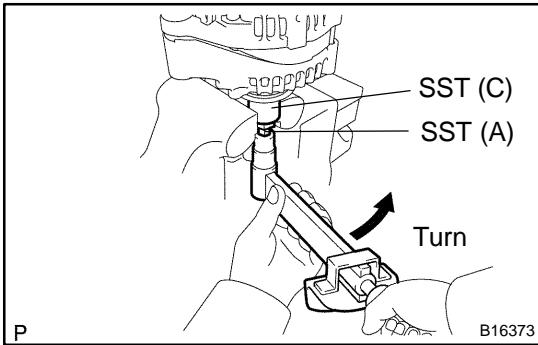


3. INSTALL PULLEY

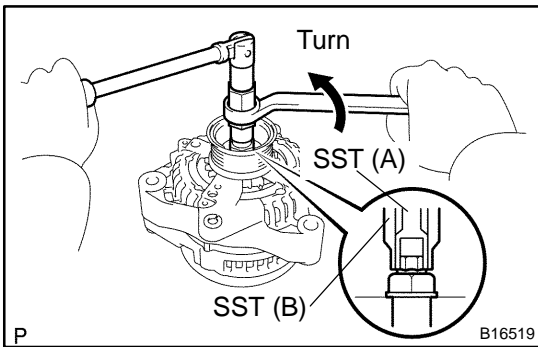
- (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
- (b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820-63011
Torque: 39 N·m (400 kgf·cm, 29 ft-lbf)
- (c) Check that SST (A) is secured to the pulley shaft.



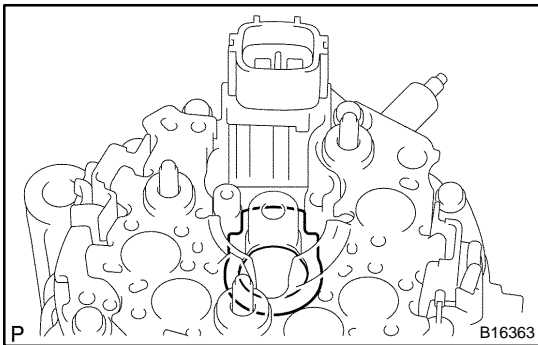
- (d) Mount SST (C) in a vise.
- (e) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



- (f) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.
Torque: 110.5 N·m (1,125 kgf·cm, 81 ft·lbf)
- (g) Remove the generator from SST (C).

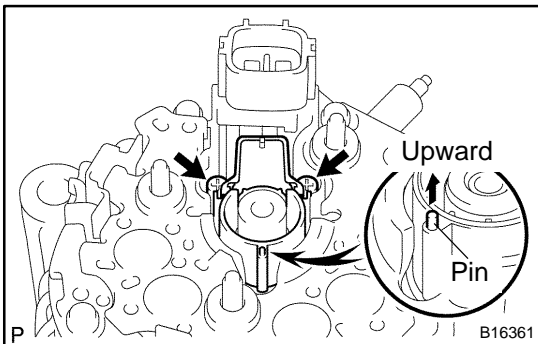


- (h) Turn SST (B), and remove SST (A and B).



4. INSTALL BRUSH HOLDER

- (a) Place the front seal plate on the coil assembly.

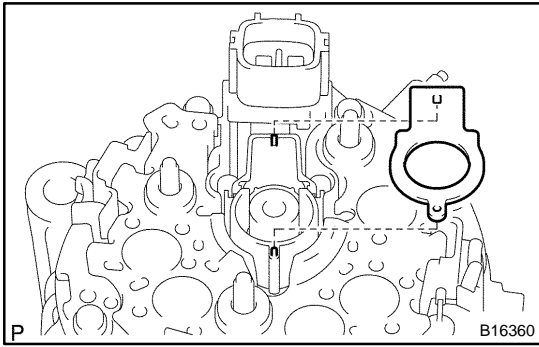


- (b) Place the brush holder on the coil assembly with the pin facing upward.

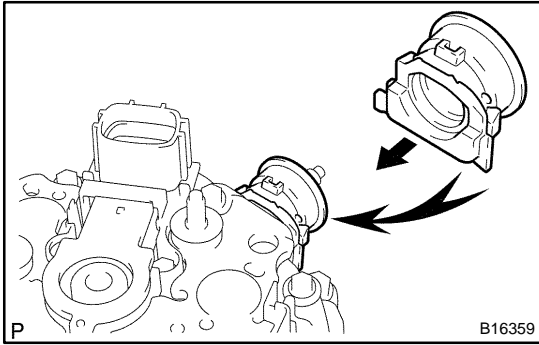
NOTICE:

Be careful of the holder installation direction.

- (c) Install the 2 screws.
Torque: 1.8 N·m (18 kgf·cm, 16 in.-lbf)



- (d) Align the pins of the brush holder with the holes of the rear seal plate, and install the rear seal plate.

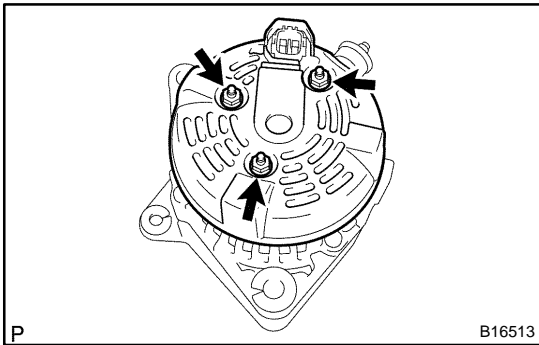


5. INSTALL REAR END COVER

- (a) Install the terminal insulator.

NOTICE:

Be careful of the terminal insulator installation direction.



- (b) Install the end cover with the 3 nuts.

Torque: 4.6 N·m (47 kgf·cm, 41 in.-lbf)

6. CHECK THAT ROTOR ROTATES SMOOTHLY

INSTALLATION

1. INSTALL GENERATOR

- (a) Install the generator with the bolt and 2 nuts.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

- (b) Connect the generator connector.
(c) Connect the generator wire with the nut.
(d) Install the terminal cap.
(e) Install the wire clamp to the cord clip on the generator.

2. INSTALL PS VANE PUMP (See page [SR-69](#))

3. INSTALL DRIVE BELT

Install the belt by turning the belt tensioner counterclockwise.

HINT:

The pulley bolt for the belt tensioner has a left-hand thread.

4. CONNECT INTAKE AIR CONNECTOR TO THROTTLE BODY

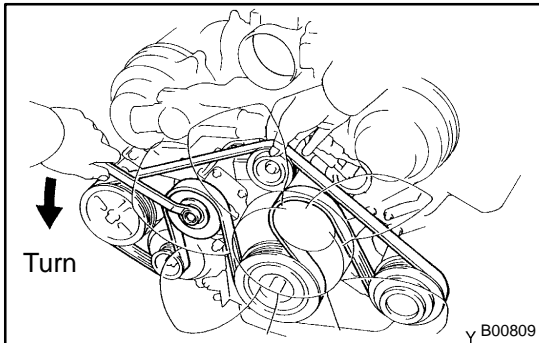
5. PERFORM ON-VEHICLE INSPECTION

(See page [CH-1](#))

6. INSTALL THROTTLE BODY COVER

7. INSTALL ENGINE UNDER COVER

8. CONNECT CABLE TO NEGATIVE (-) BATTERY TERMINAL



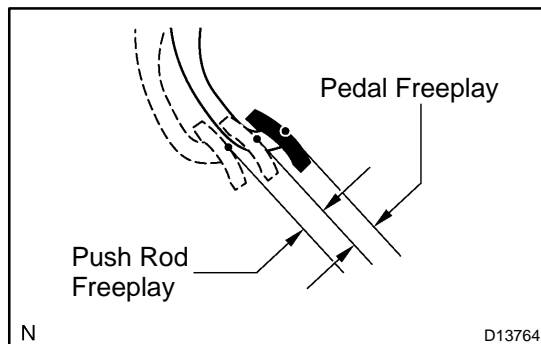
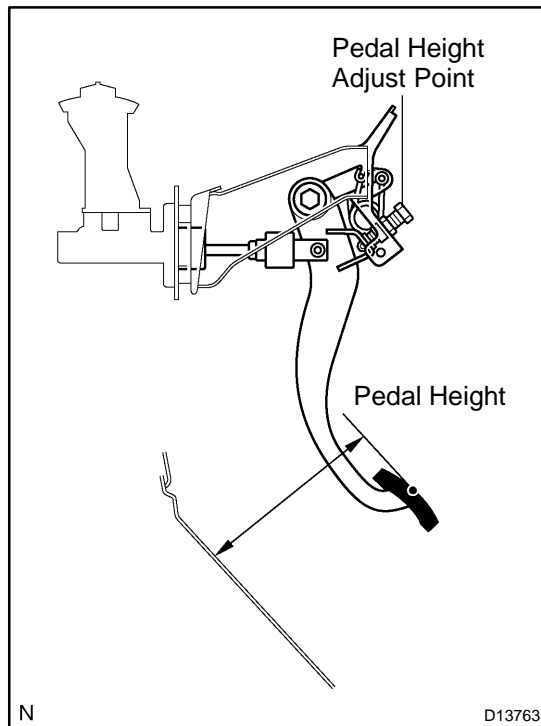
TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

CL026-03

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area	See page
Clutch grabs/chatters	<ol style="list-style-type: none"> 1. Engine mounting (Loose) 2. Clutch disc (Runout is excessive) 3. Clutch disc (Oily) 4. Clutch disc (Worn out) 5. Clutch disc (Damaged torsion rubber) 6. Clutch disc (Glazed) 7. Diaphragm spring (Out of tip alignment) 	<p>–</p> <p>CL-17</p> <p>CL-15</p> <p>CL-15</p> <p>CL-17</p> <p>CL-15</p> <p>CL-18</p>
Clutch pedal is spongy	<ol style="list-style-type: none"> 1. Clutch line (Air in line) 2. Master cylinder piston cup (Damaged) 3. Release cylinder piston cup (Damaged) 	<p>–</p> <p>CL-5</p> <p>CL-10</p>
Clutch is noisy	<ol style="list-style-type: none"> 1. Release bearing (Worn, dirty or damaged) 2. Input shaft bearing (Worn, dirty or damaged) 3. Clutch disc (Damaged torsion rubber) 	<p>CL-17</p> <p>–</p> <p>CL-15</p>
Clutch slips	<ol style="list-style-type: none"> 1. Clutch pedal (Freeplay out of adjustment) 2. Clutch disc (Oily) 3. Clutch disc (Worn out) 4. Diaphragm spring (Damaged) 5. Pressure plate (Distortion) 6. Flywheel (Distortion) 	<p>CL-2</p> <p>CL-18</p> <p>CL-17</p> <p>CL-17</p> <p>CL-17</p> <p>–</p>
Clutch does not disengage	<ol style="list-style-type: none"> 1. Clutch pedal (Freeplay out of adjustment) 2. Clutch line (Air in line) 3. Master cylinder piston cup (Damaged) 4. Release cylinder piston cup (Damaged) 5. Input shaft bearing (Worn, dirty or damaged) 6. Clutch disc (Out of true) 7. Clutch disc (Runout is excessive) 8. Clutch disc (Lining broken) 9. Clutch disc (Dirty or burred) 10. Clutch disc (Oily) 11. Clutch disc (Lack of spline grease) 12. Diaphragm spring (Damaged) 13. Diaphragm spring (Out of tip alignment) 14. Pressure plate (Distortion) 	<p>CL-2</p> <p>–</p> <p>CL-5</p> <p>CL-10</p> <p>–</p> <p>CL-17</p> <p>CL-15</p> <p>CL-17</p> <p>CL-17</p> <p>CL-17</p> <p>CL-18</p> <p>CL-17</p> <p>CL-18</p> <p>CL-17</p>
Clutch start system malfunction	<ol style="list-style-type: none"> 1. Clutch start switch 	<p>CL-2</p>



CLUTCH PEDAL INSPECTION

CLOER-01

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height from dash panel:

170.2 to 180.2 mm (6.701 to 7.095 in.)

Pedal height from dash insulator:

157.7 to 167.7 mm (6.209 to 6.602 in.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

- (a) Loosen the lock nut and turn the stopper bolt or clutch start switch until the correct height is obtained.
- (b) Tighten the lock nut.

3. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

- (a) Depress the pedal until clutch resistance begins to be felt.
Pedal freeplay: 5.0 to 15.0 mm (0.197 to 0.591 in.)
- (b) Gently push on the pedal until the resistance begins to increase a little.

Push rod play at pedal top:

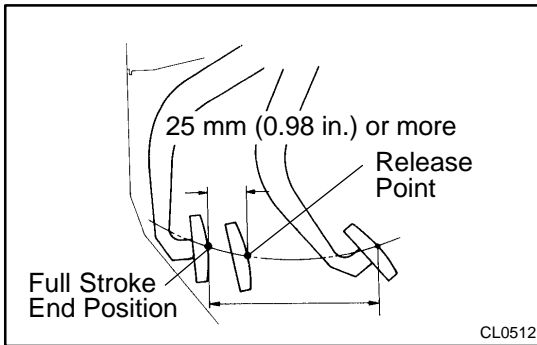
1.0 to 5.0 mm (0.039 to 0.197 in.)

4. IF NECESSARY, ADJUST PEDAL FREEPLAY AND PUSH ROD PLAY

- (a) Remove the lower finish panel and disconnect the air duct.
- (b) Loosen the lock nut and turn the push rod until correct freeplay and push rod play are obtained.
- (c) Tighten the lock nut.
- (d) After adjusting the pedal freeplay, check the pedal height.
- (e) Connect the air duct and install the lower finish panel.

5. CHECK CLUTCH RELEASE POINT

- (a) Pull the parking brake lever and install wheel stoppers.
- (b) Start the engine and run at idle.
- (c) Without depressing the clutch pedal, slowly move the shift lever into the reverse position until the gears contact.



- (d) Gradually depress the clutch pedal and measure the stroke from where the gear noise stops (release point) up to the full stroke end position.

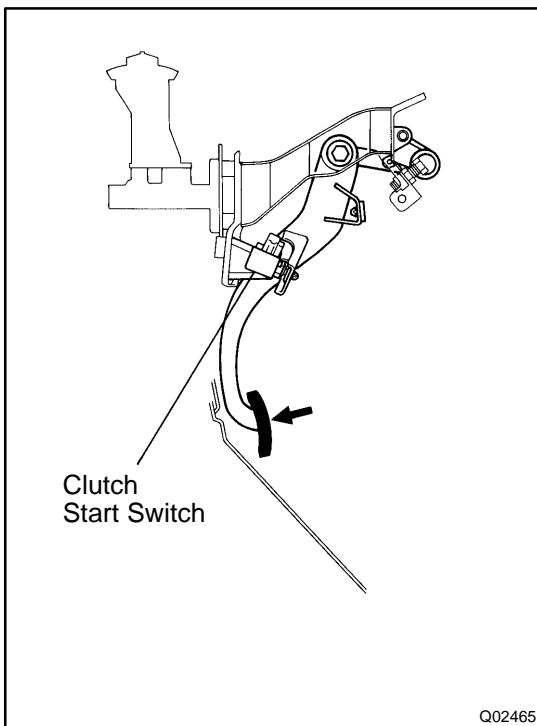
Standard distance:

25 mm (0.98 in.) or more

(From pedal stroke end position to release point)

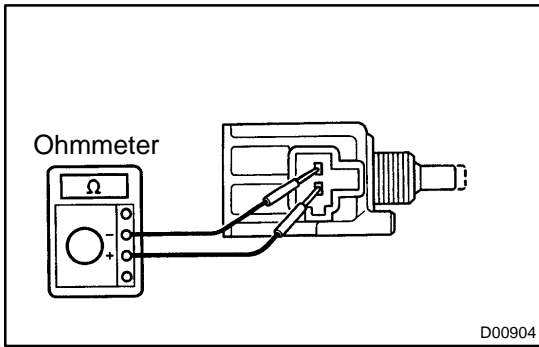
If the distance is not as specified, perform the following operations.

- Check pedal height.
- Check push rod play and pedal freeplay.
- Bleed clutch line.
- Check clutch cover and disc.



6. CHECK CLUTCH START SYSTEM

- (a) Check that the engine does not start when the clutch pedal is released.
- (b) Check that the engine starts when the clutch pedal is fully depressed.

**7. CHECK CONTINUITY OF CLUTCH START SWITCH**

- (a) Disconnect the connector.
- (b) Remove the nut and clutch start switch from the clutch pedal bracket.
- (c) Measure the resistance between the terminals when the switch is ON and when it is OFF.

Standard:

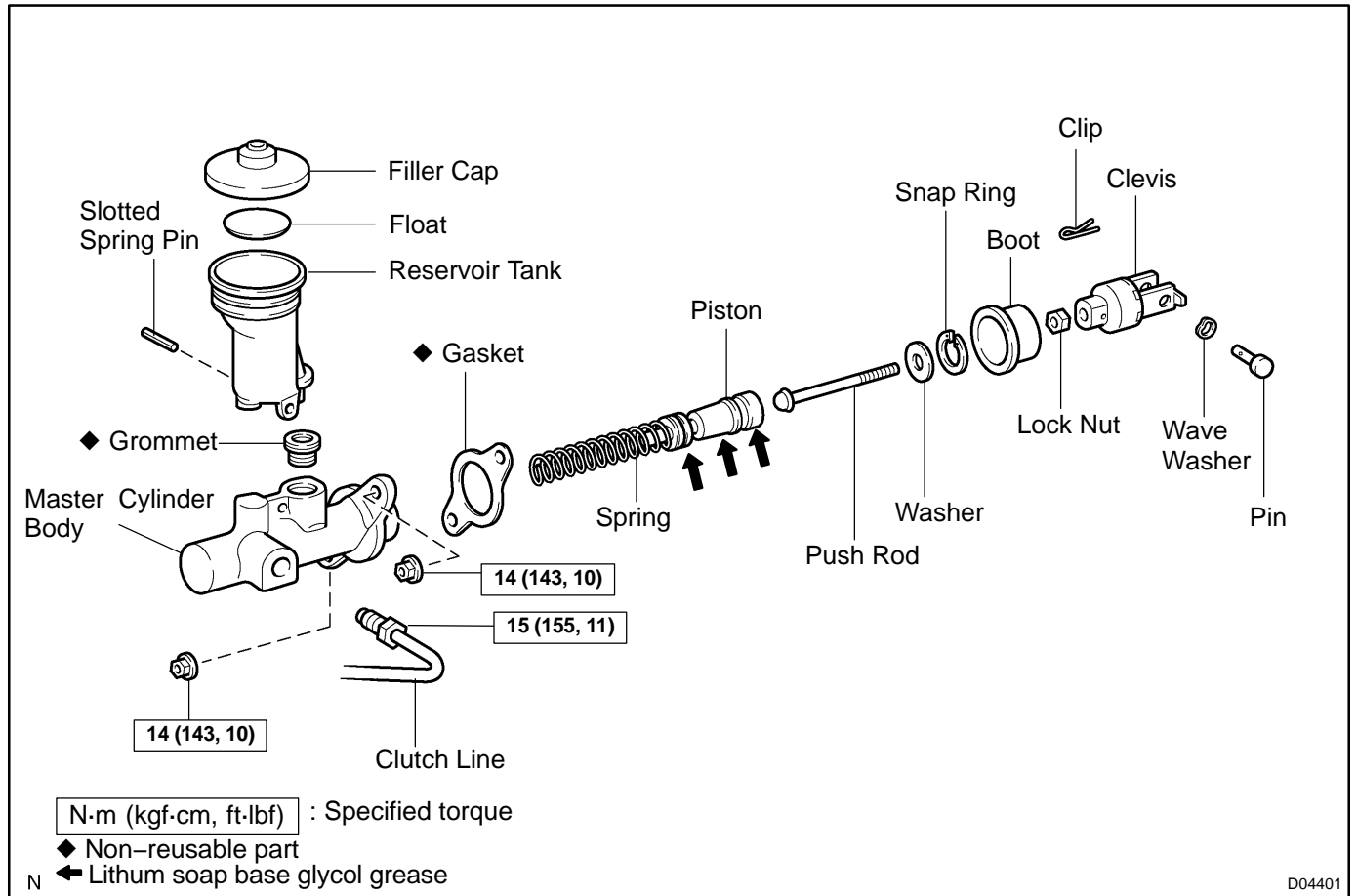
Switch position	Condition
ON (pushed)	Below 1 Ω
OFF (free)	10 k Ω or higher

If the result is not as specified, replace the switch.

- (d) Install the clutch start switch to the clutch pedal bracket with the nut.
- (e) Connect the connector.

CLUTCH MASTER CYLINDER COMPONENTS

CL028-04



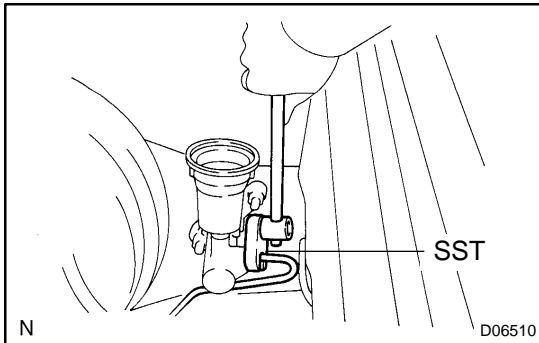
D04401

REMOVAL

1. REMOVE FILLER CAP AND FLOAT FROM RESERVOIR
2. DRAW OUT BRAKE FLUID WITH SYRINGE

NOTICE:

Do not let brake fluid remain on a painted surface. If brake fluid spill onto a painted surface, wash it off immediately.



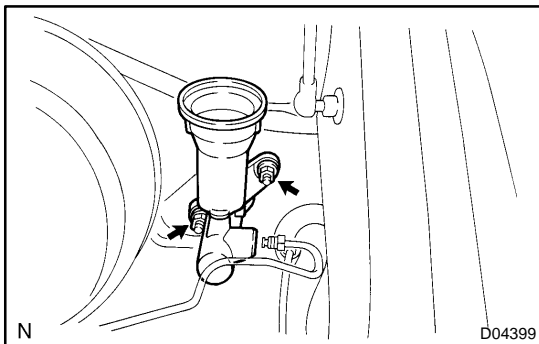
3. DISCONNECT CLUTCH LINE FROM MASTER CYLINDER

Using SST, disconnect the clutch line. Use a container to catch the fluid.

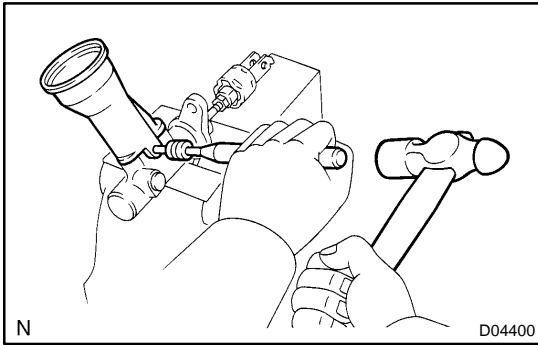
SST 09023-00101

4. REMOVE CLIP AND CLEVIS PIN

- (a) Using needle-nose pliers, remove the clip.
- (b) Remove the clevis pin and wave washer.



5. REMOVE 2 MOUNTING NUTS AND PULL OUT MASTER CYLINDER
6. REMOVE GASKET



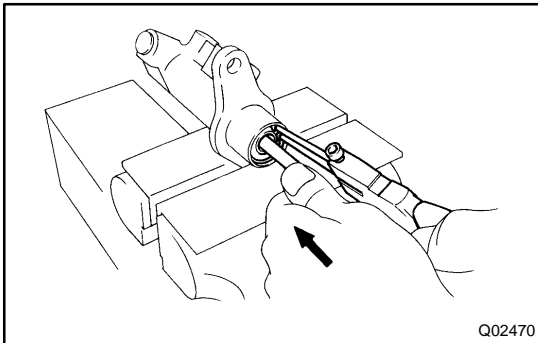
DISASSEMBLY

1. REMOVE RESERVOIR TANK

- (a) Using a pin punch and hammer, drive out the slotted spring pin.
- (b) Remove the reservoir and grommet.

2. REMOVE CLEVIS AND BOOT

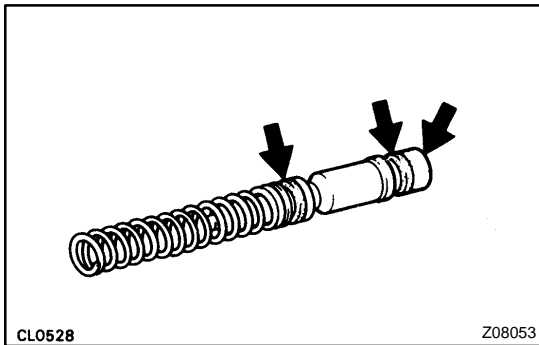
- (a) Loosen the lock nut to remove the clevis and remove the lock nut.
- (b) Remove the boot.



3. REMOVE PUSH ROD

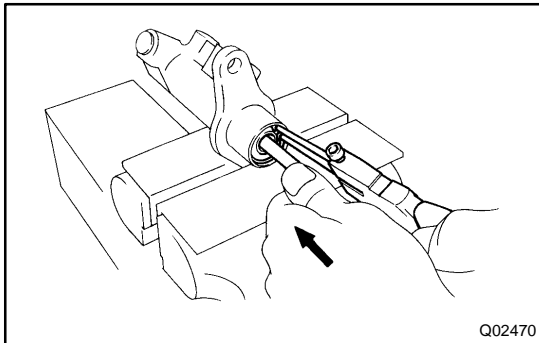
- (a) While pushing the push rod, remove the snap ring using snap ring pliers.
- (b) Remove the push rod and washer.

4. REMOVE PISTON WITH SPRING



REASSEMBLY

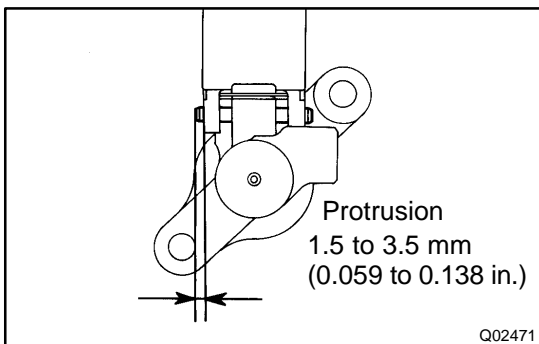
1. COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN
2. INSERT PISTON WITH SPRING INTO CYLINDER



3. INSTALL PUSH ROD AND BOOT

- (a) Install the washer to the push rod.
- (b) Push the push rod into the piston, and install the snap ring using snap ring pliers.
- (c) Install the boot.

4. TEMPORARILY INSTALL LOCK NUT AND CLEVIS

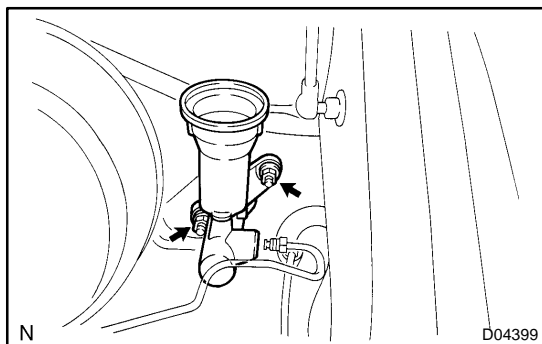


5. INSTALL RESERVOIR

- (a) Install the reservoir and a new grommet.
- (b) Using a pin punch and hammer, drive in the slotted spring pin.

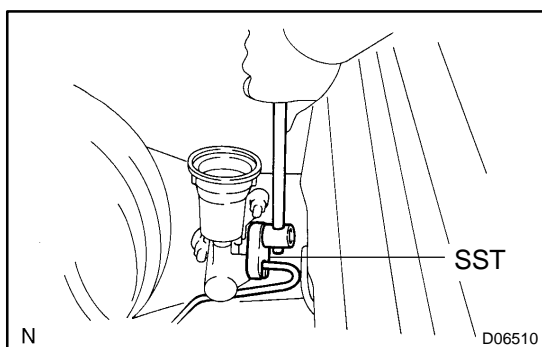
INSTALLATION

1. INSTALL NEW GASKET



2. INSTALL MASTER CYLINDER WITH 2 MOUNTING NUTS

Torque: 14 N·m (143 kgf·cm, 10 ft·lbf)



3. CONNECT CLUTCH LINE TO MASTER CYLINDER

Using SST, connect the clutch line.

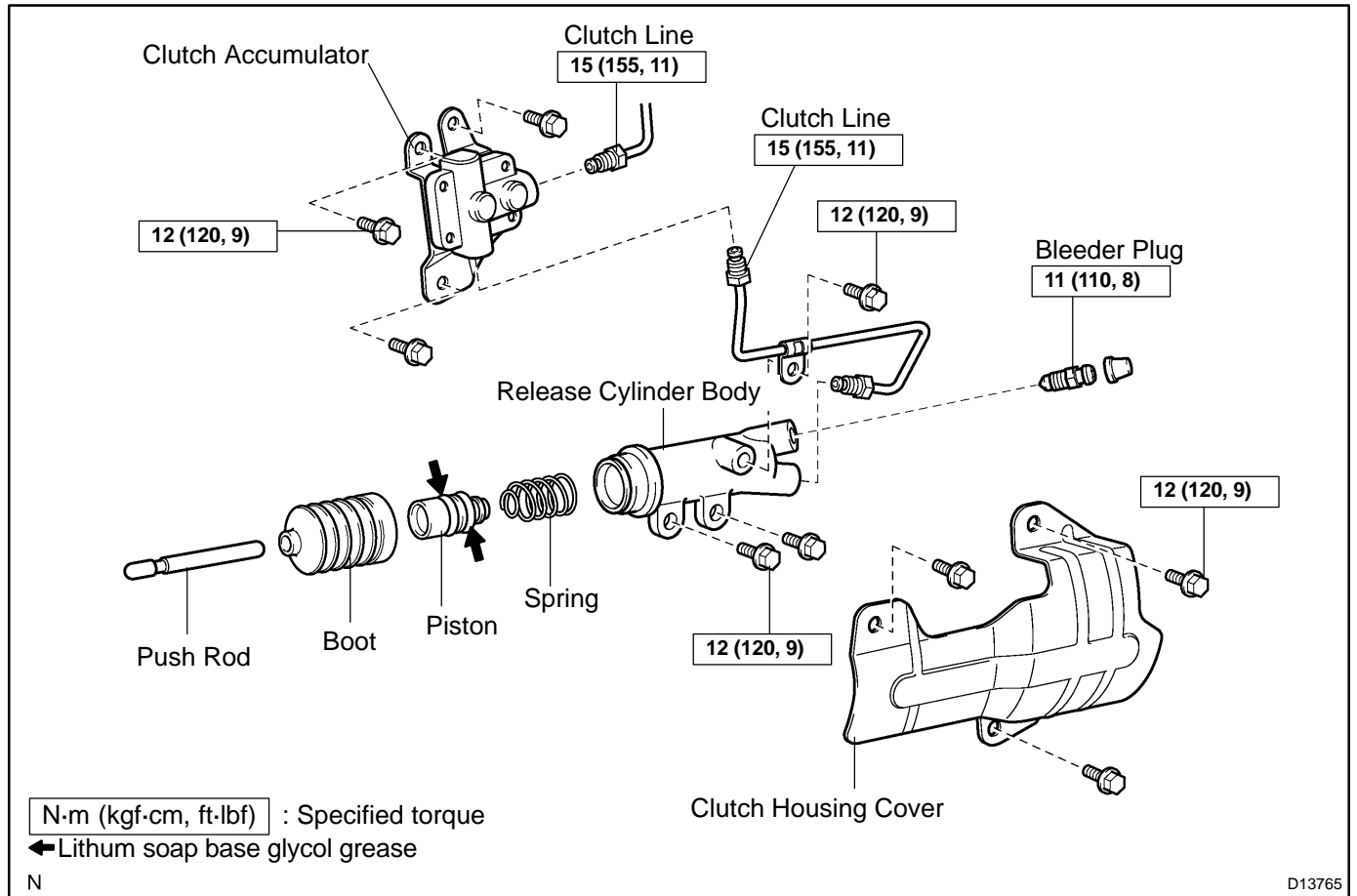
SST 09023-00101

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

4. INSTALL CLEVIS PIN, WAVE WASHER AND CLIP
5. FILL CLUTCH RESERVOIR WITH BRAKE FLUID AND BLEED CLUTCH SYSTEM
6. ADJUST CLUTCH PEDAL (See page [CL-2](#))
7. CHECK FOR LEAKS

CLUTCH RELEASE CYLINDER COMPONENTS

CL02D-04



REMOVAL

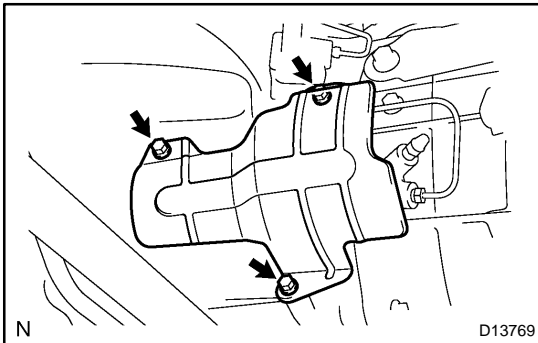
1. REMOVE FILLER CAP AND FLOAT FROM RESERVOIR
2. DRAW OUT BRAKE FLUID WITH SYRINGE

NOTICE:

Do not let brake fluid remain on a painted surface. If brake fluid spill onto a painted surface, wash it off immediately.

3. REMOVE CLUTCH HOUSING COVER

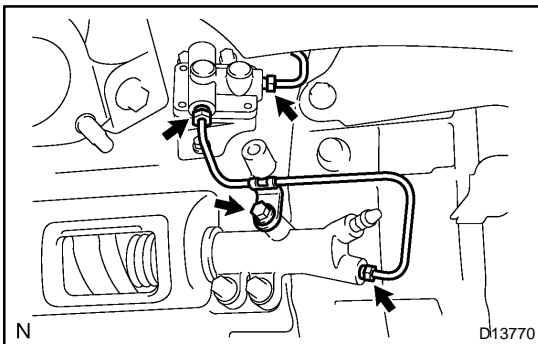
Remove the 3 bolts and clutch housing cover.



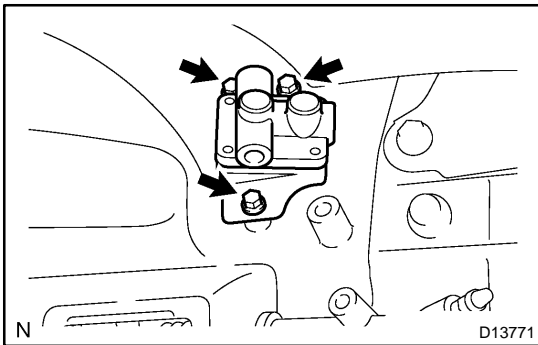
4. REMOVE CLUTCH ACCUMULATOR

- (a) Remove the bolt and clamp.
- (b) Using SST, disconnect the clutch lines from the clutch accumulator and clutch release cylinder. Use a container to catch the fluid.

SST 09023-00101

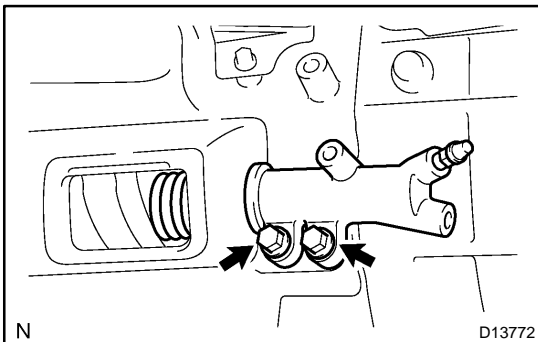


- (c) Remove the 3 bolts and clutch accumulator.



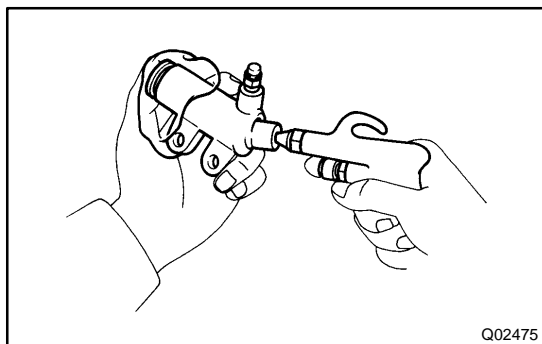
5. REMOVE CLUTCH RELEASE CYLINDER

Remove the 2 bolts and clutch release cylinder.



DISASSEMBLY

1. **REMOVE BOOT AND PUSH ROD**
 - (a) Pull out the boot with the push rod.
 - (b) Remove the boot from the push rod.



2. **REMOVE PISTON AND SPRING**

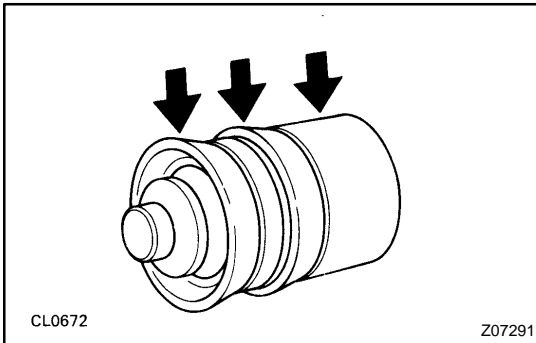
Using compressed air, remove the piston with the spring from the cylinder.

NOTICE:

- **Blowing off the air may cause the piston to jump out. When removing the piston, hold it by hand using a waste.**
 - **Take care not to splash brake fluid when air-blowing.**
3. **REMOVE BLEEDER PLUG**

REASSEMBLY

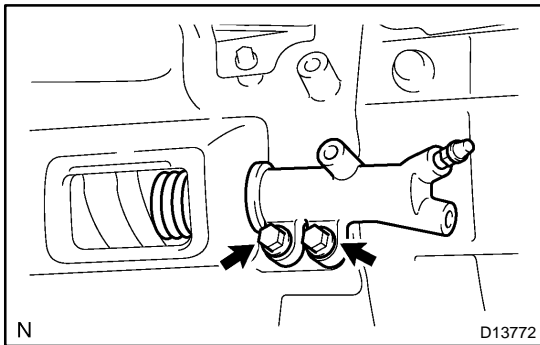
1. **INSTALL BLEEDER PLUG**
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)



CL0672

Z07291

2. **COAT PISTON WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN**
3. **INSTALL PISTON AND SPRING INTO CYLINDER**
4. **INSTALL BOOT AND PUSH ROD**
 - (a) Install the push rod to the boot.
 - (b) Install the boot with the push rod to the cylinder.

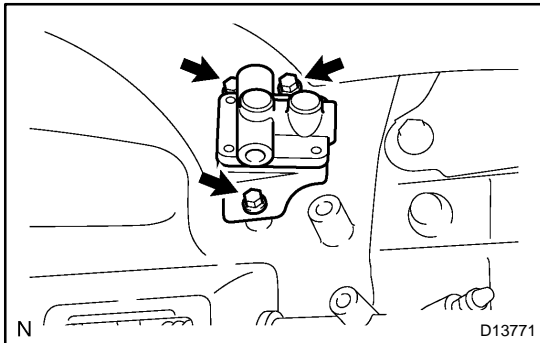


INSTALLATION

1. INSTALL CLUTCH RELEASE CYLINDER

Install the clutch release cylinder with the 2 bolts.

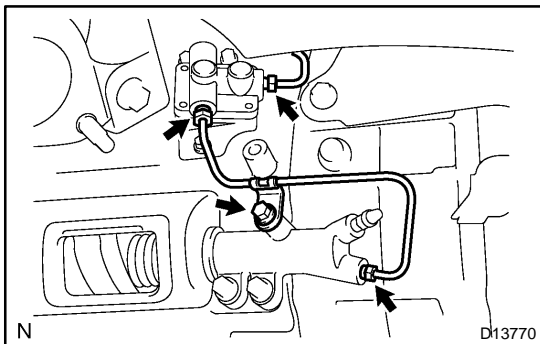
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



2. INSTALL CLUTCH ACCUMULATOR

(a) Install the clutch accumulator with the 3 bolts.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



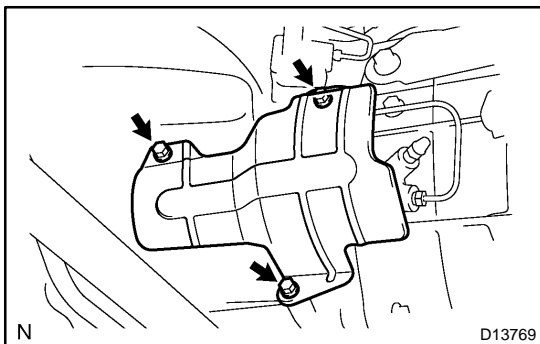
(b) Using SST, connect the clutch lines to the clutch release cylinder and clutch accumulator.

SST 09023-00101

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

(c) Install the clamp with the bolt.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



3. INSTALL CLUTCH HOUSING COVER

Install the clutch housing cover with the 3 bolts.

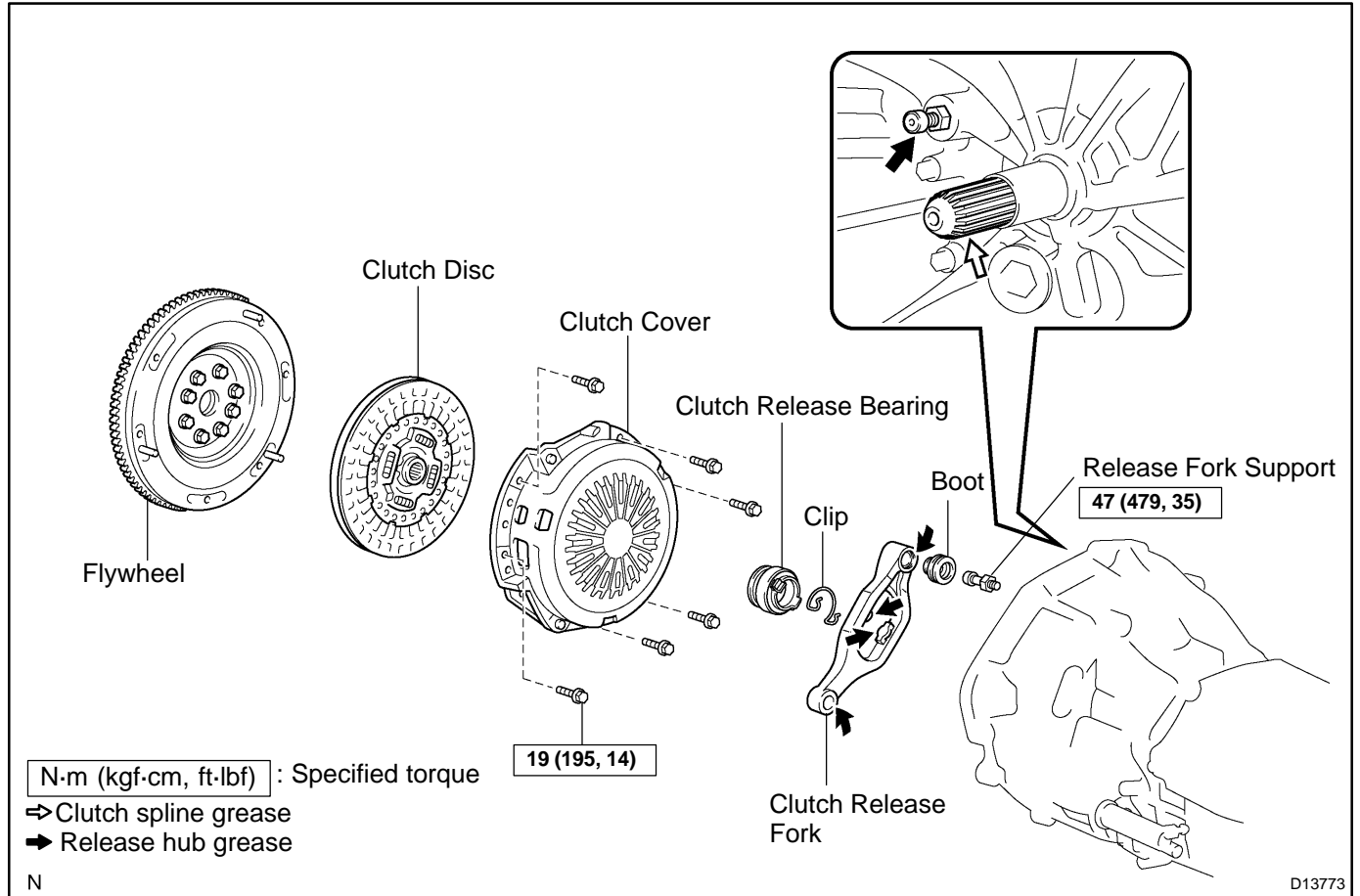
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

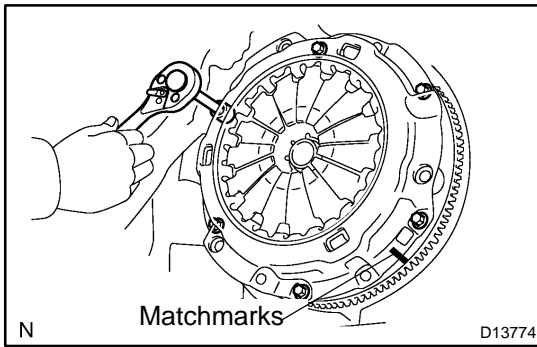
4. FILL CLUTCH RESERVOIR WITH BRAKE FLUID AND BLEED CLUTCH SYSTEM

5. CHECK FOR LEAKS

CLUTCH UNIT COMPONENTS

CL021-05



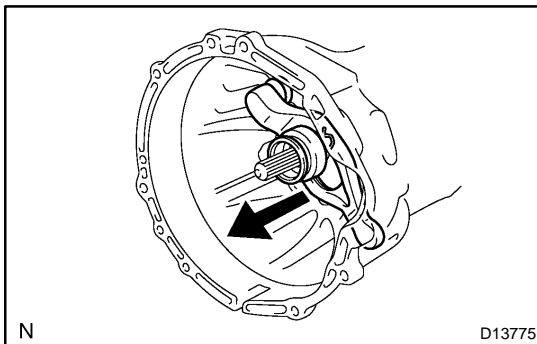


REMOVAL

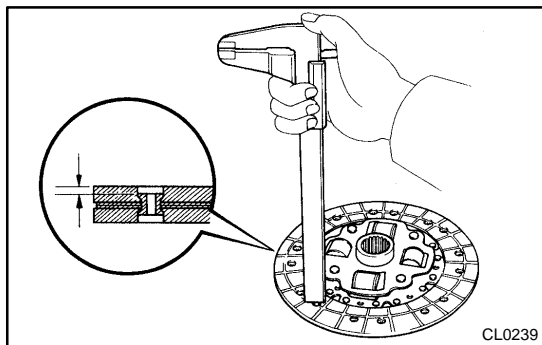
1. **REMOVE TRANSMISSION FROM ENGINE**
(See page [MT-3](#))
2. **REMOVE CLUTCH COVER AND CLUTCH DISC**
 - (a) Put matchmarks on the flywheel and clutch cover.
 - (b) Loosen each set bolt one turn at a time until spring tension is released.
 - (c) Remove the set bolts, and pull off the clutch cover with the clutch disc.

NOTICE:

Do not drop the clutch disc.



3. **REMOVE BOOT, CLUTCH RELEASE BEARING AND CLUTCH RELEASE FORK FROM TRANSMISSION**
 - (a) Remove the boot and release bearing together with the fork.
 - (b) Remove the clip from the release bearing.



CL0239

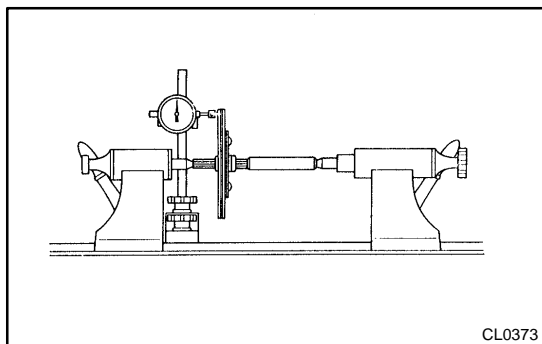
INSPECTION

1. INSPECT CLUTCH DISC FOR WEAR OR DAMAGE

Using calipers, measure the rivet head depth.

Minimum rivet depth: 0.3 mm (0.012 in.)

If necessary, replace the clutch disc.



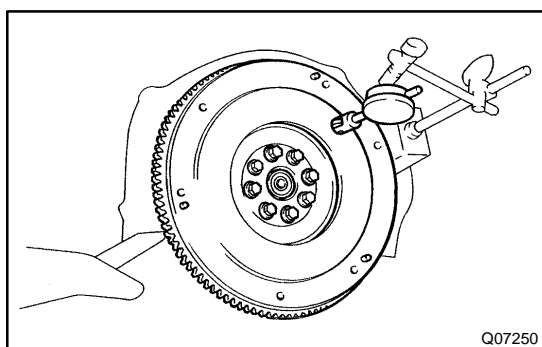
CL0373

2. INSPECT CLUTCH DISC RUNOUT

Using a dial indicator, check the disc runout.

Maximum runout: 0.7 mm (0.027 in.)

If necessary, replace the clutch disc.



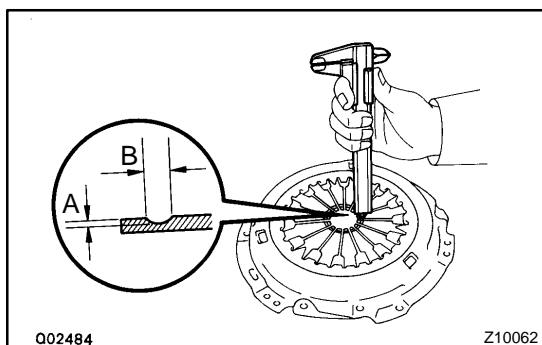
Q07250

3. INSPECT FLYWHEEL RUNOUT

Using a dial indicator with a roller instrument, check the flywheel runout.

Maximum runout: 0.1 mm (0.004 in.)

If necessary, replace the flywheel.



Q02484

Z10062

4. INSPECT DIAPHRAGM SPRING FOR WEAR

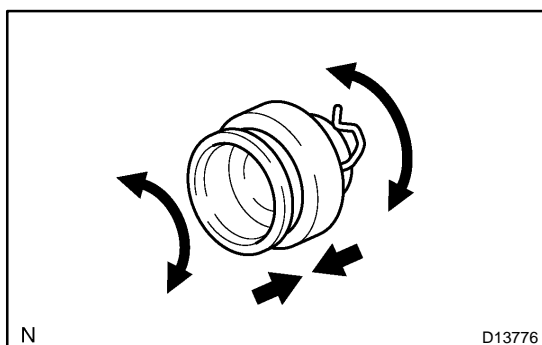
Using calipers, measure the diaphragm spring for depth and width of wear.

Maximum

Depth A: 0.5 mm (0.020 in.)

Width B: 6.0 mm (0.236 in.)

If necessary, replace the clutch cover.



N

D13776

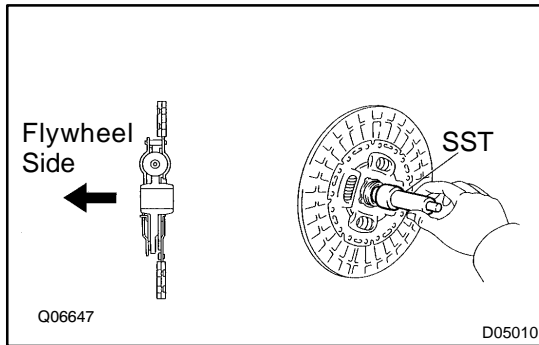
5. INSPECT CLUTCH RELEASE BEARING

Turn the bearing by hand while applying force in the axial direction.

HINT:

The bearing is permanently lubricated and requires no cleaning or lubrication.

If necessary, replace the release bearing.



INSTALLATION

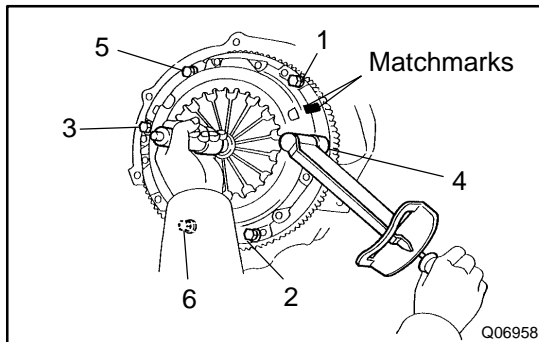
1. INSTALL CLUTCH DISC AND CLUTCH COVER ON FLYWHEEL

- (a) Insert SST in the clutch disc, then insert them in the flywheel.

SST 09301-00110

HINT:

Take care not to insert the clutch disc in the wrong direction.



- (b) Align the matchmarks on the clutch cover and flywheel.
 (c) Following the order shown in the illustration, tighten the 6 bolts starting from the bolt located near the knock pin on the top.

Torque: 19 N·m (195 kgf-cm, 14 ft-lbf)

HINT:

- Following the order shown in the illustration, tighten the bolts at a time evenly.
- Check that the disc is in the center by lightly moving SST up and down, right and left, and tighten the bolts.

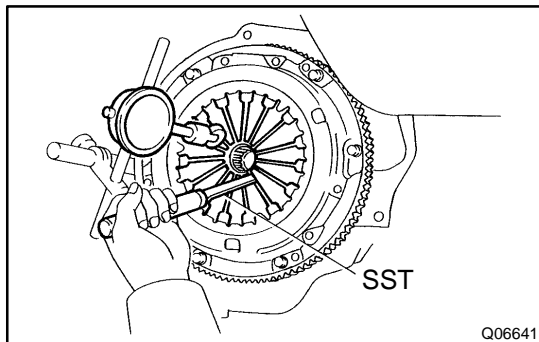
2. CHECK DIAPHRAGM SPRING TIP ALIGNMENT

Using a dial indicator with a roller instrument, check the diaphragm spring tip alignment.

Maximum non-alignment: 0.5 mm (0.020 in.)

If alignment is not as specified, adjust the diaphragm spring tip alignment using SST.

SST 09333-00013

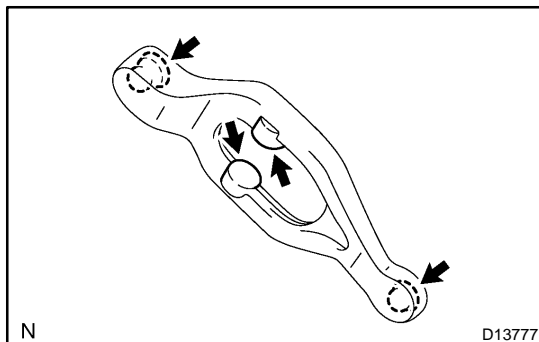


3. APPLY RELEASE HUB GREASE

Apply release hub grease to the release fork and clutch release bearing contact, push rod contact and release fork pivot contact.

Sealant:

Part No. 08887-01806, RELEASE HUB GREASE or equivalent



4. APPLY CLUTCH SPRING GREASE

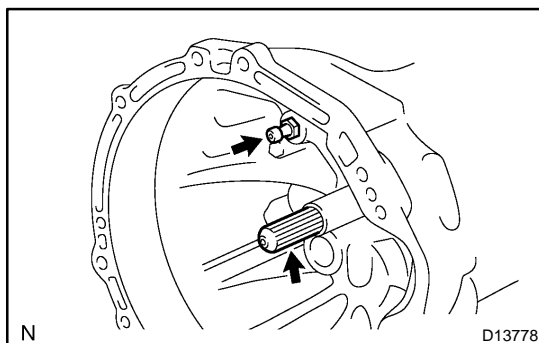
Apply clutch spline grease to the input shaft spline.

Sealant:

Part No. 08887-01706, CLUTCH SPLINE GREASE or equivalent

5. INSTALL BOOT, CLUTCH RELEASE BEARING AND CLUTCH RELEASE FORK TO TRANSMISSION

- (a) Install the clip to the release bearing.
 (b) Install the boot and release bearing to the release fork, and then install them to the transmission.



6. **INSTALL TRANSMISSION TO ENGINE**
(See page [MT-3](#))

MANUAL TRANSMISSION SYSTEM

MTOHM-01

PRECAUTION

NOTICE:

When working with FIPG material, observe the following:

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove any loose material.
- Clean both sealing surfaces with a non-residue solvent.
- Apply FIPG in a continuous line (width approximately 1 mm (0.04 in.)) along the sealing surface.
- Parts must be assembled within 10 minutes of FIPG application. Otherwise, the packing material must be removed and reapplied.

TROUBLESHOOTING

MTOHN-01

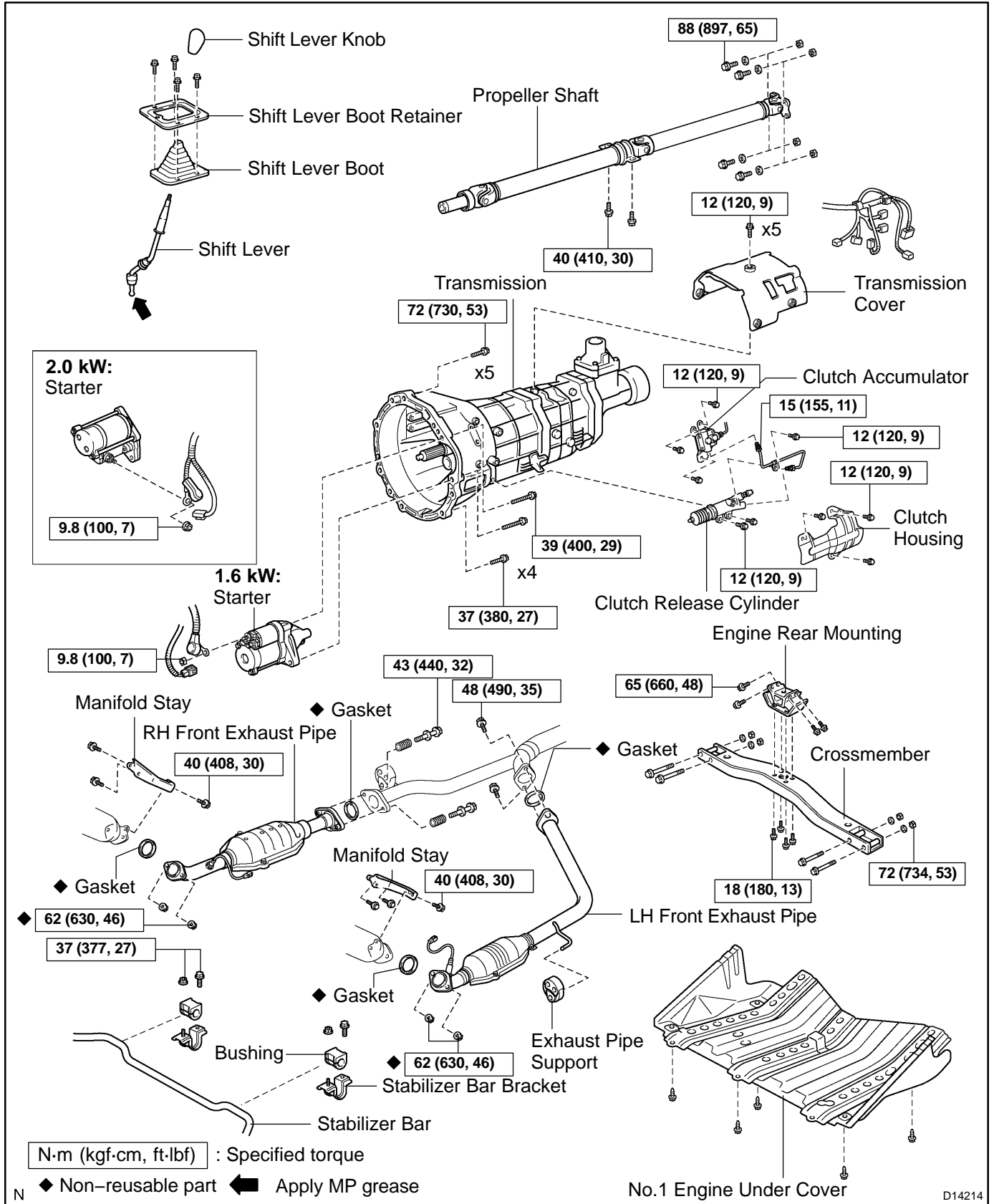
PROBLEM SYMPTOMS TABLE

Use the table below to help find the cause of the problem. The numbers indicate the priority of the likely causes of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area	See page
Noise	<ol style="list-style-type: none"> 1. Oil (Level low) 2. Oil (Wrong) 3. Gear (Worn or damaged) 4. Bearing (Worn or damaged) 	MT-7 MT-7 MT-10 MT-10
Oil leakage	<ol style="list-style-type: none"> 1. Oil (Level too high) 2. Gasket (Damaged) 3. Oil seal (Worn or damaged) 4. O-ring (Worn or damaged) 	MT-7 MT-10 MT-10 MT-10
Hard to shift or will not shift	<ol style="list-style-type: none"> 1. Synchronizer ring (Worn or damaged) 2. Shift key spring (Damaged) 	MT-34 MT-52 MT-34 MT-52
Jumps out of gear	<ol style="list-style-type: none"> 1. Locking ball spring (Damaged) 2. Shift fork (Worn) 3. Gear (Worn or damaged) 4. Bearing (Worn or damaged) 	MT-61 MT-34 MT-52 MT-10 MT-10

MANUAL TRANSMISSION UNIT COMPONENTS

MT0HO-01

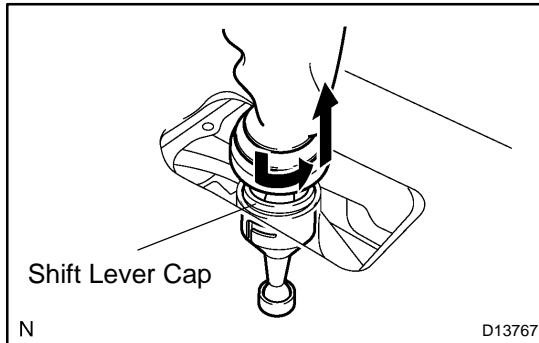


REMOVAL

1. DISCONNECT BATTERY NEGATIVE TERMINAL

2. REMOVE TRANSMISSION SHIFT LEVER

- (a) Remove the transmission shift lever knob.
- (b) Remove the 4 bolts and shift lever boot retainer.
- (c) Remove the transmission shift lever boot.



- (d) Turn over the dust boot.
- (e) While pressing down on the shift lever cap, rotate it counterclockwise to remove.

3. RAISE VEHICLE AND DRAIN TRANSMISSION OIL

- (a) Remove the drain plug and gasket and drain the transmission oil.

- (b) Install a new gasket and the drain plug.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

4. REMOVE LH AND RH FRONT EXHAUST PIPE

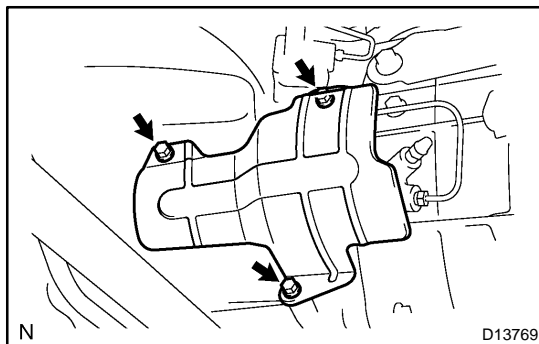
(See page [EM-126](#))

5. REMOVE PROPELLER SHAFT (See page [PR-3](#))

HINT:

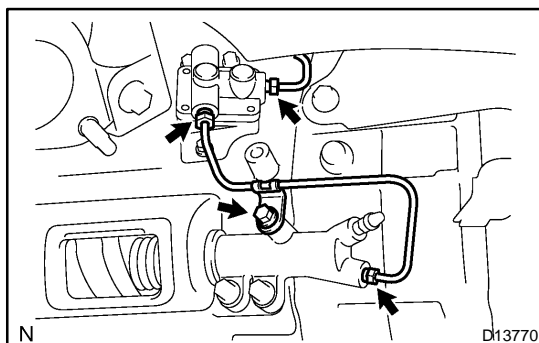
Cover the transmission extension housing with a cloth to prevent any oil from leaking.

6. DISCONNECT VEHICLE SPEED SENSOR, BACK-UP LIGHT SWITCH CONNECTOR



7. REMOVE CLUTCH HOUSING COVER

- (a) Remove the 3 bolts and clutch housing cover.

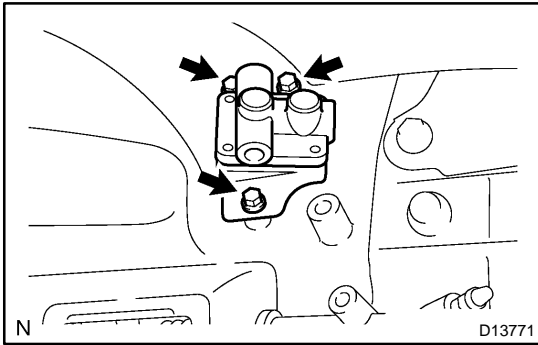


8. REMOVE CLUTCH ACCUMULATOR

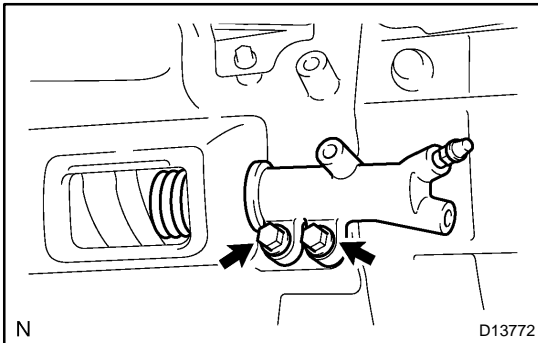
- (a) Remove the bolt and clamp.

- (b) Using SST, disconnect the clutch lines from the clutch accumulator and clutch release cylinder. Use a container to catch the fluid.

SST 09023-00101

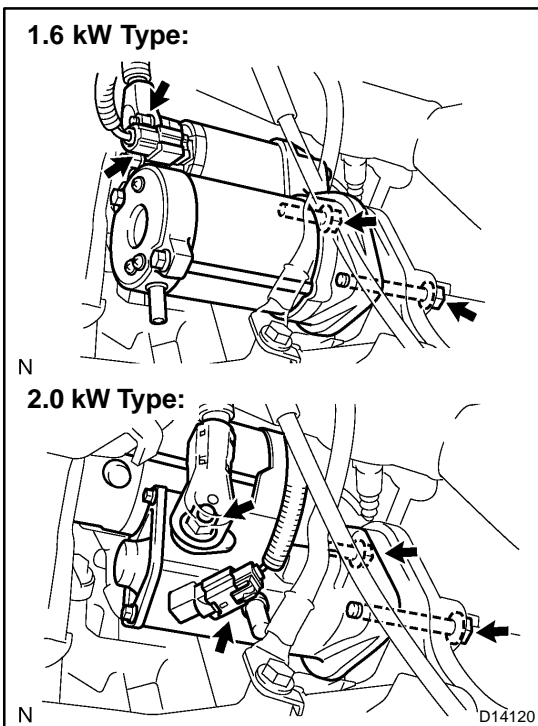


(c) Remove the 3 bolts and clutch accumulator.



9. REMOVE CLUTCH RELEASE CYLINDER

Remove the 2 bolts and clutch release cylinder.

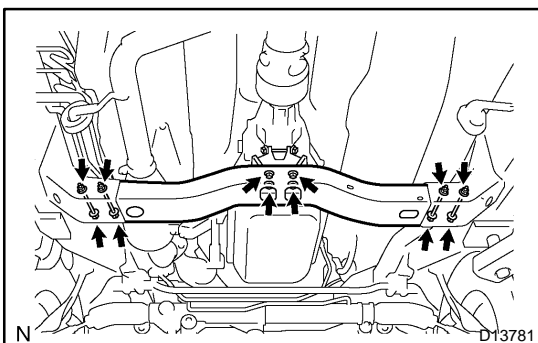


10. REMOVE STARTER

- (a) Disconnect the connector.
- (b) Remove the nut and disconnect the terminal.
- (c) Remove the 2 bolts and starter.

11. JACK UP TRANSMISSION

Using a transmission jack, support the transmission.

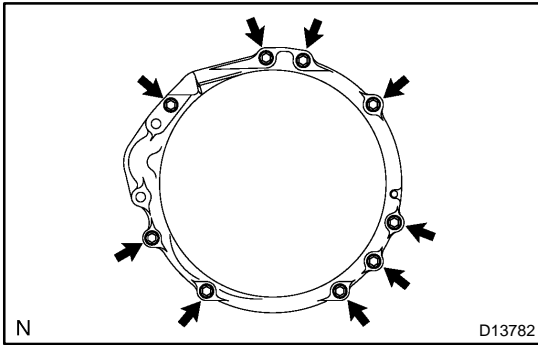


12. REMOVE CROSSMEMBER

- (a) Remove the 4 set bolts of the engine rear mounting on the crossmember.
- (b) Remove the 4 nuts, washers, bolts and crossmember.

13. REMOVE STABILIZER BAR BRACKET

Remove the 2 bolts, nuts and stabilizer bar brackets.

**14. REMOVE TRANSMISSION**

- (a) Remove the 9 transmission mounting bolts from the engine.
- (b) Separate the wire harness from the clamps of the transmission.
- (c) Pull out the transmission down and toward the rear.

NOTICE:

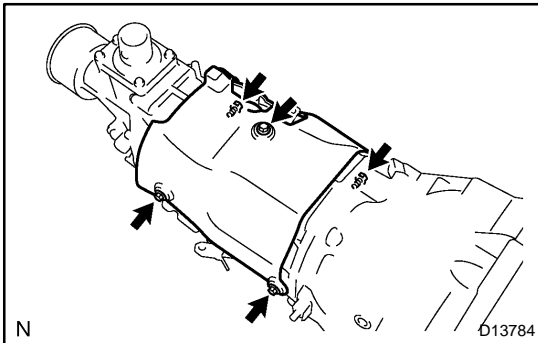
Be careful not to damage the PS tube.

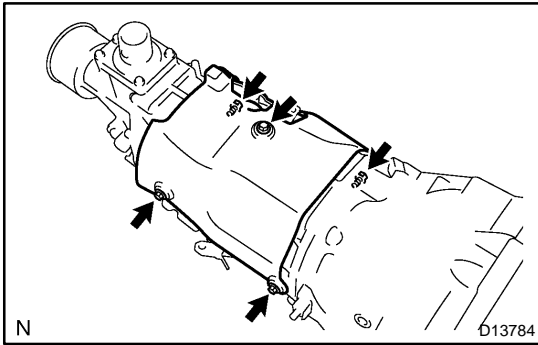
15. REMOVE ENGINE REAR MOUNTING

Remove the 4 bolts and engine rear mounting.

16. REMOVE TRANSMISSION COVER

Remove the 5 bolts and transmission cover.





INSTALLATION

1. INSTALL TRANSMISSION COVER

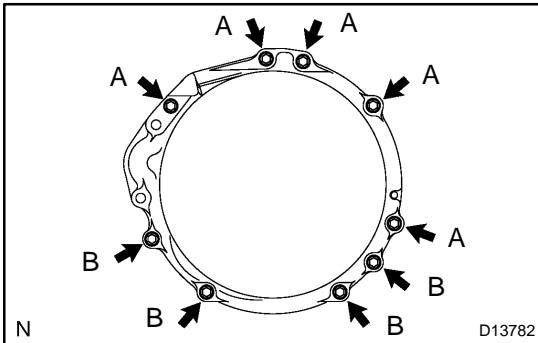
Install the transmission cover with the 5 bolts.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

2. INSTALL ENGINE REAR MOUNTING

Install the engine rear mounting with the 4 bolts.

Torque: 65 N·m (660 kgf·cm, 48 ft·lbf)



3. INSTALL TRANSMISSION

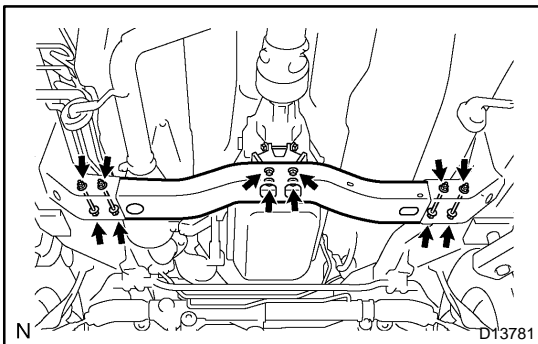
(a) Install the wire harness to the clamps of the transmission.

(b) Install the transmission to the engine with the 9 bolts.

Torque:

Bolt A: 72 N·m (730 kgf·cm, 53 ft·lbf)

Bolt B: 37 N·m (380 kgf·cm, 27 ft·lbf)



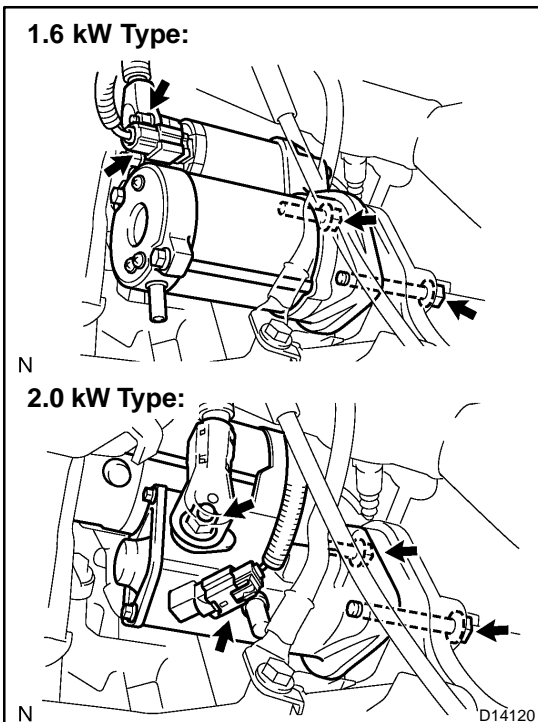
4. INSTALL CROSSMEMBER

(a) Install the crossmember with the 4 bolts, washers and nuts.

Torque: 72 N·m (734 kgf·cm, 53 ft·lbf)

(b) Install the 4 set bolts for the engine rear mounting.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)



5. INSTALL STARTER

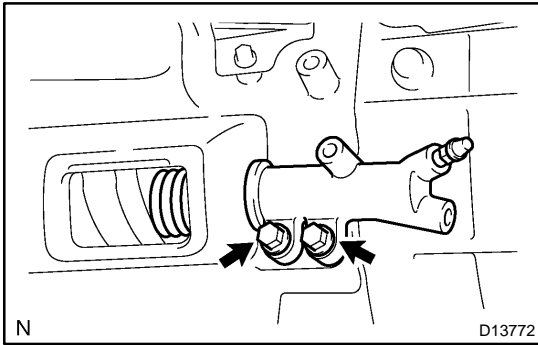
(a) Install the starter with the 2 bolts.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Connect the terminal and install the nut.

Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)

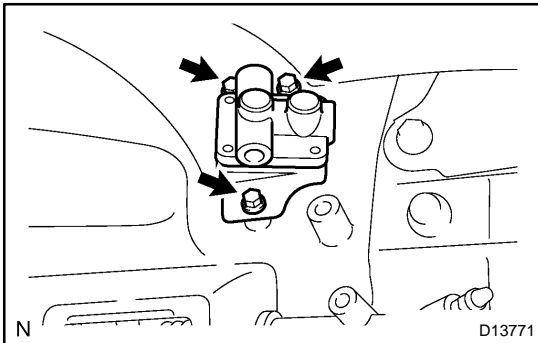
(c) Connect the connector.



6. INSTALL CLUTCH RELEASE CYLINDER

Install the clutch release cylinder with the 2 bolts.

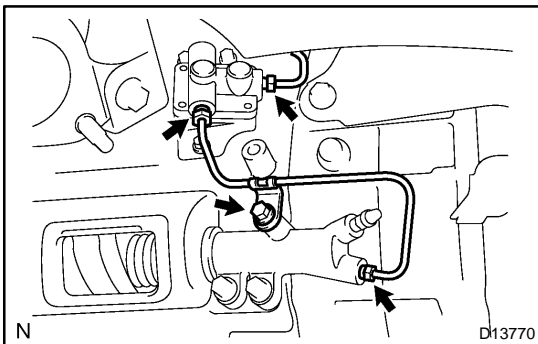
Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)



7. INSTALL CLUTCH ACCUMULATOR

(a) Install the clutch accumulator with the 3 bolts.

Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)



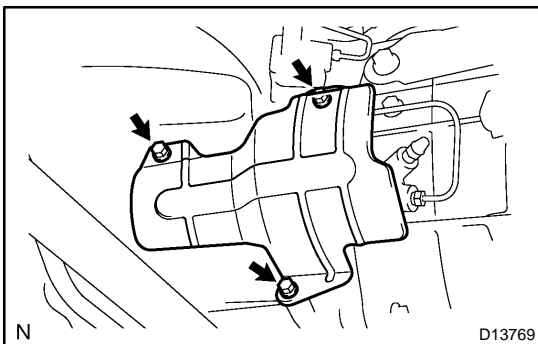
(b) Using SST, connect the clutch lines to the clutch release cylinder and clutch accumulator.

SST 09023-00101

Torque: 15 N·m (155 kgf-cm, 11 ft-lbf)

(c) Install the clamp with the bolt.

Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)



8. INSTALL CLUTCH HOUSING COVER

Install the clutch housing cover with the 3 bolts.

Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)

(a) Install the clutch accumulator with the 3 bolts.

Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)

(b) Install the clutch housing cover with the 3 bolts.

Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)

9. CONNECT VEHICLE SPEED SENSOR, BACK-UP LIGHT SWITCH CONNECTOR

10. INSTALL PROPELLER SHAFT (See page [PR-8](#))

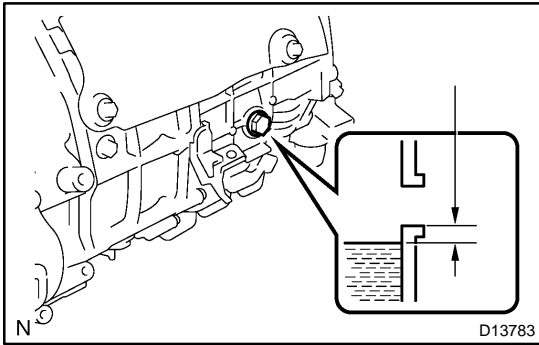
11. INSTALL LH AND RH FRONT EXHAUST PIPE

(See page [EM-127](#))

12. INSTALL STABILIZER BAR BRACKET

Install the 2 stabilizer bar brackets with the 2 bolts and nuts.

Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)



13. FILL WITH TRANSMISSION OIL

- (a) Remove the filler plug and gasket and fill with transmission oil.

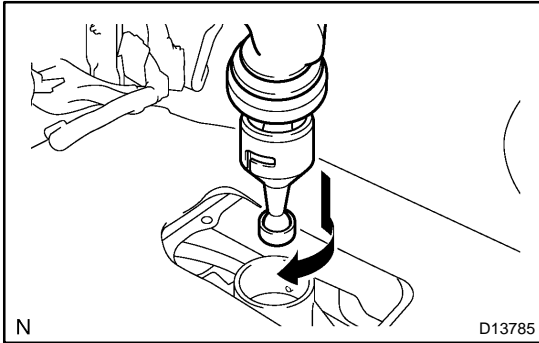
Oil grade: API GL-4 or GL-5

Viscosity: SAE 75W-90

Capacity: 1.8 liters (1.9 US qts, 1.5 Imp. qts)

- (b) Install a new gasket and the filler plug.

Torque: 37 N·m (380 kgf-cm, 27 ft-lbf)



14. INSTALL TRANSMISSION SHIFT LEVER

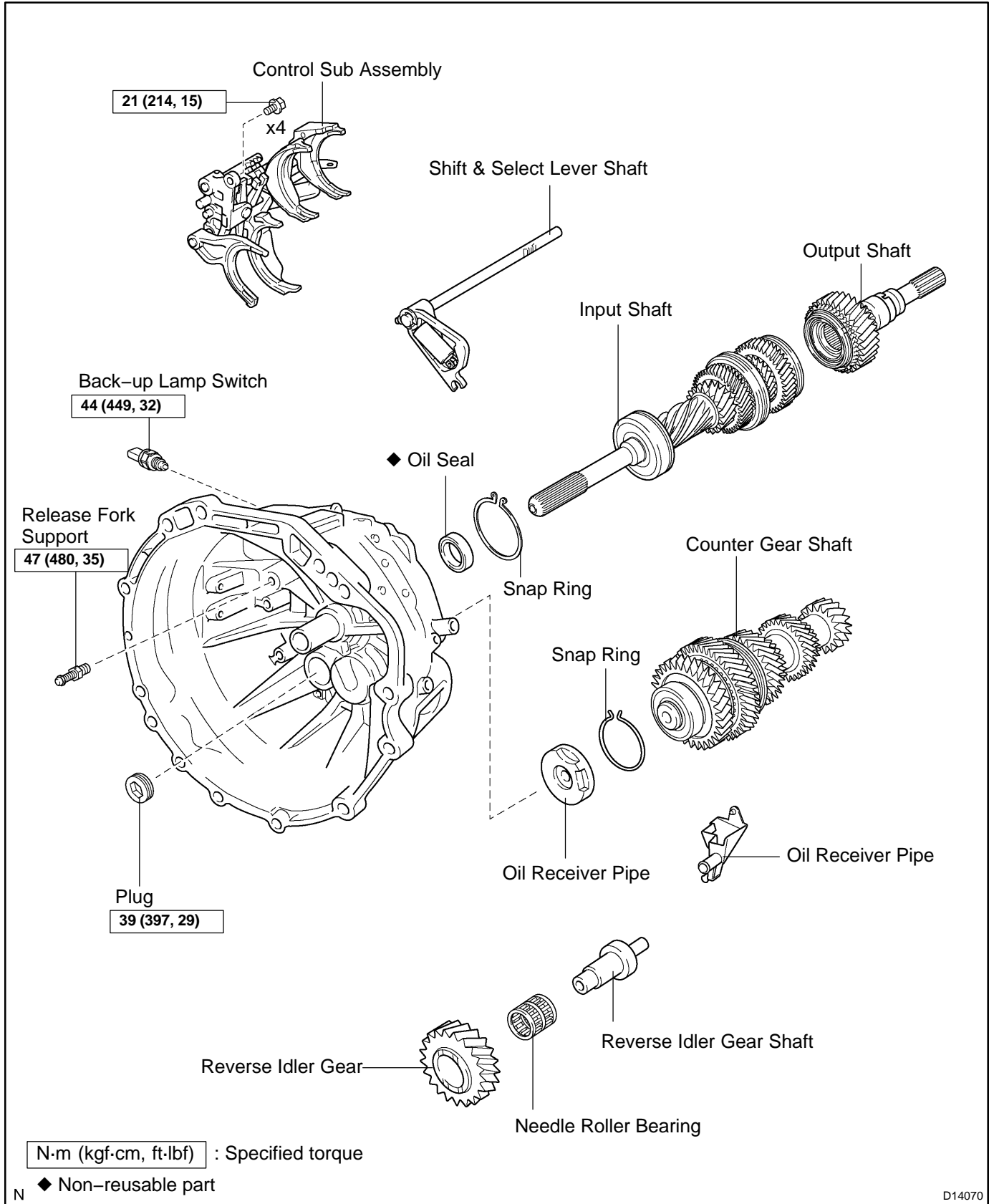
- (a) Apply MP grease to the tip of the shift lever.
- (b) While pressing down on the shift lever cap, rotate it clockwise to install.
- (c) Install the dust cover.
- (d) Install the transmission shift lever boot.
- (e) Install the shift lever boot retainer with the 4 bolts.
- (f) Install the transmission shift lever knob.

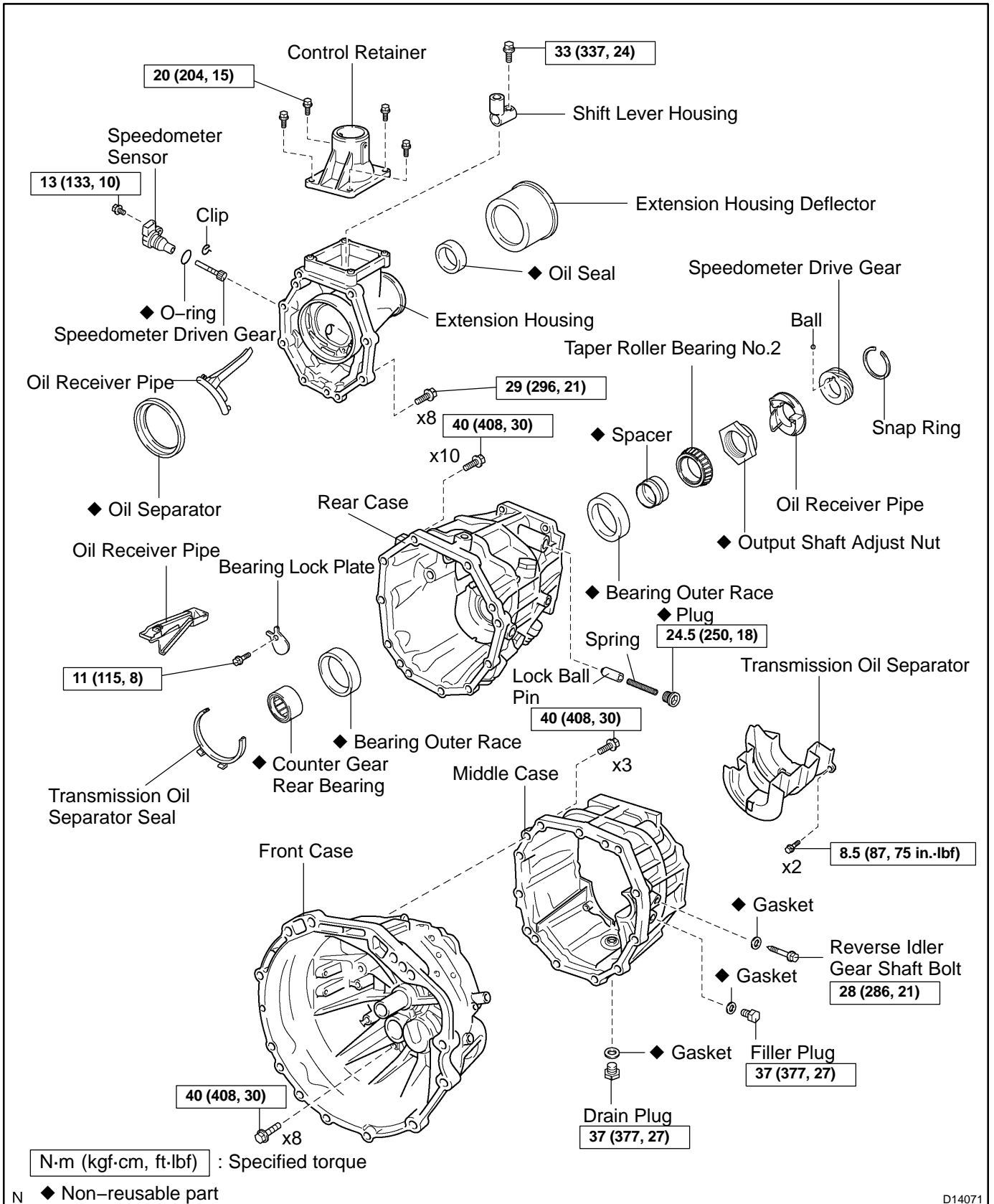
15. CONNECT BATTERY NEGATIVE TERMINAL

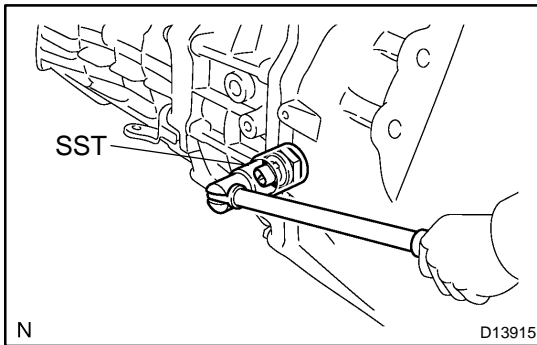
16. DO ROAD TEST

MANUAL TRANSMISSION ASSEMBLY COMPONENTS

MT0HR-01





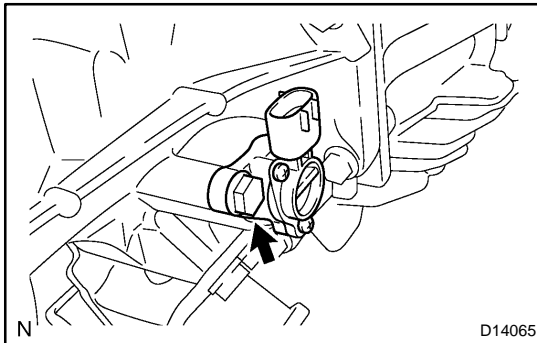


DISASSEMBLY

1. REMOVE BACK-UP LAMP SWITCH

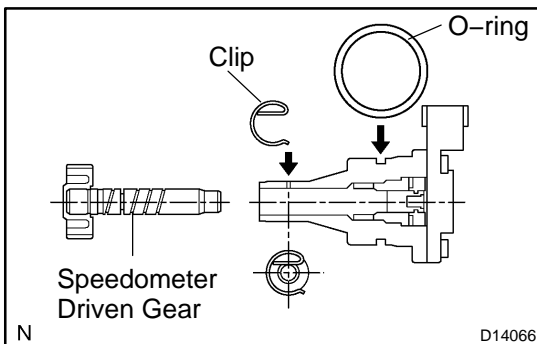
Using SST, remove the back-up lamp switch.

SST 09817-16011



2. REMOVE SPEEDOMETER DRIVEN GEAR

(a) Remove the bolt and speedometer sensor.



(b) Remove the clip from the speedometer sensor.

(c) Remove the driven gear from the speedometer sensor.

(d) Remove the O-ring from the speedometer sensor.

(e) Check the teeth of the speedometer driven gear.

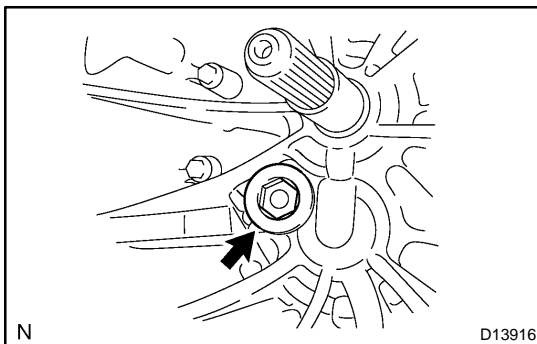
If the driven gear is damaged, replace it.

3. REMOVE EXTENSION HOUSING DEFLECTOR

Using a plastic hammer, remove the deflector.

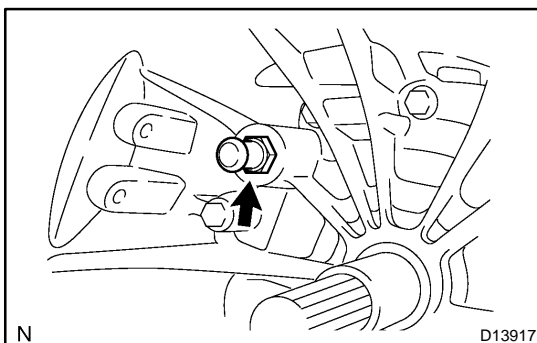
4. REMOVE DRAIN PLUG

5. REMOVE FILLER PLUG

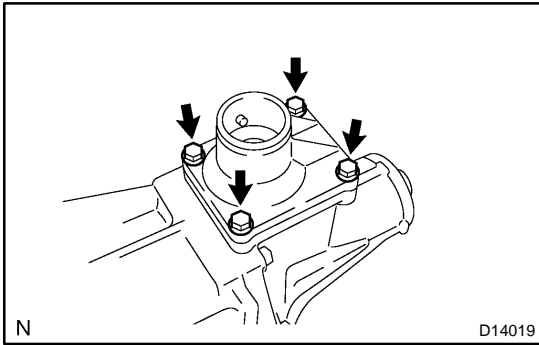


6. REMOVE PLUG

Remove the plug from the front case.

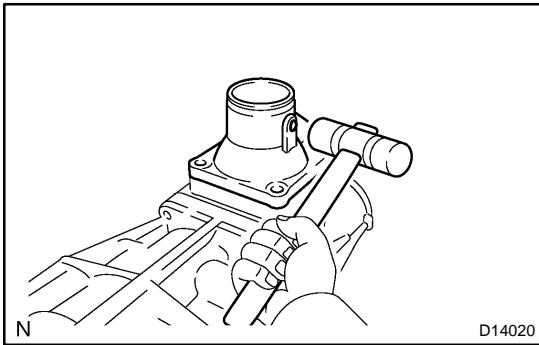


7. REMOVE RELEASE FORK SUPPORT

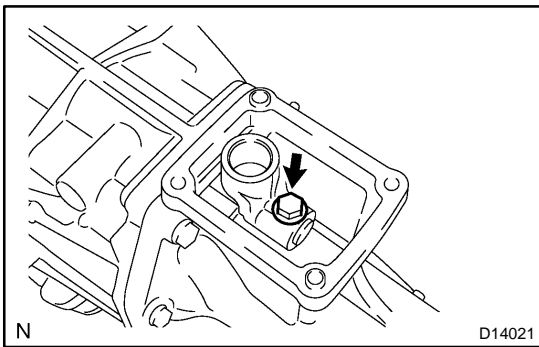


8. REMOVE CONTROL RETAINER

(a) Remove the 4 bolts from the control retainer.

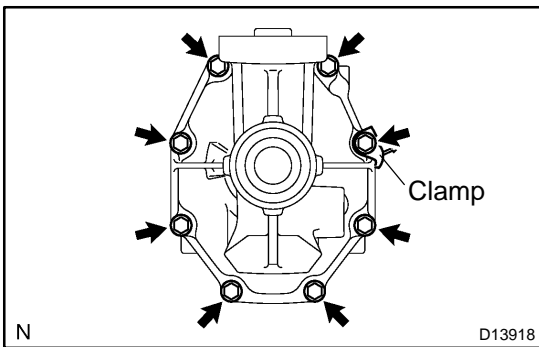


(b) Using a plastic hammer, remove the control retainer.

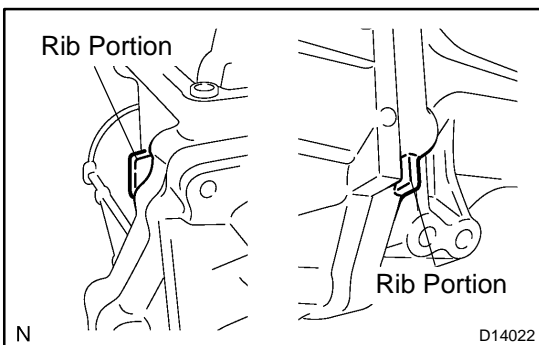


9. REMOVE EXTENSION HOUSING

(a) Remove the bolt from the shift lever housing.



(b) Remove the 8 bolts and clamp.

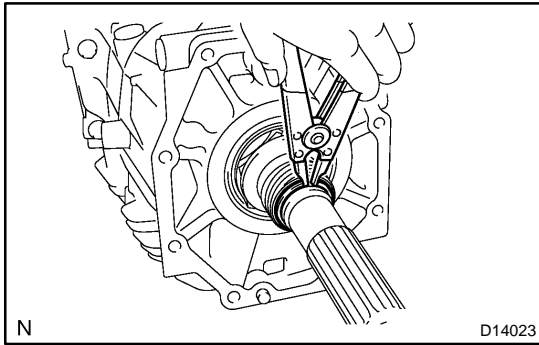


(c) Using a plastic hammer, carefully tap out the extension housing.

HINT:

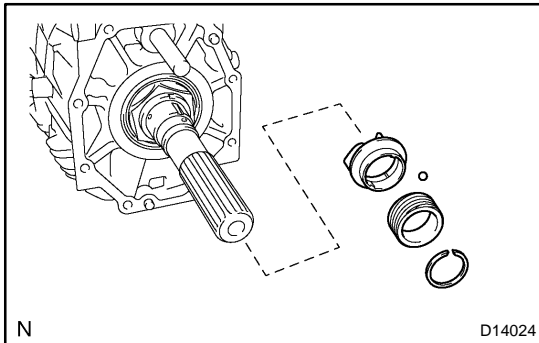
Place the brass bar against the rib portion of the case.

(d) Remove the shift lever housing.

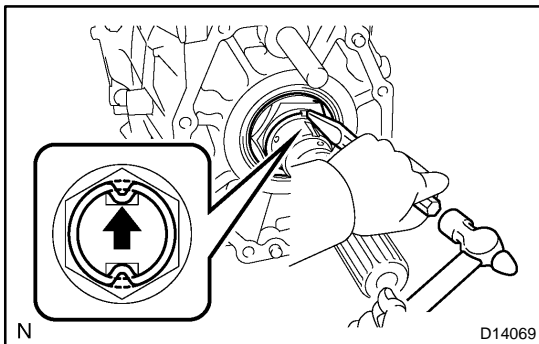


10. REMOVE SPEEDOMETER DRIVE GEAR

- (a) Using a snap ring expander, remove the snap ring.

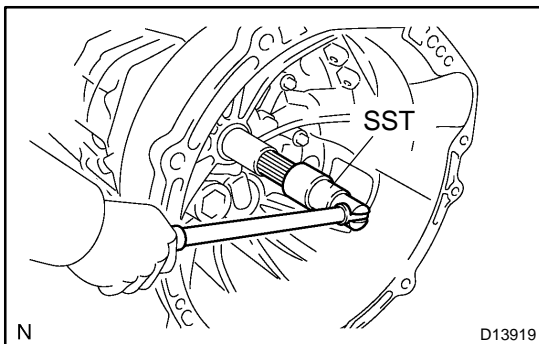


- (b) Remove the speedometer drive gear, ball and oil receiver pipe.

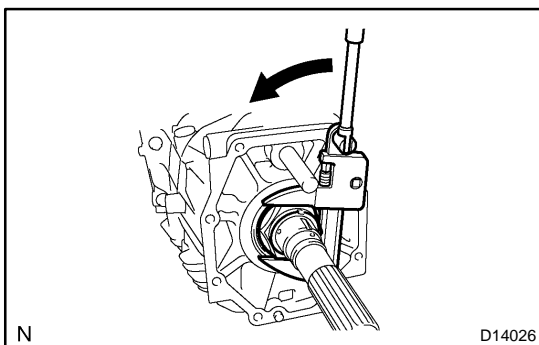


11. REMOVE OUTPUT SHAFT ADJUST NUT

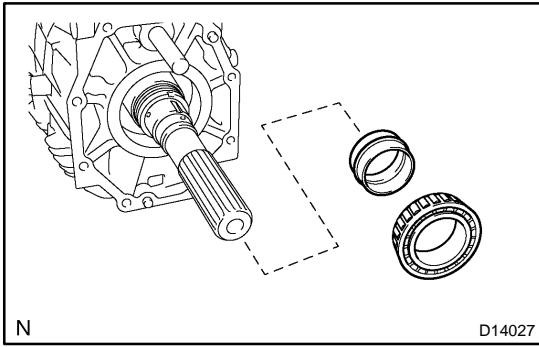
- (a) Using a chisel and hammer, unstake the nut.



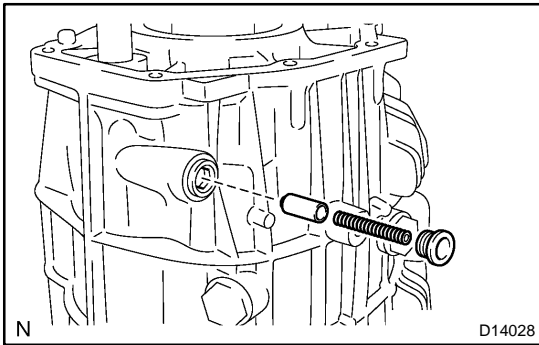
- (b) Shift to fifth gear, and then hold the input shaft with SST. SST 09556-16030
- (c) Using a belt and wooden block, fasten the transmission to the work bench.



- (d) Using SST, remove the nut from the output shaft. SST 09922-10010
- (e) Remove the belt and wooden block from the transmission.

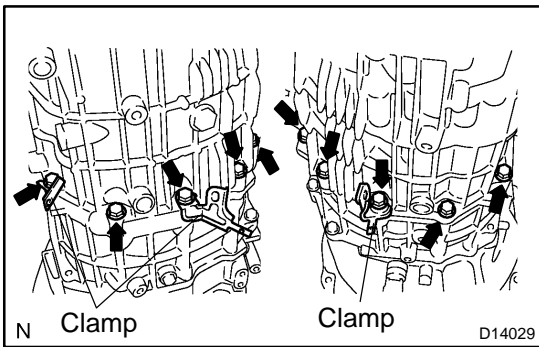


(f) Remove the taper roller bearing No.2 and spacer.

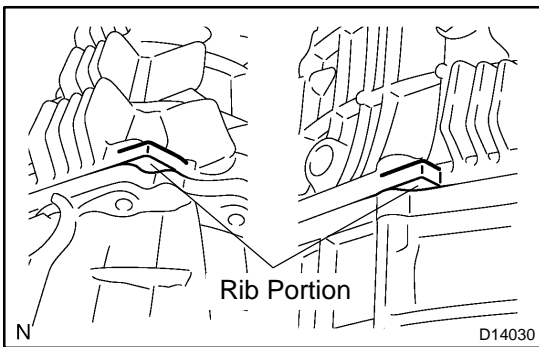


12. REMOVE REAR CASE

(a) Remove the plug, spring and lock ball pin.



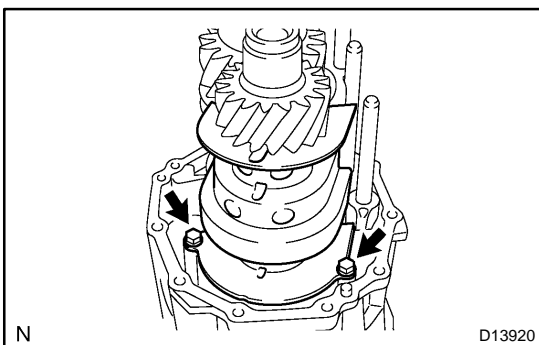
(b) Remove the 10 bolts and 3 clamps.



(c) Using a plastic hammer, carefully tap out the rear case.

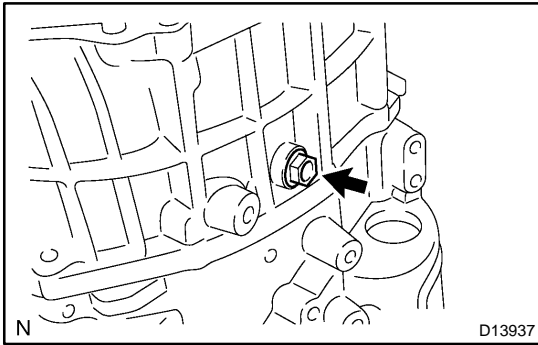
HINT:

Place the brass bar against the rib portion of the case.



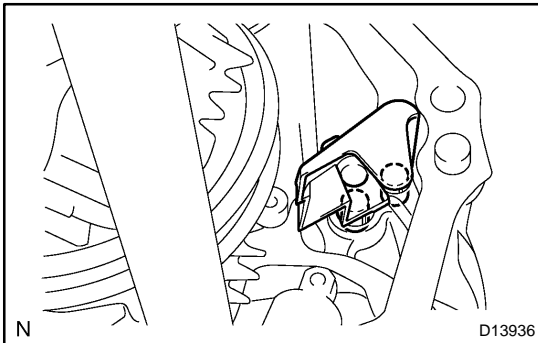
13. REMOVE TRANSMISSION OIL SEPARATOR

Remove the 2 bolts and transmission oil separator.



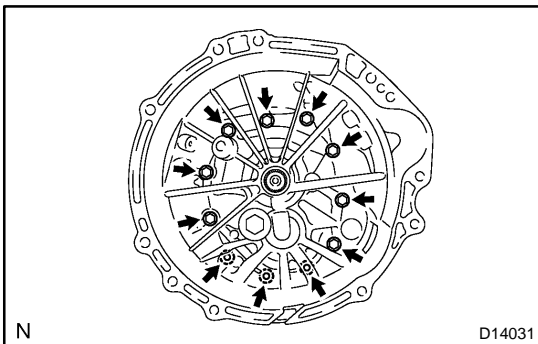
14. REMOVE REVERSE IDLER GEAR SHAFT BOLT

Remove the reverse idler gear shaft bolt and gasket.

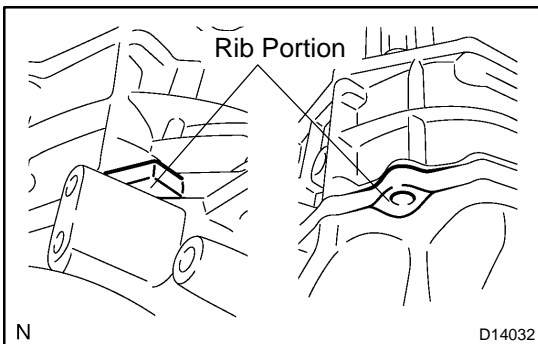


15. REMOVE MIDDLE CASE

(a) Remove the oil receiver pipe from the middle case.



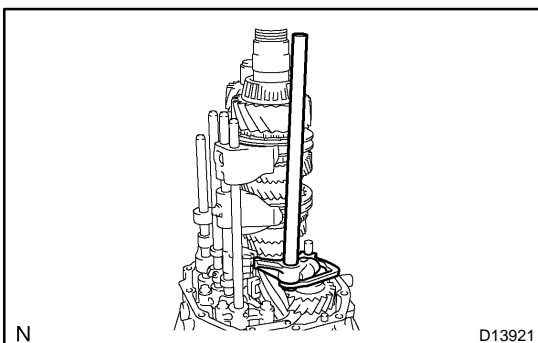
(b) Remove the 11 bolts from the middle case.



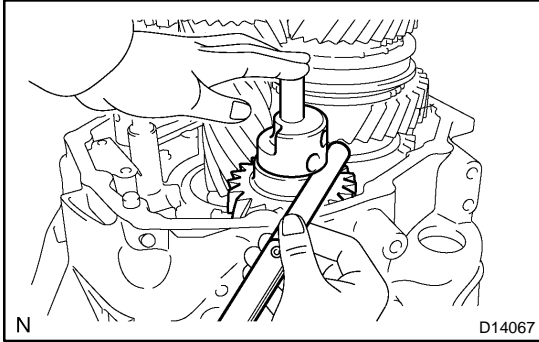
(c) Using a plastic hammer, carefully tap out the middle case.

HINT:

Place the brass bar against the rib portion of the case.



16. REMOVE SHIFT & SELECT LEVER SHAFT



17. INSPECT REVERSE IDLER GEAR THRUST CLEARANCE

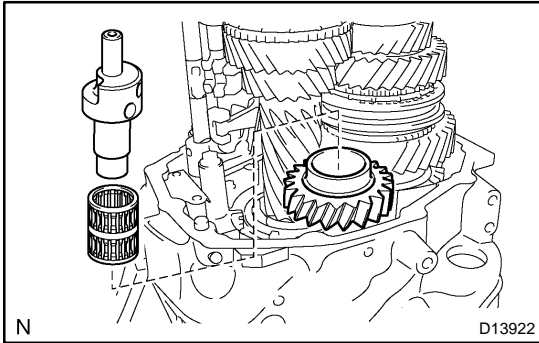
Using a feeler gauge, measure the thrust clearance.

Standard clearance:

0.10 to 0.55 mm (0.0039 to 0.0217 in.)

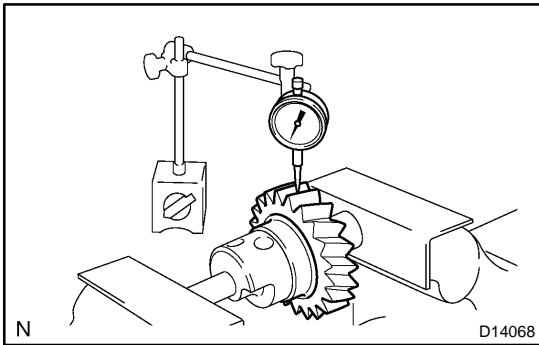
Maximum clearance:

0.55 to (0.0217 in.)



18. REMOVE REVERSE IDLER GEAR

Remove the reverse idle gear shaft, needle roller bearing and reverse idler gear.



19. INSPECT REVERSE IDLER GEAR RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance.

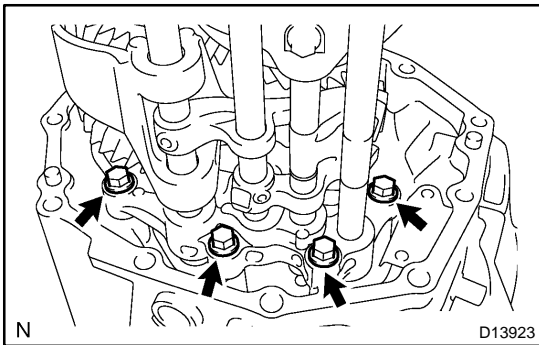
Standard clearance:

0.015 to 0.050 mm (0.0006 to 0.0020 in.)

Maximum clearance:

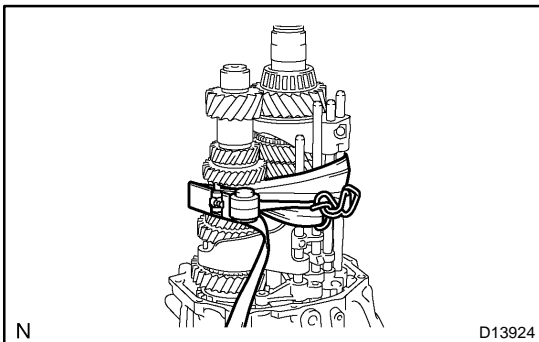
0.050 mm (0.0020 in.)

If the clearance exceeds the maximum, replace the needle roller bearing.

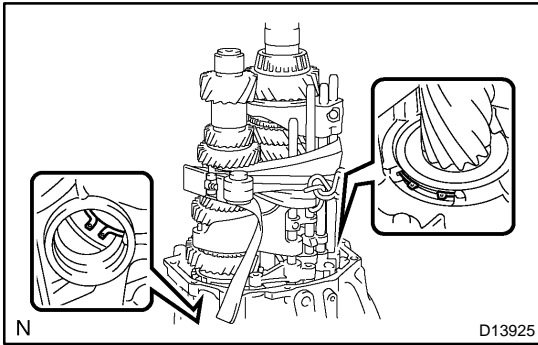


20. REMOVE OUTPUT SHAFT, INPUT SHAFT, COUNTER GEAR SHAFT AND CONTROL SUB ASSEMBLY

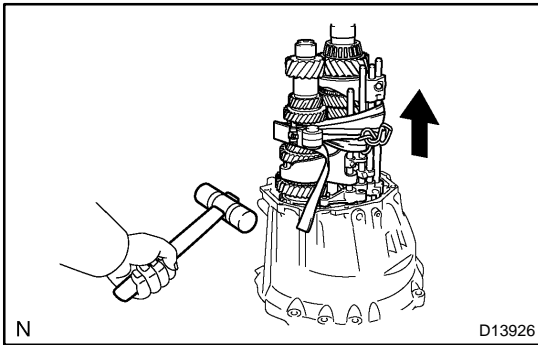
(a) Remove the 4 bolts from the control sub assembly.



(b) Securely bind the output shaft, input shaft, counter gear shaft and control sub assembly together with a belt, etc.



- (c) While expanding the 2 snap rings, raise the output shaft, input shaft, counter gear shaft and control sub assembly.



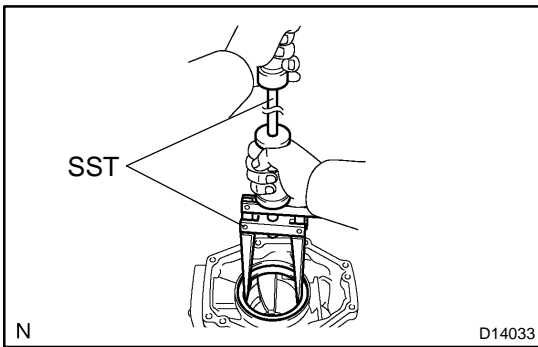
- (d) While tapping on the front case with a plastic hammer, remove the output shaft, input shaft, counter gear shaft and control sub assembly as a unit.

NOTICE:

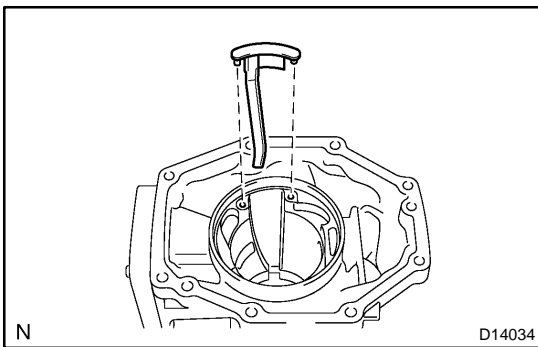
Do not strike the front case with excessive force. If the output shaft, input shaft, counter gear shaft and control sub assembly are subjected to a strong impact, the balls or springs may fly out of the clutch hubs.

- (e) Separate the output shaft, input shaft, counter gear shaft and control sub assembly.

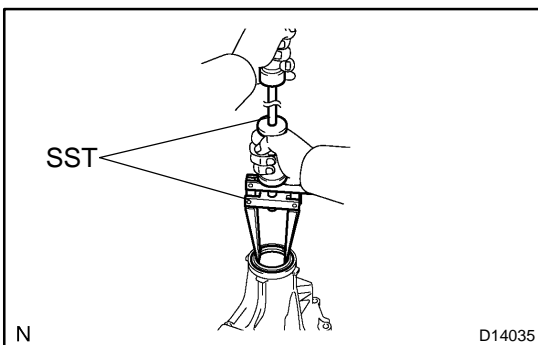
21. DISASSEMBLE EXTENSION HOUSING



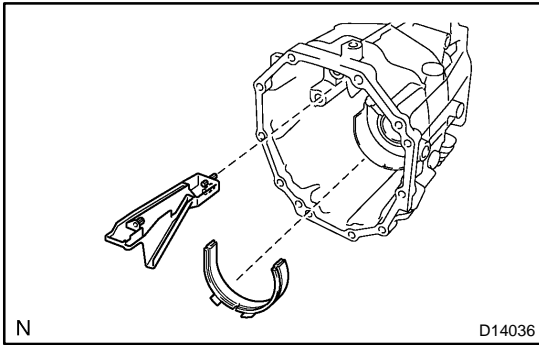
- (a) Using SST, remove the oil separator.
SST 09308-55010, 09520-00031



- (b) Remove the oil receiver pipe.

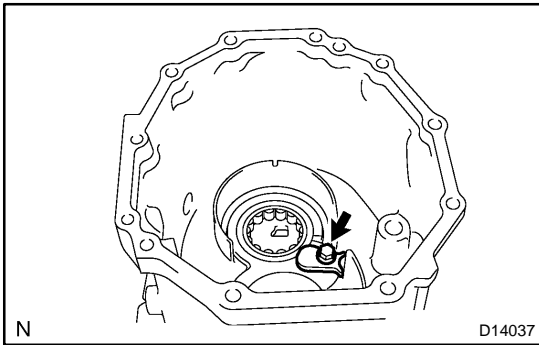


- (c) Using SST, remove the oil seal.
SST 09308-55010, 09520-00031

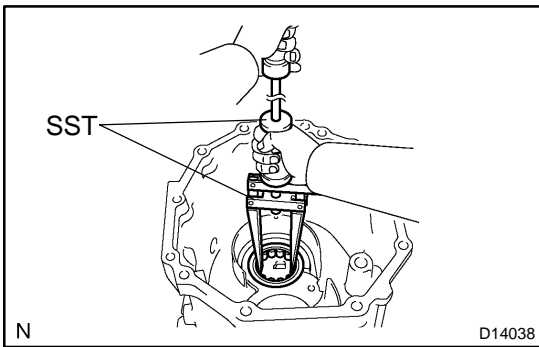


22. DISASSEMBLE REAR CASE

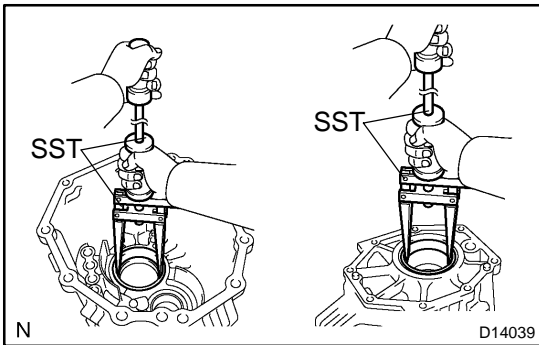
- (a) Remove the transmission oil separator seal from the rear case.
- (b) Remove the oil receiver pipe from the rear case.



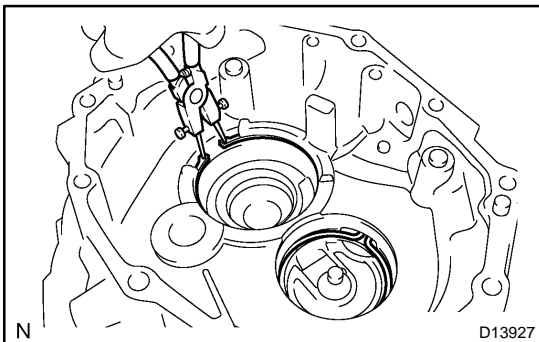
- (c) Remove the bolt and bearing lock plate from the rear case.



- (d) Using SST, remove the counter gear rear bearing.
SST 09308-55010, 09520-00031

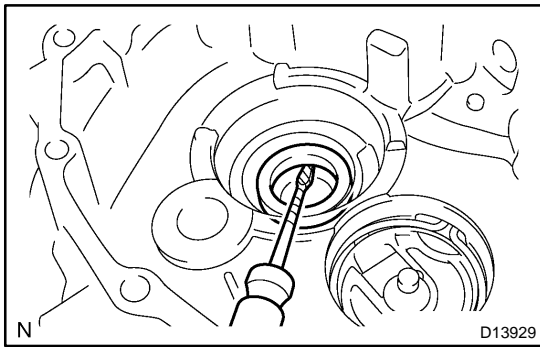


- (e) Using SST, remove the 2 bearing outer races.
SST 09308-55010, 09520-00031

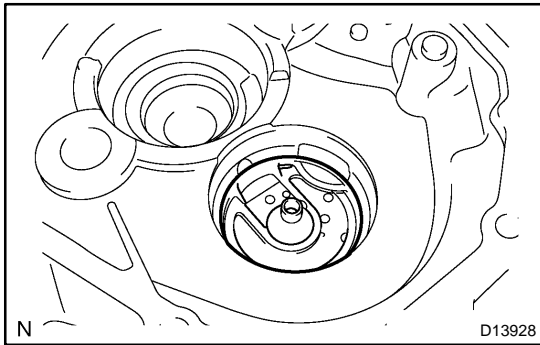


23. DISASSEMBLE FRONT CASE

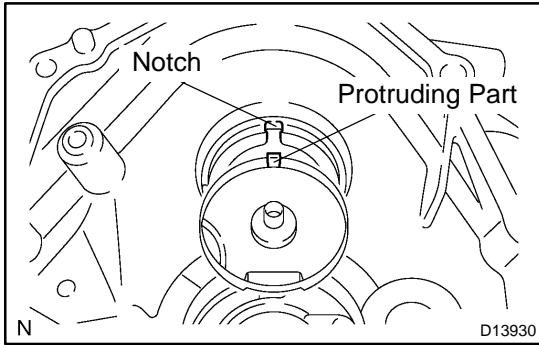
- (a) Using snap ring pliers, remove the 2 snap rings.



- (b) Using a screwdriver, remove the oil seal.
HINT:
Tape the screwdriver tip before use.



- (c) Remove the oil receiver pipe.



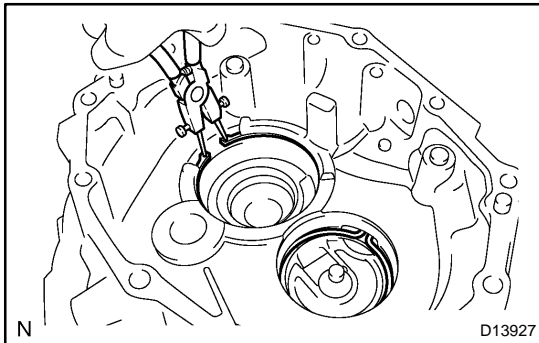
REASSEMBLY

1. REASSEMBLE FRONT CASE

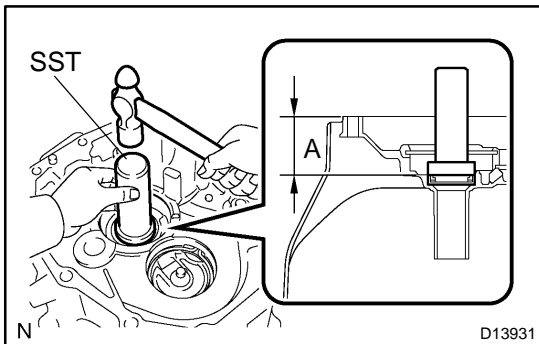
- (a) Install the oil receiver pipe to the front case.

HINT:

Make sure that the protruding part on the oil receiver pipe is fitted into the notch on the front case.



- (b) Using snap ring pliers, install the 2 snap rings.

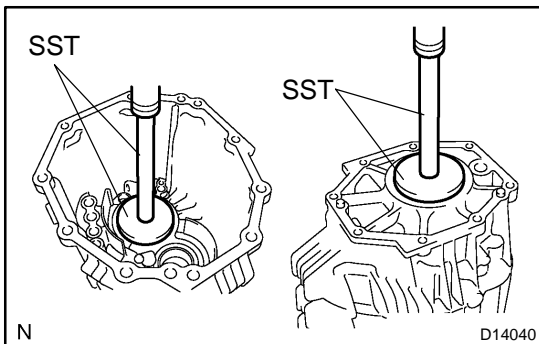


- (c) Using SST and a hammer, tap in a new oil seal to the clutch housing until dimension A falls within the specified range.

SST 09388-40010

Dimension A: 60.0 to 60.8 mm (2.362 to 2.394 in.)

- (d) Apply gear oil to the lip of the oil seal.

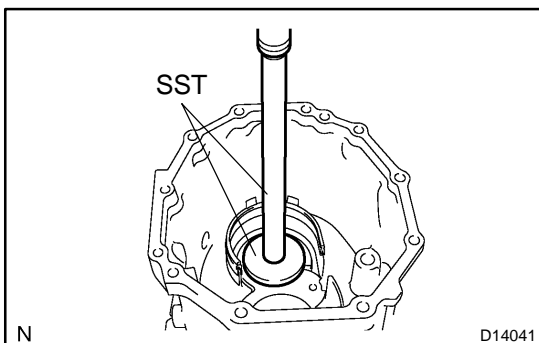


2. REASSEMBLE REAR CASE

- (a) Using SST and a press, press in 2 new bearing outer races.

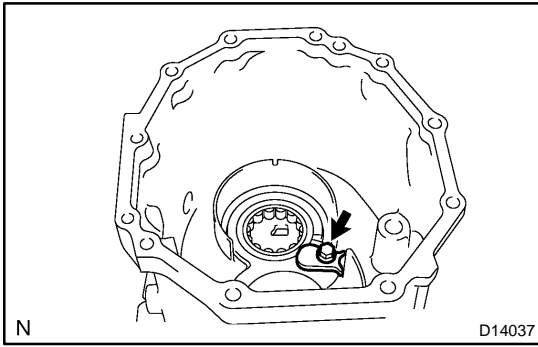
SST 09950-60020 (09951-00790, 09951-00850)

09950-70010 (09951-07100, 09951-07360)

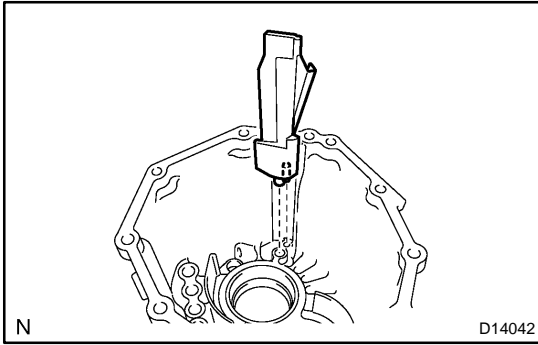


- (b) Using SST and a press, press in a new counter gear rear bearing.

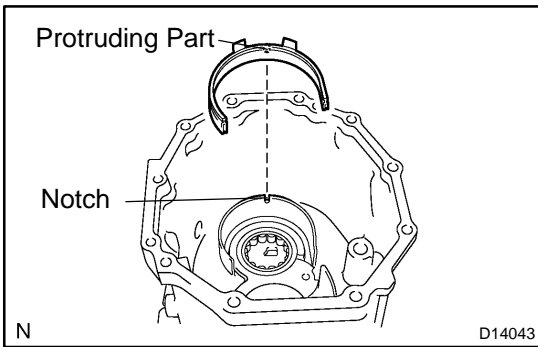
SST 09950-60010 (09951-00650), 09950-70010 (09951-07360)



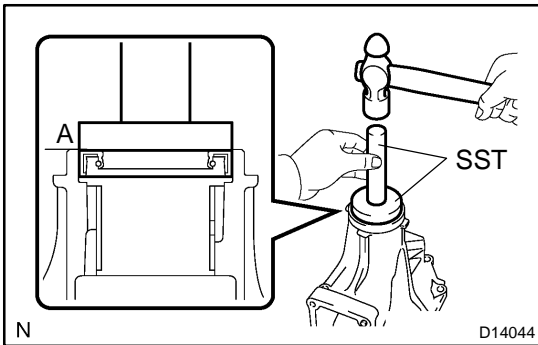
- (c) Install the bearing lock plate with the bolt.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)



- (d) Install the oil receiver pipe to the rear case.
HINT:
 Make sure that the protruding part on the oil receiver pipe is fitted into the hole on the rear case.



- (e) Install the transmission oil separator seal to the rear case.
HINT:
 Make sure that the protruding part on the transmission oil separator seal is fitted into the notch on the rear case.



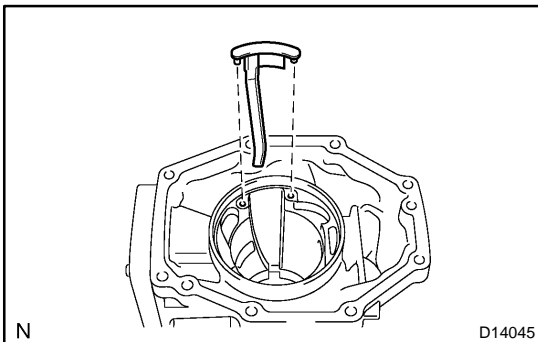
3. REASSEMBLE EXTENSION HOUSING

- (a) Using SST and a hammer, tap in a new oil seal to the extension housing until dimension A falls within the specified range.

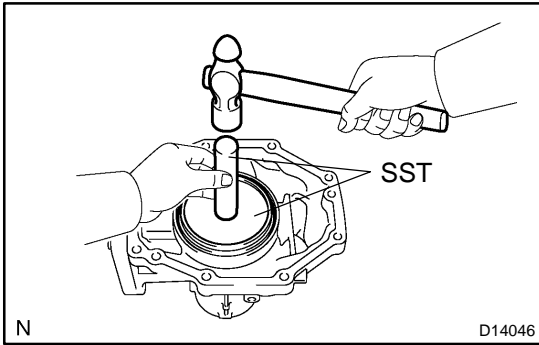
SST 09950-60020 (09951-00640), 09950-70010 (09951-07100)

Dimension A: -0.5 to 0.5 mm (-0.0197 to 0.0197 in.)

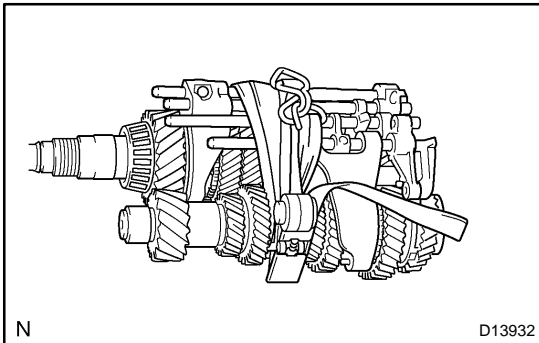
- (b) Apply gear oil to the lip of the oil seal.



- (c) Install the oil receiver pipe to the extension housing.
HINT:
 Make sure that the protruding parts on the oil receiver pipe is fitted into the holes on the extension housing.

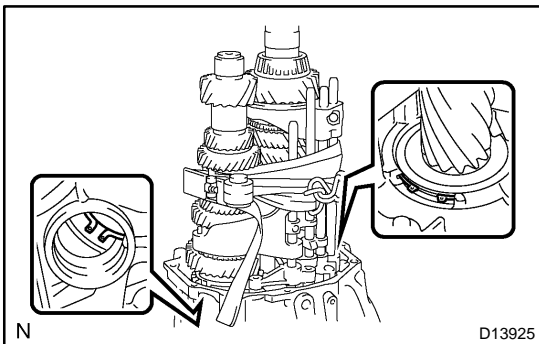


- (d) Using SST and a hammer, install a new oil separator.
SST 09255-10012, 09950-70010 (09951-07100)



4. INSTALL OUTPUT SHAFT, INPUT SHAFT, COUNTER GEAR SHAFT AND CONTROL SUB ASSEMBLY

- (a) Apply gear oil to the sliding surfaces and gear teeth.
(b) Temporarily assembly the output shaft, input shaft, counter gear shaft and control sub assembly, and bind them together with a belt, etc.

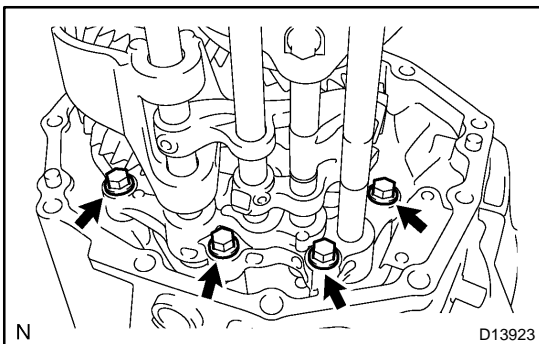


- (c) While expanding the 2 snap rings with snap ring pliers, install the output shaft, input shaft, counter gear shaft and control sub assembly.

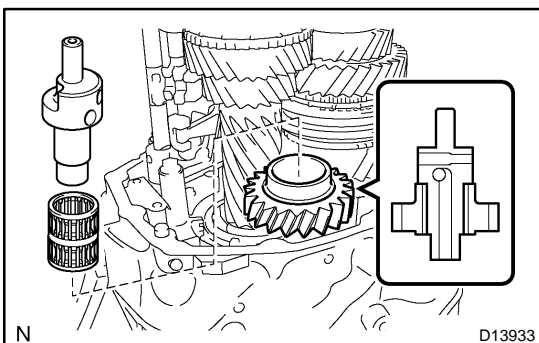
HINT:

Make sure that the snap rings are securely fitted into the grooves on the front bearings of the input shaft and counter gear shaft.

- (d) Remove the device binding the output shaft, input shaft, counter gear shaft and control sub assembly.



- (e) Install the 4 bolts to the control sub assembly.
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

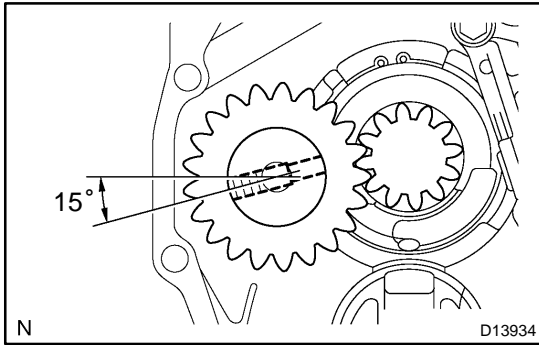


5. INSTALL REVERSE IDLER GEAR

- (a) Install the reverse idler gear, needle roller bearing and reverse idler gear shaft.

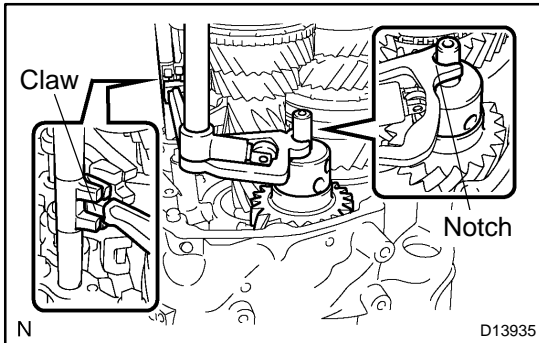
HINT:

Make sure that the reverse idler gear is installed in the direction shown in the illustration.



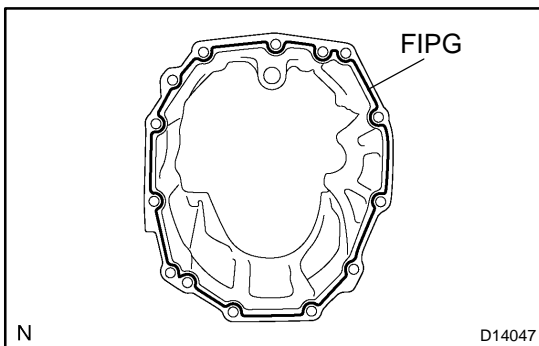
NOTICE:

Make sure that the screw hole of the reverse idler shaft is positioned as shown in the illustration.



6. INSTALL SHIFT & SELECT LEVER SHAFT

Fit the notch of the shift & select cam to the reverse idler gear shaft, and the claw to the gap on the control shaft assembly to install the shift & select lever shaft.

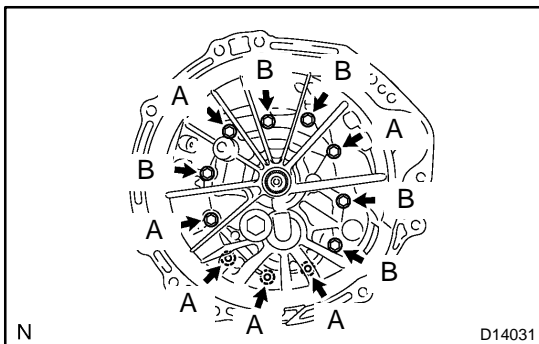


7. INSTALL MIDDLE CASE

(a) Apply FIPG to the middle case as shown in the illustration.

FIPG:

Part No. 08826-00090, THREE BOND 1281 or equivalent



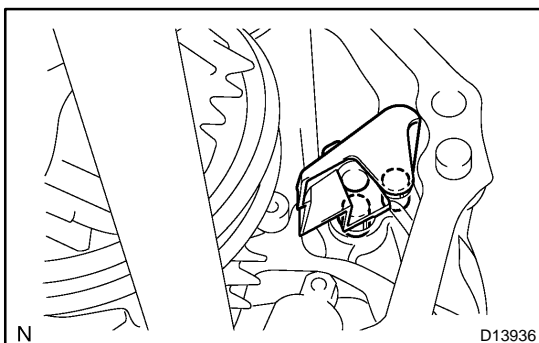
(b) Install the middle case to the front case with the 11 bolts.

Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)

Bolt length:

Bolt A: 40 mm (1.57 in.)

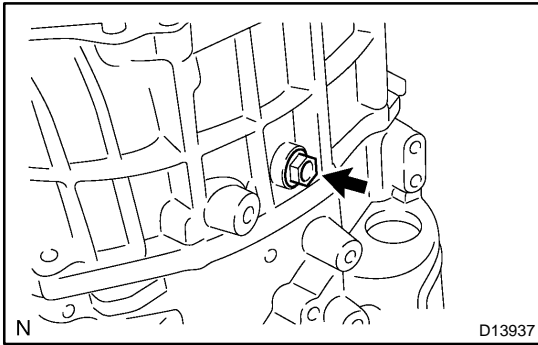
Bolt B: 80 mm (3.15 in.)



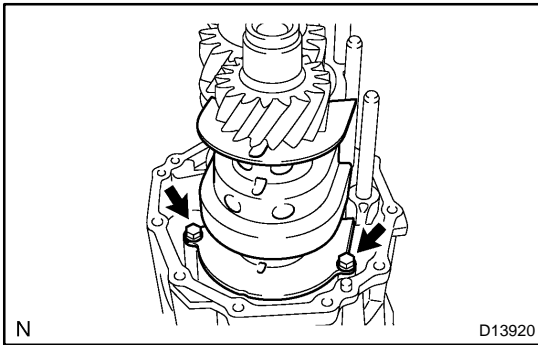
(c) Install the oil receiver pipe to the middle case.

HINT:

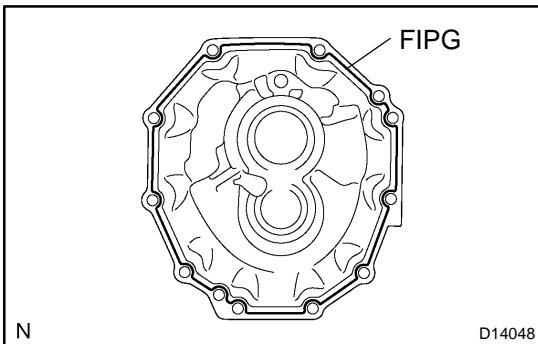
Make sure that the protruding parts on the receiver pipe are fitted into the holes on the middle case.



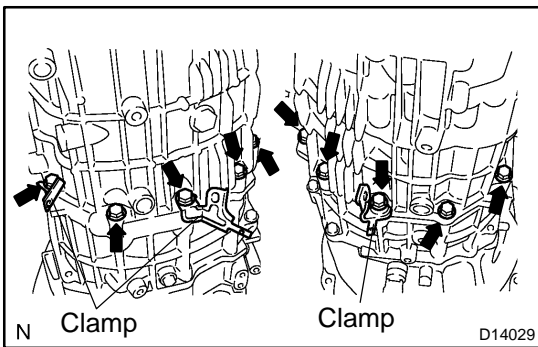
- 8. INSTALL REVERSE IDLER GEAR SHAFT BOLT**
 Install a new gasket and the reverse idler gear shaft bolt.
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)



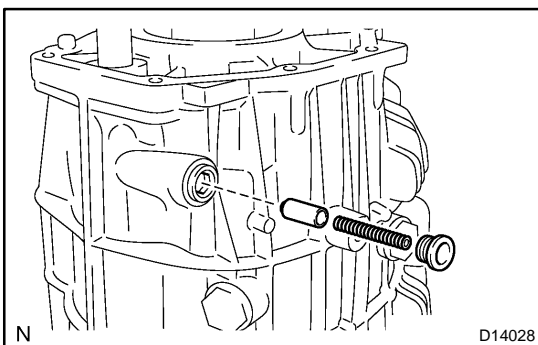
- 9. INSTALL TRANSMISSION OIL SEPARATOR**
 Install the transmission oil separator with the 2 bolts.
Torque: 8.5 N·m (87 kgf·cm, 75 in·lbf)



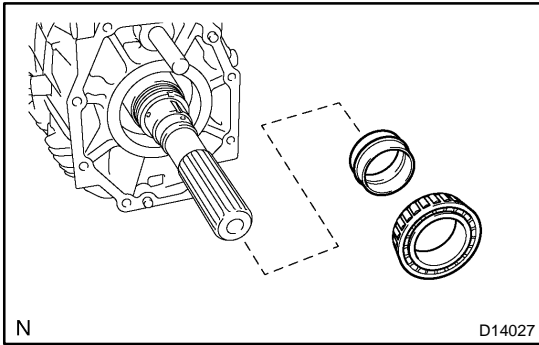
- 10. INSTALL REAR CASE**
 (a) Apply FIPG to the rear case as shown in the illustration.
FIPG:
Part No. 08826-00090, THREE BOND 1281 or equivalent



- (b) Install the rear case to the middle case with the 10 bolts and 3 clamps.
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)

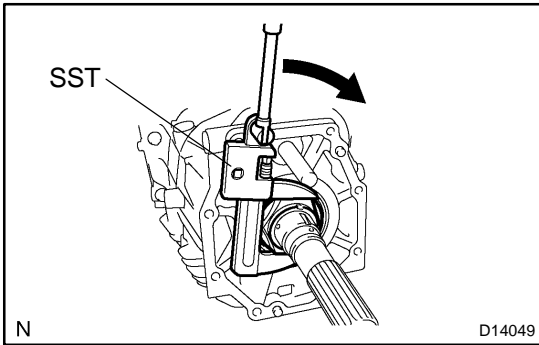


- (c) Install the lock ball pin, spring and a new plug.
Torque: 24.5 N·m (250 kgf·cm, 18 ft·lbf)



11. INSTALL OUTPUT SHAFT ADJUST NUT

- (a) Using a belt and wooden block, fasten the transmission to the work bench.
- (b) Install a new spacer and the output shaft taper roller bearing No.2.



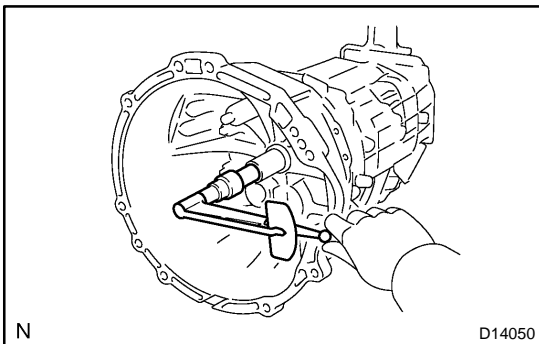
- (c) Using SST, temporarily tighten a new nut until the looseness in the output shaft is eliminated.

HINT:

Do not apply preload.

SST 09922-10010

- (d) Turn the output shaft 15 times to settle the bearing.



- (e) Shift to fifth gear, measure the starting torque and note it down.

- (f) Using SST, tighten the nut.

Torque:(Reference)

220 N·m (2,240 kgf·cm, 162 ft·lbf)

SST 09922-10010

- (g) Shift to fifth gear, measure the starting torque and note it down.

- (h) Make sure that the difference between the values measured at steps (e) and (g) is within the specified range.

Preload (at starting):

0.45 to 1.35 N·m

(4.59 to 13.77 kgf·cm, 3.98 to 11.95 in·lbf)

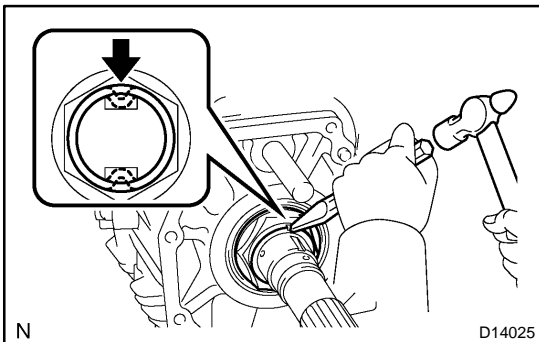
If the result is not as specified, tighten and adjust the output shaft adjust nut.

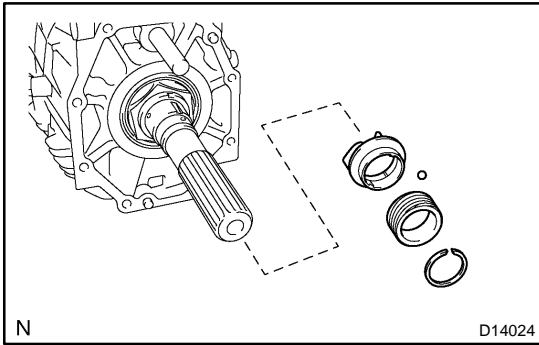
NOTICE:

Do not loosen or remove the output shaft adjust nut to adjust preload.

If the nut is loosened or removed, or if the preload exceeds the specified range, replace the spacer with a new one.

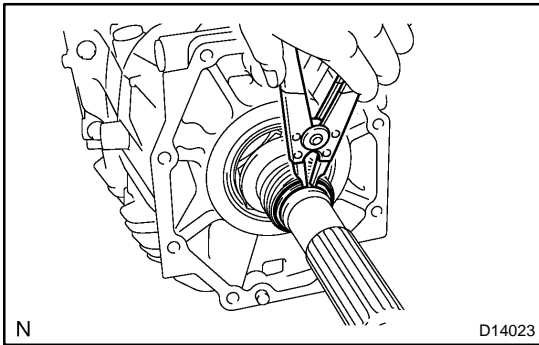
- (i) Using a chisel and hammer, stake the output shaft adjust nut.



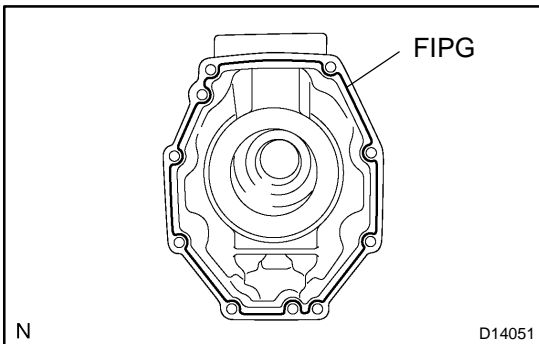


12. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the oil receiver pipe, ball and speedometer drive gear.



(b) Using a snap ring expander, install the snap ring.

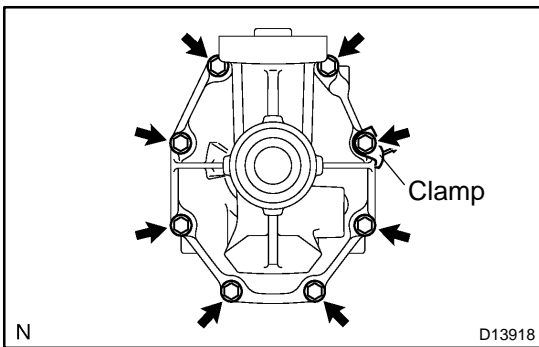


13. INSTALL EXTENSION HOUSING

(a) Apply FIPG to the extension housing as shown in the illustration.

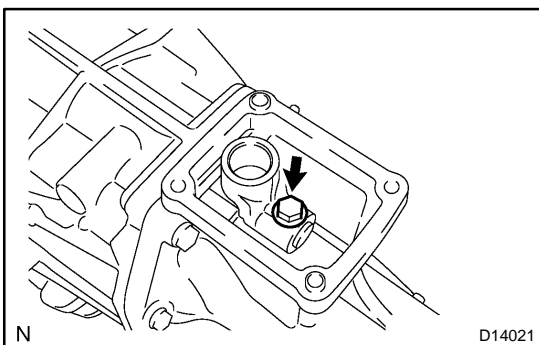
FIPG:

Part No. 08826-00090, THREE BOND 1281 or equivalent



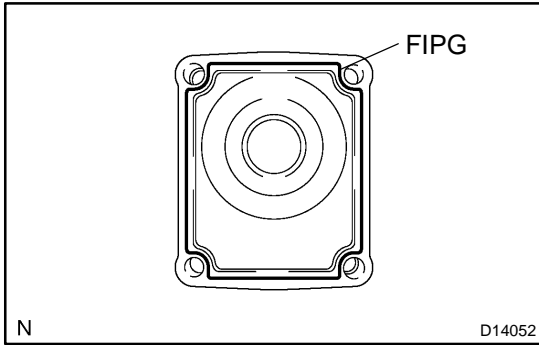
(b) Install the extension housing and shift lever housing to the rear case with the 8 bolts and clamp.

Torque: 29 N·m (296 kgf-cm, 21 ft-lbf)



(c) Install the bolt to the shift lever housing.

Torque: 33 N·m (340 kgf-cm, 25 ft-lbf)

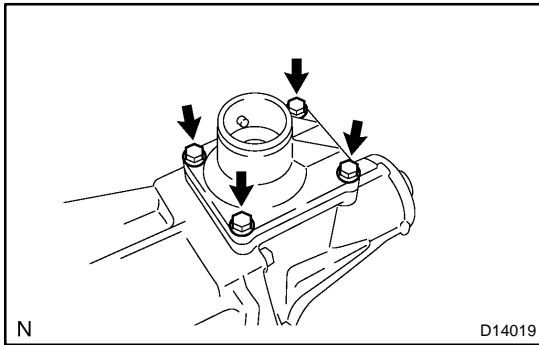


14. INSTALL CONTROL RETAINER

- (a) Apply FIPG to the control retainer as shown in the illustration.

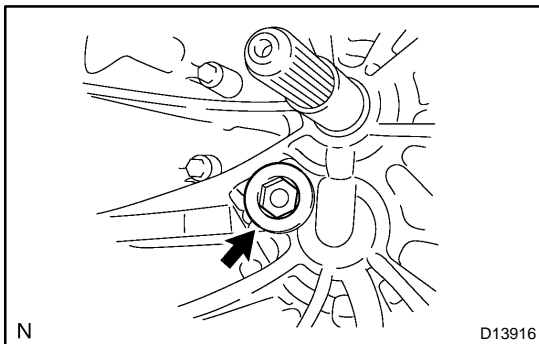
FIPG:

Part No. 08826-00090, THREE BOND 1281 or equivalent



- (b) Install the control retainer to the extension housing with the 4 bolts.

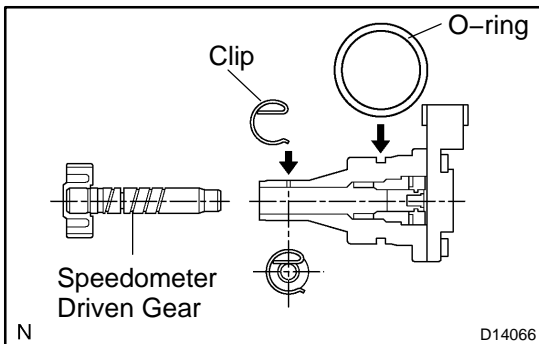
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



15. INSTALL PLUG

Install the plug to the clutch housing.

Torque: 39 N·m (397 kgf·cm, 29 ft·lbf)

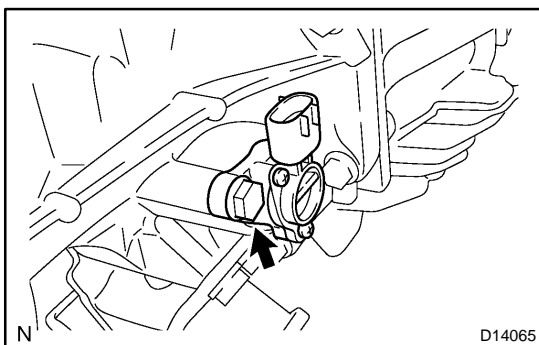


16. INSTALL SPEEDOMETER DRIVEN GEAR

- (a) Install a new O-ring to the speedometer shaft sleeve.
 (b) Install the speedometer driven gear to the speedometer sensor with the clip.

NOTICE:

Make sure to install the clip in the direction shown in the illustration.

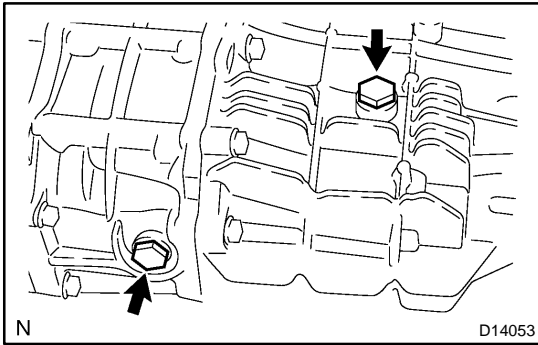


- (c) Install the speedometer sensor with the bolt.

Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)

17. INSTALL EXTENSION HOUSING DEFLECTOR

Using a plastic hammer, install the deflector.

**18. INSTALL DRAIN PLUG**

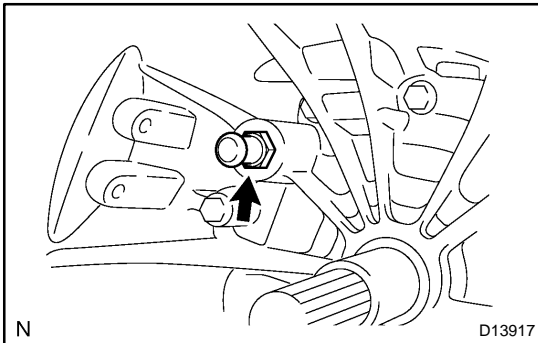
Install a new gasket and the drain plug.

Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)

19. INSTALL FILLER PLUG

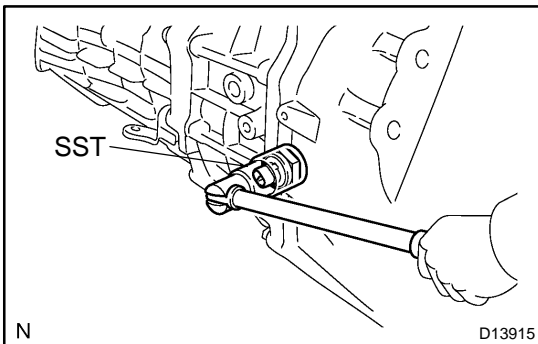
Install a new gasket and the filler plug.

Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)

**20. INSTALL RELEASE FORK SUPPORT**

Install the release fork support to the clutch housing.

Torque: 47 N·m (480 kgf-cm, 35 ft-lbf)

**21. INSTALL BACK-UP LAMP SWITCH**

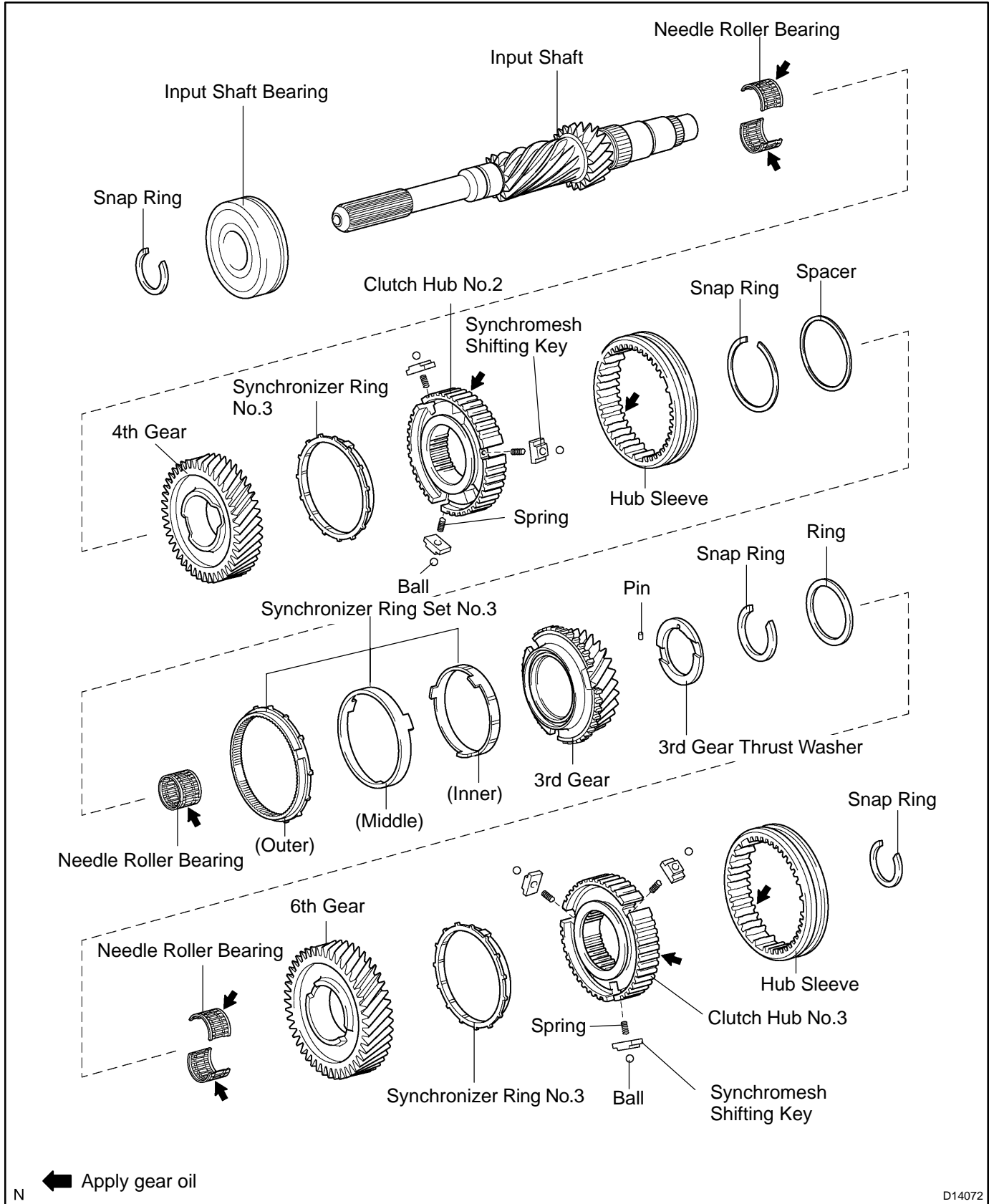
Using SST, install the back-up lamp switch.

SST 09817-16011

Torque: 44 N·m (449 kgf-cm, 32 ft-lbf)

INPUT SHAFT COMPONENTS

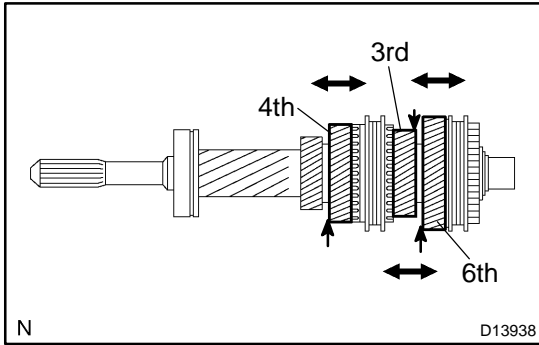
MT0HU-01



N

← Apply gear oil

D14072



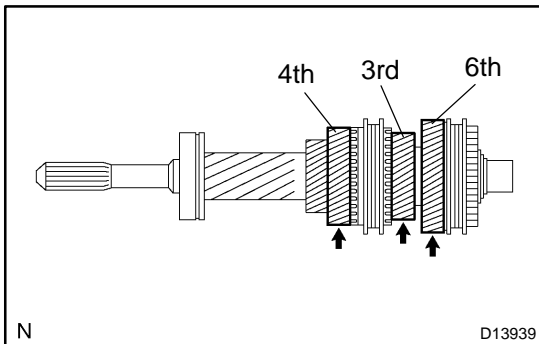
DISASSEMBLY

1. INSPECT EACH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the clearance between the gear and the shaft.

Standard gear thrust clearance:

Gear	Thrust Clearance mm (in.)
3rd	0.09 to 0.52 (0.0035 to 0.0205)
4th	0.12 to 0.38 (0.0047 to 0.0150)
6th	0.20 to 0.49 (0.0079 to 0.0193)



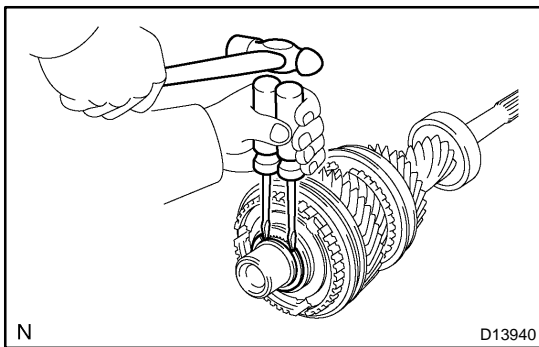
2. INSPECT EACH GEAR RADIAL CLEARANCE

Using a dial indicator, measure the clearance between the gear and the shaft with the needle roller bearing installed.

Standard gear radial clearance:

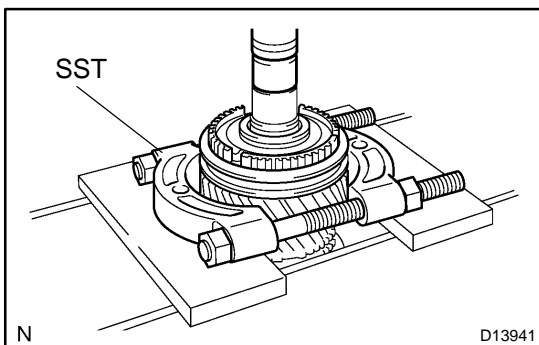
Gear	Radial Clearance mm (in.)
3rd and 4th	0.015 to 0.067 (0.00059 to 0.00264)
6th	0.015 to 0.065 (0.00059 to 0.00256)

If necessary, replace the gear, needle roller bearing or shaft.



3. REMOVE 6TH GEAR

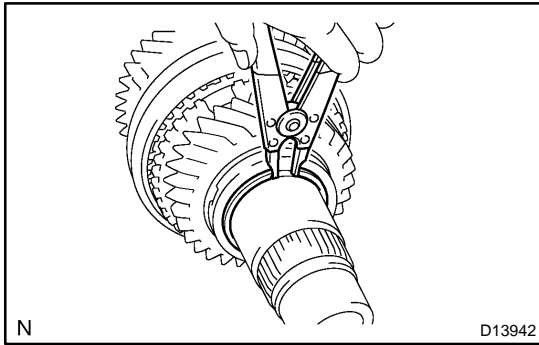
(a) Using 2 screwdrivers and a hammer, remove the snap ring.



(b) Using SST and a press, remove the clutch hub No.3, hub sleeve, synchronizer ring and 6th gear.

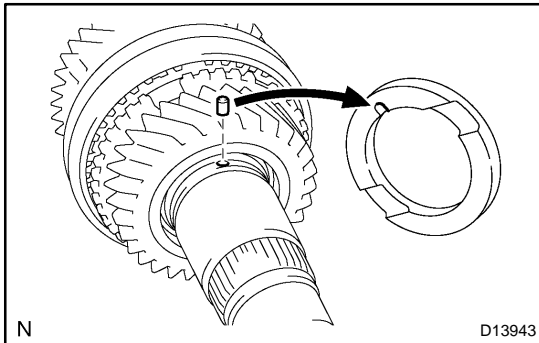
SST 09950-00020

(c) Remove the needle roller bearing and ring.

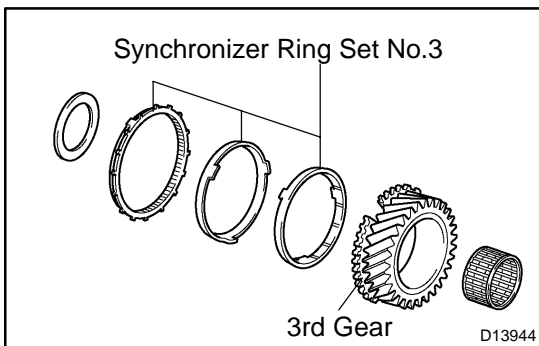


4. REMOVE 3RD GEAR

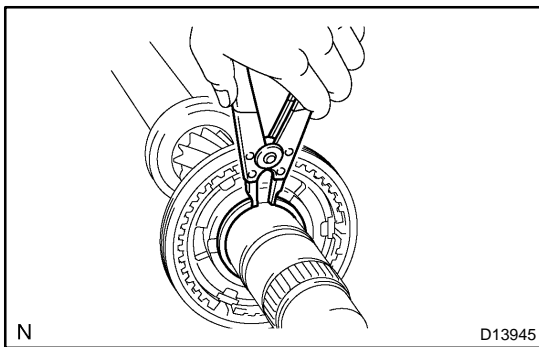
- (a) Using a snap ring expander, remove the snap ring.



- (b) Remove the 3rd gear thrust washer and pin.

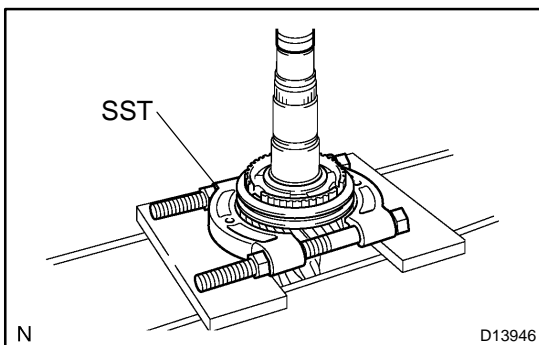


- (c) Remove the 3rd gear, synchronizer ring set No.3, needle roller bearing and spacer.

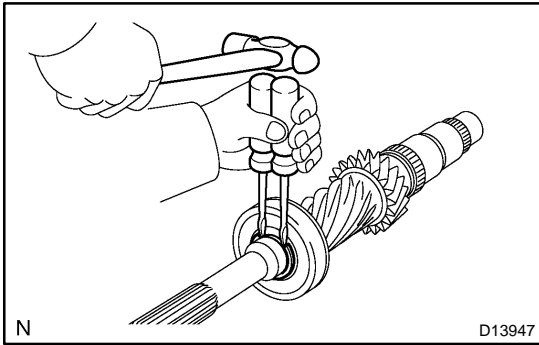


5. REMOVE 4TH GEAR

- (a) Using a snap ring expander, remove the snap ring.

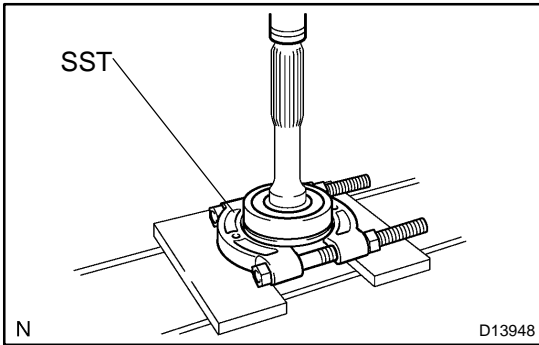


- (b) Using SST and a press, remove the clutch hub No.2, hub sleeve, synchronizer ring and 4th gear.
SST 09950-00020
- (c) Remove the needle roller bearing.

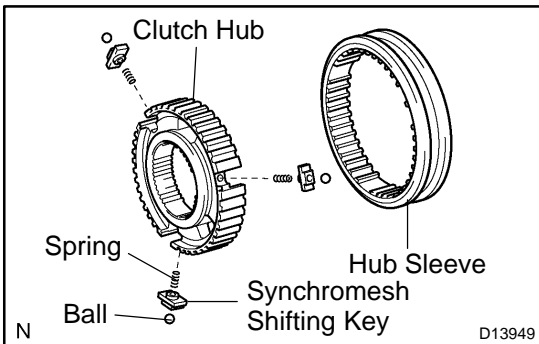


6. REMOVE INPUT SHAFT BEARING

- (a) Using 2 screwdrivers and a hammer, remove the snap ring.



- (b) Using SST and a press, remove the input shaft bearing.
SST 09950-00020

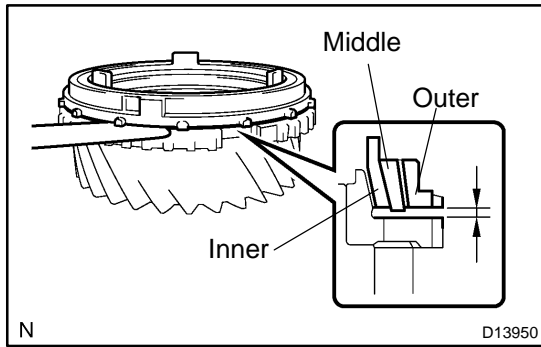


7. REMOVE CLUTCH HUB NO.2 AND NO.3

Remove the clutch hub, 3 synchromesh shifting keys, 3 balls and 3 springs from the hub sleeve.

HINT:

- Be careful not to scatter the balls or springs.
- Use the same procedures to remove the clutch hub No.2 and No.3.



INSPECTION

1. INSPECT SYNCHRONIZER RING SET NO.3

- (a) Using a feeler gauge, measure the clearance between the synchronizer ring set No.3 and the 3rd gear.

Standard clearance:

Inner: 1.20 to 2.20 mm (0.0472 to 0.0866 in.)

Middle: 0.60 to 1.80 mm (0.0236 to 0.0709 in.)

Outer: 0.80 to 1.80 mm (0.0315 to 0.0709 in.)

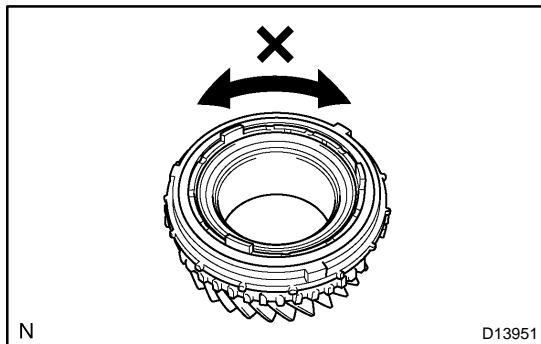
Minimum clearance:

Inner: 1.20 mm (0.0472 in.)

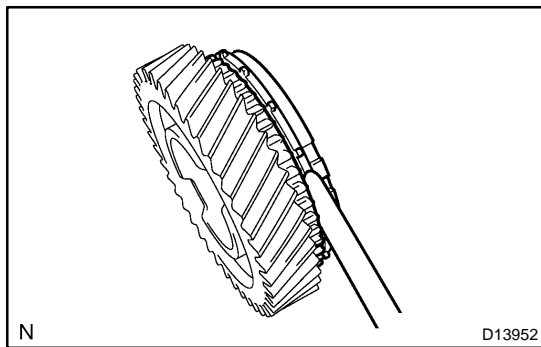
Middle: 0.60 mm (0.0236 in.)

Outer: 0.80 mm (0.0315 in.)

If the clearance is less than the minimum, replace the synchronizer ring set No.3.



- (b) Coat the 3rd gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it against the 3rd gear cone. Check that the ring locks.



2. INSPECT SYNCHRONIZER RING NO.3

- (a) Using a feeler gauge, measure the clearance between the synchronizer ring No.3 and the 4th gear.

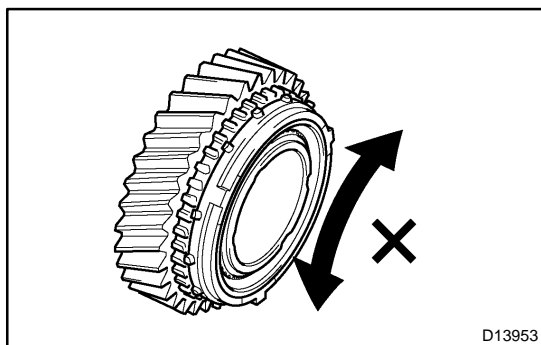
Standard clearance:

0.70 to 1.50 mm (0.0276 to 0.0591 in.)

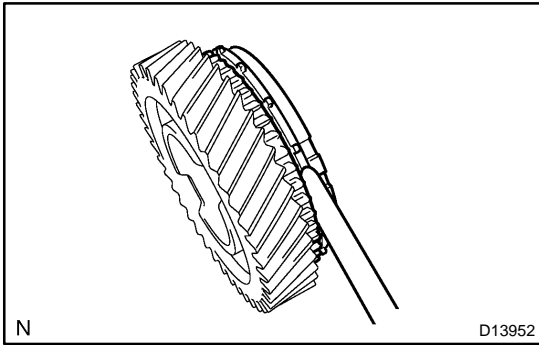
Minimum clearance:

0.70 mm (0.0276 in.)

If the clearance is less than the minimum, replace the synchronizer ring No.3.



- (b) Coat the 4th gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it against the 4th gear cone. Check that the ring locks.



3. INSPECT SYNCHRONIZER RING NO.3

- (a) Using a feeler gauge, measure the clearance between the synchronizer ring No.3 and the 6th gear.

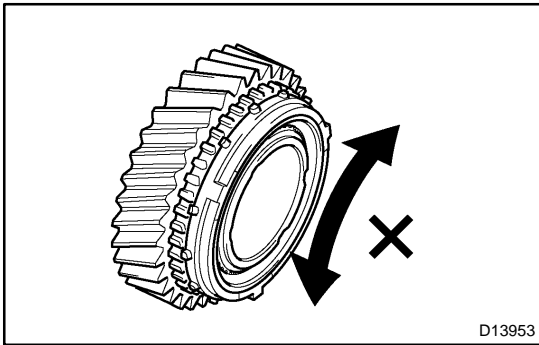
Standard clearance:

0.70 to 1.50 mm (0.0276 to 0.0591 in.)

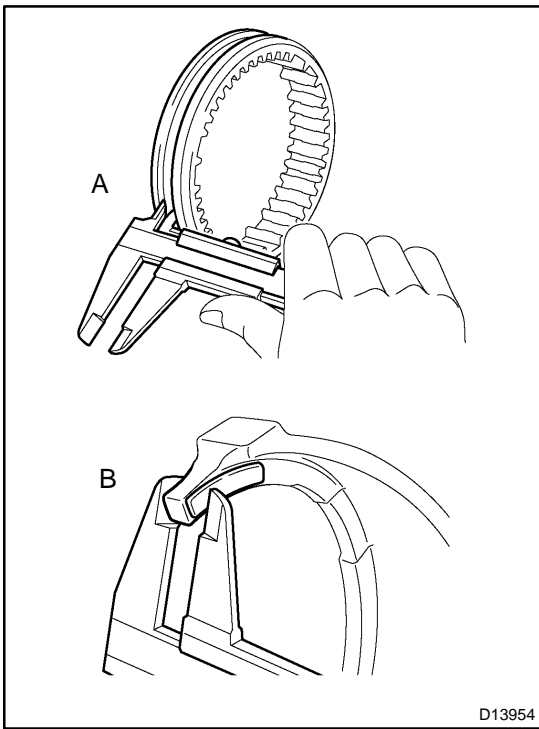
Minimum clearance:

0.70 mm (0.0276 in.)

If the clearance is less than the minimum, replace the synchronizer ring No.3.



- (b) Coat the 6th gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it against the 6th gear cone. Check that the ring locks.



4. INSPECT HUB SLEEVE

- (a) Using a vernier caliper, measure the width of the groove of the hub sleeve (A) and thickness of both the gear shift forks No.2 and No.3 (B) as shown in the illustration.

Width of the groove of the hub sleeve (A):

10.5 to 10.6 mm (0.4134 to 0.4173 in.)

Thickness of the gear shift fork (B):

9.76 to 10.24 mm (0.3843 to 0.4031 in.)

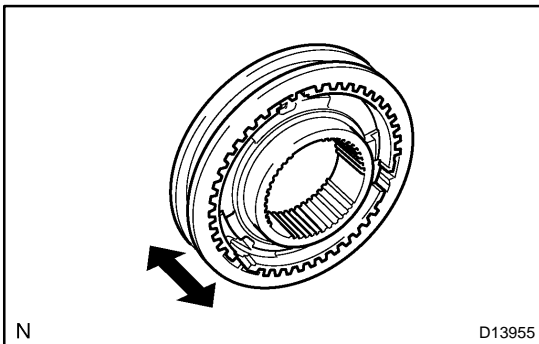
- (b) Calculate the clearance using the formula below.

Formula:

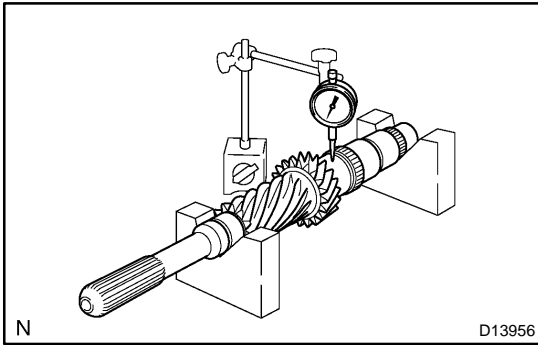
Clearance = A - B

Standard: 0.26 to 0.84 mm (0.0102 to 0.0331 in.)

If the clearance is not as specified, replace the hub sleeve and gear shift fork.



- (c) Make sure that the hub sleeve and clutch hub slide smoothly. If the hub sleeve and clutch hub do not slide smoothly, replace them.

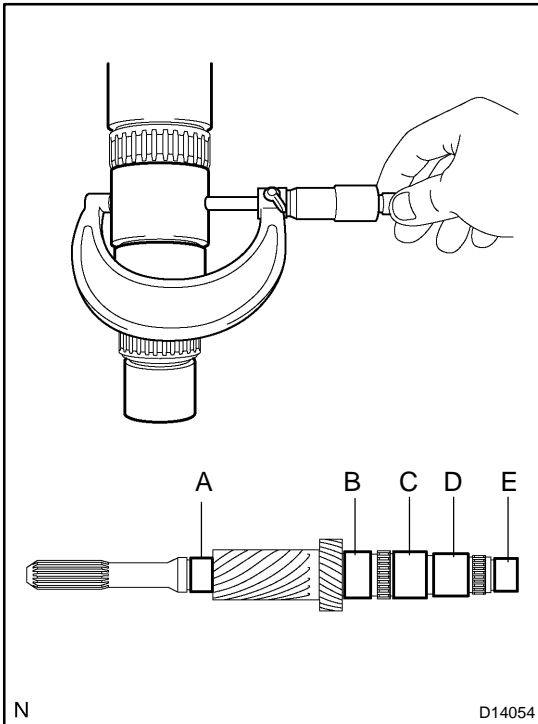


5. INSPECT INPUT SHAFT

(a) Using a dial indicator, measure the shaft runout.

Maximum runout: 0.03 mm (0.0012 in.)

If the runout exceeds the maximum, replace the input shaft.



(b) Using a micrometer, measure the outside diameter of the input shaft journal surface.

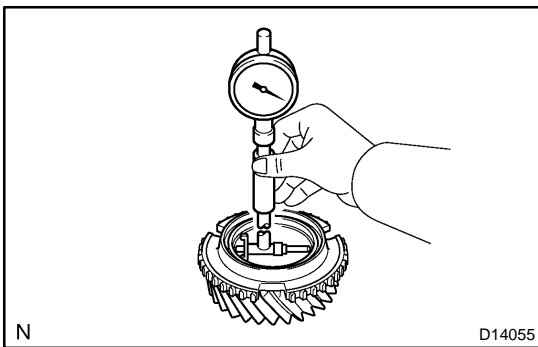
Standard:

Part	Outside diameter mm (in.)
A	34.002 to 34.015 (1.3387 to 1.3392)
B	44.985 to 45.000 (1.7711 to 1.7717)
C	44.985 to 45.000 (1.7711 to 1.7717)
D	41.985 to 42.000 (1.6530 to 1.6535)
E	32.967 to 32.980 (1.2979 to 1.2984)

Minimum:

Part	Outside diameter mm (in.)
A	34.002 (1.3387)
B	44.985 (1.7711)
C	44.985 (1.7711)
D	41.985 (1.6530)
E	32.967 (1.2979)

If the diameter is less than the minimum, replace the input shaft.



6. INSPECT 3RD GEAR

Using a cylinder gauge, measure the inside diameter of the gear.

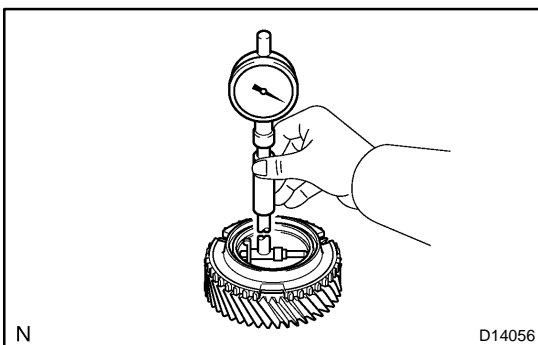
Standard inside diameter:

51.015 to 51.040 mm (2.0085 to 2.0094 in.)

Maximum inside diameter:

51.040 mm (2.0094 in.)

If the inside diameter exceeds the maximum, replace the 3rd gear.



7. INSPECT 4TH GEAR

Using a cylinder gauge, measure the inside diameter of the gear.

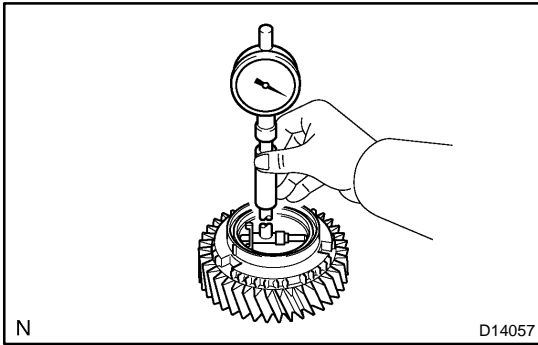
Standard inside diameter:

51.015 to 51.040 mm (2.0085 to 2.0094 in.)

Maximum inside diameter:

51.040 mm (2.0094 in.)

If the inside diameter exceeds the maximum, replace the 4th gear.

**8. INSPECT 6TH GEAR**

Using a cylinder gauge, measure the inside diameter of the gear.

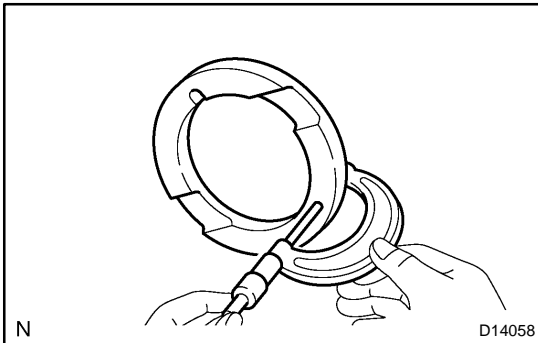
Standard inside diameter:

51.015 to 51.040 mm (2.0085 to 2.0094 in.)

Maximum inside diameter:

51.040 mm (2.0094 in.)

If the inside diameter exceeds the maximum, replace the 6th gear.

**9. INSPECT 3RD GEAR THRUST WASHER**

Using a micrometer, measure the thrust washer thickness.

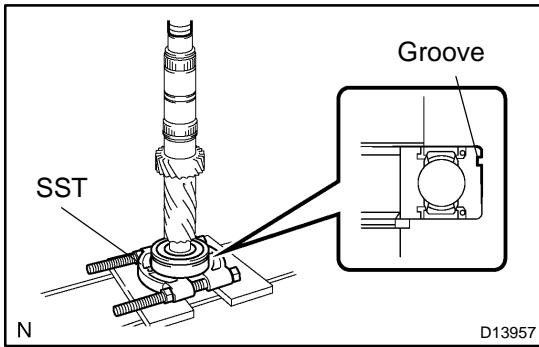
Standard thickness:

7.12 to 7.18 mm (0.2803 to 0.2827 in.)

Minimum thickness:

7.12 mm (0.2803 in.)

If the thickness is less than the minimum, replace the 3rd gear thrust washer.



REASSEMBLY

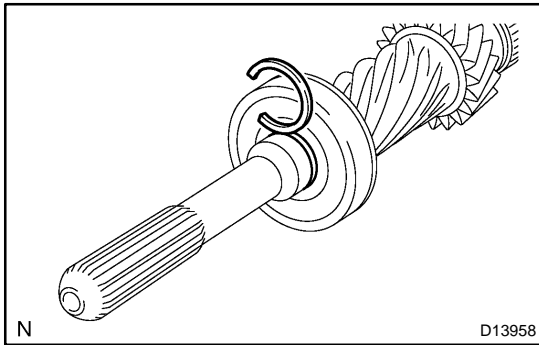
1. INSTALL INPUT SHAFT BEARING

- (a) Using SST and a press, install the input shaft bearing to the input shaft.

SST 09950-00020

HINT:

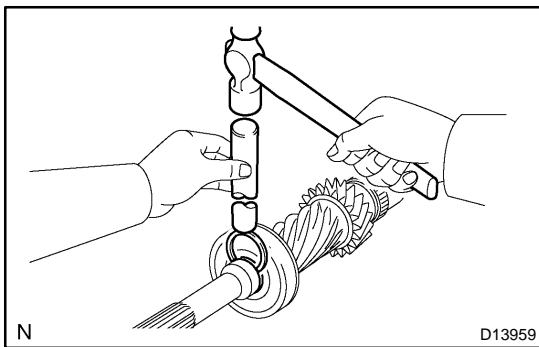
Make sure that the bearing is installed in the direction shown in the illustration.



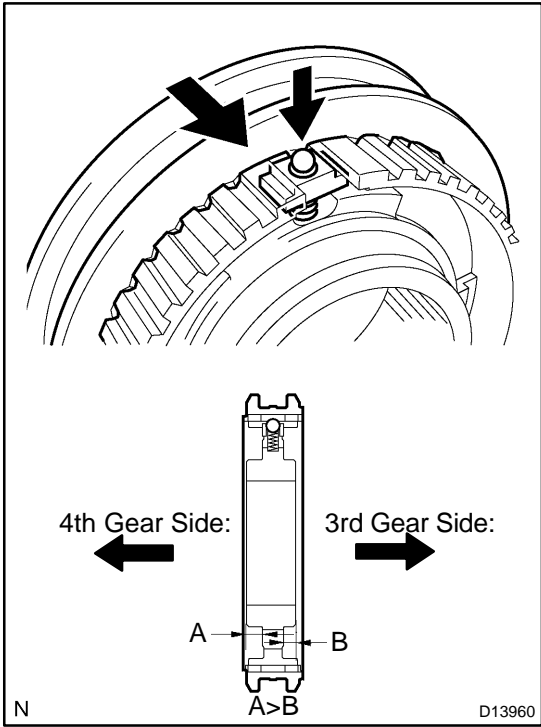
- (b) Select a snap ring that allows for the minimum amount of axial play.

Standard clearance: 0.1 mm (0.0039 in.) or less

Mark	Thickness mm (in.)
A	2.65 to 2.70 (0.1043 to 0.1063)
B	2.70 to 2.75 (0.1063 to 0.1083)
C	2.75 to 2.80 (0.1083 to 0.1102)
D	2.80 to 2.85 (0.1102 to 0.1122)
E	2.85 to 2.90 (0.1122 to 0.1142)
F	2.90 to 2.95 (0.1142 to 0.1161)



- (c) Using a brass bar and hammer, tap in the snap ring.



2. ASSEMBLE CLUTCH HUB NO.2

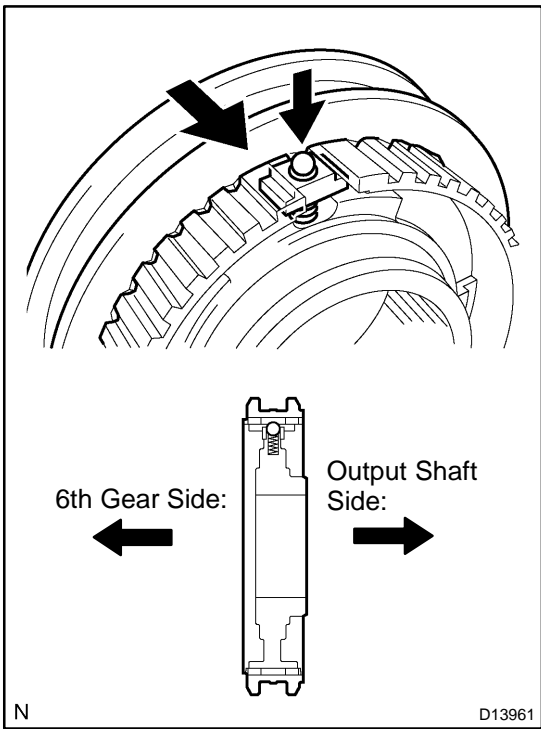
- (a) Apply gear oil to the clutch hub sleeve and clutch hub.
- (b) Install the clutch hub sleeve to the clutch hub No.2.
- (c) Install the 3 shifting keys to the clutch hub.
- (d) Install the 3 shifting key springs to the clutch hub.
- (e) Place the balls on the holes on the shifting keys, and install the hub sleeve while pushing down the balls.

NOTICE:

Be careful not to scatter the balls.

HINT:

Make sure that the clutch hub No.2 is installed in the direction shown in the illustration.



3. ASSEMBLE CLUTCH HUB NO.3

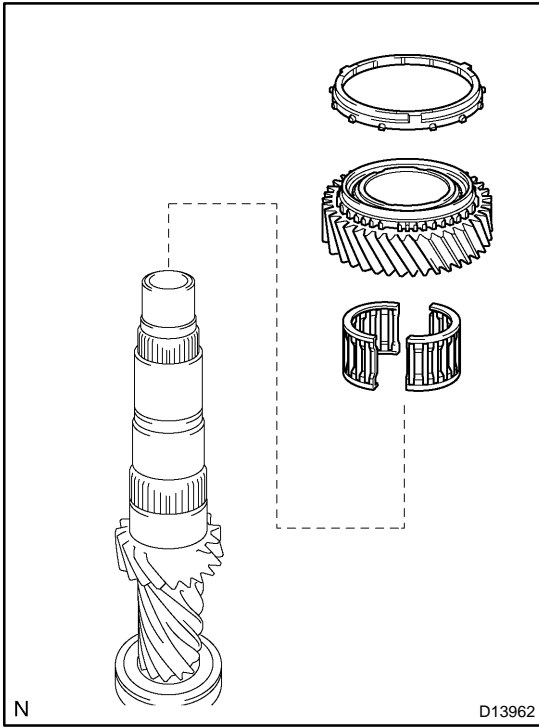
- (a) Apply gear oil to the clutch hub sleeve and clutch hub.
- (b) Install the clutch hub sleeve to the clutch hub No.3.
- (c) Install the 3 shifting keys to the clutch hub.
- (d) Install the 3 shifting key springs to the clutch hub.
- (e) Place the balls on the holes on the shifting keys, and install the hub sleeve while pushing down the balls.

NOTICE:

Be careful not to scatter the balls.

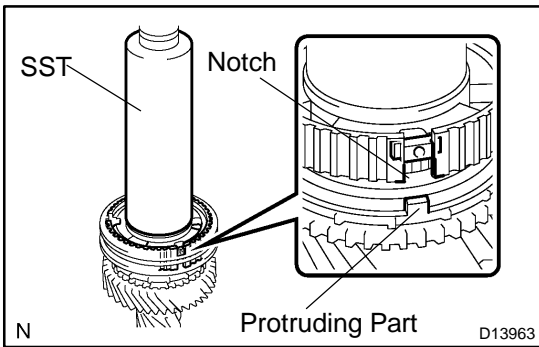
HINT:

Make sure that the clutch hub No.3 is installed in the direction shown in the illustration.



4. INSTALL 4TH GEAR

- (a) Apply gear oil to the needle roller bearing and 4th gear taper cone.
- (b) Install the needle roller bearing and 4th gear to the input shaft.
- (c) Install the synchronizer ring No.3 to the 4th gear.

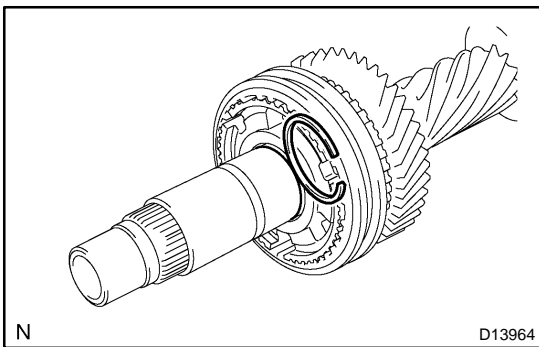


- (d) Using SST and a press, install the clutch hub No.2 to the input shaft.
SST 09308-14010

HINT:

Make sure that the protruding part on the synchronizer ring is fitted into the notch or the clutch hub.

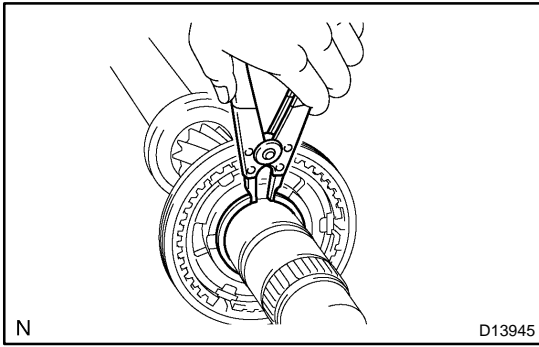
- (e) Make sure that the gear and synchronizer ring move smoothly.



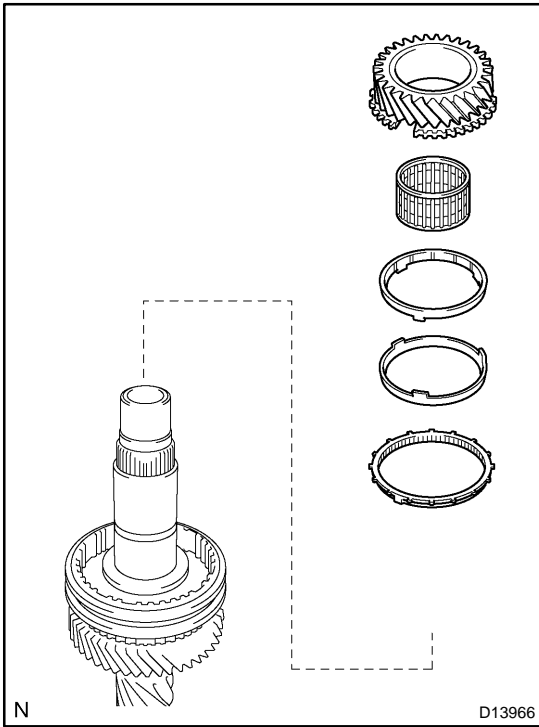
- (f) Select a snap ring that allows for the minimum amount of axial play.

Standard clearance: 0.1 mm (0.0039 in.) or less

Mark	Thickness mm (in.)
A	1.77 to 1.82 (0.0697 to 0.0717)
B	1.82 to 1.87 (0.0717 to 0.0736)
C	1.87 to 1.92 (0.0726 to 0.0756)
D	1.92 to 1.97 (0.0756 to 0.0776)
E	1.97 to 2.02 (0.0776 to 0.0795)
F	2.02 to 2.07 (0.0795 to 0.0815)
G	2.07 to 2.12 (0.0815 to 0.0835)

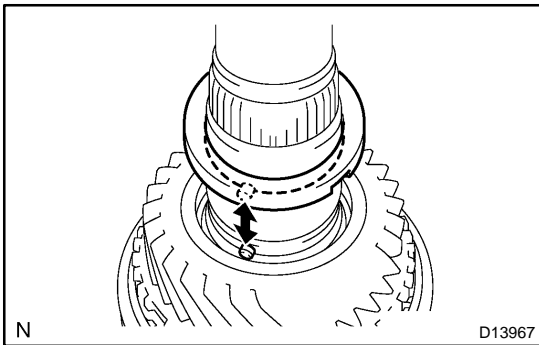


- (g) Using a snap ring expander, install the snap ring.
- (h) Install the spacer to the input shaft.

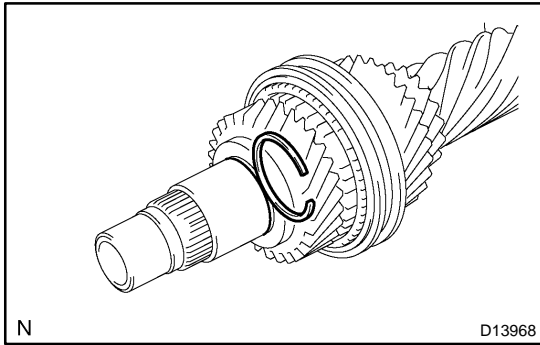


5. INSTALL 3RD GEAR

- (a) Apply gear oil to the needle roller bearing and 3rd gear taper cone.
- (b) Install the synchronizer ring set No.3 to the clutch hub No.2.
- (c) Install the needle roller bearing and 3rd gear to the input shaft.



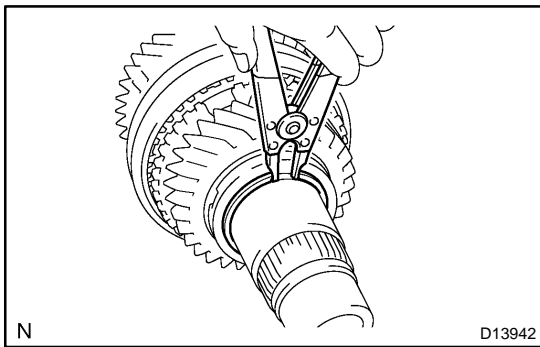
- (d) Install the pin and 3rd gear thrust washer to the input shaft.



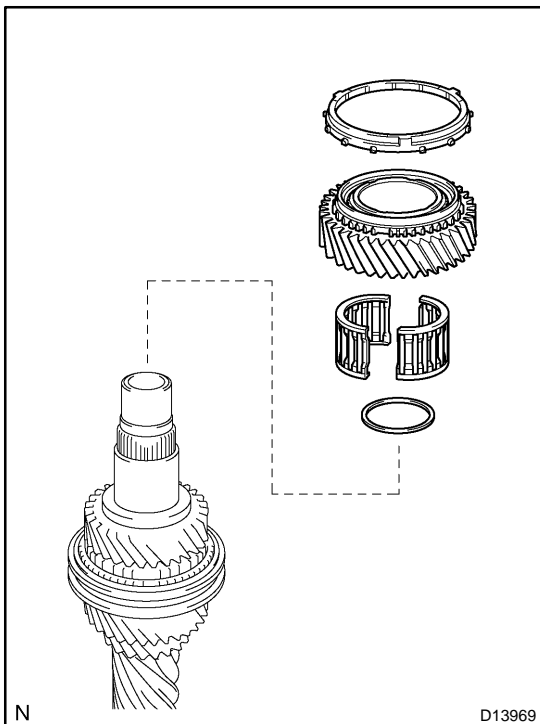
- (e) Select a snap ring that allows for the minimum amount of axial play.

Standard clearance: 0.1 mm (0.0039 in.) or less

Mark	Thickness mm (in.)
A	2.07 to 2.12 (0.0815 to 0.0835)
B	2.12 to 2.17 (0.0835 to 0.0854)
C	2.17 to 2.22 (0.0854 to 0.0874)
D	2.22 to 2.27 (0.0874 to 0.0894)
E	2.27 to 2.32 (0.0894 to 0.0913)
F	2.32 to 2.37 (0.0913 to 0.0933)

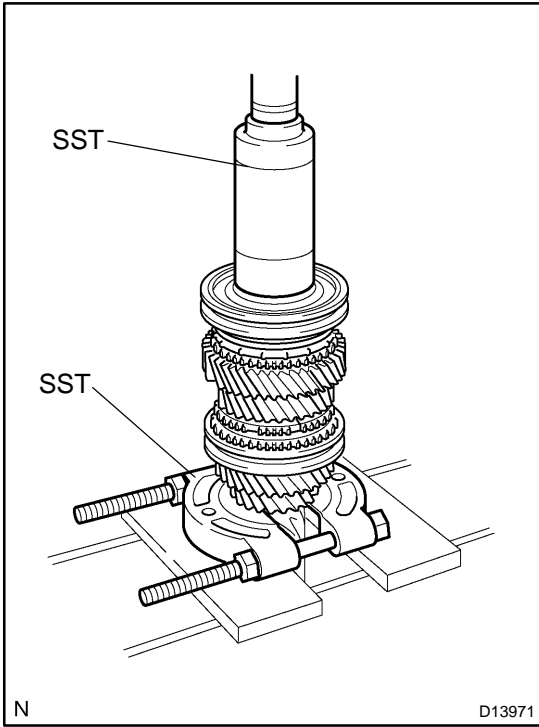


- (f) Using a snap ring expander, install the snap ring.

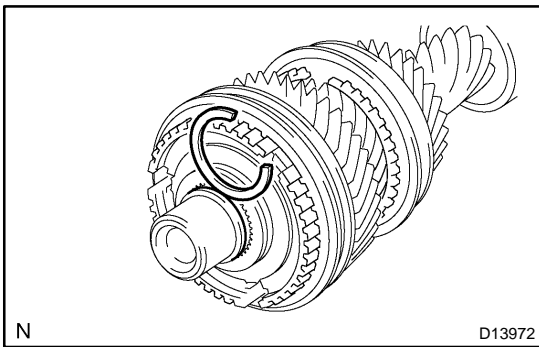


6. INSTALL 6TH GEAR

- (a) Apply gear oil to the needle roller bearing and 6th gear taper cone.
- (b) Install the ring, needle roller bearing and 6th gear to the input shaft.
- (c) Install the synchronizer ring to the 6th gear.

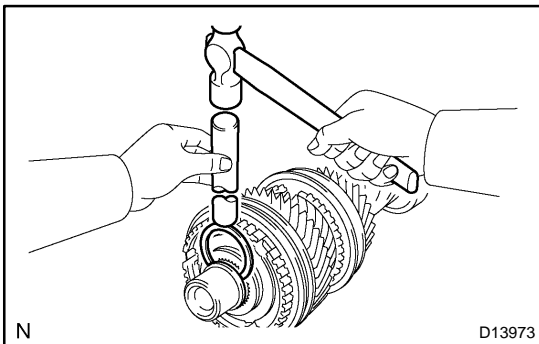


- (d) Using SST and a press, install the clutch hub No.3 to the input shaft.
SST 09309-37010, 09950-00020
- (e) Make sure that the gear and synchronizer ring move smoothly.



- (f) Select a snap ring that allow for the minimum amount of axial play.
Standard clearance: 0.1 mm (0.0039 in.) or less

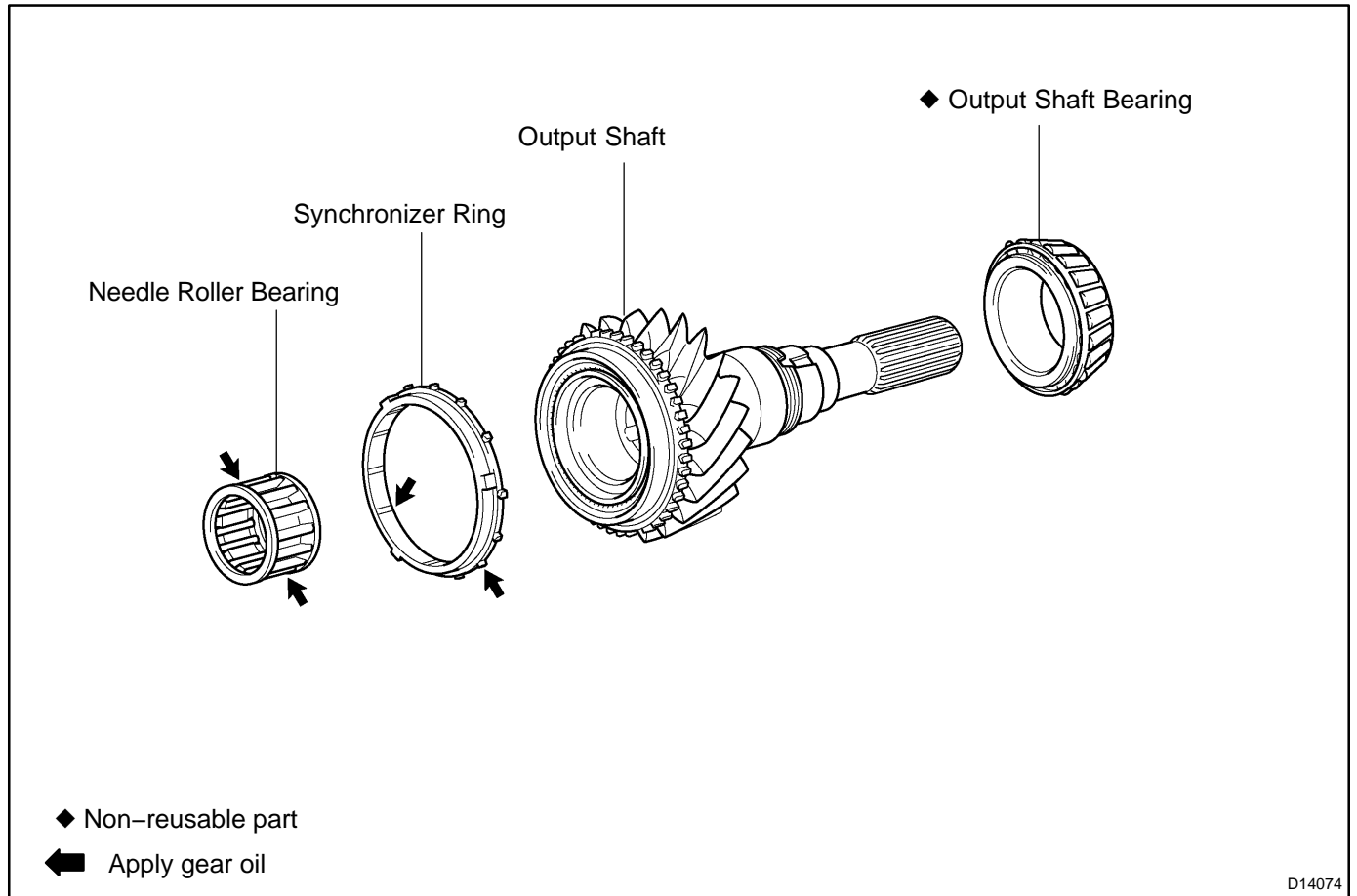
Mark	Thickness mm (in.)
A	2.10 to 2.15 (0.0827 to 0.0846)
B	2.15 to 2.20 (0.0846 to 0.0866)
C	2.20 to 2.25 (0.0866 to 0.0886)
D	2.25 to 2.30 (0.0886 to 0.0906)
E	2.30 to 2.35 (0.0906 to 0.0925)
F	2.35 to 2.40 (0.0925 to 0.0945)
G	2.40 to 2.45 (0.0945 to 0.0965)



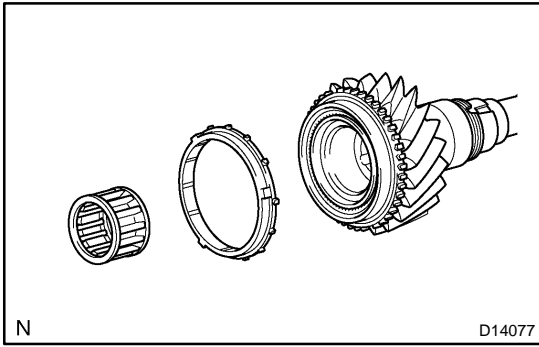
- (g) Using a brass bar and hammer, install the snap ring.

OUTPUT SHAFT COMPONENTS

MT0HY-01

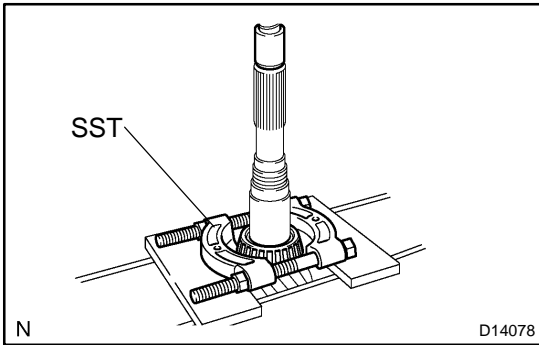


D14074



DISASSEMBLY

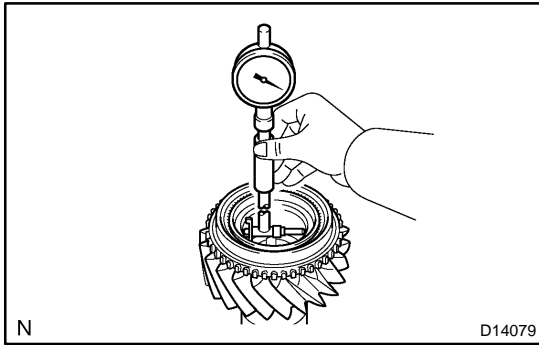
1. REMOVE SYNCHRONIZER RING
2. REMOVE NEEDLE ROLLER BEARING



3. REMOVE OUTPUT SHAFT BEARING

Using SST and a press, remove the output shaft bearing.

SST 09950-00020



INSPECTION

1. INSPECT OUTPUT SHAFT

Using a cylinder gauge, measure the inside diameter of the output shaft.

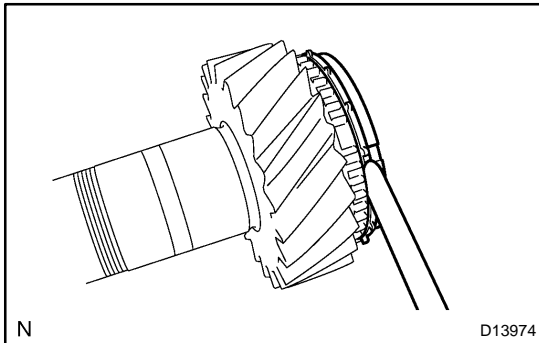
Standard inside diameter:

45.009 to 45.025 mm (1.7720 to 1.7726 in.)

Maximum inside diameter:

45.025 mm (1.7726 in.)

If the diameter exceeds the maximum, replace the output shaft.



2. INSPECT SYNCHRONIZER RING

(a) Using a feeler gauge, measure the clearance between the synchronizer ring and the gear spline.

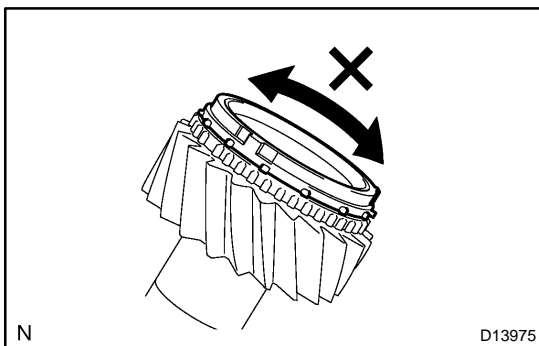
Standard clearance:

0.70 to 1.50 mm (0.0276 to 0.0591 in.)

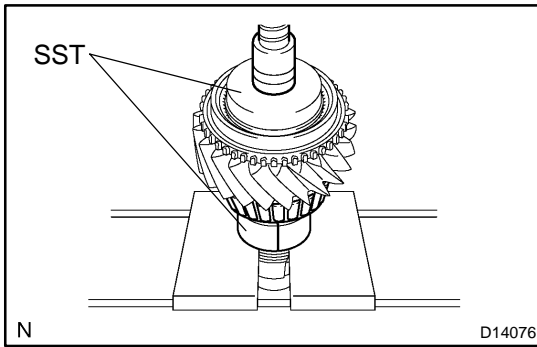
Minimum clearance:

0.70 mm (0.0276 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



(b) Coat the output shaft and synchronizer ring cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it against the gear cone. Check that the ring locks.



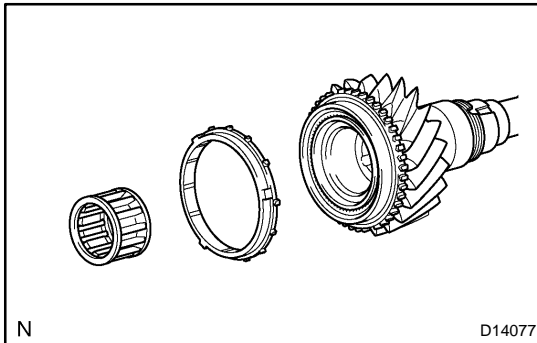
REASSEMBLY

1. INSTALL OUTPUT SHAFT BEARING

- (a) Using SST and a press, install a new output shaft bearing to the output shaft.

SST 09710-20010 (09710-06060), 09950-60010
(09951-00650)

- (b) Apply grease to the output shaft bearing



2. INSTALL NEEDLE ROLLER BEARING

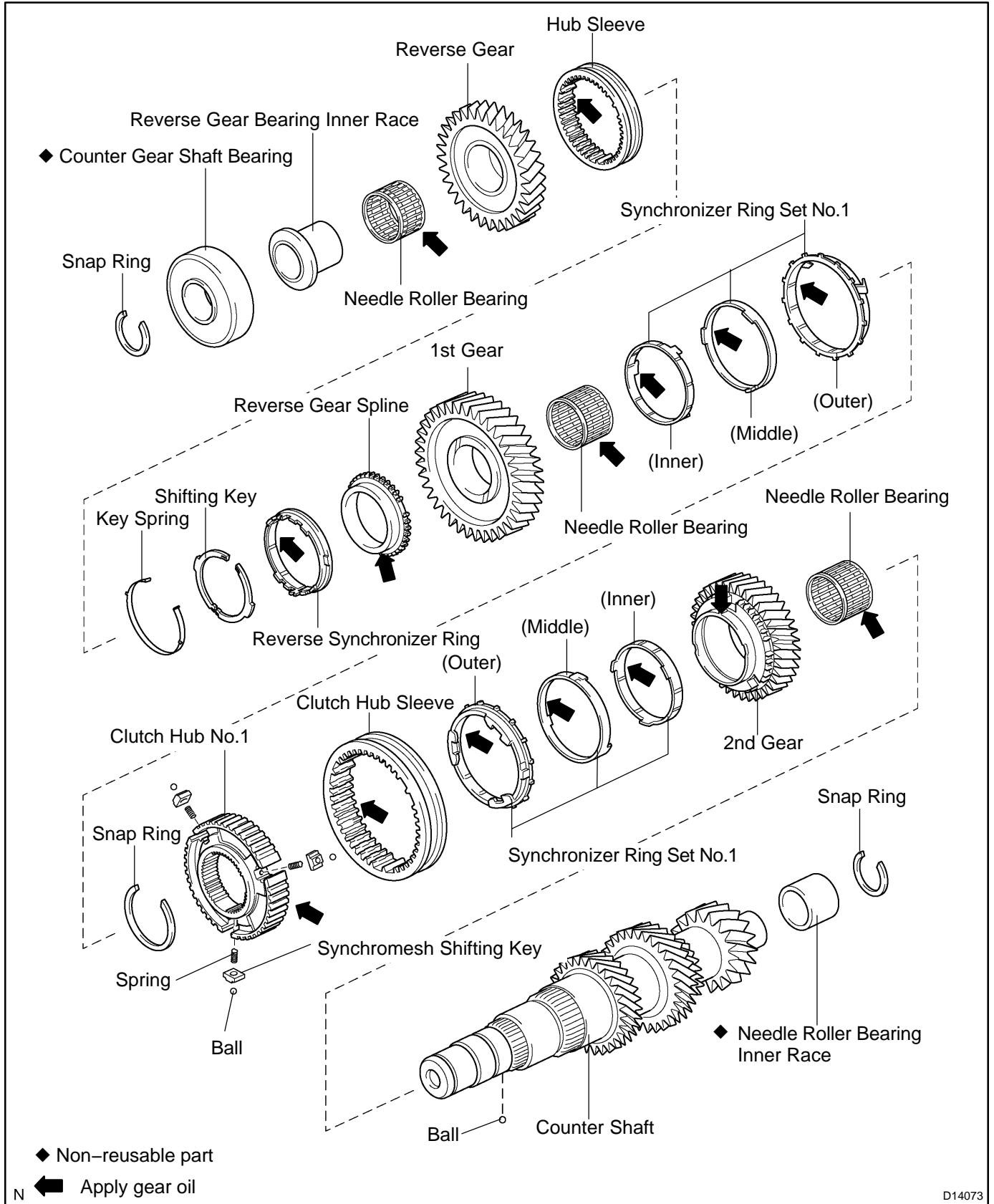
3. INSTALL SYNCHRONIZER RING

- (a) Apply gear oil to the synchronizer ring.

- (b) Install the synchronizer ring to the output shaft.

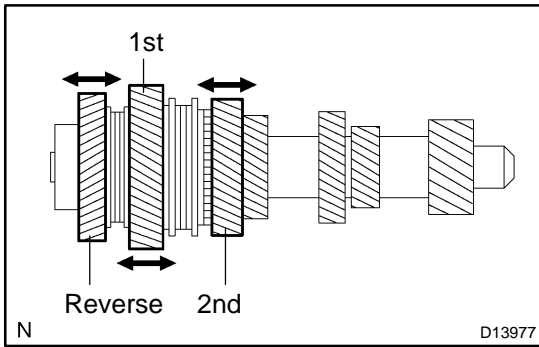
COUNTER GEAR COMPONENTS

MT012-01



N

D14073



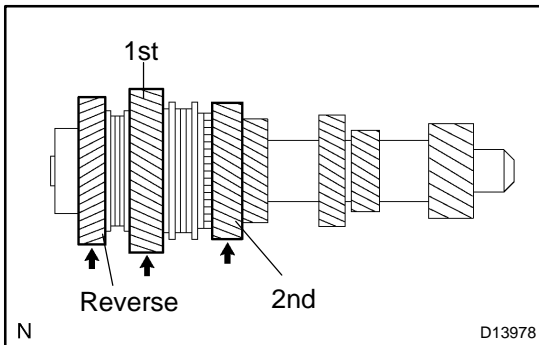
DISASSEMBLY

1. INSPECT EACH GEAR THRUST CLEARANCE

Using a dial indicator, measure the clearance between the gear and the shaft.

Standard gear thrust clearance:

Gear	Thrust Clearance mm (in.)
1st and 2nd	0.10 to 0.43 (0.0039 to 0.0169)
Reverse	0.12 to 0.37 (0.0047 to 0.0146)



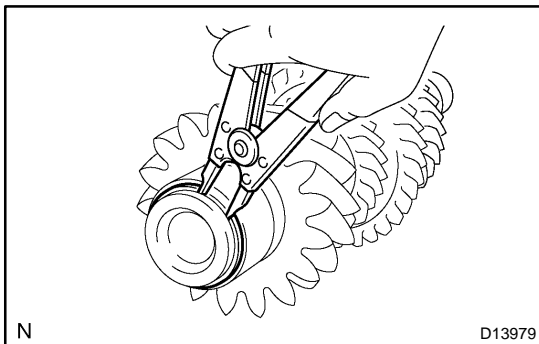
2. INSPECT EACH GEAR RADIAL CLEARANCE

Using a dial indicator, measure the clearance between the gear and the shaft with the needle roller bearing installed.

Standard gear radial clearance:

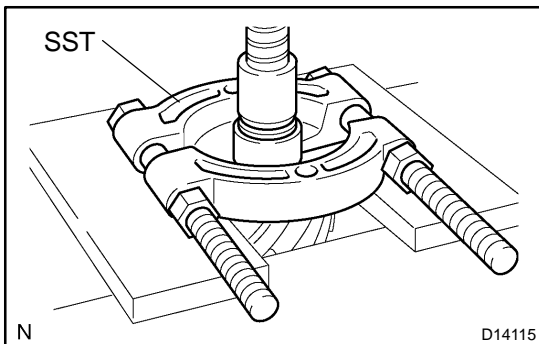
Gear	Radial Clearance mm (in.)
1st and 2nd	0.015 to 0.067 (0.00059 to 0.00264)
Reverse	0.015 to 0.065 (0.00059 to 0.00256)

If necessary, replace the gear, needle roller bearing or shaft.



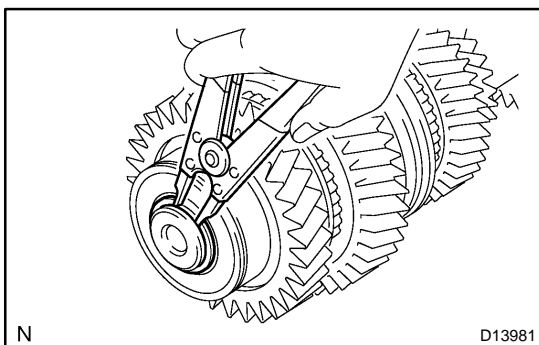
3. REMOVE NEEDLE ROLLER BEARING INNER RACE

(a) Using a snap ring expander, remove the snap ring.



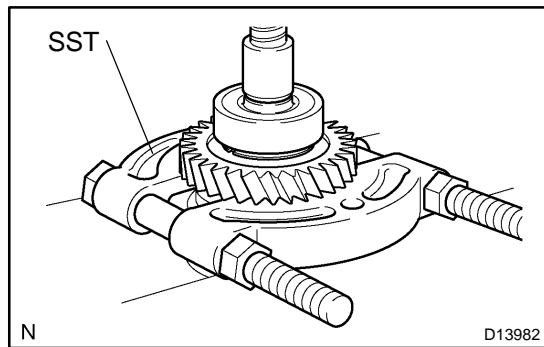
(b) Using SST and a press, remove the needle roller bearing inner race.

SST 09950-00020

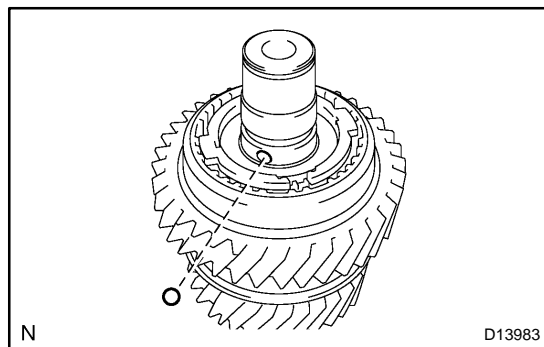


4. REMOVE REVERSE GEAR

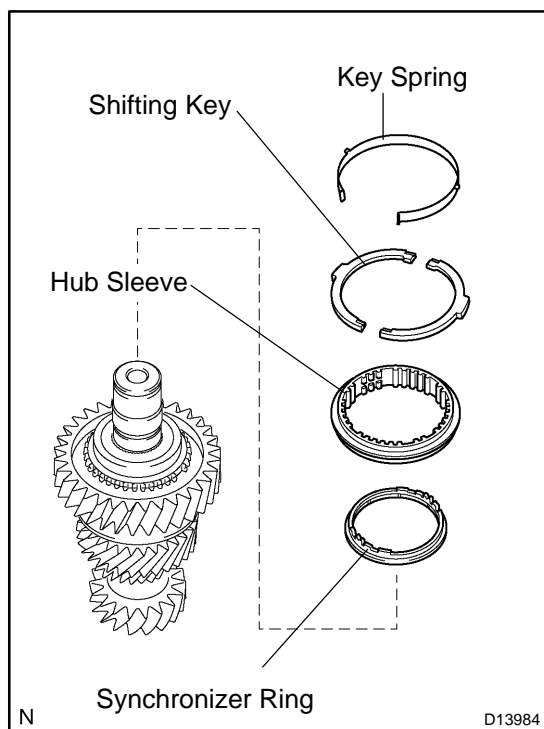
(a) Using a snap ring expander, remove the snap ring.



- (b) Using SST and a press, remove the counter gear shaft bearing, reverse gear bearing inner race, needle roller bearing and reverse gear.
SST 09950-00020

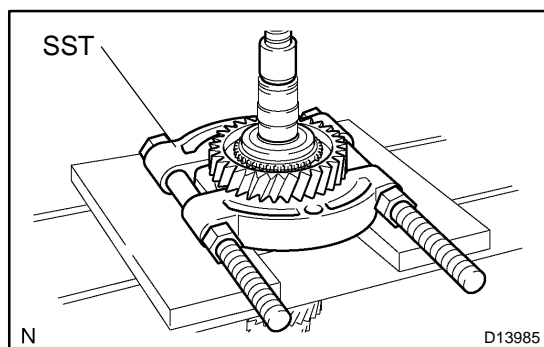


- (c) Remove the ball from the counter shaft.



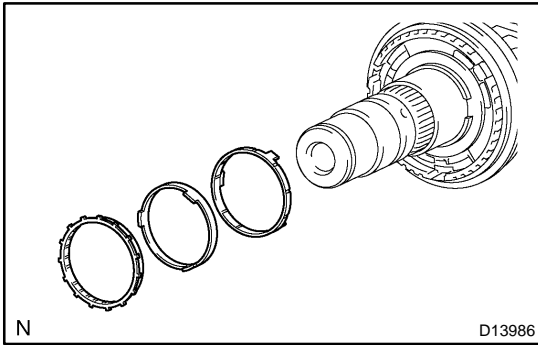
5. REMOVE HUB SLEEVE

Remove the hub sleeve, 2 shifting keys, key spring and reverse synchronizer ring from the reverse gear spline.

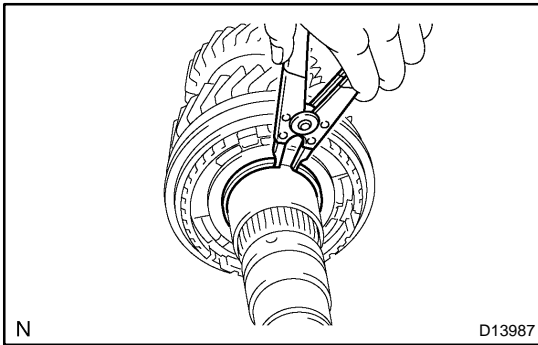


6. REMOVE 1ST GEAR

- (a) Using SST and a press, remove the reverse gear spline and 1st gear.
SST 09950-00020
- (b) Remove the needle roller bearing.

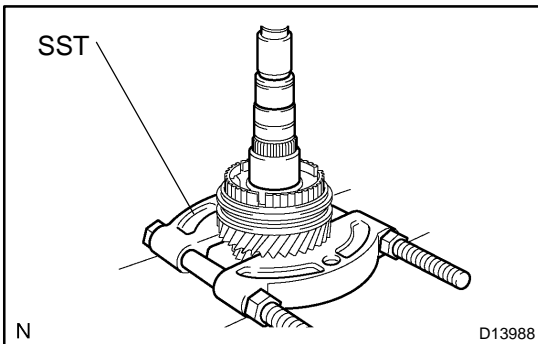


(c) Remove the synchronizer ring set No.1.



7. REMOVE 2ND GEAR

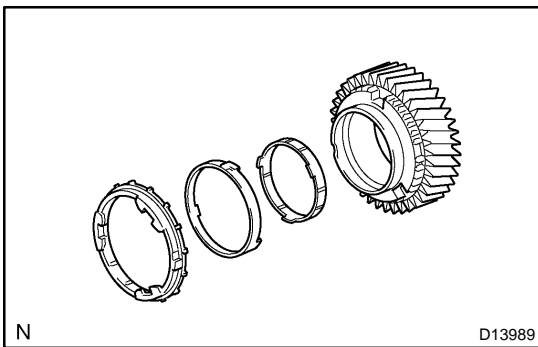
(a) Using a snap ring expander, remove the snap ring.



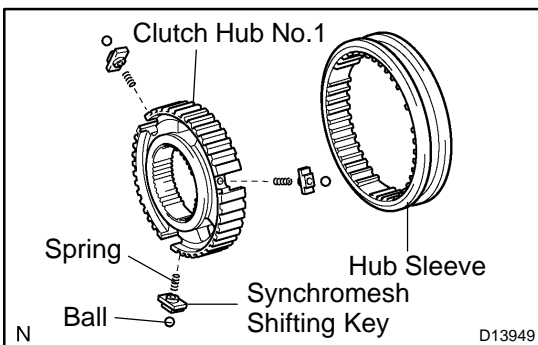
(b) Using SST and a press, remove the clutch hub No.1 and 2nd gear.

SST 09950-00020

(c) Remove the needle roller bearing.



(d) Remove the synchronizer ring set No.1 from the 2nd gear.

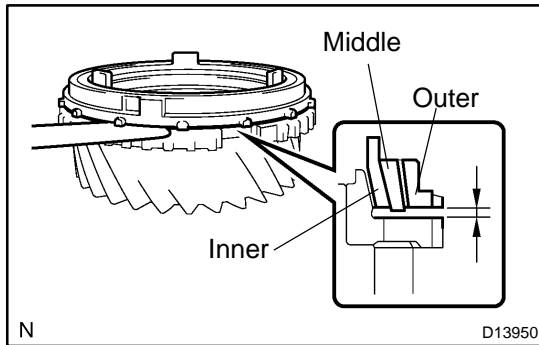


8. DISASSEMBLE CLUTCH HUB NO.1

Remove the hub sleeve, 3 synchromesh shifting keys, 3 balls and 3 springs from the clutch hub No.1.

HINT:

Be careful not to scatter the balls or springs.



INSPECTION

1. INSPECT SYNCHRONIZER RING SET NO.1

- (a) Using a feeler gauge, measure the clearance between the synchronizer ring set No.1 and the 1st gear.

Standard clearance:

Inner: 1.48 to 2.12 mm (0.0583 to 0.0835 in.)

Middle: 0.68 to 1.92 mm (0.0268 to 0.0756 in.)

Outer: 0.88 to 1.72 mm (0.0346 to 0.0677 in.)

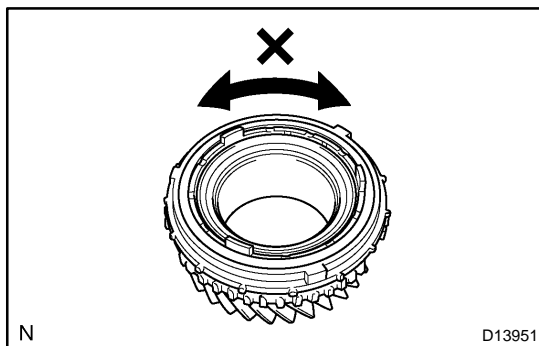
Minimum clearance:

Inner: 1.48 mm (0.0583 in.)

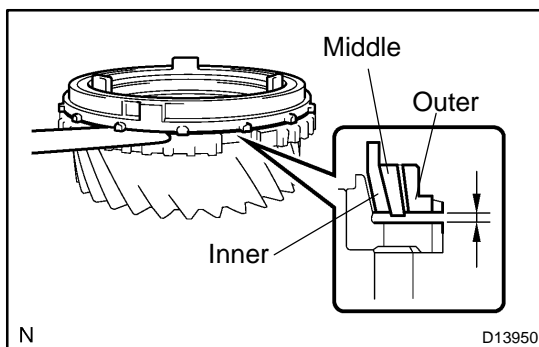
Middle: 0.68 mm (0.0268 in.)

Outer: 0.88 mm (0.0346 in.)

If the clearance is less than the minimum, replace the synchronizer ring set No.1.



- (b) Coat the 1st gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it against the 1st gear cone. Check that the ring locks.



2. INSPECT SYNCHRONIZER RING SET NO.2

- (a) Using a feeler gauge, measure the clearance between the synchronizer ring set No.1 and the 2nd gear.

Standard clearance:

Inner: 1.48 to 2.12 mm (0.0583 to 0.0835 in.)

Middle: 0.68 to 1.92 mm (0.0268 to 0.0756 in.)

Outer: 0.88 to 1.72 mm (0.0346 to 0.0677 in.)

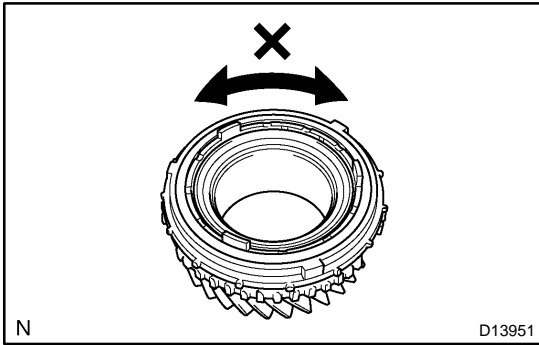
Minimum clearance:

Inner: 1.48 mm (0.0583 in.)

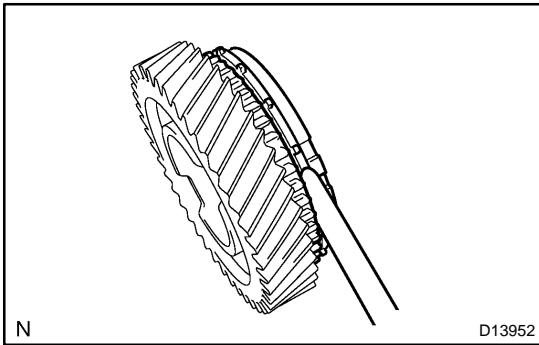
Middle: 0.68 mm (0.0268 in.)

Outer: 0.88 mm (0.0346 in.)

If the clearance is less than the minimum, replace the synchronizer ring set No.2.



- (b) Coat the 2nd gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it against the 2nd gear cone. Check that the ring locks.



3. INSPECT REVERSE SYNCHRONIZER RING

- (a) Using a feeler gauge, measure the clearance between the synchronizer ring and the reverse gear.

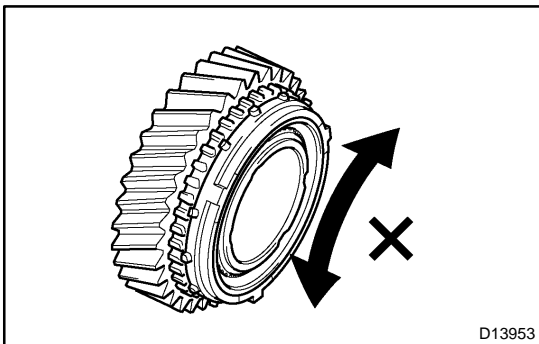
Standard clearance:

0.70 to 1.30 mm (0.0278 to 0.0512 in.)

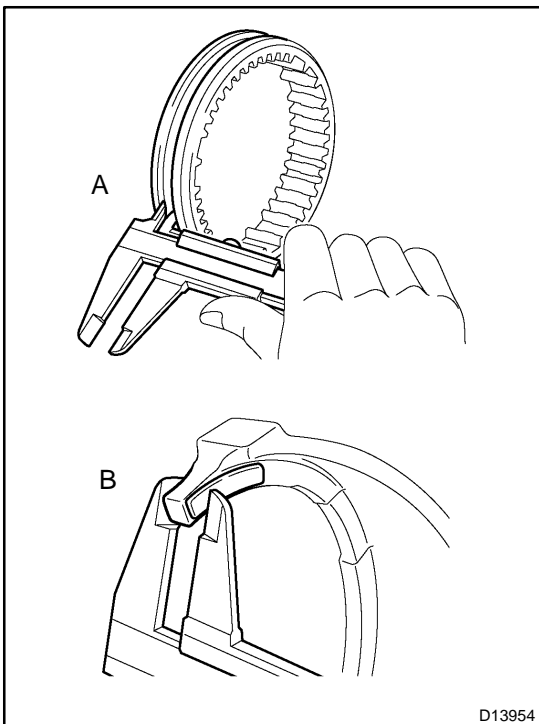
Minimum clearance:

0.70 mm (0.0278 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



- (b) Coat the reverse gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it against the reverse gear cone. Check that the ring locks.



4. INSPECT HUB SLEEVE

- (a) Using a vernier caliper, measure the width of the groove of the hub sleeve (A) and thickness of both the gear shift forks No.1 and No.4 (B) as shown in the illustration.

Width of the groove of the hub sleeve (A):

No. 1: 11.95 to 12.05 mm (0.4705 to 0.4744 in.)

No. 4: 10.5 to 10.6 mm (0.4134 to 0.4173 in.)

Thickness of the gear shift fork (B):

No. 1: 11.7 to 11.8 mm (0.4606 to 0.4646 in.)

No. 4: 9.76 to 10.24 mm (0.3843 to 0.4031 in.)

- (b) Calculate the clearance using the formula below.

Formula:

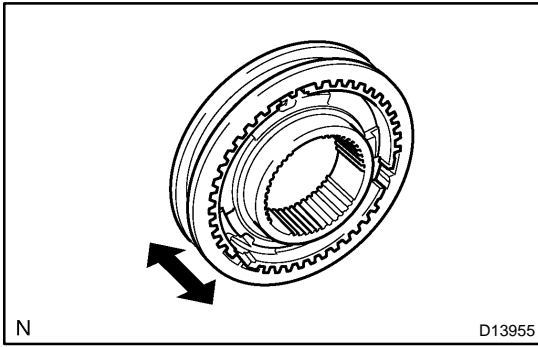
Clearance = A – B

Standard:

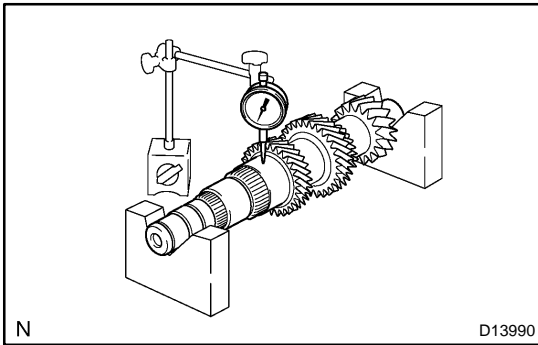
No.1: 0.15 to 0.55 mm (0.0059 to 0.0217 in.)

No.4: 0.26 to 0.84 mm (0.0102 to 0.0331 in.)

If the clearance is not as specified, replace the hub sleeve and gear shift fork.



(c) Make sure that the hub sleeve and clutch hub slide smoothly.
If the hub sleeve and clutch hub do not slide smoothly, replace them.

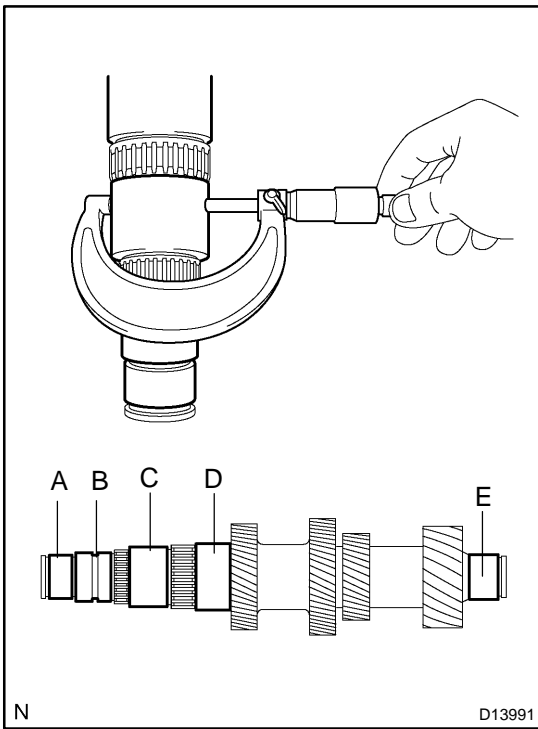


5. INSPECT COUNTER GEAR SHAFT

(a) Using a dial indicator, measure the shaft runout.

Maximum runout: 0.03 mm (0.0012 in.)

If the runout exceeds the maximum, replace the counter gear shaft.



(b) Using a micrometer, measure the outside diameter of the counter gear shaft journal surface.

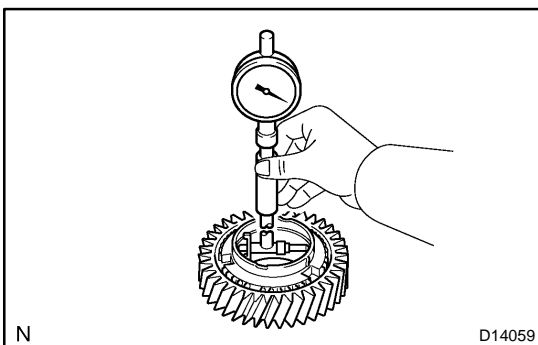
Standard:

Part	Outside diameter mm (in.)
A	34.002 to 34.015 (1.3387 to 1.3392)
B	36.985 to 37.000 (1.4561 to 1.4567)
C	47.985 to 48.000 (1.8892 to 1.8898)
D	53.985 to 54.000 (2.1254 to 2.1260)
E	34.002 to 34.015 (1.3387 to 1.3392)

Minimum:

Part	Outside diameter mm (in.)
A	34.002 (1.3387)
B	36.985 (1.4561)
C	47.985 (1.8892)
D	53.985 (2.1254)
E	34.002 (1.3387)

If the diameter is less than the minimum, replace the counter gear shaft.



6. INSPECT 1ST GEAR

Using a cylinder gauge, measure the inside diameter of the gear.

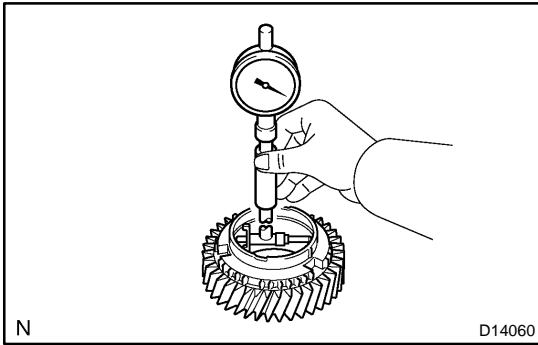
Standard inside diameter:

54.015 to 54.040 mm (2.1266 to 2.1276 in.)

Maximum inside diameter:

54.040 mm (2.1276 in.)

If the inside diameter exceeds the maximum, replace the 1st gear.



7. INSPECT 2ND GEAR

Using a cylinder gauge, measure the inside diameter of the gear.

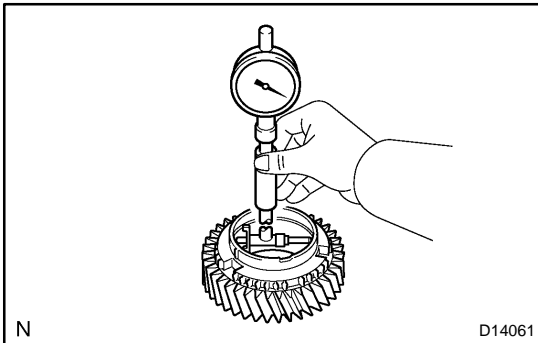
Standard inside diameter:

60.015 to 60.040 mm (2.3628 to 2.3638 in.)

Maximum inside diameter:

60.040 mm (2.3638 in.)

If the inside diameter exceeds the maximum, replace the 2nd gear.



8. INSPECT REVERSE GEAR

Using a cylinder gauge, measure the inside diameter of the gear.

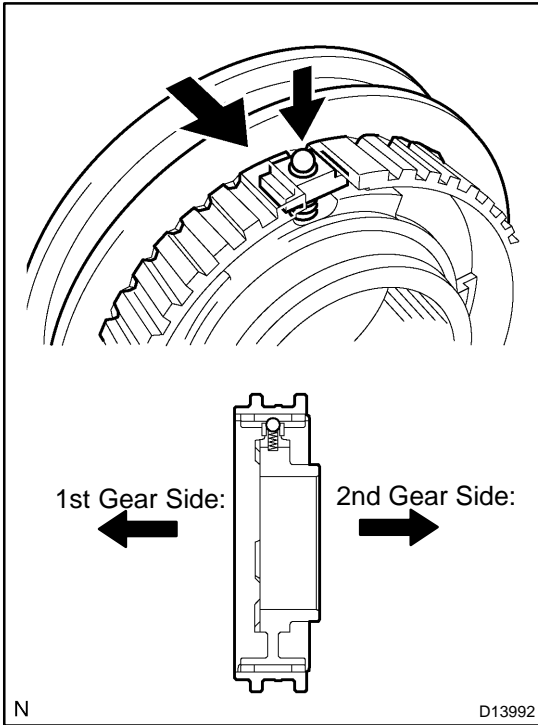
Standard inside diameter:

51.015 to 51.040 mm (2.0085 to 2.0094 in.)

Maximum inside diameter:

51.040 mm (2.0094 in.)

If the inside diameter exceeds the maximum, replace the reverse gear.



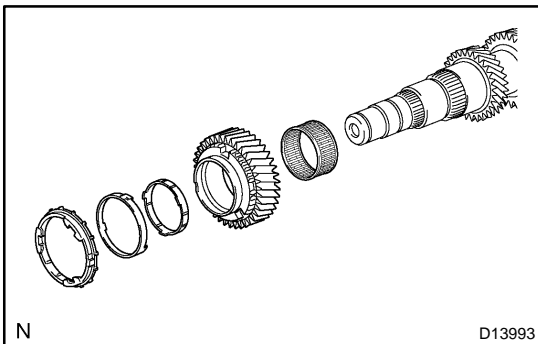
REASSEMBLY

1. REASSEMBLE CLUTCH HUB NO.1

- (a) Apply gear oil to the clutch hub sleeve and clutch hub.
- (b) Install the clutch hub sleeve to the clutch hub.
- (c) Install the 3 shifting keys to the clutch hub.
- (d) Install the 3 shifting key springs to the clutch hub.
- (e) Place the balls on the holes on the shifting keys, and install the hub sleeve while pushing down the balls.

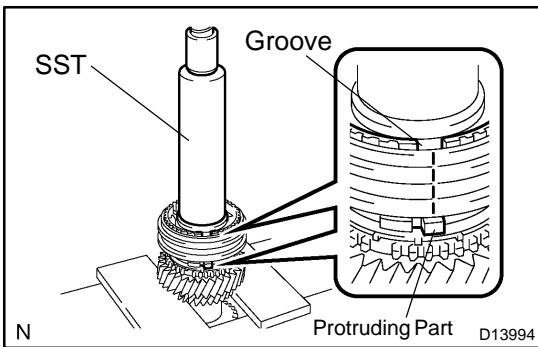
NOTICE:

Be careful not to scatter the balls.



2. INSTALL 2ND GEAR

- (a) Apply gear oil to the needle roller bearing and 2nd gear taper cone.
- (b) Install the needle roller bearing, 2nd gear and synchronizer ring set No.1 to the counter shaft.

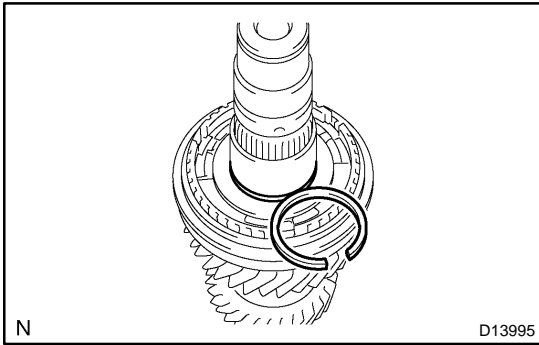


- (c) Using SST and a press, install the clutch hub No.1.
SST 09308-14010

HINT:

Make sure that the protruding part on the synchronizer ring is fitted into the groove of the clutch hub.

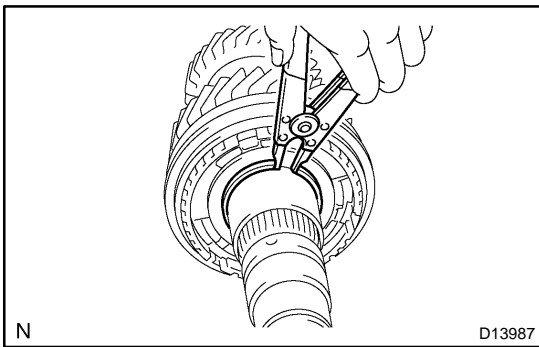
- (d) Make sure that the gear and synchronizer ring move smoothly.



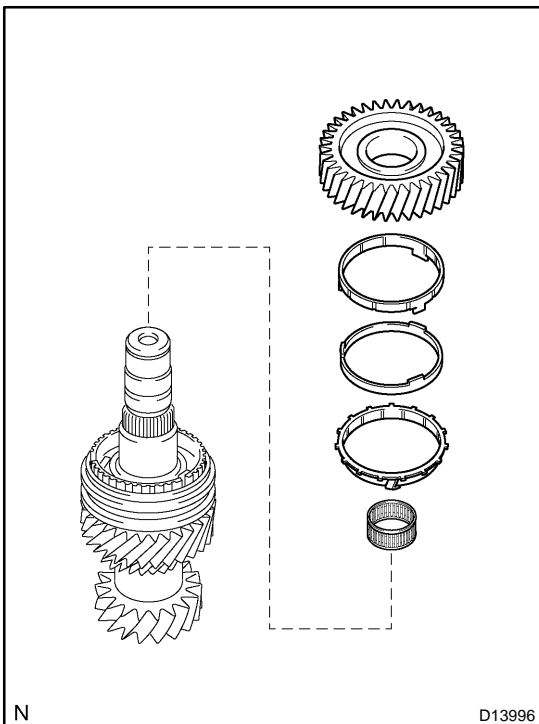
- (e) Select a snap ring that allows for the minimum amount of axial play.

Standard clearance: 0.1 mm (0.0039 in.) or less

Mark	Thickness mm (in.)
A	2.28 to 2.33 (0.0898 to 0.0917)
B	2.33 to 2.38 (0.917 to 0.0937)
C	2.38 to 2.43 (0.0937 to 0.0957)
D	2.43 to 2.48 (0.0957 to 0.0976)
E	2.48 to 2.53 (0.0976 to 0.0996)
F	2.53 to 2.58 (0.0996 to 0.1016)
G	2.58 to 2.63 (0.1016 to 0.1035)

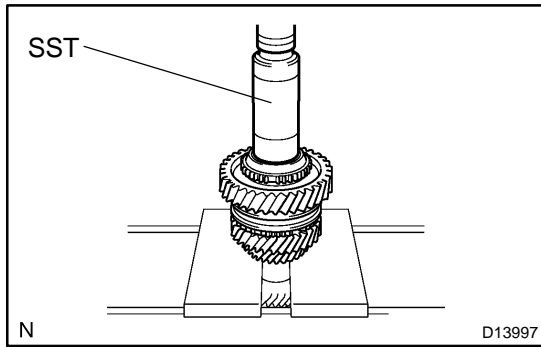


- (f) Using a snap ring expander, install the snap ring.

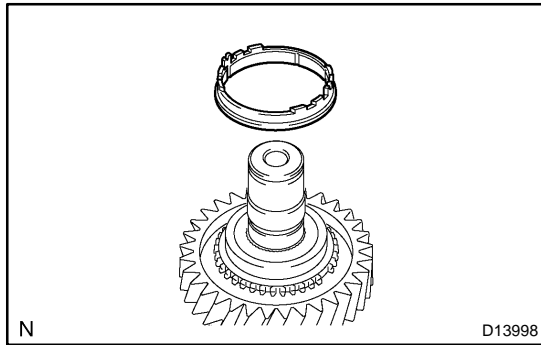


3. INSTALL 1ST GEAR

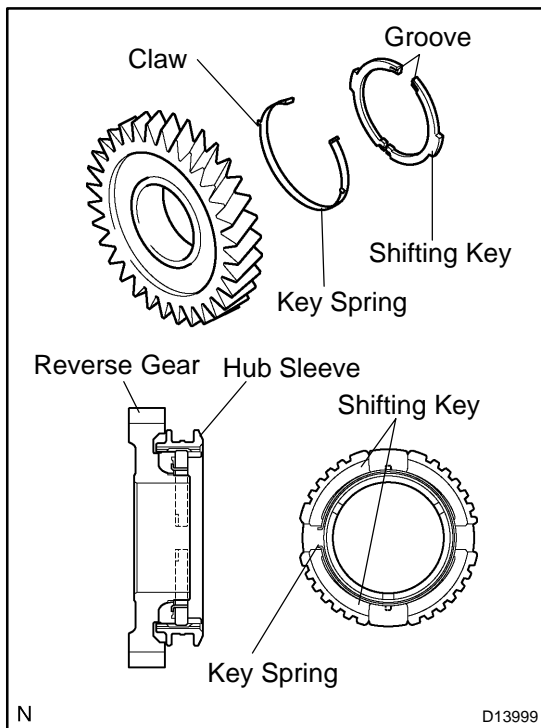
- (a) Apply gear oil to the needle roller bearing and 1st gear taper cone.
 (b) Install the needle roller bearing, synchronizer ring set No.1 and 1st gear.



- (c) Using SST and a press, install the reverse gear spline.
SST 09309-37010



- (d) Install the reverse synchronizer ring to the reverse gear spline.



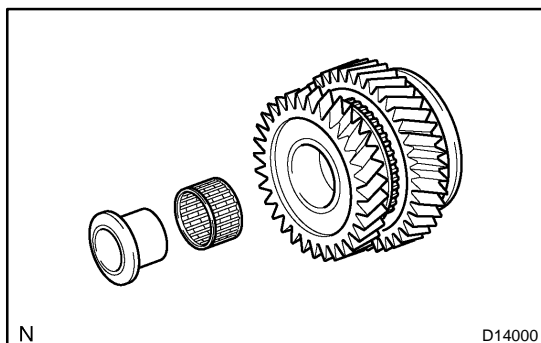
4. REASSEMBLE REVERSE GEAR

- (a) Install the key spring and 2 shifting keys to the reverse gear.

HINT:

- Face the grooves on the shifting keys towards the reverse gear.
- Face the claws on the key spring towards the reverse gear.
- Make sure that the key spring is positioned as shown in the illustration.

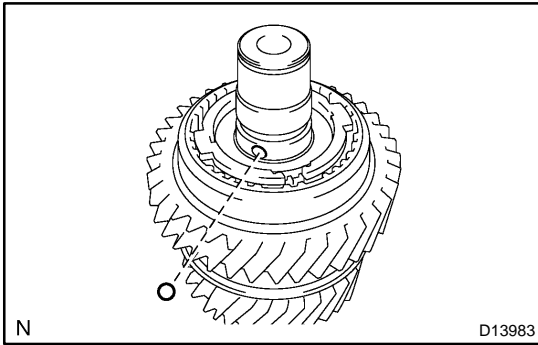
- (b) Install the hub sleeve to the reverse gear.



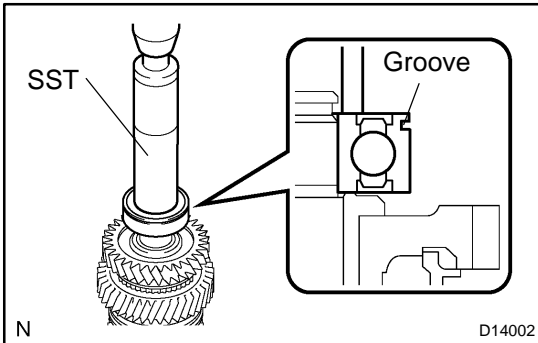
5. INSTALL REVERSE GEAR

- (a) Apply gear oil to the needle roller bearing and reverse gear bearing inner race.

- (b) Install the needle roller bearing and reverse gear bearing inner race to the reverse gear.



- (c) Install the ball to the counter shaft.
 - (d) Install the reverse gear to the counter shaft.
- HINT:
Make sure that the ball is fitted into the groove on the reverse gear bearing inner race.
- (e) Make sure that the gear and synchronizer ring move smoothly.

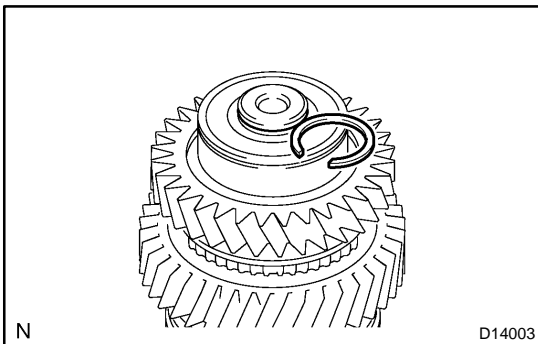


6. INSTALL COUNTER GEAR SHAFT BEARING

- (a) Using SST and a press, install a new counter gear shaft bearing to the counter shaft.

SST 09608-06041

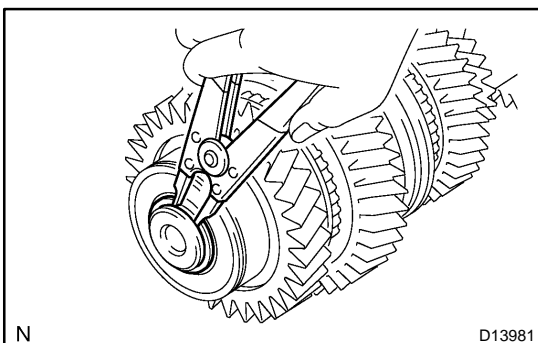
HINT:
Make sure that the bearing is installed in the direction shown in the illustration.



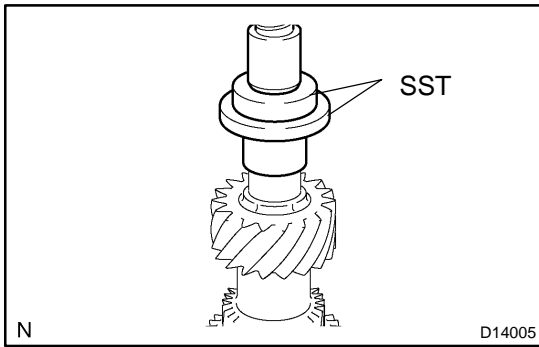
- (b) Select a snap ring that allows for the minimum amount of axial play.

Standard clearance: 0.1 mm (0.0039 in.) or less

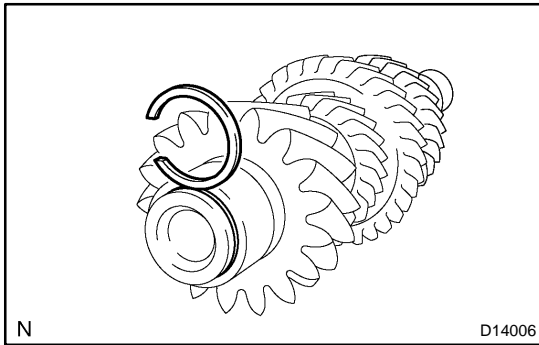
Mark	Thickness mm (in.)
A	2.35 to 2.40 (0.0925 to 0.0945)
B	2.40 to 2.45 (0.0945 to 0.0965)
C	2.45 to 2.50 (0.0965 to 0.0984)
D	2.50 to 2.55 (0.0984 to 0.1004)
E	2.55 to 2.60 (0.1004 to 0.1024)
F	2.60 to 2.65 (0.1024 to 0.1043)
G	2.65 to 2.70 (0.1043 to 0.1063)
H	2.70 to 2.75 (0.1063 to 0.1083)
J	2.75 to 2.80 (0.1083 to 0.1102)
K	2.80 to 2.85 (0.1102 to 0.1122)
L	2.85 to 2.90 (0.1122 to 0.1142)
M	2.90 to 2.95 (0.1142 to 0.1161)



- (c) Using a snap ring expander, install the snap ring.

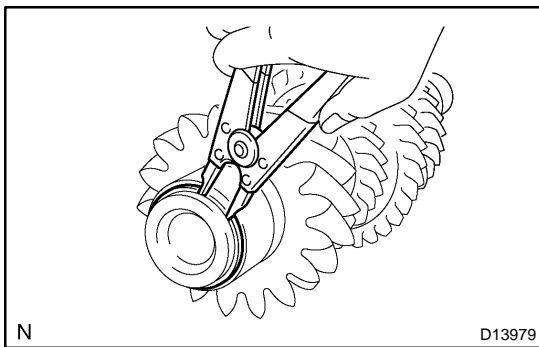


- 7. INSTALL NEEDLE ROLLER BEARING INNER RACE**
- (a) Using SST and a press, install a new needle roller bearing inner race.
 SST 09608-03070, 09950-60010 (09951-00540)



- (b) Select a snap ring that allows for the minimum amount of axial play.
Standard clearance: 0.1 mm (0.0039 in.) or less

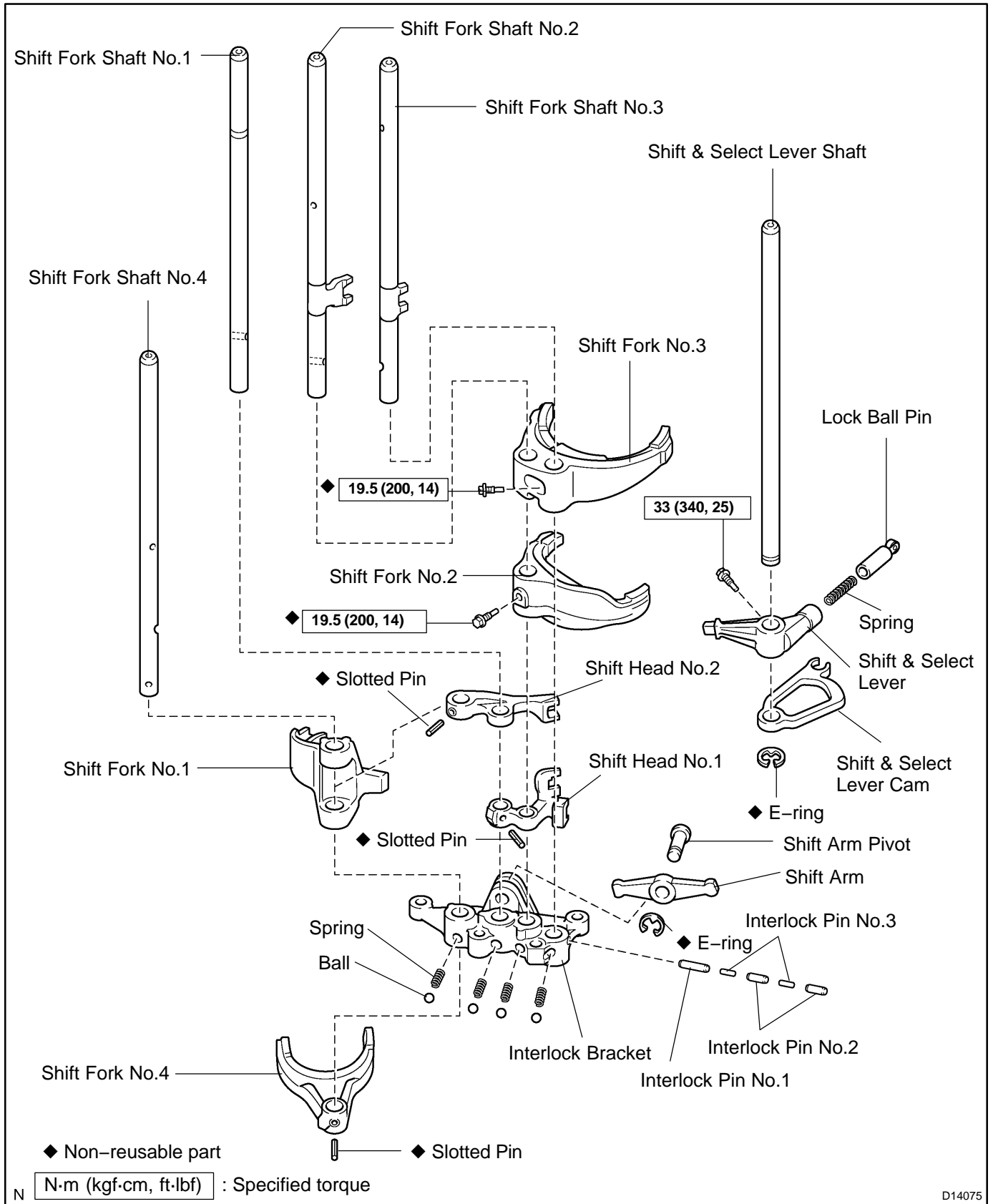
Mark	Thickness mm (in.)
A	2.35 to 2.40 (0.0925 to 0.0945)
B	2.40 to 2.45 (0.0945 to 0.0965)
C	2.45 to 2.50 (0.0965 to 0.0984)
D	2.50 to 2.55 (0.0984 to 0.1004)
E	2.55 to 2.60 (0.1004 to 0.1024)
F	2.60 to 2.65 (0.1024 to 0.1043)
G	2.65 to 2.70 (0.1043 to 0.1063)
H	2.70 to 2.75 (0.1063 to 0.1083)
J	2.75 to 2.80 (0.1083 to 0.1102)
K	2.80 to 2.85 (0.1102 to 0.1122)
L	2.85 to 2.90 (0.1122 to 0.1142)
M	2.90 to 2.95 (0.1142 to 0.1161)

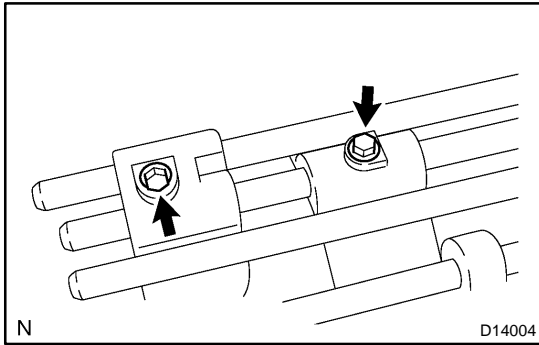


- (c) Using a snap ring expander, install the snap ring.

CONTROL SHAFT ASSEMBLY COMPONENTS

MT016-01

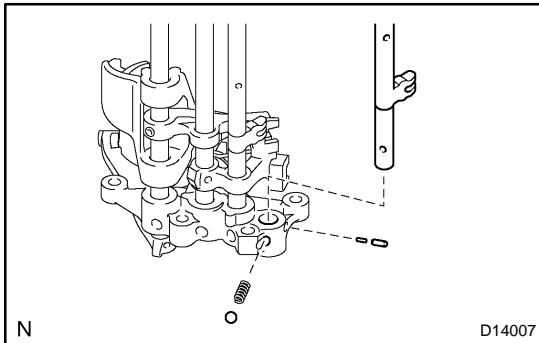




DISASSEMBLY

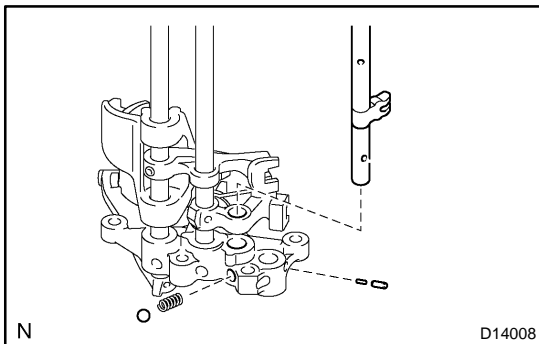
1. REMOVE SHIFT FORK NO.2 AND NO.3

Remove the 2 bolts and shift fork No.2 and No.3.



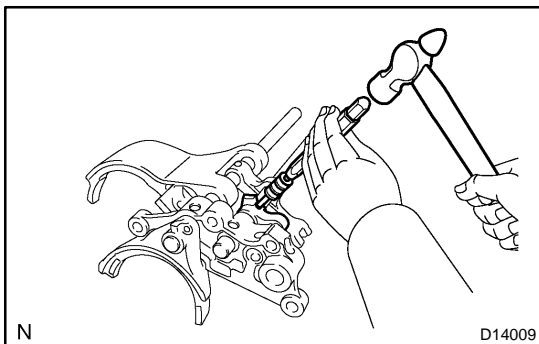
2. REMOVE SHIFT FORK SHAFT NO.3

Remove the shift fork shaft No.3, ball, spring, interlock pin No.2 and interlock pin No.3.



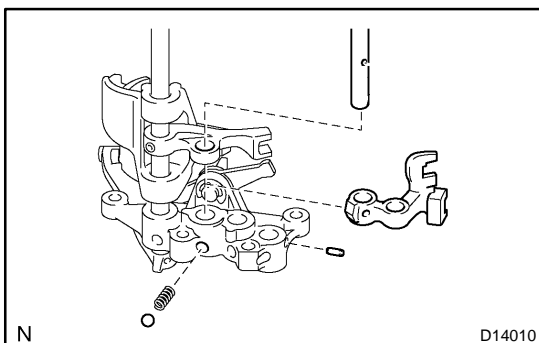
3. REMOVE SHIFT FORK SHAFT NO.2

Remove the shift fork shaft No.2, ball, spring, interlock pin No.2 and interlock pin No.3.

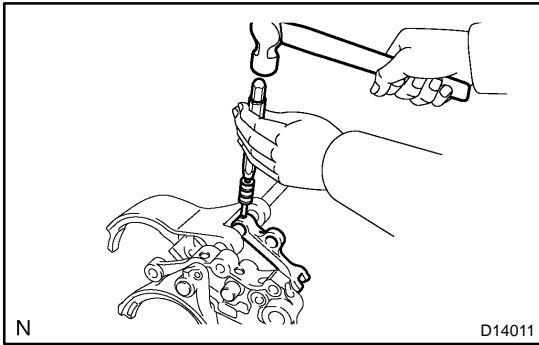


4. REMOVE SHIFT HEAD NO.1

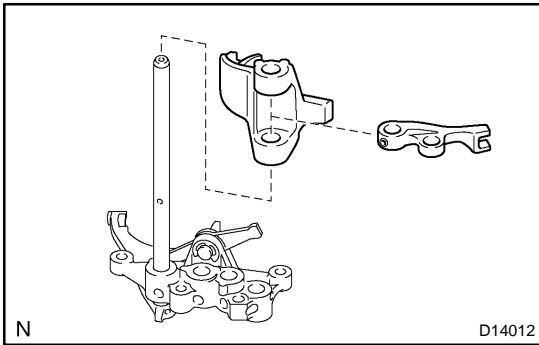
(a) Using a pin punch (5 mm (0.20 in.)) and hammer, tap out the slotted pin.



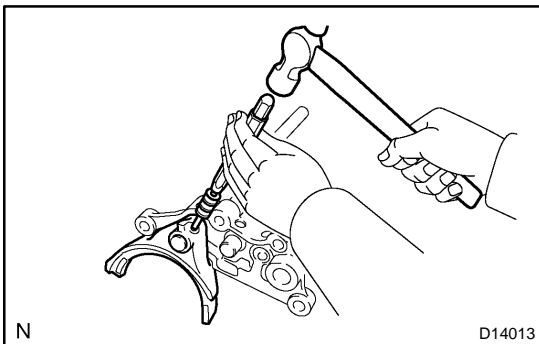
(b) Remove the shift fork shaft No.1, ball, spring, shift head No.1 and interlock pin No.1.



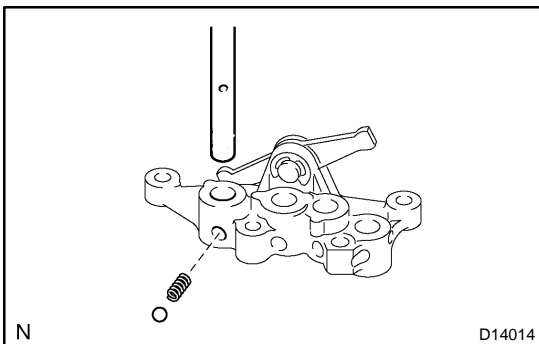
- 5. REMOVE SHIFT HEAD NO.2 AND SHIFT FORK NO.1**
 (a) Using a pin punch (5 mm (0.20 in.)) and hammer, tap out the slotted pin.



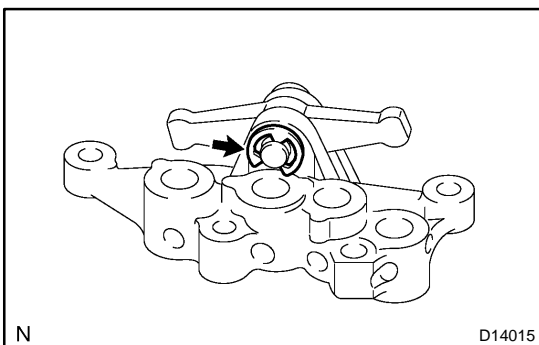
- (b) Remove the shift head No.2 and shift fork No.1.



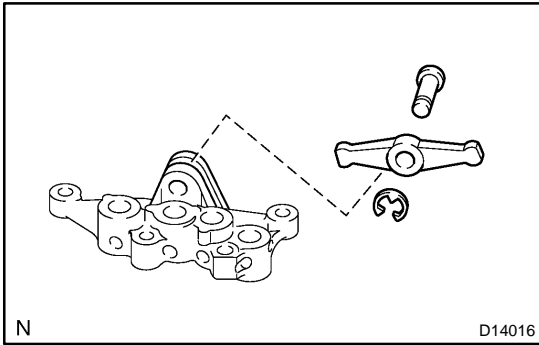
- 6. REMOVE SHIFT FORK NO.4**
 (a) Using a pin punch (5 mm (0.20 in.)) and hammer, tap out the slotted pin.
 (b) Remove the shift fork No.4.



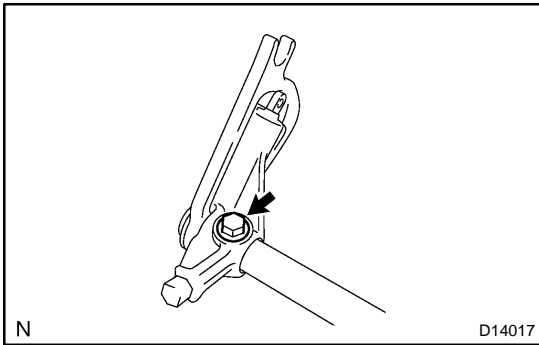
- 7. REMOVE SHIFT FORK SHAFT NO.4**
 Remove the shift fork shaft No.4, ball and spring.



- 8. REMOVE SHIFT ARM**
 (a) Using a screwdriver, remove the E-ring.

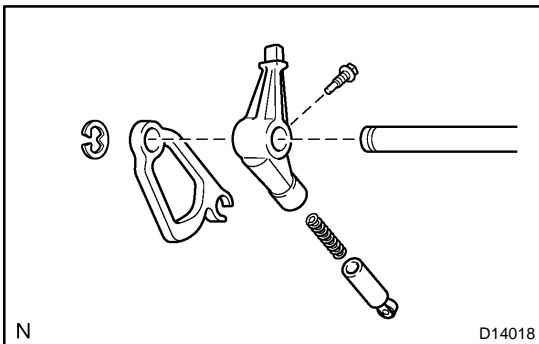


(b) Remove the shift arm pivot and shift arm.

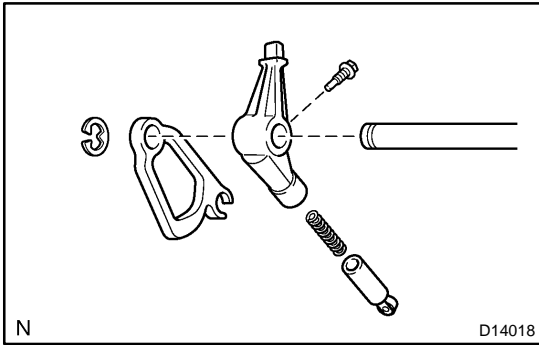


9. REMOVE SHIFT & SELECT LEVER

- (a) Remove the bolt from the shift & select lever.
- (b) Using a screwdriver, remove the E-ring.



(c) Remove the shift & select lever cam, shift & select lever, lock ball pin and spring from the shift & select shaft.

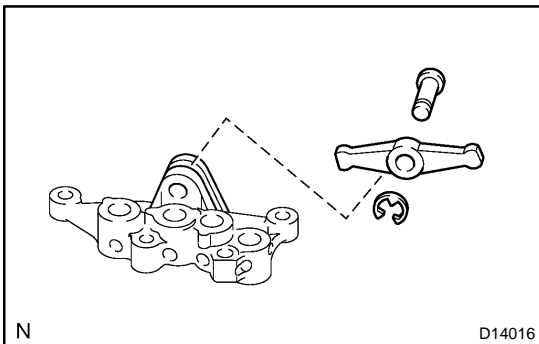
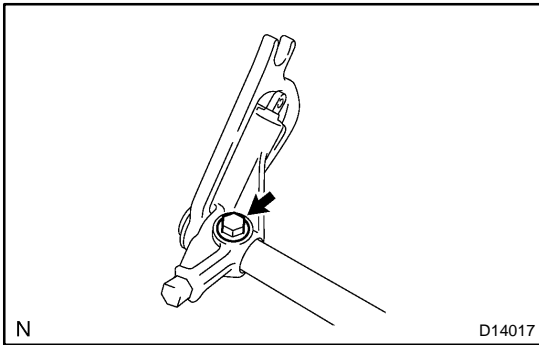


REASSEMBLY

1. INSTALL SHIFT & SELECT LEVER

- (a) Install the spring and lock ball pin to the shift & select lever.
- (b) Install the shift & select lever to the shift & select lever cam.
- (c) Install the shift & select lever shaft to the shift & select lever and shift & select lever cam.
- (d) Install a new E-ring to the shift & select lever shaft.
- (e) Install the bolt to the shift & select lever.

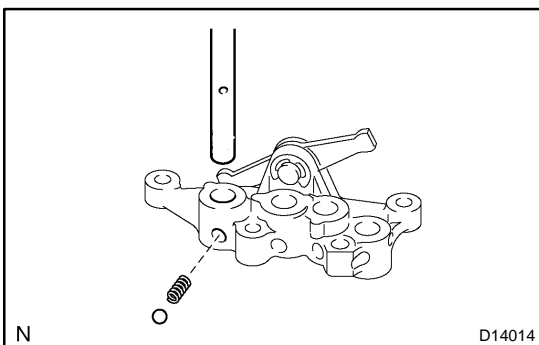
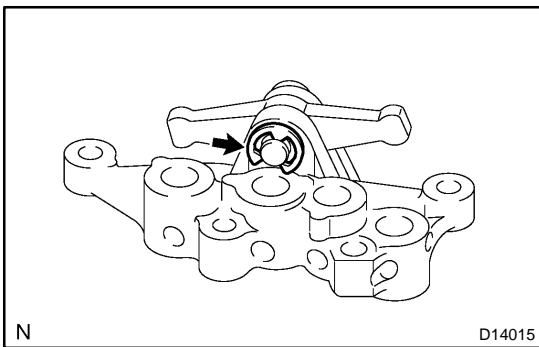
Torque: 33 N·m (340 kgf·cm, 25 ft·lbf)



2. INSTALL SHIFT ARM

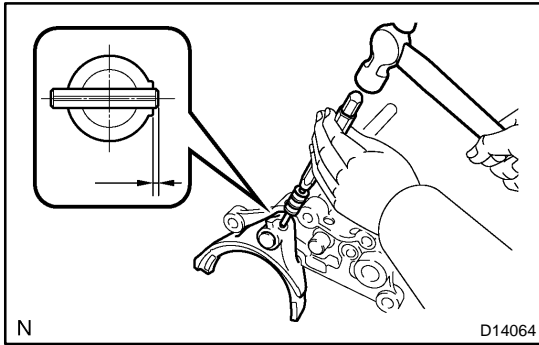
- (a) Install the shift arm and shift arm pivot to the interlock bracket.

- (b) Install a new E-ring to the shift arm pivot.



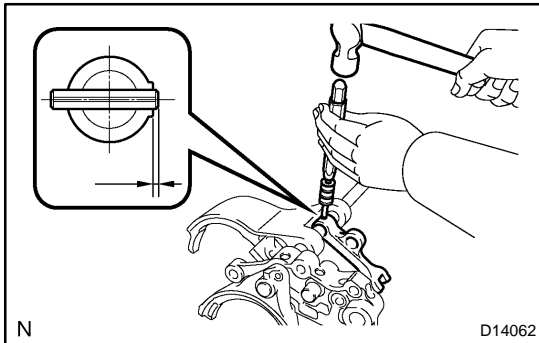
3. INSTALL SHIFT FORK SHAFT NO.4

- (a) Install the spring and ball to the interlock bracket.
- (b) Install the shift fork shaft No.4.

**4. INSTALL SHIFT FORK NO.4**

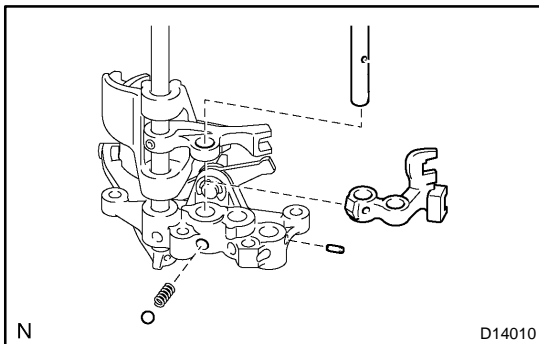
- (a) Install the shift fork No.4 to the shift fork shaft No.4.
- (b) Using a pin punch (5 mm (0.20 in.)) and hammer, tap in the slotted pin to the shaft fork No.4 and shift fork shaft No.4.

Drive in depth: 0 to 0.5 mm (0 to 0.0197 in.)

**5. INSTALL SHIFT HEAD NO.2 AND SHIFT FORK NO.1**

- (a) Install the shift fork No.1 and shift head No.2 to the shift fork shaft No.4.
- (b) Using a pin punch (5 mm (0.20 in.)) and hammer, tap in the slotted pin to the shift head No.2 and shift fork shaft No.4.

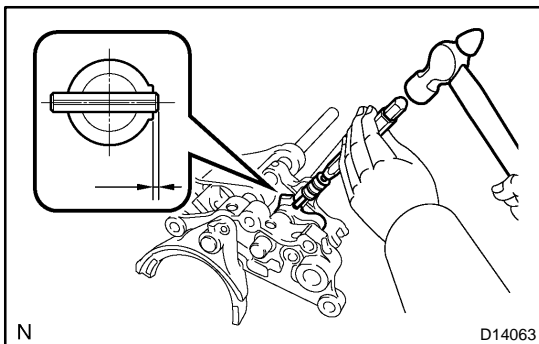
Drive in depth: 0 to 0.5 mm (0 to 0.0197 in.)

**6. INSTALL SHIFT FORK SHAFT NO.1**

- (a) Apply MP grease to the interlock pin No.1, and install it to the interlock bracket.
- (b) Install the spring and ball to the interlock bracket.
- (c) Install the shift fork shaft No.1 to the interlock bracket.

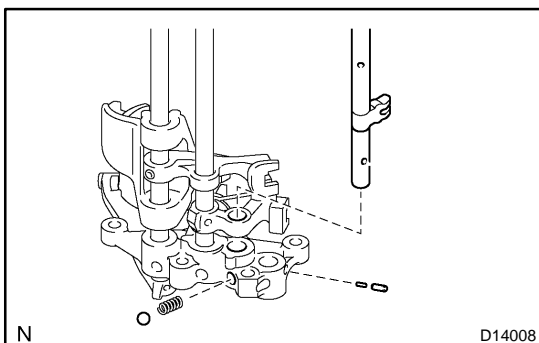
HINT:

Make sure that the shift fork shaft No.4 is in the neutral position.

**7. INSTALL SHIFT HEAD NO.1**

- (a) Install the shift head No.1 to the shift fork shaft No.1.
- (b) Using a pin punch (5 mm (0.20 in.)) and hammer, tap in the slotted pin to the shift head No.1 and shift fork shaft No.1.

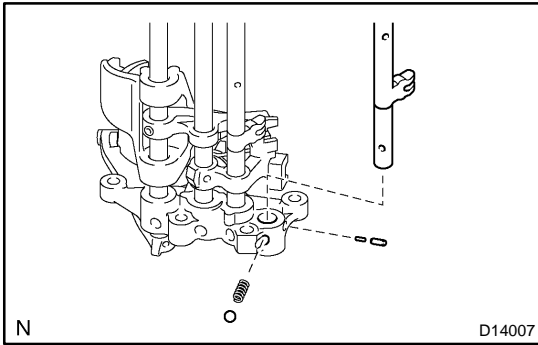
Drive in depth: 0 to 0.5 mm (0 to 0.0197 in.)

**8. INSTALL SHIFT FORK SHAFT NO.2**

- (a) Apply MP grease to the interlock pin No.2 and No.3, and install them to the interlock bracket.
- (b) Install the spring and ball to the the interlock bracket.
- (c) Install the shift fork shaft No.2 to the interlock bracket.

HINT:

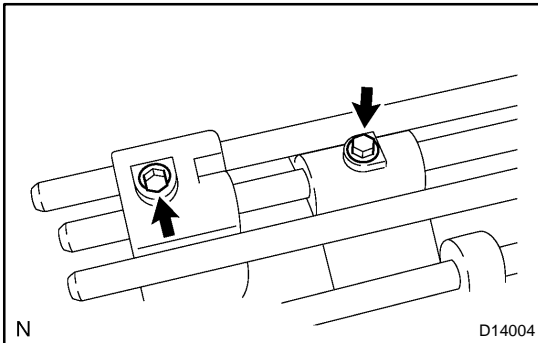
Make sure that the shift fork shaft No.3 and No.4 are in the neutral position.

**9. INSTALL SHIFT FORK SHAFT NO.3**

- (a) Apply MP grease to the interlock pin No.2 and No.3, and install them to the interlock bracket.
- (b) Install the spring and ball to the interlock bracket.
- (c) Install the shift fork shaft No.1 to the interlock bracket.

HINT:

Make sure that the shift fork shaft No.1, No.2 and No.4 are in the neutral position.

**10. INSTALL SHIFT FORK NO.2 AND NO.3**

Install the shift fork No.2 and No.3 with 2 new bolts.

Torque: 19.5 N·m (200 kgf·cm, 14 ft·lbf)

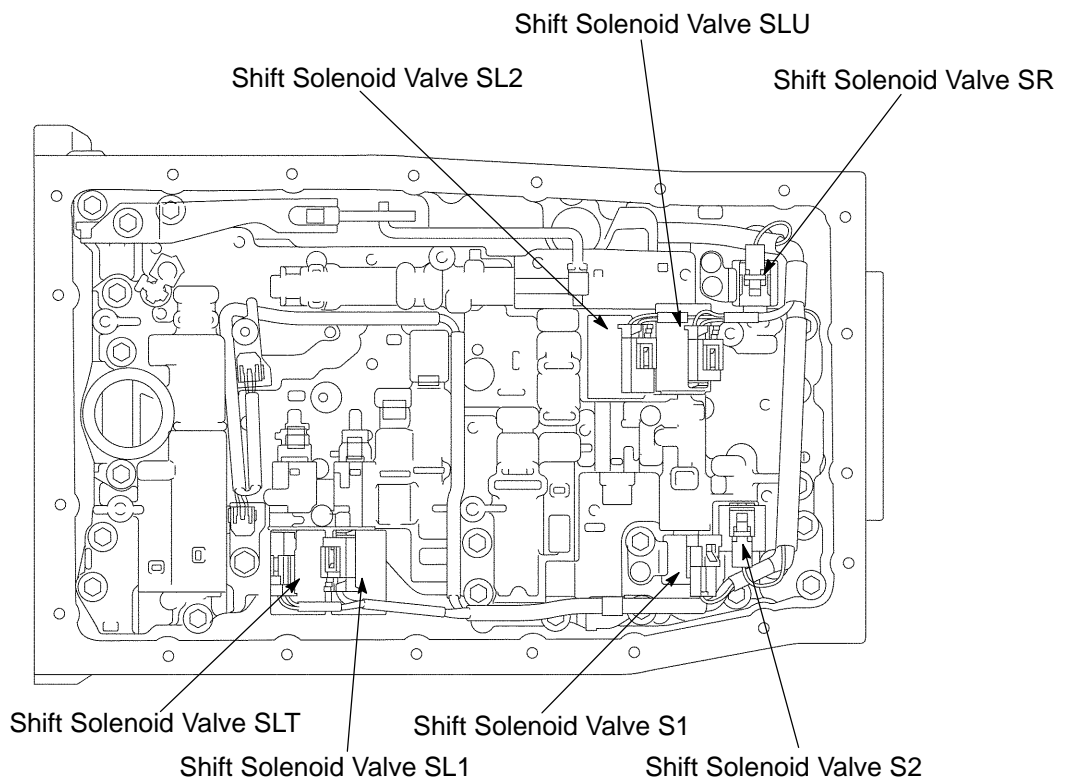
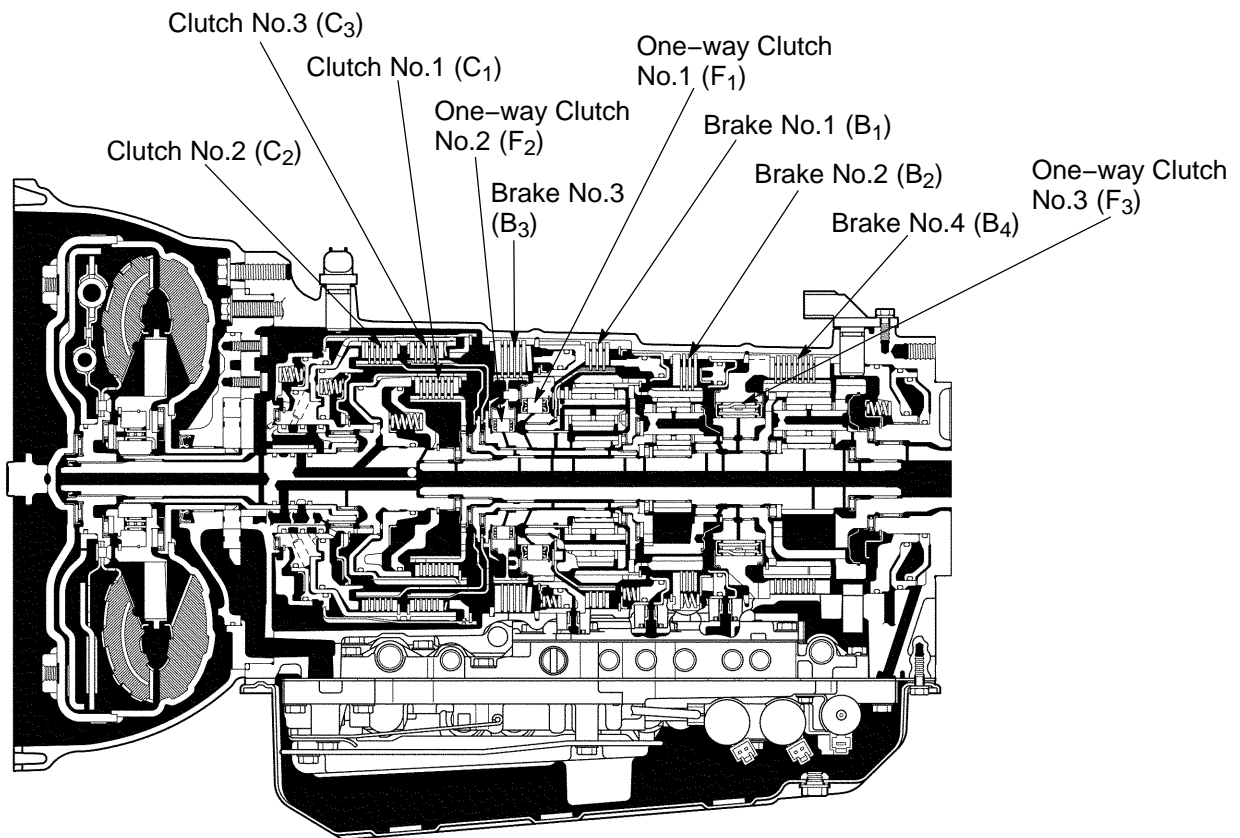
AUTOMATIC TRANSMISSION SYSTEM

AT13J-01

PRECAUTION

If the vehicle is equipped with a mobile communication system, refer to the precautions in the IN section.

OPERATION

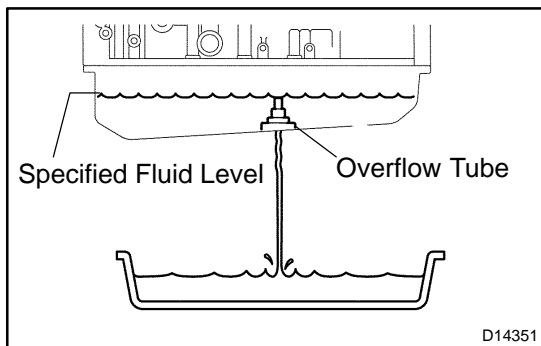
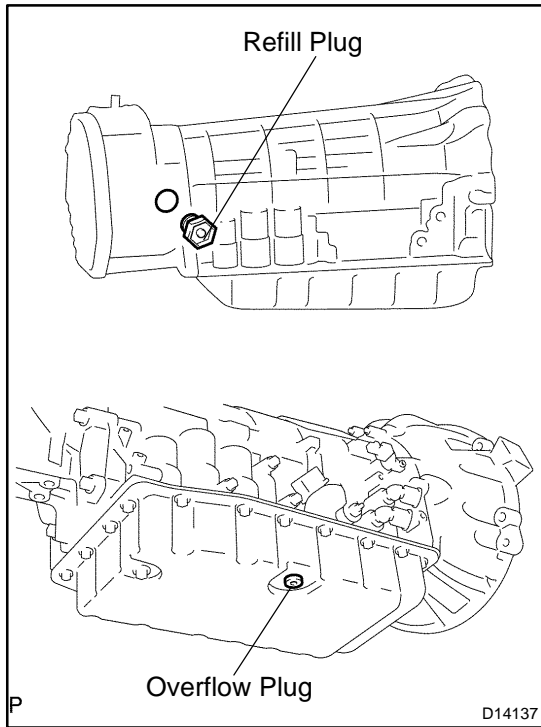


AUTOMATIC TRANSMISSION (A750E, A750F) - AUTOMATIC TRANSMISSION SYSTEM

Shift Lever Position	Gear Position	S1	S2	SR	SL1	SL2	SLU	C ₁	C ₂	C ₃	B ₁	B ₂	B ₃	B ₄	F ₁	F ₂	F ₃
P	Park	○	×	×	×	○	×	×	×	×	×	×	×	×	×	×	×
R	Reverse	○	×	×	×	○	×	×	×	○	○	×	×	○	○	×	×
N	Neutral	○	×	×	×	○	×	×	×	×	×	×	×	×	×	×	×
D	1st	○	×	×	×	○	×	○	×	×	×	×	×	×	×	×	○
	2nd	○	○	×	×	○	×	○	×	×	×	×	○	×	○	○	×
	3rd	×	○	×	×	○	×	○	×	○	×	×	○	×	○	×	×
	4th	×	×	×	×	○	○	○	○	○	×	×	○	×	×	×	×
	5th	×	×	○	○	×	○	×	○	○	○	×	○	×	×	×	×
D (O/D OFF)	1st	○	×	×	×	○	×	○	×	×	×	×	×	×	×	×	○
	2nd	○	○	×	×	○	×	○	×	×	×	×	○	×	○	○	×
	3rd	×	○	×	×	○	×	○	×	○	×	×	○	×	○	×	×
	4th	×	×	×	×	○	○	○	○	○	×	×	○	×	×	×	×
3	1st	○	×	×	×	○	×	○	×	×	×	×	×	×	×	×	○
	2nd	○	○	×	×	○	×	○	×	×	×	×	○	×	○	○	×
	3rd	×	○	×	×	×	×	○	×	○	○	×	○	×	○	×	×
2	1st	○	×	×	×	○	×	○	×	×	×	×	×	×	×	×	○
	2nd	○	○	○	×	×	×	○	×	×	×	○	○	×	○	○	×
L	1st	○	×	×	×	×	×	○	×	×	×	×	×	○	×	×	○

○ : Operates

F1, F2, F3 : Operates only when driving



AUTOMATIC TRANSMISSION FLUID

AT145-01

ADJUSTMENT

1. BEFORE TRANSMISSION FILL

- This transmission requires Toyota Genuine ATF WS transmission fluid.
- After servicing the transmission, you must refill the transmission with the correct amount of fluid.
- Maintain the vehicle in a horizontal position while adjusting fluid level.
- On vehicles equipped with active suspension, turn the suspension control switch OFF if you jack up the vehicle while the engine is running.
- Proceed to step 2 if you replaced the entire transmission, transmission pan, drain plug, valve body and/or torque converter.
- Proceed to step 3 after removing the refill plug if you replaced the transmission hose and/or output shaft oil seal.

2. TRANSMISSION PAN FILL

- (a) Remove the refill plug and overflow plug.
- (b) Fill the transmission through the refill hole until fluid begins to trickle out of the overflow tube.
- (c) Reinstall the overflow plug.

3. TRANSMISSION FILL

- (a) Fill the transmission with the correct amount of fluid as listed in the table below.
- (b) Reinstall the refill plug to avoid fluid splash.

Repair	Fill Amount
Transmission hose and pipe removal	0.6 L (0.63 US qts, 0.53 Imp qts)
Output shaft oil seal replacement	0.4 L (0.42 US qts, 0.35 Imp qts)
Transmission pan and drain plug removal	1.3 L (1.37 US qts, 1.14 Imp qts)
Transmission valve body removal	3.9 L (4.12 US qts, 3.43 Imp qts)
Torque converter removal	5.3 L (5.60 US qts, 4.66 Imp qts)
Entire transmission assembly	7.2 L (7.61 US qts, 6.34 Imp qts)

HINT:

If you cannot add the listed amount of fluid, do the following:

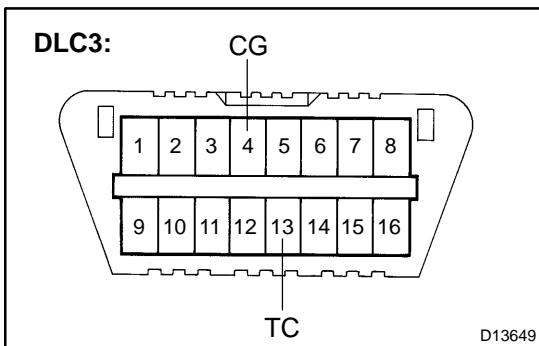
- Install the refill plug.
- Allow the engine to idle with the air conditioning OFF.
- Move the shift lever through entire gear range to circulate fluid.
- Wait for 30 seconds with the engine idling.
- Stop the engine.
- Remove the refill plug and add fluid.
- Reinstall the refill plug.

4. FLUID CIRCULATION

- (a) Allow the engine to idle with the air conditioning OFF.
- (b) Move the shift lever through entire gear range to circulate fluid.

5. FLUID TEMPERATURE CHECK

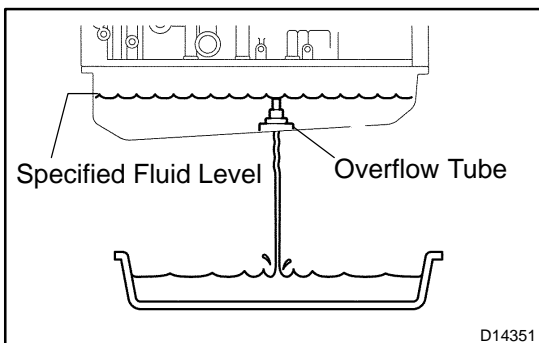
- (a) With hand-held tester
 - (1) Connect the hand-held tester to the DLC3.
 - (2) Select the tester menus: OBD/MOBD, ENGINE, DATA LIST and A/T.
 - (3) Check A/T OIL TEMP.
 - (4) Allow the engine to idle until the fluid temperature reaches 46°C (115°F).



- (b) Without hand-held tester (Using A/T OIL TEMP indicator)
 - (1) Create a short circuit between CG (4) and TC (13) of the DLC3 terminals using SST.
- SST 09843-18040
- (2) Move the shift lever back and forth between N and D at 1.5 seconds interval for six seconds.
 - (3) The A/T OIL TEMP indicator comes on for two seconds when the combination meter starts to detect the fluid temperature.
 - (4) The A/T OIL TEMP indicator comes on again when the fluid temperature reaches 46°C (115°F) and blinks when it exceeds 56°C (130°F).
 - (5) Allow the engine to idle until the fluid temperature reaches 46°C (115°F).

HINT:

The fluid temperature should be less than 30°C (86°F) before check the fluid temperature.



6. FLUID LEVEL CHECK

NOTICE:

The fluid temperature must be between 46°C (115°F) and 56°C (130°F) to check the fluid level.

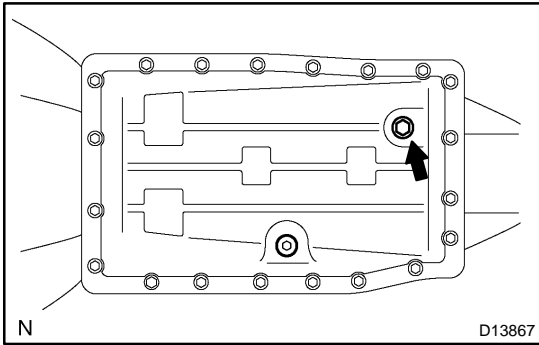
- (a) Remove the overflow plug with the engine idling.
- (b) Check that the fluid comes out of the overflow tube. If fluid does not come out, proceed to step 7. If fluid comes out, wait until the over-flow slows to a trickle and proceed to step 8.

7. TRANSMISSION REFILL

- (a) Install the overflow plug.
- (b) Stop the engine.
- (c) Remove the refill plug.
- (d) Add 0.4 liters (0.42 US qts, 0.35 Imp qts) of fluid.
- (e) Allow the engine to idle and wait for 10 seconds.
- (f) Proceed to step 6.

8. COMPLETE

- (a) Install the overflow plug with a new gasket.
Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)
- (b) Stop the engine.
- (c) Install the refill plug with a new gasket.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

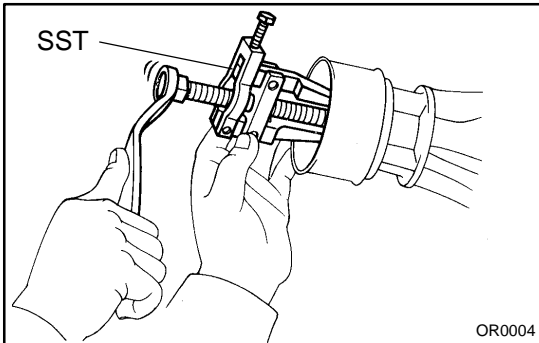


EXTENSION HOUSING OIL SEAL (A750E)

AT13L-01

ON-VEHICLE REPAIR

1. **DRAIN AUTOMATIC TRANSMISSION FLUID**
 - (a) Remove the drain plug and gasket, and drain the ATF.
 - (b) Install a new gasket and the drain plug.
Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)
2. **REMOVE PROPELLER SHAFT (See page PR-3)**



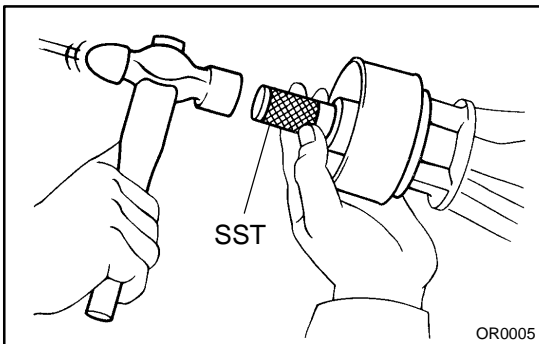
3. REMOVE REAR OIL SEAL

NOTICE:

Clean the extension housing before removing the oil seal.

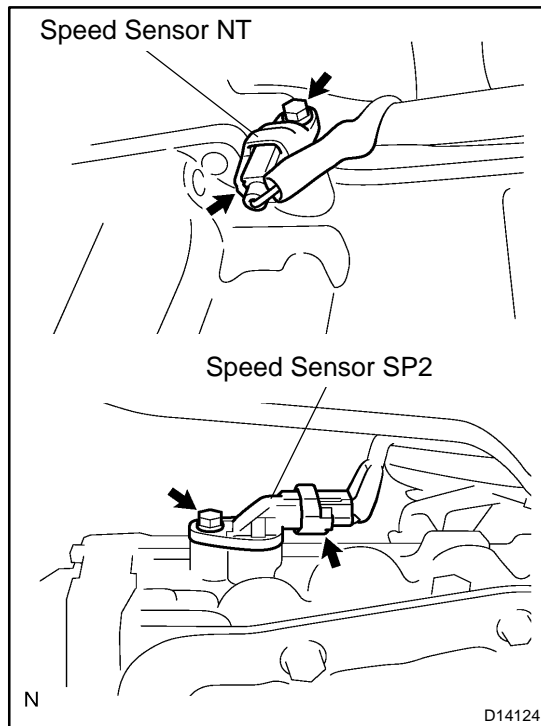
Using SST, remove the oil seal.

SST 09308-10010



4. INSTALL OIL SEAL

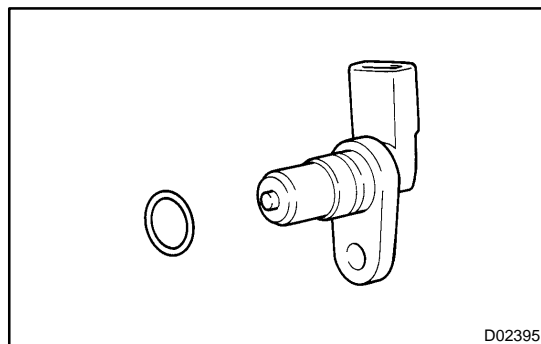
- (a) Using SST and a hammer, carefully drive a new oil seal in until it stops.
SST 09325-40010
- (b) Coat the lip of the oil seal with MP grease.
5. **INSTALL PROPELLER SHAFT (See page PR-8)**
6. **FILL TRANSMISSION (See page AT-4)**



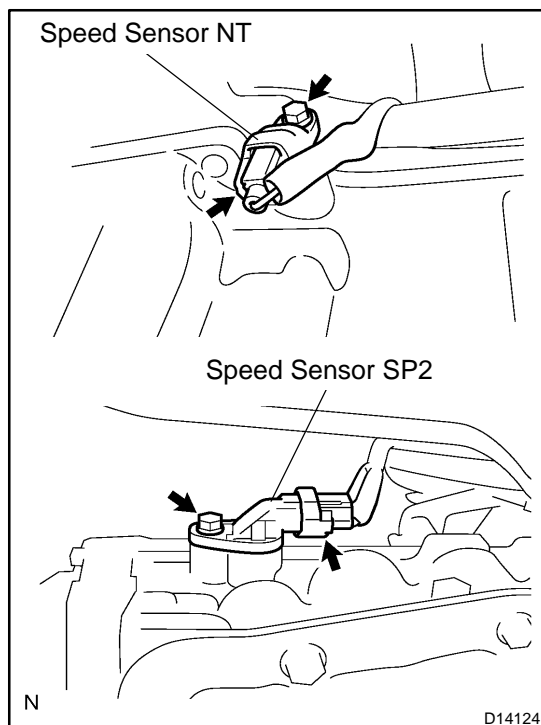
SPEED SENSOR ON-VEHICLE REPAIR

AT13M-01

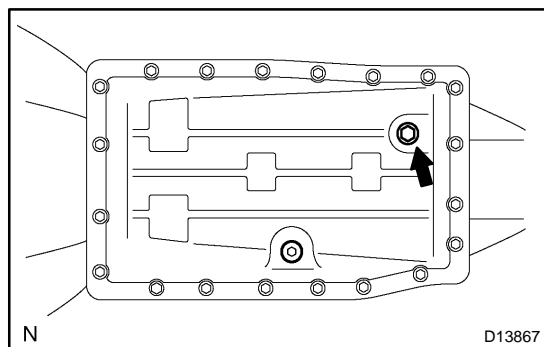
1. **DISCONNECT SPEED SENSOR NT AND SP2 CONNECTOR**
2. **REMOVE SPEED SENSOR NT AND SP2**
 - (a) Remove the 2 bolts, speed sensors NT and SP2.



- (b) Remove the 2 O-rings from the speed sensors NT and SP2.
3. **INSTALL SPEED SENSOR NT AND SP2**
 - (a) Coat 2 new O-rings with ATF and install them to the speed sensors NT and SP2.



- (b) Install the speed sensors NT and SP2 with the 2 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)
4. **CONNECT SPEED SENSOR NT AND SP2 CONNECTOR**



ATF TEMPERATURE SENSOR ON-VEHICLE REPAIR

AT13N-01

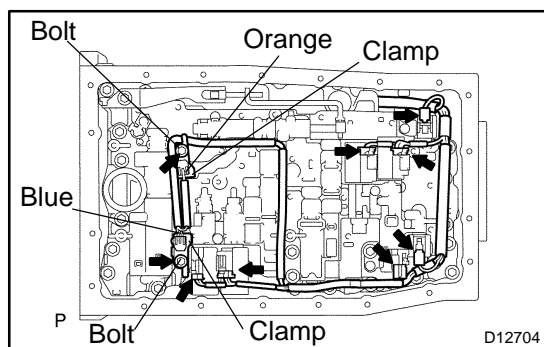
1. DRAIN AUTOMATIC TRANSMISSION FLUID

- Remove the drain plug and gasket, and drain the ATF.
- Install a new gasket and the drain plug.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

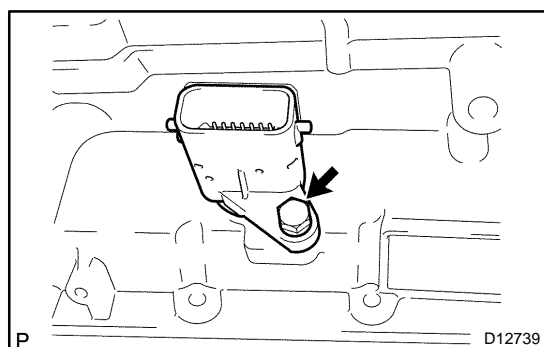
2. REMOVE OIL PAN (See page AT-12)

3. REMOVE OIL STRAINER (See page AT-12)



4. REMOVE ATF TEMPERATURE SENSOR

- Disconnect the 7 solenoid valve connectors.
- Remove the 2 bolts, clamps and ATF temperature sensors.



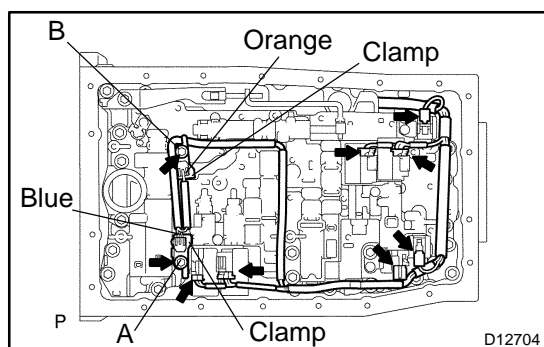
- Disconnect the transmission wire connector.
- Remove the bolt and the transmission wire harness.

5. INSTALL ATF TEMPERATURE SENSOR

- Install the transmission wire harness.
- Install the bolt.

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

- Connect the transmission wire connector.



- Connect the 7 solenoid valve connectors.
- Install the 2 ATF temperature sensors and clamps to the valve body with the 2 bolts.

HINT:

In order to install the ATF temperature sensors properly, check the wire harness color prior to installation.

Torque:

A: 11 N·m (112 kgf·cm, 8 ft·lbf)

B: 10 N·m (100 kgf·cm, 7 ft·lbf)

Bolt length:

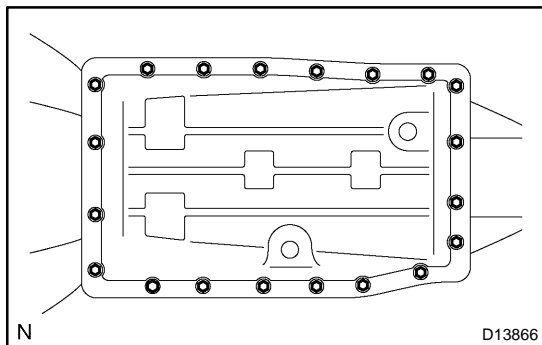
Bolt A: 36 mm (1.42 in.)

Bolt B: 12 mm (0.47 in.)

Sensor wire harness:

Wire harness	Color
for linear control	Orange
for oil temp. warning lamp	Blue

6. INSTALL OIL STRAINER (See page AT-12)



7. INSTALL OIL PAN

HINT:

Remove any packing material, and be careful not to spill oil on the contacting surfaces of the transmission case and the oil pan.

Using a new gasket, install the oil pan with the 20 bolts.

Torque: 4.4 N·m (45 kgf·cm, 39 in·lbf)

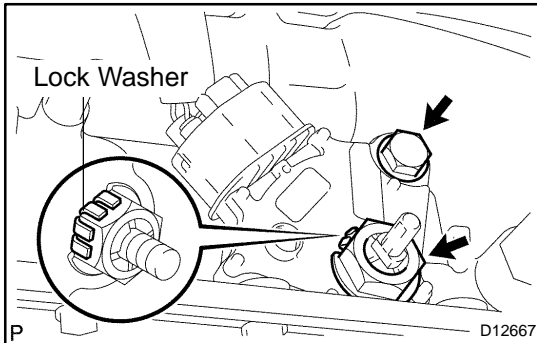
8. FILL TRANSMISSION (See page [AT-4](#))

PARK/NEUTRAL POSITION (PNP) SWITCH

AT130-01

ON-VEHICLE REPAIR

1. **DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**



2. **REMOVE PARK/NEUTRAL POSITION SWITCH**

- (a) Pry off the lock washer and remove the nut.
- (b) Remove the bolt and park/neutral position switch.

3. **INSTALL PARK/NEUTRAL POSITION SWITCH**

- (a) Install the park/neutral position switch with the bolt.

Torque: 13 N·m (130 kgf·cm, 10 ft·lbf)

- (b) Install a new lock washer and the nut.

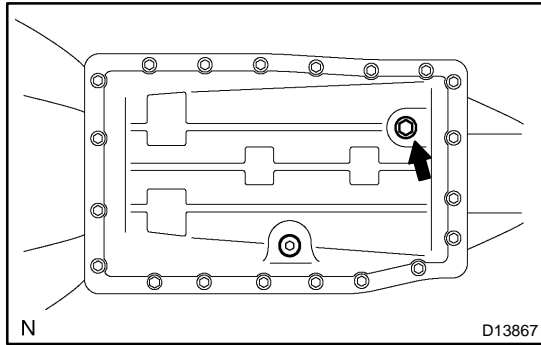
Torque: 6.9 N·m (70 kgf·cm, 61 in.-lbf)

- (c) Bend the claws on the lock washer to stake the nut.

- (d) Adjust the park/neutral position switch

(See page [DI-952](#) or [DI-1117](#)).

4. **CONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**



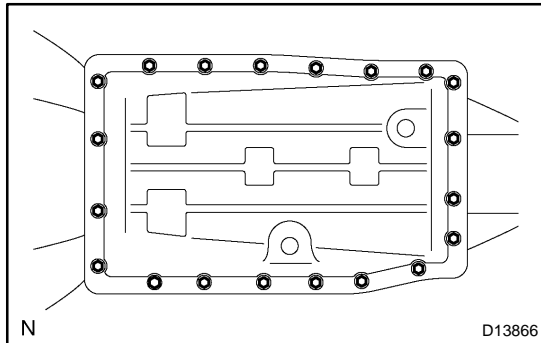
VALVE BODY ASSEMBLY ON-VEHICLE REPAIR

AT13P-01

1. DRAIN AUTOMATIC TRANSMISSION FLUID

- (a) Remove the drain plug and gasket, and drain the ATF.
- (b) Install a new gasket and the drain plug.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

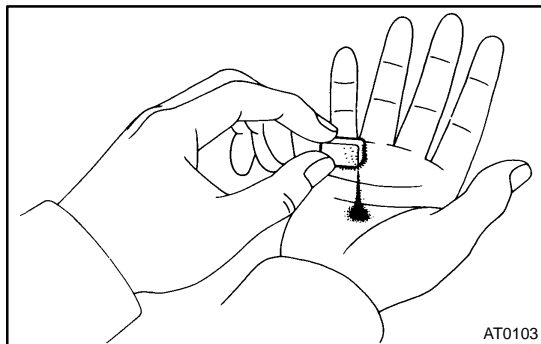


2. REMOVE OIL PAN

NOTICE:

Some fluid will remain in the oil pan.

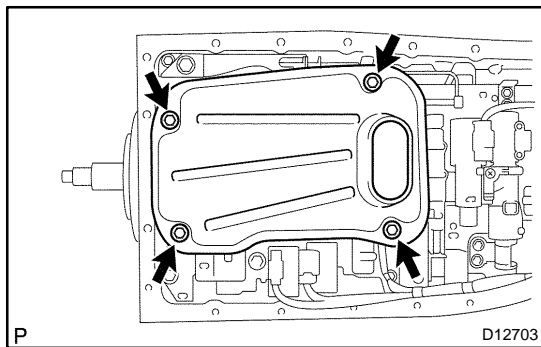
- (a) Remove the 20 bolts.
- (b) Remove the oil pan gasket.



3. EXAMINE PARTICLES IN PAN

Remove the magnets and use them to collect any steel particles. Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.

Steel (magnetic) ... bearing, gear and clutch plate wear
Brass (non-magnetic) ... bushing wear

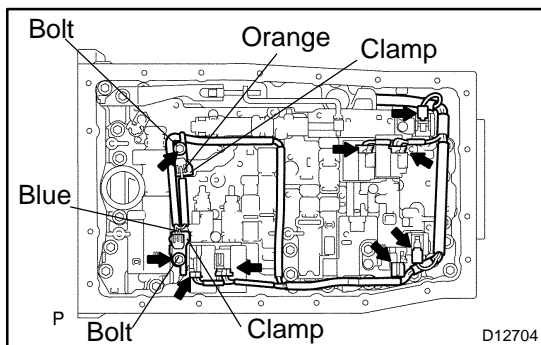


4. REMOVE OIL STRAINER

Remove the 4 bolts, the oil strainer and the O-ring.

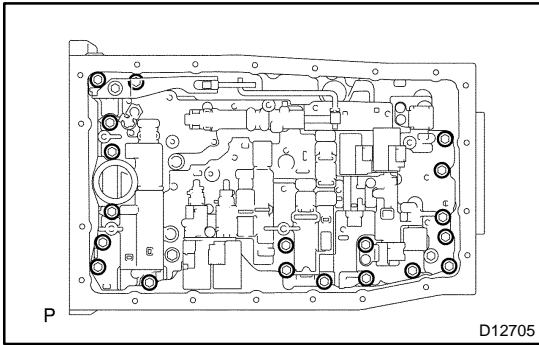
NOTICE:

Be careful as some fluid will come out with the oil strainer.



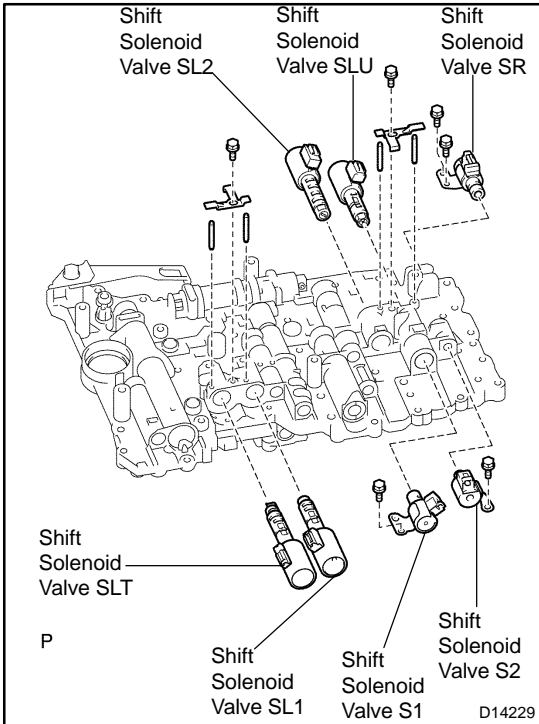
5. REMOVE ATF TEMPERATURE SENSOR

- (a) Disconnect the 7 solenoid valve connectors.
- (b) Remove the 2 bolts, clamps and ATF temperature sensors.



6. REMOVE VALVE BODY

- (a) Remove the 19 bolts and the valve body.
- (b) Remove the 3 drum seal gaskets.



7. REMOVE SOLENOID VALVE

- (a) Remove the 2 bolts and the shift solenoid valve SR.
- (b) Remove the 3 bolts and the shift solenoid valves S1 and S2.
- (c) Remove the 2 bolts, 2 solenoid lock plates and the 4 straight pins.
- (d) Remove the shift solenoid valves SL2 and SLU.
- (e) Remove the shift solenoid valves SL1 and SLT.
- (f) Remove the O-ring from the solenoid valve S2.

8. INSTALL SOLENOID VALVE

- (a) Install a new O-ring to the shift solenoid valve S2.
- (b) Install the shift solenoid valves SL1 and SLT.
- (c) Install the shift solenoid valves SL2 and SLU.
- (d) Install the 4 straight pins and the 2 solenoid lock plates with the 2 bolts.

Torque: 6.4 N·m (65 kgf-cm, 57 in-lbf)

- (e) Install the shift solenoid valve S1 with the bolt.

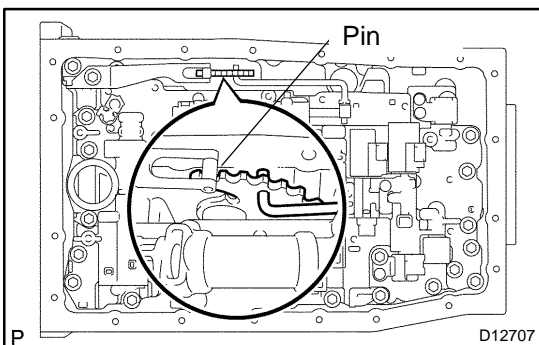
Torque: 6.4 N·m (65 kgf-cm, 57 in-lbf)

- (f) Install the shift solenoid valve S2 with the bolt.

Torque: 10 N·m (102 kgf-cm, 7 ft-lbf)

- (g) Install the shift solenoid valve SR with the 2 bolts.

Torque: 6.4 N·m (65 kgf-cm, 57 in-lbf)

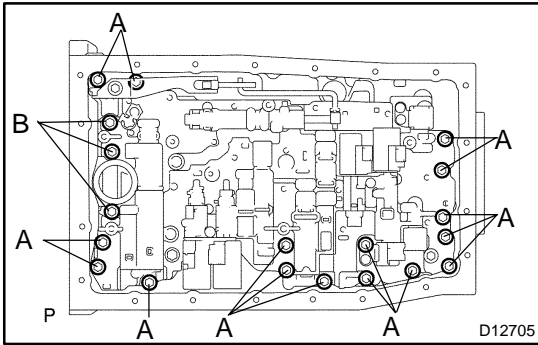


9. INSTALL VALVE BODY

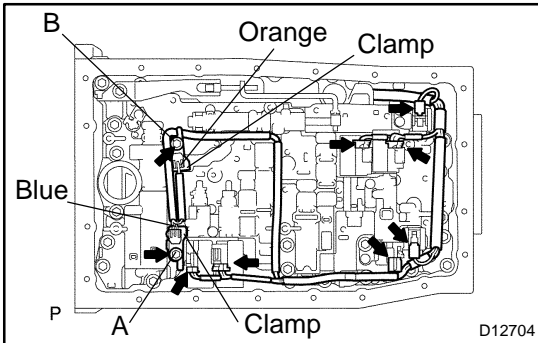
HINT:

Align the groove of the manual valve with the pin of the lever.

- (a) Install 3 new drum seal gaskets to the transmission case.



- (b) Install the 19 bolts and the valve body.
Torque: 11 N·m (112 kgf·cm, 8 ft·lbf)
Bolt length:
Bolt A: 25 mm (0.98 in.)
Bolt B: 36 mm (1.42 in.)



10. INSTALL TEMPERATURE SENSOR

- (a) Connect the 7 solenoid valve connectors.
 (b) Install the 2 temperature sensors and clamps to the valve body with the 2 bolts.

HINT:

In order to install the ATF temperature sensors properly, check the wire harness color prior to installation.

Torque:

A: 11 N·m (112 kgf·cm, 8 ft·lbf)

B: 10 N·m (100 kgf·cm, 7 ft·lbf)

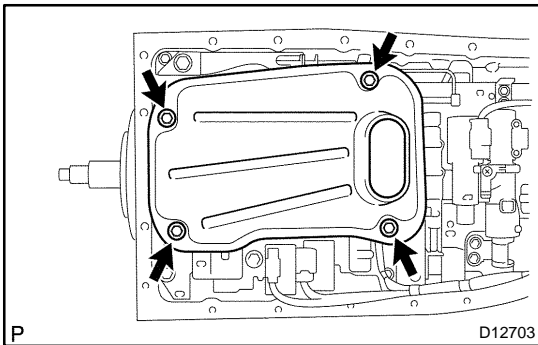
Bolt length:

Bolt A: 36 mm (1.42 in.)

Bolt B: 12 mm (0.47 in.)

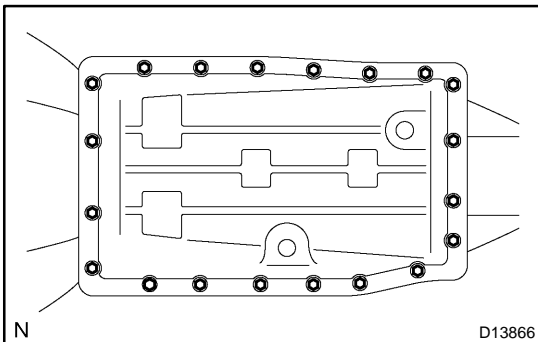
Sensor wire harness:

Wire harness	Color
for linear control	Orange
for oil temp. warning lamp	Blue



11. INSTALL OIL STRAINER

- (a) Install a new O-ring.
 (b) Install the oil strainer with the 4 bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)



12. INSTALL OIL PAN

HINT:

Remove any packing material, and be careful not to spill oil on the contacting surfaces of the transmission case and the oil pan.

Using a new gasket, install the oil pan with the 20 bolts.

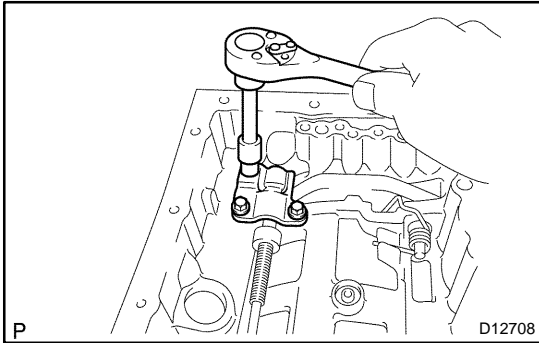
Torque: 4.4 N·m (45 kgf·cm, 39 in·lbf)

13. FILL TRANSMISSION (See page AT-4)

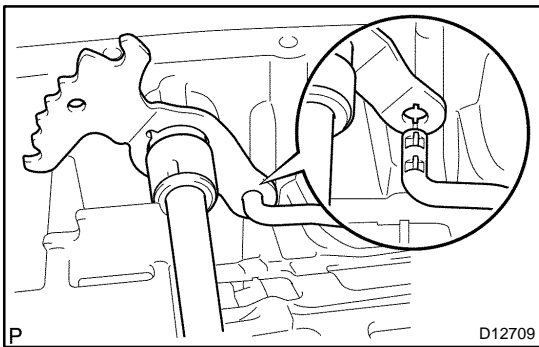
PARKING LOCK PAWL ON-VEHICLE REPAIR

AT13Q-01

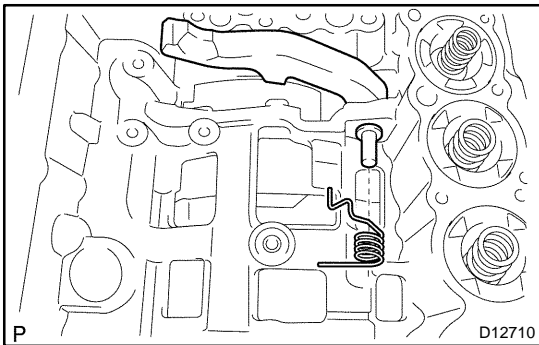
1. REMOVE VALVE BODY (See page [AT-12](#))



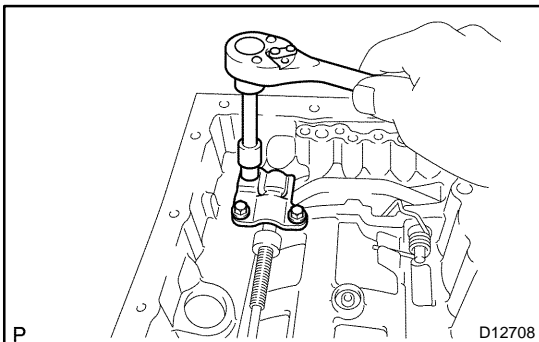
2. REMOVE PARKING LOCK PAWL BRACKET
Remove the 3 bolts and parking lock pawl bracket.



3. REMOVE PARKING LOCK ROD



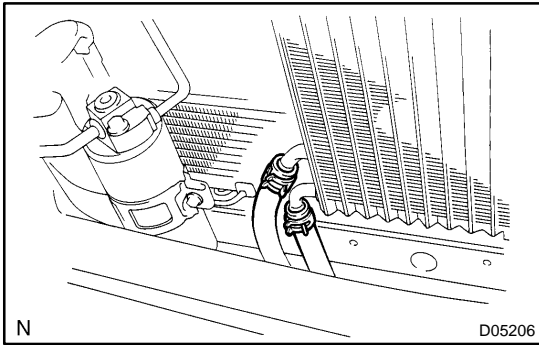
4. REMOVE SPRING FROM PARKING LOCK PAWL SHAFT
5. REMOVE PARKING LOCK PAWL AND SHAFT
6. INSTALL PARKING LOCK PAWL AND SHAFT
7. INSTALL SPRING TO PARKING LOCK PAWL SHAFT



8. INSTALL PARKING LOCK PAWL BRACKET
Install the parking lock pawl bracket with the 3 bolts.

HINT:

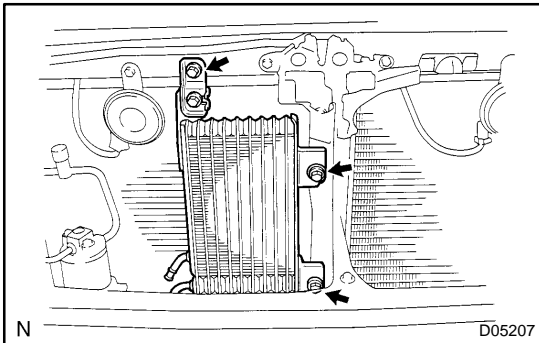
- Push the lock rod fully forward.
 - Check that the parking lock pawl operates smoothly.
- Torque: 7.4 N·m (75 kgf·cm, 65 in.-lbf)**
9. INSTALL VALVE BODY (See page [AT-12](#))



REMOVAL

1. REMOVE PIPE

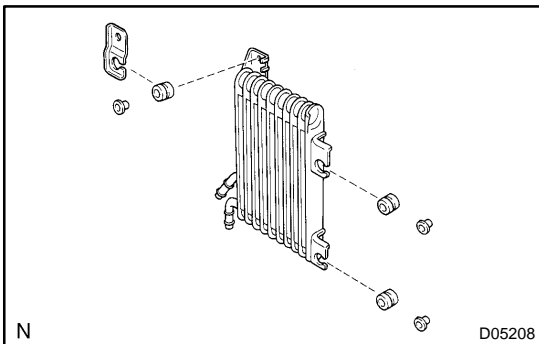
Loosen the 2 clips and disconnect the 2 hoses.



2. REMOVE OIL COOLER

(a) Remove the 3 bolts and oil cooler.

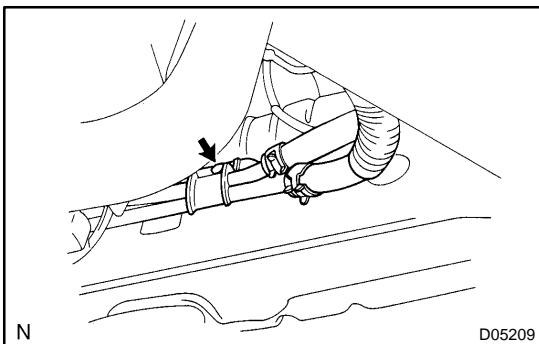
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)



(b) Remove the bolt, transmission oil cooler bracket and grommet.

Torque: 4.9 N·m (50 kgf·cm, 43 in.-lbf)

(c) Remove the 2 grommets and condenser mounting insulators.



3. REMOVE OIL COOLER TUBE

(a) Loosen the 2 clips and disconnect the 2 hoses.

(b) Remove the bolt and oil cooler tube with the 2 hoses.

Torque: 5.0 N·m (50 kgf·cm, 48 in.-lbf)

(c) Loosen the 2 clips and disconnect the 2 hoses.

INSTALLATION

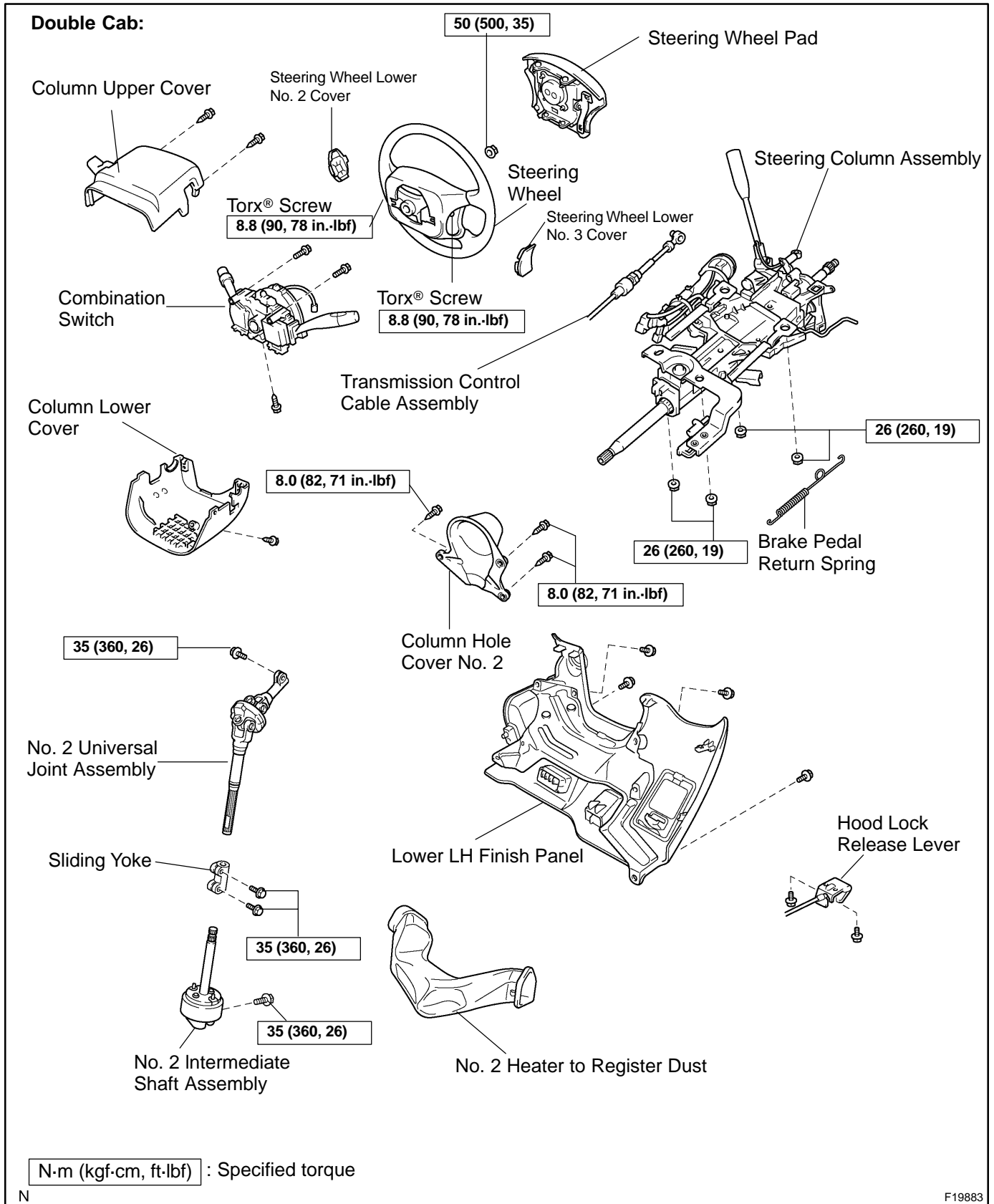
Installation is in the reverse order of removal (See page [AT-17](#)).

HINT:

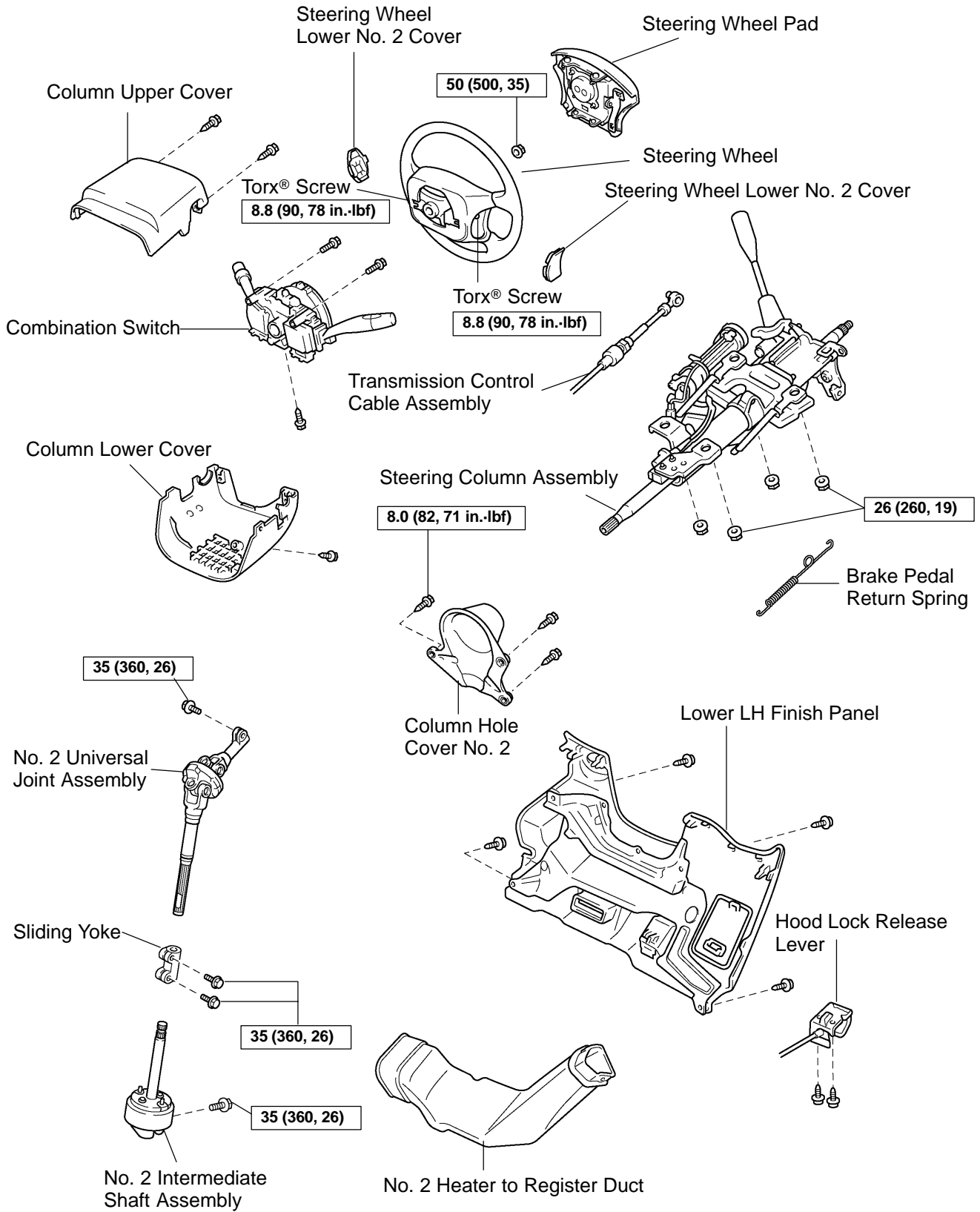
After installation, check fluid level (See page [AT-4](#)).

COLUMN SHIFT ASSEMBLY COMPONENTS

AT13U-01

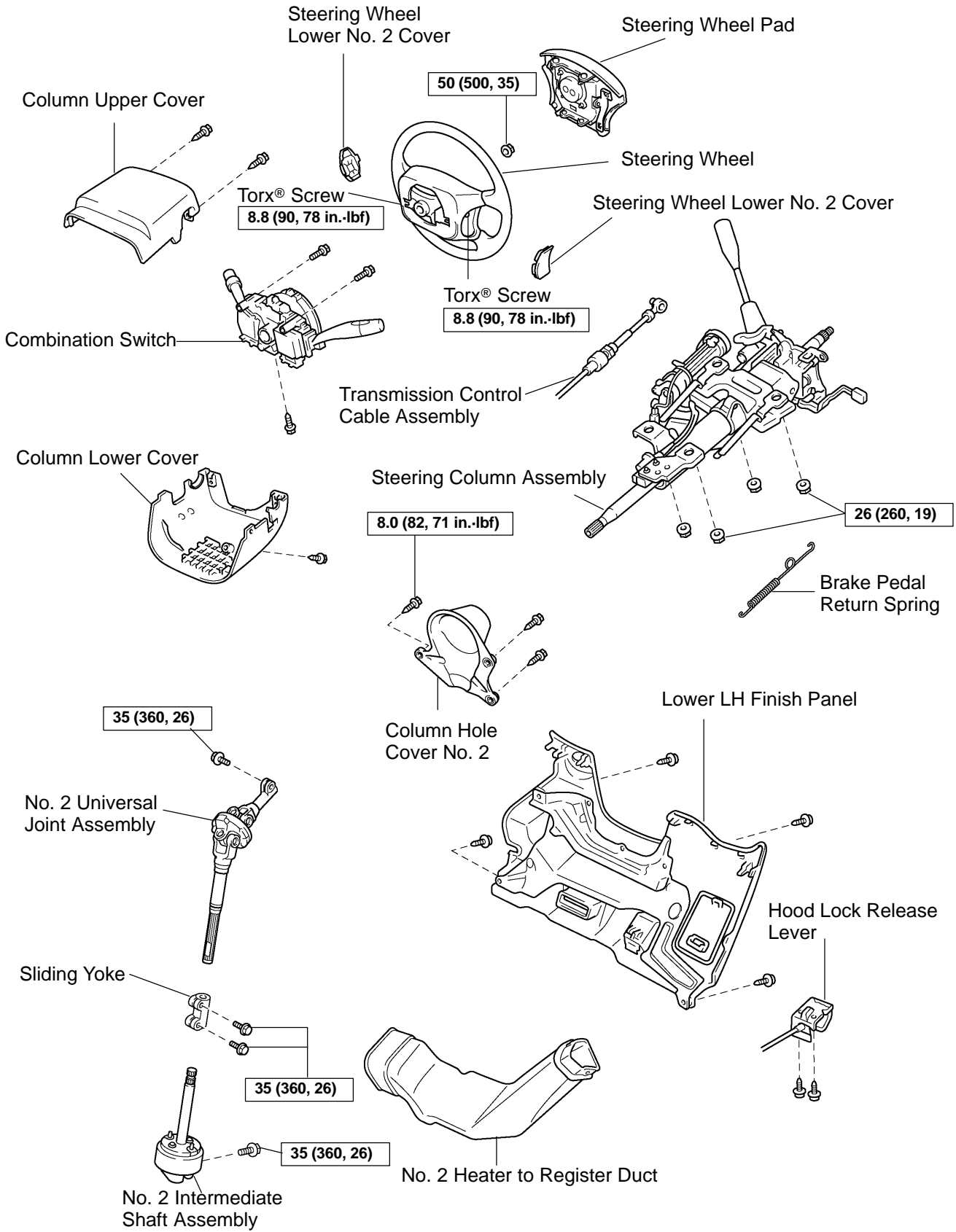


**Standard Cab, Access Cab:
Non-tilt steering column**

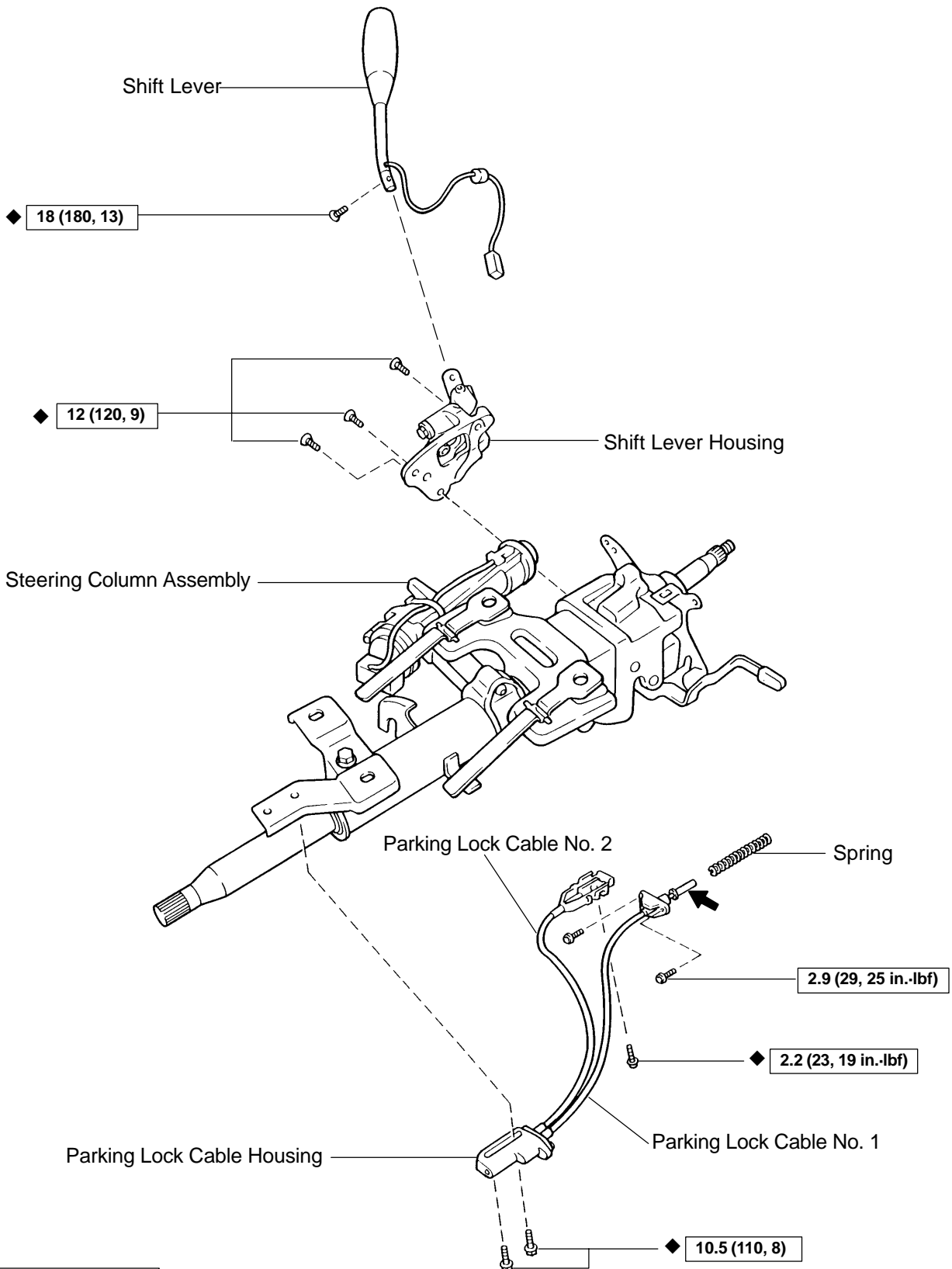


N·m (kgf·cm, ft·lbf) : Specified torque

**Standard Cab, Access Cab:
Tilt steering column**



N-m (kgf-cm, ft-lbf) : Specified torque



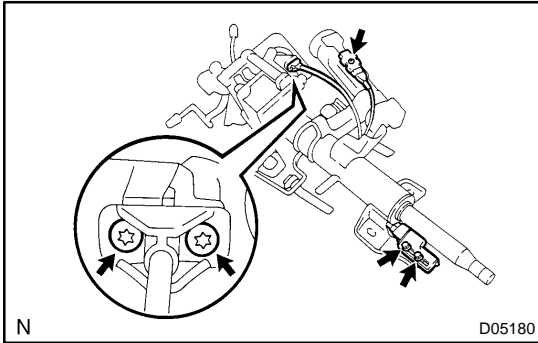
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

➔ MP grease

REMOVAL

1. **REMOVE STEERING COLUMN ASSEMBLY**
(See page [SR-18](#) or [SR-33](#))



2. **REMOVE PARKING LOCK CABLE ASSEMBLY**

- (a) Remove the screw and cable No. 2.
- (b) Using a torx® socket wrench, remove the 2 screws and cable No. 1.
- (c) Remove the spring.
- (d) Remove the 2 bolts and parking lock cable housing.

3. **REMOVE SHIFT LEVER**

- (a) Disconnect the connector.
- (b) Using a torx® socket wrench, remove the torx® screw and shift lever.

4. **REMOVE SHIFT LEVER HOUSING**

Using a torx® socket wrench, remove the 3 torx® screws and shift lever housing.

INSTALLATION

1. INSTALL SHIFT LEVER HOUSING

Using a torx® socket wrench, install the shift lever housing with the 3 new screws.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

2. INSTALL SHIFT LEVER

- (a) Install the upper No. 2 steering column cover.
- (b) Using a torx® socket wrench, install the shift lever with a new screw.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

- (c) Connect the connector.

3. INSTALL PARKING LOCK CABLE NO. 1 AND NO. 2

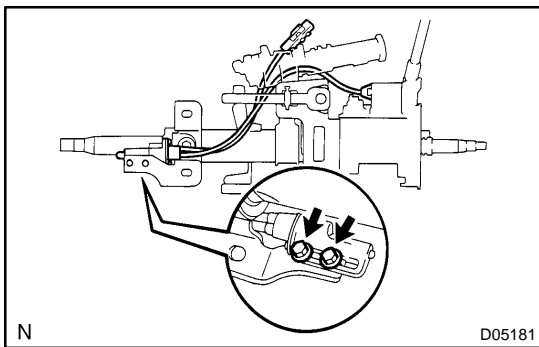
- (a) Apply MP grease on the lock pin and internal surface of shift lever housing.
- (b) Install the spring and parking lock cable No. 1 into the shift lever housing.

NOTICE:

Be careful not to bend or twist the cable abnormally.

- (c) Using a torx® socket wrench, install 2 new screws.

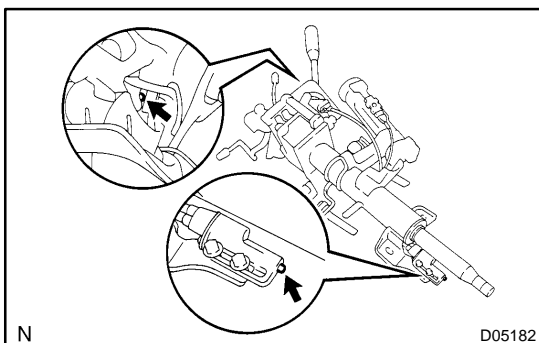
Torque: 2.9 N·m (29 kgf·cm, 25 in.-lbf)



- (d) Wire the cable No. 1 and No. 2, as shown in the illustration.
- (e) Temporarily install the cable housing to steering column assembly with 2 new bolts.

NOTICE:

Be careful not to bend or twist the cable abnormally.



- (f) After installation, confirm the following items.
 - (1) When the shift lever is in the P position and the pedal button is pushed in by 7 mm (0.28 in.), shift lever should be locked by lock pin.
 - (2) When the pedal button is released, the shift lever should be able to be shifted from P position to other positions.
 - (3) When the shift lever is in the N or D position and the pedal button is pushed in by 7 mm (0.28 in.), the shift lever should be able to be shifted.

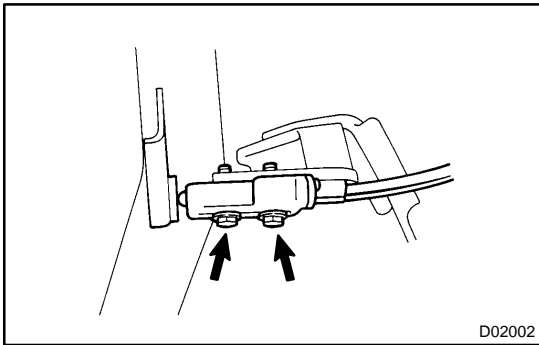
- (g) Install the cable No. 2 to column upper bracket with the clip.
- (h) Install the cable end to the sliding block of the column upper bracket with the screw.
Torque: 2.2 N·m (23 kgf·cm, 19 in.-lbf)
- (i) After installation, check the following items.
 - (1) When the pedal button is pushed, shift lever should be locked.
 - (2) When the pedal button is released, shift lever should be unlocked.

4. INSTALL STEERING COLUMN ASSEMBLY

(See page [SR-28](#) or [SR-42](#))

5. ADJUST CABLE HOUSING

- (a) Shift the shift lever to the P position.
- (b) Turn the ignition key to the LOCK position.



- (c) Loosen the 2 bolts and adjust the cable housing.

HINT:

- Pedal button should touch the pedal plate cushion.
 - Brake pedal should not be moved by the pedal button.
 - Cable housing should not be touched the brake pedal and the brake pedal plate cushion.
- (d) Torque the 2 bolts.

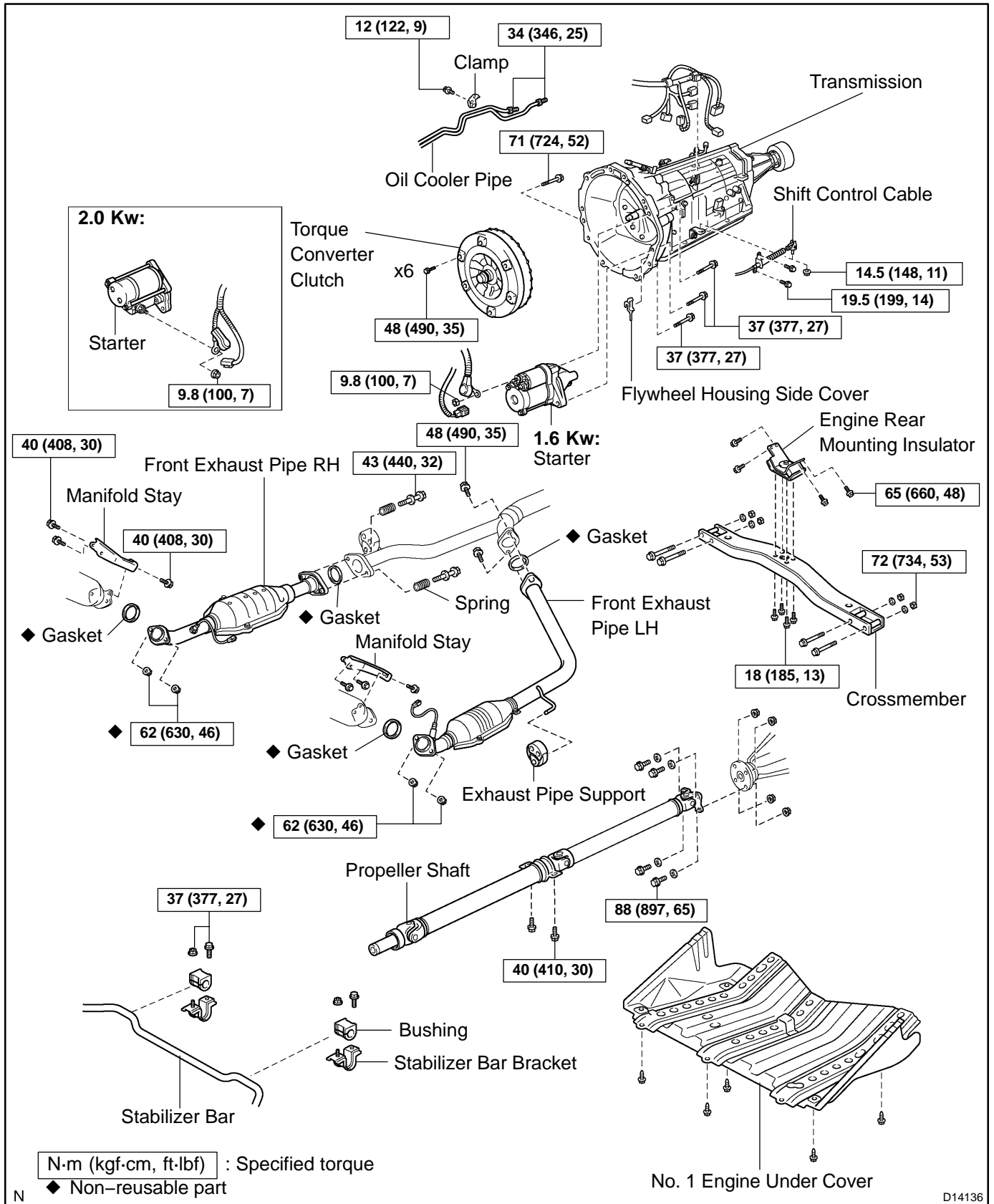
Torque: 10.5 N·m (110 kgf·cm, 8 ft-lbf)

6. CONFIRM SHIFT LOCK SYSTEM OPERATION

- (a) Only when the brake pedal is engaged and the ignition key is not in the LOCK position, the shift lever can be shifted from the P position to other positions.
When the shift lever is in the P position and the brake pedal is released, the shift lever cannot be shifted from the P position to other positions.
- (b) When the shift lever is not in the P position, the ignition key cannot be turned to the LOCK position.
Only when the shift lever is in the P position, the ignition key can be removed.
- (c) Cable No. 1 and No. 2 should not be deformed by other parts located around the steering column.

AUTOMATIC TRANSMISSION UNIT (1GR-FE) COMPONENTS

AT13X-01

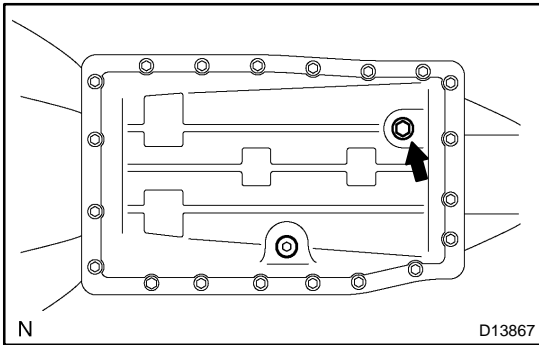


N

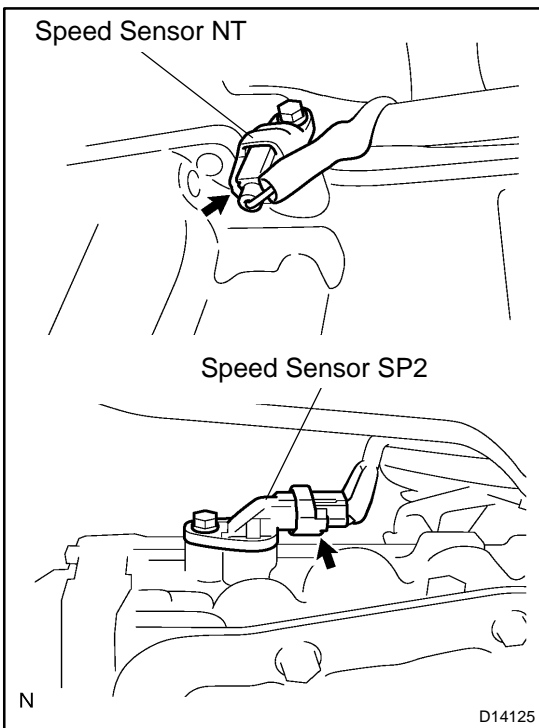
D14136

REMOVAL

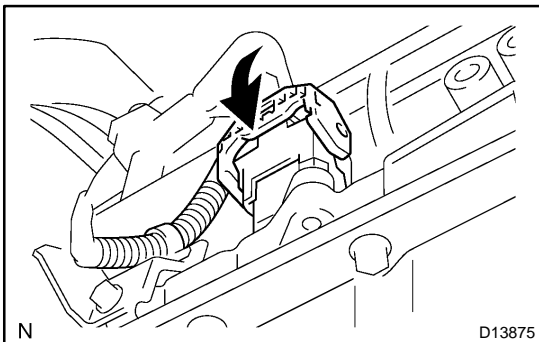
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. JACK UP VEHICLE
3. REMOVE NO. 1 ENGINE UNDER COVER



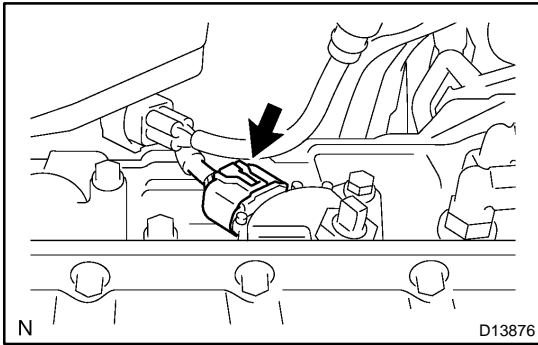
4. DRAIN AUTOMATIC TRANSMISSION FLUID
 - (a) Remove the drain plug and gasket, and drain the ATF.
 - (b) Install a new gasket and the drain plug.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
5. REMOVE RH AND LH FRONT EXHAUST PIPE
(See page [EM-138](#))
6. REMOVE PROPELLER SHAFT (See page [PR-3](#))



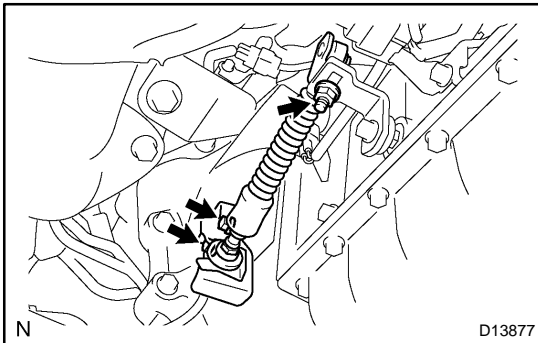
7. DISCONNECT SPEED SENSOR NT AND SP2 CONNECTORS



8. DISCONNECT TRANSMISSION WIRE CONNECTOR

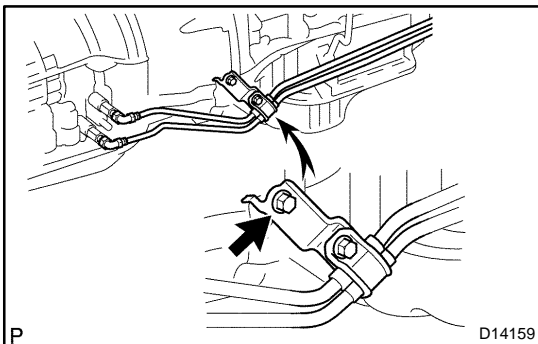


9. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR



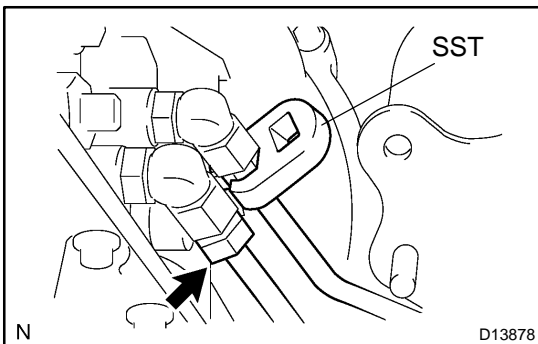
10. SEPARATE SHIFT CONTROL CABLE FROM TRANSMISSION

- (a) Remove the nut and disconnect the shift control cable.
Torque: 14.5 N·m (148 kgf-cm, 11 ft-lbf)
- (b) Remove the 2 bolts and shift control cable bracket from the transmission.
Torque: 19.5 N·m (199 kgf-cm, 14 ft-lbf)

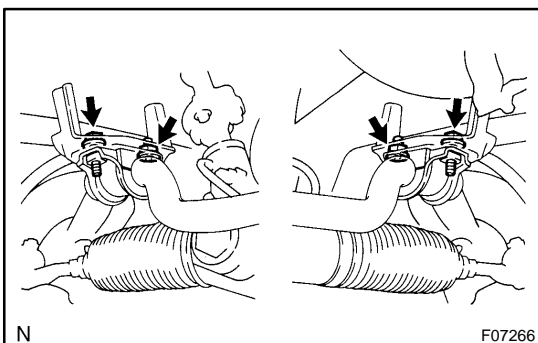


11. DISCONNECT OIL COOLER PIPE

- (a) Remove the bolt and clamp.
Torque: 12 N·m (122 kgf-cm, 9 ft-lbf)

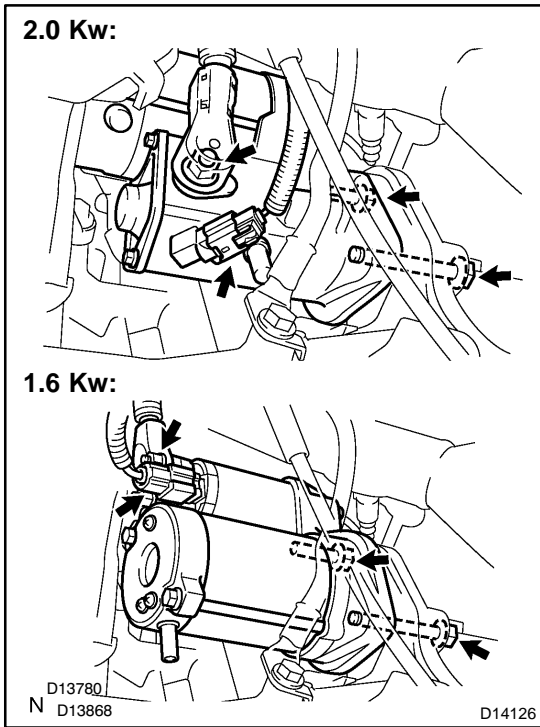


- (b) Disconnect the 2 oil cooler pipes.
SST 09023-12701
Torque: 34 N·m (346 kgf-cm, 25 ft-lbf)



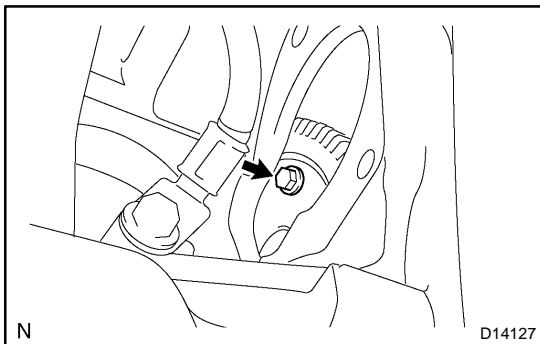
12. DISCONNECT STABILIZER BAR

- (a) Remove the 2 bolts, nuts and stabilizer bar with the bushings and brackets.
Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)
- (b) Disconnect the stabilizer bar.



13. REMOVE STARTER

- (a) Remove the nut and disconnect the starter wire and connector.
Torque: 9.8 N-m (100 kgf-cm, 7 ft-lbf)
- (b) Remove the 2 bolts and starter.
Torque: 37 N-m (377 kgf-cm, 27 ft-lbf)



14. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLT

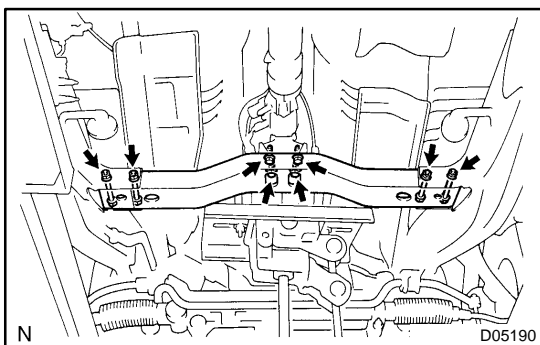
- (a) Remove the flywheel housing side cover.
- (b) Turn the crankshaft to gain access and remove the 6 bolts while holding the crankshaft pulley set bolt with a wrench.
Torque: 48 N-m (490 kgf-cm, 35 ft-lbf)

HINT:

At the time of installation, refer to the following:
First install the green colored bolt and then the remaining 5 bolts.

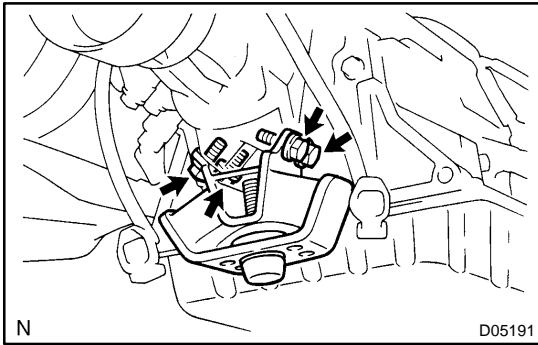
15. JACK UP TRANSMISSION SLIGHTLY

Securely support the transmission on a transmission jack.
Lift the transmission slightly from the crossmember.



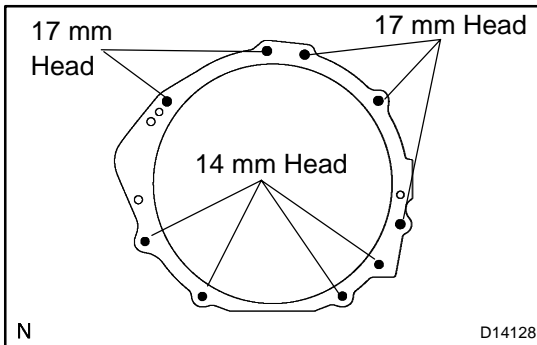
16. REMOVE CROSSMEMBER

- (a) Remove the 4 bolts of the engine rear mounting on the crossmember.
Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)
- (b) Remove the 4 nuts, bolts, washers and crossmember.
Torque: 72 N-m (734 kgf-cm, 53 ft-lbf)

**17. REMOVE ENGINE REAR MOUNTING INSULATOR**

Remove the 4 bolts and engine rear mounting insulator from the transmission.

Torque: 65 N·m (660 kgf·cm, 48 ft·lbf)

**18. REMOVE TRANSMISSION**

- Separate the wire harness from the transmission.
- Lower the rear end of the transmission.
- Remove the 9 bolts and transmission.

Torque:

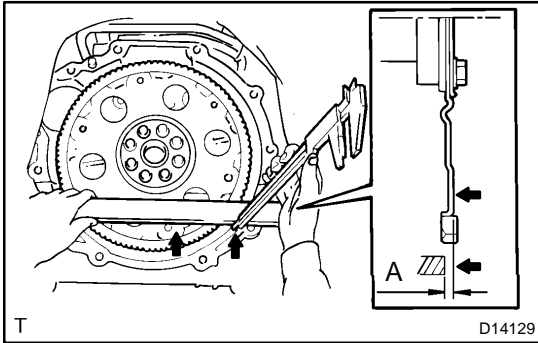
17 mm head: 71 N·m (724 kgf·cm, 52 ft·lbf)

14 mm head: 37 N·m (377 kgf·cm, 27 ft·lbf)

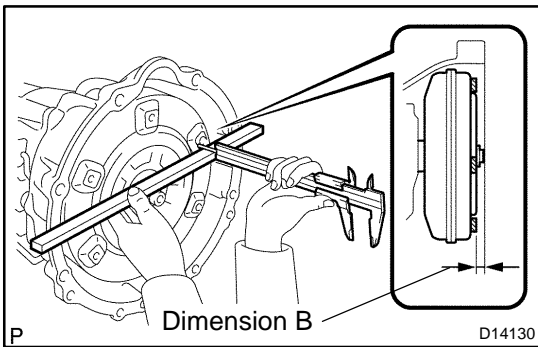
INSTALLATION

1. CHECK TORQUE CONVERTER INSTALLATION

- (a) Install the torque converter to the transmission housing.



- (b) Using vernier calipers and a straight edge, measure dimension A between the transmission fitting part and the converter fitting part of the drive plate.



- (c) Using vernier calipers and a straight edge, measure dimension B shown in the illustration and check that B is greater than A measured in step (b).

Standard distance: A + 1 mm (0.04 in.) or more

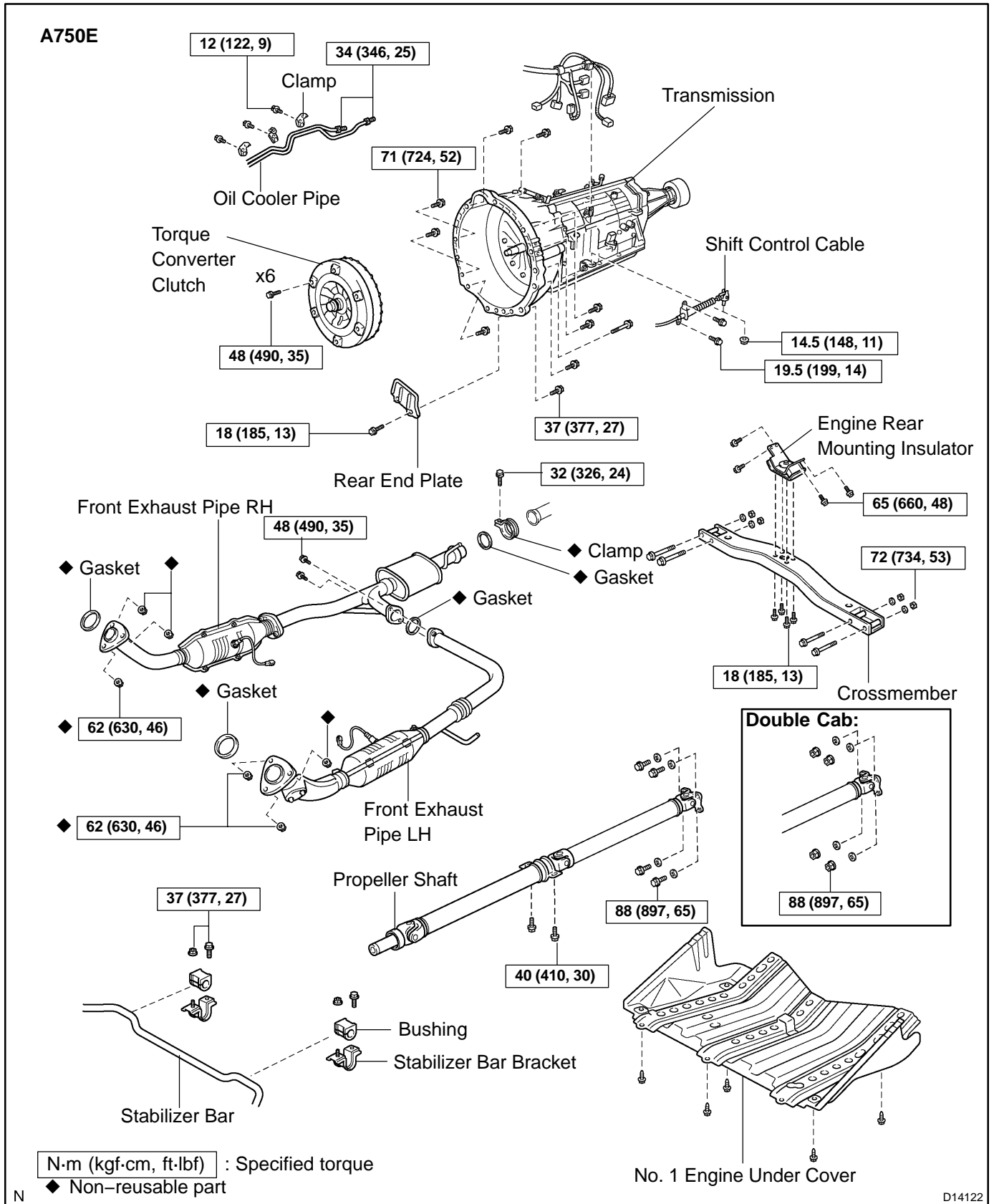
2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR (See page AT-39)

3. TRANSMISSION INSTALLATION

- (a) Installation is in the reverse order of removal (See page AT-27).
- (b) Adjust the shift lever position (See page DI-952).
- (c) Fill the transmission (See page AT-4).
- (d) Conduct the road test of the vehicle (See page DI-953).

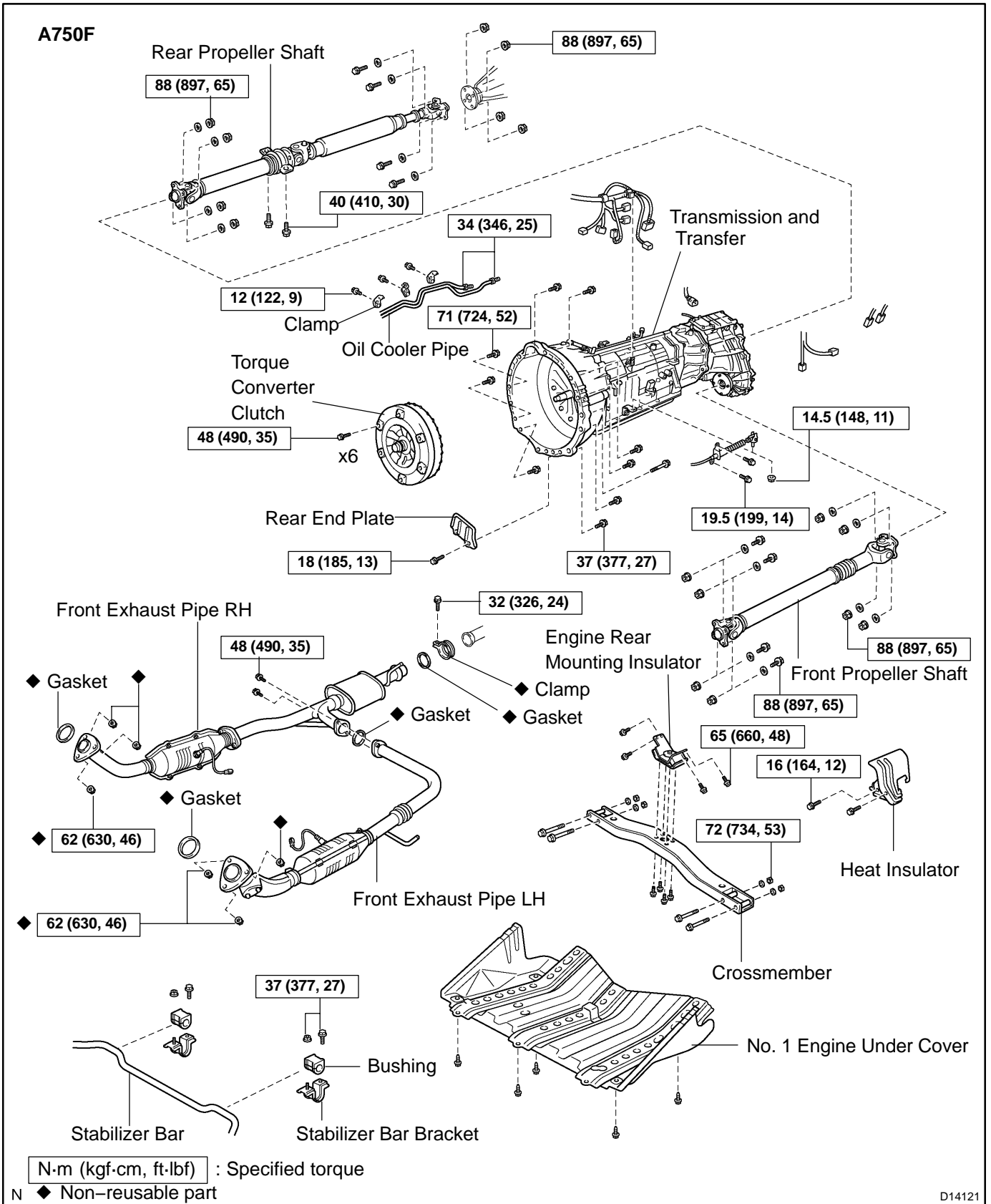
AUTOMATIC TRANSMISSION UNIT (2UZ-FE) COMPONENTS

AT140-01



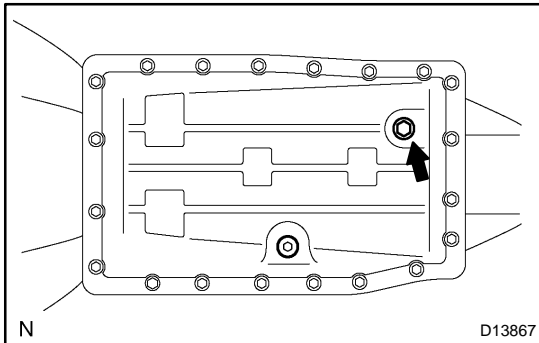
N

D14122



REMOVAL

1. JACK UP VEHICLE
2. REMOVE NO. 1 ENGINE UNDER COVER



3. DRAIN AUTOMATIC TRANSMISSION FLUID
 - (a) Remove the drain plug and gasket, and drain the ATF.
 - (b) Install a new gasket and the drain plug.

Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)

4. REMOVE RH AND LH FRONT EXHAUST PIPE
(See page [EM-125](#))

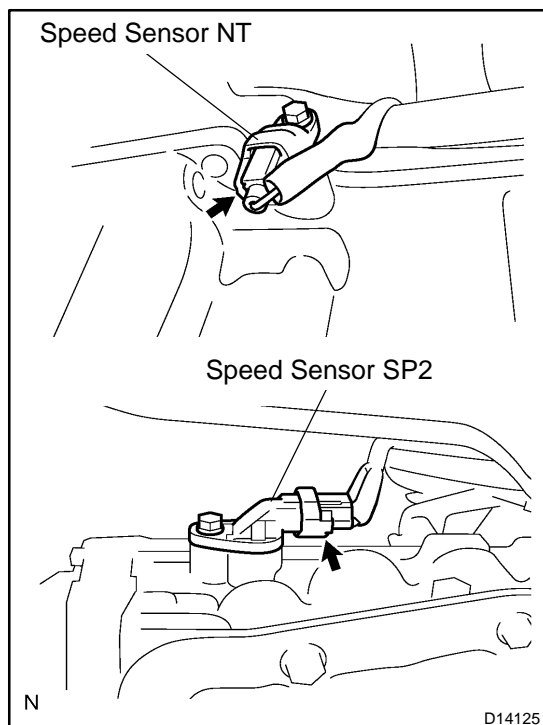
5. A750E:
REMOVE PROPELLER SHAFT (See page [PR-3](#))

6. A750F:
REMOVE HEAT INSULATOR

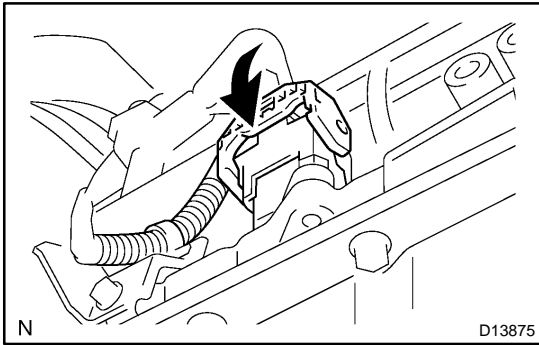
Remove the 2 bolts and heat insulator.

Torque: 16 N·m (164 kgf-cm, 12 ft-lbf)

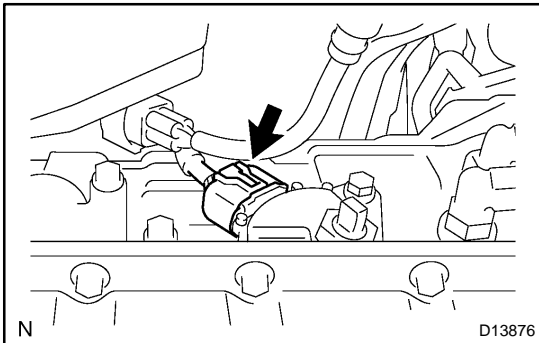
7. A750F:
REMOVE FRONT AND REAR PROPELLER SHAFT
(See page [PR-10](#))



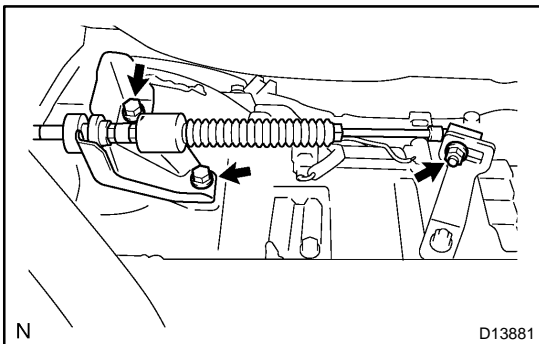
8. DISCONNECT SPEED SENSOR NT AND SP2 CONNECTORS



9. DISCONNECT TRANSMISSION WIRE CONNECTOR

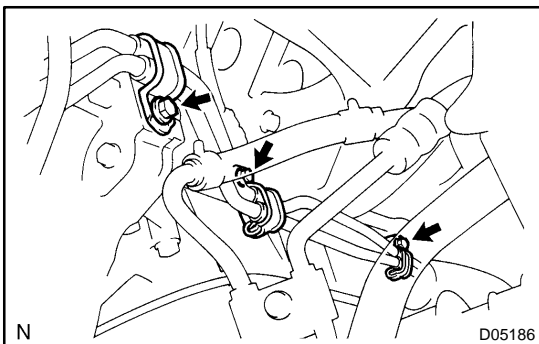


10. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR



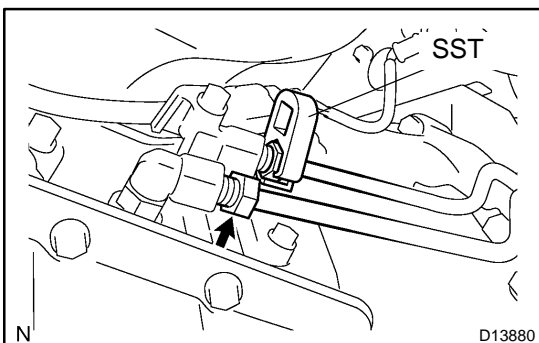
11. SEPARATE SHIFT CONTROL CABLE FROM TRANSMISSION

- (a) Remove the nut and disconnect the shift control cable.
Torque: 14.5 N·m (148 kgf-cm, 11 ft-lbf)
- (b) Remove the 2 bolts and shift control cable bracket from the transmission.
Torque: 19.5 N·m (199 kgf-cm, 14 ft-lbf)

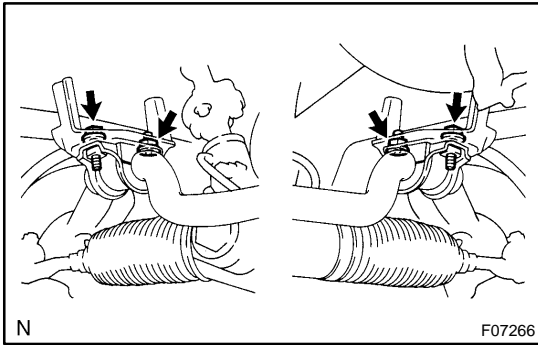


12. DISCONNECT OIL COOLER PIPE

- (a) Remove the 3 bolts and clamps.
Torque: 12 N·m (122 kgf-cm, 9 ft-lbf)



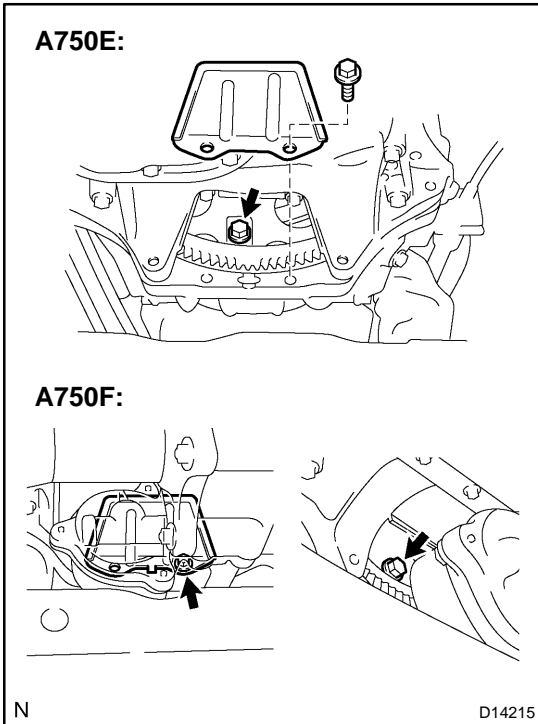
- (b) Disconnect the 2 oil cooler pipes.
SST 09023-12701
Torque: 34 N·m (346 kgf-cm, 25 ft-lbf)

**13. DISCONNECT STABILIZER BAR**

- (a) Remove the 2 bolts, nuts and stabilizer bar with the bushings and brackets.

Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)

- (b) Disconnect the stabilizer bar.

**14. REMOVE REAR END PLATE AND TORQUE CONVERTER CLUTCH MOUNTING BOLT**

- (a) Remove the bolt and rear end plate.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

- (b) Turn the crankshaft to gain access and remove the 6 bolts while holding the crankshaft pulley set bolt with a wrench.

Torque: 48 N·m (490 kgf-cm, 35 ft-lbf)

HINT:

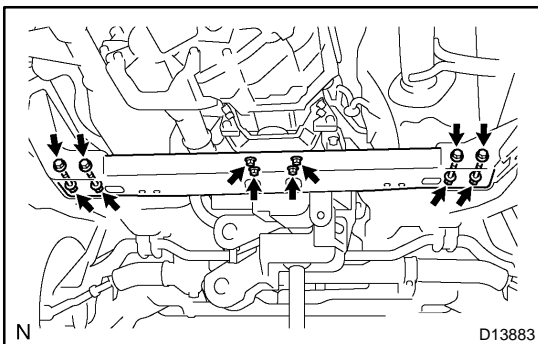
At the time of installation, refer to the following:

First install the green colored bolt and then the remaining 5 bolts.

15. JACK UP TRANSMISSION SLIGHTLY

Securely support the transmission on a transmission jack.

Lift the transmission slightly from the crossmember.

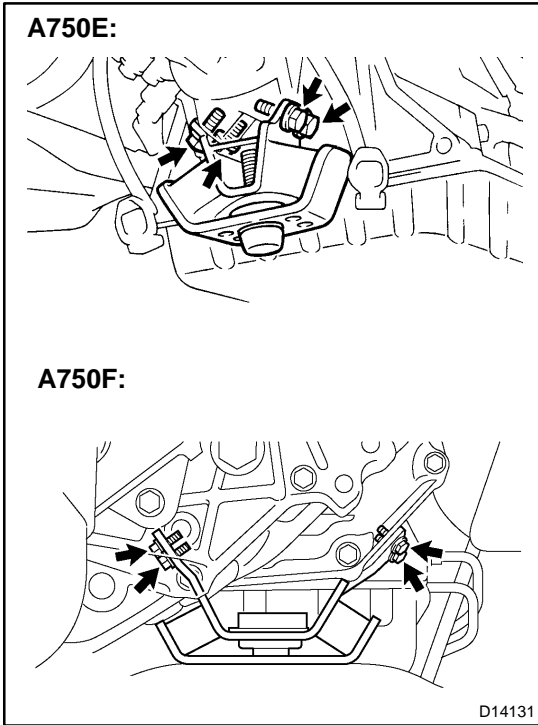
**16. REMOVE CROSSMEMBER**

- (a) Remove the 4 bolts of the engine rear mounting insulator on the crossmember.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

- (b) Remove the 4 nuts, bolts, washers and crossmember.

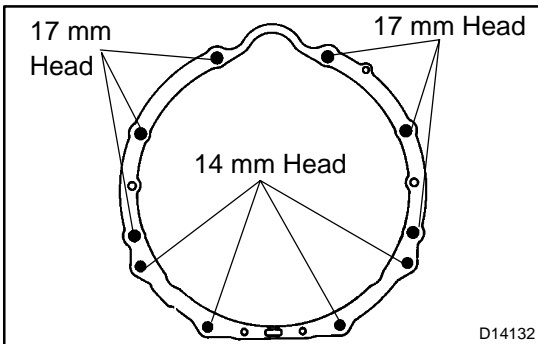
Torque: 72 N·m (734 kgf-cm, 53 ft-lbf)



17. REMOVE ENGINE REAR MOUNTING INSULATOR

Remove the 4 bolts and engine rear mounting insulator.

Torque: 65 N·m (660 kgf·cm, 48 ft·lbf)



18. REMOVE TRANSMISSION

- (a) A750E:
Separate the wire harness from the transmission.
- (b) A750F:
Separate the wire harness from the transmission and transfer.
- (c) Lower the rear end of the transmission.
- (d) Remove the 10 bolts and transmission.

Torque:

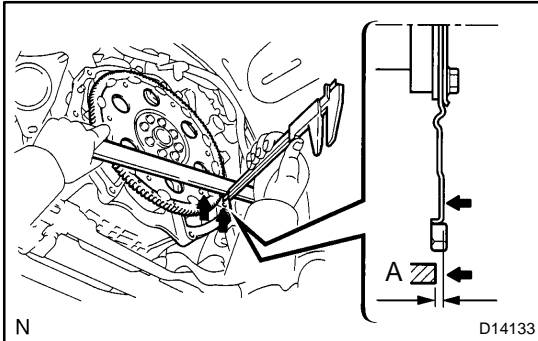
17 mm head: 71 N·m (724 kgf·cm, 52 ft·lbf)

14 mm head: 37 N·m (377 kgf·cm, 27 ft·lbf)

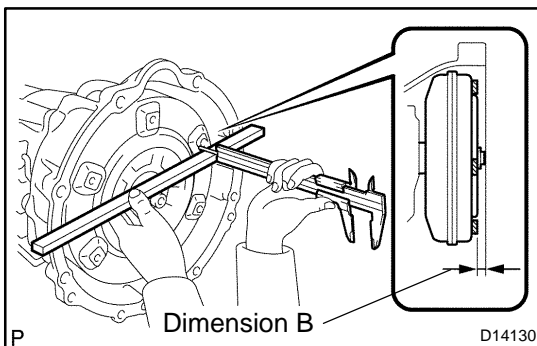
INSTALLATION

1. CHECK TORQUE CONVERTER INSTALLATION

- (a) Install the torque converter to the transmission housing.



- (b) Using vernier calipers and a straight edge, measure dimension A between the transmission fitting part and the converter fitting part of the drive plate.



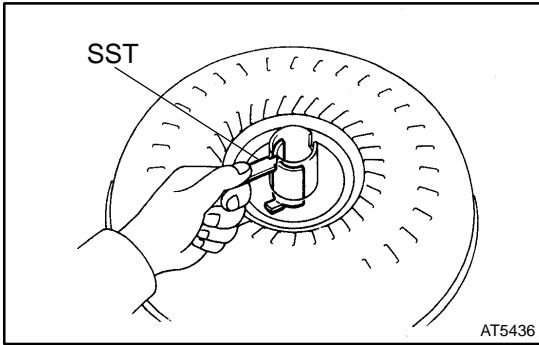
- (c) Using vernier calipers and a straight edge, measure the dimension B shown in the illustration and check that B is greater than A measured in step (b).

Standard distance: A + 1 mm (0.04 in.) or more

2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR (See page AT-39)

3. TRANSMISSION INSTALLATION

- (a) Installation is in the reverse order of removal (See page AT-34).
- (b) Adjust the shift lever position (See page DI-1117).
- (c) Fill the transmission (See page AT-4).
- (d) Conduct the road test of the vehicle (See page DI-1118).

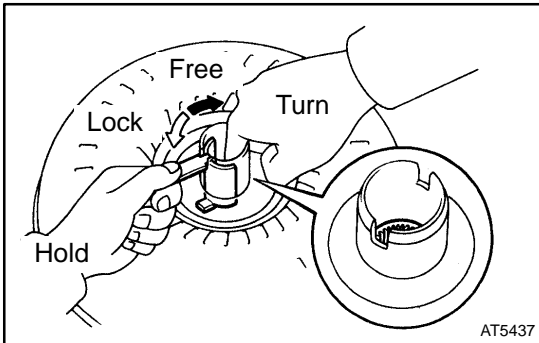


TORQUE CONVERTER CLUTCH AND DRIVE PLATE INSPECTION

AT143-01

1. INSPECT ONE-WAY CLUTCH

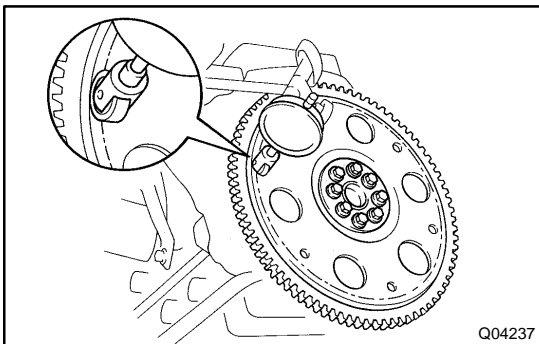
- (a) Install SST so that it fits in the notch of the converter hub and outer race of the one-way clutch.
SST 09350-30020 (09351-32020)



- (b) Press on the serrations of the stator with a finger and rotate it.
- (c) Check if it rotates smoothly when turned clockwise and locks when turned counterclockwise.

If necessary, clean the converter clutch and retest the one-way clutch.

Replace the converter clutch if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

- (a) Set up a dial indicator and measure the drive plate runout.
Maximum runout: 0.20 mm (0.0079 in.)
- (b) Check for damage to the ring gear.

If runout is not within the specification or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of the spacers and tighten the bolts (See page [EM-108](#), [EM-83](#) or [EM-95](#)).

TRANSFER SYSTEM

TR00V-03

PRECAUTION

When working with FIPG material, you must observe the following:

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from gasket surfaces.
- Thoroughly clean all components to remove any loose material.
- Clean both sealing surfaces with a non-residue solvent.
- Apply FIPG in approx. a 1 mm (0.04 in.) wide bead along the sealing surface.
- Parts must be assembled within 10 minutes of FIPG application. Otherwise, the packing material must be removed and reapplied.

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

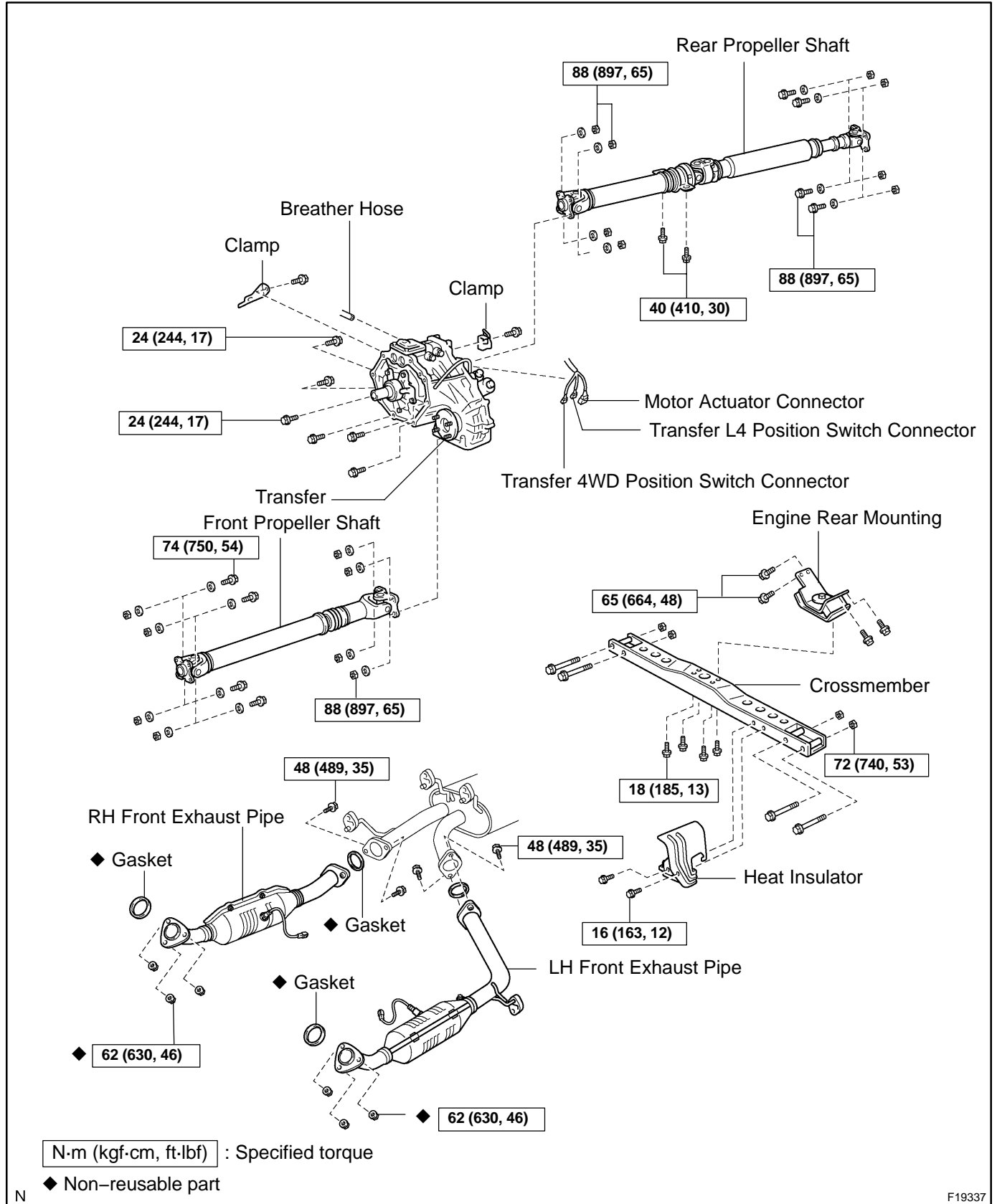
TR09F-03

Use the table below to help find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area	See page
Noise	<ol style="list-style-type: none"> 1. Oil (Level low) 2. Oil (Wrong) 3. Transfer faulty 	TR-5 TR-5 TR-6
Oil leakage	<ol style="list-style-type: none"> 1. Oil (Level too high) 2. Gasket (Damaged) 3. Oil seal (Worn or damaged) 4. O-ring (Worn or damaged) 	TR-5 TR-6 TR-36 TR-6
Shift from 2WD to 4WD (4HI) impossible	<ol style="list-style-type: none"> 1. 4WD fuse 2. Wire harness 3. 2WD/4HI switch 4. Vehicle speed sensor 5. 4WD position switch 6. 4HI indicator light 7. Actuator assembly 8. A.D.D. control system 9. 4WD control ECU 10. Transfer assembly 	– – TR-39 BE-86 TR-7 BE-86 TR-39 SA-59 TR-39 TR-6
Shift from 4WD (4HI) to 4WD (4LO) impossible	<ol style="list-style-type: none"> 1. 4LO switch 2. Vehicle speed sensor 3. L4 position switch 4. Park/neutral position switch 5. 4LO indicator switch 6. Actuator assembly 7. Wire harness 8. 4WD control ECU 	TR-39 BE-86 TR-7 DI-993 BE-86 TR-39 – TR-39
Shift from 4WD (4HI) to 2WD impossible	<ol style="list-style-type: none"> 1. 4WD fuse 2. Wire harness 3. 2WD/4HI switch 4. Vehicle speed sensor 5. 4WD position switch 6. 4HI indicator light 7. Actuator assembly 8. A.D.D. control system 9. 4WD control ECU 10. Transfer assembly 	– – TR-39 BE-86 TR-7 BE-86 TR-39 SA-59 TR-39 TR-6
Shift from 4WD (4LO) to 4WD (4HI) impossible	<ol style="list-style-type: none"> 1. 4LO switch 2. Vehicle speed sensor 3. L4 position switch 4. Park/neutral position switch 5. 4LO indicator switch 6. Actuator assembly 7. Wire harness 8. 4WD control ECU 	TR-39 BE-86 TR-7 DI-993 TR-7 TR-39 – TR-39

TRANSFER UNIT COMPONENTS

TR09G-02



REMOVAL

HINT:

Be sure to switch the transfer to 2WD before performing procedures.

1. DISCONNECT BREATHER HOSE

Disconnect the breather hose from the transfer.

2. RAISE VEHICLE AND DRAIN TRANSFER OIL

3. REMOVE LH AND RH FRONT EXHAUST PIPES

(See page [EM-126](#))

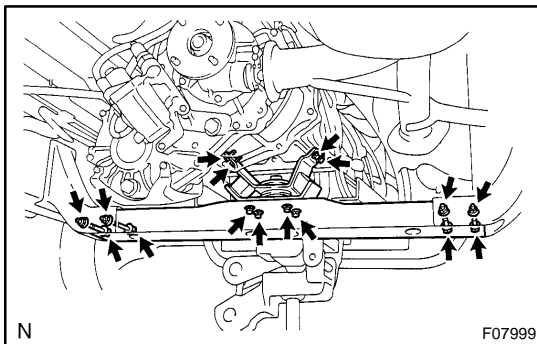
4. REMOVE FRONT AND REAR PROPELLER SHAFTS

(See page [PR-10](#))

5. REMOVE CROSSMEMBER

(a) Remove the 2 bolts and heat insulator.

(b) Support the rear side of the transmission with a transmission jack.



(c) Remove the 4 bolts.

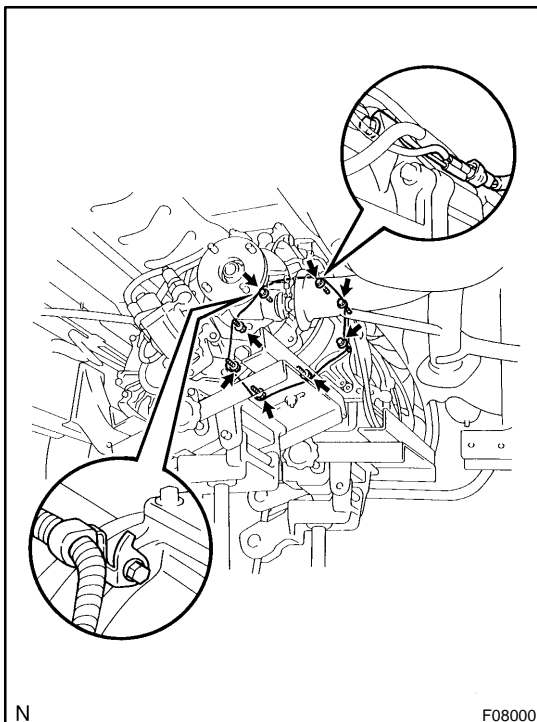
(d) Remove the 4 bolts, nuts and crossmember.

6. REMOVE ENGINE REAR MOUNTING

Remove the 4 bolts and engine rear mounting from the transfer adaptor.

7. DISCONNECT TRANSFER DETECTION SWITCHES AND MOTOR ACTUATOR CONNECTORS

(See page [TR-3](#))

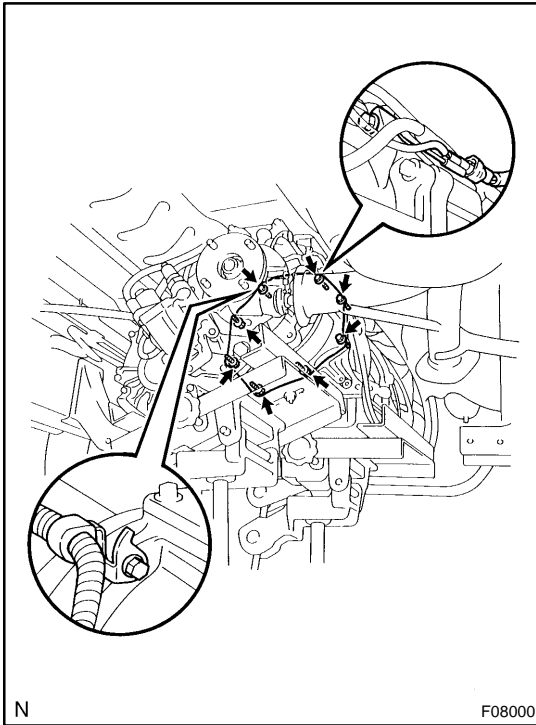


8. REMOVE TRANSFER

(a) Support the transfer with another transmission jack.

(b) Remove the 8 transfer mounting bolts and clamps.

(c) Pull the transfer out from the transfer adaptor down and toward the rear.



INSTALLATION

1. RAISE VEHICLE
2. INSTALL TRANSFER

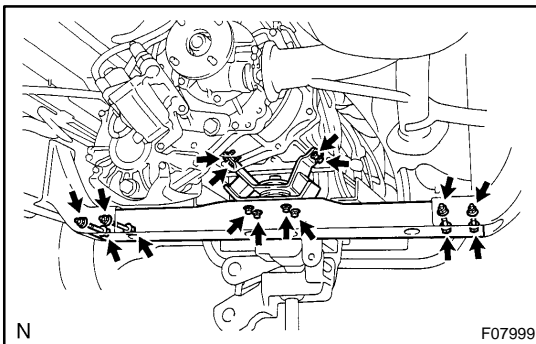
Raise the transfer and install it to the transfer adaptor with the 8 transfer mounting bolts and clamps.

Torque: 24 N·m (244 kgf·cm, 17 ft·lbf)

NOTICE:

Take care not to damage the lip of the transfer adaptor rear oil seal with the transfer input shaft.

3. CONNECT TRANSFER DETECTION SWITCHES AND MOTOR ACTUATOR CONNECTORS
(See page [TR-3](#))



4. INSTALL ENGINE REAR MOUNTING

Install the engine rear mounting to the transfer adaptor with the 4 bolts.

Torque: 65 N·m (664 kgf·cm, 48 ft·lbf)

5. INSTALL CROSSMEMBER

(a) Install the crossmember with the 4 bolts and nuts.

Torque: 72 N·m (740 kgf·cm, 53 ft·lbf)

(b) Install the 4 bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

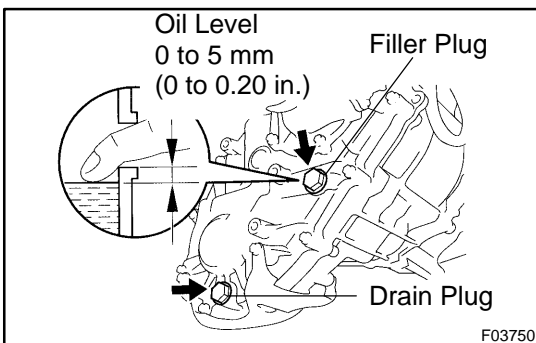
(c) Remove the transmission jacks.

(d) Install the heat insulator with the 2 bolts

Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

6. INSTALL FRONT AND REAR PROPELLER SHAFTS
(See page [PR-15](#))

7. INSTALL LH AND RH FRONT EXHAUST PIPES
(See page [EM-127](#))



8. FILL TRANSFER OIL

Oil grade: API GL-4 or GL-5

Viscosity: SAE 75W-90

Capacity: 1.0 liters (1.1 US qts, 0.9 Imp. qts)

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

9. CONNECT BREATHER HOSE

Connect the breather hose to the transfer.

Hose installation depth: 13 mm (0.51 in.) or more

10. DO ROAD TEST

Check for abnormal noises and smooth shifting.

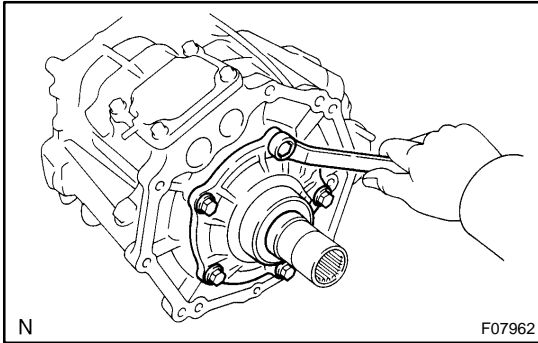
DISASSEMBLY

1. REMOVE SPEEDOMETER DRIVEN GEAR HOLE COVER

- (a) Remove the bolt and speedometer driven gear hole cover.
- (b) Remove the O-ring from the speedometer driven gear hole cover.

2. REMOVE PROTECTOR

Remove the 4 bolts and protector.

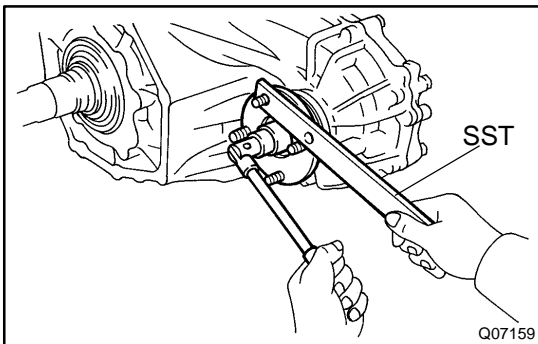


3. REMOVE FRONT BEARING RETAINER

- (a) Remove the 5 bolts.
- (b) Using a plastic hammer, tap on the front bearing retainer and remove it.

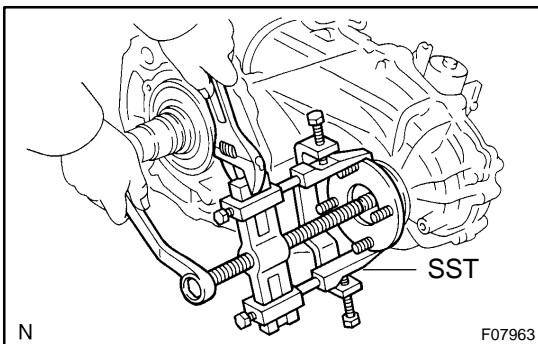
4. REMOVE UPPER COVER AND OIL DEFLECTOR

Remove the 4 bolts, upper cover and oil deflector.



5. REMOVE FRONT COMPANION FLANGE

- (a) Using a chisel and hammer, loosen the staked part of the front companion flange lock nut.
- (b) Using SST, hold the front companion flange and remove the front companion flange lock nut.
SST 09330-00021

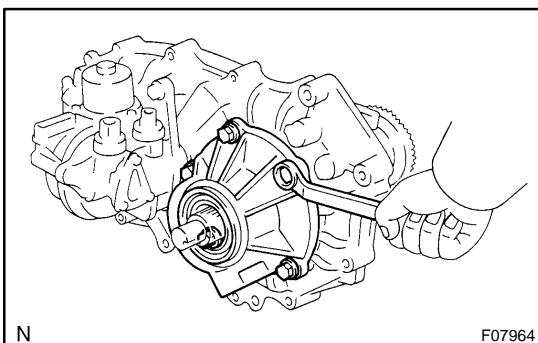


- (c) Using SST, remove the front companion flange.

SST 09950-40011 (09951-04020, 09952-04010, 09953-04030, 09954-04010, 09955-04051, 09957-04010, 09958-04011)

6. REMOVE REAR COMPANION FLANGE

Remove the rear companion flange in the same way as the front companion flange.

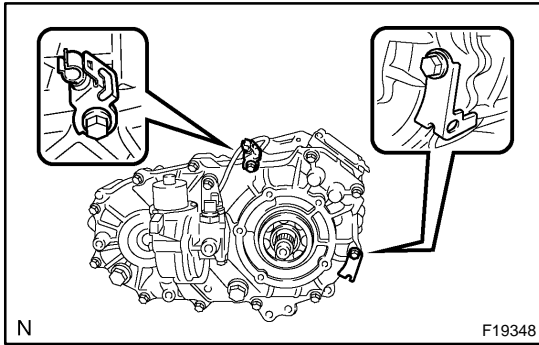


7. REMOVE EXTENSION HOUSING

- (a) Remove the 5 bolts.
- (b) Using a plastic hammer, tap on the extension housing and remove it.

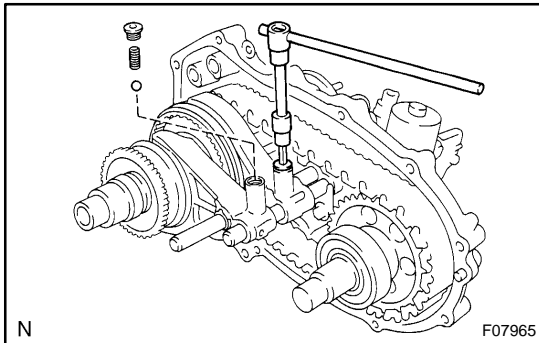
8. REMOVE VEHICLE SPEED SENSOR DRIVE GEAR

- (a) Remove the 2 output washers and vehicle speed sensor drive gear.
- (b) Using a magnetic finger, remove the ball from the rear output shaft.



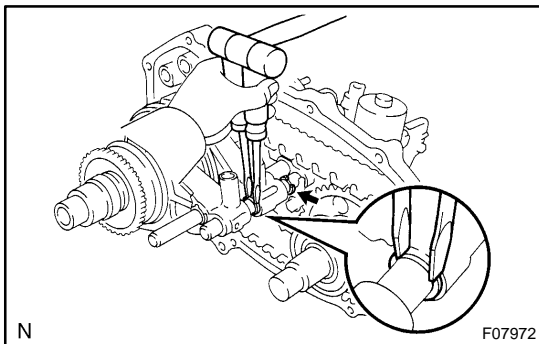
9. SEPARATE FRONT CASE AND REAR CASE

- (a) Remove the 12 bolts and 2 clamps.
- (b) Using a plastic hammer, tap on the front case and rear case, and separate them.

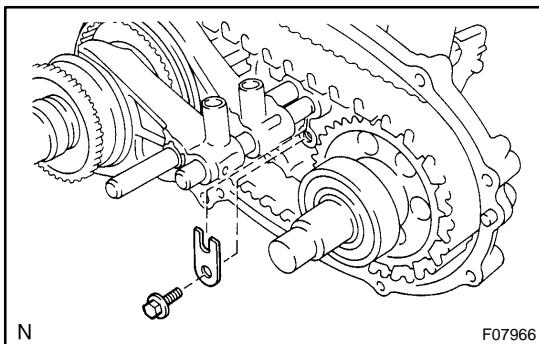


10. REMOVE SHIFT FORK SHAFT

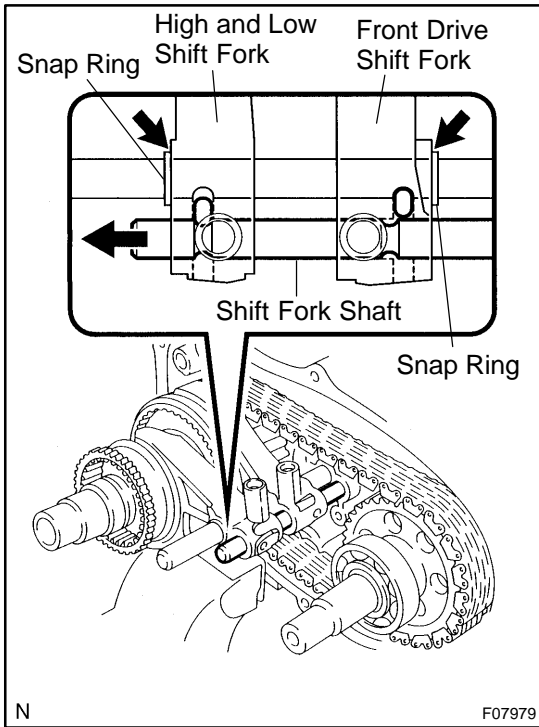
- (a) Using a hexagon wrench (6 mm), remove the 2 straight screw plugs, springs and balls from the front drive and high and low shift forks.



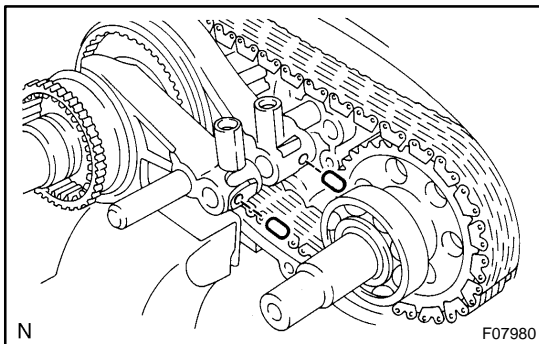
- (b) Using 2 screwdrivers and a hammer, tap out the 2 snap rings from the shift fork shaft.



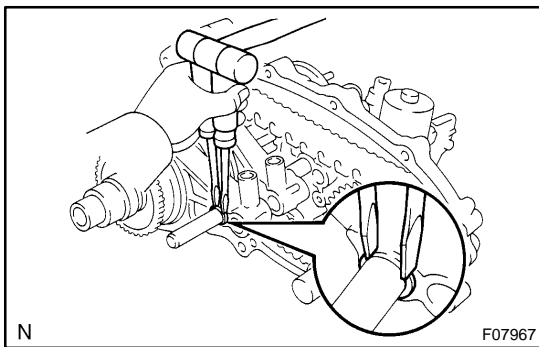
- (c) Remove the bolt and shift fork shaft stopper.



- (d) To pull out the shift fork shaft, shift the front drive and high and low shift forks to the positions as shown in the illustration.
- (e) Pull out the shift fork shaft.



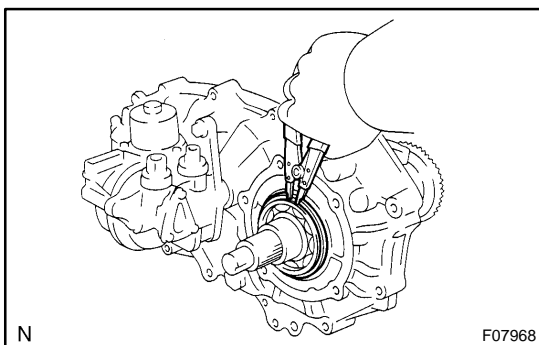
- (f) Using a magnetic finger, remove the 2 straight pins from the front drive and high and low shift forks.



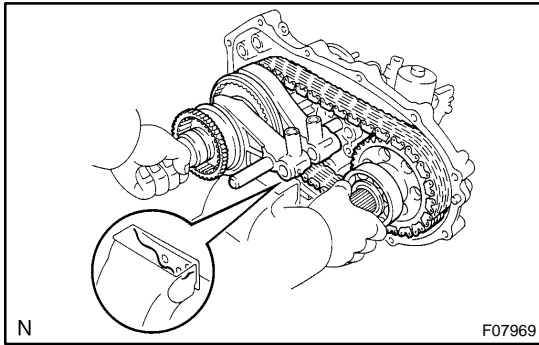
11. REMOVE REAR OUTPUT SHAFT ASSEMBLY, DRIVEN SPROCKET ASSEMBLY, CHAIN AND FRONT DRIVE AND HIGH AND LOW SHIFT FORKS

- (a) Using 2 screwdrivers and a hammer, tap out the snap ring from the shift fork shaft of the actuator assembly.

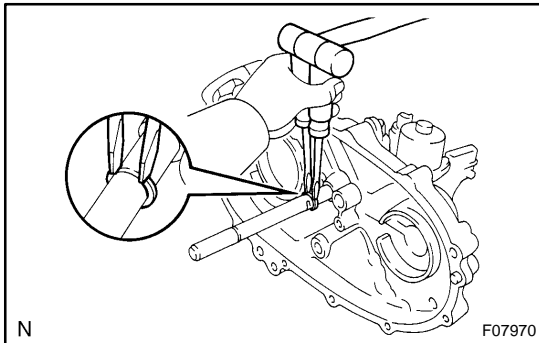
HINT:
Remove only the snap ring on the front side of the shift fork shaft.



- (b) Using a snap ring expander, remove the snap ring.

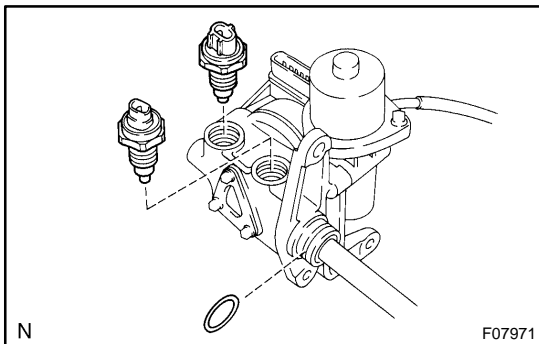


- (c) Mount the rear case in a vise.
- (d) Using a plastic hammer, carefully tap the rear case, and remove the rear output shaft assembly, driven sprocket assembly, chain and front drive and high and low shift forks as an assembly.
- (e) Remove the driven sprocket assembly, chain and front drive and high and low shift forks from the rear output shaft assembly.

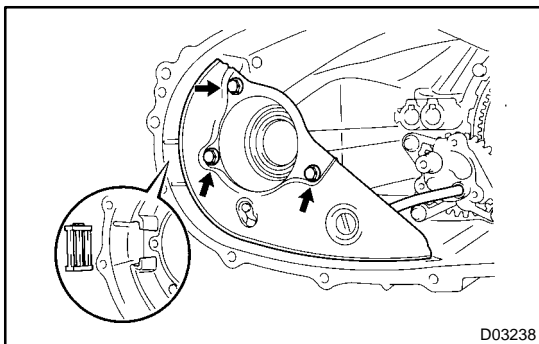


12. REMOVE ACTUATOR ASSEMBLY

- (a) Using 2 screwdrivers and a hammer, remove the snap ring.
- (b) Remove the 3 bolts and actuator assembly.

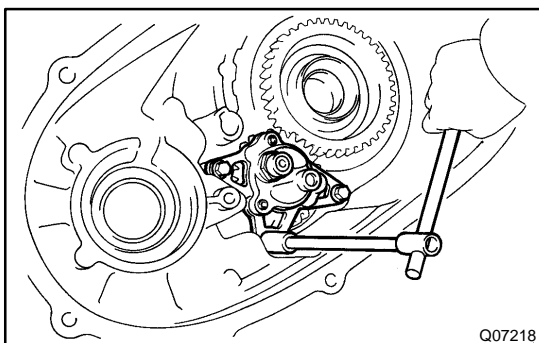


- (c) Remove the O-ring, transfer 4WD position switch, transfer L4 position switch and 2 gaskets from the actuator assembly.



13. REMOVE SEPARATOR WITH OIL STRAINER AND MAGNET

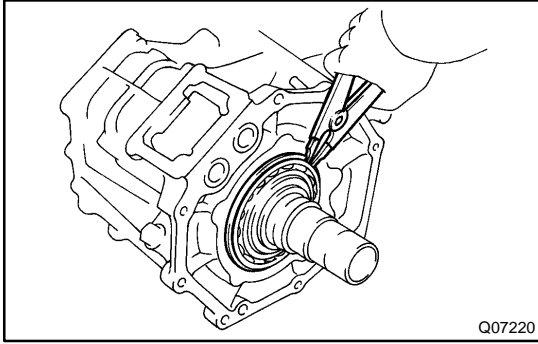
Remove the 3 bolts and separator with the oil strainer and magnet.



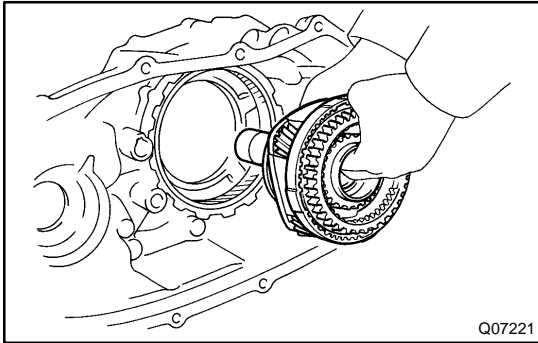
14. REMOVE OIL PUMP BODY ASSEMBLY

Remove the 3 bolts and oil pump body assembly.

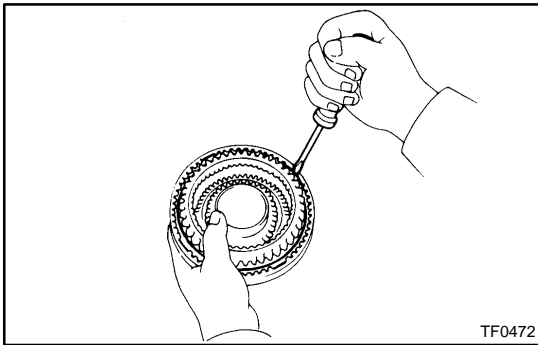
15. REMOVE OIL PUMP DRIVE GEAR

**16. REMOVE PLANETARY GEAR ASSEMBLY WITH INPUT SHAFT ASSEMBLY**

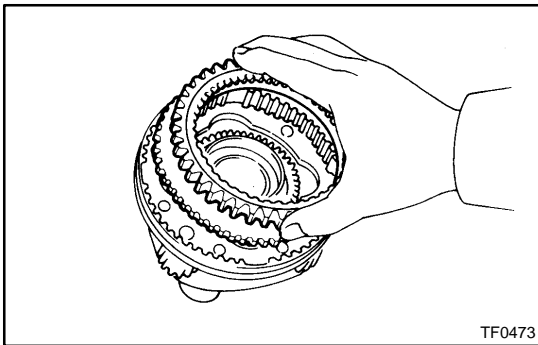
- (a) Using a snap ring expander, remove the snap ring.



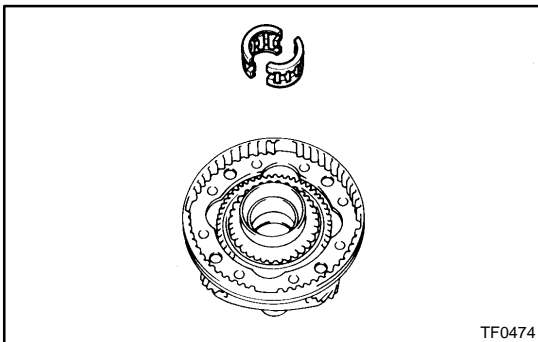
- (b) Pull out the planetary gear assembly with the input shaft assembly.

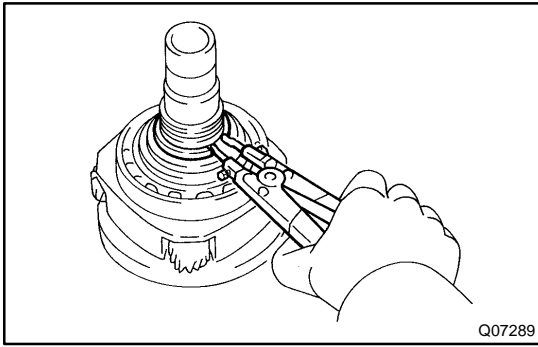
**17. REMOVE LOW GEAR SPLINE PIECE**

- (a) Using a screwdriver, remove the snap ring.



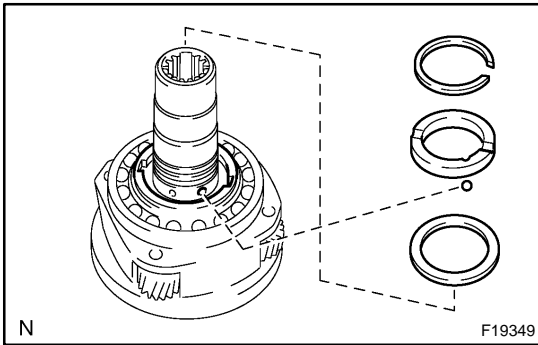
- (b) Remove the low gear spline piece.

**18. REMOVE NEEDLE ROLLER BEARING FROM INPUT SHAFT ASSEMBLY**

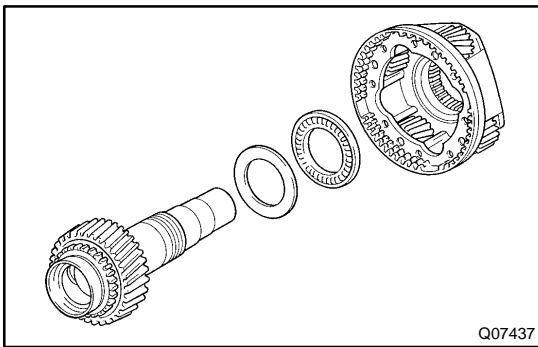


19. REMOVE INPUT GEAR STOPPER AND THRUST WASHER

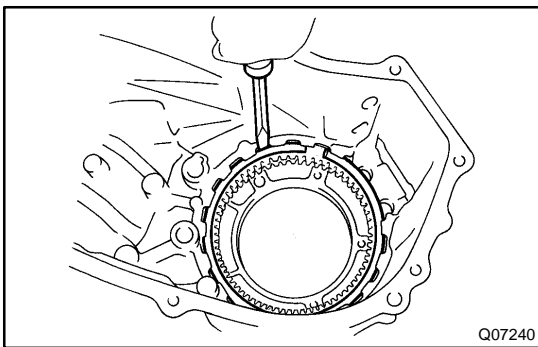
(a) Using a snap ring expander, remove the snap ring.



(b) Remove the input gear stopper, ball and thrust washer.

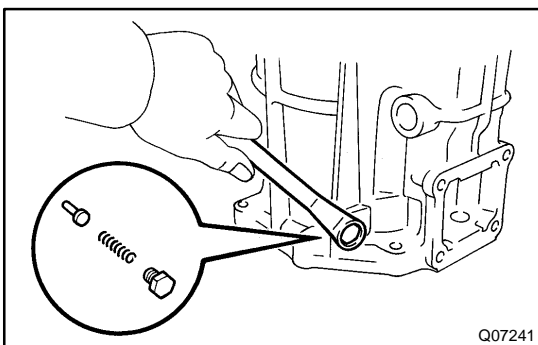


20. REMOVE INPUT SHAFT ASSEMBLY, THRUST BEARING AND RACE

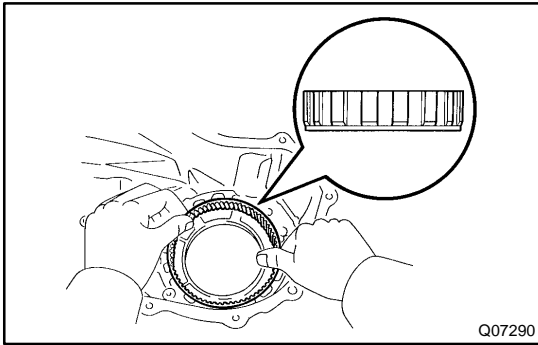


21. REMOVE PLANETARY RING GEAR

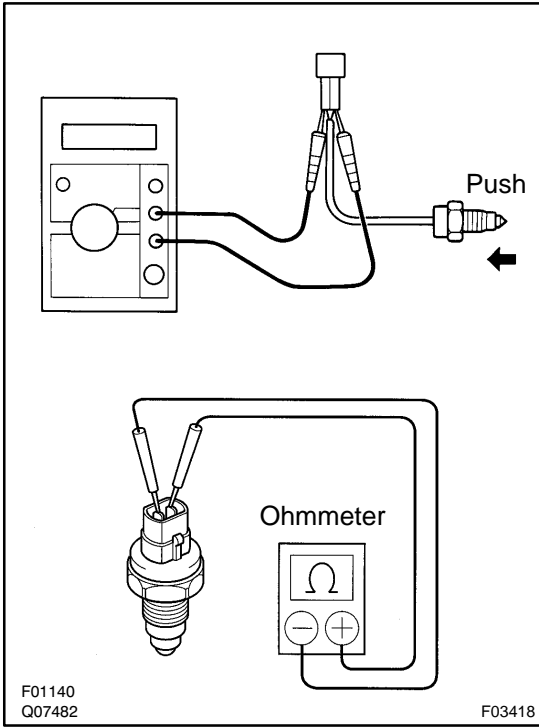
(a) Using a screwdriver, remove the snap ring.



(b) Remove the head screw plug, spring and pin.



(c) Remove the planetary ring gear.



INSPECTION

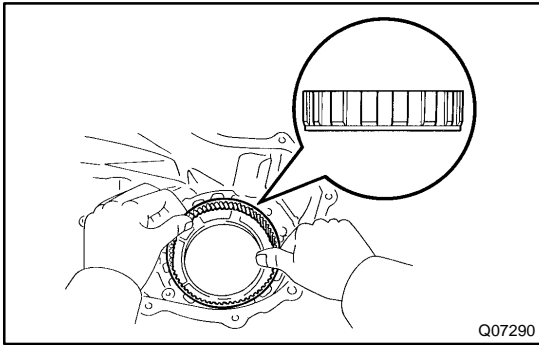
INSPECT SWITCH

Measure the resistance between the terminals as shown.

Standard:

Switch Condition	Specified Condition
Pushed	Below 1 Ω
Free	10 k Ω or higher

If the result is not as specified, replace the switch.



REASSEMBLY

HINT:

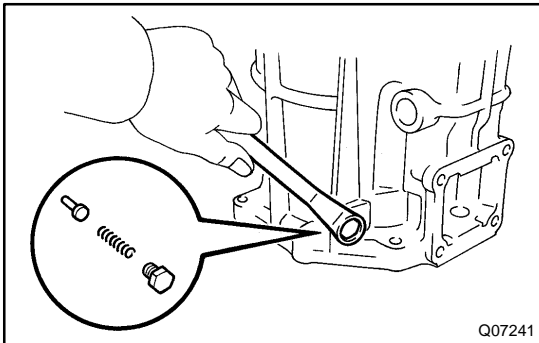
Coat all of the sliding and rotating surfaces with gear oil before reassembly.

1. INSTALL PLANETARY RING GEAR

- (a) Install the planetary ring gear.

NOTICE:

Make sure that the planetary ring gear is installed in the correct direction.



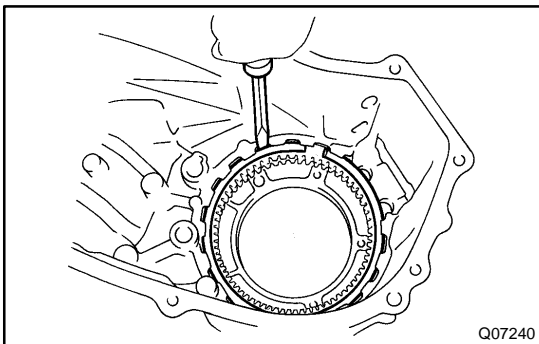
- (b) Install the pin and spring.
- (c) Apply sealant to the head screw plug threads.

Sealant:

Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

- (d) Install the head screw plug.

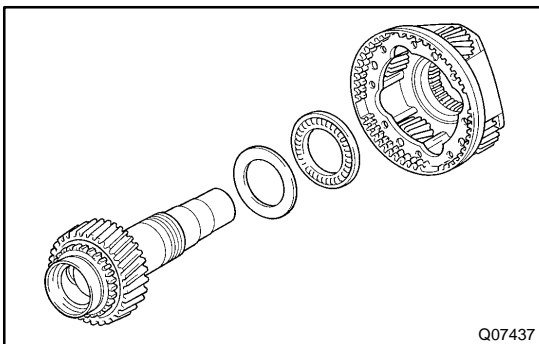
Torque: 19 N·m (190 kgf-cm, 14 ft-lbf)



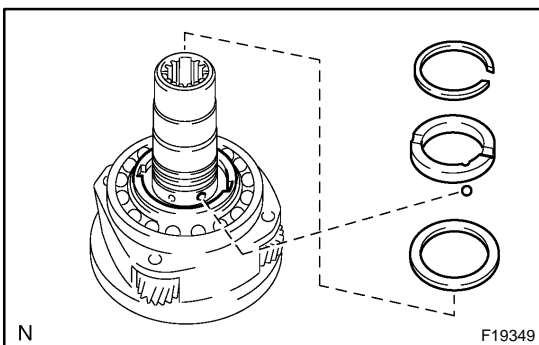
- (e) Using a screwdriver, install the snap ring.

NOTICE:

Make sure the end gap of the snap ring is not aligned with the upper side of the case.



2. INSTALL INPUT SHAFT ASSEMBLY, THRUST BEARING AND RACE

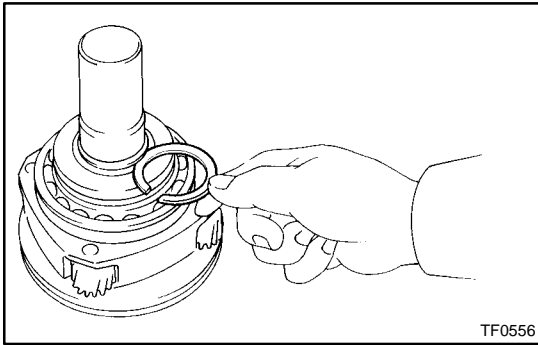


3. INSTALL THRUST WASHER AND INPUT GEAR STOPPER

- (a) Install the thrust washer, ball and input gear stopper.

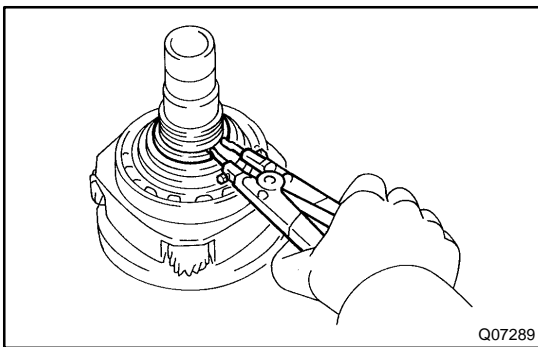
HINT:

Apply gear oil to the input gear stopper and thrust washer.

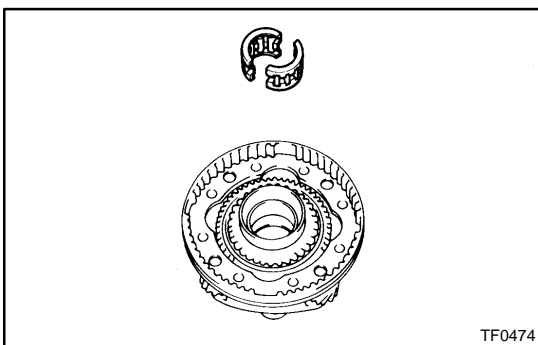


(b) Select a snap ring that allows for 0.05 to 0.15 mm (0.0020 to 0.0059 in.) axial play.

Mark	Thickness mm (in.)
A	2.10 to 2.15 (0.0827 to 0.0846)
B	2.15 to 2.20 (0.0846 to 0.0866)
C	2.20 to 2.25 (0.0866 to 0.0886)
D	2.25 to 2.30 (0.0886 to 0.0906)
E	2.30 to 2.35 (0.0906 to 0.0925)
F	2.35 to 2.40 (0.0925 to 0.0945)
G	2.40 to 2.45 (0.0945 to 0.0965)
H	2.45 to 2.50 (0.0965 to 0.0984)
J	2.50 to 2.55 (0.0984 to 0.1004)
K	2.55 to 2.60 (0.1004 to 0.1024)
L	2.60 to 2.65 (0.1024 to 0.1043)
M	2.65 to 2.70 (0.1043 to 0.1063)
N	2.70 to 2.75 (0.1063 to 0.1083)
P	2.75 to 2.80 (0.1083 to 0.1102)
Q	2.80 to 2.85 (0.1102 to 0.1122)
R	2.85 to 2.90 (0.1122 to 0.1142)
S	2.90 to 2.95 (0.1142 to 0.1161)
T	2.95 to 3.00 (0.1161 to 0.1181)
U	3.00 to 3.05 (0.1181 to 0.1201)



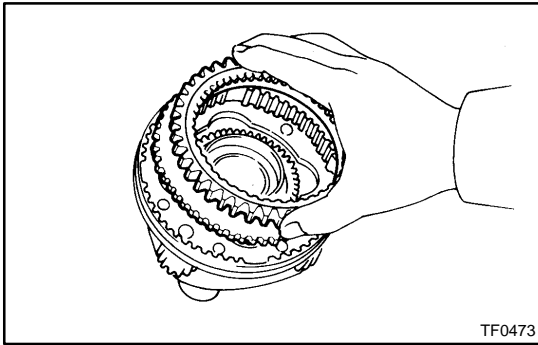
(c) Using a snap ring expander, install a snap ring.



4. INSTALL NEEDLE ROLLER BEARING TO INPUT SHAFT ASSEMBLY

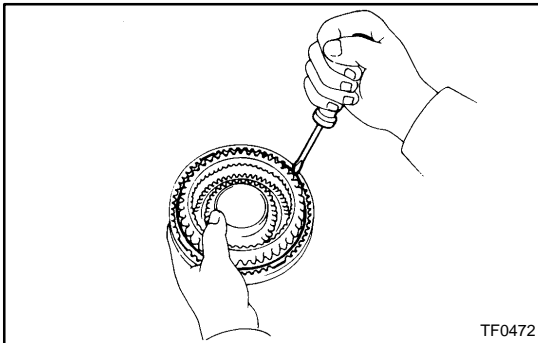
HINT:

Apply gear oil to the needle roller bearing.



5. INSTALL LOW GEAR SPLINE PIECE

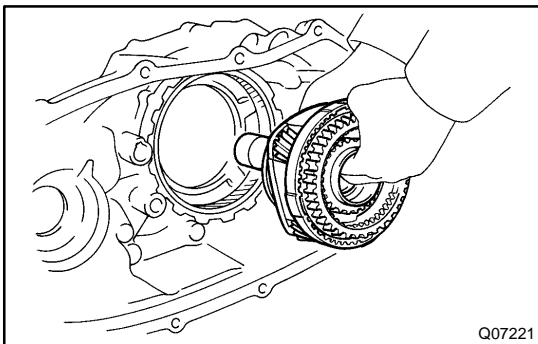
- (a) Install the low gear spline piece.



- (b) Using a screwdriver, install the snap ring.

NOTICE:

Make sure the end gap of the snap ring is not aligned with the cutout portion of the planetary carrier.

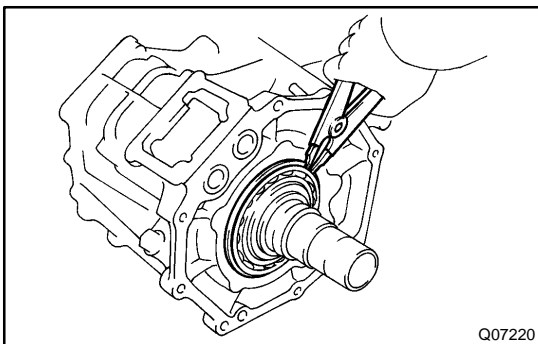


6. INSTALL PLANETARY GEAR ASSEMBLY WITH INPUT SHAFT ASSEMBLY

- (a) Install the planetary gear assembly with the input shaft assembly.

HINT:

If necessary, heat the front case to about 50 to 80 °C (122 to 176 °F).

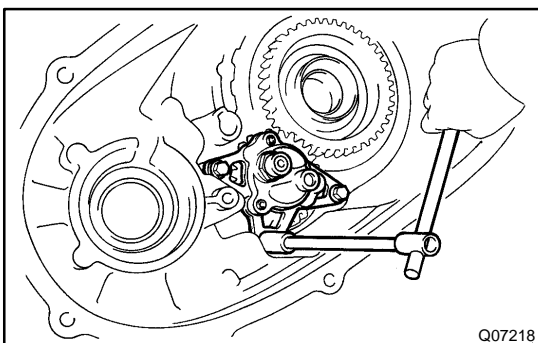


- (b) Using a snap ring expander, install the snap ring.

HINT:

Check that the planetary gear and input shaft assembly turn slightly.

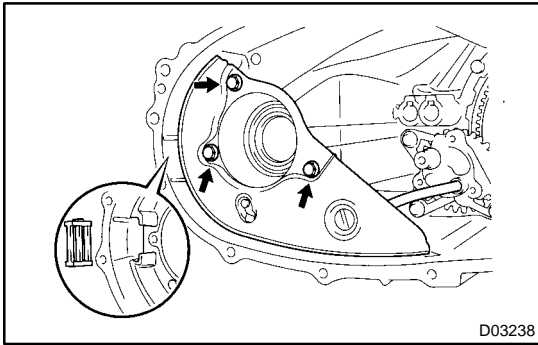
7. INSTALL OIL PUMP DRIVE GEAR



8. INSTALL OIL PUMP BODY ASSEMBLY

Install the oil pump body assembly with the 3 bolts.

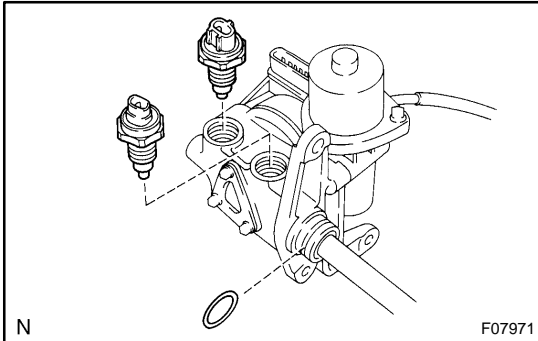
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)



9. INSTALL MAGNET AND SEPARATOR WITH OIL STRAINER

- (a) Install the magnet to the front case.
- (b) Install the separator with oil strainer with the 3 bolts.

Torque: 7.5 N·m (76 kgf-cm, 66 in.-lbf)



10. INSTALL ACTUATOR ASSEMBLY

- (a) Install a new O-ring, 2 new gaskets, transfer 4WD position switch and transfer L4 position switch to the actuator assembly.

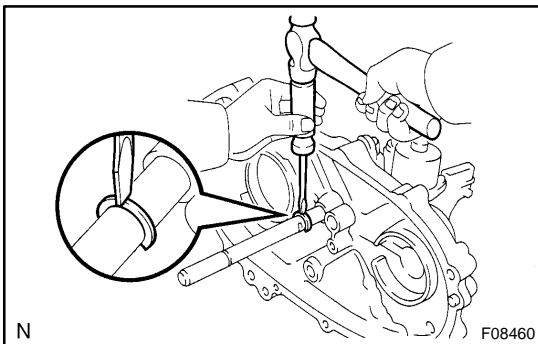
Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)

HINT:

Coat a new O-ring with gear oil.

- (b) Install the actuator assembly with the 3 bolts.

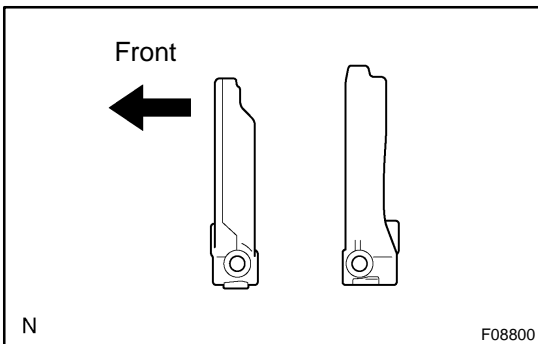
Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)



- (c) Using a screwdriver and hammer, drive in the snap ring to the shift fork shaft of the actuator assembly.

HINT:

Install only the snap ring on the rear side of the shift fork shaft.

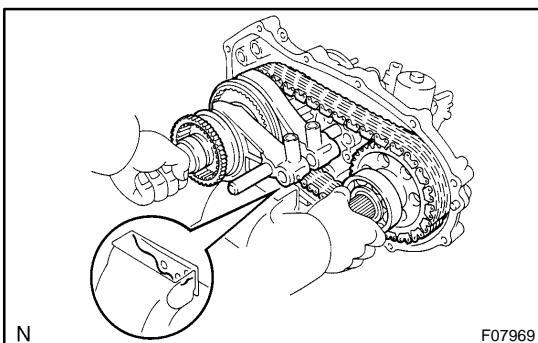


11. INSTALL REAR OUTPUT SHAFT ASSEMBLY, DRIVEN SPROCKET ASSEMBLY, CHAIN AND FRONT DRIVE AND HIGH AND LOW SHIFT FORKS

- (a) Install the driven sprocket assembly, chain and front drive and high and low shift forks to the rear output shaft assembly.

NOTICE:

Make sure that the front drive and high and low shift forks are installed in the correct direction.



- (b) Mount the rear case in a vise.

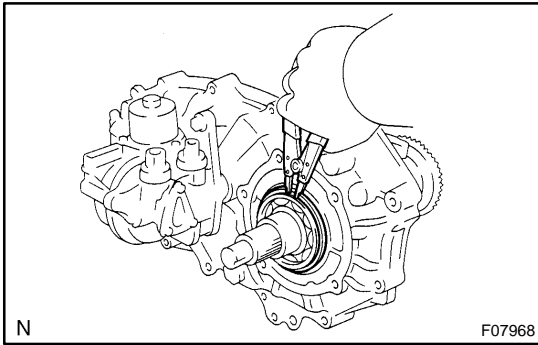
- (c) Install the rear output shaft assembly, driven sprocket assembly, chain and front drive and high and low shift forks to the rear case as an assembly.

NOTICE:

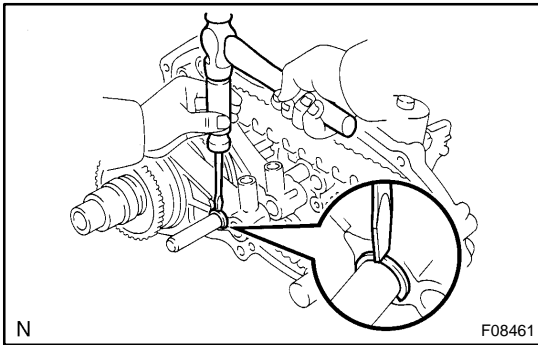
Do not drop the clutch sleeve or shifting key.

HINT:

If necessary, heat the rear case to about 50 to 80 °C (122 to 176 °F).



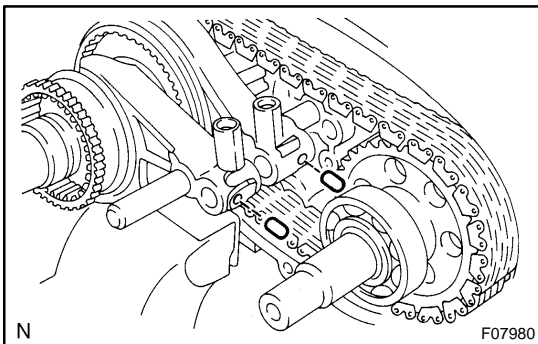
(d) Using a snap ring expander, install the snap ring.



(e) Using a screwdriver and hammer, drive in the snap ring to the shift fork shaft of the actuator assembly.

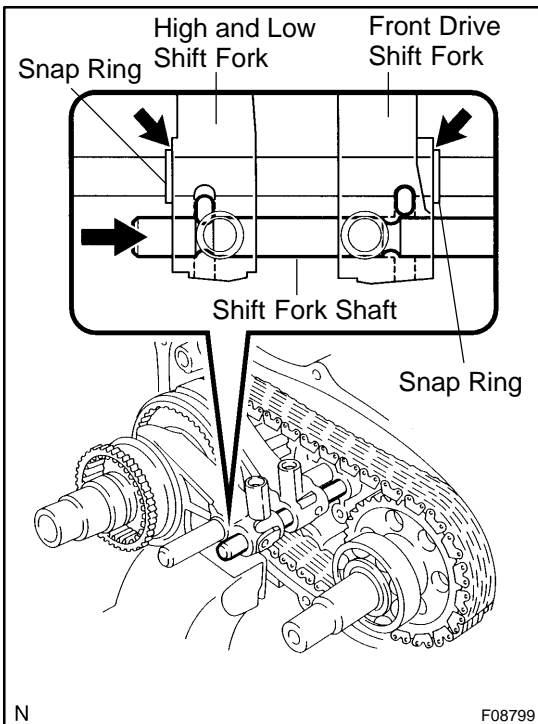
HINT:

Check that the rear output shaft assembly and driven sprocket assembly turn slightly.



12. INSTALL SHIFT FORK SHAFT

(a) Using a magnetic finger, install the 2 straight pins to the front drive and high and low shift forks.

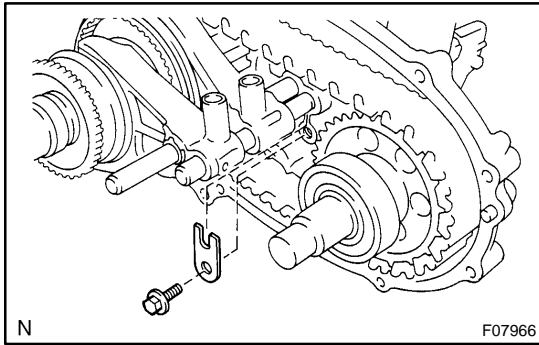


(b) To push into the shift fork shaft, shift the front drive and high and low shift forks to the positions as shown in the illustration.

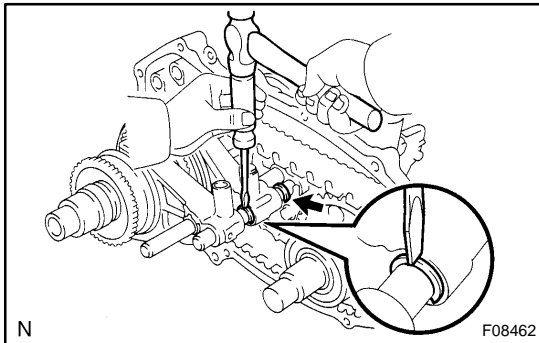
(c) Push into the shift fork shaft.

NOTICE:

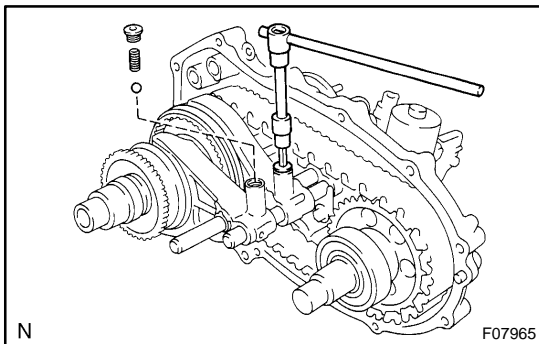
Make sure that the shift fork shaft is installed in the correct direction.



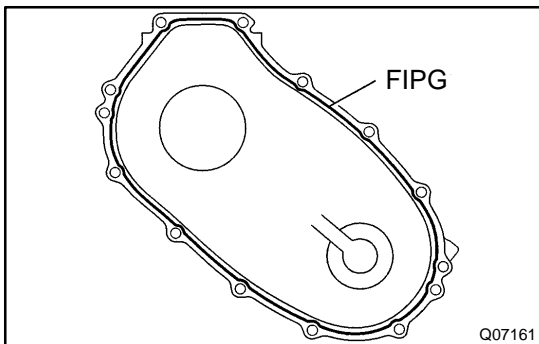
- (d) Install the shift fork shaft stopper with the bolt.
Torque: 19 N·m (190 kgf-cm, 14 ft-lbf)



- (e) Using a screwdriver and hammer, drive in the 2 snap rings to the shift fork shaft.



- (f) Install the 2 balls and springs to the front drive and high and low shift forks.
(g) Apply sealant to the straight screw plug threads.
Sealant:
Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent
(h) Using a hexagon wrench (6 mm), install the 2 straight screw plugs to the front drive and high and low shift forks.
Torque: 19 N·m (190 kgf-cm, 14 ft-lbf)

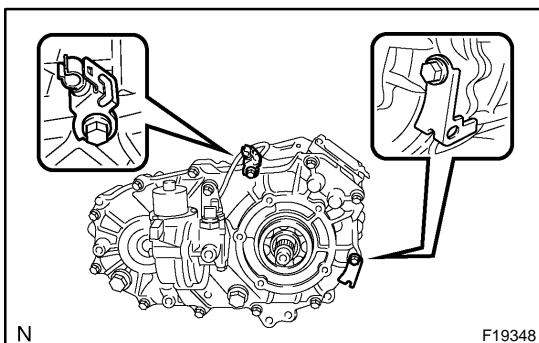


13. REASSEMBLE FRONT AND REAR CASE

HINT:

Remove any FIPG material and be careful not to drop oil on the contacting surface of the rear case.

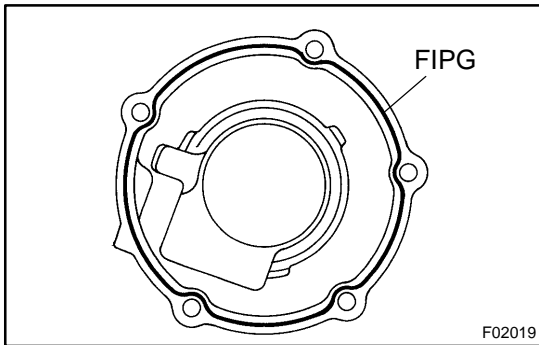
- (a) Apply FIPG to the rear case as shown in the illustration.
FIPG:
Part No. 08826-00090,
THREE BOND 1281 or equivalent



- (b) Install the 2 clamps and reassemble the front and rear case with the 12 bolts.
Torque: 28 N·m (285 kgf-cm, 21 ft-lbf)

14. INSTALL VEHICLE SPEED SENSOR DRIVE GEAR

- (a) Install the ball to the rear output shaft.
(b) Install the vehicle speed sensor drive gear and 2 output washers.



15. INSTALL EXTENSION HOUSING

HINT:

Remove any FIPG material and be careful not to drop oil on the contacting surface of the extension housing.

- (a) Apply FIPG to the extension housing as shown in the illustration.

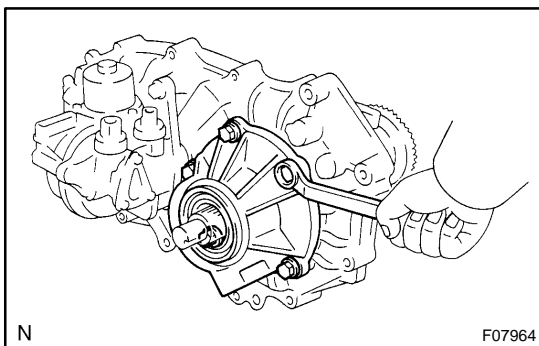
FIPG:

**Part No. 08826-00090,
THREE BOND 1281 or equivalent**

- (b) Apply sealant to the bolt threads.

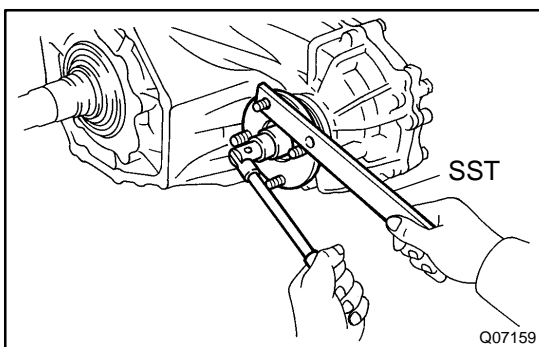
Sealant:

Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent



- (c) Install the extension housing with the 5 bolts.

Torque: 12 N·m (122 kgf-cm, 9 ft-lbf)



16. INSTALL FRONT COMPANION FLANGE

- (a) Install the front companion flange to the input shaft.

- (b) Using SST, hold the front companion flange, and install a new front companion flange lock nut.

SST 09330-00021

Torque: 118 N·m (1,203 kgf-cm, 87 ft-lbf)

- (c) Stake the front companion flange lock nut.

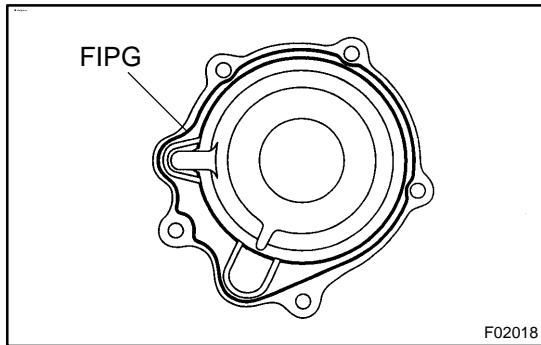
17. INSTALL REAR COMPANION FLANGE

Install the rear companion flange in the same way as the front companion flange.

18. INSTALL OIL DEFLECTOR AND UPPER COVER

Install 2 new gaskets, oil deflector and upper cover with the 4 bolts.

Torque: 18 N·m (184 kgf-cm, 13 ft-lbf)

**19. INSTALL FRONT BEARING RETAINER****HINT:**

Remove any FIPG material and be careful not to drop oil on the contacting surface of the front bearing retainer.

- (a) Apply FIPG to the front bearing retainer as shown in the illustration.

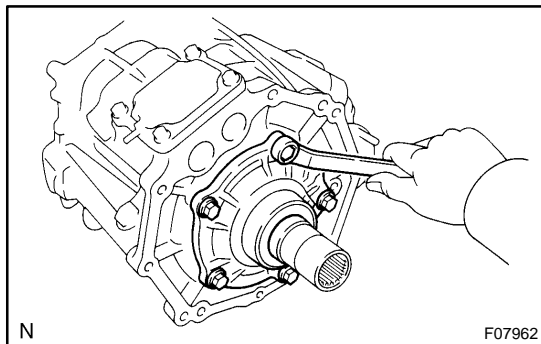
FIPG:

**Part No. 08826-00090,
THREE BOND 1281 or equivalent**

- (b) Apply sealant to the bolt threads.

Sealant:

Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent



- (c) Install the front bearing retainer with the 5 bolts.

Torque: 11.5 N·m (117 kgf-cm, 8 ft-lbf)

20. INSTALL PROTECTOR

Install the protector with the 4 bolts.

Torque: 18 N·m (184 kgf-cm, 13 ft-lbf)

Torque: 37 N·m (380 kgf-cm, 27 ft-lbf)

21. INSTALL SPEEDOMETER DRIVEN GEAR HOLE COVER

- (a) Install a new O-ring to the speedometer driven gear hole cover.

HINT:

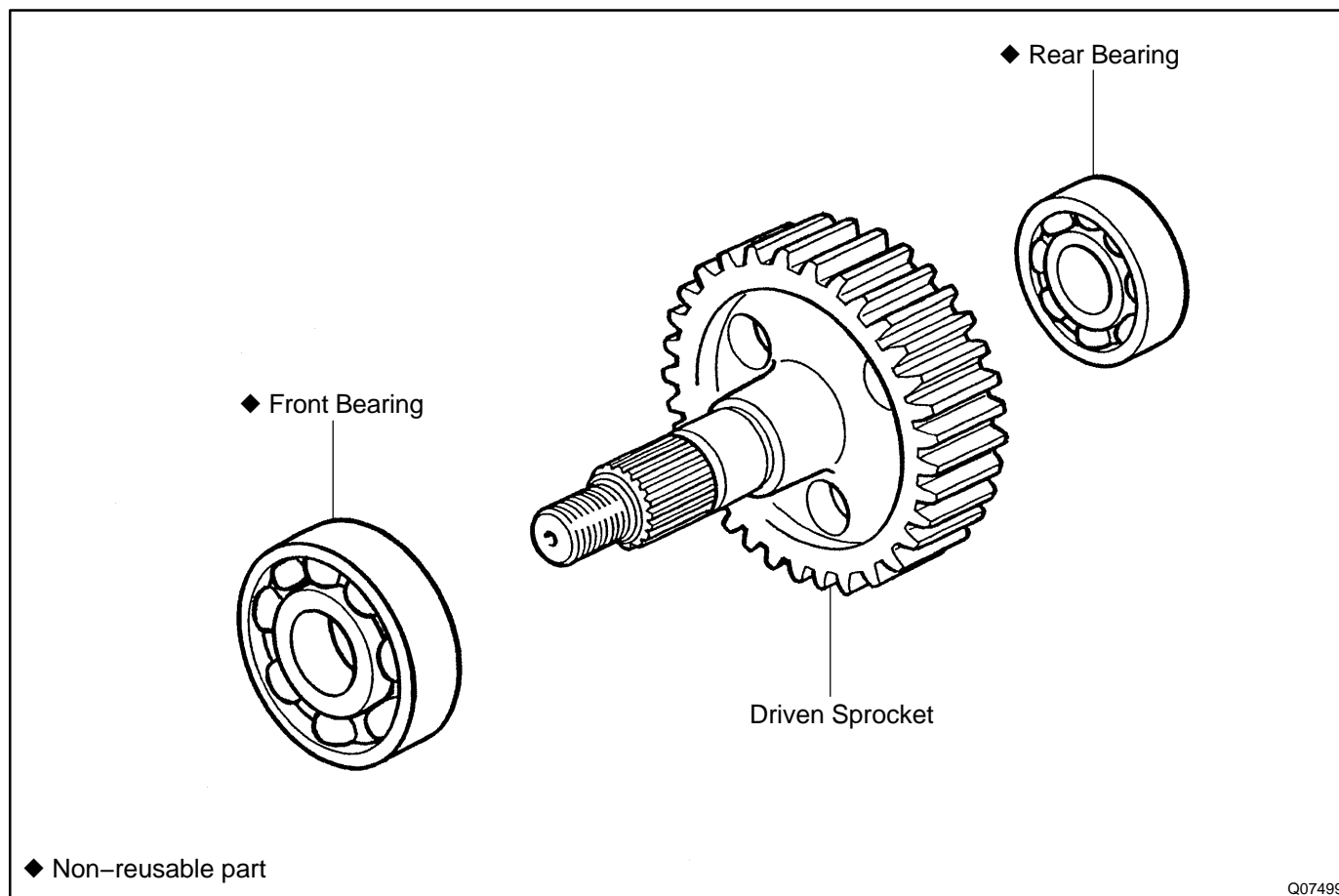
Coat a new O-ring with gear oil.

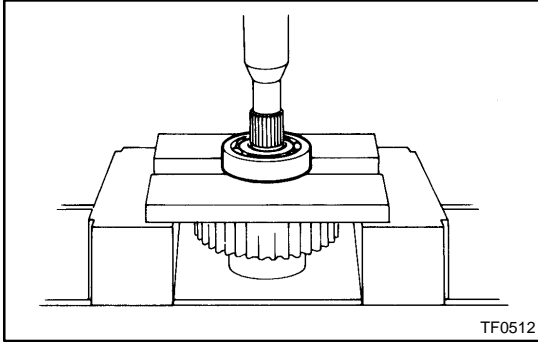
- (b) Install the speedometer driven gear hole cover with the bolt.

Torque: 11 N·m (112 kgf-cm, 8 ft-lbf)

DRIVEN SPROCKET COMPONENTS

TR00F-09

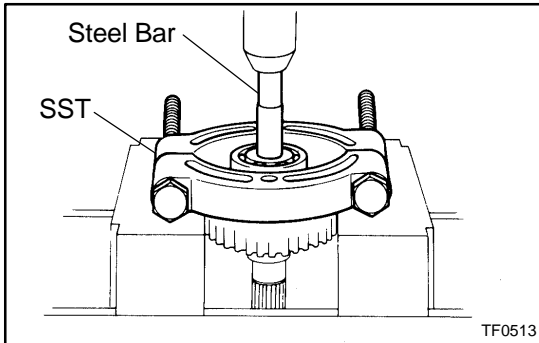




REPLACEMENT

1. REMOVE FRONT BEARING

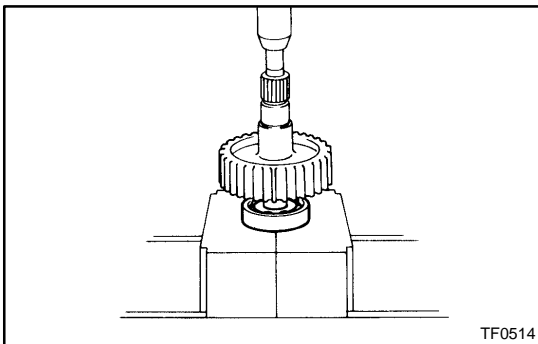
Using a press, remove the front bearing.



2. REMOVE REAR BEARING

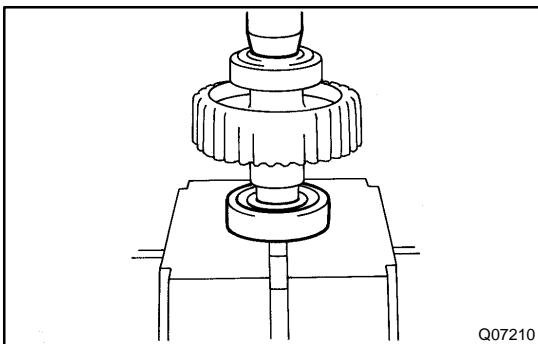
Using SST, a press and steel bar, remove the rear bearing.

SST 09555-55010



3. INSTALL REAR BEARING

Using a press, install a new rear bearing.

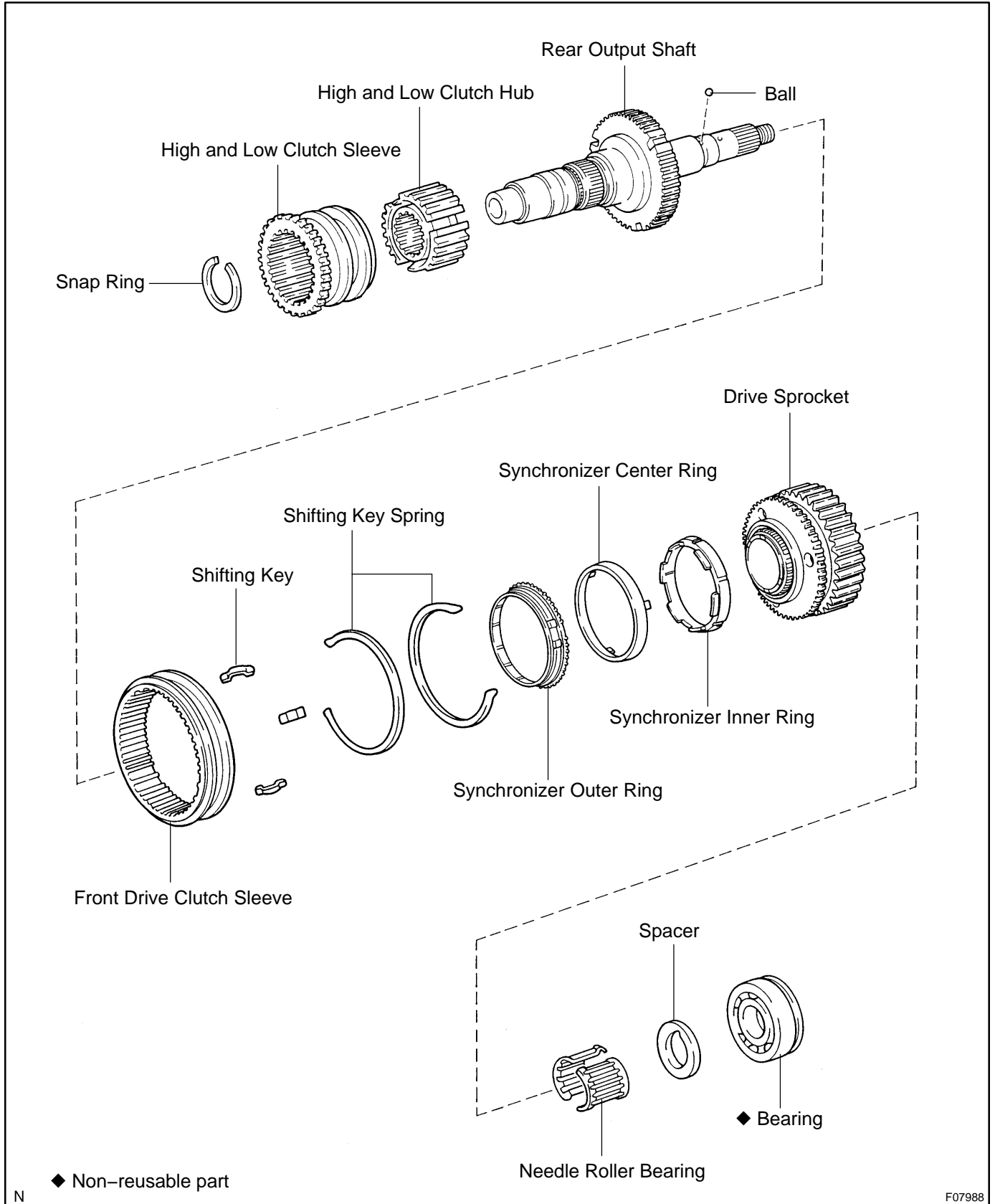


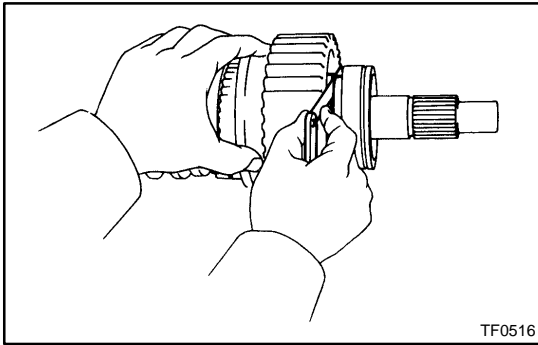
4. INSTALL FRONT BEARING

Using a press, install a new front bearing.

REAR OUTPUT SHAFT COMPONENTS

TR09M-02





DISASSEMBLY

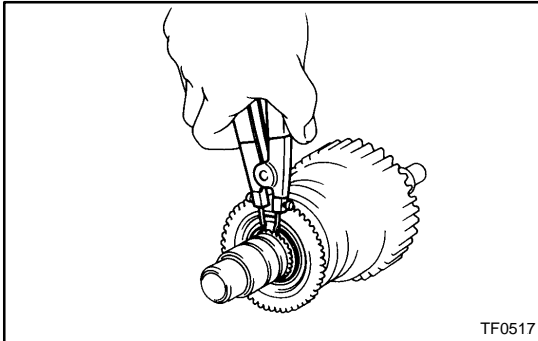
1. **INSPECT DRIVE SPROCKET THRUST CLEARANCE**
Using a feeler gauge, measure the drive sprocket thrust clearance.

Standard clearance:

0.10 to 0.25 mm (0.0039 to 0.0098 in.)

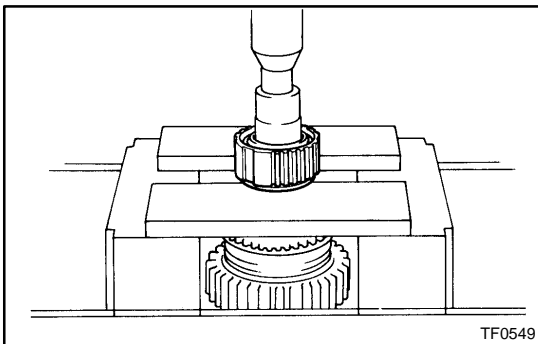
Maximum clearance: 0.25 mm (0.0098 in.)

If the clearance exceeds the maximum, replace the drive sprocket.

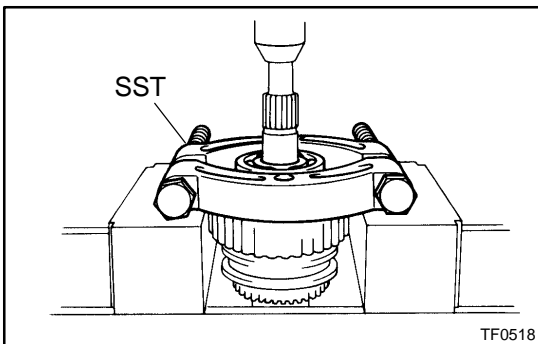


2. **REMOVE HIGH AND LOW CLUTCH SLEEVE ASSEMBLY**

- (a) Remove the clutch sleeve.
- (b) Using a snap ring expander, remove the snap ring.

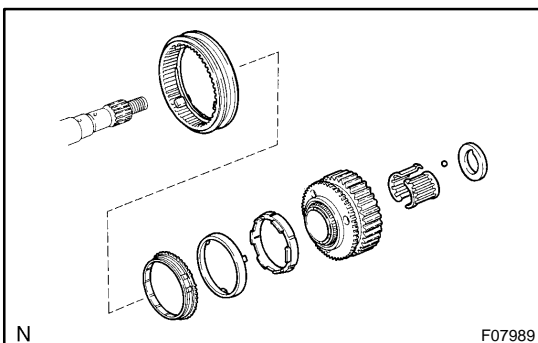


- (c) Using a press, remove the clutch hub.

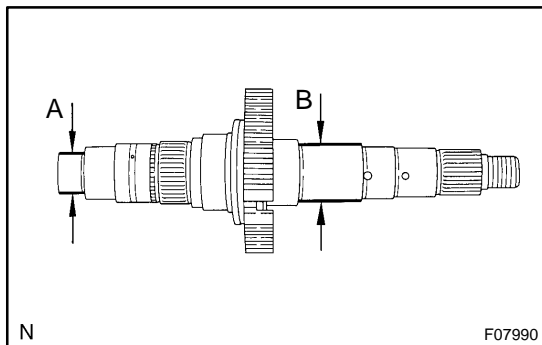


3. **REMOVE BEARING, SPACER, DRIVE SPROCKET, SYNCHRONIZER OUTER, CENTER AND INNER RINGS AND FRONT DRIVE CLUTCH SLEEVE ASSEMBLY**

- (a) Using SST and a press, remove the bearing.
SST 09555-55010



- (b) Remove the spacer and ball.
- (c) Remove the drive sprocket, needle roller bearing, synchronizer outer, center and inner rings.
- (d) Remove the front drive clutch sleeve assembly.
4. **REMOVE 3 SHIFTING KEYS AND 2 KEY SPRINGS FROM FRONT DRIVE CLUTCH SLEEVE**



INSPECTION

1. INSPECT REAR OUTPUT SHAFT

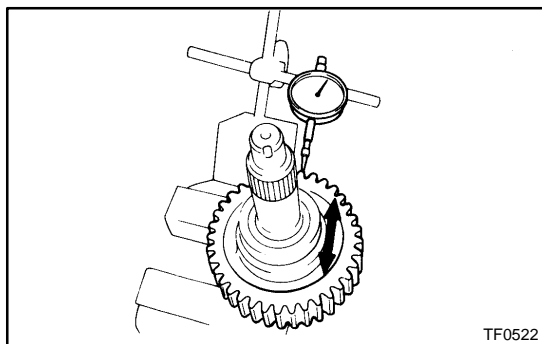
Using a micrometer, measure the rear output shaft journal surface outer diameter.

Minimum diameter:

Part A: 27.98 mm (1.1016 in.)

Part B: 36.98 mm (1.4561 in.)

If the outer diameter is less than the minimum, replace the rear output shaft.



2. INSPECT DRIVE SPROCKET RADIAL CLEARANCE

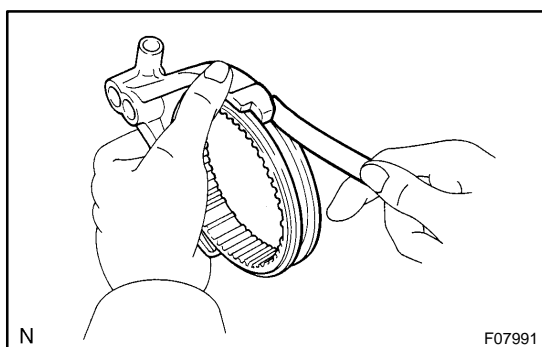
Using a dial indicator, measure the radial clearance between the sprocket and shaft with the needle roller bearing installed.

Standard clearance:

0.010 to 0.055 mm (0.0004 to 0.0022 in.)

Maximum clearance: 0.055 mm (0.0022 in.)

If the clearance exceeds the maximum, replace the drive sprocket, rear output shaft or needle roller bearing.

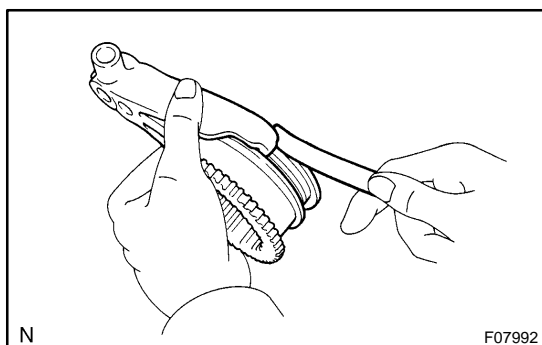


3. INSPECT FRONT DRIVE SHIFT FORK AND CLUTCH SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the front drive shift fork and clutch sleeve.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or clutch sleeve.

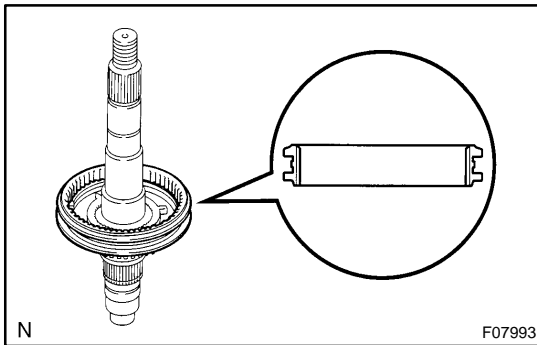


4. INSPECT HIGH AND LOW SHIFT FORK AND CLUTCH SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the high and low shift fork and clutch sleeve.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or clutch sleeve.



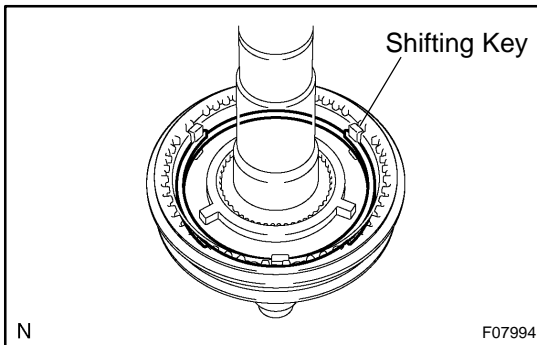
REASSEMBLY

1. INSTALL FRONT DRIVE CLUTCH SLEEVE ONTO REAR OUTPUT SHAFT

- (a) Install the front drive clutch sleeve onto the rear output shaft.

NOTICE:

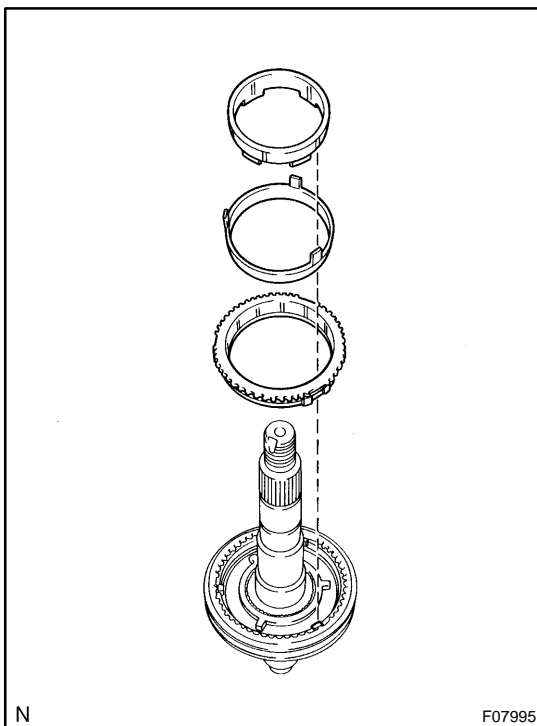
Make sure that the clutch sleeve is installed in the correct direction.



- (b) Install the 3 shifting keys and 2 springs.

NOTICE:

Install the key springs so that their end gaps are not in line.



2. INSTALL SYNCHRONIZER OUTER, CENTER AND INNER RINGS, DRIVE SPROCKET, SPACER AND BEARING

- (a) Apply gear oil to the rear output shaft and needle roller bearing.
- (b) Install the synchronizer outer ring to the rear output shaft.

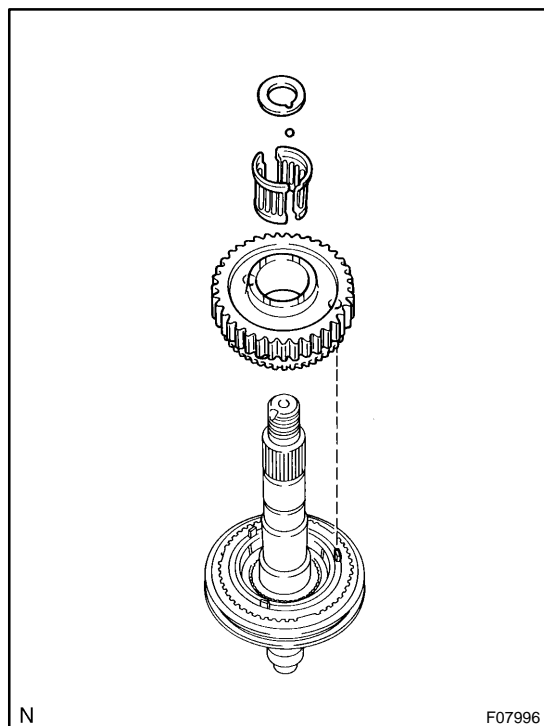
NOTICE:

Align the slots of the synchronizer outer ring with the shifting keys.

- (c) Install the synchronizer center and inner rings to the rear output shaft.

NOTICE:

Align the slots of the synchronizer outer with those of inner rings.

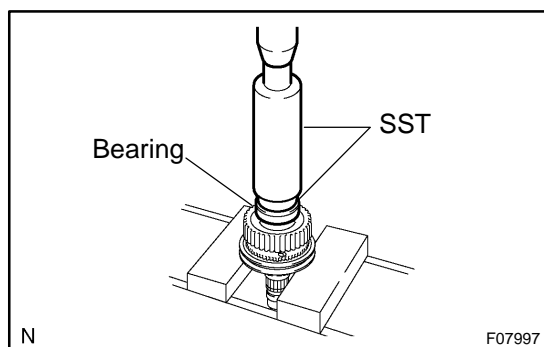


- (d) Install the needle roller bearing to the rear output shaft.
 (e) Install the drive sprocket to the rear output shaft.

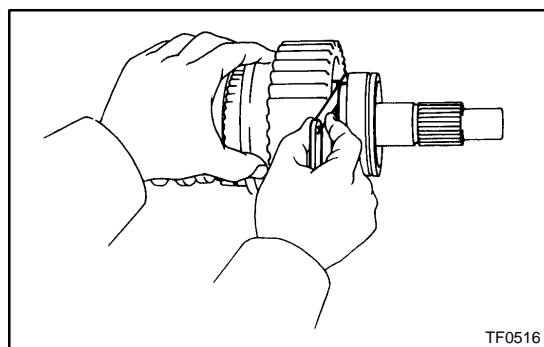
NOTICE:

Align the holes in the drive sprocket with the protrusions of the synchronizer center ring.

- (f) Install the spacer and align it with the ball.



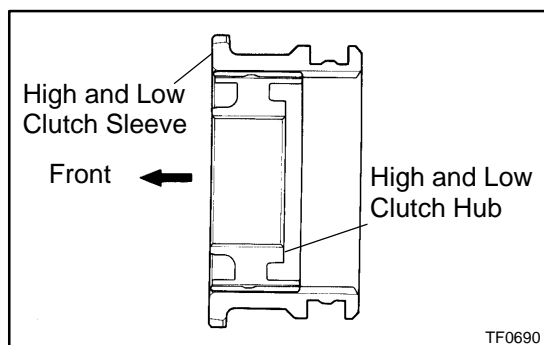
- (g) Using SST and a press, install a new bearing with the spacer groove facing the drive sprocket.
 SST 09316-60011 (09316-00011, 09316-00071)

**3. INSPECT DRIVE SPROCKET THRUST CLEARANCE**

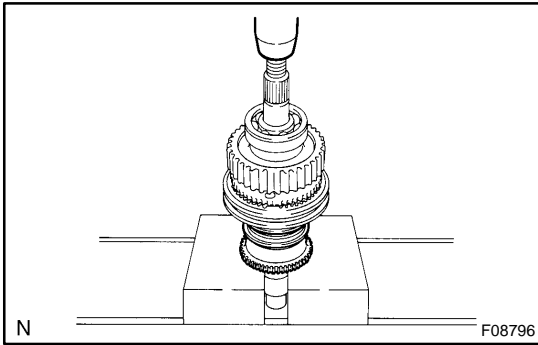
Using a feeler gauge, measure the drive sprocket thrust clearance.

Standard clearance:

0.10 to 0.25 mm (0.0039 to 0.0098 in.)

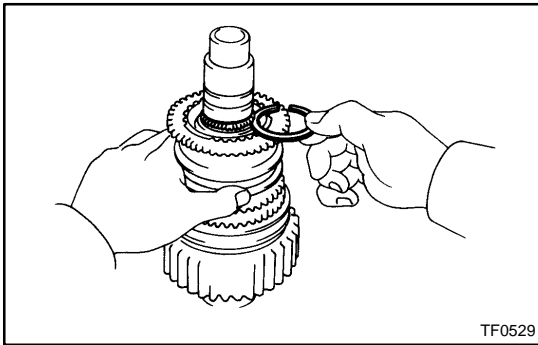
**4. INSERT HIGH AND LOW CLUTCH HUB ONTO CLUTCH SLEEVE****NOTICE:**

Make sure that the high and low clutch hub is installed in the correct direction.



5. INSTALL HIGH AND LOW CLUTCH HUB ASSEMBLY

Using a press, install the high and low clutch hub assembly.



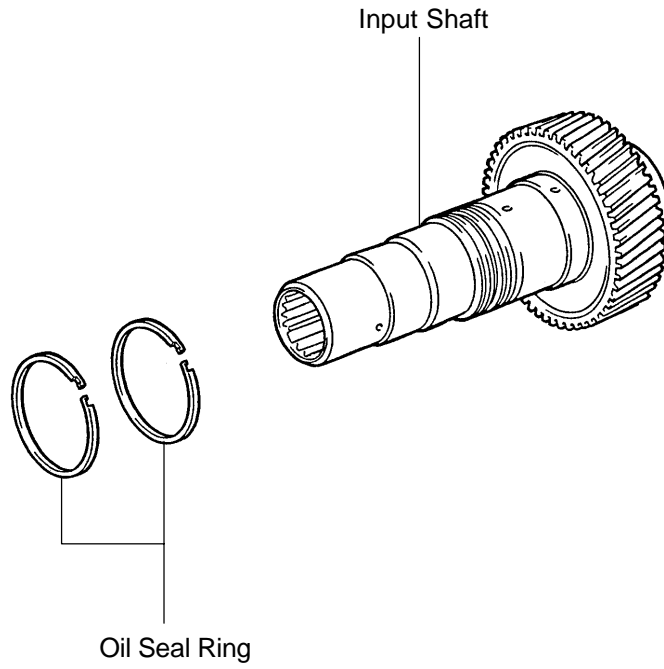
6. INSTALL SNAP RING

Select a snap ring that allows for minimum axial play and install it to the shaft.

Mark	Thickness mm (in.)
K	2.00 to 2.05 (0.0787 to 0.0807)
L	2.05 to 2.10 (0.0807 to 0.0827)
A	2.10 to 2.15 (0.0827 to 0.0846)
B	2.15 to 2.20 (0.0846 to 0.0866)
C	2.20 to 2.25 (0.0866 to 0.0886)
D	2.25 to 2.30 (0.0886 to 0.0906)
E	2.30 to 2.35 (0.0906 to 0.0925)
F	2.35 to 2.40 (0.0925 to 0.0945)
G	2.40 to 2.45 (0.0945 to 0.0965)
H	2.45 to 2.50 (0.0965 to 0.0984)
J	2.50 to 2.55 (0.0984 to 0.1004)

INPUT SHAFT COMPONENTS

TR00L-07

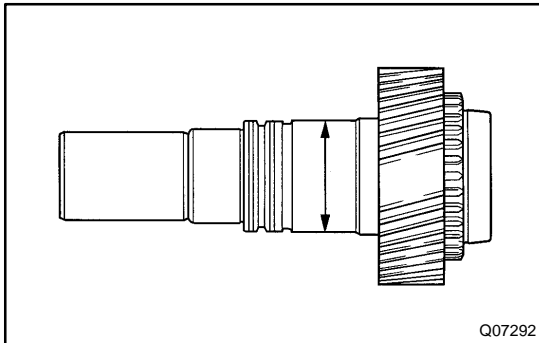


F08802

INSPECTION

1. REMOVE OIL SEAL RING

Remove the 2 oil seal rings.

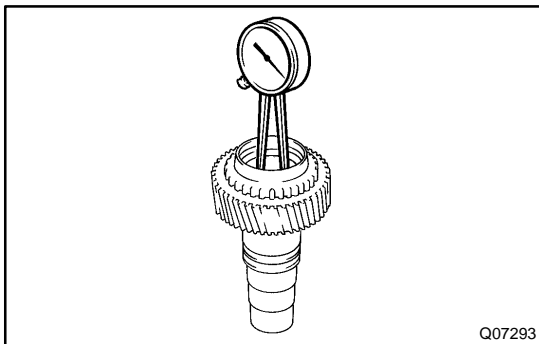


2. INSPECT INPUT SHAFT

- (a) Using a micrometer, measure the outer diameter of the input shaft journal surface.

Minimum diameter: 47.59 mm (1.8736 in.)

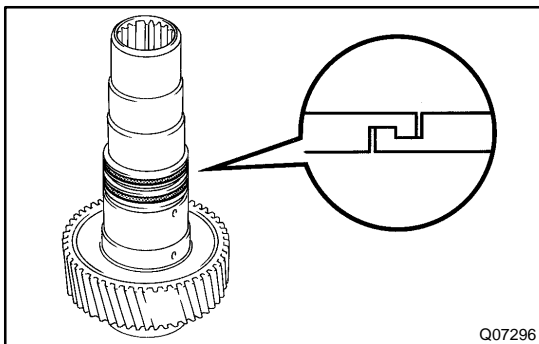
If the outer diameter is less than the minimum, replace the input shaft.



- (b) Using a dial indicator, measure the inside diameter of the input shaft bushing.

Maximum inside diameter: 39.14 mm (1.5409 in.)

If the inside diameter exceeds the maximum, replace the input shaft.



3. INSTALL OIL SEAL RING

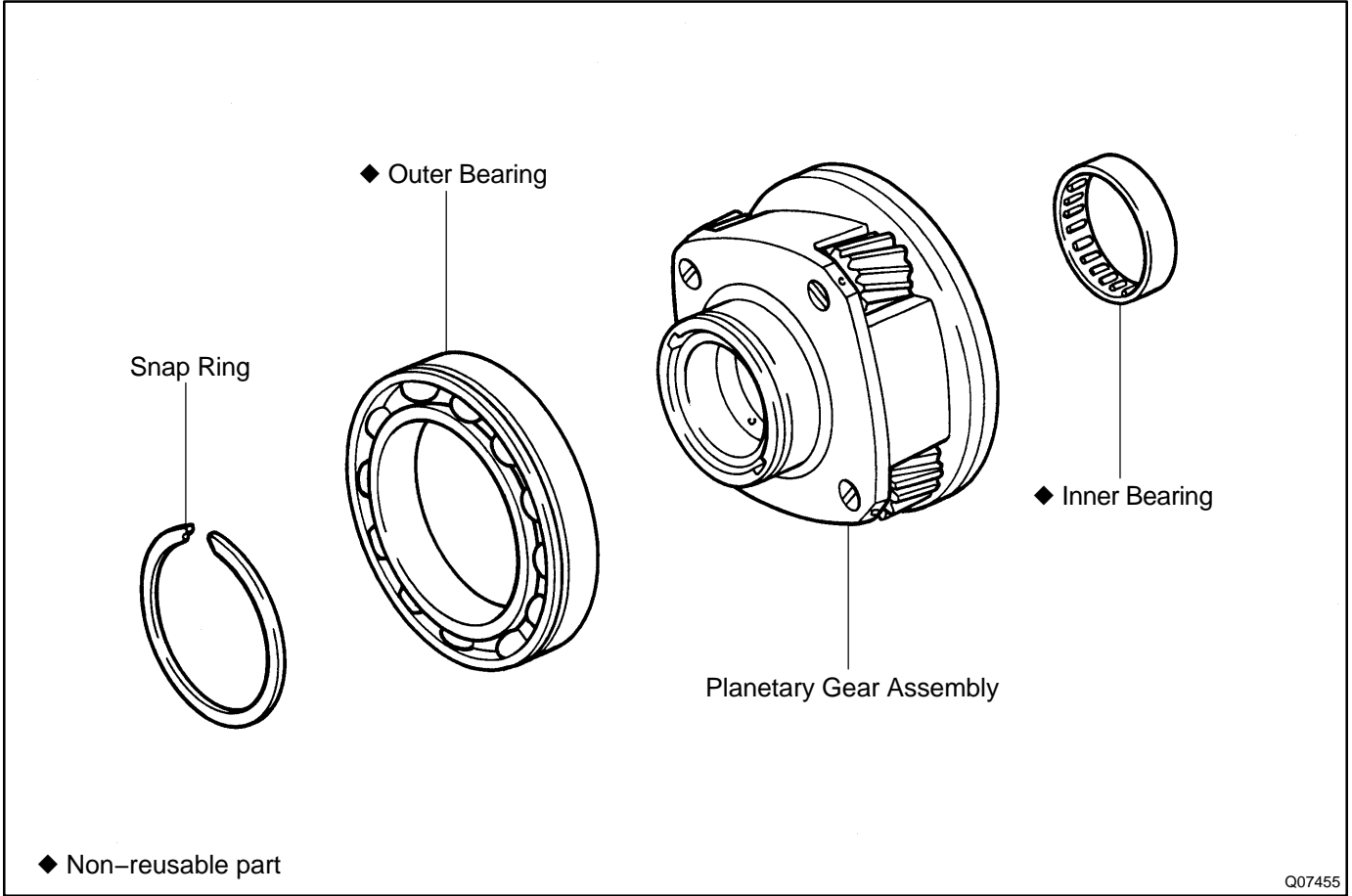
Install the 2 oil seal rings.

HINT:

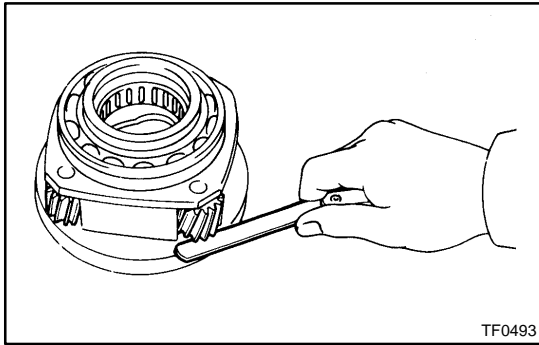
- Apply gear oil to the oil seal ring.
- Engage securely to eliminate clearance as shown in the illustration.

PLANETARY GEAR COMPONENTS

TR00N-09



Q07455



INSPECTION

1. INSPECT PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

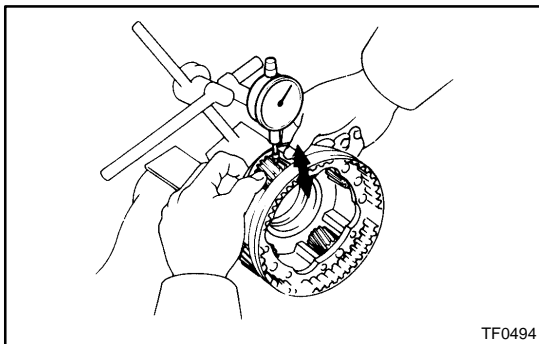
Standard clearance:

0.11 to 0.84 mm (0.0043 to 0.0331 in.)

Maximum clearance:

0.84 mm (0.0331 in.)

If the clearance exceeds the maximum, replace the planetary gear assembly.



2. INSPECT PLANETARY PINION GEAR RADIAL CLEARANCE

Using a dial indicator, measure the planetary pinion gear radial clearance.

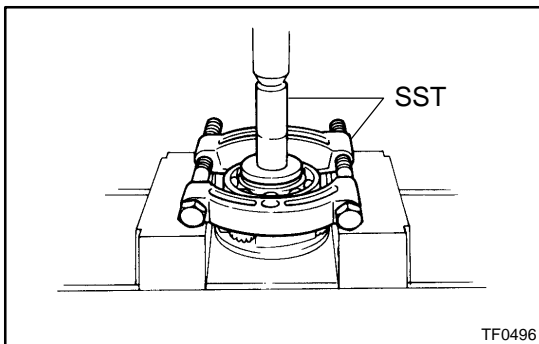
Standard clearance:

0.009 to 0.038 mm (0.0004 to 0.0015 in.)

Maximum clearance:

0.038 mm (0.0015 in.)

If the clearance exceeds the maximum, replace the planetary gear assembly.

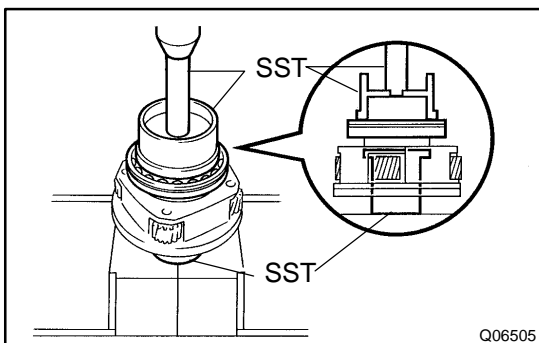


3. IF NECESSARY, REPLACE PLANETARY GEAR OUTER BEARING

(a) Using a snap ring expander, remove the snap ring.

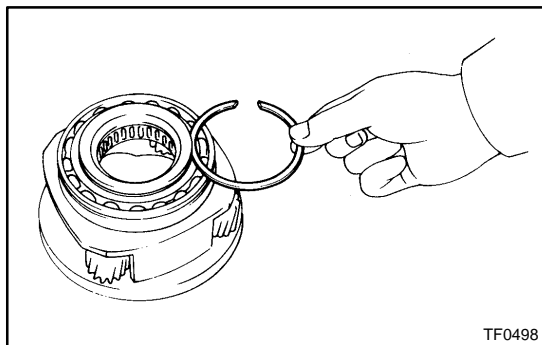
(b) Using SST and a press, remove the bearing.

SST 09554-30011, 09555-55010



(c) Using SST and a press, install a new bearing so that the groove does not face the planetary gear assembly.

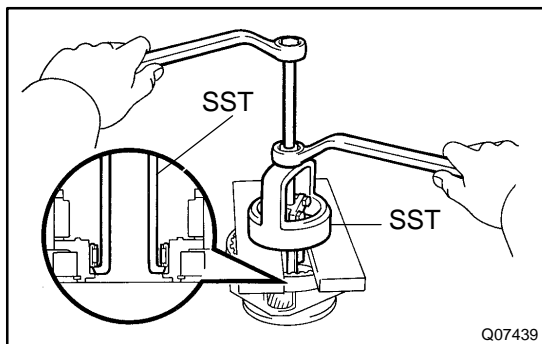
SST 09223-15020, 09515-30010, 09950-70010
(09951-07100)



(d) Select a snap ring that allows for minimum axial play.

Mark	Thickness mm (in.)
1	1.45 to 1.50 (0.0571 to 0.0591)
2	1.50 to 1.55 (0.0591 to 0.0610)
3	1.55 to 1.60 (0.0610 to 0.0630)
4	1.60 to 1.65 (0.0630 to 0.0650)
5	1.65 to 1.70 (0.0650 to 0.0669)

(e) Using a snap ring expander, install a snap ring.



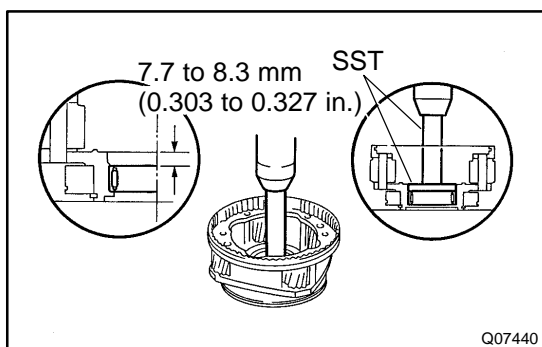
4. IF NECESSARY, REPLACE PLANETARY GEAR INNER BEARING

(a) Using SST, remove the bearing.

SST 09612-65014 (09612-01030, 09612-01050)

NOTICE:

Engage the claws of the SST securely so that there is no clearance between the inner bearing and planetary gear.

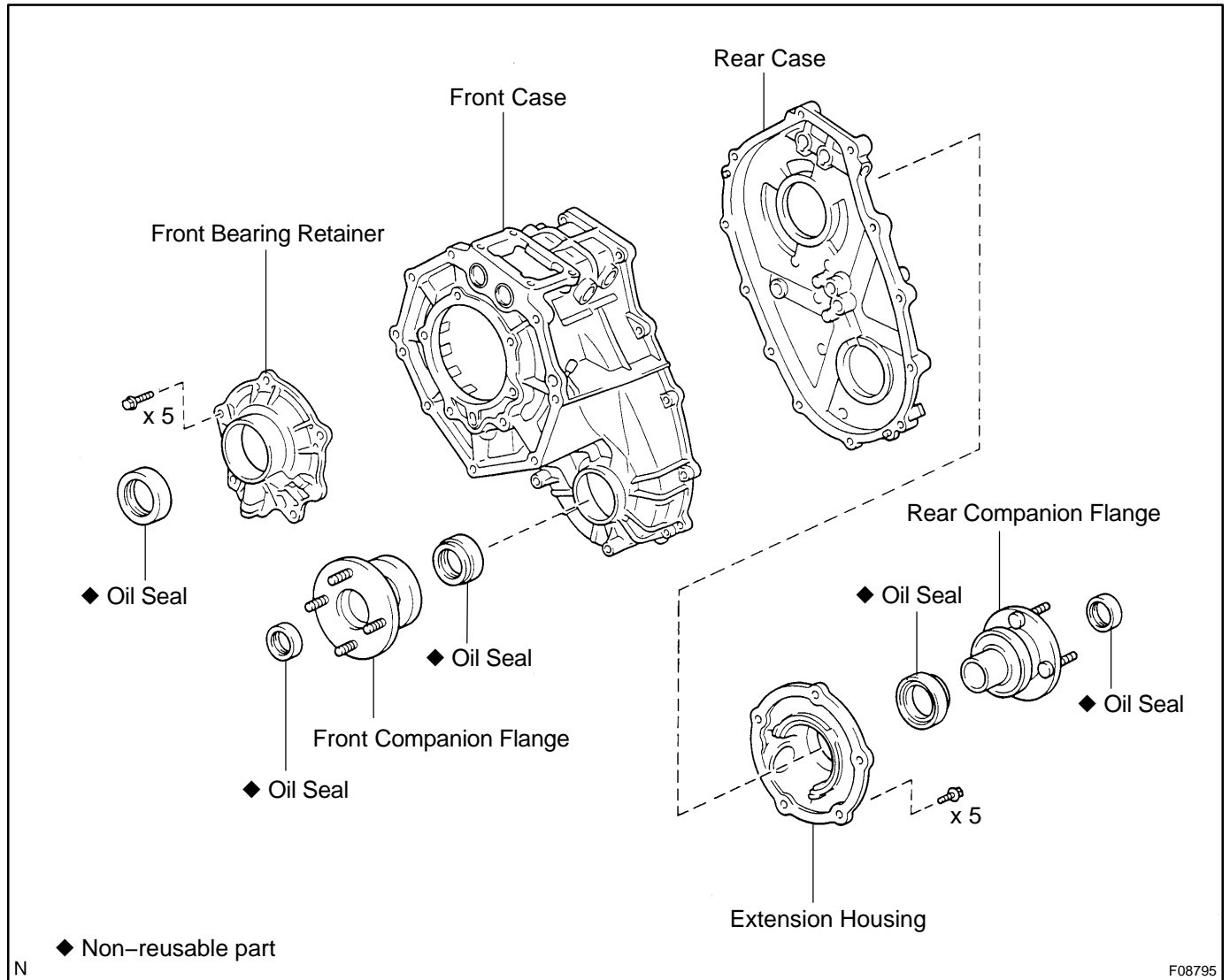


(b) Using SST and a press, install a new bearing.

SST 09950-60010 (09951-00570), 09950-70010 (09951-07100)

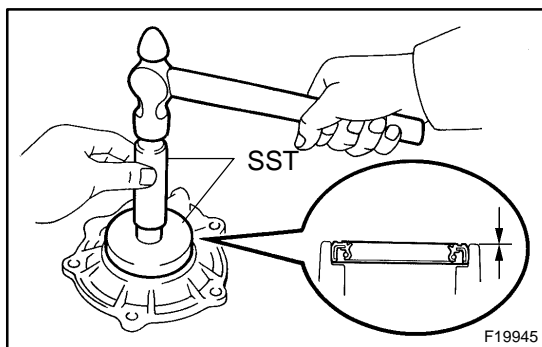
**Bearing press in depth:
7.7 to 8.3 mm (0.303 to 0.327 in.)**

OIL SEAL COMPONENTS



N

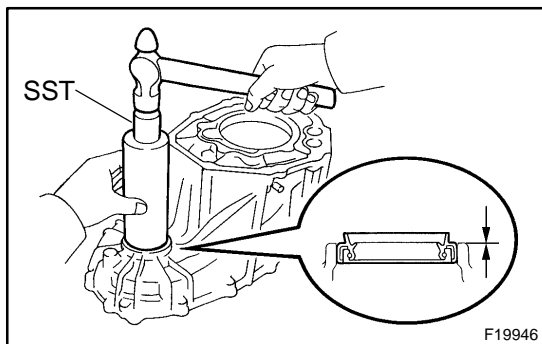
F08795



REPLACEMENT

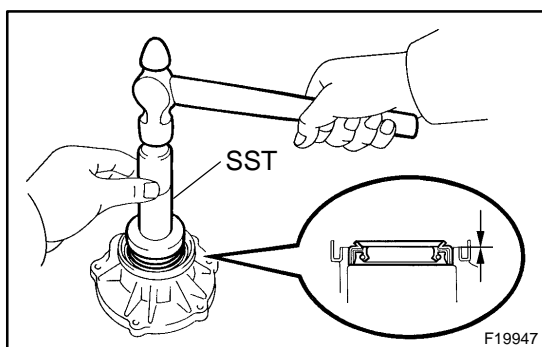
1. IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL

- Using a screwdriver and hammer, drive out the oil seal.
- Using SST and a hammer, drive in a new oil seal until its surface is flush with the retainer upper surface.
SST 09950-60010 (09951-00590), 09950-70010 (09951-07100)
- Coat the lip of the oil seal with MP grease.



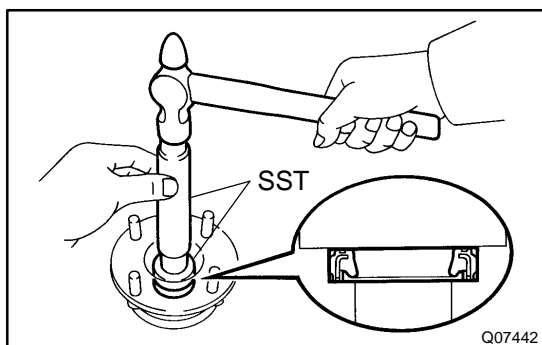
2. IF NECESSARY, REPLACE FRONT CASE OIL SEAL

- Using a screwdriver and hammer, drive out the oil seal.
- Using SST and a hammer, drive in a new oil seal until its surface is flush with the case upper surface.
SST 09316-60011 (09316-00011)
- Coat the lip of the oil seal with MP grease.



3. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

- Using a screwdriver and hammer, drive out the oil seal.
- Using SST and a hammer, drive in a new oil seal until its surface is flush with the housing upper surface.
SST 09554-22010
- Coat the lip of the oil seal with MP grease.

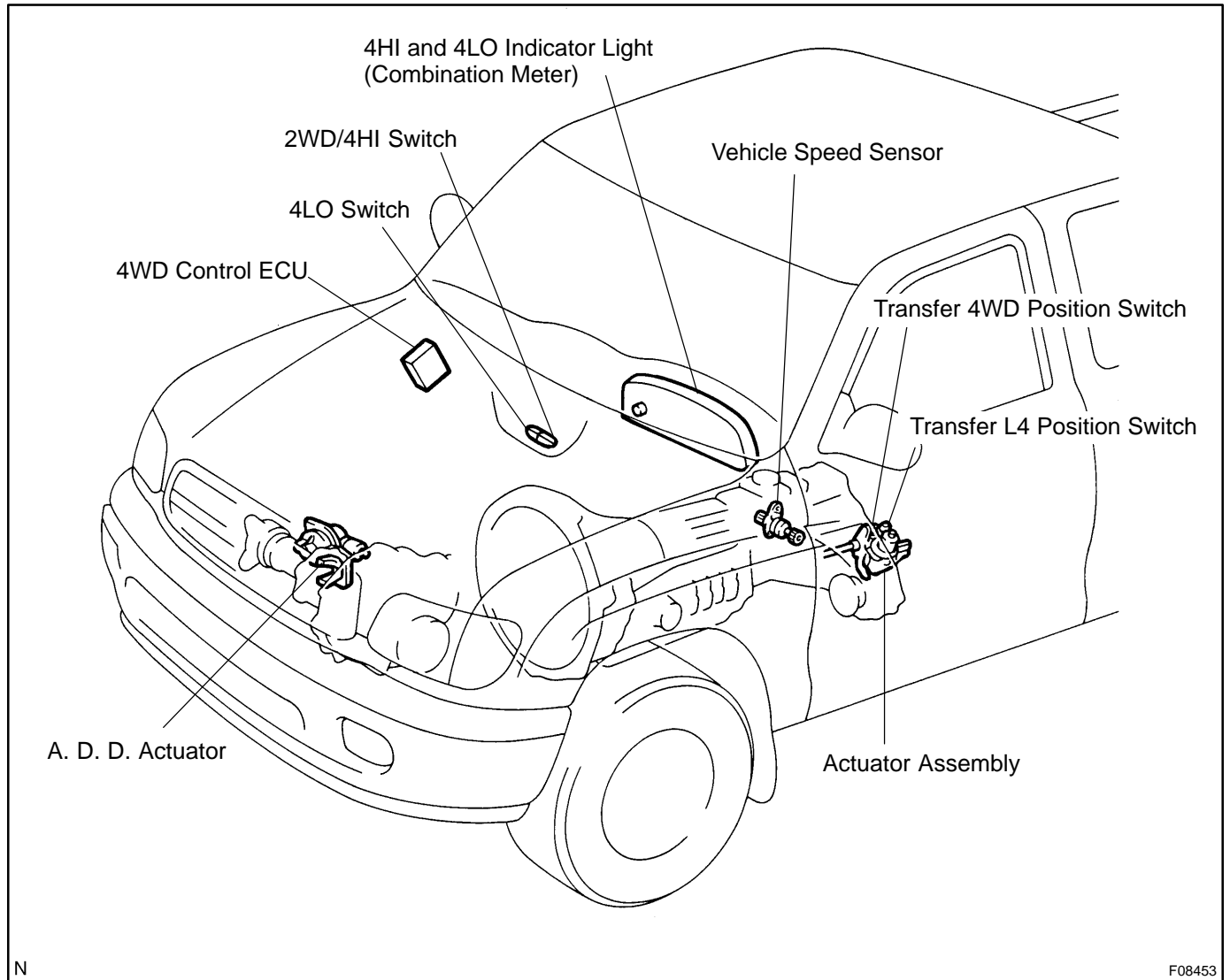


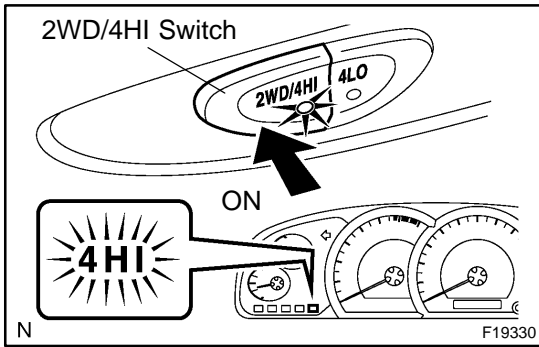
4. IF NECESSARY, REPLACE FRONT AND REAR COMPANION FLANGE OIL SEALS

- Using a screwdriver and hammer, drive out the 2 oil seals from the 2 flanges.
- Using SST and a hammer, drive in 2 new oil seals.
SST 09950-60010 (09951-00220, 09951-00350, 09952-06010), 09950-70010 (09951-07100)
- Coat the lip of the oil seal with MP grease.

TOUCH SELECT 2-4 AND HIGH-LOW SYSTEM LOCATION

TR09S-02





INSPECTION

1. INSPECT 2WD ↔ 4HI SHIFT

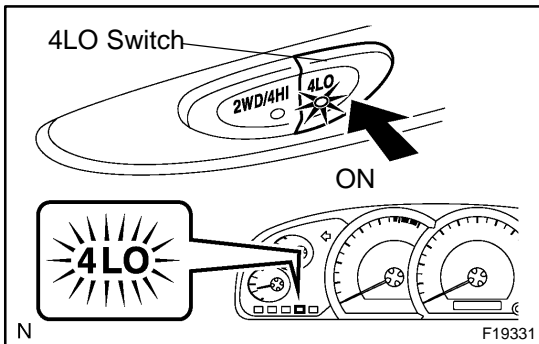
- Turn the ignition switch to the ON position.
- Check that the 4HI indicator lights come on when the 2WD/4HI switch is in the ON position.
- Check that the 4HI indicator lights go off when the 2WD/4HI switch is in the OFF position.

HINT:

- If the light does not come on, even though the switch has been turned ON, the vehicle should be moved back and forth.
- If switching is not completed after 3 seconds of shift operation, the 4HI indicator light will flash.

2. INSPECT 4HI ↔ 4LO SHIFT

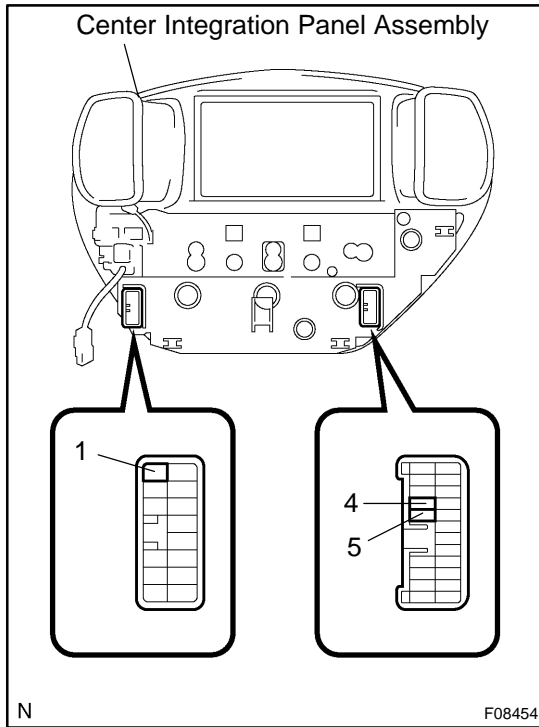
- Turn the ignition switch to the ON position.
- Shift the transmission shift lever in the N position.
- Turn the 2WD/4HI switch ON.



- Check that the 4LO indicator lights come on and the 4HI indicator lights go off when the 4LO switch is in the ON position.
- Check that the 4LO indicator lights go off and the 4HI indicator lights come on when pushing the 4LO switch once.

HINT:

- Inspection should be performed with the vehicle stopped, and transmission shift lever in the N position.
- If switching is not completed after 3 seconds of shift operation, the 4LO indicator light will flash.



- 3. INSPECT 2WD/4HI AND 4LO SWITCH CONTINUITY**
- (a) Remove the center integration panel assembly (See page BO-111).
 - (b) Measure the resistance between the terminals as shown.

2WD/4HI switch

Standard:

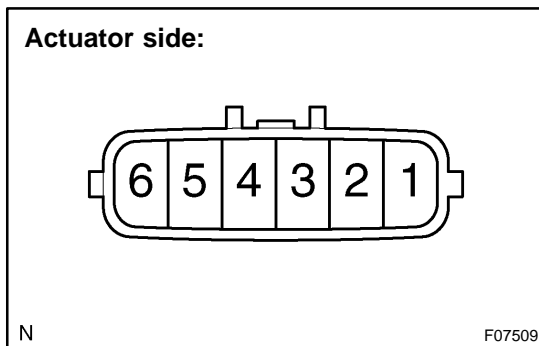
Switch position	Tester connection	Specified condition
OFF	1-5	10 kΩ or higher
ON	1-5	Below 1 Ω

4LO switch

Standard:

Switch position	Tester connection	Specified condition
OFF	1-4	10 kΩ or higher
ON	1-4	Below 1 Ω

If the result is not as specified, replace the center integration panel assembly (See page BO-111).

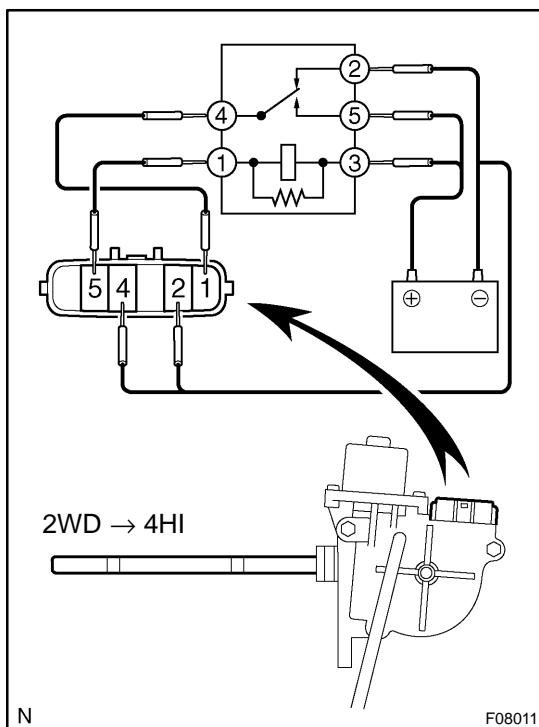


- 4. INSPECT ACTUATOR RESISTANCE**
- (a) Using an ohmmeter, measure the resistance between terminals 1 and 2.

Standard resistance: 0.3 to 100 Ω
 - (b) Using an ohmmeter, measure the resistance between terminals 1 or 2 and body ground.

Standard resistance: 0.5 MΩ or higher

If the result is not as specified, replace the actuator assembly.

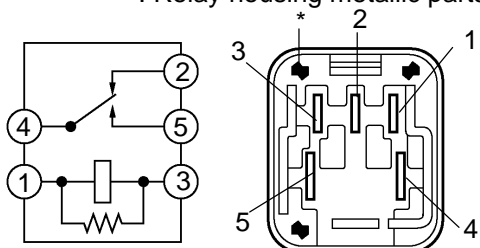


- 5. INSPECT ACTUATOR OPERATION**
- (a) 2WD → 4HI shift:

Connect lines via a relay as shown in the illustration, then check that the actuator fork shaft moves from the 2WD to 4HI position.

Heater main relay:

*: Relay housing metallic parts



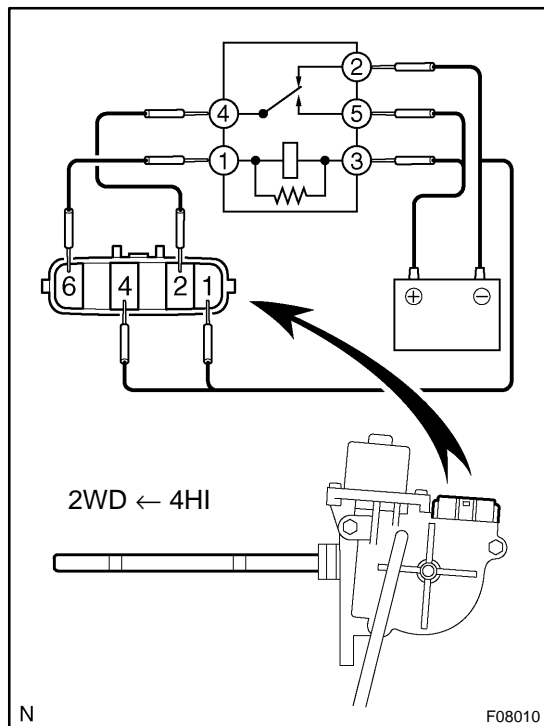
D04311

HINT:

When inspecting the operation described above, use a heater main relay.

NOTICE:

Be careful not to touch the neighboring terminals or metallic parts of the relay housing when connecting.

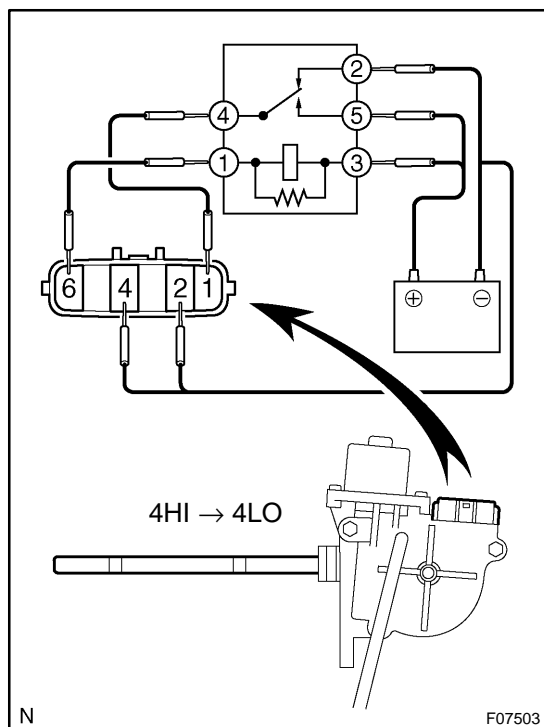


N

F08010

(b) 4HI → 2WD shift:

Connect lines via a relay as shown in the illustration, then check that the actuator fork shaft moves from the 4HI to 2WD position.

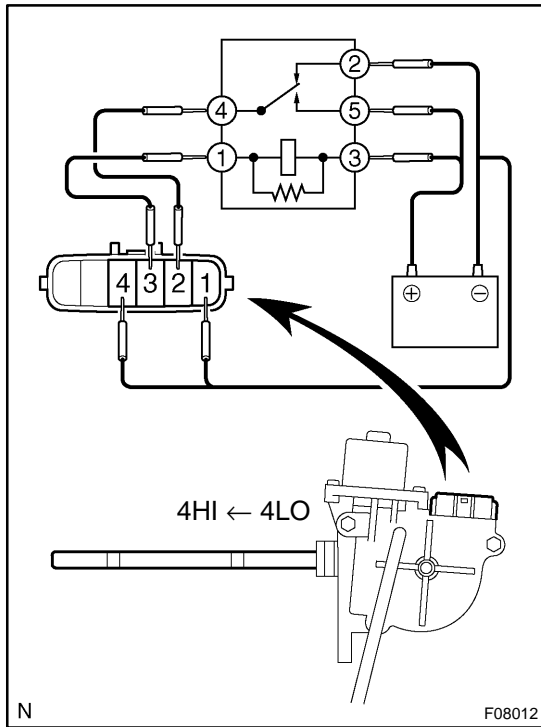


N

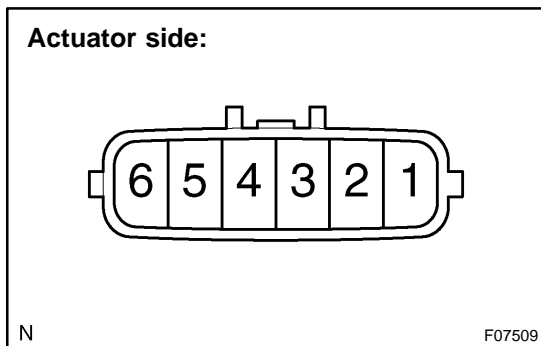
F07503

(c) 4HI → 4LO shift:

Connect lines via a relay as shown in the illustration, then check that the actuator fork shaft moves from the 4HI to 4LO position.



- (d) 4LO → 4HI shift:
Connect lines via a relay as shown in the illustration, then check that the actuator fork shaft moves from the 4LO to 4HI position.



6. INSPECT LIMIT SWITCH CONTINUITY

- (a) Start the engine and raise the vehicle.
- (b) With the actuator connector connected, shift the transfer shift lever and after checking the operating sound, disconnect the connector and measure the resistance between each terminal.

HINT:

When shifting the actuator fork shaft, connect the connectors.

Standard:

Shift position	Tester connection	Specified condition
2WD	3-4	10 kΩ or higher
	3-5	10 kΩ or higher
	3-6	10 kΩ or higher
	4-5	Below 1 Ω
	4-6	10 kΩ or higher
	5-6	10 kΩ or higher
4HI	3-4	10 kΩ or higher
	3-5	10 kΩ or higher
	3-6	10 kΩ or higher
	4-5	10 kΩ or higher
	4-6	Below 1 Ω
	5-6	10 kΩ or higher
4LO	3-4	Below 1 Ω
	3-5	10 kΩ or higher
	3-6	10 kΩ or higher
	4-5	10 kΩ or higher
	4-6	10 kΩ or higher
	5-6	10 kΩ or higher

7. INSPECT VEHICLE SPEED SENSOR

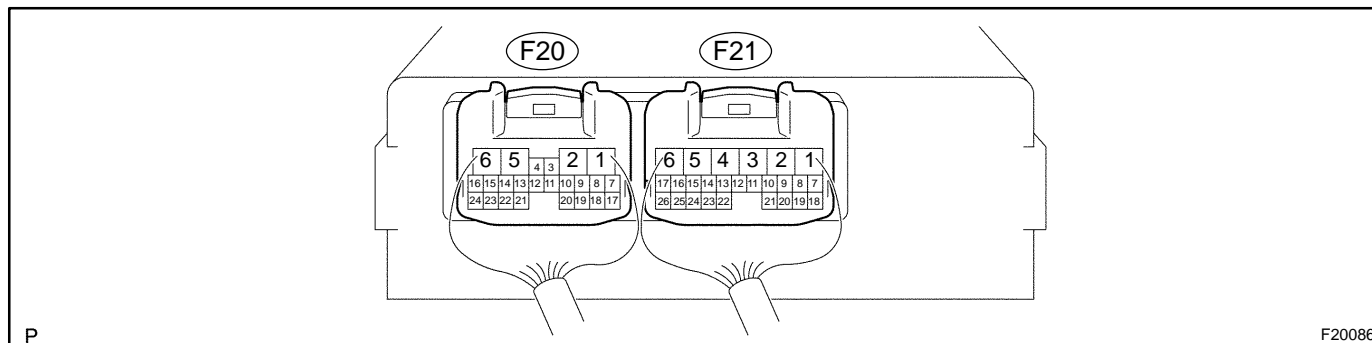
(See page [BE-86](#))

8. INSPECT 4HI AND 4LO INDICATOR LIGHT

Check the combination meter (See page [BE-86](#)).

9. INSPECT 4WD CONTROL ECU

Connect the wire harness side connector to the 4WD control ECU and inspect the wire harness side connector from the back, as shown.



P

F20086

STANDARD VALUE OF ECU TERMINAL

Terminals (Symbols)	Condition	STD Voltage (V)
F20-9 (SPD) - F20-6 (GND)	During driving	Pulse generation
F20-8 (2-4) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON Touch select 2-4 switch OFF → ON 	10 to 14 → 1.5 or less
F20-22 (N) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON Transmission shift lever : positions other than N → N 	10 to 14 → 1.5 or less
F21-22 (4WD) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON Touch select 2-4 switch OFF → ON 	10 to 14 → 1.5 or less
F20-15 (LO) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON, touch select 2-4 switch ON Touch select high-low switch OFF → ON 	10 to 14 → 1.5 or less
F21-23 (TL3) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON, touch select 2-4 switch ON 4HI (touch select high-low switch OFF) → 4LO (touch select high-low switch ON) 	10 to 14 → 0.88 or less
F21-25 (TL1) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON 4HI (touch select 2-4 switch ON) → 2WD (touch select 2-4 switch OFF) 	10 to 14 → 0.88 or less
F20-13 (DL1) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON A.D.D. FREE → LOCK 	10 to 14 → 0.5 or less
F20-2 (DM1) - F20-1 (DM2)	<ul style="list-style-type: none"> Ignition switch ON A.D.D. LOCK 	10 to 14 (for about 5 seconds) → less than 0.5
	<ul style="list-style-type: none"> Ignition switch ON A.D.D. FREE 	
F20-5 (IG) - F20-6 (GND)	Ignition switch ON	10 to 14
F21-2 (TM1) - F21-1 (TM2)	<ul style="list-style-type: none"> Ignition switch ON Touch select 2-4 switch OFF 	10 to 14 (for about 5 seconds) → less than 0.5
	<ul style="list-style-type: none"> Ignition switch ON Touch select 2-4 switch ON 	
F21-7 (L4) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON, touch select 2-4 switch ON Touch select high-low switch OFF → ON 	10 to 14 → 1.5 or less
F21-26 (ADD) - F20-6 (GND)	<ul style="list-style-type: none"> Ignition switch ON A.D.D. LOCK 	10 to 14 → 1.5 or less

F20-11 (IND2) - F20-6 (GND)	<ul style="list-style-type: none">• Ignition switch ON• Touch select high-low switch ON	1.5 to 3.5
F20-19 (IND1) - F20-6 (GND)	<ul style="list-style-type: none">• Ignition switch ON• Touch select 2-4 switch ON	1.5 to 3.5
F21-24 (TL2) - F20-6 (GND)	<ul style="list-style-type: none">• Ignition switch ON• 2WD (touch select 2-4 switch OFF) → 4HI (touch select 2-4 switch ON)	10 to 14 → 0.88 or less
F20-21 (DL2) - F20-6 (GND)	<ul style="list-style-type: none">• Ignition switch ON• A.D.D. LOCK → FREE	10 to 14 → 0.5 or less
F20-6 (GND) - Body ground	Ignition switch OFF	Below 1

TROUBLESHOOTING

PR01F-05

PROBLEM SYMPTOMS TABLE

Use the table below to help find the cause of problems. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

2WD:

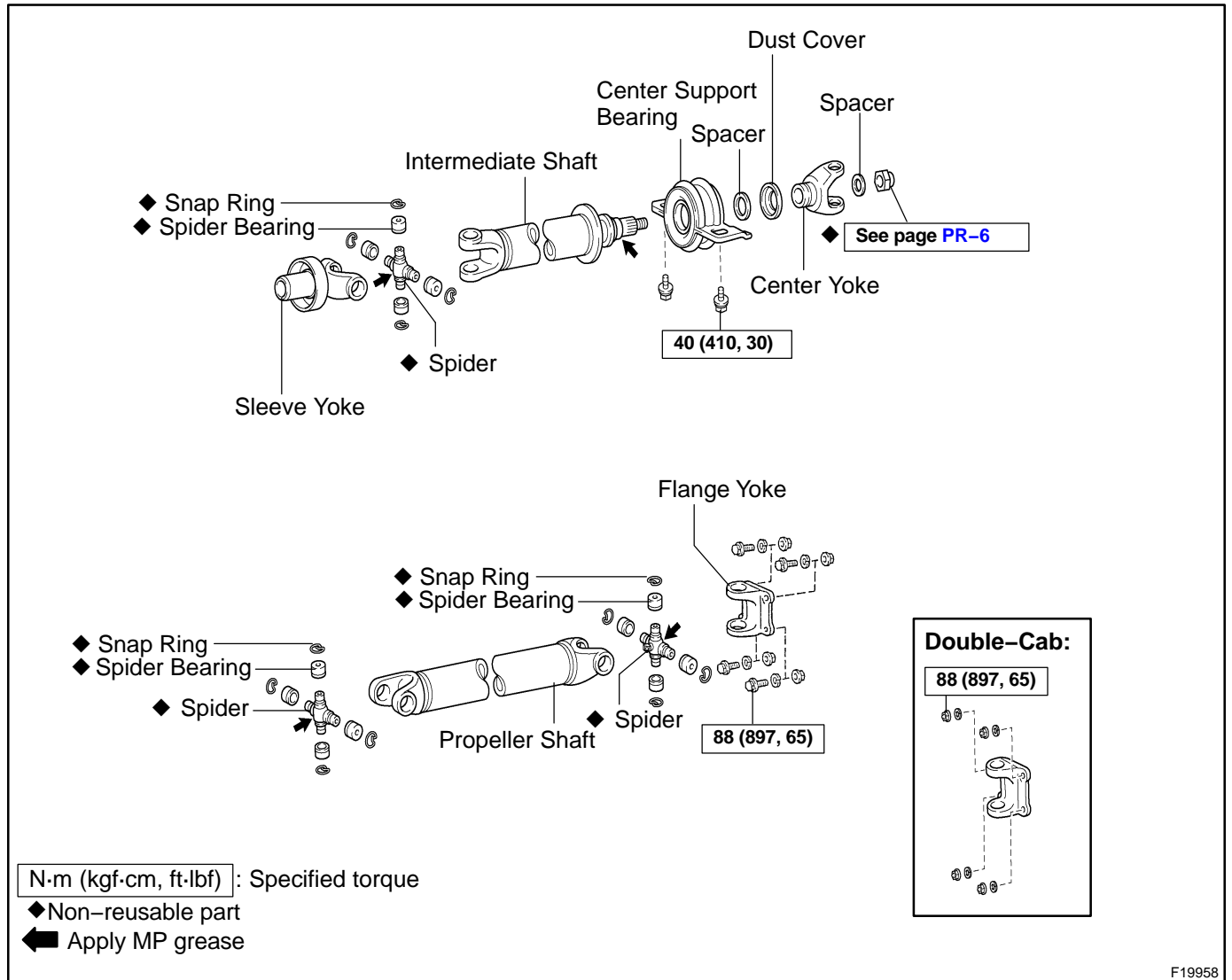
Symptom	Suspected Area	See page
Noise	<ol style="list-style-type: none"> 1. Center support bearing (Worn) 2. Sleeve yoke spline (Worn) 3. Spider bearing (Worn or stuck) 	PR-5 – PR-5
Vibration	<ol style="list-style-type: none"> 1. Transmission extension housing rear bushing (Runout) 2. Sleeve yoke spline (Stuck) 3. Propeller shaft (Runout) 4. Propeller shaft (Imbalance) 	– – PR-5 PR-5

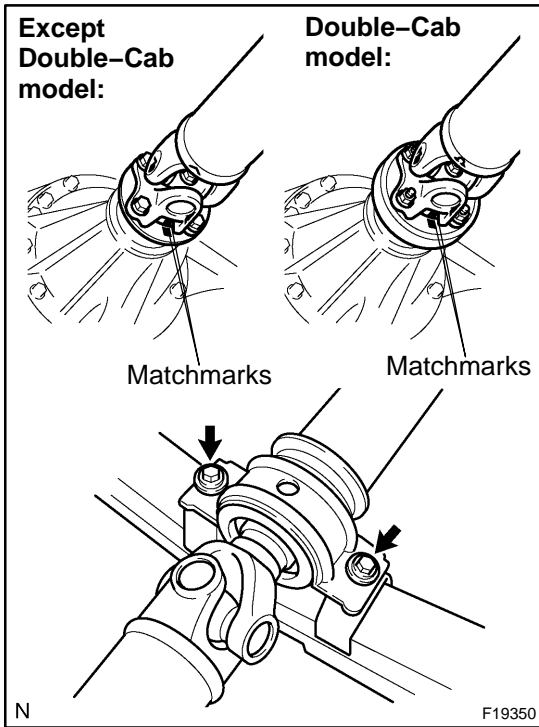
4WD:

Symptom	Suspected Area	See page
Noise	<ol style="list-style-type: none"> 1. Center support bearing (Worn) 2. Sleeve yoke spline (Worn) 3. Spider bearing (Worn or stuck) 	PR-12 – PR-12
Vibration	<ol style="list-style-type: none"> 1. Transmission extension housing rear bushing (Runout) 2. Sleeve yoke spline (Stuck) 3. Propeller shaft (Runout) 4. Propeller shaft (Imbalance) 	– – PR-12 PR-12

PROPELLER SHAFT ASSEMBLY (2WD) COMPONENTS

PR01G-07

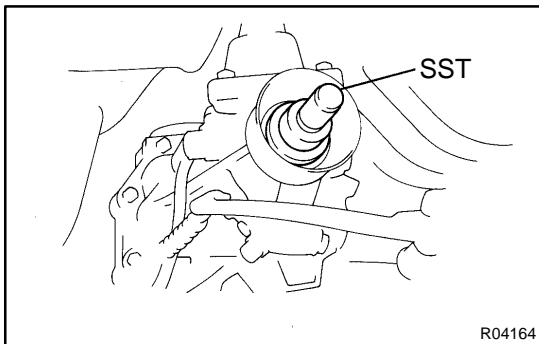




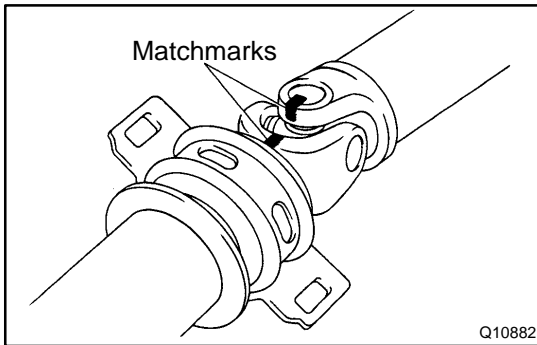
REMOVAL

REMOVE PROPELLER SHAFT

- Place matchmarks on the differential and propeller shaft flanges.
- Except Double-Cab model:
Remove the 4 bolts, washers and nuts.
- Double-Cab model:
Remove the 4 nuts and washers.
- Remove the 2 mounting bolts and center support bearing from the frame crossmember.
- Pull out the propeller shaft yoke from the transmission.



- Insert SST in the transmission to prevent oil leakage.
SST 09325-40010



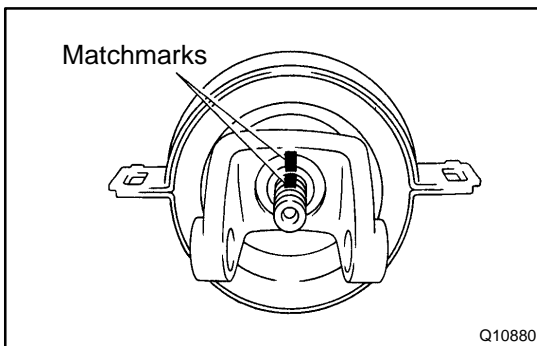
DISASSEMBLY

NOTICE:

Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

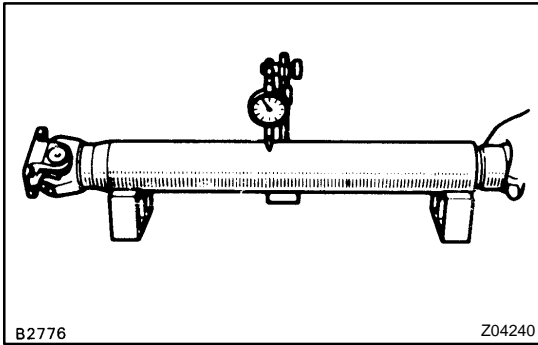
1. SEPARATE PROPELLER SHAFT AND INTERMEDIATE SHAFT

- (a) Place matchmarks on the yoke and propeller shaft.
- (b) Disassemble the center yoke
(See SPIDER BEARING REPLACEMENT on page [PR-17](#)).



2. REMOVE CENTER SUPPORT BEARING FROM INTERMEDIATE SHAFT

- (a) Using a hammer and chisel, loosen the staked part of the nut.
- (b) Clamp the yoke in a vise and remove the spacer and nut.
- (c) Place matchmarks on the yoke and shaft.
- (d) Using a brass bar and hammer, remove the center yoke, dust cover, spacer and center support bearing from the intermediate shaft.



INSPECTION

NOTICE:

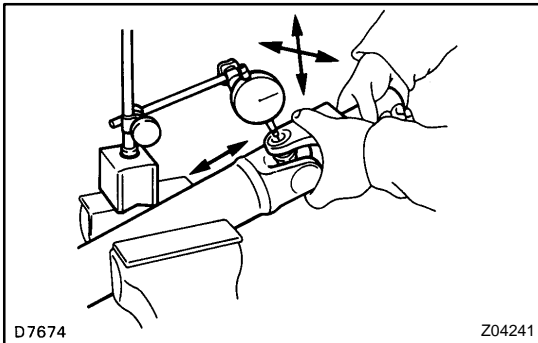
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

1. INSPECT PROPELLER SHAFT AND INTERMEDIATE SHAFT FOR DAMAGE OR RUNOUT

Using a dial indicator, check the runout of each shaft.

Maximum runout: 0.8 mm (0.031 in.)

If shaft runout is greater than the maximum, replace it.



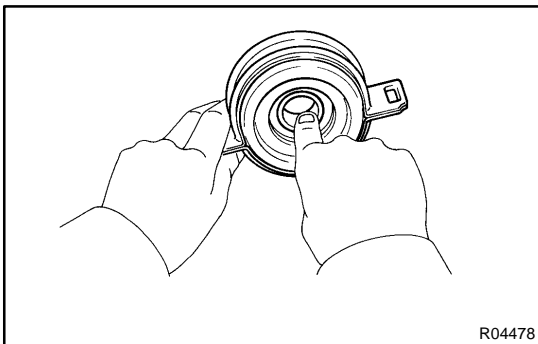
2. INSPECT SPIDER BEARING

(a) Inspect the spider bearing for wear or damage.

(b) Using a dial indicator, check the spider bearing axial play by turning the yoke of the flange while holding the shaft tightly.

Maximum bearing axial play: 0.05 mm (0.0020 in.)

If the spider bearing axial play exceeds the maximum, replace the spider bearing (See page [PR-17](#)).



3. INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE

Check that the bearing turns freely.

If the bearing is damaged, worn, or does not turn freely, replace it.

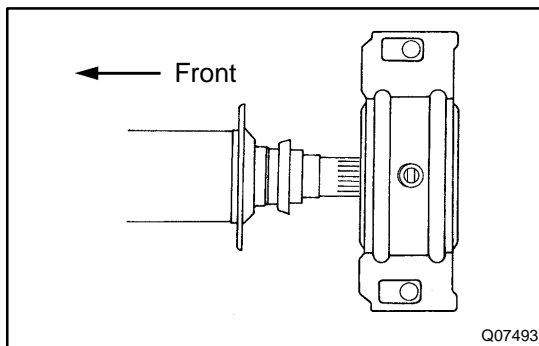
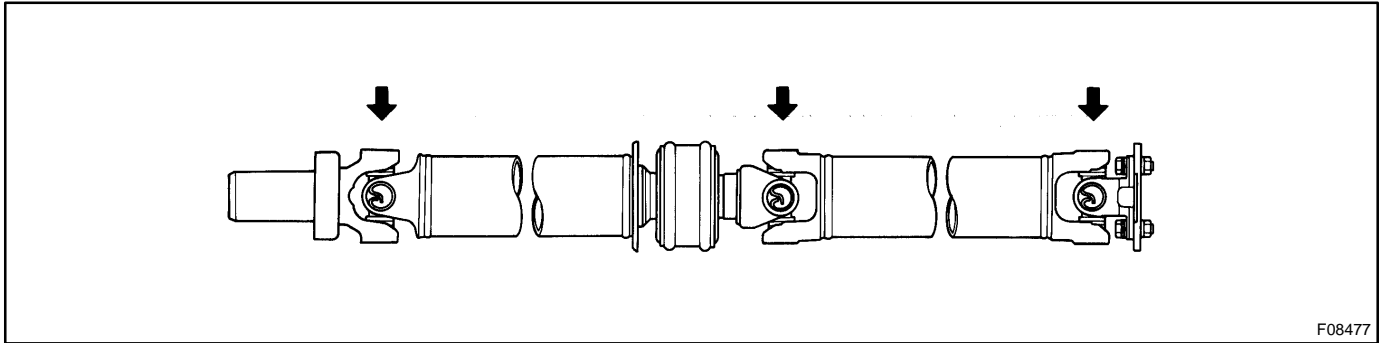
REASSEMBLY

NOTICE:

Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

HINT:

When removing or installing any part, make sure that each joint is facing the correct direction, as shown in the illustration below.



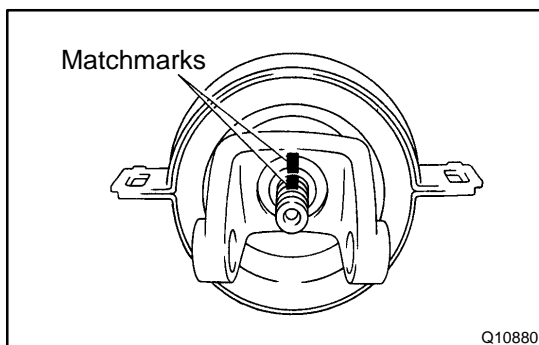
1. INSTALL CENTER SUPPORT BEARING ON INTERMEDIATE SHAFT

HINT:

Install the center support bearing in the direction shown.

2. INSTALL CENTER YOKE ON INTERMEDIATE SHAFT

- (a) Coat the splines of the intermediate shaft with MP grease.
- (b) Install the spacer and dust cover.



- (c) Place the center yoke on the shaft and align the matchmarks.

HINT:

If replacing either the center yoke or intermediate shaft, reassemble them so that the front side yoke of the intermediate shaft and the center yoke are facing the same direction.

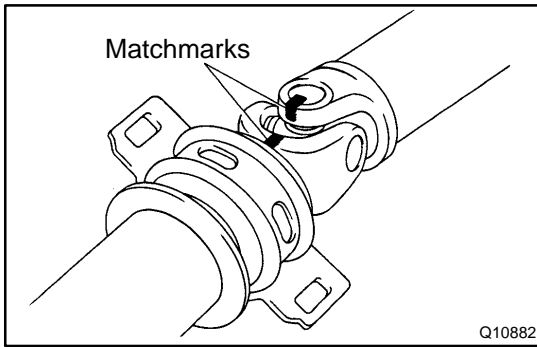
- (d) Install the spacer.
- (e) Clamp the yoke in a vise, and press in the bearing by tightening with a new nut.

Torque: 181 N·m (1,845 kgf·cm, 133 ft·lbf)

- (f) Loosen the nut.
- (g) Torque the nut again.

Torque: 82 N·m (835 kgf·cm, 60 ft·lbf)

- (h) Using a hammer and punch, stake the nut.



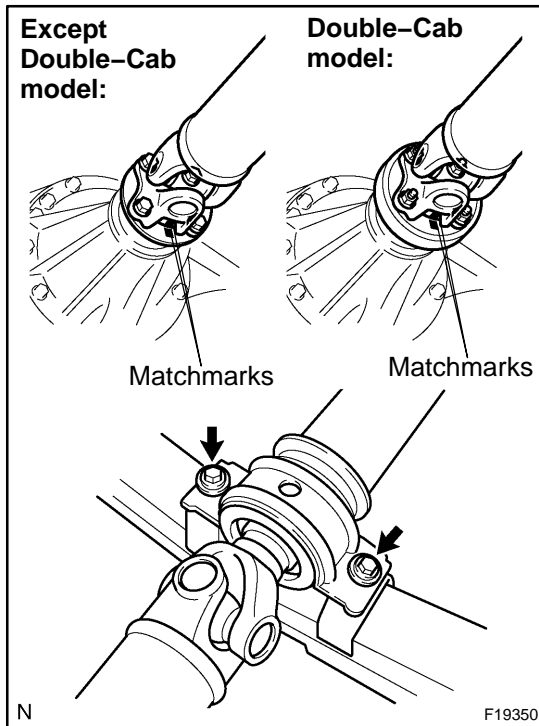
3. CONNECT PROPELLER SHAFT AND INTERMEDIATE SHAFT

Assemble the center yoke aligning matchmarks (See SPIDER BEARING REPLACEMENT on page [PR-17](#)).

INSTALLATION

1. INSTALL PROPELLER SHAFT

- (a) Remove SST from the transmission.
SST 09325-40010
- (b) Insert the yoke into the transmission.

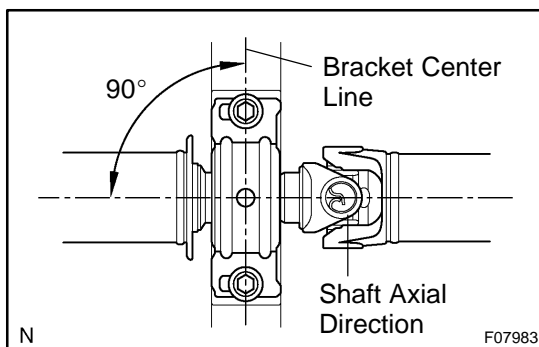


- (c) Temporarily install the center support bearing with the 2 mounting bolts.

HINT:

Make sure the bearing is installed with the drain hole facing downwards.

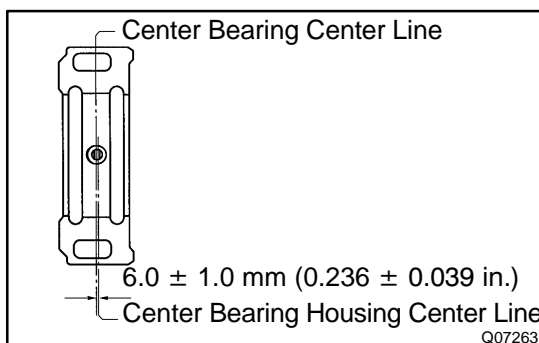
- (d) Except Double-Cab model:
Align the matchmarks on the flanges and connect the flanges with the 4 bolts, washers and nuts.
- (e) Torque the 4 bolts.
Torque: 88 N·m (897 kgf-cm, 65 ft-lbf)
- (f) Double-Cab model:
Align the matchmarks on the flanges and connect the flanges with the 4 washers and nuts.
- (g) Torque the 4 nuts.
Torque: 88 N·m (897 kgf-cm, 65 ft-lbf)



2. ADJUST CENTER SUPPORT BEARING

HINT:

- With the vehicle unloaded, adjust the center support bearing to keep the angles, as shown.
- Under the same conditions, check the center line in the axial direction. Adjust the bearing if necessary.



- The center bearing center line and center bearing housing center line must be adjusted to within 6.0 ± 1.0 mm (0.236 ± 0.039 in.) of each other in the vehicle's longitudinal direction with the vehicle unloaded.

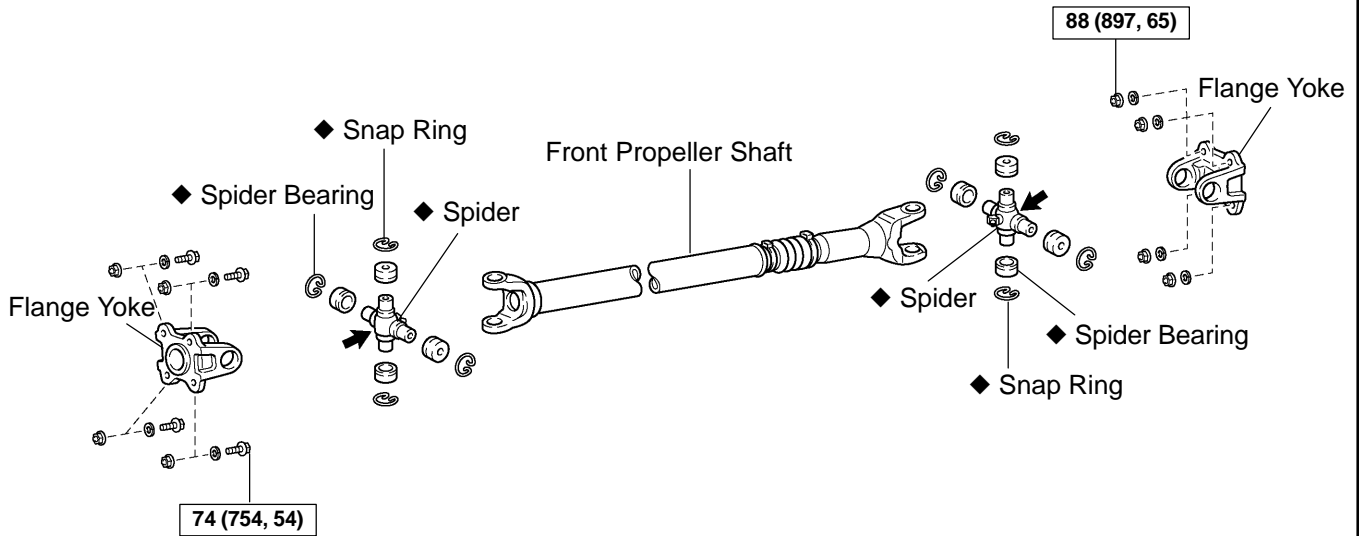
Torque the 2 bolts.

Torque: 40 N·m (410 kgf-cm, 30 ft-lbf)

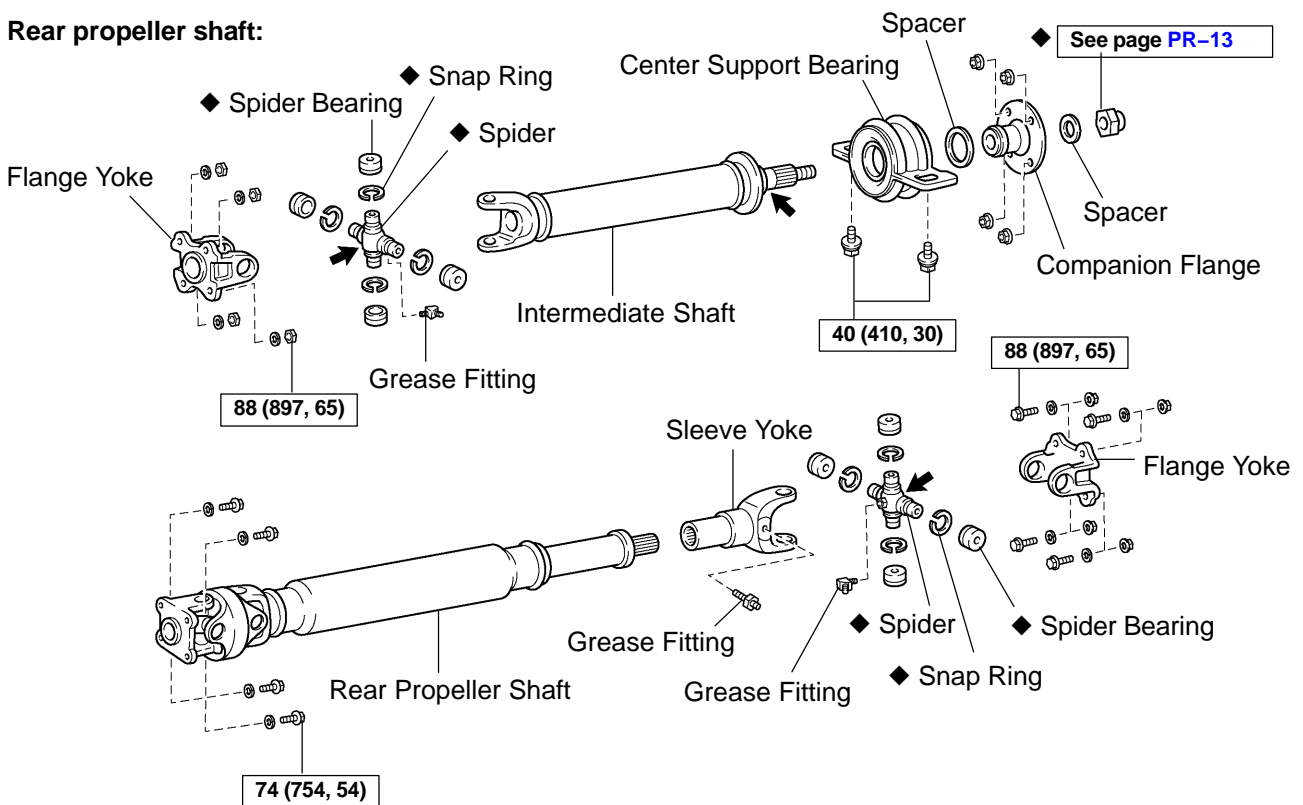
PROPELLER SHAFT ASSEMBLY (4WD) COMPONENTS

PR01M-06

Front propeller shaft:



Rear propeller shaft:

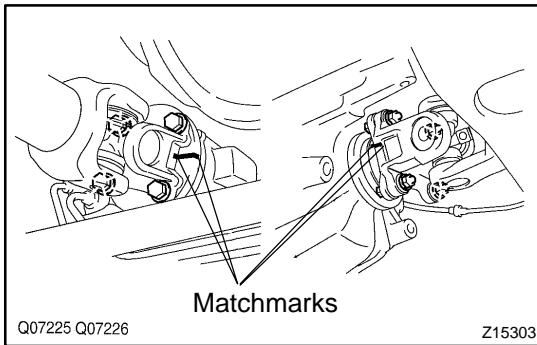


N-m (kgf-cm, ft-lbf) : Specified torque

- ◆ Non-reusable part
- ➡ Apply MP grease

N

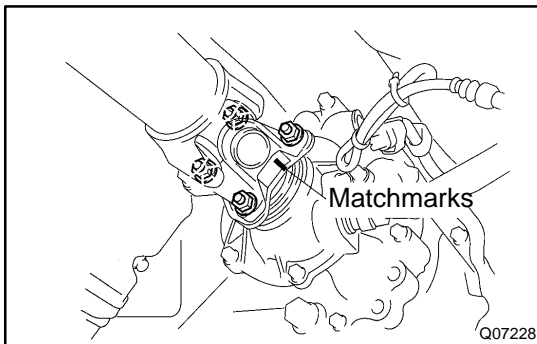
F19352



REMOVAL

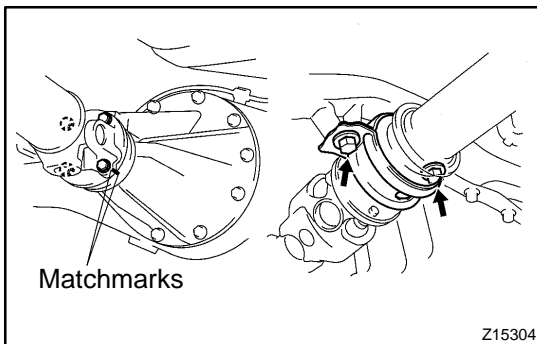
1. REMOVE FRONT PROPELLER SHAFT

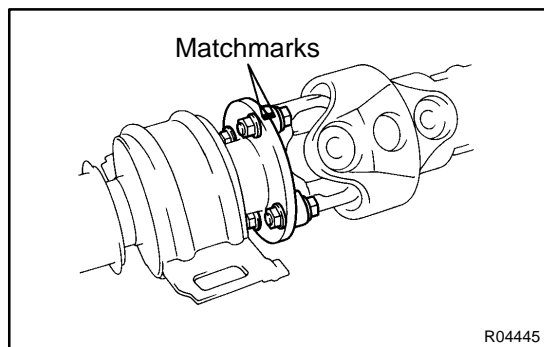
- (a) Place matchmarks on the differential and propeller shaft flange.
- (b) Remove the 4 bolts, washers and nuts, and disconnect the propeller shaft from the differential.
- (c) Use a rope to suspend the front edge of the propeller shaft.
- (d) Place matchmarks on the transfer and propeller shaft flanges.
- (e) Remove the 4 nuts and washers.
- (f) Remove the propeller shaft from the transfer flange.



2. REMOVE REAR PROPELLER SHAFT

- (a) Place matchmarks on the transfer and propeller shaft flanges.
- (b) Remove the 4 nuts and washers, and disconnect the propeller shaft from the transfer flange.
- (c) Use a rope to suspend the front edge of the propeller shaft.
- (d) Remove the 2 mounting bolts and center support bearing.
- (e) Place matchmarks on the differential and propeller shaft flanges.
- (f) Remove the 4 bolts, washers and nuts.
- (g) Remove the propeller shaft from the differential.





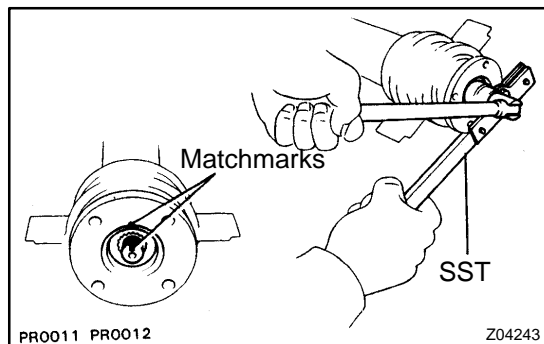
DISASSEMBLY

NOTICE:

Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

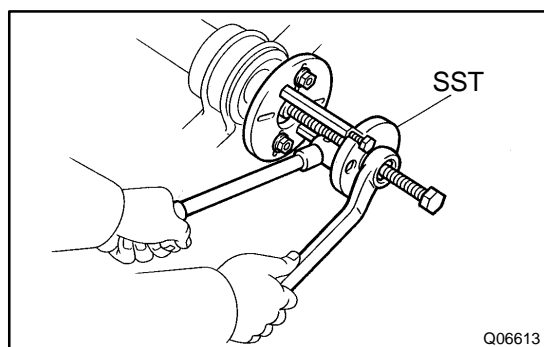
1. Rear propeller shaft: SEPARATE PROPELLER SHAFT AND INTERMEDIATE SHAFT

- (a) Place matchmarks on the flanges.
- (b) Remove the 4 nuts, bolts and washers.

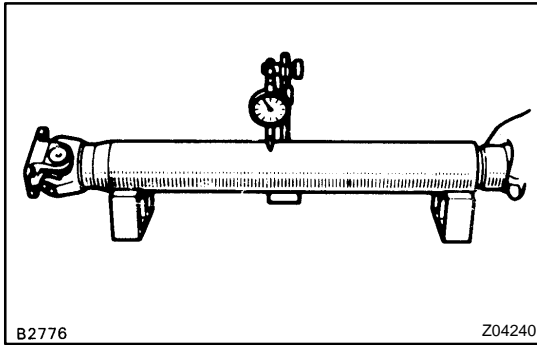


2. Rear propeller shaft: REMOVE CENTER SUPPORT BEARING FROM INTERMEDIATE SHAFT

- (a) Using a hammer and chisel, loosen the staked part of the nut.
- (b) Using SST to hold the flange, remove the nut and spacer. SST 09330-00021
- (c) Place matchmarks on the flange and shaft.



- (d) Using SST, remove the flange from the intermediate shaft. SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)
- (e) Remove the spacer and center support bearing from the intermediate shaft.



INSPECTION

NOTICE:

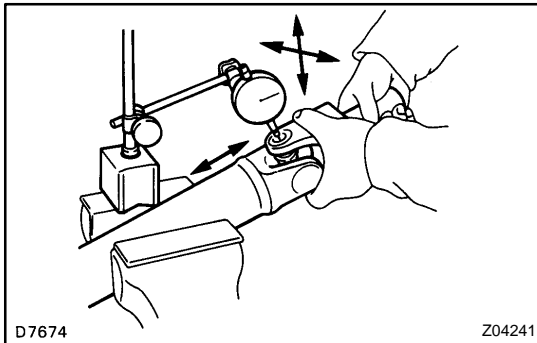
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

1. INSPECT PROPELLER SHAFT AND INTERMEDIATE SHAFT FOR DAMAGE OR RUNOUT

Using a dial indicator, check the runout of each shaft.

Maximum runout: 0.8 mm (0.031 in.)

If shaft runout is greater than the maximum, replace it.



2. INSPECT SPIDER BEARING

(a) Inspect the spider bearing for wear or damage.

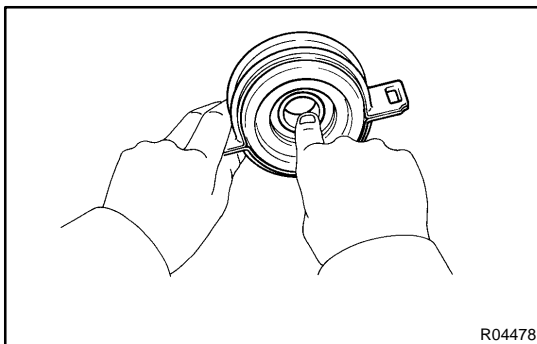
(b) Using a dial indicator, check the spider bearing axial play by turning the yoke of the flange while holding the shaft tightly.

Maximum bearing axial play:

Front propeller shaft: 0.05 mm (0.0020 in.)

Rear propeller shaft: 0 mm (0 in.)

If the spider bearing axial play exceeds the maximum, replace it (See page [PR-17](#)).

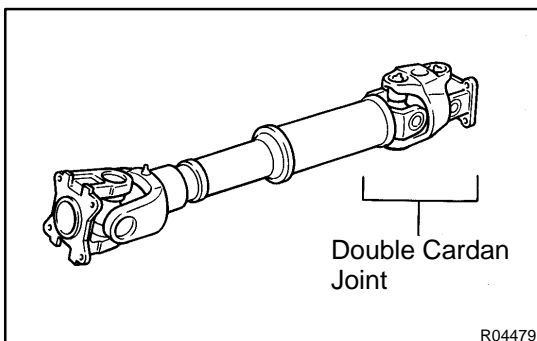


3. Rear propeller shaft:

INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE

Check that the bearing turns freely.

If the bearing is damaged, worn, or does not turn freely, replace it.



4. Rear propeller shaft:

INSPECT DOUBLE CARDAN JOINT PROPELLER SHAFT

(a) Inspect the shaft for wear or damage.

(b) Inspect the double cardan joint for wear or damage.

If any problem is found, replace the propeller shaft assembly.

HINT:

A double cardan joint is used on the rear propeller shaft.

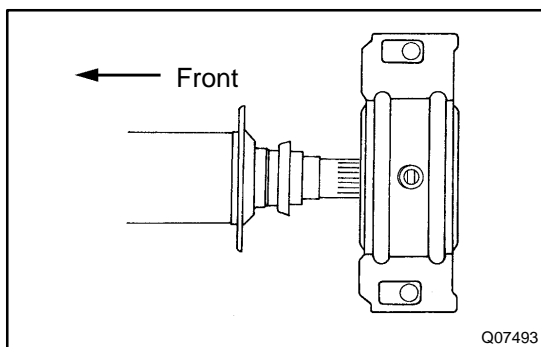
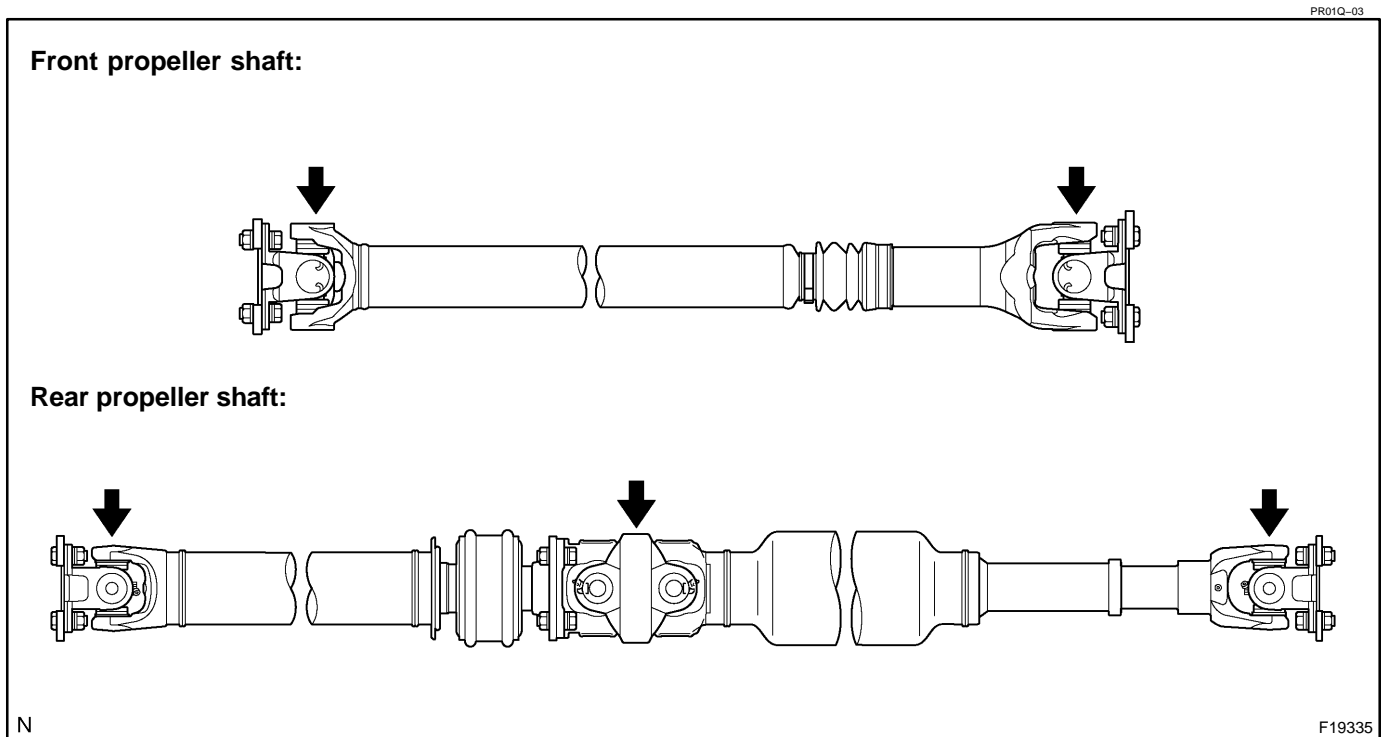
REASSEMBLY

NOTICE:

Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

HINT:

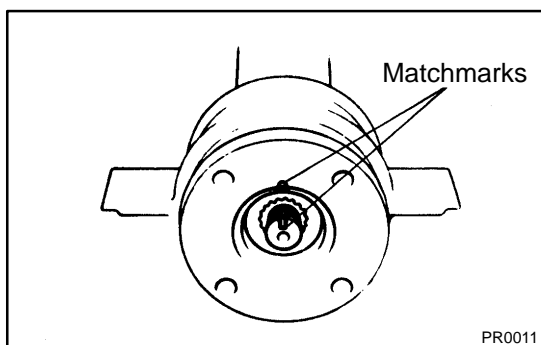
When removing or installing any part, make sure that each joint is facing the correct direction, as shown in the illustration below.



1. **Rear propeller shaft:**
INSTALL CENTER SUPPORT BEARING ON INTER-MEDIATE SHAFT

HINT:

Install the center support bearing in the direction shown.

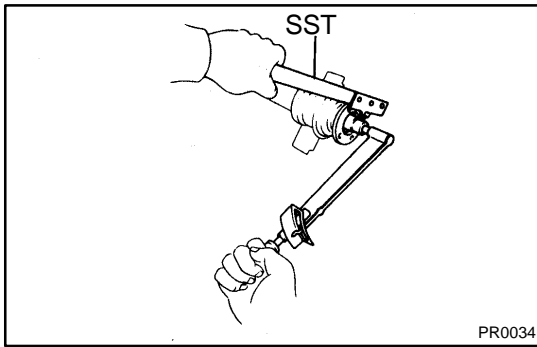


2. **Rear propeller shaft:**
INSTALL FLANGE ON INTERMEDIATE SHAFT

- (a) Coat the splines of the intermediate shaft with MP grease.
- (b) Install the spacer.
- (c) Place the flange on the shaft and align the matchmarks.

HINT:

If replacing either the center flange or intermediate shaft, reassemble it so that the front side flange yoke of the intermediate shaft and the rear side flange yoke of the propeller shaft are facing in the same direction.



- (d) Install the spacer.
- (e) Using SST to hold the flange, press in the bearing by tightening with a new nut.
SST 09330-00021
Torque: 181 N·m (1,845 kgf-cm, 133 ft-lbf)
- (f) Loosen the nut.
- (g) Torque the nut again.
Torque: 82 N·m (835 kgf-cm, 60 ft-lbf)
- (h) Using a hammer and punch, stake the nut.

3. Rear propeller shaft:

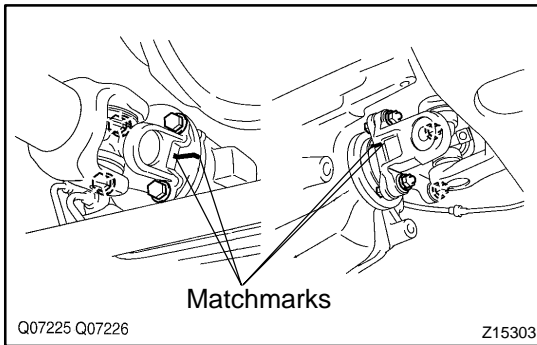
INSTALL PROPELLER SHAFT

- (a) Align the matchmarks on the flanges and connect the flanges with the 4 bolts, washers and nuts.

HINT:

If replacing either the center flange or intermediate shaft, reassembly it so that the front side flange yoke of the intermediate shaft and the rear side flange yoke of the propeller shaft are facing in the same direction.

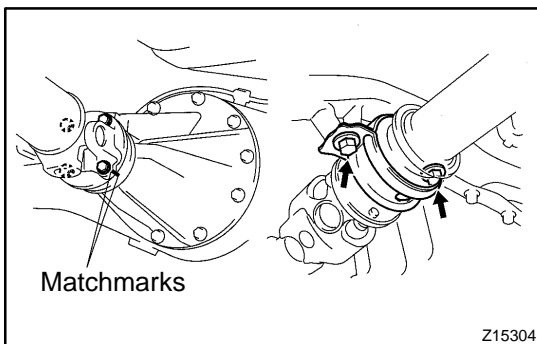
- (b) Torque the bolts.
Torque: 74 N·m (754 kgf-cm, 54 ft-lbf)



INSTALLATION

1. INSTALL FRONT PROPELLER SHAFT

- (a) Align the matchmarks on the propeller shaft and differential flanges, and connect the flanges with the 4 bolts, nuts and washers.
- (b) Torque the 4 bolts.
Torque: 74 N·m (754 kgf-cm, 54 ft-lbf)
- (c) Align the matchmarks on the propeller shaft and transfer flanges, and connect the flanges with the 4 nuts and washers.
- (d) Torque the 4 nuts.
Torque: 88 N·m (897 kgf-cm, 65 ft-lbf)

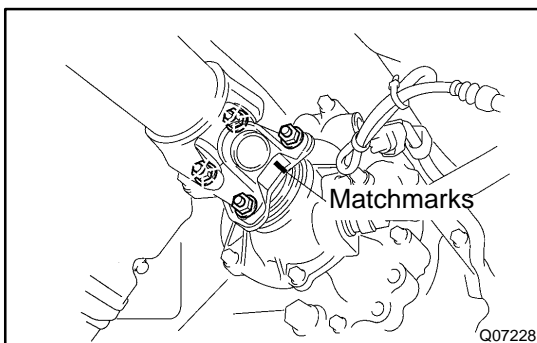


2. INSTALL REAR PROPELLER SHAFT

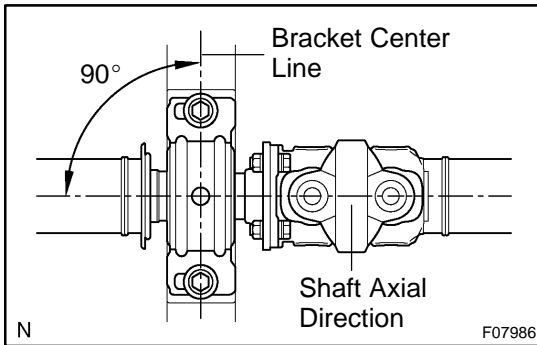
- (a) Align the matchmarks on the propeller shaft and differential flanges, and connect the flanges with the 4 bolts, washers and nuts.
- (b) Torque the 4 bolts.
Torque: 88 N·m (897 kgf-cm, 65 ft-lbf)
- (c) Temporarily install the center support bearing with the 2 mounting bolts.

HINT:

Make sure the bearing is installed with the drain hole facing downwards.



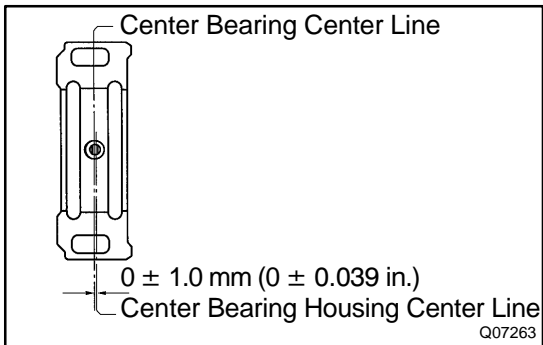
- (d) Align the matchmarks on the propeller shaft and transfer flanges, and connect the flanges with the 4 nuts and washers.
- (e) Torque the 4 nuts.
Torque: 88 N·m (897 kgf-cm, 65 ft-lbf)



3. ADJUST CENTER SUPPORT BEARING

HINT:

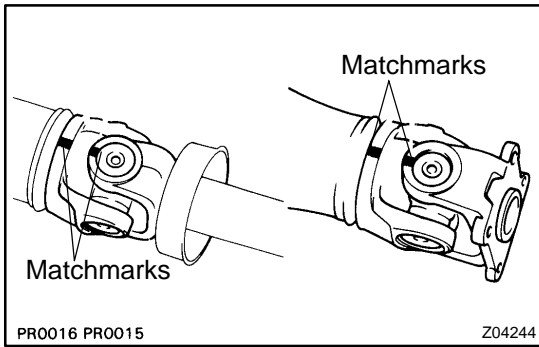
- With the vehicle unloaded, adjust the center support bearing to keep the angles, as shown.
- Under the same conditions, check the center line in the axial direction. Adjust the bearing if necessary.



- The center bearing center line and center bearing housing center line must be adjusted to within 0 ± 1.0 mm of each other in the vehicle's longitudinal direction with the vehicle unloaded.

Torque the 2 bolts.

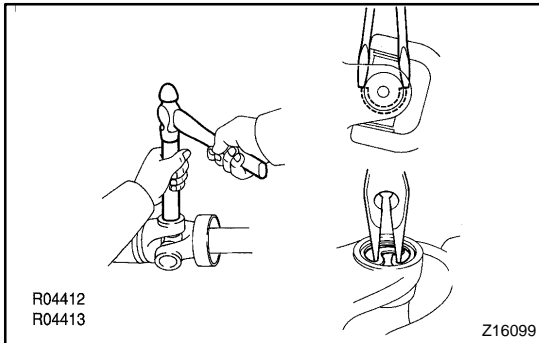
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)



SPIDER BEARING REPLACEMENT

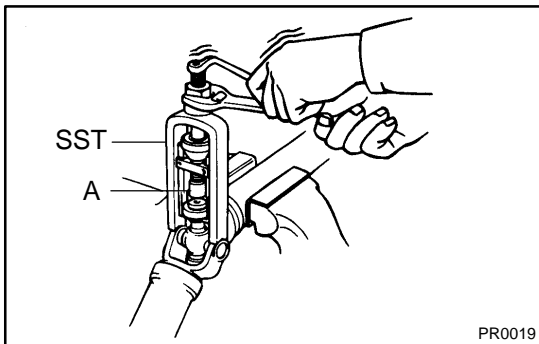
PR08F-01

1. PLACE MATCHMARKS ON SHAFT AND YOKE



2. REMOVE SNAP RING

- (a) Using a brass bar and hammer, slightly tap in the bearing outer race.
- (b) 4WD rear propeller shaft:
Using 2 screwdrivers, remove the 4 snap rings from the grooves.
- (c) 2WD and 4WD front propeller shaft:
Using needle nose pliers, remove the 4 snap rings from the grooves.



3. REMOVE SPIDER BEARING

- (a) Using SST, push out the bearing from the flange yoke.
SST 09332-25010

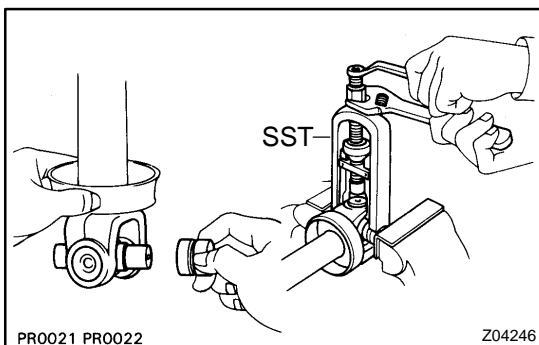
HINT:

Sufficiently raise the part indicated by "A" so that it does not come into contact with the bearing.

- (b) Clamp the bearing outer race in a vise and tap off the flange with a hammer.

HINT:

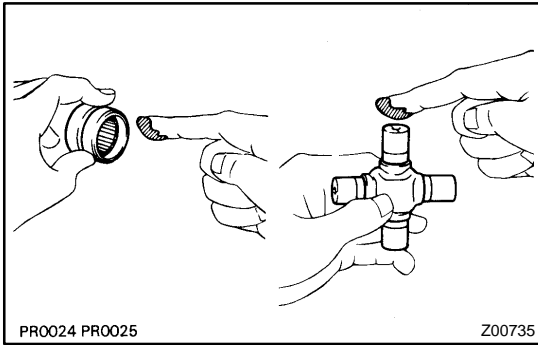
Remove the bearing on the opposite side using the same procedure.



- (c) Install the 2 removed bearing outer races to the spider, and clamp them in a vise.
- (d) Using SST, push out the bearing from the sleeve yoke.
SST 09332-25010
- (e) Clamp the outer bearing race in a vise and tap off the yoke with a hammer.

HINT:

Remove the bearing on the opposite side using the same procedure.



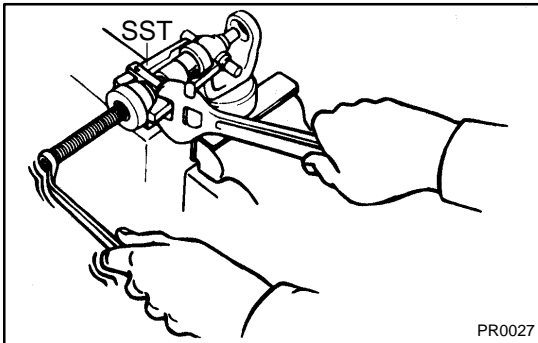
4. INSTALL SPIDER BEARING

- (a) Apply MP grease to a new spider and bearings.

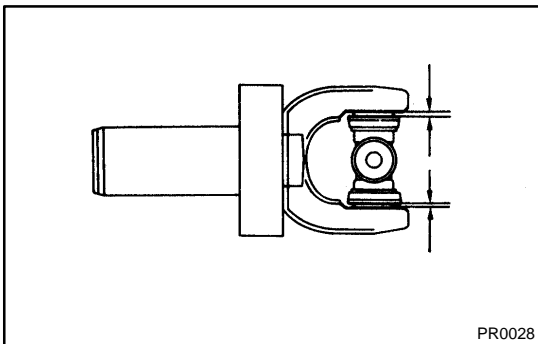
HINT:

Be careful not to apply too much grease.

- (b) Align the matchmarks on the yoke and shaft.
 (c) Fit the spider to the yoke.

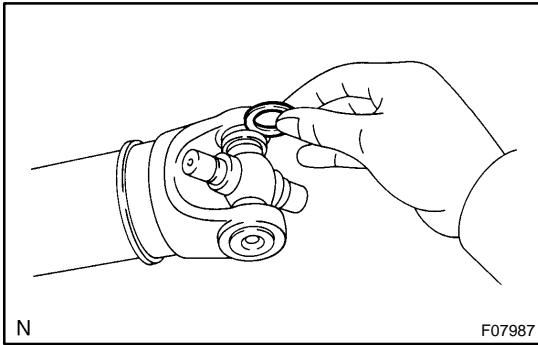


- (d) Using SST, install the bearing to the spider.
 SST 09332-25010



- (e) Using SST, adjust both bearings so that the snap ring grooves are at maximum and are equal in width.

PROPELLER SHAFT - SPIDER BEARING

**5. INSTALL SNAP RINGS**

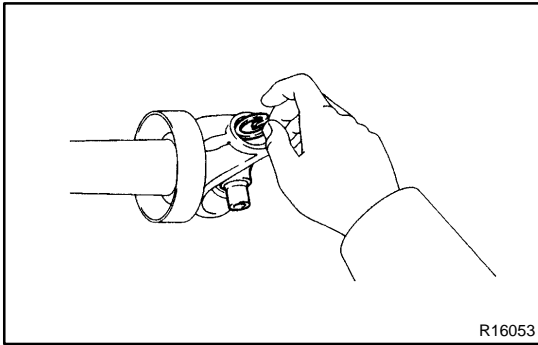
- (a) Install 2 new snap rings of equal thickness which will allow for 0 to 0.05 mm (0 to 0.0020 in.) axial play.

HINT:

Do not reuse the snap rings.

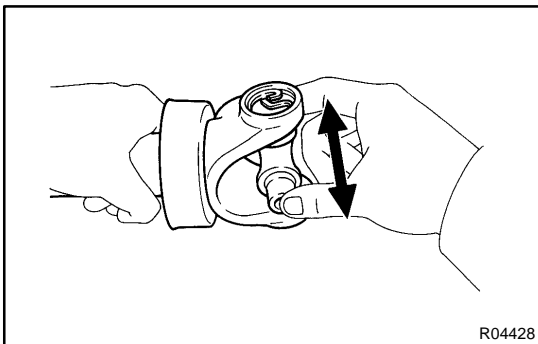
4WD rear propeller shaft:

Color	Mark	Thickness mm (in.)
-	九	2.44 to 2.46 (0.0961 to 0.0969)
-	10	2.46 to 2.48 (0.0969 to 0.0976)
-	1	2.28 to 2.30 (0.0898 to 0.0906)
-	2	2.30 to 2.32 (0.0906 to 0.0913)
-	None	2.32 to 2.34 (0.0913 to 0.0921)
Brown	-	2.34 to 2.36 (0.0921 to 0.0929)
Blue	-	2.36 to 2.38 (0.0929 to 0.0937)
-	6	2.38 to 2.40 (0.0937 to 0.0945)
-	7	2.40 to 2.42 (0.0945 to 0.0953)
-	8	2.42 to 2.44 (0.0953 to 0.0961)
-	J	2.18 to 2.20 (0.0858 to 0.0866)
-	K	2.20 to 2.22 (0.0866 to 0.0874)
-	F	2.22 to 2.24 (0.0874 to 0.0882)
-	G	2.24 to 2.26 (0.0882 to 0.0890)
-	H	2.26 to 2.28 (0.0890 to 0.0898)
-	A	2.48 to 2.50 (0.0976 to 0.0984)
-	B	2.50 to 2.52 (0.0984 to 0.0992)
-	C	2.52 to 2.54 (0.0992 to 0.1000)
-	D	2.54 to 2.56 (0.1000 to 0.1008)
-	E	2.56 to 2.58 (0.1008 to 0.1016)

**2WD and 4WD front propeller shaft:**

Color	Thickness mm (in.)
Blue	1.638 (0.0645)
Yellow	1.588 (0.0625)
Silver	1.537 (0.0605)
Copper	1.511 (0.0595)
Black	1.486 (0.0585)
Red	1.435 (0.0565)
Green	1.384 (0.0545)

- (b) Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring.

**6. CHECK SPIDER BEARING**

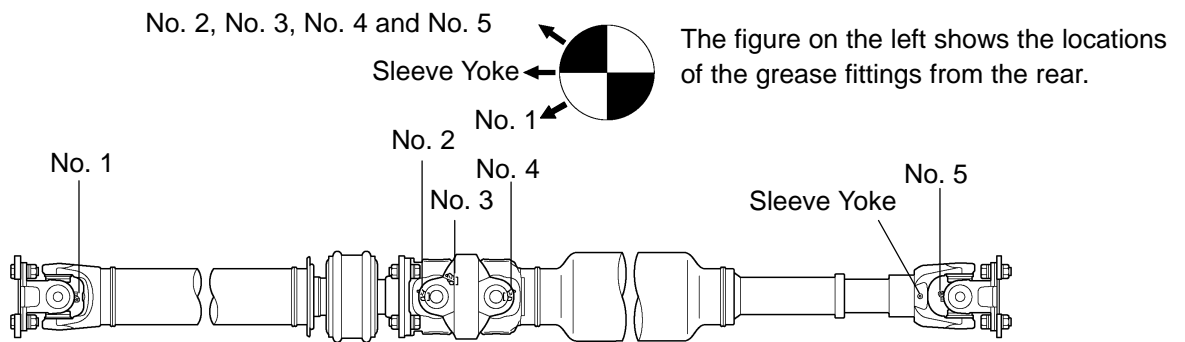
- (a) Check that the spider bearing moves smoothly.
 (b) Check the spider bearing axial play.

Maximum bearing axial play:**4WD rear propeller shaft: 0 mm (0 in.)****2WD and 4WD front propeller shaft:****0.05 mm (0.0020 in.)****HINT:**

- Install new spider bearings on the flange side using the procedure described above.

- When replacing the rear propeller shaft spider on 4WD vehicles, be sure that the grease fitting assembly holes are facing in the direction shown in the illustration below.

SPIDER GREASE FITTING ASSEMBLY DIRECTION FOR 4WD REAR PROPELLER SHAFT



TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

SA090-11

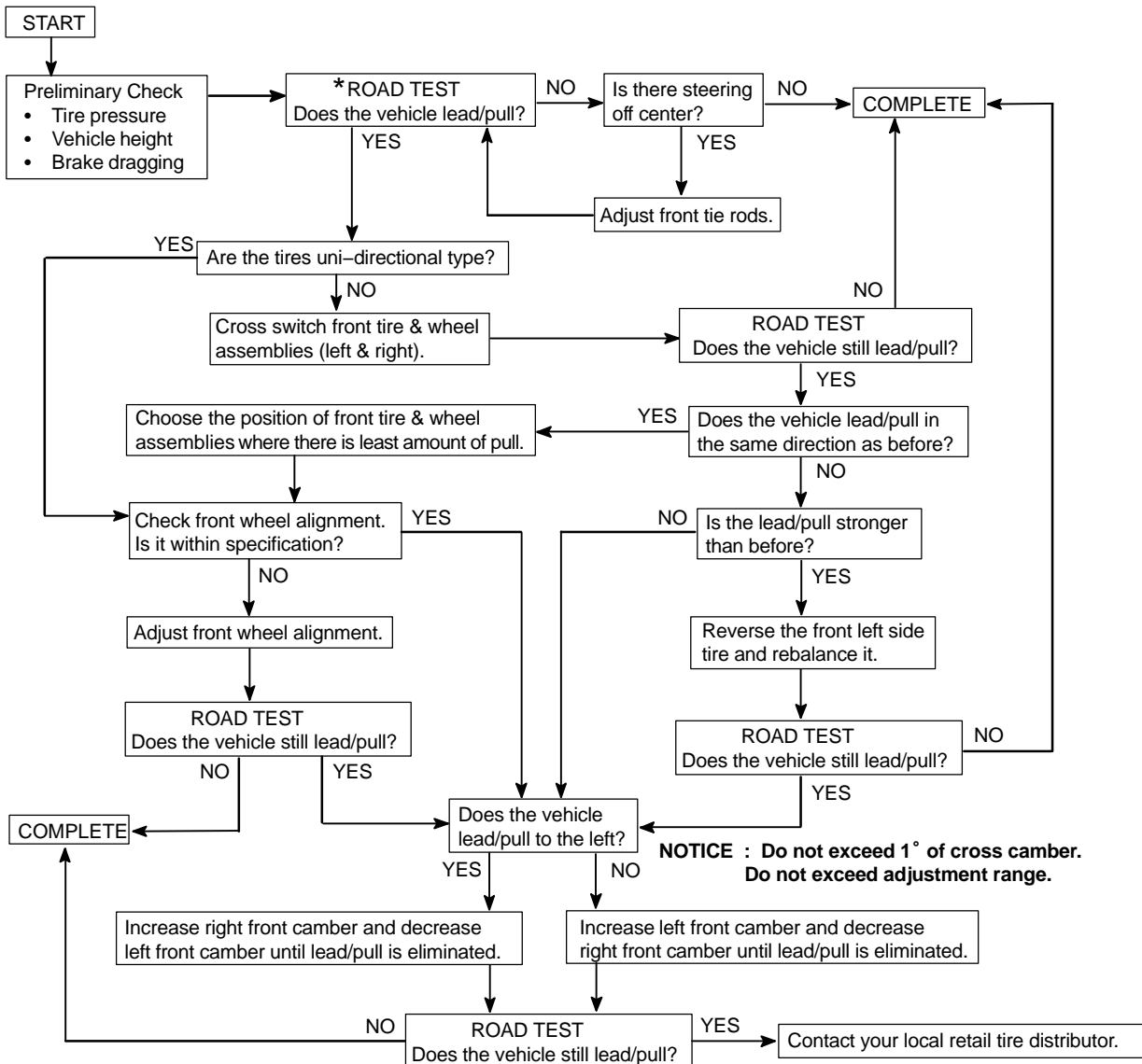
Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
Bottoming	<ol style="list-style-type: none"> 1. Vehicle (Overloaded) 2. Spring (Weak) 3. Shock absorber (Worn) 	<p>–</p> <p>SA-62</p> <p>SA-154</p> <p>SA-65</p> <p>SA-150</p>
Sways/pitches	<ol style="list-style-type: none"> 1. Tire (Worn or improperly inflated) 2. Stabilizer bar (Bent or broken) 3. Shock absorber (Worn) 	<p>SA-3</p> <p>SA-88</p> <p>SA-65</p> <p>SA-150</p>
Front wheel shimmy	<ol style="list-style-type: none"> 1. Tire (Worn or improperly inflated) 2. Wheel (Out of balance) 3. Shock absorber (Worn) 4. Wheel alignment (Incorrect) 5. Ball joints (Worn) 6. Hub bearing (Loose or worn) 7. Steering linkage (Loose or worn) 8. Steering gear (Out of adjustment or broken) 	<p>SA-3</p> <p>SA-3</p> <p>SA-65</p> <p>SA-5</p> <p>SA-81</p> <p>SA-83</p> <p>SA-86</p> <p>–</p> <p>–</p> <p>SR-70</p>
Abnormal tire wear	<ol style="list-style-type: none"> 1. Tire (Improperly inflated) 2. Wheel alignment (Incorrect) 3. Shock absorber (Worn) 4. Suspension parts (Worn) 	<p>SA-3</p> <p>SA-5</p> <p>SA-65</p> <p>SA-150</p> <p>–</p>
Noise in front differential	<ol style="list-style-type: none"> 1. Oil level (Low or wrong grade) 2. Excessive backlash between pinion and ring gear 3. Ring, pinion or side gear (Worn or chipped) 4. Pinion shaft bearing (Worn) 5. Side bearing (Worn) 6. Differential bearing (Loose or worn) 	<p>SA-36</p> <p>SA-38</p> <p>SA-38</p> <p>SA-38</p> <p>SA-38</p> <p>SA-38</p>
Oil leak from front differential	<ol style="list-style-type: none"> 1. Oil level (Too high or wrong grade) 2. Front differential rear oil seal (Worn or damaged) 3. Side gear oil seal (Worn or damaged) 4. Companion flange (Loose or damaged) 5. Side gear shaft (Damaged) 	<p>SA-36</p> <p>SA-36</p> <p>SA-38</p> <p>SA-38</p> <p>SA-38</p>
Noise in rear axle	<ol style="list-style-type: none"> 1. Oil level (Low or wrong grade) 2. Excessive backlash between pinion and ring gear 3. Ring, pinion or side gear (Worn or chipped) 4. Pinion shaft bearing (Worn) 5. Axle shaft bearing (Worn) 6. Differential bearing (Loose or worn) 	<p>SA-101</p> <p>SA-104</p> <p>SA-104</p> <p>SA-104</p> <p>SA-92</p> <p>SA-104</p>
Oil leak from rear axle	<ol style="list-style-type: none"> 1. Oil seal (Worn or damaged) 2. Rear axle housing (Cracked) 	<p>SA-92</p> <p>–</p>
Oil leak from rear differential	<ol style="list-style-type: none"> 1. Oil level (Too high or wrong grade) 2. Oil seal (Worn or damaged) 3. Companion flange (Loose or damaged) 	<p>SA-101</p> <p>SA-101</p> <p>SA-104</p>

REPAIR PROCEDURES

HINT:

This is a flow chart for vehicle pull.



* Select a flat road where the vehicle can be driven in a straight line for 100 meters at a constant speed of 35mph. Please confirm safety and set the steering wheel to its straight position. Drive the vehicle in a straight line for 100 meters at a constant speed of 35mph without holding the steering wheel.

- (1) The vehicle can keep straight but the steering wheel has some angle.
 - STEERING OFF CENTER (See page [SR-10](#))
- (2) The vehicle cannot keep straight.
 - STEERING PULL

TIRE AND WHEEL INSPECTION

SA1KL-05

1. INSPECT TIRE

(a) Check the tires for wear and proper inflation pressure.

B, C-cab Type

Cold tire inflation pressure:

Tire size	Front kPa (kgf/cm ² , psi)	Rear kPa (kgf/cm ² , psi)
P245/70R16	200 (2.0, 29)	240 (2.4, 35)
P265/70R16	180 (1.8, 26) *1 200 (2.0, 29) *2	200 (2.0, 29) *1 210 (2.1, 30) *2
P265/65R17	200 (2.0, 29)	220 (2.2, 32)

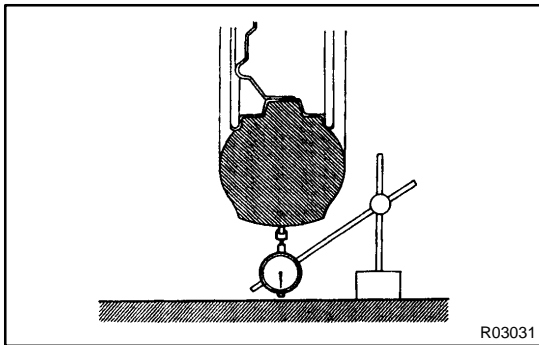
D-cab Type

Cold tire inflation pressure:

Tire size	Front kPa (kgf/cm ² , psi)	Rear kPa (kgf/cm ² , psi)
P245/70R16	220 (2.2, 32)	240 (2.4, 35)
P265/70R16 *1	200 (2.0, 29) *1 220 (2.2, 32) *2	220 (2.2, 32) *1 230 (2.3, 33) *2
P265/65R17	200 (2.0, 29)	220 (2.2, 32)

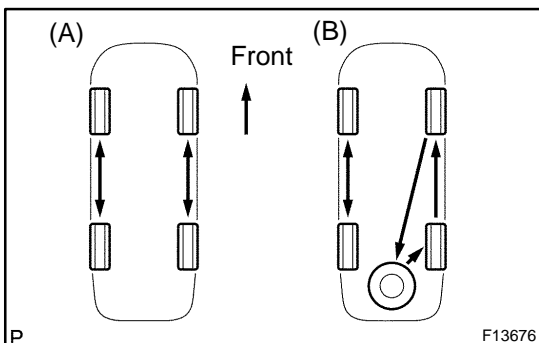
*1: Vehicle without off-road package

*2: Vehicle with off-road package



(b) Using a dial indicator, check the tire runout.

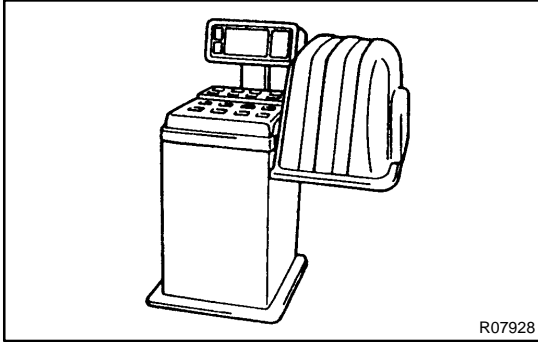
Tire runout: 3.0 mm (0.118 in.) or less



2. ROTATING TIRE

HINT:

- Rotate tires as shown in the illustration.
- Rotate as shown in (B) if the spare tire is included in the rotation.

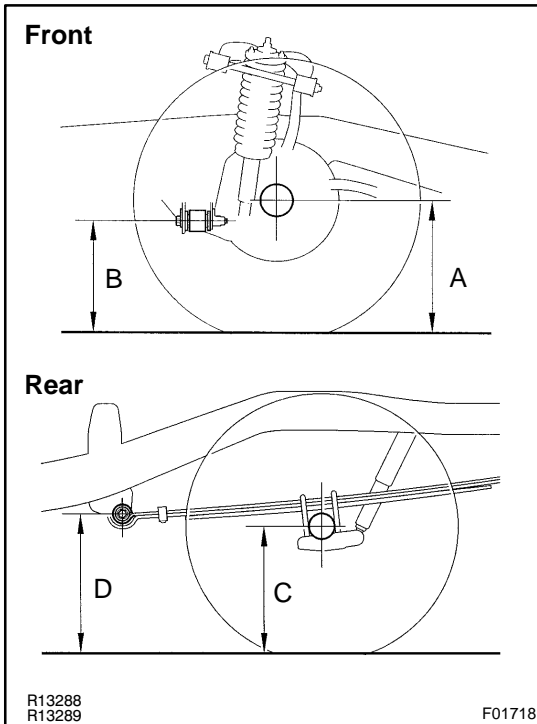
**3. INSPECT WHEEL BALANCE**

- (a) Check and adjust the Off-the-car balance.
- (b) If necessary, check and adjust the On-the-car balance.

Imbalance after adjustment: 14.0 g (0.031 lb) or less

4. CHECK FRONT SUSPENSION FOR LOOSENESS**5. CHECK STEERING LINKAGE FOR LOOSENESS****6. CHECK BALL JOINT FOR LOOSENESS****7. CHECK SHOCK ABSORBER WORKS PROPERLY**

- Check if oil leaks.
- Check the mounting bushings for wear.
- Bounce front and rear of the vehicle.



FRONT WHEEL ALIGNMENT INSPECTION

SA1FZ-06

1. MEASURE VEHICLE HEIGHT (See page SS-59)

Measuring points:

- A: Ground clearance of the front drive shaft center
- B: Ground clearance of the front adjusting cam bolt center
- C: Ground clearance of the rear axle shaft center
- D: Ground clearance of the leaf spring front side bushing center

Vehicle height:

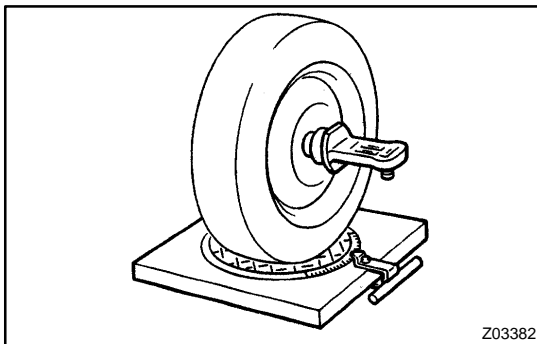
Front: A - B

Rear: C - D

NOTICE:

Before inspecting the wheel alignment, adjust the vehicle height to the specified value.

If the vehicle height is not the specified value, try to adjust it by pushing down on or lifting the body.



2. INSTALL CAMBER-CASTER-KINGPIN GAUGE OR POSITION VEHICLE ON WHEEL ALIGNMENT TESTER

Follow the specific instructions of the equipment manufacturer.

3. INSPECT CAMBER, CASTER AND STEERING AXIS INCLINATION (See page SS-59)

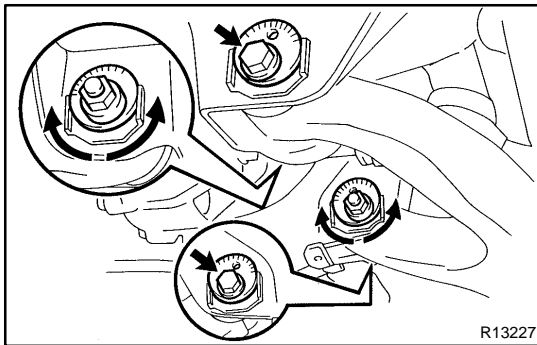
If the steering axis inclination is not within the specified value, after the camber and caster have been correctly adjusted, recheck the steering knuckle and front wheel for bearing or looseness.

4. ADJUST CAMBER AND CASTER

- (a) Loosen the front and/or rear adjusting cam set bolts.
- (b) Adjust the camber and caster by front and/or rear adjusting cams (See adjustment chart).

HINT:

Try to adjust the camber and caster to the center of the specified values.



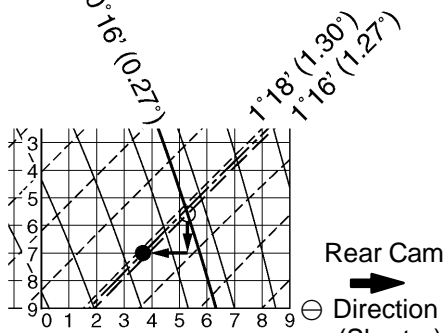
Example

- = Standard value point
- = Measured value point

——— Camber
 - - - - - Caster

Front Cam

⊖ Direction
 (Shorter)



Rear Cam

⊖ Direction
 (Shorter)

N

F17149

- (c) How to read adjustment chart (Example).
- (1) Find the applicable wheel alignment standard value for the particular model.
 - (2) Mark the selected standard value on the adjustment chart.

Example:

Camber: 0°16' (0.26°)

Caster: 1°17' (1.28°)

- (3) Measure the present wheel alignment value with the vehicle in non-loaded condition.
- (4) Mark the measured present value on the adjustment chart.

Example:

Camber: 0°50' (0.83°)

Caster: 1°18' (1.30°)

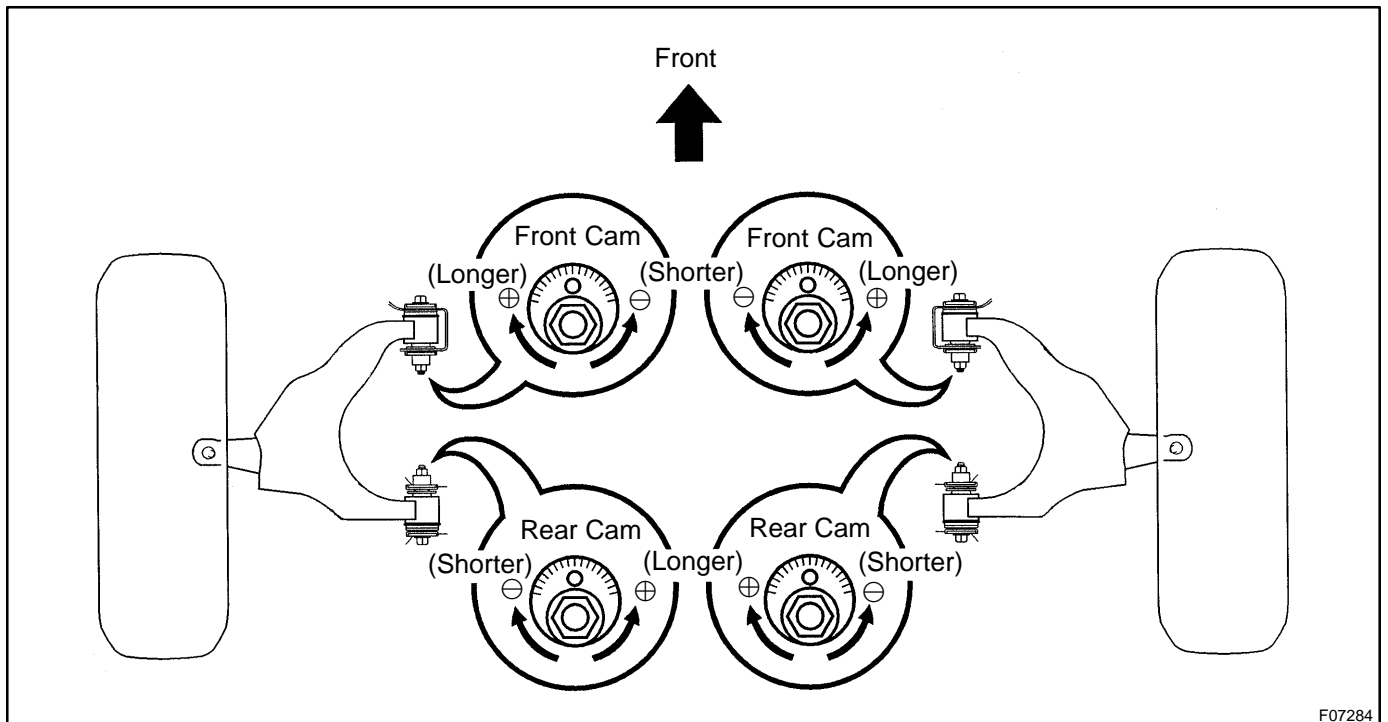
- (5) As shown in the example chart, read the distance from the measured value to the standard value, and adjust the front and/or rear adjusting cams accordingly.

Amount to turn adjusting cams (by graduation):

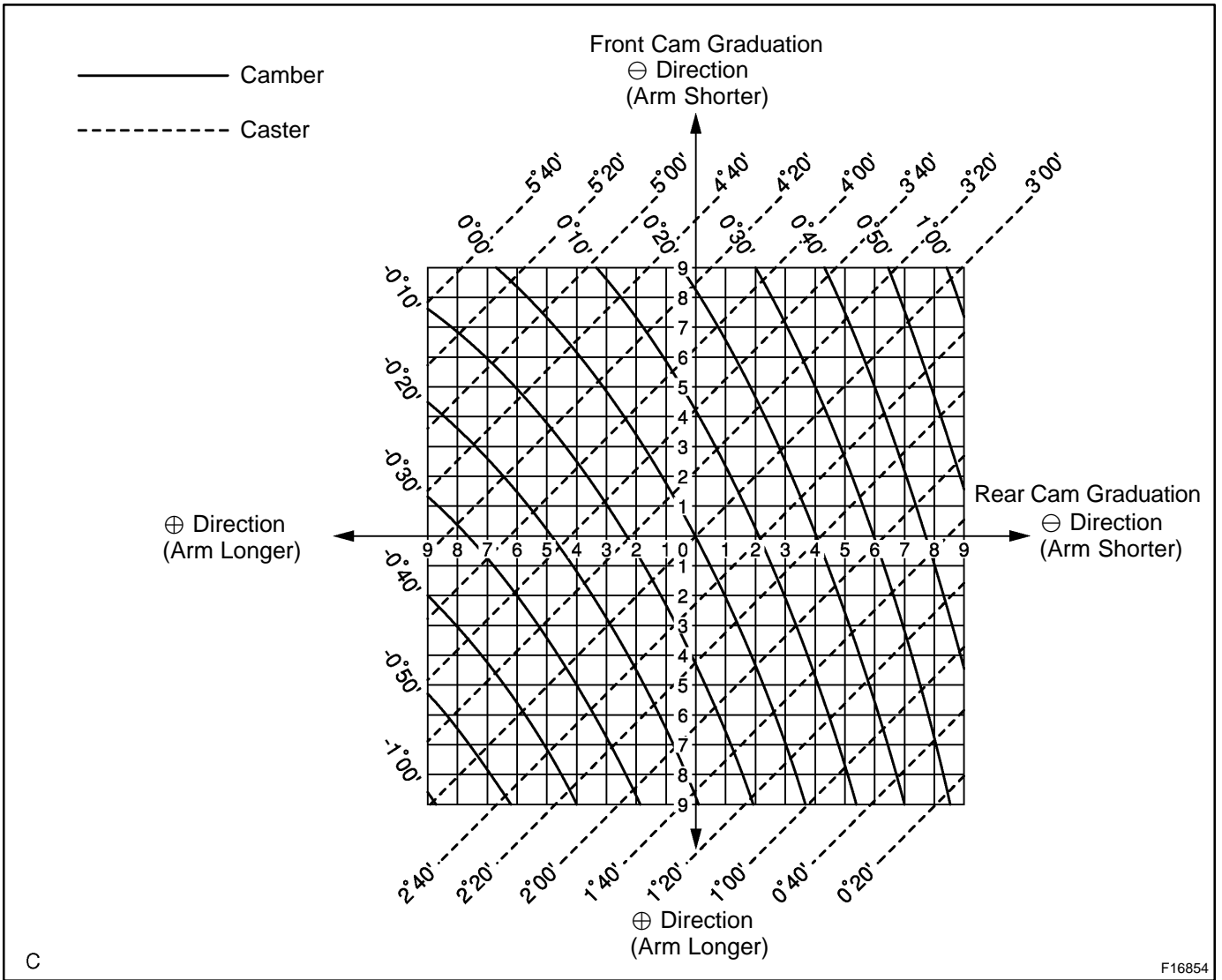
Example:

Front cam: 1.4 ⊕ Direction

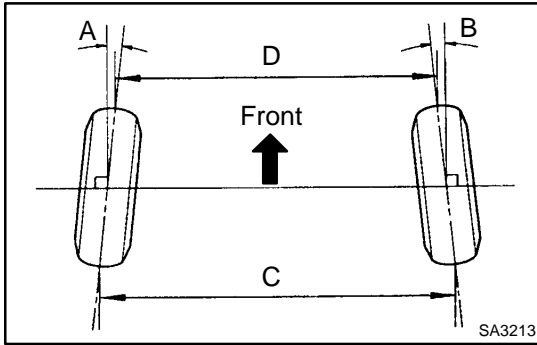
Rear cam: 1.5 ⊕ Direction



SUSPENSION AND AXLE - FRONT WHEEL ALIGNMENT



- (d) Torque the front and/or rear adjusting cam set bolts.
Torque: 130 N·m (1,325 kgf·cm, 96 ft·lbf)

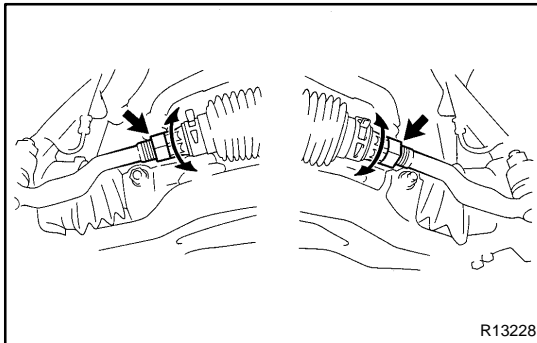


5. INSPECT TOE-IN (See page SS-59)

If the toe-in is not within the specified value, adjust the rack ends.

6. ADJUST TOE-IN AND WHEEL ANGLE

(a) Remove the 2 clips.

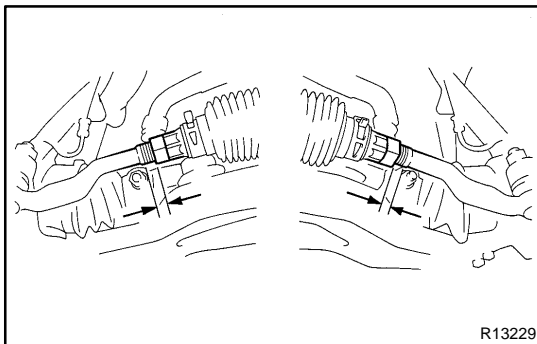


(b) Loosen the tie rod end lock nuts.

(c) Turn the right and left rack ends by an equal amount to adjust the toe-in.

HINT:

Try to adjust the toe-in to the center of the specified value.



(d) Make sure that the lengths of the right and left rack ends are the same.

Rack end length difference: 1.5 mm (0.059 in.) or less

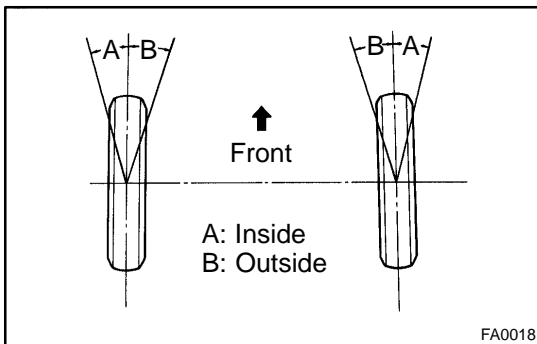
(e) Tighten the tie rod end lock nuts.

Torque: 55 N·m (560 kgf·cm, 41 ft·lbf)

(f) Place the boots on the seats and install the clips.

HINT:

Make sure that the boots are not twisted.



(g) Inspect the wheel angle See page SS-59.

Turn the steering wheel fully and measure the turning angle.

Wheel turning angle:

If the right and left wheel turning angles differ from the specified value, readjust the toe-in and wheel angle within the specified value. At this time, make sure that the lengths of the right and left rack ends are the same.

Rack end length difference: 1.5 mm (0.059 in.) or less

WHEEL AND TIRE SYSTEM

SA2D7-01

PRECAUTION

1. REMOVAL AND INSTALLATION OF TIRE PRESSURE MONITOR VALVE SUB-ASSY

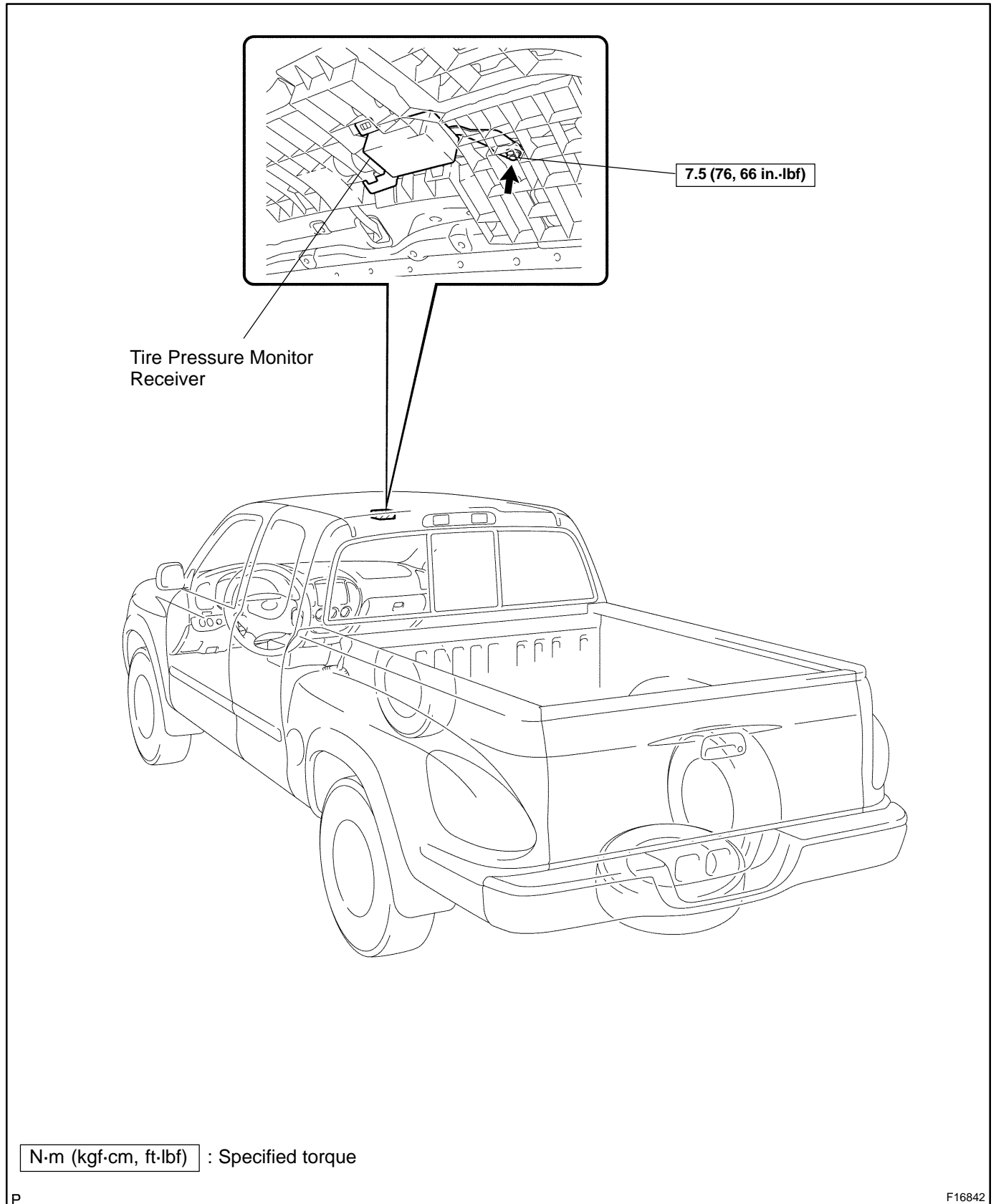
- (a) When installing a tire, make sure that the tire pressure monitor valve does not interfere with the tire bead in order to prevent damage to the sensor.
- (b) After completing the operation, remove the valve core to rapidly release air and check that the warning light comes on. If not, the system may have a defect.
- (c) If there is air leakage, tighten the nut with a force of 4.0 N·m (41 kgf·cm, 35 in.·lbf) and push the valve core 2 or 3 times to remove any dirt attached to the valve core.
If there is still air leakage, replace the grommet, the washer and the nut all together.
- (d) When installing the tire pressure monitor valve, check whether the rim, grommet, washer and nut are clean. Use a manufacturer-specified cap.
- (e) When putting air into the tire, first install the tire pressure valve straight onto the stem of the tire pressure monitor valve.

2. TIRE AND WHEEL REPLACEMENT OR TIRE ROTATION

- (a) When replacing tires, be sure to check if the grommet of the tire valve is damaged. If so, replace the grommet together with the washer and nut.
- (b) When tires and wheels are replaced, make sure to register the transmitter ID.

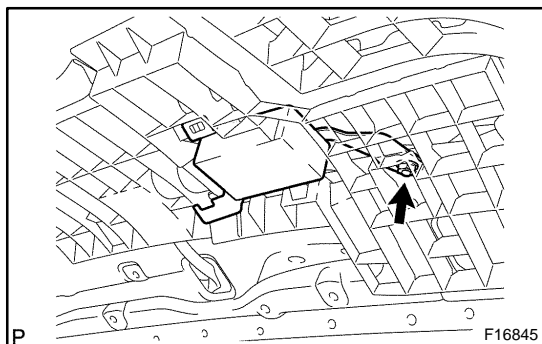
TIRE PRESSURE MONITOR RECEIVER COMPONENTS

SA2D8-01

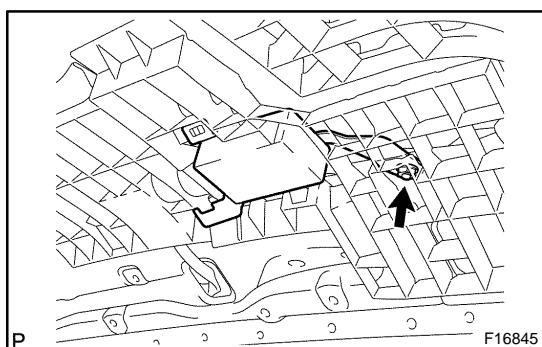


REPLACEMENT

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE ROOF HEADLINING**
(See page [BO-126](#) or [BO-133](#))



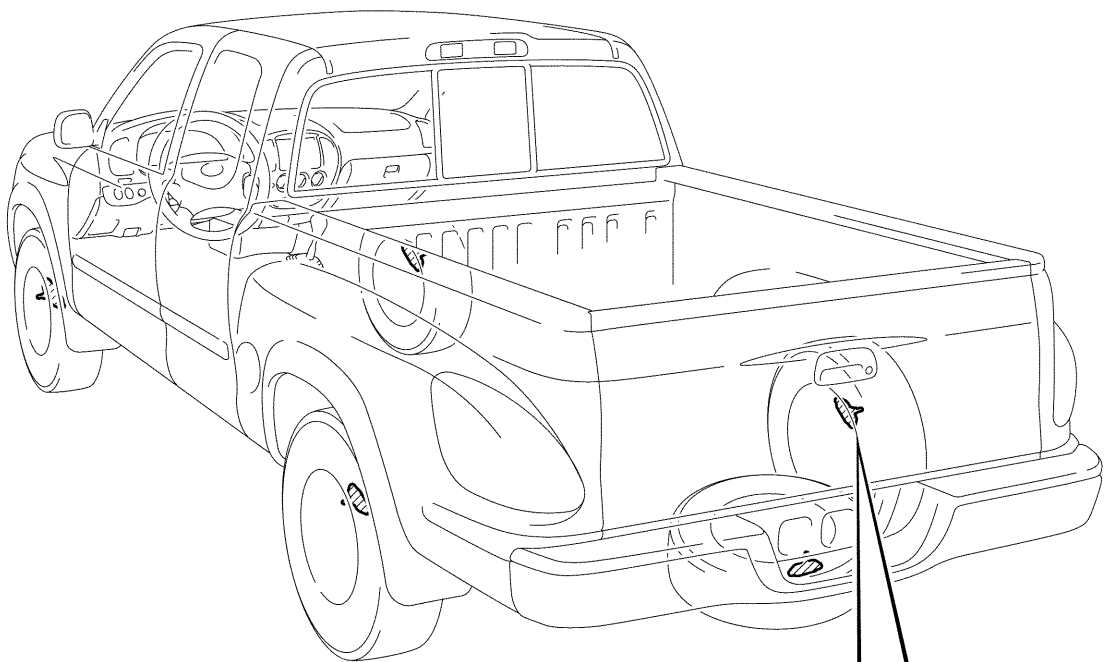
3. **REMOVE TIRE PRESSURE MONITOR RECEIVER**
 - (a) Disconnect the connector.
 - (b) Remove the nut.
 - (c) Remove the EA RIB LH.
 - (d) Remove the tire pressure monitor receiver from the EA RIB LH.



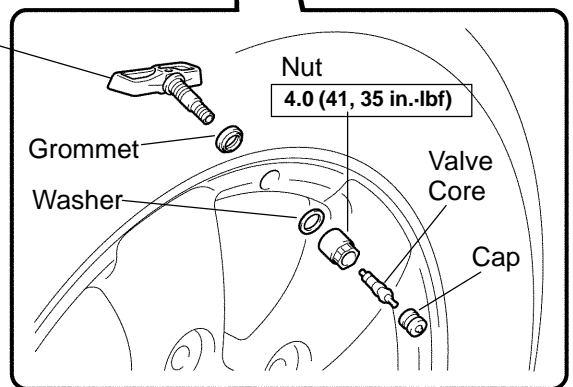
4. **INSTALL TIRE PRESSURE MONITOR RECEIVER**
 - (a) Install the tire pressure monitor receiver to the EA RIB LH.
 - (b) Connect the connector.
 - (c) Install the EA RIB LH to the body.
 - (d) Install the nut.
Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)
5. **INSTALL ROOF HEADLINING**
(See page [BO-130](#) or [BO-138](#))
6. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

TIRE PRESSURE MONITOR VALVE COMPONENTS

SAZDA-01



Tire Pressure Monitor Valve

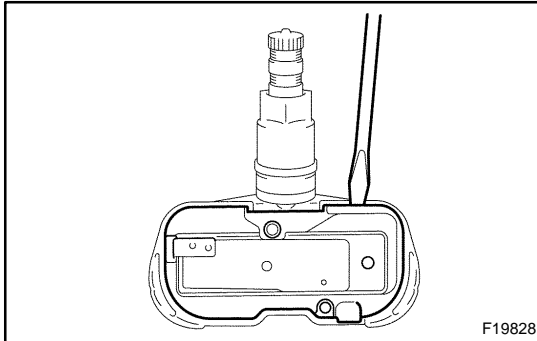


N·m (kgf·cm, ft·lbf) : Specified torque

DISPOSAL

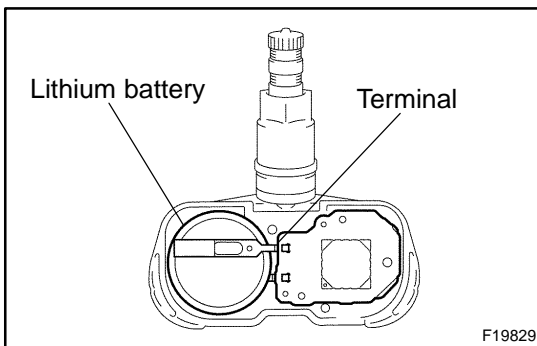
HINT:

The tire pressure monitor valve sub-assy is powered by a lithium battery. When disposing of the tire pressure monitor valve sub-assy, remove the battery and dispose of it correctly.



DISPOSE OF TIRE PRESSURE MONITOR VALVE

- (a) Insert the tip of a screwdriver into the clearance and pry off the cover. Remove the back cover.



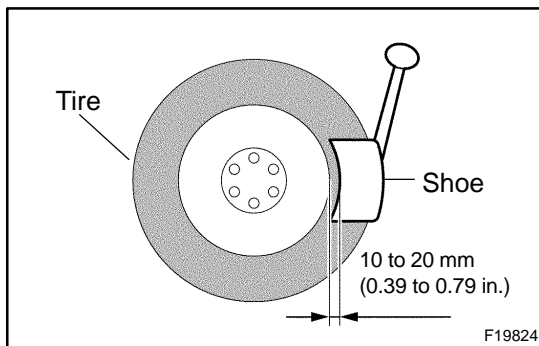
- (b) The battery and base board covered with silicone resin are exposed. While taking out the battery, cut off the 2 terminals which connect the battery and base board.

REPLACEMENT

1. REMOVE FRONT TIRE
2. REMOVE REAR TIRE
3. REMOVE TIRE PRESSURE MONITOR VALVE
 - (a) Remove the valve core and cap, and release air from the tire.
 - (b) After ensuring that air is sufficiently released, remove the nut and washer that are used to fix the tire pressure monitor valve sub-assy and drop the sensor inside the tire.

HINT:

Keep the removed cap, valve core, nut and washer.



- (c) After dropping the tire pressure monitor valve sub-assy into the tire, disengage the bead using the shoe of the tire remover.

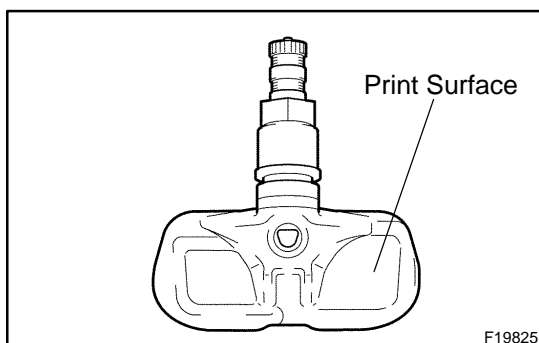
NOTICE:

Be careful not to damage the tire pressure monitor valve because of interference between the sensor and tire bead.

- (d) Remove the bead on the upper side.
- (e) Take out the sensor from the tire and remove the bead on the lower side.
- (f) Remove the inner grommet from the tire pressure monitor valve sub-assy.

HINT:

Check that there are no cracks or damage to the grommet. If any damage is found, replace the grommet together with the washer and nut.



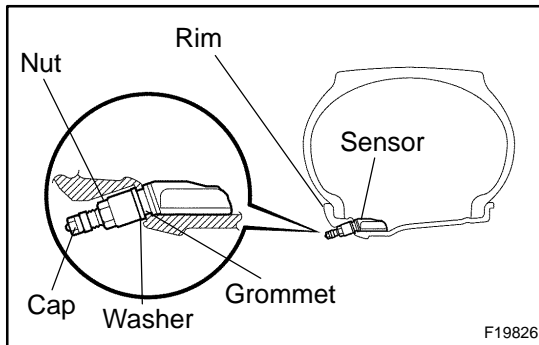
4. INSTALL TIRE PRESSURE MONITOR VALVE

- (a) Insert the tire pressure monitor valve into the valve installation hole. Insert from the inside of the rim so that the print surface can be seen.

NOTICE:

- Check that there is no visible deformation, damage or other abnormalities on the transmitter.
- Check that there is no foreign matter on the inner grommet and around the rim hole.

- If installed in the reverse direction, the tire pressure monitor valve may be damaged or fail to transmit signals when running at high speed.
- If installing a new tire pressure monitor valve, write down the ID number before installation.
- It is necessary to register an ID in the ECU after installation (See page [DI-1290](#)).



- (b) Install the washer on the tire pressure monitor valve from the rim side and tighten with a nut.

Torque: 4.0 N·m (41 kgf·cm, 35 in.-lbf)

NOTICE:

- Check that there is no foreign matter on the washer and nut.
 - If the tire pressure monitor valve is removed when the tire is removed for replacement, check that there is no damage or cuts, and no foreign matter such as mud, dirt or sand attached to the grommet. Replace the grommet with a new one if any of the defects mentioned above are found.
 - Check that there is no oil, water or lubricant around the rim hole, tire pressure monitor valve, washer and nut. Failing to do so may result in improper installation.
- (c) After the tire is inflated, the valve nut may be loose. Retighten the nut to the specified torque and then check for air leaks with soapy water.

Torque: 4.0 N·m (41 kgf·cm, 35 in.-lbf)

- (d) Set the wheel disc to the mounting machine and install the lower tire bead. Position the main body of the sensor as in the shaded area shown in the illustration.

NOTICE:

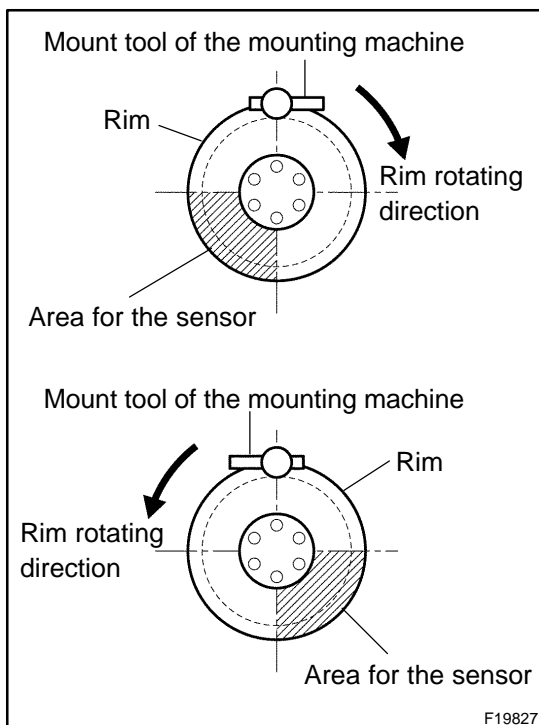
If the sensor is positioned outside this area, it generates interference with the tire bead, causing possible damage to the sensor.

- (e) Install the upper bead.

NOTICE:

Make sure that the tire bead and tool do not interfere with the main body of the sensor and that the sensor is not clamped by the bead.

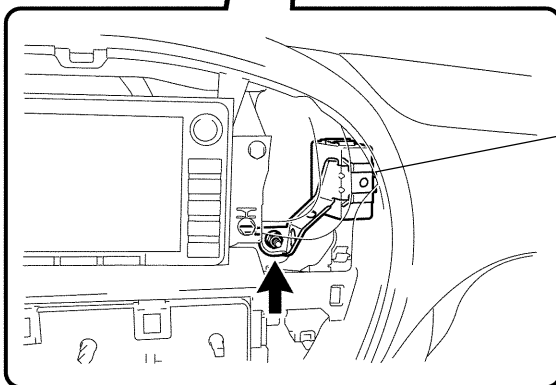
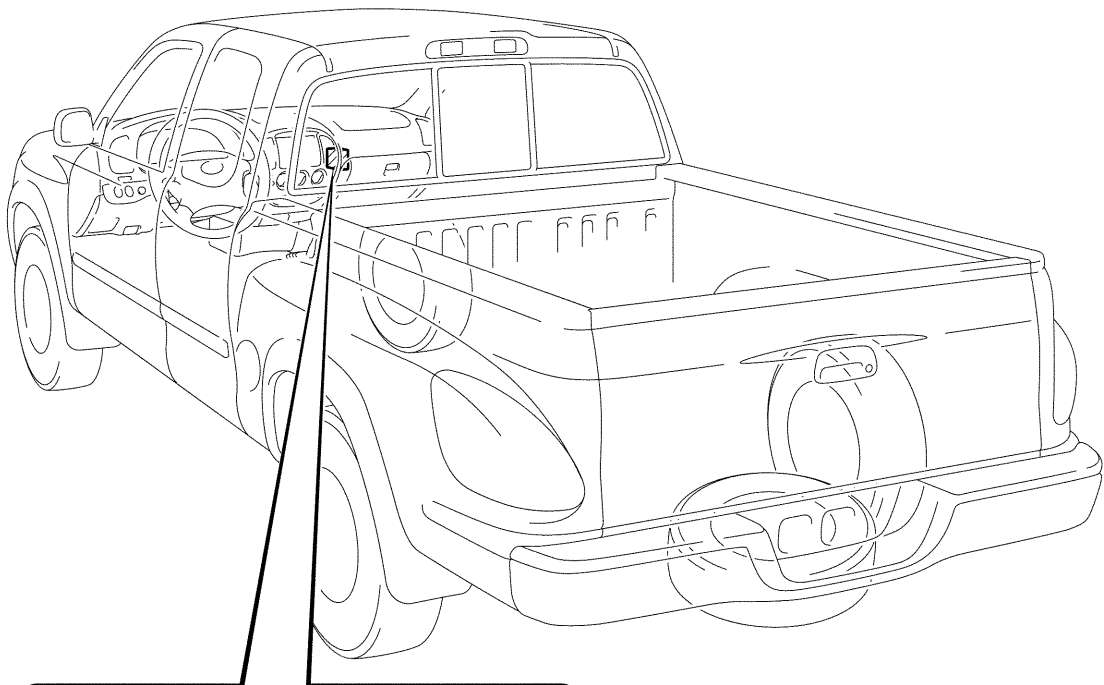
5. **INSTALL FRONT WHEEL**
Torque: 103 N·m (1,050 kgf·cm, 76 ft-lbf)
6. **INSTALL REAR WHEEL**
Torque: 103 N·m (1,050 kgf·cm, 76 ft-lbf)
7. **INSPECT TIRE** (See page [SA-3](#))
8. **REGISTRATION OF TRANSMITTED ID**
(See page [DI-1290](#))



9. **INSPECT TIRE PRESSURE WARNING SYSTEM**
(See page [DI-1287](#))
SST 09843-18040

TIRE PRESSURE MONITOR ECU COMPONENTS

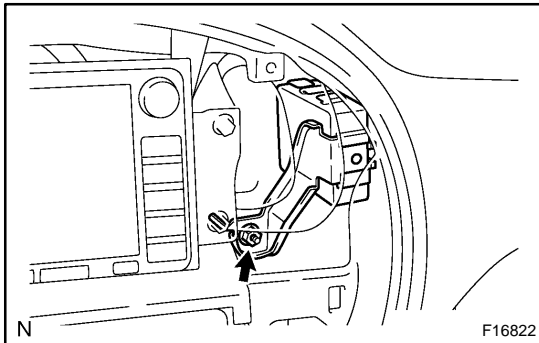
SA2D5-01



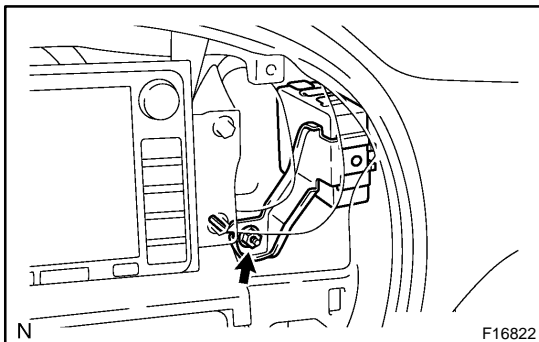
Tire Pressure Monitor ECU

REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE INTEGRATION CONTROL PANEL
(See page [BO-111](#))
3. REMOVE GLOVE COMPARTMENT
(See page [BO-111](#))



4. REMOVE TIRE PRESSURE MONITOR ECU
 - (a) Disconnect the connector.
 - (b) Remove the nut and tire pressure monitor ECU.

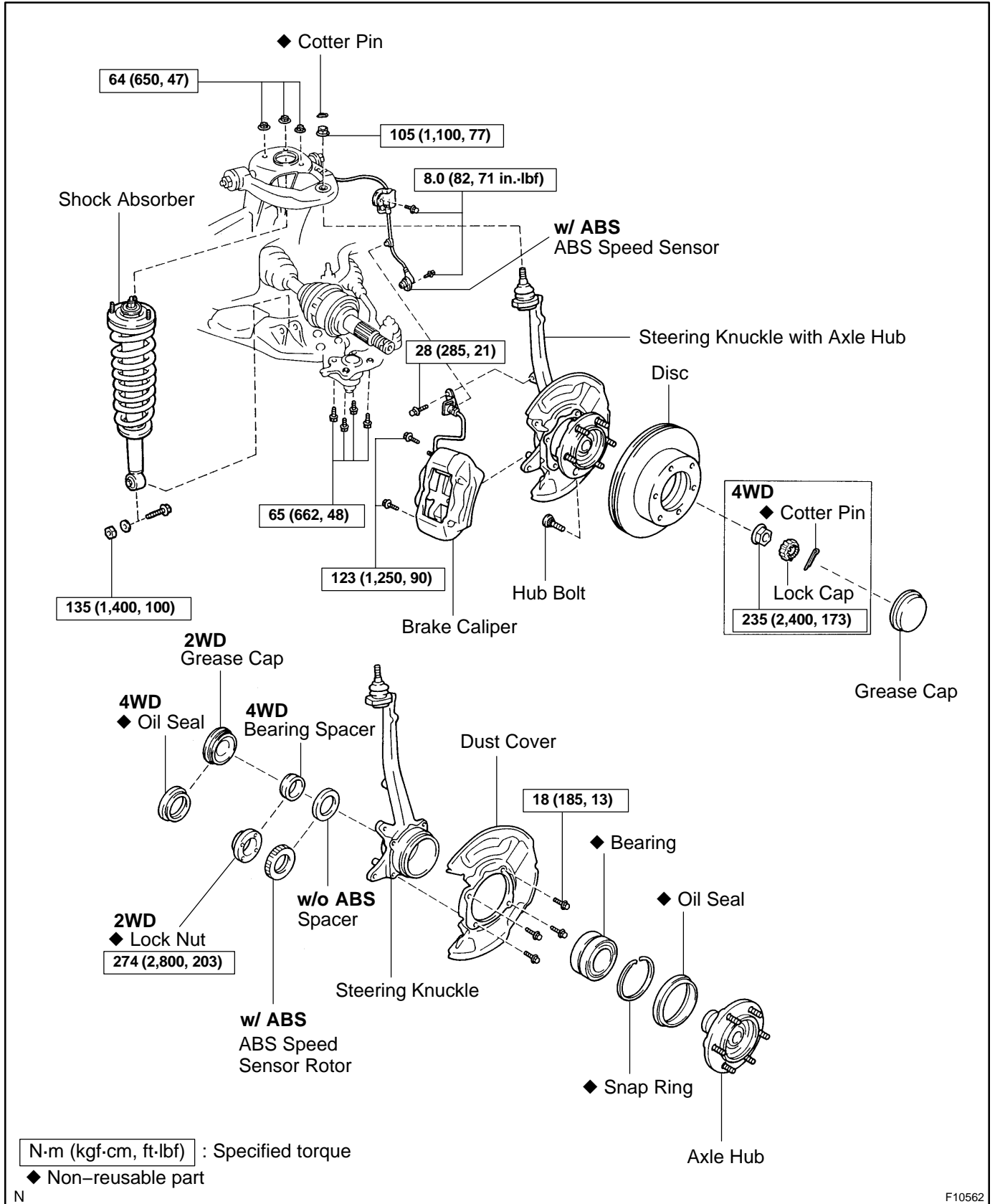


5. INSTALL TIRE PRESSURE MONITOR ECU
 - (a) Install the tire pressure monitor ECU with the nut.
 - (b) Connect the connector.
6. INSTALL GLOVE COMPARTMENT
(See page [BO-120](#))
7. INSTALL INTEGRATION CONTROL PANEL
(See page [BO-120](#))
8. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
9. REGISTRATION OF TRANSMITTED ID
(See page [DI-1290](#))
10. INSPECT TIRE PRESSURE WARNING SYSTEM
(See page [DI-1287](#))

SST 09843-18040

FRONT AXLE HUB COMPONENTS

SA1JY-03



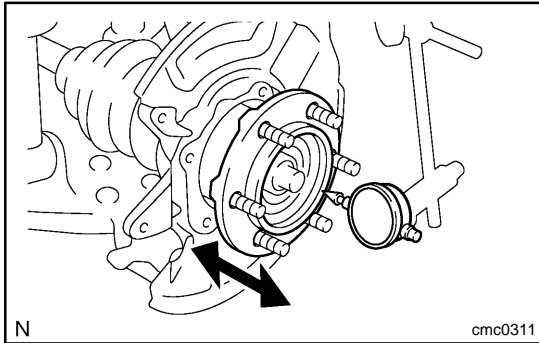
N

F10562

REMOVAL

1. REMOVE FRONT WHEEL
2. REMOVE GREASE CAP

Using a screwdriver and hammer, remove the grease cap.

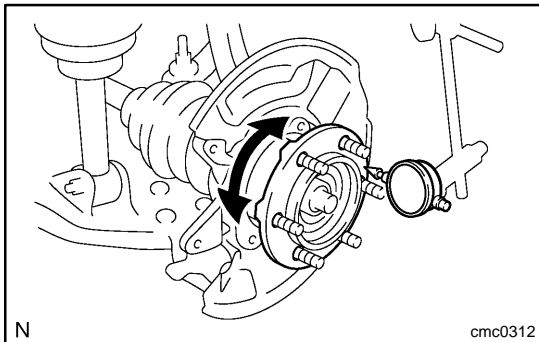


3. INSPECT FRONT AXLE HUB BEARING

- (a) Remove the front disc brake caliper.
- (b) Remove the front disc.
- (c) Inspect the axle hub backlash.
 - (1) Using a dial indicator, check the backlash near the center of the axle hub.

Maximum: 0.05 mm (0.0020 in.)

If the backlash exceeds the maximum, replace the bearing.

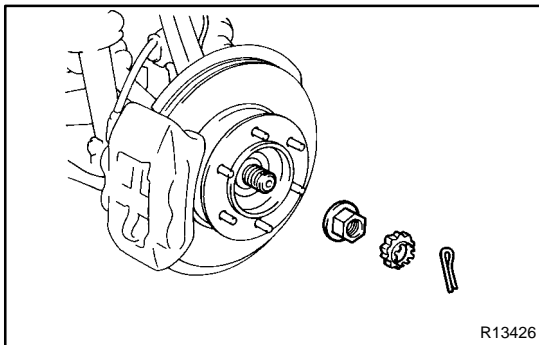


- (d) Inspect the axle hub deviation.
 - (1) Using a dial indicator, check the deviation at the surface of the axle hub.

Maximum: 0.05 mm (0.0020 in.)

If the deviation exceeds the maximum, replace the bearing.

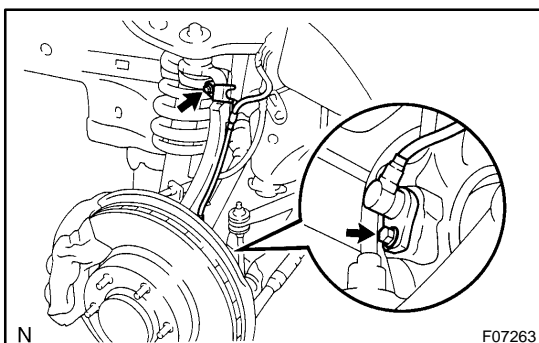
- (e) Install the front disc.
 - (f) Install the front disc brake caliper.
 - (1) Install the brake caliper and 2 bolts.
- Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)**



4. 4WD:

DISCONNECT DRIVE SHAFT

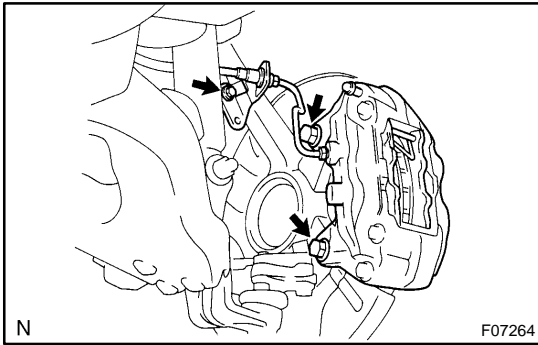
- (a) Remove the cotter pin and lock cap.
- (b) While applying the brakes, remove the lock nut.



5. w/ ABS:

DISCONNECT ABS SPEED SENSOR AND WIRE HARNESS CLAMP FROM STEERING KNUCKLE

Remove the 2 bolts and disconnect the ABS speed sensor and wire harness clamp from the steering knuckle.

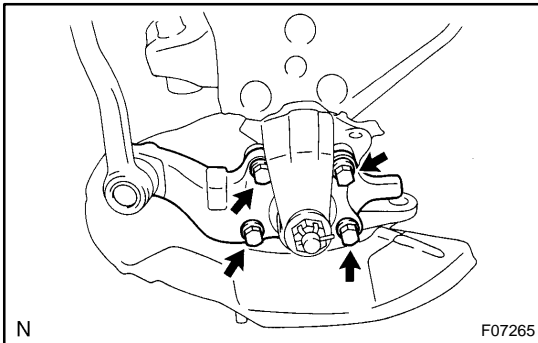
**6. REMOVE BRAKE CALIPER AND DISC**

- (a) Remove the bolt and brake line clamp from the steering knuckle.
- (b) Remove the 2 bolts, brake caliper and disc.

NOTICE:

Do not damage the brake tube.

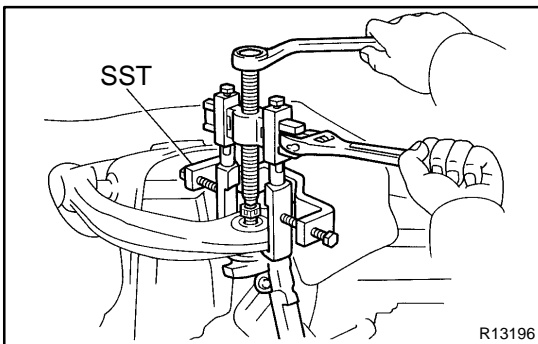
- (c) Support the brake caliper securely.

7. REMOVE SHOCK ABSORBER (See page SA-63)**8. DISCONNECT LOWER BALL JOINT WITH LOWER BALL JOINT DUST COVER PROTECTOR**

Remove the 4 bolts and disconnect the lower ball joint with lower ball joint dust cover protector.

9. REMOVE STEERING KNUCKLE

- (a) Remove the cotter pin and loosen the nut.



- (b) Using SST, disconnect the steering knuckle.

SST 09950-40011 (09951-04010, 09952-04010, 09553-04020, 09554-04010, 09955-04031, 09958-04011)

- (c) Remove the nut and steering knuckle.

NOTICE:**4WD:**

Be careful not to damage the oil seal and drive shaft boot.

HINT:**4WD:**

When it is difficult to disconnect the drive shaft, tap the tip of the drive shaft with a plastic hammer.

DISASSEMBLY

1. 2WD:

REMOVE GREASE CAP

- (a) Mount the axle hub in a soft jaw vise.

HINT:

Close the vise until it holds the hub bolts. Do not tighten further.

- (b) Using a screwdriver, remove the grease cap.

2. 4WD:

REMOVE OIL SEAL (INSIDE)

- (a) Mount the axle hub in a soft jaw vise.

HINT:

Close the vise until it holds the hub bolts. Do not tighten further.

- (b) Using a screwdriver, remove the oil seal (inside).

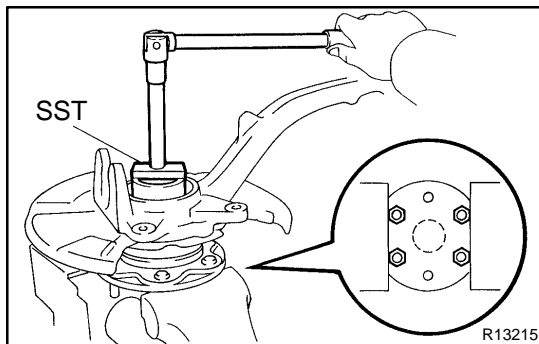
3. 2WD:

REMOVE LOCK NUT AND ABS SPEED SENSOR ROTOR/SPACER

- (a) Using a chisel and hammer, loosen the staked part of the lock nut.

NOTICE:

Be careful not to damage the bushing.



- (b) Using SST, remove the lock nut.

SST 09318-12010

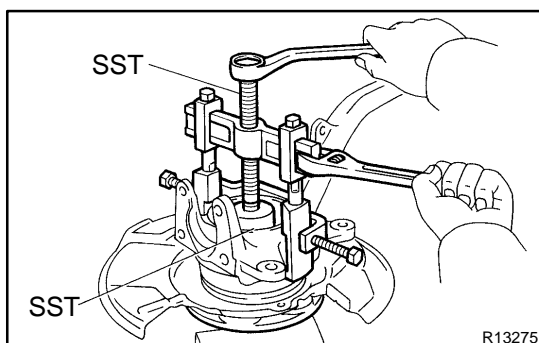
- (c) Remove the ABS speed sensor rotor/spacer.

NOTICE:

Take care not to scratch the serration of the speed sensor rotor.

4. REMOVE AXLE HUB FROM STEERING KNUCKLE

- (a) Remove the 4 bolts and shift the dust cover towards the hub side (outside).



- (b) Using SST, remove the axle hub from the steering knuckle.

SST 09710-30021 (09710-03051),
09950-40011 (09951-04020, 09952-04010,
09953-04020, 09954-04010, 09955-04031,
09957-04010, 09958-04011)

- (c) Remove the dust cover from the steering knuckle.

- (d) 4WD:

Remove the bearing spacer and ABS speed sensor rotor (w/ ABS)/spacer (w/o ABS).

NOTICE:

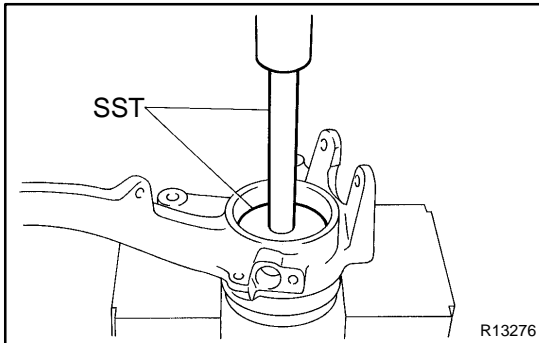
Take care not to scratch the serration of the speed sensor rotor.

5. REMOVE OIL SEAL (OUTSIDE)

Using a screwdriver, remove the oil seal (outside) from the steering knuckle.

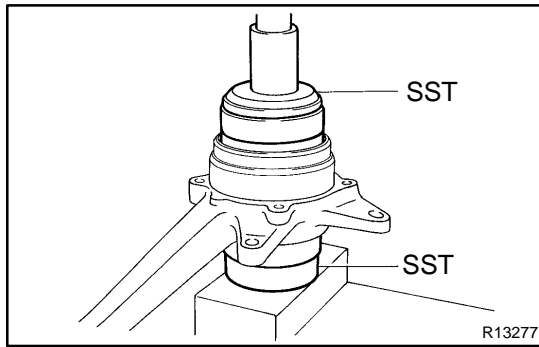
6. REMOVE BEARING FROM STEERING KNUCKLE

(a) Using snap ring pliers, remove the snap ring.



(b) Using SST and a press, remove the bearing from the steering knuckle.

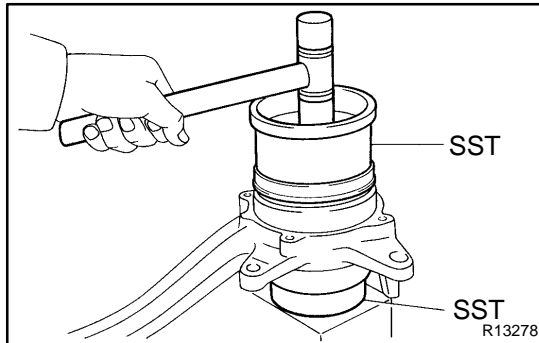
SST 09950-60020 (09951-00810),
09950-70010 (09951-07150)



REASSEMBLY

1. INSTALL NEW BEARING

- (a) Using SST and a press, install a new bearing to the steering knuckle.
SST 09527-17011, 09950-60020 (09951-00910)
- (b) Using snap ring pliers, install a new snap ring.



2. INSTALL NEW OIL SEAL (OUTSIDE)

- (a) Using SST and a plastic hammer, install a new oil seal (outside).
SST 09223-15030, 09527-17011
- (b) Coat MP grease to the oil seal lip.

3. INSTALL AXLE HUB TO STEERING KNUCKLE

- (a) Install the dust cover to the steering knuckle with the 4 bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

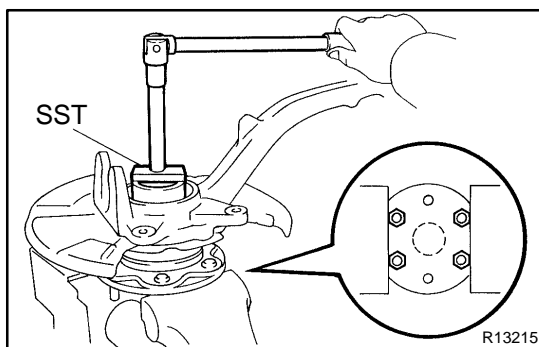
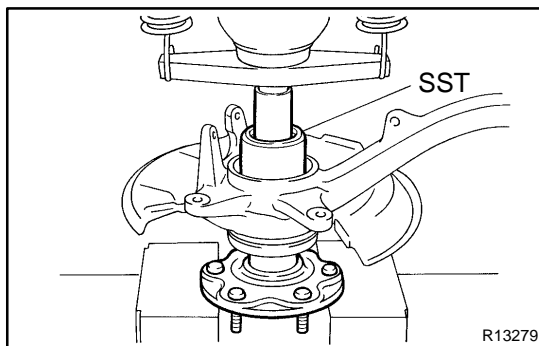
- (b) Using SST and a press, install the axle hub to the steering knuckle.

SST 09649-17010

4. INSTALL ABS SPEED SENSOR ROTOR (w/ ABS)/ SPACER (w/o ABS)

NOTICE:

Do not scratch the serration of the speed sensor rotor.



5. 2WD:

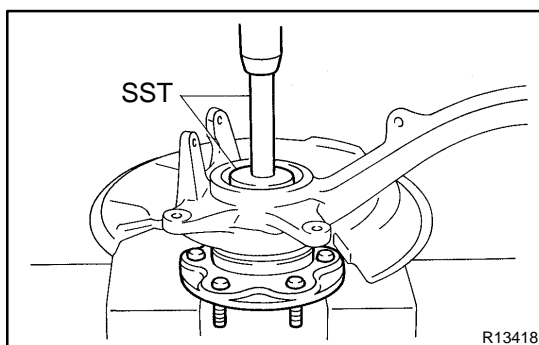
INSTALL NEW LOCK NUT

- (a) Using SST, install and torque a new lock nut to the axle hub.

SST 09318-12010

Torque: 274 N·m (2,800 kgf·cm, 203 ft·lbf)

- (b) Using a chisel and hammer, stake the lock nut.



6. 4WD:

INSTALL BEARING SPACER

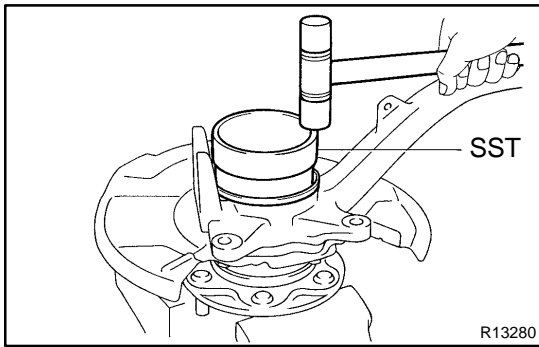
Using SST and a press, install the bearing spacer.

SST 09950-60010 (09951-00650),

09950-70010 (09951-07150)

7. 2WD:

INSTALL GREASE CAP

**8. 4WD:****INSTALL NEW OIL SEAL (INSIDE)**

- (a) Using SST and a plastic hammer, install a new oil seal (inside).

SST 09527-17011

HINT:

Lightly strike the SST on its circumference evenly.

- (b) Coat MP grease to the oil seal lip.

INSTALLATION

1. INSTALL STEERING KNUCKLE

(a) 4WD:

Insert the drive shaft into the axle hub and temporarily tighten the nut.

NOTICE:

Be careful not to damage the oil seal and drive shaft boot.

(b) Connect the steering knuckle to the upper suspension arm.

(c) Install the nut and a new cotter pin.

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

Torque: 105 N·m (1,100 kgf·cm, 77 ft·lbf)

2. CONNECT LOWER BALL JOINT WITH LOWER BALL JOINT DUST COVER PROTECTOR

Connect the lower ball joint with lower ball joint dust cover protector to the steering knuckle with the 4 bolts.

Torque: 65 N·m (662 kgf·cm, 48 ft·lbf)

3. INSTALL SHOCK ABSORBER (See page SA-68)

4. INSTALL BRAKE CALIPER

(a) Install the disc, brake caliper and 2 bolts.

Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)

(b) Install the brake line clamp to the steering knuckle with the bolt.

Torque: 28 N·m (285 kgf·cm, 21 ft·lbf)

5. w/ ABS:

CONNECT ABS SPEED SENSOR AND WIRE HARNESS CLAMP

Connect the ABS speed sensor and wire harness clamp to the steering knuckle with the 2 bolts.

Torque: 8.0 N·m (82 kgf·cm, 71 ft·lbf)

6. 4WD:

INSTALL DRIVE SHAFT LOCK NUT

(a) While applying the brakes, tighten the nut.

Torque: 235 N·m (2,400 kgf·cm, 173 ft·lbf)

(b) Install the lock cap and a new cotter pin.

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

7. INSTALL GREASE CAP

8. INSTALL FRONT WHEEL

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

9. DEPRESS BRAKE PEDAL SEVERAL TIMES

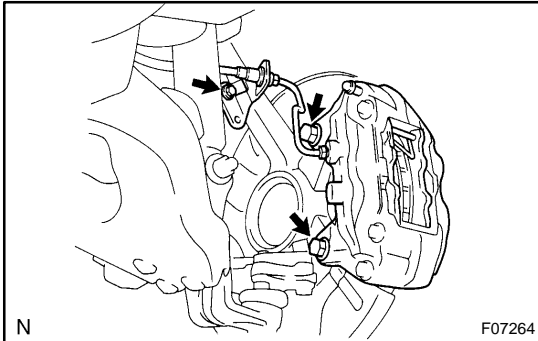
10. CHECK FRONT WHEEL ALIGNMENT (See page SA-5)

11. CHECK ABS SPEED SENSOR SIGNAL (See page DI-1387 or DI-1478)

FRONT WHEEL HUB BOLT REPLACEMENT

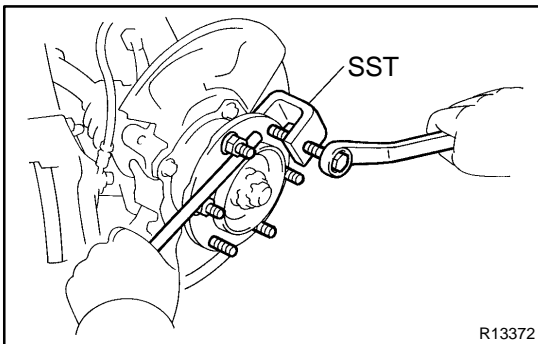
SA1K2-02

1. REMOVE FRONT WHEEL



2. REMOVE BRAKE CALIPER AND DISC

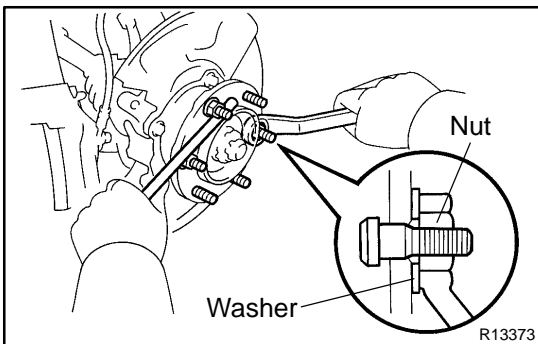
- Remove the bolt and brake line clamp from the steering knuckle.
- Remove the 2 bolts, brake caliper and disc.
- Support the brake caliper securely.



3. REMOVE HUB BOLT

Using SST and a screwdriver or an equivalent, remove the hub bolt.

SST 09650-17011



4. INSTALL HUB BOLT

- Install a washer and nut to a new hub bolt as shown in the illustration.
- Using a screwdriver or an equivalent to hold, install the hub bolt by torquing the nut.
- Remove the nut and washer.

5. INSTALL BRAKE DISC AND CALIPER

- Install the brake disc, caliper and 2 bolts.
Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)
- Install the brake line clamp to the steering knuckle with the bolt.
Torque: 28 N·m (285 kgf·cm, 21 ft·lbf)

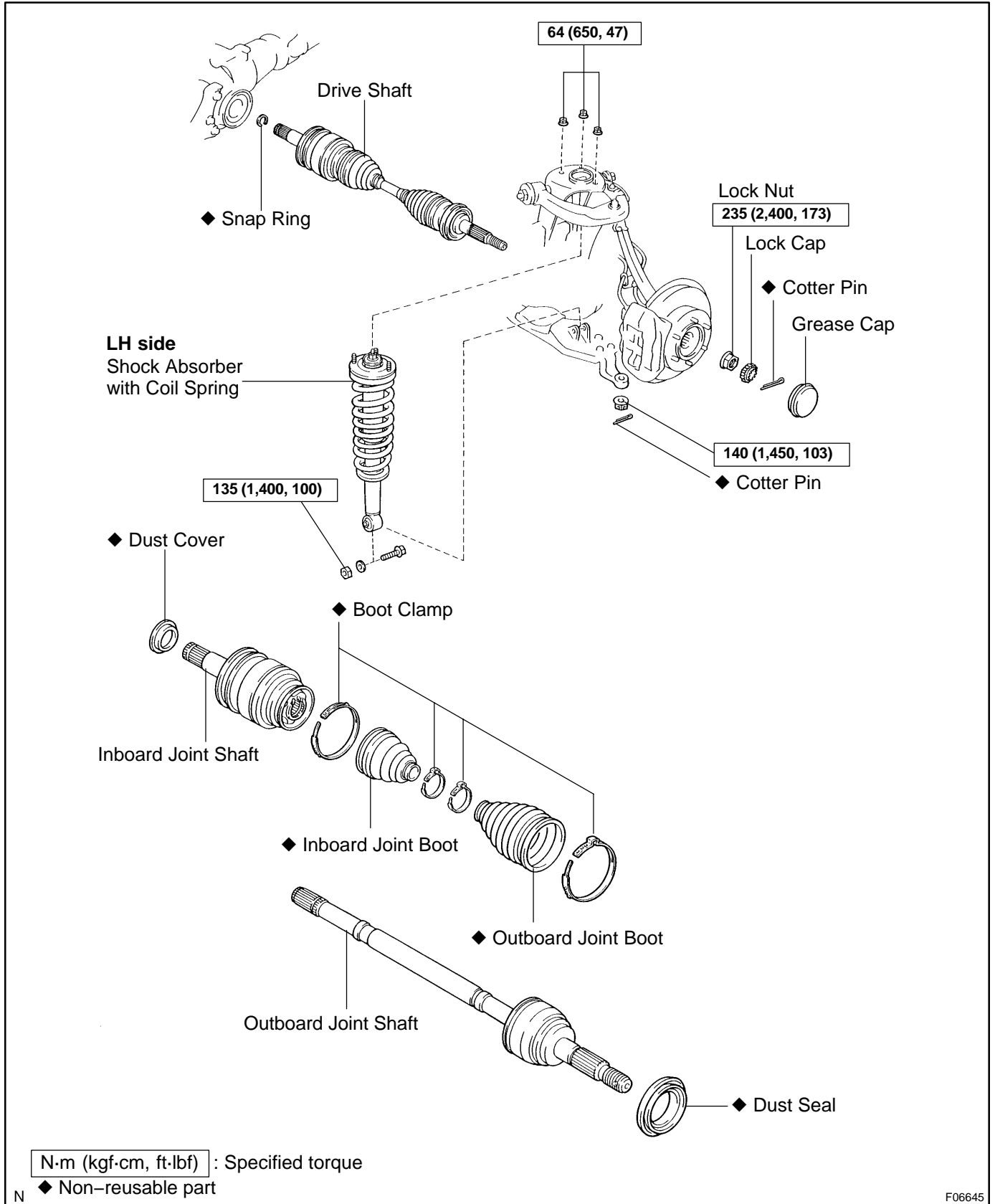
6. INSTALL FRONT WHEEL

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

7. DEPRESS BRAKE PEDAL SEVERAL TIMES

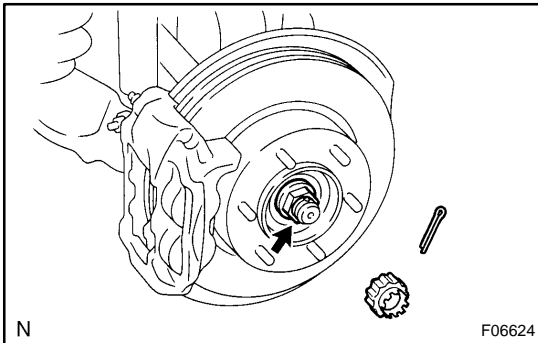
FRONT DRIVE SHAFT COMPONENTS

SA09G-07



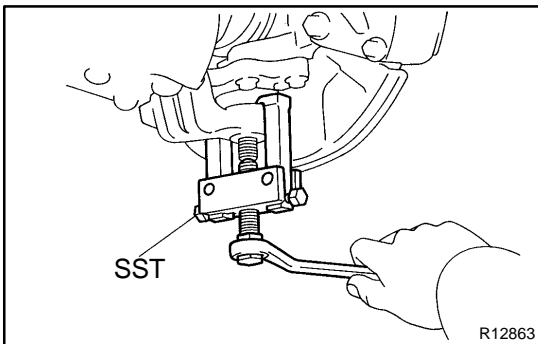
REMOVAL

1. REMOVE FRONT WHEEL
2. REMOVE ENGINE UNDER COVER
3. DRAIN DIFFERENTIAL OIL
4. REMOVE DRIVE SHAFT LOCK NUT
 - (a) Using a screwdriver and hammer, remove the grease cap.



- (b) Remove the cotter pin and lock cap.
 - (c) While applying the brakes, remove the lock nut.
5. **DISCONNECT LOWER SUSPENSION ARM FROM LOWER BALL JOINT**

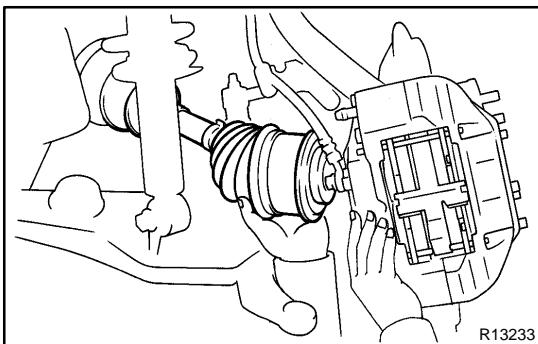
- (a) Remove the cotter pin and nut.



- (b) Using SST, disconnect the lower suspension arm from the lower ball joint.
- SST 09628-62011

6. DISCONNECT DRIVE SHAFT FROM STEERING KNUCKLE

- (a) Using a plastic hammer, disengage the drive shaft from the axle hub.

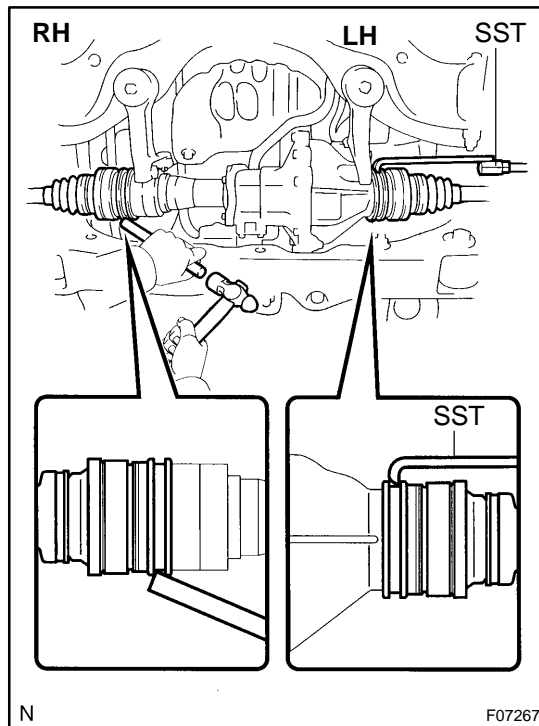


- (b) Push the steering knuckle outward and disconnect the drive shaft from the steering knuckle.

NOTICE:

Be careful not to damage the oil seal, boots and dust seal.

7. LH drive shaft:
REMOVE LH SHOCK ABSORBER (See page SA-63)

**8. REMOVE DRIVE SHAFT**

- (a) RH drive shaft:
Using a brass bar and hammer, remove the RH drive shaft.

NOTICE:

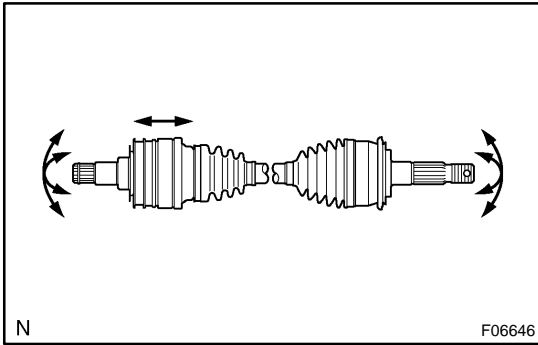
Be careful not to damage the dust cover and oil seal.

- (b) LH drive shaft:
Using SST, remove the LH drive shaft.
SST 09520-01010, 09520-24010 (09520-32040)

NOTICE:

Be careful not to damage the dust cover and oil seal.

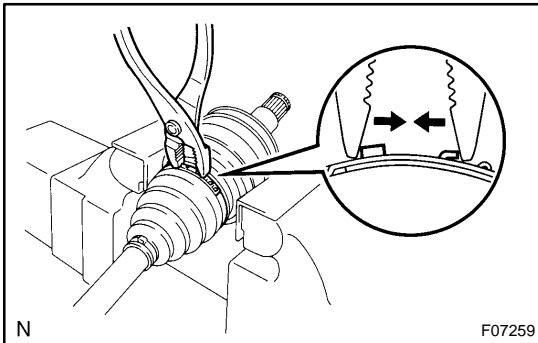
- (c) Using a screwdriver, remove the snap ring from the in-board joint shaft.



DISASSEMBLY

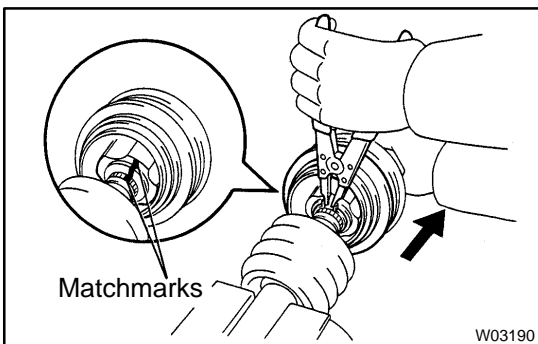
1. CHECK DRIVE SHAFT

- Check to see that there is no remarkable play in the outboard joint.
- Check to see that the inboard joint slides smoothly in the thrust direction.
- Check to see that there is no remarkable play in the radial direction of the inboard joint.
- Check the boots for damage.



2. REMOVE INBOARD AND OUTBOARD JOINT BOOT CLAMPS

- Using pliers, pinch the claws to compress the large inboard joint boot clamp and remove it.
- Using a side cutter, cut the small inboard joint boot clamp and remove it.
- Using a side cutter, cut the 2 outboard joint boot clamps and remove them.



3. REMOVE INBOARD JOINT SHAFT FROM OUTBOARD JOINT SHAFT

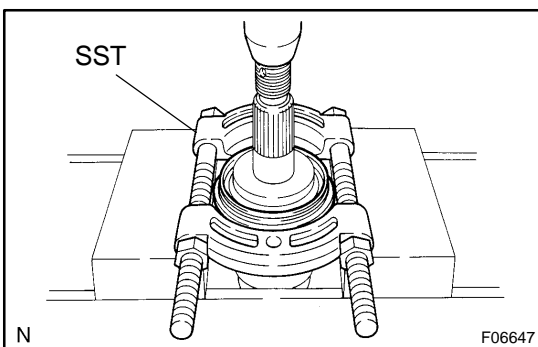
- Place matchmarks on the inboard and outboard joint shafts.

NOTICE:

Do not punch the marks.

- Using a snap ring expander, pull out the outboard joint shaft while expanding the snap ring.

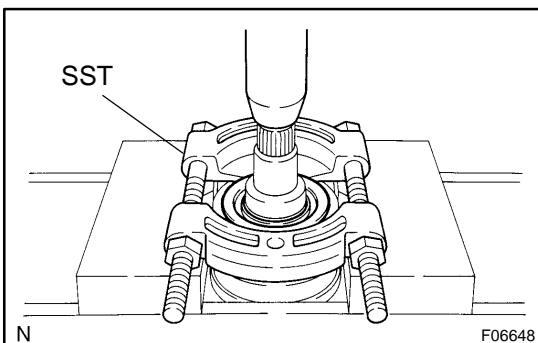
4. REMOVE INBOARD AND OUTBOARD JOINT BOOTS



5. REMOVE DUST SEAL

Using SST and a press, remove the dust seal.

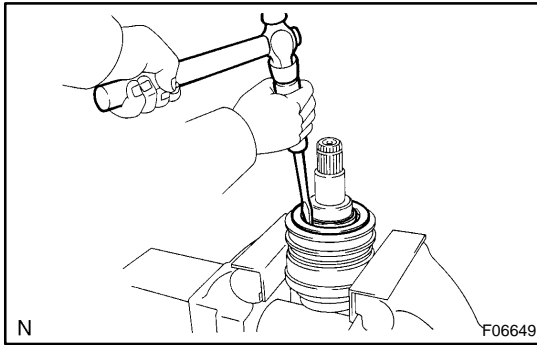
SST 09950-00020



6. REMOVE DUST COVER

Using SST and a press, remove the dust cover.

SST 09950-00020



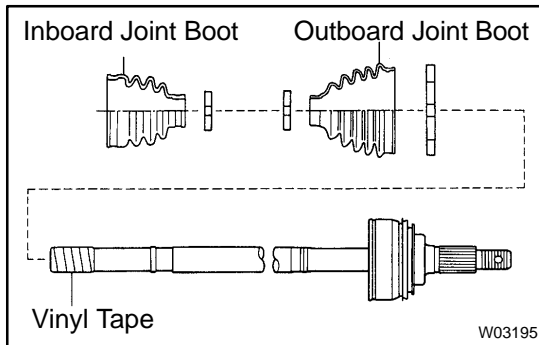
REASSEMBLY

1. INSTALL DUST COVER

Using a screwdriver and hammer, install a new dust cover.

2. INSTALL DUST SEAL

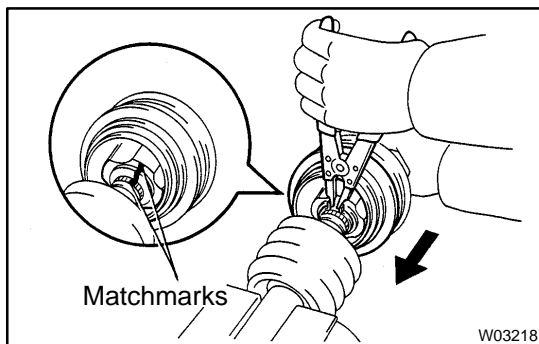
Using a screwdriver and hammer, install a new dust seal.



3. TEMPORARILY INSTALL OUTBOARD AND INBOARD JOINT BOOTS AND NEW BOOT CLAMPS

HINT:

- Before installing the boots, wrap the spline of the outboard joint shaft with vinyl tape to prevent the boots from being damaged.
- Before installing the boots, place 3 new clamps to the small boot ends and large boot end (outboard joint side).



4. INSTALL INBOARD JOINT SHAFT TO OUTBOARD JOINT SHAFT

Align the matchmarks placed before disassembly, and using a snap ring expander, put in the inboard joint shaft while expanding the snap ring.

5. INSTALL BOOT TO OUTBOARD JOINT

Before assembling the boot, pack the outboard joint and boot with grease in the boot kit.

Grease capacity (Color = Black):

205 – 225 g (7.23 – 7.94 oz.)

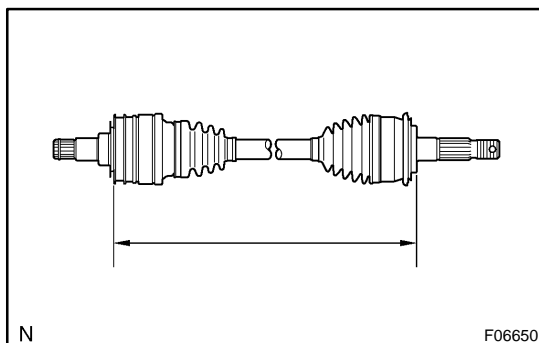
6. INSTALL BOOT TO INBOARD JOINT SHAFT

(a) Pack the inboard joint and boot with grease in the boot kit.

Grease capacity (Color = Black):

190 – 210 g (6.70 – 7.41 oz.)

(b) Temporarily install the boot to the inboard joint shaft.



7. CHECK DRIVE SHAFT LENGTH

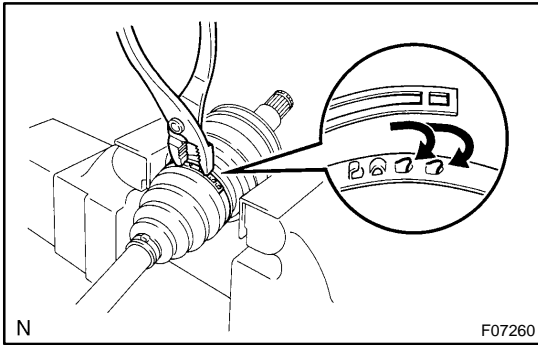
- Make sure that the 2 boots are on the shaft groove.
- Make sure that the 2 boots are not stretched or contracted when the drive shaft is at standard length.

Drive shaft standard length:

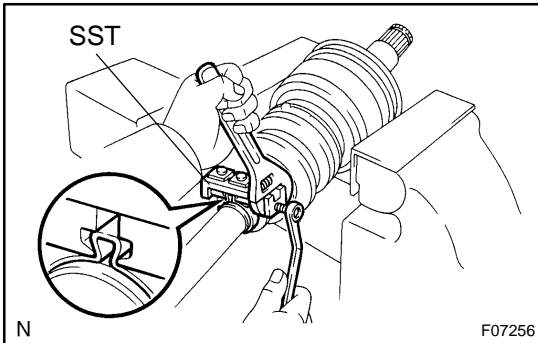
523.5 ± 2.0 mm (20.610 ± 0.079 in.)

8. INSTALL LARGE INBOARD JOINT BOOT CLAMP TO INBOARD JOINT SHAFT BOOT

- Place the large inboard joint boot clamp.



- (b) Using pliers, compress the clamp and attach the claws.

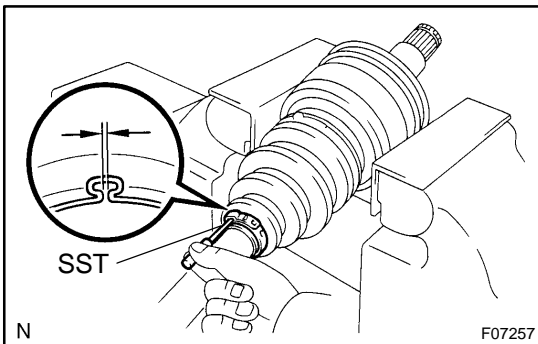


9. INSTALL OTHER BOOT CLAMPS TO BOTH BOOTS

- (a) Secure the clamp onto the boot.
 (b) Place SST onto the clamp.
 SST 09521-24010
 (c) Tighten the SST so that the clamp is pinched.

NOTICE:

Do not overtighten the SST.



- (d) Using SST, adjust the clearance of the clamp.
 SST 09240-00020

Clearance: 1.0 – 1.5 mm (0.039 – 0.059 in.)

10. CHECK DRIVE SHAFT (See page SA-31)

INSTALLATION

1. INSTALL DRIVE SHAFT TO DIFFERENTIAL

- (a) Install a new snap ring to the inboard joint shaft.
- (b) Apply the gear oil to the inboard joint shaft and differential case sliding surface.
- (c) Set the snap ring with the opening side facing downward.
- (d) Using a brass bar and hammer, install the drive shaft.

NOTICE:

Be careful not to damage the dust cover and oil seal.

HINT:

Whether the inboard joint shaft is in contact with the pinion shaft or not can be known from the sound or feeling when driving it in.

- (e) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in the axial direction.
- (f) Check that the drive shaft cannot be removed by hand.

2. LH drive shaft:

INSTALL LH SHOCK ABSORBER (See page SA-68)

3. CONNECT DRIVE SHAFT TO STEERING KNUCKLE

NOTICE:

Be careful not to damage the oil seal, boots and dust seal.

4. CONNECT LOWER SUSPENSION ARM TO LOWER BALL JOINT

- (a) Connect the lower suspension arm to the lower ball joint.
- (b) Install the nut and a new cotter pin.

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

HINT:

Face the hole for the cotter pin forward.

Torque: 140 N·m (1,450 kgf·cm, 103 ft·lbf)

5. INSTALL DRIVE SHAFT LOCK NUT

- (a) While applying brakes, install the nut.

Torque: 235 N·m (2,400 kgf·cm, 173 ft·lbf)

- (b) Install the lock cap and a new cotter pin.

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

6. FILL DIFFERENTIAL WITH HYPOID GEAR OIL (See page SA-36)

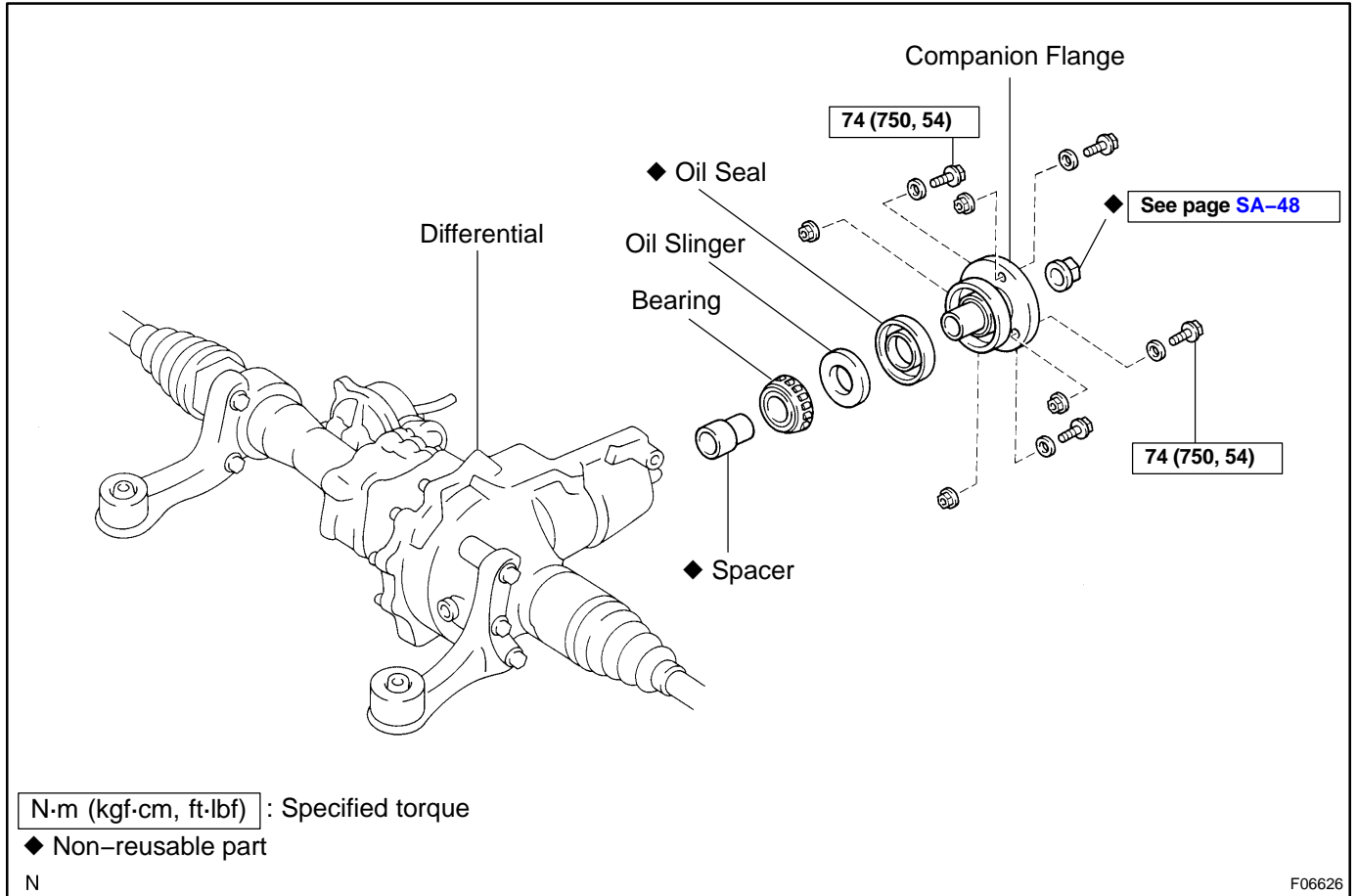
7. INSTALL ENGINE UNDER COVER

8. INSTALL FRONT WHEEL

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

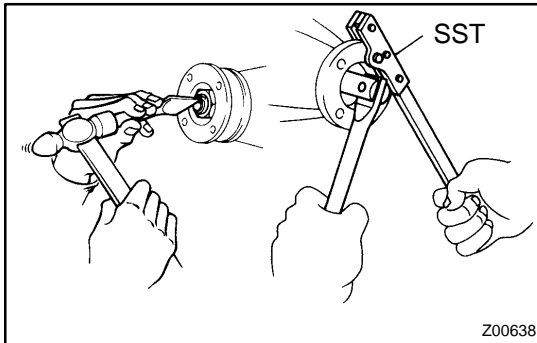
FRONT DIFFERENTIAL REAR OIL SEAL COMPONENTS

SA09L-06



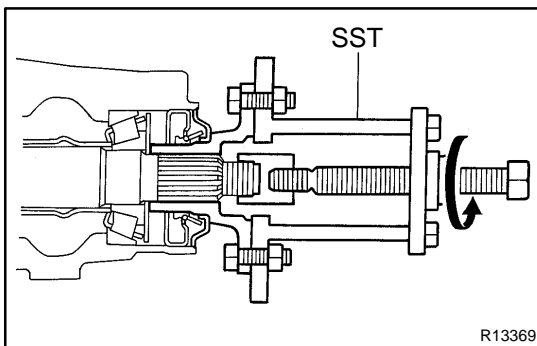
REPLACEMENT

1. REMOVE ENGINE UNDER COVER
2. DRAIN DIFFERENTIAL OIL
3. REMOVE FRONT PROPELLER SHAFT
(See page [PR-10](#))

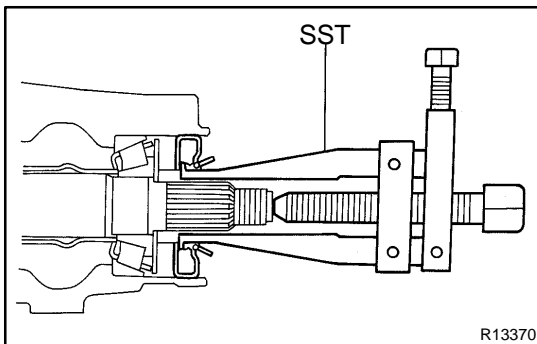


4. REMOVE COMPANION FLANGE

- (a) Using a chisel and hammer, loosen the staked part of the nut.
- (b) Using SST to hold the flange, remove the nut.
SST 09330-00021

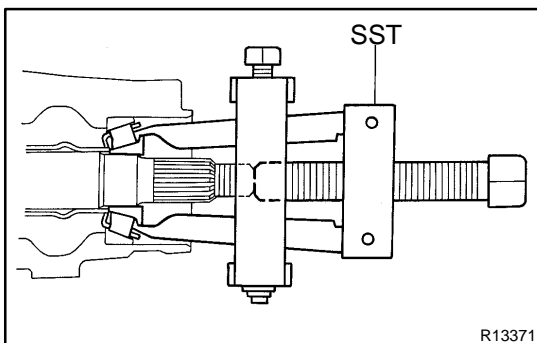


- (c) Using SST, remove the companion flange.
SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)

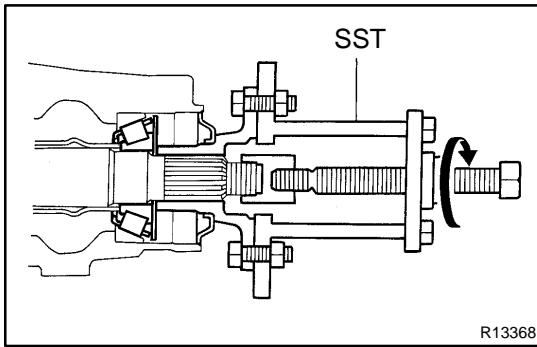


5. REMOVE OIL SEAL AND OIL SLINGER

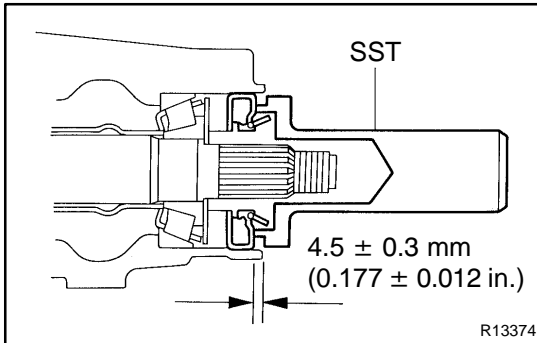
- (a) Using SST, remove the oil seal.
SST 09308-10010
- (b) Remove the oil slinger.



6. REMOVE REAR BEARING AND BEARING SPACER
 - (a) Using SST, remove the rear bearing from the drive pinion.
SST 09556-22010
 - (b) Remove the bearing spacer.
7. INSTALL BEARING SPACER, REAR BEARING AND OIL SLINGER
 - (a) Install a new bearing spacer and place the rear bearing and oil slinger.



- (b) Using SST and the companion flange, install the rear bearing, then remove the companion flange.
 SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



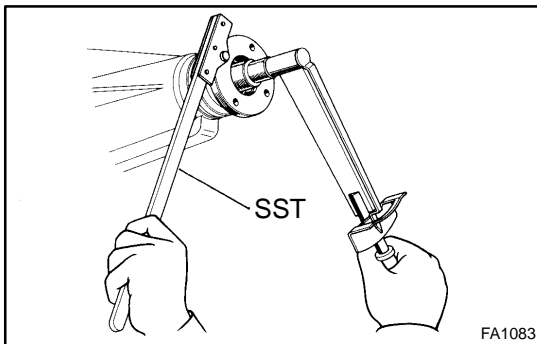
8. INSTALL OIL SEAL

- (a) Coat a new oil seal lip with MP grease.
 (b) Using SST and a hammer, install the oil seal.
 SST 09554-22010

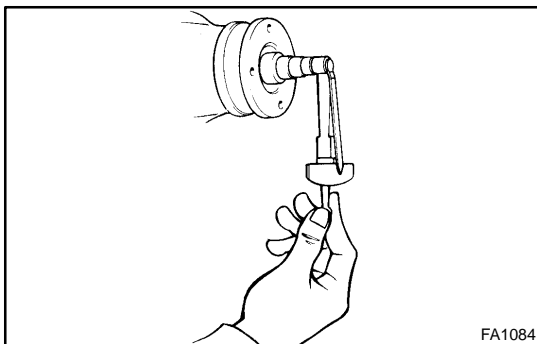
Oil seal drive in depth: 4.5 ± 0.3 mm (0.177 ± 0.012 in.)

9. INSTALL COMPANION FLANGE

- (a) Place the companion flange on the drive pinion.
 (b) Coat the threads of a new nut with hypoid gear oil.



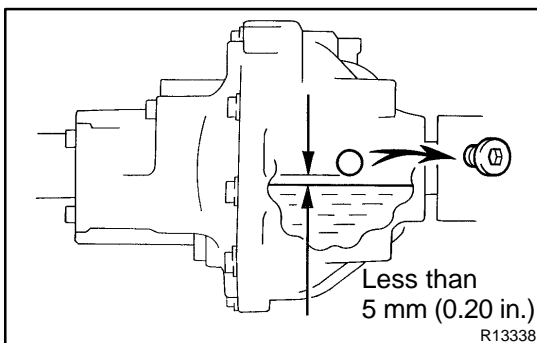
- (c) Using SST to hold the flange, torque the nut.
 SST 09330-00021
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)



10. ADJUST DRIVE PINION PRELOAD (See page SA-48)

11. STAKE DRIVE PINION NUT

12. INSTALL FRONT PROPELLER SHAFT (See page PR-15)



13. FILL DIFFERENTIAL WITH HYPOID GEAR OIL

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

Oil type: Hypoid gear oil API GL-5

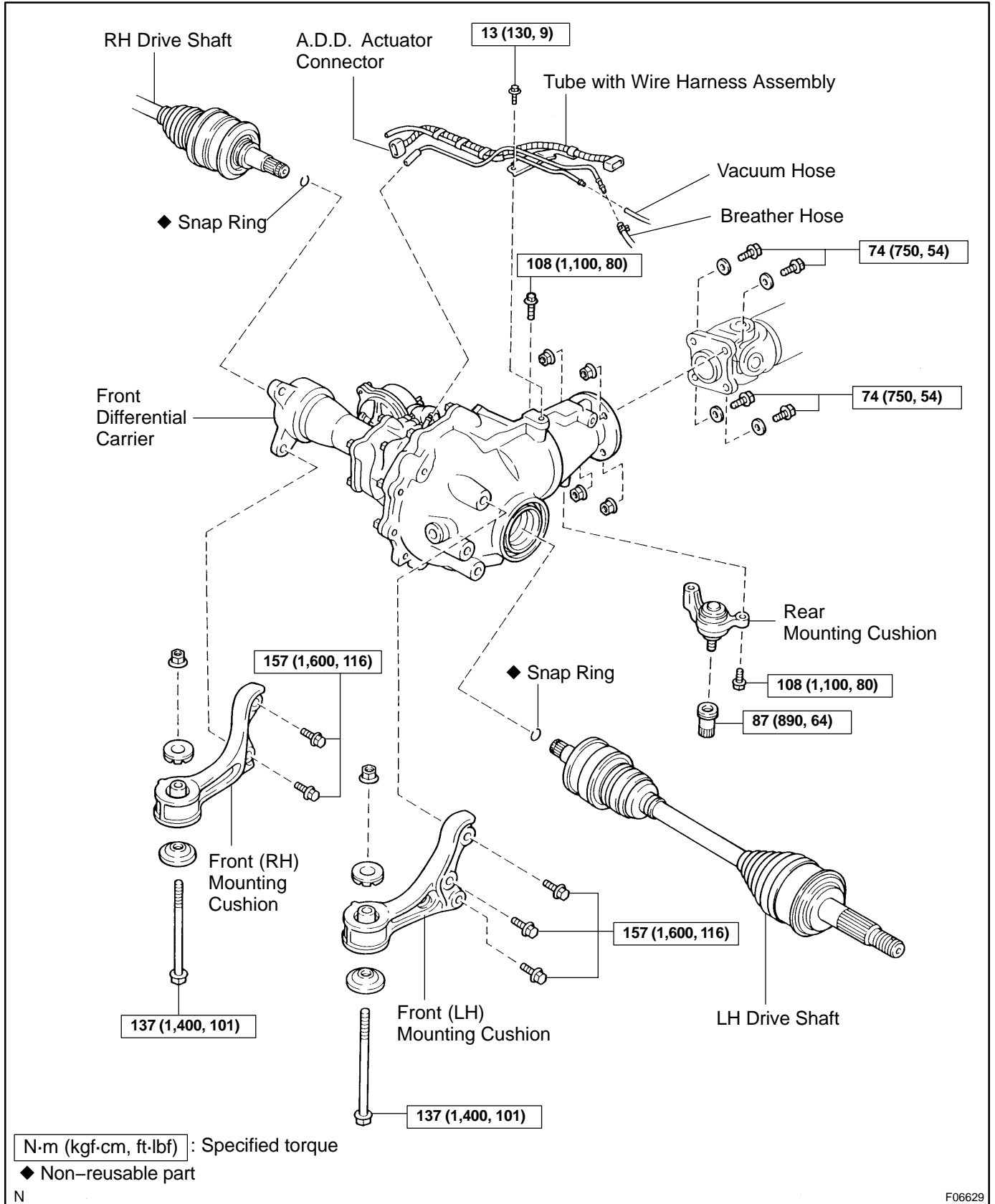
Recommended oil viscosity: SAE 75W-90

Capacity: 1.15 liters (1.22 US qts, 1.01 Imp. qts)

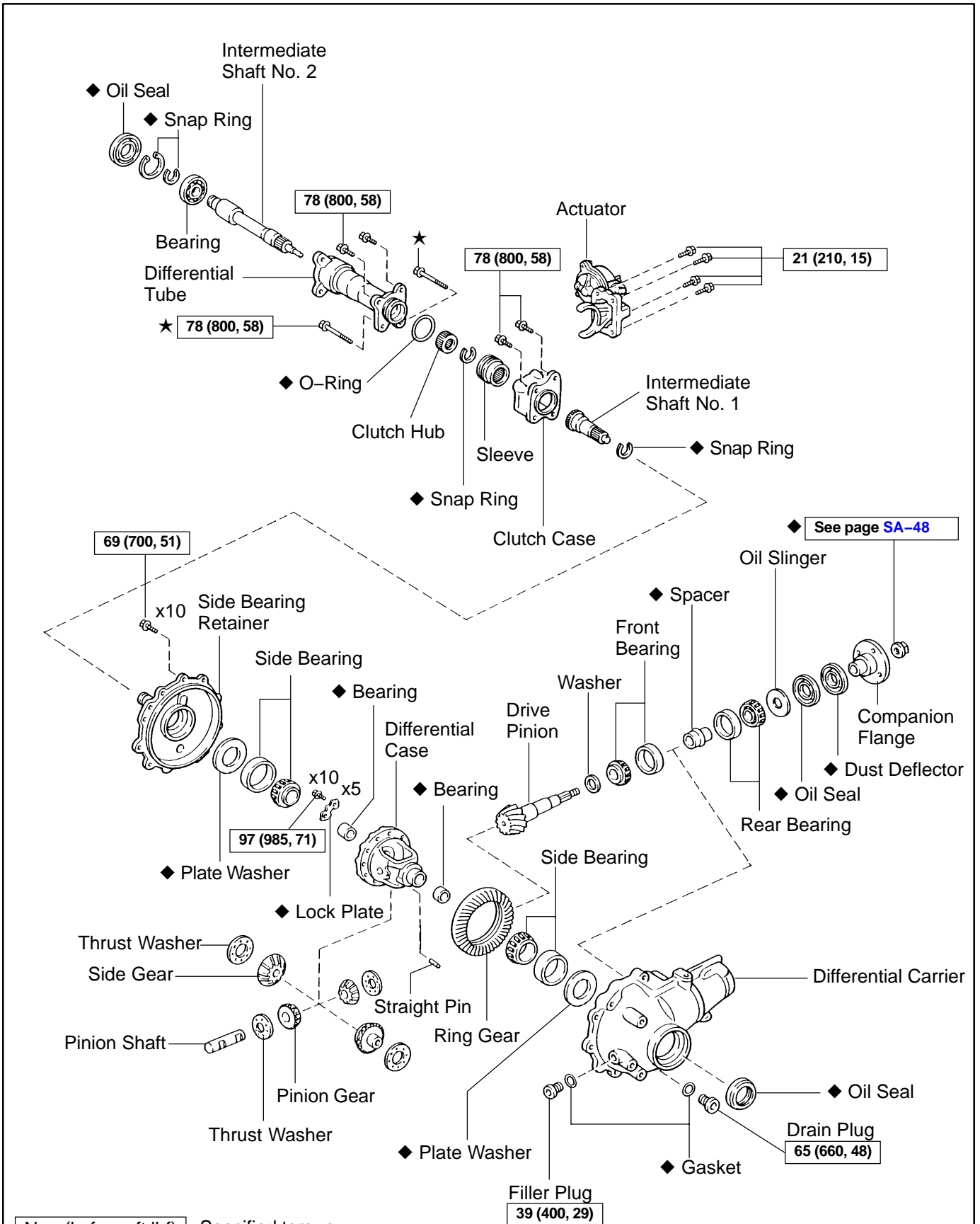
14. INSTALL ENGINE UNDER COVER

FRONT DIFFERENTIAL CARRIER COMPONENTS

SA09N-06



SUSPENSION AND AXLE - FRONT DIFFERENTIAL CARRIER



N-m (kgf-cm, ft-lbf) : Specified torque

- ◆ Non-reusable part
- ★ Precoated part

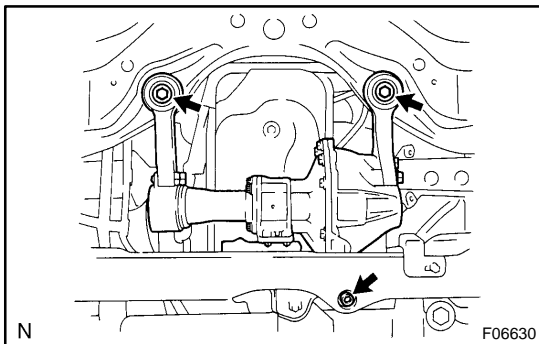
REMOVAL

1. DRAIN DIFFERENTIAL OIL
2. REMOVE DRIVE SHAFTS (See page SA-29)
3. DISCONNECT FRONT PROPELLER SHAFT
(See page PR-10)

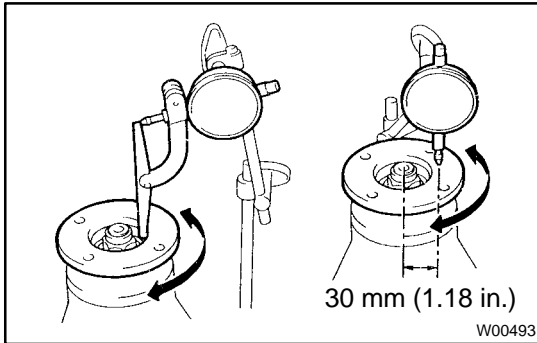
HINT:

Support the front propeller shaft securely.

4. REMOVE TUBE WITH WIRE HARNESS ASSEMBLY
 - (a) Disconnect the breather hose, vacuum hose and actuator connector.
 - (b) Remove the bolt and tube with wire harness assembly.
5. REMOVE FRONT DIFFERENTIAL CARRIER
 - (a) Support the front differential with a jack.



- (b) Using a hexagon (12 mm) wrench, remove the rear mounting nut.
- (c) Remove the 2 front mounting bolts.
- (d) Lower the jack and remove the front differential carrier.
6. REMOVE DIFFERENTIAL MOUNTING CUSHIONS
 - (a) Remove the 2 bolts and rear mounting cushion.
 - (b) Remove the 5 bolts and 2 front mounting cushions.



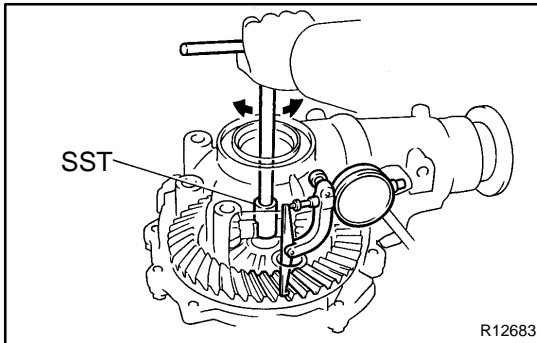
DISASSEMBLY

1. CHECK COMPANION FLANGE RUNOUT

Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum runout: 0.10 mm (0.0039 in.)

If the runout exceeds the maximum, replace the companion flange.



2. CHECK RING GEAR BACKLASH

Using SST and a dial indicator, measure the ring gear backlash.

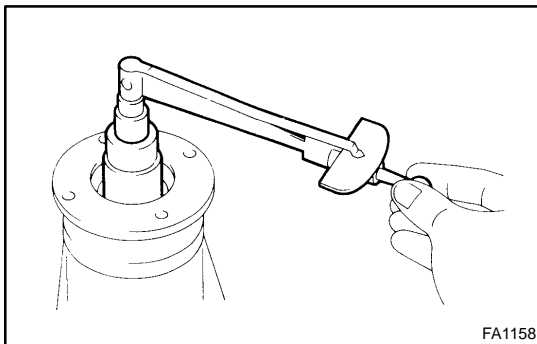
SST 09564-32011

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

HINT:

Measure at 3 or more points on the circumference of the ring gear.

If the backlash is not within the specified value, adjust the side bearing preload or repair as necessary.



3. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the preload using the backlash between the drive pinion and ring gear.

Preload (at starting):

0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.-lbf)

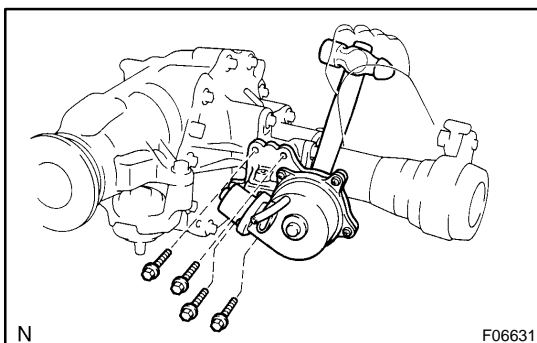
4. CHECK TOTAL PRELOAD

Using a torque wrench, measure the total preload with the teeth of the drive pinion and ring gear in contact.

Total preload (at starting):

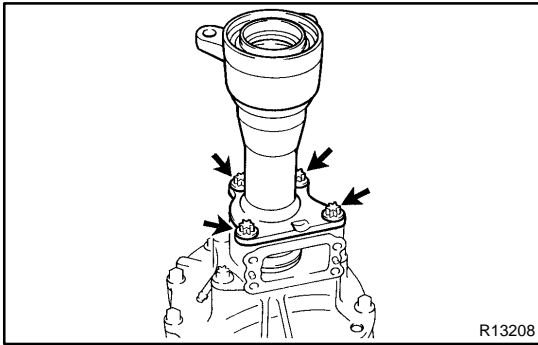
Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)

If necessary, disassemble and inspect the differential.



5. REMOVE A.D.D. ACTUATOR

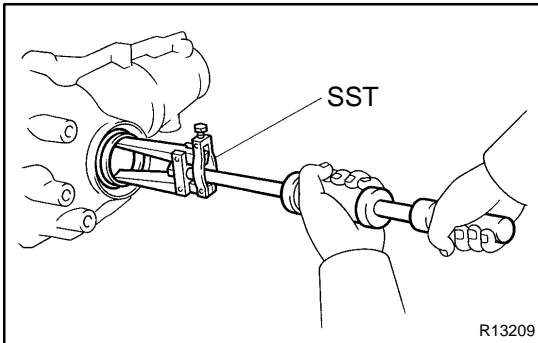
- (a) Remove the 4 bolts.
- (b) Using a hammer handle, remove the actuator.

**6. REMOVE DIFFERENTIAL TUBE**

- (a) Using a torx® socket (E14), remove the 4 torx® bolts.
- (b) Using a plastic hammer, tap on the differential tube to remove it.
- (c) Remove the sleeve.
- (d) Remove the O-ring from the differential tube.

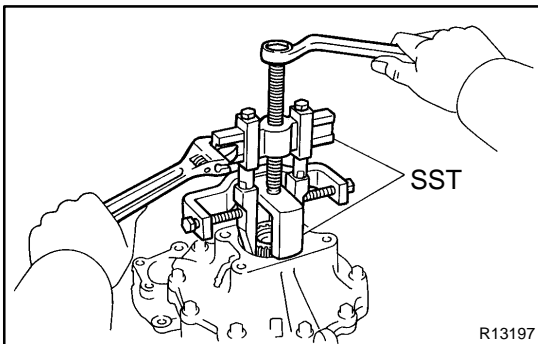
7. REMOVE CLUTCH CASE

- (a) Using a torx® socket (E14), remove the 2 torx® bolts.
- (b) Using a plastic hammer, tap on the clutch case to remove it.

**8. REMOVE SIDE OIL SEAL**

Using SST, remove the side oil seal.

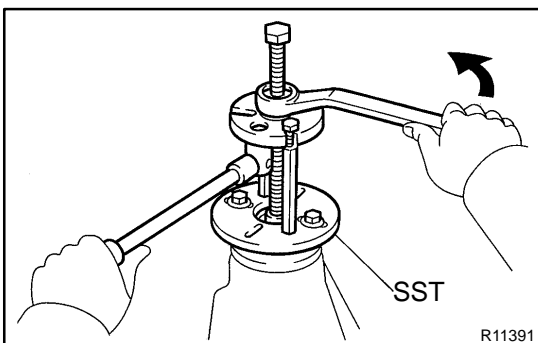
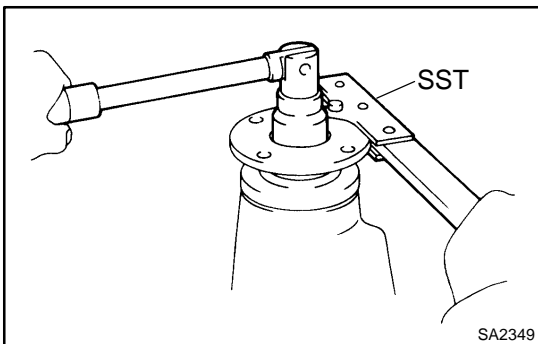
SST 09308-00010

**9. REMOVE INTERMEDIATE SHAFT NO. 1**

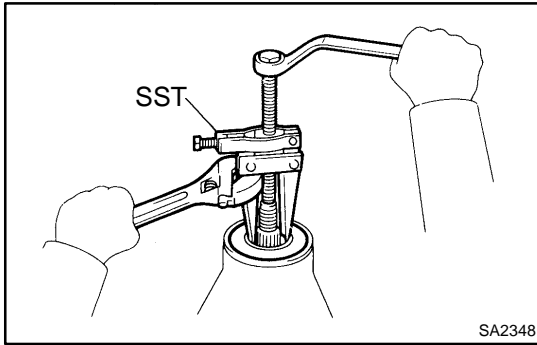
- (a) Using SST, remove the intermediate shaft No. 1.
SST 09350-20015 (09369-20040), 09950-40011
(09951-04010, 09952-04010, 09953-04020,
09954-04010, 09955-04011, 09957-04010,
09958-04011)
- (b) Remove the snap ring.

10. REMOVE COMPANION FLANGE

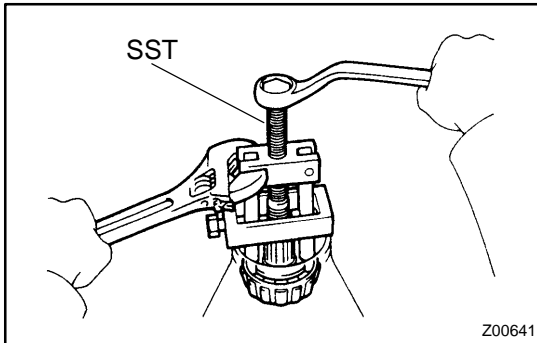
- (a) Using a chisel and hammer, unstake the nut.
- (b) Using SST to hold the flange, remove the nut.
SST 09330-00021



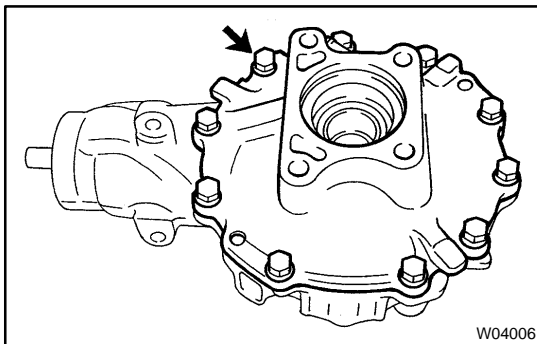
- (c) Using SST, remove the companion flange.
SST 09950-30012 (09951-03010, 09953-03010,
09954-03010, 09955-03030, 09956-03020)

**11. REMOVE OIL SEAL AND OIL SLINGER**

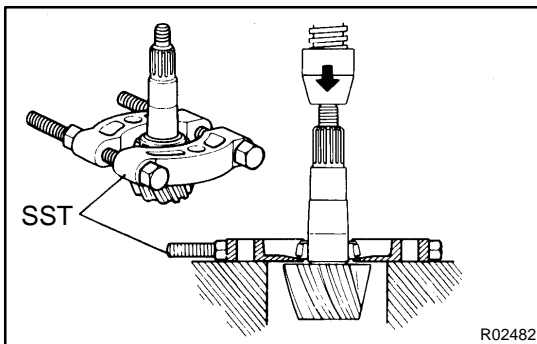
- (a) Using SST, remove the oil seal.
SST 09308-10010
- (b) Remove the oil slinger.

**12. REMOVE REAR BEARING AND BEARING SPACER**

- (a) Using SST, remove the rear bearing from the drive pinion.
SST 09556-22010
- (b) Remove the bearing spacer.

**13. REMOVE SIDE BEARING RETAINER**

Remove the 10 bolts and tap out the retainer with a plastic hammer.

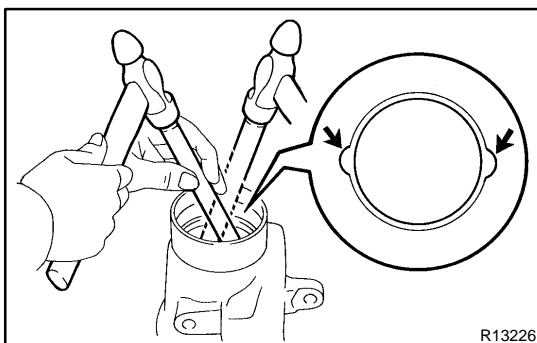
14. REMOVE DIFFERENTIAL CASE ASSEMBLY**15. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER****16. REMOVE DRIVE PINION FRONT BEARING**

Using SST and a press, remove the bearing and washer from the drive pinion.

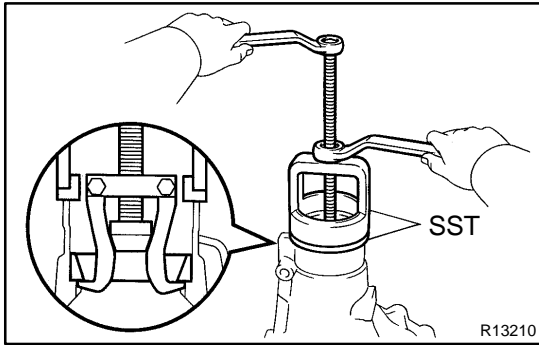
SST 09950-00020

HINT:

If the drive pinion or ring gear is damaged, replace them as a set.

**17. REMOVE DRIVE PINION BEARING OUTER RACES**

- (a) Using a brass bar and hammer, remove the front bearing outer race.

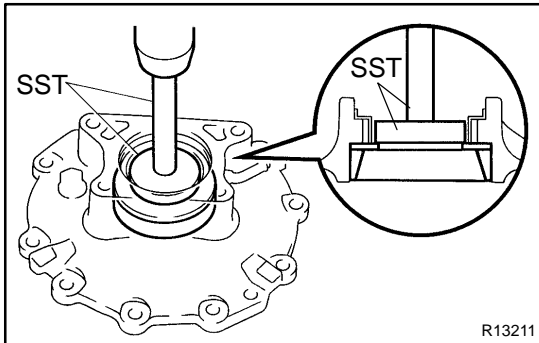


- (b) Using SST, remove the rear bearing outer race.
SST 09502-12010, 09612-65014 (09612-01020, 09612-01050)

18. REMOVE SIDE BEARING OUTER RACES

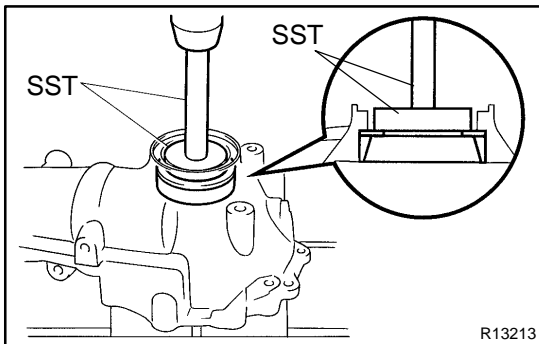
HINT:

- Measure the plate washer thickness and note it down.
- Tag the bearing outer races to show the location for reassembling.



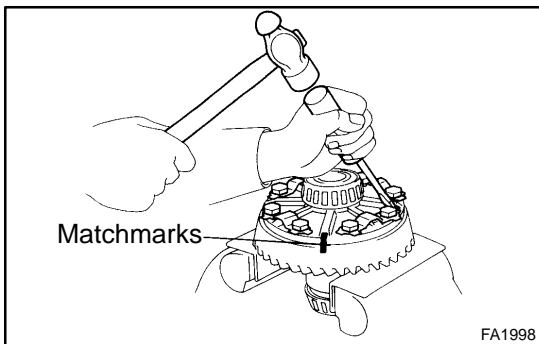
- (a) Using SST and a press, remove the plate washer and outer race from the bearing retainer.

SST 09950-60010 (09951-00540),
09950-70010 (09951-07150)



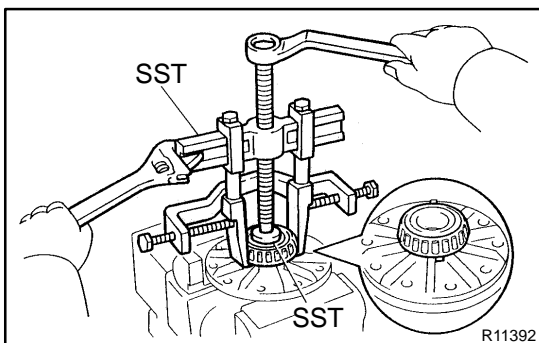
- (b) Using SST and a press, remove the plate washer and outer race from the differential carrier.

SST 09950-60010 (09951-00650),
09950-70010 (09951-07150)



19. REMOVE RING GEAR

- (a) Place matchmarks on the ring gear and differential case.
(b) Using a screwdriver and hammer, unstick the 5 lock plates.
(c) Remove the 10 bolts and 5 lock plates.
(d) Using a plastic hammer, tap on the ring gear to separate it from the differential case.



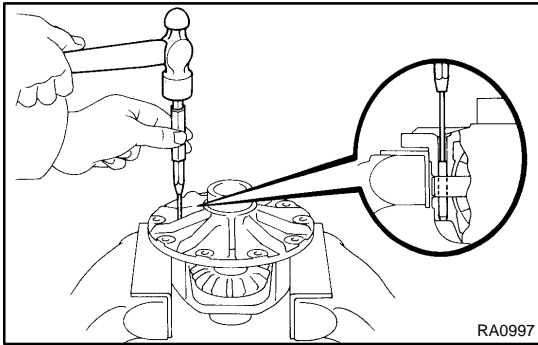
20. REMOVE SIDE BEARINGS

Using SST, remove the 2 side bearings from the differential case.

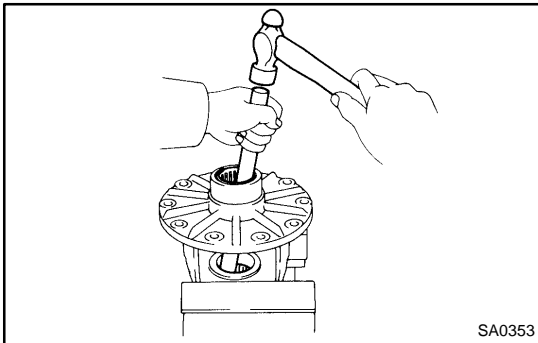
SST 09950-40011 (09951-04010, 09952-04010, 09953-04020, 09954-04010, 09955-04061, 09957-04010, 09958-04011),
09950-60010 (09951-00480)

HINT:

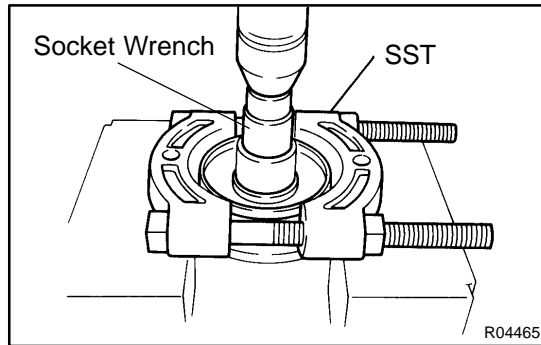
Fix the claws of SST to the notch in the differential case.



- 21. DISASSEMBLE DIFFERENTIAL CASE ASSEMBLY**
- (a) Using a pin punch and hammer, remove the straight pin.
 - (b) Remove the pinion shaft, 2 pinion gears, pinion gear thrust washers, side gears and side gear thrust washers from the differential case.



- 22. REMOVE BEARINGS**
- Using a brass bar and hammer, remove the 2 bearings.

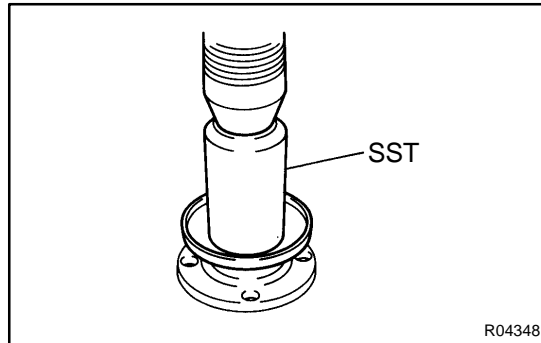


REPLACEMENT

1. REPLACE COMPANION FLANGE DUST DEFLECTOR, IF NECESSARY

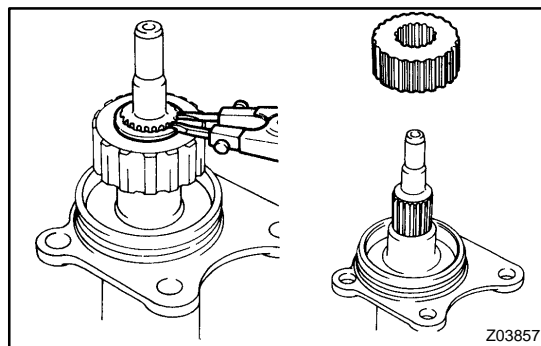
- (a) Using SST, a socket wrench and a press, remove the dust deflector.

SST 09950-00020



- (b) Using SST and a press, install a new dust deflector.

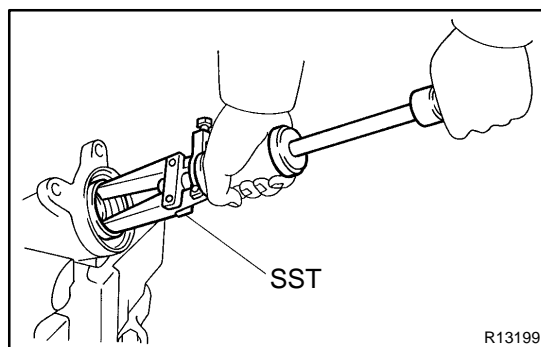
SST 09636-20010



2. REPLACE INTERMEDIATE SHAFT NO. 2, IF NECESSARY

- (a) Remove the clutch hub.

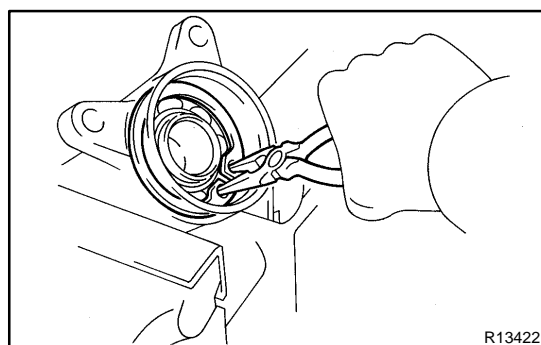
- (1) Using a snap ring expander, remove the snap ring.
- (2) Remove the clutch hub from the intermediate shaft No. 2.



- (b) Remove the oil seal.

Using SST, remove the oil seal from the tube.

SST 09308-00010



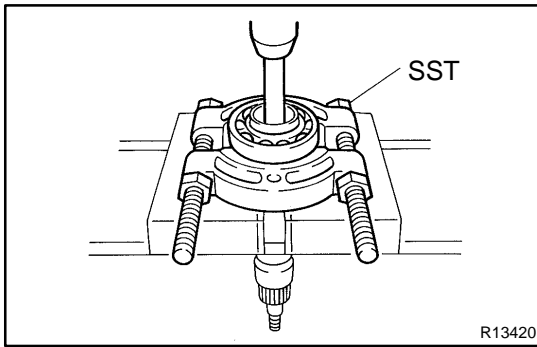
- (c) Remove the intermediate shaft No. 2 from the tube.

- (1) Using needle nose pliers, remove the snap ring.
- (2) Remove the shaft from the tube.

- (d) Remove the intermediate shaft No. 2 bearing.

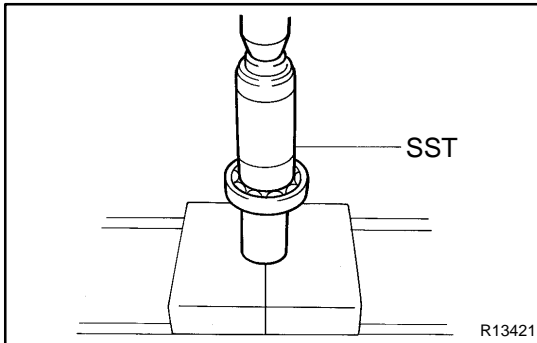
- (1) Using a snap ring expander, remove the snap ring.

SUSPENSION AND AXLE - FRONT DIFFERENTIAL CARRIER



- (2) Using SST, a brass bar and press, remove the bearing.

SST 09950-00020



- (e) Install a new intermediate shaft No. 2 bearing.

(1) Using SST and a press, install a new bearing.

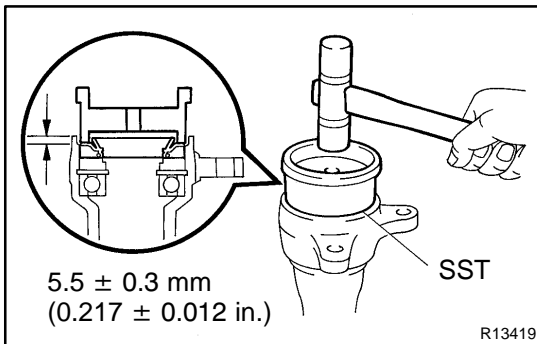
SST 09309-37010

(2) Using a snap ring expander, install a new snap ring.

- (f) Install the intermediate shaft No. 2 to the tube.

(1) Install the shaft into the tube.

(2) Using needle nose pliers, install a new snap ring.



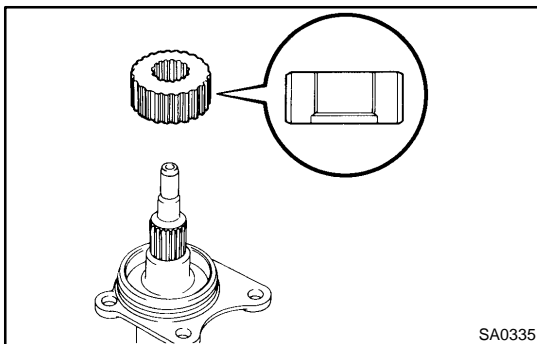
- (g) Install a new oil seal.

(1) Using SST and a plastic hammer, install a new oil seal.

SST 09223-15020

Oil seal drive in depth: 5.5 ± 0.3 mm (0.217 ± 0.012 in.)

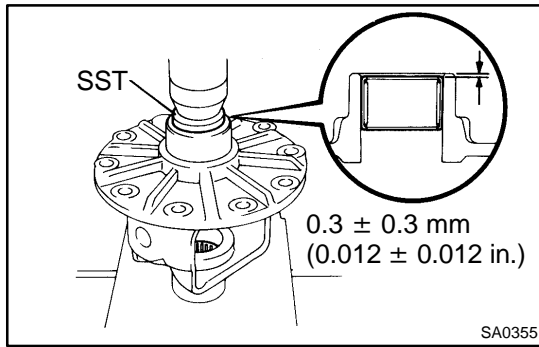
(2) Coat the oil seal lip with MP grease.



- (h) Install the clutch hub.

(1) Install the clutch hub to the shaft.

(2) Using a snap ring expander, install a new snap ring.



REASSEMBLY

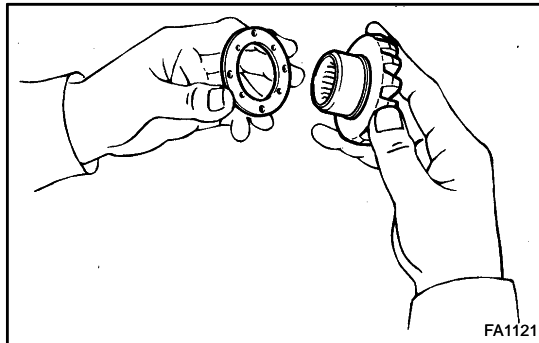
1. INSTALL NEW BEARINGS

Using SST and a press, install 2 new bearings.

SST 09950-60010 (09951-00380)

Bearing press in depth:

0.3 ± 0.3 mm (0.012 ± 0.012 in.)



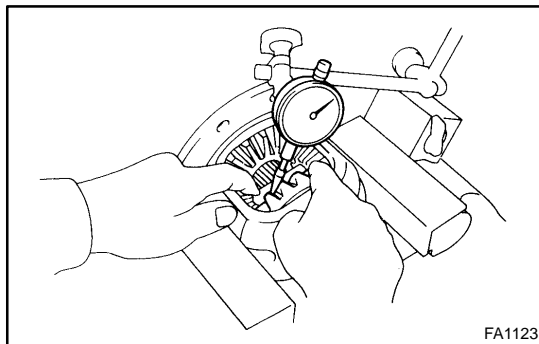
2. ASSEMBLE DIFFERENTIAL CASE

(a) Install the 2 thrust washers on the side gears.

(b) Install the 2 side gears, pinion gears, pinion gear thrust washers and pinion shaft in the differential case.

HINT:

Align the holes for the straight pin in the differential case and pinion shaft.



(c) Using a dial indicator, measure the side gear backlash while holding one pinion gear toward the differential case.

Backlash: 0 - 0.20 mm (0 - 0.0079 in.)

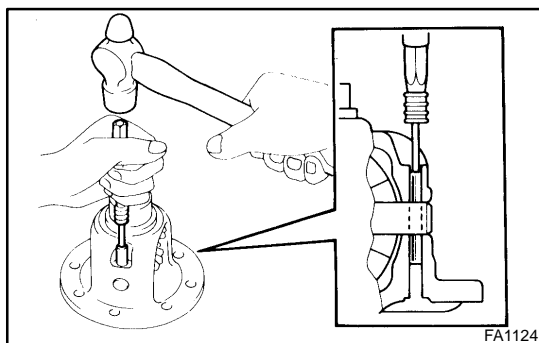
If the backlash is not within the specified value, replace the side gear thrust washer with an appropriate thickness.

HINT:

Refer to the following table to select thrust washers which will ensure that the backlash is within the specified value.

Washer thickness:

Thickness mm (in.)	Thickness mm (in.)
0.96 - 1.04 (0.0378 - 0.0409)	1.16 - 1.24 (0.0457 - 0.0488)
1.06 - 1.14 (0.0417 - 0.0449)	1.26 - 1.34 (0.0496 - 0.0528)



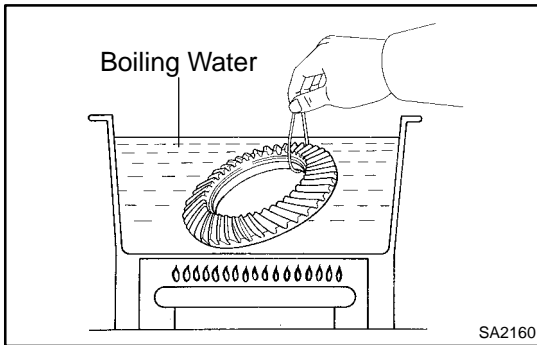
3. INSTALL STRAIGHT PIN AND STAKE DIFFERENTIAL CASE

(a) Using a pin punch and hammer, install the straight pin through the differential case and hole in the pinion shaft.

(b) Stake the differential case.

4. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surfaces of the differential case and ring gear.



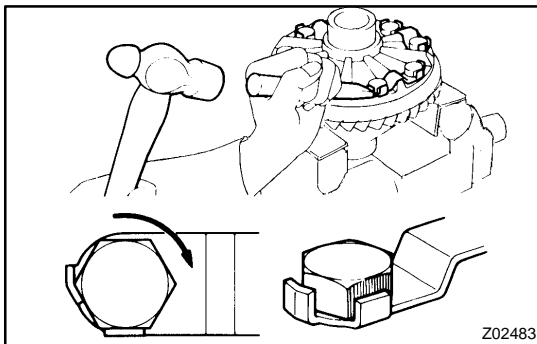
- (b) Heat the ring gear to about 100°C (212°F) in boiling water.
- (c) Carefully take the ring gear out of the boiling water.
- (d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.

HINT:

Align the matchmarks on the ring gear and differential case.

- (e) Temporarily install 5 new lock plates and 10 bolts so that the bolt holes in the ring gear and differential case are aligned.
- (f) After the ring gear has cooled sufficiently, torque the ring gear set bolts.

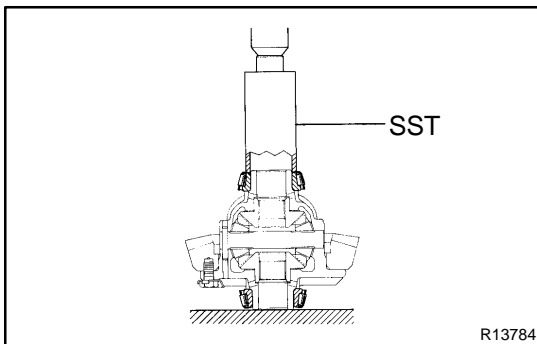
Torque: 97 N·m (985 kgf·cm, 71 ft·lbf)



- (g) Using a chisel and hammer, stake the 5 lock plates.

HINT:

Stake the claws of the lock plates to fix the bolts. For the claw contacting the protruding portion of the bolt, stake only the half of it along the tightening direction.

**5. INSTALL SIDE BEARINGS**

Using SST and a press, install the bearings into the differential case.

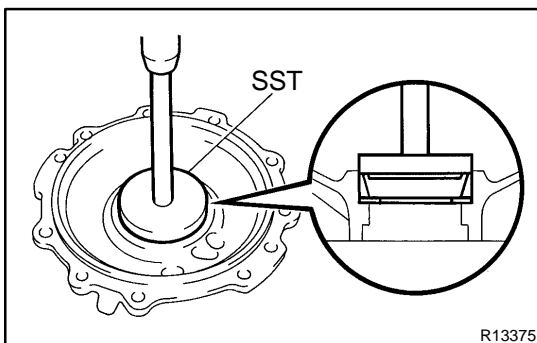
SST 09226-10010

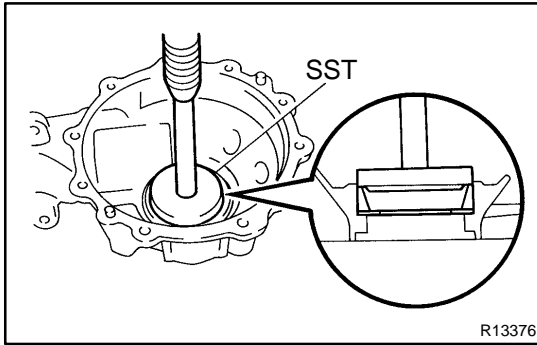
6. INSTALL SIDE BEARING OUTER RACES

If replacing the side bearings, fit the thinnest new plate washers to each bearing outer race.

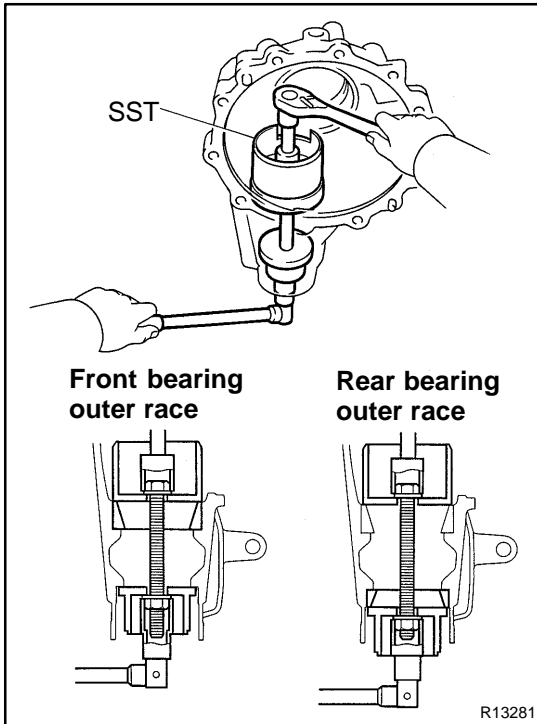
If reusing the bearings, fit the new washers with the same thickness as removed.

- (a) Install a new plate washer to the side bearing retainer.
- (b) Using SST and a press, install the bearing outer race.
SST 09950-60020 (09951-00790),
09950-70010 (09951-07150)
- (c) Install a new plate washer to the differential carrier.





- (d) Using SST and a press, install the bearing outer race.
 SST 09950-60020 (09951-00790),
 09950-70010 (09951-07150)



7. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES

Using SST, install the 2 outer races.

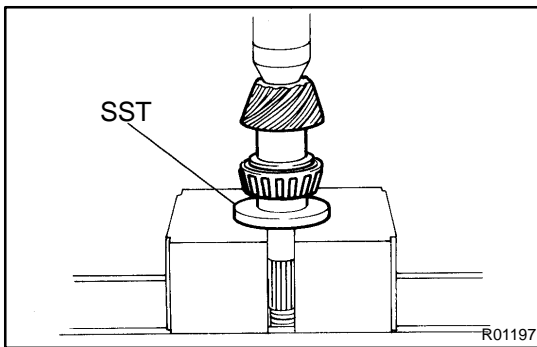
SST 09570-22011

8. INSTALL DRIVE PINION FRONT BEARING

- (a) Install the washer on the drive pinion.

HINT:

First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with one of a different thickness if necessary.



- (b) Using SST and a press, install the front bearing onto the drive pinion.

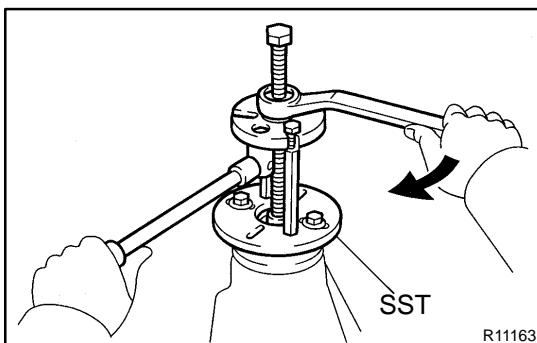
SST 09506-30012

9. TEMPORARILY ADJUST DRIVE PINION PRELOAD

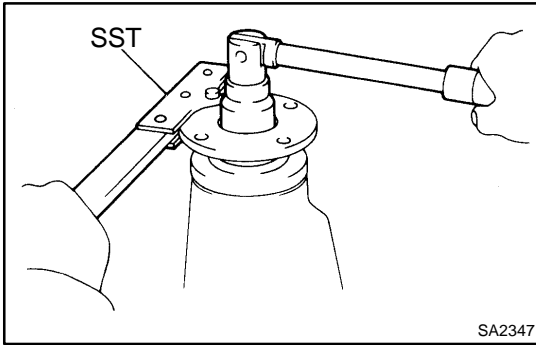
- (a) Install the drive pinion, rear bearing and oil slinger.

HINT:

After adjusting the ring gear tooth contact pattern, assemble the spacer and oil seal.



- (b) Using SST, install the companion flange.
 SST 09950-30012 (09951-03010, 09953-03010,
 09954-03010, 09955-03030, 09956-03020)
- (c) Coat the threads of the nut with hypoid gear oil.



(d) Using SST to hold the flange, tighten the nut.

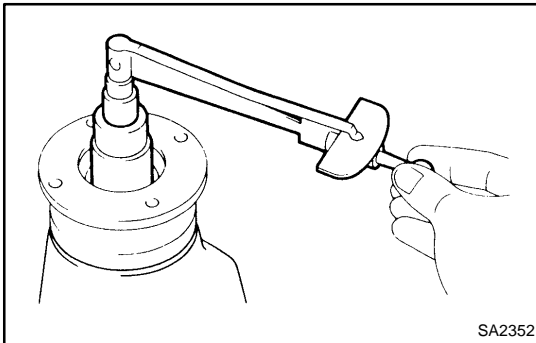
HINT:

Adjust the drive pinion preload by tightening the companion flange nut.

SST 09330-00021

NOTICE:

As there is no spacer, tighten the nut a little at a time and be careful not to overtighten it.



(e) Using a torque wrench, measure the preload of the drive pinion using the backlash between the drive pinion and ring gear.

Preload (at starting):

New bearing

1.2 – 1.9 N·m (12 – 19 kgf·cm, 10.4 – 16.5 in.-lbf)

Reused bearing

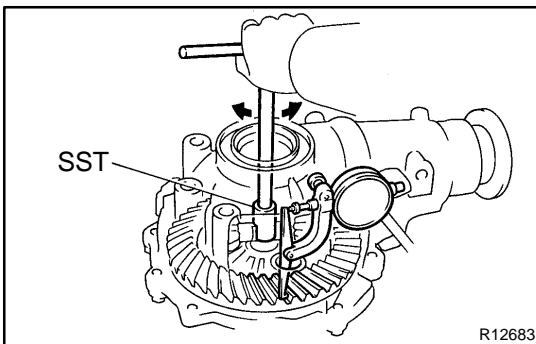
0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.-lbf)

10. INSTALL DIFFERENTIAL CASE IN DIFFERENTIAL CARRIER

11. ADJUST RING GEAR BACKLASH

(a) Install the side bearing retainer with the 10 bolts.

Torque: 69 N·m (700 kgf·cm, 51 ft-lbf)



(b) Using SST and a dial indicator, measure the ring gear backlash.

SST 09564-32011

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within the specified value, adjust it by either increasing or decreasing the thickness of plate washers on both sides by an equal amount.

HINT:

There should be no clearance between the plate washer and case. Ensure that there is ring gear backlash.

Washer thickness:

Thickness mm (in.)	Thickness mm (in.)	Thickness mm (in.)
2.00 – 2.02 (0.0787 – 0.0795)	2.27 – 2.29 (0.0894 – 0.0902)	2.54 – 2.56 (0.1000 – 0.1008)
2.03 – 2.05 (0.0799 – 0.0807)	2.30 – 2.32 (0.0906 – 0.0913)	2.57 – 2.59 (0.1012 – 0.1020)
2.06 – 2.08 (0.0811 – 0.0819)	2.33 – 2.35 (0.0917 – 0.0925)	2.60 – 2.62 (0.1024 – 0.1031)
2.09 – 2.11 (0.0823 – 0.0831)	2.36 – 2.38 (0.0929 – 0.0937)	2.63 – 2.65 (0.1035 – 0.1043)
2.12 – 2.14 (0.0835 – 0.0843)	2.39 – 2.41 (0.0941 – 0.0949)	2.66 – 2.68 (0.1047 – 0.1055)
2.15 – 2.17 (0.0846 – 0.0854)	2.42 – 2.44 (0.0953 – 0.0961)	2.69 – 2.71 (0.1059 – 0.1067)
2.18 – 2.20 (0.0858 – 0.0866)	2.45 – 2.47 (0.0965 – 0.0972)	2.72 – 2.74 (0.1071 – 0.1079)
2.21 – 2.23 (0.0870 – 0.0878)	2.48 – 2.50 (0.0976 – 0.0984)	2.75 – 2.77 (0.1083 – 0.1091)
2.24 – 2.26 (0.0882 – 0.0890)	2.51 – 2.53 (0.0988 – 0.0996)	2.78 – 2.80 (0.1094 – 0.1102)

12. MEASURE TOTAL PRELOAD

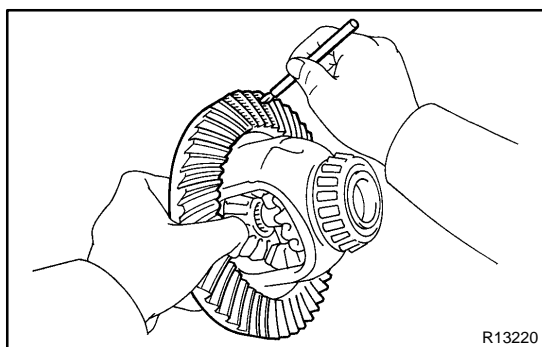
Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

Total preload (at starting):

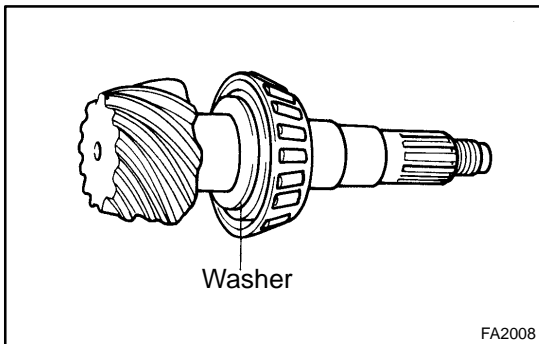
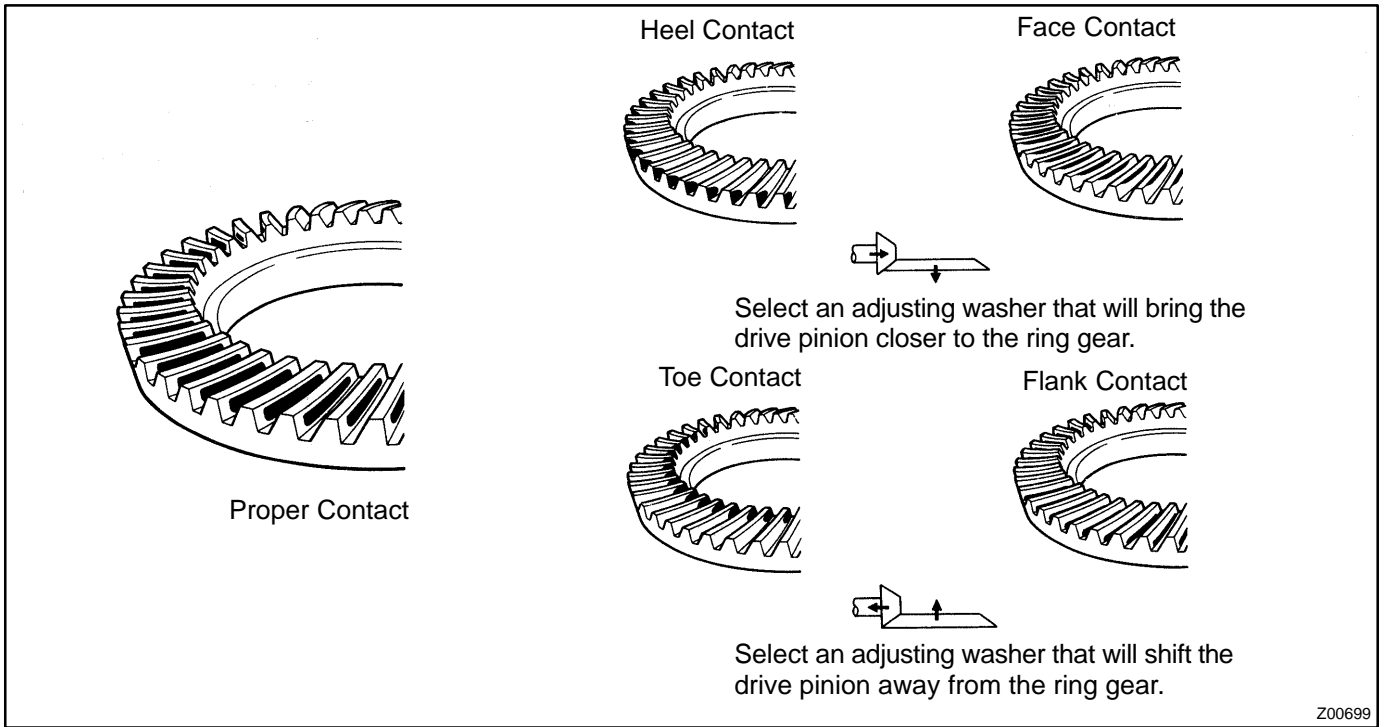
Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)

13. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

- (a) Remove the 10 bolts, side bearing retainer and differential case.



- (b) Coat 3 or 4 teeth at three different positions on the ring gear with red lead primer.
- (c) Install the differential case and side bearing retainer with the 10 bolts.
- Torque: 69 N·m (700 kgf·cm, 51 ft-lbf)**
- (d) Hold the companion flange firmly and rotate the ring gear in both directions.
- (e) Remove the 10 bolts, side bearing retainer and differential case.
- (f) Inspect the tooth contact pattern.

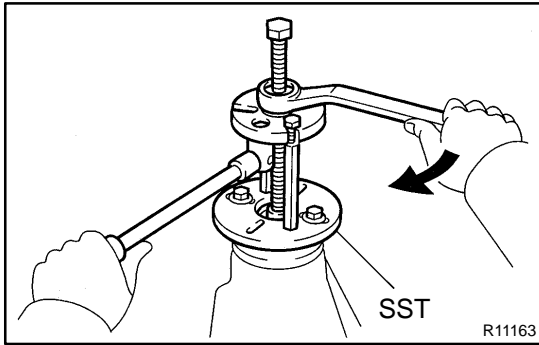


If the teeth are not contacting properly, use the following table to select a proper washer for correction.

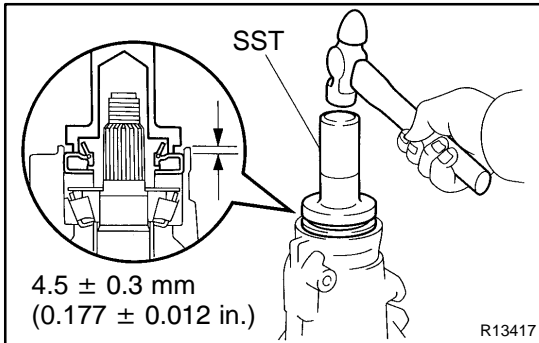
Washer thickness:

Thickness mm (in.)	Thickness mm (in.)	Thickness mm (in.)
1.69 - 1.71 (0.0665 - 0.0673)	1.93 - 1.95 (0.0760 - 0.0768)	2.17 - 2.19 (0.0854 - 0.0862)
1.72 - 1.74 (0.0677 - 0.0685)	1.96 - 1.98 (0.0772 - 0.0780)	2.20 - 2.22 (0.0866 - 0.0874)
1.75 - 1.77 (0.0689 - 0.0697)	1.99 - 2.01 (0.0783 - 0.0791)	2.23 - 2.25 (0.0878 - 0.0886)
1.78 - 1.80 (0.0701 - 0.0709)	2.02 - 2.04 (0.0795 - 0.0803)	2.26 - 2.28 (0.0890 - 0.0898)
1.81 - 1.83 (0.0713 - 0.0720)	2.05 - 2.07 (0.0807 - 0.0815)	2.29 - 2.31 (0.0902 - 0.0909)
1.84 - 1.86 (0.0724 - 0.0732)	2.08 - 2.10 (0.0819 - 0.0827)	2.32 - 2.34 (0.0913 - 0.0921)
1.87 - 1.89 (0.0736 - 0.0744)	2.11 - 2.13 (0.0831 - 0.0839)	-
1.90 - 1.92 (0.0748 - 0.0756)	2.14 - 2.16 (0.0843 - 0.0850)	-

14. REMOVE COMPANION FLANGE AND OIL SLINGER (See page SA-41)
15. REMOVE REAR BEARING (See page SA-41)
16. INSTALL NEW BEARING SPACER, REAR BEARING AND OIL SLINGER
 - (a) Install a new bearing spacer and place the rear bearing and oil slinger.



- (b) Using SST and the companion flange, install the rear bearing, then remove the companion flange.
 SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



17. INSTALL OIL SEAL

- (a) Using SST and a hammer, install a new oil seal.

SST 09554-22010

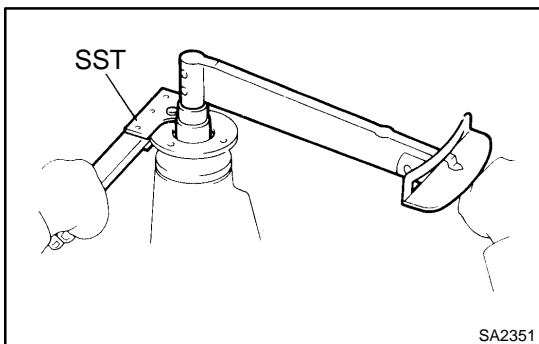
Oil seal drive in depth: 4.5 ± 0.3 mm (0.177 ± 0.012 in.)

- (b) Coat the oil seal lip with MP grease.

18. INSTALL COMPANION FLANGE

- (a) Place the companion flange on the drive pinion.

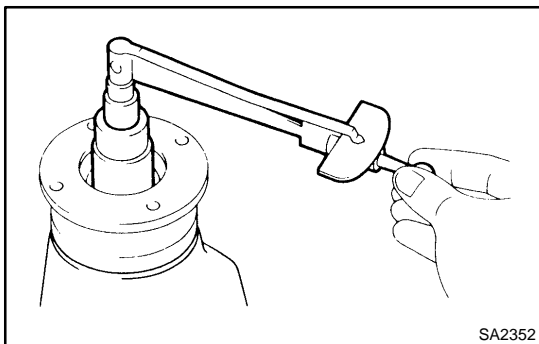
- (b) Coat the threads of a new nut with hypoid gear oil.



- (c) Using SST to hold the flange, torque the nut.

SST 09330-00021

Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)



19. ADJUST DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of the drive pinion using the backlash between the drive pinion and the ring gear.

Preload (at starting):

New bearing

1.2 – 1.9 N·m (12 – 19 kgf·cm, 10.4 – 16.5 in.-lbf)

Reused bearing

0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.-lbf)

If the preload is greater than the specified value, replace the bearing spacer.

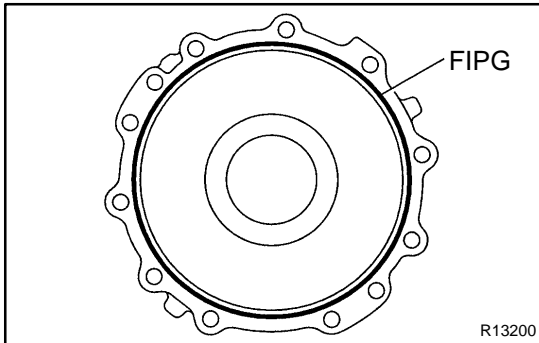
If the preload is less than the specified value, retighten the nut with 13 N·m (130 kgf·cm, 9 ft·lbf) of torque until the specified preload is reached.

Torque: 223 N·m (2,275 kgf·cm, 165 ft·lbf) or less

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload adjusting procedure. Do not loosen the nut to reduce the preload.

20. INSTALL DIFFERENTIAL CASE**21. INSTALL SIDE BEARING RETAINER**

- (a) Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential carrier and side bearing retainer.
- (b) Clean both installation surfaces of loose FIPG and oil material with gasoline or alcohol.



- (c) Apply FIPG to the side bearing retainer, as shown in the illustration.

FIPG:

Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT:

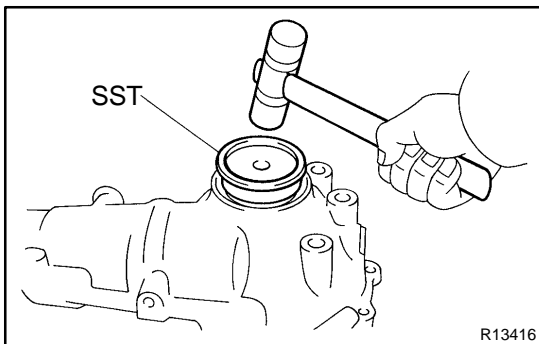
Install the side bearing retainer within 10 minutes after applying FIPG.

- (d) Install the side bearing retainer with the 10 bolts.

Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

22. CHECK TOTAL PRELOAD (See step 12.)**23. RECHECK RING GEAR BACKLASH**

(See page [SA-41](#))

24. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 13.)**25. CHECK COMPANION FLANGE RUNOUT (See page [SA-41](#))****26. STAKE DRIVE PINION NUT****27. INSTALL SIDE OIL SEAL**

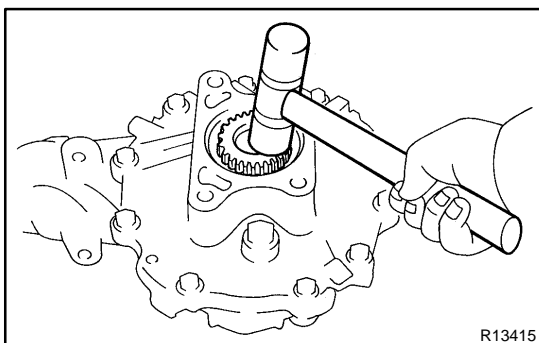
- (a) Using SST and a plastic hammer, install a new oil seal until its surface is flush with the differential carrier end.

SST 09608-32010

- (b) Coat the oil seal lip with MP grease.

28. INSTALL INTERMEDIATE SHAFT NO. 1

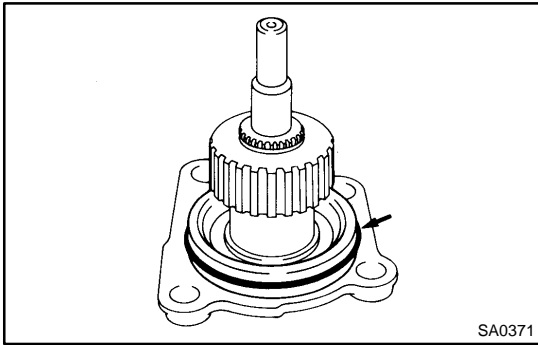
- (a) Install a new snap ring to the shaft.



- (b) Using a plastic hammer, install the shaft to the differential case.

- (c) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in the axial direction.

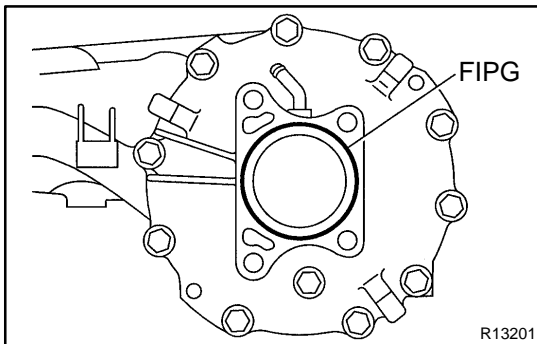
- (d) Check that the intermediate shaft will not come out by trying to pull it completely out by hand.

**29. INSTALL CLUTCH CASE TO DIFFERENTIAL TUBE**

- (a) Install a new O-ring to the tube.
- (b) Coat the O-ring with MP grease.
- (c) Install the clutch case to the tube.
- (d) Using a torx® socket (E14), torque the 2 torx® bolts.
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

30. INSTALL CLUTCH SLEEVE**31. INSTALL DIFFERENTIAL TUBE TO DIFFERENTIAL**

- (a) Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential and clutch case.
- (b) Clean both installation surfaces of loose FIPG and oil material with gasoline or alcohol.



- (c) Apply FIPG to the differential, as shown in the illustration.

FIPG:

Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT:

Install the differential tube within 10 minutes after applying FIPG.

- (d) Install the differential tube to the differential.
- (e) Clean the threads of the 2 long torx® bolts and retainer bolt holes with toluene or trichlorethylene.
- (f) Apply adhesive to 2 or 3 threads of the long bolts end.

Adhesive:

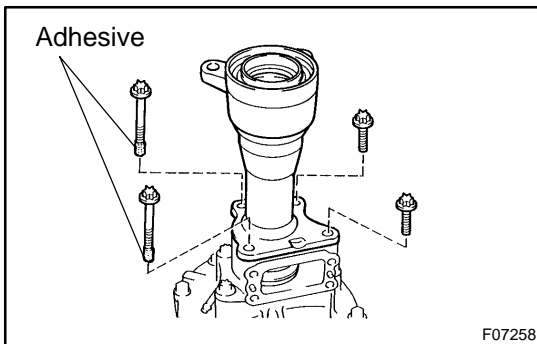
Part No. 08833-00070, THREE BOND 1324 or equivalent

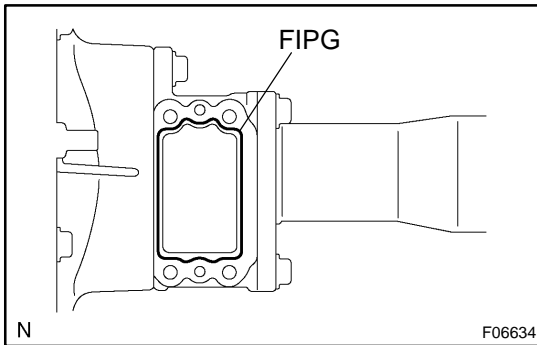
- (g) Using torx® socket (E14), torque the 4 torx® bolts.

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

32. INSTALL A.D.D. ACTUATOR

- (a) Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the actuator and clutch case.
- (b) Clean both installation surfaces of loose FIPG and oil material with gasoline or alcohol.





- (c) Apply FIPG to the clutch case, as shown in the illustration.

FIPG:

Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT:

Install the actuator within 10 minutes after applying FIPG.

- (d) Install the A.D.D. actuator with the 4 bolts.

Torque: 21 N·m (210 kgf-cm, 15 ft·lbf)

INSTALLATION

1. INSTALL DIFFERENTIAL MOUNTING CUSHIONS

- (a) Install the 2 front mounting cushions with the 5 bolts.

Torque: 157 N·m (1,600 kgf·cm, 116 ft·lbf)

- (b) Install the rear mounting cushion with the 2 bolts.

Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)

2. INSTALL FRONT DIFFERENTIAL CARRIER

- (a) Jack up the front differential.

- (b) Install the 2 front mounting bolts.

Torque: 137 N·m (1,400 kgf·cm, 101 ft·lbf)

- (c) Using a hexagon (12 mm) wrench, install the rear mounting nut.

Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)

- (d) Remove the jack.

3. INSTALL TUBE WITH WIRE HARNESS ASSEMBLY

- (a) Install the tube with wire harness assembly with the bolt.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (b) Connect the actuator connector, vacuum hose and breather hose.

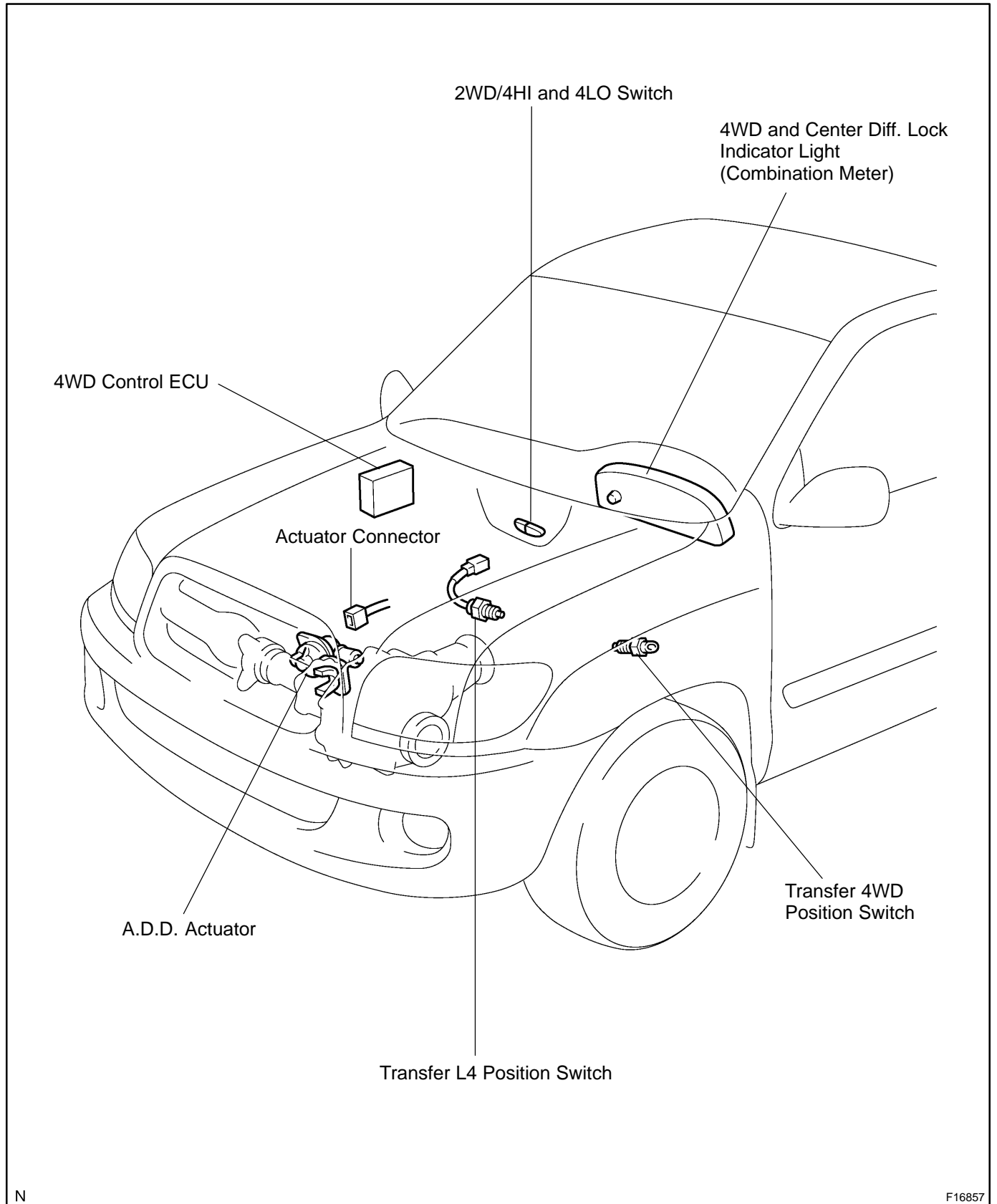
4. CONNECT FRONT PROPELLER SHAFT (See page [PR-15](#))

5. INSTALL DRIVE SHAFTS (See page [SA-34](#))

6. FILL DIFFERENTIAL WITH HYPOID GEAR OIL (See page [SA-36](#))

A.D.D. CONTROL SYSTEM LOCATION

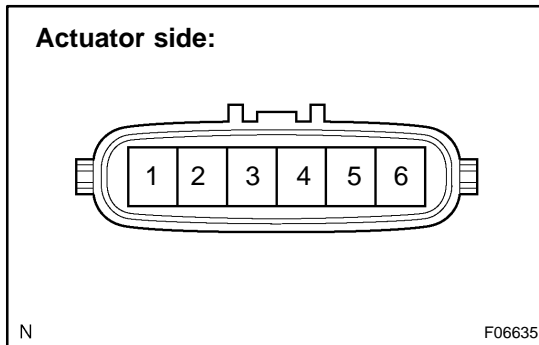
SA0BF-07



INSPECTION

1. INSPECT A.D.D. ACTUATOR

- (a) Disconnect the actuator connector.



- (b) Measure the resistance between terminals 2 and 6.
Standard resistance: 0.3 – 100 Ω
- (c) Measure the resistance between terminal 2 or 6 and body ground.
Standard resistance: More than 0.5 MΩ

If the resistance value is not as specified, replace the actuator assembly.

2. INSPECT A.D.D. ACTUATOR OPERATION

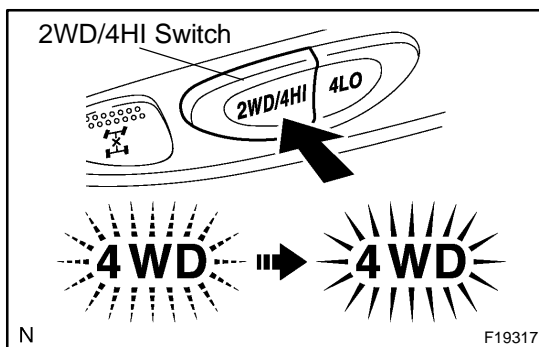
Apply battery positive voltage between terminals 2 and 6, and check the actuator operation by sound, A.D.D. status and continuity between terminals 3 and 4.

Battery voltage applied terminal	3 – 4 terminals continuity	A.D.D. status
2 (+) – 6 (-)	Continuity	Connected
2 (-) – 6 (+)	No continuity	Disconnected

If the operation is not as specified, replace the actuator assembly.

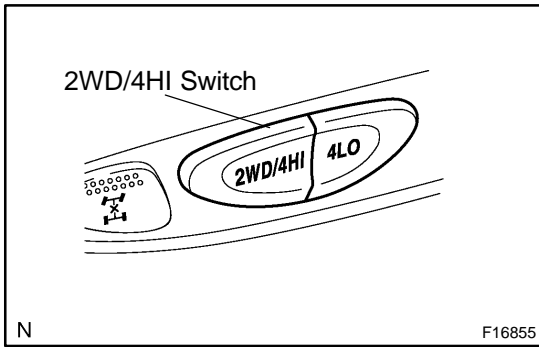
3. INSPECT LIMIT SWITCH CONTINUITY

- (a) Connect the actuator connector.
- (b) Push the 2WD/4HI switch and check that the 4WD indicator light comes on after it is blinking.
- (c) Check the A.D.D. actuator operation by sound.
- (d) Disconnect the actuator connector.
- (e) Check the continuity between each terminal, as shown in the chart.



Tester connected terminal number	Specified condition
1 – 3	No continuity
1 – 4	No continuity
3 – 5	Continuity
4 – 5	No continuity

- (f) Connect the actuator connector.



- (g) Push the 2WD/4HI switch and check that the 4WD indicator light goes off after it is blinking.
- (h) Check the A.D.D. actuator operation by sound.
- (i) Disconnect the actuator connector.
- (j) Check the continuity between each terminal, as shown in the chart.

Tester connected terminal number	Specified condition
1 - 3	Continuity
1 - 4	No continuity
3 - 5	No continuity
4 - 5	No continuity

- (k) Connect the actuator connector.

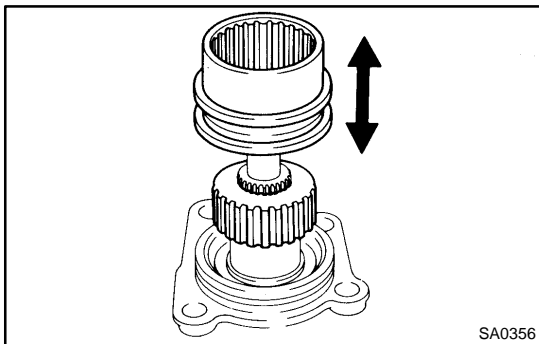
4. INSPECT TRANSFER 4WD POSITION SWITCH
(See page [TR-14](#))

5. REMOVE A.D.D. ACTUATOR (See page [SA-41](#))

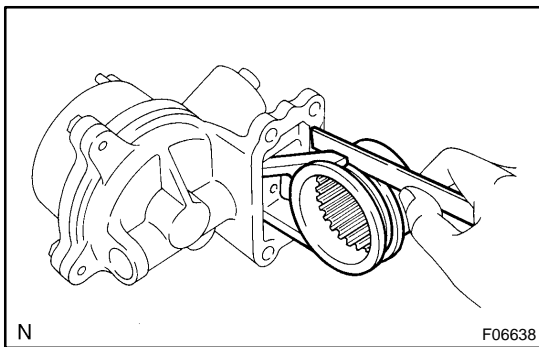
6. INSPECT CLUTCH HUB AND CLUTCH SLEEVE

- (a) Check the clutch hub and clutch sleeve for wear and damage.

If necessary, replace them.



- (b) Check that clutch sleeve slides smoothly on the clutch hub.



7. MEASURE SLEEVE FORK AND CLUTCH SLEEVE CLEARANCE

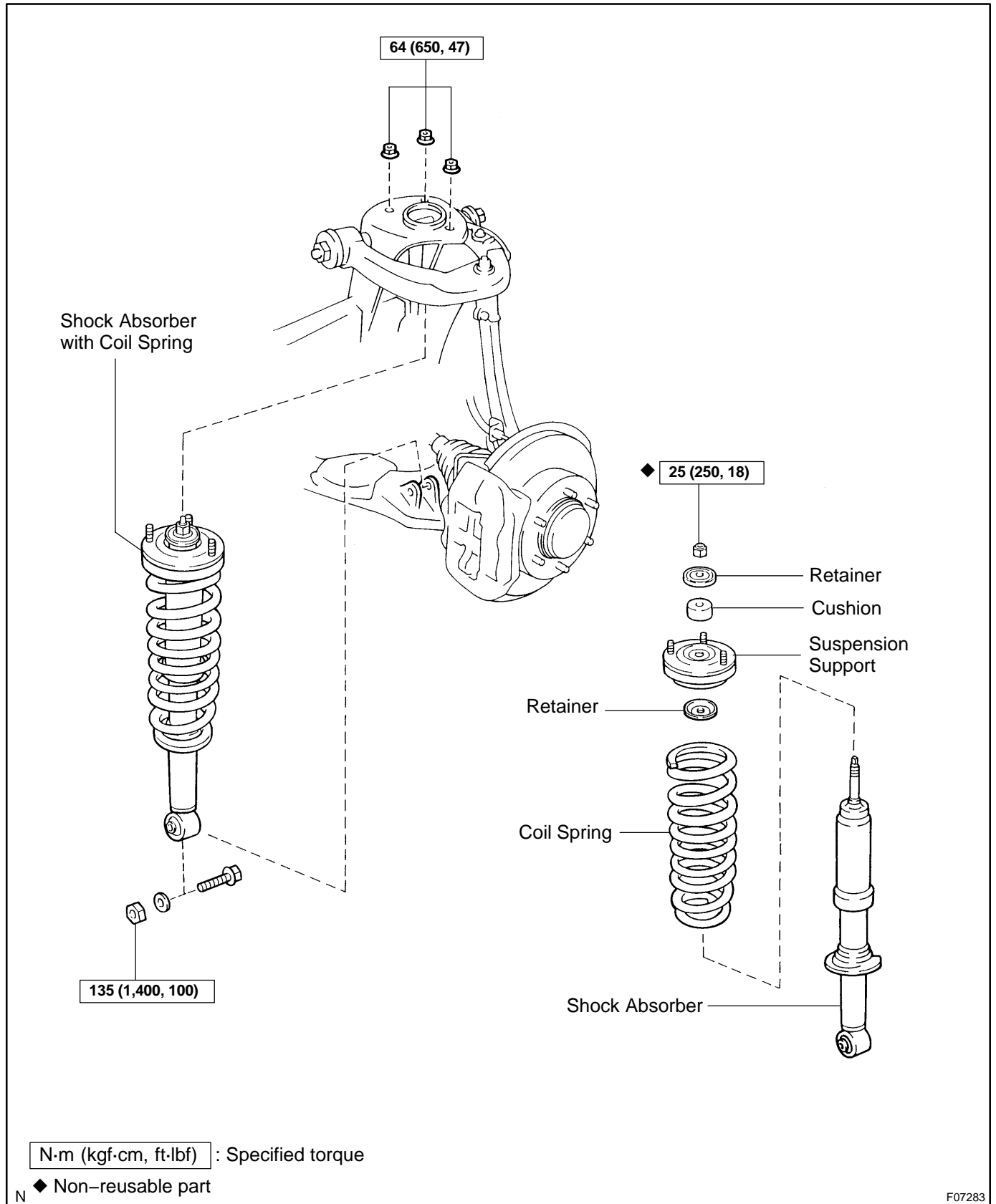
Using a feeler gauge, measure the clearance between the sleeve fork and clutch sleeve.

Maximum clearance: 0.35 mm (0.0138 in.)

If the clearance exceeds the maximum, replace the fork or sleeve.

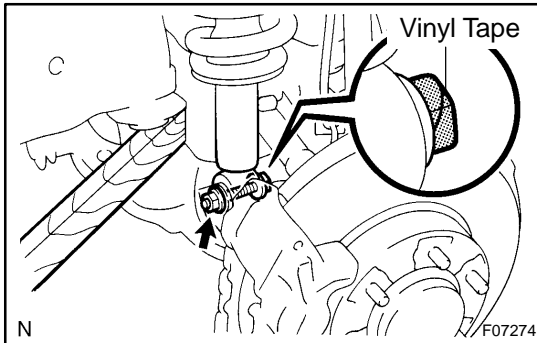
FRONT SHOCK ABSORBER COMPONENTS

SA09Z-07



REMOVAL

1. REMOVE FRONT WHEEL



2. DISCONNECT SHOCK ABSORBER FROM LOWER SUSPENSION ARM

- (a) Remove the shock absorber lower side set nut and washer.

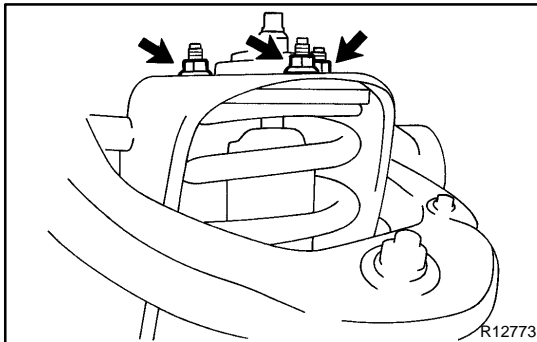
NOTICE:

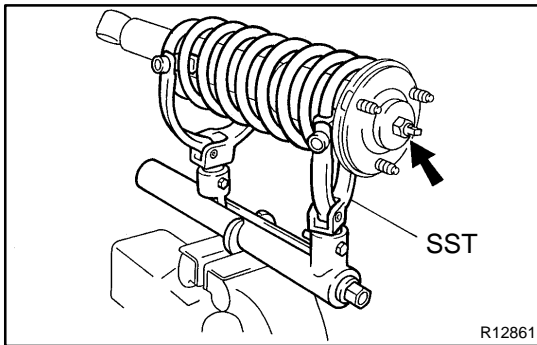
Do not remove the bolt.

- (b) Wrap the bolt's head with vinyl tape to prevent the drive shaft boot from being damaged.
- (c) Pry down the lower suspension arm to remove the bolt and disconnect the shock absorber.

3. REMOVE SHOCK ABSORBER WITH COIL SPRING

Remove the 3 nuts and shock absorber with the coil spring.





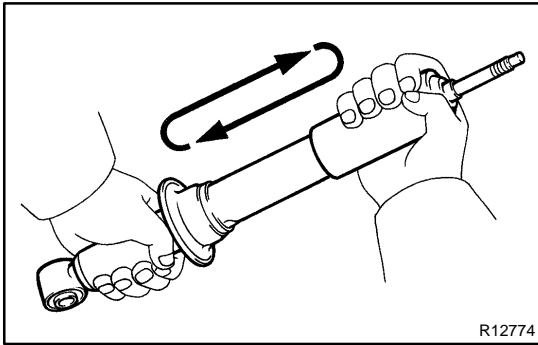
DISASSEMBLY

REMOVE SUSPENSION SUPPORT AND COIL SPRING

- (a) Using SST, compress the coil spring.
SST 09727-30021 (09727-00010, 09727-00021,
09727-00031)

NOTICE:

- **Make sure that the suspension support is free from the coil spring.**
 - **Do not compress the coil spring more than necessary.**
 - **Do not use an impact wrench. It will damage the SST.**
 - **Do not place yourself over the top of the shock absorber.**
- (b) Remove the suspension support center nut.
(c) Remove the 2 retainers, cushion, suspension support and coil spring.



INSPECTION

INSPECT SHOCK ABSORBER

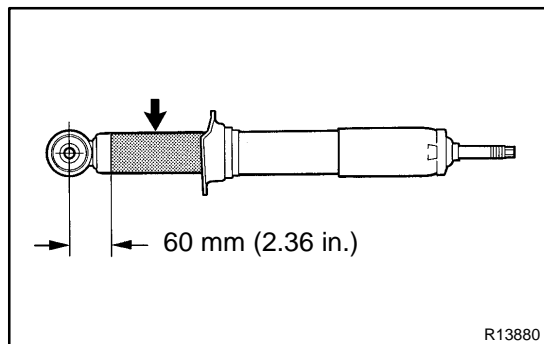
Compress and extend the shock absorber rod and check that there is no abnormal resistance or unusual operation sounds. If there is any abnormality, replace the shock absorber with a new one.

NOTICE:

When discarding the shock absorber, see **DISPOSAL** on page [SA-66](#).

DISPOSAL

1. FULLY EXTEND SHOCK ABSORBER ROD



2. DRILL HOLE TO DISCHARGE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder as shown in the illustration to discharge the gas inside.

CAUTION:

The discharged gas is harmless, but be careful of chips which may fly out when drilling.

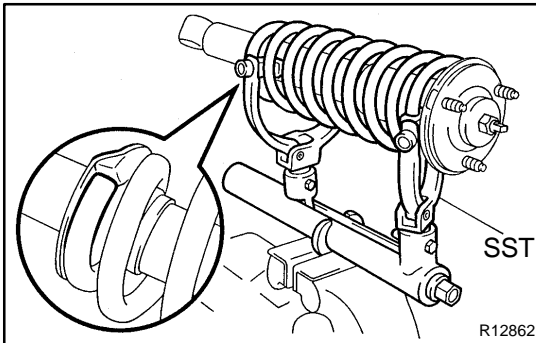
REASSEMBLY

1. INSTALL COIL SPRING TO SHOCK ABSORBER

- (a) Using SST, compress the coil spring.
SST 09727-30021 (09727-00010, 09727-00021, 09727-00031)

NOTICE:

- Do not compress the coil spring more than necessary.
- Do not use an impact wrench. It will damage the SST.



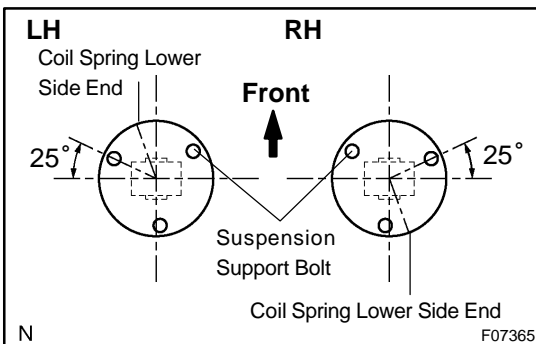
- (b) Install the coil spring to the shock absorber.

HINT:

Fit the lower end of the coil spring into the gap of the spring seat of the shock absorber.

2. INSTALL SUSPENSION SUPPORT

- (a) Install the cushion, 2 retainers and suspension support to the piston rod.
(b) Temporarily tighten a new suspension support center nut.



- (c) Position the suspension support as shown in the illustration.

- (d) Remove the SST.

SST 09727-30021 (09727-00010, 09727-00021, 09727-00031)

NOTICE:

Do not place yourself over the top of the shock absorber.

HINT:

After removing the SST, recheck the direction of the suspension support.

- (e) Torque the suspension center nut.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

INSTALLATION

1. INSTALL SHOCK ABSORBER WITH COIL SPRING

- (a) Install the upper side of the shock absorber to the chassis frame with the 3 nuts.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

- (b) Connect the lower side of the shock absorber to the lower suspension arm with the bolt, washer and nut.

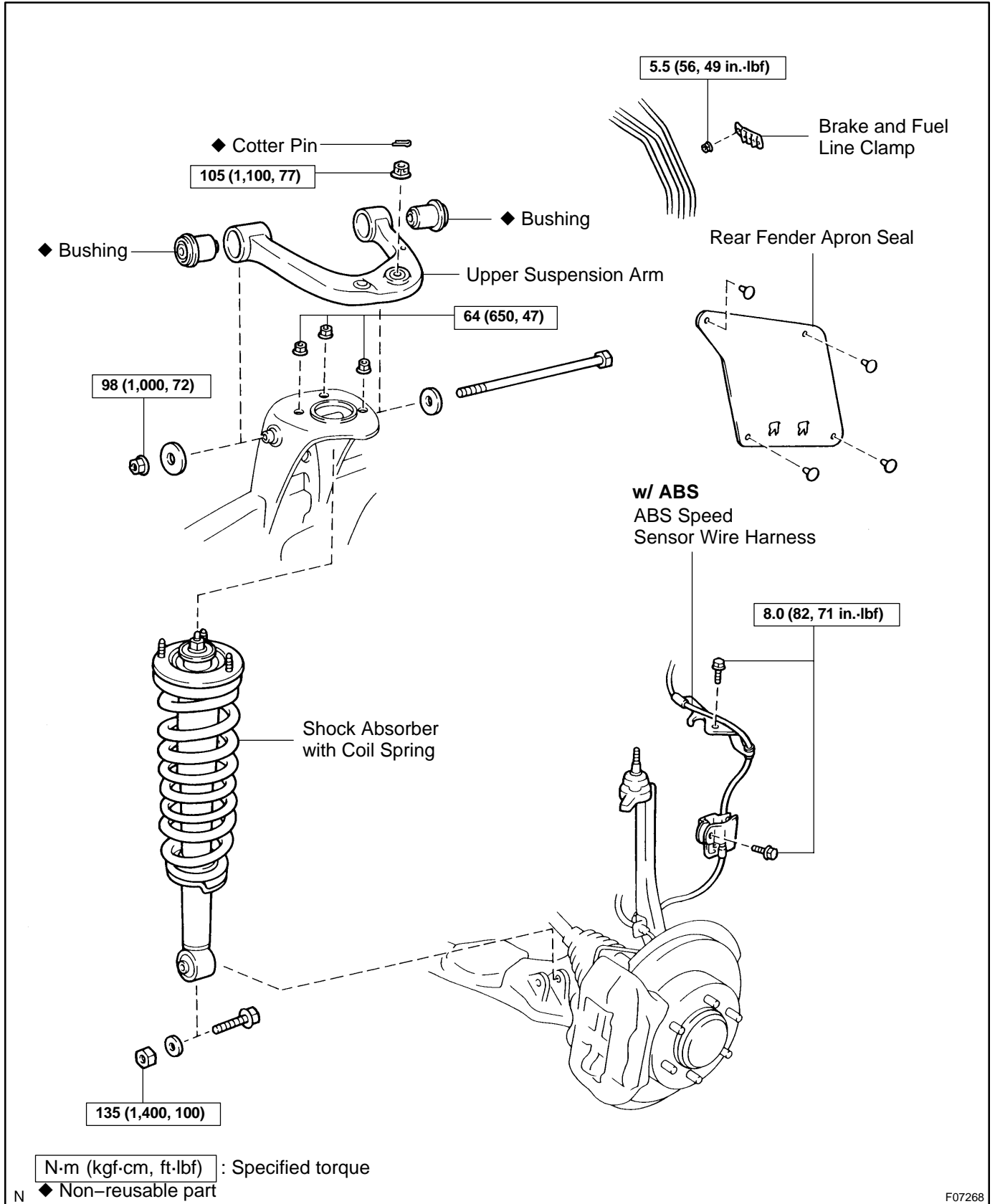
Torque: 135 N·m (1,400 kgf·cm, 100 ft·lbf)

2. INSTALL FRONT WHEEL

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

FRONT UPPER SUSPENSION ARM COMPONENTS

SA0AC-08



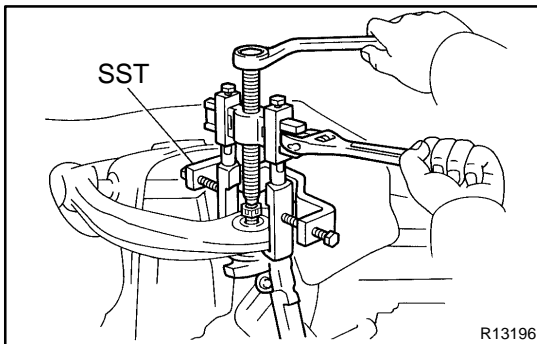
REMOVAL

1. REMOVE SHOCK ABSORBER WITH COIL SPRING
(See page SA-63)
2. w/ ABS:
DISCONNECT ABS SPEED SENSOR WIRE HARNESS
CLAMPS

Remove the 2 bolts and ABS speed sensor wire harness clamps from the steering knuckle and upper suspension arm.

3. DISCONNECT UPPER BALL JOINT

(a) Remove the cotter pin and loosen the nut.

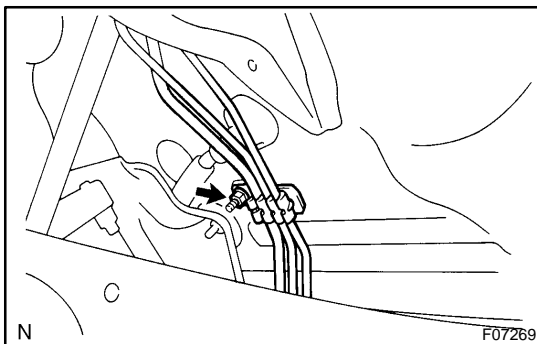


(b) Using SST, disconnect the upper ball joint.
SST 09950-40011 (09951-04010, 09952-04010,
09953-04020, 09954-04010, 09955-04031,
09958-04011)

(c) Support the steering knuckle securely.
(d) Remove the nut.

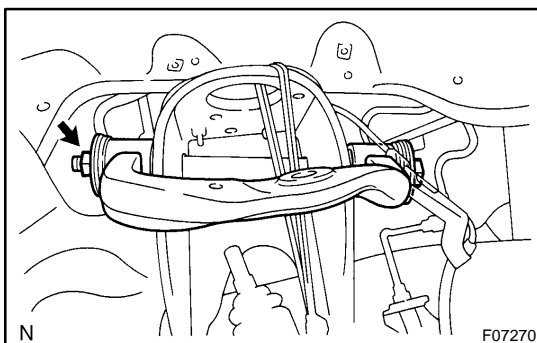
4. REMOVE REAR FENDER APRON SEAL

Remove the 4 clips and rear fender apron seal.



5. REMOVE BRAKE AND FUEL LINE CLAMP

Disengage the 2 brake lines and fuel line, and remove the nut and brake line clamp.



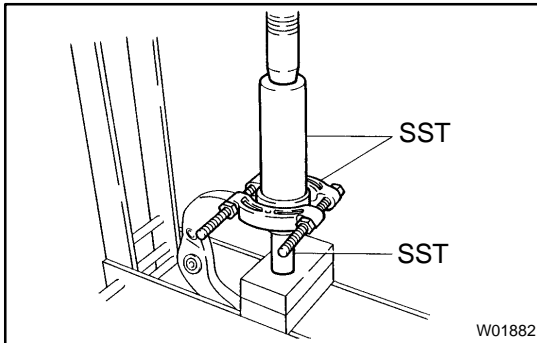
6. REMOVE UPPER SUSPENSION ARM

Remove the nut, bolt, 2 washers and upper suspension arm.

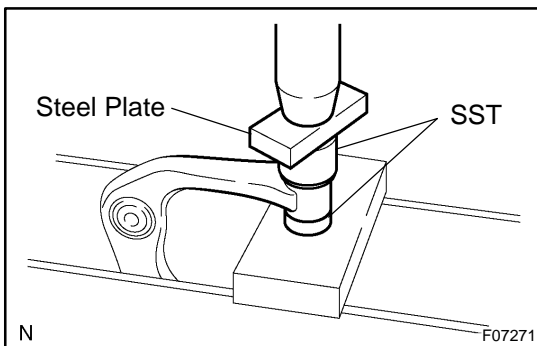
REPLACEMENT

1. REMOVE BUSHING

- (a) Using a chisel and hammer, pry up the flange of the bushing.



- (b) Using SST and a press, remove the bushing.
SST 09613-26010, 09631-20060, 09950-00020



2. INSTALL NEW BUSHING

- Using SST, a press and steel plate, install a new bushing.
SST 09631-12090, 09710-30021 (09710-03051)

INSTALLATION

1. INSTALL UPPER SUSPENSION ARM

Install the upper suspension arm with the 2 washers, bolt and nut.

Torque: 98 N·m (1,000 kgf·cm, 72 ft·lbf)

HINT:

After stabilizing the suspension, torque the nut.

2. INSTALL BRAKE AND FUEL LINE CLAMP

Torque: 5.5 N·m (56 kgf·cm, 49 in·lbf)

3. INSTALL REAR FENDER APRON SEAL

4. CONNECT UPPER BALL JOINT

(a) Connect the upper ball joint to the upper suspension arm.

(b) Install the nut and a new cotter pin.

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

Torque: 105 N·m (1,100 kgf·cm, 77 ft·lbf)

5. w/ ABS:

CONNECT ABS SPEED SENSOR WIRE HARNESS CLAMPS

Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)

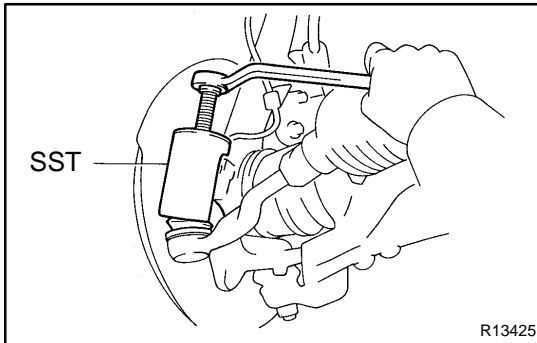
6. INSTALL SHOCK ABSORBER WITH COIL SPRING (See page [SA-68](#))

7. CHECK FRONT WHEEL ALIGNMENT (See page [SA-5](#))

REMOVAL

1. REMOVE RH AND LH FRONT WHEELS
2. DISCONNECT RH AND LH TIE ROD ENDS

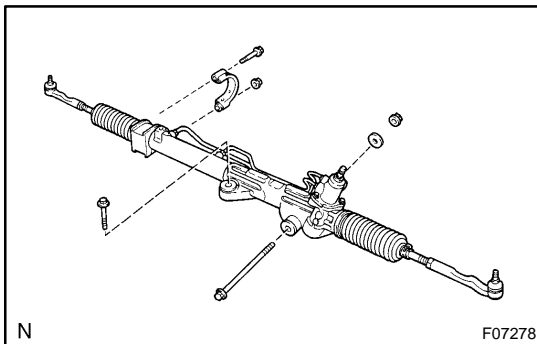
(a) Remove the cotter pin and nut.



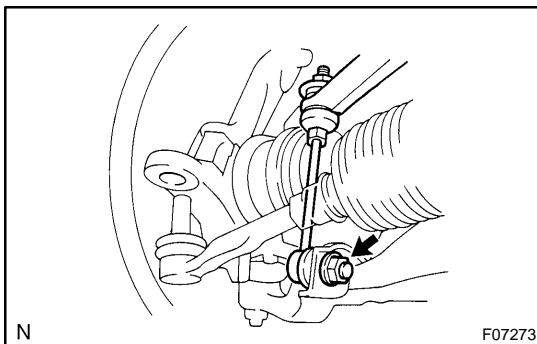
(b) Using SST, disconnect the tie rod end from the lower ball joint.

SST 09610-20012

(c) Use the same procedures described above to the other side.



3. REMOVE POWER STEERING GEAR SET BOLTS AND NUTS

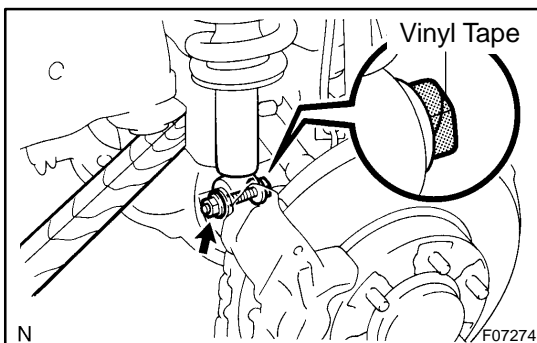


4. DISCONNECT STABILIZER BAR LINK FROM LOWER SUSPENSION ARM

Remove the nut and disconnect the stabilizer bar link from the lower suspension arm.

HINT:

If the ball joint turns together with the nut, use a hexagon (6 mm) wrench to hold the stud.



5. DISCONNECT SHOCK ABSORBER FROM LOWER SUSPENSION ARM

(a) Remove the shock absorber lower side set nut and washer.

NOTICE:

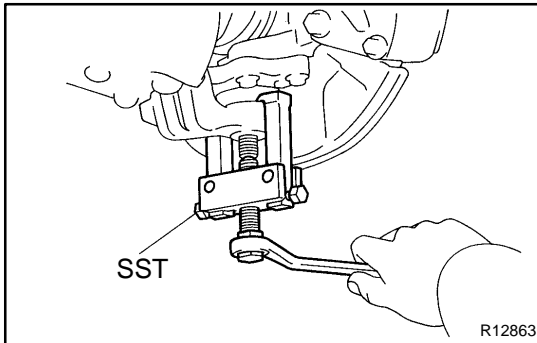
Do not remove the bolt.

(b) Wrap the bolt's head with vinyl tape to prevent the drive shaft boot from being damaged.

(c) Pry down the lower suspension arm to remove the bolt and disconnect the shock absorber.

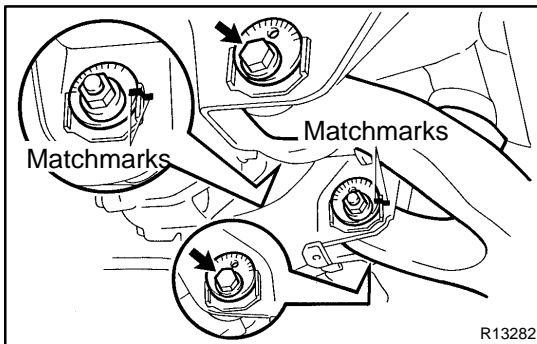
6. DISCONNECT LOWER BALL JOINT FROM LOWER SUSPENSION ARM

- (a) Remove the cotter pin and nut.



- (b) Using SST, disconnect the lower ball joint from the lower suspension arm.

SST 09628-62011



7. REMOVE LOWER SUSPENSION ARM

- (a) Place matchmarks on the front and rear cam plates and chassis frame.
- (b) Remove the 2 cam plates, bolts, cams and lower suspension arm while slightly shifting the power steering gear rearward.

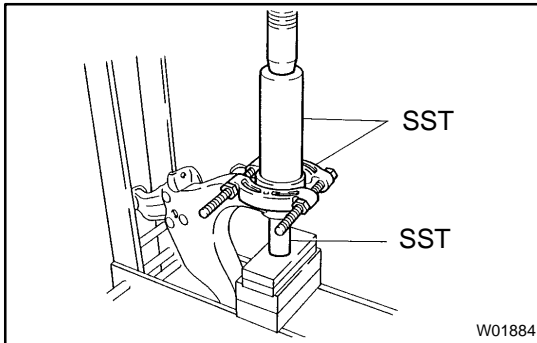
NOTICE:

Do not damage the power steering gear tubes.

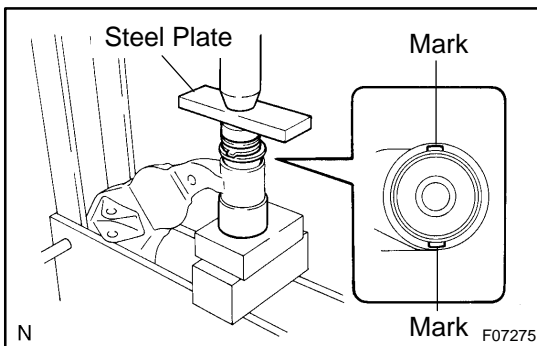
REPLACEMENT

1. REPLACE BUSHING

- (a) Using a chisel and hammer, pry up the flange of the bushing.



- (b) Using SST and a press, remove the bushing.
SST 09613-26010, 09632-36010, 09950-00020

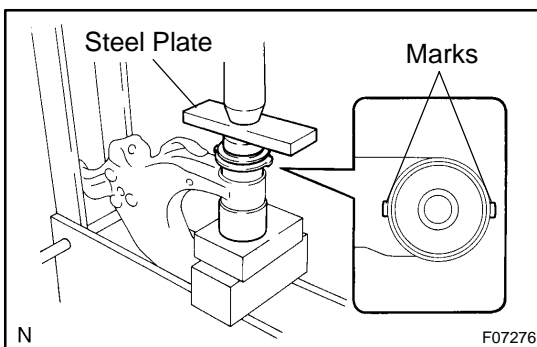


- (c) Using SST, a press and steel plate, install a new No. 1 bushing.

SST 09502-12010, 09631-12090

HINT:

Before installing the bushing, set it in the correct direction, as shown in the illustration.



- (d) Using SST, a press and steel plate, install a new No. 2 bushing.

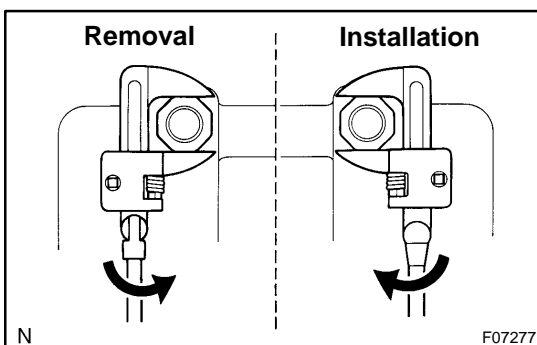
SST 09631-12090, 09950-60020 (09951-00680)

HINT:

Before installing the bushing, set it in the correct direction, as shown in the illustration.

2. REPLACE NO. 1 AND NO. 2 SPRING BUMPERS ON-VEHICLE

- (a) Remove the front wheel.



- (b) Using SST, replace the No. 1 spring bumper.

SST 09922-10010

HINT:

At the time of installation, use a torque wrench with a fulcrum length of 345 mm (13.58 in.).

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

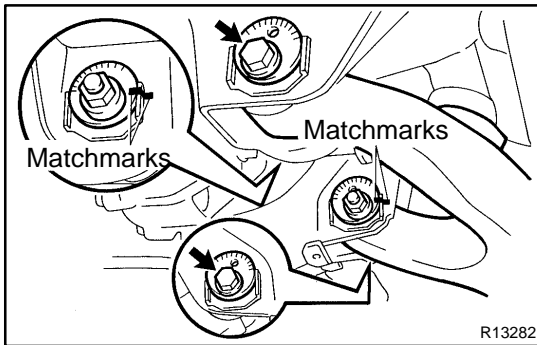
- (c) Replace the No. 2 spring bumper.
 - (1) Remove the stabilizer bar (See page [SA-89](#)).
 - (2) Using SST, replace the No. 2 spring bumper.
SST 09922-10010

HINT:

At the time of installation, use a torque wrench with a fulcrum length of 345 mm (13.58 in.).

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

- (3) Install the stabilizer bar (See page [SA-91](#)).
- (d) Install the front wheel.
Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)



INSTALLATION

1. INSTALL LOWER SUSPENSION ARM TO CHASSIS FRAME

Install the lower suspension arm with the 2 cams, bolts and cam plates while slightly shifting the power steering gear rearward.

Torque: 130 N·m (1,325 kgf·cm, 96 ft·lbf)

NOTICE:

Do not damage the power steering gear tubes.

HINT:

After stabilizing the suspension, align the matchmarks on the front and rear cam plates and chassis frame, and torque the bolts.

2. CONNECT LOWER BALL JOINT TO LOWER SUSPENSION ARM

Connect the lower ball joint and install the nut and a new cotter pin.

Torque: 140 N·m (1,450 kgf·cm, 103 ft·lbf)

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

3. CONNECT SHOCK ABSORBER TO LOWER SUSPENSION ARM

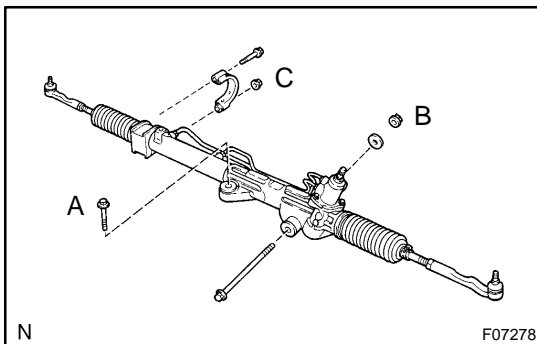
Torque: 135 N·m (1,400 kgf·cm, 100 ft·lbf)

4. CONNECT STABILIZER BAR LINK TO LOWER SUSPENSION ARM

Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

HINT:

If the ball joint turns together with the nut, use a hexagon (6 mm) wrench to hold the stud.



5. INSTALL POWER STEERING GEAR

Torque:

A bolt: 165 N·m (1,700 kgf·cm, 122 ft·lbf)

B nut: 130 N·m (1,350 kgf·cm, 96 ft·lbf)

C bolt and nut: 165 N·m (1,700 kgf·cm, 122 ft·lbf)

6. CONNECT RH AND LH TIE ROD ENDS

Connect the RH and LH tie rod ends to the lower ball joints with the nuts and new cotter pins.

Torque: 91 N·m (930 kgf·cm, 67 ft·lbf)

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

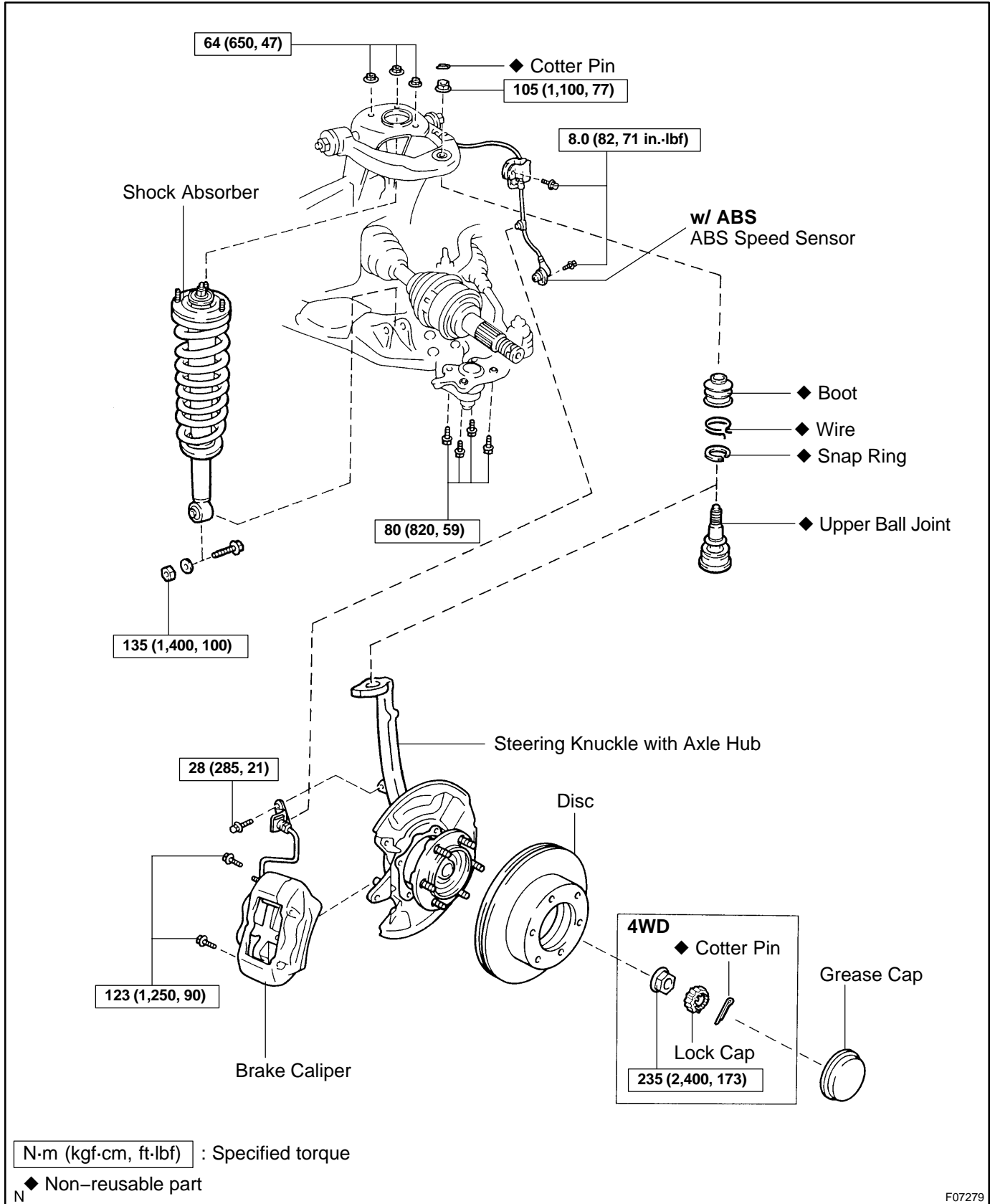
7. INSTALL RH AND LH FRONT WHEELS

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

8. CHECK FRONT WHEEL ALIGNMENT (See page SA-5)

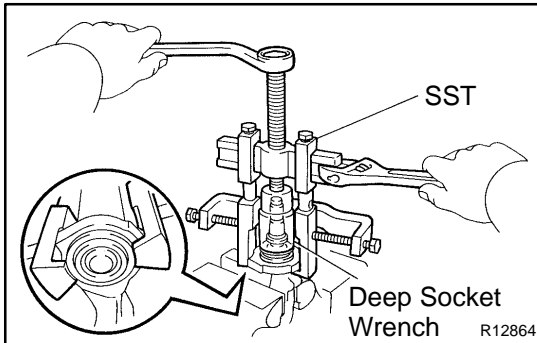
FRONT UPPER BALL JOINT COMPONENTS

SA1K7-03



REMOVAL

1. REMOVE STEERING KNUCKLE WITH AXLE HUB
(See page SA-20)
2. REMOVE UPPER BALL JOINT
 - (a) Remove the wire and boot.
 - (b) Using a snap ring expander, remove the snap ring.

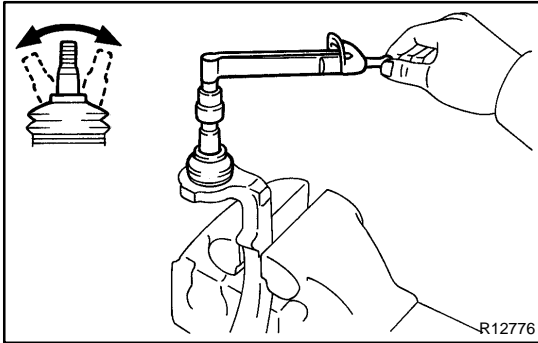


- (c) Using SST and a deep socket wrench, remove the upper ball joint.

SST 09950-40011 (09951-04010, 09952-04010, 09953-04020, 09954-04010, 09955-04031, 09957-04010, 09958-04011)

INSPECTION

1. INSPECT UPPER BALL JOINT BOOT FOR DAMAGE

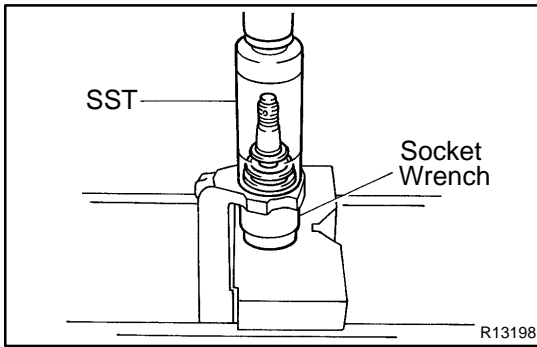


2. INSPECT UPPER BALL JOINT FOR ROTATION CONDITION

- (a) As shown in the illustration, flip the ball joint stud back and forth 5 times before installing the nut.
- (b) Using a torque wrench, turn the nut continuously 1 turn per 2 – 4 seconds and take the torque reading on the 5th turn.

Turning torque:

0.7 – 4.4 N·m (7 – 45 kgf·cm, 6 – 39 in.-lbf)



INSTALLATION

1. INSTALL UPPER BALL JOINT

- (a) Using SST and a socket wrench, install a new ball joint.
SST 09309-37010
- (b) Using a snap ring expander, install a new snap ring.
- (c) Install a new boot and fix it with a new wire.

HINT:

Use the grease supplied in the kit.

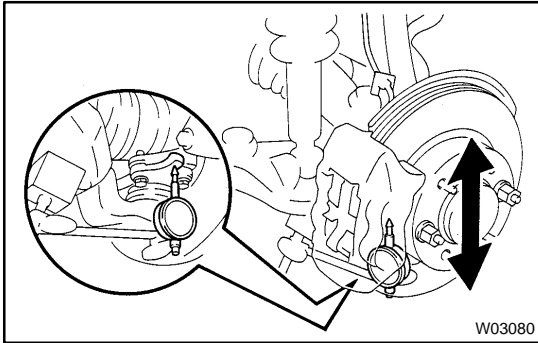
2. INSTALL STEERING KNUCKLE WITH AXLE HUB (See page [SA-26](#))

FRONT LOWER BALL JOINT ON-VEHICLE INSPECTION

SA0AW-05

INSPECT LOWER BALL JOINT EXCESSIVE PLAY ON-VEHICLE

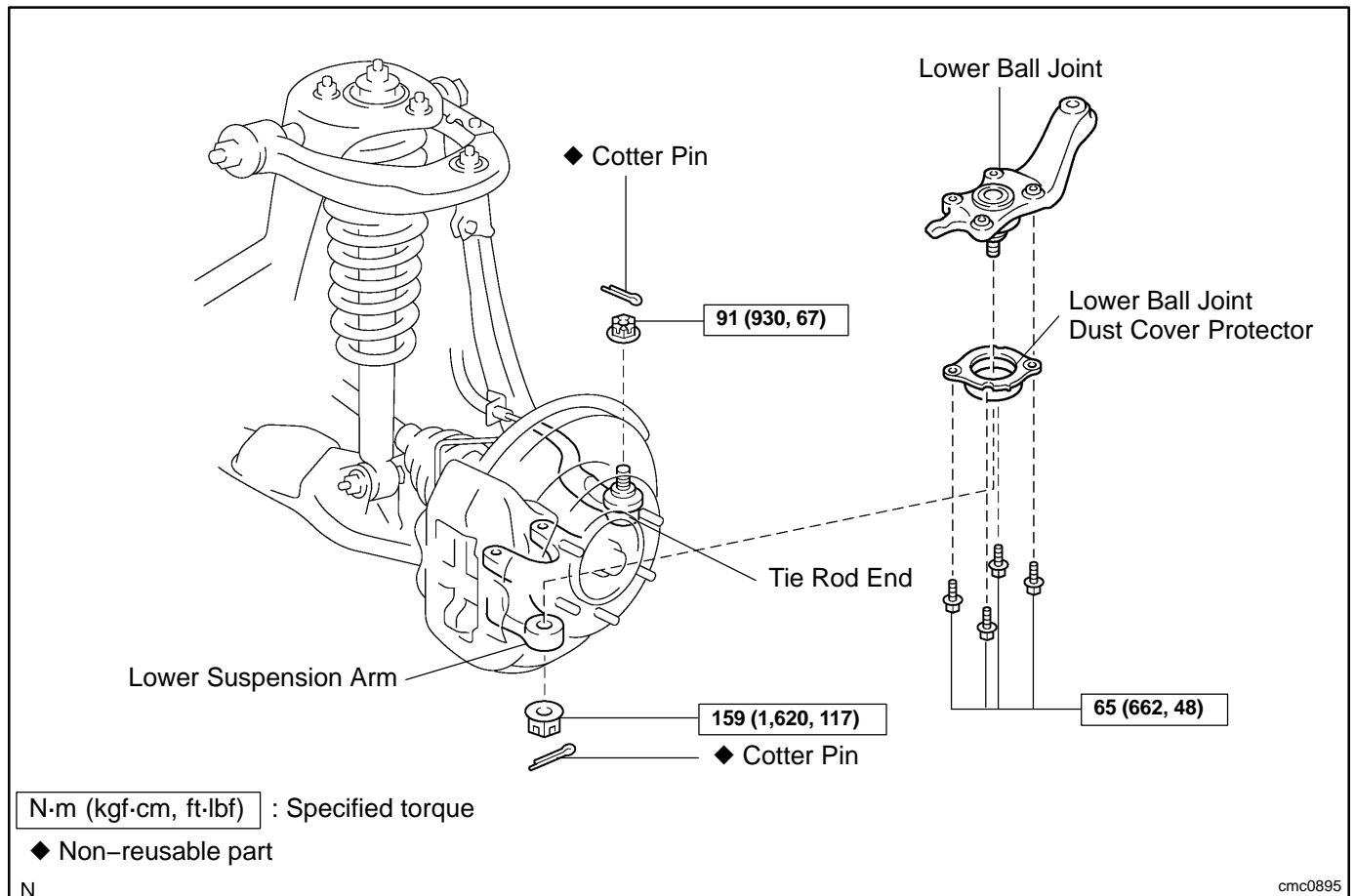
- (a) Remove the front wheel and install the hub nuts to the disc.



- (b) Using a dial indicator, check the lower ball joint for excessive play when you push the hub nuts up and down with a force of 294 N (30 kgf, 66 lbf).

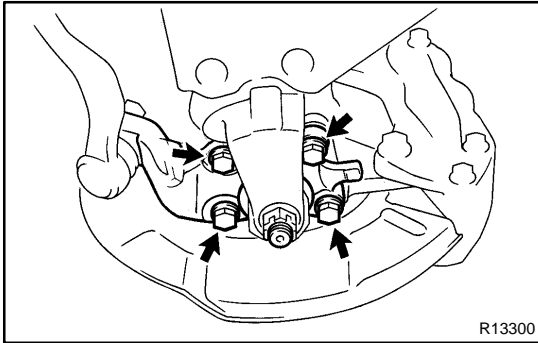
Maximum: 0.5 mm (0.020 in.)

COMPONENTS



REMOVAL

1. REMOVE FRONT WHEEL



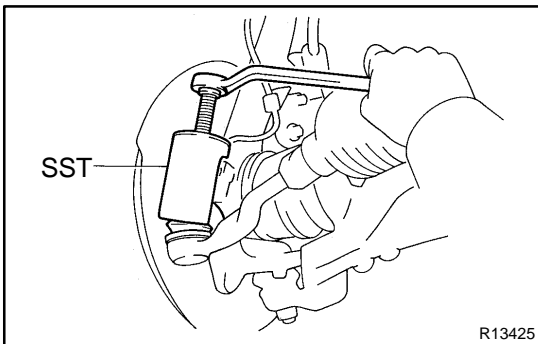
2. LOOSEN 4 LOWER BALL JOINT SET BOLTS

HINT:

Do not remove the bolts.

3. DISCONNECT TIE ROD END

- (a) Remove the cotter pin and nut from the tie rod end.

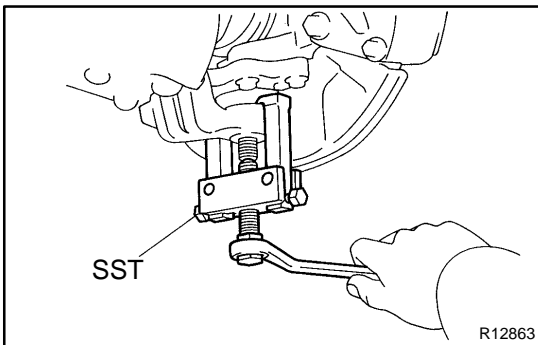


- (b) Using SST, disconnect the tie rod end from the lower ball joint.

SST 09610-20012

4. REMOVE LOWER BALL JOINT WITH LOWER BALL JOINT DUST COVER PROTECTOR

- (a) Remove the cotter pin and nut from the lower ball joint.



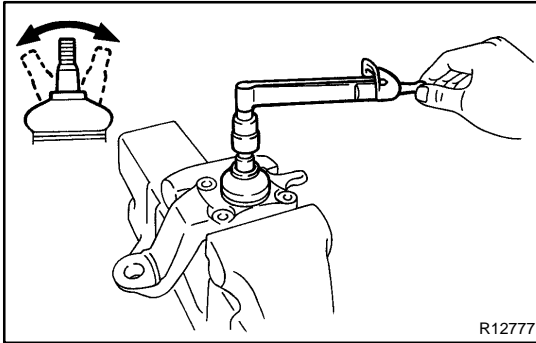
- (b) Using SST, disconnect the lower ball joint from the lower suspension arm.

SST 09628-62011

- (c) Remove the 4 lower ball joint set bolts.
 (d) Remove the lower ball joint dust cover protector.
 (e) While lifting the upper suspension arm and steering knuckle, remove the lower ball joint.
 (f) Support the upper suspension arm and steering knuckle securely.

INSPECTION

1. INSPECT LOWER BALL JOINT BOOT FOR DAMAGE



2. INSPECT LOWER BALL JOINT FOR ROTATION CONDITION

- (a) As shown in the illustration, flip the ball joint stud back and forth 5 times before installing the nut.
- (b) Using a torque wrench, turn the nut continuously 1 turn per 2 – 4 seconds and take the torque reading on the 5th turn.

Turning torque:

0.1 – 2.5 N·m (1 – 25 kgf·cm, 1 – 22 in.-lbf)

INSTALLATION

1. INSTALL LOWER BALL JOINT WITH LOWER BALL JOINT DUST COVER PROTECTOR

- (a) While lifting the upper suspension arm and steering knuckle, install the lower ball joint.
- (b) Install the lower ball joint dust cover protector.
- (c) Temporarily install the 4 bolts to the lower ball joint.
- (d) Install the set nut to hold the lower ball joint to the lower suspension arm and a new cotter pin.

Torque: 159 N·m (1,620 kgf·cm, 117 ft·lbf)

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

2. CONNECT TIE ROD END

Connect the tie rod end to the lower ball joint with the nut and a new cotter pin.

Torque: 91 N·m (930 kgf·cm, 67 ft·lbf)

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

3. TIGHTEN LOWER BALL JOINT SET 4 BOLTS

Torque: 65 N·m (662 kgf·cm, 48 ft·lbf)

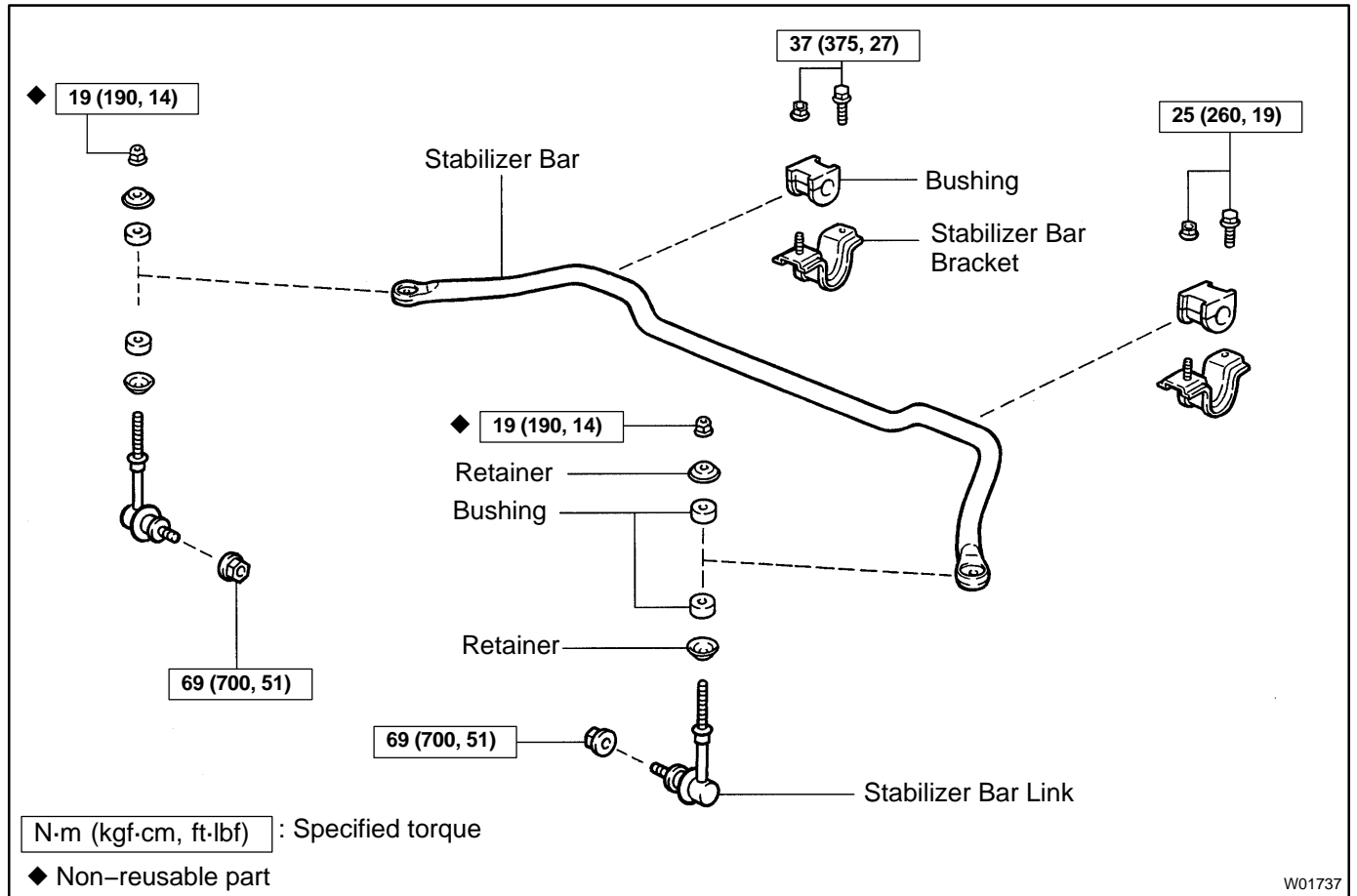
4. INSTALL FRONT WHEEL

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

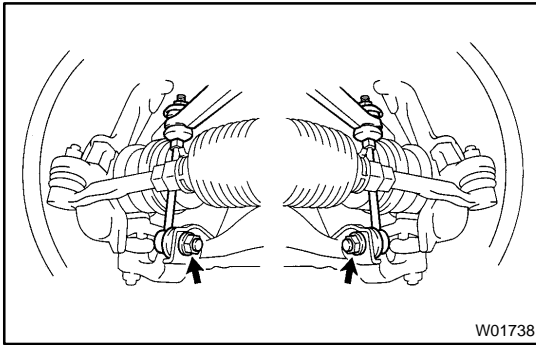
5. CHECK FRONT WHEEL ALIGNMENT (See page [SA-5](#))

FRONT STABILIZER BAR COMPONENTS

SA0B4-06



W01737



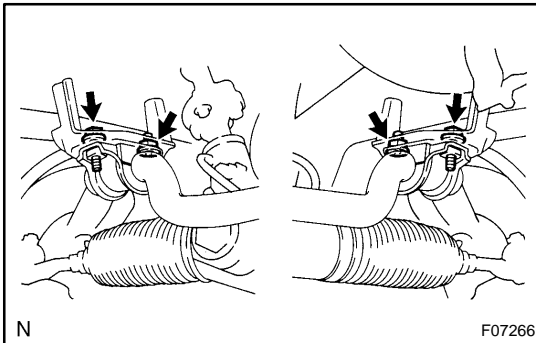
REMOVAL

1. DISCONNECT STABILIZER BAR LINKS

Remove the 2 nuts and disconnect the stabilizer bar links from the lower suspension arms.

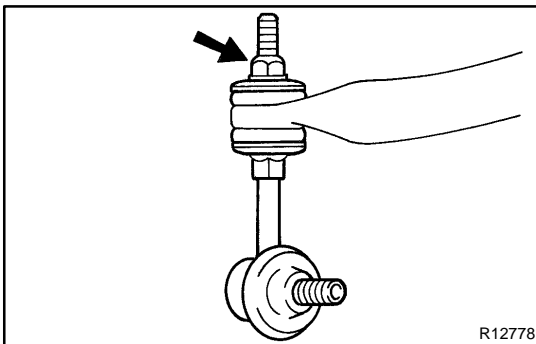
HINT:

If the ball joint turns together with the nut, use a hexagon (6 mm) wrench to hold the stud.



2. REMOVE STABILIZER BAR

- (a) Remove the 2 bolts, nuts and stabilizer bar with the cushions and brackets.
- (b) Remove the 2 brackets and cushions from the stabilizer bar.

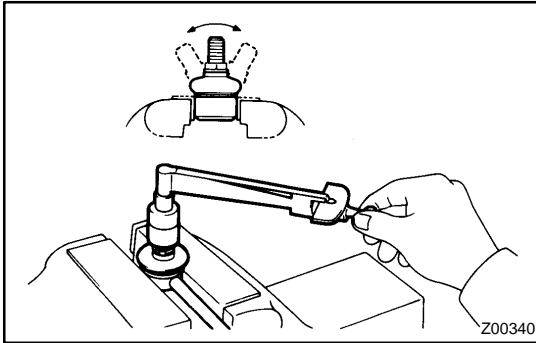


3. REMOVE STABILIZER BAR LINKS

- (a) Hold the stabilizer bar link, and remove the nut.
- (b) Remove the stabilizer bar link, 2 retainers and bushings from the stabilizer bar.
- (c) Use the same procedures described above to the other side.

INSPECTION

1. **INSPECT STABILIZER BAR LINK BALL JOINT BOOT FOR DAMAGE**



2. **INSPECT STABILIZER BAR LINK BALL JOINT FOR ROTATION CONDITION**

- (a) As shown in the illustration, flip the ball joint stud back and forth 5 times before installing the nut.
- (b) Using a torque wrench, turn the nut continuously 1 turn per 2 – 4 seconds and take the torque reading on the 5th turn.

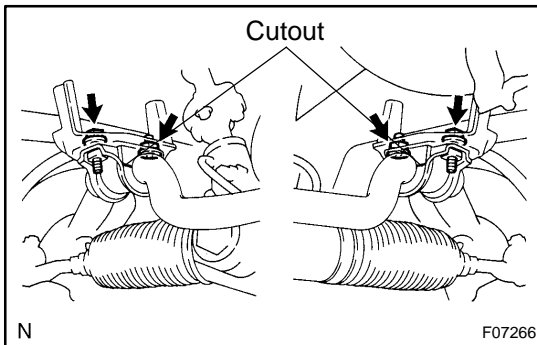
Turning torque:

0.05 – 2.0 N·m (0.5 – 20 kgf·cm, 0.4 – 17 in.-lbf)

INSTALLATION

1. INSTALL STABILIZER BAR LINKS

- (a) Install the 2 bushings, retainers and stabilizer bar link to the stabilizer bar.
- (b) Hold the stabilizer bar link, and install the nut.
Torque: 19 N·m (190 kgf-cm, 14 ft-lbf)
- (c) Use the same procedures described above to the other side.



2. INSTALL STABILIZER BAR

- (a) Install the 2 bushings with their cutouts facing to the rearward to the stabilizer bar.
- (b) Install the stabilizer bar and 2 brackets with the nut and bolts.

Torque: 37 N·m (375 kgf-cm, 27 ft-lbf)

3. CONNECT STABILIZER BAR LINKS TO LOWER SUSPENSION ARM

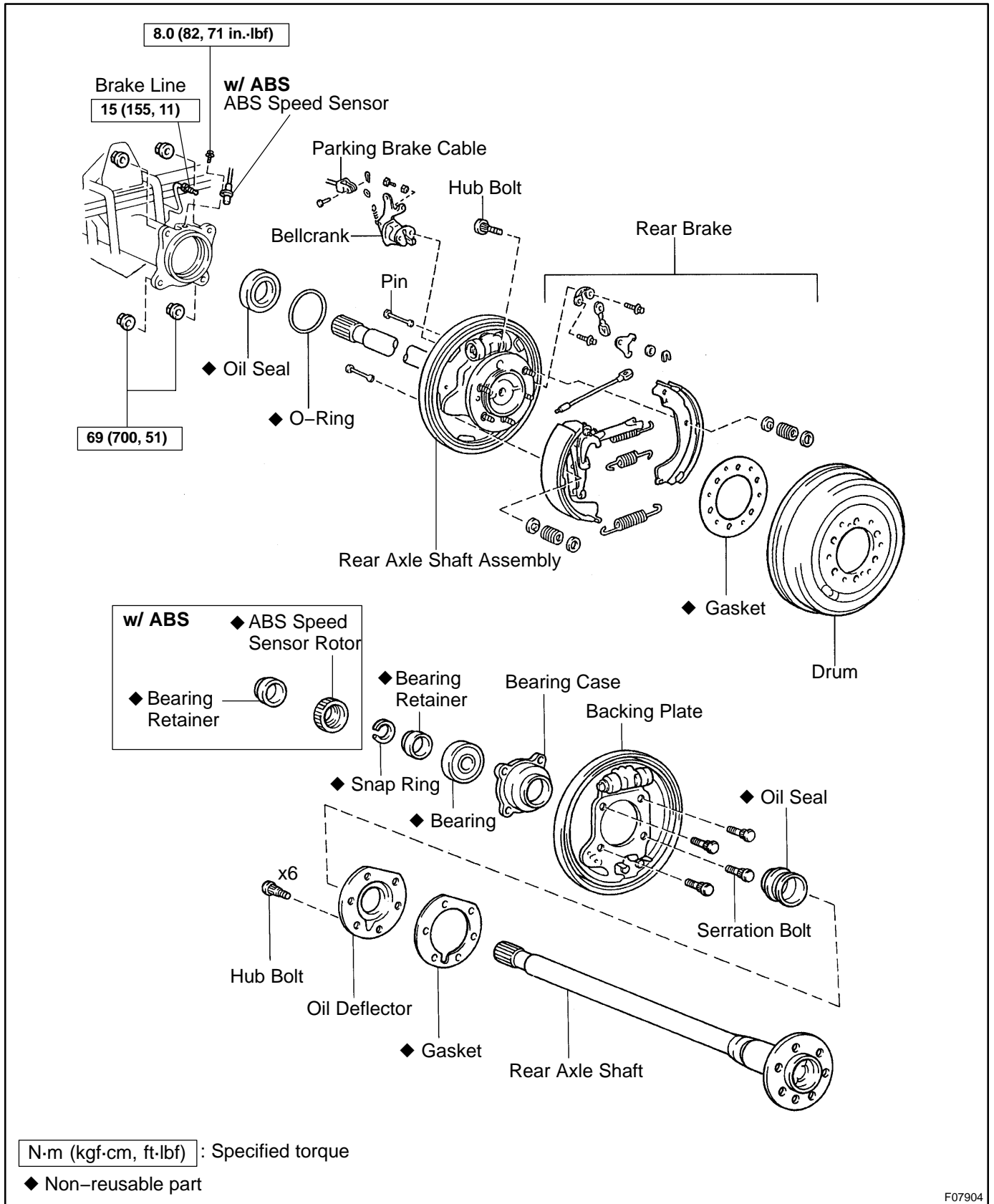
Torque: 69 N·m (700 kgf-cm, 51 ft-lbf)

HINT:

If the ball joint turns together with the nut, use a hexagon (6 mm) wrench to hold the nut.

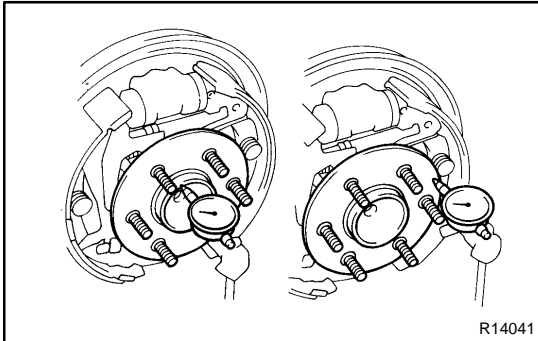
REAR AXLE SHAFT COMPONENTS

SA1KB-03



REMOVAL

1. REMOVE REAR WHEEL
2. REMOVE BRAKE DRUM AND GASKET



3. CHECK BEARING BACKLASH AND AXLE SHAFT DEVIATION

- (a) Using a dial indicator, check the backlash in the bearing shaft direction.

Maximum: 0.7 mm (0.028 in.)

If the backlash exceeds the maximum, replace the bearing.

- (b) Using a dial indicator, check the deviation at the surface of the axle shaft outside the hub bolt.

Maximum: 0.1 mm (0.004 in.)

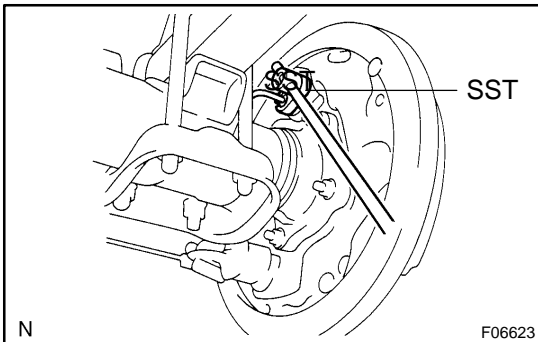
If the deviation exceeds the maximum, replace the axle shaft.

4. w/ ABS:

REMOVE ABS SPEED SENSOR FROM REAR AXLE HOUSING

Remove the bolt and ABS speed sensor.

5. REMOVE REAR BRAKE ASSEMBLY (See page [BR-48](#))



6. DISCONNECT BRAKE LINE AND PARKING BRAKE CABLE

- (a) Using SST, disconnect the brake line from the wheel cylinder.

SST 09023-00101

- (b) Remove the clip and pin, and disconnect the parking brake cable.

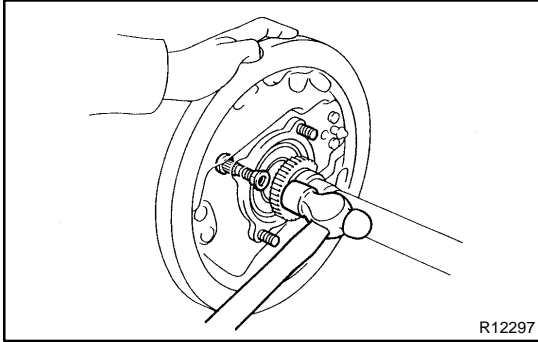
7. REMOVE REAR AXLE SHAFT ASSEMBLY

- (a) Remove the 4 backing plate mounting nuts.
- (b) Pull out the rear axle shaft assembly from the rear axle housing.

NOTICE:

Be careful not to damage the oil seal.

8. REMOVE O-RING FROM REAR AXLE HOUSING



INSPECTION

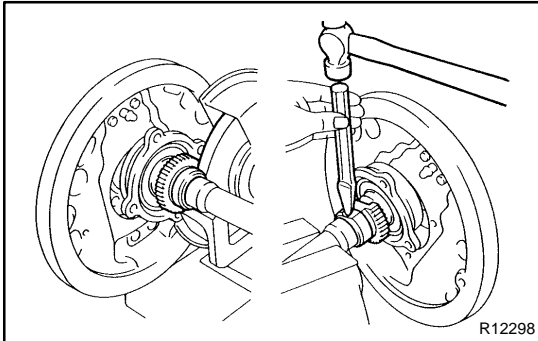
1. w/ ABS:

REMOVE BEARING RETAINER (DIFFERENTIAL SIDE) AND ABS SPEED SENSOR ROTOR

- (a) Attach the 4 nuts to the serration bolts, and using a hammer, remove the serration bolts from the backing plate.

NOTICE:

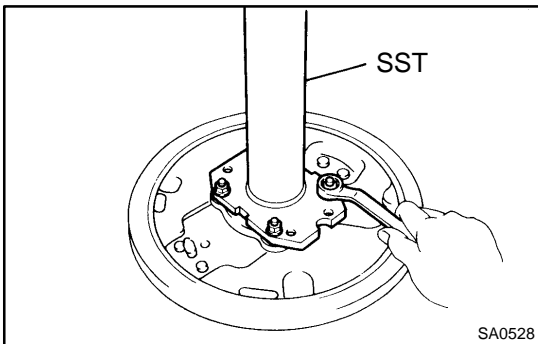
At the time of installation, do not reuse the nuts.



- (b) Grind the retainer and sensor rotor surfaces, then chisel them out.
 (c) Attach the washers and nuts to the serration bolts, then torque the nuts to install the serration bolts to the backing plate.
 (d) Remove the 4 nuts and washers from the serration bolts.

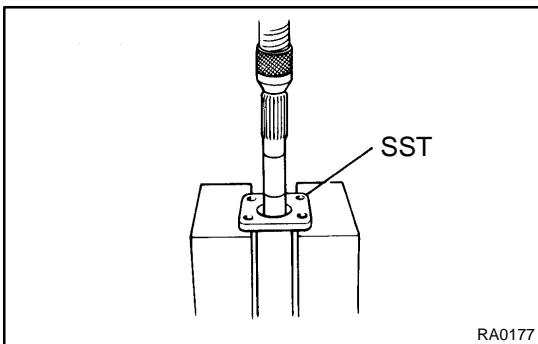
2. REMOVE SNAP RING FROM AXLE SHAFT

Using a snap ring expander, remove the snap ring.

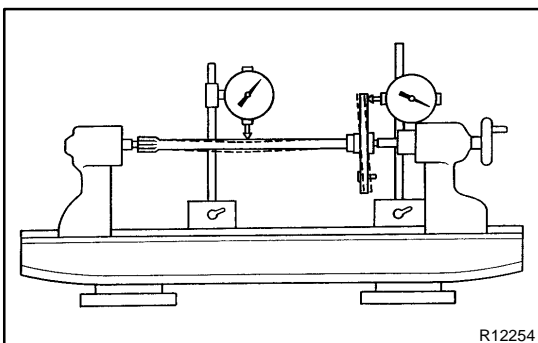


3. REMOVE REAR AXLE SHAFT FROM BACKING PLATE

- (a) Position SST on the backing plate with the 4 nuts.
 SST 09521-25011, 09521-25022



- (b) Using a press, remove the rear axle shaft and bearing retainer from the backing plate.
 (c) Remove the SST.
 SST 09521-25011, 09521-25022



4. INSPECT AXLE SHAFT

Using a dial indicator, measure the runout of the shaft and flange.

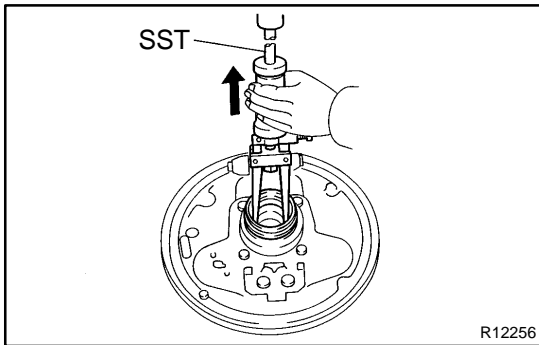
Maximum shaft runout: 2.0 mm (0.079 in.)

Maximum flange runout: 0.1 mm (0.004 in.)

If the rear axle shaft or flange are damaged or worn, or if runout is greater than the maximum, replace the rear axle shaft.

5. INSPECT OIL SEAL (OUTER SIDE)

- (a) Check for damage.
 (b) Check the oil seal lip for wear or damage.

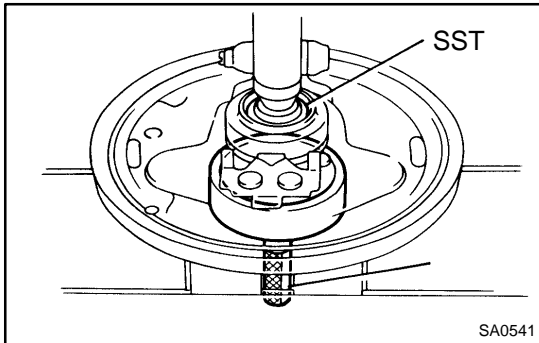
**6. REMOVE OIL SEAL (OUTER SIDE)**

Using SST, remove the oil seal.

SST 09308-00010

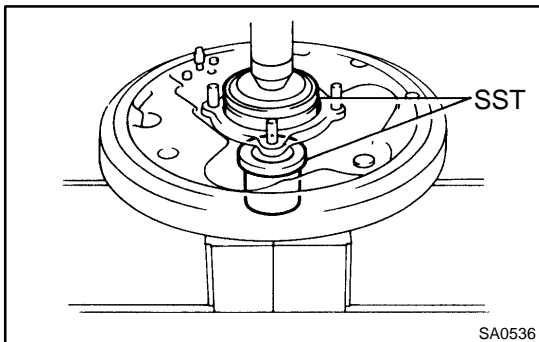
7. INSPECT REAR AXLE BEARING

Check for wear or damage.

**8. REPLACE REAR AXLE BEARING**

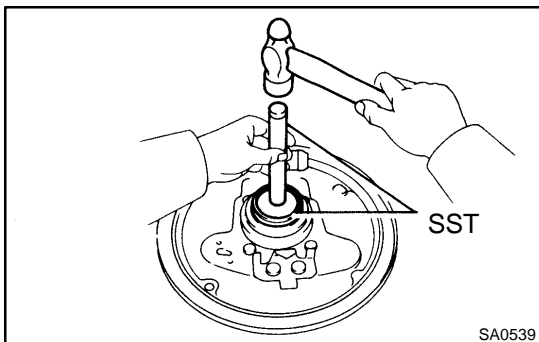
(a) Using SST and a press, remove the bearing.

SST 09223-56010, 09950-60010 (09951-00560)



(b) Using SST and a press, install a new bearing.

SST 09515-30010, 09950-60020 (09951-00890)

**9. INSTALL NEW OIL SEAL (OUTER SIDE)**

Using SST and a hammer, install a new oil seal.

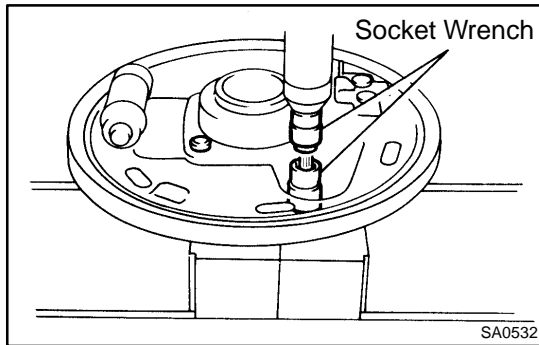
SST 09950-60010 (09951-00610),
09950-70010 (09951-07150)

10. INSPECT BEARING CASE

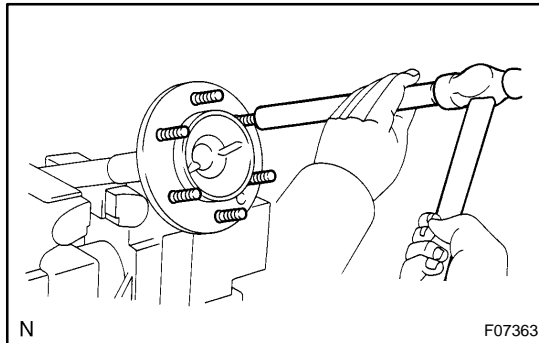
Check for wear or damage.

11. REPLACE BEARING CASE

- (a) Remove the outer side oil seal (See step 5.).
- (b) Remove the bearing (See step 6.).
- (c) Remove the serration bolts (See step 1.).
- (d) Remove the bearing case.



- (e) Position the backing plate on a new bearing case and using 2 socket wrenches and a press, install the serration bolts.
- (f) Install a new bearing (See step 6.).
- (g) Install a new outer side oil seal (See step 7.).

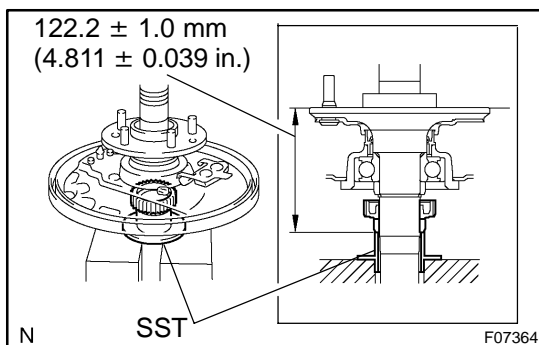
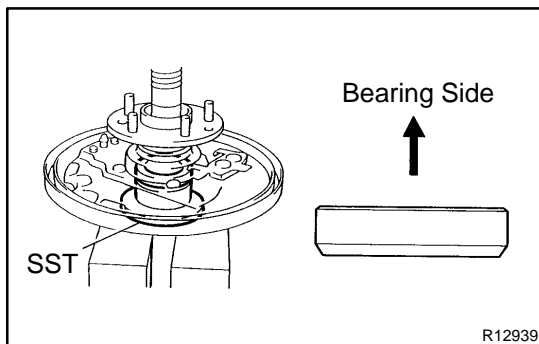


12. REPLACE OIL DEFLECTOR

- (a) Using a brass bar and hammer, remove the hub bolts, oil deflector and gasket.
- (b) Position a new gasket and oil deflector on the axle shaft and install a washer and nut to the hub bolt and install the hub bolt by torquing the nut.
- (c) Remove the nut and washer.

13. INSTALL REAR AXLE SHAFT IN BACKING PLATE

- (a) Coat the new outer side oil seal lip with MP grease.
- (b) Install the backing plate and bearing retainer on the rear axle shaft.
- (c) Using SST and a press, install the rear axle shaft into the backing plate.
SST 09316-60011 (09316-00051)
- (d) Using a snap ring expander, install a new snap ring.



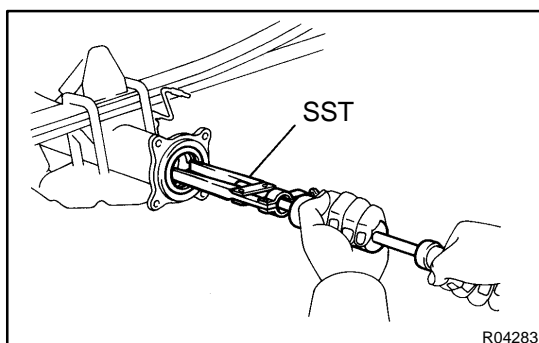
14. w/ ABS:

INSTALL ABS SPEED SENSOR ROTOR AND BEARING RETAINER (DIFFERENTIAL SIDE)

Using SST and a press, install a new sensor rotor and new bearing retainer to the axle shaft.

SST 09316-60011 (09316-00051)

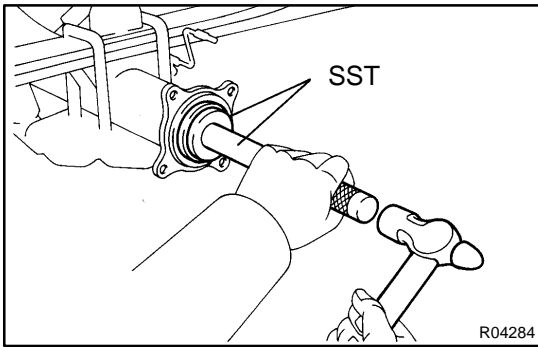
Standard length: 122.2 ± 1.0 mm (4.811 ± 0.039 in.)



15. REPLACE OIL SEAL (INNER SIDE)

- (a) Using SST, remove the oil seal.
SST 09308-00010

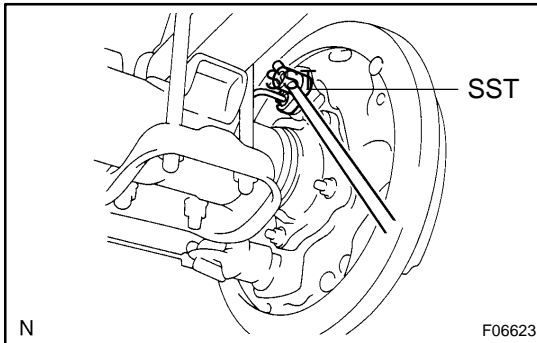
SUSPENSION AND AXLE - REAR AXLE SHAFT



- (b) Using SST and a hammer, install a new oil seal.
SST 09950-60020 (09951-00710),
09950-70010 (09951-07150)
- (c) Coat a new oil seal lip with MP grease.

INSTALLATION

1. **INSTALL NEW O-RING TO REAR AXLE HOUSING**
 2. **INSTALL REAR AXLE SHAFT ASSEMBLY**
Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)
 3. **CONNECT BRAKE LINE AND PARKING BRAKE CABLE**
- (a) Connect the parking brake cable with the pin and clip.

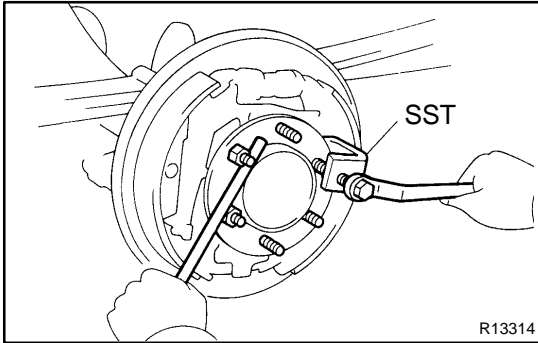


- (b) Using SST, connect the brake line to the wheel cylinder.
SST 09023-00101
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)
4. **INSTALL REAR BRAKE ASSEMBLY (See page [BR-52](#))**
 5. **w/ ABS:**
INSTALL ABS SPEED SENSOR
Torque: 8.0 N·m (82 kgf·cm, 71 ft·lbf)
 6. **CHECK BEARING BACKLASH AND AXLE SHAFT DEVIATION (See page [SA-93](#))**
 7. **INSTALL NEW GASKET AND BRAKE DRUM**
 8. **INSTALL REAR WHEEL**
Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)
 9. **BLEED BRAKE SYSTEM (See page [BR-4](#))**
 10. **w/ ABS:**
CHECK ABS SPEED SENSOR SIGNAL (See page [DI-1387](#) or [DI-1478](#))

REAR WHEEL HUB BOLT REPLACEMENT

SA0BC-05

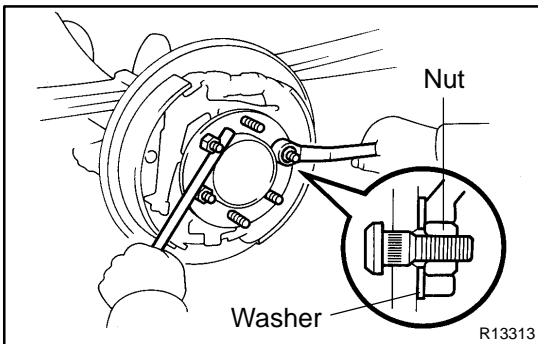
1. REMOVE REAR WHEEL
2. REMOVE BRAKE DRUM AND GASKET



3. REMOVE REAR HUB BOLT

Using SST and a brass bar or an equivalent, remove the hub bolt.

SST 09650-17011



4. INSTALL HUB BOLT

- (a) Install a washer and nut to a new hub bolt as shown in the illustration.
- (b) Using a brass bar or an equivalent to hold, install the hub bolt by torquing the nut.
- (c) Remove the nut and washer.

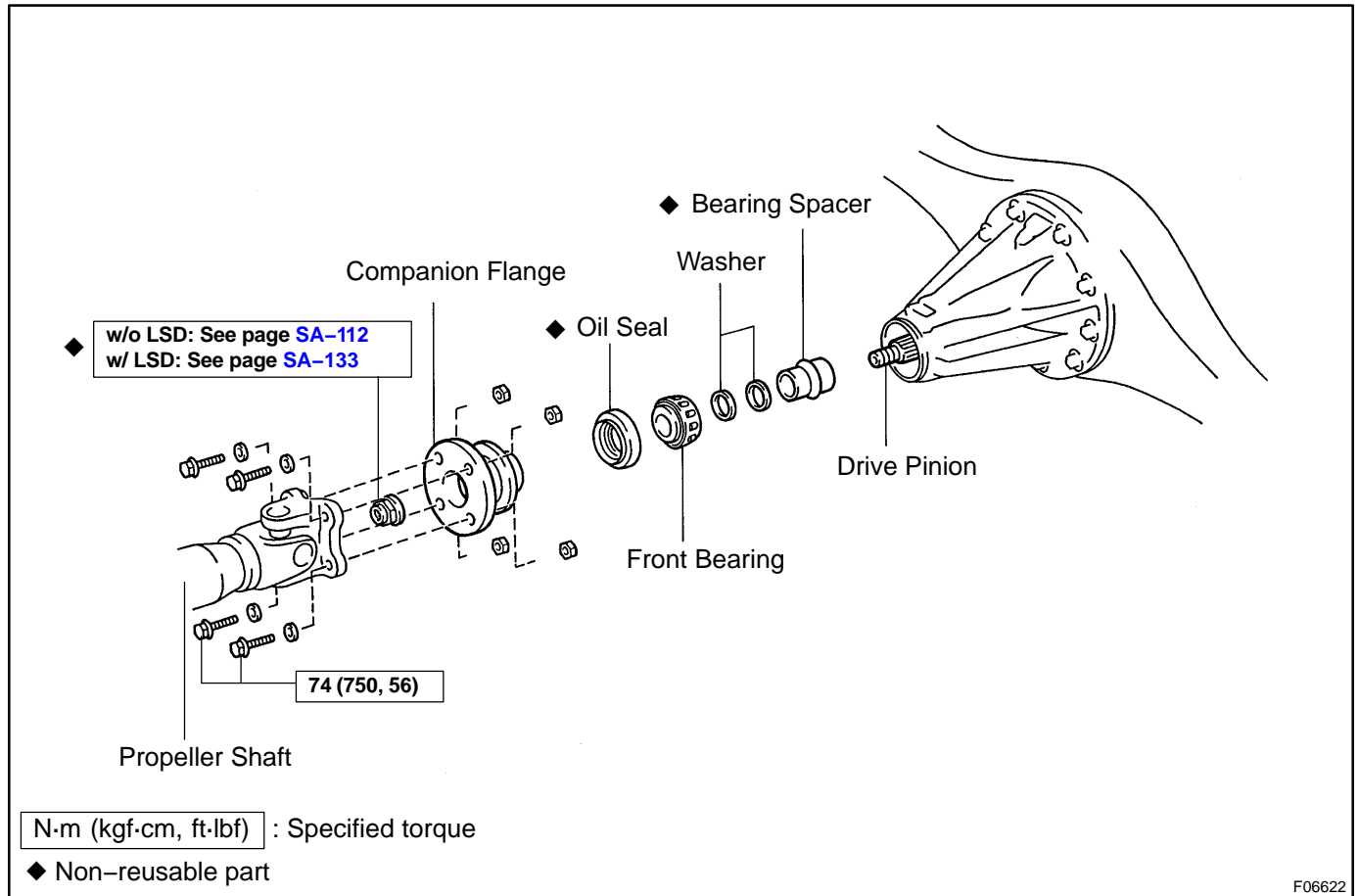
5. INSTALL NEW GASKET AND BRAKE DRUM

6. INSTALL REAR WHEEL

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

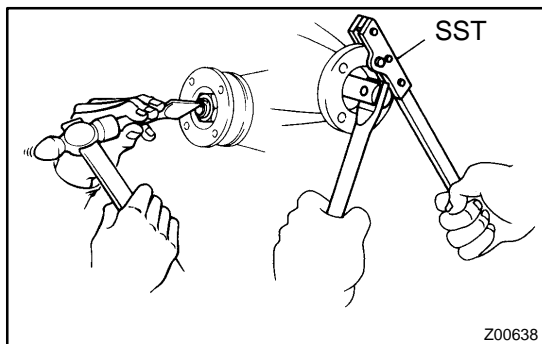
REAR DIFFERENTIAL FRONT OIL SEAL COMPONENTS

SA0BD-08



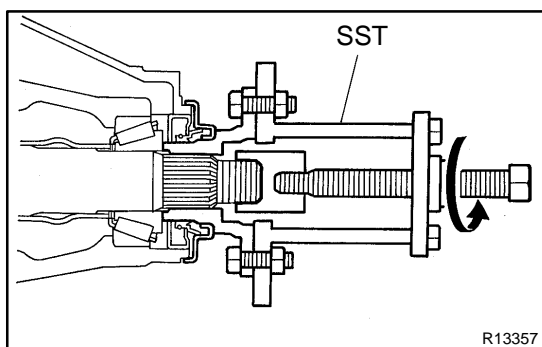
REPLACEMENT

1. DRAIN DIFFERENTIAL OIL
2. DISCONNECT REAR PROPELLER SHAFT
2WD: See page [PR-3](#)
4WD: See page [PR-10](#)

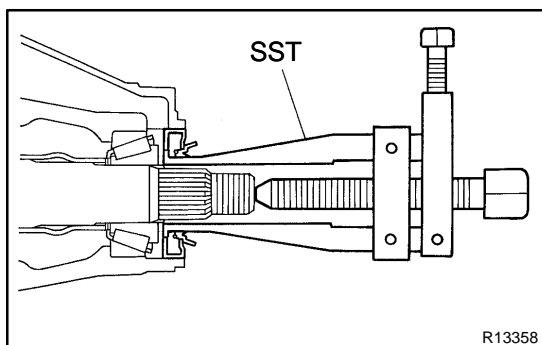


3. REMOVE COMPANION FLANGE

- (a) Using a chisel and hammer, loosen the staked part of the nut.
- (b) Using SST to hold the flange, remove the nut.
SST 09330-00021

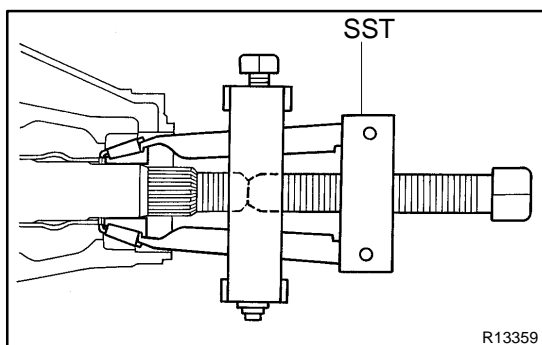


- (c) Using SST, remove the companion flange.
SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03050)



4. REMOVE OIL SEAL

- Using SST, remove the oil seal.
SST 09308-10010



5. REMOVE FRONT BEARING

- Using SST, remove the front bearing from the drive pinion.
SST 09556-22010

6. REMOVE BEARING SPACER

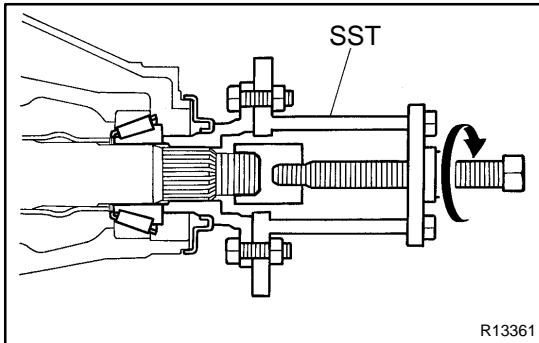
- (a) Remove the 2 washers.
- (b) Remove the bearing spacer.

7. INSTALL NEW BEARING SPACER

- (a) Install a new bearing spacer.
- (b) Install the 2 washers.

8. INSTALL FRONT BEARING

- (a) Place the front bearing.

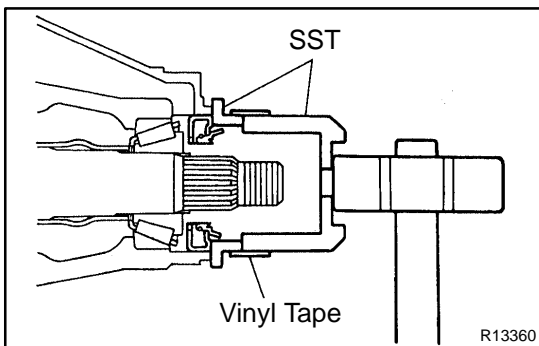


- (b) Using SST and the companion flange, install the front bearing then remove the companion flange.

SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03050)

9. INSTALL NEW OIL SEAL

- (a) Coat a new oil seal lip with MP grease.



- (b) Using SST and a plastic hammer, install the oil seal until its surface is flush with the differential carrier end.

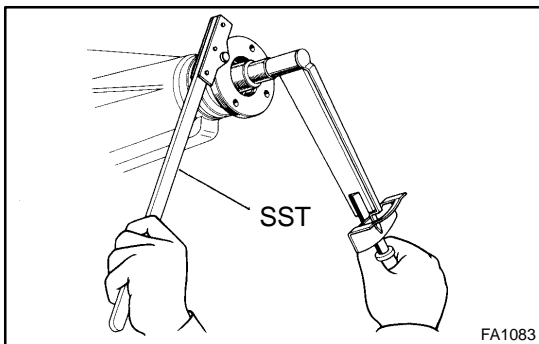
SST 09316-12010, 09649-17010

HINT:

Connect the 2 SST with vinyl tape.

10. INSTALL COMPANION FLANGE

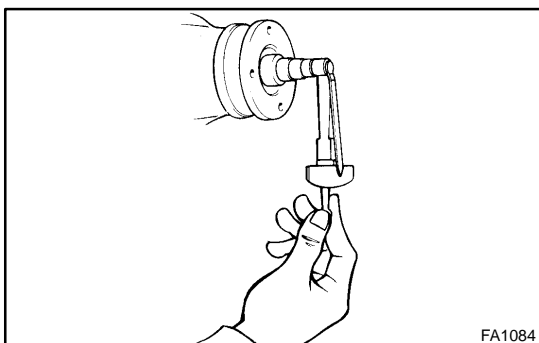
- (a) Place the companion flange on the drive pinion.
 (b) Coat the threads of a new nut with hypoid gear oil.



- (c) Using SST to hold the flange, torque the nut.

SST 09330-00021

Torque: 147 N·m (1,500 kgf·cm, 109 ft·lbf)

**11. ADJUST DRIVE PINION PRELOAD**

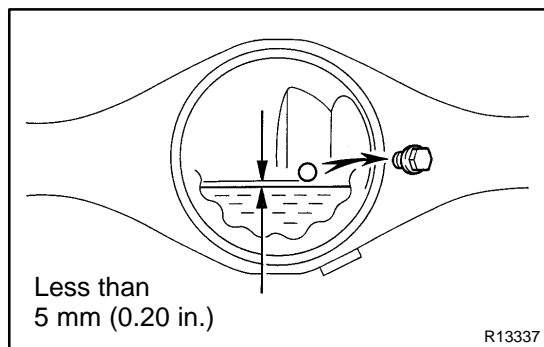
w/o LSD: See page [SA-112](#)

w/ LSD: See page [SA-133](#)

12. STAKE DRIVE PINION NUT**13. CONNECT REAR PROPELLER SHAFT**

2WD: See page [PR-8](#)

4WD: See page [PR-15](#)

**14. FILL DIFFERENTIAL WITH HYPOID GEAR OIL****Torque: 49 N·m (500 kgf-cm, 39 ft-lbf)****Oil type:**

w/o LSD	Hypoid gear oil API GL-5
w/ LSD	Hypoid gear oil for LSD API GL-5

Recommended oil viscosity:

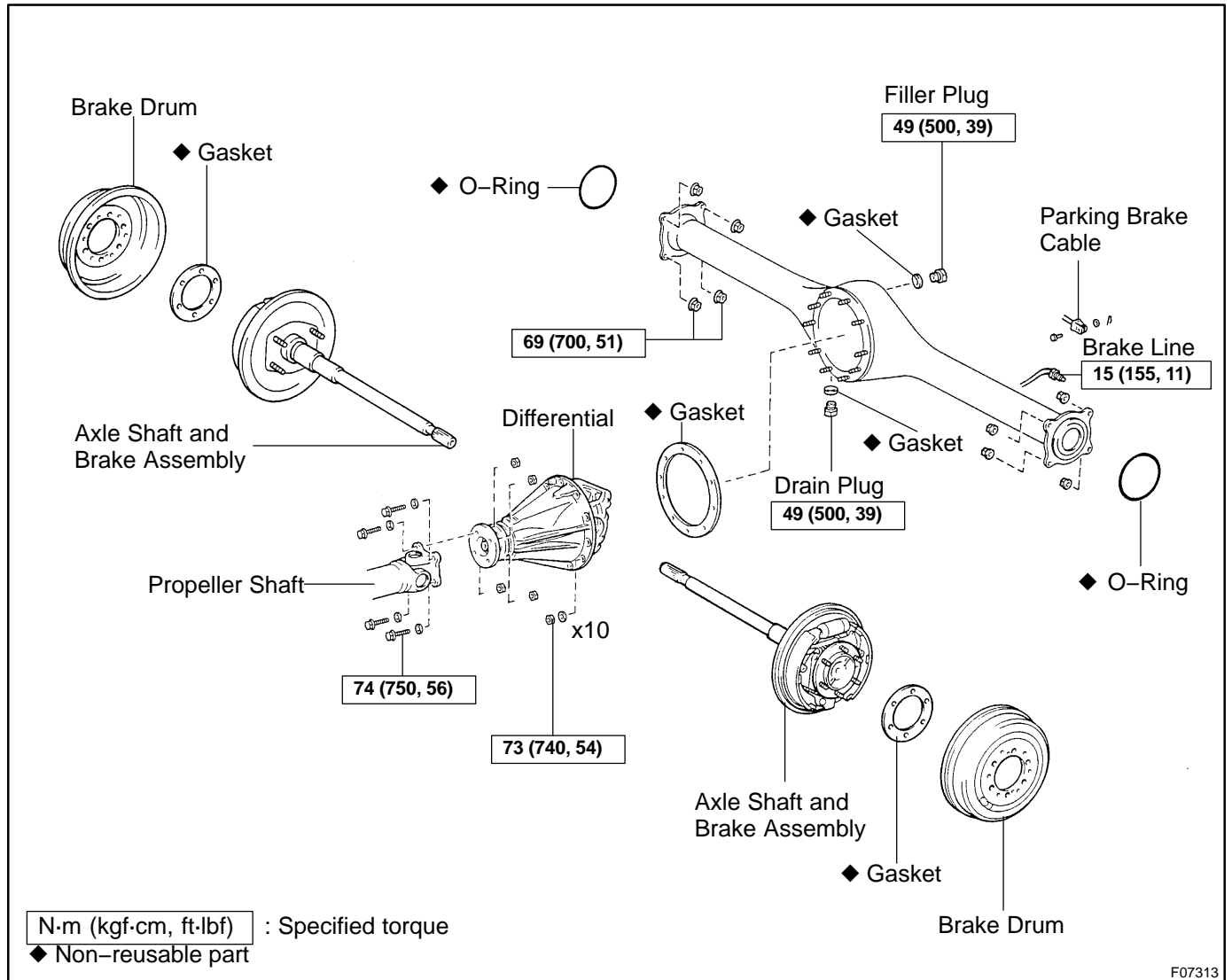
Standard type	SAE 75W - 140
LSD type	Above - 18 °C (0 °F) SAE 90
	Below - 18 °C (0 °F) SAE 80W or 80W - 90

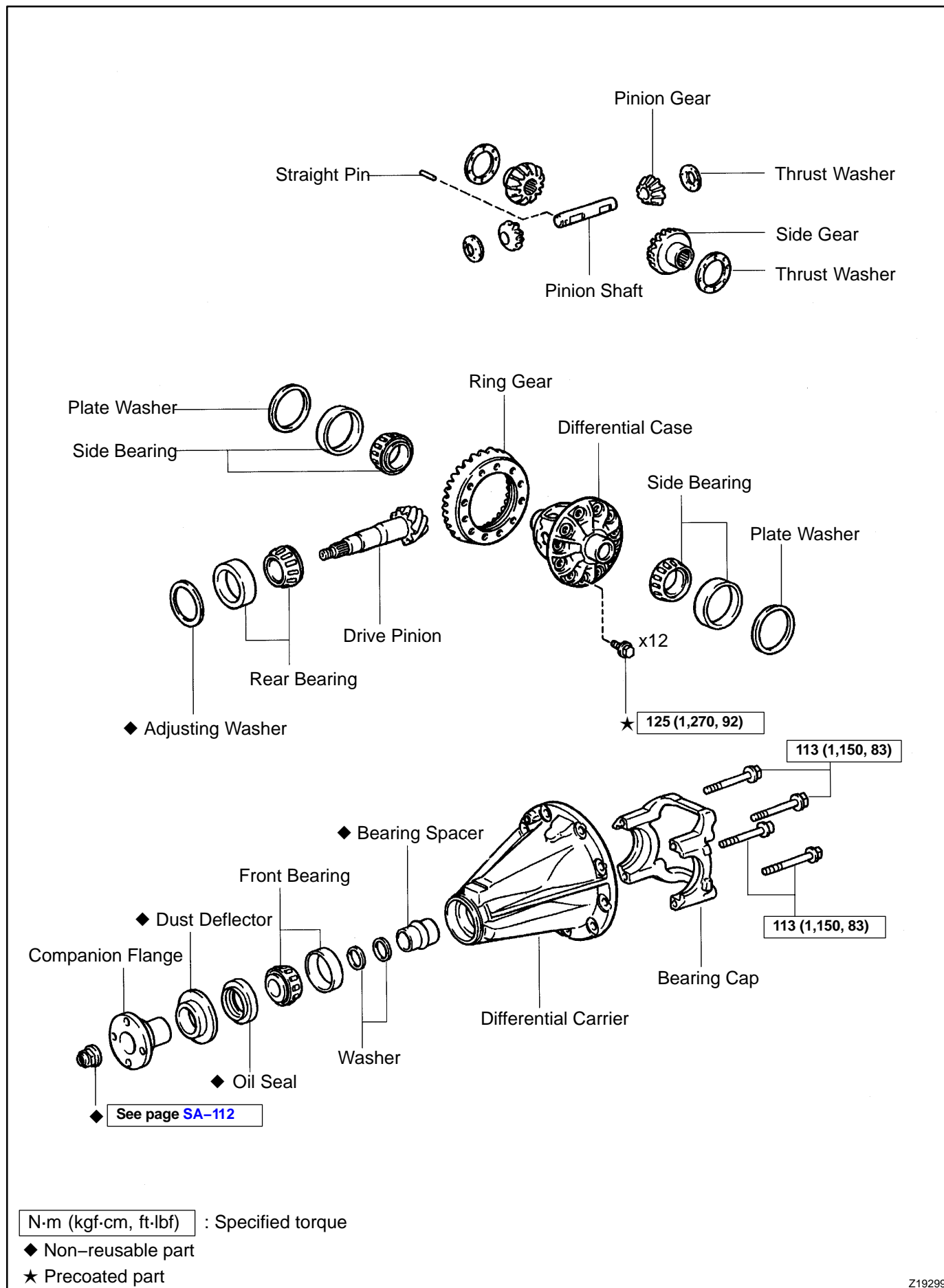
Capacity:

Differential type	Capacity
Standard type	
2WD	
Standard Cab and Access Cab:	3.80 liters (4.02 US qts., 3.34 Imp. qts.)
Double Cab	4.00 liters (4.23 US qts., 3.52 Imp. qts.)
4WD	
Standard Cab and Access Cab:	3.50 liters (3.70 US qts., 3.08 Imp. qts.)
Double Cab	4.00 liters (4.23 US qts., 3.52 Imp. qts.)
LSD type	
2WD	
Standard Cab and Access Cab:	3.15 liters (3.33 US qts., 2.77 Imp. qts.)
Double Cab	3.35 liters (3.54 US qts., 2.95 Imp. qts.)
4WD	
Standard Cab and Access Cab:	2.85 liters (3.01 US qts., 2.51 Imp. qts.)
Double Cab	3.35 liters (3.54 US qts., 2.95 Imp. qts.)

REAR DIFFERENTIAL CARRIER COMPONENTS

SA0BN-06





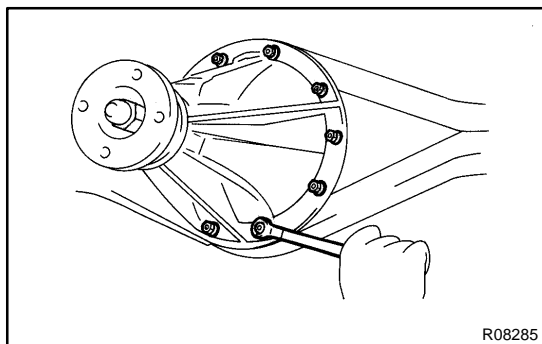
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

★ Precoated part

REMOVAL

1. DRAIN HYPOID GEAR OIL
2. REMOVE REAR AXLE SHAFTS (See page [SA-93](#))
3. DISCONNECT REAR PROPELLER SHAFT
2WD: See page [PR-3](#)
4WD: See page [PR-10](#)

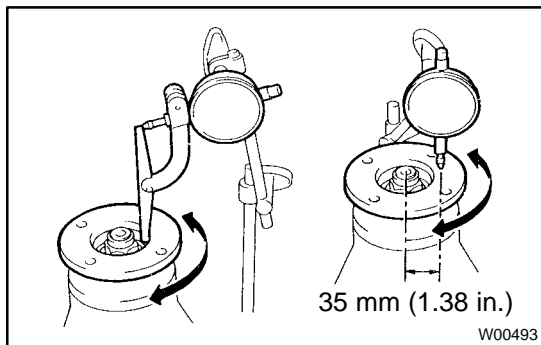


4. REMOVE DIFFERENTIAL CARRIER ASSEMBLY
 - (a) Remove the 10 nuts, washers and differential carrier assembly.

NOTICE:

Be careful not to damage the installation surface.

- (b) Remove the gasket.



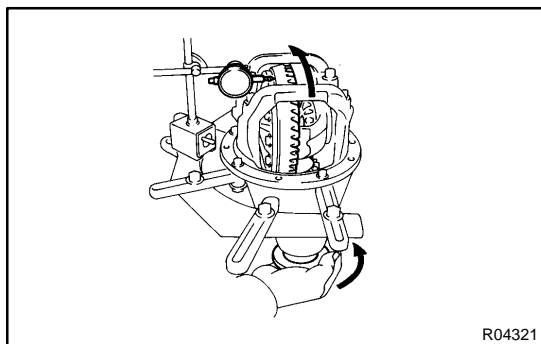
DISASSEMBLY

1. CHECK COMPANION FLANGE RUNOUT

Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum: runout: 0.09 mm (0.0035 in.)

If the runout exceeds the maximum, replace the companion flange.

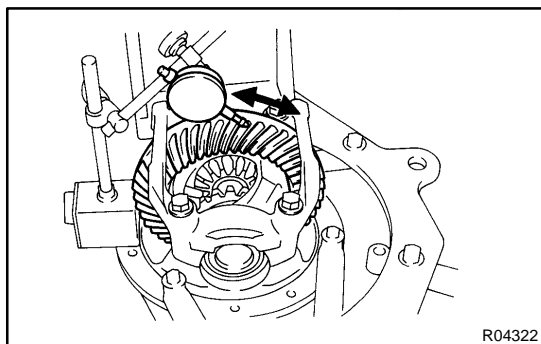


2. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.05 mm (0.0020 in.)

If the runout exceeds the maximum, replace the ring gear.



3. CHECK RING GEAR BACKLASH

Using a dial indicator, while holding the companion flange, measure the ring gear backlash.

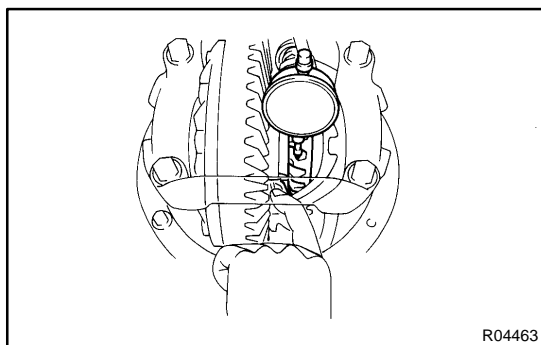
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

HINT:

Measure at 3 or more positions around the circumference of the ring gear.

If the backlash is not within the specified value, adjust the side bearing preload or repair as necessary.

4. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA-112)

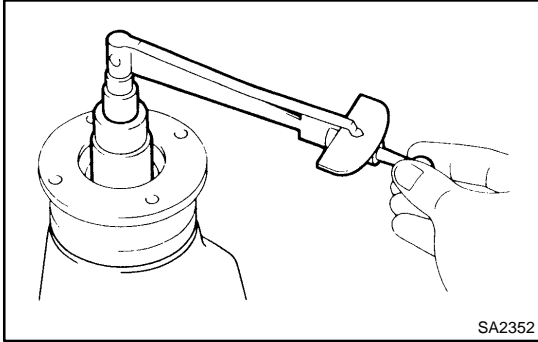


5. CHECK SIDE GEAR BACKLASH

Using a dial indicator, measure the side gear backlash while holding one pinion gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within the specified value, replace the side gear thrust washer with the different thickness (See page SA-112).



6. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of the drive pinion using the backlash between the drive pinion and ring gear.

Preload (at starting):

0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.-lbf)

7. CHECK TOTAL PRELOAD

Using a torque wrench, measure the total preload with the teeth of the drive pinion and ring gear in contact.

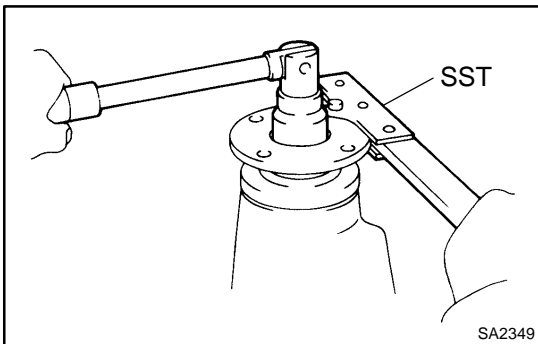
Total preload (at starting):

Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)

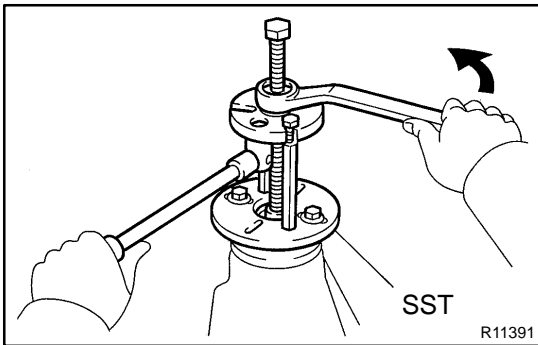
If necessary, disassemble and inspect the differential.

8. REMOVE COMPANION FLANGE

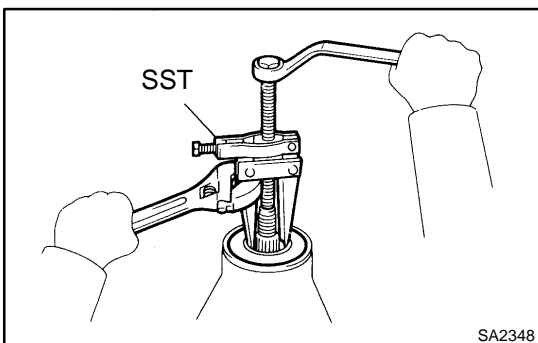
- (a) Using a chisel and hammer, unstake the staked part of the nut.



- (b) Using SST to hold the flange, remove the nut.
SST 09330-00021

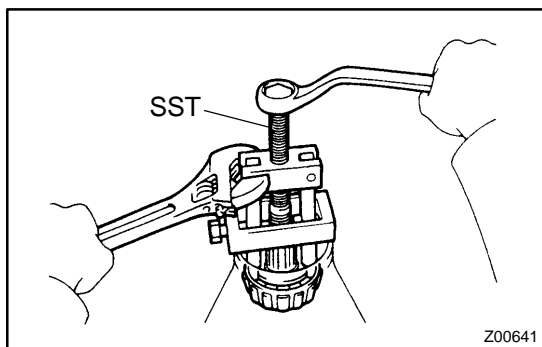


- (c) Using SST, remove the companion flange.
SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03050)



9. REMOVE FRONT OIL SEAL

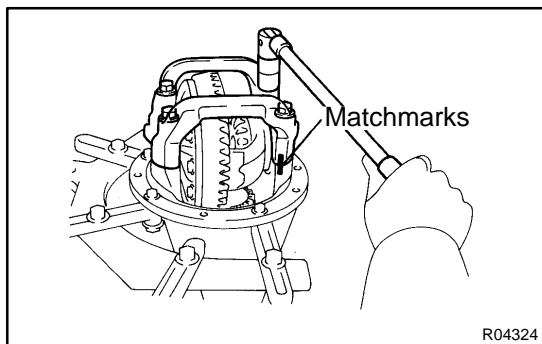
Using SST, remove the oil seal from the differential carrier.
SST 09308-10010

**10. REMOVE FRONT BEARING AND BEARING SPACER**

- (a) Using SST, remove the bearing from the drive pinion.
SST 09556-22010

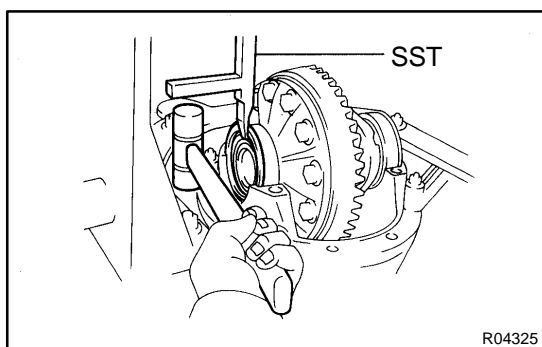
If the front bearing is damaged or worn, replace the front bearing.

- (b) Remove the 2 washers and bearing spacer.

**11. REMOVE DIFFERENTIAL CASE**

- (a) Place matchmarks on the bearing cap and differential carrier.

- (b) Remove the 4 bolts and bearing cap.



- (c) Using SST and a plastic hammer, remove the 2 side bearing plate washers.

SST 09504-22012

HINT:

Measure the plate washer thickness and note it down.

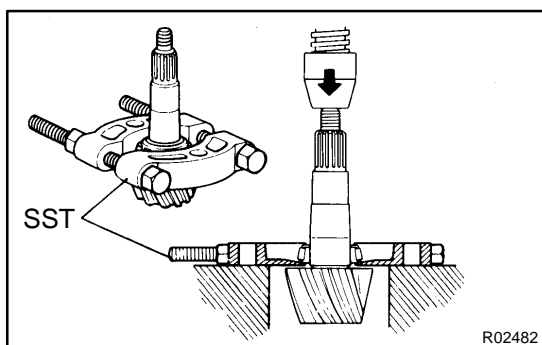
- (d) Remove the differential case with the bearing outer races from the carrier.

HINT:

Tag the bearing outer races to show the location for reassembling.

12. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

Remove the drive pinion with the rear bearing.

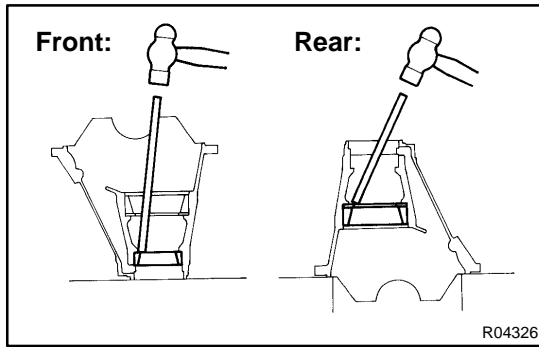
**13. REMOVE DRIVE PINION REAR BEARING**

Using SST and a press, remove the bearing from the drive pinion.

SST 09950-00020

HINT:

If the drive pinion or ring gear is damaged, replace them as a set.



14. REMOVE FRONT AND REAR BEARING OUTER RACES AND ADJUSTING WASHER

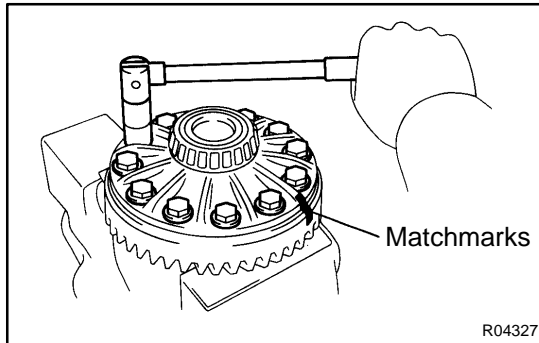
NOTICE:

Do not remove the outer races except when replacing the bearings.

Using a brass bar and hammer, remove the outer races and adjusting washer from the carrier.

HINT:

Measure the adjusting washer thickness and note it down.

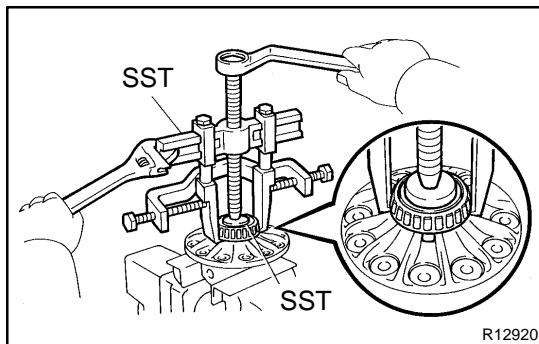
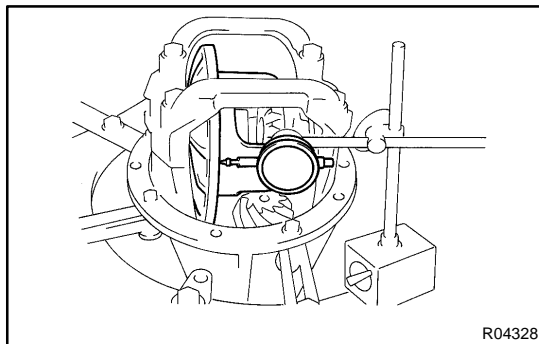


15. REMOVE RING GEAR

- Place matchmarks on the ring gear and differential case.
- Remove the 12 ring gear set bolts.
- Using a plastic hammer, tap on the ring gear to separate it from the differential case.

16. CHECK DIFFERENTIAL CASE RUNOUT

- Install the differential case in the differential carrier (See page [SA-112](#)).
- Using a dial indicator, measure the differential case runout.
Maximum case runout: 0.04 mm (0.0016 in.)
- Remove the differential case.



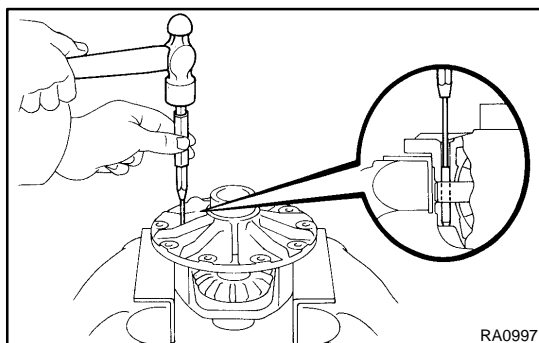
17. REMOVE SIDE BEARINGS

Using SST, remove the 2 side bearings from the differential case.

SST 09950-40011 (09951-04010, 09952-04010, 09953-04020, 09954-04010, 09955-04061, 09957-04010, 09958-04011), 09950-60010 (09951-00480)

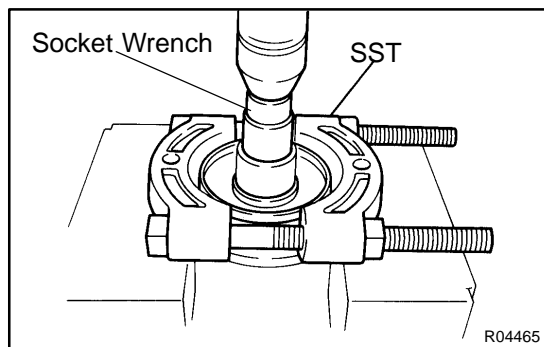
HINT:

Fix the claws of SST to the notch in the differential case.



18. DISASSEMBLE DIFFERENTIAL CASE ASSEMBLY

- Using a pin punch and hammer, remove the straight pin.
- Remove the pinion shaft, 2 pinion gears, pinion gear thrust washers, side gears and side gear thrust washers from the differential case.

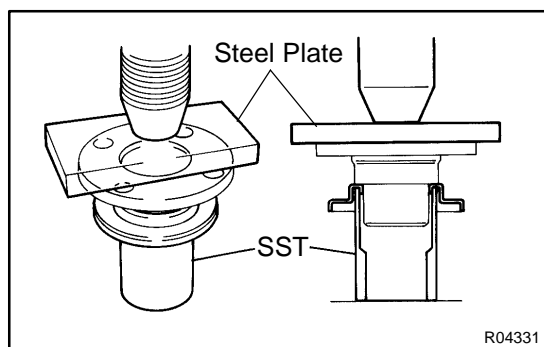


REPLACEMENT

REPLACE COMPANION FLANGE DUST DEFLECTOR

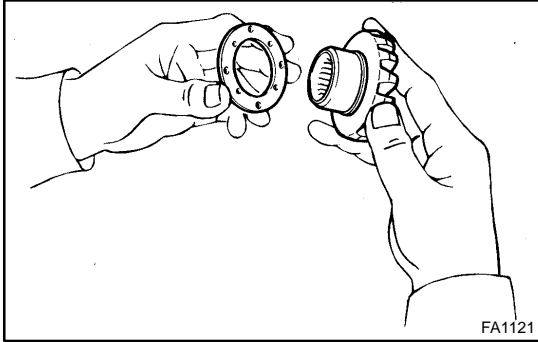
- (a) Using SST, a socket wrench and a press, remove the dust deflector.

SST 09950-00020



- (b) Using SST, a press and steel plate, install a new dust deflector.

SST 09523-36010



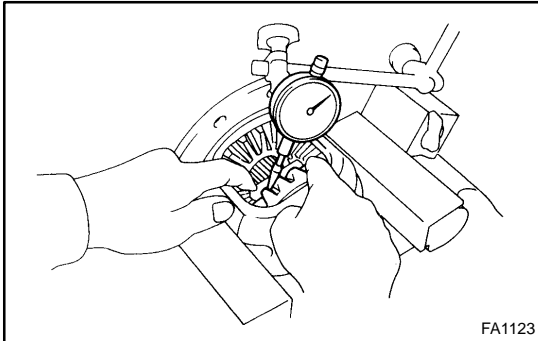
REASSEMBLY

1. ASSEMBLE DIFFERENTIAL CASE

- (a) Install the 2 thrust washers to the side gears.
- (b) Install the 2 side gears with the thrust washers, 2 pinion gears, 2 pinion gear thrust washers and pinion shaft.

HINT:

Align the holes for the straight pin in the differential case and pinion shaft.



- (c) Using a dial indicator, measure the side gear backlash while holding one pinion gear toward the differential case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

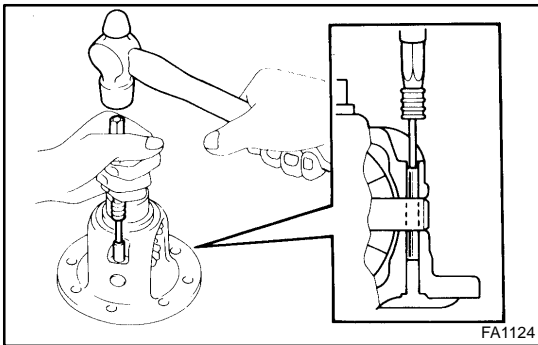
If the backlash is not within the specified value, replace the side gear thrust washer with an appropriate thickness.

HINT:

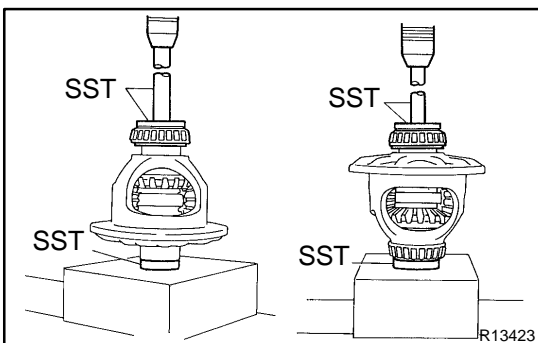
Refer to the following table to select thrust washers which will ensure that the backlash is within the specified value.

Washer thickness:

Thickness mm (in.)	Thickness mm (in.)
1.50 (0.0590)	1.75 (0.0689)
1.55 (0.0610)	1.80 (0.0709)
1.60 (0.0630)	1.85 (0.0728)
1.65 (0.0650)	1.90 (0.0748)
1.70 (0.0669)	-



- (d) Using a pin punch and hammer, install the straight pin through the holes in the differential case and pinion shaft.
- (e) Using a chisel and hammer, stake the outside of the differential case pin hole.



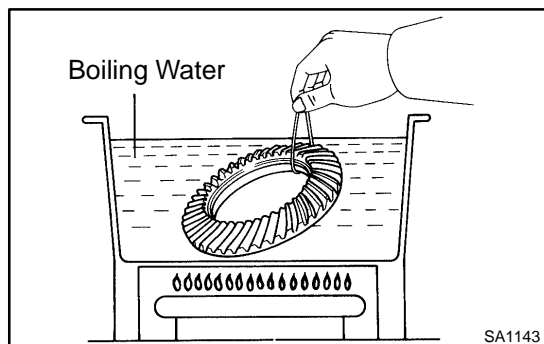
2. INSTALL SIDE BEARINGS

Using SST and a press, install the 2 side bearings into the differential case.

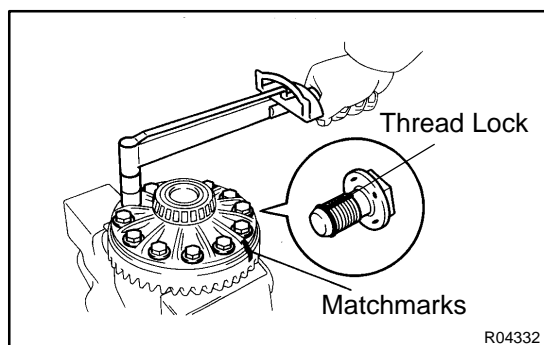
SST 09950-60010 (09951-00480, 09951-00640)
09950-70010 (09951-07150)

3. INSTALL RING GEAR ON DIFFERENTIAL CASE

- (a) Clean the contact surfaces of the differential case and ring gear.



- (b) Heat the ring gear to about 100°C (212°F) in boiling water.
- (c) Carefully take the ring gear out of the boiling water.



- (d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.

HINT:

Align the matchmarks on the ring gear and differential case.

- (e) After the ring gear has cooled sufficiently, torque the set bolts to which thread lock has been applied.

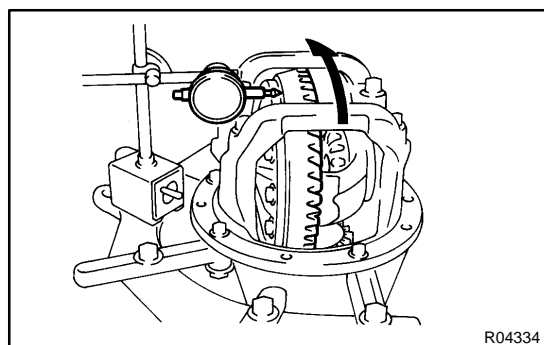
Thread lock:

Part No. 08833-00100, THREE BOND 1360K or equivalent.

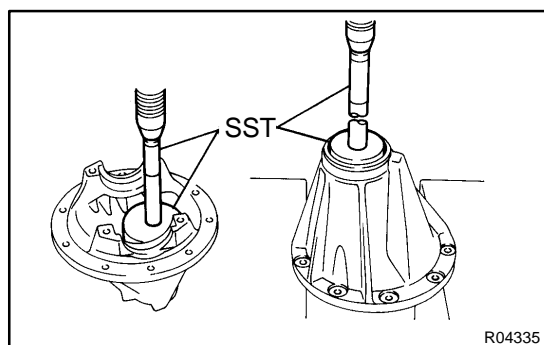
Torque: 125 N·m (1,270 kgf·cm, 92 ft·lbf)

4. INSPECT RING GEAR RUNOUT

- (a) Install the differential case into the carrier and install the plate washers to where there is no play in the bearing (See step 8.).
- (b) Install the bearing cap (See step 11.).



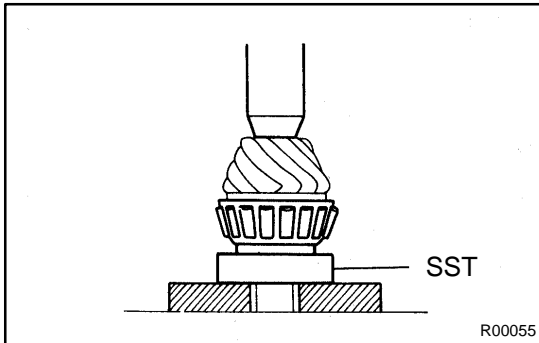
- (c) Using a dial indicator, measure the runout of the ring gear.
 - (d) Remove the bearing caps and differential case.
- Maximum runout: 0.05 mm (0.0020 in.)**

**5. INSTALL DRIVE PINION BEARING OUTER RACES AND ADJUSTING WASHER**

- (a) Using SST and a press, install a new front bearing outer race to the carrier.
SST 09950-60020 (09951-00710),
09950-70010 (09951-07150)
- (b) Using SST and a press, install a new adjusting washer and a new rear bearing outer race to the carrier.
SST 09950-60020 (09951-00910),
09950-70010 (09951-07150)

HINT:

First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with a different thickness if necessary.

**6. INSTALL DRIVE PINION REAR BEARING**

Using SST and a press, install the rear bearing onto the drive pinion.

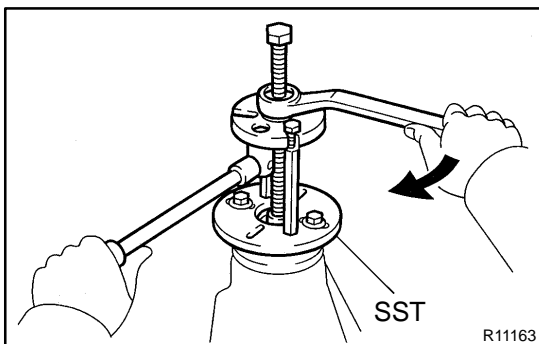
SST 09506-35010

7. TEMPORARILY ADJUST DRIVE PINION PRELOAD

(a) Install the drive pinion and front bearing.

HINT:

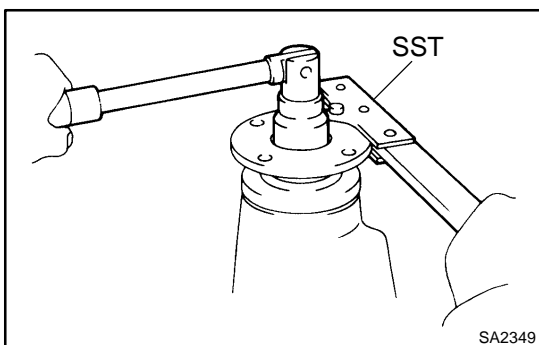
After adjusting the ring gear tooth contact pattern, assemble the spacer, washers and oil seal.



(b) Using SST, install the companion flange.

SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03050)

(c) Coat the threads of the nut with hypoid gear oil.



(d) Adjust the drive pinion preload by tightening the companion flange nut.

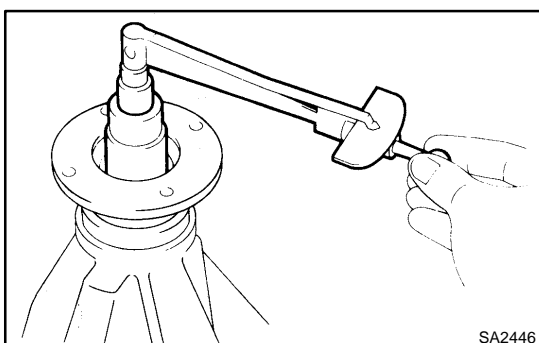
HINT:

Using SST to hold the flange, torque the nut.

SST 09330-00021

NOTICE:

As there is no spacer, tighten the nut a little at a time and be careful not to overtighten it.



(e) Using a torque wrench, measure the preload of the drive pinion using the backlash between the drive pinion and ring gear.

Preload (at starting):**New bearing**

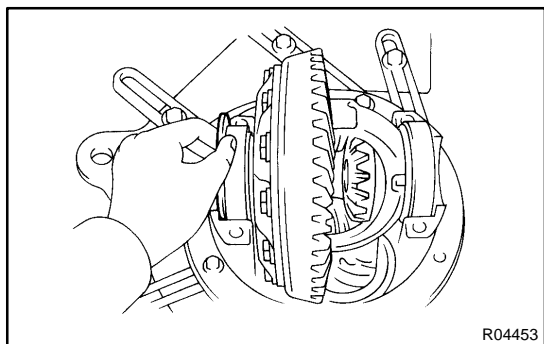
1.3 - 1.9 N·m (13 - 19 kgf·cm, 11.4 - 16.7 in.-lbf)

Reused bearing

0.5 - 0.8 N·m (5 - 8 kgf·cm, 4.3 - 6.9 in.-lbf)

8. INSTALL DIFFERENTIAL CASE IN CARRIER

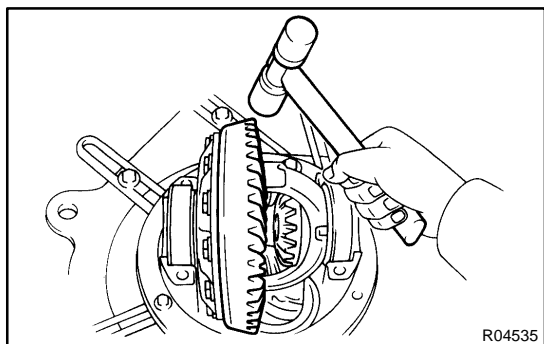
- (a) Place the 2 bearing outer races on their respective bearings. Make sure the right and left races are not interchanged.
- (b) Install the differential case in the carrier.

**9. ADJUST RING GEAR BACKLASH**

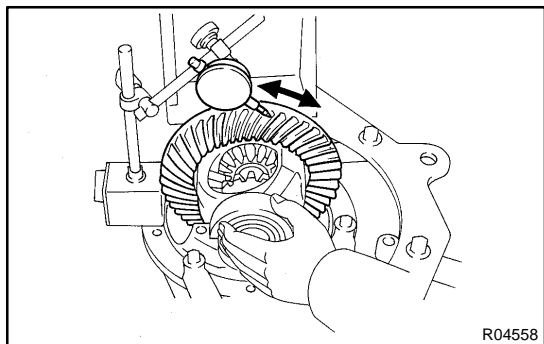
- (a) Install the plate washer on the ring gear back side.

HINT:

Make sure that the ring gear has backlash.



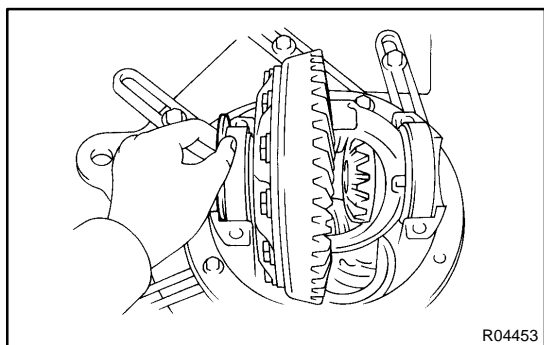
- (b) Tap on the ring gear with a plastic hammer so that the washer fits to the bearing.



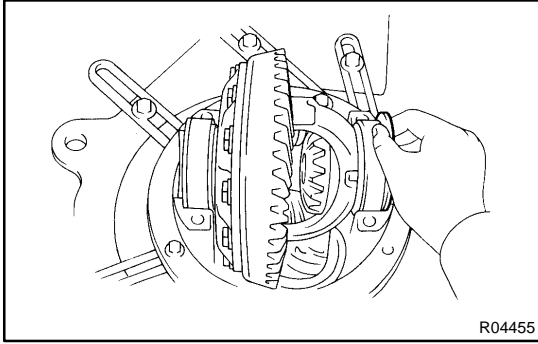
- (c) Using a dial indicator, while holding the companion flange, measure the ring gear backlash.

Backlash (reference):

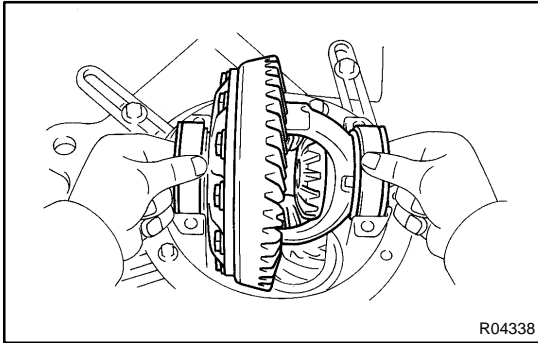
0.13 – 0.18 mm (0.0051 – 0.0071 in.)



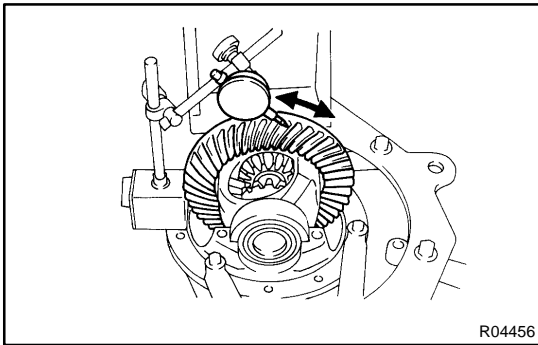
- (d) Select a plate washer for back side ring gear using the backlash as a reference.



- (e) Select a ring gear teeth side plate washer so that there is no clearance between the outer race and case.
- (f) Remove the 2 plate washers and differential case.
- (g) Install the plate washer into the ring gear back side of the carrier.



- (h) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.
- (i) Tap on the ring gear with a plastic hammer so that the washers fit to the bearing.



- (j) Using a dial indicator, while holding the companion flange, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within the specified value, adjust it by either increasing or decreasing the thickness of the washers on both sides by an equal amount.

HINT:

There should be no clearance between the plate washer and the case.

Make sure that there is a ring gear backlash.

10. ADJUST SIDE BEARING PRELOAD

- (a) Remove the ring gear teeth side plate washer and using a micrometer, measure the thickness.
- (b) Using the backlash as a reference, install a new washer that is 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the washer removed.

HINT:

Select a washer which can be pressed in 2/3 of the way with your finger.

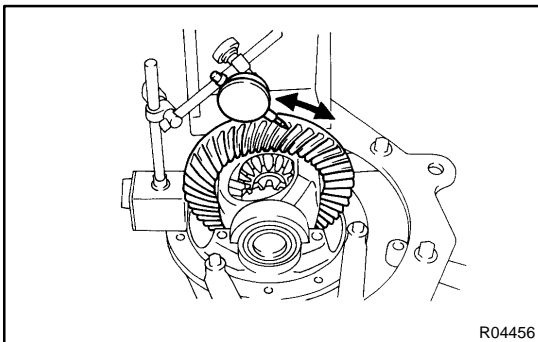
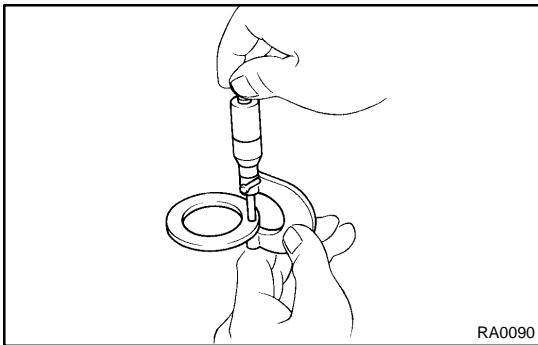
- (c) Using a plastic hammer, install the plate washer.
- (d) Recheck the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within the specified value, adjust it by either increasing or decreasing the thickness of washers on both sides by equal amount.

HINT:

The backlash will change by about 0.02 mm (0.0008 in.) corresponding to 0.03 mm (0.0012 in.) change in the plate washer.



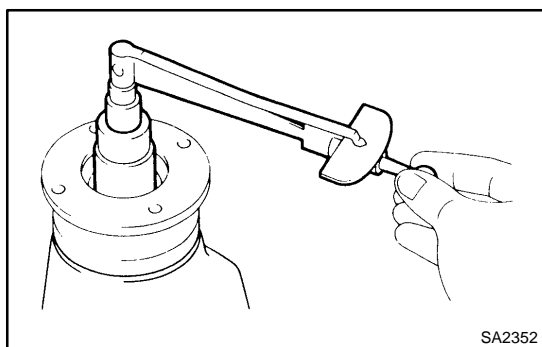
Washer thickness:

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
58	2.58 (0.1015)	90	2.90 (0.1142)	22	3.22 (0.1268)
60	2.60 (0.1024)	92	2.92 (0.1150)	24	3.24 (0.1276)
62	2.62 (0.1031)	94	2.94 (0.1157)	26	3.26 (0.1283)
64	2.64 (0.1039)	96	2.96 (0.1165)	28	3.28 (0.1291)
66	2.66 (0.1047)	98	2.98 (0.1173)	30	3.30 (0.1299)
68	2.68 (0.1055)	00	3.00 (0.1181)	32	3.32 (0.1307)
70	2.70 (0.1063)	02	3.02 (0.1189)	34	3.34 (0.1315)
72	2.72 (0.1071)	04	3.04 (0.1197)	36	3.36 (0.1323)
74	2.74 (0.1079)	06	3.06 (0.1205)	38	3.38 (0.1331)
76	2.76 (0.1087)	08	3.08 (0.1213)	40	3.40 (0.1339)
78	2.78 (0.1094)	10	3.10 (0.1220)	42	3.42 (0.1346)
80	2.80 (0.1102)	12	3.12 (0.1228)	44	3.44 (0.1354)
82	2.82 (0.1110)	14	3.14 (0.1236)	46	3.46 (0.1362)
84	2.84 (0.1118)	16	3.16 (0.1244)	48	3.48 (0.1370)
86	2.86 (0.1126)	18	3.18 (0.1252)		–
88	2.88 (0.1134)	20	3.20 (0.1260)		–

11. INSTALL BEARING CAP

- (a) Align the matchmarks on the cap and carrier.
- (b) Install and torque the 4 bolts.

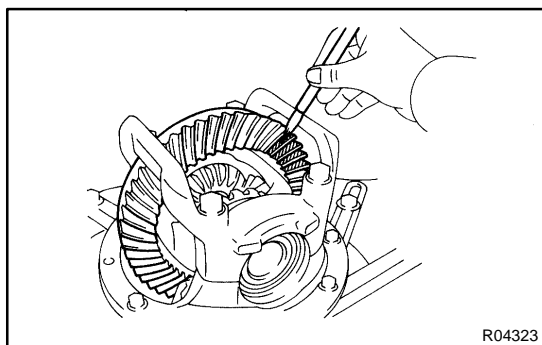
Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)

**12. MEASURE TOTAL PRELOAD**

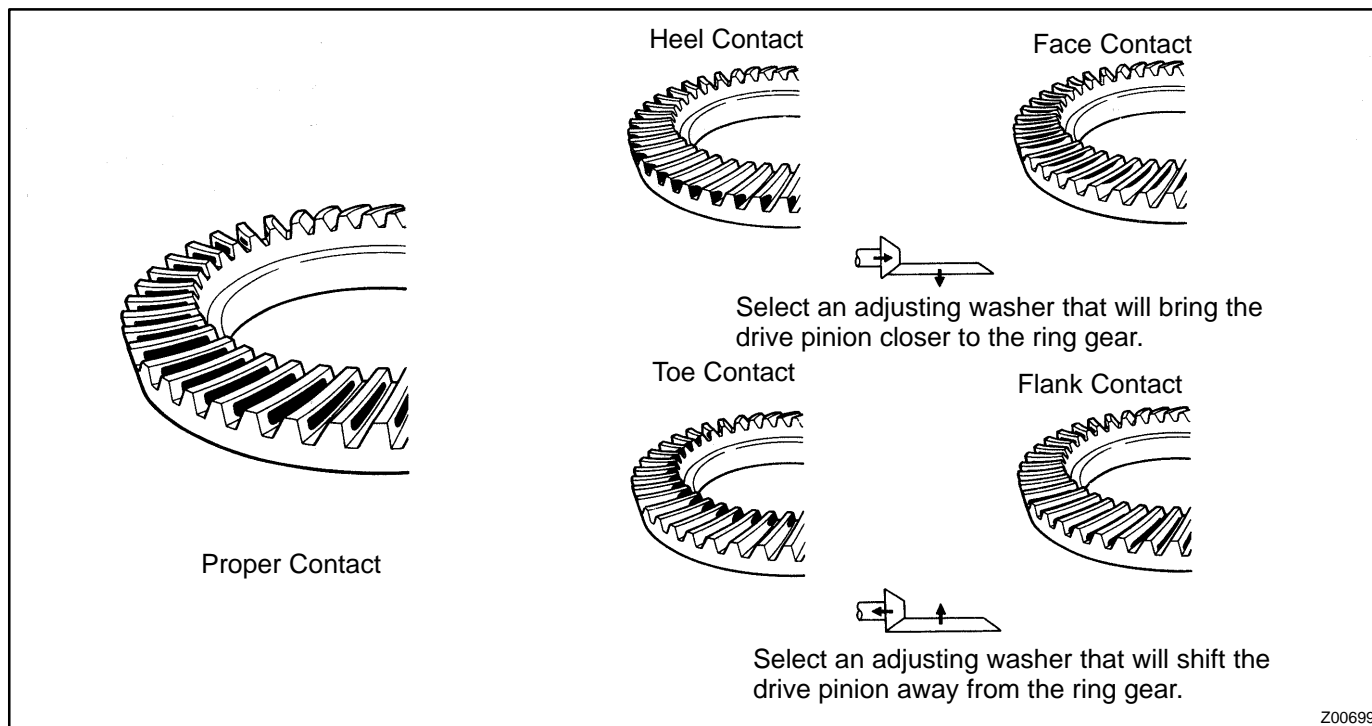
Using a torque wrench, measure the total preload with the teeth of the drive pinion and ring gear in contact.

Total preload (at starting):

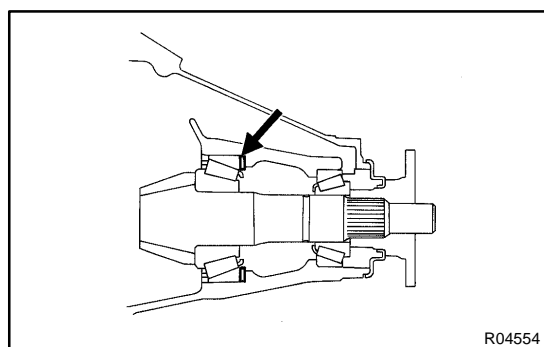
Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in·lbf)

**13. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION**

- (a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead primer.
- (b) Hold the companion flange firmly and rotate the ring gear in both directions.
- (c) Inspect the teeth pattern.



Z00699



R04554

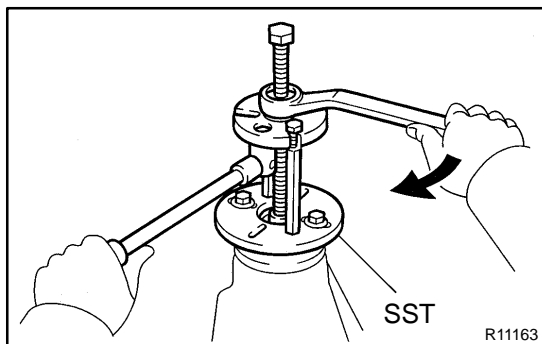
If the teeth are not contacting properly, use the following table to select a proper washer for correction.

Washer thickness:

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
87	1.87 (0.0736)	01	2.01 (0.0791)	15	2.15 (0.0846)
88	1.88 (0.0740)	02	2.02 (0.0795)	16	2.16 (0.0850)
89	1.89 (0.0744)	03	2.03 (0.0799)	17	2.17 (0.0854)
90	1.90 (0.0748)	04	2.04 (0.0803)	18	2.18 (0.0858)
91	1.91 (0.0752)	05	2.05 (0.0807)	19	2.19 (0.0862)
92	1.92 (0.0756)	06	2.06 (0.0811)	20	2.20 (0.0866)
93	1.93 (0.0760)	07	2.07 (0.0815)	21	2.21 (0.0870)
94	1.94 (0.0764)	08	2.08 (0.0819)	22	2.22 (0.0874)
95	1.95 (0.0768)	09	2.09 (0.0823)	23	2.23 (0.0878)
96	1.96 (0.0772)	10	2.10 (0.0827)	24	2.24 (0.0882)
97	1.97 (0.0776)	11	2.11 (0.0831)	25	2.25 (0.0886)
98	1.98 (0.0780)	12	2.12 (0.0835)	26	2.26 (0.0890)
99	1.99 (0.0783)	13	2.13 (0.0839)	27	2.27 (0.0894)
00	2.00 (0.0787)	14	2.14 (0.0843)	28	2.28 (0.0898)

14. REMOVE COMPANION FLANGE (See page SA-107)
15. REMOVE FRONT BEARING (See page SA-107)
16. INSTALL NEW BEARING SPACER, 2 WASHERS AND FRONT BEARING

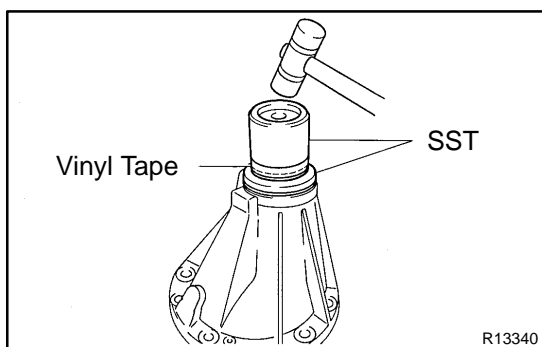
- (a) Install a new bearing spacer and 2 washers, and place the front bearing.



- (b) Using SST and the companion flange, install the front bearing then remove the companion flange.
SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03050)

17. INSTALL NEW OIL SEAL

- (a) Coat a new oil seal lip with MP grease.



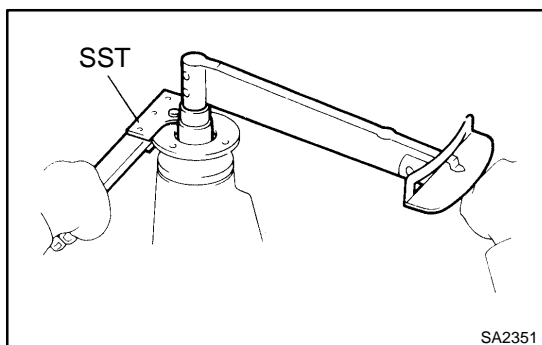
- (b) Using SST and a plastic hammer, install the oil seal until its surface is flush with the differential carrier end.
SST 09316-12010, 09649-17010

HINT:

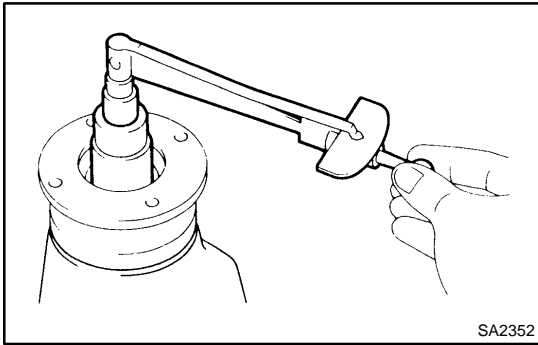
Connect 2 SST with vinyl tape.

18. INSTALL COMPANION FLANGE

- (a) Place the companion flange.
- (b) Coat the threads of a new nut with hypoid gear oil.



- (c) Using SST to hold the flange, torque the nut.
SST 09330-00021
Torque: 147 N·m (1,500 kgf·cm, 109 ft·lbf)



19. ADJUST DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of the drive pinion using the backlash between the drive pinion and ring gear.

Preload (at starting):

New bearing

1.3 – 1.9 N·m (13 – 19 kgf·cm, 11.4 – 16.7 in.-lbf)

Reused bearing

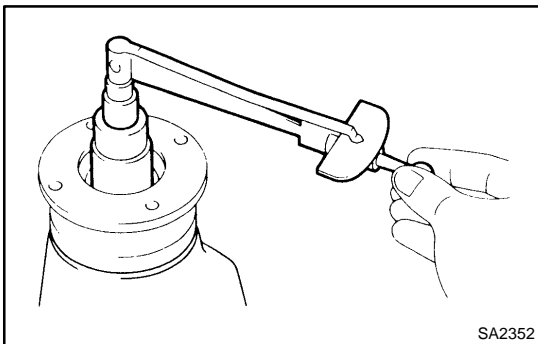
0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.-lbf)

If the preload is greater than the specified value, replace the bearing spacer.

If the preload is less than the specified value, retighten the nut with a force of 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached.

Torque: 451 N·m (4,600 kgf·cm, 333 ft·lbf) or less

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not loosen the pinion nut to reduce the preload.



20. CHECK TOTAL PRELOAD

Using a torque wrench, measure the total preload with the teeth of the drive pinion and ring gear in contact.

Total preload (at starting):

Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)

21. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

22. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 13.)

23. CHECK COMPANION FLANGE RUNOUT

(See page [SA-107](#))

24. STAKE DRIVE PINION NUT

INSTALLATION

1. INSTALL DIFFERENTIAL CARRIER ASSEMBLY

- (a) Install a new gasket.
- (b) Install the differential carrier assembly with the 10 washers and nuts.

NOTICE:

Be careful not to damage the installation surface.

Torque: 73 N·m (740 kgf·cm, 54 ft·lbf)

2. CONNECT REAR PROPELLER SHAFT

2WD: See page [PR-8](#)

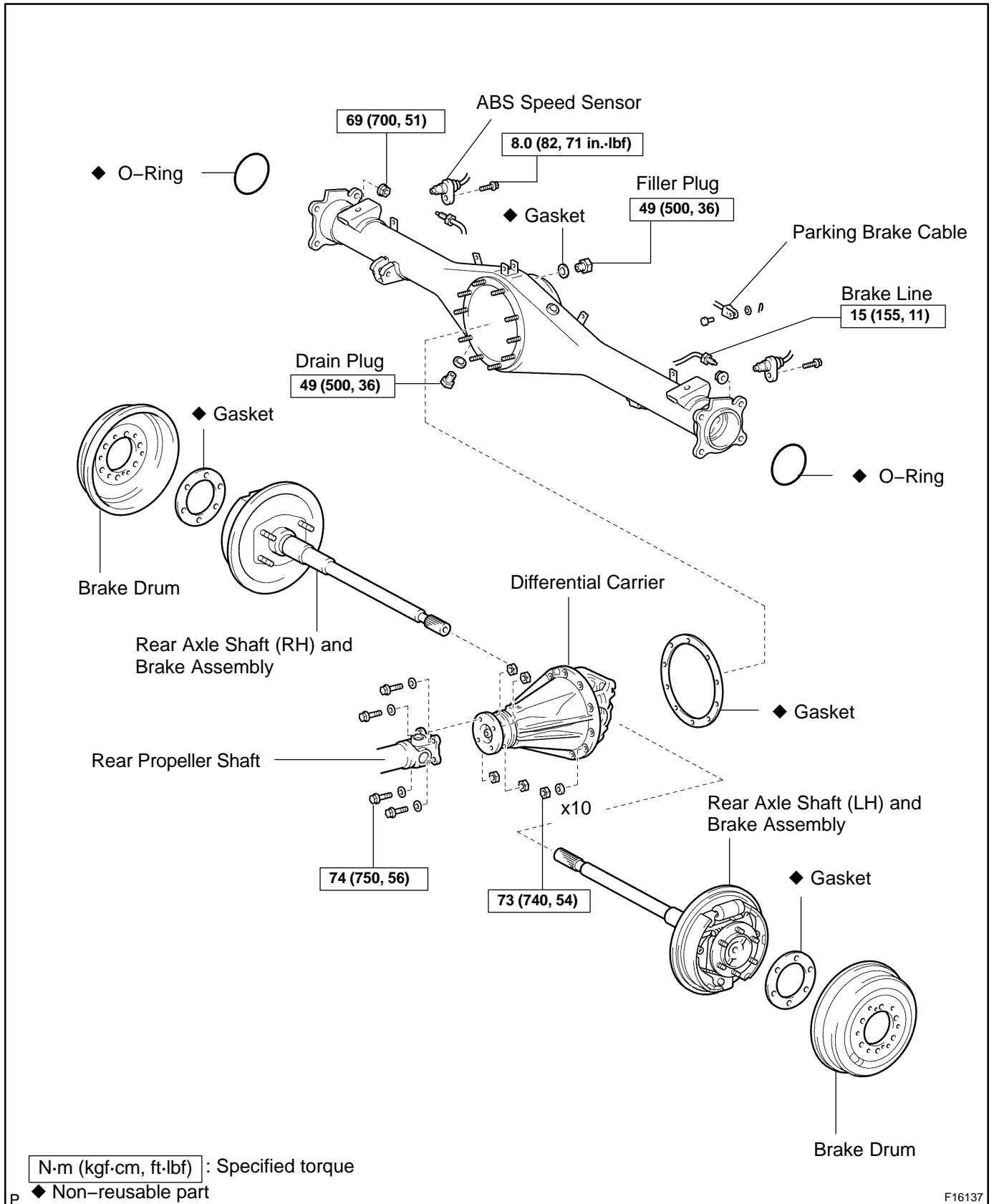
4WD: See page [PR-15](#)

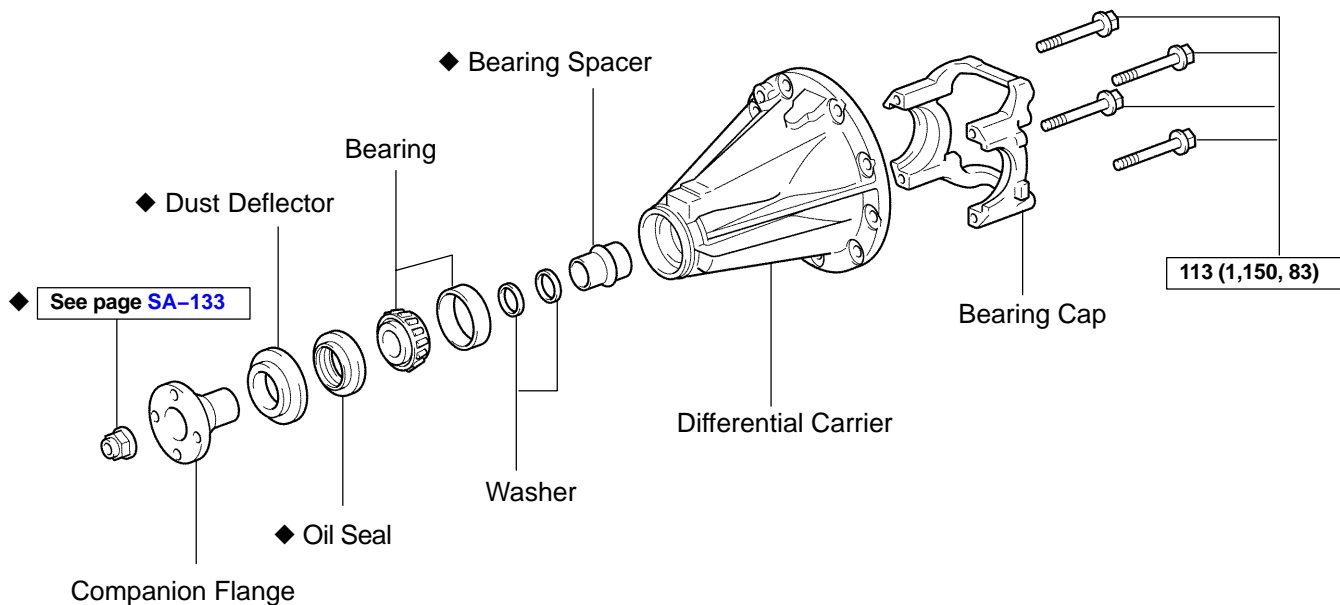
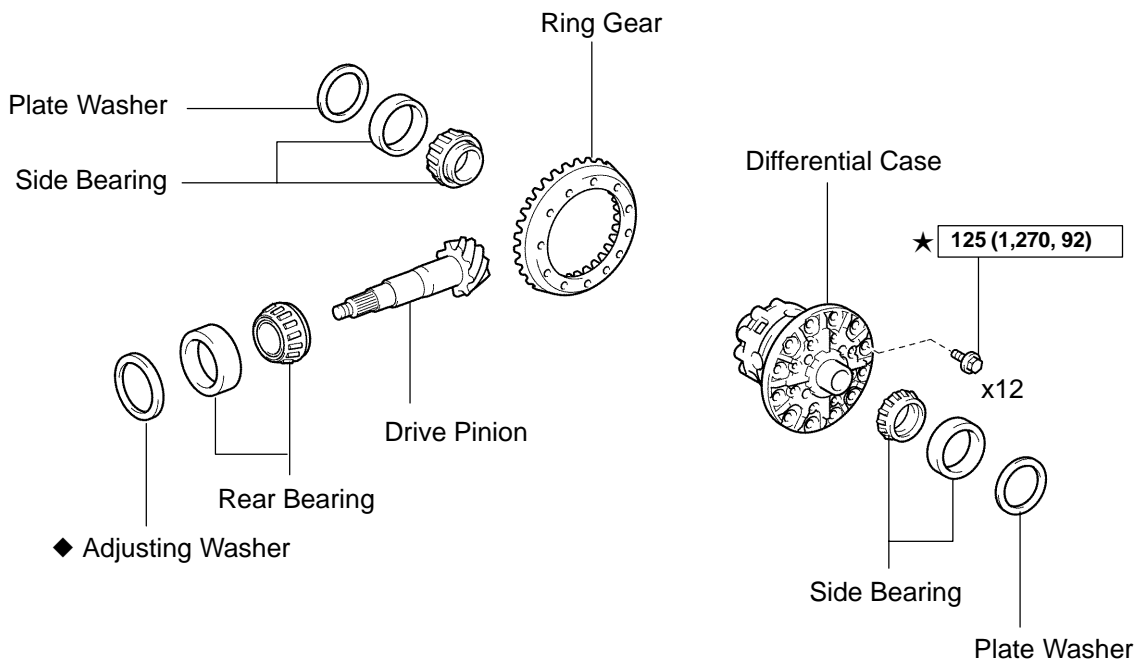
3. INSTALL REAR AXLE SHAFTS (See page [SA-98](#))

4. FILL DIFFERENTIAL WITH HYPOID GEAR OIL (See page [SA-101](#))

REAR DIFFERENTIAL CARRIER (w/ LSD) COMPONENTS

SA28M-02



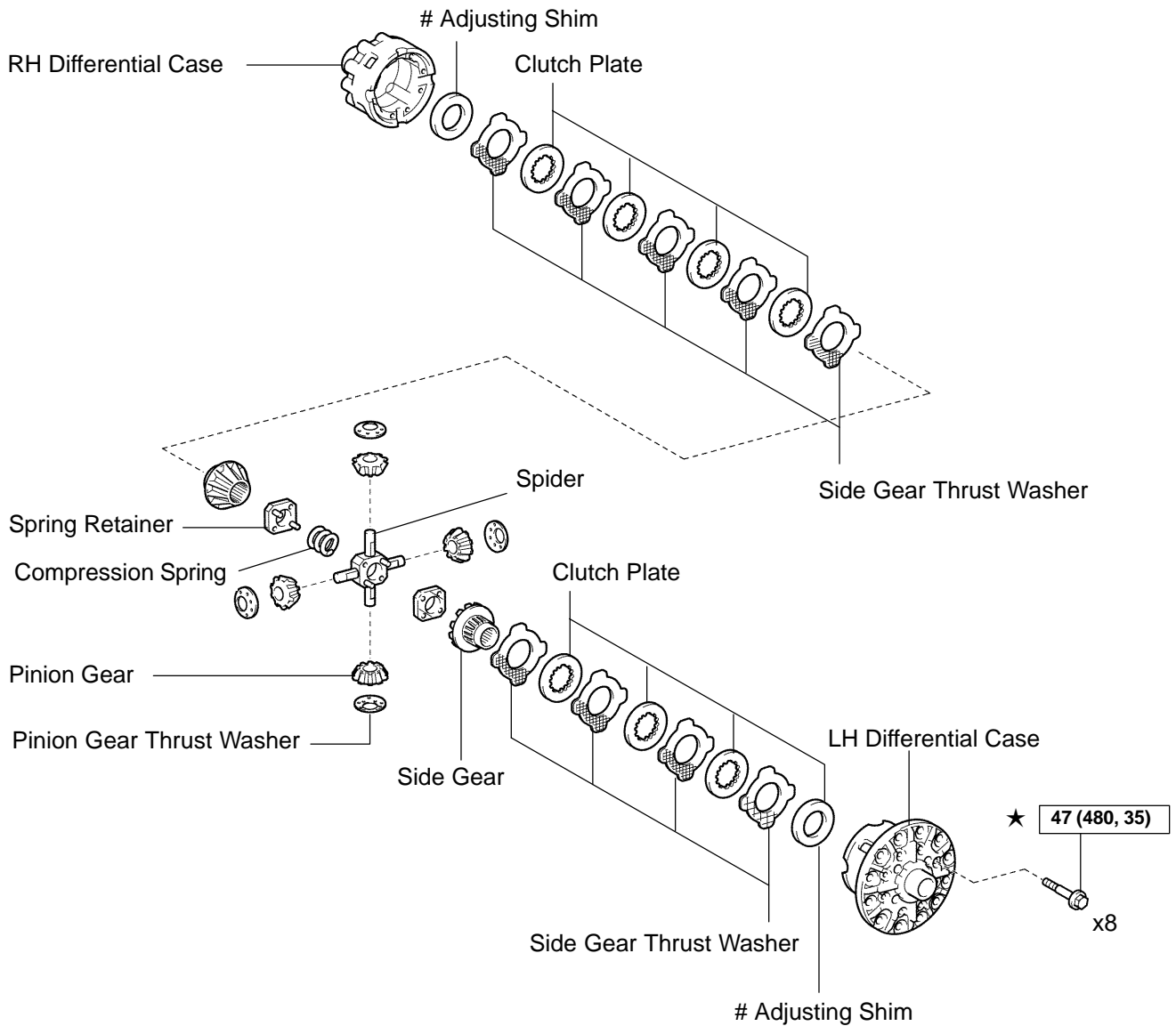


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

★ Precoated part

#: If the side gear backlash has been adjusted by TOYOTA dealer, adjusting shims are installed between the side gear thrust washer and the differential case.

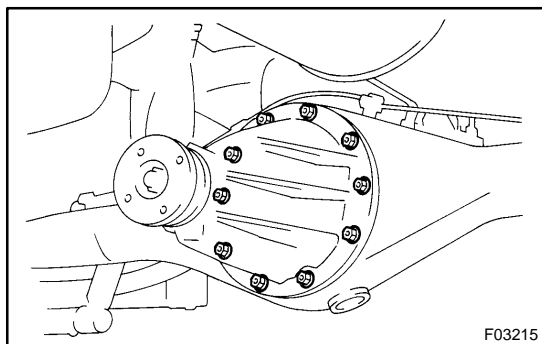


N·m (kgf·cm, ft·lbf) : Specified torque

★ Precoated part

REMOVAL

1. DRAIN HYPOID GEAR OIL
2. REMOVE REAR AXLE SHAFTS (See page [SA-93](#))
3. DISCONNECT REAR PROPELLER SHAFT
2WD: See page [PR-3](#)
4WD: See page [PR-10](#)

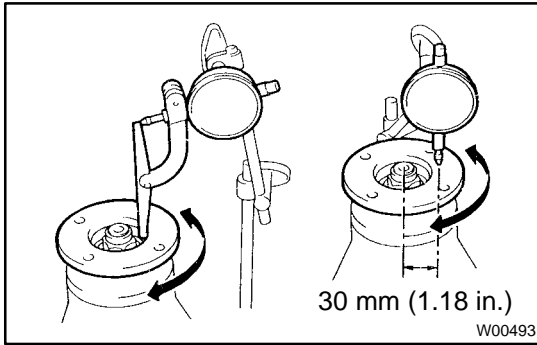


4. REMOVE DIFFERENTIAL CARRIER ASSEMBLY
 - (a) Remove the 10 nuts, washers and differential carrier assembly.

NOTICE:

Be careful not to damage the installation surface.

- (b) Remove the gasket.



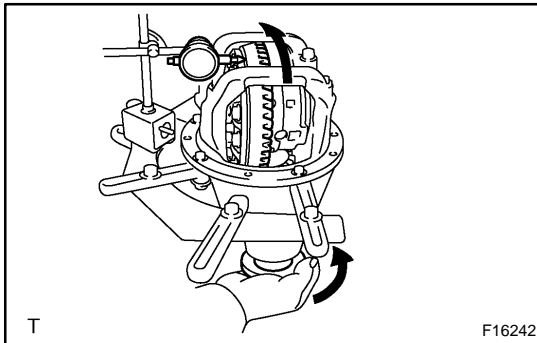
DISASSEMBLY

1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum runout: 0.09 mm (0.0035 in.)

If the runout is not within the specification, replace the companion flange.

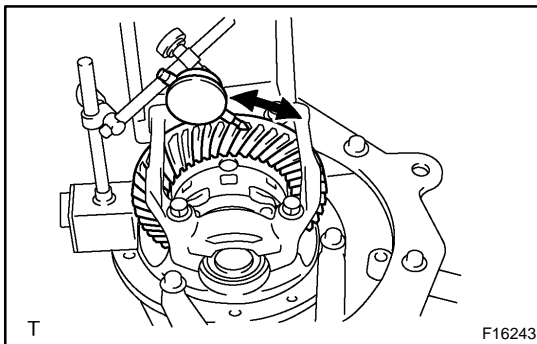


2. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.05 mm (0.0020 in.)

If the runout is not within the specification, replace the ring gear.



3. CHECK RING GEAR BACKLASH

Using a dial indicator, while holding the companion flange, measure the ring gear backlash.

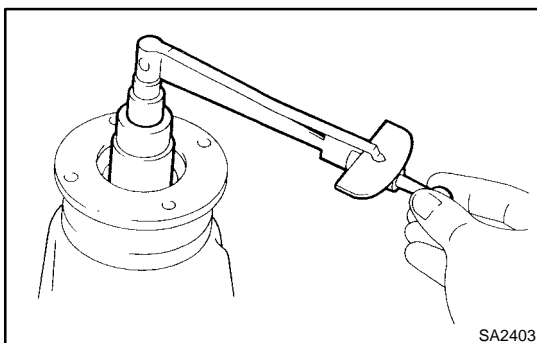
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

HINT:

Measure at 3 or more positions around the circumference of the ring gear.

If the backlash is not within the specification, adjust the side bearing preload or repair if necessary.

4. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page [SA-133](#))



5. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the drive pinion preload using the backlash of the drive pinion and ring gear.

Preload (at starting):

0.6 – 0.9 N·m (6.1 – 9.2 kgf·cm, 5.3 – 8.0 in.-lbf)

6. CHECK TOTAL PRELOAD

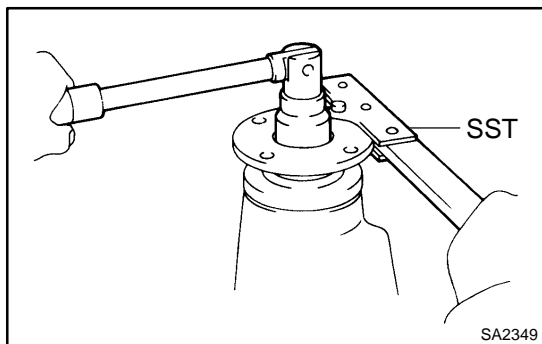
Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

Total preload (at starting):**Drive pinion preload plus****0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)**

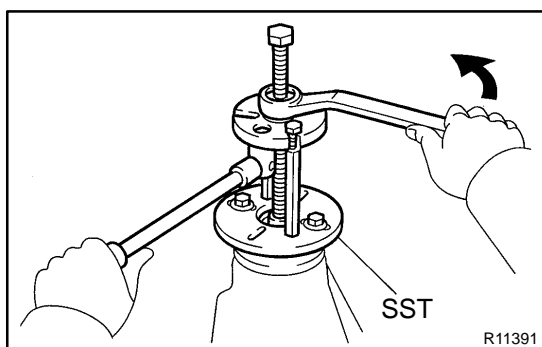
If necessary, disassemble and inspect the differential.

7. REMOVE COMPANION FLANGE

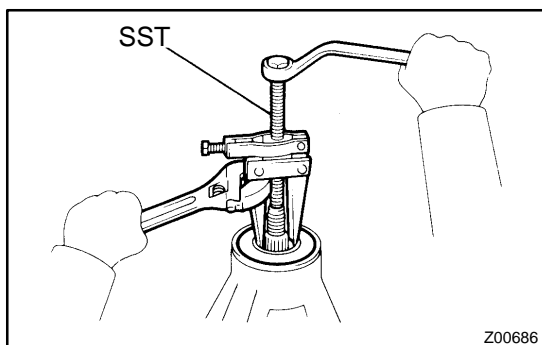
- (a) Using a chisel and a hammer, unstake the nut.



- (b) Using SST to hold the flange, remove the nut.
SST 09330-00021

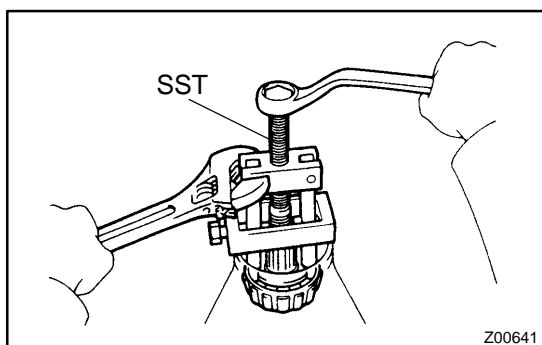


- (c) Using SST, remove the companion flange.
SST 09950-30012 (09951-03010, 09953-03010,
09954-03010, 09955-03030, 09956-03030)

**8. REMOVE FRONT OIL SEAL**

Using SST, remove the oil seal from the differential carrier.

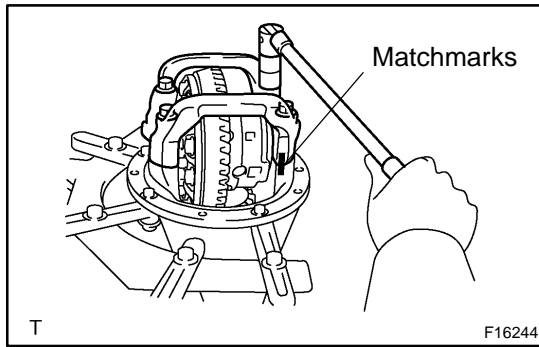
SST 09308-10010

**9. REMOVE FRONT BEARING AND BEARING SPACER**

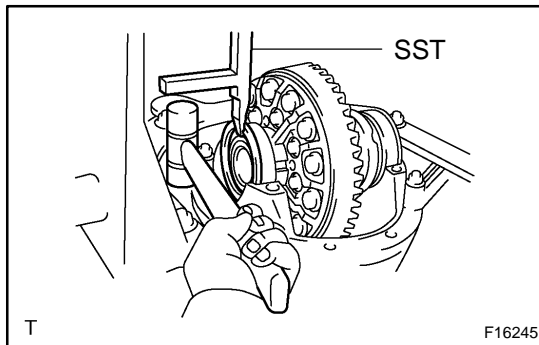
- (a) Using SST, remove the bearing from the drive pinion.
SST 09556-22010

If the front bearing is damaged or worn, replace the front bearing.

- (b) Remove the 2 washers and bearing spacer.

**10. REMOVE DIFFERENTIAL CASE**

- (a) Place matchmarks on the bearing cap and differential carrier.
- (b) Remove the 4 bolts and bearing cap.



- (c) Using SST and a plastic hammer, remove the 2 side bearing plate washers.

SST 09504-22012

HINT:

Measure the plate washer thickness and note it down.

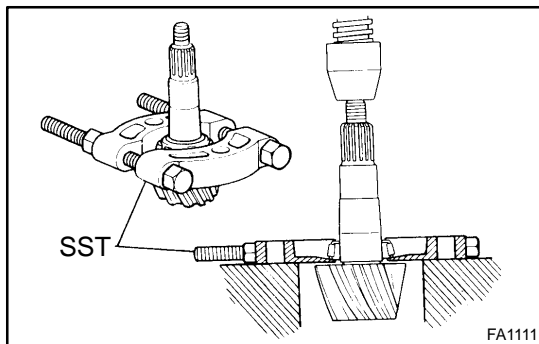
- (d) Remove the differential case with the bearing outer races from the carrier.

HINT:

Tag the disassembled parts to show the location for reassembling.

11. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

Remove the drive pinion with the rear bearing.

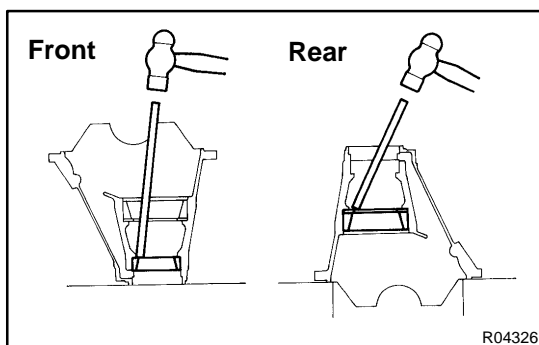
**12. REMOVE DRIVE PINION REAR BEARING**

Using SST and a press, remove the bearing from the drive pinion.

SST 09950-00020

HINT:

If the drive pinion or ring gear is damaged, replace them as a set.

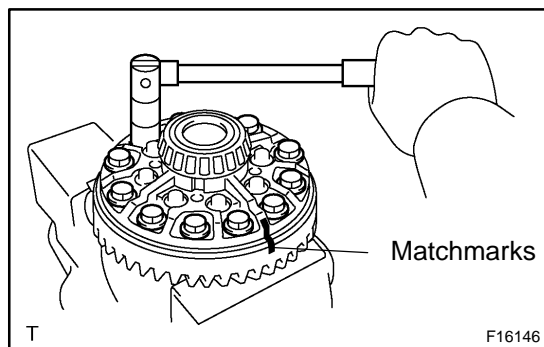
**13. REMOVE FRONT AND REAR BEARING OUTER RACES AND ADJUST WASHER****NOTICE:**

Do not remove the outer races except when replacing the bearings.

Using a brass bar and hammer, remove the outer races and adjusting washer from the carrier.

HINT:

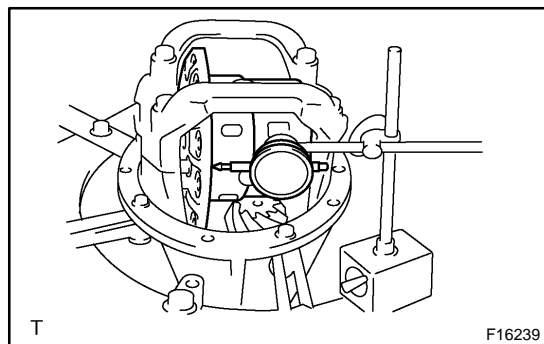
Measure the adjusting washer thickness and note it down.

**14. REMOVE RING GEAR**

- (a) Place matchmarks on the ring gear and differential case.
- (b) Remove the 12 ring gear set bolts.
- (c) Using a plastic hammer, tap on the ring gear to separate it from the differential case.

15. CHECK DIFFERENTIAL CASE RUNOUT

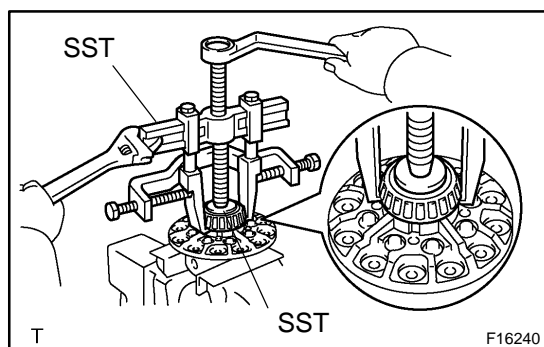
- (a) Install the differential case in the differential carrier (See page SA-133).



- (b) Using a dial indicator, measure the differential case runout.

Maximum case runout: 0.04 mm (0.0016 in.)

- (c) Remove the differential case.

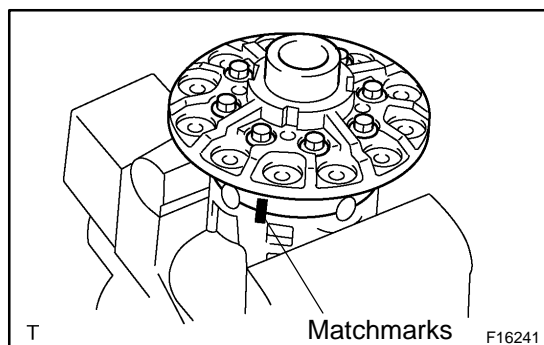
**16. REMOVE SIDE BEARINGS**

Using SST, remove the 2 side bearings from the differential case.

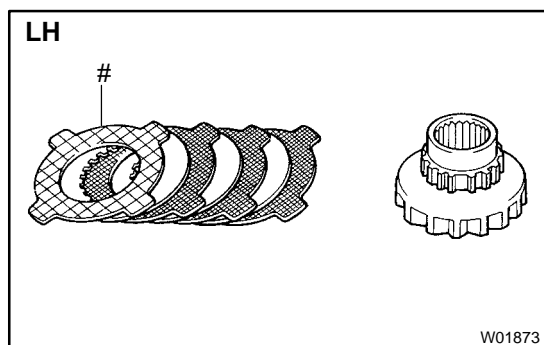
SST 09950-40011 (09951-04010, 09952-04010, 09953-04020, 09954-04010, 09955-04061, 09957-04010, 09958-04011), 09950-60010 (09951-00480)

HINT:

Fix the claws of SST to the notch in the differential case.

**17. DISASSEMBLE DIFFERENTIAL CASE**

- (a) Place matchmarks on the LH and RH cases.
- (b) Remove the 8 bolts uniformly, a little at a time.
- (c) Using a plastic hammer, separate the LH and RH cases.

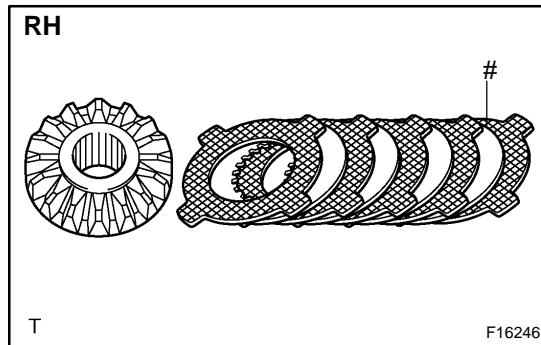
**18. REMOVE THESE PARTS FROM DIFFERENTIAL LH AND RH CASES:****HINT:**

Keep the disassembled parts in order.

- (a) Remove these parts from the LH case.
 - (1) Remove the side gear.
 - (2) Remove the 4 side gear thrust washers.
 - (3) Remove the 3 clutch plates.

HINT:

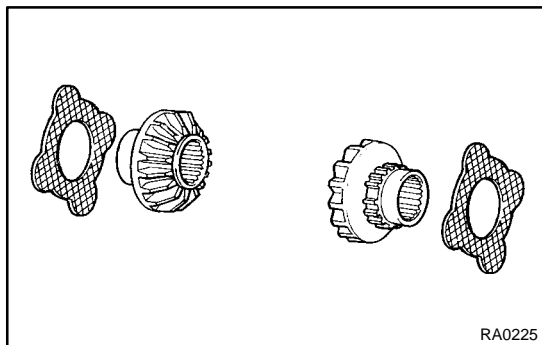
Face the rough side of the thrust washer marked by "#" to the differential case.



- (b) Remove these parts from the RH case.
- (1) Remove the spring LH retainer.
 - (2) Remove the compression spring.
 - (3) Remove the spider with the pinion gear.
 - (4) Remove the spring RH retainer.
 - (5) Remove the side gear.
 - (6) Remove the 5 side gear thrust washers.
 - (7) Remove the 4 clutch plates.

HINT:

Face the rough side of the thrust washer marked by "#" to the differential case.

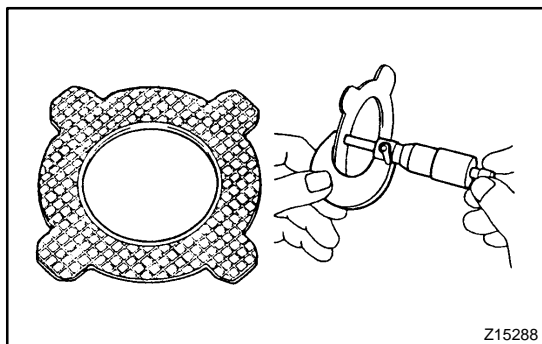


INSPECTION

1. REPLACE PARTS THAT ARE DAMAGED OR WORN

HINT:

If replacing the side gear, also replace the thrust washer that contacts with it.



2. INSPECT SIDE GEAR THRUST WASHERS FOR WEAR OR DAMAGE

Using a micrometer, measure that the contact surface of the thrust washer is even and check that no bare metal is showing.

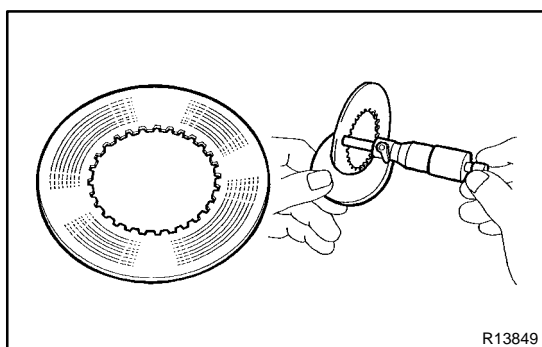
Thickness (For reference):

1.77 – 2.49 mm (0.0697 – 0.0980 in.)

If necessary, replace the thrust washers.

HINT:

If replacing the thrust washer, also replace the clutch plate that contacts with it.



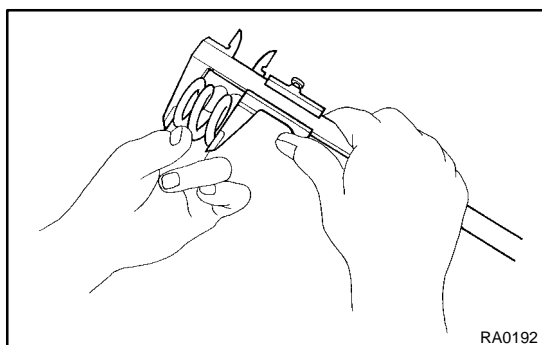
3. INSPECT CLUTCH PLATE FOR WEAR OR DAMAGE

Using a micrometer, measure the contact surface of the clutch plate and check that there is no abnormal wear.

Thickness (For reference):

1.57 – 1.63 mm (0.0618 – 0.0642 in.)

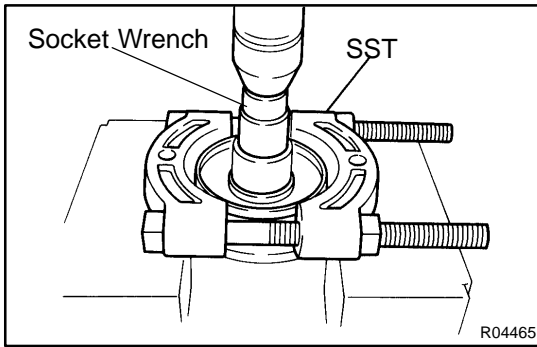
If necessary, replace the clutch plate.



4. INSPECT COMPRESSION SPRING FREE LENGTH

Using vernier calipers, measure the free length of the spring.

Length (For reference): 26.4 mm (1.039 in.)

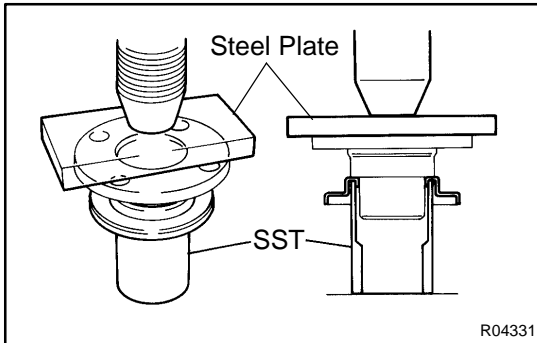


REPLACEMENT

REPLACE COMPANION FLANGE DUST DEFLECTOR

- (a) Using SST, a socket wrench and a press, remove the dust deflector.

SST 09950-00020



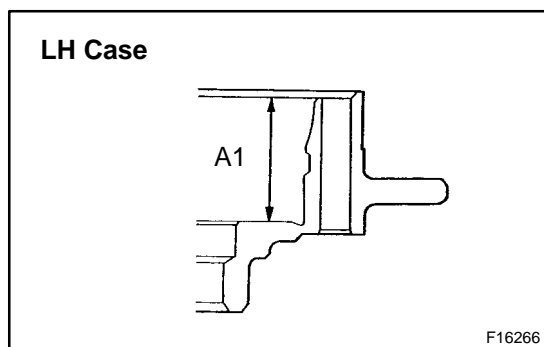
- (b) Using SST, a press and steel plate, install a new dust deflector.

SST 09523-36010

REASSEMBLY

HINT:

- When reusing the side gear, thrust washers and clutch plates, skip the STEP 1.
- Using a shop rag, clean off any foreign object from the parts.
- Apply all of the sliding and rotating surfaces with LSD oil.

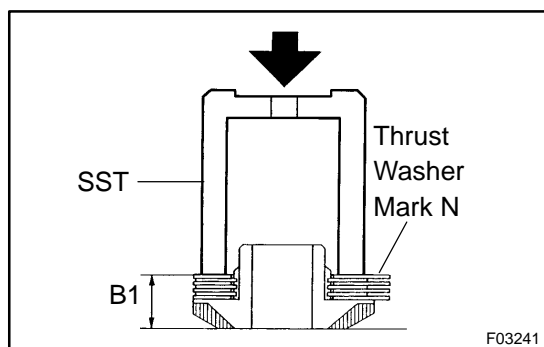


1. LH side: SELECT ADJUSTING SHIM(S)

- Measure the differential case dimension "A1", as shown in the illustration.
- Install the thrust washers (face their fine side to the side gear) and clutch plates on the side gear.

HINT:

Install the new thrust washer (Mark N) instead of the thrust washers (Mark A - M) to the differential case side.



- Using SST to press down the thrust washers and clutch plates with about pressure of 10 kgf (22 lbf), measure dimension "B1", as shown in the illustration.

SST 09649-17010

- Referring to the following selection table on the next page, select the proper adjusting shim(s).

**Adjusting shim thickness =
A1 - B1 - 16.175 mm (0.63681 in.)**

LH Side

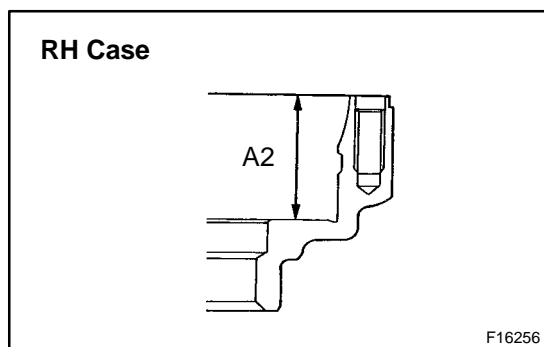
A1mm \ B1mm	41.48	41.50	41.52	41.54	41.56	41.58	41.60	41.62	41.64	41.66	41.68	41.70	41.72
24.66													
24.68											C+C+E		
24.70													
24.72											C+C+D		
24.74													
24.76											C+C+C		
24.78													
24.80											E+E		
24.82											D+E		
24.84													
24.86									D+D				
24.88													
24.90									C+D				
24.92													
24.94									C+C				
24.96													
24.98									B+C				
25.00									B+B				
25.02													
25.04									E				
25.06													
25.08									D				
25.10													
25.12									C				
25.14									B				
25.16													
25.18									A				
25.20													
25.22	#												
25.24													

Reassemble another type shim or check the backlash after assembling A shim.

HINT:

Three or two adjusting shims can be used together if the total of their thickness meets one of the above combinations, even if the combination does not exist in the above table.

	Adjusting shim mark and thickness mm (in.)
A	0.15 (0.0059)
B	0.20 (0.0079)
C	0.25 (0.0098)
D	0.30 (0.0118)
E	0.35 (0.0138)



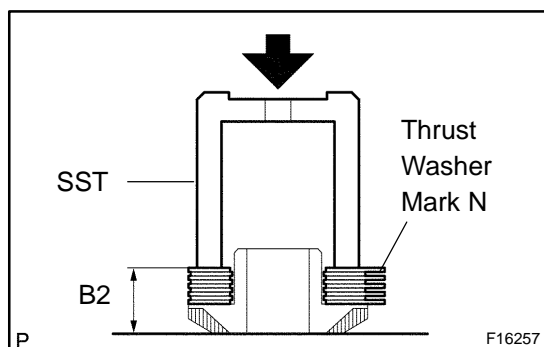
2. RH side:

SELECT ADJUSTING SHIM(S)

- Measure the differential case dimension "A2", as shown in the illustration.
- Install the thrust washers (face their fine side to the side gear) and clutch plates on the side gear.

HINT:

Install the new thrust washer (Mark N) instead of the thrust washers (Mark A - M) to the differential case side.



- Using SST to press down the thrust washers and clutch plates with about pressure of 10 kgf (22 lbf), measure dimension "B2", as shown in the illustration.
SST 09649-17010
- Referring to the following selection table on the next page, select the proper adjusting shim(s).

Adjusting shim thickness =

$$A2 - B2 - 16.175 \text{ mm (0.63681 in.)}$$

RH Side

A2mm \ B2mm	44.88	44.90	44.92	44.94	44.96	44.98	45.00	45.02	45.04	45.06	45.08	45.10	45.12
28.00											D+D+D		
28.02													
28.04													
28.06											C+C+E		
28.08													
28.10											C+C+D		
28.12													
28.14										C+C+C			
28.16													
28.18										E+E			
28.20									D+E				
28.22													
28.24								D+D					
28.26													
28.28							C+D						
28.30						C+C							
28.32													
28.34					B+C								
28.36													
28.38					B+B								
28.40													
28.42					E								
28.44													
28.46				D									
28.48			C										
28.50													
28.52			B										
28.54													
28.56		A											
28.58													
28.60													
28.62													
28.64													
28.66		#											
28.68													
28.70													
28.72	Less												

Reassemble another type shim or check the backlash after assembling A shim.

HINT:

Three or two adjusting shims can be used together if the total of their thickness meets one of the above combinations, even if the combination does not exist in the above table.

	Adjusting shim mark and thickness mm (in.)
A	0.15 (0.0059)
B	0.20 (0.0079)
C	0.25 (0.0098)
D	0.30 (0.0118)
E	0.35 (0.0138)

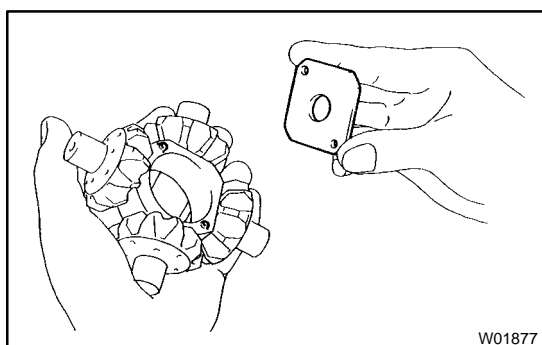
3. CHECK SIDE GEAR BACKLASH

- (a) Install the clutch plates, thrust washers and side gear to the LH and RH differential cases.

HINT:

If necessary, install the adjusting shim(s).

- (b) Install the 4 pinion gears and thrust washers to the spider.

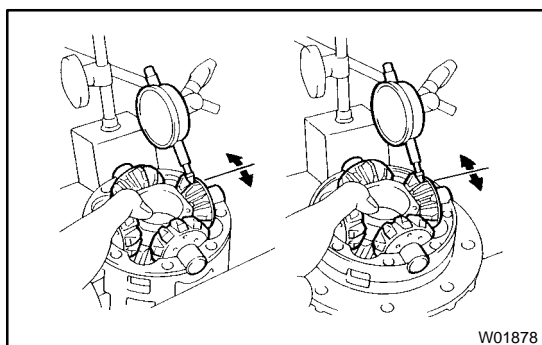


- (c) Align the spring LH retainer holes with the spider knock pins and install the LH retainer.

- (d) Install the pinion gear and spider to the differential LH case.

HINT:

Install the spider to the LH case tightly and do not move the spring retainer.



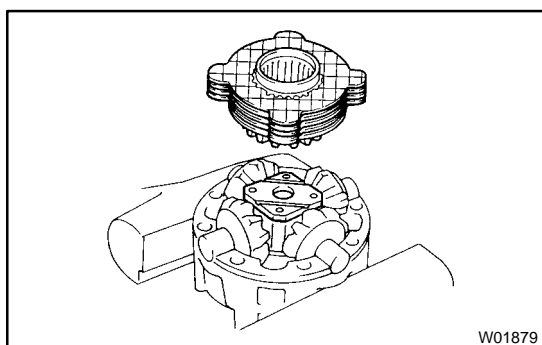
- (e) Using a dial indicator, check the side gear backlash while holding the side gear and spider.

Backlash: 0.05 – 0.20 mm (0.0019 – 0.0079 in.)

HINT:

- Measure at all 4 locations.
- Measure the backlash at the LH case and at the RH case.

If the backlash is not within the specification, select the adjusting shim(s).

**4. ASSEMBLE DIFFERENTIAL CASE**

- (a) Reinstall the spider and spring LH retainer to the differential LH case.

HINT:

Install the spider to the LH case tightly and do not move the spring retainer.

- (b) Install the compression spring and spring RH retainer.
 (c) Install the side gear, thrust washers and clutch plates.
 (d) Align the matchmarks and assemble the RH and LH cases.

HINT:

Be careful not to drop the side gear and check the pinion and side gear alignment.

- (e) Tighten the 8 bolts uniformly, a little at a time.

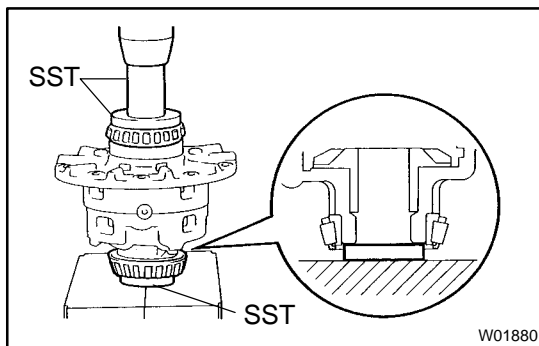
Torque: 47 N·m (480 kgf·cm, 35 ft·lbf)

5. MEASURE ROTATION TORQUE OF DIFFERENTIAL CASE

While holding one of the side gears, measure the rotation torque of the other gear.

Rotation torque (standard):

27.5 – 43.0 N·m (281 – 439 kgf·cm, 20 – 32 ft·lbf)



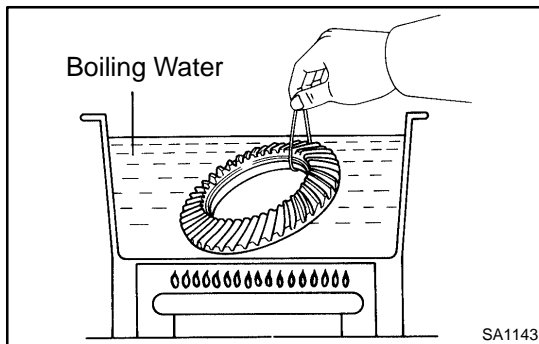
6. INSTALL SIDE BEARINGS

Using SST and a press, install the 2 side bearings into the differential case.

SST 09950-60010 (09951-00480, 09951-00640)
09950-70010 (09951-07150)

7. INSTALL RING GEAR ON DIFFERENTIAL CASE

- (a) Clean the contact surfaces of the differential case and ring gear.
(b) Heat the ring gear to about 100°C (212°F) in boiling water.
(c) Carefully take the ring gear out of the boiling water.



- (d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.

HINT:

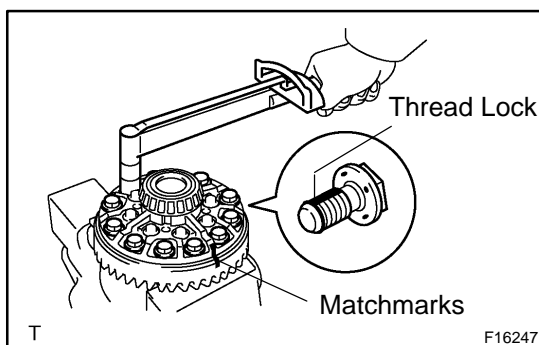
Align the matchmarks on the ring gear and differential case.

- (e) After the ring gear has cooled sufficiently, torque the set bolts to which thread lock has been applied.

Thread lock:

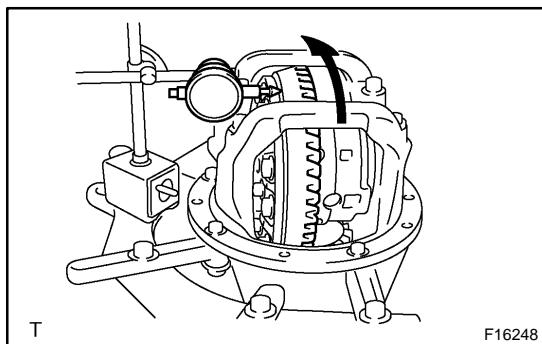
Part No. 08833-00100, THREE BOND 1360K or equivalent.

Torque: 125 N·m (1,270 kgf·cm, 92 ft·lbf)

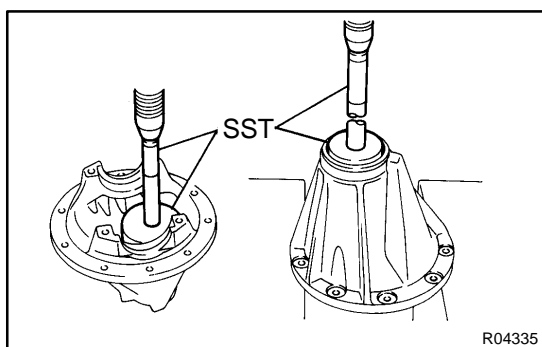


8. INSPECT RING GEAR RUNOUT

- (a) Install the differential case into the carrier and install the plate washers to where there is no play in the bearing (See step 12.).
- (b) Install the bearing cap (See step 15.).



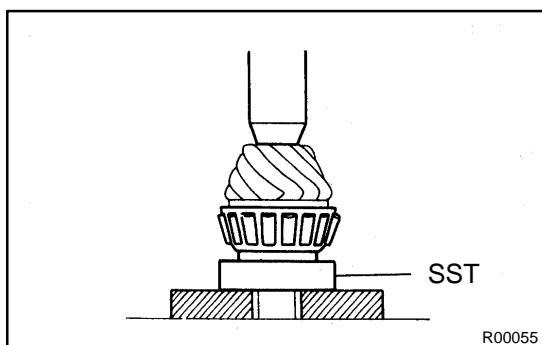
- (c) Using a dial indicator, measure the runout of the ring gear.
- (d) Remove the bearing caps and differential case.
Maximum runout: 0.05 mm (0.0020 in.)

**9. INSTALL DRIVE PINION BEARING OUTER RACES AND ADJUSTING WASHER**

- (a) Using SST and a press, install a new front bearing outer race to the carrier.
SST 09950-60020 (09951-00710),
09950-70010 (09951-07150)
- (b) Using SST and a press, install a new adjusting washer and a new rear bearing outer race to the carrier.
SST 09950-60020 (09951-00910),
09950-70010 (09951-07150)

HINT:

First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with a different thickness if necessary.

**10. INSTALL DRIVE PINION REAR BEARING**

Using SST and a press, install the rear bearing onto the drive pinion.

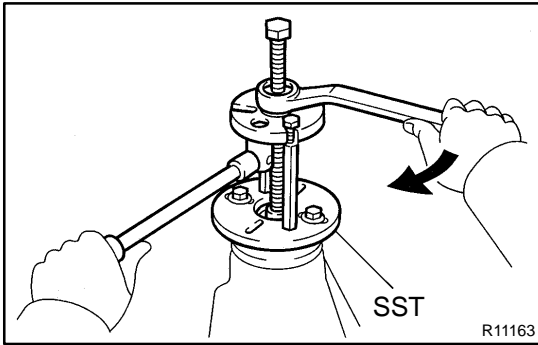
SST 09506-35010

11. TEMPORARILY ADJUST DRIVE PINION PRELOAD

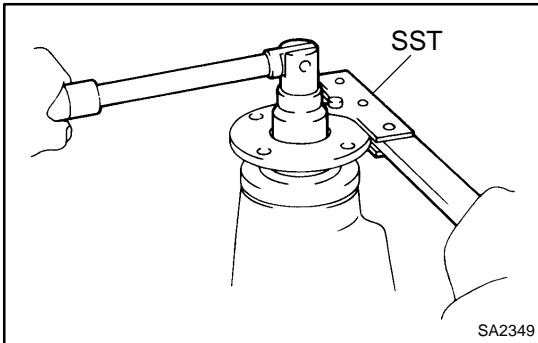
- (a) Install the drive pinion and front bearing.

HINT:

After adjusting the ring gear tooth contact pattern, assemble the spacer, washers and oil seal.



- (b) Using SST, install the companion flange.
SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03050)
- (c) Coat the threads of the nut with hypoid gear oil.



- (d) Adjust the drive pinion preload by tightening the companion flange nut.

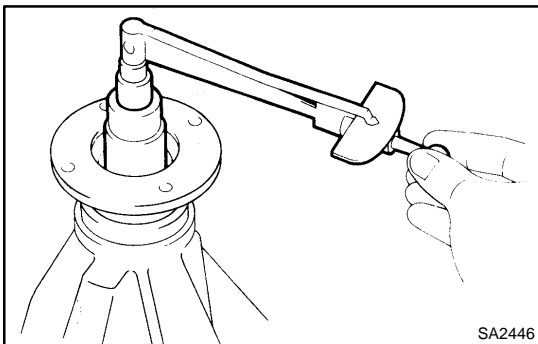
HINT:

Using SST to hold the flange, torque the nut.

SST 09330-00021

NOTICE:

As there is no spacer, tighten the nut a little at a time and be careful not to overtighten it.



- (e) Using a torque wrench, measure the preload of the drive pinion using the backlash between the drive pinion and ring gear.

Preload (at starting):**New bearing**

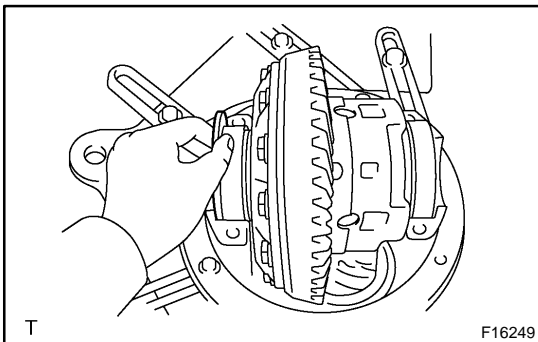
1.3 – 1.9 N·m (13 – 19 kgf·cm, 11.4 – 16.7 in.-lbf)

Reused bearing

0.6 – 0.9 N·m (6.1 – 9.2 kgf·cm, 5.3 – 8.0 in.-lbf)

12. INSTALL DIFFERENTIAL CASE IN CARRIER

- (a) Place the 2 bearing outer races on their respective bearings. Make sure the right and left races are not interchanged.
- (b) Install the differential case in the carrier.

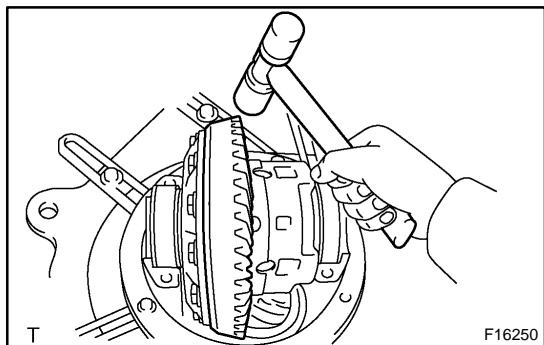
**13. ADJUST RING GEAR BACKLASH**

- (a) Install the plate washer on the ring gear back side.

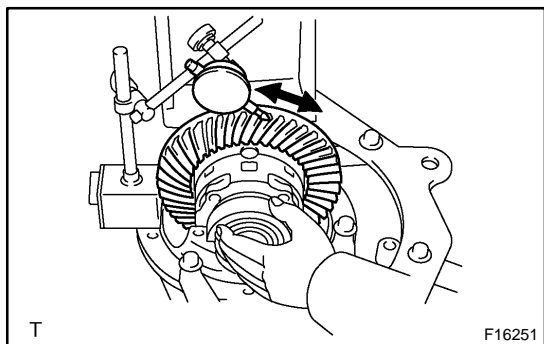
HINT:

Make sure that the ring gear has backlash.

SUSPENSION AND AXLE - REAR DIFFERENTIAL CARRIER (w/ LSD)



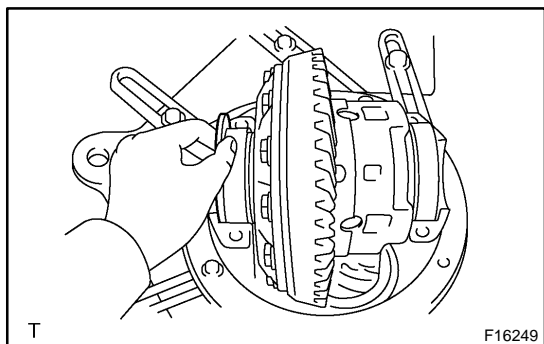
- (b) Tap on the ring gear with a plastic hammer so that the washer fits to the bearing.



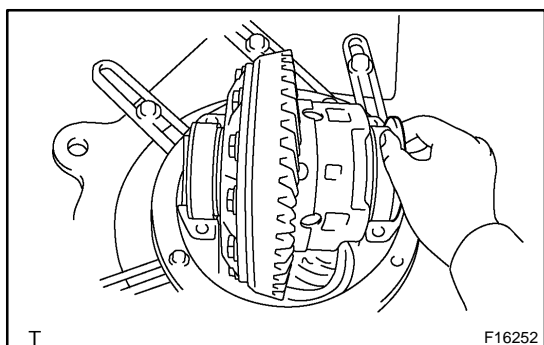
- (c) Using a dial indicator, while holding the companion flange, measure the ring gear backlash.

Backlash (reference):

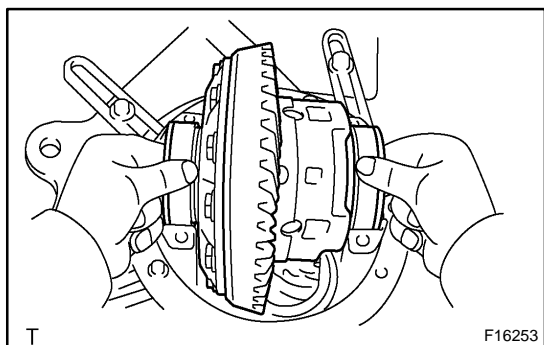
0.13 – 0.18 mm (0.0051 – 0.0071 in.)



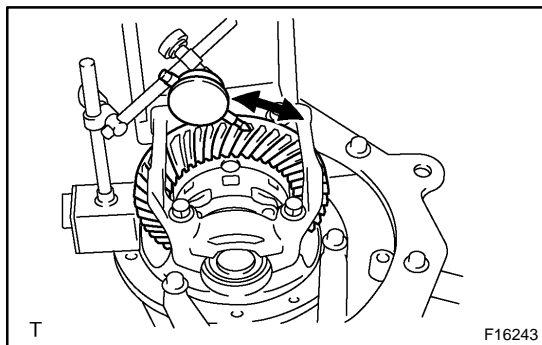
- (d) Select a plate washer for back side ring gear using the backlash as a reference.



- (e) Select a ring gear teeth side plate washer so that there is no clearance between the outer race and case.
 (f) Remove the 2 plate washers and differential case.
 (g) Install the plate washer into the ring gear back side of the carrier.



- (h) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.
 (i) Tap on the ring gear with a plastic hammer so that the washers fit to the bearing.



- (j) Using a dial indicator, while holding the companion flange, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within the specified value, adjust it by either increasing or decreasing the thickness of washers on both sides by an equal amount.

HINT:

There should be no clearance between the plate washer and the case.

Make sure that there is a ring gear backlash.

14. ADJUST SIDE BEARING PRELOAD

- (a) Remove the ring gear teeth side plate washer and using a micrometer, measure the thickness.
- (b) Using the backlash as a reference, install a new washer that is 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the washer removed.

HINT:

Select a washer which can be pressed in 2/3 of the way with your finger.

- (c) Using a plastic hammer, install the plate washer.

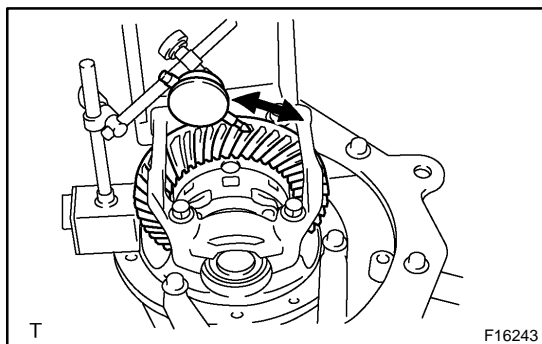
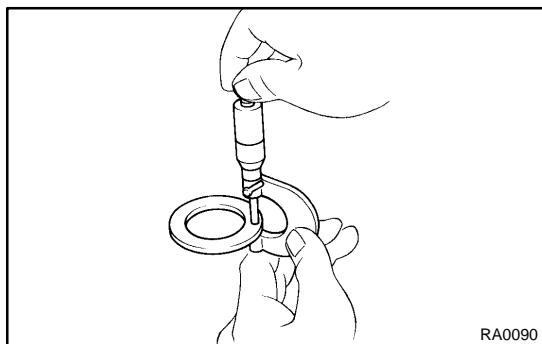
- (d) Recheck the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within the specified value, adjust it by either increasing or decreasing the thickness of washers on both sides by an equal amount.

HINT:

The backlash will change by about 0.02 mm (0.0008 in.) corresponding to 0.03 mm (0.0012 in.) change in the plate washer.



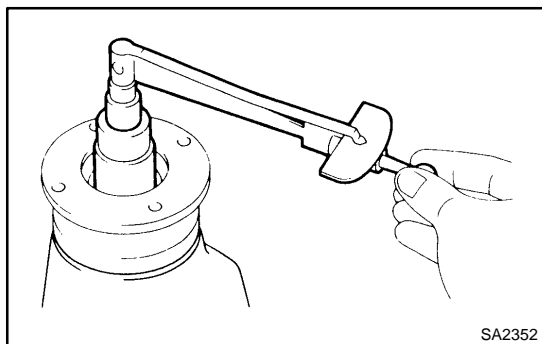
Washer thickness:

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
58	2.58 (0.1015)	90	2.90 (0.1142)	22	3.22 (0.1268)
60	2.60 (0.1024)	92	2.92 (0.1150)	24	3.24 (0.1276)
62	2.62 (0.1031)	94	2.94 (0.1157)	26	3.26 (0.1283)
64	2.64 (0.1039)	96	2.96 (0.1165)	28	3.28 (0.1291)
66	2.66 (0.1047)	98	2.98 (0.1173)	30	3.30 (0.1299)
68	2.68 (0.1055)	00	3.00 (0.1181)	32	3.32 (0.1307)
70	2.70 (0.1063)	02	3.02 (0.1189)	34	3.34 (0.1315)
72	2.72 (0.1071)	04	3.04 (0.1197)	36	3.36 (0.1323)
74	2.74 (0.1079)	06	3.06 (0.1205)	38	3.38 (0.1331)
76	2.76 (0.1087)	08	3.08 (0.1213)	40	3.40 (0.1339)
78	2.78 (0.1094)	10	3.10 (0.1220)	42	3.42 (0.1346)
80	2.80 (0.1102)	12	3.12 (0.1228)	44	3.44 (0.1354)
82	2.82 (0.1110)	14	3.14 (0.1236)	46	3.46 (0.1362)
84	2.84 (0.1118)	16	3.16 (0.1244)	48	3.48 (0.1370)
86	2.86 (0.1126)	18	3.18 (0.1252)		–
88	2.88 (0.1134)	20	3.20 (0.1260)		–

15. INSTALL BEARING CAP

- (a) Align the matchmarks on the cap and carrier.
- (b) Install and torque the 4 bolts.

Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)



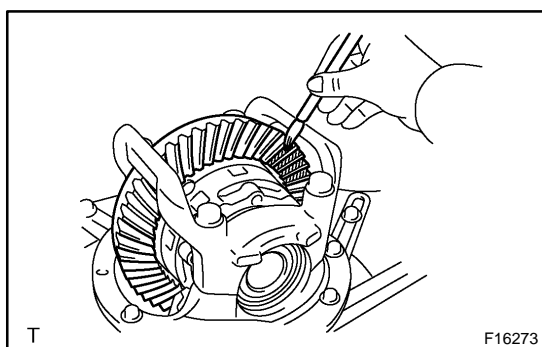
SA2352

16. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the total preload with the teeth of the drive pinion and ring gear in contact.

Total preload (at starting):

Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)

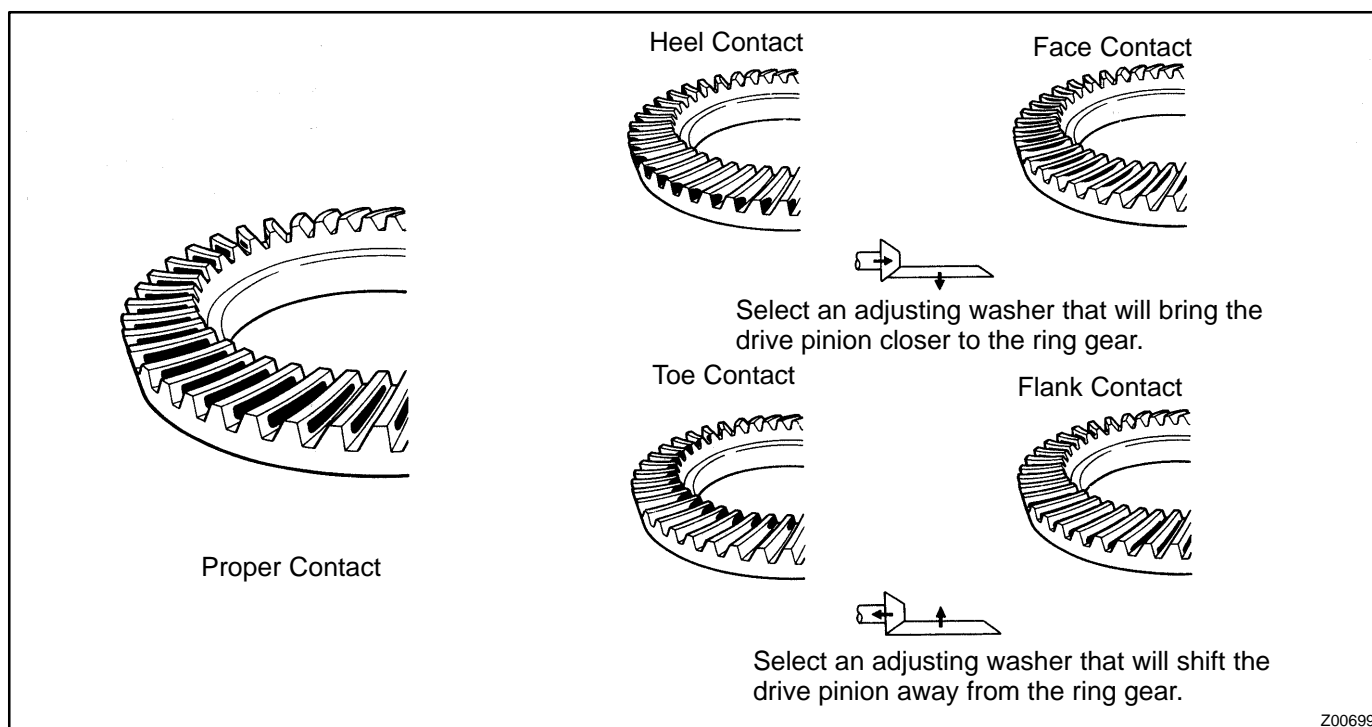


T

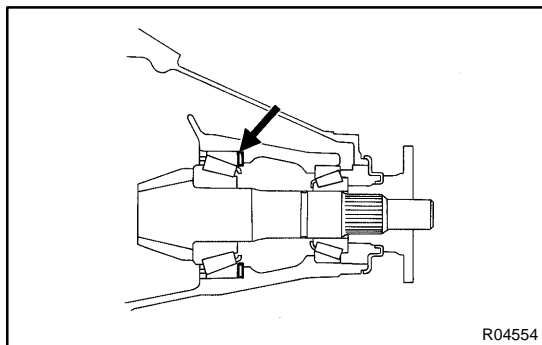
F16273

17. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

- (a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead primer.
- (b) Hold the companion flange firmly and rotate the ring gear in both directions.
- (c) Inspect the teeth pattern.



Z00699



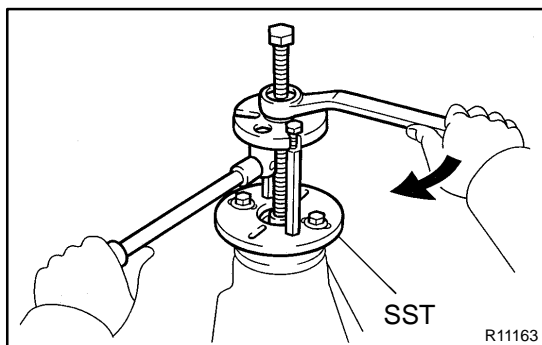
If the teeth are not contacting properly, use the following table to select a proper washer for correction.

Washer thickness:

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
87	1.87 (0.0736)	01	2.01 (0.0791)	15	2.15 (0.0846)
88	1.88 (0.0740)	02	2.02 (0.0795)	16	2.16 (0.0850)
89	1.89 (0.0744)	03	2.03 (0.0799)	17	2.17 (0.0854)
90	1.90 (0.0748)	04	2.04 (0.0803)	18	2.18 (0.0858)
91	1.91 (0.0752)	05	2.05 (0.0807)	19	2.19 (0.0862)
92	1.92 (0.0756)	06	2.06 (0.0811)	20	2.20 (0.0866)
93	1.93 (0.0760)	07	2.07 (0.0815)	21	2.21 (0.0870)
94	1.94 (0.0764)	08	2.08 (0.0819)	22	2.22 (0.0874)
95	1.95 (0.0768)	09	2.09 (0.0823)	23	2.23 (0.0878)
96	1.96 (0.0772)	10	2.10 (0.0827)	24	2.24 (0.0882)
97	1.97 (0.0776)	11	2.11 (0.0831)	25	2.25 (0.0886)
98	1.98 (0.0780)	12	2.12 (0.0835)	26	2.26 (0.0890)
99	1.99 (0.0783)	13	2.13 (0.0839)	27	2.27 (0.0894)
00	2.00 (0.0787)	14	2.14 (0.0843)	28	2.28 (0.0898)

18. REMOVE COMPANION FLANGE (See page SA-126)
19. REMOVE FRONT BEARING (See page SA-126)
20. INSTALL NEW BEARING SPACER, 2 WASHERS AND FRONT BEARING

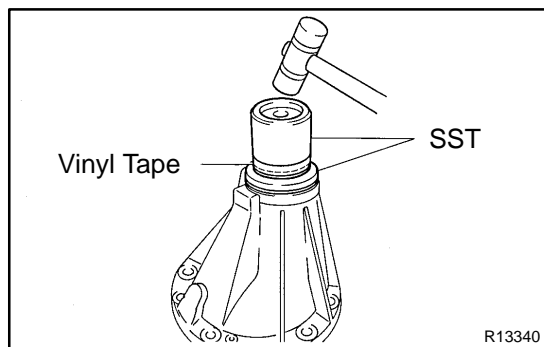
(a) Install a new bearing spacer and 2 washers, and place the front bearing.



(b) Using SST and the companion flange, install the front bearing then remove the companion flange.
SST 09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03050)

21. INSTALL NEW OIL SEAL

(a) Coat a new oil seal lip with MP grease.



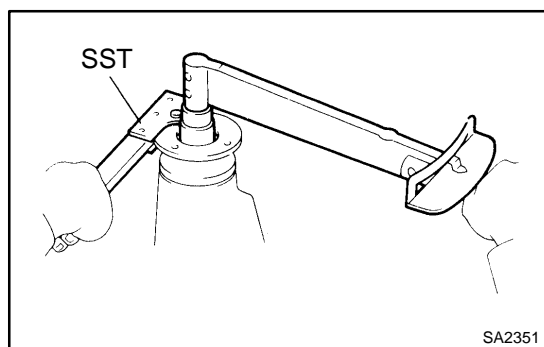
- (b) Using SST and a plastic hammer, install the oil seal until its surface is flush with the differential carrier end.
SST 09316-12010, 09649-17010

HINT:

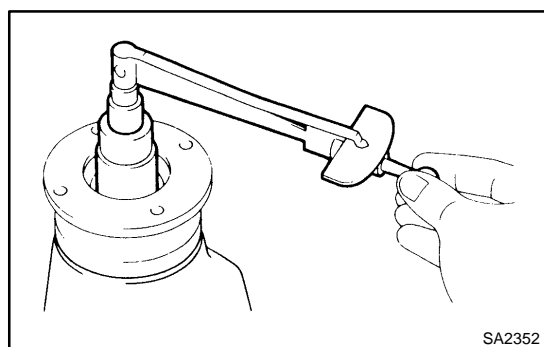
Connect 2 SST with vinyl tape.

22. INSTALL COMPANION FLANGE

- (a) Place the companion flange.
(b) Coat the threads of a new nut with hypoid gear oil.



- (c) Using SST to hold the flange, torque the nut.
SST 09330-00021
Torque: 147 N·m (1,500 kgf·cm, 109 ft·lbf)



23. ADJUST DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of the drive pinion using the backlash between the drive pinion and ring gear.

Preload (at starting):

New bearing

1.3 – 1.9 N·m (13 – 19 kgf·cm, 11.4 – 16.7 in.-lbf)

Reused bearing

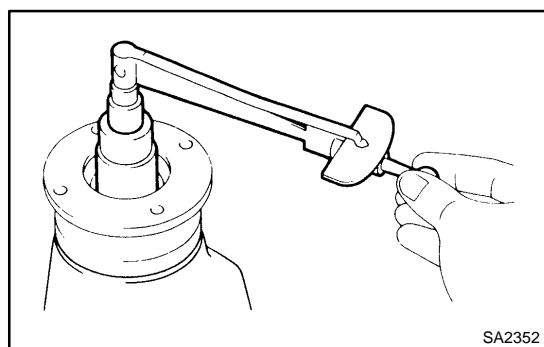
0.6 – 0.9 N·m (6.1 – 9.2 kgf·cm, 5.3 – 8.0 in.-lbf)

If the preload is greater than the specified value, replace the bearing spacer.

If the preload is less than the specified value, retighten the nut with a force of 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached.

Torque: 451 N·m (4,600 kgf·cm, 333 ft·lbf) or less

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not loosen the pinion nut to reduce the preload.



24. CHECK TOTAL PRELOAD

Using a torque wrench, measure the total preload with the teeth of the drive pinion and ring gear in contact.

Total preload (at starting):

Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)

25. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

26. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 17.)
27. CHECK COMPANION FLANGE RUNOUT (See page [SA-126](#))
28. STAKE DRIVE PINION NUT

INSTALLATION

1. INSTALL DIFFERENTIAL CARRIER ASSEMBLY

- (a) Install a new gasket.
- (b) Install the differential carrier assembly with the 10 washers and nuts.

NOTICE:

Be careful not to damage the installation surface.

Torque: 73 N·m (740 kgf·cm, 54 ft·lbf)

2. CONNECT REAR PROPELLER SHAFT

2WD: See page [PR-8](#)

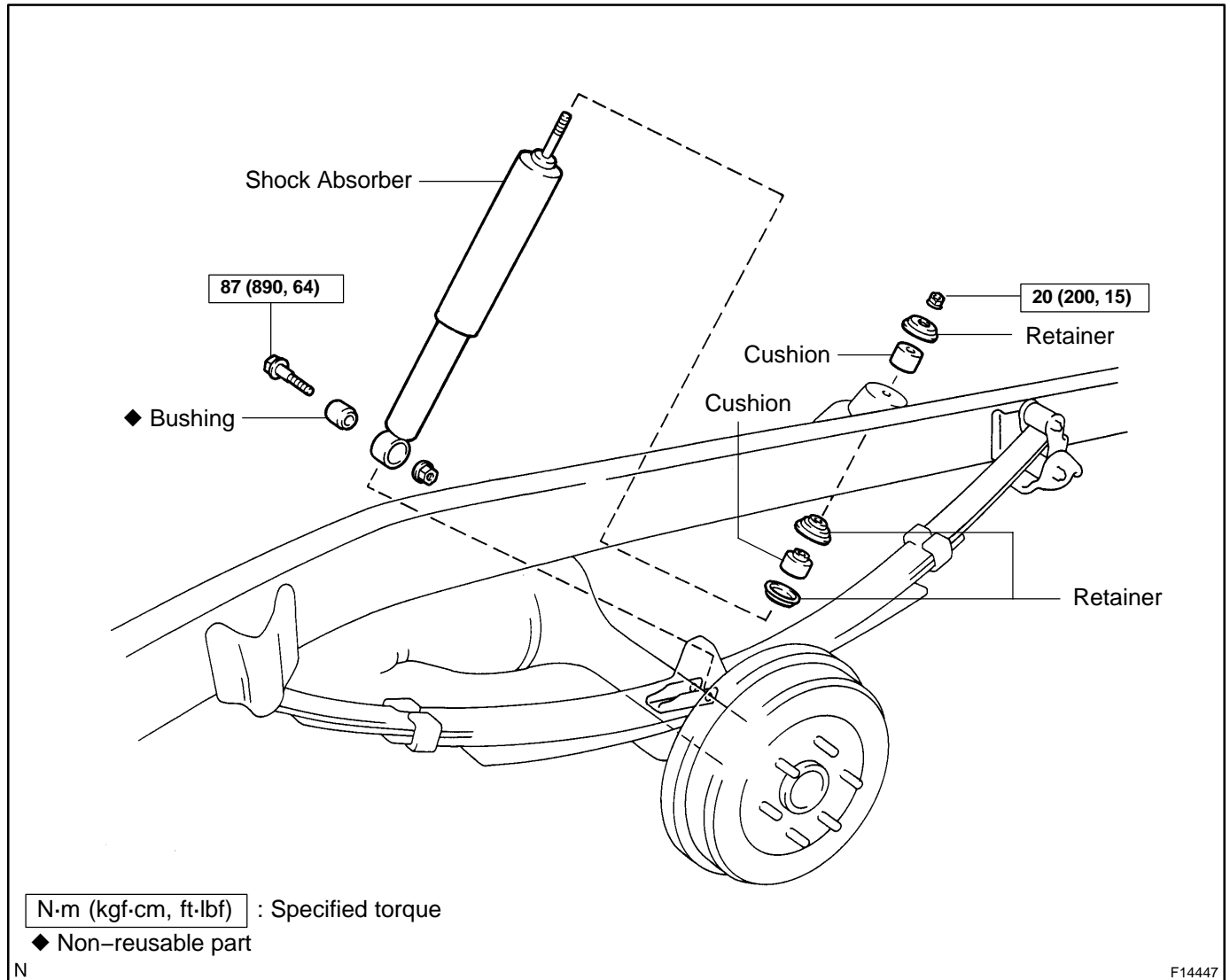
4WD: See page [PR-15](#)

3. INSTALL REAR AXLE SHAFTS (See page [SA-98](#))

4. FILL DIFFERENTIAL WITH HYPOID GEAR OIL (See page [SA-101](#))

REAR SHOCK ABSORBER COMPONENTS

SAOBX-10



F14447

REMOVAL

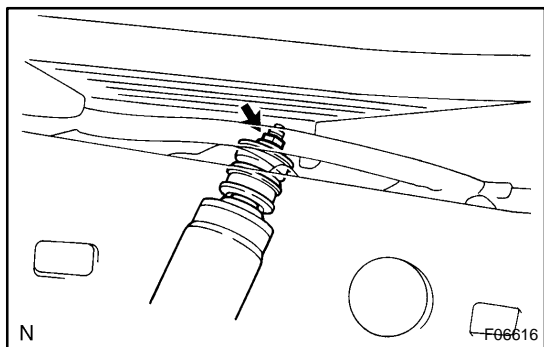
1. SUPPORT BODY WITH SAFETY STANDS

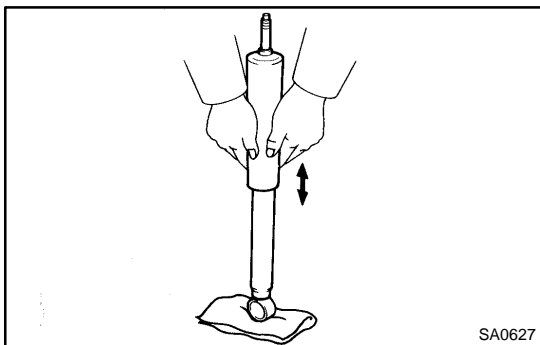
- (a) Jack up and support the body on safety stands.
- (b) Lower the axle housing until the leaf spring tension is free, and keep it at this position.

2. REMOVE REAR WHEEL

3. REMOVE REAR SHOCK ABSORBER

- (a) Remove the bolt and nut on the lower side of the shock absorber.
- (b) While holding the piston rod, remove the nut, retainer, cushion and shock absorber.
- (c) Remove the 2 retainers and cushion from the shock absorber.





INSPECTION

INSPECT SHOCK ABSORBER

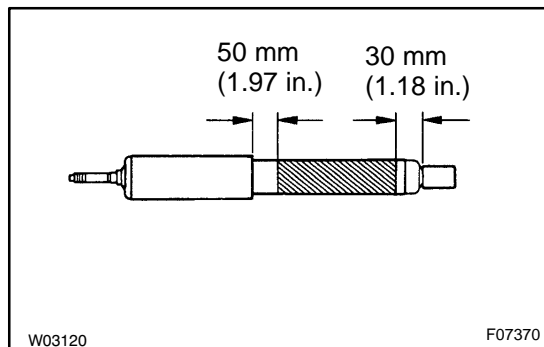
Compress and extend the shock absorber rod and check that there is no abnormal resistance or unusual operation sounds. If there is any abnormality, replace the shock absorber with a new one.

NOTICE:

When disposing of the shock absorber, see **DISPOSAL** on page [SA-151](#).

DISPOSAL

1. FULLY EXTEND SHOCK ABSORBER ROD

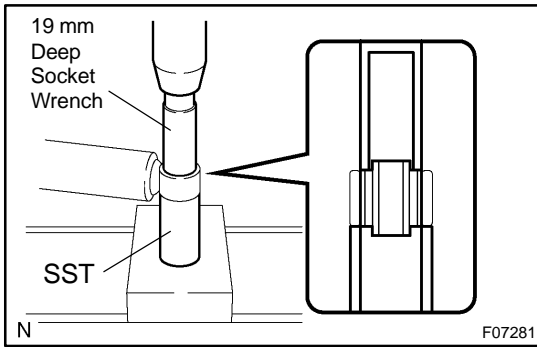


2. DRILL HOLE TO REMOVE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder, as shown in the illustration to discharge the gas inside.

CAUTION:

The discharged gas is harmless, but be careful of chips which may fly out when drilling.

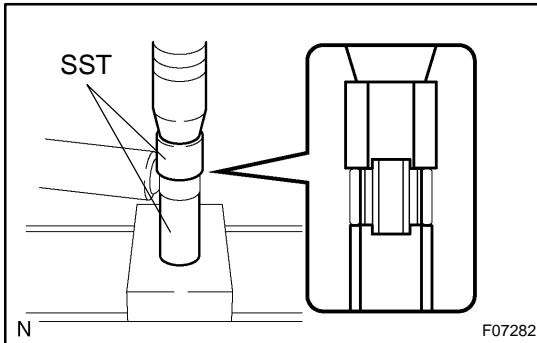


REPLACEMENT

REPLACE BUSHING

- (a) Using SST, 19 mm deep socket wrench and a press, remove the bushing.

SST 09632-36010



- (b) Using SST and a press, install a new bushing.

SST 09630-24014 (09620-24041), 09632-36010

INSTALLATION

1. INSTALL REAR SHOCK ABSORBER

- (a) Install the 2 retainers and cushion to the shock absorber.
- (b) Install the shock absorber, cushion and retainer with the nut.

Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

- (c) Install the lower side of the shock absorber with the bolt and nut.

Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)

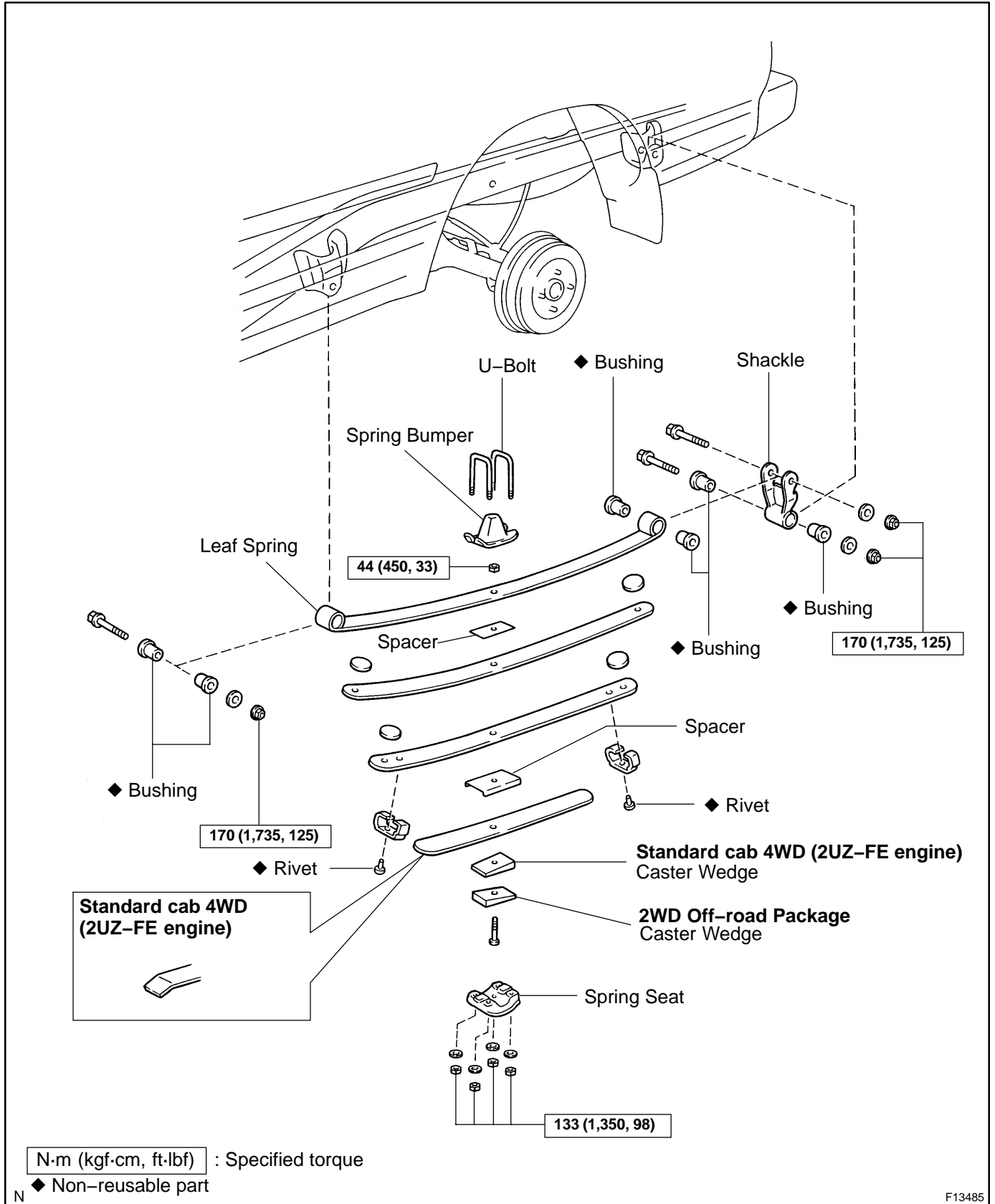
2. INSTALL REAR WHEEL

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

3. REMOVE SAFETY STANDS

REAR LEAF SPRING COMPONENTS

SA0C2-08

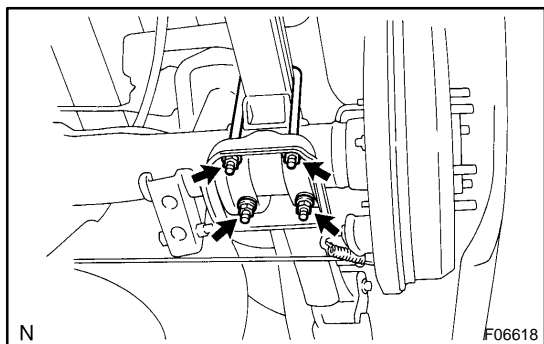


REMOVAL

1. SUPPORT BODY WITH SAFETY STANDS

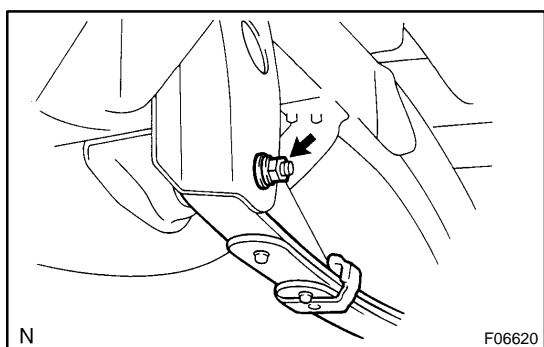
- (a) Jack up and support the body on safety stands.
- (b) Lower the axle housing until the leaf spring tension is free, and keep it at this position.

2. REMOVE REAR WHEEL



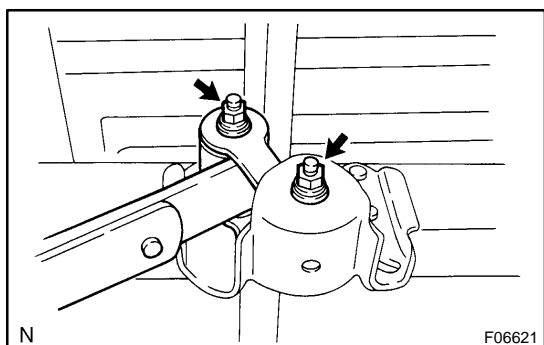
3. REMOVE U-BOLTS

- (a) Remove the 4 U-bolt mounting nuts and washers.
- (b) Remove the spring seat and 2 U-bolts.
- (c) Remove the spring bumper.

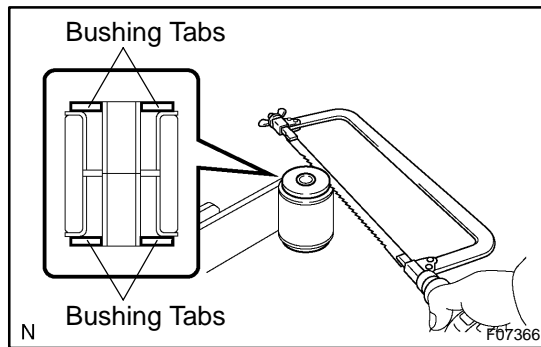


4. REMOVE LEAF SPRING

- (a) Remove the nut, washer and bolt.



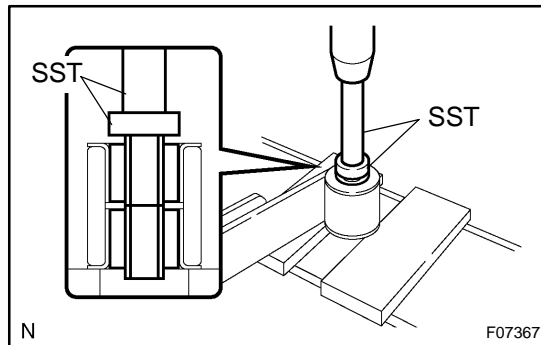
- (b) Remove the 2 nuts, washers, bolts, shackle and leaf spring.



REPLACEMENT

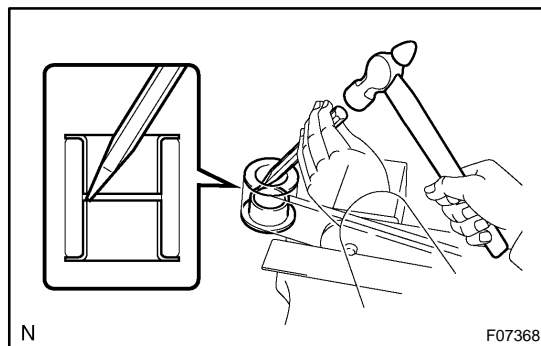
1. REPLACE BUSHINGS

- (a) Using a saw, cut the both bushing tabs as shown in the illustration.

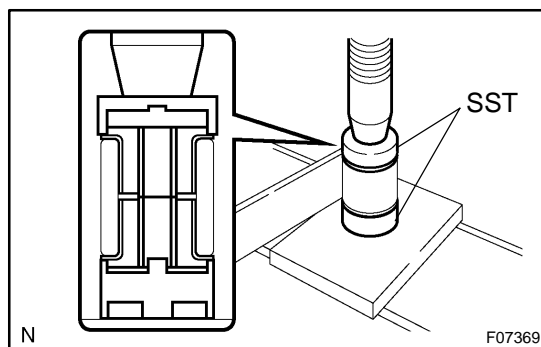


- (b) Using SST and a press, press out the both inner tubes and rubber parts of the bushings.

SST 09950-60010 (09951-00350)
09950-70010 (09951-07150)

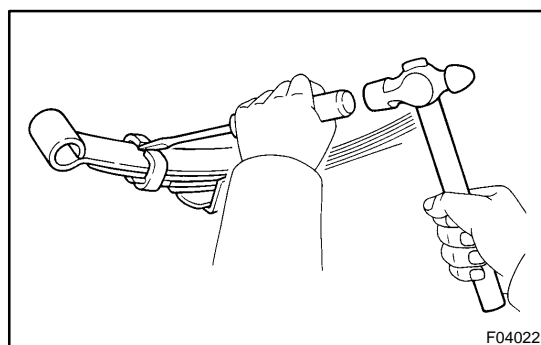


- (c) Using a chisel and hammer, tap out the outer tubes.



- (d) Using SST and a press, install 2 new bushings.

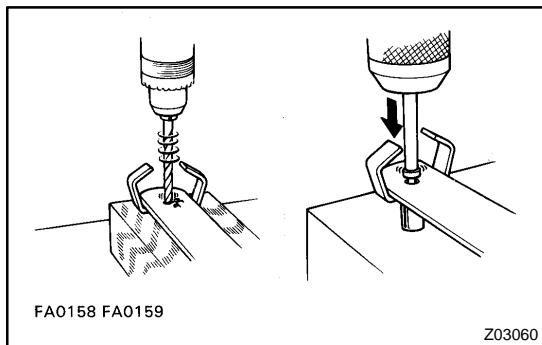
SST 09710-28012 (09710-07062),
09710-30041 (09710-03211)



2. REPLACE LEAF SPRING

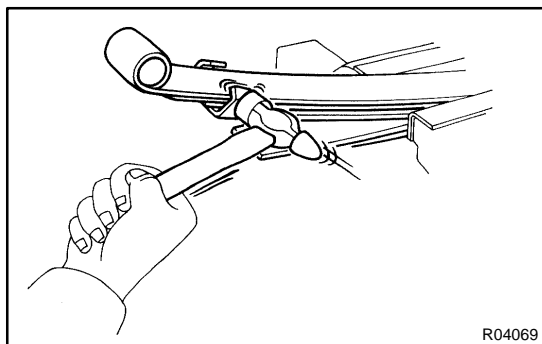
- (a) Bend to open the spring clips.
Using a chisel and hammer, pry up the 2 spring clips.
- (b) Remove the center bolt and nut.
Hold the spring near the spring center bolt in a vise and remove the center bolt and nut.

SUSPENSION AND AXLE - REAR LEAF SPRING



- (c) Replace the spring clip.
- (1) Drill off the head of the rivet and drive it out.
 - (2) Install a new rivet into the holes of the leaf spring and clip. Then rivet with a press.
- (d) Install the spring center bolt and nut.
- (1) Align the leaf spring holes and secure the leaves with a vise.
 - (2) Install the spring center bolt and nut.

Torque: 44 N·m (450 kgf-cm, 33 ft-lbf)



- (e) Bend the spring clips.
- Using a hammer, bend the spring clips into the position.

INSTALLATION

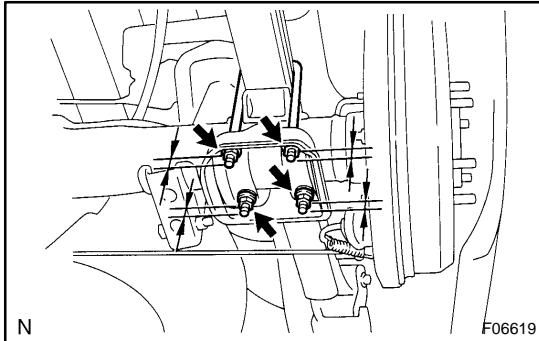
1. INSTALL LEAF SPRING

Install the shackle and leaf spring with the 3 bolts, washers and nuts.

Torque: 170 N·m (1,735 kgf·cm, 125 ft·lbf)

HINT:

After stabilizing the suspension, torque the nuts.



2. INSTALL U-BOLTS

Install the spring bumper, spring seat and 2 U-bolts with the 4 washers and nuts.

Torque: 133 N·m (1,350 kgf·cm, 98 ft·lbf)

HINT:

Tighten the U-bolts so that the lengths of all the U-bolts under the spring seat are the same.

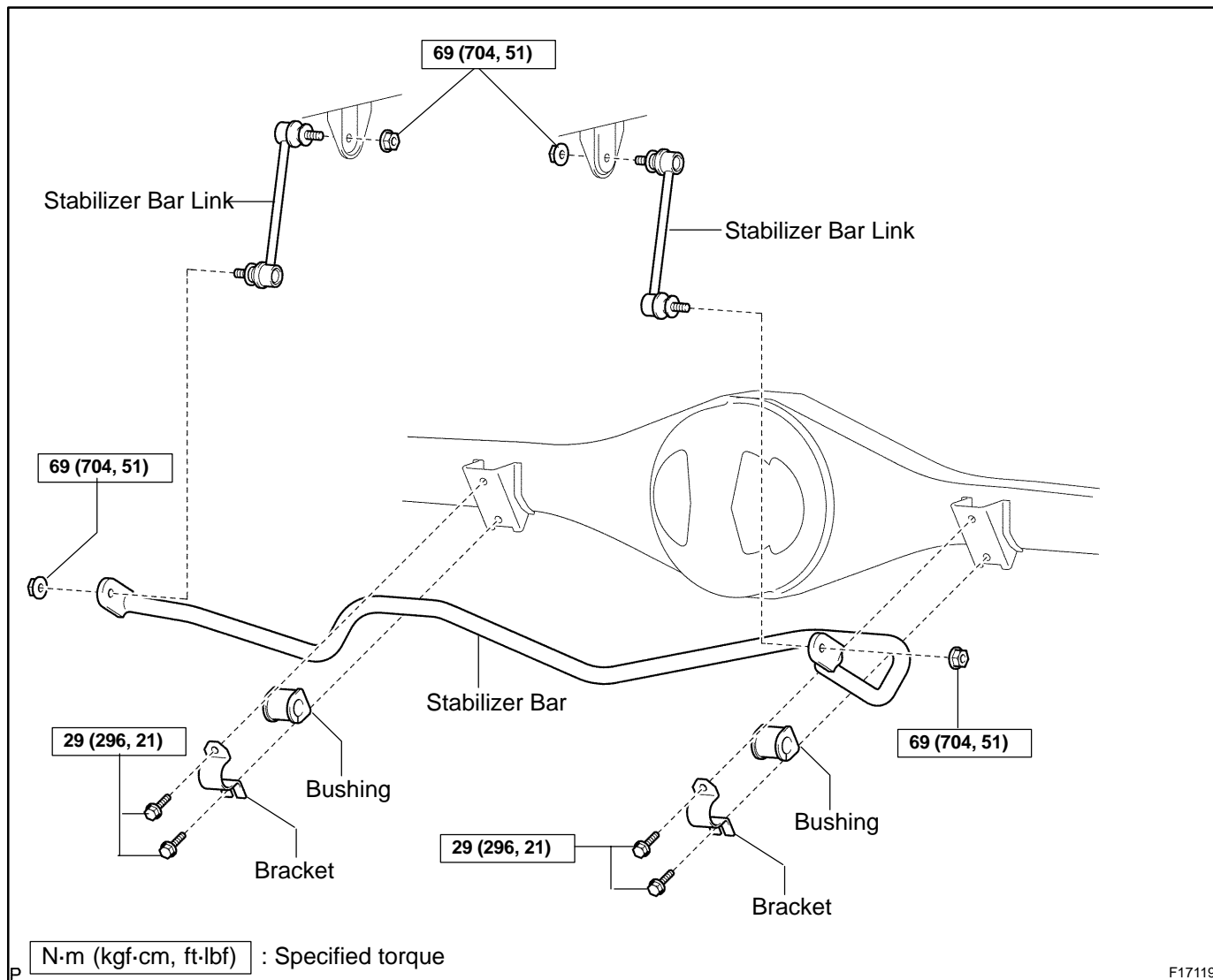
3. INSTALL REAR WHEEL

Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)

4. REMOVE SAFETY STANDS

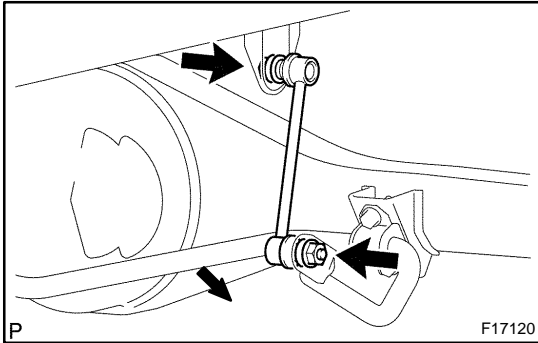
REAR STABILIZER BAR (Sport Suspension Package) COMPONENTS

SA2BC-02



REMOVAL

1. **REMOVE REAR WHEELS**
Torque: 110 N·m (1,150 kgf·cm, 83 ft·lbf)
2. **SUPPORT REAR AXLE HOUSING WITH JACK**

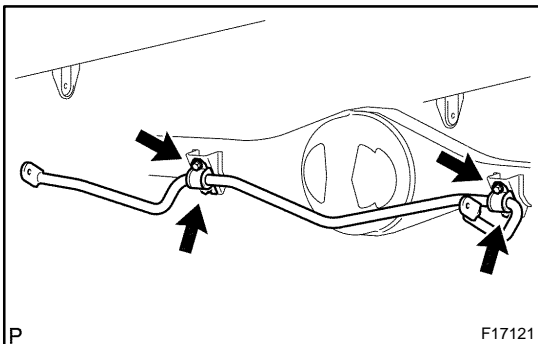


3. **REMOVE STABILIZER BAR LINKS**
 - (a) Remove the 2 nuts and stabilizer bar link.
Torque: 69 N·m (704 kgf·cm, 51 ft·lbf)

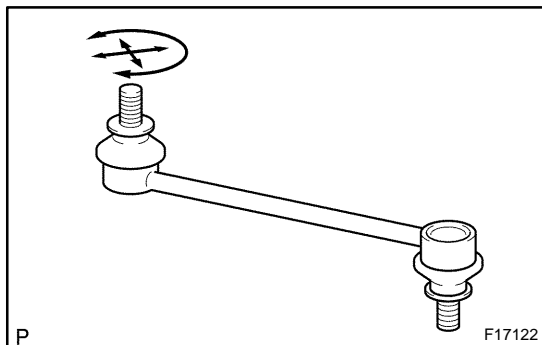
HINT:

If the ball joint stud turns together with the nut, use a hexagon wrench to hold the stud.

- (b) Use the same procedure described above to the other side.



4. **REMOVE STABILIZER BAR FROM REAR AXLE HOUSING**
 - (a) Remove the 4 bolts and stabilizer bar with the bushings and brackets.
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)
 - (b) Remove the 2 brackets and 2 bushings from the stabilizer bar.



INSPECTION

INSPECT STABILIZER BAR LINK

Rotate the ball joint stud in all directions.

If it does not move smoothly and freely, replace the stabilizer link.

INSTALLATION

Installation is in the reverse order of removal (See page [SA-160](#)).

BRAKE SYSTEM

BR0A9-05

PRECAUTION

- Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts having the same part number or equivalent.
- It is very important to keep parts and the area clean when repairing the brake system.
- If the vehicle is equipped with a mobile communication system, refer to the precautions in the IN section.

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

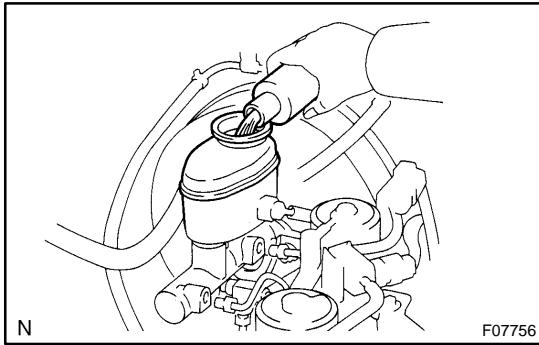
BR08P-08

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area	See page
Low pedal or spongy pedal	<ol style="list-style-type: none"> 1. Fluid leak in brake system 2. Air in brake system 3. Piston seals (Worn or damaged) 4. Rear brake shoe clearance (Out of adjustment) 5. Master cylinder (Faulty) 6. Booster push rod (Out of adjustment) 	DI-1455 BR-4 BR-41 BR-51 BR-22 BR-28 BR-34 BR-38
Brake drag	<ol style="list-style-type: none"> 1. Brake pedal freeplay (Minimum) 2. Parking brake lever travel (Out of adjustment) 3. Parking brake pedal travel (Out of adjustment) 4. Parking brake wire (Sticking) 5. Rear brake shoe clearance (Out of adjustment) 6. Pad or lining (Cracked or distorted) 7. Piston (Stuck) 8. Piston (Frozen) 9. Anchor or return spring (Faulty) 10. Booster push rod (Out of adjustment) 11. Vacuum leak in booster system 12. Master cylinder (Faulty) 	BR-10 BR-18 BR-14 BR-52 BR-39 BR-47 BR-41 BR-41 BR-47 BR-34 BR-38 BR-31 BR-35 BR-22 BR-28
Brake pull	<ol style="list-style-type: none"> 1. Piston (Stuck) 2. Pad or lining (Oily) 3. Piston (Frozen) 4. Disc (Scored) 5. Pad or lining (Cracked or distorted) 	BR-41 BR-39 BR-47 BR-41 BR-44 BR-39 BR-47

BRAKE - TROUBLESHOOTING

Hard pedal but brake inefficient	<ol style="list-style-type: none"> 1. Fluid leak in brake system 2. Air in brake system 3. Pad or lining (Worn) 4. Pad or lining (Cracked or distorted) 5. Rear brake shoe clearance (Out of adjustment) 6. Pad or lining (Oily) 7. Pad or lining (Glazed) 8. Disc (Scored) 9. Booster push rod (Out of adjustment) 10. Vacuum leak in booster system 	<p>DI-1455 BR-4 BR-39 BR-47 BR-39 BR-47 BR-52 BR-39 BR-47 BR-39 BR-47 BR-44 BR-34 BR-38 BR-31 BR-35</p>
Noise from brakes	<ol style="list-style-type: none"> 1. Pad or lining (Cracked or distorted) 2. Installation bolt (Loose) 3. Disc (Scored) 4. Pad or lining (Dirty) 5. Pad or lining (Glazed) 6. Anchor or return spring (Faulty) 7. Anti-squeal shim (Damaged) 8. Shoe hold-down spring (Damaged) 	<p>BR-39 BR-47 BR-41 BR-44 BR-39 BR-47 BR-39 BR-47 BR-47 BR-39 BR-47</p>



BRAKE FLUID BLEEDING

BR1XV-01

1. BLEED BRAKE LINE (W/O VSC, STANDARD CAB/ACCESS CAB)

HINT:

If any work is done on the brake system or if air is suspected in the brake lines, bleed the air from the system.

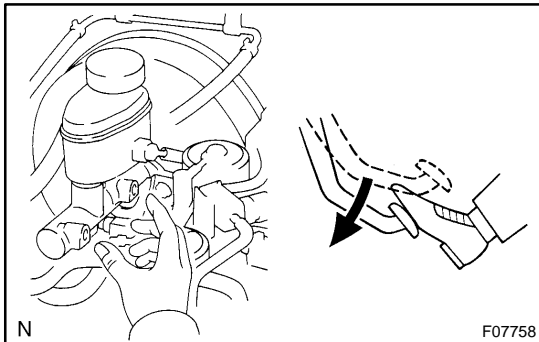
NOTICE:

Do not let brake fluid remain on a painted surface. Wash it off immediately.

- (a) Fill reservoir with brake fluid.

Check the fluid level in the reservoir after bleeding each wheel. Add fluid, if necessary.

Fluid: SAE J1703 or FMVSS No. 116 DOT3

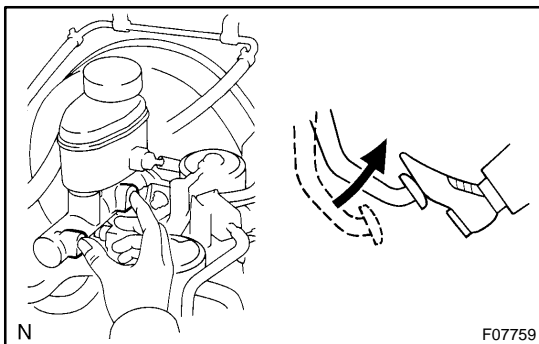


- (b) Bleed master cylinder.

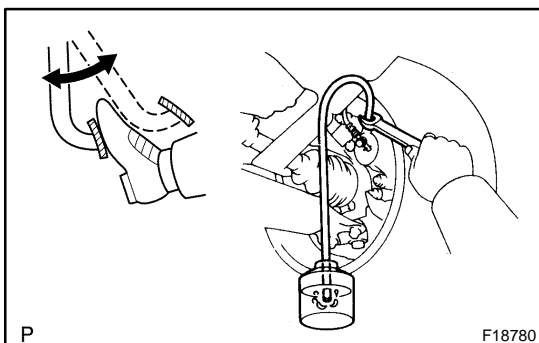
HINT:

If the master cylinder was disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

- (1) Disconnect the brake lines from the master cylinder.
SST 09023-00101
- (2) Slowly depress the brake pedal and hold it.



- (3) Block off the outlet plug with your finger, and release the brake pedal.
- (4) Repeat (2) and (3) 3 or 4 times.



- (c) Bleed brake line.

- (1) Connect the vinyl tube to the caliper.
- (2) Depress the brake pedal several times, then loosen the bleeder plug with the pedal held down.
- (3) At the point when fluid stops coming out, tighten the bleeder plug, then release the brake pedal.
- (4) Repeat (2) and (3) until all the air in the fluid has been bled out.

Torque: (Bleeder plug) 11 N·m (110 kgf·cm, 8 ft·lbf)

- (5) Repeat the above procedure for each wheel to bleed the air out of the brake line.
- (d) Check fluid level in reservoir.
Check the fluid level and add fluid if necessary.

Fluid: SAE J1703 or FMVSS No. 116 DOT3

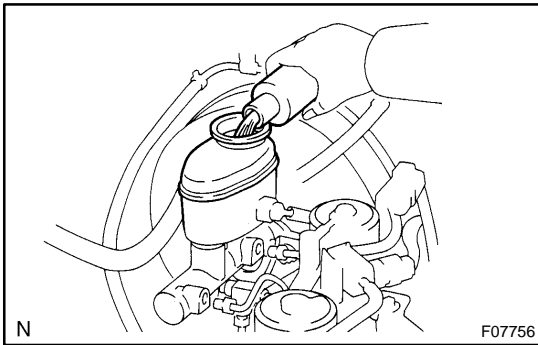
2. BLEED BRAKE LINE (W/O VSC, DOUBLE CAB)

HINT:

If any work is done on the brake system or if air is suspected in the brake lines, bleed the air from the system.

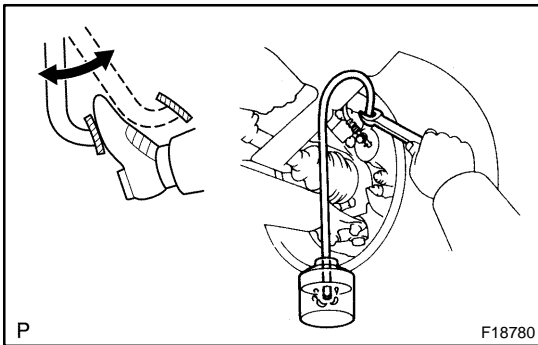
NOTICE:

- **Bleed air from the chassis, 3rd chamber, and chassis in order.**
- **When the air is bled from the 3rd chamber, be sure to run the engine.**
- **If the brake fluid attaches to any painted surfaces, wash it off immediately.**



- (a) Fill reservoir with brake fluid.
Check the fluid level in the reservoir after bleeding each wheel. Add fluid, if necessary.

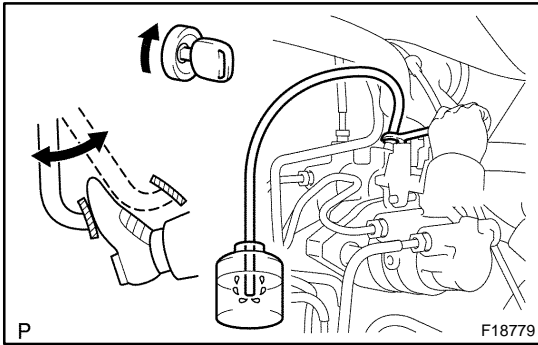
Fluid: SAE J1703 or FMVSS No. 116 DOT3



- (b) Bleed brake line.
 - (1) Connect the vinyl tube to the brake caliper bleeder plug.
 - (2) Depress the brake pedal several times, then loosen the bleeder plug with the pedal held down.
 - (3) At the point when the fluid stops coming out, tighten the bleeder plug, then release the brake pedal.
 - (4) Repeat (2) and (3) until all the air in the fluid has been bled out.

Torque: (Bleeder plug) 11 N·m (110 kgf·cm, 8 ft·lbf)

- (5) Repeat the above procedures for each wheel to bleed the air out of the brake line.



(c) Bleed master cylinder.

NOTICE:

When the air is bled from the master cylinder (3rd chamber), be sure to run the engine.

HINT:

After disassembling the master cylinder, or if the reservoir becomes empty, bleed the air from the master cylinder.

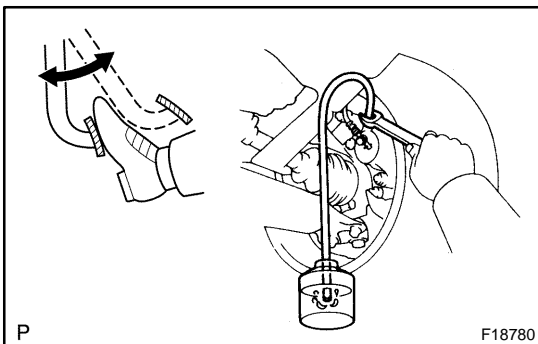
- (1) Run the engine at idle.
- (2) Connect the vinyl tube to the master cylinder and the brake caliper or wheel cylinder bleeder plug.
- (3) Open the brake caliper bleed plug or wheel cylinder bleeder plug.
- (4) Depress the brake pedal several times, then loosen the master cylinder (3rd chamber) bleeder plug with the pedal held down.
- (5) When the fluid stops coming out, tighten the master cylinder (3rd chamber) bleeder plug, then release the brake pedal.
- (6) Repeat (4) and (5) until all the air in the fluid has been bled out.
- (7) Tighten the master cylinder (3rd chamber) bleeder plug.

Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

- (8) Tighten the brake caliper bleeder plug or wheel cylinder bleeder plug.

Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

- (9) Stop the engine.

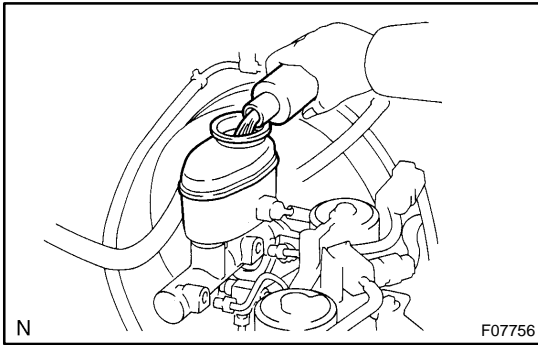


(d) Bleed brake line.

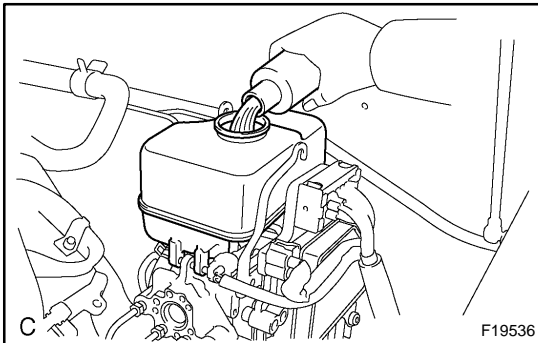
- (1) Connect the vinyl tube to the brake caliper.
- (2) Depress the brake pedal several times, then loosen the bleeder plug with the pedal held down.
- (3) When the fluid stops coming out, tighten the bleeder plug, then release the brake pedal.
- (4) Repeat (2) and (3) until all the air in the fluid has been bled out.

Torque: (Bleeder plug) 11 N·m (110 kgf·cm, 8 ft·lbf)

- (5) Repeat the above procedures for each wheel to bleed the air out of the brake line.



- (e) Check fluid level in reservoir.
Check the fluid level and add fluid if necessary.
Fluid: SAE J1703 or FMVSS No. 116 DOT3



3. BLEED BRAKE LINE (W/VSC)

- (a) Fill reservoir with brake fluid.
Check the fluid level in the reservoir after bleeding each wheel. Add fluid, if necessary.
Fluid: SAE J1703 or FMVSS No.116 DOT3
- (b) Bleed hydraulic brake booster.
- (1) Turn the ignition switch to the ON position and wait until the pump motor has stopped.

HINT:

Pump operating sound can be heard.

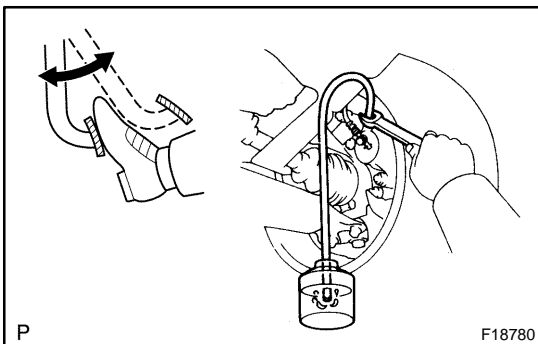
- (2) Turn the ignition switch off and depress the brake pedal more than 20 times.

HINT:

When pressure in the accumulator is released, reaction force becomes light and stroke becomes longer.

- (3) Repeat (1) and (2) 5 times.
- (4) Make sure that the interval between pump start and pump stop is 8 to 14 seconds.

If it takes 14 seconds or more, repeat (3).



- (c) Bleed front brake line.
- (1) Turn the ignition switch to the ON position and wait until the pump motor has stopped.

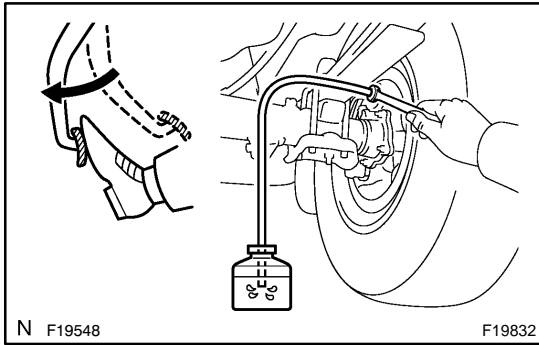
HINT:

Pump operating sound can be heard.

- (2) Connect the vinyl tube to the brake caliper.
- (3) Depress the brake pedal several times, then loosen the bleeder plug with the pedal held down.
- (4) When the fluid stops coming out, tighten the bleeder plug, then release the brake pedal.
- (5) Repeat (3) and (4) until all the air in the fluid has been bled out.

Torque: (Bleeder plug) 11 N·m (110 kgf·cm, 8 ft·lbf)

- (6) Repeat the above procedures for each wheel to bleed the air out of the brake line.



(d) Bleed rear brake line.

- (1) Turn the ignition switch to the ON position and wait until the pump motor has stopped.

HINT:

Pump operating sound can be heard.

- (2) Connect the vinyl tube to the wheel cylinder.
- (3) Depress the brake pedal, hold it, and then loosen the bleeder plug.

HINT:

Brake fluid is pumped out automatically.

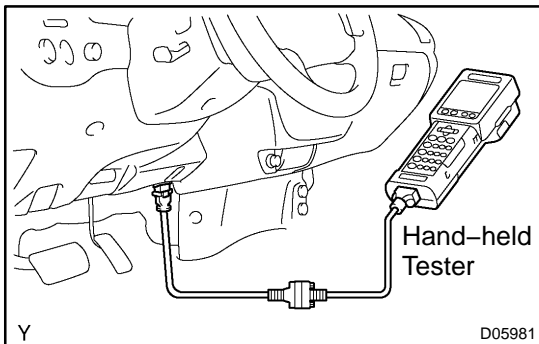
NOTICE:

Keep brake fluid in the reservoir tank above the MIN line during the above procedures.

- (4) When air does not come out with brake fluid anymore, tighten the bleeder plug and release the brake pedal.

Torque: (Bleeder plug) 11 N·m (110 kgf·cm, 8 ft·lbf)

- (5) Repeat the above procedures for each wheel to bleed the air out of the brake line .



(e) Hydraulic brake booster disassembly:

Bleed hydraulic brake booster.

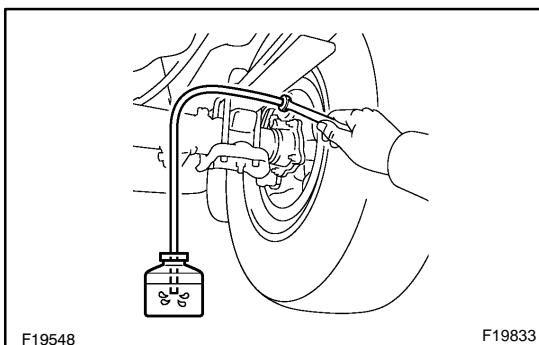
NOTICE:

When disassembling the hydraulic brake booster, bleed the air from the hydraulic brake booster by following the procedures below.

- (1) Connect the hand-held tester to the DLC3.
- (2) Turn the ignition switch to the ON position.

HINT:

- Pump operating sound can be heard.
- Please refer to the hand-held tester operator's manual for further details.
- (3) Select "ACTIVE TEST" mode on the hand-held tester.



- (4) Connect the vinyl tube to the rear wheel cylinder.
- (5) Loosen the bleeder plug
- (6) Select "SRMF & SRMR" on the "ACTIVE TEST" of the hand-held tester to drive solenoids.

NOTICE:

- **Do not depress the brake pedal.**
- **Keep brake fluid in the reservoir tank above the MIN line during the above procedures.**

HINT:

- Pump operating sound can be heard.
- Brake fluid is pumped out automatically.
- To protect the solenoids, the hand-held tester turns OFF automatically 2 sec. after every solenoid has been turned ON.

(7) Repeat (6) until the air is completely bled out of brake fluid.

(8) When air does not come out with brake fluid, tighten the bleeder plug.

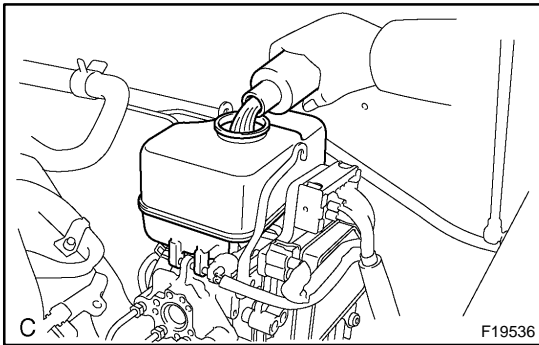
Torque: (Bleeder plug) 11 N·m (110 kgf·cm, 8 ft·lbf)

(9) Repeat the above procedures for each wheel to bleed the air out of the brake line .

(10) Turn the ignition switch off.

(11) Turn the ignition switch on again.

(12) Clear DTCs (see page [DI-1397](#) or [DI-1497](#)).



(f) Check fluid level in reservoir.

(1) Turn the ignition switch off and depress the brake pedal more than 20 times.

HINT:

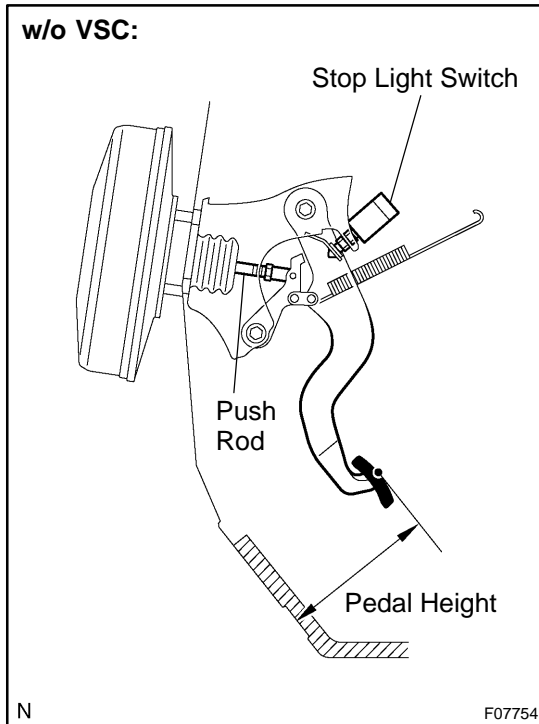
When pressure in the accumulator is released, reaction force becomes light and stroke becomes longer.

(2) Add brake fluid up to the MAX line of the reservoir tank.

Fluid: SAE J1703 or FMVSS No.116 DOT3

HINT:

When the ignition switch is turned to the ON position, brake fluid is sent to the accumulator. The brake fluid level drops by 5 mm when the ignition switch is off, which is normal.



BRAKE PEDAL ON-VEHICLE INSPECTION

BR1WB-02

1. CHECK PEDAL HEIGHT (W/O VSC)

Pedal height from dash panel:

Standard, access cab:

163.6 to 173.6 mm (6.44 to 6.83 in.)

Double cab:

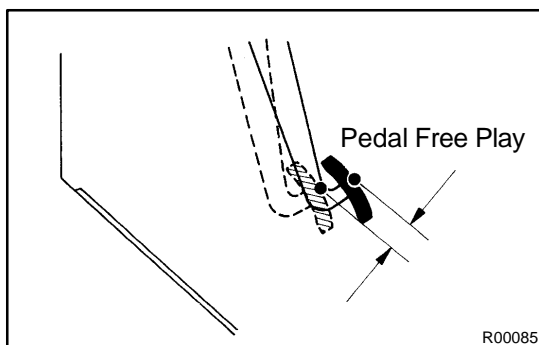
151.1 to 165.1 mm (5.95 to 6.50 in.)

NOTICE:

Do not adjust the pedal height. Doing so by changing the push rod length will structurally change the pedal ratio.

2. CHECK AND ADJUST STOP LIGHT SWITCH

- Disconnect the connector from the stop light switch.
- Turn the stop light switch until it lightly contacts the pedal stopper.
- Connect the connector to the stop light switch.
- Push in the brake pedal 5 to 15 mm (0.20 to 0.59 in), turn the stop light switch to lock the nut in the position where the stop light goes off.
- After installation, push in the brake pedal 5 to 15 mm (0.20 to 0.59 in.) and check that the stop light lights up.
- After adjusting the stop light switch, check the pedal height and the pedal free play.



3. CHECK PEDAL FREE PLAY (W/O VSC)

- Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.
- Push in the pedal by hand until the second point of resistance begins to be felt, then measure the distance as shown in the illustration.

Pedal free play: 1 to 6 mm (0.04 to 0.24 in.)

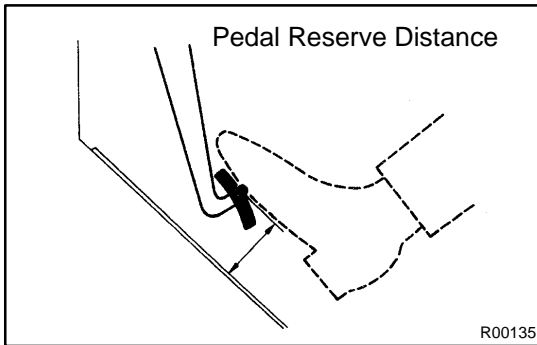
If incorrect, check the stop light switch clearance. If the clearance is OK, then troubleshoot the brake system.

Stop light switch clearance:

0.5 to 2.4 mm (0.020 to 0.094 in.)

HINT:

The free play to the first point of resistance is due to the play between the clevis and pin. It is 1 to 3 mm (0.04 to 0.12 in.) at the pedal.



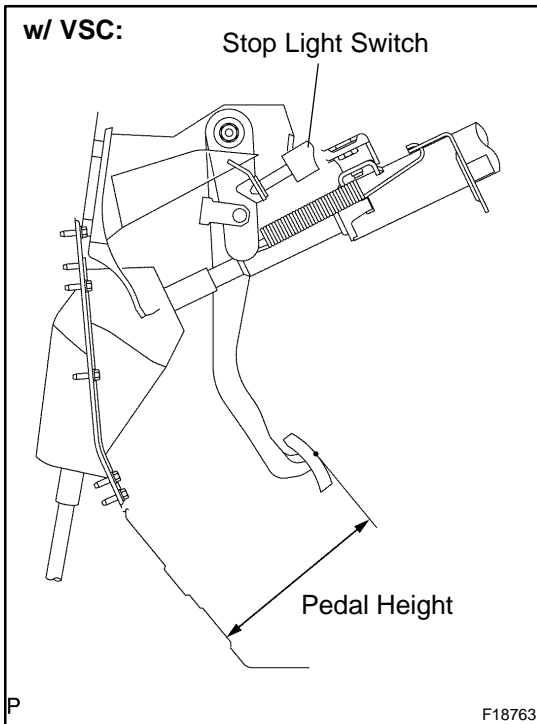
4. CHECK PEDAL RESERVE DISTANCE (W/O VSC)

Release the parking brake.

With the engine running, depress the pedal and measure the pedal reserve distance, as shown in the illustration.

Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf): More than 95 mm (3.74 in.)

If the reserve distance is incorrect, troubleshoot the brake system.



5. CHECK PEDAL HEIGHT (w/ VSC)

Pedal height from dash panel:

Standard, access cab:

164.0 to 174.0 mm (6.46 to 6.85 in.)

Double cab:

151.1 to 165.1 mm (5.95 to 6.50 in.)

6. IF NECESSARY, ADJUST PEDAL HEIGHT (w/ VSC)

(a) Remove the scuff plate LH, cowl side trim LH, lower finish panel and No. 2 heater to register duct (see page [BO-111](#)).

(b) Disconnect the connector from the stop light switch.

(c) Loosen the stop light switch lock nut and remove the stop light switch.

(d) Loosen the push rod lock nut.

(e) Adjust the pedal height by turning the pedal push rod.

(f) Tighten the clevis lock nut.

Torque: 25.5 N-m (260 kgf-cm, 19 ft-lbf)

(g) Install the stop light switch and turn it until it lightly contacts the pedal stopper.

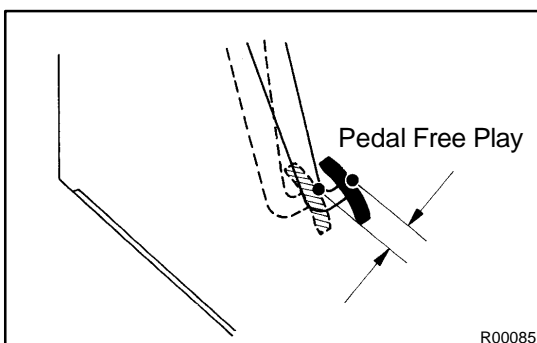
(h) Connect the connector to the stop light switch.

(i) Push in the brake pedal 5 to 15 mm (0.20 to 0.59 in), turn the stop light switch to lock the nut in the position where the stop light goes off.

(j) After installation, push in the brake pedal 5 to 15 mm (0.20 to 0.59 in.) and check that the stop light lights up.

(k) After adjusting the pedal height, check the pedal free play.

(l) Install the No. 2 heater to register duct, lower finish panel, cowl side trim LH and scuff plate LH.



7. CHECK PEDAL FREE PLAY (w/ VSC)

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) Push in the pedal by hand until the second point of resistance begins to be felt, then measure the distance as shown in the illustration.

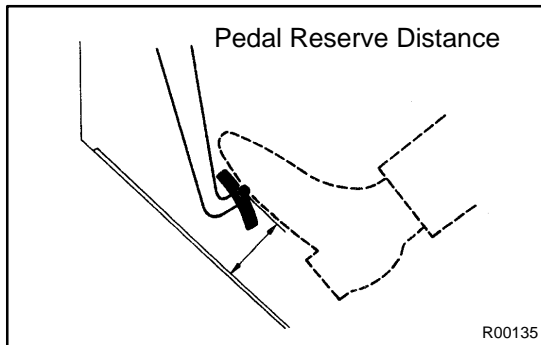
Pedal free play: 1 to 6 mm (0.04 to 0.24 in.)

If incorrect, check the stop light switch clearance. If the clearance is OK, then troubleshoot the brake system.

**Stop light switch clearance:
0.5 to 2.4 mm (0.020 to 0.094 in.)**

HINT:

The free play to the first point of resistance is due to the play between the clevis and pin. It is 1 to 3 mm (0.04 to 0.12 in.) at the pedal.



8. CHECK PEDAL RESERVE DISTANCE (w/ VSC)

Release the parking brake.

With the engine running, depress the pedal and measure the pedal reserve distance, as shown in the illustration.

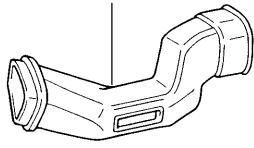
**Pedal reserve distance from asphalt sheet at 490 N
(50 kgf, 110.2 lbf): More than 95 mm (3.74 in.)**

If the reserve distance is incorrect, troubleshoot the brake system.

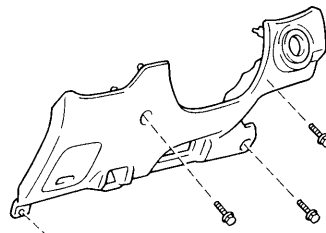
COMPONENTS

Automatic Transmission:

No. 2 Heater to Register Duct



Lower Finish Panel



Hood Lock Release Lever

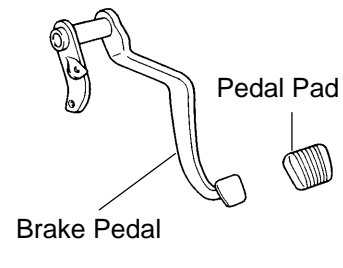
Stop Light Switch

Brake Pedal Bracket

13 (130, 9)

13 (130, 9)

Manual Transmission:



Bushing

Bushing

Collar

34 (350, 25)

Clip

Brake Pedal Lever

Clevis Pin

Return Spring

Cushion Plate

Bushing

Cushion

Collar

Pin

Brake Pedal

E-Ring 34 (350, 25)

Brake Pedal Link

Cowl Side Trim

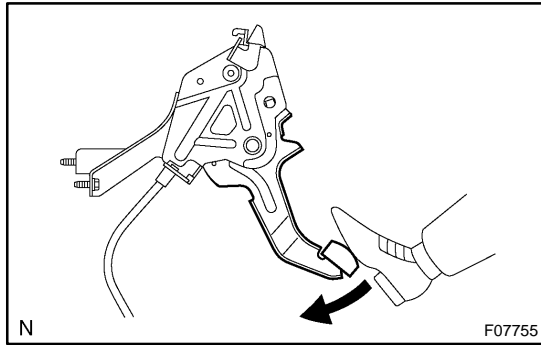
Front Door Scuff Plate

N-m (kgf-cm, ft-lbf) : Specified torque

◆ Non-reusable part

➔ Lithium soap base glycol grease

N



PARKING BRAKE PEDAL ON-VEHICLE INSPECTION

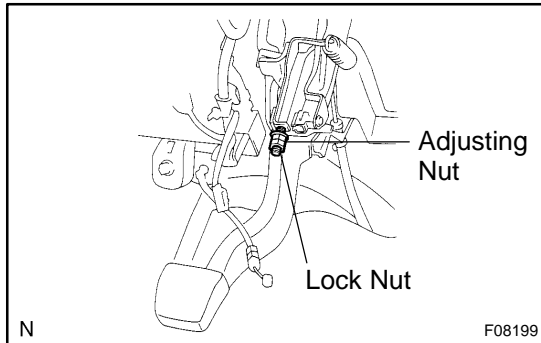
BR109-05

1. CHECK PARKING BRAKE PEDAL TRAVEL

Depress the parking brake pedal all the way and count the number of clicks.

**Parking brake pedal travel at 294 N (30 kgf, 66 lbf):
8 to 10 clicks**

If incorrect, adjust the parking brake.



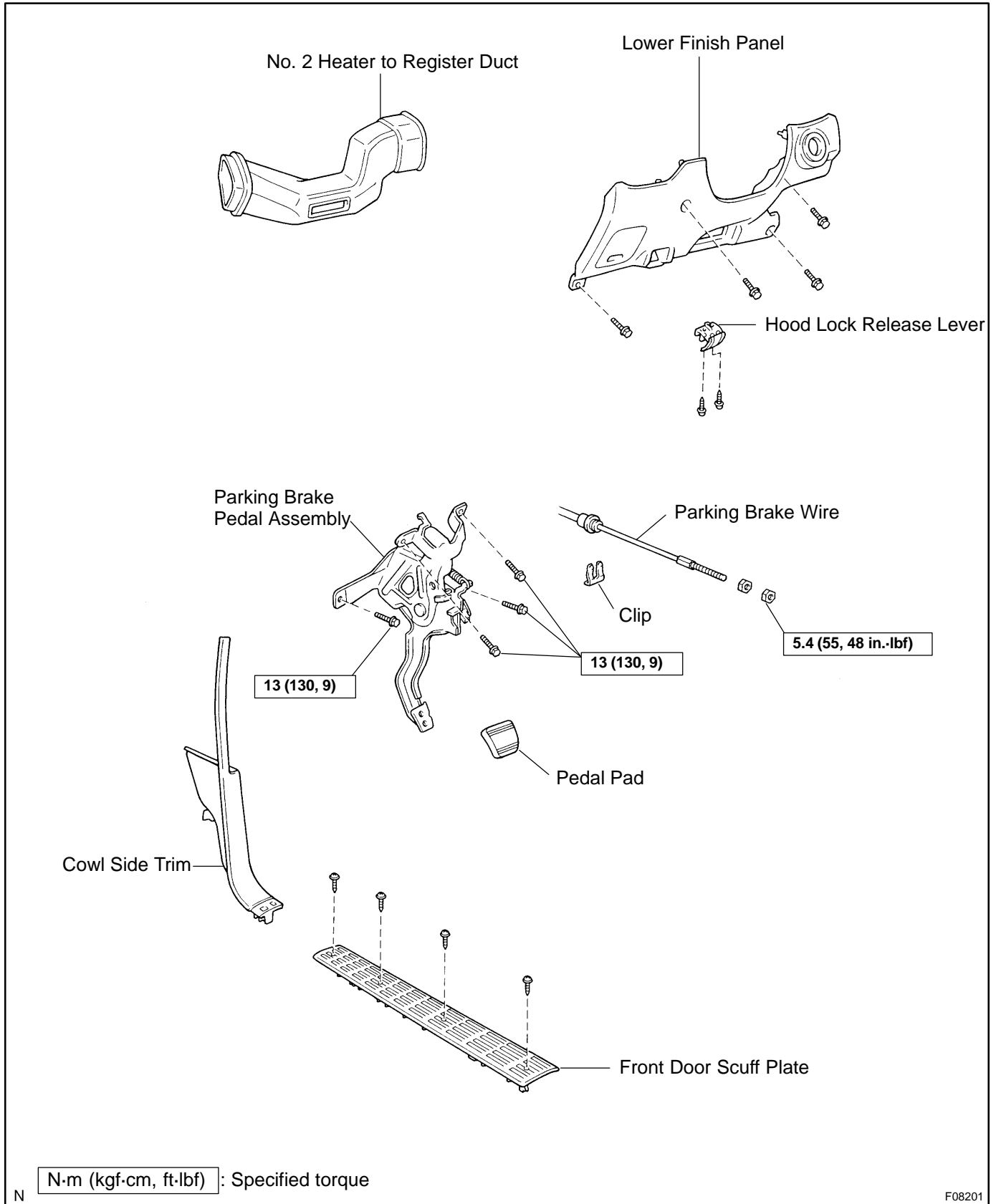
2. IF NECESSARY, ADJUST PARKING BRAKE PEDAL TRAVEL

HINT:

Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted. For shoe clearance adjustment, see step 3 on page [BR-52](#).

- (a) Remove the scuff plate LH.
- (b) Remove the cowl side trim LH.
- (c) Remove the lower finish panel.
- (d) Remove the No. 2 heater to register duct.
- (e) Loosen the lock nut and turn the adjusting nut until the pedal travel is correct.
- (f) Tighten the lock nut.
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)
- (g) Install the removed parts.

COMPONENTS



REMOVAL

1. REMOVE SCUFF PLATE LH, COWL SIDE TRIM LH, LOWER FINISH PANEL AND NO. 2 HEATER TO REGISTER DUCT
2. REMOVE PARKING BRAKE PEDAL ASSEMBLY
 - (a) Disconnect the parking brake switch connector.
 - (b) Remove the lock nut and adjusting nut from the parking brake wire.
 - (c) Remove the clip and parking brake wire.
 - (d) Remove the 4 bolts and parking brake pedal assembly.

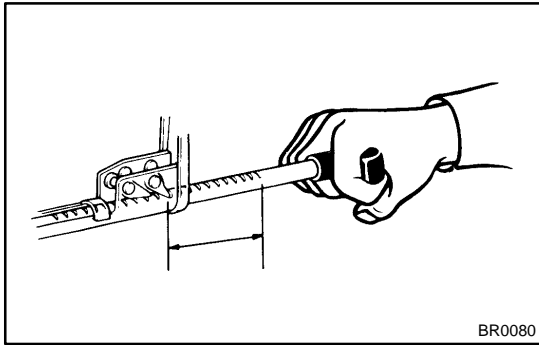
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

INSTALLATION

Installation is in the reverse order of removal (See page [BR-16](#)).

HINT:

After installation, check and adjust the parking brake pedal travel (see page [BR-14](#)).



PARKING BRAKE LEVER ON-VEHICLE INSPECTION

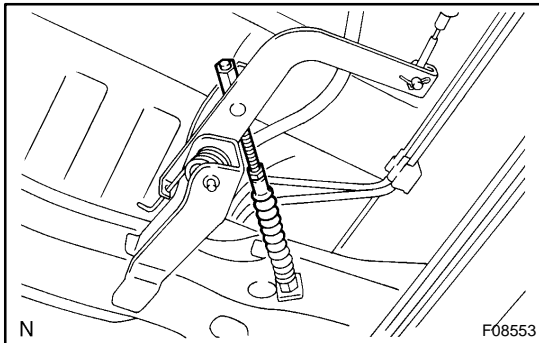
BR10D-02

1. CHECK PARKING BRAKE LEVER TRAVEL

Pull the parking brake lever all the way up, and count the number of clicks.

**Parking brake lever travel at 196 N (20 kgf, 44 lbf):
19 to 25 clicks**

If incorrect, adjust the parking brake.



2. IF NECESSARY, ADJUST PARKING BRAKE

HINT:

Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted. For shoe clearance adjustment, see step 3 on page [BR-52](#).

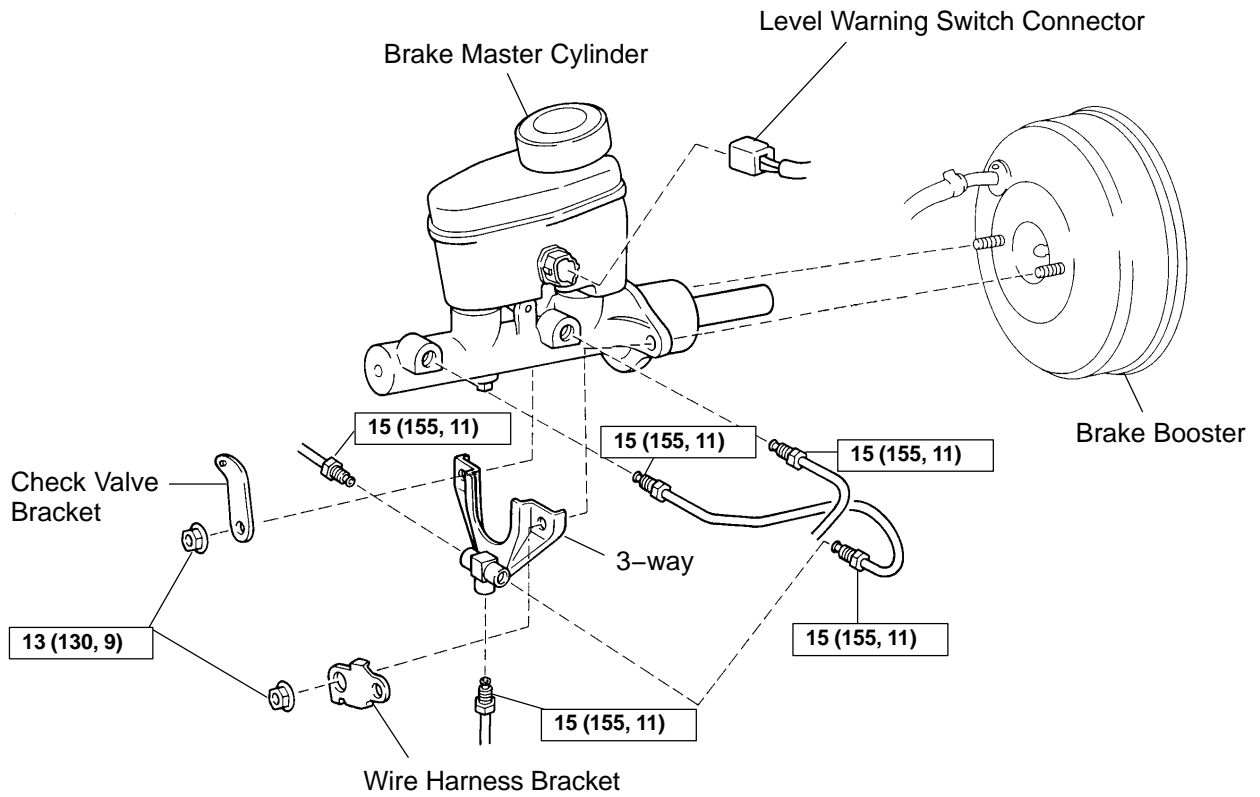
- (a) Tighten one of the adjusting nuts of the intermediate lever while loosening the other one until the travel is correct. Tighten the 2 adjusting nuts.
- (b) After adjusting the parking brake, confirm that the bell-crank stopper screw comes into contact with the backing plate (See page [BR-52](#)).

For shoe clearance adjustment, see step 3 on page [BR-52](#).

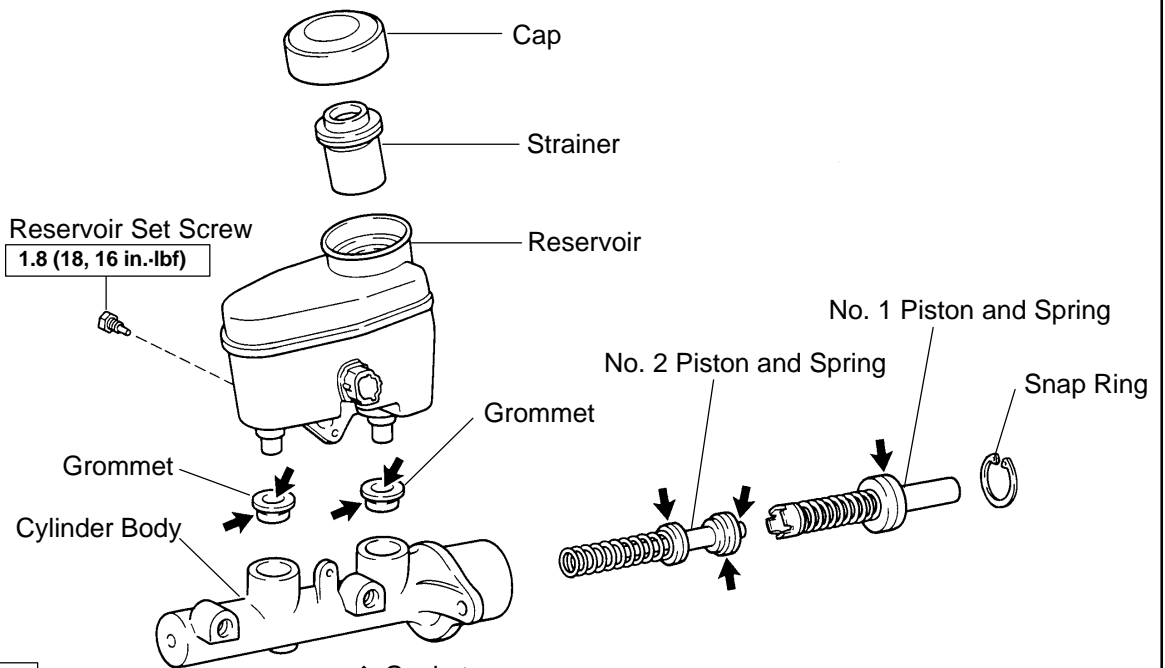
BRAKE MASTER CYLINDER (Standard Cab, Access Cab) COMPONENTS

BR1XW-01

w/o VSC:



N



- N·m (kgf·cm, ft·lbf) : Specified torque
- ◆ Non-reusable part
- ➔ Lithium soap base glycol grease
- ◆ Gasket
- ◆ Piston Stopper Bolt
- 10 (100, 7)

F08197
F08196

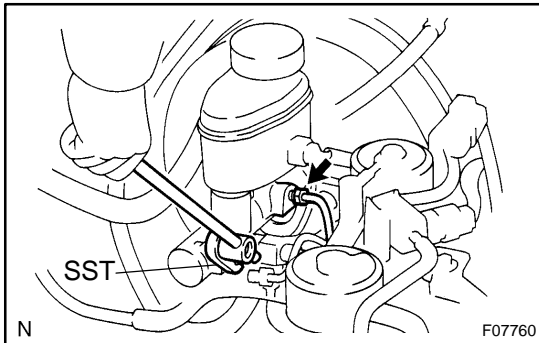
F18914

REMOVAL

1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR
2. TAKE OUT FLUID WITH SYRINGE

NOTICE:

Do not let brake fluid remain on a painted surface. Wash it off immediately.

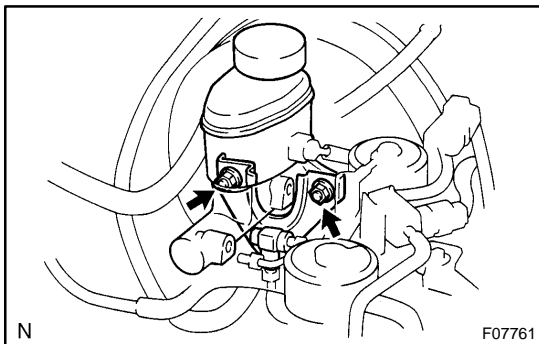


3. DISCONNECT BRAKE LINES

Using SST, disconnect the 5 brake lines from the master cylinder and 3-way.

SST 09023-00101

Torque: 15 N·m (155 kgf-cm, 11 ft-lbf)



4. REMOVE MASTER CYLINDER

(a) Remove the 2 nuts, wire harness bracket, 3-way and check valve bracket.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

(b) Pull out the master cylinder from the brake booster.

DISASSEMBLY

1. REMOVE RESERVOIR

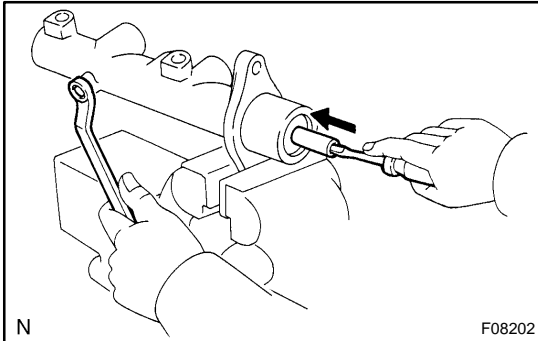
- (a) Remove the set screw and pull out the reservoir.

Torque: 1.8 N·m (18 kgf·cm, 16 in.-lbf)

- (b) Remove the cap and strainer from the reservoir.

2. REMOVE 2 GROMMETS

3. PLACE CYLINDER IN VISE



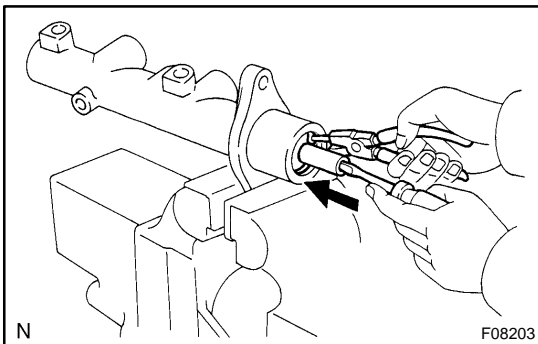
4. REMOVE PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

HINT:

Tape the screwdriver tip before use.

Torque: 10 N·m (100 kgf·cm, 7 ft-lbf)



5. REMOVE 2 PISTONS AND SPRINGS

- (a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

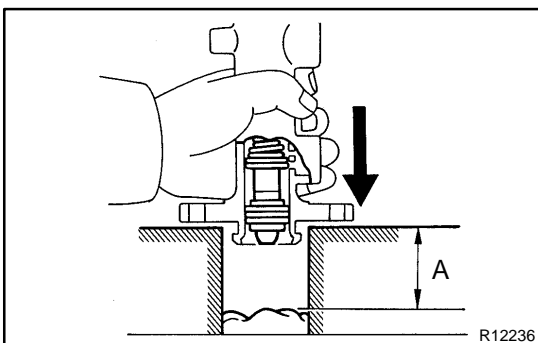
HINT:

Tape the screwdriver tip before use.

- (b) Remove the No. 1 piston and spring by hand, pulling them straight out, not at an angle.

NOTICE:

- If pulled out and installed at an angle, there is a possibility that the cylinder bore could be damaged.
- At the time of reassembly, be careful not to damage the rubber lips on the pistons.



- (c) Place a rag and 2 wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No. 2 piston and spring drop out of the cylinder.

HINT:

Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

INSPECTION

HINT:

Clean the disassembled parts with compressed air.

1. INSPECT CYLINDER BORE FOR RUST OR SCORING

If necessary, clean or replace the cylinder.

2. INSPECT CYLINDER FOR WEAR OR DAMAGE

If necessary, clean or replace the cylinder.

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BR-21](#)).

NOTICE:

Apply lithium soap base glycol grease to the rubber parts indicated by the arrows (See page [BR-19](#)).

INSTALLATION

Installation is in the reverse order of removal (See page [BR-20](#)).

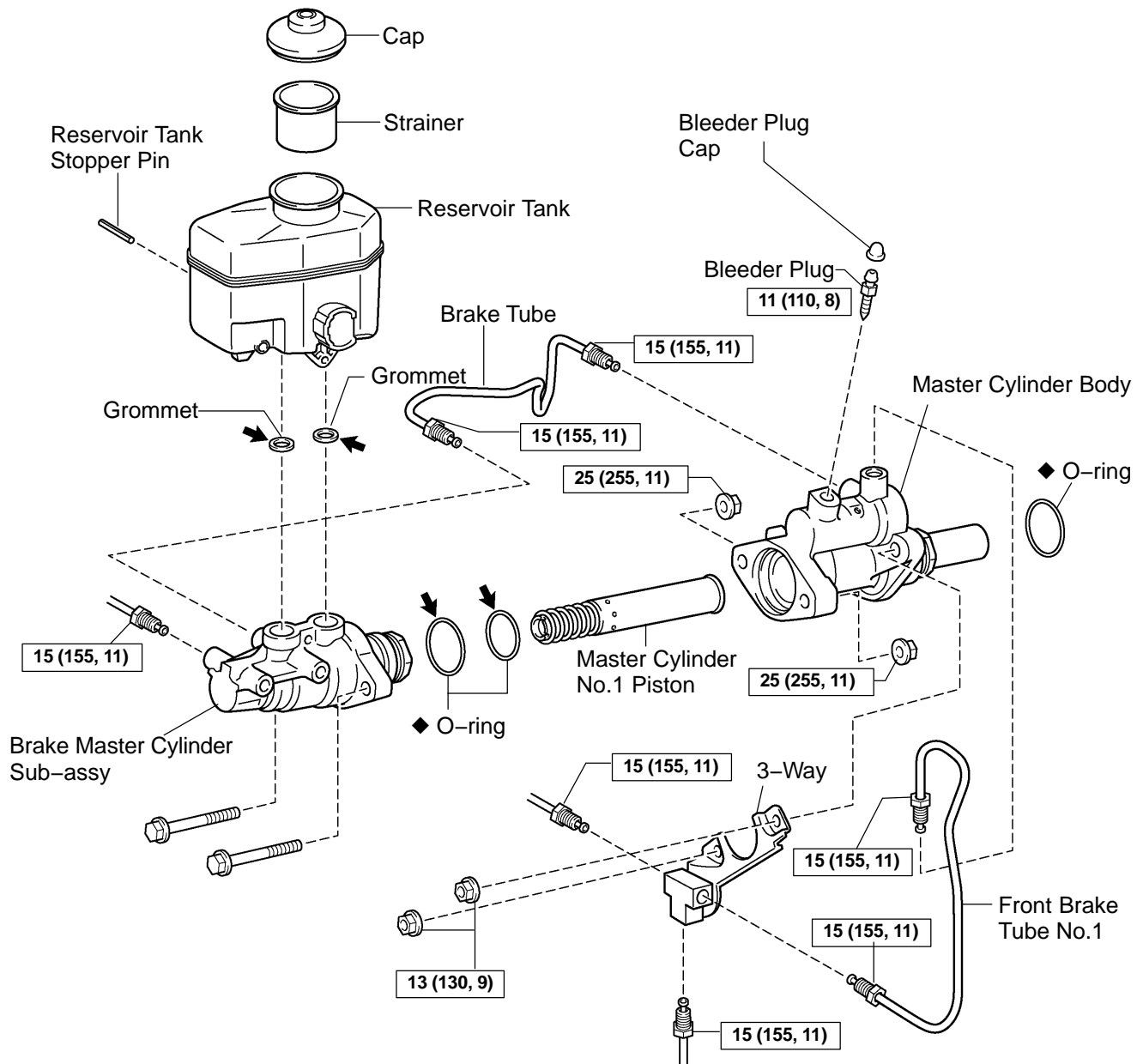
HINT:

- Before installation, adjust length of the brake booster push rod (see page [BR-34](#)).
- After installation, fill the brake reservoir with brake fluid and bleed the brake system (see page [BR-4](#)).
- Check for leaks, check and adjust the brake pedal (see page [BR-10](#)).
- Check brake pedal height (see page [BR-10](#)).
- Check the brake actuator with the hand-held tester (see page [BR-62](#)).

BRAKE MASTER CYLINDER (Double Cab) COMPONENTS

BR1X8-02

w/o VSC:



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

N → Lithium soap base glycol grease

REMOVAL

1. **DISCONNECT LEVEL WARNING SWITCH CONNECTOR**

NOTICE:

- Do not adjust the brake booster push rod.
- Do not change the combination of the diameter converting unit and brake.

2. **TAKE OUT FLUID WITH SYRINGE**

NOTICE:

Do not let brake fluid remain on a painted surface. Wash it off immediately.

3. **DISCONNECT BRAKE LINES**

- (a) Using SST, disconnect the 5 brake lines from the master cylinder and 3-way.

SST 09023-00101

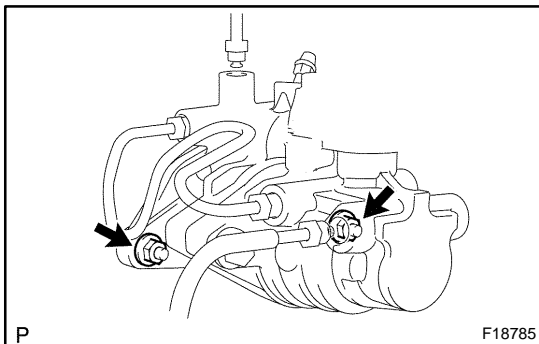
Torque: 15 N·m (155 kgf-cm, 11 ft-lbf)

- (b) Remove the front brake tube No. 1 from the master cylinder and 3-way.

4. **REMOVE BRAKE MASTER CYLINDER**

Remove the 2 nuts, 3-way and brake master cylinder.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

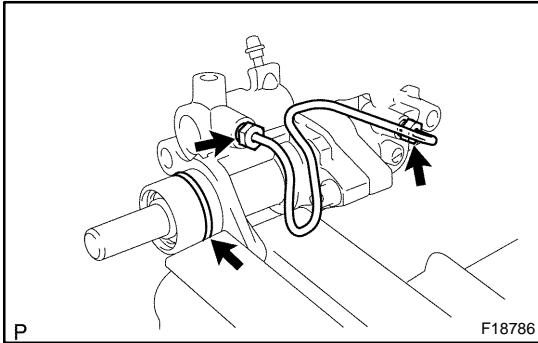


DISASSEMBLY

1. REMOVE RESERVOIR TANK

- (a) Remove the brake master cylinder reservoir tank stopper pin and pull out the reservoir.
- (b) Remove the cap and strainer from the reservoir.

2. REMOVE 2 GROMMETS

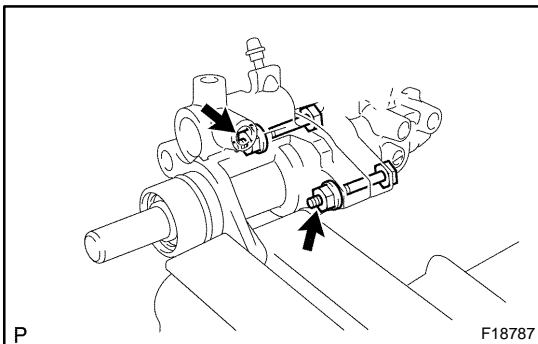


3. REMOVE BRAKE MASTER CYLINDER SUB-ASSY

- (a) Hold the brake master cylinder in a vise with aluminum plates in between.
- (b) Using a screwdriver, remove the O-ring.
- (c) Using SST, remove the brake tube from the brake master cylinder.

SST 09023-00101

Torque: 15 N·m (155 kgf-cm, 11 ft-lbf)



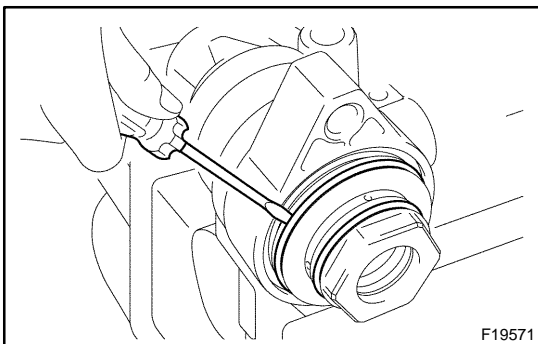
- (d) Remove the 2 nuts, 2 bolts and brake master cylinder sub-assy.

Torque: 25 N·m (255 kgf-cm, 18 ft-lbf)

NOTICE:

Pay due attention so as not to drop the No. 1 piston from the plunger master cylinder. (If the No. 1 piston is dropped, it cannot be reused.)

- (e) Remove the master cylinder body and master cylinder No. 1 piston from the brake master cylinder sub-assy.



- (f) Using a screwdriver, remove the 2 O-rings.
- (g) Remove the bleeder plug from the brake master cylinder sub-assy.

Torque: 11 N·m (110 kgf-cm, 8 ft-lbf)

- (h) Remove the bleeder plug cap.

INSPECTION

HINT:

Clean the disassembled parts with compressed air.

1. INSPECT CYLINDER BORE FOR RUST OR SCORING

If necessary, clean or replace the cylinder.

2. INSPECT CYLINDER FOR WEAR OR DAMAGE

If necessary, clean or replace the cylinder.

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BR-27](#)).

NOTICE:

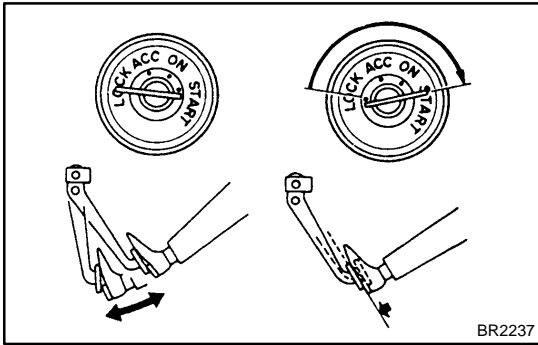
Apply lithium soap base glycol grease to the rubber parts indicated by the arrows (See page [BR-25](#)).

INSTALLATION

Installation is in the reverse order of removal (See page [BR-26](#)).

HINT:

- After installation, fill the brake reservoir with brake fluid and bleed the brake system (see page [BR-4](#)).
- Check for leaks, check and adjust the brake pedal (see page [BR-10](#)).
- Check brake pedal height (see page [BR-10](#)).
- Check the brake actuator with the hand-held tester (see page [BR-67](#)).

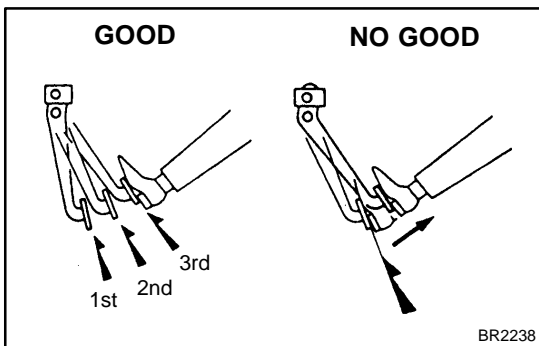


BRAKE BOOSTER ASSEMBLY (Standard Cab, Access Cab) ON-VEHICLE INSPECTION

BR1Y3-01

1. OPERATING CHECK

- (a) Depress the brake pedal several times with the engine off and check that there is no change in the pedal reserve distance.
- (b) Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.



2. AIR TIGHTNESS CHECK

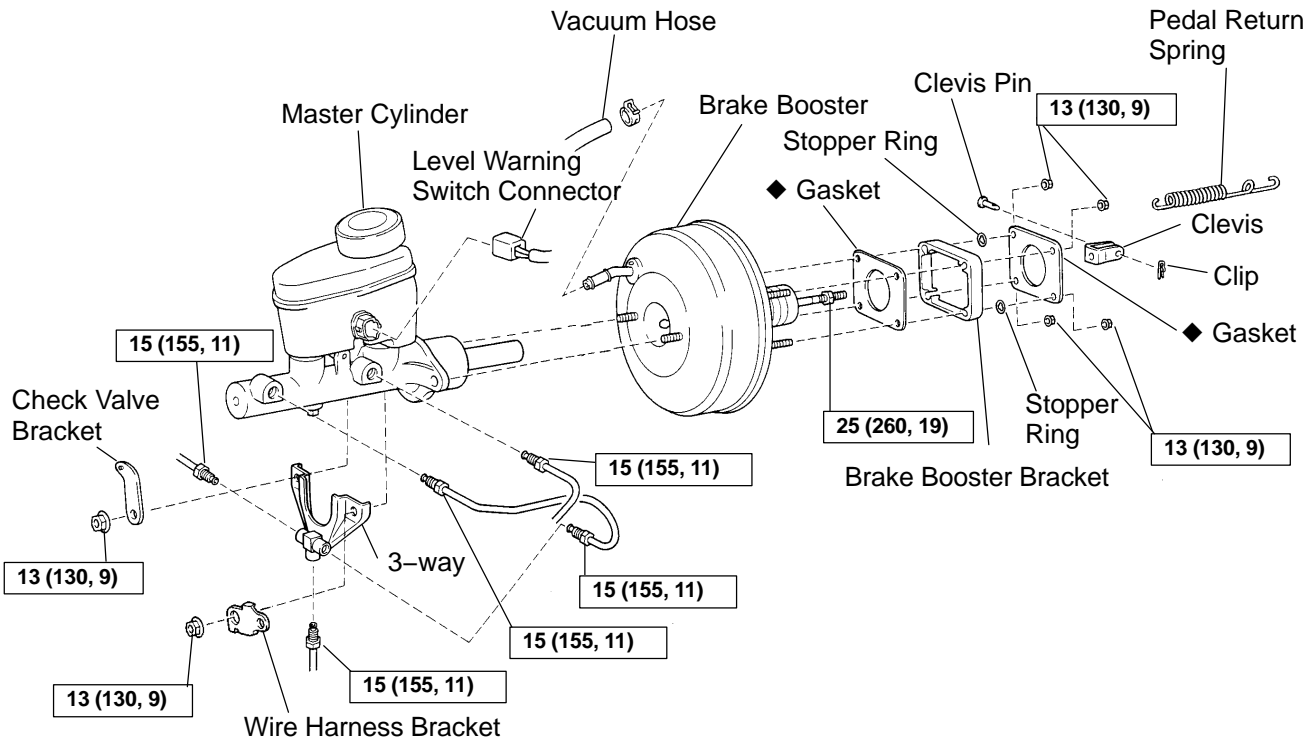
- (a) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly.

If the pedal goes down farthest the 1st time, but gradually rises after the 2nd or 3rd time, the booster is air tight.

- (b) Depress the brake pedal while the engine is running, and stop the engine with the pedal depressed. If there is no change in the pedal reserve travel after holding down the pedal for 30 seconds, the booster is air tight.

COMPONENTS

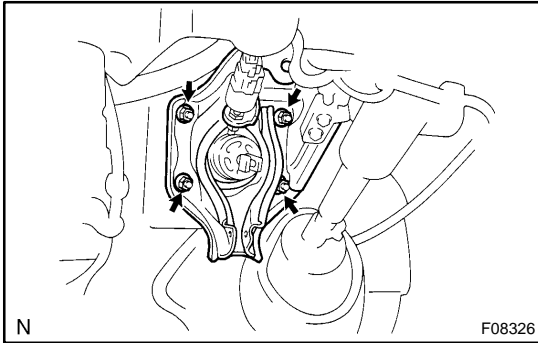
w/o VSC:



N N·m (kgf·cm, ft·lbf) : Specified torque
 ◆ Non-reusable part

REMOVAL

1. REMOVE MASTER CYLINDER (See page [BR-20](#))
2. DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER
3. REMOVE SCUFF PLATE LH, COWL SIDE TRIM LH, LOWER FINISH PANEL AND NO. 2 HEATER TO REGISTER DUCT (See page [BO-111](#))
4. REMOVE PEDAL RETURN SPRING
5. REMOVE CLIP AND CLEVIS PIN
6. REMOVE BRAKE BOOSTER
 - (a) Remove the 4 nuts and clevis.
 - (b) Pull out the brake booster and gasket.
 - (c) Remove the 2 stopper rings, brake booster bracket and gasket from the brake booster.



INSTALLATION

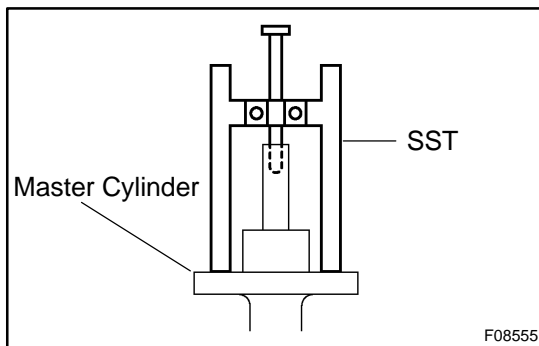
1. INSTALL BRAKE BOOSTER

- (a) Install a new gasket to the brake booster.
- (b) Install the brake booster bracket and 2 stopper rings to the brake booster.
- (c) Install the booster and a new gasket.
- (d) Install the clevis to the operating rod.
- (e) Install and torque the booster installation nuts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (f) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.
- (g) Connect the vacuum hose to the brake booster.

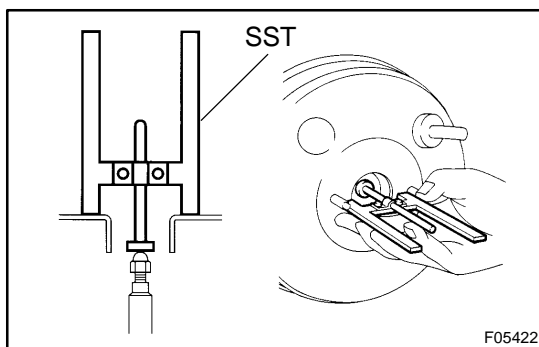
2. INSTALL NO. 2 HEATER TO REGISTER DUCT, LOWER FINISH PANEL, COWL SIDE TRIM LH AND SCUFF PLATE (See page [BO-120](#))



3. ADJUST LENGTH OF BOOSTER PUSH ROD

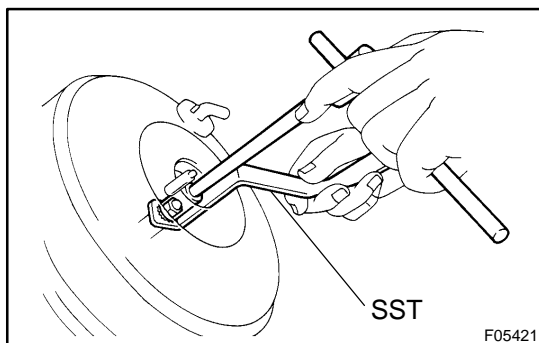
- (a) Set the SST on the master cylinder, and lower the pin until its tip slightly touches the piston.

SST 09737-00011



- (b) Turn the SST upside down, and set it on the booster.
- (c) Measure the clearance between the booster push rod and pin head (SST).

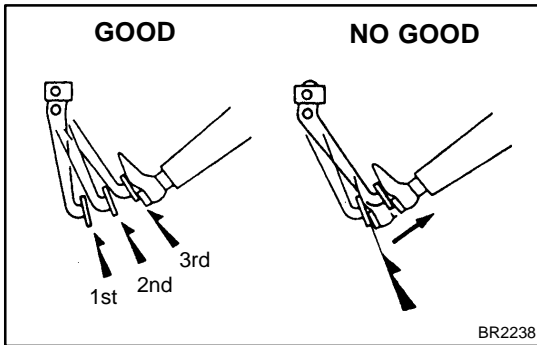
Clearance: 0 mm (0 in.)



- (d) Using SST, adjust the booster push rod length until the push rod lightly touches the pin head.

SST 09737-00020

4. **INSTALL MASTER CYLINDER (See page [BR-24](#))**
5. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page [BR-4](#))**
6. **CHECK FOR FLUID LEAKAGE**
7. **CHECK AND ADJUST BRAKE PEDAL (See page [BR-10](#))**
8. **DO OPERATIONAL CHECK (See page [BR-31](#))**



BRAKE BOOSTER ASSEMBLY (Double Cab)

BR1XE-02

ON-VEHICLE INSPECTION

1. INSPECT BRAKE BOOSTER

- (a) Air tightness check.
 - (1) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly.

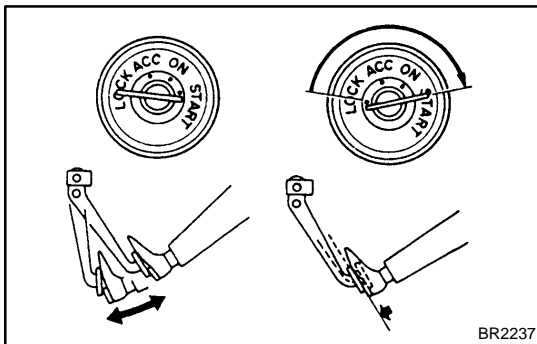
HINT:

If the pedal goes down farthest the 1st time, and gradually rises at the 2nd or 3rd time, the booster is airtight.

- (2) Depress the brake pedal while the engine is running, and stop the engine with the pedal depressed.

HINT:

- If there is no change in the pedal reserve distance after holding the pedal for 30 seconds, the booster is airtight.
- If not, replace the brake booster.



- (b) Operating check.

- (1) Depress the brake pedal several times with the ignition switch OFF and check that there is no change in the pedal reserve distance.
- (2) Depress the brake pedal and start the engine.

HINT:

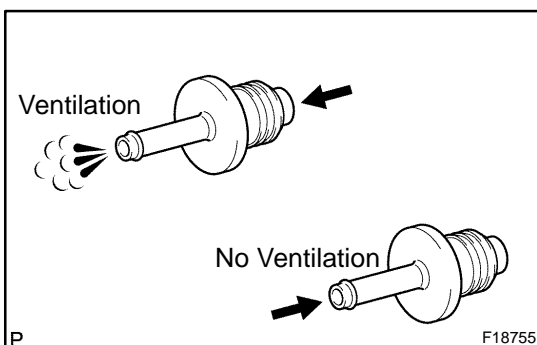
- If the pedal goes down slightly, the operation is normal.
- If not, replace the brake booster.

- (c) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly.

If the pedal goes down farthest the 1st time, but gradually rises after the 2nd or 3rd time, the booster is air tight.

2. INSPECT VACUUM CHECK VALVE

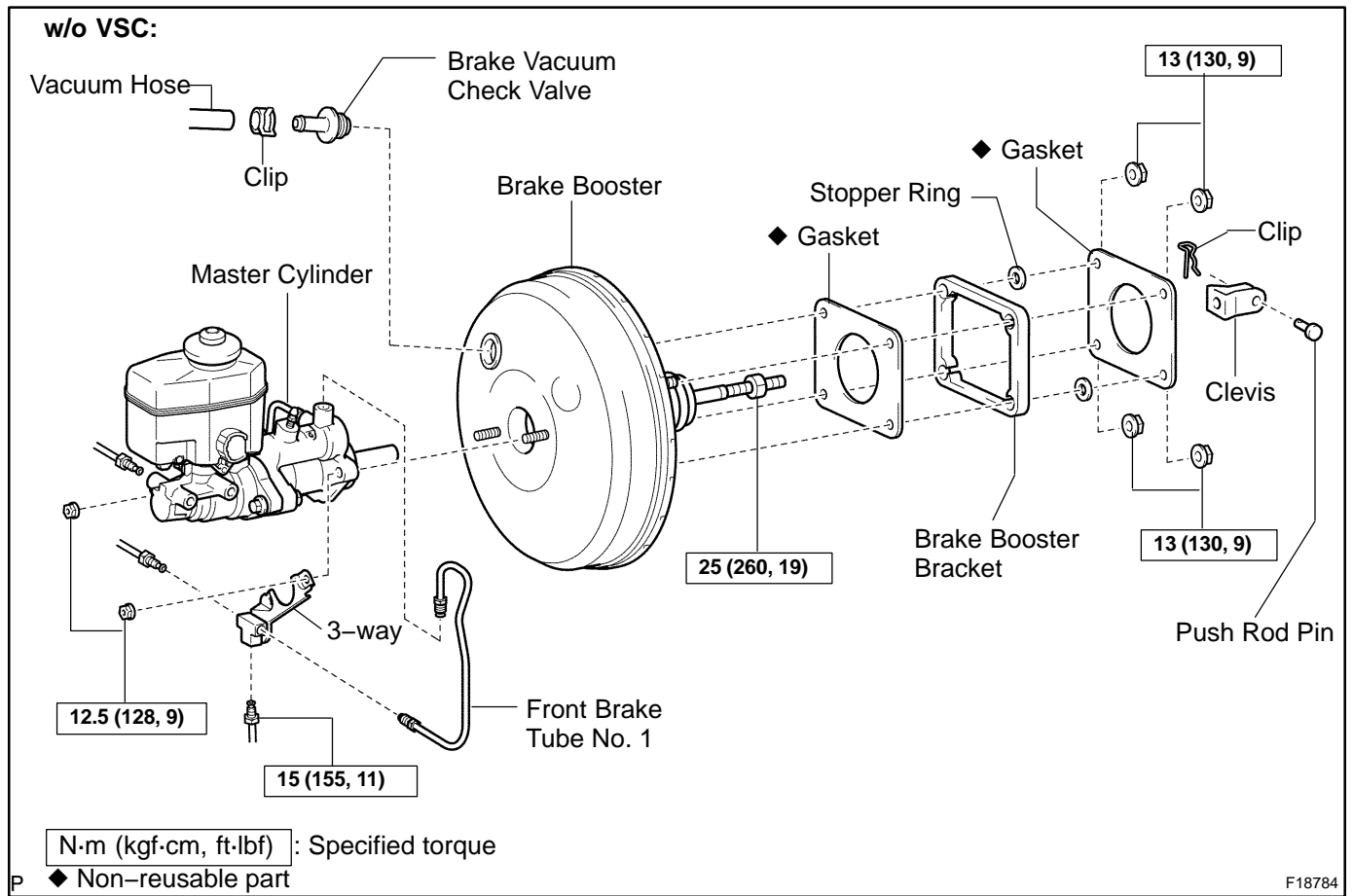
- (a) Check the vacuum check valve.
 - (1) Slide the clip and disconnect the vacuum hose.
 - (2) Remove the vacuum check valve.
- (3) Check that there is ventilation from the booster to the engine, and no ventilation from the engine to the booster.
- (4) If any fault is found, replace the vacuum check valve.



P

F18755

COMPONENTS

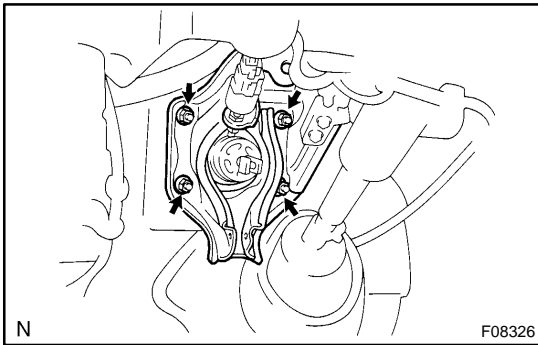


REMOVAL

NOTICE:

- Do not adjust the brake booster push rod.
- Do not change the combination of the diameter converting unit and brake.

1. REMOVE MASTER CYLINDER (See page [BR-26](#))
2. DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER
3. REMOVE SCUFF PLATE LH, COWL SIDE TRIM LH, LOWER FINISH PANEL AND NO. 2 HEATER TO REGISTER DUCT (See page [BO-111](#))
4. REMOVE PEDAL RETURN SPRING
5. REMOVE CLIP AND CLEVIS PIN



6. REMOVE BRAKE BOOSTER

- (a) Remove the 4 nuts and clevis.
- (b) Pull out the brake booster and gasket.
- (c) Remove the 2 stopper rings, brake booster bracket and gasket from the brake booster.

INSTALLATION

1. INSTALL BRAKE BOOSTER

- (a) Install a new gasket to the brake booster.
- (b) Install the brake booster bracket and 2 stopper rings to the brake booster.
- (c) Install the booster and a new gasket.
- (d) Install the clevis to the operating rod.
- (e) Install and torque the booster installation nuts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (f) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.
- (g) Connect the vacuum hose to the brake booster.

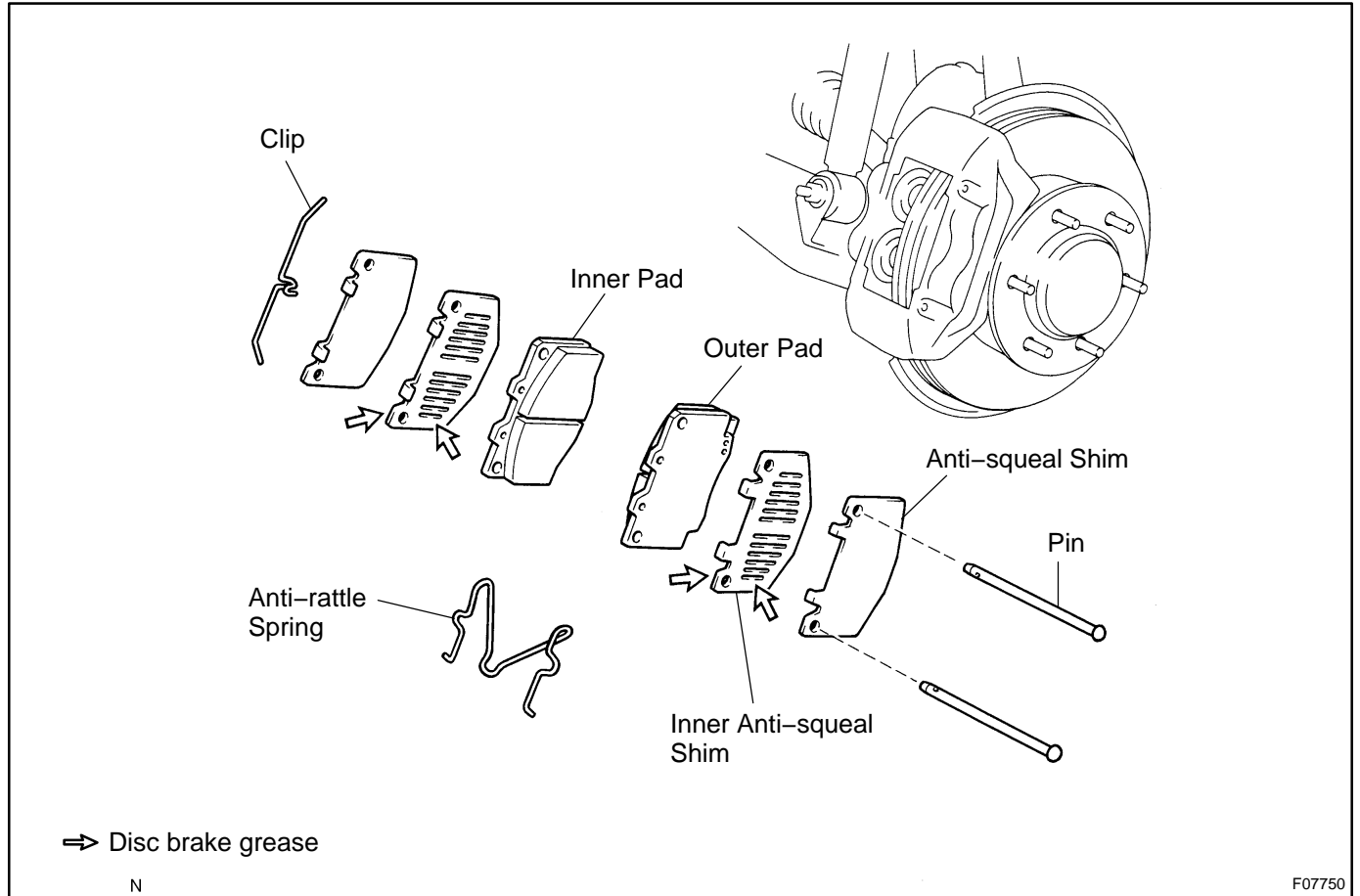
2. INSTALL NO. 2 HEATER TO REGISTER DUCT, LOWER FINISH PANEL, COWL SIDE TRIM LH AND SCUFF PLATE (See page [BO-120](#))

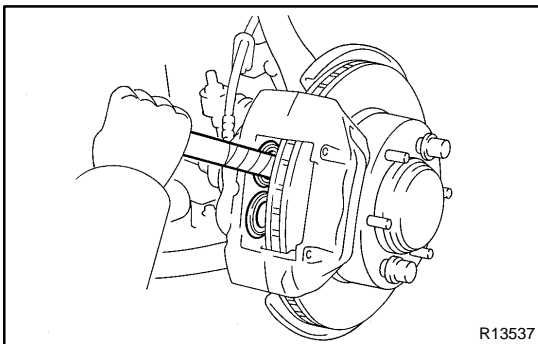
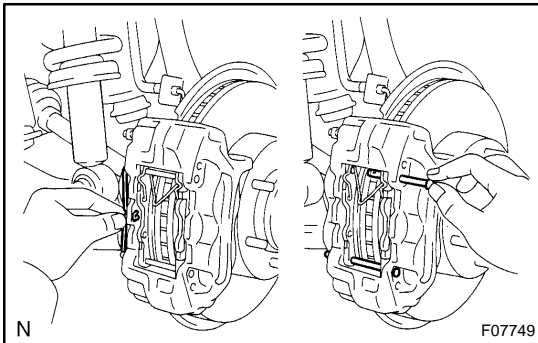
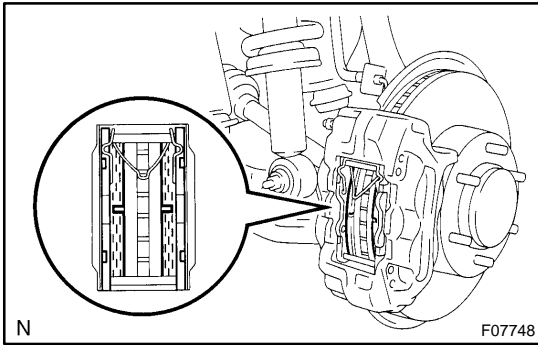
NOTICE:

- Do not adjust the brake booster push rod.
 - Do not change the combination of the diameter converting unit and brake.
3. INSTALL MASTER CYLINDER (See page [BR-30](#))
 4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page [BR-4](#))
 5. CHECK FOR FLUID LEAKAGE
 6. CHECK AND ADJUST BRAKE PEDAL (See page [BR-10](#))
 7. DO OPERATIONAL CHECK (See page [BR-35](#))

FRONT BRAKE PAD COMPONENTS

BR10J-05





REPLACEMENT

1. REMOVE FRONT WHEEL
2. INSPECT PAD LINING THICKNESS

Check the pad thickness and replace pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)

3. REMOVE CLIP, 2 PINS AND ANTI-RATTLE SPRING
4. REMOVE 2 PADS AND 4 ANTI-SQUEAL SHIMS

NOTICE:

The anti-rattle spring and clip can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.

5. CHECK DISC THICKNESS AND RUNOUT
(See page [BR-44](#))

6. INSTALL NEW PADS

NOTICE:

When replacing worn pads, the anti-squeal shims must be replaced together with the pads.

- (a) Draw out a small amount of brake fluid from the reservoir.
- (b) Press in the pistons with a monkey wrench handle or equivalent.

HINT:

- Tape the monkey wrench handle before use.
- Always change the pads on one wheel at a time as there is a possibility of the opposite piston flying out.
- If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.

- (c) Install the anti-squeal shims to new pads.

HINT:

Apply disc brake grease to both sides of the inner anti-squeal shims (See page [BR-39](#)).

- (d) Install new pads.

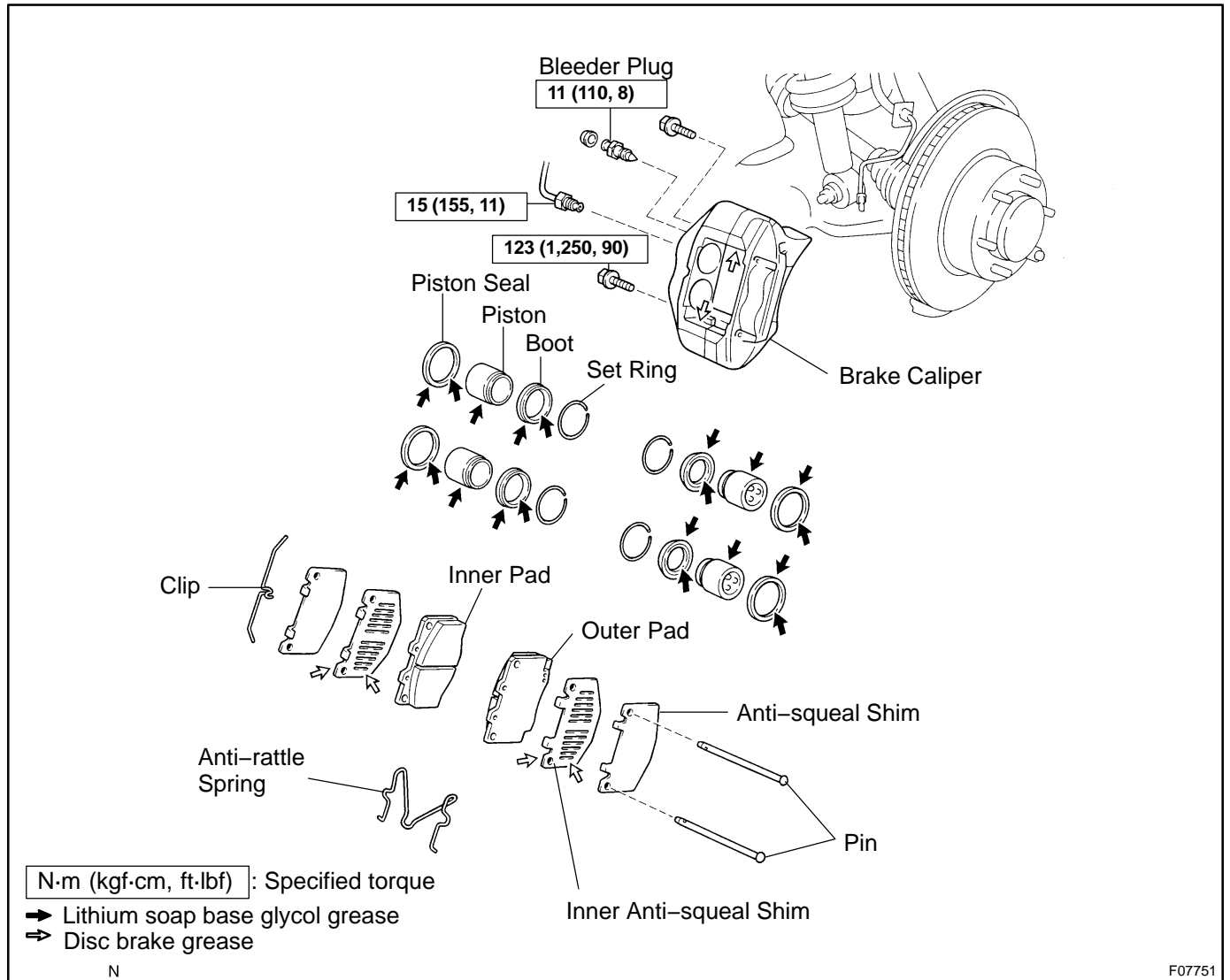
NOTICE:

Do not allow oil or grease to come in contact with the rubbing face.

7. INSTALL ANTI-RATTLE SPRING AND 2 PINS
8. INSTALL CLIP
9. INSTALL FRONT WHEEL
Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)
10. DEPRESS BRAKE PEDAL SEVERAL TIMES
11. CHECK THAT FLUID LEVEL IS AT MAX LINE

FRONT BRAKE CALIPER COMPONENTS

BR10L-04



N

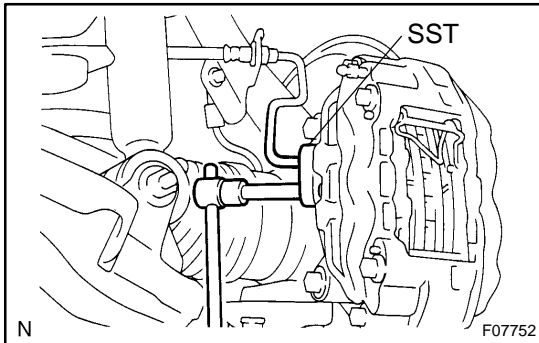
F07751

REMOVAL

1. REMOVE FRONT WHEEL

Remove the wheel and temporarily fasten the disc with hub nuts.

Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)

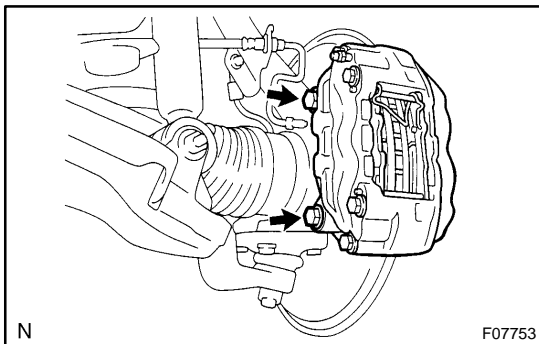


2. DISCONNECT BRAKE LINE

Using SST, disconnect the brake line. Use a container to catch brake fluid.

SST 09023-00101

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)



3. REMOVE CALIPER

Remove the 2 mounting bolts and caliper.

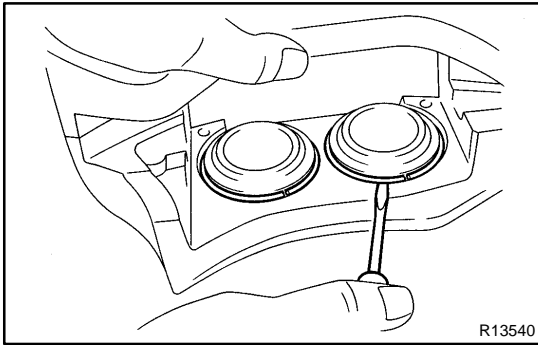
Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)

4. REMOVE CLIP, 2 PINS AND ANTI-RATTLE SPRING

5. REMOVE 2 PADS AND 4 ANTI-SQUEAL SHIMS

NOTICE:

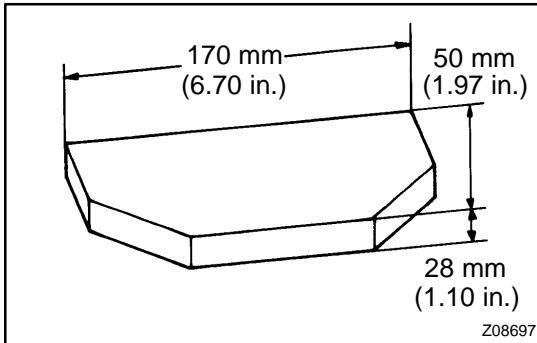
The anti-rattle spring and clip can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.



DISASSEMBLY

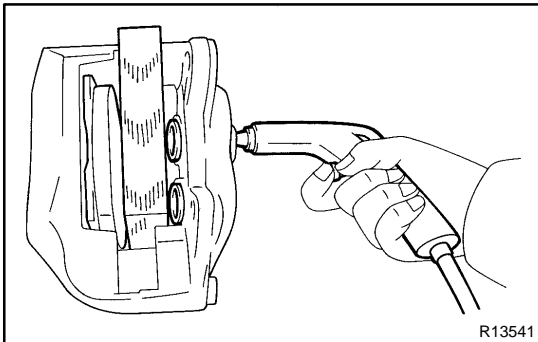
1. REMOVE CYLINDER BOOT SET RINGS AND BOOTS

Using a screwdriver, remove the 4 cylinder boot set rings and boots.



2. REMOVE PISTONS FROM CYLINDER

(a) Prepare a wooden plate to hold the pistons.

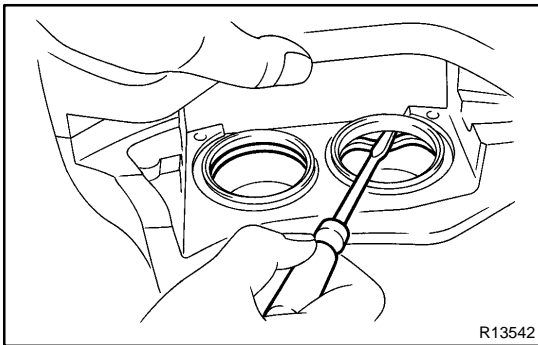


(b) Place the plate between the pistons and insert a pad at one side.

(c) Use compressed air to remove the pistons alternately from the cylinder.

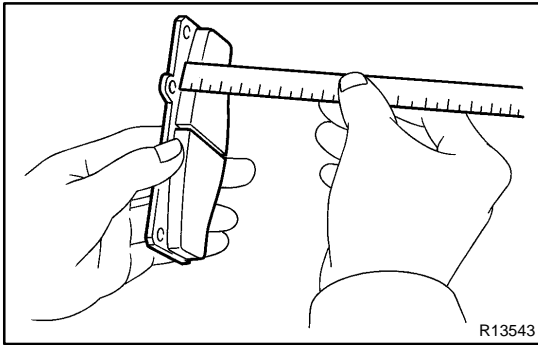
CAUTION:

Do not place your fingers in front of the pistons when using compressed air.



3. REMOVE PISTON SEALS

Using a screwdriver, remove the 4 piston seals from the cylinder.



INSPECTION

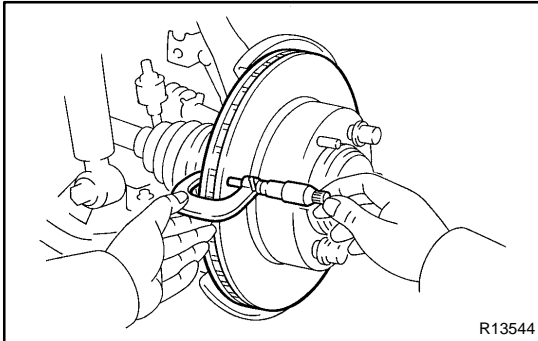
1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness: 11.5 mm (0.453 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible), or if it shows signs of uneven wear.



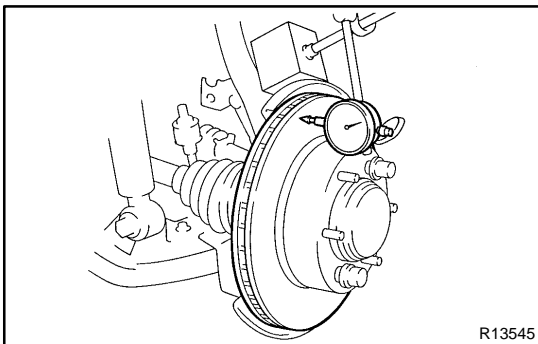
2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness: 28.0 mm (1.102 in.)

Minimum thickness: 26.0 mm (1.024 in.)

Replace the disc if the thickness of the disc is at the minimum or less. Replace the disc or grind it on a lathe if it is scored or worn unevenly.



3. MEASURE DISC RUNOUT

Using a dial indicator, measure the disc runout at a position 10 mm (0.39 in.) from the outside edge.

Maximum disc runout: 0.07 mm (0.0028 in.)

If the runout is greater than the maximum, replace the disc or grind it on an "On-Car" brake lathe.

HINT:

Before measuring the runout, confirm that the front hub bearing play is within specifications (see page SA-20).

4. IF NECESSARY, ADJUST DISC RUNOUT

(a) Remove the hub nuts and disc. Reinstall the disc 1/6 of a turn round from its original position on the hub. Install and torque the hub nuts.

Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)

(b) Remeasure the disc runout. Make a note of the runout and the disc's position on the hub.

(c) Repeat (a) and (b) until the disc has been installed on the 4 remaining hub positions.

If the minimum runout recorded in (a) to (c) is less than the maximum disc runout, install the disc in that position.

If the minimum runout recorded in (a) to (c) is greater than the maximum disc runout, replace the disc and repeat step 3.

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BR-43](#)).

NOTICE:

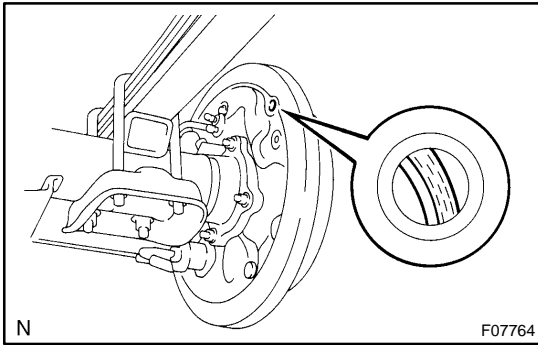
Apply lithium soap base glycol grease and disc brake grease to the parts indicated by the arrows (See page [BR-41](#)).

INSTALLATION

Installation is in the reverse order of removal (See page [BR-42](#)).

HINT:

- After installation, fill the brake reservoir with brake fluid and bleed the brake system (See page [BR-4](#)).
- Check for leaks.



REMOVAL

1. INSPECT SHOE LINING THICKNESS

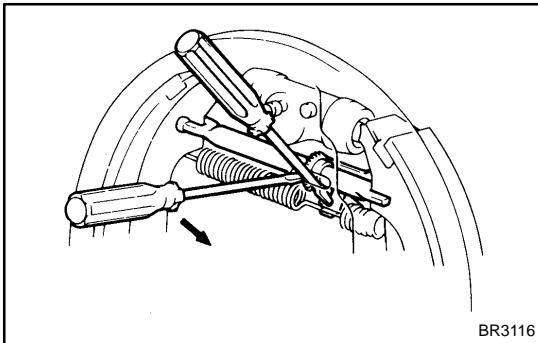
Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than the minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)



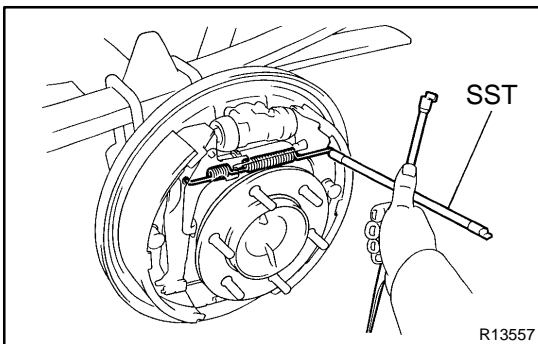
3. REMOVE BRAKE DRUM

- (a) Release the parking brake lever or pedal and remove the brake drum.

HINT:

If the brake drum cannot be removed easily, do the following steps.

- (b) Remove the adjusting hole plug from the backing plate.
 (c) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.
 (d) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.

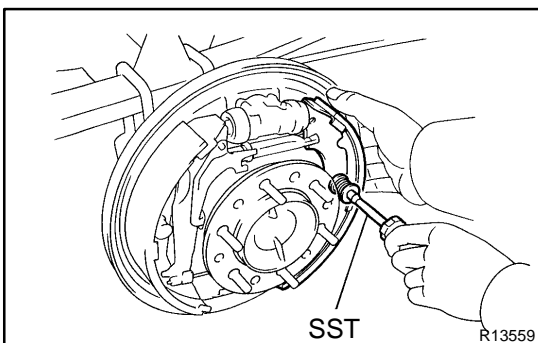


4. REMOVE REAR SHOE

- (a) Using SST, disconnect the return spring from the rear shoe.

SST 09703-30010

- (b) Remove the return spring from the front shoe.

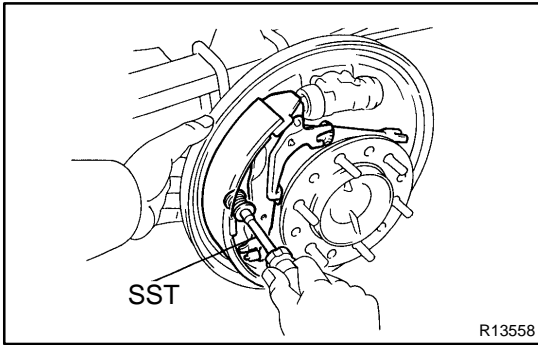


- (c) Using SST, remove the shoe hold-down spring, 2 cups and pin.

SST 09718-00010

- (d) Disconnect the anchor spring from the rear shoe and remove the rear shoe.

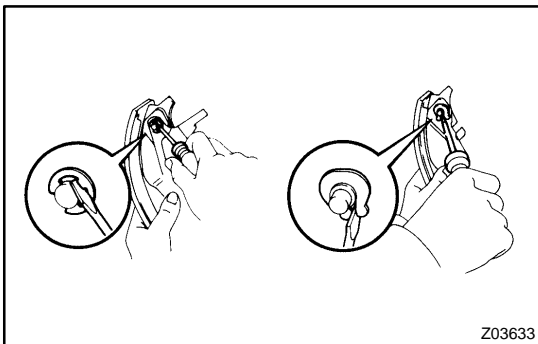
- (e) Remove the anchor spring from the front shoe.

**5. REMOVE FRONT SHOE**

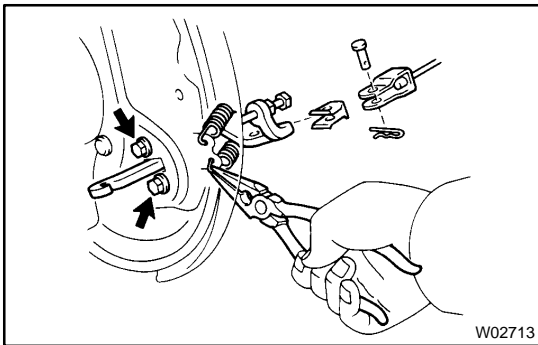
- (a) Using SST, remove the shoe hold-down spring, 2 cups and pin.
SST 09718-00010
- (b) Disconnect the parking brake cable No. 1 from the parking brake bellcrank.
- (c) Remove the front shoe with adjuster.
- (d) Disconnect the parking brake cable No. 1 from the front shoe.

6. REMOVE ADJUSTER FROM FRONT SHOE

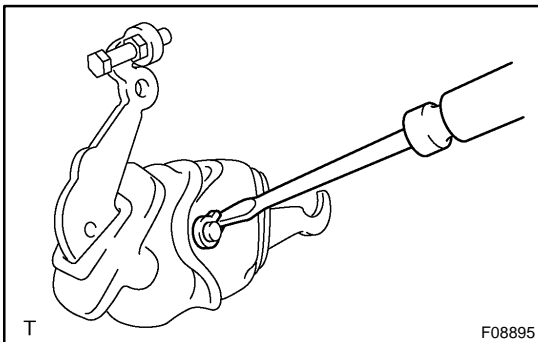
- (a) Remove the adjusting lever spring.
- (b) Remove the adjuster.

**7. REMOVE AUTOMATIC ADJUSTING LEVER AND PARKING BRAKE LEVER**

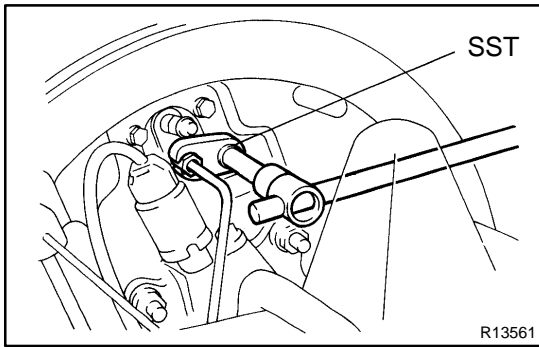
- (a) Remove the E-ring.
- (b) Remove the automatic adjusting lever.
- (c) Remove the C-washer.
- (d) Remove the parking brake lever.

**8. REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK**

- (a) Remove the clip and pin and disconnect the parking brake cable.
- (b) Remove the 2 tension springs.
- (c) Remove the 2 bolts and bellcrank.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



- (d) Turn over the bellcrank boot and remove the C-washer and pin.
- (e) Remove the bellcrank bracket and bellcrank boot from the parking brake bellcrank.

**9. REMOVE WHEEL CYLINDER**

- (a) Using SST, disconnect the brake line. Use a container to catch brake fluid.

SST 09023-00101

Torque: 15 N·m (155 kgf-cm, 11 ft-lbf)

- (b) Remove the 2 bolts and the wheel cylinder.

Torque: 10 N·m (100 kgf-cm, 7 ft-lbf)

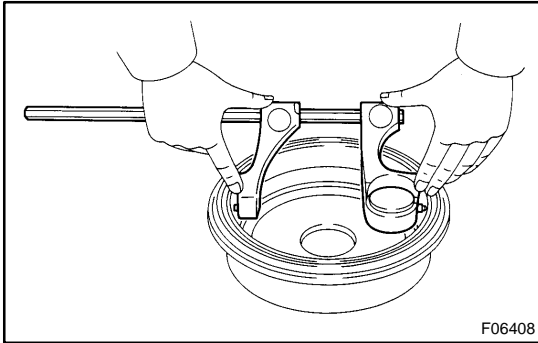
10. DISASSEMBLE WHEEL CYLINDER

- (a) Remove the 2 boots, 2 pistons and spring.
(b) Remove the 2 piston cups from each piston.

INSPECTION

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.



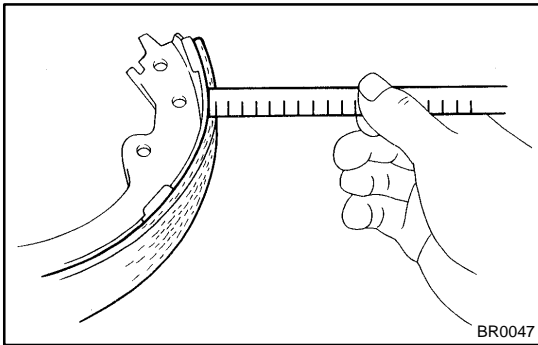
2. MEASURE BRAKE DRUM INSIDE DIAMETER

Using a brake drum gauge or equivalent, measure the inside diameter of the drum.

Standard inside diameter: 295.0 mm (11.614 in.)

Maximum inside diameter: 297.0 mm (11.693 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.



3. MEASURE BRAKE SHOE LINING THICKNESS

Using a ruler, measure the shoe lining thickness.

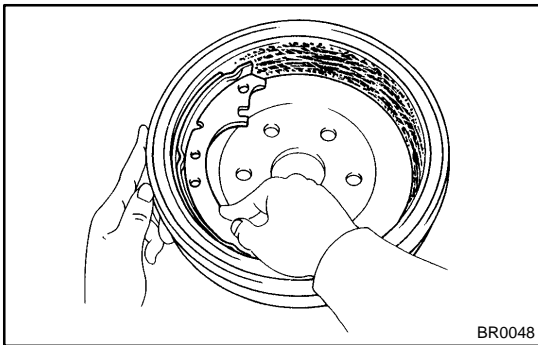
Standard thickness: 6.0 mm (0.236 in.)

Minimum thickness: 1.0 mm (0.039 in.)

If the shoe lining is less than the minimum, or shows signs of uneven wear, replace the brake shoes.

HINT:

If any of the brake shoes have to be replaced, replace all of the brake shoes in order to maintain even braking.



4. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

Apply chalk to the inside surface of the drum, then grind down the brake shoe lining to fit.

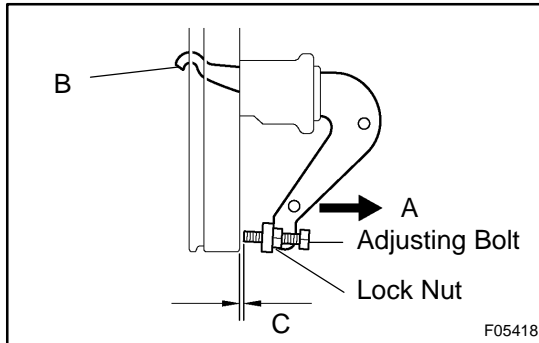
If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

INSTALLATION

Installation is in the reverse order of removal (See page [BR-48](#)).

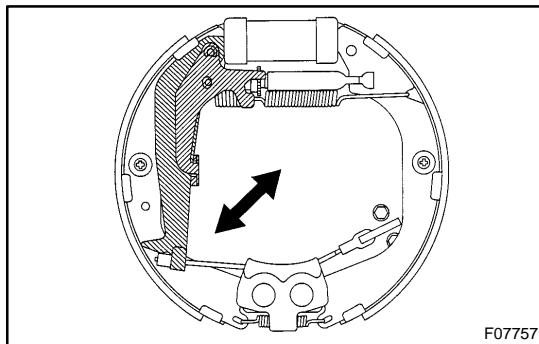
NOTICE:

Apply lithium soap base glycol grease and high temperature grease to the parts indicated by the arrows (See page [BR-47](#)).



1. ADJUST BELLCRANK

- Lightly pull the bellcrank in direction A until there is no slack at part B.
- In this condition, turn the adjusting bolt so that dimension C will be 0.4 to 0.8 mm (0.016 to 0.031 in.).
- Lock the adjusting bolt with the lock nut.
- Connect the parking brake cable to the parking brake bellcrank and install the pin and clip.
- Install the 2 tension springs.

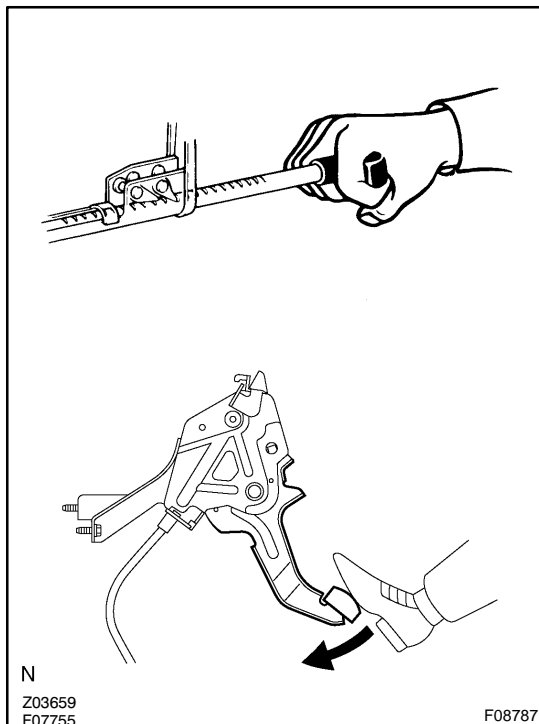


2. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

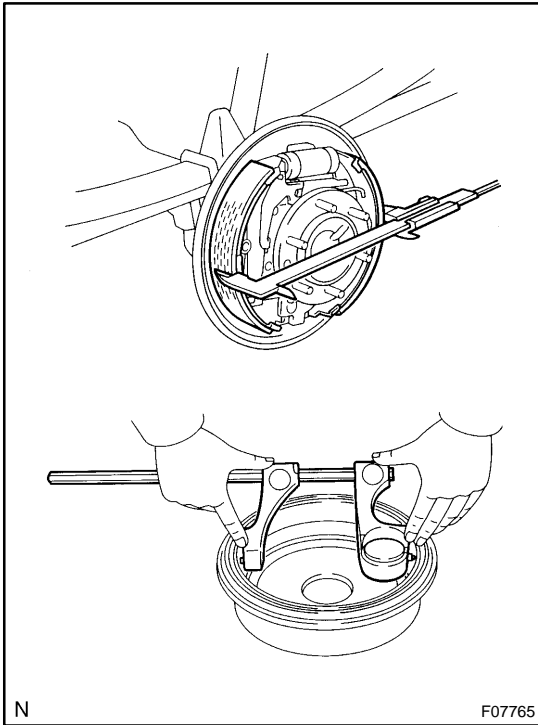
- Move the parking brake lever of the front shoe back and forth. Check that the adjuster turns.

If the adjuster does not turn, check for incorrect installation of the rear brakes.

- Adjust the adjuster length as short as possible.
- Install the brake drum.



- Pull the parking brake lever all the way up or depress the parking brake pedal all the way until a clicking sound can no longer be heard.



3. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

- (a) Remove the drum.
- (b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

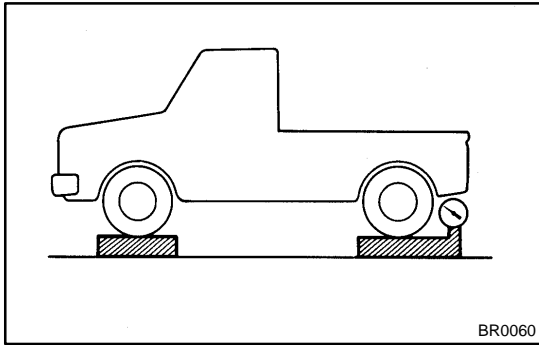
Shoe clearance: 0.5 mm (0.020 in.)

If it is incorrect, check the parking brake system.

- 4. FILL BRAKE RESERVOIR WITH BRAKE FLUID**
- 5. BLEED BRAKE SYSTEM (See page [BR-4](#))**
- 6. CHECK FOR LEAKS**

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F07765



LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV) ON-VEHICLE INSPECTION

BR09R-13

1. SET REAR AXLE LOAD

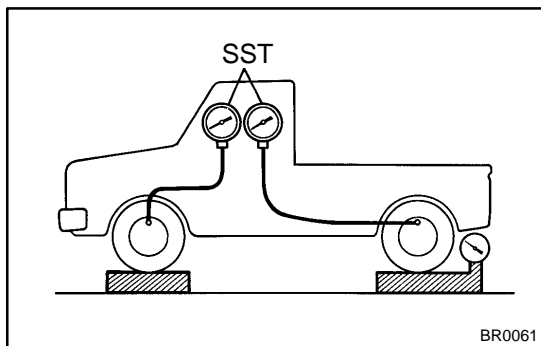
Rear axle load (includes vehicle weight):

Standard cab: 950 kg (2,094 lb)

Access cab:

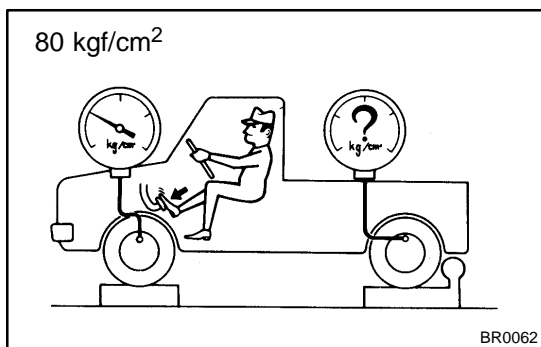
1GR-FT engine: 1,000 kg (2,205 lb)

2UZ-FE engine: 1,050 kg (2,315 lb)



2. INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709-29018



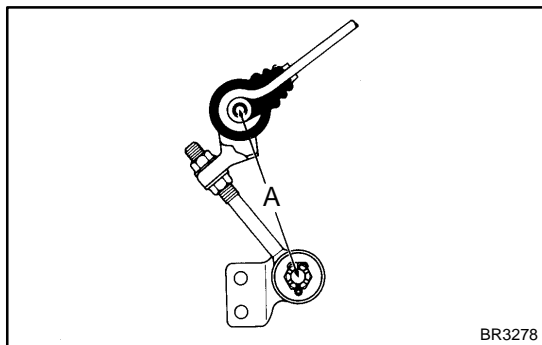
3. RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm², 1,138 psi) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure:

5,110 ± 490 kPa (52.1 ± 5 kgf/cm², 741 ± 71 psi)

HINT:

The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear brake pressure after holding the specified fluid pressure for 2 seconds. If the brake pressure is incorrect, adjust the fluid pressure.



4. IF NECESSARY, ADJUST FLUID PRESSURE

- (a) Loosen the lock nut.
- (b) Adjust the length of shackle No. 2.

Low pressure: Lengthen A

High pressure: Shorten A

Initial set: 120 mm (4.72 in.)

Adjustment range: 112 to 128 mm (4.41 to 5.04 in.)

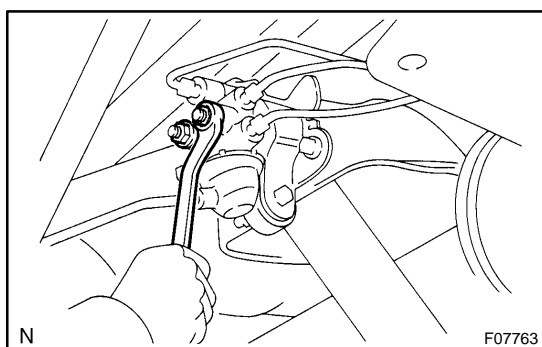
HINT:

One turn of the nut changes the fluid pressure as shown in the following specification.

7.4 kPa (0.76 kgf/cm² 11 psi)

- (c) Torque the lock nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



- (d) If the pressure cannot be adjusted by shackle No. 2, raise or lower the valve body.

Low pressure: Lower the body

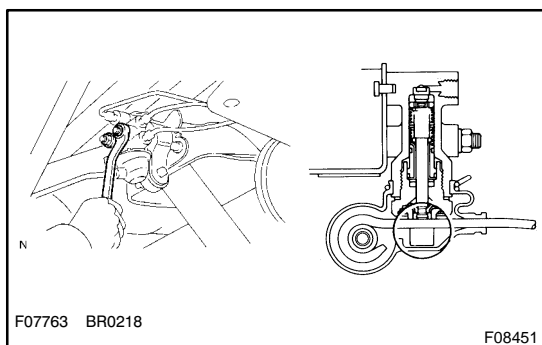
High pressure: Raise the body

- (e) Torque the nuts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (f) Adjust the length of shackle No. 2 again.

If it cannot be adjusted, inspect the valve body.



5. IF NECESSARY, CHECK VALVE BODY

- (a) Assemble the valve body in the uppermost position.

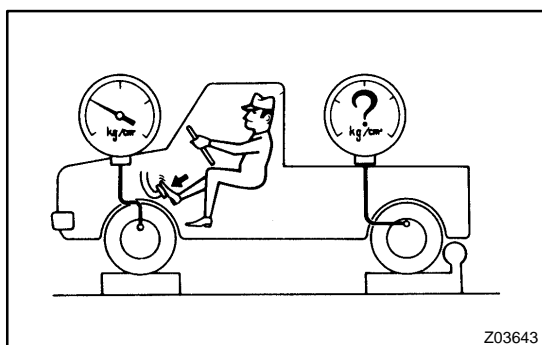
HINT:

When the brakes are applied, the piston will move down about 0.8 mm (0.03 in.). In this situation, do not move the piston or make it come into contact with the load sensing spring.

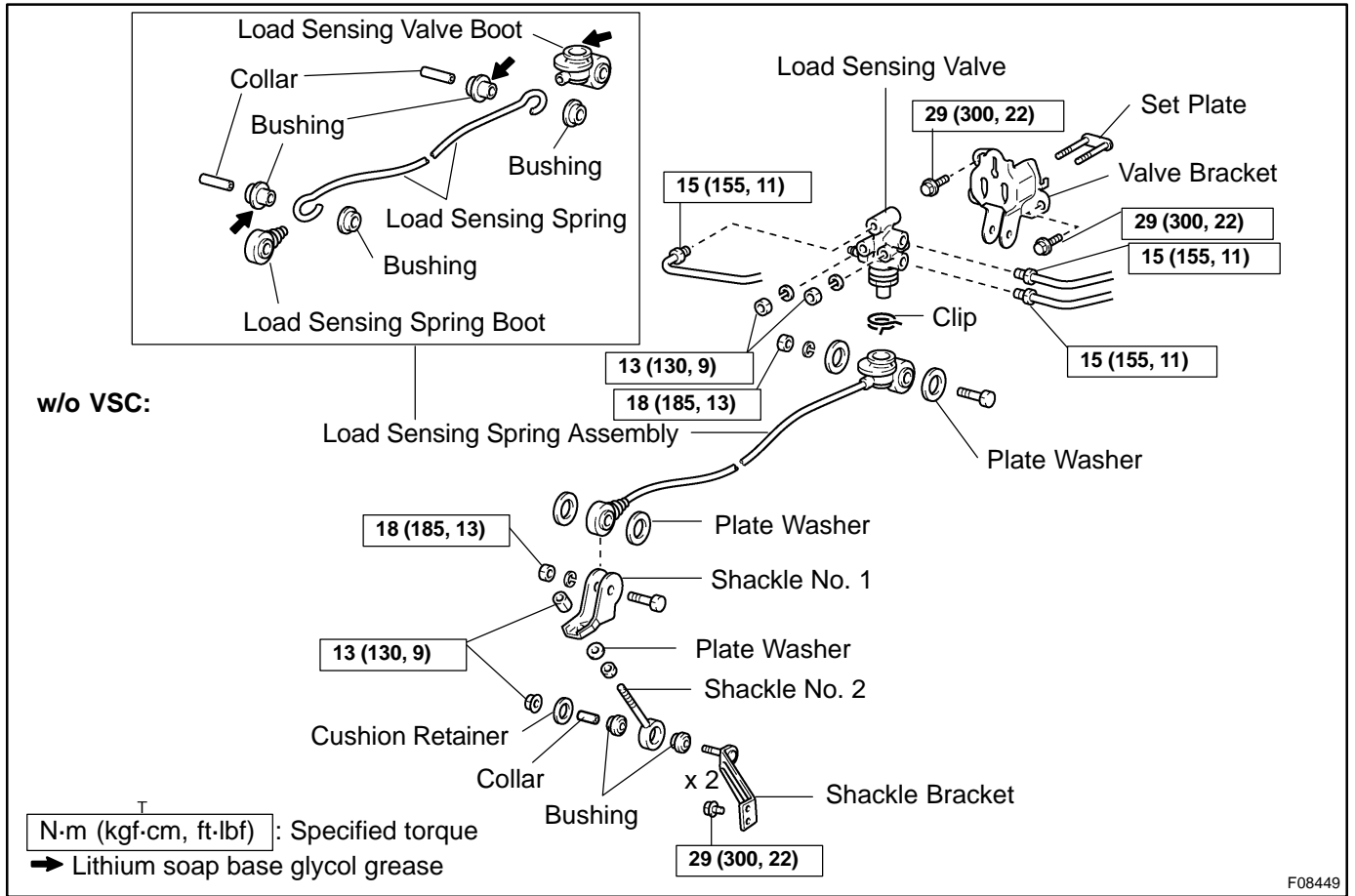
- (b) In this position, check the rear brake pressure.

Front brake pressure kPa (kgf/cm ² , psi)	Rear brake pressure kPa (kgf/cm ² , psi)
1,470 (15, 213)	1,470 (15, 213)
3,922 (40, 569)	2,210 ± 390 (22.5 ± 4, 320 ± 57)
13,720 (140, 1,990)	5,150 ± 590 (52.5 ± 6, 767 ± 85)

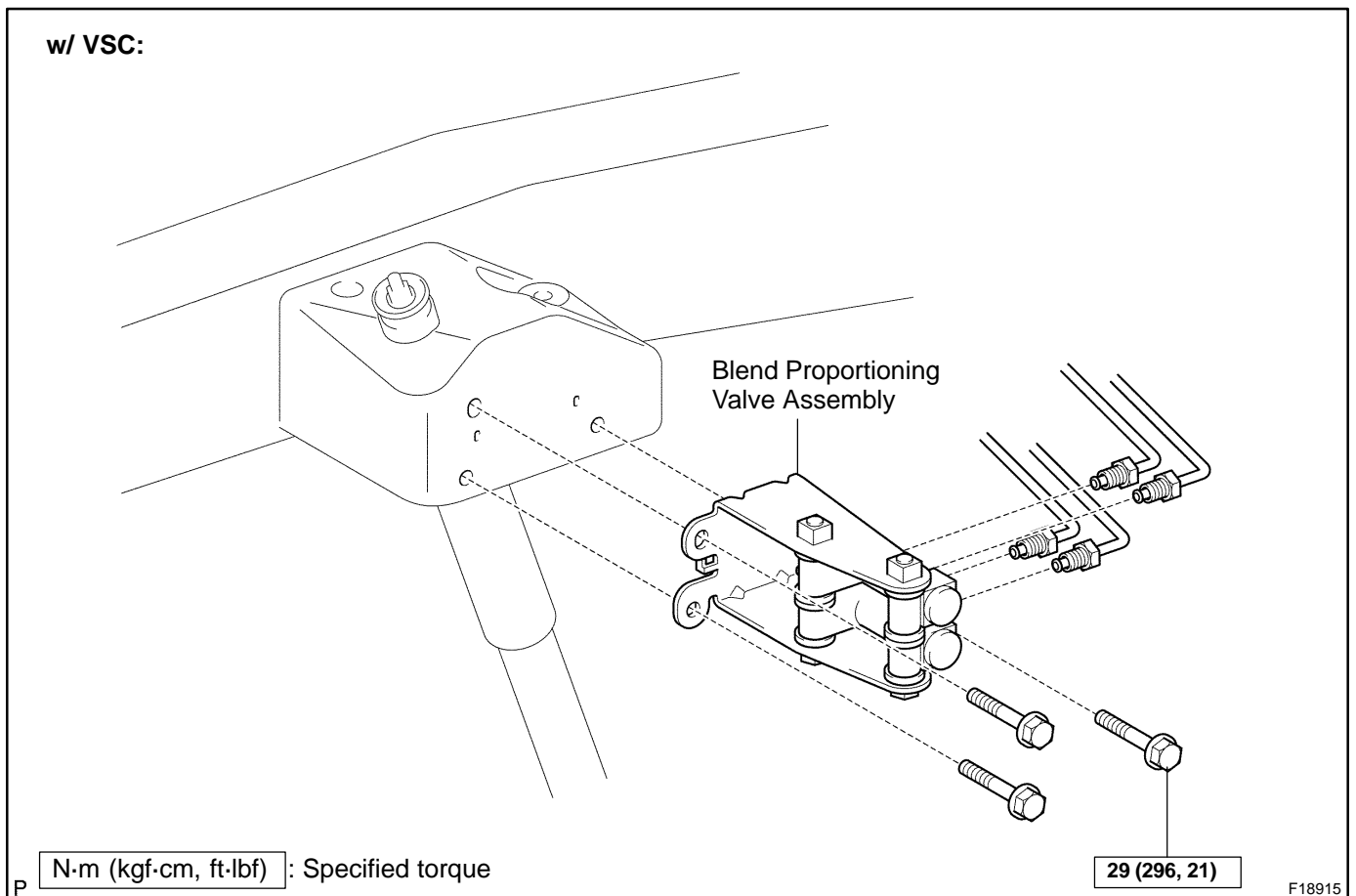
If the measured value is not within the standard, replace the valve body.



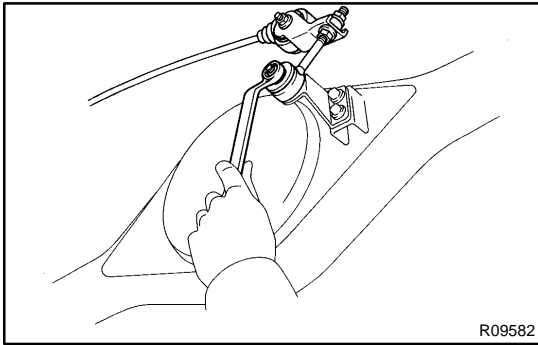
COMPONENTS



F08449



F18915

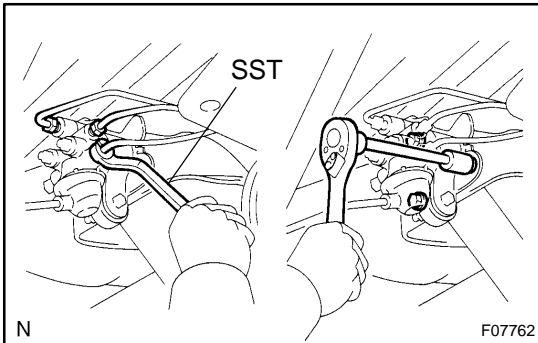


REMOVAL

1. w/ LOAD SENSING VALVE

DISCONNECT SHACKLE NO. 2 FROM BRACKET

- (a) Remove the nut and cushion retainer, and disconnect shackle No. 2.
- (b) Remove the 2 bushings and collar.
- (c) Remove the 2 bolts and shackle bracket.



2. REMOVE LSP & BV ASSEMBLY

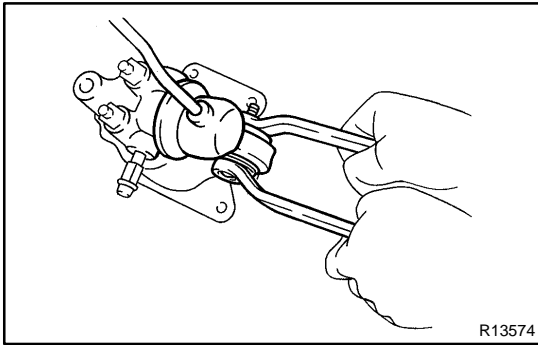
- (a) Using SST, disconnect the 3 brake lines from the valve body.
SST 09751-36011
- (b) Remove the 2 valve bracket mounting bolts and the LSP & BV assembly.

3. w/ BLEND PROPORTIONING VALVE

REMOVE BLEND PROPORTIONING VALVE ASSEMBLY

- (a) Disconnect the 4 brake lines.
- (b) Remove the 3 bolts and blend valve.

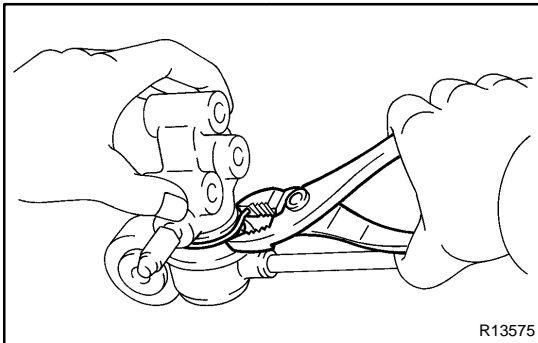
Torque: 29 N-m (296 kgf-cm, 21 ft-lbf)



DISASSEMBLY

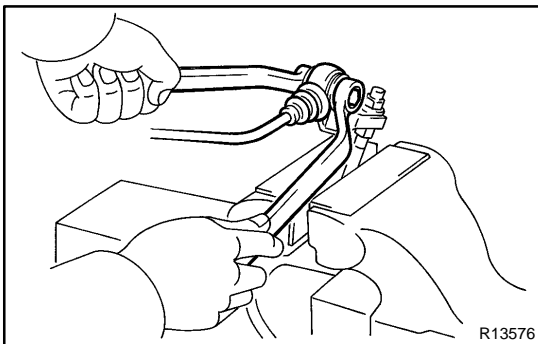
1. REMOVE VALVE BRACKET

- (a) Remove the nut, washer, bolt and 2 plate washers.
- (b) Remove the 2 nuts, 2 washers, set plate and valve bracket from the valve body.



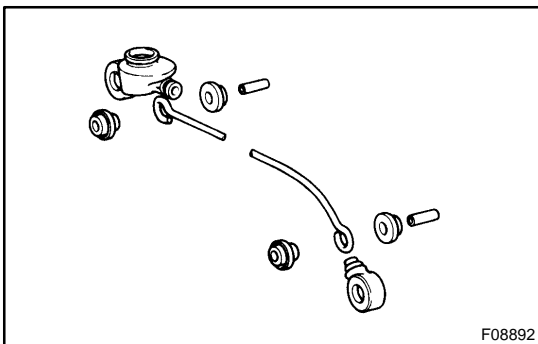
2. DISCONNECT SPRING FROM VALVE

Using pliers, remove the clip, and remove the spring from the valve.



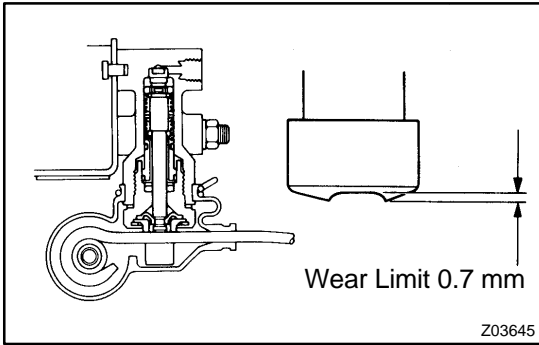
3. REMOVE SHACKLES NO. 1 AND NO. 2

- (a) Remove the nut washer and bolt, and remove the load sensing spring and 2 plate washers.
- (b) Loosen the 2 nuts and plate washer plate, and remove shackle No. 1 from shackle No. 2.



4. DISASSEMBLE LOAD SENSING SPRING

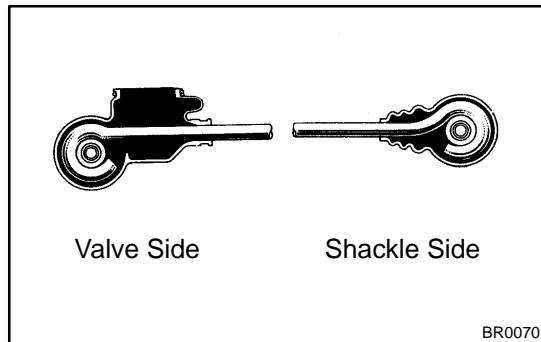
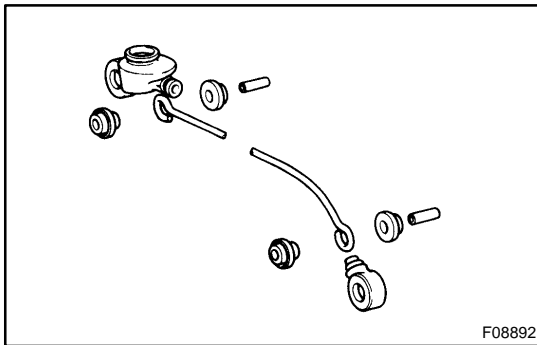
- (a) Remove the 4 bushings and 2 collars.
- (b) Remove the load sensing valve boot and load sensing spring boot.



INSPECTION

INSPECT VALVE PISTON PIN AND LOAD SENSING CONTACT SURFACE FOR WEAR

Wear limit: 0.7 mm (0.028 in.)



REASSEMBLY

1. ASSEMBLE LOAD SENSING SPRING

- (a) Install the load sensing valve boot and load sensing spring boot.
- (b) Install the 2 collars and 4 bushings.

HINT:

- Apply lithium soap-base glycol grease to all rubbing areas.

- Do not mistake the valve side for the shackle side of the load sensing spring.

2. INSTALL SHACKLE NO. 1 AND NO. 2

Install the lock nut, plate washer and shackle No. 1 to shackle No. 2, then install the upper nut.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

3. INSTALL LOAD SENSING SPRING TO SHACKLE NO. 1

- (a) Install the load sensing spring and 2 plate washers to shackle No. 1.
- (b) Install the bolt, washer and nut.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

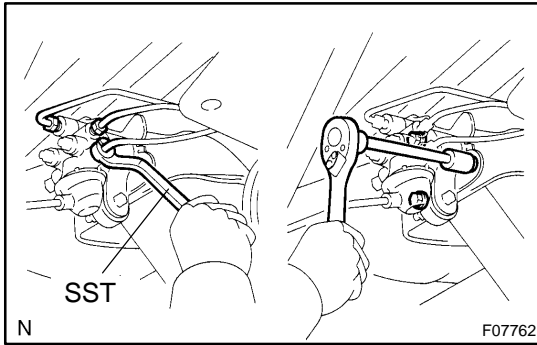
4. INSTALL LOAD SENSING SPRING TO VALVE BODY

Install the load sensing spring to the load sensing valve with the clip.

5. INSTALL VALVE BRACKET

- (a) Install the set plate to the load sensing valve through the valve bracket and temporarily tighten the 2 washers and 2 nuts.
- (b) Install the load sensing spring assembly, 2 plate washers, bolt, washer and nut.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



INSTALLATION

1. INSTALL LSP & BV ASSEMBLY TO FRAME

Install the LSP & BV assembly and 2 valve bracket mounting bolts.

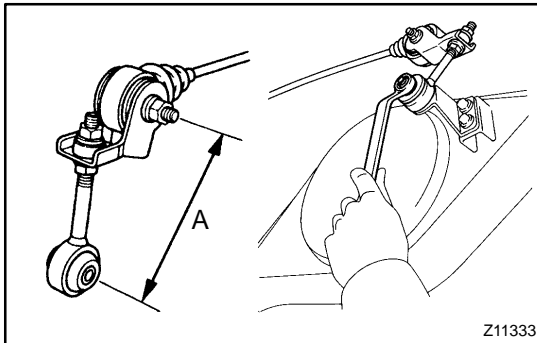
Torque: 29 N·m (300 kgf-cm, 22 ft-lbf)

2. CONNECT BRAKE LINE

Using SST, connect the 3 brake lines.

Torque: 15 N·m (155 kgf-cm, 11 ft-lbf)

SST 09751-36011



3. CONNECT SHACKLE NO. 2 BRACKET

(a) Set dimension A and torque the lock nut.

Initial set: 120 mm (4.72 in.)

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

(b) Install the shackle bracket and 2 bolts.

Torque: 29 N·m (300 kgf-cm, 22 ft-lbf)

(c) Connect the 2 bushings, collar and shackle No. 2 to the shackle bracket.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

(d) Install the cushion retainer and nut.

4. SET REAR AXLE LOAD (See page BR-54)

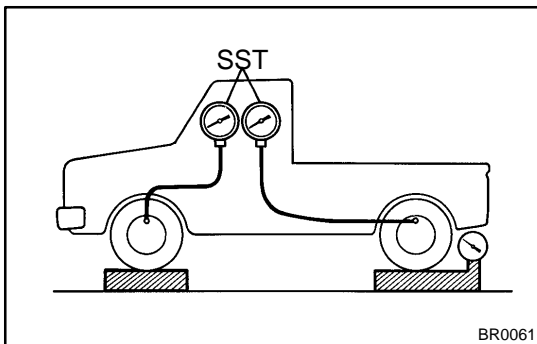
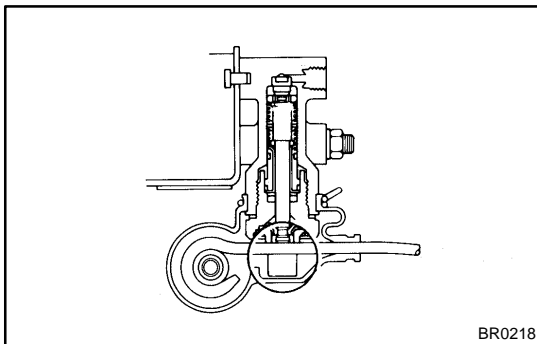
5. SET VALVE BODY

(a) When pulling down the load sensing spring, check that the valve piston moves down smoothly.

(b) Position the valve body so that the valve piston lightly contacts the load sensing spring.

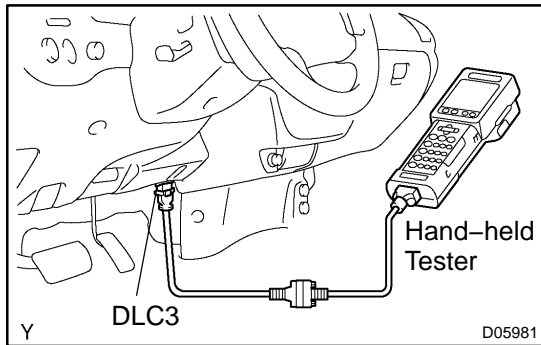
(c) Tighten the 2 valve body mounting nuts.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)



6. BLEED BRAKE LINE (See page BR-4)

7. CHECK AND ADJUST LSP & BV FLUID PRESSURE (See page BR-54)



ABS ACTUATOR ON-VEHICLE INSPECTION

BR10Z-02

1. CONNECT HAND-HELD TESTER

- (a) Connect the hand-held tester to the DLC3.
- (b) Start the engine and run it at idle.
- (c) Select ACTIVE TEST mode on the hand-held tester.

HINT:

Please refer to the hand-held tester operator's manual for further details.

2. INSPECT ABS ACTUATOR MOTOR OPERATION

- (a) Select the "ABS MOT RELAY" on the hand-held tester display, then operate the ABS actuator motor.
- (b) Check that the operation sound of the ABS motor can be heard when the ABS actuator relay is turned ON by the hand-held tester.

NOTICE:

Do not keep the motor relay ON for more than 5 seconds continuously. When operating it continuously, set the interval of more than 20 seconds.

If the operation sound cannot be heard, replace the ABS actuator because motor operation is in failure.

- (c) Turn the motor relay OFF.

3. INSPECT RIGHT FRONT WHEEL SOLENOID

- (a) Depress the brake pedal and hold it for about 15 seconds, and then check that the brake pedal does not go down further.

If the brake pedal goes down, replace the ABS actuator because the sealing condition of the reduction solenoid valve is abnormal.

- (b) Select the "ABS MOT RELAY" on the hand-held tester display, then operate the ABS actuator motor.
- (c) Check that the brake pedal does not pulsate when the motor relay is turned ON by the hand-held tester.

NOTICE:

Do not keep the motor relay ON for more than 5 seconds continuously. When operating it continuously, set the interval of more than 20 seconds.

If there is pulsation in the brake pedal, replace the ABS actuator because the sealing condition of the reduction solenoid valve is abnormal.

- (d) Turn the ABS actuator motor OFF.
- (e) Depress the brake pedal and hold it until step (j) is completed.
- (f) Select the "SFRH" on the hand-held tester display, then operate the solenoid.
- (g) Check that the brake pedal does not go down further when the SFRH solenoid is turned ON by the hand-held tester.

NOTICE:

Do not keep the solenoid ON for more than 2 seconds continuously. When operating it continuously, set the interval of more than 20 seconds.

If the brake pedal goes down, replace the ABS actuator because holding solenoid valve operation is abnormal.

HINT:

To protect the solenoid, the hand-held tester turns OFF automatically 2 seconds after the solenoid has been turned ON.

- (h) Select the "SFRR" on the hand-held tester display, then operate the solenoid.
- (i) Check that the brake pedal goes down further when the SFRR solenoid is turned ON by the hand-held tester.

If the brake pedal does not go down, replace the ABS actuator because reduction solenoid valve operation is abnormal.

- (j) Check that the brake pedal returns when the motor relay is turned ON by the hand-held tester.

NOTICE:

Do not keep the motor relay ON for more than 5 seconds continuously. When operating it continuously, set the interval of more than 20 seconds.

If the brake pedal does not return, replace the ABS actuator because motor operation is in failure.

- (k) Turn the motor relay OFF and release the brake pedal.

4. INSPECT OTHER WHEEL SOLENOIDS OPERATION

Check the solenoids of the other wheels by following the same inspection procedures as for the right front wheel solenoids.

HINT:

Left front wheel: "SFLH" and "SFLR"

Right rear wheel: "SRRH" and "SRRR"

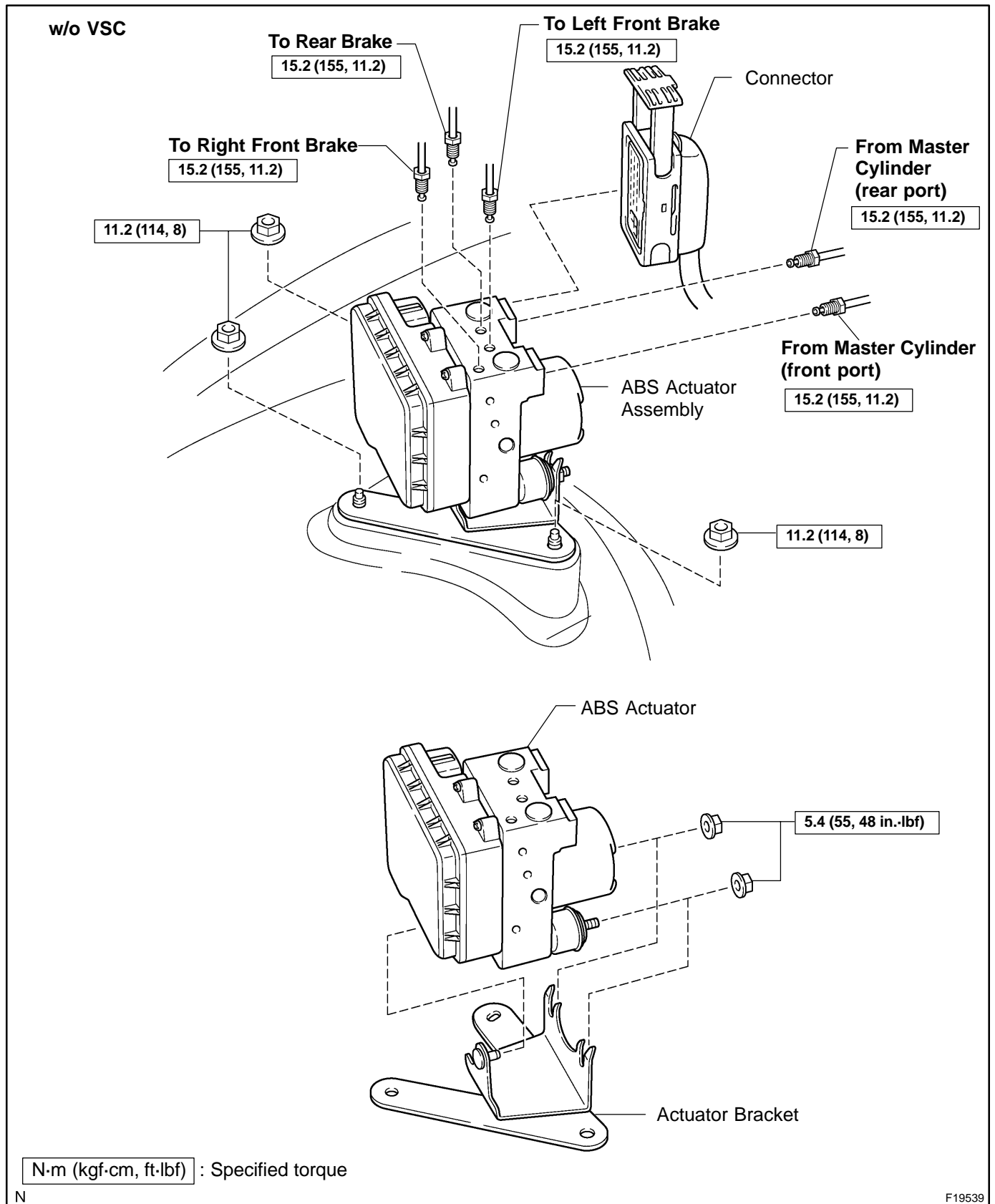
Right front wheel: "SFRR" and "SFRH"

NOTICE:

Never depress the brake pedal when the reduction solenoid alone is turned ON and the ABS ECU is reset.

5. CLEAR DTC (See page [DI-1397](#))

COMPONENTS

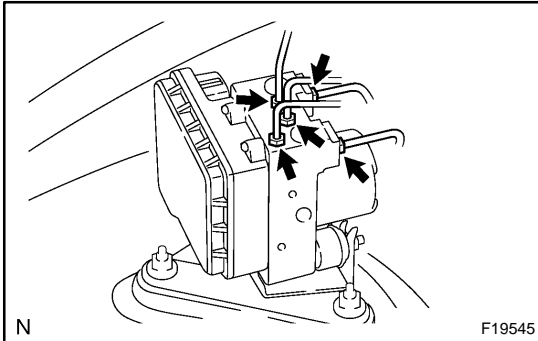


REMOVAL

1. REMOVE BRAKE LINE COVER

2. DISCONNECT CONNECTOR

Pull out the release bar, and disconnect the ABS ECU connector.



3. DISCONNECT BRAKE LINES

Using SST, disconnect the 5 brake lines from the ABS actuator.

SST 09023-00101

Torque: 15.2 N·m (155 kgf·cm, 11.2 ft·lbf)

HINT:

- When disconnecting the brake line, use tags or make a memo to identify the place to reconnect (see page [BR-64](#)).
- At the time of installation, connect each brake line to the correct position (see page [BR-64](#)).

4. REMOVE ABS ACTUATOR ASSEMBLY

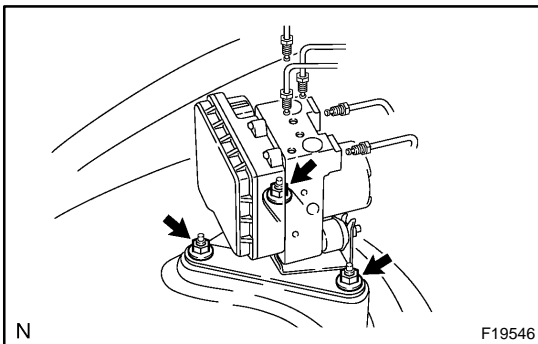
Remove the 3 nuts and ABS actuator assembly.

Torque: 11.2 N·m (114 kgf·cm, 8 ft·lbf)

5. REMOVE ABS ACTUATOR

(a) Remove the 2 nuts and ABS actuator from the actuator bracket.

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)



INSTALLATION

Installation is in the reverse order of removal (See page [BR-65](#)).

HINT:

- After installation, fill the brake reservoir with brake fluid and bleed the brake system (See page [BR-4](#)).
- Check for leaks.

HYDRAULIC BRAKE BOOSTER (w/ VSC)

BR1Y8-01

ON-VEHICLE INSPECTION

1. CHECK HYDRAULIC BRAKE BOOSTER FLUID PRESSURE CHANGE

- (a) Inspect the battery voltage.
Battery voltage: 10 to 14 V
- (b) Turn the ignition switch off, and depress the brake pedal more than 20 times.

HINT:

When pressure in the accumulator power supply system is released, reaction force becomes light and stroke becomes longer.

- (c) Install the brake pedal effort gauge (SST), and bleed air.
SST 09709-29018
- (d) When booster does not operate:
Depress the brake pedal and check fluid pressure.

At 245 N (25 kgf, 55 lbf):

Front brake pressure	Rear brake pressure
2,050 to 3650 kPa (20.9 to 37.2 kgf/cm ² , 297 to 529 psi)	0 kPa (0 kgf/cm ² , 0 psi)

At 343 N (35 kgf, 77 lbf):

Front brake pressure	Rear brake pressure
3,270 to 4870 kPa (33.3 to 50 kgf/cm ² , 474 to 711 psi)	0 kPa (0 kgf/cm ² , 0 psi)

- (e) When booster operates:
 - (1) Turn the ignition switch on and wait until the pump motor has stopped.

HINT:

Pump operating sound can be heard.

- (2) Turn the ignition switch off, and depress the brake pedal more than 20 times.

HINT:

When pressure in the accumulator is released, reaction force becomes light and stroke becomes longer.

- (3) Repeat (1) and (2) 5 times.
- (4) Make sure that the interval between pump start and pump stop is 8 to 14 seconds.

If it takes 14 seconds or more, repeat (3).

(5) Depress the brake pedal and check fluid pressure.

At 49 N (5 kgf, 11 lbf):

Front brake pressure	Rear brake pressure
933 to 2,533 kPa (9.5 to 25.8 kgf/cm ² , 135 to 367 psi)	993 to 1,888 kPa (10.1 to 19.3 kgf/cm ² , 144 to 274 psi)

At 98 N (10 kgf, 22 lbf):

Front brake pressure	Rear brake pressure
3,109 to 4,709 kPa (31.7 to 48.0 kgf/cm ² , 451 to 683 psi)	2,087 to 3,181 kPa (21.3 to 32.4 kgf/cm ² , 303 to 461 psi)

At 147 N (15 kgf, 33 lbf):

Front brake pressure	Rear brake pressure
5,284 to 6,884 kPa (53.9 to 70.2 kgf/cm ² , 766 to 998 psi)	3,713 to 5,311 kPa (37.9 to 54.2 kgf/cm ² , 539 to 770 psi)

At 196 N (20 kgf, 44 lbf):

Front brake pressure	Rear brake pressure
7,460 to 9,060 kPa (76.1 to 92.4 kgf/cm ² , 1,082 to 1,314 psi)	5,843 to 7,441 kPa (59.6 to 75.9 kgf/cm ² , 848 to 1,079 psi)

2. INSPECT HYDRAULIC BRAKE BOOSTER OPERATION

(a) Inspect the battery voltage.

Battery voltage: 10 to 14 V

(b) Turn the ignition switch off, and depress the brake pedal more than 20 times.

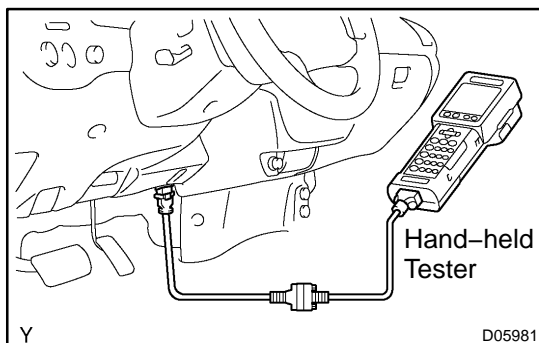
HINT:

When pressure in the accumulator power supply system is released, reaction force becomes light and stroke becomes longer.

(c) Check that the brake pedal becomes light to depress. If the pedal does not become light to depress, check and replace the brake line and hydraulic brake booster.

(d) Turn the ignition switch on, and check the pump motor operation noise.

If the pump motor does not operate, check and replace the wire harness and pump motor (See page [BR-90](#)).



(e) Connect the hand-held tester.

(1) Connect the hand-held tester to the DLC3.

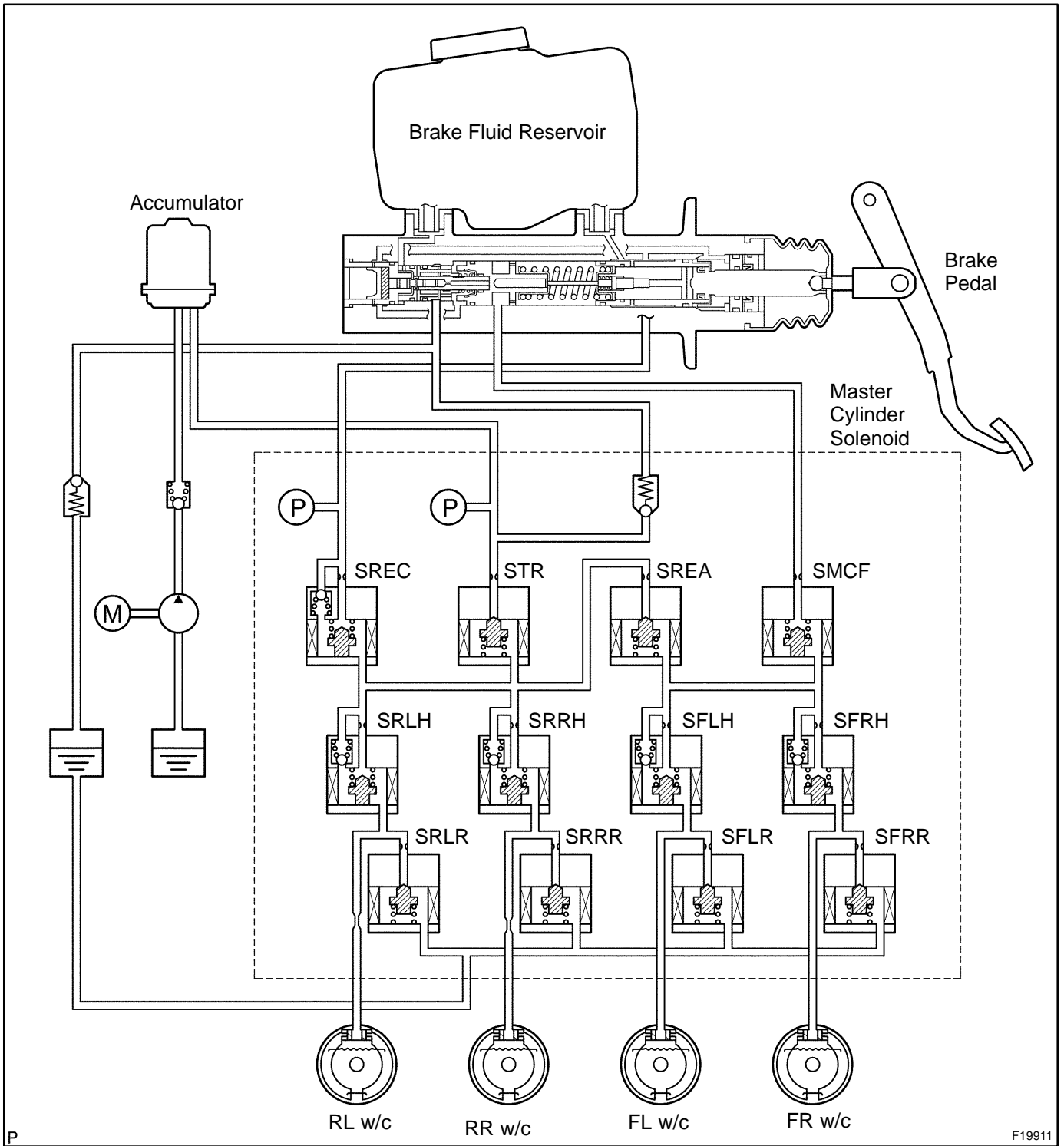
(2) Turn the ignition switch on.

(3) Select "ACTIVE TEST" mode on the hand-held tester.

HINT:

- Please refer to the hand-held tester operator's manual for further details.
- To protect solenoids, hand-held tester turns off automatically 2 sec. after every solenoid has been turned on.

3. INSPECTION PROCEDURE



P

F19911

Inspection order (step)	SOL selected by active test	SOL to be activated
(a)	SRCF (SA1)	SMCF
(c)	SRCF (SA1) and SRCR (SA2)	SREA and SMCF
(d)	SFRH	SFRH
(e)	SFLH	SFLH
(f)	SFRR & SFRH	SFRR and SFRH
(g)	SFLR & SFLH	SFLR and SFLH
(h)	SRMF (SMCF, SA3)	SREC
(i)	SRMF (SMCF, SA3) and SRMR (SMCR, STR)	STR and SREC
(j)	SRRH	SRRH
(k)	SRLH	SRLH
(l)	SRH & SRR	SRRR and SRRH
(m)	SRLR & SRLH	SRLR and SRLH

(a) Inspect front VSC solenoid (SMCF) operation.

HINT:

- ON: Activate SMCF and check that the brake pedal cannot be depressed (the pedal feels tight).
- OFF: Deactivate SMCF and check that the brake pedal can be depressed.
 - (1) Select "SRCF (SA1)" on the hand-held tester.
 - (2) Turn the "SRCF (SA1)" on by the hand-held tester, then depress the brake pedal with stable force and check that the pedal cannot be depressed.

If the pedal can be depressed, replace the hydraulic brake booster.

HINT:

To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

- (3) Release the brake pedal.
- (4) When the solenoid is off, depress the brake pedal again and check that the brake pedal can be depressed.

If the pedal can be depressed, replace the hydraulic brake booster.

(b) PREPARE THE VEHICLE

- (1) Jack up and support the vehicle.
- (2) Release the parking brake lever.
- (3) Shift the transfer shift lever to the "N" position and check the rear wheels by rotating them by hand.

(c) Inspect front VSC solenoid (SREA) operation.

HINT:

- ON: Activate SREA and SMCF, depress the brake pedal, and then check that the front wheels do not rotate.
- OFF: Deactivate SREA and SMCF. Reactivate SMCF, depress the brake pedal, and then check that the front wheels rotate.
 - (1) Select "SRCR (SA2)" and "SRCF (SMCF)" on the hand-held tester.
 - (2) Turn the "SRCR (SA2)" and "SRCF (SMCF)" on simultaneously by the hand-held tester, then depress the brake pedal with stable force.
 - (3) When the solenoids are on, check that the front wheels do not rotate by hand.

If the front wheels rotate, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheels fast, the fail-safe function is activated and judgement cannot be made properly. So rotate the wheels as slowly as possible.
 - (4) When the solenoids are off, turn the "SRCF (SMCF)" on again, then depress the brake pedal and check the front wheels by rotating them by hand.

If front wheels stop, replace the hydraulic brake booster.

- (5) When the "SRCF (SMCF)" is off, depress the brake pedal again and check that the brake pedal can be depressed.

If the pedal can be depressed, replace the hydraulic brake booster.

(d) Inspect front ABS solenoid (SFRH) operation.

HINT:

- ON: Activate SFRH, depress the brake pedal, and then check that the right front wheel rotates.
- OFF: Deactivate SFRH, depress the brake pedal, and then check that the front right wheel does not rotate.
 - (1) Select "SFRH" on the hand-held tester.
 - (2) Turn the "SFRH" on by the hand-held tester, then depress the brake pedal with stable force.
 - (3) When the solenoid is on, check the right front wheel by rotating it by hand.

If the right front wheel stops, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheel fast, the fail-safe function is activated and judgement cannot be made properly.

So rotate the wheel as slowly as possible.

 - (4) When the solenoid is off, depress the brake pedal again and check that the right front wheel does not rotate by hand.

If the right front wheel rotates, replace the hydraulic brake booster.

(e) Inspect front ABS solenoid (SFLH) operation.

HINT:

- ON: Activate SFLH, depress the brake pedal, and then check that the left front wheel rotates.
- OFF: Deactivate SFLH, depress the brake pedal, and then check that the front left wheel does not rotate.
 - (1) Select "SFLH" on the hand-held tester.
 - (2) Turn the "SFLH" on by the hand-held tester, then depress the brake pedal with stable force.
 - (3) When the solenoid is on, check the left front wheel by rotating it by hand.

If the left front wheel stops, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheel fast, the fail-safe function is activated and judgement cannot be made properly. So rotate the wheel as slowly as possible.
 - (4) When the solenoid is off, depress the brake pedal again and check that the left front wheel does not rotate by hand.

If the left front wheel rotates, replace the hydraulic brake booster.

(f) Inspect front ABS solenoid (SFRR) operation.

HINT:

- ON: Depress the brake pedal, activate SFRR and SFRH, and then check that the right front wheel rotates.
- OFF: Deactivate SFRR and SFRH, depress the brake pedal, and then check that the right front wheel does not rotate.
 - (1) Select "SFRR & SFRH" on the hand-held tester.
 - (2) Depress the brake pedal with stable force, then turn the "SFRR & SFRH" on simultaneously by the hand-held tester.
 - (3) When the solenoids are on, check the right front wheel by rotating it by hand.

If the right front wheel stops, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheel fast, the fail-safe function is activated and judgement cannot be made properly.
So rotate the wheel as slowly as possible.
 - (4) When the solenoids are off, depress the brake pedal again and check that the right front wheel does not rotate by hand.

If the right front wheel rotates, replace the hydraulic brake booster.

(g) Inspect front ABS solenoid (SFLR) operation.

HINT:

- ON: Depress the brake pedal, activate SFLR and SFLH, and then check that the left front wheel rotates.
- OFF: Deactivate SFLR and SFLH, depress the brake pedal, and then check that the left front wheel does not rotate.
 - (1) Select "SFLR & SFLH" on the hand-held tester.
 - (2) Depress the brake pedal with stable force, then turn the "SFLR & SFLH" on simultaneously by the hand-held tester.
 - (3) When the solenoids are on, check the left front wheel by rotating it by hand.

If the left front wheel stops, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheel fast, the fail-safe function is activated and judgement cannot be made properly. So rotate the wheel as slowly as possible.
 - (4) When the solenoids are off, depress the brake pedal again and check that the left front wheel does not rotate by hand.

If the left front wheel rotates, replace the hydraulic brake booster.

(h) Inspect rear VSC solenoid (SREC) operation.

HINT:

- ON: Depress the brake pedal and activate SREC. Release the brake pedal and check that the rear wheels do not rotate.
- OFF: Deactivate SREC and check that the rear wheels rotate.
 - (1) Select "SRMF (SMCF, SA3)" on the hand-held tester.
 - (2) Depress the brake pedal with stable force, then turn the "SRMF (SMCF, SA3)" on by the hand-held tester.
 - (3) Release the brake pedal when the solenoid is on, and check that the rear wheels do not rotate by hand.

If the rear wheels rotate, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheels fast, the fail-safe function is activated and judgement cannot be made properly. So rotate the wheels as slowly as possible.
 - (4) When the solenoid is off, check the rear wheels by rotating them by hand.

If the rear wheels stop, replace the hydraulic brake booster.

(i) Inspect rear VSC solenoid (STR) operation.

HINT:

- ON: Activate STR and SREC, then check that the rear wheels do not rotate.
- OFF: Deactivate STR and SREC. Reactivate SREC and check that the rear wheels rotate.
 - (1) Select "SRMR (SMCR, STR)" on the hand-held tester.
 - (2) Turn the "SRMR (SMCR, STR)" on simultaneously by the hand-held tester.
 - (3) When the solenoids are on, check that the rear wheels do not rotate by hand.

If the rear wheels rotate, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheels fast, the fail-safe function is activated and judgement cannot be made properly.
So rotate the wheels as slowly as possible.
 - (4) When the solenoids are off, check the rear wheels by rotating them by hand.

If the rear wheels stop, replace the hydraulic brake booster.

- (5) When the "SRMF (SREC)" is off, depress the brake pedal again and check that the rear wheels do not rotate by hand.

If the rear wheels rotate, replace the hydraulic brake booster.

(j) Inspect rear ABS solenoid (SRRH) operation.

HINT:

- ON: Activate SRRH, depress the brake pedal, and then check that the right rear wheel rotates.
- OFF: Deactivate SRRH, depress the brake pedal, and then check that the right rear wheel does not rotate.
 - (1) Select "SRRH" on the hand-held tester.
 - (2) Turn the "SRRH" on by the hand-held tester, then depress the brake pedal with stable force.
 - (3) When the solenoid is on, check the right rear wheel by rotating it by hand.

If the right rear wheel stops, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheel fast, the fail-safe function is activated and judgement cannot be made properly.
So rotate the wheel as slowly as possible.
 - (4) When the solenoid is off, depress the brake pedal again and check that the right rear wheel does not rotate by hand.

If the right rear wheel rotates, replace the hydraulic brake booster.

(k) Inspect rear ABS solenoid (SRLH) operation.

HINT:

- ON: Activate SRLH, depress the brake pedal, and then check that the left rear wheel rotates.
- OFF: Deactivate SRLH, depress the brake pedal, and then check that the left rear wheel does not rotate.
 - (1) Select "SRLH" on the hand-held tester.
 - (2) Turn the "SRLH" on by the hand-held tester, then depress the brake pedal with stable force.
 - (3) When the solenoids is on, check the left rear wheel by rotating it by hand.

If the left rear wheel stops, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheel fast, the fail-safe function is activated and judgement cannot be made properly. So rotate the wheel as slowly as possible.
 - (4) When the solenoid is off, depress the brake pedal again and check that the left rear wheel does not rotate by hand.

If the left rear wheel rotates, replace the hydraulic brake booster.

(I) Inspect rear ABS solenoid (SRRR) operation.

HINT:

- ON: Depress the brake pedal, activate SRRR and SRRH, and then check that the right rear wheel rotates.
- OFF: Deactivate SRRR and SRRH, depress the brake pedal, and then check that the right rear wheel does not rotate.
 - (1) Select "SRH & SRR" on the hand-held tester.
 - (2) Depress the brake pedal with stable force, then turn the "SRH & SRR" on simultaneously by the hand-held tester.
 - (3) When the solenoids are on, check the right rear wheel by rotating it by hand.

If the right rear wheel stops, replace the hydraulic brake booster.

NOTICE:

When operating it continuously, set the interval of more than 20 seconds.

HINT:

- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheel fast, the fail-safe function is activated and judgement cannot be made properly. So rotate the wheel as slowly as possible.
 - (4) When the solenoids are off, depress the brake pedal again and check that the right rear wheel does not rotate by hand.

If the right rear wheel rotates, replace the hydraulic brake booster.

(m) Inspect rear ABS solenoid (SRLR) operation.

HINT:

- ON: Depress the brake pedal, activate SRLR and SRLH, and then check that the left rear wheel rotates.
- OFF: Deactivate SRLR and SRLH, depress the brake pedal, and then check that the left rear wheel does not rotate.
 - (1) Select "SRLR & SRLH" on the hand-held tester.
 - (2) Depress the brake pedal with stable force, then turn the "SRLR & SRLH" on simultaneously by the hand-held tester.
 - (3) When the solenoids are on, check the left rear wheel by rotating it by hand.

If the left rear wheel stops, replace the hydraulic brake booster.

NOTICE:

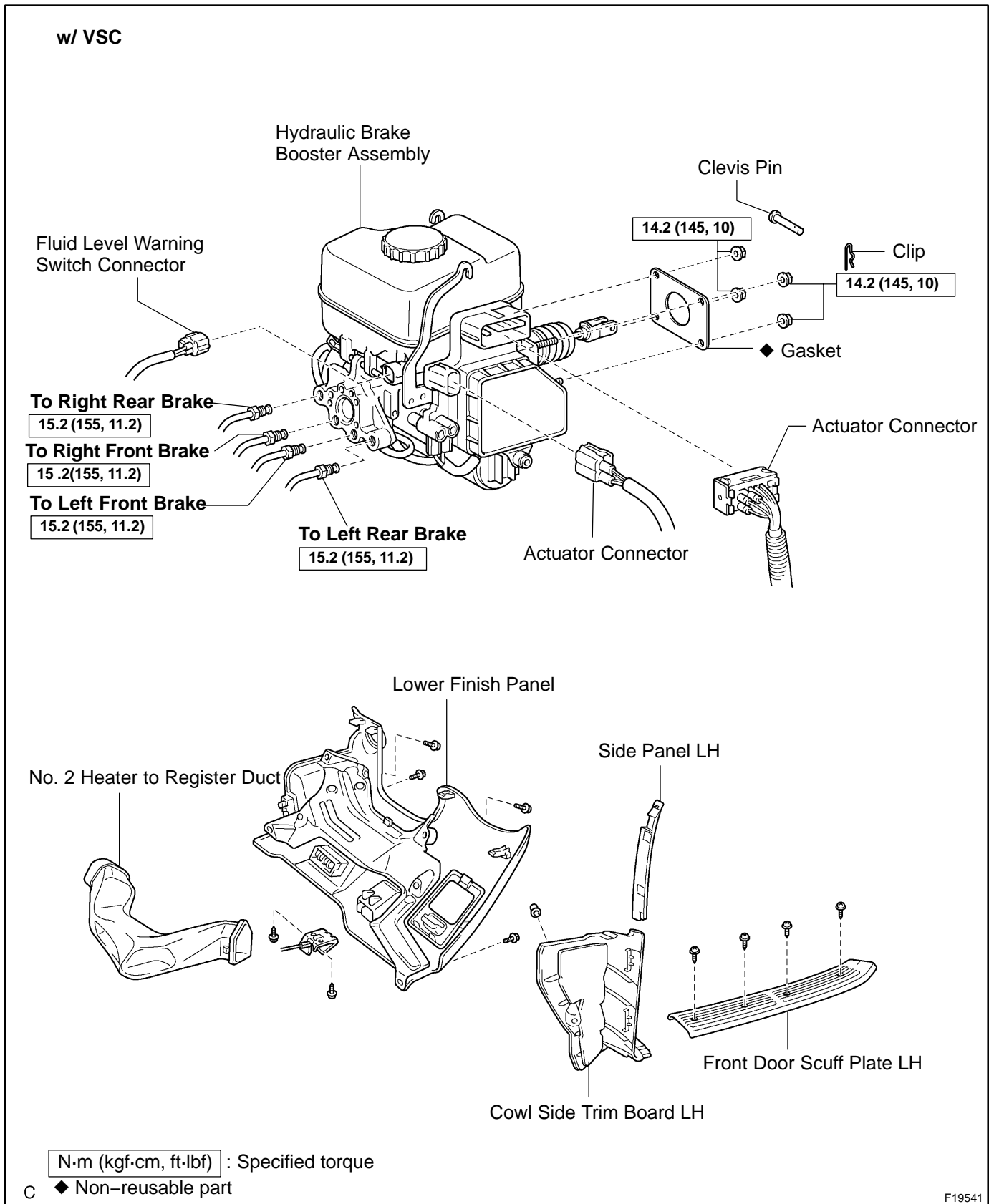
When operating it continuously, set the interval of more than 20 seconds.

HINT:

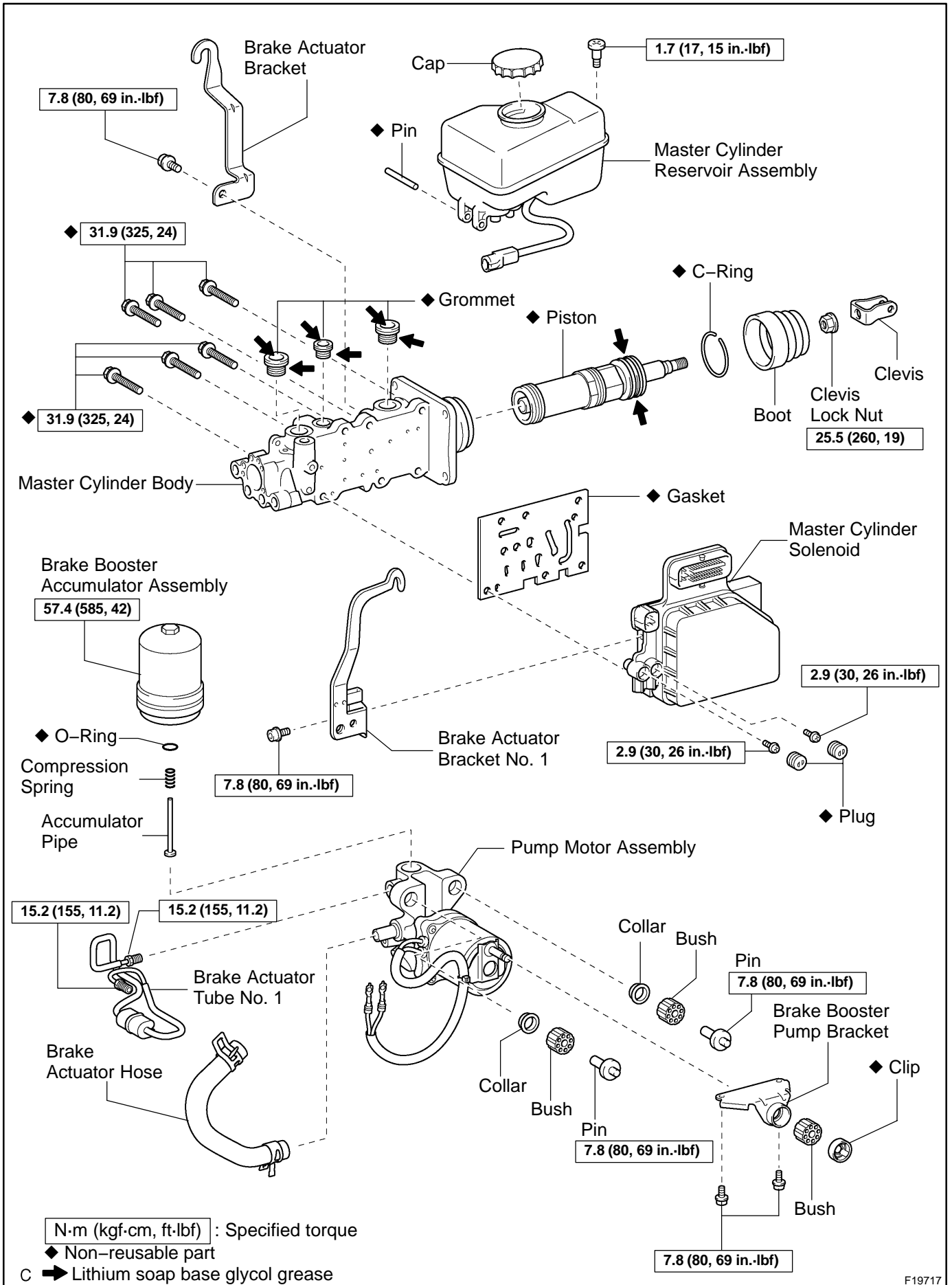
- To protect the solenoids, the hand-held tester turns off automatically 2 seconds after every solenoid has been turned on.
- When rotating the wheel fast, the fail-safe function is activated and judgement cannot be made properly.
So rotate the wheel as slowly as possible.
 - (4) When the solenoids are off, depress the brake pedal again and check that the left rear wheel does not rotate by hand.

If the left rear wheel rotates, replace the hydraulic brake booster.

COMPONENTS



BRAKE - HYDRAULIC BRAKE BOOSTER (w/ VSC)



REMOVAL

NOTICE:

Before starting work, make sure that the ignition switch is OFF and depress the brake pedal more than 20 times.

HINT:

When pressure in the accumulator power supply system is released, reaction force becomes light and stroke becomes longer.

NOTICE:

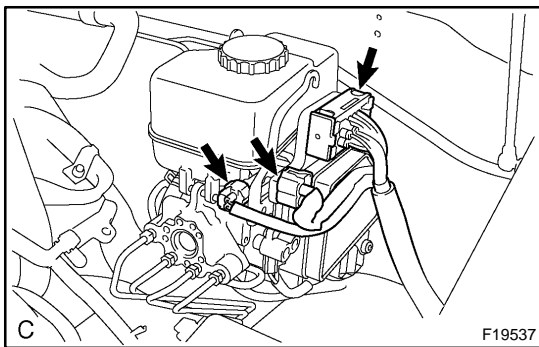
- As high pressure is applied to the brake actuator tube No. 1, do not deform it.
- Do not turn the ignition switch ON until work is over.

1. DRAW OUT FLUID WITH SYRINGE

NOTICE:

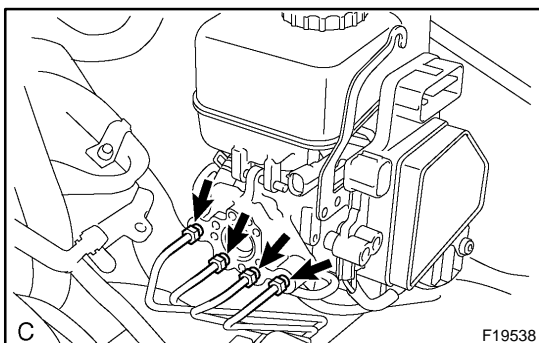
Do not let brake fluid remain on a painted surface. Wash it off immediately.

2. REMOVE FRONT DOOR SCUFF PLATE, COWL SIDE TRIM BOARD, SIDE PANEL, LOWER FINISH PANEL AND NO. 2 HEATER TO REGISTER DUCT
(See page [BO-111](#))



3. DISCONNECT 3 CONNECTORS

Disconnect the 2 actuator connectors and fluid level warning switch connector.



4. DISCONNECT BRAKE LINES

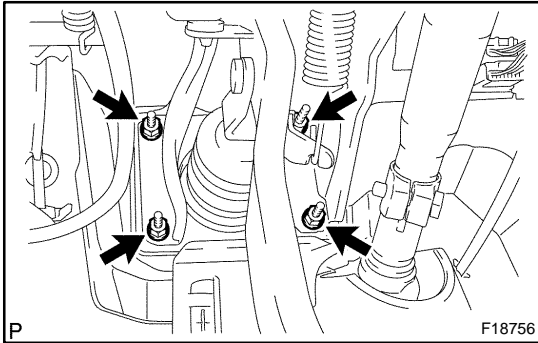
Using SST, disconnect the 4 brake lines.

SST 09023-00101

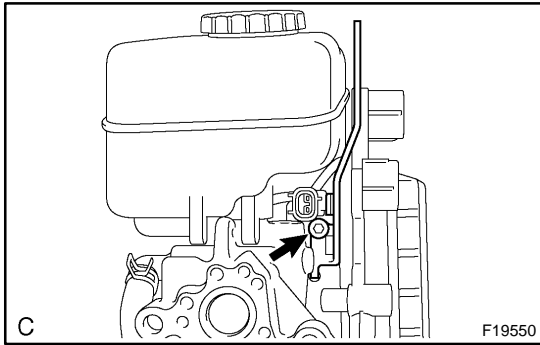
Torque: 15.2 N·m (155 kgf·cm, 11.2 ft·lbf)

HINT:

- When disconnecting the brake lines, use tags or make a memo to identify the place to reconnect (see page [BR-82](#)).
- At the time of installation, connect each brake line to the correct position (see page [BR-82](#)).

5. REMOVE CLIP AND CLEVIS PIN**6. REMOVE HYDRAULIC BRAKE BOOSTER ASSEMBLY**

- (a) Remove the 4 booster installation nuts.
Torque: 14.2 N·m (145 kgf·cm, 10 ft·lbf)
- (b) Remove the hydraulic brake booster assembly and gasket.



DISASSEMBLY

NOTICE:

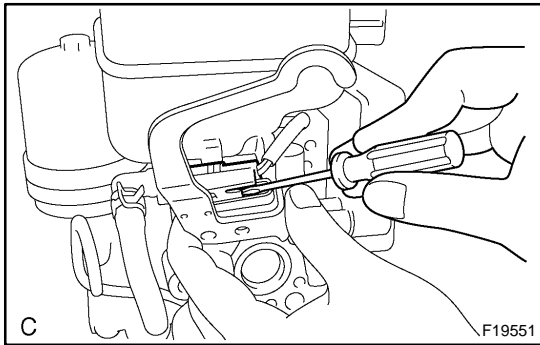
As high pressure is applied to the brake actuator tube No. 1, do not deform it.

1. REMOVE BRAKE ACTUATOR BRACKET NO. 1

- (a) Using a hexagon wrench (5 mm), remove the screw and brake actuator bracket No. 1 from the hydraulic brake booster assembly.

Torque: 7.8 N·m (80 kgf·cm, 69 in.-lbf)

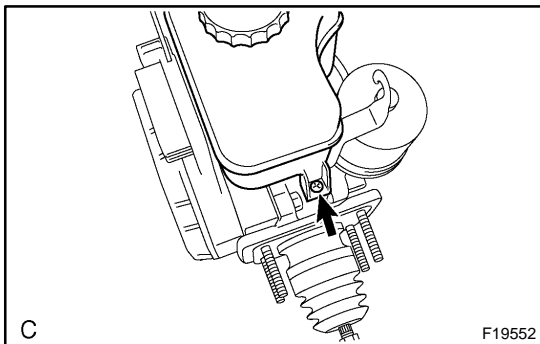
- (b) Using a screwdriver, remove the fluid level warning switch connector from the brake actuator bracket No. 1.



2. REMOVE MASTER CYLINDER RESERVOIR ASSEMBLY

- (a) Remove the screw from the master cylinder reservoir assembly.

Torque: 1.7 N·m (17 kgf·cm, 15 in.-lbf)

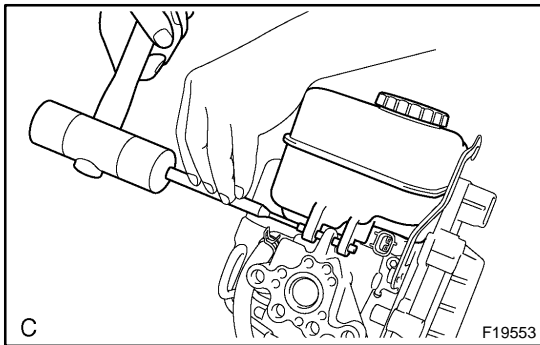


- (b) Using a pin punch and hammer, remove the pin from the master cylinder reservoir assembly.

- (c) Pull out the master cylinder reservoir assembly from the hydraulic brake booster assembly.

- (d) Remove the 3 grommets from the master cylinder reservoir assembly.

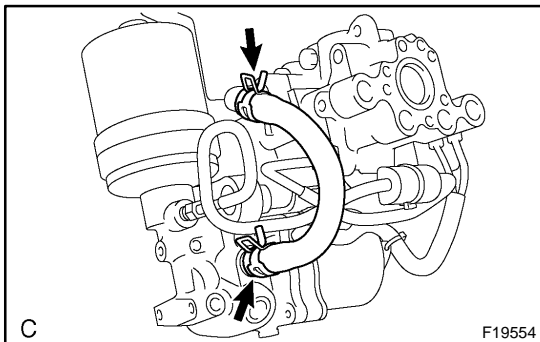
- (e) Remove the cap from the master cylinder reservoir assembly.

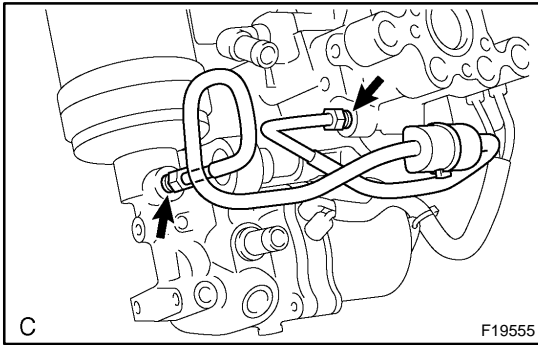


3. REMOVE BRAKE ACTUATOR HOSE

- (a) Using needle nose pliers, slide the 2 clips.

- (b) Remove the brake actuator hose from the hydraulic brake booster assembly.

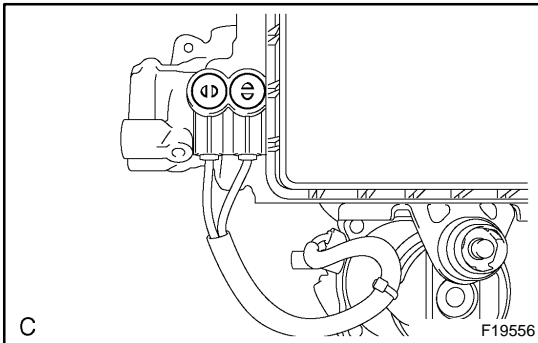




4. REMOVE BRAKE ACTUATOR TUBE NO. 1

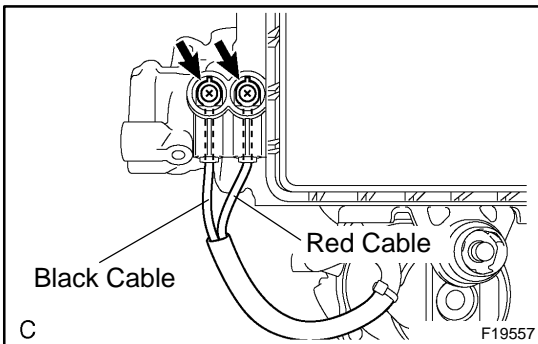
- (a) Using SST, remove the brake actuator tube No. 1 from the hydraulic brake booster assembly.

Torque: 15.2 N·m (155 kgf·cm, 11.2 ft·lbf)



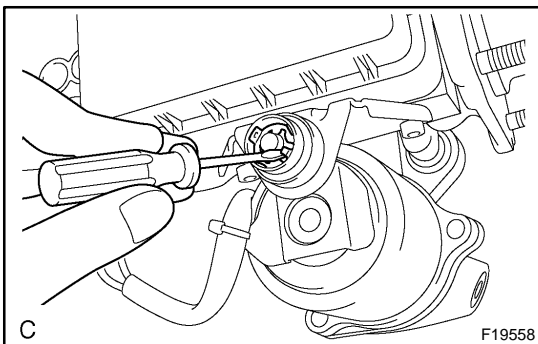
5. REMOVE BRAKE BOOSTER W/ ACCUMULATOR

- (a) Using a screwdriver, remove the 2 plugs from the hydraulic brake booster assembly.

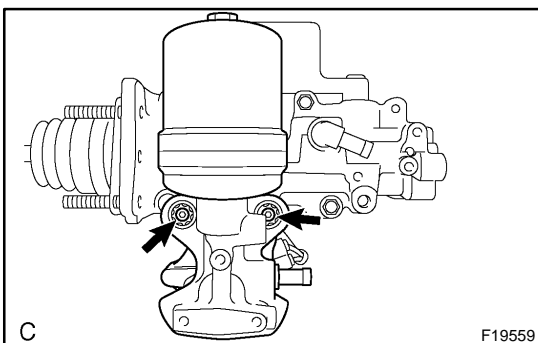


- (b) Remove the 2 screws and pull the wire harness from the hydraulic brake booster assembly.

Torque: 2.9 N·m (30 kgf·cm, 26 in.-lbf)



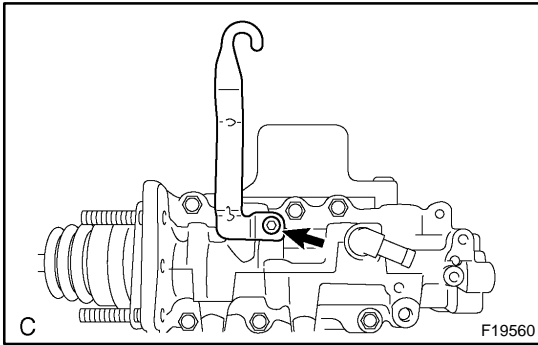
- (c) Using a screwdriver, remove the clip from the hydraulic brake booster assembly.



- (d) Using a hexagon wrench (4 mm), loosen the 2 pins and brake booster w/ accumulator pump assembly from the hydraulic brake booster assembly.

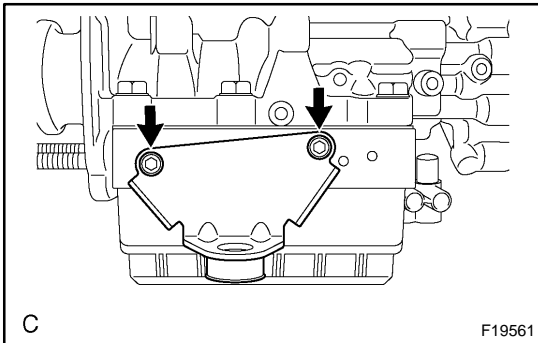
Torque: 7.8 N·m (80 kgf·cm, 69 in.-lbf)

- (e) Remove the 2 pins, 2 bushes and 2 collars from the brake booster w/ accumulator pump assembly.

**6. REMOVE BRAKE ACTUATOR BRACKET**

Using a hexagon wrench (5 mm), remove the screw and brake actuator bracket from the hydraulic brake booster assembly.

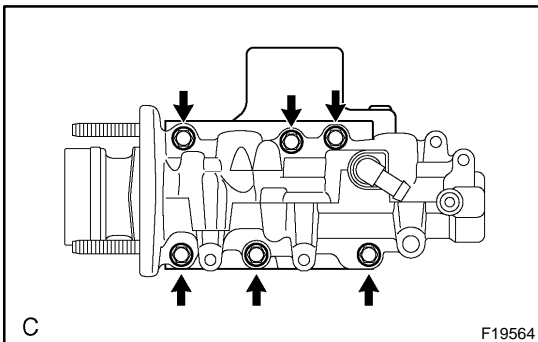
Torque: 7.8 N-m (80 kgf-cm, 69 in.-lbf)

**7. REMOVE BRAKE BOOSTER PUMP BRACKET**

(a) Using a hexagon wrench (5 mm), remove the 2 screws and brake booster pump bracket from the hydraulic brake booster assembly.

Torque: 7.8 N-m (80 kgf-cm, 69 in.-lbf)

(b) Remove the bush from the brake booster pump bracket.

**8. REMOVE MASTER CYLINDER SOLENOID**

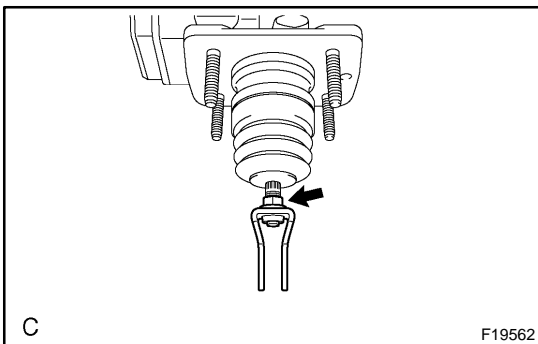
(a) Remove the 6 bolts.

Torque: 31.9 N-m (325 kgf-cm, 24 ft-lbf)

(b) Remove the master cylinder solenoid and the gasket from the master cylinder body.

NOTICE:

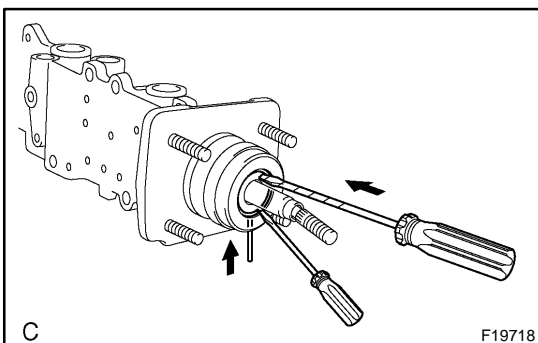
Do not let water, dust, and/or other objects attach to the surface and/or attaching surface of the master cylinder solenoid, master cylinder and body gasket.

**9. REMOVE CLEVIS**

(a) Loosen the clevis lock nut.

Torque: 25.5 N-m (260 kgf-cm, 19 ft-lbf)

(b) Remove the clevis and clevis lock nut from the hydraulic brake booster assembly.

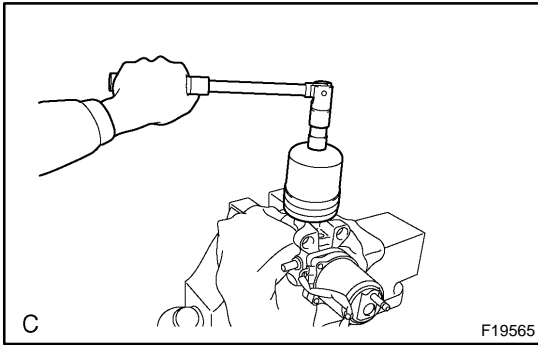
10. REMOVE BOOT**11. REMOVE PISTON**

(a) Pressing the piston in with a screwdriver, use a pin or equivalent to push the C-ring from the hole in the master cylinder body then remove it with another screwdriver.

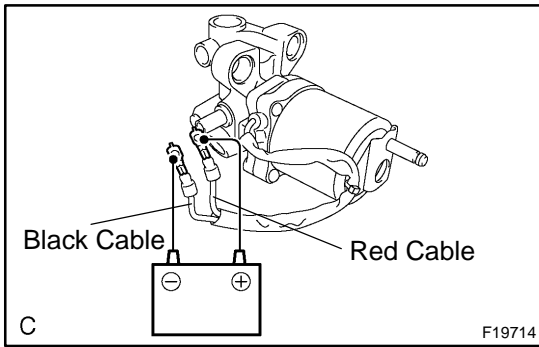
(b) Remove the piston, pulling it straight out, not at an angle.

NOTICE:

- **If pulled out at an angle, there is a possibility that the cylinder bore could be damaged.**
- **During reassembly, be careful not to damage the rubber lips of the piston.**

**12. REMOVE BRAKE BOOSTER ACCUMULATOR ASSEMBLY**

- (a) Place the brake booster w/ accumulator pump assembly in a vise between a cloth.
- (b) Using a socket wrench (17 mm), remove the brake booster accumulator assembly from the pump motor assembly.
Torque: 57.4 N·m (585 kgf·cm, 42 ft·lbf)
- (c) Remove the brake accumulator pipe, compression spring and O-ring from the brake booster accumulator assembly and the pump motor assembly.

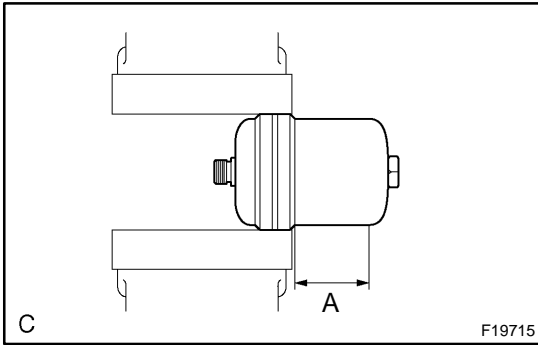


INSPECTION

INSPECT HYDRAULIC BRAKE BOOSTER PUMP MOTOR ASSEMBLY OPERATION

- (a) Connect the positive (+) lead from the battery to the red cable of the pump motor, and the negative (-) lead to the black cable.
- (b) Check pump motor operation.

OK: Normal operating sound is heard.



DISPOSAL

DISPOSAL METHOD OF BRAKE BOOSTER ACCUMULATOR ASSEMBLY

- (a) Place the brake booster accumulator assembly in a vise and cover it with cloth.
- (b) Carefully cut a hole in area A of the brake accumulator assembly shown in the illustration on the left using a saw and discharge the gas remaining inside.

CAUTION:

- **Cover with a piece of cloth when working because gas and liquid may blow out.**
 - **Carefully, not abruptly, cut the assembly.**
 - **Wear protective glasses.**
- (c) When the outer body of the brake booster accumulator assembly is cut, gas and liquid discharge.

HINT:

- The gas is colorless, odorless and harmless nitrogen gas.
- The liquid is brake fluid.

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BR-86](#)).

NOTICE:

Apply lithium soap base glycol grease to the rubber parts indicated by the arrows (See page [BR-82](#)).

INSTALLATION

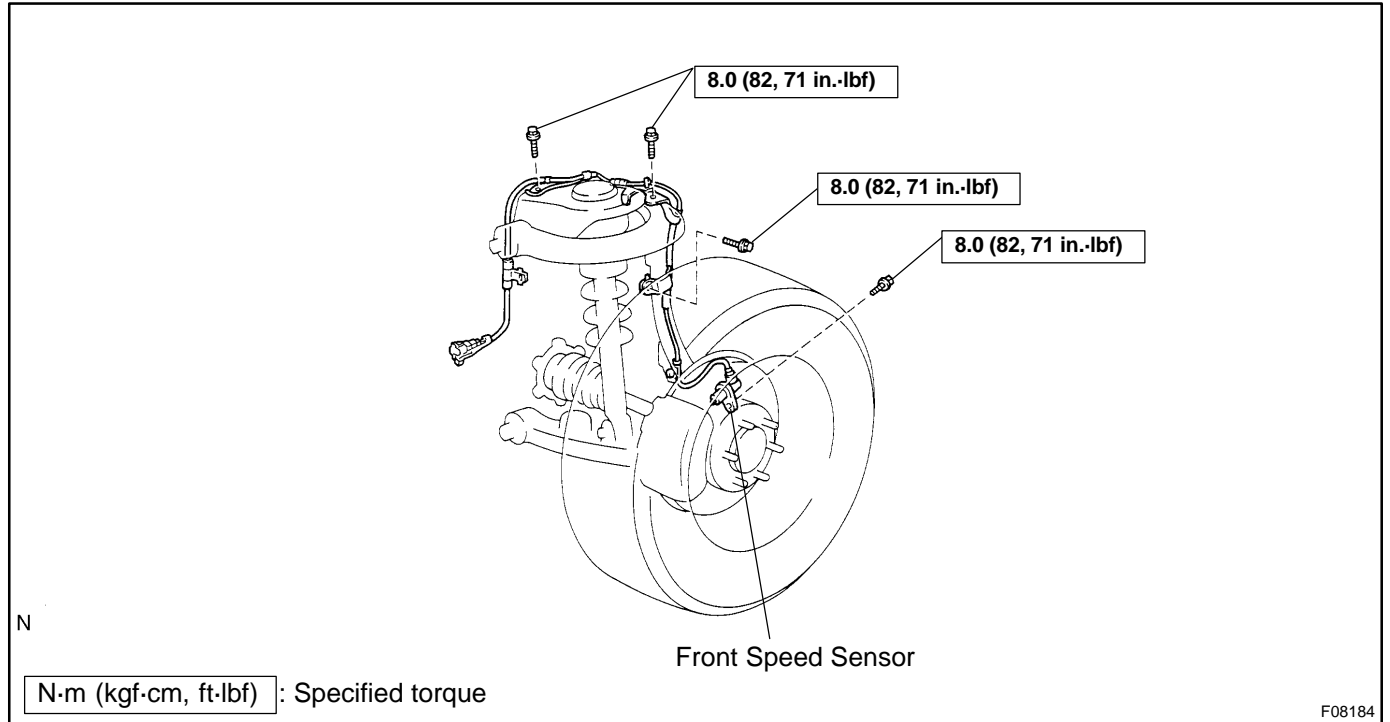
Installation is in the reverse order of removal (See page [BR-84](#)).

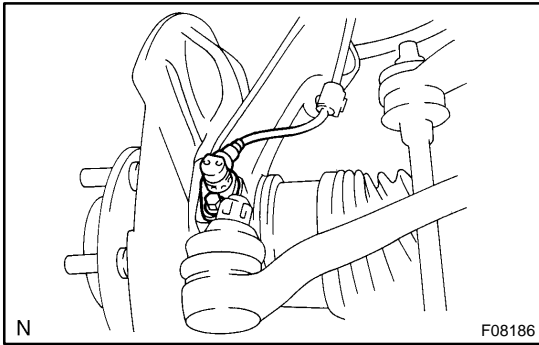
HINT:

- After installation, fill the brake reservoir with brake fluid and bleed the brake system (See page [BR-4](#)).
- Check for leaks.

FRONT SPEED SENSOR COMPONENTS

BR0A2-06





REMOVAL

1. **REMOVE FRONT WHEEL**
Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)
2. **DISCONNECT SPEED SENSOR CONNECTOR**
3. **REMOVE SPEED SENSOR**
 - (a) Remove the 2 clips and 3 clamp bolts holding the sensor harness from the frame, upper arm and steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)
 - (b) Remove the bolt and speed sensor from the steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

INSTALLATION

Installation is in the reverse order of removal (See page [BR-95](#)).

HINT:

After installation, check the speed sensor signal (See page [DI-1387](#) or [DI-1478](#)).

STEERING ANGLE SENSOR REMOVAL

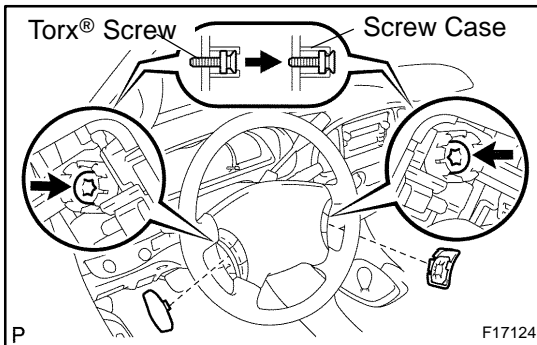
BR1YG-01

1. REMOVE STEERING WHEEL PAD

NOTICE:

If the airbag connector is disconnected with the ignition switch in ACC or ON, DTCs will be recorded.

(a) Disconnect battery negative terminal.



(b) Place the front wheels facing straight ahead.

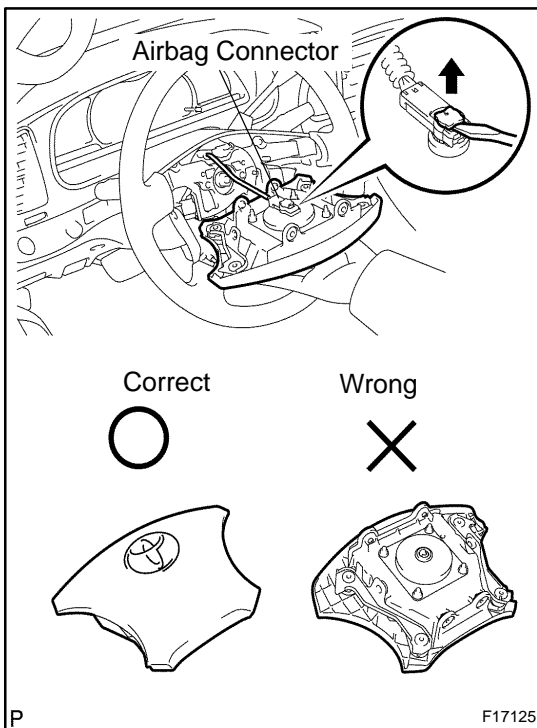
(c) Remove the steering wheel lower No. 3 cover.

(d) Remove the steering wheel lower No. 2 cover.

(e) Using a torx® socket wrench (T30), loosen the 2 torx® screws.

HINT:

Loosen the screw until the groove along the screw circumference catches on the screw case.



(f) Pull out the wheel pad from the steering wheel.

(g) Using a screwdriver, disconnect the airbag connector.

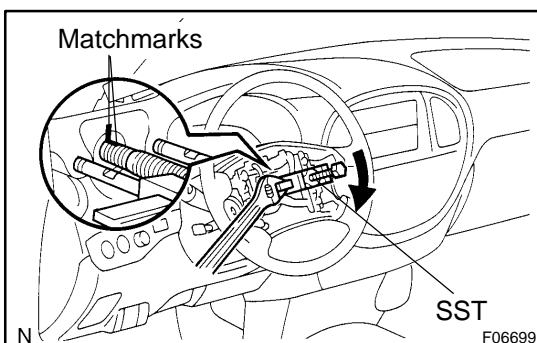
CAUTION:

- When storing the steering wheel pad, keep the upper surface of the pad facing upward.
- Never disassemble the steering wheel pad.

NOTICE:

When removing the steering wheel pad, take care not to pull the airbag wire harness.

(h) Disconnect the horn connector and remove the steering wheel pad.



2. REMOVE STEERING WHEEL

(a) Remove the steering wheel set nut.

(b) Place matchmarks on the steering wheel and main shaft assembly.

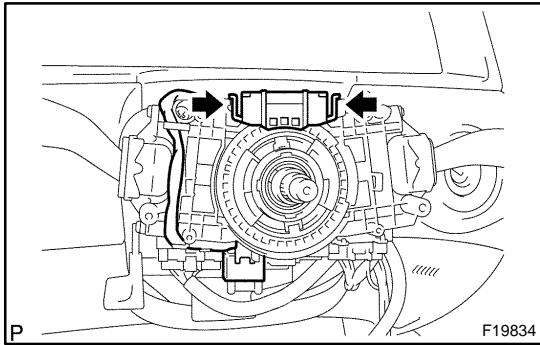
(c) Using SST, remove the wheel.

SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)

3. REMOVE SPIRAL CABLE

(a) Disconnect the 2 connectors.

(b) Remove the 4 screws and remove the spiral cable.



4. REMOVE STEERING ANGLE SENSOR

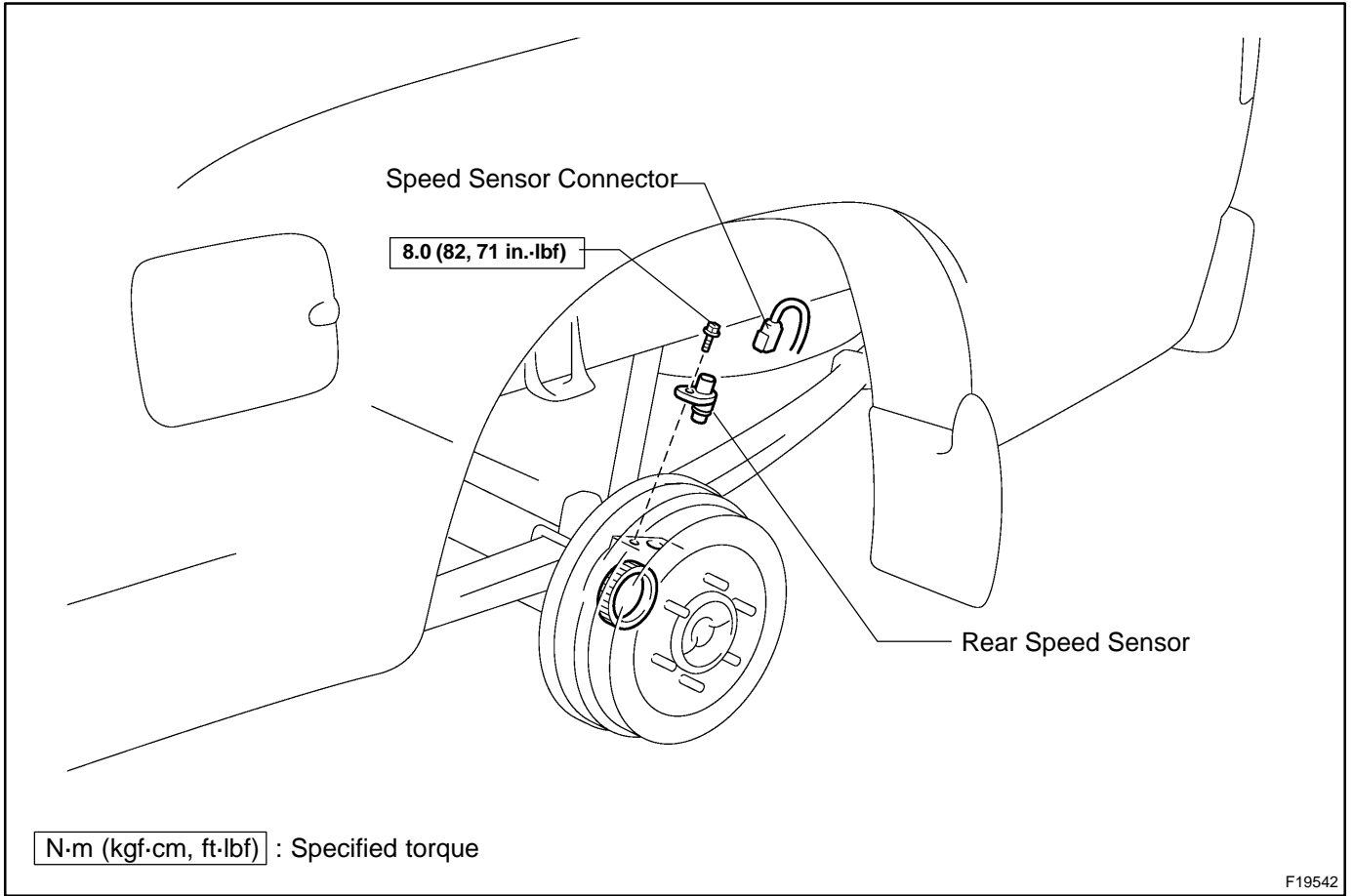
- (a) Disconnect the connector.
- (b) While pressing the 2 claws, remove the steering sensor.

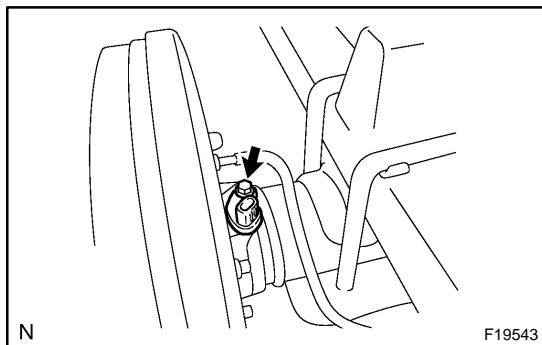
INSTALLATION

Installation is in the reverse order of removal (See page [BR-97](#)).

REAR SPEED SENSOR COMPONENTS

BR0A5-06





REMOVAL

1. **REMOVE REAR WHEEL**
Torque: 113 N·m (1.150 kgf·cm, 83 ft·lbf)
2. **DISCONNECT SPEED SENSOR CONNECTOR**
3. **REMOVE SPEED SENSOR**
 - (a) Remove the bolt and speed sensor from the axle carrier.
Torque: 8.0 N·m (82 kgf·cm, 71 ft·lbf)

INSTALLATION

Installation is in the reverse order of removal (See page [BR-101](#)).

HINT:

After installation, check the speed sensor signal
(See page [DI-1387](#) or [DI-1478](#)).

STEERING SYSTEM

SR01S-07

PRECAUTION

- ★ Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.
- ★ The TOYOTA TUNDRA is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.
- ★ When replacing the steering angle sensor, drive the vehicle straight ahead at a speed of 6.5 mph (10.5 km/h) or more. Accordingly, zero point calibration of the steering angle sensor is performed.
- ★ After performing "Front wheel alignment adjustment", clearing and reading the yaw rate & deceleration sensor zero point calibration data is necessary (See page [DI-1494](#)).

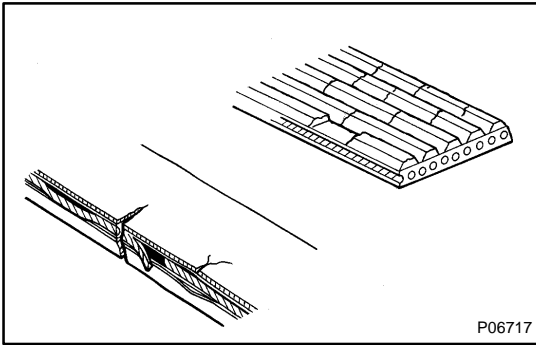
TROUBLESHOOTING

SR01T-09

PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in the order shown. If necessary, repair or replace these parts.

Symptom	Suspect Area	See page
Hard steering	<ol style="list-style-type: none"> 1. Tires (Improperly inflated) 2. Power steering fluid level (Low) 3. Drive belt (Loose) 4. Front wheel alignment (Incorrect) 5. Steering system joints (Worn) 6. Suspension arm ball joints (Worn) 7. Steering column (Binding) 8. Power steering vane pump 9. Power steering gear 	<p>SA-3</p> <p>SR-5</p> <p>SR-3</p> <p>SA-5</p> <p>-</p> <p>SA-84</p> <p>-</p> <p>SR-45</p> <p>SR-59</p> <p>SR-70</p>
Poor return	<ol style="list-style-type: none"> 1. Tires (Improperly inflated) 2. Front wheel alignment (Incorrect) 3. Steering column (Binding) 4. Power steering gear 	<p>SA-3</p> <p>SA-5</p> <p>-</p> <p>SR-70</p>
Excessive play	<ol style="list-style-type: none"> 1. Steering system joints (Worn) 2. Suspension arm ball joints (Worn) 3. Intermediate shaft, Sliding yoke (Worn) 4. Front wheel bearing (Worn) 5. Power steering gear 	<p>-</p> <p>SA-84</p> <p>-</p> <p>SA-19</p> <p>SR-70</p>
Abnormal noise	<ol style="list-style-type: none"> 1. Power steering fluid level (Low) 2. Steering system joints (Worn) 3. Power steering vane pump 4. Power steering gear 	<p>SR-5</p> <p>-</p> <p>SR-45</p> <p>SR-59</p> <p>SR-70</p>



DRIVE BELT INSPECTION

SR1KF-01

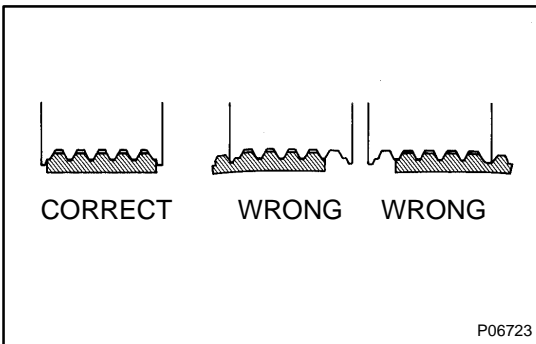
INSPECT DRIVE BELT

- (a) Visually check the belt for excessive wear, frayed cords, etc.

If any defect is found, replace the drive belt.

HINT:

Cracks on the rib side of a belt are considered acceptable. Replace the belt if there are any missing ribs.



HINT:

- ★ After installing a belt, check that it fits properly in the ribbed grooves.
- ★ Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.

POWER STEERING FLUID BLEEDING

SR01V-11

1. **CHECK FLUID LEVEL** (See page [SR-5](#))
2. **JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS**

3. **TURN STEERING WHEEL**

With the engine stopped, turn the wheel slowly from lock to lock several times.

4. **LOWER VEHICLE**

5. **START ENGINE**

Run the engine at idle for a few minutes.

6. **TURN STEERING WHEEL**

(a) With the engine idling, turn the wheel left or right to the full lock position and keep it there for 2 to 3 seconds, then turn the wheel to the opposite full lock position and keep it there for 2 to 3 seconds.

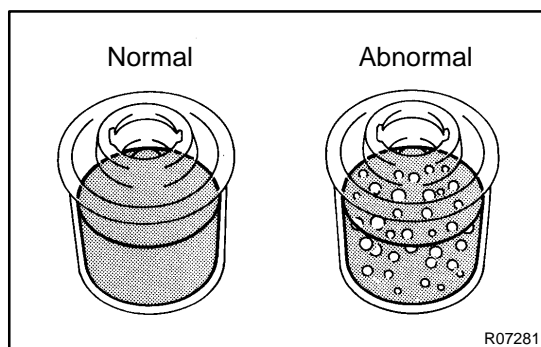
(b) Repeat (a) several times.

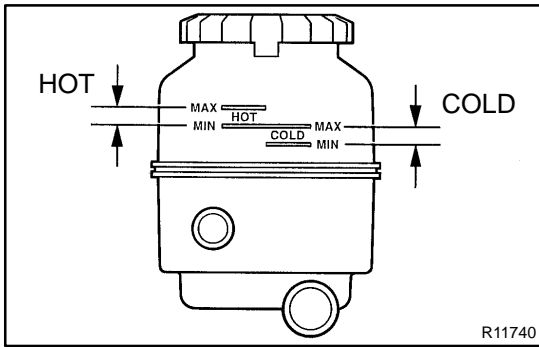
7. **STOP ENGINE**

8. **CHECK FOR FOAMING OR EMULSIFICATION**

If the system has to be bled twice specifically because of foaming or emulsification, check for fluid leaks in the system.

9. **CHECK FLUID LEVEL** (See page [SR-5](#))





INSPECTION

1. CHECK FLUID LEVEL

- (a) Keep the vehicle level.
- (b) With the engine stopped, check the fluid level in the reservoir.

If necessary, add fluid.

Fluid: ATF DEXRON® II or III

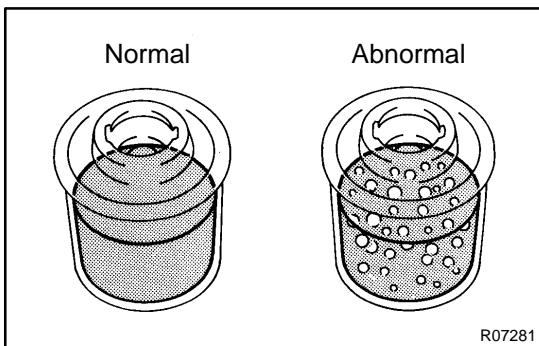
HINT:

When the fluid is hot, check that the fluid level is within the HOT range.

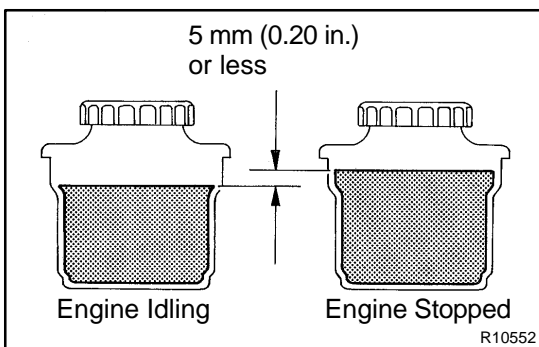
If the fluid is cold, check that it is within the COLD range.

- (c) Start the engine and run at idle.
- (d) Turn the steering wheel from lock to lock several times to raise fluid temperature.

Fluid temperature: 80°C (176°F)



- (e) Check for foaming or emulsification.
- If foaming or emulsification is identified, bleed air from the power steering system (See page [SR-4](#)).



- (f) With the engine idling, measure the fluid level in the reservoir.
- (g) Stop the engine.
- (h) Wait a few minutes and remeasure the fluid level in the reservoir.

Maximum fluid level rise: 5 mm (0.20 in.)

If the fluid level rise exceeds the maximum, bleed air from the power steering system (See page [SR-4](#)).

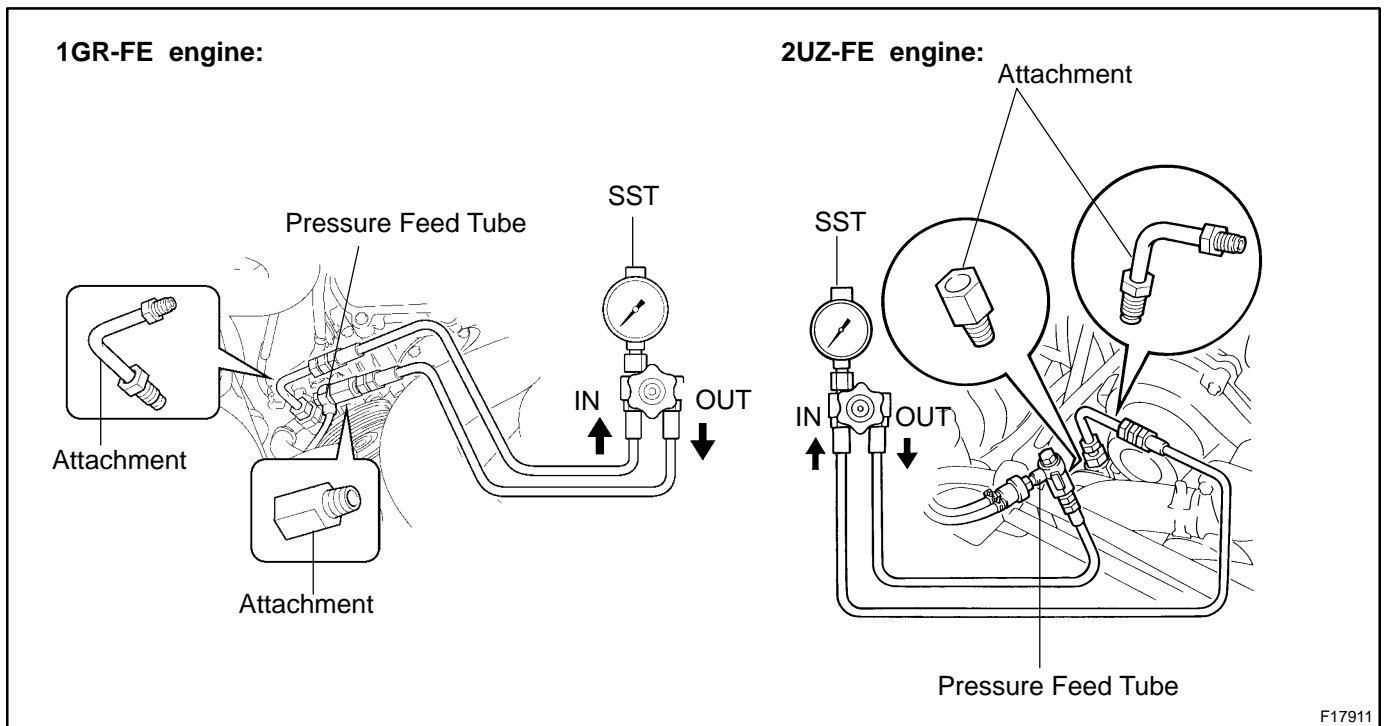
- (i) Check the fluid level.

2. CHECK STEERING FLUID PRESSURE

- (a) 2UZ-FE engine:
Remove the air cleaner assembly with the air cleaner hose (See page [SR-61](#)).
- (b) Disconnect the pressure feed tube from the PS vane pump.
(1GR-FE engine: See page [SR-47](#) .)
(2UZ-FE engine: See page [SR-61](#) .)
- (c) Connect SST, as shown in the illustration below.
SST 09640-10010 (09641-01010, 09641-01030, 09641-01060)

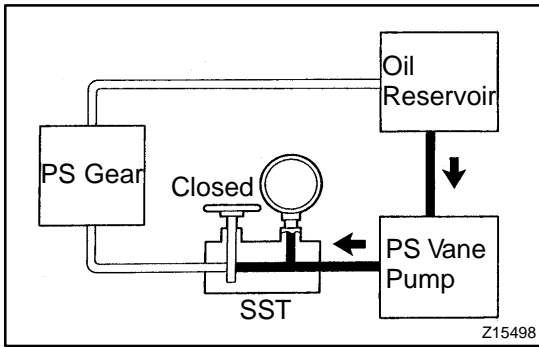
NOTICE:

Check that the valve of the SST is in the open position.



- (d) Bleed air from the power steering system (See page [SR-4](#)).
- (e) Start the engine and run at idle.
- (f) Turn the steering wheel from lock to lock several times to raise fluid temperature.

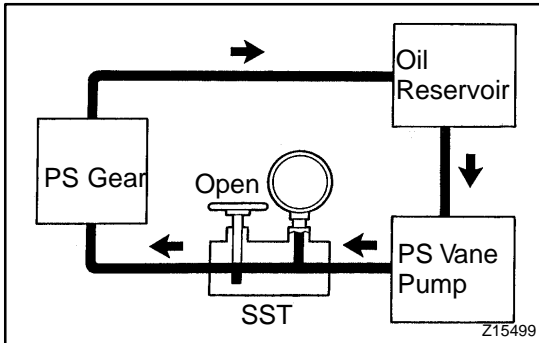
Fluid temperature: 80 °C (176 °F)



- (g) With the engine idling, close the valve of the SST and observe the reading on the SST.
Minimum fluid pressure:
8,336 kPa (85 kgf/cm², 1,209 psi)

NOTICE:

- ★ Do not keep the valve closed for more than 10 seconds.
- ★ Do not allow the fluid temperature to become too high.

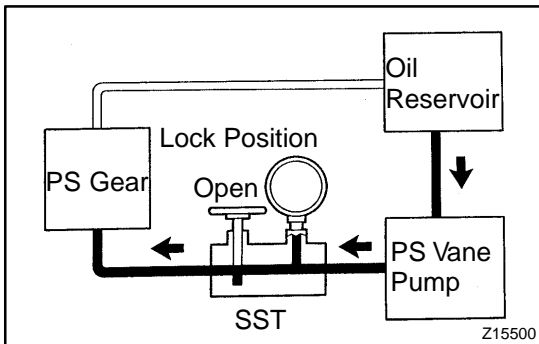


- (h) With the engine idling, fully open the valve.
- (i) Measure the fluid pressure at engine speeds of 1,000 rpm and 3,000 rpm.

Difference in fluid pressure:
490 kPa (5 kgf/cm², 71 psi) or less

NOTICE:

Do not turn the steering wheel.



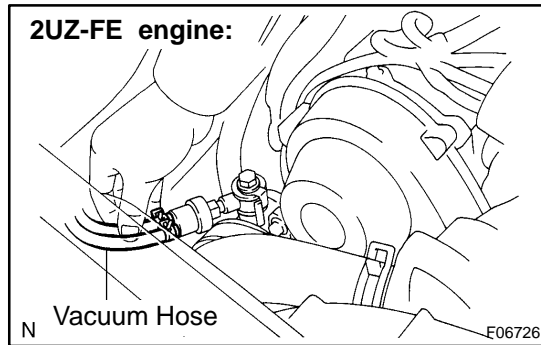
- (j) With the engine idling and the valve fully opened, turn the steering wheel left or right to the full lock position.

Minimum fluid pressure:
8,336 kPa (85 kgf/cm², 1,209 psi)

NOTICE:

- ★ Do not keep the steering wheel in the full lock position for more than 10 seconds.
- ★ Do not allow the fluid temperature to become too high.

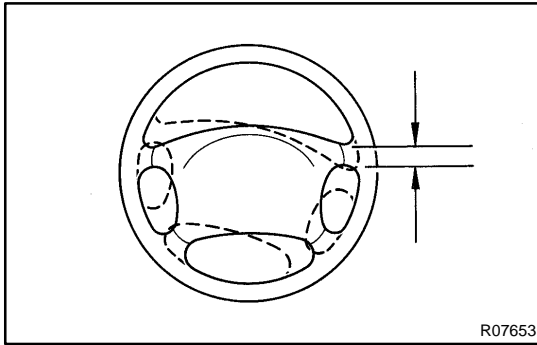
- (k) Disconnect the SST.
 SST 09640-10010 (09641-01010, 09641-01030, 09641-01060)
- (l) Connect the pressure feed tube.
 (1GR-FE engine: See page [SR-57](#).)
 (2UZ-FE engine: See page [SR-69](#).)
- (m) 2UZ-FE engine:
 Install the air cleaner assembly with the air cleaner hose
 (See page [SR-69](#)).
- (n) Bleed air from the power steering system (See page [SR-4](#)).



AIR CONTROL VALVE INSPECTION

SR01X-04

1. **TURN AIR CONDITIONING SWITCH OFF**
2. **CHECK IDLE-UP**
 - (a) Start the engine and run it at idle.
 - (b) Fully turn the steering wheel.
 - (c) Check that the engine rotations decrease when the vacuum hose of the air control valve is pinched.
 - (d) Check that the engine rotations increase when the hose is released.



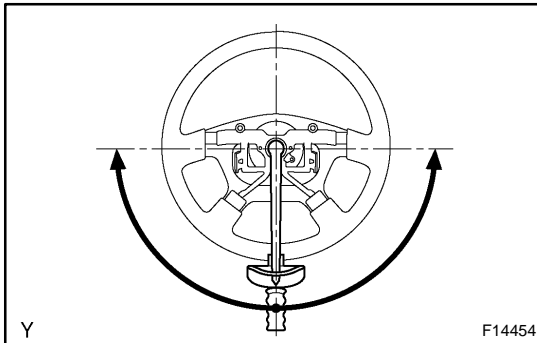
STEERING WHEEL INSPECTION

SR01Y-13

1. CHECK STEERING WHEEL FREE PLAY

- Stop the vehicle and face the tires straight ahead.
- Gently rock the steering wheel up and down with a finger, and check the steering wheel free play.

Maximum free play: 30 mm (1.18 in.)



2. CHECK STEERING EFFORT

- Center the steering wheel.
- Remove the steering wheel pad (See page [SR-18](#) , [SR-33](#)).
- Start the engine and run at idle.
- Measure the steering effort in both directions.

Steering effort (Reference):

4.9 N·m (50 kgf·cm, 43 in.-lbf)

HINT:

Check tire type, pressure and contact surface before making your diagnosis.

- Tighten the steering wheel set nut.

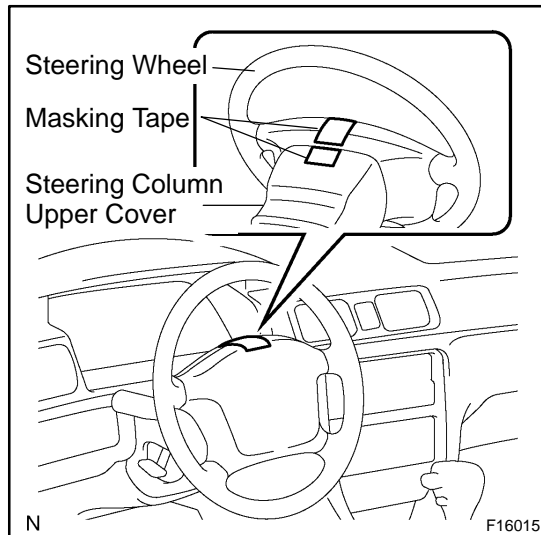
Torque: 50 N·m (510 kgf·cm, 37 ft-lbf)

- Install the steering wheel pad (See page [SR-28](#) , [SR-42](#)).

REPAIR PROCEDURES

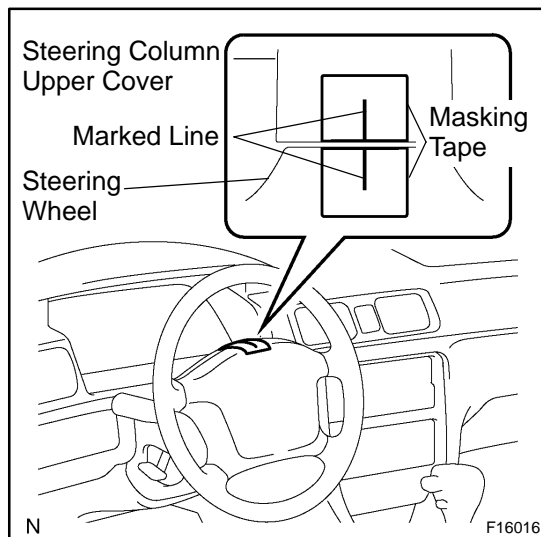
HINT:

This is the repair procedure for steering off center.

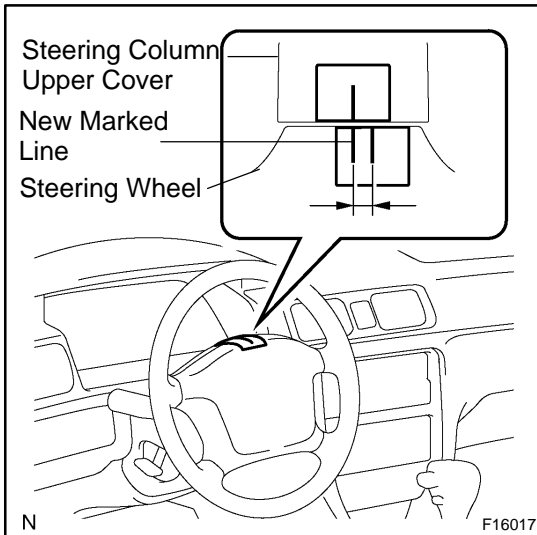


1. INSPECT STEERING WHEEL OFF CENTER

- (a) Apply masking tape on the top center of the steering wheel and steering column upper cover.



- (b) Drive the vehicle in a straight line for 100 meters at a constant speed of 35 mph (56 km/h), and hold the steering wheel to maintain the course.
- (c) Draw a line on the masking tape as shown in the illustration.



(d) Turn the steering wheel to its straight position.

HINT:

Refer to the upper surface of the steering wheel, steering spoke and SRS airbag line for the straight position.

(e) Draw a new line on the masking tape of the steering wheel as shown in the illustration.

(f) Measure the distance between the 2 lines on the masking tape of the steering wheel.

(g) Convert the measured distance to steering angle.

Measured distance 1 mm (0.04 in.) = Steering angle approximately 1 deg.

HINT:

Make a note of the steering angle.

2. ADJUST STEERING ANGLE

(a) Lift up the vehicle.

NOTICE:

The adjustment method for steering angle is different depending on the models. Check whether it is type A or B.

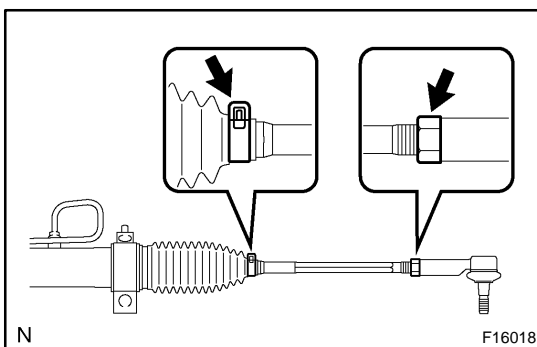
(b) Draw a line on the RH and LH tie rod and rack ends where it can easily be seen.

(c) Using a paper gauge, measure the distance from RH and LH tie rod ends to the rack end screws.

HINT:

★ Measure the RH side and LH side.

★ Make a note of the measured values.



(d) Remove the RH and LH boot clips from the rack boots.

(e) Loosen the RH and LH lock nuts.

(f) Turn the RH and LH rack end by the same amount (but in different directions) according to the steering angle.

1 turn 360 deg. of rack end (1.5 mm (0.059 in.) horizontal movement) = 12 deg. of steering angle

(g) Tighten the RH and LH lock nuts by the specified torque.

Torque: 55 N·m (560 kgf·cm, 41 ft·lbf)

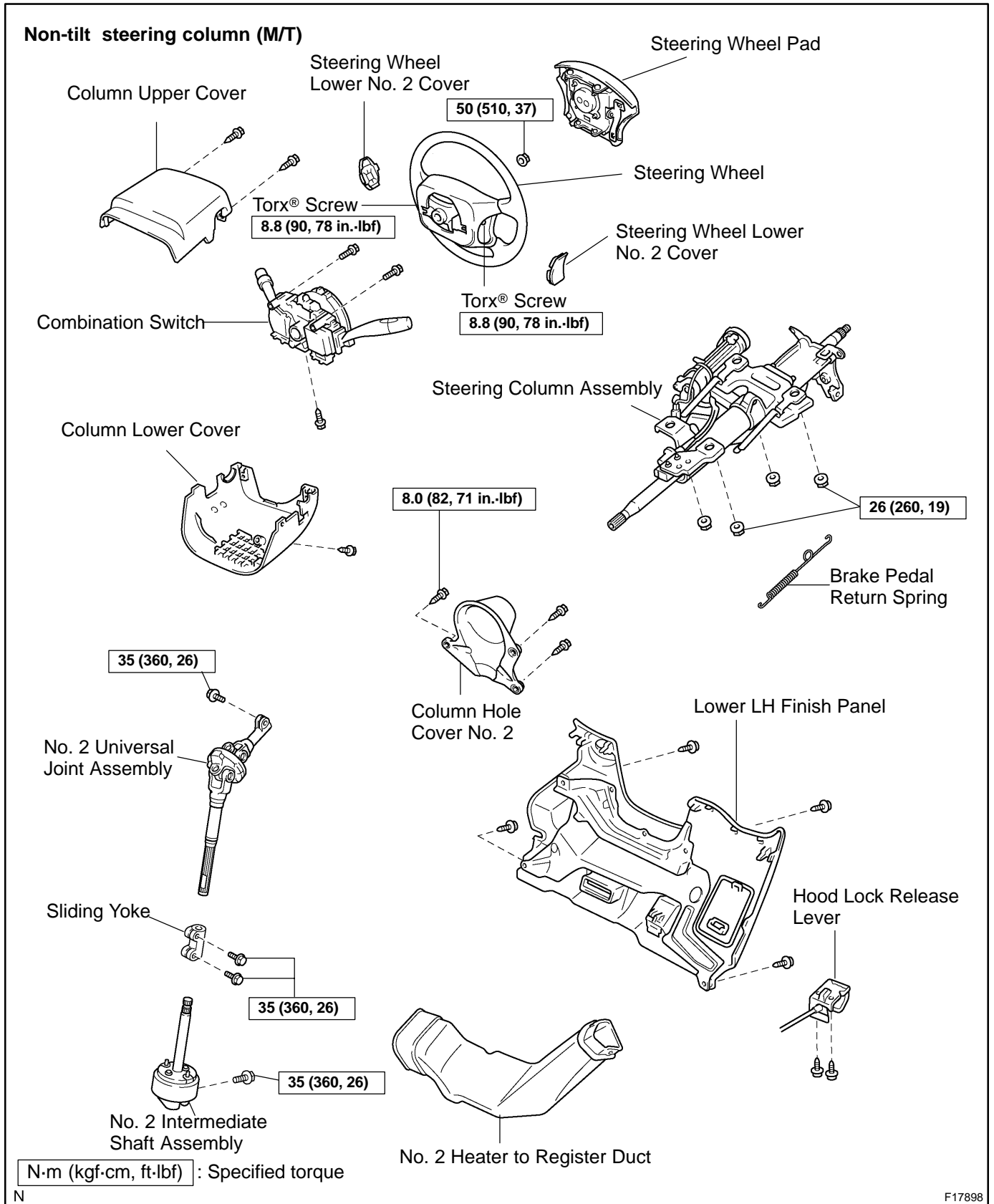
NOTICE:

Make sure that the difference in length between RH and LH tie rod ends and rack end screws are within 1.5 mm (0.059 in.).

(h) Install the RH and LH boot clips.

STEERING COLUMN (Standard Cab, Access Cab) COMPONENTS

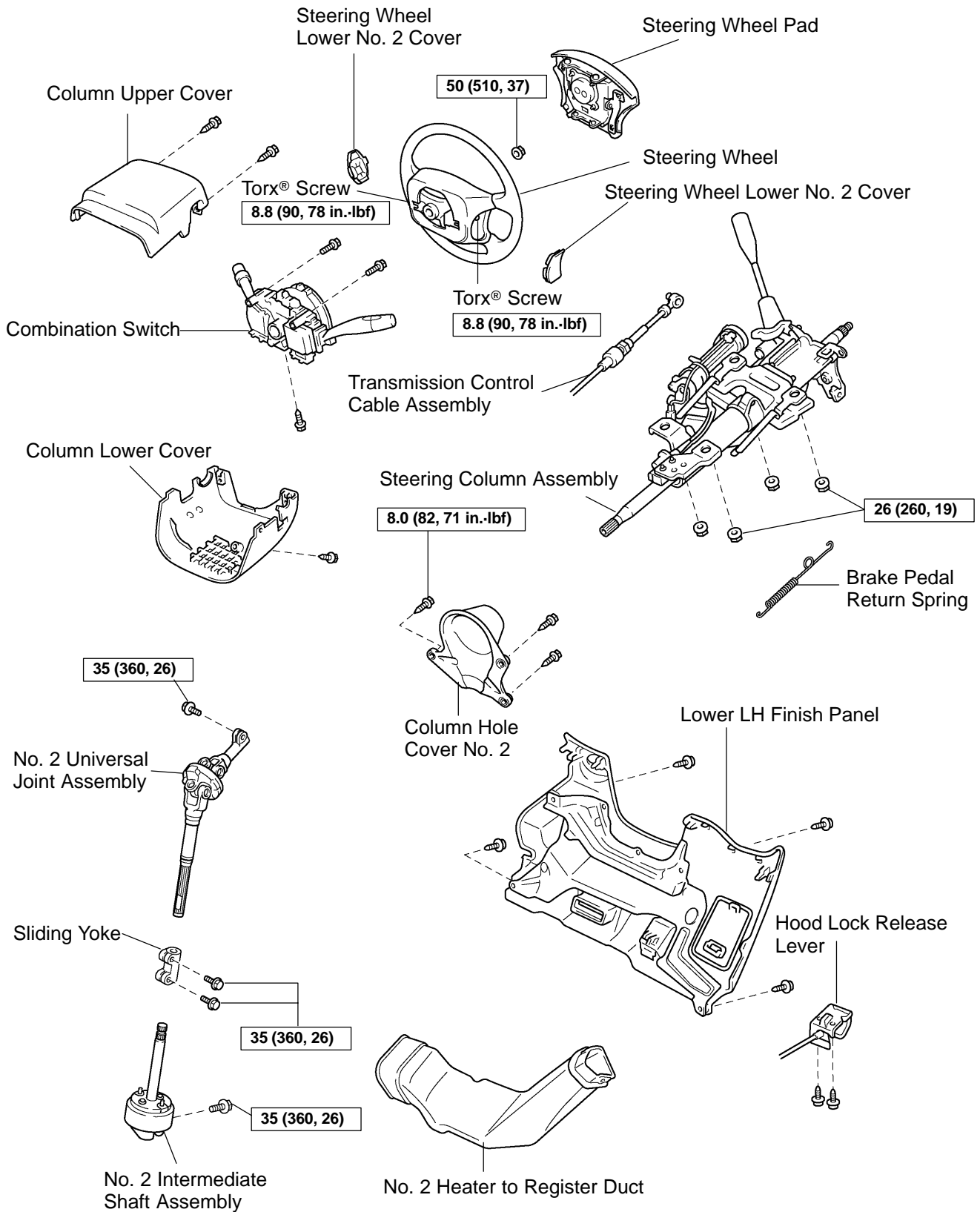
SR1KG-02



N

F17898

Non-tilt steering column (A/T)

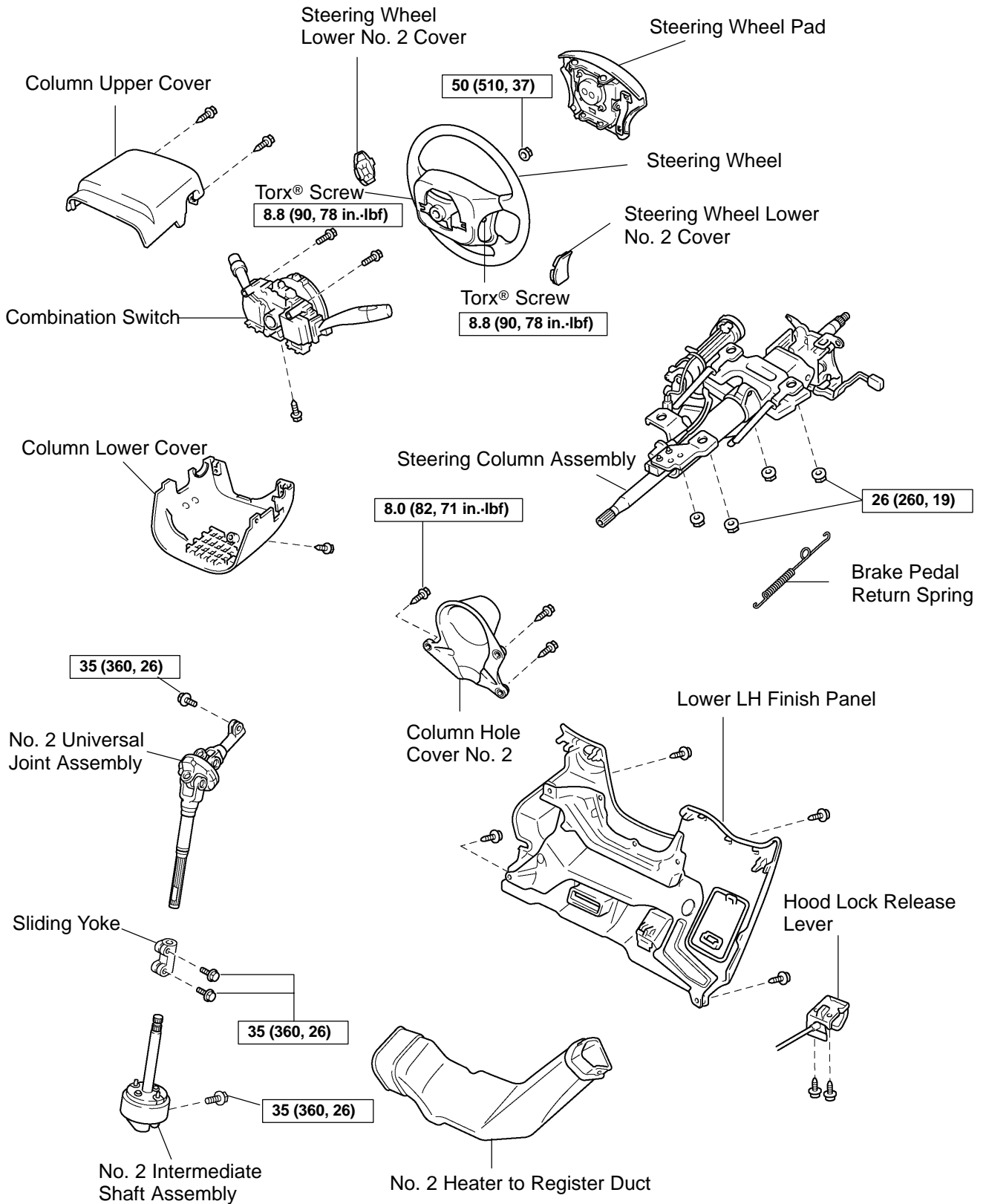


N·m (kgf·cm, ft·lbf) : Specified torque

N

F17899

Tilt steering column (M/T)

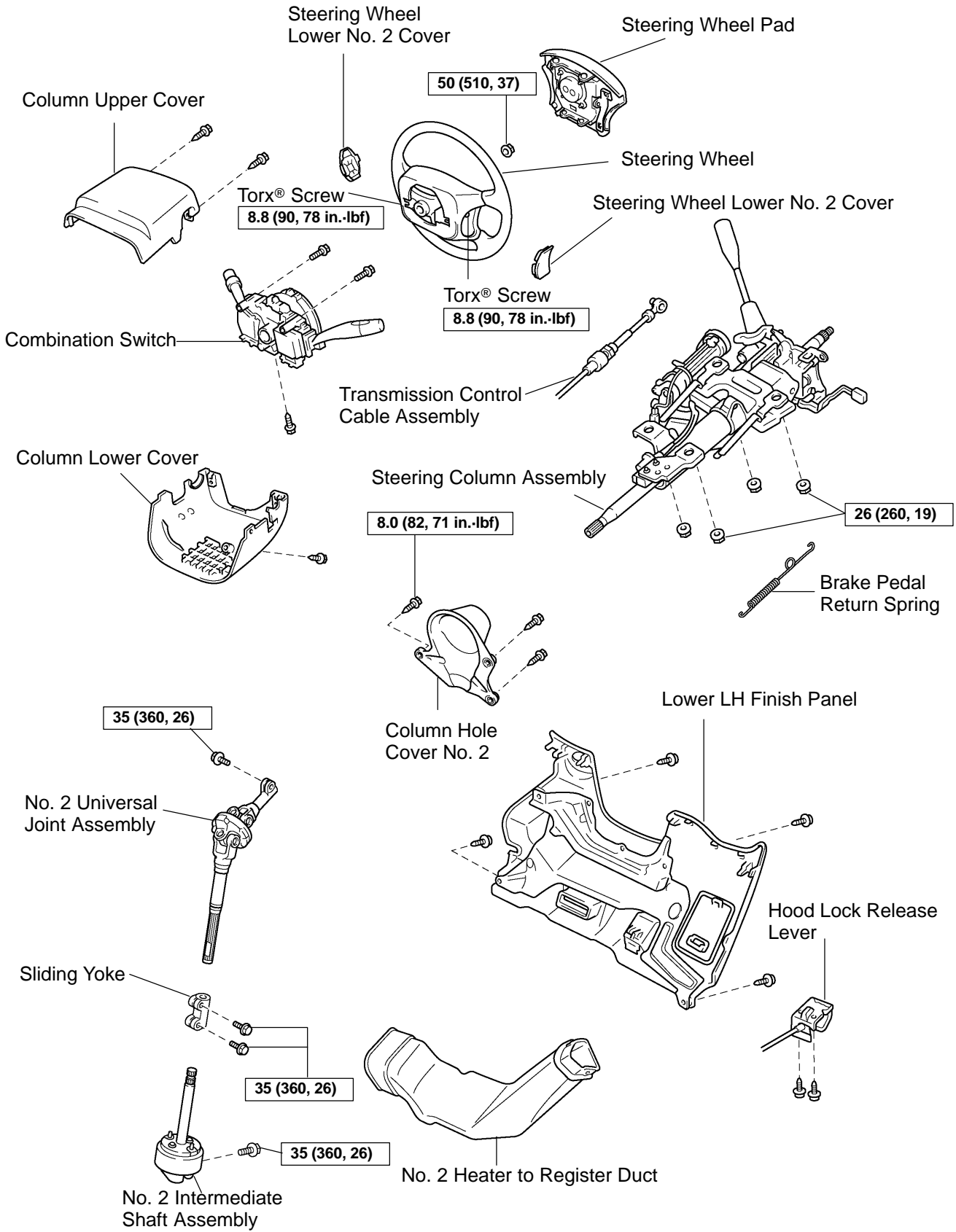


N·m (kgf·cm, ft·lbf) : Specified torque

N

F17900

Tilt steering column (A/T)

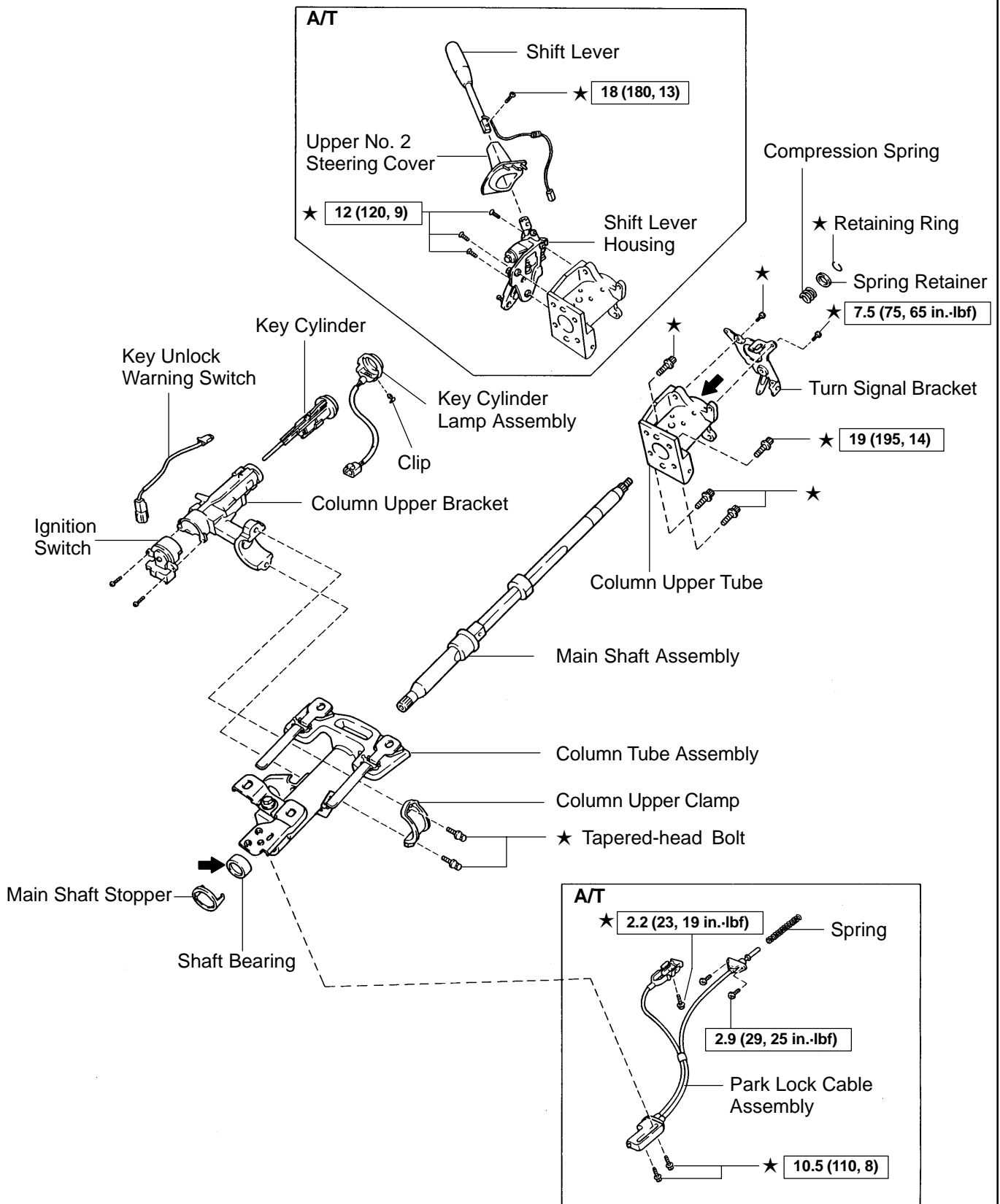


N-m (kgf-cm, ft-lbf) : Specified torque

N

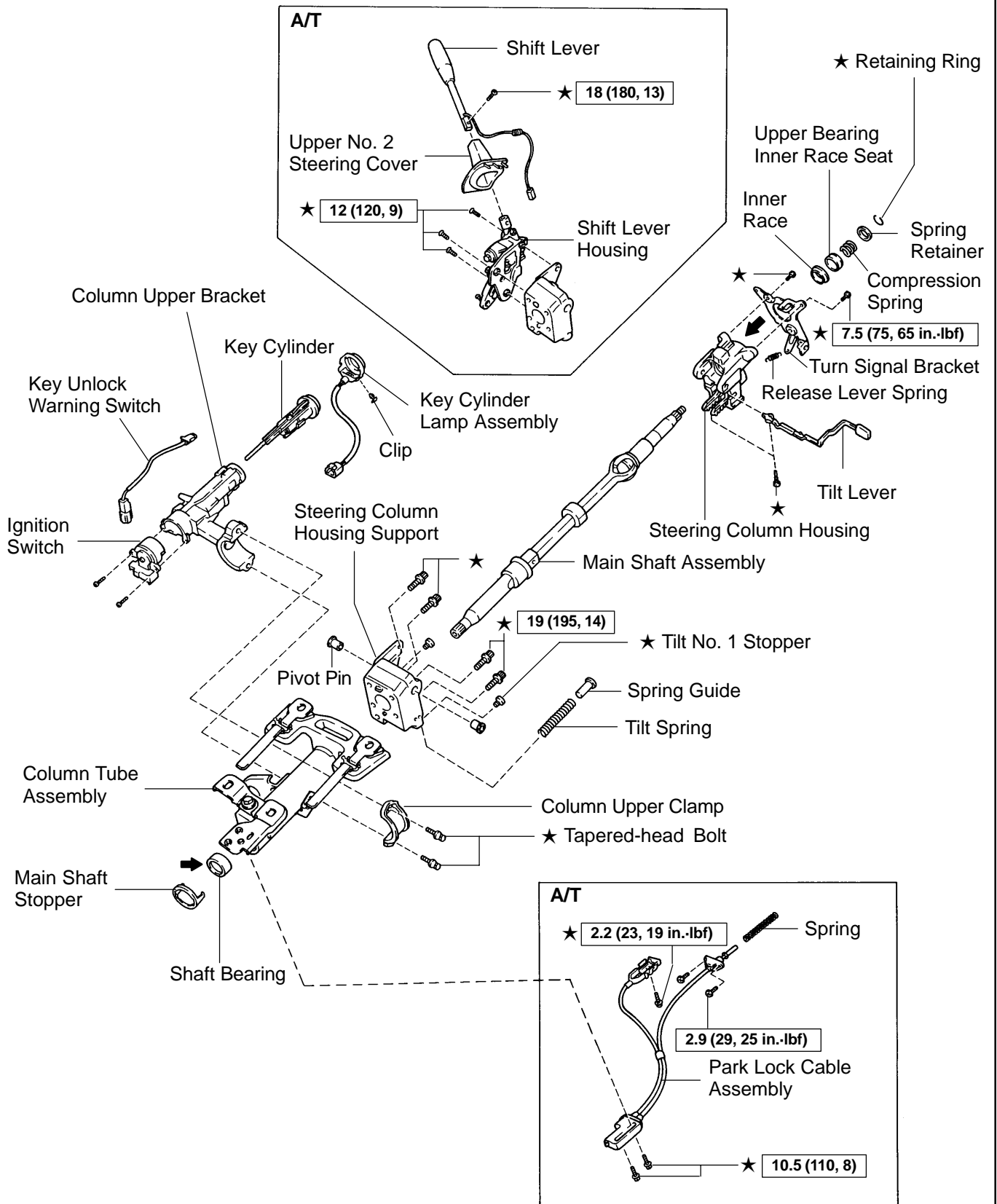
F17901

Non-tilt steering column



N-m (kgf·cm, ft·lbf) : Specified torque
 ★ Non-reusable part
 ← Molybdenum disulfide lithium base grease

Tilt steering column



N-m (kgf-cm, ft-lbf) : Specified torque

★ Non-reusable part

← Molybdenum disulfide lithium base grease

N

F14449

REMOVAL

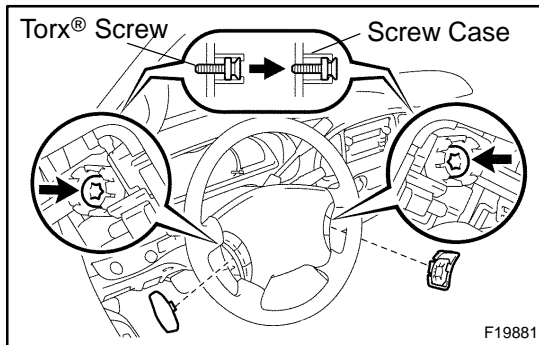
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

2. REMOVE STEERING WHEEL PAD

NOTICE:

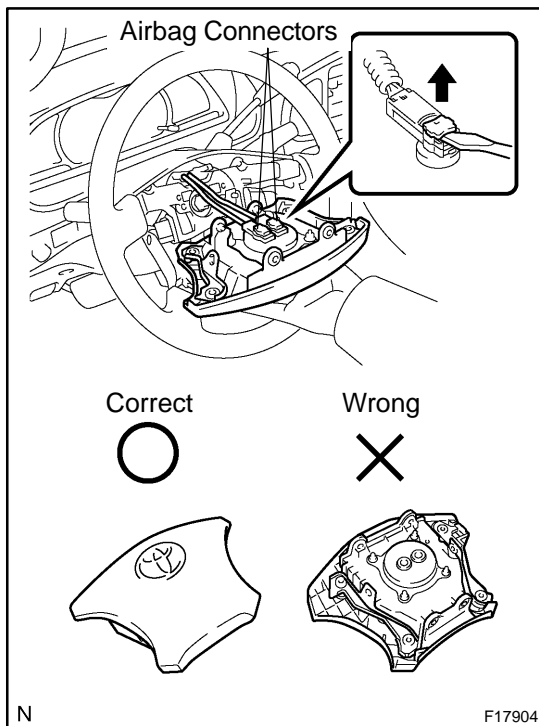
If the airbag connector is disconnected with the ignition switch in the ON or ACC position, DTCs will be recorded.



- Place the front wheels facing straight ahead.
- Remove the steering wheel lower No. 2 cover.
- Remove the steering wheel lower No. 3 cover.
- Using a torx® socket wrench, loosen the 2 torx® screws.

HINT:

Loosen each screw until the groove along the screw circumference is caught on the screw case.



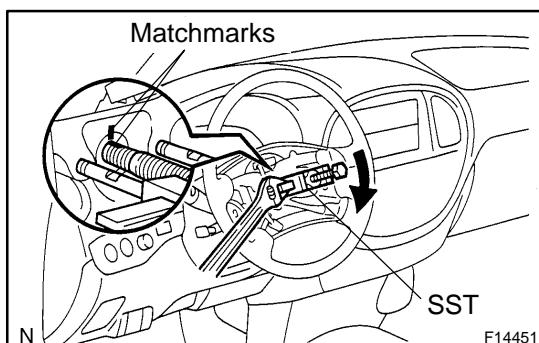
- Pull out the wheel pad from the steering wheel and disconnect the airbag connectors and horn terminal.

CAUTION:

- ★ When storing the wheel pad, keep the upper surface of the pad facing upward.
- ★ Never disassemble the wheel pad.

NOTICE:

When removing the wheel pad, take care not to pull on the airbag wire harness.



3. REMOVE STEERING WHEEL

- Remove the steering wheel set nut.
- Put matchmarks on the steering wheel and main shaft assembly.
- Using SST, remove the wheel.
SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)
- Disconnect the connector.

4. REMOVE UPPER AND LOWER COLUMN COVERS

Remove the 3 screws, upper and lower column covers.

5. REMOVE COMBINATION SWITCH WITH SPIRAL CABLE

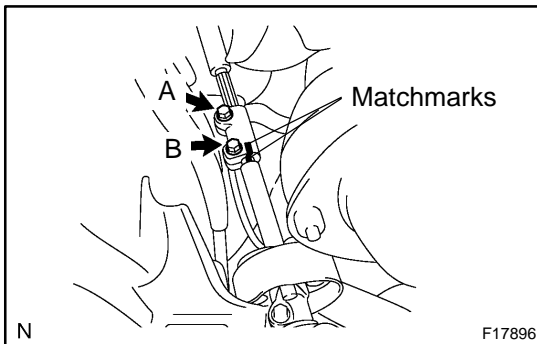
- (a) M/T:
Disconnect the 3 connectors.
- (b) A/T:
Disconnect the 4 connectors.
- (c) Disconnect the airbag connector.
- (d) Remove the 3 screws and combination switch.

6. REMOVE SPIRAL CABLE (See page BE-40)**NOTICE:**

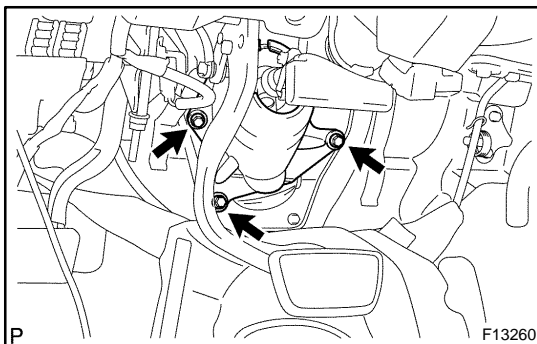
Do not disassemble the cable or apply oil to it.

7. REMOVE LOWER LH FINISH PANEL

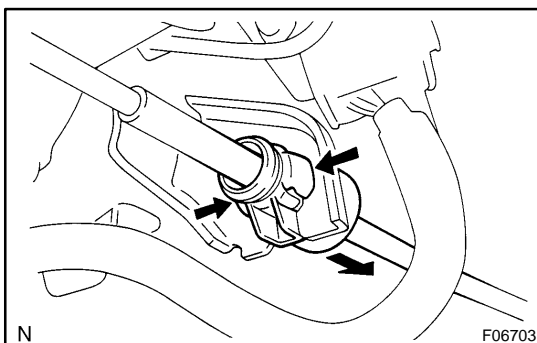
- (a) Remove the 2 screws and disconnect the hood lock release lever from the panel.
- (b) Remove the 4 panel set bolts and lower LH finish panel.

8. REMOVE NO. 2 HEATER TO REGISTER DUCT**9. REMOVE BRAKE PEDAL RETURN SPRING****10. REMOVE SLIDING YOKE**

- (a) Put matchmarks on the sliding yoke and No. 2 intermediate shaft assembly.
- (b) Remove the "A" bolt.
- (c) Remove the "B" bolt.
- (d) Slide the sliding yoke and remove it.

**11. REMOVE COLUMN HOLE COVER NO. 2**

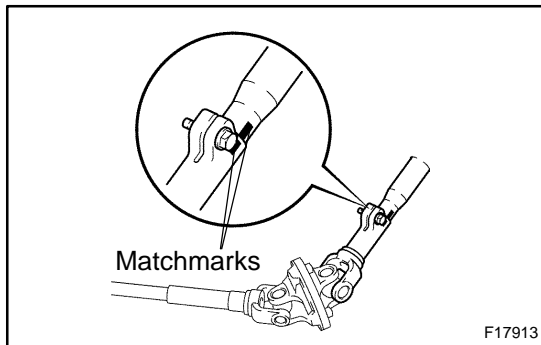
Remove the 3 bolts and column hole cover No. 2.

**12. A/T:****DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**

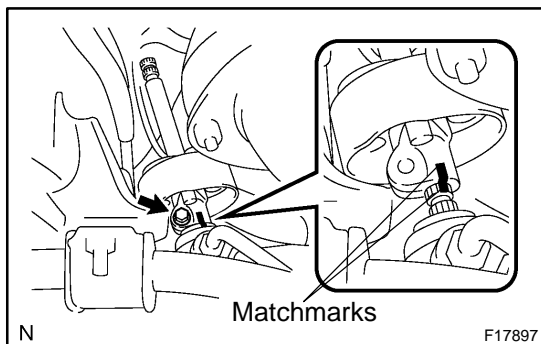
Disconnect the cable assembly from the column shift lever assembly.

13. REMOVE STEERING COLUMN ASSEMBLY WITH NO. 2 UNIVERSAL JOINT ASSEMBLY

- (a) Disconnect the connectors.
- (b) Remove the 4 steering column set nuts.
- (c) Pull out the steering column assembly with the No. 2 universal joint assembly.

**14. DISCONNECT NO. 2 UNIVERSAL JOINT ASSEMBLY**

- (a) Put matchmarks on the steering column assembly and No. 2 universal joint assembly.
- (b) Remove the bolt and No. 2 universal joint assembly.

**15. REMOVE NO. 2 INTERMEDIATE SHAFT ASSEMBLY**

- (a) Put matchmarks on the No. 2 intermediate shaft assembly and control valve shaft.
- (b) Remove the bolt and No. 2 intermediate shaft assembly.

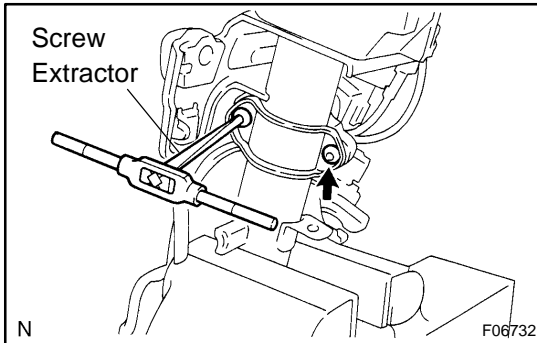
DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. REMOVE KEY CYLINDER LAMP ASSEMBLY

Remove the clip and key cylinder lamp assembly.



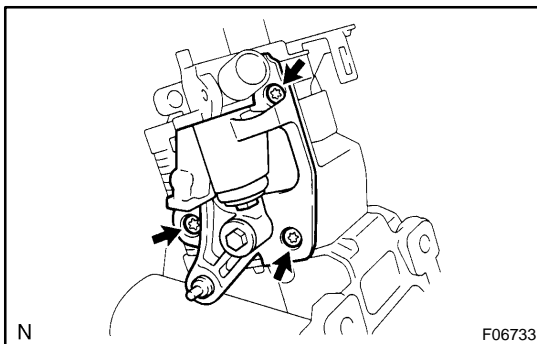
2. REMOVE COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP

- Using a centering punch, mark the center of the 2 tapered-head bolts.
- Using a 3 to 4 mm (0.12 to 0.16 in.) drill, drill a hole into the 2 bolts.
- Using a screw extractor, remove the 2 bolts, column upper bracket and column upper clamp.

3. A/T: REMOVE SHIFT LEVER

Remove the screw and shift lever.

4. A/T: REMOVE UPPER NO. 2 STEERING COVER



5. A/T: REMOVE PARK LOCK CABLE ASSEMBLY (See page [AT-21](#))

6. A/T: REMOVE SHIFT LEVER HOUSING

Remove the 3 torx® screws and shift lever housing.

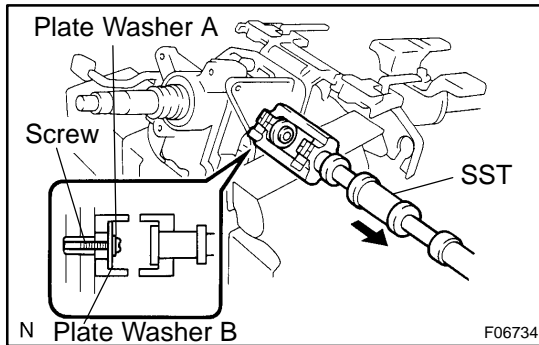
7. Tilt steering column: REMOVE RELEASE LEVER SPRING

8. REMOVE TURN SIGNAL BRACKET

Remove the 2 torx® screws and turn signal bracket.

9. Non-tilt steering column: REMOVE COLUMN UPPER TUBE WITH MAIN SHAFT ASSEMBLY

- Remove the 4 torx® bolts.
- Remove the column upper tube with the main shaft assembly from the column tube assembly.



**10. Tilt steering column:
REMOVE STEERING COLUMN HOUSING WITH MAIN
SHAFT ASSEMBLY**

- (a) Set SST, 2 plate washers (18 and 36 mm outer diameter) and a screw (4.0 mm diameter, 0.7 mm pitch, 15.0 mm length), as shown in the illustration. Then remove the 2 pivot pins.

SST 09910-00015 (09911-0001 1, 09912-00010)

Reference

Plate washer A (18 mm): 90562-04012

Plate washer B (36 mm): 90201-10201

Screw: 90154-40015

- (b) Remove the column housing with the shaft assembly from the column tube assembly.

NOTICE:

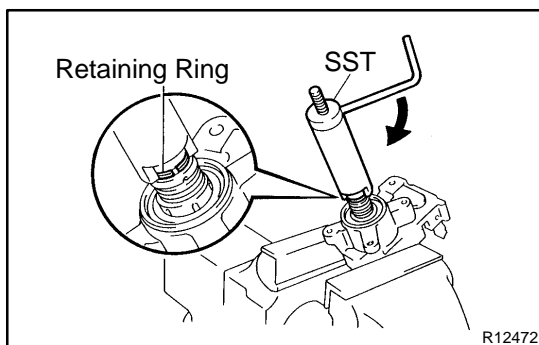
Do not bend the universal joint of the main shaft assembly more than 15°.

- (c) Remove the tilt spring and spring guide.

**11. Tilt steering column:
REMOVE STEERING COLUMN HOUSING SUPPORT**

- (a) Remove the 4 torx® bolts.
(b) Remove the 2 tilt No.1 stoppers and steering column housing support.

12. REMOVE MAIN SHAFT STOPPER



13. REMOVE MAIN SHAFT ASSEMBLY

- (a) Install SST to the main shaft assembly, as shown in the illustration.

SST 09612-07010

- (b) Using SST, compress the compression spring.

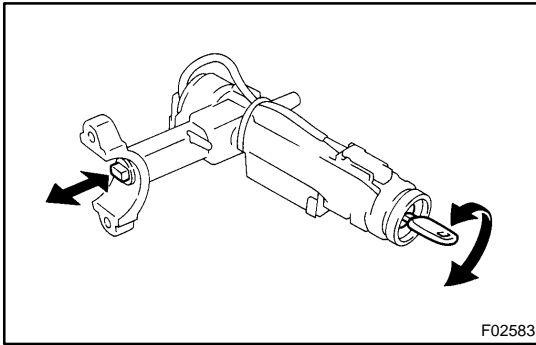
NOTICE:

Do not bend the universal joint of the shaft assembly more than 15°.

HINT:

Hold the shaft assembly with your hand to prevent rotation.

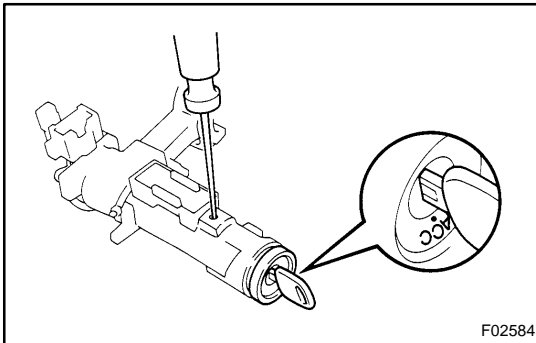
- (c) Using a screwdriver, remove the retaining ring.
(d) Non-tilt steering column:
Remove the spring retainer and compression spring.
(e) Tilt steering column:
Remove the spring retainer, compression spring, upper bearing inner race seat and inner race.



INSPECTION

1. INSPECT STEERING LOCK OPERATION

Check that the steering lock mechanism operates properly.



2. IF NECESSARY, REPLACE KEY CYLINDER

- (a) Place the ignition key in the ACC position.
- (b) Push down the stop pin with a screwdriver, and pull out the cylinder.
- (c) Install a new cylinder.

HINT:

Make sure the key is in the ACC position.

3. INSPECT IGNITION SWITCH (See page BE-37)

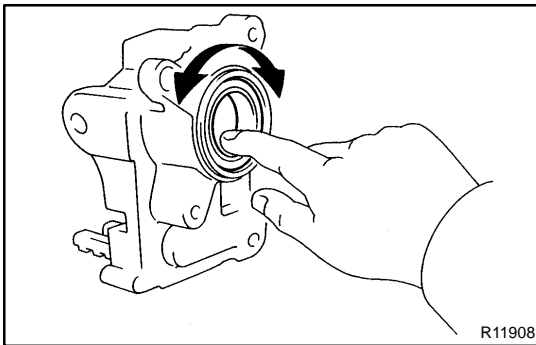
4. IF NECESSARY, REPLACE IGNITION SWITCH

- (a) Remove the 2 screws and ignition switch.
- (b) Install a new ignition switch with the 2 screws.

5. INSPECT KEY UNLOCK WARNING SWITCH (See page BE-37)

6. IF NECESSARY, REPLACE KEY UNLOCK WARNING SWITCH

- (a) Slide out the key unlock warning switch.
- (b) Install a new key unlock warning switch.



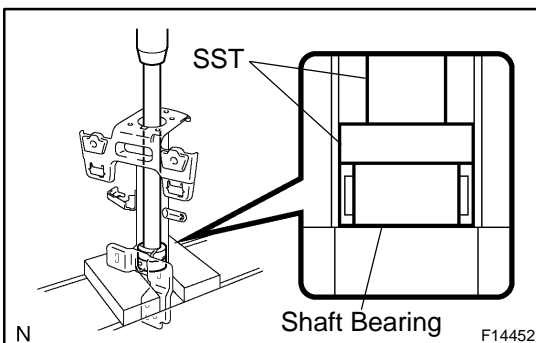
7. A/T:

INSPECT BEARING

- (a) Check that the bearing rotates smoothly without abnormal noise.

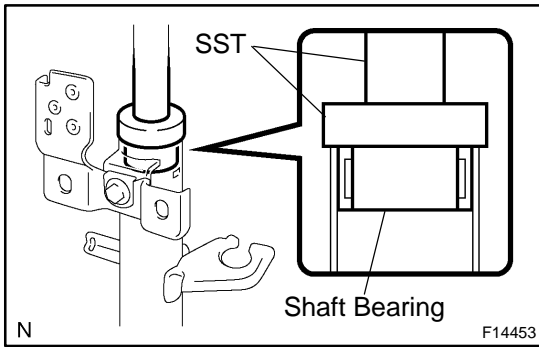
If it does not rotate smoothly or abnormal noise occurs, replace the column housing.

- (b) Coat the bearing with molybdenum disulfide lithium base grease.



8. IF NECESSARY, REPLACE SHAFT BEARING

- (a) Using SST and a press, press out the shaft bearing.
 SST 09950-60010 (09951-00430),
 09950-70010 (09951-07360)



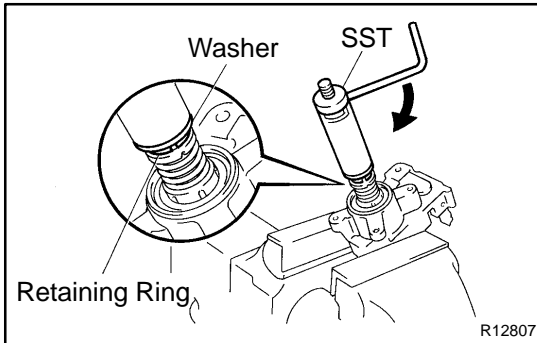
- (b) Coat a new shaft bearing with molybdenum disulfide lithium base grease.
- (c) Using SST and a press, press in the shaft bearing.
SST 09950-60010 (09951-00460),
09950-70010 (09951-07150)

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. **COAT PARTS INDICATED BY ARROWS WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See page SR-12)**



2. INSTALL MAIN SHAFT ASSEMBLY

- (a) **Non-tilt steering column:**
Install the compression spring and spring retainer.
- (b) **Tilt steering column:**
Install the inner race, upper bearing inner race seat, compression spring and spring retainer.
- (c) Install a new retaining ring to the main shaft assembly.
- (d) Install the washer of SST to the main shaft assembly.
- (e) Set SST on the main shaft assembly, as shown in the illustration.
SST 09612-07010
- (f) Using SST, push down the retaining ring until it fits into the shaft groove and install the main shaft assembly.

NOTICE:

Do not bend the universal joint of the shaft assembly more than 15°.

HINT:

Hold the main shaft assembly with your hand to prevent rotation.

3. INSTALL MAIN SHAFT STOPPER

4. Tilt steering column:

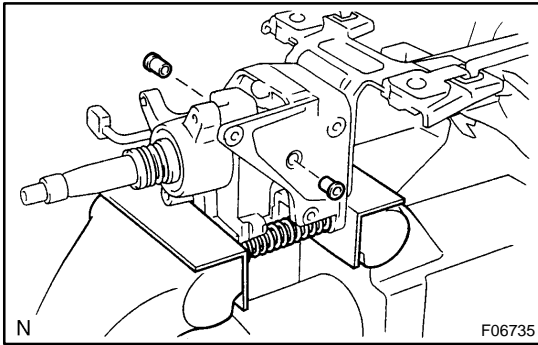
INSTALL STEERING COLUMN HOUSING SUPPORT

- (a) Install 2 new tilt No.1 stoppers and the steering column housing support.
- (b) Install 4 new torx® bolts.
Torque: 19 N·m (195 kgf-cm, 14 ft-lbf)

5. Non-tilt steering column:

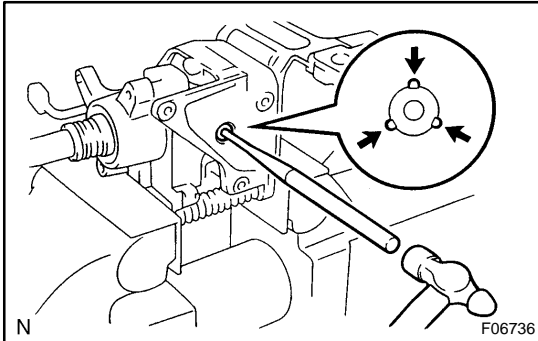
INSTALL COLUMN UPPER TUBE WITH MAIN SHAFT ASSEMBLY

- (a) Install the column upper tube with the main shaft assembly to the column tube assembly.
- (b) Install 4 new torx® bolts.
Torque: 19 N·m (195 kgf-cm, 14 ft-lbf)

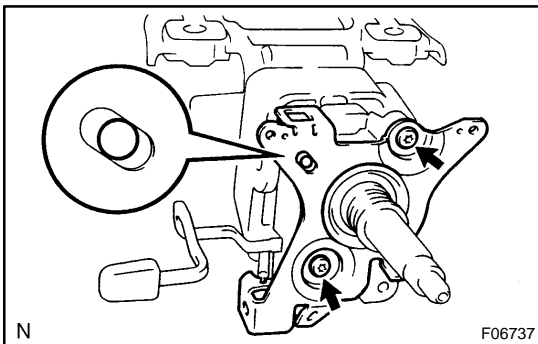


**6. Tilt steering column:
INSTALL STEERING COLUMN HOUSING WITH MAIN
SHAFT ASSEMBLY**

- (a) Install the steering column housing with the main shaft assembly into the column tube assembly.
- (b) Install the tilt spring and spring guide.
- (c) Hold the steering column housing and steering column housing support in a vise.
- (d) Temporarily install 2 new pivot pins.



- (e) Using a punch and a hammer, tap in the pivot pin.
- (f) Using a pin punch and hammer, stake at 3 places evenly around the hole as shown in the illustration.



7. INSTALL TURN SIGNAL BRACKET

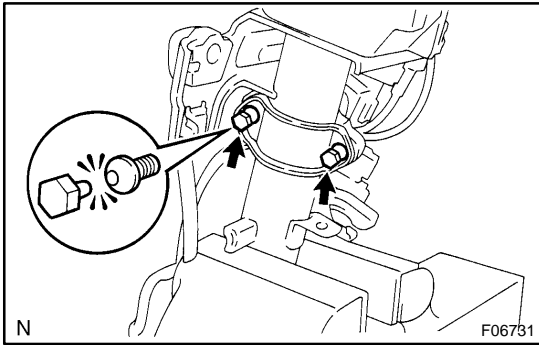
Install the turn signal bracket with 2 new torx® screws.

Torque: 7.5 N·m (75 kgf·cm, 65 in.-lbf)

HINT:

Make sure that the protrusion on the steering column housing is fitted into the hole of the turn signal bracket.

- 8. Tilt steering column:
INSTALL RELEASE LEVER SPRING**
- 9. A/T:
INSTALL PARK LOCK CABLE ASSEMBLY (See page
[AT-22](#))**
- 10. A/T:
INSTALL SHIFT LEVER HOUSING**
Install the shift lever housing with 3 new torx® screws.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)
- 11. A/T:
INSTALL UPPER NO. 2 STEERING COVER**
- 12. A/T:
INSTALL SHIFT LEVER**
Install the shift lever with a new torx® screw.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

**13. INSTALL COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP**

- (a) Install the column upper bracket and column upper clamp with 2 new tapered-head bolts.

HINT:

Insert the bracket pin into the column tube hole.

- (b) Tighten the tapered-head bolts until the bolt heads break off.

14. INSTALL KEY CYLINDER LAMP ASSEMBLY

Install the key cylinder lamp assembly with the clip.

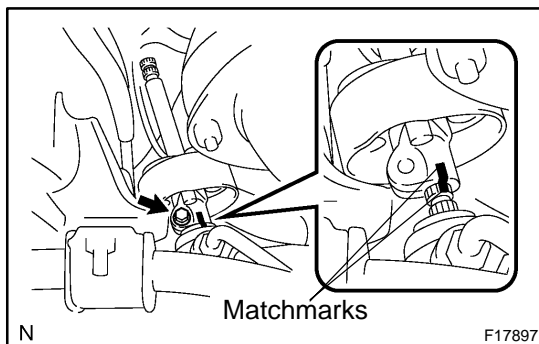
INSTALLATION

NOTICE:

When replacing the steering angle sensor, drive the vehicle straight ahead at a speed of 6.5 mph (10.5 km/h) or more. Accordingly, zero point calibration of the steering angle sensor is performed.

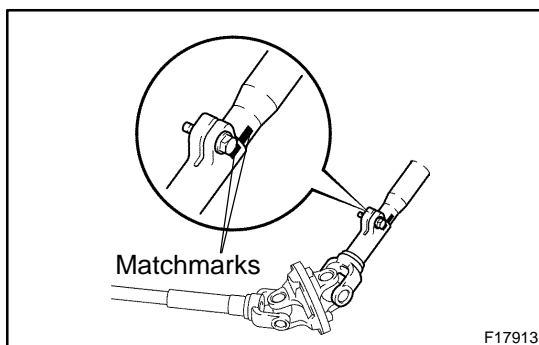
HINT:

If the steering angle sensor zero point calibration is not performed, its value will be fixed. Check after driving the vehicle straight ahead at a speed of 6.5 mph (10.5 km/h) or more (See page [DI-1568](#)).



1. **INSTALL NO. 2 INTERMEDIATE SHAFT ASSEMBLY**
 - (a) Align the matchmark on the No. 2 intermediate shaft assembly with the one on the control valve shaft.
 - (b) Install the bolt.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)



2. **CONNECT NO. 2 UNIVERSAL JOINT ASSEMBLY**
 - (a) Insert the column hole cover No. 2.
 - (b) Align the matchmarks on the column assembly and No. 2 universal joint assembly.
 - (c) Install the bolt.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

3. **INSTALL STEERING COLUMN ASSEMBLY WITH NO. 2 UNIVERSAL JOINT ASSEMBLY**

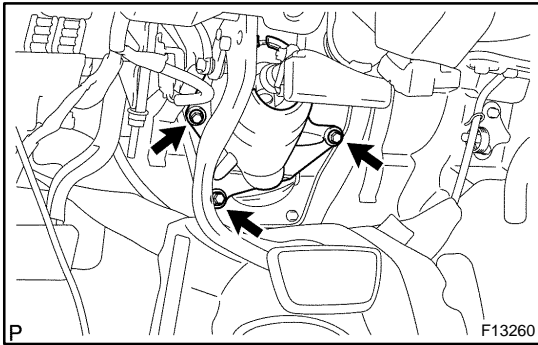
- (a) Install the column assembly with the No. 2 universal joint assembly.
- (b) Install the 4 steering column set nuts.
- (c) Connect the connectors.

Torque: 26 N·m (260 kgf·cm, 19 ft·lbf)

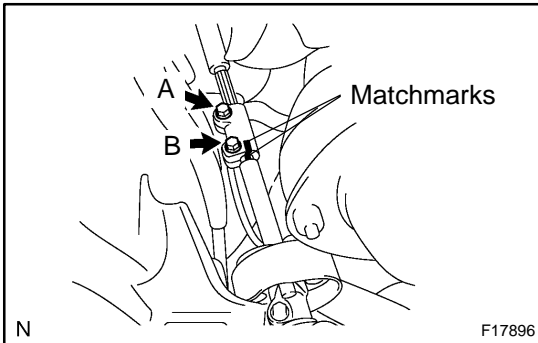
4. **A/T:**

CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

Connect the cable assembly to the shift lever assembly.

**5. INSTALL COLUMN HOLE COVER NO. 2**

Install the column hole cover No. 2 to the body with the 3 bolts.
Torque: 8.0 N·m (82 kgf·cm, 71 ft·lbf)

**6. INSTALL SLIDING YOKE**

(a) Align the matchmark on the sliding yoke with the one on the No. 2 intermediate shaft assembly.

(b) Install the "B" bolt.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

(c) Install the "A" bolt.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

7. INSTALL BRAKE PEDAL RETURN SPRING**8. INSTALL NO. 2 HEATER TO REGISTER DUCT****9. INSTALL LOWER LH FINISH PANEL**

(a) Install the lower LH finish panel with the 4 bolts.

(b) Connect the hood lock release lever with the 2 screws.

10. INSTALL SPIRAL CABLE (See page BE-40)**11. INSTALL COMBINATION SWITCH WITH SPIRAL CABLE**

(a) Install the combination switch with the 3 screws.

(b) Connect the airbag connector.

(c) M/T:

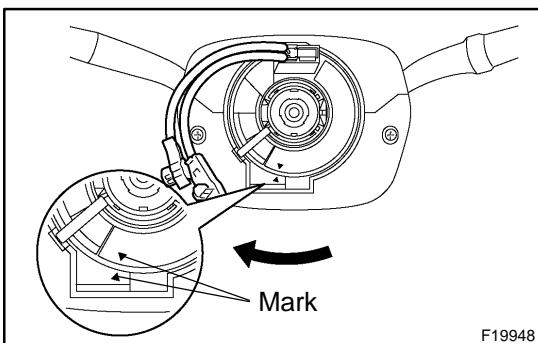
Connect the 3 connectors.

(d) A/T:

Connect the 4 connectors.

12. INSTALL UPPER AND LOWER COLUMN COVERS

Install the upper and lower column covers with the 3 screws.

**13. CENTER SPIRAL CABLE**

(a) Check that the front wheels are facing straight ahead.

(b) Turn the cable counterclockwise by hand until it feels firm.

(c) Then rotate the cable clockwise about 2.5 turns to align the marks.

HINT:

The cable will rotate about 2.5 turns to both the left and right from the center.

14. INSTALL STEERING WHEEL

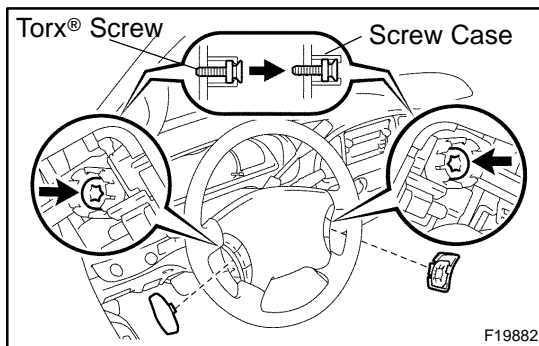
- (a) Align the matchmarks on the wheel and main shaft.
- (b) Install the wheel set nut.

Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

- (c) Connect the connector.

15. INSTALL STEERING WHEEL PAD**NOTICE:**

- ★ **Never use airbag parts from another vehicle. When replacing parts, replace with new ones.**
- ★ **Make sure the wheel pad is installed with the specified torque.**
- ★ **If the wheel pad has been dropped, or there are cracks, dents or other defects on the case or connector, replace the wheel pad with a new one.**
- ★ **When installing the wheel pad, take care that the wirings do not interfere with other parts and are not pinched between other parts.**
- ★ **When installing torx® screws, take care not to scratch other parts (ex. cruise control switch, lower cover) with a torx® socket wrench.**



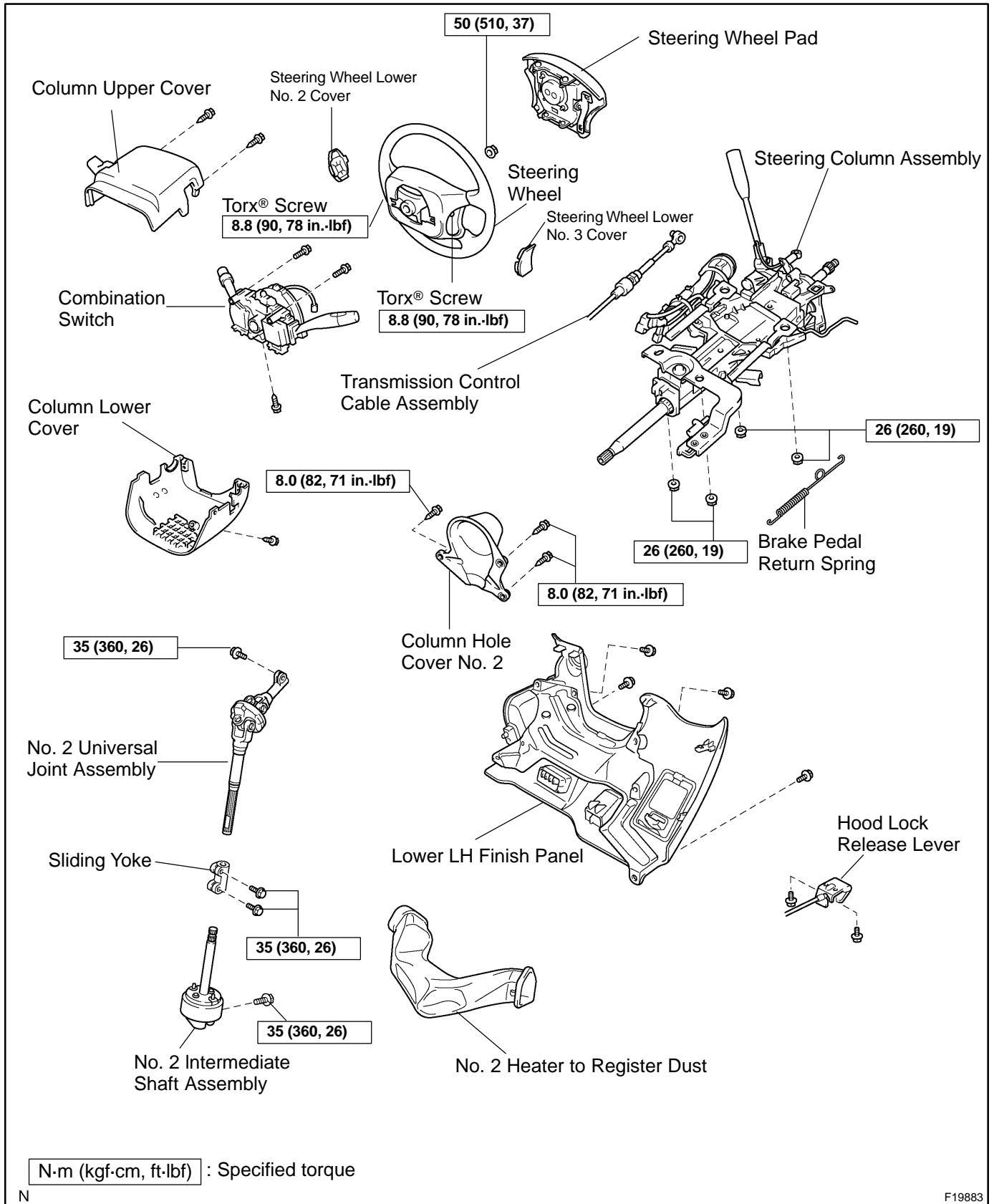
- (a) Connect the airbag connectors and horn terminal.
- (b) Install the wheel pad after confirming that the circumference groove of the torx® screw is caught on the screw case.
- (c) Using a torx® socket wrench, tighten the 2 screws while holding down the upper surface of the wheel pad properly to prevent the wheel pad from floating up.

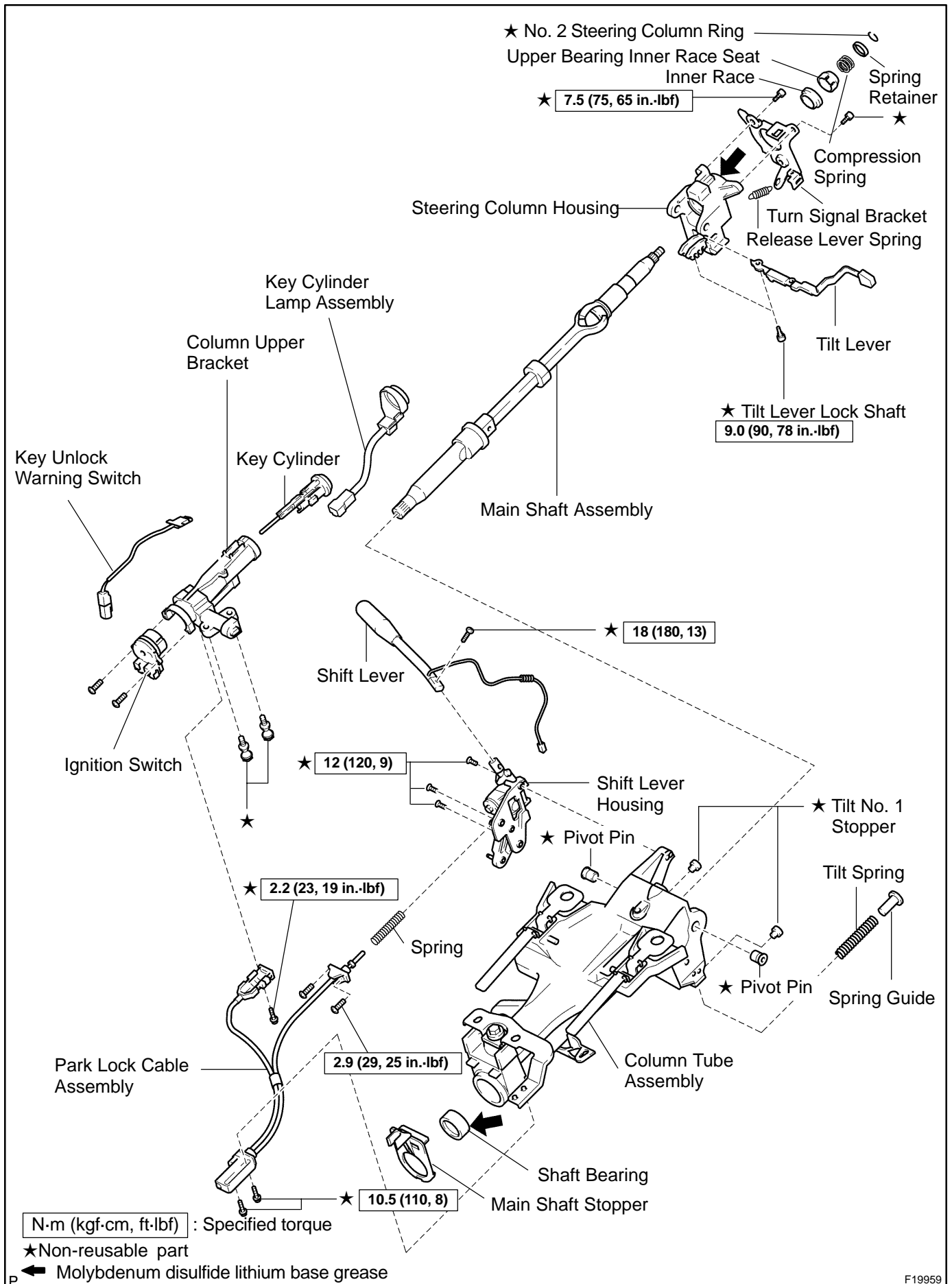
Torque: 8.8 N·m (90 kgf·cm, 78 in.-lbf)
- (d) Install the steering wheel lower No. 2 cover.
- (e) Install the steering wheel lower No. 3 cover.

16. CHECK STEERING WHEEL CENTER POINT**17. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

STEERING COLUMN (Double Cab) COMPONENTS

SR1KM-01





F19959

REMOVAL

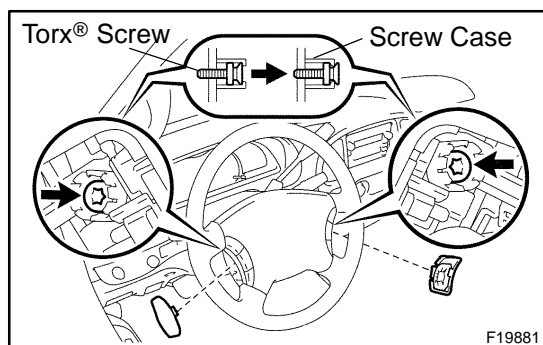
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

2. REMOVE STEERING WHEEL PAD

NOTICE:

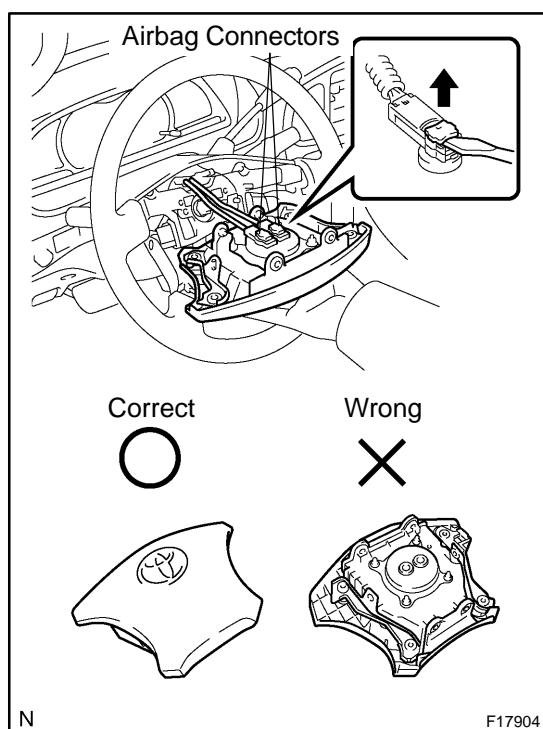
If the airbag connector is disconnected with the ignition switch in the ON or ACC position, DTCs will be recorded.



- Place the front wheels facing straight ahead.
- Remove the steering wheel lower No. 2 cover.
- Remove the steering wheel lower No. 3 cover.
- Using a torx® socket wrench, loosen the 2 torx® screws.

HINT:

Loosen each screw until the groove along the screw circumference is caught on the screw case.



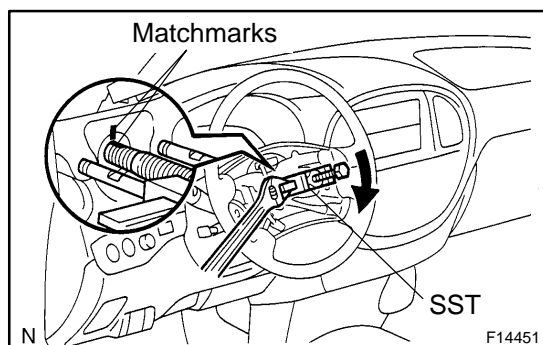
- Pull out the wheel pad from the steering wheel and disconnect the airbag connectors and horn terminal.

CAUTION:

- ★ When storing the wheel pad, keep the upper surface of the pad facing upward.
- ★ Never disassemble the wheel pad.

NOTICE:

When removing the wheel pad, take care not to pull the airbag wire harness.



3. REMOVE STEERING WHEEL

- Remove the steering wheel set nut.
- Put matchmarks on the steering wheel and main shaft assembly.
- Using SST, remove the wheel.
SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)
- Disconnect the connector.

4. REMOVE UPPER AND LOWER COLUMN COVERS

Remove the 3 screws, upper and lower column covers.

5. REMOVE COMBINATION SWITCH WITH SPIRAL CABLE

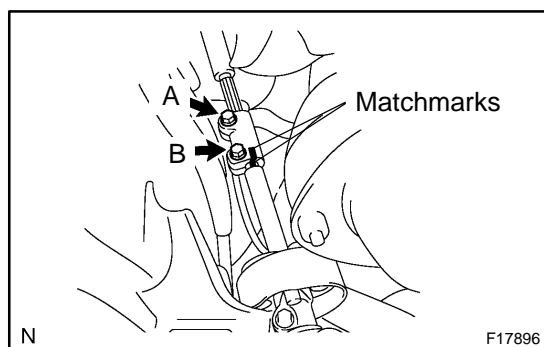
- (a) Disconnect the 4 connectors.
- (b) Disconnect the airbag connector.
- (c) Remove the 3 screws and combination switch.

6. REMOVE SPIRAL CABLE (See page BE-40)**NOTICE:**

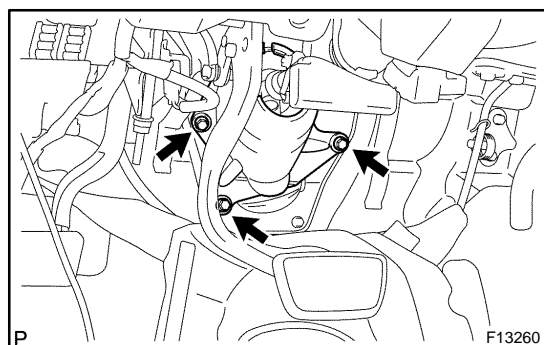
Do not disassemble the cable or apply oil to it.

7. REMOVE LOWER LH FINISH PANEL

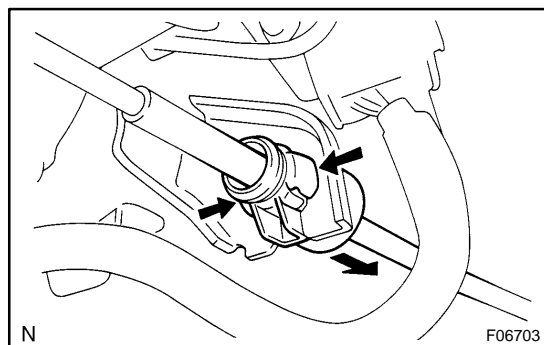
- (a) Remove the 2 screws and disconnect the hood lock release lever from the panel.
- (b) Remove the 4 panel set bolts and lower LH finish panel.

8. REMOVE NO. 2 HEATER TO REGISTER DUCT**9. REMOVE BRAKE PEDAL RETURN SPRING****10. REMOVE SLIDING YOKE**

- (a) Put matchmarks on the sliding yoke and No. 2 intermediate shaft assembly.
- (b) Remove the "A" bolt.
- (c) Remove the "B" bolt.
- (d) Slide the sliding yoke and remove it.

**11. REMOVE COLUMN HOLE COVER NO. 2**

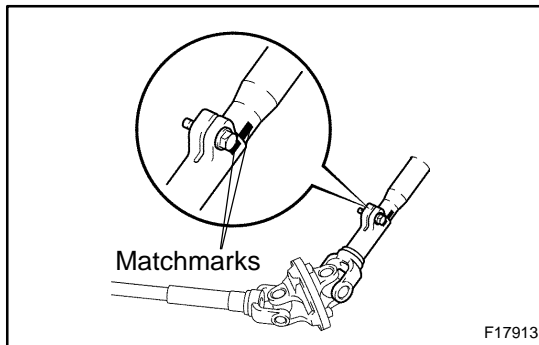
Remove the 3 bolts and column hole cover No. 2.

**12. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**

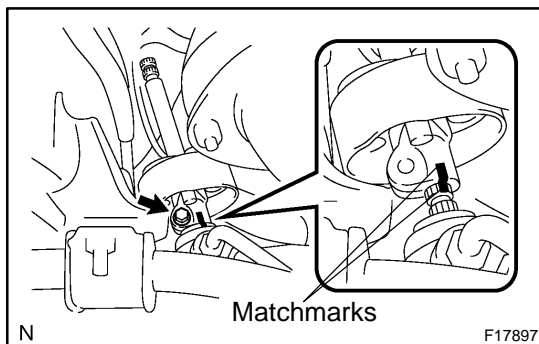
Disconnect the cable assembly from the column shift lever assembly.

13. REMOVE STEERING COLUMN ASSEMBLY WITH NO. 2 UNIVERSAL JOINT ASSEMBLY

- (a) Disconnect the connectors.
- (b) Remove the 4 steering column set nuts.
- (c) Pull out the steering column assembly with the No. 2 universal joint assembly.

**14. DISCONNECT NO. 2 UNIVERSAL JOINT ASSEMBLY**

- (a) Put matchmarks on the steering column assembly and No. 2 universal joint assembly.
- (b) Remove the bolt and No. 2 universal joint assembly.

**15. REMOVE NO. 2 INTERMEDIATE SHAFT ASSEMBLY**

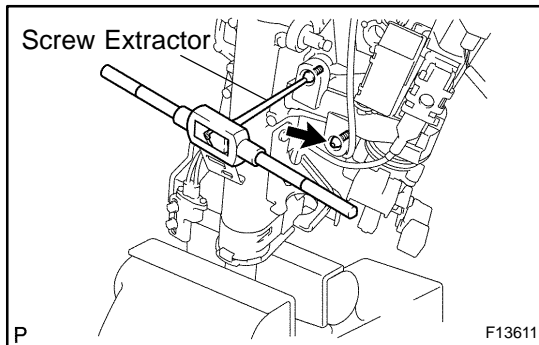
- (a) Put matchmarks on the No. 2 intermediate shaft assembly and control valve shaft.
- (b) Remove the bolt and No. 2 intermediate shaft assembly.

DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. REMOVE KEY CYLINDER LAMP ASSEMBLY



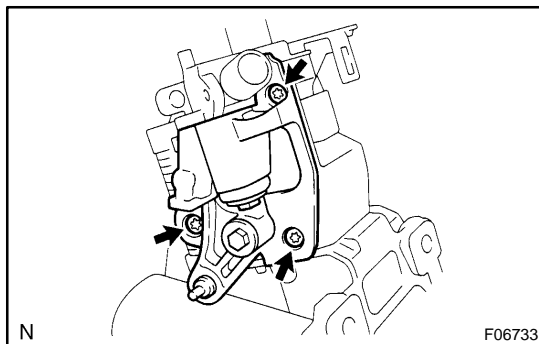
2. REMOVE COLUMN UPPER BRACKET

- Using a centering punch, mark the center of the 2 tapered-head bolts.
- Using a 3 to 4 mm (0.12 to 0.16 in.) drill, drill a hole into the 2 bolts.
- Using a screw extractor, remove the 2 bolts and column upper bracket.

3. REMOVE SHIFT LEVER

Using a torx® socket wrench, remove the torx® screw and shift lever.

4. REMOVE PARK LOCK CABLE ASSEMBLY (See page [AT-21](#))



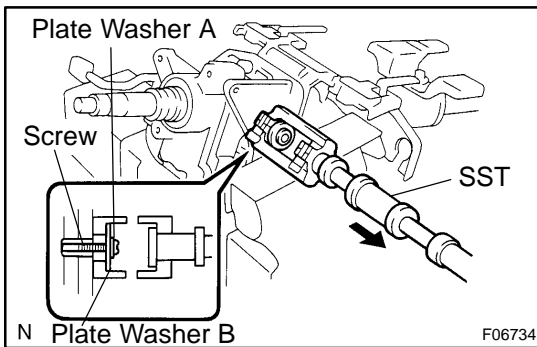
5. REMOVE SHIFT LEVER HOUSING

Using a torx® socket wrench, remove the 3 torx® screws and shift lever housing.

6. REMOVE RELEASE LEVER SPRING

7. REMOVE TURN SIGNAL BRACKET

Using a torx® socket wrench, remove the 2 torx® screws and turn signal bracket.



8. REMOVE STEERING COLUMN HOUSING WITH MAIN SHAFT ASSEMBLY

- (a) Set SST, 2 plate washers (18 and 36 mm outer diameter) and a screw (4.0 mm diameter, 0.7 mm pitch, 15.0 mm length), as shown in the illustration. Then remove the 2 pivot pins.

SST 09910-00015 (09911-0001 1, 09912-00010)

Reference

Plate washer A (18 mm): 90562-04012

Plate washer B (36 mm): 90201-10201

Screw: 90154-40015

- (b) Remove the column housing with the shaft assembly from the column tube assembly.

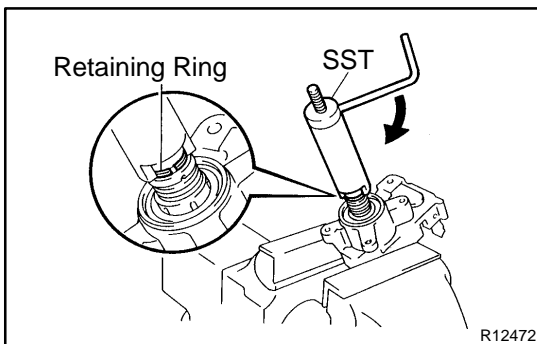
NOTICE:

Do not bend the universal joint of the main shaft assembly more than 15°.

- (c) Remove the tilt spring and spring guide.

9. REMOVE 2 TILT NO. 1 STOPPERS

10. REMOVE MAIN SHAFT STOPPER



11. REMOVE MAIN SHAFT ASSEMBLY

- (a) Install SST to the main shaft assembly, as shown in the illustration.

SST 09612-07010

- (b) Using SST, compress the compression spring.

SST 09612-07010

NOTICE:

Do not bend the universal joint of the shaft assembly more than 15°.

HINT:

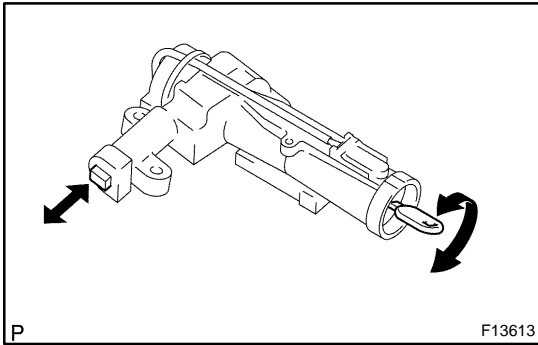
Hold the shaft assembly with your hand to prevent rotation.

- (c) Using a screwdriver, remove the No. 2 steering column ring.

- (d) Remove the spring retainer, compression spring, upper bearing inner race seat and inner race.

12. REMOVE TILT LEVER

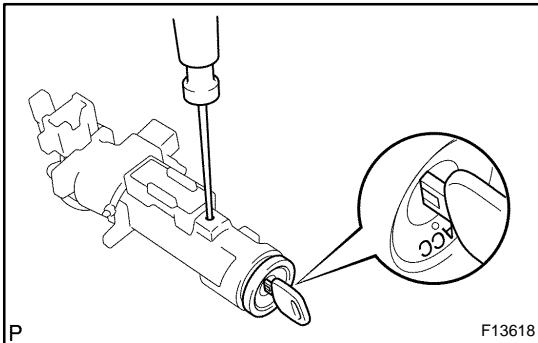
Remove the tilt lever lock shaft and shift lever.



INSPECTION

1. INSPECT STEERING LOCK OPERATION

Check that the steering lock mechanism operates properly.



2. IF NECESSARY, REPLACE KEY CYLINDER

- (a) Turn the ignition key to the ACC position.
- (b) Push down the stop pin with a screwdriver, and pull out the cylinder.
- (c) Install a new cylinder.

HINT:

Make sure that the key is in the ACC position.

3. INSPECT IGNITION SWITCH (See page BE-37)

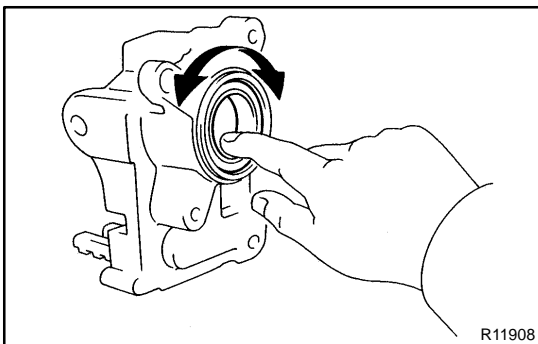
4. IF NECESSARY, REPLACE IGNITION SWITCH

- (a) Remove the 2 screws and ignition switch.
- (b) Install a new ignition switch with the 2 screws.

5. INSPECT KEY UNLOCK WARNING SWITCH (See page BE-37)

6. IF NECESSARY, REPLACE KEY UNLOCK WARNING SWITCH

- (a) Slide out the key unlock warning switch.
- (b) Install a new key unlock warning switch.

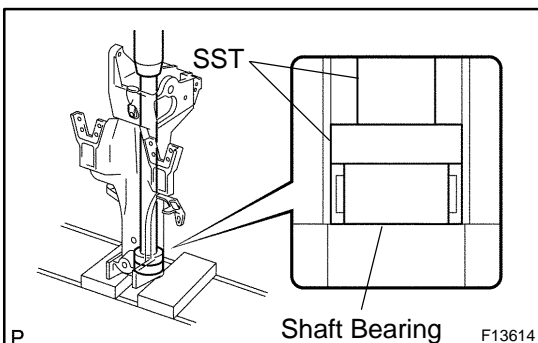


7. INSPECT BEARING

- (a) Check that the bearing rotates smoothly without abnormal noise.

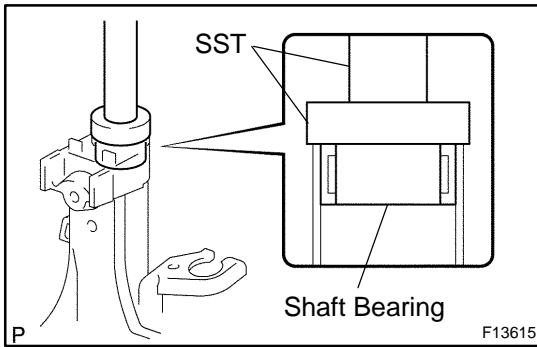
If it does not rotate smoothly or abnormal noise occurs, replace the column housing.

- (b) Coat the bearing with molybdenum disulfide lithium base grease.



8. IF NECESSARY, REPLACE SHAFT BEARING

- (a) Using SST and a press, press out the shaft bearing.
 SST 09950-60010 (09951-00400),
 09950-70010 (09951-07360)



- (b) Coat a new shaft bearing with molybdenum disulfide lithium base grease.
- (c) Using SST and a press, press in the shaft bearing.
SST 09950-60010 (09951-00460),
09950-70010 (09951-07150)

REASSEMBLY

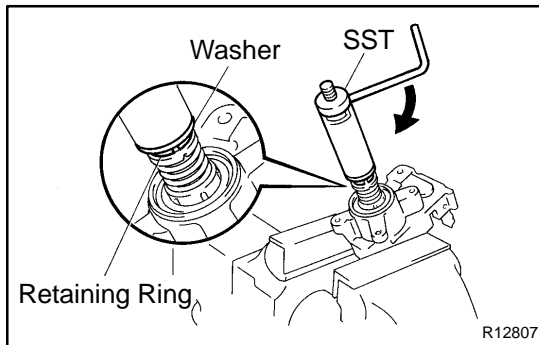
NOTICE:

When using a vise, do not overtighten it.

1. COAT PARTS INDICATED BY ARROWS WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See page SR-31)
2. INSTALL TILT LEVER

Install the tilt lever with a new tilt lever lock shaft.

Torque: 9.0 N·m (90 kgf·cm, 78 in.-lbf)



3. INSTALL MAIN SHAFT ASSEMBLY

- (a) Install the inner race, upper bearing inner race seat, compression spring and spring retainer.
- (b) Install a new No. 2 steering column ring to the main shaft assembly.
- (c) Install the washer of SST on the main shaft assembly.
SST 09612-07010
- (d) Set SST on the main shaft assembly, as shown in the illustration.
SST 09612-07010
- (e) Using SST, push down the retaining ring until it fits into the shaft groove and install the main shaft assembly.

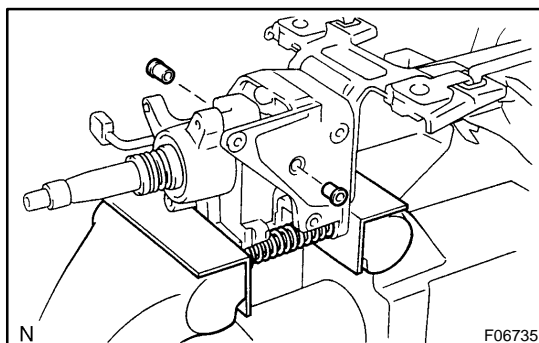
NOTICE:

Do not bend the universal joint of the shaft assembly more than 15°.

HINT:

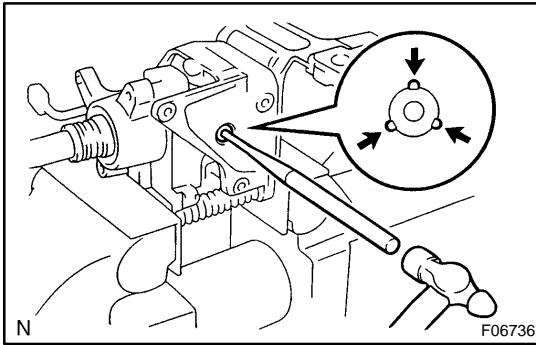
Hold the main shaft assembly with your hand to prevent rotation.

4. INSTALL MAIN SHAFT STOPPER
5. INSTALL 2 NEW TILT NO. 1 STOPPERS

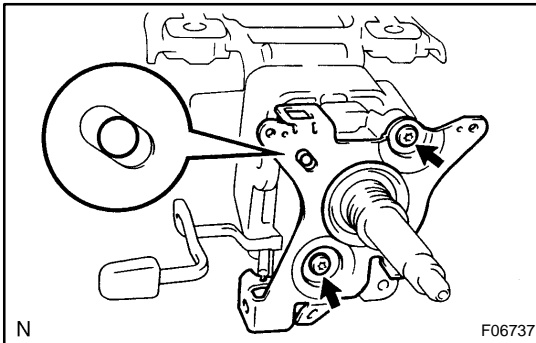


6. INSTALL STEERING COLUMN HOUSING WITH MAIN SHAFT ASSEMBLY

- (a) Install the steering column housing with the main shaft assembly into the column tube assembly.
- (b) Install the tilt spring and spring guide.
- (c) Hold the steering column housing and steering column housing support in a vise.
- (d) Temporarily install 2 new pivot pins.



- (e) Using a punch and a hammer, tap in the pivot pin.
 (f) Using a pin punch and a hammer, stake at 3 places evenly around the hole as shown in the illustration.



7. INSTALL TURN SIGNAL BRACKET

Using a torx® socket wrench, install the turn signal bracket with 2 new torx® screws.

Torque: 7.5 N·m (75 kgf·cm, 65 in.-lbf)

HINT:

Make sure that the protrusion on the steering column housing is fitted into the hole of the turn signal bracket.

8. INSTALL RELEASE LEVER SPRING

9. INSTALL SHIFT LEVER HOUSING

Using a torx® socket wrench, install the shift lever housing with 3 new torx® screws.

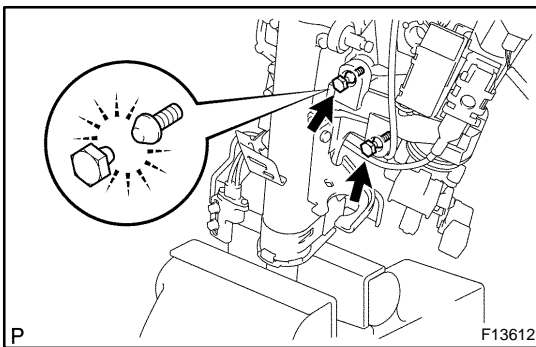
Torque: 12 N·m (120 kgf·cm, 9 ft-lbf)

10. INSTALL PARK LOCK CABLE ASSEMBLY (See page [AT-22](#))

11. INSTALL SHIFT LEVER

Using a torx® socket wrench, install the shift lever with a new torx® screw.

Torque: 18 N·m (180 kgf·cm, 13 ft-lbf)



12. INSTALL COLUMN UPPER BRACKET

- (a) Install the column upper bracket with 2 new tapered-head bolts.

HINT:

Insert the bracket pin into the column tube hole.

- (b) Tighten the tapered-head bolts until the bolt heads break off.

13. INSTALL KEY CYLINDER LAMP ASSEMBLY

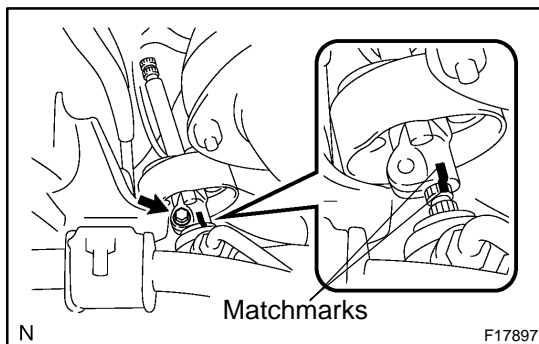
INSTALLATION

NOTICE:

When replacing the steering angle sensor, drive the vehicle straight ahead at a speed of 6.5 mph (10.5 km/h) or more. Accordingly, zero point calibration of the steering angle sensor is performed.

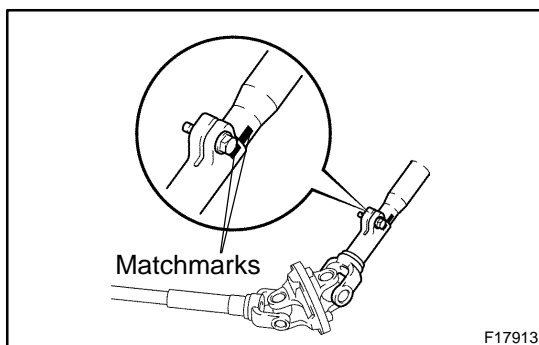
HINT:

If the steering angle sensor zero point calibration is not performed, its value will be fixed. Check after driving the vehicle straight ahead at a speed of 6.5 mph (10.5 km/h) or more (See page [DI-1568](#)).



1. **INSTALL NO. 2 INTERMEDIATE SHAFT ASSEMBLY**
 - (a) Align the matchmark on the No. 2 intermediate shaft assembly with the one on the control valve shaft.
 - (b) Install the bolt.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)



2. **CONNECT NO. 2 UNIVERSAL JOINT ASSEMBLY**
 - (a) Insert the column hole cover No. 2.
 - (b) Align the matchmarks on the column assembly and No. 2 universal joint assembly.
 - (c) Install the bolt.

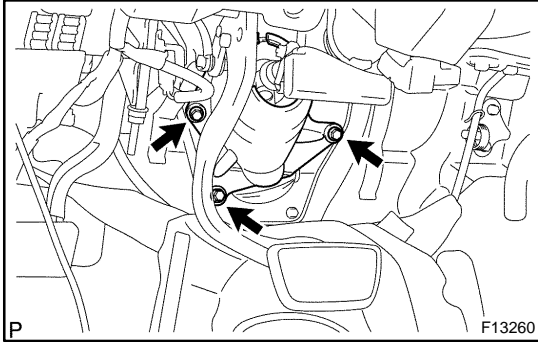
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

3. **INSTALL STEERING COLUMN ASSEMBLY WITH NO. 2 UNIVERSAL JOINT ASSEMBLY**

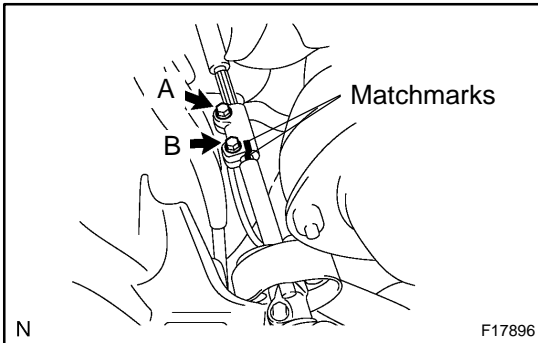
- (a) Install the column assembly with the No. 2 universal joint assembly.
 - (b) Install the 4 steering column set nuts.
- Torque: 26 N·m (260 kgf·cm, 19 ft·lbf)**
- (c) Connect the connectors.

4. **CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**

Connect the cable assembly to the shift lever assembly.

**5. INSTALL COLUMN HOLE COVER NO. 2**

Install the column hole cover No. 2 to the body with the 3 bolts.
Torque: 8.0 N-m (82 kgf-cm, 71 ft-lbf)

**6. INSTALL SLIDING YOKE**

(a) Align the matchmark on the sliding yoke with the one on the No. 2 intermediate shaft assembly.

(b) Install the "B" bolt.

Torque: 35 N-m (360 kgf-cm, 26 ft-lbf)

(c) Install the "A" bolt.

Torque: 35 N-m (360 kgf-cm, 26 ft-lbf)

7. INSTALL BRAKE PEDAL RETURN SPRING**8. INSTALL NO. 2 HEATER TO REGISTER DUCT****9. INSTALL LOWER LH FINISH PANEL**

(a) Install the lower LH finish panel with the 4 bolts.

(b) Connect the hood lock release lever with the 2 screws.

10. INSTALL SPIRAL CABLE (See page BE-40)**11. INSTALL COMBINATION SWITCH WITH SPIRAL CABLE**

(a) Install the combination switch with the 3 screws.

(b) Connect the airbag connector.

(c) Connect the 4 connectors.

12. INSTALL UPPER AND LOWER COLUMN COVERS

Install the upper and lower column covers with the 3 screws.

13. CENTER SPIRAL CABLE

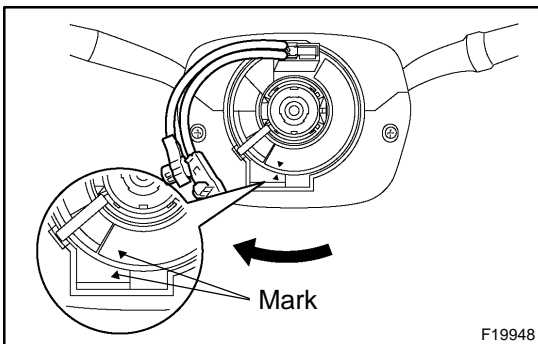
(a) Check that the front wheels are facing straight ahead.

(b) Turn the cable counterclockwise by hand until it feels firm.

(c) Then rotate the cable clockwise about 2.5 turns to align the marks.

HINT:

The cable will rotate about 2.5 turns to both the left and right from the center.

**14. INSTALL STEERING WHEEL**

(a) Align the matchmarks on the wheel and main shaft.

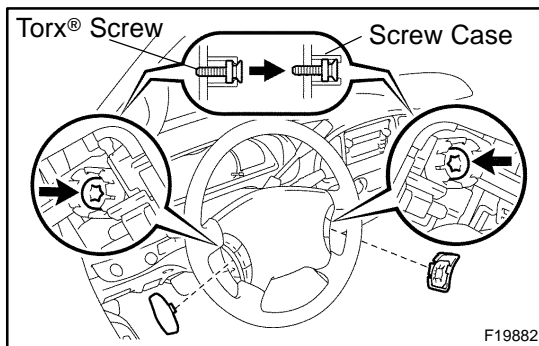
(b) Install the wheel set nut.

Torque: 50 N-m (510 kgf-cm, 37 ft-lbf)

(c) Connect the connector.

15. INSTALL STEERING WHEEL PAD**NOTICE:**

- ★ **Never use airbag parts from another vehicle. When replacing parts, replace with new ones.**
- ★ **Make sure the wheel pad is installed with the specified torque.**
- ★ **If the wheel pad has been dropped, or there are cracks, dents or other defects on the case or connector, replace the wheel pad with a new one.**
- ★ **When installing the wheel pad, take care that the wirings do not interfere with other parts and are not pinched between other parts.**
- ★ **When installing torx® screws, take care not to scratch other parts (ex. cruise control switch, lower cover) with a torx® socket wrench.**

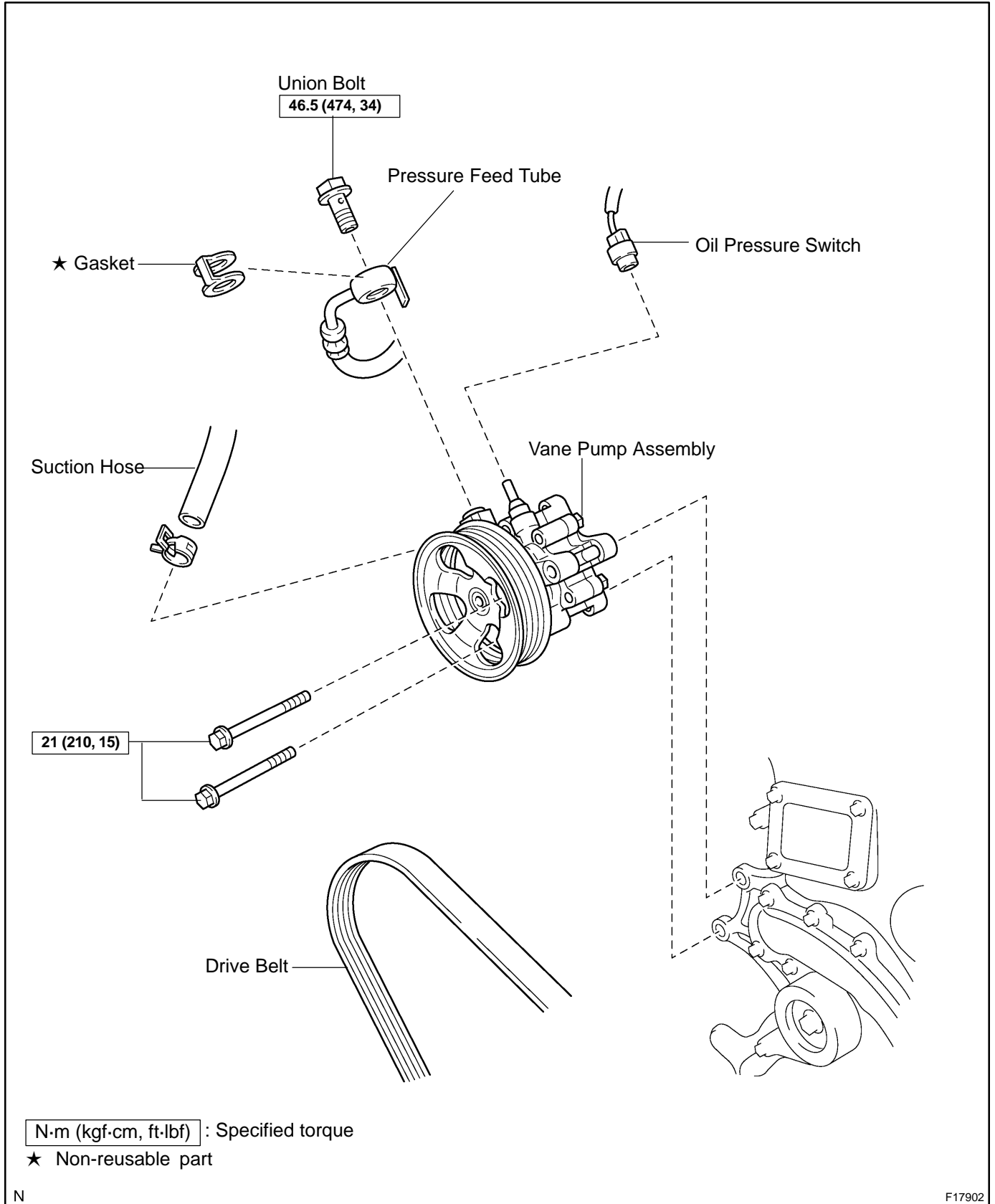


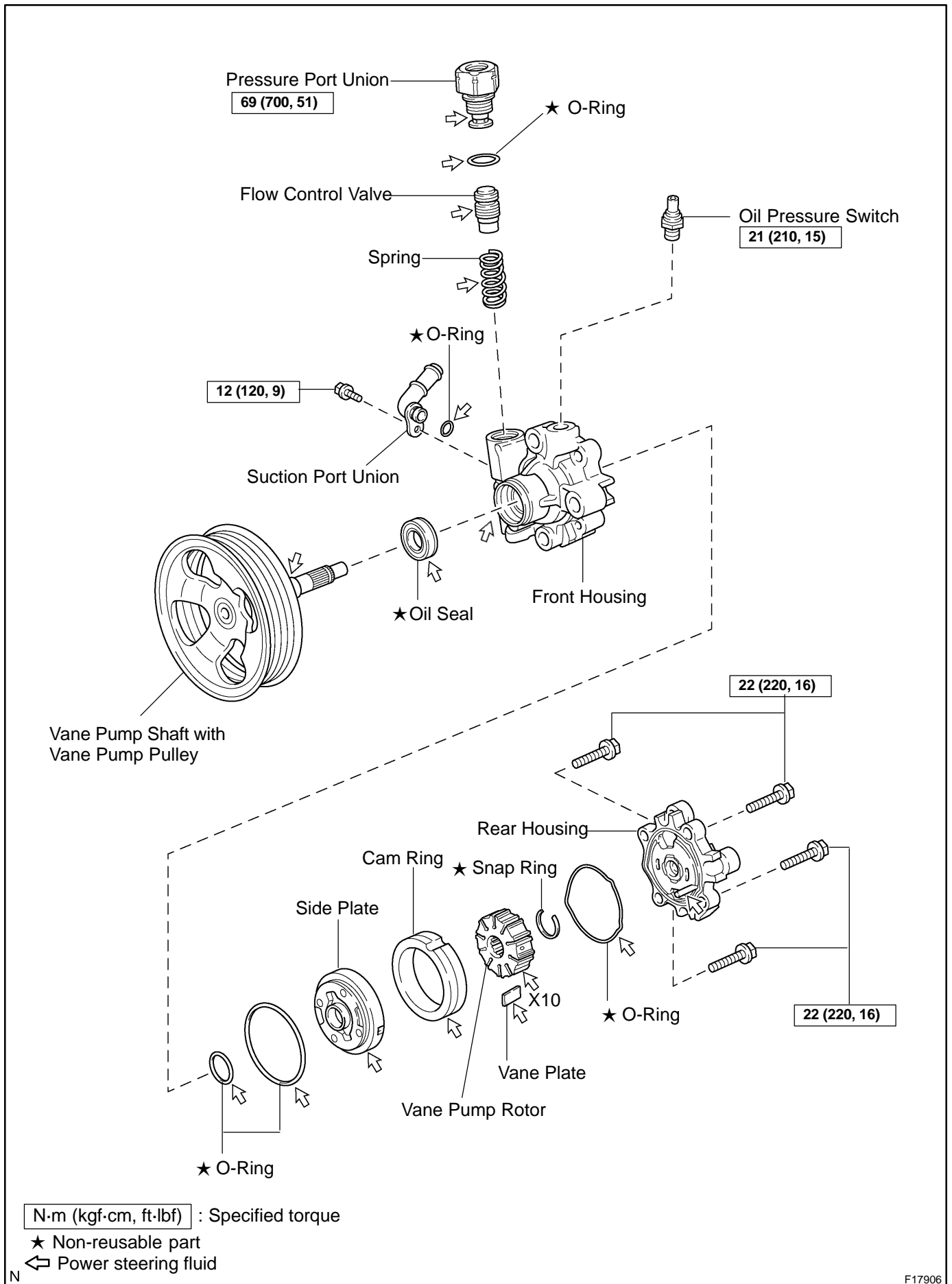
- (a) Connect the airbag connectors and horn terminal.
- (b) Install the wheel pad after confirming that the circumference groove of the torx® screw is caught on the screw case.
- (c) Using a torx® socket wrench, tighten the 2 screws while holding down the upper surface of the wheel pad properly to prevent the wheel pad from floating up.
Torque: 8.8 N·m (90 kgf·cm, 78 in.-lbf)
- (d) Install the steering wheel lower No. 2 cover.
- (e) Install the steering wheel lower No. 3 cover.

16. CHECK STEERING WHEEL CENTER POINT**17. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

POWER STEERING VANE PUMP (1GR-FE) COMPONENTS

SR1KS-01





N·m (kgf·cm, ft·lbf) : Specified torque

★ Non-reusable part

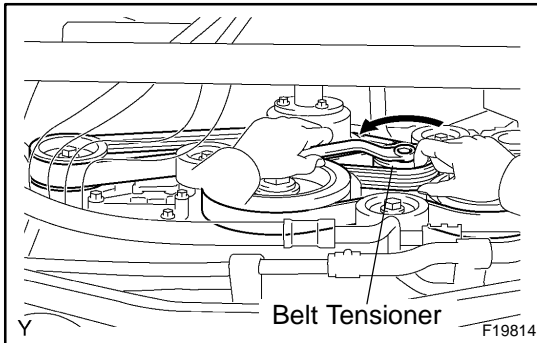
↔ Power steering fluid

N

F17906

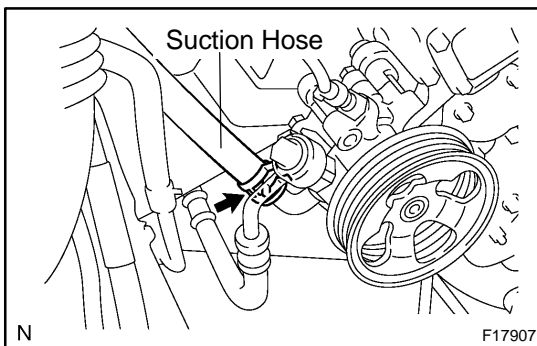
REMOVAL

1. REMOVE ENGINE UNDER COVER



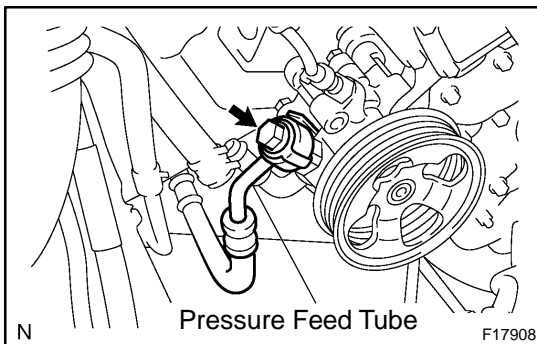
2. REMOVE DRIVE BELT

While releasing the belt tension by turning the belt tensioner counterclockwise, remove the drive belt.



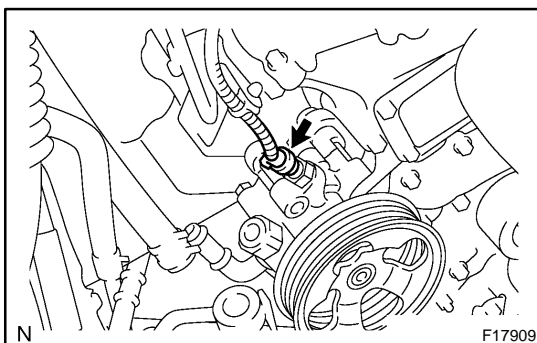
3. DISCONNECT SUCTION HOSE

Remove the clip and disconnect the suction hose.



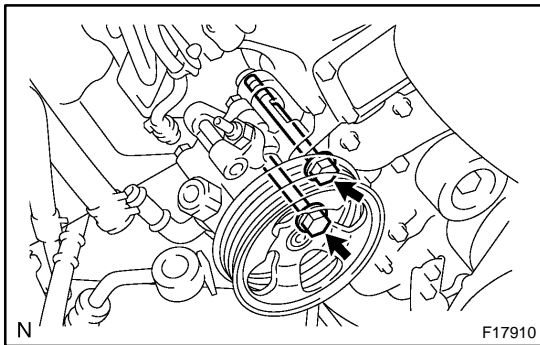
4. DISCONNECT PRESSURE FEED TUBE

- (a) Remove the bolt and disconnect the pressure feed tube.
- (b) Remove the gasket.

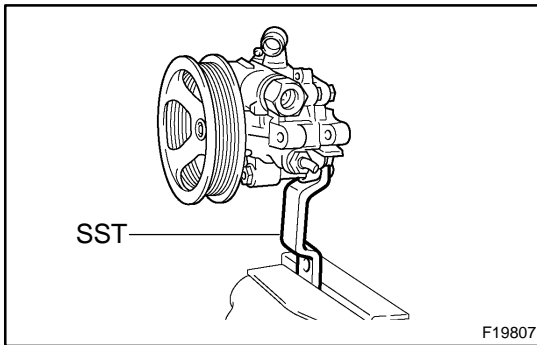


5. REMOVE VANE PUMP ASSEMBLY

- (a) Disconnect the oil pressure switch connector.



(b) Remove the 2 bolts and vane pump assembly.



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. FIX VANE PUMP ASSEMBLY

- (a) Using SST, hold the vane pump assembly in a vise.
SST 09630-00014 (09631-00132)

HINT:

Detach SST depending on the situation.

2. REMOVE SUCTION PORT UNION

- (a) Remove the bolt and suction port union.
- (b) Remove the O-ring from the suction port union.

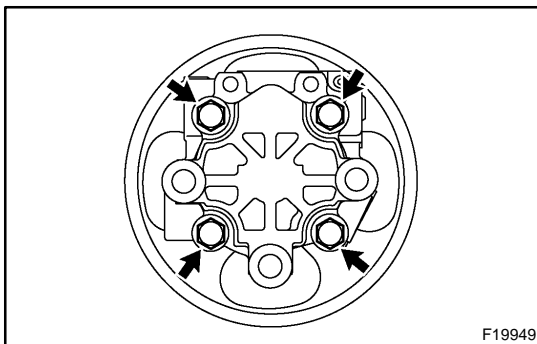
3. REMOVE PRESSURE PORT UNION, FLOW CONTROL VALVE AND SPRING

- (a) Remove the pressure port union, flow control valve and spring.
- (b) Remove the O-ring from the pressure port union.

4. REMOVE OIL PRESSURE SWITCH

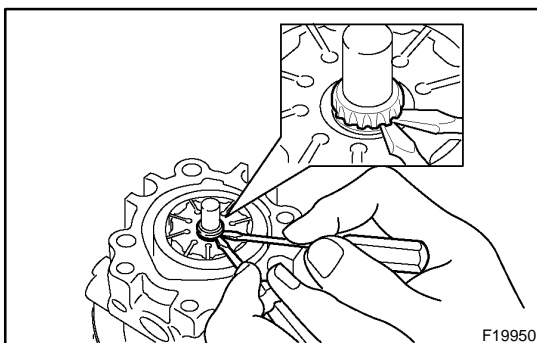
NOTICE:

If the oil pressure switch is dropped or damaged, replace it with a new one.



5. REMOVE REAR HOUSING

- (a) Remove the 4 bolts and rear housing.
- (b) Remove the O-ring from the rear housing.



6. REMOVE VANE PUMP SHAFT WITH VANE PUMP PULLEY

- (a) Using 2 screwdrivers, remove the snap ring from the vane pump shaft with vane pump pulley.
- (b) Remove the vane pump shaft with vane pump pulley.

NOTICE:

Be careful not to drop or damage the vane pump shaft with vane pump pulley. If it is damaged, replace the vane pump assembly.

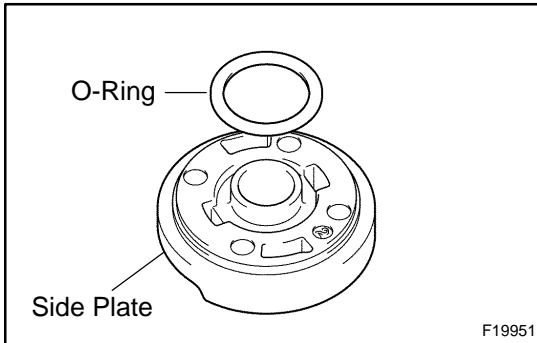
7. REMOVE 10 VANE PLATES AND VANE PUMP ROTOR

- (a) Remove the 10 vane plates.

NOTICE:

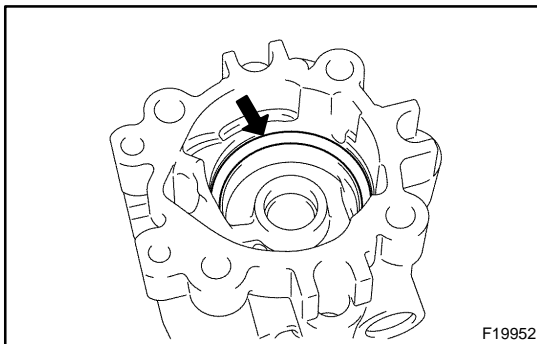
Take care not to drop the vane plate.

- (b) Remove the vane pump rotor.

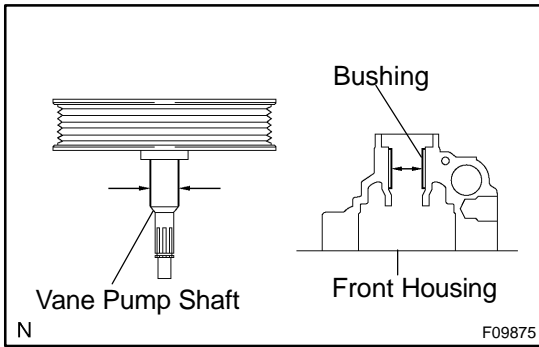
8. REMOVE CAM RING**9. REMOVE SIDE PLATE**

- (a) Remove the side plate from the front housing.

- (b) Remove the O-ring from the side plate.



- (c) Remove the O-ring from the front housing.



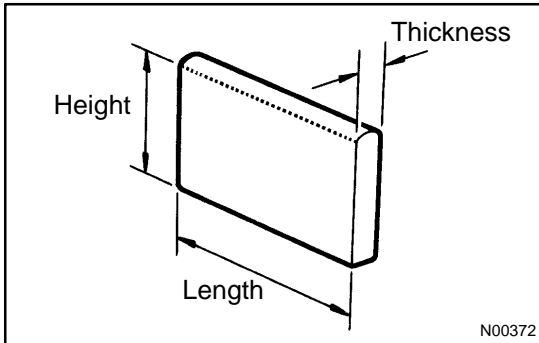
INSPECTION

1. MEASURE OIL CLEARANCE BETWEEN VANE PUMP SHAFT AND BUSHING

Using a micrometer and a caliper gauge, measure the oil clearance.

Maximum clearance: 0.07 mm (0.0028 in.)

If it is more than the maximum, replace the vane pump assembly.

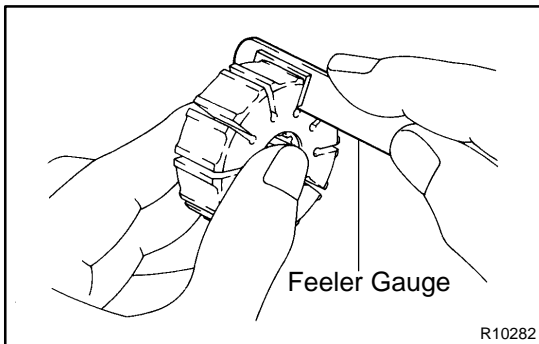


2. INSPECT VANE PUMP ROTOR AND VANE PLATES

(a) Using a micrometer, measure the thickness of the 10 vane plates.

Standard thickness:

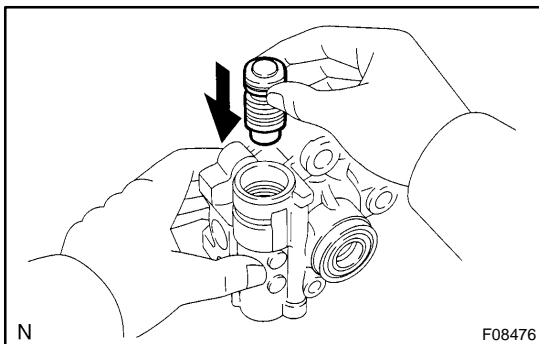
1.405 to 1.411 mm (0.05531 to 0.05555 in.)



(b) Using a feeler gauge, measure the clearance between a side face of the vane pump rotor groove and the vane plate.

Maximum clearance: 0.03 mm (0.0012 in.)

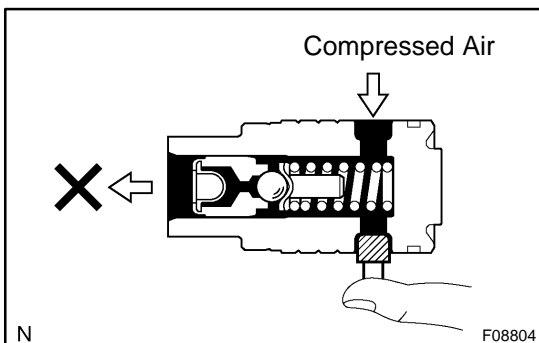
If it is more than the maximum, replace the vane pump assembly.



3. INSPECT FLOW CONTROL VALVE

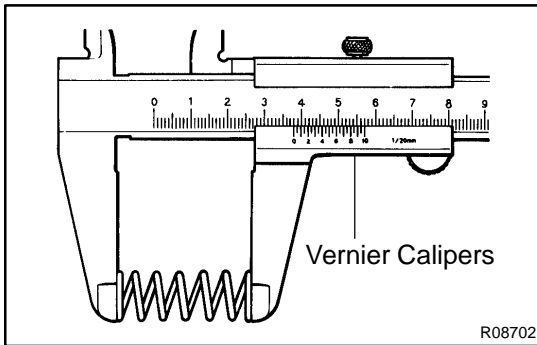
(a) Coat the flow control valve with power steering fluid and check that it falls smoothly into the valve hole of the front housing under its own weight.

If it lacks smoothness, replace the vane pump assembly.



(b) Check the flow control valve for leakage. Close one of the holes and apply compressed air of 392 to 490 kPa (4 to 5 kgf/cm², 57 to 71 psi) into the opposite side hole, and confirm that air does not come out from the end hole.

If air leaks, replace the vane pump assembly.



4. INSPECT SPRING

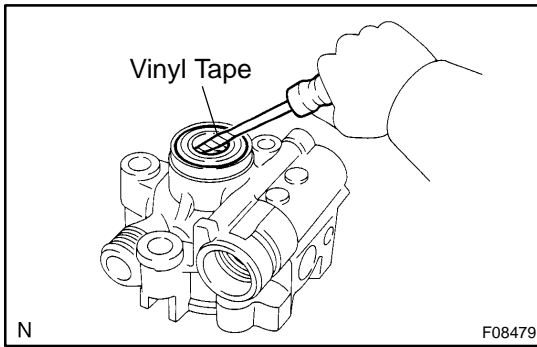
Using vernier calipers, measure the free length of the spring.

Minimum free length: 36.9 mm (1.453 in.)

If it is not within the specification, replace the vane pump assembly.

5. INSPECT PRESSURE PORT UNION

If the union seat in the pressure port union is severely damaged, it may cause fluid leakage. In that case, replace the vane pump assembly.



REPLACEMENT

NOTICE:

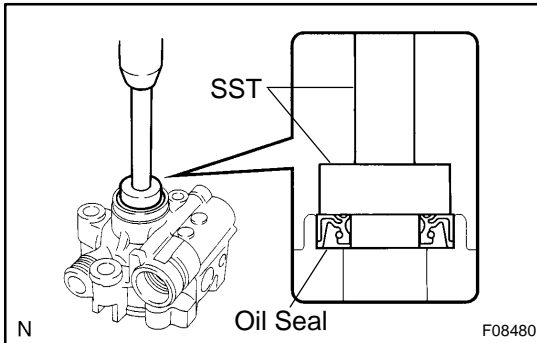
When using a vise, do not overtighten it.

IF NECESSARY, REPLACE OIL SEAL

- (a) Using a screwdriver with vinyl tape wound around its tip, remove the oil seal.

NOTICE:

Be careful not to damage the bushing of the front housing.



- (b) Coat a new oil seal lip with power steering fluid.

- (c) Using SST, press in the oil seal.

SST 09950-60010 (09951-00280),
09950-70010 (09951-07100)

NOTICE:

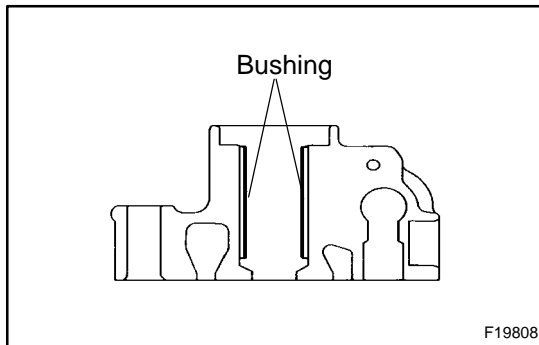
Make sure that the oil seal is installed in the correct direction.

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT PARTS INDICATED BY ARROWS WITH POWER STEERING FLUID (See page [SR-45](#))

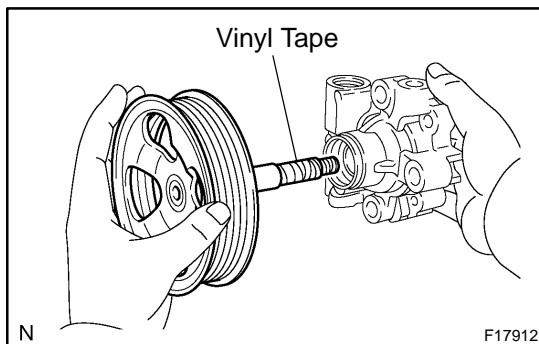


2. INSTALL VANE PUMP SHAFT WITH VANE PUMP PULLEY

- (a) Coat the inside surface of the bushing in the front housing with power steering fluid.
- (b) Gradually insert the vane pump shaft.

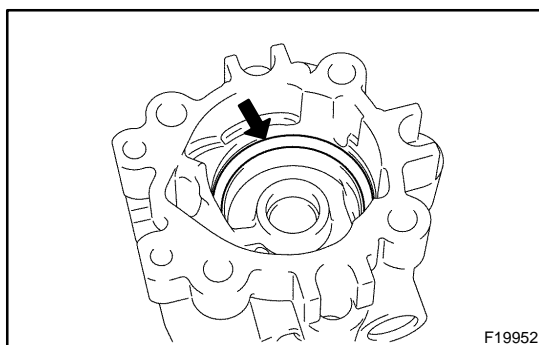
NOTICE:

Do not damage the oil seal lip in the front housing.



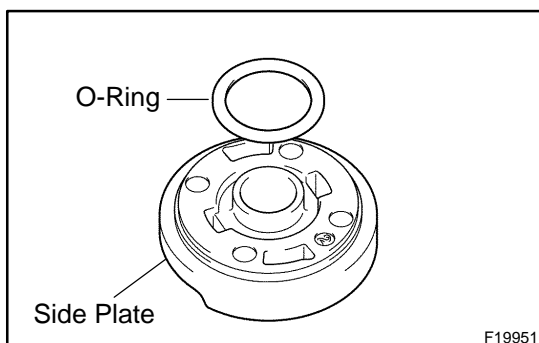
HINT:

Wrap the shaft surface with vinyl tape before inserting.

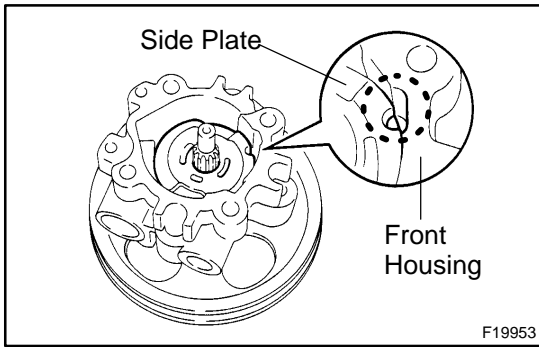


3. INSTALL SIDE PLATE

- (a) Coat a new O-ring with power steering fluid, and install it to the front housing.



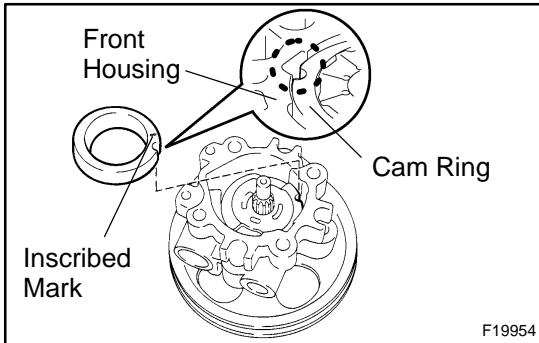
- (b) Coat a new O-ring with power steering fluid, and install it to the side plate.



(c) Align the dent of the side plate with the dent of the front housing, and install the side plate.

NOTICE:

Make sure that the side plate is installed in the correct direction.

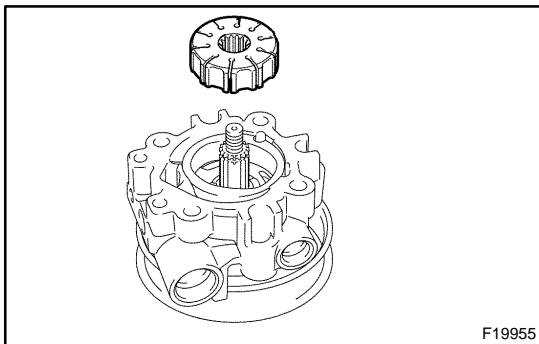


4. INSTALL CAM RING

Align the dent of the cam ring with the dent of the side plate, and install the cam ring with the inscribed mark facing outward.

NOTICE:

Make sure that the cam ring is installed in the correct direction.

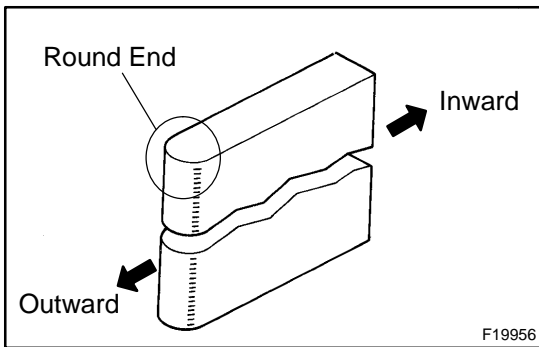


5. INSTALL VANE PUMP ROTOR

(a) Install the vane pump rotor.

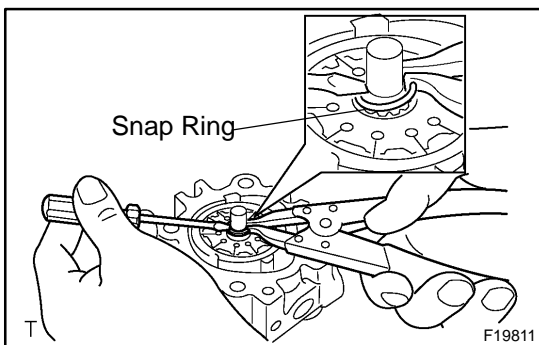
HINT:

Vane pump rotor has no specific direction.

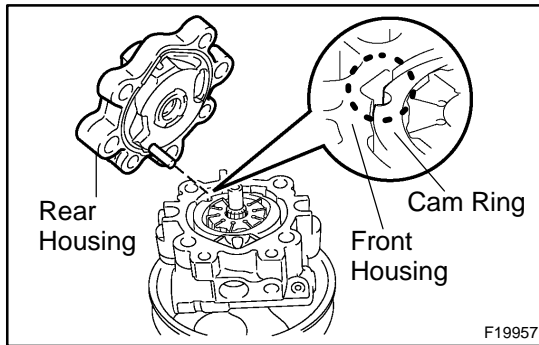


(b) Coat 10 vane plates with power steering fluid.

(c) Install the 10 vane plates with the round end facing outward.

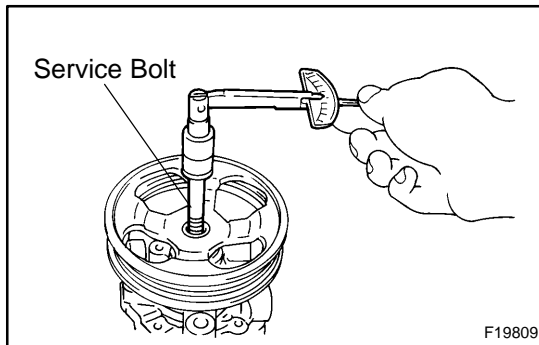


(d) Using a screwdriver and a snap ring expander, install a new snap ring to the vane pump shaft.

**6. INSTALL REAR HOUSING**

- (a) Coat a new O-ring with power steering fluid, and install it to the rear housing.
- (b) Align the straight pin of the rear housing with the dents of the cam ring, side plate and front housing, and install the rear housing with the 4 bolts.

Torque: 22 N·m (220 kgf-cm, 16 ft-lbf)

**7. INSPECT PRELOAD**

- (a) Check that the pump rotates smoothly without abnormal noise.

- (b) Temporarily install the service bolt.

Recommended service bolt:

Thread diameter: 10 mm (0.39 in.)

Thread pitch: 1.25 mm (0.0492 in.)

Bolt length: 50 mm (1.97 in.)

- (c) Using a torque wrench, check the pump rotating torque.

Rotating torque:

0.27 N·m (2.8 kgf-cm, 2.4 in.-lbf) or less

If the rotating torque is not as specified above, check the installation of the vane pump housing oil seal.

8. INSTALL OIL PRESSURE SWITCH

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

9. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION

- (a) Coat the spring and flow control valve with power steering fluid.

- (b) Install the spring.

- (c) Install the flow control valve in the correct direction (See page [SR-45](#)).

- (d) Coat a new O-ring with power steering fluid, and install it to the pressure port union.

- (e) Install the pressure port union.

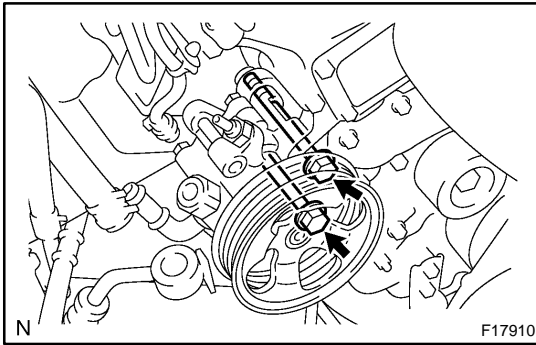
Torque: 69 N·m (700 kgf-cm, 51 ft-lbf)

10. INSTALL SUCTION PORT UNION

- (a) Coat a new O-ring with power steering fluid, and install it to the suction port union.

- (b) Install the suction port union with the bolt.

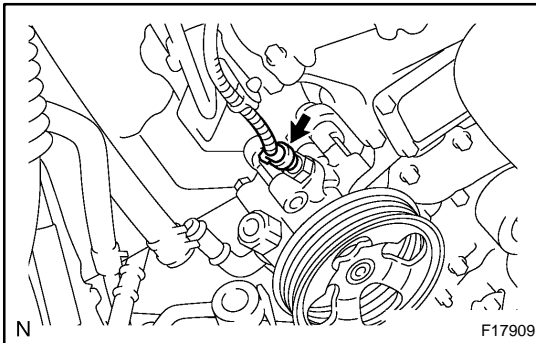
Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)



INSTALLATION

1. INSTALL VANE PUMP ASSEMBLY

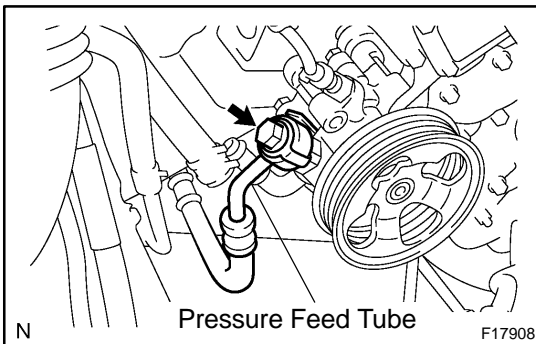
- (a) Install the vane pump assembly with the 2 bolts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



- (b) Connect the oil pressure switch connector.

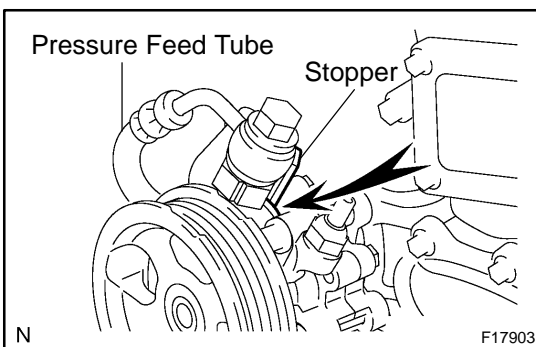
NOTICE:

Be careful that the oil does not come into contact with the connector.



2. CONNECT PRESSURE FEED TUBE

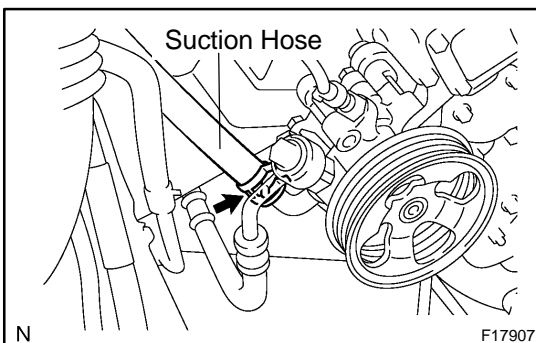
- (a) Install a new gasket to the pressure feed tube.
 (b) Install the pressure feed tube with the union bolt.



HINT:

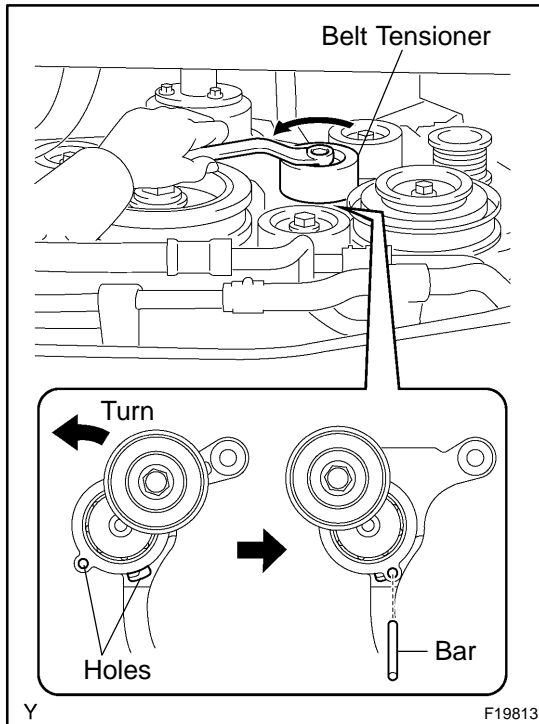
Make sure that the stopper of the pressure feed tube contacts the pump housing as shown in the illustration.

- (c) Tighten the union bolt.
Torque: 46.5 N·m (474 kgf·cm, 34 ft·lbf)

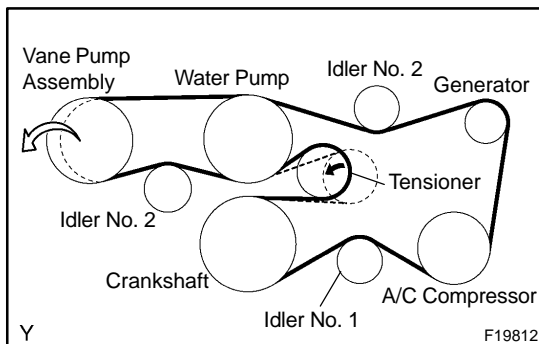


3. CONNECT SUCTION HOSE

Connect the suction hose with the clip.

**4. INSTALL DRIVE BELT**

- (a) While turning the belt tensioner counterclockwise, align the holes, and then insert a bar of 6 mm (0.24 in.) into the holes to fix the belt tensioner.
- (b) Install the drive belt.
- (c) While turning the belt tensioner counterclockwise, remove the bar.

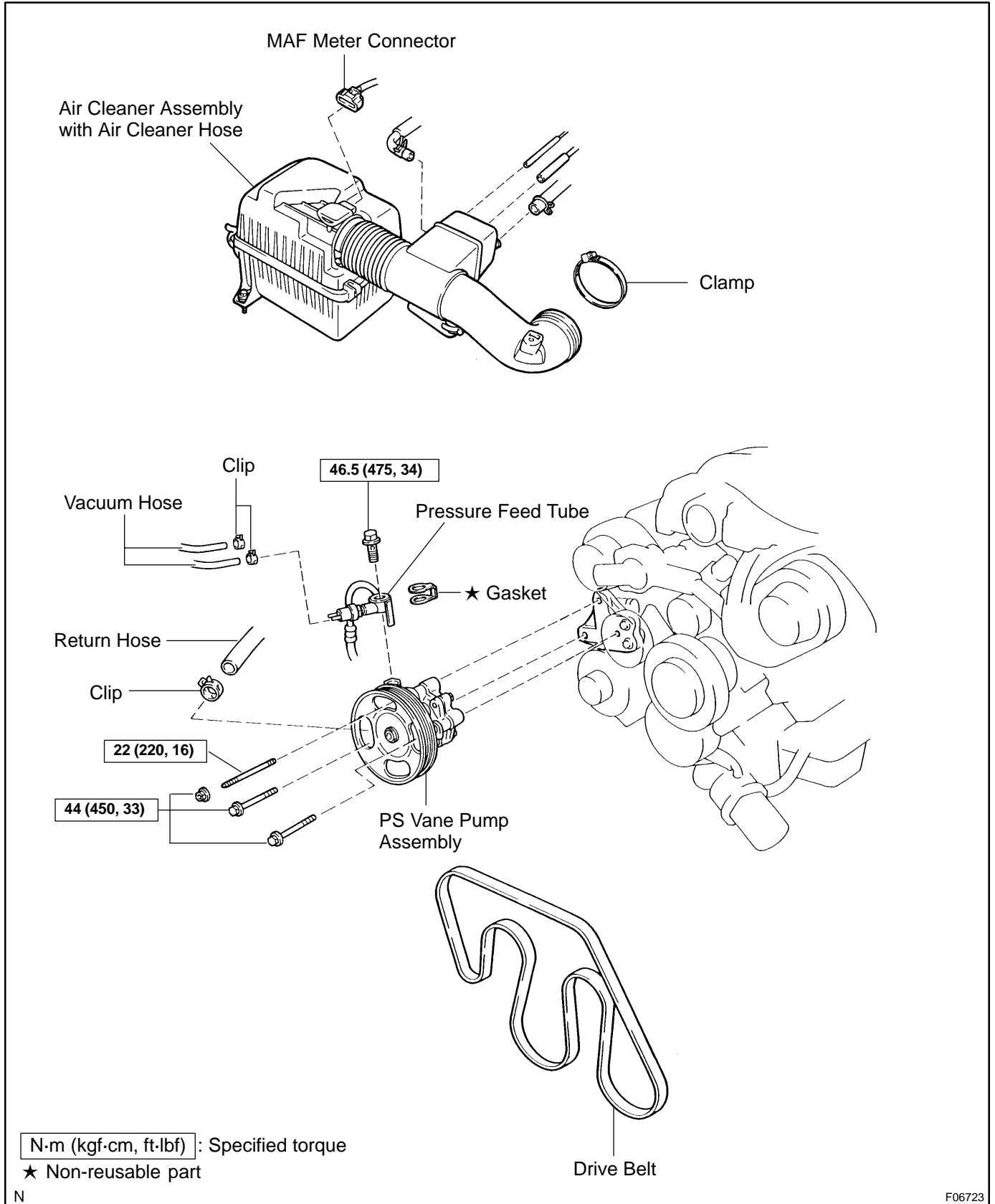


- (d) If it is hard to install the drive belt, perform the following procedure:
 - (1) Wrap the drive belt around all the pulleys and idlers, except for the vane pump assembly, as shown in the illustration.
 - (2) While releasing belt tension by turning the belt tensioner counterclockwise, wrap the drive belt around the vane pump assembly.

- 5. ADD POWER STEERING FLUID**
- 6. BLEED POWER STEERING FLUID**
- 7. INSPECT FLUID LEAK**
- 8. INSTALL ENGINE UNDER COVER**

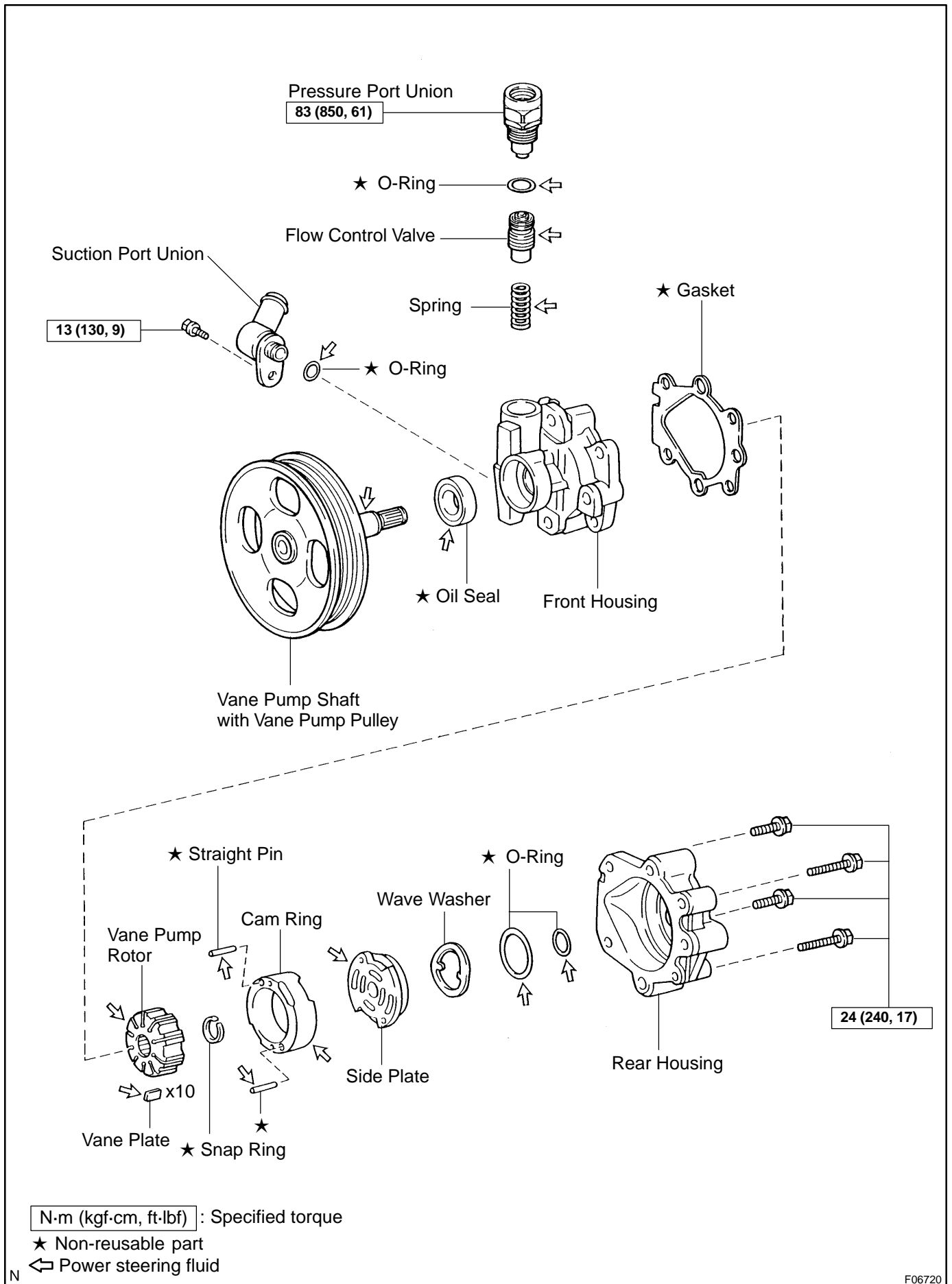
POWER STEERING VANE PUMP (2UZ-FE) COMPONENTS

SR0MD-14



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F06723



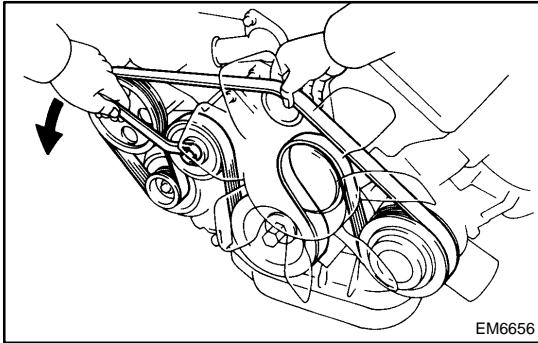
N

F06720

REMOVAL

1. REMOVE AIR CLEANER ASSEMBLY WITH AIR CLEANER HOSE

- (a) Disconnect the MAF meter connector.
- (b) Disconnect the hoses.
- (c) Remove the clamp.
- (d) Remove the 3 bolts and air cleaner assembly with air cleaner hose connected.



2. REMOVE DRIVE BELT

Loosen the drive belt tension by turning the drive belt tensioner counterclockwise, and remove the drive belt.

3. DISCONNECT 2 VACUUM HOSES

Remove the 2 clips and disconnect the 2 vacuum hoses.

4. DISCONNECT RETURN HOSE

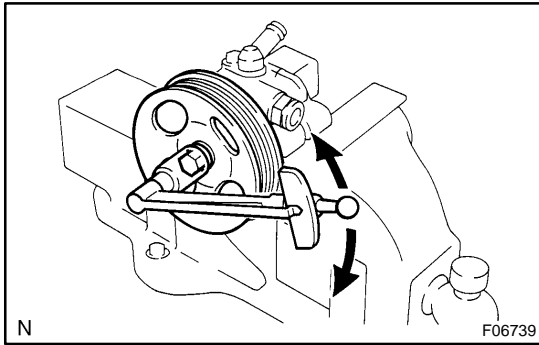
Remove the clip and disconnect the return hose.

5. DISCONNECT PRESSURE FEED TUBE

Remove the union bolt and gasket, disconnect the pressure feed tube.

6. REMOVE PS VANE PUMP ASSEMBLY

Remove the 2 bolts, nut, stud bolt and PS vane pump assembly.



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. MEASURE PS VANE PUMP ROTATING TORQUE

- (a) Check that the pump rotates smoothly without abnormal noise.
- (b) Temporarily install the bolt.
- (c) Using a torque wrench, check the pump rotating torque.

Rotating torque:

0.28 N·m (2.8 kgf·cm, 2.4 in.-lbf) or less

2. REMOVE SUCTION PORT UNION

- (a) Remove the bolt and suction port union.
- (b) Remove the O-ring from the union.

3. REMOVE PRESSURE PORT UNION, FLOW CONTROL VALVE AND SPRING

- (a) Remove the pressure port union, the flow control valve and spring.
- (b) Remove the O-ring from the pressure port union.

4. REMOVE REAR HOUSING

- (a) Remove the 4 bolts and rear housing.

HINT:

If the wave washer and side plate are stuck to the rear housing, lightly tap the rear housing with a plastic hammer, and remove the wave washer and side plate.

- (b) Remove the 2 O-rings from the rear housing.

5. REMOVE WAVE WASHER

6. REMOVE SIDE PLATE

7. REMOVE GASKET

8. REMOVE CAM RING, 10 VANE PLATES AND VANE PUMP ROTOR

- (a) Using a screwdriver, remove the snap ring from the vane pump shaft.
- (b) Remove the cam ring, 10 vane plates and vane pump rotor.

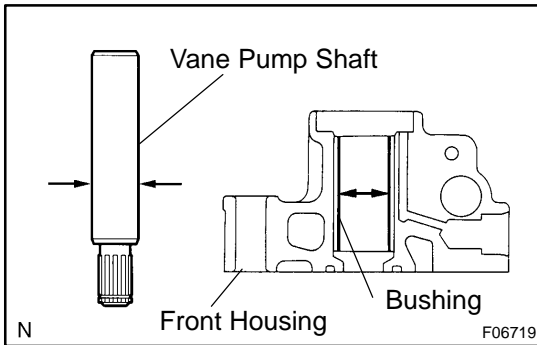
NOTICE:

Be careful not to drop the plates.

9. REMOVE VANE PUMP SHAFT WITH VANE PUMP PULLEY

10. REMOVE STRAIGHT PINS

Remove the 2 pins from the front housing.



INSPECTION

1. CHECK OIL CLEARANCE BETWEEN VANE PUMP SHAFT AND BUSHING

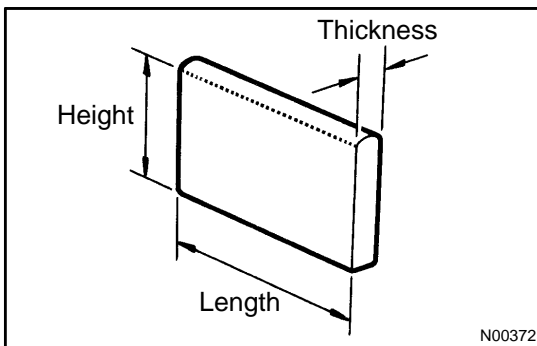
Using a micrometer and caliper gauge, measure the oil clearance.

Standard clearance:

0.03 to 0.05 mm (0.0012 to 0.0020 in.)

Maximum clearance: 0.07 mm (0.0028 in.)

If it is more than the maximum, replace the shaft and front housing.



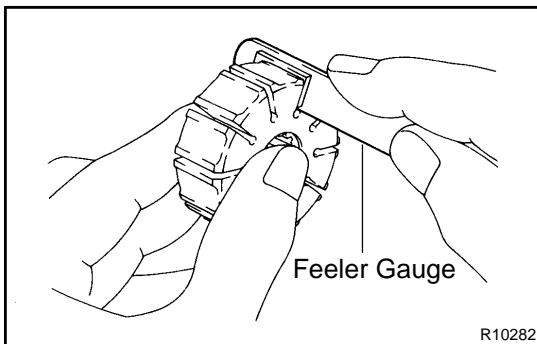
2. INSPECT VANE PUMP ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the 10 plates.

Minimum height: 8.6 mm (0.339 in.)

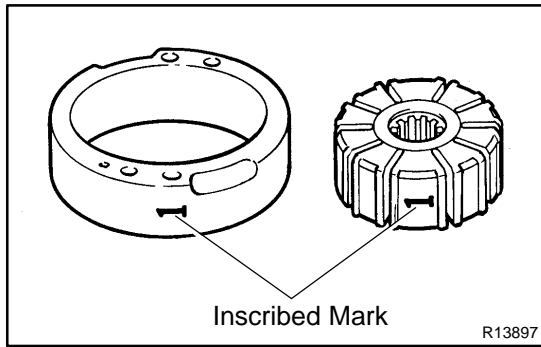
Minimum thickness: 1.397 mm (0.0550 in.)

Minimum length: 14.991 mm (0.5902 in.)



(b) Using a feeler gauge, measure the clearance between the rotor groove and plate.

Maximum clearance: 0.033 mm (0.0013 in.)



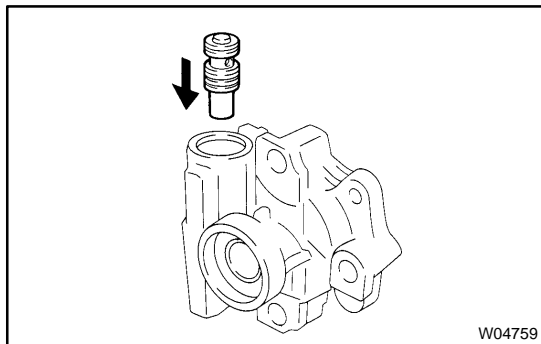
If it is more than the maximum, replace the plate and/or rotor with the one having the same mark stamped on the cam ring.

Inscribed mark: 1, 2, 3, 4 or None

HINT:

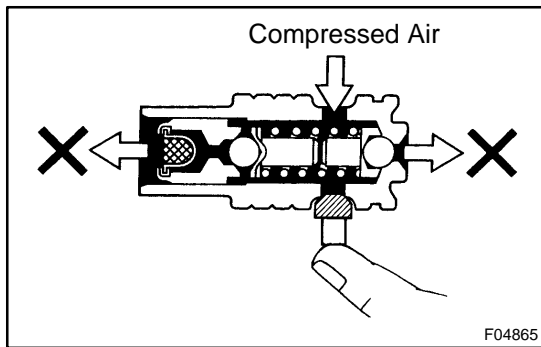
There are 5 vane plate lengths with the following rotor and cam ring marks:

Rotor and cam ring mark	Vane plate part number	Vane plate length mm (in.)
None	44345-04010	14.999-15.001 (0.59051-0.59059)
1	44345-04020	14.997-14.999 (0.59043-0.59051)
2	44345-04030	14.995-14.997 (0.59035-0.59043)
3	44345-04040	14.993-14.995 (0.59027-0.59035)
4	44345-04050	14.991-14.993 (0.59020-0.59027)

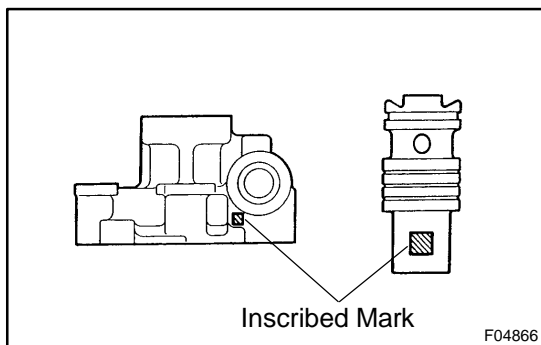


3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole under its own weight.

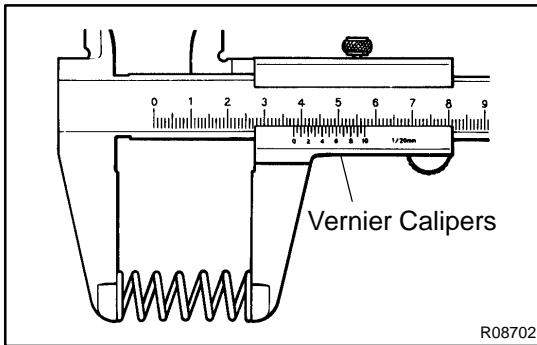


(b) Check the flow control valve for leakage. Close one of the holes and apply compressed air 392 to 490 kPa (4 to 5 kgf/cm², 57 to 71 psi) into the opposite side, and confirm that air does not come out from the end holes.



If necessary, replace the valve with the one having the same letter inscribed on the front housing.

Inscribed mark: A, B, C, D, E or F

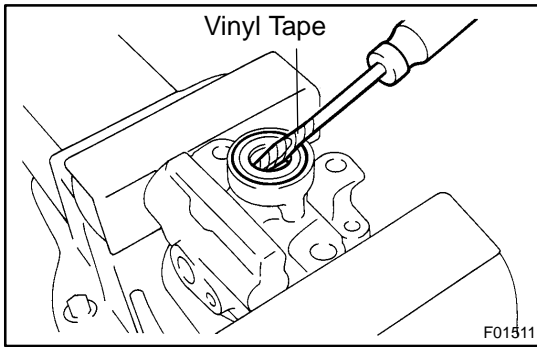


4. INSPECT SPRING

Using vernier calipers, measure the free length of the spring.

Minimum free length: 33.2 mm (1.307 in.)

If it is not within the specification, replace the spring.



REPLACEMENT

NOTICE:

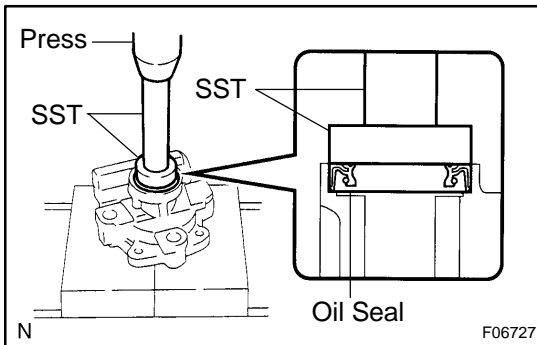
When using a vise, do not overtighten it.

IF NECESSARY, REPLACE OIL SEAL

- (a) Using a screwdriver with vinyl tape wound around its tip, remove the oil seal.

NOTICE:

Be careful not to damage the front housing.



- (b) Coat a new oil seal lip with power steering fluid.

- (c) Using SST, press in the oil seal.

SST 09950-60010 (09951-00330),
09950-70010 (09951-07100)

NOTICE:

Make sure to install the oil seal in the correct direction.

REASSEMBLY

NOTICE:

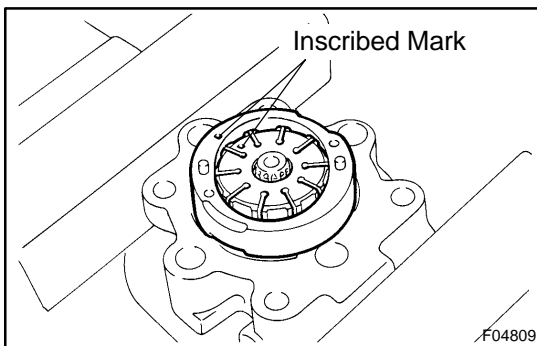
When using a vise, do not overtighten it.

1. COAT PARTS INDICATED BY ARROWS WITH POWER STEERING FLUID (See page [SR-59](#))
2. INSTALL VANE PUMP SHAFT WITH VANE PUMP PULLEY
3. INSTALL STRAIGHT PINS

Using a plastic hammer, tap in 2 new pins into the front housing.

NOTICE:

Be careful not to damage the pins.



4. INSTALL CAM RING

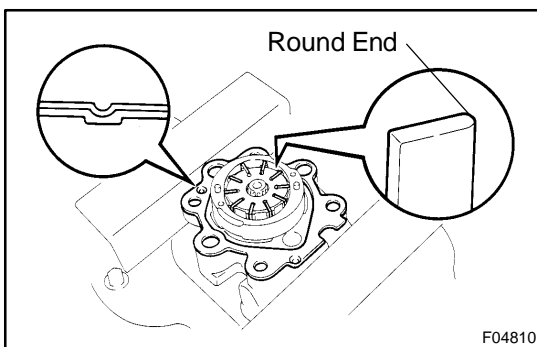
Install the cam ring with the inscribed mark facing outward.

HINT:

Align the hole of the cam ring with the one of the straight pins.

5. INSTALL VANE PUMP ROTOR

- (a) Install the vane pump rotor with the inscribed mark facing outward.
- (b) Install a new snap ring to the vane pump shaft.



6. INSTALL VANE PLATES AND GASKET

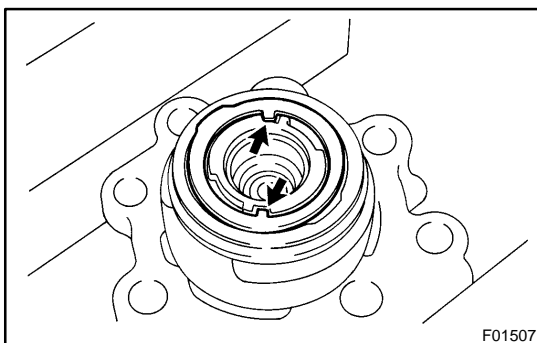
- (a) Install the 10 plates with the round end facing outward.
- (b) Install a new gasket on the front housing.

NOTICE:

Be careful of the direction of the gasket.

7. INSTALL SIDE PLATE

Align the hole of the plate with the hole of the 2 straight pins.



8. INSTALL WAVE WASHER

Install the washer so that the protrusions fit into the slots in the side plate.

9. INSTALL REAR HOUSING

- (a) Coat 2 new O-rings with power steering fluid and install them to the rear housing.
- (b) Install the rear housing with the 4 bolts.

Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)

10. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION

- (a) Install the spring on the front housing.
- (b) Install the flow control valve in the correct direction (See page [SR-59](#)).
- (c) Coat a new O-ring with power steering fluid and install it on the pressure port union.
- (d) Install the pressure port union.

Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)**11. INSTALL SUCTION PORT UNION**

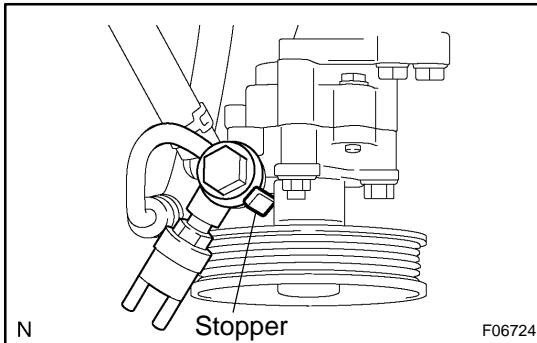
- (a) Coat a new O-ring with power steering fluid and install it on the suction port union.
- (b) Install the suction port union with the bolt.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**12. MEASURE PS VANE PUMP ROTATING TORQUE****(See page [SR-62](#))**

INSTALLATION

1. INSTALL PS VANE PUMP ASSEMBLY

- (a) Install the PS vane pump assembly with the stud bolt.
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)
- (b) Install the 2 bolt and nut.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)



2. INSTALL PRESSURE FEED TUBE

- (a) Connect the pressure feed tube.
- (b) Install a new gasket and the union bolt on the pressure feed tube.

HINT:

Make sure that the stopper of the pressure feed tube contacts the PS vane pump body as shown in the illustration, then tighten the union bolt.

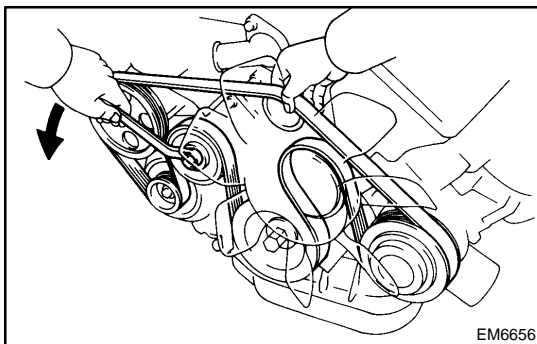
Torque: 46.5 N·m (475 kgf·cm, 34 ft·lbf)

3. CONNECT RETURN HOSE

Connect the return hose with the clip.

4. CONNECT 2 VACUUM HOSES

Connect the 2 vacuum hoses and install the 2 clips.



5. INSTALL DRIVE BELT

Loosen the drive belt tension by turning the drive belt tensioner counterclockwise, and install the belt.

6. INSTALL AIR CLEANER ASSEMBLY WITH AIR CLEANER HOSE

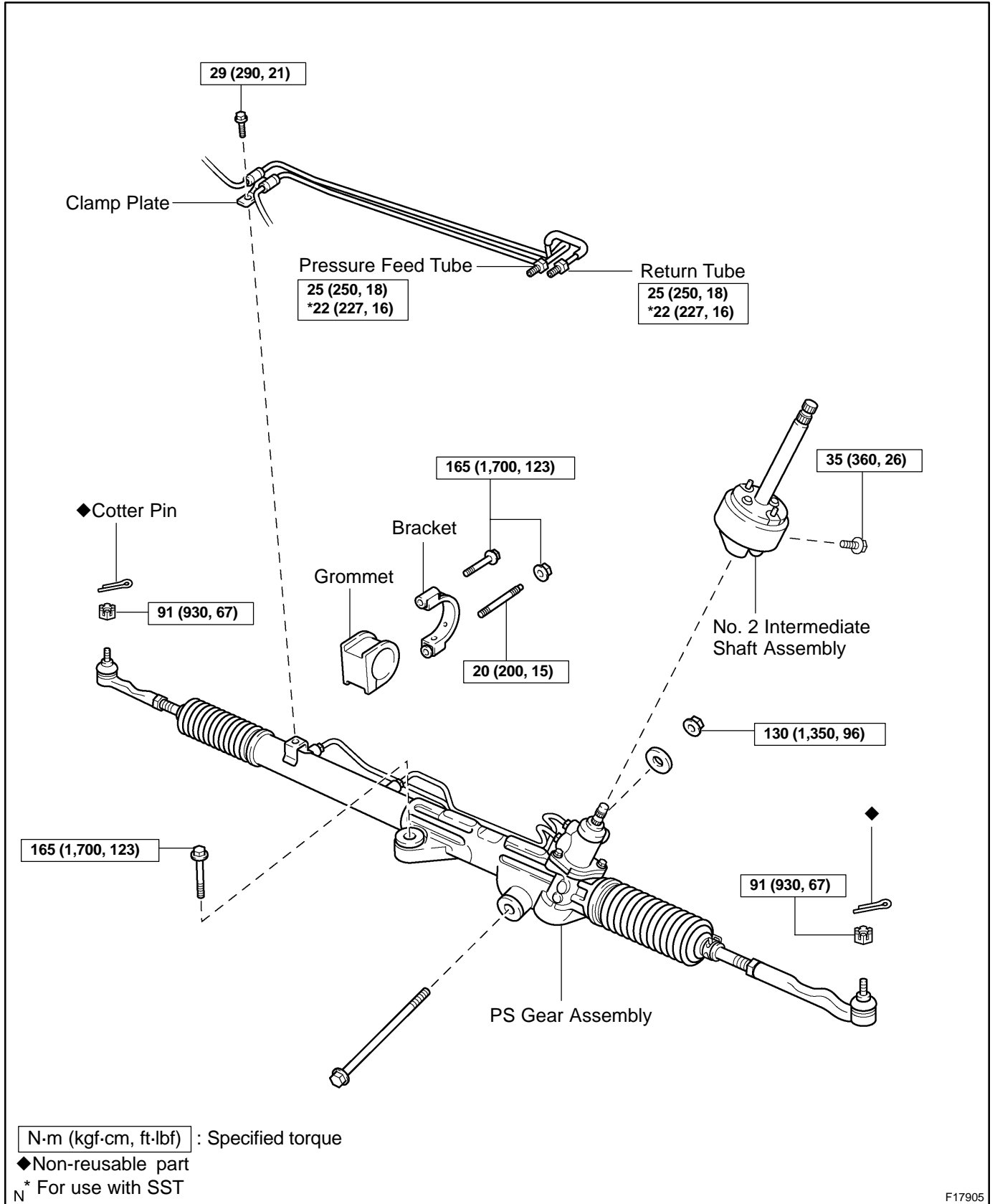
- (a) Install the air cleaner assembly with air cleaner hose and the 3 bolts.
- (b) Install the clamp.
- (c) Connect the hoses.
- (d) Connect the MAF meter connector.

7. BLEED POWER STEERING SYSTEM

(See page [SR-4](#))

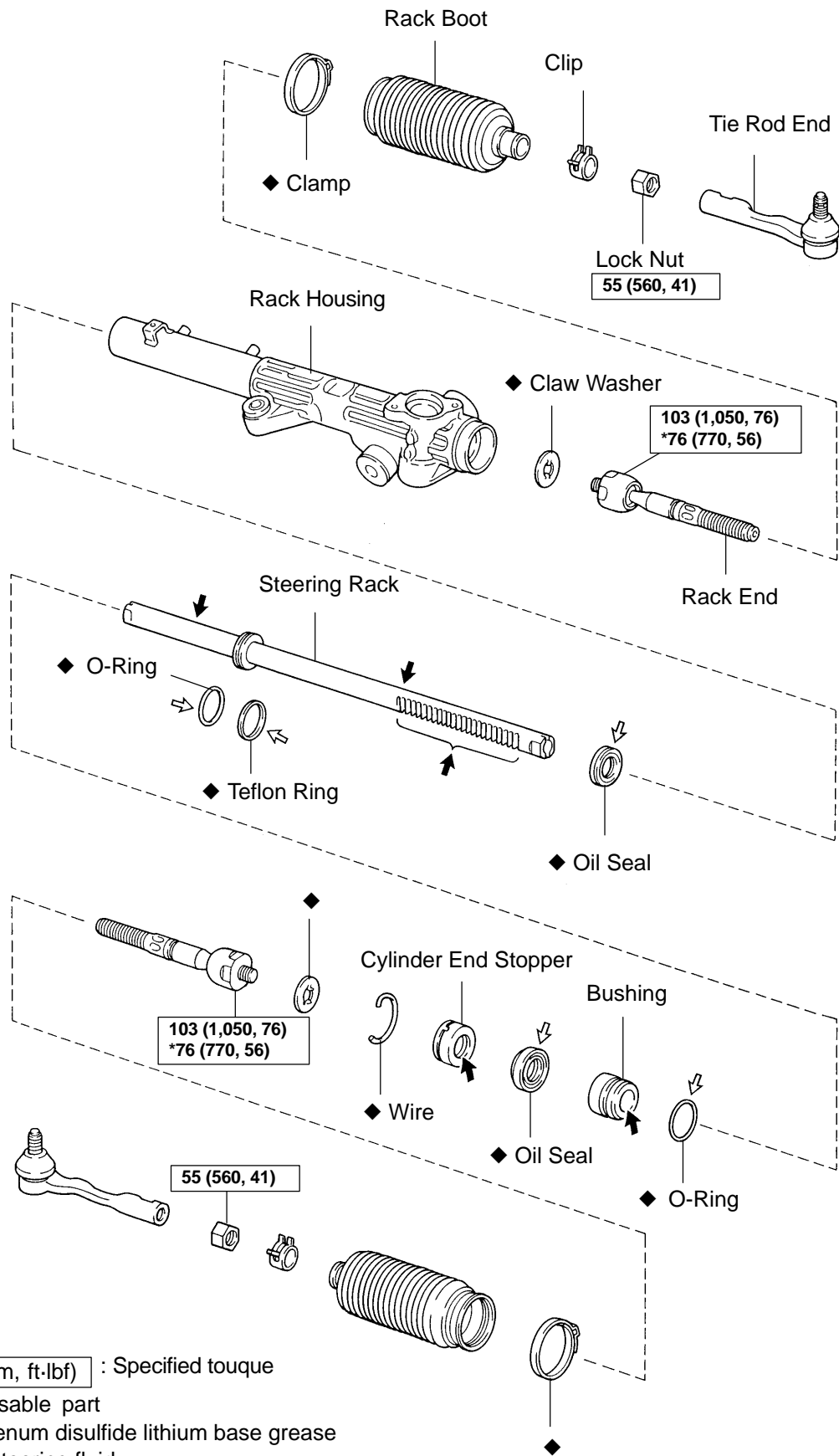
POWER STEERING GEAR COMPONENTS

SR02N-09



F17905

STEERING - POWER STEERING GEAR



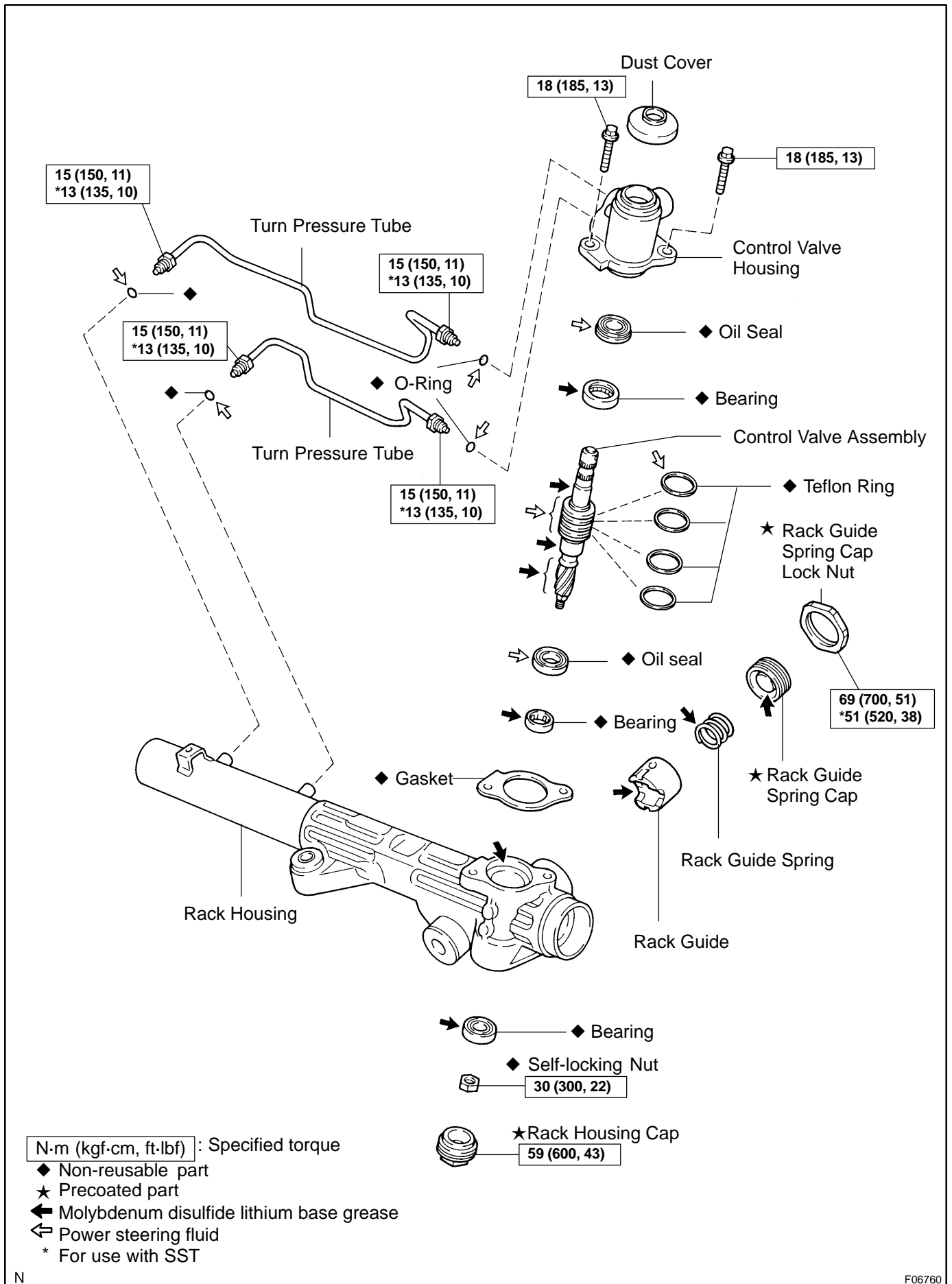
N-m (kgf-cm, ft-lbf) : Specified torque

◆ Non-reusable part

← Molybdenum disulfide lithium base grease

↔ Power steering fluid

N * For use with SST



REMOVAL

NOTICE:

Remove the steering wheel assembly before the steering gear removal, because there is possibility of breaking of the spiral cable.

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

2. PLACE FRONT WHEELS FACING STRAIGHT AHEAD

3. REMOVE STEERING WHEEL PAD

(See page [SR-18](#) , [SR-33](#))

4. REMOVE STEERING WHEEL

(See page [SR-18](#) , [SR-33](#))

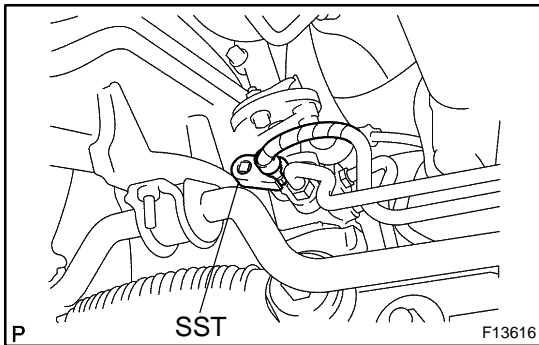
5. DISCONNECT RH AND LH TIE ROD ENDS

(See page [SA-84](#))

6. DISCONNECT NO. 2 INTERMEDIATE SHAFT ASSEMBLY (See page [SR-18](#) , [SR-33](#))

7. DISCONNECT CLAMP PLATE

Remove the bolt and disconnect the clamp plate.



8. DISCONNECT PRESSURE FEED AND RETURN TUBES

Using SST, disconnect the tube.

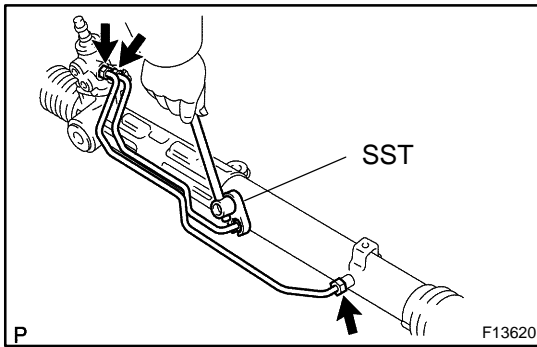
SST 09023-12701

9. REMOVE PS GEAR ASSEMBLY

(a) Remove the bolt, nut and stud bolt from the bracket.

(b) Remove the 2 set bolts, nut, washer and PS gear assembly.

10. REMOVE BRACKET AND GROMMET



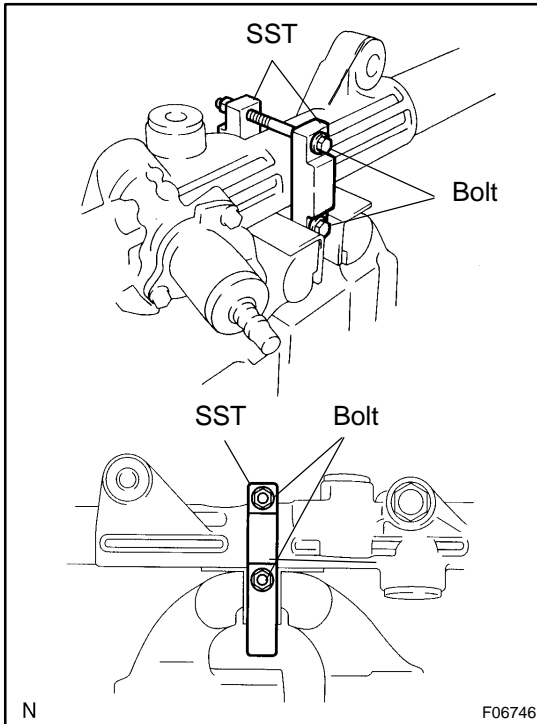
DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. REMOVE 2 TURN PRESSURE TUBES

- (a) Using SST, remove the 2 turn pressure tubes.
SST 09023-38401
- (b) Remove the 4 O-rings from the tubes.



2. SECURE PS GEAR ASSEMBLY IN VISE

Using SST, 2 bolts and nuts, secure the gear assembly in a vise, as shown in the illustration.

SST 09612-00012

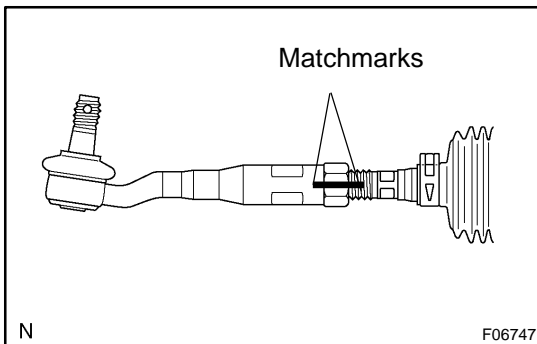
Reference:

Bolt: 90105-10346

Nut: 90170-10198

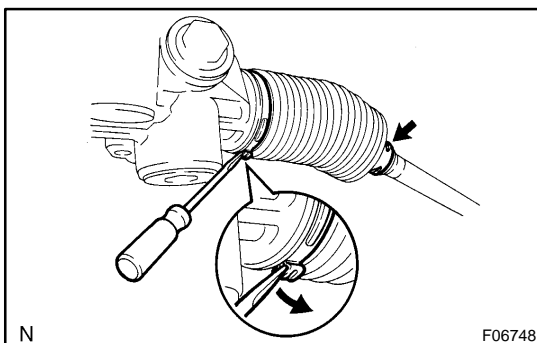
HINT:

Use 2 of the same type of SST.



3. REMOVE RH AND LH TIE ROD ENDS AND LOCK NUTS

- (a) Put matchmarks on the tie rod end, lock nut and rack end.
- (b) Loosen the lock nut, remove the tie rod end and lock nut.
- (c) Perform the same procedure on the other side.



4. REMOVE RH AND LH CLIPS, RACK BOOTS AND CLAMPS

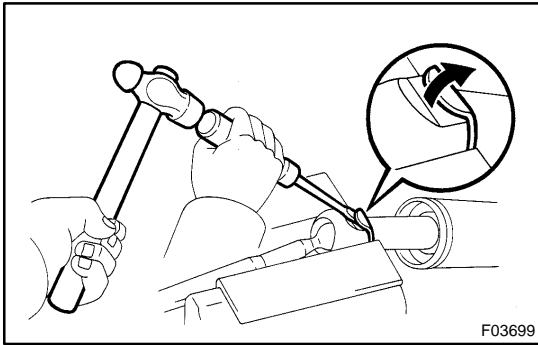
- (a) Using a screwdriver, loosen the 2 clamps.
- (b) Remove the 2 clips and boots.

HINT:

Mark the RH and LH boots.

NOTICE:

Be careful not to damage the boot.

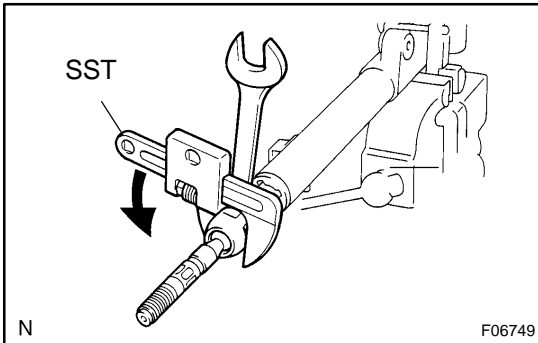


5. REMOVE RH AND LH RACK ENDS AND CLAW WASHERS

- (a) Using a screwdriver and hammer, unstake the washer.

NOTICE:

Avoid any impact on the steering rack.



- (b) Using a spanner to hold the steering rack steadily, and using SST, remove the rack end.

SST 09922-10010

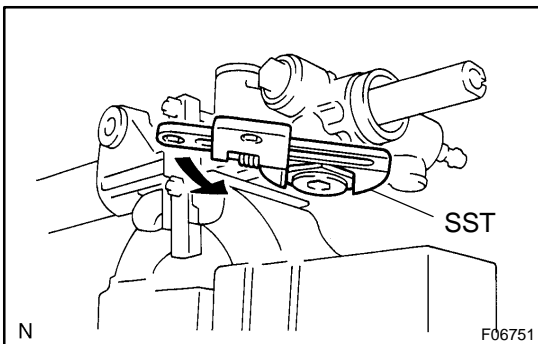
HINT:

Mark the RH and LH rack ends.

NOTICE:

Use SST 09922-10010 in the direction shown in the illustration.

- (c) Remove the washer from the rack end.
 (d) Perform the same procedure on the other side.



6. REMOVE RACK GUIDE SPRING CAP LOCK NUT

Using SST, remove the lock nut.

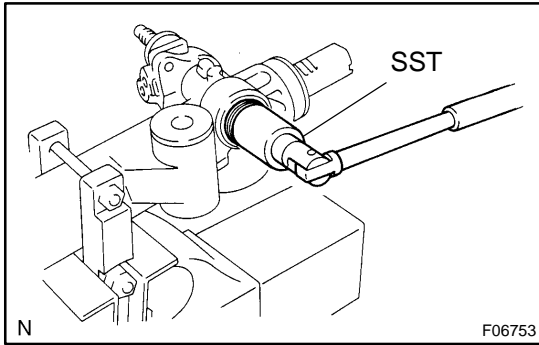
SST 09922-10010

NOTICE:

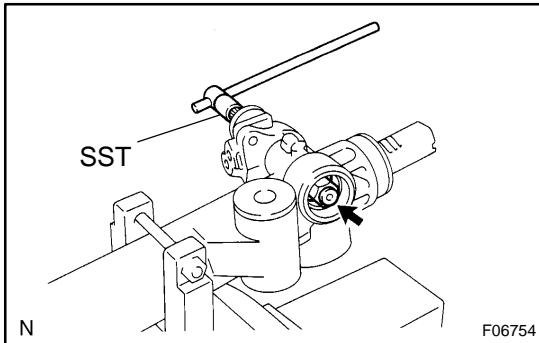
Use SST 09922-10010 in the direction shown in the illustration.

7. REMOVE RACK GUIDE SPRING CAP, RACK GUIDE SPRING AND RACK GUIDE

- (a) Using a hexagon wrench, remove the rack guide spring cap.
 (b) Remove the rack guide spring and rack guide.

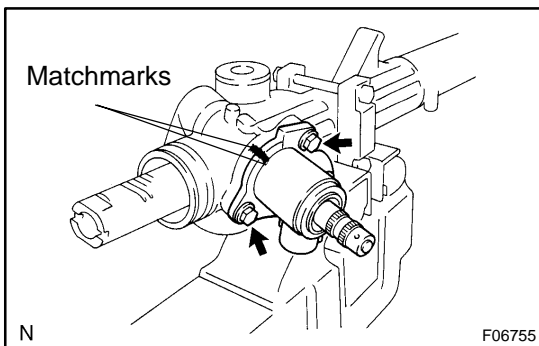
**8. REMOVE RACK HOUSING CAP**

Using SST, remove the rack housing cap.
SST 09816-30010

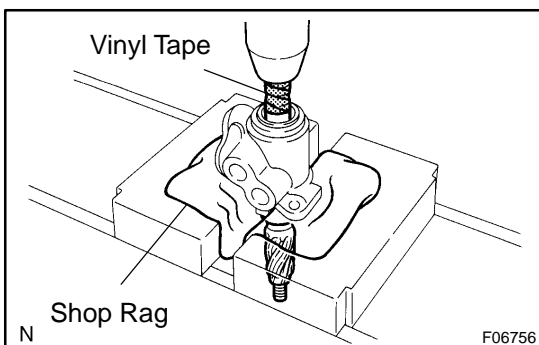
**9. REMOVE SELF-SOCKING NUT**

Using SST to stop the control valve shaft rotating, remove the nut.

SST 09616-0001 1

10. REMOVE DUST COVER**11. REMOVE CONTROL VALVE HOUSING WITH CONTROL VALVE ASSEMBLY**

- Put matchmarks on the control valve housing and rack housing.
- Remove the 2 bolts and control valve housing with control valve assembly.
- Remove the gasket from the rack housing.

**12. REMOVE CONTROL VALVE ASSEMBLY**

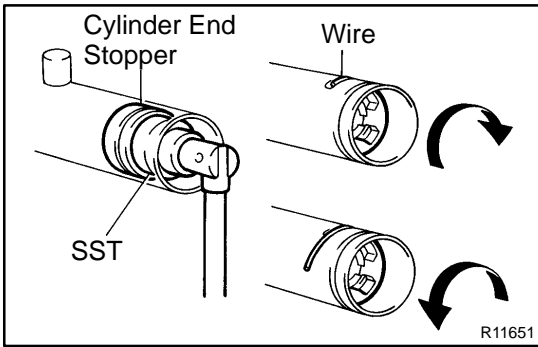
- To prevent oil seal lip damage, wind vinyl tape on the serrated part of the valve shaft.
- Press out the valve assembly with the oil seal.

NOTICE:

- ★ Place a shop rag between the valve housing and the blocks.
- ★ Be careful not to drop the valve assembly.
- ★ Be careful not to damage the oil seal lip.

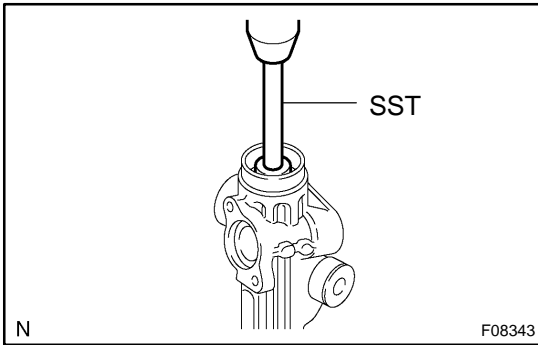
13. REMOVE OIL SEAL

Remove the oil seal from the control valve assembly.



14. REMOVE CYLINDER END STOPPER

- (a) Using SST, turn the stopper clockwise until the wire end is visible through the service hole.
SST 09631-16010
- (b) Using SST, turn the stopper counterclockwise, and remove the wire.
SST 09631-16010



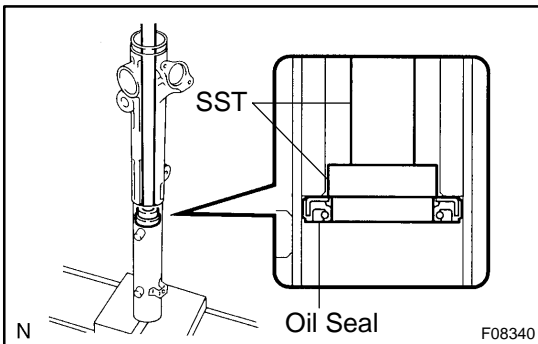
15. REMOVE STEERING RACK AND BUSHING

- (a) Using SST, press out the steering rack with the bushing

NOTICE:

Take care not to drop the rack.

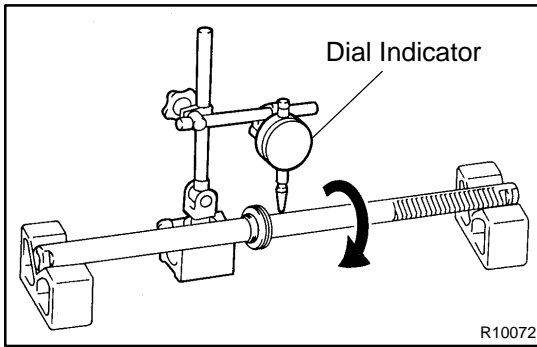
- SST 09950-70010 (09951-07200)
- (b) Remove the bushing from the rack.
- (c) Remove the O-ring from the bushing.



16. REMOVE OIL SEAL

Using SST, press out the oil seal.

- SST 09950-60010 (09951-00360),
- 09950-70010 (09951-07360)



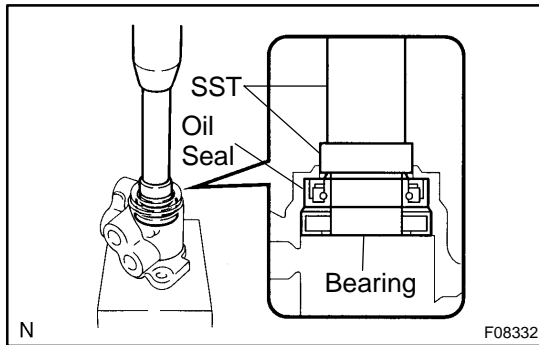
INSPECTION

INSPECT STEERING RACK

- (a) Using a dial indicator, check the rack for runout, teeth wear and damage.

Maximum runout: 0.09 mm (0.0035 in.)

- (b) Check the back surface for wear and damage.



REPLACEMENT

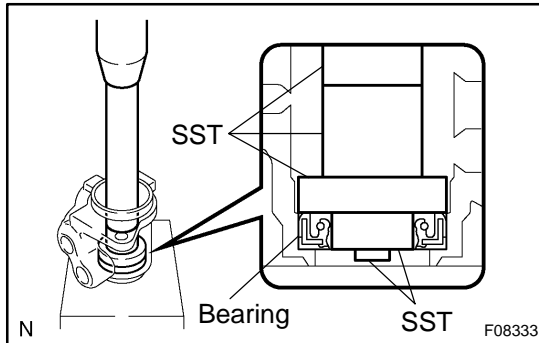
NOTICE:

When using a vise, do not overtighten it.

1. IF NECESSARY, REPLACE OIL SEAL AND BEARING

- (a) Using SST, press out the oil seal and bearing from the control valve housing.

SST 09950-60010 (09951-00250),
09950-70010 (09951-07150)



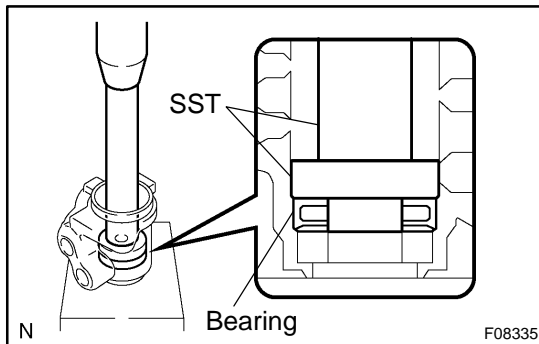
- (b) Coat a new oil seal lip with power steering fluid.

- (c) Using SST, press in the oil seal.

SST 09950-60010 (09951-00180, 09951-00320,
09952-06010), 09950-70010 (09951-07150)

NOTICE:

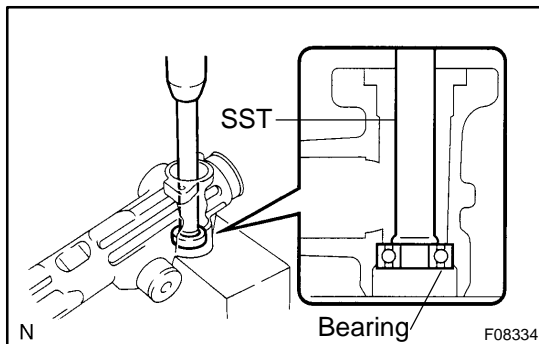
Make sure to install the oil seal in the correct direction.



- (d) Coat a new bearing with molybdenum disulfide lithium base grease.

- (e) Using SST, press in the bearing.

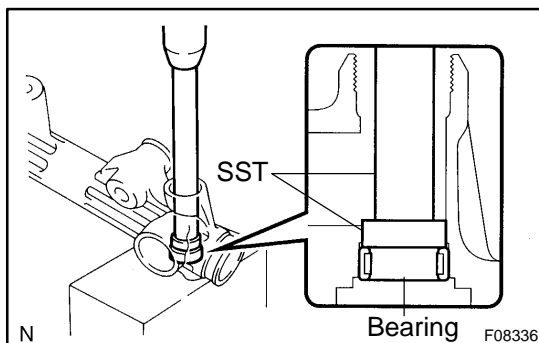
SST 09950-60010 (09951-00340),
09950-70010 (09951-07150)



2. IF NECESSARY, REPLACE 2 BEARINGS

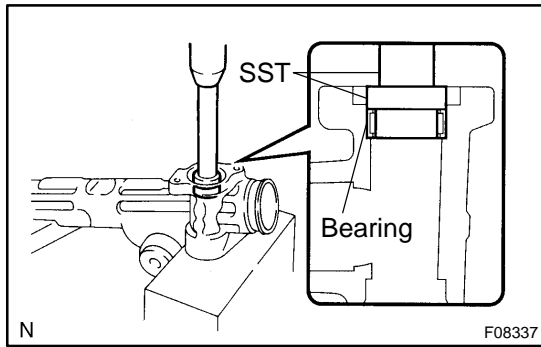
- (a) Using SST, press out the bearing.

SST 09950-60010 (09951-00260),
09950-70010 (09951-07150)

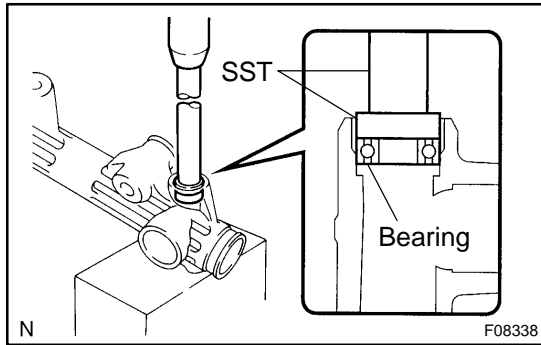


- (b) Using SST, press out the bearing from the rack housing.

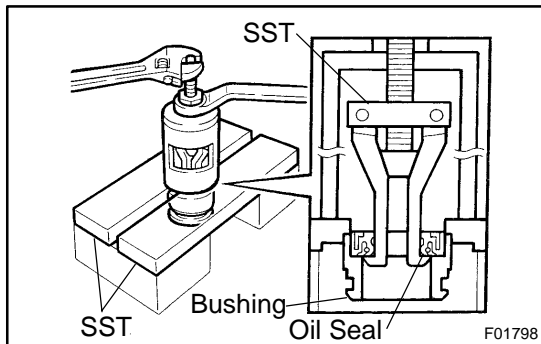
SST 09950-60010 (09951-00260),
09950-70010 (09951-07200)



- (c) Coat a new bearing with molybdenum disulfide lithium base grease.
- (d) Using SST, press in the bearing.
SST 09950-60010 (09951-00310),
09950-70010 (09951-07150)

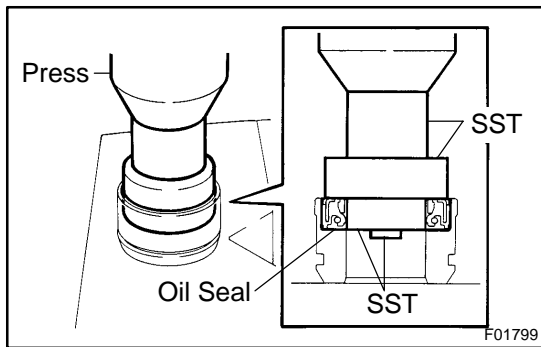


- (e) Coat a new bearing with molybdenum disulfide lithium base grease.
- (f) Using SST, press in the bearing.
SST 09950-60010 (09951-00320),
09950-70010 (09951-07150)



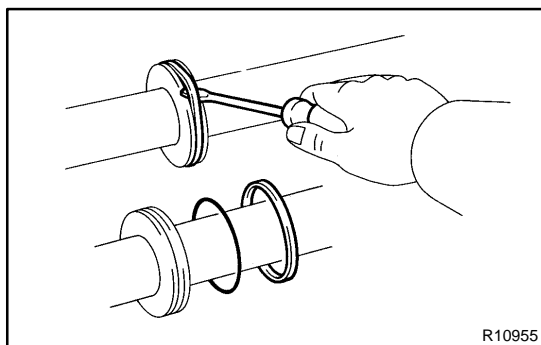
- 3. IF NECESSARY, REPLACE OIL SEAL**
- (a) Using SST, remove the oil seal from the bushing.
SST 09527-2001 1, 09612-24014 (09613-22011)

NOTICE:
Be careful not to damage the bushing.



- (b) Coat a new oil seal lip with power steering fluid.
- (c) Using SST, press in the oil seal.
SST 09950-60010 (09951-00300, 09951-00460,
09952-06010)

NOTICE:
Make sure to install the oil seal in the correct direction.

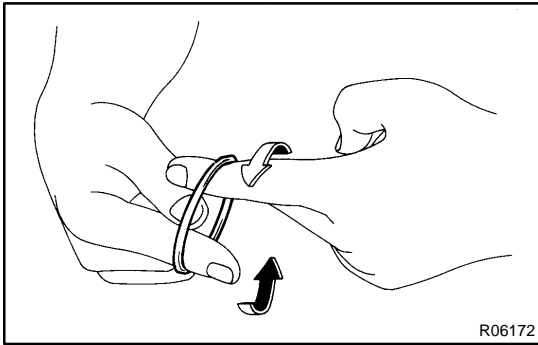


- 4. IF NECESSARY, REPLACE TEFLON RING AND O-RING**

- (a) Using a screwdriver, remove the teflon ring and O-ring from the steering rack.

NOTICE:
Be careful not to damage the groove for the teflon ring.

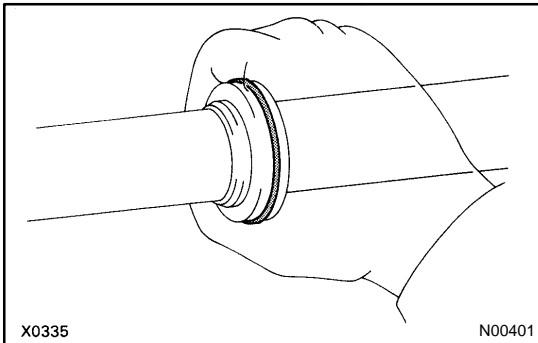
- (b) Coat a new O-ring with power steering fluid and install it to steering rack.



(c) Expand a new teflon ring with your fingers.

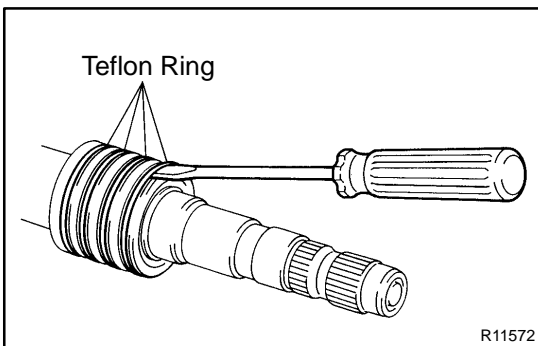
NOTICE:

Be careful not to over-expand the teflon ring.



(d) Coat the teflon ring with power steering fluid.

(e) Install the teflon ring to the steering rack, and settle it down with your fingers.



5. IF NECESSARY, REPLACE TEFLON RINGS

(a) Using a screwdriver, remove the 4 teflon rings from the control valve assembly.

NOTICE:

Be careful not to damage the grooves for the teflon ring.

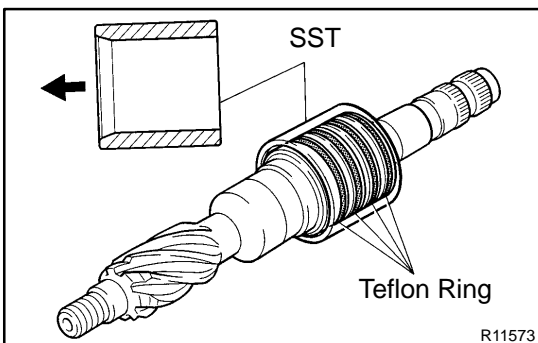
(b) Expand 4 new teflon rings with your fingers.

NOTICE:

Be careful not to overexpand the teflon ring.

(c) Coat the teflon rings with power steering fluid.

(d) Install the teflon rings to the control valve assembly, and settle them down with your fingers.



(e) Carefully slide the tapered end of SST over the teflon rings until they fit to the control valve assembly.

SST 09631-20081

NOTICE:

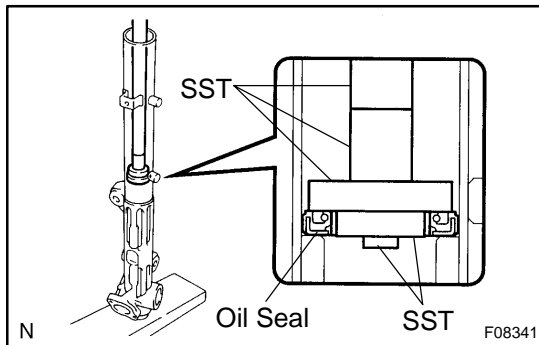
Be careful not to damage the teflon rings.

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT PARTS INDICATED BY ARROWS WITH POWER STEERING FLUID OR MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See pages [SR-70](#))



2. INSTALL OIL SEAL

- (a) Coat a new oil seal lip with power steering fluid.
- (b) Using SST, press in the oil seal.
SST 09950-60010 (09951-00330, 09951-00490, 09952-06010), 09950-70010 (09951-07360)

NOTICE:

- ★ Make sure to install the oil seal in the correct direction.
- ★ Take care that the oil seal does not get reversed as you install it.

3. INSTALL STEERING RACK

- (a) Install SST to the rack.
SST 09631-20051

HINT:

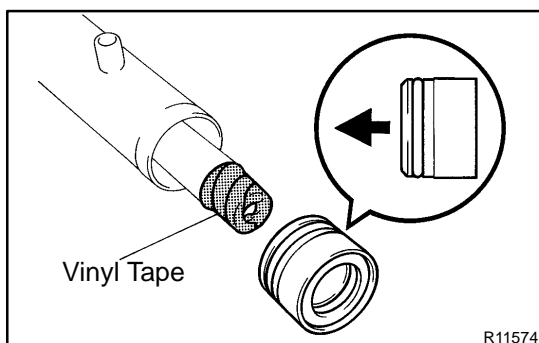
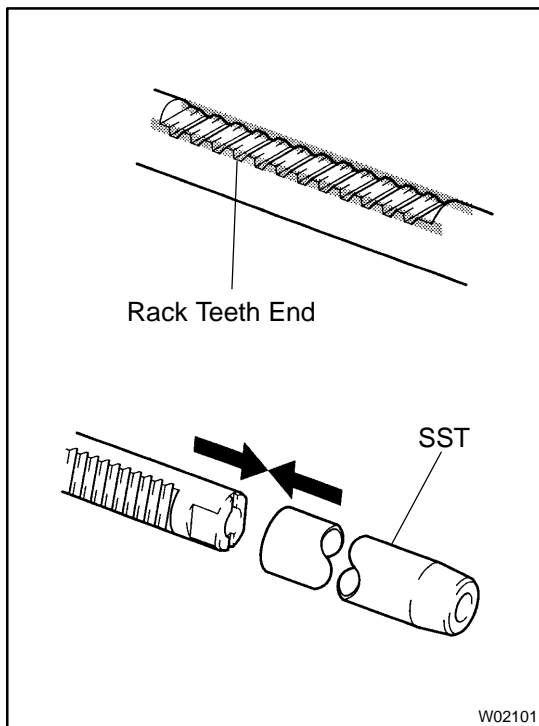
If necessary, scrape the burrs off the rack teeth end and bur-nish.

- (b) Coat the SST with power steering fluid.
- (c) Install the steering rack into the rack housing.

NOTICE:

Be careful not to damage the oil seal lip.

- (d) Remove the SST.
SST 09631-20051

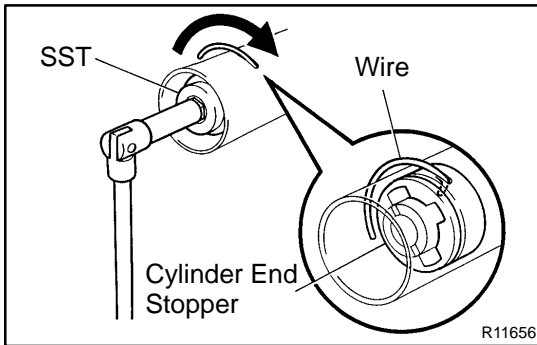


4. INSTALL BUSHING

- (a) Coat a new O-ring with power steering fluid and install it to the bushing.
- (b) To prevent oil seal lip damage, wind vinyl tape on the steering rack end, and apply power steering fluid.
- (c) Install the bushing.

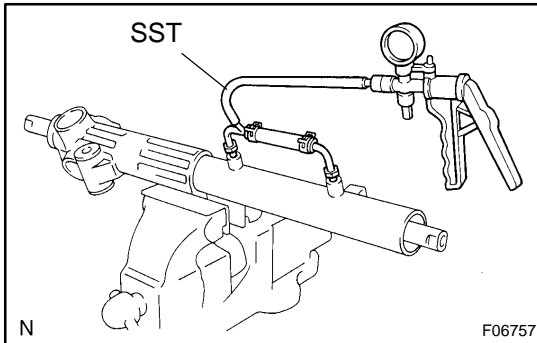
NOTICE:

- ★ Make sure to install the bushing in the correct direction.
- ★ Be careful not to damage the oil seal lip.



5. INSTALL CYLINDER END STOPPER

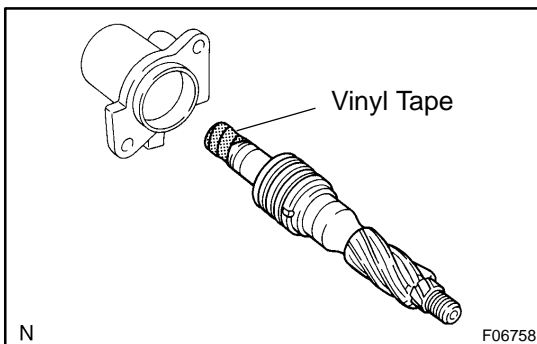
- Align the installation hole for the wire of the stopper with the slot of the rack housing.
- Install a new wire into the stopper.
- Using SST, turn the stopper clockwise 400° to 500° .
SST 09631-16010



6. AIR TIGHTNESS TEST

- Install SST to the rack housing.
SST 09631-12071
- Apply 53 kPa (400 mmHg, 15.75 in.Hg) of vacuum for about 30 seconds.
- Check that there is no change in the vacuum.

If there is change in the vacuum, check the installation of the oil seals.

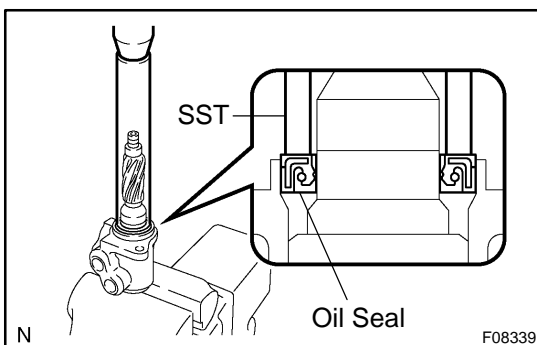


7. INSTALL CONTROL VALVE ASSEMBLY

- To prevent oil seal lip damage, wind vinyl tape on the serrated part of the valve shaft.
- Coat the teflon rings with power steering fluid.
- Install the valve assembly into the valve housing.

NOTICE:

Be careful not to damage the teflon rings and oil seal.



8. INSTALL OIL SEAL

- Coat a new oil seal lip with power steering fluid.
- Using SST, press in the oil seal.
SST 09612-2201 1

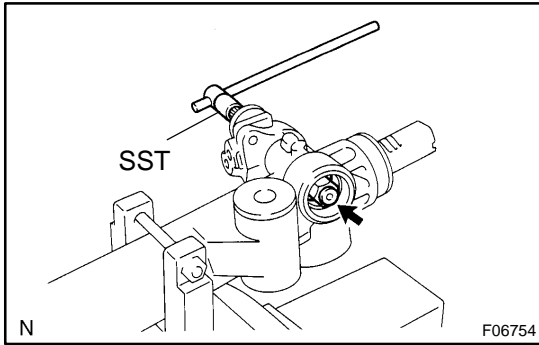
NOTICE:

Make sure to install the oil seal in the correct direction.

9. INSTALL CONTROL VALVE HOUSING WITH CONTROL VALVE ASSEMBLY

- Place a new gasket on the rack housing.
- Align the matchmark on the control valve housing with control valve assembly and rack housing.
- Install the 2 bolts.

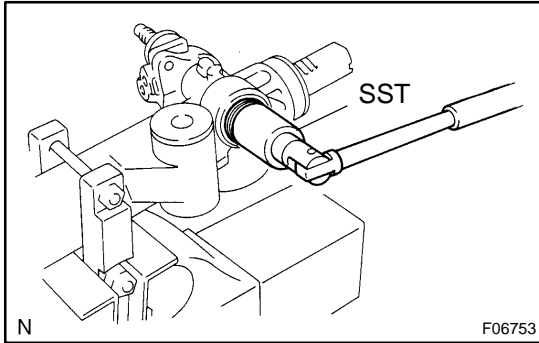
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

**10. INSTALL SELF-LOCKING NUT**

Using SST to stop the control valve shaft rotating, install a new nut.

SST 09616-0001 1

Torque: 30 N·m (300 kgf·cm, 22 ft·lbf)

11. INSTALL DUST COVER**12. INSTALL RACK HOUSING CAP**

(a) Apply sealant to 2 or 3 threads of the rack housing cap.

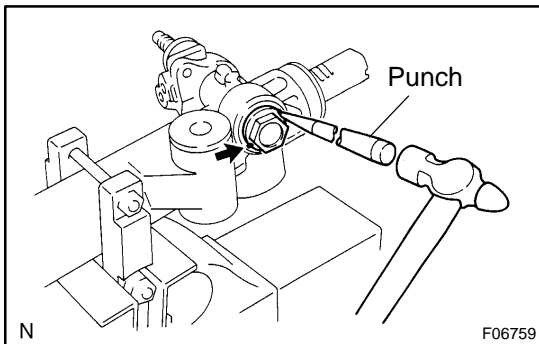
Sealant:

**Part No.08833-00080, THREE BOND 1344,
LOCTITE 242 or equivalent**

(b) Using SST, install the rack housing cap.

SST 09816-30010

Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)



(c) Using a punch and hammer, stake the 2 parts of the cap.

13. INSTALL RACK GUIDE, RACK GUIDE SPRING AND RACK GUIDE SPRING CAP

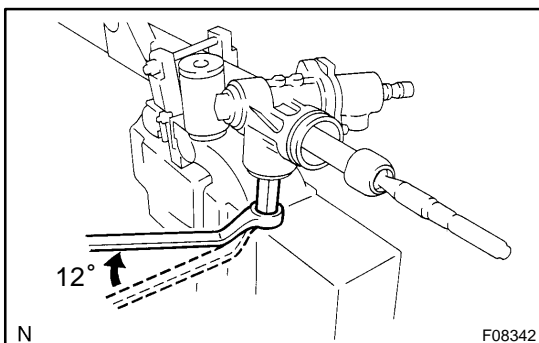
(a) Install the rack guide and rack guide spring.

(b) Apply sealant to 2 or 3 threads of the rack guide spring cap.

Sealant:

**Part No.08833-00080, THREE BOND 1344,
LOCTITE 242 or equivalent**

(c) Temporarily install the rack guide spring cap.

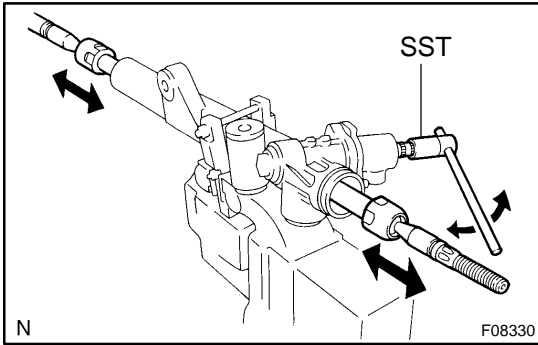
**14. ADJUST TOTAL PRELOAD**

(a) To prevent the steering rack teeth from damaging the oil seal lip, temporarily install the RH and LH rack ends.

(b) Using a hexagon wrench, install the rack guide spring cap.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

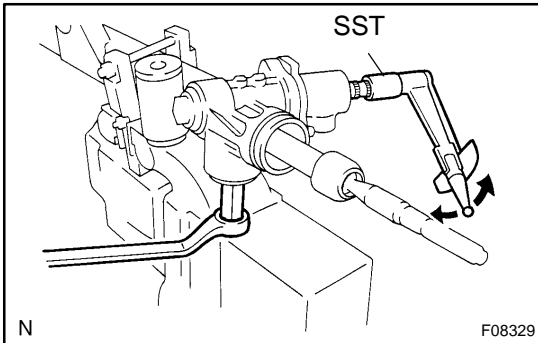
(c) Using a hexagon wrench, return the rack guide spring cap 12°.



(d) Using SST, turn the control valve shaft right and left 1 or 2 times.

SST 09616-0001 1

(e) Using a hexagon wrench, loosen the rack guide spring cap until the rack guide spring is not functioning.

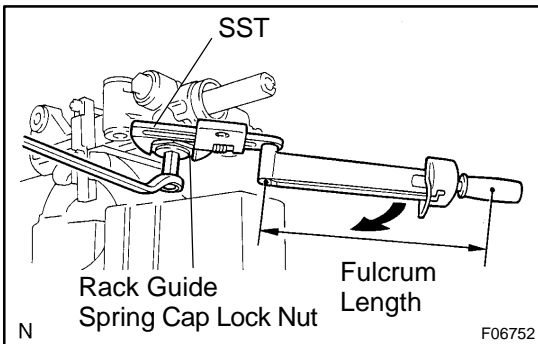


(f) Using SST, torque wrench and hexagon wrench, tighten the rack guide spring cap until the preload is within specification.

SST 09616-0001 1

Preload (turning):

1.0 to 1.45 N-m (10 to 14.5 kgf-cm, 8.7 to 12.6 in.-lbf)



15. INSTALL RACK GUIDE SPRING CAP LOCK NUT

(a) Apply sealant to 2 or 3 threads of the lock nut.

Sealant:

Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Temporarily install the lock nut.

(c) Using a hexagon wrench to hold the rack guide spring cap, and using SST, tighten the lock nut.

SST 09922-10010

Torque: 51 N-m (520 kgf-cm, 38 ft-lbf)

NOTICE:

Use SST 09922-10010 in the direction shown in the illustration.

HINT:

Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).

(d) Recheck the total preload.

Preload (turning):

1.0 to 1.45 N-m (10 to 14.5 kgf-cm, 8.7 to 12.6 in.-lbf)

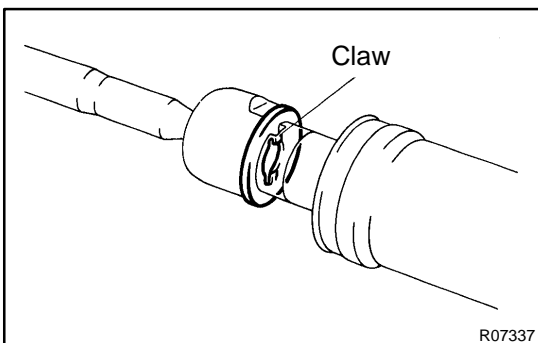
(e) Remove the RH and LH rack ends.

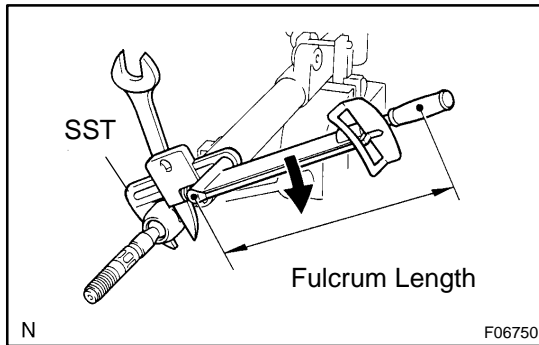
16. INSTALL RH AND LH CLAW WASHERS AND RACK ENDS

(a) Install a new claw washer, and temporarily install the rack end.

HINT:

Align the claws of the claw washer with the steering rack grooves.





- (b) Using a spanner to hold the steering rack steady, and using SST, tighten the rack end.

SST 09922-10010

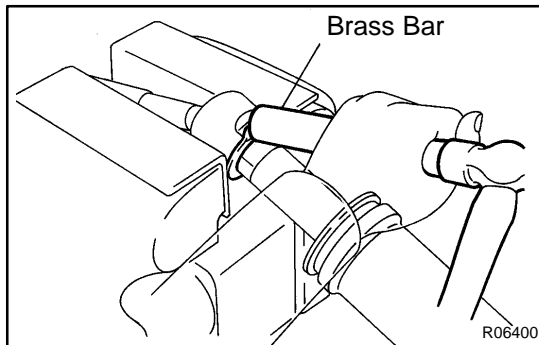
Torque: 76 N·m (770 kgf·cm, 56 ft·lbf)

NOTICE:

Use SST 09922-10010 in the direction shown in the illustration.

HINT:

Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).

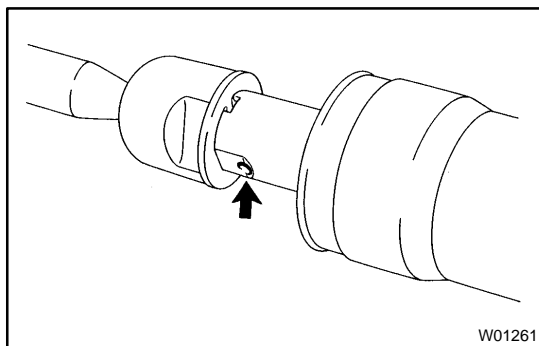


- (c) Using a brass bar and hammer, stake the washer.

NOTICE:

Avoid any impact on the rack.

- (d) Perform the same procedure on the other side.



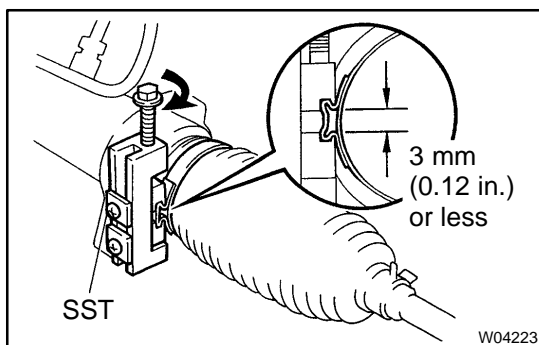
17. INSTALL RH AND LH RACK BOOTS, CLAMPS AND CLIPS

- (a) Ensure that the steering rack hole is not clogged with grease.

HINT:

If the hole is clogged, the pressure inside the boot will change after it is assembled and the steering wheel is turned.

- (b) Set a new clamp to the groove of the rack boot.



- (c) Install the boot.

NOTICE:

Be careful not to damage or twist the boot.

- (d) Using SST, tighten the clamp as shown in the illustration.

SST 09521-24010

- (e) Install the clip to the rack boot.

- (f) Perform the same procedure on the other side.

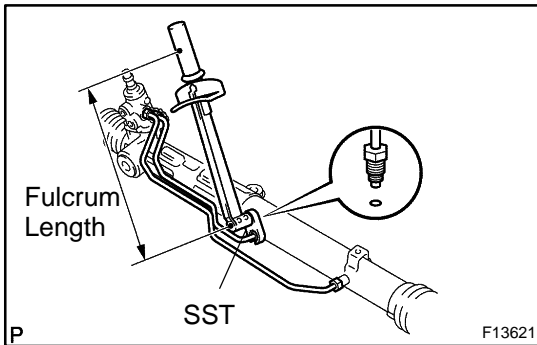
18. INSTALL RH AND LH TIE ROD ENDS AND LOCK NUTS

- (a) Screw the lock nut and tie rod end onto the rack end until the matchmarks are aligned.

- (b) After adjusting toe-in, tighten the nut

(See page [SA-5](#)).

Torque: 55 N·m (560 kgf·cm, 41 ft·lbf)

**19. INSTALL 2 TURN PRESSURE TUBES**

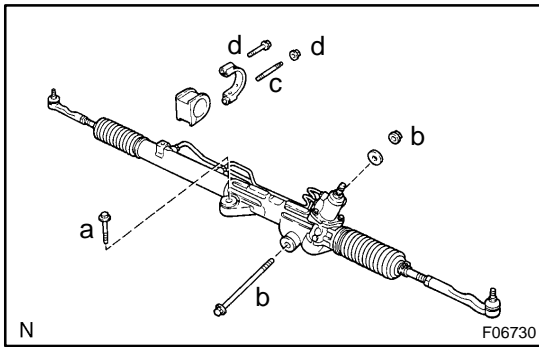
- (a) Coat 4 new O-rings with power steering fluid and install them to the turn pressure tubes.
- (b) Using SST, install the 2 turn pressure tubes.

SST 09023-34201

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)

HINT:

- ★ Use a torque wrench with a fulcrum length of 250 mm (9.84 in.).
- ★ This torque value is effective in case that SST is parallel to a torque wrench.



INSTALLATION

1. INSTALL GROMMET AND BRACKET

2. INSTALL PS GEAR ASSEMBLY

- (a) Install the PS gear assembly with the gear assembly set bolt.

Torque: 165 N·m (1,700 kgf·cm, 123 ft·lbf)

- (b) Install the gear assembly set bolt, washer and nut.

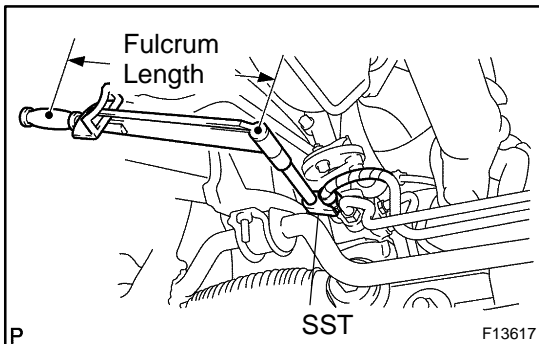
Torque: 130 N·m (1,350 kgf·cm, 96 ft·lbf)

- (c) Install the stud bolt to the bracket.

Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

- (d) Install the bolt and nut to the bracket.

Torque: 165 N·m (1,700 kgf·cm, 123 ft·lbf)



3. CONNECT PRESSURE FEED AND RETURN TUBES

Using SST, connect the tubes.

SST 09023-12701

Torque: 22 N·m (227 kgf·cm, 16 ft·lbf)

HINT:

- ★ Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).
- ★ This torque value is effective in case that SST is parallel to a torque wrench.

4. CONNECT CLAMP PLATE

Connect the clamp plate and install the bolt.

Torque: 29 N·m (290 kgf·cm, 21 ft·lbf)

5. CONNECT NO. 2 INTERMEDIATE SHAFT ASSEMBLY (See page [SR-28](#) , [SR-42](#))

6. CONNECT RH AND LH TIE ROD ENDS (See page [SA-84](#))

7. POSITION FRONT WHEEL FACING STRAIGHT AHEAD

HINT:

Do it with the front of the vehicle jacked up.

8. CENTER SPIRAL CABLE

(See page [SR-28](#) , [SR-42](#))

9. INSTALL STEERING WHEEL

- (a) Align the matchmark on the wheel and steering column main shaft.

- (b) Temporarily tighten the wheel set nut.

- (c) Connect the connector.

10. BLEED POWER STEERING SYSTEM (See page [SR-4](#))

11. CHECK STEERING WHEEL CENTER POINT
12. TORQUE STEERING WHEEL SET NUT
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)
13. INSTALL STEERING WHEEL PAD
(See page [SR-28](#) , [SR-42](#))
14. CHECK FRONT WHEEL ALIGNMENT
(See page [SA-5](#))
15. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
16. PERFORM YAW RATE AND DECELERATION SENSOR ZERO POINT CALIBRATION (See page [DI-1494](#))

SRS AIRBAG

PRECAUTION

RS01Y-61

CAUTION:

- ◆ The vehicle is equipped with SRS, which consists of a driver airbag, front passenger airbag, side airbag and curtain shield airbag. Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Further, if a mistake is made in servicing the SRS, it is possible that the SRS may fail to operate when required. Before performing servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedures indicated in the repair manual.
- ◆ Wait at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
(The SRS is equipped with a back-up power source, so that if work is started within 90 seconds after disconnecting the negative (-) terminal cable of the battery, the SRS may be deployed.)
- ◆ Do not expose the steering wheel pad, front passenger airbag assembly, side airbag assembly, curtain shield airbag assembly, airbag sensor assembly, front airbag sensor, side airbag sensor assembly, curtain shield airbag sensor assembly, seat position sensor assembly or occupant classification ECU directly to hot air or flames.
- ◆ Be sure to perform the initialization of the occupant classification ECU if any of the following conditions occur (see page [DI-1849](#)). If the initialization is not performed, the SRS may not operate properly.
 - ◆ The occupant classification ECU is replaced.
 - ◆ Accessories (seatback tray, seat cover, etc.) are installed to the vehicle.
 - ◆ The passenger seat is removed from the vehicle, and then reinstalled or replaced.
 - ◆ The passenger airbag ON/OFF indicator light ("OFF") comes on when the passenger seat is not occupied.
 - ◆ The vehicle is brought to the workshop for repair due to an accident or collision.

NOTICE:

- ◆ Malfunction symptoms of the SRS are difficult to confirm, so DTCs are the most important source of information when troubleshooting. When troubleshooting the SRS, always inspect DTCs before disconnecting the battery.
- ◆ Even in the case of a minor collision when the SRS does not deploy, the steering wheel pad, front passenger airbag assembly, side airbag assembly, curtain shield airbag assembly, airbag sensor assembly, front airbag sensor, side airbag sensor assembly, curtain shield airbag sensor assembly, seat position sensor assembly and occupant classification ECU should be inspected. (see page [RS-24](#) , [RS-38](#) , [RS-52](#) , [RS-67](#) , [RS-77](#) , [RS-85](#) , [RS-97](#) , [RS-102](#) , [RS-107](#) , [RS-112](#) , [RS-120](#) and [RS-126](#)).
- ◆ Before repair work, remove the airbag sensor if any kind of shock is likely to occur to the airbag sensor during the operation.
- ◆ Never use SRS parts from another vehicle. When replacing the parts, replace them with new ones.
- ◆ Never disassemble or repair the steering wheel pad, front passenger airbag assembly, side airbag assembly, curtain shield airbag assembly, airbag sensor assembly, front airbag sensor, side airbag sensor assembly, curtain shield airbag sensor assembly, seat position sensor assembly or occupant classification ECU in order to reuse it.

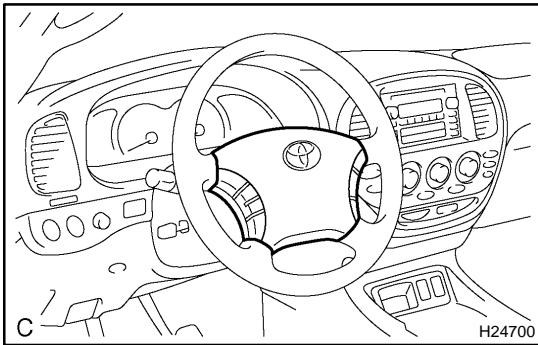
- ◆ If the steering wheel pad, front passenger airbag assembly, side airbag assembly, curtain shield airbag assembly, airbag sensor assembly, front airbag sensor, side airbag sensor assembly, curtain shield airbag sensor assembly, seat position sensor assembly or occupant classification ECU has been dropped, or if there are any cracks, dents or other defects in the case, bracket or connector, replace it with a new one.
- ◆ Use a volt/ohmmeter with high impedance (10 k Ω /V minimum) for troubleshooting the electrical circuits.
- ◆ Information labels are attached to the periphery of the SRS components. Follow the instructions in the caution.
- ◆ After work on the SRS is completed, perform the SRS warning light check (see page [DI-1859](#)).
- ◆ When the negative (-) terminal cable is disconnected from the battery, the memory will be cleared. Because of this, be sure to make a record of the contents memorized in each system before starting work. When work is finished, adjust each system as it was before. Never use a back-up power supply from outside the vehicle to avoid erasing the memory in any system.

OPERATION

CAUTION:

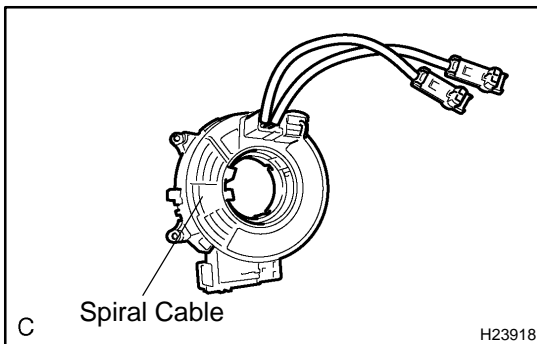
Be sure to perform the initialization of the occupant classification ECU if any of the following conditions occur (see page [DI-1849](#)). If the initialization is not performed, the SRS may not operate properly.

- ◆ The occupant classification ECU is replaced.
- ◆ Accessories (seatback tray, seat cover, etc.) are installed to the vehicle.
- ◆ The passenger seat is removed from the vehicle, and then reinstalled or replaced.
- ◆ The passenger airbag ON/OFF indicator light ("OFF") comes on when the passenger seat is not occupied.
- ◆ The vehicle is brought to the workshop for repair due to an accident or collision.



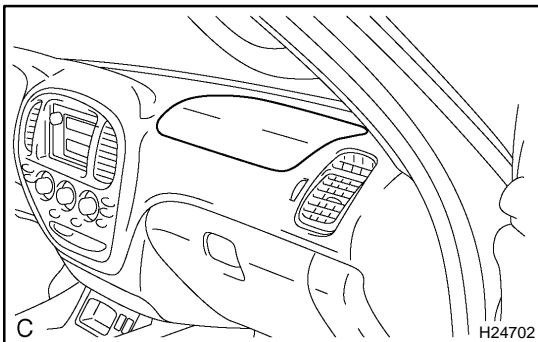
1. STEERING WHEEL PAD

The inflator and bag of the SRS are stored in the steering wheel pad and cannot be disassembled. The inflator contains a squib, igniter charge, and gas generator, etc., and inflates the bag when instructed by the airbag sensor assembly. The steering wheel pad cannot be disassembled.



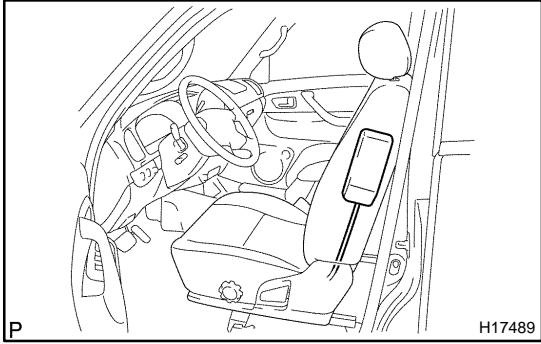
2. SPIRAL CABLE

A spiral cable is used as an electrical joint from the vehicle body side to the steering wheel. The spiral cable cannot be disassembled.



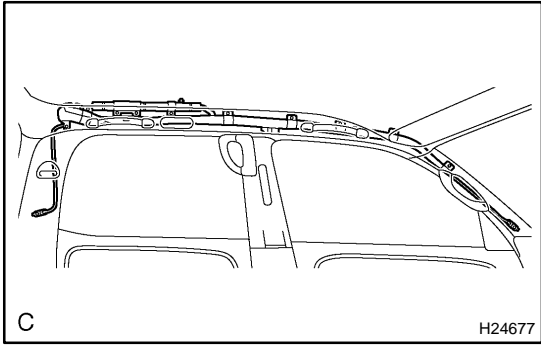
3. FRONT PASSENGER AIRBAG ASSEMBLY

The inflator and bag of the SRS are stored in the front passenger airbag assembly and cannot be disassembled. The inflator contains a squib, igniter charge, gas generator, etc., and inflates the bag when instructed by the airbag sensor assembly. The front passenger airbag assembly cannot be disassembled.



4. SIDE AIRBAG ASSEMBLY

The inflator and bag of the SRS are stored in the side airbag assembly and cannot be disassembled. The inflator contains a squib, igniter charge and gas generator, etc., and inflates the bag when instructed by the airbag sensor assembly. The side airbag assembly cannot be disassembled.

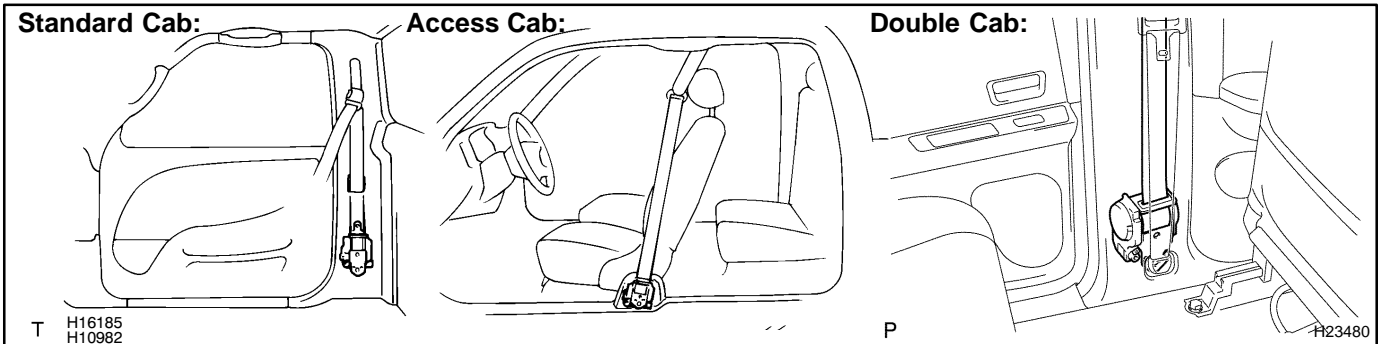


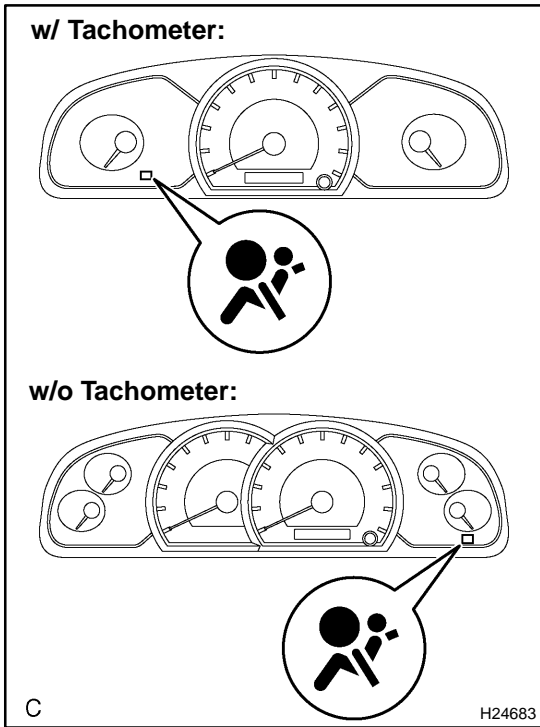
5. CURTAIN SHIELD AIRBAG ASSEMBLY

The inflator and bag of the SRS are stored in the curtain shield airbag assembly and cannot be disassembled. The inflator contains a squib, igniter charge, gas generator, etc., and inflates the bag when instructed by the airbag sensor assembly. The curtain shield airbag assembly cannot be disassembled.

6. SEAT BELT PRETENSIONER

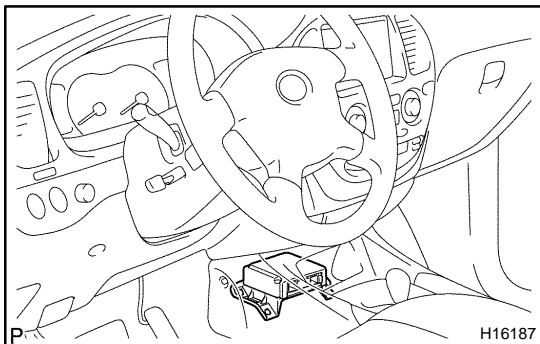
The front seat outer belt has the seat belt pretensioner system. The pretensioner operates in the event of a frontal collision. The seat belt pretensioner cannot be disassembled.





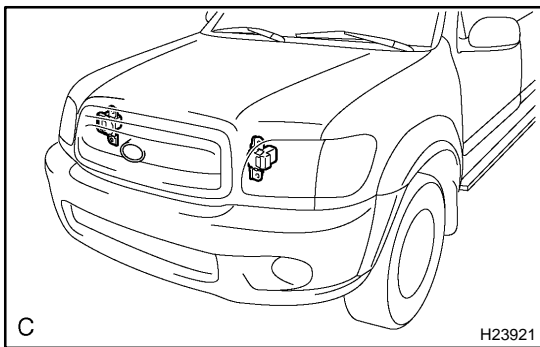
7. SRS WARNING LIGHT

The SRS warning light is located on the combination meter. It comes on to alert the driver of trouble in the system when a malfunction is detected in the airbag sensor assembly. In normal operation conditions when the ignition switch is turned to the ON position, the light comes on for approximately 6 seconds and then goes off.



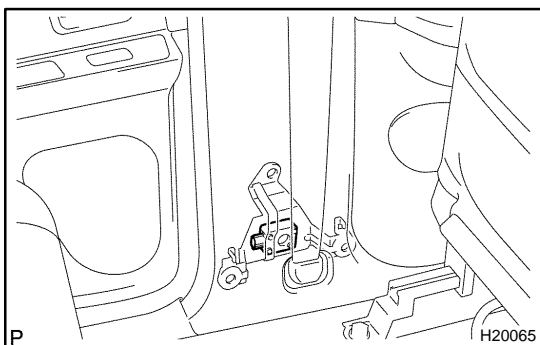
8. AIRBAG SENSOR ASSEMBLY

The airbag sensor assembly is mounted on the floor inside the lower center finish panel. The airbag sensor assembly consists of an airbag sensor, safing sensor, diagnosis circuit, ignition control, drive circuit, etc. It receives signals from the airbag sensor, front airbag sensor, side and curtain shield airbag sensor and curtain shield airbag sensor, and judges whether the SRS must be activated or not. The airbag sensor assembly cannot be disassembled.



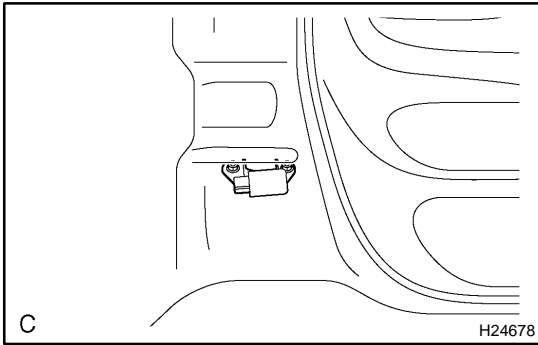
9. FRONT AIRBAG SENSOR

The front airbag sensor is mounted inside each of the radiator support. The front airbag sensor consists of an airbag sensor, diagnosis circuit, etc. It sends signals to the airbag sensor assembly to judge whether the SRS must be activated or not. The front airbag sensor cannot be disassembled.



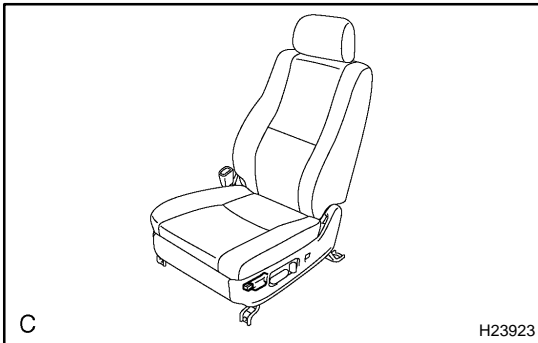
10. SIDE AIRBAG SENSOR ASSEMBLY

The side airbag sensor assembly is mounted in the LH and RH center pillars. The side airbag sensor assembly consists of an airbag sensor, diagnosis circuit, etc. It sends signals to the airbag sensor assembly to judge whether the SRS must be activated or not. The side airbag sensor assembly cannot be disassembled.



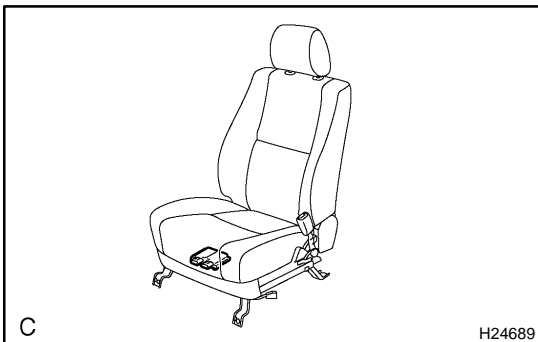
11. CURTAIN SHIELD AIRBAG SENSOR ASSEMBLY

The curtain shield airbag sensor assembly is mounted in the LH and RH quarter panels. The curtain shield airbag sensor assembly consists of an airbag sensor, diagnosis circuit, etc. It sends signals to the airbag sensor assembly to judge whether the SRS must be activated or not. The curtain shield airbag sensor assembly cannot be disassembled.



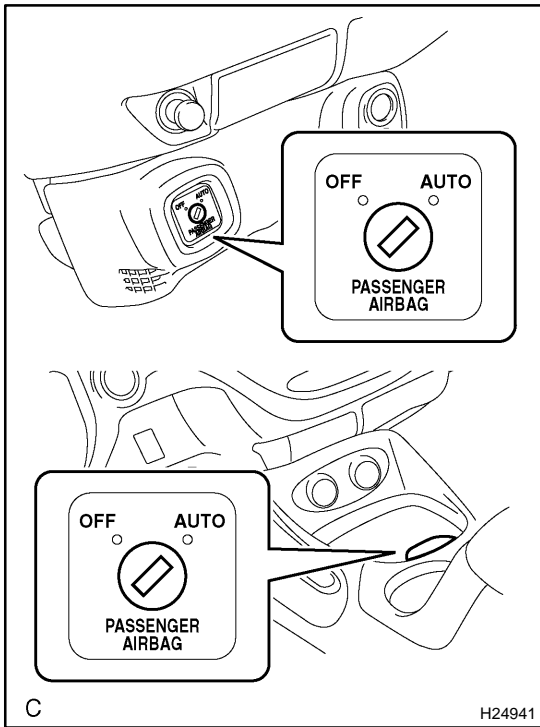
12. SEAT POSITION SENSOR ASSEMBLY

The seat position sensor assembly is mounted in the driver's seat. The sensor unit consists of a magnet sensor, etc. It judges the seat sliding position and sends the signal to the airbag sensor assembly. The seat position sensor assembly cannot be disassembled.



13. OCCUPANT CLASSIFICATION ECU

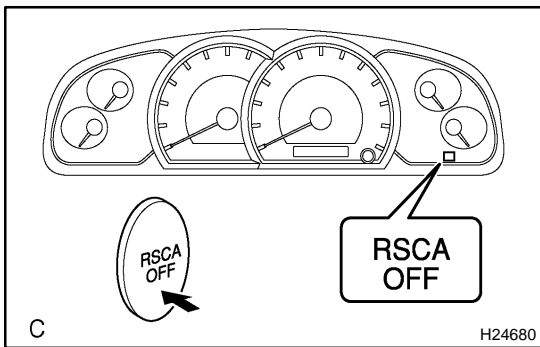
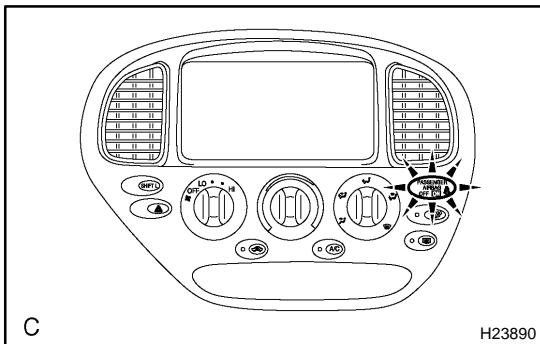
The occupant classification ECU is mounted in the passenger seat. Based on the information sent from the occupant classification ECU, the airbag sensor assembly determines whether the SRS should be activated or not. The occupant classification ECU cannot be disassembled.



14. PASSENGER AIRBAG MANUAL AUTO (ON)- OFF SWITCH

The passenger airbag manual AUTO (ON)- OFF switch is mounted on the lower center cover or front console box. By turning the passenger airbag manual AUTO (ON)-OFF switch to OFF with the ignition key, the passenger airbag system can be disabled. Also, in order to inform the passenger that the front passenger airbag is disabled, the OFF indicator inside the switch illuminates.

Switch Position	Passenger Airbag	Indicator Light
ON or AUTO	Operative	OFF
OFF	Disabled	ON



15. RSCA OFF SWITCH

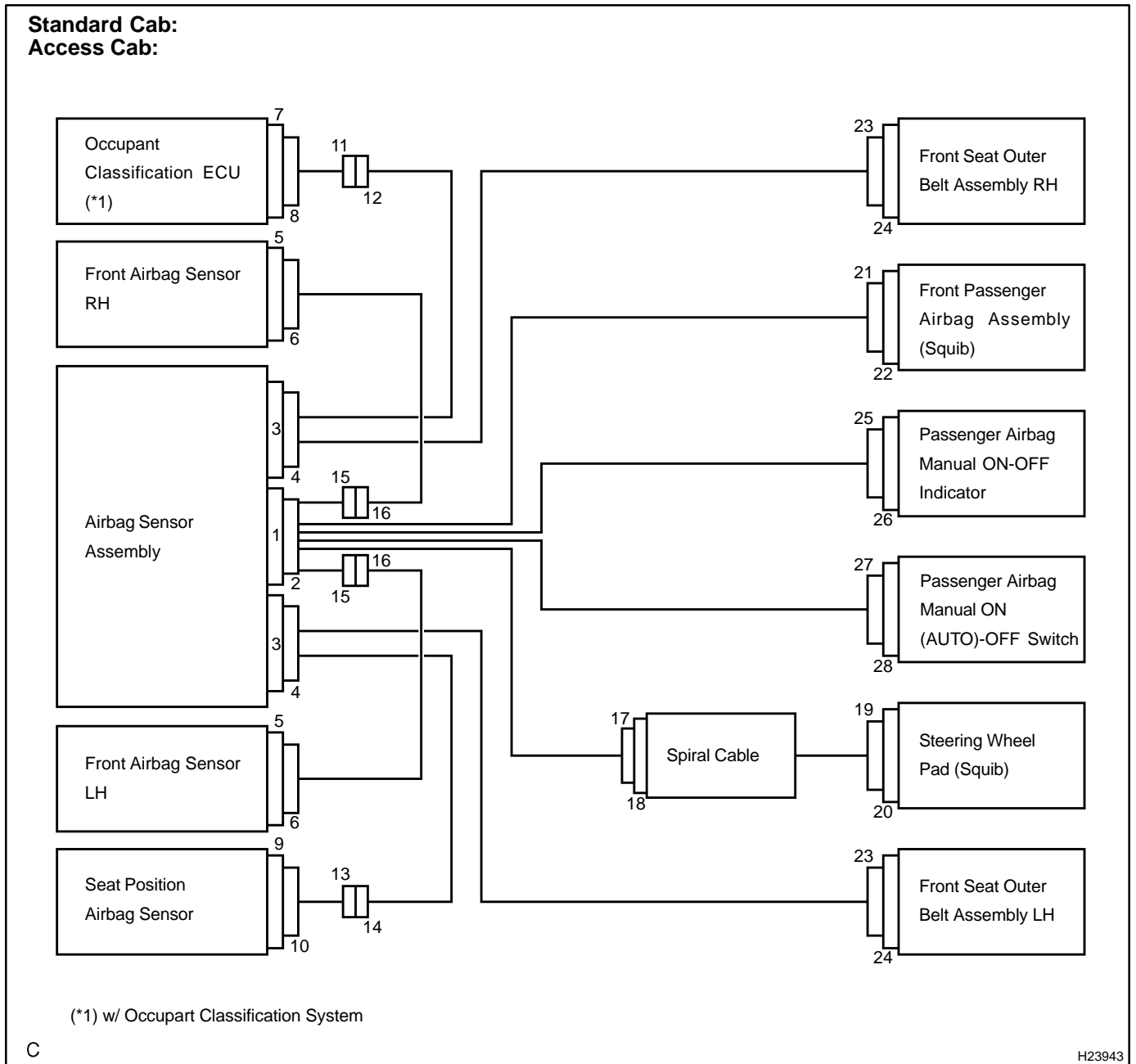
The RSCA OFF switch is located on the switch base. The curtain shield airbag can be switched ON and OFF by pushing the RSCA OFF switch. Also, the RSCA OFF indicator lamp comes on to inform the passenger that the curtain shield airbag is disabled.

Switch Position	Curtain Shield Airbag	Indicator Light
ON	Operative	OFF
OFF	Disabled	ON

16. SRS CONNECTORS

HINT:

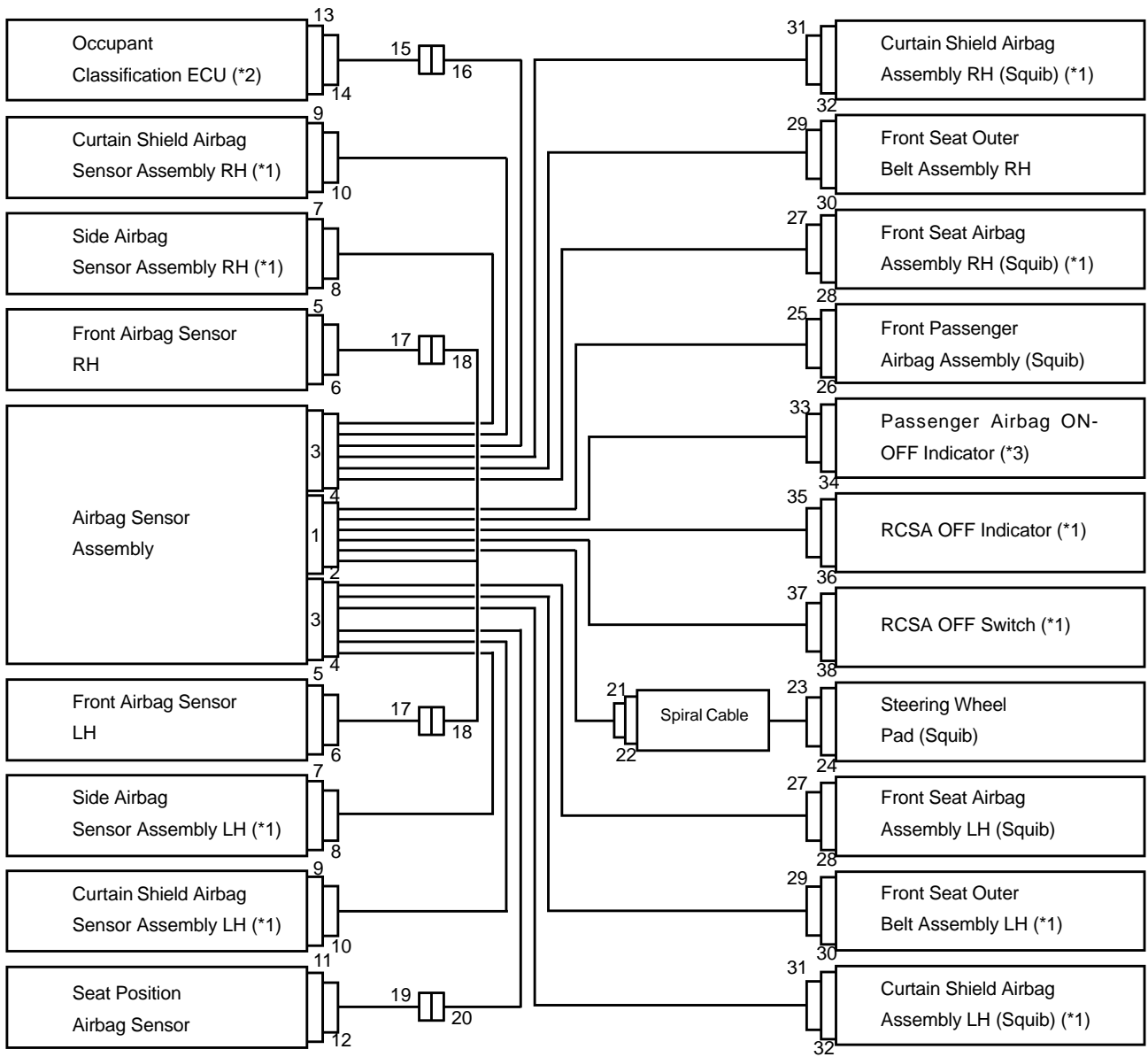
SRS connectors are located as shown in the following illustration.



No.	Connector Type	Application
(1)	Terminal Twin-Lock Mechanism	Connectors 2, 4, 16, 17, 21, 22
(2)	Activation Prevention Mechanism	Connectors 2, 4, 18, 20, 22, 24
(3)	Half Connection Prevention Mechanism	Connectors 6, 15, 17, 21
(4)	Connector Lock Mechanism (1)	Connectors 19, 31
(5)	Connector Lock Mechanism (2)	Connectors 2, 4
(6)	Improper Connection Prevention Lock Mechanism	Connectors 1, 3
(7)	RSCA OFF Switch	Connectors 1, 3

SUPPLEMENTAL RESTRAINT SYSTEM - SRS AIRBAG

Double Cab:

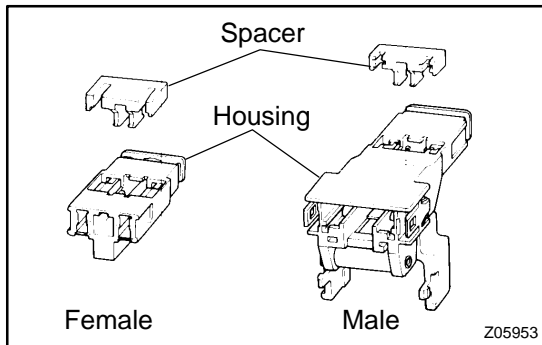


(*1) w/ Side Airbag and Curtain Shield Airbag (*3) Separate Seat Type
 (*2) w/ Occupant Classification System

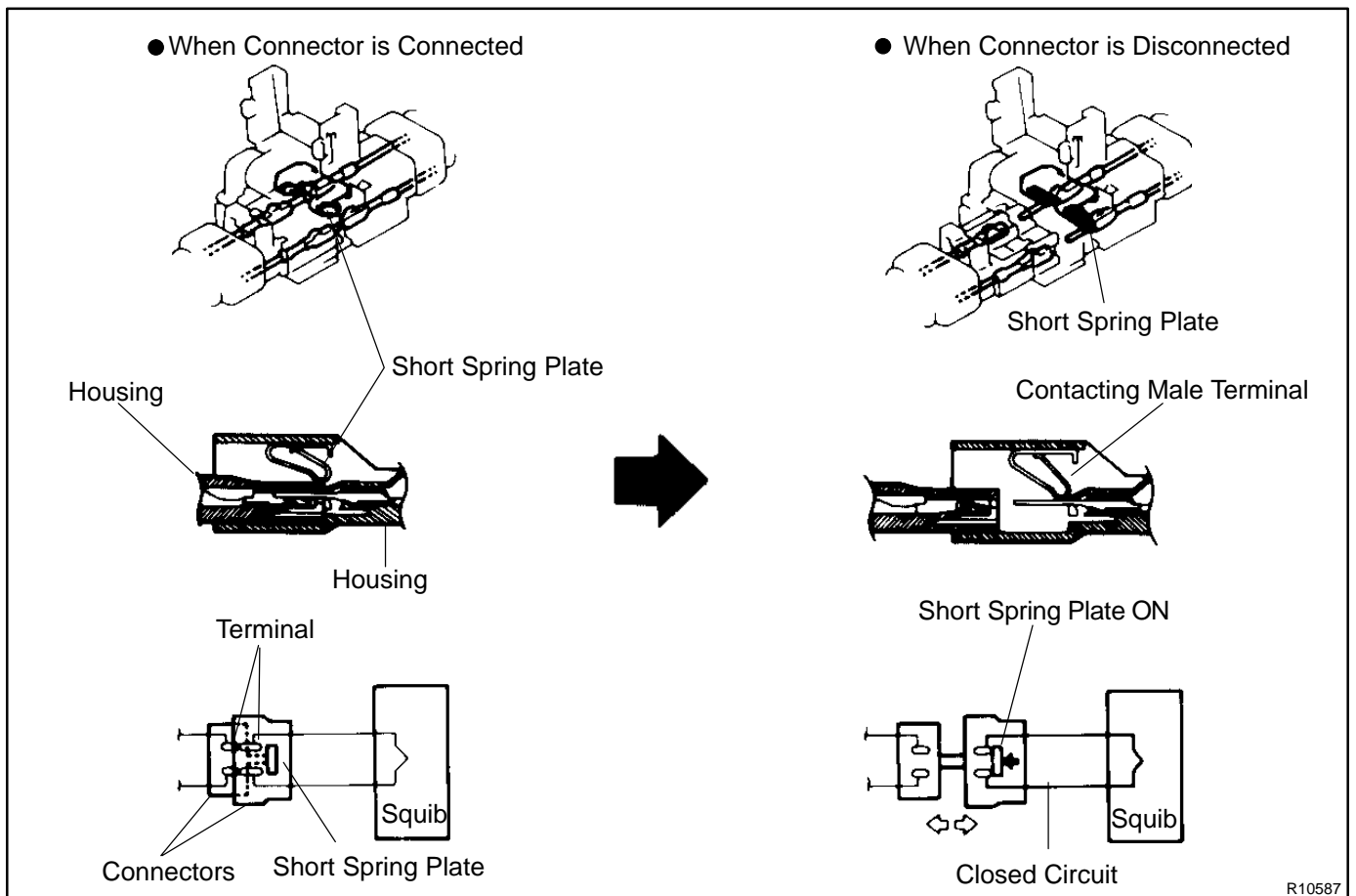
H24699

No.	Connector Type	Application
(1)	Terminal Twin-Lock Mechanism	Connectors 2, 4, 6, 8, 10, 18, 21, 25, 26, 27, 28, 31, 32
(2)	Activation Prevention Mechanism	Connectors 2, 4, 22, 24, 26, 28, 30, 32
(3)	Half Connection Prevention Mechanism	Connectors 6, 8, 10, 17, 21, 25, 27
(4)	Connector Lock Mechanism (1)	Connectors 23, 29
(5)	Connector Lock Mechanism (2)	Connectors 2, 4
(6)	Improper Connection Prevention Lock Mechanism	Connectors 1, 3

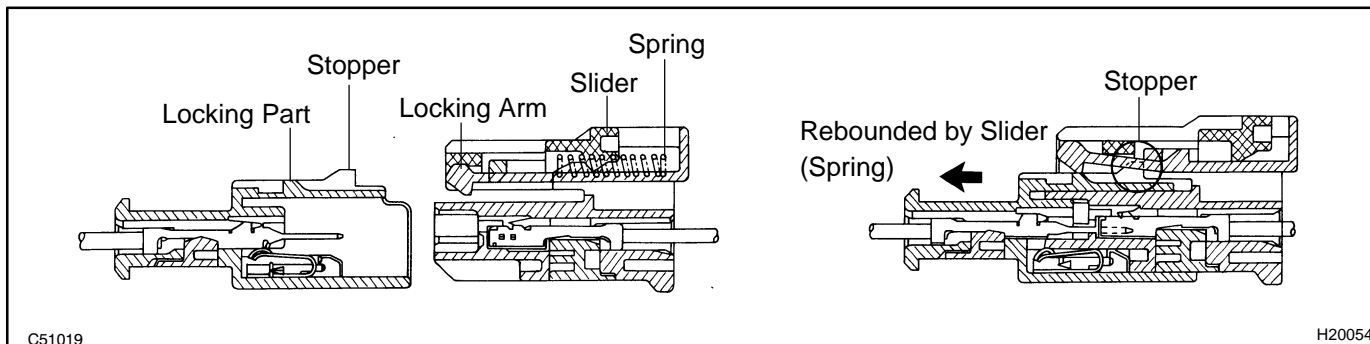
- (a) All connectors in the SRS, except the seat position airbag sensor connector and occupant classification ECU connectors, are colored yellow to distinguish them from other connectors. These connectors have special functions, and are specially designed for the SRS. All SRS connectors use durable gold-plated terminals, and are placed in the locations shown on the previous page to ensure high reliability.



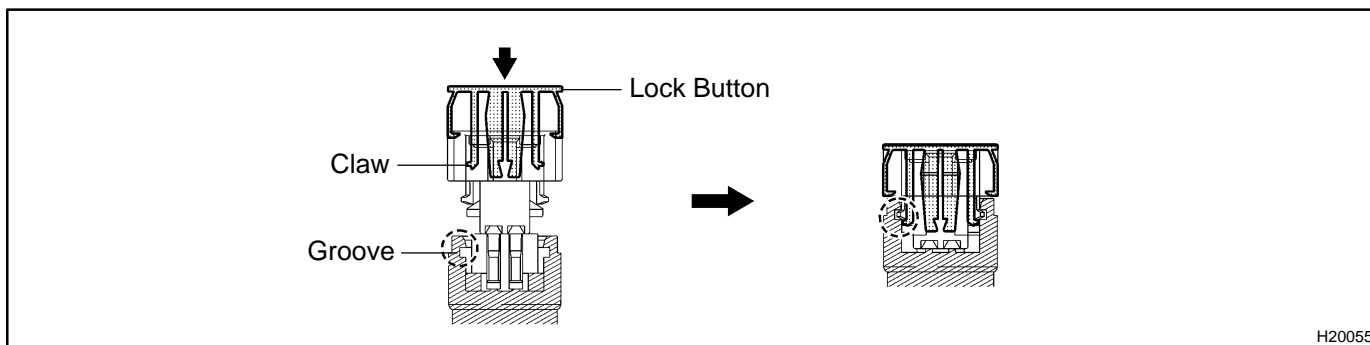
- (1) **Terminal Twin-Lock Mechanism**
 Each connector has a two-piece component consisting of a housing and a spacer. This design allows the terminal to be locked securely by two locking devices (the retainer and the lance) to prevent terminals from coming out.
- (2) **Activation Prevention Mechanism**
 Each connector contains a short spring plate. When the connector is disconnected, the short spring plate automatically connects the positive (+) terminal and negative (-) terminal of the squib.



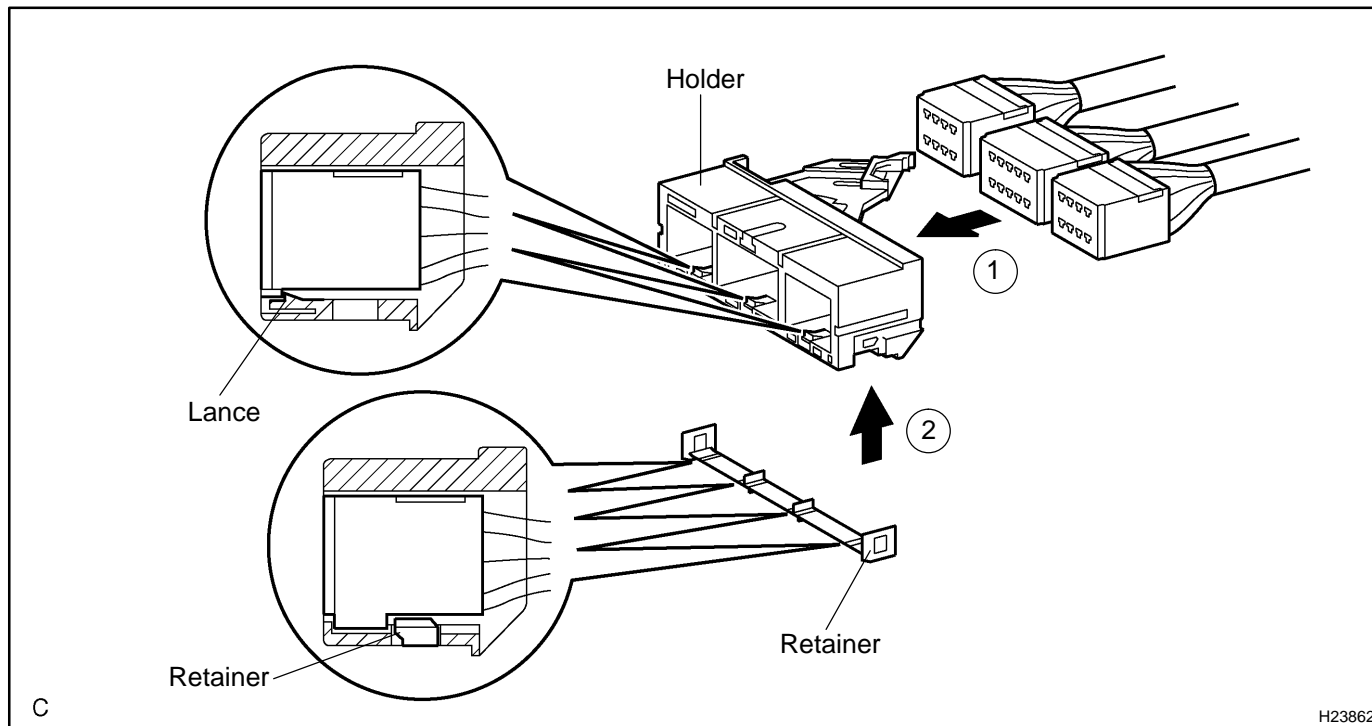
- (3) Half connection prevention mechanism:
 If the connector is not completely connected, the connector is disconnected due to the spring operation to the extent that no continuity exists.



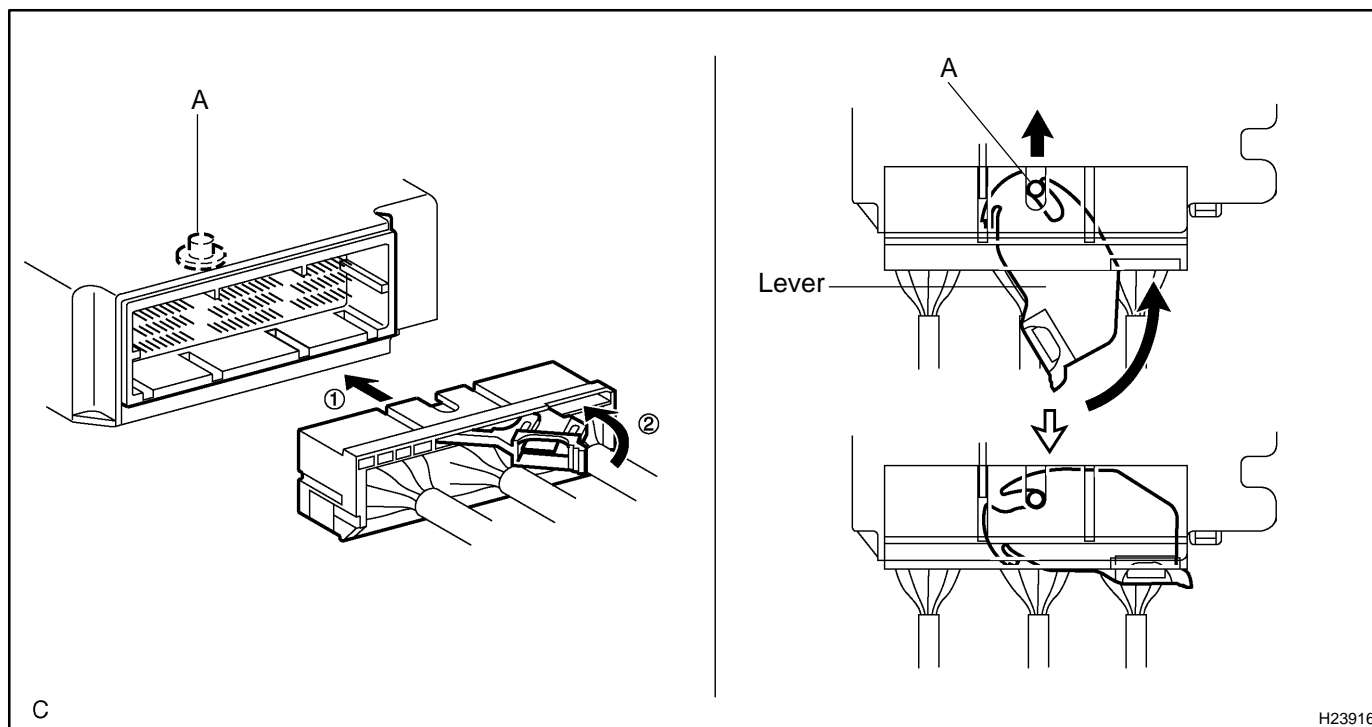
- (4) Connector lock mechanism (1):
 Locking the connector lock button securely connects the connector.



- (5) Connector lock mechanism (2): Both the primary lock with holder lances and the secondary lock with retainer prevent the connectors from becoming disconnected.

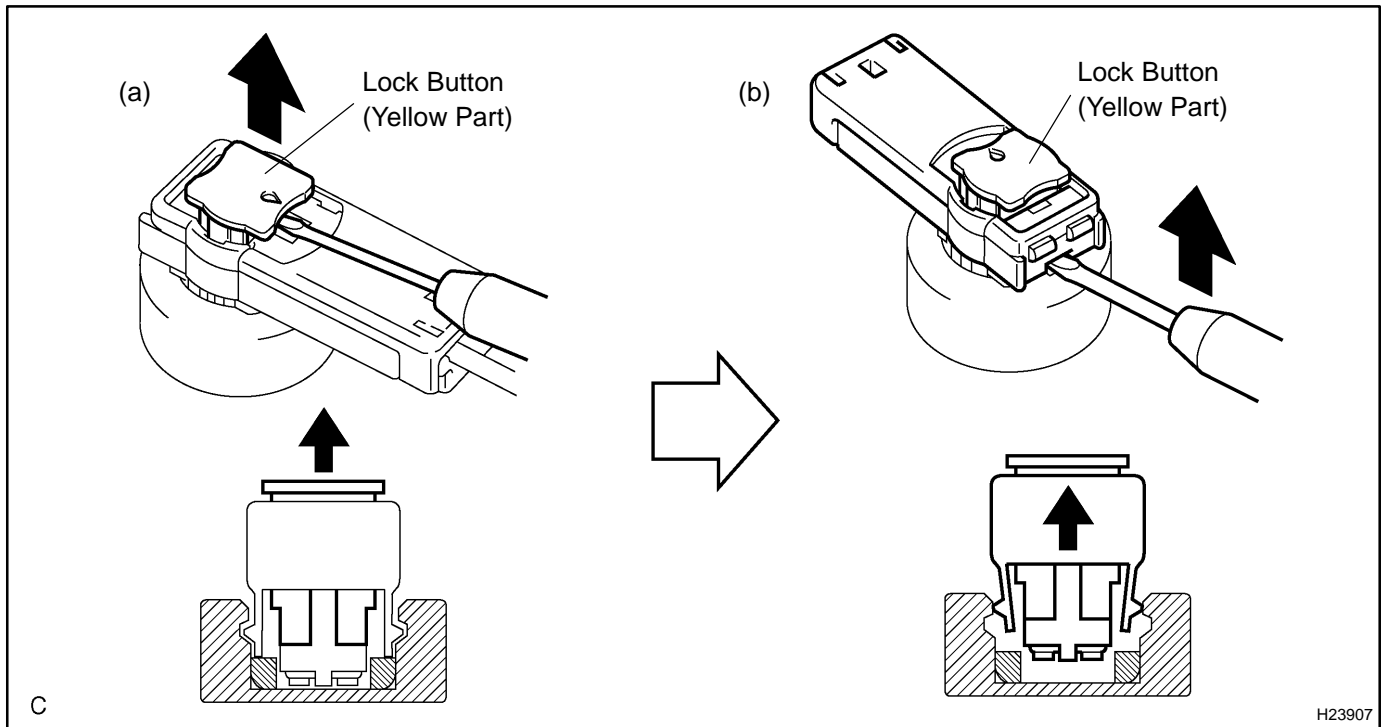


- (6) Improper connection prevention lock mechanism: When connecting the holder, the lever is pushed into the end by rotating around the A axis to lock the holder securely.

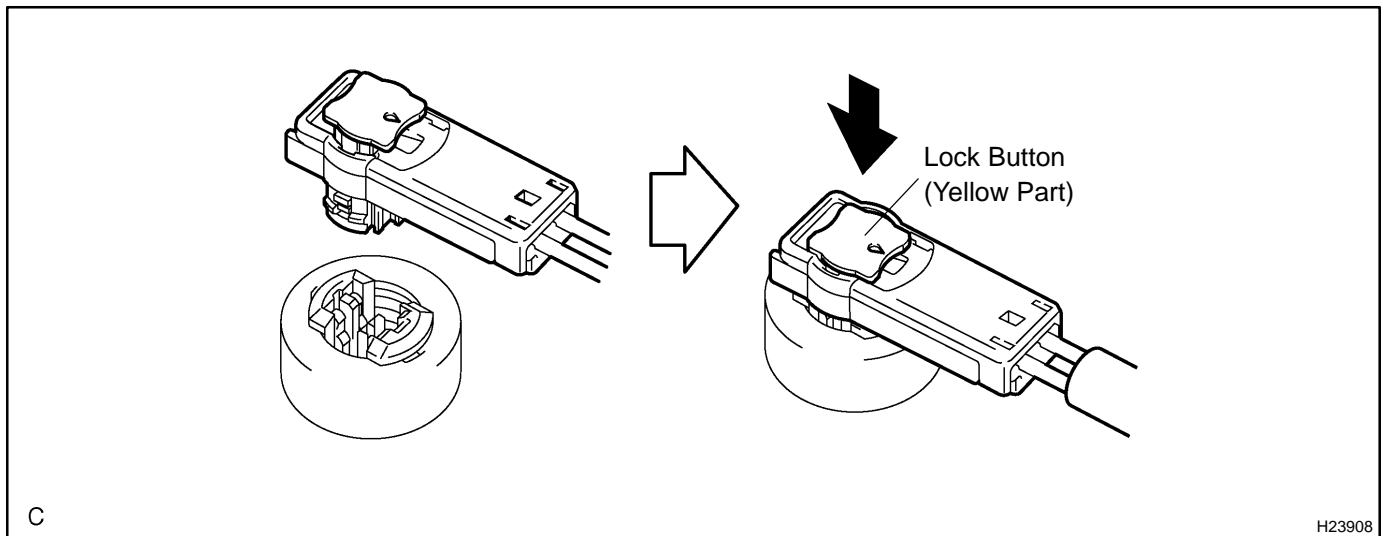


17. DISCONNECTION OF CONNECTORS FOR STEERING WHEEL PAD

- (a) Release the lock button (yellow part) of the connector using a screwdriver.
- (b) Insert the screwdriver tip between the connector and the base, and then raise the connector.

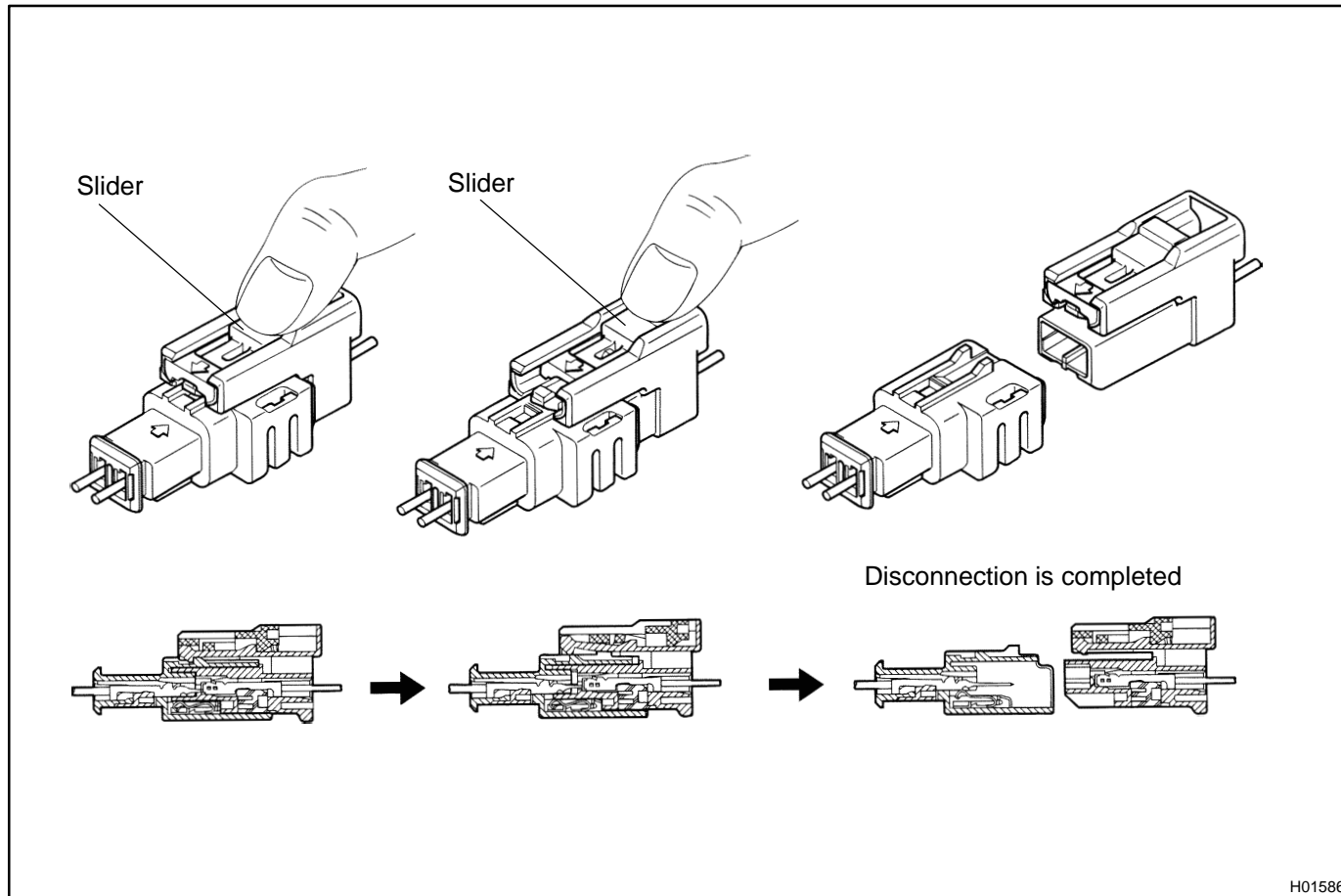
**18. CONNECTION OF CONNECTORS FOR STEERING WHEEL PAD**

- (a) Connect the connector.
- (b) Push down securely on the lock button (yellow part) of the connector. (When locking, a click sound can be heard.)



19. DISCONNECTION OF CONNECTORS FOR FRONT PASSENGER AIRBAG ASSEMBLY AND CURTAIN SHIELD AIRBAG ASSEMBLY

(a) Place a finger on the slider, slide the slider to release the lock, and then disconnect the connector.



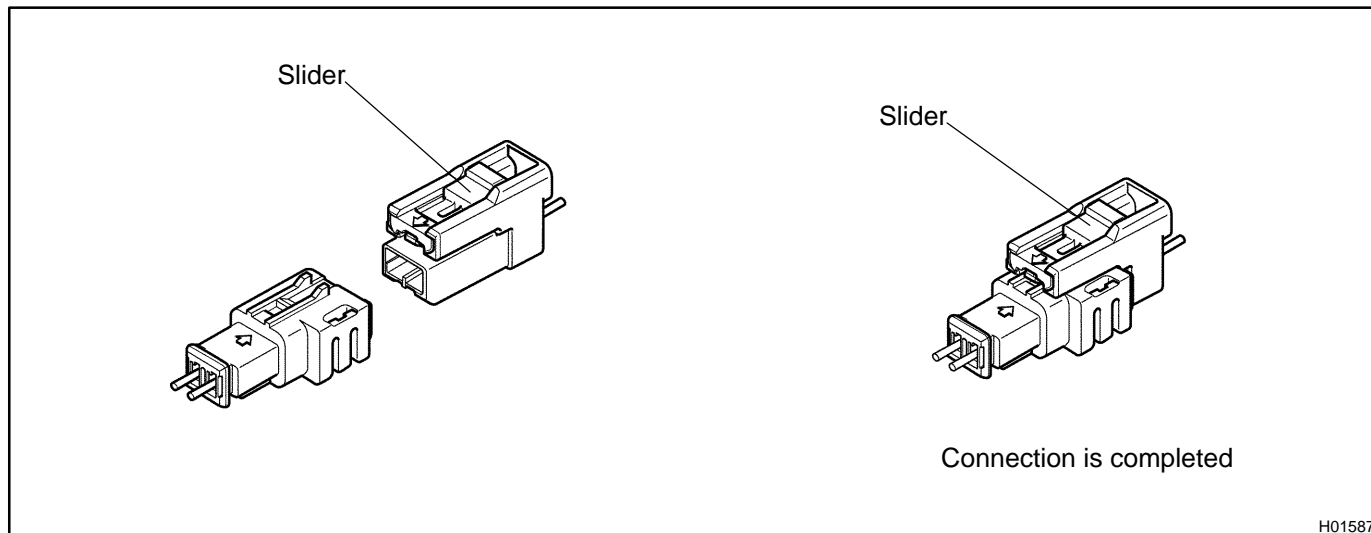
H01586

20. CONNECTION OF CONNECTORS FOR FRONT PASSENGER AIRBAG ASSEMBLY AND CURTAIN SHIELD AIRBAG ASSEMBLY

(a) Connect the connector as shown in the illustration. (When locking, make sure that the slider returns to its original position and a click sound can be heard.)

HINT:

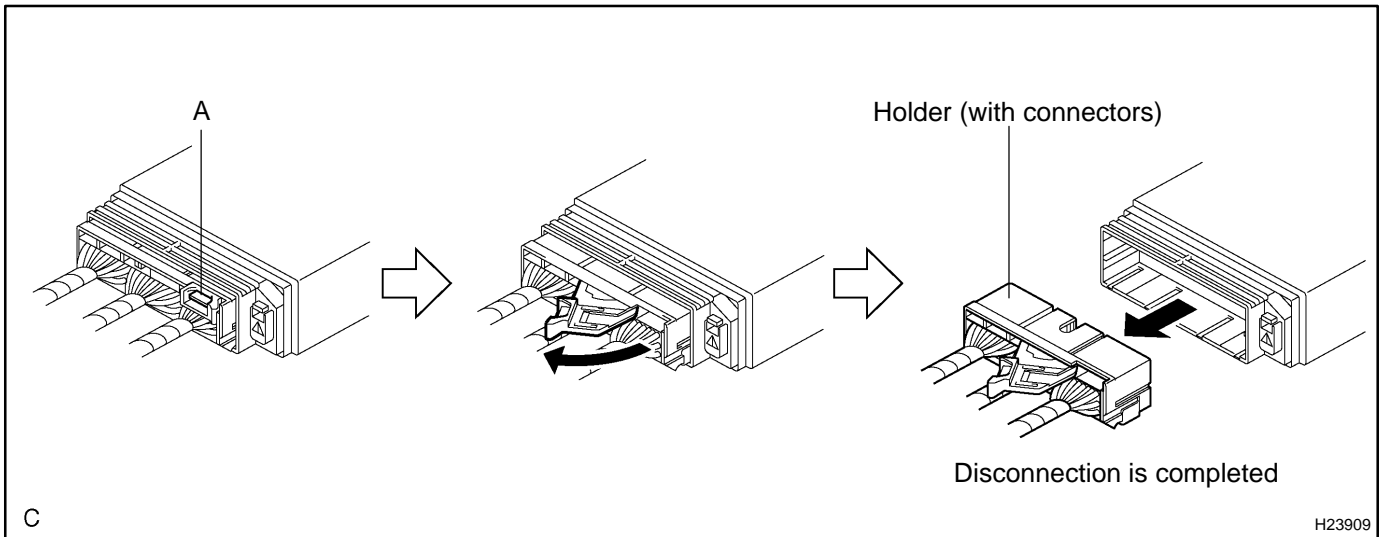
When connecting, the slider will slide. Be sure not to touch the slider while connecting, as it may result in an insecure fit.



H01587

21. DISCONNECTION OF CONNECTOR FOR AIRBAG SENSOR ASSY CENTER

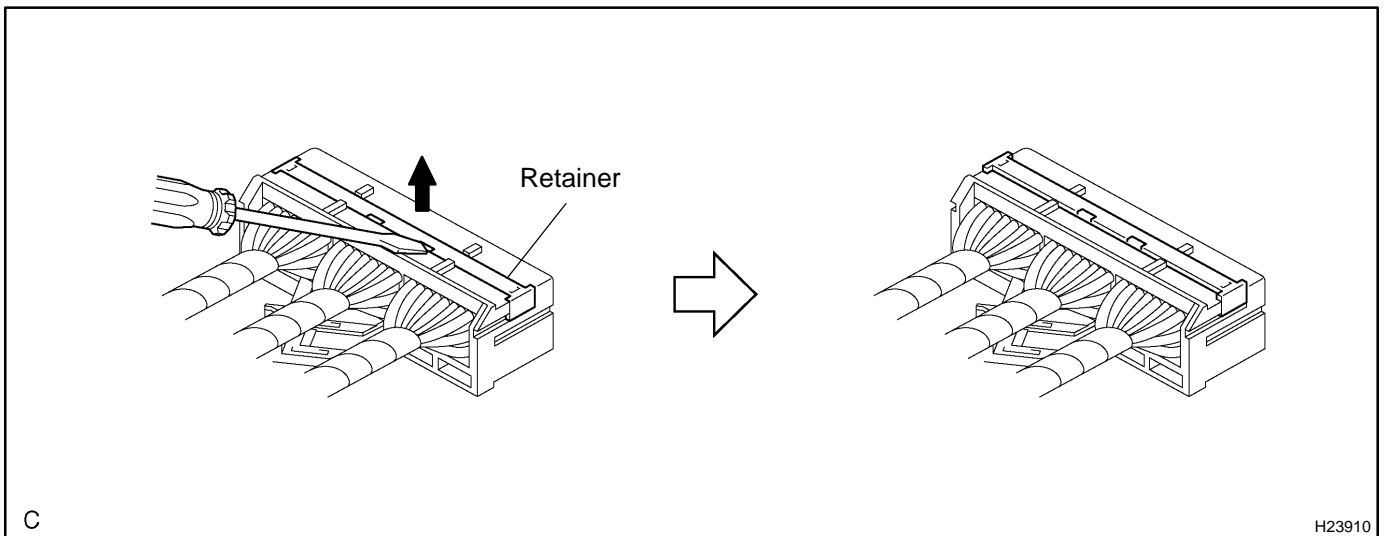
- (a) Pull the lever by pushing part A as shown in the illustration and disconnect the holder (with connectors).



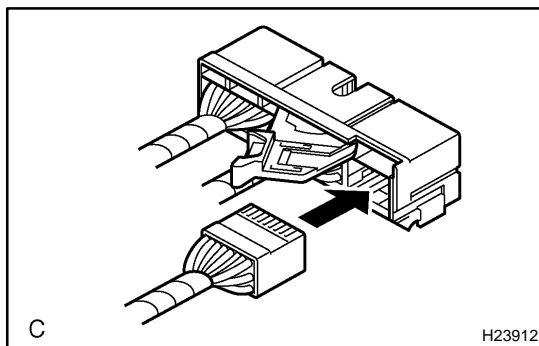
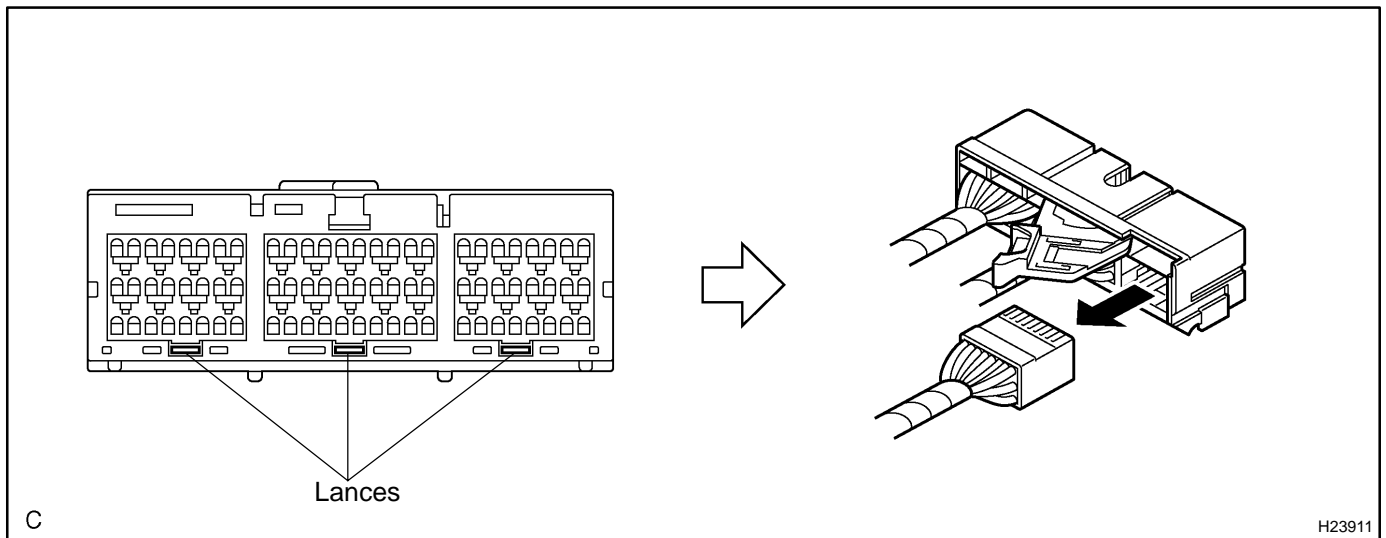
HINT:

Perform the following procedures when replacing the holder.

- (b) Remove the holder.
 - (1) Using a screwdriver, unlock the retainer.



- (2) Release the fitting lances and remove the holder.



- (c) Install the holder.
(1) Install the connectors to the holder. (When locking, a click sound can be heard.)

HINT:

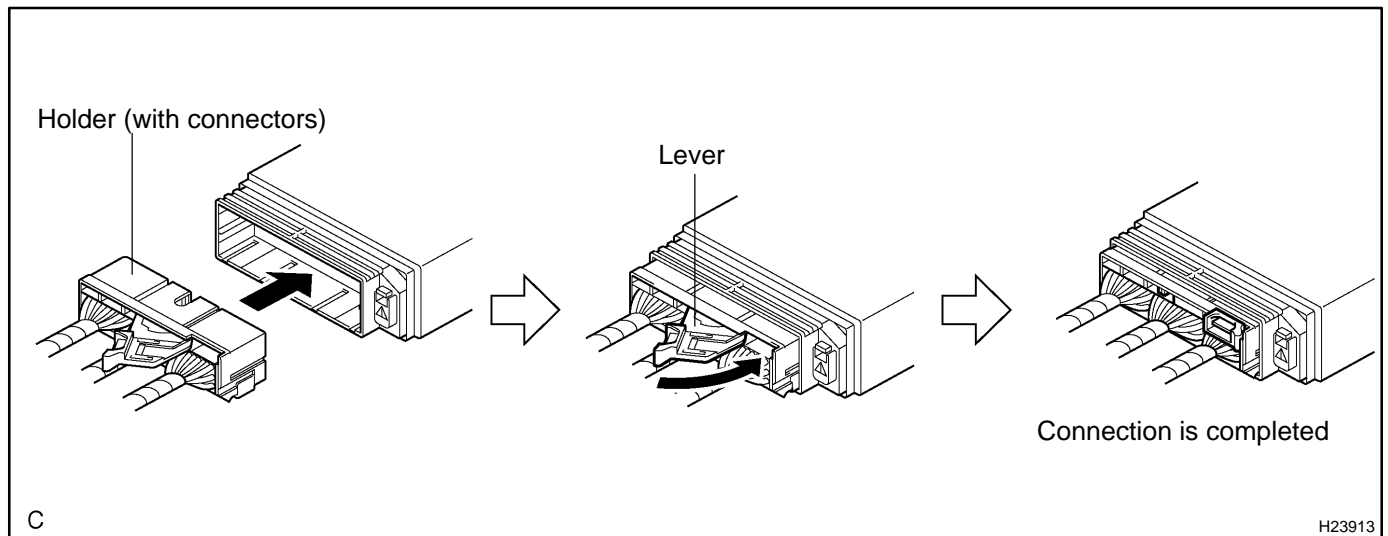
The retainer is locked when the holder is connected.

22. CONNECTION OF CONNECTOR FOR AIRBAG SENSOR ASSY CENTER

- (a) Firmly insert the holder (with connectors) until it can not be pushed any further.
(b) Push the lever to connect the holder (with connectors). (When locking, a click sound can be heard.)

HINT:

The holder slides when connecting. Be sure not to hold the holder while connecting, as it may result in an insecure fit.

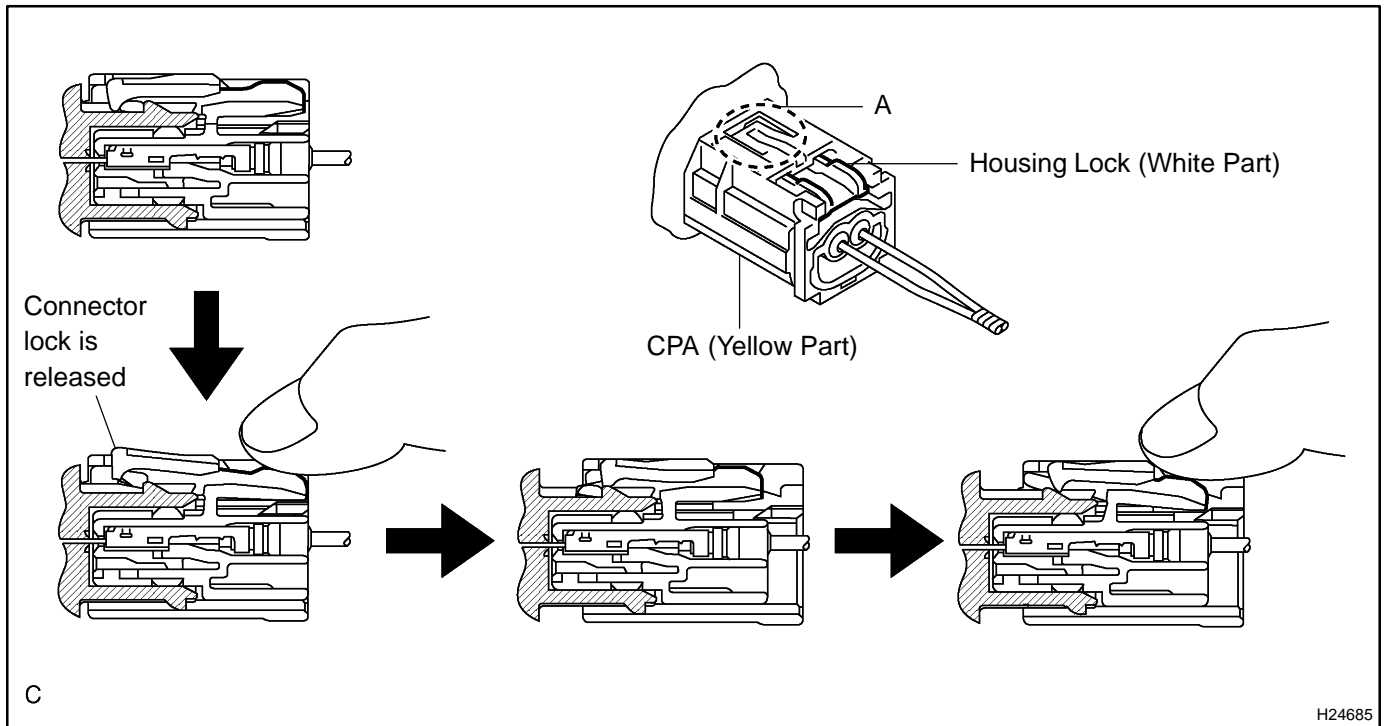


23. DISCONNECTION OF CONNECTOR FOR FRONT AIRBAG SENSOR

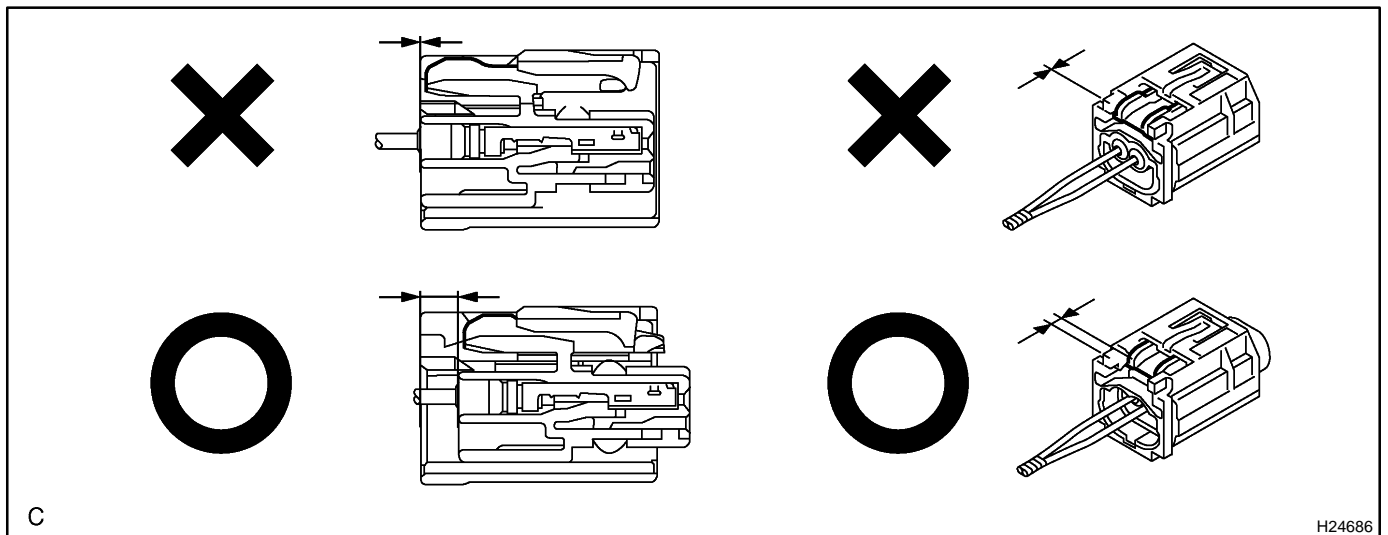
- (a) Push down the housing lock (white part) and slide the CPA (yellow part). (At this time, the connector cannot be disconnected yet).
- (b) Push down the housing lock (white part) again and disconnect the connector.

HINT:

Do not push down the A part shown in the illustration when disconnecting.

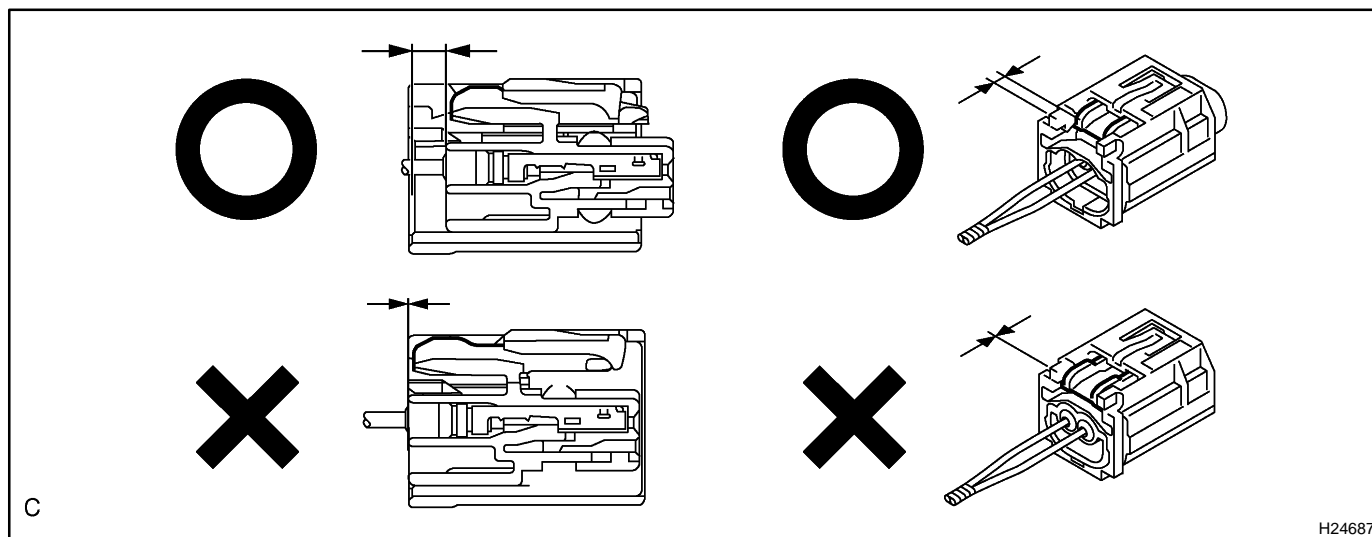


- (c) After disconnecting the connector, check that the position of the housing lock (white part) is as shown in the illustration.



24. CONNECTION OF CONNECTOR FOR FRONT AIRBAG SENSOR

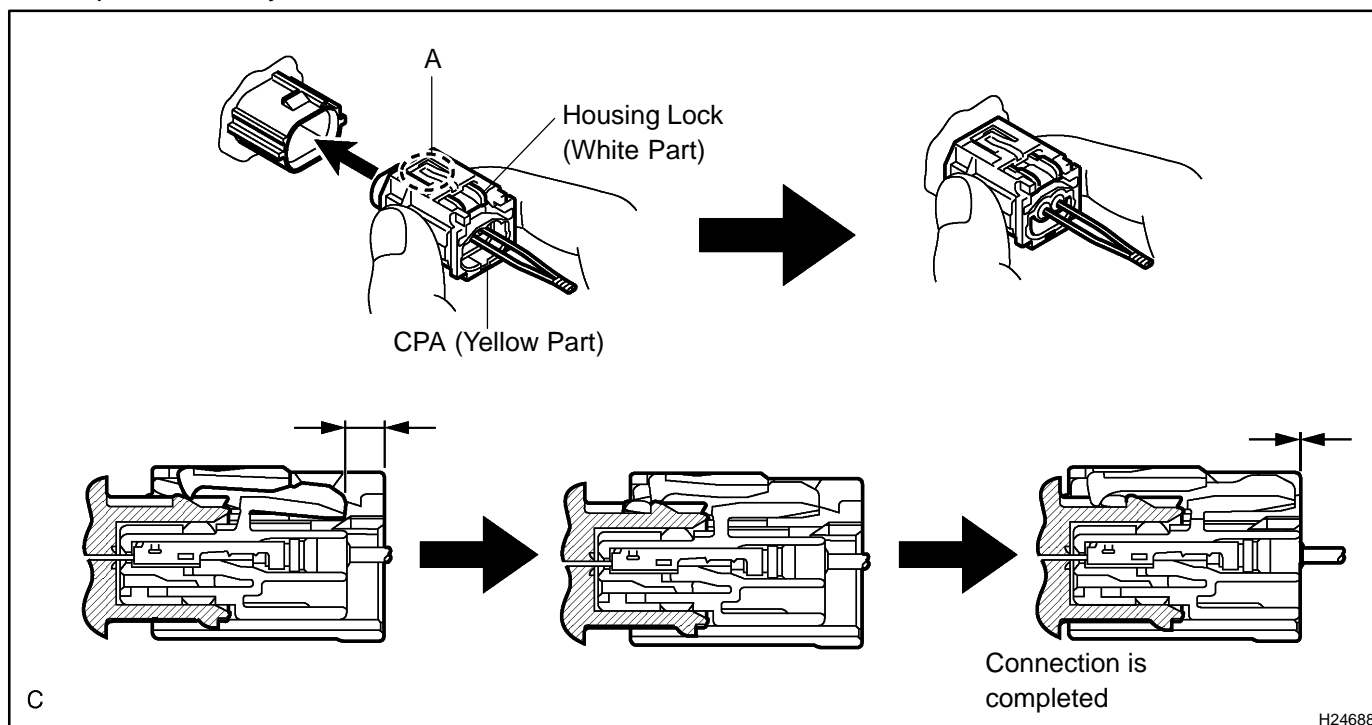
- (a) Before connecting the connectors, check that the position of the housing lock (white part) is as shown in the illustration.



- (b) Be sure to engage the connectors until they are locked. (When locking, make sure that a click sound can be heard.)

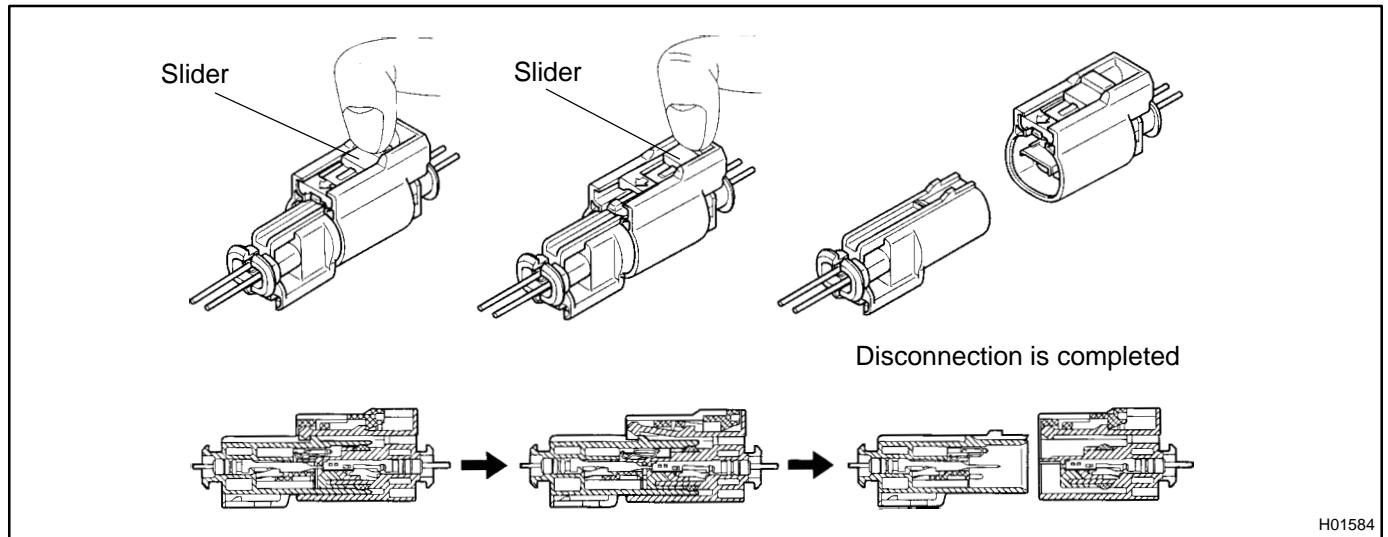
HINT:

When connecting them, the housing lock (white part) slides. Be sure not to hold the housing lock (white part) and A part, as it may result in an insecure fit.



25. DISCONNECTION OF CONNECTOR FOR SIDE AIRBAG ASSEMBLY

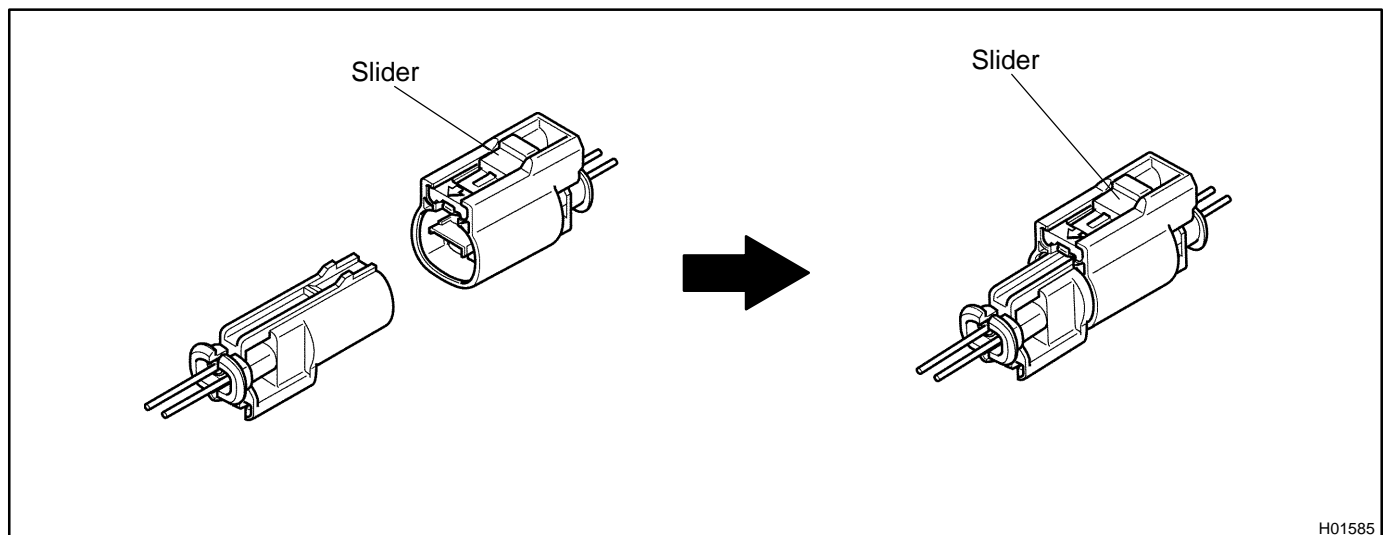
- (a) Place a finger on the slider, slide the slider to release the lock, and then disconnect the connector.

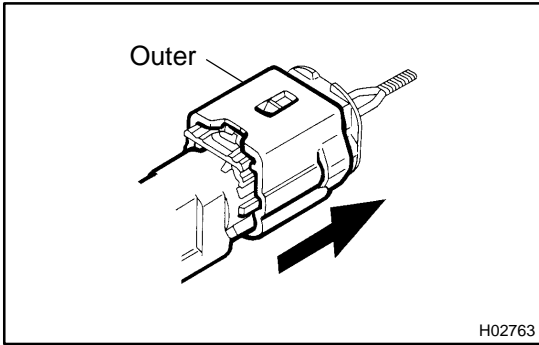
**26. CONNECTION OF CONNECTOR FOR SIDE AIRBAG ASSEMBLY**

- (a) Connect the connector as shown in the illustration. (When locking, make sure that the slider returns to its original position and a click sound can be heard.)

HINT:

When connecting, the slider will slide. Be sure not to touch the slider while connecting, as it may result in an insecure fit.



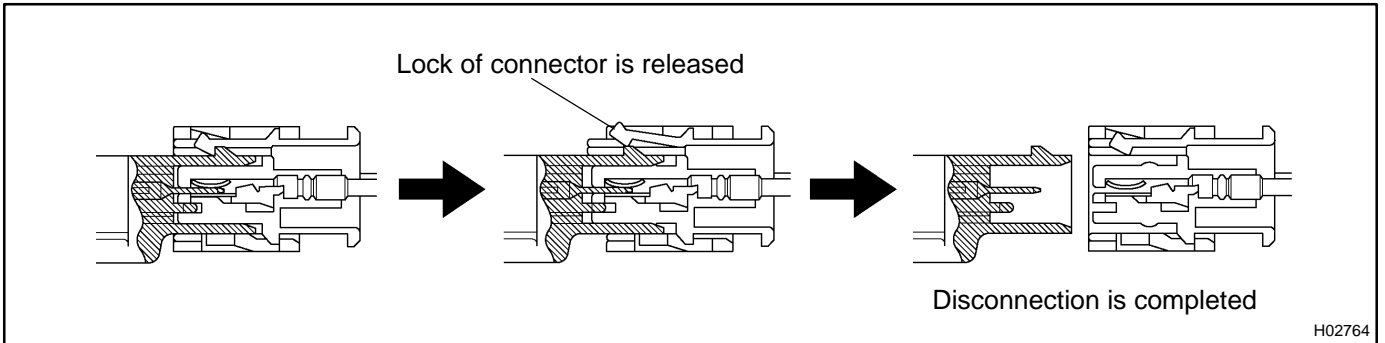


27. DISCONNECTION OF CONNECTORS FOR SIDE AIRBAG SENSOR AND CURTAIN SHIELD AIRBAG SENSOR

- (a) While holding both outer flank sides, slide the outer in the direction shown by the arrow.
- (b) When the connector lock is released, the connectors are disconnected.

HINT:

Be sure to hold both outer flank sides. Holding the top and bottom sides will make disconnection difficult.

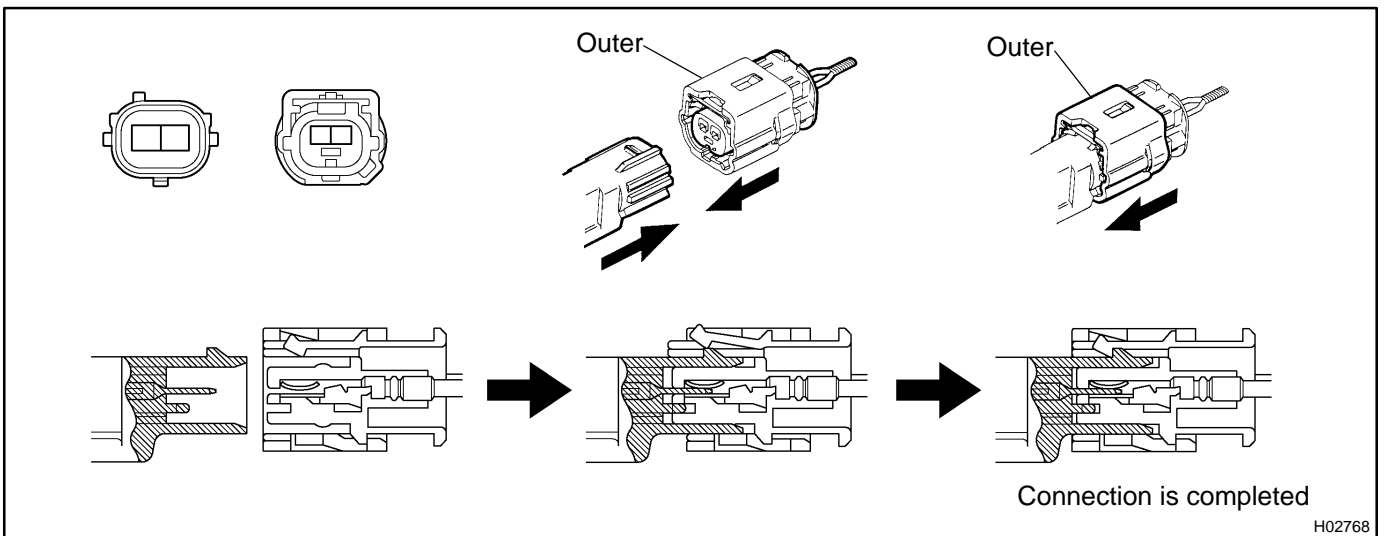


28. CONNECTION OF CONNECTORS FOR SIDE AIRBAG SENSOR AND CURTAIN SHIELD AIRBAG SENSOR

- (a) Connect the connector as shown in the illustration. (When locking, make sure that the outer returns to its original position and a click sound can be heard.)

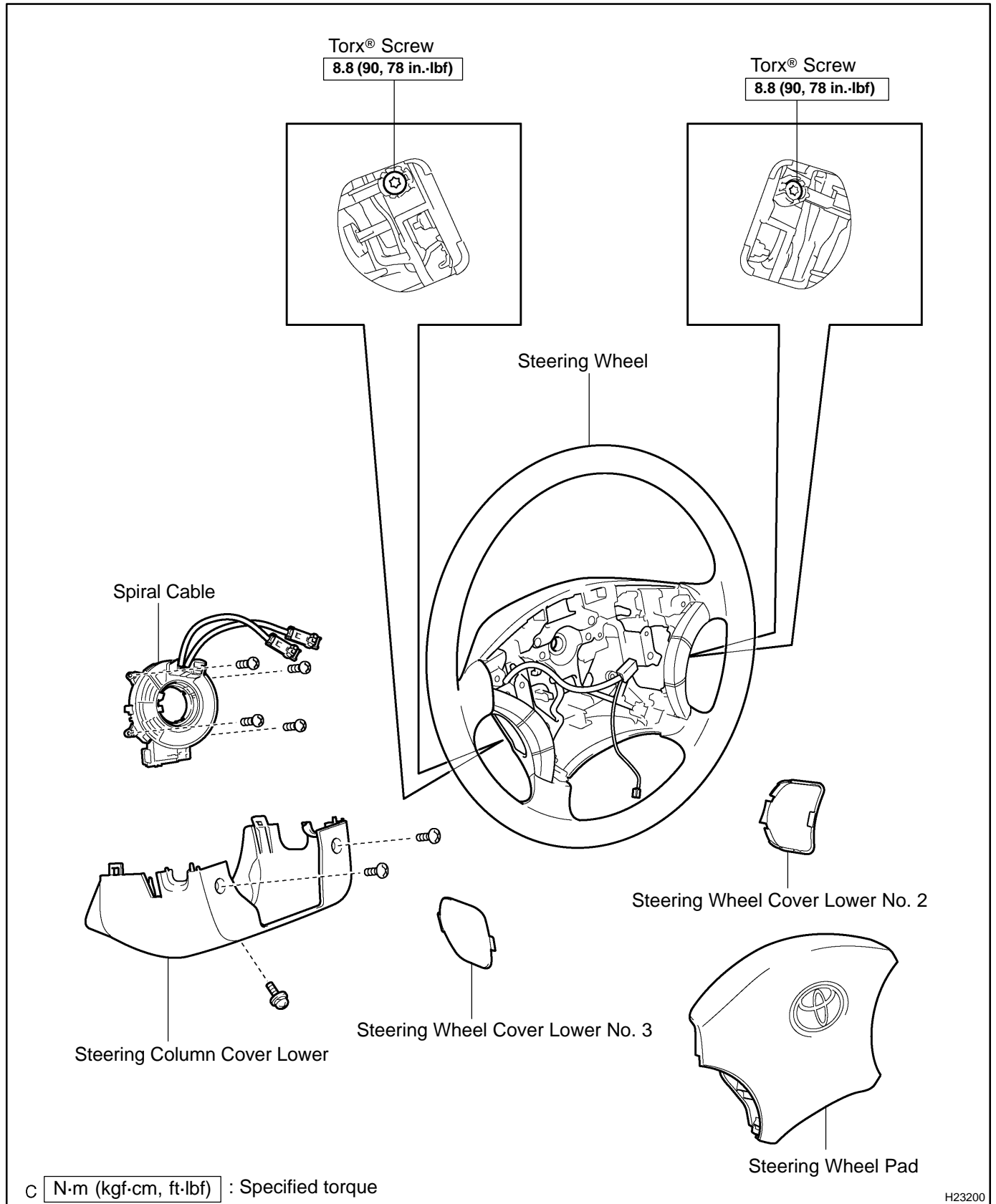
HINT:

When connecting, the outer will slide. Be sure not to hold the outer while connecting, as it may result in an insecure fit.



STEERING WHEEL PAD AND SPIRAL CABLE COMPONENTS

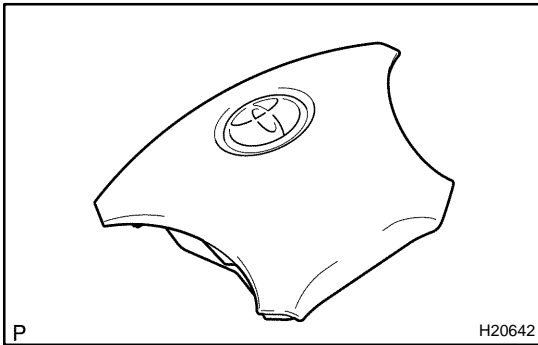
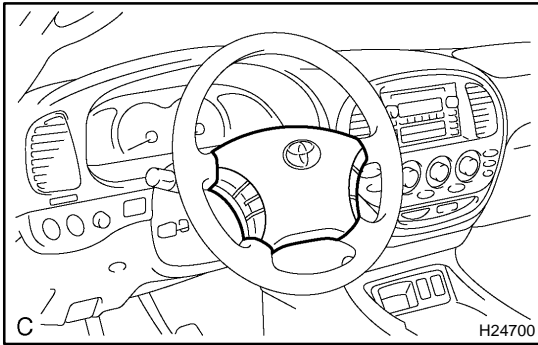
RS00Y-59



REMOVAL

NOTICE:

- ◆ If the wiring connector of the SRS is disconnected and the ignition switch is in the ON or ACC position, DTCs will be recorded.
 - ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.
1. PRECAUTION (SEE PAGE [RS-1](#) AND [RS-3](#))
 2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
- Wait for 90 seconds after disconnecting the cable to prevent the airbag working.
3. REMOVE STEERING WHEEL PAD (SEE PAGE [SR-18](#) AND [SR-33](#))
 4. REMOVE STEERING WHEEL (SEE PAGE [SR-18](#) AND [SR-33](#))
 5. REMOVE STEERING COLUMN COVER LOWER (SEE PAGE [SR-18](#) AND [SR-33](#))
 6. REMOVE SPIRAL CABLE (SEE PAGE [SR-18](#) AND [SR-33](#))



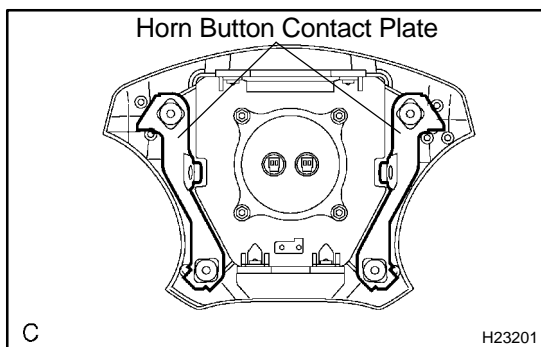
INSPECTION

1. VEHICLES NOT INVOLVED IN A COLLISION

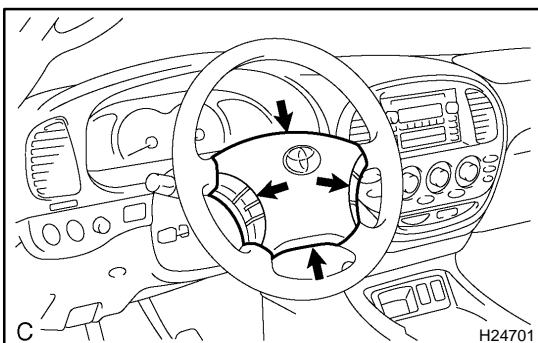
- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) With the steering wheel pad installed on the vehicle, perform a visual check. If there are any defects as mentioned below, replace the steering wheel pad with a new one: Cuts, minute cracks or marked discoloration on the steering wheel pad top surface or in the grooved portion.

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) With the steering wheel pad removed from the vehicle, perform a visual check. If there are any defects as mentioned below, replace the steering wheel pad or steering wheel assembly with a new one:
 - ◆ Cuts, minute cracks or marked discoloration on the steering wheel pad top surface or in the grooved portion.
 - ◆ Cracks or other damage to the connectors.
 - ◆ Deformation of the steering wheel assembly.



- ◆ Deformation of the horn button contact plate of the horn button assembly.



- ◆ There should be no interference between the steering wheel pad and steering wheel assembly, and the clearance should be uniform all the way around when the new steering wheel pad is installed on the steering wheel assembly.

CAUTION:

For removal and installation procedures of the steering wheel pad, see page [RS-23](#) and [RS-33](#) . Be sure to follow the correct procedure.

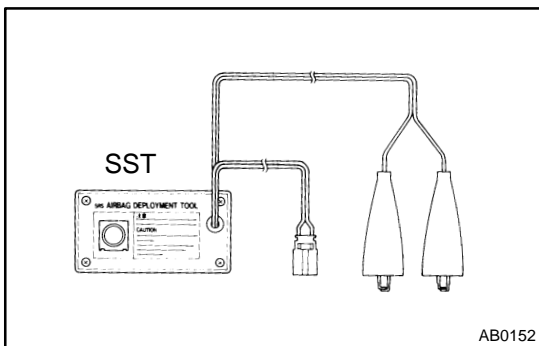
DISPOSAL

HINT:

When scrapping a vehicle equipped with SRS or disposing of the steering wheel pad, be sure to deploy the airbag first in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, USA, INC.

CAUTION:

- ◆ Never dispose of a steering wheel pad which has an undeployed airbag.
- ◆ The airbag produces an exploding sound when it is deployed, so perform the operation outdoors and where it will not create a nuisance to nearby residents.

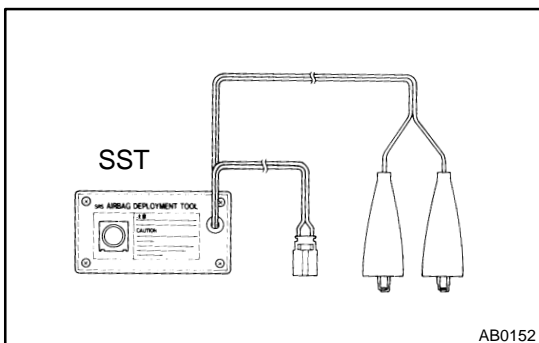


- ◆ When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.
- ◆ When deploying an airbag, perform the operation at least 10 m (33 ft) away from the steering wheel pad.
- ◆ The steering wheel pad becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
- ◆ Use gloves and safety glasses when handling a steering wheel pad with a deployed airbag.
- ◆ Do not apply water, etc. to a steering wheel pad with a deployed airbag.
- ◆ Always wash your hands with water after completing the operation.

1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

HINT:

Prepare a battery as the power source to deploy the airbag.

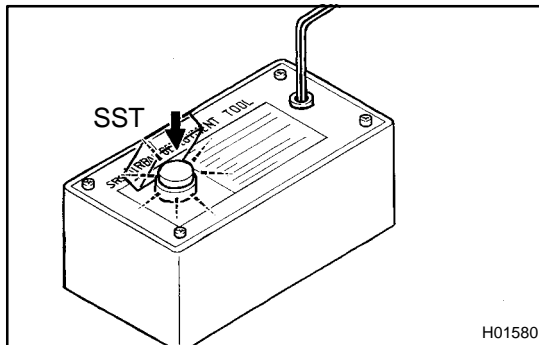
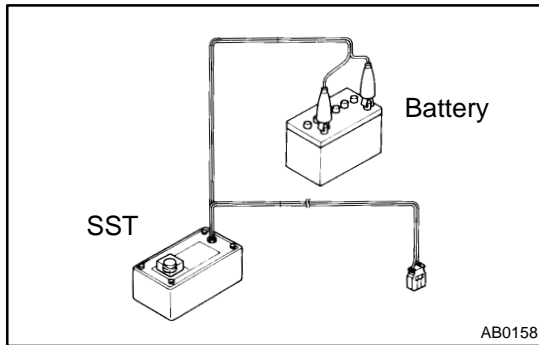


- (a) Check the function of the SST.

SST 09082-00700

CAUTION:

When deploying the airbag, always use the specified SST: SRS Airbag Deployment Tool.



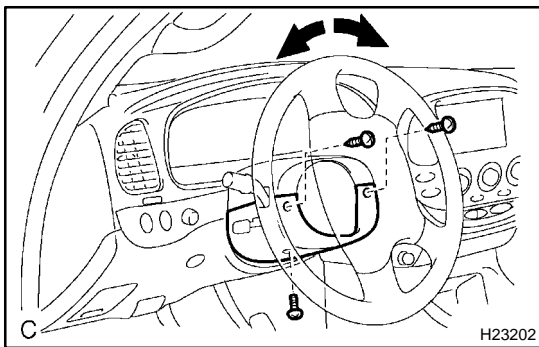
- (1) Connect the SST to the battery.
Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (-) terminal.

- (2) Check the function of the SST.
Press the SST activation switch, and check that the LED of the SST activation switch comes on.

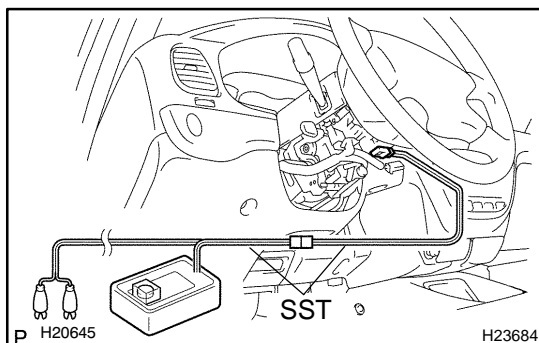
CAUTION:

- ◆ Do not connect the SST connector (yellow colored one) to the airbag.
- ◆ If the LED comes on when the activation switch is not being pressed, SST malfunction is possible, so replace the SST with a new one.

- (3) Disconnect the SST from the battery.
- (b) Precaution (see page RS-1 and RS-3).
- (c) Disconnect the cable from the negative battery terminal.
Wait for 90 seconds after disconnecting the cable to prevent the airbag working.



- (d) Remove the steering column cover lower.
 - (1) While turning the steering wheel assembly to the right and left, remove the 3 screws and steering column cover lower.



- (e) Install the SST.

CAUTION:

Check that there is no looseness in the steering wheel assembly and steering wheel pad.

- (1) Disconnect the airbag connector (yellow colored one) from the spiral cable.

NOTICE:

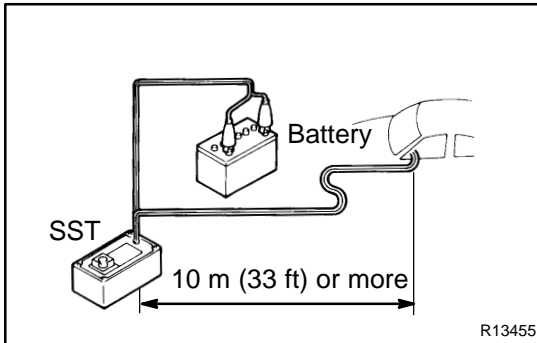
When handling the airbag connector, take care not to damage the airbag wire harness.

- (2) Connect the SST connector to the airbag connector of the spiral cable.

SST 09082-00700, 09082-00780

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.



- (3) Move the SST at least 10 m (33 ft) away from the vehicle front side window.
- (4) Maintaining enough clearance for the SST wire harness in the front side window, close all doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

- (5) Connect the red clip of the SST to the battery positive (+) terminal and the black clip of the SST to the negative (-) terminal.

- (f) Deploy the airbag.

- (1) Check that no one is inside the vehicle or within a 10 m (33 ft) radius of the vehicle.
- (2) Press the SST activation switch and deploy the airbag.

CAUTION:

- ◆ When deploying the airbag, make sure that no one is near the vehicle.
- ◆ The steering wheel pad becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
- ◆ Use gloves and safety glasses when handling a steering wheel pad with a deployed airbag.
- ◆ Do not apply water, etc. to a steering wheel pad with a deployed airbag.
- ◆ Always wash your hands with water after completing the operation.

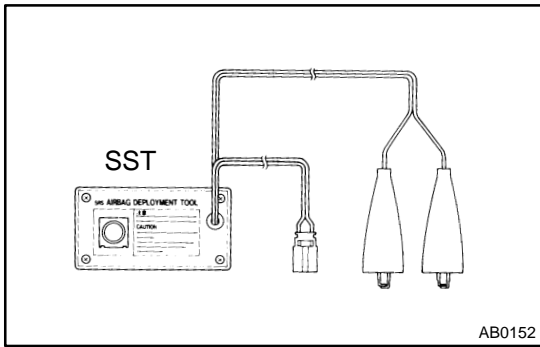
2. DEPLOYMENT WHEN DISPOSING OF STEERING WHEEL PAD ONLY

NOTICE:

- ◆ When disposing of the steering wheel pad, never use the customer's vehicle to deploy the airbag.
- ◆ Be sure to follow the procedure given below when deploying the airbag.

HINT:

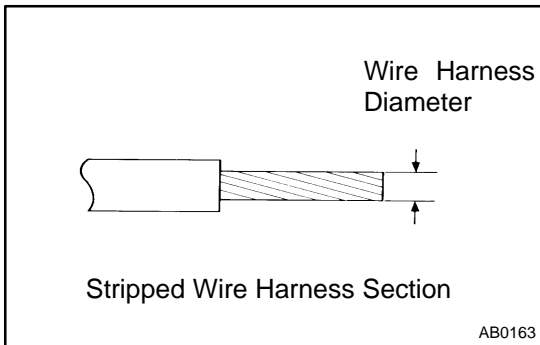
Prepare a battery as the power source to deploy the airbag.



- (a) Check the function of the SST (see step 1-(a)).
- (b) Remove the steering wheel pad (see page RS-23).

CAUTION:

- ◆ When removing the steering wheel pad, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
- ◆ When storing the steering wheel pad, keep the airbag deployment side facing upward.



- (c) Using a service-purpose wire harness for the vehicle, tie down the steering wheel pad to the disc wheel.

Wire harness: Stripped wire harness section 1.25 mm² or more (0.0019 in.² or more)

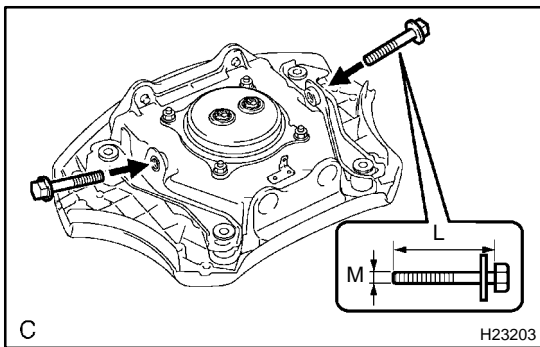
CAUTION:

If the wire harness is too thin or an alternative object is used to tie down the steering wheel pad, it may be snapped by the shock when the airbag is deployed. Always use a wire harness for vehicle use with an area of at least 1.25 mm² (0.0019 in.²).

HINT:

To calculate the area of the stripped wire harness section:

$$\text{Area} = 3.14 \times (\text{Diameter})^2 \text{ divided by } 4$$



- (1) Install the 2 bolts with washers into the 2 bolt holes on the steering wheel pad.

Bolt:

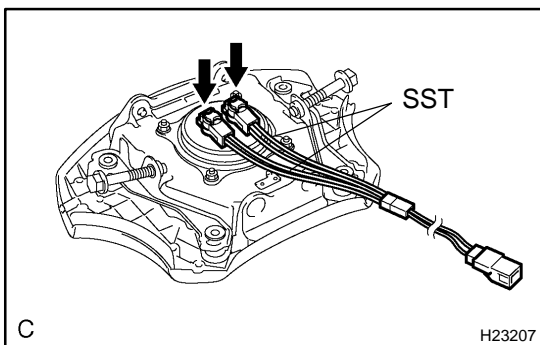
L: 35.0 mm (1.378 in.)

M: 6.0 mm (0.236 in.)

Pitch: 1.0 mm (0.039 in.)

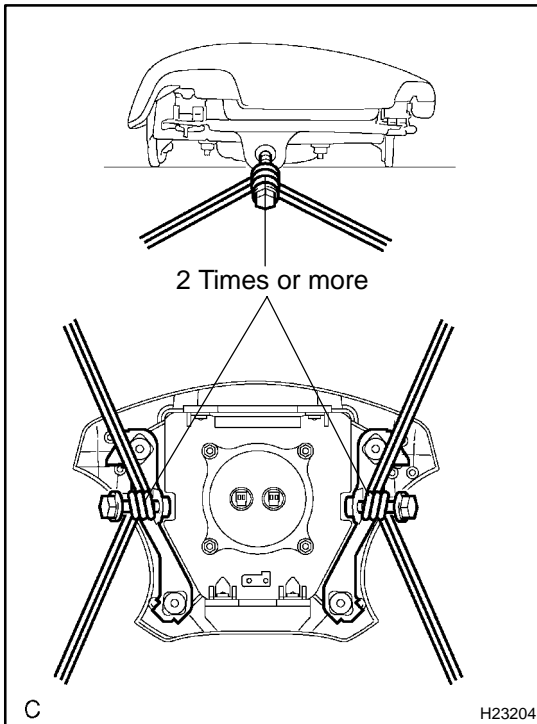
NOTICE:

- ◆ Tighten the bolts by hand until the bolts become difficult to turn.
- ◆ Do not tighten the bolts excessively.



- (2) After connecting the SST below to each other, connect them to the steering wheel pad connectors.

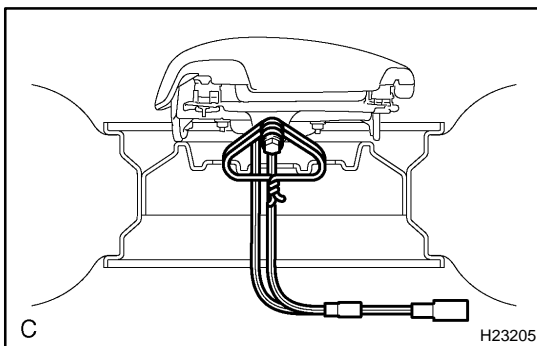
SST 09082-00802 (09082-10801, 09082-30801)



- (3) Using 3 wire harnesses, wind wire harness at least 2 times each around the bolts installed on the left and right sides of the steering wheel pad.

CAUTION:

- ◆ Tightly wind the wire harness around the bolts so that there is no slack.
- ◆ Make sure that the wire harness is tight. If there is slack in wire harness, the steering wheel pad may become loose due to the shock when the airbag is deployed.



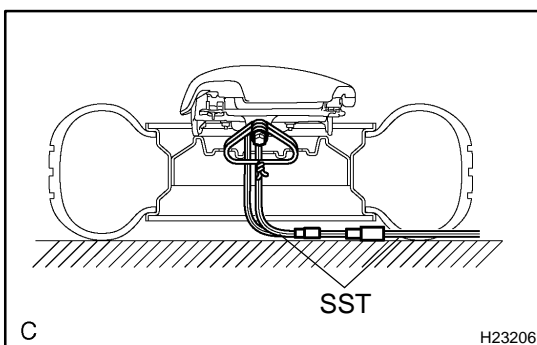
- (4) Face the airbag deployment side of the steering wheel pad upward. Separately tie the left and right sides of the steering wheel pad to the disc wheel through the hub nut holes. Position the SST connector so that it hangs downward through the hub hole in the disc wheel.

CAUTION:

- ◆ Make sure that the wire harness is tight. If there is slack in wire harness, the steering wheel pad may become loose due to the shock when the airbag is deployed.
- ◆ Always tie down the steering wheel pad with the airbag deployment side facing upward.

NOTICE:

The disc wheel will be marked by the airbag deployment, so use an extra disc wheel.



- (d) Install the SST.

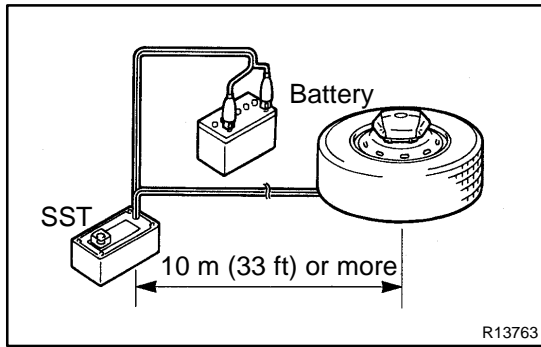
CAUTION:

Place the disc wheel on level ground.

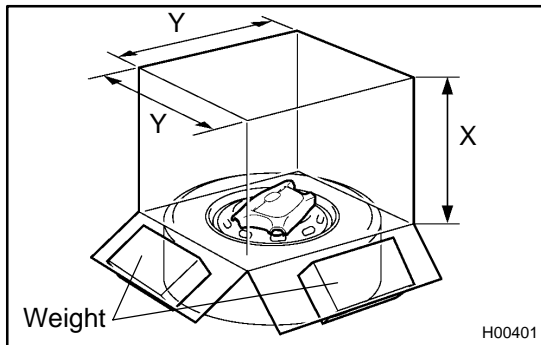
- (1) Connect the SST connector.
SST 09082-00700

CAUTION:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the disc wheel.



- (2) Move the SST at least 10 m (33 ft) away from the steering wheel pad tied down to the disc wheel.



- (e) Cover the steering wheel pad with a cardboard box or tires.

Covering method using a cardboard box:

Cover the steering wheel pad with the cardboard box and place weights on the cardboard box in 4 places totalling at least 190 N (19 kg, 43 lb).

Cardboard box size:

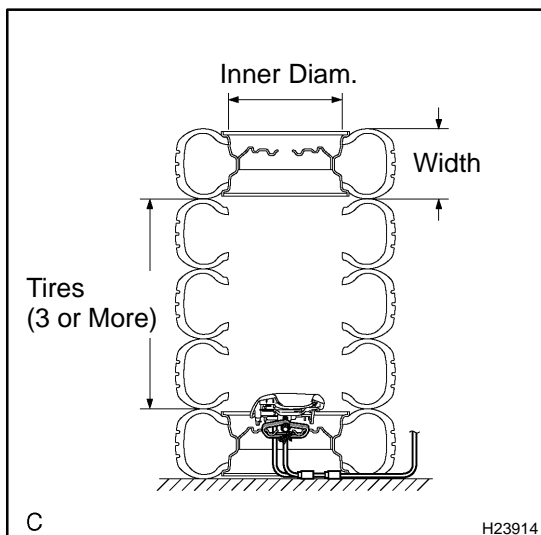
Must exceed the following dimensions:

X = 460 mm (18.11 in.)

Y = 650 mm (25.59 in.)

NOTICE:

- ◆ When dimension Y of the cardboard box exceeds the diameter of the disc wheel with tire which the steering wheel pad is tied to, X should be the following size.
 $X = 460 \text{ mm (18.11 in.)} + \text{width of tire}$
- ◆ If a cardboard box which is smaller than the specified size is used, the cardboard box will be broken by the shock from the airbag deployment.



- ◆ Covering method using tires:

Place at least 3 tires without disc wheels on the tire with disc wheel which the steering wheel pad is tied to. Place the tire with disc wheel on them.

Tire size: Must exceed the following dimensions:

Width: 185 mm (7.28 in.)

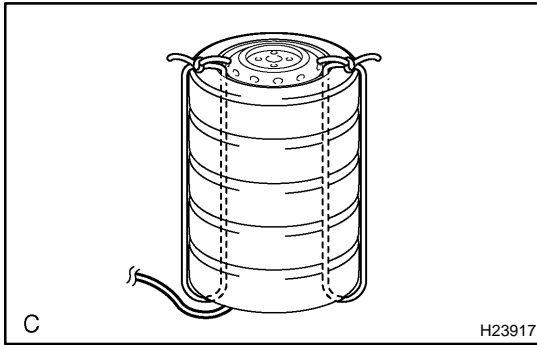
Inner diameter: 360 mm (14.17 in.)

CAUTION:

Do not use tires with disc wheels except on the top and bottom.

NOTICE:

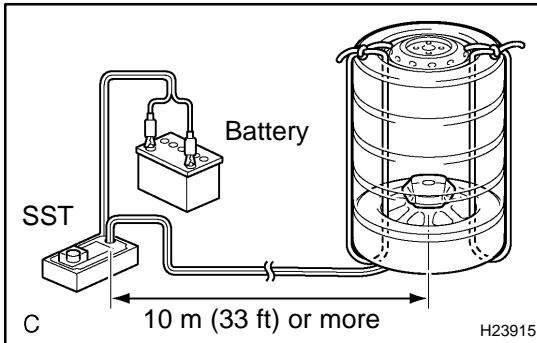
- ◆ The tires may be marked by the airbag deployment, so use the redundant tires.
- ◆ Do not place the SST connector under the tire because it could be damaged.



- (1) Tie the tires together with 2 wire harnesses.

CAUTION:

Make sure that the wire harness is tight. Looseness in the wire harness results in the tires coming free due to the shock when the airbag is deployed.



- (f) Deploy the airbag.

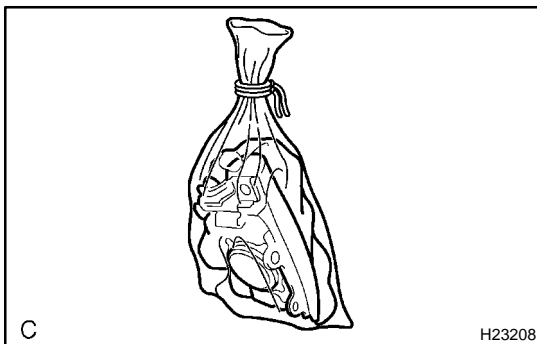
- (1) Connect the red clip of the SST to the battery positive (+) terminal and the black clip of the SST to the battery negative (-) terminal.
- (2) Check that no one is within a 10 m (33 ft) radius of the disc wheel which the steering wheel pad is tied to.
- (3) Press the SST activation switch and deploy the airbag.

CAUTION:

When deploying the airbag, make sure that no one is near the tire.

HINT:

The airbag is deployed as the LED of the SST activation switch comes on.



- (g) Dispose of the steering wheel pad.

CAUTION:

- ◆ The steering wheel pad becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
- ◆ Use gloves and safety glasses when handling a steering wheel pad with a deployed airbag.
- ◆ Do not apply water, etc. to a steering wheel pad with a deployed airbag.
- ◆ Always wash your hands with water after completing the operation.

- (1) Remove the steering wheel pad from the disc wheel.
- (2) Place the steering wheel pad in a plastic bag, tie it tightly and dispose of it as other general part disposal.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the steering wheel pad, steering wheel or spiral cable with a new one.

Case	Replacing part
The airbag has been deployed.	Steering wheel pad
The steering wheel pad has been found to be faulty in troubleshooting.	Steering wheel pad
The spiral cable has been found to be faulty in troubleshooting.	Spiral cable
The steering wheel pad has been found to be faulty while checking items. (see page RS-24)	Steering wheel pad
The steering wheel has been found to be faulty while checking items. (see page RS-24)	Steering wheel
The spiral cable has been found to be faulty while checking items. (see page RS-24)	Spiral cable
The steering wheel pad has been dropped.	Steering wheel pad

CAUTION:

For removal and installation of the steering wheel pad, see page [RS-23](#) and [RS-33](#) . Be sure to follow the correct procedure.

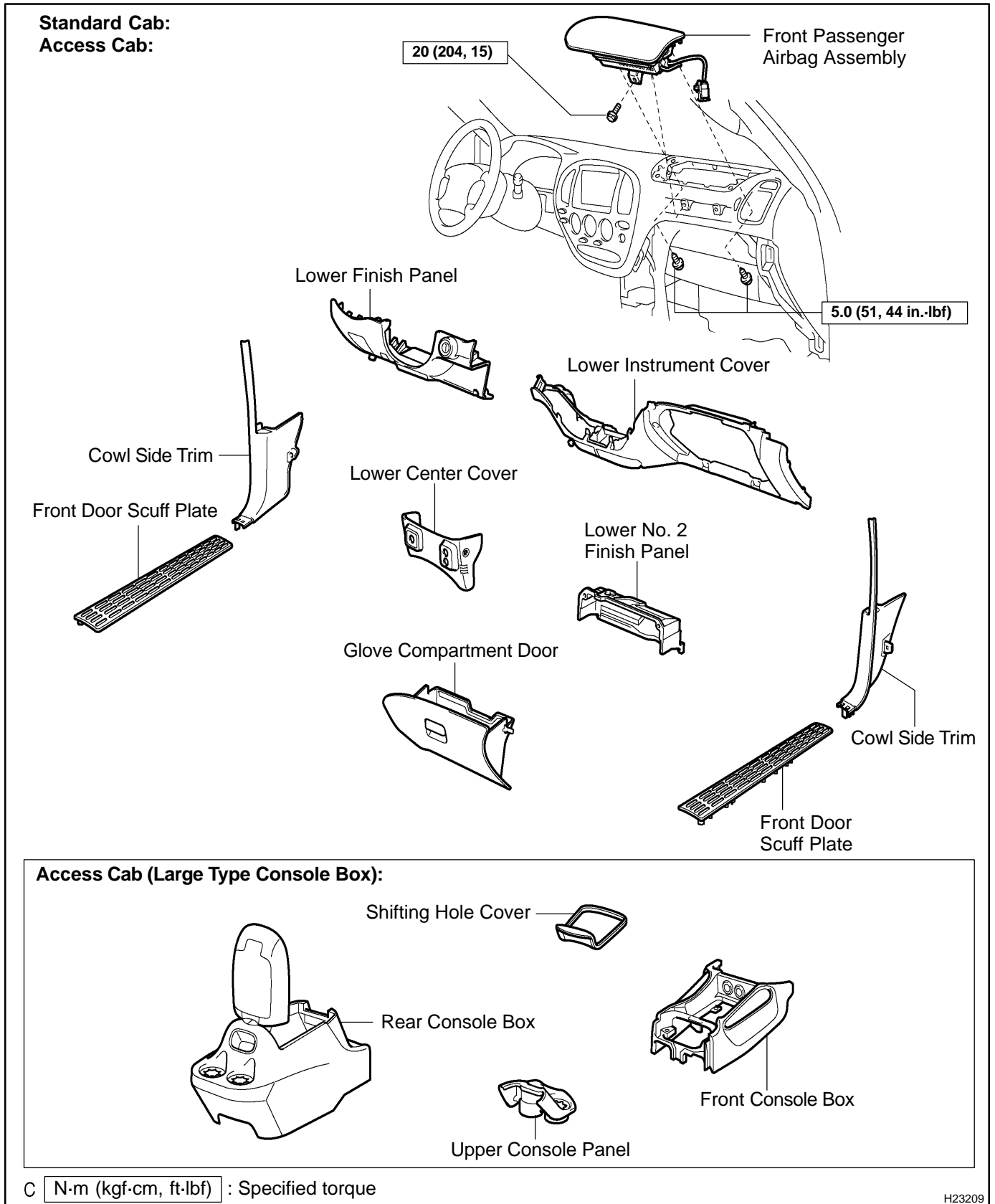
INSTALLATION

CAUTION:

- ◆ If the steering wheel pad has been dropped, or there are cracks, dents or other defects in the case or connector, replace the steering wheel pad with a new one.
 - ◆ When installing the steering wheel pad, take care that it is not pinched between other parts.
 - ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.
1. INSTALL SPIRAL CABLE (SEE PAGE [SR-28](#) AND [SR-42](#))
 2. INSTALL STEERING COLUMN COVER LOWER (SEE PAGE [SR-28](#) AND [SR-42](#))
 3. INSTALL STEERING WHEEL (SEE PAGE [SR-28](#) AND [SR-42](#))
 4. INSTALL STEERING WHEEL PAD (SEE PAGE [SR-28](#) AND [SR-42](#))
 5. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
 6. INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))

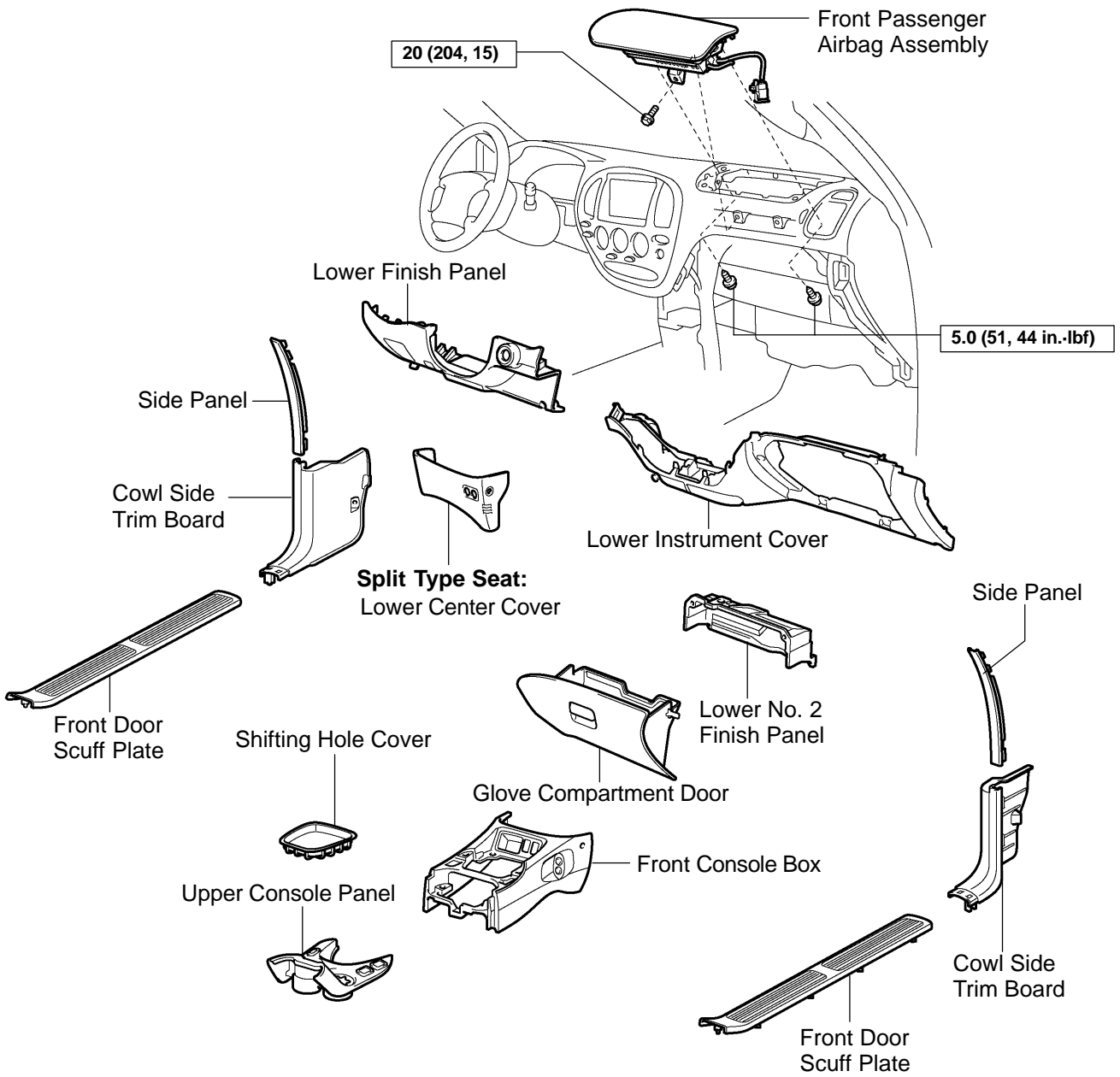
FRONT PASSENGER AIRBAG ASSEMBLY COMPONENTS

RS10J-02

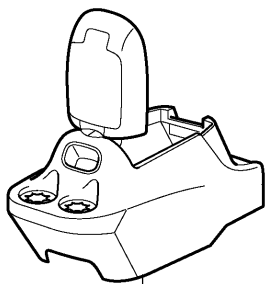


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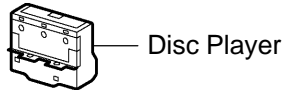
Double Cab:



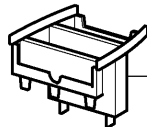
w/ Rear seat audio or Rear seat entertainment:



Rear Console Box



Disc Player



Disc Player Cover

C N·m (kgf·cm, ft·lbf) : Specified torque

H23210

REMOVAL

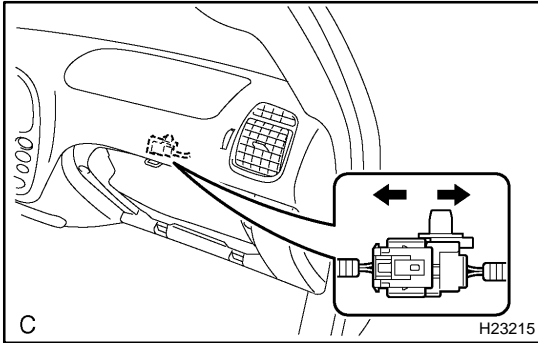
NOTICE:

- ◆ If the wiring connector of the SRS is disconnected and the ignition switch is in the ON or ACC position, DTCs will be recorded.
 - ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.
1. PRECAUTION (SEE PAGE RS-1 AND RS-3)
 2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. REMOVE FRONT DOOR SCUFF PLATES
(SEE PAGE BO-1 11)
4. Standard cab:
Access cab:
REMOVE COWL SIDE TRIMS (SEE PAGE BO-1 11)
5. Double cab:
REMOVE COWL SIDE TRIM BOARDS
(SEE PAGE BO-1 11)
6. Double cab:
REMOVE SIDE PANELS (SEE PAGE BO-1 11)
7. REMOVE LOWER FINISH PANEL
(SEE PAGE BO-1 11)
8. REMOVE GLOVE COMPARTMENT DOOR
(SEE PAGE BO-1 11)
9. REMOVE LOWER NO. 2 FINISH PANEL
(SEE PAGE BO-1 11)
10. Standard cab:
Access cab (w/o Large type console box):
Double cab (Split type seat):
REMOVE LOWER CENTER COVER
(SEE PAGE BO-1 11)
11. Access cab (w/ Large type console box):
Double cab:
REMOVE SHIFTING HOLE COVER
(SEE PAGE BO-1 11)
12. Access cab (w/ Large type console box):
Double cab:
REMOVE UPPER CONSOLE PANEL
(SEE PAGE BO-1 11)
13. Access cab (w/ Large type console box):
Double cab:
REMOVE REAR CONSOLE BOX
(SEE PAGE BO-1 11)
14. Access cab (w/ Large type console box):
Double cab:
REMOVE FRONT CONSOLE BOX
(SEE PAGE BO-1 11)

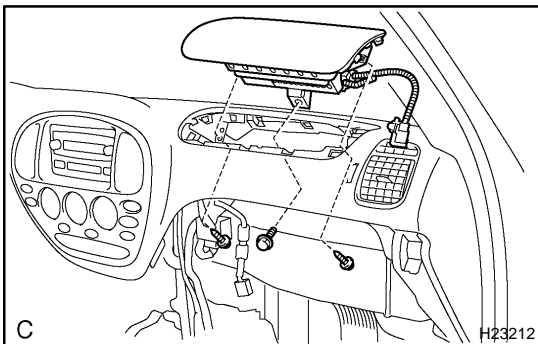
**15. REMOVE LOWER INSTRUMENT COVER
(SEE PAGE BO-1 11)**



- 16. REMOVE FRONT PASSENGER AIRBAG ASSEMBLY**
 (a) Using a clip remover, disengage the connector clamp.
 (b) Disconnect the airbag connector.

NOTICE:

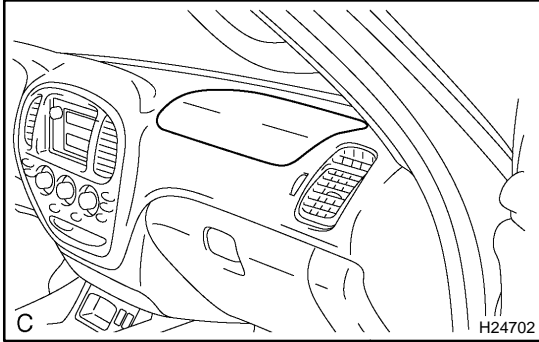
When handling the airbag connector, take care not to damage the airbag wire harness.



- (c) Remove the bolt holding the front passenger airbag assembly and instrument panel.
 (d) Remove the 2 bolts holding the front passenger airbag assembly and instrument panel reinforcement.
 (e) Remove the front passenger airbag assembly.

CAUTION:

- ◆ Do not store the front passenger airbag assembly with the airbag deployment side facing downward.
- ◆ Never disassemble the front passenger airbag assembly.



INSPECTION

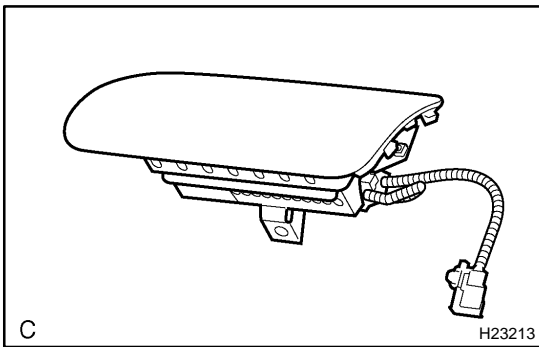
1. VEHICLES NOT INVOLVED IN A COLLISION

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) With the front passenger airbag assembly installed on the vehicle, perform a visual check. If there are any defects as mentioned below, replace the front passenger airbag assembly with a new one:

Cuts, minute cracks or marked discoloration on the instrument panel around the front passenger airbag assembly.

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

- (a) Perform a diagnostic system check (see page [DI-1871](#)).



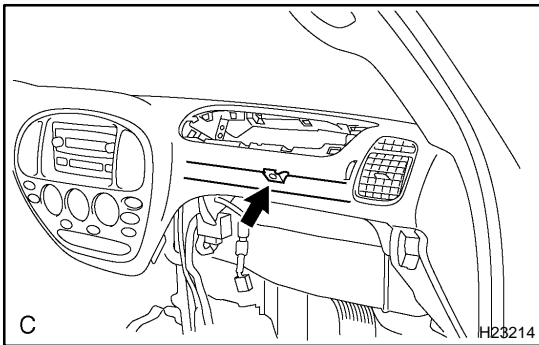
- (b) With the front passenger airbag assembly removed from the vehicle, perform a visual check. If there are any defects as mentioned below, replace the front passenger airbag assembly, instrument panel or instrument panel reinforcement with a new one:

- ◆ Cuts, minute cracks or marked discoloration on the front passenger airbag assembly.
- ◆ Cracks or other damage to the connectors.

- ◆ Deformation or cracks on the instrument panel or instrument panel reinforcement.

CAUTION:

For removal and installation procedures of the front passenger airbag assembly, see page [RS-36](#) and [RS-46](#) . Be sure to follow the correct procedure.



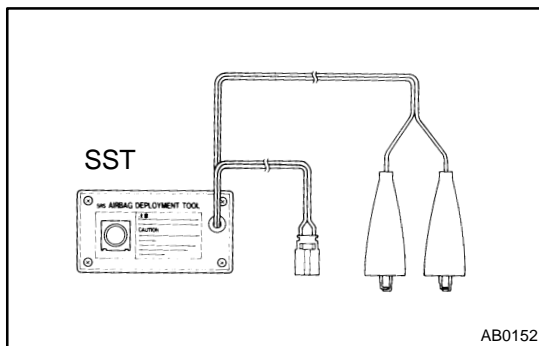
DISPOSAL

HINT:

When scrapping a vehicle equipped with the SRS or disposing of the front passenger airbag assembly, be sure to deploy the airbag first in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of the TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION:

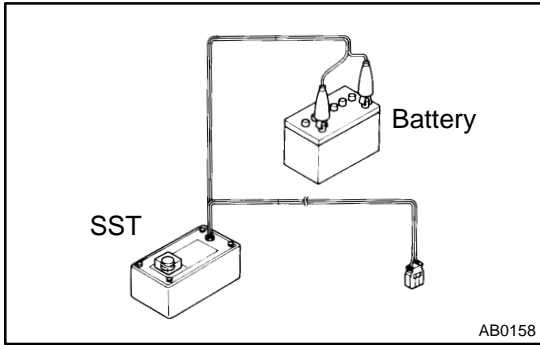
- ◆ Never dispose of a front passenger airbag assembly that has an undeployed airbag.
- ◆ The airbag produces an exploding sound when it is deployed, so perform the operation outdoors and where it will not create a nuisance to nearby residents.



- ◆ When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.
- ◆ When deploying the airbag, perform the operation at least 10 m (33 ft) away from the front passenger airbag assembly.
- ◆ The front passenger airbag assembly becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
- ◆ Use gloves and safety glasses when handling a front passenger airbag assembly with a deployed airbag.
- ◆ Do not apply water, etc. to a front passenger airbag assembly with a deployed airbag.
- ◆ Always wash your hands with water after completing the operation.

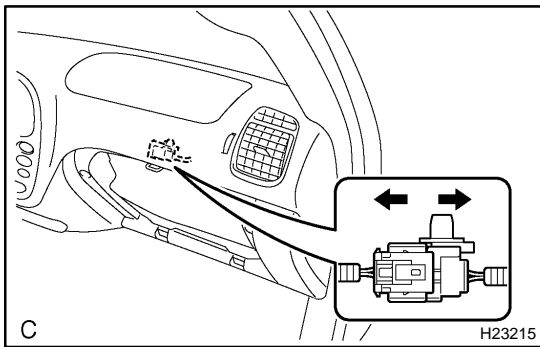
HINT:

Prepare a battery as the power source to deploy the airbag.



1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

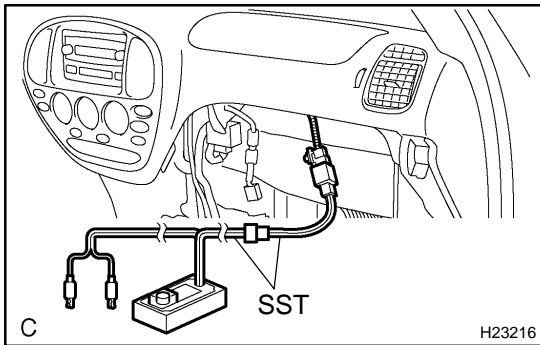
- (a) Check the function of the SST (see step 1-(a) on page RS-25).
- (b) Precaution (see page RS-1 and RS-3).
- (c) Disconnect the cable from the negative battery terminal. Wait for 90 seconds after disconnecting the cable to prevent the airbag working.
- (d) Remove the glove compartment door (see page BO-1 11).
- (e) Remove the lower No. 2 finish panel (see page BO-1 11).



- (f) Disconnect the airbag connector (yellow colored one) from the front passenger airbag assembly.
 - (1) Using a clip remover, disengage the connector clamp.
 - (2) Disconnect the airbag connector.

NOTICE:

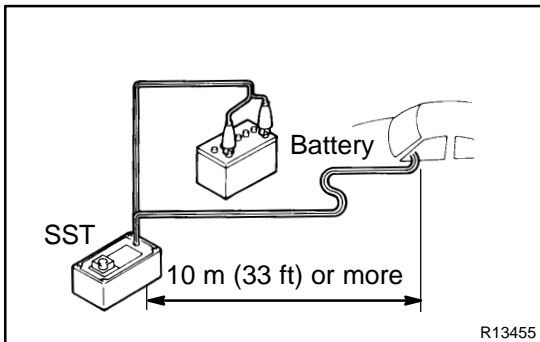
When handling the airbag connector, take care not to damage the airbag wire harness.



- (g) Install the SST.
 - (1) Connect the SST connector to the front passenger airbag assembly.
- SST 09082-00700, 09082-00780

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.



- (2) Move the SST at least 10 m (33 ft) away from the vehicle side window.
- (3) Maintaining enough clearance for the SST wire harness in the front side window, close all doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

- (4) Connect the red clip of the SST to the battery positive (+) terminal and the black clip of the SST to the negative (-) terminal.

- (h) Deploy the airbag.
- (1) Check that no one is inside the vehicle or within a 10 m (33 ft) radius of the vehicle.
 - (2) Press the SST activation switch and deploy the airbag.

CAUTION:

- ◆ When deploying the airbag, make sure that no one is near the vehicle.
- ◆ The front passenger airbag assembly becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
- ◆ Use gloves and safety glasses when handling a front passenger airbag assembly with a deployed airbag.
- ◆ Do not apply water, etc. to a front passenger airbag assembly with a deployed airbag.
- ◆ Always wash your hands with water after completing the operation.

HINT:

The airbag deploys as the LED of the SST activation switch comes on.

2. DEPLOYMENT WHEN DISPOSING OF FRONT PASSENGER AIRBAG ASSEMBLY ONLY

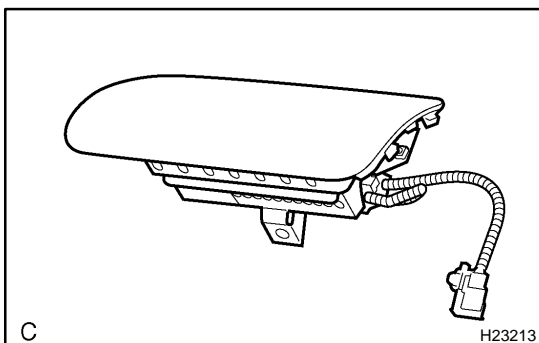
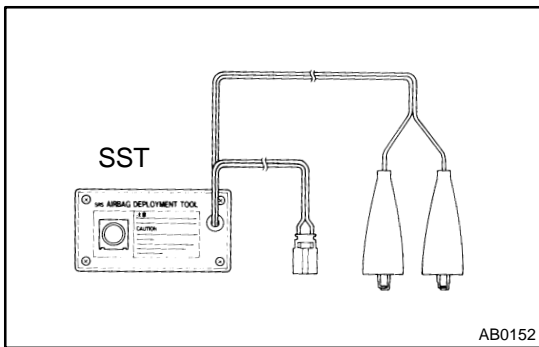
NOTICE:

- ◆ When disposing of the front passenger airbag assembly, never use the customer's vehicle to deploy the airbag.
- ◆ Be sure to follow the procedure detailed below when deploying the airbag.

HINT:

Prepare a battery as the power source to deploy the airbag.

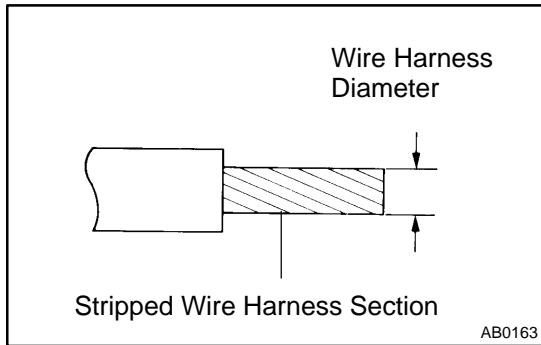
- (a) Check the function of the SST (see step 1-(a)).



- (b) Remove the front passenger airbag assembly (see page [RS-36](#)).

CAUTION:

- ◆ When removing the front passenger airbag assembly, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
- ◆ When storing the front passenger airbag assembly, keep the airbag deployment side facing upward.



- (c) Using a service-purpose wire harness for the vehicle, tie down the front passenger airbag assembly to the tire.
Wire harness: Stripped wire harness section 1.25 mm² or more (0.0019 in.² or more)

CAUTION:

If the wire harness is too thin or an alternative object is used to tie down the front passenger airbag assy, it may be snapped by the shock when the airbag is deployed. Always use a wire harness for vehicle use with an area of at least 1.25 mm² (0.0019 in.²).

HINT:

To calculate the area of the stripped wire harness section:

Area = 3.14 X (Diameter)² divided by 4

- (1) Position the front passenger airbag assembly inside the tire with the airbag deployment side facing inside.

Tire size: Must exceed the following dimensions:

Width: 185 mm (7.28 in.)

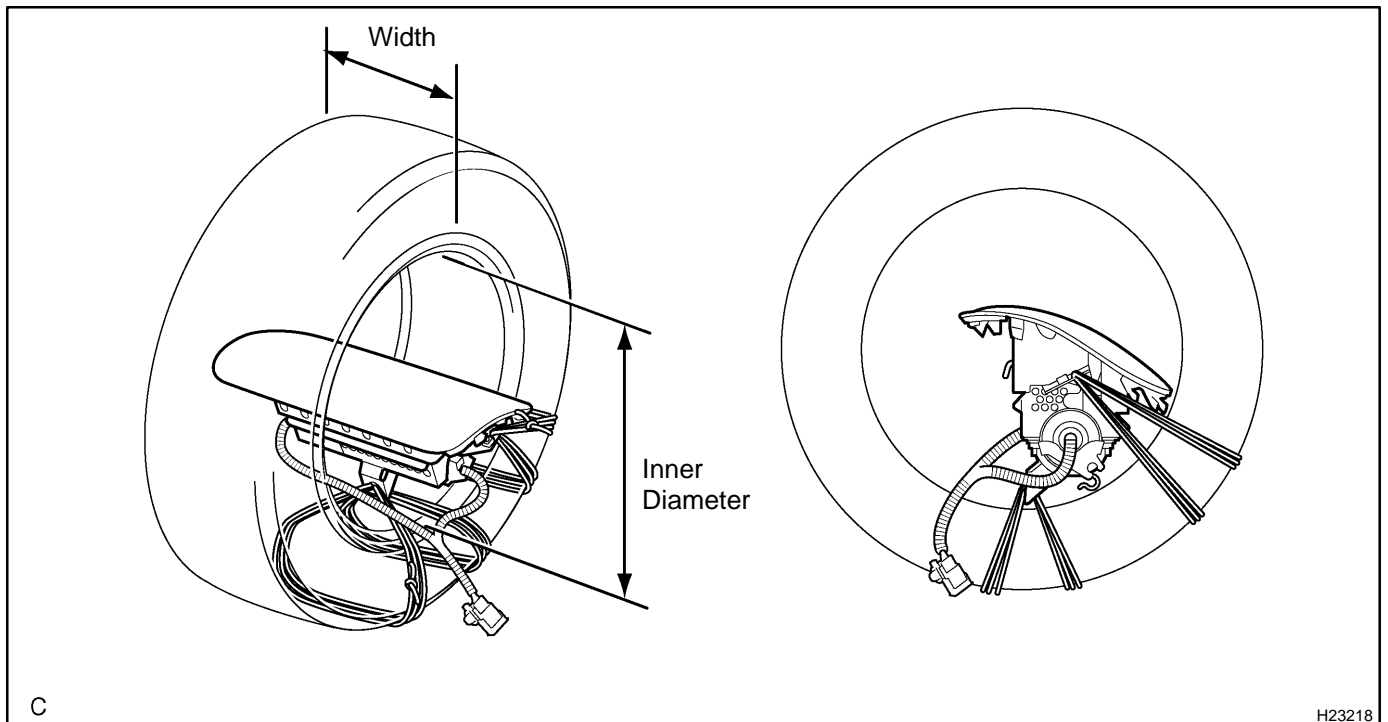
Inner diameter: 360 mm (14.17 in.)

CAUTION:

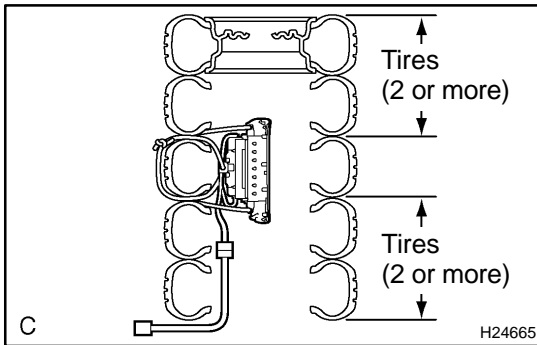
- ◆ Make sure that the wire harness is tight. If there is slack in wire harness, the front passenger airbag assembly may become loose due to the shock when the airbag is deployed.
- ◆ Always tie down the front passenger airbag assembly with the airbag deployment side facing inside.

NOTICE:

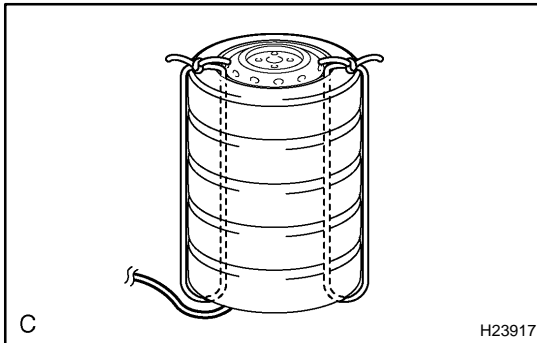
The tire will be marked by the airbag deployment, so use an extra tire.



SUPPLEMENTAL RESTRAINT SYSTEM - FRONT PASSENGER AIRBAG ASSEMBLY



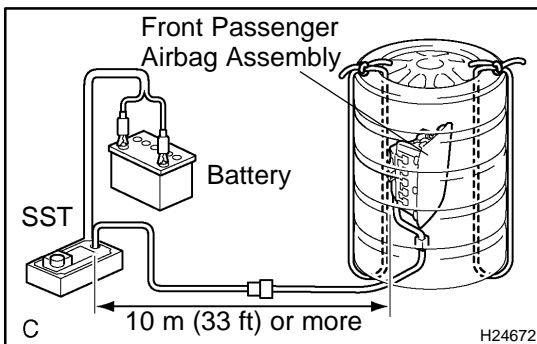
- (d) Place the tires.
- (1) Place at least 2 tires under the tire which the front passenger airbag assembly is tied to.
 - (2) Place at least 2 tires over the tire which the front passenger airbag assembly is tied to. The top tire should have the disc wheel installed.



- (3) Tie the tires together with 2 wire harness.

CAUTION:

Make sure that the wire harness is tight. Looseness in the wire harness results in the tires coming free due to the shock when the airbag is deployed.



- (e) Install the SST.
Connect the SST connector.
SST 09082-00700, 09082-00780

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the tire.

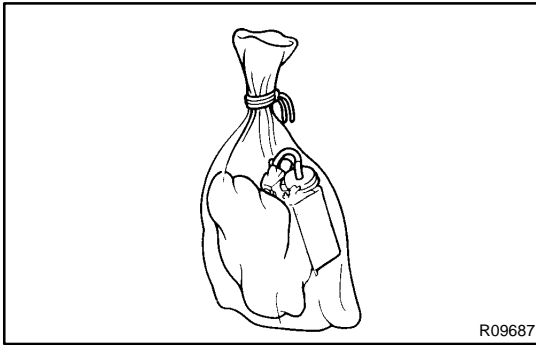
- (f) Deploy the airbag.
- (1) Connect the red clip of the SST to the battery positive (+) terminal and the black clip of the SST to the battery negative (-) terminal.
 - (2) Check that no one is within a 10 m (33 ft) radius of the tire which the front passenger airbag assembly is tied to.
 - (3) Press the SST activation switch and deploy the airbag.

CAUTION:

When deploying the airbag, make sure that no one is near the tire.

HINT:

The airbag deploys as the LED of the SST activation switch comes on.



(g) Dispose of the front passenger airbag assembly.

CAUTION:

- ◆ The front passenger airbag assembly becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
 - ◆ Use gloves and safety glasses when handling a front passenger airbag assembly with a deployed airbag.
 - ◆ Do not apply water, etc. to a front passenger airbag assembly with a deployed airbag.
 - ◆ Always wash your hands with water after completing the operation.
- (1) Remove the front passenger airbag assembly from the tire.
 - (2) Place the front passenger airbag assembly in a plastic bag, tie it tightly and dispose of it as other general part disposal.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the front passenger airbag assembly, instrument panel or instrument panel reinforcement with a new one.

Case	Replacing part
The airbag has been deployed.	Front passenger airbag assembly
The front passenger airbag assembly has been found to be faulty in troubleshooting.	Front passenger airbag assembly
The front passenger airbag assembly has been found to be faulty while checking items (see page RS-38).	Front passenger airbag assembly
The instrument panel has been found to be faulty while checking items (see page RS-38).	Instrument panel
The instrument panel reinforcement has been found to be faulty while checking items (see page RS-38).	Instrument panel reinforcement
The front passenger airbag assembly has been dropped.	Front passenger airbag assembly

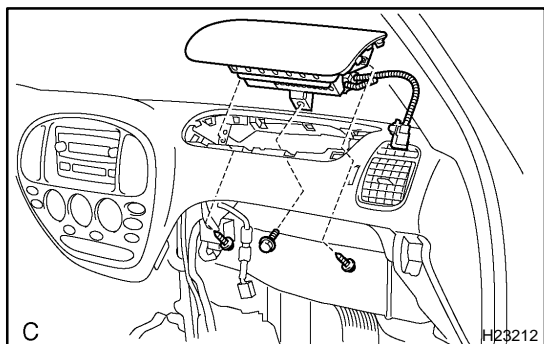
CAUTION:

For replacement of the front passenger airbag assembly, see page [RS-36](#) and [RS-46](#) . Be sure to follow the correct procedure.

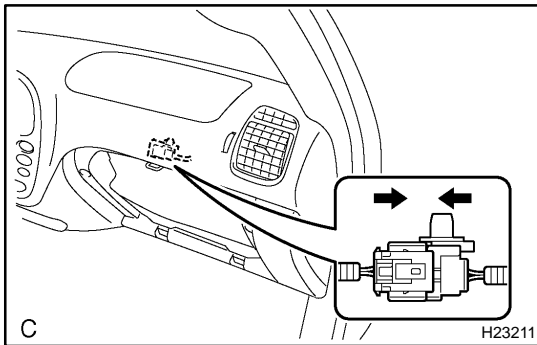
INSTALLATION

NOTICE:

- ◆ If the front passenger airbag assembly has been dropped, or there are cracks, dents or other defects in the case or connector, replace the front passenger airbag assembly with a new one.
- ◆ When installing the front passenger airbag assembly, take care it is not pinched between other parts.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.



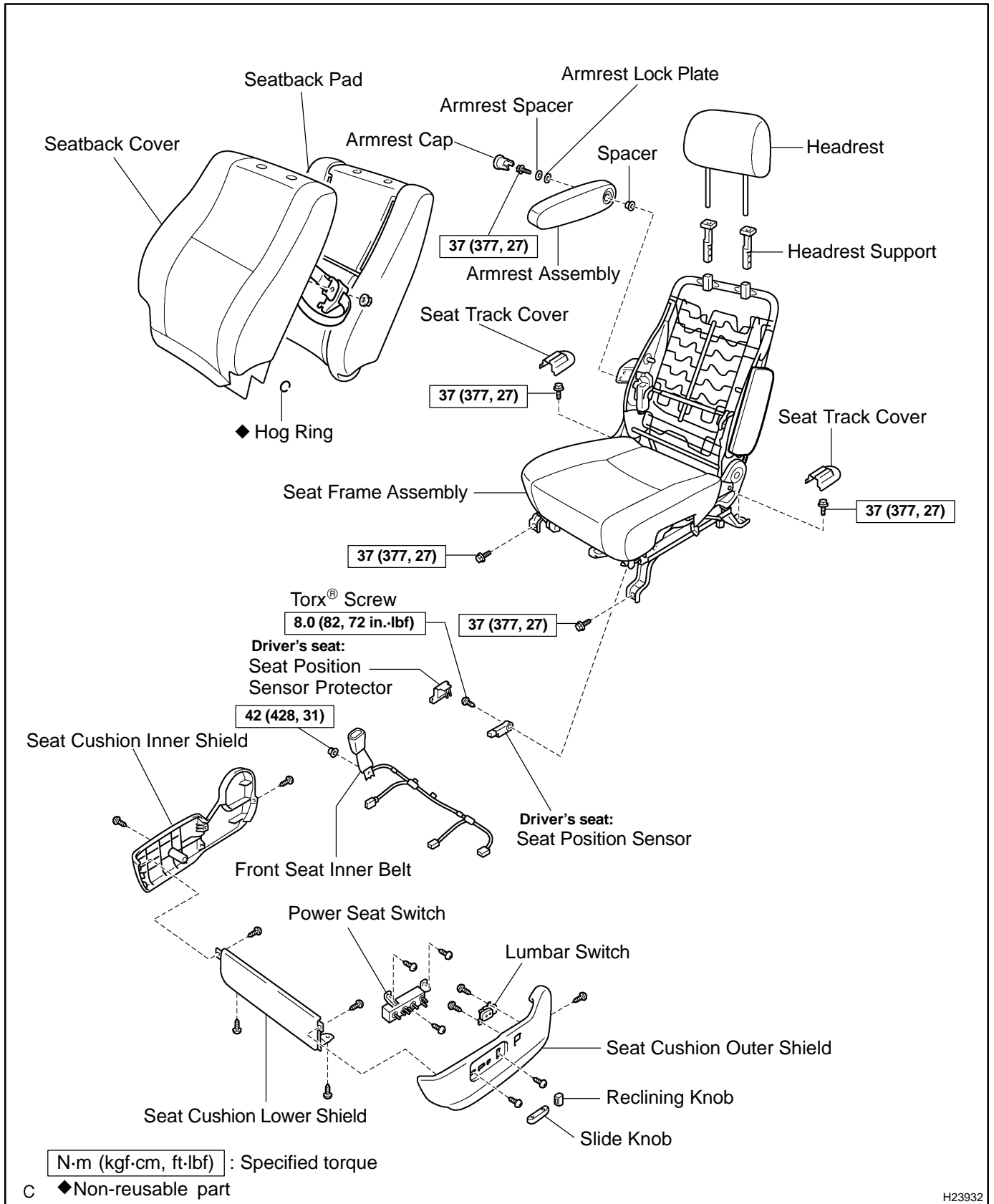
1. **INSTALL FRONT PASSENGER AIRBAG ASSEMBLY**
 - (a) Install the bolt to hold the front passenger airbag assembly and instrument panel reinforcement.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
 - (b) Install the 2 bolts to hold the front passenger airbag assembly and instrument panel.
Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)
2. **INSTALL LOWER INSTRUMENT COVER (SEE PAGE BO-120)**
3. **Access cab (w/ Large type console box):**
Double cab:
INSTALL FRONT CONSOLE BOX (SEE PAGE BO-120)
4. **Access cab (w/ Large type console box):**
Double cab:
INSTALL REAR CONSOLE BOX (SEE PAGE BO-120)
5. **Access cab (w/ Large type console box):**
Double cab:
INSTALL UPPER CONSOLE PANEL (SEE PAGE BO-120)
6. **Access cab (w/ Large type console box):**
Double cab:
INSTALL SHIFTING HOLE COVER (SEE PAGE BO-120)
7. **Standard cab:**
Access cab (w/o Large type console box):
Double cab (Split type seat):
INSTALL LOWER CENTER COVER (SEE PAGE BO-120)



- 8. CONNECT AIRBAG CONNECTOR**
 - (a) Connect the airbag connector as shown in the illustration.
 - (b) Attach the connector clamp to the reinforcement.
- 9. INSTALL LOWER NO. 2 FINISH PANEL**
(SEE PAGE [BO-120](#))
- 10. INSTALL GLOVE COMPARTMENT DOOR**
(SEE PAGE [BO-120](#))
- 11. INSTALL LOWER FINISH PANEL**
(SEE PAGE [BO-120](#))
- 12. Double cab:**
INSTALL SIDE PANELS (SEE PAGE [BO-120](#))
- 13. Double cab:**
INSTALL COWL SIDE TRIM BOARDS
(SEE PAGE [BO-120](#))
- 14. Standard cab:**
Access cab:
INSTALL COWL SIDE TRIMS (SEE PAGE [BO-120](#))
- 15. INSTALL FRONT DOOR SCUFF PLATES**
(SEE PAGE [BO-120](#))
- 16. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
- 17. INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

SIDE AIRBAG ASSEMBLY (Power Adjuster Type) COMPONENTS

RS126-01



H23932

REMOVAL

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

- ◆ If the wiring connector of the SRS is disconnected and the ignition switch is in the ON or ACC position, DTCs will be recorded.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.

1. PRECAUTION (SEE PAGE RS-1 AND RS-3)
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. REMOVE SEAT TRACK COVERS

Using a screwdriver, remove the 2 seat track covers.

HINT:

Tape the screwdriver tip before use.

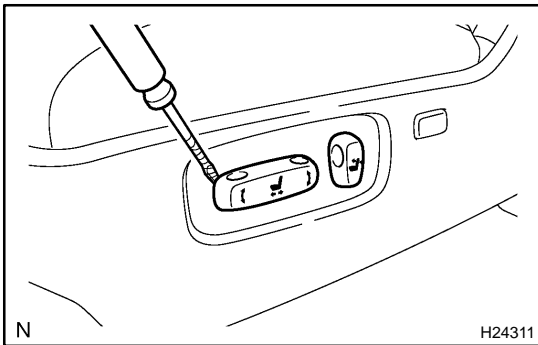
4. REMOVE FRONT SEAT

- (a) Remove the 4 bolts.
- (b) Disconnect the connectors.
- (c) Remove the front seat.

CAUTION:

Be careful not to damage the body.

5. REMOVE HEADREST

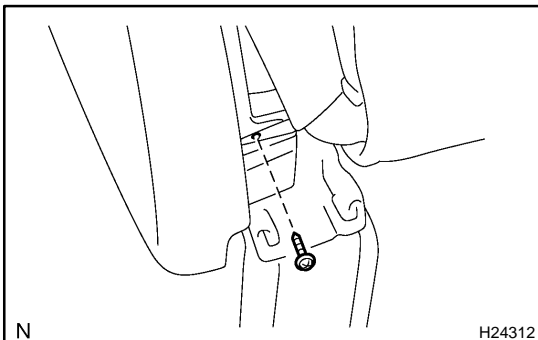


6. REMOVE SLIDE KNOB AND RECLINING KNOB

Using a screwdriver, remove the slide knob and reclining knob.

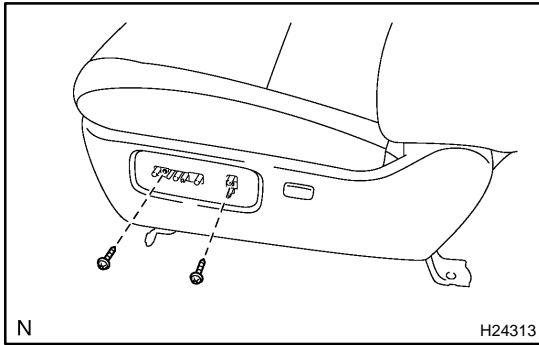
HINT:

Tape the screwdriver tip before use.

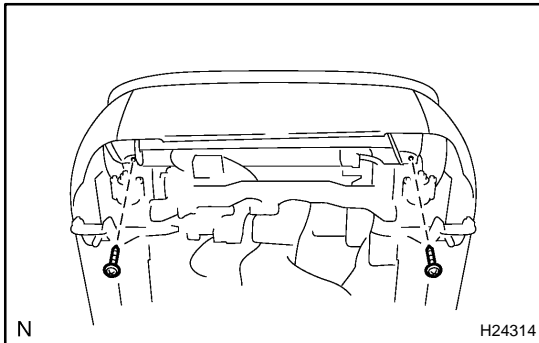


7. REMOVE SEAT CUSHION LOWER SHIELD, SEAT CUSHION OUTER SHIELD AND SEAT CUSHION INNER SHIELD

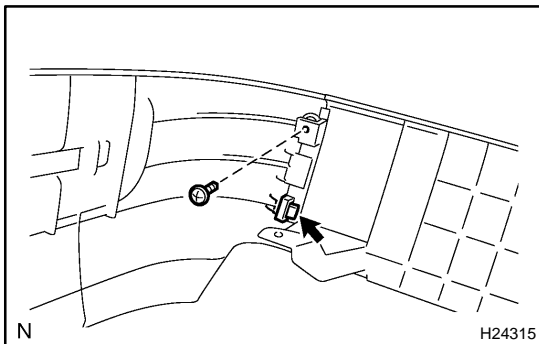
- (a) Remove the screw from the seat cushion outer shield.
- (b) Perform the same procedure as for the seat cushion inner shield.



- (c) Remove the 2 screws from the seat cushion outer shield.
- (d) Remove the screw from the seat cushion inner shield.



- (e) Remove the 2 screws from the seat cushion lower shield.
- (f) Disconnect the lumbar switch connector from the lumbar switch, and remove the seat cushion lower shield, outer shield and inner shield.



- (g) Remove the screw and separate the seat cushion lower shield and seat cushion outer shield.
- (h) Perform the same procedure as for the other side.

8. REMOVE FRONT SEAT INNER BELT

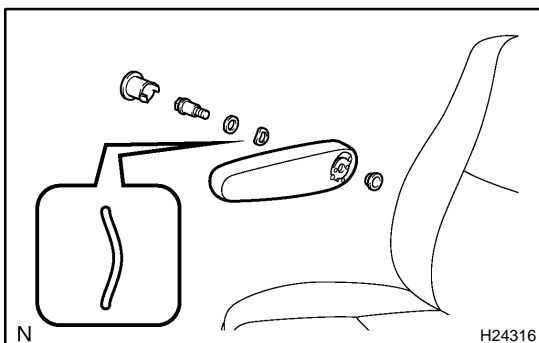
- (a) Disconnect the wire harness clamps and connectors.
- (b) Remove the nut and front seat inner belt.

9. REMOVE LUMBAR SWITCH

Remove the 2 screws and lumbar switch from the seat cushion outer shield.

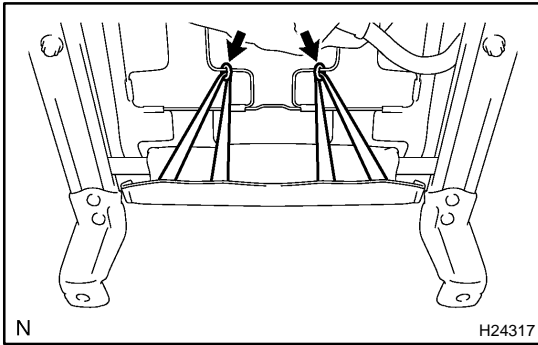
10. REMOVE POWER SEAT SWITCH

Remove the 3 screws and power seat switch.

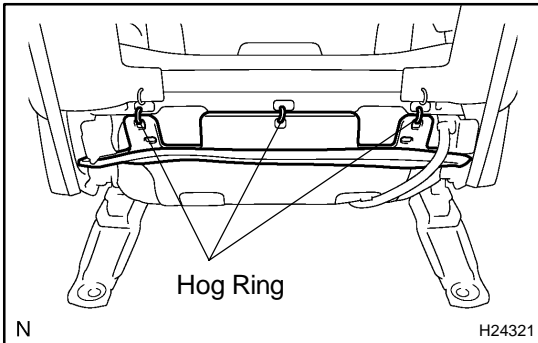


11. REMOVE ARMREST ASSEMBLY

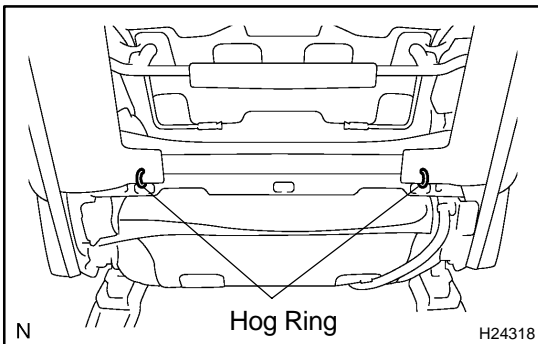
- (a) Using a screwdriver, remove the armrest cap.
- (b) Remove the bolt, armrest spacer, armrest lock plate and armrest assembly.
- (c) Remove the spacer from the armrest assembly.

**12. REMOVE SEATBACK COVER AND PAD**

- (a) Remove the seatback cover belt from the seat frame assembly.
- (b) Open the fastener.



- (c) Remove the hog rings from the seat frame assembly.



- (d) Remove the hog rings from the seat frame assembly.
- (e) Remove the 2 headrest supports from the seat frame assembly.
- (f) Remove the seatback cover and pad from the seat frame assembly.

INSPECTION

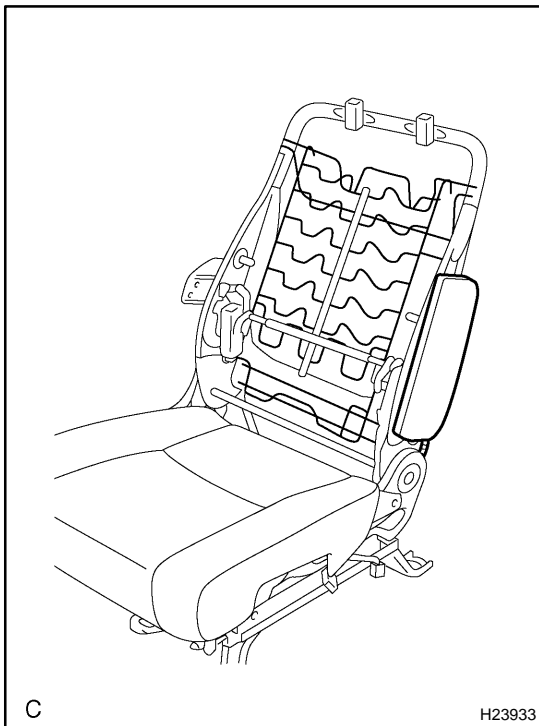
1. VEHICLE NOT INVOLVED IN A COLLISION

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) With the front seat airbag assy installed on the vehicle, perform a visual check. If there are any defects as mentioned below, replace the front seatback assy with a new one:

Cuts, minute cracks or marked discoloration on the front seatback assy around the front seat airbag assy.

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

- (a) Perform a diagnostic system check (see page [DI-1871](#)).



- (b) Perform a visual check which includes the following items with the seatback assembly removed from the vehicle.

- ◆ Cuts, tears and cracks on the side airbag assembly.
- ◆ Cuts and cracks in the wire harness, and chipping in the connectors.

CAUTION:

For removal and installation of the front seatback assembly, see page [RS-49](#) and [RS-60](#) . Be sure to follow the correct procedure.

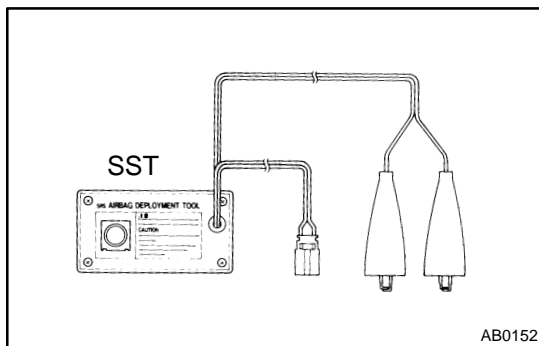
DISPOSAL

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.
- ◆ When scrapping a vehicle equipped with the SRS or disposing of the front seat airbag assy LH, be sure to deploy the airbag first in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION:

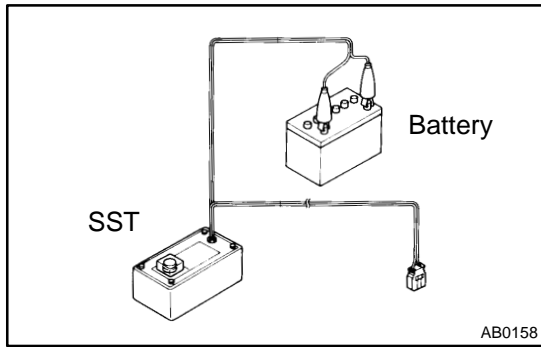
- ◆ **Never dispose of a front seat airbag assembly that has an undeployed airbag.**
- ◆ **The airbag produces an exploding sound when it is deployed, so perform the operation outdoors and where it will not create a nuisance to nearby residents.**



- ◆ **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.**
- ◆ **When deploying the airbag, perform the operation at least 10 m (33 ft) away from the front seat airbag assembly.**
- ◆ **The front seat airbag assembly becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.**
- ◆ **Use gloves and safety glasses when handling a front seat airbag assembly with a deployed airbag.**
- ◆ **Always wash your hands with water after completing the operation.**
- ◆ **Do not apply water, etc. to a front seat airbag assembly with a deployed airbag.**

HINT:

Prepare a battery as the power source to deploy the airbag.

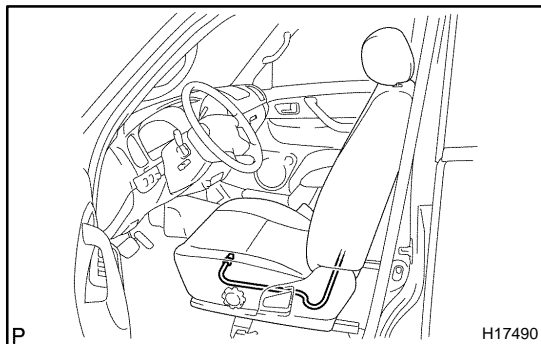


1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

- (a) Check the function of the SST (see step 1-(a) on page RS-25).
SST 09082-00700
- (b) Precaution (see page RS-1 and RS-3).
- (c) Disconnect the battery negative terminal.
Wait for 90 seconds after disconnecting the cable to prevent the airbag working.
- (d) Remove the 4 bolts from the front seat assy (see page RS-49 (power adjuster type), RS-64 (manual adjuster type) and RS-74 (passenger side of split type)).

HINT:

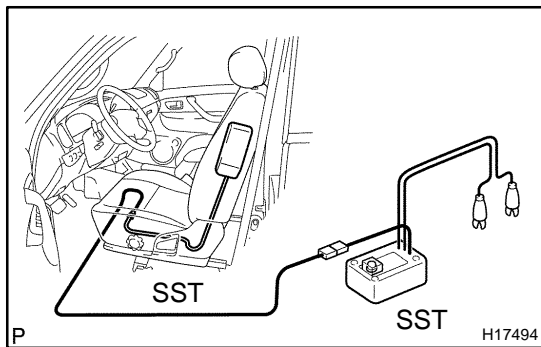
Keep the front seat assy LH in the cabin.



- (e) Disconnect the connector (yellow colored one) from the front seat airbag assy LH.

NOTICE:

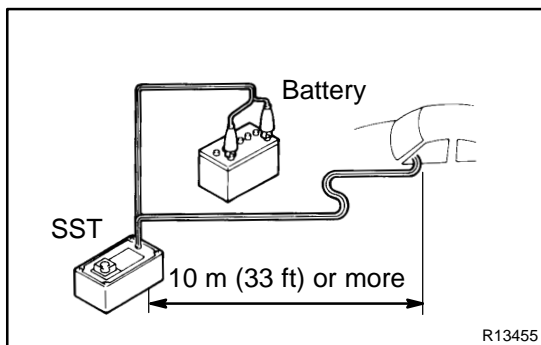
When handling the airbag connector, take care not to damage the airbag wire harness.



- (f) Install the SST.
 - (1) Connect the connectors of the SST to the airbag connector.
SST 09082-00700, 09082-00750

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.

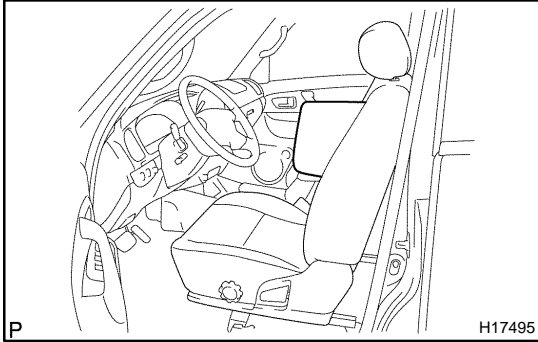


- (2) Move the SST at least 10 m (33 ft) away from the vehicle side window.
- (3) Maintaining enough clearance for the SST wire harness in the front side window, close all doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

- (4) Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (-) terminal.



- (g) Deploy the airbag.
- (1) Check that no one is inside the vehicle or within a 10 m (33 ft) radius of the vehicle.
 - (2) Press the SST activation switch and deploy the airbag.

CAUTION:

- ◆ When deploying the airbag, make sure that no one is near the vehicle.
- ◆ The front seat airbag assembly becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
- ◆ Use gloves and safety glasses when handling a front seat airbag assembly with a deployed airbag.
- ◆ Do not apply water, etc. to a front seat airbag assembly with a deployed airbag.
- ◆ Always wash your hands with water after completing the operation.

HINT:

The airbag deploys as the LED of the SST activation switch comes on.

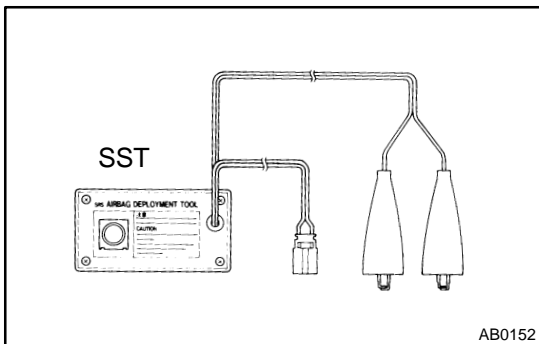
2. DEPLOYMENT WHEN DISPOSING OF SIDE AIRBAG ASSEMBLY

NOTICE:

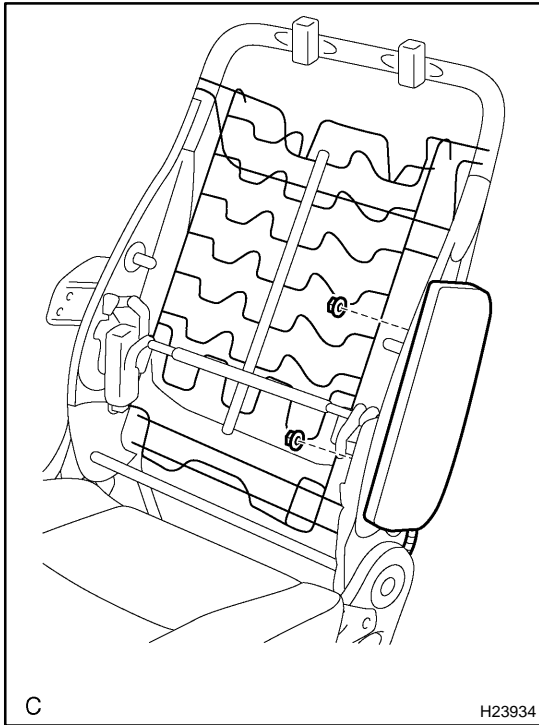
- ◆ When disposing of the side airbag assembly, never use the customer's vehicle to deploy the airbag.
- ◆ Be sure to follow the procedure given below when deploying the airbag.

HINT:

Prepare a battery as the power source to deploy the airbag.



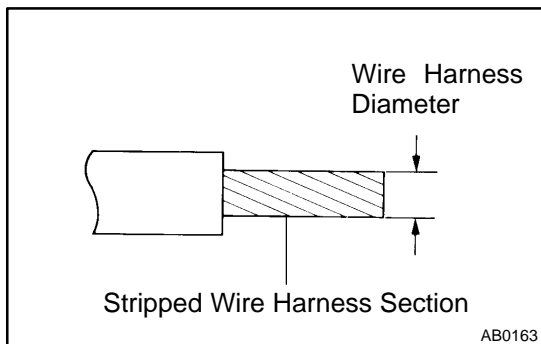
- (a) Check the function of the SST (see step 1-(a)).
- (b) Remove the front seat airbag assembly (see page [RS-49](#) (power adjuster type), [RS-64](#) (manual adjuster type) and [RS-74](#) (passenger side of split type)).
- (c) Remove the seatback assembly (see page [RS-49](#) (power adjuster type), [RS-64](#) (manual adjuster type) and [RS-74](#) (passenger side of split type)).



- (d) Remove the 2 nuts and side airbag assembly from the seatback assembly.

CAUTION:

- ◆ When removing the front seat airbag assembly, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
- ◆ When storing the front passenger airbag assembly, keep the airbag deployment side facing upward.



- (e) Using a service-purpose wire harness for the vehicle, tie down the front passenger airbag assembly to the tire.

**Wire harness: Stripped wire harness section
1.25 mm² or more (0.0019 in.² or more)**

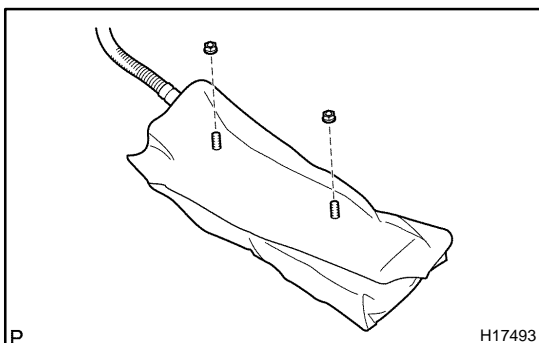
HINT:

To calculate the area of the stripped wire harness section:

$$\text{Area} = 3.14 \times (\text{Diameter})^2 \text{ divided by } 4$$

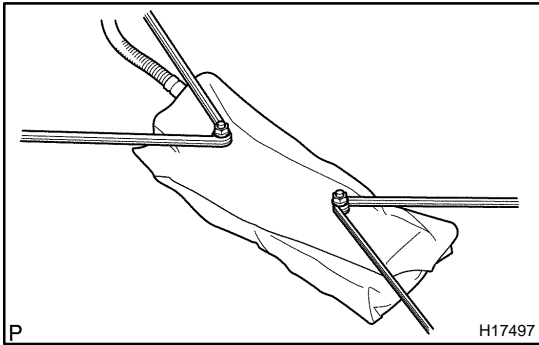
CAUTION:

If the wire harness is too thin or an alternative object is used to tie down the front passenger airbag assy, it may be snapped by the shock when the airbag is deployed. Always use a wire harness for vehicle use with an area of at least 1.25 mm² (0.0019 in.²).

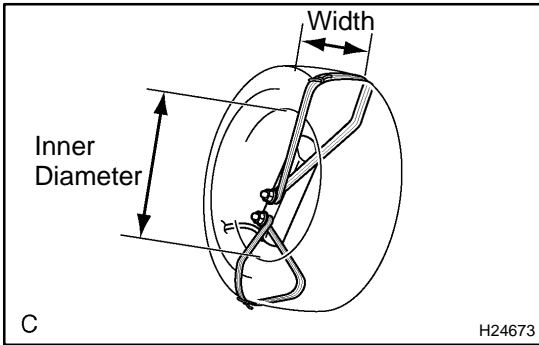


- (1) Install the 2 nuts to the side airbag assembly.

SUPPLEMENTAL RESTRAINT SYSTEM - SIDE AIRBAG ASSEMBLY (Power Adjuster Type)



- (2) Wind the wire harness around the stud bolts of the side airbag assembly as shown in the illustration.



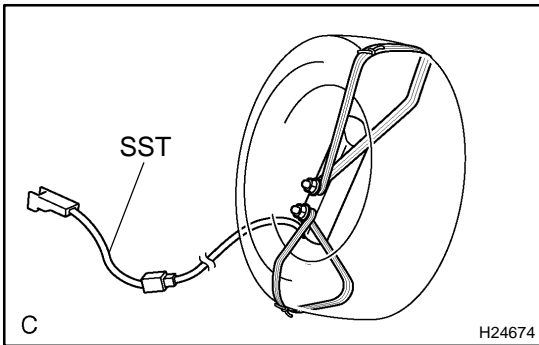
- (3) Position the side airbag assembly inside the tire with the airbag deployment direction facing inside.
Tire size: Must exceed the following dimensions:
Width: 185 mm (7.28 in.)
Inner diameter: 360 mm (14.17 in.)

CAUTION:

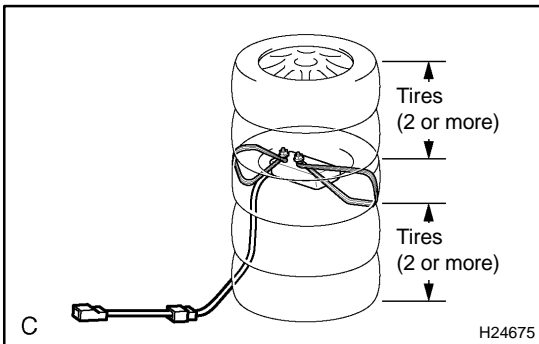
- ◆ Make sure that the wire harness is tight. If there is slack in wire harness, the side airbag assembly may become loose due to the shock when the airbag is deployed.
- ◆ Always tie down the side airbag assembly with the airbag deployment side facing inside the tire.

NOTICE:

The tire will be marked by the airbag deployment, so use an extra tire.



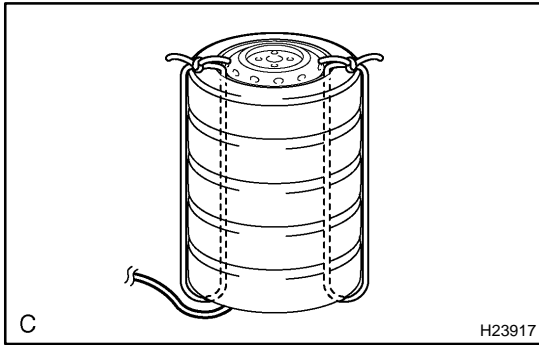
- (f) Install the SST.
 - (1) Connect the SST connector to the side airbag assembly connector.
 SST 09082-00750



- (g) Place the tires.
 - (1) Place at least 2 tires under the tire which the front seat airbag assembly is tied to.
 - (2) Place at least 2 tires over the tire which the front seat airbag assembly is tied to. The top tire should have the disc wheel installed.

NOTICE:

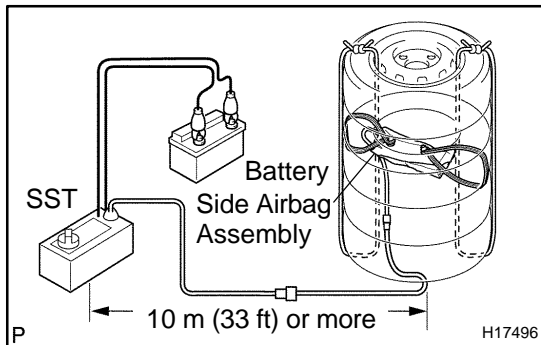
Do not place the SST connector under the tire because it could be damaged.



- (3) Tie the tires together with 2 wire harness.

CAUTION:

Make sure that the wire harness is tight. Looseness in the wire harness results in the tires coming free due to the shock when the airbag is deployed.



- (h) Install the SST.

Connect the connectors of the 2 SST to the side airbag assembly connector.

SST 09082-00700

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the tire.



- (i) Deploy the airbag.

- (1) Connect the red clip of the SST to the battery positive (+) terminal and the black clip of the SST to the battery negative (-) terminal.
- (2) Check that no one is within a 10 m (33 ft) radius of the tire which the front seat airbag assy LH is tied to.
- (3) Press the SST activation switch and deploy the airbag.

CAUTION:

When deploying the airbag, make sure that no one is near the tire.

HINT:

The airbag deploys as the LED of the SST activation switch comes on.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the seat frame assembly or seatback cover with a new one.

Case	Replacing part
The side airbag has been deployed.	Seat assembly
The side airbag assembly has been found to be faulty in troubleshooting.	Seat frame assembly
The side airbag assembly has been found to have cuts while checking items (see page RS-52).	Seat frame assembly
The seatback cover has been found to have cuts and frayed seams while checking items (see page RS-52).	Seatback cover
The side airbag assembly has been found to be faulty while checking items (see page RS-52).	Seat frame assembly
The seatback cover has been found to be faulty while checking items (see page RS-52).	Seatback cover
The seatback assembly has been dropped.	Seat frame assembly

CAUTION:

For removal and installation of the seat frame assembly, see page [RS-49](#) and [RS-60](#) . Be sure to follow the correct procedure.

INSTALLATION

HINT:

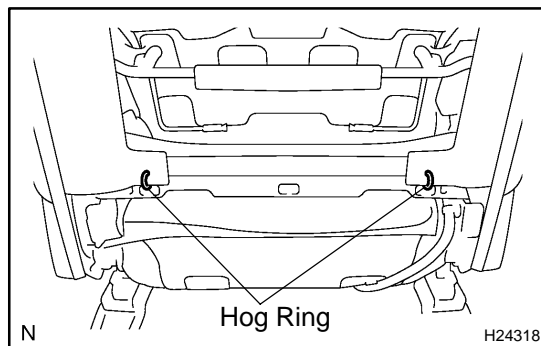
- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

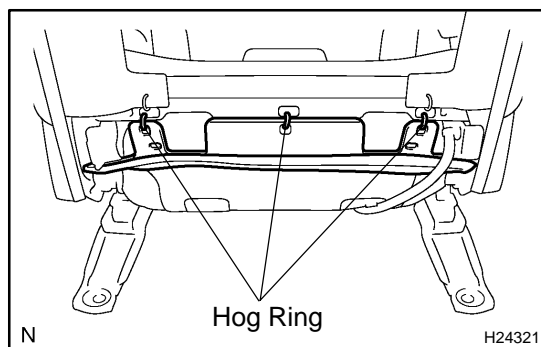
- ◆ If the side airbag assembly has been dropped, or there are cracks, dents or other defects in the case or connector, replace the side airbag assembly with a new one.
- ◆ When installing the side airbag assembly, take care it is not pinched between other parts.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.

1. INSTALL SEATBACK COVER AND PAD

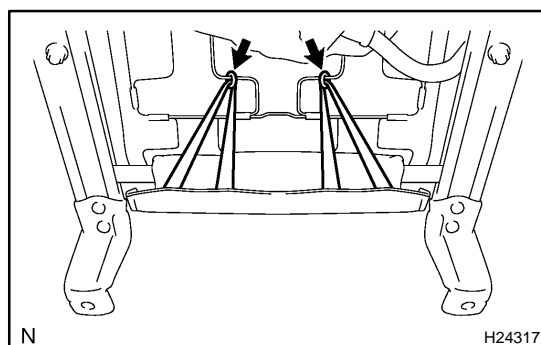
- (a) Install the seatback cover and pad to the seat frame assembly.
- (b) Install the 2 headrest supports to the seat frame assembly.



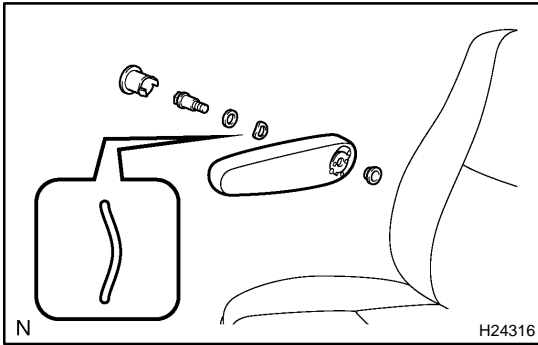
- (c) Install the hog rings to the seat frame assembly.



- (d) Install the hog rings to the seat frame assembly.
- (e) Close the fastener.



- (f) Install the seatback cover belt to the seat frame assembly.



2. INSTALL ARMREST ASSEMBLY

- (a) Install the spacer to the armrest assembly.
- (b) Install the armrest assembly, armrest lock plate and armrest spacer with the bolt.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

HINT:

- (c) Install the armrest cap to the armrest assembly.

3. INSTALL POWER SWITCH

Install the power switch with the 3 screws.

4. INSTALL LUMBAR SWITCH

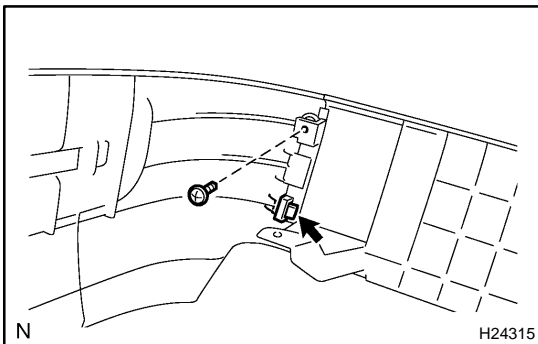
Install the lumbar switch with the 2 screws to the seat cushion outer shield.

5. INSTALL FRONT SEAT INNER BELT

- (a) Install the front seat inner belt with the nut.

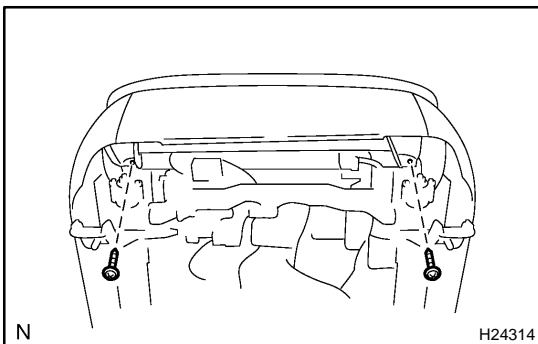
Torque: 42 N·m (428 kgf·cm, 31 ft·lbf)

- (b) Connect the connectors and wire harness clamps.



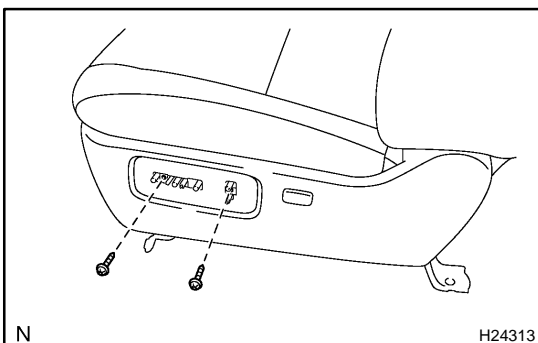
6. INSTALL SEAT CUSHION LOWER SHIELD, SEAT CUSHION OUTER SHIELD AND SEAT CUSHION INNER SHIELD

- (a) Assemble the seat cushion lower shield and seat cushion outer shield with the screw.
- (b) Perform the same procedure as for the other side.
- (c) Connect the lumbar switch connector to the lumbar switch, and install the seat cushion lower shield, outer shield and inner shield.

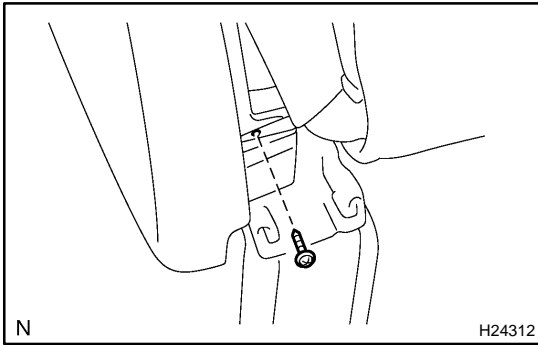


- (d) Install the 2 screws to the seat cushion lower shield.

- (e) Install the 2 screws to the seat cushion inner shield.



- (f) Install the 2 screws to the seat cushion outer shield.



- (g) Install the screw to the seat cushion outer shield.
7. **INSTALL SLIDE KNOB AND RECLINING KNOB**
 8. **INSTALL HEADREST**
 9. **INSTALL FRONT SEAT**

Mount the front seat to the vehicle.

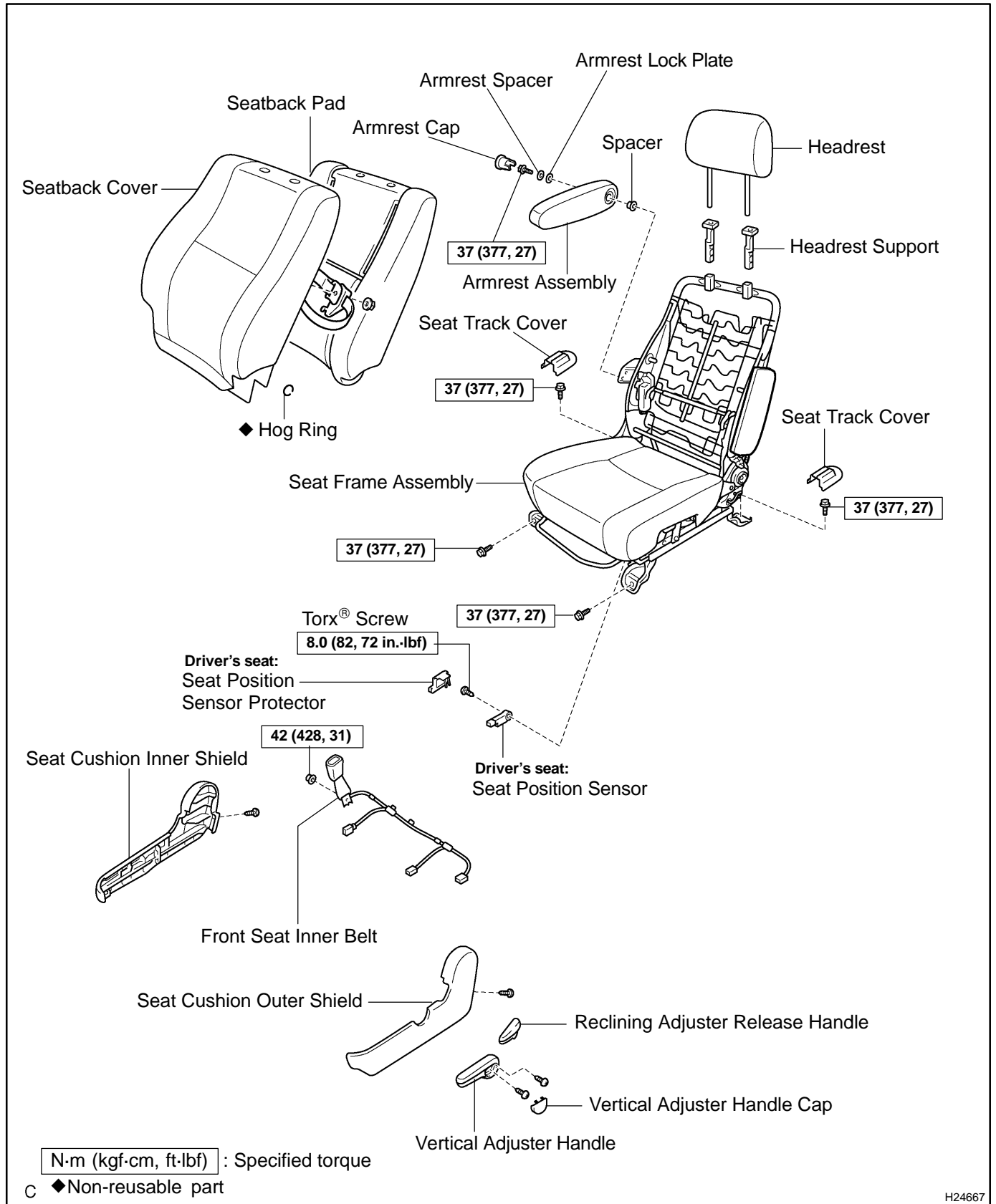
NOTICE:

Be careful not to damage the body.

- (a) Connect the connectors.
 - (b) Slide the front seat to the rearmost position.
 - (c) Temporarily tighten the bolts on the front side, starting from the bolt on the inner side, and fully tighten them.
Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)
 - (d) Slide the front seat to the most front position.
 - (e) Temporarily tighten the bolts on the rear side, starting from the bolt on the inner side, and fully tighten them.
Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)
10. **INSTALL SEAT TRACK COVERS**
 11. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
 12. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

SIDE AIRBAG ASSEMBLY (Manual Adjuster Type) COMPONENTS

RS12C-01



H24667

REMOVAL

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

- ◆ If the wiring connector of the SRS is disconnected and the ignition switch is in the ACC or ON position, DTCs will be recorded.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.

1. PRECAUTION (SEE PAGE RS-1 AND RS-3)
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. REMOVE SEAT TRACK COVERS

Using a screwdriver, remove the seat track covers.

HINT:

Tape the screwdriver tip before use.

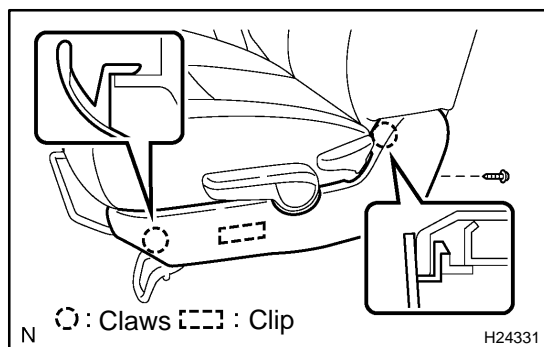
4. REMOVE FRONT SEAT

- (a) Remove the 4 bolts.
- (b) Disconnect the connectors.
- (c) w/ Side airbag:
Disconnect the airbag connector.
- (d) Remove the front seat.

NOTICE:

Be careful not to damage the body.

5. REMOVE HEADREST



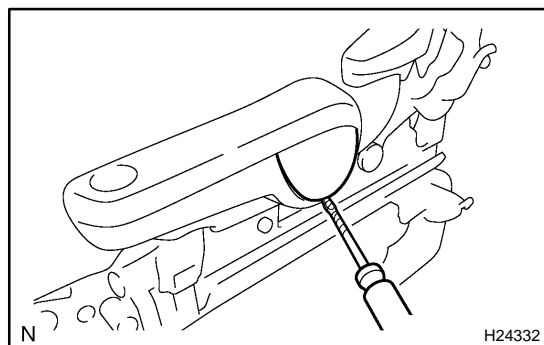
6. REMOVE SEAT CUSHION OUTER SHIELD

- (a) Remove the screw from the seat cushion outer shield.
- (b) Using a screwdriver, remove the seat cushion outer shield.

HINT:

Tape the screwdriver tip before use.

7. REMOVE RECLINING ADJUSTER RELEASE HANDLE

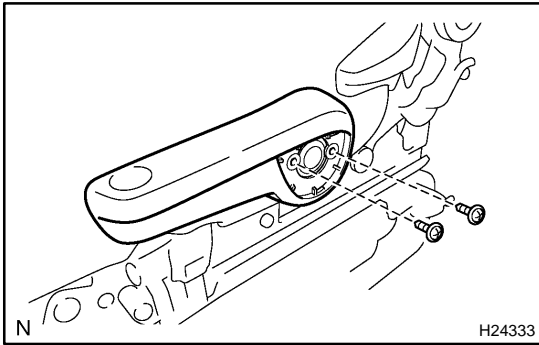


8. REMOVE VERTICAL ADJUSTER HANDLE

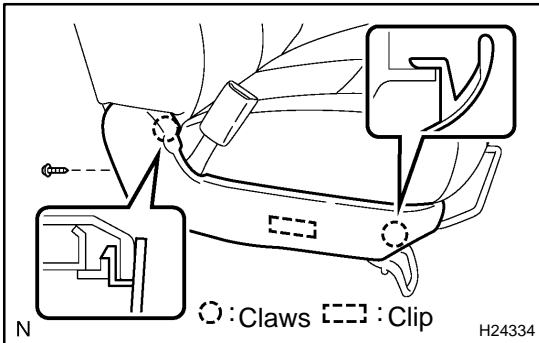
- (a) Using a screwdriver, remove the vertical adjuster handle cap.

HINT:

Tape the screwdriver tip before use.



- (b) Remove the 2 screws and vertical adjuster handle.



9. REMOVE SEAT CUSHION INNER SHIELD

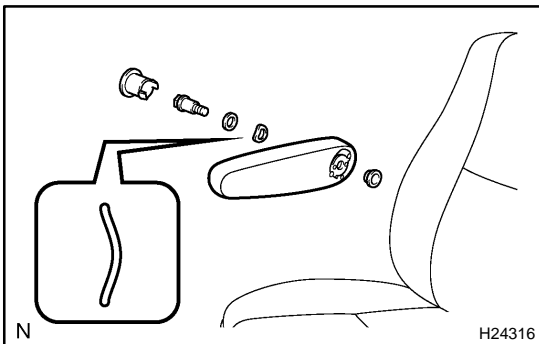
- (a) Remove the screw from the seat cushion inner shield.
- (b) Using a screwdriver, remove the seat cushion inner shield.

HINT:

Tape the screwdriver tip before use.

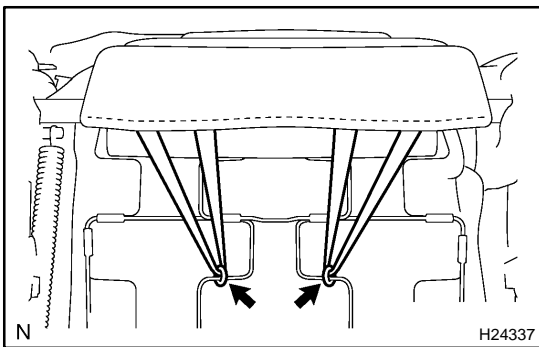
10. REMOVE FRONT SEAT INNER BELT

- (a) Disconnect the wire harness clamps and connectors.
- (b) Remove the nut and front seat inner belt.



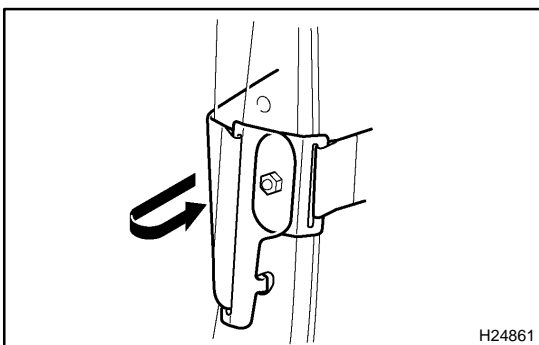
11. REMOVE ARMREST ASSEMBLY

- (a) Using a screwdriver, remove the armrest cap.
- (b) Remove the bolt, armrest spacer, armrest lock plate and armrest assembly.
- (c) Remove the spacer from the armrest assembly.

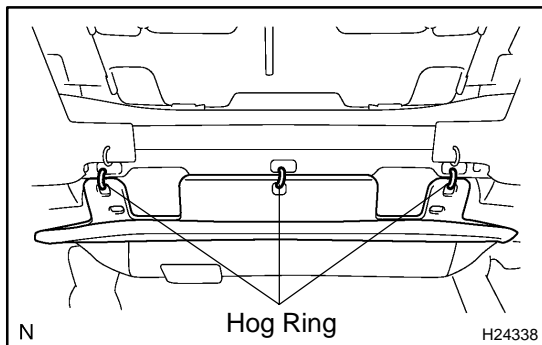


12. REMOVE SEATBACK COVER AND PAD

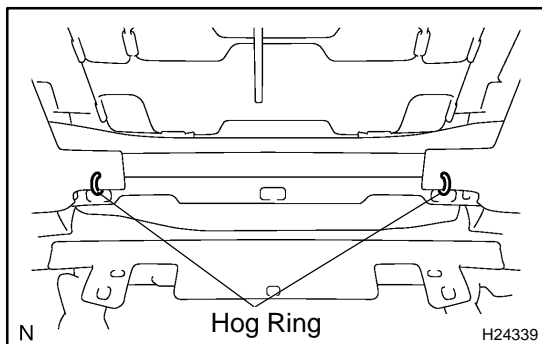
- (a) Remove the seatback cover lower part from the seat frame assembly.
- (b) Open the fastener.



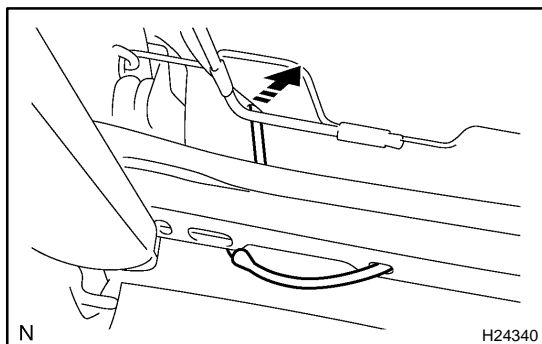
- (c) w/ Side airbag:
Remove the nut and disconnect the seatback cover bracket from the seat frame assembly.



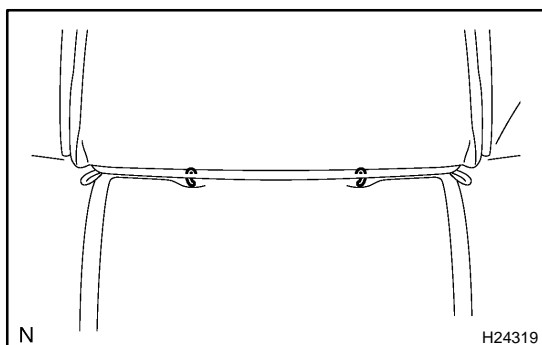
- (d) Remove the hog rings from the seat frame assembly.



- (e) Remove the hog rings from the seat frame assembly.



- (f) Remove the hog rings shown in the illustration from the seat frame assembly.
 (g) Remove the seatback cover and pad from the seat frame assembly.



13. REMOVE SEATBACK COVER

- (a) Turn up the seatback cover and remove the hog rings.
 (b) Remove the 2 headrest supports.
 (c) Remove the seatback cover from the seatback pad.

INSPECTION

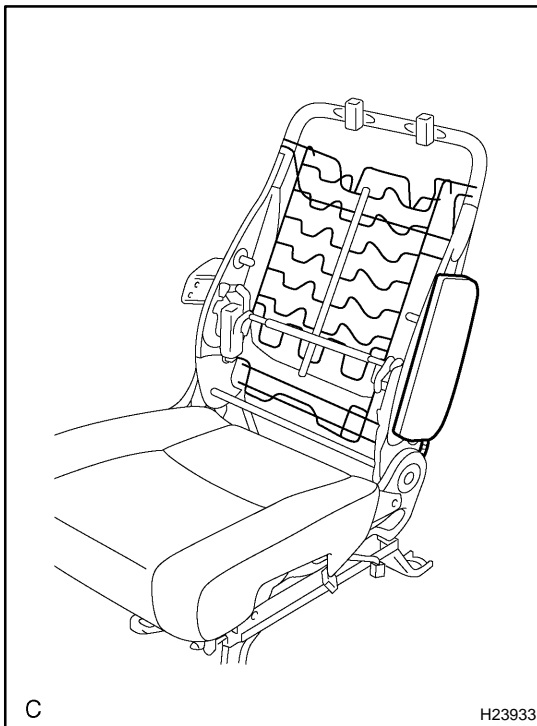
1. VEHICLE NOT INVOLVED IN A COLLISION

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) With the front seat airbag assy installed on the vehicle, perform a visual check. If there are any defects as mentioned below, replace the front seatback assy with a new one:

Cuts, minute cracks or marked discoloration on the front seatback assy around the front seat airbag assy.

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

- (a) Perform a diagnostic system check (see page [DI-1871](#)).



- (b) Perform a visual check which includes the following items with the seatback assembly removed from the vehicle.

- ◆ Cuts, tears and cracks on the side airbag assembly.
- ◆ Cuts and cracks in the wire harness, and chipping in the connectors.

CAUTION:

For removal and installation of the front seatback assembly, see page [RS-64](#) and [RS-70](#) . Be sure to follow the correct procedure.

DISPOSAL

See page [RS-53](#).

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the seat frame assembly or seatback cover with a new one.

Case	Replacing part
The side airbag has been deployed.	Seat assembly
The side airbag assembly has been found to be faulty in troubleshooting.	Seat frame assembly
The side airbag assembly has been found to have cuts while checking items (see page RS-67).	Seat frame assembly
The seatback cover has been found to have cuts while checking items (see page RS-67).	Seatback cover
The side airbag assembly has been found to be faulty while checking items (see page RS-67).	Seat frame assembly
The seatback cover has been found to be faulty while checking items (see page RS-67).	Seatback cover
The front seat adjuster LH has been dropped.	Seat frame assembly

CAUTION:

For removal and installation procedures of the seat frame assembly, see page [RS-64](#) and [RS-70](#) . Be sure to follow the correct procedure.

INSTALLATION

HINT:

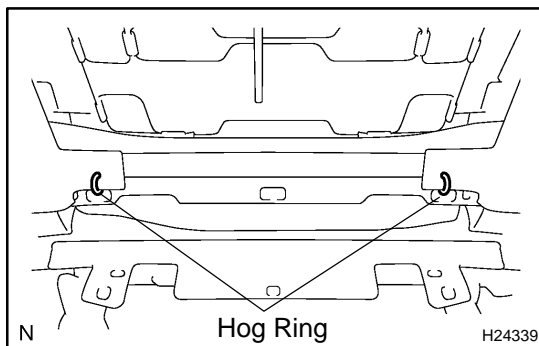
- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

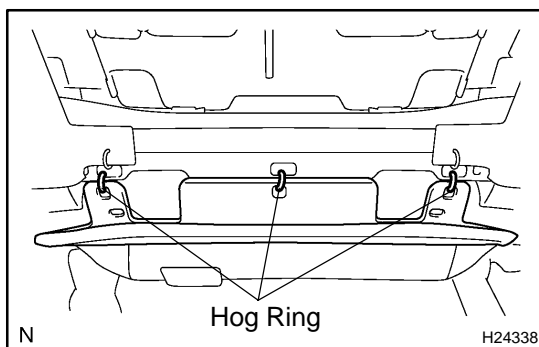
- ◆ If the side airbag assembly has been dropped, or there are cracks, dents or other defects in the case or connector, replace the side airbag assembly with a new one.
- ◆ When installing the side airbag assembly, take care that it is not pinched between other parts.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.

1. INSTALL SEATBACK COVER AND PAD

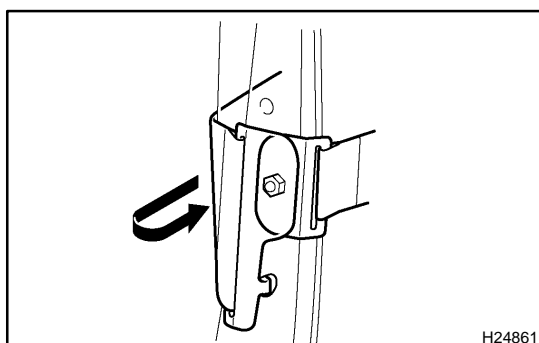
- (a) Install the seatback cover and pad to the seat frame assembly.



- (b) Install the seatback cover tubes with the hog rings to the seat frame assembly.



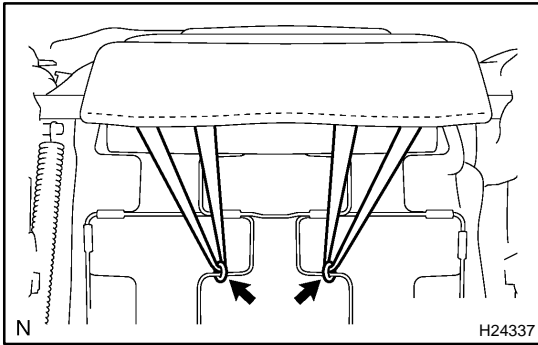
- (c) Install the hog rings to the seat frame assembly.



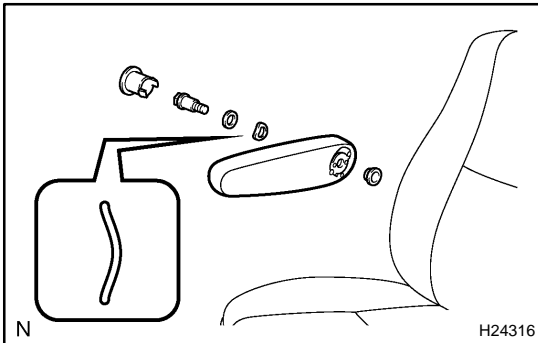
- (d) w/ Side airbag:
Connect the seatback cover bracket with the nut to the seat frame assembly.

Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)

- (e) Close the fastener.



- (f) Install the seatback cover belt to the seat frame assembly.



2. INSTALL ARMREST ASSEMBLY

- (a) Install the spacer to the armrest assembly.
 (b) Install the armrest assembly, armrest lock plate and armrest spacer with the bolt.

Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)

HINT:

Install the armrest lock plate as shown in the illustration.

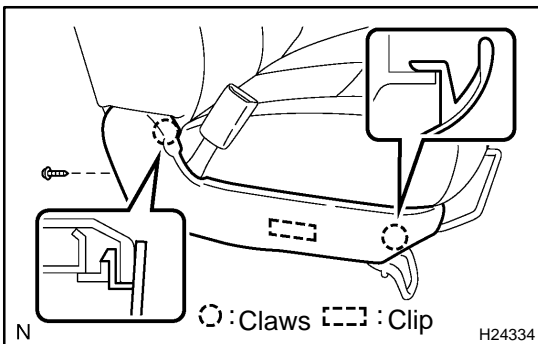
- (c) Install the armrest cap.

3. INSTALL FRONT SEAT INNER BELT

- (a) Install the front seat inner belt with the nut.

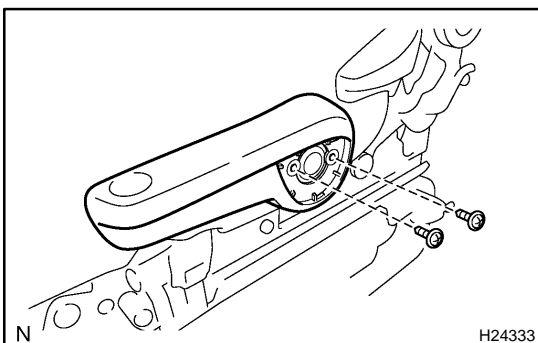
Torque: 42 N·m (428 kgf-cm, 31 ft-lbf)

- (b) Connect the connectors and wire harness clamps.



4. INSTALL SEAT CUSHION INNER SHIELD

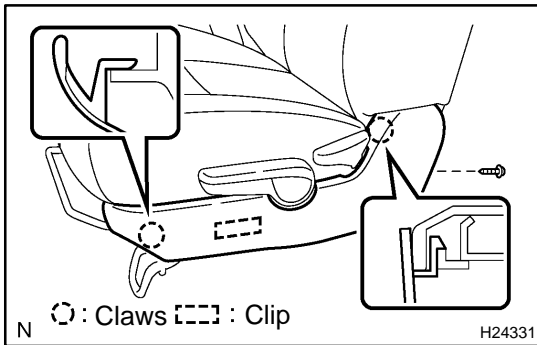
Install the seat cushion inner shield with the screw.



5. INSTALL VERTICAL ADJUSTER HANDLE

- (a) Install the vertical adjuster handle with the 2 screws.
 (b) Install the vertical adjuster handle cap.

6. INSTALL RECLINING ADJUSTER RELEASE HANDLE



7. INSTALL SEAT CUSHION OUTER SHIELD

Install the seat cushion outer shield with the screw.

8. INSTALL HEADREST

9. INSTALL FRONT SEAT

Mount the front seat to the vehicle.

NOTICE:

Be careful not to damage the body.

- (a) Connect the connectors.
- (b) Slide the front seat to the rearmost position.
- (c) Temporarily tighten the bolts on the front side, starting from the bolt on the inner side, and fully tighten them.
- (d) Slide the front seat to the most front position.
- (e) Temporarily tighten the bolts on the rear side, starting from the bolt on the inner side, and fully tighten them.

Torque: 37 N·m (377 kgf-cm, 27 ft-lbf)

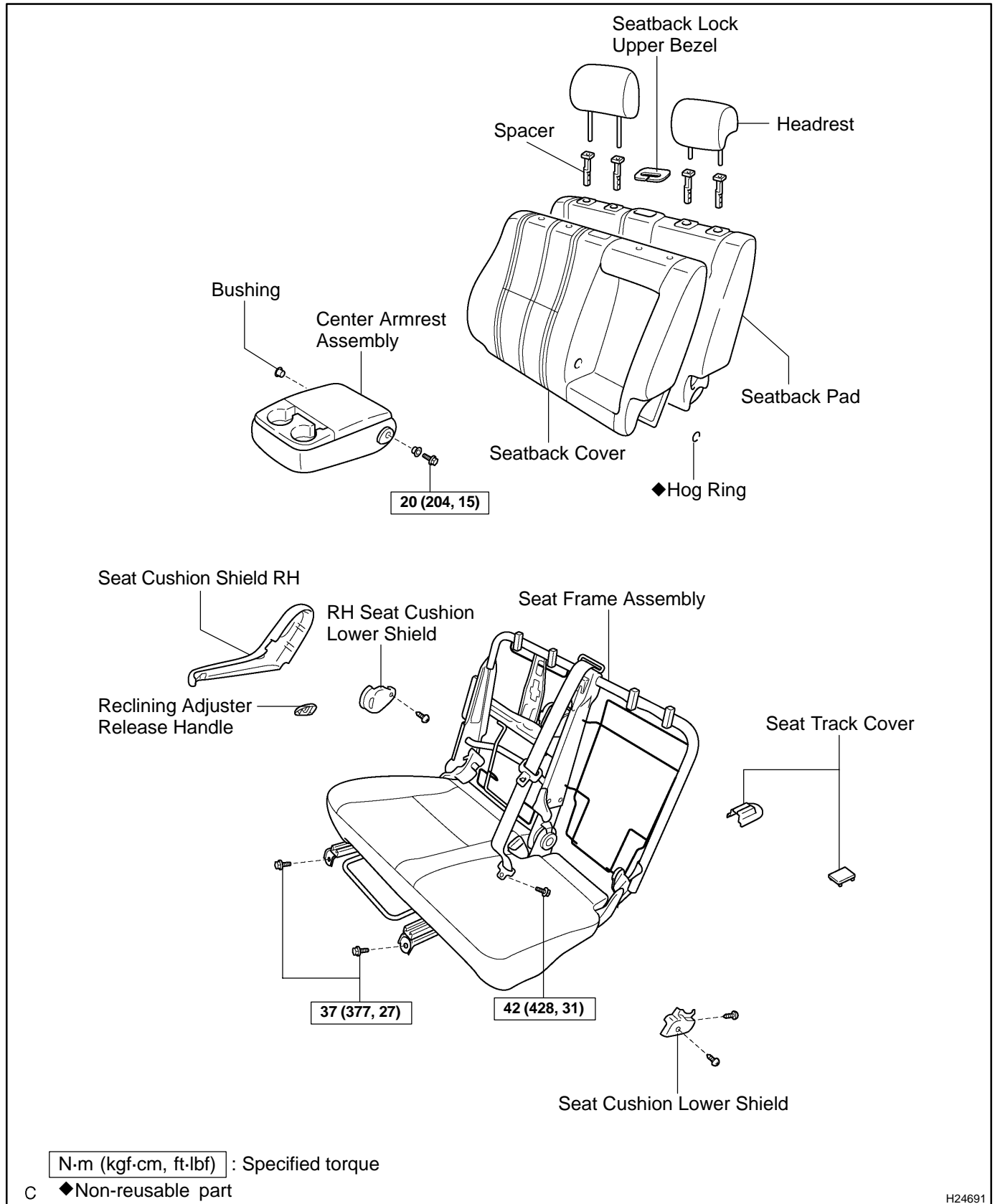
10. INSTALL SEAT TRACK COVERS

11. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

12. INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))

SIDE AIRBAG ASSEMBLY (Passenger Side of Split Type) COMPONENTS

RS121-01



H24691

REMOVAL

NOTICE:

- ◆ If the wiring connector of the SRS is disconnected and the ignition switch is in the ACC or ON position, DTCs will be recorded.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.

1. PRECAUTION (SEE PAGE RS-1 AND RS-3)
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. REMOVE SEAT TRACK COVERS

Using a screwdriver, remove the seat track covers.

HINT:

Tape the screwdriver tip before use.

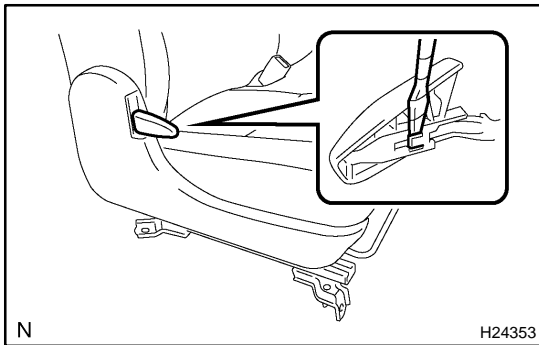
4. REMOVE FRONT SEAT

- (a) Remove the 4 bolts.
- (b) Disconnect the connectors.
- (c) w/ Side airbag:
Disconnect the airbag connector.
- (d) Remove the front seat.

NOTICE:

Be careful not to damage the body.

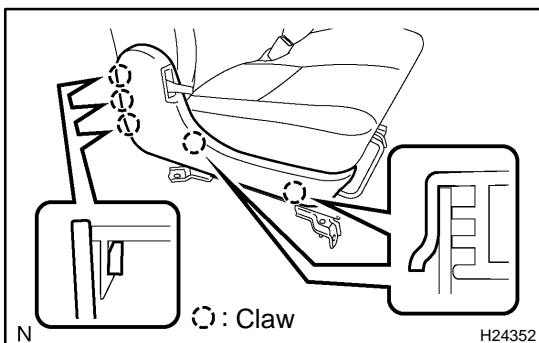
5. REMOVE HEADRESTS



- ### 6. REMOVE RECLINING ADJUSTER RELEASE HANDLE
- Using a screwdriver, remove the reclining adjuster release handle.

HINT:

Tape the screwdriver tip before use.

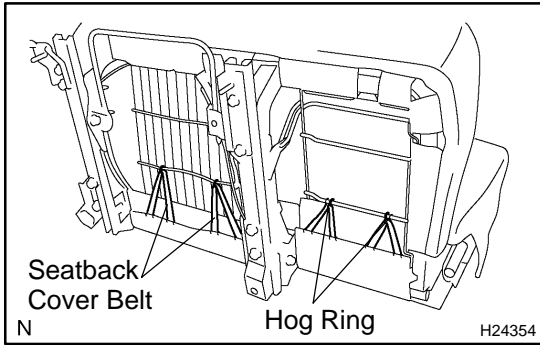


7. REMOVE RH SEAT CUSHION SHIELD

Disengage the claws and remove the RH seat cushion shield.

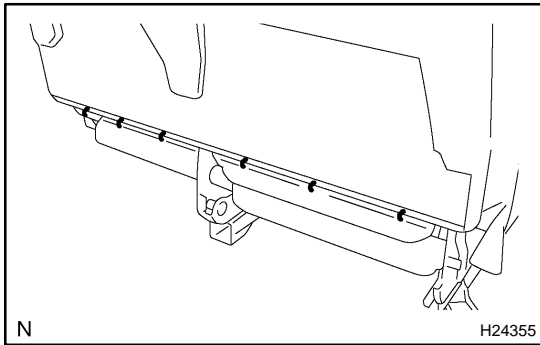
8. REMOVE SEAT CUSHION LOWER SHIELD

Remove the 2 screws and seat cushion lower shield.

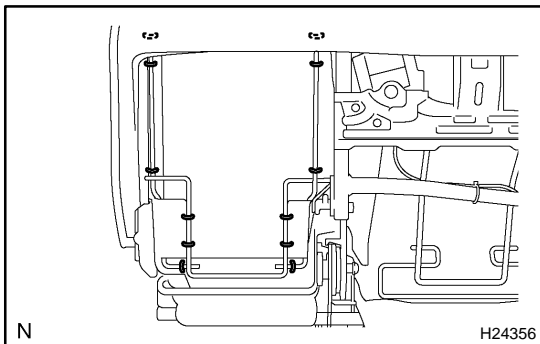


9. REMOVE SEATBACK ASSEMBLY

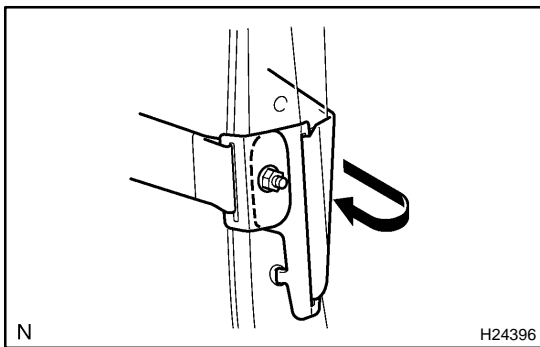
- (a) Remove the hog rings from the seatback cover belt.
- (b) Remove the seatback cover belt from the hook.



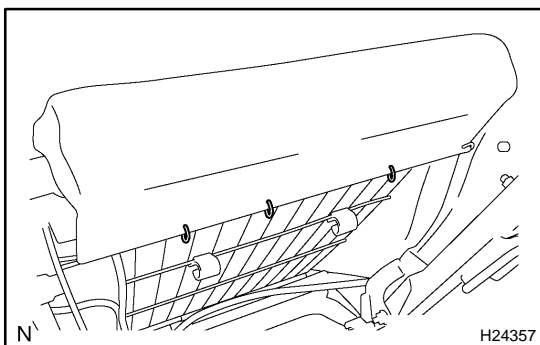
- (c) Remove the hog rings from the seatback cover.
- (d) Open the fastener.
- (e) Remove the bolt and center armrest assembly.
- (f) Remove the 2 bushings.



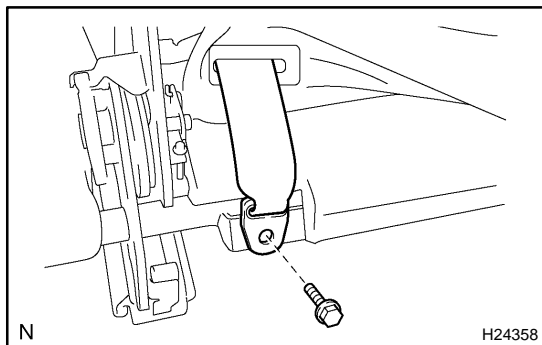
- (g) Remove the hog rings from the seatback cover.



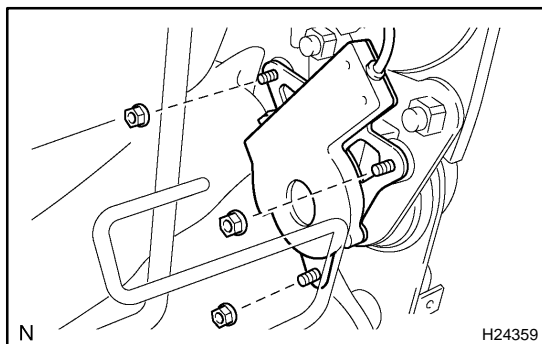
- (h) w/ Side airbag:
Remove the nut and disconnect the seatback cover brackets from the seatback frame.



- (i) Remove the hog rings from the seat cushion cover.

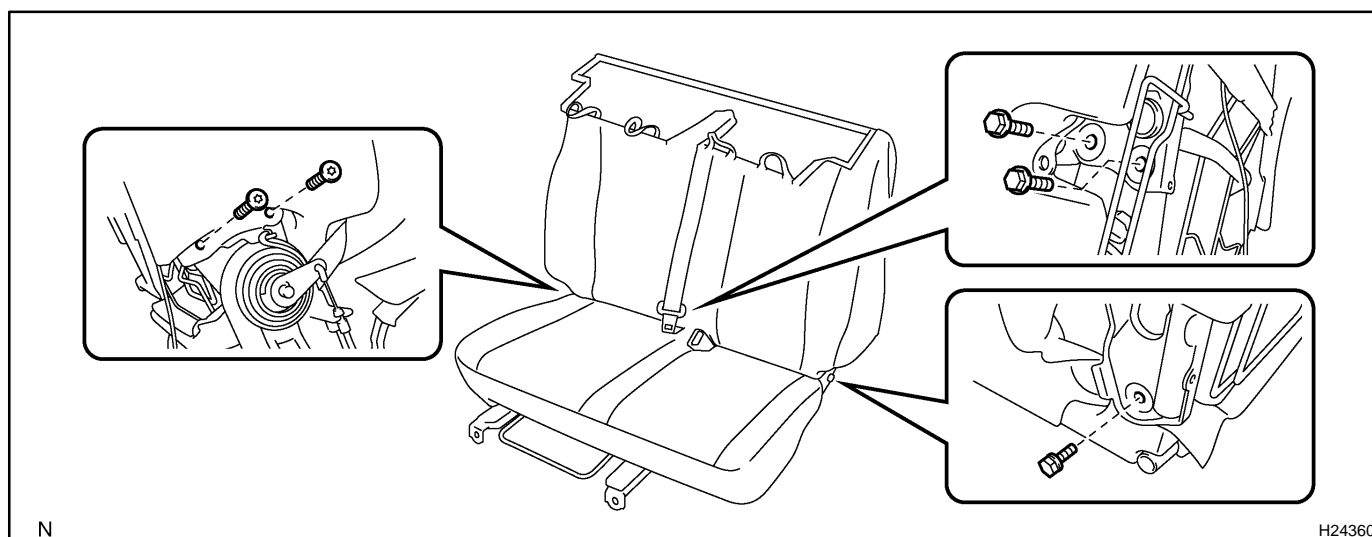


- (j) Remove the bolt and disconnect the front seat center belt from the seat cushion assembly.
- (k) Remove the screw and RH seat cushion lower shield.
- (l) Remove the 2 screws and RH reclining adjuster inside cover.



- (m) Remove the 3 nuts and disconnect the front seat center belt.

- (n) Remove the 3 bolts.
- (o) Using a torx® socket wrench, remove the 2 torx® screws and seatback assembly from the seat cushion assembly.
- (p) Remove the bushing from the seatback frame.
- (q) Remove the 4 headrest supports from the seatback assembly.
- (r) Remove the seatback lock upper bezel.
- (s) Remove the seatback frame from the seatback pad.



INSPECTION

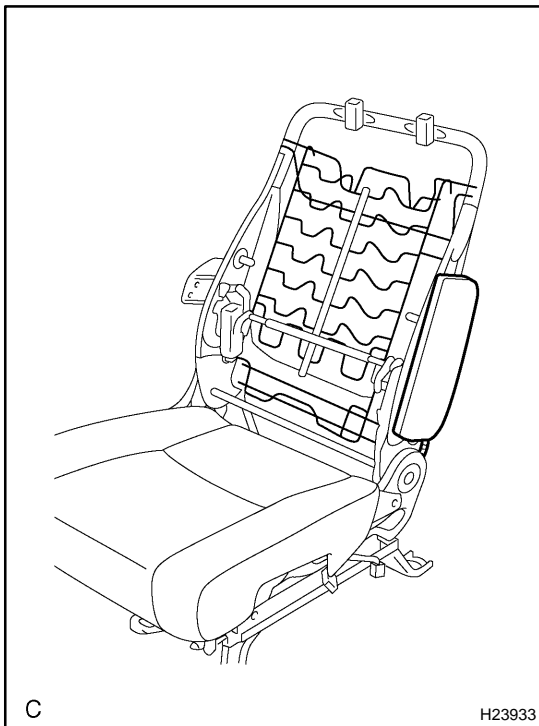
1. VEHICLE NOT INVOLVED IN A COLLISION

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) With the front seat airbag assy installed on the vehicle, perform a visual check. If there are any defects as mentioned below, replace the front seatback assy with a new one:

Cuts, minute cracks or marked discoloration on the front seatback assy around the front seat airbag assy.

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

- (a) Perform a diagnostic system check (see page [DI-1871](#)).



- (b) Perform a visual check which includes the following items with the seatback assembly removed from the vehicle:
 - ◆ Cuts, tears and cracks on the side airbag assembly.
 - ◆ Cuts and cracks in the wire harness, and chipping in the connectors.

CAUTION:

For removal and installation of the front seatback assembly, see page [RS-74](#) and [RS-80](#) . Be sure to follow the correct procedure.

DISPOSAL

See page [RS-53](#) .

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the seat frame assembly or seatback cover with a new one.

Case	Replacing part
The side airbag has been deployed.	Seat assembly
The side airbag assembly has been found to be faulty in troubleshooting.	Seatback assembly
The side airbag assembly has been found to have cuts while checking items (see page RS-77).	Seat frame assembly
The seatback cover has been found to have cuts and frayed seams while checking items (see page RS-77).	Seatback cover
The side airbag assembly has been found to be faulty while checking items (see page RS-77).	Seat frame assembly
The seatback cover has been found to be faulty while checking items (see page RS-77).	Seatback cover
The seatback assembly has been dropped.	Seat frame assembly

CAUTION:

For removal and installation of the seat frame assembly, see page [RS-74](#) and [RS-80](#) . Be sure to follow the correct procedure.

INSTALLATION

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

- ◆ If the side airbag assembly has been dropped, or there are cracks, dents or other defects in the case or connector, replace the side airbag assembly with a new one.
- ◆ When installing the side airbag assembly, take care it is not pinched between other parts.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.

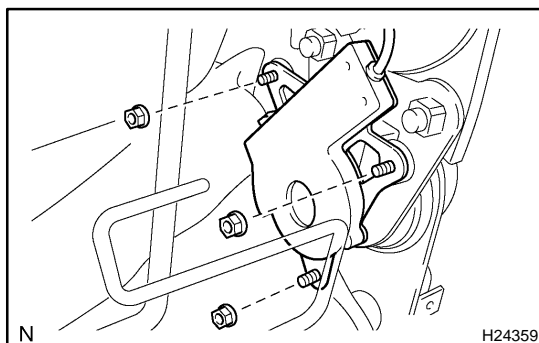
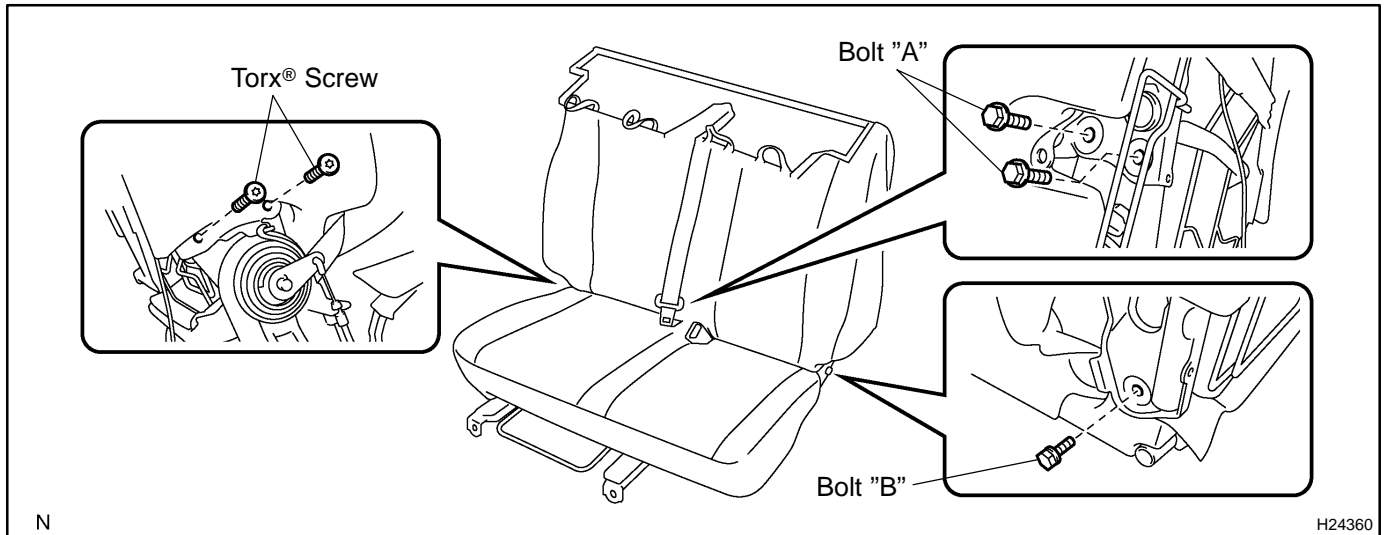
1. INSTALL SEATBACK ASSEMBLY

- (a) Install the bushing to the seatback frame.
- (b) Using a torx® socket wrench, install the seatback assembly with the 2 torx® screws to the seat cushion assembly.
Torque: 42 N·m (428 kgf·cm, 31 ft·lbf)
- (c) Install the 3 bolts.

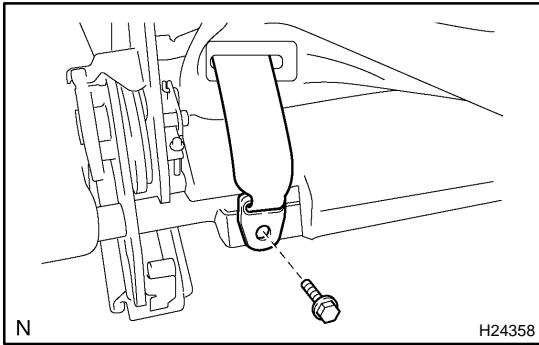
Torque:

Bolt A: 55 N·m (561 kgf·cm, 41 ft·lbf)

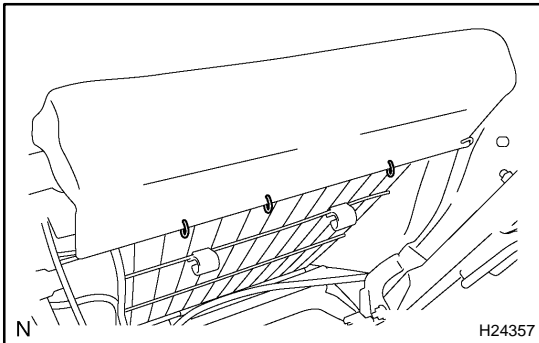
Bolt B: 21 N·m (214 kgf·cm, 15 ft·lbf)



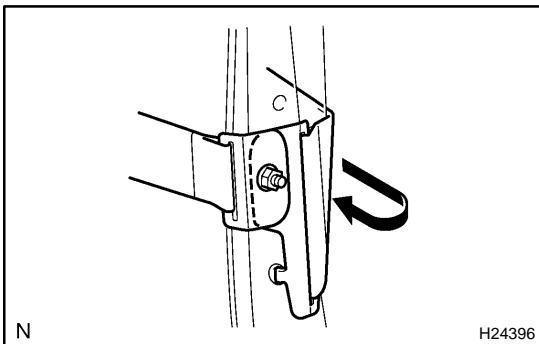
- (d) Connect the front seat center belt with the 3 nuts.
- (e) Install the RH reclining adjuster inside cover with the 2 screws.
- (f) Install the RH seat cushion lower shield with the screw.



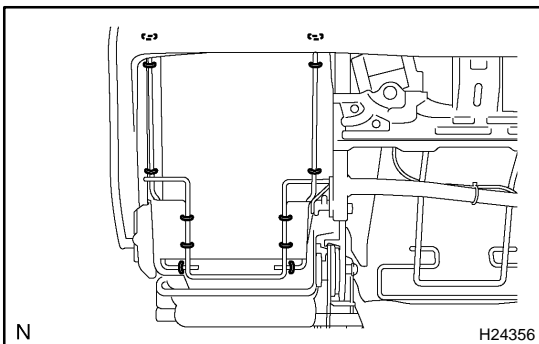
- (g) Connect the front seat center belt with the bolt to the seat cushion assembly.
Torque: 42 N·m (428 kgf-cm, 31 ft-lbf)



- (h) Install the hog rings to the seat cushion cover.
HINT:
 When installing hog rings, take care to prevent wrinkles as much as possible.



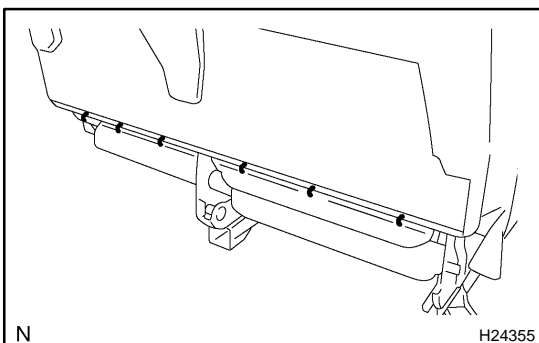
- (i) w/ Side airbag:
 Connect the seatback cover brackets with the nut to the seatback frame.
Torque: 5.5 N·m (56 kgf-cm, 49 in.-lbf)



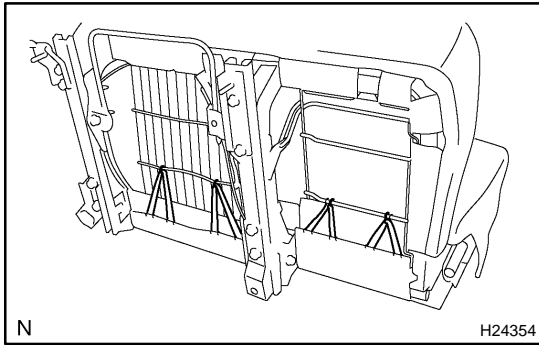
- (j) Install the hog rings to the seatback cover.
HINT:
 When installing hog rings, take care to prevent wrinkles as much as possible.

- (k) Install the 2 bushings.
 (l) Install the center armrest assembly with the bolt.
Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)

- (m) Close the fastener.



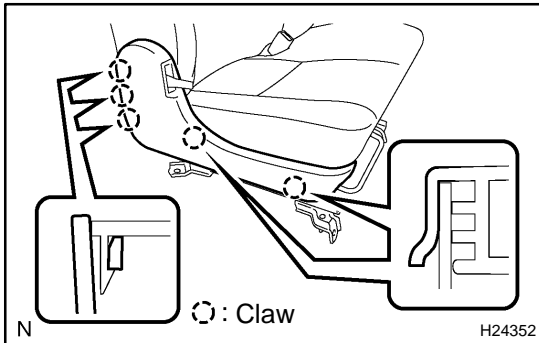
- (n) Install the hog rings to the seatback cover.
HINT:
 When installing hog rings, take care to prevent wrinkles as much as possible.



- (o) Install the seatback cover belt to the hook.
- (p) Install the hog rings to the seatback cover belt.

2. INSTALL SEAT CUSHION LOWER SHIELD

Install the seat cushion lower shield with the 2 screws.



3. INSTALL RH SEAT CUSHION SHIELD

Engage the claws and install the RH seat cushion shield.

4. INSTALL RECLINING ADJUSTER RELEASE HANDLE

5. INSTALL HEADRESTS

6. INSTALL SEAT LEG INNER COVER

Install the seat leg inner cover with the 3 screws.

7. INSTALL FRONT SEAT

- (a) Mount the front seat to the vehicle.

NOTICE:

Be careful not to damage the body.

- (b) w/ Side airbag:
Connect the airbag connector.
- (c) Connect the connectors.
- (d) Slide the front seat to the rearmost position .
- (e) Tighten the bolts on the front side temporarily, starting from the bolt on the inner side tighten them completely.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

- (f) Slide the front seat to the most front position.
- (g) Tighten the bolts on the rear side temporarily, starting from the bolt on the inner side tighten them completely.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

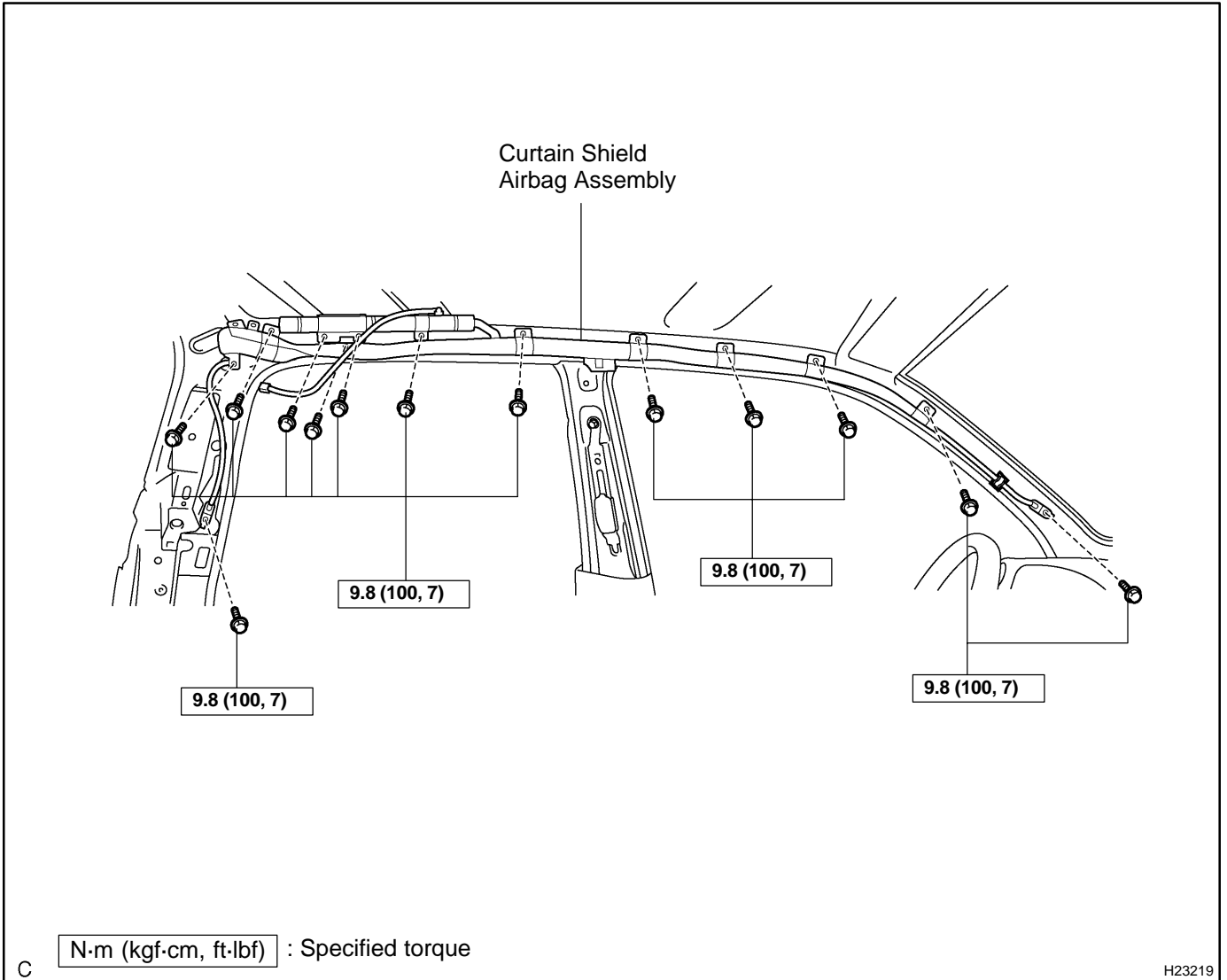
8. INSTALL SEAT TRACK COVERS

9. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

10. INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))

CURTAIN SHIELD AIRBAG ASSEMBLY COMPONENTS

RS0N2-17



REMOVAL

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

- ◆ If the wiring connector of the SRS is disconnected and the ignition switch is in the ACC or ON position, DTCs will be recorded.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.

1. PRECAUTION (SEE PAGE RS-1 AND RS-3)
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

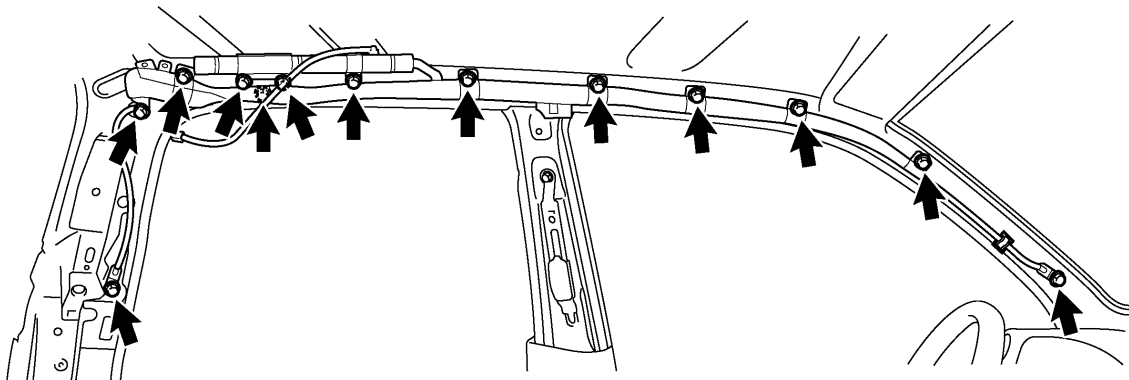
Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. REMOVE ROOF HEADLINING (SEE PAGE BO-126 AND BO-133)
4. REMOVE CURTAIN SHIELD AIRBAG ASSEMBLY
 - (a) Disconnect the curtain shield airbag connector.

NOTICE:

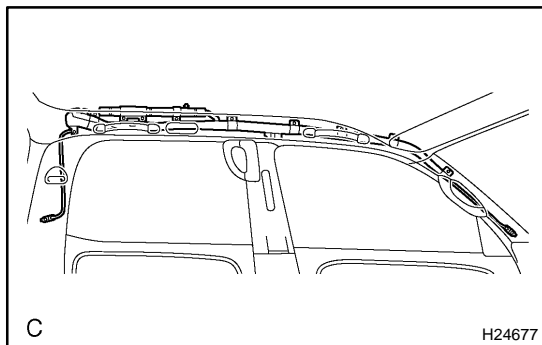
When handling the airbag connector, take care not to damage the airbag wire harness.

- (b) Remove the 13 bolts and the curtain shield airbag assembly.



C

H23220



INSPECTION

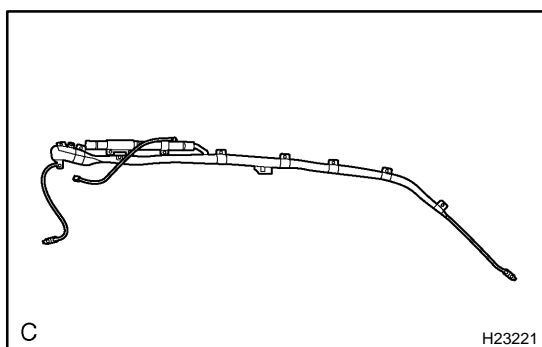
1. VEHICLES NOT INVOLVED IN A COLLISION

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) With the curtain shield airbag assembly installed on the vehicle, perform a visual check. If there are any defects as mentioned below, replace the front pillar garnish or roof headlining assy with a new one:

Cuts, minute cracks or marked discoloration on the front pillar garnish or roof headlining assy around the curtain shield airbag assembly.

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

- (a) Perform a diagnostic system check (see page [DI-1871](#)).



- (b) With the curtain shield airbag assembly removed from the vehicle, perform a visual check. If there are any defects as mentioned below, replace the curtain shield airbag assembly with a new one:

- ◆ Cuts, tears and cracks, or marked discoloration on the curtain shield airbag assembly.
- ◆ Cracks or other damage to the connector.

CAUTION:

For removal and installation of the curtain shield airbag assembly, see page [RS-1 11](#) and [RS-1 14](#). Be sure to follow the correct procedure.

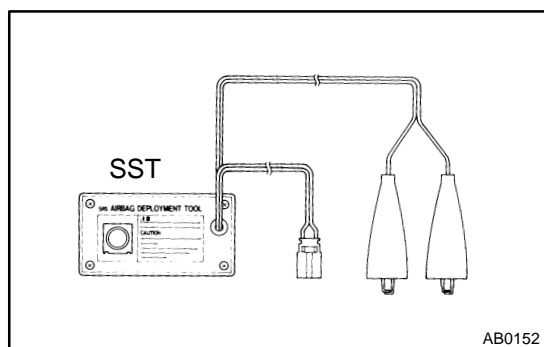
DISPOSAL

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.
- ◆ When scrapping a vehicle equipped with the SRS or disposing of the curtain shield airbag assembly, be sure to deploy the airbag first in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION:

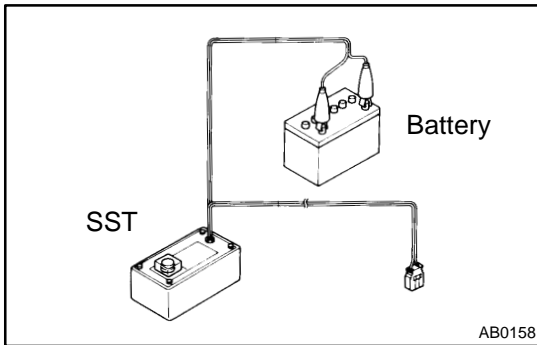
- ◆ **Never dispose of a curtain shield airbag assembly which has an undeployed airbag.**
- ◆ **The airbag produces an exploding sound when it is deployed, so perform the operation outdoors and where it will not create a nuisance to nearby residents.**



- ◆ **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.**
- ◆ **When deploying the airbag, perform the operation at least 10 m (33 ft) away from the curtain shield airbag assembly.**
- ◆ **The curtain shield airbag assembly becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.**
- ◆ **Use gloves and safety glasses when handling a curtain shield airbag assembly with a deployed airbag.**
- ◆ **Do not apply water, etc. to a front passenger airbag assembly with a deployed airbag.**
- ◆ **Always wash your hands with water after completing the operation.**

HINT:

Prepare a battery as the power source to deploy the airbag.

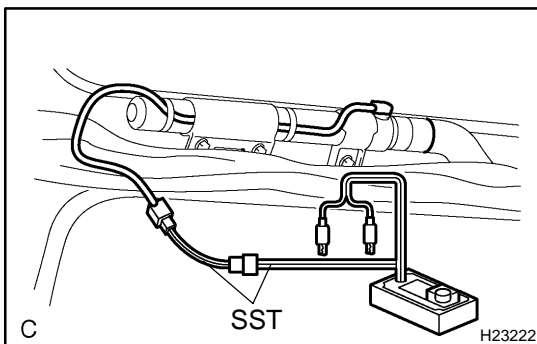


1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

- (a) Check the function of the SST (see step 1-(a) on page [RS-25](#)).
SST 09082-00700
- (b) Precaution (see page [RS-1](#) and [RS-3](#)).
- (c) Disconnect the cable from the negative battery terminal. Wait for 90 seconds after disconnecting the cable to prevent the airbag working.
- (d) Remove the roof headlining (see page [BO-126](#) and [BO-133](#)).
- (e) Disconnect the curtain shield airbag connector.

NOTICE:

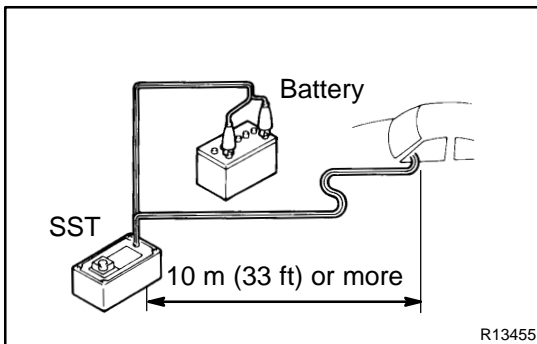
When handling the airbag connector, be careful not to damage the airbag wire harness.



- (f) Install the SST.
 - (1) Connect the connectors of the SST to the curtain shield airbag assembly.
SST 09082-00700, 09082-00760

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.



- (2) Move the SST at least 10 m (33 ft) away from the vehicle rear side window.
- (3) Maintaining enough clearance for the SST wire harness in the rear side window, close all doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

- (4) Connect the red clip of the SST to the battery positive (+) terminal and the black clip of the SST to the negative (-) terminal.

- (g) Deploy the airbag.
- (1) Check that no one is inside the vehicle or within a 10 m (33 ft) radius of the vehicle.
 - (2) Press the SST activation switch and deploy the airbag.

CAUTION:

- ◆ When deploying the airbag, make sure that no one is near the vehicle.
- ◆ The curtain shield airbag assembly becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
- ◆ Use gloves and safety glasses when handling a curtain shield airbag assembly with a deployed airbag.
- ◆ Do not apply water, etc. to a curtain shield airbag assembly with a deployed airbag.
- ◆ Always wash your hands with water after completing the operation.

HINT:

The airbag deploys as the LED of the SST activation switch comes on.

2. DEPLOYMENT WHEN DISPOSING OF CURTAIN SHIELD AIRBAG ASSEMBLY

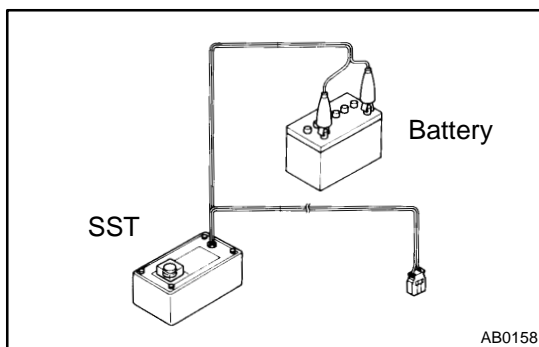
NOTICE:

- ◆ When disposing of the curtain shield airbag assembly, never use the customer's vehicle to deploy the airbag.
- ◆ Be sure to follow the procedure given below when deploying the airbag.

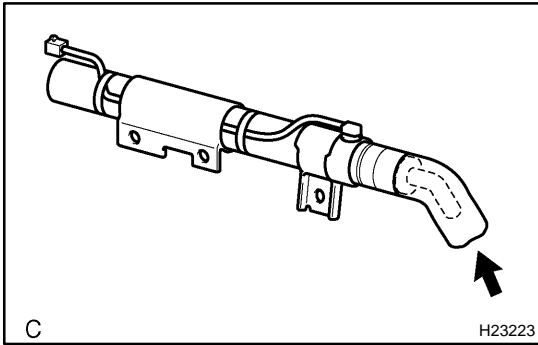
HINT:

Prepare a battery as the power source to deploy the airbag.

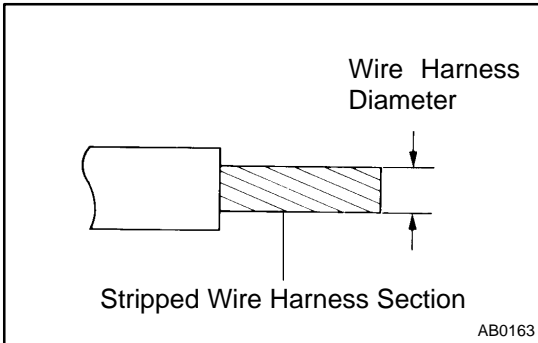
- (a) Check the function of the SST (see step 1-(a) on page [RS-25](#)).
 - (b) Remove the curtain shield airbag assembly (see page [RS-84](#)).
- ◆ When removing the front passenger airbag assembly, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
 - ◆ When storing the front passenger airbag assembly, keep the airbag deployment side facing upward.



SUPPLEMENTAL RESTRAINT SYSTEM - CURTAIN SHIELD AIRBAG ASSEMBLY



(c) Cut off the deployment section of the curtain shield airbag assembly.

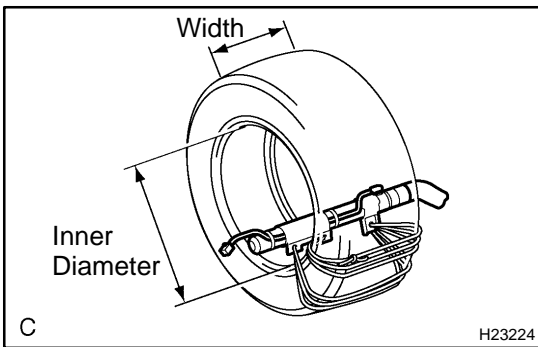


(d) Using a service-purpose wire harness for the vehicle, tie down the front passenger airbag assembly to the tire.

Wire harness: Stripped wire harness section 1.25 mm² or more (0.0019 in². or more)

CAUTION:

If the wire harness is too thin or an alternative object is used to tie down the curtain shield airbag assembly, it may be snapped by the shock when the airbag is deployed. Always use a wire harness for vehicle use with an area of at least 1.25 mm² (0.0019 in².).



HINT:

To calculate the area of the stripped wire harness section:

Area = 3.14 x (Diameter)² divided by 4

(1) Position the curtain shield airbag assembly inside the tire with the airbag deployment side facing inside.

Tire size: Must exceed the following dimensions:

Width: 185 mm (7.28 in.)

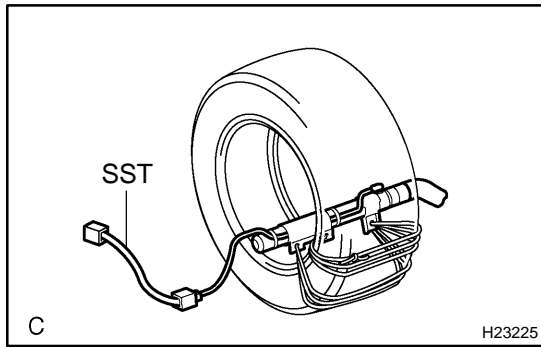
Inner diameter: 360 mm (14.17 in.)

CAUTION:

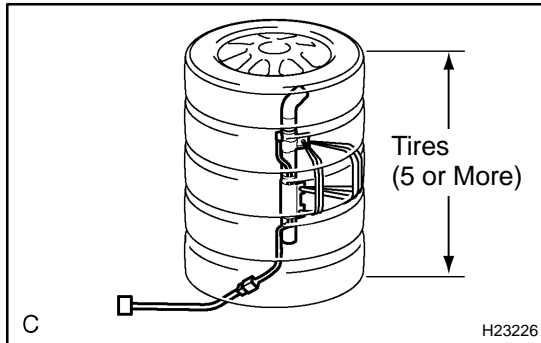
- ◆ Make sure that the wire harness is tight. If there is slack in wire harness, the curtain shield airbag assembly may become loose due to the shock when the airbag is deployed.
- ◆ Always tie down the curtain shield airbag assembly with the airbag deployment side facing inside.

NOTICE:

The tire will be marked by the airbag deployment, so use an extra tire.



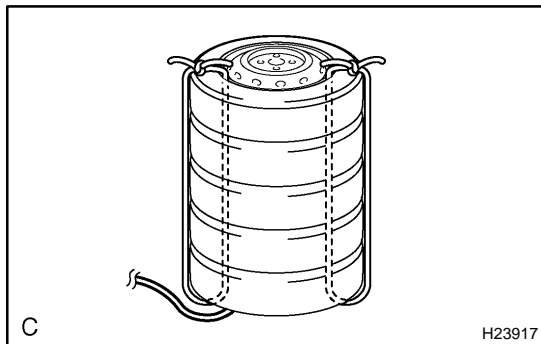
- (e) Install the SST.
After connecting the SST below to each other, connect them to the curtain shield airbag assembly.
SST 09082-00802, 09082-00760



- (f) Place the tires.
(1) Place at least 2 tires under the tire which the curtain shield airbag assembly is tied to.
(2) Place at least 2 tires over the tire which the curtain shield airbag assembly is tied to. The top tire should have the disc wheel installed.

NOTICE:

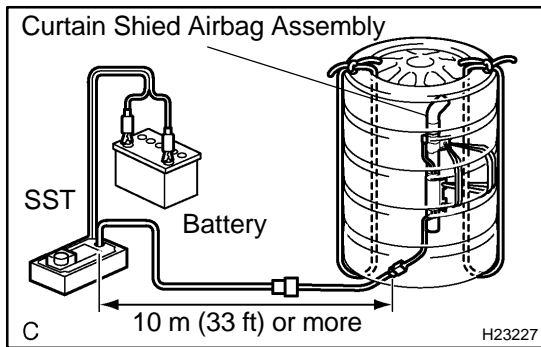
Do not place the SST connector under the tire because it could be damaged.



- (3) Tie the tires together with 2 wire harness.

CAUTION:

Make sure that the wire harness is tight. Looseness in the wire harness results in the tires coming free due to the shock when the airbag is deployed.



- (g) Install the SST.
Connect the SST connector.
SST 09082-00700

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the tire.

- (h) Deploy the airbag.
(1) Connect the red clip of the SST to the battery positive (+) terminal and the black clip of the SST to the battery negative (-) terminal.
(2) Check that no one is within a 10 m (33 ft) radius of the tire which the shield airbag assembly is tied to.

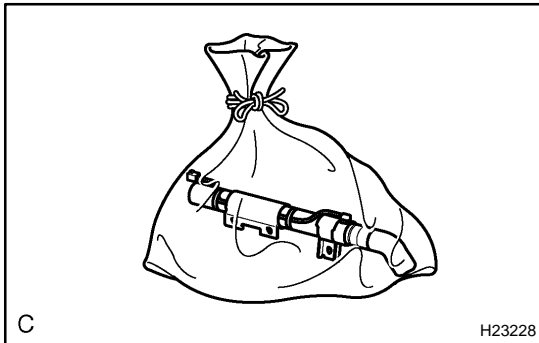
- (3) Press the SST activation switch and deploy the airbag.

CAUTION:

When deploying the airbag, make sure that no one is near the tire.

HINT:

The airbag deploys as the LED of the SST activation switch comes on.



- (i) Dispose of the curtain shield airbag assembly.

CAUTION:

- ◆ The curtain shield airbag assembly becomes extremely hot when the airbag is deployed, so do not touch it for at least 30 minutes after deployment.
- ◆ Use gloves and safety glasses when handling a curtain shield airbag assembly with a deployed airbag.
- ◆ Do not apply water, etc. to a curtain shield airbag assembly with a deployed airbag.
- ◆ Always wash your hands with water after completing the operation.

- (1) Remove the curtain shield airbag assembly from the tire.
- (2) Place the curtain shield airbag assembly in a plastic bag, tie it tightly and dispose of it as other general part disposal.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the curtain shield airbag assembly or curtain shield airbag cover with a new one.

Case	Replacing part
The curtain shield airbag has been deployed.	Curtain shield airbag assembly
The curtain shield airbag assembly has been found to be faulty in troubleshooting.	Curtain shield airbag assembly
The curtain shield airbag assembly has been found to be faulty while checking items (see page RS-85).	Curtain shield airbag assembly
The front pillar garnish has been found to be faulty while checking items (see page RS-85).	Front pillar garnish
The roof headlining has been found to be faulty while checking items (see page RS-85).	Roof headlining
The curtain shield airbag assembly has been dropped.	Curtain shield airbag assembly

CAUTION:

For removal and installation of the curtain shield airbag assembly, see page [RS-1 11](#) and [RS-1 14](#). Be sure to follow the correct procedure.

INSTALLATION

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

1. INSTALL CURTAIN SHIELD AIRBAG ASSEMBLY

- (a) Install the curtain shield airbag assembly with the 13 bolts.

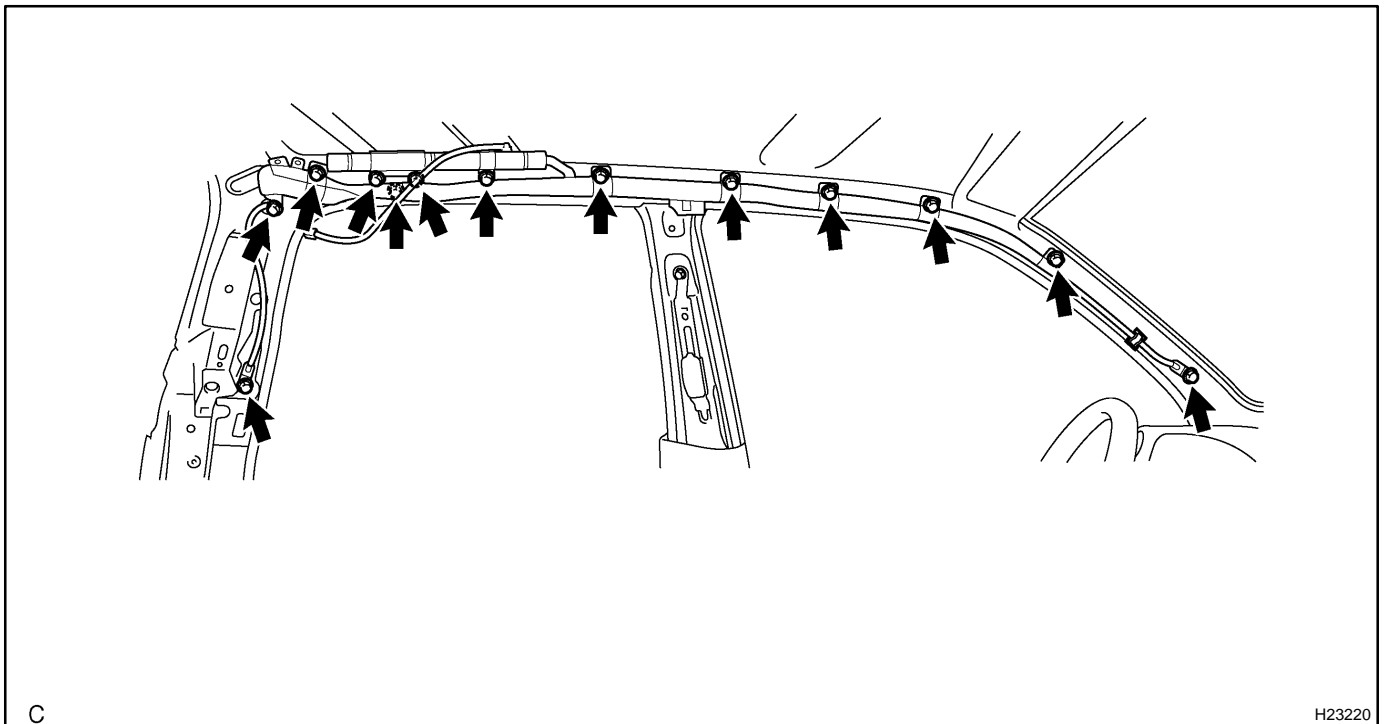
Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)

CAUTION:

Pay attention not to twist the deployment section of the curtain shield airbag assembly.

NOTICE:

- ◆ If the curtain shield airbag assembly has been dropped, or there are cracks, dents or other defects in the case or connector, replace the curtain shield airbag assembly with a new one.
- ◆ When installing the curtain shield airbag assembly, take care that it is not pinched between other parts.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.

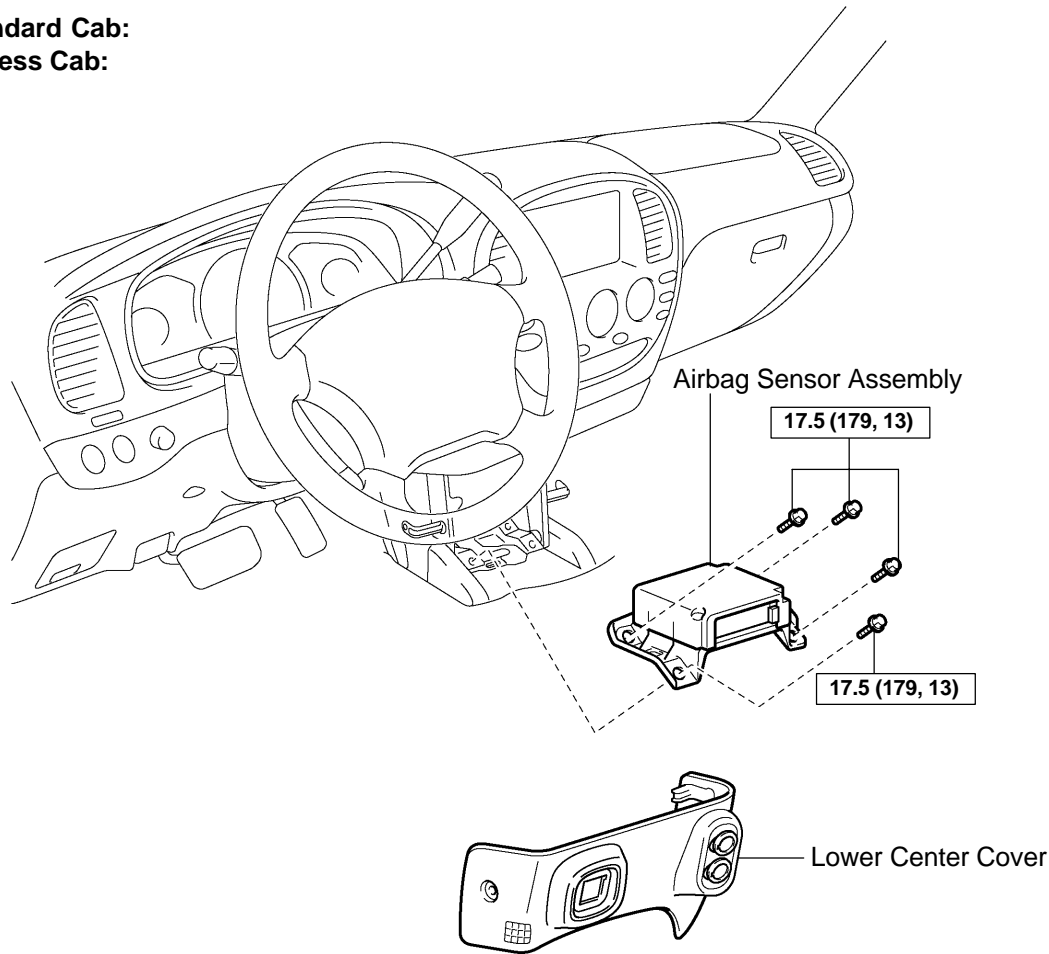


- (b) Connect the connector of the curtain shield airbag assembly.
2. **INSTALL ROOF HEADLINING (SEE PAGE [BO-130](#) AND [BO-138](#))**
 3. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
 4. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

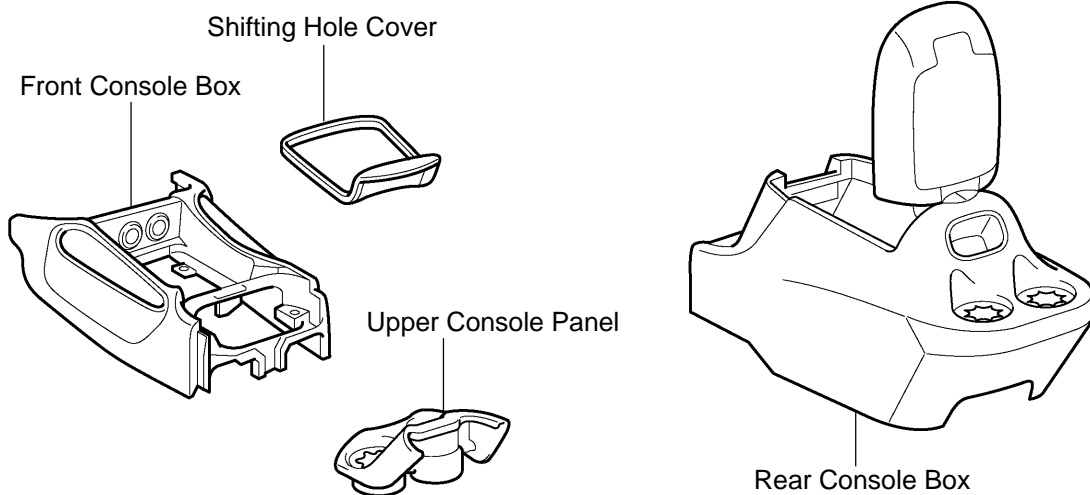
AIRBAG SENSOR ASSEMBLY COMPONENTS

RS10N-02

Standard Cab:
Access Cab:



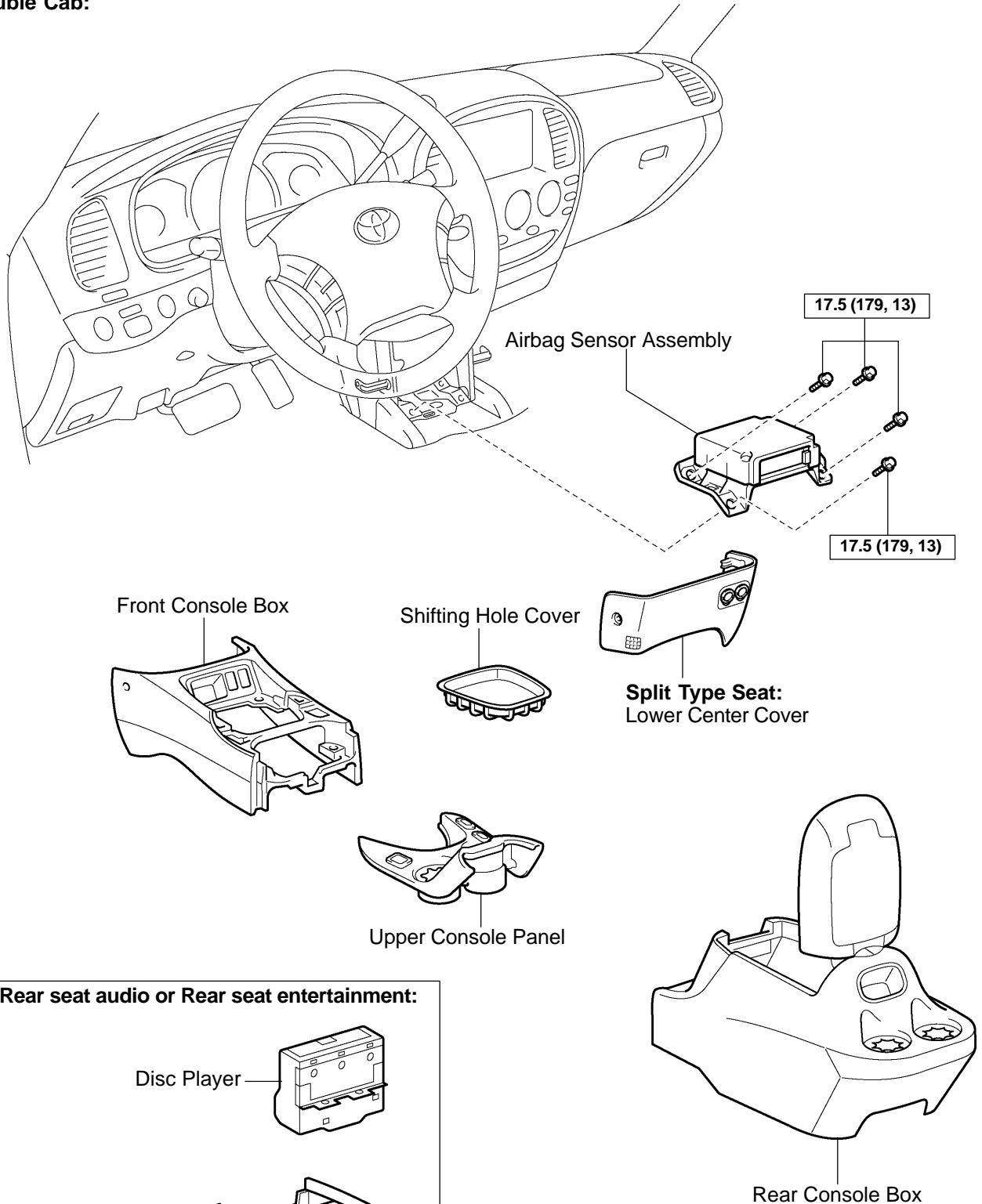
Access Cab (Large Type Console Box):



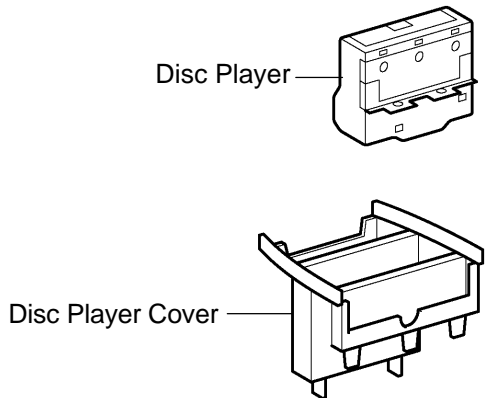
C N·m (kgf·cm, ft·lbf) : Specified torque

H23229

Double Cab:



w/ Rear seat audio or Rear seat entertainment:



C N·m (kgf·cm, ft·lbf) : Specified torque

H23230

REMOVAL

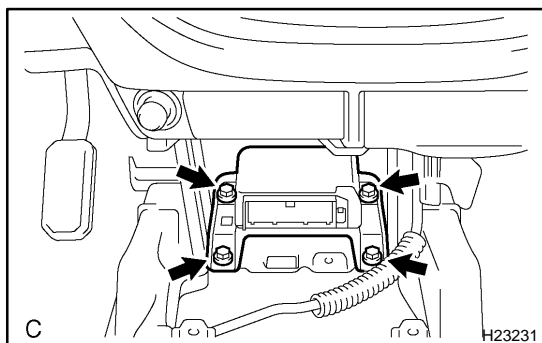
NOTICE:

- ◆ If the wiring connector of the SRS is disconnected with the ignition switch in the ON position, DTCs will be recorded.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse an airbag sensor assembly if the airbag has previously deployed in a collision.

1. PRECAUTION (SEE PAGE RS-1 AND RS-3)
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. **Standard cab:**
 Access cab (w/o Large type console box):
 Double cab (Split type seat):
REMOVE LOWER CENTER COVER
 (SEE PAGE BO-1 11)
4. **Access cab (w/ Large type console box):**
 Double cab:
REMOVE SHIFTING HOLE COVER
 (SEE PAGE BO-1 11)
5. **Access cab (w/ Large type console box):**
 Double cab:
REMOVE UPPER CONSOLE PANEL
 (SEE PAGE BO-1 11)
6. **Access cab (w/ Large type console box):**
 Double cab:
REMOVE REAR CONSOLE BOX
 (SEE PAGE BO-1 11)
7. **Access cab (w/ Large type console box):**
 Double cab:
REMOVE FRONT CONSOLE BOX
 (SEE PAGE BO-1 11)



8. **REMOVE AIRBAG SENSOR ASSEMBLY**
 - (a) Disconnect the holder (with connectors) from the airbag sensor assembly.
 - (b) Remove the 4 bolts and airbag sensor assembly.

INSPECTION

1. VEHICLE NOT INVOLVED IN A COLLISION

Perform a diagnostic system check (see page [DI-1871](#)).

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

Perform a diagnostic system check (see page [DI-1871](#)).

3. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS DEPLOYED

Replace the airbag sensor assembly (see page [DI-1871](#)).

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the airbag sensor assembly with a new one.

- ◆ The SRS has been deployed in a collision.
- ◆ The airbag sensor assembly has been found to be faulty in troubleshooting.
- ◆ The airbag sensor assembly has been dropped.

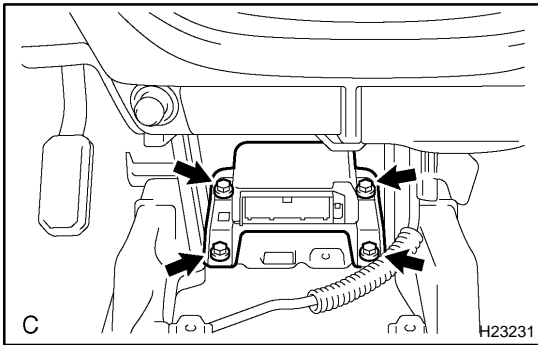
CAUTION:

For removal and installation of the airbag sensor assembly, see page [RS-101](#) and [RS-104](#) . Be sure to follow the correct procedure.

INSTALLATION

NOTICE:

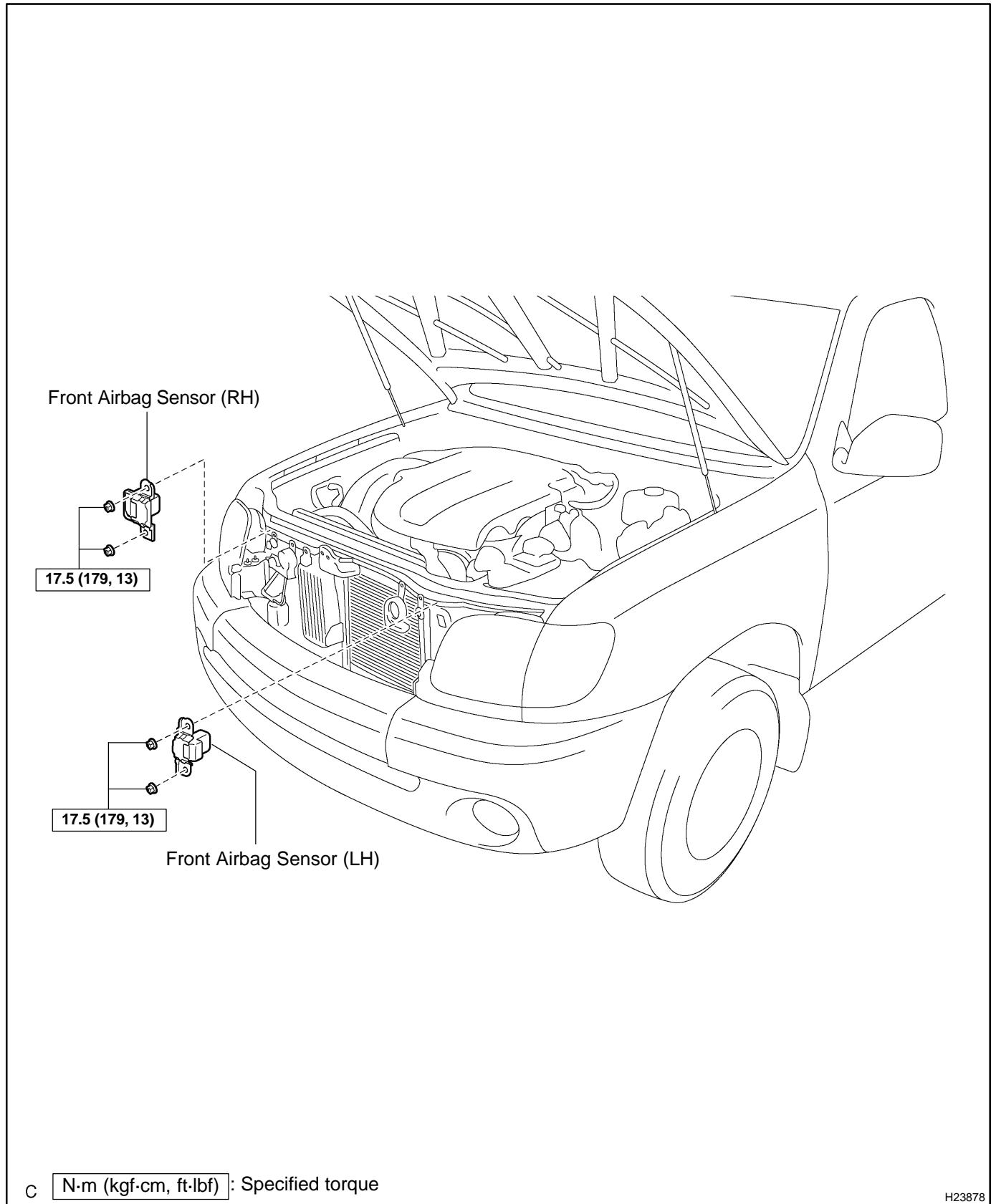
- ◆ Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse the airbag sensor assembly involved in a collision when the airbag has deployed.
- ◆ If the airbag sensor assembly center has been dropped, or there are any cracks, dents or other defects in the case, bracket or connector, replace it with a new one.
- ◆ When installing the airbag sensor assembly center, be careful that the SRS wiring does not interfere with other parts and that it is not pinched between other parts.
- ◆ After installing, shake the airbag sensor assembly to check that there is no looseness.



1. **INSTALL AIRBAG SENSOR ASSEMBLY**
 - (a) Install the airbag sensor assembly with the 4 bolts.
Torque: 17.5 N·m (179 kgf·cm, 13 ft·lbf)
 - (b) Connect the airbag sensor holder (with connectors).
2. **Access cab (w/ Large type console box):**
Double cab:
INSTALL FRONT CONSOLE BOX
(SEE PAGE [BO-120](#))
3. **Access cab (w/ Large type console box):**
Double cab:
INSTALL REAR CONSOLE BOX
(SEE PAGE [BO-120](#))
4. **Access cab (w/ Large type console box):**
Double cab:
INSTALL UPPER CONSOLE PANEL
(SEE PAGE [BO-120](#))
5. **Access cab (w/ Large type console box):**
Double cab:
INSTALL SHIFTING HOLE COVER
(SEE PAGE [BO-120](#))
6. **Standard cab:**
Access cab (w/o Large type console box):
Double cab (Split type seat):
INSTALL LOWER CENTER COVER
(SEE PAGE [BO-120](#))
7. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
8. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

FRONT AIRBAG SENSOR COMPONENTS

RS01L-39



REMOVAL

HINT:

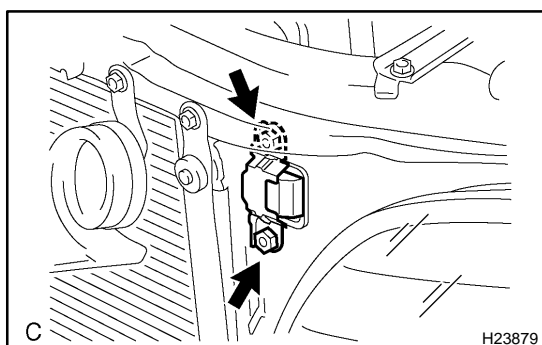
- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

- ◆ If the wiring connector of the SRS is disconnected with the ignition switch in the ON position, DTCs will be recorded.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse a front airbag sensor if the airbag has previously deployed in a collision.

1. PRECAUTION (SEE PAGE RS-1 AND RS-3)
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.



3. REMOVE FRONT AIRBAG SENSOR LH

- (a) Disconnect the front airbag sensor LH connector.

NOTICE:

Disconnect the connector with the sensor assembly installed.

- (b) Remove the 2 nuts and front airbag sensor LH.

INSPECTION

1. VEHICLE NOT INVOLVED IN A COLLISION

Perform a diagnostic system check (see page [DI-1871](#)).

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

Perform a diagnostic system check (see page [DI-1871](#)).

3. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS DEPLOYED

Replace the front airbag sensor RH and LH (see page [DI-1871](#)).

REPLACEMENT

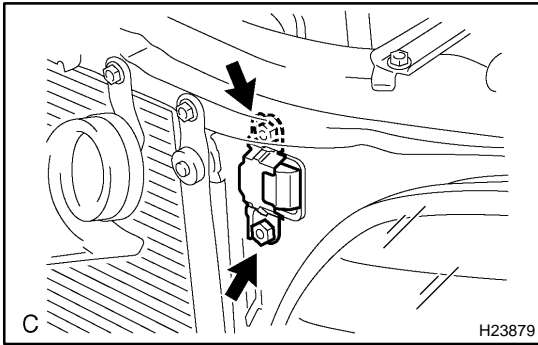
REPLACEMENT REQUIREMENTS

In the following cases, replace the front airbag sensor with a new one.

- ◆ The SRS has been deployed in a collision. (Replace both the left and right airbag sensors.)
- ◆ The front airbag sensor has been found to be faulty in troubleshooting.
- ◆ The front airbag sensor has been found to be faulty while checking items (see page [RS-102](#)).
- ◆ The front airbag sensor has been dropped.

CAUTION:

For removal and installation of the front airbag sensor, see page [RS-101](#) and [RS-104](#) . Be sure to follow the correct procedure.



INSTALLATION

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

- ◆ **Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.**
- ◆ **Never reuse the front airbag sensor involved in a collision when the airbag has deployed.**
- ◆ **If the front airbag sensor center has been dropped, or there are any cracks, dents or other defects in the case, bracket or connector, replace it with a new one.**
- ◆ **When installing the front airbag sensor center, be careful that the SRS wiring does not interfere with other parts and that it is not pinched between other parts.**
- ◆ **After installing, shake the front airbag sensor to check that there is no looseness.**

1. INSTALL FRONT AIRBAG SENSOR LH

- (a) Install the front airbag sensor LH with the 2 nuts.

Torque: 17.5 N·m (179 kgf·cm, 13 ft·lbf)

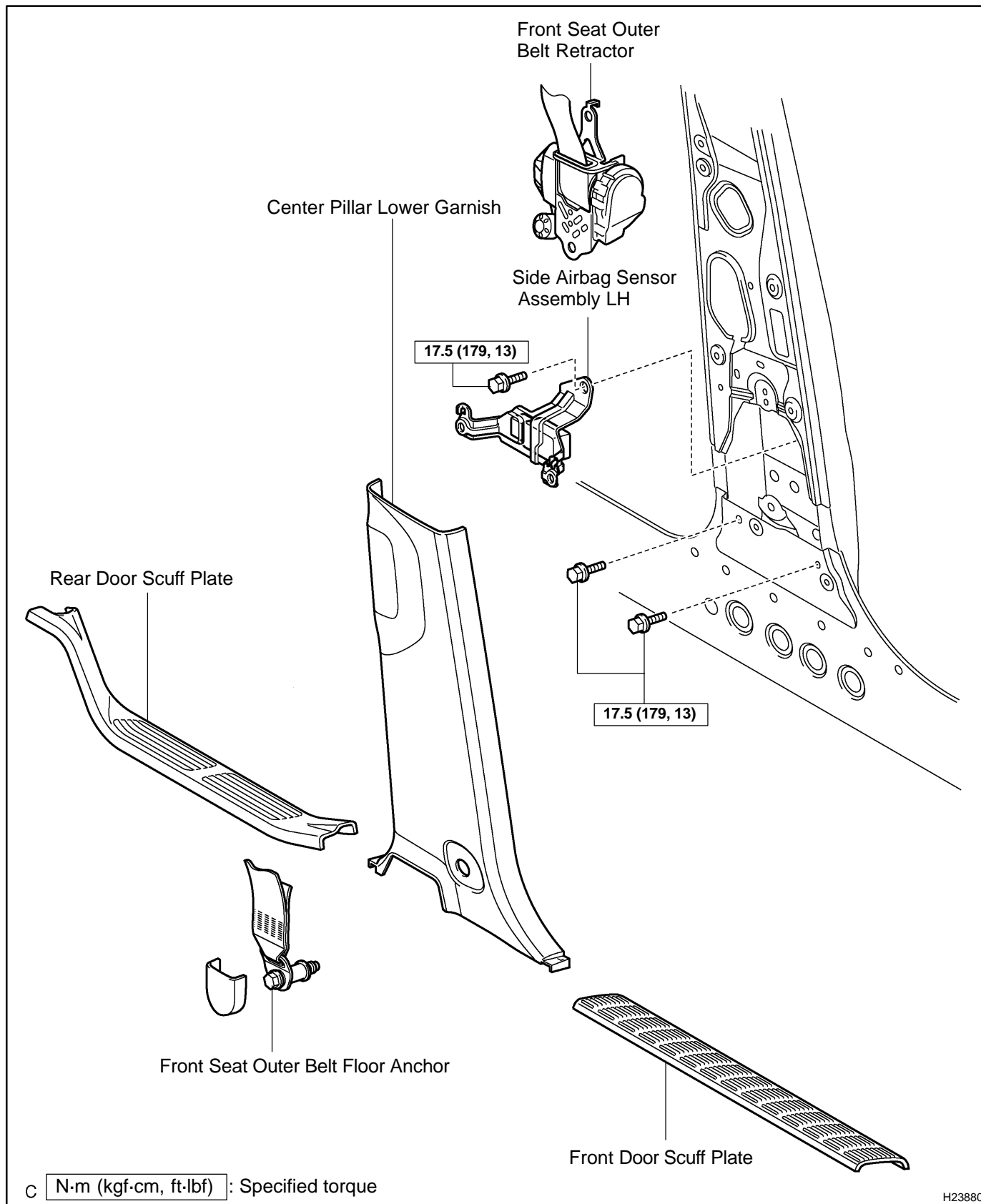
- (b) Connect the front airbag sensor connector.

2. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

3. INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))

SIDE AIRBAG SENSOR ASSEMBLY COMPONENTS

RS12S-01



REMOVAL

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

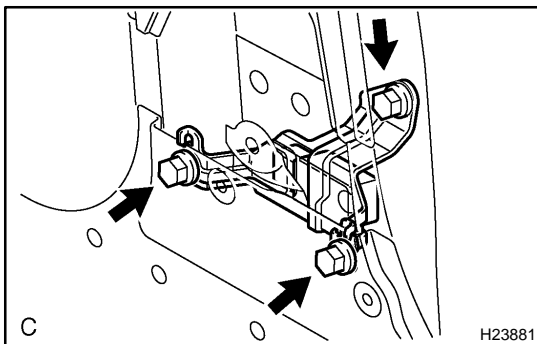
NOTICE:

- ◆ If the wiring connector of the SRS is disconnected with the ignition switch in the ON position, DTCs will be recorded.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse a side airbag sensor assembly if the airbag has previously deployed in a collision.

1. PRECAUTION (SEE PAGE [RS-1](#) AND [RS-3](#))
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. REMOVE FRONT DOOR SCUFF PLATE (SEE PAGE [BO-133](#))
4. REMOVE REAR DOOR SCUFF PLATE (SEE PAGE [BO-133](#))
5. REMOVE FRONT SEAT OUTER BELT FLOOR ANCHOR (SEE PAGE [BO-133](#))
6. REMOVE CENTER PILLAR LOWER GARNISH (SEE PAGE [BO-133](#))
7. REMOVE FRONT SEAT OUTER BELT RETRACTOR (SEE PAGE [BO-236](#))



8. REMOVE SIDE AIRBAG SENSOR ASSEMBLY LH
 - (a) Disconnect the connector from the side airbag sensor assembly LH.
 - (b) Remove the 3 bolts and the side airbag sensor assembly LH.

INSPECTION

1. VEHICLE NOT INVOLVED IN A COLLISION

Perform a diagnostic system check (see page [DI-1871](#)).

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

Perform a diagnostic system check (see page [DI-1871](#)).

3. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS DEPLOYED

Replace the side airbag sensor assembly (see page [DI-1871](#)).

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the side airbag sensor assembly with a new one.

- ◆ The side airbag assembly has been deployed in a collision.
- ◆ The side airbag sensor assembly has been found to be faulty in troubleshooting.
- ◆ The side airbag sensor assembly has been dropped.

CAUTION:

For removal and installation of the side airbag sensor assembly, see page [RS-106](#) and [RS-109](#) . Be sure to follow the correct procedure.

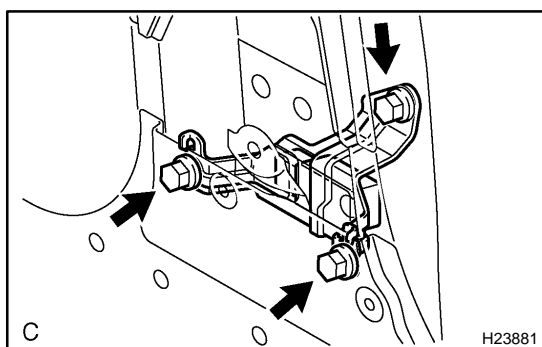
INSTALLATION

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

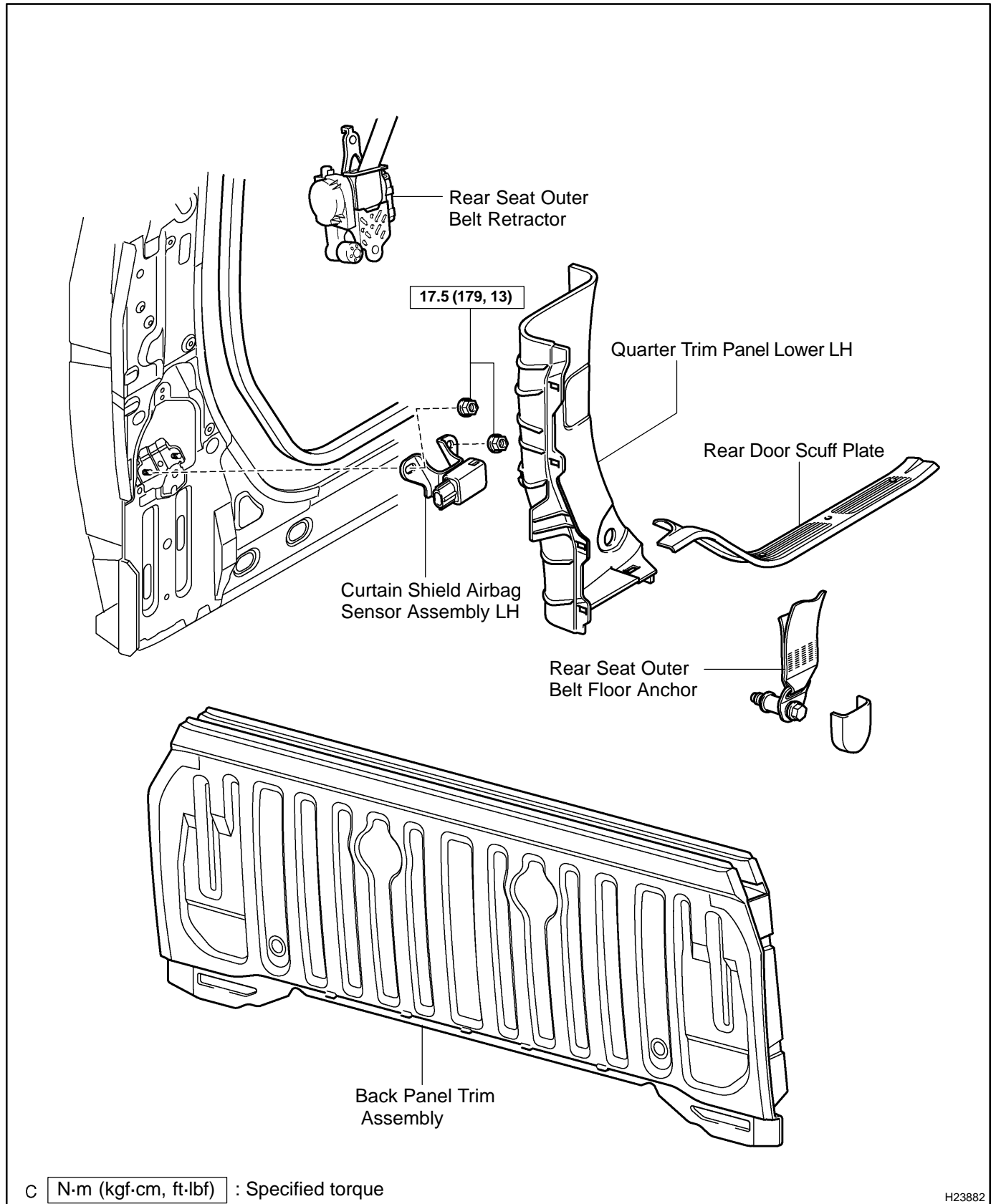
- ◆ Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse the side airbag sensor assembly involved in a collision when the airbag has deployed.
- ◆ If the side airbag sensor assembly center has been dropped, or there are any cracks, dents or other defects in the case, bracket or connector, replace it with a new one.
- ◆ When installing the side airbag sensor assembly, be careful that the SRS wiring does not interfere with other parts and that it is not pinched between other parts.
- ◆ After installing, shake the side airbag sensor assembly to check that there is no looseness.



1. **INSTALL SIDE AIRBAG SENSOR ASSEMBLY LH**
 - (a) Install the side airbag sensor assembly LH with the 3 bolts.
Torque: 17.5 N·m (179 kgf·cm, 13 ft·lbf)
 - (b) Connect the connector to the side airbag sensor assembly LH.
2. **INSTALL FRONT SEAT OUTER BELT RETRACTOR (SEE PAGE [BO-252](#))**
3. **INSTALL CENTER PILLAR LOWER GARNISH (SEE PAGE [BO-138](#))**
4. **INSTALL FRONT SEAT OUTER BELT FLOOR ANCHOR (SEE PAGE [BO-138](#))**
5. **INSTALL REAR DOOR SCUFF PLATE (SEE PAGE [BO-138](#))**
6. **INSTALL FRONT DOOR SCUFF PLATE (SEE PAGE [BO-138](#))**
7. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
8. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

CURTAIN SHIELD AIRBAG SENSOR ASSEMBLY COMPONENTS

RSOSH-08



REMOVAL

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

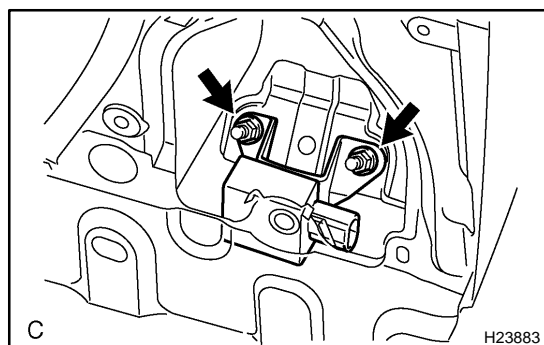
NOTICE:

- ◆ If the wiring connector of the SRS is disconnected with the ignition switch in the ON position, DTCs will be recorded.
- ◆ Never use airbag parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse a curtain shield airbag sensor assembly if the airbag has previously deployed in a collision.

1. PRECAUTION (SEE PAGE RS-1 AND RS-3)
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. REMOVE REAR DOOR SCUFF PLATE
(SEE PAGE BO-133)
4. REMOVE BACK PANEL TRIM ASSEMBLY
(SEE PAGE BO-133)
5. REMOVE REAR SEAT OUTER BELT FLOOR ANCHOR
(SEE PAGE BO-133)
6. REMOVE QUARTER TRIM PANEL LOWER LH
(SEE PAGE BO-133)
7. REMOVE REAR SEAT OUTER BELT RETRACTOR
(SEE PAGE BO-236)



8. REMOVE CURTAIN SHIELD AIRBAG SENSOR ASSEMBLY LH

- (a) Disconnect the curtain shield airbag sensor assembly LH connector.

NOTICE:

Disconnect the connector with the sensor assembly installed.

- (b) Remove the 2 nuts and curtain shield airbag sensor assembly LH.

INSPECTION

1. VEHICLE NOT INVOLVED IN A COLLISION

Perform a diagnostic system check (see page [DI-1871](#)).

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

Perform a diagnostic system check (see page [DI-1871](#)).

3. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS DEPLOYED

Replace the curtain shield airbag sensor assembly (see page [DI-1871](#)).

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the curtain shield airbag sensor assembly with a new one.

- ◆ The curtain shield airbag assembly has been deployed in a collision.
- ◆ The curtain shield airbag sensor assembly has been found to be faulty in troubleshooting.
- ◆ The curtain shield airbag sensor assembly has been dropped.

CAUTION:

For removal and installation procedures of the curtain shield airbag sensor assembly, see page [RS-1 18](#) and [RS-122](#) . Be sure to follow the correct procedure.

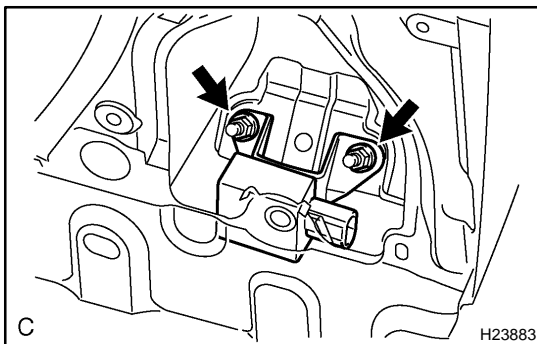
INSTALLATION

HINT:

- ◆ Use the same procedures for the RH side and LH side.
- ◆ The procedures listed below are for the LH side.

NOTICE:

- ◆ Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse the curtain shield airbag sensor assembly involved in a collision when the airbag has deployed.
- ◆ If the curtain shield airbag sensor assembly center has been dropped, or there are any cracks, dents or other defects in the case, bracket or connector, replace it with a new one.
- ◆ When installing the curtain shield airbag sensor assembly center, be careful that the SRS wiring does not interfere with other parts and that it is not pinched between other parts.
- ◆ After installing, shake the curtain shield airbag sensor assembly to check that there is no looseness.

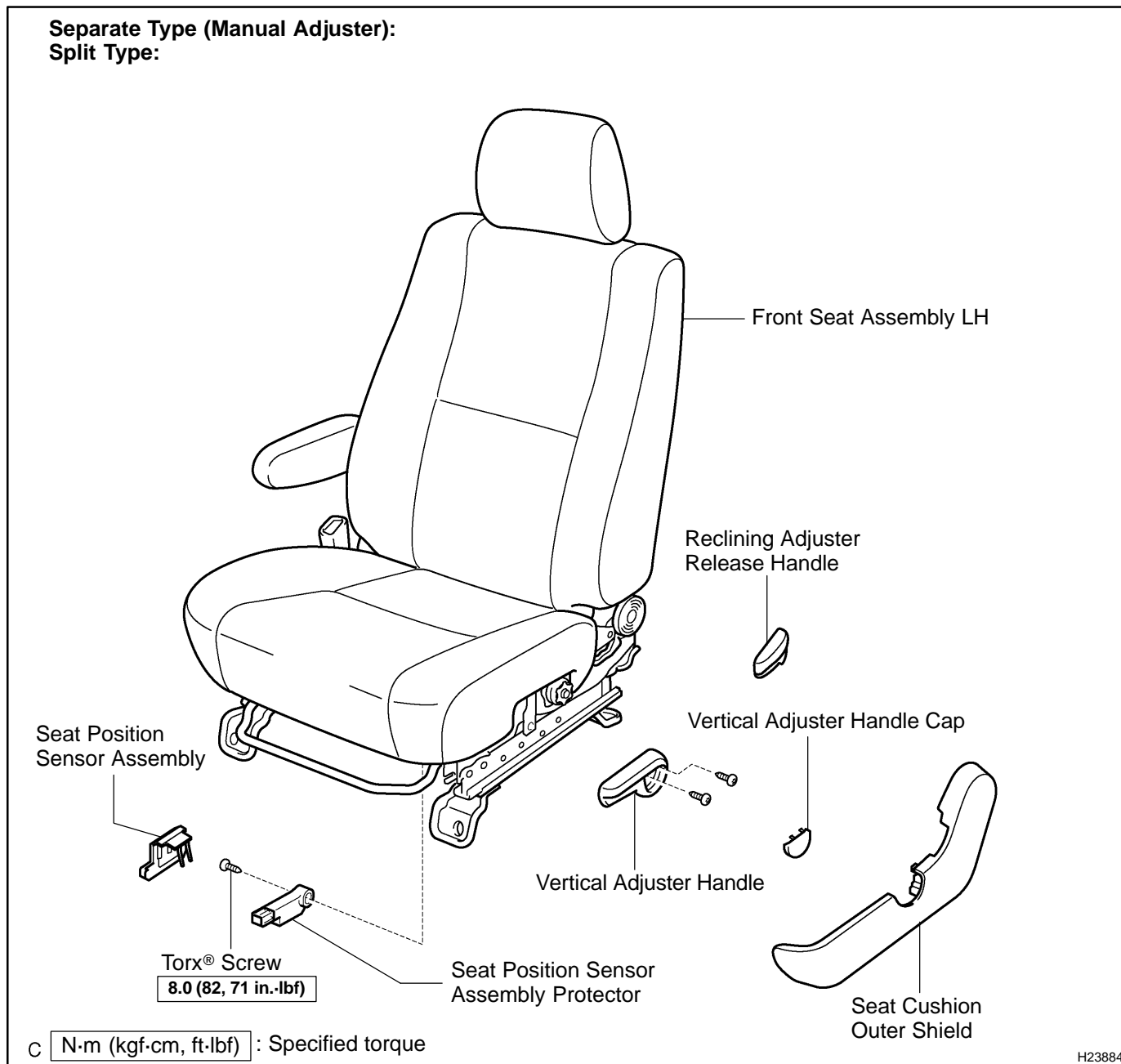


1. **INSTALL CURTAIN SHIELD AIRBAG SENSOR ASSEMBLY LH**
 - (a) Install the curtain shield airbag sensor assembly LH with the 2 nuts.
Torque: 17.5 N·m (179 kgf·cm, 13 ft·lbf)
 - (b) Connect the curtain shield airbag sensor assembly LH connector.
2. **INSTALL REAR SEAT OUTER BELT RETRACTOR (SEE PAGE [BO-252](#))**
3. **INSTALL QUARTER TRIM PANEL LOWER LH (SEE PAGE [BO-138](#))**
4. **INSTALL REAR SEAT OUTER BELT FLOOR ANCHOR (SEE PAGE [BO-138](#))**
5. **INSTALL BACK PANEL TRIM ASSEMBLY (SEE PAGE [BO-138](#))**
6. **INSTALL REAR DOOR SCUFF PLATE (SEE PAGE [BO-138](#))**
7. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
8. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

SEAT POSITION SENSOR ASSEMBLY COMPONENTS

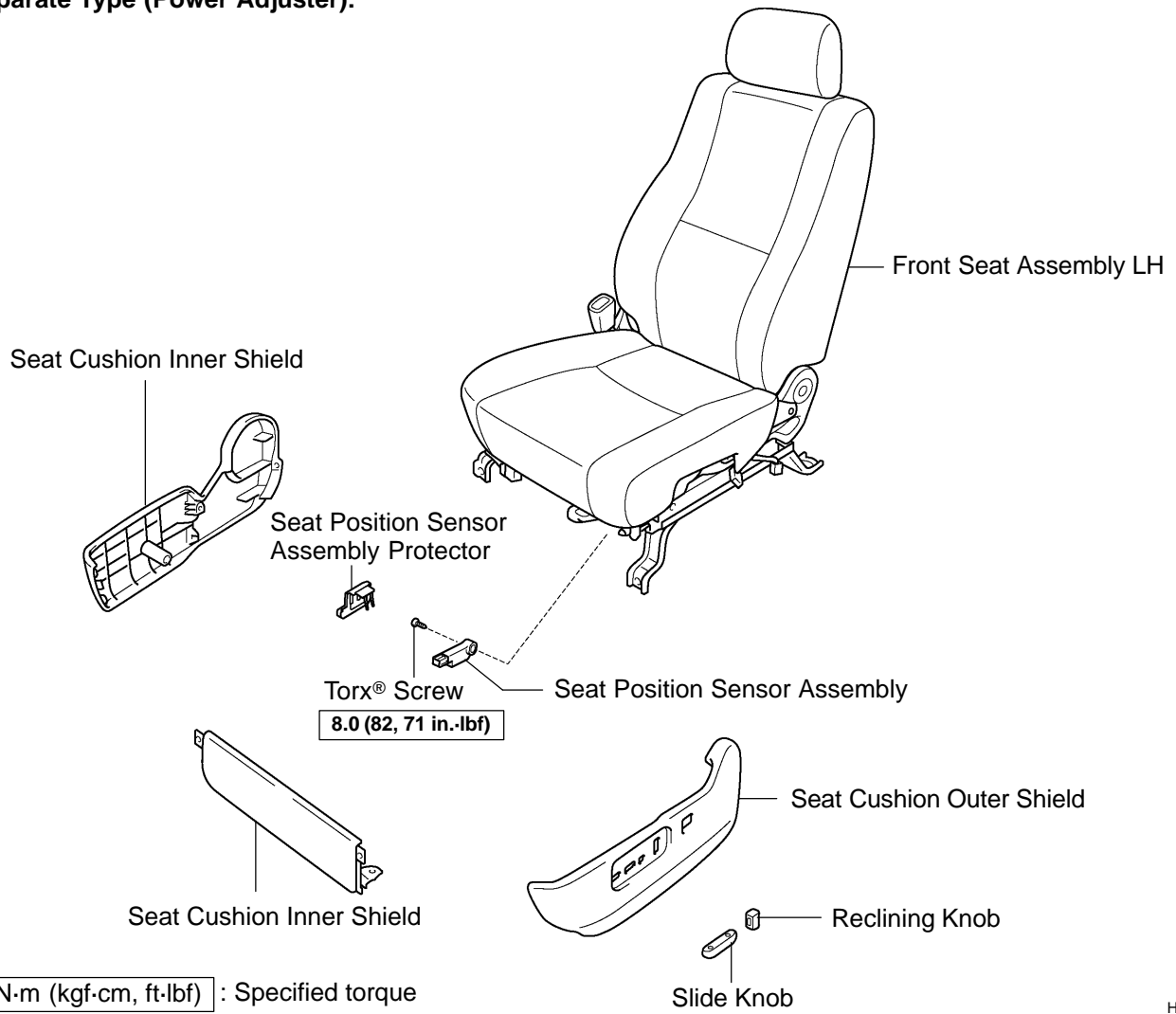
RS12X-01

Separate Type (Manual Adjuster):
Split Type:

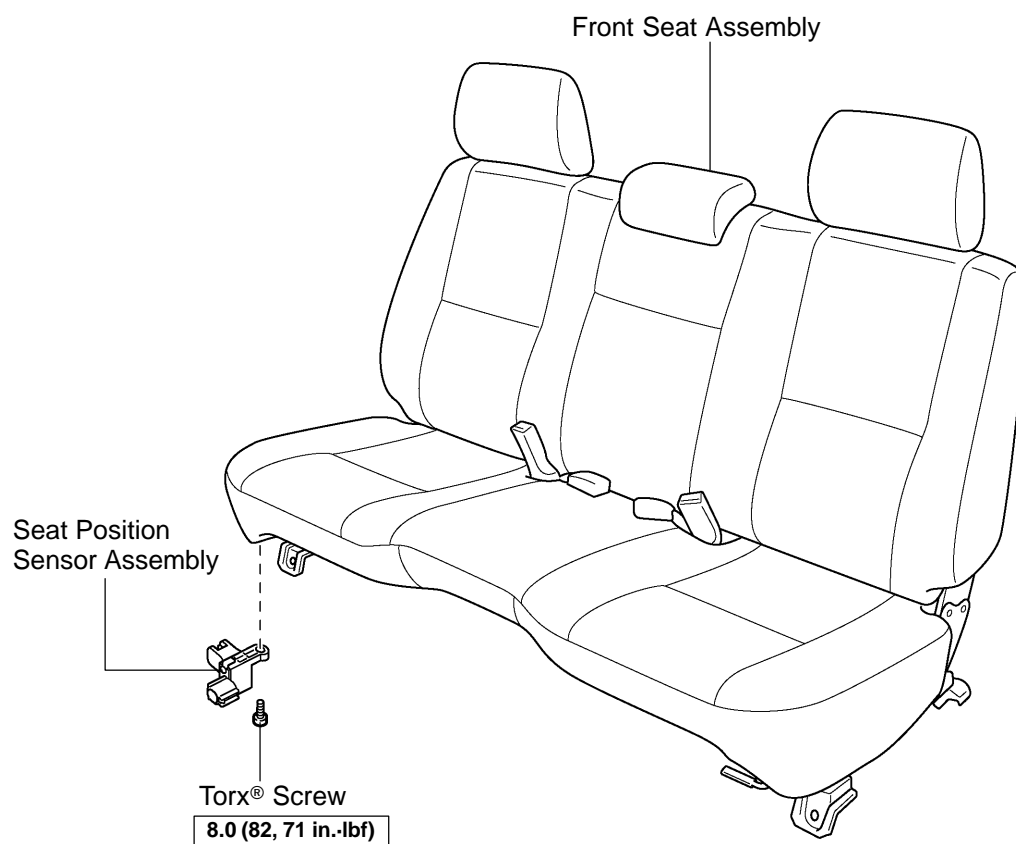


H23884

Separate Type (Power Adjuster):



H23936

Bench Type:

C N·m (kgf·cm, ft·lbf) : Specified torque

H24690

REMOVAL

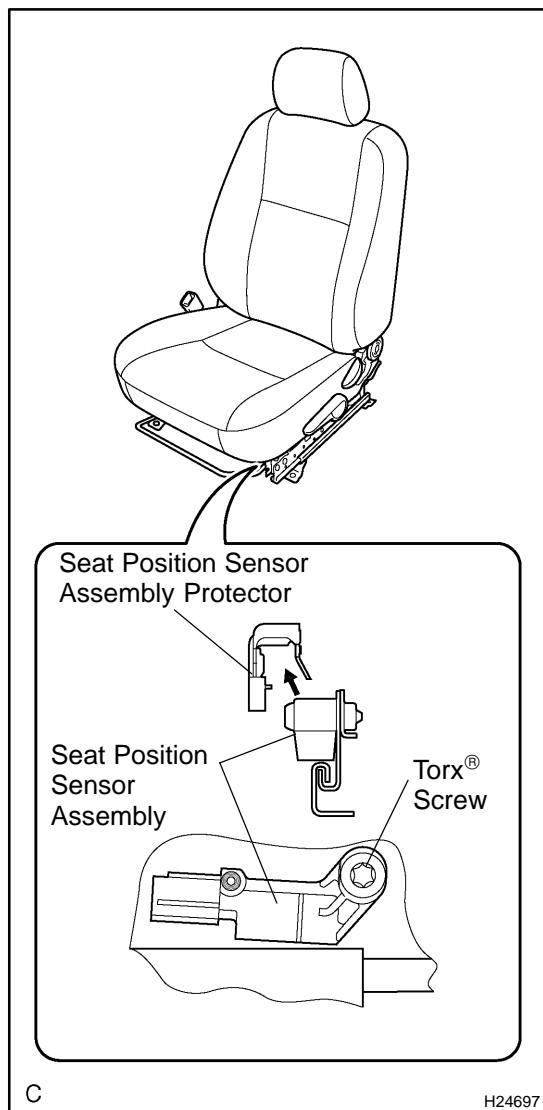
NOTICE:

- ◆ If the wiring connector of the SRS is disconnected with the ignition switch in the ON position, DTCs will be recorded.
- ◆ Never use SRS parts from another vehicle. When replacing the parts, replace them with new ones.
- ◆ Never reuse a seat position sensor assembly if the airbag has previously deployed in a collision.

1. PRECAUTION (SEE PAGE [RS-1](#) AND [RS-3](#))
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. Separate type:
Split type:
REMOVE FRONT SEAT ASSEMBLY LH
(SEE PAGE [BO-141](#))
4. Bench type:
REMOVE FRONT SEAT ASSEMBLY
(SEE PAGE [BO-166](#))
5. Separate type (Manual adjuster):
Split type:
REMOVE VERTICAL ADJUSTER HANDLE
(SEE PAGE [BO-156](#))
6. Separate type (Manual adjuster):
Split type:
REMOVE SEAT CUSHION OUTER SHIELD
(SEE PAGE [BO-156](#))
7. Separate type (Power adjuster):
REMOVE SLIDE KNOB AND RECLINING KNOB
(SEE PAGE [BO-142](#))
8. Separate type (Power adjuster):
REMOVE SEAT CUSHION LOWER SHIELD, SEAT CUSHION OUTER SHIELD AND SEAT CUSHION INNER SHIELD (SEE PAGE [BO-142](#))



- 9. Separate type:**
Split type:
REMOVE SEAT POSITION SENSOR ASSEMBLY PROTECTOR

Remove the seat position sensor assembly protector from the seat position sensor assembly.

- 10. REMOVE SEAT POSITION SENSOR ASSEMBLY**
- Disconnect the connector from the seat position sensor assembly.
 - Using a torx® socket wrench (T30), remove the torx® screw and the seat position sensor assembly.

INSPECTION

1. VEHICLE NOT INVOLVED IN A COLLISION

Perform a diagnostic system check (see page [DI-1871](#)).

2. VEHICLE INVOLVED IN A COLLISION

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) Even if the airbag was not deployed, perform a visual check for damage to the seat position sensor assembly. If there are any defects mentioned below, replace the seat position sensor assembly with a new one:
 - ◆ Cracks, dents or chips in the case.
 - ◆ Cracks or other damage to the connector.

CAUTION:

For removal and installation procedures of the seat position sensor assembly, see page [RS-1 18](#) and [RS-122](#) . Be sure to follow the correct procedure.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the seat position sensor assembly with a new one.

- ◆ The seat position sensor assembly has been found to be faulty in troubleshooting.
- ◆ The seat position sensor assembly has been dropped.

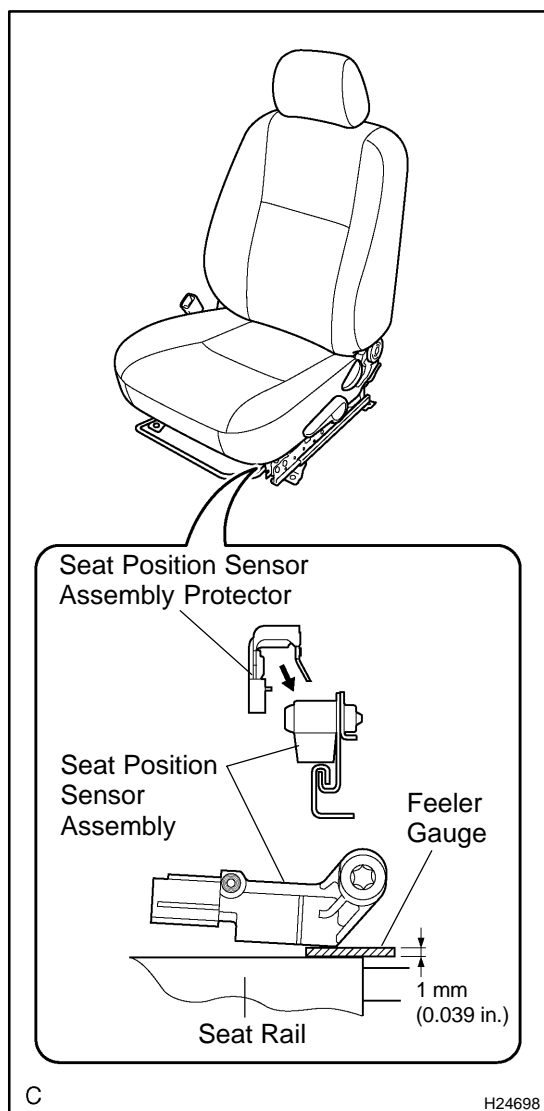
CAUTION:

For removal and installation procedures of the seat position sensor assembly, see page [RS-1 18](#) and [RS-122](#) . Be sure to follow the correct procedure.

INSTALLATION

NOTICE:

- ◆ Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse the seat position sensor assembly involved in a collision when the airbag has deployed.
- ◆ If the seat position sensor assembly center has been dropped, or there are any cracks, dents or other defects in the case, bracket or connector, replace it with a new one.
- ◆ When installing the seat position sensor assembly center, be careful that the SRS wiring does not interfere with other parts and that it is not pinched between other parts.
- ◆ After installing, shake the seat position sensor assembly to check that there is no looseness.



1. INSTALL SEAT POSITION SENSOR ASSEMBLY

- (a) Using a torx[®] socket wrench, install the seat position sensor assembly.

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

NOTICE:

Using a feeler gauge of 1 mm (0.039 in.), make a clearance between the seat position sensor assembly and the seat rail.

- (b) Make sure that a clearance between the seat position sensor assembly and the seat rail is between 0.6 mm (0.023 in.) and 2 mm (0.079 in.).
- (c) Connect the connector to the seat position sensor assembly.

2. Separate type:

Split type:

INSTALL SEAT POSITION SENSOR ASSEMBLY PROTECTOR

Install the seat position sensor assembly protector to the seat position sensor assembly.

3. Separate type (Power adjuster):

INSTALL SEAT CUSHION LOWER SHIELD, SEAT CUSHION OUTER SHIELD AND SEAT CUSHION INNER SHIELD (SEE PAGE [BO-147](#))

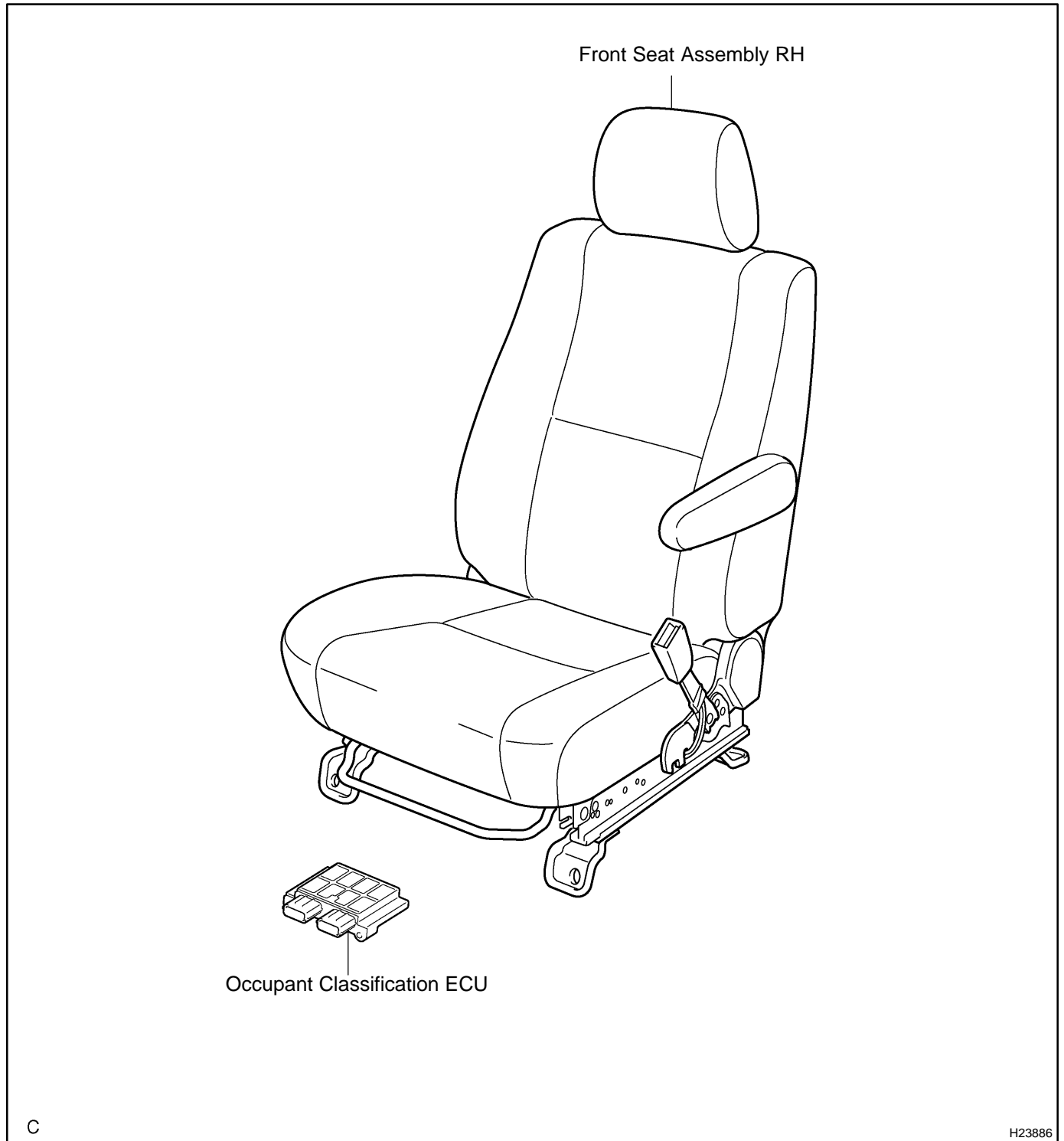
4. Separate type (Power adjuster):

INSTALL SLIDE KNOB AND RECLINING KNOB (SEE PAGE [BO-147](#))

5. **Separate type (Manual adjuster):**
Split type:
INSTALL SEAT CUSHION OUTER SHIELD
(SEE PAGE [BO-160](#))
6. **Separate type (Manual adjuster):**
Split type:
INSTALL VERTICAL ADJUSTER HANDLE
(SEE PAGE [BO-160](#))
7. **Separate type:**
Split type:
INSTALL FRONT SEAT ASSEMBLY LH
(SEE PAGE [BO-153](#))
8. **Bench type:**
INSTALL FRONT SEAT ASSEMBLY
(SEE PAGE [BO-175](#))
9. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
10. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

OCCUPANT CLASSIFICATION ECU COMPONENTS

RS00U-06



C

H23886

REMOVAL

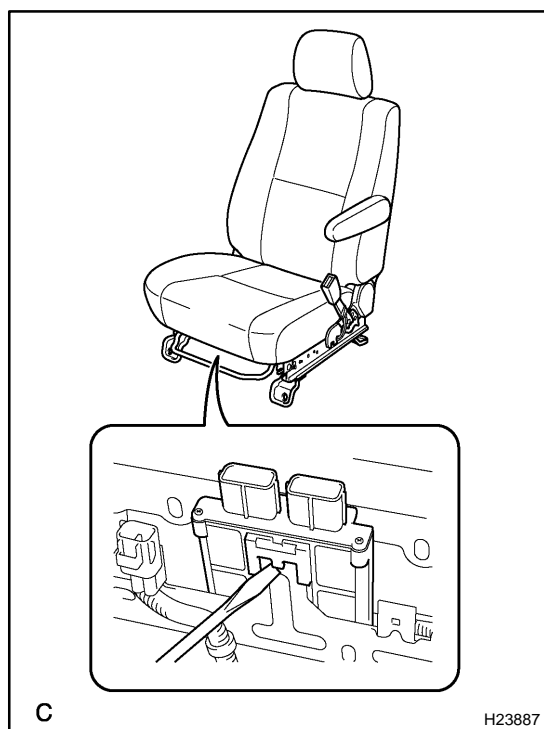
NOTICE:

- ◆ If the wiring connector of the SRS is disconnected with the ignition switch in the ON position, DTCs will be recorded.
- ◆ Never use SRS parts from another vehicle. When replacing the parts, replace them with new ones.
- ◆ Never reuse an occupant classification ECU if the airbag has previously deployed in a collision.

1. PRECAUTION (SEE PAGE [RS-1](#) AND [RS-3](#))
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. REMOVE FRONT SEAT ASSEMBLY RH
(SEE PAGE [BO-141](#))



4. REMOVE OCCUPANT CLASSIFICATION ECU

- (a) Disconnect the 2 connectors from the occupant classification ECU.
- (b) Using a screwdriver, remove the occupant classification ECU.

C

H23887

INSPECTION

1. VEHICLE NOT INVOLVED IN A COLLISION

Perform a diagnostic system check (see page [DI-1871](#)).

2. VEHICLE INVOLVED IN A COLLISION

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) Even if the airbag was not deployed, perform a visual check for damage to the occupant classification ECU. If there are any defects mentioned below, replace the occupant classification ECU with a new one:
 - ◆ Cracks, dents or chips in the case.
 - ◆ Cracks or other damage to the connector.

CAUTION:

For removal and installation procedures of the occupant classification ECU, see page [RS-125](#) and [RS-128](#) . Be sure to follow the correct procedure.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the occupant classification ECU with a new one.

- ◆ The occupant classification ECU has been found to be faulty in troubleshooting.
- ◆ The occupant classification ECU has been dropped.

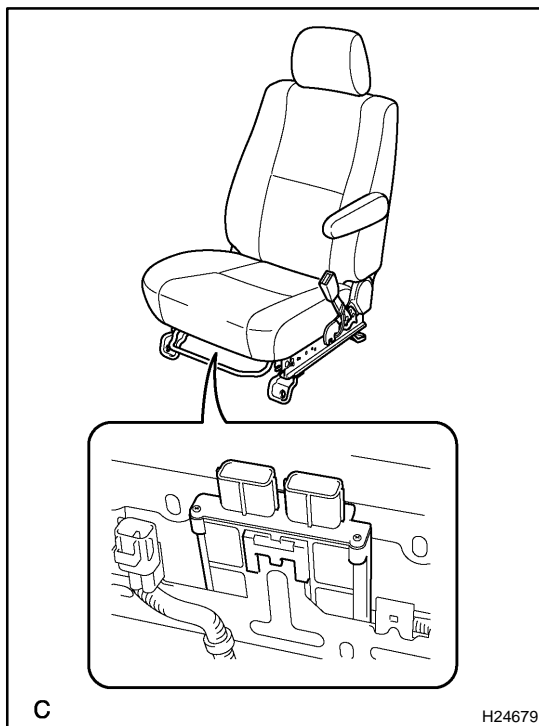
CAUTION:

For removal and installation procedures of the occupant classification ECU, see page [RS-125](#) and [RS-128](#) . Be sure to follow the correct procedure.

INSTALLATION

NOTICE:

- ◆ Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.
- ◆ Never reuse the occupant classification ECU involved in a collision when the airbag has deployed.
- ◆ If the occupant classification ECU center has been dropped, or there are any cracks, dents or other defects in the case, bracket or connector, replace it with a new one.
- ◆ When installing the seat position sensor assembly center, be careful that the SRS wiring does not interfere with other parts and that it is not pinched between other parts.

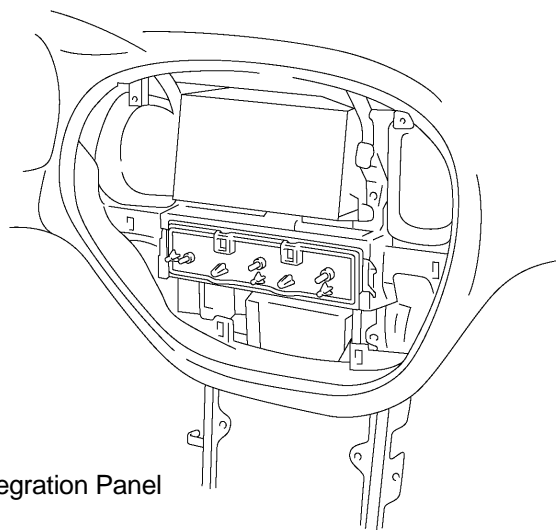


1. **INSTALL OCCUPANT CLASSIFICATION ECU**
 - (a) Install the occupant classification ECU.
 - (b) Connect the 2 connectors to the occupant classification ECU.
2. **INSTALL FRONT SEAT ASSEMBLY RH (SEE PAGE [BO-153](#))**
3. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
4. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

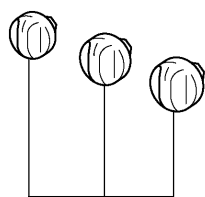
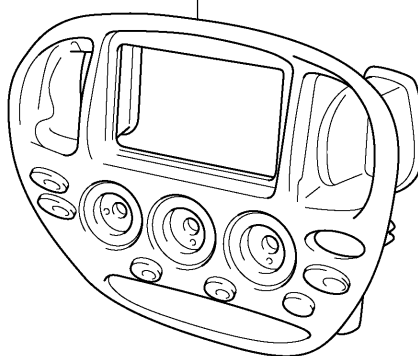
PASSENGER AIRBAG MANUAL ON-OFF SWITCH COMPONENTS

RS12Y-01

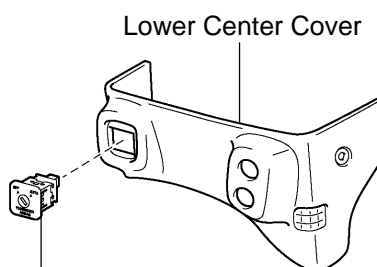
Standard Cab:
Access Cab (w/o Large Type Console Box):



Center Cluster Integration Panel



Knob Sub Assembly



Lower Center Cover

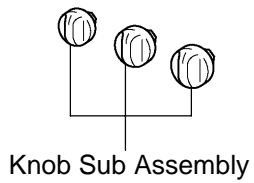
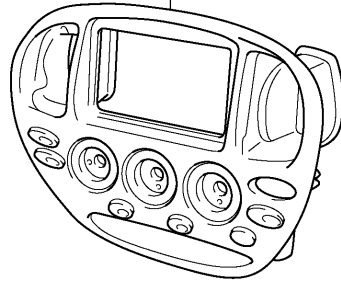
Passenger Airbag Manual AUTO (ON)-OFF Switch

C

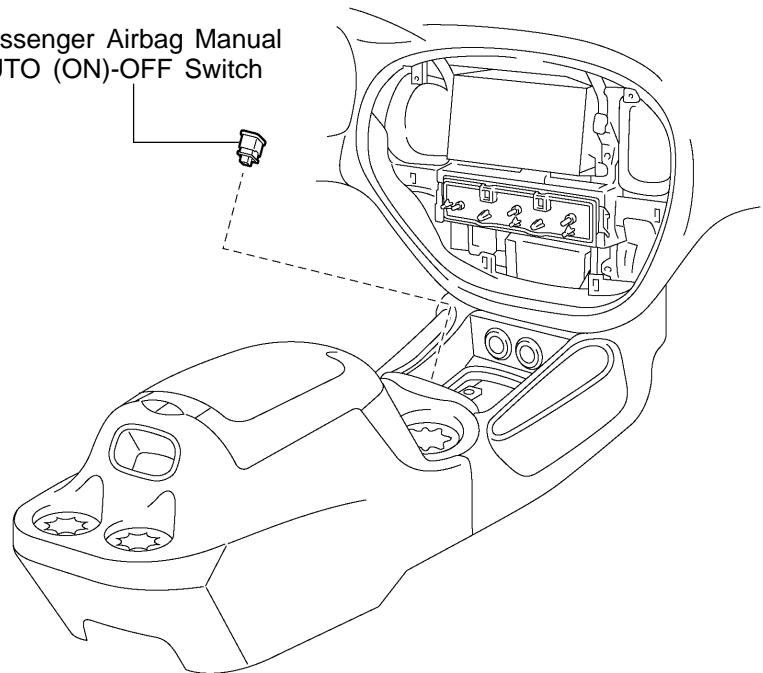
H23888

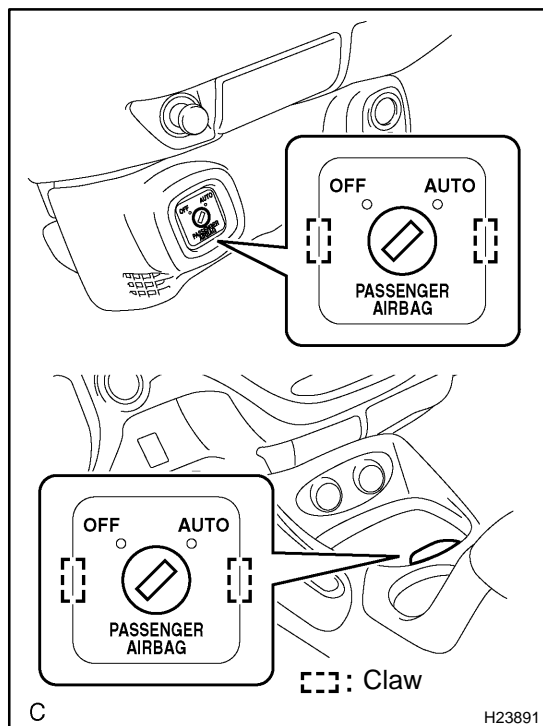
Access Cab (w/ Large Type Console Box):

Center Cluster Integration Panel



Passenger Airbag Manual
AUTO (ON)-OFF Switch





REMOVAL

1. **PRECAUTION (SEE PAGE RS-1 AND RS-3)**
2. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

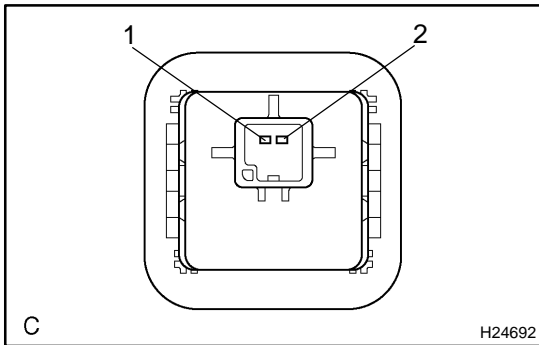
3. **REMOVE PASSENGER AIRBAG MANUAL AUTO (ON)-OFF SWITCH**

- (a) Using a screwdriver, release the 2 claws and remove the passenger airbag manual AUTO (ON)-OFF switch.

HINT:

Tape up the screwdriver tip before use.

- (b) Disconnect the connector.



INSPECTION

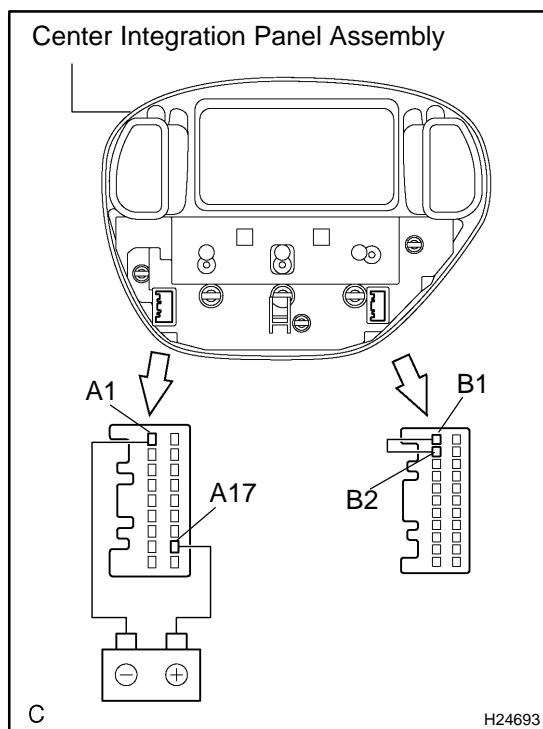
1. INSPECT PASSENGER AIRBAG MANUAL AUTO (ON)-OFF SWITCH

Measure the resistance between terminals 1 and 2 of the passenger airbag manual AUTO (ON)-OFF switch.

Result:

Switch Position	Tester Connection	Specified Condition
ON	1 - 2	360 to 440 Ω
OFF	1 - 2	90 to 110 Ω

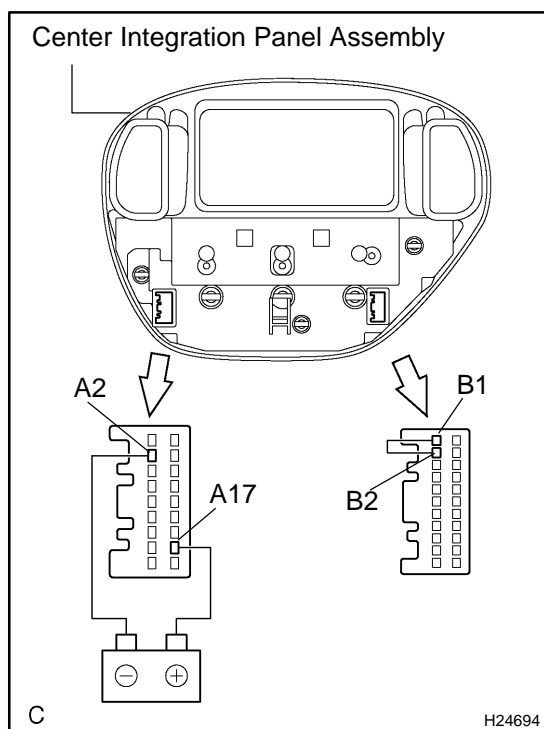
If the result is not as specified, replace the switch.



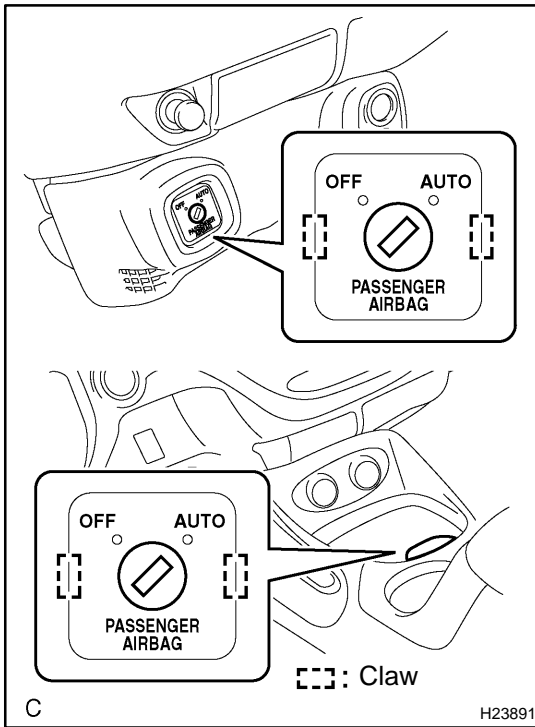
2. INSPECT PASSENGER AIRBAG MANUAL ON-OFF INDICATOR OPERATION

- Remove the center cluster integration panel assembly (see page [BO-1 11](#)).
- Using a service wire, connect terminals B1 and B2.
- Connect the battery's positive (+) lead from the battery to terminal A17 and the negative (-) lead to terminal A1.
- Check that the indicator ON light illuminates.

If it does not illuminate, replace the center cluster integration panel assembly.



- (e) Using a service wire, connect terminals B1 and B2.
 - (f) Connect the battery's positive (+) lead from the battery to terminal A17 and the negative (-) lead to terminal A2.
 - (g) Check that the indicator OFF light illuminates.
- If it does not illuminate, replace the center cluster integration panel assembly.

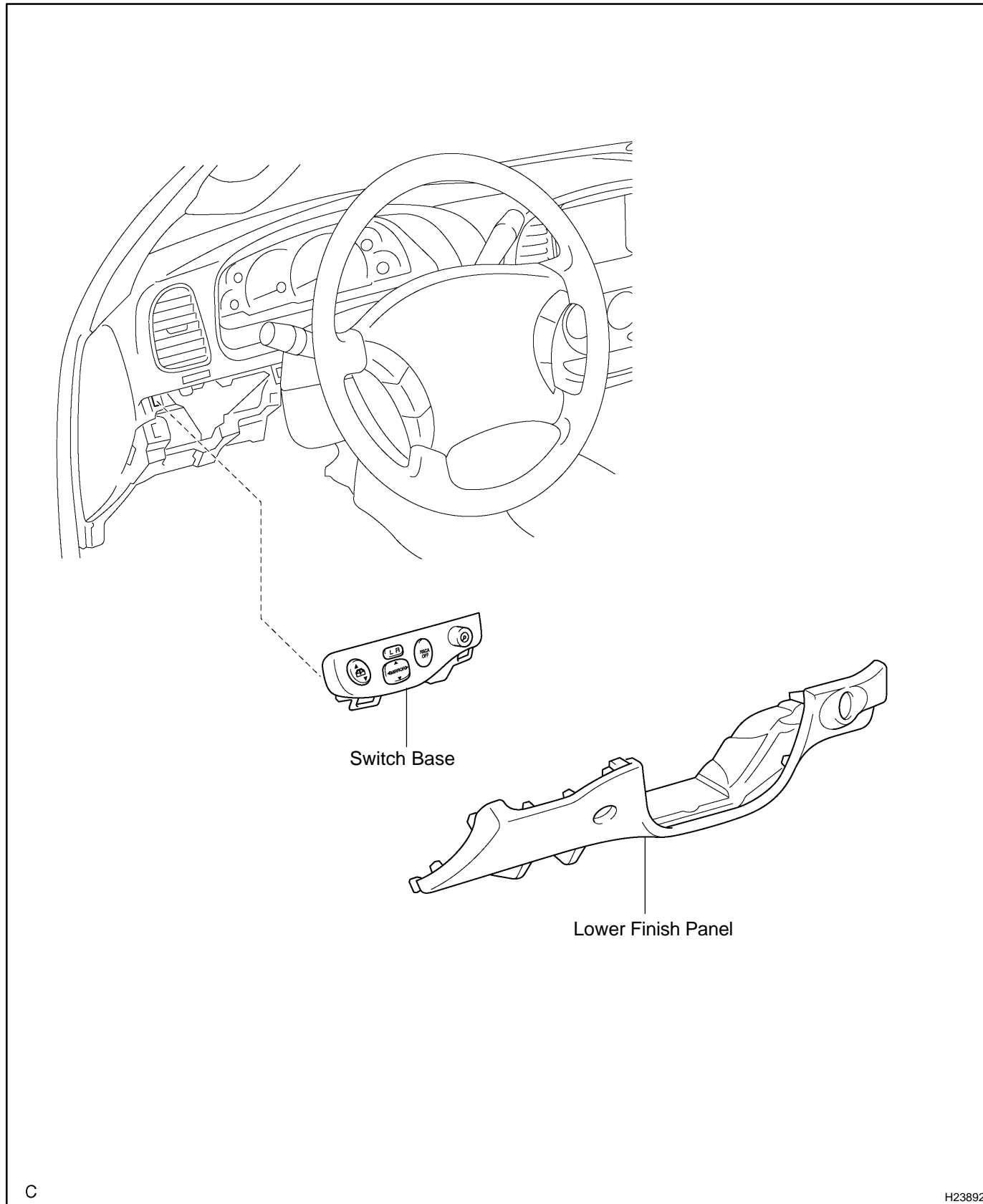


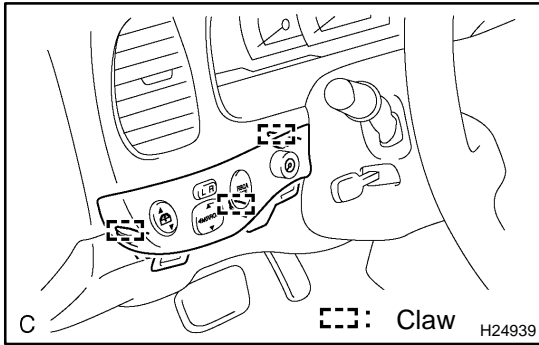
INSTALLATION

1. **INSTALL PASSENGER AIRBAG MANUAL AUTO (ON)-OFF SWITCH**
 - (a) Connect the connector.
 - (b) Install the passenger airbag manual AUTO (ON)-OFF switch.
2. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
3. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

RSCA OFF SWITCH COMPONENTS

RS130-01





REMOVAL

1. **PRECAUTION (SEE PAGE RS-1 AND RS-3)**
2. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

3. **REMOVE LOWER FINISH PANEL (SEE PAGE BO-1 11)**

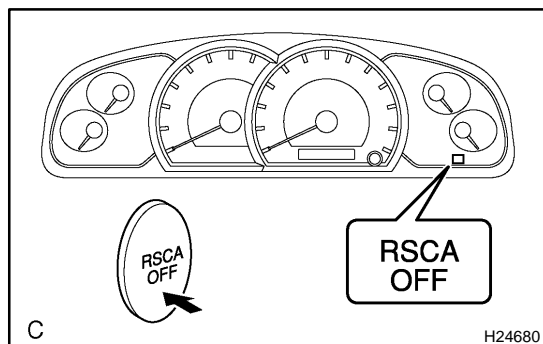
4. **REMOVE SWITCH BASE**

(a) Using a screwdriver, remove the 3 claws and switch base.

HINT:

Tape up the screwdriver tip before use.

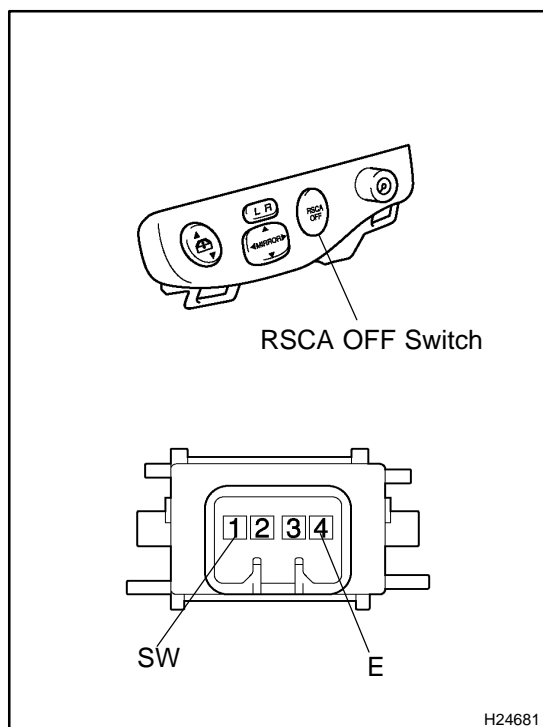
(b) Disconnect the connectors.



INSPECTION

1. INSPECT RSCA OFF INDICATOR LIGHT

- Turn the ignition switch to the ON position.
- Check that the RSCA OFF indicator light goes off after it comes on for 3 seconds.
- Check that the RSCA OFF indicator light comes on after pressing the RSCA OFF switch for approx. 2 seconds.

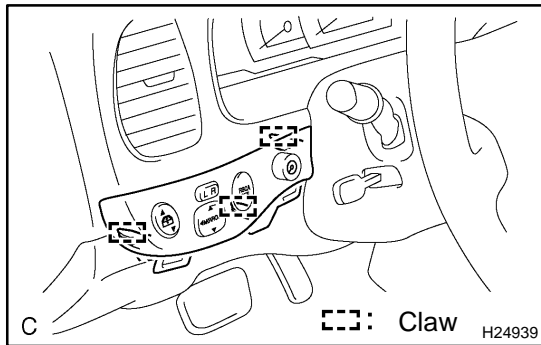


2. INSPECT RSCA OFF SWITCH CONTINUITY

- Inspect the continuity between each terminal.

Switch Position	Tester Connection	Specified Condition
OFF	SW (1) ↔ E (4)	No Continuity
Hold ON	SW (1) ↔ E (4)	Continuity

If continuity is not as specified, replace the RSCA OFF switch.



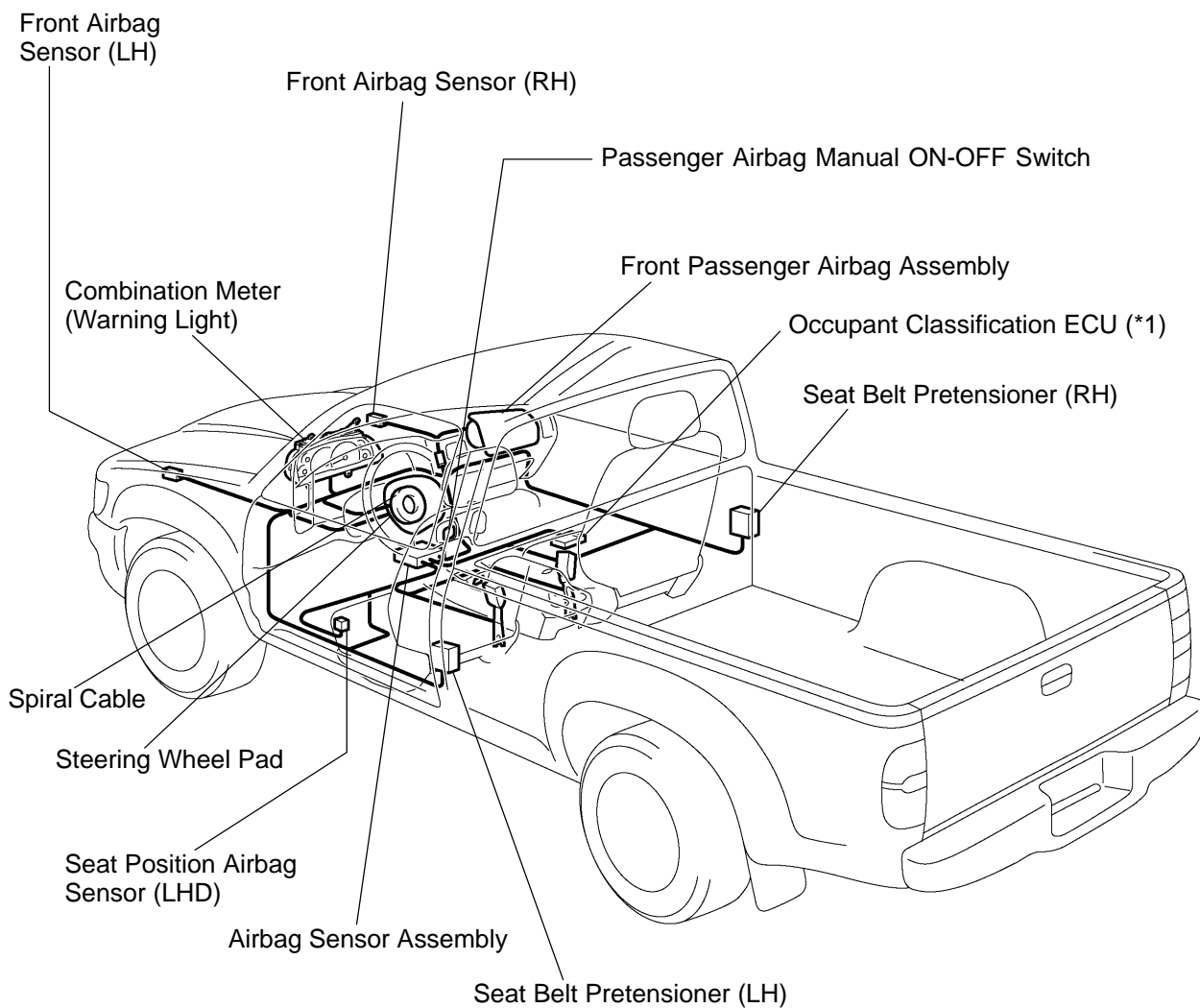
INSTALLATION

1. **INSTALL SWITCH BASE**
 - (a) Connect the connectors.
 - (b) Install the switch base.
2. **INSTALL LOWER FINISH PANEL (SEE PAGE [BO-120](#))**
3. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
4. **INSPECT SRS WARNING LIGHT (SEE PAGE [DI-1859](#))**

WIRE HARNESS AND CONNECTOR LOCATION

RS134-01

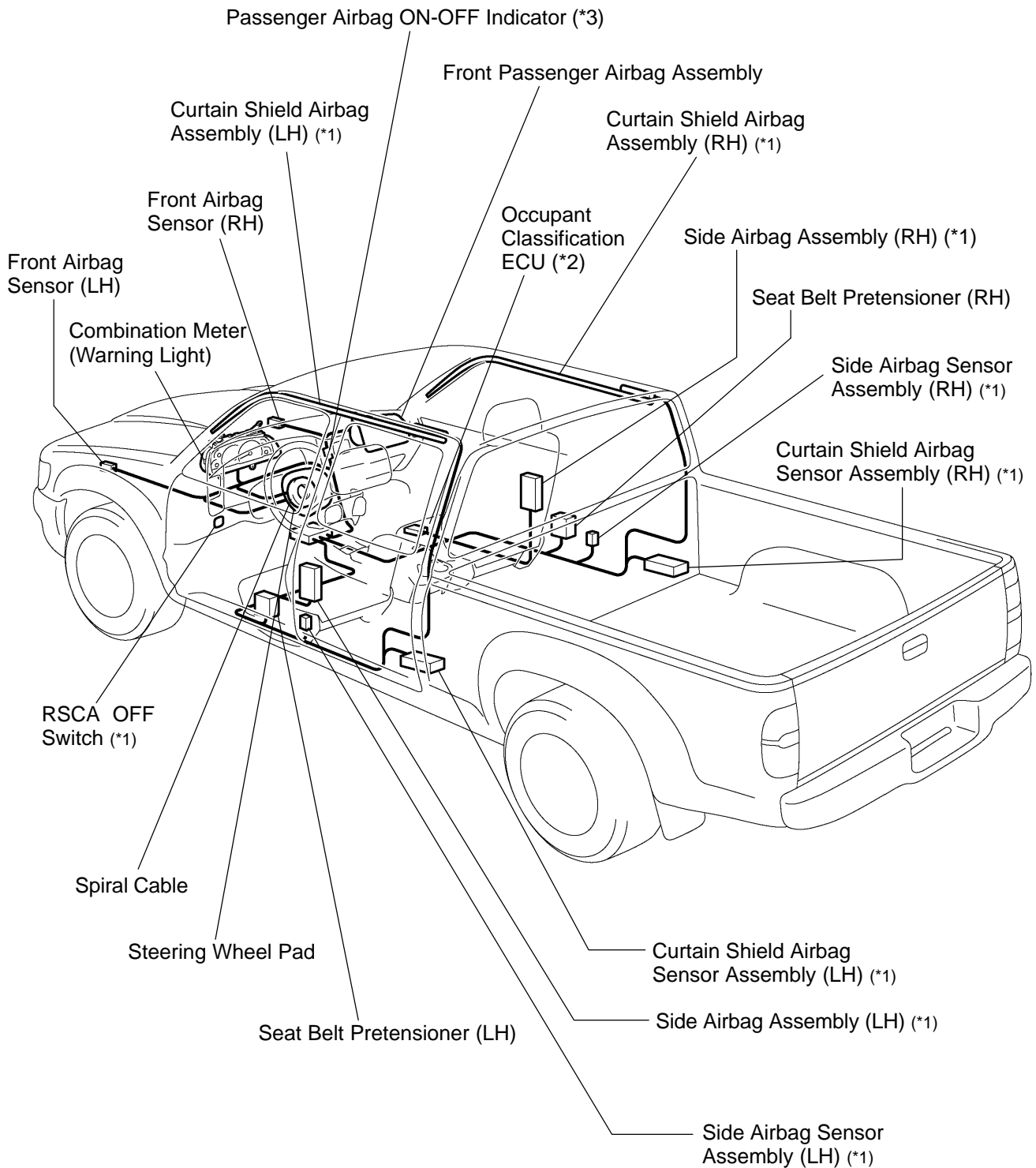
Standard Cab:
Access Cab:



C (*1) w/Occupant Classification System

H23894

Double Cab:



(*1) w/ Side Airbag and Curtain Shield Airbag

(*2) w/ Occupant Classification System

(*3) Separate Seat Type

C

H23895

INSPECTION

HINT:

The SRS wire harness is integrated with the cowl wire harness assembly. The SRS wire harness are encased in a yellow corrugated tube and all the connectors in the system except the seat position airbag sensor connector and occupant classification ECU connectors, are colored yellow.

1. VEHICLE NOT INVOLVED IN A COLLISION

Perform a diagnostic system check (see page [DI-1871](#)).

2. VEHICLE INVOLVED IN A COLLISION

- (a) Perform a diagnostic system check (see page [DI-1871](#)).
- (b) Check breaks in all wires of the SRS wire harness, and exposed conductors.
- (c) Check if the SRS wire harness connectors are cracked or chipped.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the wire harness or connector with a new one.

- ◆ Any of the SRS wire harness and connectors has been found to be faulty in troubleshooting.
- ◆ Any of the SRS wire harness and connectors has been found to be faulty while checking items (see page [RS-141](#)).

CAUTION:

If the wire harness used in the SRS is damaged, replace the whole SRS wire harness assembly.

BODY ELECTRICAL SYSTEM

BE01E-11

PRECAUTION

Carefully to observe the following precautions when servicing the parts related to the body electrical system.

1. LIGHTING SYSTEM

Halogen bulbs have pressurized gas inside and require special handling.

They can burst or scatter if scratched or dropped. Hold a bulb only by its plastic or metal case. Do not touch the glass part of a bulb with bare hands.

2. SRS (SUPPLEMENTAL RESTRAINT SYSTEM)

The TOYOTA TUNDRA is equipped with the Supplemental Restraint System (SRS) (for example, the driver airbag). Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal, installation, inspection and replacement), be sure to read the precautionary notices in the RS section.

3. AUDIO SYSTEM

If the battery negative (-) terminal is disconnected, the preset AM, FM 1 and FM 2 stations stored in the memory are erased. Be sure to make a note of the stations and reset them after the battery terminal is reconnected.

4. MOBILE COMMUNICATION SYSTEM

If the vehicle is equipped with a mobile communication system, refer to the precautions for the mobile communication system in the IN section.

TROUBLESHOOTING (Double Cab)

BE2JW-02

PROBLEM SYMPTOMS TABLE

POWER OUTLET

Symptom	Suspected Area	See Page
Electric power source cannot be out of the power outlet.	1. AC INV Fuse	BE-24
	2. CIG Fuse	BE-24
	3. ECU-IG Fuse	BE-24
	4. RAD NO. 2 Fuse	BE-24
	5. PWR OUTLET Fuse	BE-24
	6. INVERTER Relay	BE-34
	7. ACC Relay	BE-34
	8. ACC CUT Relay	BE-34
	9. Ignition Switch	BE-37
	10. Main Switch	BE-24
	11. Voltage Inverter	BE-24
	12. Wire Harness	-

IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with the troubleshooting.

Symptom	Suspected Area	See Page
Ignition switch cannot be turned to any position.	1. Ignition Switch	BE-37
	2. Power Source Circuit	-
Key unlock warning system does not operate.	1. DOME Fuse	BE-24
	2. ECU-B Fuse	BE-24
	3. Key Unlock Warning Switch	BE-37
	4. Door Courtesy Switch	BE-57
	5. Meter Circuit Plate	BE-82
	6. Wire Harness	DI-241 1
	7. Body ECU	-

w/ Daytime running light:

HEADLIGHT AND TAILLIGHT SYSTEM

This system uses the multiplex communication system. Check diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
Only one headlight does not light up.	1. HEAD (LL, RL, LH, RH) Fuse	BE-24
	2. Bulb	-
	3. Wire Harness	-
Both headlights do not light up.	1. HEAD (LL, RL, LH,RH) Fuse	BE-24
	2. HEAD Relay	BE-41
	3. DIMMER Relay	BE-41
	4. DRL NO. 4 Relay	BE-41
	5. Daytime Running Light Resistor	BE-41
	6. Light Control Switch	BE-41
	7. Bulb	-
	8. Body ECU	-
	9. Wire Harness	-
Lo-beam does not operate on one side.	1. HEAD (LL, RL) Fuse	BE-24
	2. Bulb	-
	3. Wire Harness	-
Lo-beam does not operate on both sides.	1. DIMMER Relay	BE-41
	2. Headlight Dimmer Switch	BE-41
	3. Wire Harness	-

BODY ELECTRICAL - TROUBLESHOOTING (Double Cab)

Hi-beam does not operate on one side.	1. H-LP (LH, RH) Fuse 2. Bulb 3. Wire Harness	BE-24 - -
Hi-beam does not operate on both sides.	1. DIMMER Relay 2. Headlight Dimmer Switch 3. Wire Harness	BE-41 BE-41 -
Flash does not operate.	1. Headlight Dimmer Switch 2. Bulb 3. Body ECU 4. Wire Harness	BE-41 - DI-241 1 -
Headlight flickers.	1. Bulb 2. Body ECU 3. Wire Harness	- - -
Headlight is dark.	1. Bulb 2. Body ECU 3. Wire Harness	- DI-241 1 -
Headlights do not light up while engine is running, light control switch is OFF and parking brake is released.	1. TAIL Fuse 2. ECU-IG Fuse 3. Parking Brake Switch 4. Body ECU 5. Generator 6. Wire Harness	BE-24 BE-24 BE-86 DI-241 1 - -
Only one taillight does not light up.	1. Bulb 2. Wire Harness	- -
Taillights do not light up with light control switch in TAIL position.	1. TAIL Fuse 2. Light Control Switch 3. Body ECU 4. Bulb 5. Wire Harness	BE-24 BE-41 DI-241 1 - -

**w/o Daytime running light:
HEADLIGHT AND TAILLIGHT SYSTEM**

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
Only one headlight does not light up.	1. HEAD (LH, RH) Fuse 2. Bulb 3. Wire Harness	BE-24 - -
Both headlights do not light up.	1. HEAD (LH, RH) Fuse 2. HEAD Relay 3. Light Control Switch 4. Bulb 5. Body ECU 6. Wire Harness	BE-24 BE-41 BE-41 - DI-241 1 -
Lo-beam does not operate on one side.	1. Bulb 2. Wire Harness	- -
Lo-beam does not operate on both sides.	1. Headlight Dimmer Switch 2. Wire Harness	BE-41 -
Hi-beam does not operate on one side.	1. Bulb 2. Wire Harness	- -
Hi-beam does not operate on both sides.	1. Headlight Dimmer Switch 2. Wire Harness	BE-41 -
Flash does not operate.	1. Headlight Dimmer Switch 2. Wire Harness	BE-41 -

Headlight flickers.	1. Bulb 2. Body ECU 3. Wire Harness	- DI-241 1 -
Headlight is dark.	1. Bulb 2. Body ECU 3. Wire Harness	- DI-241 1 -
Only one taillight does not light up.	1. Bulb 2. Wire Harness	- -
Taillights do not light up with light control switch in TAIL position.	1. TAIL Fuse 2. Light Control Switch 3. Bulb 4. Body ECU 5. Wire Harness	BE-24 BE-41 - DI-241 1 -

FOG LIGHT SYSTEM

Double cab:

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
Fog lights do not light up with light control switch in HEAD position. Headlights are normal.	1. FOG Fuse 2. FOG LIGHT Relay 3. Fog Light Switch 4. Body ECU 5. Wire Harness	BE-24 BE-49 BE-49 BE-86 -
Fog lights do not light up with light control switch in HEAD position. Headlights do not light up.	1. Other Parts* 2. Wire Harness	- -
Only one fog light does not light up.	1. Bulb 2. Wire Harness	- -

HINT:

*: Inspect the headlight system.

TURN SIGNAL LIGHT AND HAZARD WARNING LIGHT SYSTEM

Symptom	Suspected Area	See Page
Hazard warning lights and turn signal lights do not flash.	1. TURN-HAZ Fuse 2. GAUGE Fuse 3. Ignition Switch 4. Turn Signal Switch 5. Turn Signal Flasher Relay 6. Wire Harness	BE-24 BE-24 BE-37 BE-53 BE-53 -
Hazard warning lights do not flash. Turn signal lights are normal.	1. Hazard Warning Switch 2. Wire Harness	BE-53 -
Turn signal lights do not flash.	1. Turn Signal Flasher Relay 2. Wire Harness	BE-53 -
Turn signal lights do not flash on one side.	1. Turn Signal Switch 2. Wire Harness	BE-53 -
Only one bulb does not flash.	1. Bulb 2. Wire Harness	- -

INTERIOR LIGHT SYSTEM

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
All lights do not light up.	1. DOME Fuse 2. Body ECU	BE-24 DI-241 1

BODY ELECTRICAL - TROUBLESHOOTING (Double Cab)

Light does not light up when driver's door is opened.	1. Driver's Door Courtesy Switch 2. Wire Harness	BE-57 -
Light does not light up when passenger's door is opened.	1. Passenger's Door Courtesy Switch 2. Wire Harness	BE-57 -
Light does not light up when rear-right door is opened.	1. Rear-Right Door Courtesy Switch 2. Wire Harness	BE-57 -
Light does not light up when rear-left door is opened.	1. Rear-Left Door Courtesy Switch 2. Wire Harness	BE-57 -
Light does not fade out when all doors are closed.	1. Courtesy Switch 2. Wire Harness	BE-57 -
Light does not fade out immediately when all doors are locked within 15 seconds after they are closed.	1. Door Unlock Detection Switch 2. Wire Harness	BE-124 -
Personal light does not light up.	1. DOME Fuse 2. Bulb 3. Front Personal Light 4. Wire Harness	BE-24 - BE-57 -
Dome light does not light up.	1. DOME Fuse 2. Bulb 3. Door Light 4. Wire Harness	BE-24 - BE-57 -
Vanity light does not light up.	1. DOME Fuse 2. Bulb 3. Vanity Light 4. Wire Harness	BE-24 - BE-57 -
Door courtesy light does not light up.	1. DOME Fuse 2. Bulb 3. Door Courtesy Switch 4. Wire Harness	BE-24 - BE-57 -

BACK-UP LIGHT SYSTEM

Symptom	Suspected Area	See Page
Back-up lights do not light up.	1. GAUGE Fuse 2. Ignition Switch 3. Park/neutral Position Switch 4. BACK-UP Light Relay 5. Bulb 6. Wire Harness	BE-24 BE-37 DI-1 179 BE-67 - -
Back-up lights remain on.	1. Park/neutral Position Switch 2. Wire Harness	DI-1 179 -
Only one light does not light up.	1. Bulb 2. Wire Harness	- -

STOP LIGHT SYSTEM

Symptom	Suspected Area	See Page
Stop lights do not light up.	1. STOP Fuse 2. Stop Light Switch 3. Wire Harness	BE-24 BE-70 -
Stop lights remain on.	1. Stop Light Switch 2. Wire Harness	BE-70 -
Only one light does not light up.	1. Bulb 2. Wire Harness	- -

CARGO LIGHT SYSTEM

Symptom	Suspected Area	See Page
Cargo light does not light up.	1. CARGO Fuse	BE-24
	2. Bulb	-
	3. Cargo Light Switch	BE-72
	4. Body ECU	DI-2411
	5. Wire Harness	-

WIPER AND WASHER SYSTEM

Symptom	Suspected Area	See Page
Wipers and washer do not operate.	1. Ignition Switch	BE-37
	2. Wiper and Washer Switch	BE-76
	3. Wire Harness	-
Wipers do not operate.	1. WIP Fuse	BE-24
	2. Wiper and Washer Switch	BE-76
	3. Wiper Motor	BE-76
	4. Wire Harness	-
Washer motor does not operate.	1. Wiper and Washer Switch	BE-76
	2. Washer Motor	BE-76
	3. Wire Harness	-
Washer fluid is not injected	Washer Hose and Nozzles	-

COMBINATION METER (Meter, Gauges and Illumination Lights)

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
Tachometer, fuel gauge and engine coolant temperature gauge do not operate.	1. GAUGE Fuse	BE-24
	2. Meter Circuit Plate	BE-82
	3. Wire Harness	-
Speedometer does not operate.	1. Vehicle Speed Sensor	BE-86
	2. Meter Circuit Plate	BE-82
	3. Wire Harness	-
Tachometer does not operate.	1. ECM	DI-428
	2. Meter Circuit Plate	BE-82
	3. Wire Harness	-
Fuel gauge does not operate or operates abnormally.	1. Fuel Receiver Gauge	BE-86
	2. Fuel Sender Gauge	BE-86
	3. Meter Circuit Plate	BE-82
	4. Wire Harness	-
Engine coolant temperature gauge does not operate or operates abnormally.	1. Engine Coolant Temperature Receiver Gauge	BE-86
	2. Engine Coolant Temperature Sender Gauge	BE-86
	3. Meter Circuit Plate	BE-82
	4. Wire Harness	-
Voltmeter does not operate.	1. Voltmeter	BE-86
	2. Meter Circuit Plate	BE-86
	3. Wire Harness	-
All illumination lights do not light up.	1. TAIL Fuse	BE-24
	2. Light Control Rheostat	BE-86
	3. Wire Harness	-
Brightness does not change even when rheostat is turned.	1. Bulb	-
	2. Light Control Rheostat	BE-86
	3. Wire Harness	-
Only one illumination light does not light up.	1. Bulb	-
	2. Wire Harness	-

COMBINATION METER (Warning Lights)

Symptom	Suspected Area	See Page
Only discharge warning lights light up. Other warning lights do not light up.	1. LED 2. GAUGE Fuse 3. Meter Circuit Plate 4. Wire Harness	- BE-24 BE-82 -
Low oil pressure warning light does not light up.	1. LED 2. Low Oil Pressure Warning Switch 3. Meter Circuit Plate 4. Wire Harness	- BE-86 BE-82 -
Fuel level warning light does not light up.	1. LED 2. Fuel Level Warning Switch 3. Meter Circuit Plate 4. Wire Harness	- BE-86 BE-82 -
ABS warning light does not light up.	1. LED 2. Meter Circuit Plate 3. Skid Control ECU 4. Wire Harness	- BE-82 DI-1405 DI-1489 -
Seat belt warning light does not light up.	1. LED 2. Seat Belt Buckle Switch 3. Meter Circuit Plate 4. Wire Harness	- BE-86 BE-82 -
Discharge warning light does not light up.	1. IGN Fuse 2. LED 3. Meter Circuit Plate 4. Wire Harness 5. Generator	BE-24 - BE-82 - -
Brake warning light does not light up.	1. LED 2. Parking Brake Switch 3. Brake Fluid Level Warning Switch 4. Meter Circuit Plate 5. Skid Control ECU 6. Wire Harness	- BE-86 BE-86 BE-82 DI-1405 DI-1489 -
VSC TRAC warning light does not light up.	1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness	- DI-1405 DI-1489 BE-82 -
ATF temperature warning light does not light up.	1. LED 2. ATF Temperature Sensor 3. ECM 4. Meter Circuit Plate 5. Wire Harness	- DI-1 186 DI-428 BE-82 -
SRS warning light does not light up.	1. LED 2. Airbag Sensor Assembly 3. Meter Circuit Plate 4. Wire Harness	- DI-2305 BE-82 -

Door open warning light does not light up.	<ol style="list-style-type: none"> 1. DOME Fuse 2. LED 3. Door Courtesy Switch 4. Meter Circuit Plate 5. Wire Harness 	BE-24 - BE-57 BE-82 -
Washer level warning light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Washer Fluid Level Warning Switch 3. Meter Circuit Plate 4. Wire Harness 	- BE-86 BE-82 -

COMBINATION METER (Indicator Lights)

Symptom	Suspected Area	See Page
"4LO" indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. 4WD Control ECU 3. Meter Circuit 4. Integration Control Panel 5. Wire Harness 	- TR-38 BE-82 AC-83 -
"4HI" indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. 4WD Control ECU 3. Meter Circuit Plate 4. Integration Control Panel 5. Wire Harness 	- TR-38 BE-82 AC-83 -
O/D OFF indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. O/D Main Switch 3. ECM 4. Meter Circuit Plate 5. Wire Harness 	- DI-1112 DI-1294 DI-428 BE-82 -
AUTO LSD indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	- DI-1405 DI-1489 BE-82 -
VSC OFF indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	- DI-1405 DI-1489 BE-82 -
SLIP indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	- DI-1405 DI-1489 BE-82 -
Cruise control indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. ECM 3. Meter Circuit Plate 4. Wire Harness 	- DI-428 BE-82 -
High-beam indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Headlight and Taillight System 3. Meter Circuit Plate 4. Wire Harness 	- BE-41 BE-82 -
Turn signal indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Turn Signal and Hazard Warning System 3. Meter Circuit Plate 4. Wire Harness 	- BE-53 BE-82 -

BODY ELECTRICAL - TROUBLESHOOTING (Double Cab)

Shift indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Park/neutral Position Switch 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-1003</p> <p>DI-1179</p> <p>BE-82</p> <p>-</p>
Only one shift indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Meter Circuit Plate 	<p>-</p> <p>BE-82</p>
MIL does not light up.	<ol style="list-style-type: none"> 1. LED 2. ECM 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-428</p> <p>BE-82</p> <p>-</p>
OIL MAINT indicator does not light up.	<ol style="list-style-type: none"> 1. LED 2. Resetting Procedure 3. Wire Harness 	<p>DI-428</p> <p>BE-86</p> <p>-</p>
Tire pressure indicator does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	<p>DI-428</p> <p>DI-1405</p> <p>DI-1489</p> <p>BE-82</p> <p>-</p>

DEFOGGER SYSTEM

Symptom	Suspected Area	See Page
Only rear window defogger system does not operate.	<ol style="list-style-type: none"> 1. HTR Fuse 2. DWFOG Relay 3. Ignition Switch 4. Defogger Switch (in A/C Panel Switch) 5. Defogger Wire 6. Wire Harness 	<p>BE-24</p> <p>BE-103</p> <p>BE-37</p> <p>BE-103</p> <p>BE-103</p> <p>-</p>
Mirror defogger does not operate.	<ol style="list-style-type: none"> 1. MIR HTR Fuse (E/G Room J/B) 2. MIR HTR Relay 3. Mirror Heater 4. Wire Harness 	<p>BE-24</p> <p>BE-107</p> <p>BE-107</p> <p>-</p>

POWER WINDOW CONTROL SYSTEM

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
Power window does not operate. Power door lock does not operate.	<ol style="list-style-type: none"> 1. POWER NO. 1 Fuse 2. POWER NO. 2 Fuse 3. POWER NO. 3 Fuse 4. POWER NO. 4 Fuse 5. POWER MAIN Relay 6. Ignition Switch 7. Power Window Master Switch (Driver Door ECU) 8. Power Window Regulator Switch (Front Passenger Door ECU) 9. Body ECU 	<p>BE-24</p> <p>BE-24</p> <p>BE-24</p> <p>BE-24</p> <p>BE-24</p> <p>BE-37</p> <p>DI-2473</p> <p>DI-2495</p> <p>DI-2411</p>
Power window does not operate. Power door lock is normal.	<ol style="list-style-type: none"> 1. Power Window Master Switch (Driver Door ECU) 2. Power Window Regulator Switch (Front Passenger Door ECU) 3. Wire Harness 	<p>DI-2473</p> <p>DI-2495</p> <p>-</p>
One-touch power window system does not operate.	Power Window Master Switch	DI-2473

Only one window glass does not move.	<ol style="list-style-type: none"> 1. Power Window Master Switch (Driver Door ECU) 2. Power Window Regulator Switch (Front Passenger Door ECU) 3. Power Window Motor 4. Wire Harness 	DI-2473 DI-2495 BE-109 -
Window lock system does not operate.	Power Window Master Switch	DI-2473
Key-off power window does not operate.	<ol style="list-style-type: none"> 1. ECU-IG Fuse 2. Ignition Switch 3. Door Courtesy Switch 4. Body ECU 5. Wire Harness 	BE-24 BE-37 BE-57 DI-2411 -

POWER BACK WINDOW SYSTEM

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
Power back window does not operate.	<ol style="list-style-type: none"> 1. ECU-IG Fuse 2. BACK WINDOW Relay 3. BACK WINDOW CONTROL Relay 4. Ignition Switch 5. Power Back Window Switch 6. Power Back Window Motor 7. Body ECU 	BE-24 BE-119 BE-119 BE-37 BE-119 BE-119 DI-2411

POWER DOOR LOCK CONTROL SYSTEM

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
Entire door lock system does not operate.	<ol style="list-style-type: none"> 1. POWER NO. 1 Fuse 2. POWER NO. 2 Fuse 3. Body ECU 4. Wire Harness 	BE-24 BE-24 DI-2411 -
Manual door lock/unlock switch does not operate.	<ol style="list-style-type: none"> 1. Door Lock Control Switch (Driver Door ECU, Front Passenger Door ECU) 2. Door Unlock Detection Switch 3. Body ECU 4. Wire Harness 	DI-2473 DI-2495 BE-124 DI-2411 -
Door lock/unlock key does not operate.	<ol style="list-style-type: none"> 1. Door Key Lock and Unlock Switch 2. Body ECU 3. Wire Harness 4. Door Lock Link Disconnected 	BE-124 DI-2411 - -
Key confine prevention function does not operate.	<ol style="list-style-type: none"> 1. Key Unlock Warning Switch 2. Door Courtesy Switch 3. Body ECU 4. Wire Harness 	BE-124 BE-57 DI-2411 -
Only one door lock does not operate.	<ol style="list-style-type: none"> 1. Door Lock Motor 2. Wire Harness 	BE-124 -

THEFT DETERRENT SYSTEM

Symptom	Suspected Area	See Page
Theft deterrent system operates abnormally.	TROUBLESHOOTING	DI-2317

WIRELESS DOOR LOCK CONTROL SYSTEM

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

HINT:

Troubleshooting of the wireless door lock control system is based on the premise that the door lock control system is operating normally. Accordingly, before troubleshooting the wireless door lock control system, first make certain that the door lock control system is operating normally.

Symptom	Suspected Area	See Page
Entire wireless door lock control system does not operate.	1. Transmitter 2. Body ECU 3. Wire Harness	BE-166 DI-2411 -
Wireless door lock operates, but the buzzer does not sound.	1. Wireless Door Lock Buzzer 2. Wireless Door Lock Control Receiver 3. Wire Harness	BE-159 BE-159 -

POWER SEAT CONTROL SYSTEM

Symptom	Suspected Area	See Page
Power seat does not operate.	1. POWER SEAT Fuse 2. Power Seat Switch 3. Wire Harness	BE-24 BE-184 -
Slide operation does not operate.	1. Power Seat Switch 2. Slide Motor 3. Wire Harness	BE-184 BE-184 -
Front tilt operation does not operate.	1. Power Seat Switch 2. Front Tilt Motor 3. Wire Harness	BE-184 BE-184 -
Rear lifter operation does not operate.	1. Power Seat Switch 2. Rear Lifter Motor 3. Wire Harness	BE-184 BE-184 -
Reclining operation does not operate.	1. Power Seat Switch 2. Reclining Motor 3. Wire Harness	BE-184 BE-184 -
Lumbar support operation does not operate.	1. Lumbar Support Switch 2. Lumbar Support Motor 3. Wire Harness	BE-184 BE-184 -

POWER MIRROR CONTROL SYSTEM

This system uses the multiplex communication system. Check the diagnosis system of the multiplex communication system before you proceed with this troubleshooting.

Symptom	Suspected Area	See Page
Mirror does not operate.	1. RAD NO. 2 Fuse 2. ACC CUT Relay 3. Ignition Switch 4. Mirror Switch 5. Mirror Motor 6. Wire Harness	BE-24 BE-189 BE-37 BE-189 BE-189 -
Mirror operates abnormally.	1. Mirror Switch 2. Mirror Motor 3. Wire Harness	BE-189 BE-189 -

ELECTRO CHROMIC MIRROR SYSTEM

Symptom	Suspected Area	See Page
Electro chromic mirror does not operate.	1. GAUGE Fuse 2. Electro Chromic Mirror 3. Wire Harness	BE-24 BE-189 -

SEAT HEATER SYSTEM

Symptom	Suspected Area	See Page
Seat heaters do not operate.	1. SEAT HTR Fuse 2. Seat Heater Switch	BE-24 BE-198
Driver's seat heater does not operate.	1. Driver's Seat Heater Switch 2. Seat Heater 3. Wire Harness	BE-198 BE-198 -
Passenger's seat heater does not operate.	1. Passenger's Seat Heater Switch 2. Seat Heater 3. Wire Harness	BE-198 BE-198 -
Seat heater temperature is too hot.	Seat Heater	BE-198

CLOCK SYSTEM (in A/C Control Panel)

Symptom	Suspected Area	See Page
Clock does not operate.	TROUBLESHOOTING NO. 1	BE-200
Clock loses or gains time.	TROUBLESHOOTING NO. 2	BE-200

GARAGE DOOR OPENER SYSTEM

Symptom	Suspected Area	See Page
The equipment of which code has been registered does not operate.	1. Garage Door Opener Switch 2. Wire Harness 3. *	BE-208 - -
LED does not turn on. (Even though either switch is pressed.)	1. Garage Door Opener Switch 2. Wire Harness	BE-208 -
LED does not turn on. (Only one switch is pressed.)	Garage Door Opener Switch	BE-208

*: As the GARAGE DOOR OPENER on the vehicle side seems to be normal, check the OPENER on the equipment side, of which code has been registered.

NAVIGATION SYSTEM

Symptom	Suspected Area	See Page
Navigation system operates abnormally.	TROUBLESHOOTING	DI-2786

AUDIO SYSTEM

Symptom	Suspected Area	See Page
Audio system operates abnormally.	TROUBLESHOOTING	DI-2545
Rear seat audio system operates abnormally.	TROUBLESHOOTING	DI-2656

REAR SEAT ENTERTAINMENT SYSTEM

Symptom	Suspected Area	See Page
Rear seat entertainment system operates abnormally.	TROUBLESHOOTING	DI-2693

TRAILER TOWING

Symptom	Suspected Area	See Page
Trailer towing does not operate.	<ol style="list-style-type: none">1. TOWING Fuse2. TOWING TAIL Fuse3. TOWING BRK Fuse4. TOWING TAIL Relay5. BATT CHARGE Relay6. Towing Converter7. Wire Harness	<p>BE-24 BE-24 BE-24 BE-210 BE-210 BE-210 -</p>

TROUBLESHOOTING (Except Double Cab)

BE2JX-02

PROBLEM SYMPTOMS TABLE

POWER OUTLET

Symptom	Suspected Area	See Page
Electric power source cannot be out of the power outlet.	1. PWR OUTLET1 Fuse	BE-29
	2. PWR OUTLET2 Fuse	BE-29
	3. ECU-B Fuse	BE-29
	4. DOME Fuse	BE-29
	5. POWER OUTLET Relay	BE-34
	6. ACC CUT Relay	BE-34
	7. Ignition Switch	BE-37
	8. Wire Harness	-

IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

Symptom	Suspected Area	See Page
Ignition switch cannot be turned to any position.	1. Ignition Switch	BE-37
	2. Power Source Circuit	-
Key unlock warning system does not operate.	1. DOME Fuse	BE-29
	2. Key Unlock Warning Switch	BE-37
	3. Door Courtesy Switch	BE-61
	4. Meter Circuit Plate	BE-82
	5. Wire Harness	-
	6. Integration Relay (Driver Side J/B)	BE-41

w/ Daytime running light:

HEADLIGHT AND TAILLIGHT SYSTEM

Symptom	Suspected Area	See Page
Only one headlight does not light up.	1. HEAD (LL, RL, LH, RH) Fuse	BE-29
	2. Bulb	-
	3. Wire Harness	-
Both headlights do not light up.	1. HEAD (LL, RL, LH,RH) Fuse	BE-29
	2. TAIL Fuse	BE-29
	3. ECU-IG Fuse	BE-29
	4. H-LP Relay	BE-41
	5. DIMMER Relay	BE-41
	6. DRL NO. 4 Relay	BE-41
	7. Daytime Running Light Resistor	BE-41
	8. Light Control Switch	BE-41
	9. Bulb	BE-41
	10. Integration Relay	BE-41
	11. Wire Harness	-
Lo-beam does not operate on one side.	1. HEAD (LL, RL) Fuse	BE-29
	2. Bulb	-
	3. Wire Harness	-
Lo-beam does not operate on both sides.	1. DIMMER Relay	BE-41
	2. Headlight Dimmer Switch	BE-41
	3. Wire Harness	-
Hi-beam does not operate on one side.	1. H-LP (LH, RH) Fuse	BE-29
	2. Bulb	-
	3. Wire Harness	-
Hi-beam does not operate on both sides.	1. DIMMER Relay	BE-41
	2. Headlight Dimmer Switch	BE-41
	3. Wire Harness	-

BODY ELECTRICAL - TROUBLESHOOTING (Except Double Cab)

Flash does not operate.	1. Headlight Dimmer Switch 2. Integration Relay 3. Bulb 4. Wire Harness	BE-41 BE-41 - -
Headlight flickers.	1. Bulb 2. Integration Relay 3. Wire Harness	- BE-41 -
Headlight is dark.	1. Bulb 2. Integration Relay 3. Wire Harness	- BE-41 -
Headlights do not light up while engine is running, light control switch is OFF and parking brake is released.	1. TAIL Fuse 2. ECU-IG Fuse 3. Parking Brake Switch 4. Integration Relay 5. Generator 6. Wire Harness	BE-29 BE-29 BE-86 BE-41 - -
Only one taillight does not light up.	1. Bulb 2. Wire Harness	- -
Taillights do not light up with light control switch in TAIL position.	1. TAIL Fuse 2. Light Control Switch 3. Integration Relay 4. Bulb 5. Wire Harness	BE-29 BE-41 BE-41 - -

**w/o Daytime running light:
HEADLIGHT AND TAILLIGHT SYSTEM**

Symptom	Suspected Area	See Page
Only one headlight does not light up.	1. HEAD (LH, RH) Fuse 2. Bulb 3. Wire Harness	BE-29 - -
Both headlights do not light up.	1. HEAD (LH, RH) Fuse 2. H-LP Relay 3. Light Control Switch 4. Bulb 5. Integration Relay 6. Wire Harness	BE-29 BE-41 BE-41 - BE-41 -
Lo-beam does not operate on one side.	1. Bulb 2. Wire Harness	- -
Lo-beam does not operate on both sides.	1. Headlight Dimmer Switch 2. Wire Harness	BE-41 -
Hi-beam does not operate on one side.	1. Bulb 2. Wire Harness	- -
Hi-beam does not operate on both sides.	1. Headlight Dimmer Switch 2. Wire Harness	BE-41 -
Flash does not operate.	1. Headlight Dimmer Switch 2. Wire Harness	BE-41 -
Headlight flickers.	1. Bulb 2. Integration Relay 3. Wire Harness	- BE-41 -
Headlight is dark.	1. Bulb 2. Integration Relay 3. Wire Harness	- BE-41 -

Only one taillight does not light up.	1. Bulb 2. Wire Harness	- -
Taillights do not light up with light control switch in TAIL position.	1. TAIL Fuse 2. Light Control Switch 3. Integration Relay 4. Bulb 5. Wire Harness	BE-29 BE-41 BE-41 - -

FOG LIGHT SYSTEM

Symptom	Suspected Area	See Page
Fog lights do not light up with light control switch in HEAD position. Headlights are normal.	1. FOG Fuse 2. FOG Relay 3. Fog Light Switch 4. Integration Relay 5. Wire Harness	BE-29 BE-49 BE-49 BE-41 -
Fog lights do not light up with light control switch in HEAD position. Headlights do not light up.	1. Other Parts* 2. Wire Harness	- -
Only one fog light does not light up.	1. Bulb 2. Wire Harness	- -

HINT:

*: Inspect the headlight system.

TURN SIGNAL LIGHT AND HAZARD WARNING LIGHT SYSTEM

Symptom	Suspected Area	See Page
Hazard warning lights and turn signal lights do not flash.	1. TURN Fuse 2. HAZ Fuse 3. Ignition Switch 4. Turn Signal Switch 5. Turn Signal Flasher Relay 6. Wire Harness	BE-29 BE-29 BE-37 BE-53 BE-53 -
Hazard warning lights do not flash. Turn signal lights are normal.	1. Hazard Warning Switch 2. Wire Harness	BE-53 -
Turn signal lights do not flash.	1. Turn Signal Flasher Relay 2. Wire Harness	BE-53 -
Turn signal lights do not flash on one side.	1. Turn Signal Switch 2. Wire Harness	BE-53 -
Only one bulb does not flash.	1. Bulb 2. Wire Harness	- -

INTERIOR LIGHT SYSTEM

Symptom	Suspected Area	See Page
All lights do not light up.	DOME Fuse	BE-29
Light does not light up when driver's door is opened.	1. Driver's Door Courtesy Switch 2. Wire Harness	BE-61 -
Light does not light up when passenger's door is opened.	1. Passenger's Door Courtesy Switch 2. Wire Harness	BE-61 -
Light does not light up when RH access door is opened.	1. RH Access Door Courtesy Switch 2. Wire Harness	BE-61 -
Light does not light up when LH access door is opened.	1. LH Access Door Courtesy Switch 2. Wire Harness	BE-61 -
Light does not fade out when all doors are closed.	1. Courtesy Switch 2. Wire Harness	BE-61 -
Light does not fade out when all doors are locked within 15 seconds after they are closed.	1. Door Unlock Detection Switch 2. Wire Harness	BE-128 -

BODY ELECTRICAL - TROUBLESHOOTING (Except Double Cab)

Personal light does not light up.	<ol style="list-style-type: none"> 1. DOME Fuse 2. Bulb 3. Front Personal Light 4. Wire Harness 	<p>BE-29</p> <p>-</p> <p>BE-128</p> <p>-</p>
Vanity light does not light up.	<ol style="list-style-type: none"> 1. DOME Fuse 2. Bulb 3. Vanity Light 4. Wire Harness 	<p>BE-29</p> <p>-</p> <p>BE-128</p> <p>-</p>
Door courtesy light does not light up.	<ol style="list-style-type: none"> 1. DOME Fuse 2. Bulb 3. Door Courtesy Switch 4. Wire Harness 	<p>BE-29</p> <p>-</p> <p>BE-128</p> <p>-</p>

BACK-UP LIGHT SYSTEM

Symptom	Suspected Area	See Page
Back-up lights do not light up.	<ol style="list-style-type: none"> 1. GAUGE Fuse 2. Bulb 3. Ignition Switch 4. Back-up Light Switch (M/T) 5. Park/neutral Position Switch (A/T) 6. BACK-UP Light Relay (A/T) 7. Wire Harness 	<p>BE-29</p> <p>-</p> <p>BE-37</p> <p>BE-67</p> <p>BE-67</p> <p>BE-67</p> <p>-</p>
Back-up lights remain on.	<ol style="list-style-type: none"> 1. Back-up Light Switch (M/T) 2. Park/neutral Position Switch (A/T) 3. Wire Harness 	<p>BE-67</p> <p>BE-67</p> <p>-</p>
Only one light does not light up.	<ol style="list-style-type: none"> 1. Bulb 2. Wire Harness 	<p>-</p> <p>-</p>

STOP LIGHT SYSTEM

Symptom	Suspected Area	See Page
Stop lights do not light up.	<ol style="list-style-type: none"> 1. STOP Fuse 2. Stop Light Switch 3. Wire Harness 	<p>BE-29</p> <p>BE-70</p> <p>-</p>
Stop lights remain on.	<ol style="list-style-type: none"> 1. Stop Light Switch 2. Wire Harness 	<p>BE-70</p> <p>-</p>
Only one light does not light up.	<ol style="list-style-type: none"> 1. Bulb 2. Wire Harness 	<p>-</p> <p>-</p>

CARGO LIGHT SYSTEM

Symptom	Suspected Area	See Page
Cargo light does not light up.	<ol style="list-style-type: none"> 1. CARGO LP Fuse 2. Bulb 3. Cargo Light Switch 4. Integration Relay 5. Wire Harness 	<p>BE-29</p> <p>-</p> <p>BE-72</p> <p>BE-128</p> <p>-</p>

WIPER AND WASHER SYSTEM

Symptom	Suspected Area	See Page
Wipers and washer do not operate.	<ol style="list-style-type: none"> 1. WIP Fuse 2. Ignition Switch 3. Wiper and Washer Switch 4. Wire Harness 	<p>BE-29</p> <p>BE-37</p> <p>BE-76</p> <p>-</p>
Wipers do not operate.	<ol style="list-style-type: none"> 1. Wiper and Washer Switch 2. Wiper Motor 3. Wire Harness 	<p>BE-76</p> <p>BE-76</p> <p>-</p>

Washer motor does not operate.	1. Wiper and Washer Switch 2. Washer Motor 3. Wire Harness	BE-76 BE-76 -
Washer fluid is not injected	Washer Hose and Nozzles	-

COMBINATION METER (Meter, Gauges and Illumination Lights)

Symptom	Suspected Area	See Page
Tachometer, fuel gauge and engine coolant temperature gauge do not operate.	1. GAUGE Fuse 2. Meter Circuit Plate 3. Wire Harness	BE-29 BE-82 -
Speedometer does not operate.	1. Vehicle Speed Sensor 2. Meter Circuit Plate 3. Wire Harness	BE-86 BE-86 -
Tachometer does not operate.	1. Igniter (1GR-FE) 2. ECM (2UZ-FE) 3. Meter Circuit Plate 4. Wire Harness	- - BE-86 -
Fuel gauge does not operate or operates abnormally.	1. Fuel Receiver Gauge 2. Fuel Sender Gauge 3. Meter Circuit Plate 4. Wire Harness	BE-86 BE-86 BE-82 -
Engine coolant temperature gauge does not operate or operates abnormally.	1. Engine Coolant Temperature Receiver Gauge 2. Engine Coolant Temperature Sender Gauge 3. Meter Circuit Plate 4. Wire Harness	BE-86 BE-86 BE-82 -
Voltmeter does not operate.	1. Voltmeter 2. Meter Circuit Plate 3. Wire Harness	BE-86 BE-82 -
All illumination lights do not light up.	1. TAIL Fuse 2. Light Control Rheostat 3. Integration Relay 4. Wire Harness	BE-29 BE-86 BE-41 -
Brightness does not change even when rheostat is turned.	1. Bulb 2. Light Control Rheostat 3. Wire Harness	- BE-86 -
Only one illumination light does not light up.	1. Bulb 2. Wire Harness	- -

COMBINATION METER (Warning Lights)

Symptom	Suspected Area	See Page
Only discharge warning lights light up. Other warning lights do not light up.	1. LED 2. GAUGE Fuse 3. Meter Circuit Plate 4. Wire Harness	- BE-29 BE-82 -
Low oil pressure warning light does not light up.	1. LED 2. Low Oil Pressure Warning Switch 3. Meter Circuit Plate 4. Wire Harness	- BE-86 BE-82 -
Fuel level warning light does not light up.	1. LED 2. Fuel Level Warning Switch 3. Meter Circuit Plate 4. Wire Harness	- BE-86 BE-82 -

BODY ELECTRICAL - TROUBLESHOOTING (Except Double Cab)

ABS warning light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Meter Circuit Plate 3. Skid Control ECU 4. Wire Harness 	<p>-</p> <p>BE-82</p> <p>DI-1405</p> <p>DI-1489</p> <p>-</p>
Seat belt warning light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Seat Belt Buckle Switch 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>BE-86</p> <p>BE-82</p> <p>-</p>
Discharge warning light does not light up.	<ol style="list-style-type: none"> 1. IGN Fuse 2. LED 3. Meter Circuit Plate 4. Wire Harness 5. Generator 	<p>BE-29</p> <p>-</p> <p>BE-82</p> <p>-</p> <p>-</p>
Brake warning light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Parking Brake Switch 3. Brake Fluid Level Warning Switch 4. Meter Circuit Plate 5. Skid Control ECU 6. Wire Harness 	<p>-</p> <p>BE-86</p> <p>BE-86</p> <p>BE-82</p> <p>DI-1405</p> <p>DI-1489</p> <p>-</p>
VSC TRAC warning light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-1405</p> <p>DI-1489</p> <p>BE-82</p> <p>-</p>
ATF temperature warning light does not light up.	<ol style="list-style-type: none"> 1. LED 2. ATF Temperature Sensor 3. ECM 4. Meter Circuit Plate 5. Wire Harness 	<p>-</p> <p>DI-1009</p> <p>DI-1186</p> <p>-</p> <p>BE-82</p> <p>-</p>
SRS warning light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Airbag Sensor Assembly 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-1847</p> <p>BE-82</p> <p>-</p>
Door open warning light does not light up.	<ol style="list-style-type: none"> 1. DOME Fuse 2. LED 3. Door Courtesy Switch 4. Meter Circuit Plate 5. Wire Harness 	<p>BE-29</p> <p>-</p> <p>BE-61</p> <p>BE-82</p> <p>-</p>
Washer level warning light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Washer Fluid Level Warning Switch 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>BE-86</p> <p>BE-82</p> <p>-</p>

COMBINATION METER (Indicator Lights)

Symptom	Suspected Area	See Page
"4LO" indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. 4WD Control ECU (2UZ-FE) 3. Meter Circuit 4. Integration Control Panel 5. Wire Harness 	<p>-</p> <p>TR-38</p> <p>BE-82</p> <p>AC-83</p> <p>-</p>

"4HI/4WD" indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. A.D.D. Actuator (1GR-FE) 3. 4WD Control ECU (2UZ-FE) 4. Meter Circuit Plate 5. Integration Control Panel 6. Wire Harness 	<p>-</p> <p>TR-38</p> <p>TR-38</p> <p>BE-82</p> <p>AC-83</p> <p>-</p>
O/D OFF indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. O/D Main Switch 3. ECM 4. Meter Circuit Plate 5. Wire Harness 	<p>-</p> <p>DI-1112</p> <p>DI-1294</p> <p>DI-9</p> <p>DI-428</p> <p>BE-82</p> <p>-</p>
AUTO LSD indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-1405</p> <p>DI-1489</p> <p>BE-82</p> <p>-</p>
VSC OFF indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-1405</p> <p>DI-1489</p> <p>BE-82</p> <p>-</p>
SLIP indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-1405</p> <p>DI-1489</p> <p>BE-82</p> <p>-</p>
Cruise control indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. ECM 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-9</p> <p>DI-428</p> <p>BE-82</p> <p>-</p>
High-beam indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Headlight and Taillight System 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>BE-41</p> <p>BE-82</p> <p>-</p>
Turn signal indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Turn Signal and Hazard Warning System 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>BE-53</p> <p>BE-82</p> <p>-</p>
Shift indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Park/Neutral Position Switch 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-1003</p> <p>DI-1179</p> <p>BE-82</p> <p>-</p>
Only one shift indicator light does not light up.	<ol style="list-style-type: none"> 1. LED 2. Meter Circuit Plate 	<p>-</p> <p>BE-82</p>
MIL does not light up.	<ol style="list-style-type: none"> 1. LED 2. ECM 3. Meter Circuit Plate 4. Wire Harness 	<p>-</p> <p>DI-9</p> <p>DI-428</p> <p>BE-82</p> <p>-</p>

BODY ELECTRICAL - TROUBLESHOOTING (Except Double Cab)

OIL MAINT indicator does not light up.	<ol style="list-style-type: none"> 1. LED 2. Resetting Procedure 3. Wire Harness 	DI-428 BE-86 -
Tire pressure indicator does not light up.	<ol style="list-style-type: none"> 1. LED 2. Skid Control ECU 3. Meter Circuit Plate 4. Wire Harness 	DI-428 DI-1405 DI-1489 BE-82 -

MIRROR HEATER SYSTEM

Symptom	Suspected Area	See Page
Mirror heater system does not operate.	<ol style="list-style-type: none"> 1. GAUGE Fuse 2. Mirror Heater Switch 3. Ignition Switch 4. MIR HTR Relay 5. Wire Harness 	BE-29 BE-107 BE-37 BE-107 -

POWER WINDOW CONTROL SYSTEM

Symptom	Suspected Area	See Page
Power window does not operate. Power door lock does not operate.	<ol style="list-style-type: none"> 1. ECU-IG Fuse 2. POWER Relay 3. Ignition Switch 4. Integration Relay 	BE-29 BE-114 BE-37 BE-128
Power window does not operate. Power door lock is normal.	<ol style="list-style-type: none"> 1. Power Window Master Switch 2. Wire Harness 	BE-114 -
One-touch power window system does not operate.	Power Window Master Switch	BE-114
Only one window does not move.	<ol style="list-style-type: none"> 1. Power Window Master Switch 2. Power Window Control Switch 3. Power Window Motor 4. Wire Harness 	BE-114 BE-114 BE-114 -
Window lock system does not operate.	Power Window Master Switch	BE-114
Key-off power window does not operate.	<ol style="list-style-type: none"> 1. ECU-IG Fuse 2. POWER Relay 3. Ignition Switch 4. Door Courtesy Switch 5. Integration Relay 6. Wire Harness 	BE-29 BE-114 BE-37 BE-61 BE-128 -

POWER SLIDE BACK WINDOW SYSTEM

Symptom	Suspected Area	See Page
Power slide back window does not operate. Power window does not operate.	<ol style="list-style-type: none"> 1. ECU-IG Fuse 2. POWER Relay 3. Ignition Switch 4. Integration Relay 	BE-114 BE-114 BE-37 BE-128
Power slide back window does not operate. Power window is normal.	<ol style="list-style-type: none"> 1. Power Slide Back Window Switch 2. Power Slide Back Window Motor 3. Wire Harness 	BE-122 BE-122 -

POWER DOOR LOCK CONTROL SYSTEM

Symptom	Suspected Area	See Page
Entire door lock system does not operate.	<ol style="list-style-type: none"> 1. ECU-IG Fuse 2. POWER Fuse 3. Integration Relay 4. Wire Harness 	BE-29 BE-29 BE-128 -

Manual door lock/unlock switch does not operate.	1. Door Lock Control Switch 2. Door Unlock Detection Switch 3. Integration Relay 4. Wire Harness	BE-128 BE-128 BE-128 -
Door lock/unlock key does not operate.	1. Door Key Lock and Unlock Switch 2. Integration Relay 3. Wire Harness 4. Door Lock Link Disconnected	BE-128 BE-128 - -
Key confine prevention function does not operate.	1. Key Unlock Warning Switch 2. Door Courtesy Switch 3. Integration Relay 4. Wire Harness	BE-37 BE-61 BE-180 -
Only one door lock does not operate.	1. Door Lock Motor 2. Wire Harness	BE-180 -

TOYOTA VEHICLE INTRUSION PROTECTION (TVIP) SYSTEM

Symptom	Suspected Area	See Page
TOYOTA vehicle intrusion protection (TVIP) system operates abnormally.	TROUBLESHOOTING	DI-2317

WIRELESS DOOR LOCK CONTROL SYSTEM

HINT:

Troubleshooting of the wireless door lock control system is based on the premise that the door lock control system is operating normally. Accordingly, before troubleshooting the wireless door lock control system, first make certain that the door lock control system is operating normally.

Symptom	Suspected Area	See Page
Entire wireless door lock control system does not operate.	1. Transmitter 2. TVIP ECU 3. Wire Harness	BE-180 DI-2317 -
Wireless door lock operates, but the buzzer does not sound.	1. TVIP Buzzer 2. TVIP ECU 3. Wire Harness	DI-2317 -

POWER SEAT CONTROL SYSTEM

Symptom	Suspected Area	See Page
Power seat does not operate.	1. POWER Fuse 2. Power Seat Switch 3. Wire Harness	BE-114 BE-184 -
Slide operation does not operate.	1. Power Seat Switch 2. Slide Motor 3. Wire Harness	BE-184 BE-184 -
Front tilt operation does not operate.	1. Power Seat Switch 2. Front Tilt Motor 3. Wire Harness	BE-184 BE-184 -
Rear lifter operation does not operate.	1. Power Seat Switch 2. Rear Lifter Motor 3. Wire Harness	BE-184 BE-184 -
Reclining operation does not operate.	1. Power Seat Switch 2. Reclining Motor 3. Wire Harness	BE-184 BE-184 -
Lumbar support operation does not operate.	1. Lumbar Support Switch 2. Lumbar Support Motor 3. Wire Harness	BE-184 BE-184 -

POWER MIRROR CONTROL SYSTEM

Symptom	Suspected Area	See Page
Mirror does not operate.	<ol style="list-style-type: none"> 1. ACC Fuse 2. ECU-B Fuse (2UZ-FE) 3. ACC CUT Relay (2UZ-FE) 4. Ignition Switch 5. Mirror Switch 6. Mirror Motor 7. ECM (2UZ-FE) 8. Wire Harness 	BE-114 BE-114 BE-192 BE-37 BE-192 BE-192 DI-428 -
Mirror operates abnormally.	<ol style="list-style-type: none"> 1. Mirror Switch 2. Mirror Motor 3. Wire Harness 	BE-192 BE-192 -

ELECTRO CHROMIC MIRROR SYSTEM

Symptom	Suspected Area	See Page
Electro chromic mirror does not operate.	<ol style="list-style-type: none"> 1. GAUGE Fuse 2. Electro Chromic Mirror 3. Wire Harness 	BE-24 BE-189 -

CLOCK SYSTEM (in A/C Control Panel)

Symptom	Suspected Area	See Page
Clock does not operate.	TROUBLESHOOTING NO. 1	BE-200
Clock loses or gains time.	TROUBLESHOOTING NO. 2	BE-200

NAVIGATION SYSTEM

Symptom	Suspected Area	See Page
Navigation system operates abnormally.	TROUBLESHOOTING	DI-2786

AUDIO SYSTEM

Symptom	Suspected Area	See Page
Audio system operates abnormally.	TROUBLESHOOTING	DI-2545
Rear seat audio system operates abnormally.	TROUBLESHOOTING	DI-2656

REAR SEAT ENTERTAINMENT SYSTEM

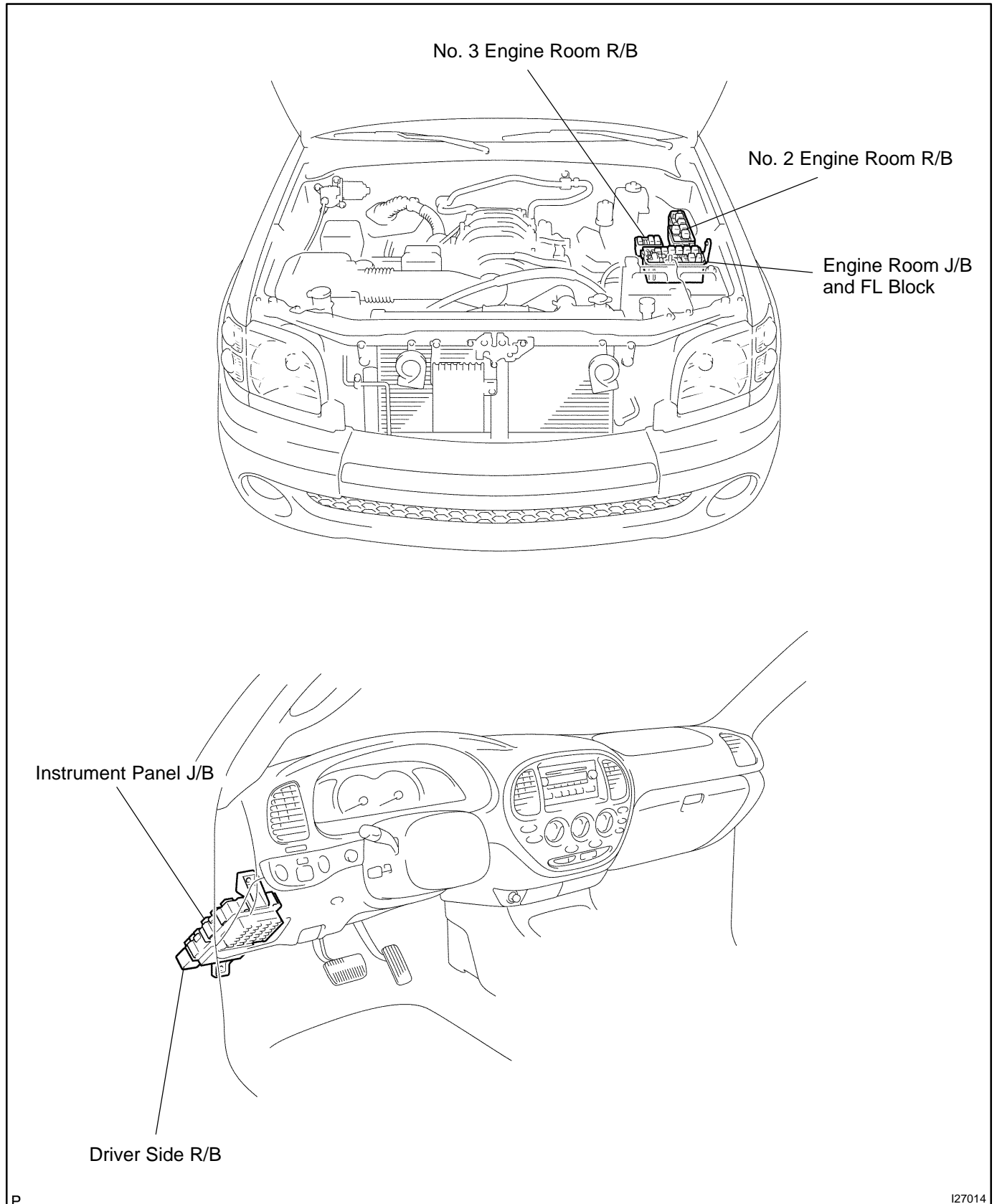
Symptom	Suspected Area	See Page
Rear seat entertainment system operates abnormally.	TROUBLESHOOTING	DI-2693

TRAILER TOWING

Symptom	Suspected Area	See Page
Trailer towing does not operate.	<ol style="list-style-type: none"> 1. TOWING Fuse 2. TOWING TAIL Fuse 3. TOWING BRK Fuse 4. GAUGE Fuse 5. TOW TAIL Relay 6. SUB BATT Relay 7. Towing Converter 8. Wire Harness 	BE-29 BE-29 BE-29 BE-29 BE-213 BE-213 BE-213 -

POWER SOURCE (Double Cab) LOCATION

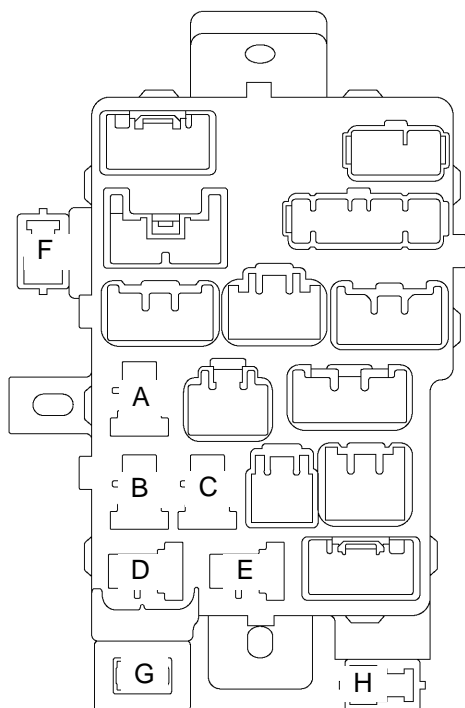
BE2JY-01



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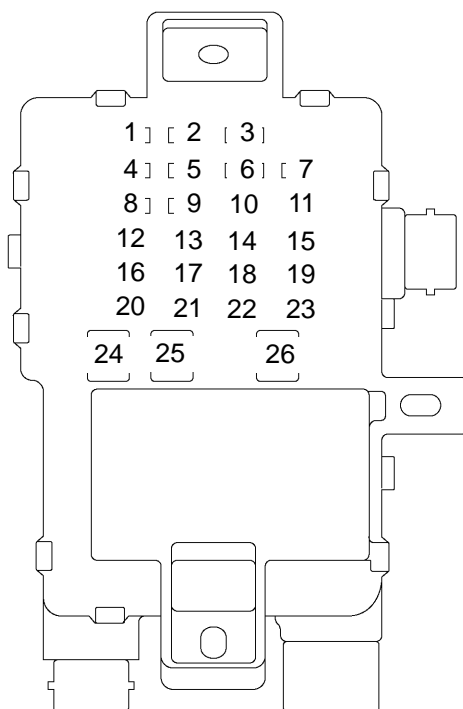
I27014

Instrument Panel J/B



Relays

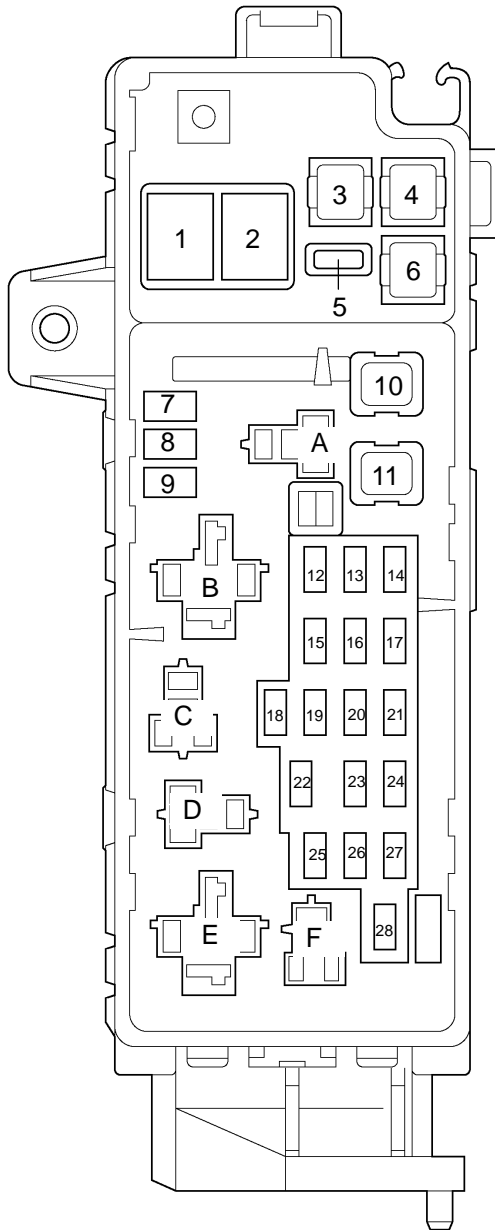
- A: TAILLIGHT Relay
- B: BACK-UP Light Relay
- C: ACC Relay
- D: POWER MAIN Relay
- E: FOG LIGHT Relay
- F: BACK WINDOW Relay
- G: Turn Signal Flasher Relay



Fuses

- | | | | |
|-------------------|-------|---------------------|-------|
| 1: TAIL Fuse | 15 A | 14: IGN1 Fuse | 10 A |
| 2: PWR NO. 4 Fuse | 20 A | 15: GAUGE Fuse | 15 A |
| 3: PANEL Fuse | 7.5 A | 16: IGN2 Fuse | 20 A |
| 4: ECU-IG Fuse | 10 A | 17: STOP Fuse | 15 A |
| 5: CIG Fuse | 15 A | 18: SUN ROOF Fuse | 25 A |
| 6: PWR NO. 1 Fuse | 25 A | 19: PWR OUTLET Fuse | 15 A |
| 7: HTR Fuse | 10 A | 20: PWR NO. 3 Fuse | 20 A |
| 8: WSH Fuse | 25 A | 21: OBD Fuse | 7.5 A |
| 9: RAD NO. 2 Fuse | 7.5 A | 22: PWR NO. 2 Fuse | 25 A |
| 10: WIP Fuse | 25 A | 23: SEAT HTR Fuse | 15 A |
| 11: FOG Fuse | 15 A | 24: PWR SEAT M-fuse | 30 A |
| 12: AC INV Fuse | 15 A | 25: AM1 M-fuse | 40 A |
| 13: 4WD Fuse | 20 A | 26: PWR NO. 5 Fuse | 30 A |

Engine Room J/B and FL Block



Fuses

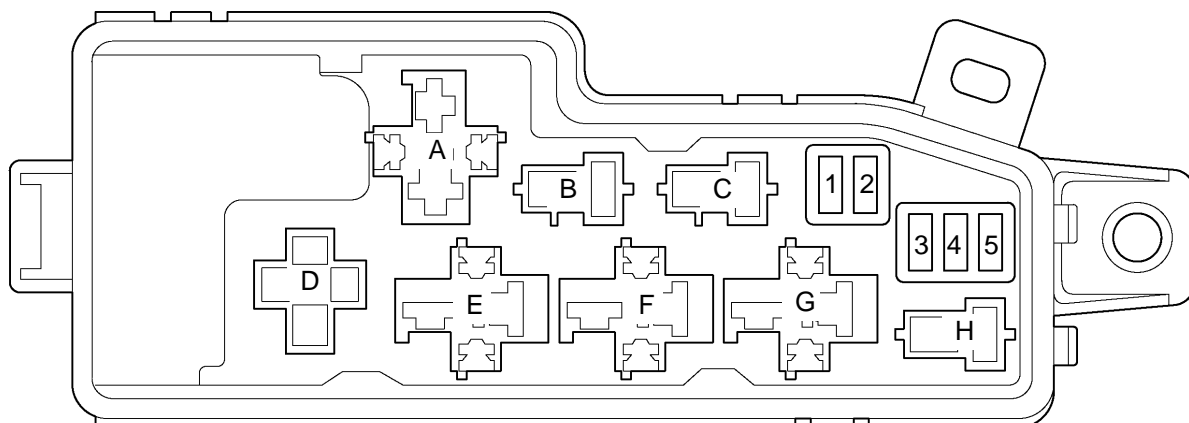
1: ABS NO. 2 H-fuse	60 A	15: DRL Fuse*3	15 A
2: ALT H-fuse	140 A	H-LP LH Fuse*4	15 A
3: DEFOG M-fuse	40 A	16: ALT-S Fuse	7.5 A
4: ABS NO. 1 M-fuse*1	50 A	17: TOWING Fuse	30 A
ABS NO. 1 M-fuse*2	30 A	18: ST Fuse	30 A
5: CARGO LP Fuse	7.5 A	19: RAD No. 3 Fuse	20 A
6: HEATER M-fuse	50 A	20: TURN-HAZ Fuse	20 A
7: Spare Fuse	15 A	21: AM2 Fuse	25 A
8: Spare Fuse	20 A	22: EFI NO. 2 Fuse	10 A
9: Spare Fuse	30 A	23: SHORT-PIN	
10: MAIN Fuse	40 A	24: HORN Fuse	10 A
11: DOOR NO. 2 M-fuse	30 A	25: MIR HTR Fuse	15 A
12: H-LP RH Fuse*4	15 A	26: ECU-B Fuse	7.5 A
13: EFI NO. 1 Fuse	20 A	27: DOME Fuse	10 A
14: ETCS Fuse	10 A	28: RAD NO. 1 Fuse	25 A

Relays

- A: C/OPN Relay
- B: HEAD Relay
- C: EFI Relay
- D: FUEL PUMP Relay
- E: DEFOG Relay
- F: HORN Relay

*1: w/ VSC
 *2: w/o VSC
 *3: w/ Daytime Running Light
 *4: w/o Daytime Running Light

No. 2 Engine Room R/B

**Fuses**

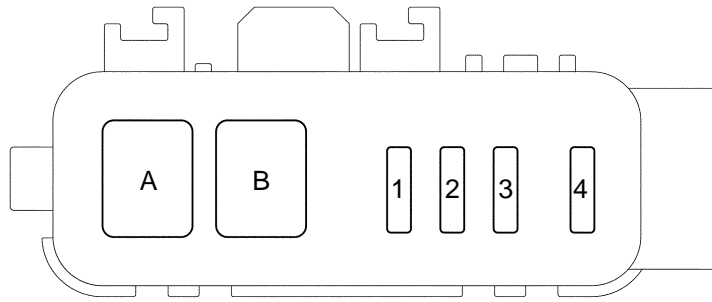
1: H-LP LL Fuse*	10 A
2: H-LP RL*	10 A
3: A/C Fuse	7.5 A
4: H-LP LH Fuse*	10 A
5: H-LP RH Fuse*	10 A

Relays

A:	-
B:	MIR HTR Relay
C:	ABS SOL Relay
D:	-
E:	DRL NO. 4 Relay*
F:	HEATER Relay
G:	DIMMER Relay
H:	ST Relay

*: w/ Daytime Running Light

No. 3 Engine Room R/B



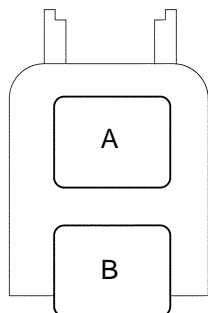
Fuses

- 1: TOWING BRK Fuse 30 A
- 2: BATT CHARGE Fuse 30 A
- 3: TOWING TAIL Fuse 30 A
- 4: RSE Fuse 7.5 A

Relays

- A: BATT CHARGE Relay
- B: TOWING TAIL Relay

Driver Side R/B

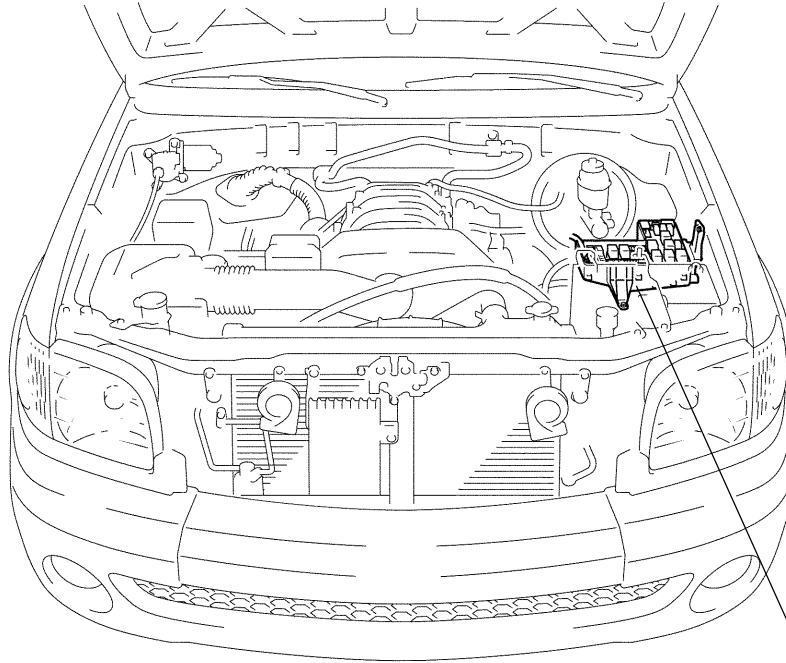


Relays

- A: INVERTER Relay
- B: SEAT HEATER Relay

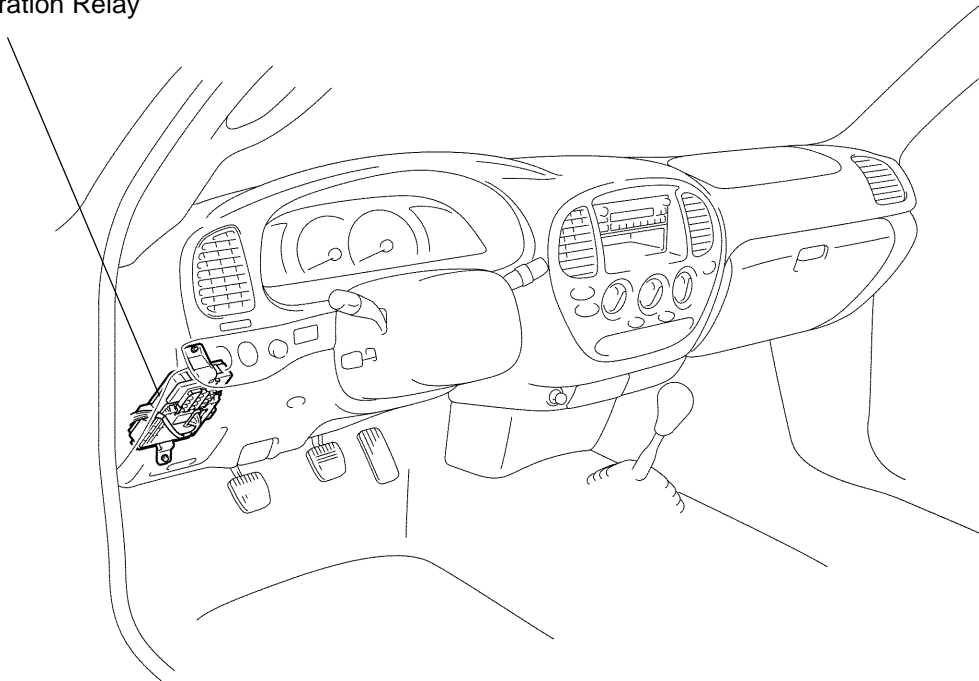
POWER SOURCE (Except Double Cab) LOCATION

BE2JZ-02



Engine Room R/B

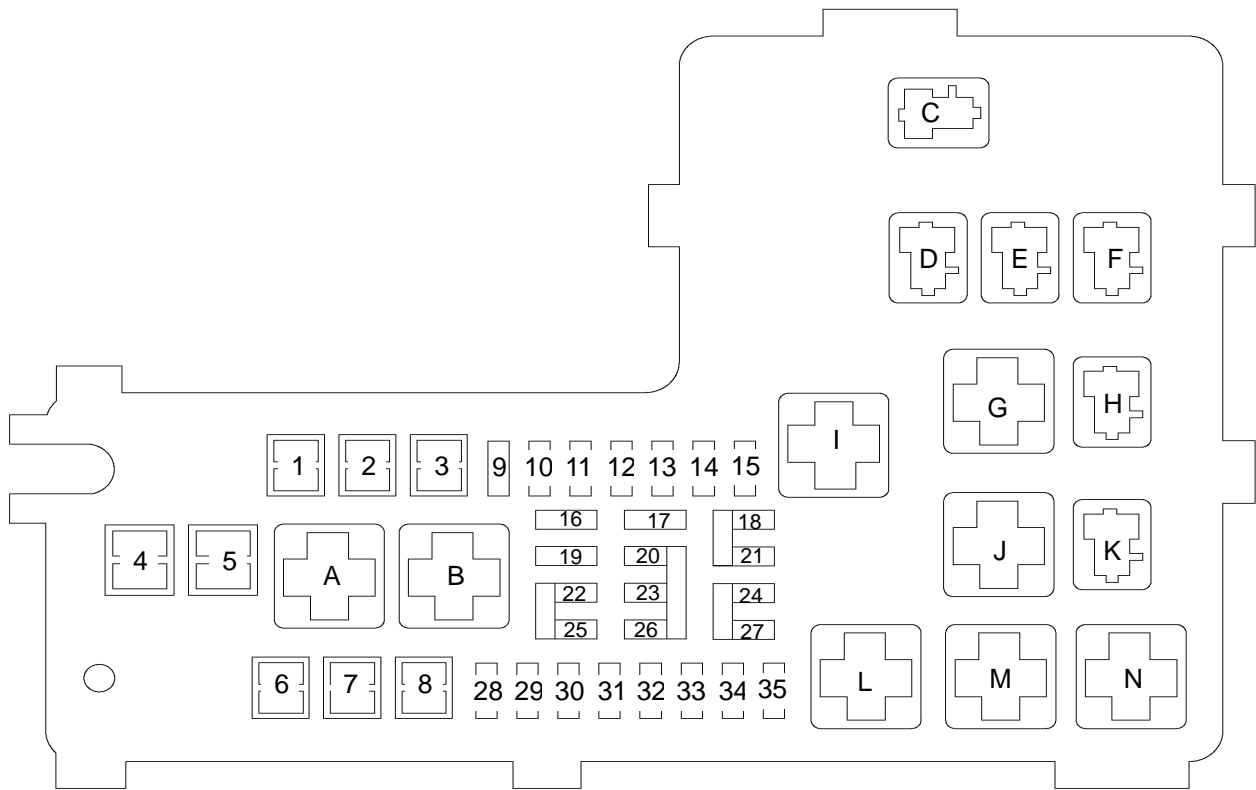
Driver Side J/B
● Integration Relay



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Engine Room R/B



Fuses

1: ABS2 M-fuse	50 A
2: ABS3 M-fuse	50 A
3: ST3 M-fuse	30 A
4: ALT H-fuse*1	140 A
ALT H-fuse*2	100 A
5: -	
6: AM1 M-fuse	40 A
7: HTR M-fuse	50 A
8: J/B M-fuse	50 A
9: ALT-S Fuse	7.5 A
10: ETCS Fuse	15 A
11: HAZ Fuse	15 A
12: EFI NO. 1 Fuse	20 A
13: AM2 Fuse	30 A
14: TOWING Fuse	30 A
15: SHORT PIN	-
16: A/C Fuse	10 A
17: -	
18: HEAD LL Fuse	10 A
19: EFI NO. 2 Fuse	10 A

20: RADIO Fuse	20 A
21: HEAD RL Fuse	10 A
22: PWR OUTLET2 Fuse	15 A
23: DOME Fuse	10 A
24: H-LP LH Fuse	10 A
25: PWR OUTLET1 Fuse	15 A
26: ECU-B Fuse	5 A
27: H-LP RH Fuse	10 A
28: MIR HTR Fuse	15 A
29: FOG Fuse	15 A
30: TOW BRK Fuse	30 A
31: SUB BATT Fuse	30 A
32: TOW TAIL Fuse	30 A
33: -	
34: -	
35: -	

Relays

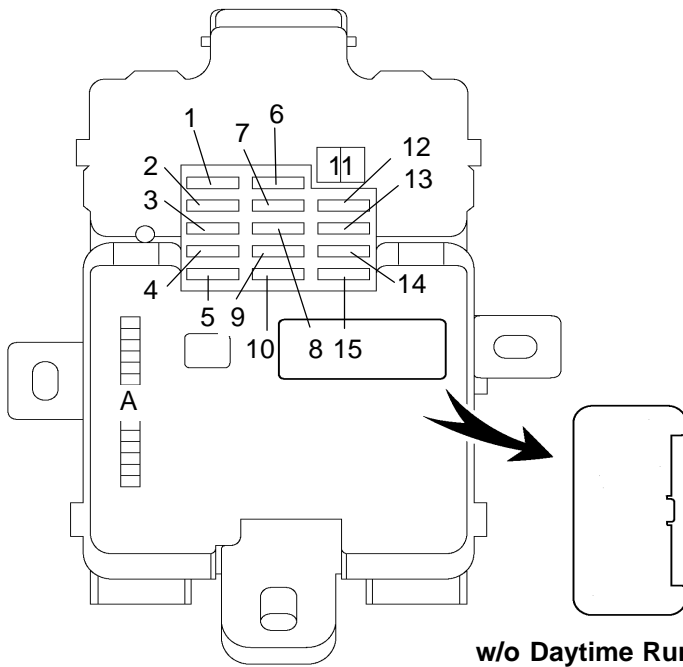
A: DRL NO. 4 Relay
B: DIMMER Relay
C: ST Relay
D: F/PMP Relay
E: C/OPN Relay
F: EFI Relay
G: TOW TAIL Relay
H: ABS SOL Relay
I: H-LP Relay
J: SUB BATT Relay
K: MIR HTR Relay
L: POWER OUTLET Relay
M: FOG Relay
N: HEATER Relay

*1: Towing Package

*2: Except Towing Package

Driver Side J/B

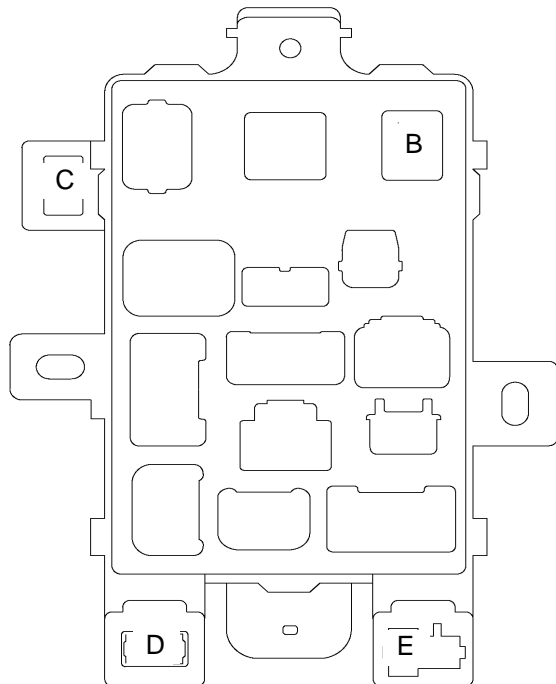
w/ Daytime Running Light



Fuses

1: -	
2: WIP Fuse	20 A
3: TURN Fuse	5 A
4: ECU-IG Fuse	5 A
5: 4WD Fuse	20 A
6: ACC Fuse	15 A
7: GAUGE Fuse	10 A
8: IGN Fuse	5 A
9: CARGO LP Fuse	5 A
10: TAIL Fuse	15 A
11: POWER M-fuse*1	30 A
12: OBD Fuse	7.5 A
13: HORN Fuse	10 A
14: STA Fuse	5 A
15: STOP Fuse	15 A

w/o Daytime Running Light



Relays

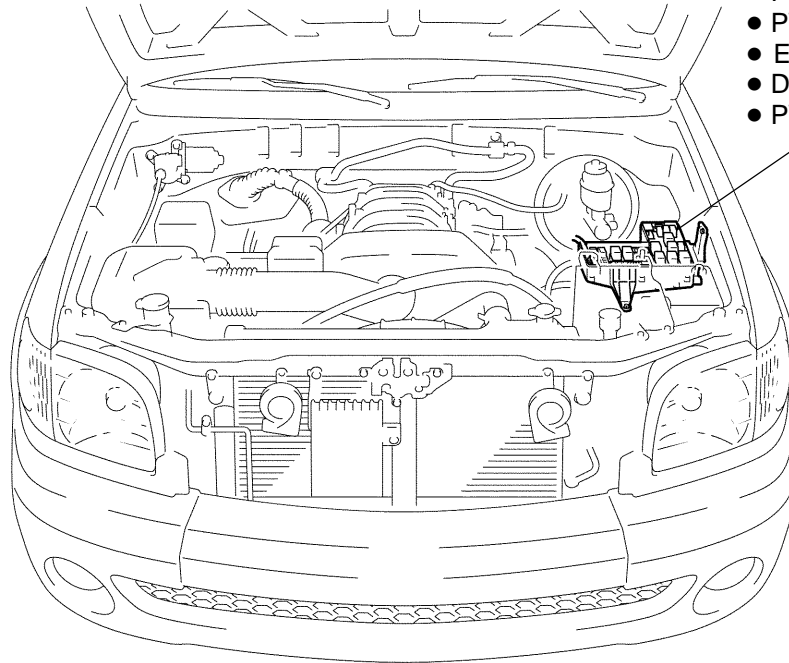
- A: Integration Relay
- B: POWER Relay
- C: ACC CUT Relay
- D: Turn Signal Flasher
- E: BACK-UP LIGHT Relay*2

*1: Towing Package

*2: A/T

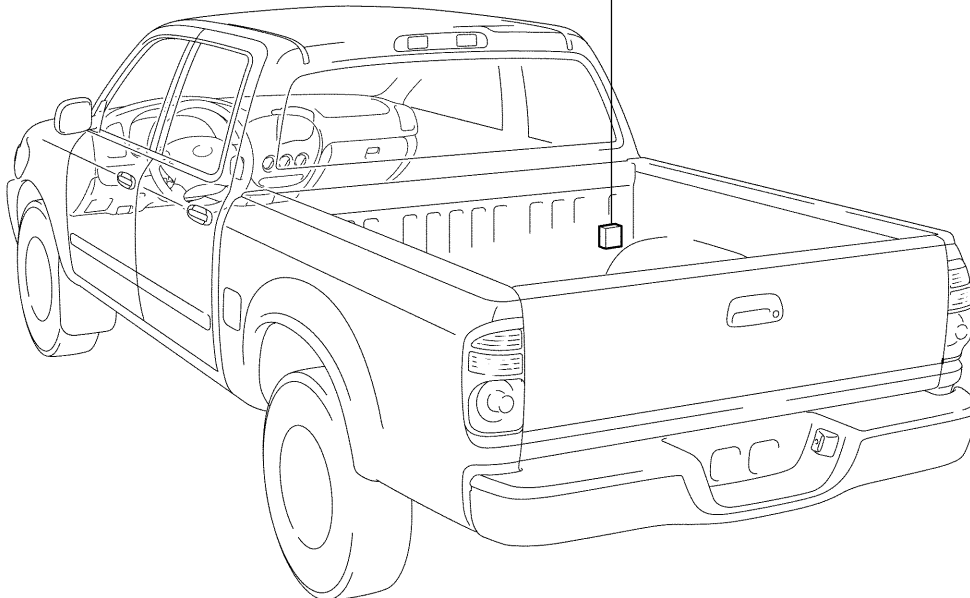
POWER OUTLET LOCATION

BE2K0-01



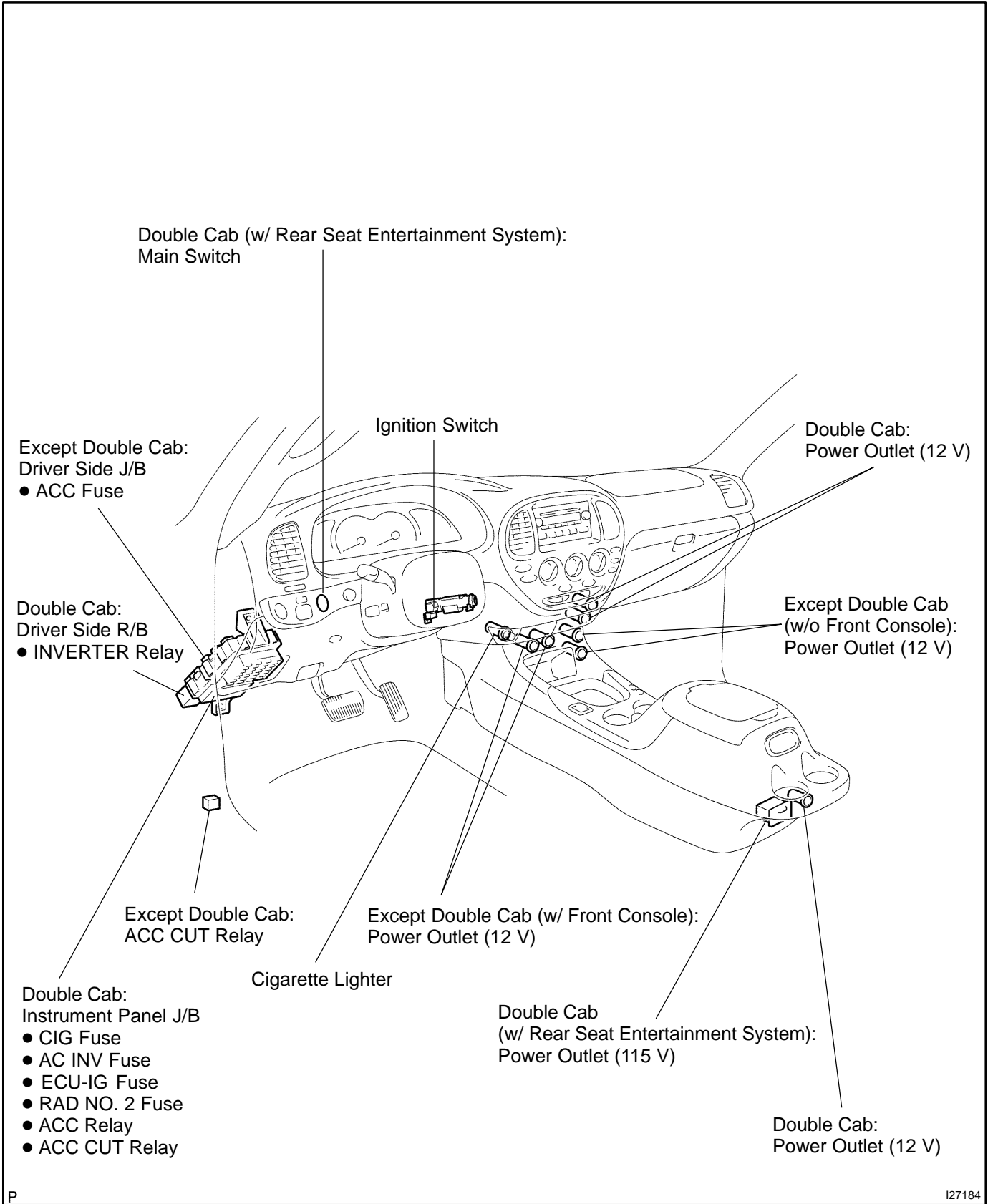
- Except Double Cab:
Engine Room R/B
- PWR OUTLET1 Fuse
 - PWR OUTLET2 Fuse
 - EUC-B Fuse
 - DOME Fuse
 - PWR OUTLET Relay

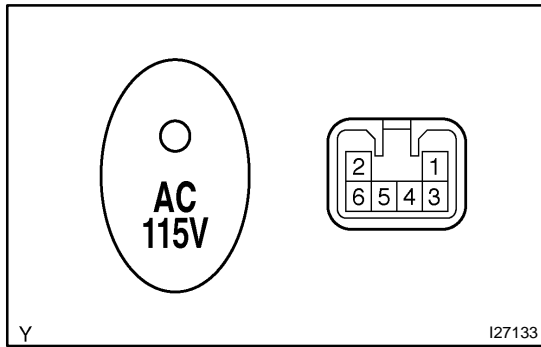
Double Cab (w/ Rear Seat Entertainment System):
Voltage Inverter



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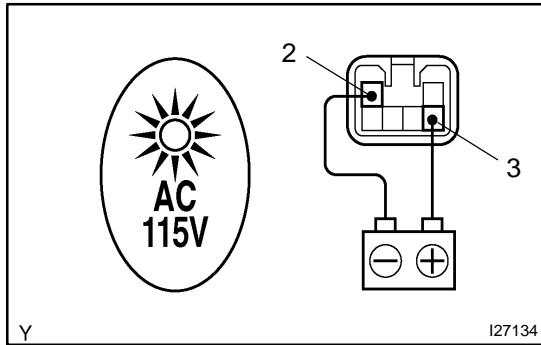


INSPECTION

1. Double cab (115 V): INSPECT MAIN SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
ON	3 - 6	Continuity
OFF	3 - 6	No continuity

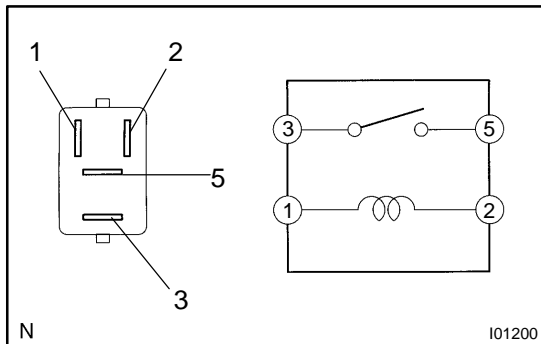
If the continuity is not as specified, replace the switch.



2. Double cab (115 V): INSPECT MAIN SWITCH INDICATOR LIGHT OPERATION

- Connect the positive (+) lead from the battery to terminal 3 and the negative (-) lead to terminal 2.
- Push the main switch and check that the indicator light turns on.

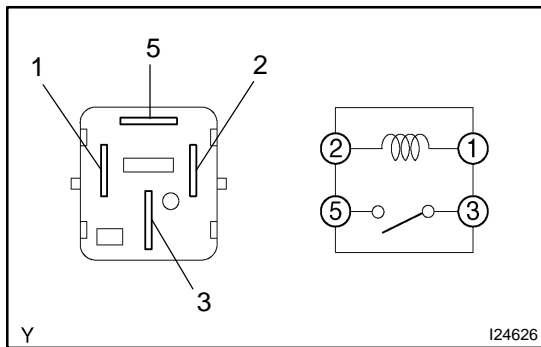
If operation is not as specified, replace the switch.



3. Double cab (115 V): INSPECT INVERTER RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

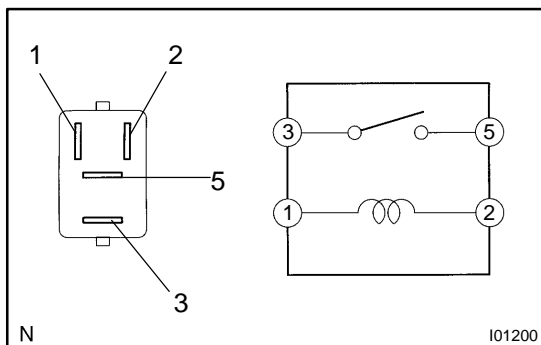
If the continuity is not as specified, replace the switch.



4. Double cab (12 V): INSPECT ACC RELAY AND ACC CUT RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

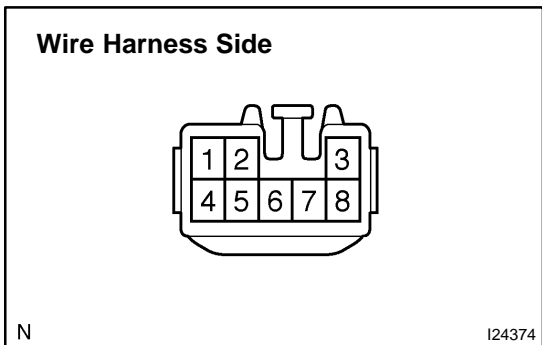
If the continuity is not as specified, replace the switch.



5. Except double cab: INSPECT POWER OUTLET RELAY (Marking: PWR OUTLET) CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the switch.



6. Double cab (115 V):

INSPECT VOLTAGE INVERTER CIRCUIT

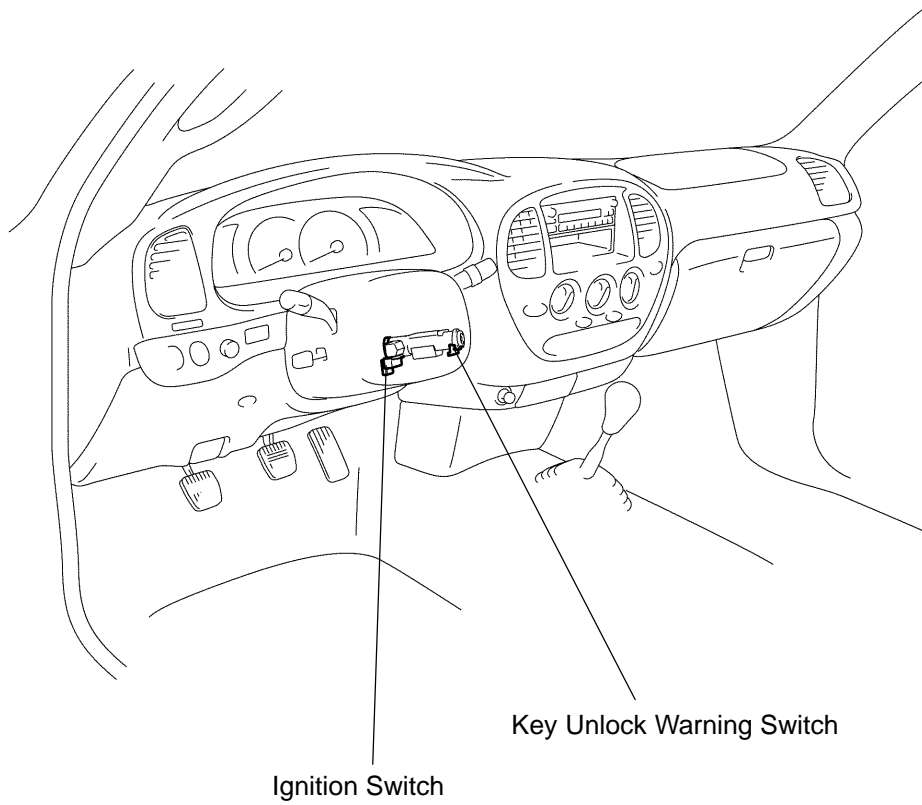
Disconnect the connector from the voltage inverter and check the connector on the wire harness side, as shown in the table.

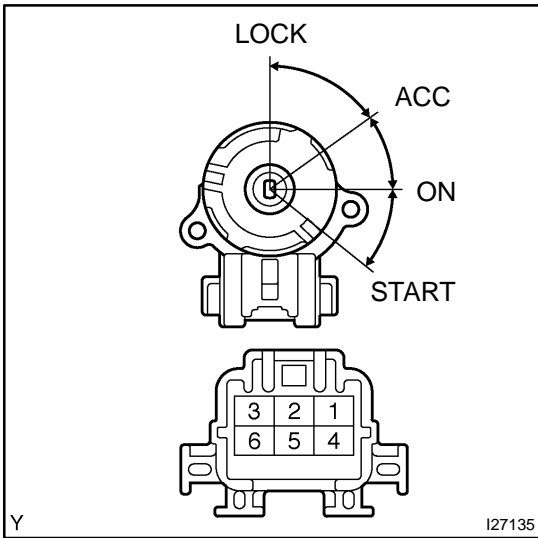
Main Switch Position	Tester Connection	Specified Condition
ON	1 - 4	10 - 14 V
OFF	1 - 4	No continuity

If the result is not as specified, replace the inverter.

IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH LOCATION

BE02W-05



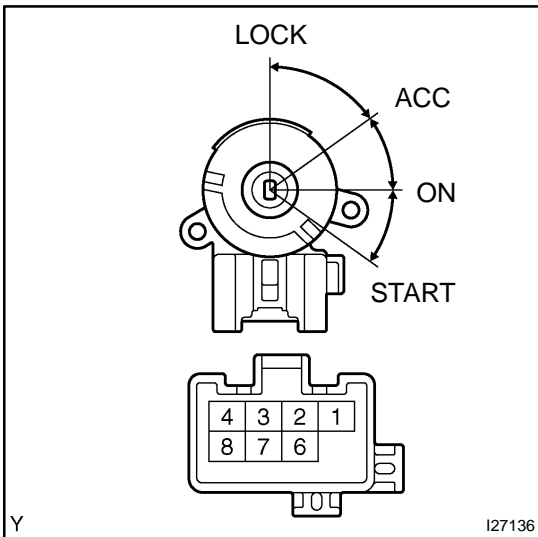


INSPECTION

1. Double cab: INSPECT IGNITION SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
ACC	1 - 3	Continuity
ON	1 - 2 - 3 5 - 6	Continuity
START	1 - 2 4 - 5 - 6	Continuity

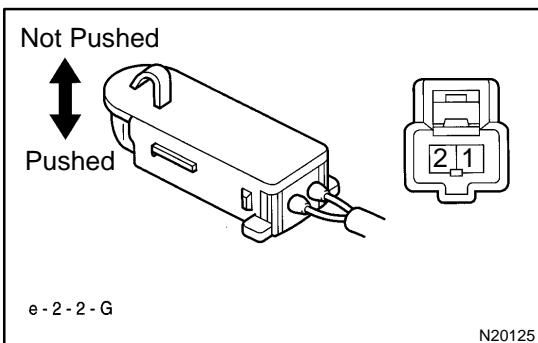
If the continuity is not as specified, replace the switch.



2. Except double cab: INSPECT IGNITION SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
ACC	2 - 3	Continuity
ON	2 - 3 - 4 6 - 7	Continuity
START	1 - 2 - 4 6 - 7 - 8	Continuity

If the continuity is not as specified, replace the switch.



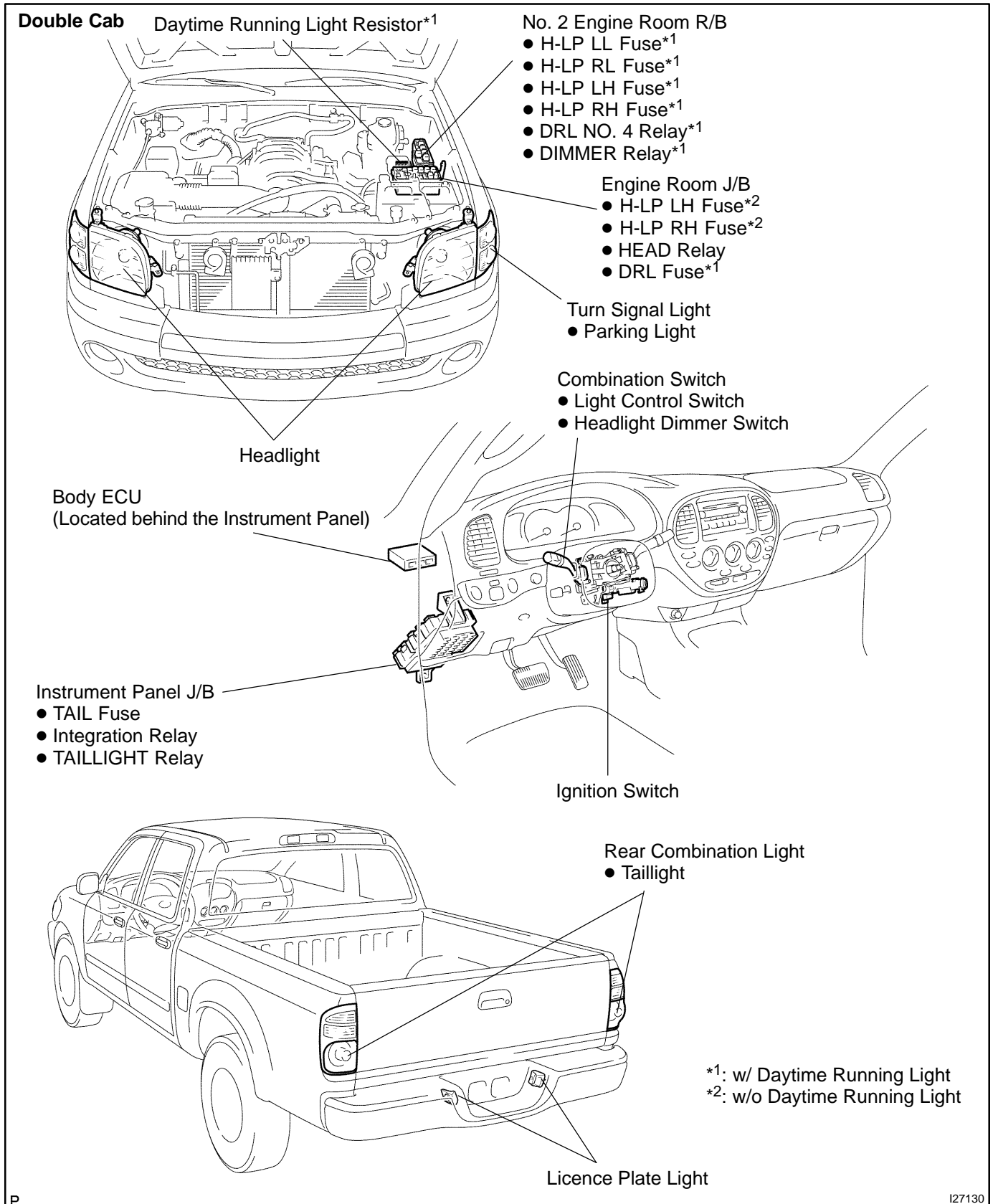
3. INSPECT KEY UNLOCK WARNING SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
Switch not pushed (Key removed)	1 - 2	No continuity
Switch pushed (Key inserted)	1 - 2	Continuity

If the continuity is not as specified, replace the switch.

HEADLIGHT AND TAILLIGHT SYSTEM LOCATION

BE2K3-01

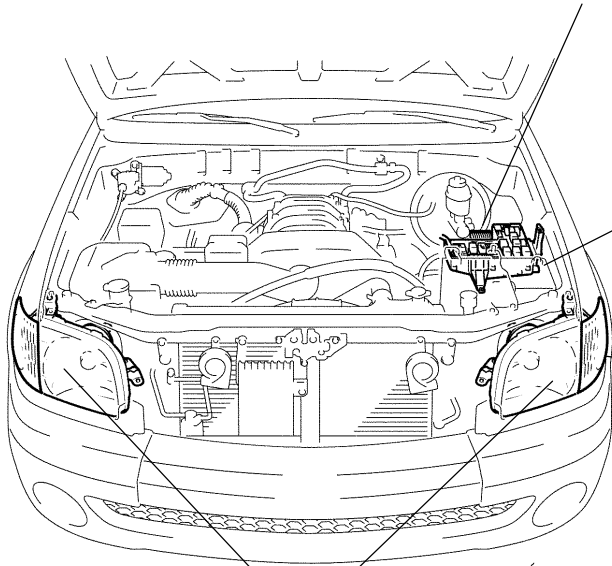


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Except Double Cab

Daytime Running Light Resistor*



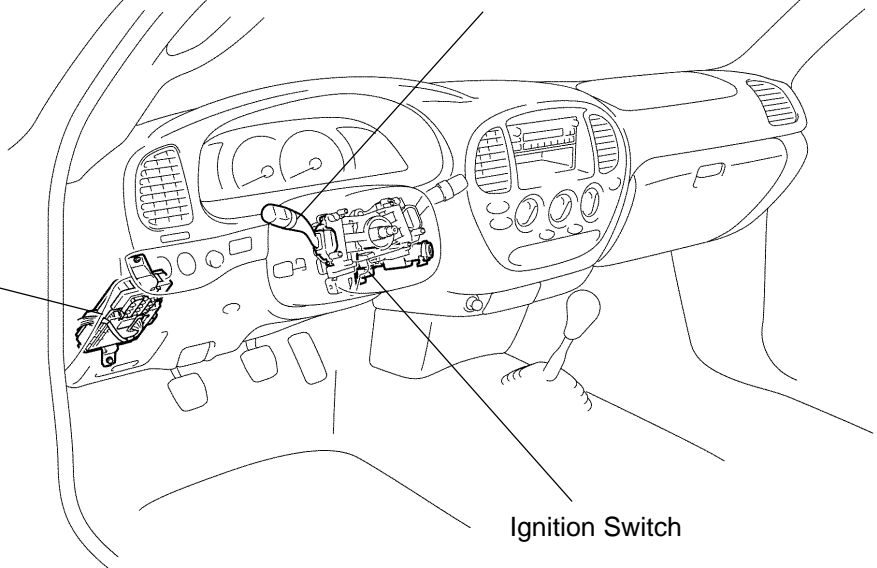
- Engine Room R/B
- HEAD LL Fuse*
 - HEAD RL Fuse*
 - HEAD LH Fuse
 - HEAD RH Fuse
 - H-LP Relay
 - DIMMER Relay
 - DRL NO. 4 Relay*

- Turn Signal Light
- Parking Light

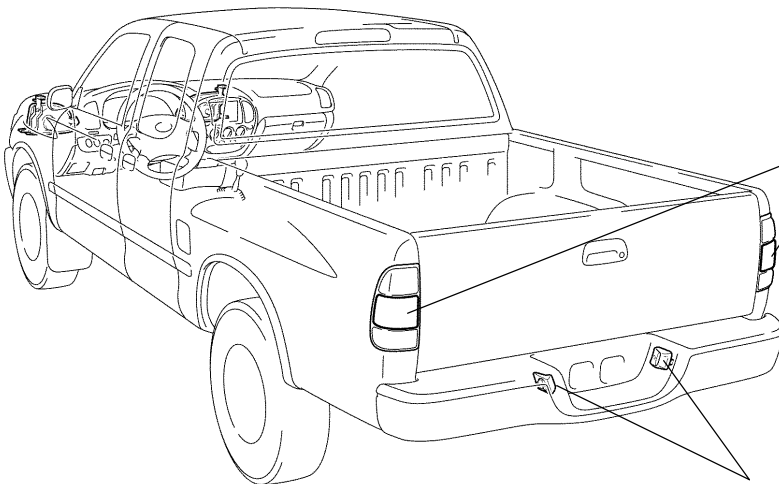
- Combination Switch
- Light Control Switch
 - Headlight Dimmer Switch

Headlight

- Driver Side J/B
- TAIL Fuse
 - Integration Relay



Ignition Switch



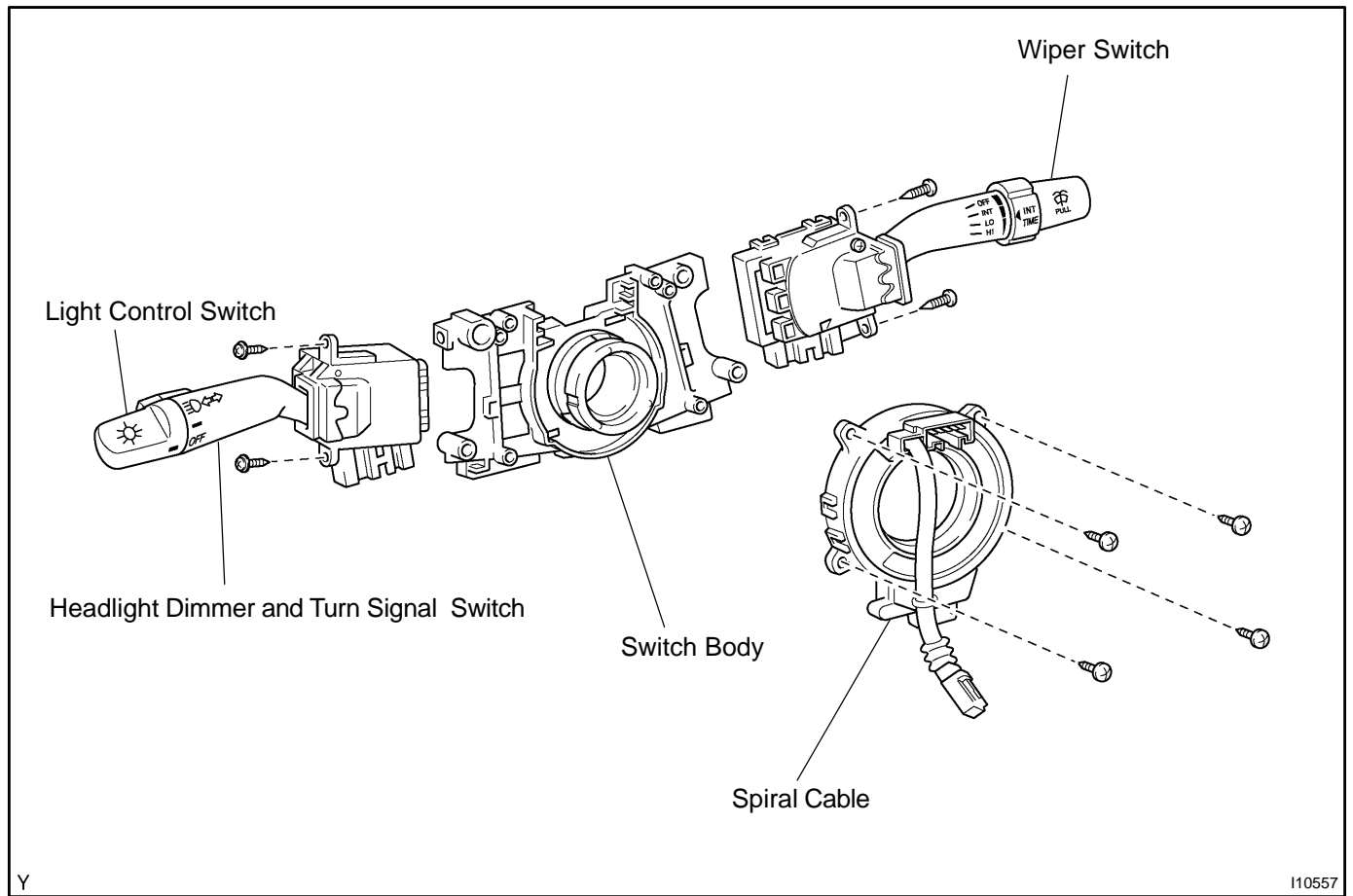
- Rear Combination Light
- Taillight

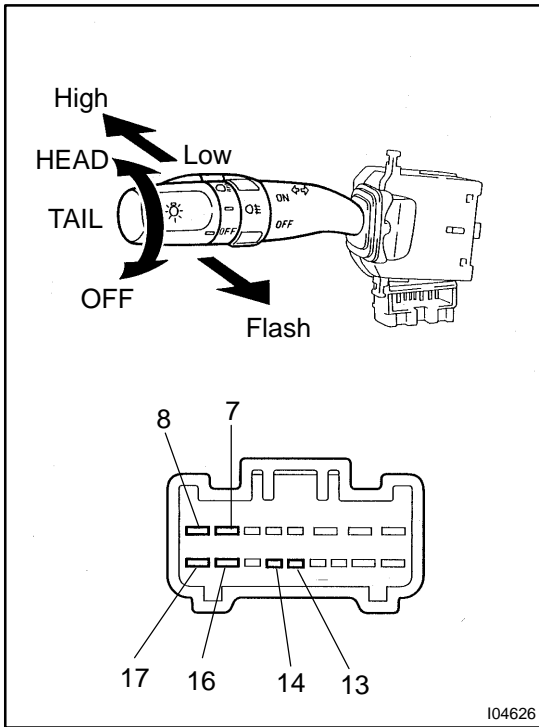
Licence Plate Light

*: w/ Daytime Running Light

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COMPONENTS





INSPECTION

1. INSPECT LIGHT CONTROL SWITCH CONTINUITY

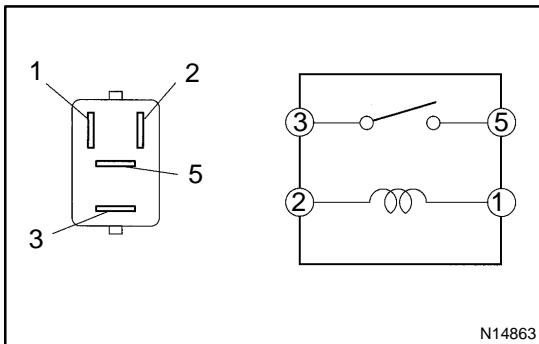
Switch Position	Tester Connection	Specified Condition
OFF	-	No continuity
TAIL	14 - 16	Continuity
HEAD	13 - 14 - 16	Continuity

If the continuity is not as specified, replace the switch.

2. INSPECT HEADLIGHT DIMMER SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
Flash	7 - 8 - 16	Continuity
Low beam	16 - 17	Continuity
High beam	7 - 16	Continuity

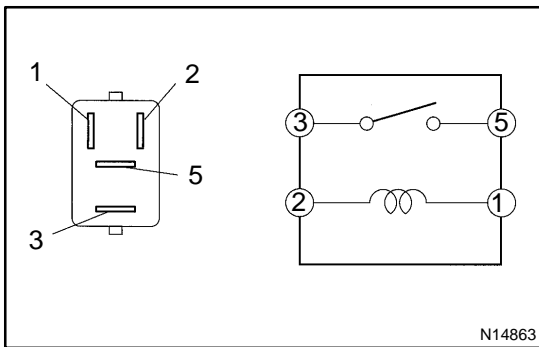
If the continuity is not as specified, replace the switch.



3. INSPECT HEADLIGHT RELAY (Marking: HEAD (Double Cab) or H-LP (Except Double Cab)) CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

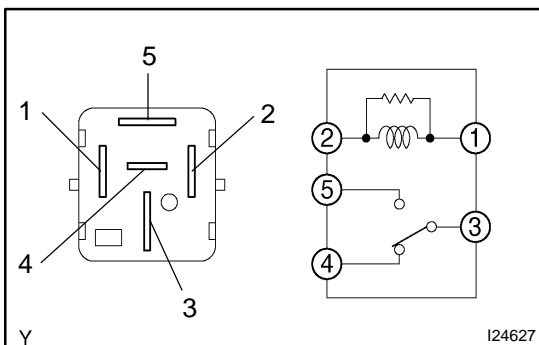
If the continuity is not as specified, replace the relay.



4. Double cab: INSPECT TAILLIGHT RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.



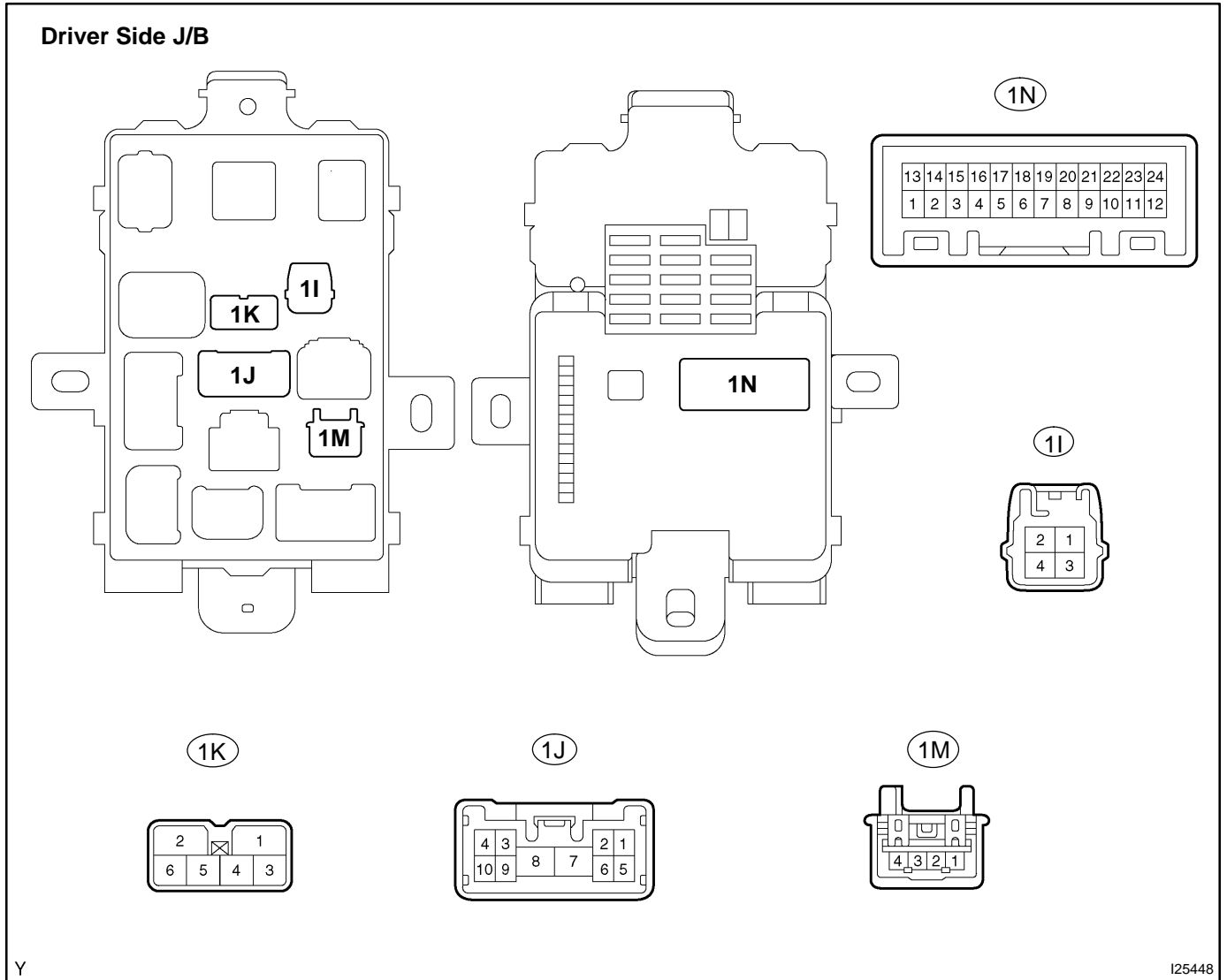
5. w/ Daytime running light: INSPECT DIMMER RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 4	Continuity
3 - 4	No continuity (When battery voltage is applied to terminals 1 and 2)
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the switch.

**6. Except double cab (w/ Day time running light):
CHECK INTEGRATION RELAY (DRIVER SIDE J/B)
CIRCUIT**

- (a) Disconnect the 1I, 1J, 1K, 1M and 1N driver side J/B connectors, and check the voltage or continuity of each terminal of the wire harness side connectors.



Tester Connection	Condition	Specified Condition
1I-2 - Body ground	Ignition switch LOCK or ACC	No voltage
1I-2 - Body ground	Ignition switch ON or START	10 - 14 V
1J-8 - Body ground	Constant	Continuity
1K-2 - Body ground	Constant	10 - 14 V
1K-5 - Body ground	Constant	10 - 14 V
1M-5 - Body ground	Fog light ON	10 - 14 V
1M-5 - Body ground	Fog light OFF	Below 1 V
1M-6 - Body ground	Constant	Continuity

BODY ELECTRICAL - HEADLIGHT AND TAILLIGHT SYSTEM

Tester Connection	Condition	Specified Condition
1N-1 - Body ground	Parking lever released	No continuity
1N-1 - Body ground	Parking lever pulled up	Continuity
1N-2 - Body ground	Engine Stop	No voltage
1N-2 - Body ground	Engine Running	10 - 14 V
1N-3 - Body ground	Light control switch OFF or TAIL	No continuity
1N-3 - Body ground	Light control switch HEAD	Continuity
1N-4 - Body ground	Light control switch OFF or TAIL	No continuity
1N-4 - Body ground	Light control switch HEAD	Continuity
1N-7 - Body ground	Headlight dimmer switch low beam	No continuity
1N-7 - Body ground	Headlight dimmer switch high beam or flash	Continuity
1N-8 - Body ground	Headlight dimmer switch low or high beam	No continuity
1N-8 - Body ground	Headlight dimmer switch flash	Continuity
1N-13 - Body ground	Brake fluid level warning light OFF	No continuity
1N-13 - Body ground	Brake fluid level warning light ON	Continuity
1N-24 - Body ground	Constant	Continuity

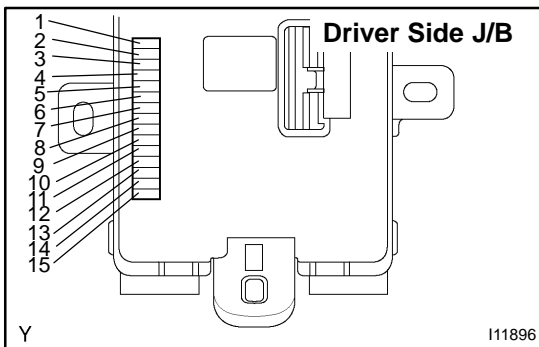
If the result is not as specified, there may be a malfunction on the wire harness side.

- (b) Reconnect the 1I, 1J, 1K, 1M and 1N J/B connectors, and check the voltage of each terminal of the connectors.

Tester Connection	Condition	Specified Condition
1M-3 - Body ground	Light control switch TAIL or HEAD	10 - 14 V
1M-3 - Body ground	Light control switch OFF	Below 1 V
1N-15 - Body ground	Light control switch TAIL or HEAD	10 - 14 V
1N-15 - Body ground	Light control switch OFF	Below 1 V

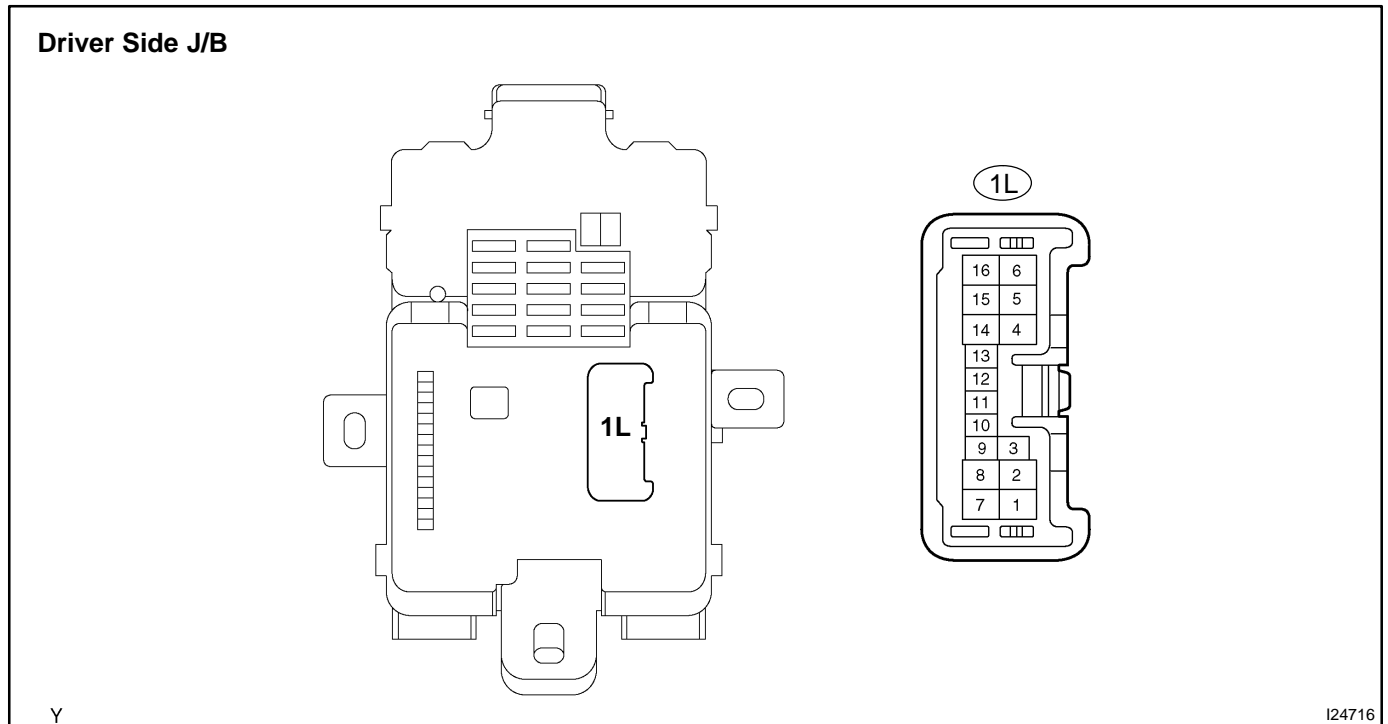
If the result is not as specified, the integration relay (drive side J/B) may have a malfunction.

- (c) Remove the integration relay from the driver side J/B, and check the voltage or continuity of each terminal on the J/B side (see page BE-128).



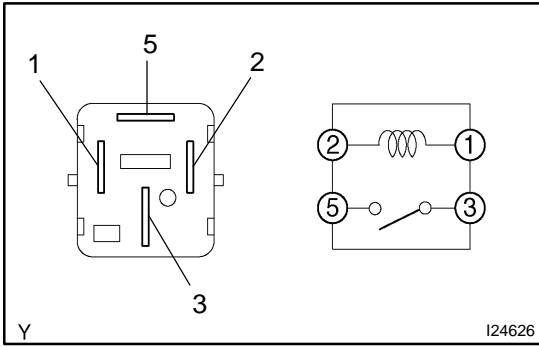
**7. Except double cab (Daytime running light):
CHECK INTEGRATION RELAY (DRIVER SIDE J/B)
CIRCUIT**

Disconnect the 1L driver side J/B connector, and check the voltage or continuity of each terminal of the wire harness side connector.



Tester Connection	Condition	Specified Condition
1L-5 - Body ground	Light control switch OFF	No continuity
1L-5 - Body ground	Light control switch TAIL or HEAD	Continuity
1L-6 - Body ground	Constant	10 - 14 V
1L-13 - Body ground	Light control switch OFF	No continuity
1L-13 - Body ground	Light control switch TAIL or HEAD	Continuity

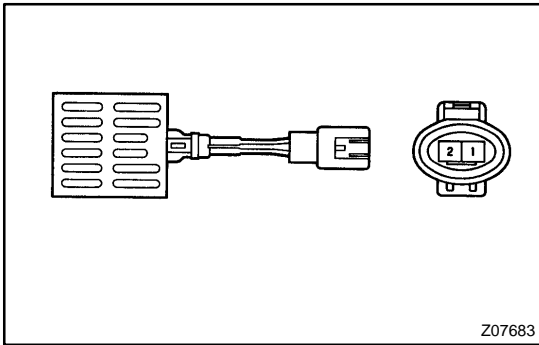
If the result is as specified, there may be a malfunction on the wire harness side.



8. INSPECT DAYTIME RUNNING LIGHT NO. 4 RELAY (Marking: DRL NO. 4) CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.

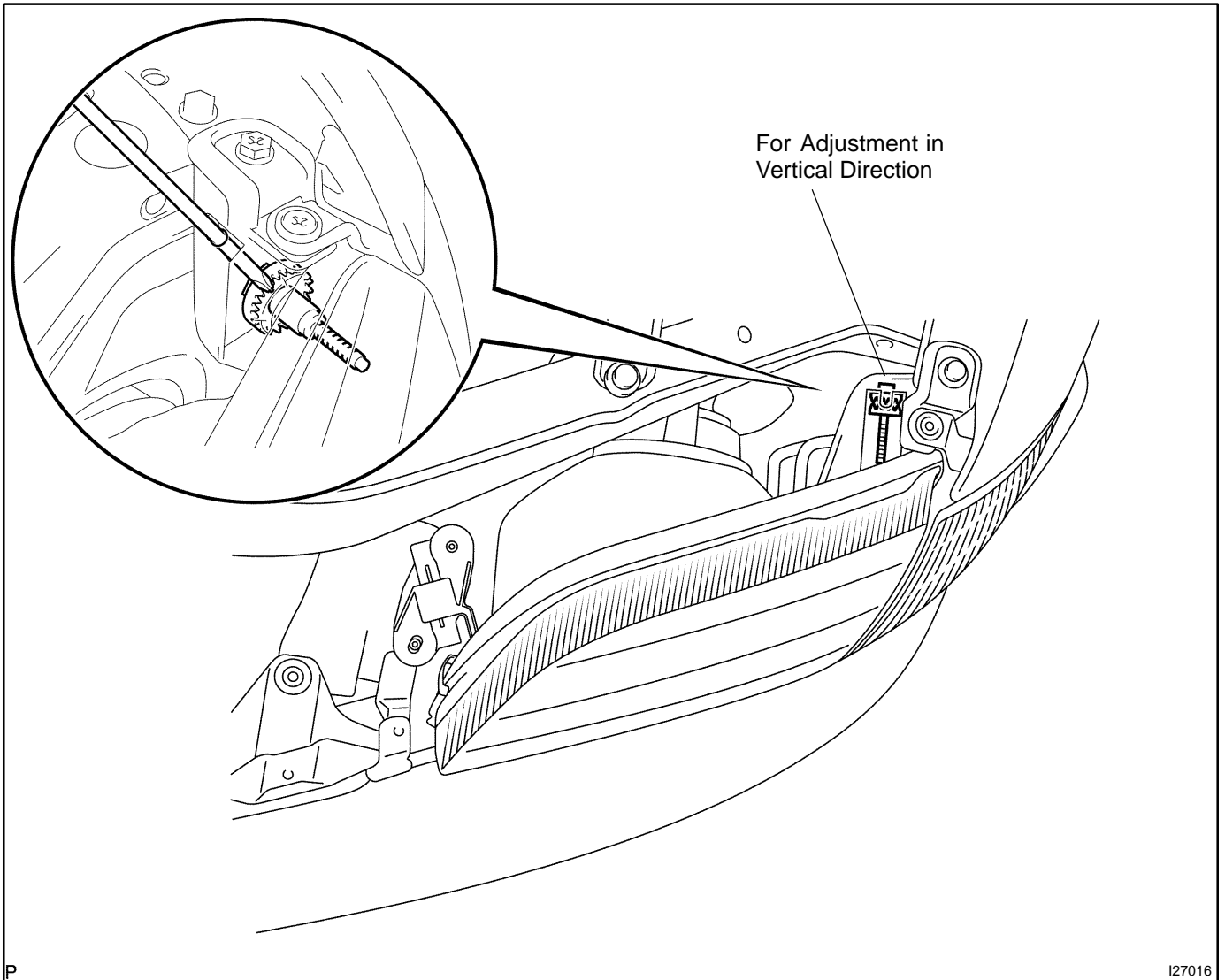


9. INSPECT DAYTIME RUNNING LIGHT RESISTOR

Tester Condition	Specified Condition
1 - 2	Approx. 337 m Ω

If the result is not as specified, replace the resistor.

ADJUSTMENT



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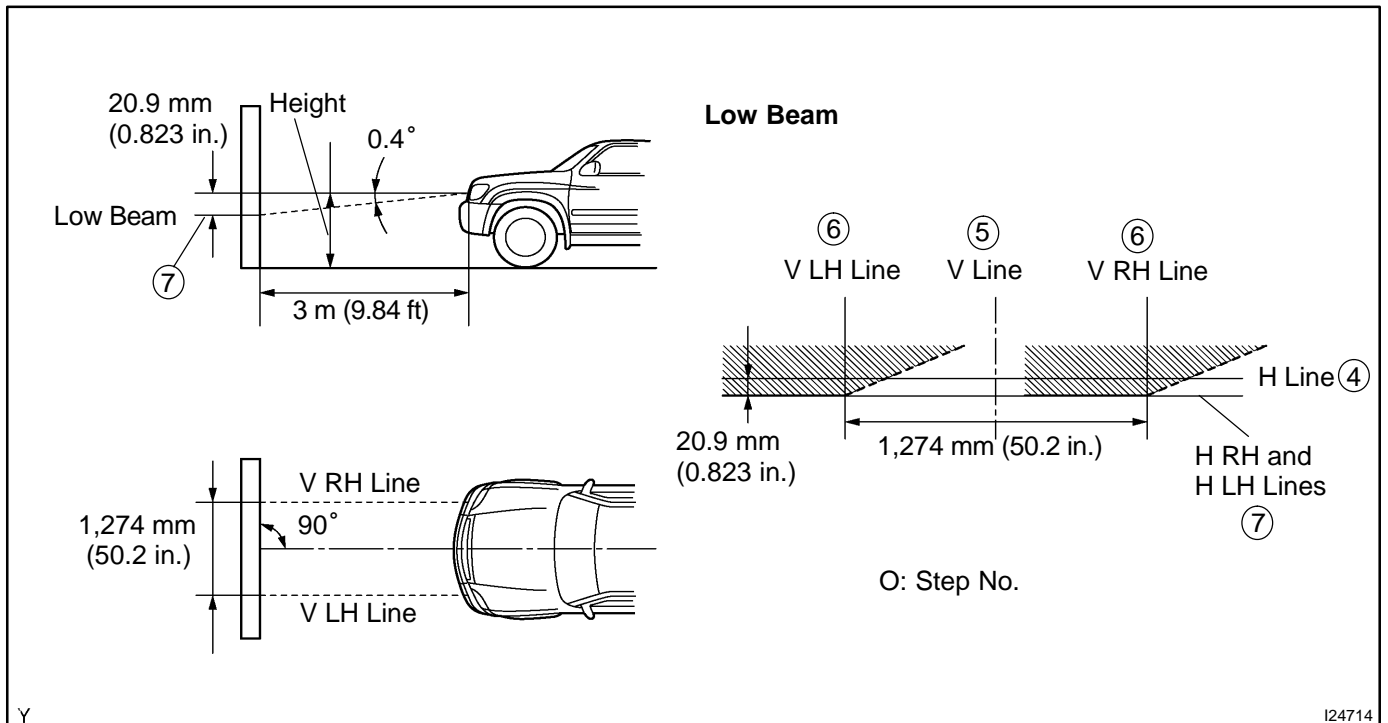
ADJUST HEADLIGHT AIM ONLY

- (a) Place the vehicle in the following conditions.
 - The area where the headlight aiming is not deformed.
 - The vehicle is parked in a flat area.
 - The tire inflation pressure is at the specified value.
 - A driver is in the driver side seat, the vehicle is ready for driving and with the tank is full.
 - The vehicle has been bounced several times.
- (b) Check the headlight aiming.
 - (1) Prepare thick white paper.
 - (2) Put the paper perpendicularly on a ground at the position 3 m (9.84 ft) away from the headlights.
 - (3) Make sure that the center line of the vehicle and the paper face forms a 90-degree angle as shown in the illustration.
 - (4) Draw a horizontal line (H line) across the paper so that it is at the same height as the center mark of the low beam lamp on the vehicle.
 - (5) Draw a vertical line (V line) to where the center line of the vehicle is to be.
 - (6) Draw 2 vertical lines to where the headlights should strike (V RH and V LH lines).
 - (7) Draw a horizontal line by connecting both low beam center marks to where the headlights should strike (H RH and H LH lines).

HINT:

The H RH and H LH lines are 0.4° below the horizontal line (H line) of the light axis.

- (8) Start the engine.
- (9) Turn the headlights ON.
- (10) Check if the headlights properly strike the position as shown in the illustration.
- (11) If not, adjust the headlights aim vertically.



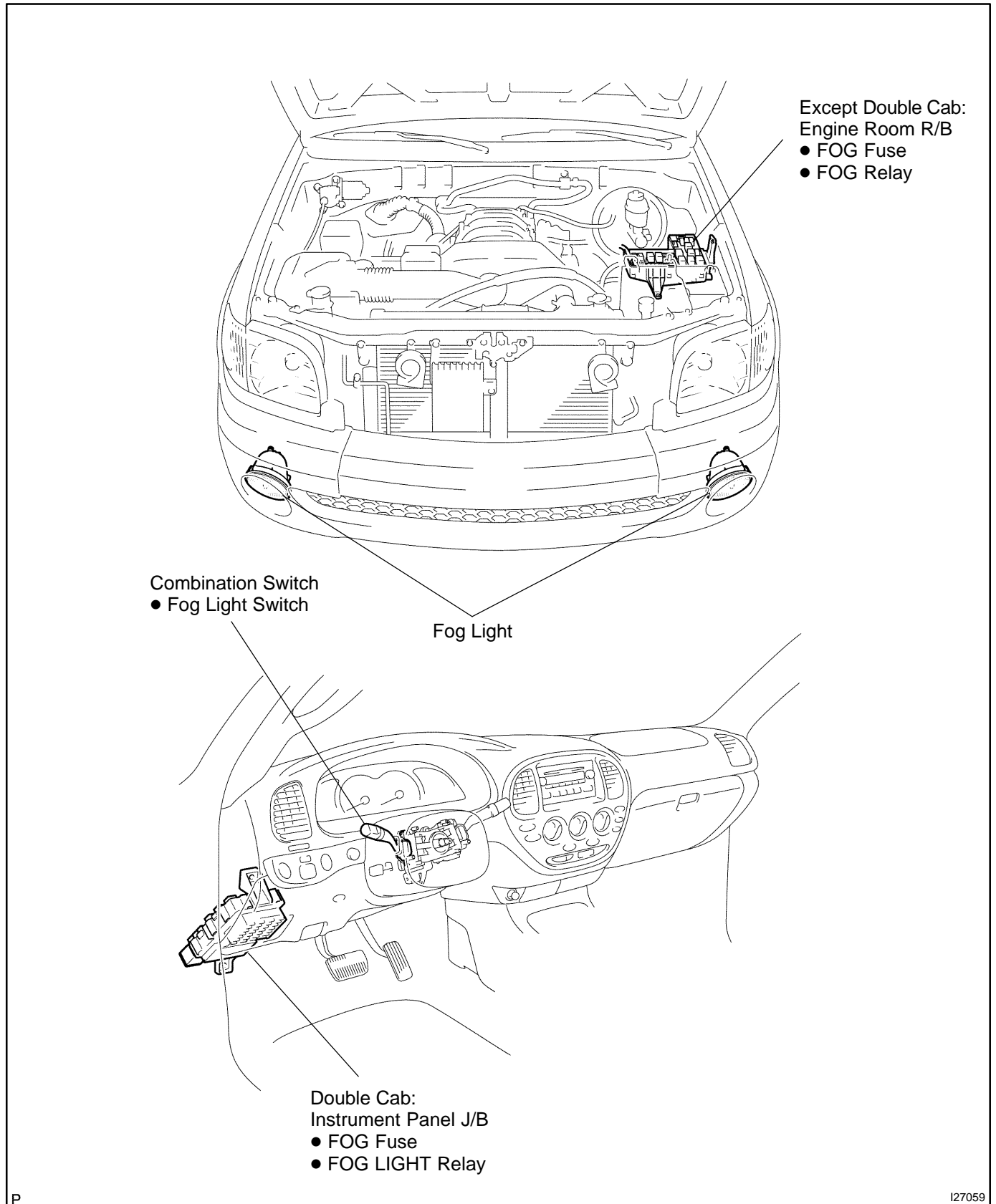
HINT:

As shown in the illustration, adjust the aim of the RH and LH headlights.

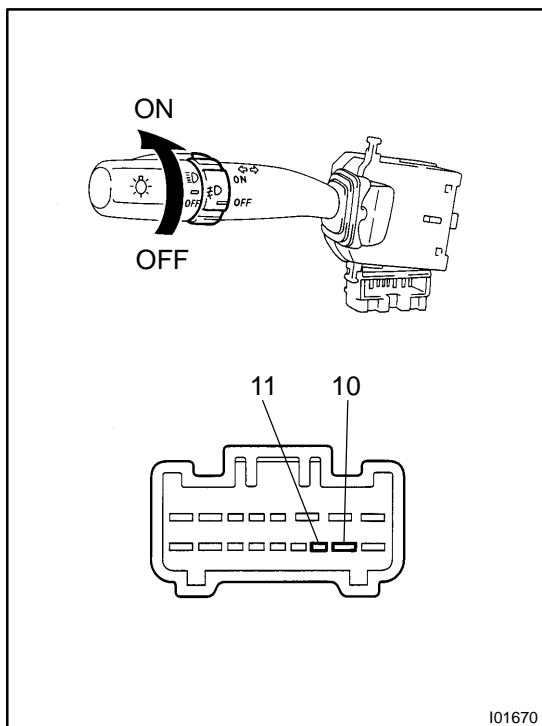
- (c) When adjusting the headlight aim vertically:
 - Using a adjusting bolt, adjust the headlight aim within the specified range.

FOG LIGHT SYSTEM LOCATION

BE0H2-18



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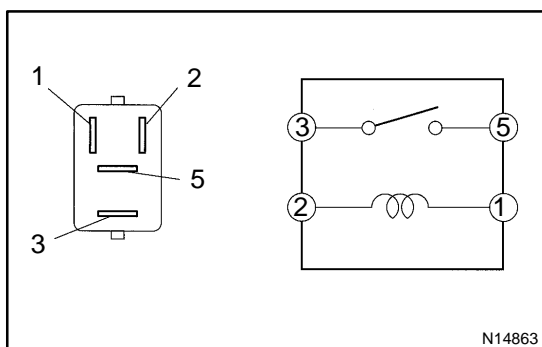


INSPECTION

1. INSPECT FOG LIGHT SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
OFF	10 - 11	No continuity
ON	10 - 11	Continuity

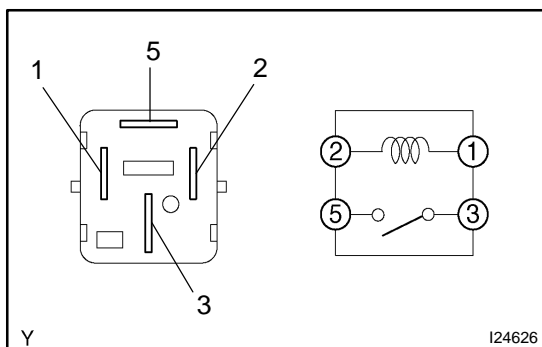
If the continuity is not as specified, replace the switch.



2. Double cab: INSPECT FOG LIGHT RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

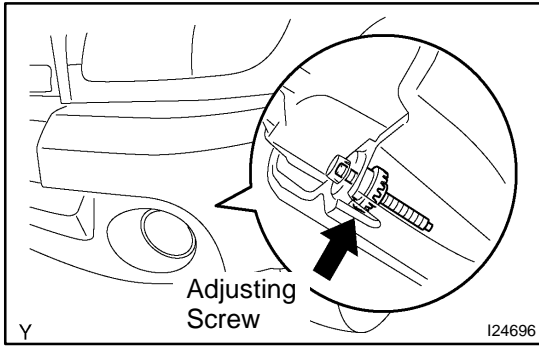
If the continuity is not as specified, replace the switch.



3. Except double cab: INSPECT FOG LIGHT RELAY (Marking: FOG) CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.



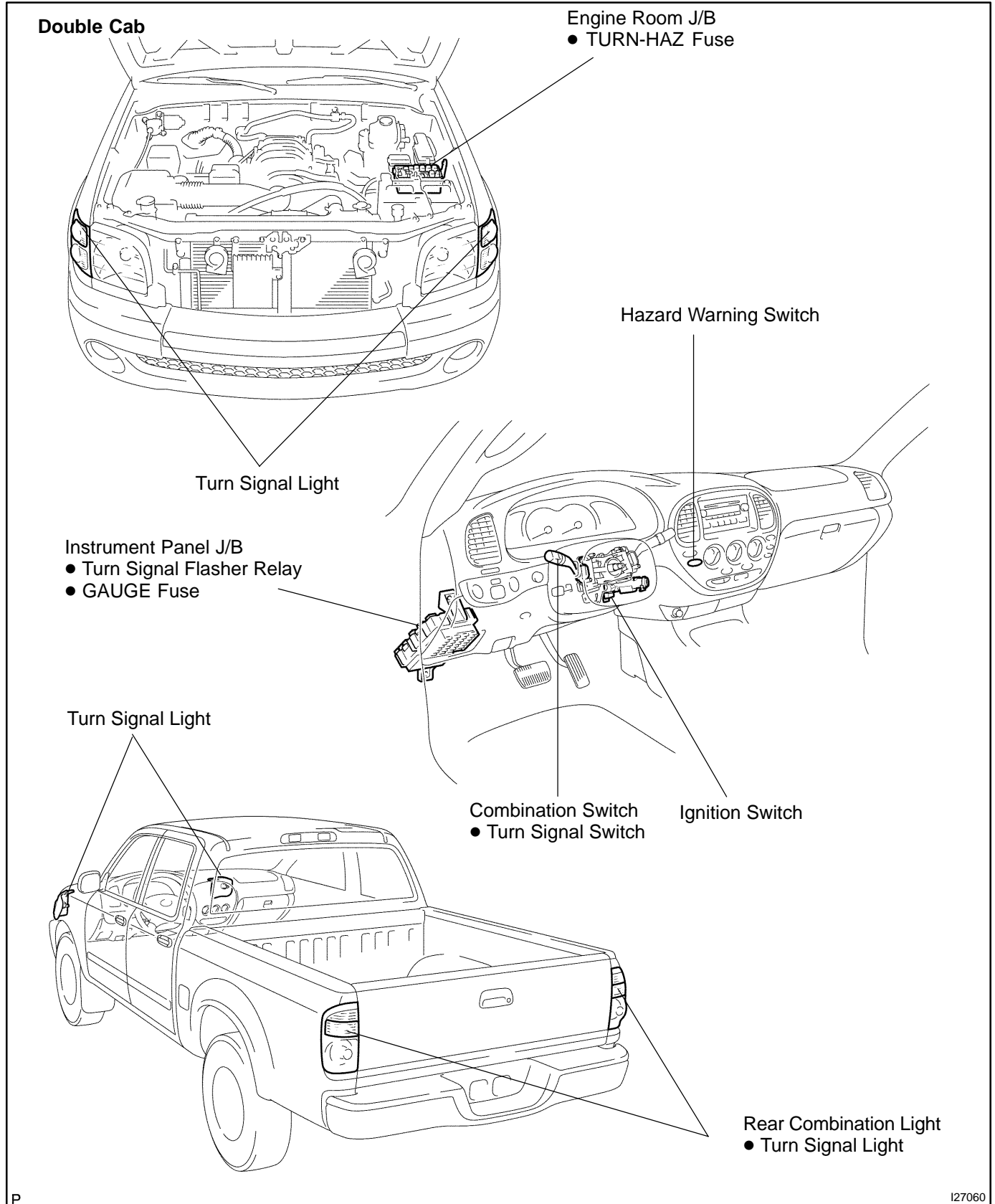
ADJUSTMENT

ADJUST FOG LIGHT AIM

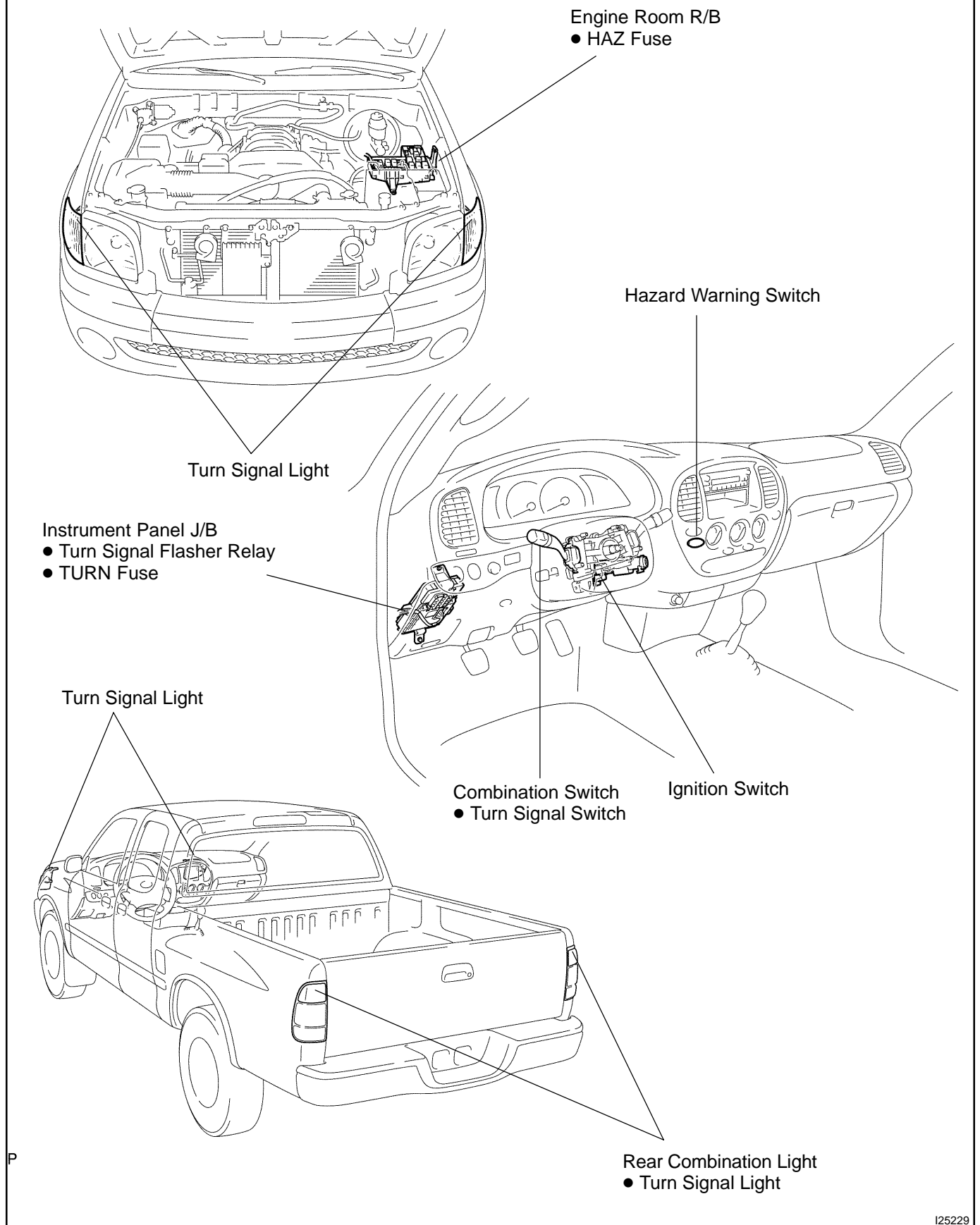
Adjusting screw: Vertical direction

TURN SIGNAL AND HAZARD WARNING SYSTEM LOCATION

BE2K6-01

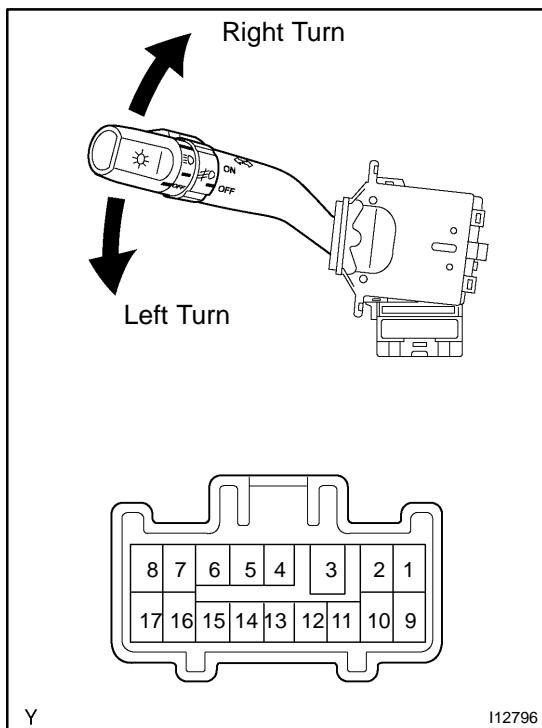


Except Double Cab



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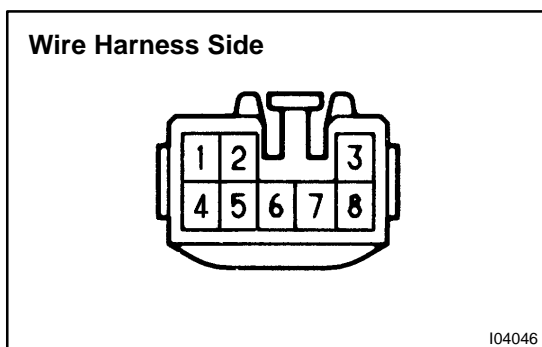


INSPECTION

1. INSPECT TURN SIGNAL SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
Left turn	1 - 2	Continuity
Original	1 -2, 2 - 3	No continuity
Right turn	2 - 3	Continuity

If the continuity is not as specified, replace the switch.

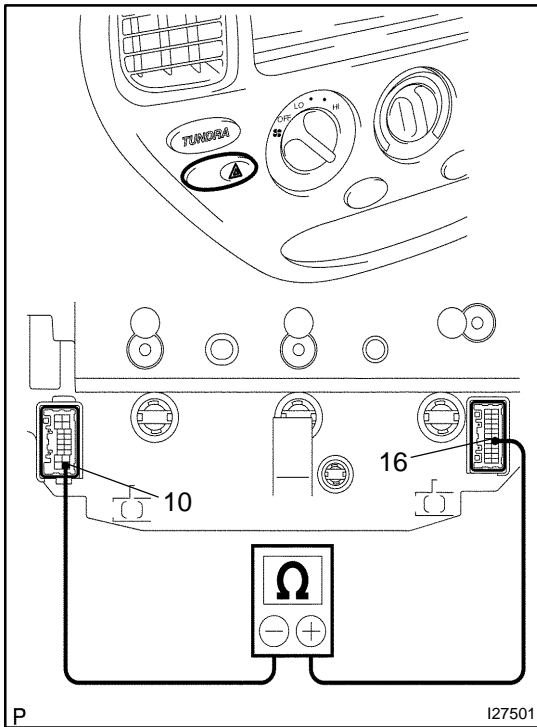


2. INSPECT TURN SIGNAL FLASHER RELAY CIRCUIT

Disconnect the connector from the turn signal flasher and inspect the connector on the wire harness side, as shown in the table.

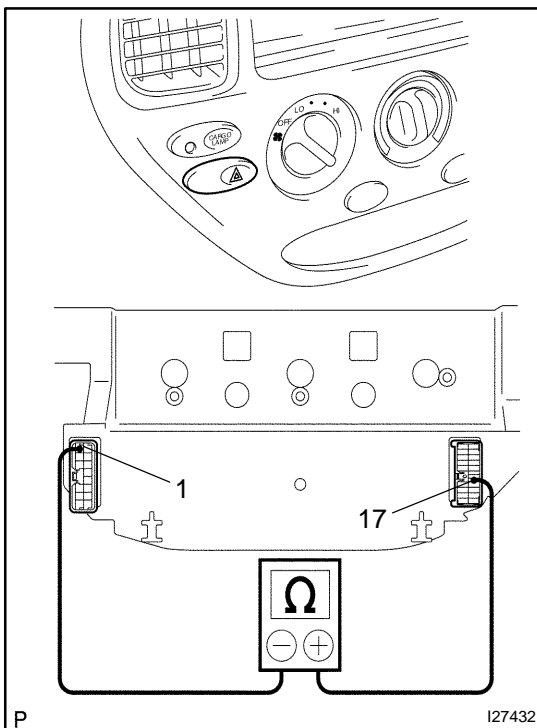
Tester Connection	Condition	Specified Condition
1 - Body ground	Ignition switch LOCK or ACC	Below 1 V
1 - Body ground	Ignition switch ON	10 - 14 V
2 - Body ground	Constant	Continuity
3 - Body ground	Constant	Continuity
4 - Body ground	Constant	10 - 14 V
5 - Body ground	Turn signal switch RIGHT or OFF	No Continuity
5 - Body ground	Turn signal switch LEFT	Continuity
6 - Body ground	Turn signal switch LEFT or OFF	No Continuity
6 - Body ground	Turn signal switch RIGHT	Continuity
7 - Body ground	Constant	Continuity
8 - Body ground	Hazard warning switch OFF	No Continuity
8 - Body ground	Hazard warning switch ON	Continuity

If the result is as specified, replace the flasher.

**3. Double cab:****INSPECT HAZARD WARNING SWITCH CONTINUITY**

- (a) Remove the integration control panel.
- (b) Check that the continuity exists between terminal 16 and terminal 10 with the switch ON.
- (c) Check that no continuity exists between terminal 16 and terminal 10 with the switch OFF.

If the continuity is not as specified, replace the panel.

**4. Except double cab:****INSPECT HAZARD WARNING SWITCH CONTINUITY**

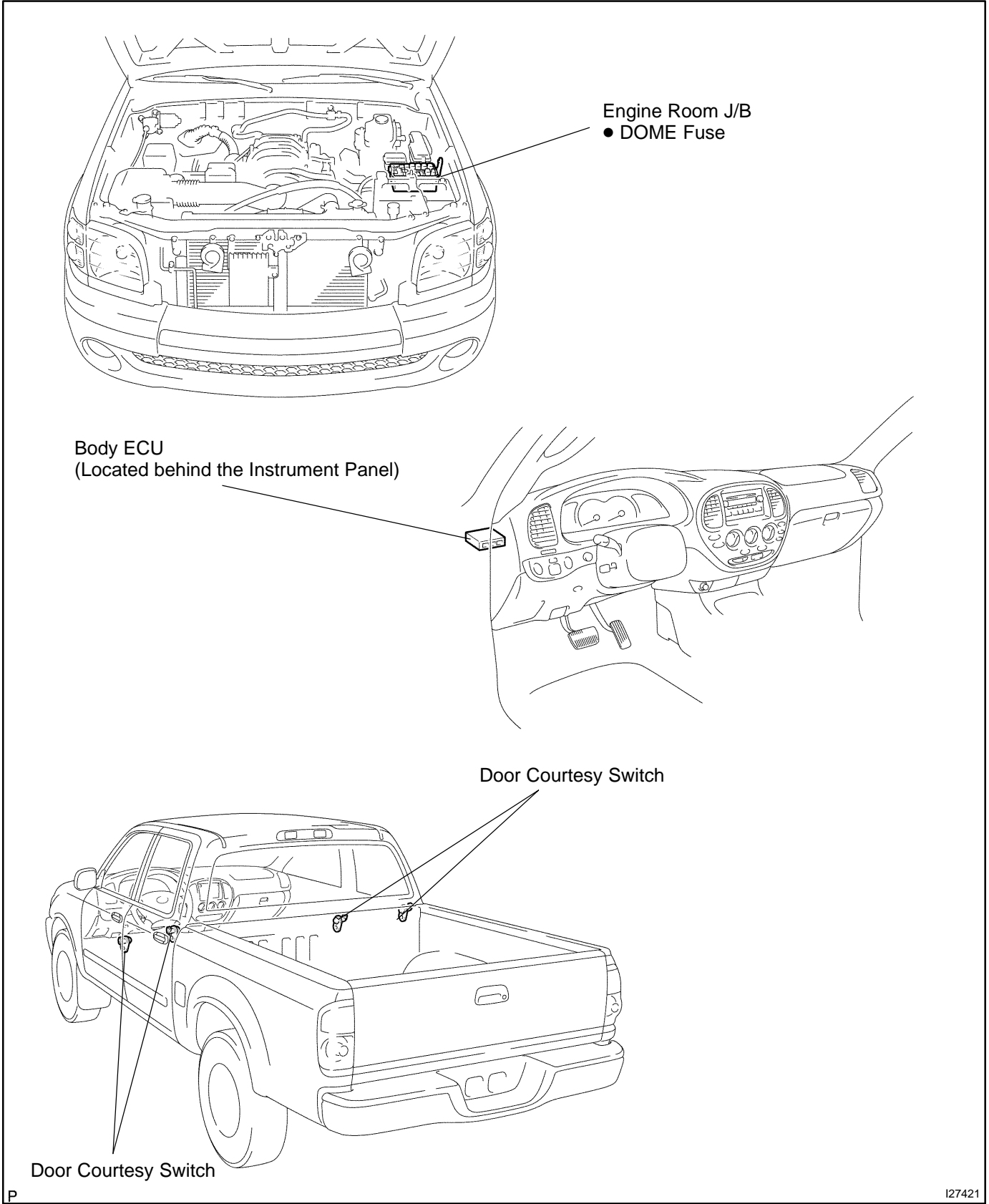
- (a) Remove the integration control panel.
- (b) Check that the continuity exists between terminal 17 and terminal 1 with the switch ON.
- (c) Check that no continuity exists between terminal 17 and terminal 1 with the switch OFF.

If the continuity is not as specified, replace the panel.

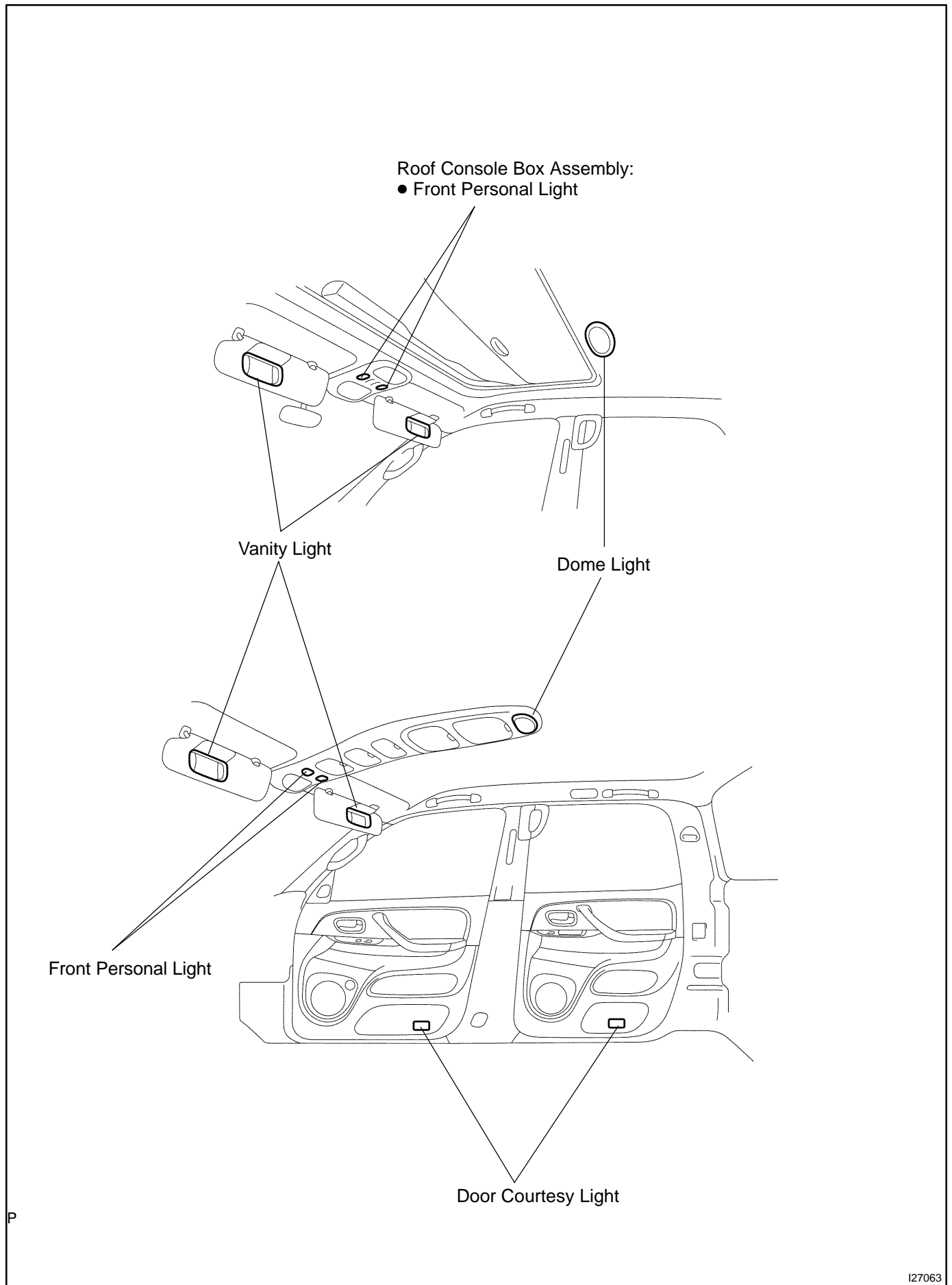
INTERIOR LIGHT SYSTEM (Double Cab)

LOCATION

BE2K8-01

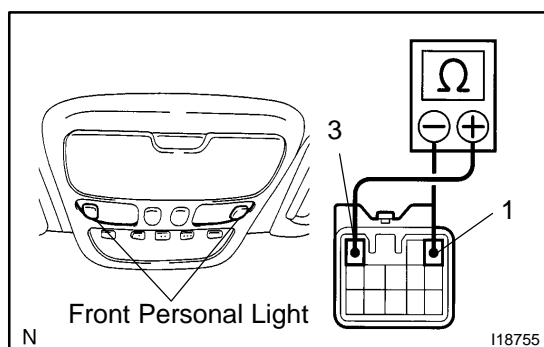


I27421



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I27063

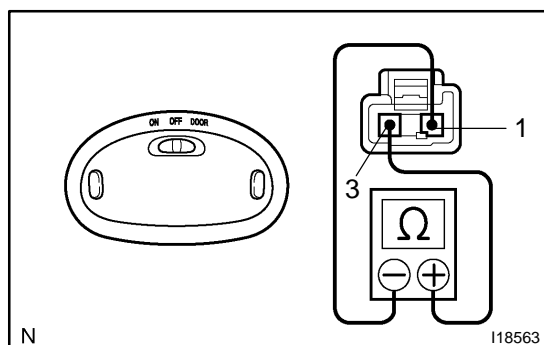


INSPECTION

1. INSPECT FRONT PERSONAL LIGHT SWITCH CONTINUITY

- Disconnect the connector from the personal light.
- Push the personal light switch on, check that continuity exists between terminals 1 and 3.

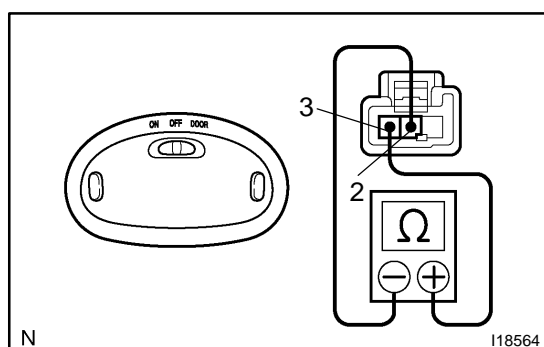
If the continuity is not as specified, replace the bulb or light.



2. INSPECT DOME LIGHT SWITCH CONTINUITY

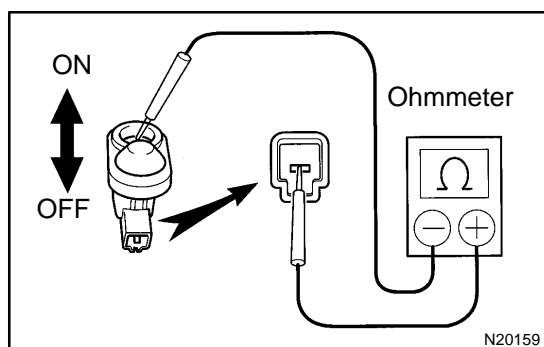
- Disconnect the connector from the dome light.
- Push the personal light switch on, check that continuity exists between terminals 1 and 3.

If the continuity is not as specified, replace the bulb or light.



- Turn the light switch to the DOOR position, check that continuity exists between terminals 2 and 3.

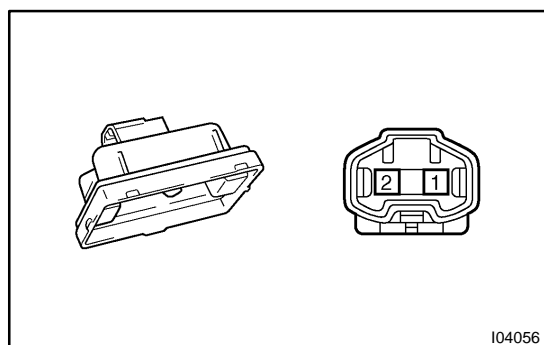
If the continuity is not as specified, replace the light.



3. INSPECT DOOR COURTESY SWITCH CONTINUITY

- Check that continuity exists between the terminal and the switch body with the switch ON (switch pin released: door opened).
- Check that no continuity exists between the terminal and the switch body with the switch OFF (switch pin pushed in: door closed).

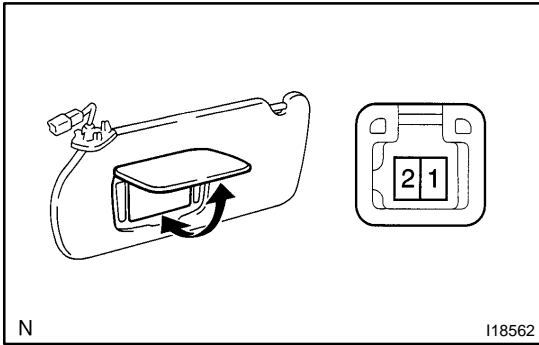
If the continuity is not as specified, replace the switch.



4. INSPECT DOOR COURTESY LIGHT CONTINUITY

Check that continuity exists between terminals 1 and 2.

If the continuity is not as specified, replace the light assembly or bulb.



5. INSPECT VANITY LIGHT CONTINUITY

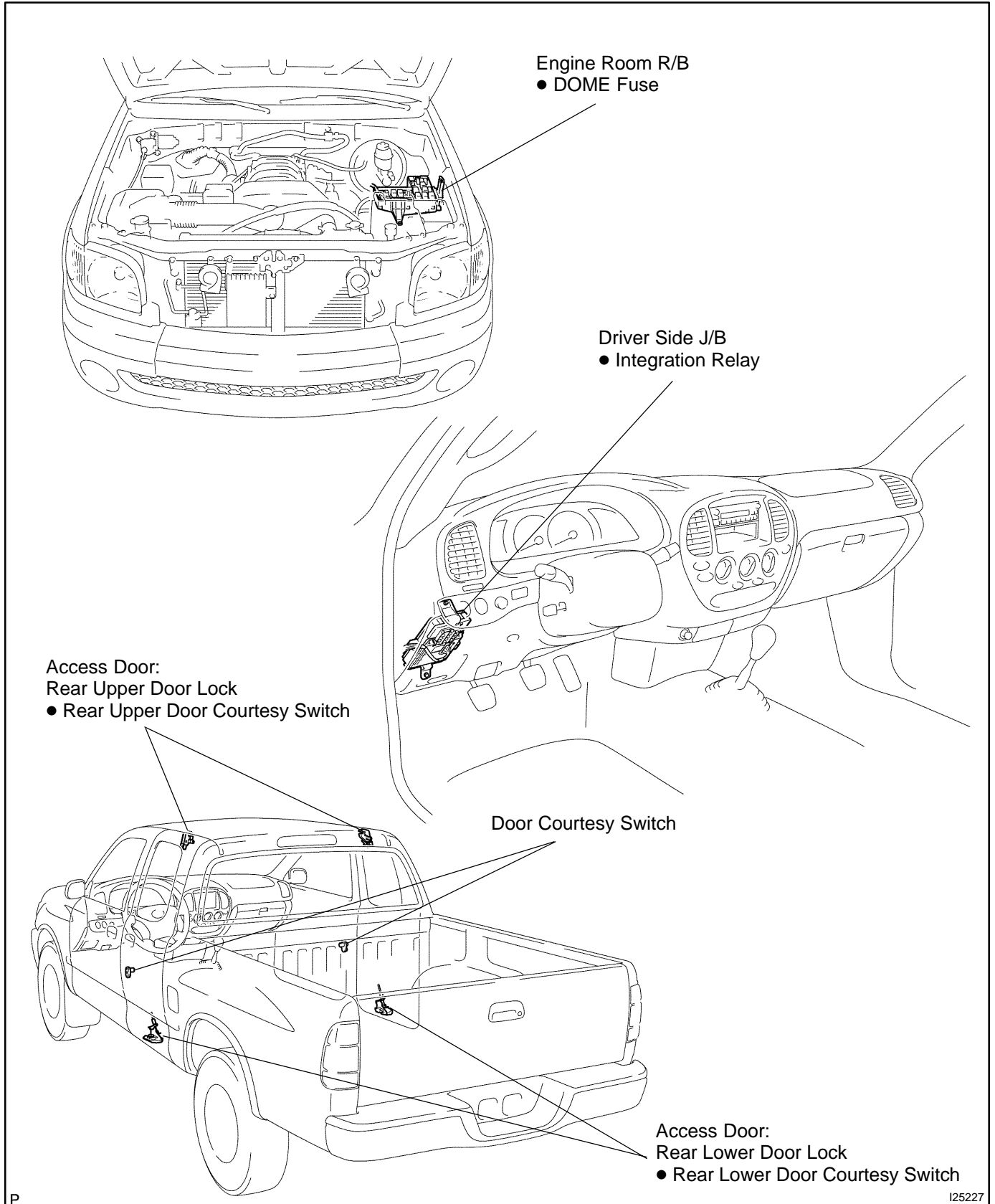
Switch Position	Tester Connection	Specified Condition
OFF (Closed)	1 - 2	No continuity
ON (Opened)	1 - 2	Continuity

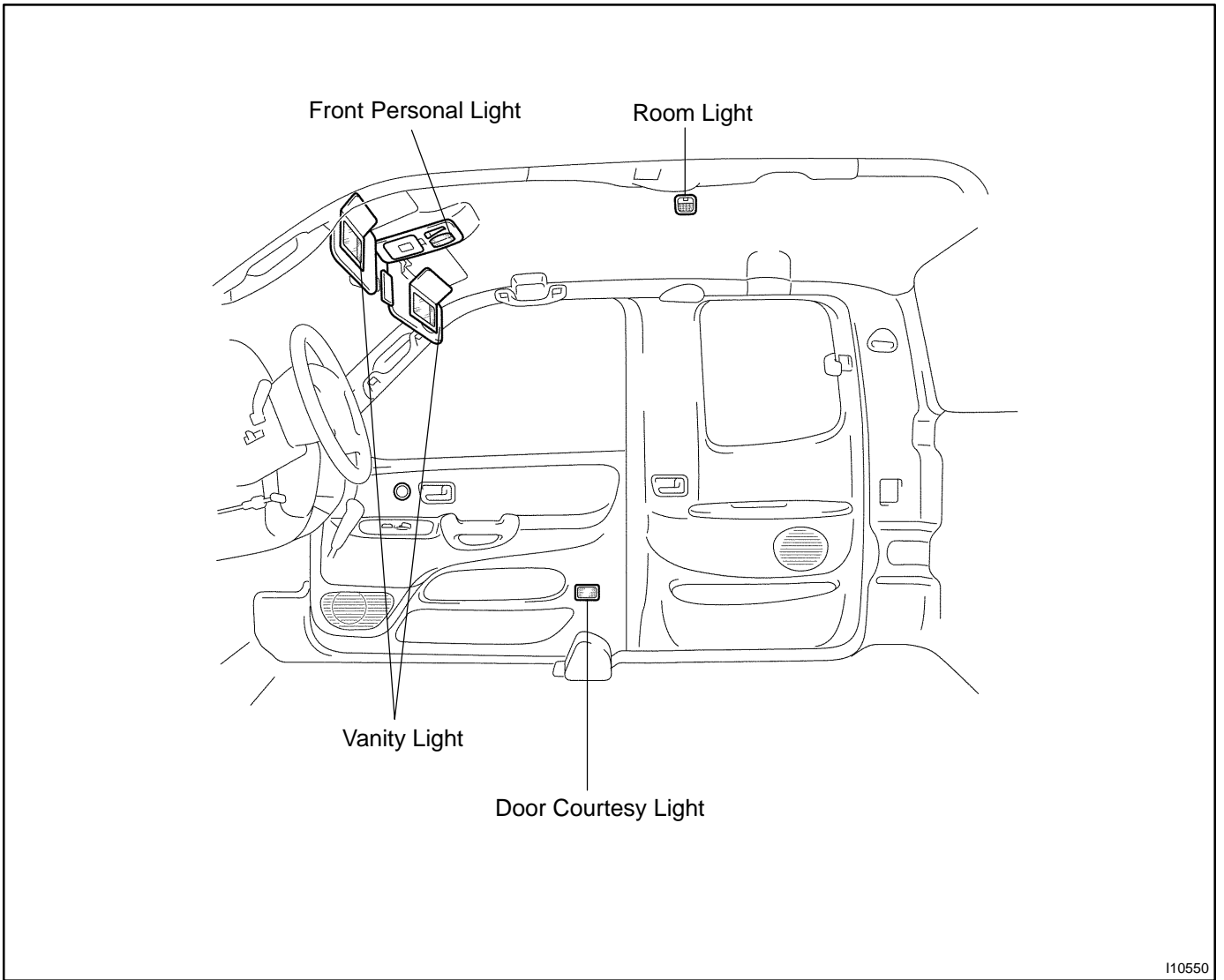
If the continuity is not as specified, replace the bulb or vanity light.

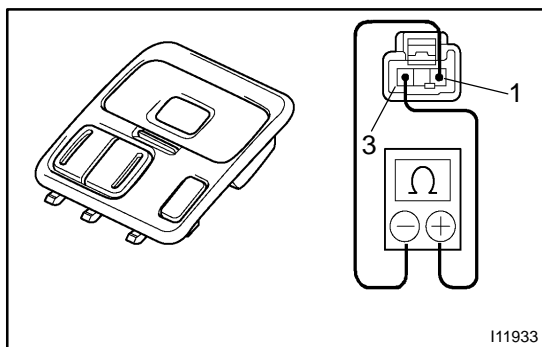
INTERIOR LIGHT SYSTEM (Except Double Cab)

LOCATION

BE2KA-01



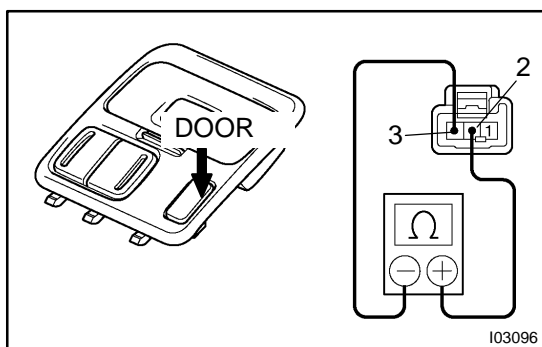




INSPECTION

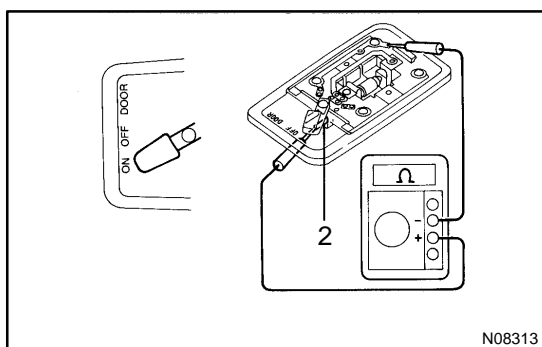
1. INSPECT FRONT PERSONAL LIGHT CONTINUITY

- (a) Disconnect the connector from the personal light.
- (b) Push the personal light switch ON, check that continuity exists between terminals 3 and 1.



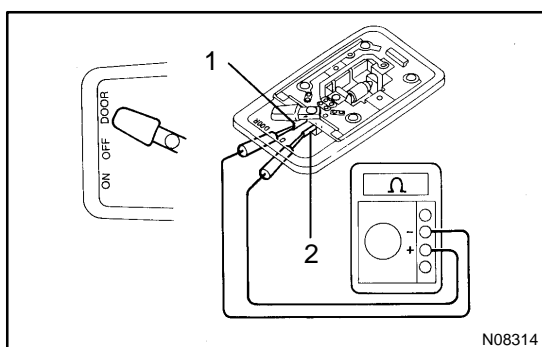
- (c) Turn the light switch to the DOOR position, check that continuity exists between terminals 2 and 3.

If the result is not as specified, replace the bulb or light.



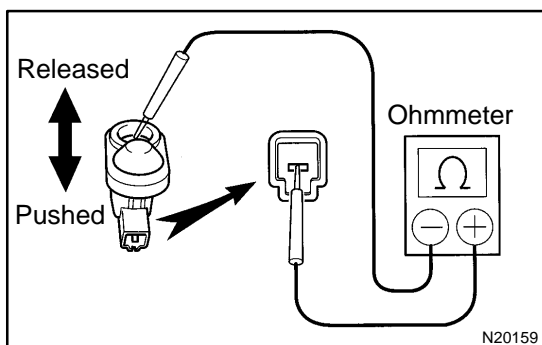
2. INSPECT ROOM LIGHT CONTINUITY

- (a) Disconnect the connector from the light.
- (b) Turn the interior light switch ON, check that continuity exists between terminal 2 and body ground.



- (c) Turn the light switch to the DOOR position, check that continuity exists between terminals 1 and 2.

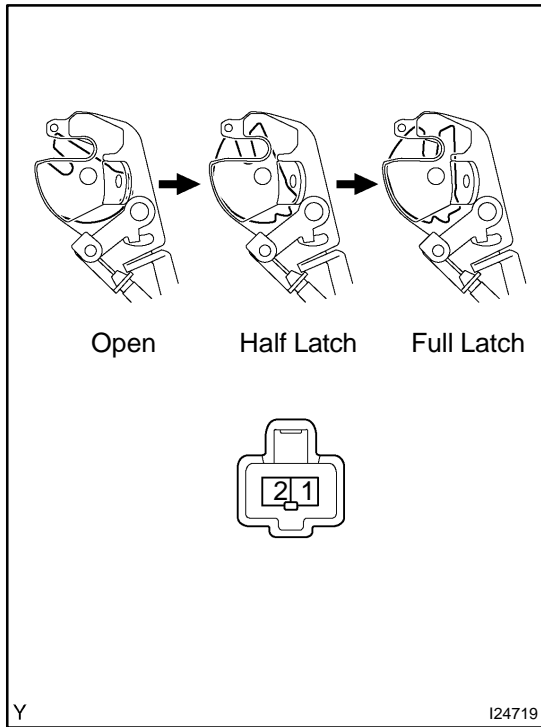
If the result is not as specified, replace the bulb or light.



3. INSPECT (FRONT) DOOR COURTESY SWITCH CONTINUITY

- (a) Check that continuity exists between the terminal and the switch body with the switch ON (switch pin released: door opened).
- (b) Check that no continuity exists between terminals and the switch body with the switch OFF (switch pin pushed in: door closed).

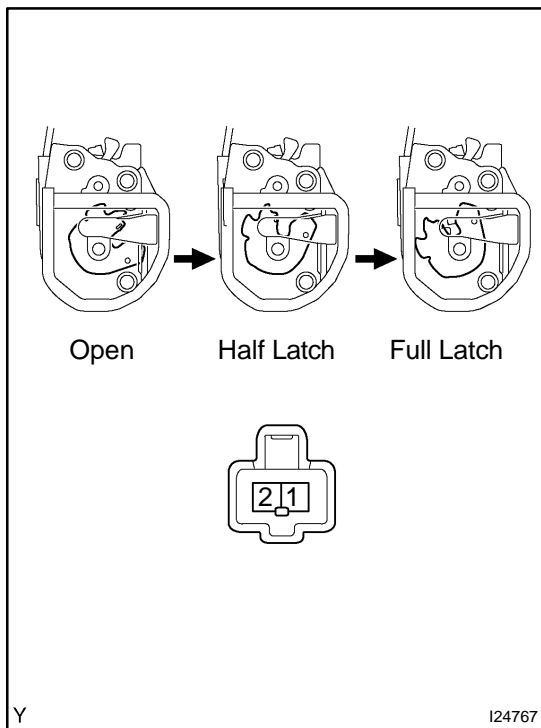
If the result is not as specified, replace the switch.



**4. Access door:
INSPECT REAR UPPER DOOR COURTESY SWITCH
CONTINUITY**

Switch Position	Tester Connection	Specified Condition
ON (Open)	1 - 2	Continuity
ON (Half latch)	1 - 2	Continuity
OFF (Full latch)	1 - 2	No continuity

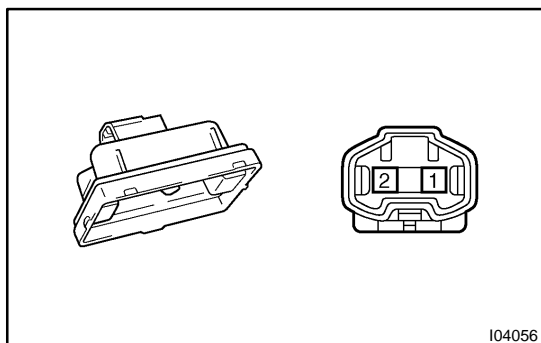
If the continuity is not as specified, replace the upper door lock.



**5. Access door:
INSPECT REAR LOWER DOOR COURTESY SWITCH
CONTINUITY**

Switch Position	Tester Connection	Specified Condition
ON (Open)	1 - 2	Continuity
ON (Half latch)	1 - 2	Continuity
OFF (Full latch)	1 - 2	No continuity

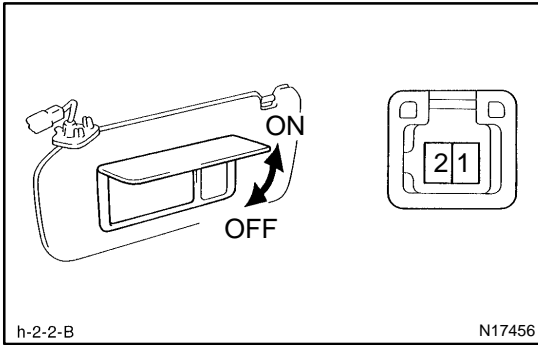
If the continuity is not as specified, replace the lower door lock.



6. INSPECT DOOR COURTESY LIGHT CONTINUITY

Check that continuity exists between terminals 1 and 2.

If the continuity is not as specified, replace the bulb or light.



7. INSPECT VANITY LIGHT CONTINUITY

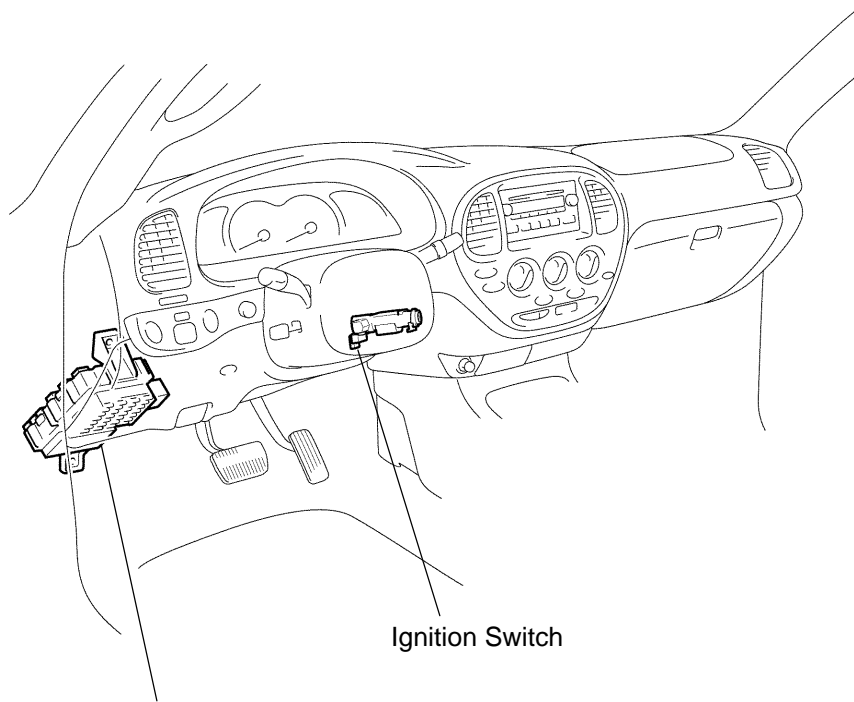
Switch Position	Tester Connection	Specified Condition
OFF (Closed)	1 - 2	No continuity
ON (Opened)	1 - 2	Continuity

If the continuity is not as specified, replace the bulb or vanity light.

BACK-UP LIGHT SYSTEM LOCATION

BE2LS-01

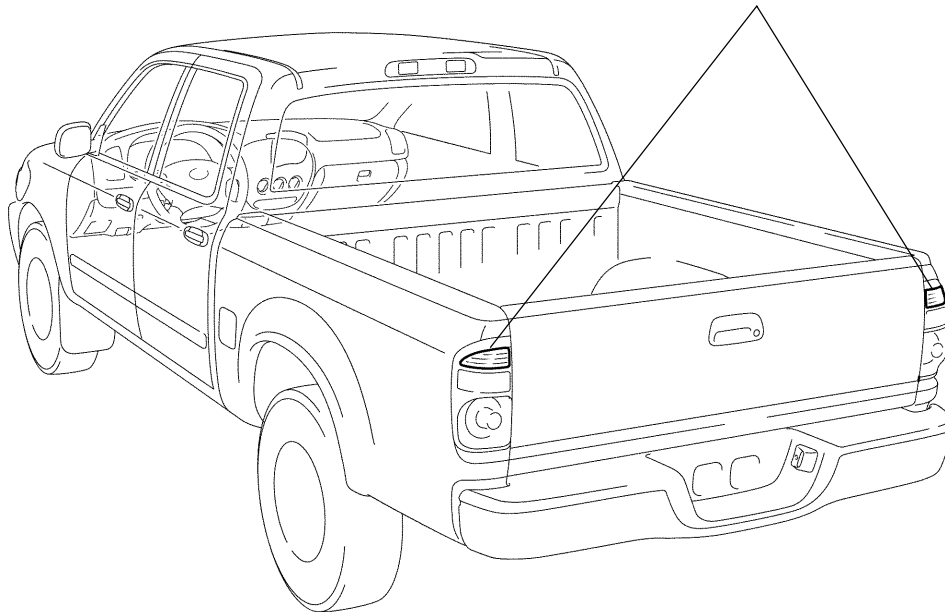
Double Cab



Ignition Switch

- Instrument Panel J/B
- BACK-UP LIGHT Relay
 - GAUGE Fuse

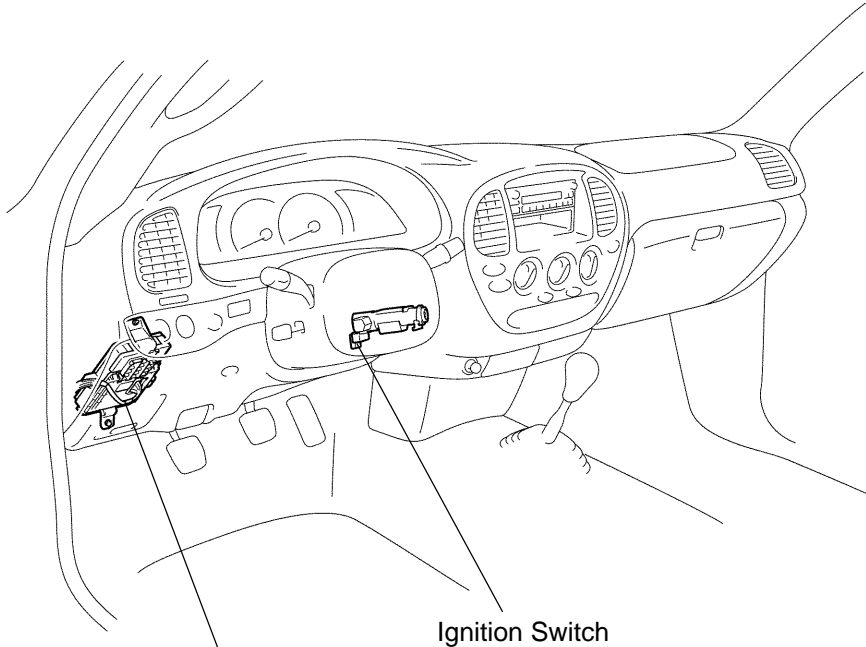
- Rear Combination Light
- Back-up Light



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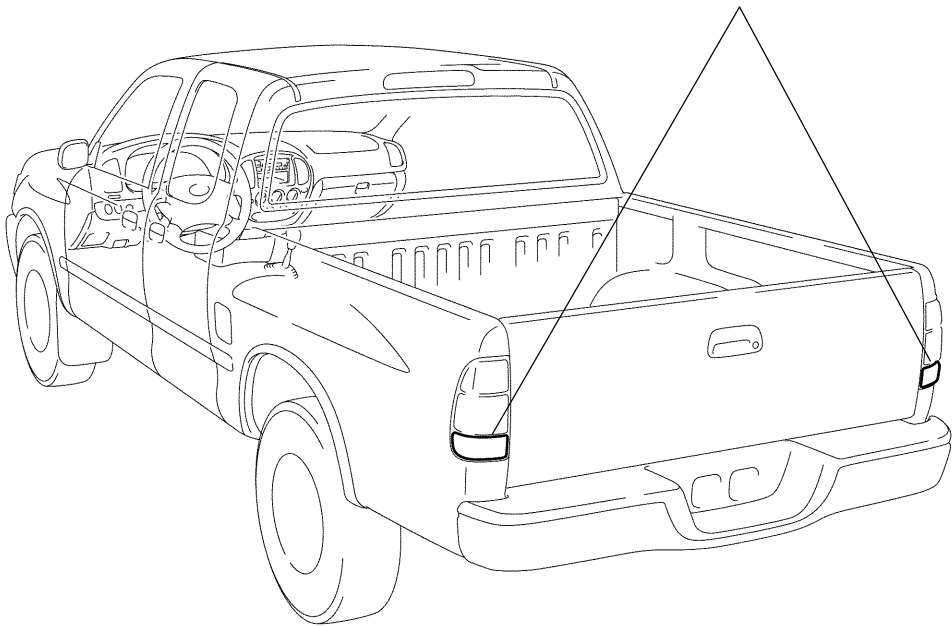
I27619

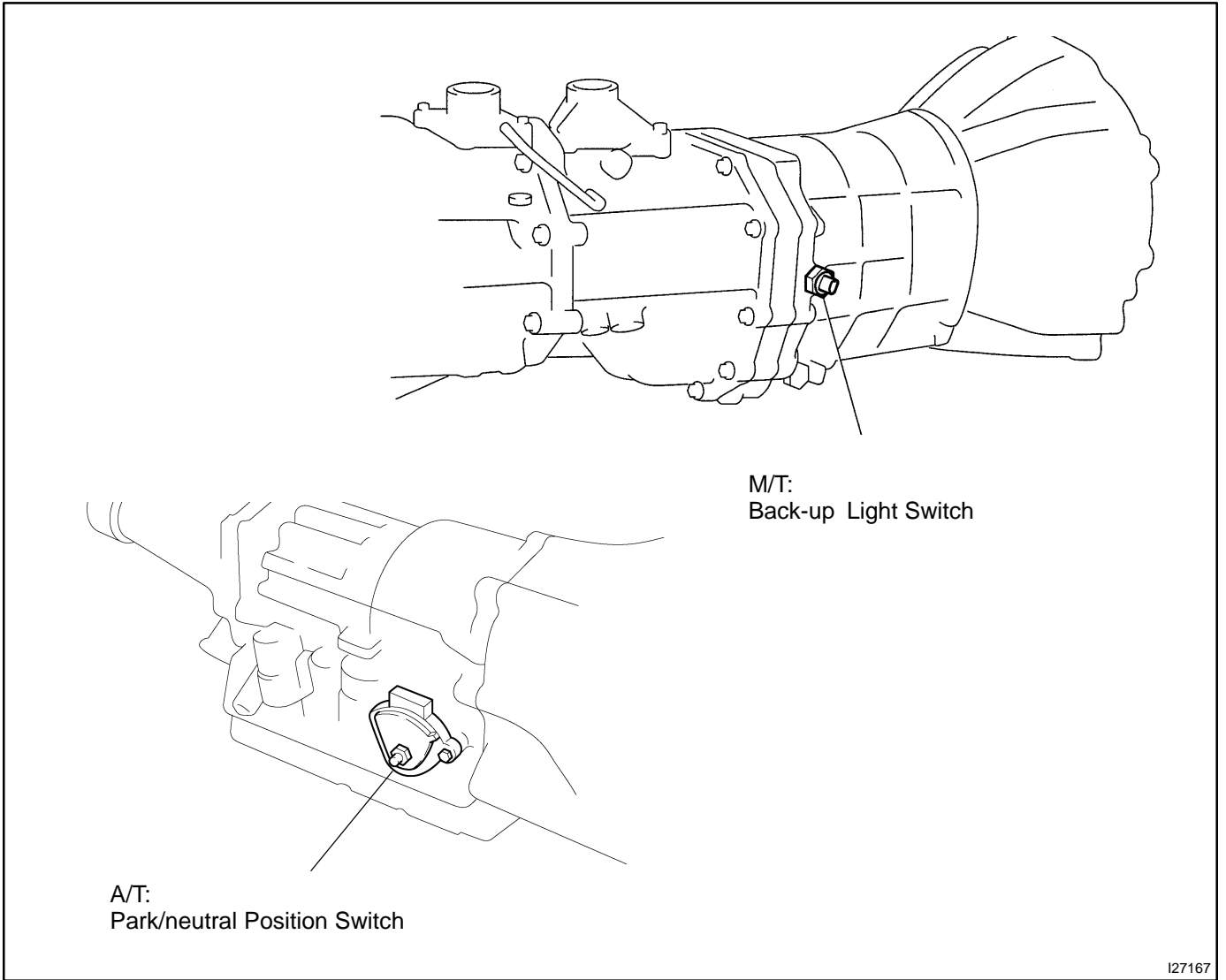
Except Double Cab



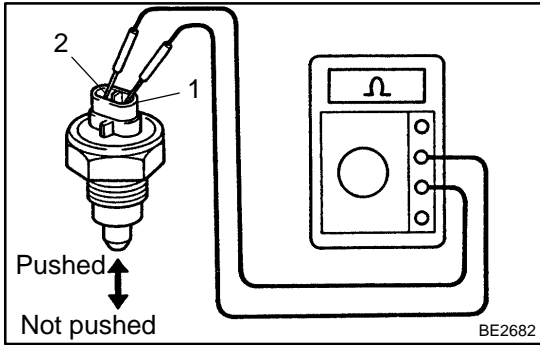
- Driver Side J/B
- BACK-UP LIGHT Relay (A/T)
 - GAUGE Fuse

- Rear Combination Light
- Back-up Light





127167



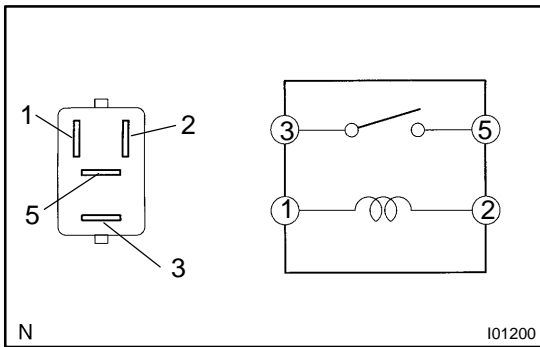
INSPECTION

- M/T:**
INSPECT BACK-UP LIGHT SWITCH CONTINUITY

Condition	Tester Connection	Specified Condition
Not pushed	1 - 2	No continuity
Pushed	1 - 2	Continuity

If the continuity is not as specified, replace the switch.

- A/T:**
INSPECT PARK/NEUTRAL POSITION SWITCH CONTINUITY (see page DI-1003 or DI-1 179).



- A/T:**
INSPECT BACK-UP LIGHT RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No Continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

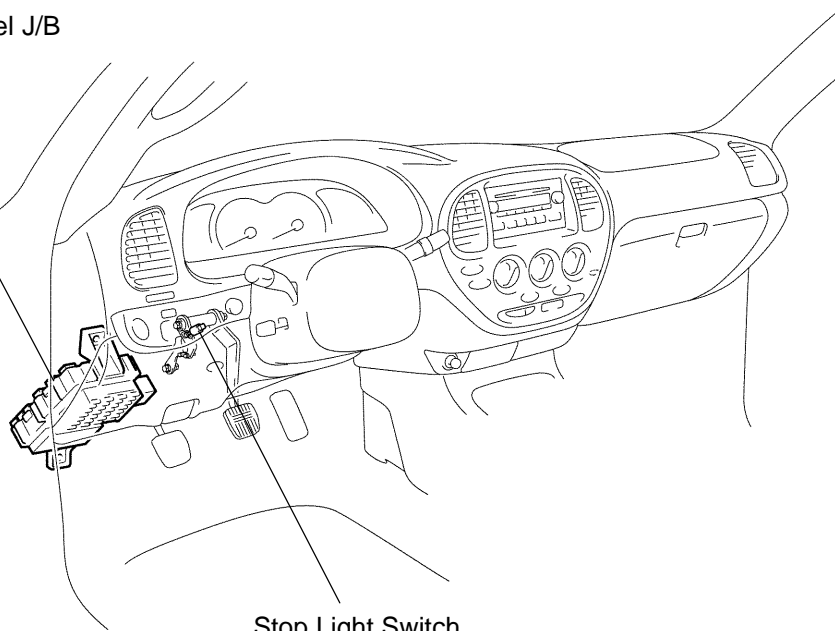
If the continuity is not as specified, replace the relay.

STOP LIGHT SYSTEM LOCATION

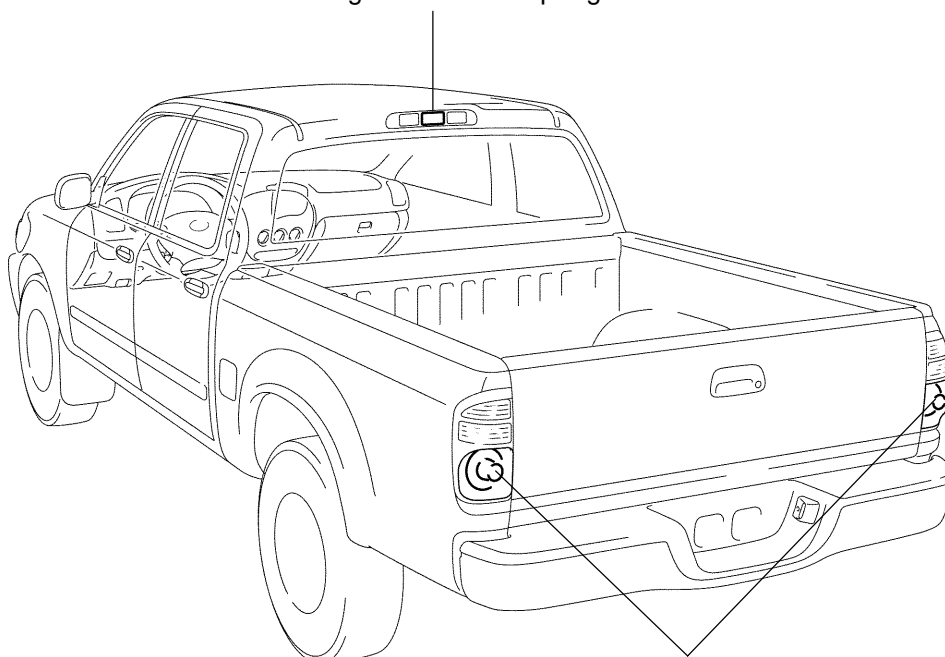
BE2LT-01

Double Cab

Instrument Panel J/B
● STOP Fuse



High-mounted Stop Light



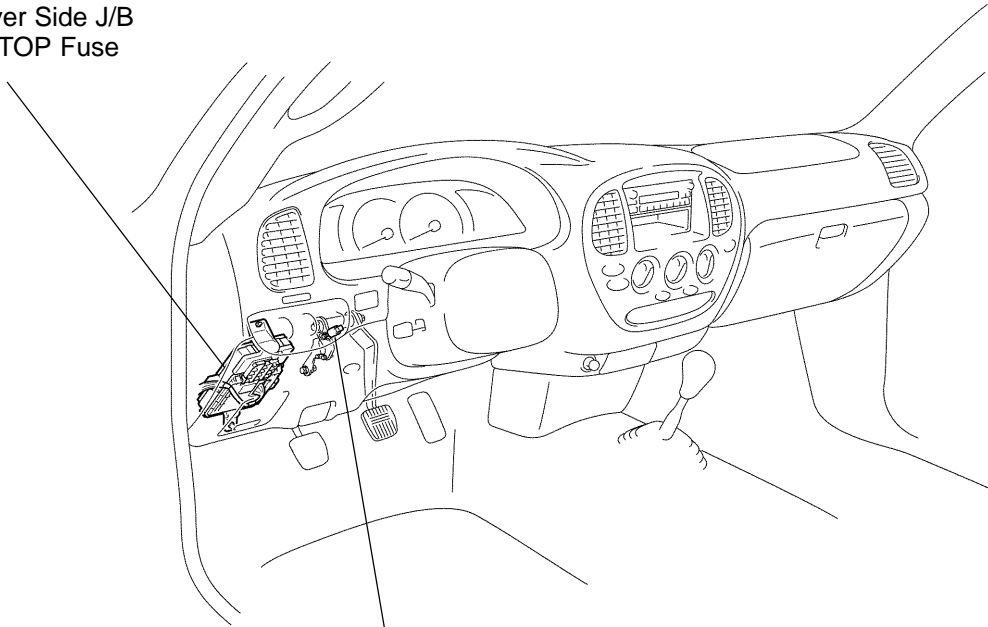
Rear Combination Light
● Stop Light

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127620

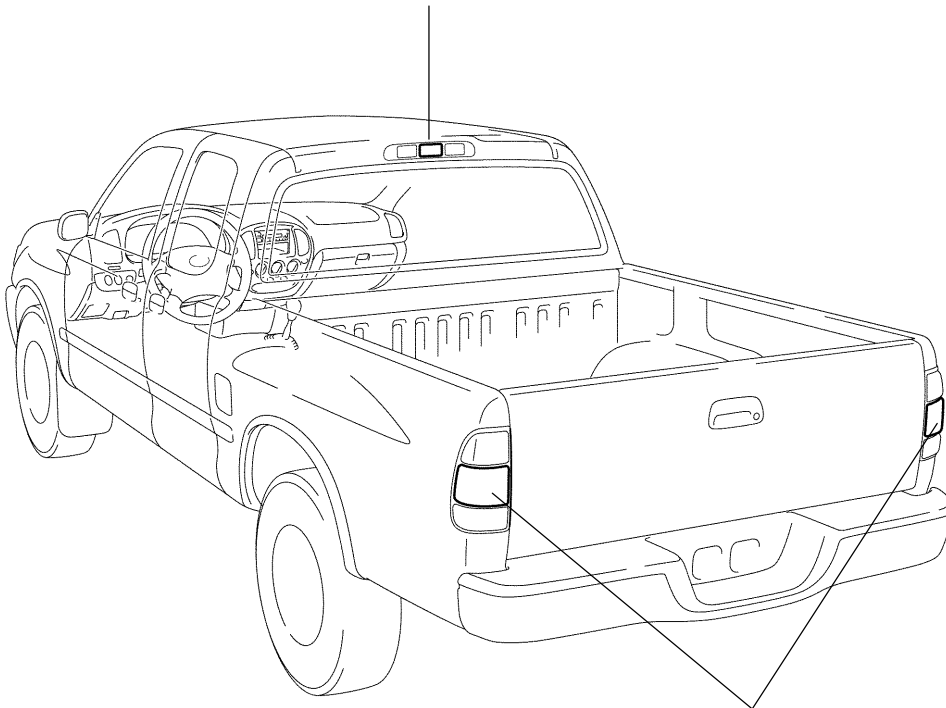
Except Double Cab

Driver Side J/B
● STOP Fuse

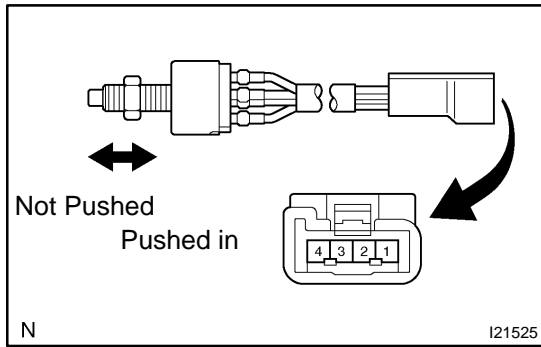


Stop Light Switch

High-mounted Stop Light



Rear Combination Light
● Stop Light

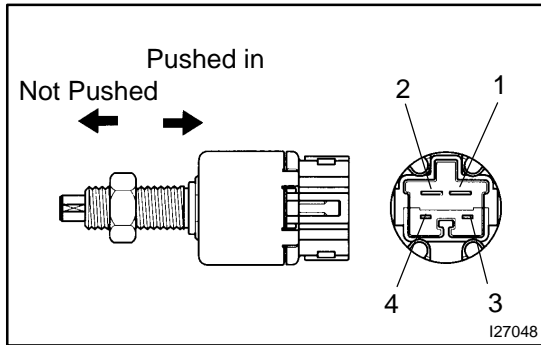


INSPECTION

1. Double cab: INSPECT STOP LIGHT SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
Not pushed	1 - 4	Continuity
Pushed in	1 - 4	No continuity
Not pushed	2 - 3	No continuity
Pushed in	2 - 3	Continuity

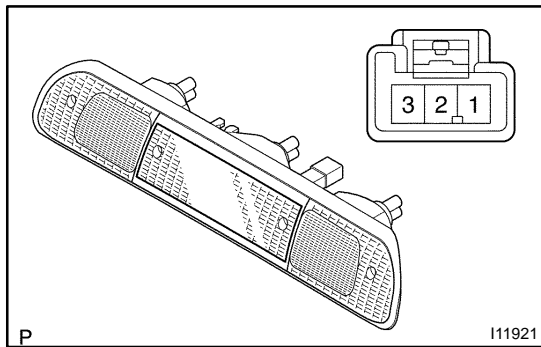
If the continuity is not as specified, replace the switch.



2. Except double cab: INSPECT STOP LIGHT SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
Not pushed	1 - 2	Continuity
Pushed in	1 - 2	No continuity
Not pushed	3 - 4	No continuity
Pushed in	3 - 4	Continuity

If the continuity is not as specified, replace the switch.



3. INSPECT HI-MOUNTED STOP LIGHT ASSEMBLY CONTINUITY

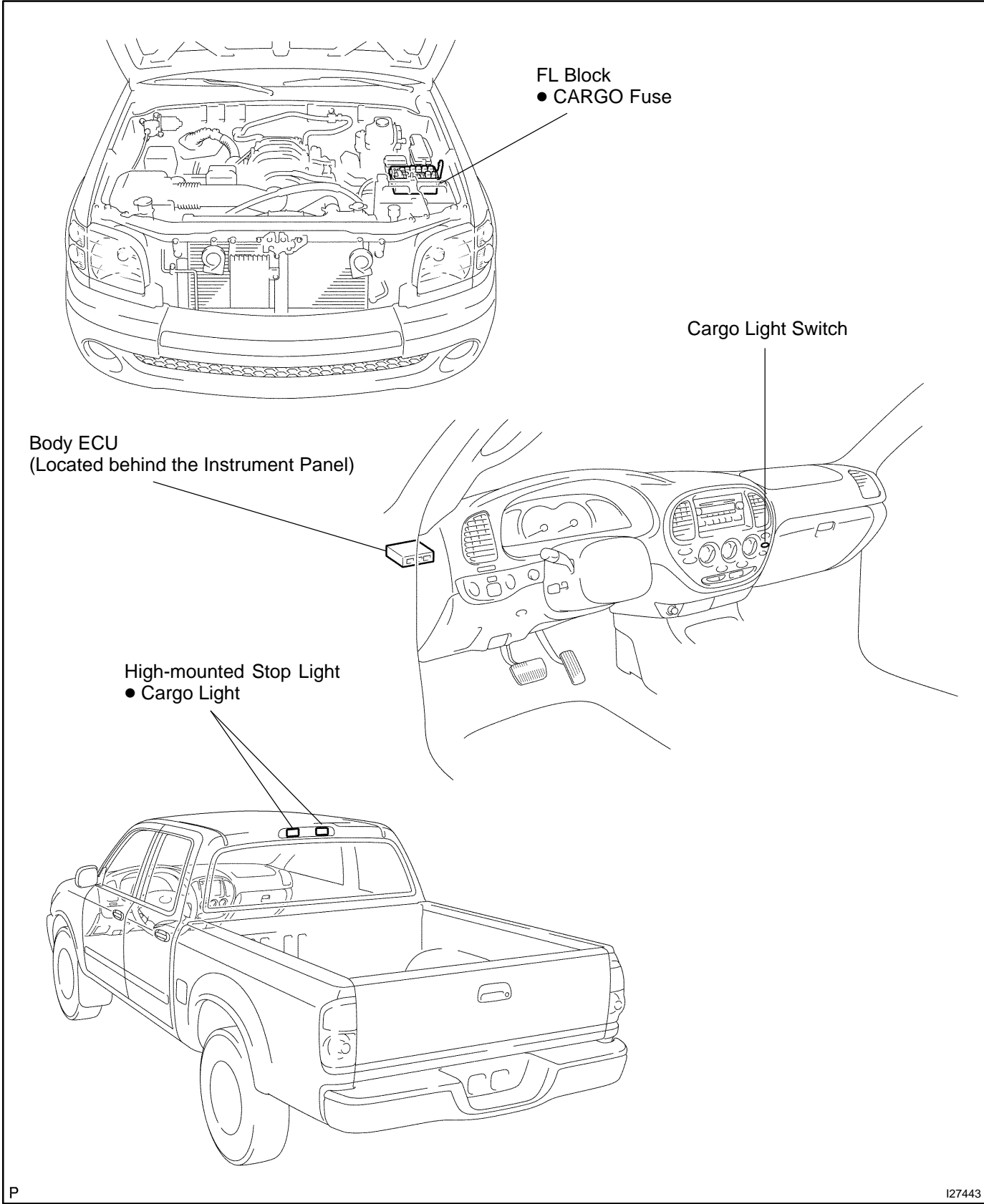
Using an ohmmeter, check that continuity exists between terminals 1 and 2.

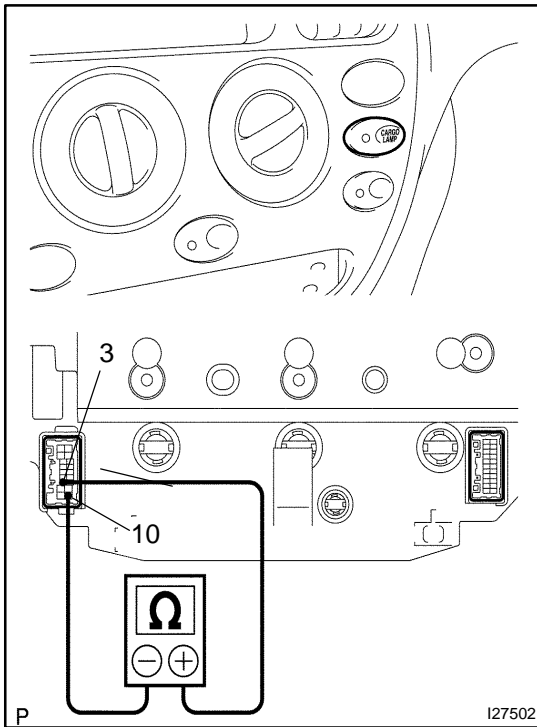
If the continuity is not as specified, replace the bulb or light.

CARGO LIGHT SYSTEM (Double Cab)

LOCATION

BE2L1-01



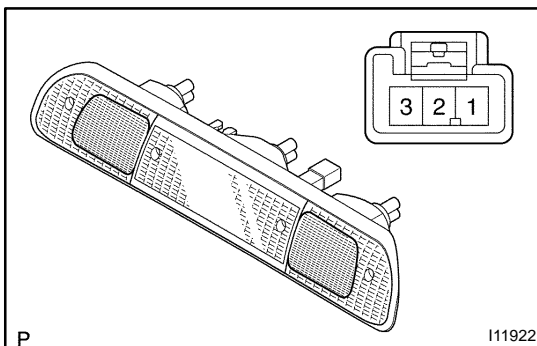


INSPECTION

1. INSPECT CARGO LIGHT SWITCH CONTINUITY

- (a) Remove the integration control panel.
- (b) Check that continuity exists between terminals 3 and 10 with the switch ON.
- (c) Check that no continuity exists between terminals 3 and 10 with the switch OFF.

If the continuity is not as specified, replace the panel.



2. INSPECT CARGO LIGHT ASSEMBLY CONTINUITY

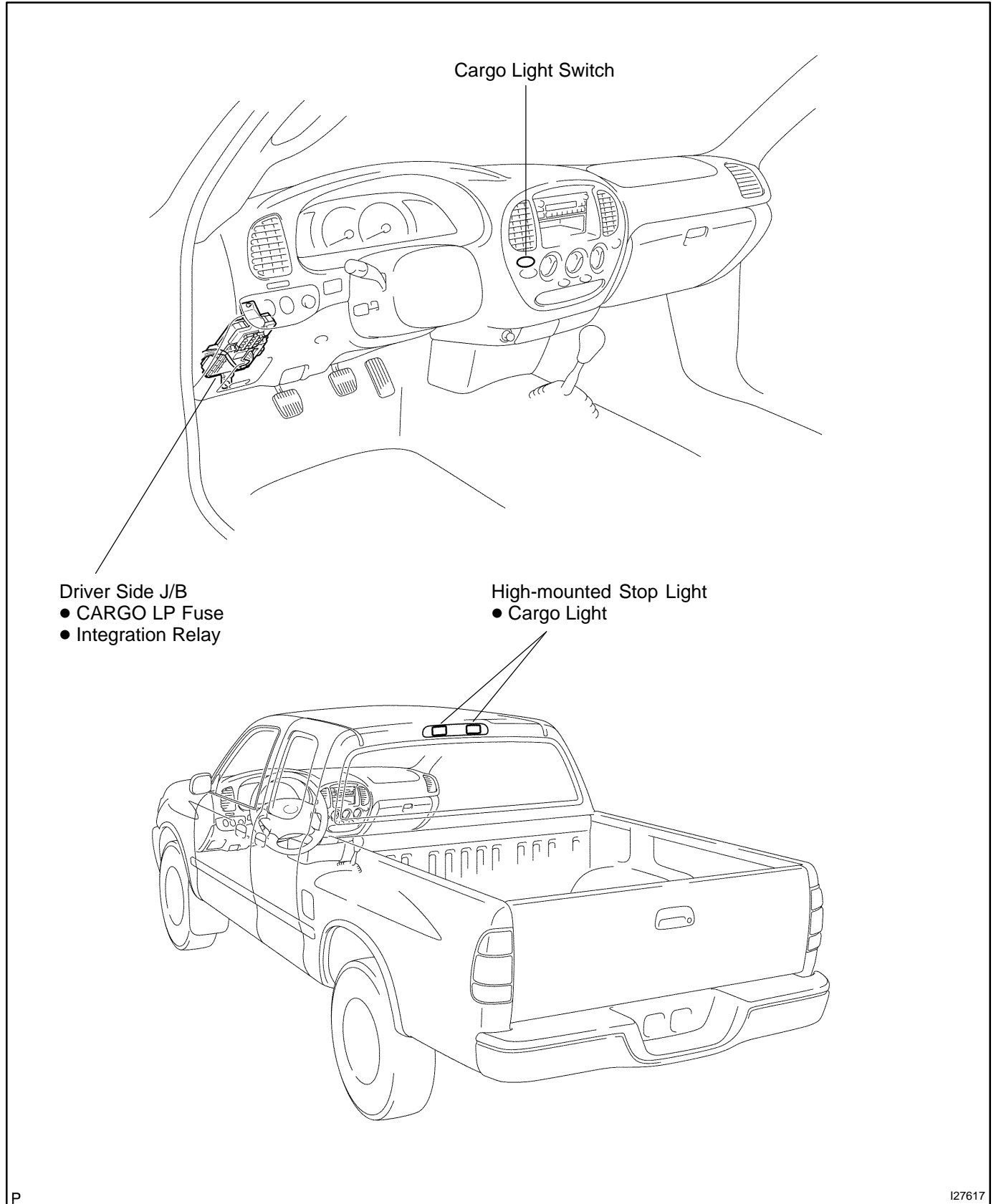
Using an ohmmeter, check that continuity exists between terminals 3 and 2.

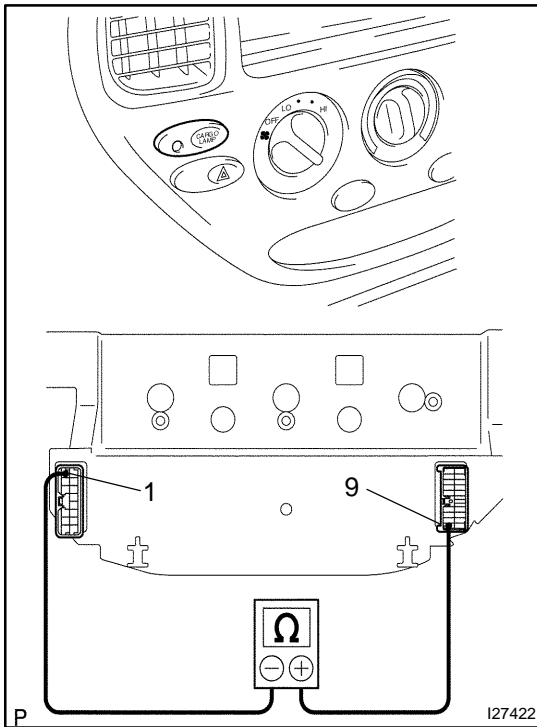
If the continuity is not as specified, replace the bulb or the stop light assembly.

CARGO LIGHT SYSTEM (Except Double Cab)

LOCATION

BE2L3-01



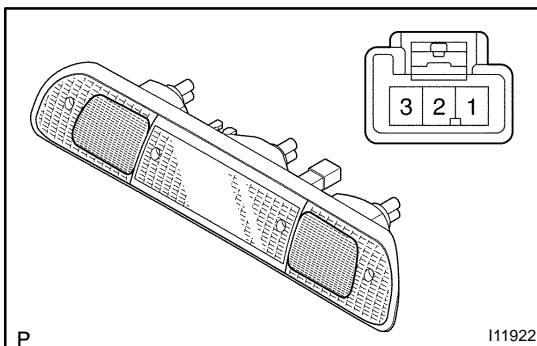


INSPECTION

1. INSPECT CARGO LIGHT SWITCH CONTINUITY

- Remove the integration control panel.
- Check that continuity exists between terminals 9 and 1 with the switch ON.
- Check that no continuity exists between terminals 9 and 1 with the switch OFF.

If the continuity is not as specified, replace the panel.



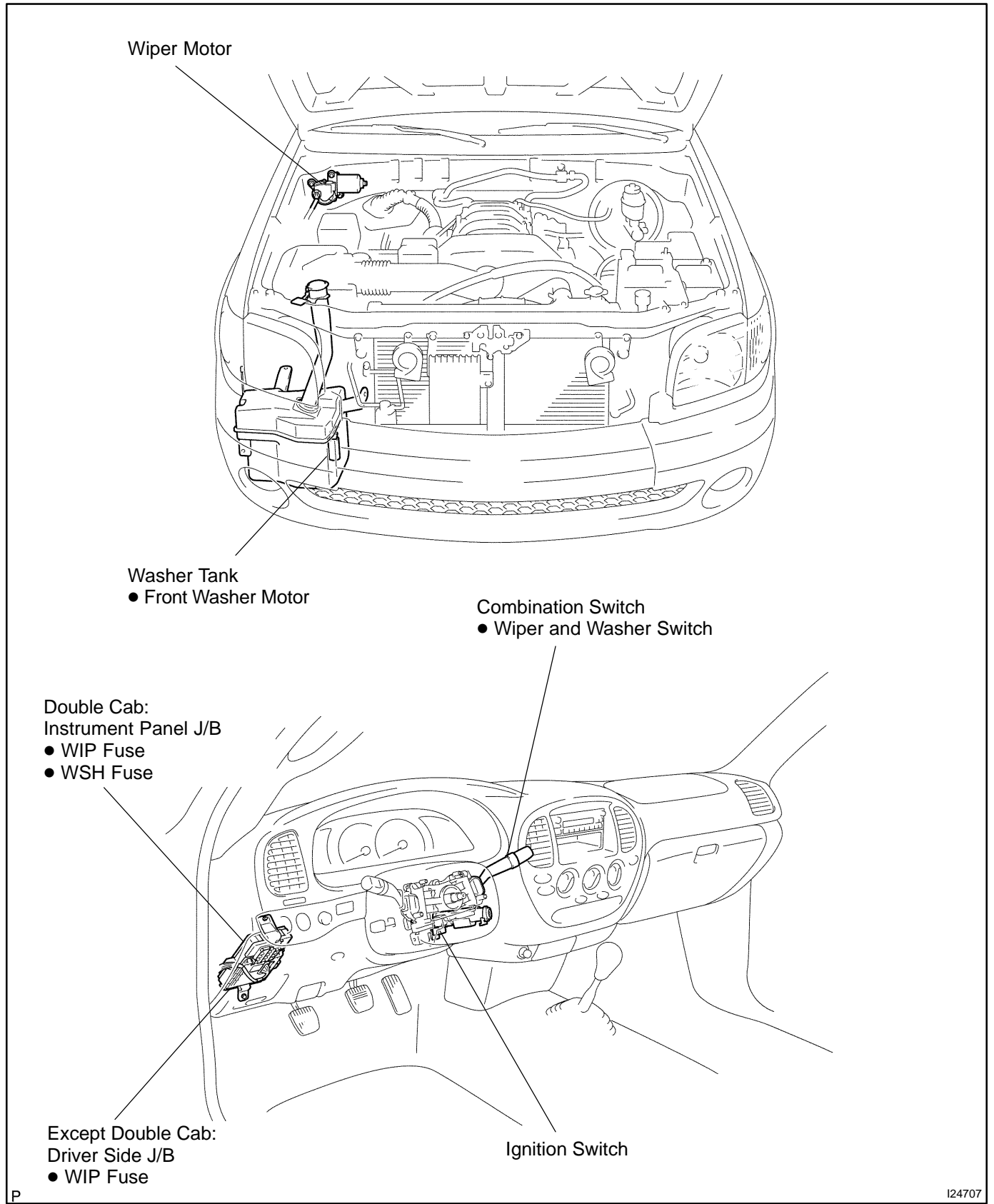
2. INSPECT CARGO LIGHT ASSEMBLY CONTINUITY

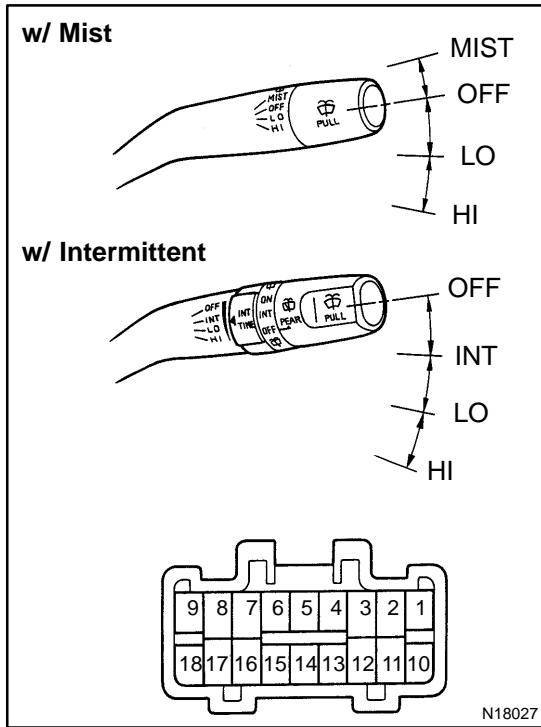
Using an ohmmeter, check that continuity exists between terminals 3 and 2.

If the continuity is not as specified, replace the bulb or the stop light assembly.

WIPER AND WASHER SYSTEM LOCATION

BE03B-09





INSPECTION

1. INSPECT FRONT WIPER AND WASHER SWITCH CONTINUITY

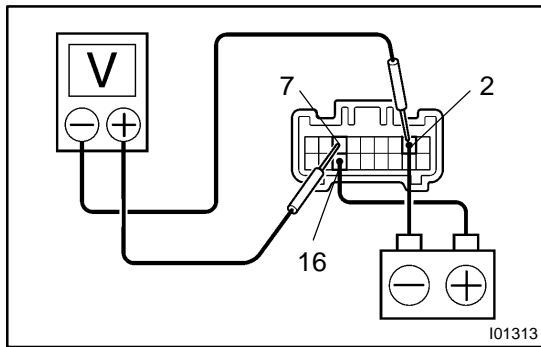
w/ Mist:

Switch Position	Tester Connection	Specified Condition
MIST	7 - 17, 16 - 17	Continuity
OFF	7 - 16	Continuity
LO	7 - 17	Continuity
HI	8 - 17	Continuity
Washer ON	2 - 11	Continuity

w/ Intermittent:

Switch Position	Tester Connection	Specified Condition
OFF	7 - 16	Continuity
INT	7 - 16	Continuity
LO	7 - 17	Continuity
HI	8 - 17	Continuity
Washer ON	2 - 11	Continuity

If the continuity is not as specified, replace the switch.



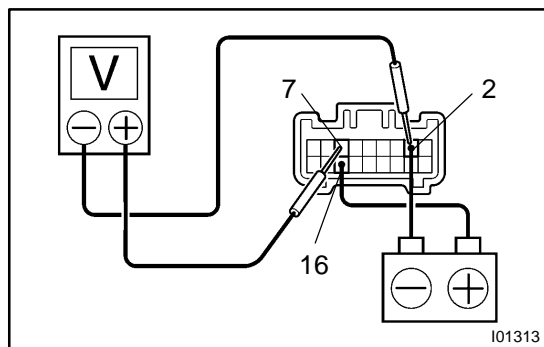
2. INSPECT INTERMITTENT OPERATION

- Turn the wiper switch to the INT position.
- Turn the intermittent time control switch to the FAST position.
- Connect the positive (+) lead from the battery to terminal 16 and the negative (-) lead to terminal 2.
- Connect the positive (+) lead from the voltmeter to terminal 7 and the negative (-) lead to terminal 2, check that the meter needle indicates battery positive voltage.

INT time control switch position	Voltage
FAST	Approx. 1 to 3 sec. Battery positive voltage 0 V
SLOW	Approx. 10 to 15 sec. Battery positive voltage 0 V

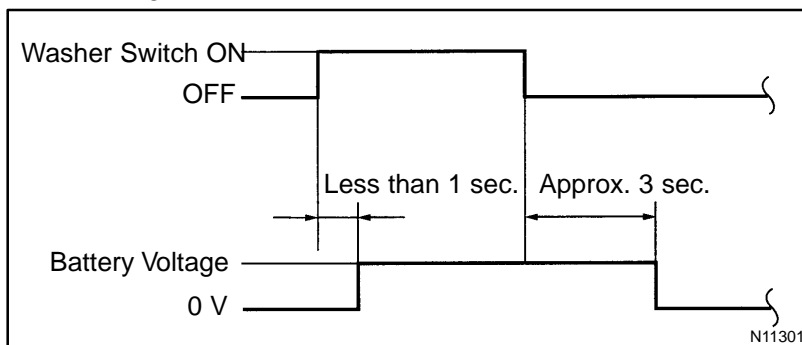
V03883

If the result is not as specified, replace the switch.

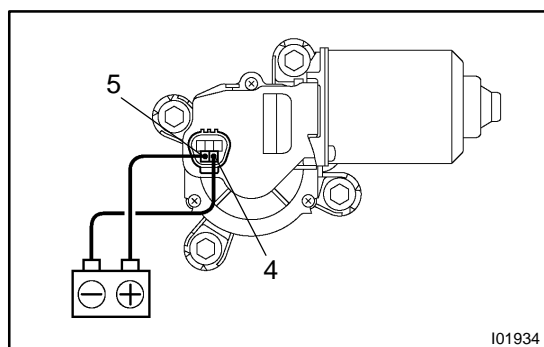


3. INSPECT WASHER LINKED OPERATION

- Connect the positive (+) lead from the battery to terminal 16 and the negative (-) lead to terminal 2.
- Connect the positive (+) lead from the voltmeter to terminal 7 and the negative (-) lead to terminal 2.
- Push in the washer switch, and check that the voltage changes as shown in the table below.



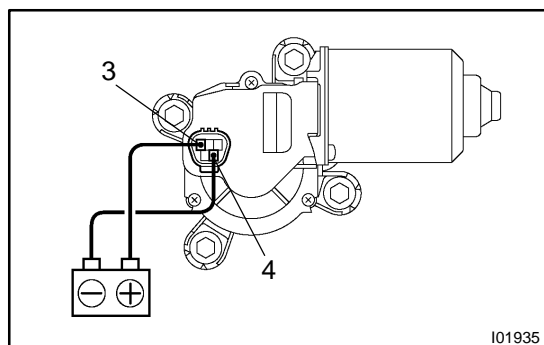
If the operation is not as specified, replace the wiper and washer switch.



4. Low speed:

INSPECT WIPER MOTOR OPERATION

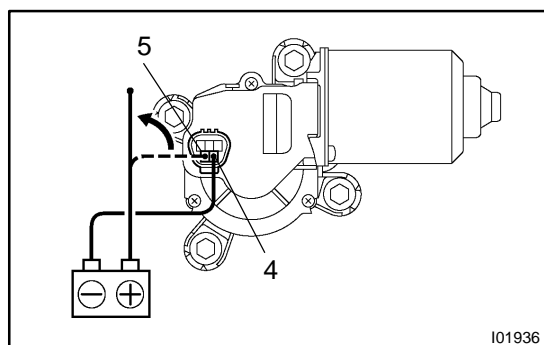
Connect the positive (+) lead from the battery to terminal 5 and the negative (-) lead from the battery to the motor body or terminal 4, and check that the motor operates at low speed. If operation is not as specified, replace the motor.



5. High speed:

INSPECT WIPER MOTOR OPERATION

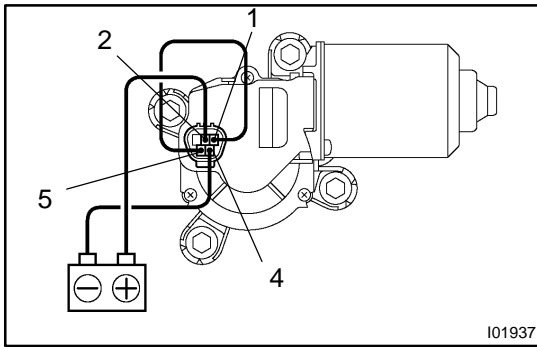
Connect the positive (+) lead from the battery to terminal 3 and the negative (-) lead from the battery to the motor body or terminal 4, and check that the motor operates at high speed. If operation is not as specified, replace the motor.



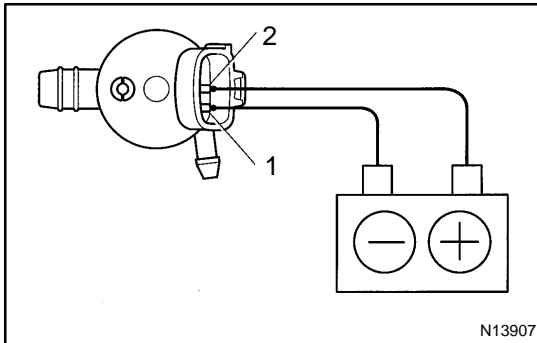
6. Stopping at stop position:

INSPECT WIPER MOTOR OPERATION

- Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting the positive (+) lead from terminal 5.



- (b) Connect terminals 1 and 5.
- (c) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead from the battery to the motor body or terminal 4, and check that the motor stops running at the stop position after the motor operates again. If operation is not as specified, replace the motor.



7. INSPECT WASHER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, and check that the motor operates.

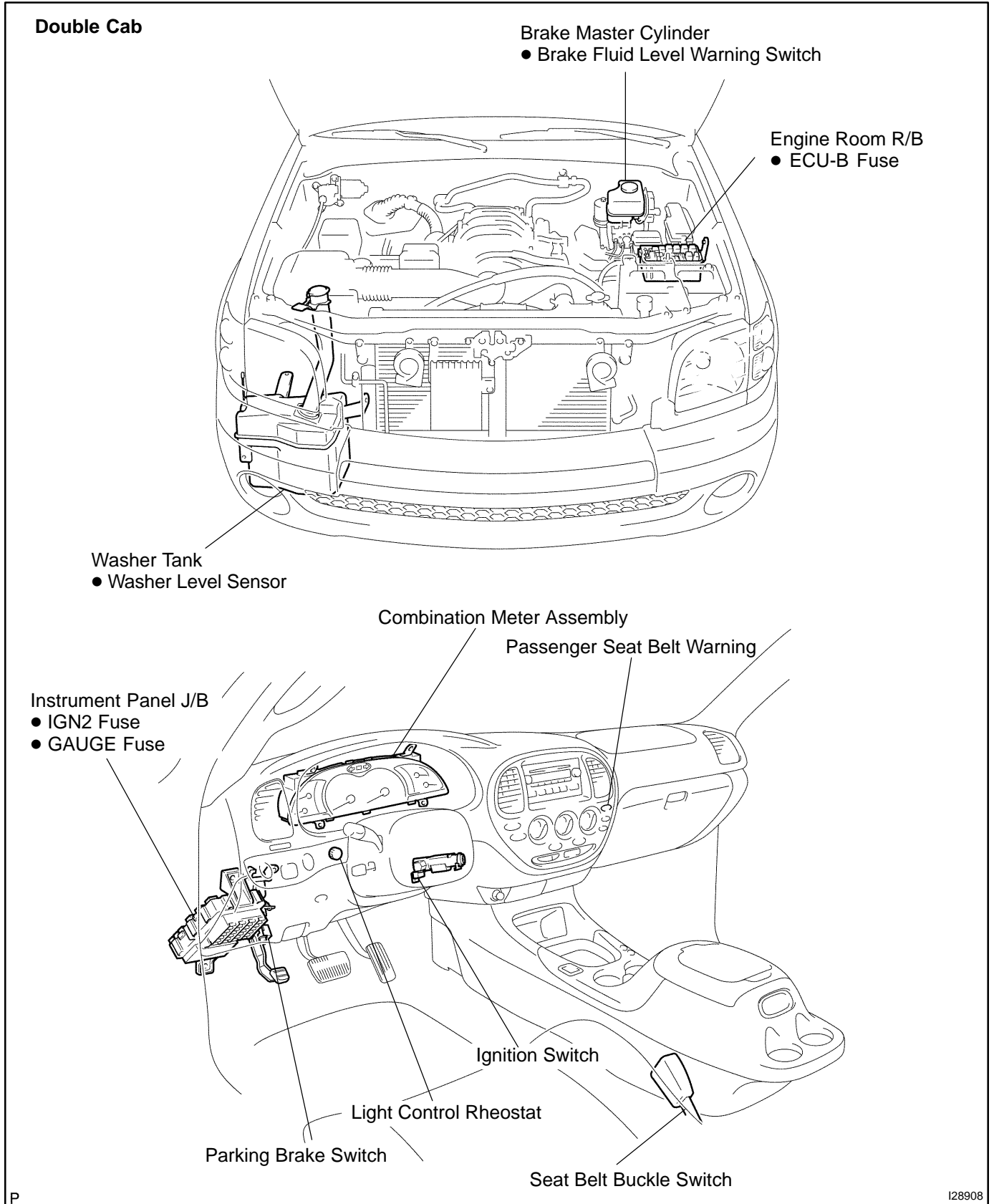
NOTICE:

These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

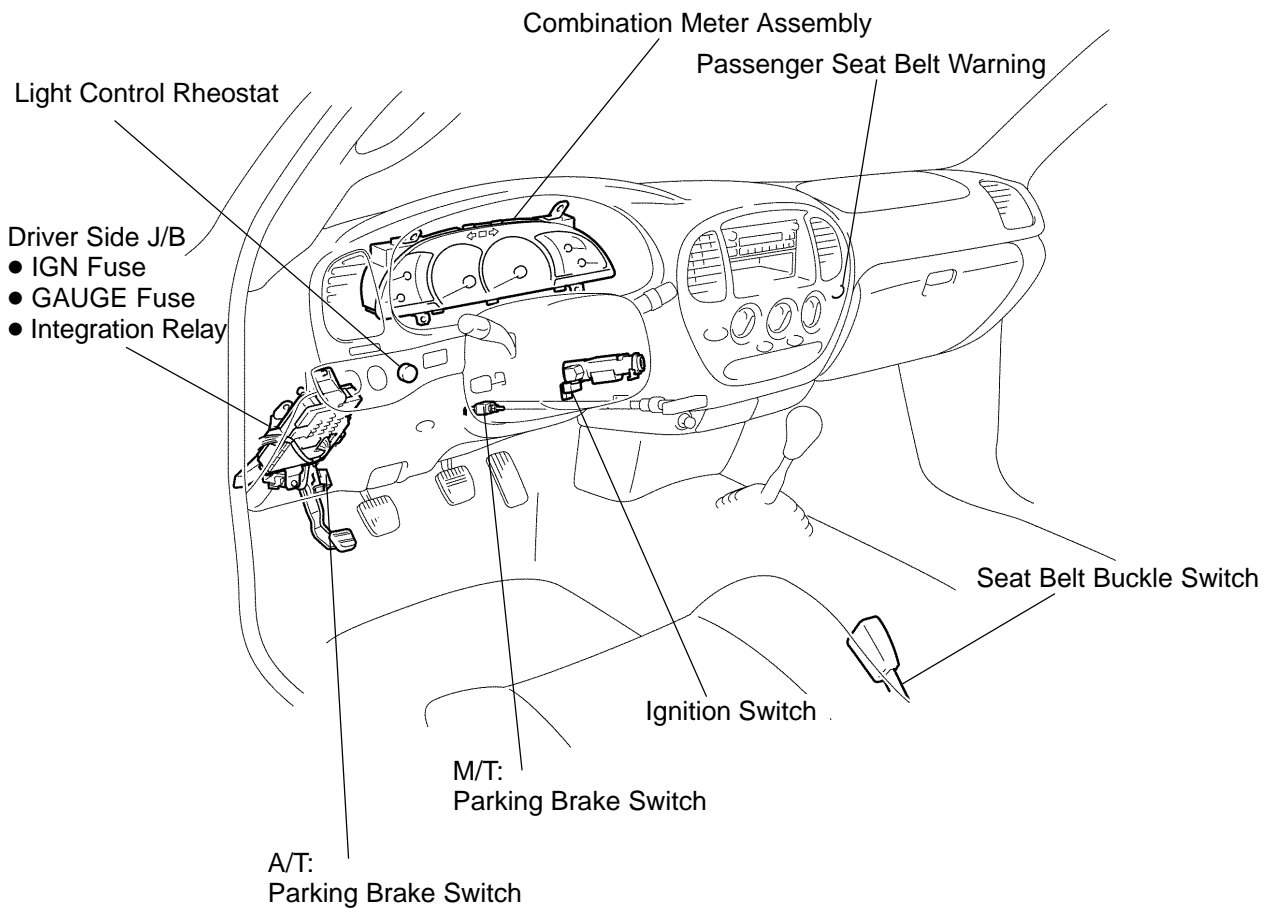
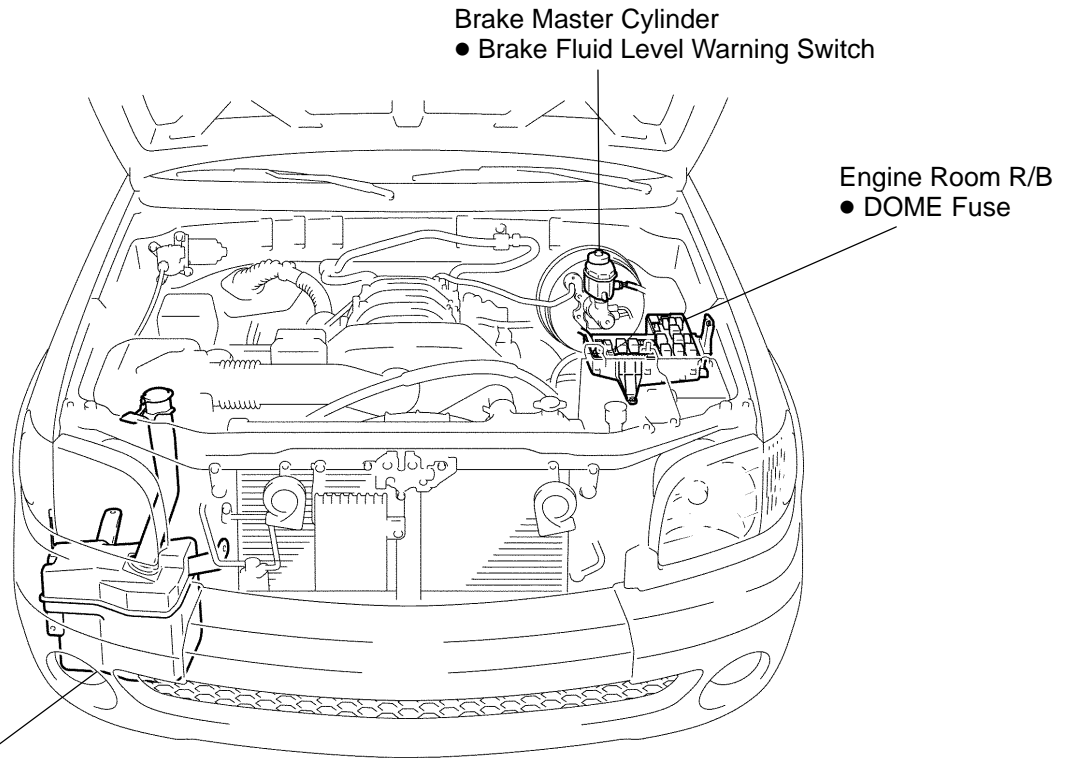
If operation is not as specified, replace the motor.

COMBINATION METER LOCATION

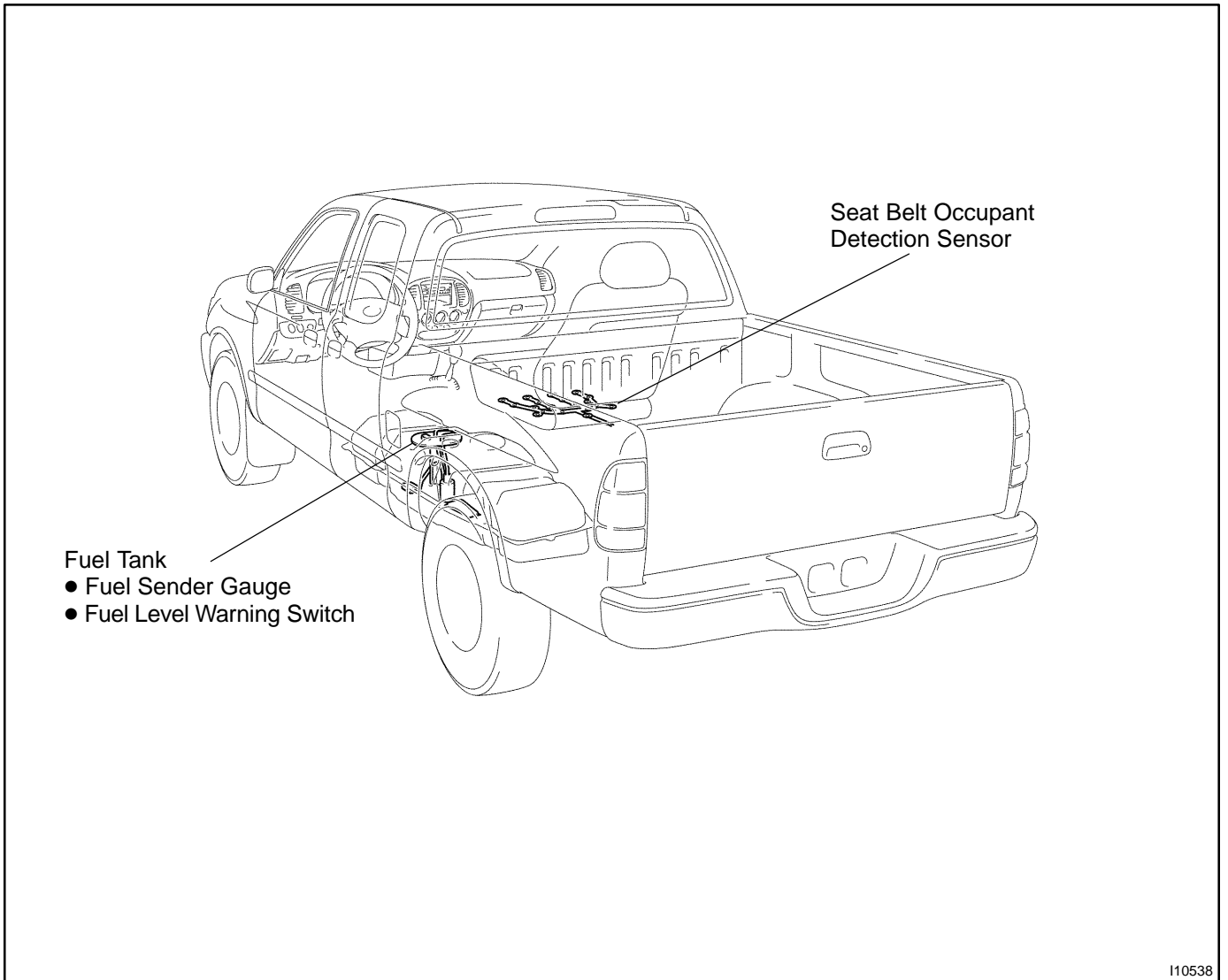
BE2L5-02



Except Double Cab

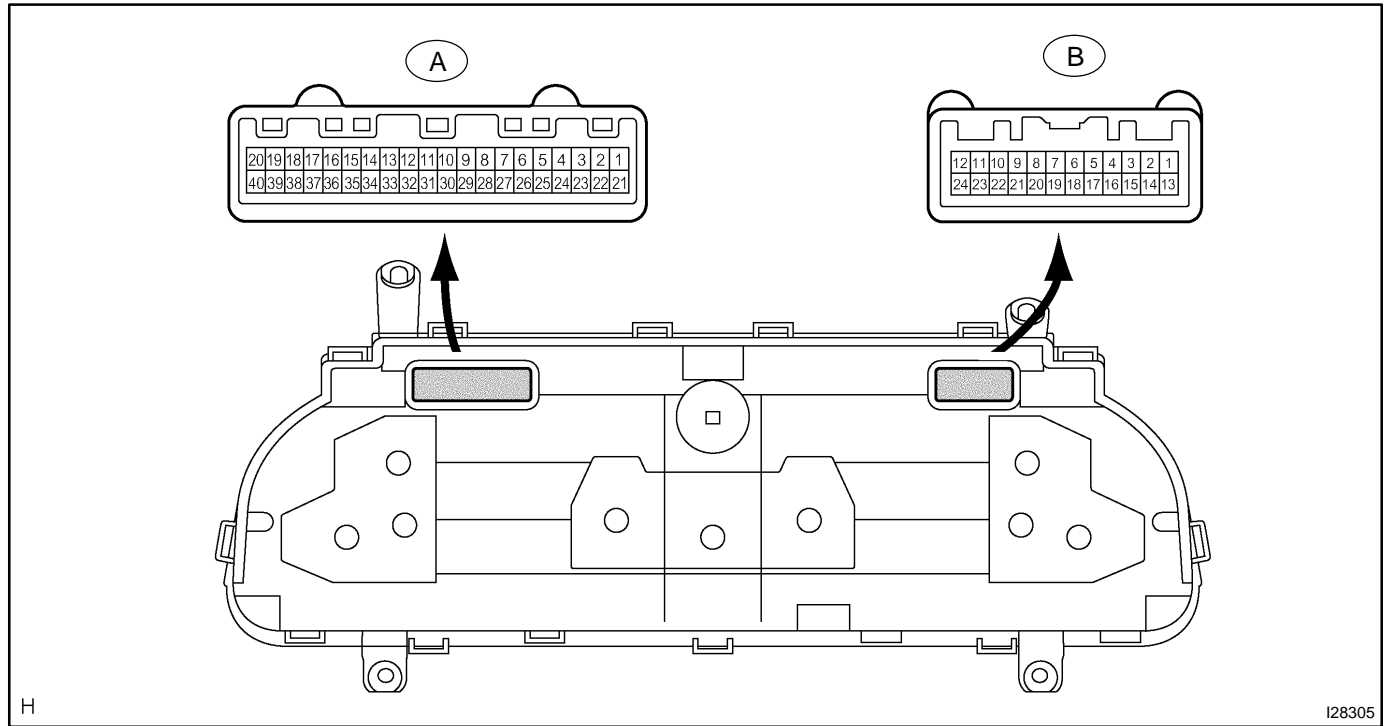


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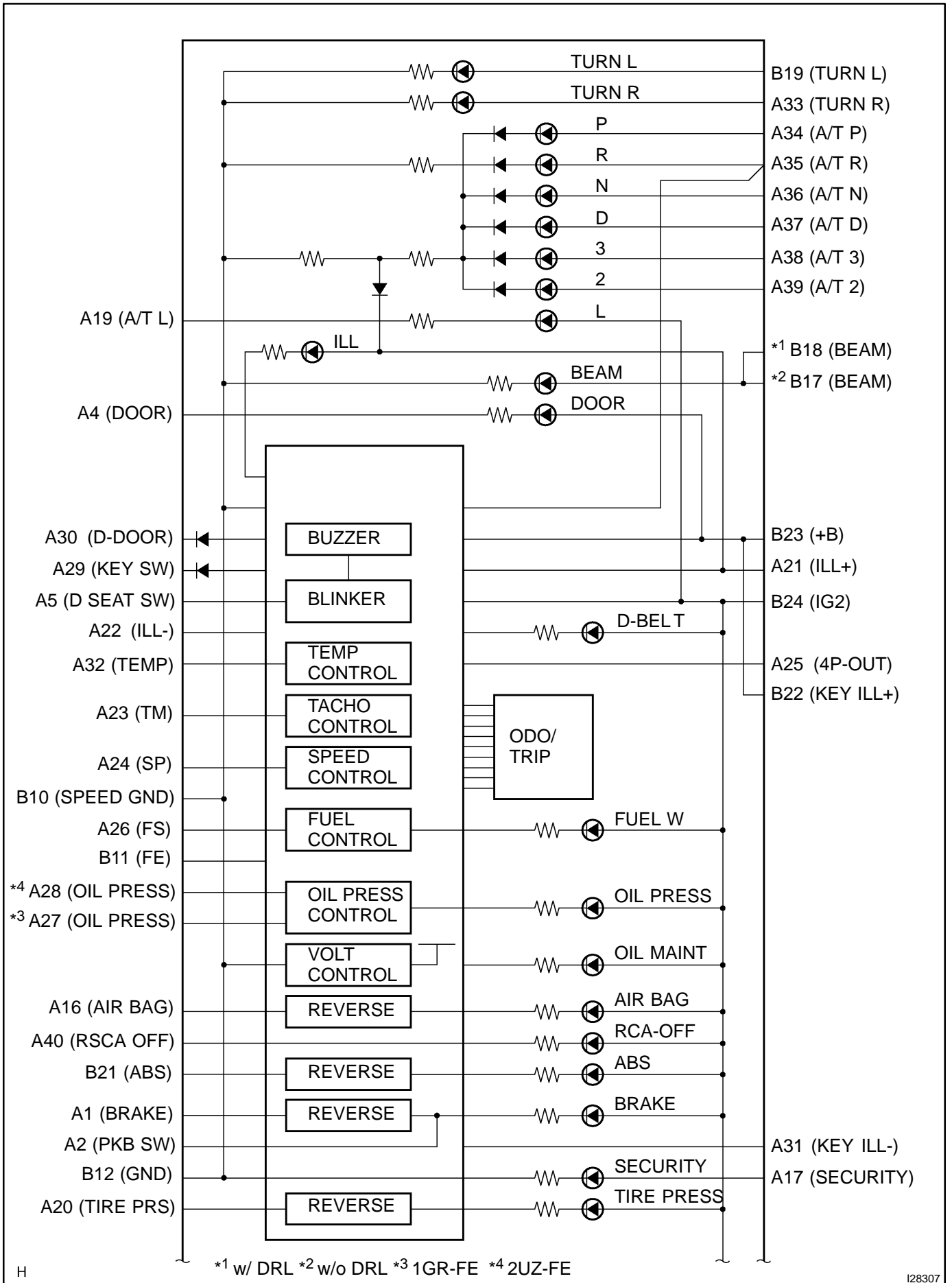


I10538

CIRCUIT

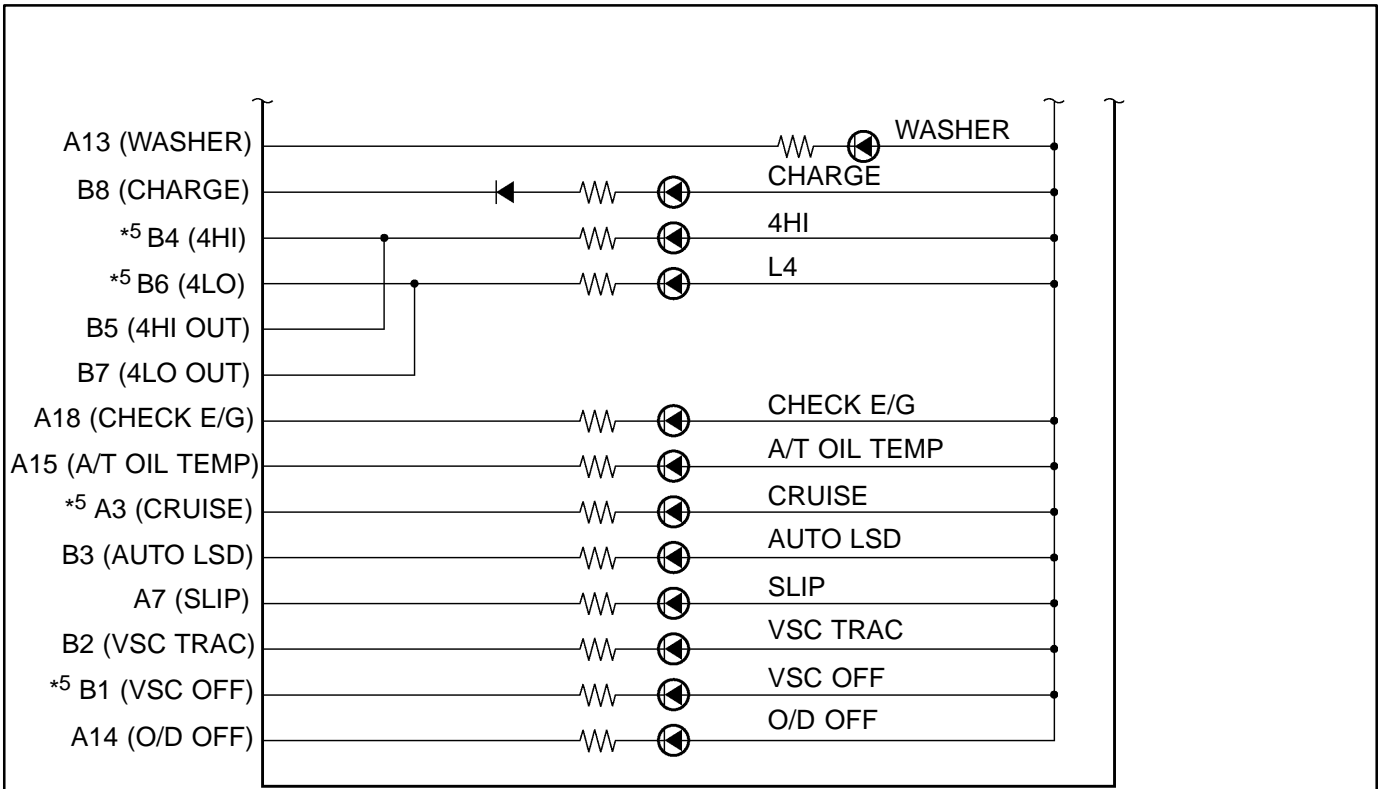


BODY ELECTRICAL - COMBINATION METER



H

I28307



H *5 6 Gauge Meter Only

BODY ELECTRICAL - COMBINATION METER

Terminal No.	Wire Harness Side
1	*1 Brake Actuator Assy (ABS)
	*2 ABS & Traction Actuator Assy (VSC)
2	Brake Fluid Level Warning Switch
	Parking Brake Switch
3	ECM
4	Body ECU
5	Front Seat Inner Belt Assy (Driver side)
7	ABS & Traction Actuator Assy (VSC)
13	Washer Level Warning Switch
14	ECM
15	ECM
16	Airbag Sensor Assy Center
17	Body ECU
18	ECM
19	ECM
20	Tire Pressure ECU
21	TAIL Fuse
22	Light Control Rheostat
23	ECM
24	*3 Brake Actuator Assy (ABS)
	*3 ABS & Traction Actuator Assy (VSC)
	*4 Vehicle Speed Sensor
25	4P-OUT
26	Fuel Sender Gauge
27	*5 Low Oil Pressure Sensor
28	*6 Low Oil Pressure Switch
29	Key Unlock Warning Switch
30	Door Courtesy Switch
31	Key Illumination
32	ECM
33	Flasher Relay
34	Park/Neutral Position Switch
35	Park/Neutral Position Switch
36	Park/Neutral Position Switch
37	Park/Neutral Position Switch
38	Park/Neutral Position Switch
39	Park/Neutral Position Switch
40	Airbag Sensor Assy Center

A

Terminal No.	Wire Harness Side
1	ABS & Traction Actuator Assy (VSC)
2	ABS & Traction Actuator Assy (VSC)
3	ABS & Traction Actuator Assy (VSC)
4	Transfer Control ECU
5	Transfer Indicator (4 Hi)
6	Transfer Control ECU
7	Transfer Indicator (4 Lo)
8	Generator
10	Vehicle Speed Sensor
11	Fuel Sender Gauge Assy
12	Body Ground
17	*7 Headlight Assy
18	*8 Body ECU
19	Flasher Relay
21	*1 Brake Actuator Assy (ABS)
	*2 ABS & Traction Actuator Assy (VSC)
22	Key Illumination
23	DOME Fuse
24	IGN1 Fuse

B

- *1 w/o VSC
- *2 w/ VSC
- *3 A/T
- *4 M/T
- *5 1GR-FE
- *6 2UZ-FE
- *7 w/o DRL
- *8 w/ DRL

INSPECTION

1. INSPECT SPEEDOMETER ON-VEHICLE

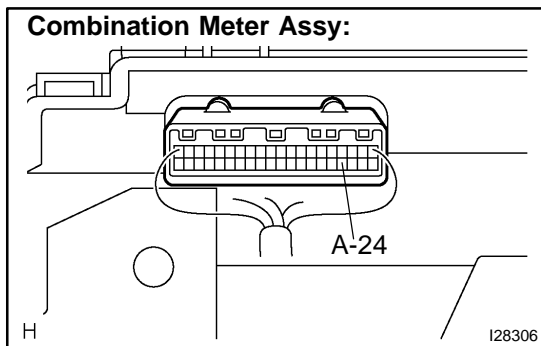
Using a speedometer tester, check the speedometer for indication error and check operation of the odometer.

HINT:

Tire wear and tire over or under inflation will increase the indication error.

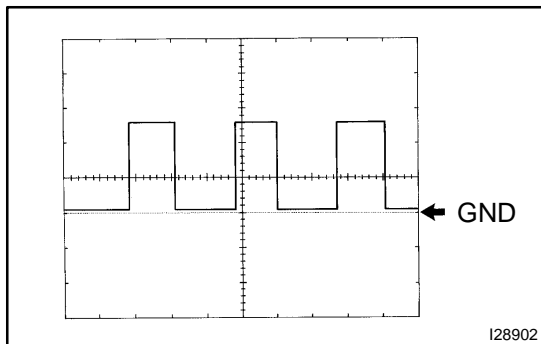
USA (mph)		CANADA (km/h)	
Standard Indication	Allowable Range	Standard Indication	Allowable Range
20	19 to 22	20	17.5 to 21.5
40	39 to 42.5	40	38 to 42
60	59.5 to 63.5	60	58 to 63
80	79.5 to 84	80	78 to 84
100	100 to 105	100	98.5 to 104.5
-		120	119 to 125
-		140	139 to 146
-		160	159 to 167

If the error is excessive, replace the speedometer.



2. INSPECT INPUT VEHICLE SPEED SIGNAL WAVEFORM (A/T)

- (a) Remove the combination meter with connectors still connected.
- (b) Connect the oscilloscope to terminal A-24 and body ground.
- (c) Start the engine.



- (d) Check the signal waveform according to the condition(s) in the table below.

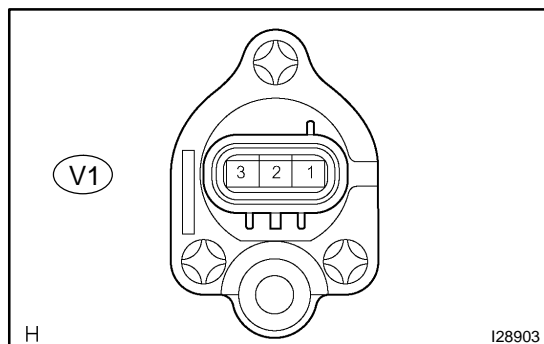
Item	Condition
Tool setting	5 V/DIV, 20 ms/DIV
Vehicle condition	Driving at approx. 20 km/h (12 mph)

OK:

As shown in the illustration

HINT:

As vehicle speed increases, the cycle of the signal waveform narrows.

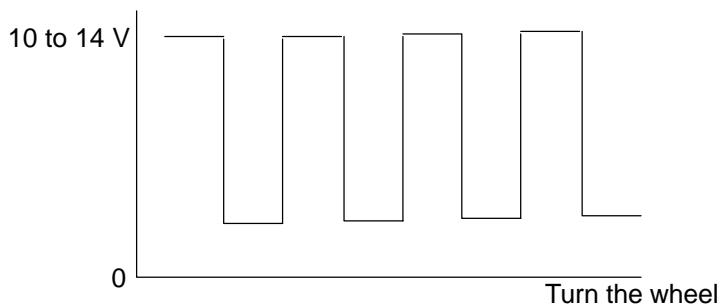


3. INSPECT INPUT VEHICLE SPEED SIGNAL WAVEFORM (M/T)

- Shift the shift lever to neutral.
- Jack up either of the front wheel.
- Turn the ignition switch to ON.
- Measure the voltage between terminals 2 and 3 of speed sensor when the front wheel is turning slowly.

Standard voltage:

Voltage is generated intermittently.



4. INSPECT TACHOMETER ON-VEHICLE

- Connect a tune-up test tachometer, and start the engine.

NOTICE:

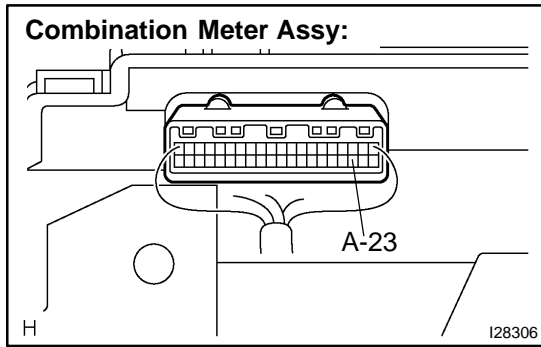
- Reversing the connection of the tachometer will damage the transistors and diodes inside the tachometer.
- When removing or installing the tachometer, be careful not to drop or subject it to heavy shocks.

- Compare the tester and tachometer indications.

DC 13.5 V at 20°C (68°F)

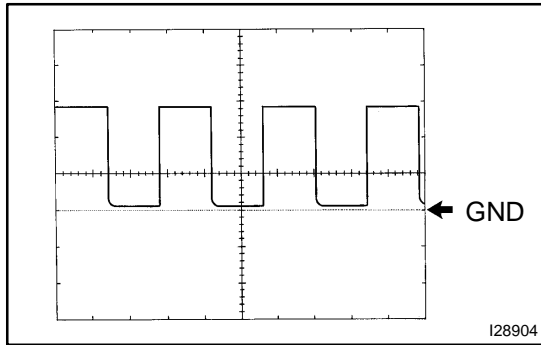
2UZ-FE		1GR-FE	
Standard Indication	Allowable Range	Standard Indication	Allowable Range
700	630 to 770	700	630 to 770
1,000	900 to 1,100	1,000	900 to 1,000
2,000	1,875 to 2,125	2,000	1,850 to 2,150
3,000	2,850 to 3,150	3,000	2,800 to 3,200
4,000	3,850 to 4,150	4,000	3,800 to 4,200
5,000	4,850 to 5,150	5,000	4,800 to 5,100
6,000	5,820 to 6,180	6,000	5,750 to 6,250

If the error is excessive, replace the tachometer.



5. INSPECT INPUT TACHO SIGNAL WAVEFORM

- (a) Remove the combination meter with connector still connected.
- (b) Connect the oscilloscope to terminal A-23 and body ground.
- (c) Start the engine.

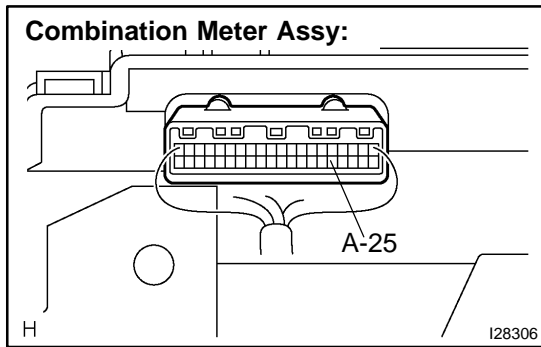


- (d) Check the signal waveform according to the condition(s) in the table below.

Item	Condition
Tool setting	5 V/DIV, 10 ms/DIV
Vehicle condition	Engine idle speed

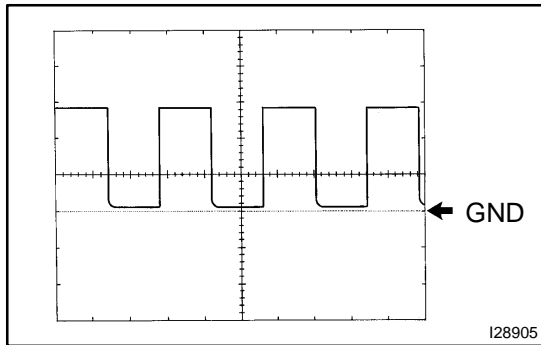
OK:

As shown in the illustration



6. INSPECT OUTPUT TACHO SIGNAL WAVEFORM

- (a) Remove the combination meter with connector still connected.
- (b) Connect the oscilloscope to terminal A-25 and body ground.
- (c) Start the engine.

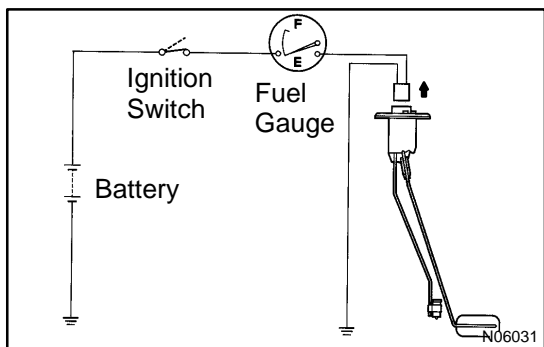


- (d) Check the signal waveform according to the condition(s) in the table below.

Item	Condition
Tool setting	5 V/DIV, 10 ms/DIV
Vehicle condition	Engine idle speed

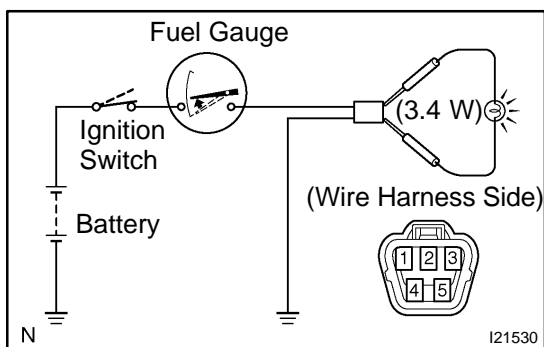
OK:

As shown in the illustration



7. INSPECT FUEL RECEIVER GAUGE OPERATION

- (a) Disconnect the connector from the sender gauge.
- (b) Turn the ignition switch ON, and check that the receiver gauge needle indicates EMPTY.

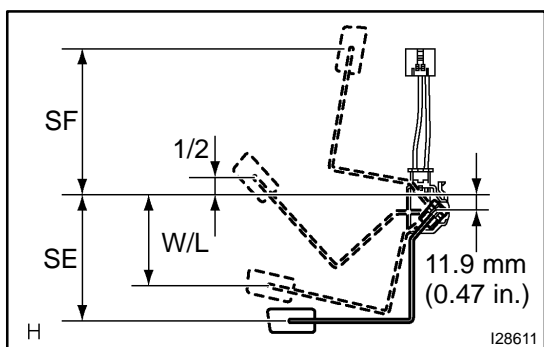


- (c) Connect terminals 2 and 3 of the wire harness side connector through a 3.4 W test bulb.
- (d) Turn the ignition switch ON, and check that the bulb lights up and the receiver gauge needle moves towards the full side.

HINT:

Because of the silicon oil in the gauge, it will take a short time for needle to stabilize.

If the operation is not as specified, inspect the receiver gauge resistance.

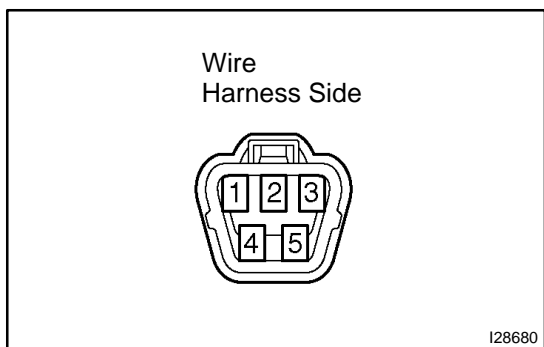


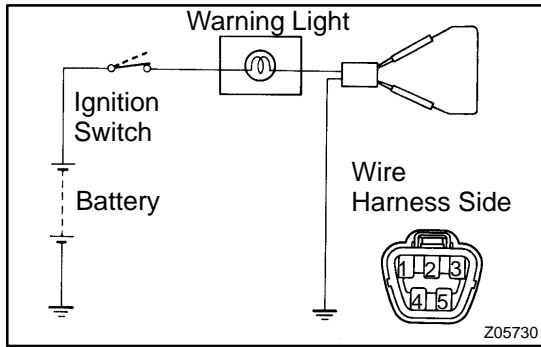
8. INSPECT FUEL SENDER GAUGE RESISTANCE

Measure the resistance between terminals 2 and 3 at each float position.

Float Position mm (in.)	Resistance (Ω)
SF: Approx. 116.5 (4.59) ± 2.5 (0.10)	Approx. 4.0
1/2: Approx. 14 (0.55)	Approx. 59.0
W/L: Approx. 72.2 (2.84)	Approx. 98.8
SE: Approx. 100 (3.90) ± 2.5 (0.10)	Approx. 110.0 ± 2.5

If the resistance value is not as specified, replace the fuel sender gauge.

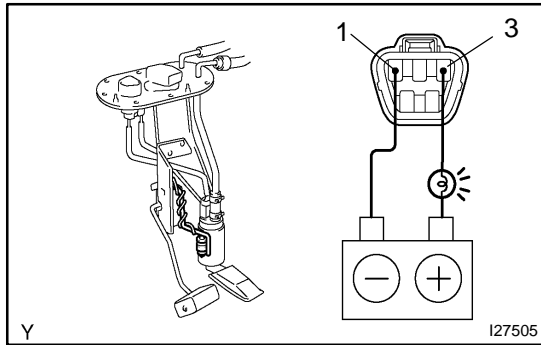




9. INSPECT FUEL LEVEL WARNING LIGHT

- (a) Disconnect the connector from the sender gauge.
- (b) Connect terminals 1 and 3 of the wire harness side connector.
- (c) Turn the ignition switch ON, and check that the warning light lights up.

If the warning light does not light up, inspect the bulb or wire harness.

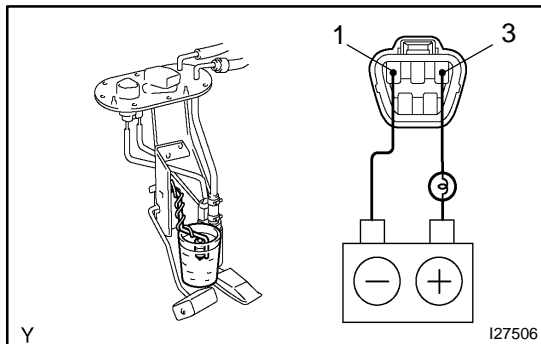


10. INSPECT FUEL LEVEL WARNING SWITCH

- (a) Apply battery voltage between terminals 1 and 3 through a 3.4 W test bulb, and check that the bulb lights up.

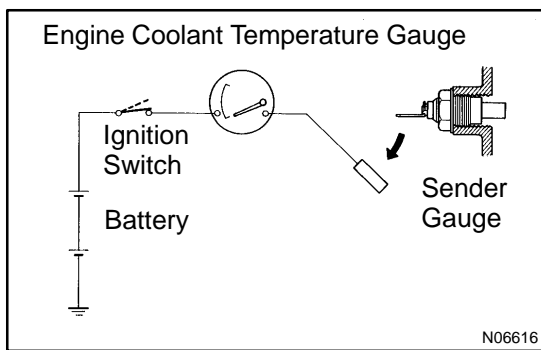
HINT:

It will take a short time for the bulb to light up.



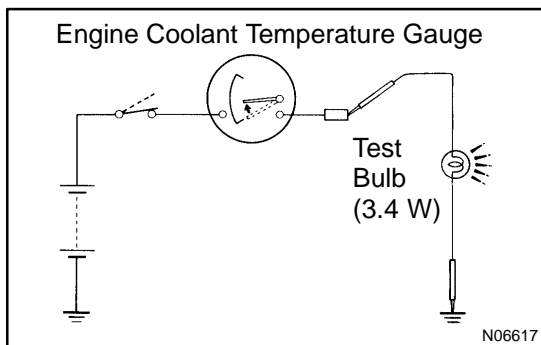
- (b) Submerge the switch in fuel, and check that the bulb turns off.

If operation is not as specified, replace the sender gauge.

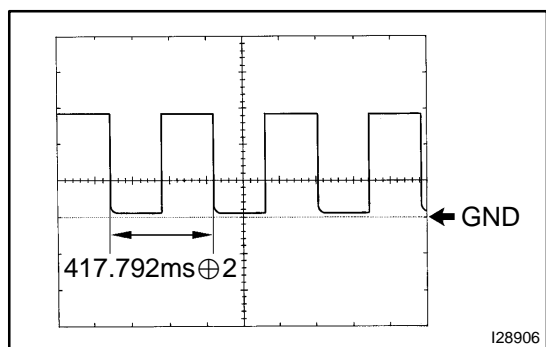
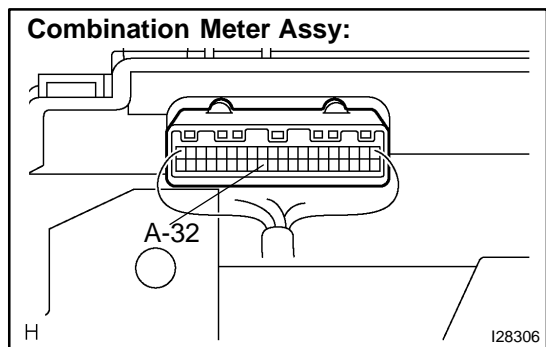


11. INSPECT ENGINE COOLANT TEMPERATURE RECEIVER GAUGE OPERATION

- (a) Disconnect the connector from the sender gauge.
- (b) Turn the ignition switch ON, and check that the receiver gauge needle indicates cool side.



- (c) Ground the terminal of the wire harness side connector through a 3.4 W test bulb.
- (d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves to the hot side.



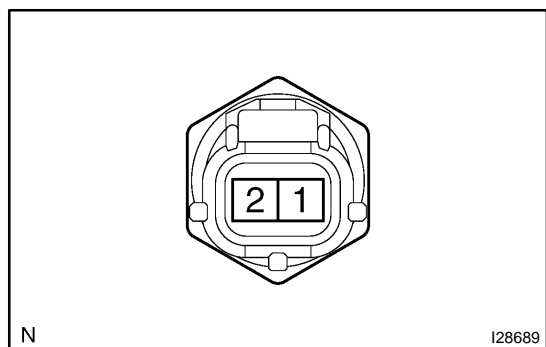
12. INSPECT INPUT ENGINE COOLANT TEMPERATURE SIGNAL WAVEFORM

- (a) Remove the combination meter with connectors still connected.
- (b) Connect the oscilloscope to terminal A32 and body ground.
- (c) Start the engine.
- (d) Check the signal waveform according to the condition(s) in the table below.

Item	Condition
Tool setting	5 V/DIV, 10 ms/DIV
Vehicle condition	Ignition switch ACC or ON

OK:

As shown in the illustration

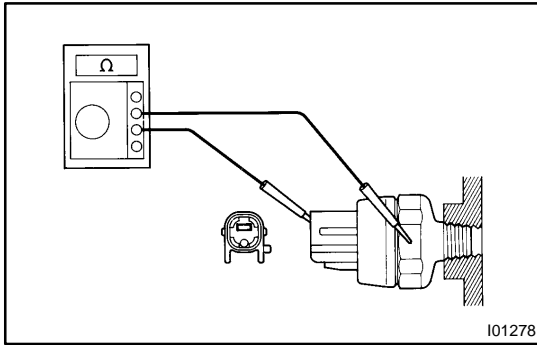


13. INSPECT ENGINE COOLANT TEMPERATURE SENDER GAUGE RESISTANCE

- (a) Disconnect the connector from the engine coolant temperature sender gauge.
- (b) Measure the resistance according to the value(s) in the table below.

Temperature °C (°F)	Resistance (kΩ)
-20 (-4)	13.54 to 16.63
20 (68)	2.28 to 2.63
80 (176)	0.31 to 0.33
110 (230)	0.13 to 0.15

If the resistance value is not as specified, replace the sender gauge.



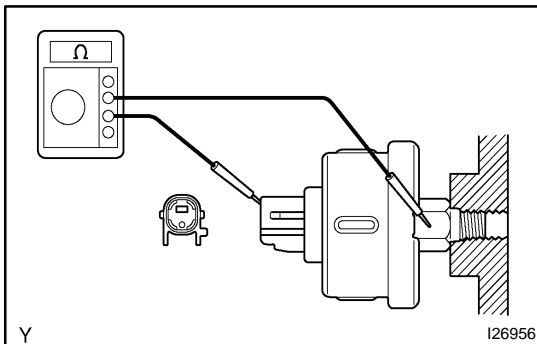
**14. 1GR-FE (Standard cab):
INSPECT OIL PRESSURE SWITCH CONTINUITY**

- Disconnect the connector from the switch.
- Check that continuity exists between the terminal and ground with the engine stopped.
- Check that no continuity exists between the terminal and ground with the engine running.

HINT:

The oil pressure should be over 24.5 kPa (0.25 kgf/cm², 3.55 psi).

If the continuity is not as specified, replace the switch.



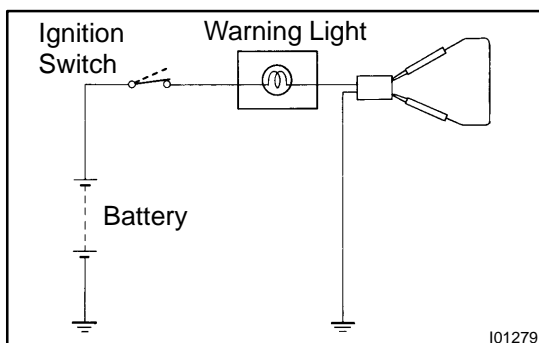
**15. 1GR-FE (Access cab) and 2UZ-FE:
INSPECT OIL PRESSURE SENDER GAUGE CONTINUITY**

- Disconnect the connector from the sender gauge.
- Check that no continuity exists between the terminal and ground with the engine stopped.
- Check that continuity exists between the terminal and ground with the engine running.

HINT:

The oil pressure should be over 29.0 kPa (0.3 kgf/cm², 4.2 psi).

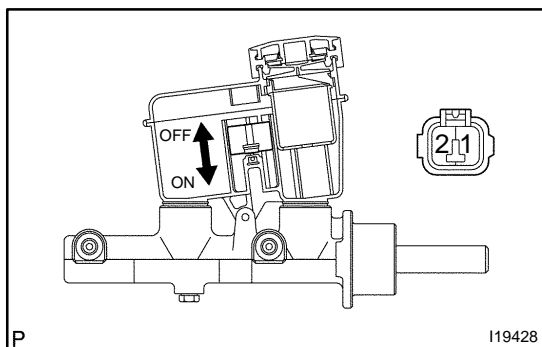
If the continuity is not as specified, replace the sender gauge.



16. INSPECT BRAKE WARNING LIGHT

- Disconnect the connector from the brake fluid warning switch.
- Release the parking brake pedal.
- Connect the terminals on the harness side of the level warning switch connector.
- Start the engine, and check that the warning light lights up.

If the warning light does not light up, inspect the bulb or wire harness.

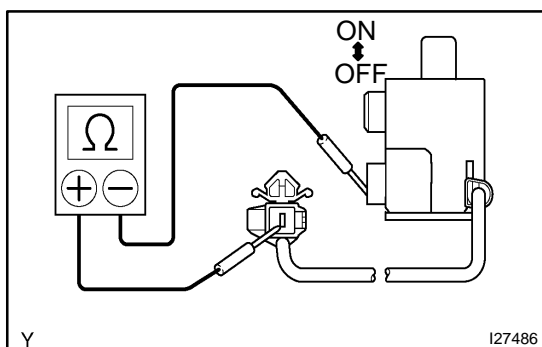


17. INSPECT BRAKE FLUID LEVEL WARNING SWITCH CONTINUITY

- Remove the reservoir tank cap and strainer.
- Disconnect the connector.
- Check that no continuity exists between the terminals with the switch OFF (float).
- Use siphon to take fluid out of the reservoir tank.
- Check that continuity exists between the terminals with the switch ON (sink).

If the continuity is not as specified, replace the switch.

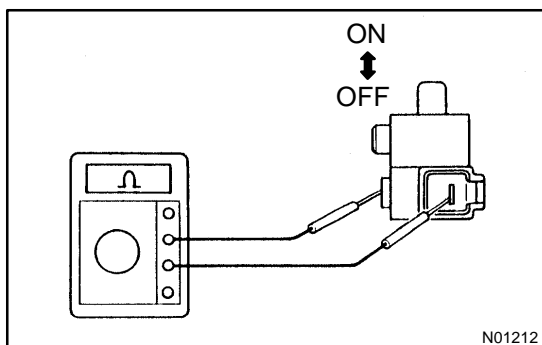
- Pour the fluid back in the reservoir tank.



18. Double cab: INSPECT PARKING BRAKE SWITCH CONTINUITY

- Check that there is continuity between the terminal and switch body with the switch ON (switch pin released).
- Check that there is no continuity between the terminals with the switch OFF (switch pin pushed in).

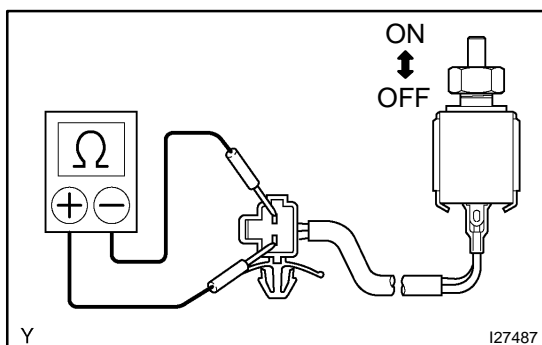
If the continuity is not as specified, replace the switch.



19. Except double cab (A/T): INSPECT PARKING BRAKE SWITCH CONTINUITY

- Check that there is continuity between the terminal and switch body with the switch ON (switch pin released).
- Check that there is no continuity between the terminals with the switch OFF (switch pin pushed in).

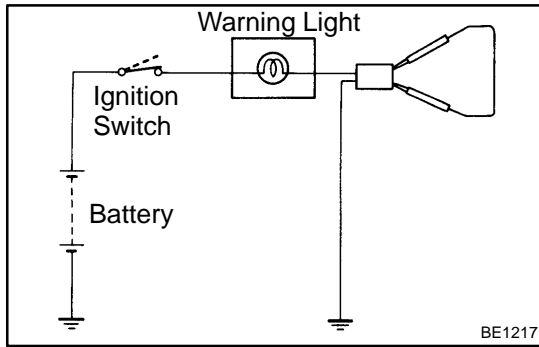
If the continuity is not as specified, replace the switch.



20. Except double cab (M/T): INSPECT PARKING BRAKE SWITCH CONTINUITY

- Check that there is continuity between the terminals with the switch ON (switch pin released).
- Check that there is no continuity between the terminals with the switch OFF (switch pin pushed in).

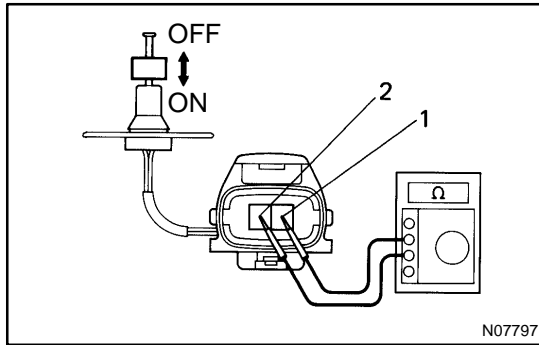
If the continuity is not as specified, replace the switch.



21. INSPECT WASHER LEVEL WARNING LIGHT

- (a) Disconnect the connectors from the level warning switch.
- (b) Connect the terminals of the wire harness side of the level warning switch connector.
- (c) Turn the ignition switch ON, and check that the warning light turns on.

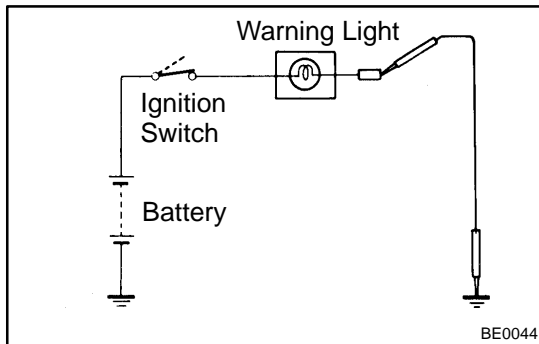
If the warning light does not turn on, inspect the bulb.



22. INSPECT WASHER LEVEL SWITCH CONTINUITY

- (a) Check that there is no continuity between the terminals with the switch OFF (float).
- (b) Check that there is continuity between the terminals with the switch ON (sink).

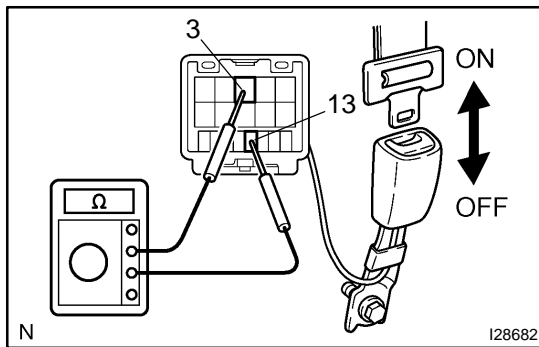
If the continuity is not as specified, replace the switch.



23. INSPECT DRIVER'S SEAT BELT WARNING LIGHT

- (a) Disconnect connector B from the combination meter.
- (b) Connect the negative (-) lead from the battery to terminal 9.
- (c) Turn the ignition switch ON and check that the warning light lights up.

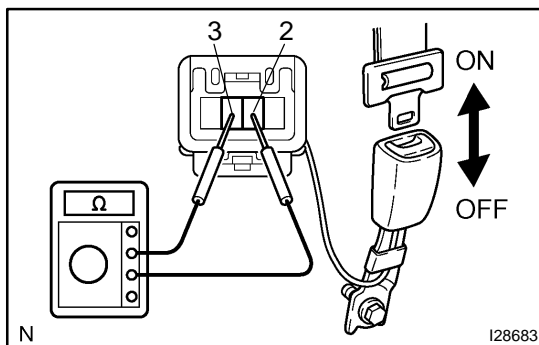
If the warning light does not light up, inspect the bulb or wire harness.



24. Except regular cab (w/o Power seat (Driver side): INSPECT BUCKLE SWITCH CONTINUITY

- (a) Check that continuity exists between terminals 3 and 13 of the switch connector with the switch ON (belt fastened).
- (b) Check that no continuity exists between terminals 3 and 13 on the switch side connector with the switch OFF (belt unfastened).

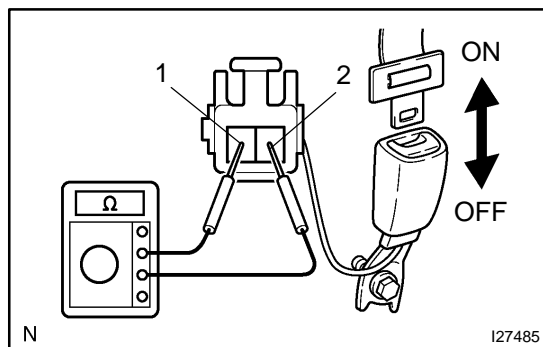
If the continuity is not as specified, replace the inner seat belt.



25. Except regular cab (w/ Power seat (Driver side): INSPECT BUCKLE SWITCH CONTINUITY

- (a) Check that continuity exists between terminals 2 and 3 on the switch side connector with the switch ON (belt fastened).
- (b) Check that no continuity exists between terminals 2 and 3 on the switch side connector with the switch OFF (belt unfastened).

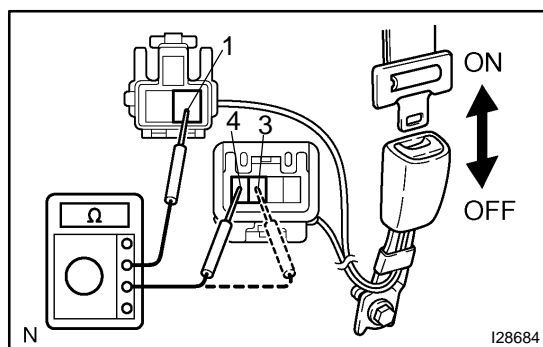
If the continuity is not as specified, replace the inner seat belt.



**26. Regular cab (Driver side):
INSPECT BUCKLE SWITCH CONTINUITY**

- (a) Check that continuity exists between terminals 1 and 2 of the switch connector with the switch ON (belt fastened).
- (b) Check that no continuity exists between terminals 1 and 2 on the switch side connector with the switch OFF (belt unfastened).

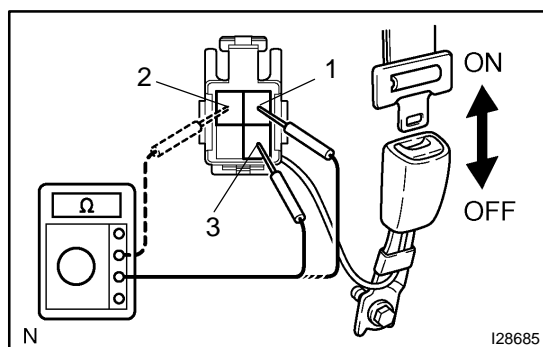
If the continuity is not as specified, replace the inner seat belt.



**27. Except regular cab (60:40 separate seat type (Passenger side)):
INSPECT BUCKLE SWITCH CONTINUITY**

- (a) Check that continuity exists between terminals 1 and 4 on the switch connector with the switch ON (belt fastened).
- (b) Check that no continuity exists between terminals 1, 3 and 4 on the switch side connector with the switch OFF (belt unfastened).

If the continuity is not as specified, replace the inner seat belt.



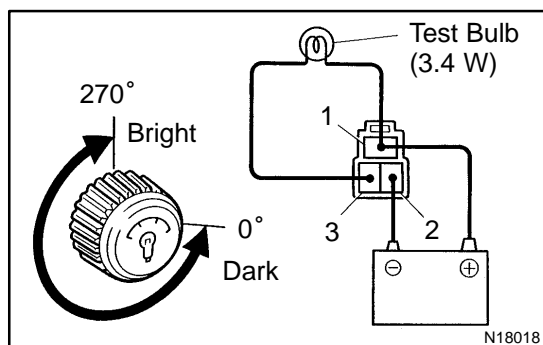
**28. Regular cab (Passenger side):
INSPECT BUCKLE SWITCH CONTINUITY**

- (a) Check that continuity exists between terminals 1 and 3 on the switch connector with the switch ON (belt fastened).
- (b) Check that no continuity exists between terminals 1, 3 and 4 on the switch side connector with the switch OFF (belt unfastened).

If the continuity is not as specified, replace the inner seat belt.

**29. Except regular cab (Except 60:40 separate seat type (Passenger side)):
INSPECT BUCKLE SWITCH CONTINUITY**

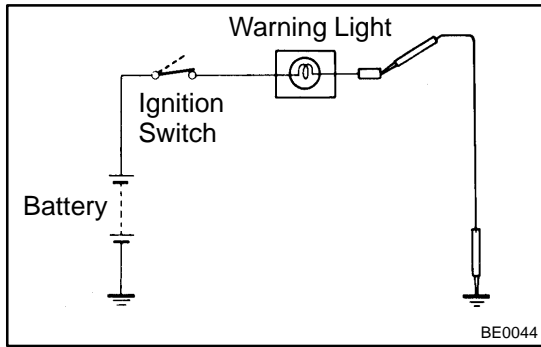
The seat belt buckle switch cannot be inspected independently because it is a hall effect switch.



30. INSPECT LIGHT CONTROL RHEOSTAT OPERATION

- (a) Connect terminals 1 and 3 through a 3.4 W test bulb.
- (b) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2.
- (c) Turn the rheostat knob fully counterclockwise, and check that the test bulb turns off.
- (d) Gradually turn the rheostat knob clockwise, and check that the test bulb brightness changes from dark to bright.

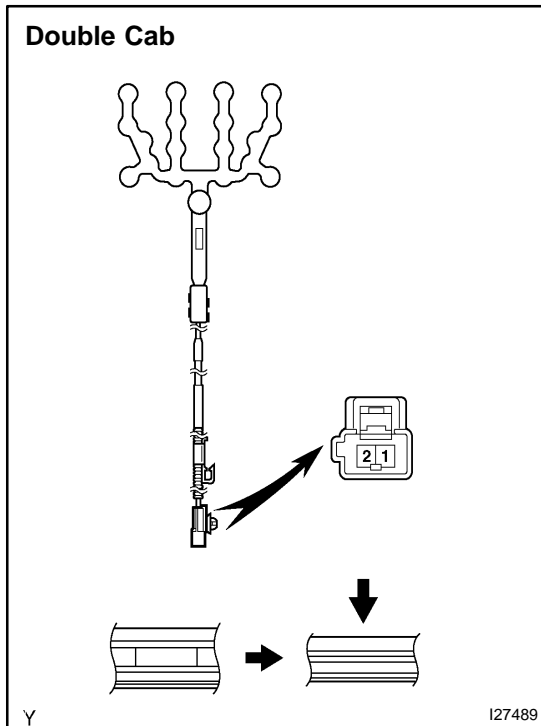
If operation is not as specified, replace the rheostat.



31. INSPECT OPEN DOOR WARNING LIGHT

- (a) Disconnect the connector from the door courtesy switch and ground terminal on the wire harness side.
- (b) Turn the ignition switch ON, and check that the warning light lights up.

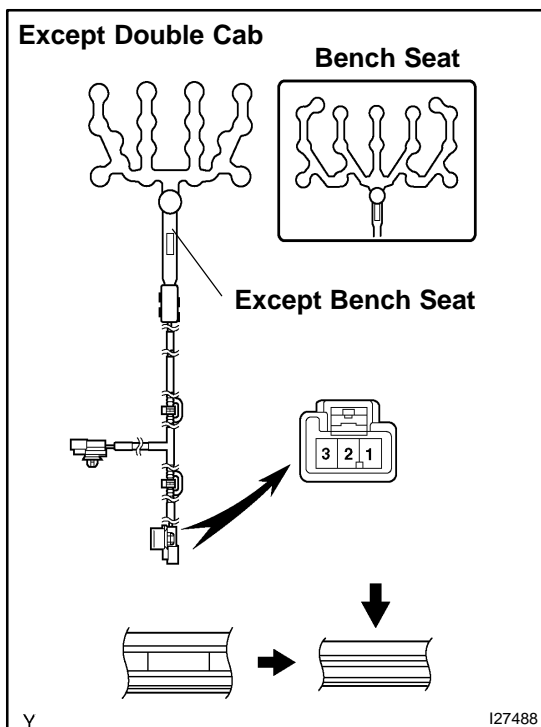
If the warning light does not light up, inspect the bulb.



**32. Double cab (Passenger's seat only):
INSPECT SEAT BELT WARNING OCCUPANT DETECTION SENSOR CONTINUITY**

Check that continuity exists between terminals 1 and 2 when pressing the sensing part.

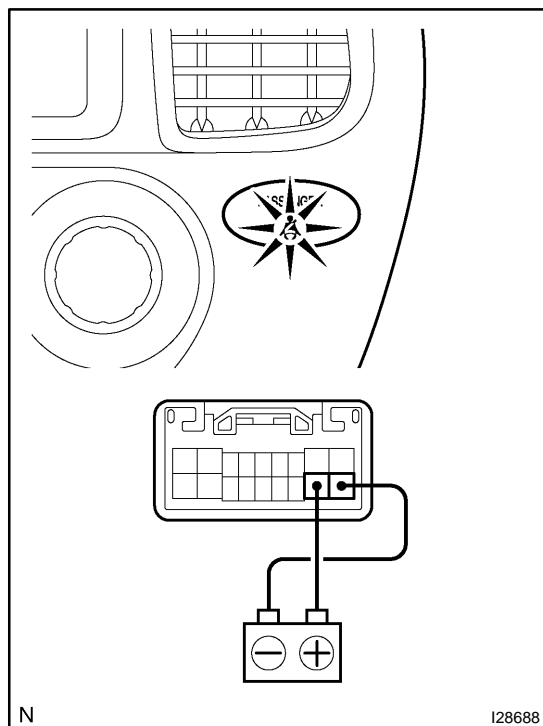
If the continuity is not as specified, replace the sensor.



**33. Except double cab (Passenger's seat only):
INSPECT SEAT BELT WARNING OCCUPANT DETECTION SENSOR CONTINUITY**

Check that continuity exists between terminals 1 and 2 when pressing the sensing part.

If the continuity is not as specified, replace the sensor.

**34. INSPECT PASSENGER SEAT BELT WARNING LIGHT**

- Remove the center cluster finish panel.
- Disconnect the connectors from the center integration.
- Connect the positive(+) lead the vattery to the terminal 11 and negative (-) lead terminal 10, and check that the warning light lights up.

If the warning light does not light up, inspect the bulb or wire harness.

35. MAINTENANCE LIQUID RESETTING PROCEDURE

- Set the display window to ODO.
- Turn the ignition switch off.
- Pressing the reset switch, turn the ignition switch to the ON position (keep pressing for at least 5 seconds.)
- Reset procedure is completed.

HINT:

- If the ignition switch is turned off during the reset procedure.
LCD: off
IND: off
- If the reset switch is pressed off during the reset procedure.
LCD: return to ODO
IND: Keep the previous state of reset

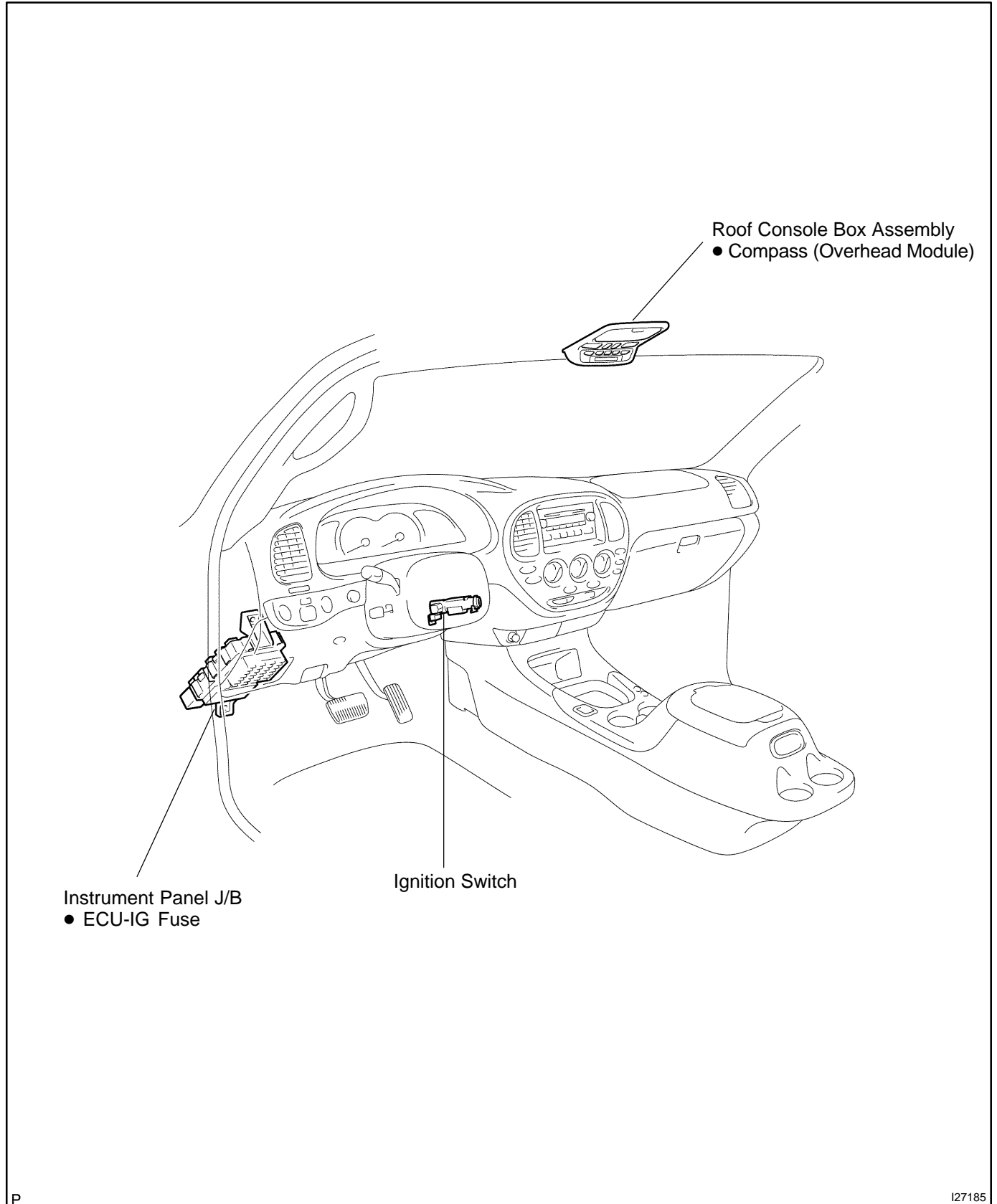
Indicator Condition:

State	Condition	Specified State
Blinking	The vehicle runs 4,500 miles after the previous setting	The indicator blinks for 12 seconds after the ignition switch is on (after 3 seconds for a bulb check).
Continuously Illuminated	The vehicle runs 5,000 miles after the previous setting	The indicator is continuously illuminated after the ignition switch is on.

COMPASS (Double Cab)

LOCATION

BE2L8-01



CALIBRATION

1. SELECTING COMPASS DISPLAY MODE

The mode select switch allows you to select the Display or Non-display mode of the compass.

2. SETTING ZONE

Deviation between the "magnetic north" and "actual north" differs depending on the terrestrial location. Therefore, adjustment of the magnetism is required. Since the magnetic condition differs depending on the area where the vehicle is used, it is necessary for each user to set the zone. (Refer to Compass Zone Map). The zone setting can be changed using the E/M switch of the display.

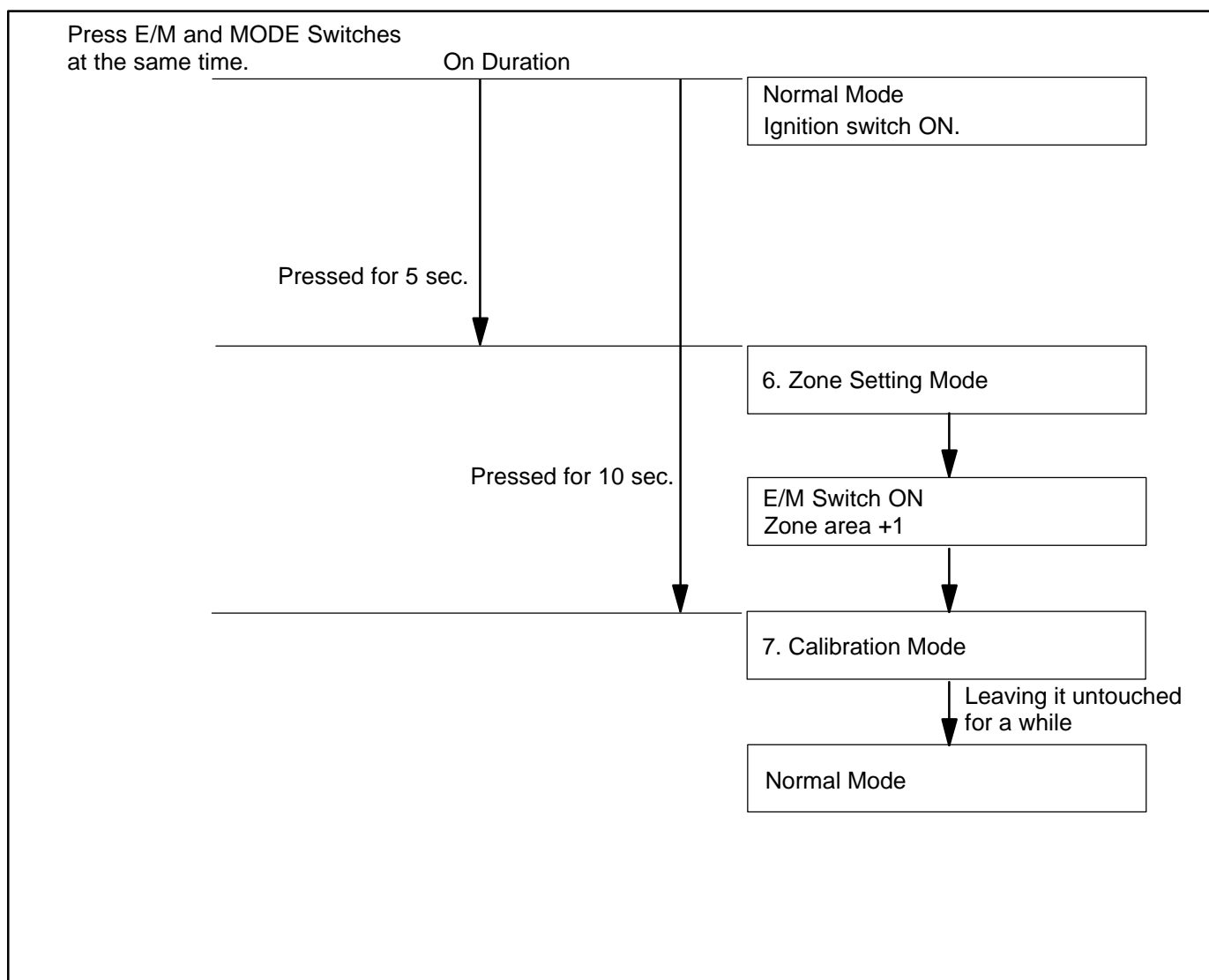
3. PERFORMING CALIBRATION

Because each vehicle has its own magnetic field, calibration should be performed for each vehicle. This compass function is used when storing the record of the vehicle's magnetic field.

4. WHEN COMPASS MAGNETIZED:

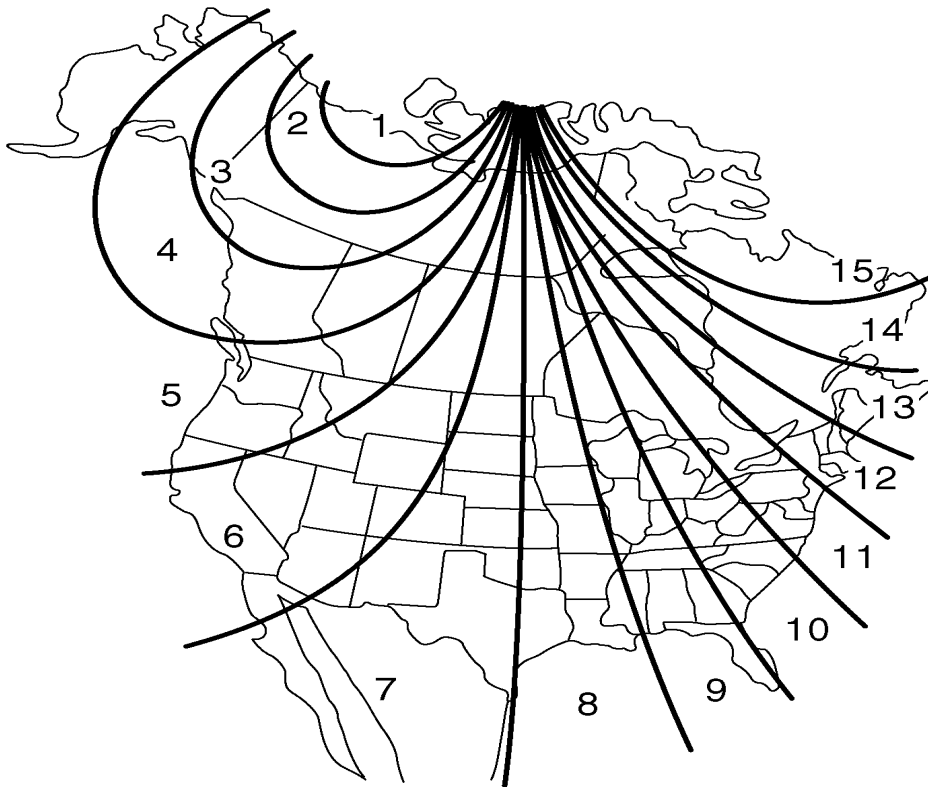
A compass could be magnetized during shipping by vessels or freight cars. Therefore, make sure to perform calibration and ensure that calibration is performed properly before delivery. If it cannot be done (cannot complete in spite of driving round several times), it may be caused by magnetization. Demagnetize the vehicle using a demagnetizer and perform calibration again.

5. SETTING COMPASS



6. ZONE SETTING MODE

- (a) Turn the ignition switch ON.
- (b) To keep pressing the E/M switch and MODE switch for 5 seconds when outer temperature is displayed will activate the zone setting mode. A number (1 to 15) is displayed on the compass display.



I27615

HINT:

In the initial status, "8" is displayed.

- (c) The displayed number increases +1 every time the E/M switch is pressed. Referring to the map, check the number for the area where the vehicle will be used and set the zone number.
- (d) Leave it untouched for several seconds after setting and check that the compass display shows an azimuthal direction (N, NE, E, SE, S, SW, W, or NW) or "VAR".

7. CALIBRATION SETTING MODE

- (a) After the set zone is displayed, if the E/M switch and MODE switch remains pressed another 5 seconds will activate the calibration setting mode.
- (b) To keep pressing the E/M switch and MODE switch for 10 seconds when outer temperature is displayed will also activate this mode.
- (c) Drive the vehicle at a slow speed of 8 km/h (5 mph) or less in the circular direction.
- (d) Driving round the circle 1 to 3 times will display the azimuthal direction on the display, completing the calibration.

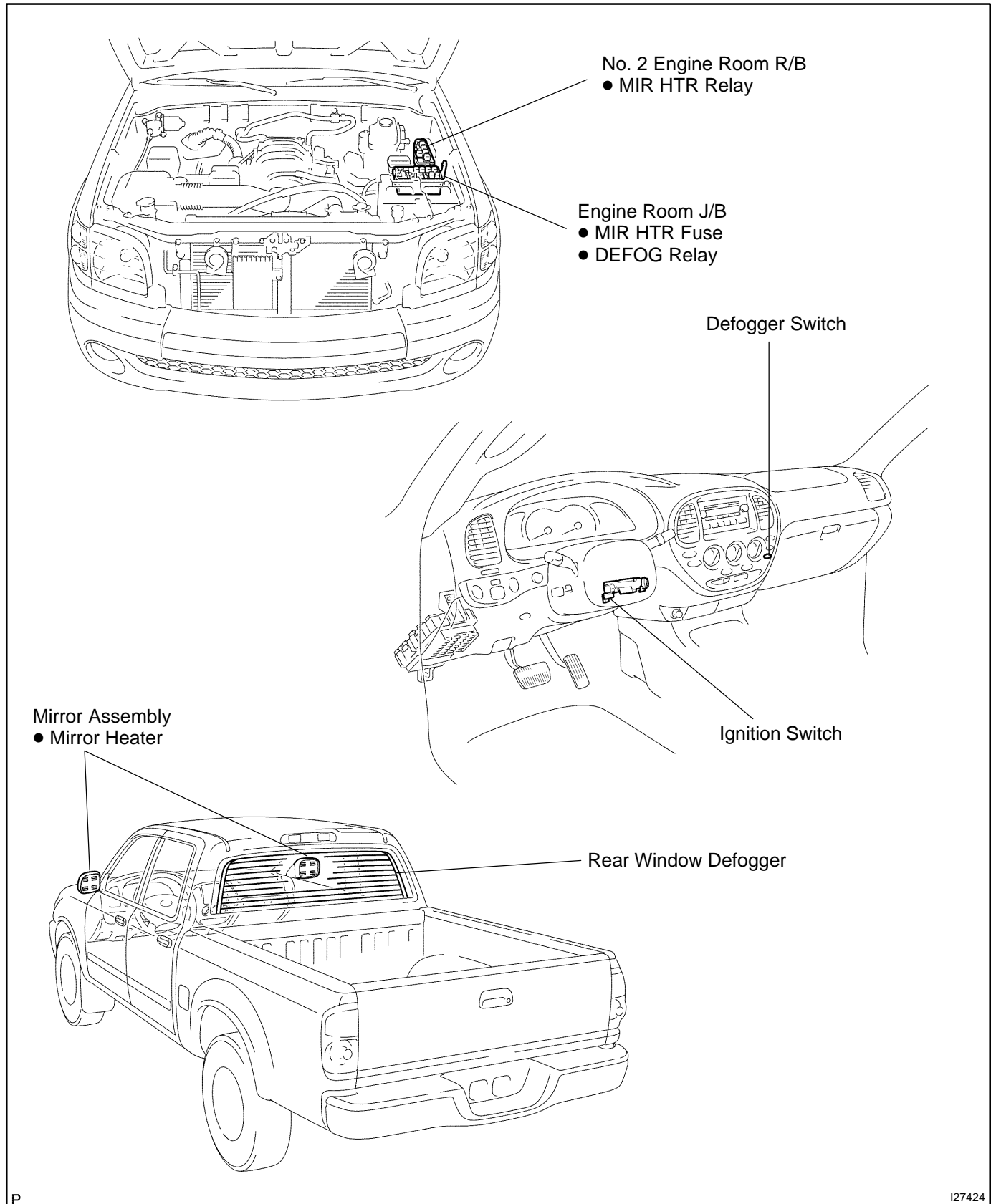
HINT:

After the calibration is completed, it is not necessary to perform the above procedures unless the magnetic field strength is drastically changed. If this happens, the azimuthal display will be changed to "CAL".

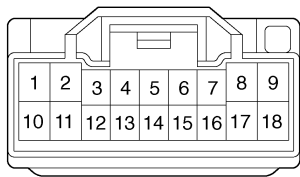
DEFOGGER SYSTEM (Double Cab)

LOCATION

BE2LA-01



Wire Harness Side



I27503

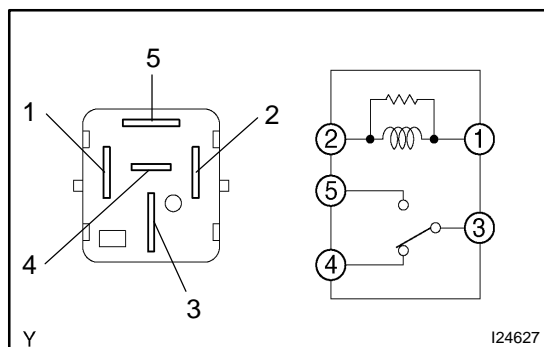
INSPECTION

1. INSPECT DEFOGGER SWITCH (in INTEGRATION CONTROL PANEL SWITCH) CIRCUIT

Disconnect the connector from the panel and inspect the connector on wire harness side, as shown in the chart.

Tester Connection	Condition	Specified Condition
4 - Ground	Ignition switch OFF or ACC	Below 1 V
4 - Ground	Ignition switch ON	10 - 14 V
6 - Ground	Constant	Continuity
10 - Ground	Constant	Continuity
14 - Ground	Ignition switch OFF or ACC	Below 1 V
14 - Ground	Ignition switch ON	10 - 14 V
15 - Ground	Constant	10 - 14 V

If the result is as specified, replace the panel.

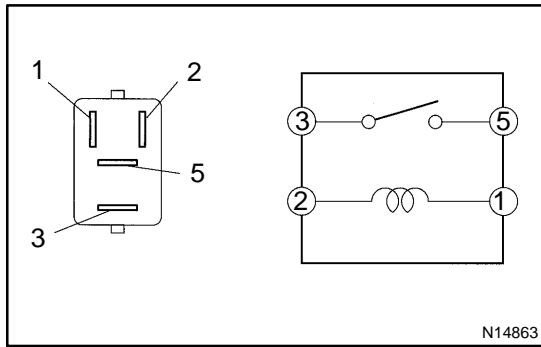


I24627

2. INSPECT DEFOGGER RELAY (Making: DEFOG) CONTINUITY

Tester Connection	Specified Condition
3 - 4	Continuity
3 - 4	No continuity (When battery voltage is applied to terminals 1 and 2)
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

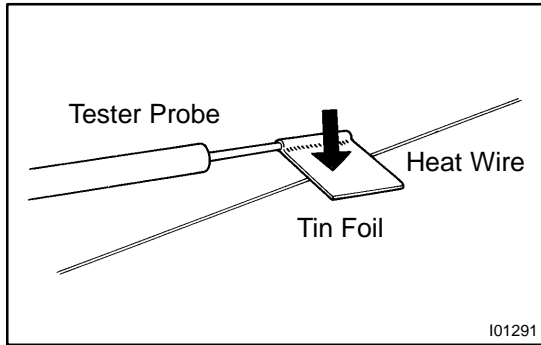
If the continuity is not as specified, replace the relay.



3. INSPECT MIRROR HEATER RELAY (Marking: MIR HTR) CONTINUITY

Condition	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

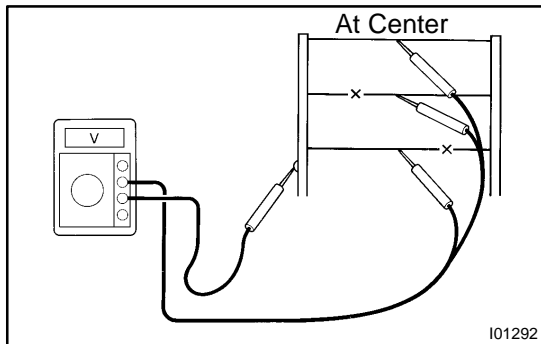
If the continuity is not as specified, replace the relay.



4. INSPECT DEFOGGER WIRE

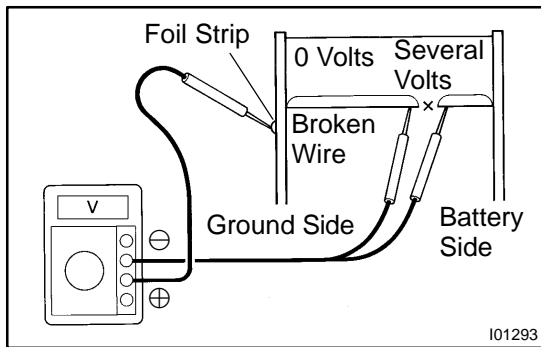
NOTICE:

- When cleaning the glass, use a soft and dry cloth and wipe the glass in the direction of the wire. Take care not to damage the wires.
- Do not use detergents or glass cleaners with abrasive ingredients.
- When measuring voltage, wrap a piece of tin foil around the tip of the negative probe and press the foil against the wire with your finger, as shown in the illustration.



- Turn the ignition switch ON.
- Turn the defogger switch on.
- Inspect the voltage at the center of each heat wire, as shown in the illustration.

Voltage	Criteria
Approx. 5 V	Okay (No break in wire)
Approx. 10 V or 0 V	Broken wire



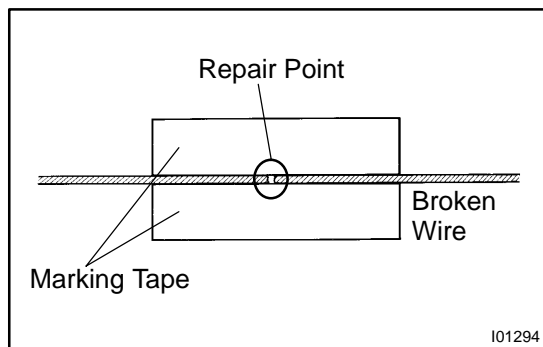
HINT:

If there is approximately 10 V, the wire is broken between the center of the wire and the positive (+) end. If there is no voltage, the wire is broken between the center of the wire and ground.

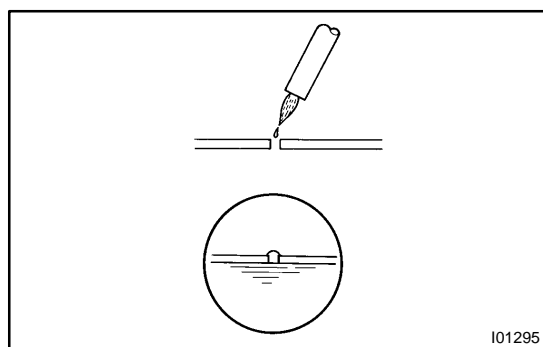
- Place the voltmeter positive (+) lead against the defogger wire on the battery side.
- Place the voltmeter negative (-) lead with the foil strip against the wire on the ground side.
- Slide the positive (+) lead from the battery to the ground side.
- The point where the voltmeter deflects from several V to zero V is the place where the defogger wire is broken.

HINT:

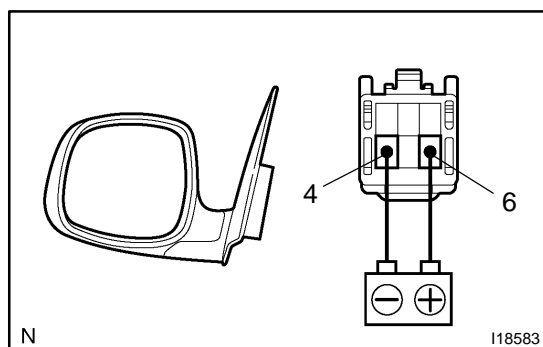
If the heat wire is not broken, the voltmeter indicates 0 V at the positive (+) end of the heat wire but gradually increases to about 12 V as the meter probe moves to the other end.

**5. IF NECESSARY, REPAIR DEFOGGER WIRE**

- (a) Clean the broken wire tips with grease, wax and silicon remover.
- (b) Place the masking tape along both sides of the wire for repair.
- (c) Thoroughly mix the repair agent (Dupont paste No. 4817).



- (d) Using a fine tip brush, apply a small amount of the agent to the wire.
- (e) After a few minutes, remove the masking tape.
- (f) Do not repair the defogger wire for at least 24 hours.

**6. INSPECT MIRROR HEATER OPERATION**

- (a) Connect the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 4.
- (b) Check that the mirror becomes warm.

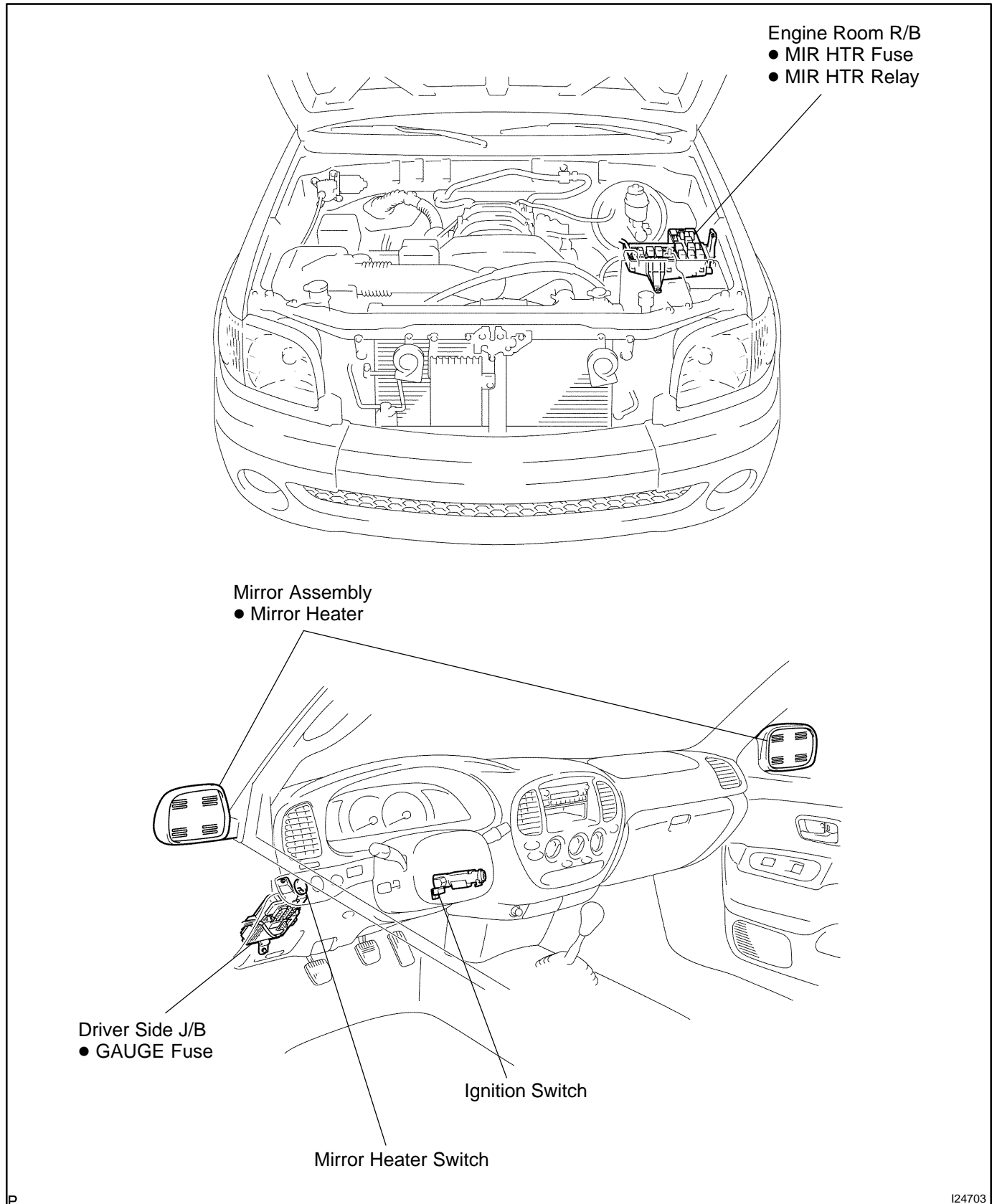
HINT:

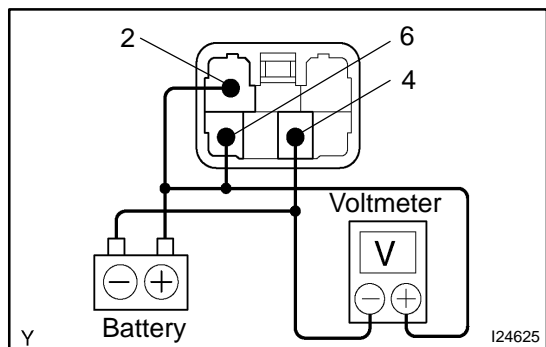
It will take a short time for the mirror to become warm.
If operation is not as specified, replace the mirror.

MIRROR HEATER SYSTEM (Except Double Cab)

LOCATION

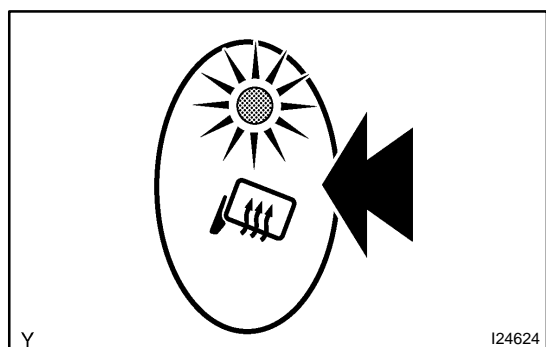
BE2LC-01



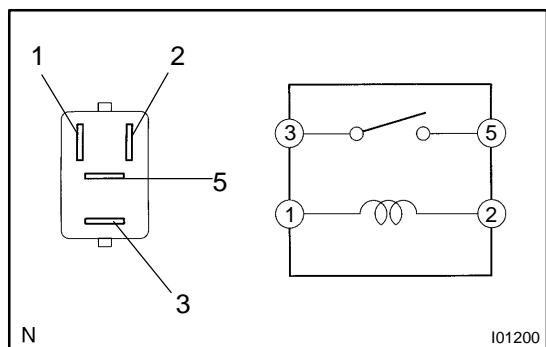


INSPECTION

1. **INSPECT MIRROR HEATER SWITCH TIMER OPERATION**
 - (a) Connect the positive (+) lead from the battery to terminals 2 and 6 of the mirror heater switch and the negative (-) lead to terminal 4.
 - (b) Connect the positive (+) lead from the voltmeter to terminal 6 of the mirror heater switch and the negative (-) lead to terminal 4.
 - (c) When the switch is OFF, the voltage should be approximately 12 V.



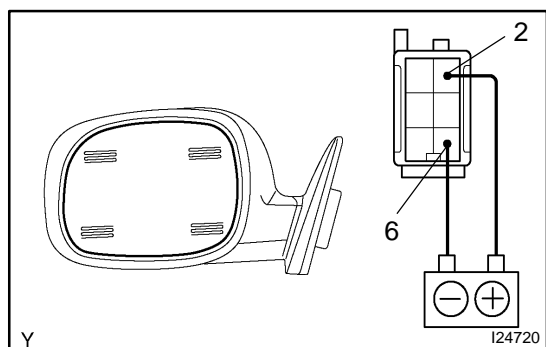
- (d) Push the mirror heater switch on and check that the indicator lights up and that the voltage is less than 1 V.
 - (e) After 15 minutes, check that the switch is OFF and the voltage is approximately 12 V.
- If the result is not as specified, replace the switch.



2. INSPECT MIRROR HEATER RELAY (Marking : MIR HTR) CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.



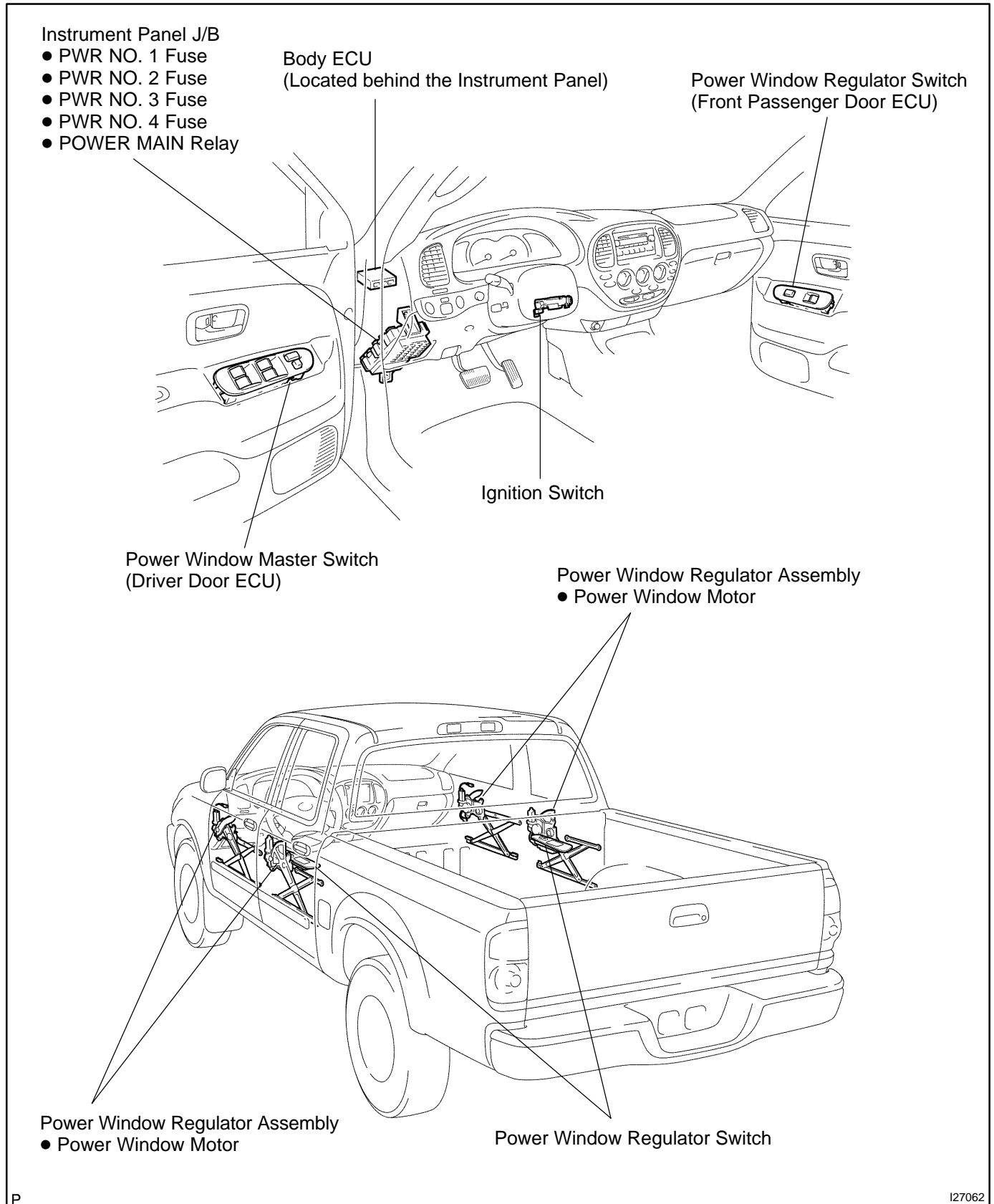
3. INSPECT MIRROR HEATER OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 6.
 - (b) Check that the mirror becomes warm.
- HINT:**
It will take a short time for the mirror to become warm.
If operation is not as specified, replace the mirror.

POWER WINDOW CONTROL SYSTEM (Double Cab)

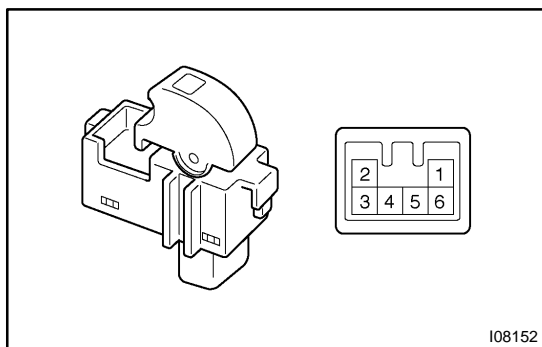
LOCATION

BE2LE-01



P

127062



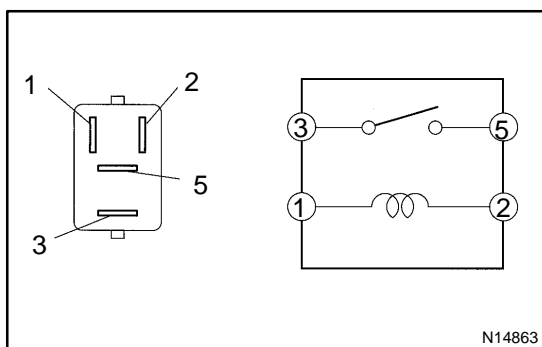
108152

INSPECTION

1. INSPECT POWER WINDOW REGULATOR SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
UP	2 - 3, 4 - 5	Continuity
OFF	2 - 3 - 5	Continuity
DOWN	2 - 4, 3 - 5	Continuity

If the continuity is not as specified, replace the switch.

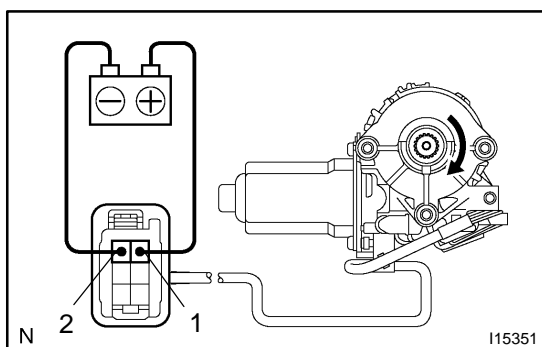


N14863

2. INSPECT POWER MAIN RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.

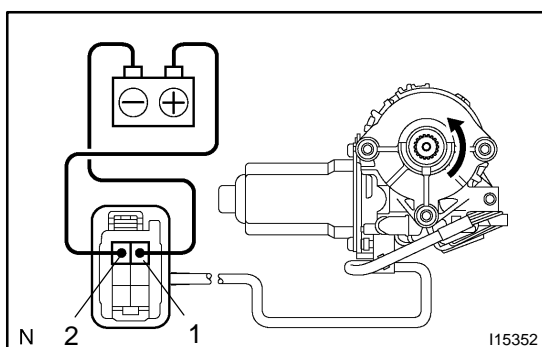


I15351

3. Driver side door:

INSPECT POWER WINDOW MOTOR OPERATION

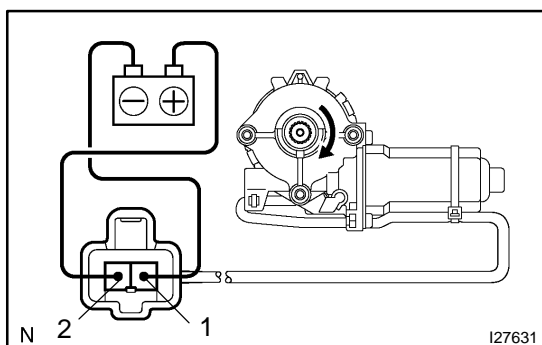
- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the motor turns clockwise.



I15352

- (b) Reverse the polarity and check that the motor turns counterclockwise.

If operation is not as specified, replace the motor.

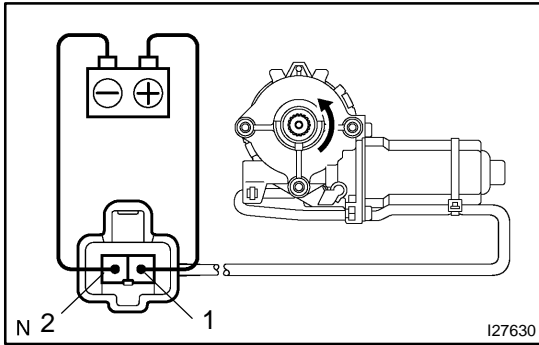


I27631

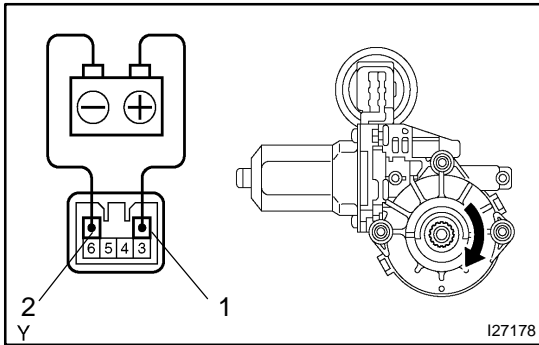
4. Passenger side door:

INSPECT POWER WINDOW MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, and check that the motor turns clockwise.



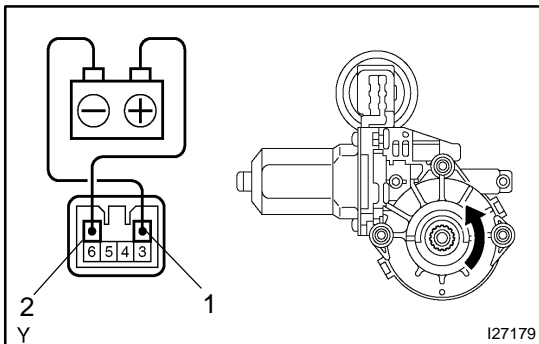
- (b) Reverse the polarity and check that the motor turns counterclockwise.
If operation is not as specified, replace the motor.



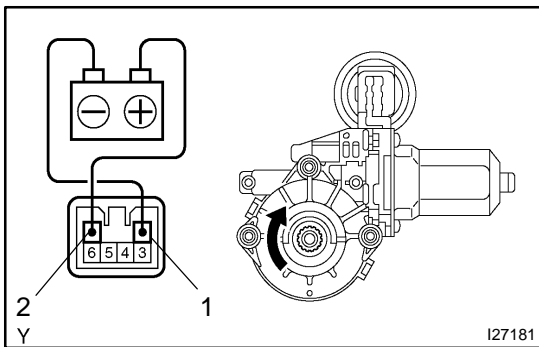
5. Rear right door:

INSPECT POWER WINDOW MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminals 2, then check that the motor turns clockwise.



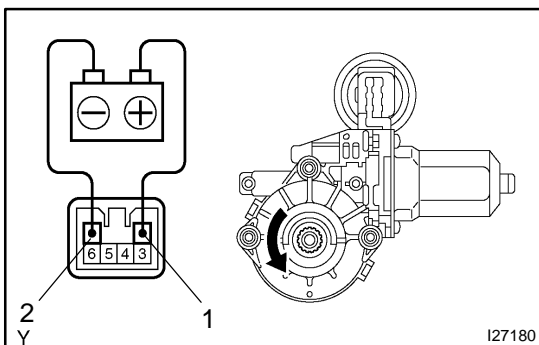
- (b) Reverse the polarity, and check that the motor turns counterclockwise.
If operation is not as specified, replace the motor.



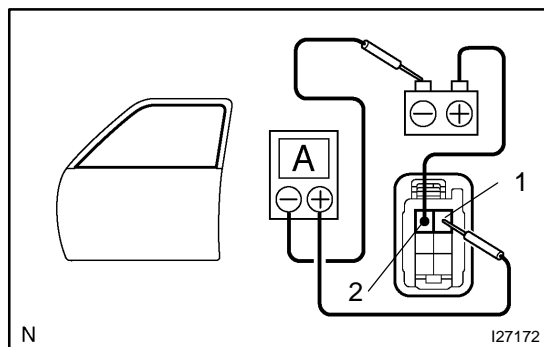
6. Rear left door:

INSPECT POWER WINDOW MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, then check that the motor turns clockwise.



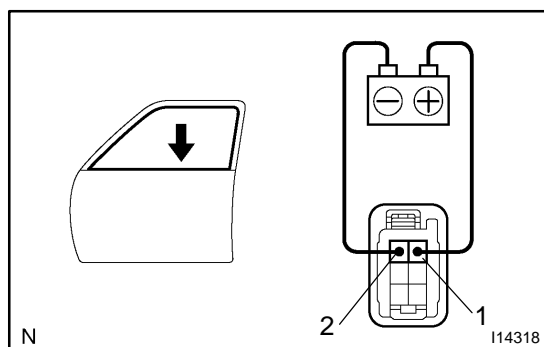
- (b) Reverse the polarity and check that the motor turns counterclockwise.
If operation is not as specified, replace the motor.



**7. Driver side door:
INSPECT POWER WINDOW MOTOR PTC THERMISTOR OPERATION**

- Disconnect the connector from the motor.
- Connect the positive (+) lead from the ammeter to terminal 1 of the motor side connector and the negative (-) lead to negative terminal of the battery.
- Connect the positive (+) lead from the battery to terminal 2 of the motor side connector, and raise the window to the fully closed position.
- Continue to apply voltage and check that the current changes from approximately 14 A to less than 1 A within 4 to 90 seconds.
- Disconnect the leads from the terminals.
- Approximately 90 seconds later, connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, then check that the window begins to move down.

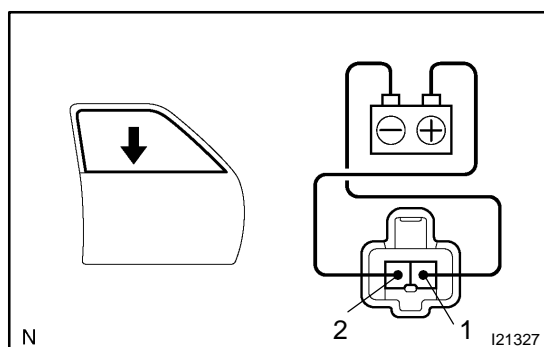
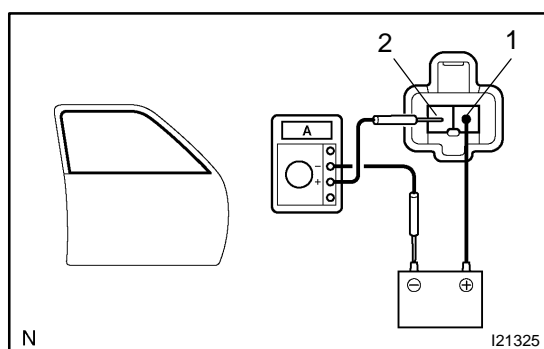
If operation is not as specified, replace the motor.



**8. Passenger side door:
INSPECT POWER WINDOW MOTOR PTC THERMISTOR OPERATION**

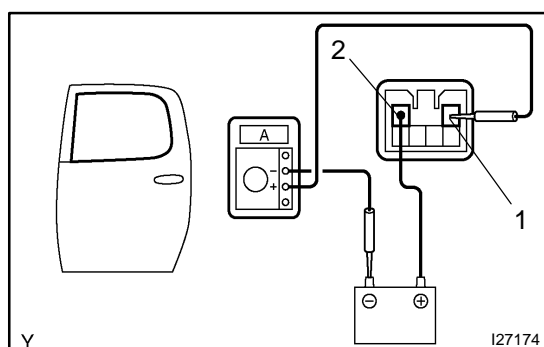
- Disconnect the connector from the motor.
- Connect the positive (+) lead from the ammeter to terminal 2 of the motor connector and the negative (-) lead to negative terminal of the battery.
- Connect the positive (+) lead from the battery to terminal 1 of the motor connector, and raise the window to the fully closed position.
- Continue to apply voltage and check that the current changes from approximately 14 A to less than 1 A within 4 to 90 seconds.
- Disconnect the leads from the terminals.
- Approximately 90 seconds later, connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, then check that the window begins to move down.

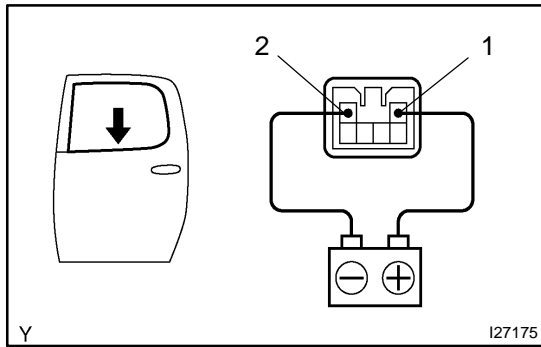
If operation is not as specified, replace the motor.



**9. Rear left door:
INSPECT POWER WINDOW MOTOR PTC THERMISTOR OPERATION**

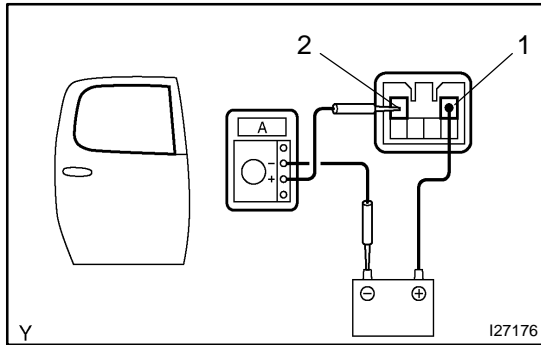
- Disconnect the connector from the motor.
- Connect the negative (+) lead from the ammeter to terminal 1 of the motor connector and the negative (-) lead to negative terminal of the battery.
- Connect the positive (+) lead from the battery to terminal 2 of the motor connector, and raise the window to the fully closed position.





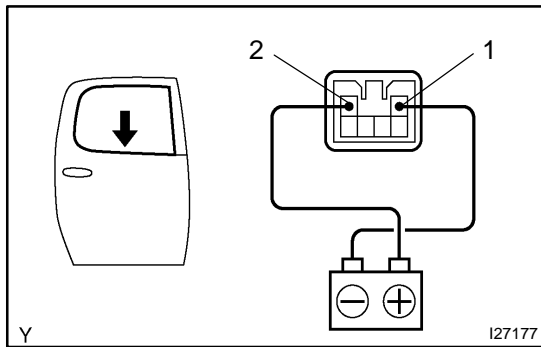
- (d) Continue to apply voltage and check that the current changes from approximately 14 A to less than 1 A within 4 to 90 seconds.
- (e) Disconnect the leads from the terminals.
- (f) Approximately 90 seconds later, connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, then check that the window begins to move down.

If operation is not as specified, replace the motor.



**10. Rear right door:
INSPECT POWER WINDOW MOTOR PTC THERMISTOR OPERATION**

- (a) Disconnect the connector from the motor.
- (b) Connect the negative (+) lead from the ammeter to terminal 2 of the motor connector and the negative (-) lead to negative terminal of the battery.
- (c) Connect the positive (+) lead from the battery to terminal 1 of the motor connector, and raise the window to the fully closed position.

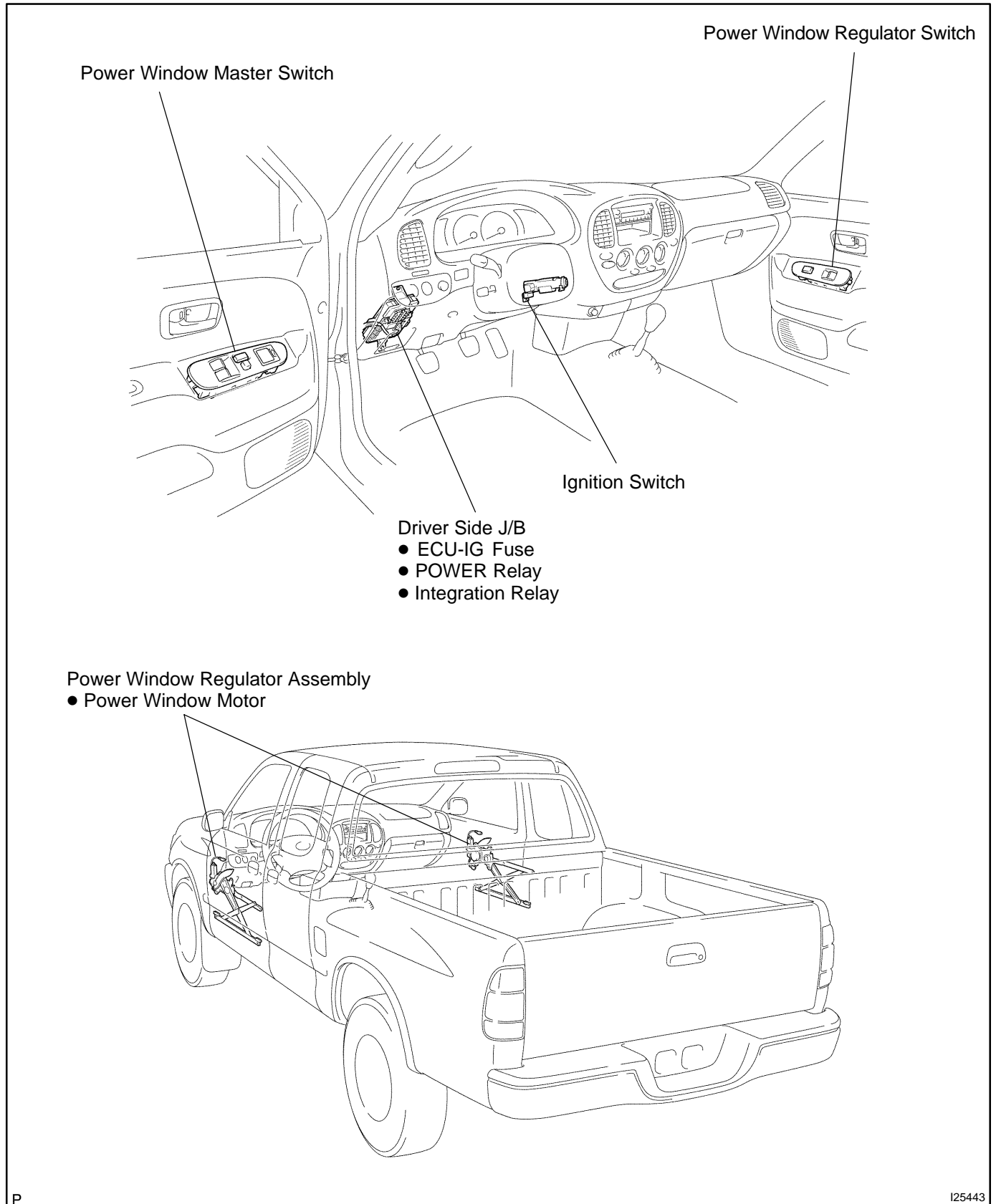


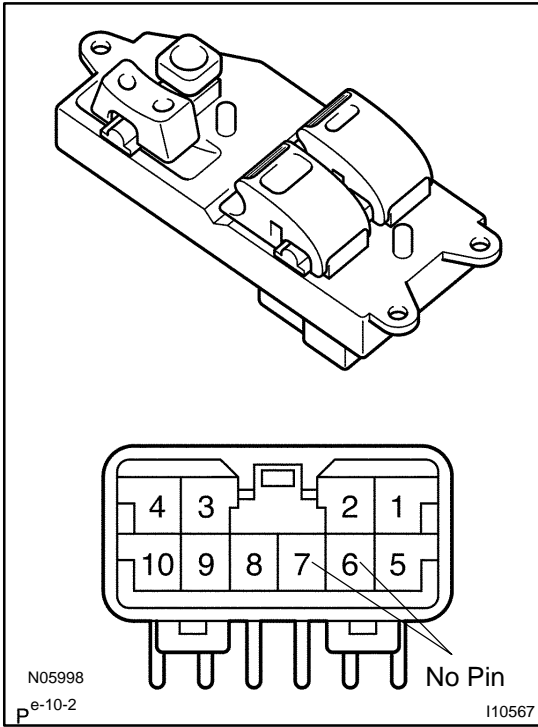
- (d) Continue to apply voltage and check that the current changes from approximately 14 A to less than 1 A within 4 to 90 seconds.
- (e) Disconnect the leads from the terminals.
- (f) Approximately 90 seconds later, connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, check that the window begins to move down.

If operation is not as specified, replace the motor.

POWER WINDOW CONTROL SYSTEM (Except Double Cab) LOCATION

BE2LG-01





INSPECTION

1. INSPECT POWER WINDOW MASTER SWITCH CONTINUITY

Driver's switch:

Switch Position	Tester Connection	Specified Condition
UP	1 - 4, 3 - 9	Continuity
OFF	1 - 3 - 4	Continuity
DOWN (AUTO)	1- 3, 4 - 9	Continuity

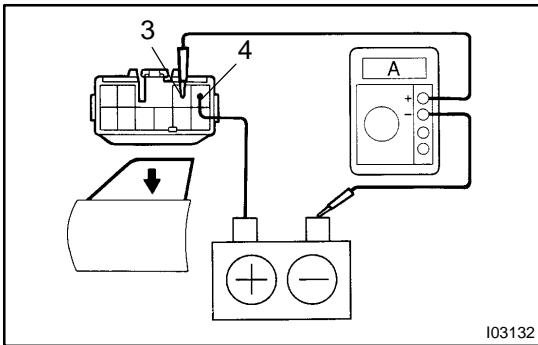
Passenger's switch (Window unlock):

Switch Position	Tester Connection	Specified Condition
UP	1 - 10, 8 - 9	Continuity
OFF	1 - 8 - 10	Continuity
DOWN	1 - 8, 9 - 10	Continuity

Passenger's switch (Window lock):

Switch Position	Tester Connection	Specified Condition
UP	8 - 9	Continuity
OFF	8 - 10	Continuity
DOWN	9 - 10	Continuity

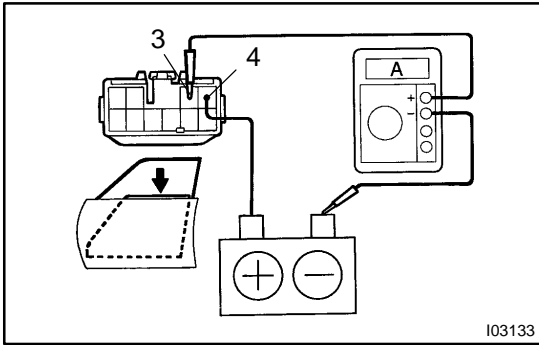
If the continuity is not as specified, replace the switch.



2. Using an ammeter:

INSPECT ONE-TOUCH POWER WINDOW SYSTEM/ CURRENT OF CIRCUIT

- Disconnect the connector from the master switch.
- Connect the positive (+) lead from the ammeter to terminal 3 on the wire harness side connector and the negative (-) lead to the negative (-) terminal of the battery.
- Connect the positive (+) lead from the battery to terminal 4 on the wire harness side connector.
- When the window moves down, check that the current is approximately 7 A.

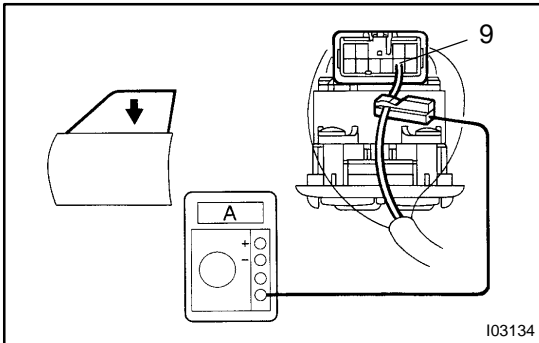


- (e) Check that the current increases to approximately 14.5 A or more when the window stops moving down.

HINT:

Since the PTC opens in 4 to 90 seconds after the window stops moving down, the check must be performed before the PTC starts operating.

If the result is not as specified, replace the switch.



3. Using an ammeter with a current-measuring probe: INSPECT ONE TOUCH POWER WINDOW SYSTEM/ CURRENT OF CIRCUIT

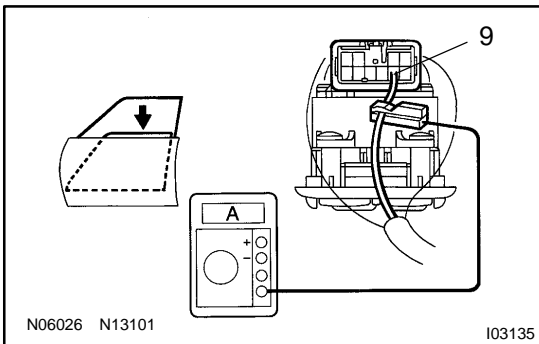
- (a) Remove the master switch with the connector connected.
 (b) Attach a current-measuring probe to terminal 9 of the wire harness side connector.
 (c) Turn the ignition switch ON and set the power window switch in the down position.
 (d) When the window moves down, check that the current is approximately 7 A.

- (e) Check that the current increases to approximately 14.5 A or more when the window stops moving down.

HINT:

Since the circuit breaker opens in 4 to 90 seconds after the window stops moving down, the check must be performed before the PTC starts operating.

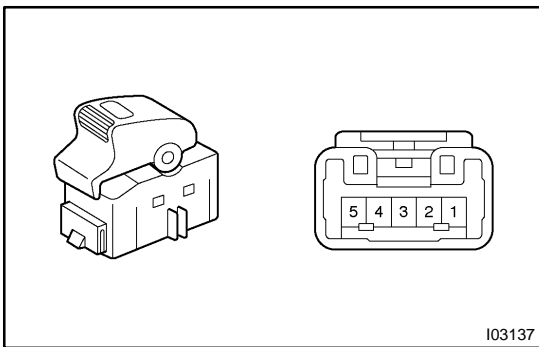
If the result is not as specified, replace the master switch.



4. INSPECT POWER WINDOW REGULATOR SWITCH CONTINUITY

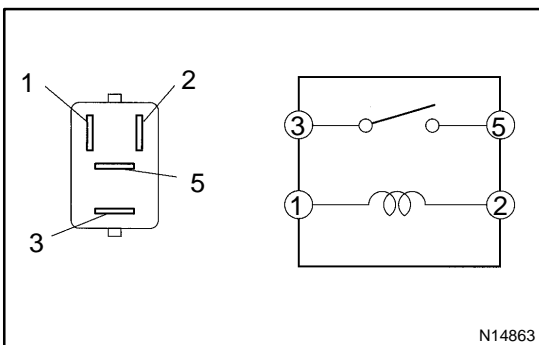
Switch Position	Tester Connection	Specified Condition
UP	1 - 2, 3 - 4	Continuity
OFF	1 - 2, 3 - 5	Continuity
DOWN	1 - 4, 3 - 5	Continuity

If the continuity is not as specified, replace the switch.

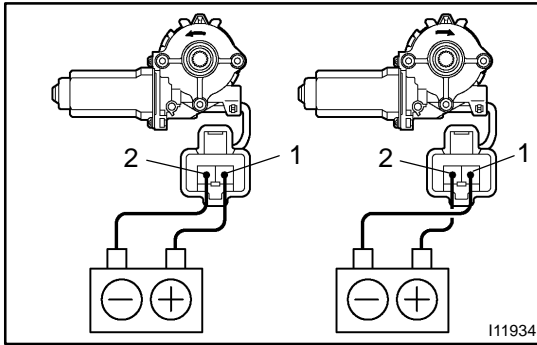


5. INSPECT POWER RELAY CONTINUITY

If the continuity is not as specified, replace the switch.

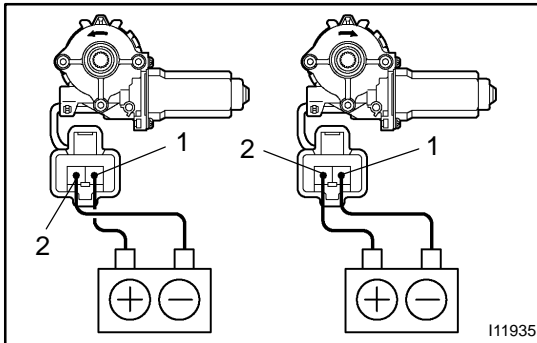


Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

**6. Driver side door:****INSPECT POWER WINDOW MOTOR OPERATION**

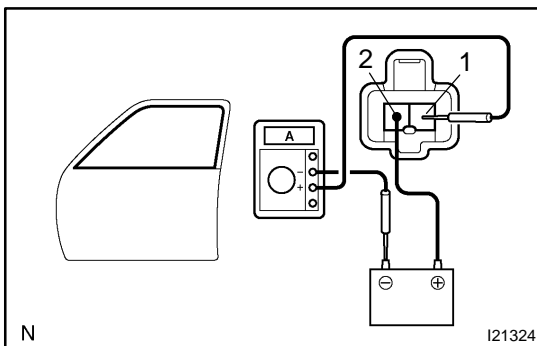
- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the motor turns counterclockwise.
- (b) Reverse the polarity, and check that the motor turns clockwise.

If operation is not as specified, replace the motor.

**7. Passenger side door:****INSPECT POWER WINDOW MOTOR OPERATION**

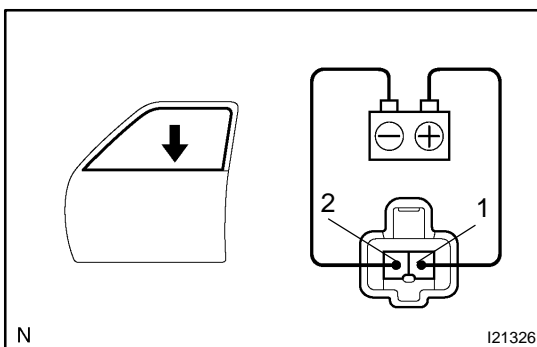
- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the motor turns counterclockwise.
- (b) Reverse the polarity, and check that the motor turns clockwise.

If operation is not as specified, replace the motor.

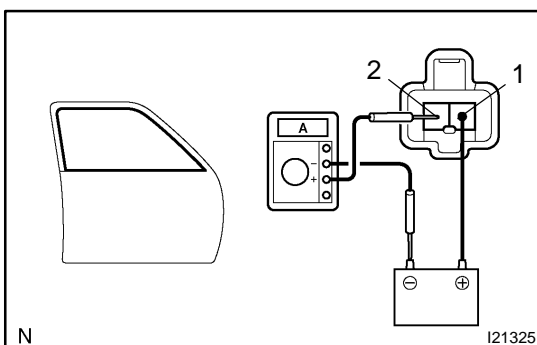
**8. Driver side door:****INSPECT POWER WINDOW MOTOR PTC THERMISTOR OPERATION**

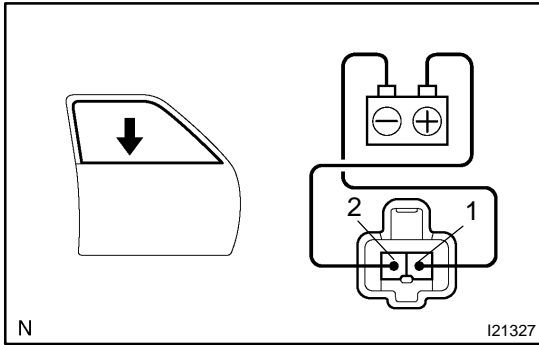
- (a) Disconnect the connector from the motor.
- (b) Connect the positive (+) lead from the ammeter to terminal 1 of the wire motor connector and the negative (-) lead to the negative terminal of the battery.
- (c) Connect the positive (+) lead from the battery to terminal 2 of the motor connector, and raise the window to the fully closed position.
- (d) Continue to apply voltage, and check that the current changes to less than 1 A in 4 to 90 seconds.
- (e) Disconnect the leads from the terminals.
- (f) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the window begins to move down.

If operation is not as specified, replace the motor.

**9. Passenger side door:****INSPECT POWER WINDOW MOTOR PTC THERMISTOR OPERATION**

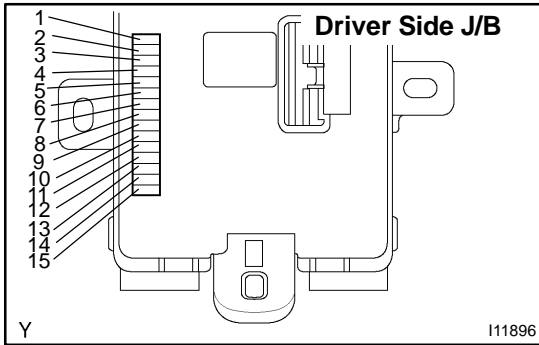
- (a) Disconnect the connector from the motor.
- (b) Connect the positive (+) lead from the ammeter to terminal 2 of the motor connector and the negative (-) lead to the negative terminal of the battery.
- (c) Connect the positive (+) lead from the battery to terminal 1 of the motor connector, and raise the window to the fully closed position.





- (d) Continue to apply voltage and check that the current changes to less than 1 A in 4 to 90 seconds.
- (e) Disconnect the leads from the terminals.
- (f) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, and check that the window begins to move down.

If operation is not as specified, replace the motor.



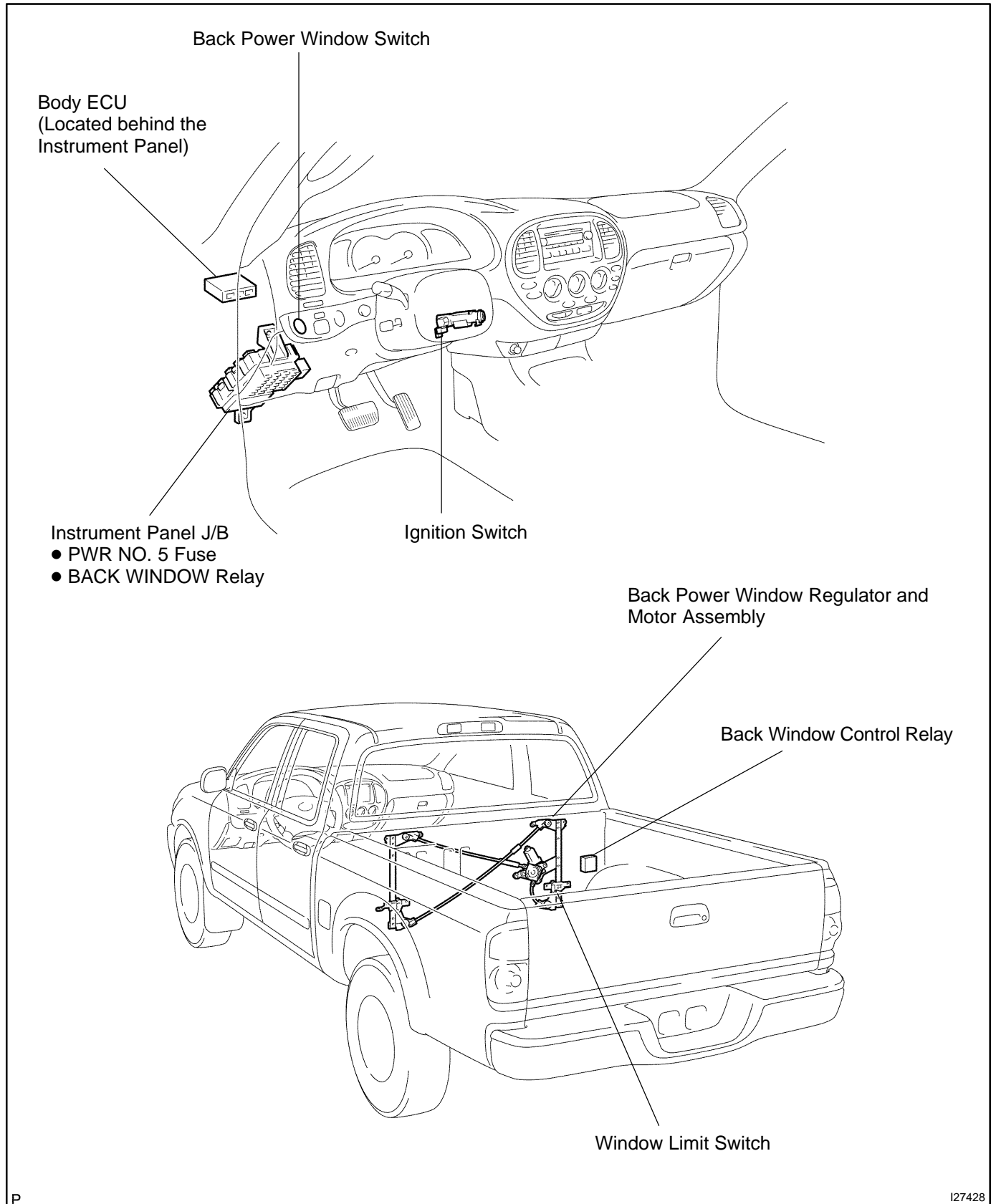
10. CHECK INTEGRATION RELAY

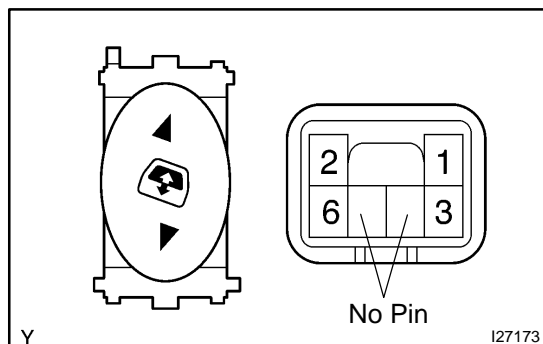
Remove the integration relay from the driver side J/B, and check the voltage or continuity of each terminal on the driver side J/B side (see page [BE-180](#)).

BACK POWER WINDOW SYSTEM (Double Cab)

LOCATION

BE2LX-01



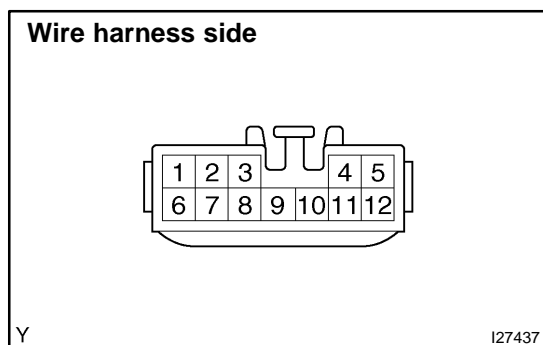


INSPECTION

1. INSPECT BACK POWER WINDOW SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
UP	1 - 3, 2 - 6	Continuity
OFF	2 - 3, 2 - 6	No continuity
DOWN	1 - 6, 2 - 3	Continuity

If the continuity is not as specified, replace the switch.



2. CHECK BACK WINDOW CONTROL RELAY CIRCUIT

- (a) Disconnect the connector from the relay, and check the connector on the wire harness side, as shown in the table below.

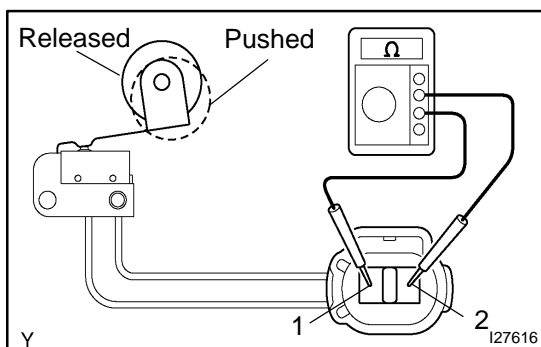
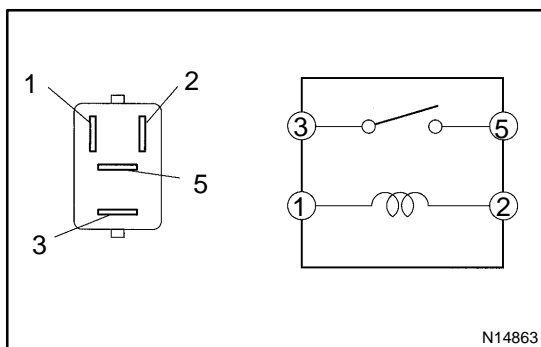
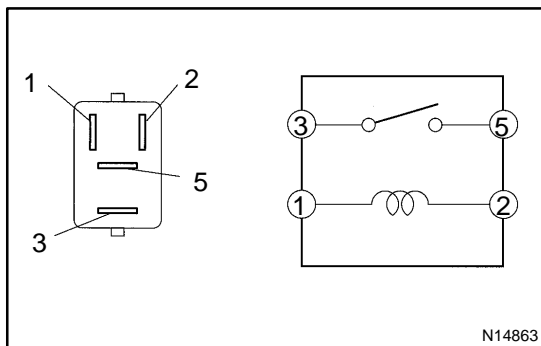
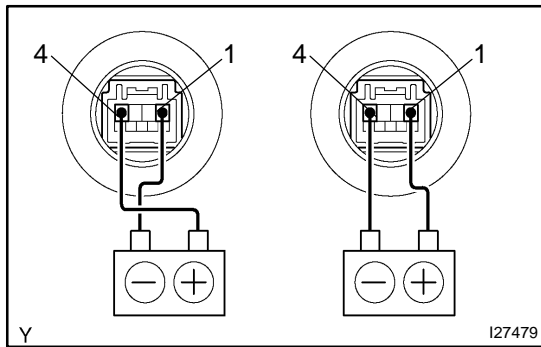
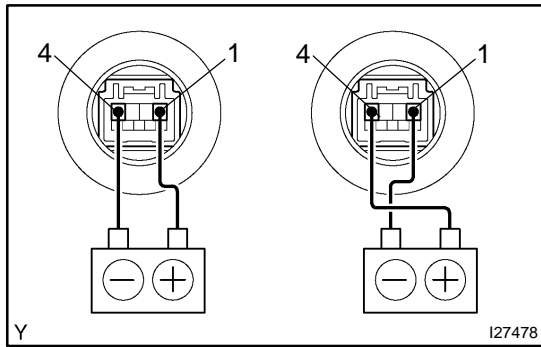
Tester Connection	Condition	Specified Condition
6 - Body ground	Ignition switch OFF or ACC → ON	0 V → 10 to 14 V
8 - Body ground	Limit switch OFF → ON	10 kΩ or higher → Below 1 Ω
9 - Body ground	Constant	Continuity
11 - Body ground	Constant	Continuity
12 - Body ground	Ignition switch OFF or ACC → ON	0 V → 10 to 14 V

If the result is not as specified, there may be a malfunction on the wire harness side or limit switch.

- (b) Reconnect the connector to the relay, and check the connector on the wire harness side, as shown in the table below.

Tester Connection	Condition	Specified Condition
4 - Body ground	<ul style="list-style-type: none"> ● Ignition switch ON ● Power back window fully open ● Limit switch OFF ● Switch not pressed (OFF) → Pressed (UP) 	0 V → 10 to 14 V
5 - Body ground	<ul style="list-style-type: none"> ● Ignition switch ON ● Power back window fully closed ● Switch not pressed (OFF) → Pressed (DOWN) 	0 V → 10 to 14 V

If the result is not as specified, replace the relay.



3. CHECK BACK POWER WINDOW MOTOR PTC THERMISTOR OPERATION

- (a) Disconnect the connector from the window motor.
- (b) Connect the positive (+) lead from the ammeter to terminal 1 of the wire harness side connector and the negative (-) lead to the negative terminal of the battery.
- (c) Connect the positive (+) lead from the battery to terminal 2 of the wire harness side connector, and slide the window to the fully closed position.
- (d) Continue to apply voltage and check that the current changes to less than 1 A in 4 to 90 seconds.
- (e) Disconnect the leads from the terminals.
- (f) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the window begins to move down.

If operation is not as specified, replace the power back window regulator and motor assembly.

4. INSPECT POWER MAIN RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No Continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.

5. INSPECT BACK WINDOW RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No Continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.

6. INSPECT WINDOW LIMIT SWITCH CONTINUITY

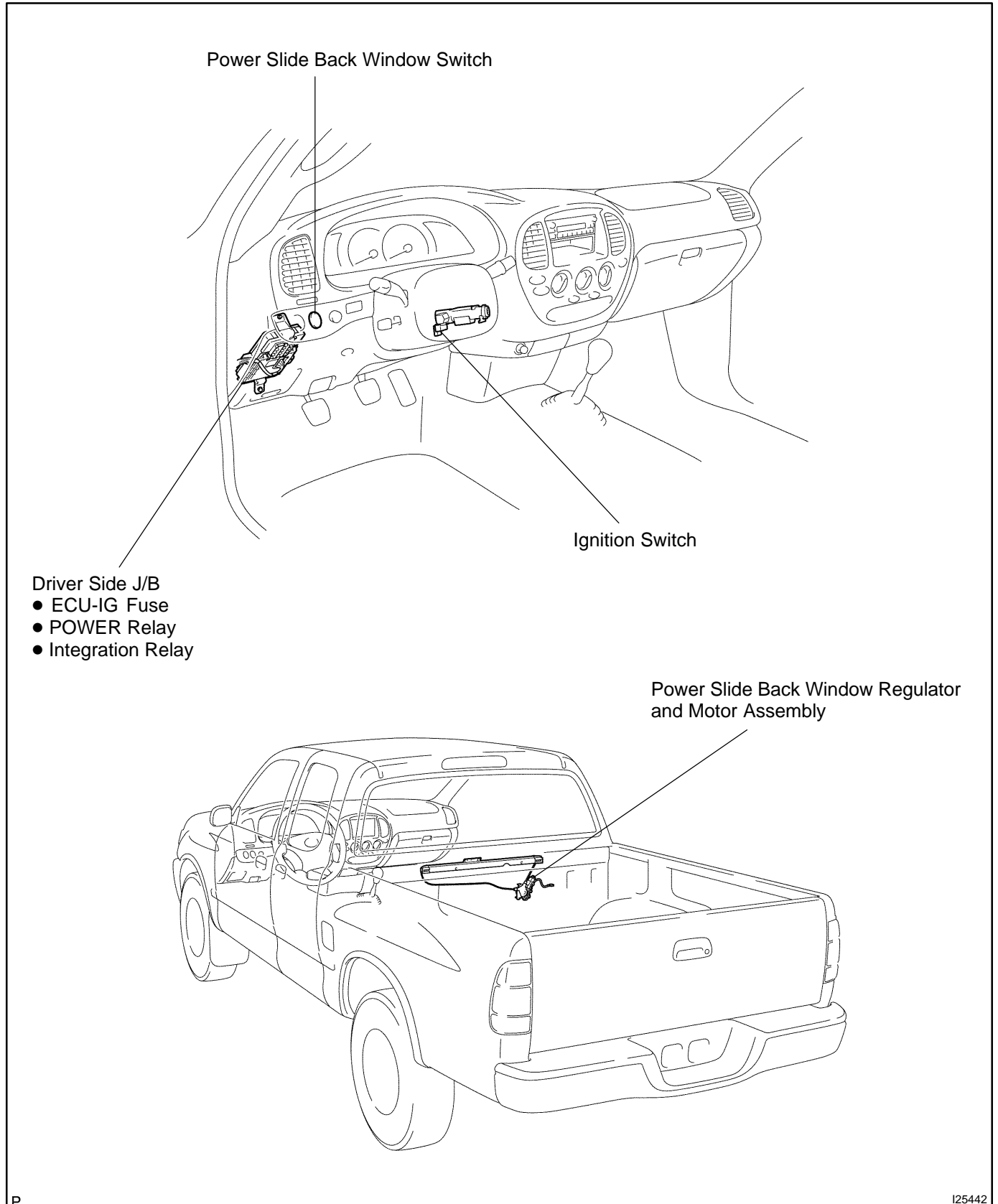
Switch position	Tester Connection	Specified Condition
Lever pushed	1 - 2	No continuity
Lever released	1 - 2	Continuity

If the continuity is not as specified, replace the power back window regulator and motor assembly.

POWER SLIDE BACK WINDOW SYSTEM (Except Double Cab)

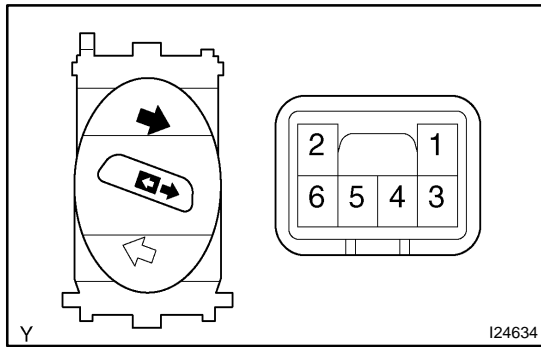
LOCATION

BE2LI-01



P

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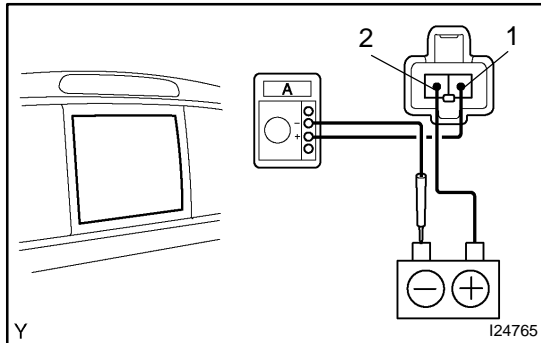


INSPECTION

1. INSPECT POWER SLIDE BACK WINDOW SWITCH CONTINUITY

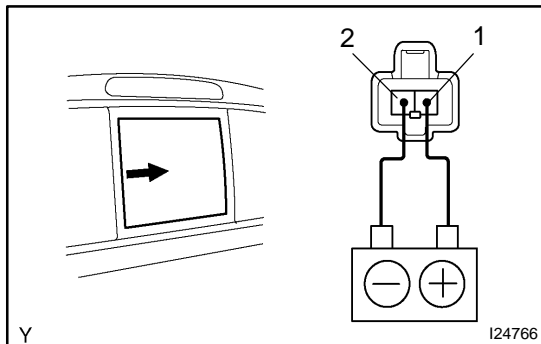
Switch Position	Tester Connection	Specified Condition
OPEN	1 - 3, 2 - 6	Continuity
OFF	2 - 3, 2 - 6	Continuity
CLOSE	1 - 6, 2 - 3	Continuity

If the continuity is not as specified, replace the switch.



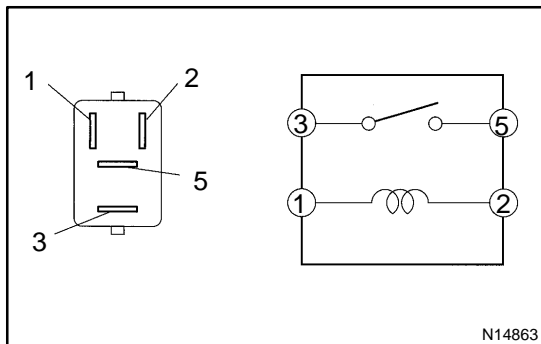
2. CHECK POWER SLIDE BACK WINDOW MOTOR PTC THERMISTOR OPERATION

- Disconnect the connector from the window motor.
- Connect the positive (+) lead from the ammeter to terminal 1 of the motor connector and the negative (-) lead to the negative terminal of the battery.
- Connect the positive (+) lead from the battery to terminal 2 of the motor connector, and slide the window to the fully closed position.



- Continue to apply voltage and check that the current changes to less than 1 A in 4 to 90 seconds.
- Disconnect the leads from the terminals.
- Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the window begins to slide open.

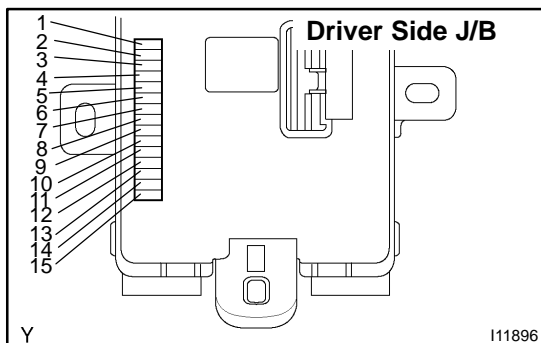
If operation is not as specified, replace the regulator and motor assembly.



3. INSPECT POWER RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.

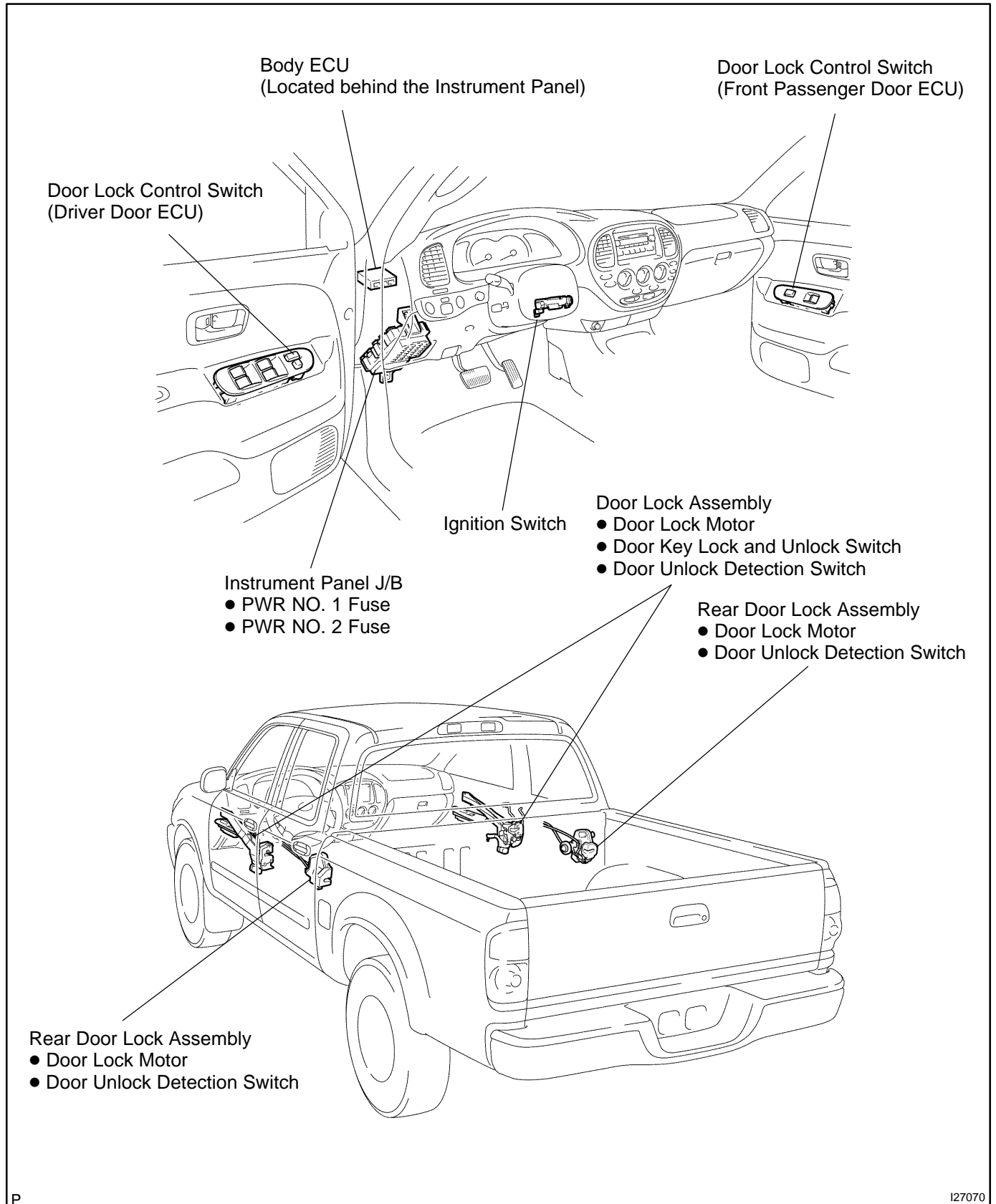


4. CHECK INTEGRATION RELAY

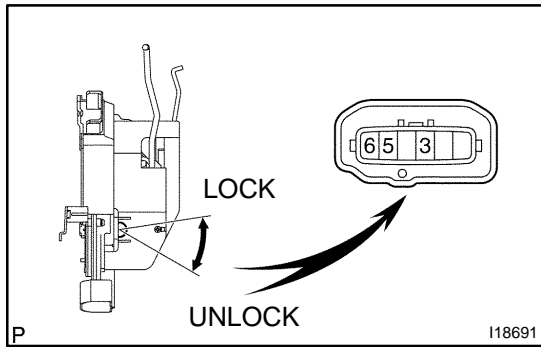
Remove the integration relay from the driver side J/B, and check the voltage or continuity of each terminal on the driver side J/B side (see page BE-128).

POWER DOOR LOCK CONTROL SYSTEM (Double Cab) LOCATION

BE2LV-01



127070

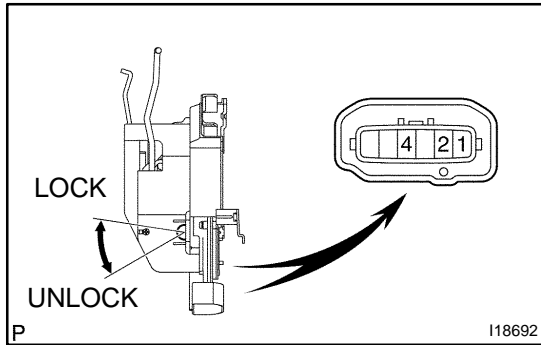


INSPECTION

1. INSPECT DRIVER DOOR KEY LOCK AND UNLOCK SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
LOCK	3 - 5	Continuity
OFF	3 - 5, 3 - 6	No continuity
UNLOCK	3 - 6	Continuity

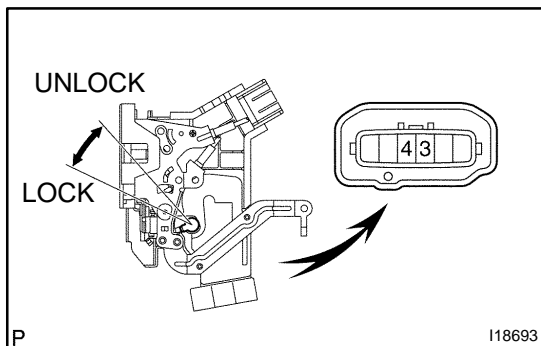
If the continuity is not as specified, replace the door lock assembly.



2. INSPECT PASSENGER SIDE DOOR KEY LOCK AND UNLOCK SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
LOCK	2 - 4	Continuity
OFF	1 - 4, 2 - 4	No continuity
UNLOCK	1 - 4	Continuity

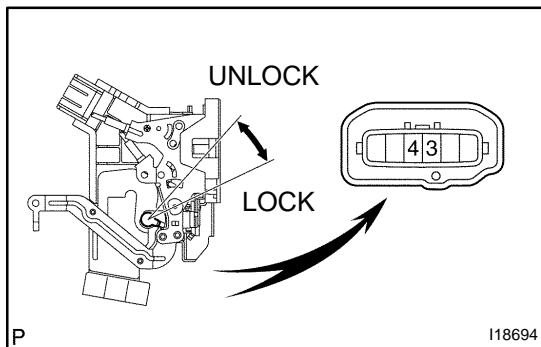
If the continuity is not as specified, replace the door lock assembly.



3. INSPECT DRIVER SIDE DOOR UNLOCK DETECTION SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
OFF (Door lock set to LOCK)	3 - 4	No continuity
ON (Door lock set to UNLOCK)	3 - 4	Continuity

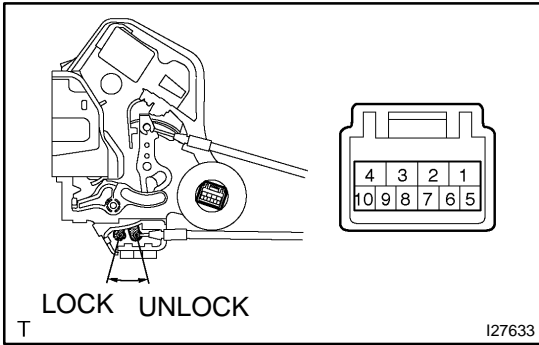
If the continuity is not as specified, replace the door lock assembly.



4. INSPECT PASSENGER SIDE DOOR UNLOCK DETECTION SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
OFF (Door lock set to LOCK)	3 - 4	No continuity
ON (Door lock set to UNLOCK)	3 - 4	Continuity

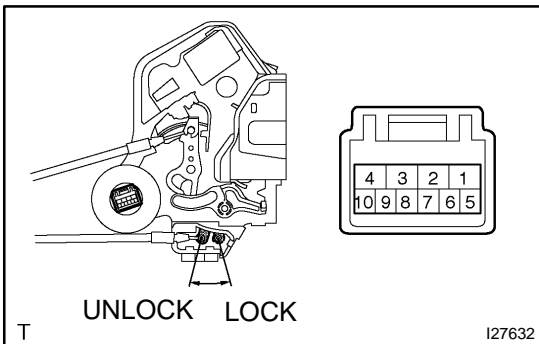
If the continuity is not as specified, replace the door lock assembly.



5. INSPECT REAR LEFT DOOR UNLOCK DETECTION SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
OFF (Door lock set to LOCK)	6 - 9	No continuity
ON (Door lock set to UNLOCK)	6 - 9	Continuity

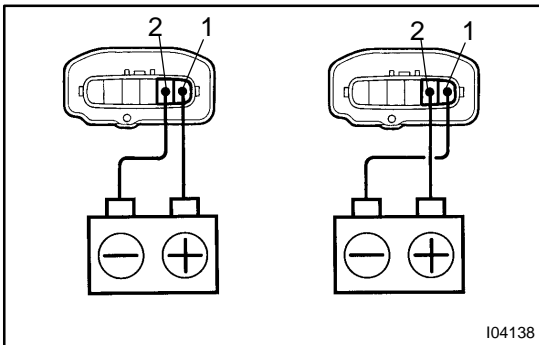
If the continuity is not as specified, replace the door lock assembly.



6. INSPECT REAR RIGHT DOOR UNLOCK DETECTION SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
OFF (Door lock set to LOCK)	6 - 9	No continuity
ON (Door lock set to UNLOCK)	6 - 9	Continuity

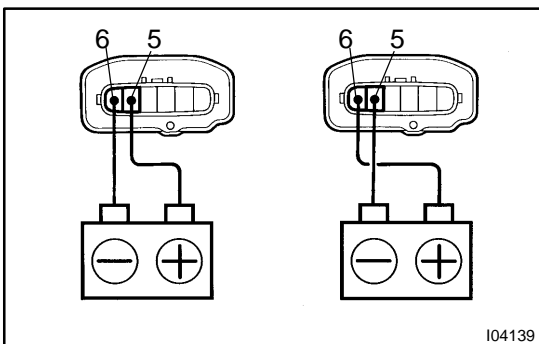
If the continuity is not as specified, replace the door lock assembly.



7. INSPECT DRIVER SIDE DOOR LOCK MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the door lock cable moves to the UNLOCK position.
- (b) Reverse the polarity and check that the door lock cable moves to the LOCK position.

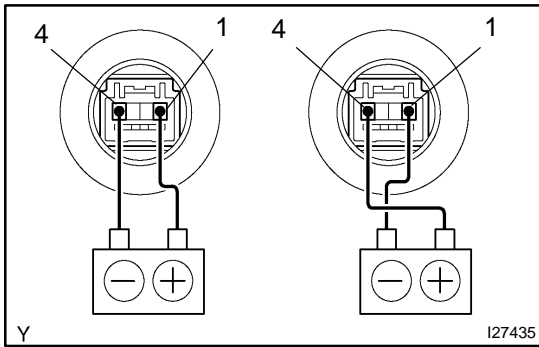
If operation is not as specified, replace the door lock assembly.



8. INSPECT PASSENGER SIDE DOOR LOCK MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 6, and check that the door lock cable moves to the UNLOCK position.
- (b) Reverse the polarity and check that the door lock cable moves to the LOCK position.

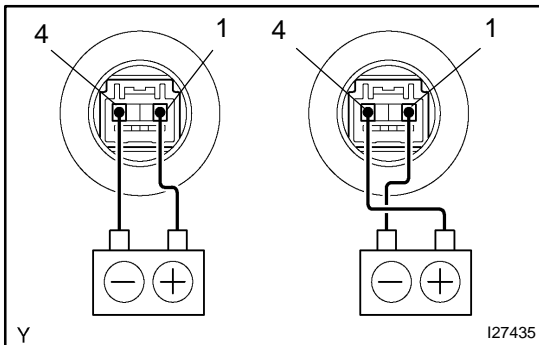
If operation is not as specified, replace the door lock assembly.



9. INSPECT REAR LEFT SIDE DOOR LOCK MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 4, and check that the door lock cable moves to the UNLOCK position.
- (b) Reverse the polarity and check that the door lock cable moves to the LOCK position.

If operation is not as specified, replace the door lock assembly.



10. INSPECT REAR RIGHT SIDE DOOR LOCK MOTOR OPERATION

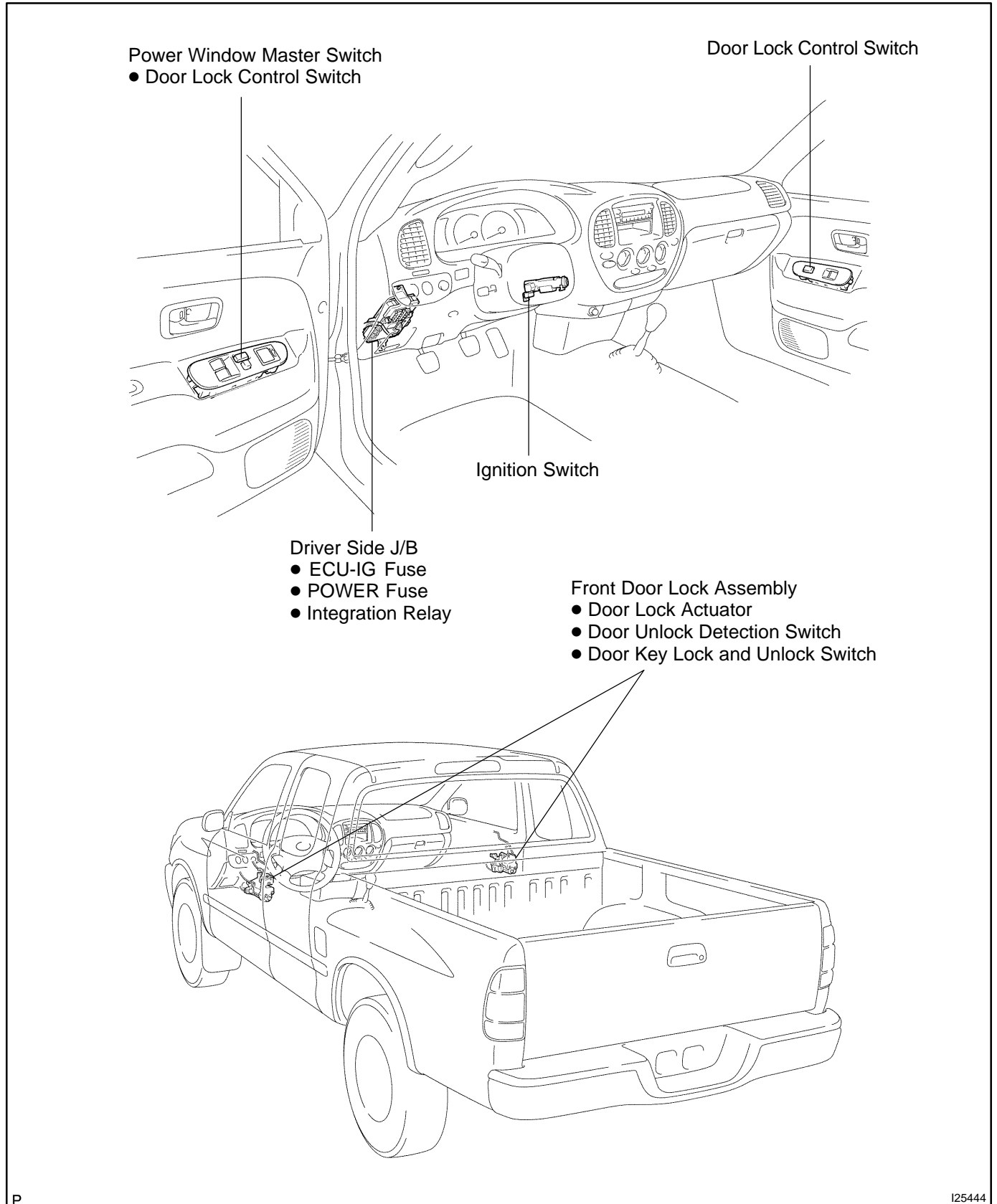
- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 4, and check that the door lock cable moves to the UNLOCK position.
- (b) Reverse the polarity and check that the door lock cable moves to the LOCK position.

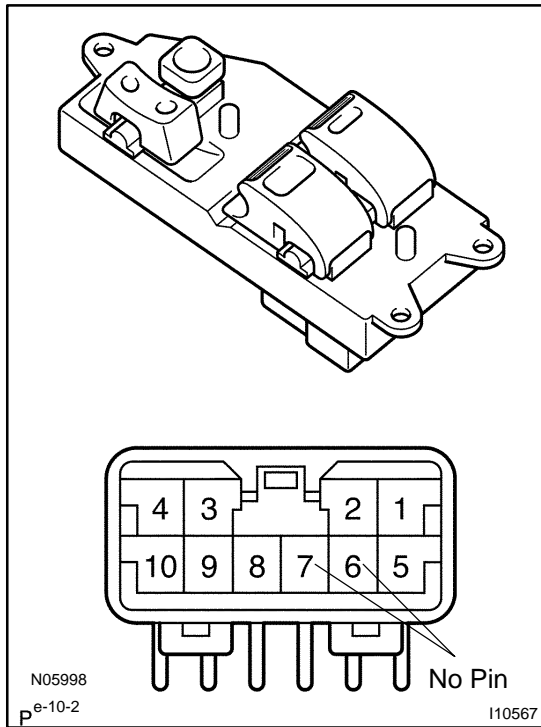
If operation is not as specified, replace the door lock assembly.

POWER DOOR LOCK CONTROL SYSTEM (Except Double Cab)

LOCATION

BE2LK-01



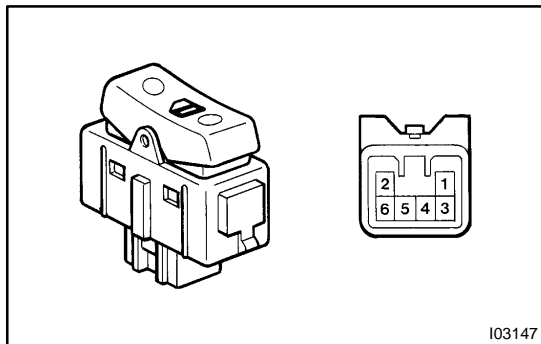


INSPECTION

1. **Driver side:**
INSPECT DOOR LOCK CONTROL SWITCH (POWER WINDOW MASTER SWITCH) CONTINUITY

Switch Position	Tester Connection	Specified Condition
LOCK	1 - 2	Continuity
OFF	1 - 2, 1 - 5	No continuity
UNLOCK	1 - 5	Continuity

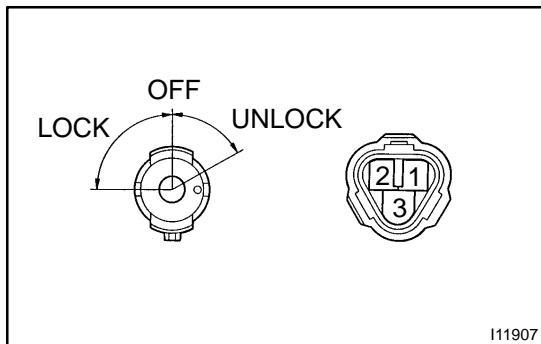
If the continuity is not as specified, replace the switch.



2. **Passenger side:**
INSPECT DOOR LOCK CONTROL SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
LOCK	3 - 6	Continuity
OFF	3 - 5, 3 - 6	No continuity
UNLOCK	3 - 5	Continuity

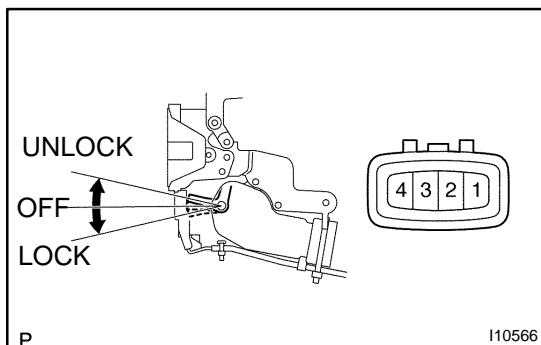
If the continuity is not as specified, replace the switch.



3. **INSPECT DOOR KEY LOCK AND UNLOCK SWITCH CONTINUITY**

Switch Position	Tester Connection	Specified Condition
LOCK	1 - 2	Continuity
OFF	1 - 2, 2 - 3	No continuity
UNLOCK	2 - 3	Continuity

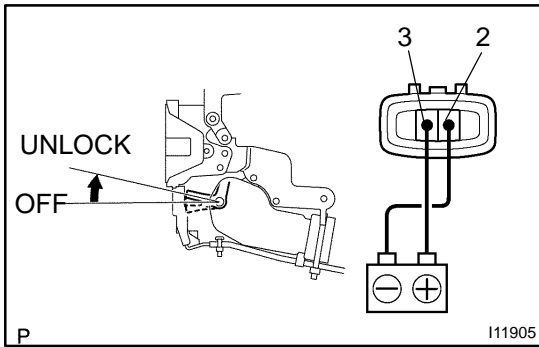
If the continuity is not as specified, replace the switch.



4. **INSPECT DOOR UNLOCK DETECTION SWITCH CONTINUITY**

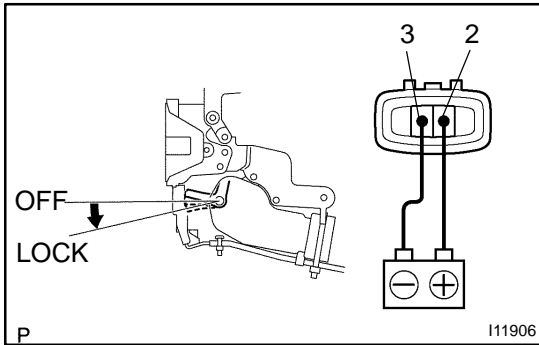
Switch Position	Tester Connection	Specified Condition
OFF (Door lock set to LOCK)	1 - 4	No continuity
ON (Door lock set to UNLOCK)	1 - 4	Continuity

If the continuity is not as specified, replace the actuator.



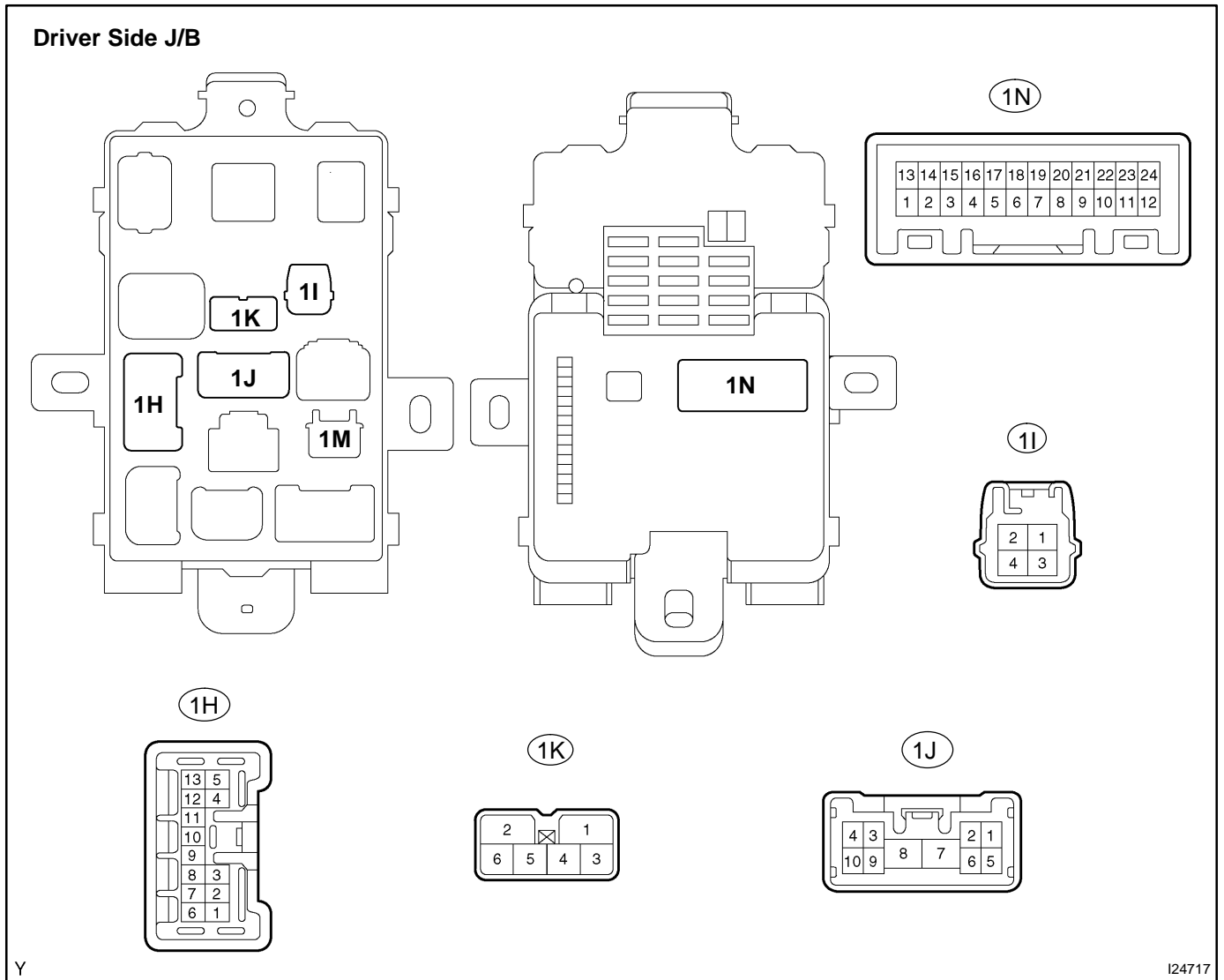
5. INSPECT DOOR LOCK ACTUATOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 3 and the negative (-) lead to terminal 2, and check that the door lock link moves to the UNLOCK position.



- (b) Reverse the polarity and check that the door lock link moves to the LOCK position.
If operation is not as specified, replace the actuator.

6. **w/ Daytime running light:**
CHECK INTEGRATION RELAY (DRIVER SIDE J/B) CIRCUIT
 - (a) Disconnect the 1H, 1I, 1J, 1K and 1N driver side J/B connectors, and check the voltage or continuity of each terminal of the wire harness side connectors.



Tester Connection	Condition	Specified Condition
1H-6 - Body ground	Passenger's door opened	Continuity
1H-6 - Body ground	Passenger's door closed	No continuity
1H-7 - Body ground	Driver's door opened	Continuity
1H-7 - Body ground	Driver's door closed	No continuity
1I-2 - Body ground	Ignition switch LOCK or ACC	Below 1 V
1I-2 - Body ground	Ignition switch ON or START	10 - 14 V
1J-8 - Body ground	Constant	Continuity
1K-2 - Body ground	Constant	10 - 14 V

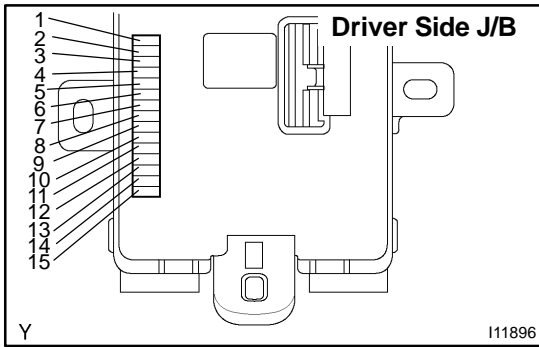
Tester Connection	Condition	Specified Condition
1N-5 - Body ground	Cargo light switch OFF	No continuity
1N-5 - Body ground	Cargo light switch ON	Continuity
1N-6 - Body ground	Key unlock warning switch OFF (Ignition key removed)	No continuity
1N-6 - Body ground	Key unlock warning switch ON (Ignition key inserted)	Continuity
1N-9 - Body ground	Driver's door unlock detection switch OFF	No continuity
1N-9 - Body ground	Driver's door unlock detection switch ON	Continuity
1N-10 - Body ground	Passenger's door unlock detection switch OFF	No continuity
1N-10 - Body ground	Passenger's door unlock detection switch ON	Continuity
1N-19 - Body ground	Door lock manual switch and door lock control switch LOCK	Continuity
1N-19 - Body ground	Door lock manual switch and door lock control switch OFF or UNLOCK	No continuity
1N-20 - Body ground	Door key lock and unlock switch LOCK	Continuity
1N-20 - Body ground	Door key lock and unlock switch OFF or UNLOCK	No continuity
1N-21 - Body ground	Door lock manual switch or door lock control switch UNLOCK	Continuity
1N-21 - Body ground	Door lock manual switch and door lock control switch OFF or LOCK	No continuity
1N-22 - Body ground	Front passenger's door key lock and unlock switch UNLOCK	Continuity
1N-22 - Body ground	Front passenger's door key lock and unlock switch LOCK or OFF	No continuity
1N-23 - Body ground	Driver's door key lock and unlock switch UNLOCK	Continuity
1N-23 - Body ground	Driver's door key lock and unlock switch LOCK or OFF	No continuity
1N-24 - Body ground	Constant	Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

- (b) Reconnect the 1H, 1I, 1J, 1K and 1N driver side J/B connectors, and check the voltage of each terminal of the connectors.

Tester Connection	Condition	Specified Condition
1H-8 - Body ground	Door lock manual switch LOCK or UNLOCK	0 V → 10 - 14 V → Below 1 V
1H-9 - Body ground	Door lock manual switch LOCK or UNLOCK	0 V → 10 - 14 V → Below 1 V

If the result is not as specified, the integration relay (driver side J/B) may malfunction.



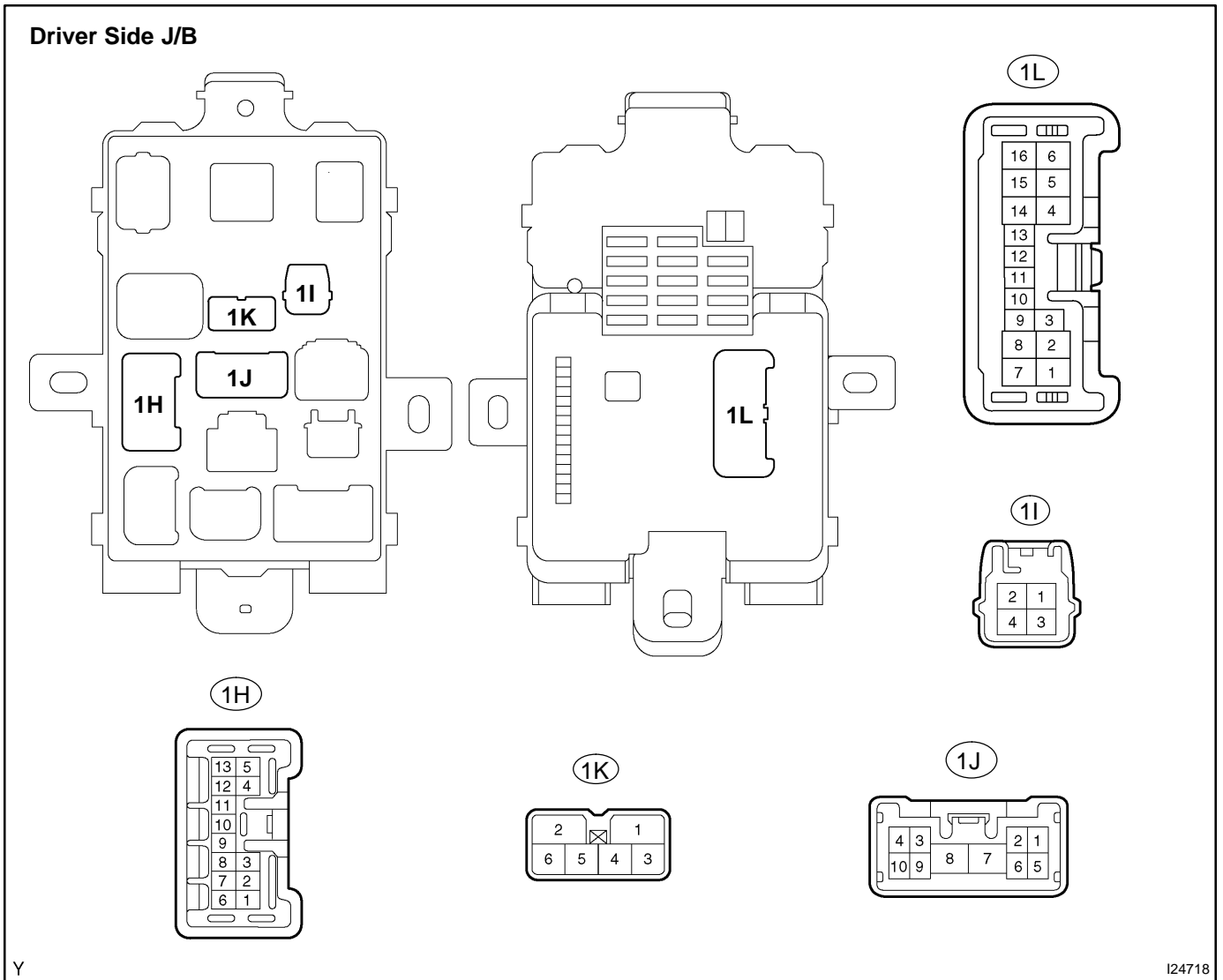
(c) Remove the integration relay from the driver side J/B, and check the voltage or continuity on each terminal of the driver side J/B side.

Tester Connection	Condition	Specified Condition
1 - Body ground	Constant	Continuity
2 - Body ground	Constant	Continuity
3 - Body ground	Constant	10 - 14 V
4 - Body ground	Constant	Continuity
5 - Body ground	Constant	10 - 14 V
6 - Body ground	Constant	10 - 14 V
7 - Body ground	Constant	10 - 14 V
8 - Body ground	Constant	Continuity
10 - Body ground	Ignition switch ON	10 - 14 V
11 - Body ground	Constant	Continuity
12 - Body ground	Constant	No continuity
13 - Body ground	Constant	No continuity
14 - Body ground	Left door courtesy switch OFF (Door closed)	No continuity
14 - Body ground	Left door courtesy switch ON (Door opened)	Continuity
15 - Body ground	Right door courtesy switch OFF (Door closed)	No continuity
15 - Body ground	Right door courtesy switch ON (Door opened)	Continuity

If the result is not as specified, replace the driver side J/B.

7. **w/o Daytime running light:**
CHECK INTEGRATION RELAY (DRIVER SIDE J/B) CIRCUIT

- (a) Disconnect the 1H, 1I, 1K, 1J and 1L driver side J/B connectors, and check the voltage or continuity of each terminal of the wire harness side connectors.



Tester Connection	Condition	Specified Condition
1H-6 - Body ground	Passenger's door opened	Continuity
1H-6 - Body ground	Passenger's door closed	No continuity
1H-7 - Body ground	Driver's door opened	Continuity
1H-7 - Body ground	Driver's door closed	No continuity
1I-2 - Body ground	Ignition switch LOCK or ACC	No voltage
1I-2 - Body ground	Ignition switch ON or START	10 - 14 V
1J-8 - Body ground	Constant	Continuity
1K-2 - Body ground	Constant	10 - 14 V

Tester Connection	Condition	Specified Condition
1L-1 - Body ground	Door lock manual switch, door lock control switch or door key lock and unlock switch LOCK	Continuity
1L-1 - Body ground	Door lock manual switch and door lock control switch and door key lock and unlock switch OFF or UNLOCK	No continuity
1L-2 - Body ground	Door lock manual switch, door lock control switch or front passenger's door key lock and unlock switch UNLOCK	Continuity
1L-2 - Body ground	Door lock manual switch, door lock control switch and front passenger's door key lock and unlock switch OFF or LOCK	No continuity
1L-3 - Body ground	Driver's door key lock and unlock switch UNLOCK	Continuity
1L-3 - Body ground	Driver's door key lock and unlock switch LOCK or OFF	No continuity
1L-6 - Body ground	Key unlock warning switch OFF (Ignition key removed)	No continuity
1L-6 - Body ground	Key unlock warning switch ON (Ignition key inserted)	Continuity
1L-8 - Body ground	Passenger's door unlock detection switch OFF	No continuity
1L-8 - Body ground	Passenger's door unlock detection switch ON	Continuity
1L-9 - Body ground	Driver's door unlock detection switch OFF	No continuity
1L-9 - Body ground	Driver's door unlock detection switch ON	Continuity
1L-10 - Body ground	Cargo light switch OFF	No continuity
1L-10 - Body ground	Cargo light switch ON	Continuity
1L-16 - Body ground	Constant	Continuity

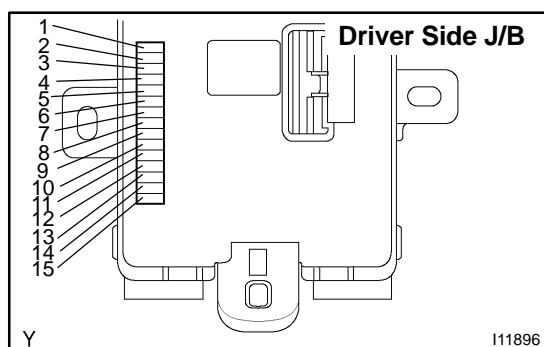
If the result is not as specified, there may be a malfunction on the wire harness side.

- (b) Reconnect the 1H, 1I, 1K, 1J and 1N driver side J/B connectors, and check the voltage of each terminal of the connectors.

Tester Connection	Condition	Specified Condition
1H-8 - Body ground	Door lock manual switch LOCK or UNLOCK	0 V → 10 - 14 V → Below 1 V
1H-9 - Body ground	Door lock manual switch LOCK or UNLOCK	0 V → 10 - 14 V → Below 1 V

If the result is not as specified, the integration relay (driver side J/B) may malfunction.

- (c) Remove the integration relay from the driver side J/B, and check the voltage or continuity of each terminal on the driver side J/B side (see step 6. (c)).



THEFT DETERRENT SYSTEM (Double Cab)

BE2KX-01

ON-VEHICLE INSPECTION

1. OUTLINE OF THEFT DETERRENT SYSTEM

- (a) When the theft deterrent system detects that the vehicle is being tampered with, the system sets off the alarm, causing the horns to sound and the lights to light up or flash in order to alert people around the vehicle to the theft.
- (b) The theft deterrent system has 2 modes; one is the active arming mode that is an initially set mode and another is the passive arming mode that can be switched by the hand-held tester.
- (c) Each mode (active and passive) has 4 states; the disarmed state, the arming preparation state, the armed state and the alarm sounding state.
- (1) Disarmed state:
- The alarm function is not operating.
 - The theft deterrent system is not operating.
- (2) Arming preparation state:
- The theft deterrent system is not operating.
- (3) Armed state:
- The theft deterrent system is operating.
- (4) Alarm sounding state:
When the theft deterrent system detects that the vehicle is being tampered with while in the armed state, the system causes the horns to sound and the lights to light up or flash in order to alert people around the vehicle to the theft.

Refer to table below for alarm method and time:

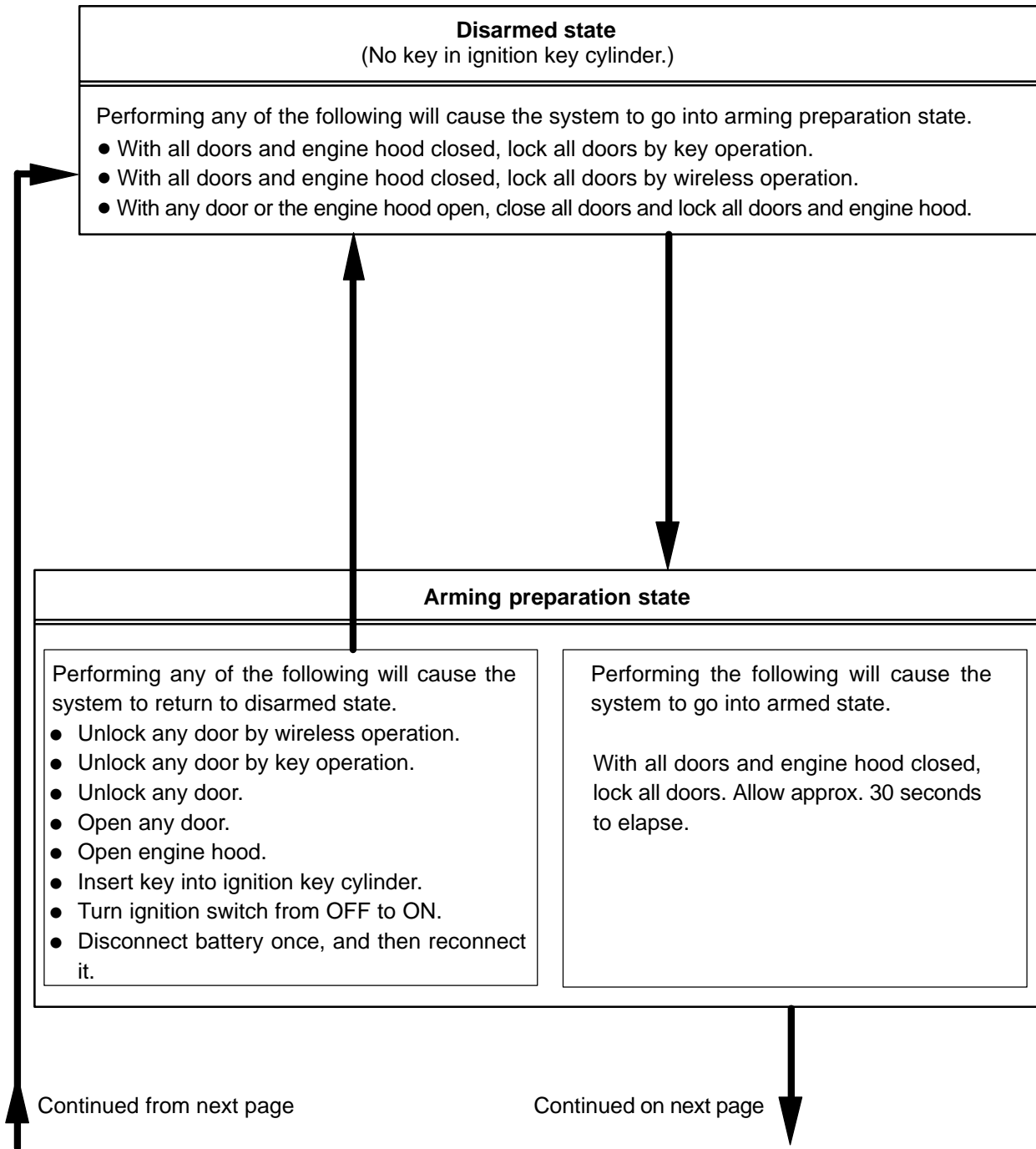
Alarming method	Headlight	Flashing at a cycle of approx. 0.4 seconds
	Taillight	Flashing at a cycle of approx. 0.4 seconds
	Interior light	Illuminating (turn on)
	Vehicle horn	Sounding at a cycle of approx. 0.4 seconds
	Security horn	Sounding at a cycle of approx. 0.4 seconds
Alarming time	Approx. 60 seconds	

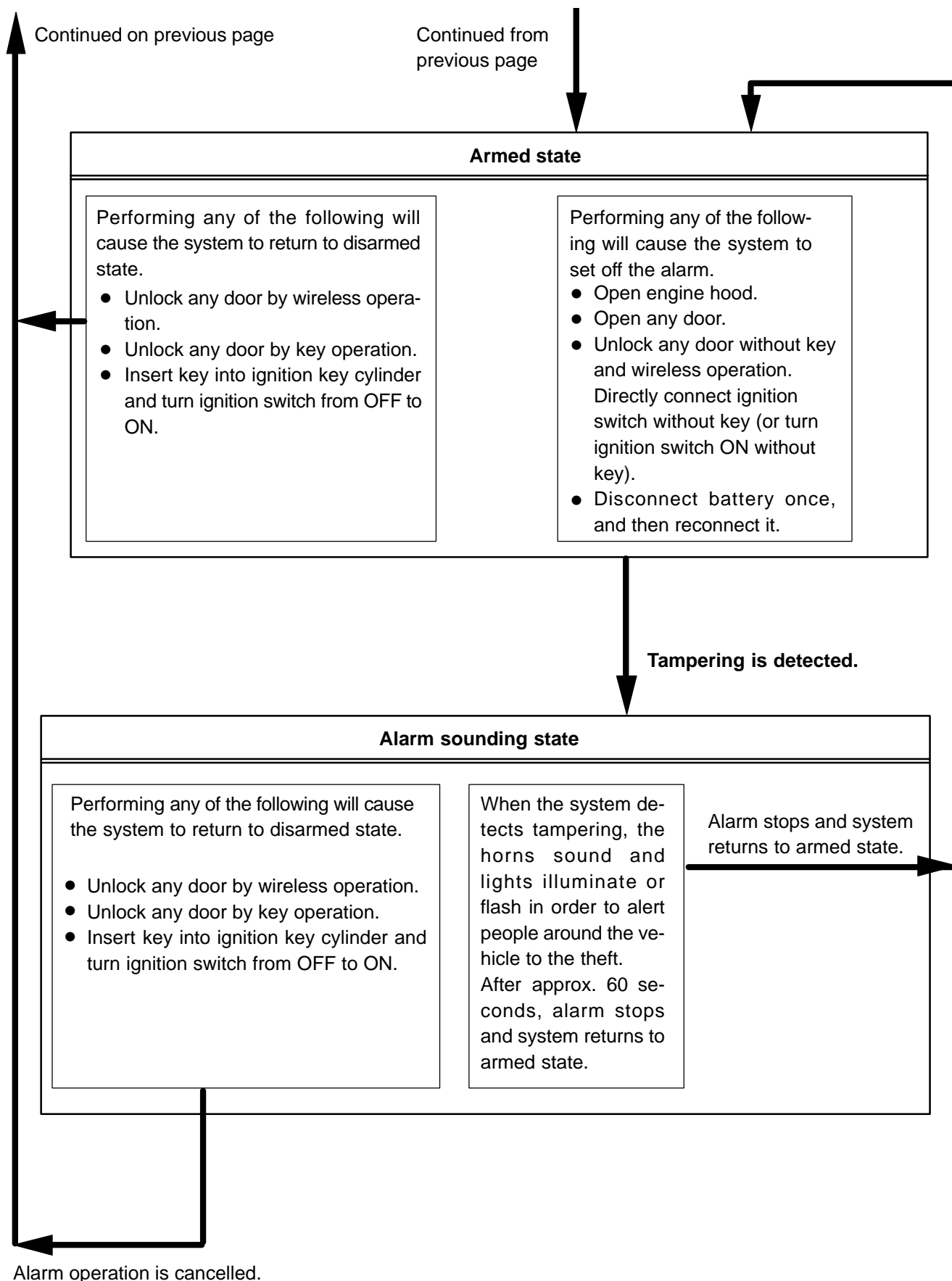
HINT:

If any of the doors are unlocked with no key in the ignition key cylinder during the alarm sounding state, a forced door lock signal will be output (see step 4).

2. ACTIVE ARMING MODE

- Active arming mode starts the alarm control immediately after the doors are locked.





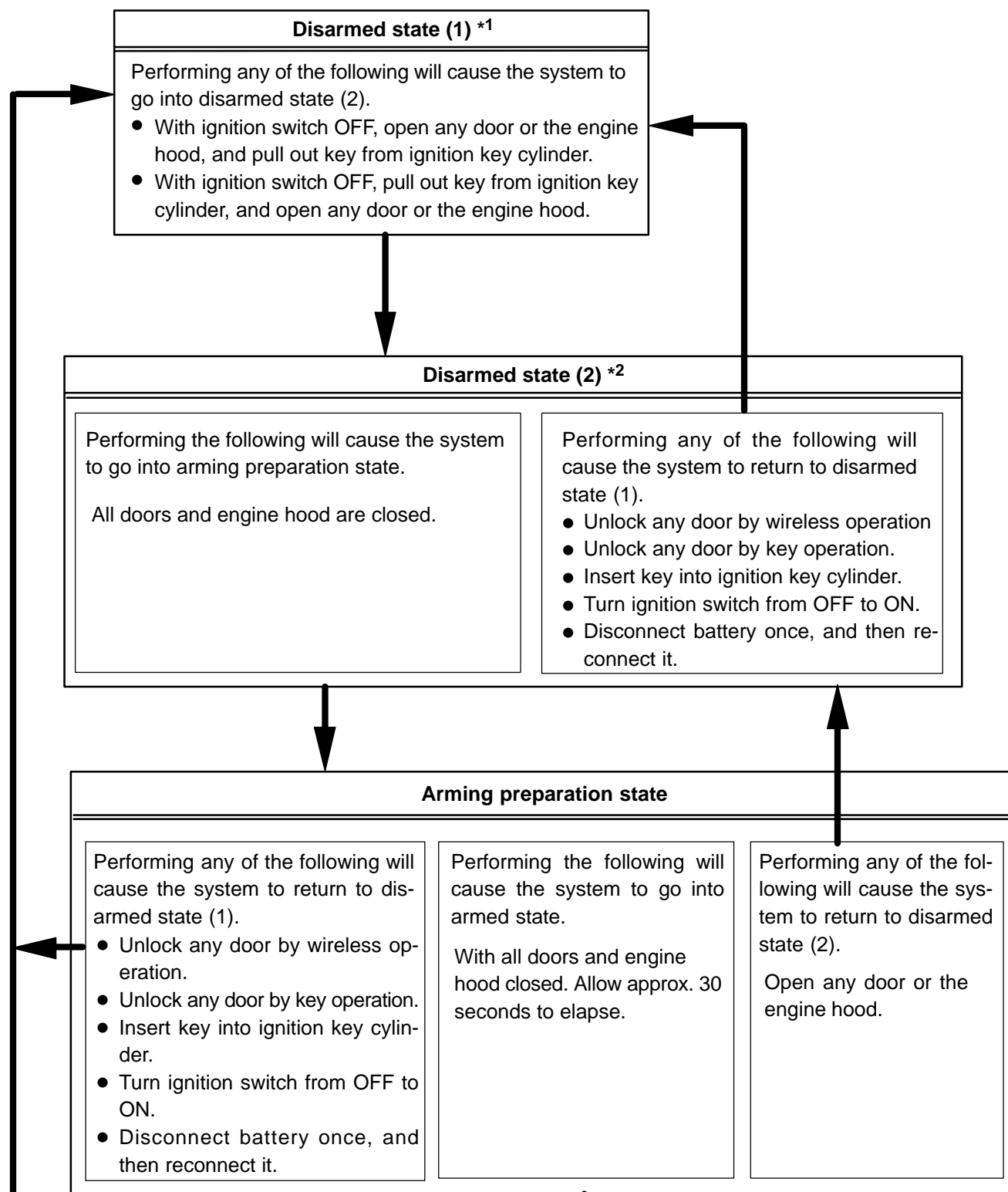
3. PASSIVE ARMING MODE

- Passive arming mode can be switched ON/OFF by the hand-held tester.
- The alarm is initially set (when shipped from factory) to active arming mode (not passive arming mode).
- During passive arming mode, the theft deterrent system goes into the armed state even if the doors are not locked.
- Passive arming mode starts the alarm control after the key is removed from the ignition key cylinder and the doors are closed.
- Detecting that the doors are unlocked does not set off the alarm during passive arming mode.
- A forced door lock signal is not output during passive arming mode (see step 4).
- When the theft deterrent system detects that the doors are opened during passive arming mode, the alarm is not set off immediately because an entry delay time is set.
- If any of the following conditions is met during passive arming mode, the theft deterrent system will switch to active arming mode.
 - With all doors and engine hood closed, lock all doors by key operation.
 - With all doors and engine hood closed, lock all doors by wireless operation.
 - With any door or the engine hood open, close all doors and lock all doors and engine hood.

HINT:

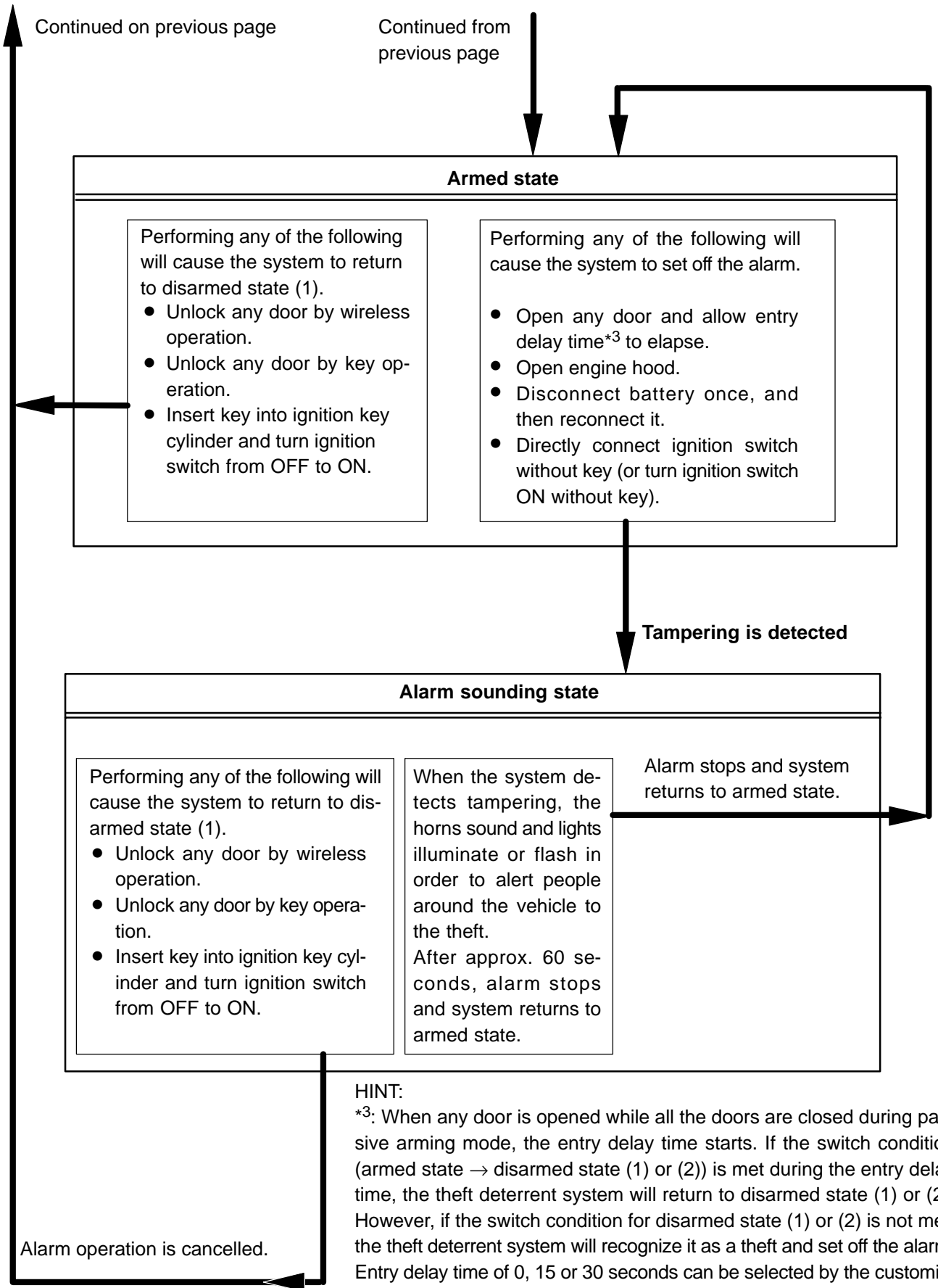
*1: Disarmed state (1) is the normal disarmed state.

*2: Disarmed state (2) is set from either the disarmed state (1) or the arming preparation state.



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4. FORCED DOOR LOCK CONTROL

- (a) The forced door lock control prevents the vehicle from being tampered with. Immediately after a door is unlocked (alarm starts), the door is forced to lock by a forced door lock signal.
- (1) Conditions that force the doors to lock:
When no key is in the ignition key cylinder, the doors will be forced to lock if any of the following conditions is met.
- The theft deterrent system is in the alarm sounding state of active arming mode.
 - All the doors are locked. ☐ Any door is unlocked.

5. Indicator light output

Condition	Indicator light
Disarmed state	OFF
Arming preparation state	ON
Armed state (Entry delay time)	BLINK (ON)
Alarm sounding state	ON

HINT:

Blinking frequency:

0.2 seconds (ON)

1.8 seconds (OFF)

6. PANIC ALARM CONTROL

- (a) The panic alarm control makes it possible for you to voluntarily set off the panic alarm by pressing the PANIC switch on the wireless transmitter. However, this control operates independently from the alarm control by the theft deterrent system (switched to the alarm sounding state from the armed state).
- (1) Conditions that cause the panic alarm control to set off the panic alarm:
The panic alarm control sets off the panic alarm by pressing the PANIC switch on the wireless transmitter under the following conditions.
- The ignition switch is OFF.
 - The theft deterrent system is not in the alarm sounding state (common to active arming mode and passive arming mode).
 - The panic alarm control is not operating (the alarm is not set off).
- (2) Conditions that cause the panic alarm control to shut off the alarm:
The panic alarm control shuts off the panic alarm when any of the following conditions is met during panic alarm operation.
- The ignition switch is turned ON.
 - Either of the switches on the wireless transmitter (LOCK/UNLOCK) is pressed.
 - The panic alarm ends (60 seconds have passed).
 - The theft deterrent system switches to the alarm sounding state (common to active arming mode and passive arming mode). However, the alarm is still sounding, because the theft deterrent system has switched to the alarm sounding state. Conditions for canceling the panic alarm are the same as for the alarm control.

HINT:

Active arming mode: See step 2

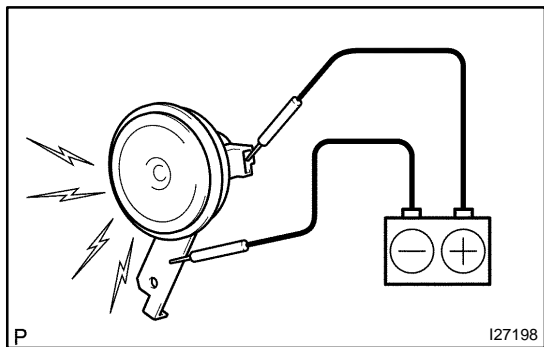
Passive arming mode: See step 3

7. Switch to the active arming mode

HINT:

In each state of the passive arming mode, when the switch condition to the active mode (disarmed state of active arming mode → arming preparation state of active arming mode) is satisfied, the system will switch to each state of the active arming mode. In this case, the active arming mode will continue until the system switches to the disarmed state.

State of Passive Arming Mode Before Switch	State of Active Arming Mode After Switch
Disarmed state	Arming preparation state
Arming preparation state	Arming preparation state (continuing for 30 seconds)
Armed state (during entry delay time)	After alarming time has elapsed, the system will switch to the armed state
Alarm sounding state	After alarming time has elapsed, the system will switch to the armed state

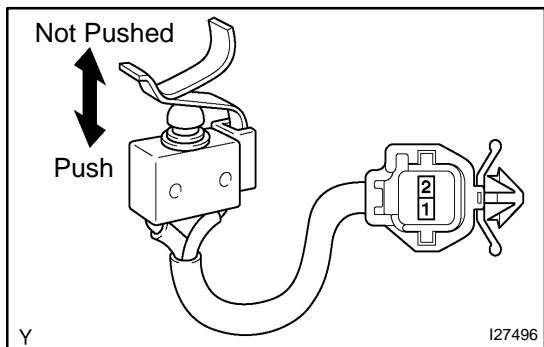


INSPECTION

1. INSPECT SECURITY HORN OPERATION

Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to the horn body, and check that the horn blows.

If operation is not as specified, replace the horn.



2. INSPECT ENGINE HOOD COURTESY SWITCH CONTINUITY

Condition	Tester Connection	Specified Condition
Push	1 - 2	No continuity
Not pushed	1 - 2	Continuity

If the continuity is not as specified, replace the switch.

WIRELESS DOOR LOCK CONTROL SYSTEM (Double Cab)

BE2LM-01

PRECAUTION

NOTICES WHEN CHECKING

(a) Power door LOCK/UNLOCK function:

The wireless remote control function operates only when the following 3 conditions are met.

- (1) No key is inserted into the ignition key cylinder.
- (2) All the doors are closed (door open indicator off).
- (3) The power door lock system operates normally.

HINT:

- The UNLOCK function operates even when any door is open.
- The UNLOCK function operates even when the key is inserted into the ignition key cylinder, however it must be in the OFF position.

(b) Remote panic function:

The wireless remote control function operates only when the following condition is met.

The ignition switch is OFF.

HINT:

The key can be inserted, however it must be in the OFF position.

(c) The wireless door lock remote control operational area differs depending on the situation.

- (1) The operational area differs depending on the operators and the ways the transmitter is held.
- (2) In certain areas, the remote control function will only operate partially for the operational area will be reduced due to the vehicle body shape and the influence of the surrounding environment.
- (3) Since the transmitter uses faint electric waves, strong electric waves or noise in the frequency used may reduce the operational area or the remote control may not function.
- (4) When the battery weakens, the operational area is reduced or the remote control may not function.

HINT:

If the door control transmitter has been left in a place that is exposed to direct sunlight, such as on the instrument panel, it may cause the battery to weaken or cause other such problems.

REGISTRATION PROCEDURE

REGISTER RECOGNITION CODE

HINT:

- Register the recognition code when replacing the door control transmitter or the door control receiver.
- The add mode is used to register new recognition codes while still retaining codes already registered. This mode is used when a new transmitter is added. If the number of registered codes exceeds 4, the previously registered codes will be erased in order, starting from the first registered code.
- The rewrite mode is used to erase all the previously registered recognition codes in order to register new recognition codes. This mode is used when the transmitter or the door control receiver is replaced a new one.
- The confirmation mode is used to confirm how many recognition codes have already been registered before an additional registration of a recognition codes.
- The prohibition mode is used to erase all the registered codes and disables the wireless door lock function. This mode is used when the transmitter is lost.
- All the following registration procedures must be performed in order continuously.

Flow Chart of Recognition Code Registration

START

Make sure that the following conditions are met.

- No key in ignition key cylinder.
- Driver side door is open (other doors are closed).
- Driver side door is unlocked.

1. Insert key into ignition key cylinder, then pull it out.

2. Press door lock control switch (for manual operation) 5 times to LOCK/UNLOCK at approx. 1 sec. interval.

The diagram shows a timing sequence for step 2. It features three horizontal lines representing the LOCK, OFF, and UNLOCK signals. The UNLOCK signal is active (low) during the first two pulses, while the LOCK signal is active (high) during the remaining three pulses. Each pulse is labeled as '1st time' through '5th time'. The interval between the first two pulses is marked as 'Approx. 1 sec.'.

Within 40 sec.

3. Close and open driver side door

4. Press door lock control switch again (for manual operation) 5 times to LOCK/UNLOCK at approx. 1 sec. interval.

The diagram shows a timing sequence for step 4, identical in format to step 2. It features three horizontal lines representing the LOCK, OFF, and UNLOCK signals. The UNLOCK signal is active (low) during the first two pulses, while the LOCK signal is active (high) during the remaining three pulses. Each pulse is labeled as '1st time' through '5th time'. The interval between the first two pulses is marked as 'Approx. 1 sec.'.

Within 40 sec.

5. Insert key into ignition key cylinder.

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Mode Selection:

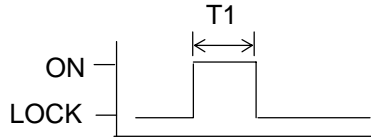
- 6. Turn ignition switch from LOCK to ON and back to LOCK at approximately 1 second intervals according to the number of times shown below.

Number of ON-LOCK operations of ignition switch:

Add Mode

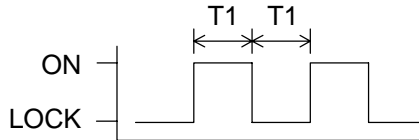
ON-LOCK operation: 1 time

T1: Approx. 1 sec.



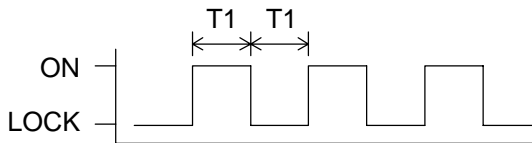
Rewrite Mode

ON-LOCK operation: 2 times



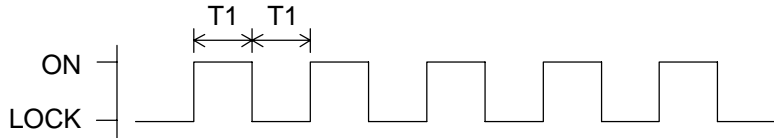
Confirmation Mode

ON-LOCK operation: 3 times



Prohibition Mode

ON-LOCK operation: 5 times



If the number of the ON-LOCK operations of the ignition switch is 0, 4 or 6 or more, there will be no response (power door lock and unlock operation) to show which mode has been selected.

Within 40 sec.

- 7. Remove key from ignition key cylinder.

Within 3 sec.

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Within 3 sec.

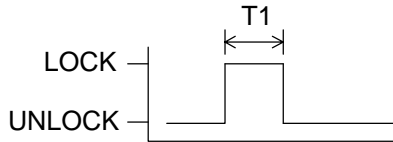
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Response to selected mode (Power door lock operation):

Body ECU automatically performs power door LOCK-UNLOCK operation to inform which mode has been selected.

Add Mode

LOCK-UNLOCK operation: 1 time

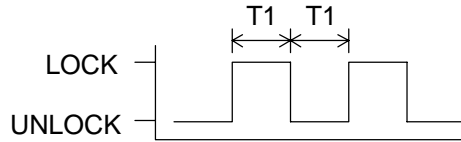


T1: Approx. 1 sec.

T2: Approx. 2 sec.

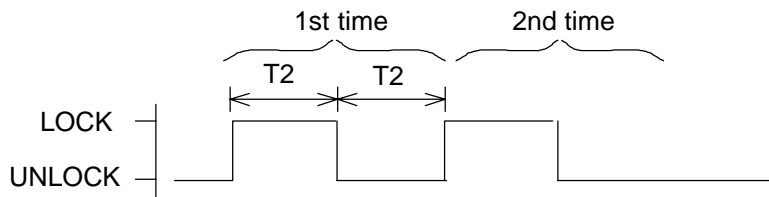
Rewrite Mode

LOCK-UNLOCK operation: 2 times



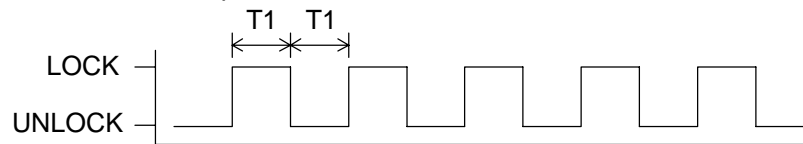
Confirmation Mode

LOCK-UNLOCK operation: The number of registered codes (1 - 5 times)



Prohibition Mode

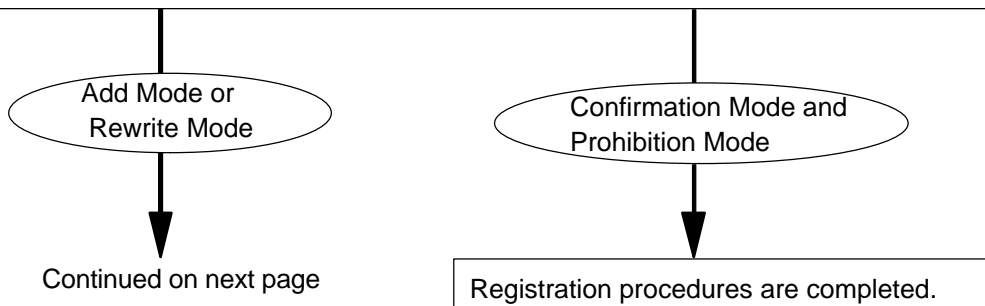
LOCK-UNLOCK operation: 5 times

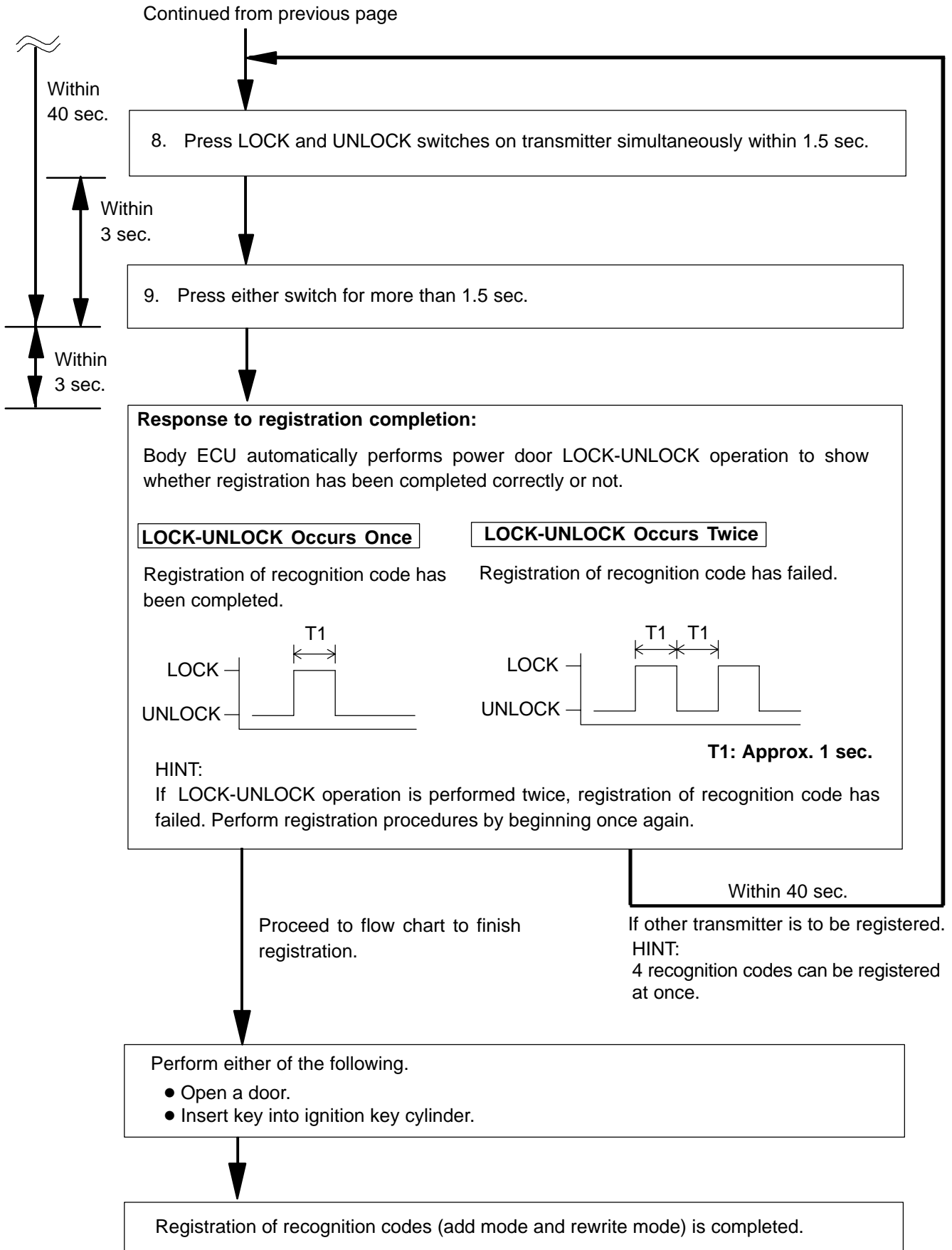


HINT:

- In the confirmation mode, when LOCK-UNLOCK operation is performed twice, the number of registered recognition codes is 2.
- In the confirmation mode, when 0 codes are registered, LOCK-UNLOCK operation is automatically performed 5 times.

Within 40 sec.





ON-VEHICLE INSPECTION

1. SYSTEM CHECK

**Only wireless function (Remote control) does not operate.
(If a new transmitter or a transmitter for same type vehicle that works properly with vehicle is not available.)**

Put vehicle in following conditions (Pre-requisite).
 (1) No key is inserted in ignition key cylinder.
 (2) All doors are closed. (Door warning light is off.)
 (3) All doors are locked.

Basic function check:

Using standard operation, press UNLOCK or LOCK transmitter switch 3 times or more alternately. Check that UNLOCK or LOCK operation works properly from 3rd time onward.

- Standard operation.

(1) Stand approximately 1 m (3.28 ft) away from driver's door outside handle on its right.
 (2) Hold transmitter toward vehicle and press one of transmitter switches for approximately 1 second.

No

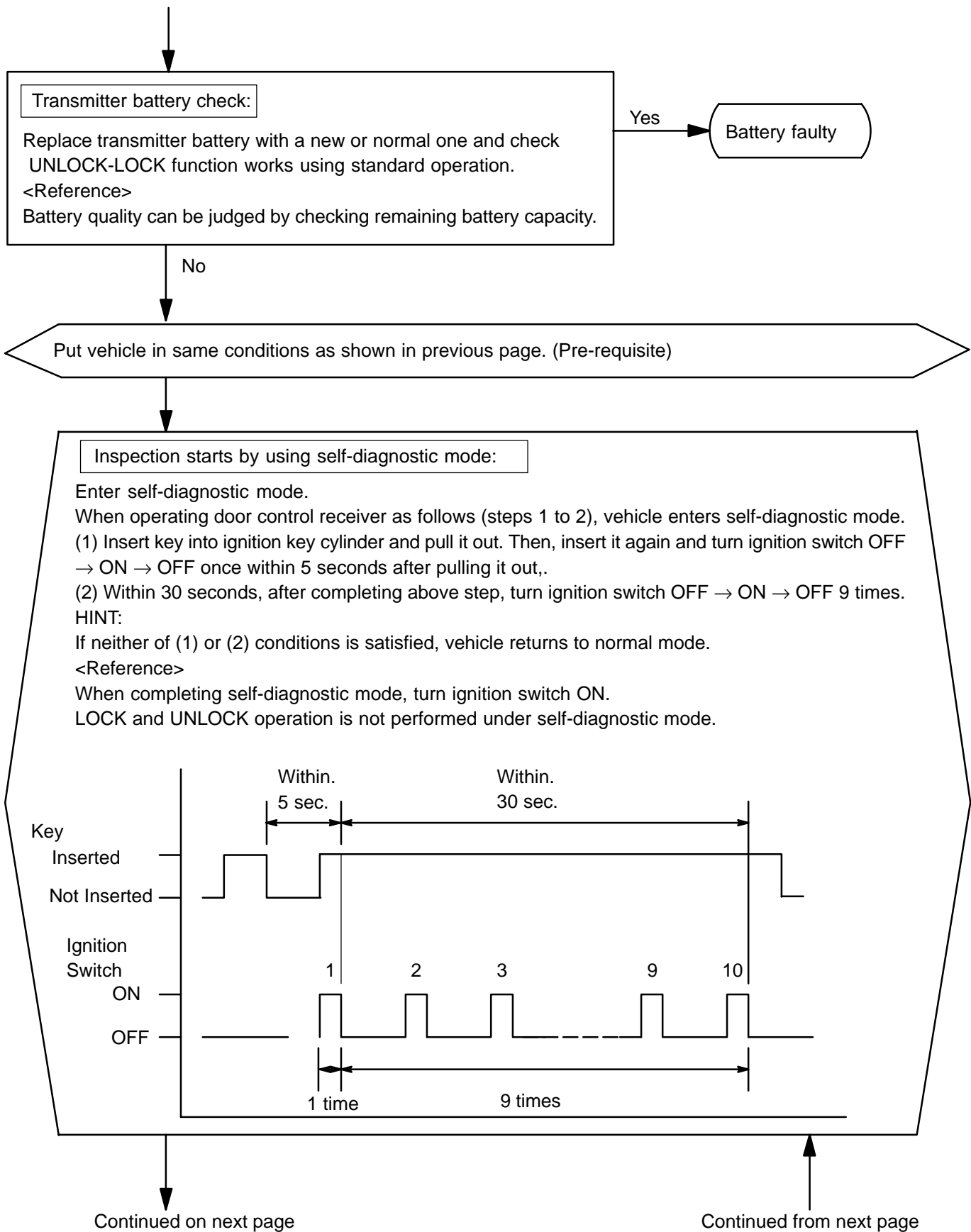
Yes

Normal
 <Reference>

- Operative distance may differ according to an operator, way of holding transmitter or position.
- As weak electric wave is used, when there is strong wave or noise in used frequency, operation distance might be shortened.

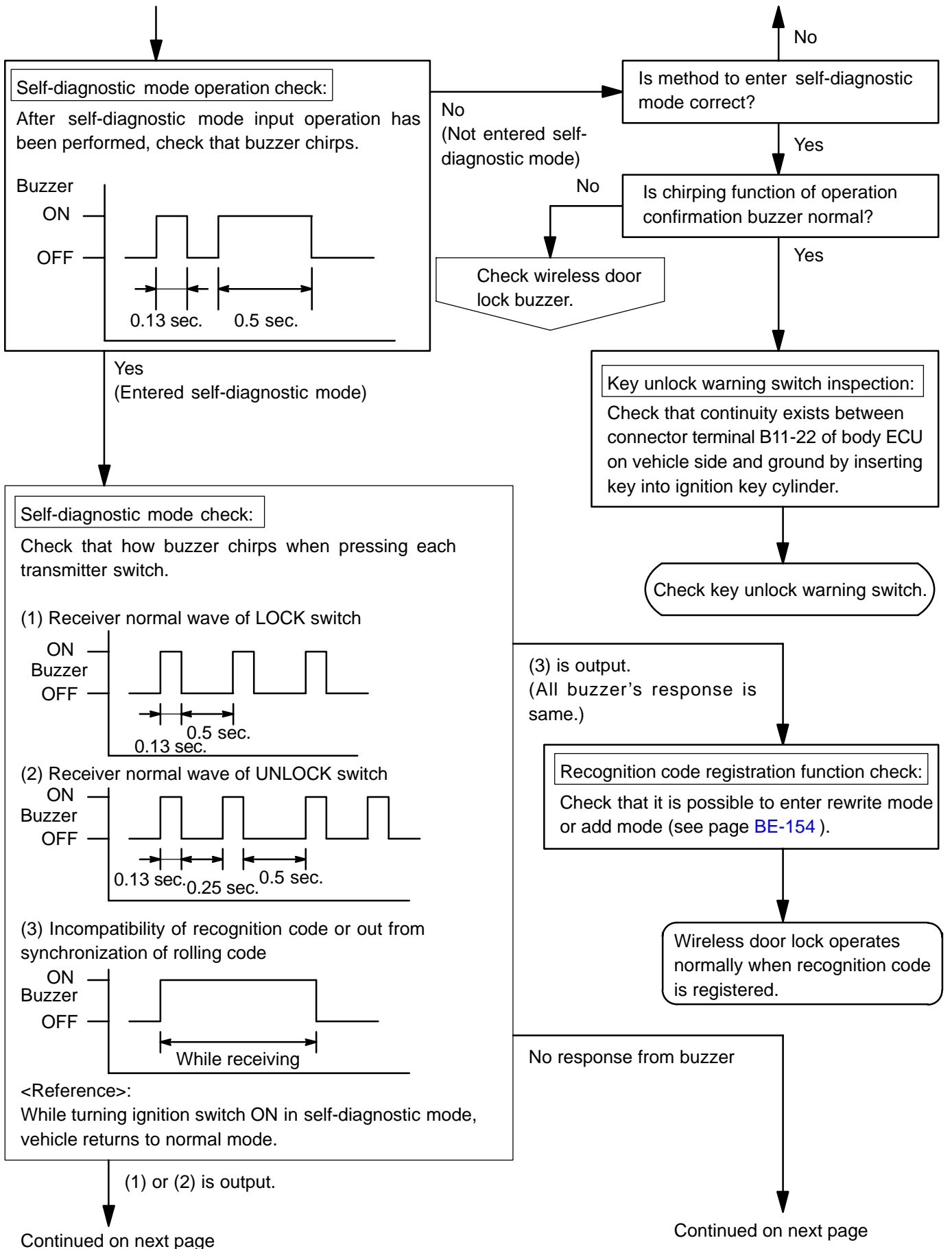
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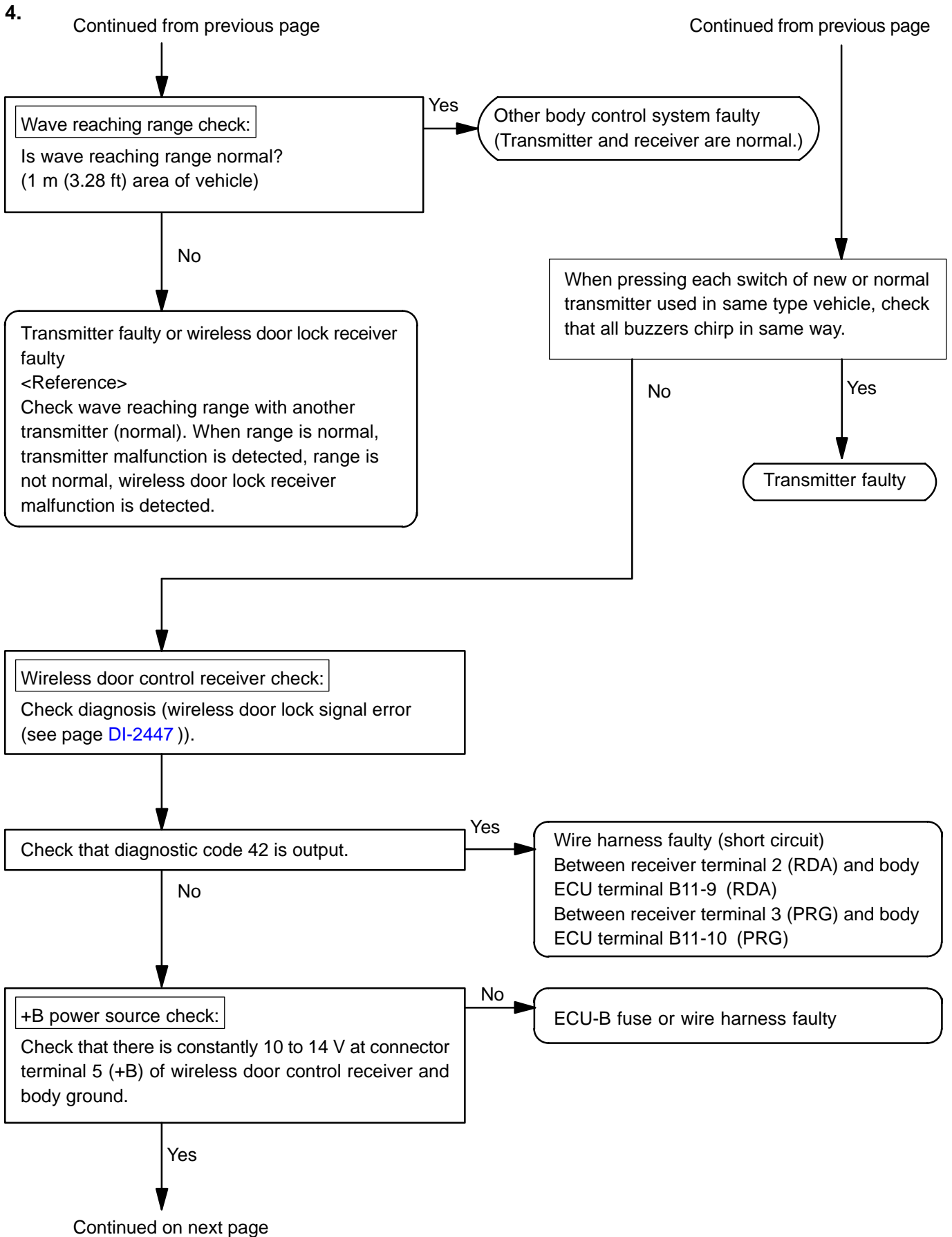
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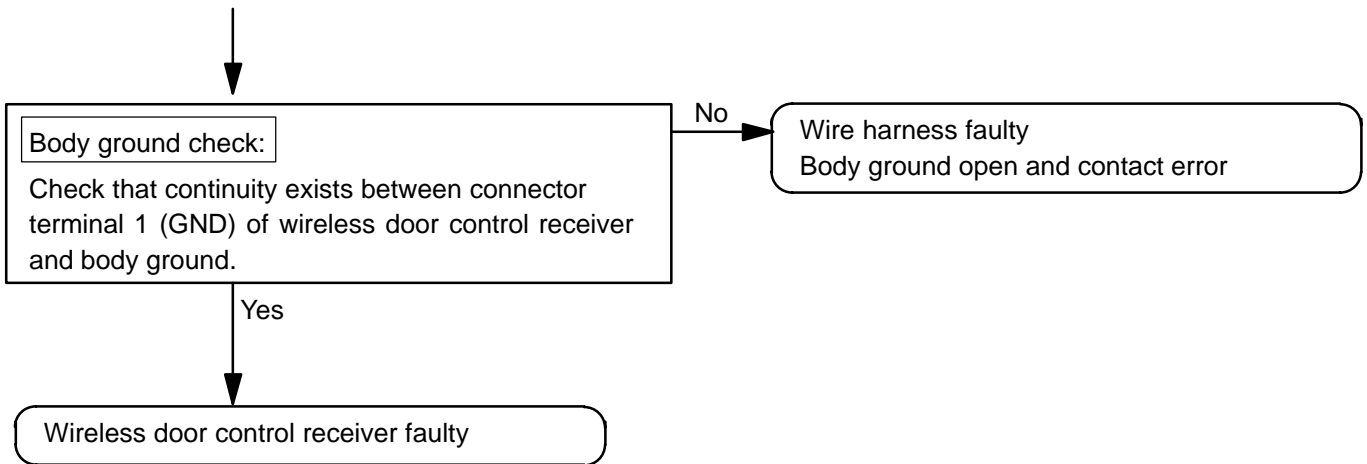
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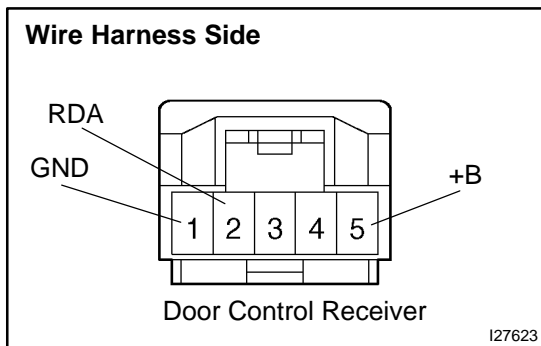


6. INSPECT WIRELESS DOOR LOCK CONTROL FUNCTIONS

HINT:

- The switch described in this text is a switch for transmitting signals which is built into the door control transmitter.
- All the functions listed below must be checked in the remote control operational area.
- (a) Put the vehicle under the conditions that allow the wireless control function to be operated (see PRECAUTION on page BE-153).
- (b) Check the basic function.
 - (1) Check that all the doors lock when the LOCK switch is pressed.
 - (2) Check that only the driver side door unlocks when the UNLOCK switch is pressed once and the other doors unlock when the UNLOCK switch is pressed again within 3 seconds.
- (c) Check the chattering prevention function.
Check that the corresponding operation occurs only once and is not repeated continuously while the switch is held. However, when the switch is operated repeatedly at 1 second intervals, check that the corresponding operation is carried out.
- (d) Check the automatic lock function.
 - (1) Check that all the doors lock automatically as long as none of them have been opened or all the doors have not been locked within approximately 30 seconds after they are unlocked by pressing the UNLOCK switch.
 - (2) Check that the automatic locking function does not operate when any door has been opened or all of them have been locked within approximately 30 seconds after they are unlocked by pressing the UNLOCK switch.
- (e) Check the switch operation fail-safe function.
Check that the doors cannot be locked using the switch while the key is in the ignition key cylinder. However, this does not apply when the system is in the recognition code registration mode.
- (f) Check the operation stop function when a door is open or not completely closed.
Check that the doors are not locked by the switch while any door is open or not completely closed.
- (g) Check the repeat function.
Check that all the doors attempt to automatically lock once again 1 second after the LOCK switch has been pressed while the movement of the driver side door control knob is being restricted in the unlocked position.
- (h) Check the taillights and parking lights flashing and wireless door lock buzzer chirp functions (answer-back).
 - (1) When the LOCK switch is pressed, check that the lights flash once and buzzer chirps once with the locking of all the doors.

- (2) When the UNLOCK switch is pressed once, check that the lights flash twice with the unlocking of the driver side door.
- (3) When the UNLOCK switch is pressed again within 3 seconds, check that the light flashes twice with the unlocking of all the doors.
- (i) Check the illuminated entry function.
 - (1) When all the doors are locked, pressing the UNLOCK switch causes the interior light (when the light switch is in the DOOR position) to illuminate simultaneously with the unlock operation.
 - (2) Check that the interior light fades out in approximately 15 seconds if doors have not been opened.
- (j) Check the remote panic alarm function.
 Check that the horn sounds, and the headlights and taillights flash for 60 seconds by the theft alarm function when the PANIC switch is pressed. Also, check that the horn stops sounding and the lights stop flashing when either PANIC or UNLOCK switch on the transmitter is pressed or any door is unlocked using the key.



7. CHECK DOOR CONTROL RECEIVER

- (a) Disconnect the receiver connector.
- (b) Check the voltage and resistance between the terminals of the wire harness side connector of the receiver and body ground.

Standard:

Tester Connection	Specified Condition
5 (+B) - Body ground	10 - 14 V
1 (GND) - Body ground	Continuity

If the result is not as specified, there may be a malfunction on the wire harness side.

- (c) Reconnect the connector and check the voltage between the terminal and body ground.

Standard:

Tester Connection	Condition	Specified Condition
2 (RDA) - Body ground	No key in ignition key cylinder, all doors closed and each transmitter switch OFF → ON	Below 1 V → Approx. 6 to 7 V → Below 1 V

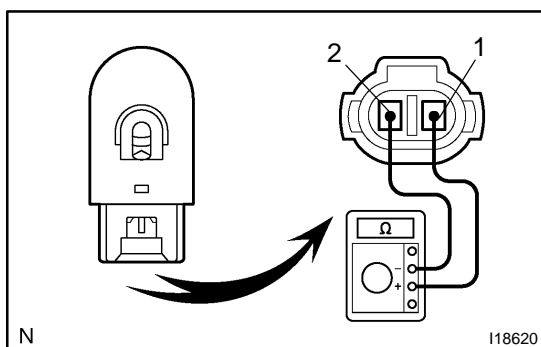
If the result is not as specified, the receiver may have a malfunction.

8. INSPECT WIRELESS DOOR LOCK BUZZER

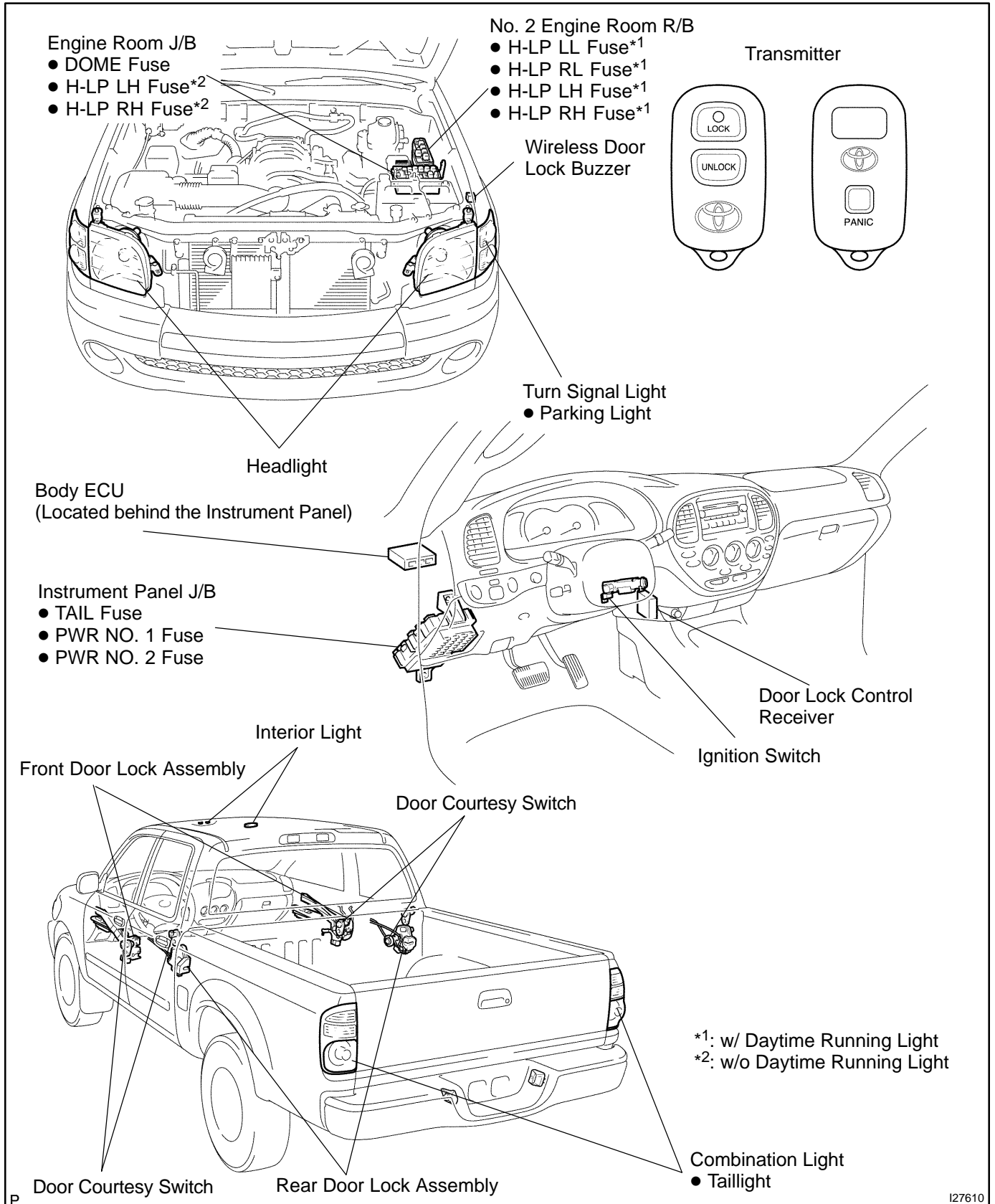
Connect the positive (+) lead from the ohmmeter to terminal 1 and the negative (-) lead to terminal 2, and measure resistance.

Standard: Approximately 1 kΩ

If the resistance is not as specified, replace the buzzer.



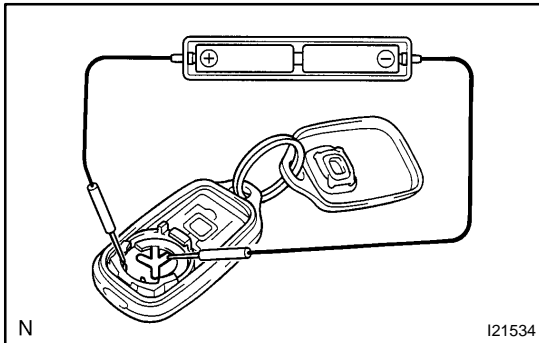
LOCATION



INSPECTION

1. INSPECT DOOR LOCK TRANSMITTER

- (a) Inspect operation of the transmitter.
 - (1) Remove the battery (lithium battery) from the transmitter (see page [BE-168](#)).
 - (2) Install a new or normal battery (lithium battery).



HINT:

When a new or normal battery is not available, connect 2 new 1.5 V batteries in series, connect the battery's positive (+) to the battery receptacle side terminal and battery's negative (-) to the bottom terminal, then apply 3 V of voltage to the transmitter.

- (3) In a location that is approx. 1 m (3.28 ft) away from the driver side outside door handle in the right direction, point the key plate of the transmitter at the vehicle and check operation of the transmitter by pressing the transmission switch on the transmitter body.

Standard:

The door lock can be operated via the remote control.

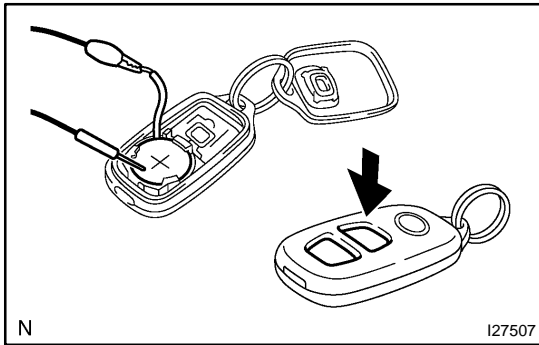
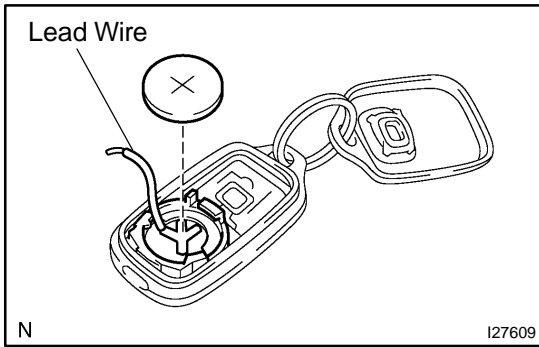
HINT:

- The minimum operational distance differs depending on the operator, the way the transmitter is held and the location.
 - Since the transmitter uses faint electric waves, the operational distance might be shortened if noise or strong electric wave occurs in the area where the frequency is used.
- (4) Install the battery (lithium battery).

- (b) Inspect the battery capacity.

HINT:

- The capacity of the battery can be determined only when the battery is installed in the transmitter. For a lithium battery used in the transmitter, a voltage of more than 2.5 V is shown on the tester until the energy is completely consumed, while no battery is installed in the transmitter. Therefore, it is necessary to measure the voltage while the battery is installed in the transmitter (a resistance of 1.2 k Ω is applied to the battery) when checking the amount of energy left in the battery.
- If the transmitter is faulty, the amount of energy left in the battery might not be checked correctly.
 - (1) Remove the battery (lithium battery) from the transmitter (see page [BE-168](#)).



(2) Connect the lead wire to the negative (-) terminal of the transmitter and install the battery.

(3) Connect the tester positive (+) probe to the positive (+) battery (lithium battery) and the tester negative (-) probe to the lead respectively.

(4) Press one of the transmission switches on the transmitter for approx. 1 second.

(5) Press the transmission switch on the transmitter again to check the voltage.

Standard: 2.2 V or higher

HINT:

- When the temperature of the battery is low, the inspection cannot be made correctly. When the outcome of the test is less than 2.2 V, conduct the test again after leaving the battery in a place with a temperature of 18°C (64°F) for more than 30 minutes.
- The automatic power-off function causes the voltage of the battery to be 2.5 V or more (a voltage with no resistance applied to the battery) when 0.8 seconds have passed after the switch is pressed. Therefore, make sure to read the voltage just after the switch is pressed.
- Because high voltage might be shown once or twice after the battery returns to the specified temperature, the inspection should be made with the voltage shown after the switch is pressed at least 3 times.

(6) Disconnect the lead.

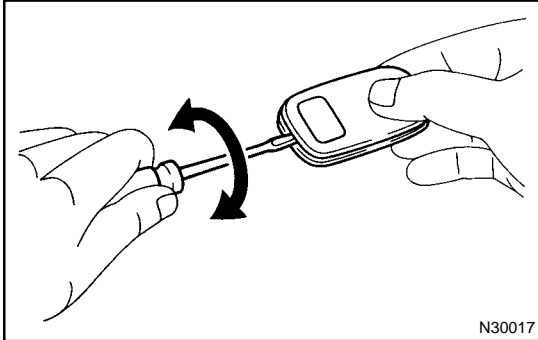
(7) Set the battery (lithium battery) in the transmitter.

REPLACEMENT

1. REMOVE TRANSMITTER BATTERY

NOTICE:

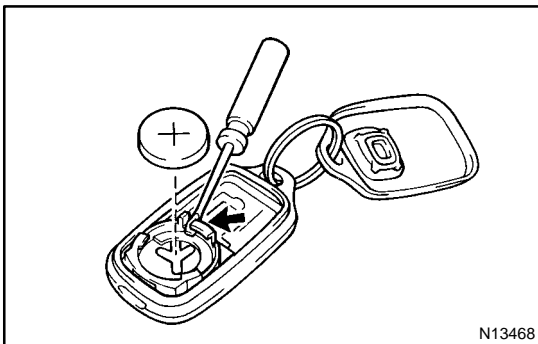
Special caution should be taken for handling each component as they are precision electronic components.



(a) Using a screwdriver, open the transmitter case.

NOTICE:

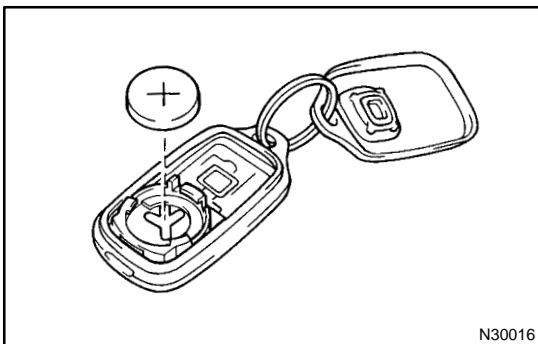
Do not forcibly pry out the cover.



(b) Using a screwdriver, pry out the battery (lithium battery).

NOTICE:

- Do not push the terminals with your finger.
- Prying up the batteries (lithium battery) to forcibly remove it will cause deformation of the terminals.
- Do not touch the battery with wet hands. Water may cause unexpected rust.
- Do not touch or move any components inside the transmitter as it may interfere with proper operation.



2. INSTALL TRANSMITTER BATTERY

(a) Install a new battery (lithium battery) with the positive (+) side up, as shown in the illustration.

NOTICE:

- Be sure that the positive side and the negative side of the transmitter battery are matched-up correctly.
- Be careful not to bend the electrode of the transmitter battery insertion.
- Be careful that dust or oil does not adhere to the transmitter case.

(b) Install the case securely.

WIRELESS DOOR LOCK CONTROL SYSTEM (Except Double Cab)

BE2KO-01

PRECAUTION

NOTICES WHEN CHECKING

(a) Power door LOCK/UNLOCK function:

The wireless remote control function operates only when the following 3 conditions are met.

- (1) No key is inserted into the ignition key cylinder.
- (2) All the doors are closed (Door open indicator off).
- (3) The power door lock system operates normally.

HINT:

The UNLOCK function operates even when any door is open.

(b) Remote panic function:

The wireless remote control function operates only when the following condition is met.

No key is inserted into the ignition key cylinder.

(c) The wireless door lock remote control operational area differs depending on the situation.

- (1) The operational area differs depending on the operators and the ways the transmitter is held.
- (2) In certain areas, the remote control function will only operate partially for the operational area will be reduced due to the vehicle body shape and the influence of the surrounding environment.
- (3) Since the transmitter uses faint electric waves, strong electric waves or noise in the frequency used may reduce the operational area or the remote control may not function.
- (4) When the battery weakens, the operational area is reduced or the remote control may not function.

HINT:

If the door control transmitter has been left in a place that is exposed to direct sunlight, such as on the instrument panel, it may cause the battery to weaken or cause other such problems.

REGISTRATION PROCEDURE

1. REGISTER RECOGNITION CODE

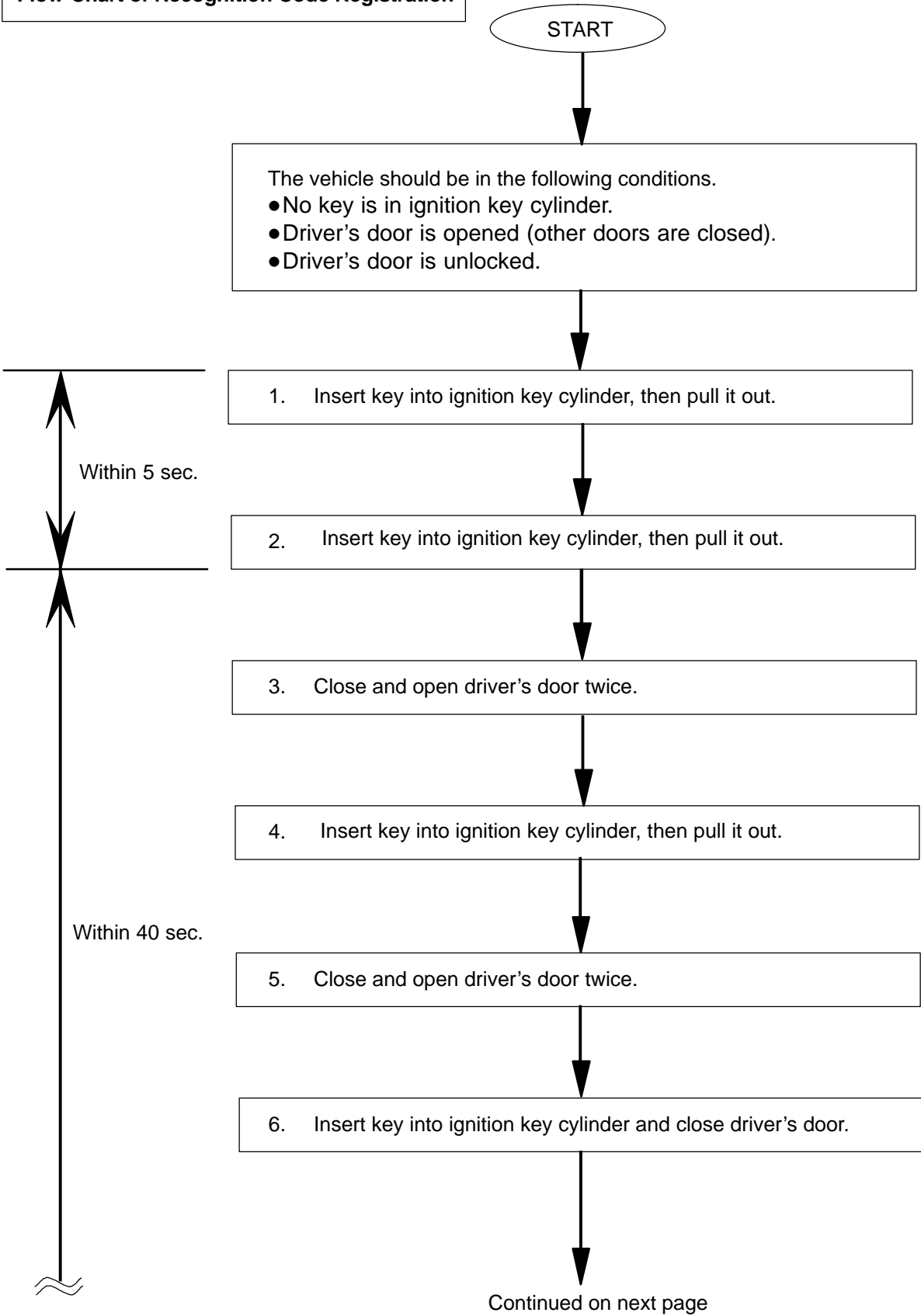
HINT:

- Register the recognition code when replacing the door control transmitter and/or TVIP ECU.
- The add mode is used to retain the registered recognition codes while a new recognition code is additionally registered. This mode is used when a new transmitter is added. If the number of the registered codes exceeds 4, the registered codes will be correspondingly erased in order, starting from the oldest code.
- The rewrite mode is used to erase all the registered recognition codes and register only new recognition codes. This mode is used when the transmitter or the door control receiver is replaced with a for new one.
- The erase mode is used to erase all the registered recognition codes and cancel the wireless door lock function. This mode is used when the transmitter is lost.
- The synchronization mode is used to renew the sequential code (rolling code) of the transmitter and synchronize it with the registered recognition code. This mode is used when the transmitter does not function because they are unsynchronized.*¹ Up to 4 transmitters can be synchronized at one time.
- The setting mode is used to set the optional operation via the transmitter that has the recognition code already registered. Double switch operation*² is available as the option. The setting of up to 4 transmitters can be changed at one time.
- All the following registration procedures must be performed in order continuously.

*¹: If a switch on the transmitter is pressed while out of range of the TVIP ECU, the system will not be able to synchronize the sequential code (rolling code) with the registered recognition code. At this time, the system will automatically synchronize them; however automatic synchronization can be performed only 500 times. Therefore, it is necessary to use this mode after they have synchronized 500 times.

*²: Double switch operation is a operation to unlock the door: when the UNLOCK switch is pressed once, only the driver's door will be unlocked; and when the UNLOCK switch is pressed again within 3 seconds, the other doors will be unlocked.

Flow Chart of Recognition Code Registration



Continued from previous page

Mode Selection:

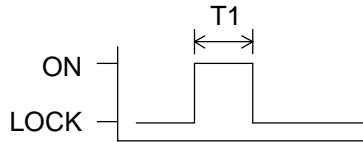
- 7. Turn ignition switch from LOCK to ON and back to LOCK at approximately 1 second interval 1 to 6 times to select a mode.

Number of ON-LOCK operation of ignition switch:

Add Mode

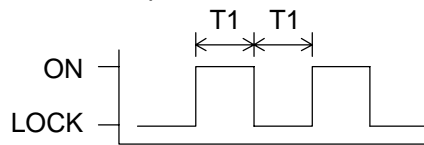
ON-LOCK operation: 1 time

T1: Approx. 1 sec.



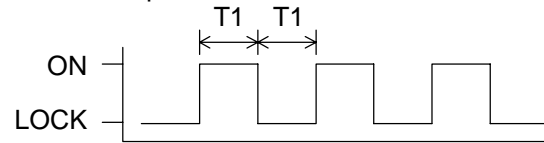
Rewrite Mode

ON-LOCK operation: 2 times



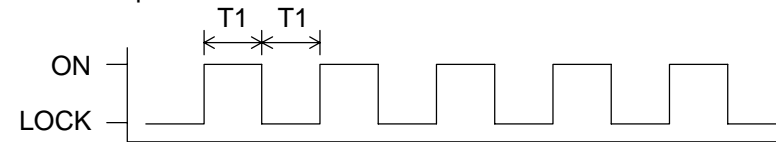
Setting Mode

ON-LOCK operation: 4 times



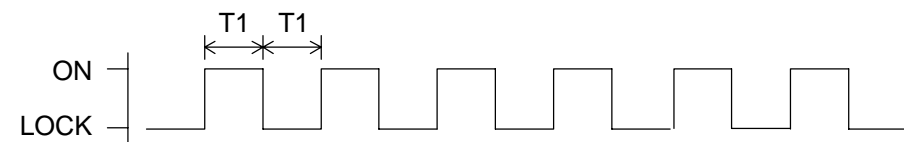
Erase Mode

ON-LOCK operation: 5 times



Synchronization Mode

ON-LOCK operation: 6 times



If the number of ON-LOCK operation of ignition switch is 0, 3 or 7 or more, there will be no response (power door lock and unlock operation) to inform which mode has been selected.

Within 40 sec.

Continued on next page

Continued from previous page

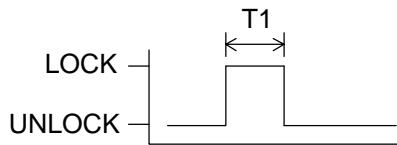
8. Remove key from ignition key cylinder.

Response of selected mode (Power door lock operation):

TVIP ECU automatically performs power door LOCK-UNLOCK operation to inform which mode has been selected. In response to LOCK-UNLOCK operation, taillights blink and TVIP buzzer chirps.

Add Mode

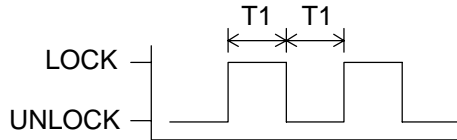
LOCK-UNLOCK operation: 1 time



T1: Approx. 1 sec.

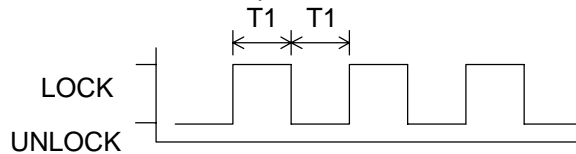
Rewrite Mode

LOCK-UNLOCK operation: 2 times



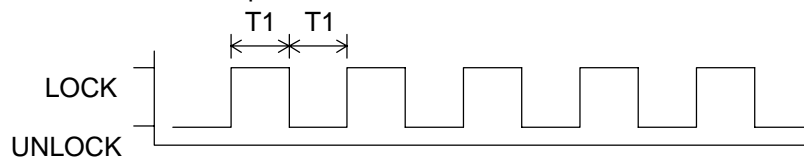
Setting Mode

LOCK-UNLOCK operation: 4 times



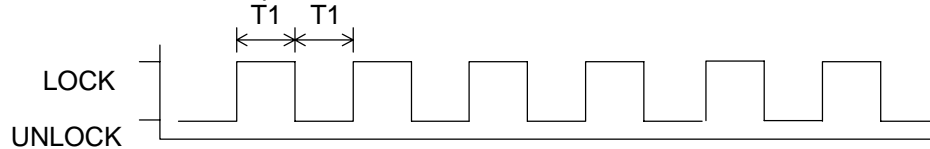
Erase Mode

LOCK-UNLOCK operation: 5 times



Synchronization Mode

LOCK-UNLOCK operation: 6 times



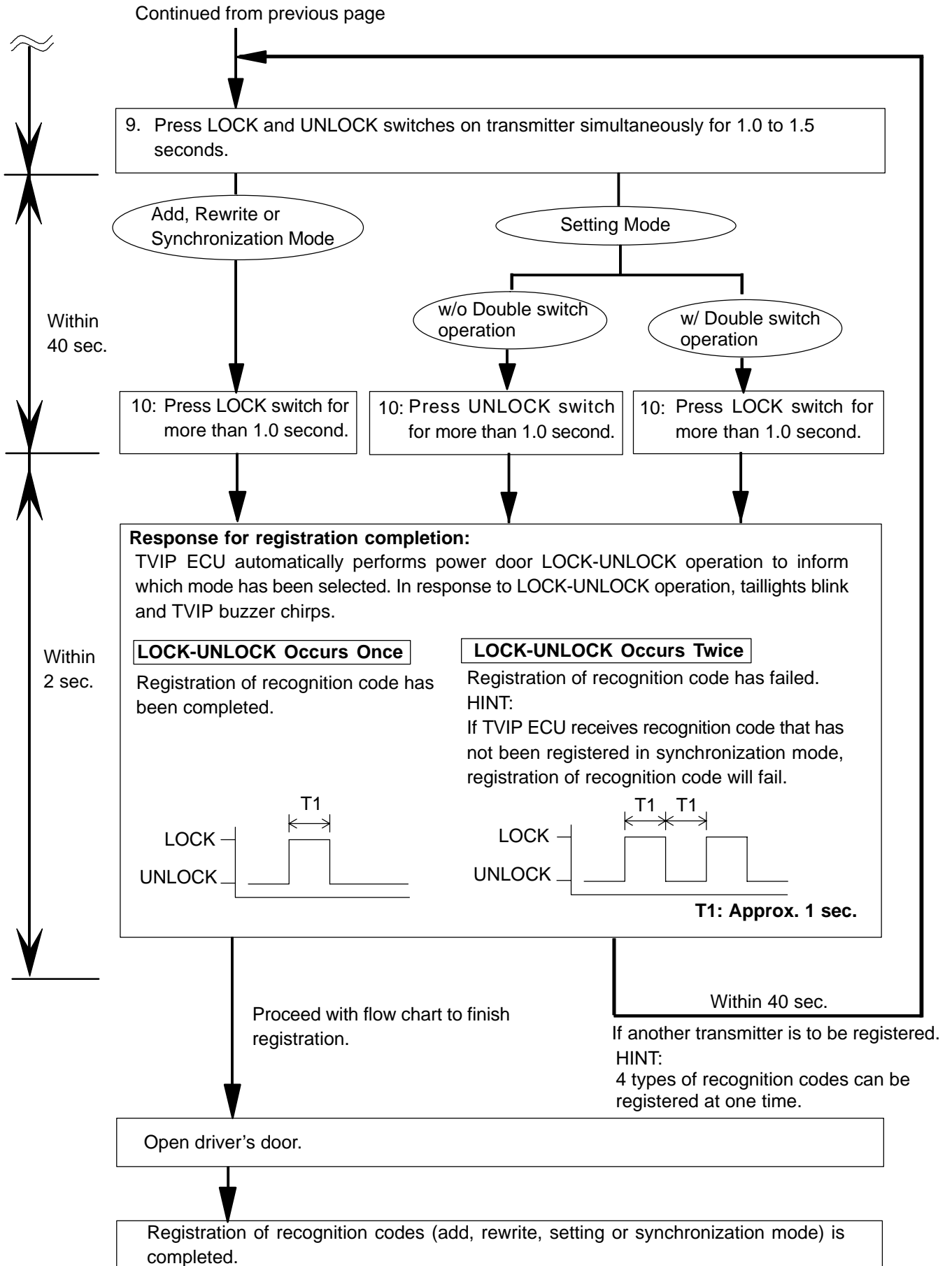
Within 2 sec.

Add, Rewrite, Setting or Synchronization Mode

Erase Mode

Continued on next page

Registration procedure is completed.

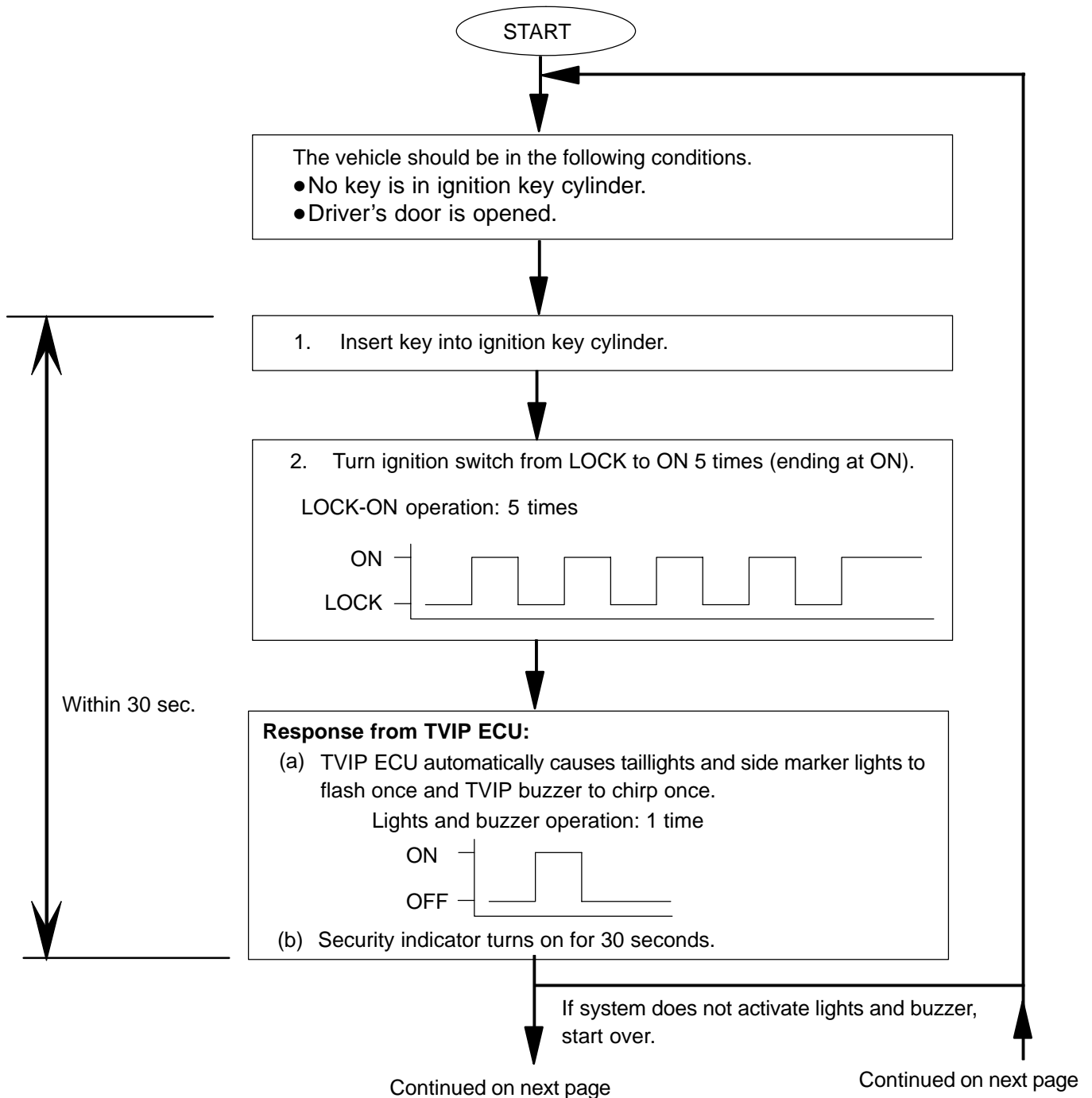


2. PROGRAM IGNITION-CONTROLLED AUTOMATIC DOOR LOCK/UNLOCK FUNCTION

HINT:

- With this function on, when the key is inserted into the ignition key cylinder and turned to the ON or START position, all the doors are automatically locked; and when the key is back to the ACC or LOCK position, all the doors are automatically unlocked.
- This function's initial mode is OFF, however the program for this function can be changed using the following procedures.
- All the following programming procedures must be performed in order continuously.

Flow Chart for Programming Ignition-controlled Automatic Door Lock/Unlock Function



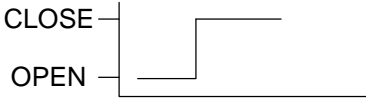
Continued from previous page

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Mode Selection:

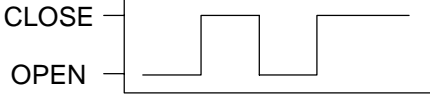
Ignition-controlled door locks ON

3-1. Close driver's door.
OPEN-CLOSE operation: 1 time



Ignition-controlled door locks OFF

3-2. Close, then open and close driver's door again.
OPEN-CLOSE operation: 2 time



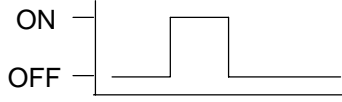
4. Turn ignition key back to LOCK.

Response of selected mode:

TVIP ECU automatically causes taillights and side marker lights to flash once and TVIP buzzer to chirp once.

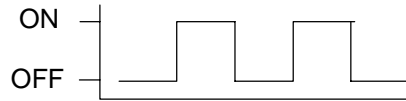
Ignition-controlled door locks ON

Lights and buzzer operation: 1 time



Ignition-controlled door locks OFF

Lights and buzzer operation: 2 time



If system does not activate lights and buzzer, start over.

Programming is completed.

ON-VEHICLE INSPECTION

INSPECT WIRELESS DOOR LOCK CONTROL FUNCTIONS

HINT:

- The switch described in this text is a switch for transmitting signals which is built into the door control transmitter.
 - All the functions listed below must be checked in the remote control operational area.
- (a) Put the vehicle under the conditions that allow the wireless control function to be operated (See PRE-CAUTION on page [BE-169](#)).
 - (b) Check the basic function.
 - (1) Check whether the LED of the transmitter lights up 3 times when each switch is pressed 3 times.

HINT:

- If the LED does not light up when the switch has been pressed 3 times or more, it may be caused by the dead battery.
- If the switch is held down, the LED blinks continuously.
 - (2) Check that all the doors lock when the LOCK switch is pressed.
 - (3) Check that all the doors will be unlocked when the UNLOCK switch is pressed.

HINT:

If the double switch operation is set in the setting mode of a transmitter, the unlock operation is not carried out as specified in step (3) but carried out as follows:

Only the driver's door will be unlocked when the UNLOCK switch is pressed once, and the other door will be unlocked when the UNLOCK switch is pressed again within 3 seconds.

- (c) Check the chattering prevention function.
Check that the corresponding operation occurs only once and is not repeated continuously while the switch is held. However, when the switch is operated repeatedly at 1 second intervals, check that the corresponding operation is carried out.
- (d) Check the automatic lock function.
 - (1) Check that all the doors lock automatically as long as none of them have been opened or all the doors have not been locked within approximately 30 seconds after they are unlocked by pressing the UNLOCK switch.
 - (2) Check that the automatic locking function does not operate when any door has been opened or all of them have been locked within approximately 30 seconds after they are unlocked by pressing the UNLOCK switch.
- (e) Check the switch operation fail-safe function.
Check that the doors can not be locked using the switch while the key is in the ignition key cylinder. However, this does not apply when the system is in the recognition code registration mode.
- (f) Check the operation stop function when a door is open or not completely closed.
Check that the doors are not locked by the switch while any door is open or not completely closed.
- (g) Check the repeat function.
Check that all the doors attempt to automatically lock once again in 2 seconds after the LOCK switch has been pressed while the movement of the driver side door control knob is being restricted while in the unlocked position.
- (h) Check the taillights and parking lights flashing and TVIP buzzer chirps functions (answerback).
 - (1) When the LOCK switch is pressed, check that the lights flash once and buzzer chirps once with the locking of all the doors.
 - (2) When the UNLOCK switch is pressed, check that the lights flash twice and buzzer chirp twice with the unlocking of all the doors.

- (i) Check the illuminated entry function.
 - (1) When all the doors are locked, pressing the UNLOCK switch causes the interior light (when the light switch is in the DOOR position) to illuminate simultaneously with the unlock operation.
 - (2) Check that the interior light fade out in approximately 30 seconds if doors have not been opened.
- (j) Check the remote panic alarm function.

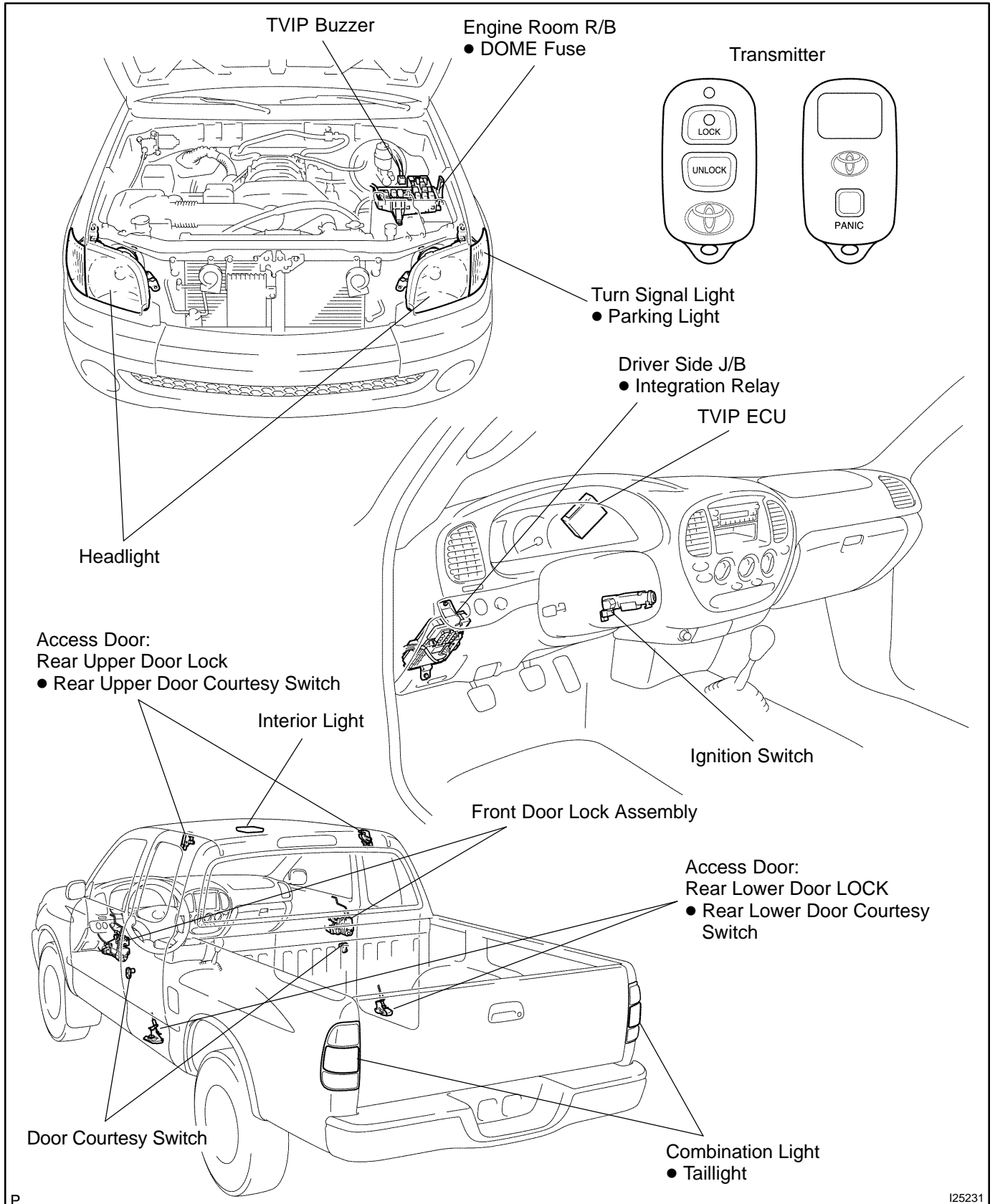
Check that the horn sounds and the headlights and taillights flash for 60 seconds by the TVIP alarm function when the PANIC switch is pressed. Also, check that the horn stops sounding and the lights stop flashing when either switch of the transmitter is pressed or any door is either locked or unlocked using the key.
- (k) Check the ignition-controlled automatic door lock/unlock function.

HINT:

This function's initial mode is OFF, however the program for this function can be changed using the specified method (see page [BE-170](#)).

- (1) Insert the key into the ignition key cylinder and turn the ignition switch to on the ON or START position. Check that all the doors are automatically locked.
- (2) Turn the key back to the ACC or LOCK position, and check that all the doors automatically unlocked.

LOCATION



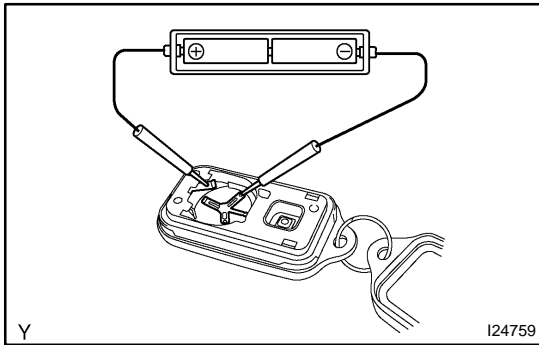
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INSPECTION

INSPECT DOOR LOCK TRANSMITTER OPERATION

- (a) Inspect operation of the transmitter.
- (1) Remove the battery (lithium battery) from the transmitter (see page [BE-182](#)).
 - (2) Install a new or normal battery (lithium battery).



HINT:

When a new or normal battery is not available, connect 2 new 1.5 V batteries in series, connect the battery's positive (+) to the battery receptacle side terminal and battery's negative (-) to the bottom terminal, then apply 3 V of voltage to the transmitter.

- (3) In a location that is approx. 1 m (3.28 ft) away from the driver side outside door handle in the right direction, point the key plate of the transmitter at the vehicle and check operation of the transmitter by pressing the transmission switch on the transmitter body.

Standard:

The door lock can be operated via the remote control.

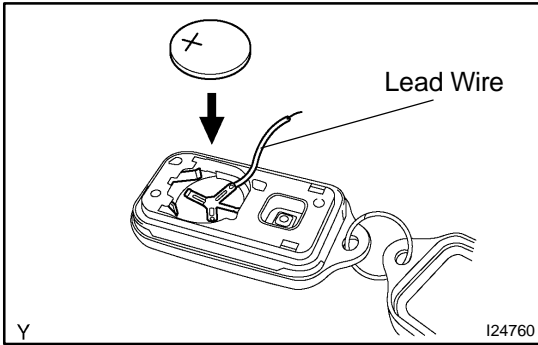
HINT:

- The minimum operational distance differs depending on the operator, the way the transmitter is held and the location.
 - Since the transmitter uses faint electric waves, the operational distance might be shortened if noise or strong electric wave occurs in the area where the frequency is used.
- (4) Install the battery (lithium battery).

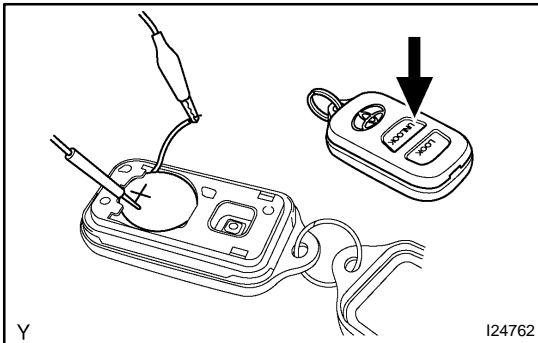
- (b) Inspect the battery capacity.

HINT:

- The capacity of the battery can be determined only when the battery is installed in the transmitter. For a lithium battery used in the transmitter, a voltage of more than 2.5 V is shown on the tester until the energy is completely consumed, while no battery is installed in the transmitter. Therefore, it is necessary to measure the voltage while the battery is installed in the transmitter (a resistance of 1.2 k Ω is applied to the battery) when checking the amount of energy left in the battery.
- If the transmitter is faulty, the amount of energy left in the battery might not be checked correctly.
 - (1) Remove the battery (lithium battery) from the transmitter (see page [BE-182](#)).



- (2) Connect the lead wire to the negative (-) terminal of the transmitter and install the battery.



- (3) Connect the tester positive (+) probe to the positive (+) battery (lithium battery) and the tester negative (-) probe to the lead respectively.
- (4) Press one of the transmission switches on the transmitter for approx. 1 second.
- (5) Press the transmission switch on the transmitter again to check the voltage.

Standard: 2.2 V or higher

HINT:

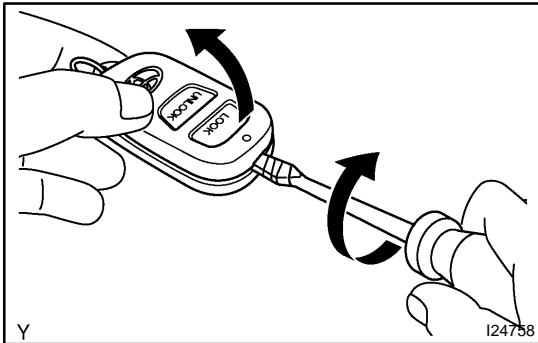
- When the temperature of the battery is low, the inspection cannot be made correctly. When the outcome of the test is less than 2.2 V, conduct the test again after leaving the battery in a place with a temperature of 18°C (64°F) for more than 30 minutes.
 - The automatic power-off function causes the voltage of the battery to be 2.5 V or more (a voltage with no resistance applied to the battery) when 0.8 seconds have passed after the switch is pressed. Therefore, make sure to read the voltage just after the switch is pressed.
 - Because high voltage might be shown once or twice after the battery returns to the specified temperature, the inspection should be made with the voltage shown after the switch is pressed at least 3 times.
- (6) Disconnect the lead.
 - (7) Set the battery (lithium battery) in the transmitter.

REPLACEMENT

1. REMOVE TRANSMITTER BATTERY

NOTICE:

Special caution should be taken for handling each component as they are precision electronic components.



(a) Using a screwdriver, open the transmitter case.

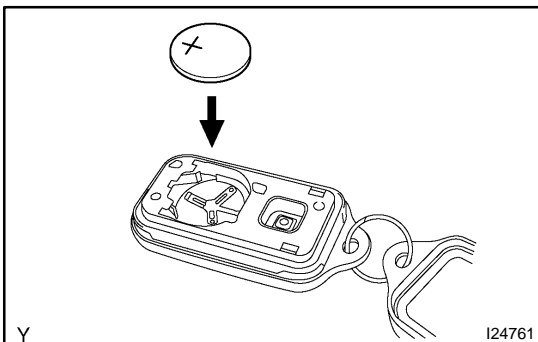
NOTICE:

Do not forcibly pry out the cover.

(b) Remove the battery (lithium battery).

NOTICE:

- Do not push the terminals with your finger.
- Prying up the batteries (lithium battery) to forcibly remove it will cause deformation of the terminals.
- Do not touch the battery with wet hands. Water may cause unexpected rust.
- Do not touch or move any components inside the transmitter as it may interfere with proper operation.



2. INSTALL TRANSMITTER BATTERY

(a) Install a new battery (lithium battery) with the positive (+) side up, as shown in the illustration.

NOTICE:

- Be sure that the positive side and the negative side of the transmitter battery are matched-up correctly.
- Be careful not to bend the electrode of the transmitter battery insertion.
- Be careful that dust or oil does not adhere to the transmitter case.

(b) Check that the rubber cover is not distorted or slipped off, and install the cover.

NOTICE:

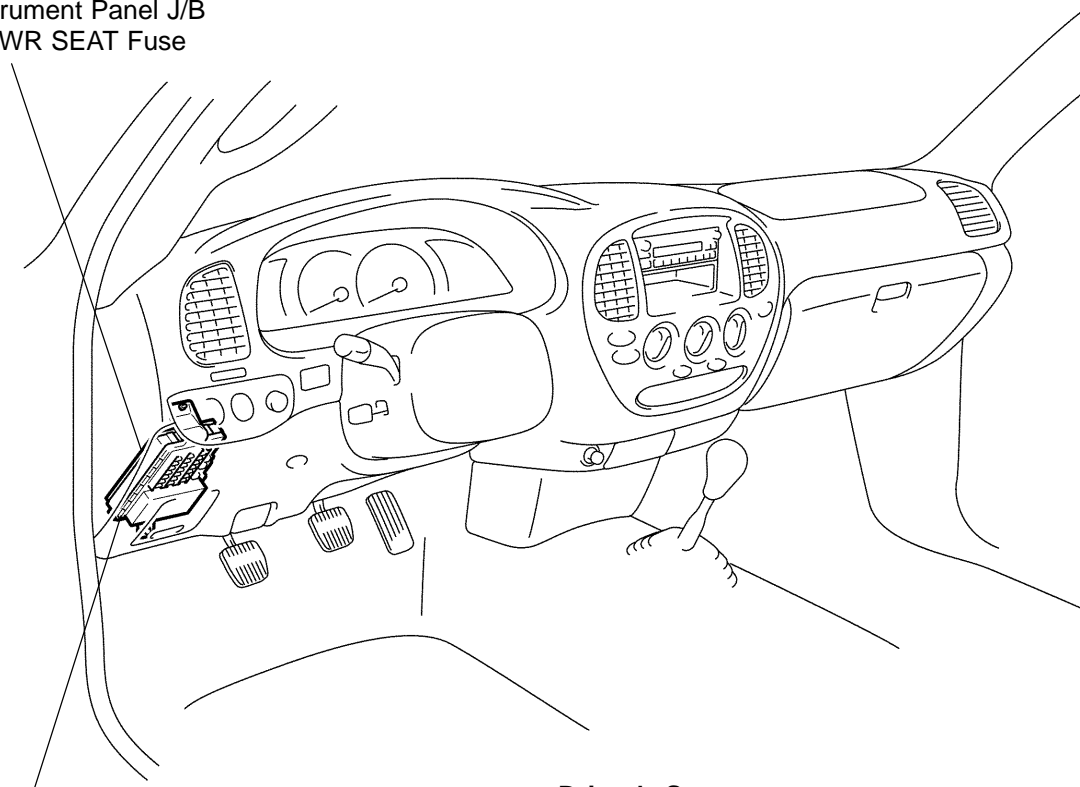
Any damage might cause faulty contact of battery (lithium battery) and terminals.

POWER SEAT CONTROL SYSTEM

BE17F-07

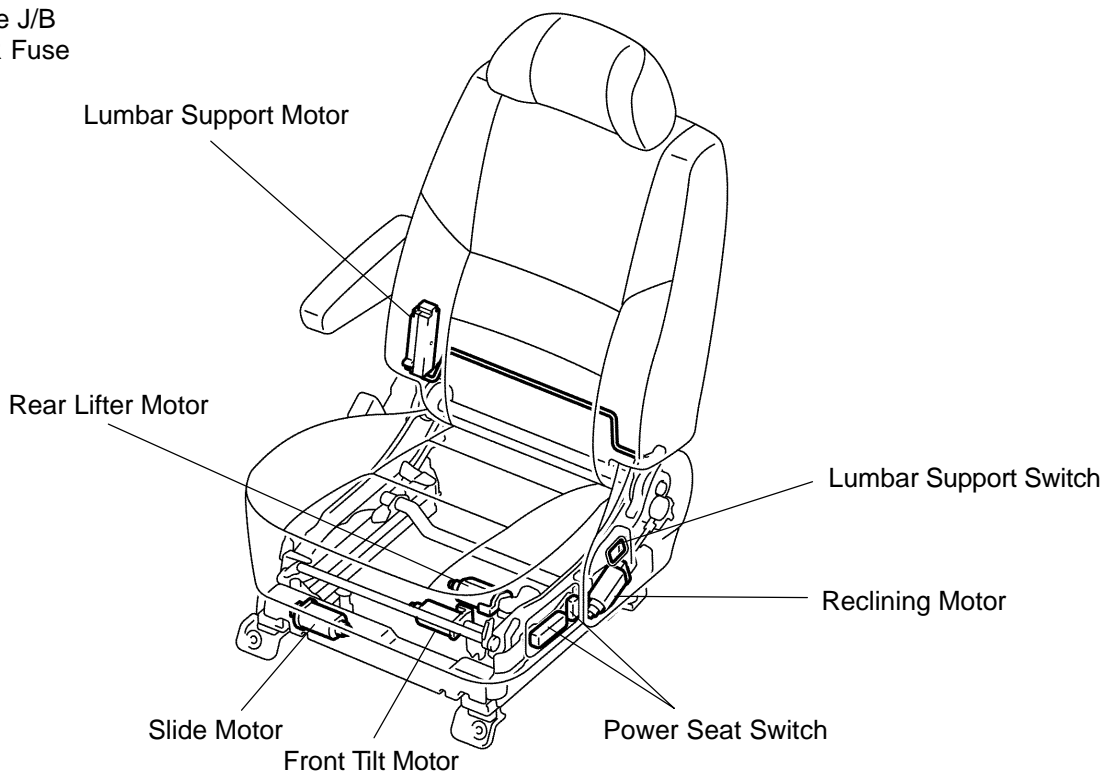
LOCATION

Double Cab:
Instrument Panel J/B
● PWR SEAT Fuse



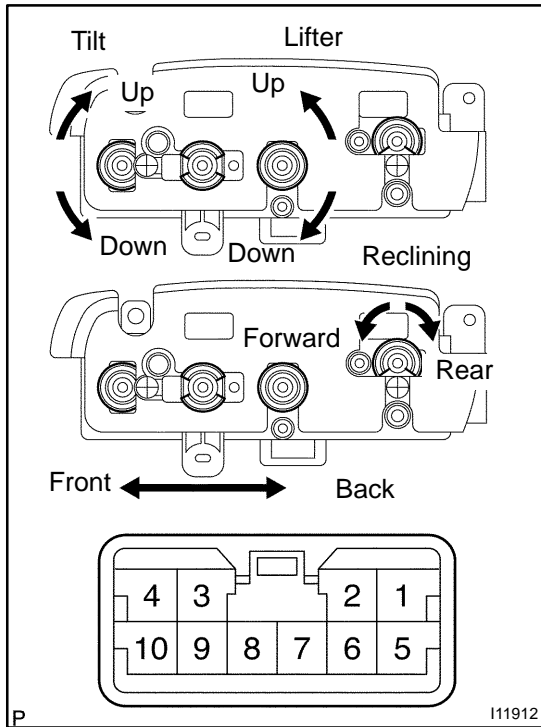
Except Double Cab:
Driver Side J/B
● POWER Fuse

Driver's Seat



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INSPECTION

1. INSPECT POWER SEAT SWITCH CONTINUITY

Slide switch:

Switch Position	Tester Connection	Specified Condition
FRONT	1 - 9, 4 - 6	Continuity
OFF	4 - 6 - 9	Continuity
BACK	1 - 6, 4 - 9	Continuity

Front tilt switch:

Switch Position	Tester Connection	Specified Condition
UP	1 - 10, 4 - 5	Continuity
OFF	4 - 5 - 10	Continuity
DOWN	1 - 5, 4 - 10	Continuity

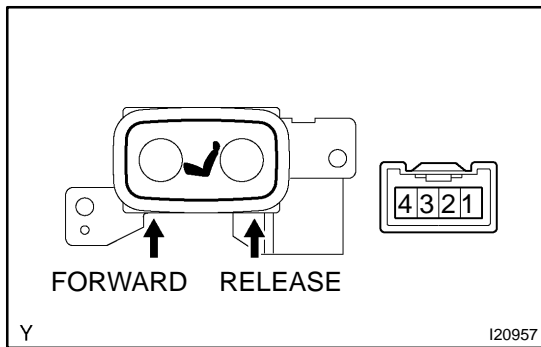
Rear lifter switch:

Switch Position	Tester Connection	Specified Condition
UP	1 - 7, 4 - 8	Continuity
OFF	4 - 7 - 8	Continuity
DOWN	1 - 8, 4 - 7	Continuity

Reclining switch:

Switch Position	Tester Connection	Specified Condition
FORWARD	1 - 3, 2 - 4	Continuity
OFF	2 - 3 - 4	Continuity
REAR	1 - 2, 3 - 4	Continuity

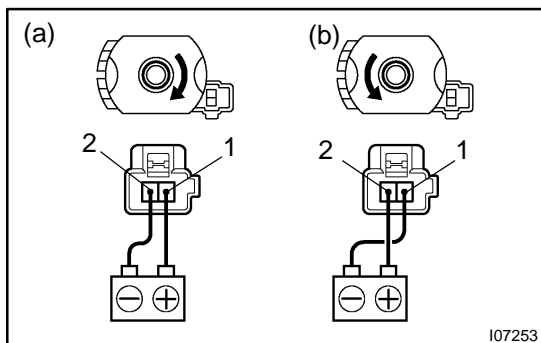
If the continuity is not as specified, replace the switch.



2. INSPECT LUMBAR SUPPORT SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
FORWARD	1 - 4, 2 - 3	Continuity
OFF	1 - 2 - 3	Continuity
RELEASE	1 - 3, 2 - 4	Continuity

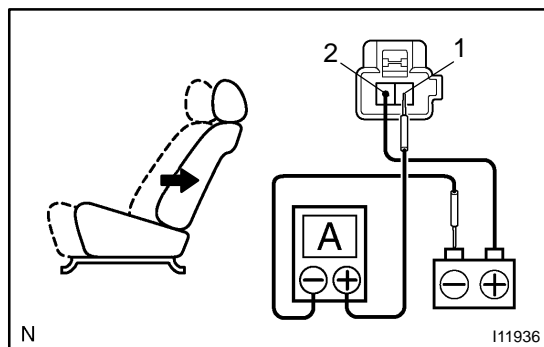
If the continuity is not as specified, replace the switch.



3. INSPECT SLIDE MOTOR OPERATION

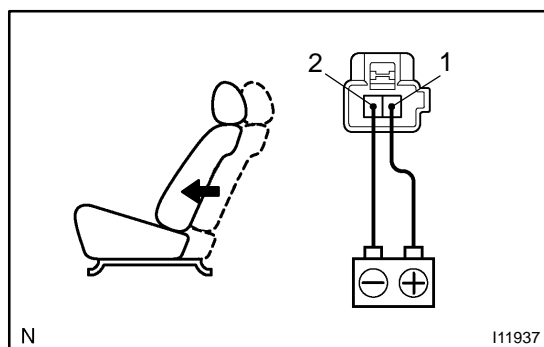
- Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2. Check that the motor turns clockwise.
- Reverse the polarity, and check that the motor turns counterclockwise.

If operation is not as specified, replace the seat adjuster.



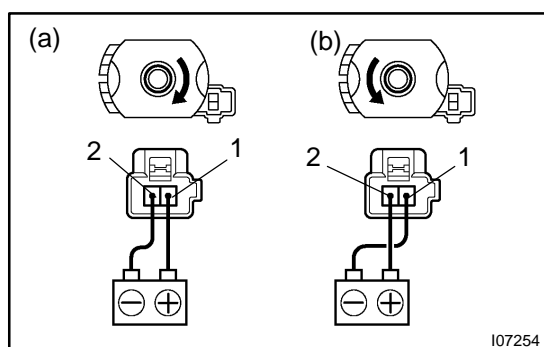
4. INSPECT SLIDE MOTOR PTC THERMISTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 2, the positive (+) lead from the ammeter to terminal 1 and the negative (-) lead to the battery negative (-) terminal. Then move the seat cushion to the rear position.
- (b) Continue to apply voltage, and check that current changes to less than 1 A within 4 to 90 seconds.



- (c) Disconnect the leads from the terminals.
- (d) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2. Check that the seat cushion begins to move forward.

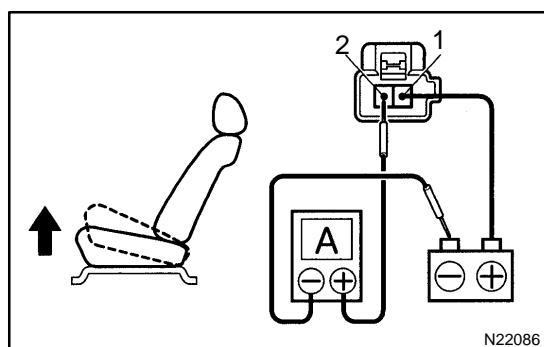
If operation is not as specified, replace the seat adjuster.



5. INSPECT FRONT TILT MOTOR OPERATION

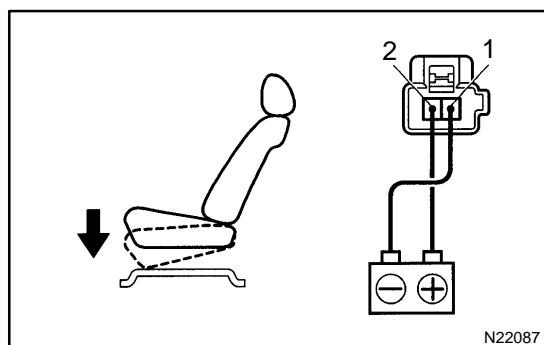
- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2. Check that the motor turns clockwise.
- (b) Reverse the polarity, and check that the motor turns counterclockwise.

If operation is not as specified, replace the seat adjuster.



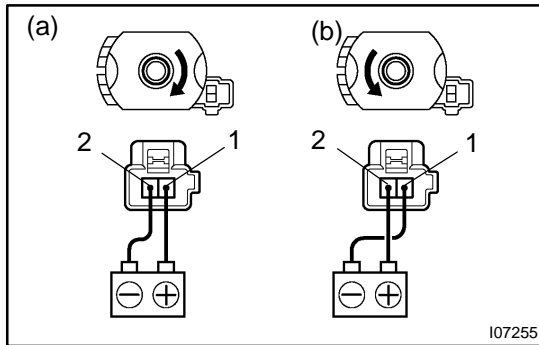
6. INSPECT FRONT TILT MOTOR PTC THERMISTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 1, the positive (+) lead from the ammeter to terminal 2 and the negative (-) lead to the battery negative (-) terminal. Then move the seat cushion to the highest position.
- (b) Continue to apply voltage, and check that the current changes to less than 1 A within 4 to 90 seconds.



- (c) Disconnect the leads from the terminals.
- (d) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1. Check that the seat cushion begins to descend.

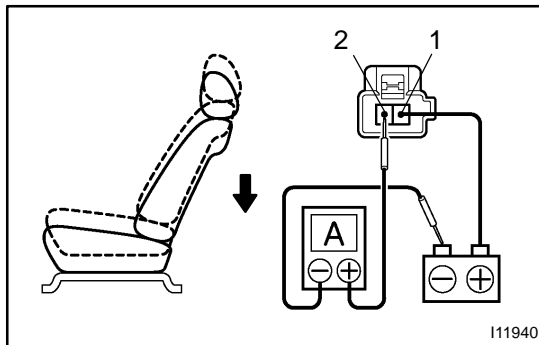
If operation is not as specified, replace the seat adjuster.



7. INSPECT LIFTER MOTOR OPERATION

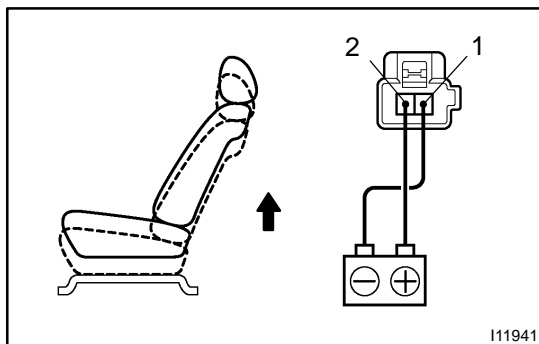
- Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2. Check that the motor turns clockwise.
- Reverse the polarity, and check that the motor turns counterclockwise.

If operation is not as specified, replace the seat adjuster.



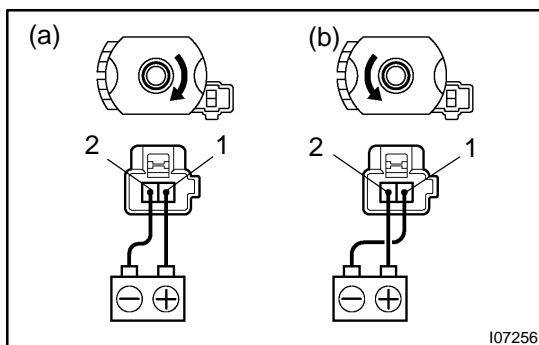
8. INSPECT LIFTER MOTOR PTC THERMISTOR OPERATION

- Connect the positive (+) lead from the battery to terminal 1, the positive (+) lead from the ammeter to terminal 2 and the negative (-) lead to the battery negative (-) terminal. Then move the seat cushion to the lowest position.
- Continue to apply voltage, and check that the current changes to less than 1 A within 4 to 90 seconds.



- Disconnect the leads from the terminals.
- Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1. Check that the seat cushion begins to ascend.

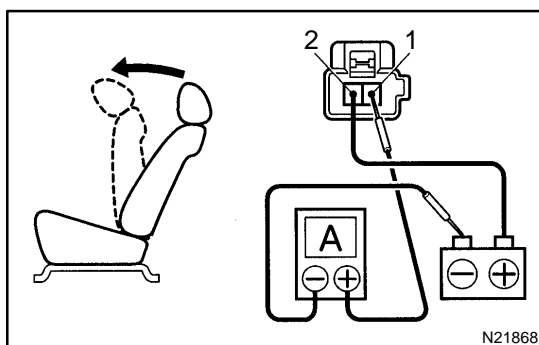
If operation is not as specified, replace the seat adjuster.



9. INSPECT RECLINING MOTOR OPERATION

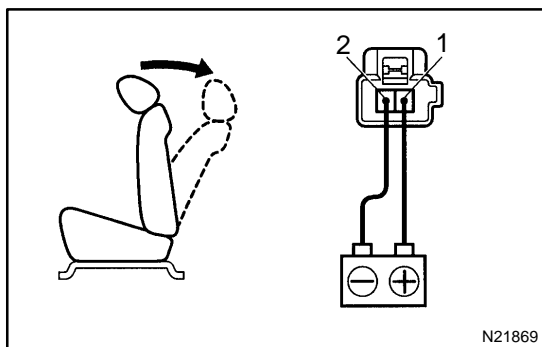
- Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2. Check that the motor turns clockwise.
- Reverse the polarity, and check that the motor turns counterclockwise.

If operation is not as specified, replace the seat adjuster.



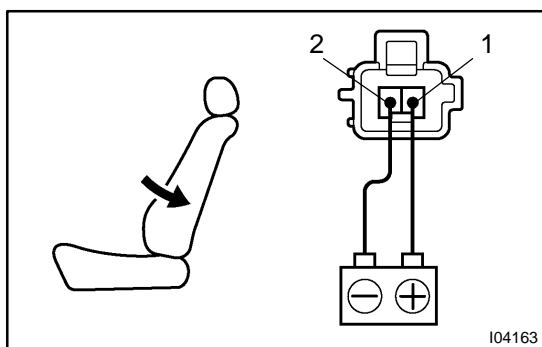
10. INSPECT RECLINING MOTOR PTC THERMISTOR OPERATION

- Connect the positive (+) lead from the battery to terminal 2, the positive (+) lead from the ammeter to terminal 1 and the negative (-) lead to the battery negative (-) terminal. Then recline the seatback to the most forward position.
- Continue to apply voltage, and check that the current changes to less than 1 A within 4 to 90 seconds.



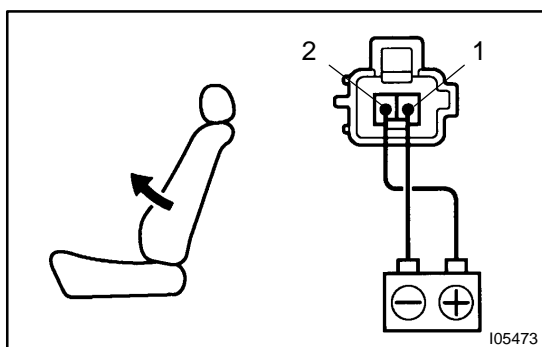
- (c) Disconnect the leads from the terminals.
- (d) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2. Check that the seatback begins to fall backward.

If operation is not as specified, replace the seat adjuster.



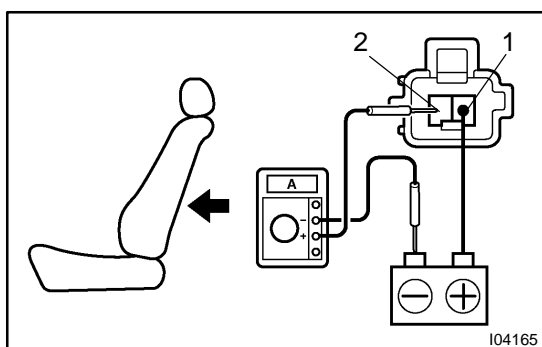
11. INSPECT LUMBAR SUPPORT MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2. Check that the lumbar support moves to the release side.



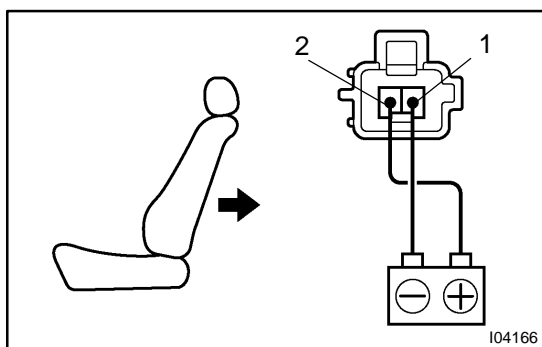
- (b) Reverse the polarity, and check that the lumbar support moves forward.

If operation is not as specified, replace the lumbar support adjuster.



12. INSPECT LUMBAR SUPPORT MOTOR CIRCUIT BREAKER OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1 on the lumbar support motor connector. Move the lumbar support to the front end position.

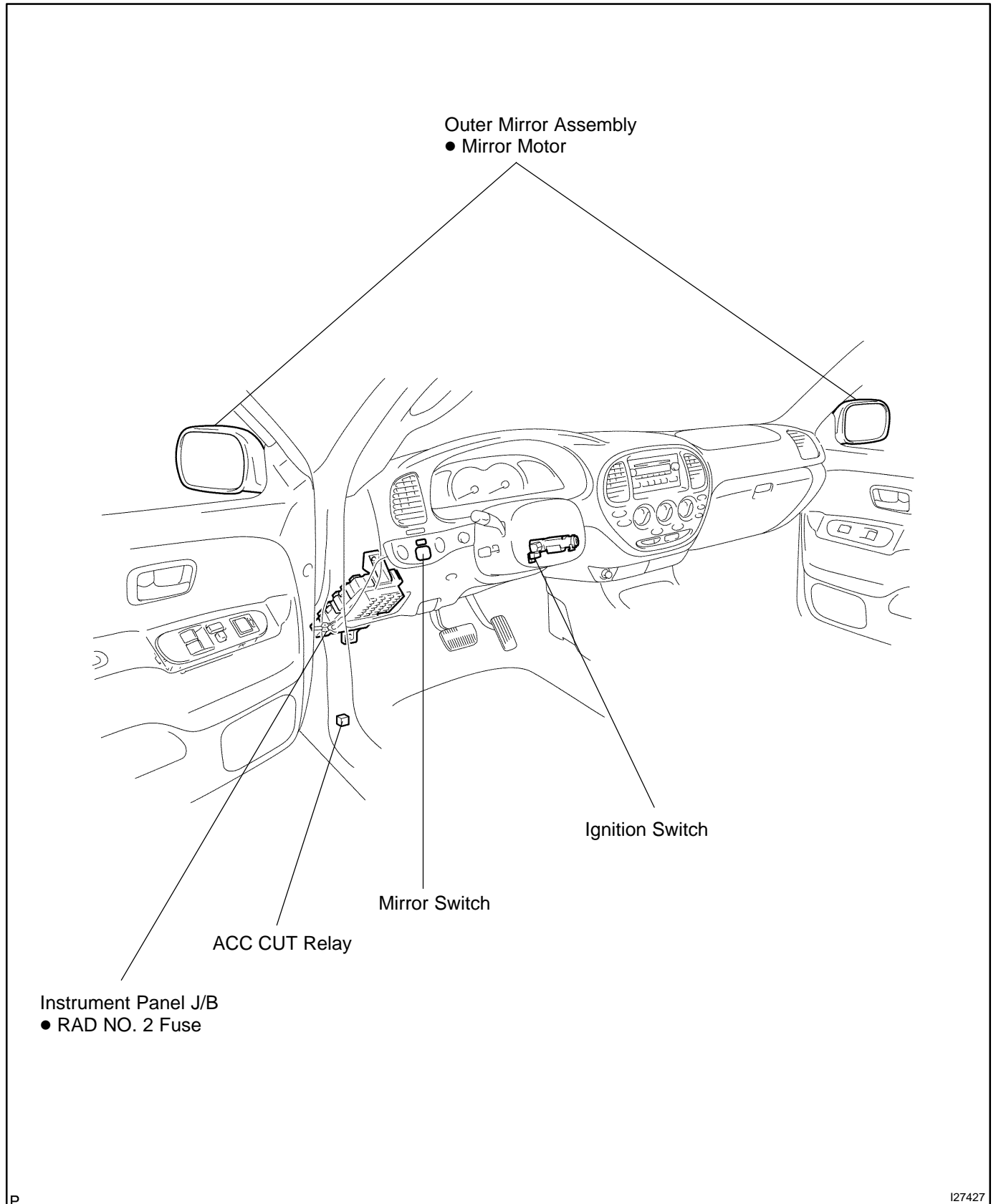


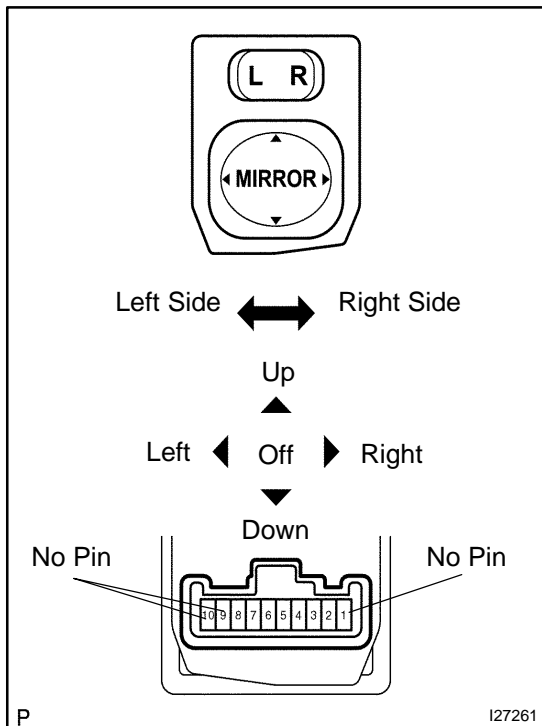
- (b) Continue to apply voltage, and check that a circuit breaker operation noise can be heard within 4 to 60 seconds.
- (c) Reverse the polarity, and check that the lumbar support begins to move to the release side within approximately 60 seconds.

If operation is not as specified, replace the lumbar support adjuster.

POWER MIRROR CONTROL SYSTEM (Double Cab) LOCATION

BE2KN-01





INSPECTION

1. Left side: INSPECT MIRROR SWITCH CONTINUITY

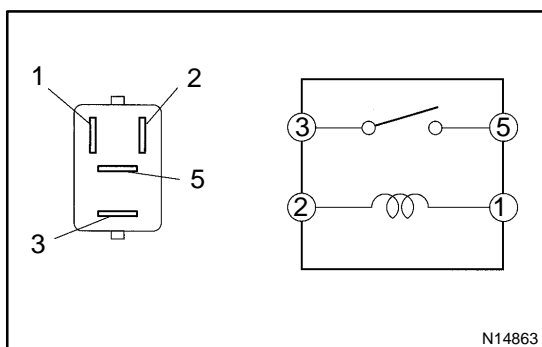
Switch Position	Tester Connection	Specified Condition
UP	4 - 8, 6 - 7	Continuity
DOWN	4 - 7, 6 - 8	Continuity
LEFT	5 - 8, 6 - 7	Continuity
RIGHT	5 - 7, 6 - 8	Continuity

If the continuity is not as specified, replace the switch.

2. Right side: INSPECT MIRROR SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
UP	3 - 8, 6 - 7	Continuity
DOWN	3 - 7, 6 - 8	Continuity
LEFT	5 - 8, 6 - 7	Continuity
RIGHT	5 - 7, 6 - 8	Continuity

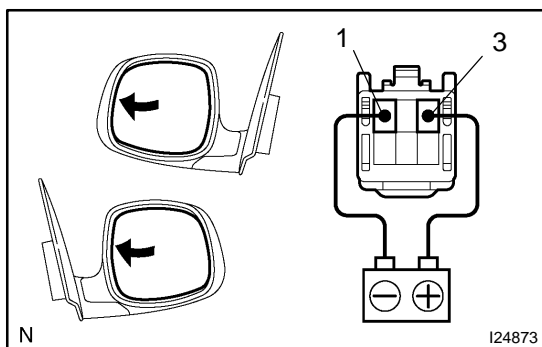
If the continuity is not as specified, replace the switch.



3. INSPECT ACC CUT RELAY CONTINUITY

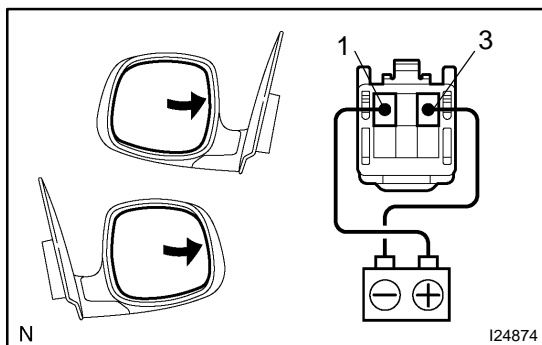
Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.

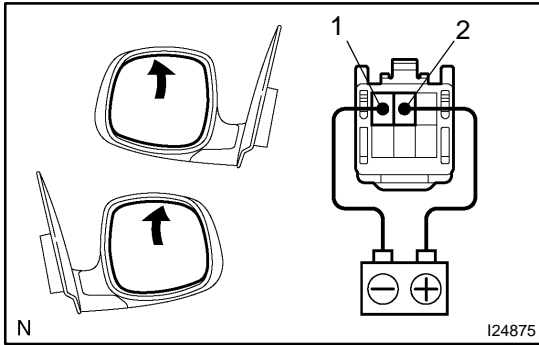


4. INSPECT MIRROR MOTOR OPERATION

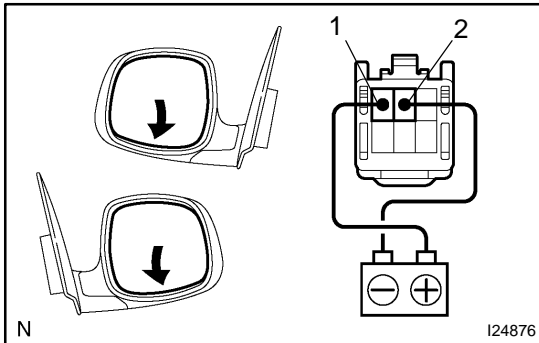
(a) Connect the positive (+) lead from the battery to terminal 3 and negative (-) lead to terminal 1. Check that the mirror turns leftward.



(b) Reverse the polarity, check that the mirror turns rightward.



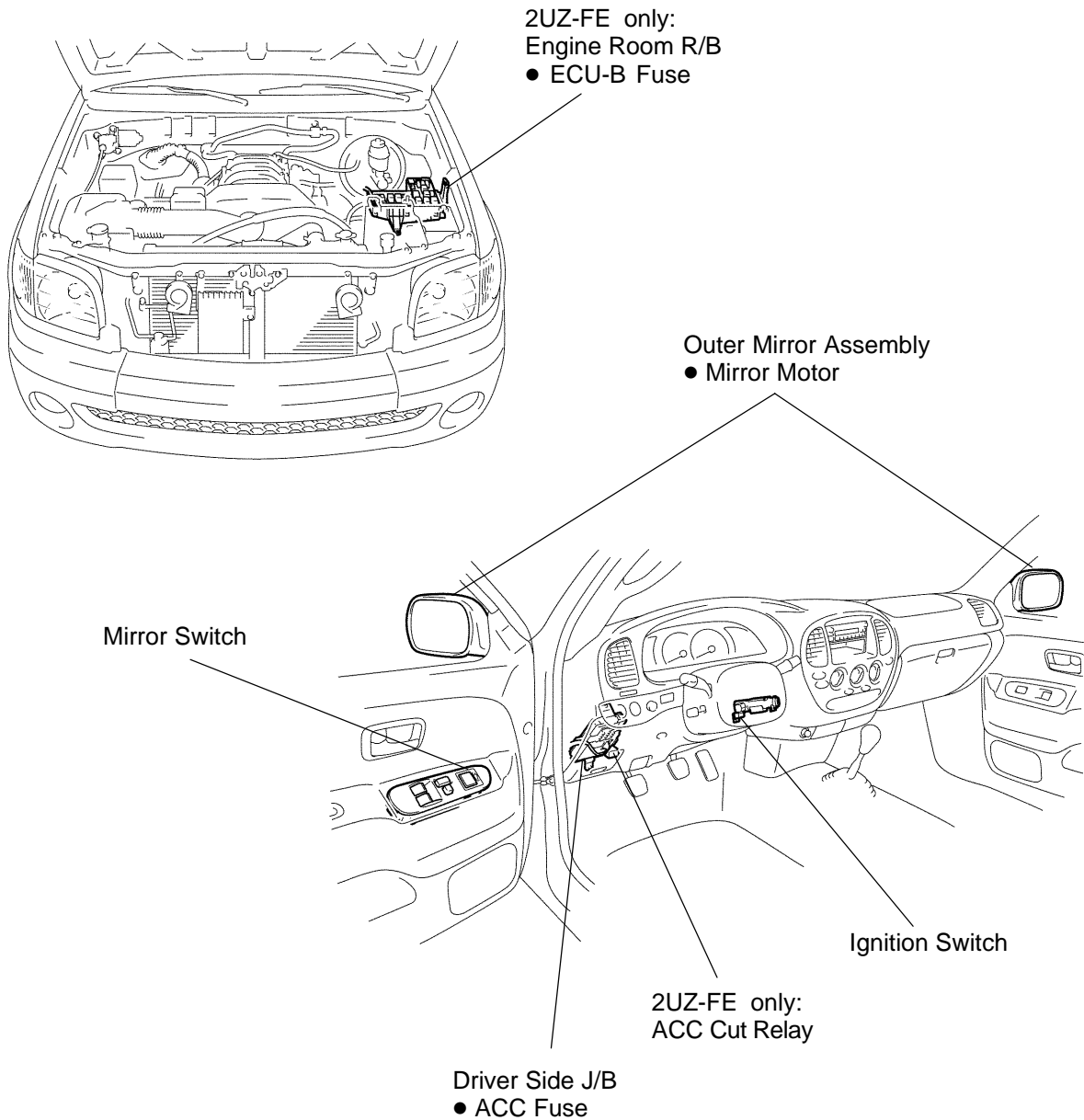
- (c) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1. Check that the mirror turns upward.



- (d) Reverse the polarity, check that the mirror turns downward.
If operation is not as specified, replace the mirror assembly.

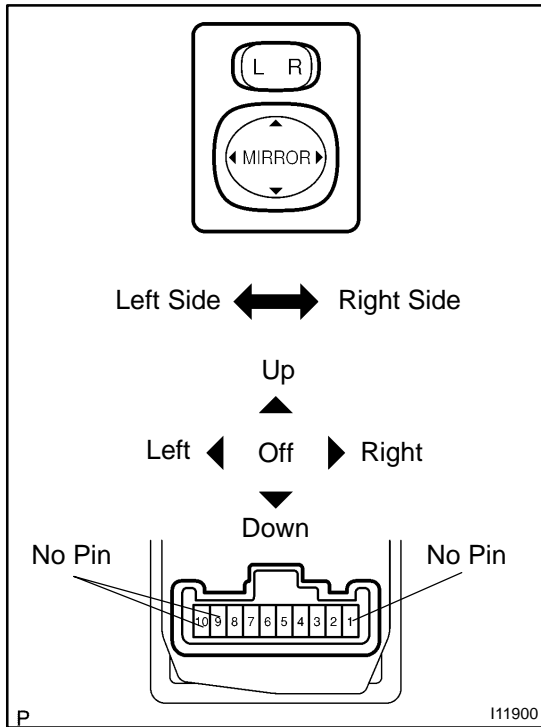
POWER MIRROR CONTROL SYSTEM (Except Double Cab) LOCATION

BE2KL-01



I27069

I27249



INSPECTION

1. Left side: INSPECT MIRROR SWITCH CONTINUITY

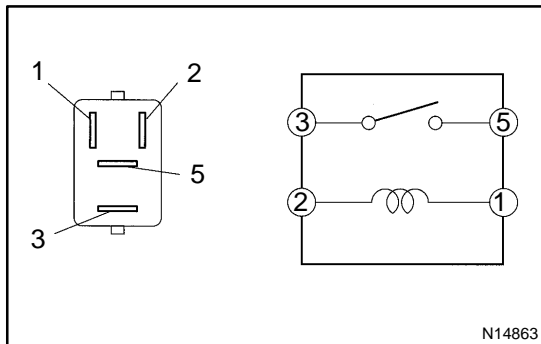
Switch Position	Tester Connection	Specified Condition
UP	4 - 8, 6 - 7	Continuity
DOWN	4 - 7, 6 - 8	Continuity
LEFT	5 - 8, 6 - 7	Continuity
RIGHT	5 - 7, 6 - 8	Continuity

If the continuity is not as specified, replace the switch.

2. Right side: INSPECT MIRROR SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
UP	3 - 8, 6 - 7	Continuity
DOWN	3 - 7, 6 - 8	Continuity
LEFT	5 - 8, 6 - 7	Continuity
RIGHT	5 - 7, 6 - 8	Continuity

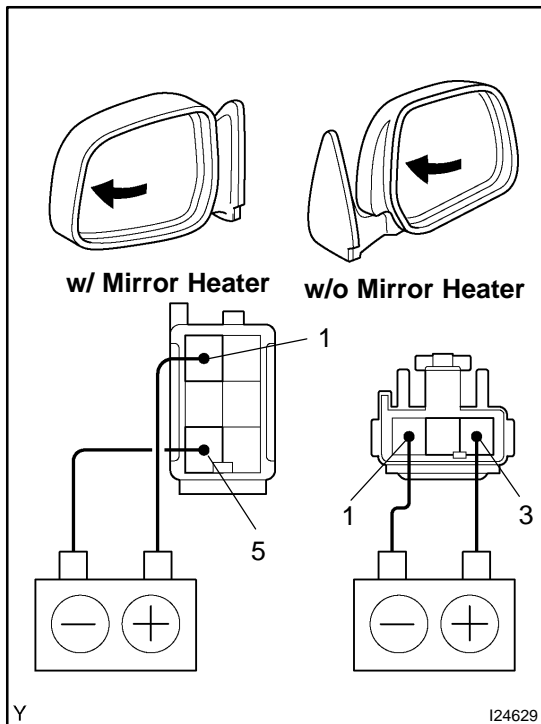
If the continuity is not as specified, replace the switch.



3. 2UZ-FE: INSPECT ACC CUT RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

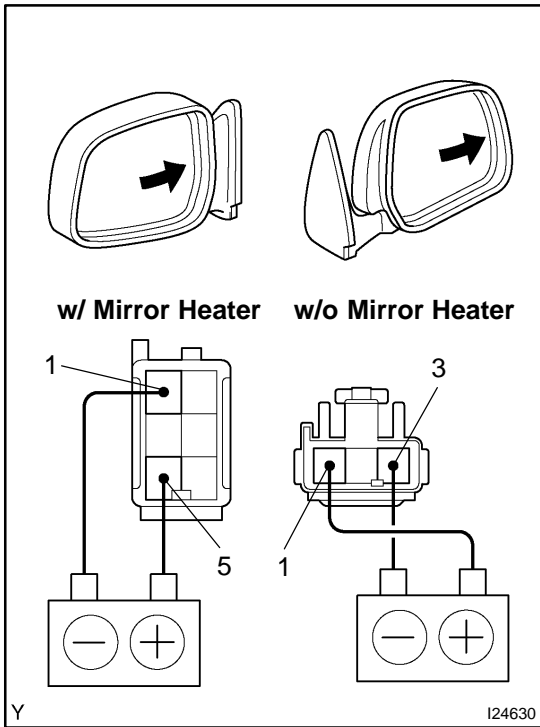
If the continuity is not as specified, replace the relay.



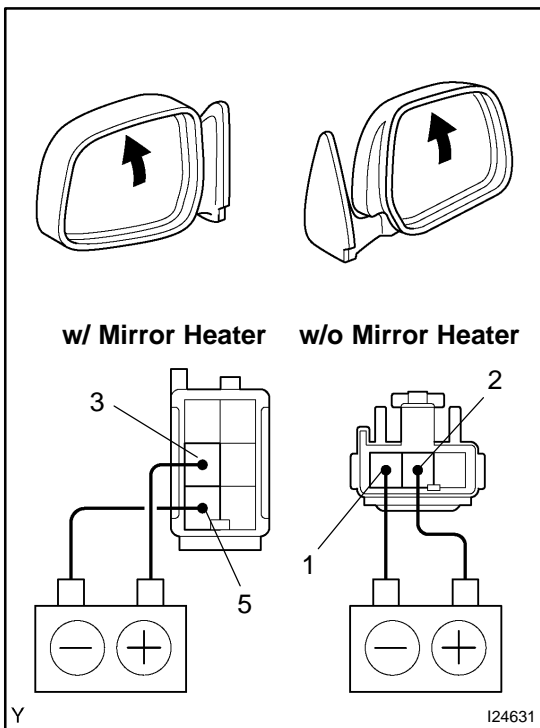
4. INSPECT MIRROR MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 1 (3) and the negative (-) lead to terminal 5 (1). Check that the mirror turns to the left.

(): w/o Mirror heater.

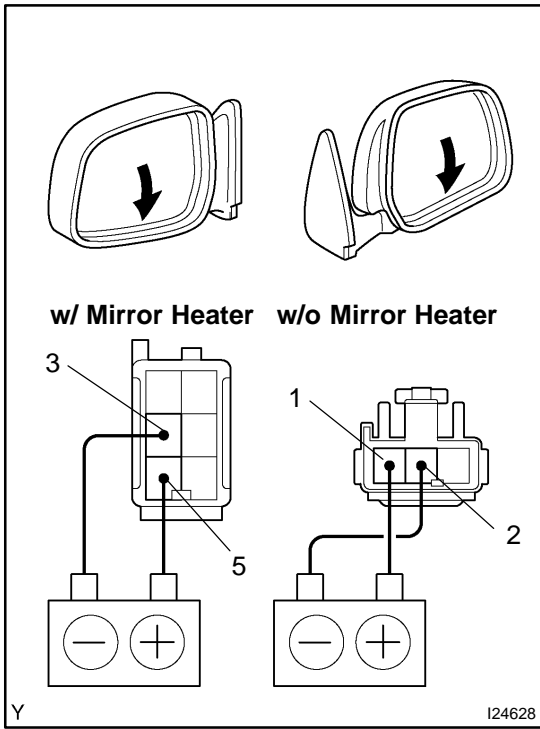


(b) Reverse the polarity, check that the mirror turns to the right.



(c) Connect the positive (+) lead from the battery to terminal 3 (2) and the negative (-) lead to terminal 5 (1). Check that the mirror turns upward.

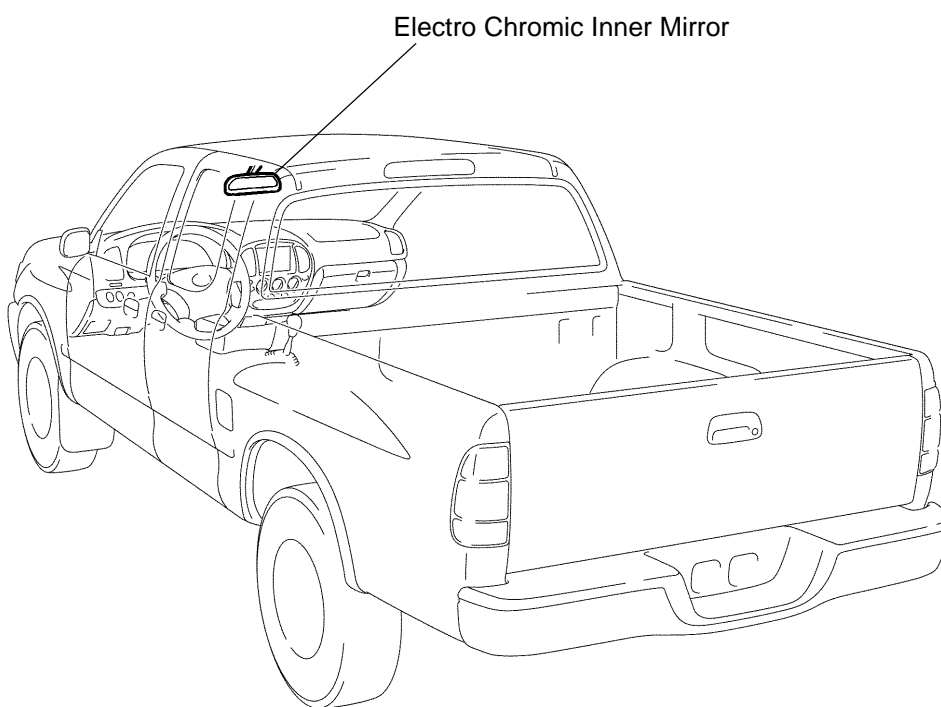
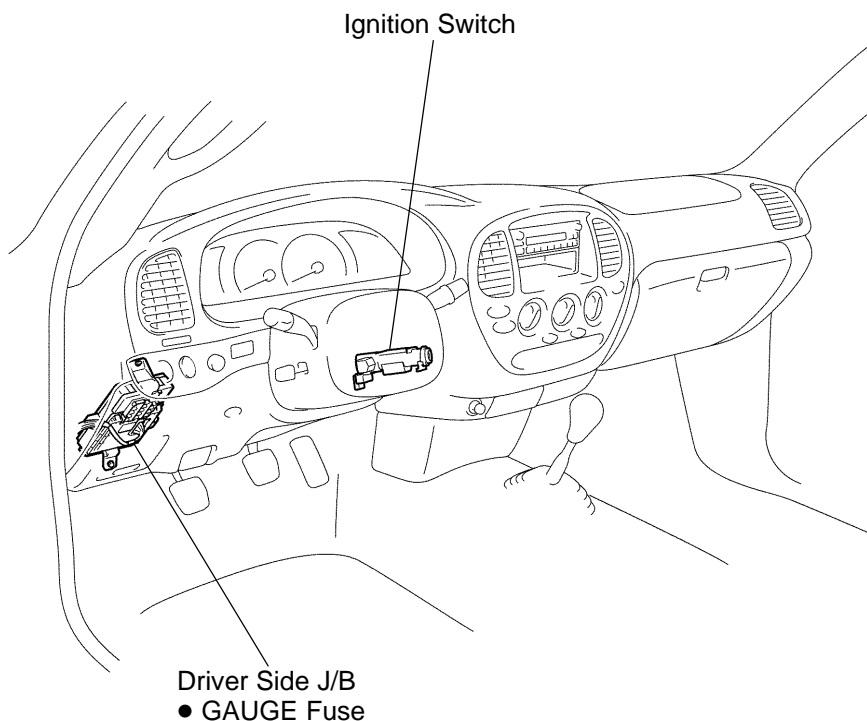
(): w/o Mirror heater.

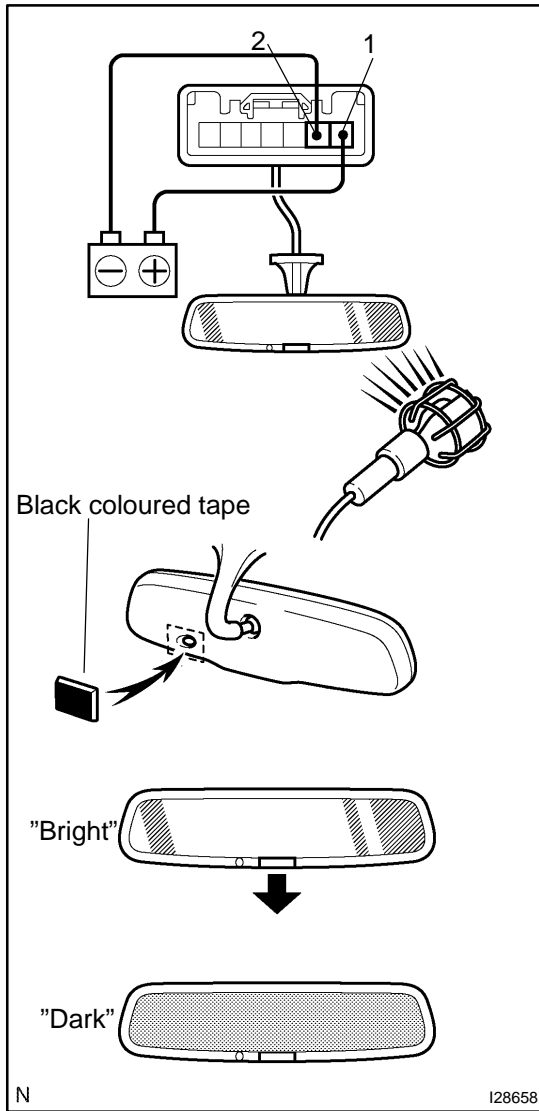


(d) Reverse the polarity, and check that the mirror turns downward.
If operation is not as specified, replace the mirror assembly.

ELECTRO CHROMIC MIRROR SYSTEM LOCATION

BE2MG-01



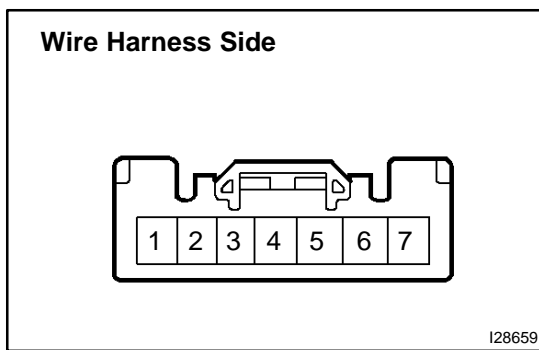


INSPECTION

1. INSPECT ELECTRO CHROMIC INNER MIRROR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2.
- (b) Attach a black coloured tape to forward sensor to prevent it from sensing.
- (c) When the mode is turned to AUTO, check that indicator light lights up.
- (d) Shine an electric light on the mirror. Check that the mirror surface changes from bright to dark.

If operation is not as specified, replace the inner mirror.



2. INSPECT ELECTRO CHROMIC INNER MIRROR CIRCUIT

Disconnect the connector from the mirror and inspect the connector on the wire harness side, as shown.

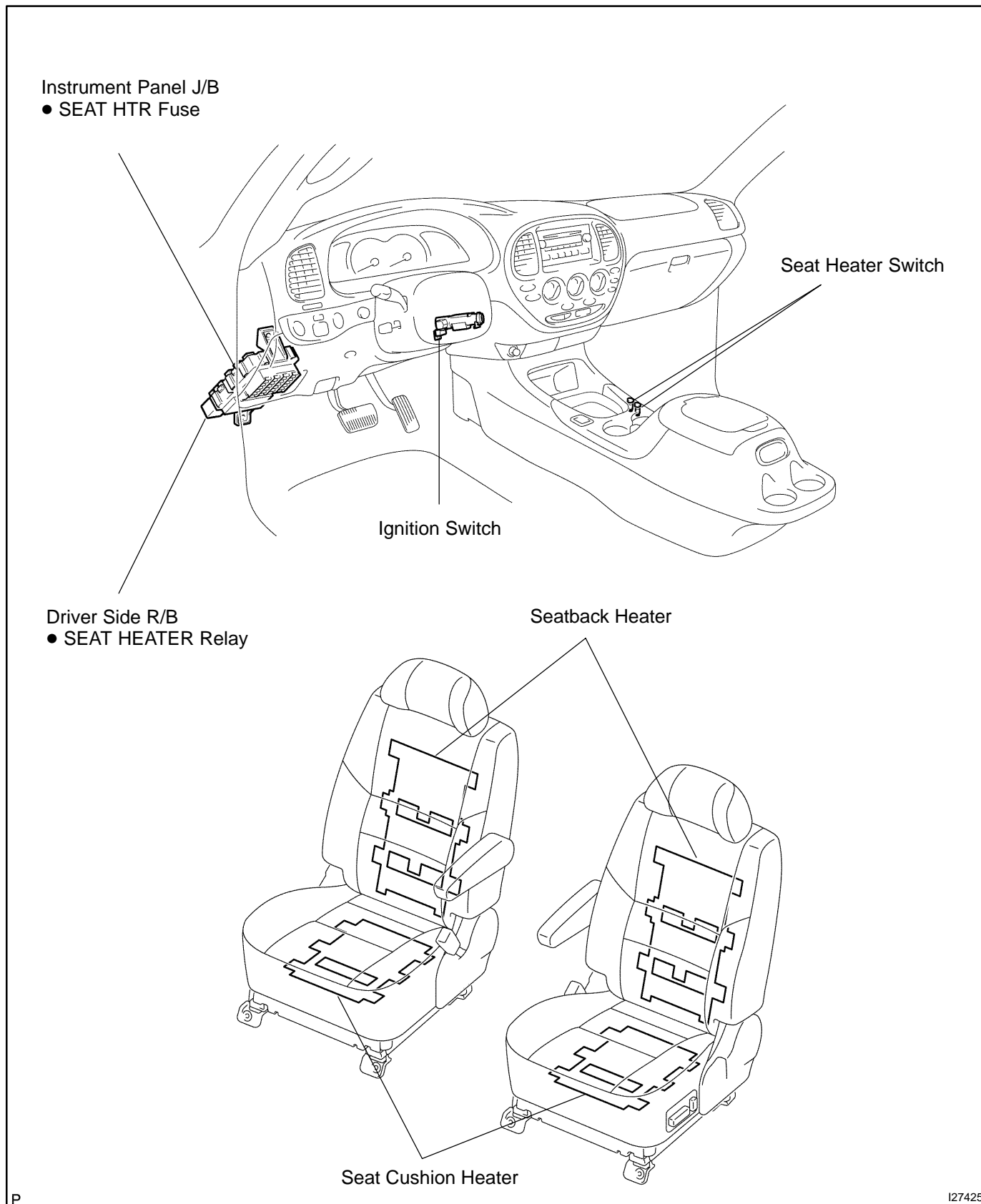
Tester connection	Condition	Specified condition
1 - Ground	Ignition switch LOCK or ACC	No voltage
1 - Ground	Ignition switch ON	Battery positive voltage
2 - Ground	Constant	Continuity

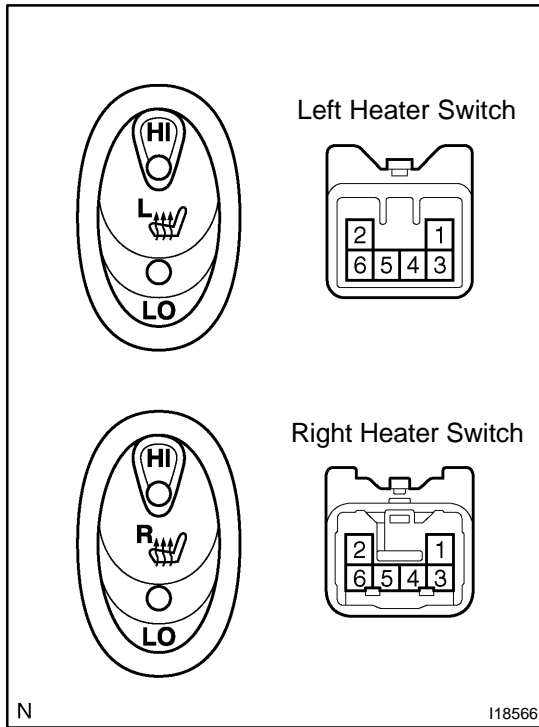
If circuit is not as specified, inspect the circuits connected to other parts.

SEAT HEATER SYSTEM (Double Cab)

BE2KJ-01

LOCATION



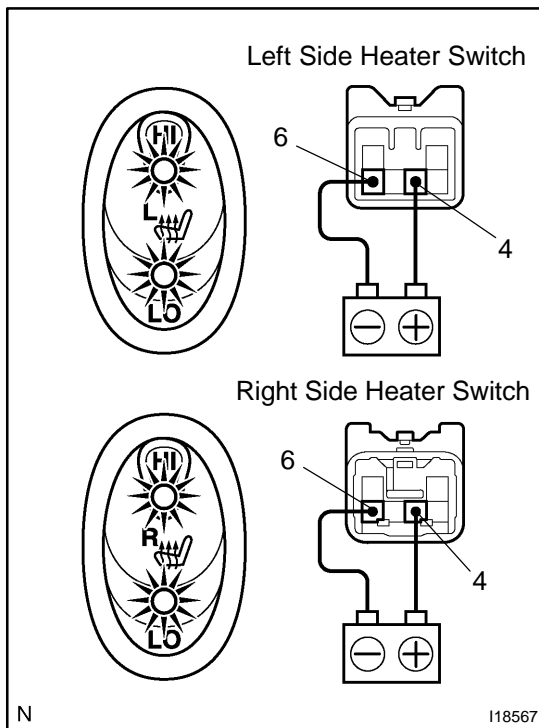


INSPECTION

1. INSPECT SEAT HEATER SWITCH CONTINUITY

Switch Position	Tester Connection	Specified Condition
HI	3 - 4, 5 - 6	Continuity
LO	4 - 5	Continuity
Illumination circuit	1 - 2	Continuity

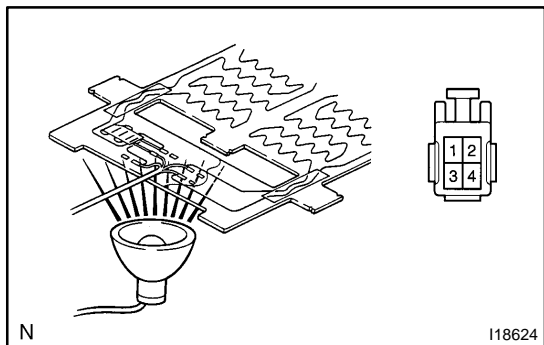
If the continuity is not as specified, replace the switch.



2. INSPECT SEAT HEATER INDICATOR LIGHT OPERATION

- Connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 6.
- Push the seat heater switch on the HI position and check that the HI indicator light turns on.
- Push the seat heater switch on the LO position and check that the LO indicator light turns on.

If operation is not as specified, replace the switch.

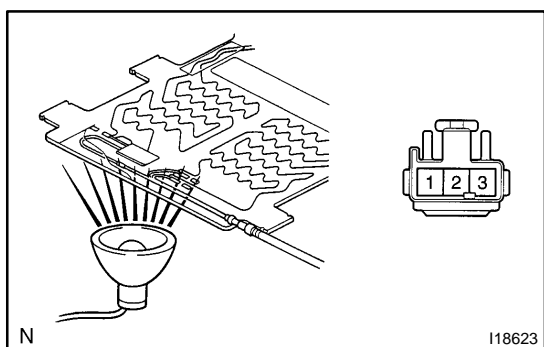


3. INSPECT SEAT CUSHION HEATER CONTINUITY

- (a) Heat the thermostat with a light.
- (b) Inspect the seat cushion heater continuity between the terminals, as shown in the illustration.

Tester Connection	Condition	Specified Condition
2 - 4	Constant	Continuity
1 - 3	Seat heater temperature below 30°C (80°F)	Continuity
1 - 3	Seat heater temperature above 40°C (104°F)	No continuity

If the continuity is not as specified, replace the seat cushion pad.

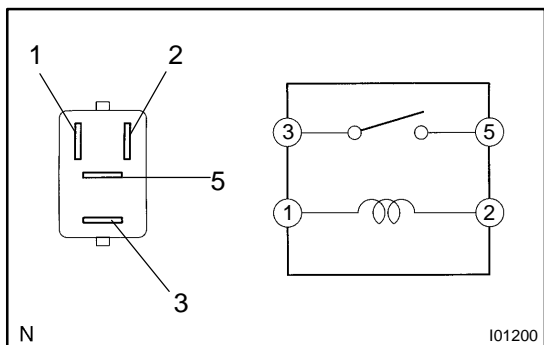


4. INSPECT SEATBACK HEATER CONTINUITY

- (a) Heat the thermostat with a light.
- (b) Inspect the seatback heater continuity between terminals, as shown in the illustration.

Tester Connection	Condition	Specified Condition
2 - 3	Constant	Continuity
1 - 2, 1 - 3	Seat heater temperature below 30°C (86°F)	Continuity
1 - 2, 1 - 3	Seat heater temperature above 50°C (122°F)	No continuity

If the continuity is not as specified, replace the seatback pad.



5. INSPECT SEAT HEATER RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.

CLOCK TROUBLESHOOTING

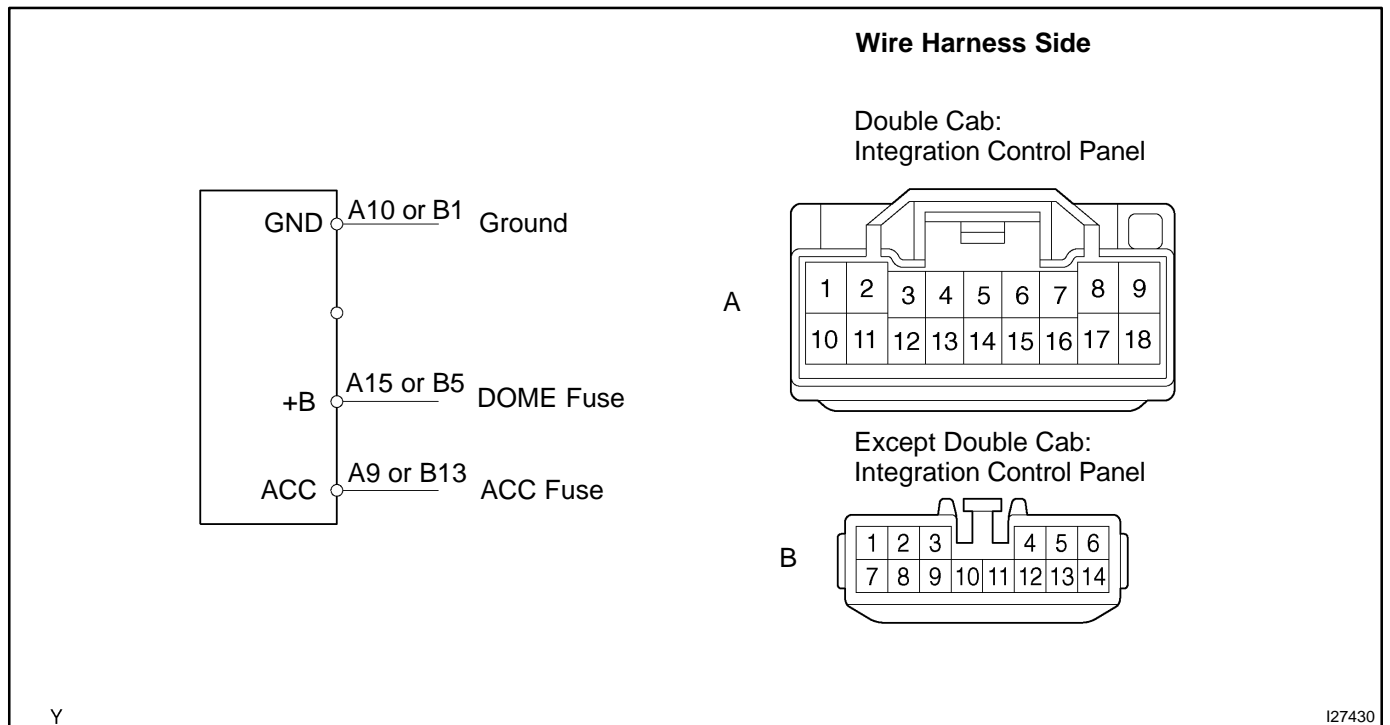
BE03N-13

HINT:

Troubleshoot the clock according to the table below.

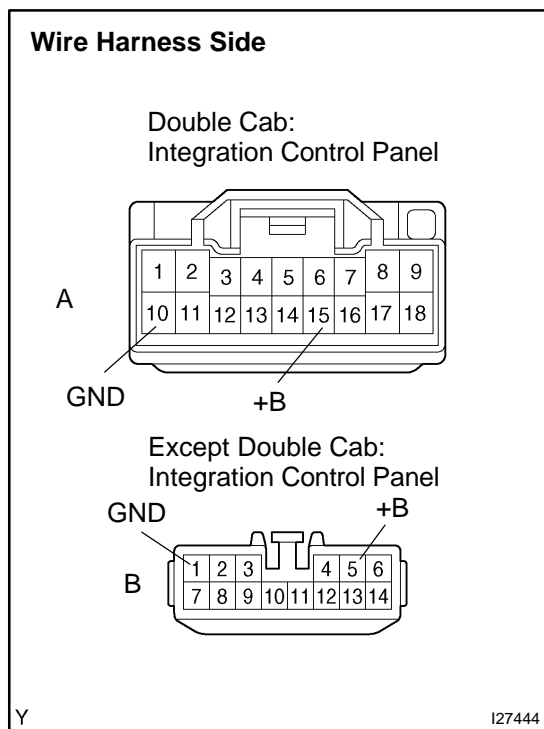
Problem	No.
Clock does not operate	1
Clock loses or gains time	2

± 1.5 seconds/day

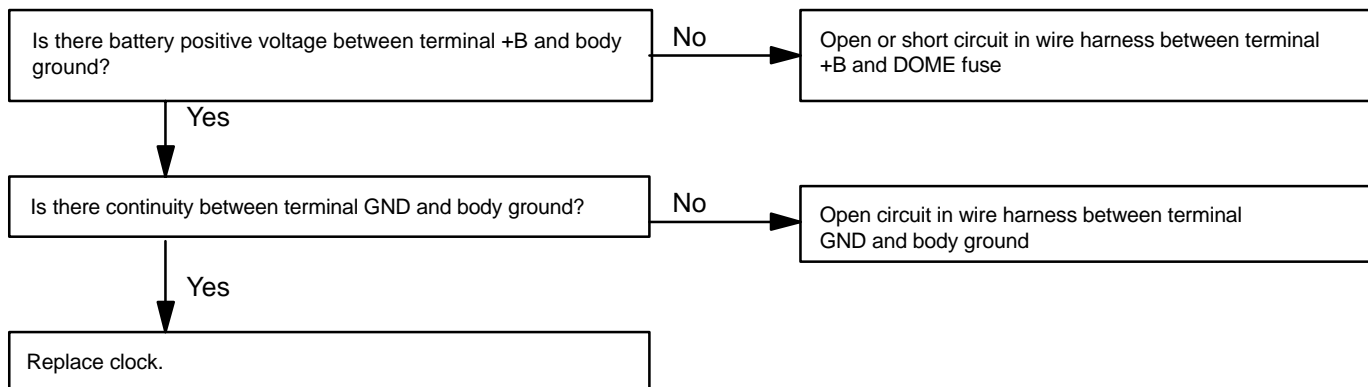


1. PROBLEM NO. 1

1	CLOCK DOES NOT OPERATE
---	-------------------------------

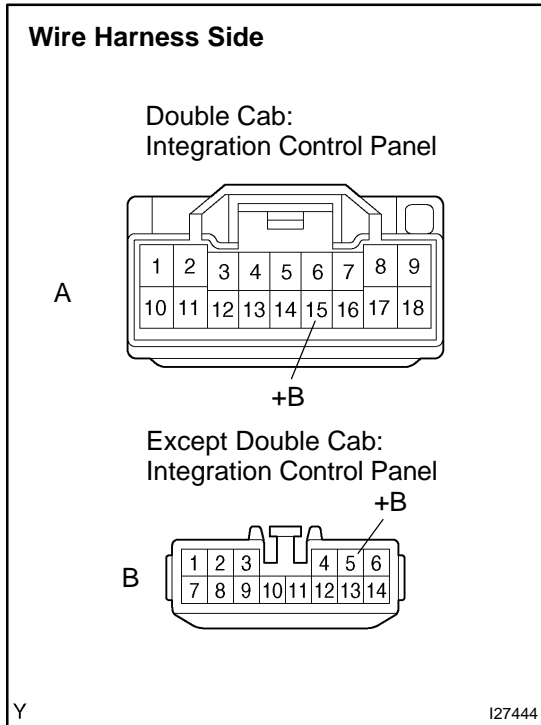


- (a) Check that the battery positive voltage is between 10 to 14 V.
If voltage is not as specified, replace the battery.
 - (b) Check that the DOME fuse is not blown.
If the fuse is blown, replace the fuse and check for short.
 - (c) Troubleshoot the clock as follows.
- HINT:**
Inspect the connector on the wire harness side.

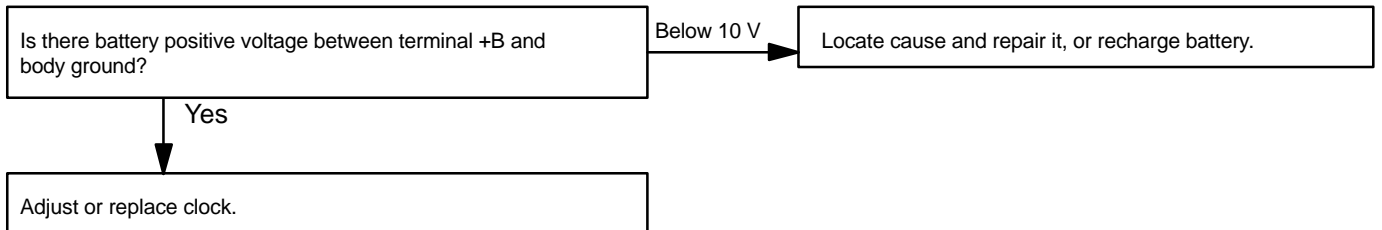


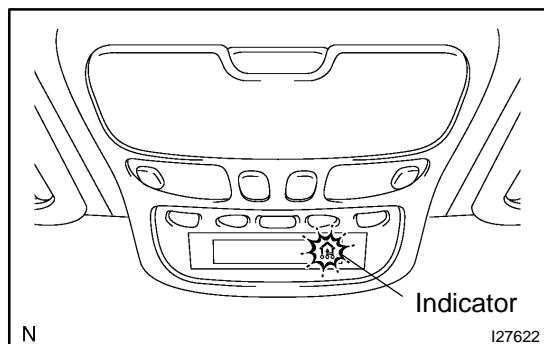
2. PROBLEM NO. 2

2	CLOCK LOSES OR GAINS TIME
---	---------------------------



- (a) Check that the battery positive voltage is between 10 to 14 V.
If voltage is not as specified, replace the battery.
 - (b) Inspect the error of the clock.
Allowable error (per day): ± 1.5 seconds
If the error exceeds the allowable error, replace the clock.
 - (c) Check that the clock adjusting button is stuck in position and has failed to return.
If the error exceeds the allowable error, replace the clock.
 - (d) Troubleshoot the clock as follows.
- HINT:
Inspect the connector on the wire harness side.





GARAGE DOOR OPENER SYSTEM (Double Cab)

REGISTRATION PROCEDURE

BE2KG-01

REGISTER TRANSMITTER CODE

HINT:

The vehicle's garage door opener records transmitter codes for systems such as garage doors, gates, entry gates, door locks, home lighting systems, security systems or other transmitter code based systems. The garage door opener is built into the roof console box assembly. After the console box assembly is replaced, transmitter codes for any systems previously registered in the garage door opener must be re-registered.

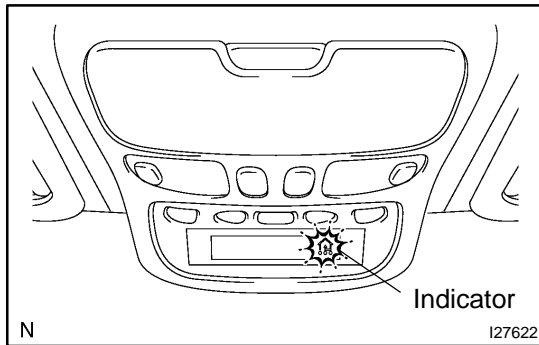
- (a) Re-register systems in the garage door opener registration mode.

NOTICE:

- Do not perform transmitter code registration for a system if people or objects are near the system to be registered. When registering transmitter codes, injury or damage can occur as the system may open, close, unlock or otherwise operate.
- Before transmitter code registration, stop the engine and remove the key from the ignition switch.
- The garage door opener cannot be used with: 1) systems that: 1) were manufactured before April 1, 1982; or 2) systems that do not meet Federal Safety Standards (for example, garage doors without a jam protection function).

HINT:

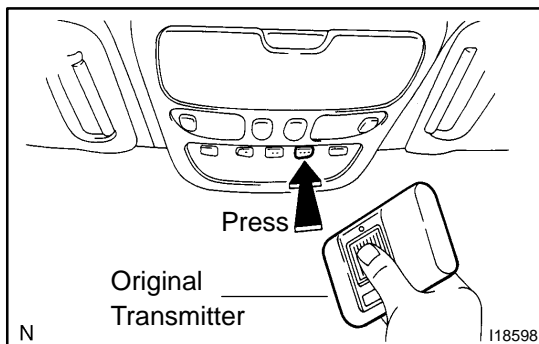
- 3 transmitter codes can be registered with the garage door opener, one transmitter code for each of the 3 garage door opener switches.
- Disconnecting the battery will not erase the transmitter codes registered with the garage door opener.
- An attempt to overwrite a previously registered transmitter code with a new system's transmitter code may fail. In these situations, the previously registered transmitter code will not be erased.



- (1) Select a switch of the garage door opener for the transmitter code registration.
- (2) Press and hold the selected switch for 20 seconds. Then, the garage door opener enters registration mode.

HINT:

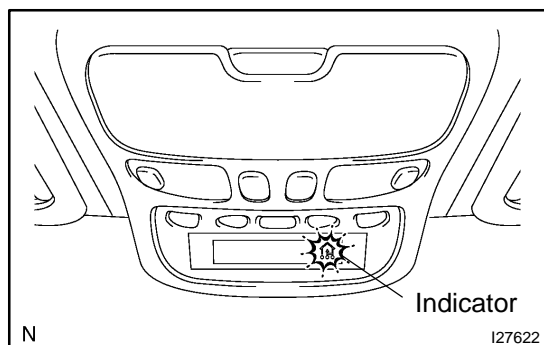
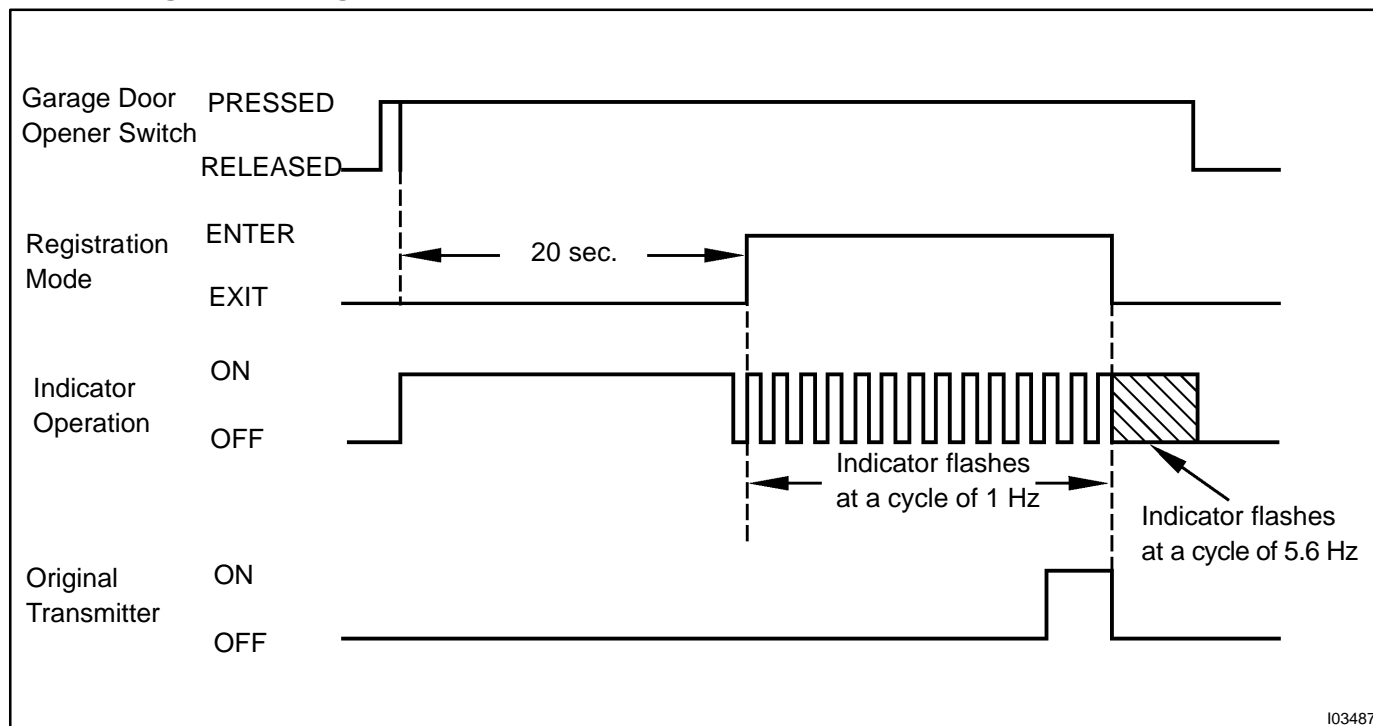
Before entering registration mode, the indicator shows the display. After entering registration mode, the indicator flashes at a cycle of 1 Hz. For a "rolling code" type system, after entering registration mode, the indicator flashes at a cycle of 8.8 Hz for 1.6 seconds, and then the indicator flashes at a cycle of 1 Hz.



- (3) After the garage door opener has entered registration mode, bring the original transmitter of the system to be registered within 1 to 3 inches of the garage door opener and press and hold one of the garage door opener switches. Then press the original transmitter switch.
- (4) If the transmitter code registration was successful, the indicator of the garage door opener flashes at a cycle of 5.6 Hz. If no malfunction occurs, release both the garage door opener switch and the original transmitter switch.

HINT:

- If transmitter code registration fails: 1) the original transmitter's battery may be low or need to be replaced, or 2) the system to be registered may not be compatible with the garage door opener.
- Some transmitter's signals stop after 1 to 2 seconds. For these types of transmitters: 1) press and hold one of the garage door opener switches, and 2) press and release (cycle) the transmitter switch every 2 seconds. Check if the transmitter code was successfully registered.
- After entering the garage door opener registration mode, transmitter code registration must be completed within 90 seconds. If 90 seconds elapses, the garage door opener will enter low power mode (See step (c)).

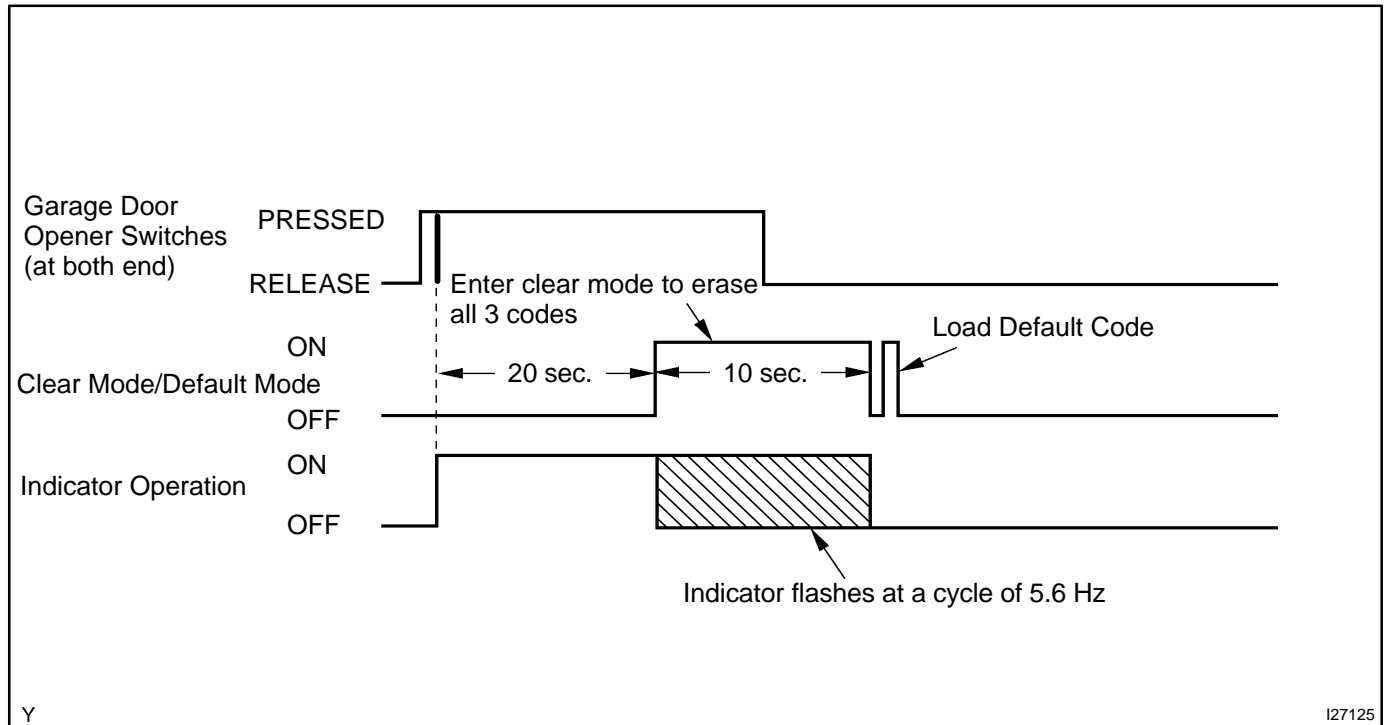
Timing chart of registration mode:

(b) Erase transmitter codes in the garage door opener clear mode.

HINT:

- All 3 registered transmitter codes must be erased at the same time.
- If the switches are released within 10 seconds after the transmitter codes have been erased, the garage door opener will enter registration mode.
- If the switches are held for 10 seconds or more after the transmitter codes have been erased, default codes will be set to the 3 switches of the garage door opener. Using these default codes, you can check operation of the garage door opener can be checked using a tester. Press and hold the left and right switch of the garage door opener for 20 seconds. The indicator will begin to flash at a cycle of 5.6 Hz. Releasing the switches will end clear mode.

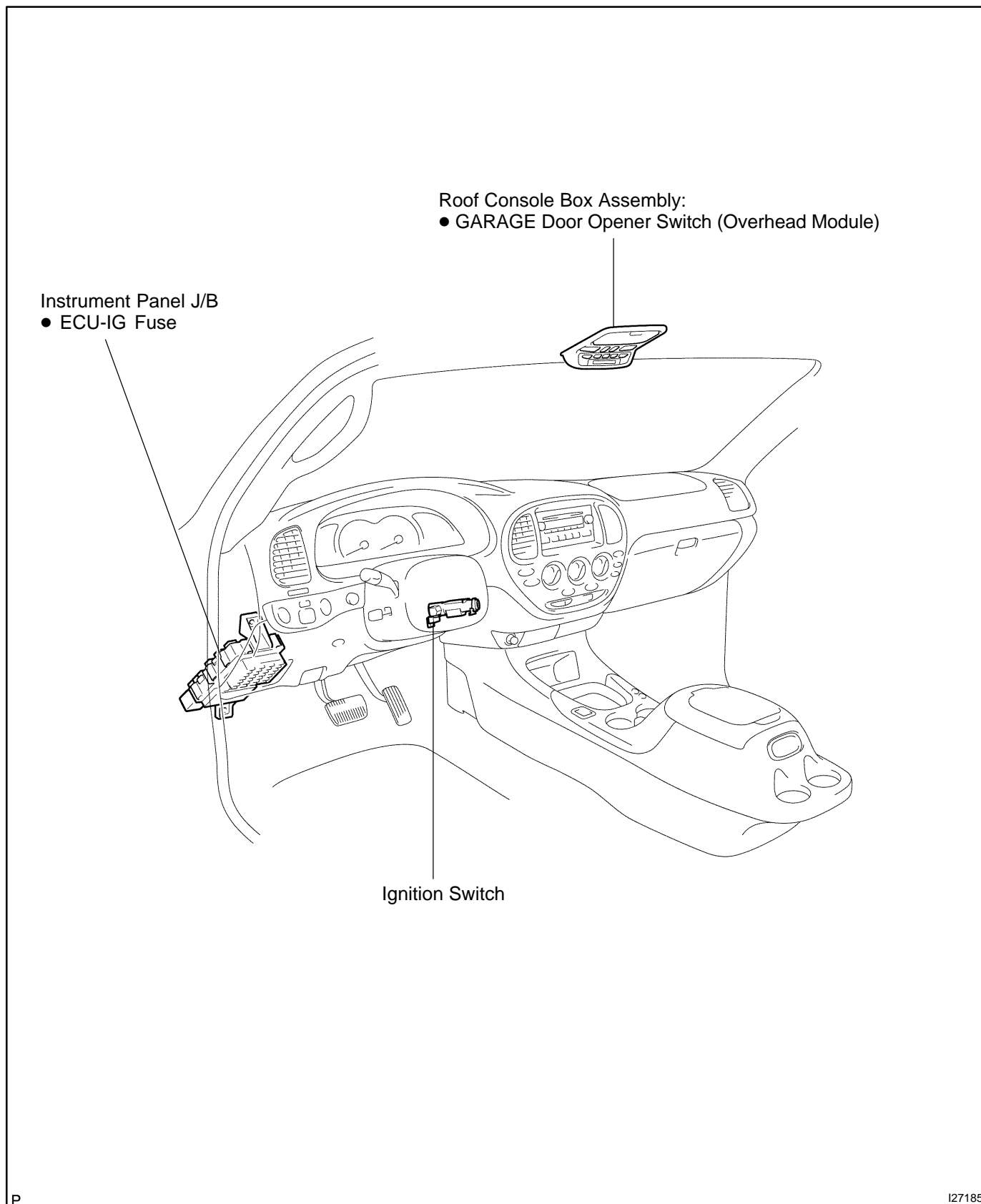
Timing chart of clear mode:

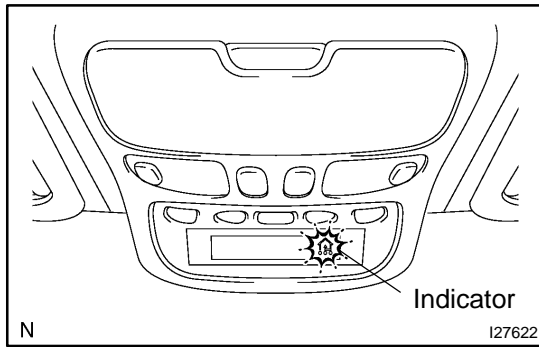


(c) Low power mode:

If a garage door opener switch is held for 55 seconds or more, the garage door opener will enter low power mode to economize on power consumption. When the garage door opener has entered low power mode, the indicator turns off.

LOCATION



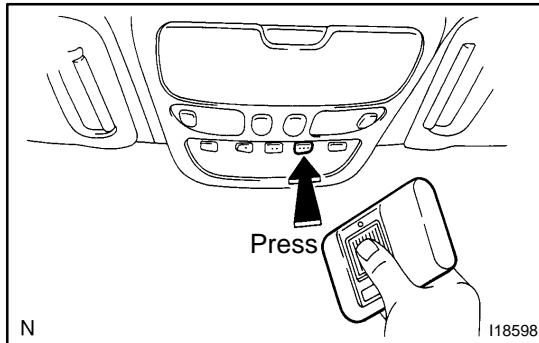


INSPECTION

1. INSPECT GARAGE DOOR OPENER

Press the switch and check that indicator turns on.

Even if only one switch cannot turn on an indicator, replace the door opener.



2. INSPECT GARAGE DOOR OPENER REGISTRATION AND TRANSMITTING

HINT:

Use the KENTMORE home link tester and a tester transmitter for this test. First erase the customer's transmitter code, and then register the tester transmitter code.

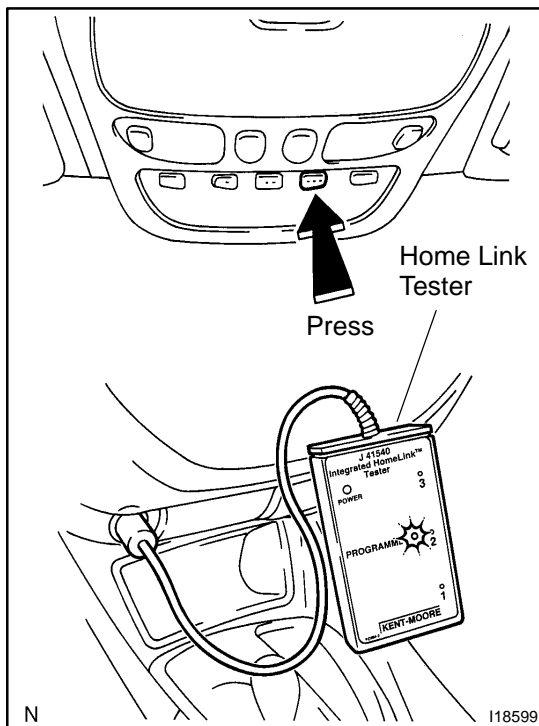
(a) Check if the tester transmitter code was successfully registered.

(b) Press the garage door opener switch that was registered to the tester transmitter. Check if the home link tester's green LED illuminates.

HINT:

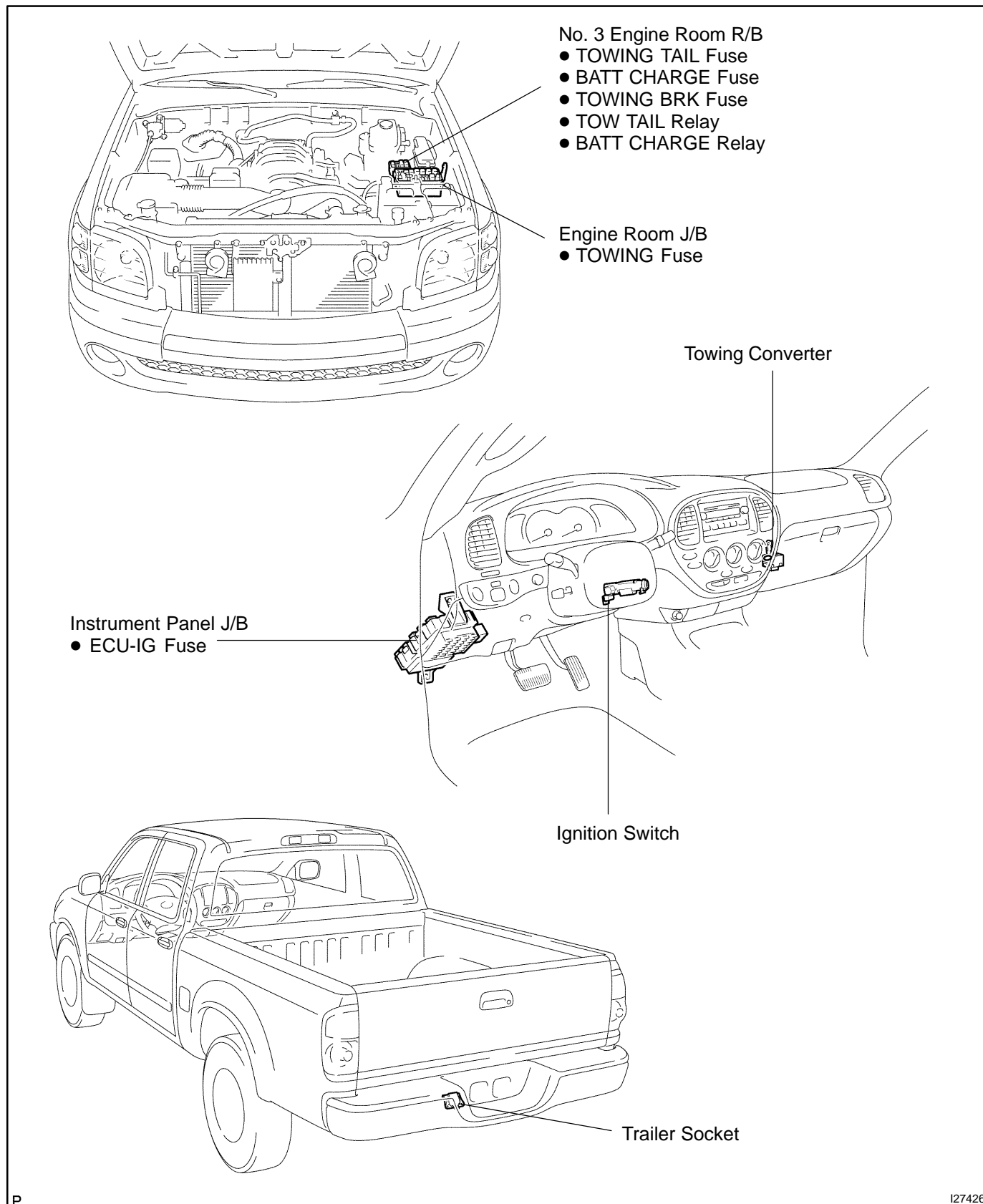
If the green LED does not illuminate, replace the garage door opener.

(c) When the inspection is complete, re-register the customer's transmitter code(s) again.

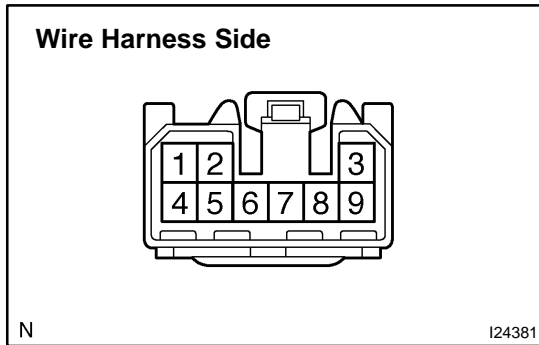


TRAILER TOWING (Double Cab) LOCATION

BE2KC-01



I27426



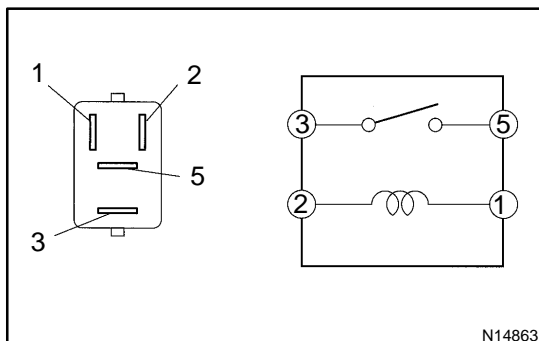
INSPECTION

1. INSPECT TOWING CONVERTER CIRCUIT

Remove the towing converter with the connector still connected and inspect the wire harness side connector from the backside, as shown in the table.

Tester Connection	Condition	Specified Condition
1 - 6	Constant	10 - 14 V
2 - 6	Turn signal switch RIGHT or hazard warning switch ON	10 - 14 V ↔ Below 1 V
	Turn signal switch RIGHT and stop light switch ON (brake pedal depressed)	10 - 14 V ↔ Below 1 V
	Turn signal switch OFF, hazard warning switch OFF and stop light switch OFF (brake pedal released)	Below 1 V
	Stop light switch ON (brake pedal depressed)	10 - 14 V ↔ Below 1 V
3 - 6	Turn signal switch RIGHT or hazard warning switch ON	10 - 14 V ↔ Below 1 V
	Turn signal switch OFF or LEFT and hazard warning switch OFF	Below 1 V
4 - 6	Turn signal switch LEFT or hazard warning switch ON	10 - 14 V ↔ Below 1 V
	Turn signal switch LEFT and stop light switch ON (brake pedal depressed)	10 - 14 V ↔ Below 1 V
	Turn signal switch OFF, hazard warning switch OFF and stop light switch OFF (brake pedal released)	Below 1 V
	Stop light switch ON (brake pedal depressed)	10 - 14 V
6 - 8	Stop light switch ON (brake pedal depressed)	10 - 14 V
	Stop light switch OFF (brake pedal released)	Below 1 V
6 - 9	Turn signal switch LEFT or hazard warning switch ON	10 - 14 V ↔ Below 1 V
	Turn signal switch OFF or RIGHT and hazard warning switch OFF	Below 1 V
6 - Body ground	Constant	Continuity

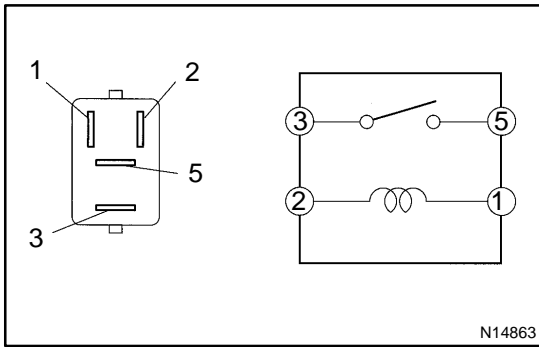
If the result is as specified, replace the towing converter.



2. INSPECT TOWING TAIL RELAY CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.



3. INSPECT BATTERY CHARGE RELAY (Marking: BATT CHARGE) CONTINUITY

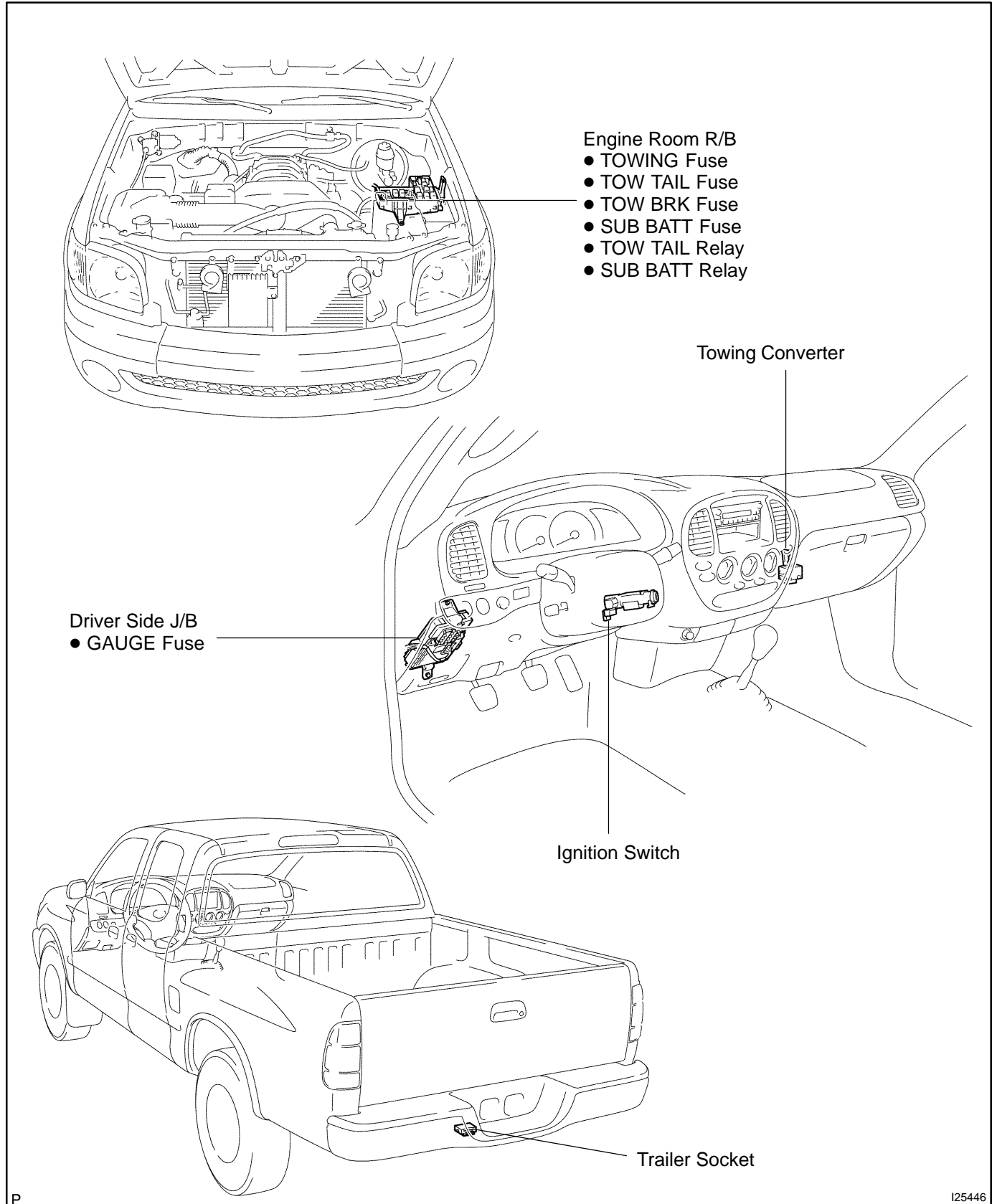
Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

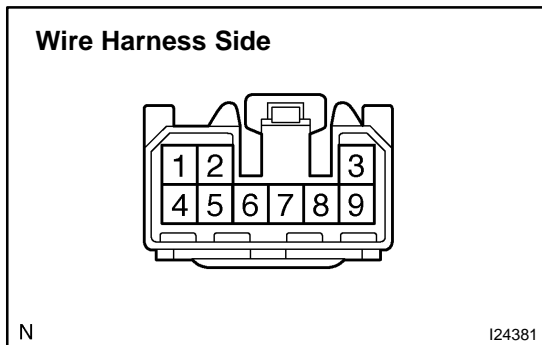
If the continuity is not as specified, replace the relay.

TRAILER TOWING (Except Double Cab)

LOCATION

BE2KE-01





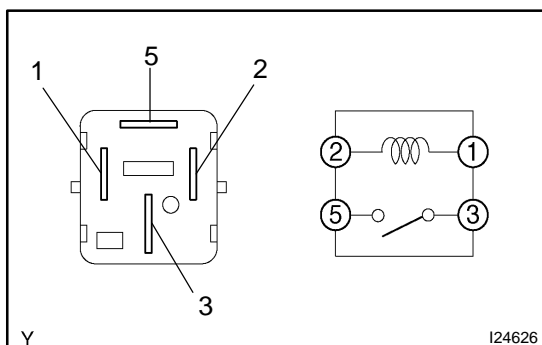
INSPECTION

1. INSPECT TOWING CONVERTER CIRCUIT

Remove the towing converter with the connector still connected and inspect the wire harness side connector from the backside, as shown in the table.

Tester Connection	Condition	Specified Condition
1 - 6	Constant	10 - 14 V
2 - 6	Turn signal switch RIGHT or hazard warning switch ON	10 - 14 V ↔ Below 1 V
	Turn signal switch RIGHT and stop light switch ON (brake pedal depressed)	10 - 14 V ↔ Below 1 V
	Turn signal switch OFF, hazard warning switch OFF and stop light switch OFF (brake pedal released)	Below 1 V
	Stop light switch ON (brake pedal depressed)	10 - 14 V ↔ Below 1 V
3 - 6	Turn signal switch RIGHT or hazard warning switch ON	10 - 14 V ↔ Below 1 V
	Turn signal switch OFF or LEFT and hazard warning switch OFF	Below 1 V
4 - 6	Turn signal switch LEFT or hazard warning switch ON	10 - 14 V ↔ Below 1 V
	Turn signal switch LEFT and stop light switch ON (brake pedal depressed)	10 - 14 V ↔ Below 1 V
	Turn signal switch OFF, hazard warning switch OFF and stop light switch OFF (brake pedal released)	Below 1 V
	Stop light switch ON (brake pedal depressed)	10 - 14 V
6 - 8	Stop light switch ON (brake pedal depressed)	10 - 14 V
	Stop light switch OFF (brake pedal released)	Below 1 V
6 - 9	Turn signal switch LEFT or hazard warning switch ON	10 - 14 V ↔ Below 1 V
	Turn signal switch OFF or RIGHT and hazard warning switch OFF	Below 1 V
6 - Body ground	Constant	Continuity

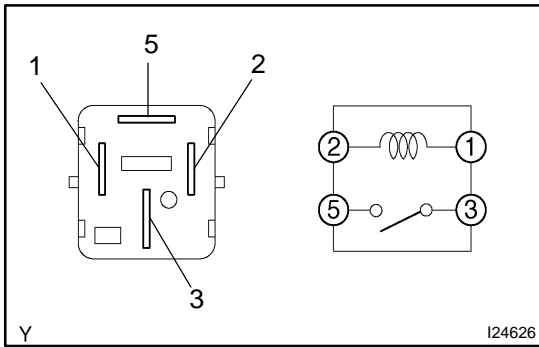
If the result is as specified, replace the towing converter.



2. INSPECT TOWING TAIL RELAY (Marking: TOW TAIL) CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.



3. INSPECT SUB BATTERY RELAY (Marking: SUB BATT) CONTINUITY

Tester Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (When battery voltage is applied to terminals 1 and 2)

If the continuity is not as specified, replace the relay.

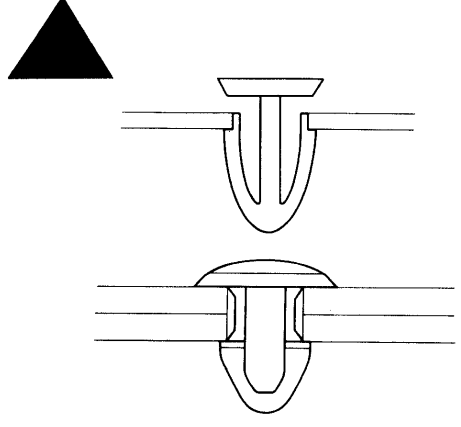
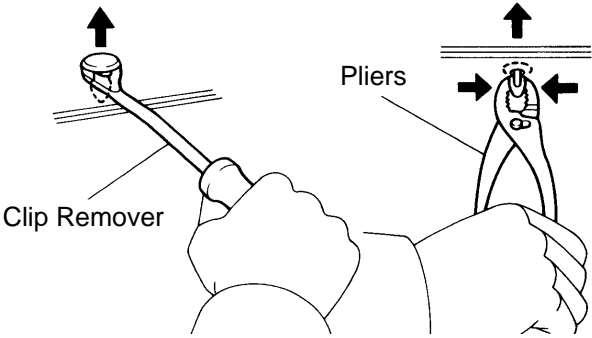
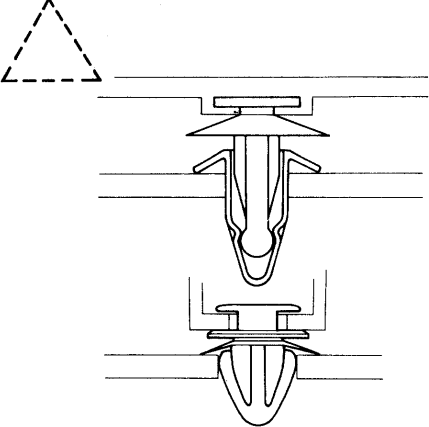
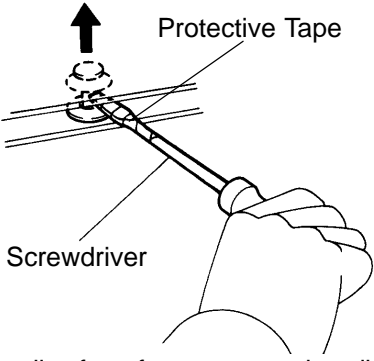
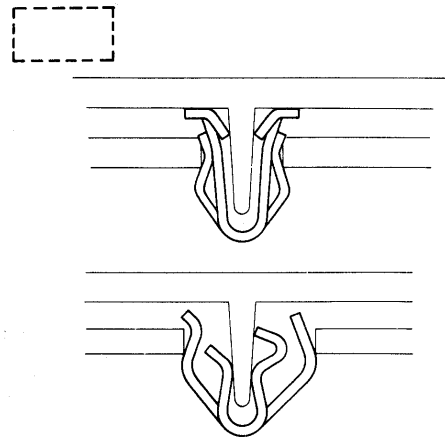
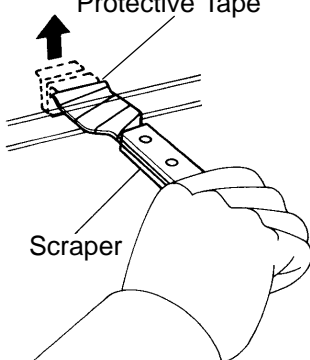
CLIP REPLACEMENT

BO0HX-04

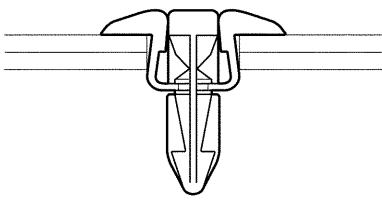
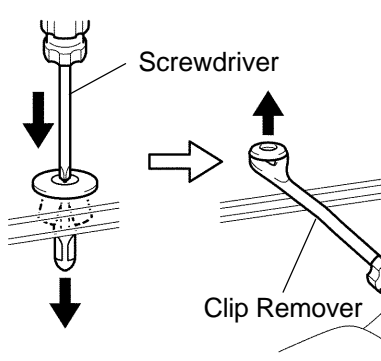
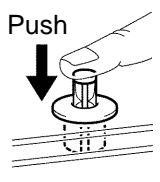
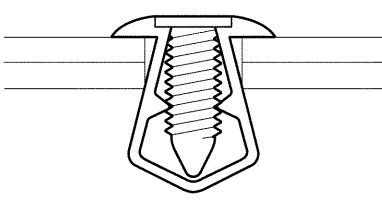
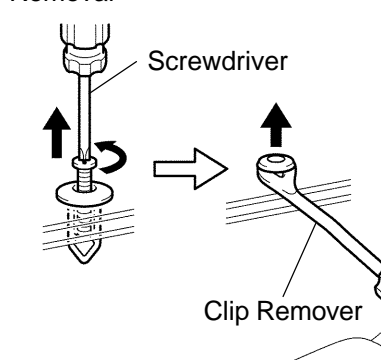
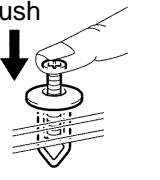
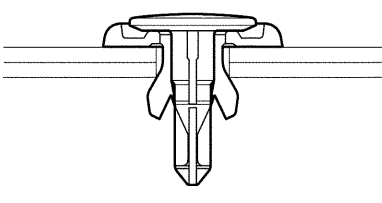
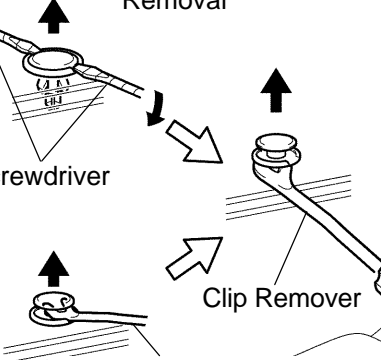
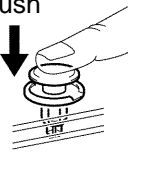
The removal and installation methods of typical clips used in body parts are shown in the table below.

HINT:

If the clip is damaged during the operation, always replace it with a new clip.

Shape (Example)	Removal / Installation
	 <p>Remove clips from front or rear using clip remover or pliers.</p>
	 <p>Remove clips from front or rear using clip remover or pliers.</p>
	 <p>Remove clips from front or rear using clip remover or pliers.</p>

V00005

Shape (Example)	Removal/Installation	
	<p>Removal</p>  <p>Screwdriver</p> <p>Clip Remover</p>	<p>Installation</p>  <p>Push</p>
	<p>Removal</p>  <p>Screwdriver</p> <p>Clip Remover</p>	<p>Installation</p>  <p>Push</p>
	<p>Removal</p>  <p>Screwdriver</p> <p>Small Clip Remover</p> <p>Clip Remover</p>	<p>Installation</p>  <p>Push</p>

SRS AIRBAG

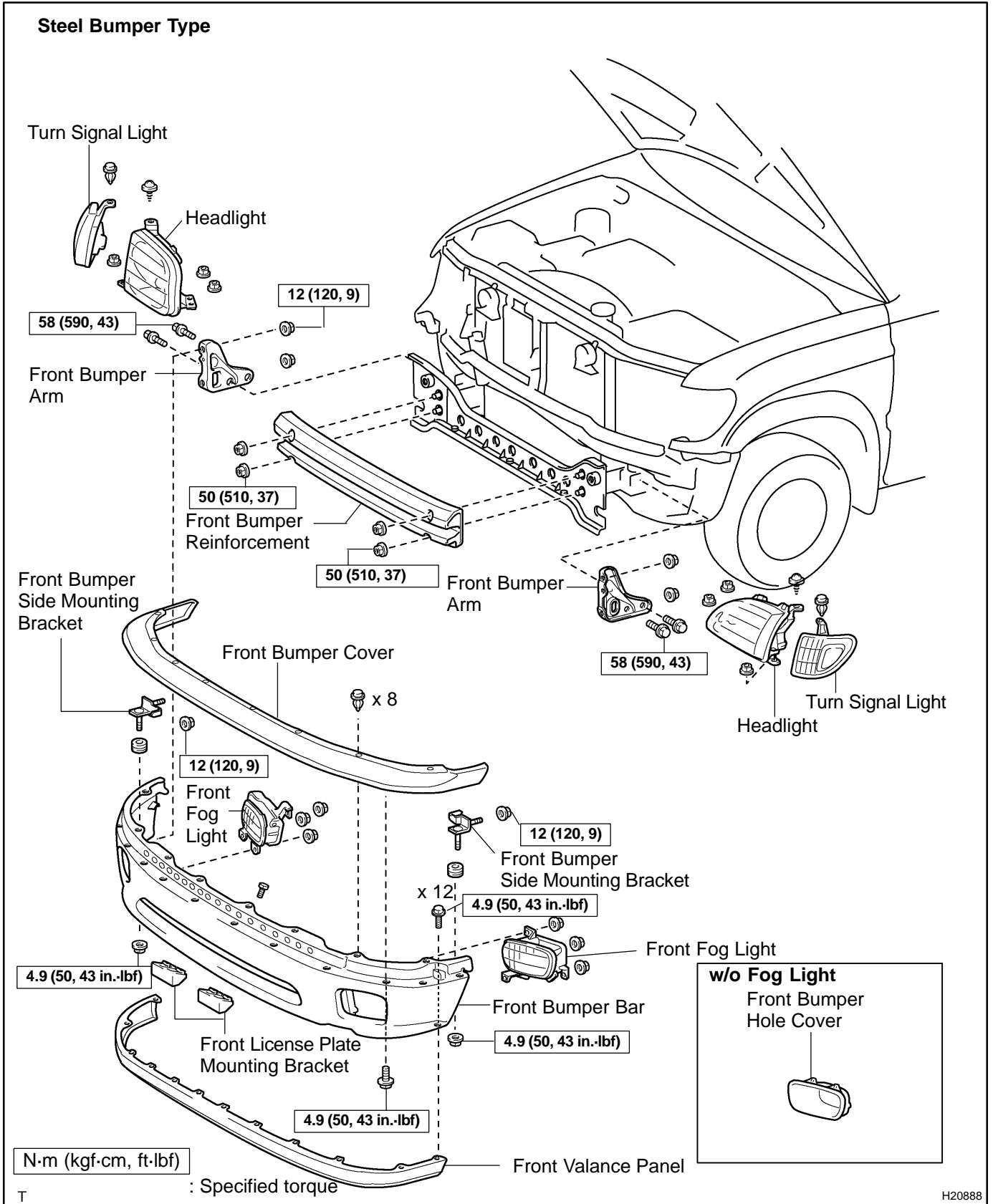
BO0HY-06

PRECAUTION

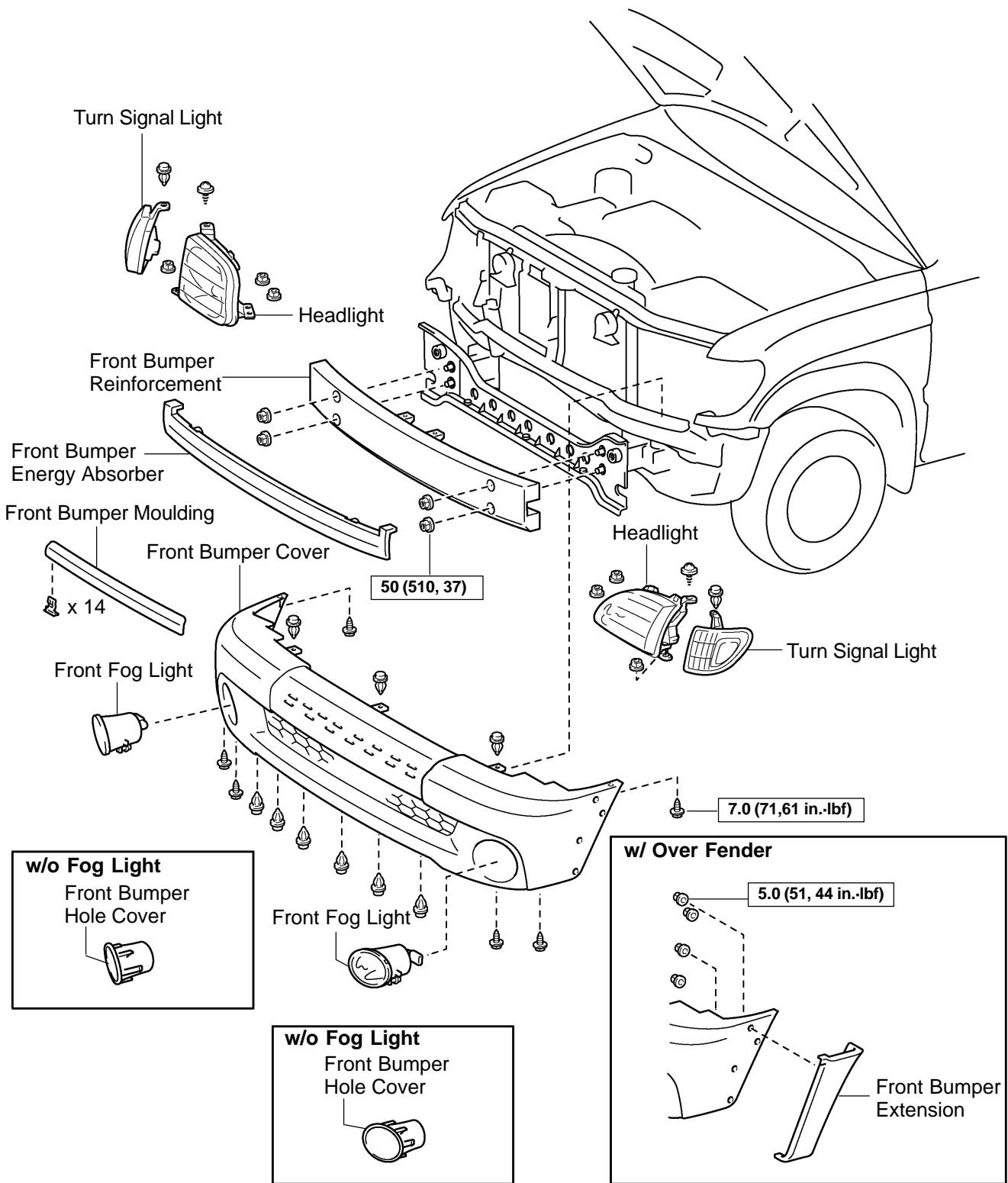
The TOYOTA TUNDRA is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

FRONT BUMPER COMPONENTS

BO4H1-02



Resin Bumper Type

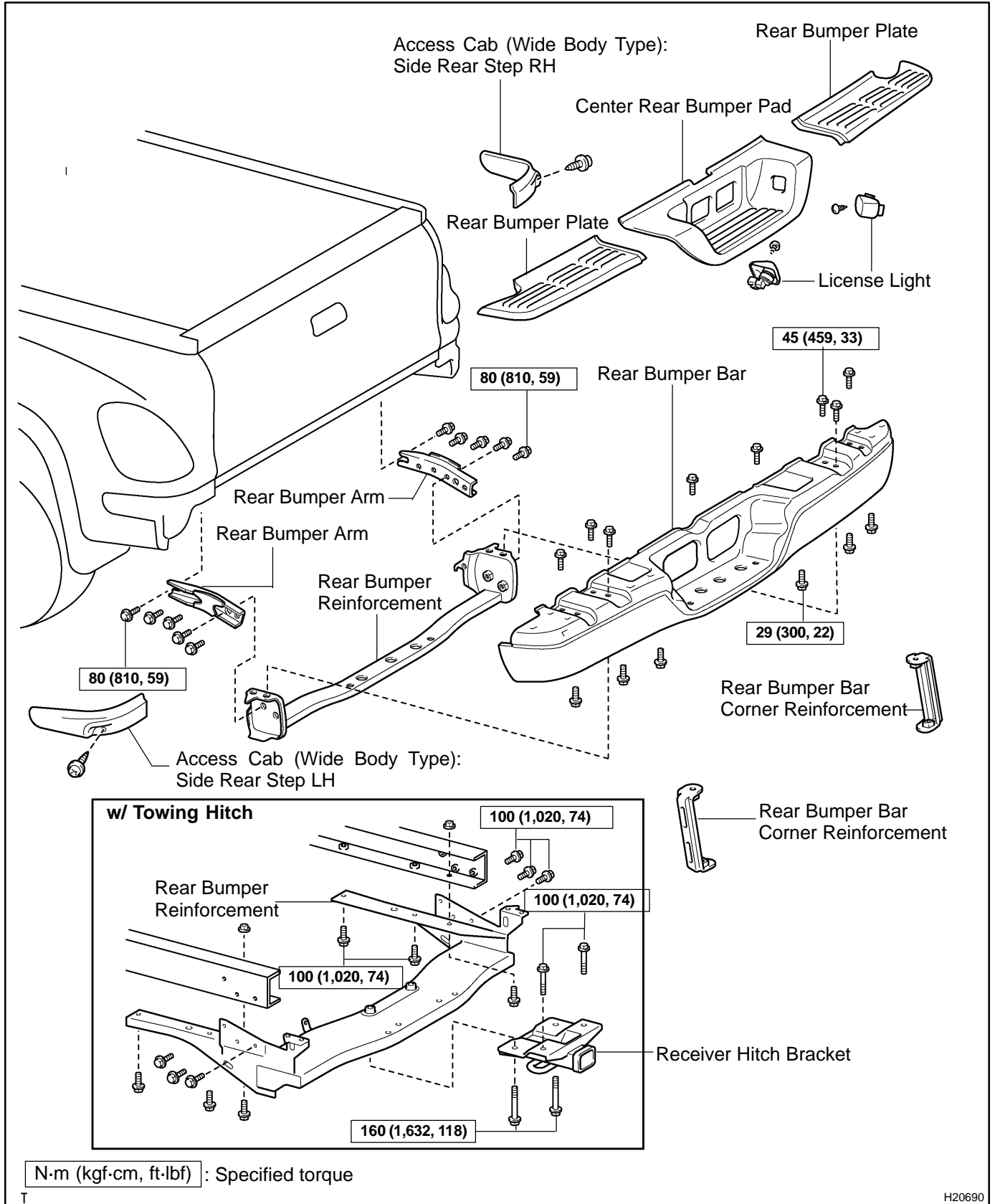


T N·m (kgf·cm, ft·lbf) : Specified torque

H20689

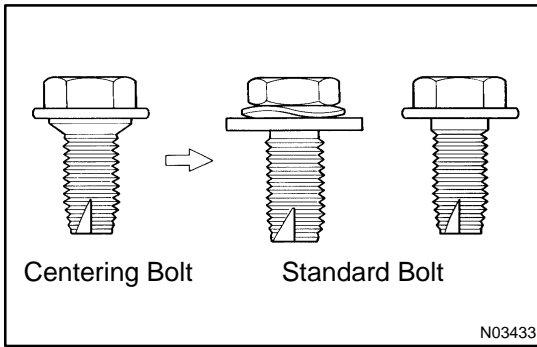
REAR BUMPER COMPONENTS

BO2EJ-03



T

H20690

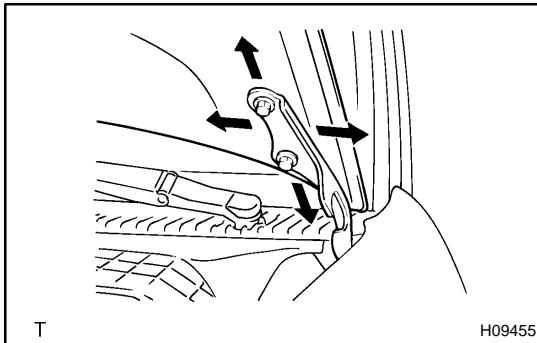


HOOD ADJUSTMENT

B0011-03

HINT:

Since the centering bolt is used as the hood hinge set bolt, the hood cannot be adjusted with it on. Substitute the standard bolt for the centering bolt.



1. ADJUST HOOD IN FORWARD/REARWARD

Adjust the hood by loosening the hood side hinge bolts.

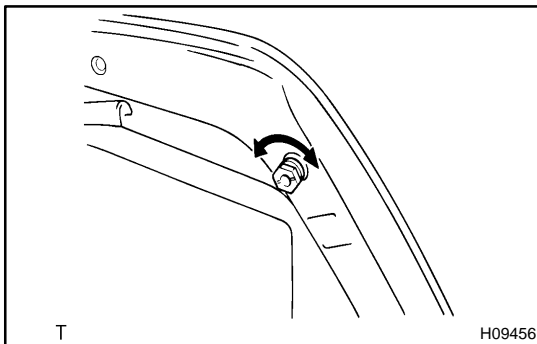
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)

2. ADJUST HOOD IN VERTICAL DIRECTIONS

(a) Remove the bolts and increase or decrease the number of washers between the hinge and hood.

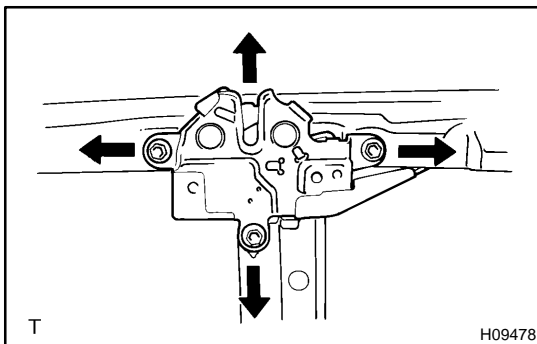
(b) Install the bolts again.

Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



3. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTION

Adjust the hood by turning the cushions.



4. ADJUST HOOD LOCK

Adjust the lock by loosening the bolts.

Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)

HOOD SUPPORT REPLACEMENT

1. REMOVE HOOD SUPPORT

- (a) Remove the bolt and hood support from the hood.

HINT:

While supporting the hood by hand, remove the hood support from the hood.

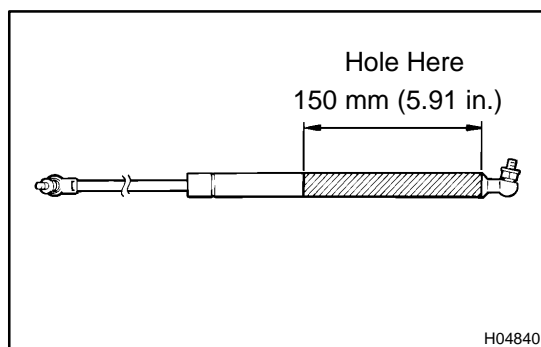
- (b) Remove the bolt and hood support.

2. IF NECESSARY, REPLACE HOOD SUPPORT

NOTICE:

Handling the hood support

- ◆ Do not disassemble the support as the cylinder is filled with pressurized gas.



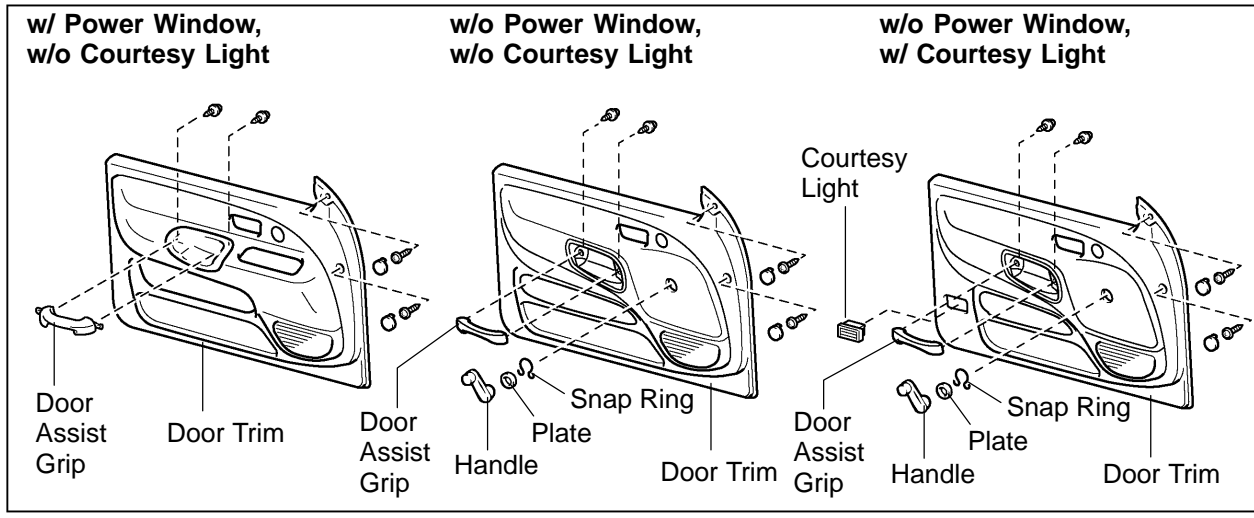
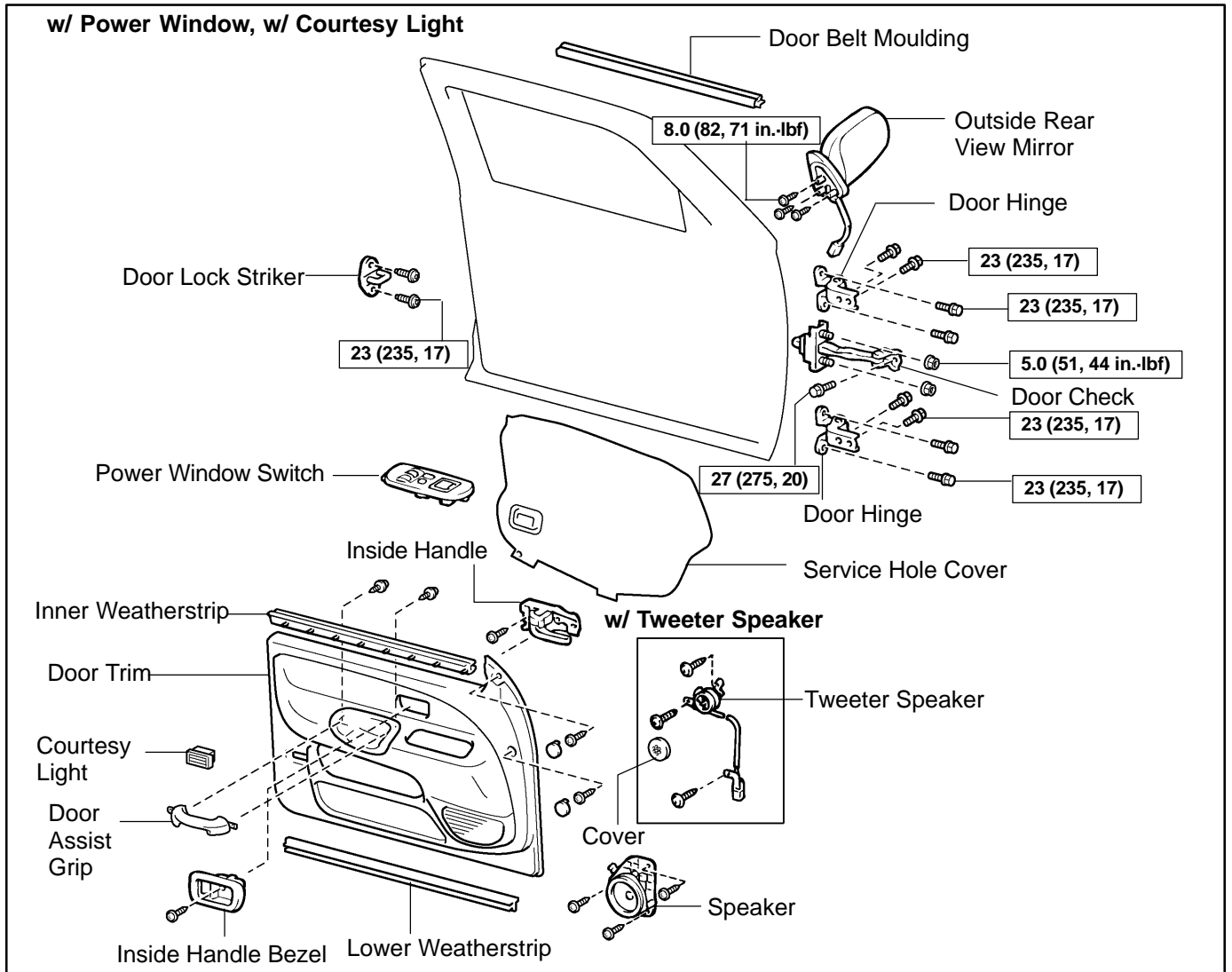
- ◆ If the hood support is to be replaced, drill a 2.0 to 3.0 mm (0.079 to 0.118 in.) hole in the area shown in the illustration to completely release the high pressure gas before disposing of it.
- ◆ When drilling, chips may fly out so work carefully.
- ◆ The gas is colorless, odorless and non - toxic.
- ◆ When working, handle the hood support carefully. Never score or scratch the exposed part of the piston rod, and allow any paint or oil to get on it.
- ◆ Do not turn the piston rod and cylinder with the hood support fully extended.

3. INSTALL HOOD SUPPORT

- (a) Install the bolt and hood support to the body.
Torque: 22 N·m (224 kgf·cm, 16 ft·lbf)
- (b) Install the bolt and hood support to the hood.
Torque: 22 N·m (224 kgf·cm, 16 ft·lbf)

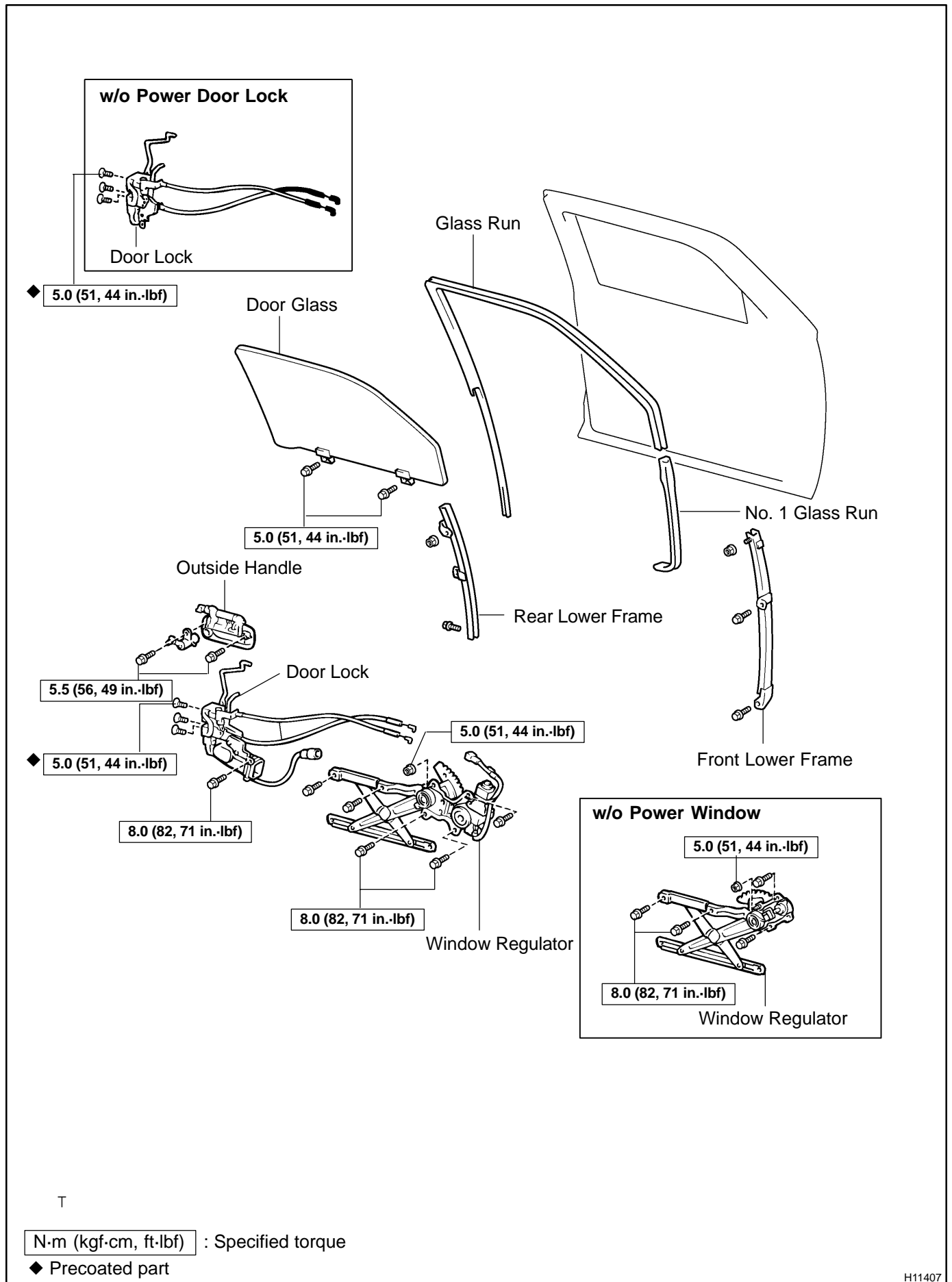
FRONT DOOR COMPONENTS

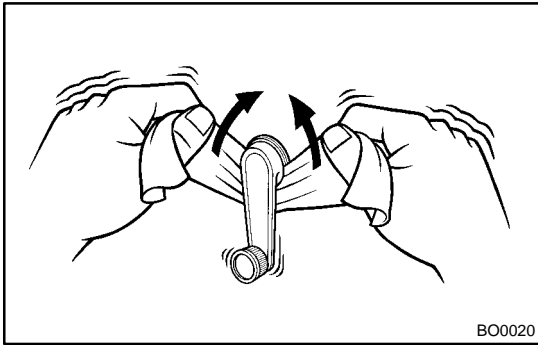
BO2EL-03



T [N·m (kgf·cm, ft·lbf)] : Specified torque

H23541





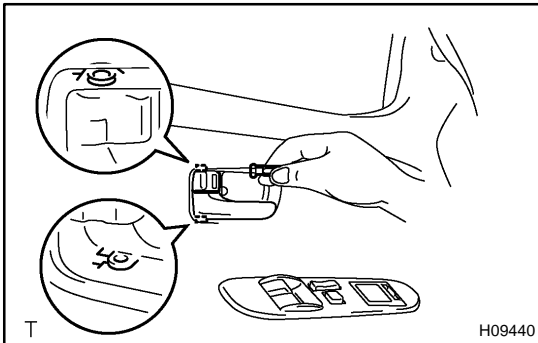
DISASSEMBLY

HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. w/o Power window: REMOVE REGULATOR HANDLE

Pull off the snap ring with a cloth and remove the regulator handle and plate.

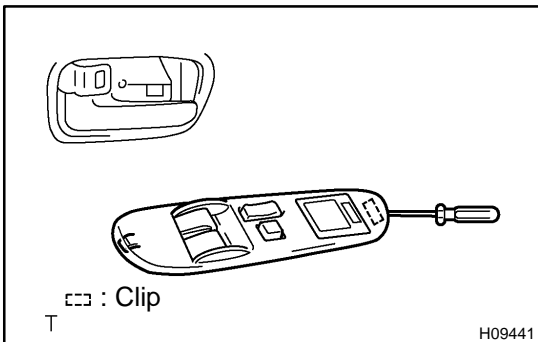


2. REMOVE INSIDE HANDLE BEZEL

- Remove the screw.
- Using a screwdriver, remove the inside handle bezel as shown in the illustration.

HINT:

Tape the screwdriver tip before use.



3. w/ Power window: REMOVE POWER WINDOW SWITCH

- Using a screwdriver, remove the power window switch.

HINT:

Tape the screwdriver tip before use.

- Disconnect the connectors.

4. w/ Courtesy light: REMOVE COURTESY LIGHT

- Using a screwdriver, remove the courtesy light.

HINT:

Tape the screwdriver tip before use.

- Disconnect the connector.

5. w/o Courtesy light: REMOVE COURTESY LIGHT COVER

Using a screwdriver, remove the courtesy light cover.

HINT:

Tape the screwdriver tip before use.

6. w/ Tweeter speaker: REMOVE TWEETER SPEAKER

- Using a screwdriver, remove the tweeter speaker cover.

HINT:

Tape the screwdriver tip before use.

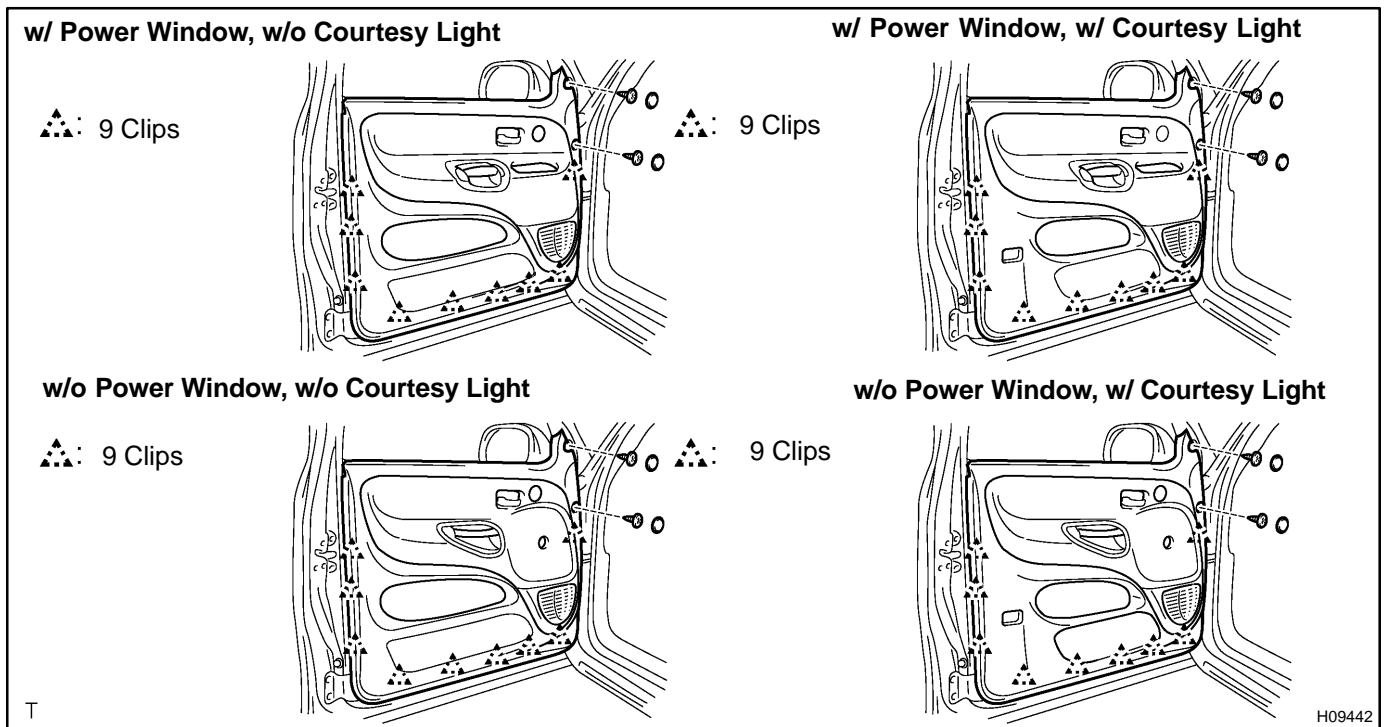
- Disconnect the connector.
- Remove the 3 screws and tweeter speaker.

7. REMOVE DOOR TRIM

- (a) Remove the 2 caps and 2 screws.
- (b) Insert a screwdriver between the door trim and door panel to remove the door trim.

HINT:

Tape the screwdriver tip before use.



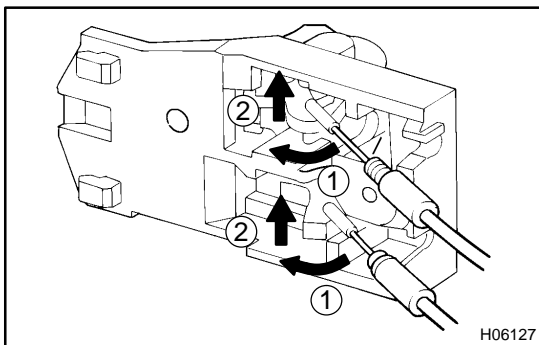
- (c) Pull the door trim upward to remove it.

8. REMOVE DOOR ASSIST GRIP

Remove the 2 screws and door assist grip from the door trim.

9. REMOVE INNER WEATHERSTRIP**10. REMOVE LOWER WEATHERSTRIP****11. REMOVE INSIDE HANDLE**

- (a) Remove the screw.
- (b) Slide the inside handle backward to remove it.



- (c) Disconnect the 2 cables from the inside handle as shown in the illustration.

12. REMOVE SERVICE HOLE COVER

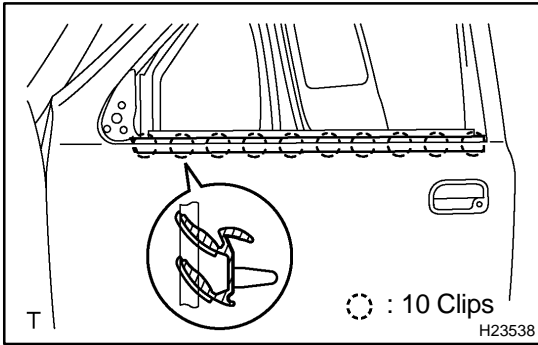
- (a) Disconnect the clamps and connector.
- (b) Remove the service hole cover.

13. REMOVE SPEAKER

- (a) Disconnect the connector.
- (b) Remove the 3 screws and speaker.

14. REMOVE OUTSIDE REAR VIEW MIRROR

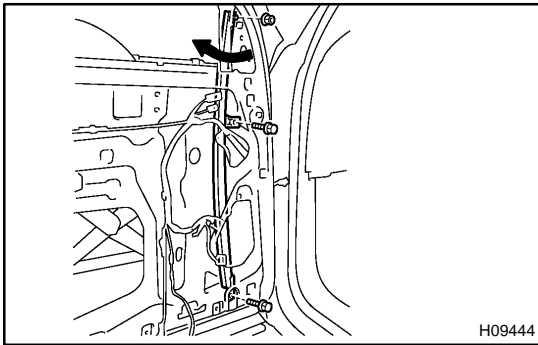
- (a) w/ Remote control:
Disconnect the connector.
- (b) Remove the 3 screws and outside rear view mirror.



15. REMOVE DOOR BELT MOULDING

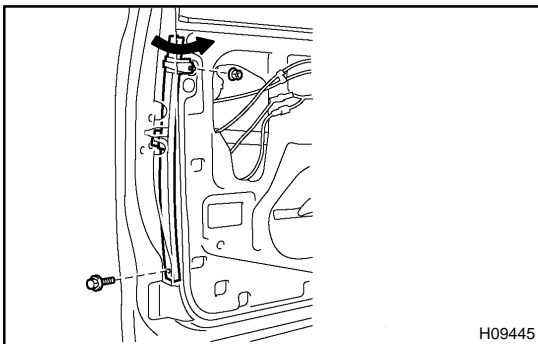
Using a moulding remover, remove the door belt moulding.

16. REMOVE DOOR GLASS RUN



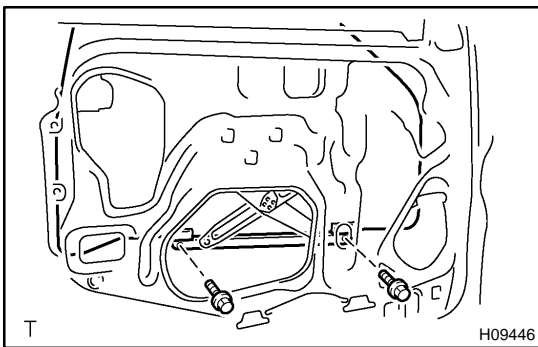
17. REMOVE FRONT LOWER FRAME

Remove the 2 bolts, nut and front lower frame as shown in the illustration.



18. REMOVE REAR LOWER FRAME

Remove the bolt, nut and rear lower frame as shown in the illustration.

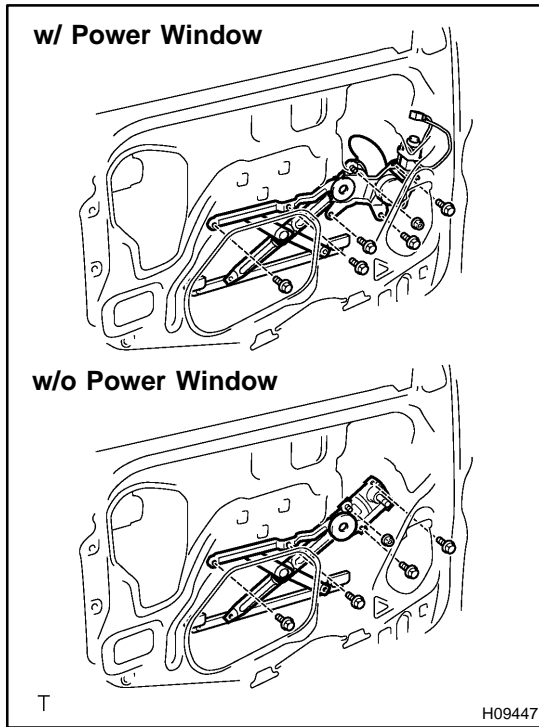


19. REMOVE DOOR GLASS

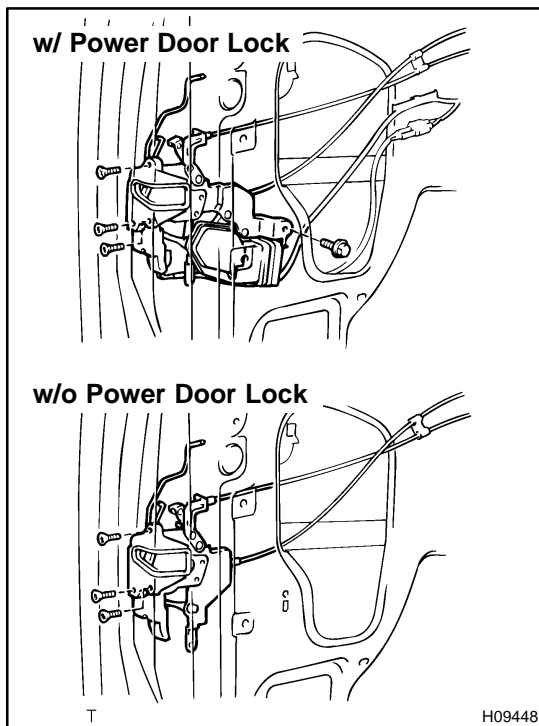
- (a) Open the door glass until the bolts appear in the service hole.
- (b) Remove the 2 bolts and door glass.

NOTICE:

Do not damage the door glass.

**20. REMOVE WINDOW REGULATOR**

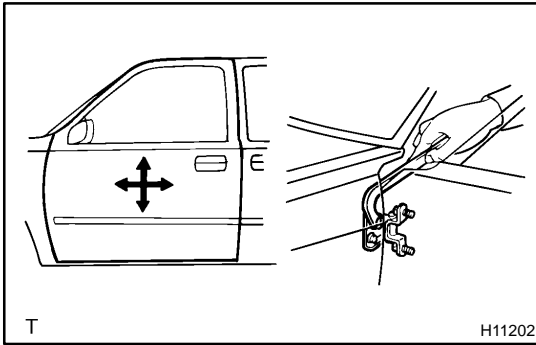
- (a) w/ Power window:
Disconnect the connector.
- (b) w/ Power window:
Remove the 5 bolts, nut and window regulator.
- (c) w/o Power window:
Remove the 4 bolts, nut and window regulator.
- (d) Remove the window regulator through the service hole.

**21. REMOVE DOOR LOCK**

- (a) Disconnect the 2 links from the outside handle and door lock cylinder.
- (b) w/ Power door lock:
Disconnect the connector and remove the bolt.
- (c) Using a torx® socket wrench, remove the 3 torx® screws.

Torx® socket wrench:**T30 (Part No. 09042-00010 or locally manufactured tool)****22. REMOVE OUTSIDE HANDLE WITH DOOR LOCK CYLINDER**

- (a) Remove the 2 bolts and outside handle together with the door lock cylinder.
- (b) Remove the door lock cylinder from the outside handle.



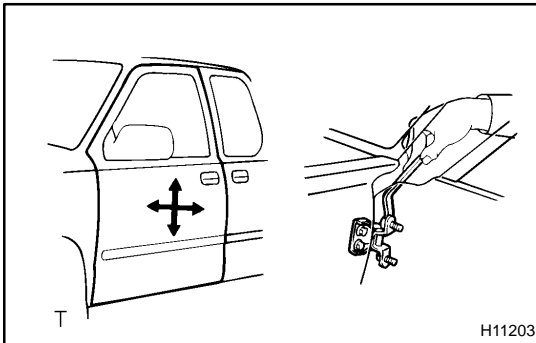
ADJUSTMENT

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812-00010

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)



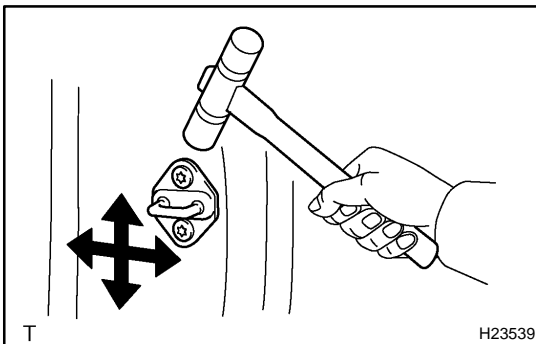
2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Adjust the door by loosening the door side hinge bolts.

HINT:

Substitute the standard bolt for the centering bolt (see page [BO-7](#)).

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)



3. ADJUST DOOR LOCK STRIKER

- Check that the door fit and door lock linkages are adjusted correctly.
- Adjust the striker position by slightly loosening the striker mounting screws and hitting the striker with a hammer.
- Tighten the striker mounting screws again.

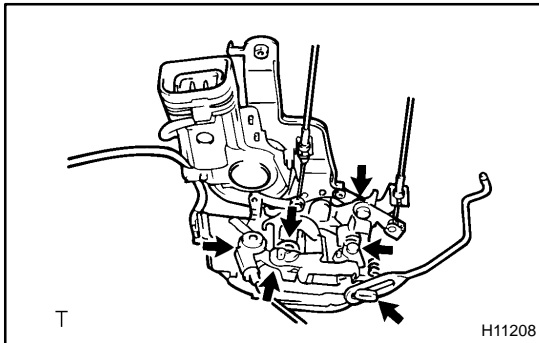
Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

REASSEMBLY

1. INSTALL OUTSIDE HANDLE WITH DOOR LOCK CYLINDER

- (a) Install the door lock cylinder to the outside handle.
- (b) Install the outside handle with door lock cylinder with the 2 bolts.

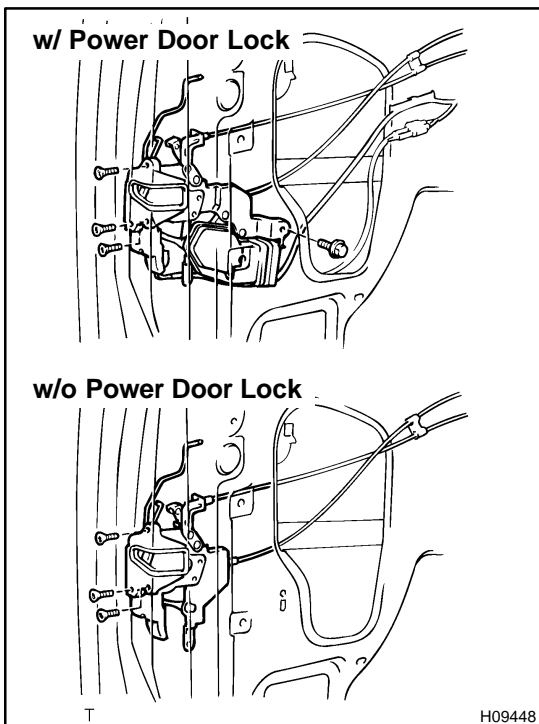
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)



2. INSTALL DOOR LOCK

HINT:

Apply MP grease to the sliding and rotating parts of the door lock.



- (a) Using a torx® socket wrench, install the door lock with the 3 torx® screws.

Torx® socket wrench:

T30 (Part No. 09042-00010 or locally manufactured tool)

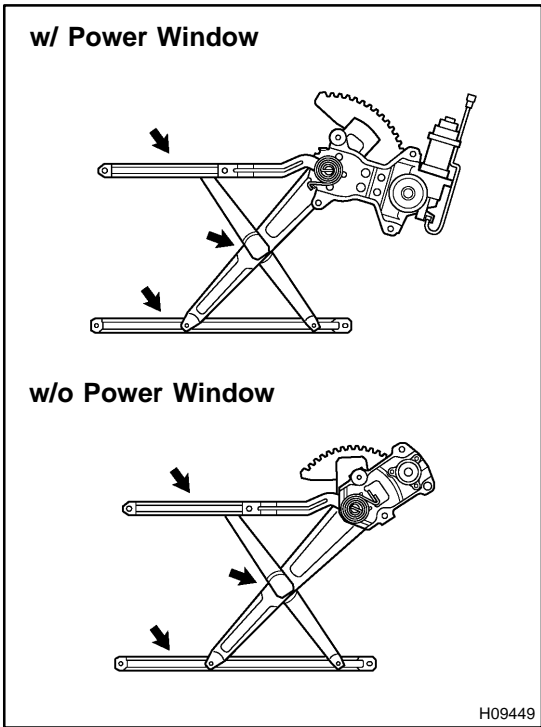
Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

HINT:

Apply adhesive to the 3 screws.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

- (b) w/ Power door lock:
Connect the connector and install the bolt.
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)
- (c) Connect the 2 links to the outside handle and door lock cylinder.

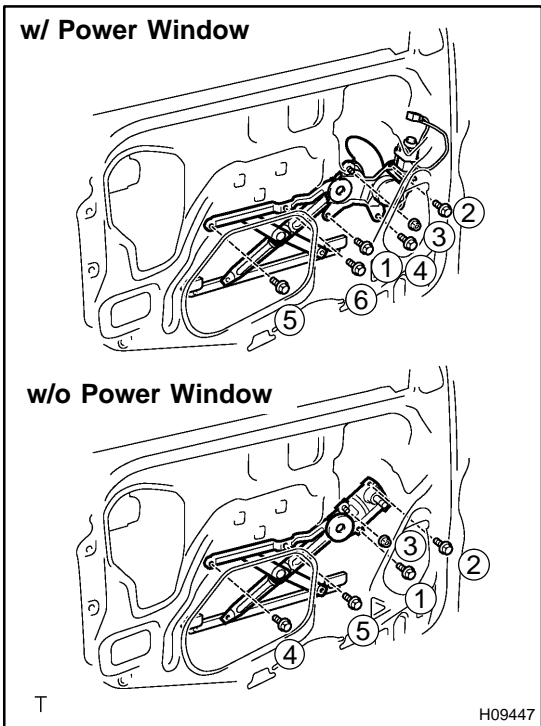


3. INSTALL WINDOW REGULATOR

HINT:

Apply MP grease to the sliding and rotating parts of the window regulator.

- (a) Install the window regulator through the service hole.



- (b) w/ Power window:

Install the window regulator with the 5 bolts and nut.

Torque:

8.0 N·m (82 kgf·cm, 71 in.-lbf) for bolt

5.0 N·m (51 kgf·cm, 44 in.-lbf) for nut

HINT:

When installing the window regulator, tighten the bolts and nut in the order shown in the illustration.

- (c) w/o Power window:

Install the window regulator with the 4 bolts and nut.

Torque:

5.0 N·m (82 kgf·cm, 71 in.-lbf) for bolt

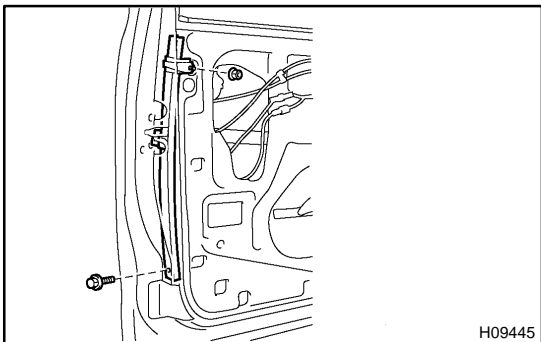
5.0 N·m (51 kgf·cm, 44 in.-lbf) for nut

HINT:

When installing the window regulator, tighten the bolts and nut in the order shown in the illustration.

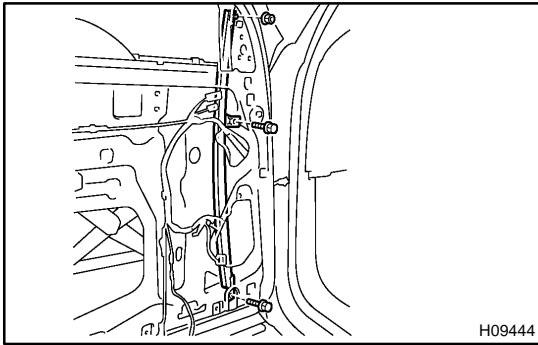
- (d) w/ Power window:

Connect the connector.

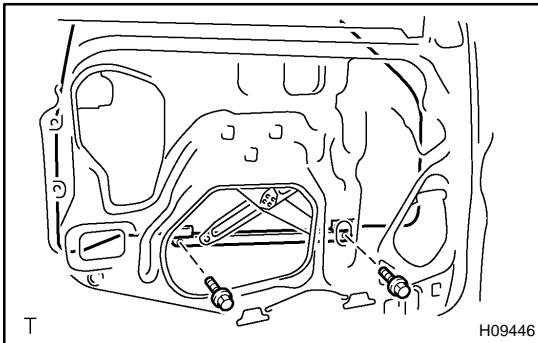


4. INSTALL REAR LOWER FRAME

Install the rear lower frame with the bolt and nut.

**5. INSTALL FRONT LOWER FRAME**

Install the front lower frame with the 2 bolts and nut.

6. INSTALL DOOR GLASS RUN**7. INSTALL DOOR GLASS**

Install the door glass with the 2 bolts.

Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

NOTICE:

Do not damage the door glass.

8. INSTALL DOOR BELT MOULDING**9. INSTALL OUTSIDE REAR VIEW MIRROR**

(a) Install the outside rear view mirror with the 3 screws.

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

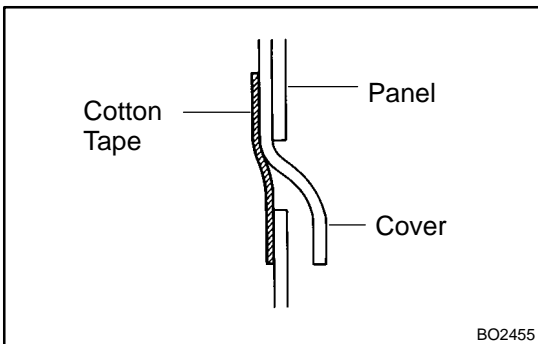
(b) w/ Remote control:

Connect the connector.

10. INSTALL SPEAKER

(a) Install the speaker with the 3 screws.

(b) Connect the connector.

**11. INSTALL SERVICE HOLE COVER**

(a) Install the service hole cover.

HINT:

- ◆ When installing the service hole cover, pull out the cables and connectors through the service hole cover.
- ◆ There should be no wrinkles or folds after attaching the service hole cover.
- ◆ After attaching the service hole cover, confirm the sealing condition.

(b) Connect the clamps and connector.

12. INSTALL INSIDE HANDLE

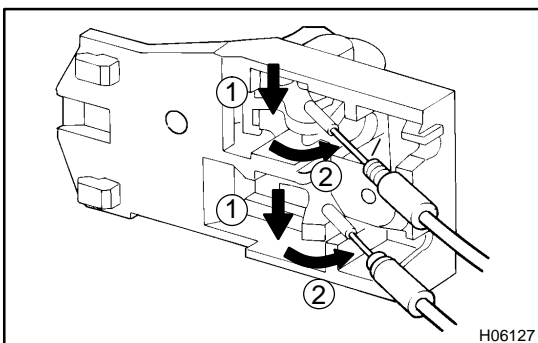
(a) Connect the 2 cables to the inside handle.

(b) Slide the inside handle forward to install it.

(c) Install the screw.

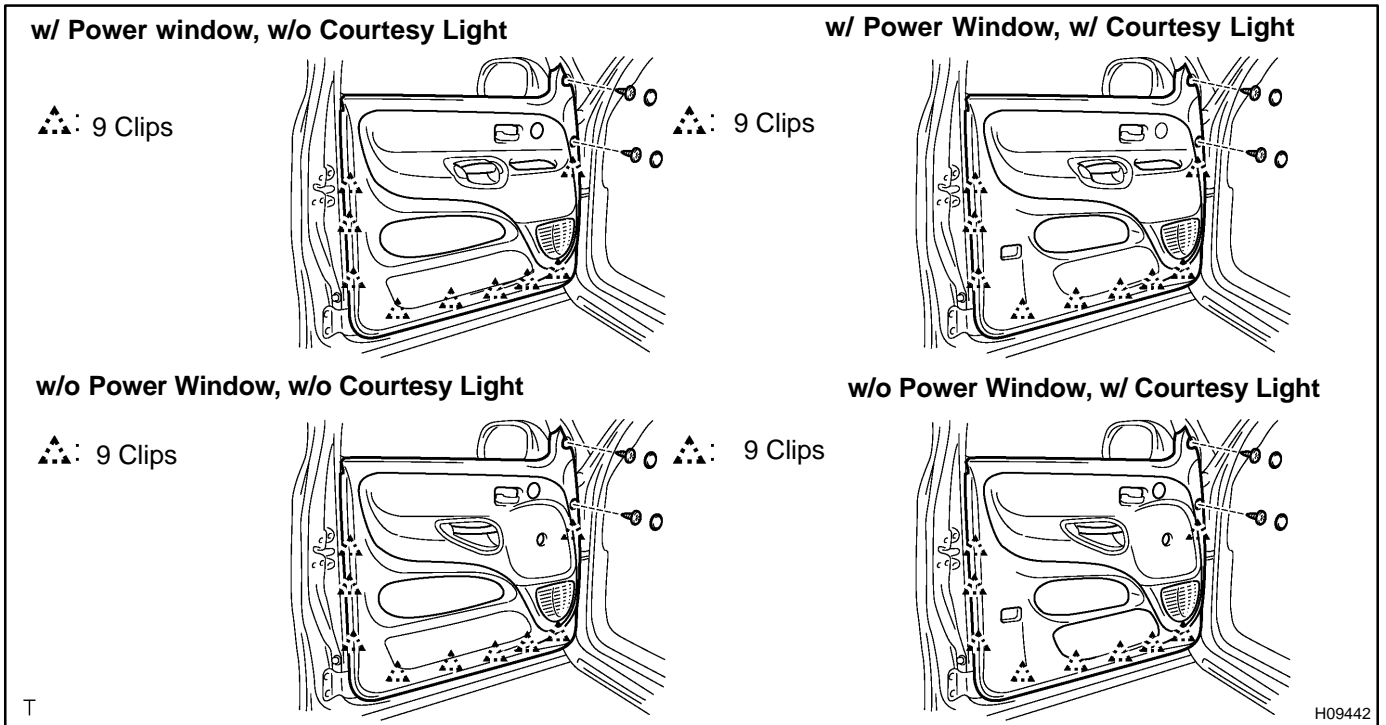
13. INSTALL DOOR ASSIST GRIP

Install the door assist grip to the door trim with the 2 screws..

14. INSTALL LOWER WEATHERSTRIP**15. INSTALL INNER WEATHERSTRIP**

16. INSTALL DOOR TRIM

Install the door trim with the 2 screws and 2 caps.



17. w/ Tweeter speaker:

INSTALL TWEETER SPEAKER

- (a) Install the tweeter speaker with the 3 screws, then connect the connector.
- (b) Install the tweeter speaker cover.

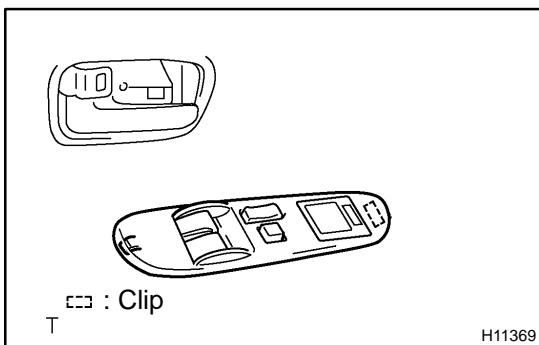
18. w/ Courtesy light:

INSTALL COURTESY LIGHT

- (a) Connect the connector.
- (b) Install the courtesy light.

19. w/o Courtesy light:

INSTALL COURTESY LIGHT COVER



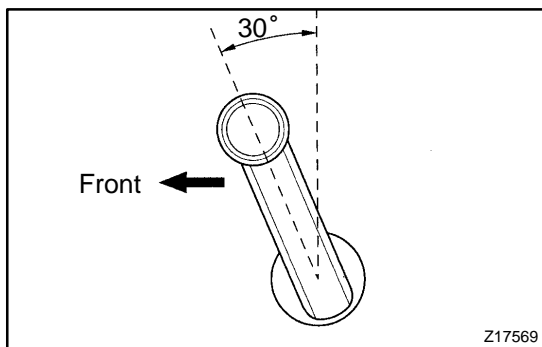
20. w/ Power window:

INSTALL POWER WINDOW SWITCH

- (a) Connect the connectors.
- (b) Install the power window switch.

21. INSTALL INSIDE HANDLE BEZEL

Install the inside handle bezel with the screw.



**22. w/o Power window:
INSTALL REGULATOR HANDLE**

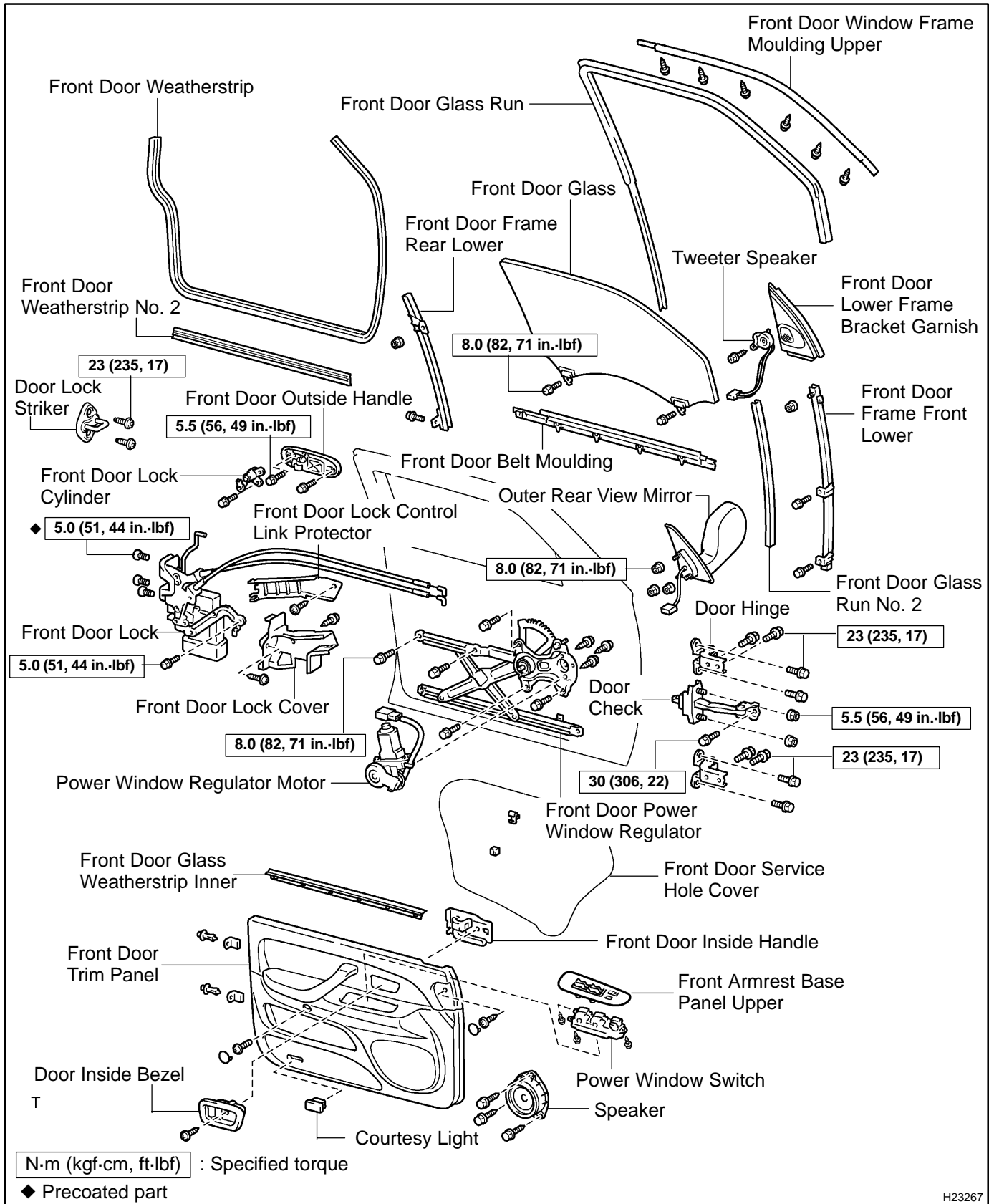
Install the regulator handle with the snap ring.

HINT:

With the door window fully closed, install the plate and the regulator handle with the snap ring as shown in the illustration.

FRONT DOOR (Double Cab) COMPONENTS

BO4PQ-01



H23267

DISASSEMBLY

HINT:

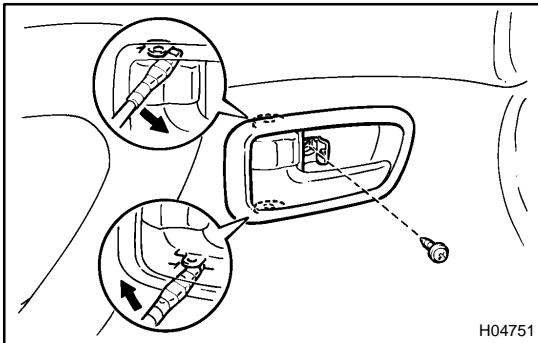
A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. REMOVE DOOR INSIDE BEZEL

- (a) Using a screwdriver, open the cover.

HINT:

Tape the screwdriver tip before use.



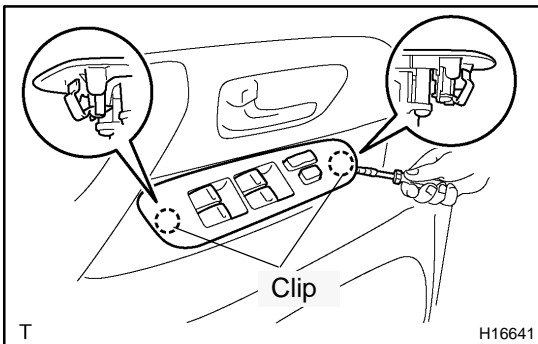
- (b) Remove the screw.

- (c) Using a screwdriver, remove the door inside bezel, as shown in the illustration.

HINT:

Tape the screwdriver tip before use.

2. REMOVE COURTESY LIGHT



3. REMOVE FRONT ARMREST BASE PANEL UPPER WITH POWER WINDOW SWITCH

- (a) Using a screwdriver, remove the front armrest base panel upper together with the power window switch.

HINT:

Tape the screwdriver tip before use.

- (b) Disconnect the connector.

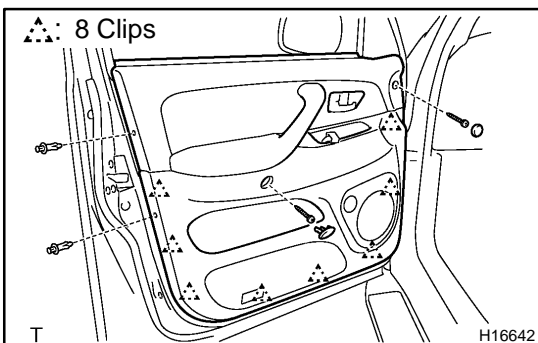
- (c) Remove the power window switch from the front armrest base panel upper.

4. REMOVE FRONT DOOR LOWER FRAME BRACKET GARNISH

Using a screwdriver, remove the front door lower frame bracket garnish.

HINT:

Tape the screwdriver tip before use.



5. REMOVE FRONT DOOR TRIM PANEL

- (a) Using a screwdriver, remove the 2 caps.

HINT:

Tape the screwdriver tip before use.

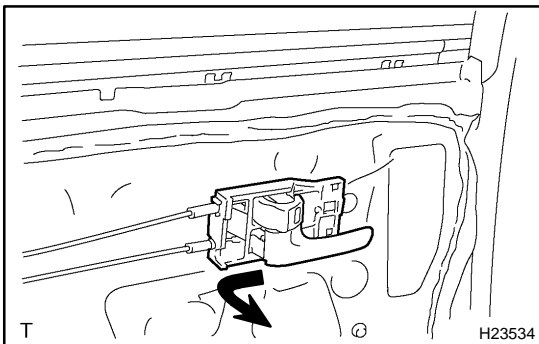
- (b) Remove the 2 screws and 2 clips.

- (c) Insert a screwdriver between the front door trim panel and front door panel to remove the front door trim panel.

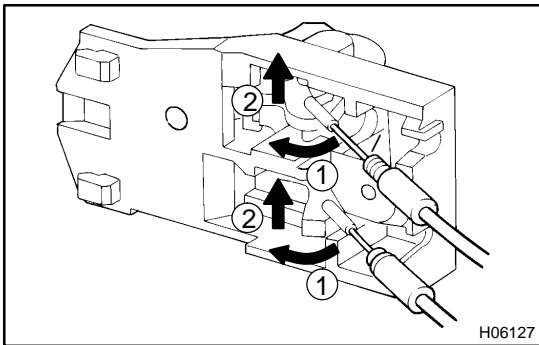
HINT:

Tape the screwdriver tip before use.

- (d) Pull the front door trim panel upward to remove the front door trim panel.
- (e) Remove the front door glass weatherstrip inner from the front door trim panel.
- 6. REMOVE TWEETER SPEAKER**
- 7. REMOVE OUTER REAR VIEW MIRROR**
- (a) Disconnect the connector.
- (b) Remove the 3 bolts and outer rear view mirror.
- 8. REMOVE SPEAKER**
- (a) Disconnect the connector.
- (b) Remove the 3 screws and speaker.



- 9. REMOVE FRONT DOOR INSIDE HANDLE**
- (a) Slide the front door inside handle backward to remove it.



- (b) Disconnect the 2 cables from the front door inside handle, as shown in the illustration.
- 10. REMOVE FRONT DOOR SERVICE HOLE COVER**
- (a) Using a clip remover, remove the clamps and grommets.
- (b) Remove the front door service hole cover.

NOTICE:

Do not tear the front door service hole cover.

11. REMOVE FRONT DOOR GLASS

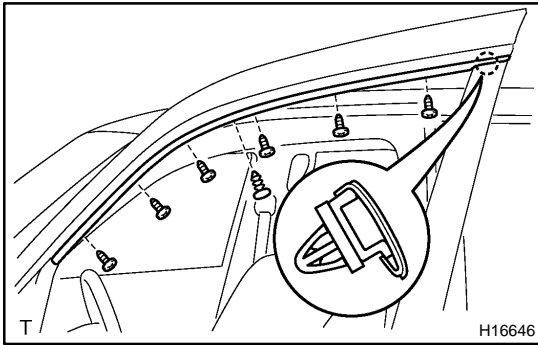
- (a) Open the front door glass until the bolts appear in the service hole.
- (b) Remove the 2 bolts.

NOTICE:

Do not damage the door glass.

- (c) Pull the front door glass upward to remove it.

12. REMOVE FRONT DOOR GLASS RUN

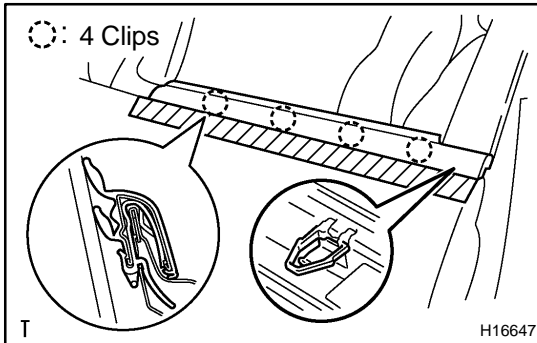


13. REMOVE FRONT DOOR WINDOW FRAME MOULDING UPPER

- (a) Remove the 6 screws.
- (b) Using a screwdriver or clip remover, remove the front door window frame moulding upper.

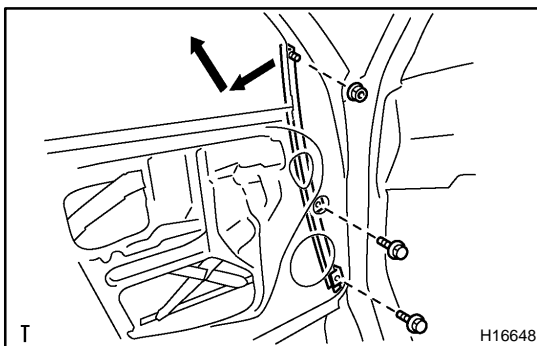
HINT:

Tape the screwdriver tip before use.



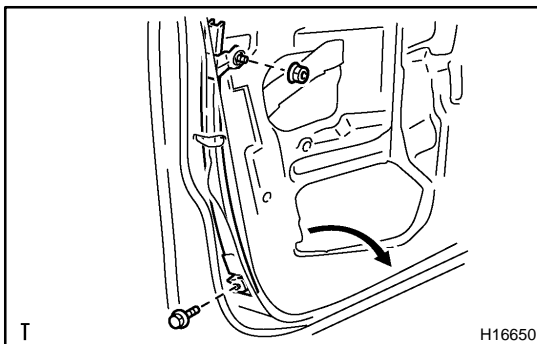
14. REMOVE FRONT DOOR BELT MOULDING

- (a) Apply protective tape to the outer surface, as shown in the illustration, to prevent the vehicle surface from being scratched.
- (b) Using a moulding remover, remove the front door belt moulding.



15. REMOVE FRONT DOOR FRAME FRONT LOWER

- (a) Remove the 2 bolts, nut and front door frame front lower, as shown in the illustration.
- (b) Remove the front door glass run No. 2 from the front door frame front lower.

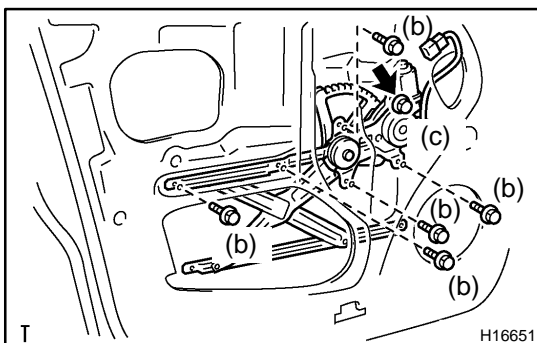


16. REMOVE FRONT DOOR FRAME REAR LOWER

Remove the bolt, nut and front door frame rear lower, as shown in the illustration.

HINT:

Remove the front door frame rear lower through the service hole.



17. REMOVE FRONT DOOR POWER WINDOW REGULATOR

- (a) Disconnect the connector.
- (b) Remove the 5 bolts.
- (c) Loosen the bolt, and remove the front door power window regulator.

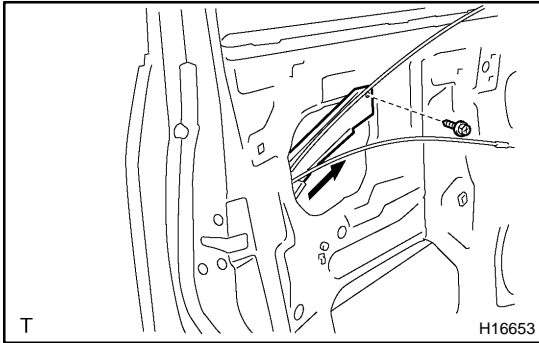
HINT:

Remove the front door power window regulator through the service hole.

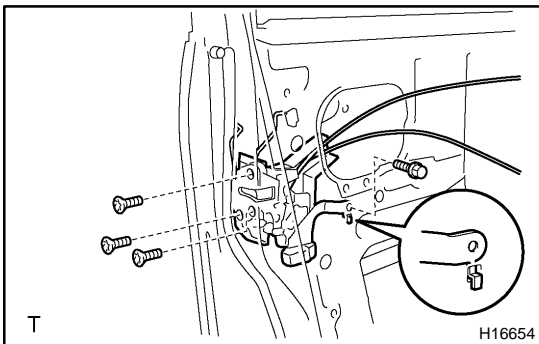
- (d) Remove the 3 screws and power window regulator motor from the front door power window regulator.

18. REMOVE FRONT DOOR LOCK

- (a) Disconnect the 2 control cables from the clamp.
- (b) Remove the clamp.



- (c) Remove the screw and front door lock control link protector.
- (d) Disconnect the 2 control links from the front door outside handle and front door lock cylinder.



- (e) Disconnect the connector and remove the bolt.
- (f) Using a torx® socket wrench, remove the 3 torx® screws.
Torx® socket wrench:
T30 (Part No. 09042-00010 or locally manufactured tool)
- (g) Remove the front door lock.

HINT:

Remove the front door lock through the service hole.

- (h) Remove the 2 screws and front door lock cover from the front door lock.

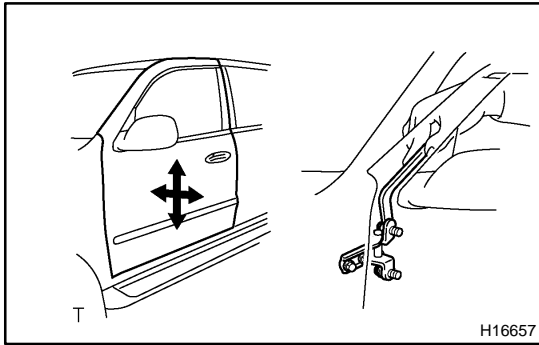
19. REMOVE FRONT DOOR OUTSIDE HANDLE WITH LOCK CYLINDER

- (a) Remove the service hole plug.
- (b) Remove the 2 bolts and front door outside handle together with lock cylinder.
- (c) Remove the bolt and lock cylinder from the front door outside handle.

20. REMOVE FRONT DOOR WEATHERSTRIP

Using a clip remover, remove the front door weatherstrip.

21. REMOVE FRONT DOOR WEATHERSTRIP NO. 2



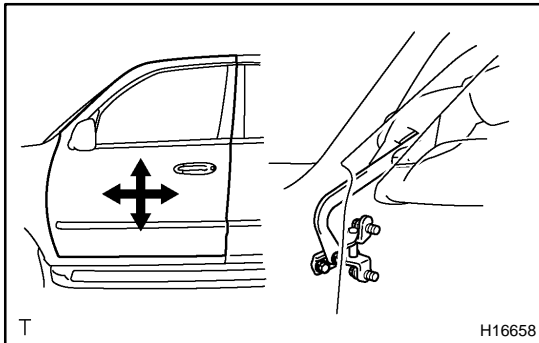
ADJUSTMENT

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812-00010

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)



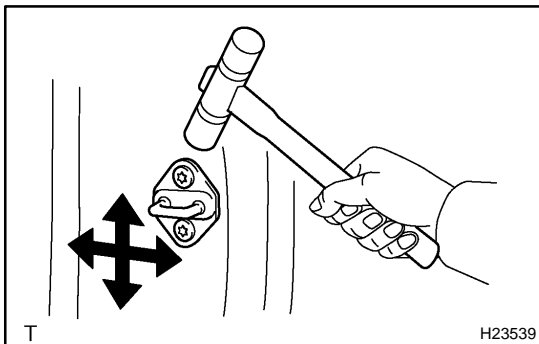
2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Adjust the door by loosening the door side hinge bolts.

HINT:

Substitute the standard bolt for the centering bolt (see page [BO-7](#)).

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)



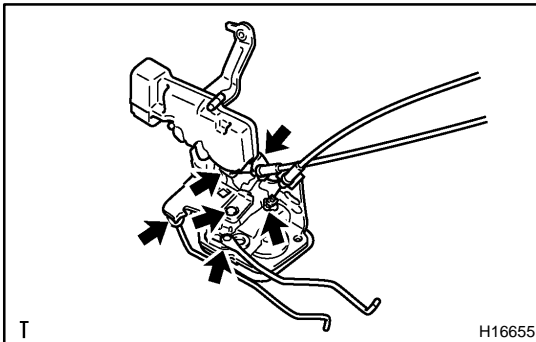
3. ADJUST DOOR LOCK STRIKER

- (a) Check that the door fit and door lock linkages are adjusted correctly.
- (b) Adjust the striker position by slightly loosening the striker mounting screws and hitting the striker with a hammer.
- (c) Tighten the striker mounting screws again.

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

REASSEMBLY

1. **INSTALL FRONT DOOR WEATHERSTRIP NO. 2**
2. **INSTALL FRONT DOOR WEATHERSTRIP**
3. **INSTALL FRONT DOOR OUTSIDE HANDLE WITH LOCK CYLINDER**
 - (a) Install the lock cylinder to the front door outside handle with the bolt.
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)
 - (b) Install the front door outside handle with lock cylinder with the 2 bolts.
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)
 - (c) Install the service hole plug.

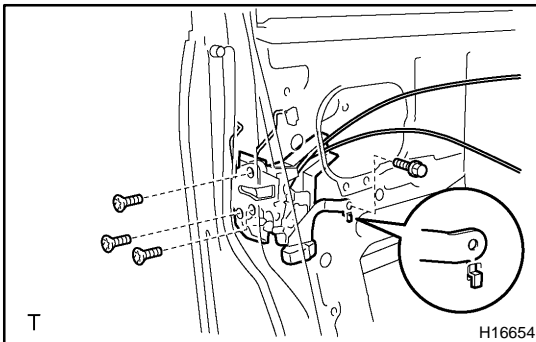


4. **INSTALL FRONT DOOR LOCK**

HINT:

Apply MP grease to the sliding and rotating parts of the front door lock.

- (a) Install the front door lock cover to the front door lock with the 2 screws.



- (b) Using a torx[®] socket wrench, install the front door lock with the 3 torx[®] screws.

Torx[®] socket wrench:

T30 (Part No. 09042-00010 or locally manufactured tool)

Torque:

5.0 N·m (51 kgf·cm, 44 in.-lbf) for bolt

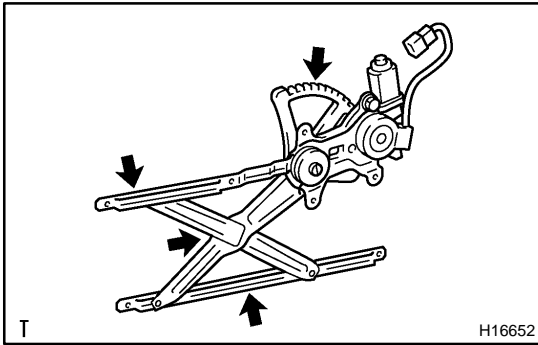
5.0 N·m (51 kgf·cm, 44 in.-lbf) for screw

HINT:

Apply adhesive to the 3 screws.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent.

- (c) Connect the connector and tighten the bolt.
- (d) Connect the 2 control links to the front door outside handle and front door lock cylinder.
- (e) Install the front door lock control link protector with the screw.
- (f) Install the clamp.
- (g) Connect the 2 control cables to the clamp.

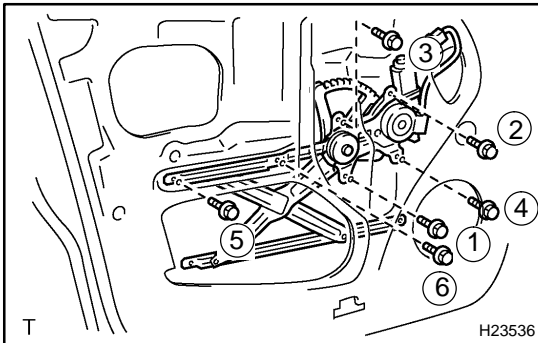


5. INSTALL FRONT DOOR POWER WINDOW REGULATOR

HINT:

Apply MP grease to the sliding and rotating parts of the front door power window regulator.

- (a) Install the power window regulator motor to the front door power window regulator with the 3 screws.



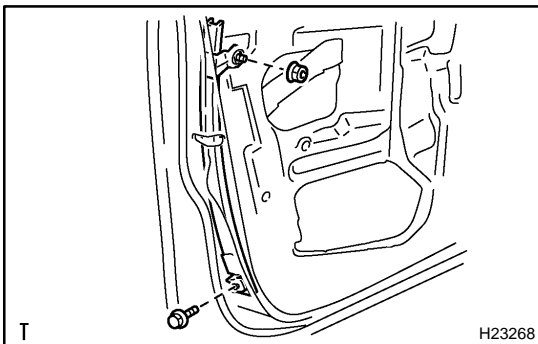
- (b) Install the front door power window regulator with the 6 bolts.

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

HINT:

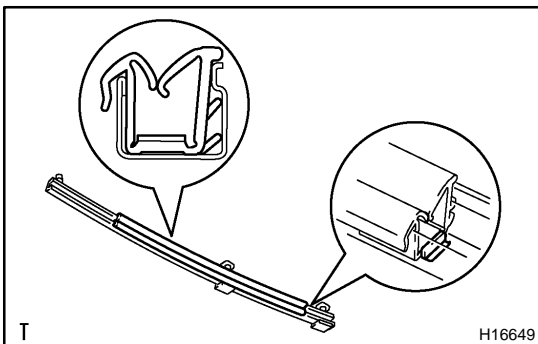
Tighten the 6 bolts in the order shown in the illustration.

- (c) Connect the connector.



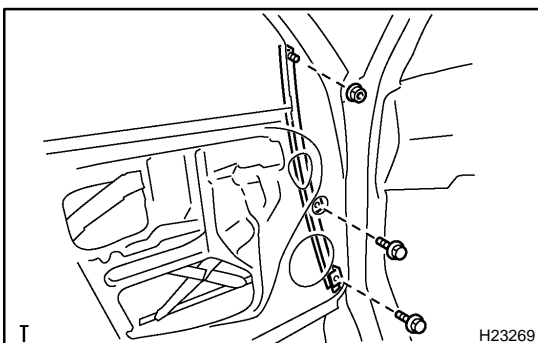
6. INSTALL FRONT DOOR FRAME REAR LOWER

Install the front door frame rear lower with the bolt and nut.



7. INSTALL FRONT DOOR FRAME FRONT LOWER

- (a) Install the front door glass run No. 2 to the front door frame front lower.



- (b) Install the front door frame front lower with the 2 bolts and nut.

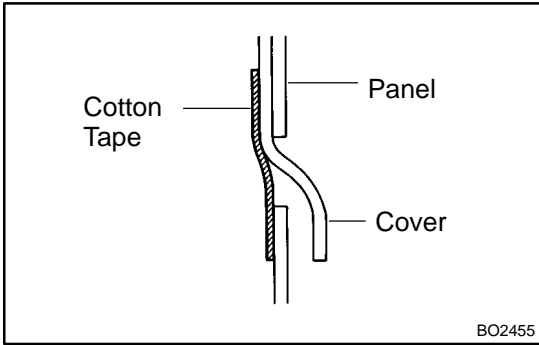
8. INSTALL FRONT DOOR BELT MOULDING

9. INSTALL FRONT DOOR WINDOW FRAME MOULDING UPPER

10. INSTALL FRONT DOOR GLASS RUN

11. INSTALL FRONT DOOR GLASS

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)



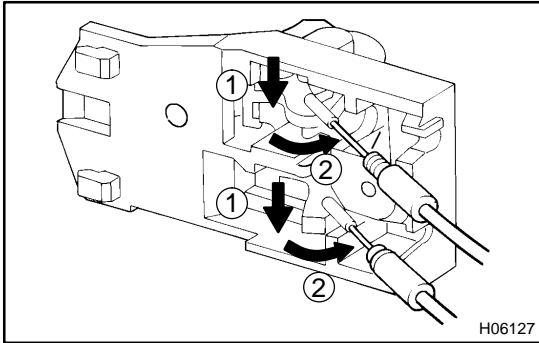
12. INSTALL FRONT DOOR SERVICE HOLE COVER

(a) Install the front door service hole cover.

HINT:

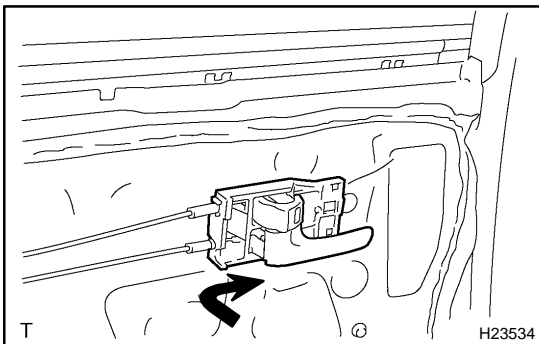
- ◆ When installing the service hole cover, pull out the cables and connectors through the service hole cover.
- ◆ There should be no wrinkles or folds after attaching the service hole cover.
- ◆ After attaching the service hole cover, confirm the sealing condition.

(b) Connect the clamps and connector.



13. INSTALL FRONT DOOR INSIDE HANDLE

(a) Connect the 2 cables to the inside handle.



(b) Slide the inside handle forward to install it.

14. INSTALL SPEAKER

15. INSTALL OUTER REAR VIEW MIRROR

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

16. INSTALL TWEETER SPEAKER

17. INSTALL FRONT DOOR TRIM PANEL

18. INSTALL FRONT DOOR LOWER FRAME BRACKET GARNISH

19. INSTALL FRONT ARMREST BASE PANEL UPPER WITH POWER WINDOW SWITCH

20. INSTALL COURTESY LIGHT

21. INSTALL DOOR INSIDE BEZEL

DISASSEMBLY

HINT:

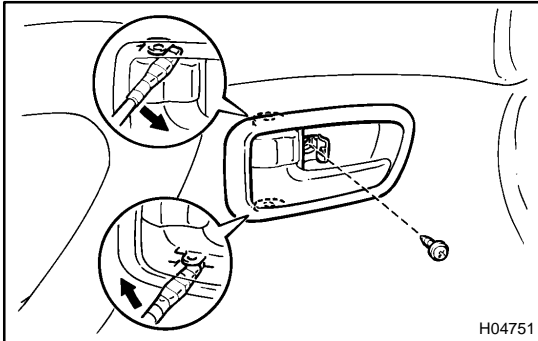
A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. REMOVE DOOR INSIDE BEZEL

- (a) Using a screwdriver, open the cover.

HINT:

Tape the screwdriver tip before use.



- (b) Remove the screw.

- (c) Using a screwdriver, remove the door inside bezel, as shown in the illustration.

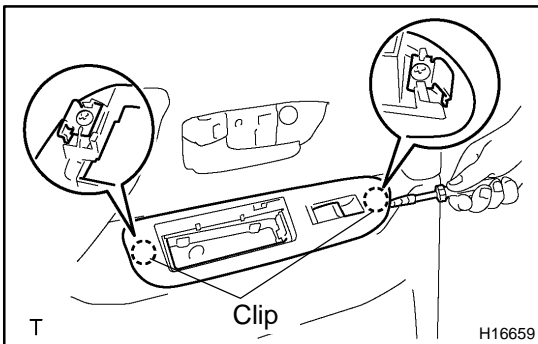
HINT:

Tape the screwdriver tip before use.

2. REMOVE COURTESY LIGHT

3. REMOVE REAR ARMREST BASE PANEL UPPER

- (a) Remove the rear ash receptacle.



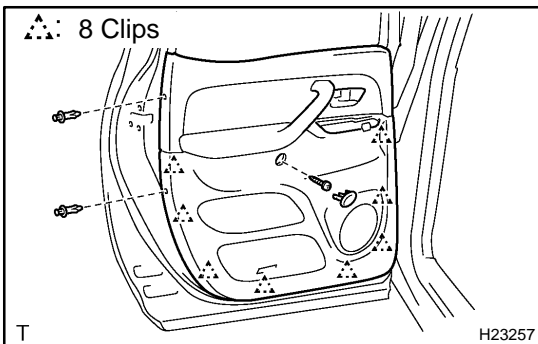
- (b) Using a screwdriver, remove the rear armrest base panel upper together with the power window switch.

HINT:

Tape the screwdriver tip before use.

- (c) Disconnect the connector.

- (d) Remove the power window switch from the rear armrest base panel upper.



4. REMOVE REAR DOOR TRIM PANEL

- (a) Using a screwdriver, remove the cap.

HINT:

Tape the screwdriver tip before use.

- (b) Remove the screw and 2 clips.

- (c) Insert a screwdriver between the rear door trim panel and door panel to remove the rear door trim panel.

HINT:

Tape the screwdriver tip before use.

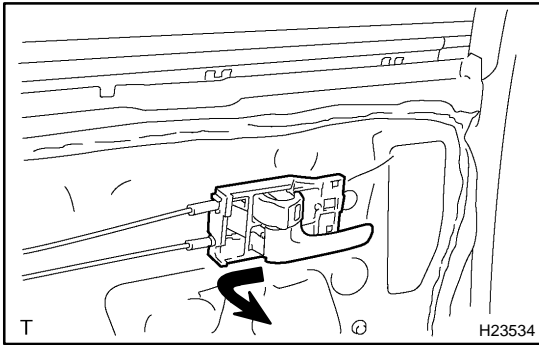
- (d) Pull the rear door trim panel upward to remove the rear door trim panel.

- (e) Remove the rear door weatherstrip inner from the rear door trim panel.

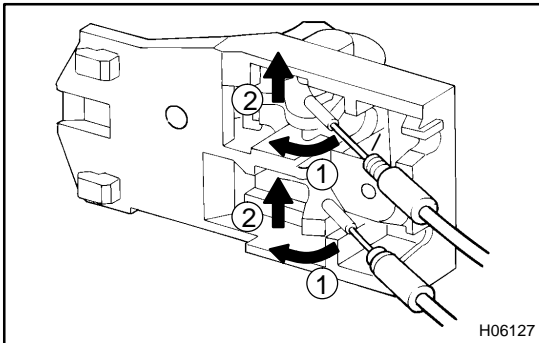
5. REMOVE SPEAKER

- (a) Disconnect the connector.

- (b) Remove the 3 screws and speaker.

**6. REMOVE REAR DOOR INSIDE HANDLE**

- (a) Slide the rear door inside handle backward to remove it.



- (b) Disconnect the 2 cables from the rear door inside handle, as shown in the illustration.

7. REMOVE REAR DOOR SERVICE HOLE COVER

- (a) Using a clip remover, remove the clamp and grommets.
 (b) Remove the rear door service hole cover.

NOTICE:

Do not tear the rear door service hole cover.

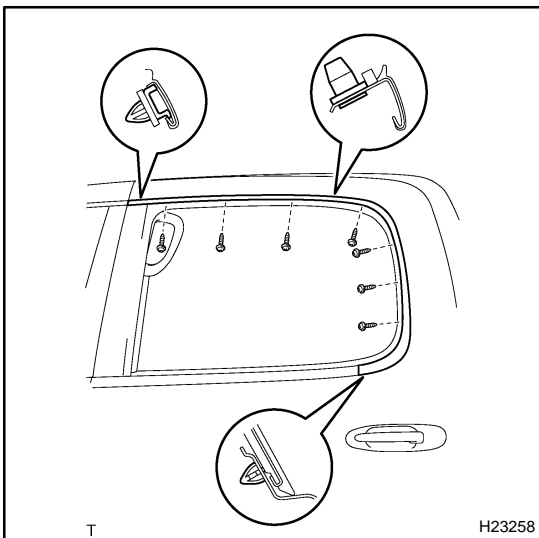
8. REMOVE REAR DOOR GLASS

- (a) Open the rear door glass until the bolts appear in the service hole.
 (b) Remove the 2 bolts.

NOTICE:

Do not damage the door glass.

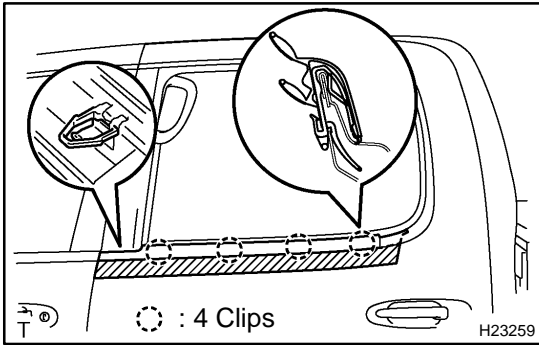
- (c) Pull the rear door glass upward to remove it.

9. REMOVE REAR DOOR GLASS RUN**10. REMOVE REAR DOOR WINDOW FRAME MOULDING UPPER**

- (a) Remove the 7 screws.
 (b) Using a screwdriver or clip remover, remove the rear door window frame moulding upper.

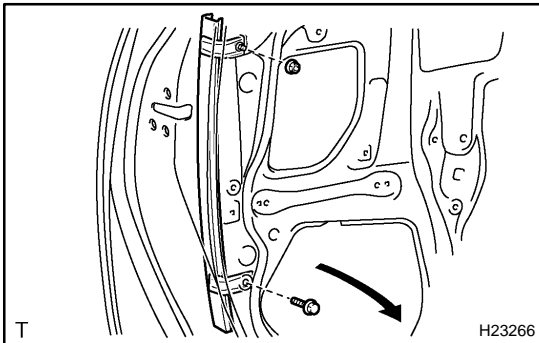
HINT:

Tape the screwdriver tip before use.



11. REMOVE REAR DOOR BELT MOULDING

- (a) Apply protective tape to the outer surface, as shown in the illustration, to prevent the vehicle surface from being scratched.
- (b) Using a moulding remover, remove the rear door belt moulding.

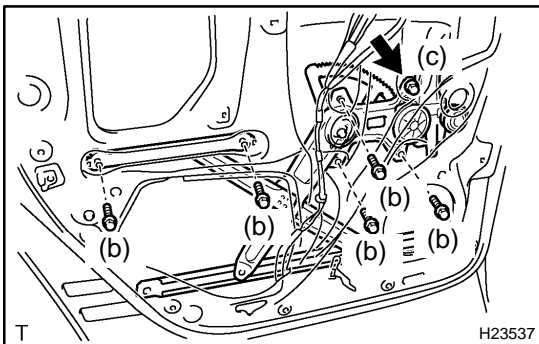


12. REMOVE REAR DOOR WINDOW FRAME REAR LOWER

Remove the bolt, nut and rear door window frame rear lower, as shown in the illustration.

HINT:

Remove the rear door window frame rear lower through the service hole.



13. REMOVE REAR DOOR POWER WINDOW REGULATOR

- (a) Disconnect the connector.
- (b) Remove the 5 bolts.
- (c) Loosen the bolt, and remove the rear door power window regulator.

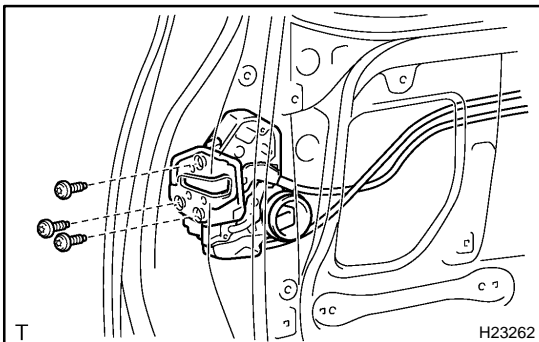
HINT:

Remove the rear door power window regulator through the service hole.

- (d) Remove the 3 screws and power window regulator motor from the rear door power window regulator.

14. REMOVE REAR DOOR LOCK

- (a) Disconnect the 2 control cables from the clamp.
- (b) Remove the clamp.
- (c) Disconnect the connector.



- (d) Using a torx® socket wrench, remove the 3 torx® screws.
Torx® socket wrench:
T30 (Part No. 09042-00010 or locally manufactured tool)

- (e) Remove the rear door lock.

HINT:

Remove the rear door lock through the service hole.

15. REMOVE REAR DOOR OUTSIDE HANDLE

Remove the 2 bolts and rear door outside handle.

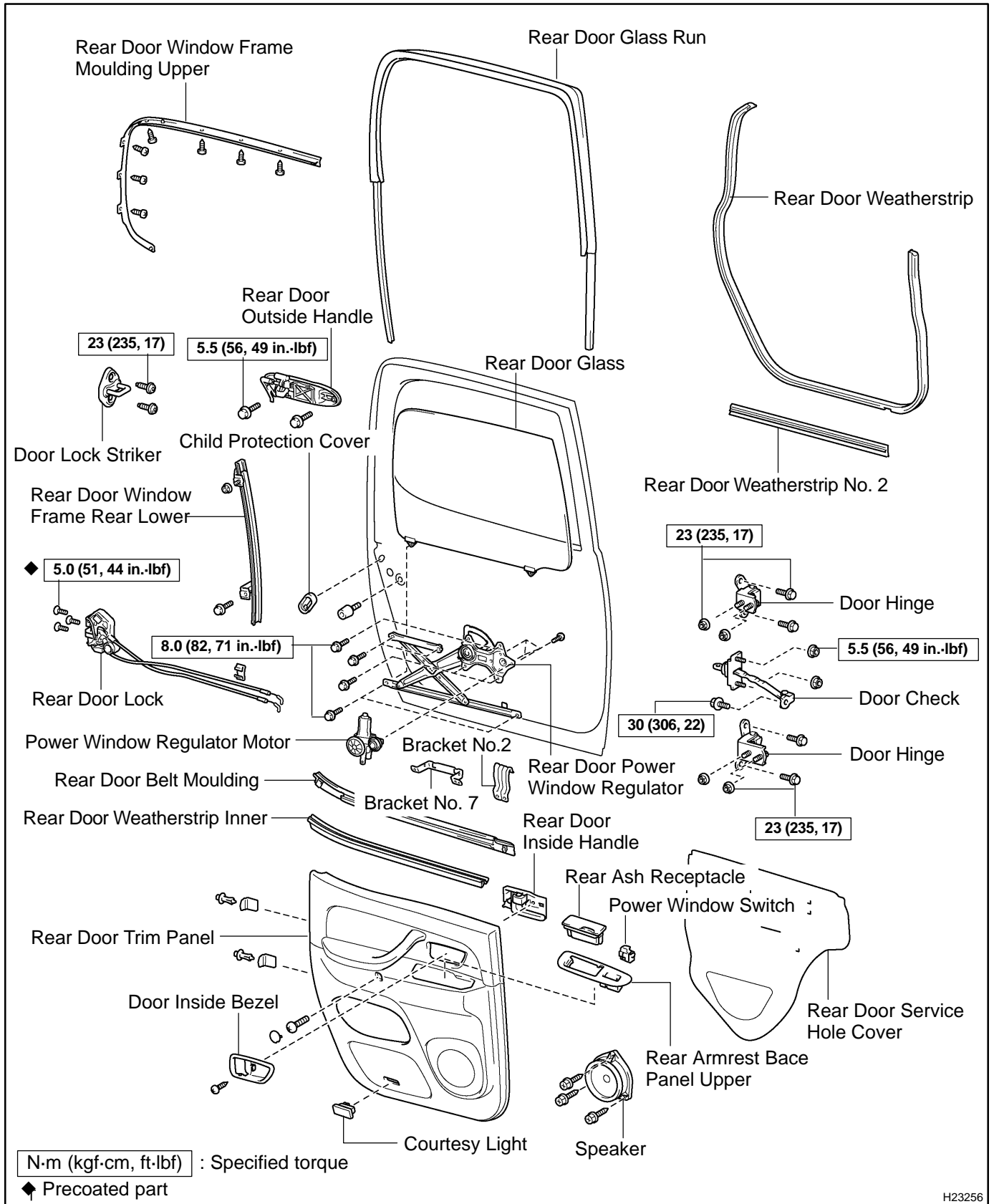
16. REMOVE REAR DOOR WEATHERSTRIP

Using a clip remover, remove the rear door weatherstrip.

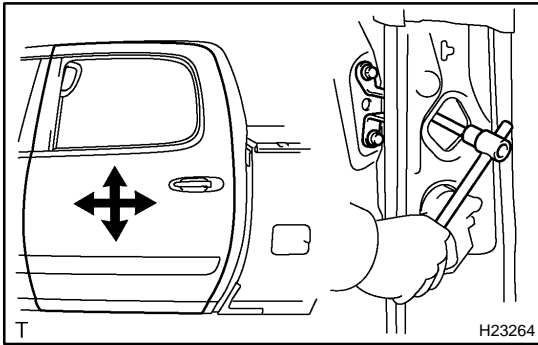
17. REMOVE REAR DOOR WEATHERSTRIP NO. 2

REAR DOOR (Double Cab) COMPONENTS

BO4PU-01



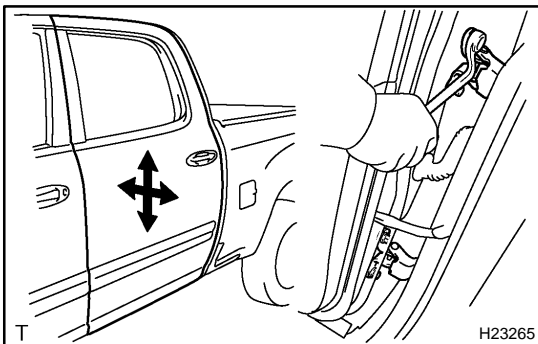
H23256



ADJUSTMENT

1. ADJUST DOOR IN FORWARD/ REARWARD AND VERTICAL DIRECTIONS

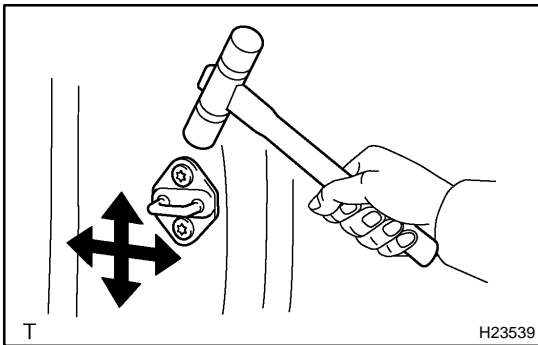
- Remove the front and rear door scuff plates.
- Remove the center pillar lower garnish.
- Remove the front seat outer belt (see page [BO-133](#)).
- Loosen the body side hinge nuts to adjust.
Torque: 23 N·m (230 kgf-cm, 17 ft-lbf)
- Install the front seat outer belt and center pillar lower garnish (see page [BO-133](#)).
- Install the front and rear door scuff plates.



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.

Torque: 23 N·m (230 kgf-cm, 17 ft-lbf)

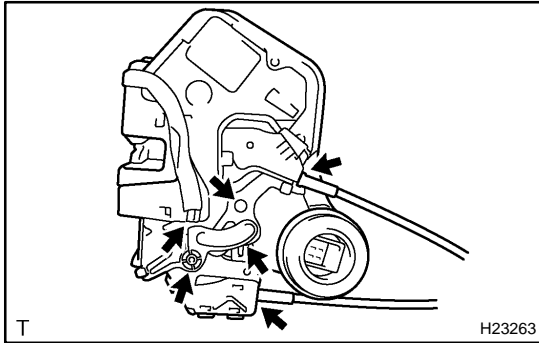


3. ADJUST DOOR LOCK STRIKER

- Check that the door fit and door lock linkages are adjusted correctly.
- Loosen the striker mounting screws to adjust.
Torque: 23 N·m (230 kgf-cm, 17 ft-lbf)
- Using a plastic hammer, tap the striker to adjust it.

REASSEMBLY

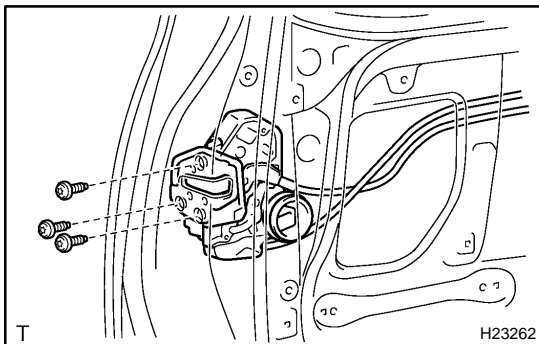
1. INSTALL REAR DOOR WEATHERSTRIP NO. 2
2. INSTALL REAR DOOR WEATHERSTRIP
3. INSTALL REAR DOOR OUTSIDE HANDLE
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)



4. INSTALL REAR DOOR LOCK

HINT:

Apply MP grease to the sliding and rotating parts of the front door lock.



- (a) Using a torx® socket wrench, install the rear door lock with the 3 torx® screws.

Torx® socket wrench:

T30 (Part No. 09042-00010 or locally manufactured tool)

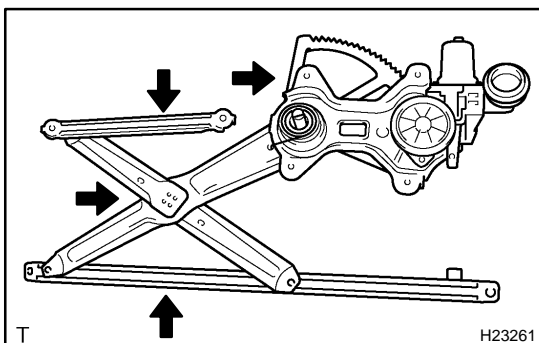
Torque: 5 N·m (51 kgf·cm, 44 in.-lbf)

HINT:

Apply adhesive to the 3 screws.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent.

- (b) Connect the connector.
- (c) Install the clamp.
- (d) Connect the 2 control cables to the clamp.

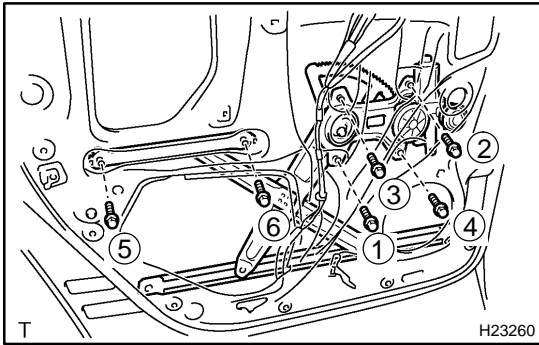


5. INSTALL REAR DOOR POWER WINDOW REGULATOR

HINT:

Apply MP grease to the rear door power window regulator.

- (a) Install the power window regulator motor to the rear door power window regulator with the 3 screws.



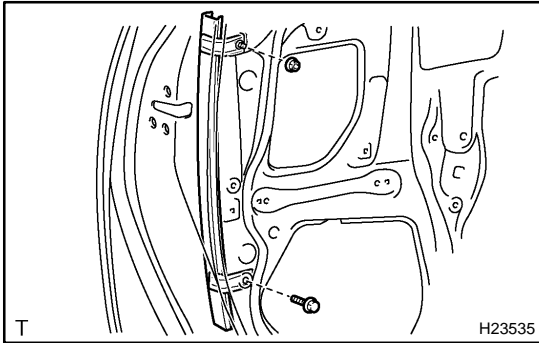
(b) Install the rear door power window regulator with the 6 bolts.

Torque: 8.0 N-m (82 kgf-cm, 71 in.-lbf)

HINT:

Tighten the 6 bolts in the order shown in the illustration.

(c) Connect the connector.



6. INSTALL REAR DOOR WINDOW FRAME REAR LOWER

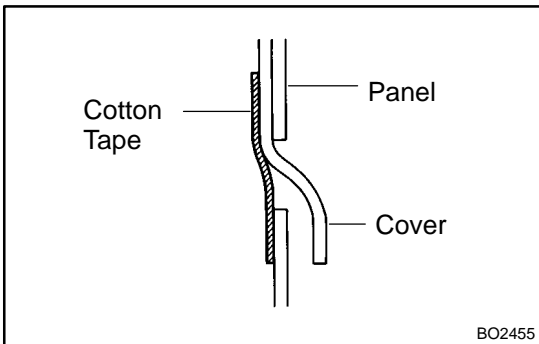
7. INSTALL REAR DOOR BELT MOULDING

8. INSTALL REAR DOOR WINDOW FRAME MOULDING UPPER

9. INSTALL REAR DOOR GLASS RUN

10. INSTALL REAR DOOR GLASS

Torque: 8.0 N-m (82 kgf-cm, 71 in.-lbf)



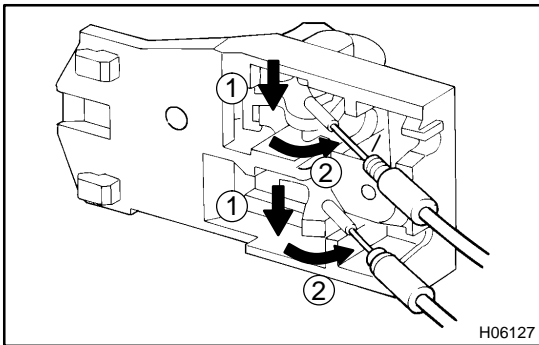
11. INSTALL REAR DOOR SERVICE HOLE COVER

(a) Install the service hole cover.

HINT:

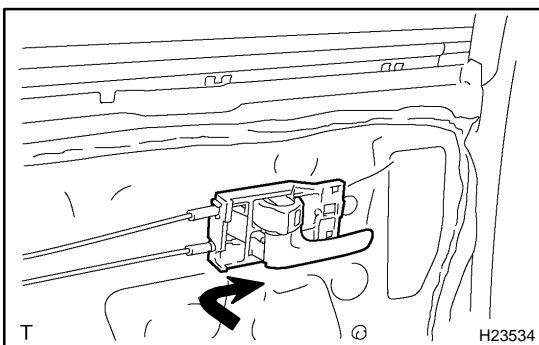
- ◆ When installing the service hole cover, pull out the cables and connectors through the service hole cover.
- ◆ There should be no wrinkles or folds after attaching the service hole cover.
- ◆ After attaching the service hole cover, confirm the sealing condition.

(b) Connect the clamps and connector.



12. INSTALL REAR DOOR INSIDE HANDLE

(a) Connect the 2 cables to the inside handle.



(b) Slide the inside handle forward to install it.

(c) Install the screw.

13. INSTALL SPEAKER

14. INSTALL REAR DOOR TRIM PANEL

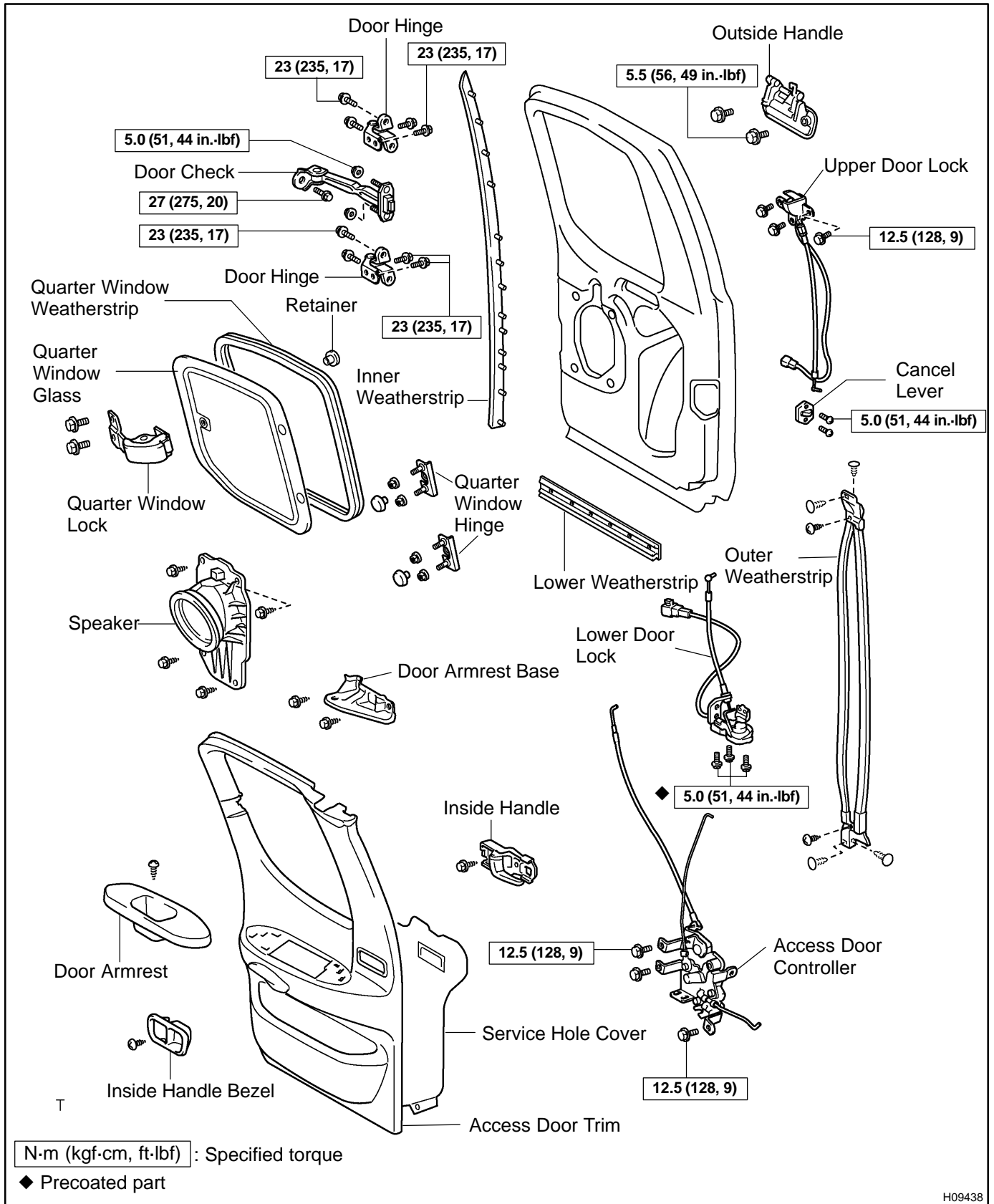
15. INSTALL REAR ARMREST BACE PANEL UPPER

16. INSTALL COURTESY LIGHT

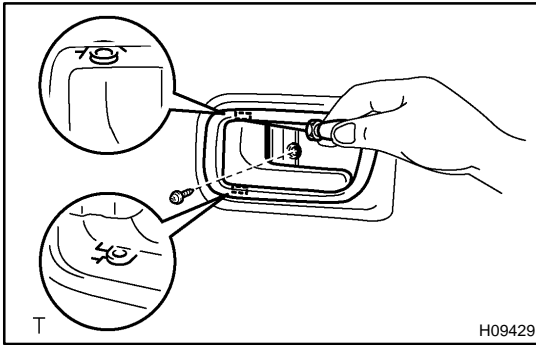
17. INSTALL DOOR INSIDE BEZEL

ACCESS DOOR COMPONENTS

BO2EN-02



H09438



DISASSEMBLY

HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. REMOVE DOOR INSIDE HANDLE BEZEL

- (a) Remove the screw.
- (b) Using a screwdriver, remove the door inside handle bezel.

HINT:

Tape the screwdriver tip before use.

2. REMOVE DOOR ARMREST

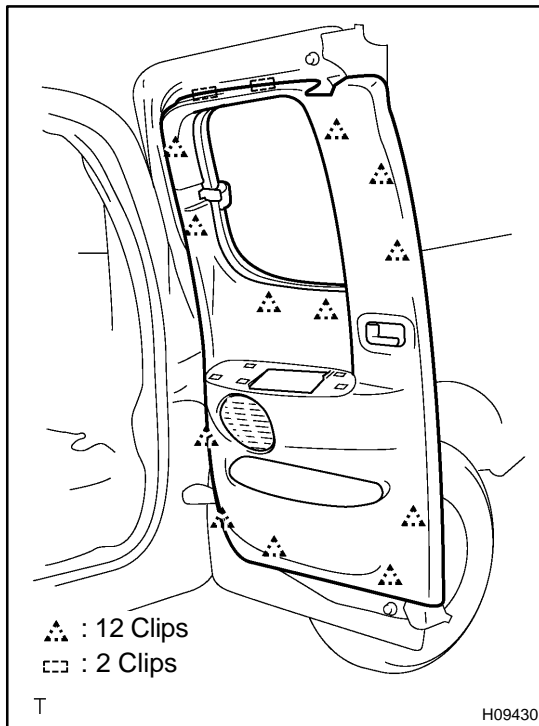
- (a) Remove the screw.
- (b) Using a screwdriver, remove the door armrest.

HINT:

Tape the screwdriver tip before use.

3. REMOVE ACCESS DOOR TRIM

- (a) Release the quarter window lock.



- (b) Insert a screwdriver between the door trim and door panel to remove the door trim.

HINT:

Tape the screwdriver tip before use.

4. REMOVE DOOR ARMREST BASE

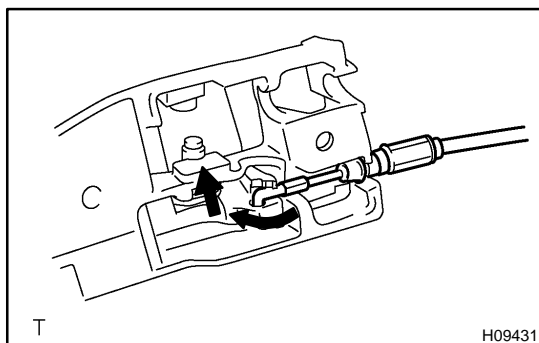
Remove the 2 screws and door armrest base.

5. REMOVE SPEAKER

- (a) Disconnect the connector.
- (b) Remove the 4 screws and speaker.

6. REMOVE DOOR INSIDE HANDLE

- (a) Remove the screw and slide the inside handle forward.



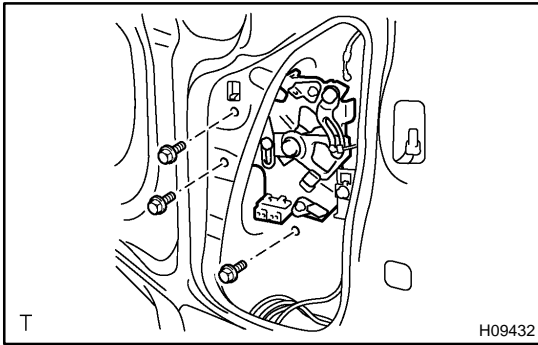
- (b) Disconnect the cable as shown in the illustration.

7. REMOVE SERVICE HOLE COVER

- (a) Disconnect the connector.
- (b) Remove the service hole cover.

HINT:

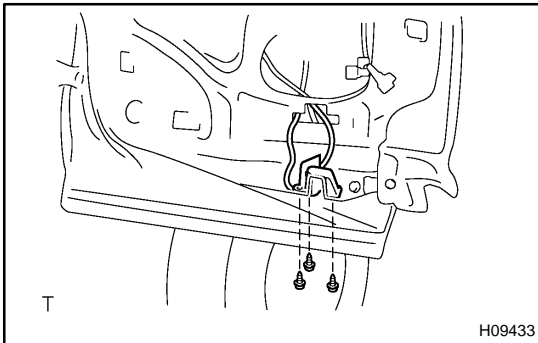
Bring out the cable and connector through the service hole cover.

**8. REMOVE ACCESS DOOR CONTROLLER**

- (a) Disconnect the 2 cables and 2 links.
- (b) Disengage the 2 clamps.
- (c) Remove the 3 bolts and access door controller.

9. REMOVE LOWER DOOR LOCK

- (a) Disconnect the connector.



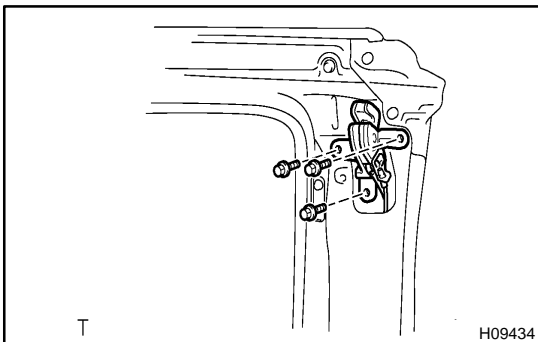
- (b) Using a torx® socket wrench, remove the 3 torx® screws and lower door lock.

Torx® socket wrench:

T30 (Part No. 09042-00010 or locally manufactured tool)

10. REMOVE UPPER DOOR LOCK

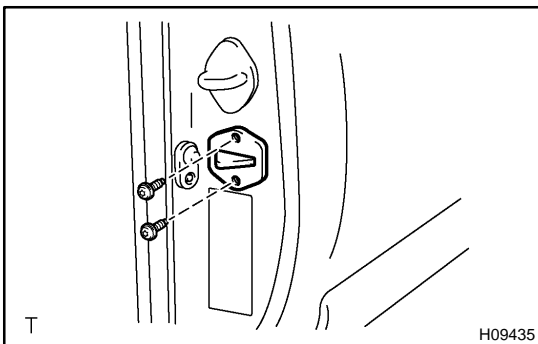
- (a) Disconnect the connector.



- (b) Remove the 3 bolts and upper door lock.

11. REMOVE OUTSIDE HANDLE

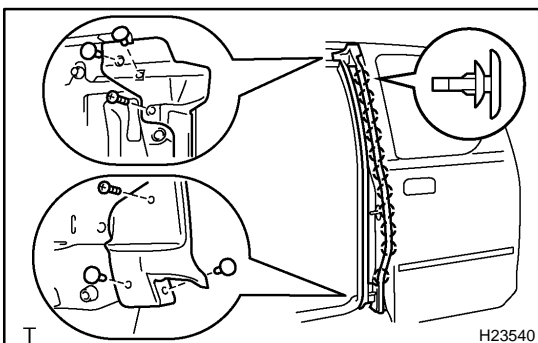
Remove the 2 bolts and outside handle.

**12. REMOVE CANCEL LEVER**

Using a torx® socket wrench, remove the 2 torx® screws and cancel lever.

Torx® socket wrench:

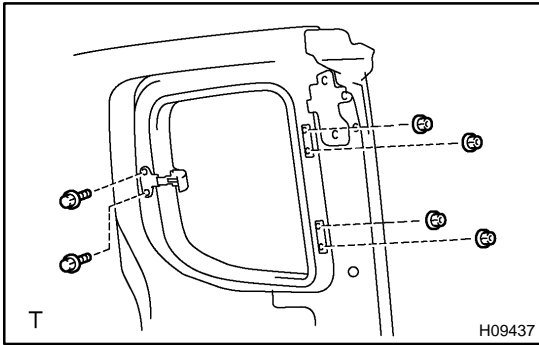
T30 (Part No. 09042-00010 or locally manufactured tool)

**13. REMOVE OUTER WEATHERSTRIP**

- (a) Remove the 2 screws and 4 clips.
- (b) Using a clip remover, remove the outer weatherstrip.

14. REMOVE INNER WEATHERSTRIP

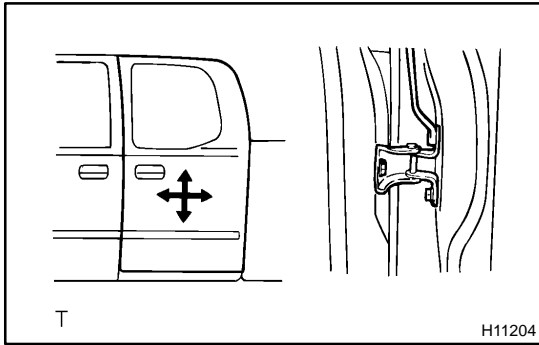
Using a clip remover, remove the inner weatherstrip.

**15. REMOVE QUARTER WINDOW AND WEATHERSTRIP**

- (a) Remove the 2 bolts, 4 nuts and quarter window.
- (b) Remove the weatherstrip.

16. REMOVE QUARTER WINDOW LOCK AND HINGES

- (a) Remove the screws and window lock from the quarter window.
- (b) Remove the 2 screws and 2 hinges from the quarter window.

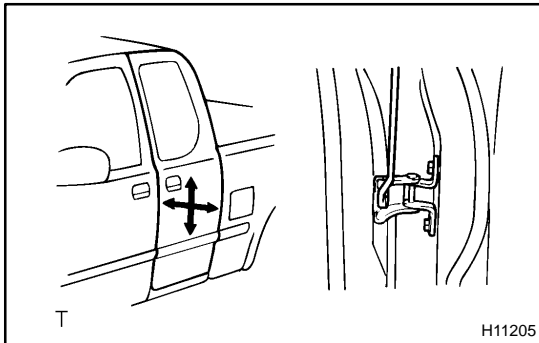


ADJUSTMENT

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Adjust the door by loosening the body side hinge bolts.

Torque: 23 N·m (235 kgf-cm, 17 ft-lbf)



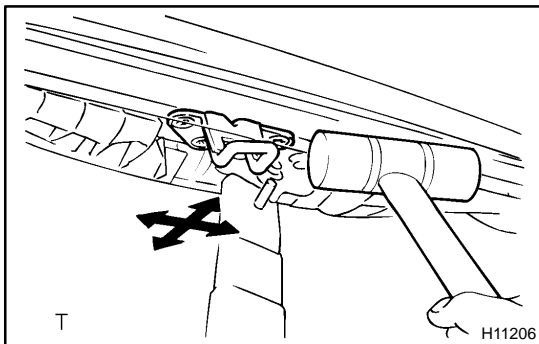
2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Adjust the door by loosening the door side bolts.

HINT:

Substitute the standard bolt for the centering bolt (see page [BO-7](#)).

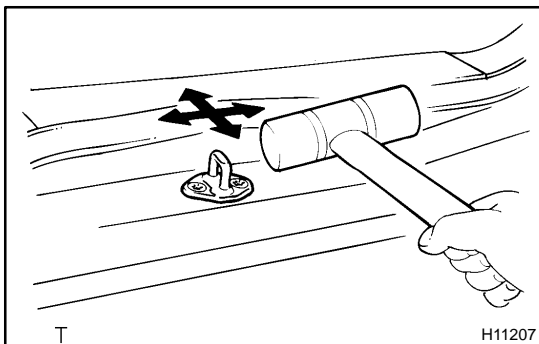
Torque: 23 N·m (235 kgf-cm, 17 ft-lbf)



3. ADJUST DOOR LOCK UPPER STRIKER

- Check that the door fit and door lock linkages are adjusted correctly.
- Adjust the striker position by slightly loosening the striker mounting screws and hitting the striker with a hammer.
- Tighten the striker mounting screws again.

Torque: 23 N·m (235 kgf-cm, 17 ft-lbf)



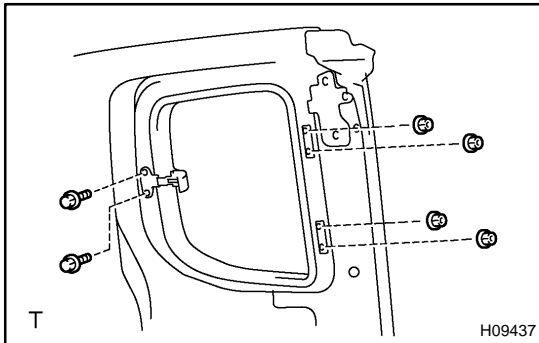
4. ADJUST DOOR LOCK LOWER STRIKER

- Check that the door fit and door lock linkages are adjusted correctly.
- Adjust the striker position by slightly loosening the striker mounting screws and hitting the striker with a hammer.
- Tighten the striker mounting screws again.

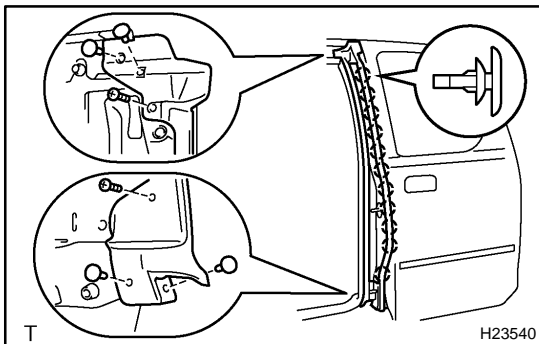
Torque: 23 N·m (235 kgf-cm, 17 ft-lbf)

REASSEMBLY

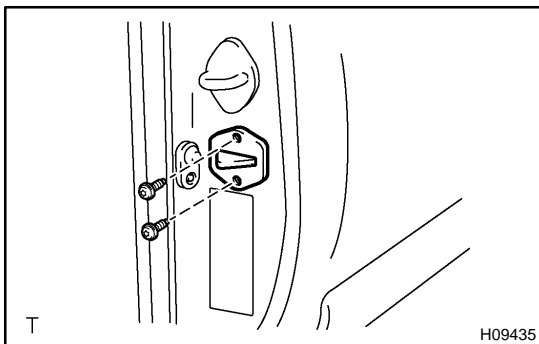
1. **INSTALL QUARTER WINDOW LOCK AND HINGES**
 - (a) Install the 2 hinges to the quarter window with the 2 screws.
 - (b) Install the window lock to the quarter window with the screw.



2. **INSTALL QUARTER WINDOW AND WEATHERSTRIP**
 - (a) Install the weatherstrip.
 - (b) Install the quarter window with the 2 bolts and 4 nuts.
3. **INSTALL INNER WEATHERSTRIP**



4. **INSTALL OUTER WEATHERSTRIP**
Install the outer weatherstrip with the 2 screws and 4 clips.



5. **INSTALL CANCEL LEVER**
Using a torx® socket wrench, install the cancel lever with the 2 torx® screws.

Torx® socket wrench:

T30 (Part No. 09042-00010 or locally manufactured tool)

Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

6. **INSTALL OUTSIDE HANDLE**

Install the outside handle with the 2 bolts.

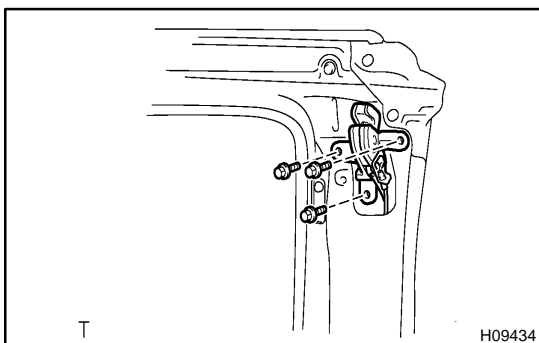
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)

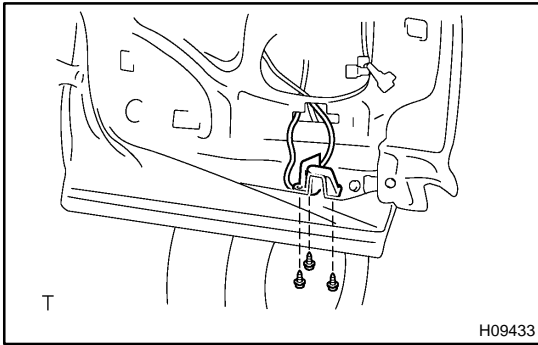
7. **INSTALL UPPER DOOR LOCK**

(a) Install the upper door lock with the 3 bolts.

Torque: 12.5 N·m (128 kgf·cm, 9 ft-lbf)

(b) Connect the connector.





8. INSTALL LOWER DOOR LOCK

- (a) Using a torx® socket wrench, install the lower door lock with the 3 torx® screws.

Torx® socket wrench:

T30 (Part No. 09042-00010 or locally manufactured tool)

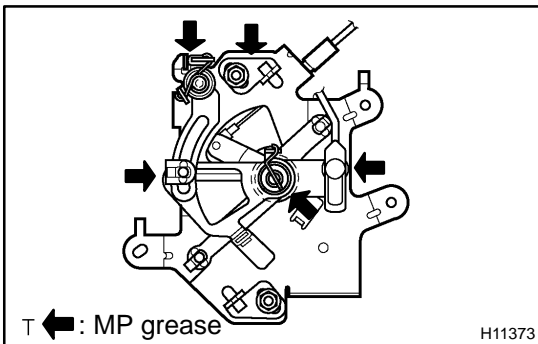
Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

- (b) Connect the connector.

HINT:

Apply adhesive to the 3 torx® screws.

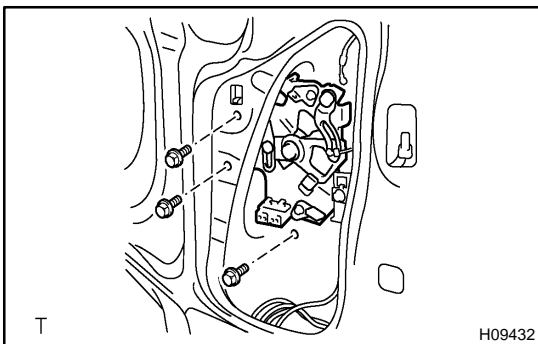
Adhesive: Part No. 08833-00070, THREE BOND 1342 or equivalent



9. INSTALL ACCESS DOOR CONTROLLER

HINT:

Apply MP grease to the sliding and rotating parts of the access door controller.

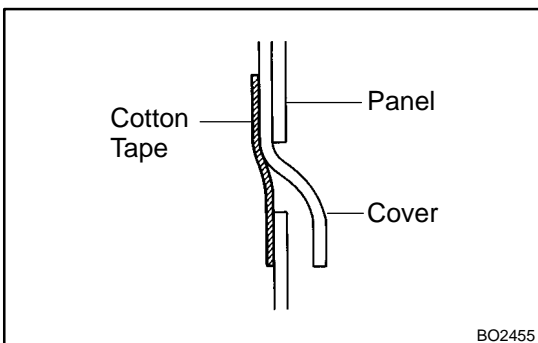


- (a) Install the access door controller with the 3 bolts.

Torque: 12.5 N·m (128 kgf·cm, 9 ft·lbf)

- (b) Attach the 2 clamps.

- (c) Connect the 2 cables and 2 links.



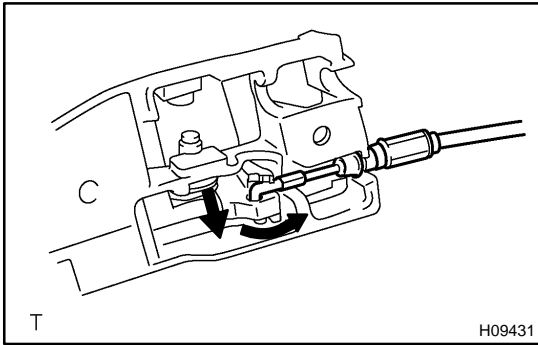
10. INSTALL SERVICE HOLE COVER

- (a) Install the service hole cover.

HINT:

- ◆ When installing the service hole cover, pull out the cable and connector through the service hole cover.
- ◆ There should be no wrinkles or folds after attaching the service hole cover.
- ◆ After attaching the service hole cover, confirm the sealing condition.

- (b) Connect the connector.

**11. INSTALL DOOR INSIDE HANDLE**

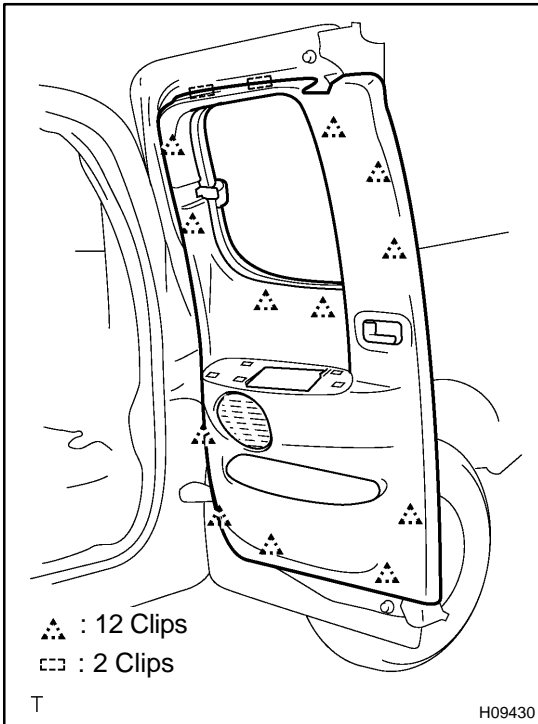
- (a) Connect the cable to the inside handle.
- (b) Install the inside handle with the screw.

12. INSTALL SPEAKER

- (a) Install the speaker with the 4 screws.
- (b) Connect the connector.

13. INSTALL DOOR ARMREST BASE

Install the door armrest base with the 2 screws.

**14. INSTALL ACCESS DOOR TRIM**

- (a) Install the door trim.
- (b) Lock the quarter window lock.

15. INSTALL DOOR ARMREST

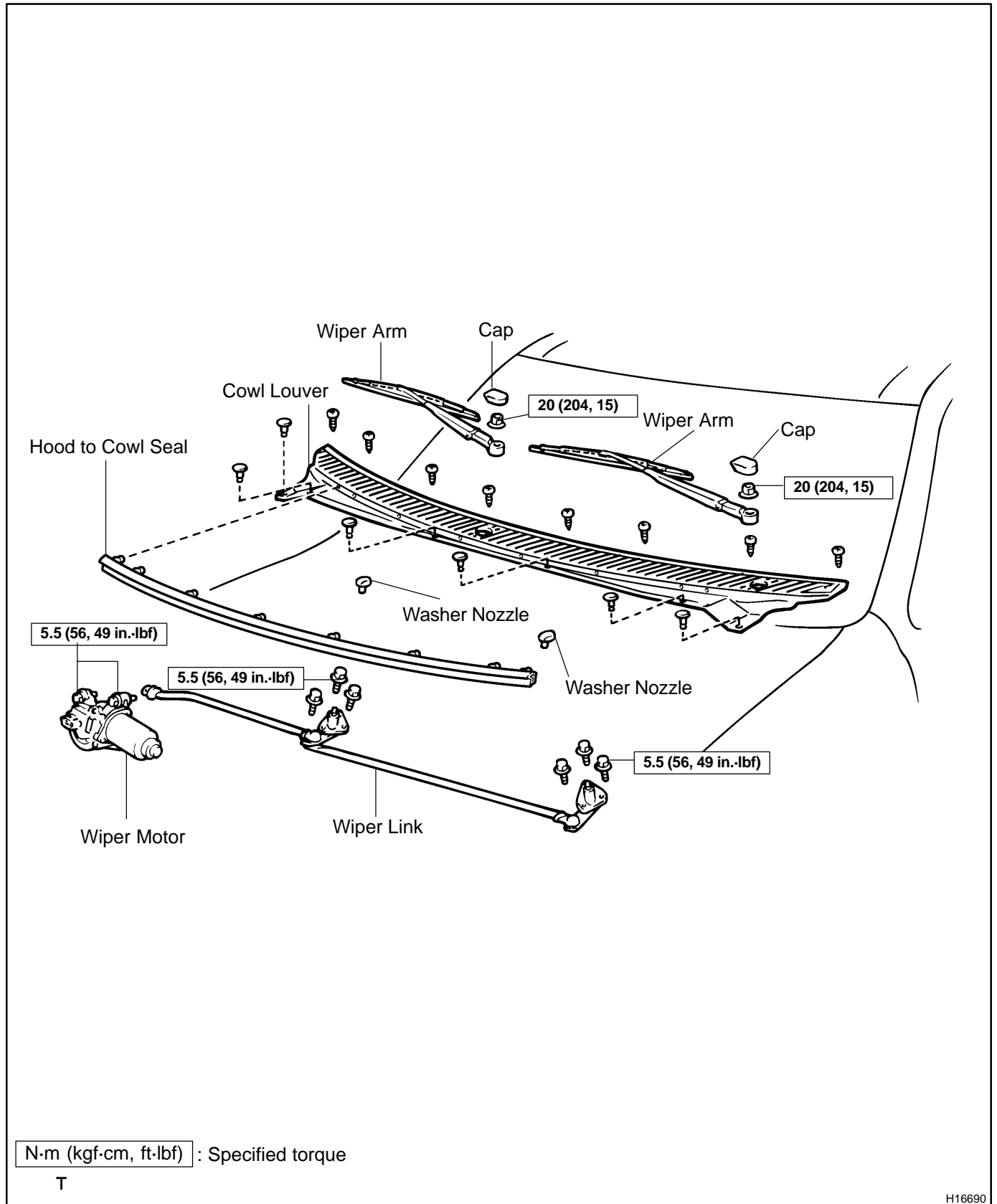
Install the door armrest with the screw.

16. INSTALL DOOR INSIDE HANDLE BEZEL

Install the door inside handle bezel with the screw.

FRONT WIPER AND WASHER COMPONENTS

B001A-04



H16690

REMOVAL

1. REMOVE WIPER ARMS

- (a) Using a screwdriver, remove the 2 caps.

HINT:

Tape the screwdriver tip before use.

- (b) Remove the 2 nuts and wiper arms.

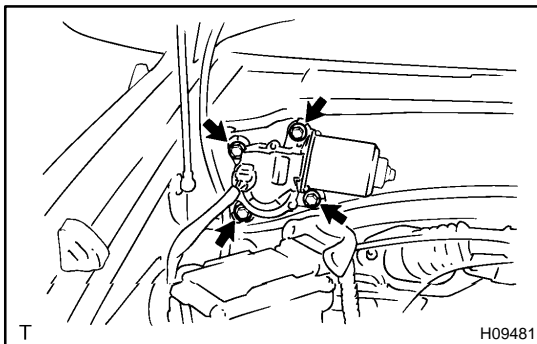
2. REMOVE COWL TOP VENTILATOR LOUVER

- (a) Using a clip remover, remove the 6 clips.

- (b) Remove the 8 screws and cowl top ventilator louver.

3. REMOVE HOOD TO COWL TOP SEAL

Remove the hood to cowl top seal from the cowl top ventilator louver.



4. REMOVE WIPER MOTOR

- (a) Disconnect the connector.

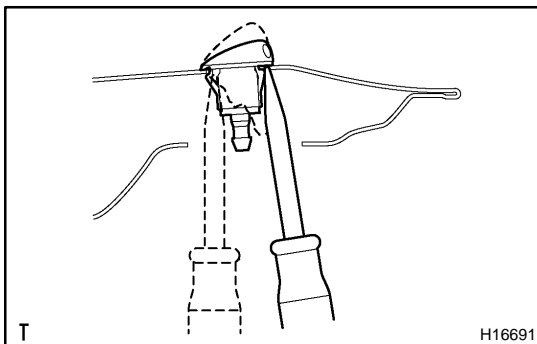
- (b) Unfasten the 4 bolts.

- (c) Disconnect the wiper motor from the wiper link, then remove the wiper motor.

5. REMOVE WIPER LINK

- (a) Remove the 6 bolts.

- (b) Remove the wiper link through the service hole.



6. REMOVE WASHER NOZZLE

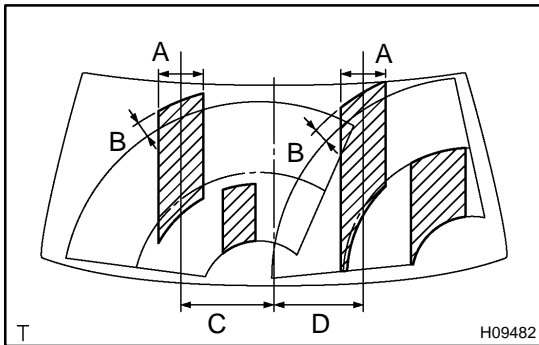
- (a) Disconnect the washer hose.

- (b) Using a screwdriver, remove the nozzle.

HINT:

Tape the screwdriver tip before use.

- (c) Perform the same procedure on the other side.



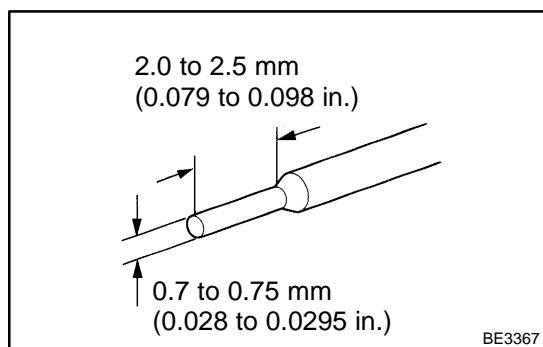
INSPECTION

1. INSPECT WASHER NOZZLE

- (a) While operating the washer, check whether the upper point where the washer fluid hits the windshield and the surge area are within the range indicated by the hatched line.

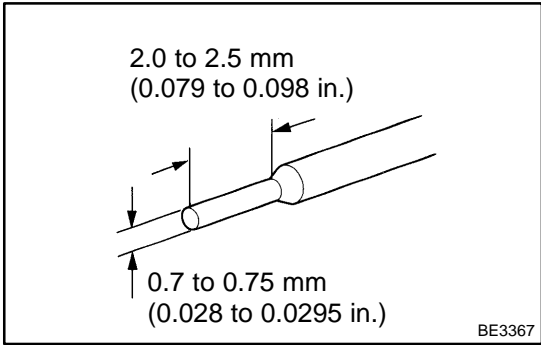
A	Approx. 150 mm (5.90 in.)
B	Approx. 50 mm (1.97 in.)
C	Approx. 312.3 mm (12.295 in.)
D	Approx. 299.2 mm (11.780 in.)

- (b) Check if the lower point where the washer fluid hits the windshield is within the range of the wiping pattern (the area of the glass which is wiped by the wiper blades).



2. ADJUST WASHER NOZZLE

Using a tool like the one shown in the illustration, change the direction of the nozzle hole to adjust the point where washer fluid hits the windshield.



ADJUSTMENT

ADJUST WASHER NOZZLE

Using a tool like the one shown in the illustration, change the direction of the nozzle hole to adjust the point where washer fluid hits the windshield.

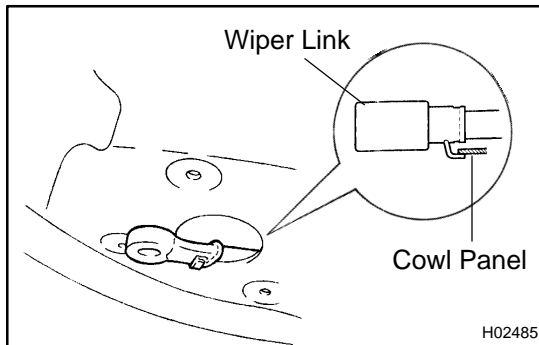
INSTALLATION

1. INSTALL WASHER NOZZLES

2. INSTALL WIPER LINK

Install the wiper link through the service hole, then torque the 6 bolts.

Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)



3. INSTALL WIPER MOTOR

(a) Install the wiper motor to the wiper link.

HINT:

When installing the wiper motor, connect the claw of wiper link to the cowl panel shown in the illustration.

(b) Torque the 4 bolts.

Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)

(c) Connect the connector.

4. INSTALL HOOD TO COWL TOP SEAL

Install the hood to cowl top seal to the cowl top ventilator louver.

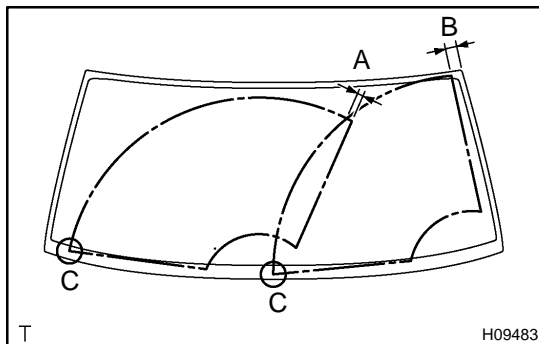
5. INSTALL COWL TOP VENTILATOR LOUVER

Install the cowl top ventilator louver with the 8 screws and 6 clips.

6. INSTALL WIPER ARMS

(a) Operate the wiper once and turn the wiper switch OFF.

(b) Install the wiper arms and tighten the nuts by hand.



(c) Adjust the installation positions of the wiper arms to the positions shown in the illustration.

A: Approx. 25.4 mm (1.000 in)

B: Approx. 40.0 mm (1.574 in)

HINT:

When installing the wiper arms, make sure that the tips of the blades are not beyond the ceramic edge as indicated "C" part in the illustration.

(d) Torque the 2 nuts.

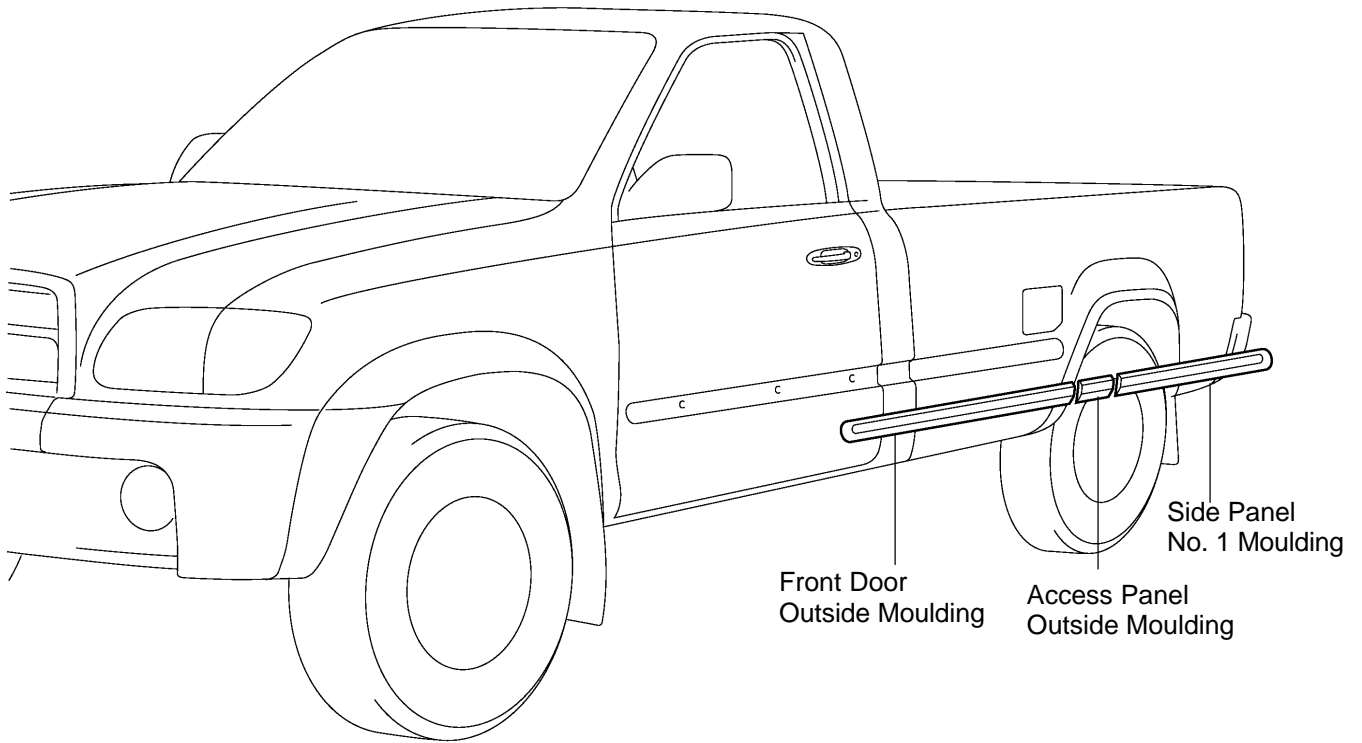
Torque: 20 N·m (205 kgf·cm, 15 ft-lbf)

(e) Install the 2 caps.

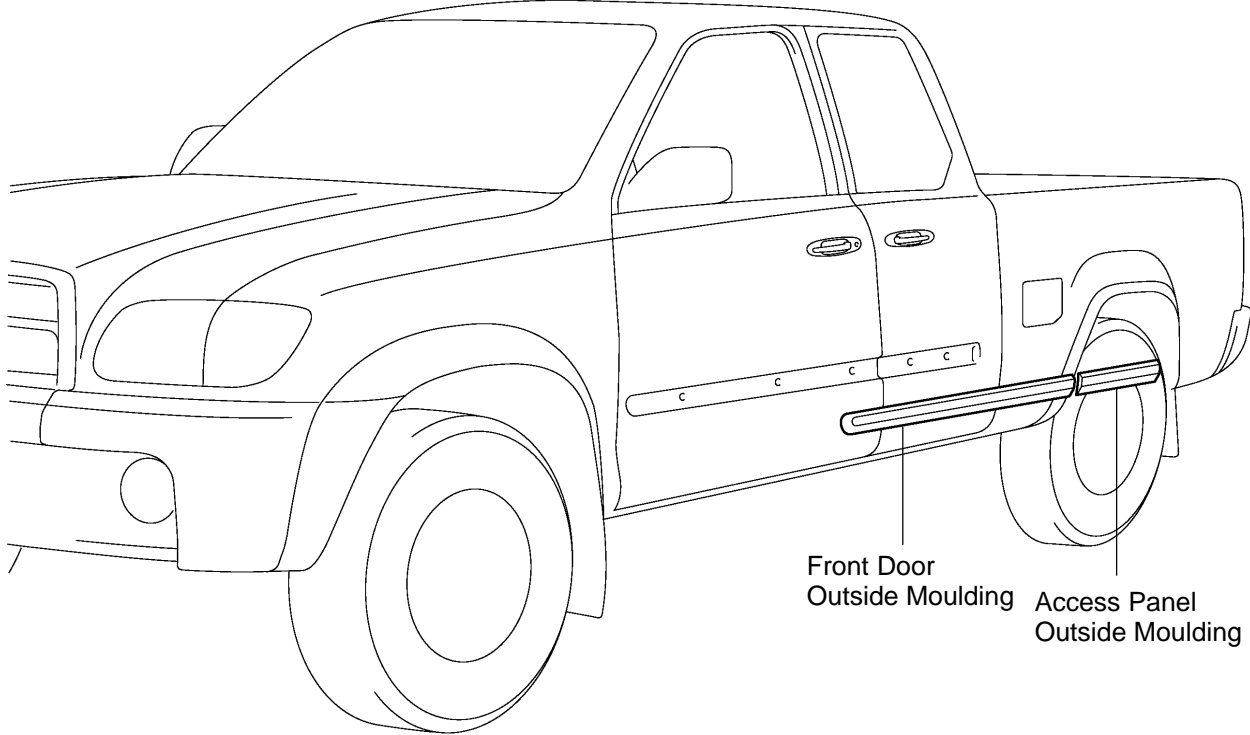
BODY OUTSIDE MOULDING COMPONENTS

BO4PZ-01

Standard Cab



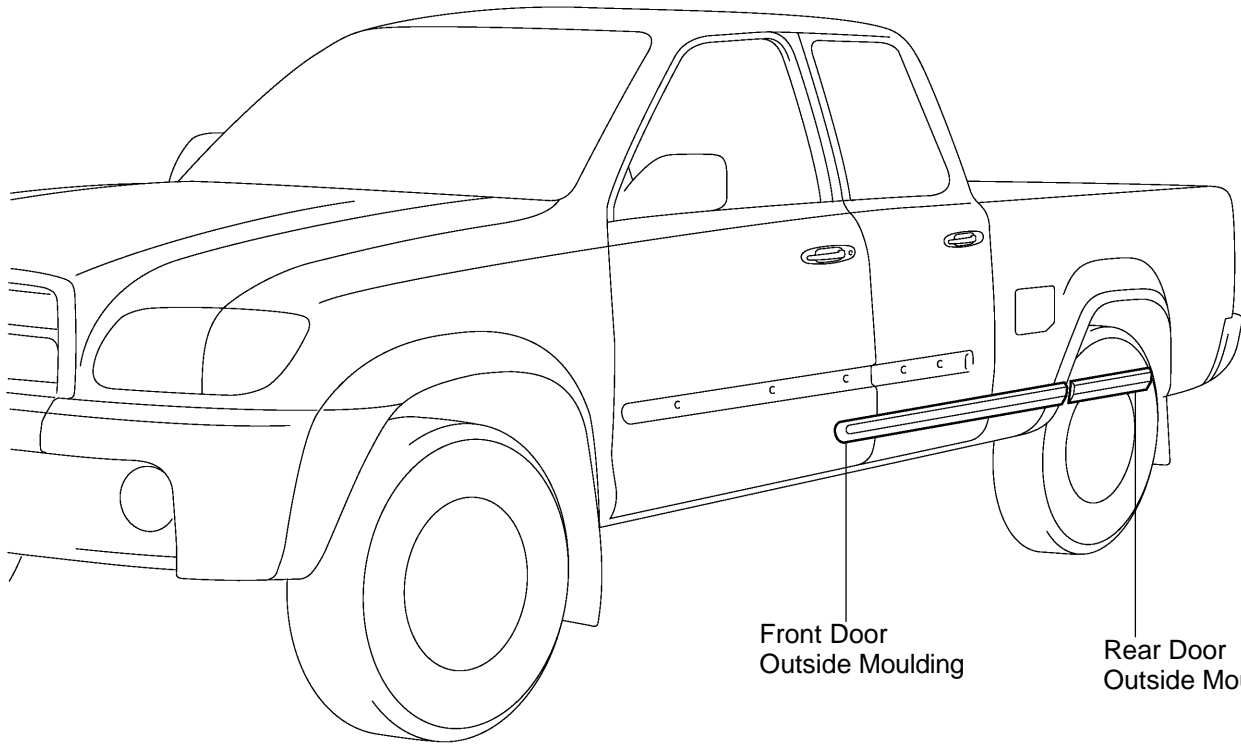
Access Cab (Standard Body Type), Access Cab (Wide Body Type)



T

B17040

Double Cab



T

B17041

REMOVAL

1. HEAT MOULDING

Using a heat light, heat the moulding between 20 to 30°C (68 to 86 °F).

NOTICE:

Do not heat the moulding excessively.

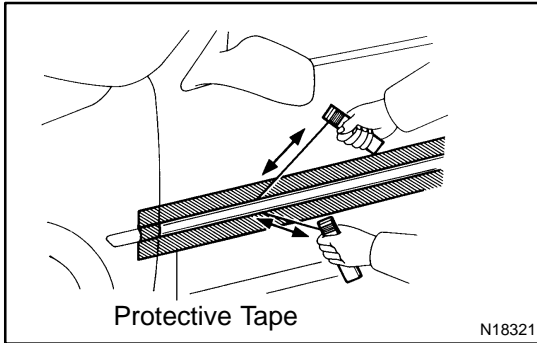
2. REMOVE MOULDING

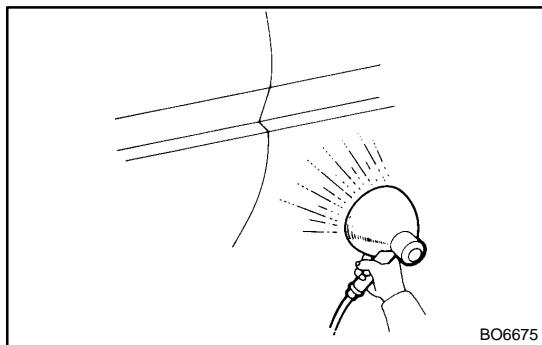
- (a) Insert piano wire between the vehicle body and moulding.
- (b) Tie objects that can serve a handle (for example, wooden blocks) to all wire ends.
- (c) Cut off the double-sided tape by pulling the piano wire as shown in the illustration.

NOTICE:

Do not damage the body.

- (d) Remove the moulding.





INSTALLATION

1. CLEAN BODY MOUNTING SURFACE

- (a) Using a heat light, heat the body mounting surface between 40 to 60°C (104 to 140°F).

NOTICE:

Do not heat the body excessively.

- (b) Remove the double-sided tape from the body.
 (c) Wipe off the stains with cleaner.

2. INSTALL MOULDING

- (a) Using a heat light, heat the body and moulding.

Heating Temperature:

Item	Temperature
Body	40 to 60°C (104 to 140°F)
Moulding	20 to 30°C (68 to 86°F)

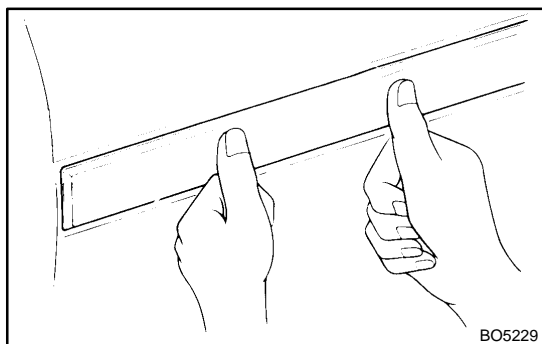
NOTICE:

Do not heat the body and moulding excessively.

- (b) Remove the moulding peeling paper from the face of the moulding.

NOTICE:

After removing the peeling paper, keep the exposed adhesive away from dirt and other contaminants.



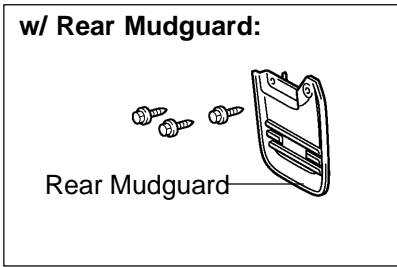
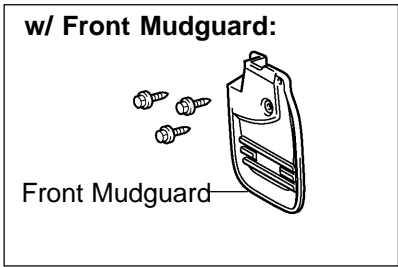
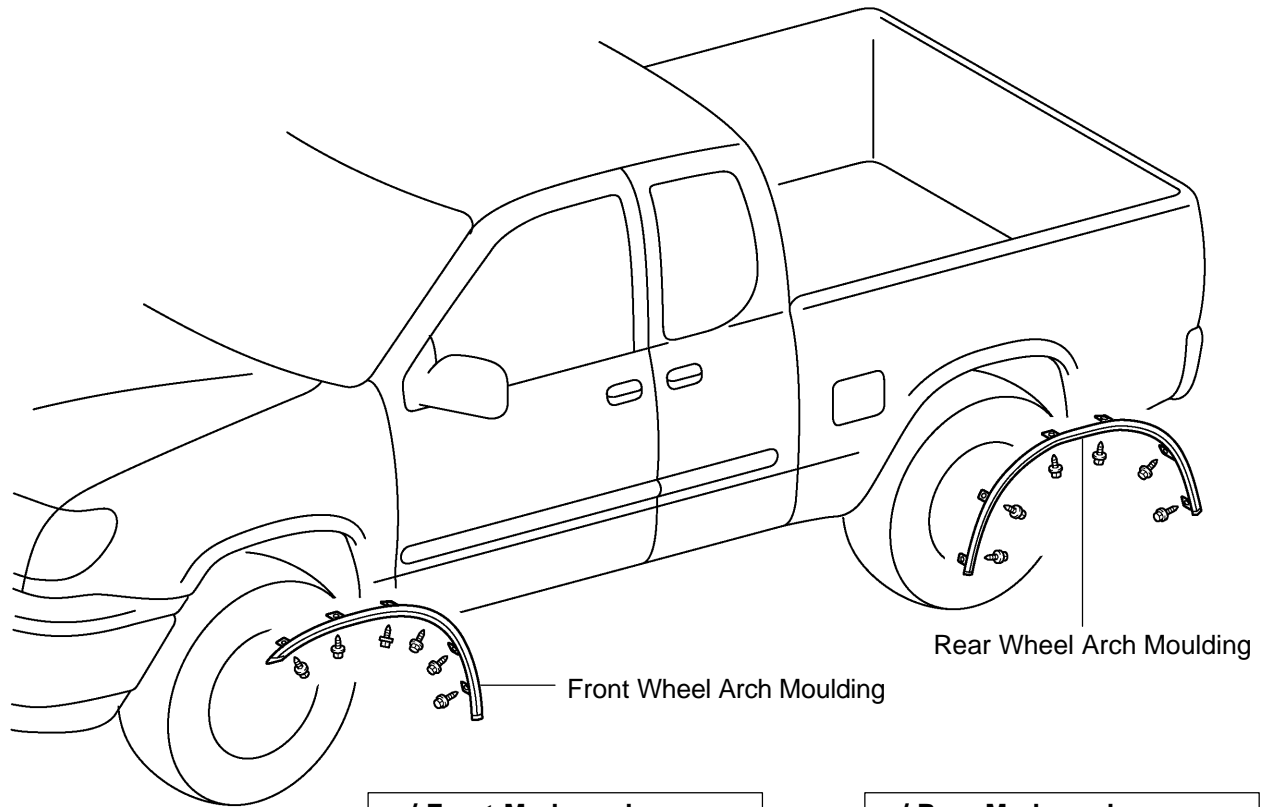
- (c) Align the bosses with their corresponding holes on the body, and press the moulding firmly.

NOTICE:

Do not apply excessive force onto the moulding, but steady pressure with your thumbs.

WHEEL ARCH MOULDING COMPONENTS

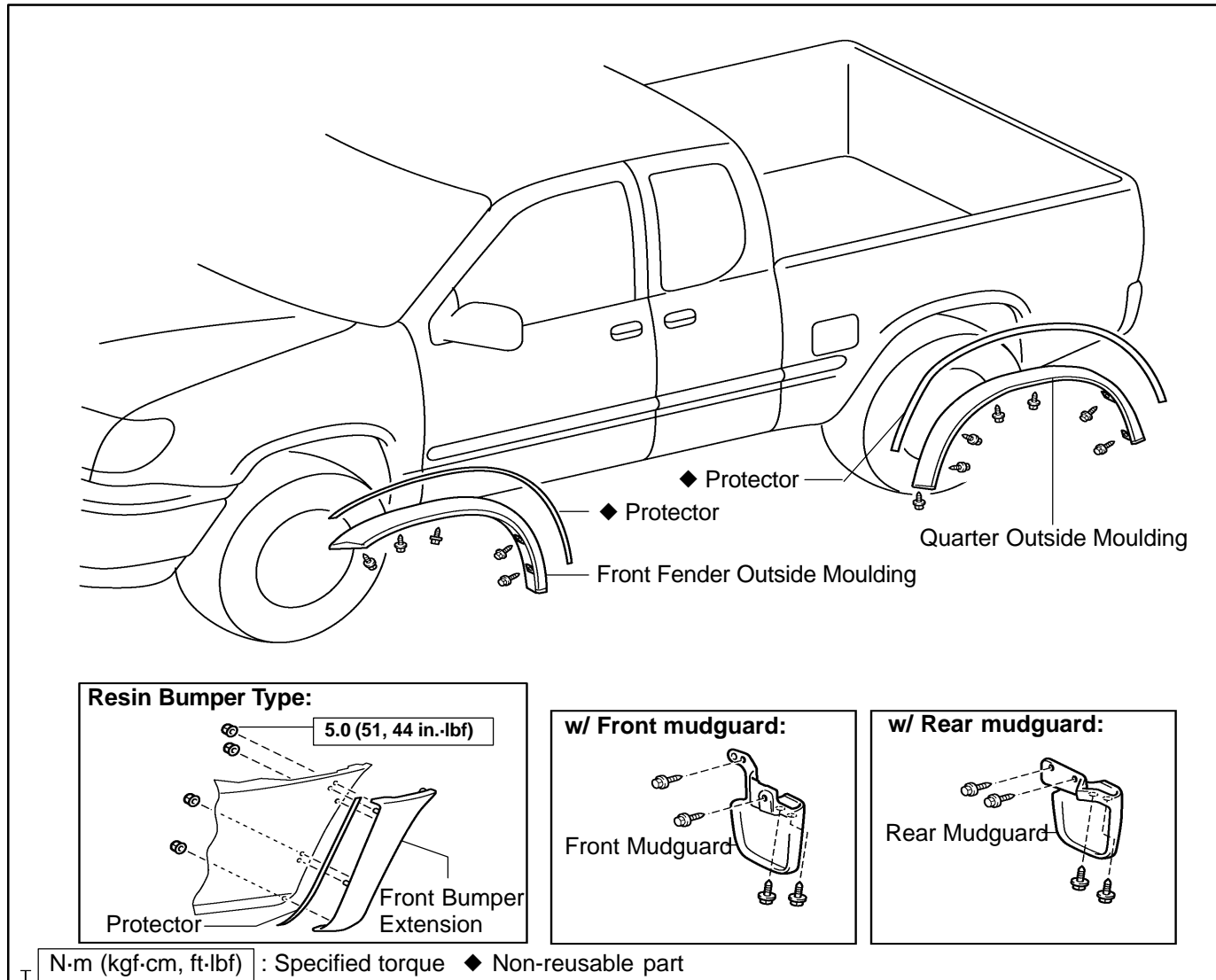
BO0IF-05

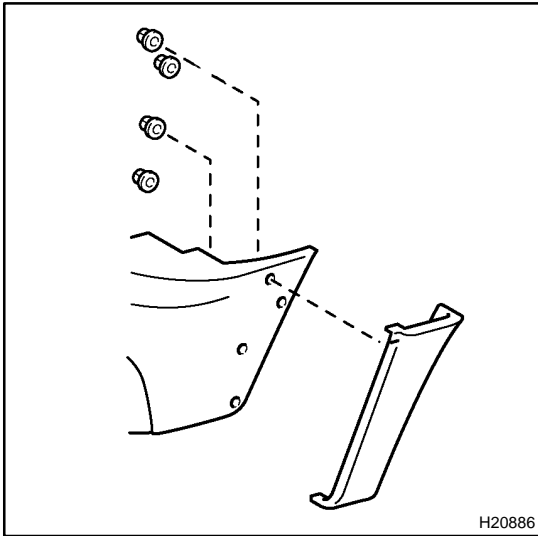


H21129

WHEEL OPENING MOULDING COMPONENTS

BO2EV-03





REMOVAL

1. Resin bumper type:

REMOVE FRONT BUMPER EXTENSION

Remove the 4 nuts and front bumper extension.

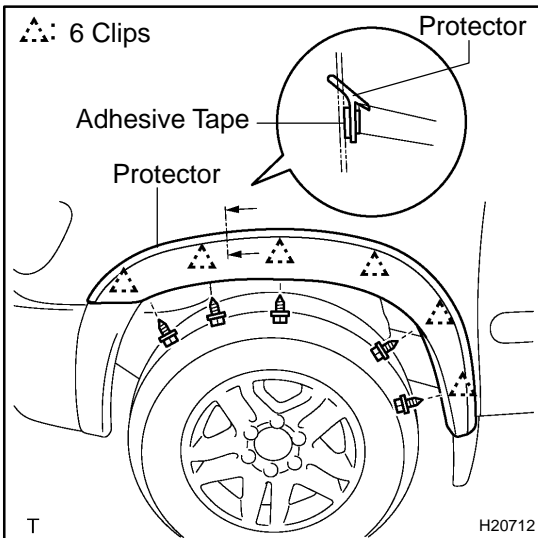
NOTICE:

If the protector are damaged, exchange them for new protector.

2. w/ Front mudguard:

REMOVE FRONT MUDGUARD

Remove the 4 screws and front mudguard.



3. REMOVE FRONT FENDER OUTSIDE MOULDING

(a) Remove the 6 screws.

(b) Using a heat light, heat the moulding to 20 to 30°C (68 to 86°F).

NOTICE:

Do not heat the moulding excessively.

(c) Cut off the adhesive tape with a knife.

NOTICE:

Do not damage the body.

(d) Remove the moulding.

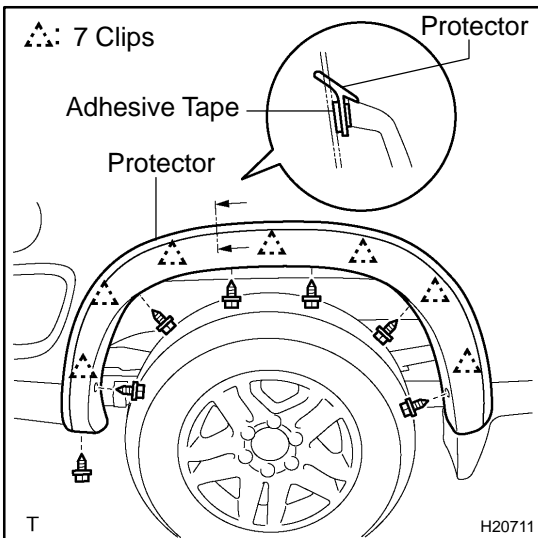
NOTICE:

If the clips are damaged, exchange them for new clips.

4. w/ Rear mudguard:

REMOVE REAR MUDGUARD

Remove the 4 screws and rear mudguard.



5. REMOVE QUARTER OUTSIDE MOULDING

(a) Remove the 6 screws.

(b) Using a heat light, heat the moulding to 20 to 30°C (68 to 86°F).

NOTICE:

Do not heat the moulding excessively.

(c) Cut off the adhesive tape with a knife.

NOTICE:

Do not damage the body.

(d) Remove the moulding.

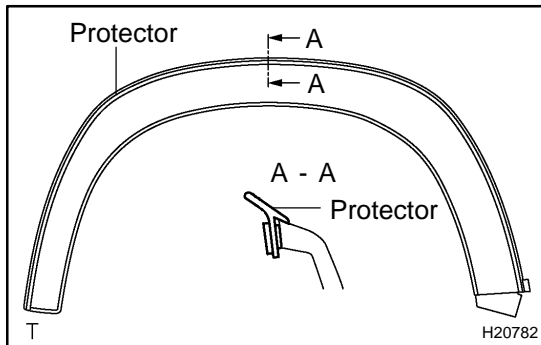
NOTICE:

If the clips are damaged, exchange them for new clips.

INSTALLATION

1. INSTALL QUARTER OUTSIDE MOULDING

- (a) Clean the body mounting surface.
 - (1) Using a heat light, heat the body mounting surface to 40 to 60°C (104 to 140°F).
 - (2) Remove the protector from the body.
 - (3) Wipe off the stains with cleaner.



- (4) Install a new protector as shown in the illustration.
- (b) Install the quarter outside moulding.
 - (1) Using a heat light, heat the body and moulding.
Body: 40 to 60°C (104 to 140°F)
Moulding: 20 to 30°C (68 to 86°F)

NOTICE:

Do not heat the body and moulding excessively.

- (2) Remove the moulding release sheet from the face of the moulding.

NOTICE:

When removing the moulding release sheet, be careful that dirt or dust will not adhere to the face of the moulding.

- (3) Align the bosses with their corresponding holes on the body and press the moulding firmly.

NOTICE:

Do not apply excessive force onto the moulding, but steady pressure with your thumbs.

- (4) Install the 6 screws.

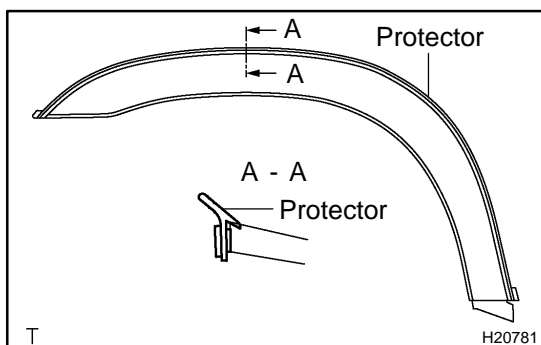
2. w/ Rear mudguard:

INSTALL REAR MUDGUARD

Install the rear mudguard with the 4 screws.

3. INSTALL FRONT FENDER OUTSIDE MOULDING

- (a) Clean the body mounting surface.
 - (1) Using a heat light, heat the body mounting surface to 40 to 60°C (104 to 140°F).
 - (2) Remove the protector from the body.
 - (3) Wipe off the stains with cleaner.



- (4) Install a new protector as shown in the illustration.
- (b) Install the front fender outside moulding.
 - (1) Using a heat light, heat the body and moulding.
Body: 40 to 60°C (104 to 140°F)
Moulding: 20 to 30°C (68 to 86°F)

NOTICE:

Do not heat the body and moulding excessively.

- (2) Remove the moulding release sheet from the face of the moulding.

NOTICE:

When removing the moulding release sheet, be careful that dirt or dust will not adhere to the face of the moulding.

- (3) Align the bosses with their corresponding holes on the body, and press the moulding firmly.

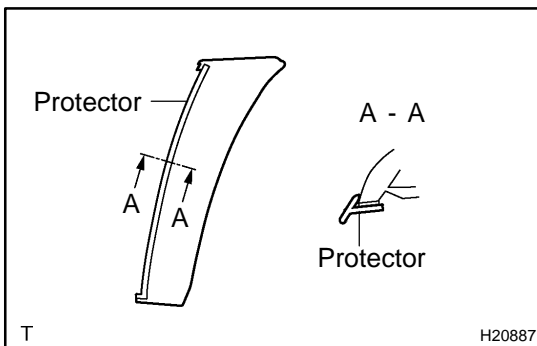
NOTICE:

Do not apply excessive force onto the moulding, but steady pressure with your thumbs.

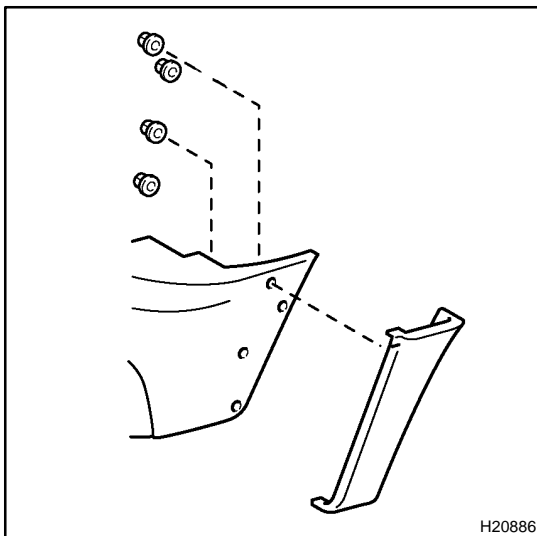
- (4) Install the 6 screws.

4. w/ Rear mudguard:**INSTALL FRONT MUDGUARD**

Install the front mudguard with the 4 screws.

**5. Resin bumper type:****INSTALL FRONT BUMPER EXTENSION**

- (a) Install the new protector as shown in the illustration.



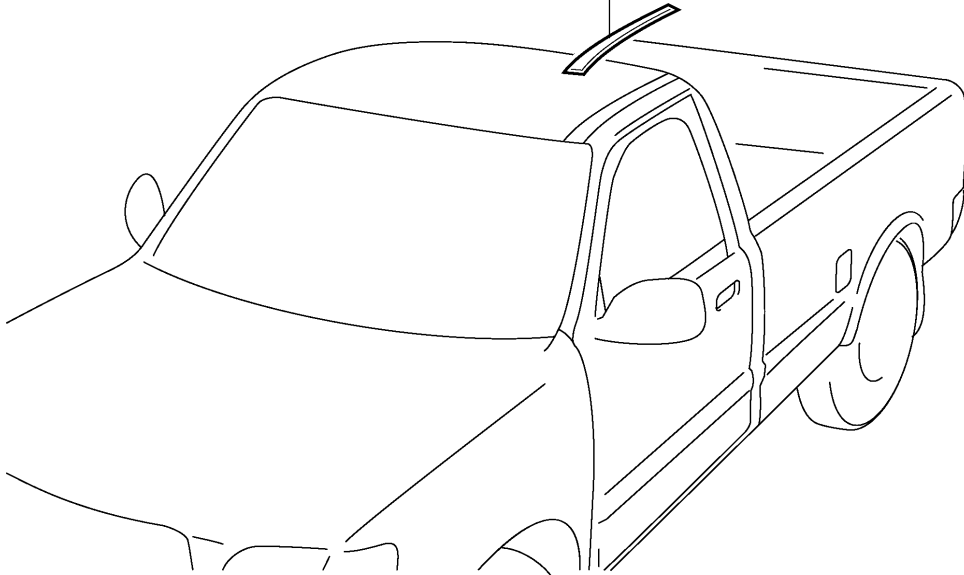
- (b) Install the front bumper extension with the 4 nuts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

ROOF DRIP SIDE FINISH MOULDING COMPONENTS

BO0IL-04

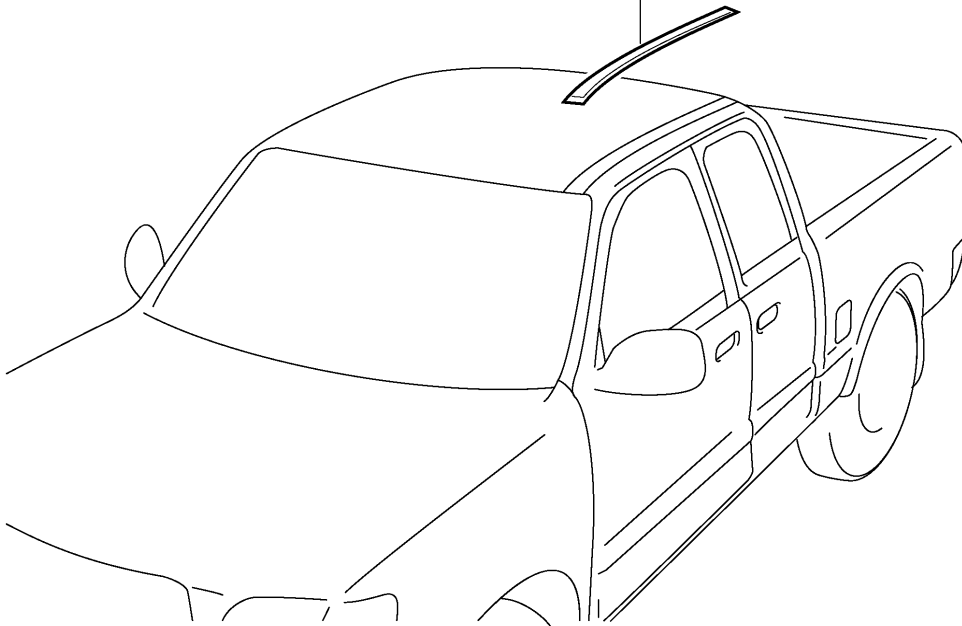
Standard cab:

◆ Roof Drip Side Finish Moulding



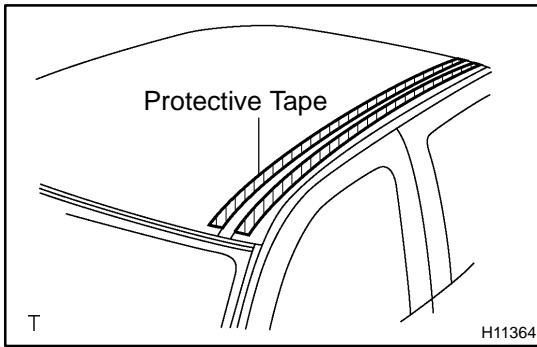
Access cab:

◆ Roof Drip Side Finish Moulding



T ◆ Non-reusable part

H11362



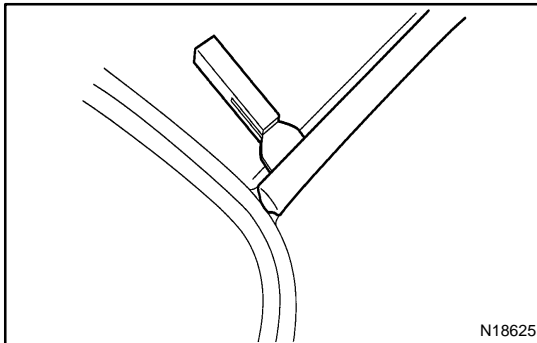
REMOVAL

1. REMOVE ENDS OF MOULDING

- (a) Apply protective tape to the outer surface as shown in illustration, to keep the surface from being scratched.
- (b) Using a heat light, heat the moulding to 20 to 30 °C (68 to 86 °F).

NOTICE:

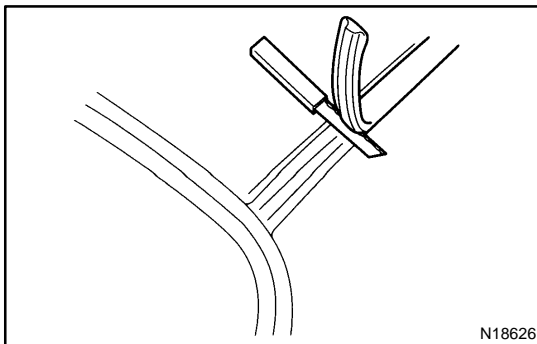
Do not heat the moulding excessively.



- (c) Using a scraper, pull off the roof drip side finish moulding from front end and rear end.

HINT:

Tape the scraper tip before use.



2. REMOVE MOULDING AND ADHESIVE

- (a) Pull off the moulding by cutting the adhesive with a knife.
- (b) Remove the moulding

NOTICE:

Do not damage the body with the knife.

INSTALLATION

1. CLEAN CONTACT SURFACE OF BODY

- (a) Using a heat light, heat the body surface 40 to 60 °C (104 to 140 °F).

NOTICE:

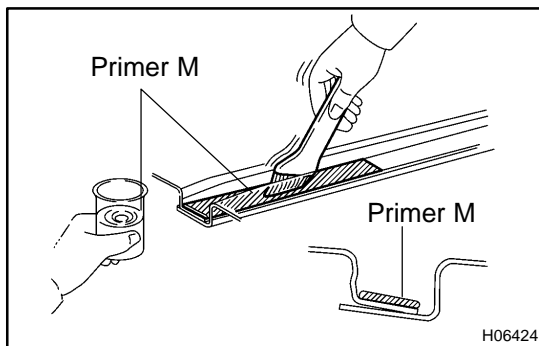
Do not heat the body excessively.

- (b) Using a knife, cut away any rough areas on the body.

NOTICE:

Be careful not to damage the body.

- (c) Wipe off stains with cleaner.



2. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat the body surface except the front and rear end with Primer M as shown in the illustration.

Front end: 23 mm (0.91 in.) + 8 mm (0.31 in.) or less

Rear end: 70 mm (2.76 in.) + 12 mm (0.47 in.) or less

NOTICE:

- ◆ Let the primer coating dry for 3 minutes or more.
- ◆ Do not coat to the adhesive.
- ◆ Do not keep any of the opened Primer M for later use.

3. INSTALL NEW MOULDING

- (a) Using a heat light, heat the body and moulding.

Body: 40 to 60 °C (104 to 140 °F)

Moulding: 20 to 30 °C (68 to 86 °F)

NOTICE:

Do not heat the moulding excessively.

- (b) Lift the moulding release sheet from face of the moulding.

NOTICE:

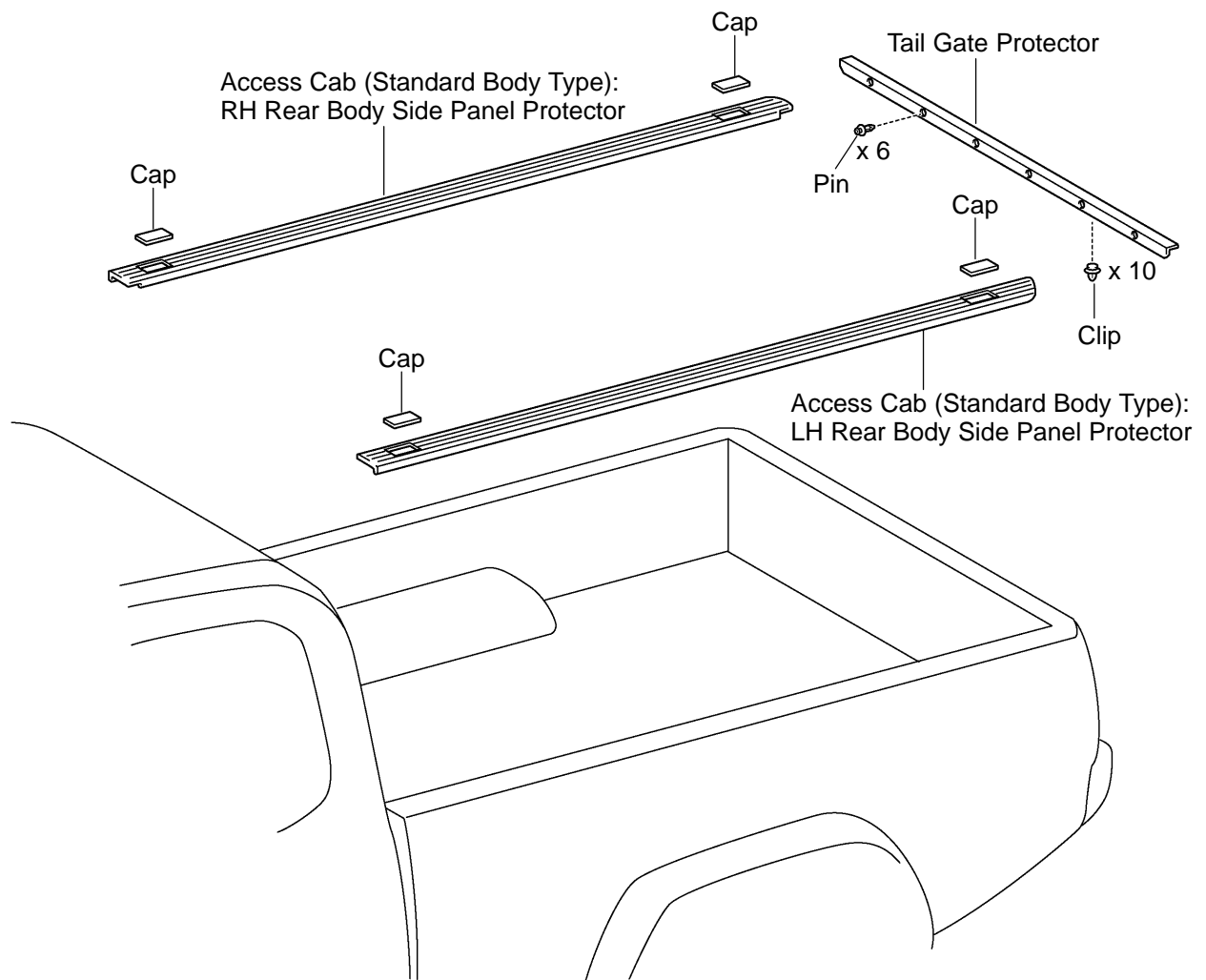
When the moulding release sheet is removed, make sure that no dirt or dust can get onto the uncoated area.

- (c) Install the moulding.

DECK TOP PROTECTOR COMPONENTS

BO4Q0-01

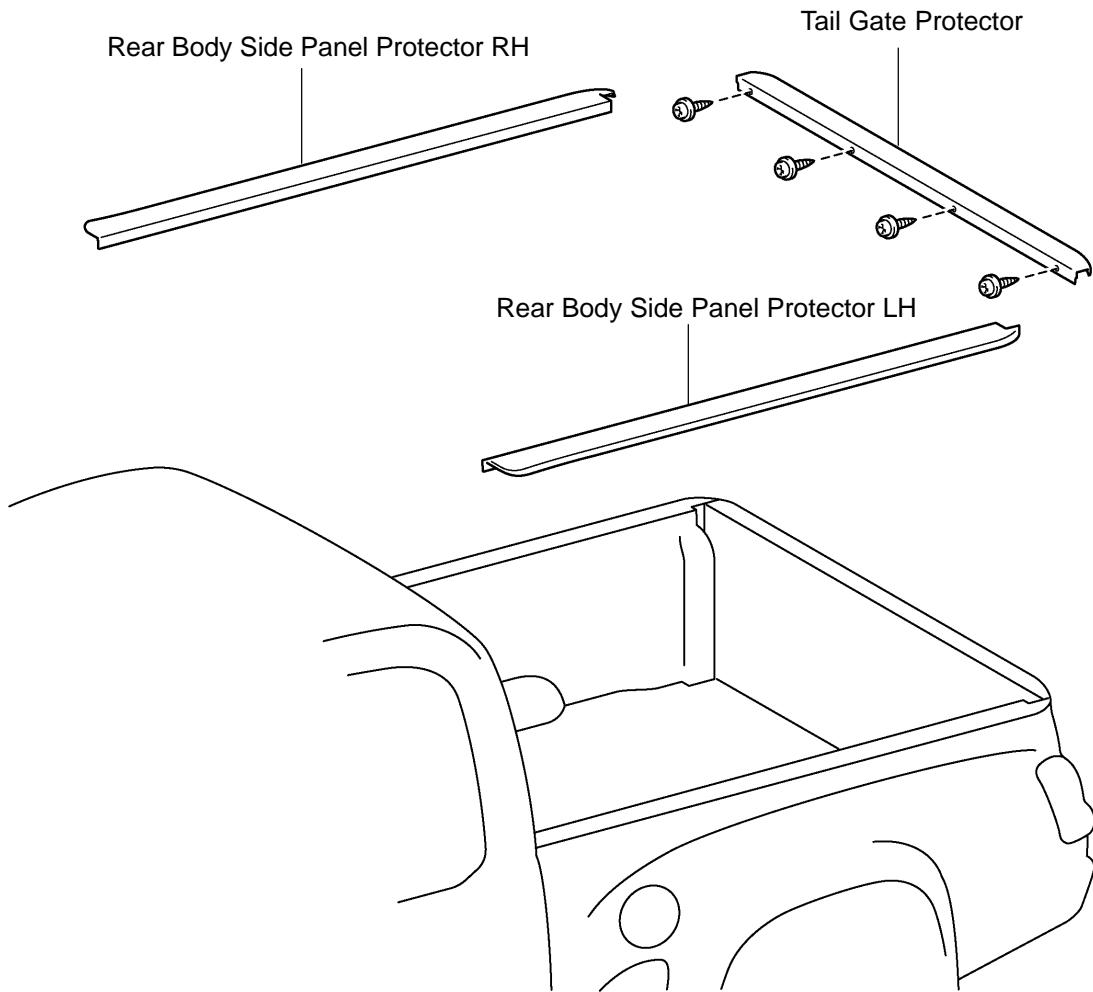
Access Cab (Standard Body Type), Standard Cab



T

H15019

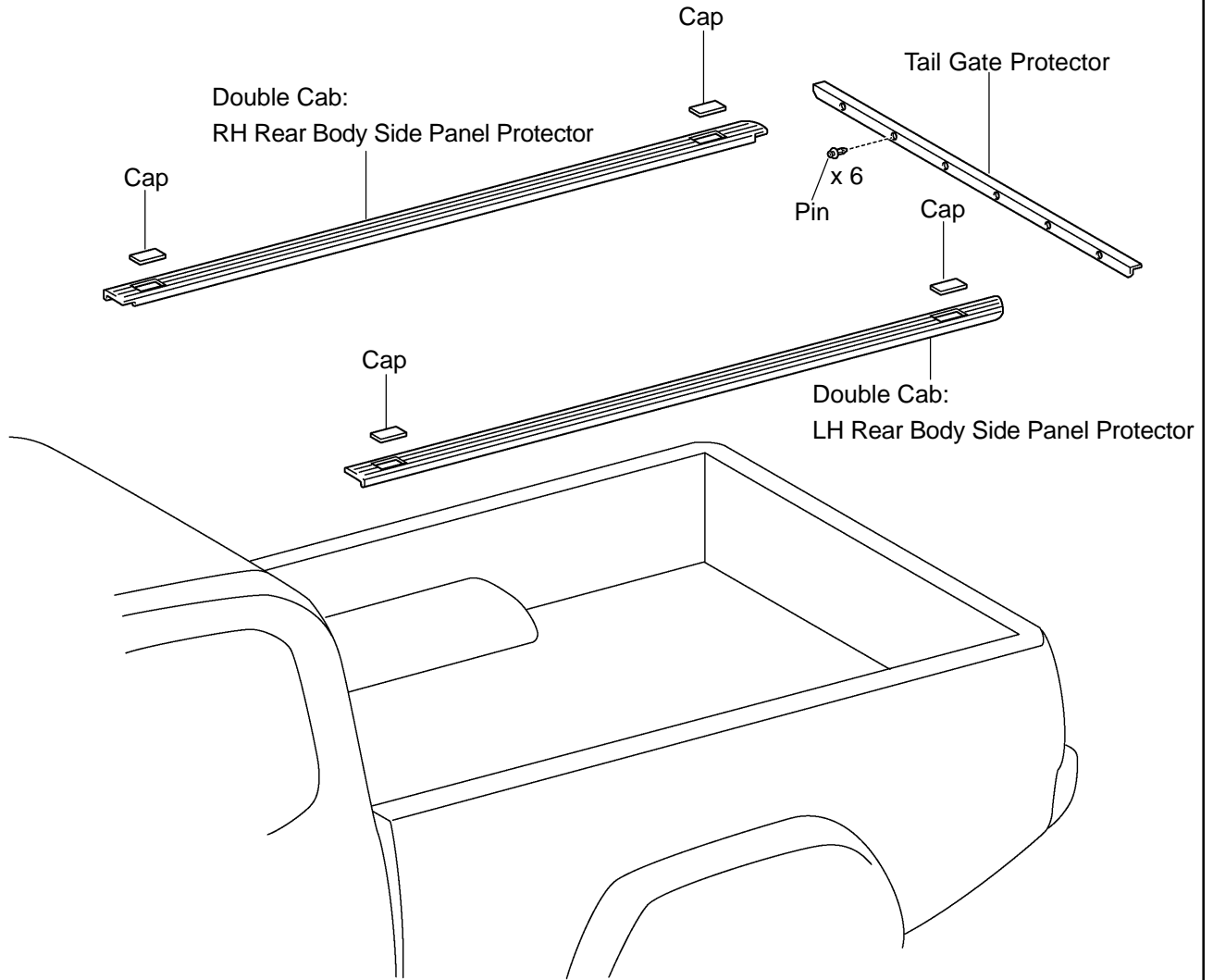
Access Cab (Wide Body Type)



T

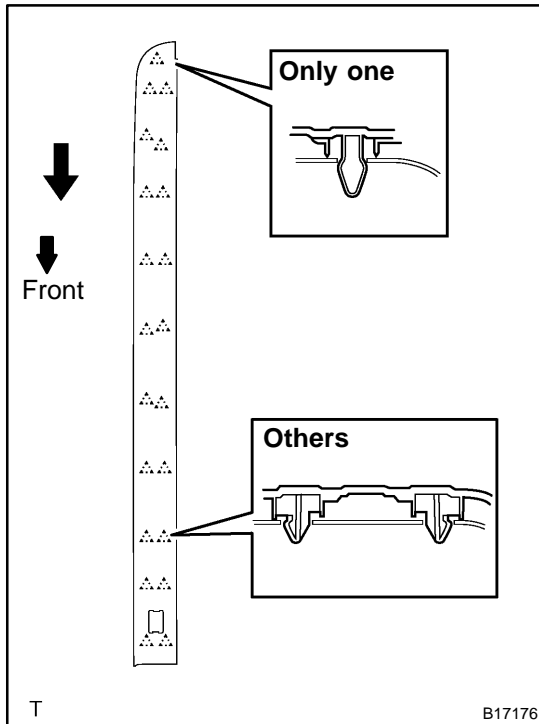
H20693

Double Cab



T

H23622



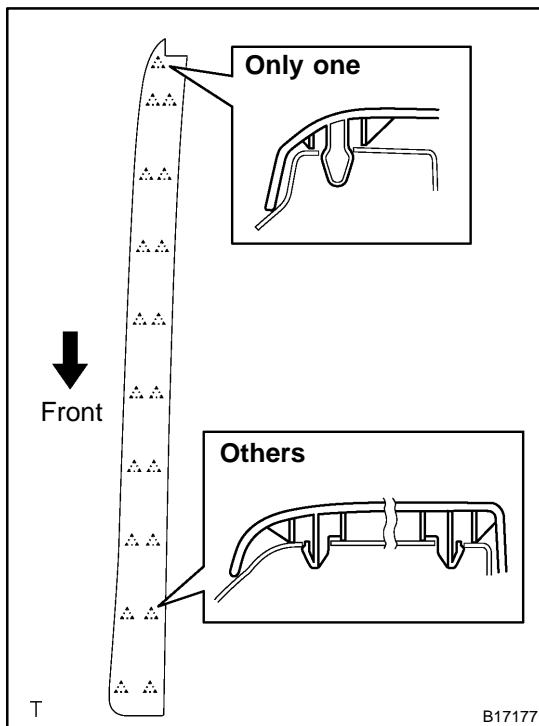
REMOVAL

1. **Access cab (Standard body type):**
REMOVE REAR BODY SIDE PANEL PROTECTOR

Using a moulding remover, remove the 2 protectors.

NOTICE:

- ◆ Each protector has 21 clips as shown in the illustration.
- ◆ Be careful not to damage the clips.



2. **Access cab (Wide body type):**
REMOVE REAR BODY SIDE PANEL PROTECTOR

Using a moulding remover, remove the 2 protectors.

NOTICE:

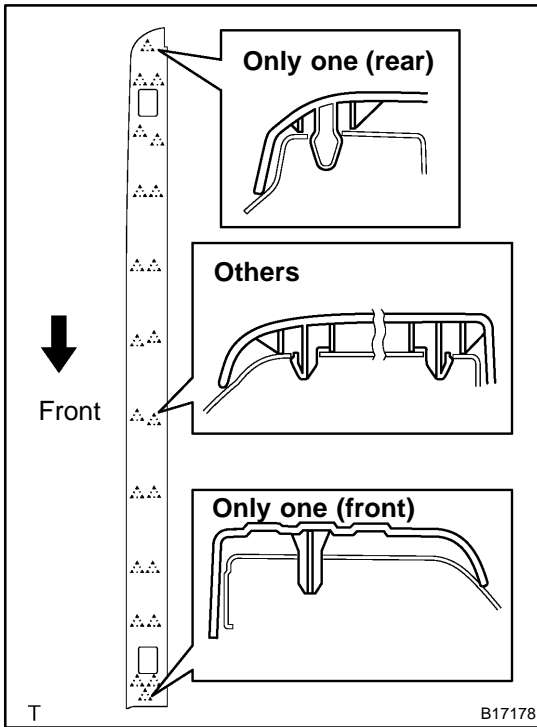
- ◆ Each protector has 19 clips as shown in the illustration.
- ◆ Be careful not to damage the clips.

3. **Access cab (Standard body type), Standard cab:**
REMOVE TAIL GATE PROTECTOR

- (a) Remove the 6 pins.
- (b) Using a clip remover, remove the protector and 10 clips.

4. **Access cab (Wide body type) only:**
REMOVE TAIL GATE PROTECTOR

- (a) Using a torx® socket wrench (T30), remove the 4 screws.
- (b) Using a moulding remover, remove the protector and 8 clips.



5. Double cab:

REMOVE REAR BODY SIDE PANEL PROTECTOR

Using a moulding remover, remove the 2 protectors.

- (a) Using a torx® socket wrench (T30), remove the 4 screws.
- (b) Using a moulding remover, remove the protector and 8 clips.

NOTICE:

- ◆ Each protector has 22 clips (3 types) as shown in the illustration.
- ◆ Be careful not to damage the clips.

6. Double cab:

REMOVE TAIL GATE PROTECTOR

- (a) Remove the 6 pins.

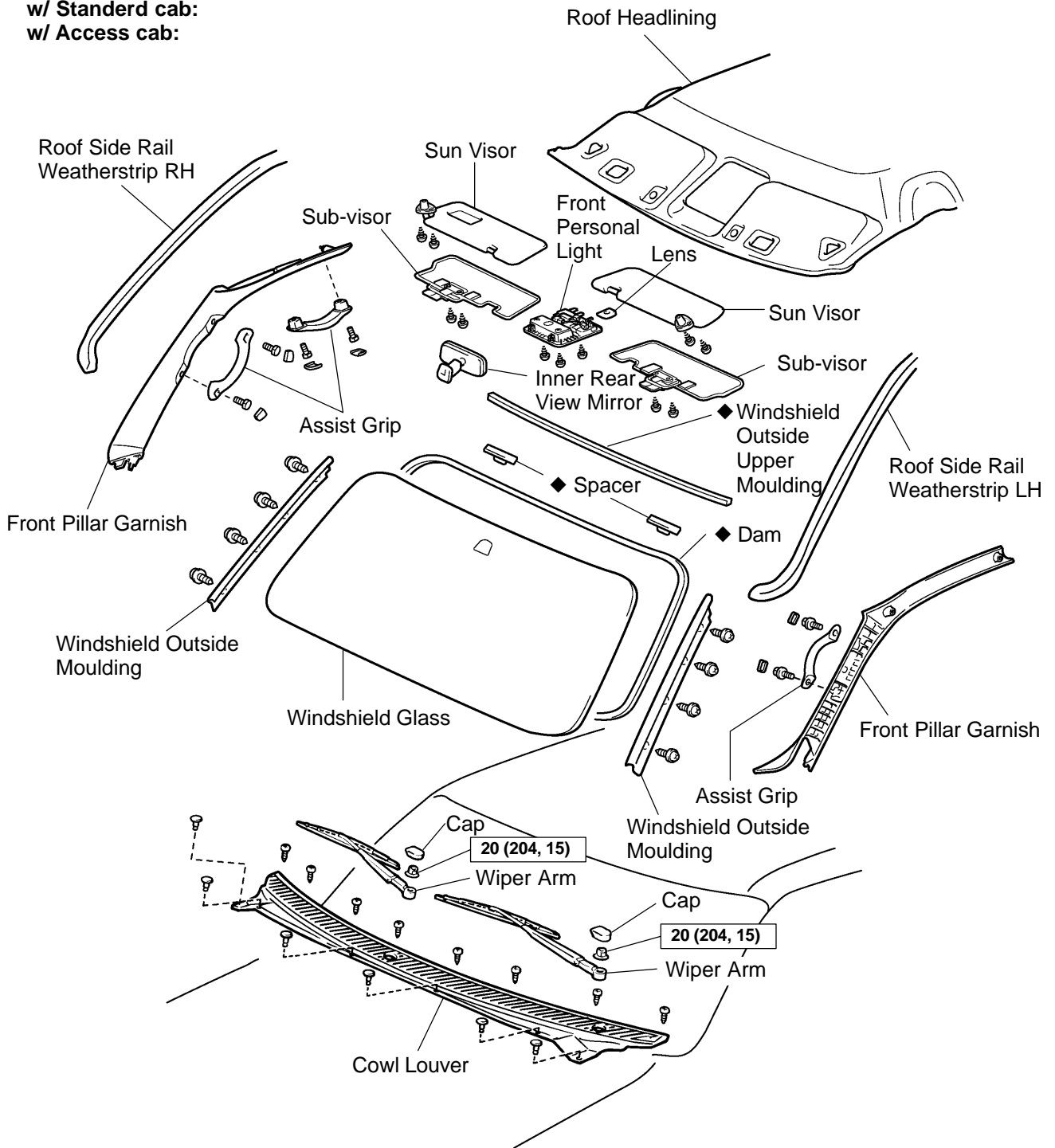
INSTALLATION

Installation is in the reverse order of removal (see page [BO-66](#)).

WINDSHIELD COMPONENTS

BO4Q2-01

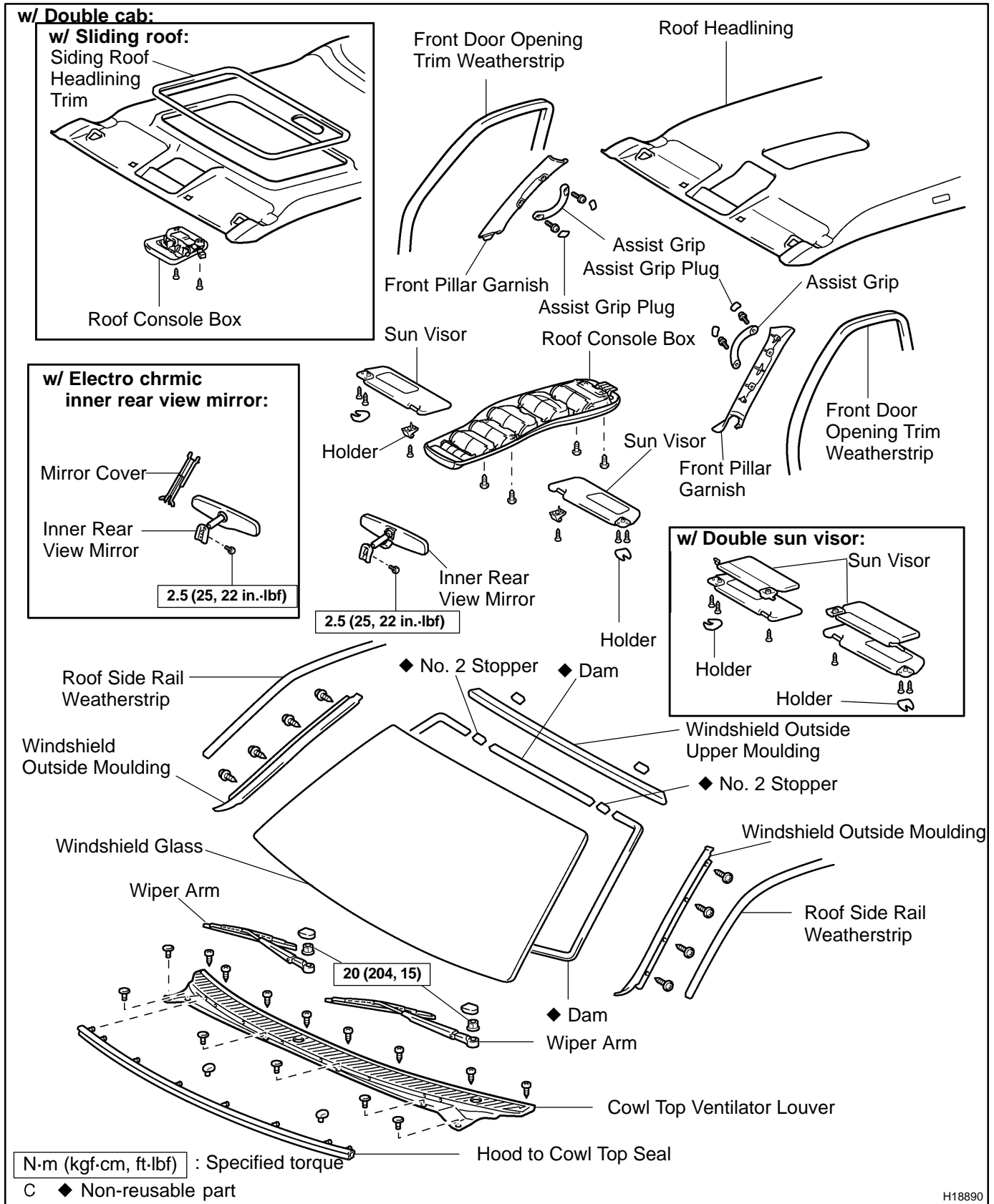
w/ Standerd cab:
w/ Access cab:



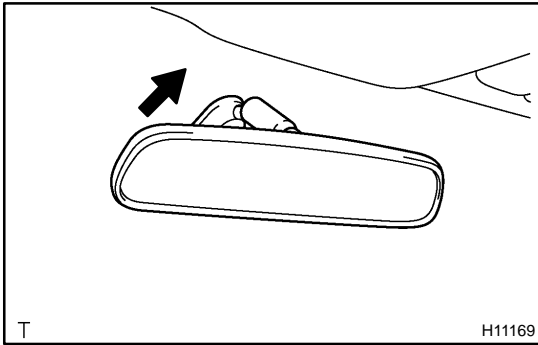
N·m (kgf·cm, ft·lbf) : Specified torque

T ◆ Non-reusable part

H11397



H18890



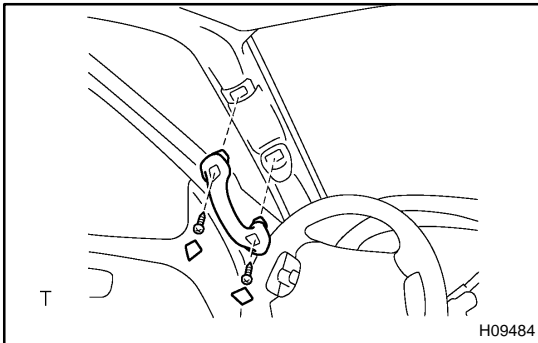
REMOVAL

HINT:

While supporting the hood by hand, remove the hood support from the hood.

1. REMOVE INNER REAR VIEW MIRROR

Remove the inner rear view mirror as shown in the illustration.



2. REMOVE ASSIST GRIPS

(a) Using a screwdriver, remove the caps.

HINT:

Tape the screwdriver tip before use.

(b) Driver side:

Using a torx® driver, remove the 2 torx® screws and assist grip.

Torx® driver: T30 (Part No.09041-00030 or locally manufactured tool)

(c) Standard cab, Access cab, Passenger side:

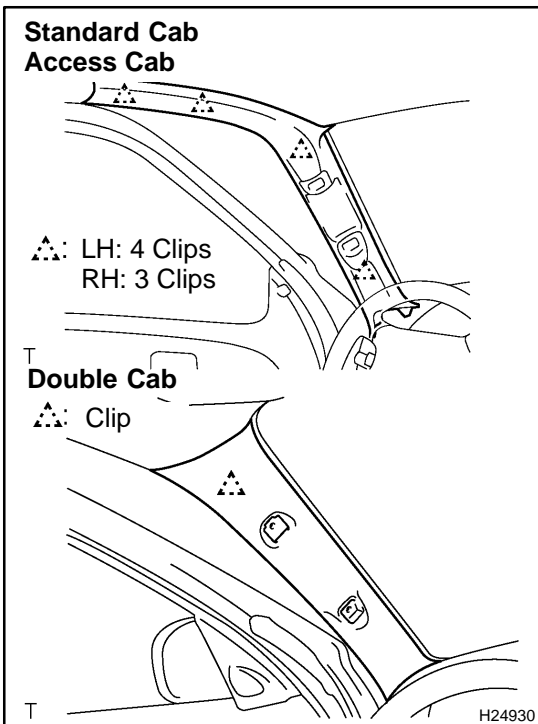
Using a torx® driver, remove the 4 torx® screws and 2 assist grips.

Torx® driver: T30 (Part No.09041-00030 or locally manufactured tool)

(d) Double cab cab, Passenger side:

Using a torx® driver, remove the 2 torx® screws and assist grips.

Torx® driver: T30 (Part No.09041-00030 or locally manufactured tool)



3. REMOVE FRONT PILLAR GARNISH

(a) Using a screwdriver, remove the front pillar garnish.

HINT:

Tape the screwdriver tip before use.

(b) Employ the same manner described above to the other side.

4. REMOVE SUN VISORS

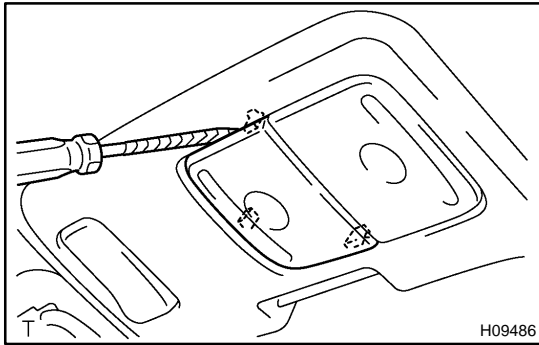
(a) Remove the 4 screws and 2 sun visors.

(b) w/ Light:

Disconnect the connector.

5. REMOVE SUB-VISORS

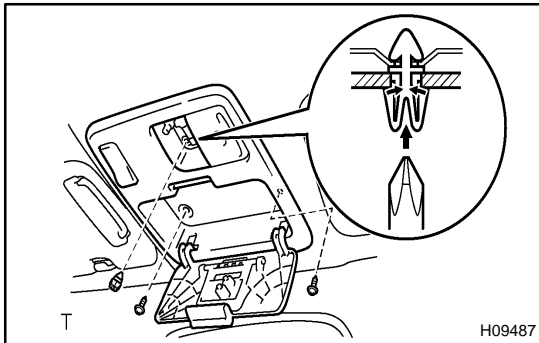
Remove the 4 screws and 2 sub-visors.

**6. REMOVE FRONT PERSONAL LIGHT**

(a) Using a screwdriver, remove the left side lens.

HINT:

Tape the screwdriver tip before use.



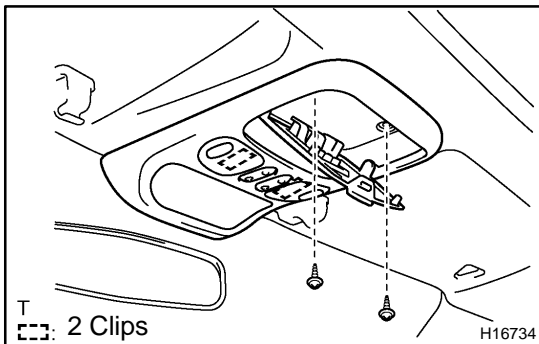
(b) Remove the 2 screws.

(c) Using a screwdriver, rotate the clip by 90° and remove it.

HINT:

Tape the screwdriver tip before use.

(d) Remove the front personal light, then disconnect the connector.

**7. w/ Sliding roof:****REMOVE ROOF CONSOLE BOX**

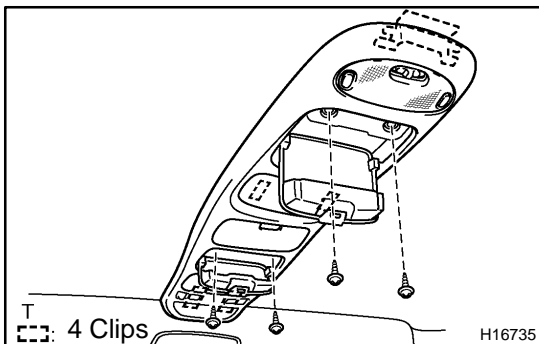
(a) Remove the 2 screws.

(b) Using a screwdriver, remove the roof console box.

HINT:

Tape the screwdriver tip before use.

(c) Disconnect the connectors.

**8. w/o Sliding roof:****REMOVE ROOF CONSOLE BOX**

(a) Remove the 4 screws.

(b) Using a screwdriver, remove the roof console box.

HINT:

Tape the screwdriver tip before use.

(c) Disconnect the connectors.

9. REMOVE SUN VISOR HOLDERS

Remove the 2 screws and 2 sun visor holders.

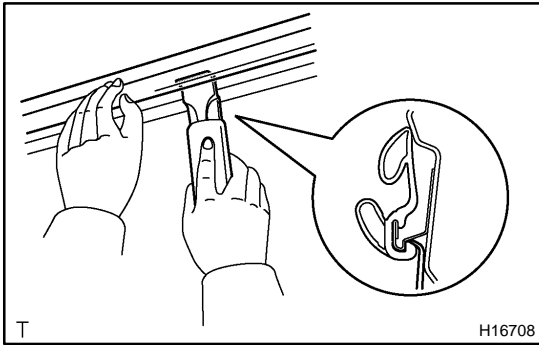
10. REMOVE FRONT PART OF ROOF HEADLINING**11. REMOVE WIPER ARMS**

(a) Using a screwdriver, remove the 2 caps.

HINT:

Tape the screwdriver tip before use.

(b) Remove the 2 nuts and wiper arms.

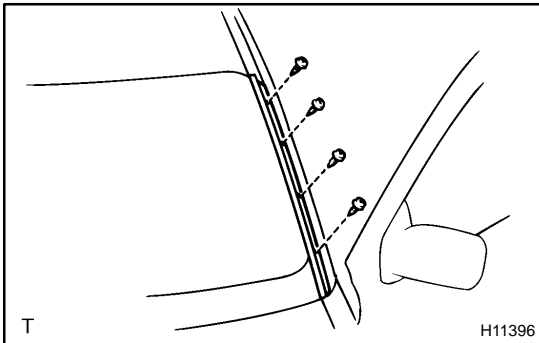


12. REMOVE COWL TOP VENTILATOR LOUVER

- (a) Remove the hood to cowl top seal.
- (b) Using a clip remover, remove the 6 clips.
- (c) Remove the 8 screws and cowl top ventilator louver.

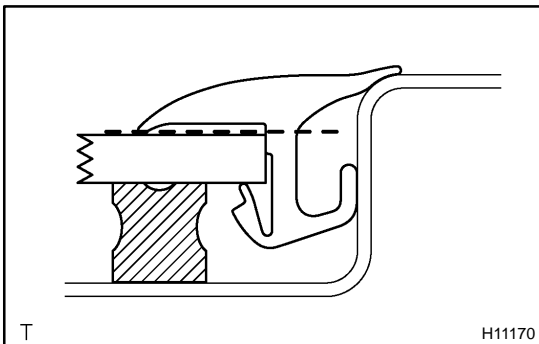
13. REMOVE FRONT PART OF ROOF SIDE RAIL WEATHERSTRIP LH AND RH

Using SST, pull off the roof side rail weatherstrip from front end.
SST 09806-30010



14. REMOVE WINDSHIELD OUTSIDE MOULDING

- (a) Remove the 4 screws and windshield outside moulding.
- (b) Perform the same procedure on the other side.



15. w/ Standed cab, Access cab:

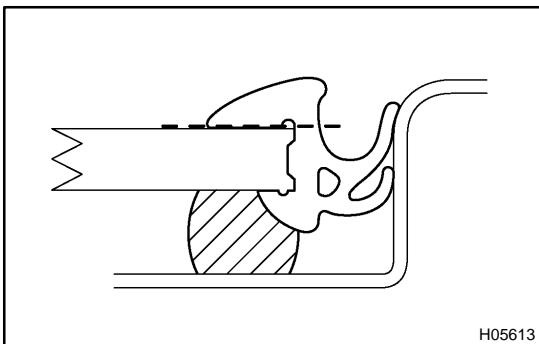
REMOVE WINDSHIELD OUTSIDE UPPER MOULDING

- (a) Using a knife, cut off the moulding as shown in the illustration.

NOTICE:

Do not damage the body with the knife.

- (b) Remove the remaining moulding.



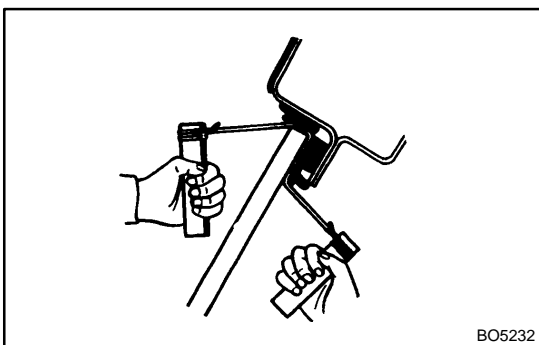
16. w/Double cab:

REMOVE WINDSHIELD OUTSIDE UPPER MOULDING

Using a knife, cut off the moulding as shown in the illustration.

NOTICE:

Do not damage the body with the knife.

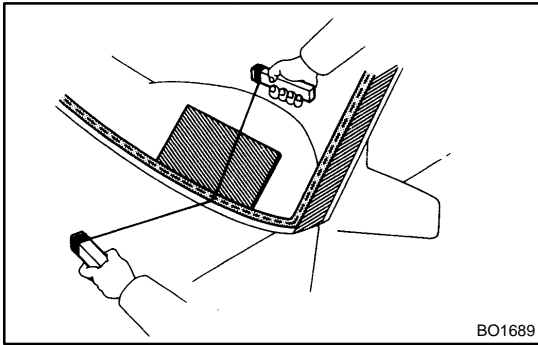


17. REMOVE WINDSHIELD GLASS

- (a) Push piano wire through between the body and glass from the interior.
- (b) Tie both wire ends to wooden blocks or similar objects.

HINT:

Apply protective tape to the outer surface to keep the surface from being scratched.

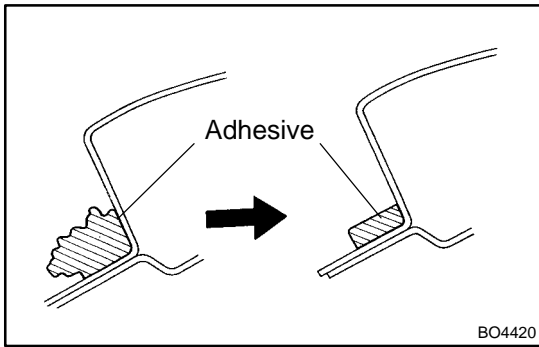
**NOTICE:**

When separating the glass, take care not to damage the paint and exterior ornaments. To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.

- (c) Cut the adhesive by pulling the piano wire around it.
- (d) Remove the glass.

NOTICE:

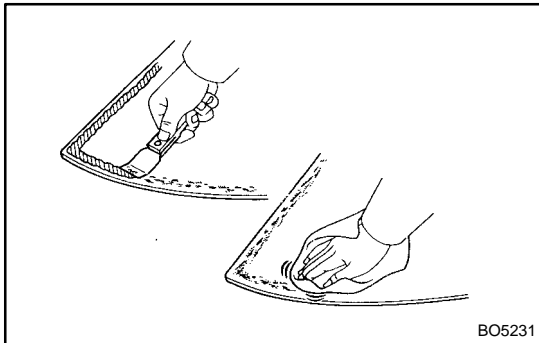
Leave as much of the adhesive on the body as possible when cutting off the glass.



INSTALLATION

1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

- (a) Using a knife, cut away any rough areas on the body.
- HINT:
Leave as much of the adhesive on the body as possible.
- (b) Clean the cutting surface of the adhesive with a shop rag saturated in cleaner.
- HINT:
Even if all the adhesive has been removed, clean the body.

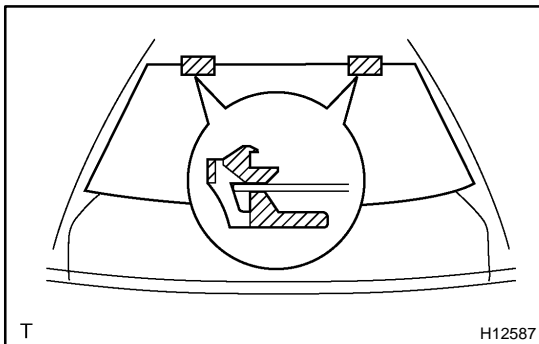


2. CLEAN REMOVED GLASS

- (a) Remove the damaged stoppers and dam.
- (b) Using a scraper, remove the adhesive sticking to the glass.
- (c) Clean the glass with cleaner.

NOTICE:

- ◆ Be careful not to damage the glass.
- ◆ Do not touch the glass face after cleaning it.



3. w/ No. 1 stopper:

REPLACE NO. 1 STOPPERS

- (a) Remove the damaged stoppers.
- (b) Cut off the old adhesive around the stopper installation area.

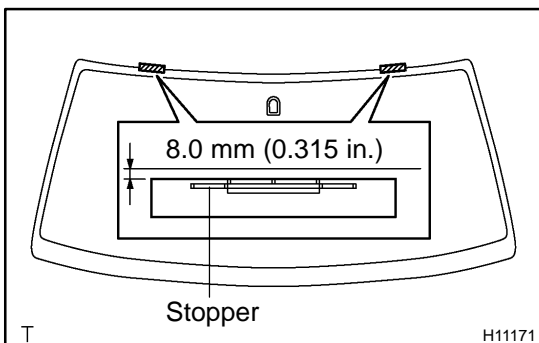
NOTICE:

Be careful not to damage the body.

- (c) Clean the installation area.
- (d) Attach new stoppers to the body so that the notches on the body will align with the stoppers as shown in the illustration.

HINT:

Make sure that the stoppers are installed facing the correct direction.

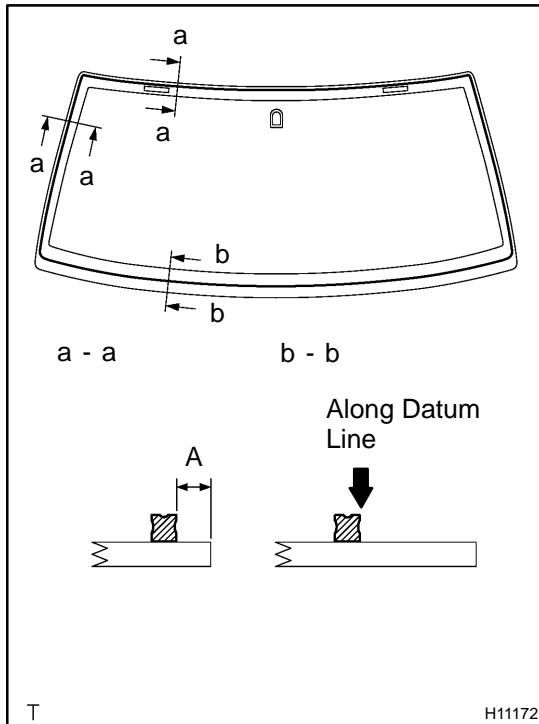


4. INSTALL NEW STOPPERS

Attach new stoppers to the glass with the ceramic notches on the glass aligned with the stoppers as shown in the illustration.

HINT:

Make sure that the stoppers are installed facing the correct direction.



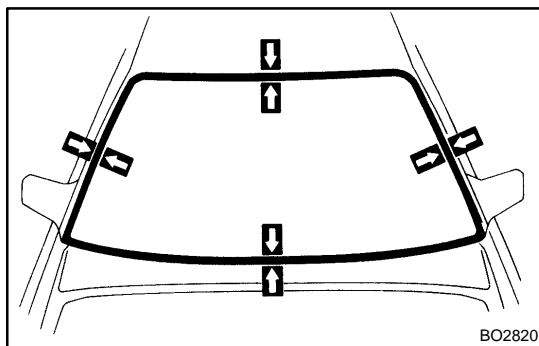
5. INSTALL NEW DAM

Install a new dam with double-stick tape as shown in the illustration.

A: 7.0 mm (0.276 in.)

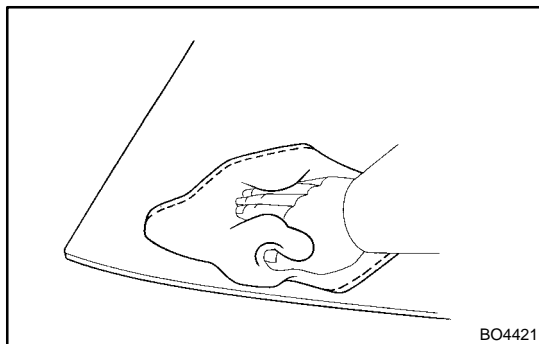
NOTICE:

Do not touch the glass surface after cleaning it.



6. POSITION GLASS

- Place the glass in the correct position.
- Check that all contacting parts of the glass rim are perfectly even.
- Place reference marks between the glass and body.
- Remove the glass.

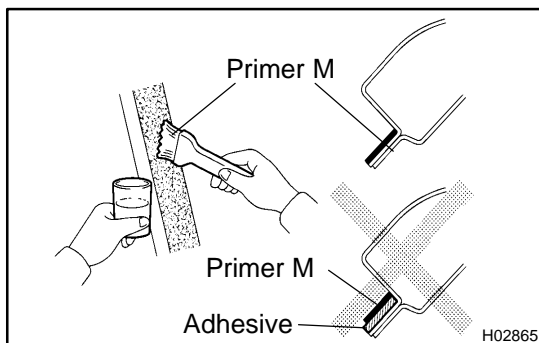


7. CLEAN CONTACT SURFACE OF GLASS

Using a cleaner, clean the contact surface which is black-colored area around the entire glass rim.

NOTICE:

Do not touch the glass face after cleaning it.

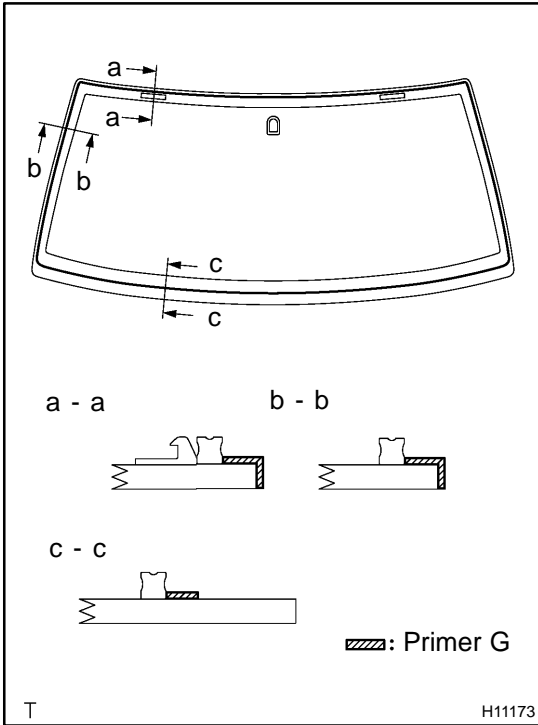


8. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat Primer M to the exposed part of body on the vehicle side.

NOTICE:

- ◆ Let the primer coating dry for 3 minutes or more.
- ◆ Do not coat Primer M to the adhesive.
- ◆ Do not keep any of the opened Primer M for later use.

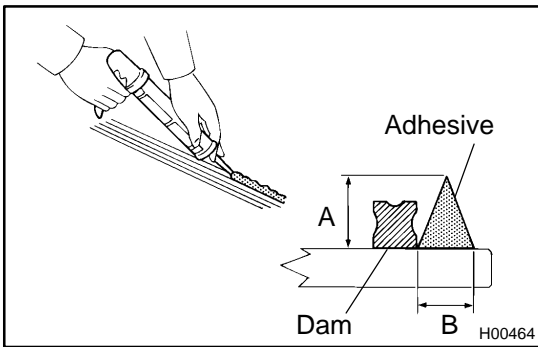


9. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

- (a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G.
- (b) When the primer is coated wrongly to the area other than the specified, wipe it off with a clean shop rag before the primer dries.

NOTICE:

- ◆ Let the primer coating dry for 3 minutes or more.
- ◆ Do not keep any of the opened Primer G for later use.



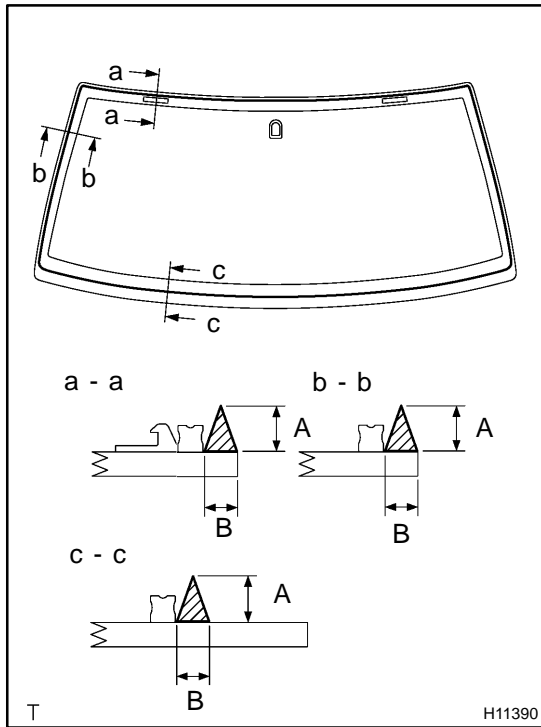
10. APPLY ADHESIVE

- (a) Cut off the tip of the cartridge nozzle.
Part No. 08850-00801 or equivalent

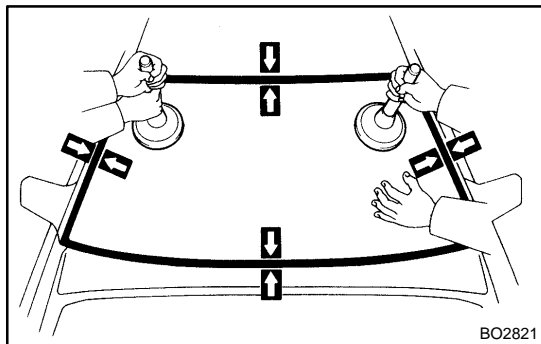
HINT:

After cutting off the tip, use all adhesive within the time described in the table below.

Temperature	Tackfree time
35 °C (95 °F)	15 minutes
20 °C (68 °F)	100 minutes
5 °C (41 °F)	8 hours



- (b) Load the cartridge into the sealer gun.
- (c) Coat the glass with adhesive as shown in the illustration.
A: 12 mm (0.47 in.)
B: 8 mm (0.31 in.)



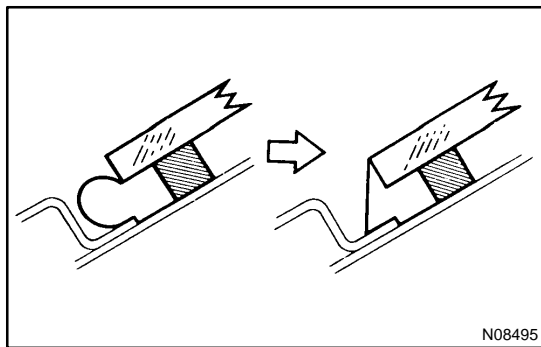
11. INSTALL WINDSHIELD GLASS AND MOULDING

- (a) Install the glass, aligning the reference marks using a suction rubber.

HINT:

Check that stoppers engage correctly viewing.

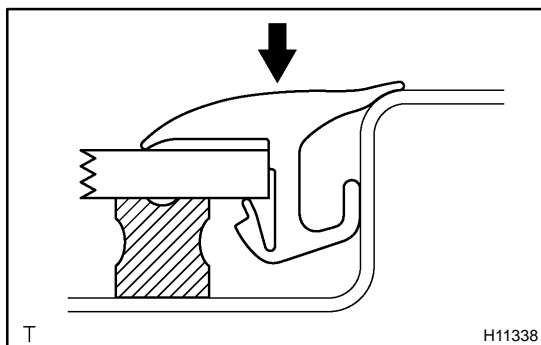
- (b) Lightly press the glass front surface for close contact.



- (c) Correct insufficient or protruded adhesive agent using a spatula.

HINT:

Apply the adhesive agent up to the windshield glass edge.



- (d) Install a new windshield outside upper moulding to the windshield glass before the adhesive agent hardens.

HINT:

Install the moulding, aligning the center of moulding with the center of body.

- (e) Using a scraper, remove any excessive adhesive agent before it hardens.

- (f) Hold the glass and moulding in place securely with a protective tape or equivalent until the adhesive hardened.

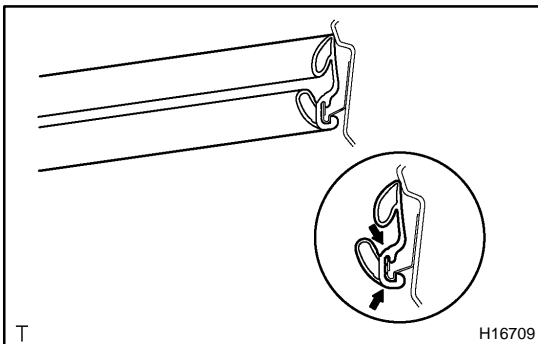
NOTICE:

Take care not to drive the vehicle during the time described in the table below.

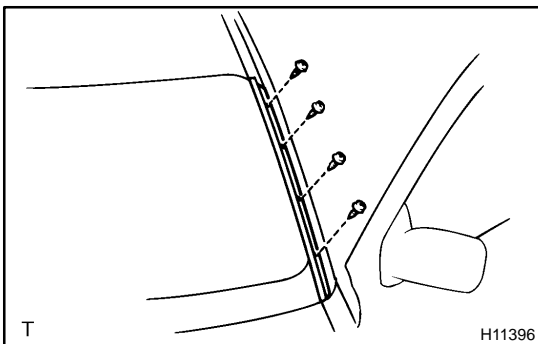
Temperature	Minimum time prior to drive of the vehicle
35 °C (95 °F)	1.5 hours
20 °C (68 °F)	5 hours
5 °C (41 °F)	24 hours

12. INSPECT FOR LEAKAGE AND REPAIR**NOTICE:**

Conduct a leak test after the hardening time has elapsed.

**13. INSTALL ROOF SIDE RAIL WEATHERSTRIP**

Attach the upper edge of the weatherstrip to body flange. Tap on the weatherstrip by hand.

**14. INSTALL WINDSHIELD OUTSIDE MOULDING**

- (a) Install the 4 screws and windshield outside moulding.
- (b) Employ the same manner described above to the other side.

15. INSTALL FRONT PART OF ROOF SIDE RAIL WEATHERSTRIP LH AND RH

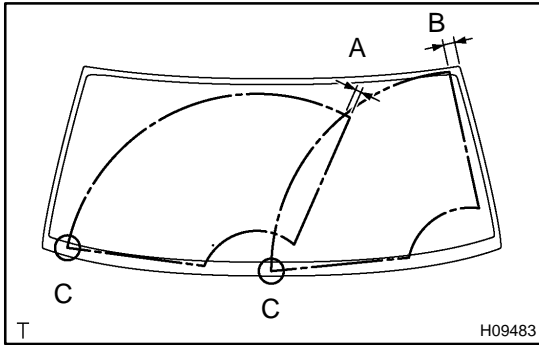
Install the front part of roof side rail weatherstrip LH and RH.

16. INSTALL COWL TOP VENTILATOR LOUVER

Install the cowl louver with the 8 screws and 6 clips.

17. INSTALL WIPER ARMS

- (a) Operate the wipers once and turn the wiper switch OFF.
- (b) Install the wiper arms and tighten the nuts by hand.



- (c) Adjust the installation positions of the wiper arms to the positions shown in the illustration.
A: Approx. 25.7 mm (1.012 in.)
B: Approx. 39.7 mm (1.563 in.)

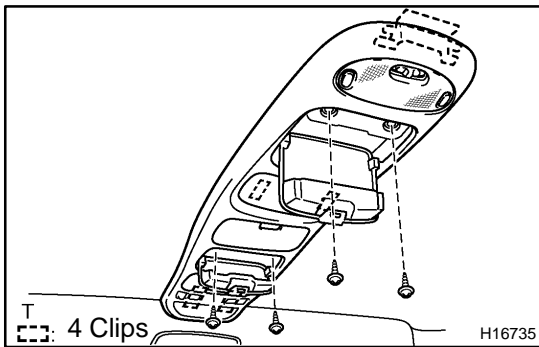
HINT:

When installing wiper arms, make sure that the tips of the blades are not beyond the ceramic edge as indicated by "C" part in the illustration.

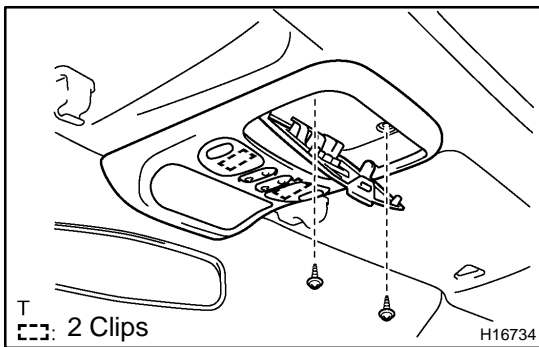
- (d) Torque the nuts.
Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)
 (e) Install the caps.

18. INSTALL FRONT PART OF ROOF HEADLINING**19. INSTALL SUN VISOR HOLDERS**

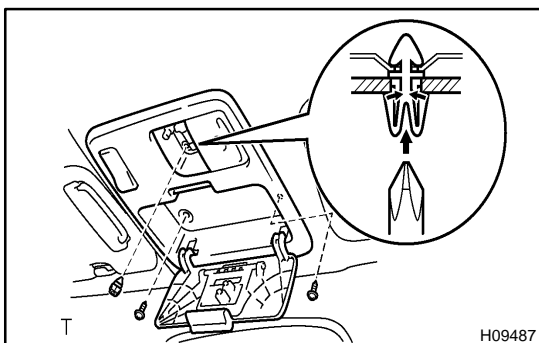
Install the 2 sun visor holders with the 2 screws.

**20. w/o Sliding roof:
INSTALL ROOF CONSOLE BOX**

- (a) Connect the connector.
 (b) Install the console box with the 4 screws.

**21. w/ Sliding roof:
INSTALL ROOF CONSOLE BOX**

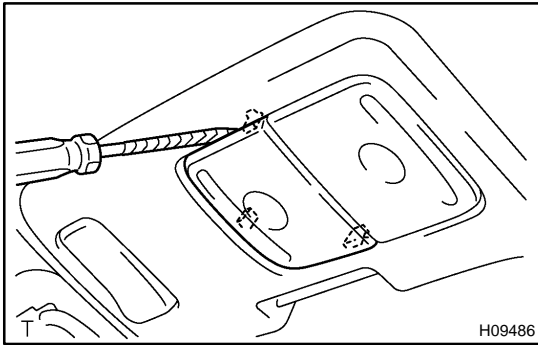
- (a) Connect the connector.
 (b) Install the console box with the 2 screws.

**22. INSTALL FRONT PERSONAL LIGHT**

- (a) Connect the connector, then install the front personal light.
 (b) Install the 2 screws and the clip.

HINT:

When installing the front personal light, attach the clip to the housing and push it to the bracket.



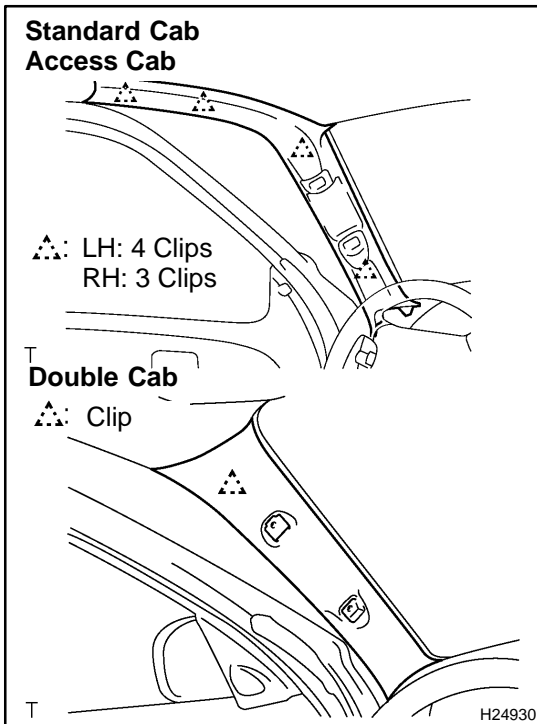
- (c) Install the left side lens.

23. INSTALL SUB-VISORS

Install the 2 sub-visors with the 4 screws.

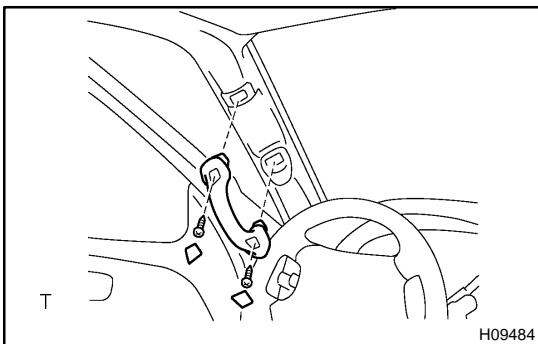
24. INSTALL SUN VISORS

- (a) w/ Light:
Connect the connector.
- (b) Install the 2 sun visors with the 4 screws.



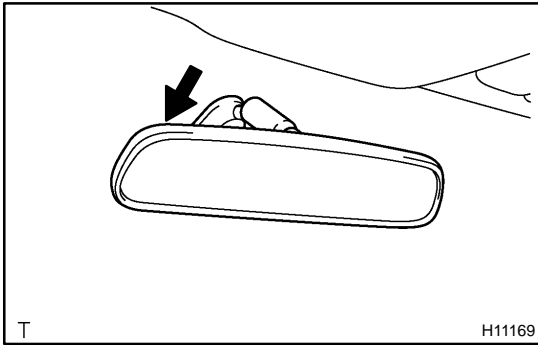
25. INSTALL FRONT PILLAR GARNISH

- (a) Install the front pillar garnish.
- (b) Perform the same procedure on the other side.



26. INSTALL ASSIST GRIPS

- (a) Driver's side:
Using a torx® socket wrench, install the assist grip with the 2 torx® screws.
Torx® driver: T30 (Part No. 09041-00030 or locally manufactured tool)
- (b) Standard cab, Access cab, Passenger side:
Using a torx® driver, install the 2 assist grips with the 4 torx® screws.
Torx® driver: T30 (Part No.09041-00030 or locally manufactured tool)
- (c) Double cab cab, Passenger side:
Using a torx® driver, install the assist grips with the 2 torx® screws.
Torx® driver: T30 (Part No.09041-00030 or locally manufactured tool)
- (d) Install the caps.

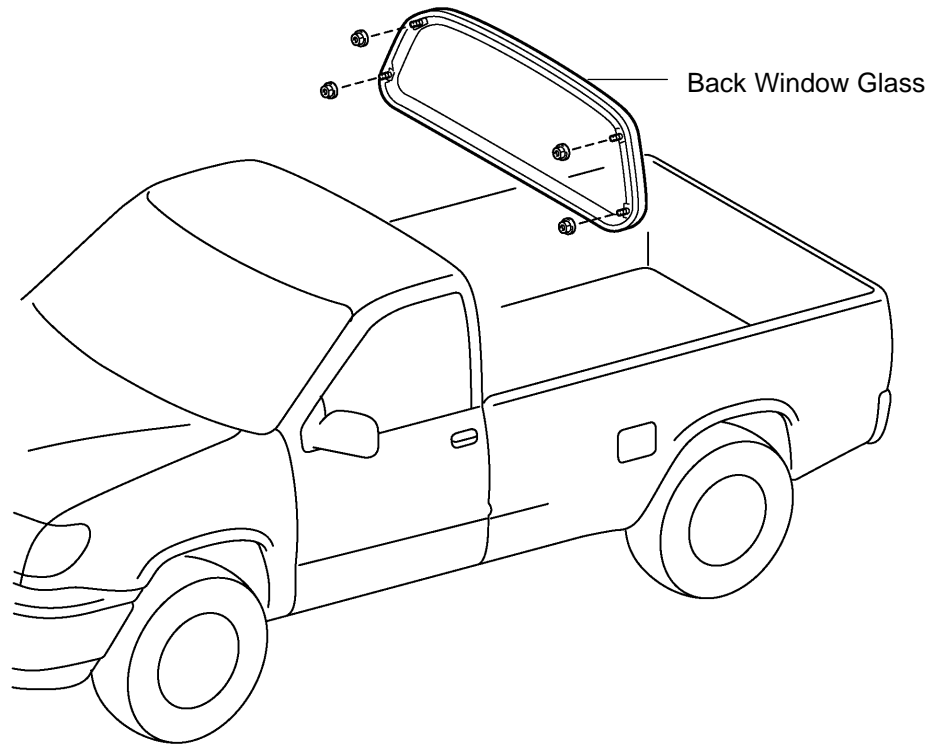
**27. INSTALL INNER REAR VIEW MIRROR**

Install the inner rear view mirror as shown in the illustration.

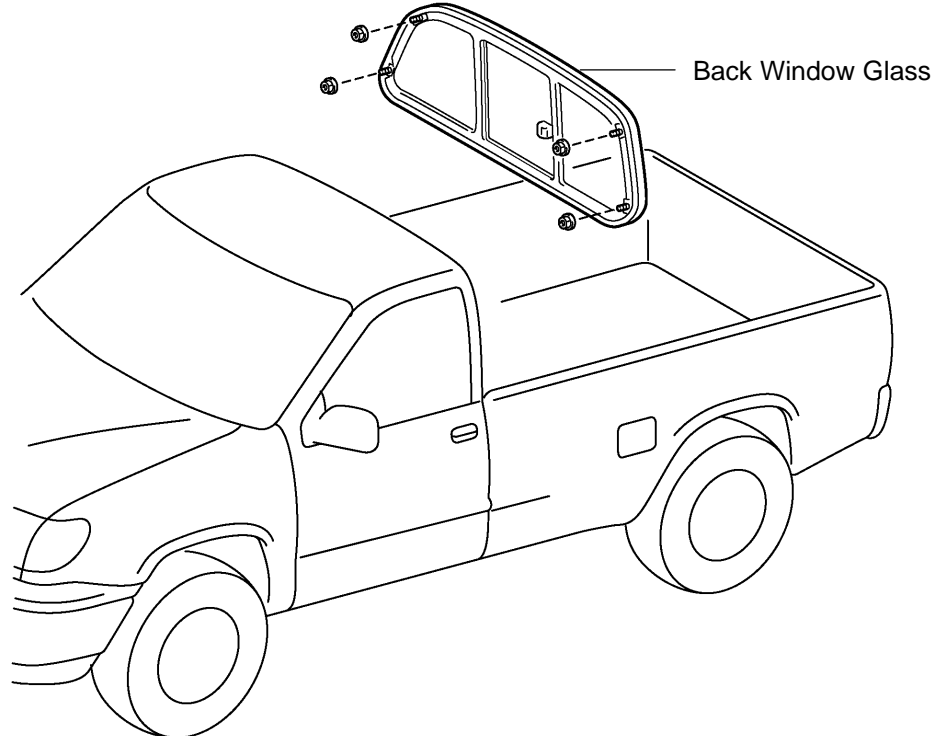
BACK WINDOW GLASS COMPONENTS

BO4H8-02

Fixed Type



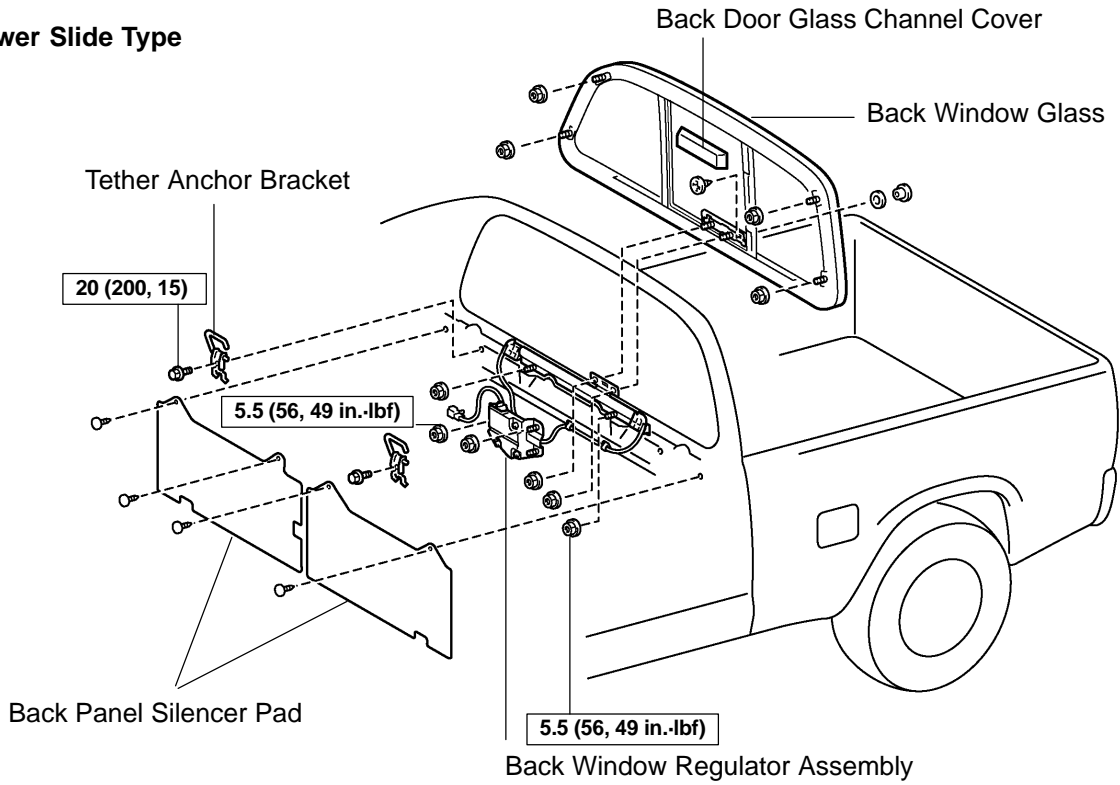
Slide Type



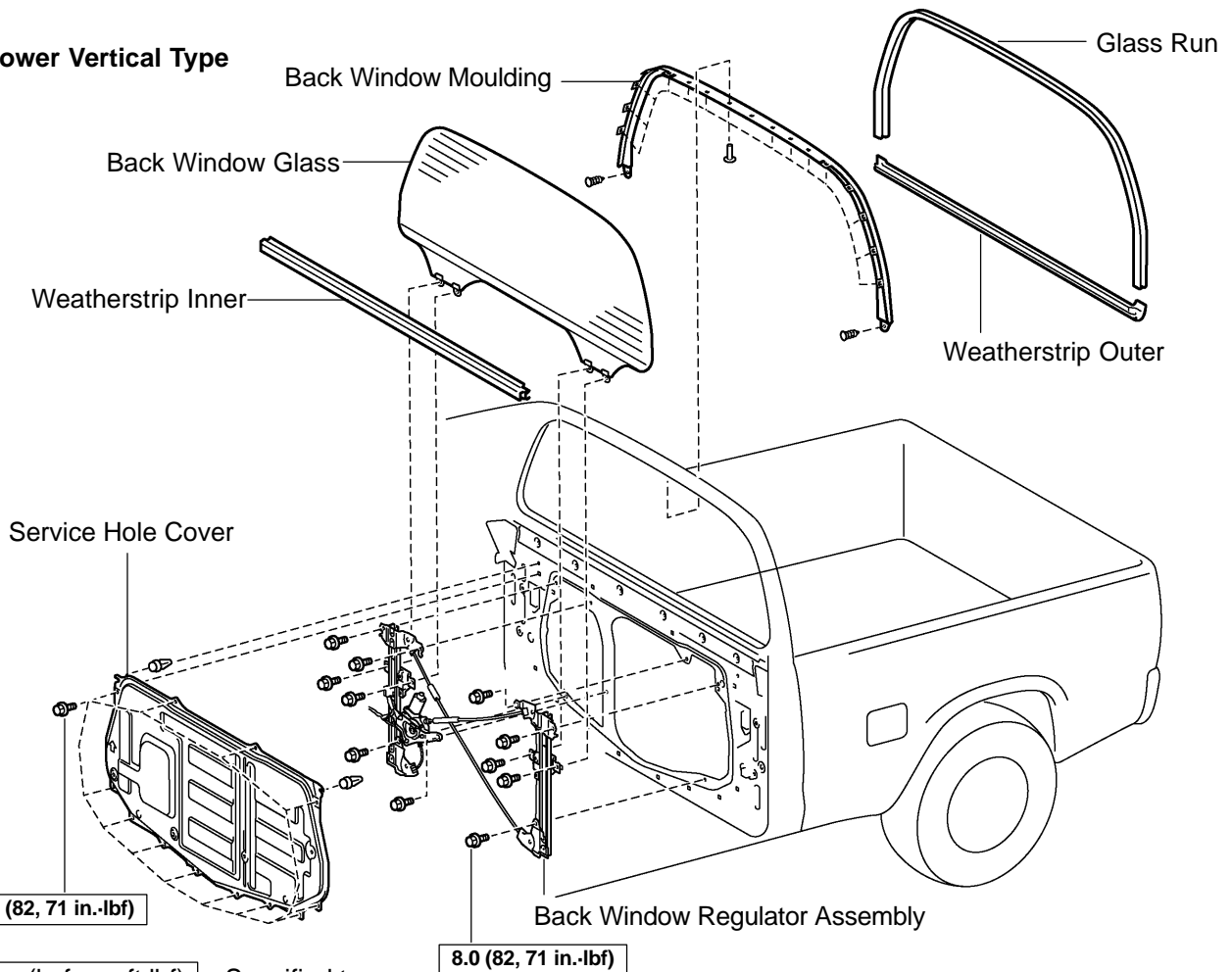
T

H11406

Power Slide Type



Power Vertical Type



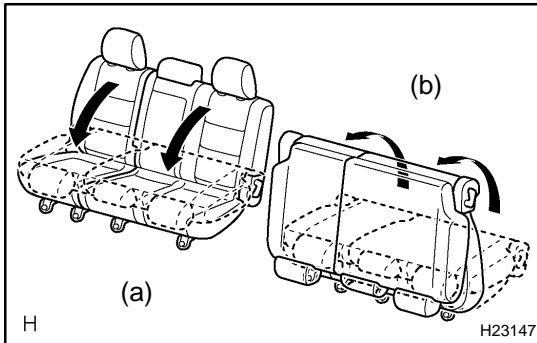
N·m (kgf·cm, ft·lbf) : Specified torque

REMOVAL

HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

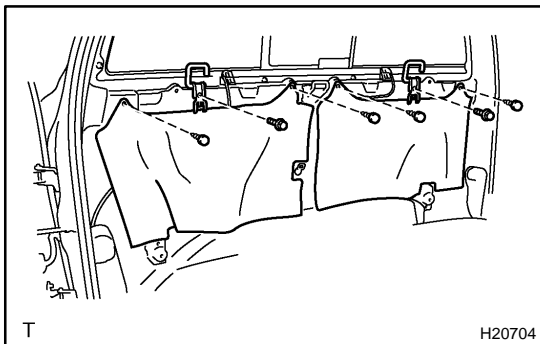
1. **Access cab (Standard body type):**
Access cab (Wide body type):
REMOVE REAR SEAT (See page [BO-203](#))



2. **Double cab:**
FOLD REAR SEAT
 - (a) Lower the headrest to the lowest position. Pull the seat-back angle adjusting lever and fold the seatback down.
 - (b) Unlock the seat legs by pulling up one of the lever on the seat legs and turn up the whole seat forward.
3. **Standard cab:**
REMOVE FRONT DOOR SCUFF PLATES
(see page [BO-126](#))
4. **Access cab (Standard body type):**
Access cab (Wide body type):
REMOVE ACCESS DOOR SCUFF PLATES
(See page [BO-126](#))
5. **Double cab:**
REMOVE BACK PANEL TRIM (See page [BO-133](#))
6. **REMOVE ASSIST GRIPS**
(See page [BO-126](#) , [BO-133](#))
7. **Standard cab:**
REMOVE FRONT PILLAR GARNISHES
(See page [BO-126](#))
8. **Access cab (Standard body type):**
Access cab (Wide body type):
REMOVE ROOF SIDE RAIL GARNISHES
(See page [BO-126](#))
9. **REMOVE ROOM LIGHT (See page [BO-126](#) , [BO-133](#))**
10. **Standard cab:**
REMOVE COAT HOOK (See page [BO-126](#))
11. **Standard cab:**
REMOVE BACK PANEL UPPER GARNISH
(See page [BO-126](#))
12. **Access cab (Standard body type):**
Access cab (Wide body type):
REMOVE QUARTER TRIMS (See page [BO-126](#))
13. **Double cab:**
REMOVE QUARTER TRIMS LOWER
(See page [BO-133](#))
14. **Double cab:**
REMOVE QUARTER TRIMS UPPER
(See page [BO-133](#))

15. Standard cab:**Access cab (Standard body type):****Access cab (Wide body type):****REMOVE REAR PART OF ROOF HEADLINING**

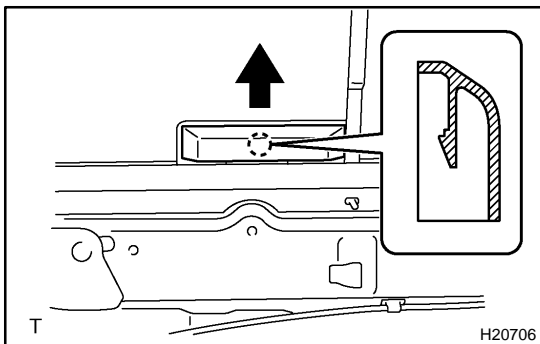
- (a) Standard cab:
Remove the 2 clips and the rear part of the roof headlining.
- (b) Access cab (Standard body type):
Access cab (Wide body type):
Remove the 3 clips and the rear part of the roof headlining.

**16. Power slide type:****REMOVE BACK WINDOW REGULATOR ASSEMBLY**

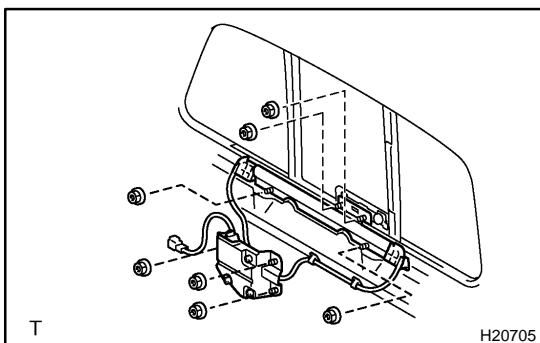
- (a) Remove the 2 bolts and tether anchor brackets.
- (b) Remove the 4 clips and 2 back panel silencer pads.
- (c) Using a screwdriver, remove the back door glass channel cover.

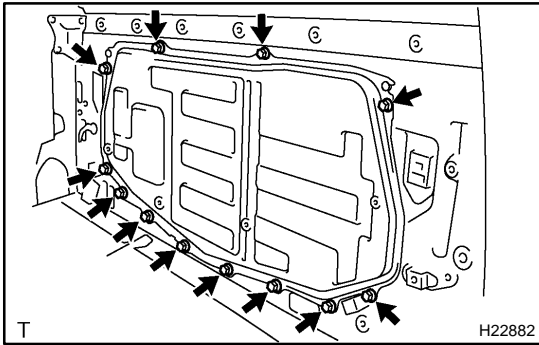
HINT:

Tape the screwdriver tip before use.



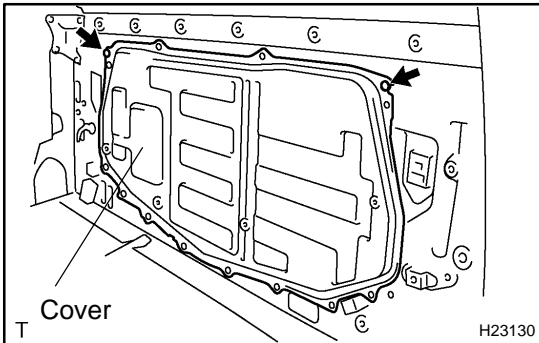
- (d) Remove the 7 nuts and the back window regulator assembly.





**17. Power vertical type:
REMOVE SERVICE HOLE COVER**

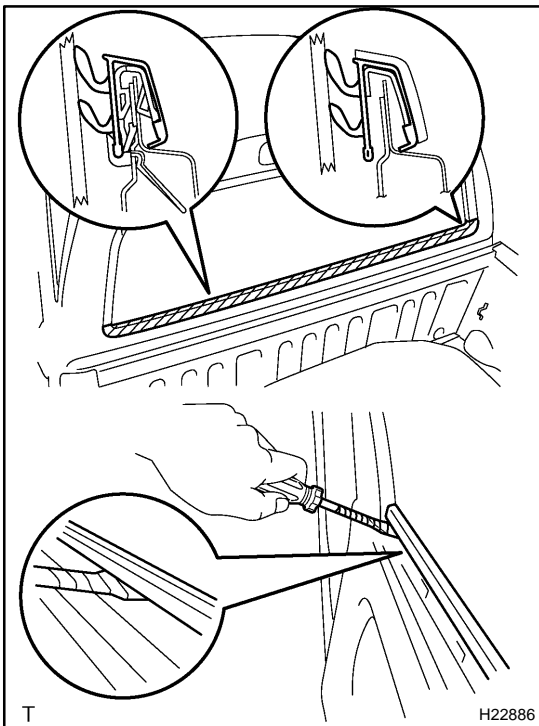
(a) Remove the 12 bolts.



(b) Using a clip remover, remove the 2 clips and cover.

NOTICE:

When the clips are removed, the cover may fall and become deformed.



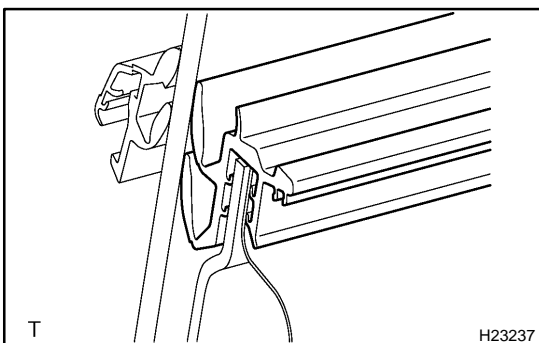
**18. Power vertical type:
REMOVE WEATHERSTRIP OUTER**

(a) Put protective tape under the weatherstrip.

(b) Using a screwdriver, disengage the claws and remove the weatherstrip.

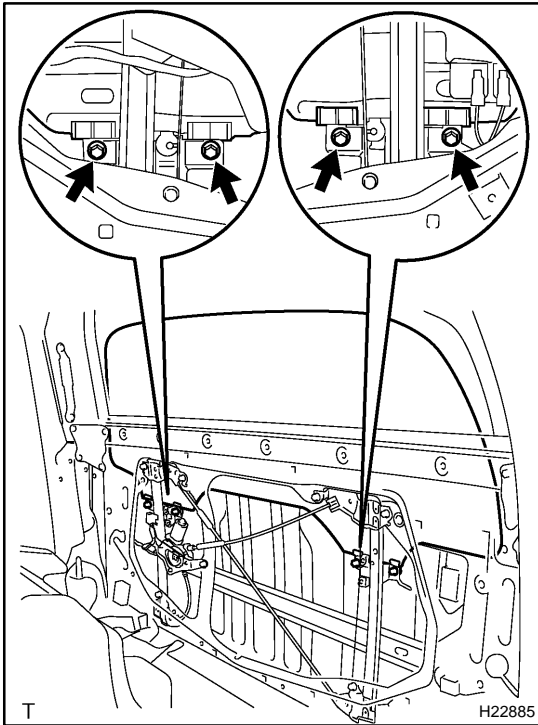
HINT:

Tape the screwdriver tip before use.



**19. Power vertical type:
REMOVE WEATHERSTRIP INNER**

Using a screwdriver, remove the weatherstrip.



**20. Power vertical type:
REMOVE BACK WINDOW GLASS**

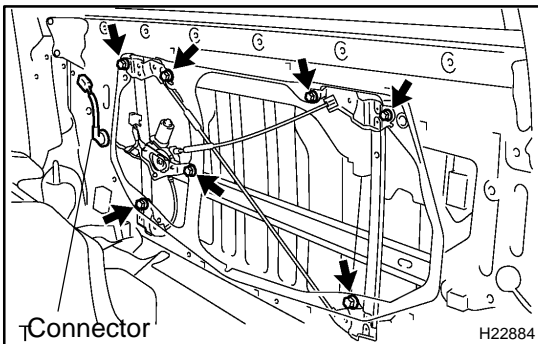
- (a) Disconnect the defogger connector.
- (b) Remove the 4 bolts and glass.

HINT:

Insert a shop rag inside the panel to prevent the back window glass from being scratched.

NOTICE:

- ◆ Do not damage the back window glass assembly.
- ◆ When the bolts are removed, the back window glass assembly might fall and become deformed.



**21. Power vertical type:
REMOVE BACK WINDOW REGULATOR ASSEMBLY**

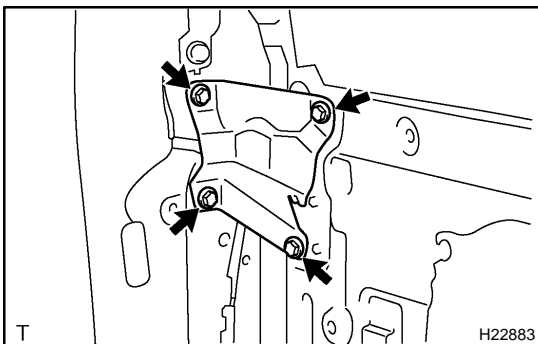
- (a) Disconnect the connector.
- (b) Remove the 7 bolts and regulator.

HINT:

Remove the back window regulator assembly through the service hole.

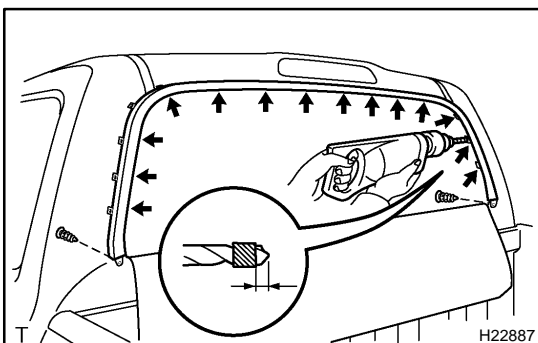
NOTICE:

When the bolts are removed, the back window regulator assembly may fall and become deformed.



**22. Power vertical type:
REMOVE BACK WINDOW MOULDING**

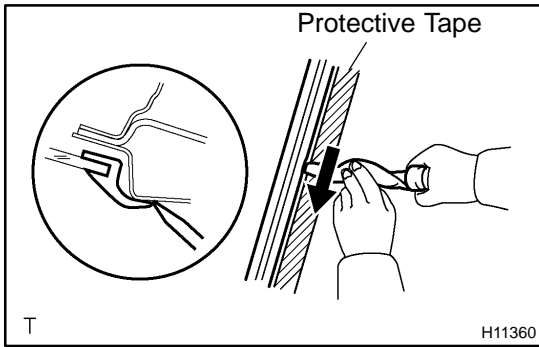
- (a) Remove the 8 bolts and the bracket LH and RH.



- (b) Remove the 2 clips.
- (c) Using a drill of less than $\varnothing 4$ mm (0.16 in.), drill out the 14 rivet heads and remove the moulding.

NOTICE:

- ◆ Be sure to gently place the drill perpendicular to the rivet, otherwise the rivet hole and the drill itself will be damaged.
- ◆ Be careful as the cut rivet will be very hot
- ◆ Cover the panel with a shop rag to prevent metal debris from entering inside the panel.



**23. Fix type, Slide type, Power slide type:
REMOVE BACK WINDOW GLASS**

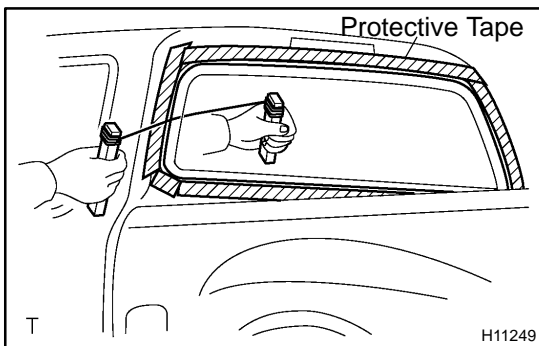
- (a) Remove the 4 nuts.
- (b) Using a screwdriver, remove the weatherstrip from the body.

HINT:

Tape the screwdriver tip before use.

NOTICE:

Be careful not to damage the body paint.



- (c) From the interior, insert piano wire between the vehicle body and glass.
- (d) Tie objects that can serve as handle (for example, wooden blocks) to all wire ends.

HINT:

Apply protective tape to the outer surface to prevent the surface from being scratched.

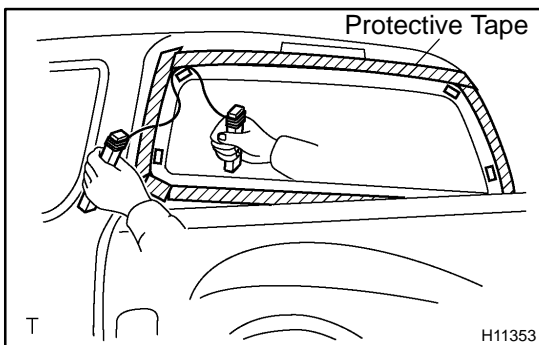
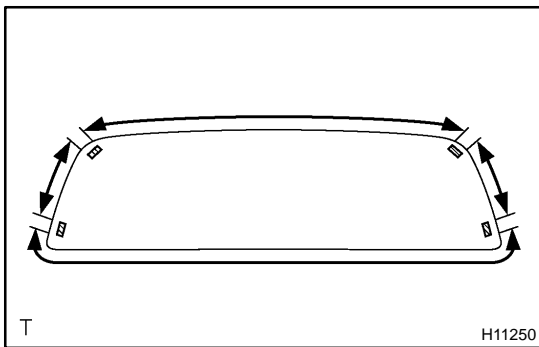
NOTICE:

When separating the glass, take care not to damage the body paint and exterior.

- (e) Cut off the adhesive by pulling the piano wire around it.

HINT:

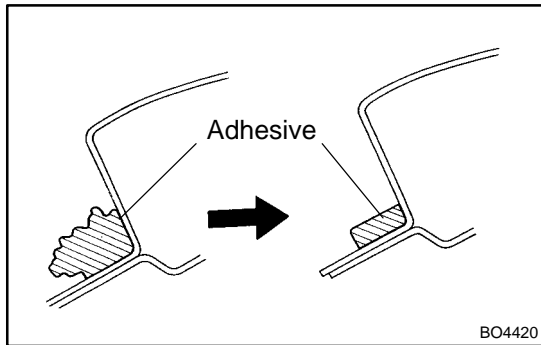
Cut off the adhesive on the areas as shown in the illustration but leave the adhesive where the stud bolts exist.



- (f) Pass piano wire through as shown in the illustration, and cut off the adhesive on the part adhered to the stud bolts.
- (g) Remove the glass.

NOTICE:

Leave as much of the adhesive on the body as possible when removing the glass.



INSTALLATION

1. Fix type, Slide type, Power slide type:

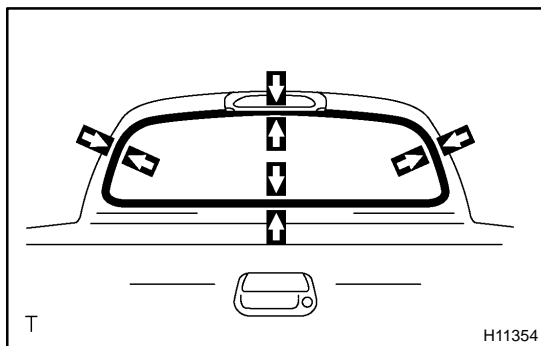
CLEAN AND SHAPE CONTACT SURFACE OF BODY

- (a) Using a knife, cut away any rough adhesive on the contact surface of the body to shape the surface.

HINT:

Leave as much of the adhesive on the body as possible.

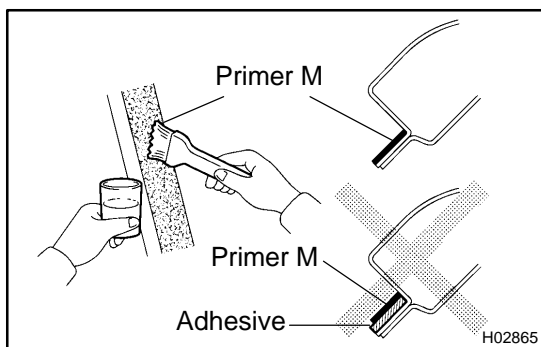
- (b) Clean the contact surface of the body with a piece of shop rag saturated with cleaner.



2. Fix type, Slide type, Power slide type:

POSITION GLASS

- (a) Place the glass in the correct position.
 (b) Check that the whole contact surface of the glass rim is perfectly even.
 (c) Place reference marks on the glass and body.
 (d) Remove the glass.



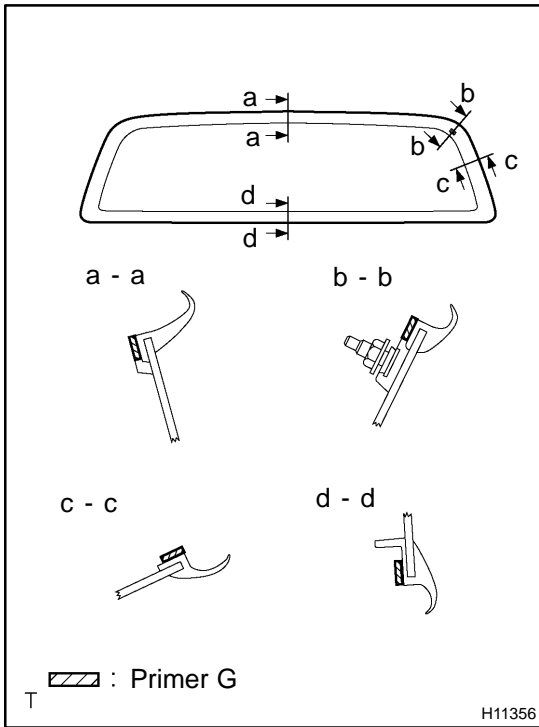
3. Fix type, Slide type, Power slide type:

COAT CONTACT SURFACE OF BODY WITH PRIMER M

Using a brush, coat the exposed part of the body with Primer M.

NOTICE:

- ◆ Allow the primer coating to dry for 3 minutes or more.
- ◆ Do not apply too much Primer M.
- ◆ Throw away any leftover Primer M.



**4. Fixed type:
COAT CONTACT SURFACE OF GLASS WITH PRIMER
G**

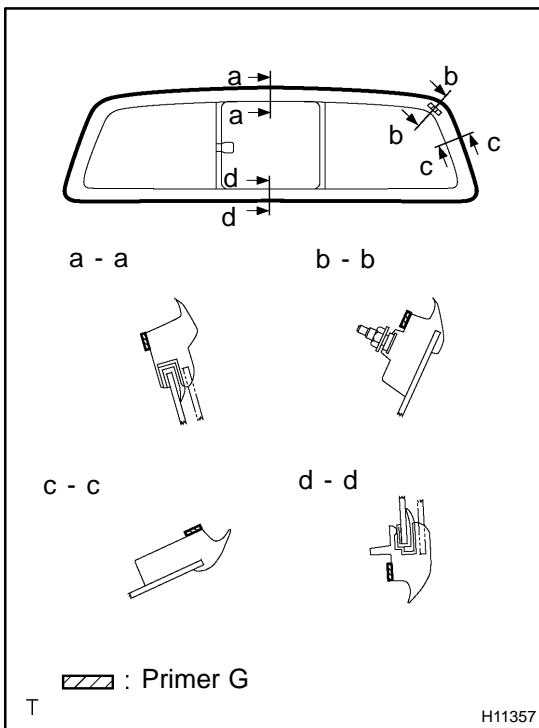
Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G as shown in the illustration.

HINT:

If the area other than that specified is coated by accident, wipe off the primer with a clean shop rag before it dries.

NOTICE:

- ◆ Allow the primer coating for 3 minutes or more.
- ◆ Throw away leftover Primer G.



**5. Slide type, Power slide type:
COAT CONTACT SURFACE OF GLASS WITH PRIMER
G**

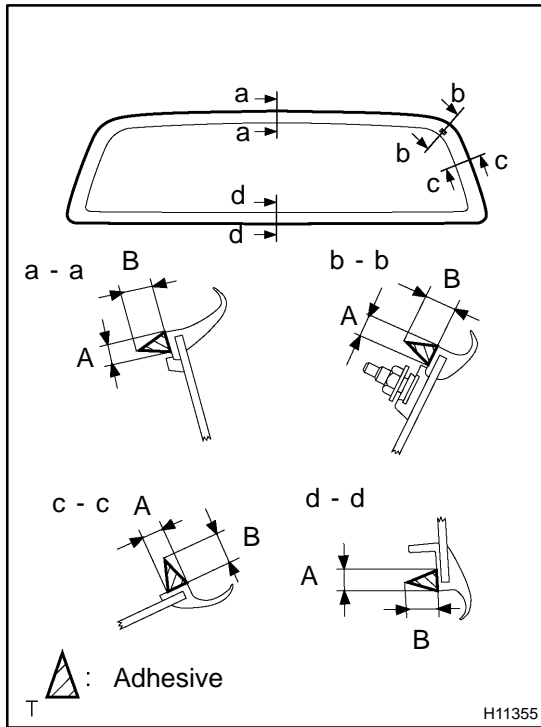
Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G as shown in the illustration.

HINT:

If the area other than that specified is coated by accident, wipe off the primer with a clean shop rag before it dries.

NOTICE:

- ◆ Allow the primer coating for 3 minutes or more.
- ◆ Throw away leftover Primer G.



6. Fixed type:

APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle.

Adhesive: Part No. 08850-00801 or equivalent

HINT:

After cutting off the tip, use all adhesive within the time described in the table below.

Usage timeframe:

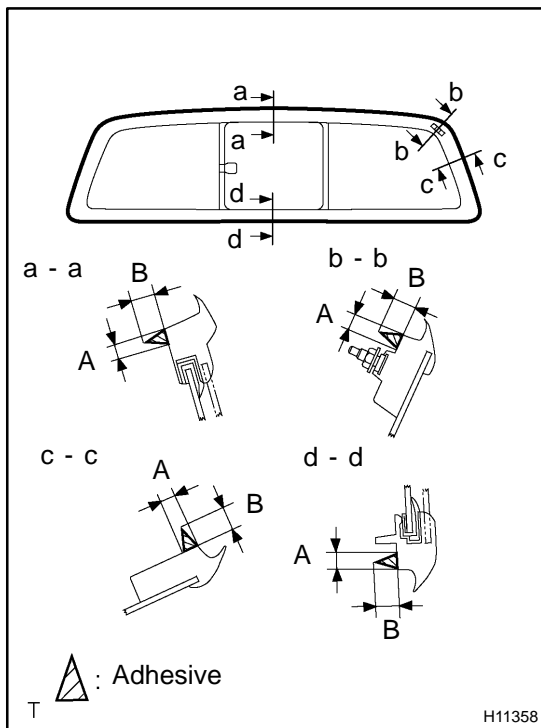
Temperature	Usage Timeframe
35°C (95°F)	15 minutes
20°C (68°F)	100 minutes
5°C (41°F)	8 hours

(b) Load the cartridge into a sealer gun.

(c) Coat the glass with adhesive, as shown in the illustration.

Specification:

Area	Measurement
A	8.0 mm (0.314 in.)
B	12.0 mm (0.472 in.)



7. Slide type, Power slide type:

APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle.

Part No. 08850-00801 or equivalent

HINT:

After cutting off the tip, use all adhesive within the time described in the table below.

Usage timeframe:

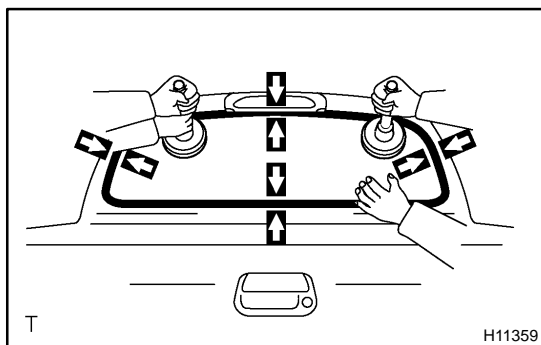
Temperature	Usage Timeframe
35°C (95°F)	15 minutes
20°C (68°F)	100 minutes
5°C (41°F)	8 hours

(b) Load the cartridge into a sealer gun.

(c) Coat the glass with adhesive, as shown in the illustration.

Specification:

Area	Measurement
A	8.0 mm (0.314 in.)
B	12.0 mm (0.472 in.)



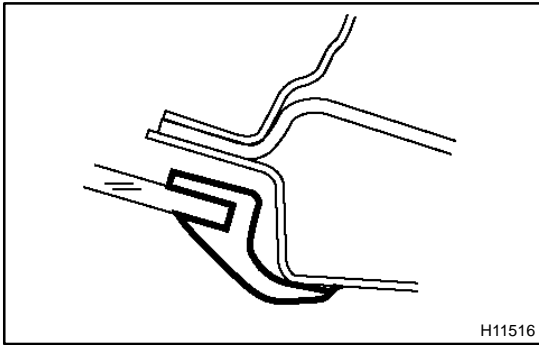
8. Fix type, Slide type, Power slide type:

INSTALL BACK WINDOW GLASS

(a) Position the glass so that the reference marks are aligned, and press it in gently along the rim.

(b) Using a spatula, apply adhesive on the glass rim.

(c) Use a scraper to remove any excess or protruding adhesive.



HINT:

Confirm that the moulding is attached to the body panel as shown in the illustration.

- (d) Hold the back window glass in place securely with a protective tape or equivalent until the adhesive hardens.

NOTICE:

Take care not to drive the vehicle during the time described in the table below.

Usage timeframe:

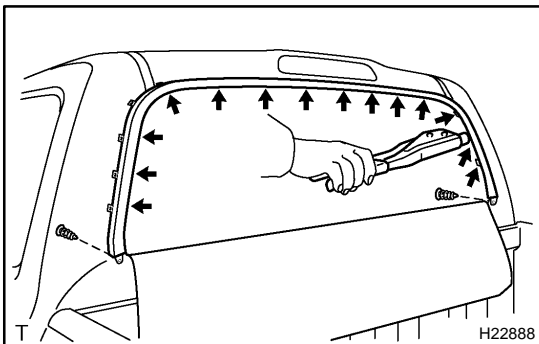
Temperature	Usage Timeframe
35 °C (95 °F)	1.5 hours
20 °C (68 °F)	5 hours
5 °C (41 °F)	24 hours

9. INSPECT FOR LEAK AND REPAIR

NOTICE:

Conduct a leak test after the adhesive has completely hardened.

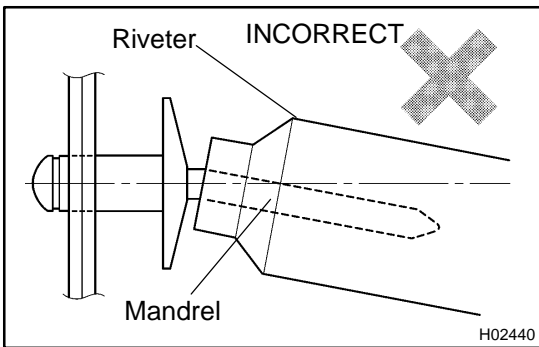
Adhesive: Part No. 08833-00030 or equivalent



10. Power vertical type:

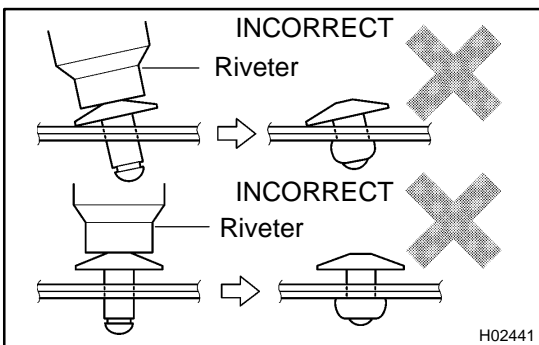
INSTALL BACK WINDOW MOULDING

- (a) Using a hand riveter or an air riveter, install the 14 drive pulley assemblies.

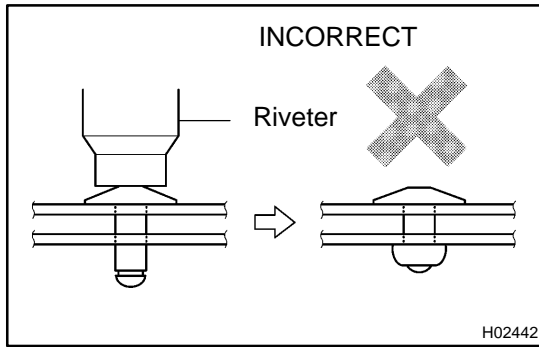


NOTICE:

Do not prize the riveter. The riveter will be damaged and the mandrel will bend.

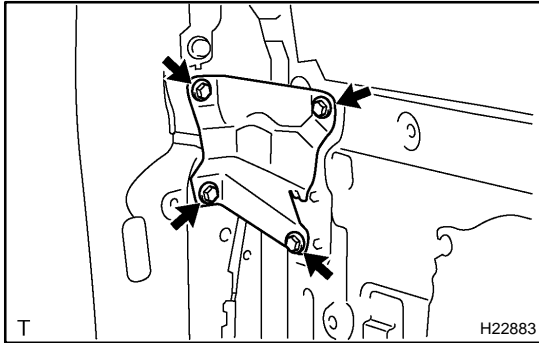


- ◆ Do not tilt the riveter when fastening the rivet to the item(s) as this will cause the rivet to be loose.
- ◆ Do not have any space between the rivet head and the item(s). The rivet head must be completely flat against the item(s).

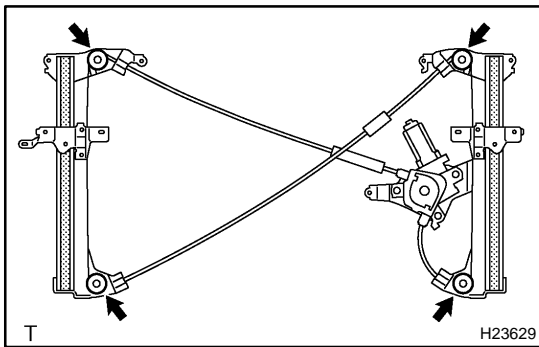


Do not have any space between the items. Firmly hold together the two items while installing the rivet.

(b) Install the 2 clips.



(c) Install the bracket LH and RH with the 8 bolts.



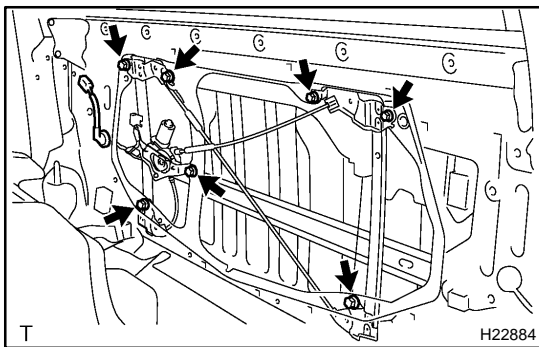
11. Power vertical type:

INSTALL BACK DOOR WINDOW REGULATOR ASSEMBLY

(a) Apply MP grease to the sliding and rotating parts of the window regulator assembly.

NOTICE:

Do not apply grease to the spring of the window regulator assembly.



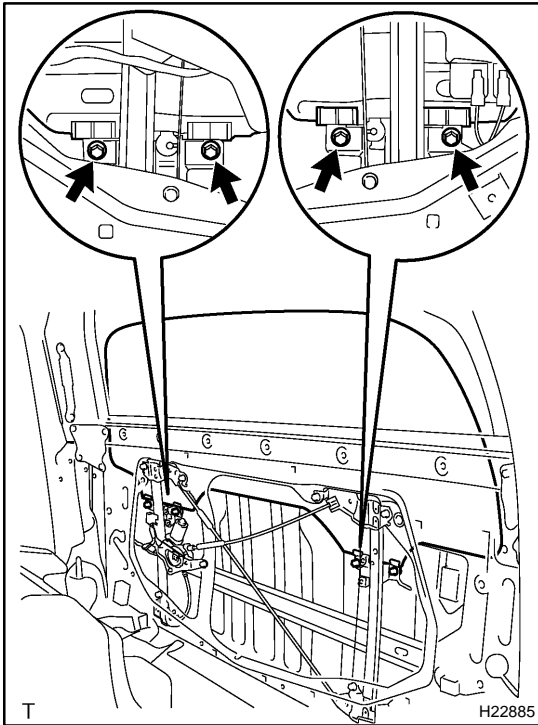
(b) Install the window regulator assembly with the 7 bolts.

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

(c) Connect the window regulator connector.

NOTICE:

Be careful not to drop and deform the window regulator assembly.



- 12. Power vertical type:
INSTALL BACK WINDOW GLASS**
- (a) Install the back window glass to the window regulator assembly with the 4 bolts..

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

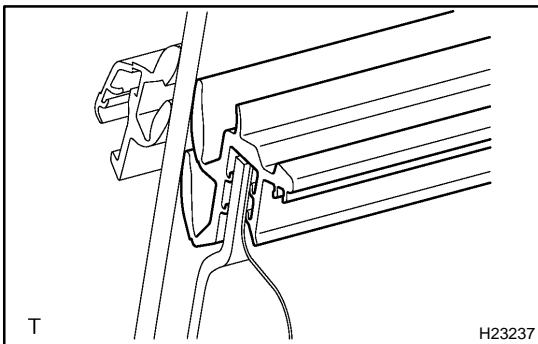
NOTICE:

Do not damage the back window glass sub-assy.

HINT:

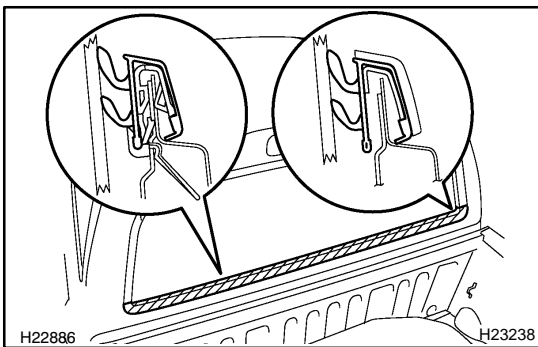
Insert a shop rag inside the door panel to prevent the back window glass from being scratched.

- (b) Connect the defogger connector.



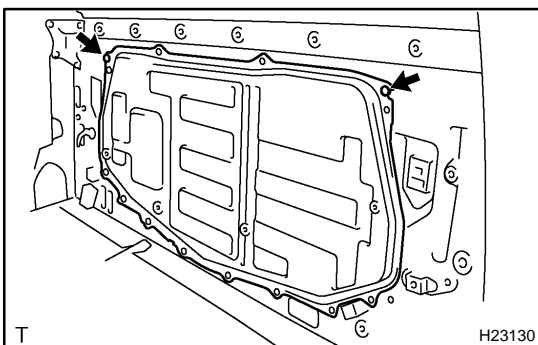
- 13. Power vertical type:
INSTALL WEATHERSTRIP INNER**

Install the back window glass to the window regulator assembly.



- 14. Power vertical type:
INSTALL WEATHERSTRIP OUTER**

Install the weatherstrip as shown in the illustration.



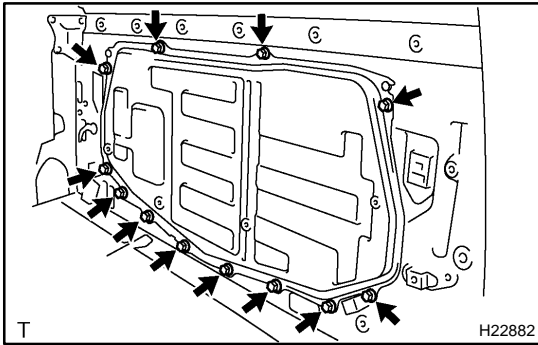
- 15. Power vertical type:
INSTALL SERVICE HOLE COVER**

- (a) Install the cover with the 2 clips.

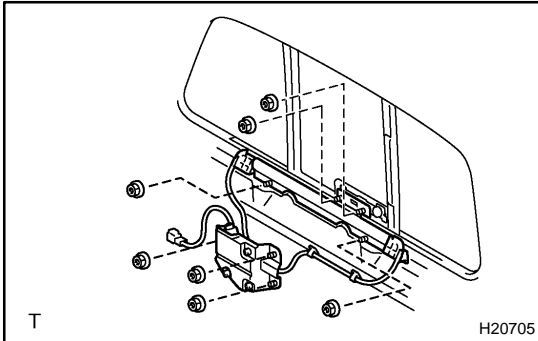
NOTICE:

Be careful not to drop and deform the cover as this may cause deformation.

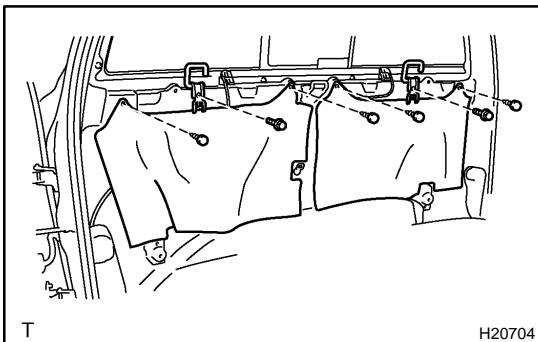
- (b) Install the cover to the body.



- (c) Install the 12 bolts.
Torque: 8.0 N-m (82 kgf-cm, 71 in.-lbf)



- 16. Power slide type:**
INSTALL BACK WINDOW REGULATOR ASSEMBLY
 (a) Install the back window regulator assembly with the 7 nuts.
Torque: 5.5 N-m (54 kgf-cm, 49 in.-lbf)
 (b) Install the back door glass channel cover.



- (c) Install the 4 clips and 2 back panel silencer pads.
 (d) Install the tether anchor brackets with the 2 bolts.
Torque: 20 N-m (200 kgf-cm, 15 ft-lbf)
17. Standard cab:
Access cab (Standard body type):
Access cab (Wide body type):
INSTALL REAR PART OF ROOF HEADLINING
 (a) Standard cab:
 Install the rear part of the roof headlining with the 2 clips.
 (b) Access cab:
 Install the rear part of the roof headlining with the 3 clips.

- 18. Double cab:**
INSTALL QUARTER TRIMS UPPER
 (See page [BO-138](#))

- 19. Double cab:**
INSTALL QUARTER TRIMS LOWER
 (See page [BO-138](#))

- 20. INSTALL QUARTER TRIMS (See page [BO-130](#), [BO-138](#))**

- 21. Standard cab:**
INSTALL BACK PANEL UPPER GARNISH
 (See page [BO-130](#))

- 22. Standard cab:**
INSTALL COAT HOOK (See page [BO-130](#))

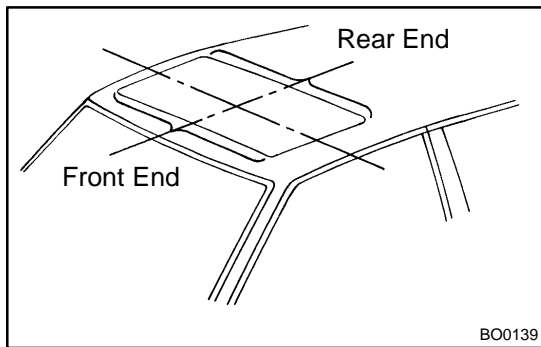
- 23. INSTALL ROOM LIGHT (See page [BO-130](#) , [BO-138](#))**

- 24. Access cab (Standard body type):**
Access cab (Wide body type):
INSTALL ROOF SIDE RAIL GARNISHES
 (See page [BO-130](#) , [BO-138](#))

25. **Standard cab:**
INSTALL FRONT PILLAR GARNISHES
(See page [BO-130](#))
26. **INSTALL ASSIST GRIPS** (See page [BO-130](#) , [BO-138](#))
27. **Double cab:**
INSTALL BACK PANEL TRIM (See page [BO-138](#))
28. **Access cab (Standard body type),**
Access cab (Wide body type):
INSTALL ACCESS DOOR SCUFF PLATES
(See page [BO-130](#))
29. **Standard cab:**
INSTALL FRONT DOOR SCUFF PLATES
(See page [BO-130](#))
30. **Access cab (Standard body type),**
Access cab (Wide body type):
INSTALL REAR SEAT (See page [BO-21 1](#))
31. **Double cab:**
UNFOLD REAR SEAT

CAUTION:

When returning the seat, make sure the seat is securely locked by pushing forward and rearward on the top of the seatback or by trying to pull up the edge of the bottom cushion. Failure to do so will cause the seat belt from operating improperly.



SLIDING ROOF ON-VEHICLE INSPECTION

B0408-01

INSPECT SLIDING ROOF GLASS ALIGNMENT

- (a) Start the engine and check the operation time of the sliding roof.

Operation time:

Approx. 6 secs.

- (b) Check for abnormal noise or binding during operation.
 (c) With the sliding roof fully closed, check for water leakage.
 (d) Check for a difference in level between the sliding roof weatherstrip and roof panel.

Front end:

0 - 2.0 mm (0 - 0.079 in.)

0 + 1.0 mm (0 + 0.039 in.)

Side end:

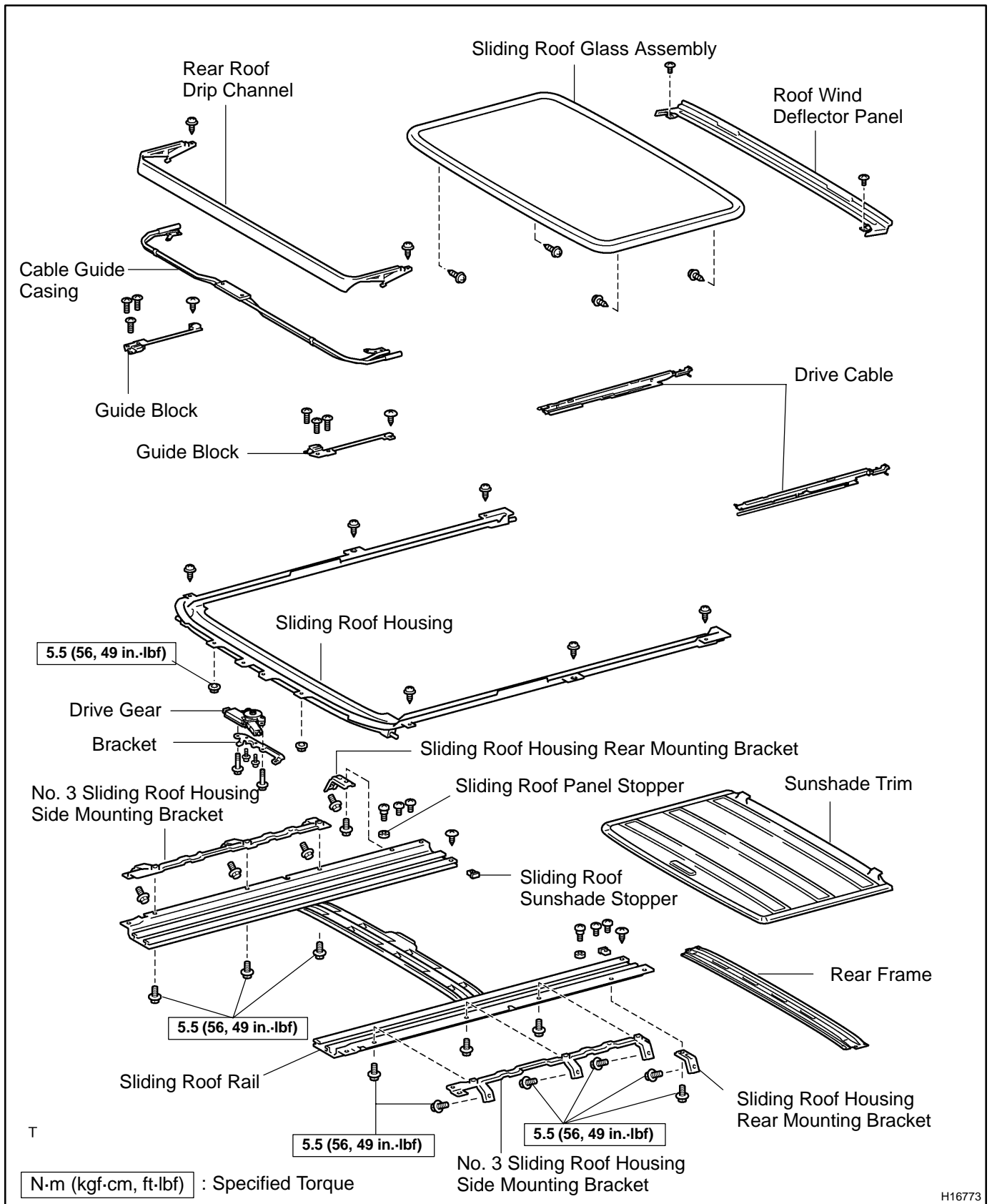
0 ± 1.5 mm (0 ± 0.059 in.)

Rear end:

0 - 1.0 mm (0 - 0.039 in.)

0 + 2.0 mm (0 + 0.079 in.)

COMPONENTS

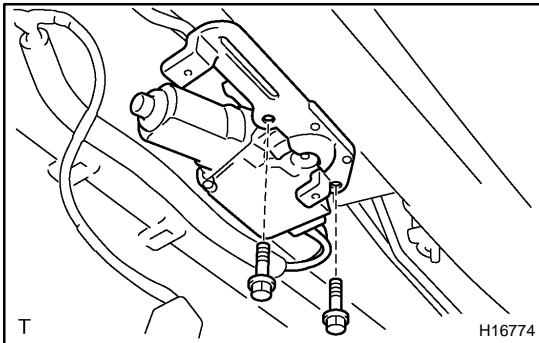


REMOVAL

HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. **REMOVE ROOF HEADLINING (See page [BO-133](#))**
2. **REMOVE SLIDING ROOF GLASS ASSEMBLY**
 - (a) Using a torx wrench, remove the 4 screws.
 - (b) Pull the glass upward to remove it.



3. REMOVE DRIVE GEAR

NOTICE:

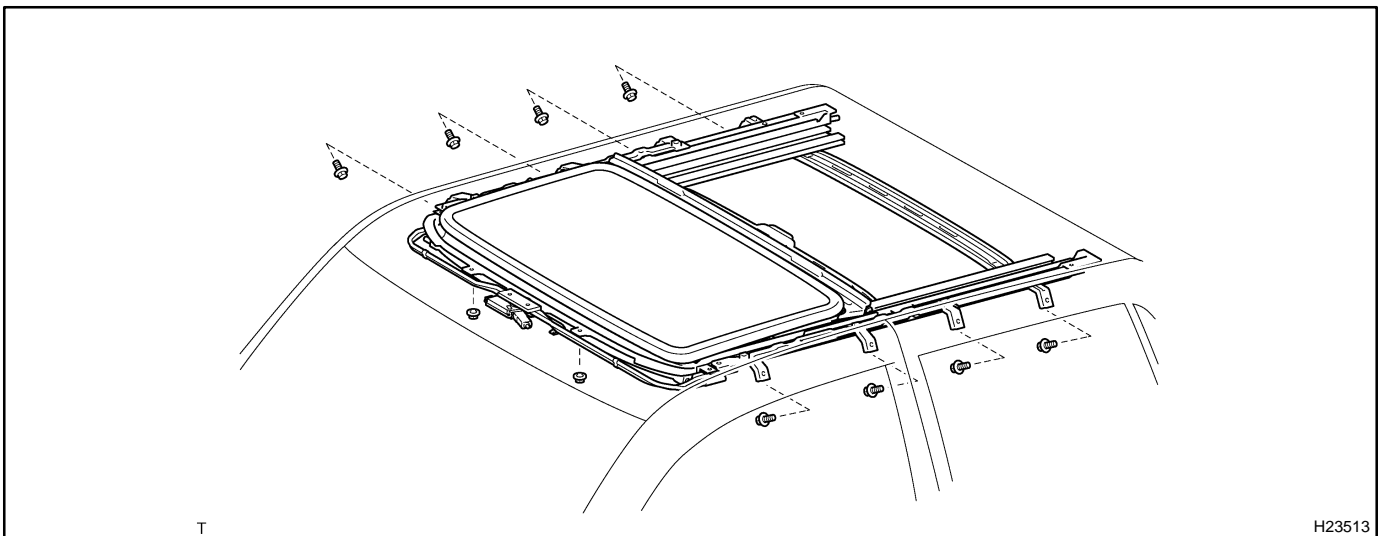
Remove the drive gear with the sliding roof fully closed.

- (a) Disconnect the connector.
- (b) Remove the 2 bolts and drive gear.
- (c) Remove the 2 screws and drive gear bracket.

4. REMOVE SLIDING ROOF HOUSING

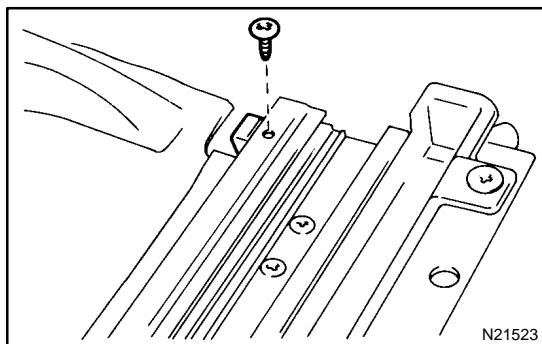
- (a) Disconnect the 4 drain hoses from the housing.
- (b) Disengage the wire harness clamps.
- (c) Remove the 8 bolts, 2 nuts and sliding roof housing.

Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)

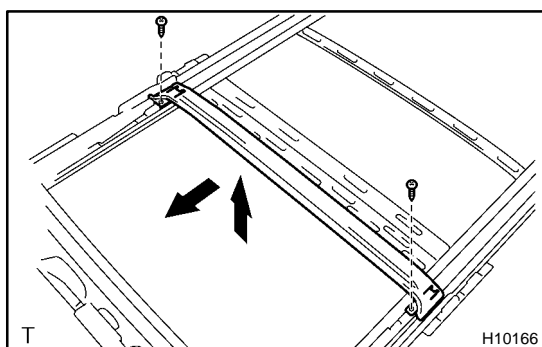


DISASSEMBLY

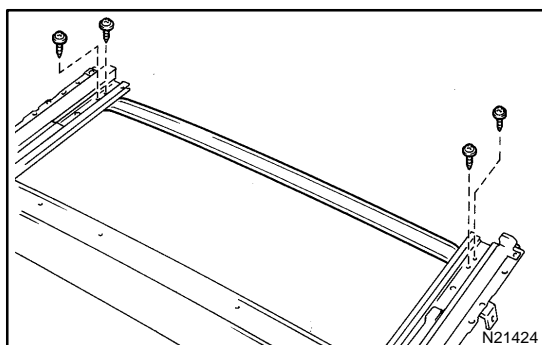
1. REMOVE NO. 3 SLIDING ROOF HOUSING SIDE MOUNTING BRACKETS
2. REMOVE SLIDING ROOF HOUSING REAR MOUNTING BRACKETS

**3. REMOVE SLIDING ROOF SUNSHADE STOPPER**

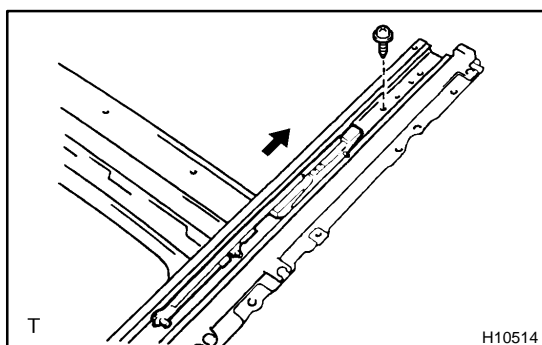
- (a) Remove the screw and stopper.
- (b) Perform the same procedure on the other side.

4. REMOVE SUNSHADE TRIM**5. REMOVE REAR ROOF DRIP CHANNEL**

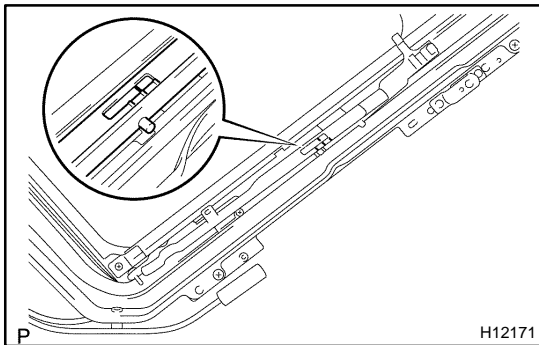
Remove the 2 screws and rear roof drip channel as shown in the illustration.

**6. REMOVE REAR FRAME**

Remove the 4 screws and rear frame.

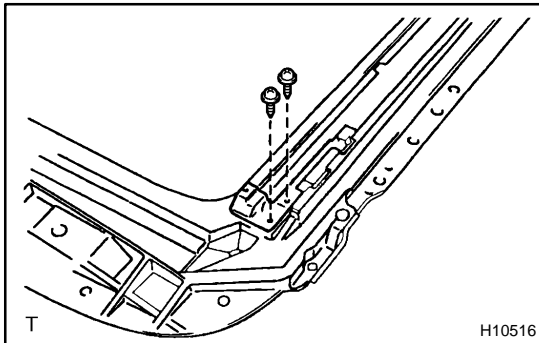
**7. REMOVE DRIVE CABLE**

- (a) Remove the screw and sliding roof panel stopper.
- (b) Slide the drive cable rearward, then remove it.
- (c) Perform the same procedure on the other side.

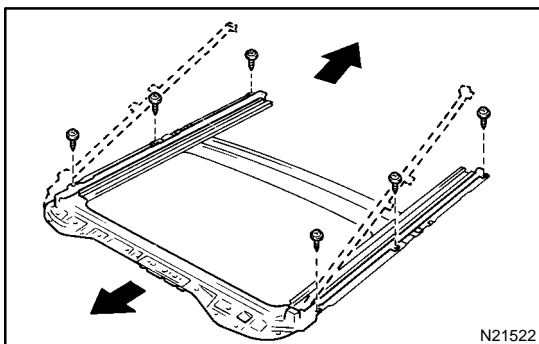
**HINT:**

At the time of reassembly, please refer to the following items.

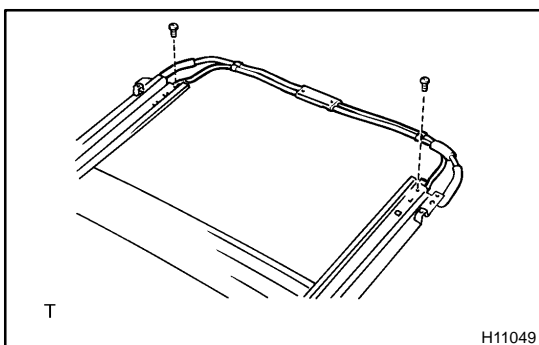
- ◆ Adjust the drive cable to a closed and tilted down position.
- ◆ Slide the cable forward or backward to align the 2 marks as shown in the illustration.
- ◆ Slide the cable to the forefront with your hand.

8. REMOVE ROOF WIND DEFLECTOR PANEL**9. REMOVE GUIDE BLOCK**

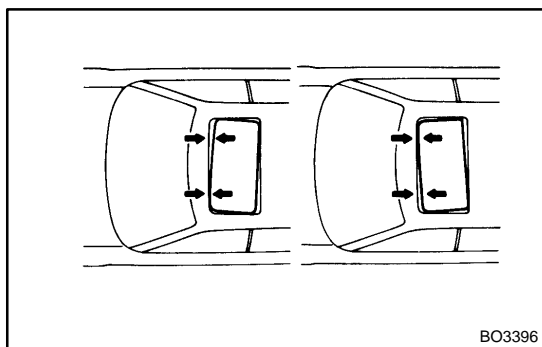
- (a) Remove the 2 screws and guide block.
- (b) Perform the same procedure on the other side.

**10. REMOVE SLIDING ROOF HOUSING**

Remove the 6 screws and sliding roof housing.

**11. REMOVE CABLE GUIDE CASING**

Remove the 2 screws and cable guide casing.

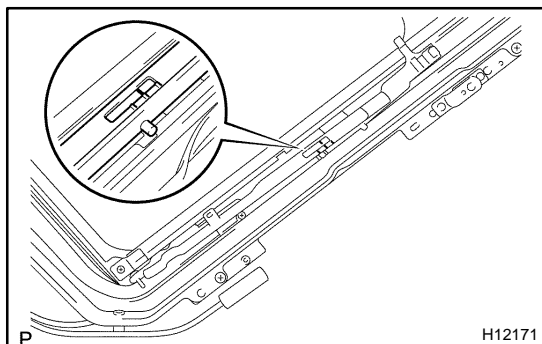


B03396

ADJUSTMENT

ADJUST SLIDING ROOF GLASS IN CLEARANCE

- (a) When the front or rear/left or right alignment is not correct, remove the drive gear and sliding roof glass, then adjust the drive cable.



H12171

NOTICE:

Remove the drive gear with the sliding roof fully closed.

- (b) Adjust by sliding the cable forward or rearward or rearward to align the 2 marks as shown.
- (c) Install the driving gear and sliding roof glass.

REASSEMBLY

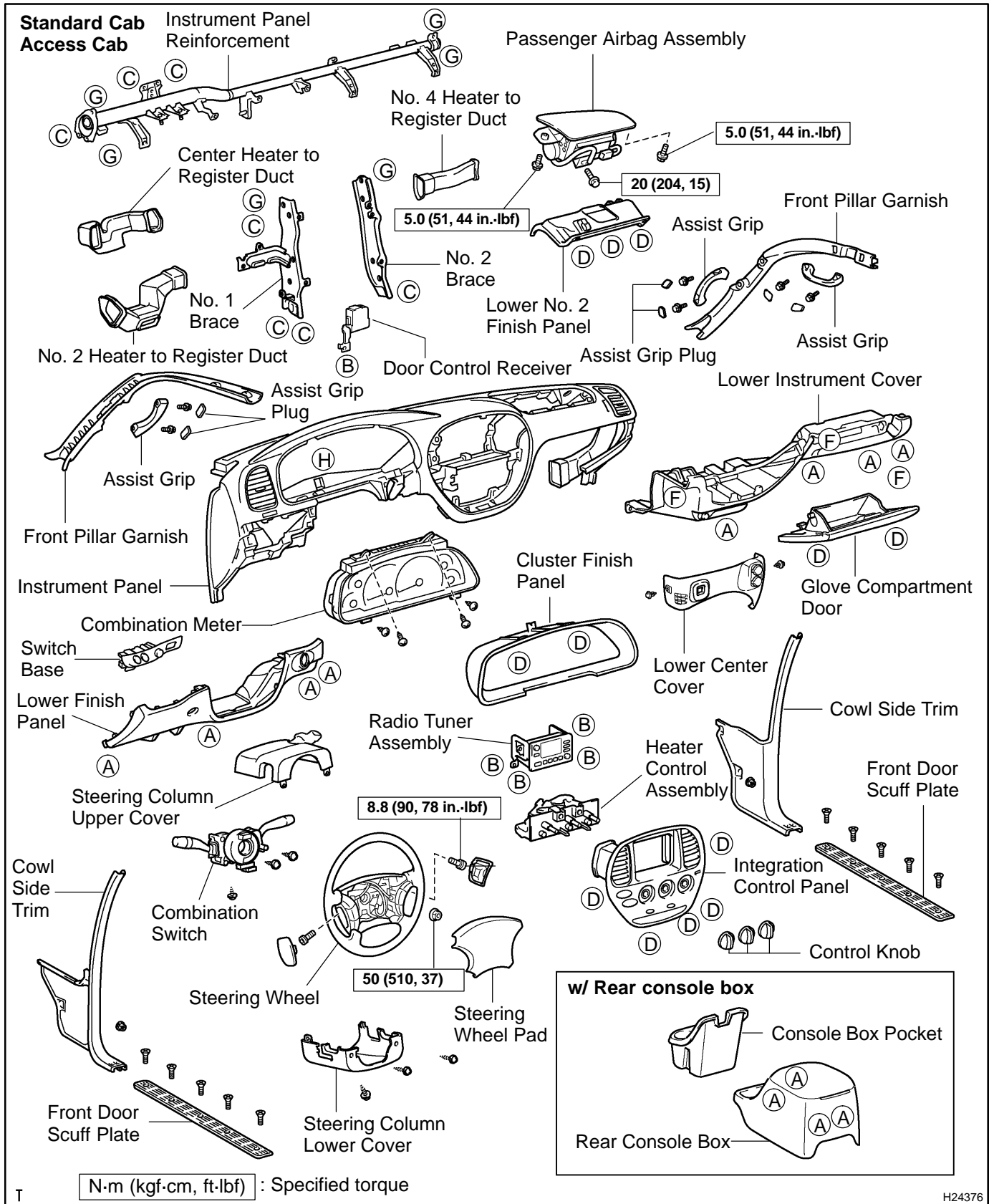
Reassembly is in the reverse order of disassembly (see page [BO-101](#)).

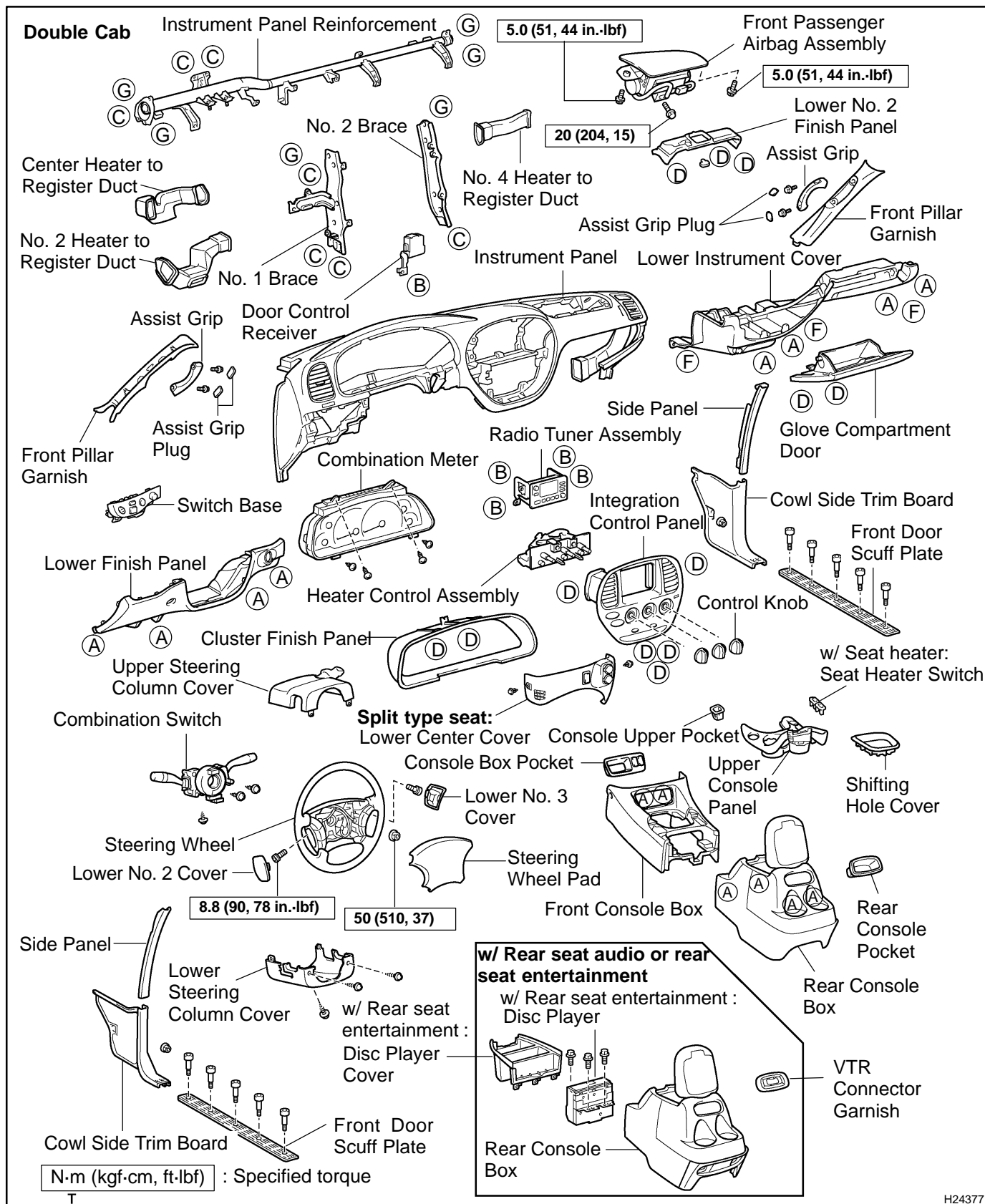
INSTALLATION

Installation is in the reverse order of removal (see page [BO-100](#)).

INSTRUMENT PANEL COMPONENTS

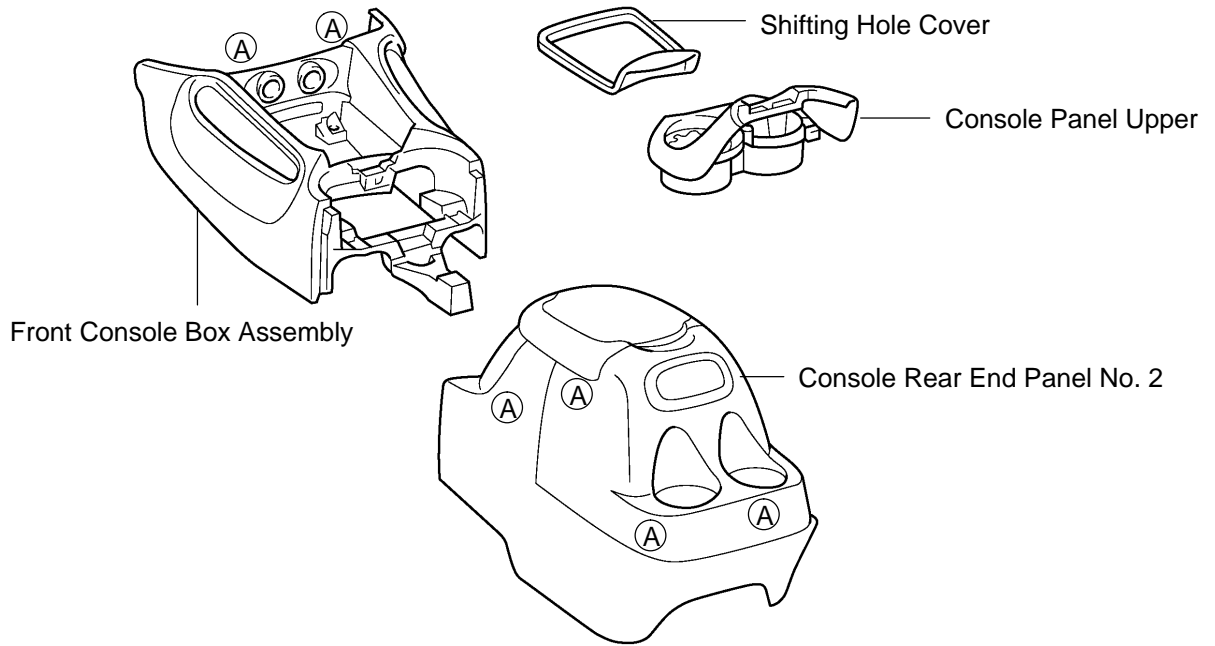
BO4QE-04





H24377

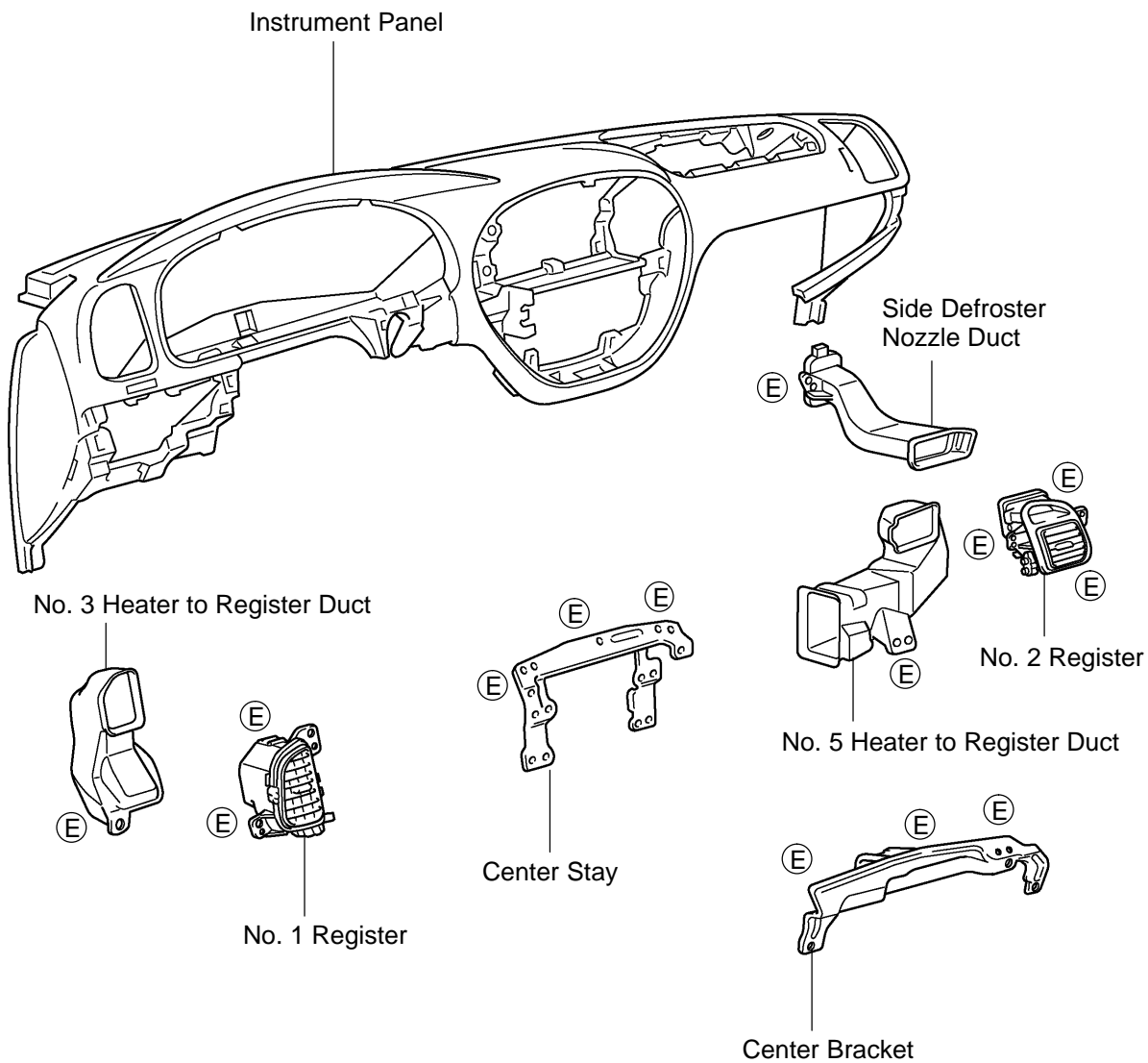
**Access Cab
Large Type Console Box**



T

H20694

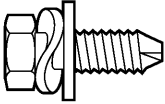
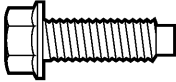
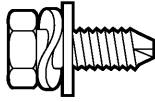


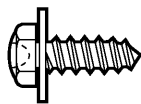
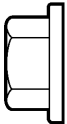

Standard Cab
Access Cab
Double Cab



T

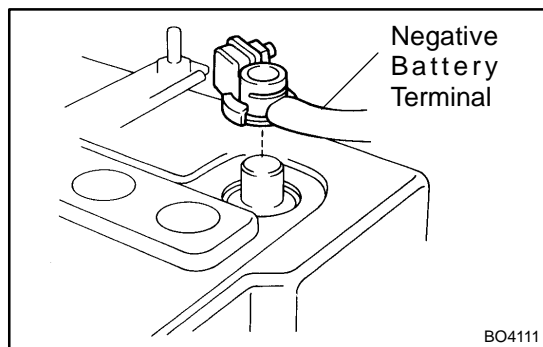
H21123

The shapes and sizes of the screws, bolts and nuts are indicated in the table below. The codes (A-H) correspond to those indicated in COMPONENTS on the previous pages.

mm (in.)								
Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
Ⓐ		∅ = 6 (0.24) L = 25 (0.98)	Ⓑ		∅ = 6 (0.24) L = 14 (0.55)	Ⓒ		∅ = 8 (0.31) L = 22 (0.87)
Ⓓ		∅ = 5.22 (0.2055) L = 16 (0.63)	Ⓔ		∅ = 5 (0.20) L = 16 (0.63)	Ⓕ		∅ = 5 (0.20) L = 16 (0.63)
Ⓖ		∅ = 8 (0.31)	Ⓖ		∅ = 6 (0.24)			

T

H11188



REMOVAL

HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

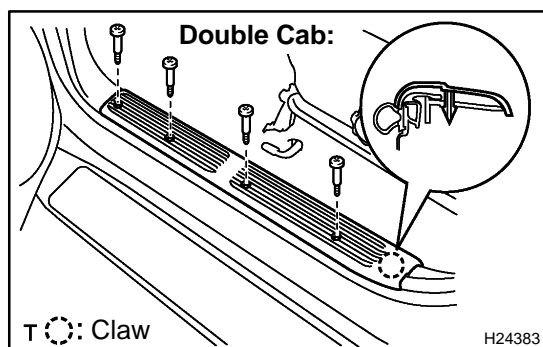
Disconnect the cable from the negative (-) battery terminal.

NOTICE:

If the cable is disconnected from the negative battery terminal, the preset AM and FM stations stored in the memory will be erased. Be sure to make note of them before disconnecting the cable.

CAUTION:

Work must not be started until at least 90 seconds after the ignition switch is turned to the LOCK position and the cable is disconnected from the negative (-) battery terminal. (The SRS is equipped with a back-up power source. If work is started within 90 seconds of disconnecting the cable from the negative (-) battery terminal, the SRS may deploy.)



2. REMOVE FRONT DOOR SCUFF PLATE

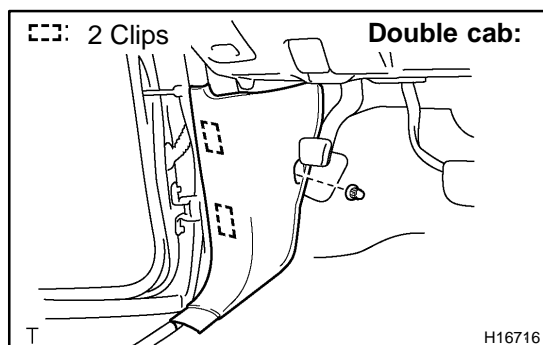
- (a) Standard cab:
Remove the 5 screws and front door scuff plate.
- (b) Access cab (standard and wide body type):
Remove the 4 screws and front door scuff plate.
- (c) Double cab:
Remove the 4 screws and front door scuff plate.
- (d) Use the same procedures described above on the other side.

3. Standard cab:

Access cab:

REMOVE COWL SIDE TRIM

- (a) Remove the 2 clips and cowl side trim.
- (b) Use the same procedures described above on the other side.



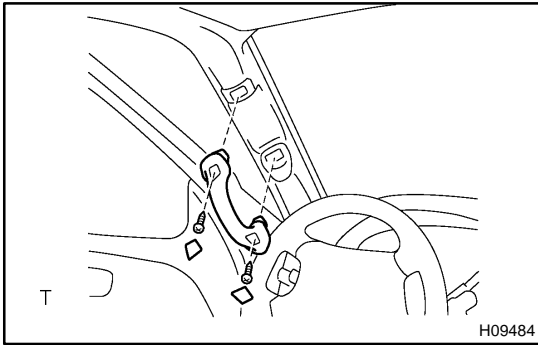
4. Double cab:

REMOVE COWL SIDE TRIM BOARD

- (a) Remove the nut, 2 clips and cowl side trim board.
- (b) Use the same procedures described above on the other side.

5. Double cab:

REMOVE SIDE PANEL



6. REMOVE ASSIST GRIPS

- (a) Using a screwdriver, remove the plugs.

HINT:

Tape the screwdriver tip before use.

- (b) Driver side:

Using a torx® driver, remove the 2 torx® screws and assist grip.

Torx® driver:

T30 (Part No.09041-00030 or locally manufactured tool)

- (c) Standard cab (Passenger side):

Access cab (Passenger side):

Using a torx® driver, remove the 4 torx® screws and 2 assist grips.

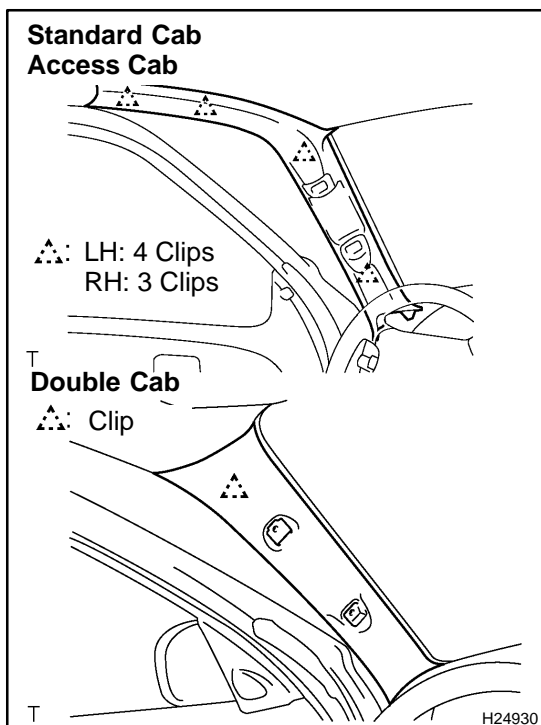
Torx® driver: T30 (Part No.09041-00030 or locally manufactured tool)

- (d) Double cab (Passenger side):

Using a torx® driver, remove the 2 torx® screws and assist grips.

Torx® driver:

T30 (Part No.09041-00030 or locally manufactured tool)



7. REMOVE FRONT PILLAR GARNISH

- (a) Using a screwdriver, remove the front pillar garnish.

HINT:

Tape the screwdriver tip before use.

- (b) Use the same procedures described above on the other side.

8. REMOVE STEERING WHEEL PAD

(See page [SR-18](#) , [SR-33](#))

9. REMOVE STEERING WHEEL

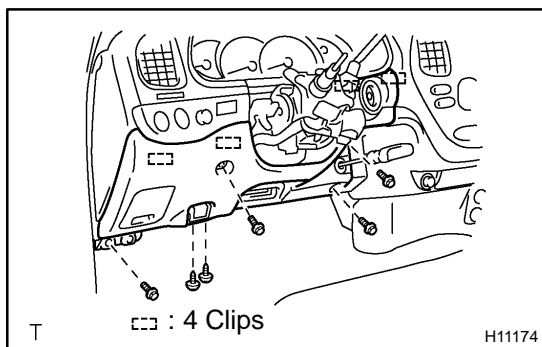
(See page [SR-18](#) , [SR-33](#))

10. REMOVE STEERING COLUMN COVERS

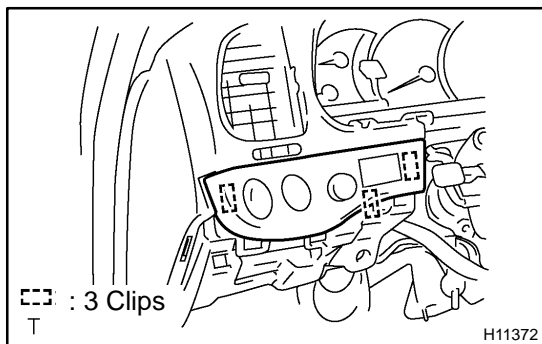
(See page [SR-18](#) , [SR-33](#))

11. REMOVE COMBINATION SWITCH

Disconnect the 4 connectors and remove the 3 screws and combination switch.

**12. REMOVE LOWER FINISH PANEL**

- (a) Remove the 2 screws and hood lock release lever.
- (b) Remove the 4 bolts and lower finish panel.
- (c) Disconnect the connectors.

**13. REMOVE SWITCH BASE**

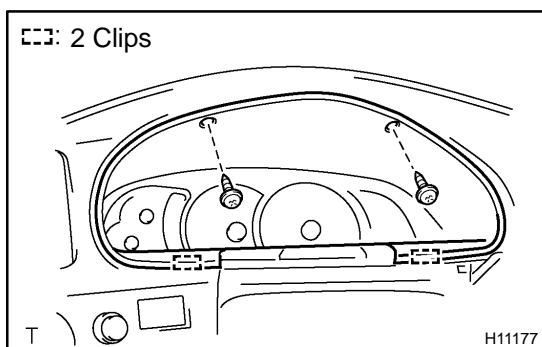
Using a screwdriver, lift up the switch base and remove it.

HINT:

Tape the screwdriver tip before use.

14. REMOVE NO. 2 HEATER TO REGISTER DUCT**15. REMOVE STEERING COLUMN**

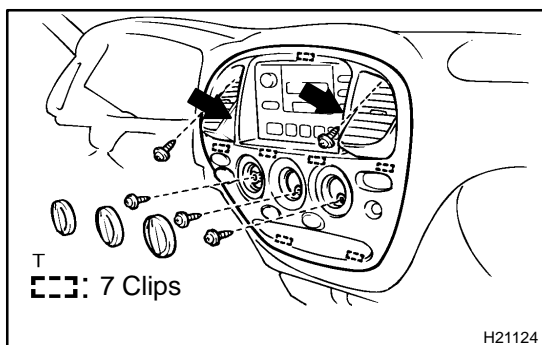
(See page [SR-18](#) , [SR-33](#))

**16. REMOVE CLUSTER FINISH PANEL**

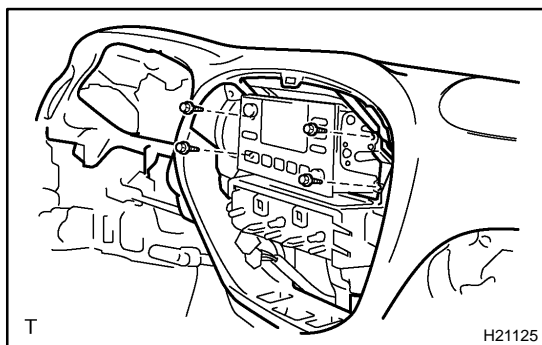
Remove the 2 screws and cluster finish panel.

17. REMOVE COMBINATION METER

- (a) Remove the 4 screws.
- (b) Remove the combination meter and disconnect the 4 connectors.

**18. REMOVE INTEGRATION CONTROL PANEL**

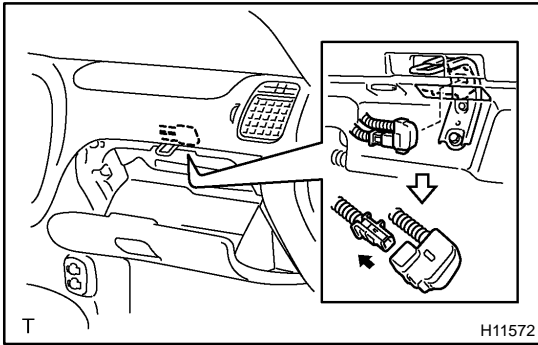
- (a) Remove the 3 control knobs.
- (b) Remove the 5 screws.
- (c) Remove the integration control panel by pulling at the positions indicated by the arrows in the illustration.
- (d) Disconnect the connectors.

**19. REMOVE RADIO TUNER ASSEMBLY**

- (a) Disconnect the connector.
- (b) Remove the 4 bolts and the radio tuner assembly.

20. REMOVE HEATER CONTROL ASSEMBLY

(See page [AC-101](#))

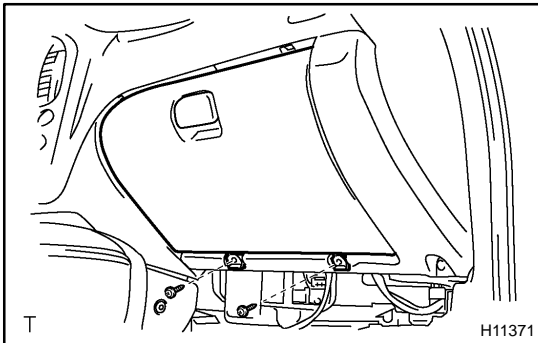


21. DISCONNECT PASSENGER AIRBAG ASSEMBLY CONNECTOR

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

- (a) Using a clip remover, disengage the connector clamp.
- (b) Disconnect the connector as shown in the illustration.

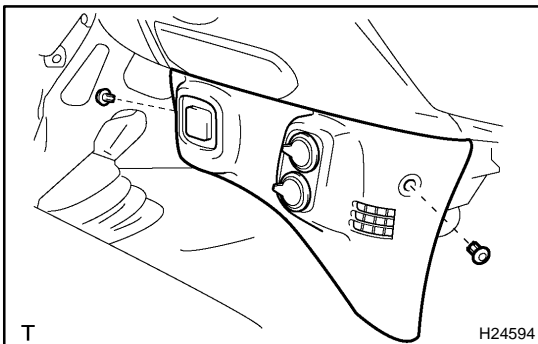


22. REMOVE GLOVE COMPARTMENT DOOR

Remove the 2 screws and glove compartment door.

23. REMOVE LOWER NO. 2 FINISH PANEL

Remove the 3 screws and lower No. 2 finish panel.



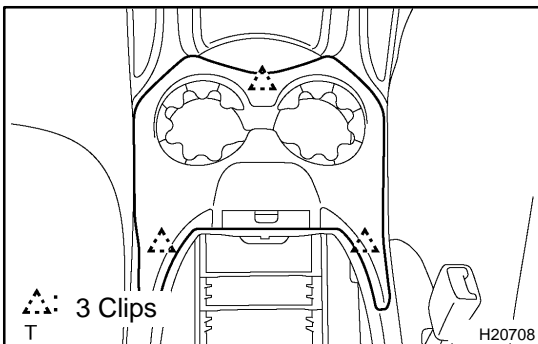
24. Standard cab:

Access cab (w/o Large type console box):

Double cab (Split type seat):

REMOVE LOWER CENTER COVER

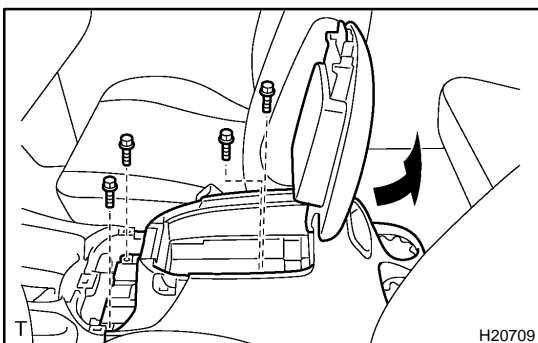
- (a) Remove the 2 clips and lower center cover.
- (b) Disconnect the connectors.



25. Access cab (w/ Large type console box):

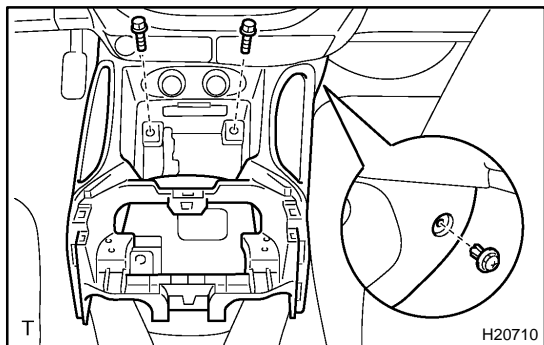
REMOVE FRONT CONSOLE BOX ASSEMBLY

- (a) Remove the shifting hole cover.
- (b) Using a screwdriver, disengage the 3 clips and remove the console panel upper.

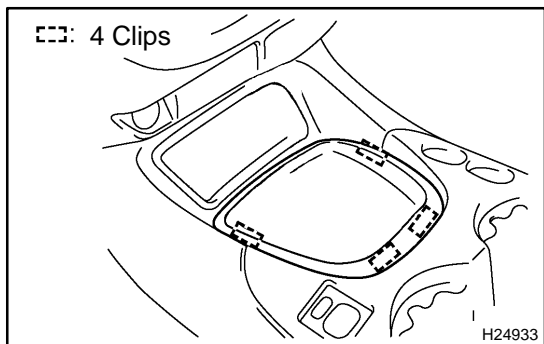


- (c) Remove the 4 bolts and console rear end panel No. 2.

BODY - INSTRUMENT PANEL



- (d) Remove the 2 bolts, clip and the front console box assembly.
- (e) Disconnect the connector.



**26. Double cab:
REMOVE SHIFTING HOLE COVER**

- (a) Using a screwdriver, disengage the 4 clips and remove the shifting hole cover.

HINT:

Tape the screwdriver tip before use.

**27. Double cab:
REMOVE UPPER CONSOLE PANEL**

- (a) w/ Seat heater:
Using a screwdriver, remove the seat heater switches, then disconnect the connectors.

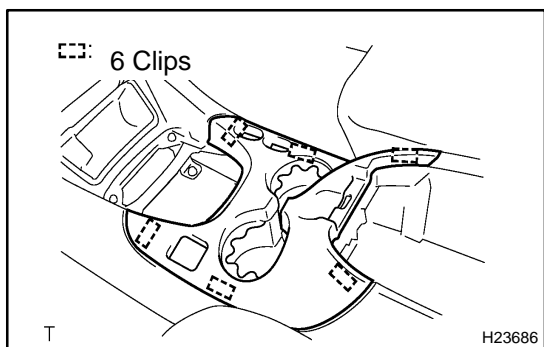
HINT:

Tape the screwdriver tip before use.

- (b) Using a screwdriver, remove the power mirror control switch, then disconnect the connector.

HINT:

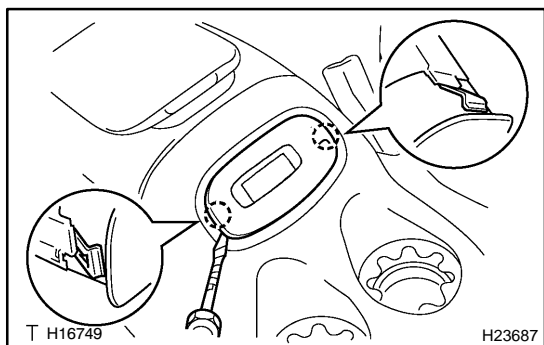
Tape the screwdriver tip before use.



- (c) Using a screwdriver, disengage the 6 clips and remove the upper console panel.

HINT:

Tape the screwdriver tip before use.



**28. Double cab:
REMOVE REAR CONSOLE BOX**

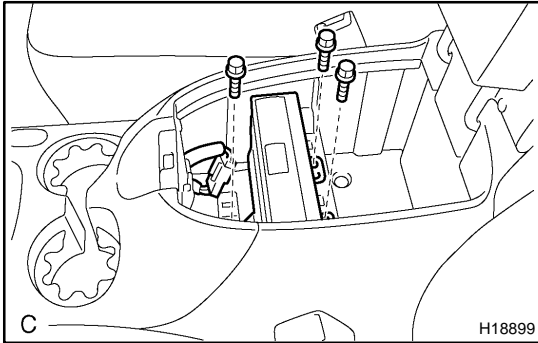
- (a) w/ VTR control garnish.
Using a screwdriver, disengage the 2 claws, and remove the VTR control garnish and connector.

- (b) Disconnect the connector.

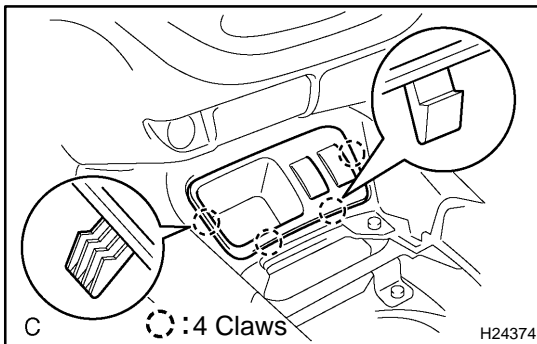
HINT:

Tape the screwdriver tip before use.

- (c) w/o VTR control garnish.
Using a screwdriver, remove the rear console pocket.
HINT:
Tape the screwdriver tip before use.



- (d) w/ Rear seat entertainment:
(1) Remove the disc bracket.
(2) Remove the 3 bolts and disc player.
(3) Disconnect the connector.
(e) Remove the 4 bolts and rear console box.

**29. Double cab:****REMOVE CONSOLE BOX POCKET**

- (a) Using a screwdriver, disengage the 4 claws.

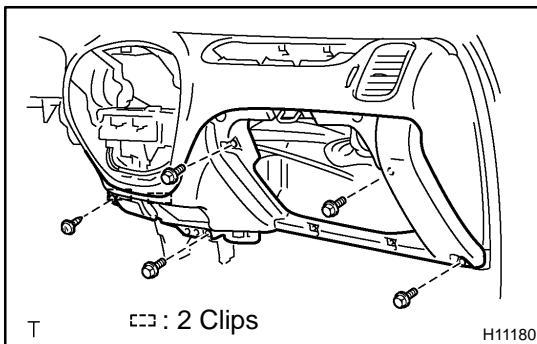
HINT:

Tape the screwdriver tip before use.

- (b) Disconnect the connectors and remove the console box pocket.

30. REMOVE FRONT CONSOLE BOX

Remove the 2 bolts, 2 clips and front console box.

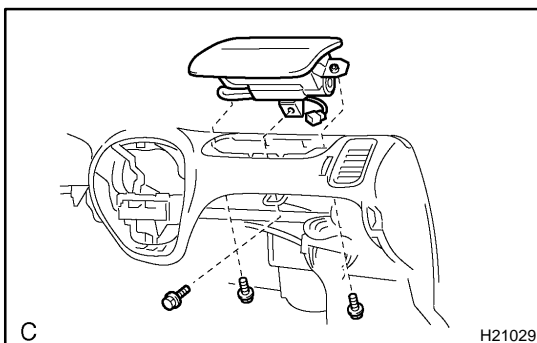
**31. REMOVE LOWER INSTRUMENT COVER**

- (a) Remove the 4 bolts and screw.

- (b) Using a screwdriver, disengage the clips and remove the lower instrument cover.

HINT:

Tape the screwdriver tip before use.

**32. REMOVE PASSENGER AIRBAG ASSEMBLY**

- (a) Remove the 2 bolts which hold the passenger airbag assembly and instrument panel.

Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)

- (b) Remove the bolt which hold the passenger airbag assembly and instrument panel reinforcement.

Torque: 20 N·m (204 kgf·cm, 15 ft-lbf)**CAUTION:**

- ◆ Do not place the passenger airbag assembly with the airbag deployment side facing down.

◆ **Never disassemble the passenger airbag assembly.**

33. w/ Rear console box:

REMOVE REAR CONSOLE BOX

- (a) Using a screwdriver, remove the console box pocket.

HINT:

Tape the screwdriver tip before use.

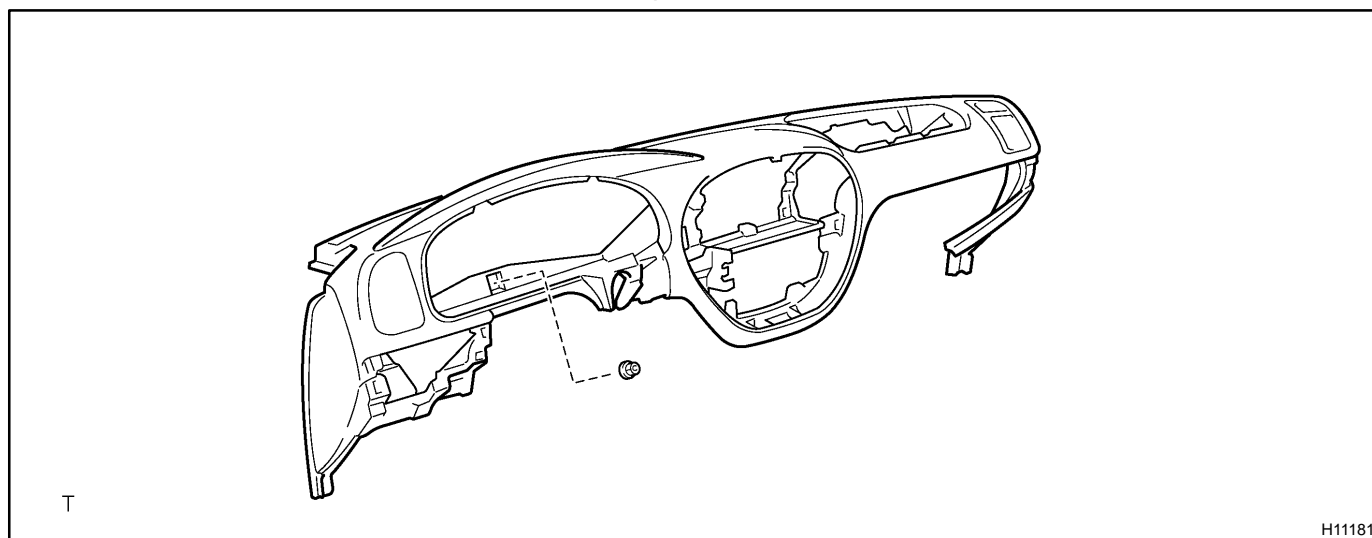
- (b) Remove the 4 bolts and rear console box.

34. REMOVE NO. 4 HEATER TO REGISTER DUCT

35. REMOVE INSTRUMENT PANEL

- (a) Remove the nut.

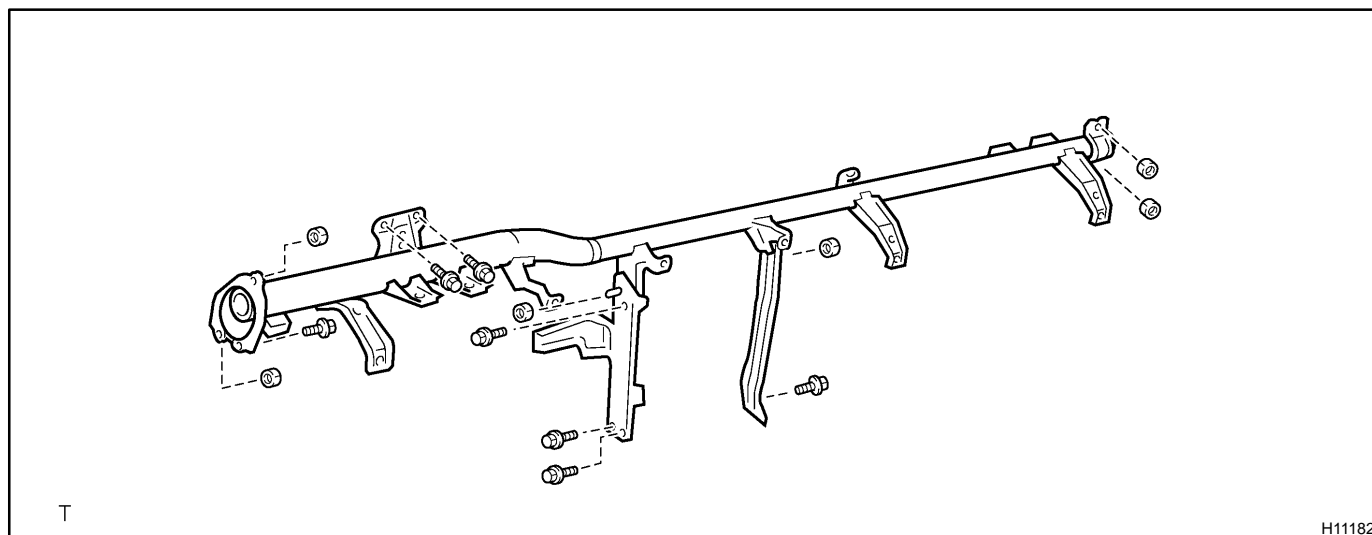
- (b) Disconnect the connectors and remove the instrument panel.

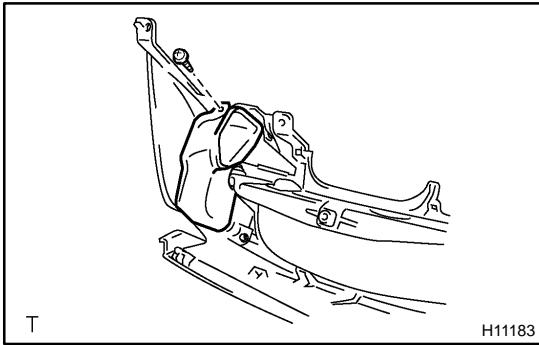


36. REMOVE CENTER HEATER TO REGISTER DUCT

37. REMOVE INSTRUMENT PANEL REINFORCEMENT

- (a) Disconnect the connectors.
- (b) Remove the bolt and door control receiver.
- (c) Remove the 3 bolts, nut and No. 1 brace.
- (d) Remove the bolt, nut and No. 2 brace.
- (e) Remove the 3 bolts, 4 nuts and instrument panel reinforcement.





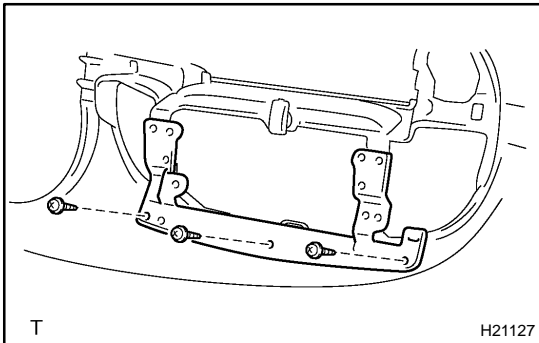
DISASSEMBLY

1. REMOVE NO. 3 HEATER TO REGISTER DUCT

Remove the screw and duct.

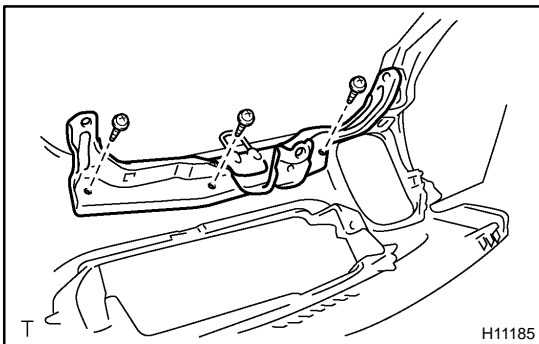
2. REMOVE NO. 1 REGISTER

Remove the 2 screws and register.



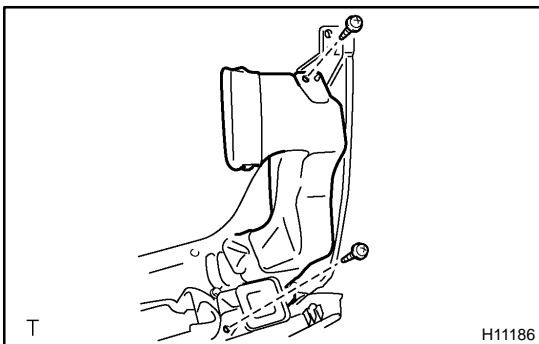
3. REMOVE CENTER STAY

Remove the 3 screws and center stay.



4. REMOVE CENTER BRACKET

Remove the 3 screws and center bracket.

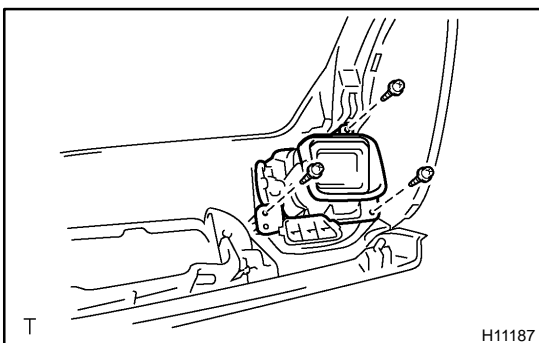


5. REMOVE NO. 5 HEATER TO REGISTER DUCT

Remove the screw and duct.

6. REMOVE SIDE DEFROSTER NOZZLE DUCT

Remove the screw and duct.



7. REMOVE NO. 2 REGISTER

Remove the 3 screws and register.

REASSEMBLY

Reassembly is in the reverse order of disassembly (see page [BO-1 18](#)).

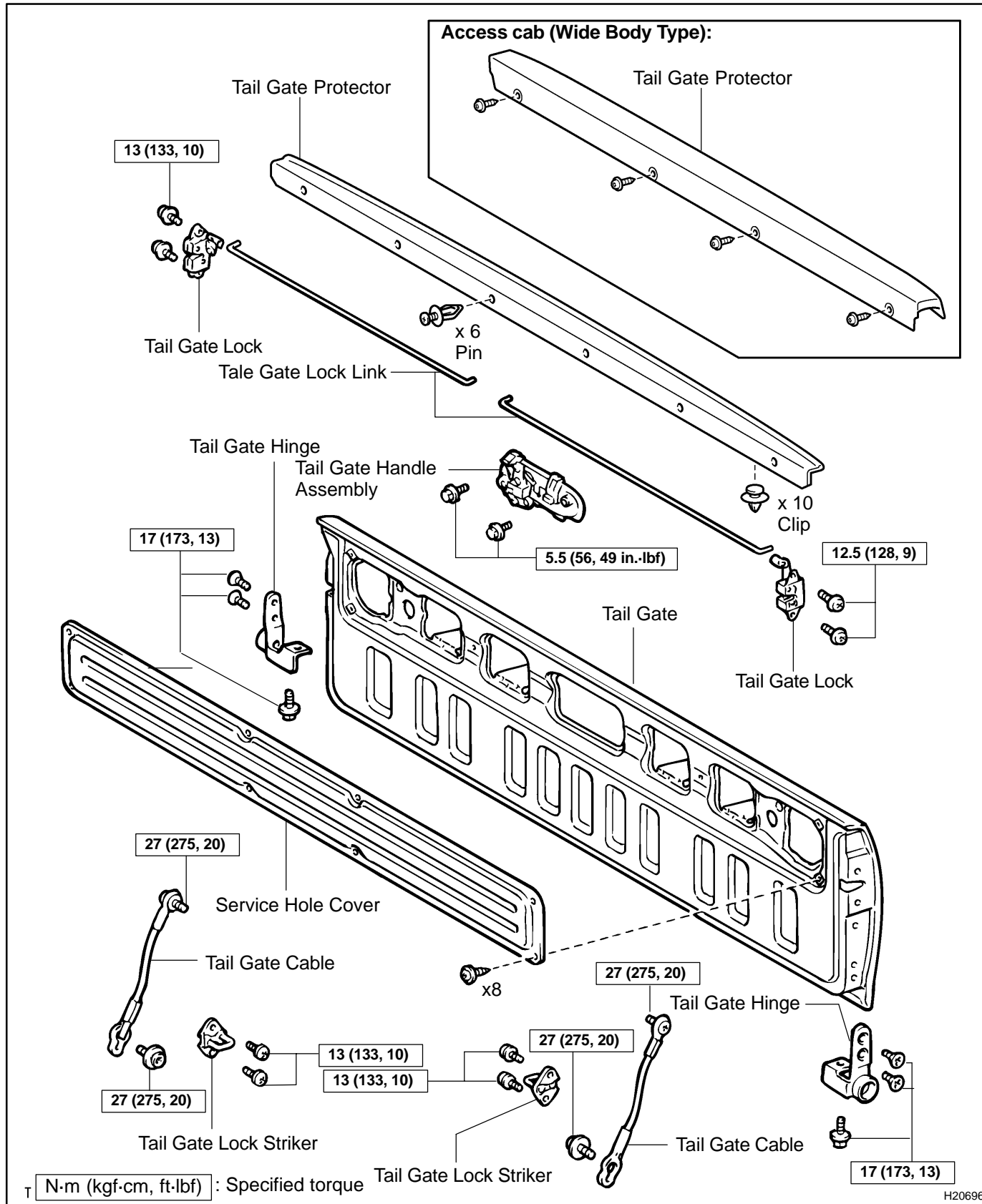
INSTALLATION

Installation is in the reverse order of removal (see page [BO-1 11](#)).

CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

TAIL GATE COMPONENTS

B00J7-07



REMOVAL

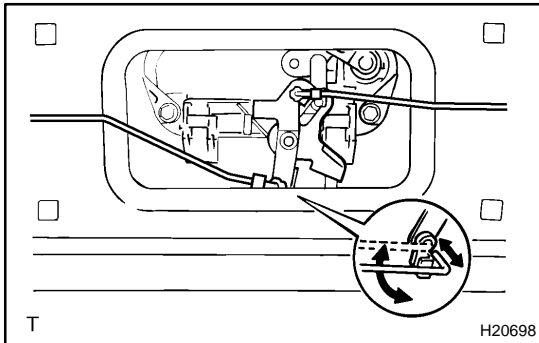
HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. REMOVE TAIL GATE PROTECTOR (See page [BO-66](#))

2. REMOVE SERVICE HOLE COVER

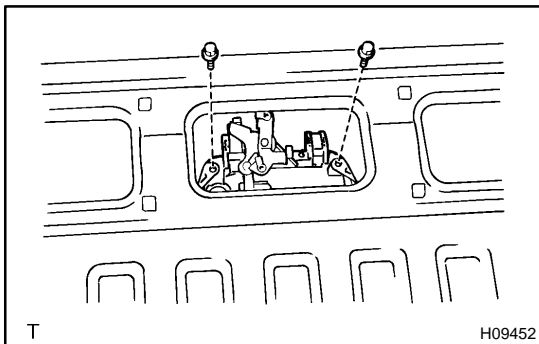
Using a torx® socket wrench (T30), remove the 8 screws and service hole cover.



3. REMOVE TAIL GATE LOCK

(a) Remove the 2 tail gate lock links from the tail gate locks and tail gate handle assembly.

(b) Using a torx® socket wrench (T40), remove the 4 screws and 2 tail gate locks.

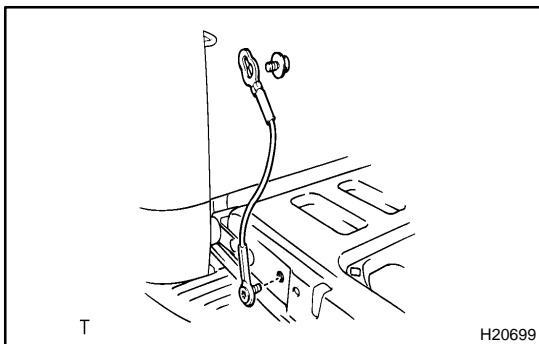


4. REMOVE TAIL GATE HANDLE ASSEMBLY

Remove the 2 bolts and tail gate handle assembly.

5. REMOVE TAIL GATE LOCK STRIKERS

Using a torx® socket wrench (T40), remove the 4 screws and tail gate lock strikers.



6. REMOVE TAIL GATE CABLE

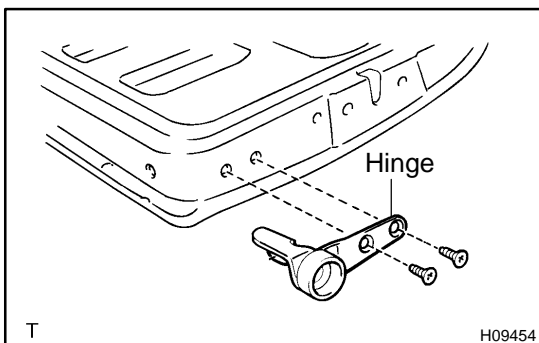
(a) Remove the deck side shaft and tail gate cable from the deck.

(b) Remove the gate side shaft and tail gate cable.

(c) Use the same procedures described above to the other side.

7. REMOVE TAIL GATE

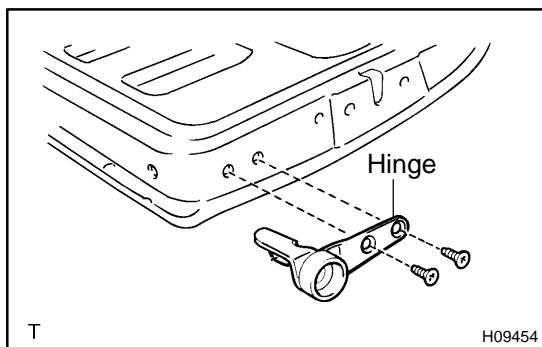
(a) Remove the 2 bolts and tail gate.



NOTICE:

Be careful not to drop the tail gate.

(b) Using a torx® socket wrench (T40), remove the 6 screws and 2 tail gate hinges from the tail gate.



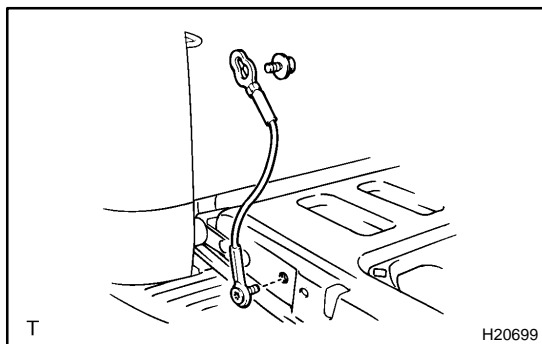
INSTALLATION

1. INSTALL TAIL GATE

- Using a torx® socket wrench (T40), install the tail gate hinges to the tail gate with the 4 screws.
Torque: 17 N·m (178 kgf-cm, 13 ft-lbf)
- Install the tail gate to the body with the 2 bolts.
Torque: 17 N·m (178 kgf-cm, 13 ft-lbf)

NOTICE:

Be careful not to drop the tail gate.



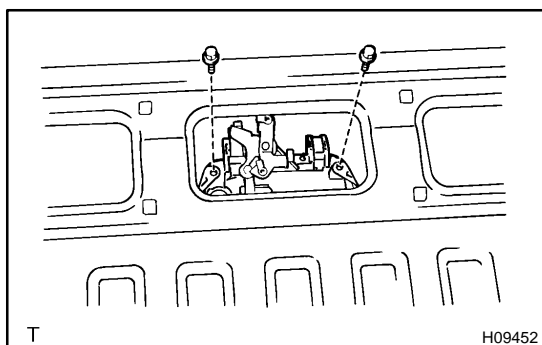
2. INSTALL TAIL GATE CABLE

- Install the tail gate cable and gate side shaft to the tail gate.
Torque: 27 N·m (275 kgf-cm, 20 ft-lbf)
- Install the tail gate cable and deck side shaft to the body.
Torque: 27 N·m (275 kgf-cm, 20 ft-lbf)
- Use the same procedures described above to the other side.

3. INSTALL TAIL GATE LOCK STRIKER

Using a torx® socket wrench (T40), install the 2 tail gate lock strikers with the 4 screws.

Torque: 13 N·m (133 kgf-cm, 10 ft-lbf)



4. INSTALL TAIL GATE HANDLE ASSEMBLY

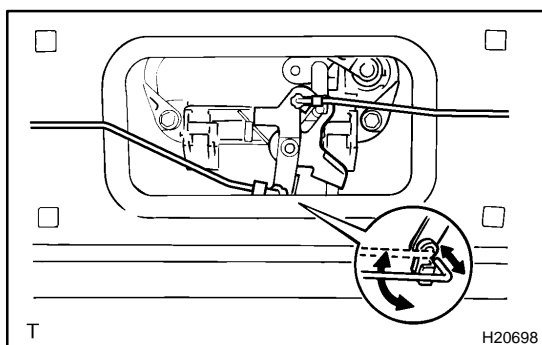
Install the tail gate handle assembly with the 2 bolts.

Torque: 5.5 N·m (56 kgf-cm, 49 in.-lbf)

5. INSTALL TAIL GATE LOCK

- Using a torx® socket wrench (T40), install the 2 tail gate locks with the 4 screws.

Torque: 12.5 N·m (128 kgf-cm, 9 ft-lbf)



- Connect one end of the tail gate lock link to the tail gate lock and another end to the tail gate handle assembly.

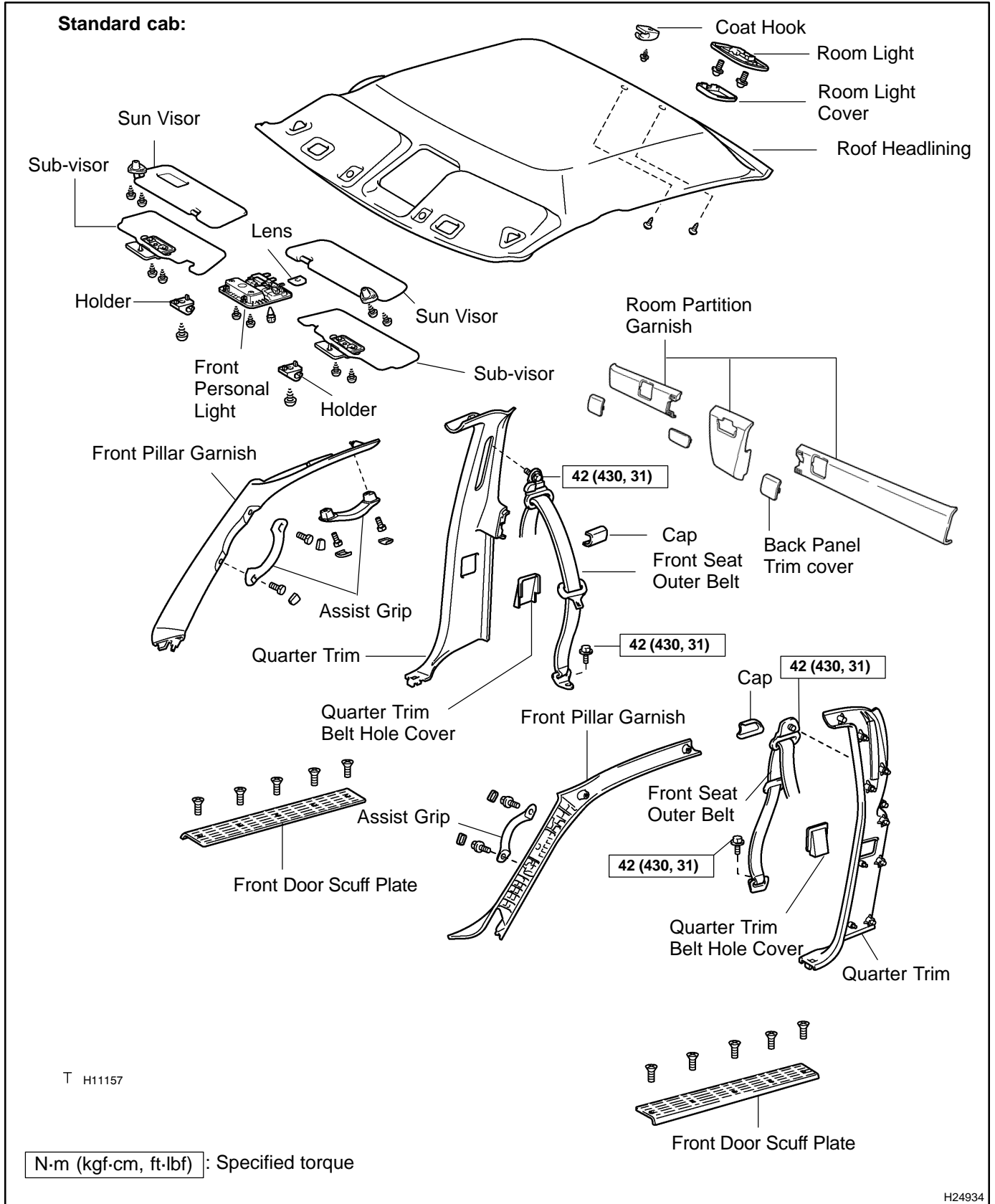
6. INSTALL SERVICE HOLE COVER

Using a torx® socket wrench (T30), install the service hole cover with the 8 screws.

7. INSTALL TAIL GATE PROTECTOR (See page [BO-68](#))

ROOF HEADLINING COMPONENTS

BO2F8-04



REMOVAL

HINT:

- ◆ A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).
- ◆ Tape the screwdriver tip before using it to remove the parts.

1. Access cab:

REMOVE REAR SEAT (See page [BO-203](#))

2. REMOVE FRONT DOOR SCUFF PLATES

(a) Standard cab:

Remove the 10 screws and front door scuff plates.

(b) Access cab:

Remove the 8 screws and front door scuff plates.

3. Access cab:

REMOVE ACCESS DOOR SCUFF PLATES

Remove the 6 screws and access door scuff plates.

4. Access cab:

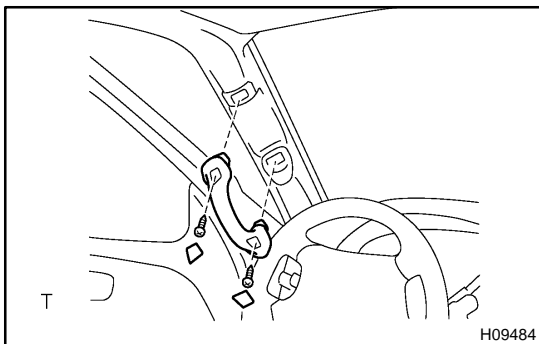
REMOVE FRONT DOOR REAR SCUFF PLATES

(a) Remove the 2 clips and 2 covers.

(b) Remove the 2 clips and 2 front door rear scuff plates.

5. REMOVE ASSIST GRIPS

(a) Using a screwdriver, remove the caps.

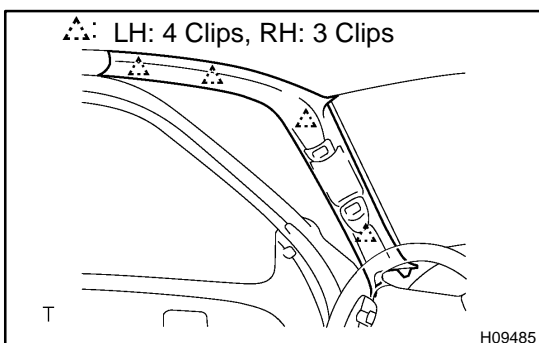


(b) Driver's side:

Using a torx® driver (T30), remove the 2 screws and assist grip.

(c) Passenger's side:

Using a torx® driver (T30), remove the 4 screws and 2 assist grips.



6. REMOVE FRONT PILLAR GARNISH

(a) Using a screwdriver, remove the front pillar garnish.

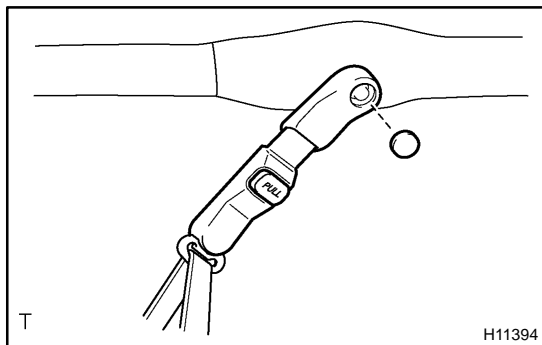
(b) Perform the same procedure on the other side.

7. Access cab:

REMOVE FRONT SEAT OUTER BELT ANCHORS

(a) Remove the bolt and front seat outer belt floor anchor.

Torque: 42 N·m (430 kgf·cm, 31 ft·lbf)



- (b) Using a screwdriver, remove the cap.
- (c) Remove the bolt and front seat outer belt shoulder anchor.

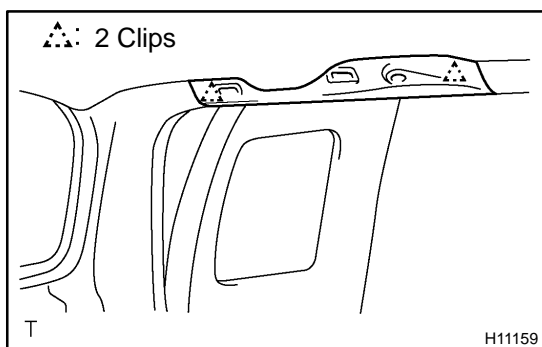
Torque: 42 N·m (430 kgf·cm, 31 ft·lbf)

- (d) Perform the same procedure on the other side.

8. Access cab:

REMOVE ROOF SIDE RAIL GARNISH

- (a) Using a screwdriver, remove the caps.
- (b) Using a torx® driver (T30), remove the 2 screws and assist grip.



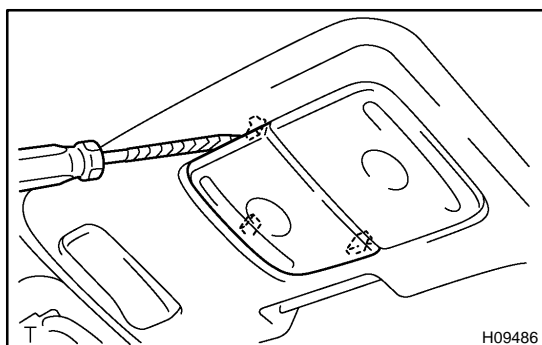
- (c) Using a screwdriver, remove the roof side rail garnish.

9. REMOVE SUN VISORS

- (a) Remove the 4 screws and 2 sun visors.
- (b) w/ Light:
Disconnect the connector.

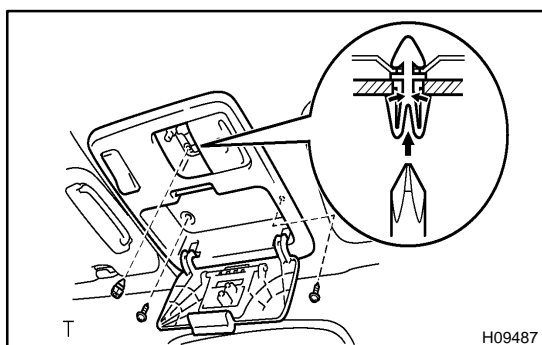
10. REMOVE SUB-VISORS

Remove the 4 screws and 2 sub-visors.



11. REMOVE FRONT PERSONAL LIGHT

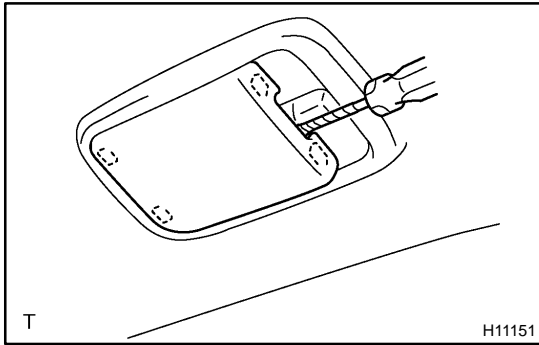
- (a) Using a screwdriver, remove the left side lens.



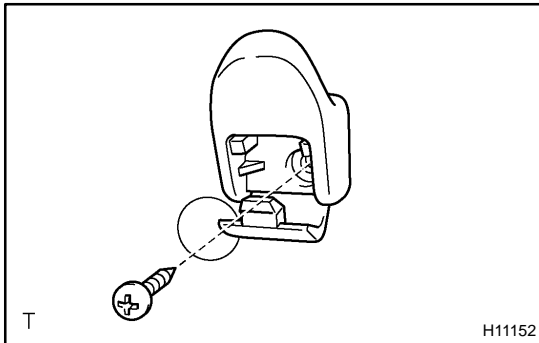
- (b) Remove the 2 screws.
- (c) Using a screwdriver, rotate the clip by 90° and remove it.
- (d) Remove the front personal light, then disconnect the connector.

HINT:

At the time of installation, please refer to the following item.
When installing the front personal light, attach the clip to the housing and push it to the bracket.

**12. REMOVE ROOM LIGHT**

- (a) Using a screwdriver, remove the room light cover.
- (b) Remove the 2 screws and room light, then disconnect the connector.

**13. Standard cab:
REMOVE COAT HOOK**

- (a) Using a screwdriver, open the cap.
- (b) Remove the screw and coat hook.

**14. Standard cab:
REMOVE ROOM PARTITION GARNISHES**

- (a) Using a screwdriver, remove the back panel trim covers.

HINT:

Tape the screwdriver tip before use.

- (b) Using a screwdriver, remove the room partition garnishes.

HINT:

Tape the screwdriver tip before use.

15. REMOVE QUARTER TRIM

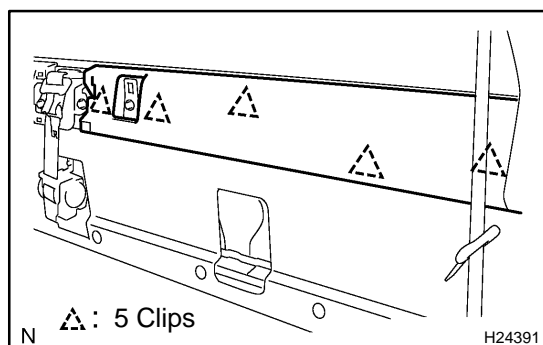
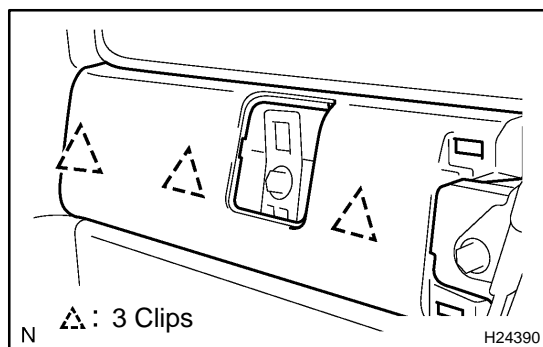
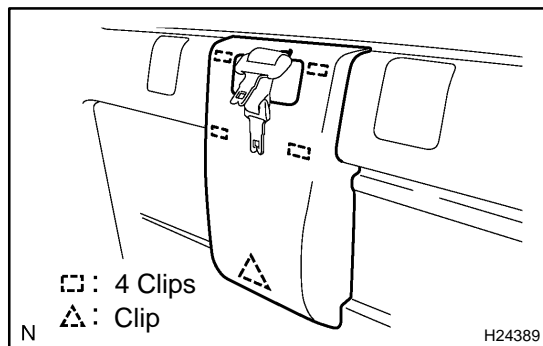
- (a) Standard cab:

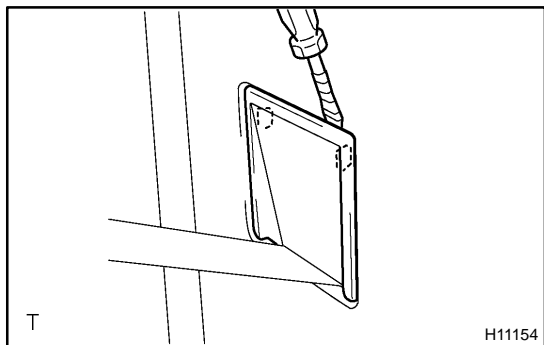
Remove the bolt and front seat outer belt floor anchor.

Torque: 42 N·m (430 kgf·cm, 31 ft·lbf)

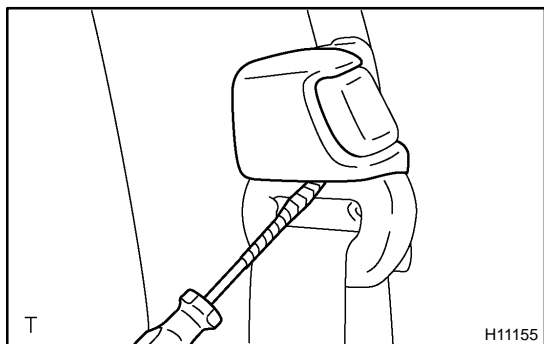
- (b) Access cab:

Remove the bolt and rear seat outer belt floor anchor.

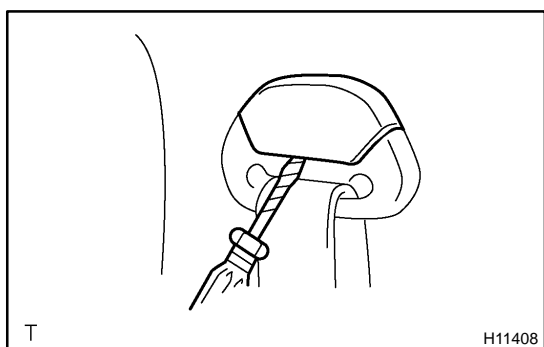
Torque: 42 N·m (430 kgf·cm, 31 ft·lbf)



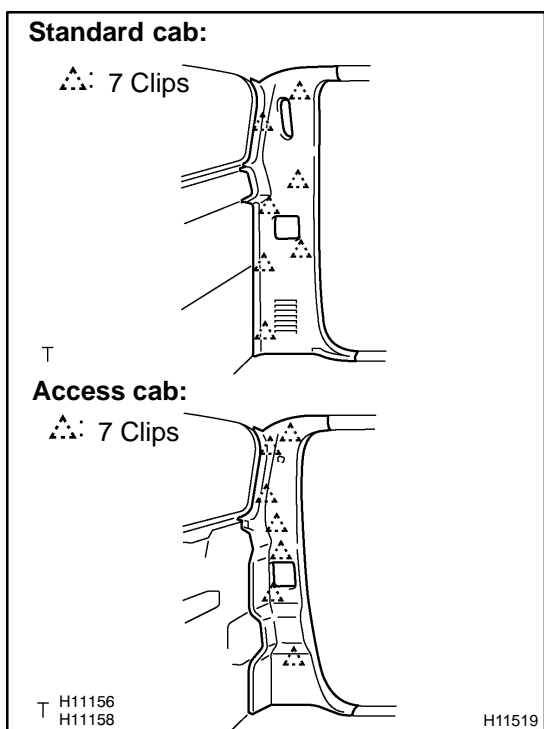
- (c) Using a screwdriver, remove the quarter trim belt hole cover.



- (d) Standard cab:
Using a screwdriver, remove the cap.
- (e) Standard cab:
Unfasten the bolt and remove front seat outer belt shoulder anchor.
Torque: 42 N·m (430 kgf·cm, 31 ft·lbf)



- (f) Access cab:
Using a screwdriver, open the cap.
- (g) Access cab:
Unfasten the bolt and remove rear seat outer belt shoulder anchor.
Torque: 42 N·m (430 kgf·cm, 31 ft·lbf)



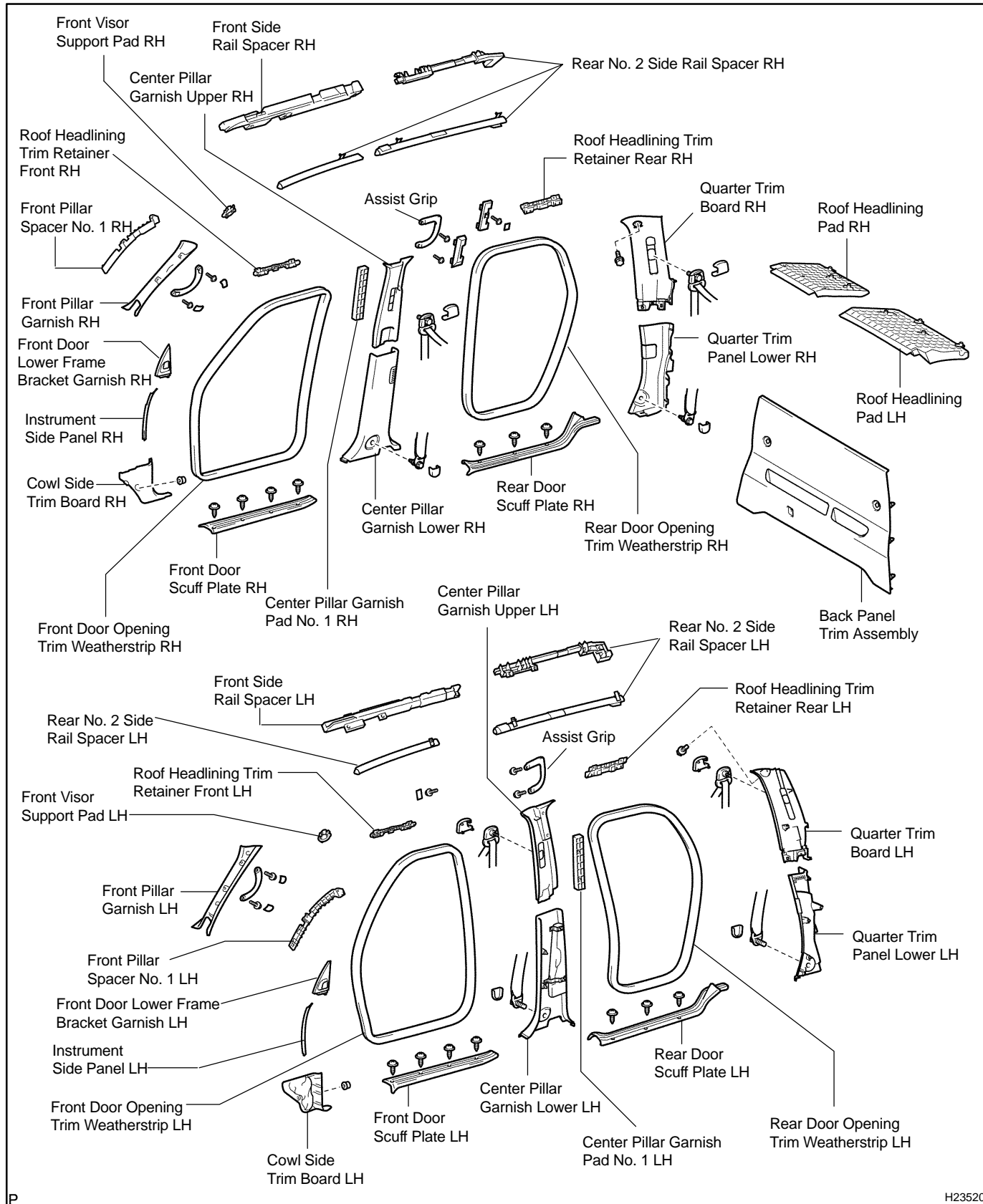
- (h) Insert a screwdriver between the quarter trim and body panel to remove the quarter trim.
 - (i) Perform the same procedure on the other side.
- 16. REMOVE ROOF HEADLINING**
- (a) Remove the 2 screws and 2 sun visor holders.
 - (b) Standard cab:
Remove the 2 clips and roof headlining.
 - (c) Access cab:
Remove the 3 clips and roof headlining.

INSTALLATION

Installation is in the reverse order of removal (see page [BO-126](#)).

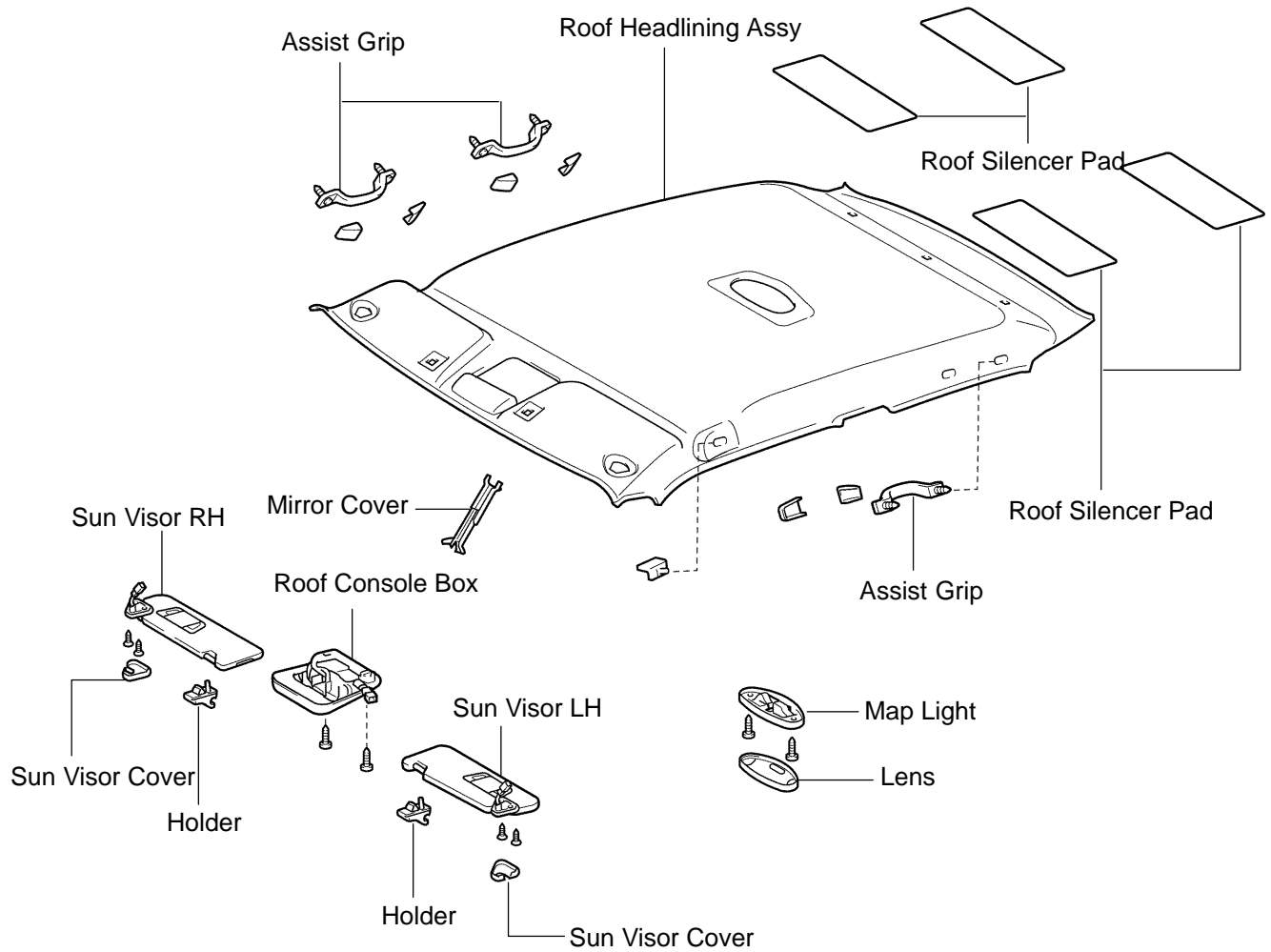
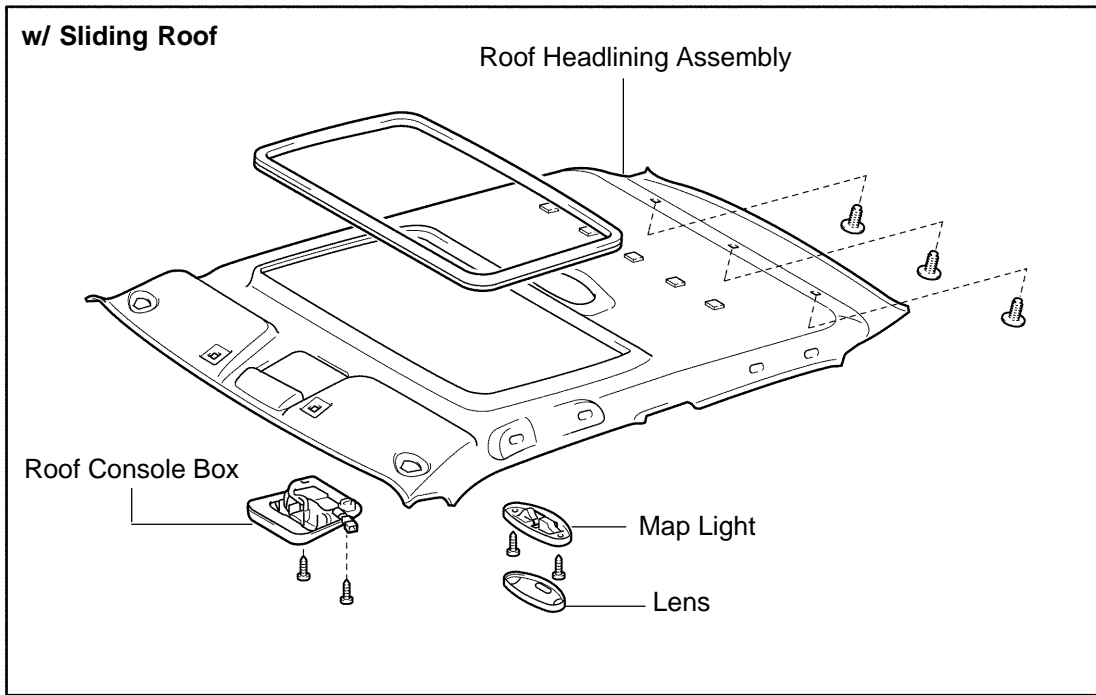
ROOF HEADLINING (Double Cab) COMPONENTS

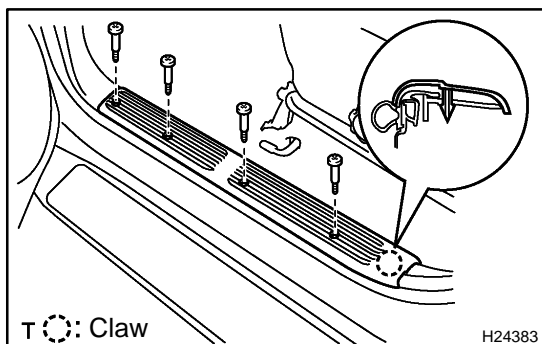
BO4QG-01



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REMOVAL

HINT:

- ◆ A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. REMOVE FRONT DOOR SCUFF PLATE LH

- (a) Remove the 4 screws.
- (b) Using a screwdriver, disengage the claw and remove the scuff plate.

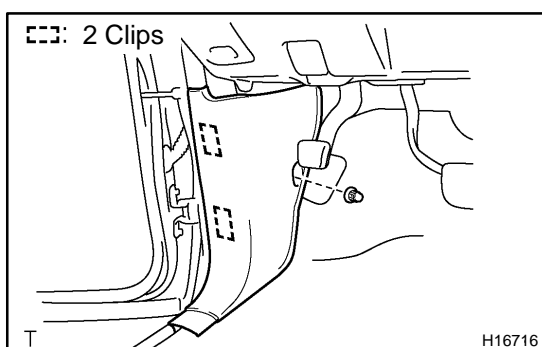
HINT:

Tape the screwdriver tip before use.

2. REMOVE FRONT DOOR SCUFF PLATE RH

HINT:

Use the same procedures described for the LH side.



3. REMOVE COWL SIDE TRIM BOARD LH

- (a) Remove the nut, 2 clips and cowl side trim board.

4. REMOVE COWL SIDE TRIM BOARD RH

HINT:

Use the same procedures described for the LH side.

5. REMOVE FRONT DOOR OPENING TRIM WEATHERSTRIP LH

6. REMOVE FRONT DOOR OPENING TRIM WEATHERSTRIP RH

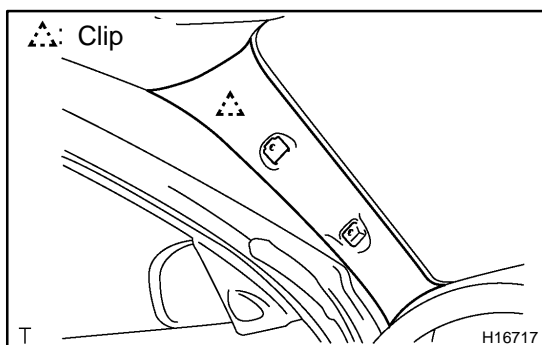
7. REMOVE FRONT PILLAR GARNISH LH

- (a) Remove the assist grip.
 - (1) Using a screwdriver, remove the 2 assist grip plugs.

HINT:

Tape the screwdriver tip before use.

- (2) Remove the 2 screws and assist grip.



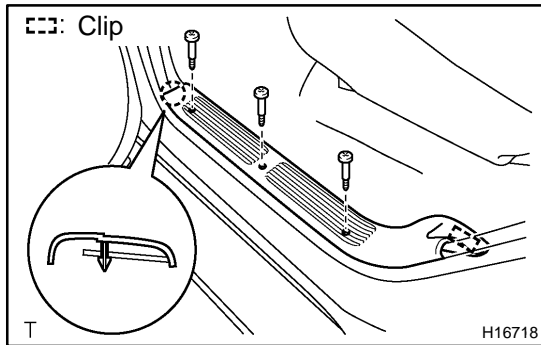
- (b) Remove the front pillar garnish.

- (c) Use the same manner described above to the other side.

8. REMOVE FRONT PILLAR GARNISH RH

HINT:

Use the same procedures described for the LH side.

**9. REMOVE REAR DOOR SCUFF PLATE LH**

- (a) Remove the 3 screws.
- (b) Using a screwdriver, disengage the claw and remove the scuff plate.

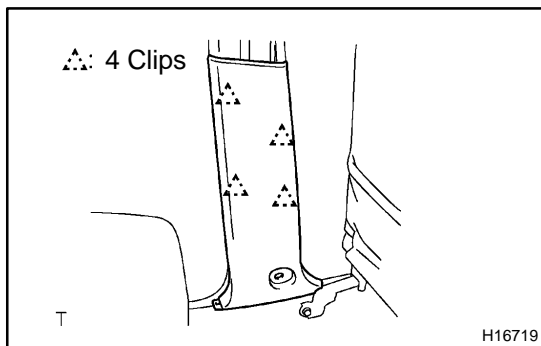
HINT:

Tape the screwdriver tip before use.

10. REMOVE REAR DOOR SCUFF PLATE RH

HINT:

Use the same procedures described for the LH side.

11. REMOVE REAR DOOR OPENING TRIM WEATHERSTRIP LH**12. REMOVE REAR DOOR OPENING TRIM WEATHERSTRIP RH****13. REMOVE LOWER CENTER PILLAR GARNISH LH**

- (a) Remove the front seat outer belt floor anchor.
Torque: 42 N·m (430 kgf·cm, 31 ft·lbf)
- (b) Using a screwdriver, remove the 4 clips and pillar garnish.

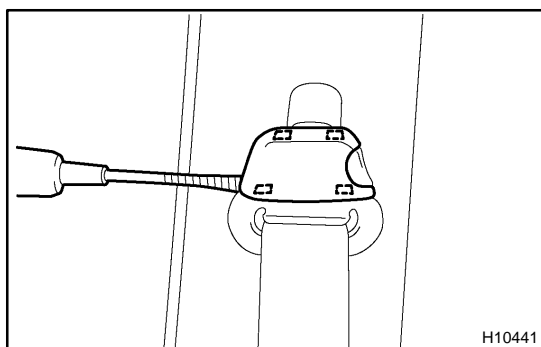
HINT:

Tape the screwdriver tip before use.

14. REMOVE LOWER CENTER PILLAR GARNISH RH

HINT:

Use the same procedures described for the LH side.

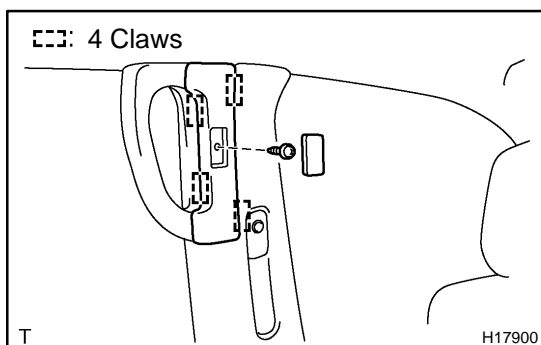
**15. REMOVE FRONT SEAT OUTER BELT SHOULDER ANCHOR**

- (a) Using a screwdriver, remove the anchor cap.

HINT:

Tape the screwdriver tip before use.

- (b) Remove the front seat outer belt shoulder anchor.

Torque: 42 N·m (430 kgf·cm, 31 ft·lbf)**16. w/ Curtain shield airbag assembly:
REMOVE ASSIST GRIP**

- (a) Using a screwdriver, remove the cap.

HINT:

Tape the screwdriver tip before use.

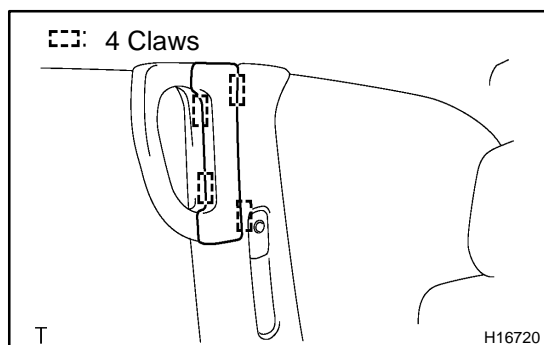
- (b) Remove the screw.

- (c) Using a screwdriver, remove the No. 2 assist grip plug.

HINT:

Tape the screwdriver tip before use.

- (d) Remove the 2 screws and assist grip.
- (e) Use the same manner described above to the other side.



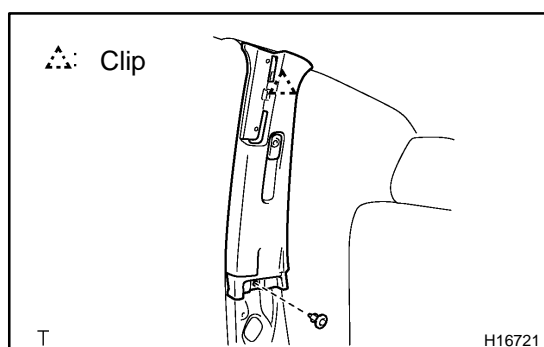
**17. w/o Curtain shield airbag assembly:
REMOVE ASSIST GRIP**

- (a) Using a screwdriver, remove the No. 2 assist grip piug.

HINT:

Tape the screwdriver tip before use.

- (b) Remove the 2 screws and assist grip.
- (c) Use the same manner described above to the other side.



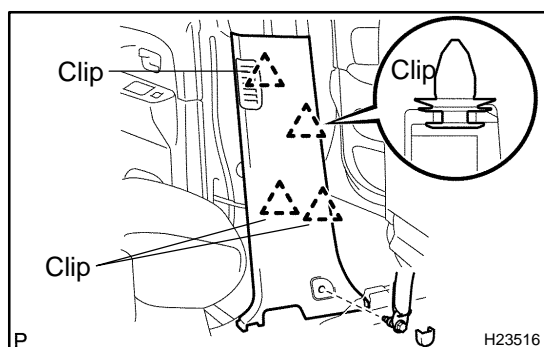
18. REMOVE CENTER PILLAR GARNISH UPPER LH

- (a) Using a clip remover, remove the clip labeled A, clip labeled B and garnish.

19. REMOVE CENTER PILLAR GARNISH UPPER RH

HINT:

Use the same procedures described for the RH side.



20. REMOVE CENTER PILLAR GARNISH LOWER LH

Using a screwdriver, remove the 4 clips and garnish.

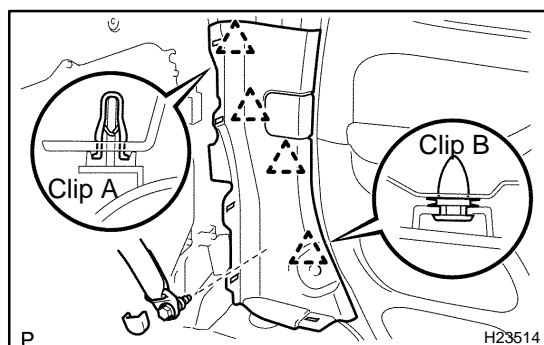
HINT:

Tape the screwdriver tip before use.

21. REMOVE CENTER PILLAR GARNISH LOWER RH

HINT:

Use the same procedures described for the RH side.



22. REMOVE QUARTER TRIM PANEL LOWER LH

- (a) Remove the rear floor anchor belt cover and bolt.
- (b) Using a screwdriver, remove the clip labeled A, 3 clips labeled B and pillar garnish.

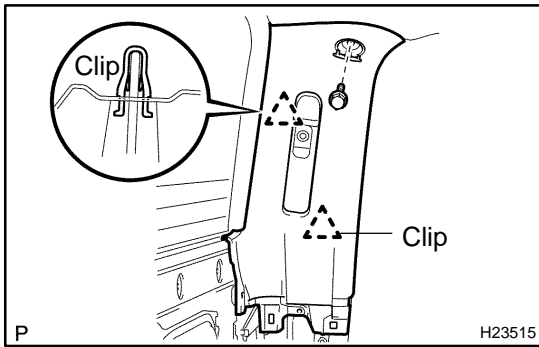
HINT:

Tape the screwdriver tip before use.

23. REMOVE QUARTER TRIM PANEL LOWER RH

HINT:

Use the same procedures described for the RH side.

**24. REMOVE QUARTER TRIM BOARD LH**

- (a) Remove the shoulder anchor bolt.
- (b) Using a screwdriver, remove the 2 clips and bolt.

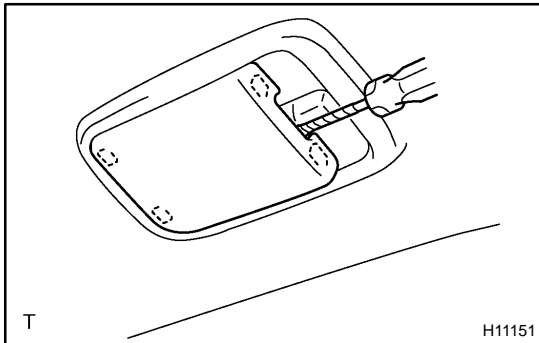
HINT:

Tape the screwdriver tip before use.

25. REMOVE QUARTER TRIM BOARD RH

HINT:

Use the same procedures described for the RH side.

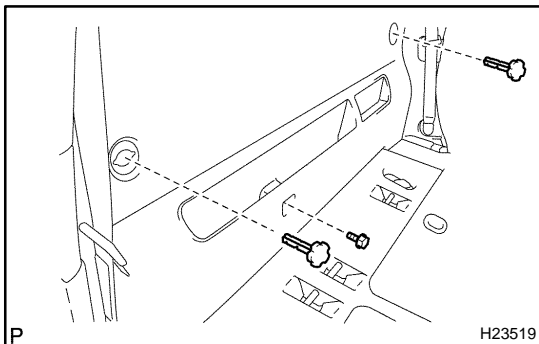
**26. REMOVE DOME LIGHT**

- (a) Using a screwdriver, remove the lens.

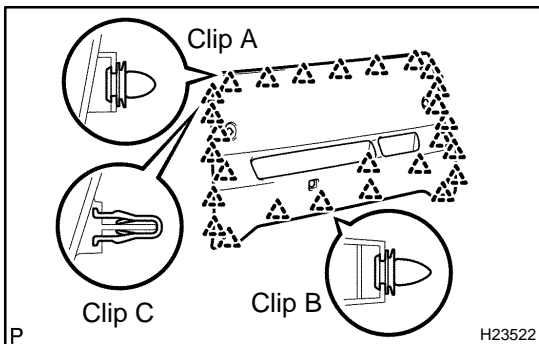
HINT:

Tape the screwdriver tip before use.

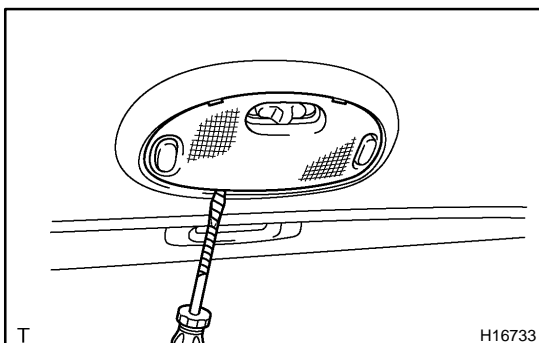
- (b) Remove the 2 screws and dome light, then disconnect the connector.

**27. BACK PANEL TRIM**

- (a) Remove the 2 clips and bolt.



- (b) Using a clip remover, remove the 6 clips labeled A and 7 clips labeled B, 14 clips labeled C and panel.

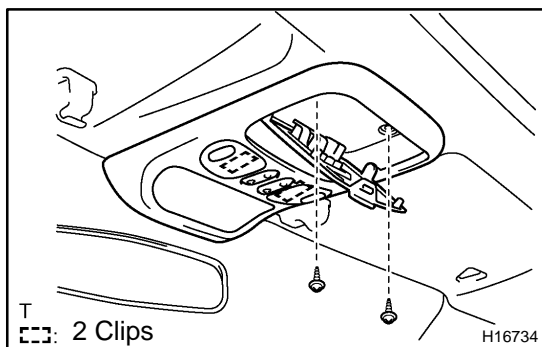
**28. REMOVE MAP LIGHT**

- (a) Using a screwdriver, remove the lens.

HINT:

Tape the screwdriver tip before use.

- (b) Remove the 2 screws and map light, then disconnect the connector.

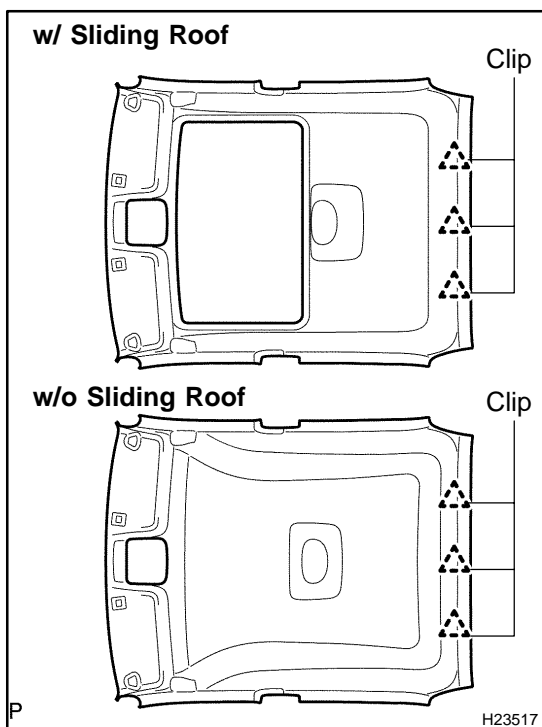
**29. REMOVE ROOF CONSOLE BOX**

- (a) Remove the 2 screws.
- (b) Using a screwdriver, remove the roof console box.

HINT:

Tape the screwdriver tip before use.

- (c) Disconnect the connector.

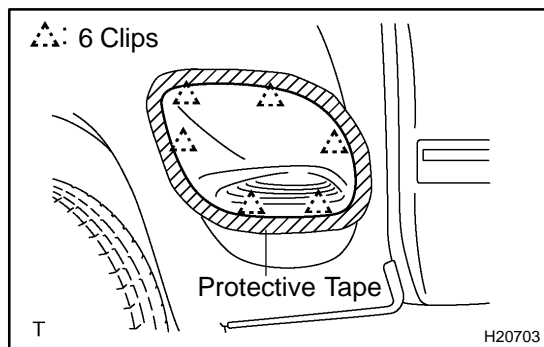
30. REMOVE SUN VISORS AND HOLDERS**31. REMOVE ROOF HEADLINING**

Using a clip remover, remove the 3 clips and headlining.

- 32. REMOVE ROOF SILENCER PAD**
- 33. REMOVE FRONT SIDE RAIL SPACER LH**
- 34. REMOVE FRONT SIDE RAIL SPACER RH**
- 35. REMOVE REAR NO. 2 SIDE RAIL SPACER LH**
- 36. REMOVE REAR NO. 2 SIDE RAIL SPACER RH**
- 37. REMOVE FRONT PILLAR SPACER NO. 1 LH**
- 38. REMOVE FRONT PILLAR SPACER NO. 1 RH**
- 39. REMOVE FRONT DOOR LOWER FRAME BRACKET GARNISH LH**
- 40. REMOVE FRONT DOOR LOWER FRAME BRACKET GARNISH RH**
- 41. REMOVE INSTRUMENT PANEL LH**
- 42. REMOVE INSTRUMENT PANEL RH**
- 43. REMOVE CENTER PILLAR GARNISH PAD NO. 1 LH**
- 44. REMOVE CENTER PILLAR GARNISH PAD NO. 1 RH**
- 45. REMOVE ROOF HEADLINING TRIM RETAINER FRONT LH**
- 46. REMOVE ROOF HEADLINING TRIM RETAINER FRONT RH**
- 47. REMOVE FRONT VISOR SUPPORT PAD LH**
- 48. REMOVE FRONT VISOR SUPPORT PAD RH**
- 49. REMOVE ROOF HEADLINING TRIM RETAINER REAR LH**
- 50. REMOVE ROOF HEADLINING TRIM RETAINER REAR RH**
- 51. REMOVE ROOF HEADLINING PAD LH**
- 52. REMOVE ROOF HEADLINING PAD RH**

INSTALLATION

Installation is in the reverse order of removal (see page [BO-133](#)).



SIDE STEP REPLACEMENT

BO4HS-02

REMOVE SIDE FRONT STEP

Using a screwdriver, remove the side front step.

HINT:

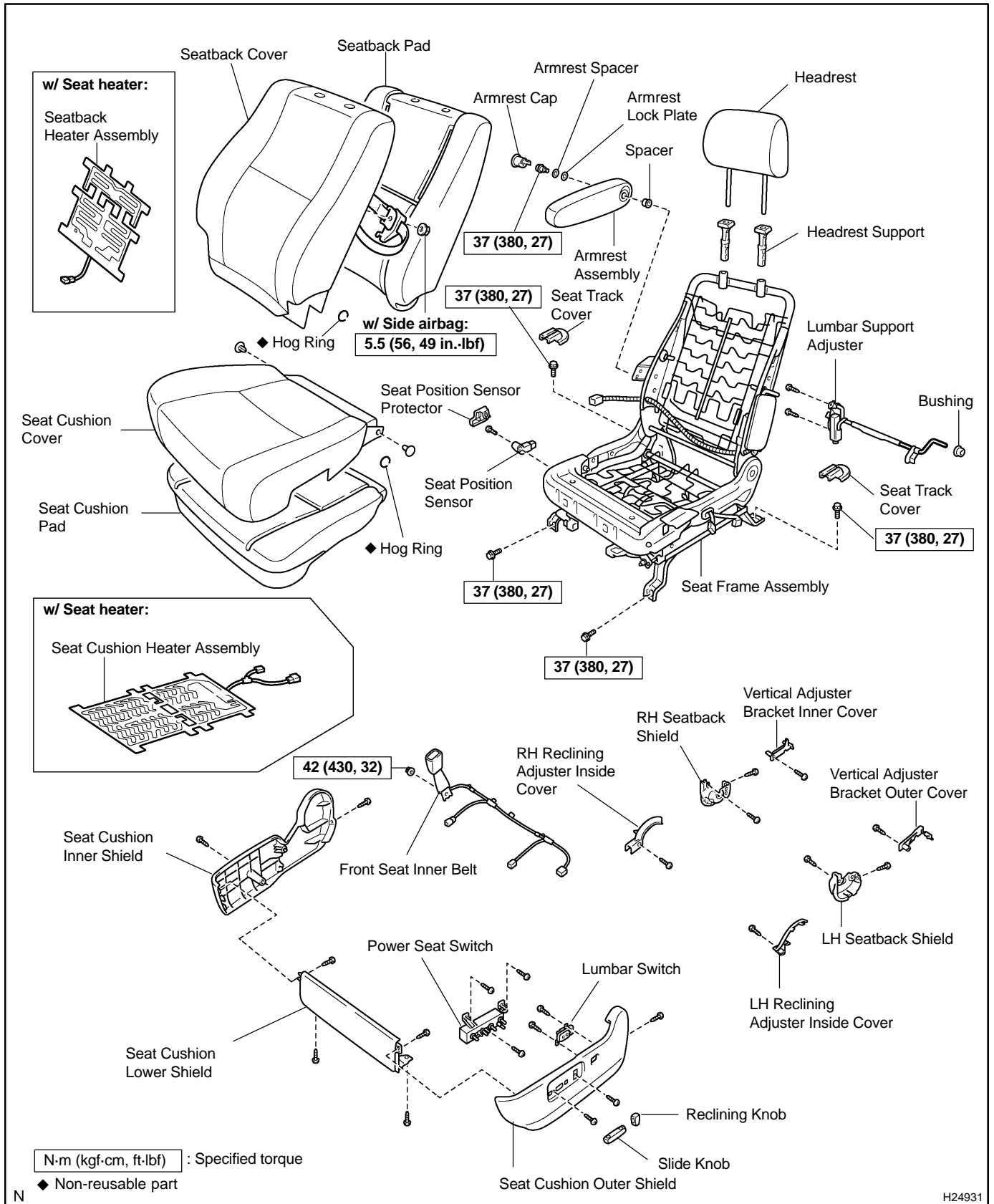
Tape the screwdriver tip before use.

NOTICE:

- ◆ Do not damage the body.
- ◆ If the clips are damaged, exchange them for new clips.

FRONT SEAT (Separate Type: Power Adjuster) COMPONENTS

BO4S6-03



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REMOVAL

CAUTION:

Work must not be started until at least 90 seconds after the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery.

(The SRS is equipped with a back-up power source. If work is started within 90 seconds from disconnecting the negative (-) terminal cable of the battery, the SRS may deploy.)

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

2. REMOVE SEAT TRACK COVERS

Using a screwdriver, remove the seat track covers.

HINT:

Tape the screwdriver tip before use.

3. REMOVE FRONT SEAT

- (a) Remove the 4 bolts.
- (b) Disconnect the connectors.
- (c) w/ Side airbag:
Disconnect the airbag connector.
- (d) Remove the front seat.

NOTICE:

Be careful not to damage the body.

DISASSEMBLY

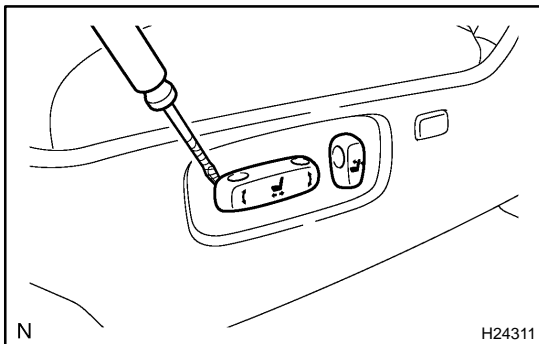
CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

- ◆ Tape the screwdriver tip before using it to remove the parts.
- ◆ For easy removal of the lumbar support adjuster, release the lumbar support through lumbar switch operation.

1. REMOVE HEADREST

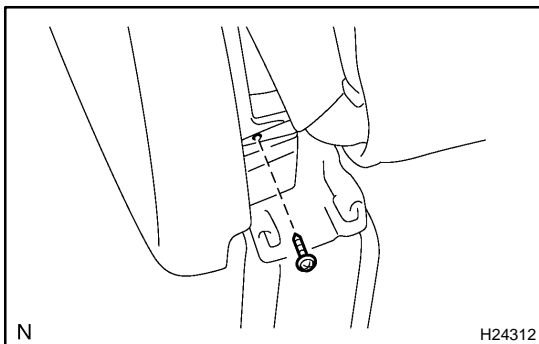


2. REMOVE SLIDE KNOB AND RECLINING KNOB

Using a screwdriver, remove the slide knob and reclining knob.

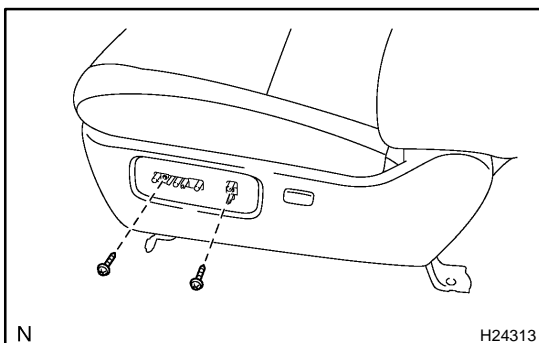
HINT:

Tape the screwdriver tip before use.

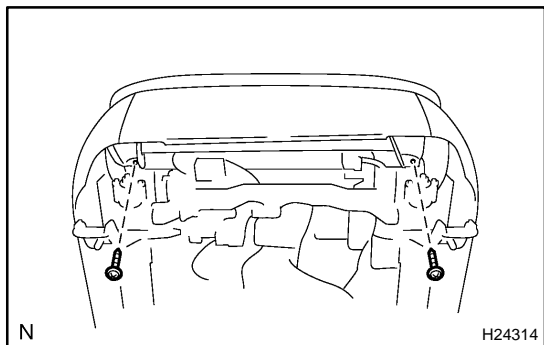


3. REMOVE SEAT CUSHION LOWER SHIELD, SEAT CUSHION OUTER SHIELD AND SEAT CUSHION INNER SHIELD

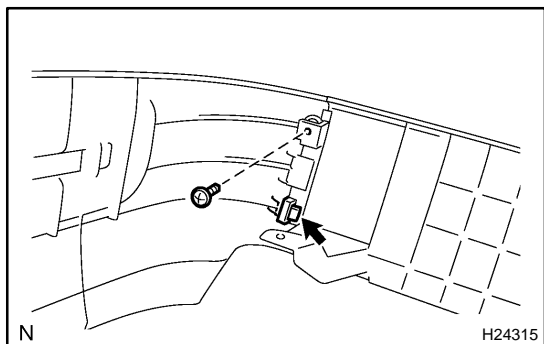
- (a) Remove the screw from the seat cushion outer shield.
- (b) Perform the same procedure on the seat cushion inner shield.



- (c) Remove the 2 screws from the seat cushion outer shield.
- (d) Remove the screw from the seat cushion inner shield.



- (e) Remove the 2 screws from the seat cushion lower shield.
- (f) Disconnect the lumbar switch connector from the seat cushion outer shield, and remove the seat cushion lower shield, outer shield and inner shield.



- (g) Remove the screw and separate the seat cushion lower shield and seat cushion outer shield.
- (h) Perform the same procedure on the other side.

4. REMOVE FRONT SEAT INNER BELT

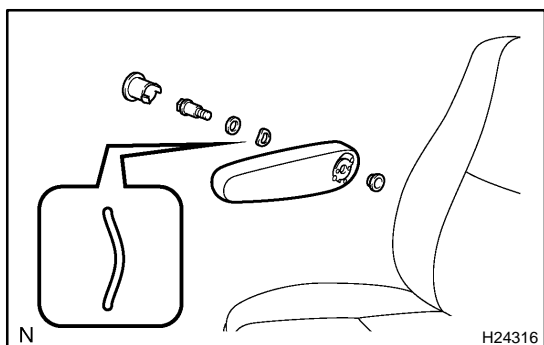
- (a) Disconnect the wire harness clamps and connectors.
- (b) Remove the nut and front seat inner belt.

5. REMOVE LUMBAR SWITCH

Remove the 2 screws and lumbar switch from the seat cushion outer shield.

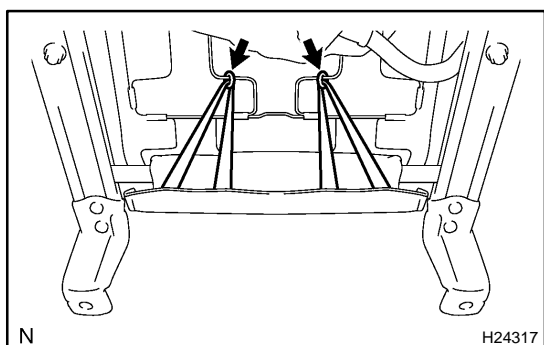
6. REMOVE POWER SEAT SWITCH

Remove the 3 screws and power seat switch.



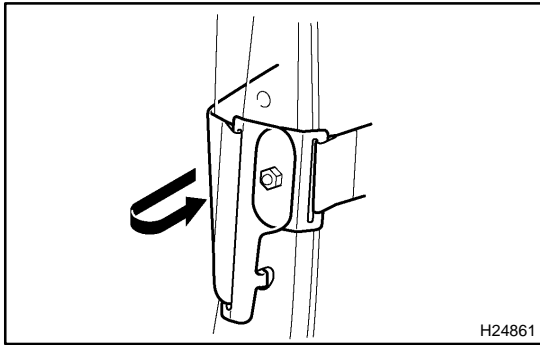
7. REMOVE ARMREST ASSEMBLY

- (a) Using a screwdriver, remove the armrest cap.
- (b) Remove the bolt, armrest spacer, armrest lock plate and armrest assembly.
- (c) Remove the spacer from the armrest assembly.

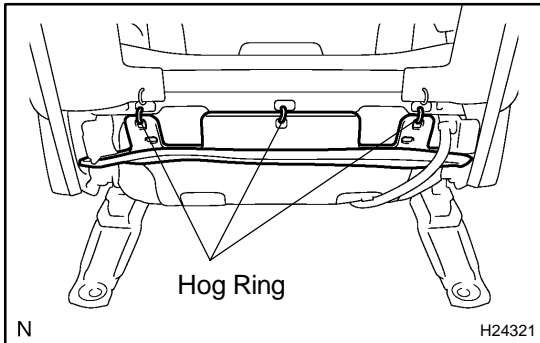


8. REMOVE SEATBACK COVER AND PAD

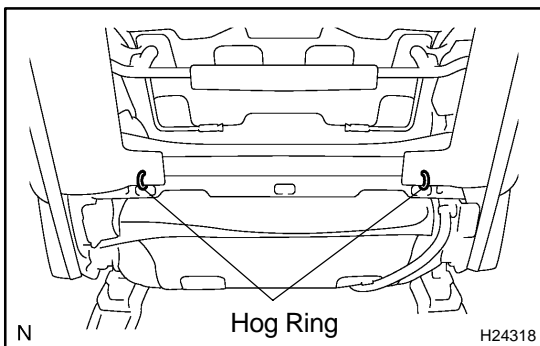
- (a) Remove the hog rings from the seat frame assembly.
- (b) Open the fastener.



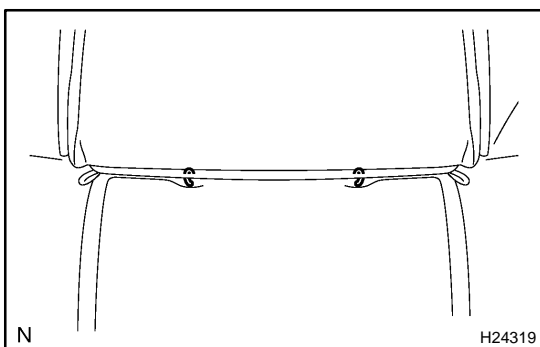
- (c) w/ Side airbag:
Remove the nut and disconnect the seatback cover bracket from the seat frame assembly.



- (d) Remove the hog rings from the seat frame assembly.



- (e) Remove the hog rings from the seat frame assembly.
(f) Remove the seatback cover and pad from the seat frame assembly.



9. REMOVE SEATBACK COVER

- (a) Turn up the seatback cover and remove the hog rings.
(b) Remove the 2 headrest supports.
(c) Remove the seatback cover from the seatback pad.

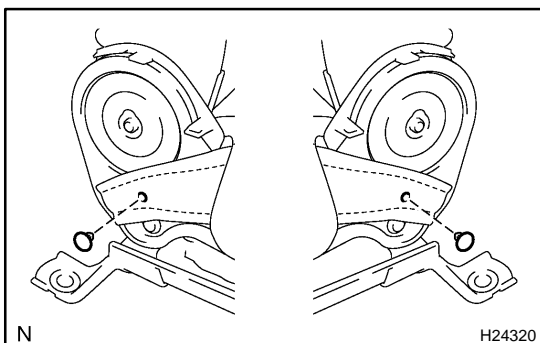
10. w/ Seat heater:

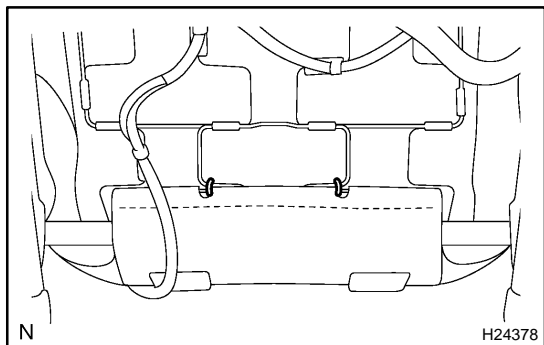
REMOVE SEATBACK HEATER ASSEMBLY

Cut off the tack pins which fasten the seat heater, and then remove the seatback heater assembly from the seatback cover.

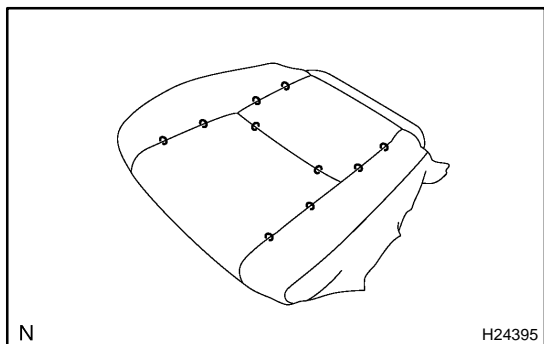
11. REMOVE SEAT CUSHION COVER AND PAD

- (a) Disconnect the wire harness clamp.
(b) Remove the 2 clips.





- (c) Remove the hog rings from the seat cushion cover.
- (d) Unlatch the seat cushion cover hooks, then remove the seat cushion cover and seat cushion pad.



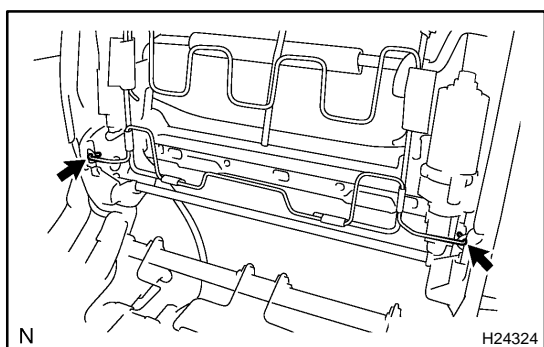
12. REMOVE SEAT CUSHION COVER

Remove the hog rings and seat cushion cover from the seat cushion pad.

13. w/ Seat heater:

REMOVE SEAT CUSHION HEATER ASSEMBLY

Cut off the tack pins which fasten the seat heater, and then remove the seat cushion heater assembly from the seat cushion cover.

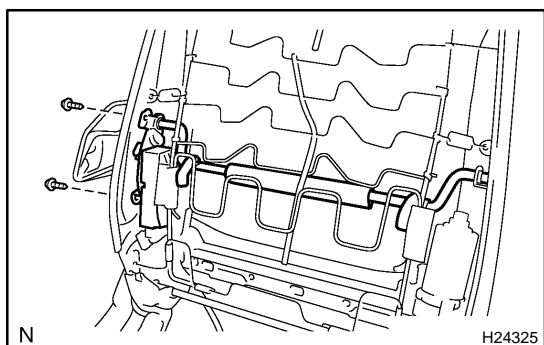


14. REMOVE LUMBAR SUPPORT ADJUSTER

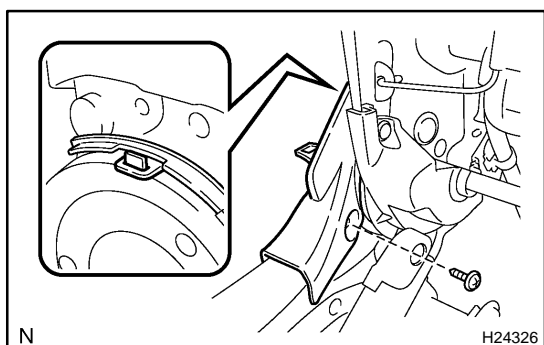
- (a) Disconnect the connector.
- (b) Disengage the seatback spring edge from the seat frame assembly.

NOTICE:

Be careful when releasing the seatback spring edge, because there is a possibility that the spring may break due to tension by the lumbar support.

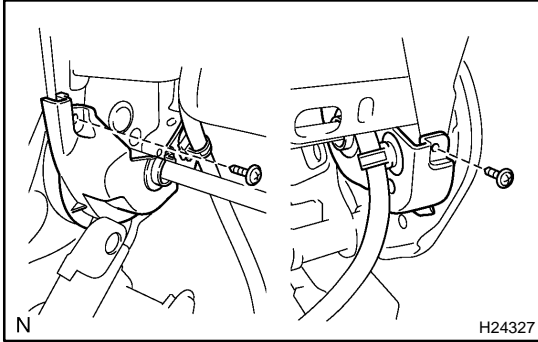


- (c) Remove the 2 screws and lumbar support adjuster.
- (d) Remove the bushing from the lumbar support adjuster.



15. REMOVE RH AND LH RECLINING ADJUSTER INSIDE COVERS

- (a) Remove the screw and RH reclining adjuster inside cover.
- (b) Disconnect the wire harness clamp.
- (c) Perform the same procedure on the other side.

**16. REMOVE RH AND LH SEATBACK SHIELDS**

- (a) Remove the 2 screws and RH seatback shield.
- (b) Perform the same procedure on the other side.

17. REMOVE VERTICAL ADJUSTER BRACKET INNER AND OUTER COVERS

- (a) Remove the screw and vertical adjuster bracket inner cover.
- (b) Perform the same procedure on the other side.

18. REMOVE SEAT POSITION SENSOR

(See page [RS-1 18](#))

REASSEMBLY

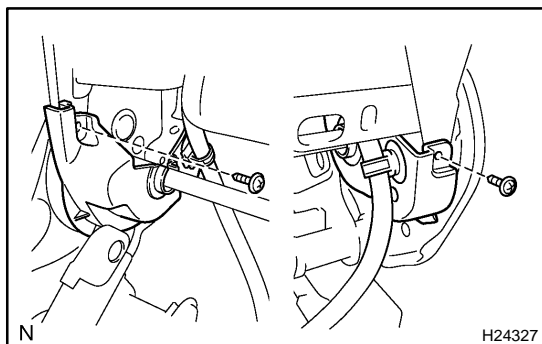
CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

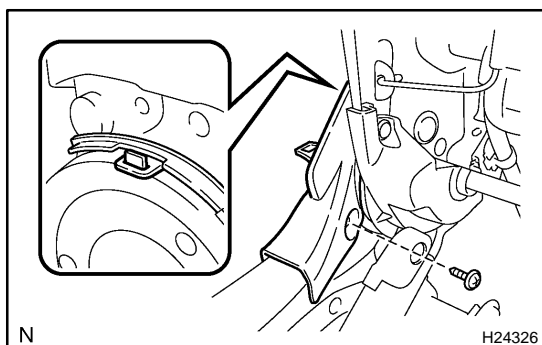
HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

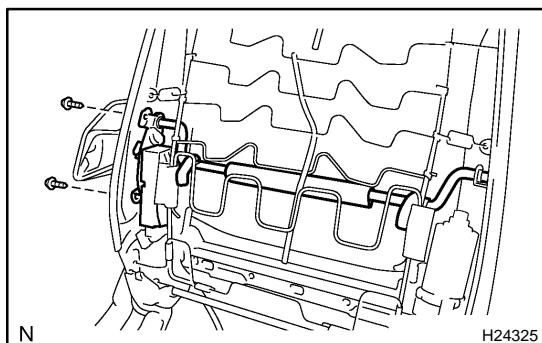
1. **INSTALL SEAT POSITION SENSOR
(SEE PAGE [RS-122](#))**
2. **INSTALL VERTICAL ADJUSTER BRACKET INNER AND OUTER COVERS**
 - (a) Install the vertical adjuster bracket inner cover with the screw.
 - (b) Perform the same procedure on the other side.



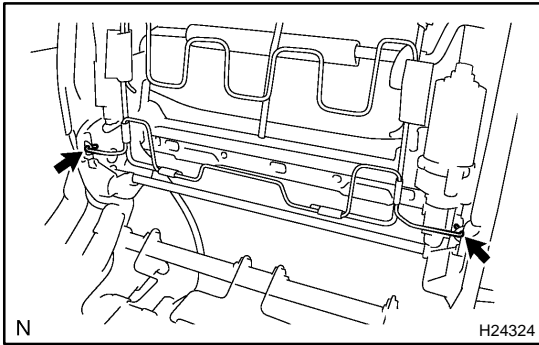
3. **INSTALL RH AND LH SEATBACK SHIELDS**
 - (a) Install the RH seatback shield with the 2 screws.
 - (b) Perform the same procedure on the other side.



4. **INSTALL RH AND LH RECLINING ADJUSTER INSIDE COVERS**
 - (a) Connect the wire harness clamp.
 - (b) Install the RH reclining adjuster inside cover with the screw.
 - (c) Perform the same procedure on the other side.



5. **INSTALL LUMBAR SUPPORT ADJUSTER**
 - (a) Install a new bushing to the lumbar support adjuster.
 - (b) Install the lumbar support adjuster with the 2 screws.



(c) Engage the seatback spring edge with the seat frame assembly.

6. w/ Seat heater:

INSTALL SEAT CUSHION HEATER ASSEMBLY

- (a) Set the seat cushion heater assembly with the name stamp side facing the seat cushion cover.
- (b) Install the seat cushion heater assembly with the 10 tack pins.

NOTICE:

Do not substitute other metal parts for tack pins.

a-a:

Listing Pocket, Seat Heater, Tack Pin, Seat Wire, Seat Cushion Cover

A: Install the tack pins under the wire.

b-b:

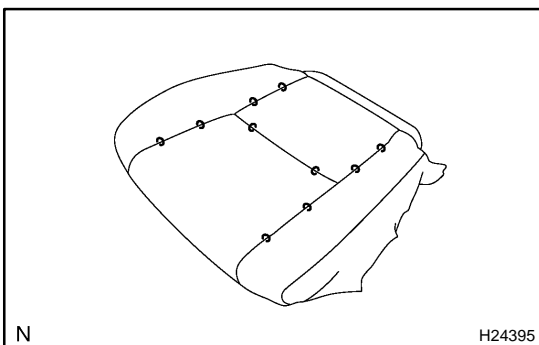
Seat Heater Strap, Tack Pin, Seat Heater, Seat Cushion Cover

Tack pins should not be beyond the seat.

Front ↑

Tack Pin, Name Stamp

T H24394



7. INSTALL SEAT CUSHION COVER

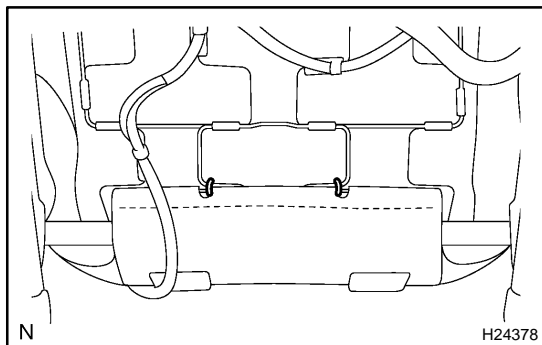
Install the seat cushion cover to the seat cushion pad with the hog rings.

HINT:

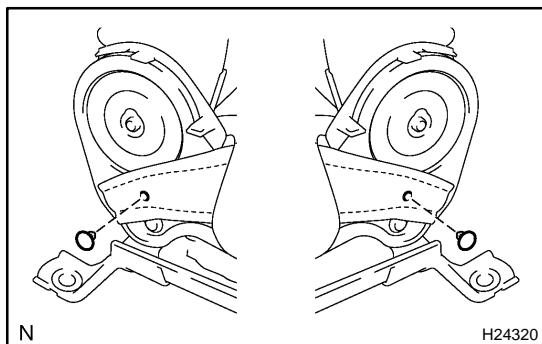
When installing the hog rings, take as much care as possible to prevent wrinkles.

8. INSTALL SEAT CUSHION COVER AND PAD

- (a) Install the seat cushion cover with seat cushion pad, and latch the seat cushion cover hooks.



(b) Install the hog rings to the seat cushion cover.



(c) Install the 2 clips.
 (d) Connect the wire harness clamp.

**9. w/ Seat heater:
 INSTALL SEATBACK HEATER ASSEMBLY**

(a) Set the seatback heater assembly with the name stamp side facing the seatback cover.
 (b) Install the seatback heater assembly with the 11 tack pins.

NOTICE:
 Do not substitute other metal parts for tack pins.

a-a:

A: Install the tack pins under the wire.

Upper

Tack Pin

a

b

Name Stamp

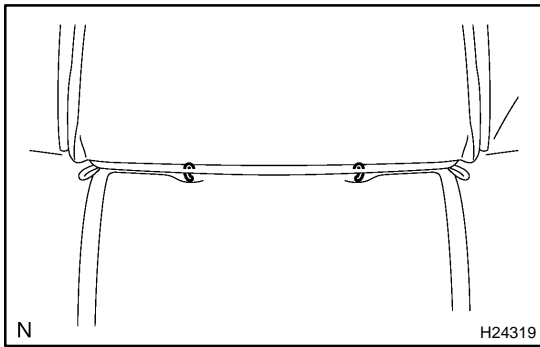
b-b:

Tack pins should not be beyond the seat.

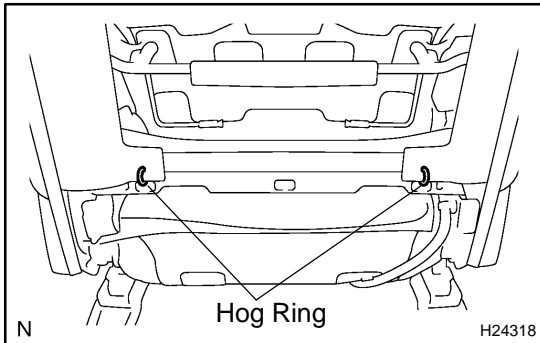
T H24393

10. INSTALL SEATBACK COVER

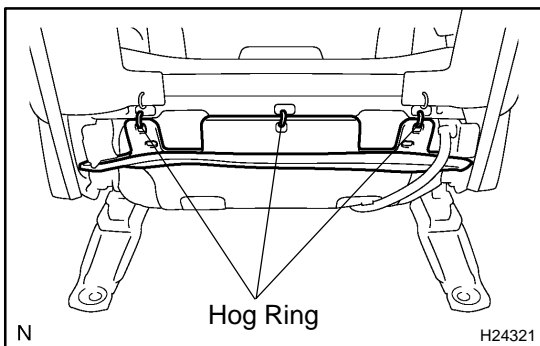
(a) Install the seatback cover to the seatback pad.
 (b) Install the 2 headrest supports.



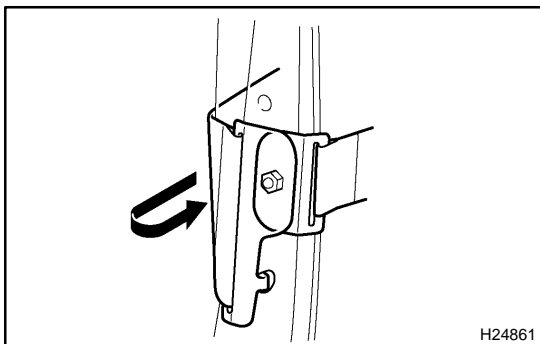
- (c) Turn up the seatback cover and install the hog rings.
11. INSTALL SEATBACK COVER AND PAD
 (a) Install the seatback cover and pad to the seat frame assembly.



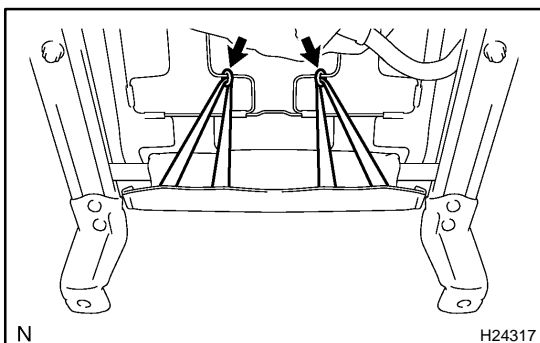
- (b) Install the hog rings to the seat frame assembly.



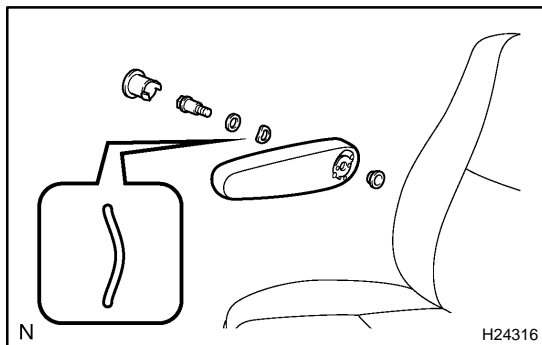
- (c) Install the hog rings to the seat frame assembly.



- (d) w/ Side airbag:
 Connect the seatback cover bracket to the seat frame assembly with the nut.
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)
 (e) Close the fastener.



- (f) Install the hog rings to the seat frame assembly.

**12. INSTALL ARMREST ASSEMBLY**

- (a) Install the spacer to the armrest assembly.
- (b) Install the armrest assembly, armrest lock plate and armrest spacer with the bolt.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

HINT:

Install the armrest lock plate as shown in the illustration.

- (c) Install the armrest cap.

13. INSTALL POWER SWITCH

Install the power switch with the 3 screws.

14. INSTALL LUMBAR SWITCH

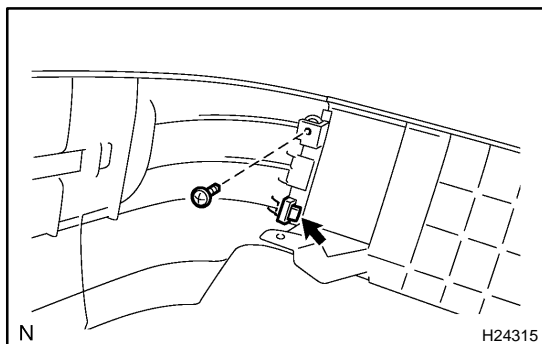
Install the lumbar switch with the 2 screws to the seat cushion outer shield.

15. INSTALL FRONT SEAT INNER BELT

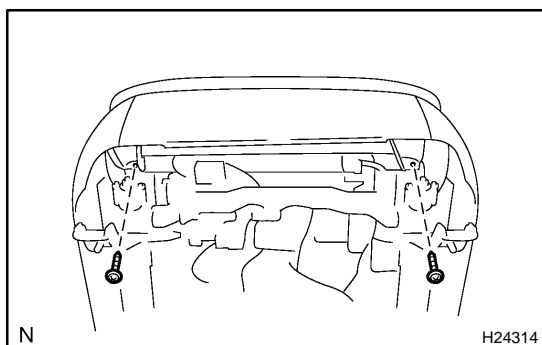
- (a) Install the front seat inner belt with the nut.

Torque: 42 N·m (430 kgf·cm, 32 ft·lbf)

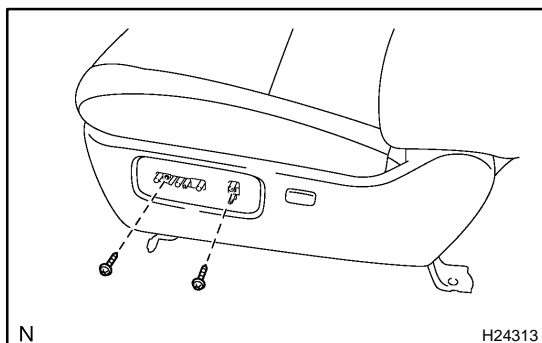
- (b) Connect the connectors and wire harness clamps.

**16. INSTALL SEAT CUSHION LOWER SHIELD, SEAT CUSHION OUTER SHIELD AND SEAT CUSHION INNER SHIELD**

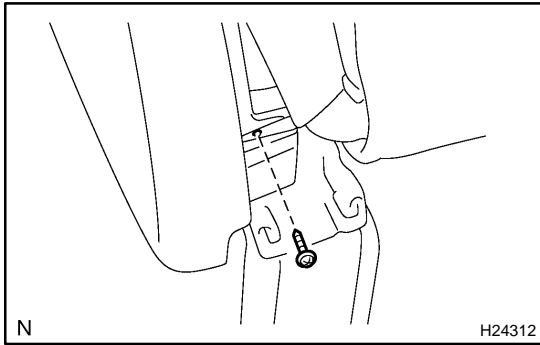
- (a) Assemble the seat cushion lower shield and seat cushion outer shield with the screw.
- (b) Perform the same procedure on the other side.
- (c) Connect the lumbar switch connector to the seat cushion outer shield, and install the seat cushion lower shield, outer shield and inner shield.



- (d) Install the 2 screws to the seat cushion lower shield.
- (e) Install the screw to the seat cushion inner shield.



- (f) Install the 2 screws to the seat cushion outer shield.



- (g) Install the screw to the seat cushion outer shield.
- (h) Perform the same procedure on the seat cushion inner shield.

17. INSTALL SLIDE KNOB AND RECLINING KNOB

18. INSTALL HEADREST

INSTALLATION

1. INSTALL FRONT SEAT

- (a) Mount the front seat to the vehicle.

NOTICE:

Be careful not to damage the vehicle body.

- (b) w/ Side airbag:
Connect the airbag connector.
- (c) Connect the connectors.
- (d) Slide the front seat to the rearmost position.
- (e) Tighten the bolts on the front side temporarily, starting from the bolt on the inner side.
- (f) Tighten them completely.
- Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)**
- (g) Slide the front seat to the foremost position.
- (h) Tighten the bolts on the rear side temporarily, starting from the bolt on the inner side.
- (i) Tighten them completely.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

2. INSTALL SEAT TRACK COVERS

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

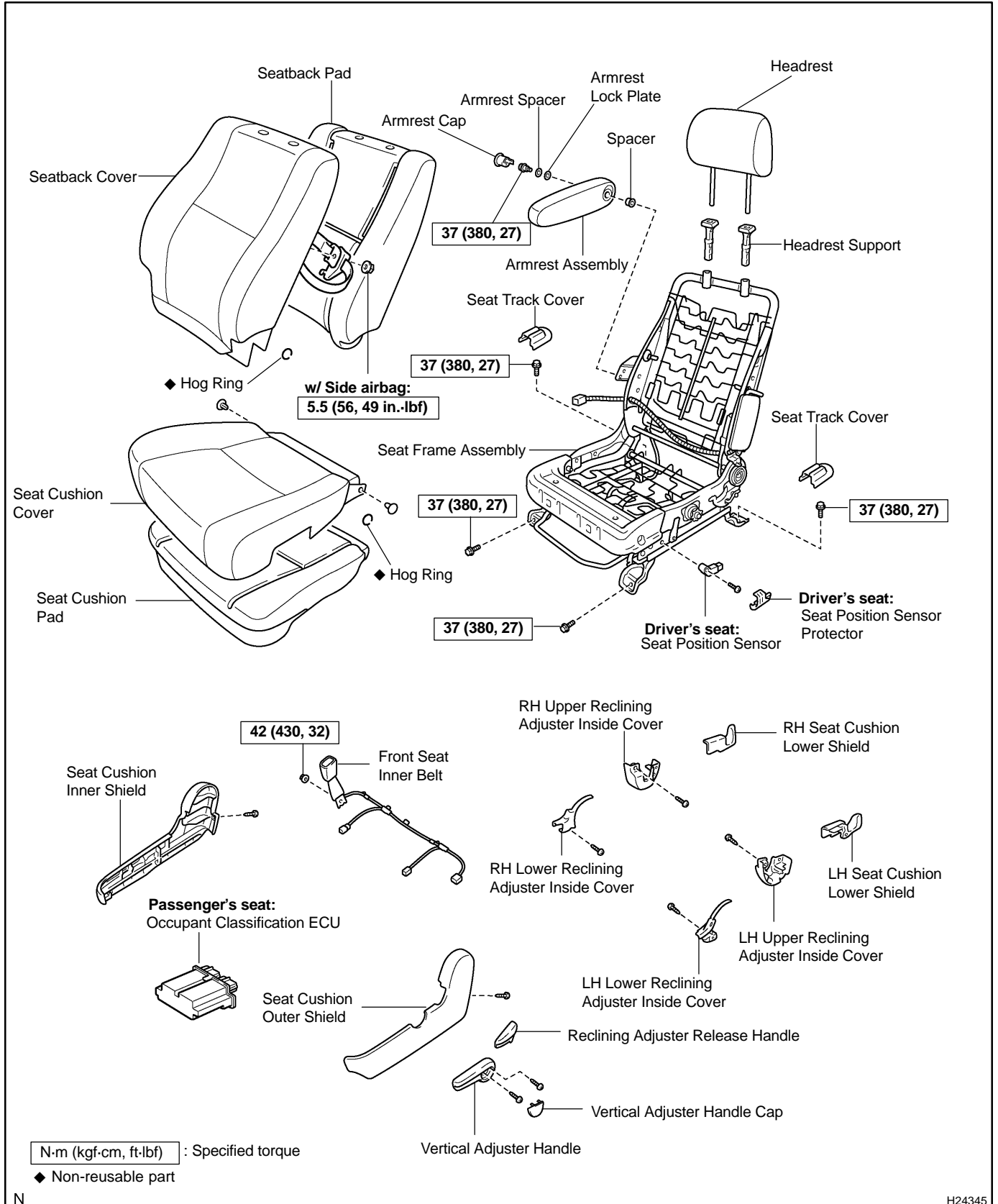
FRONT SEAT (Separate Type: Manual Adjuster)

COMPONENTS

BO4SB-03

HINT:

The procedures listed below are for the LH side.



N

H24345

REMOVAL

CAUTION:

Work must not be started until at least 90 seconds after the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery.

(The SRS is equipped with a back-up power source. If work is started within 90 seconds from disconnecting the negative (-) terminal cable of the battery, the SRS may deploy.)

NOTICE:

When removing/installing and overhauling the passenger seat, check the passenger occupant classification system and perform the zero point calibration (see page [DI-1849](#)).

HINT:

The procedures listed below are for the LH side.

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

2. REMOVE SEAT TRACK COVERS

Using a screwdriver, remove the seat track covers.

HINT:

Tape the screwdriver tip before use.

3. REMOVE FRONT SEAT

- (a) Remove the 4 bolts.
- (b) Disconnect the connectors.
- (c) w/ Side airbag:
Disconnect the airbag connector.
- (d) Remove the front seat.

NOTICE:

Be careful not to damage the vehicle body.

DISASSEMBLY

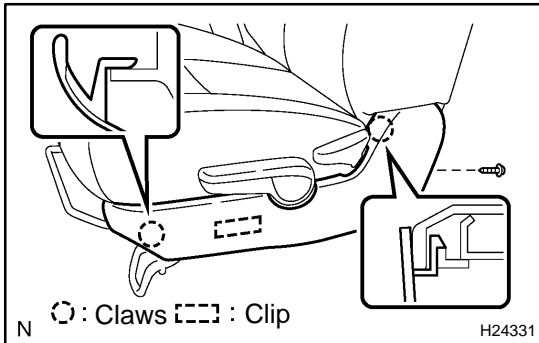
CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

- ◆ The procedures listed below are for the LH side.
- ◆ Tape the screwdriver tip before using it to remove the parts.

1. REMOVE HEADREST



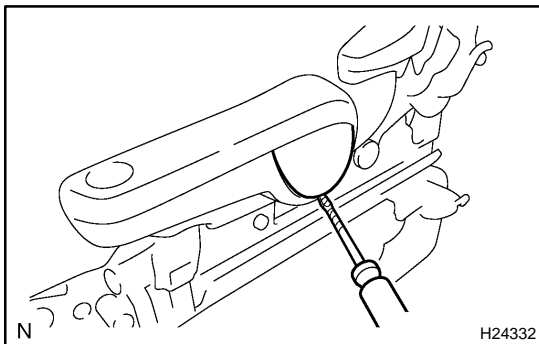
2. REMOVE SEAT CUSHION OUTER SHIELD

- (a) Remove the screw from the seat cushion outer shield.
- (b) Using a screwdriver, remove the seat cushion outer shield.

HINT:

Tape the screwdriver tip before use.

3. REMOVE RECLINING ADJUSTER RELEASE HANDLE

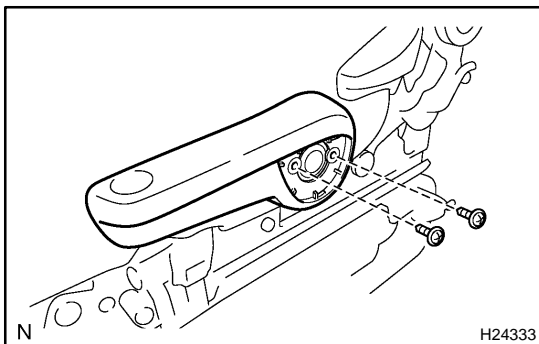


4. REMOVE VERTICAL ADJUSTER HANDLE

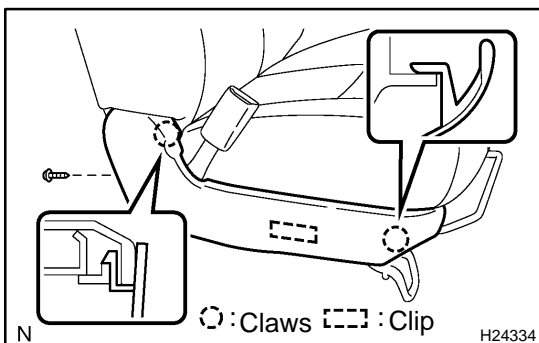
- (a) Using a screwdriver, remove the vertical adjuster handle cap.

HINT:

Tape the screwdriver tip before use.



- (b) Remove the 2 screws and the vertical adjuster handle.



5. REMOVE SEAT CUSHION INNER SHIELD

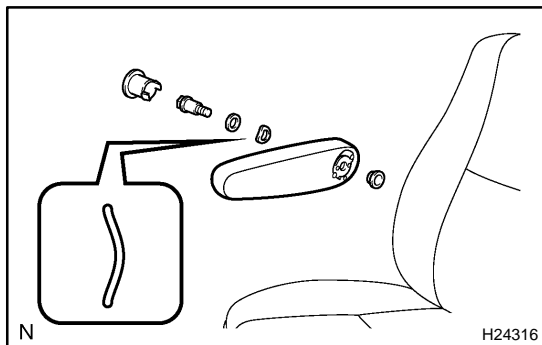
- (a) Remove the screw from the seat cushion inner shield.
- (b) Using a screwdriver, remove the seat cushion inner shield.

HINT:

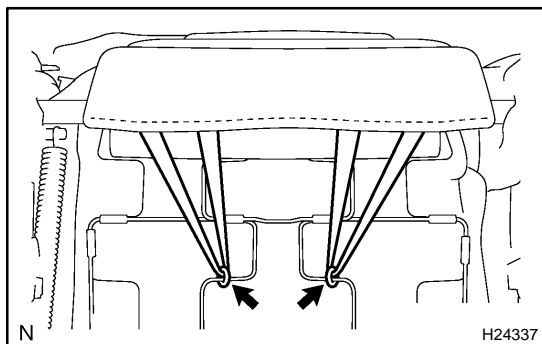
Tape the screwdriver tip before use.

6. REMOVE FRONT SEAT INNER BELT

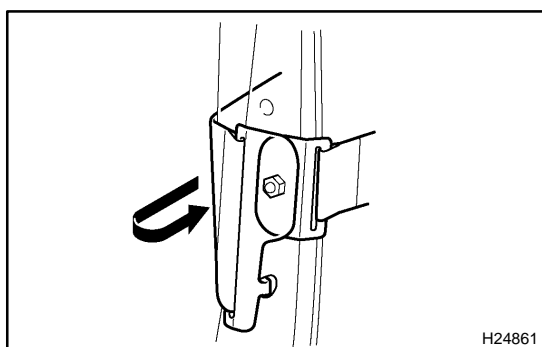
- (a) Disconnect the wire harness clamps and connectors.
- (b) Remove the nut and front seat inner belt.

**7. REMOVE ARMREST ASSEMBLY**

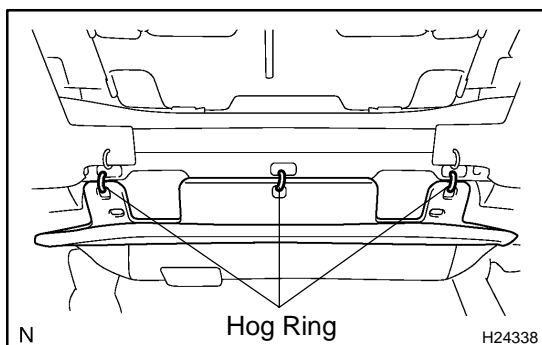
- (a) Using a screwdriver, remove the armrest cap.
- (b) Remove the bolt, armrest spacer, armrest lock plate and armrest assembly.
- (c) Remove the spacer from the armrest assembly.

**8. REMOVE SEATBACK COVER AND PAD**

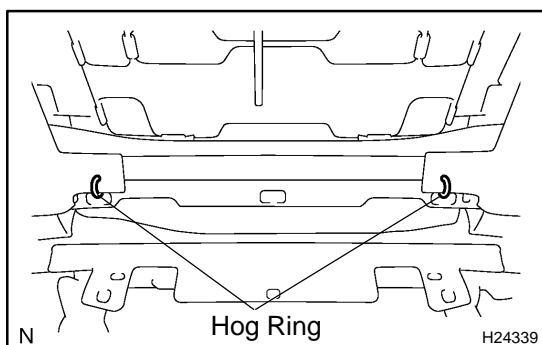
- (a) Remove the hog rings from the seat frame assembly.
- (b) Open the fastener.



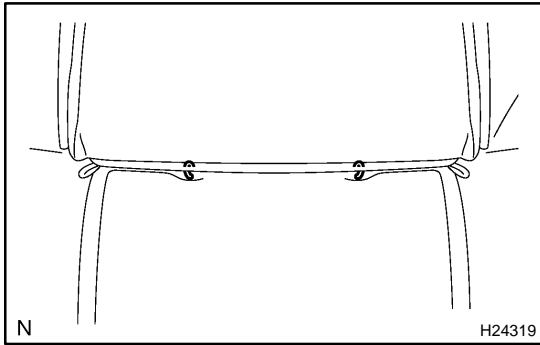
- (c) w/ Side airbag:
Remove the nut and disconnect the seatback cover bracket from the seat frame assembly.



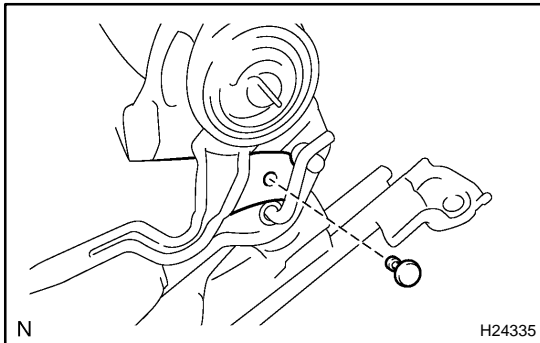
- (d) Remove the hog rings shown in the illustration from the seat frame assembly.



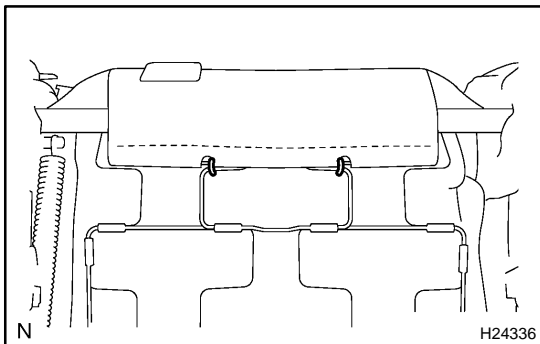
- (e) Remove the hog rings shown in the illustration from the seat frame assembly.
- (f) Remove the seatback cover and pad from the seat frame assembly.

**9. REMOVE SEATBACK COVER**

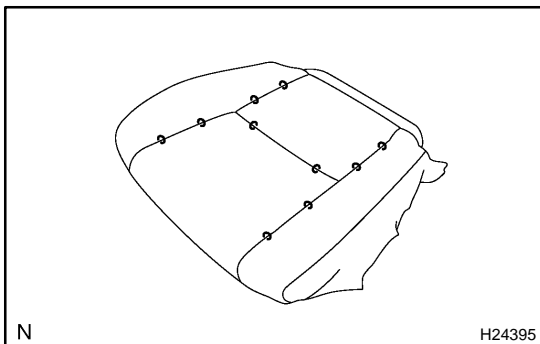
- (a) Turn up the seatback cover and remove the hog rings.
- (b) Remove the 2 headrest supports.
- (c) Remove the seatback cover from the seatback pad.

**10. REMOVE SEAT CUSHION COVER AND PAD**

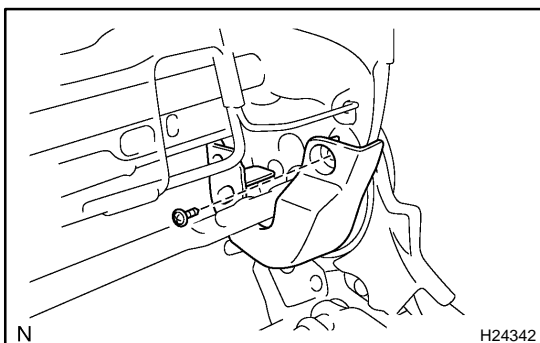
- (a) Remove the clip.
- (b) Perform the same procedure on the other side.



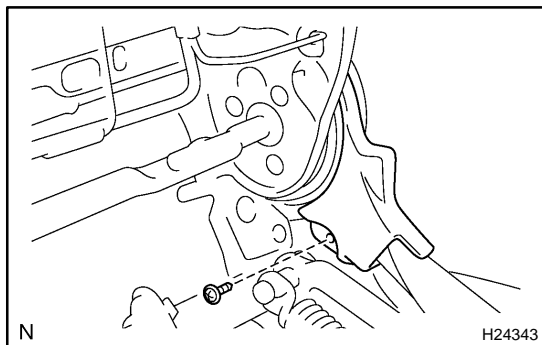
- (c) Remove the hog rings from the seat cushion cover.
- (d) Unlatch the seat cushion cover hooks, then remove the seat cushion cover with seat cushion pad.

**11. REMOVE SEAT CUSHION COVER**

Remove the hog rings and seat cushion cover from the seat cushion pad.

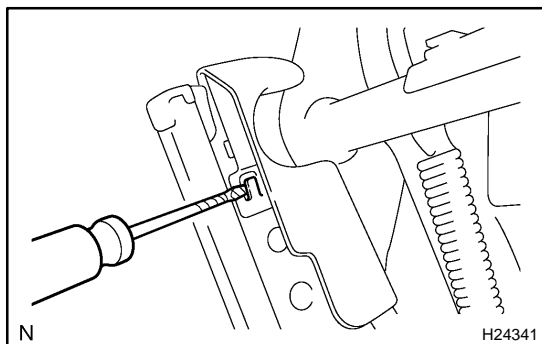
**12. REMOVE RH AND LH UPPER RECLINING ADJUSTER INSIDE COVERS**

- (a) Remove the screw and LH upper reclining adjuster inside cover.
- (b) Perform the same procedure on the other side.



13. REMOVE RH AND LH LOWER RECLINING ADJUSTER INSIDE COVERS

- (a) Remove the screw and LH lower reclining adjuster inside cover.
- (b) Perform the same procedure on the other side.



14. REMOVE RH AND LH SEAT CUSHION LOWER SHIELDS

- (a) Using a screwdriver, disengage the claw and remove the LH seat cushion lower shield.

HINT:

Tape the screwdriver tip before use.

- (b) Perform the same procedure on the other side.

**15. Driver's seat:
REMOVE SEAT POSITION SENSOR
(See page [RS-1 18](#))**

REASSEMBLY

CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

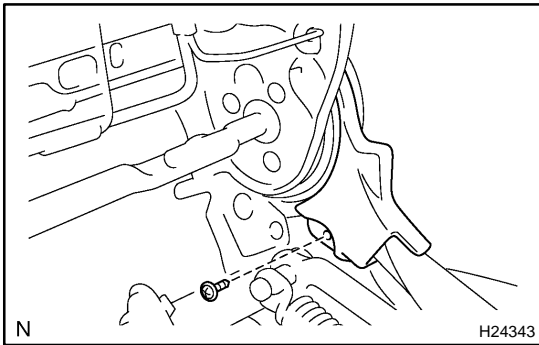
HINT:

- ◆ The procedures listed below are for the LH side.
- ◆ A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. Driver's seat:

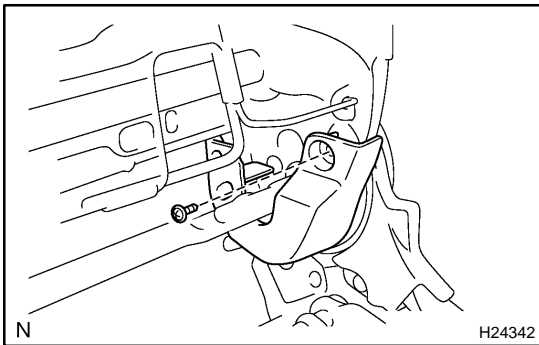
**INSTALL SEAT POSITION SENSOR
(SEE PAGE [RS-122](#))**

2. INSTALL RH AND LH SEAT CUSHION LOWER SHIELDS



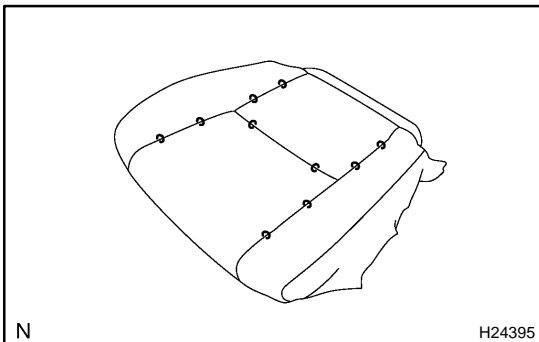
3. INSTALL RH AND LH LOWER RECLINING ADJUSTER INSIDE COVERS

- (a) Install the LH lower reclining adjuster inside cover with the screw.
- (b) Perform the same procedure on the other side.



4. INSTALL RH AND LH UPPER RECLINING ADJUSTER INSIDE COVERS

- (a) Install the LH upper reclining adjuster inside cover with the screw.
- (b) Perform the same procedure on the other side.



5. INSTALL SEAT CUSHION COVER

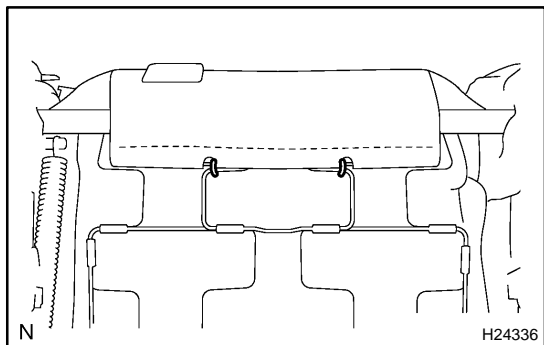
Install the seat cushion cover to the seat cushion pad with the hog rings.

HINT:

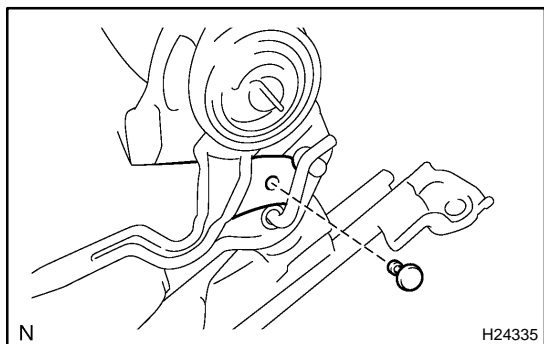
When installing the hog rings, take as much care as possible to prevent wrinkles.

6. INSTALL SEAT CUSHION COVER AND PAD

- (a) Install the seat cushion cover with seat cushion pad, and latch the seat cushion cover hooks.



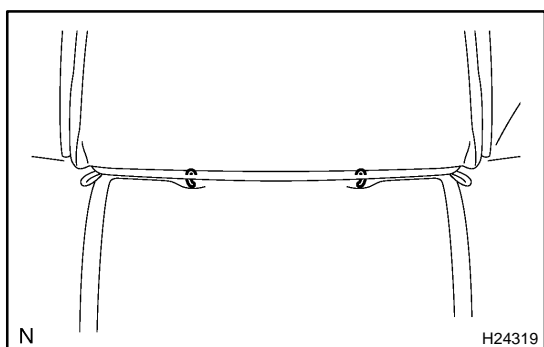
- (b) Install the hog rings to the seat cushion cover.



- (c) Install the clip.
- (d) Perform the same procedure on the other side.

7. INSTALL SEATBACK COVER

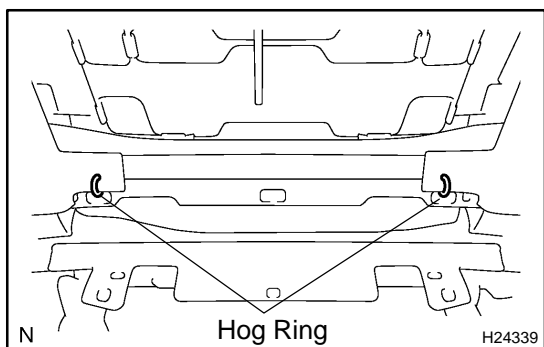
- (a) Install the seatback cover to the seatback pad.
- (b) Install the 2 headrest supports.



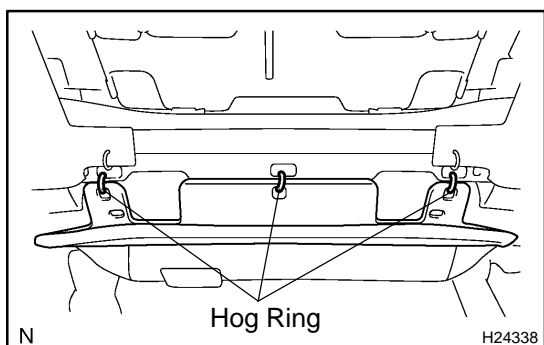
- (c) Turn up the seatback cover and install the hog rings.

8. INSTALL SEATBACK COVER AND PAD

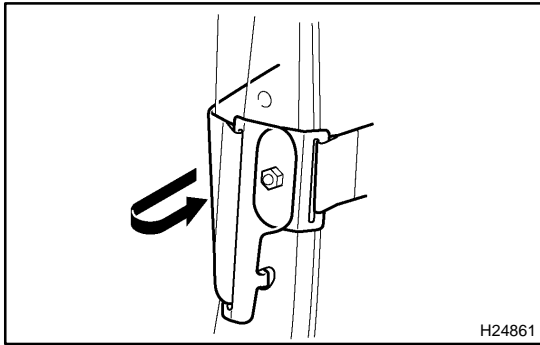
- (a) Install the seatback cover and pad to the seat frame assembly.



- (b) Install the hog rings to the seat frame assembly.



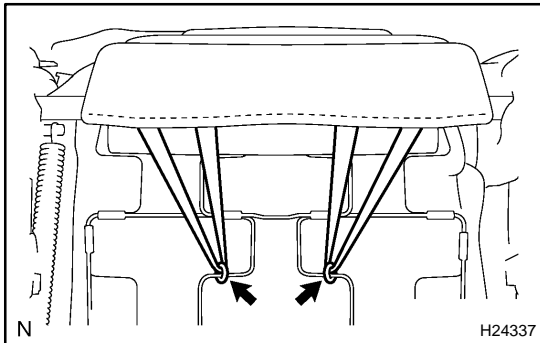
- (c) Install the hog rings to the seat frame assembly.



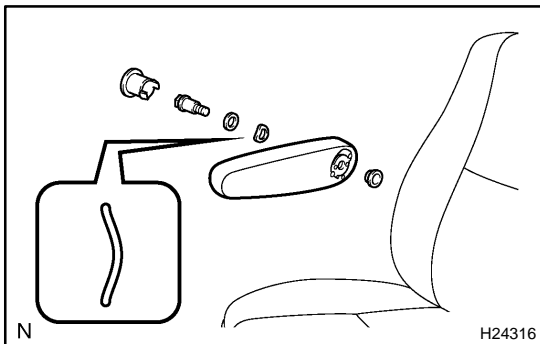
- (d) w/ Side airbag:
Connect the seatback cover bracket to the seat frame assembly with the nut.

Torque: 5.5 N·m (56 kgf-cm, 49 in.-lbf)

- (e) Close the fastener.



- (f) Install the hog rings to the seat frame assembly.



9. INSTALL ARMREST ASSEMBLY

- (a) Install the spacer to the armrest assembly.
(b) Install the armrest assembly, armrest lock plate and armrest spacer with the bolt.

Torque: 37 N·m (380 kgf-cm, 27 ft-lbf)

HINT:

Install the armrest lock plate as shown in the illustration.

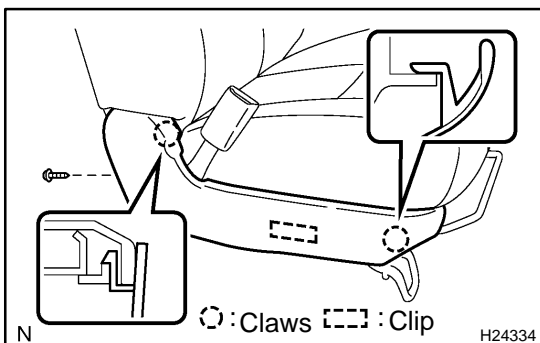
- (c) Install the armrest cap.

10. INSTALL FRONT SEAT INNER BELT.

- (a) Install the front seat inner belt with the nut.

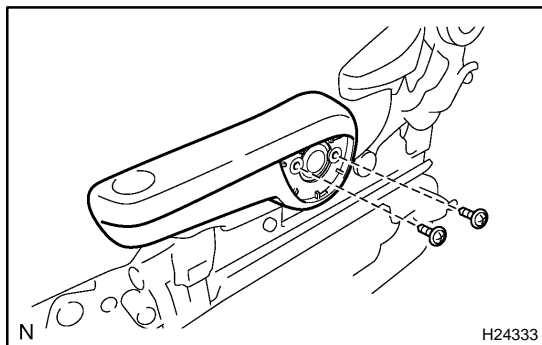
Torque: 42 N·m (430 kgf-cm, 32 ft-lbf)

- (b) Connect the connectors and wire harness clamps.

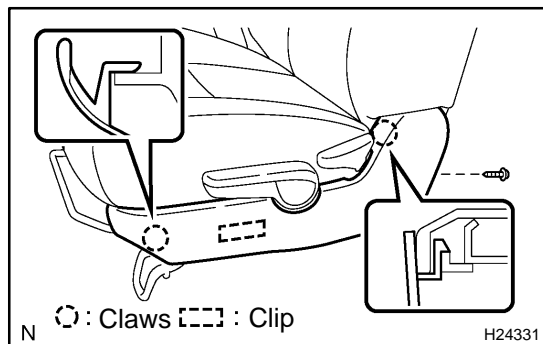


11. INSTALL SEAT CUSHION INNER SHIELD

Install the seat cushion inner shield with the screw.

**12. INSTALL VERTICAL ADJUSTER HANDLE**

- (a) Install the vertical adjuster handle with the 2 screws.
- (b) Install the vertical adjuster handle cap.

13. INSTALL RECLINING ADJUSTER RELEASE HANDLE**14. INSTALL SEAT CUSHION OUTER SHIELD**

Install the seat cushion outer shield with the screw.

15. INSTALL HEADREST

INSTALLATION

HINT:

The procedures listed below are for the LH side.

1. INSTALL FRONT SEAT

- (a) Mount the front seat to the vehicle.

NOTICE:

Be careful not to damage the vehicle body.

- (b) w/ Side airbag:
Connect the airbag connector.
- (c) Connect the connectors.
- (d) Slide the front seat to the rearmost position.
- (e) Tighten the bolts on the front side temporarily, starting from the bolt on the inner side.
- (f) Tighten them completely.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

- (g) Slide the front seat to the foremost position.
- (h) Tighten the bolts on the rear side temporarily, starting from the bolt on the inner side.
- (i) Tighten them completely.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

2. INSTALL SEAT TRACK COVERS

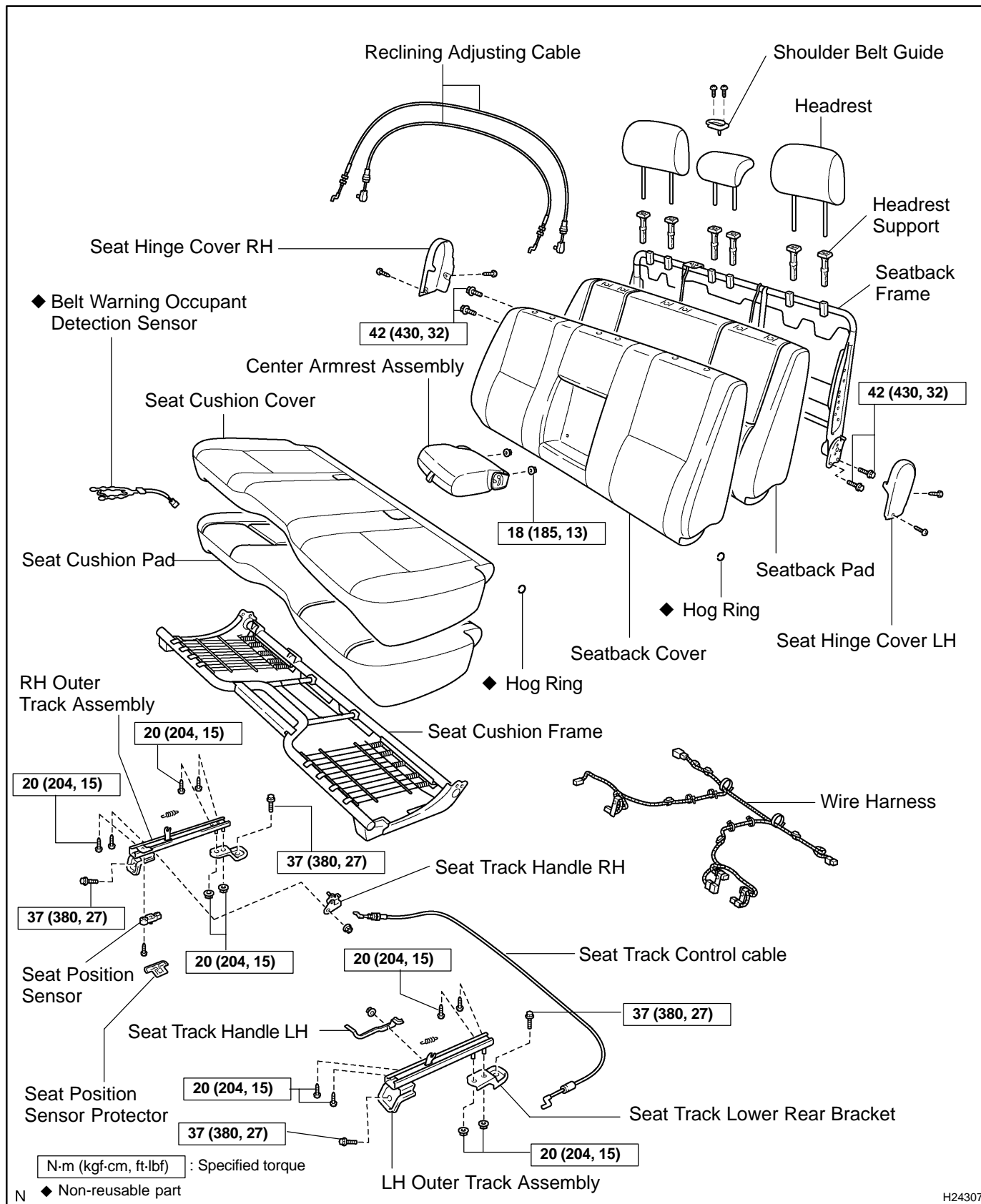
3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

4. Passenger's seat:

PERFORM PASSENGER OCCUPANT CLASSIFICATION SYSTEM ZERO POINT CALIBRATION
(See page [DI-1849](#))

FRONT SEAT (Bench Type) COMPONENTS

BO0JS-08



H24307

REMOVAL

1. REMOVE FRONT SEAT

- (a) Remove the 4 bolts.
- (b) Disconnect the connectors.
- (c) Remove the front seat.

NOTICE:

Be careful not to damage the vehicle body.

DISASSEMBLY**CAUTION:**

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

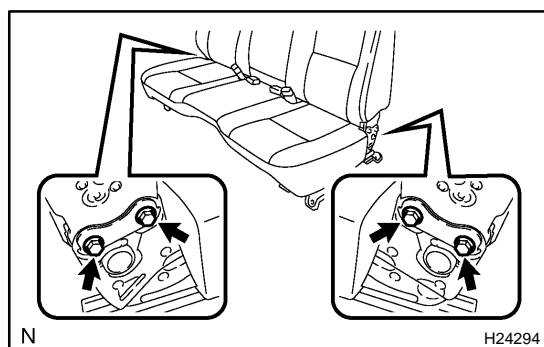
Tape the screwdriver tip before using it to remove the parts.

1. REMOVE HEADRESTS**2. REMOVE SEAT HINGE COVER LH**

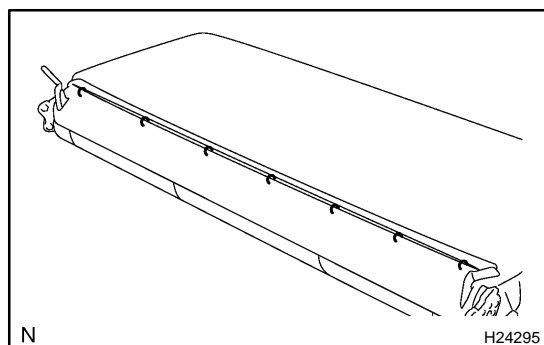
Remove the 2 screws and seat hinge cover LH.

3. REMOVE SEAT HINGE COVER RH

Remove the 2 screws and seat hinge cover RH.

**4. REMOVE SEATBACK ASSEMBLY**

Remove the 4 bolts and seatback assembly.

**5. REMOVE CENTER ARMREST ASSEMBLY**

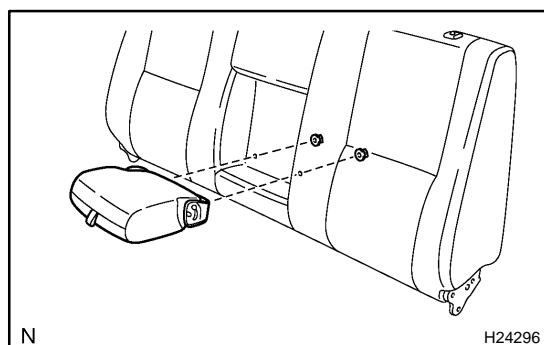
(a) Remove the hog rings and turn the seatback cover over.

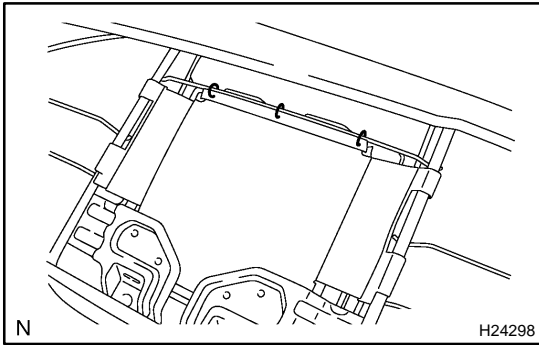
(b) Remove the 2 nuts and center armrest assembly from the seatback frame.

6. REMOVE SEATBACK FRAME

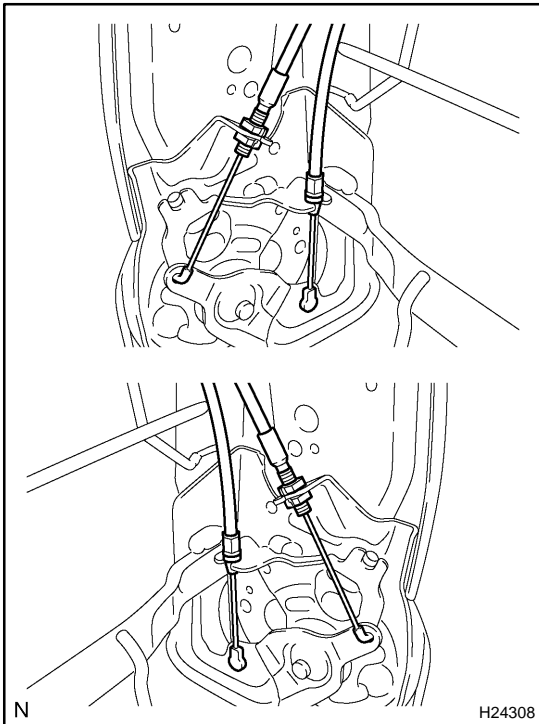
(a) Remove the 6 headrest supports from the seatback assembly.

(b) Remove the 2 screws and shoulder belt guide.





- (c) Remove the hog rings from the seatback frame.
- (d) Remove the seatback frame from the seatback pad and cover.

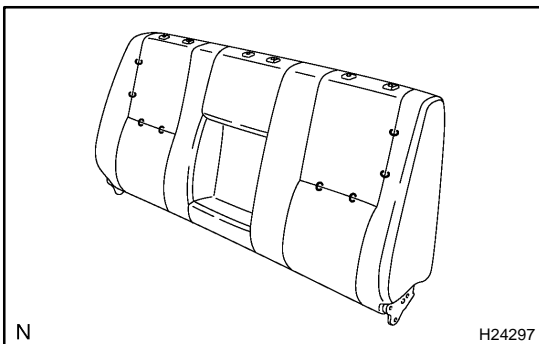


- (e) Disconnect the clamp.
- (f) Loosen the adjusting nuts.

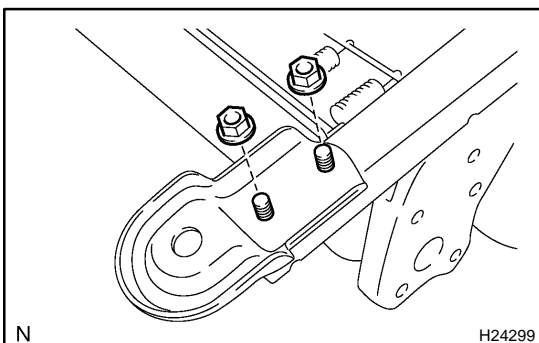
HINT:

When loosening the nuts, hold one and loosen the other.

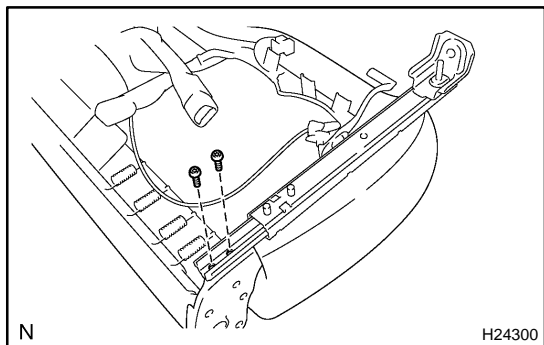
- (g) Perform the same procedure on the other side.
- (h) Remove the reclining adjusting cables.

**7. REMOVE SEATBACK COVER**

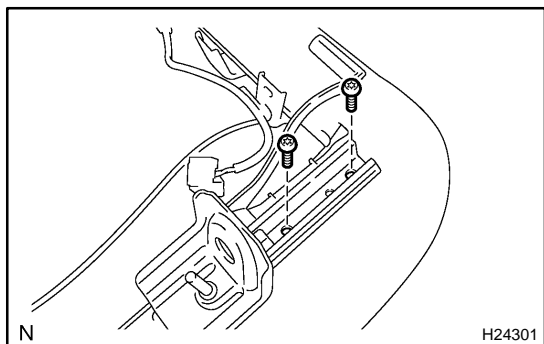
Remove the hog rings and seatback cover.

**8. REMOVE SEAT POSITION SENSOR
(See page RS-1 18)****9. REMOVE 2 SEAT TRACK LOWER REAR BRACKETS**

- (a) Remove the 2 nuts and seat track lower rear bracket.
- (b) Perform the same procedure on the other side.

**10. REMOVE LH OUTER TRACK ASSEMBLY**

- (a) Slide the LH outer track assembly until the torx® screws on the rear side can be seen.
- (b) Using a torx® socket wrench, remove the 2 torx® screws from the LH outer track assembly rear side.

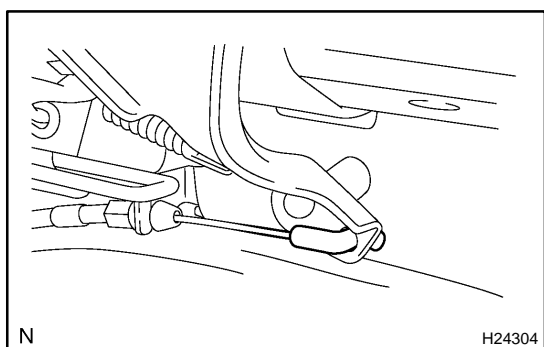


- (c) Slide the LH outer track assembly until the torx® screws on the front side can be seen.
- (d) Using a torx® socket wrench, remove the 2 torx® screws from the LH outer track assembly front side, and remove the LH outer track assembly.

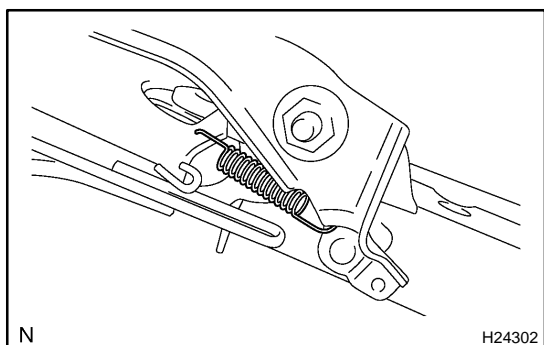
11. REMOVE RH OUTER TRACK ASSEMBLY

HINT:

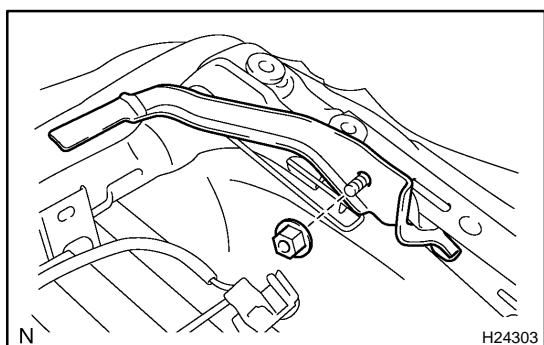
Perform the same procedure on the other side.

**12. REMOVE SEAT TRACK HANDLE LH**

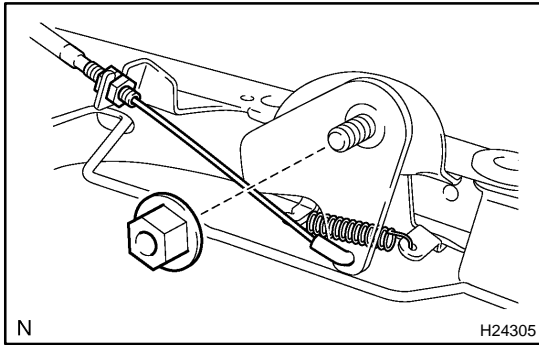
- (a) Disconnect the seat track control cable.



- (b) Remove the spring.



- (c) Remove the nut and seat track handle LH.

**13. REMOVE SEAT TRACK HANDLE RH**

(a) Loosen the adjusting nuts.

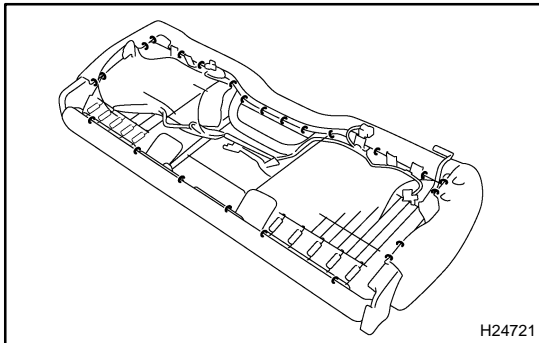
HINT:

When loosening the nuts, hold one and loosen the other.

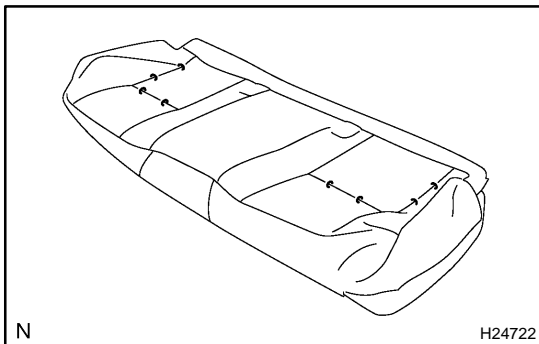
(b) Disconnect the seat track control cable.

(c) Remove the spring.

(d) Remove the nut and seat track handle RH.

**14. REMOVE SEAT CUSHION FRAME**

Remove the hog rings and seat cushion frame from the seat cushion pad and cover.

**15. REMOVE SEAT CUSHION COVER**

Remove the hog rings and seat cushion cover from the seat cushion pad.

16. REMOVE BELT WARNING OCCUPANT DETECTION SENSOR

Detach the belt warning occupant detection sensor from the seat cushion pad.

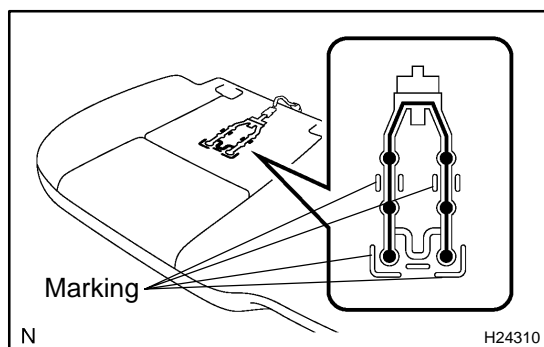
REASSEMBLY

CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

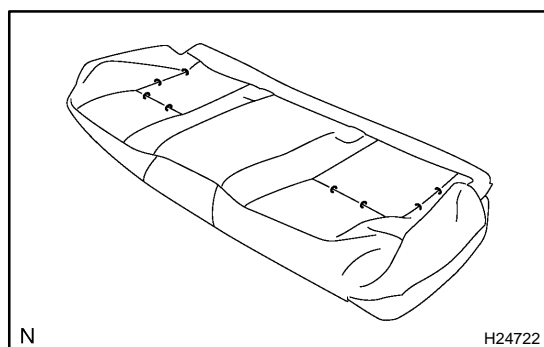
HINT:

A bolt without a torque specification is shown in the standard bolt chart (See page [SS-2](#)).



1. INSTALL BELT WARNING OCCUPANT DETECTION SENSOR

Peel the coated paper off the back of the new sensor. Attach the sensor along with the marking on the pad surface as shown in the illustration.

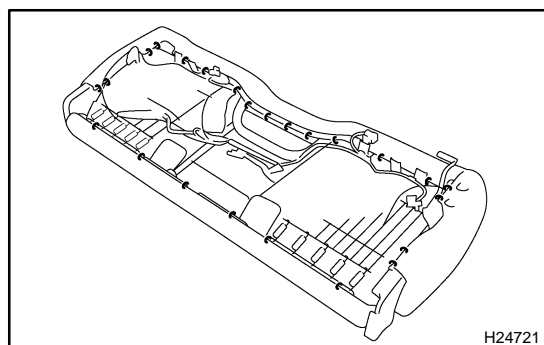


2. INSTALL SEAT CUSHION COVER

Install the seat cushion cover with the hog rings.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.

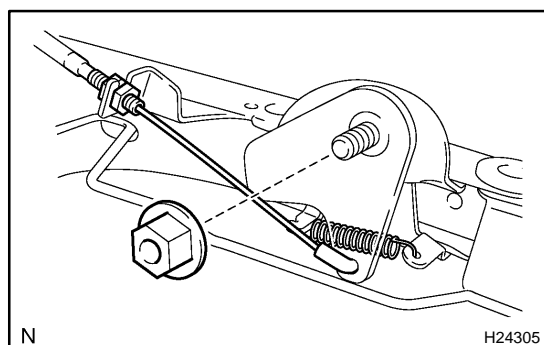


3. INSTALL SEAT CUSHION FRAME

Install the seat cushion frame to the seat cushion pad and cover with the hog rings.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.

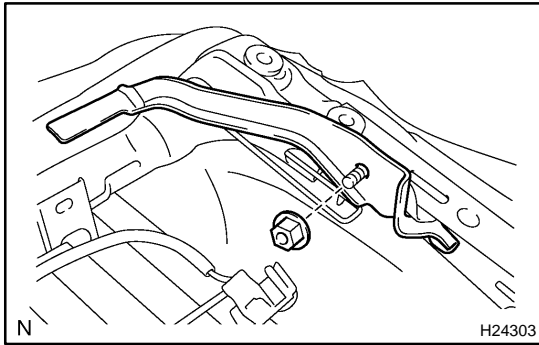


4. INSTALL SEAT TRACK HANDLE RH

- (a) Install the seat track handle RH with the nut.
- (b) Install the spring.
- (c) Connect the seat track control cable.
- (d) Tighten the adjusting nuts.

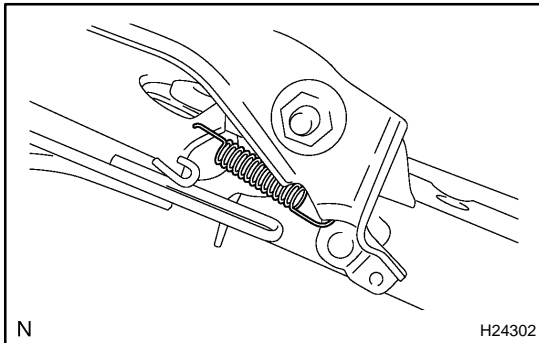
HINT:

When tightening the nuts, hold one and tighten the other.

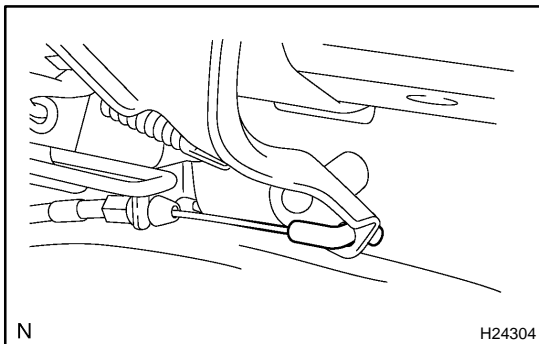


5. INSTALL SEAT TRACK HANDLE LH

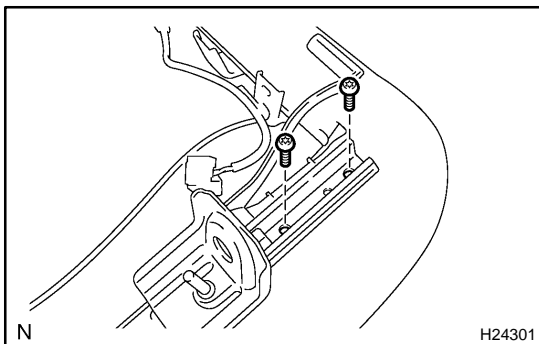
- (a) Install the seat track handle LH with the nut.



- (b) Install the spring.



- (c) Connect the seat track control cable.

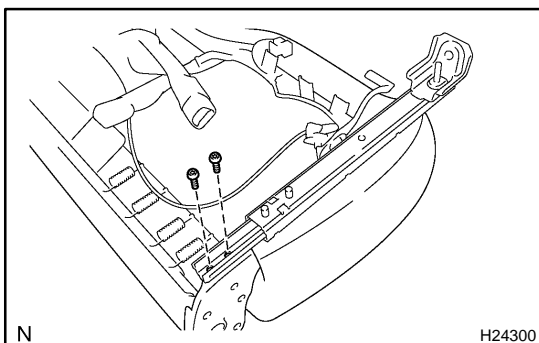


6. INSTALL LH OUTER TRACK ASSEMBLY

- (a) Slide the LH outer track assembly until the torx® screws on the front side can be seen.

- (b) Using a torx® socket wrench, install the 2 torx® screws to the LH outer track assembly front side.

Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)



- (c) Slide the LH outer track assembly until the torx® screws on the rear side can be seen.

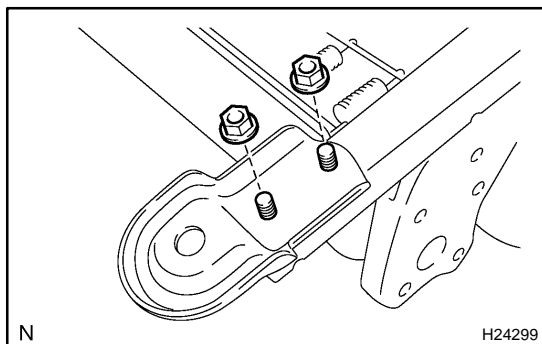
- (d) Using a torx® socket wrench, install the 2 torx® screws to the LH outer track assembly rear side.

Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)

7. INSTALL RH OUTER TRACK ASSEMBLY

HINT:

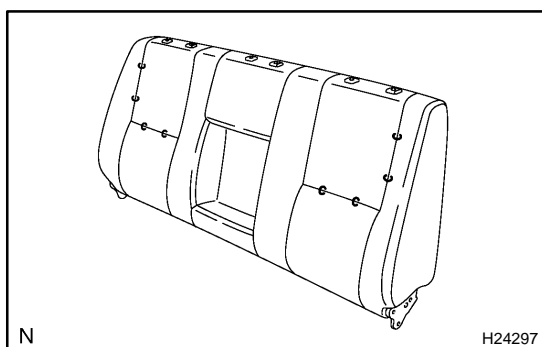
Perform the same procedure on the other side.

**8. INSTALL 2 SEAT TRACK LOWER REAR BRACKETS**

(a) Install the seat track lower rear bracket with the 2 nuts.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

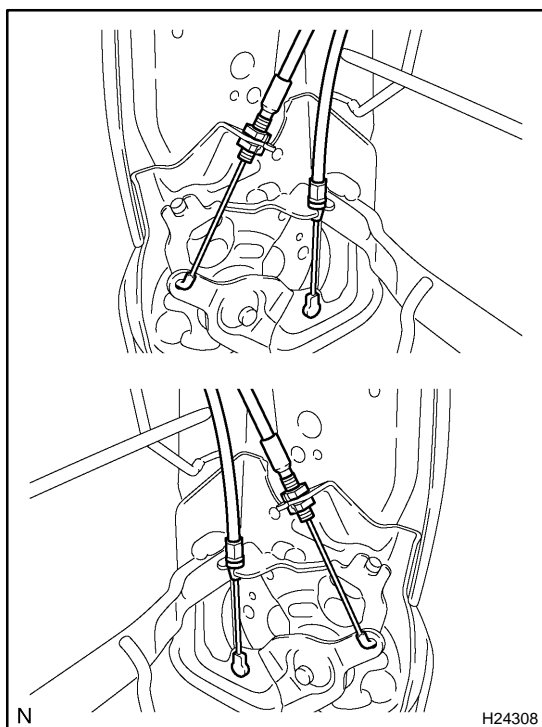
(b) Perform the same procedure on the other side.

9. INSTALL SEAT POSITION SENSOR(See page [RS-122](#))**10. INSTALL SEATBACK COVER**

Install the seatback cover with the hog rings.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.

**11. INSTALL SEATBACK FRAME**

(a) Temporarily install the reclining adjusting cables.

(b) Tighten the adjusting nuts.

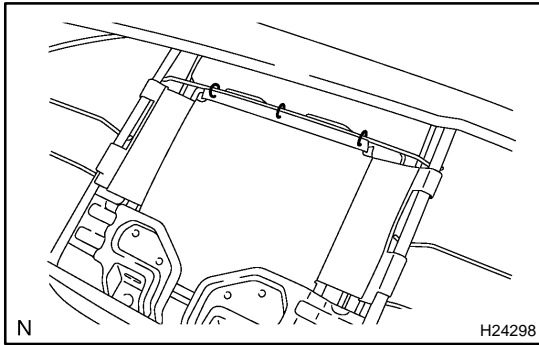
HINT:

When tightening the nuts, hold one and tighten the other.

(c) Perform the same procedure on the other side.

(d) Connect the clamp.

(e) Install the seatback frame to the seatback pad and cover.



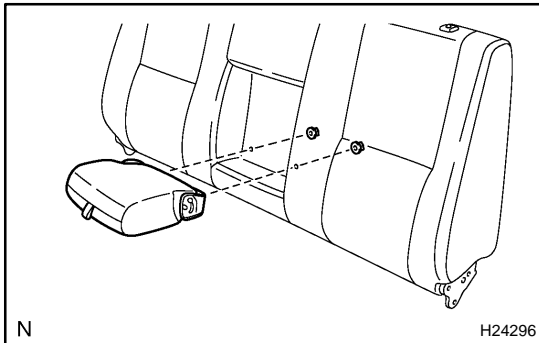
(f) Install the hog rings to the seatback frame.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.

(g) Install the shoulder belt guide with the 2 screws.

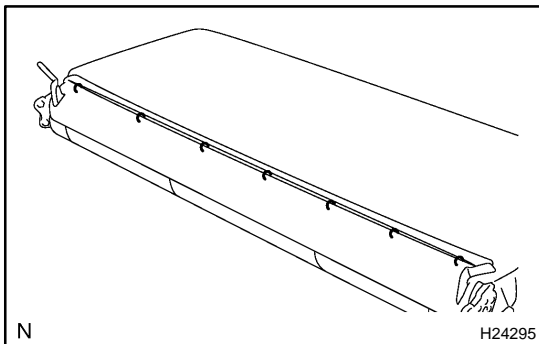
(h) Install the 6 headrest supports to the seatback assembly.



12. INSTALL CENTER ARMREST ASSEMBLY

(a) Install the center armrest assembly to the seatback frame with the 2 nuts.

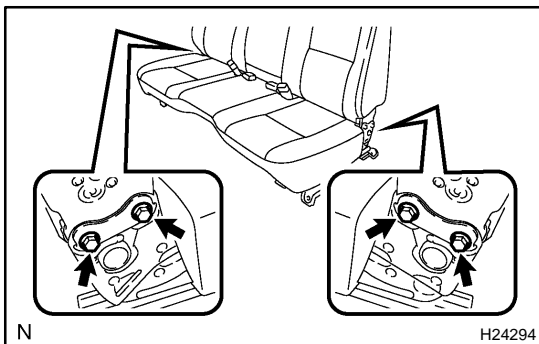
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



(b) Install the hog rings to the seatback cover.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.



13. INSTALL SEATBACK ASSEMBLY

Install the seatback assembly with the 4 bolts.

Torque: 42 N·m (430 kgf-cm, 32 ft-lbf)

14. INSTALL SEAT HINGE COVER LH

Install the seat hinge cover LH with the 2 screws.

15. INSTALL SEAT HINGE COVER RH

Install the seat hinge cover RH with the 2 screws.

16. INSTALL HEADRESTS

INSTALLATION

1. INSTALL FRONT SEAT

- (a) Mount the front seat to the vehicle.

NOTICE:

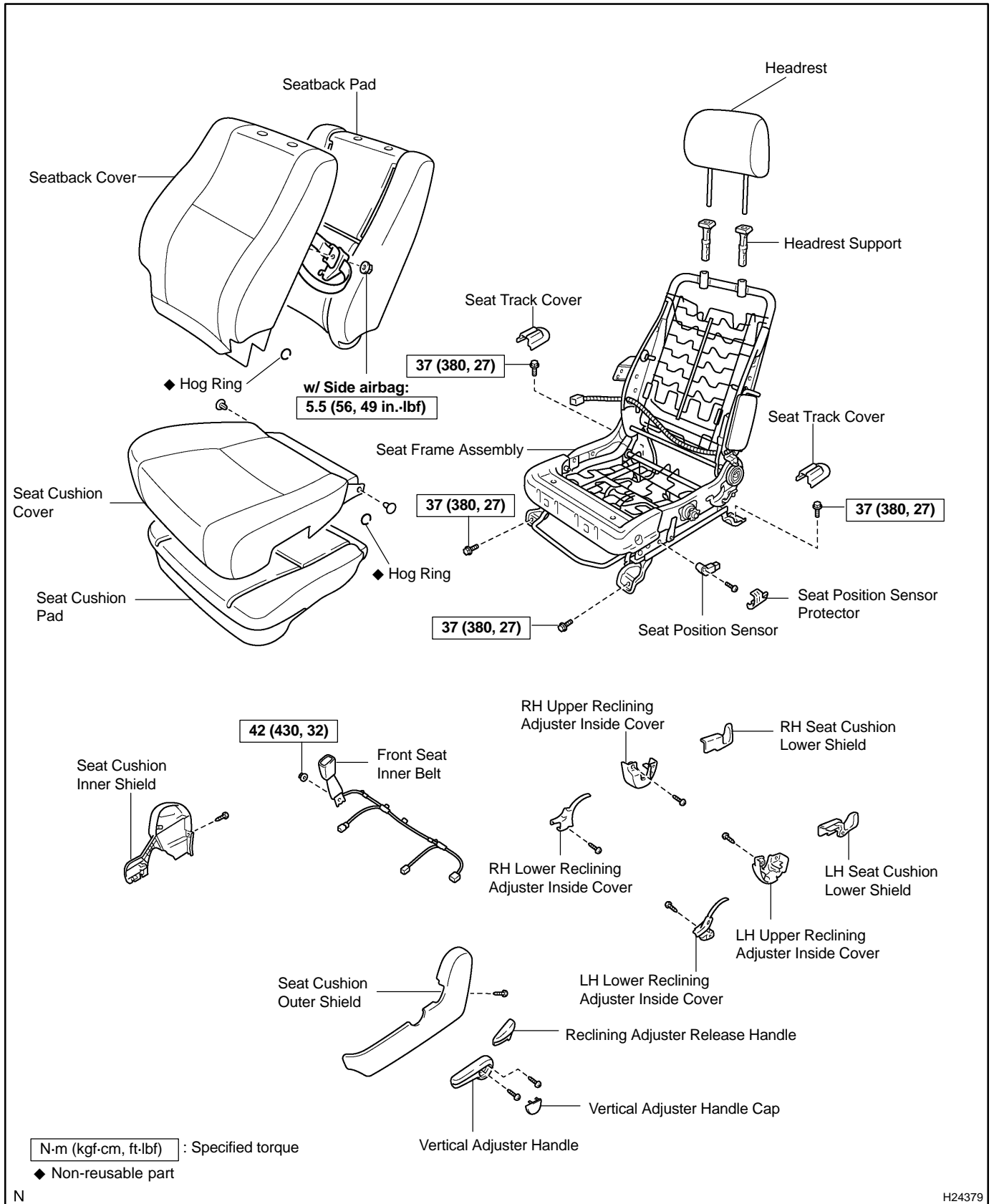
Be careful not to damage the vehicle body.

- (b) Connect the connectors.
- (c) Install the 4 bolts.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

FRONT SEAT (Split Type: Driver's Side) COMPONENTS

BO4SB-04



REMOVAL

CAUTION:

Work must not be started until at least 90 seconds after the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery.

(The SRS is equipped with a back-up power source. If work is started within 90 seconds from disconnecting the negative (-) terminal cable of the battery, the SRS may deploy.)

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

2. REMOVE SEAT TRACK COVERS

Using a screwdriver, remove the seat track covers.

HINT:

Tape the screwdriver tip before use.

3. REMOVE FRONT SEAT

- (a) Remove the 4 bolts.
- (b) Disconnect the connectors.
- (c) w/ Side airbag:
Disconnect the airbag connector.
- (d) Remove the front seat.

NOTICE:

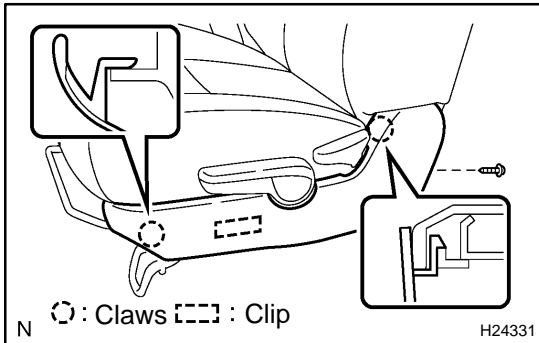
Be careful not to damage the vehicle body.

DISASSEMBLY**CAUTION:**

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

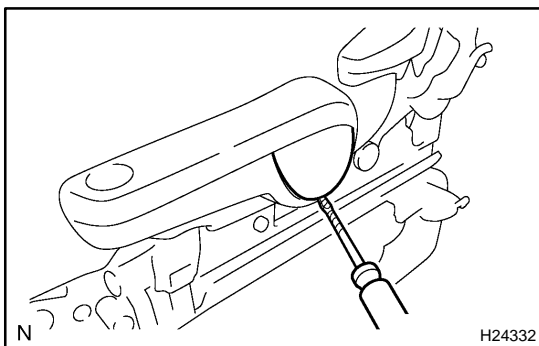
Tape the screwdriver tip before using it to remove the parts.

1. REMOVE HEADREST**2. REMOVE SEAT CUSHION OUTER SHIELD**

- (a) Remove the screw from the seat cushion outer shield.
- (b) Using a screwdriver, remove the seat cushion outer shield.

HINT:

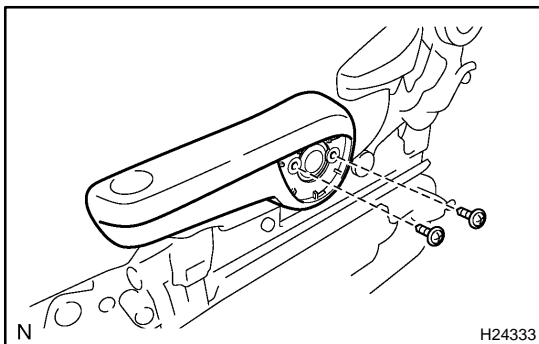
Tape the screwdriver tip before use.

3. REMOVE RECLINING ADJUSTER RELEASE HANDLE**4. REMOVE VERTICAL ADJUSTER HANDLE**

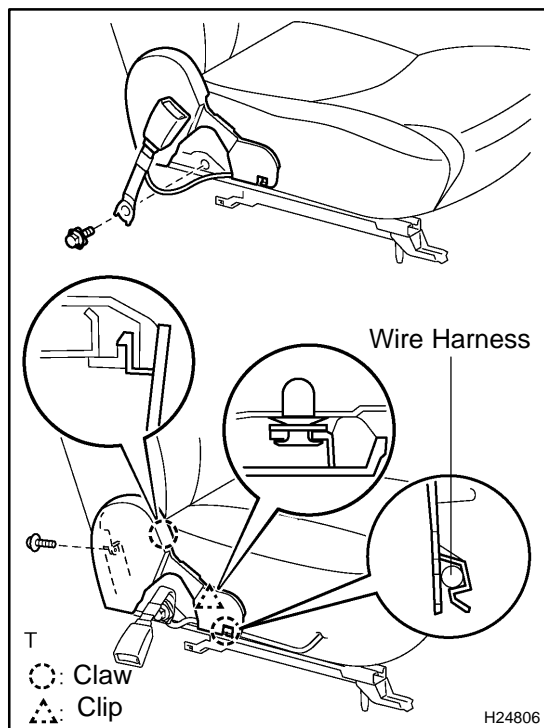
- (a) Using a screwdriver, remove the vertical adjuster handle cap.

HINT:

Tape the screwdriver tip before use.



- (b) Remove the 2 screws and the vertical adjuster handle.

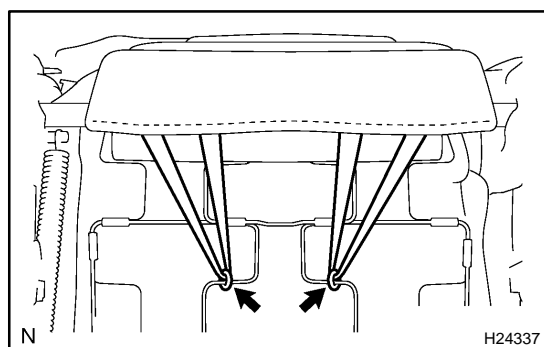
**5. REMOVE SEAT CUSHION INNER SHIELD**

- (a) Remove the bolt and front seat inner belt.
- (b) Remove the screw from the seat cushion inner shield.
- (c) Disconnect the front seat inner belt wire harness clamp from the seat cushion inner shield.
- (d) Using a screwdriver, remove the seat cushion inner shield.

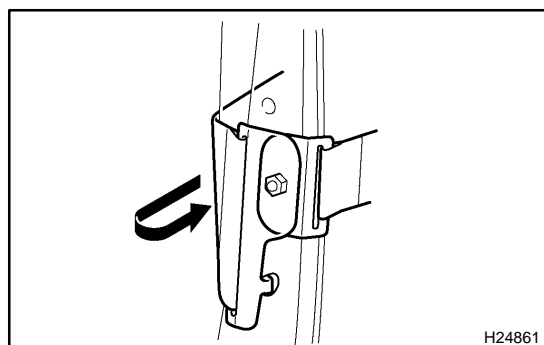
HINT:

Tape the screwdriver tip before use.

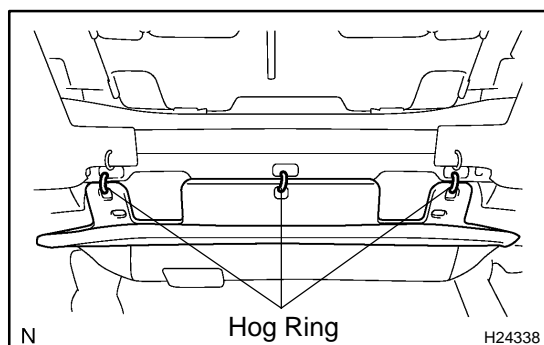
- (e) Disconnect the connectors and clamps, and remove the front seat inner belt.

**6. REMOVE SEATBACK COVER AND PAD**

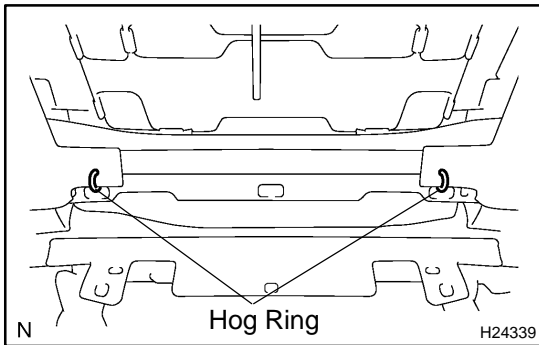
- (a) Remove the hog rings from the seat frame assembly.
- (b) Open the fastener.



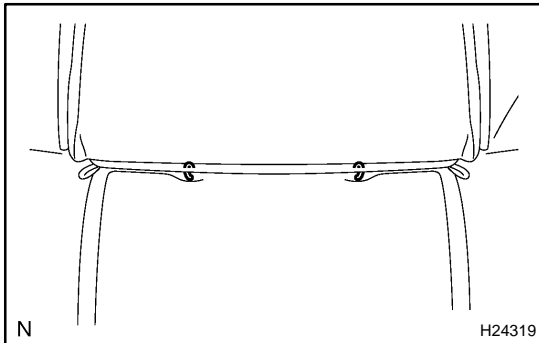
- (c) w/ Side airbag:
Remove the nut and disconnect the seatback cover bracket from the seat frame assembly.



- (d) Remove the hog rings shown in the illustration from the seat frame assembly.

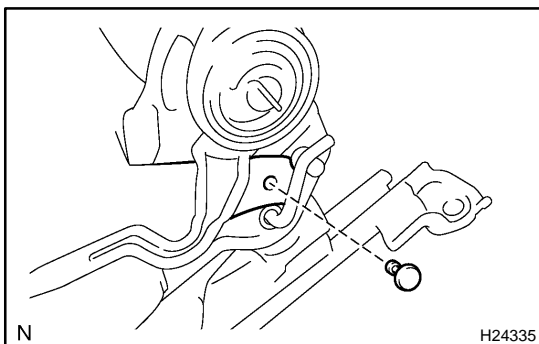


- (e) Remove the hog rings shown in the illustration from the seat frame assembly.
- (f) Remove the seatback cover and pad from the seat frame assembly.



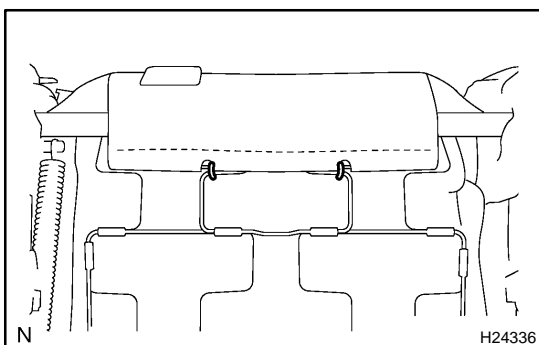
7. REMOVE SEATBACK COVER

- (a) Turn up the seatback cover and remove the hog rings.
- (b) Remove the 2 headrest supports.
- (c) Remove the seatback cover from the seatback pad.

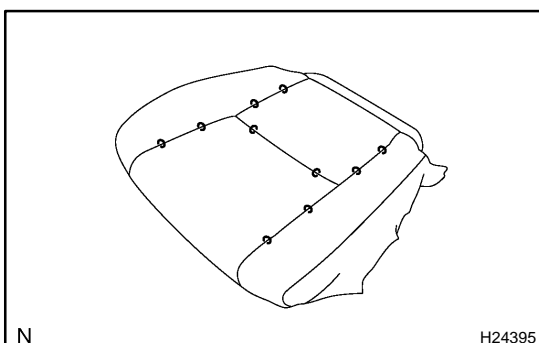


8. REMOVE SEAT CUSHION COVER AND PAD

- (a) Remove the clip.
- (b) Perform the same procedure on the other side.

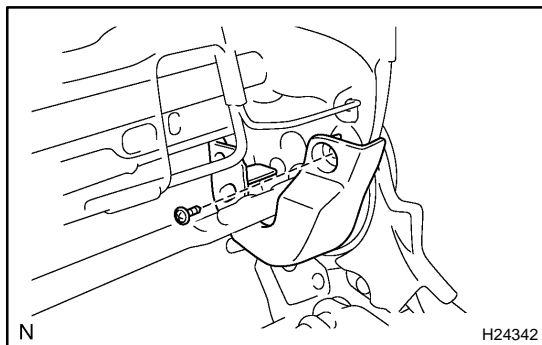


- (c) Remove the hog rings from the seat cushion cover.
- (d) Unlatch the seat cushion cover hooks, then remove the seat cushion cover with seat cushion pad.



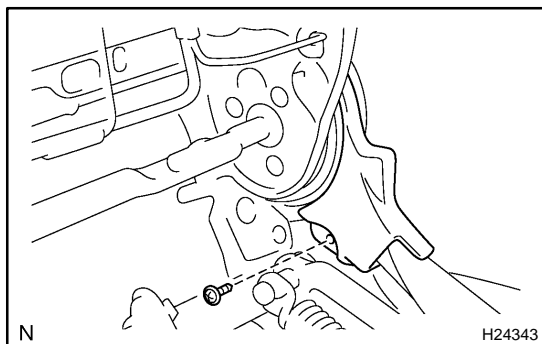
9. REMOVE SEAT CUSHION COVER

Remove the hog rings and seat cushion cover from the seat cushion pad.



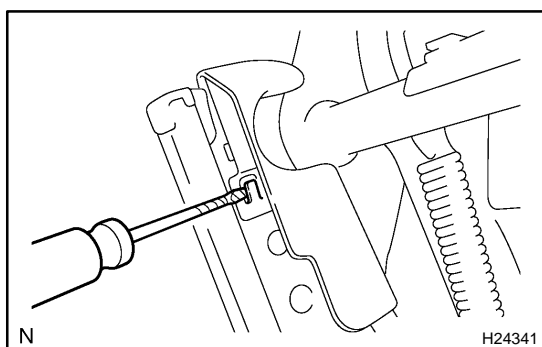
10. REMOVE RH AND LH UPPER RECLINING ADJUSTER INSIDE COVERS

- (a) Remove the screw and LH upper reclining adjuster inside cover.
- (b) Perform the same procedure on the other side.



11. REMOVE RH AND LH LOWER RECLINING ADJUSTER INSIDE COVERS

- (a) Remove the screw and LH lower reclining adjuster inside cover.
- (b) Perform the same procedure on the other side.



12. REMOVE RH AND LH SEAT CUSHION LOWER SHIELDS

- (a) Using a screwdriver, disengage the claw and remove the LH seat cushion lower shield.

HINT:

Tape the screwdriver tip before use.

- (b) Perform the same procedure on the other side.

**13. REMOVE SEAT POSITION SENSOR
(See page [RS-1 18](#))**

REASSEMBLY

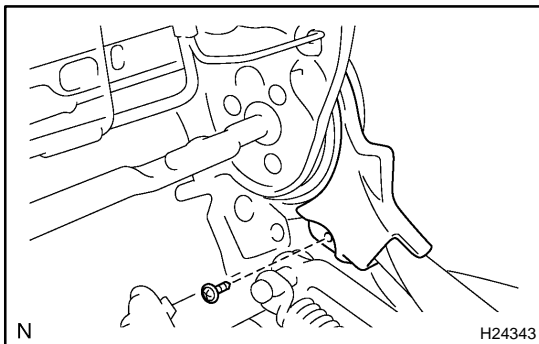
CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

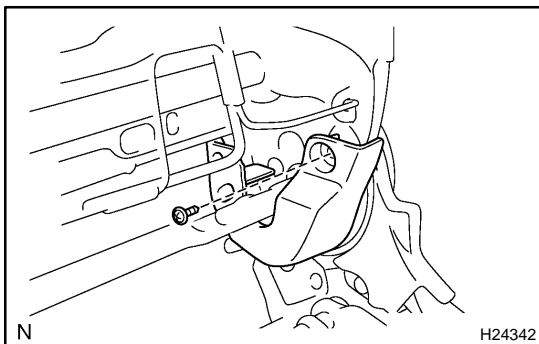
A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. **INSTALL SEAT POSITION SENSOR
(SEE PAGE [RS-122](#))**
2. **INSTALL RH AND LH SEAT CUSHION LOWER SHIELDS**



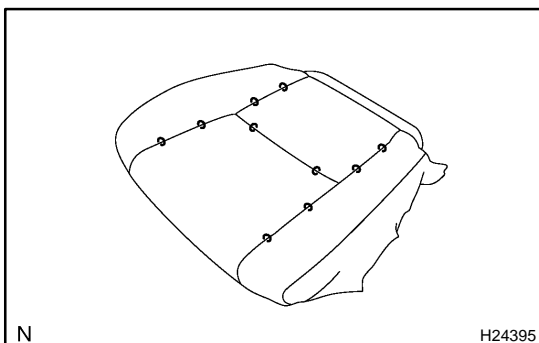
3. **INSTALL RH AND LH LOWER RECLINING ADJUSTER INSIDE COVERS**

- (a) Install the LH lower reclining adjuster inside cover with the screw.
- (b) Perform the same procedure on the other side.



4. **INSTALL RH AND LH UPPER RECLINING ADJUSTER INSIDE COVERS**

- (a) Install the LH upper reclining adjuster inside cover with the screw.
- (b) Perform the same procedure on the other side.



5. **INSTALL SEAT CUSHION COVER**

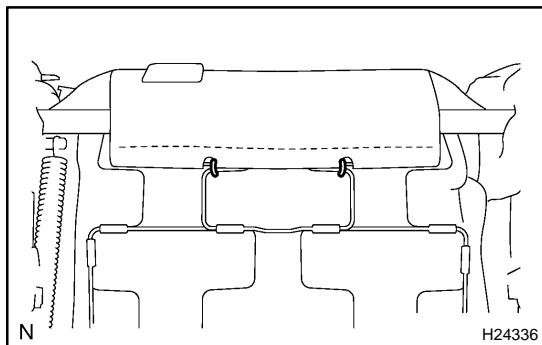
Install the seat cushion cover to the seat cushion pad with the hog rings.

HINT:

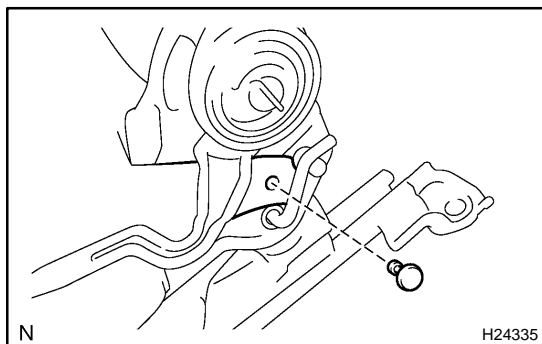
When installing the hog rings, take as much care as possible to prevent wrinkles.

6. **INSTALL SEAT CUSHION COVER AND PAD**

- (a) Install the seat cushion cover with seat cushion pad, and latch the seat cushion cover hooks.



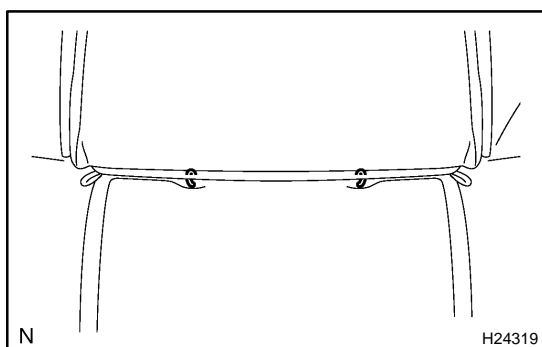
- (b) Install the hog rings to the seat cushion cover.



- (c) Install the clip.
(d) Perform the same procedure on the other side.

7. INSTALL SEATBACK COVER

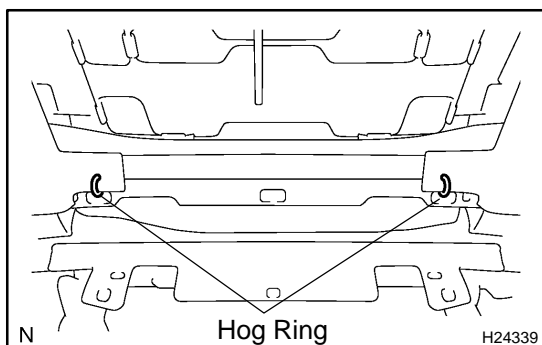
- (a) Install the seatback cover to the seatback pad.
(b) Install the 2 headrest supports.



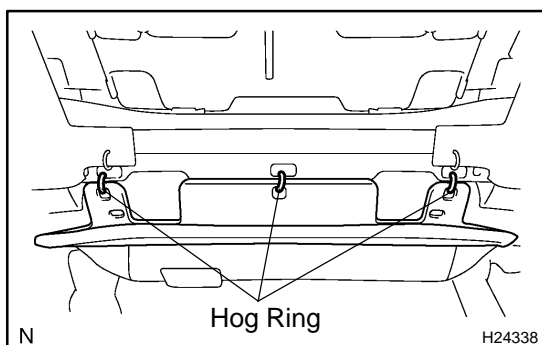
- (c) Turn up the seatback cover and install the hog rings.

8. INSTALL SEATBACK COVER AND PAD

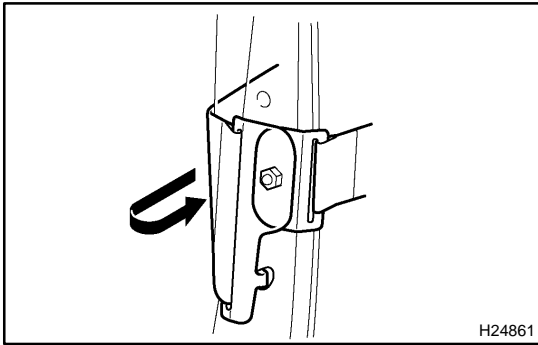
- (a) Install the seatback cover and pad to the seat frame assembly.



- (b) Install the hog rings to the seat frame assembly.



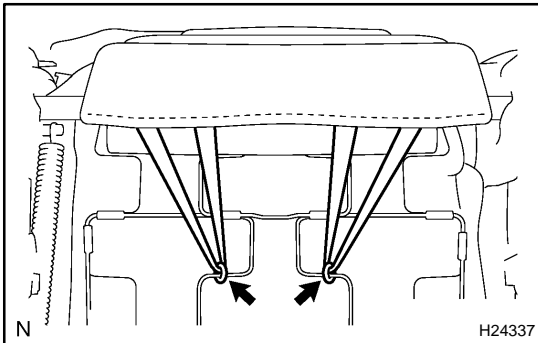
- (c) Install the hog rings to the seat frame assembly.



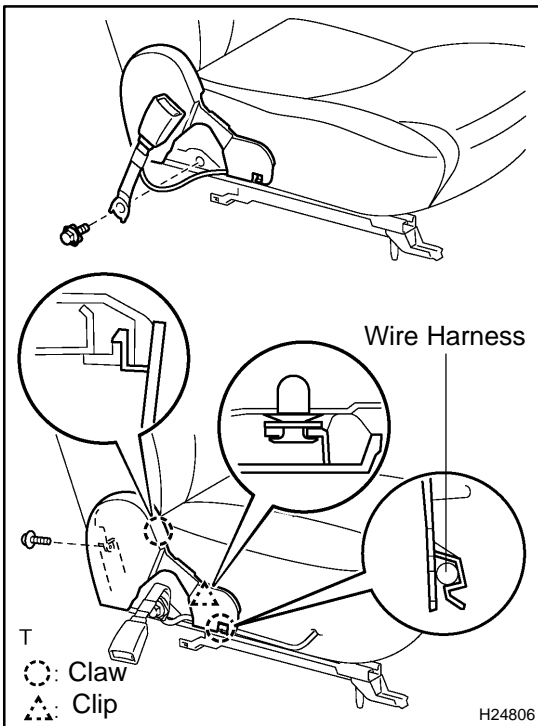
- (d) w/ Side airbag:
Connect the seatback cover bracket to the seat frame assembly with the nut.

Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)

- (e) Close the fastener.



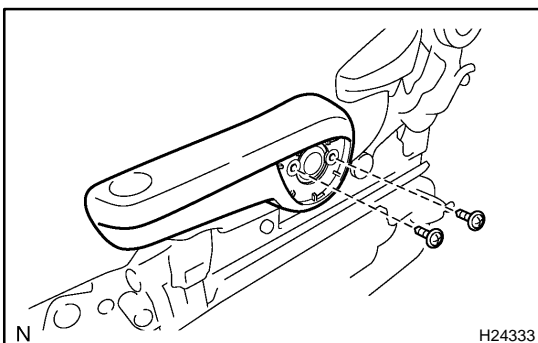
- (f) Install the hog rings to the seat frame assembly.



9. INSTALL SEAT CUSHION INNER SHIELD

- (a) Connect the front seat inner belt connectors and clamps.
(b) Install the seat cushion inner shield.
(c) Connect the front seat inner belt wire harness clamp to the seat cushion inner shield.
(d) Install the screw to the seat cushion inner shield.
(e) Install the front seat inner belt with the bolt.

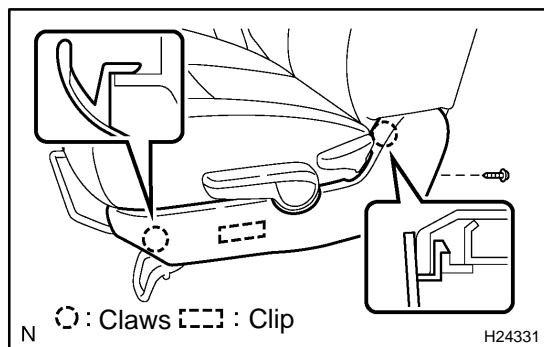
Torque: 42 N·m (430 kgf·cm, 32 ft·lbf)



10. INSTALL VERTICAL ADJUSTER HANDLE

- (a) Install the vertical adjuster handle with the 2 screws.
(b) Install the vertical adjuster handle cap.

11. INSTALL RECLINING ADJUSTER RELEASE HANDLE

**12. INSTALL SEAT CUSHION OUTER SHIELD**

Install the seat cushion outer shield with the screw.

13. INSTALL HEADREST

INSTALLATION

1. INSTALL FRONT SEAT

- (a) Mount the front seat to the vehicle.

NOTICE:

Be careful not to damage the vehicle body.

- (b) w/ Side airbag:
Connect the airbag connector.
- (c) Connect the connectors.
- (d) Slide the front seat to the rearmost position.
- (e) Tighten the bolts on the front side temporarily, starting from the bolt on the inner side.
- (f) Tighten them completely.
- Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)**
- (g) Slide the front seat to the foremost position.
- (h) Tighten the bolts on the rear side temporarily, starting from the bolt on the inner side.
- (i) Tighten them completely.

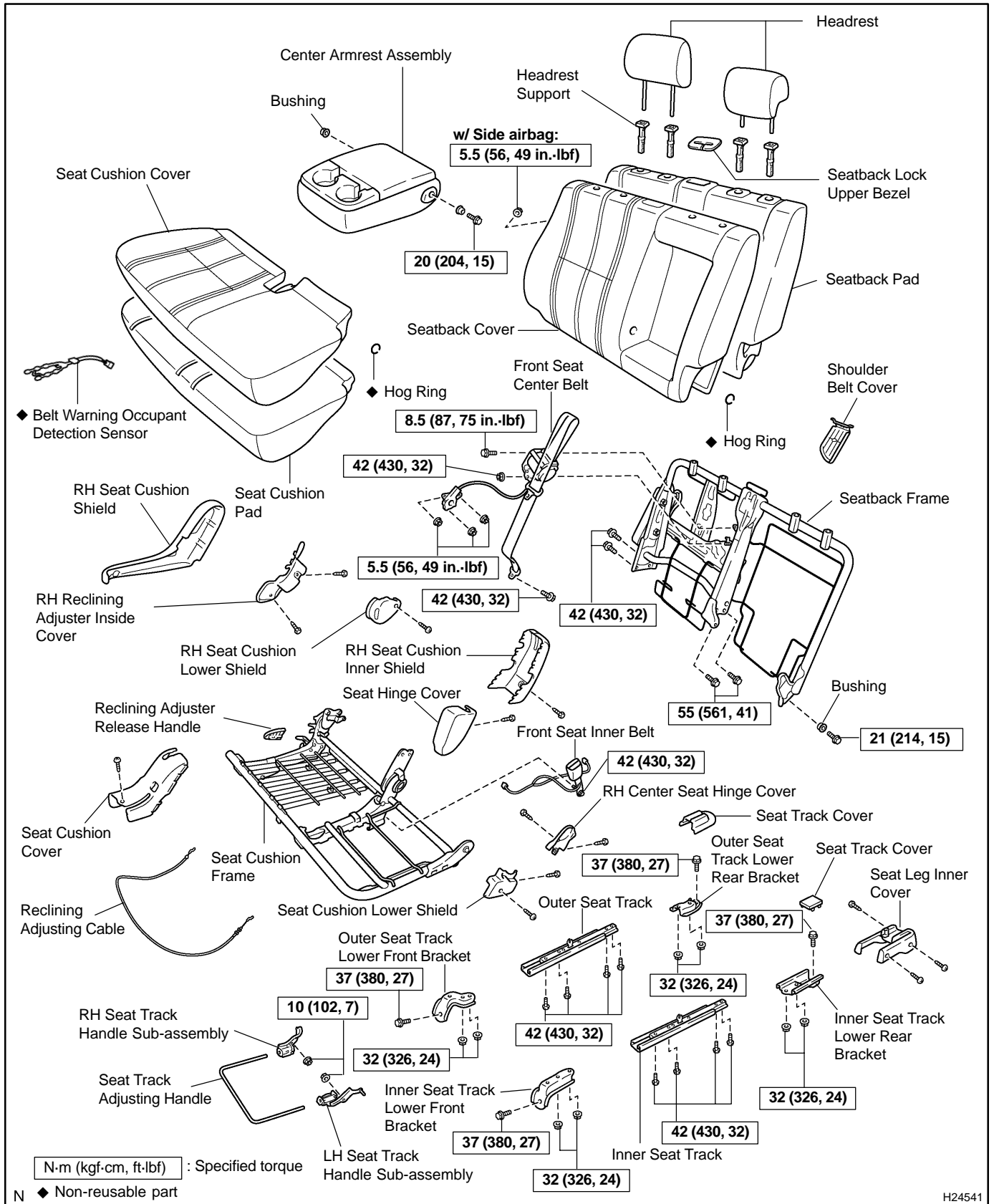
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

2. INSTALL SEAT TRACK COVERS

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

FRONT SEAT (Split Type: Passenger's Side) COMPONENTS

BO4SW-02



H24541

REMOVAL

CAUTION:

Work must not be started until at least 90 seconds after the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery.

(The SRS is equipped with a back-up power source. If work is started within 90 seconds from disconnecting the negative (-) terminal cable of the battery, the SRS may deploy.)

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Wait for 90 seconds after disconnecting the cable to prevent the airbag working.

2. REMOVE SEAT TRACK COVERS

Using a screwdriver, remove the seat track covers.

HINT:

Tape the screwdriver tip before use.

3. REMOVE FRONT SEAT

- (a) Remove the 4 bolts.
- (b) Disconnect the connectors.
- (c) w/ Side airbag:
Disconnect the airbag connector.
- (d) Remove the front seat.

NOTICE:

Be careful not to damage the vehicle body.

DISASSEMBLY**CAUTION:**

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

Tape the screwdriver tip before using it to remove parts.

1. REMOVE SEAT LEG INNER COVER

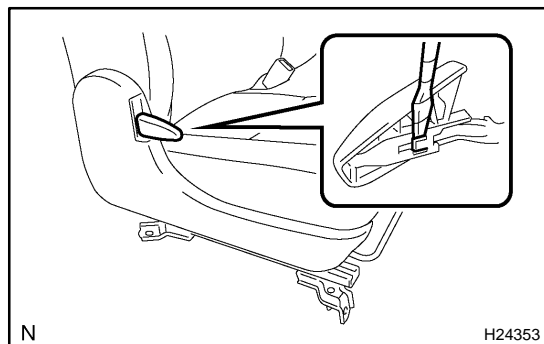
Remove the 3 screws and seat leg inner cover.

2. REMOVE HEADRESTS**3. REMOVE RECLINING ADJUSTER RELEASE HANDLE**

Using a screwdriver, remove the reclining adjuster release handle.

HINT:

Tape the screwdriver tip before use.



N

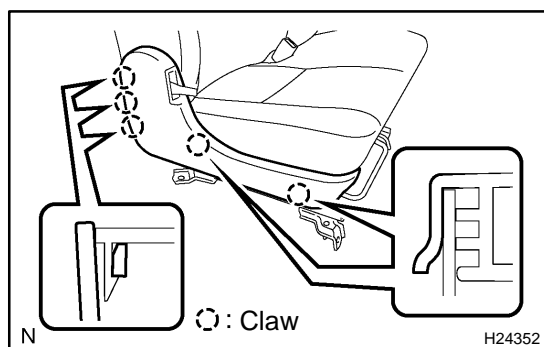
H24353

4. REMOVE RH SEAT CUSHION SHIELD

Disengage the claws and remove the RH seat cushion shield.

5. REMOVE SEAT CUSHION LOWER SHIELD

Remove the 2 screws and seat cushion lower shield.



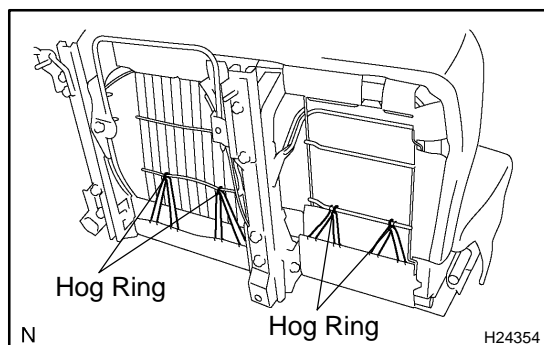
N

○ : Claw

H24352

6. REMOVE SEATBACK ASSEMBLY

(a) Remove the hog rings from the seatback cover belt.



N

Hog Ring

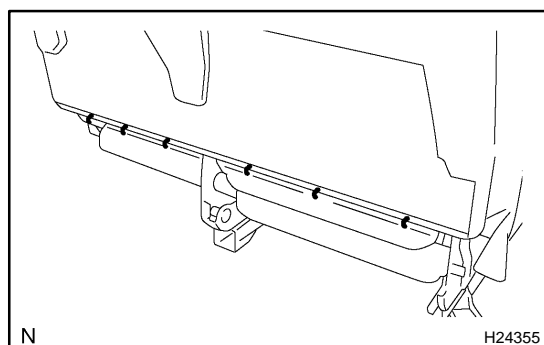
H24354

(b) Remove the hog rings from the seatback cover.

(c) Open the fastener.

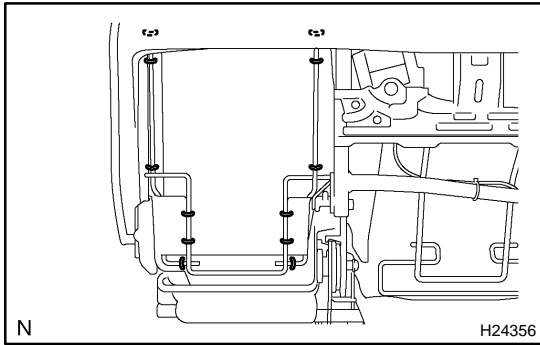
(d) Remove the bolt and center armrest assembly.

(e) Remove the 2 bushings.

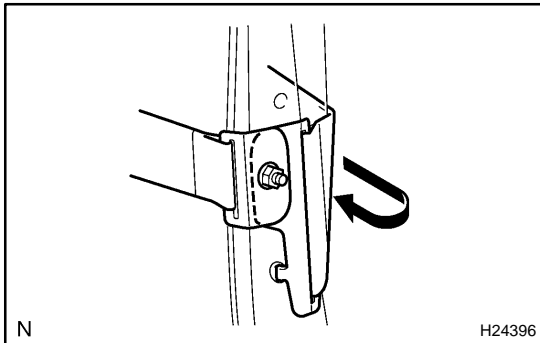


N

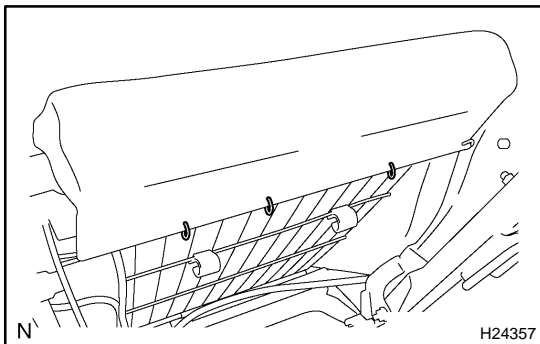
H24355



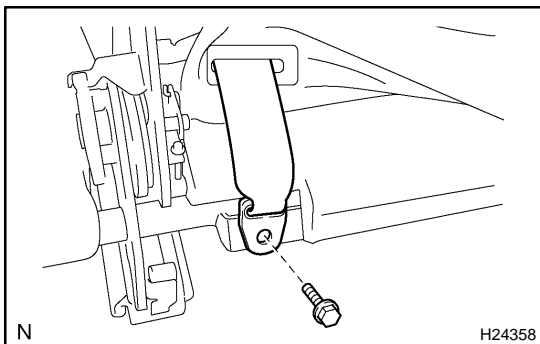
- (f) Remove the hog rings from the seatback cover.



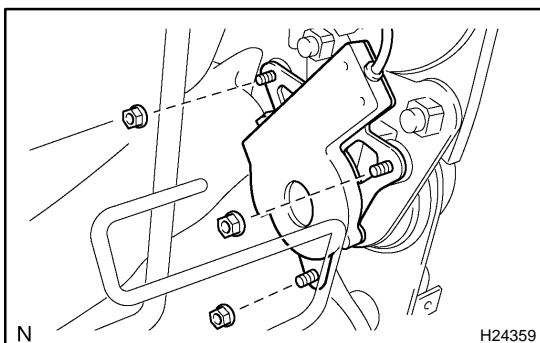
- (g) w/ Side airbag:
Remove the nut and disconnect the seatback cover bracket from the seatback frame.



- (h) Remove the hog rings from the seat cushion cover.

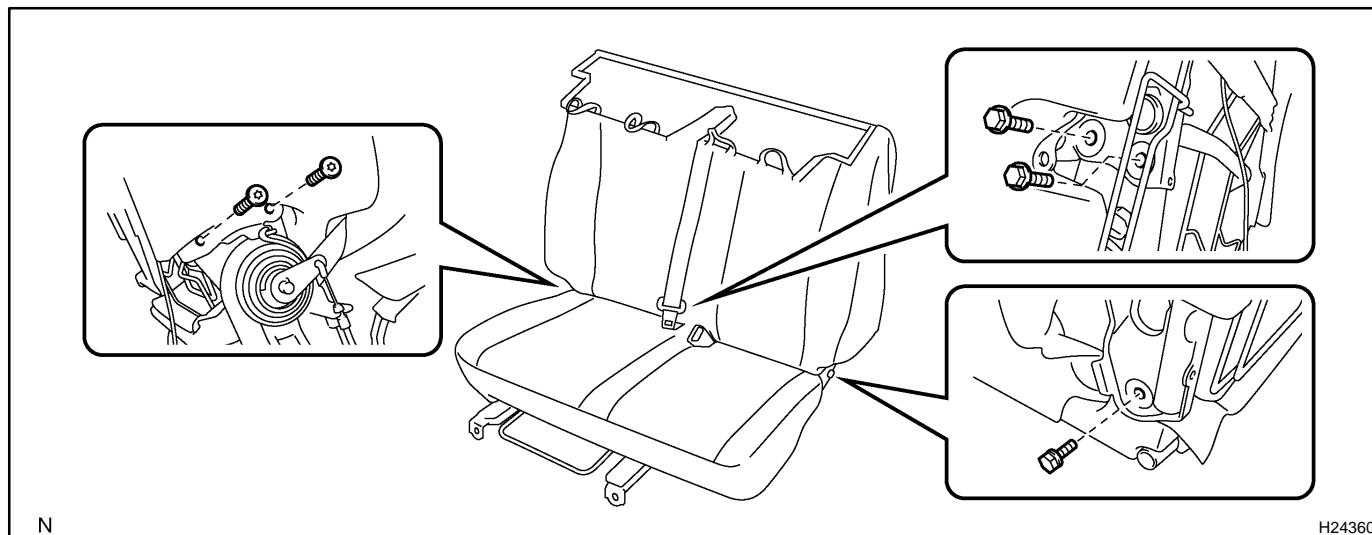


- (i) Remove the bolt and disconnect the front seat center belt from the seat cushion assembly.
(j) Remove the screw and RH seat cushion lower shield.
(k) Remove the 2 screws and RH reclining adjuster inside cover.



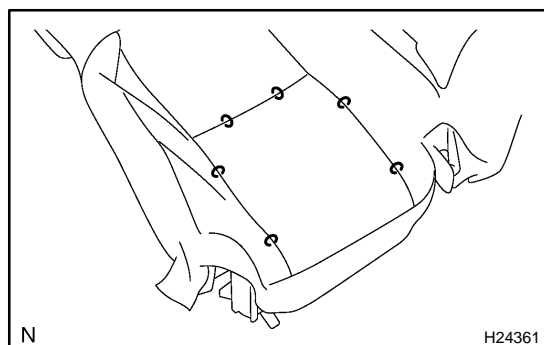
- (l) Remove the 3 nuts and disconnect the front seat center belt.

- (m) Remove the 3 bolts.
- (n) Using a torx® socket wrench, remove the 2 torx® screws and seatback assembly from the seat cushion assembly.
- (o) Remove the bushing from the seatback frame



7. REMOVE SEATBACK FRAME

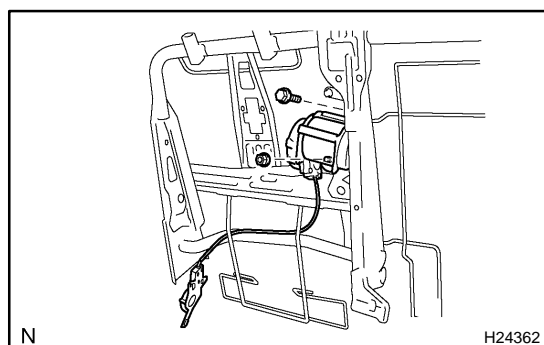
- (a) Remove the 4 headrest supports from the seatback assembly.
- (b) Remove the seatback lock upper bezel.
- (c) Remove the seatback frame from the seatback pad.



8. REMOVE SEATBACK COVER

Remove the hog rings and seatback cover from the seatback pad.

9. REMOVE SHOULDER BELT COVER



10. REMOVE FRONT SEAT CENTER BELT

- (a) Disconnect the clamps.
- (b) Remove the bolt, nut and front seat center belt.

11. REMOVE RH CENTER SEAT HINGE COVER

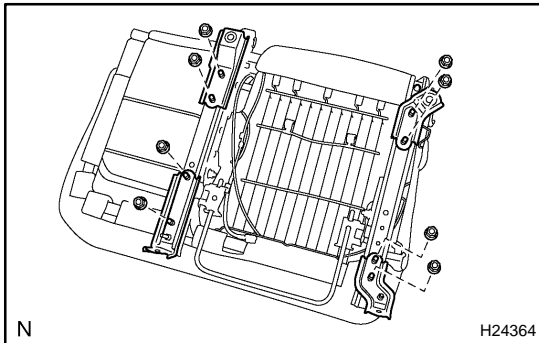
Remove the 2 screws and RH center seat hinge cover.

12. REMOVE RH SEAT CUSHION INNER SHIELD AND SEAT CUSHION COVER

Remove the 2 screws, RH seat cushion inner shield and seat cushion cover.

13. REMOVE SEAT HINGE COVER

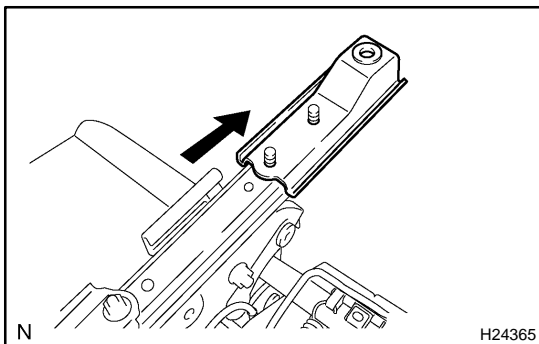
Remove the screw and seat hinge cover.

**14. REMOVE OUTER SEAT TRACK LOWER FRONT AND REAR BRACKET**

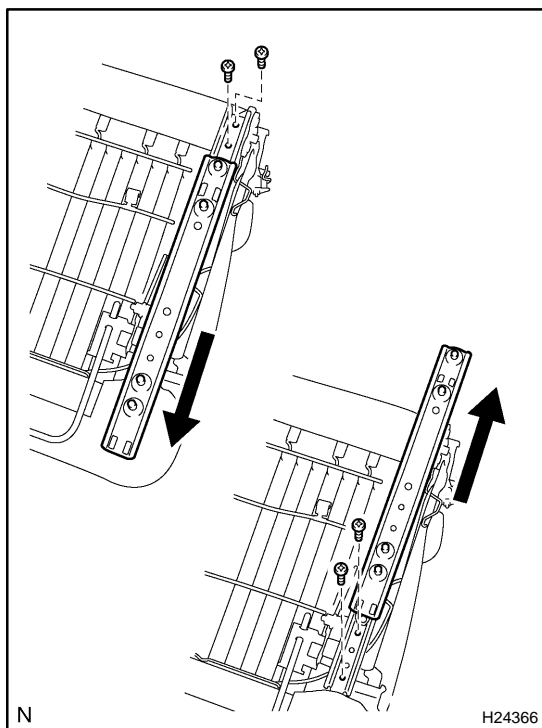
- (a) Remove the 2 nuts and outer seat track lower front bracket.
- (b) Remove the 2 nuts and outer seat track lower rear bracket.

15. REMOVE INNER SEAT TRACK LOWER FRONT AND REAR BRACKET

- (a) Remove the 2 nuts and inner seat track lower front bracket.
- (b) Remove the 2 nuts and inner seat track lower rear bracket.

**HINT:**

When removing the inner seat track lower rear bracket, slide the inner seat track as shown in the illustration.

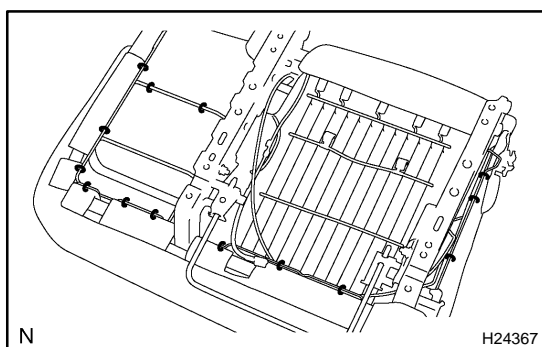
**16. REMOVE OUTER SEAT TRACK****HINT:**

Slide the outer seat track until the torx® screws on the front and rear sides can be seen.

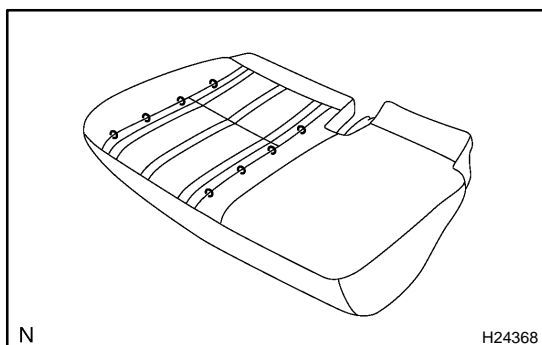
Remove the 4 torx® screws and outer seat track.

17. REMOVE INNER SEAT TRACK

Perform the same procedure on the inner seat track.

**18. REMOVE SEAT CUSHION FRAME**

Remove the hog rings and seat cushion frame from the seat cushion pad.

**19. REMOVE SEAT CUSHION COVER**

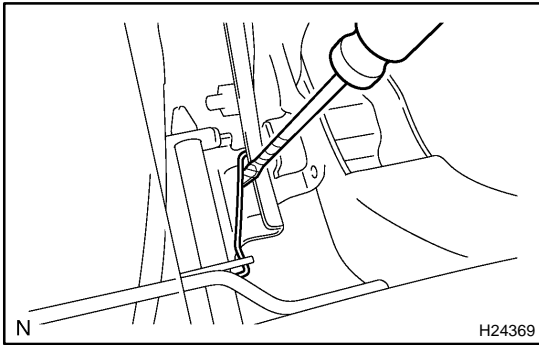
Remove the hog rings and seat cushion cover from the seat cushion pad.

20. REMOVE BELT WARNING OCCUPANT DETECTION SENSOR

Detach the belt warning occupant detection sensor from the seat cushion pad.

21. REMOVE FRONT SEAT INNER BELT

- (a) Disconnect the wire harness clamps.
- (b) Remove the bolt and front seat inner belt from the seat cushion frame.

**22. REMOVE SEAT TRACK ADJUSTING HANDLE**

- (a) Using a screwdriver, disengage the seat track cover spring.

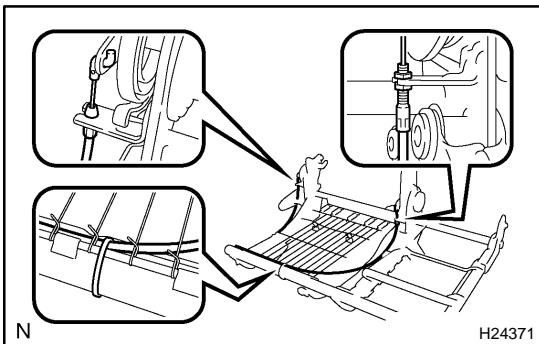
HINT:

Tape the screwdriver tip before use.

- (b) Perform the same procedure on the other side.
 (c) Remove the seat track adjusting handle.

23. REMOVE RH AND LH SEAT TRACK HANDLE SUB-ASSEMBLY

- (a) Remove the nut and RH seat track handle sub-assembly.
 (b) Perform the same procedure on the other side.

**24. REMOVE RECLINING ADJUSTING CABLE**

- (a) Disconnect the clamp.
 (b) Loosen the adjusting nuts.

HINT:

When loosening the nuts, hold one and loosen the other.

- (c) Remove the reclining adjusting cable.

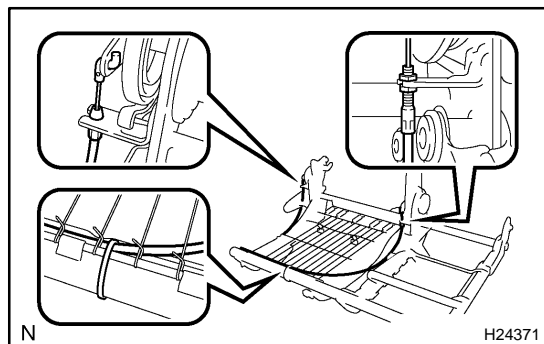
REASSEMBLY

CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).



1. INSTALL RECLINING ADJUSTING CABLE

- (a) Temporarily install the reclining adjusting cable.
- (b) Tighten the adjusting nuts.

HINT:

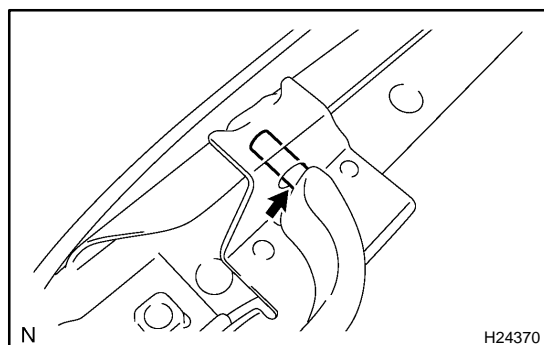
When tighten the nuts, hold one and tighten the other.

- (c) Connect the clamp.

2. INSTALL RH AND LH SEAT TRACK HANDLE SUB-ASSEMBLY

- (a) Install the RH seat track handle sub-assembly with the nut.

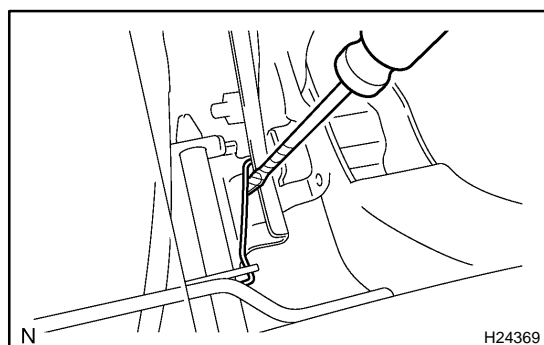
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)



HINT:

Apply MP grease to the sliding part of the seat track handle sub-assembly .

- (b) Perform the same procedure on the other side.



3. INSTALL SEAT TRACK ADJUSTING HANDLE

- (a) Install the seat track adjusting handle.
- (b) Using a screwdriver, engage the seat track cover spring.

HINT:

Tape the screwdriver tip before use.

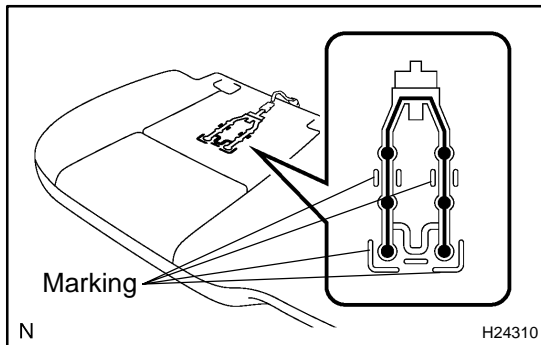
- (c) Perform the same procedure on the other side.

4. INSTALL FRONT SEAT INNER BELT

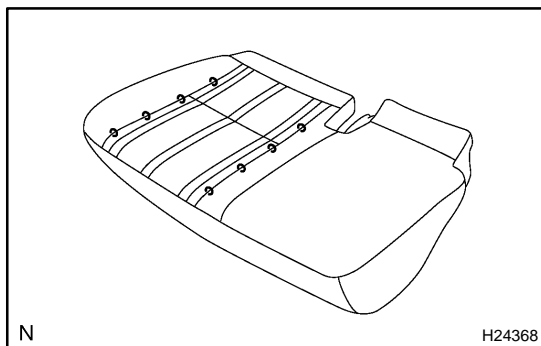
- (a) Install the front seat inner belt to the seat cushion frame with the bolt.

Torque: 42 N·m (430 kgf·cm, 32 ft·lbf)

- (b) Connect the wire harness clamps.

**5. INSTALL BELT WARNING OCCUPANT DETECTION SENSOR**

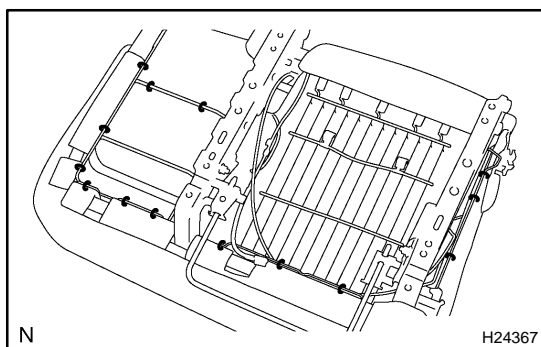
Peel the coated paper off the back of the new sensor. Attach the sensor along with the marking on the pad surface as shown in the illustration.

**6. INSTALL SEAT CUSHION COVER**

Install the seat cushion cover to the seat cushion pad with the hog rings.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.

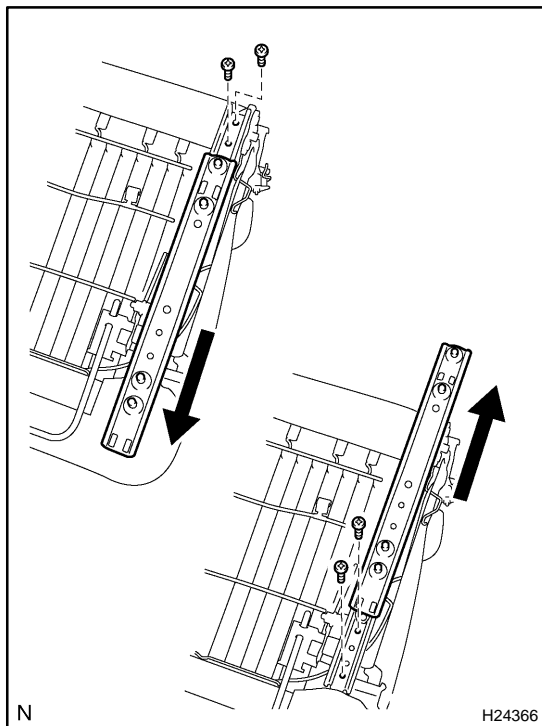
**7. INSTALL SEAT CUSHION FRAME**

- (a) Install the seat cushion frame to the seat cushion pad.

- (b) Install the hog rings.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.

**8. INSTALL OUTER SEAT TRACK****HINT:**

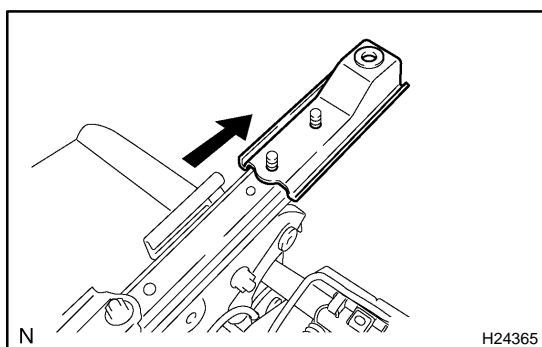
Slide the outer seat track until the torx® screws on the front and rear sides can be seen.

Using a torx® socket wrench, install the outer seat track with the 4 torx® screws.

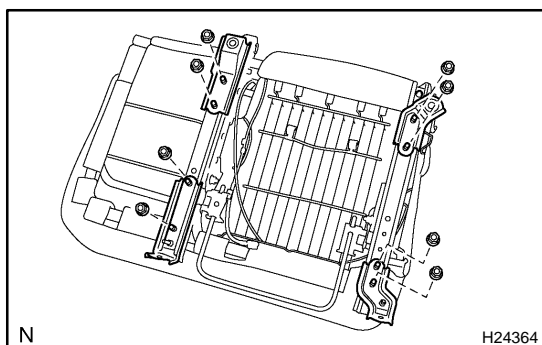
Torque: 42 N·m (430 kgf·cm, 32 ft·lbf)

9. INSTALL INNER SEAT TRACK

Perform the same procedure on the inner seat track.

**10. INSTALL INNER SEAT TRACK LOWER FRONT AND REAR BRACKET****HINT:**

When installing the inner seat track lower rear bracket, slide the inner seat track as shown in the illustration.



(a) Install the inner seat track lower rear bracket with the 2 nuts.

Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)

(b) Install the inner seat track lower front bracket with the 2 nuts.

Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)

11. INSTALL OUTER SEAT TRACK LOWER FRONT AND REAR BRACKET

(a) Install the outer seat track lower rear bracket with the 2 nuts.

Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)

(b) Install the outer seat track lower front bracket with the 2 nuts.

Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)

12. INSTALL SEAT HINGE COVER

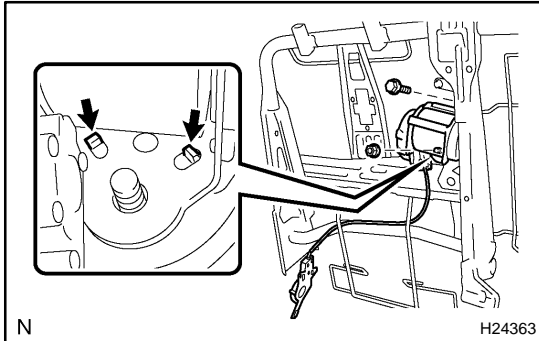
Install the seat hinge cover with the screw.

13. INSTALL RH SEAT CUSHION INNER SHIELD AND SEAT CUSHION COVER

Install the RH seat cushion inner shield and seat cushion cover with the 2 screws.

14. INSTALL RH CENTER SEAT HINGE COVER

Install the RH center seat hinge cover with the 2 screws.



15. INSTALL FRONT SEAT CENTER BELT

(a) Install the front seat center belt with the bolt and nut.

Torque:

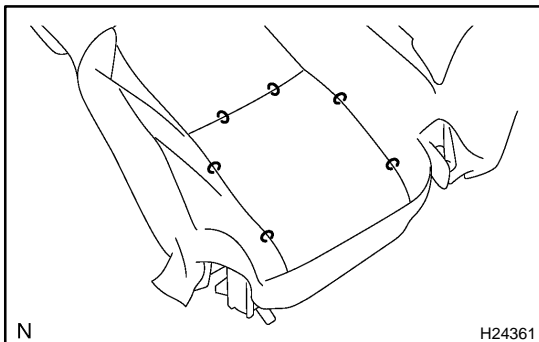
Bolt: 8.5 N·m (87 kgf·cm, 75 in.-lbf)

Nut: 42 N·m (430 kgf·cm, 32 ft-lbf)

HINT:

Check that the seatback frame claws are securely engaged.

16. INSTALL SHOULDER BELT COVER



17. INSTALL SEATBACK COVER

Install the seatback cover to the seatback pad with the hog rings.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.

18. INSTALL SEATBACK FRAME

(a) Install the seatback frame to the seatback pad.

(b) Install the seatback lock upper bezel.

(c) Install the 4 headrest supports to the seatback assembly.

19. INSTALL SEATBACK ASSEMBLY

(a) Install the bushing to the seatback frame.

(b) Using a torx® socket wrench, install the seatback assembly with the 2 torx® screws to the seat cushion assembly.

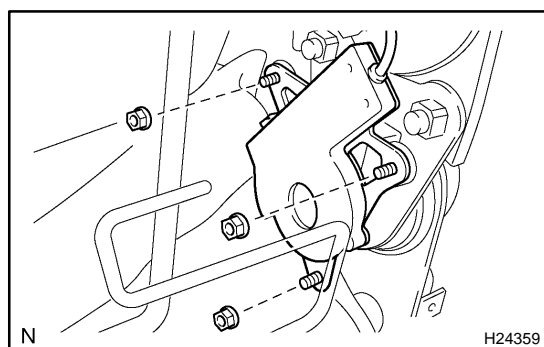
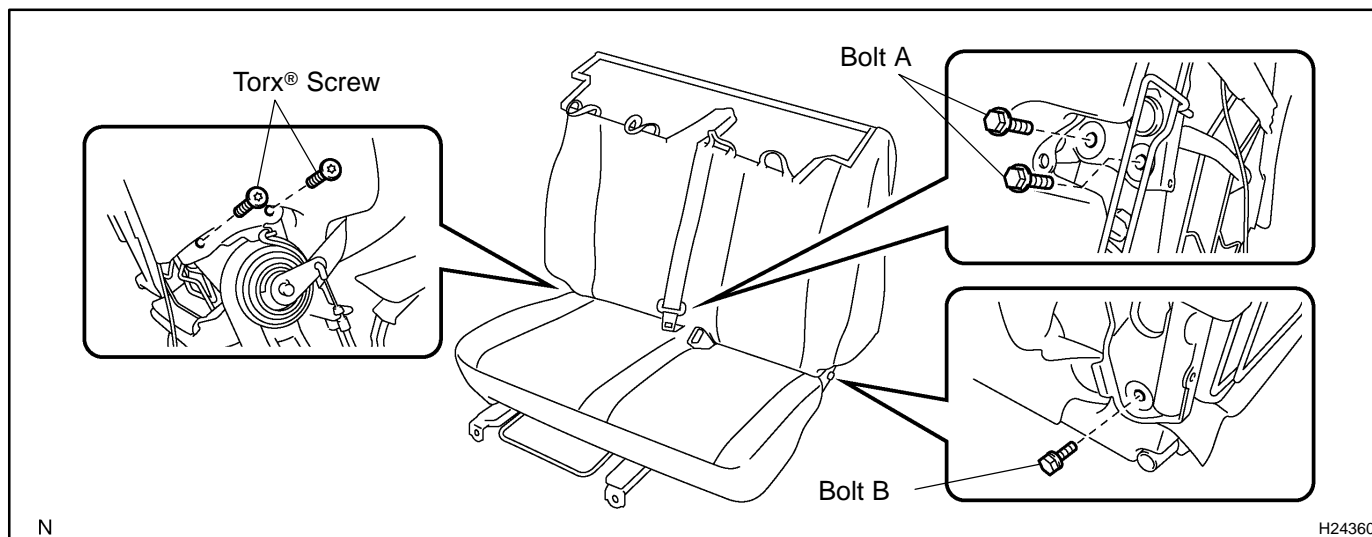
Torque: 42 N·m (430 kgf·cm, 32 ft-lbf)

- (c) Install the 3 bolts.

Torque:

Bolt A: 55 N·m (561 kgf·cm, 41 ft·lbf)

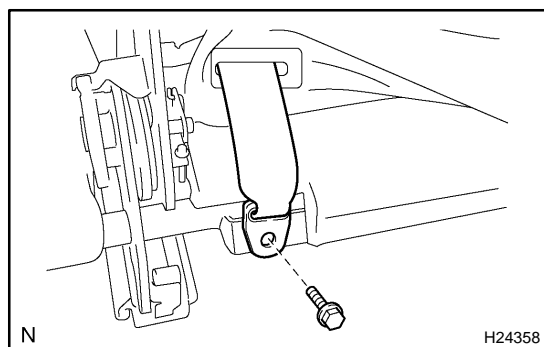
Bolt B: 21 N·m (214 kgf·cm, 15 ft·lbf)



- (d) Connect the front seat center belt with the 3 nuts.

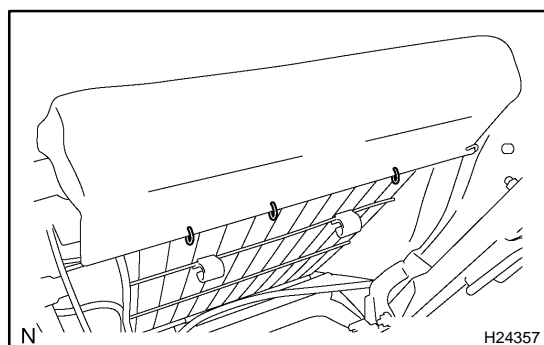
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)

- (e) Install the RH reclining adjuster inside cover with the 2 screws.
- (f) Install the RH seat cushion lower shield with the screw.



- (g) Connect the front seat center belt with the bolt to the seat cushion assembly.

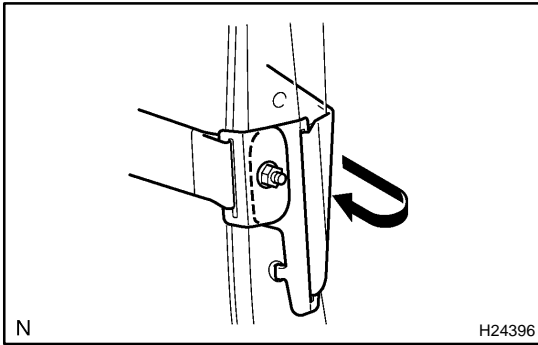
Torque: 42 N·m (430 kgf·cm, 32 ft·lbf)



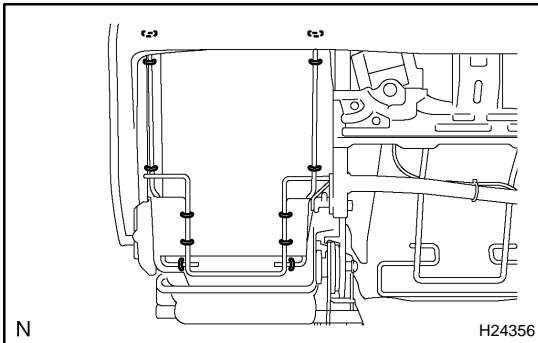
- (h) Install the hog rings to the seat cushion cover.

HINT:

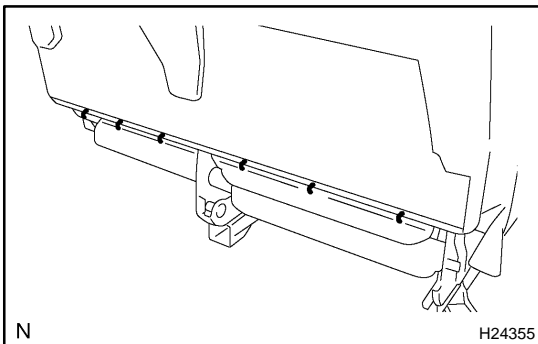
When installing the hog rings, take as much care as possible to prevent wrinkles.



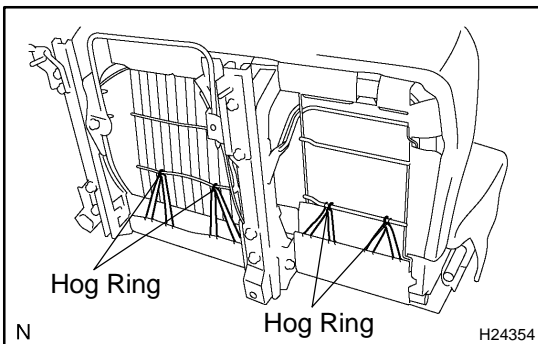
- (i) w/ Side airbag:
Connect the seatback cover bracket to the seatback frame with the nut.
Torque: 5.5 N·m (56 kgf-cm, 49 in.-lbf)



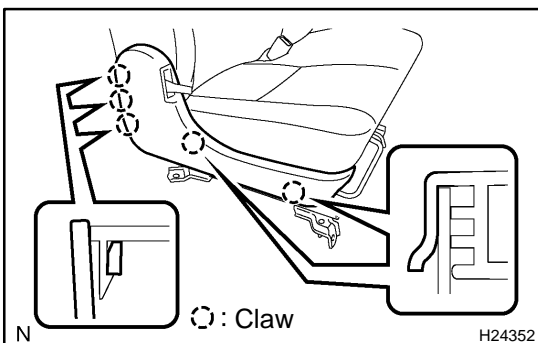
- (j) Install the hog rings to the seatback cover.
HINT:
When installing the hog rings, take as much care as possible to prevent wrinkles.
- (k) Install the 2 bushings.
- (l) Install the center armrest assembly with the bolt.
Torque: 20 N·m (204 kgf-cm, 15 ft-lbf)
- (m) Close the fastener.



- (n) Install the hog rings to the seatback cover.
HINT:
When installing the hog rings, take as much care as possible to prevent wrinkles.



- (o) Install the hog rings to the seatback cover belt.
- 20. INSTALL SEAT CUSHION LOWER SHIELD**
Install the seat cushion lower shield with the 2 screws.



- 21. INSTALL RH SEAT CUSHION SHIELD**
Engage the claws and install the RH seat cushion shield.
- 22. INSTALL RECLINING ADJUSTER RELEASE HANDLE**
- 23. INSTALL HEADRESTS**
- 24. INSTALL SEAT LEG INNER COVER**
Install the seat leg inner cover with the 3 screws.

INSTALLATION

1. INSTALL FRONT SEAT

- (a) Mount the front seat to the vehicle.

NOTICE:

Be careful not to damage the vehicle body.

- (b) w/ Side airbag:
Connect the airbag connector.
- (c) Connect the connectors.
- (d) Slide the front seat to the rearmost position .
- (e) Tighten the bolts on the front side temporarily, starting from the bolt on the inner side.
- (f) Tighten them completely.
- Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)**
- (g) Slide the front seat to the foremost position.
- (h) Tighten the bolts on the rear side temporarily, starting from the bolt on the inner side.
- (i) Tighten them completely.

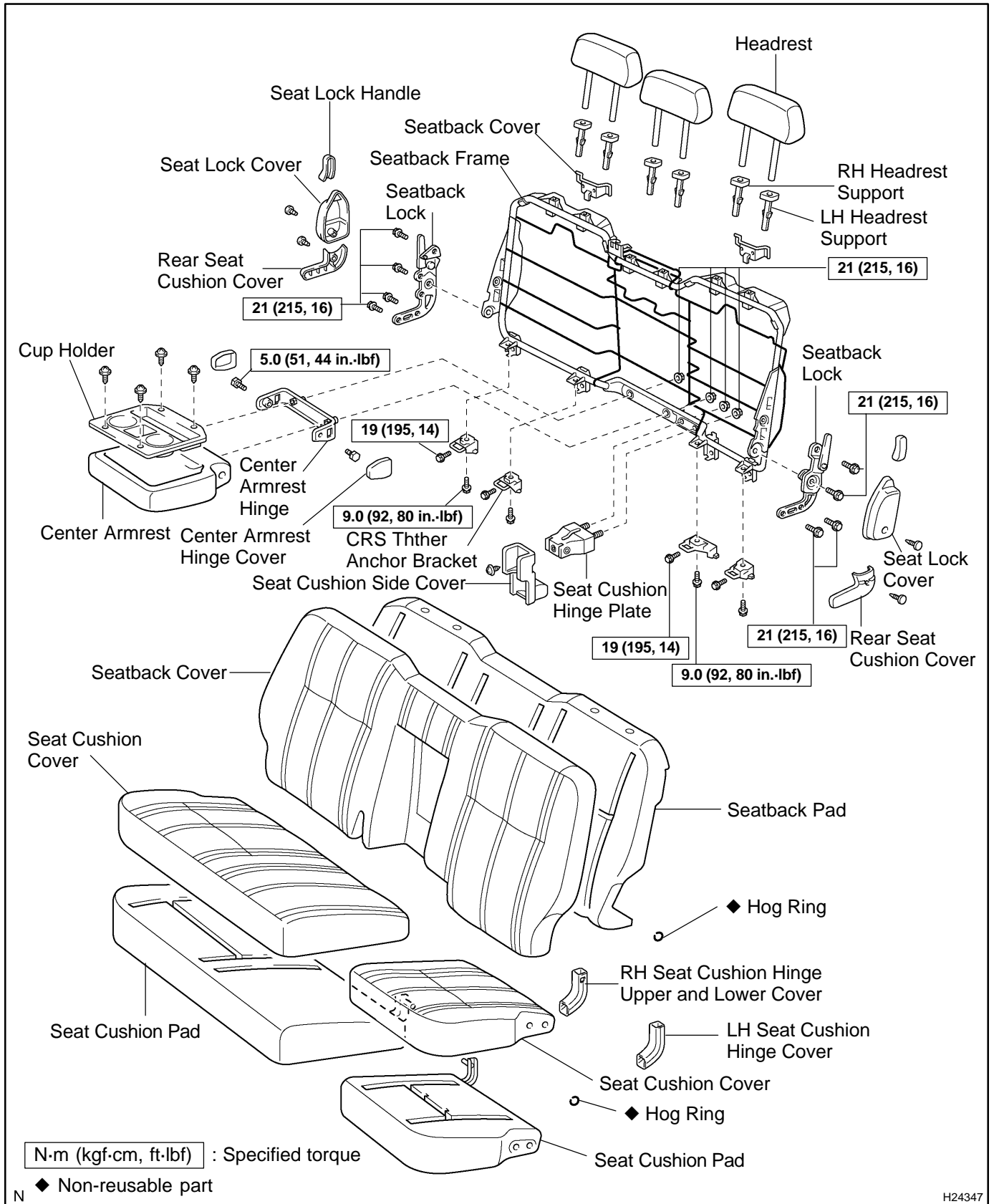
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

2. INSTALL SEAT TRACK COVERS

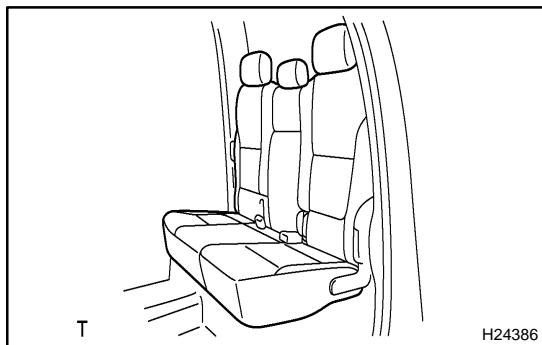
3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

REAR SEAT (Bench Type) COMPONENTS

B02FY-04



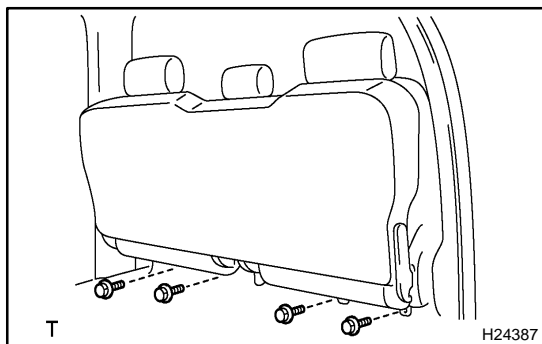
H24347



REMOVAL

REMOVE REAR SEAT

- (a) Release the rear seat lock and swing the seat cushions up.



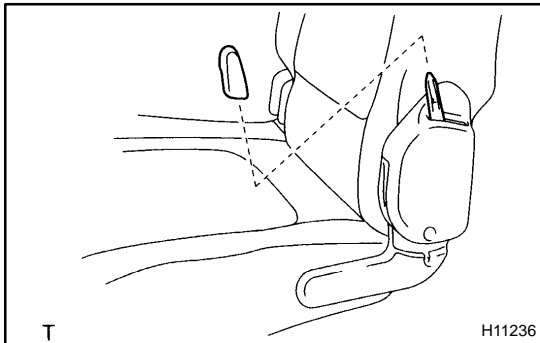
- (b) Remove the 4 bolts.
(c) Lift up the rear seat and remove it.

DISASSEMBLY**CAUTION:**

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

Tape the screwdriver tip before using it to remove the parts.

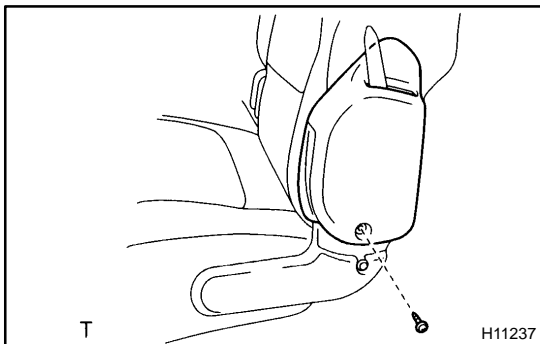
1. REMOVE HEADRESTS**2. REMOVE REAR SEAT LOCK HANDLE**

(a) Using a screwdriver, remove the rear seat lock handle.

HINT:

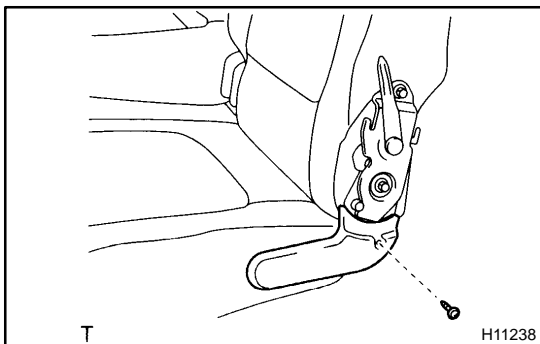
Tape the screwdriver tip before use.

(b) Perform the same procedure on the other side.

**3. REMOVE REAR SEAT LOCK COVER**

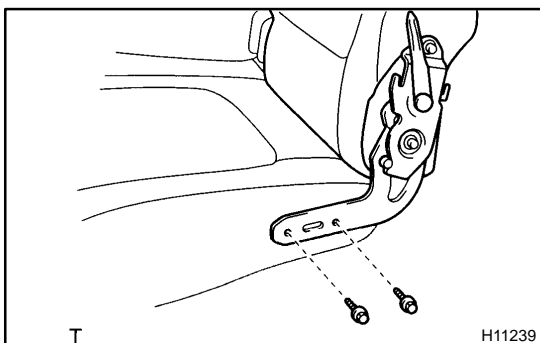
(a) Remove the screw and rear seat lock cover.

(b) Perform the same procedure on the other side.

**4. REMOVE REAR SEAT CUSHION COVER**

(a) Remove the screw and rear seat cushion cover.

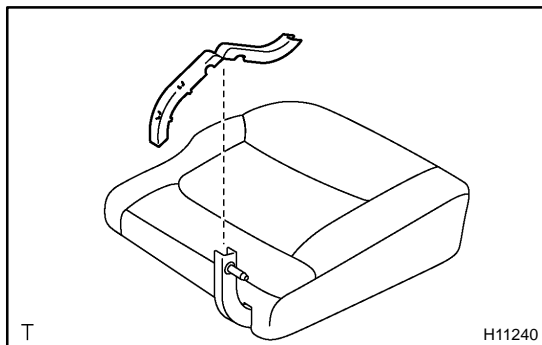
(b) Perform the same procedure on the other side.

**5. REMOVE SEAT CUSHION ASSEMBLY**

(a) Remove the 2 bolts.

(b) Remove the seat cushion assembly front the seat cushion hinge plate.

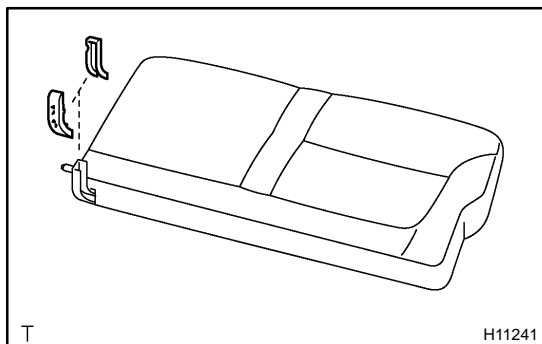
(c) Perform the same procedure on the other side.

**6. REMOVE LH SEAT CUSHION HINGE COVER**

Using a screwdriver, remove the LH seat cushion hinge cover.

HINT:

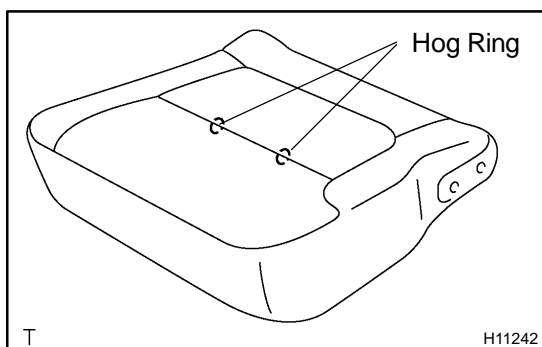
Tape the screwdriver tip before use.

**7. REMOVE RH SEAT CUSHION HINGE UPPER AND LOWER COVERS**

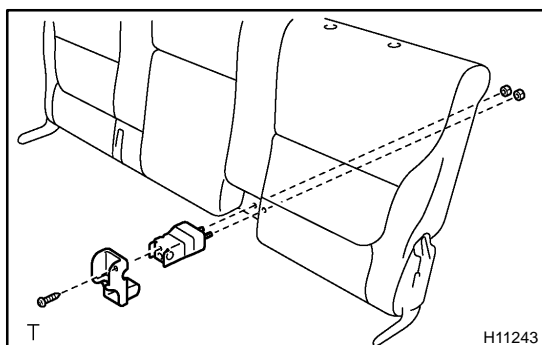
Using a screwdriver, remove the RH seat cushion hinge upper and lower covers.

HINT:

Tape the screwdriver tip before use.

**8. REMOVE SEAT CUSHION COVER**

- (a) Open the fastener.
- (b) Remove the hog rings and seat cushion cover.
- (c) Perform the same procedure on the other side.

**9. REMOVE SEAT CUSHION SIDE COVER**

Remove the screw and seat cushion side cover.

10. REMOVE SEAT CUSHION HINGE PLATE

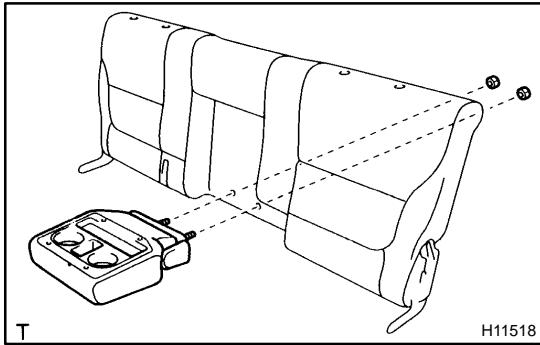
Remove the 2 nuts and seat cushion hinge plate from the seat-back frame.

11. REMOVE SEATBACK ASSEMBLY

Remove the 4 bolts and seatback assembly.

12. REMOVE 4 CRS TETHER ANCHOR BRACKETS

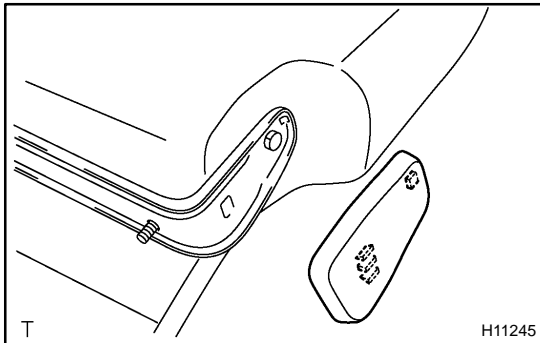
- (a) Remove the bolt and CRS tether anchor bracket.
- (b) Perform the same procedure on the other CRS tether anchors.

**13. REMOVE CENTER ARMREST**

Remove the 2 nuts and center armrest from the seatback assembly.

14. REMOVE CUP HOLDER

Remove the 4 screws and cup holder from the center armrest.

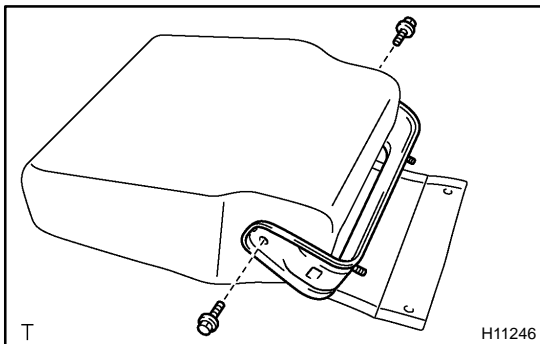
**15. REMOVE CENTER ARMREST HINGE**

(a) Using a screwdriver, remove the center armrest hinge cover.

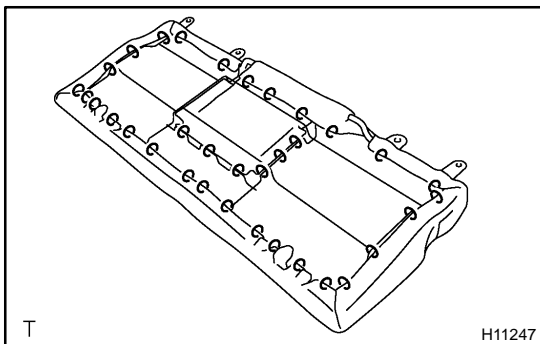
HINT:

Tape the screwdriver tip before use.

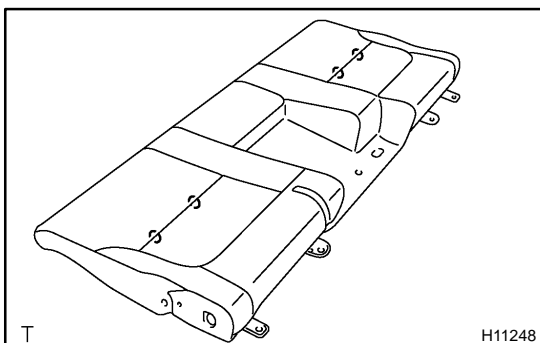
(b) Perform the same procedure on the other side.



(c) Remove the 2 bolts and center armrest hinge.

16. REMOVE HEADREST SUPPORTS**17. REMOVE SEATBACK COVER**

(a) Remove the hog rings from the rear side of the seatback assembly.



(b) Remove the hog rings and seatback cover.

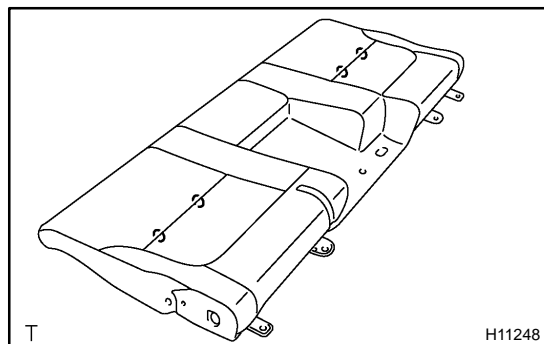
REASSEMBLY

CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

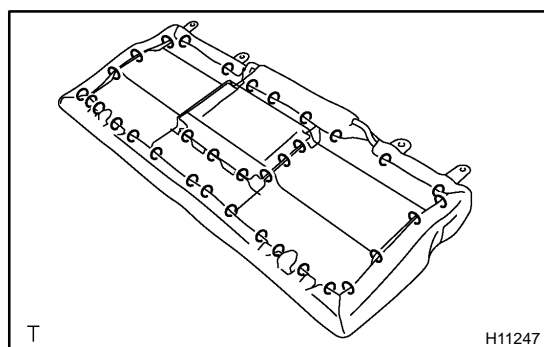


1. INSTALL SEATBACK COVER

(a) Install the seatback cover with new hog rings.

HINT:

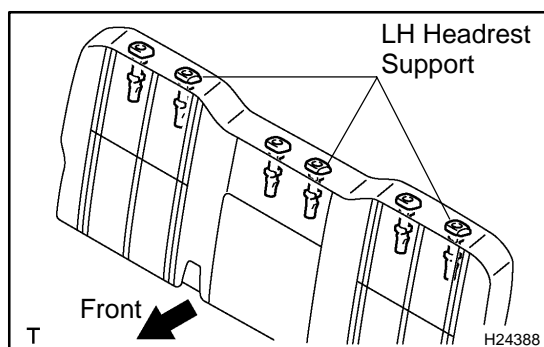
When installing the hog rings, take as much care as possible to prevent wrinkles.



(b) Install the new hog rings to the rear side of the seatback assembly.

HINT:

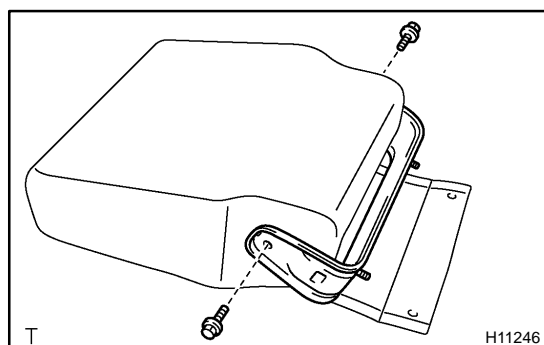
When installing the hog rings, take as much care as possible to prevent wrinkles.



2. INSTALL HEADREST SUPPORTS

HINT:

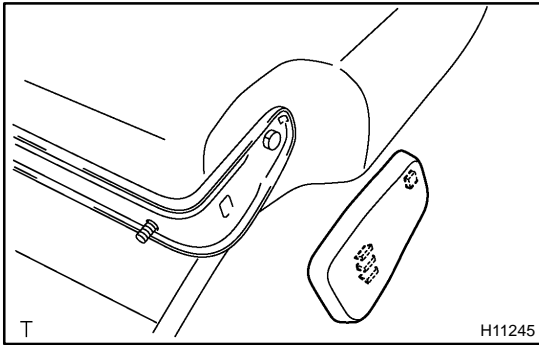
Ensure that the button of the 3 LH headrest supports is installed to the left.



3. INSTALL CENTER ARMREST HINGE

(a) Install the center armrest hinge with the 2 bolts.

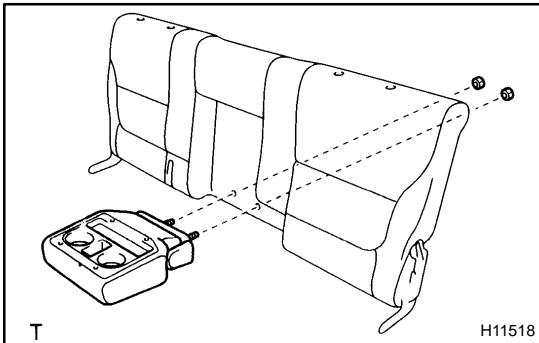
Torque: 5.0 N·m (51 kgf·cm, 44 in.-lbf)



- (b) Install the center armrest hinge cover as shown in the illustration, then perform the same procedure on the other side.

4. INSTALL CUP HOLDER

Install the cup holder with the 4 screws to the center armrest.



5. INSTALL CENTER ARMREST

Install the center armrest with the 2 nuts to the seatback assembly.

Torque: 21 N·m (215 kgf·cm, 16 ft·lbf)

6. INSTALL 4 CRS TETHER ANCHOR BRACKETS

- (a) Install the CRS tether anchor bracket with the bolt.

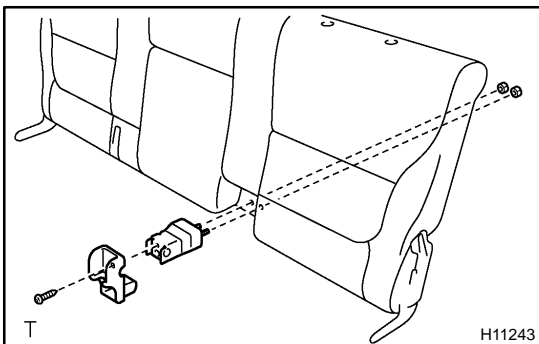
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

- (b) Perform the same procedure on the other CRS tether anchors.

7. INSTALL SEATBACK ASSEMBLY

Install the seatback assembly with the 4 bolts.

Torque: 21 N·m (215 kgf·cm, 16 ft·lbf)



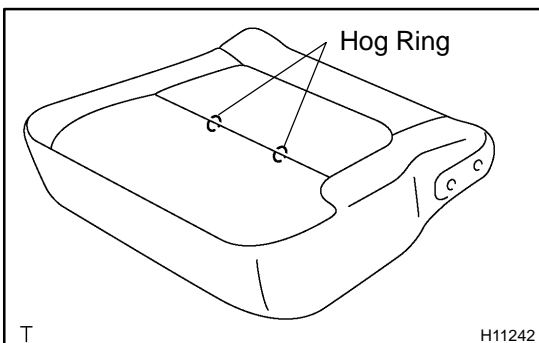
8. INSTALL SEAT CUSHION HINGE PLATE

Install the seat cushion hinge plate with the 2 nuts to the seatback frame.

Torque: 21 N·m (215 kgf·cm, 16 ft·lbf)

9. INSTALL SEAT CUSHION SIDE COVER

Install the seat cushion side cover with the screw.



10. INSTALL SEAT CUSHION COVER

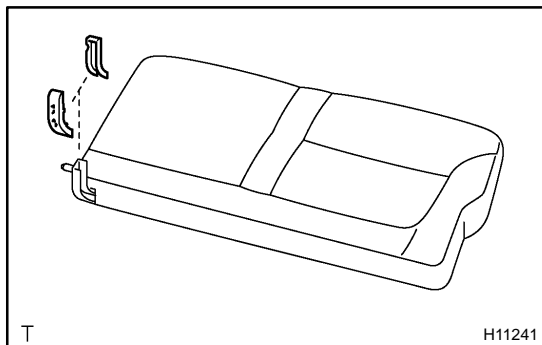
- (a) Install the seat cushion cover with new hog rings.

HINT:

When installing the hog rings, take as much care as possible to prevent wrinkles.

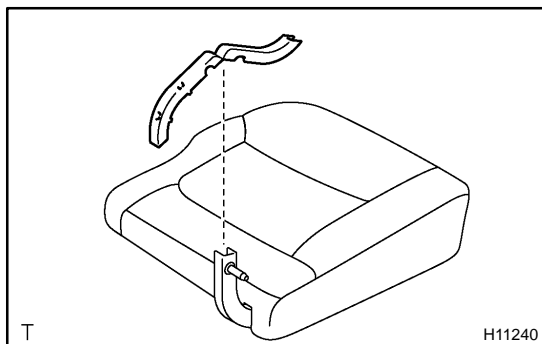
- (b) Close the fastener.

- (c) Perform the same procedure on the other side.



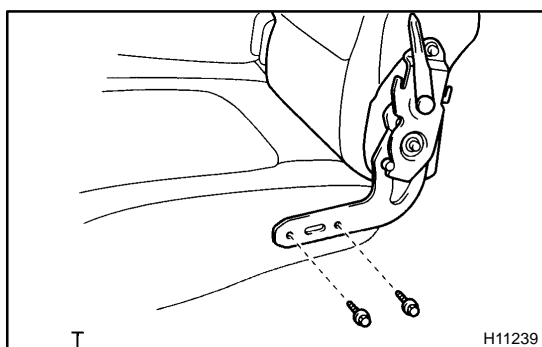
11. INSTALL RH SEAT CUSHION HINGE UPPER AND LOWER COVERS

Install the RH seat cushion hinge upper and lower covers.



12. INSTALL LH SEAT CUSHION HINGE COVER

Install the LH seat cushion hinge cover.

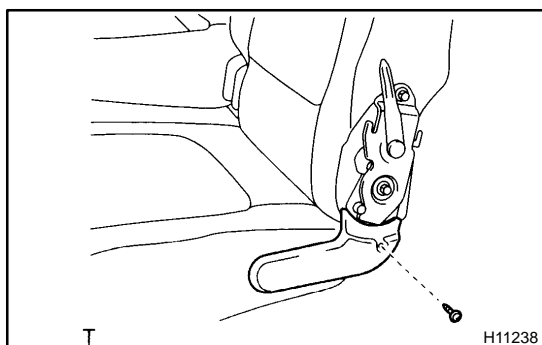


13. INSTALL SEAT CUSHION ASSEMBLY

- Install the seat cushion assembly to the seat cushion hinge plate.
- Install the seat cushion assembly to the seatback lock with the 2 bolts.

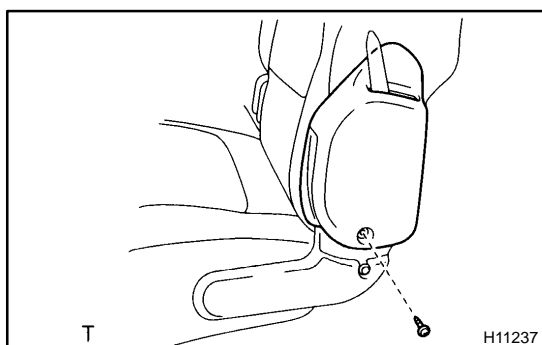
Torque: 21 N·m (215 kgf·cm, 16 ft·lbf)

- Perform the same procedure on the other side.



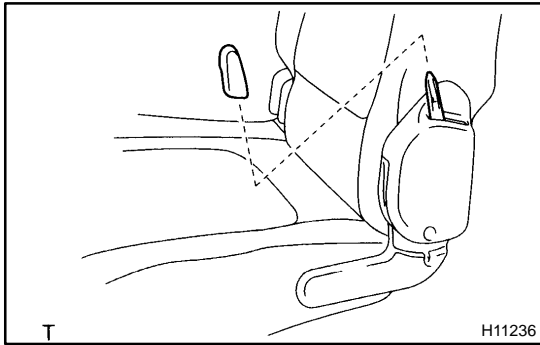
14. INSTALL REAR SEAT CUSHION COVER

- Install the rear seat cushion cover with the screw.
- Perform the same procedure on the other side.



15. INSTALL REAR SEAT LOCK COVER

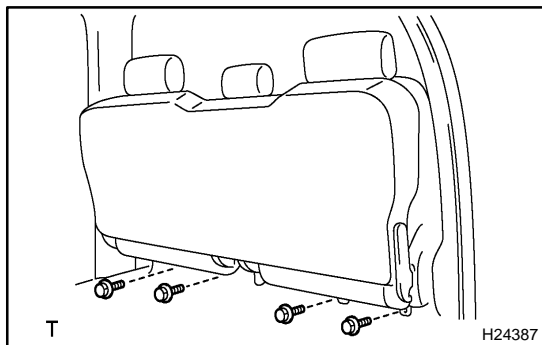
- Install the rear seat lock cover with the screw.
- Perform the same procedure on the other side.



16. INSTALL REAR SEAT LOCK HANDLE

- (a) Install the rear seat lock handle.
- (b) Perform the same procedure on the other side.

17. INSTALL HEADRESTS



INSTALLATION

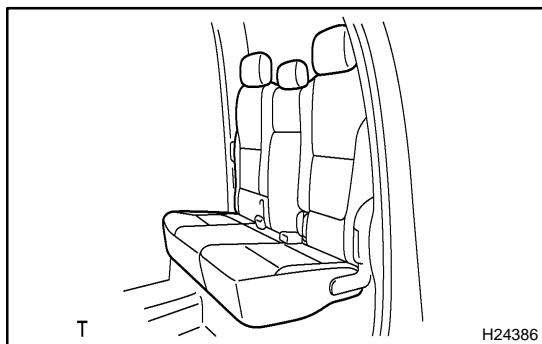
HINT:

A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

INSTALL REAR SEAT

- (a) Hook the rear seat to the body panel.
- (b) Install the 4 bolts.

Torque: 19 N·m (195 kgf-cm, 14 ft-lbf)



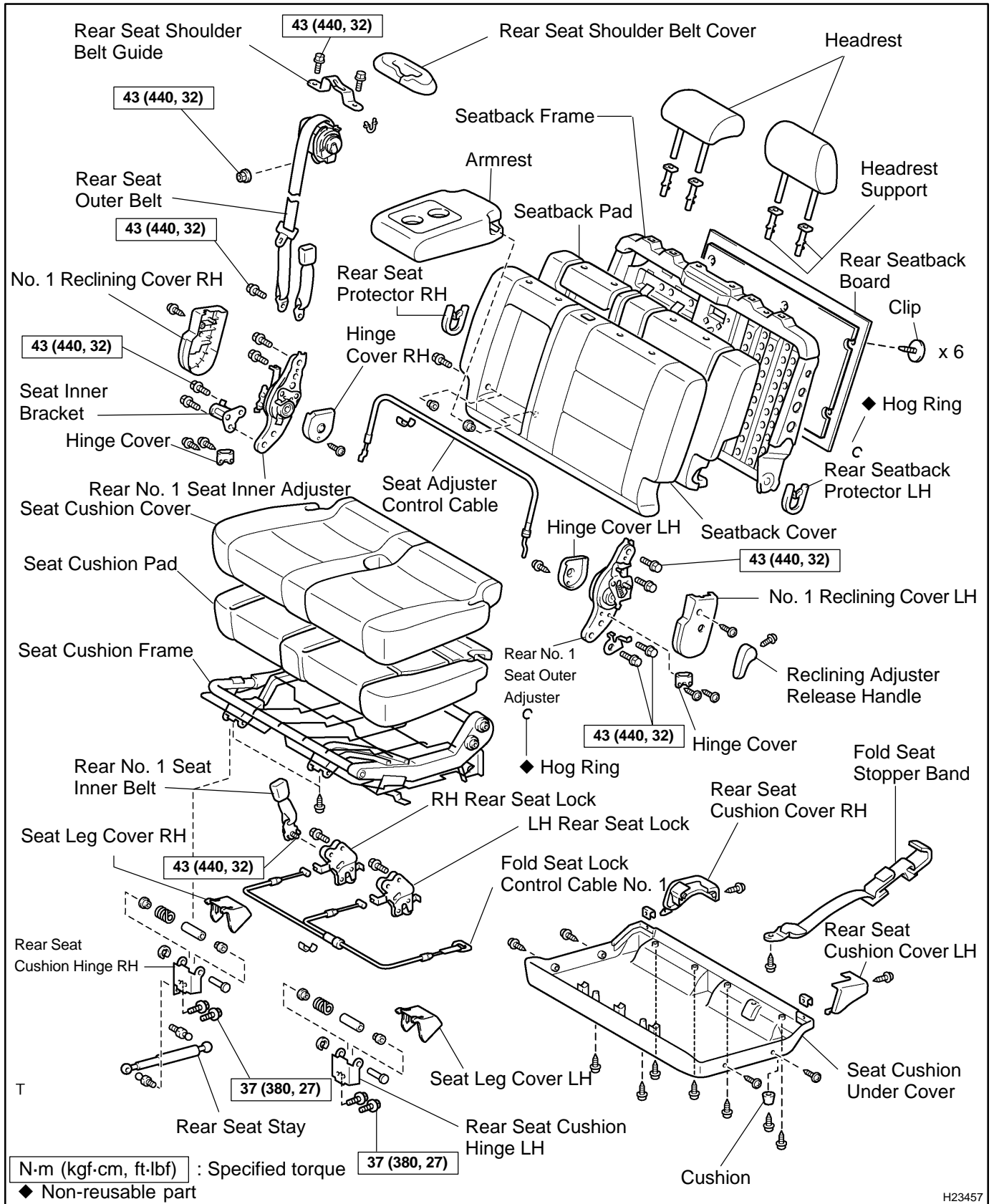
- (c) Release the rear seat lock and swing down the seat cushions.

HINT:

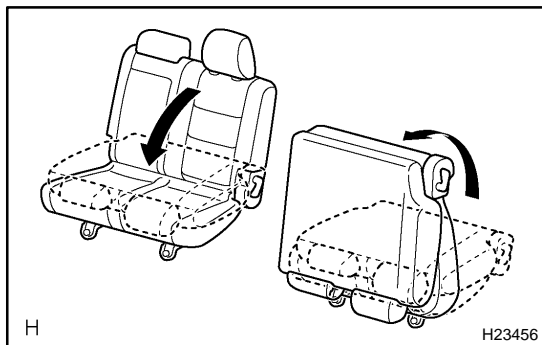
Before swinging down the seat cushion, store the inner belts in the rear seat.

REAR SEAT (LH) COMPONENTS

BO4R3-02



H23457



REMOVAL

1. FOLDING REAR SEAT LH

- (a) Lower the headrest to the lowest position. Pull the seat-back angle adjusting lever and fold the seatback down.
- (b) Unlock the seat legs by pulling up one of the lever on the seat legs, and swing the seat up and forward.

2. REMOVE REAR SEAT LH

- (a) Using a screwdriver, remove the 2 seat leg covers.

HINT:

Tape the screwdriver tip before use.

- (b) Remove the 4 bolts and rear No.1 seat.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

DISASSEMBLY

CAUTION:

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

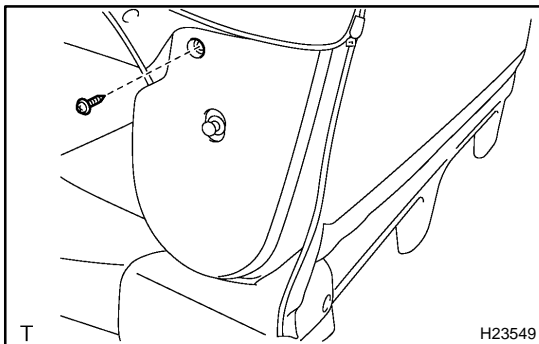
- ◆ Tape the screwdriver tip before using it to remove the parts.
- ◆ A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. REMOVE HEADREST

Remove the 2 headrests.

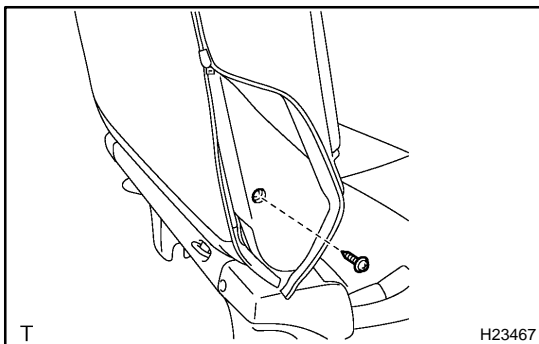
2. REMOVE RECLINING ADJUSTER RELEASE HANDLE

Remove the screw and release handle.



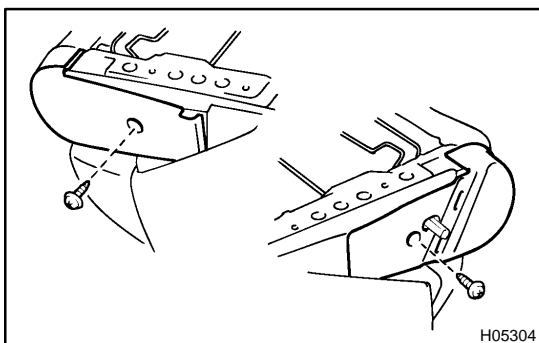
3. REMOVE NO. 1 RECLINING COVER LH

- (a) Unzip the seat cushion cover.
- (b) Remove the screw and No. 1 rear seat reclining cover.



4. REMOVE NO. 1 RECLINING COVER RH

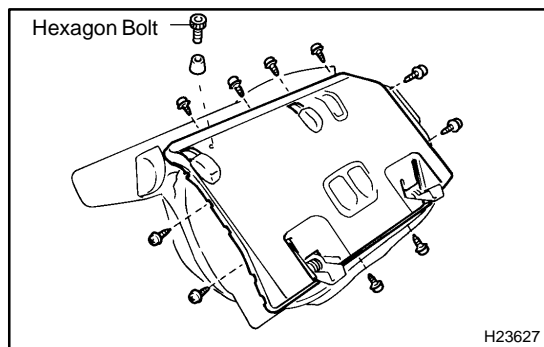
- (a) Unzip the seat cushion cover.
- (b) Remove the screw and No. 1 rear seat reclining cover.



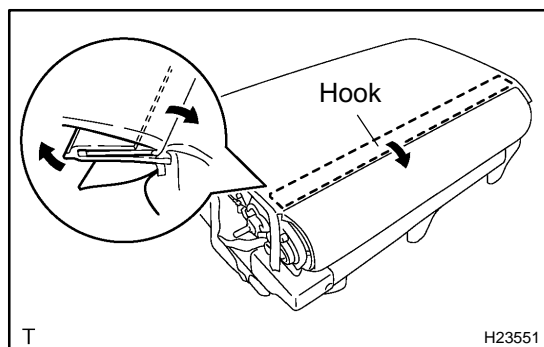
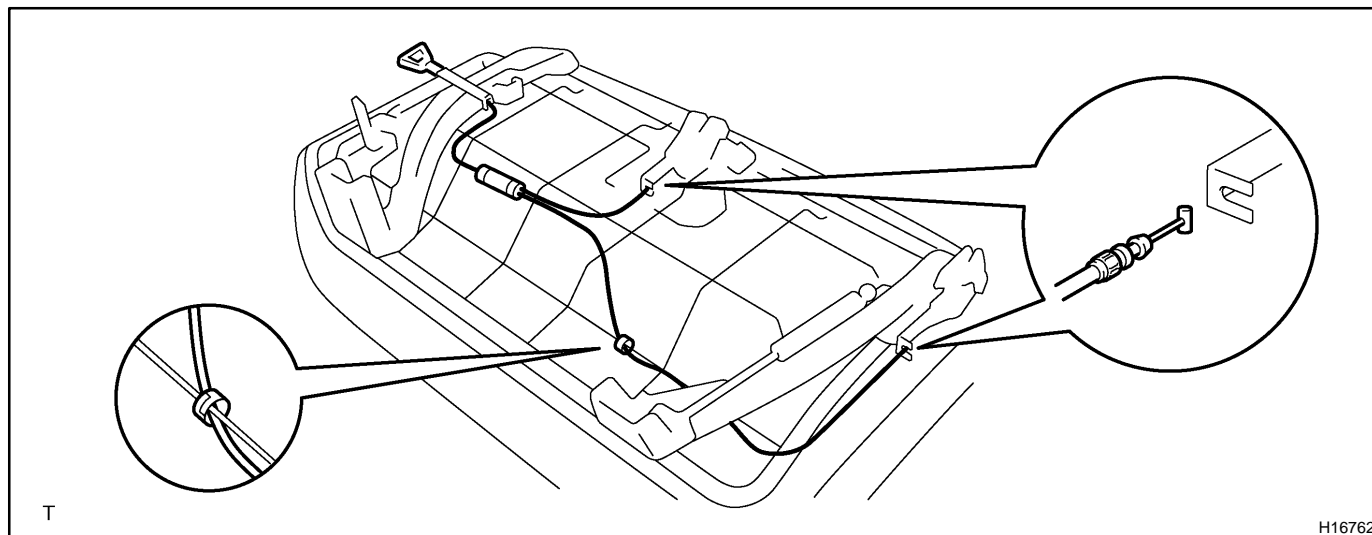
5. REMOVE SEAT CUSHION UNDER COVER (LH AND RH)

- (a) Remove the 2 screws and 2 seat cushion under covers.

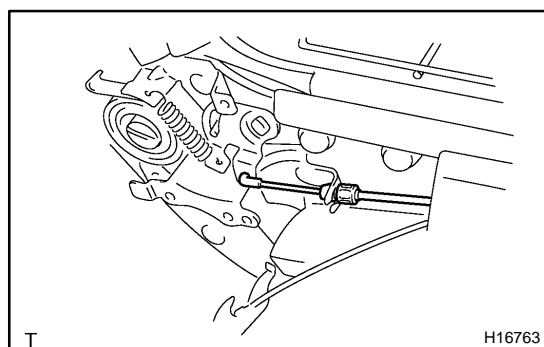
BODY - REAR SEAT (LH)



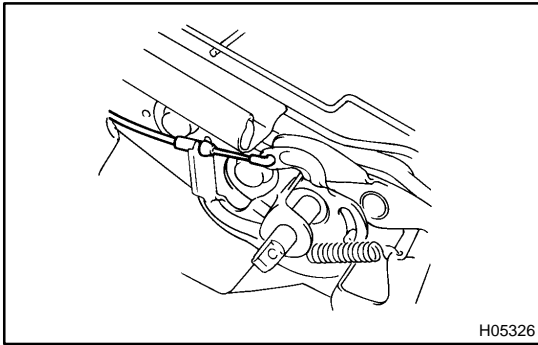
- (b) Using a 5 mm hexagon wrench, remove the bolt and cushion.
- (c) Remove the 10 screws and seat cushion under cover.
- 6. REMOVE FOLD SEAT LOCK CONTROL CABLE NO. 1**
- (a) Tilt the seat forward.
- (b) Remove the clamp and fold seat lock control cable as shown in the illustration.



- 7. REMOVE SEATBACK ASSEMBLY**
- (a) As shown in the illustration, disengage the hook and open the seatback cover.



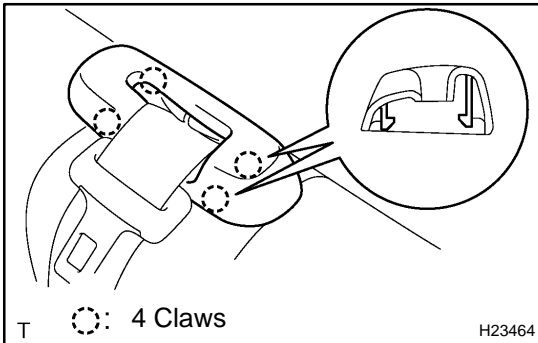
- (b) Remove the reclining connecting wire of the LH side edge.



- (c) Remove the reclining connecting wire of the RH side edge.
- (d) Remove the 4 bolts and the seatback assembly.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

8. REMOVE ARMREST



9. REMOVE SEATBACK COVER

- (a) Using a screwdriver, disengage the 4 claws and remove the rear seat shoulder belt cover.

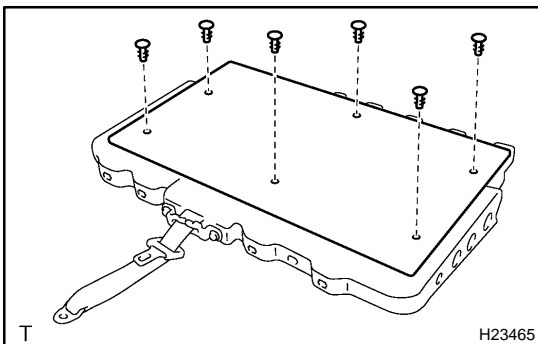
HINT:

Tape the screwdriver tip before use.

- (b) Remove the 4 headrest supports.
- (c) Disengage the hooks, and remove the seatback frame from the seatback cover with pad.
- (d) Remove the seatback cover from the seatback pad.
- (e) Remove the hog rings and seatback cover.

HINT:

At the time of reassembly, take as much care as possible to minimize wrinkles when installing hog rings.

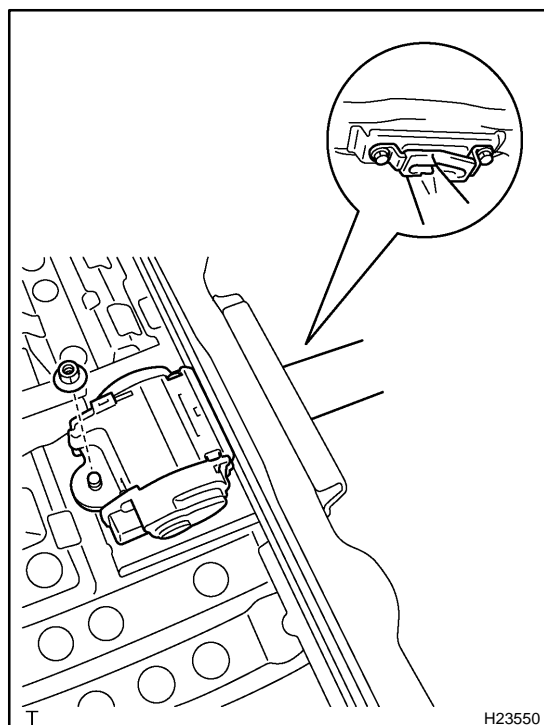
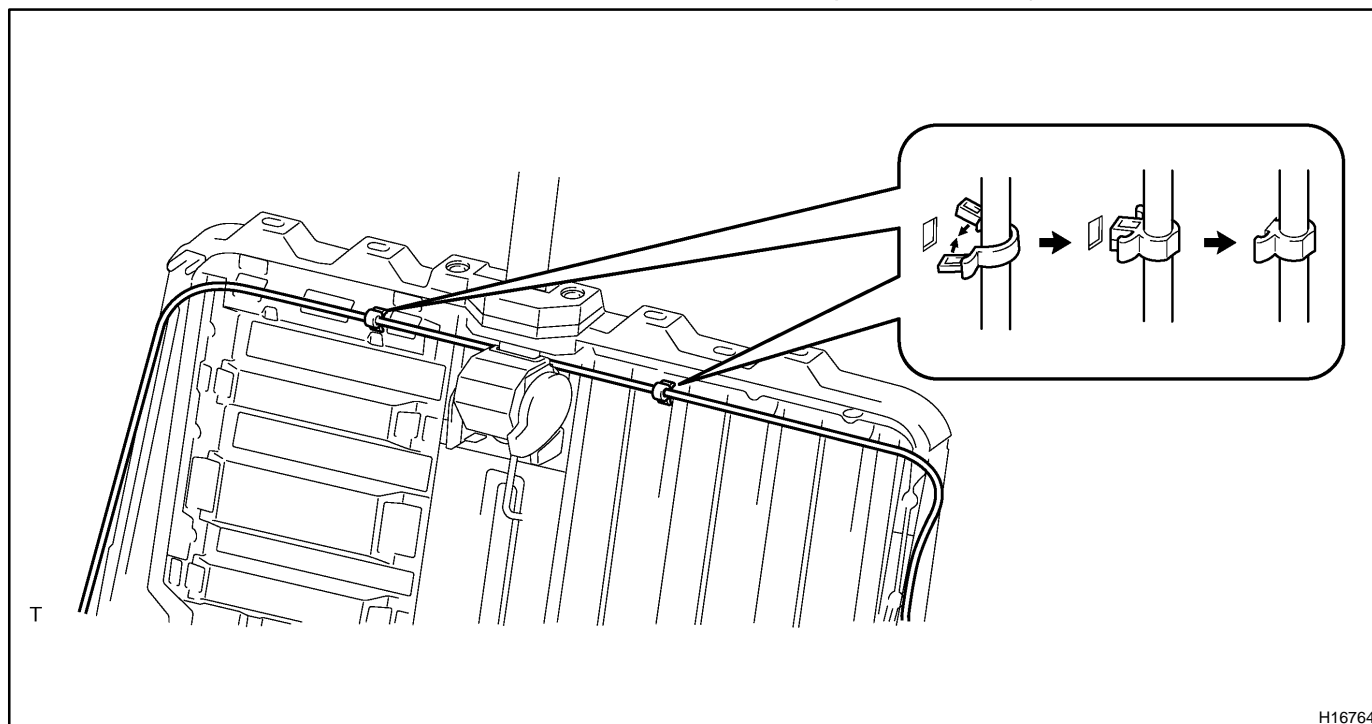


10. REMOVE REAR SEATBACK BOARD

Using a clip remover, remove the 6 clips and seatback board.

11. REMOVE SEAT ADJUSTER CONTROL CABLE

Remove the 2 clamps and seat adjuster control cable.

**12. REMOVE REAR SEAT OUTER BELT**

(a) Remove the 2 bolts and rear seat shoulder belt guide.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

(b) Remove the nut, rear seat outer belt.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)**13. REMOVE SEAT CUSHION COVER**

(a) Remove the seat cushion cover with pad from the seat cushion frame.

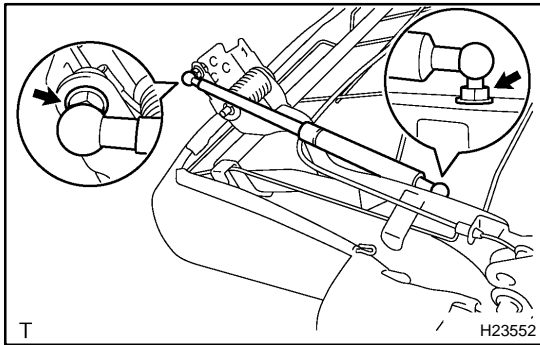
(b) Remove the seat cushion cover from the seat cushion pad.

HINT:

At the time of reassembly, take as much care as possible to minimize wrinkles when installing hog rings.

14. REMOVE REAR NO. 1 SEAT ADJUSTER

- (a) Remove the 2 bolts and rear No. 1 seat outer adjuster.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)
- (b) Remove the 2 bolts and rear No. 1 seat inner adjuster.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)
- (c) Remove the 4 screws and 2 hinges covers from the rear No. 1 seat outer and inner adjusters.
- (d) Remove the 2 screws and 2 reclining inner covers from the rear No. 1 seat outer and inner adjusters.

**15. REMOVE REAR SEAT STAY**

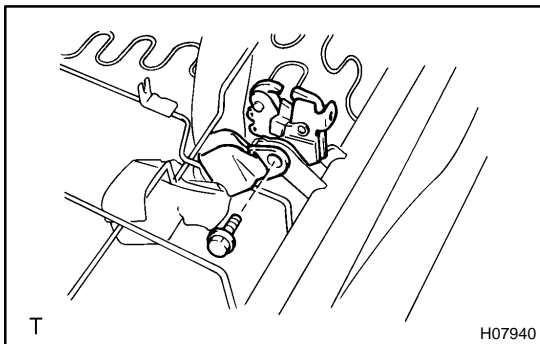
Remove the 2 bolts and rear seat stay.

16. REMOVE REAR SEAT CUSHION HINGE (LH AND RH)

- (a) Using a screwdriver, remove the spring nut and E-rings.
- (b) Remove the 2 hinge pins, 2 cushion spacers, 2 cushion support springs and 2 rear seat cushion hinges.

17. REMOVE LH REAR SEAT LOCK

Unfasten the bolt, then remove the inner belt and LH rear seat lock.

**18. REMOVE RH REAR SEAT LOCK**

- (a) Remove the screw and rear seat lock cover.
- (b) Remove the bolt, seat belt anchor and inner belt.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)
- (c) Remove the RH rear seat lock.

REASSEMBLY

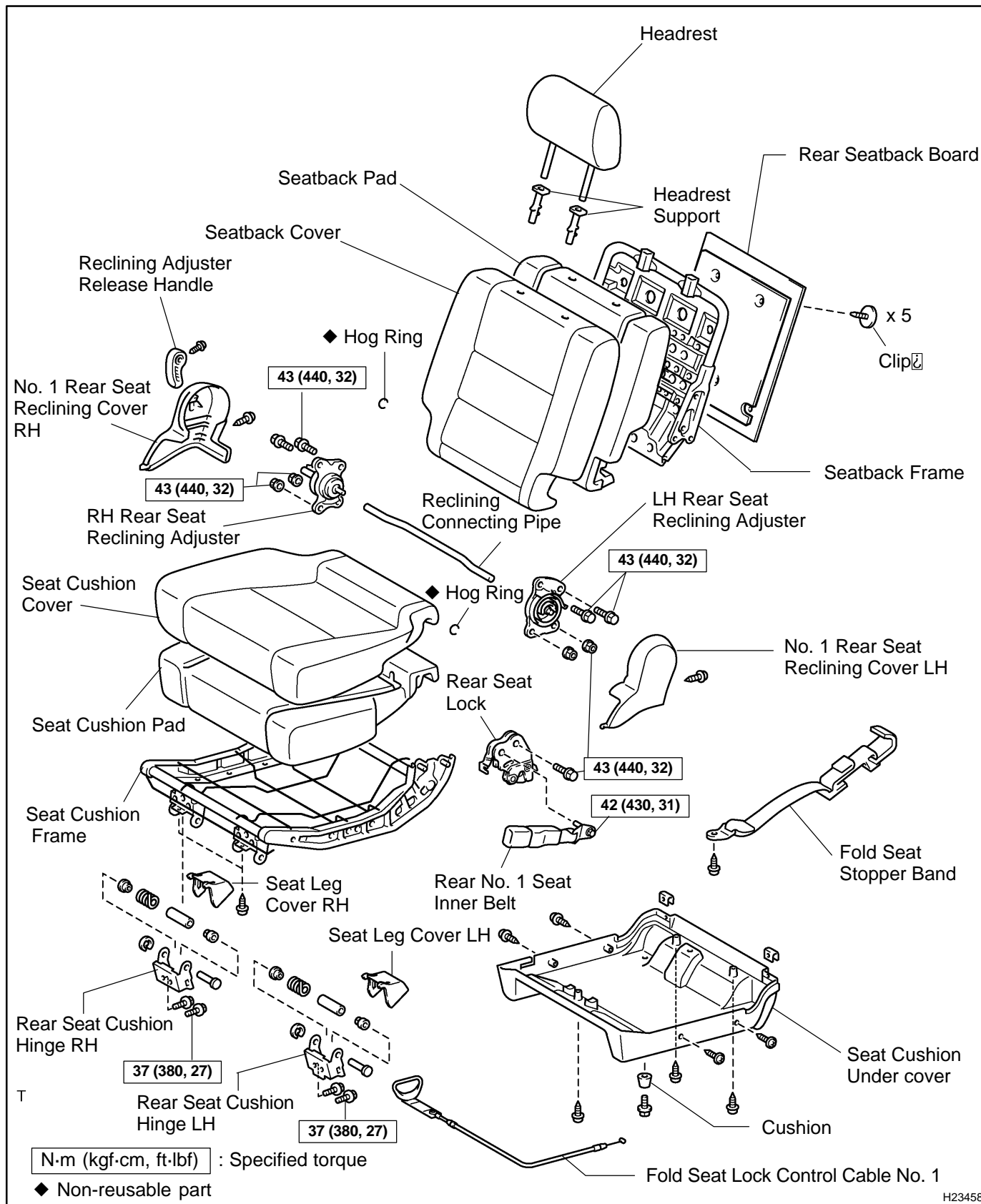
Reassembly is in the reverse order of disassembly (see page [BO-214](#)).

INSTALLATION

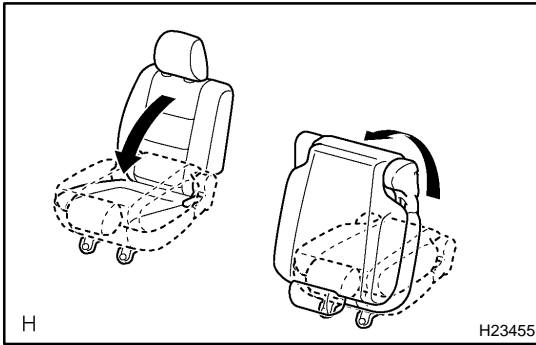
Installation is in the reverse order of removal (see page [BO-213](#)).

REAR SEAT (RH) COMPONENTS

BO4R6-03



H23458



REMOVAL

1. FOLDING REAR SEAT RH

- (a) Lower the headrest to the lowest position. Pull the seat-back angle adjusting lever and fold the seatback down.
- (b) Unlock the seat legs by pulling up one of the lever on the seat legs, and swing the seat up and forward.

2. REMOVE REAR SEAT RH

- (a) Using a screwdriver, remove the 2 seat leg covers.

HINT:

Tape the screwdriver tip before use.

- (b) Remove the 4 bolts and rear No.1 seat.

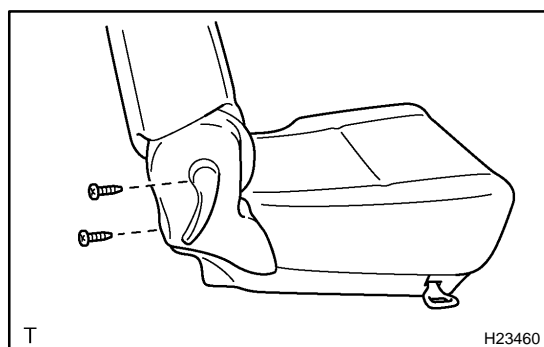
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

DISASSEMBLY**CAUTION:**

Wear safety gloves, because the sharp edges and surfaces of the seat frame may cause injury to the hands.

HINT:

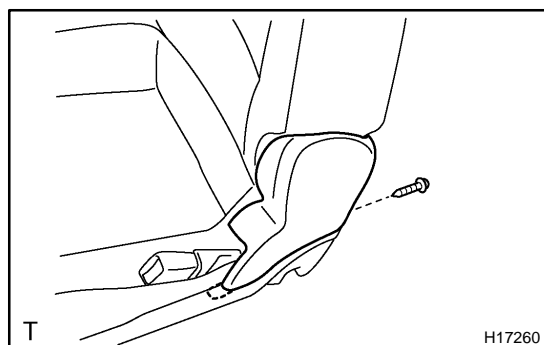
- ◆ Tape the screwdriver tip before using it to remove the parts.
- ◆ A bolt without a torque specification is shown in the standard bolt chart (see page [SS-2](#)).

1. REMOVE HEADREST**2. REMOVE RECLINING ADJUSTER RELEASE HANDLE**

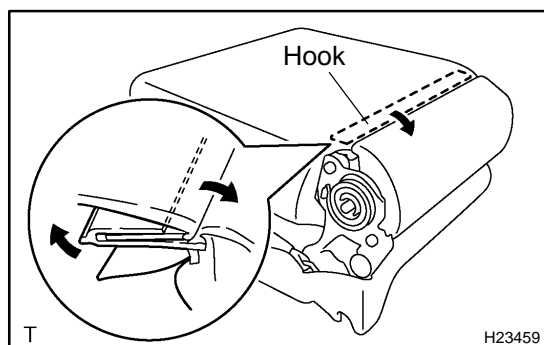
- (a) Remove the screw and release handle.

3. REMOVE NO. 1 REAR SEAT RECLINING COVER RH

- (a) Remove the screw and No. 1 rear seat reclining cover.

**4. REMOVE NO. 1 REAR SEAT RECLINING COVER LH**

- (a) Remove the screw and No. 1 rear seat reclining cover.

**5. REMOVE SEATBACK ASSEMBLY**

- (a) Tilting the seat forward.
 (b) As shown in the illustration, disengage the hook and open the seatback cover.
 (c) Remove the 4 bolts and the seatback assembly.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

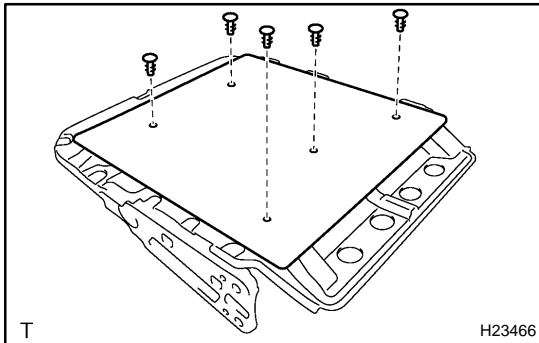
6. REMOVE SEATBACK COVER

- (a) Remove the headrest supports.
 (b) Disengage the hooks, and remove the seatback frame from the seatback cover with pad.

(c) Remove the seatback cover from the seatback pad.

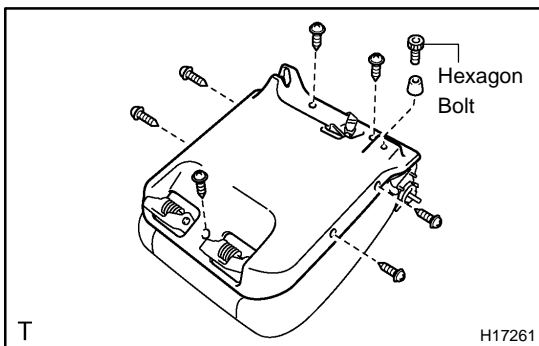
HINT:

At the time of reassembly, take as much care as possible to minimize wrinkles when installing hog rings.



7. REMOVE REAR SEATBACK BOARD

Using a clip remover, remove the 5 clips and seatback board.

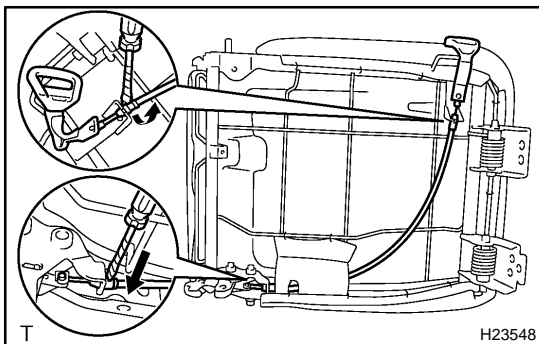


8. REMOVE REAR SEAT CUSHION UNDER COVER

(a) Using a 5 mm hexagon wrench, remove the bolt and cushion.

(b) Remove the 6 screws and rear seat cushion under cover.

(c) Remove the screw and fold seat stopper band.

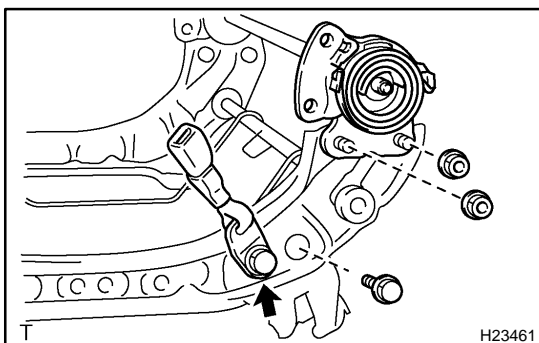


9. REMOVE FOLD SEAT LOCK CONTROL CABLE ASSY NO. 1

Using a screwdriver, remove the control cable as shown in the illustration.

HINT:

Tape the screwdriver tip before use.



10. REMOVE LH REAR SEAT RECLINING ADJUSTER AND REAR SEAT LOCK

(a) Unfasten the bolt, then remove the rear No. 1 seat inner belt.

Torque: 42 N·m (430 kgf·cm, 32 ft·lbf)

(b) Remove the bolt, 2 nuts and LH rear seat reclining adjuster with rear seat lock.

Torque:

43 N·m (440 kgf·cm, 32 ft·lbf) for bolt

43 N·m (440 kgf·cm, 32 ft·lbf) for nut

- (c) Using a screwdriver, remove the E-ring, then remove the LH rear seat reclining adjuster from the rear seat lock.

11. REMOVE RECLINING CONNECTING PIPE

12. REMOVE RH REAR SEAT RECLINING ADJUSTER

Remove the 2 nuts and RH rear seat reclining adjuster.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

13. REMOVE SEAT CUSHION COVER

- (a) Remove the seat cushion cover with pad from the seat cushion frame.
- (b) Remove the seat cushion cover from the seat cushion pad.

HINT:

At the time of reassembly, take as much care as possible to minimize wrinkles when installing hog rings.

14. REMOVE REAR SEAT CUSHION HINGE LH

- (a) Using a screwdriver, remove the E-ring.
- (b) Remove the pin, bushings, spring, collar and rear seat cushion hinge.
- (c) Remove the rear seat cushion hinge on the other side using the same procedures (a to b) described above.

INSPECTION

INSPECT RECLINING LOCK POSITION SLIPPING OFF

When reclining the seat, check that the RH and LH rear seat reclining adjusters are released at the same time.

HINT:

When the reclining lock position slips off, disassemble the seat to adjust the position.

REASSEMBLY

Reassembly is in the reverse order of disassembly (see page [BO-223](#)).

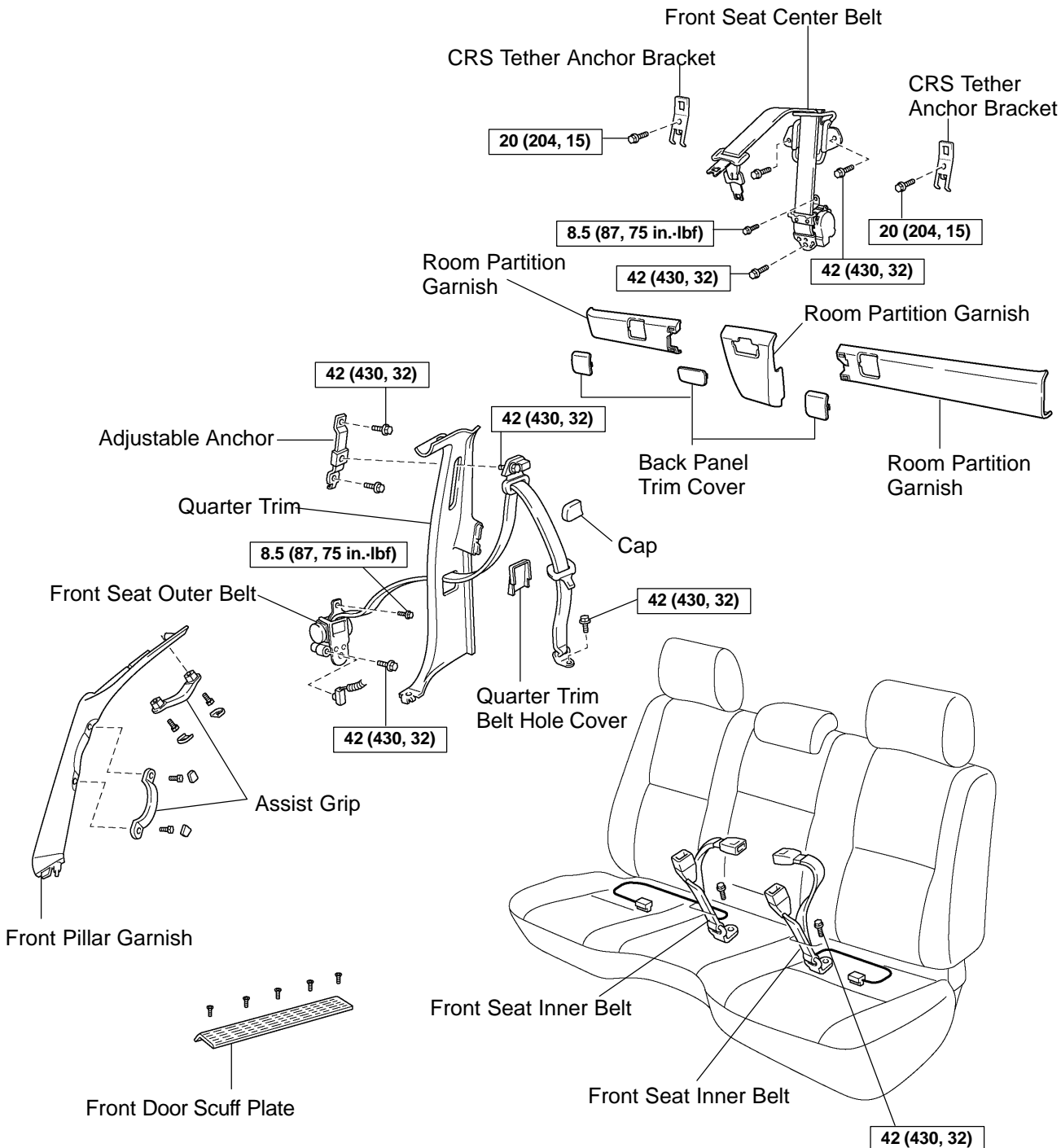
INSTALLATION

Installation is in the reverse order of removal (see page [BO-222](#)).

SEAT BELT COMPONENTS

BO4T1-03

Standard Cab



N-m (kgf-cm, ft-lbf) : Specified torque

N

H24330

INSPECTION

CAUTION:

Replace the seat belt assembly (outer belt, inner belt, bolts, nuts or sill-bar) if it has been used in a severe impact. The entire assembly should be replaced even if damage is not obvious.

1. Except manual type:

CONDUCT RUNNING TEST (IN SAFE AREA)

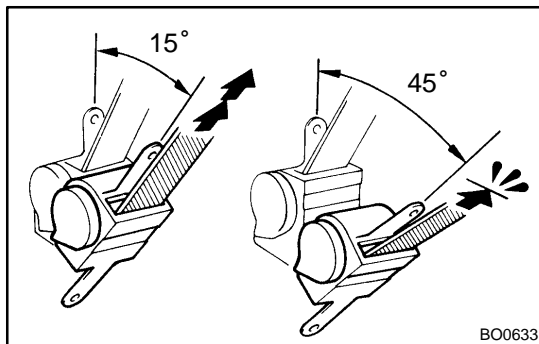
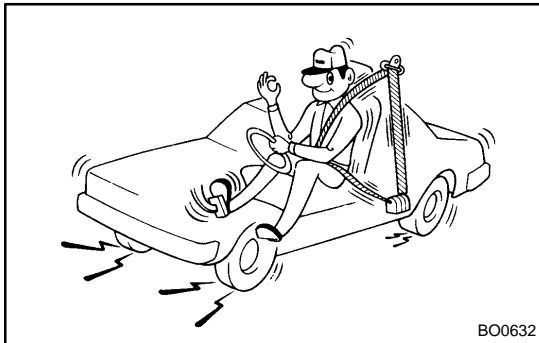
- (a) Fasten the front seat belts.
- (b) Drive the vehicle at 16 km/h (10 mph) and brake hard. Check that the belt locks and cannot be extended at this time.

HINT:

Conduct this test in a safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper operation before installation.

2. Driver seat belt (ELR): STATIC TEST

- (a) Make sure that the belt locks when pulled out quickly.
- (b) Remove the locking retractor assembly.
- (c) Tilt the retractor slowly.



- (d) Make sure that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out over 45 degrees. If a problem is found, replace the assembly.

3. Except driver seat belt (ALR/ELR): STATIC TEST

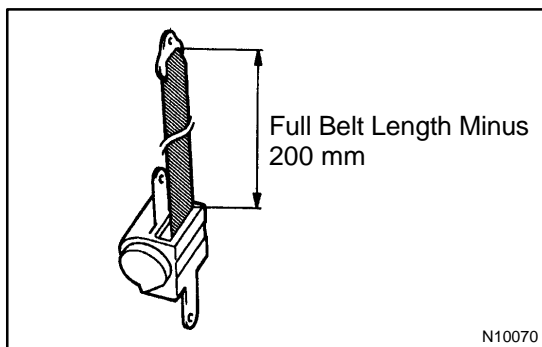
- (a) Make sure that the belt locks when pulled out quickly.
- (b) Pull out the whole belt, then retract the belt slightly and pull it out again.
- (c) Make sure that the belt cannot be extended further. If a problem is found, replace the assembly.
- (d) Remove the locking retractor assembly.

HINT:

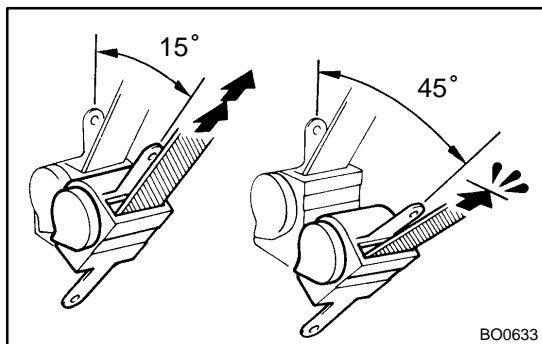
Front passenger's seat belt only:

Before removing the pretensioner connector, be sure to read the precautionary notice in the RS section.

- (e) Tilt the retractor slowly.

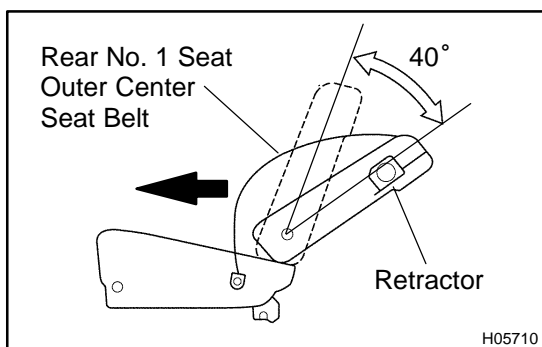


- (f) Retract the whole belt, then pull out the belt until 200 mm (7.87 in.) of belt remains retracted.
- (g) Tilt the retractor slowly.



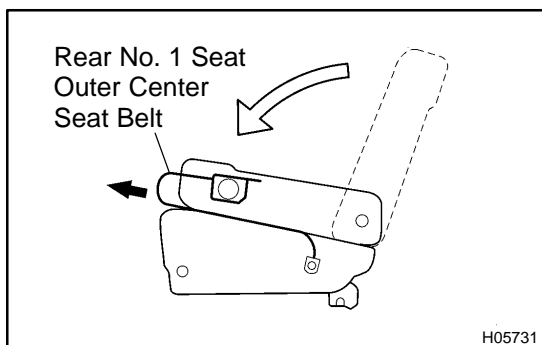
- (h) Make sure that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees.

If a problem is found, replace the assembly.



4. INSPECT REAR NO. 1 SEAT CENTER BELT

- (a) After extracting 300 mm (11.81 in.), check that the belt locks when suddenly extracted.
- (b) Check that the belt can be extracted 300 mm (11.81 in.) without being locked when the seat is reclined as shown in the illustration.
- (c) Check that the belt is locked when the belt is extracted by a certain amount under condition (a).



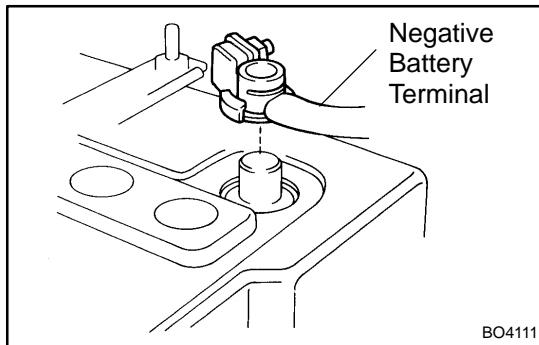
- (d) When folding down the seatback forward and extracting the seat belt slowly, check that the belt is locked after a certain length (approximately 500 mm (19.69 in.)) of the belt has been extracted.

SEAT BELT PRETENSIONER REMOVAL

BO4T3-02

NOTICE:

- ◆ If the wiring connector of the seat belt pretensioner is disconnected with the ignition switch ON, diagnostic trouble codes will be recorded.
- ◆ Never use a seat belt pretensioner from another vehicle. When replacing parts, replace them with new parts.



1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

Disconnect the cable from the negative (-) battery terminal.

NOTICE:

If the cable is disconnected from the negative battery terminal, the preset AM and FM stations stored in memory are erased. Be sure to make note of them before disconnecting the cable.

CAUTION:

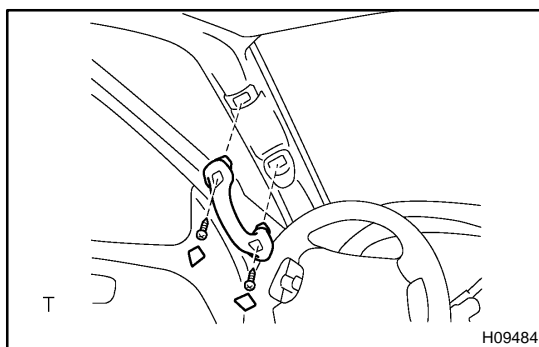
Work must be started at least 90 seconds after the ignition switch is turned to the LOCK position and the cable is disconnected from the negative (-) battery terminal.

(The SRS is equipped with a back-up power source. If work is started within 90 seconds of disconnecting the cable from the negative (-) battery terminal, the SRS may deploy.)

2. Standard cab:

REMOVE FRONT SEAT OUTER BELT

- (a) Remove the 5 screws and front door scuff plate.



- (b) Remove the front pillar garnish.

- (1) Using a screwdriver, remove the caps.

HINT:

Tape the screwdriver tip before use.

- (2) Using a torx® driver, remove the torx® screws and assist grip.

Torx® driver:

T30 (Part No. 09041-00030 or locally manufactured tool)

- (3) Using a screwdriver, remove the front pillar garnish.

HINT:

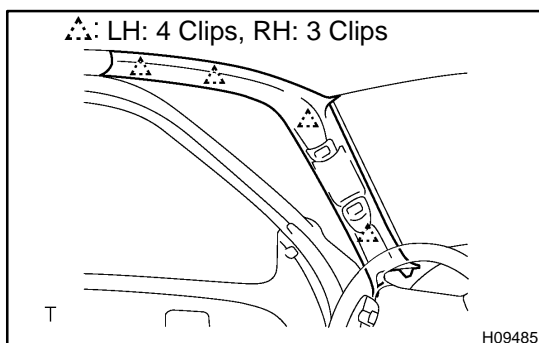
Tape the screwdriver tip before use.

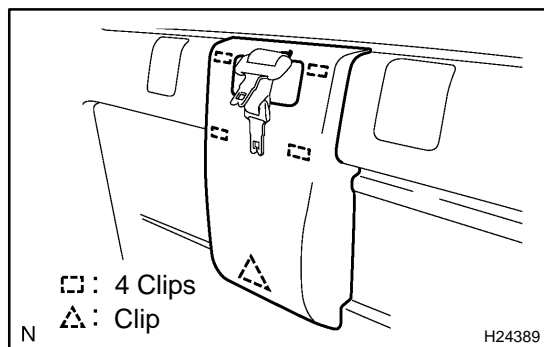
- (c) Remove the room partition garnishes.

- (1) Using a screwdriver, remove the back panel trim covers.

HINT:

Tape the screwdriver tip before use.



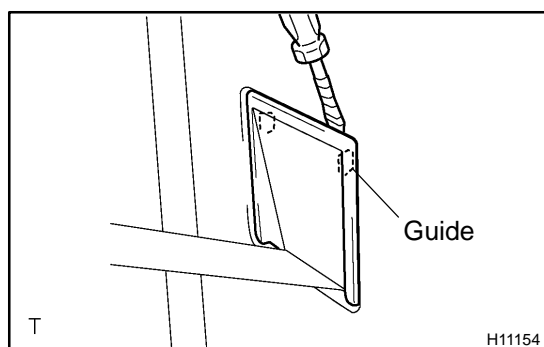
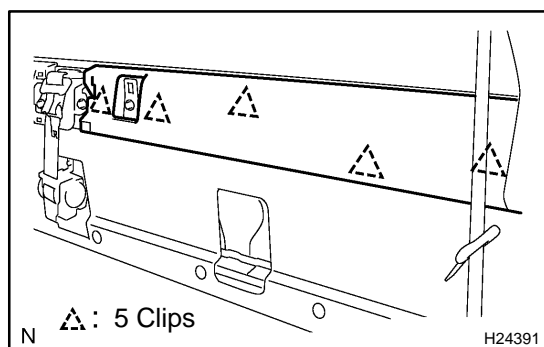
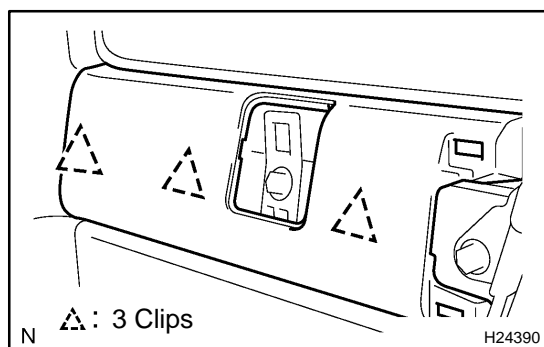


- (2) Using a screwdriver, remove the room partition garnishes.

HINT:

Tape the screwdriver tip before use.

- (d) Remove the bolt and front seat outer belt floor anchor.

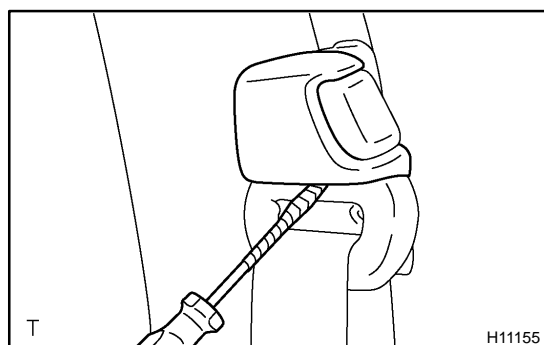


- (e) Remove the quarter trim.

- (1) Using a screwdriver, remove the quarter trim belt hole cover.

HINT:

Tape the screwdriver tip before use.

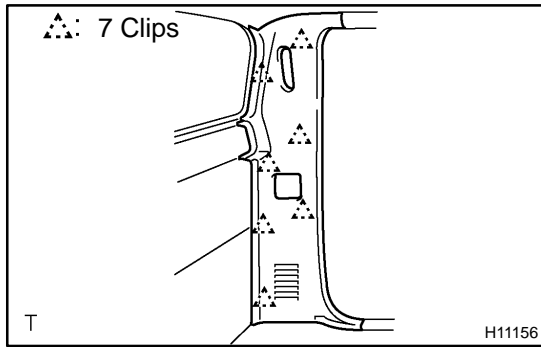


- (2) Using a screwdriver, remove the cap.

HINT:

Tape the screwdriver tip before use.

- (3) Remove the bolt and front seat outer belt shoulder anchor.



- (4) Using a screwdriver, remove the quarter trim.

HINT:

Tape the screwdriver tip before use.

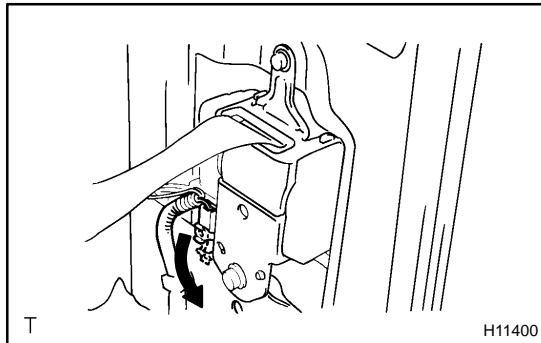
- (f) Remove the retractor of the front seat outer belt.

CAUTION:

Never disassemble the front seat outer belt.

NOTICE:

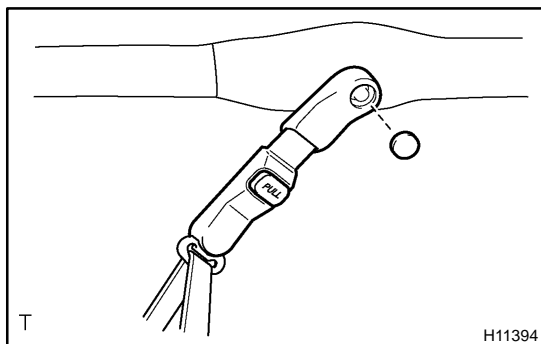
When removing the retractor of the front seat outer belt, take care not to pull the seat belt pretensioner wire harness.



- (1) Disconnect the pretensioner connector as shown in the illustration.
- (2) Remove the 2 bolts and retractor of the front seat outer belt.

3. Access cab:**REMOVE FRONT SEAT OUTER BELT**

- (a) Remove the 4 screws and front door scuff plate.
- (b) Remove the 3 screws and rear door scuff plate.
- (c) Remove the bolt and front seat outer belt floor anchor.



- (d) Remove the front seat outer belt shoulder anchor.

- (1) Using a screwdriver, remove the cap.

HINT:

Tape the screwdriver tip before use.

- (2) Remove the bolt and front seat outer belt shoulder anchor.

- (e) Remove the roof side rail garnish.

- (1) Using a screwdriver, remove the caps.

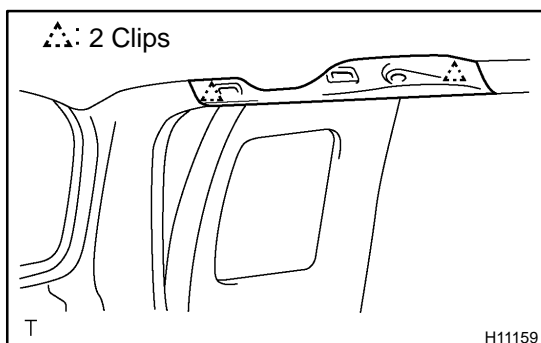
HINT:

Tape the screwdriver tip before use.

- (2) Using a torx® driver, remove the 2 torx® screws and assist grip.

Torx® driver:

T30 (Part No. 09041-00030 or locally manufactured tool)



- (3) Using a screwdriver, remove the roof side rail garnish.

HINT:

Tape the screwdriver tip before use.

- (f) Remove the front door rear scuff plate and cover.

- (1) Remove the clip and cover.

- (2) Remove the clip and front door rear scuff plate.

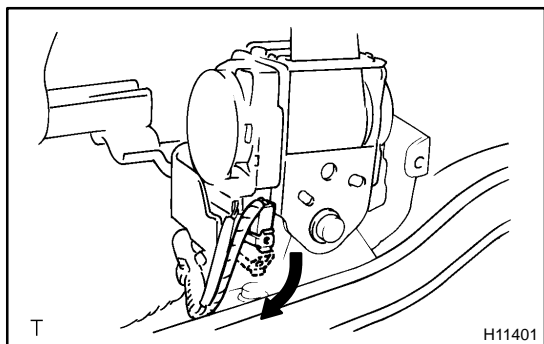
- (g) Remove the retractor of the front seat outer belt.

CAUTION:

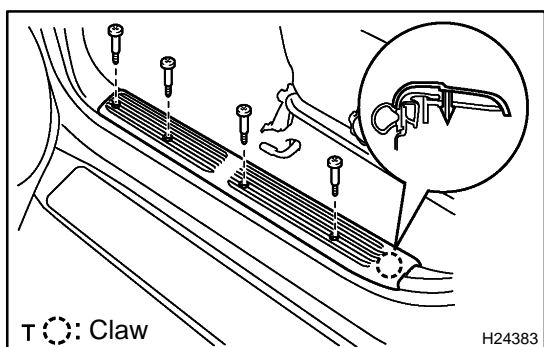
Never disassemble the front seat outer belt.

NOTICE:

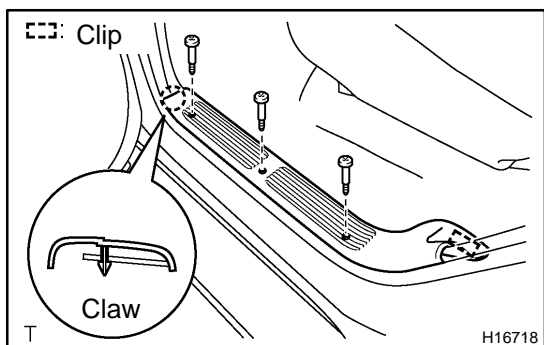
When removing the retractor of the front seat outer belt, take care not to pull the seat belt pretensioner wire harness.



- (1) Disconnect the pretensioner connector as shown in the illustration.
- (2) Remove the 2 bolts and retractor of the front seat outer belt.

**4. Double cab:****REMOVE FRONT SEAT OUTER BELT**

- (a) Remove the front door scuff plate.
 - (1) Remove the 4 screws, disengage the claw and front door scuff plate.
 - (2) Remove the front door opening trim weatherstrip.

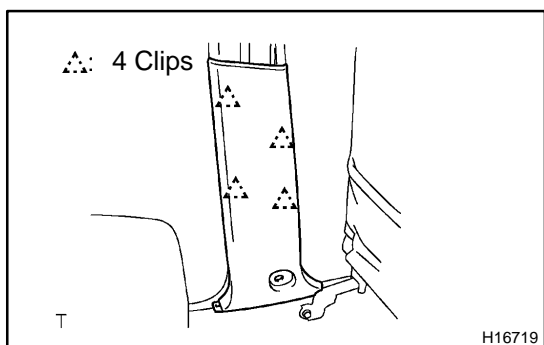


- (b) Remove the rear door scuff plate.
 - (1) Remove the 3 screws.
 - (2) Using a screwdriver, disengage the clip and remove the rear door scuff plate.

HINT:

Tape the screwdriver tip before use.

- (c) Remove the rear door opening trim weatherstrip.

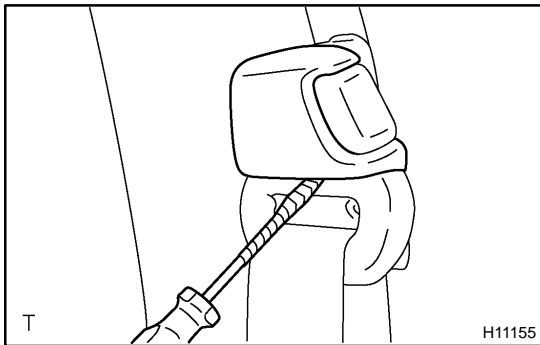


- (d) Remove the lower center pillar garnish.
 - (1) Remove the front seat outer belt floor anchor.
 - (2) Using a screwdriver, remove the lower center pillar garnish.

HINT:

Tape the screwdriver tip before use.

- (e) Remove the front seat outer belt shoulder anchor.



- (1) Using a screwdriver, remove the cap.

HINT:

Tape the screwdriver tip before use.

- (2) Remove the bolt and front seat outer belt shoulder anchor.

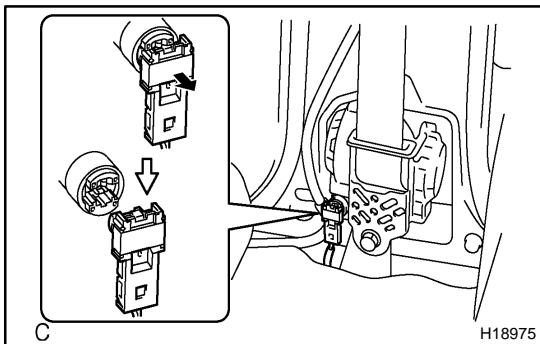
- (f) Remove the retractor of front seat outer belt.

CAUTION:

Never disassemble the front seat outer belt.

NOTICE:

When removing the retractor of front seat outer belt, take care not to pull the seat belt pretensioner wire harness.



- (1) Using a screwdriver, pull the locking button of the pretension connector to your side to release the lock.

HINT:

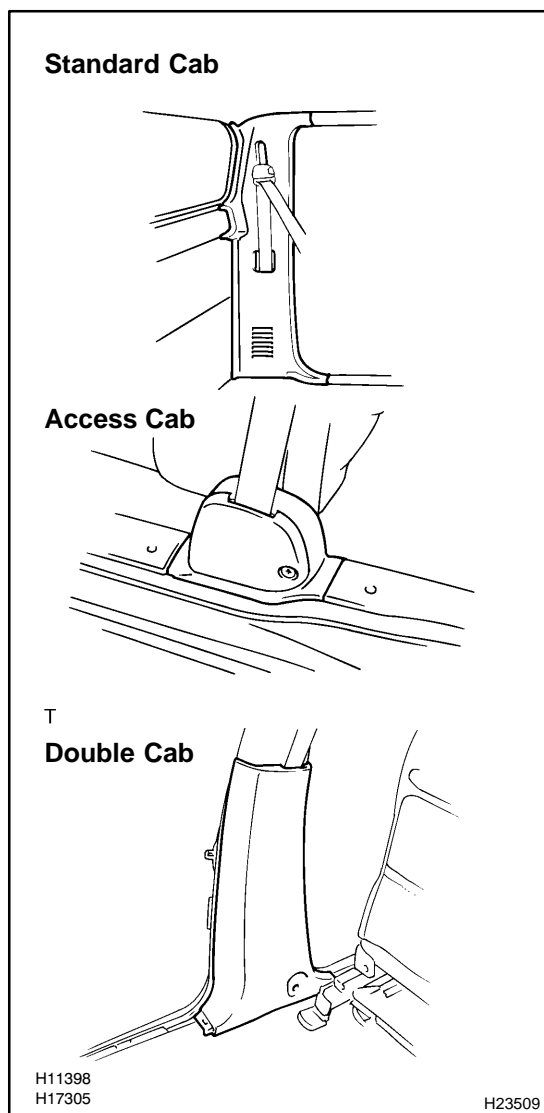
Tape the screwdriver tip before use.

- (2) Disconnect the connector.
- (3) Remove the 2 bolts and the front seat outer belt assembly.

INSPECTION

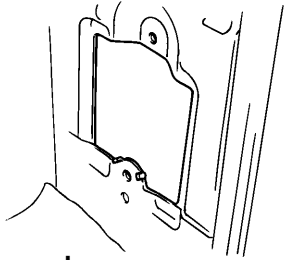
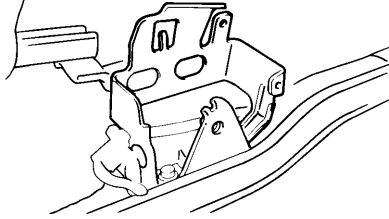
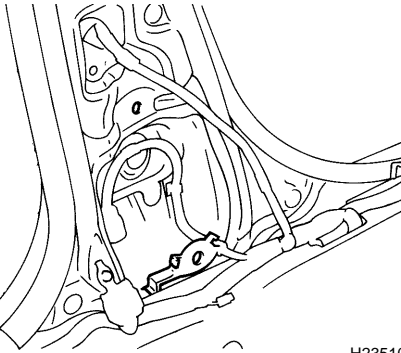
1. PRETENSIONER IS NOT ACTIVATED

(a) Perform a diagnostic system check (see page [DI-1871](#)).



(b) Perform a visual check which includes the following items with the front seat outer belt removed from the vehicle.

- ◆ **Standard cab:**
Check the quarter trim for cuts, cracks or marked discoloration.
- ◆ **Access cab:**
Check for cuts and cracks in, or marked discoloration on the front door rear scuff plate.
- ◆ **Double cab:**
Check for cuts and cracks in, or marked discoloration on the front door rear scuff plate and front door rear scuff plate and center pillar garnish lower.
- ◆ Check for cuts and cracks in wire harness, and for chipping in connectors.

Standard cab:**Access cab:****Double cab:**H11399
H04116

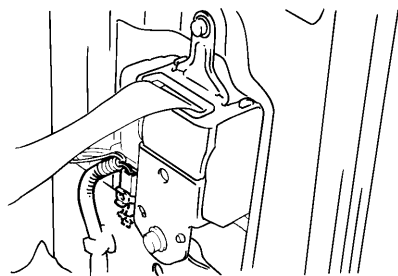
H23510

- ◆ Standard cab:
Check for deformation of the quarter panel.
- ◆ Access cab:
Check for deformation of the ELR bracket.
- ◆ Double cab:
Check for deformation of the ELR bracket.

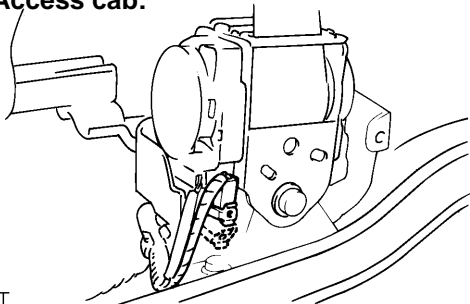
CAUTION:

For removal and installation of the front seat outer belt, see page [BO-236](#) and [BO-252](#) .

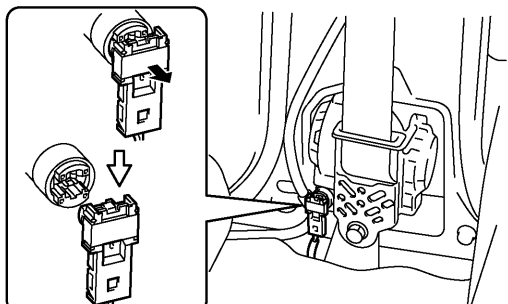
Be sure to follow the correct procedure.

Standard cab:

T

Access cab:

T

Double cab:

C H11400 H11401 H18975

H23512

- ◆ Check for cuts and miute cracks in wire harness or marked discoloration on the front seat outer belt.

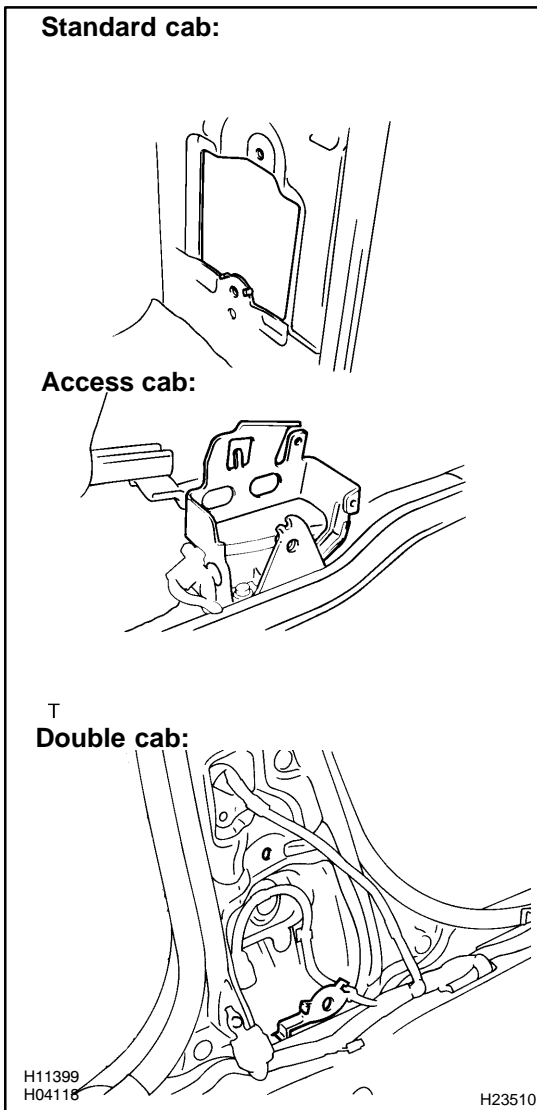
CAUTION:

For removal and installation of the front seat outer belt, see page [BO-236](#) and [BO-252](#) .

Be sure to follow the correct procedure.

2. PRETENSIONER IS ACTIVATED

- (a) Perform a diagnostic system check (see page [DI-1871](#)).



- (b) Perform a visual check which includes the following items with the front seat outer belt removed from the vehicle.
- ◆ Standard cab:
Check for deformation of the quarter panel.
 - ◆ Access cab:
Check for deformation of the ELR bracket.
 - ◆ Check for damage on the connector and wire harness.

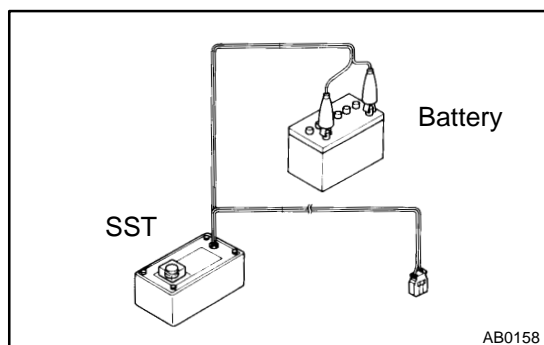
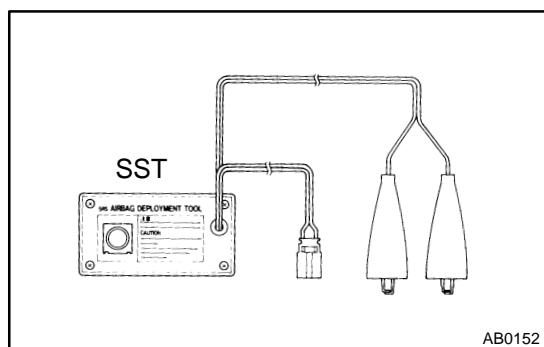
DISPOSAL

HINT:

When scrapping vehicles equipped with a seat belt pretensioner or disposing of a front seat outer belt (with seat belt pretensioner), always first activate the seat belt pretensioner in accordance with the procedure described below. If any abnormality occurs in the seat belt pretensioner operation, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC. When disposing of a front seat outer belt (with seat belt pretensioner) activated in a collision, follow the same procedure given in step 1-(h) in "DISPOSAL".

CAUTION:

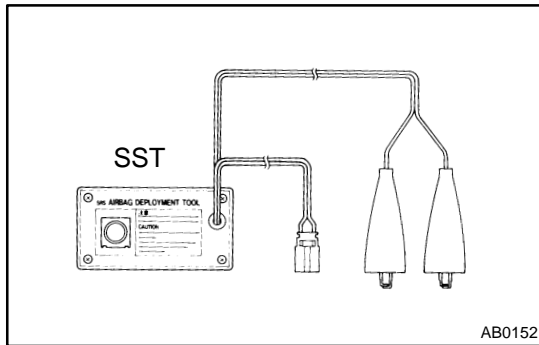
- ◆ Never dispose of a front seat outer belt which has an inactivated pretensioner.
- ◆ The seat belt pretensioner produces a sizeable exploding sound when it activates, so perform the operation out-of-door and where it will not create a nuisance to nearby residents.
- ◆ When activating the seat belt pretensioner, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.
SST 09082-00700, 09082-00740
- ◆ When activating a front seat outer belt (with seat belt pretensioner), perform the operation at least 10 m (33 ft) away from the front seat outer belt.
- ◆ Use gloves and safety glasses when handling a front seat outer belt with activated pretensioner.
- ◆ Always wash your hands with water after completing the operation.
- ◆ Do not apply water to a front seat outer belt with activated pretensioner.



1. SEAT BELT PRETENSIONER ACTIVATION WHEN SCRAPPING VEHICLE

HINT:

Have a battery ready as the power source to activate the seat belt pretensioner.

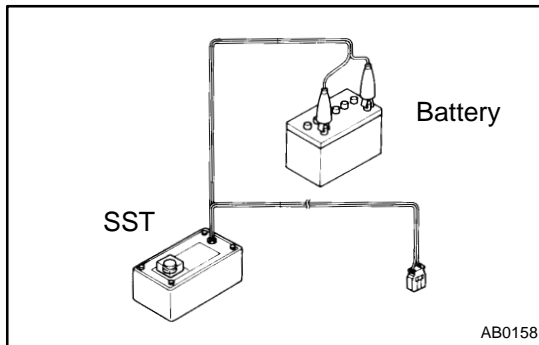


(a) Check the functioning of SST.

CAUTION:

When activating the seat belt pretensioner, always use the specified SST (SRS Airbag Deployment Tool.)

SST 09082-00700, 09082-00740

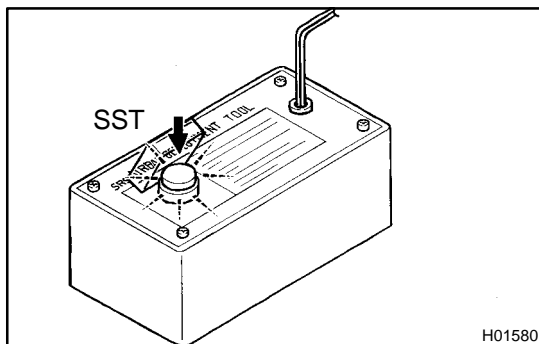


(1) Connect the SST to the battery.

Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (-) terminal.

HINT:

Do not connect the yellow connector which will be connected with the seat belt pretensioner.



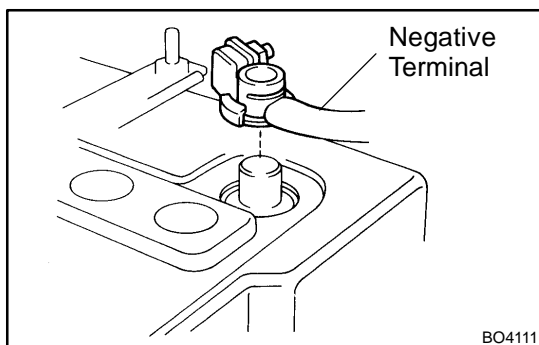
(2) Check the functioning of the SST.

Press the SST activation switch, and check that the LED of the SST activation switch lights up.

CAUTION:

If the LED lights up when the activation switch is not being pressed, SST may be malfunctioning. Definitely do not use the SST.

(3) Disconnect the SST from the battery.



(b) Disconnect the negative (-) terminal cable from the battery.

CAUTION:

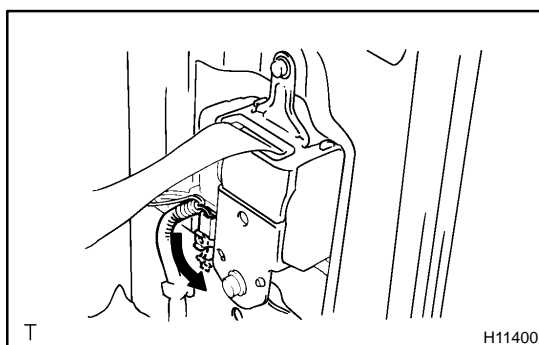
Work must be started at least 90 seconds after the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery.

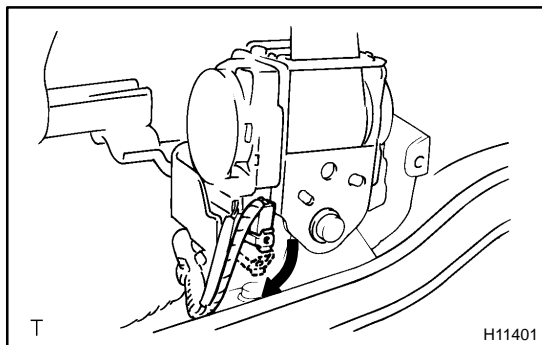
(The SRS is equipped with a back-up power source. If work is started within 90 seconds of disconnecting the negative (-) terminal cable from the battery, the SRS may deploy.)

(c) Standard cab:

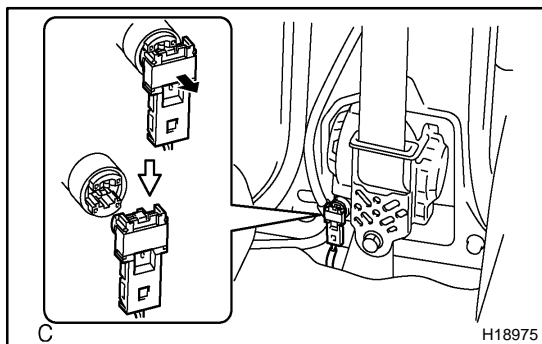
Disconnect the pretensioner connector.

- (1) Remove the front door scuff plate.
- (2) Remove the front pillar garnish.
- (3) Remove the back panel upper garnish.
- (4) Remove the front seat outer belt floor anchor.
- (5) Remove the quarter trim.
- (6) Disconnect the pretensioner connector as shown in the illustration.

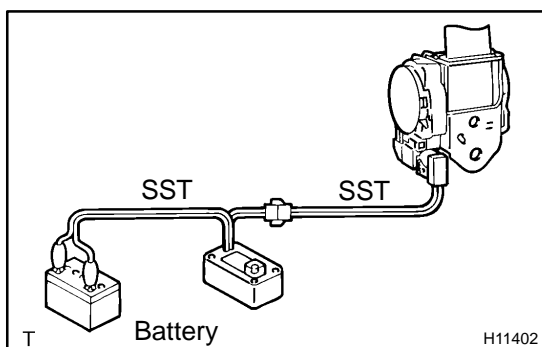




- (d) Access cab:
Disconnect the pretensioner connector.
- (1) Remove the front door scuff plate.
 - (2) Remove the rear door scuff plate.
 - (3) Remove the front seat outer belt floor anchor.
 - (4) Remove the front seat outer belt shoulder belt.
 - (5) Remove the roof side rail garnish.
 - (6) Remove the front door rear scuff plate and cover.
 - (7) Disconnect the pretensioner connector as shown in the illustration.



- (e) Double cab:
Disconnect the pretensioner connector.
- (1) Remove the front door scuff plate.
 - (2) Remove the back door scuff plate.
 - (3) Remove the lower center pillar garnish.
 - (4) Disconnect the pretensioner connector as shown in the illustration.



- (f) Install the SST.
- (1) Buckle the front seat belt and check that there is no looseness and slack in the front seat inner belt and front seat outer belt.
 - (2) Connect the 2 SST, then connect them to the seat belt pretensioner.

SST 09082-00700, 09082-00740

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.

- (3) Move the SST to at least 10 m (33 ft) away from the front of the vehicle.
- (4) Close all the doors and windows of the vehicle.

HINT:

Do not close the window fully. Allow clearance for inserting the SST wire harness.

NOTICE:

Take care not to damage the SST wire harness.

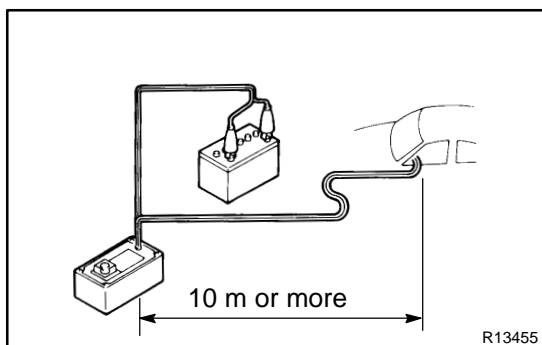
- (5) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (-) terminal.

- (g) Activate the seat belt pretensioner.

- (1) Confirm that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle.
- (2) Press the SST activation switch and activate the seat belt pretensioner.

HINT:

The seat belt pretensioner operates simultaneously as the LED of the SST activation switch lights up.



- (h) Dispose of the front seat outer belt (with seat belt pretensioner).

CAUTION:

- ◆ The front seat outer belt is very hot when the seat belt pretensioner is activated. Leave it alone for at least 30 minutes after activation.
- ◆ Use gloves and safety glasses when handling a front seat outer belt with activated seat belt pretensioner.
- ◆ Always wash your hands with water after completing the operation.
- ◆ Do not apply water to a front seat outer belt with activated seat belt pretensioner.

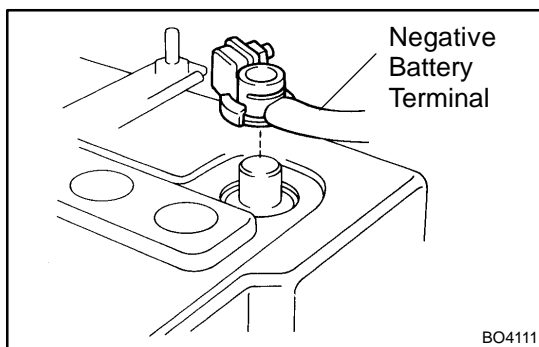
HINT:

When scrapping a vehicle, activate the seat belt pretensioner and scrap the vehicle with activated front seat outer belt still installed.

2. ACTIVATION WHEN DISPOSING OF FRONT SEAT OUTER BELT ONLY

NOTICE:

- ◆ When disposing of the front seat outer belt (with seat belt pretensioner) only, never use the customer's vehicle to activate the seat belt pretensioner.
- ◆ Be sure to follow the procedure given on the next page when activating the seat belt pretensioner.



- (a) Disconnected the negative (-) terminal cable from the battery.

HINT:

Have a battery ready as the power source when activating the seat belt pretensioner.

NOTICE:

If the cable is disconnected from the negative battery terminal, the preset AM and FM stations stored in memory are erased. Be sure to make note of them before disconnecting the cable.

CAUTION:

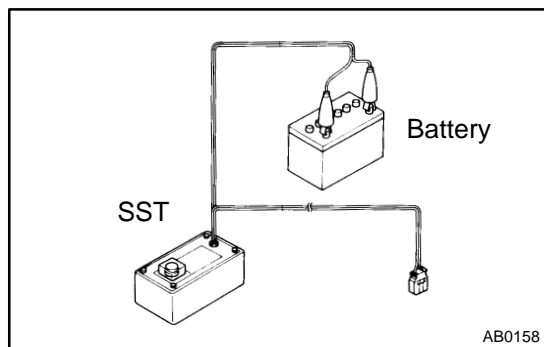
Work must be started at least 90 seconds after the ignition switch is turned to the LOCK position and the cable is disconnected from the negative (-) battery terminal.

(The SRS is equipped with a back-up power source. If work is started within 90 seconds of disconnecting the cable from the negative (-) battery terminal, the SRS may deploy.)

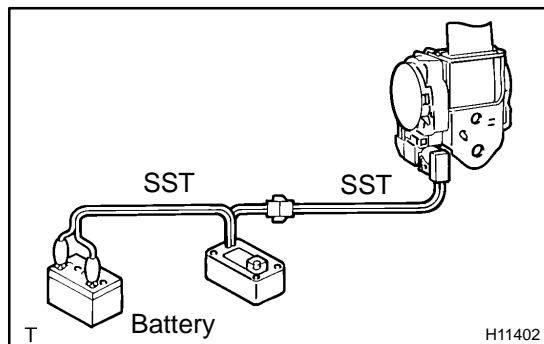
- (b) Remove the front seat outer belt (see page [BO-229](#)).

HINT:

Cut the belt near the seat belt retractor.



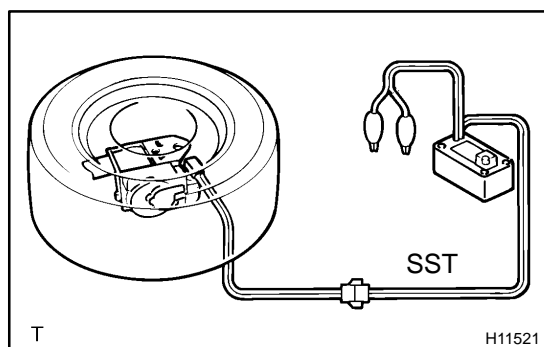
- (c) Check the functioning of SST (see step 1-(a)).
SST 09082-00700, 09082-00740
(1) Disconnect the SST from the battery.



- (d) Install the SST.
(1) Connect the 2 SST, then connect them to the seat belt pretensioner.
SST 09082-00700, 09082-00740

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.



- (2) Place the front seat outer belt on the ground and cover it with the disc wheel with tire.

NOTICE:

Place the front seat outer belt as shown in the illustration.

- (3) Move the SST at least 10 m (33 ft) away from the disc wheel.

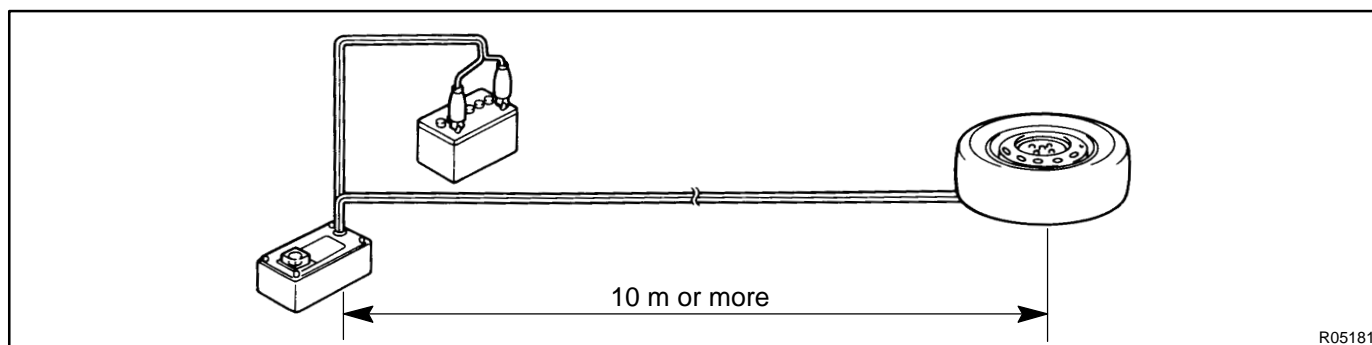
NOTICE:

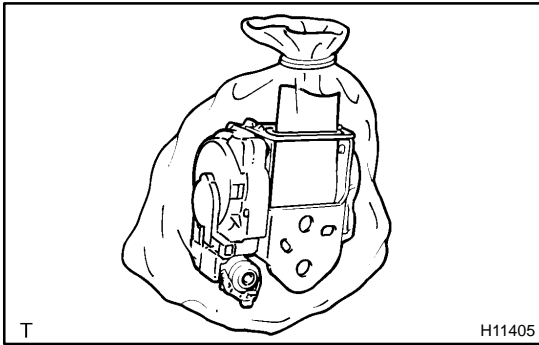
Take care not to damage the SST wire harness.

- (e) Activate the seat belt pretensioner.
(1) Connect the SST red clip to the battery positive (+) terminal and black clip to the battery negative (-) terminal.
(2) Check that no one is within 10 m (33 ft) area around the disc wheel.
(3) Press the SST activation switch and activate the seat belt pretensioner.

HINT:

The seat belt pretensioner operates simultaneously as the LED of the SST activation switch lights up.





- (f) Dispose of the front seat outer belt (with seat belt pretensioner).

CAUTION:

- ◆ **The front seat outer belt is very hot when the seat belt pretensioner is activated. Leave it alone for at least 30 minutes after activation.**
- ◆ **Use gloves and safety glasses when handling a front seat outer belt with activated seat belt pretensioner.**
- ◆ **Always wash your hands with water after completing the operation.**
- ◆ **Do not apply water to a front seat outer belt with activated seat belt pretensioner.**
 - (1) Remove the disc wheel and SST.
 - (2) Place the front seat outer belt in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts.

REPLACEMENT

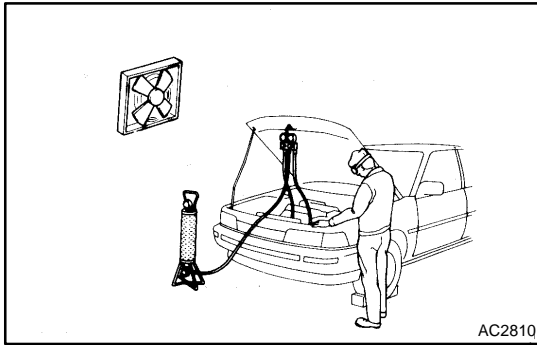
REQUIREMENTS FOR REPLACEMENT

In the following cases, replace the seat belt pretensioner.

- ◆ The seat belt pretensioner has been activated.
- ◆ The seat belt pretensioner has been found to be faulty during troubleshooting.
- ◆ The front seat outer belt has been found to be faulty while checking items 1-(b) or 2-(b) (see page [BO-241](#)).
- ◆ The front seat outer belt has been dropped.

CAUTION:

For removal and installation of the seat belt pretensioner, see pages [BO-236](#) and [BO-252](#) . Be sure to follow the correct procedure.

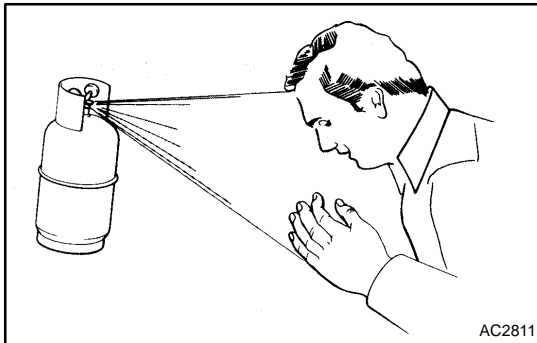


AC2810

AIR CONDITIONING SYSTEM PRECAUTION

AC001-14

1. **DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR NEAR AN OPEN FLAME**
2. **ALWAYS WEAR EYE PROTECTION**



AC2811

3. **BE CAREFUL NOT TO GET LIQUID REFRIGERANT IN YOUR EYES OR ON YOUR SKIN**

If liquid refrigerant gets in your eyes or on your skin.

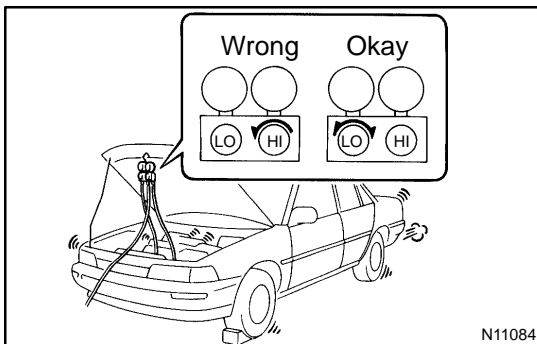
- (a) Wash the area with lots of cool water.

CAUTION:

Do not rub your eyes or skin.

- (b) Apply clean petroleum jelly to the skin.
- (c) Go immediately to a physician or hospital for professional treatment.

4. **NEVER HEAT CONTAINER OR EXPOSE IT TO OPEN FLAME**
5. **BE CAREFUL NOT TO DROP CONTAINER OR NOT TO APPLY PHYSICAL SHOCKS TO IT**



N11084

6. **DO NOT OPERATE COMPRESSOR WITHOUT ENOUGH REFRIGERANT IN REFRIGERATION SYSTEM**

If there is not enough refrigerant in the refrigerant system, oil lubrication will be insufficient and compressor burnout may occur. Necessary care should be taken to avoid this.

7. **DO NOT OPEN PRESSURE MANIFOLD VALVE WHILE COMPRESSOR IS OPERATING**

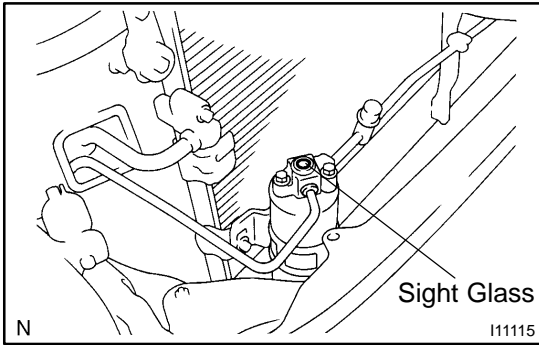
If the high pressure valve is opened, refrigerant flows in the reverse direction and could cause the charging cylinder to rupture, so open and close only the low pressure valve.

8. **BE CAREFUL NOT TO OVERCHARGE SYSTEM WITH REFRIGERANT**

If refrigerant is overcharged, it causes problems such as insufficient cooling, poor fuel economy, engine overheating, etc.

9. SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

The TOYOTA TUNDRA is equipped with an SRS (Supplemental Restraint System) such as the driver and front passenger airbags. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.



ON-VEHICLE INSPECTION

1. Access cab, Standard cab: INSPECT REFRIGERANT VOLUME

Observe the sight glass on the liquid tube.

Test conditions:

- ◆ Running engine at 1,500 rpm
- ◆ Blower speed control switch at "HI" position
- ◆ A/C switch ON
- ◆ Temperature control dial at "COOL" position
- ◆ Fully open the doors

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles are present in sight glass	Insufficient*	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Add refrigerant until bubbles disappear
2	No bubbles are present in sight glass	None, sufficient or too much	Refer to items 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Add refrigerant until bubbles disappear
4	Temperature between compressor inlet and outlet is noticeably different	Correct or too much	Refer to items 5 and 6
5	Immediately after air conditioning is turned off, refrigerant in sight glass stays clear	Too much	(1) Discharge refrigerant (2) Evacuate air and charge proper amount of purified refrigerant
6	When air conditioning is turned off, refrigerant foams and then stays clear	Correct	-

*: Bubbles in the sight glass with ambient temperature higher than usual can be considered normal if cooling is sufficient.

HINT:

Double cab models do not have a sight glass. When inspecting, use a manifold gauge set.

2. INSPECT REFRIGERANT PRESSURE WITH MANIFOLD GAUGE SET

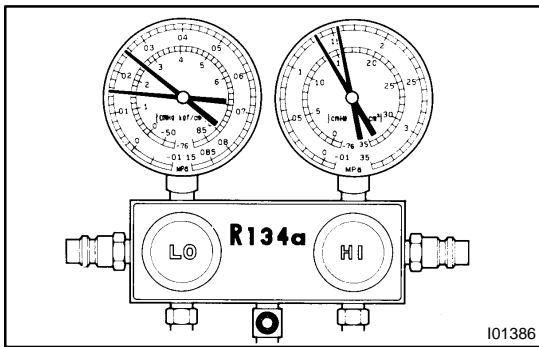
This is a method for checking the A/C system by using a manifold gauge set. Read the manifold gauge pressure when the following conditions are established.

Test conditions:

- ◆ Temperature at the air inlet with the switch set at RECURC is 30 to 35°C (86 to 95°F)
- ◆ Engine running at 1500 rpm
- ◆ Blower speed control switch at "HI" position
- ◆ Temperature control dial at "COOL" position

HINT:

Gauge indications may vary slightly due to ambient temperature conditions.



(1) Normally functioning refrigeration system.

Gauge reading:

Low pressure side:

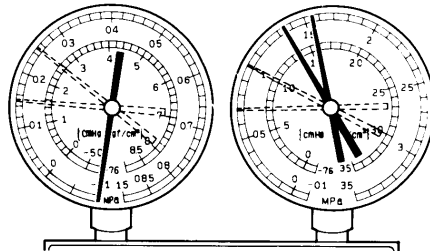
0.15 to 0.25 MPa (1.5 to 2.5 kgf/cm²)

High pressure side:

1.37 to 1.57 MPa (14 to 16 kgf/cm²)

(2) Moisture present in refrigeration system.

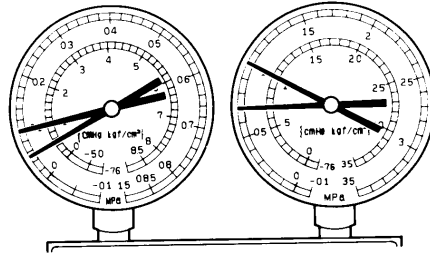
Condition : Periodically cools and then fails to cool



Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
During operation, pressure on low pressure side cycles between vacuum and normal	Moisture in refrigeration system freezes at expansion valve orifice and temporarily stops cycle, but normal state is restored after the ice melts	<ul style="list-style-type: none"> ◆Drier in oversaturated state ◆Moisture in refrigeration system freezes at expansion valve orifice and blocks circulation of refrigerant 	<ul style="list-style-type: none"> (1) Replace receiver (2) Remove moisture in cycle by repeatedly evacuating air (3) Charge proper amount of new refrigerant

(3) Insufficient cooling

Condition: Insufficient cooling

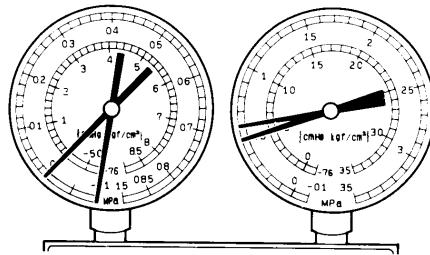


I01388

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> ◆ Pressure low on both low and high pressure sides ◆ Bubbles seen in sight glass continuously ◆ Insufficient cooling performance 	Gas leakage in refrigeration system	<ul style="list-style-type: none"> ◆ Insufficient refrigerant in system ◆ Refrigerant leaking 	<ol style="list-style-type: none"> (1) Check for gas leakage with gas leak detector and repair if necessary (2) Charge proper amount of refrigerant (3) If indicated pressure value is near 0 when connected to gauge, create the vacuum after inspecting and repairing the location of the leak

(4) Poor circulation of refrigerant

Condition: Insufficient cooling

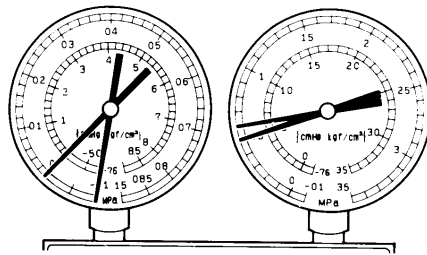


I01389

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> ◆ Pressure low on both low and high pressure sides ◆ Frost on tube from receiver to unit 	Refrigerant flow obstructed by dirt in receiver	Receiver clogged	Replace receiver

(5) Refrigerant does not circulate

Condition: Does not cool (Cools from time to time in some cases)

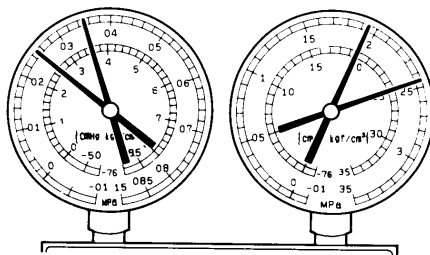


I01449

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> ◆ Vacuum indicated on low pressure side, very low pressure indicated on high pressure side ◆ Frost or dew seen on piping on both sides of receiver/drier or expansion valve 	<ul style="list-style-type: none"> ◆ Refrigerant flow obstructed by moisture or dirt in refrigeration system ◆ Refrigerant flow obstructed by gas leakage from expansion valve 	Refrigerant does not circulate	<ol style="list-style-type: none"> (1) Check expansion valve (2) Clean out dirt in expansion valve by blowing with air (3) Replace receiver (4) Evacuate air and charge new refrigerant to proper amount (5) For gas leakage from expansion valve, replace expansion valve

(6) Refrigerant overcharged or insufficient cooling of condenser

Condition: Insufficient cooling

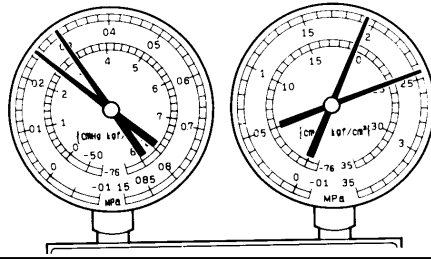


I01390

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> ◆ Pressure too high on both low and high pressure sides ◆ No air bubbles seen through the sight glass even when the engine rpm is lowered 	<ul style="list-style-type: none"> ◆ Unable to develop sufficient performance due to excessive refrigerant ◆ Insufficient cooling of condenser 	<ul style="list-style-type: none"> ◆ Excessive refrigerant in cycle → refrigerant overcharged ◆ Condenser cooling insufficient → condenser fins clogged or cooling fan faulty 	<ol style="list-style-type: none"> (1) Clean condenser (2) Check cooling fan with fluid coupling operation (3) If (1) and (2) are in normal state, check amount of refrigerant and charge proper amount of refrigerant

(7) Air present in refrigeration system

Condition: Insufficient cooling



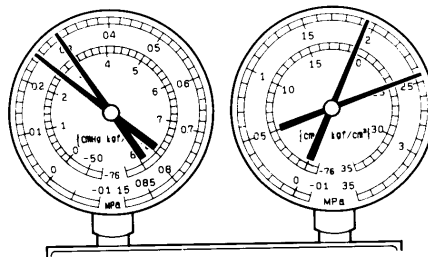
NOTE : These gauge indications are shown when the refrigeration system has been opened and the refrigerant has been charged without vacuum purging.

I01392

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> ◆Pressure too high on both low and high pressure sides ◆The low pressure piping hot to the touch ◆Bubbles seen in sight glass 	Air in refrigeration system	<ul style="list-style-type: none"> ◆Air present in refrigeration system ◆Insufficient vacuum purging 	<ul style="list-style-type: none"> (1) Check compressor oil to see if it is dirty or insufficient (2) Evacuate air and charge new refrigerant

(8) Expansion valve malfunction

Condition: Insufficient cooling

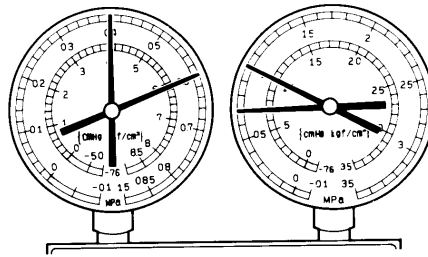


I01450

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> ◆Pressure too high on both low and high pressure sides ◆Frost or large amount of dew on piping on low pressure side 	Trouble in expansion valve	<ul style="list-style-type: none"> ◆Excessive refrigerant in low pressure piping ◆Expansion valve opened too wide 	<ul style="list-style-type: none"> Check expansion valve Replace if defective

(9) Insufficient compressor compression

Condition : Does not cool



I01393

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> ◆ Pressure too high on both low and high pressure sides ◆ Pressure too low on high pressure side 	Internal leak in compressor	<ul style="list-style-type: none"> ◆ Low compression ◆ Leak from valve or broken sliding parts 	Repair or replace compressor

3. INSPECT IDLE-UP SPEED

- (a) Warm up the engine.
- (b) Inspect idle-up speed when the following conditions are established.
 - ◆ Warm up engine
 - ◆ Blower speed control switch at "HI" position
 - ◆ A/C switch ON
 - ◆ Temperature control dial at "COOL" position

Magnetic clutch condition	Idle-up speed
1GR-FE Engine	-
Magnetic clutch not engaged	700 ± 50 rpm
Magnetic clutch engaged	700 ± 50 rpm
2UZ-FE Engine	-
Magnetic clutch not engaged	750 ± 50 rpm
Magnetic clutch engaged	800 ± 50 rpm

If idle speed is not as specified, check the Idle control system.

4. INSPECT FOR LEAKAGE OF REFRIGERANT

- (a) Perform under the following conditions:
 - ◆ Stop the engine.
 - ◆ Secure good ventilation (If not, the gas leak detector may react to volatile gases which are not refrigerant, such as evaporated gasoline and exhaust gas.)
 - ◆ Repeat the test 2 or 3 times.
 - ◆ Make sure that there is some refrigerant remaining in the refrigeration system.
- When the compressor is OFF: approx. 392 to 588 kPa (4 to 6 kgf/cm², 57 to 85 psi)

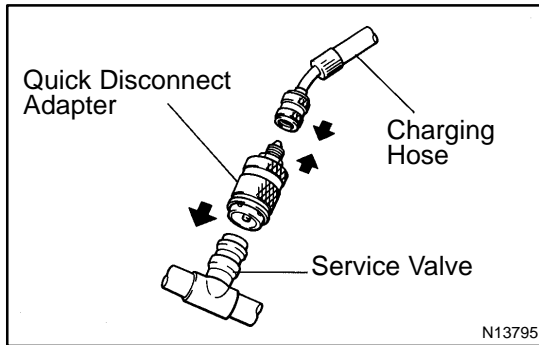
- (b) Bring the gas leak detector close to the drain hose before performing the test.

HINT:

- ◆ After the blower motor stopped, leave the cooling unit for more than 15 minutes.
- ◆ Bring the gas leak detector sensor under the drain hose.
- ◆ When bringing the gas leak detector close to the drain hose, make sure that the gas leak detector does not react to the volatile gases.

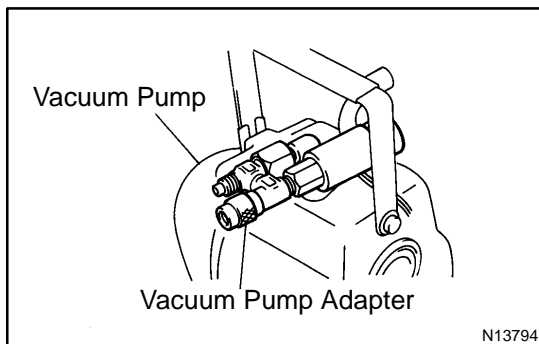
If such reaction is unavoidable, the vehicle must be lifted up.

- (c) If gas leak is not detected on the drain hose, remove the blower motor linear controller from the cooling unit. Then insert the gas leak detector sensor into the unit and perform the test.
- (d) Disconnect the connector and leave the pressure switch for approx. 20 minutes. Then bring the gas leak detector close to the pressure switch and perform the test.
- (e) Bring the gas leak detector close to the refrigerant lines and perform the test.

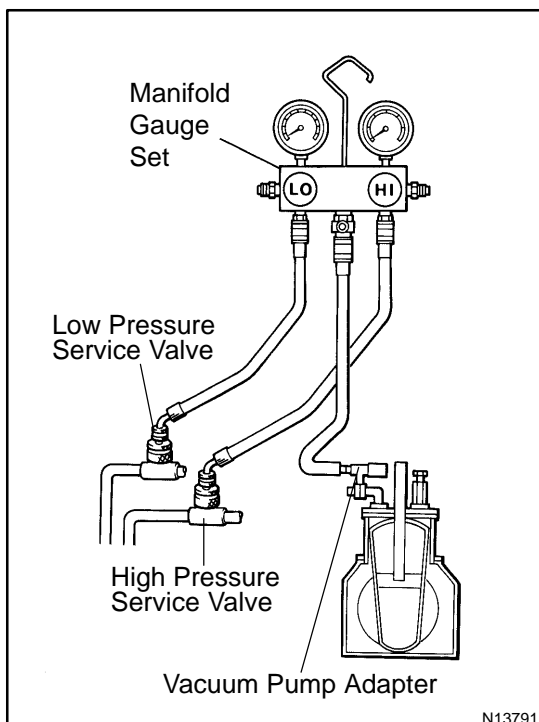


EVACUATING

1. **CONNECT QUICK DISCONNECT ADAPTER TO CHARGING HOSES**
2. **REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINES**
3. **SET MANIFOLD GAUGE SET**
 - (a) Close both valves of the manifold gauge set.
 - (b) Connect the quick disconnect adapters to the service valves.



4. **EVACUATE AIR FROM REFRIGERATION SYSTEM**
 - (a) Connect the vacuum pump adapter to the vacuum pump.

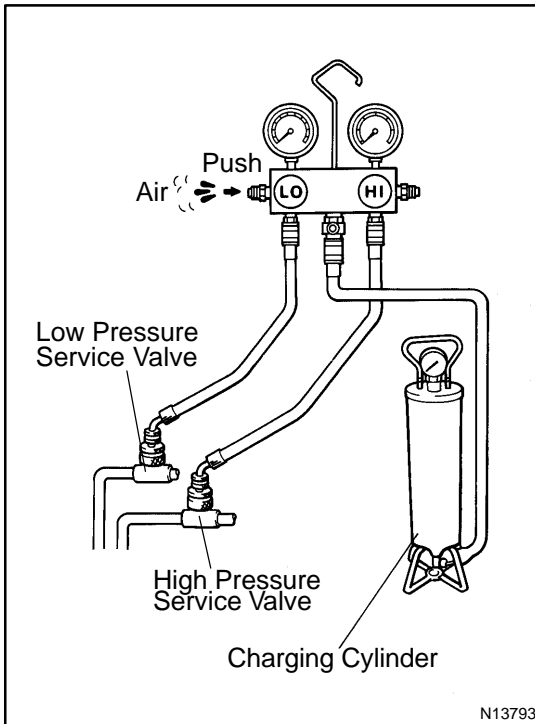


- (b) Connect the center hose of the manifold gauge set to the vacuum pump adapter.
- (c) Open both the high and low side valves and run the vacuum pump.
- (d) After 10 minutes or more, check that the low pressure gauge indicates 750 mmHg (30 in. Hg) or more.

HINT:

If the reading is 750 mmHg (30 in. Hg) or more, close both valves of the manifold gauge set and stop the vacuum pump. Check the system for leaks and repair if necessary.

- (e) Close both the high and low side valves and stop the vacuum pump.
- (f) Leave the system in this condition for 5 minutes or more and check that there is no change in gauge indication.



CHARGING

1. INSTALL CHARGING CYLINDER

HINT:

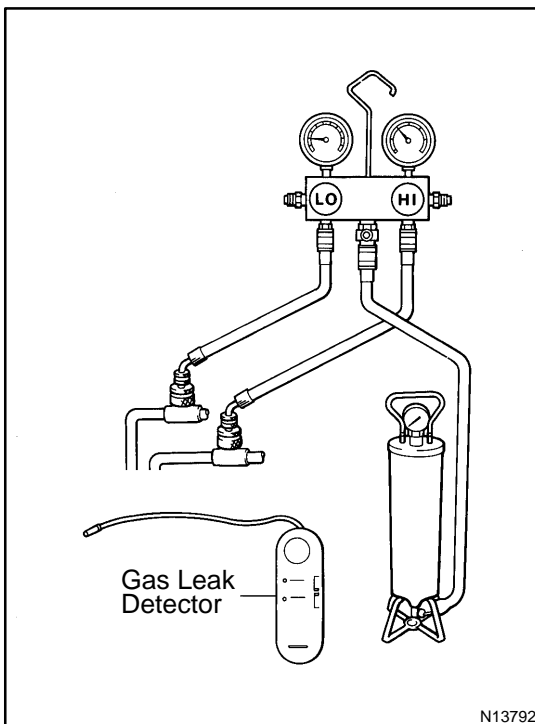
When handling the charging cylinder, always follow the directions given in the instruction manual.

- (a) Charge the proper amount of refrigerant into the charging cylinder.
- (b) Connect the center hose to the charging cylinder.

CAUTION:

Do not open either the high or low side valve of the manifold gauge set.

- (c) Open the valve of the charging cylinder.
- (d) Press the valve core on the side of the manifold gauge and expel the air from the center hose.

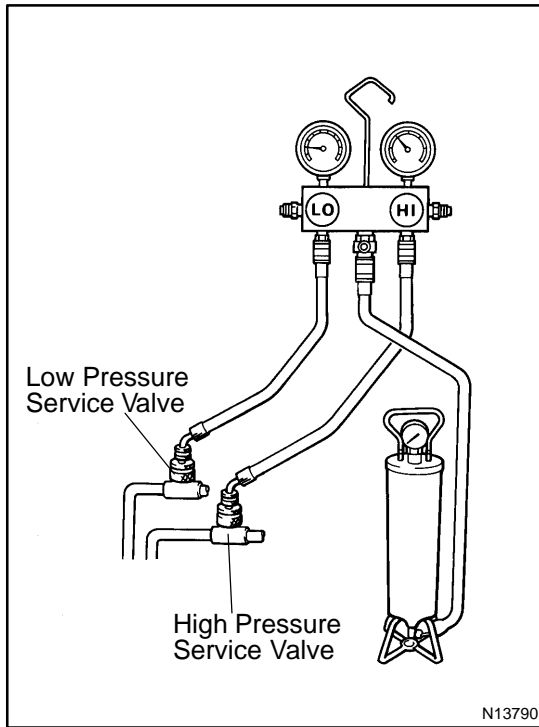


2. INSPECT REFRIGERATION SYSTEM FOR LEAKS

- (a) Open the high pressure side valve and charge refrigerant.
- (b) When the low pressure gauge indicates 98 kPa (1 kgf/cm², 14 psi), close the high pressure side valve.
- (c) Using a gas leak detector, check the system for leakage.

CAUTION:

Use a refrigerant recovery/recycling machine to recover the refrigerant whenever replacing parts.



3. CHARGE REFRIGERANT INTO REFRIGERANT SYSTEM

If there is no leak after refrigerant leak check, charge the proper amount of refrigerant into the refrigeration system.

CAUTION:

- ◆ Never run the engine when charging the system through the high pressure side.
- ◆ Do not open the low pressure side valve when the system is being charged with liquid refrigerant.

- (a) Open the high pressure side valve fully.
- (b) Charge specified amount of refrigerant, then close the high pressure side valve.

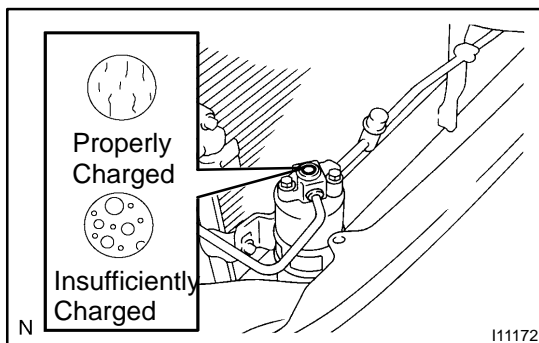
HINT:

The system is fully charged if bubbles cannot be seen through the sight glass.

- (c) Partially charge the refrigeration system with refrigerant.
 - (1) Prepare the vehicle:
 - ◆ Running engine at 1,500 rpm
 - ◆ Single A/C: Front blower speed control dial at "HI" position
 - ◆ Dual A/C: Front and rear blower speed set at "HI" position
 - ◆ Single A/C: Front temperature control dial at "MAX. COOL" position
 - ◆ Dual A/C: Front temperature control dial at "MAX. COOL" position
Rear temperature control set at 18.5°C (65°F)
 - ◆ Air inlet control set at "RECIRC"
 - ◆ Fully open doors (Sliding roof: closed)
 - (2) Open the low pressure side valve.

CAUTION:

Do not open the high pressure side valve.



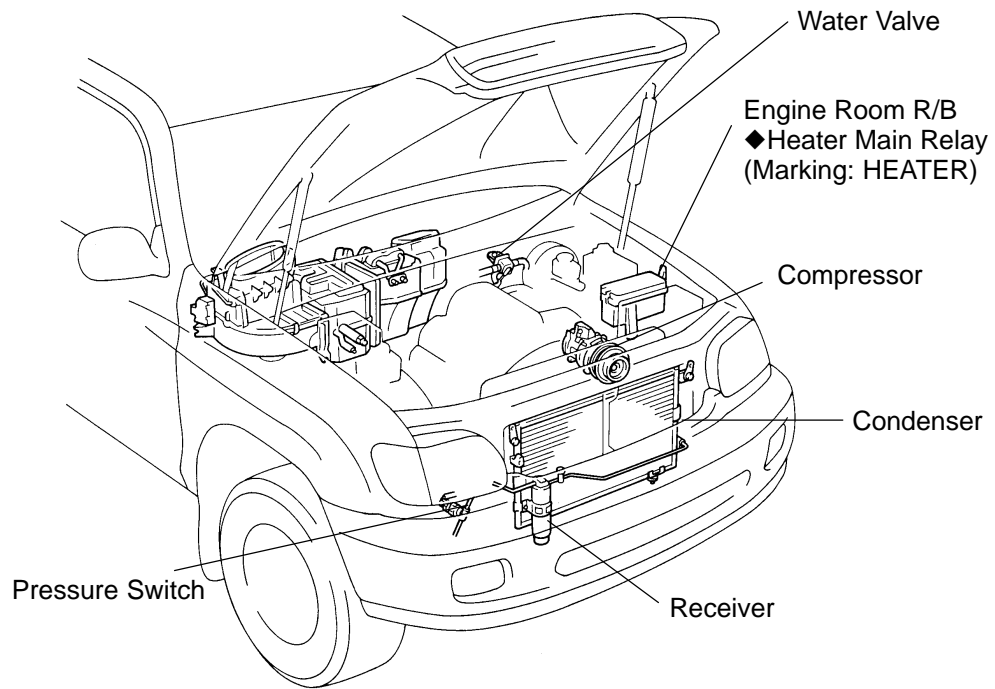
- (d) Access cab, Standard cab: Charge refrigerant until bubbles disappear and check the pressure on the gauge through the sight glass.

HINT:

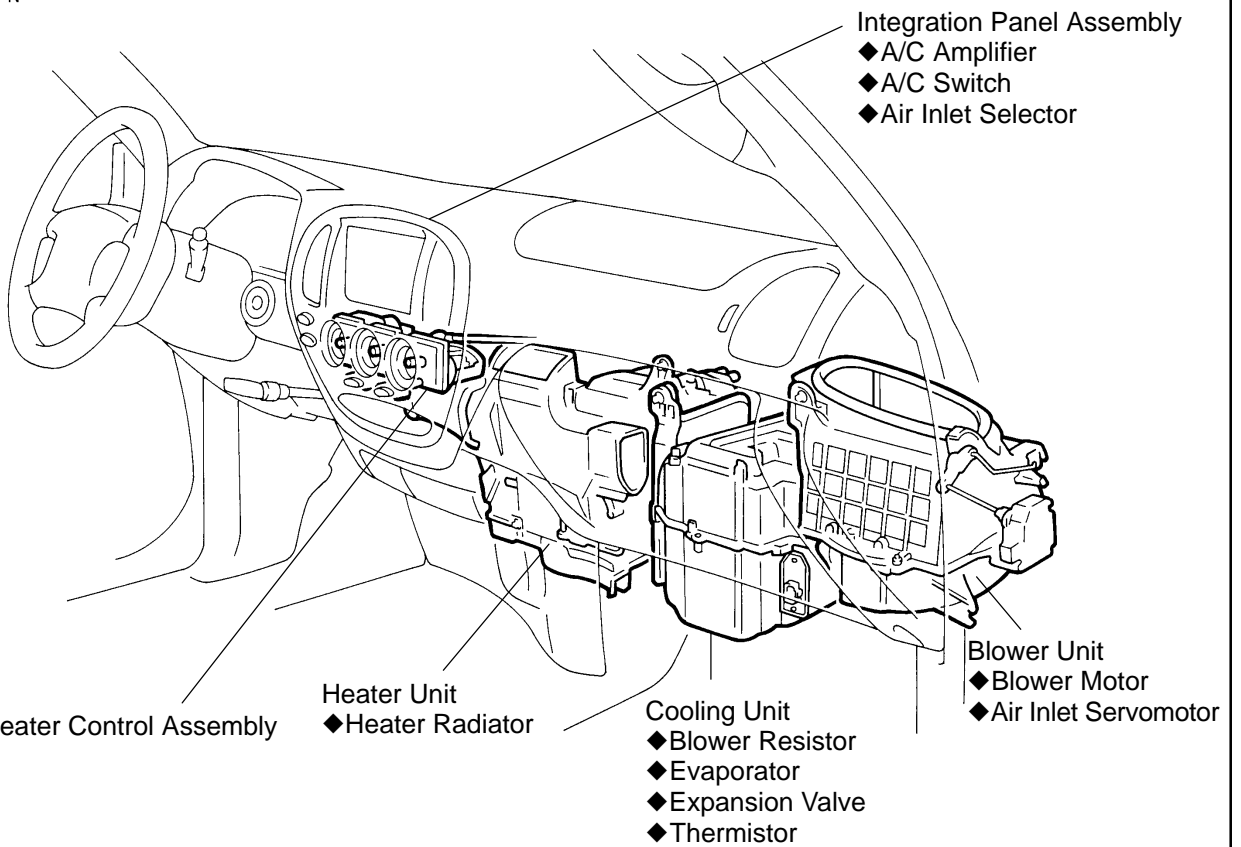
Double cab models do not have a sight glass. When inspecting, use a manifold gauge set.

LOCATION

Access Cab, Standard Cab:



N

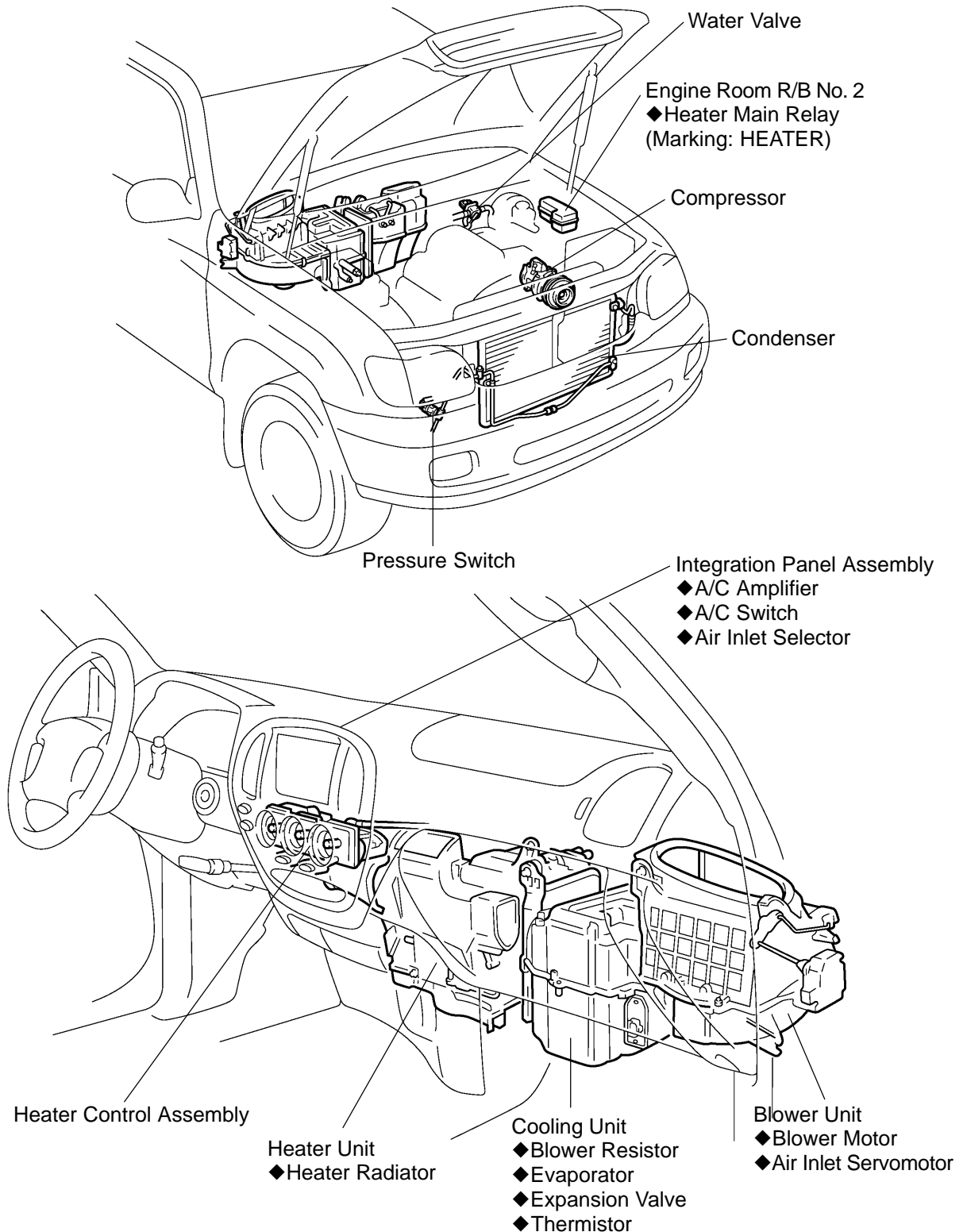


I11116
I11117

N

I29016

Double Cab:



N

H23499

TROUBLESHOOTING

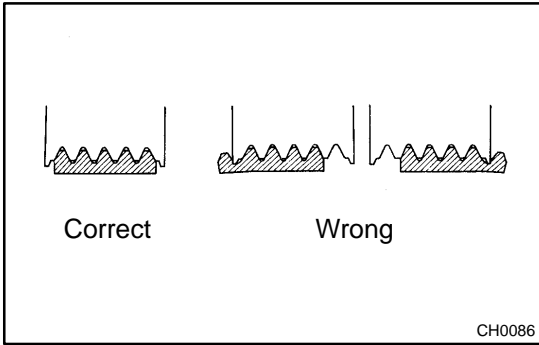
PROBLEM SYMPTOMS TABLE

AC22H-05

Use the table below to help find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area	See page
No blower operation	9. HTR Fuse 10.Heater main relay 11.Blower motor 12.Blower resistor 13.Blower speed control switch 14.Wire harness	- AC-82 AC-77 AC-78 AC-103 -
No air temperature control	1. Engine coolant volume 2. Heater control assembly 3. Water valve	- AC-99 AC-74
No compressor operation	1. Refrigerant volume 2. A.C Fuse 3. Magnetic clutch 4. Compressor 5. Pressure switch 6. Heater main relay 7. Blower speed control switch 8. A/C switch 9. Integration control and panel 10.Thermistor 11.Wire harness	AC-3 - 1GR-FE: AC-52 2UZ-FE: AC-59 1GR-FE: AC-52 2UZ-FE: AC-59 AC-79 AC-82 AC-103 AC-92 AC-83 AC-28 -
Compressor operates intermittently	1. Refrigerant volume 2. Pressure switch 3. A/C switch 4. Thermistor 5. Wire harness	AC-3 AC-79 AC-92 AC-28 -
No cool air comes out	1. Refrigerant volume 2. Refrigerant pressure 3. Drive belt 4. Magnetic clutch 5. Compressor 6. Pressure switch 7. Thermistor 8. A/C switch 9. Integration control and panel 10.Heater control assembly 11.Wire harness	AC-3 AC-3 AC-17 1GR-FE: AC-52 2UZ-FE: AC-59 1GR-FE: AC-52 2UZ-FE: AC-59 AC-79 AC-28 AC-92 AC-83 AC-99 -

Cool air comes out only at high engine rpm	<ol style="list-style-type: none"> 1. Refrigerant volume 2. Drive belt 3. Magnetic clutch 1GR-FE: AC-52 2UZ-FE: AC-59 4. Compressor 1GR-FE: AC-52 2UZ-FE: AC-59 5. Condenser 6. Receiver 7. Expansion valve 8. Evaporator 9. Thermistor 10. A/C switch 11. Wire harness 	<p>AC-3 AC-17 AC-52 AC-59 AC-52 AC-59 AC-70 AC-67 AC-28 AC-34 AC-28 AC-92 -</p>
Insufficient cooling	<ol style="list-style-type: none"> 1. Refrigerant volume 2. Drive belt 3. Magnetic clutch 1GR-FE: AC-52 2UZ-FE: AC-59 4. Compressor 1GR-FE: AC-52 2UZ-FE: AC-59 5. Condenser 6. Receiver 7. Expansion valve 8. Evaporator 9. Refrigerant lines 10. Pressure switch 11. Integration control and panel 12. Heater control assembly 	<p>AC-3 AC-17 AC-52 AC-59 AC-52 AC-59 AC-70 AC-67 AC-28 AC-34 AC-23 AC-79 AC-83 AC-99</p>
No engine idle-up with A/C switch ON	<ol style="list-style-type: none"> 1. Integration control and panel 2. Idle control system 1GR-FE: DI-266 2UZ-FE: DI-712 3. Wire harness 	<p>AC-83 DI-266 DI-712 -</p>
*2A/C indicator blinks	<ol style="list-style-type: none"> 4. Compressor 1GR-FE: AC-52 2UZ-FE: AC-59 5. Drive belt 6. Compressor lock sensor 1GR-FE: AC-52 2UZ-FE: AC-59 7. A/C amplifier 	<p>AC-52 AC-59 AC-17 AC-52 AC-59 AC-83</p>
No warm air comes out	<ol style="list-style-type: none"> 1. Engine coolant volume 2. Heater control assembly 3. Water valve 4. Heater radiator 	<p>- AC-99 AC-74 AC-42</p>



DRIVE BELT ON-VEHICLE INSPECTION

AC3SB-01

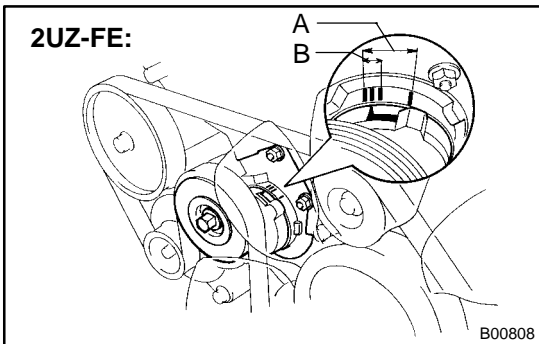
1. INSPECT DRIVE BELT'S INSTALLATION CONDITION

Check that the drive belt fits properly in the ribbed grooves.

2. 1GR-FE engine: INSPECT DRIVE BELT TENSIONER

Check that nothing gets caught in the tensioner by turning it clockwise and counterclockwise.

If a malfunction exists, replace the tensioner.



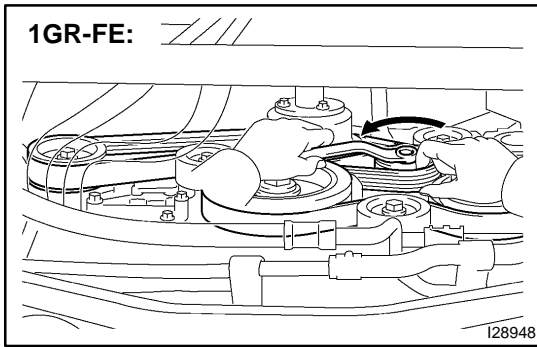
3. 2UZ-FE engine: INSPECT DRIVE BELT TENSION

Check that the tension is within the range A on the auto tensioner scale.

If the tension is not within the range A on the scale, replace the belt with a new one.

HINT:

When replacing the drive belt with a new one, the belt tension should be within range B on the belt tensioner scale.

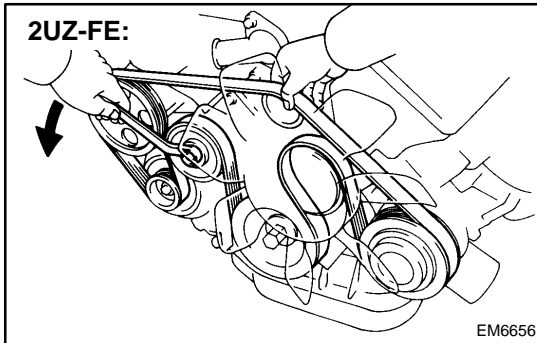


REMOVAL

1. 1GR-FE engine:

REMOVE DRIVE BELT

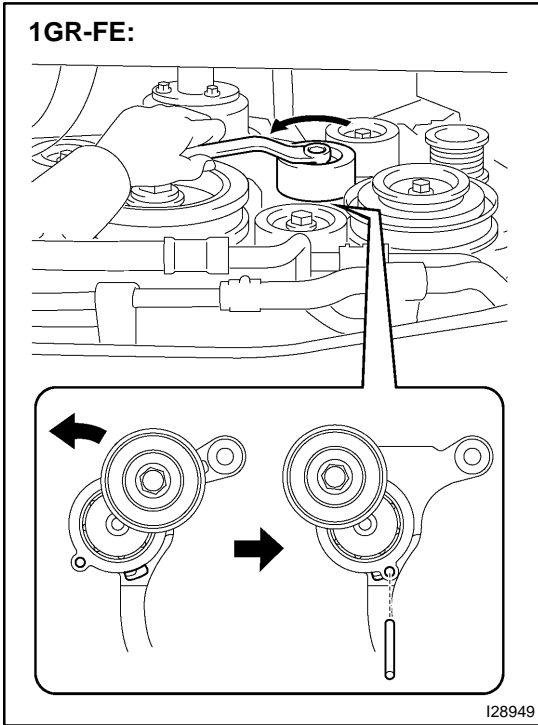
- (a) Remove the engine under cover.
- (b) Loosen the belt tension by turning the belt tensioner counterclockwise, and remove the drive belt from the belt tensioner.



2. 2UZ-FE engine:

REMOVE DRIVE BELT

Loosen the drive belt tension by turning the drive belt tensioner counterclockwise, and remove the drive belt.

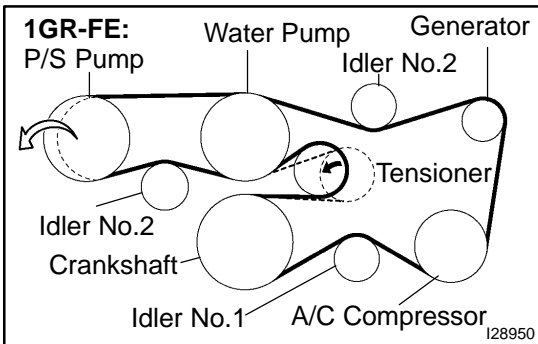


INSTALLATION

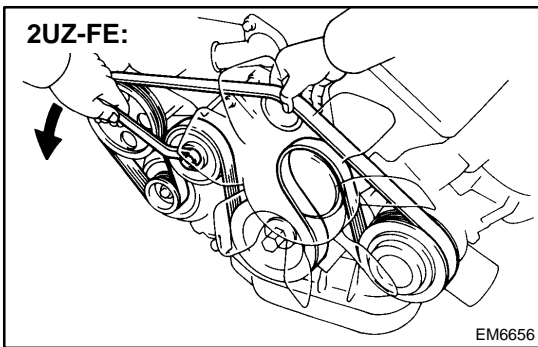
1. 1GR-FE engine:

INSTALL DRIVE BELT

- (a) While turning the belt tensioner counterclockwise, align the holes. Insert a 6 mm (0.24 in.) bar into the holes to fix the belt tensioner.
- (b) Install the drive belt.
- (c) While turning the belt tensioner counterclockwise, remove the bar.



- (d) If it is hard to install the drive belt, perform the following procedures:
 - (1) Wrap the drive belt around all the pulleys and idlers, except for the P/S pump, as shown in the illustration.
 - (2) While releasing belt tension by turning the belt tensioner counterclockwise, wrap the drive belt around the P/S pump.
- (e) Install the engine under cover.



2. 2UZ-FE engine:

INSTALL DRIVE BELT

- Turn the drive belt tensioner counterclockwise and install the drive belt.

MANIFOLD GAUGE SET SET ON

1. **CONNECT CHARGE HOSE TO MANIFOLD GAUGE SET**

Tighten the nuts by hand.

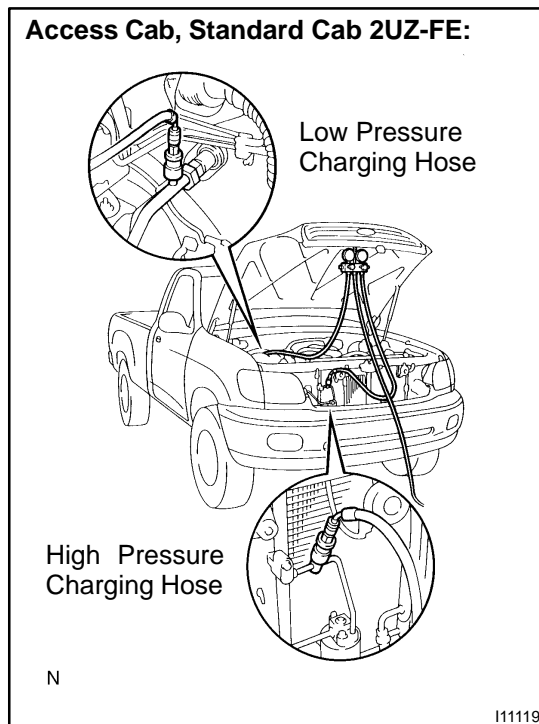
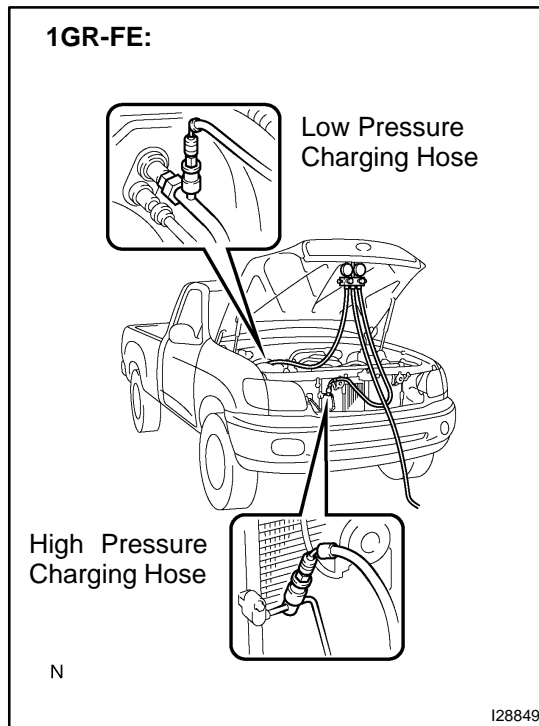
CAUTION:

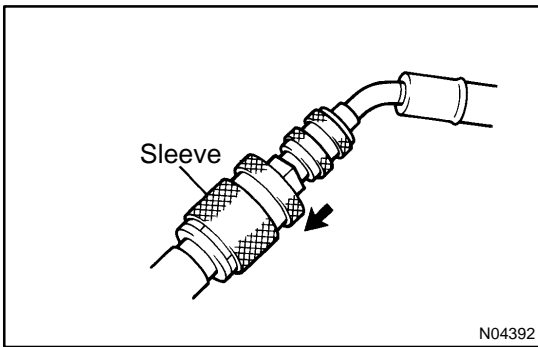
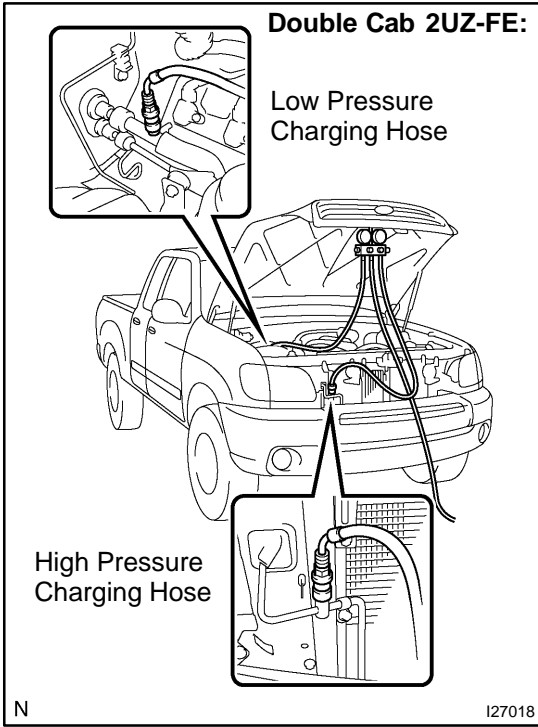
Do not connect the wrong hoses.

2. **CONNECT QUICK DISCONNECT ADAPTERS TO CHARGING HOSES**

Tighten the nuts by hand.

3. **CLOSE BOTH VALVES OF MANIFOLD GAUGE SET**
4. **REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINE**

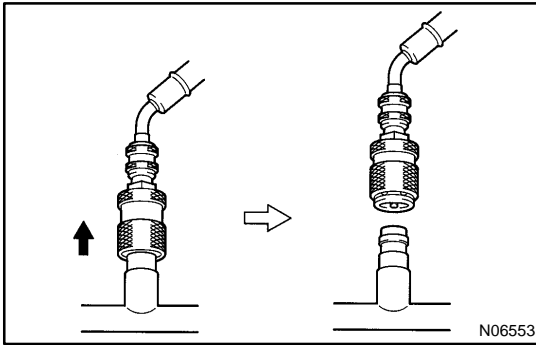




5. CONNECT QUICK DISCONNECT ADAPTERS TO SERVICE VALVES

HINT:

Push the quick disconnect adapter onto the service valve, then slide. Slide the sleeve of the quick disconnect adapter downward to lock it.



SET OFF

1. **CLOSE BOTH VALVES OF MANIFOLD GAUGE SET**
2. **DISCONNECT QUICK DISCONNECT ADAPTERS FROM SERVICE VALVES ON REFRIGERANT LINE**

HINT:

Slide the sleeve of the quick disconnect adapter upward to unlock the adapter and remove it from the service valve.

3. **INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINE**

REFRIGERANT LINE

AC00C-03

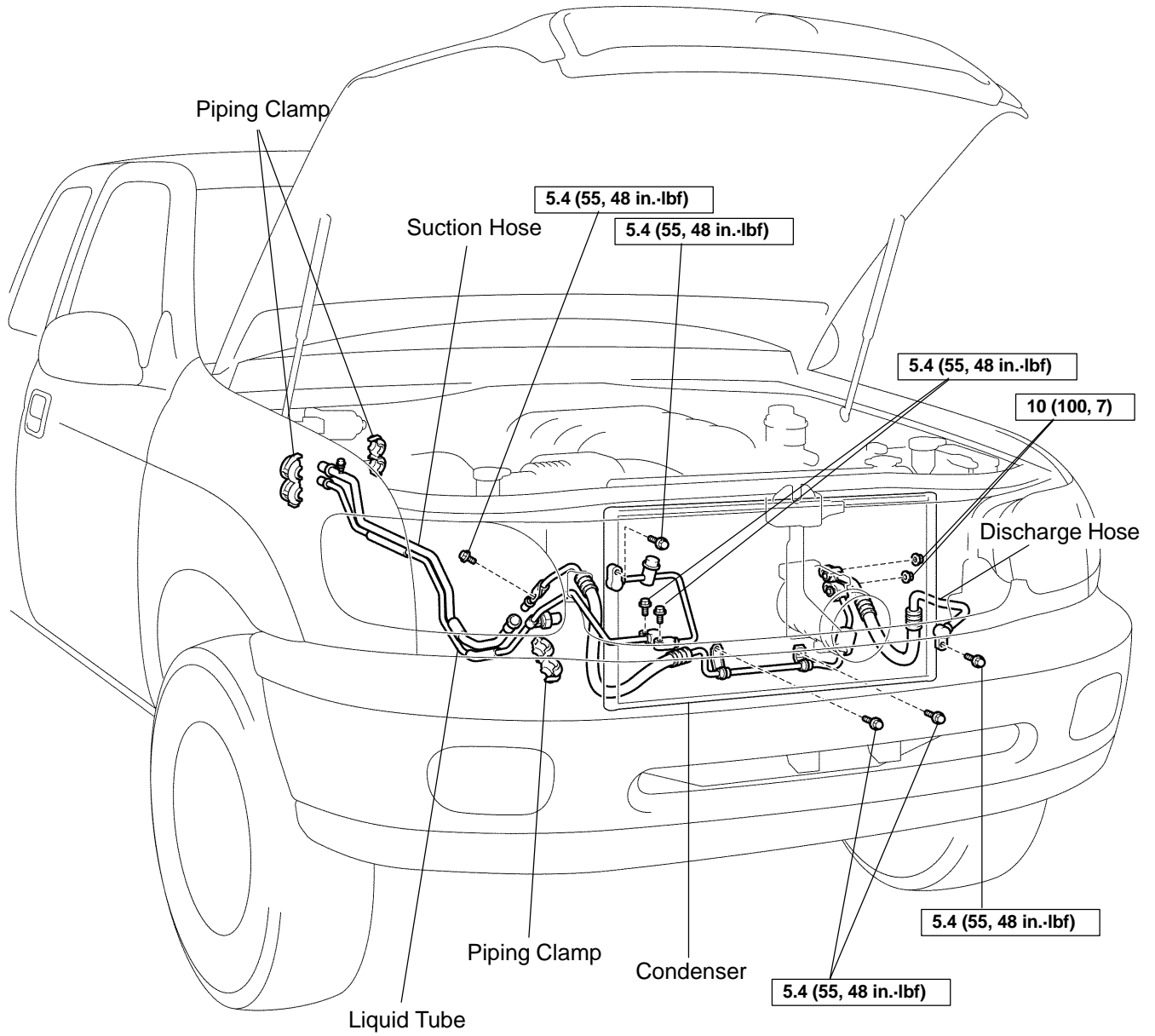
ON-VEHICLE INSPECTION

1. INSPECT HOSE AND TUBE CONNECTIONS FOR LOOSENESS
2. INSPECT HOSES AND TUBES FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant.

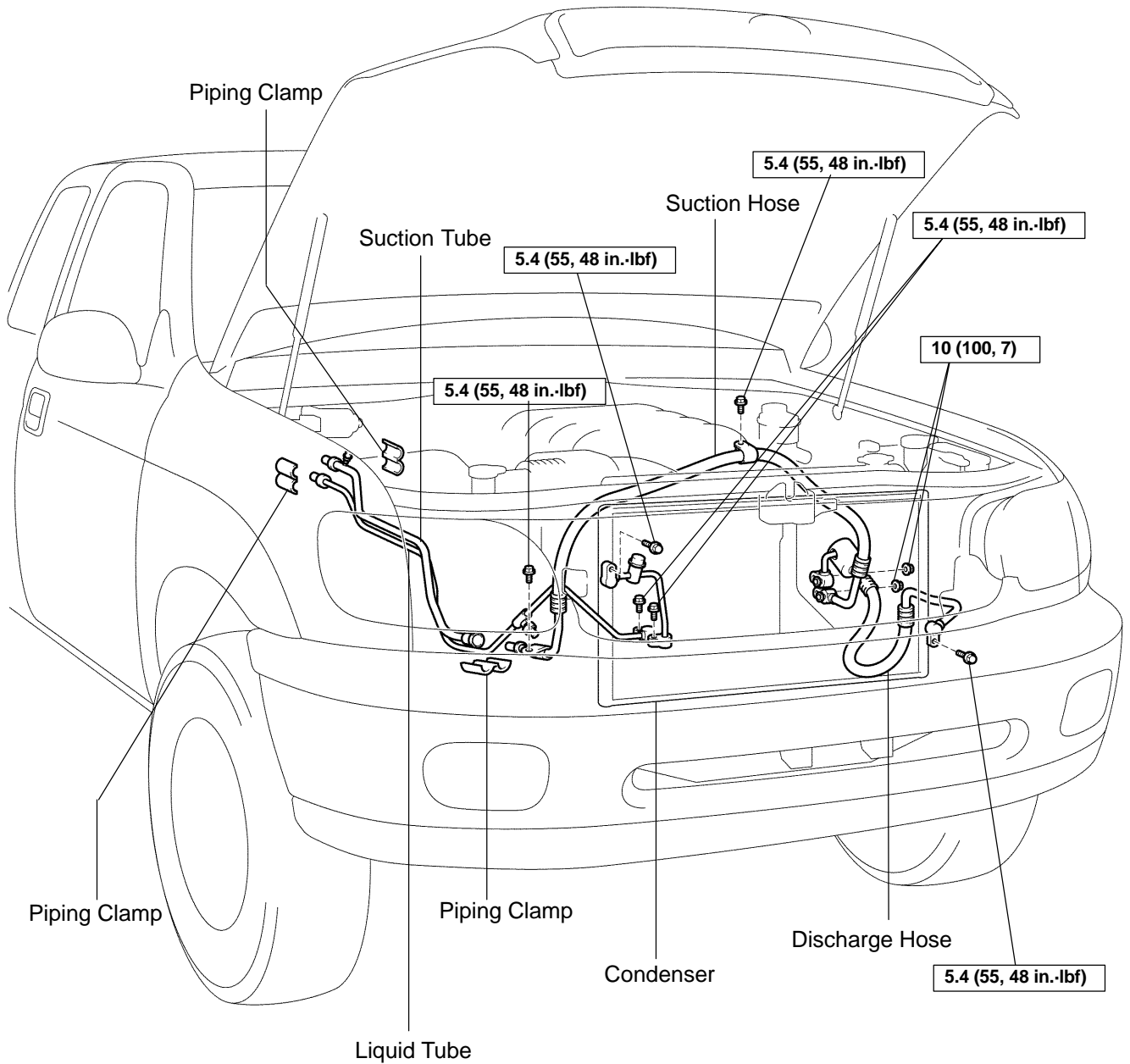
LOCATION

1GR-FE:



N·m (kgf·cm, ft·lbf) : Specified torque

Access Cab, Standard Cab 2UZ-FE:

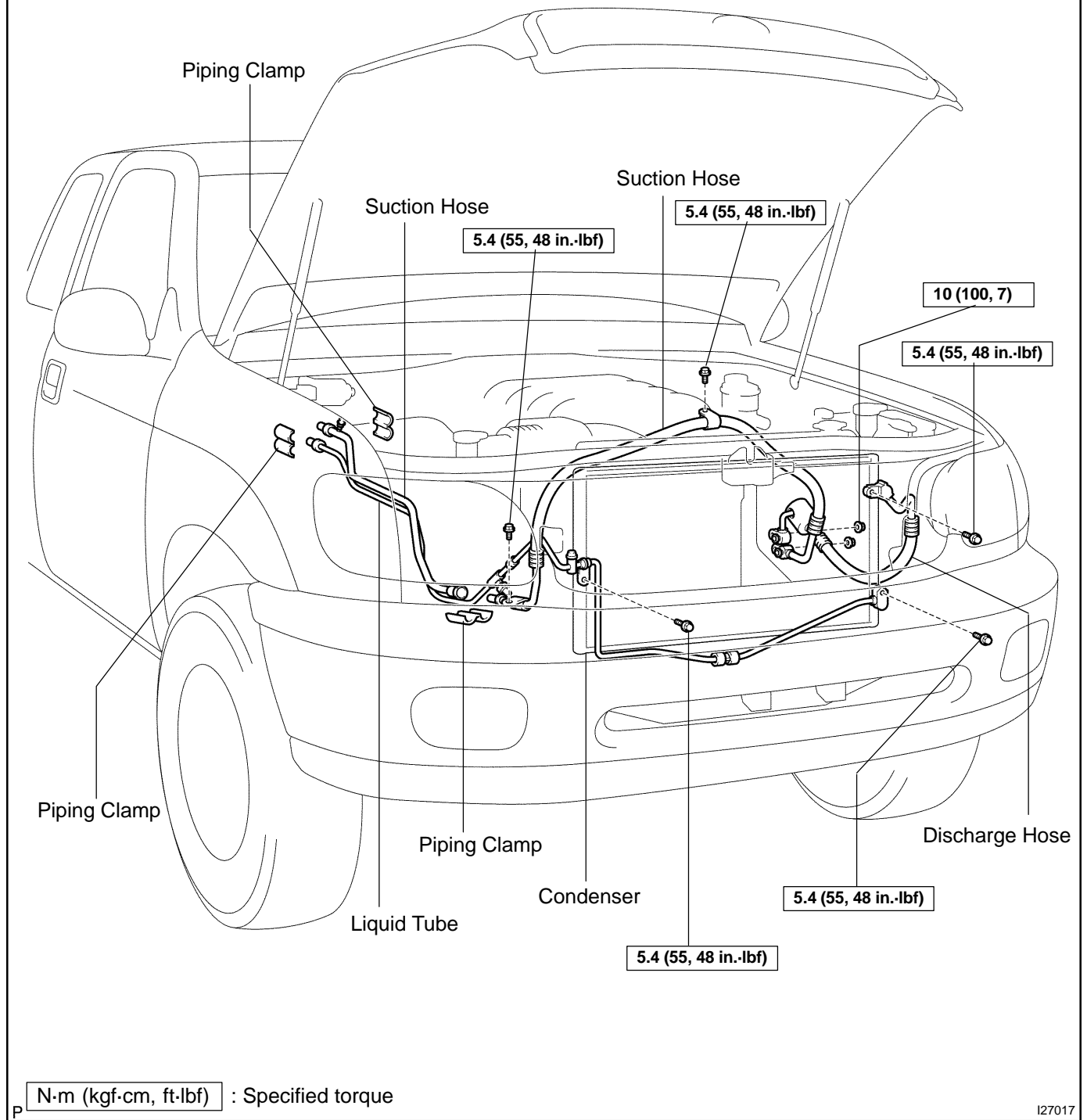


N·m (kgf·cm, ft·lbf) : Specified torque

P

I28071

Double Cab:



REPLACEMENT

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM
2. REPLACE FAULTY TUBE OR HOSE

NOTICE:

Cap the openings immediately to keep moisture or dirt out of the system.

3. TIGHTEN JOINT OF BOLT OR NUT TO SPECIFIED TORQUE

NOTICE:

Do not exceed specified torque.

Part tightened	N-m	kgf-cm	ft.lbf
Receiver x Liquid tube	5.4	55	48 in.lbf
Condenser x Discharge hose	5.4	55	48 in.lbf
Condenser x Liquid tube	5.4	100	48 in.lbf
Compressor x Discharge hose	10	100	7
Compressor x Suction hose	10	100	7
Expansion valve x Evaporator	5.4	55	48 in.lbf

4. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE SYSTEM WITH REFRIGERANT

Specified amount:

Access cab, Standard cab: 600 ± 50 g (21.16 ± 1.76 oz.)

Double cab: 530 ± 50 g (18.69 ± 1.76 oz.)

5. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak detector, check for leakage of refrigerant.

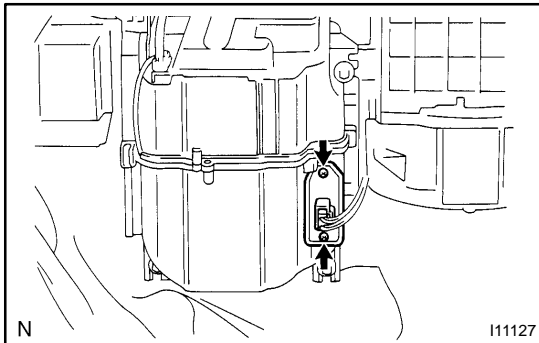
6. INSPECT AIR CONDITIONING OPERATION

COOLING UNIT ON-VEHICLE INSPECTION

AC271-03

1. INSPECT FOR LEAKAGE OF REFRIGERANT

- (a) Remove the glove compartment door.
- (b) Remove the lower No. 2 finish panel.
- (c) Remove the lower center cover.
- (d) Remove the lower LH finish panel.
- (e) Remove the lower cover (See page [BO-1 11](#)).



- (f) Remove the blower resistor.
 - (1) Disconnect the connector.
 - (2) Remove the 2 screws and blower resistor.

- (g) Using a gas leak detector, check for leakage.

If there is leakage, check the tightening torque at the joints or check the evaporator.

- (h) Install the blower resistor with the 2 screws.
- (i) Install the lower cover.
- (j) Install the lower LH finish panel.
- (k) Install the lower center cover.
- (l) Install the lower No. 2 finish panel.
- (m) Install the glove compartment door (See page [BO-120](#)).

2. INSPECT EXPANSION VALVE

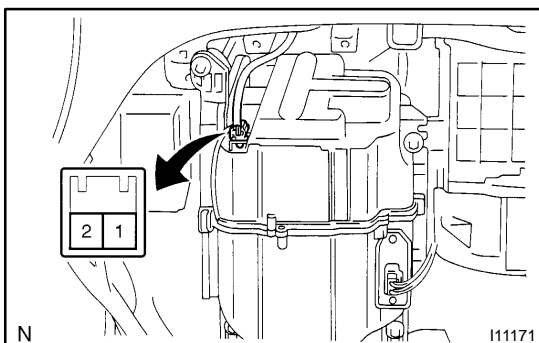
- (a) Check quantity of gas during refrigeration cycle.
- (b) Set the manifold gauge set.
- (c) Run the engine.
 - (1) Run the engine at 1,500 rpm for at least 5 minutes.
 - (2) Then check that the high pressure reading is 1.37 to 1.57 Mpa (14 to 16 kgm/cm², 199 to 288 psi).

- (d) Check the expansion valve.

If the expansion valve is faulty, the low pressure reading will drop to 0 kPa (0 kgf/cm², 0 psi).

HINT:

When the low pressure reading drops to 0 kPa (0 kgf/cm², 0 psi), there is no difference in temperature between the IN and OUT sides of the receiver.



3. INSPECT THERMISTOR RESISTANCE

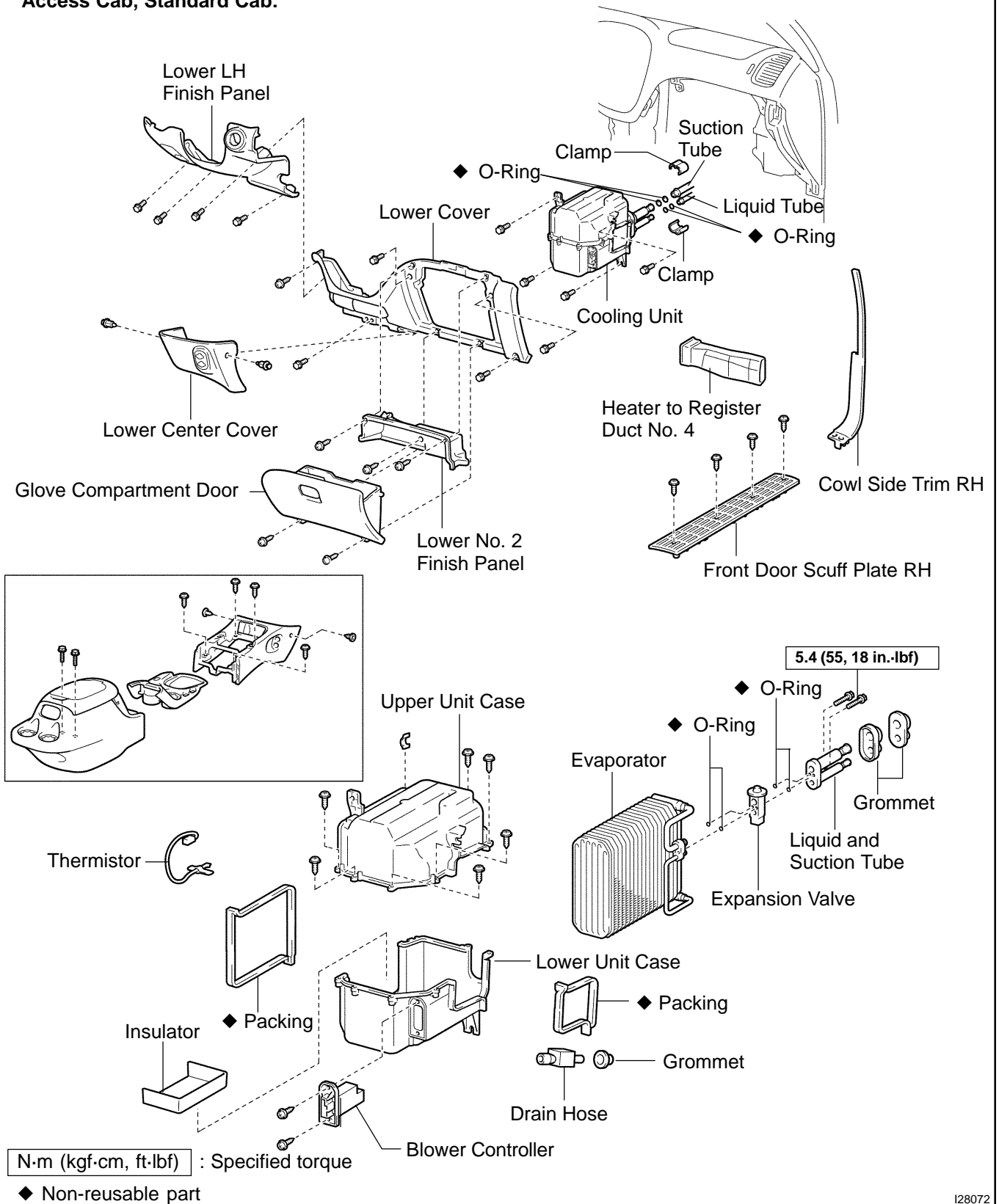
- (a) Disconnect the connector.
- (b) Measure the resistance between terminals.

Standard resistance: 1,500 Ω at 25°C (77°F)

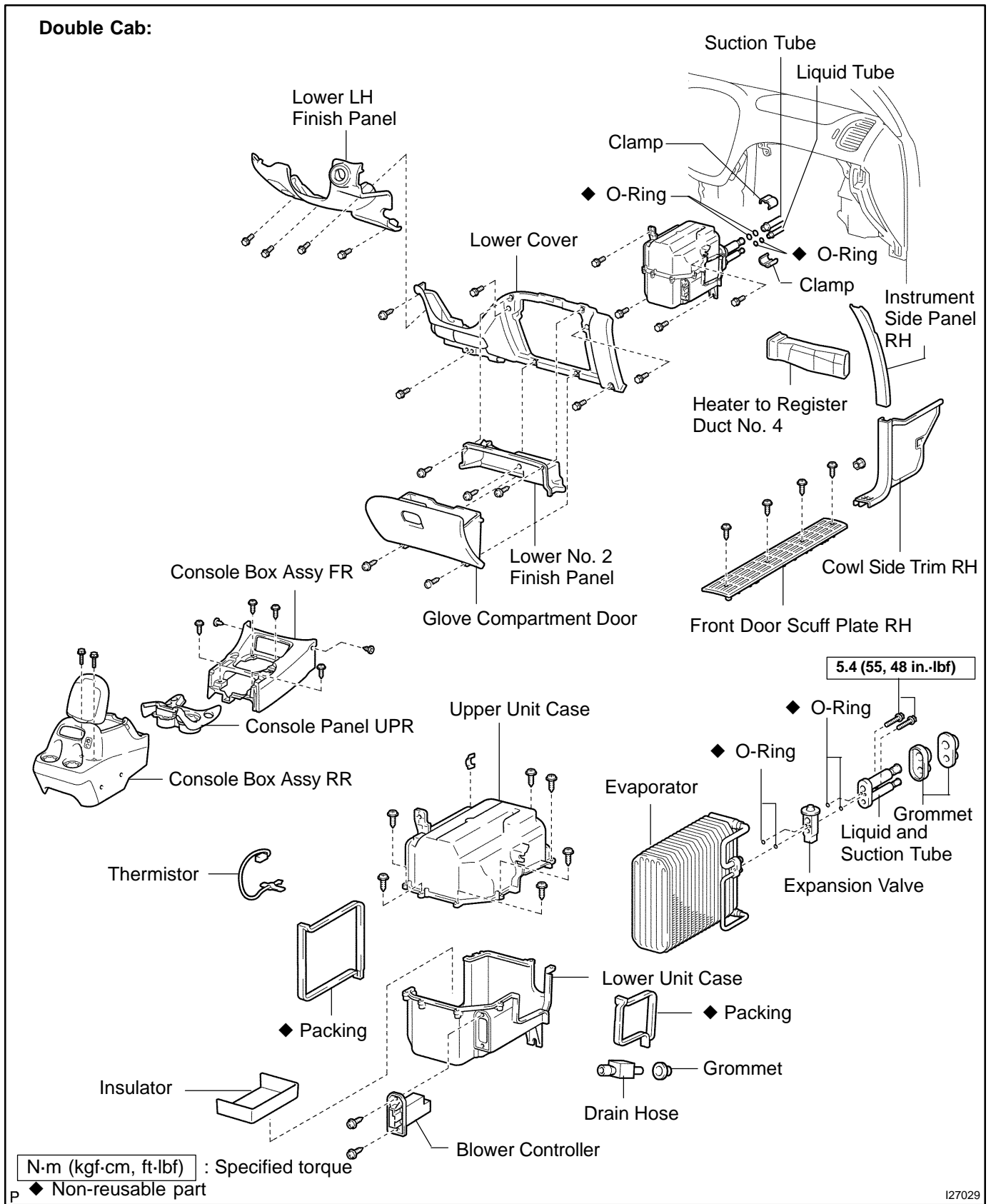
If resistance is not as specified, replace the thermistor.

COMPONENTS

Access Cab, Standard Cab:



Double Cab:



I27029

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

At the time of installation, refer to the following:

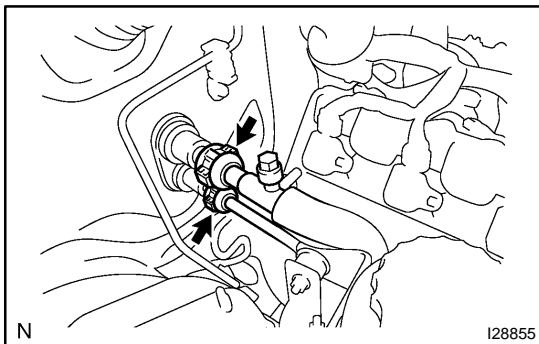
- ◆ Evacuate air from the refrigeration system.
- ◆ Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount:

Access cab, Standard cab:

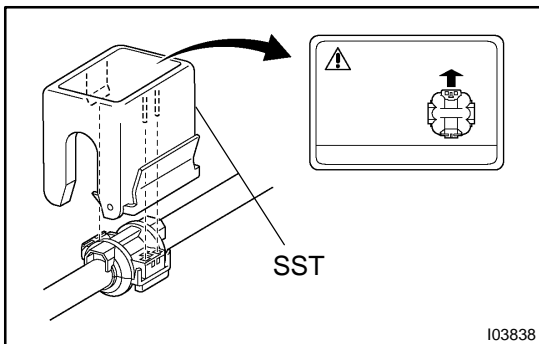
600 ± 50 g (21.16 ± 1.76 oz.)

Double cab: 530 ± 50 g (18.69 ± 1.76 oz.)



2. DISCONNECT LIQUID AND SUCTION TUBE

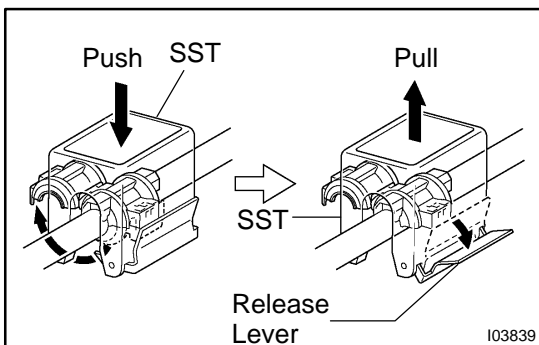
- (a) Using SST, remove the piping clamp.
SST 09870-00025 (Liquid tube)



- (1) Install SST to the piping clamp.

HINT:

Confirm the directions of the piping clamp claw and SST using the illustration on the caution label.

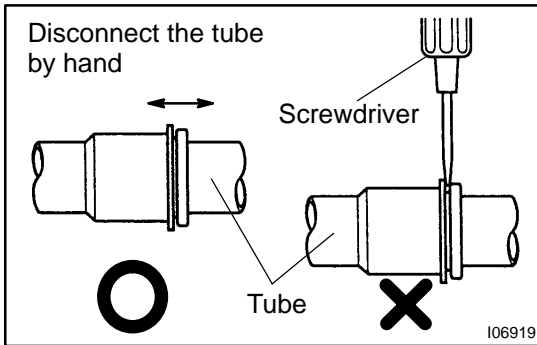


- (2) Push down SST and release the clamp lock.

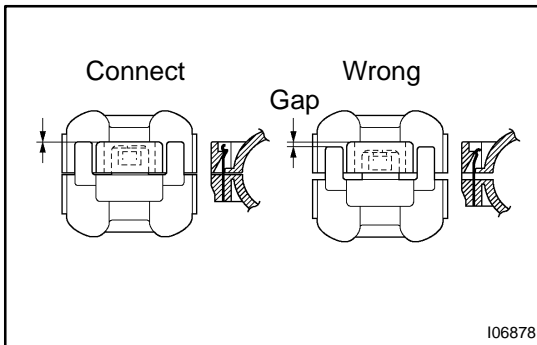
NOTICE:

Be careful not to deform the tubes, when pushing SST.

- (3) Pull SST slightly and push the release lever, then remove the piping clamp with SST.
(4) Remove the piping clamp from SST.
(b) Disconnect both tubes.

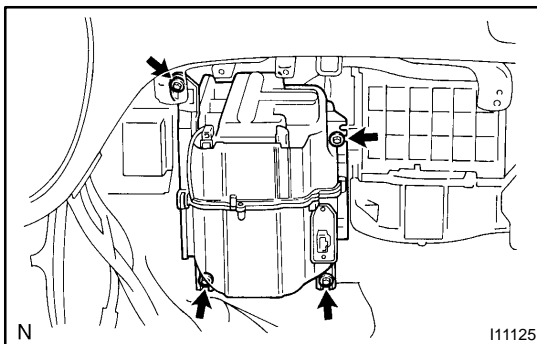
**NOTICE:**

- ◆ Do not use tools like a screwdriver to remove the tube.
- ◆ Cap the openings immediately to keep moisture or dirt out of the system.

**HINT:**

At the time of installation, refer to the following:

- ◆ Lubricate 2 new O-rings with compressor oil and install them to the tubes.
- ◆ After connection, check the claw of the piping clamp is securely engaged.

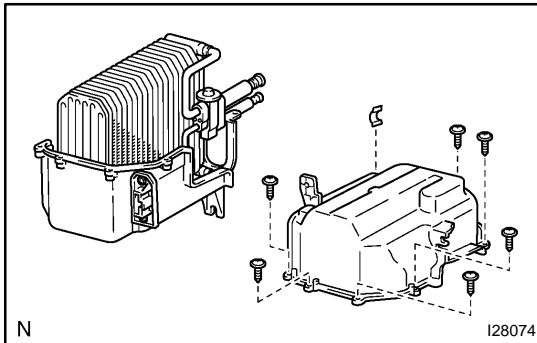
3. REMOVE GLOVE COMPARTMENT PARTS**4. REMOVE LOWER NO. 2 FINISH PANEL****5. REMOVE LOWER CENTER COVER****6. REMOVE LOWER LH FINISH PANEL****7. REMOVE LOWER COVER (See page [BO-1 11](#))****8. REMOVE NO. 4 HEATER TO REGISTER DUCT****9. REMOVE COOLING UNIT**

- (a) Disconnect the connectors.
- (b) Remove the 3 screws, bolt and the cooling unit.

DISASSEMBLY

1. REMOVE BLOWER RESISTOR

Remove the 2 screws and blower resistor.



2. SEPARATE UPPER AND LOWER UNIT CASES

- Disconnect the connector clamp from the upper unit case.
- Using a knife, cut off each packing.
- Remove the clip and 6 screws.
- Separate the upper and lower unit cases, then pull out the thermistor from the evaporator.

3. REMOVE EVAPORATOR FROM LOWER UNIT CASE

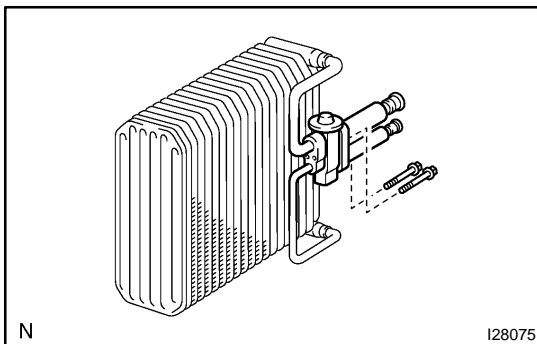
HINT:

At the time of reassembly, refer to the following:

If the evaporator is replaced, add compressor oil to the compressor.

Add 40 to 50 cc (1.4 to 1.7 fl.oz.)

Compressor oil: ND-OIL 8 or equivalent



4. REMOVE EXPANSION VALVE

Using a hexagon wrench (5.0 mm, 0.20 in.), remove the 2 bolts and separate the expansion valve, evaporator and tubes.

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

HINT:

At the time of reassembly, refer to the following:

Lubricate 4 new O-rings with compressor oil and install them to the tubes and valve.

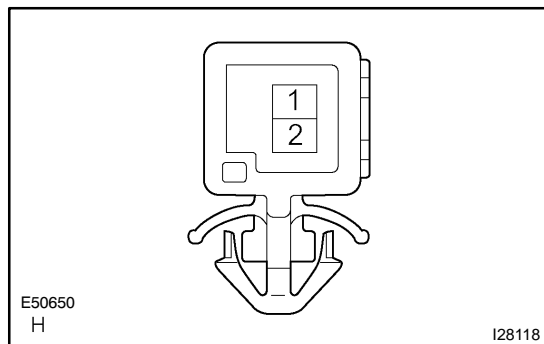
INSPECTION

1. CHECK EVAPORATOR FINS FOR BLOCKAGE

If the fins are clogged, clean them with compressed air.

2. CHECK FITTING FOR CRACKS OR SCRATCHES

If necessary, repair or replace.



3. INSPECT THERMISTOR RESISTANCE

(a) Remove the A/C evaporator temperature sensor (cooler thermister No.1).

(b) Measure the resistance according to the value(s) in the table below.

Standard:

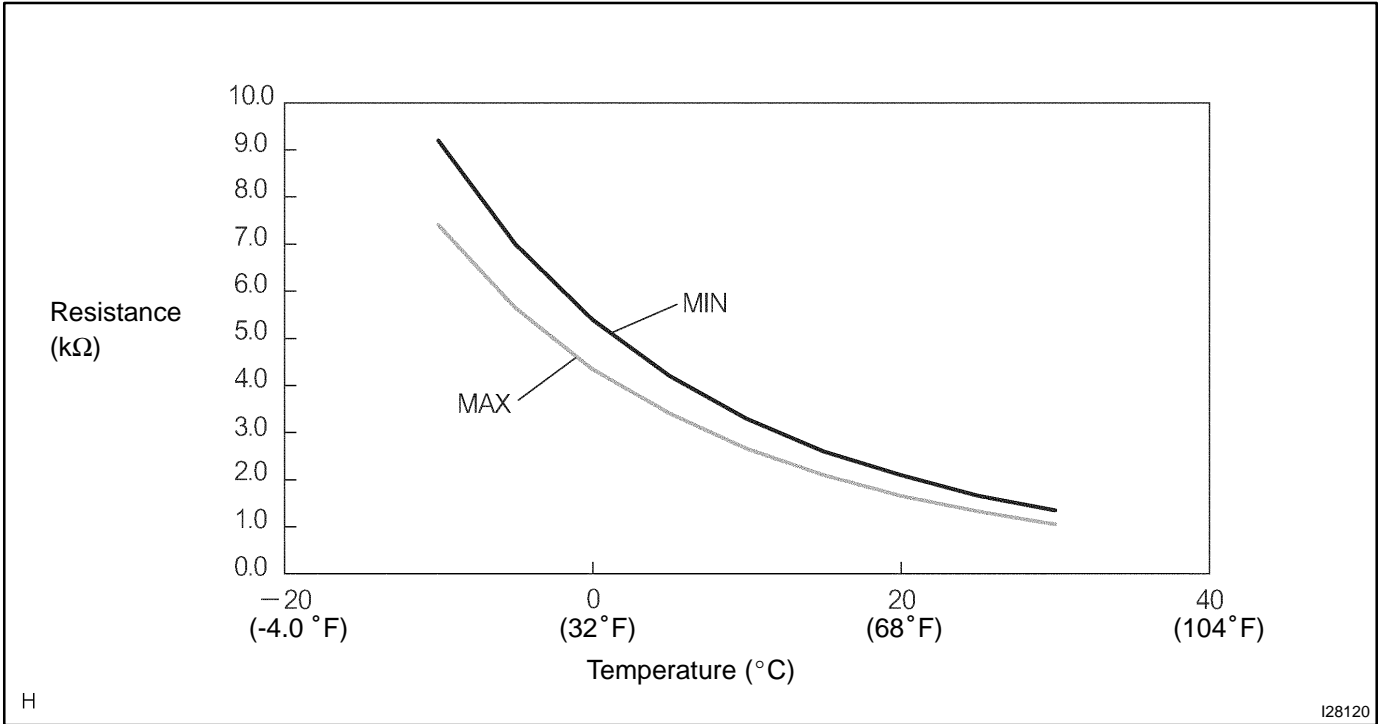
Tester connection	Condition	Specified condition
1 - 2	-10 °C (14 °F)	7.40 to 9.20 kΩ
1 - 2	-5 °C (23 °F)	5.65 to 7.00 kΩ
1 - 2	0 °C (32 °F)	4.35 to 5.40 kΩ
1 - 2	5 °C (41 °F)	3.40 to 4.20 kΩ
1 - 2	10 °C (50 °F)	2.68 to 3.30 kΩ
1 - 2	15 °C (59 °F)	2.10 to 2.60 kΩ
1 - 2	20 °C (68 °F)	1.66 to 2.10 kΩ
1 - 2	25 °C (77 °F)	1.32 to 1.66 kΩ
1 - 2	30 °C (86 °F)	1.05 to 1.35 kΩ

NOTICE:

- ◆ Even slightly touching the sensor may change the resistance value. Be sure to hold the connector of the sensor.
- ◆ When measuring, the sensor temperature must be the same as the ambient temperature.

HINT:

As the temperature increases, the resistance decreases (see the graph below).



If the result is not as specified, replace the sensor.

REASSEMBLY

The reassembly procedures are the disassembly procedures in reverse order (see page [AC-33](#)).

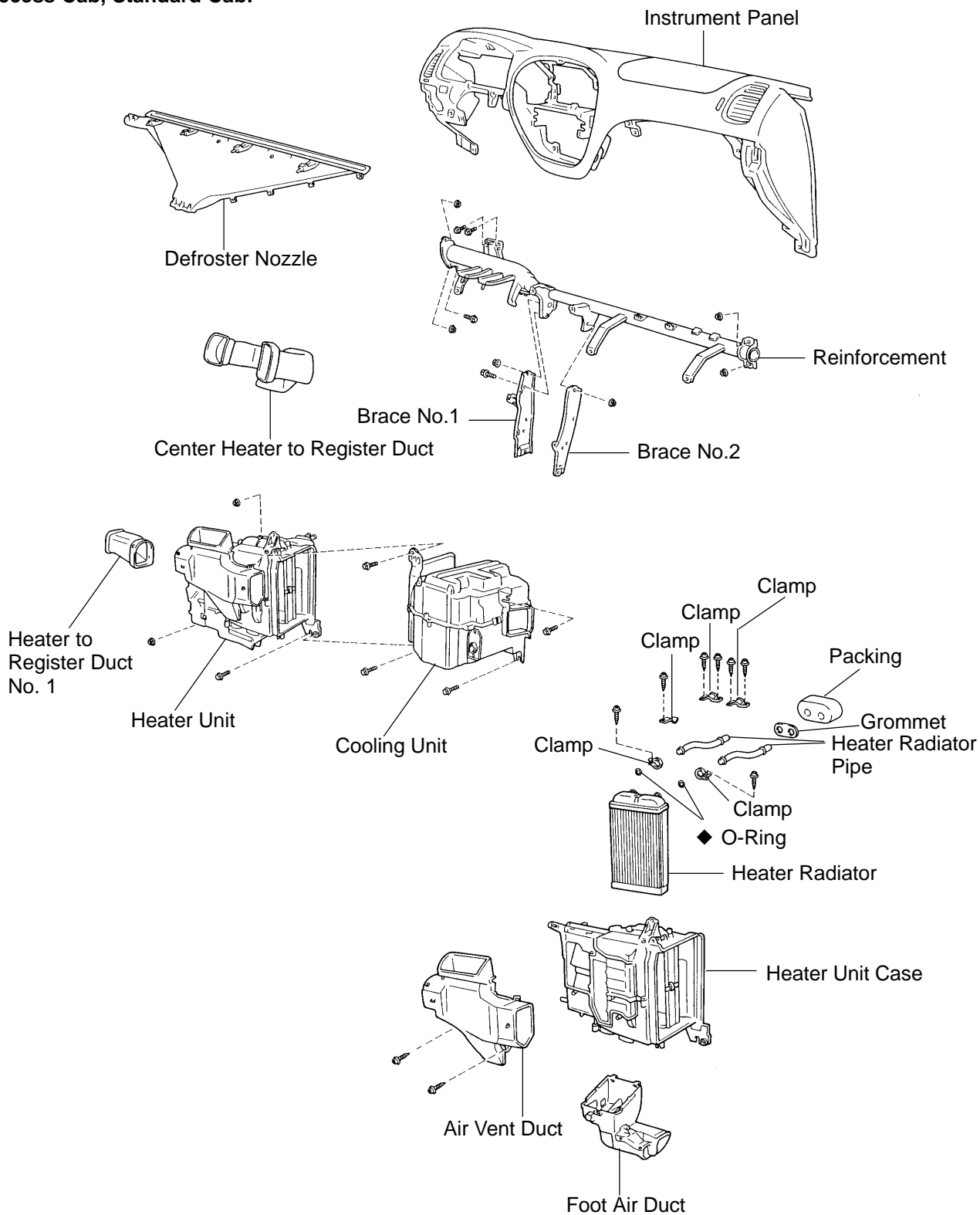
INSTALLATION

The installation procedures are the removal procedures in reverse order (see page [AC-31](#)).

HEATER UNIT COMPONENTS

AC3RU-02

Access Cab, Standard Cab:

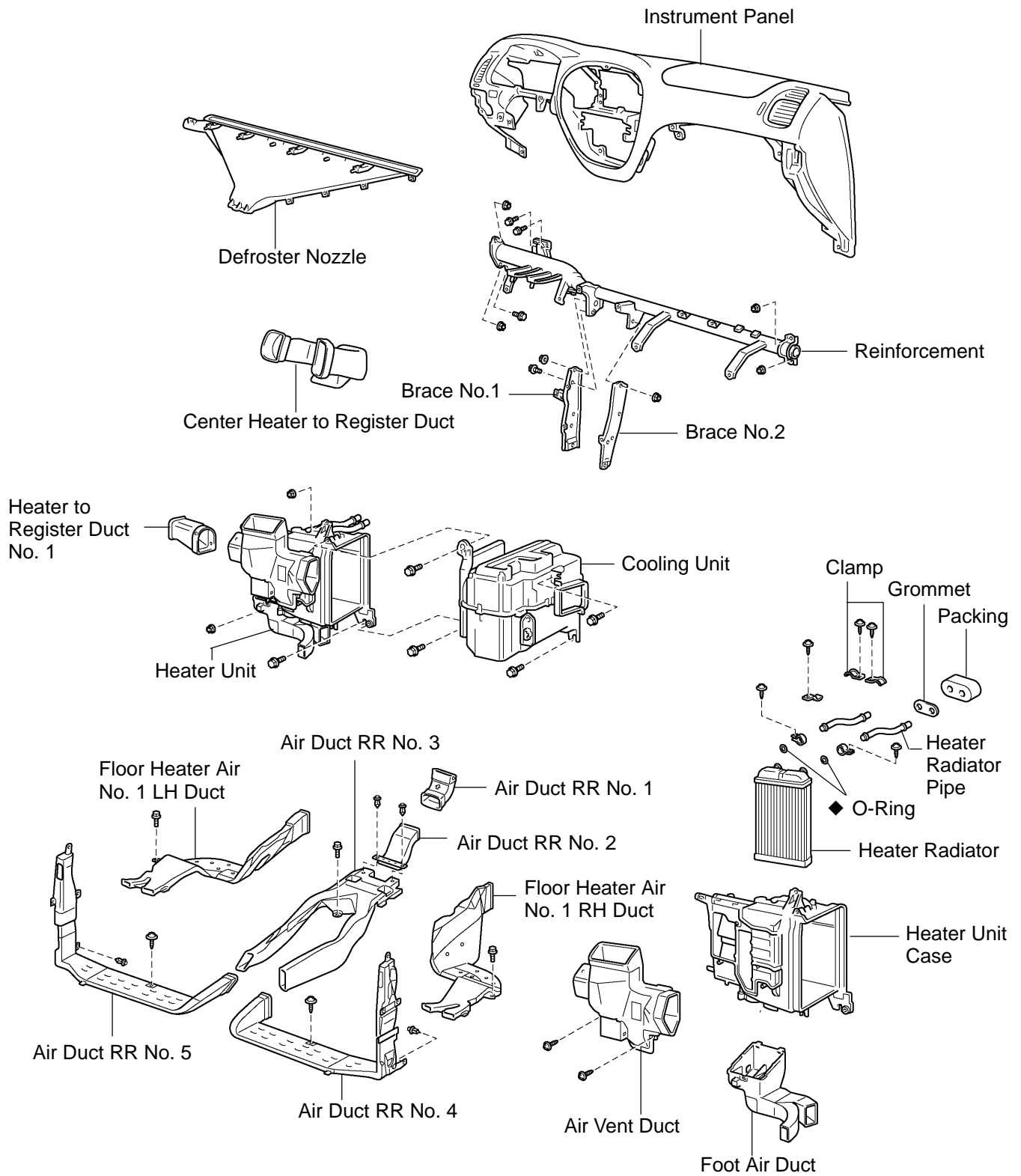


◆ Non-reusable part

N

I11128

Double Cab:



◆ Non-reusable part

N

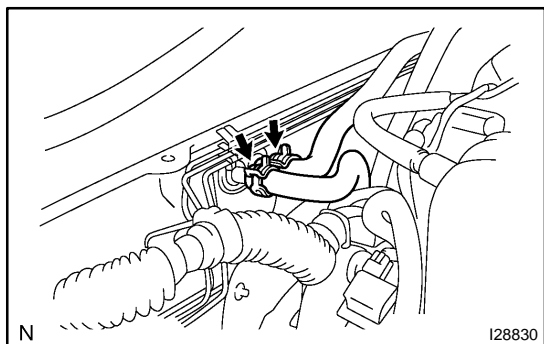
I27019

REMOVAL

1. REMOVE COOLING UNIT (See page AC-31)
2. DRAIN ENGINE COOLANT FROM RADIATOR

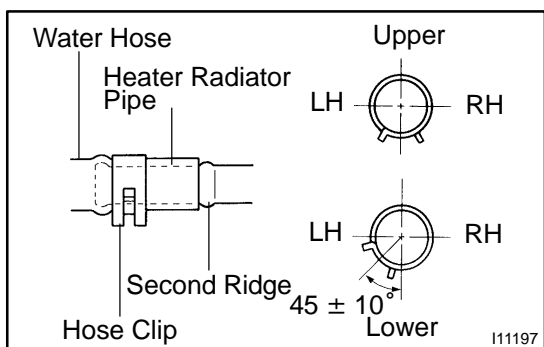
HINT:

It is not necessary to drain out all the coolant.



3. DISCONNECT WATER HOSES FROM HEATER RADIATOR PIPES

- (a) Using pliers, grip the claws of clips and slide the clips along the hoses.
- (b) Disconnect the water hoses.

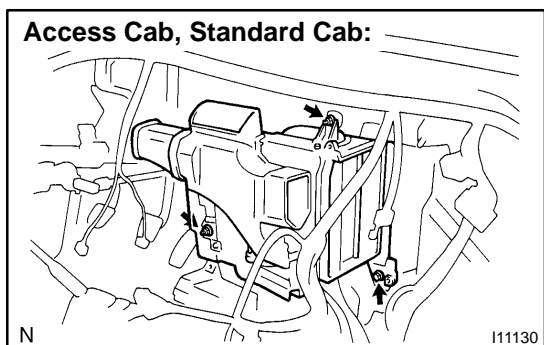


HINT:

At the time of installation, refer to the following:

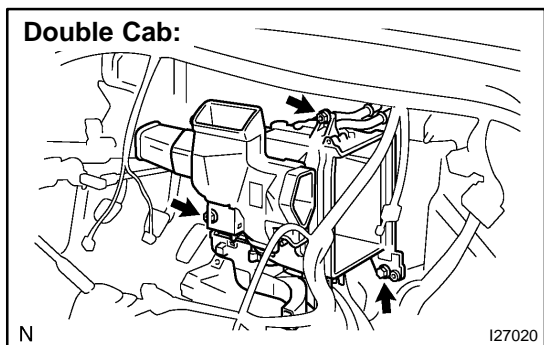
- ◆ Push the water hose onto the heater radiator pipe up to the second ridge on the pipe.
- ◆ Install the hose clip to the position shown in the illustration.

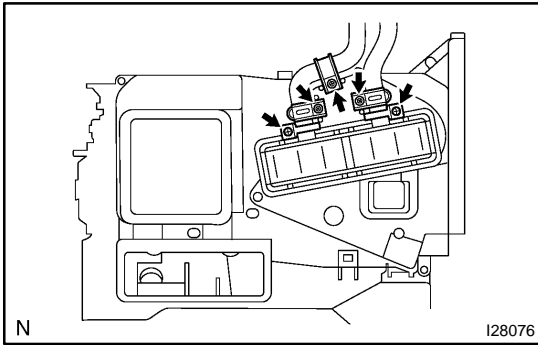
4. REMOVE INSTRUMENT PANEL AND REINFORCEMENT (See page BO-1 11)
5. REMOVE DEFROSTER NOZZLE AND HEATER TO REGISTER DUCT



6. REMOVE HEATER UNIT

Remove the 3 nuts and heater unit.





DISASSEMBLY

1. REMOVE HEATER RADIATOR

- (a) Remove the 3 screws and 3 clamps.
- (b) Pull out the heater radiator.
- (c) Remove the 2 screws and 2 clips, then disconnect the heater radiator pipes.

2. REMOVE AIR VENT DUCT

Remove the 2 screws and duct.

INSPECTION

INSPECT FINS FOR BLOCKAGE

If the fins are clogged, clean them with compressed air.

REASSEMBLY

The reassembly procedures are the disassembly procedures in reverse order (see page [AC-41](#)).

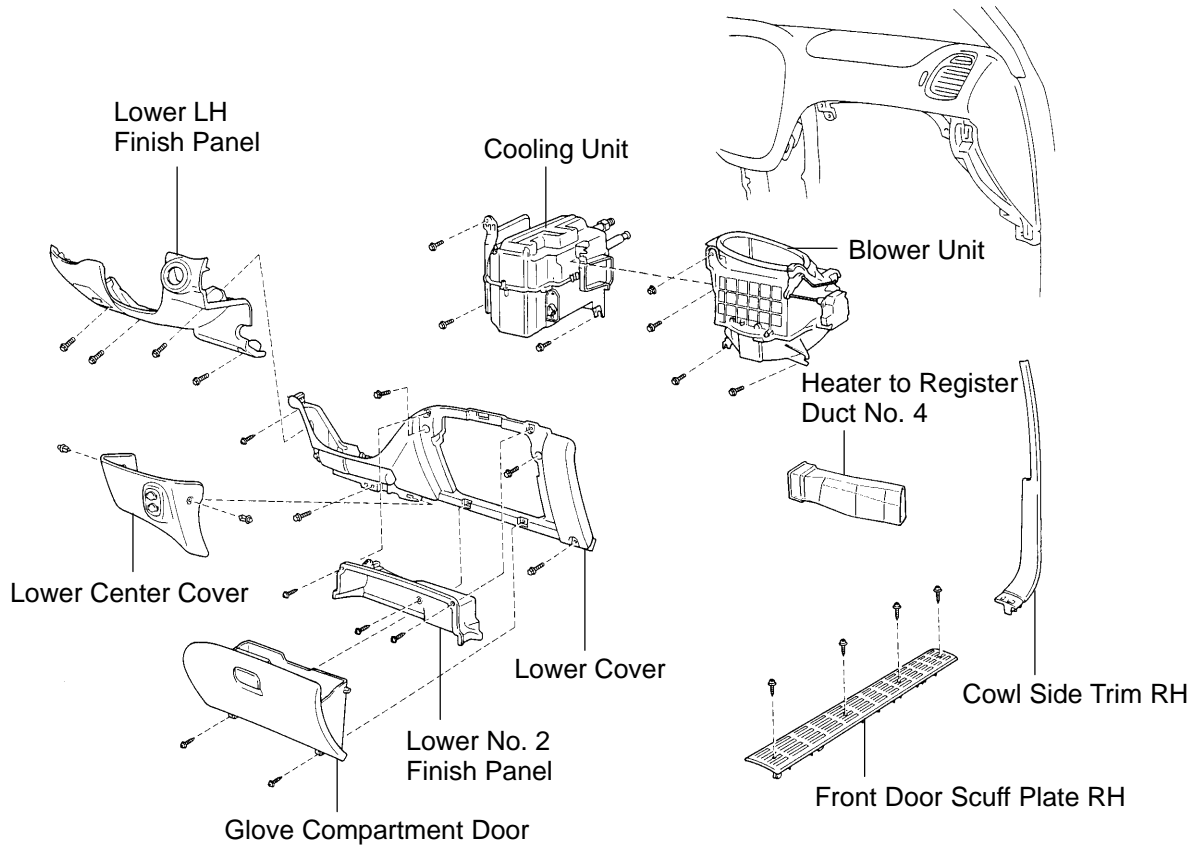
INSTALLATION

The installation procedures are the removal procedures in reverse order (see page [AC-40](#)).

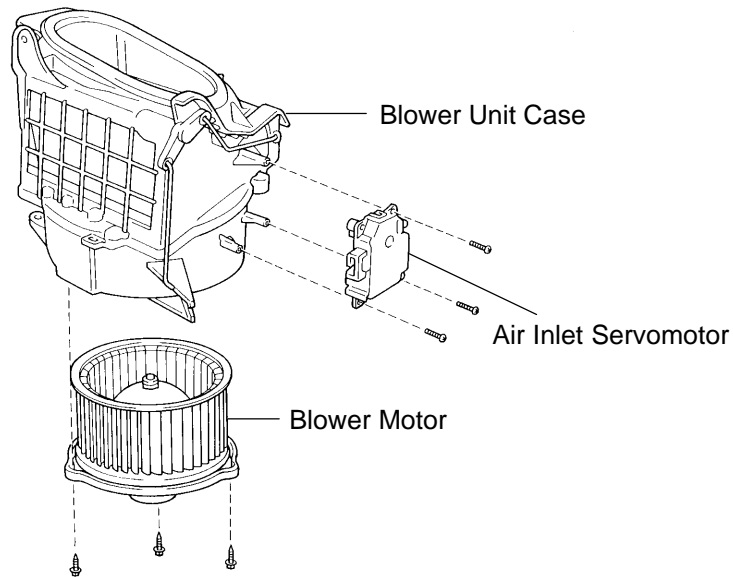
BLOWER UNIT COMPONENTS

AC3RW-02

Access Cab, Standard Cab:



N

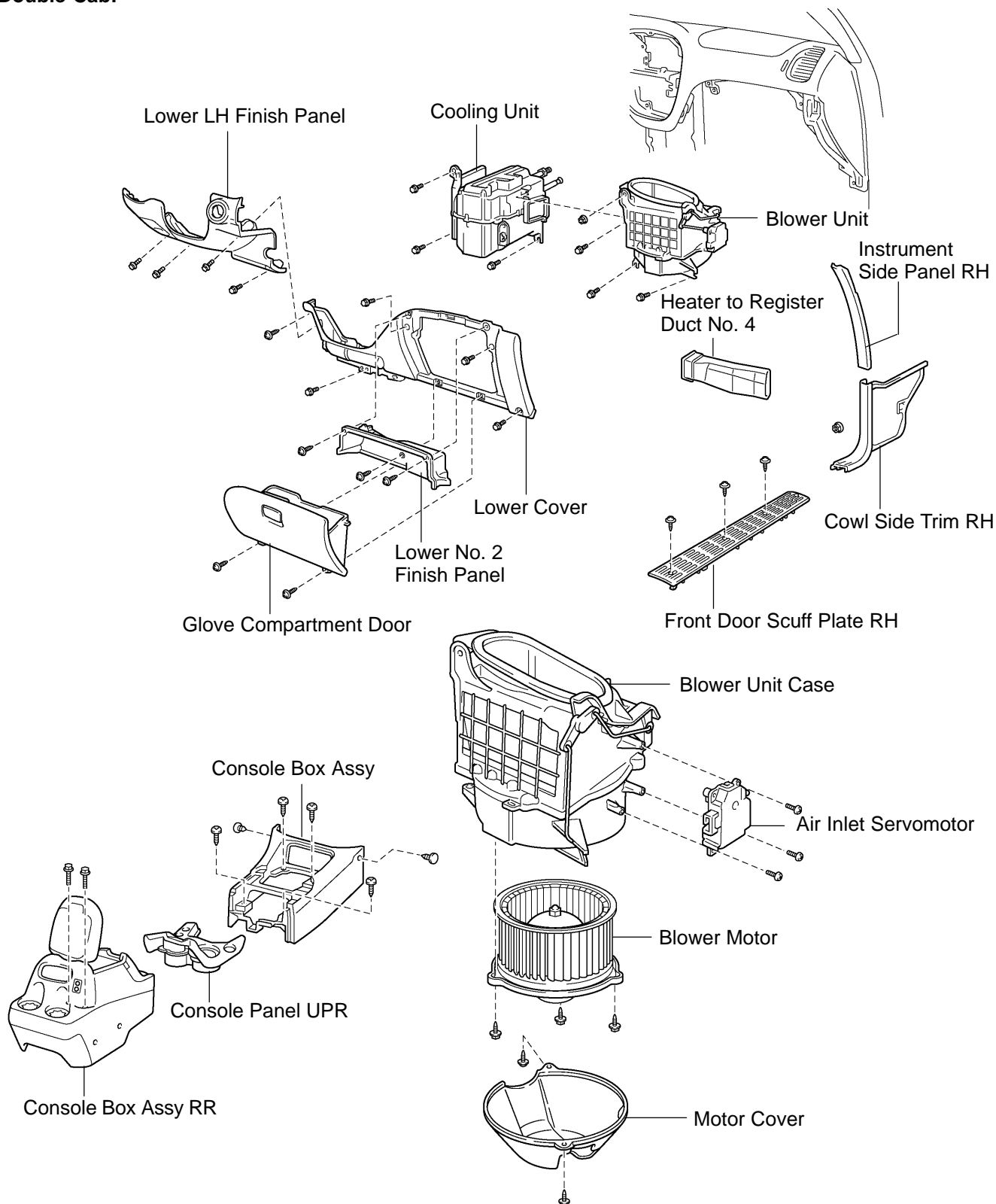


111157
111132

N

111178

Double Cab:



N

I27021

REMOVAL

1. **REMOVE COOLING UNIT (See page AC-31)**
2. **REMOVE BLOWER UNIT**
 - (a) Double cab:
Remove the 2 screws and motor cover.
 - (b) Disconnect the connector from the blower motor.
 - (c) Disconnect the air inlet damper control cable from the blower unit.

HINT:

At the time of installation, refer to the following:

After connection, adjust the control cable.

- (d) Remove the nut, bolt and blower unit.

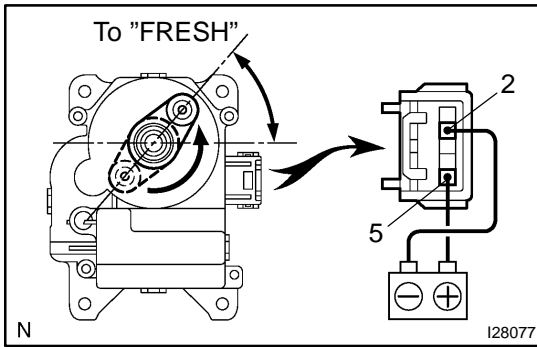
DISASSEMBLY

1. REMOVE BLOWER MOTOR

- (a) Double cab:
Remove the 2 screws and motor cover.
- (b) Remove the 3 screws and blower motor.

2. REMOVE AIR INLET SERVOMOTOR

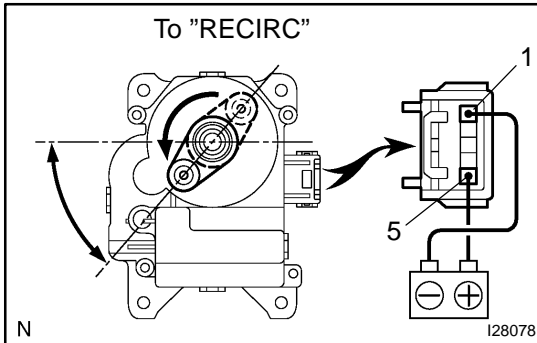
Remove the 3 screws and servomotor.



INSPECTION

INSPECT AIR INLET SERVOMOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 2.
- (b) Check the motor arm rotates counterclockwise and stops in the "FRESH" position.



- (c) Connect the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 1.
- (d) Check the motor arm rotates counterclockwise and stops in the "RECIRC" position.

REASSEMBLY

The reassembly procedures are the disassembly procedures in reverse order (see page [AC-48](#)).

INSTALLATION

The installation procedures are the removal procedures in reverse order (see page [AC-47](#)).

COMPRESSOR AND MAGNETIC CLUTCH (1GR-FE)

ON-VEHICLE INSPECTION

AC3SD-01

1. SET MANIFOLD GAUGE SET (See page AC-20)

2. START ENGINE

3. INSPECT COMPRESSOR FOR METALLIC SOUND

Check if a metallic sound can be heard from the compressor when the A/C switch is on.

If a metallic sound cannot be heard, replace the compressor assembly.

4. INSPECT REFRIGERANT PRESSURE

(See page AC-3)

5. STOP ENGINE

6. INSPECT VISUALLY FOR LEAKAGE OF REFRIGERANT FROM SAFETY SEAL

Using a gas leak detector, check for leakage of refrigerant.

If there is any leakage, replace the compressor assembly.

7. REMOVE MANIFOLD GAUGE SET

(See page AC-22)

8. CHECK FOR LEAKAGE OF GREASE FROM CLUTCH BEARING

9. CHECK FOR SIGNS OF OIL ON PRESSURE PLATE

If necessary, repair or replace the pressure plate.

10. INSPECT MAGNETIC CLUTCH BEARING FOR NOISE

(a) Start the engine.

(b) Check if abnormal noise is heard from near the compressor when the A/C switch is OFF.

If abnormal noise is being emitted, replace the magnetic clutch.

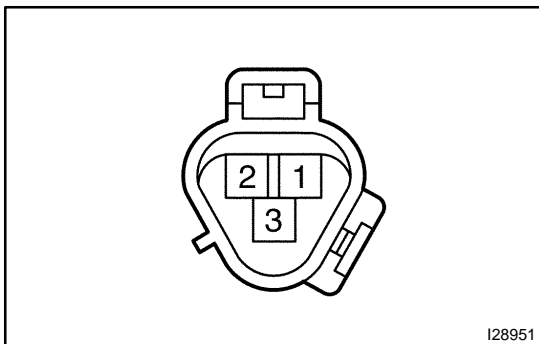
11. INSPECT MAGNETIC CLUTCH OPERATION

(a) Disconnect the connector.

(b) Connect the positive (+) lead from the battery to terminal 3 on the magnetic clutch connector and the negative (-) lead to body ground.

(c) Check that the magnetic clutch is energized.

If operation is not as specified, replace the magnetic clutch.



I28951

12. INSPECT COMPRESSOR LOCK SENSOR RESISTANCE

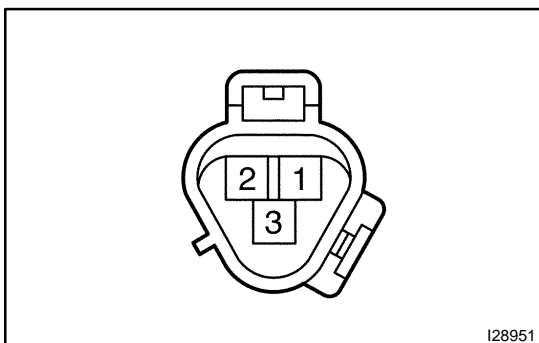
(a) Disconnect the connector.

(b) Measure the resistance between terminals 1 and 2.

Standard resistance:

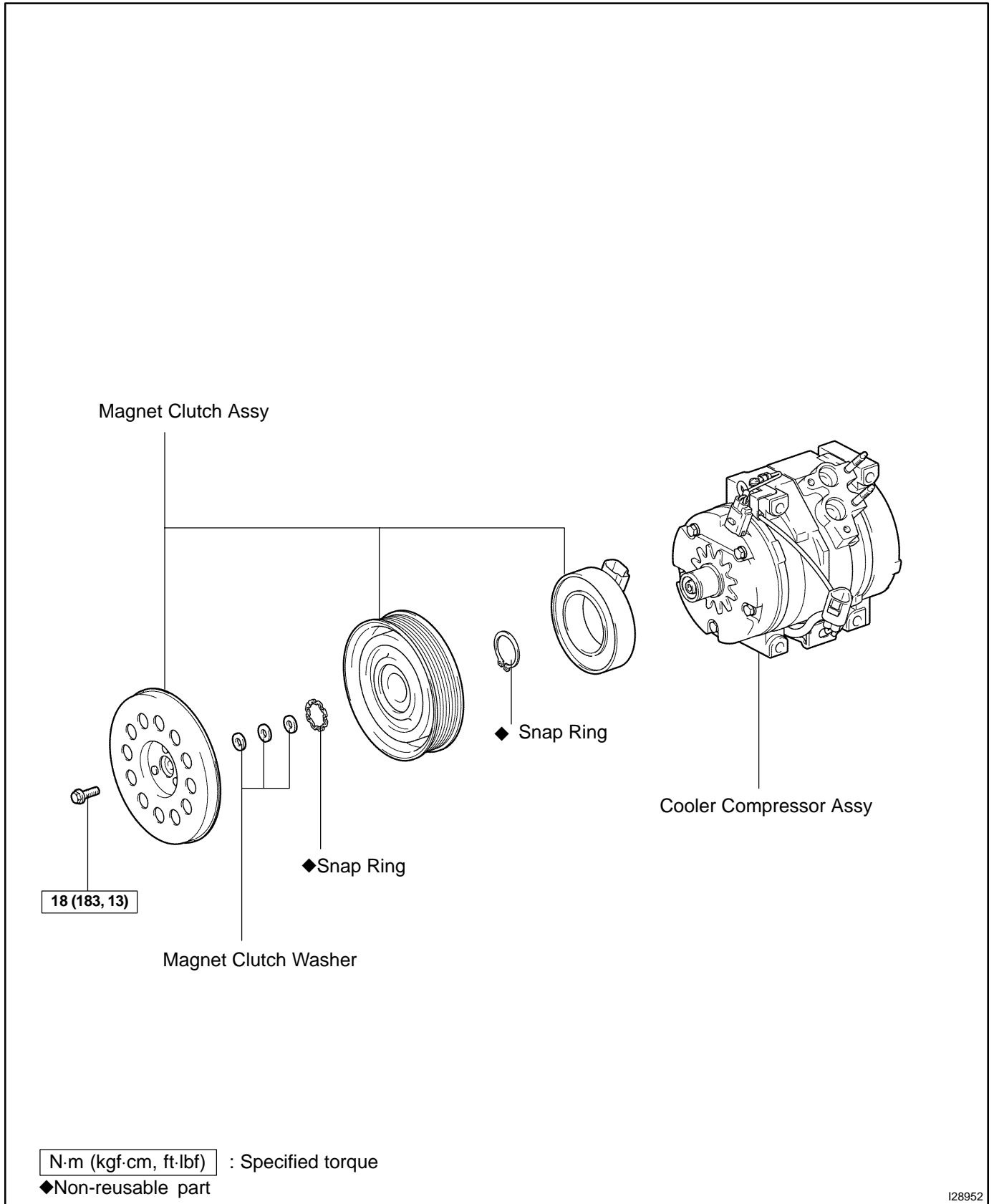
165 to 205 Ω at 20°C (68°F)

If resistance is not as specified, replace the compressor.



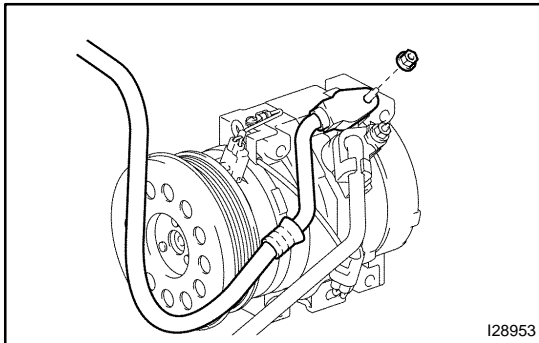
I28951

COMPONENTS



REMOVAL

1. RUN ENGINE AT IDLE SPEED WITH A/C ON FOR APPROX. 10 MINUTES
2. STOP ENGINE
3. DISCONNECT NEGATIVE (-) TERMINAL CABLE FROM BATTERY
4. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM
5. REMOVE ENGINE UNDER COVER

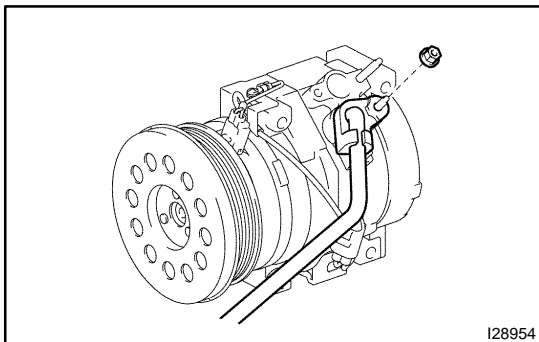


6. DISCONNECT DISCHARGE HOSE

- (a) Remove the nut and disconnect the discharge hose sub-assy from the compressor and magnetic clutch.
- (b) Remove the O-ring from the discharge hose sub-assy.

NOTICE:

Seal the openings of the disconnected parts using vinyl tape to prevent moisture and foreign matter from entering.

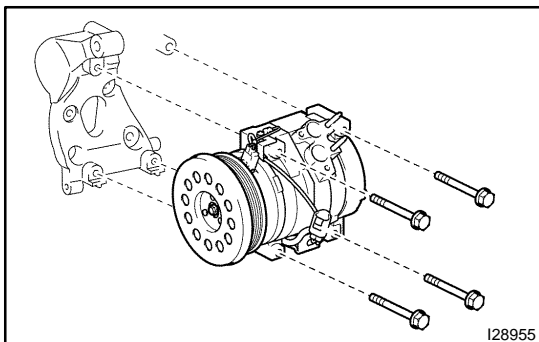


7. DISCONNECT SUCTION HOSE

- (a) Remove the nut and disconnect the suction hose sub-assy from the compressor and magnetic clutch.
- (b) Remove the O-ring from the suction hose sub-assy.

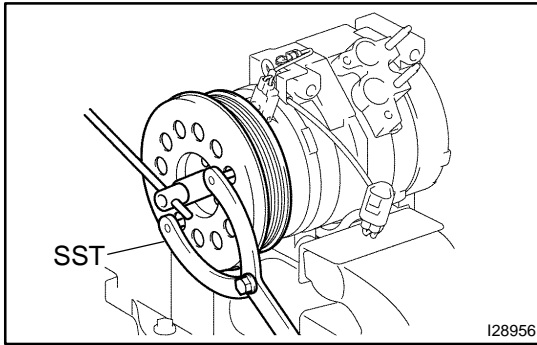
NOTICE:

Seal the openings of the disconnected parts using vinyl tape to prevent moisture and foreign matter from entering.



8. REMOVE COMPRESSOR AND MAGNETIC CLUTCH

- (a) Disconnect the connector.
- (b) Remove the 4 bolts and the compressor and magnetic clutch.

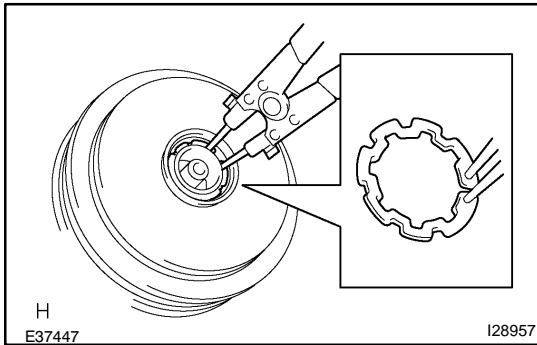


DISASSEMBLY

1. REMOVE MAGNET CLUTCH

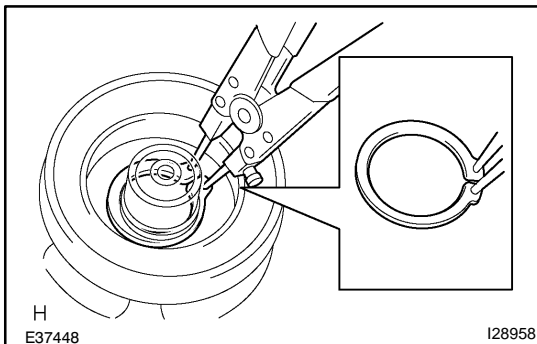
- (a) Place the compressor and magnetic clutch in a vise.
- (b) Using SST, remove the bolt, the magnet clutch hub and the magnet clutch washer.

SST 09960-10010 (09962-01000, 09963-00500)

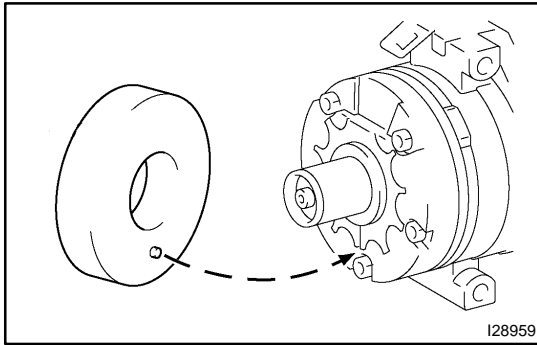


- (c) Using a snap ring expander, remove the snap ring and the magnet clutch rotor.

- (d) Remove the screw and disconnect the connector.



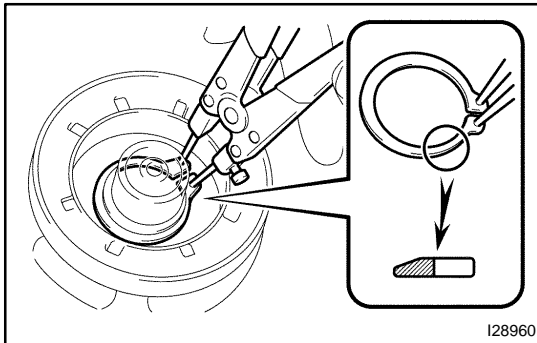
- (e) Using a snap ring expander, remove the snap ring and the magnet clutch stator.



REASSEMBLY

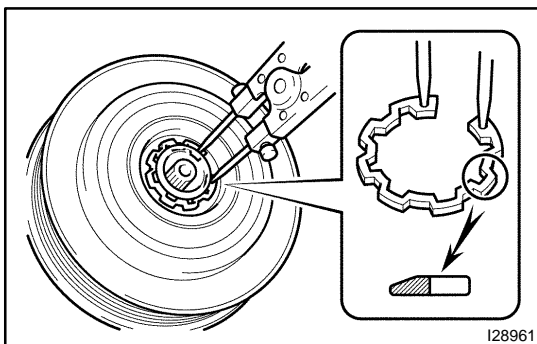
1. INSTALL MAGNET CLUTCH

- (a) Fit the parts as shown in the illustration, and install the magnet clutch stator.



- (b) Using a snap ring expander, install a new snap ring with the chamfered side facing up.

- (c) Install the screw and connect the connector.

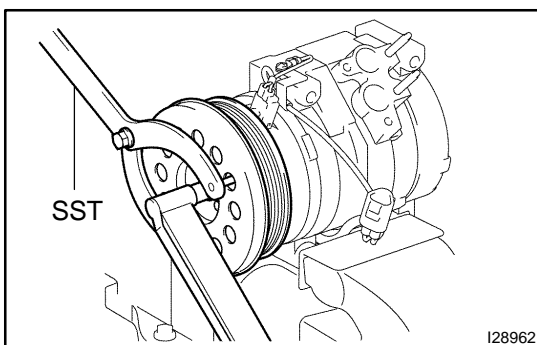


- (d) Using a snap ring expander, install the magnet clutch rotor and a new snap ring with the chamfered side facing up.

- (e) Install the magnet clutch washer and the magnet clutch hub.

NOTICE:

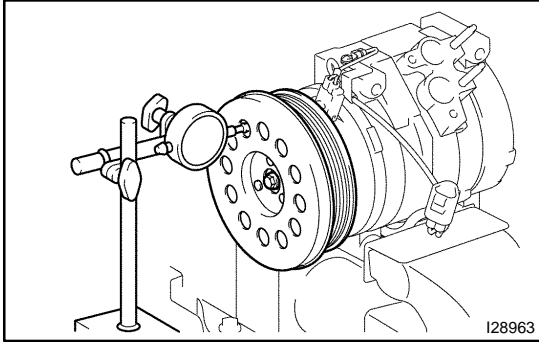
Do not change the combination of the magnet clutch washers used before disassembly.



- (f) Using SST, install the magnet clutch hub and the magnet clutch washer with the bolt.

SST 09960-10010 (09962-01000, 09963-00500)

Torque: 18 N·m (183 kgf·cm, 13 ft·lbf)



2. INSPECT MAGNET CLUTCH CLEARANCE

- (a) Set the dial indicator to the magnet clutch hub.
- (b) Connect the positive battery lead to terminal 1 of the magnet clutch connector and the negative lead to the earth wire. Turn the magnet clutch on and off and measure the clearance.

Standard clearance:

0.35 to 0.60 mm (0.013 to 0.023 in.)

If the measured value is not within the standard range, remove the magnet clutch hub and adjust it with magnet clutch washers.

NOTICE:

Adjustment should be performed with 3 or less magnet clutch washers.

3. INSPECT COMPRESSOR OIL

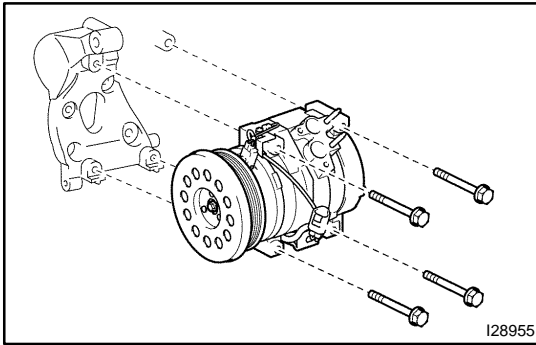
When replacing the compressor and magnetic clutch with a new one, after gradually removing the refrigerant gas from the service valve, drain the following amount of oil from the new compressor and magnetic clutch before installation.

Standard:

(Oil capacity inside the new compressor and magnetic clutch: 120 + 15 cc (4.0 + 0.5 fl. oz.)) - (Remaining oil amount in the removed compressor and magnetic clutch) = (Oil amount to be removed when replacing)

NOTICE:

- ◆ When checking the compressor oil level, observe the precautions in the cooler removal/installation.
- ◆ Because compressor oil remains in the pipes of the vehicle, if a new compressor and magnetic clutch is installed without removing some oil inside, the oil amount becomes excessive, preventing heat exchange in the refrigerant cycle and causing refrigerant failure.
- ◆ If the remaining oil in the removed compressor and magnetic clutch is too small in volume, check for an oil leakage.
- ◆ Be sure to use ND-OIL 8 or equivalent for compressor oil.

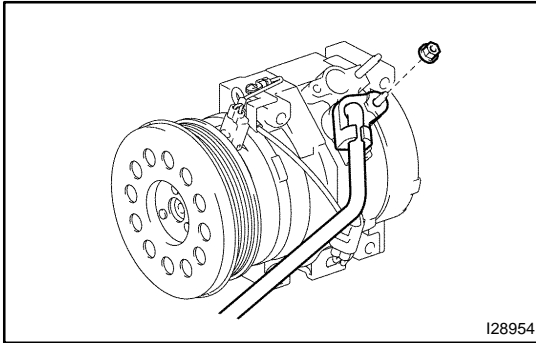


INSTALLATION

1. **INSTALL COMPRESSOR AND MAGNET CLUTCH**
 - (a) Install the compressor and the magnetic clutch with the 4 bolts.

Torque: 24 N·m (245 kgf·cm, 18 ft·lbf)

- (b) Connect the connector.



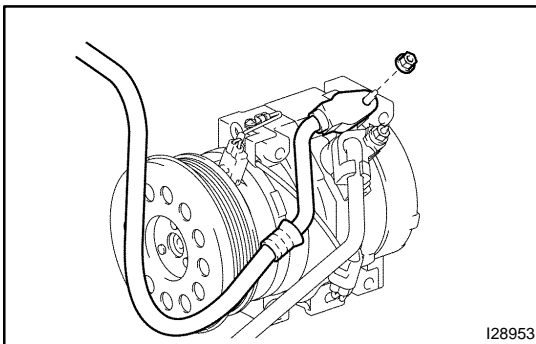
2. **INSTALL SUCTION HOSE**

- (a) Remove the attached vinyl tape from the hose.
 - (b) Sufficiently apply compressor oil to a new O-ring and the fitting surfaces of the compressor and magnetic clutch.

Compressor oil: ND-OIL 8 or equivalent

- (c) Install the O-ring on the suction hose sub-assy.
 - (d) Install the suction hose sub-assy on the compressor and magnetic clutch with the nut.

Torque: 10 N·m (100 kgf·cm, 7 in·lbf)



3. **INSTALL DISCHARGE HOSE**

- (a) Remove the attached vinyl tape from the hose.
 - (b) Sufficiently apply compressor oil to a new O-ring and the fitting surfaces of the compressor and magnetic clutch.

Compressor oil: ND-OIL 8 or equivalent

- (c) Install the O-ring on the discharge hose sub-assy.
 - (d) Install the discharge hose sub-assy on the compressor and magnetic clutch with the nut.

Torque: 10 N·m (100 kgf·cm, 7 in·lbf)

4. **INSTALL AND CHECK DRIVE BELT**

(See page [AC-19](#) and [AC-17](#))

5. **INSTALL ENGINE UNDER COVER**

6. **CONNECT NEGATIVE (-) TERMINAL CABLE TO BATTERY**

7. **EVACUATE AIR FROM REFRIGERATION SYSTEM**

8. **CHARGE SYSTEM WITH REFRIGERANT**

Specified amount:

Access cab, Standard cab:

600 ± 50 g (21.16 ± 1.76 oz.)

Double cab:

530 ± 50 g (18.69 ± 1.76 oz.)

9. **INSPECT FOR LEAKAGE OF REFRIGERANT**

Using a gas leak detector, check for leakage of refrigerant. If there is leakage, check the tightening torque at the joints.

COMPRESSOR AND MAGNETIC CLUTCH (2UZ-FE) ON-VEHICLE INSPECTION

AC3SJ-01

1. SET MANIFOLD GAUGE SET (See page AC-20)

2. START ENGINE

3. INSPECT COMPRESSOR FOR METALLIC SOUND

Check if a metallic sound can be heard from the compressor when the A/C switch is on.

If a metallic sound cannot be heard, replace the compressor assembly.

4. INSPECT REFRIGERANT PRESSURE

(See page AC-3)

5. STOP ENGINE

6. INSPECT VISUALLY FOR LEAKAGE OF REFRIGERANT FROM SAFETY SEAL

Using a gas leak detector, check for leakage of refrigerant.

If there is any leakage, replace the compressor assembly.

7. REMOVE MANIFOLD GAUGE SET

(See page AC-22)

8. CHECK FOR LEAKAGE OF GREASE FROM CLUTCH BEARING

9. CHECK FOR SIGNS OF OIL ON PRESSURE PLATE

If necessary, repair or replace.

10. INSPECT MAGNETIC CLUTCH BEARING FOR NOISE

(a) Start the engine.

(b) Check if abnormal noise is heard from near the compressor when the A/C switch is OFF.

If abnormal noise is being emitted, replace the magnetic clutch.

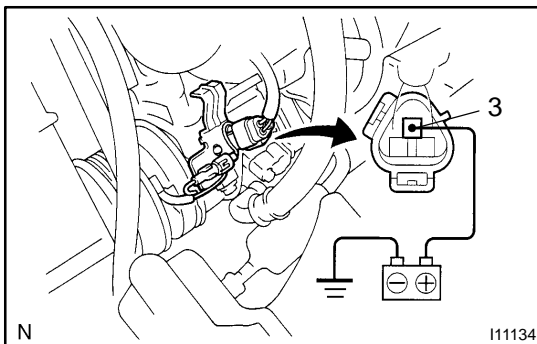
11. INSPECT MAGNETIC CLUTCH OPERATION

(a) Disconnect the connector.

(b) Connect the positive (+) lead from the battery to terminal 3 and the negative (-) lead to body ground.

(c) Check that the magnetic clutch is energized.

If operation is not as specified, replace the magnetic clutch.



12. INSPECT COMPRESSOR LOCK SENSOR RESISTANCE

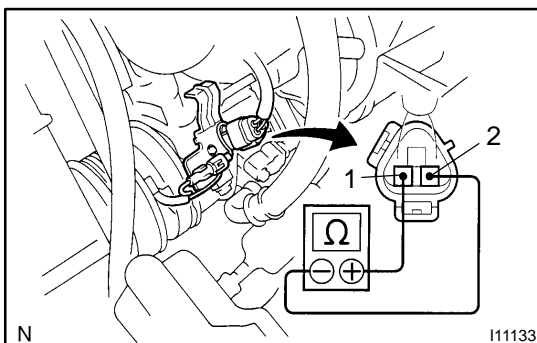
(a) Disconnect the connector.

(b) Measure the resistance between terminals 1 and 2.

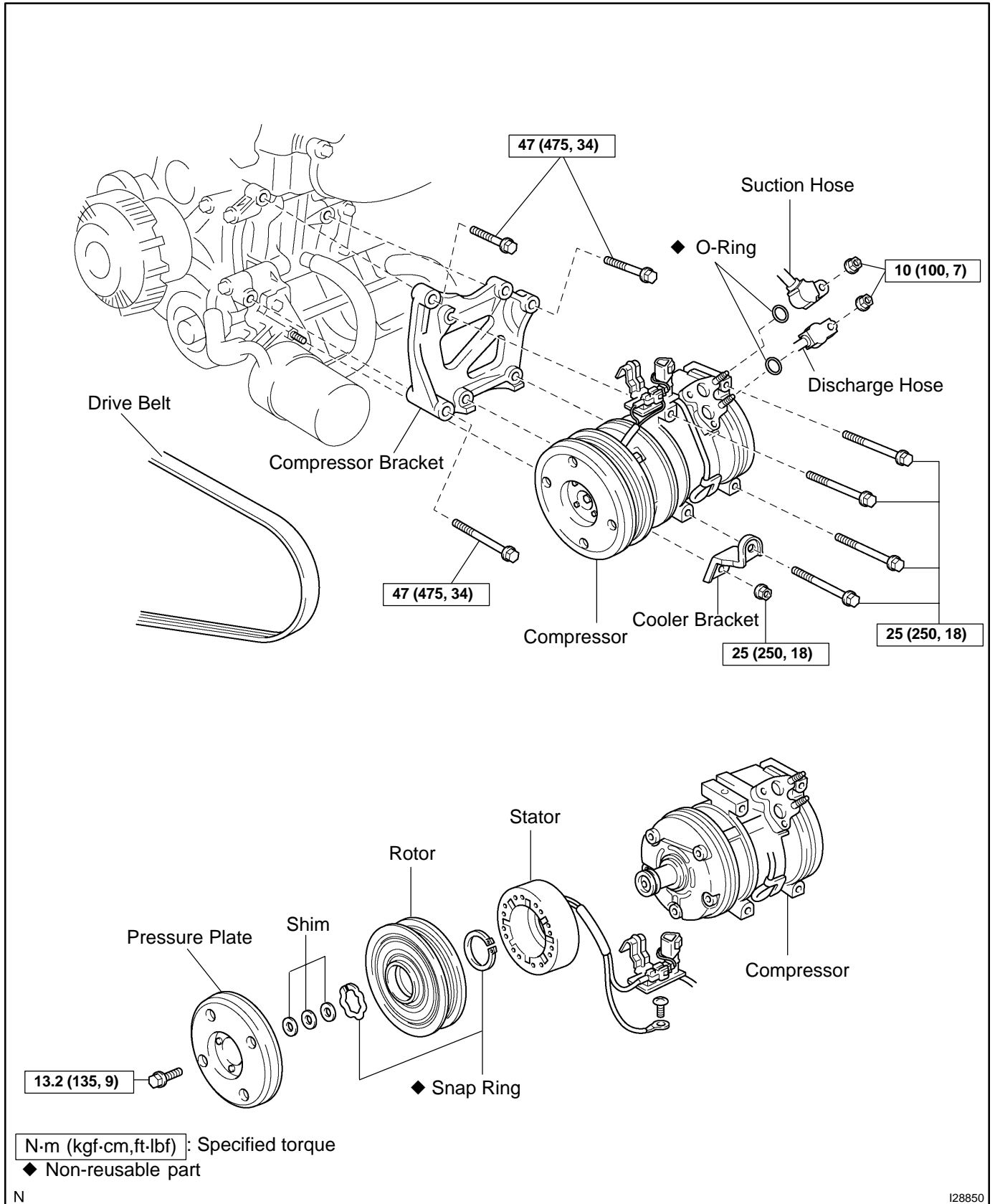
Standard resistance:

65 to 125 Ω at 20 °C (68 °F)

If resistance is not as specified, replace the compressor.



COMPONENTS



N

128850

REMOVAL

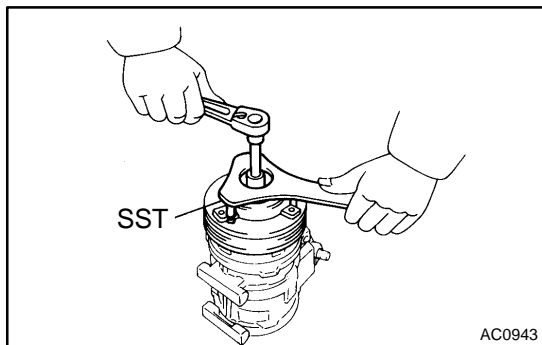
1. RUN ENGINE AT IDLE SPEED WITH A/C ON FOR APPROX. 10 MINUTES
2. STOP ENGINE
3. DISCONNECT NEGATIVE (-) TERMINAL CABLE FROM BATTERY
4. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM
5. DISCONNECT DISCHARGE AND SUCTION HOSES

Remove the 2 nuts and disconnect both hoses.

NOTICE:

Cap the openings immediately to keep moisture or dirt out of the system.

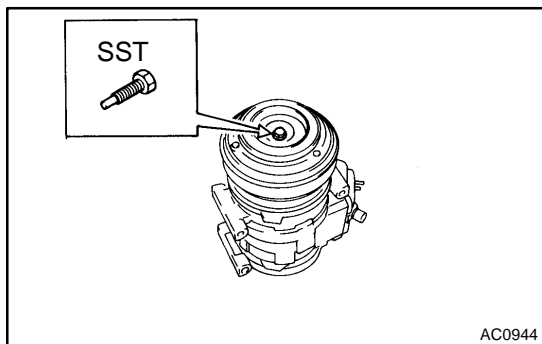
6. REMOVE DRIVE BELT (See page [AC-18](#))
7. REMOVE COMPRESSOR
 - (a) Disconnect the connector.
 - (b) Remove the 4 bolts and nut.
 - (c) Remove the cooler bracket.
 - (d) Remove the compressor.



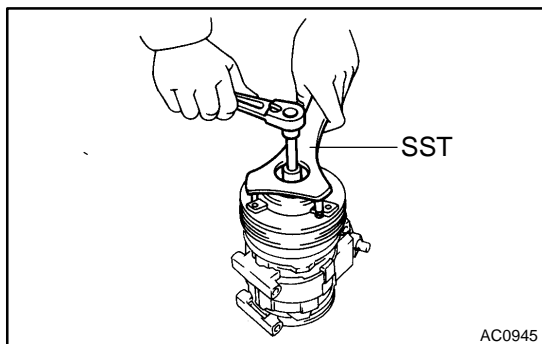
DISASSEMBLY

1. REMOVE PRESSURE PLATE

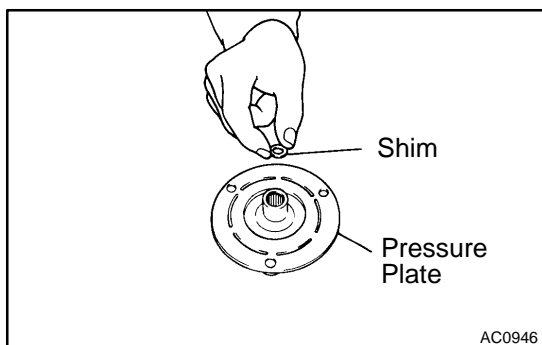
- (a) Using SST and a socket wrench, remove the shaft bolt.
SST 07112-76060
Torque: 13.2 N·m (135 kgf·cm, 9 ft·lbf)



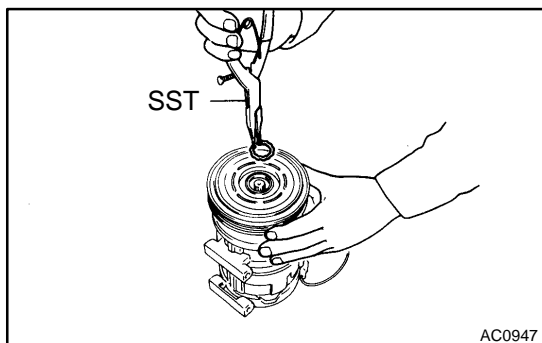
- (b) Install SST on the pressure plate.
SST 07112-66040



- (c) Using SST and a socket wrench, remove the pressure plate.
SST 07112-66040, 07112-76060,

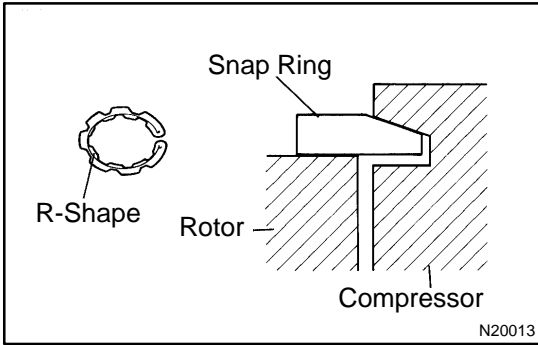


- (d) Remove the shims from the pressure plate.



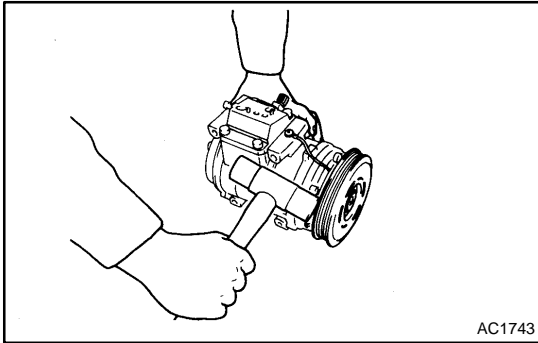
2. REMOVE ROTOR

- (a) Using SST, remove the snap ring.
SST 95994-10020



NOTICE:

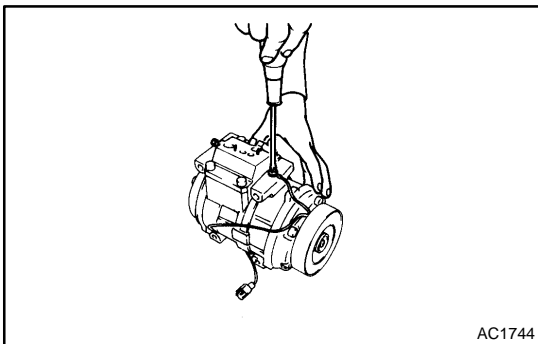
The snap ring should be installed so that its beveled side faces up.



(b) Using a plastic hammer, remove the rotor from the shaft.

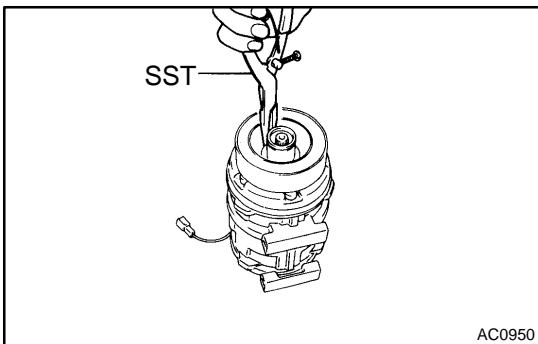
NOTICE:

Be careful not to damage the pulley when tapping on the rotor.



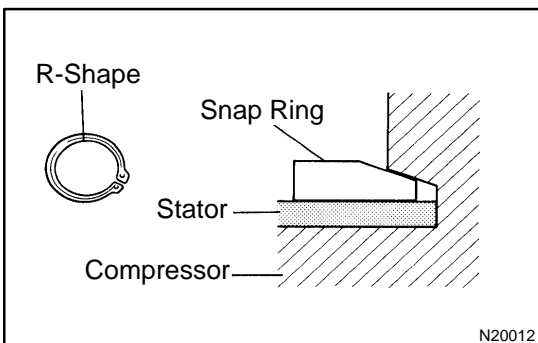
3. REMOVE STATOR

(a) Disconnect the stator lead wire from the compressor housing.



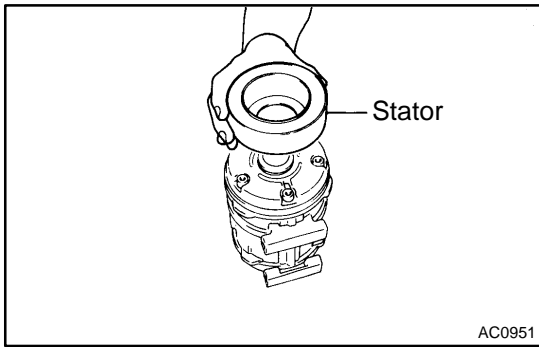
(b) Using SST, remove the snap ring.

SST 95994-10020

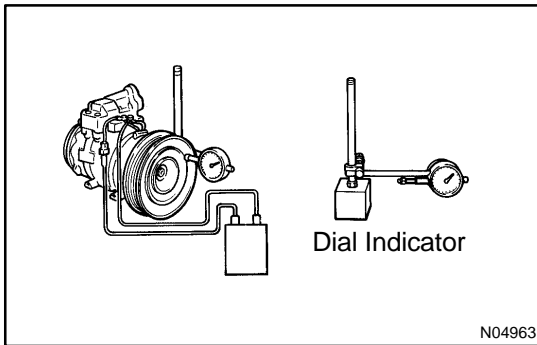


NOTICE:

The snap ring should be installed so that its beveled side faces up.



(c) Remove the stator.



REASSEMBLY

Reassembly is in the reverse order of disassembly
(See page AC-62).

AFTER REASSEMBLY, CHECK MAGNETIC CLUTCH CLEARANCE

- (a) Set the dial indicator to the pressure plate of the magnetic clutch.
- (b) Connect the magnetic clutch lead wire to the positive (+) terminal of the battery.
- (c) Check the clearance between the pressure plate and rotor when connecting the negative (-) terminal to the battery.

Standard clearance:

0.5 ± 0.15 mm (0.020 ± 0.0059 in.)

If the clearance is not within the standard range, adjust the clearance using shims to obtain the standard clearance.

Standard thickness:

0.1 mm (0.004 in.)

0.3 mm (0.012 in.)

0.5 mm (0.020in.)

INSTALLATION

1. INSTALL COMPRESSOR

- (a) Install the compressor with the cooler bracket with the 4 bolts and nut.

Torque: 25 N·m (250 kgf·cm, 18 in.-lbf)

- (b) Connect the connector.

2. CONNECT DISCHARGE AND SUCTION HOSES

Connect both hoses with the 2 nuts.

Torque: 10 N·m (100 kgf·cm, 7 in.-lbf)

NOTICE:

Hoses should be connected immediately after the caps have been removed.

HINT:

Lubricate 2 new O-rings with compressor oil and install them to the hoses.

3. INSTALL AND CHECK DRIVE BELT (See page [AC-19](#) and [AC-17](#))

4. CONNECT NEGATIVE (-) TERMINAL CABLE TO BATTERY

5. EVACUATE AIR FROM REFRIGERATION SYSTEM

6. CHARGE SYSTEM WITH REFRIGERANT

Specified amount:

Access cab, Standard cab: 600 ± 50 g (21.16 ± 1.76 oz.)

Double cab: 530 ± 50 g (18.69 ± 1.76 oz.)

7. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak detector, check for leakage of refrigerant.

If there is leakage, check the tightening torque at the joints.

RECEIVER

ON-VEHICLE INSPECTION

AC276-01

INSPECT FITTINGS FOR LEAKAGE

Using a gas leak detector, check for leakage.

If there is leakage, check the tightening torque at the joints.

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

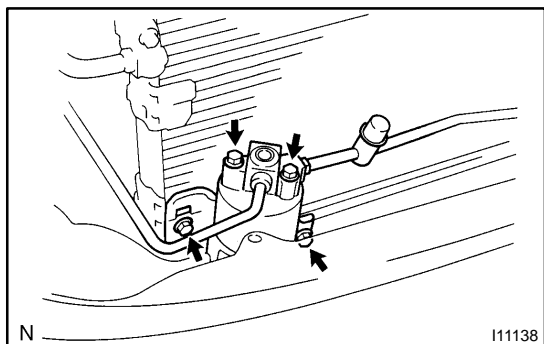
At the time of the installation, refer to the following:

- ◆ Evacuate air from the refrigeration system.
- ◆ Charge the system with refrigerant and inspect for leakage of refrigerant.

Specified amount:

Access cab, Standard cab:

600 ± 50 g (21.16 ± 1.76 oz.)



2. DISCONNECT 2 LIQUID TUBES FROM RECEIVER

Remove the 2 bolts and disconnect both tubes.

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

NOTICE:

Cap the openings immediately to keep moisture or dirt out of the system.

HINT:

At the time of the installation, refer to the following:

Lubricate 2 new O-rings with compressor oil and install them to the tubes.

3. REMOVE RECEIVER

(a) Remove the holder bolt and pull the receiver downward.

HINT:

At the time of the installation, refer to the following:

If the receiver is replaced, add compressor oil to the compressor.

Add 20 cc (0.71 fl.oz.)

Compressor oil: ND-OIL 8 or equivalent

(b) Remove the bolt and holder.

INSTALLATION

The installation procedures are the removal procedures in reverse order (see page [AC-68](#)).

CONDENSER

AC08-01

ON-VEHICLE INSPECTION

1. INSPECT CONDENSER FINS FOR BLOCKAGE OR DAMAGE

If the fins are clogged, wash them with water and dry with compressed air.

NOTICE:

Be careful not to damage the fins.

If the fins are bent, straighten them with a screwdriver or pliers.

2. INSPECT CONDENSER AND FITTINGS FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant.

If there is leakage, check the tightening torque at the joints.

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

At the time of installation, refer to the following:

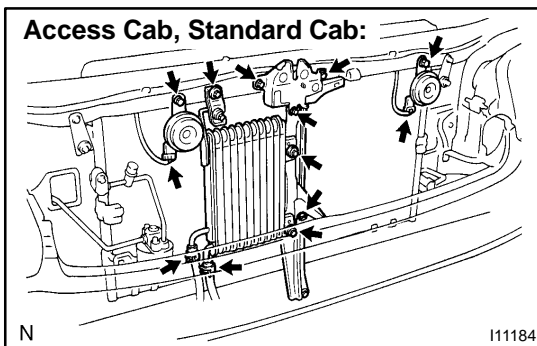
- ◆ Evacuate air from the refrigeration system.
- ◆ Charge the system with refrigerant and inspect for leakage of refrigerant.

Specified amount:

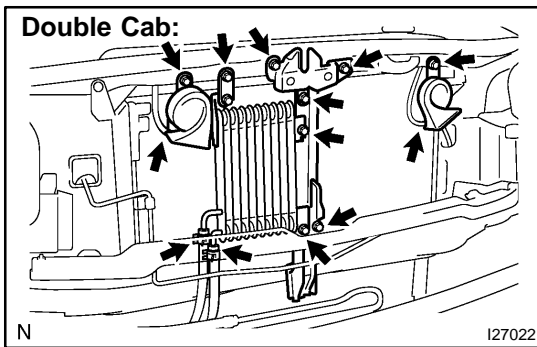
Access cab, Standard cab:

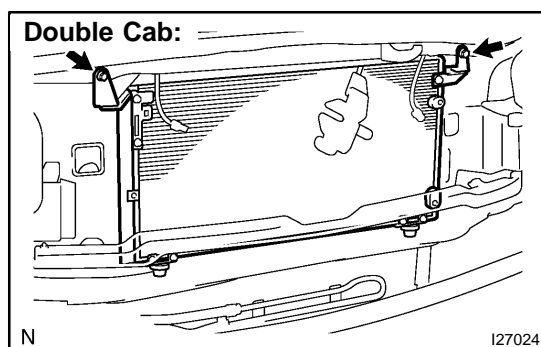
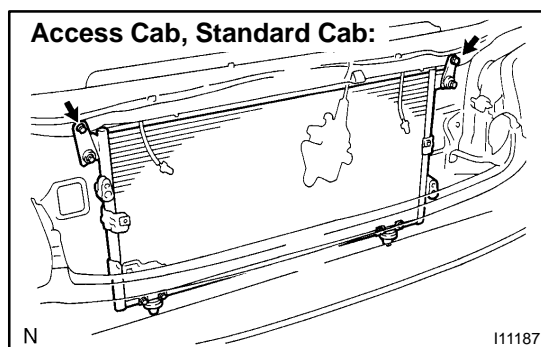
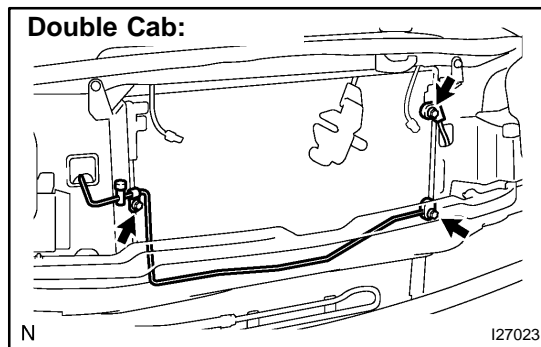
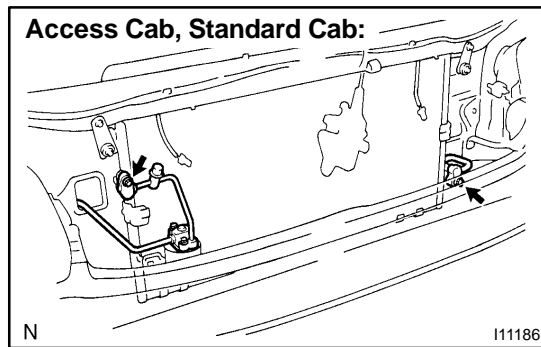
600 ± 50 g (21.16 ± 1.76 oz.)

Double cab: 530 ± 50 g (18.69 ± 1.76 oz.)



2. A/T models:
REMOVE A/T OIL COOLER
3. REMOVE HORN
4. REMOVE HOOD LOCK
5. REMOVE CENTER BRACE
6. REMOVE RECEIVER AND HOLDER
(See page [AC-68](#))





7. DISCONNECT LIQUID TUBE AND DISCHARGE HOSE

Remove the 2 bolts and disconnect both tube and hose.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

NOTICE:

Cap the openings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, refer to the following:

Lubricate 2 new O-rings with compressor oil and install them to the tubes.

8. REMOVE CONDENSER

- (a) Remove the 2 bolts and 2 lower brackets.
- (b) Remove the 4 bolts and 2 upper brackets.
- (c) Pull the condenser forward and then upward.

HINT:

At the time of installation, refer to the following:

If the condenser is replaced, add compressor oil to the compressor.

Add 40 to 50 cc (1.4 to 1.7 fl.oz.)

Compressor oil: ND-OIL 8 or equivalent

INSTALLATION

The installation procedures are the removal procedures in reverse order (see page [AC-71](#)).

WATER VALVE

AC27A-02

ON-VEHICLE INSPECTION

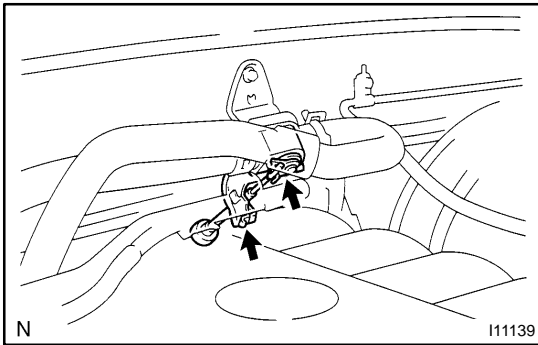
1. **WARM UP ENGINE**
2. **DISCONNECT WATER VALVE CONTROL CABLE**
3. **INSPECT WATER VALVE OPERATION**
 - (a) Check that warm air comes out from the vent when the water valve lever is moved to the "WARM" position.
 - (b) Check that cool air comes out when the water valve is moved to the "COOL" position.
If operation is not as specified, replace the water valve.
4. **CONNECT WATER VALVE CONTROL CABLE**

REMOVAL

1. DRAIN ENGINE COOLANT FROM RADIATOR

HINT:

It is not necessary to drain out all the coolant.

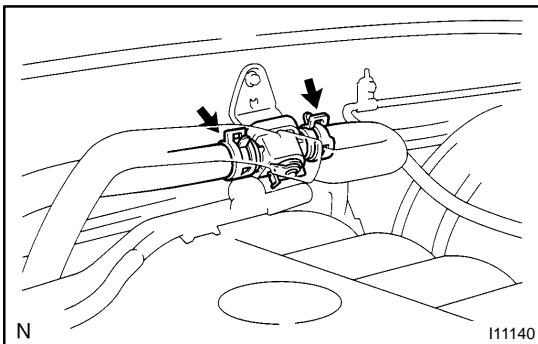


2. DISCONNECT WATER VALVE CONTROL CABLE FROM WATER VALVE

HINT:

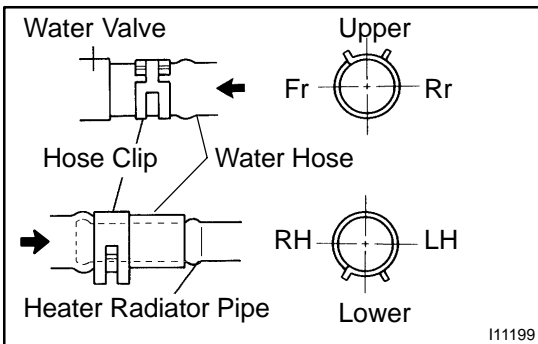
At the time of installation, refer to the following:

After connection, adjust the control cable (See page [AC-105](#)).



3. DISCONNECT WATER HOSES

- (a) Using pliers, grip the claws of the hose clips and slide the hose clips along the hoses.
- (b) Disconnect the water hoses.



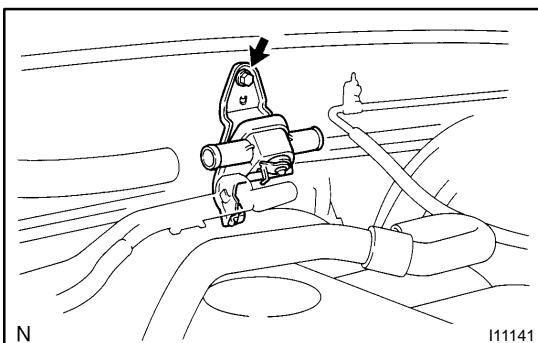
HINT:

At the time of installation, refer to the following:

- ◆ Heater radiator pipe:
Push the water hose onto the heater radiator pipe up to the second ridge on the pipe.
- ◆ Water valve:
Push the water hose onto the water valve pipe up to the water valve.
- ◆ Install the hose clip in the position shown in the illustration.

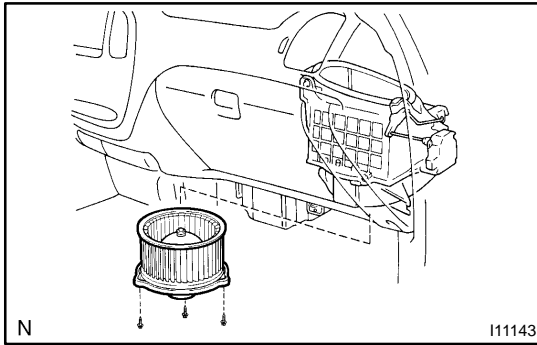
4. REMOVE WATER VALVE

Remove the bolt and water valve.



INSTALLATION

The installation procedures are the removal procedures in reverse order (see page [AC-75](#)).

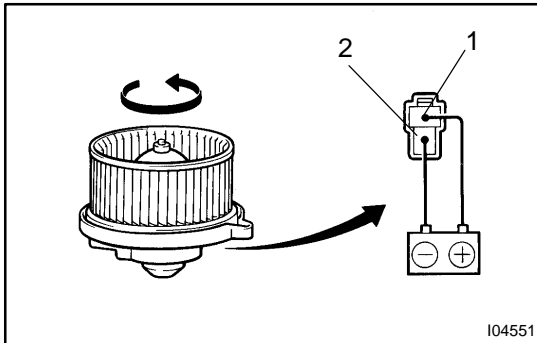


BLOWER MOTOR INSPECTION

AC3RY-02

1. REMOVE BLOWER MOTOR

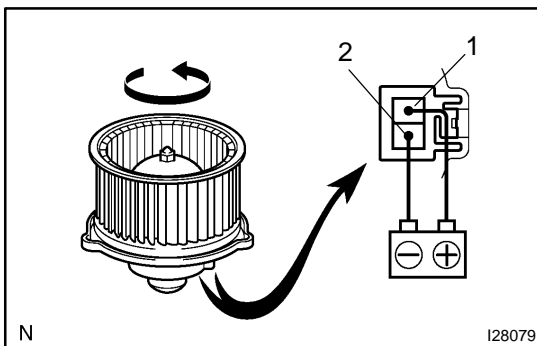
- (a) Double cab:
Remove the 2 screws and motor cover.
- (b) Disconnect the connector.
- (c) Remove the 3 screws and motor.



2. Standard cab, Access cab: INSPECT BLOWER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, then check that the motor operates smoothly.

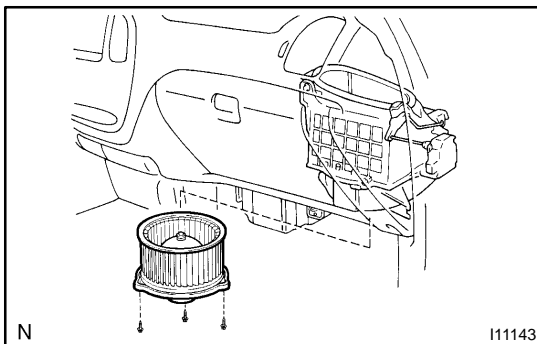
If operation is not as specified, replace the blower motor.



3. Double cab: INSPECT BLOWER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, then check that the motor operates smoothly.

If operation is not as specified, replace the blower motor.



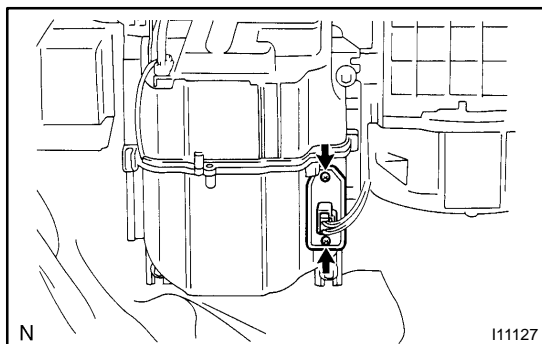
4. INSTALL BLOWER MOTOR

- (a) Install the motor with the 3 screws.
- (b) Connect the connector.

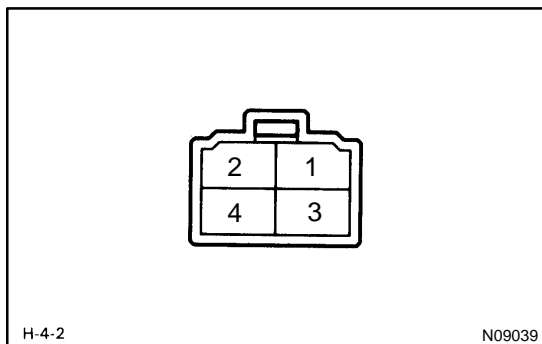
BLOWER RESISTOR INSPECTION

AC23E-05

1. REMOVE GLOVE COMPARTMENT PARTS
2. REMOVE LOWER NO. 2 FINISH PANEL
3. REMOVE LOWER CENTER COVER
4. REMOVE LOWER LH FINISH PANEL
5. REMOVE LOWER COVER (See page [BO-1 11](#))
6. REMOVE NO. 4 HEATER TO REGISTER DUCT



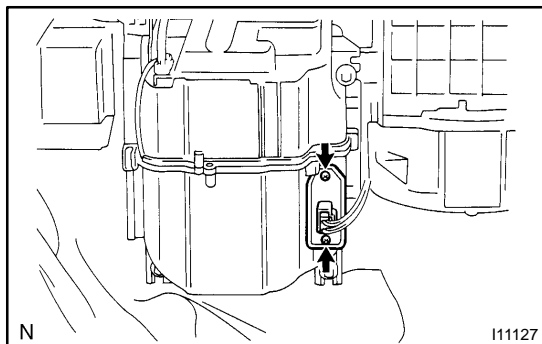
7. REMOVE BLOWER RESISTOR
 - (a) Disconnect the connector.
 - (b) Remove the 2 screws and blower resistor.



8. INSPECT BLOWER RESISTOR RESISTANCE

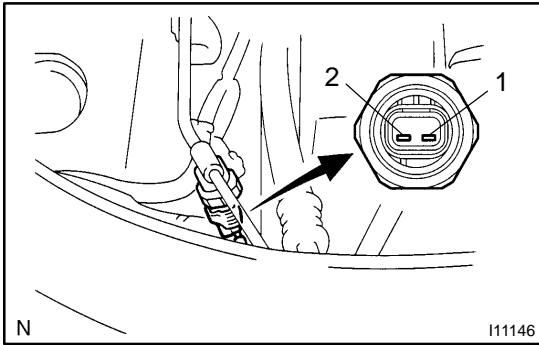
Tester connection	Condition	Specified condition
1-4	Constant	$3.3 \pm 0.2 \Omega$
1-3	Constant	$1.9 \pm 0.1 \Omega$
1-2	Constant	$2.9 \pm 0.2 \Omega$

If resistance is not as specified, replace the blower resistor.



9. INSTALL BLOWER RESISTOR
 - (a) Install the blower resistor with the 2 screws.
 - (b) Connect the connector.

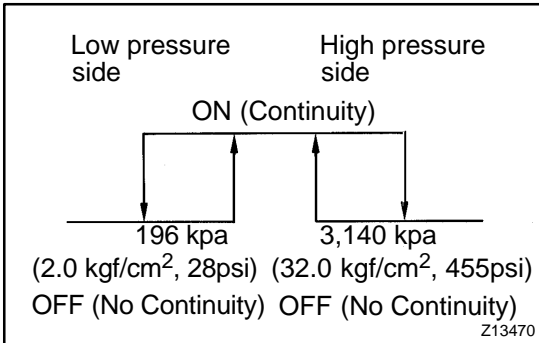
10. INSTALL NO. 4 HEATER TO REGISTER DUCT
11. INSTALL LOWER COVER
12. INSTALL LOWER LH FINISH PANEL
13. INSTALL LOWER CENTER COVER
14. INSTALL LOWER NO. 2 FINISH PANEL
15. INSTALL GLOVE COMPARTMENT PARTS
(See page [BO-120](#))



PRESSURE SWITCH ON-VEHICLE INSPECTION

AC0E7-05

1. SET MANIFOLD GAUGE SET (See page AC-20)
 2. DISCONNECT CONNECTOR
 3. RUN ENGINE AT APPROX. 2,000 rpm
 4. SET BLOWER SPEED CONTROL SWITCH TO "HI" POSITION
 5. SET TEMPERATURE CONTROL LEVER TO "MAX. COOL" POSITION
 6. A/C SWITCH ON
 7. INSPECT PRESSURE SWITCH OPERATION
 - (a) Connect the positive (+) lead from the ohmmeter to terminal 1 and the negative (-) lead to terminal 2.
 - (b) Check continuity between terminals when refrigerant pressure is changed, as shown in the illustration.
- If operation is not as specified, replace the pressure switch.



REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

At the time of installation, refer to the following:

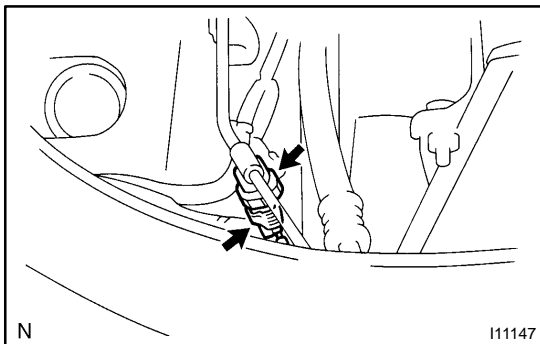
- ◆ Evacuate air from the refrigeration system.
- ◆ Charge the system with refrigerant and inspect for leakage of refrigerant.

Specified amount:

Access cab, Standard cab:

600 ± 50 g (21.16 ± 1.76 oz.)

Double cab: 530 ± 50 g (18.69 ± 1.76 oz.)



2. REMOVE PRESSURE SWITCH FROM LIQUID TUBE

Disconnect the connector and remove the pressure switch.

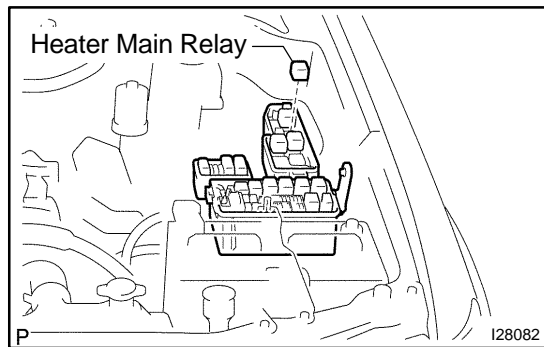
Torque: 10 N·m (100 kgf-cm, 7 ft-lbf)

HINT:

- ◆ Being careful not to deform the tube, lock the switch mounted on the tube with an open end wrench, and remove the switch.
- ◆ At the time of installation, refer to the following:
Lubricate a new O-ring with the compressor oil and install it to the switch.

INSTALLATION

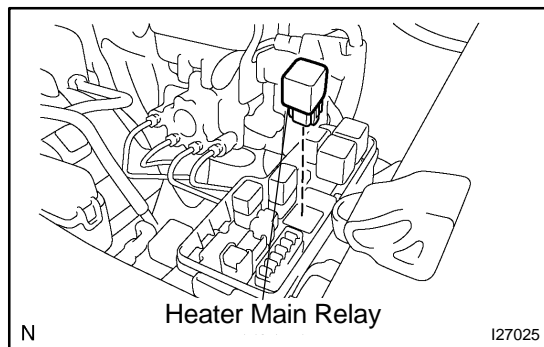
The installation procedures are the removal procedures in reverse order (see page [AC-80](#)).



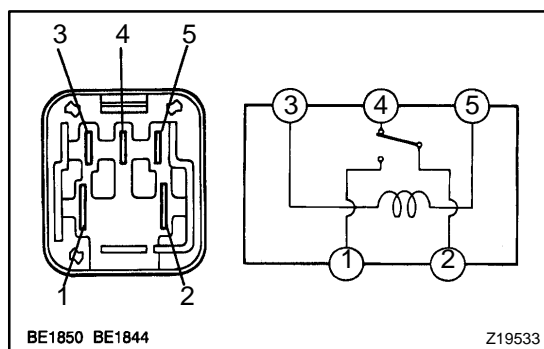
HEATER MAIN RELAY INSPECTION

AC3RZ-02

1. Access cab, Standard cab:
REMOVE HEATER MAIN RELAY FROM ENGINE ROOM RELAY BLOCK



2. Double cab:
REMOVE HEATER MAIN RELAY FROM ENGINE ROOM RELAY BLOCK NO. 2



3. **INSPECT HEATER MAIN RELAY (Marking: HEATER) CONTINUITY**

Condition	Tester connection	Specified condition
Constant	2 - 4	Continuity
	3 - 5	
Apply B+ between terminals 3 and 5	1 - 2	Continuity

If continuity is not as specified, replace the relay.

AIR CONDITIONING CONTROL ASSEMBLY (Center Cluster Integration)

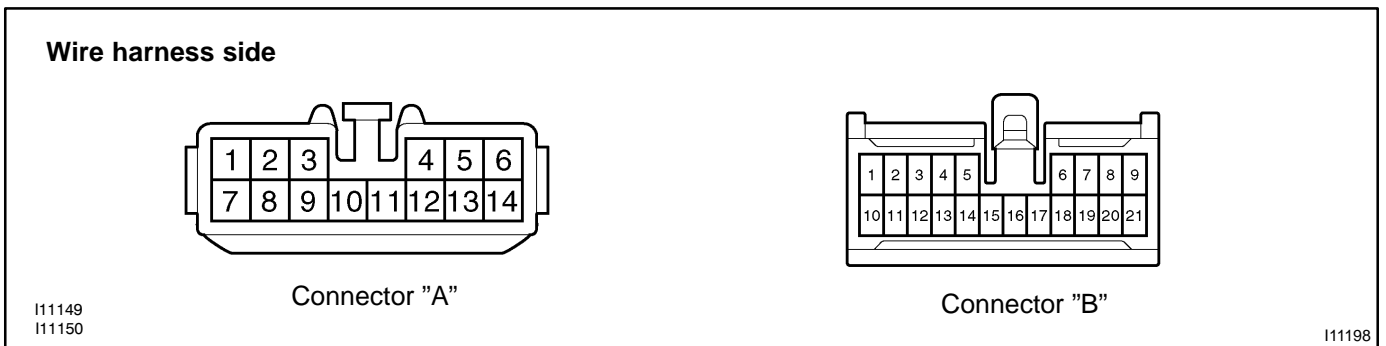
AC350-02

ON-VEHICLE INSPECTION

1. REMOVE CENTER CLUSTER INTEGRATION PANEL (See page AC-89)
2. Access cab, Standard cab:
 - INSPECT A/C CONTROL ASSEMBLY CIRCUIT
 - (a) Disconnect the connectors from the A/C control assembly and inspect the connectors on the wire harness side, as shown in the chart below.

Test condition:

Turn the ignition switch to ON



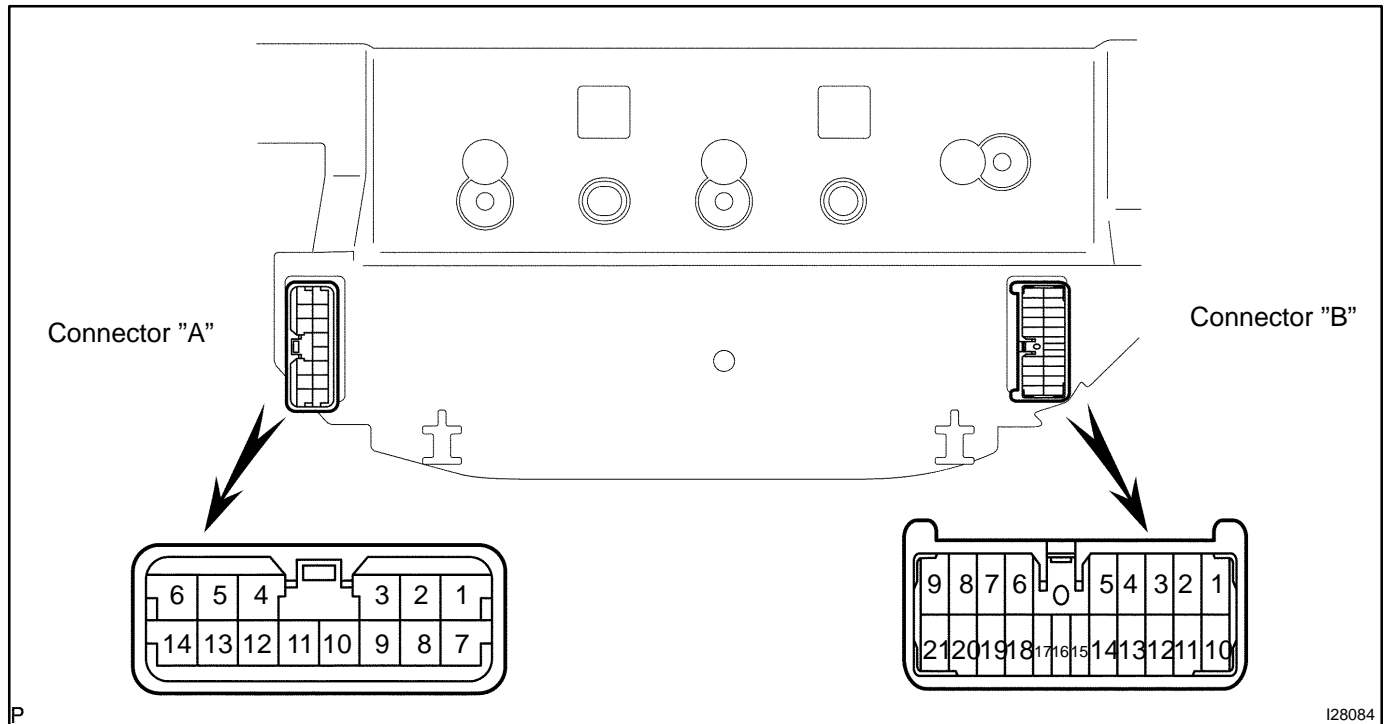
Tester connection	Condition	Specified condition
A1 - Ground	Constant	Continuity
A4 - Ground	Turn ignition switch to ON	Battery positive voltage
	Turn ignition switch OFF	No voltage
A5 - Ground	Constant	Battery positive voltage
A13 - Ground	Turn ignition switch to ACC	Battery positive voltage
	Turn ignition switch OFF	No voltage
B11 - Ground (5VZ-FE engine)	Constant	Continuity
B20 - B10	Evaporator temperature at 25°C (77°F)	1.5 kΩ

If the result is as specified, replace the amplifier with a new one.
If the result is not as specified, inspect the circuits connected to other parts.

- (b) Connect the connectors to the A/C control assembly and inspect the connectors on the wire harness side from the back side, as shown in the chart below.

Test condition:

- ◆ Run the engine at idle speed
- ◆ Set the manifold gauge set



Tester connection	Condition	Specified condition
B1 - Ground	Constant	Continuity
B8 - Ground	Magnetic clutch is engaged	Battery positive voltage
	Magnetic clutch is not engaged	Below 1.0 V
B13 - Ground	Air inlet switch "FRESH"	Below 1.0 V
	Air inlet switch "RECIRC"	Battery positive voltage
B15 - Ground	Air inlet switch "RECIRC"	Below 1.0 V
	Air inlet switch "FRESH"	Battery positive voltage
B19 - Ground	A/C switch ON	Below 1.0 V
	A/C switch OFF	Battery positive voltage

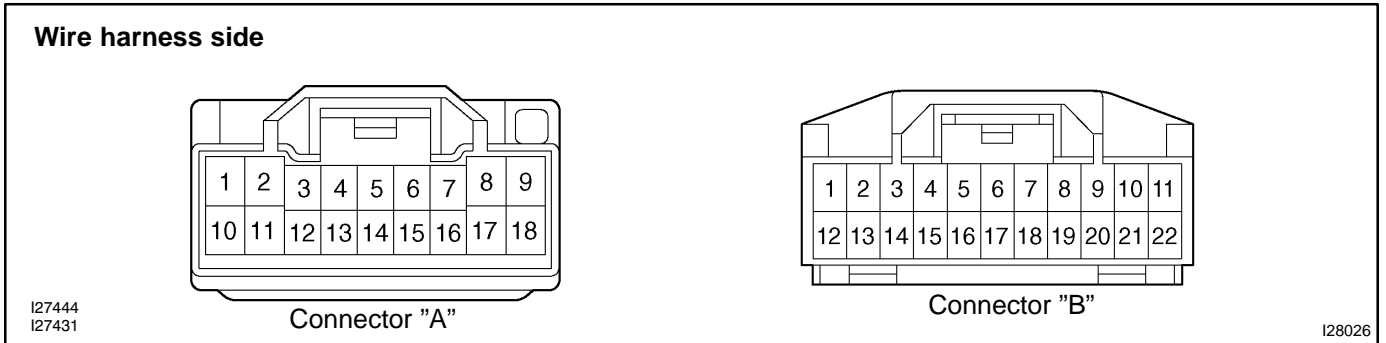
If the result is as specified, replace the amplifier with a new one. If the result is not as specified, inspect the circuits connected to other parts.

3. Double cab:
INSPECT A/C CONTROL ASSEMBLY CIRCUIT

- (a) Disconnect the connectors from the A/C control assembly and inspect the connectors on the wire harness side, as shown in the chart below.

Test condition:

Turn the ignition switch to ON



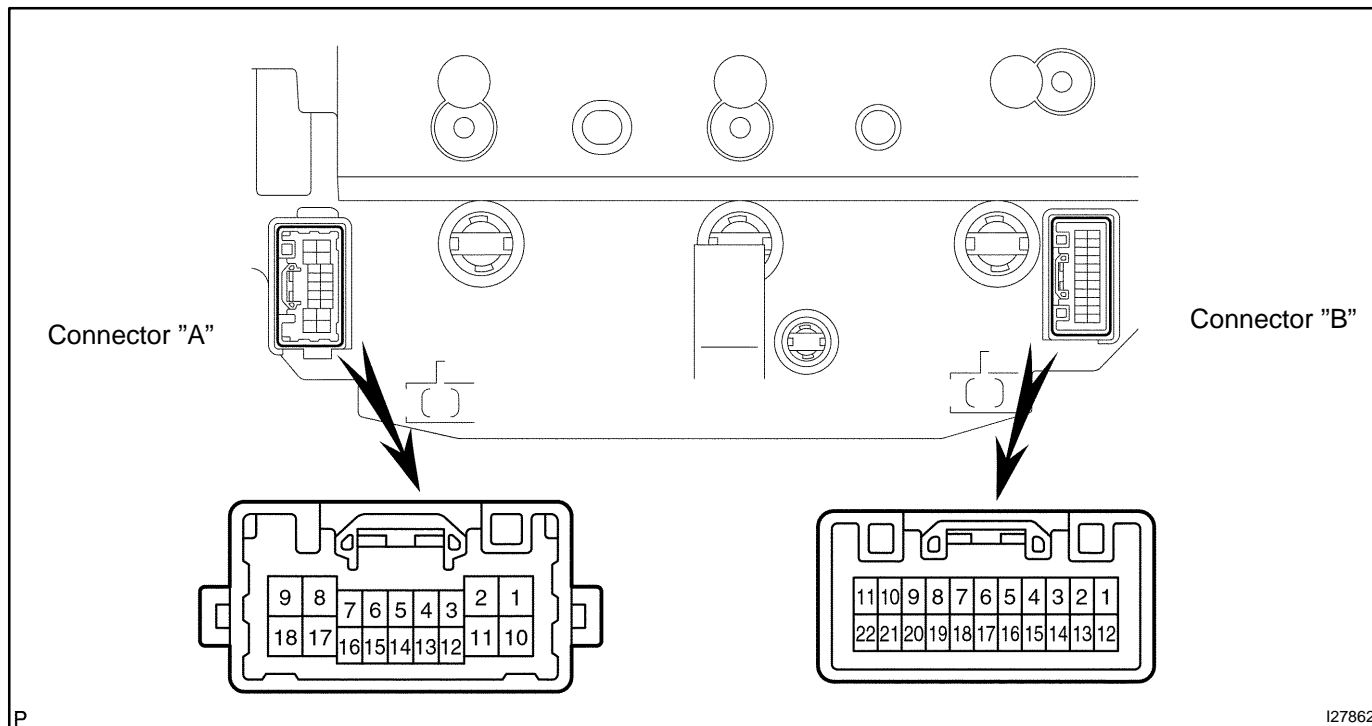
Tester connection	Condition	Specified condition
A10 - Ground	Constant	Continuity
A14 - Ground	Turn ignition switch ON	Battery positive voltage
	Turn ignition switch OFF	No voltage
A15 - Ground	Constant	Battery positive voltage
A9 - Ground	Turn ignition switch to ACC	Battery positive voltage
	Turn ignition switch OFF	No voltage

If the result is as specified, replace the amplifier with a new one.
 If the result is not as specified, inspect the circuits connected to other parts.

- (b) Connect the connectors to the A/C control assembly and inspect the connectors on the wire harness side from the back side, as shown in the chart below.

Test condition:

- ◆ Run the engine at idle speed
- ◆ Set the manifold gauge set



P

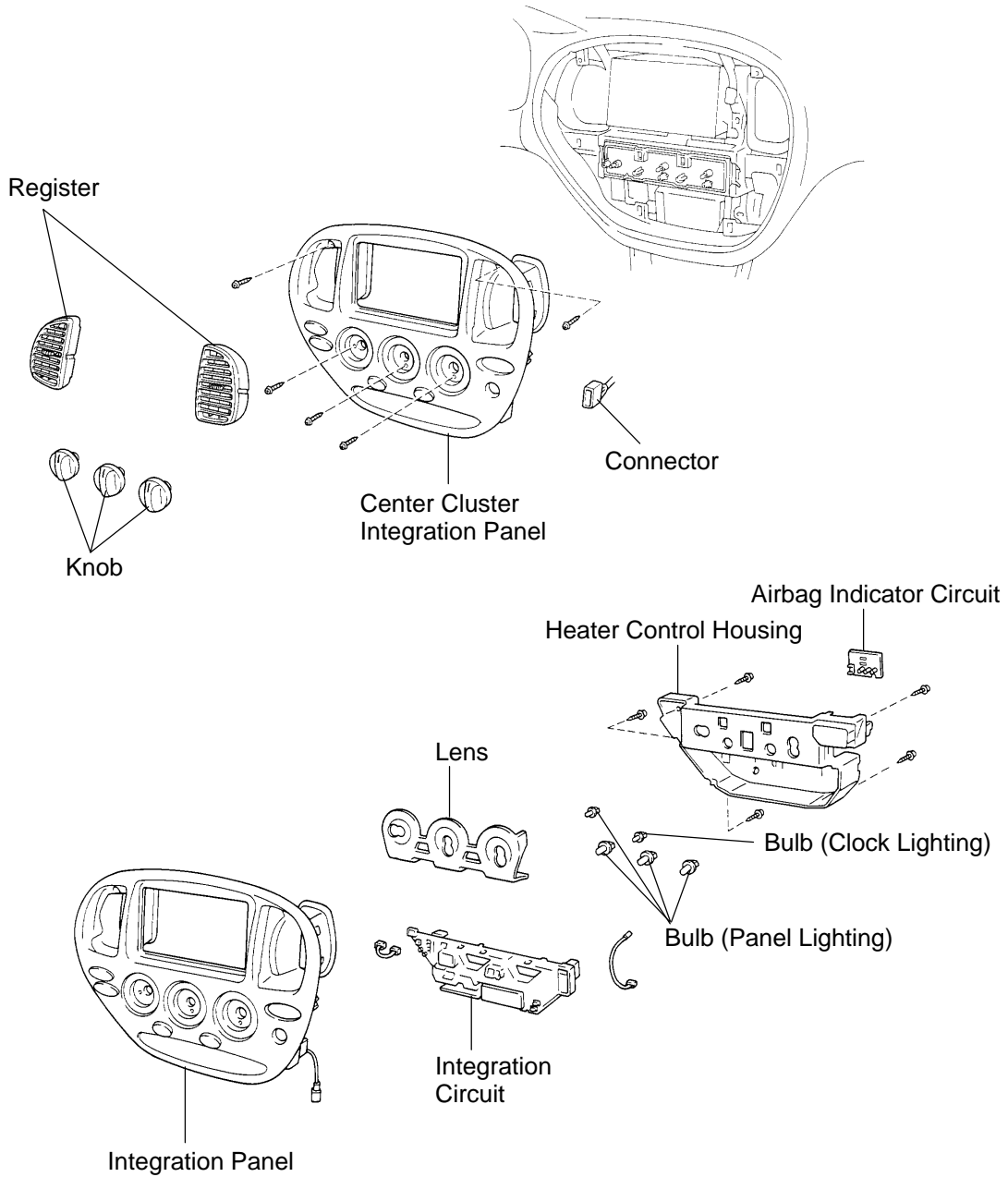
127862

Tester connection	Condition	Specified condition
A10 - Ground	Constant	Continuity
A18 - Ground	Magnetic clutch is engaged	Battery positive voltage
	Magnetic clutch is not engaged	Below 1.0 V
B8 - Ground	Air inlet switch "FRESH"	Battery positive voltage
	Air inlet switch "RECIRC"	Below 1.0 V
B7 - Ground	Air inlet switch "RECIRC"	Battery positive voltage
	Air inlet switch "FRESH"	Below 1.0 V
B12 - Ground	A/C switch ON	9.0 V
	A/C switch OFF	Below 1.0 V

If the result is as specified, replace the amplifier with a new one. If the result is not as specified, inspect the circuits connected to other parts.

COMPONENTS

Access Cab, Standard Cab:



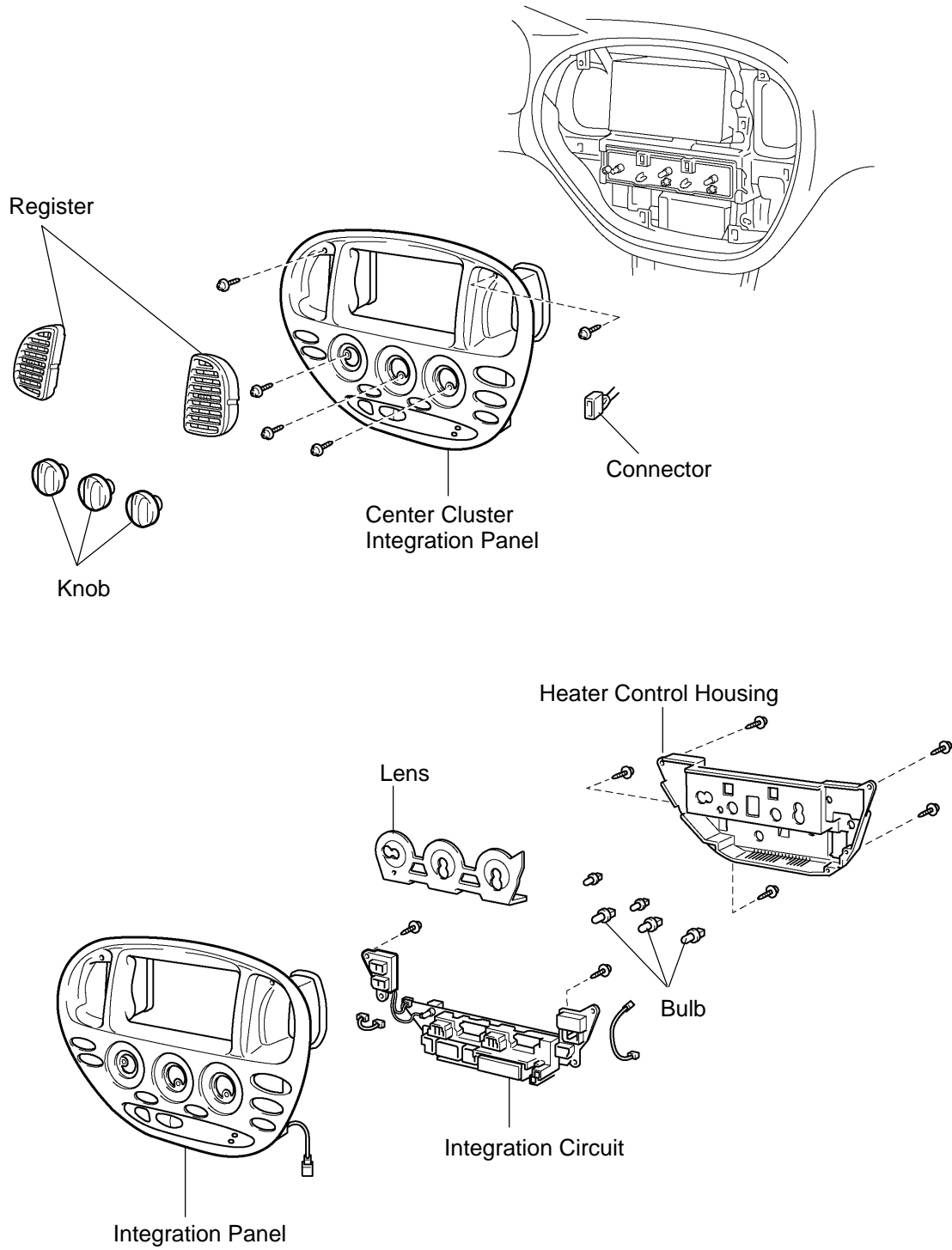
N

I11181
I11182

N

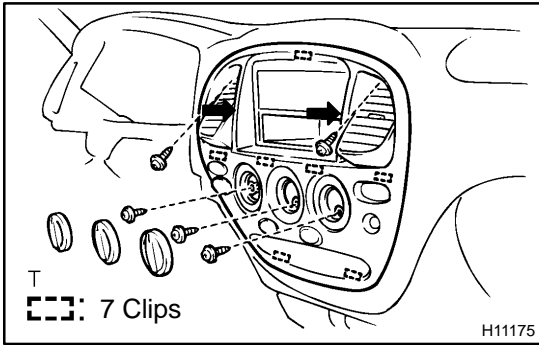
I11200

Double Cab:



N

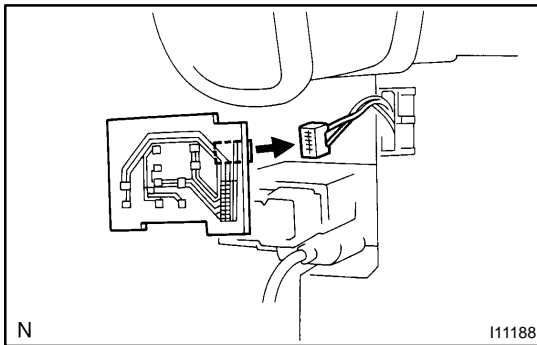
I27026



REMOVAL

REMOVE CENTER CLUSTER INTEGRATION PANEL

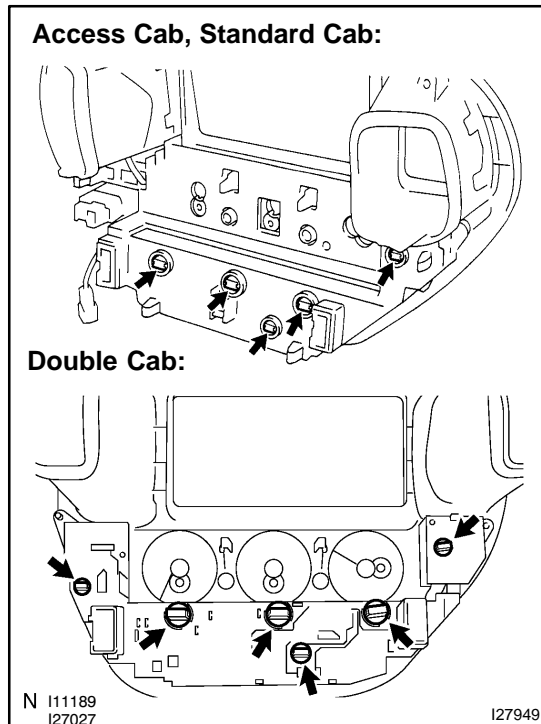
- (a) Remove the 3 heater control knobs.
- (b) Remove the 5 screws.
- (c) Remove the integration control panel by pulling the portions indicated by arrows in the illustration.
- (d) Disconnect the connector.



DISASSEMBLY

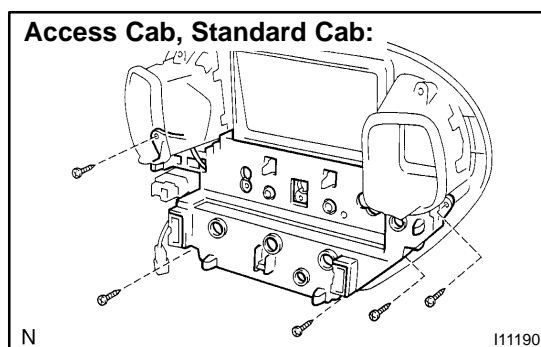
1. Access cab, Standard cab: REMOVE AIRBAG INDICATOR CIRCUIT

Release the 2 claws and remove the indicator circuit, then disconnect the connector.



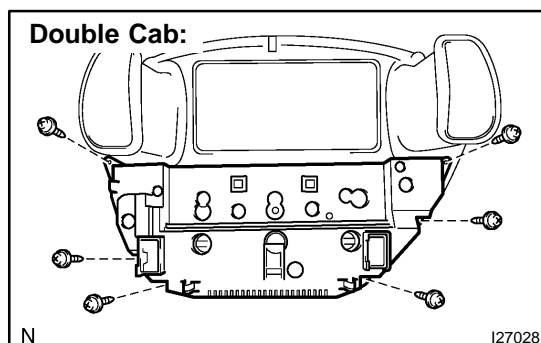
2. REMOVE BULBS

- (a) Access cab, standard cab:
Remove the 5 bulbs.
- (b) Double cab:
Remove the 6 bulbs.



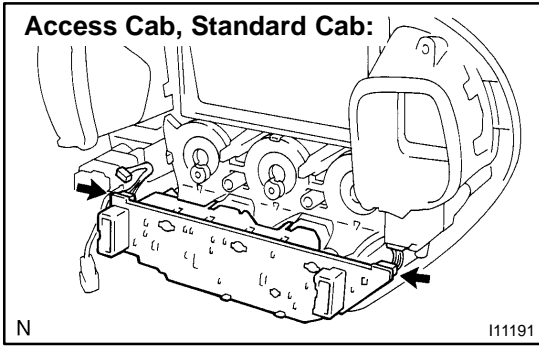
3. Access cab, Standard cab: REMOVE HEATER CONTROL HOUSING

- (a) Remove the 5 screws.
- (b) Remove the heater control housing.

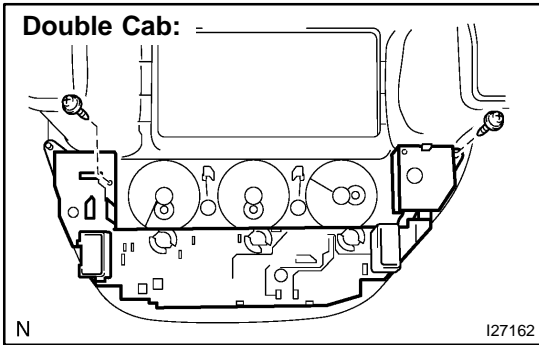


4. Double cab: REMOVE HEATER CONTROL HOUSING

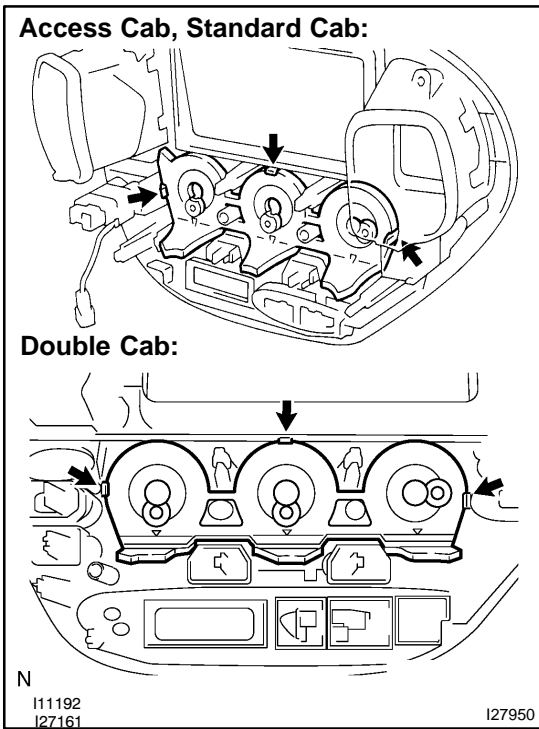
- (a) Remove the 5 screws.
- (b) Remove the heater control housing.



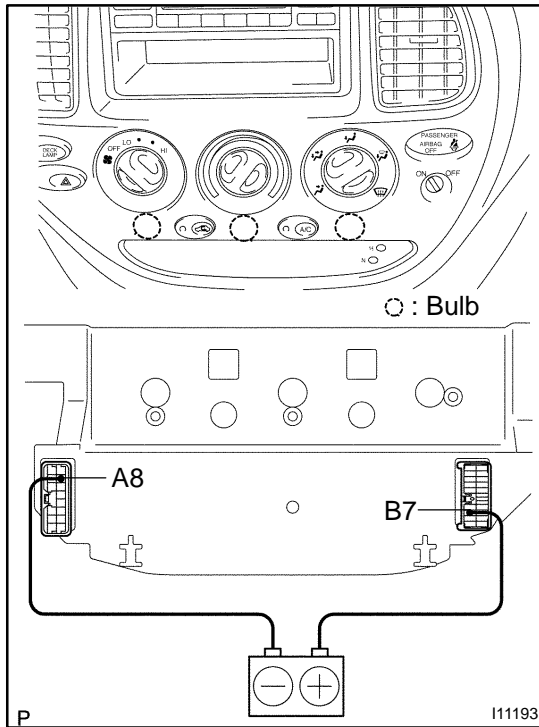
- 5. Access cab, Standard cab:
REMOVE INTEGRATION CIRCUIT**
- (a) Disconnect the 2 connectors.
 - (b) Remove the circuit.



- 6. Double cab:
REMOVE INTEGRATION CIRCUIT**
- (a) Remove the 2 screws.
 - (b) Remove the circuit.



- 7. REMOVE LENS**
Release the 3 claws, then remove the lens.



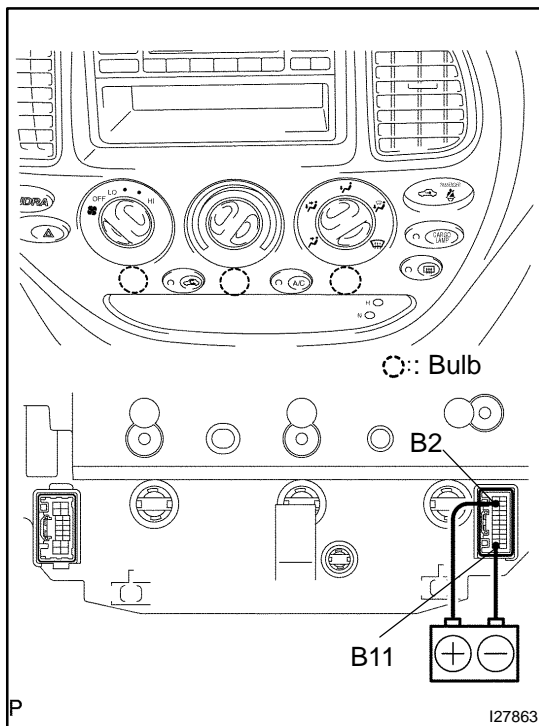
INSPECTION

1. Access cab, Standard cab:

INSPECT ILLUMINATION OPERATION

Connect the positive (+) lead from the battery to terminal B7 and the negative (-) lead to terminal A8 then check that the illuminations lights up.

If operation is not as specified, check the faulty bulb.

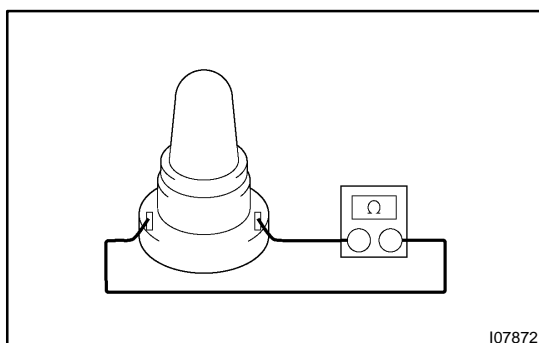


2. Double cab:

INSPECT ILLUMINATION OPERATION

Connect the positive (+) lead from the battery to terminal B2 and the negative (-) lead to terminal B11 then check that the illuminations lights up.

If operation is not as specified, check the faulty bulb.

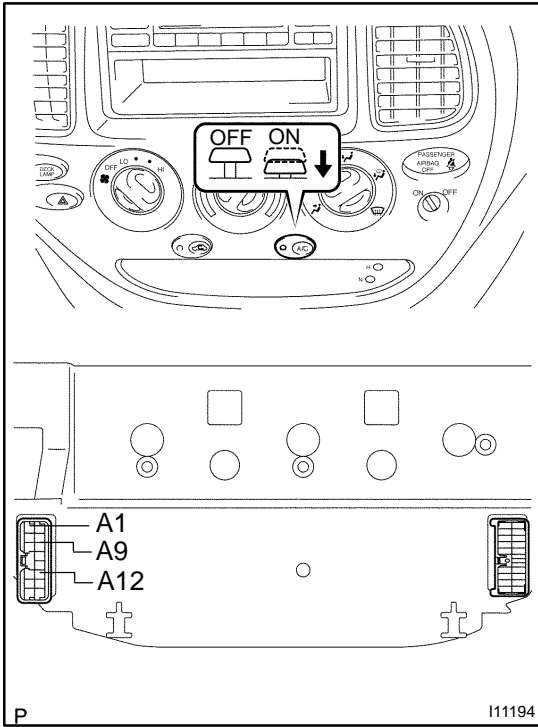


3. INSPECT BULB

Set the tester as shown in the illustration to check for continuity.

If continuity exists, replace the heater control.

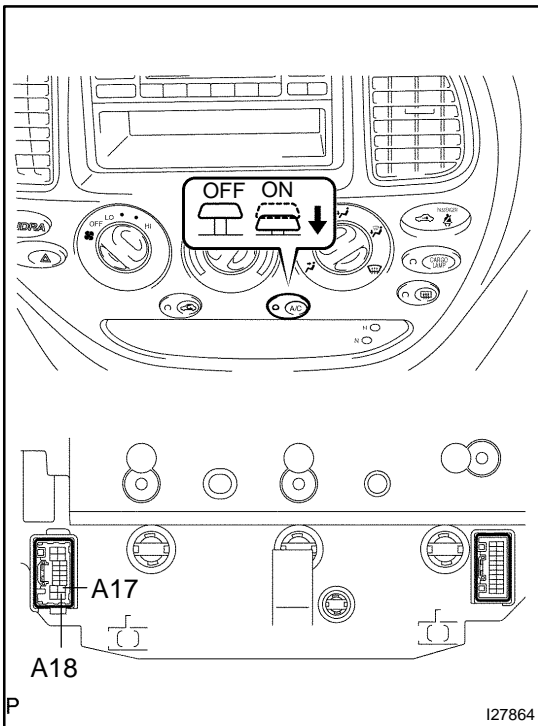
If no continuity exists, replace the bulb.



**4. Access cab, Standard cab:
INSPECT A/C SWITCH CONTINUITY
Standard:**

Switch condition	Tester connection	Specified condition
OFF	A12 - A9	No continuity
ON	A12 - A9	Continuity

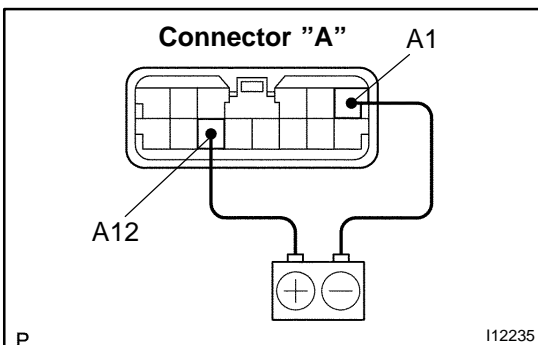
If operation is not as specified, replace the integration circuit bulb.



**5. Double cab:
INSPECT A/C SWITCH CONTINUITY
Standard:**

Switch condition	Tester connection	Specified condition
OFF	A17 - A18	No continuity
ON	A17 - A18	Continuity

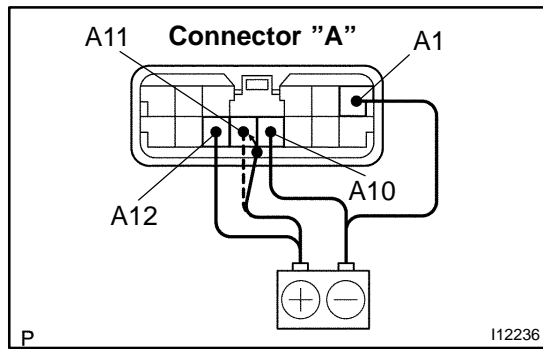
If operation is not as specified, replace the integration circuit bulb.



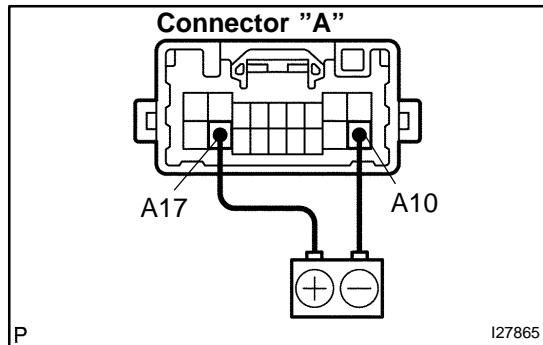
**6. Access cab, Standard cab:
INSPECT A/C INDICATOR OPERATION**

- (a) Connect the positive (+) lead from the battery to terminal A12 and the negative (-) lead to terminal A1.
- (b) Push the A/C button in and check that the A/C indicator lights up.

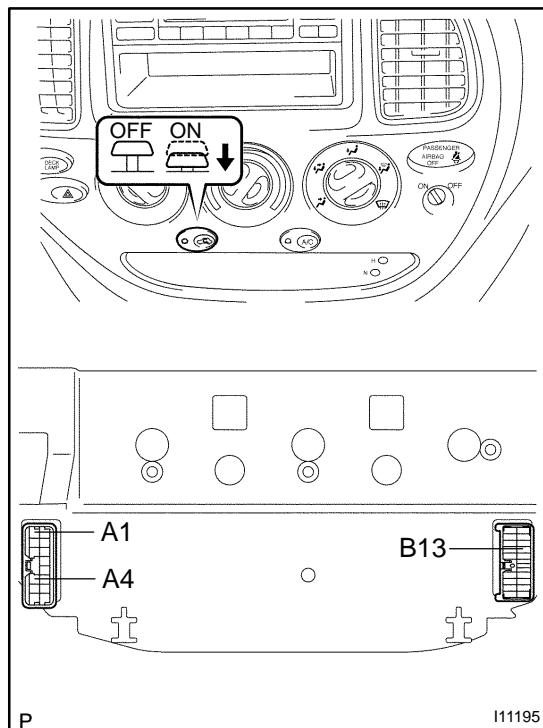
If operation is not as specified, replace the integration circuit.



- (c) Connect the positive (+) lead from the battery to terminal A11 and the negative (-) lead to terminal A10, then check that the indicator dims.
- If operation is not as specified, replace the integration circuit.



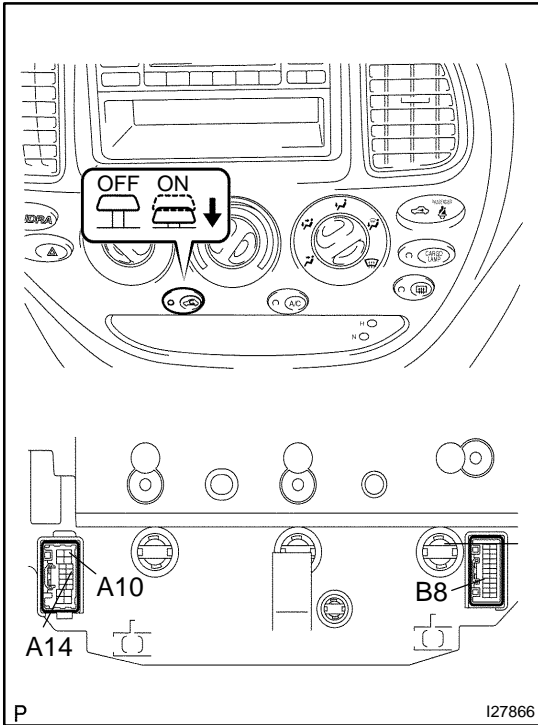
- 7. Double cab:**
INSPECT A/C INDICATOR OPERATION
- (a) Connect the positive (+) lead from the battery to terminal A17 and the negative (-) lead to terminal A10.
 - (b) Push the A/C button in and check that the A/C indicator lights up.
- If operation is not as specified, replace the integration circuit.



- 8. Access cab, Standard cab:**
INSPECT AIR INLET CONTROL SWITCH CONTINUITY

Switch condition	Tester connection	Specified condition
OFF	B13 - A1	No continuity
ON	B13 - A1	Continuity
Illumination circuit	A4 - B13	Continuity

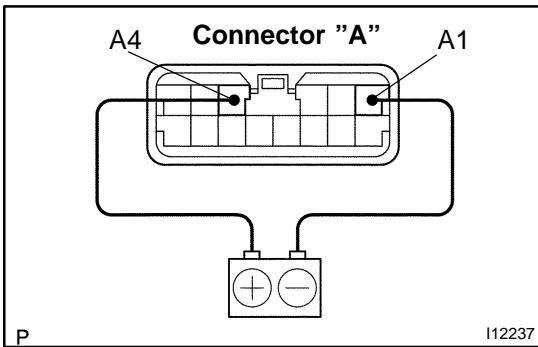
If operation is not as specified, replace the integration circuit bulb



9. Double cab:
INSPECT AIR INLET CONTROL SWITCH CONTINUITY

Switch condition	Tester connection	Specified condition
OFF	B8 - A10	No continuity
ON	B8 - A10	Continuity
Illumination circuit	A14 - B8	Continuity

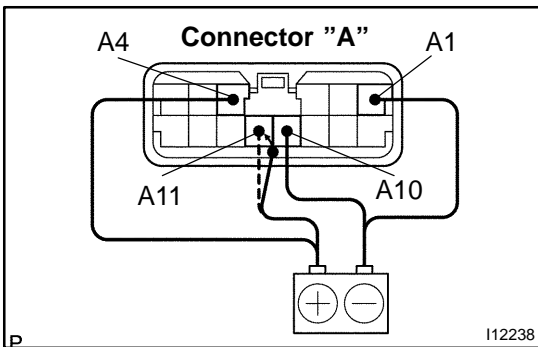
If operation is not as specified, replace the integration circuit bulb



10. Access cab, Standard cab:
INSPECT AIR INLET INDICATOR OPERATION

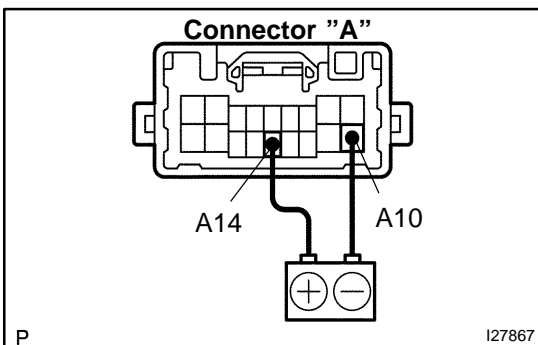
- (a) Connect the positive (+) lead from the battery to terminal A4 and the negative (-) lead to terminal A1.
- (b) Push the air inlet button in and check that the air inlet indicator lights up.

If operation is not as specified, replace the integration circuit.



- (c) Connect the positive (+) lead from the battery to terminal A11 and the negative (-) lead to terminal A10, then check that the indicator dims.

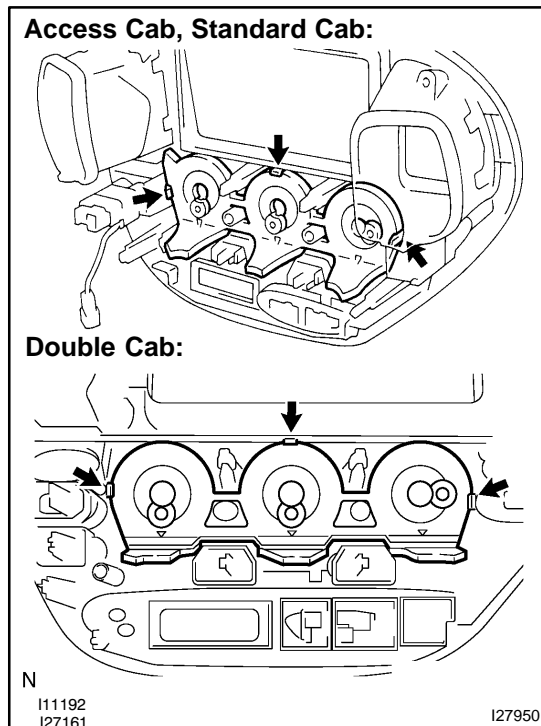
If operation is not as specified, replace the integration circuit.



11. Double cab:
INSPECT AIR INLET INDICATOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal A14 and the negative (-) lead to A10.
- (b) Push the air inlet button in and check that the air inlet indicator lights up.

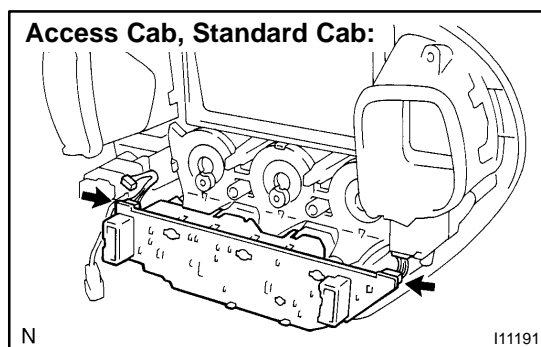
If operation is not as specified, replace the integration circuit.



REASSEMBLY

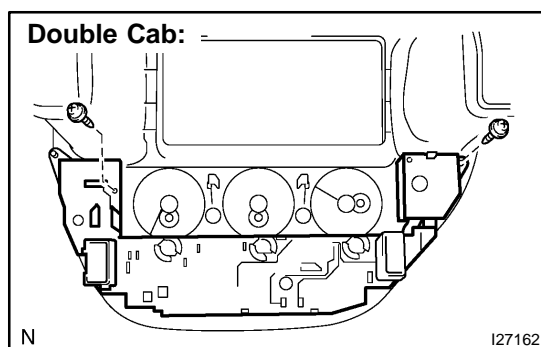
1. INSTALL LENS

Install the lens.



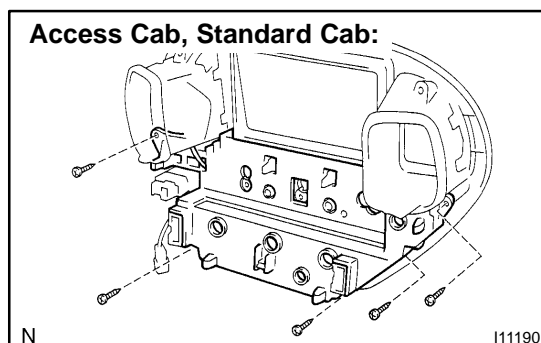
2. Access cab, Standard cab: INSTALL INTEGRATION CIRCUIT

- (a) Connect the 2 connectors.
- (b) Install the circuit.



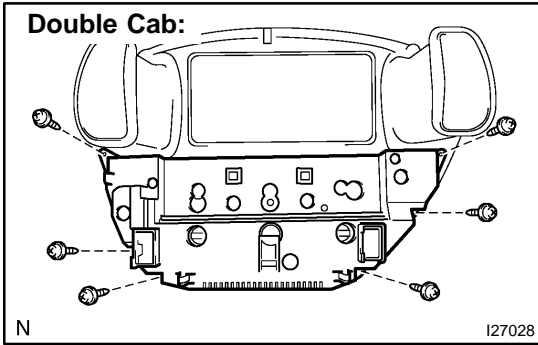
3. Double cab: INSTALL INTEGRATION CIRCUIT

- (a) Install the circuit.
- (b) Install the 2 screws.

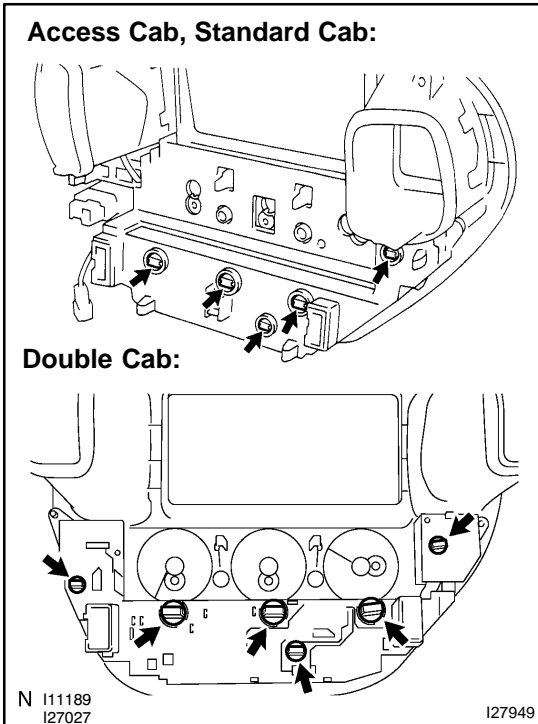


4. Access cab, Standard cab: INSTALL HEATER CONTROL HOUSING

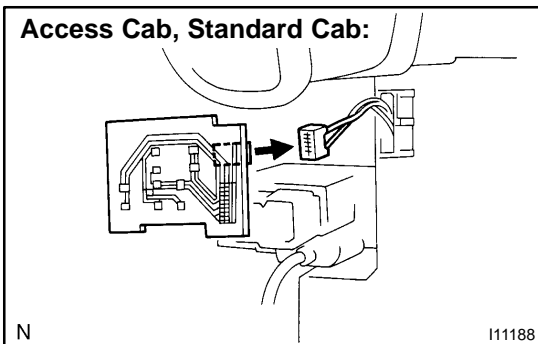
- (a) Connect the connector.
- (b) Install the heater control housing.
- (c) Install the 5 screws.



- 5. Double cab:
INSTALL HEATER CONTROL HOUSING**
- (a) Install the heater control housing.
 - (b) Install the 6 screws.



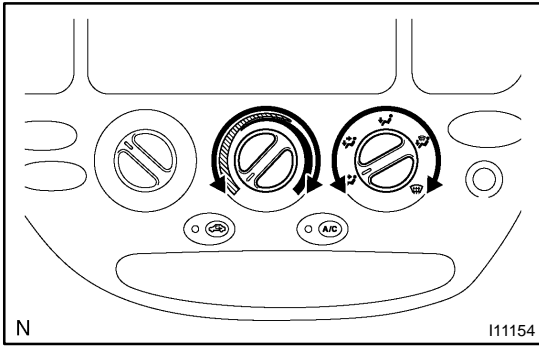
- 6. INSTALL BULBS**
- (a) Access cab, standard cab:
Install the 5 bulbs.
 - (b) Double cab:
Install the 6 bulbs.



- 7. Access cab, Standard cab:
INSTALL AIRBAG INDICATOR CIRCUIT**
- (a) Connect the connector.
 - (b) Install the circuit.

INSTALLATION

The installation procedures are the removal procedures in reverse order (see page [AC-89](#)).



HEATER CONTROL ASSEMBLY ON-VEHICLE INSPECTION

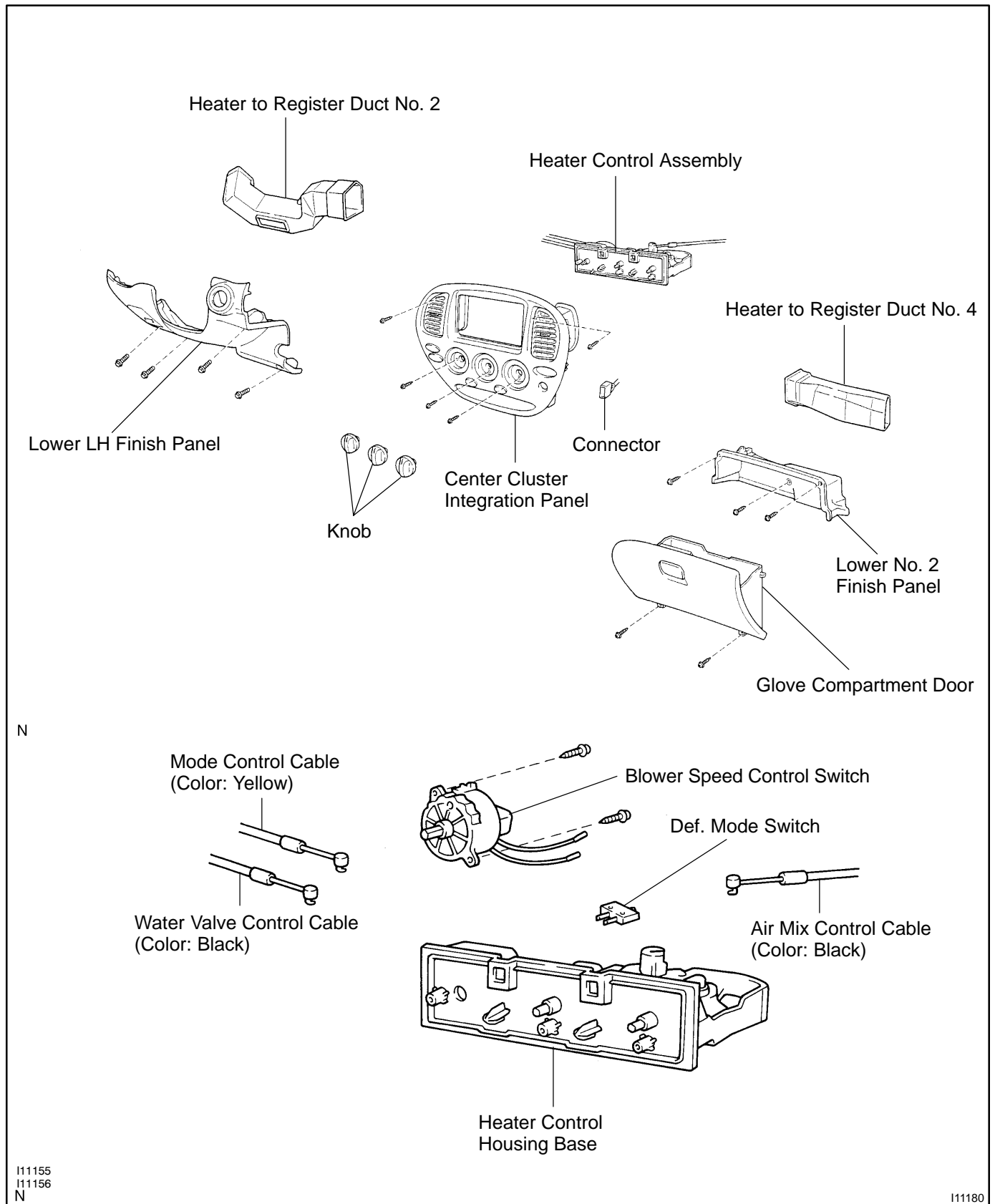
AC27J-03

INSPECT HEATER CONTROL DIAL AND LEVER OPERATION

Move the control dial and lever left and right and check for stiffness and binding through the full range of the levers.

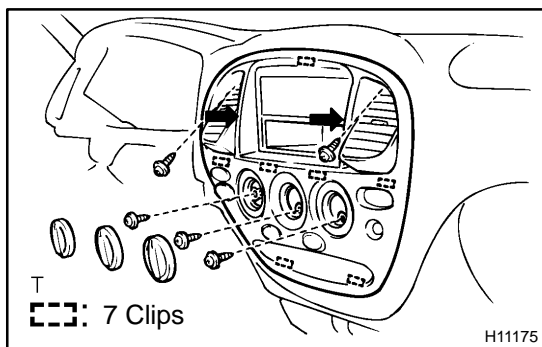
If a click sound cannot be heard or recoil is felt, adjust the control cable or check the control cable and heater control assembly.

COMPONENTS



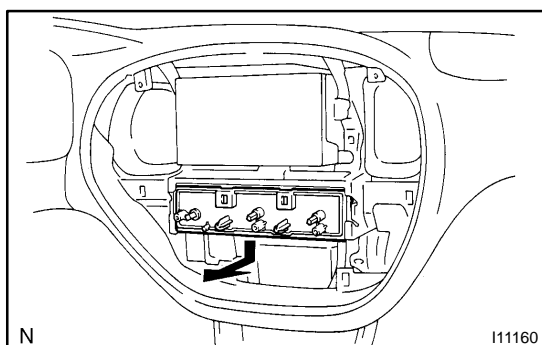
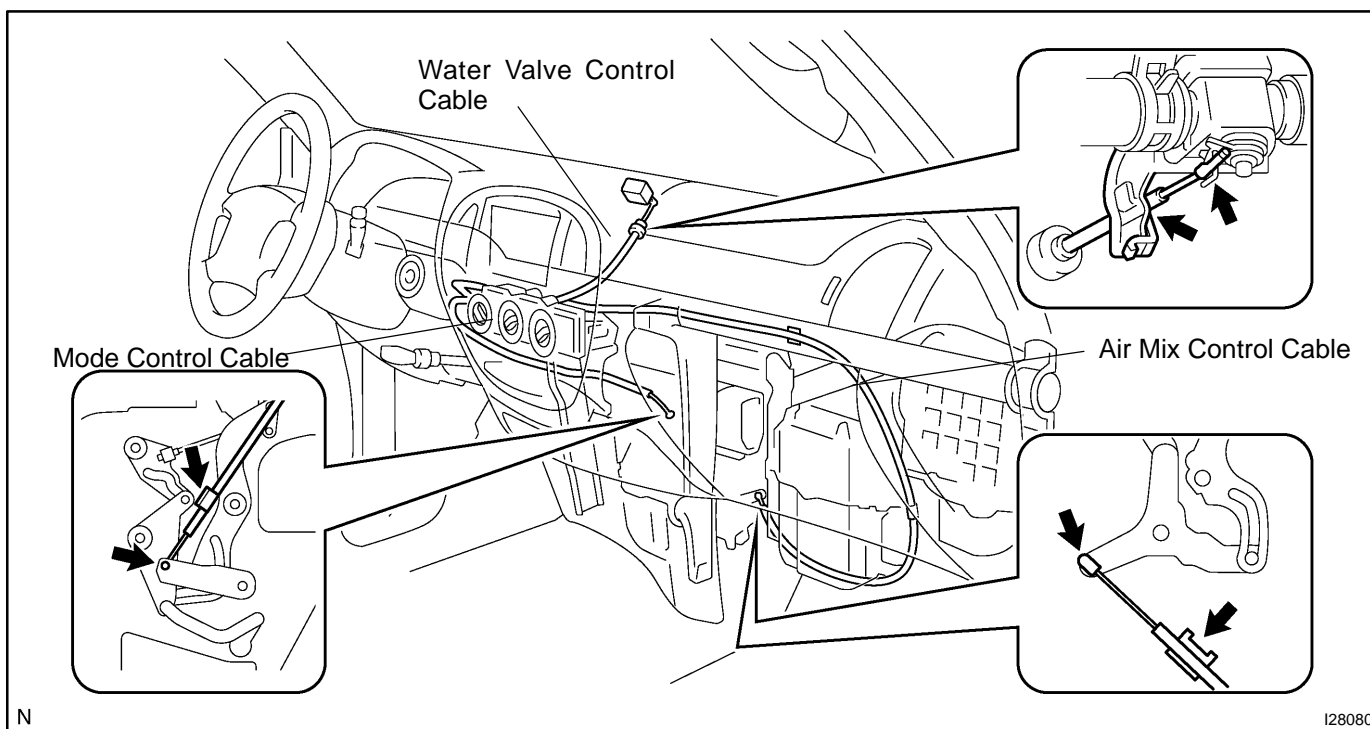
I11155
I11156
N

I11180

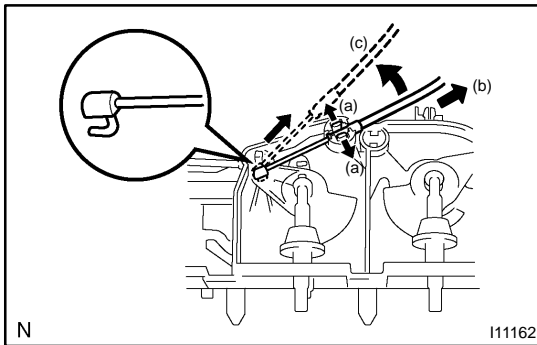


REMOVAL

1. **REMOVE CENTER CLUSTER INTEGRATION PANEL**
 - (a) Remove the 3 heater control knobs.
 - (b) Remove the 5 screws.
 - (c) Remove the integration control panel by pulling the portions indicated by arrows in the illustration.
 - (d) Disconnect the connector.
2. **REMOVE LOWER LH FINISH PANEL**
3. **REMOVE HEATER TO REGISTER DUCT NO. 2**
4. **REMOVE GLOVE COMPARTMENT DOOR**
5. **REMOVE LOWER NO. 2 FINISH PANEL**
6. **REMOVE HEATER TO REGISTER DUCT NO. 4**
(See page [BO-1 11](#))
7. **DISCONNECT HEATER CONTROL CABLES**



8. **REMOVE HEATER CONTROL ASSEMBLY**
Remove the heater control assembly, then disconnect the connectors.



DISASSEMBLY

1. REMOVE HEATER CONTROL CABLES

(a) Using a screwdriver, push the claws left and right.

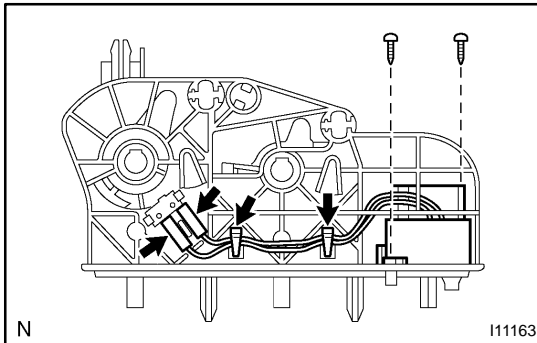
HINT:

Tape the screwdriver tip before use.

(b) Pull the cable rearward until the claws are disengaged.

(c) Remove the cable.

(d) Remove the inner cable from the heater control assembly.

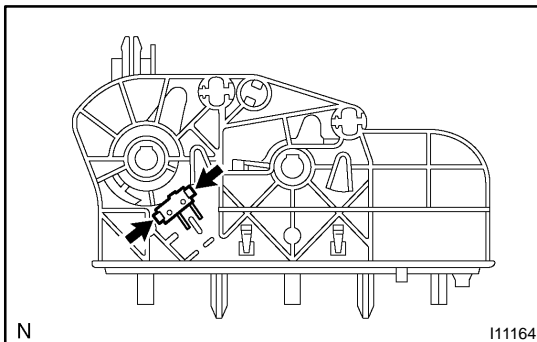


2. REMOVE BLOWER SPEED CONTROL SWITCH

(a) Disconnect the connector.

(b) Remove the 2 screws.

(c) Remove the switch.

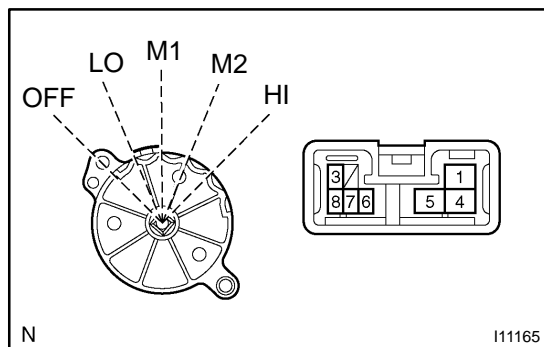


3. REMOVE DEF. MODE SWITCH

Release the 2 claws, then remove the switch.

HINT:

Tape the screwdriver tip before use.

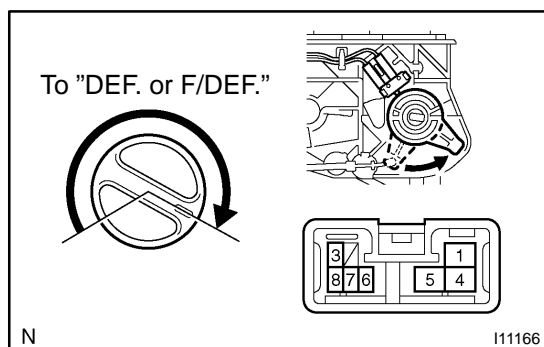


INSPECTION

1. INSPECT BLOWER SPEED CONTROL SWITCH CONTINUITY

Switch position/ Circuit	Tester connection	Specified condition
OFF	-	No continuity
LO	1 - 3	Continuity
M1	1 - 3 - 4	Continuity
M2	1 - 3 - 8	Continuity
HI	1 - 3 - 5	Continuity
Illumination circuit	6 - 7	Continuity

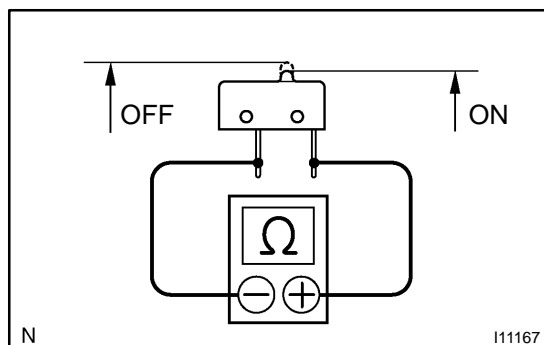
If continuity is not as specified, replace the switch and check the bulb.



2. INSPECT DEF. MODE SWITCH

- (a) Check the continuity exists between terminals 1 and 3 of the blower switch connector when turning the mode selector to the DEF. position and F/DEF. position.

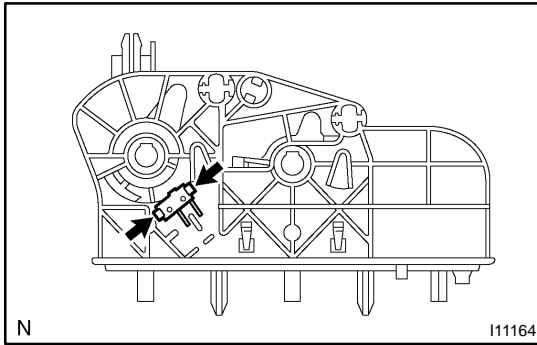
If no continuity exists, proceed to the next step.



- (b) Check the continuity exists between the terminals of the A/C mode switch.

If no continuity exists, replace the A/C mode switch.

If continuity exists, check or replace the heater control housing base.



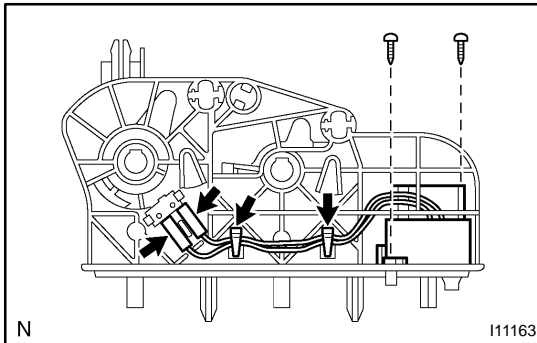
REASSEMBLY

1. INSTALL DEF. MODE SWITCH

Install the switch.

HINT:

After installation, check that the 2 claws are securely engaged.



2. INSTALL BLOWER SPEED CONTROL SWITCH

(a) Install the switch with the 2 screws.

(b) Connect the connector.

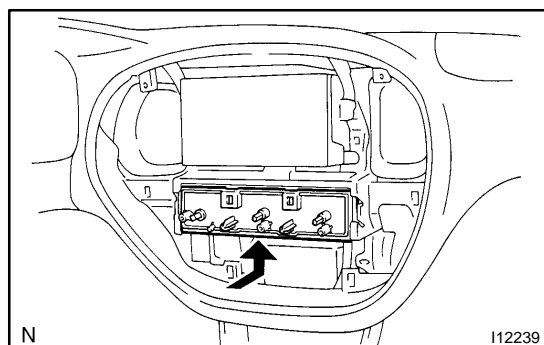
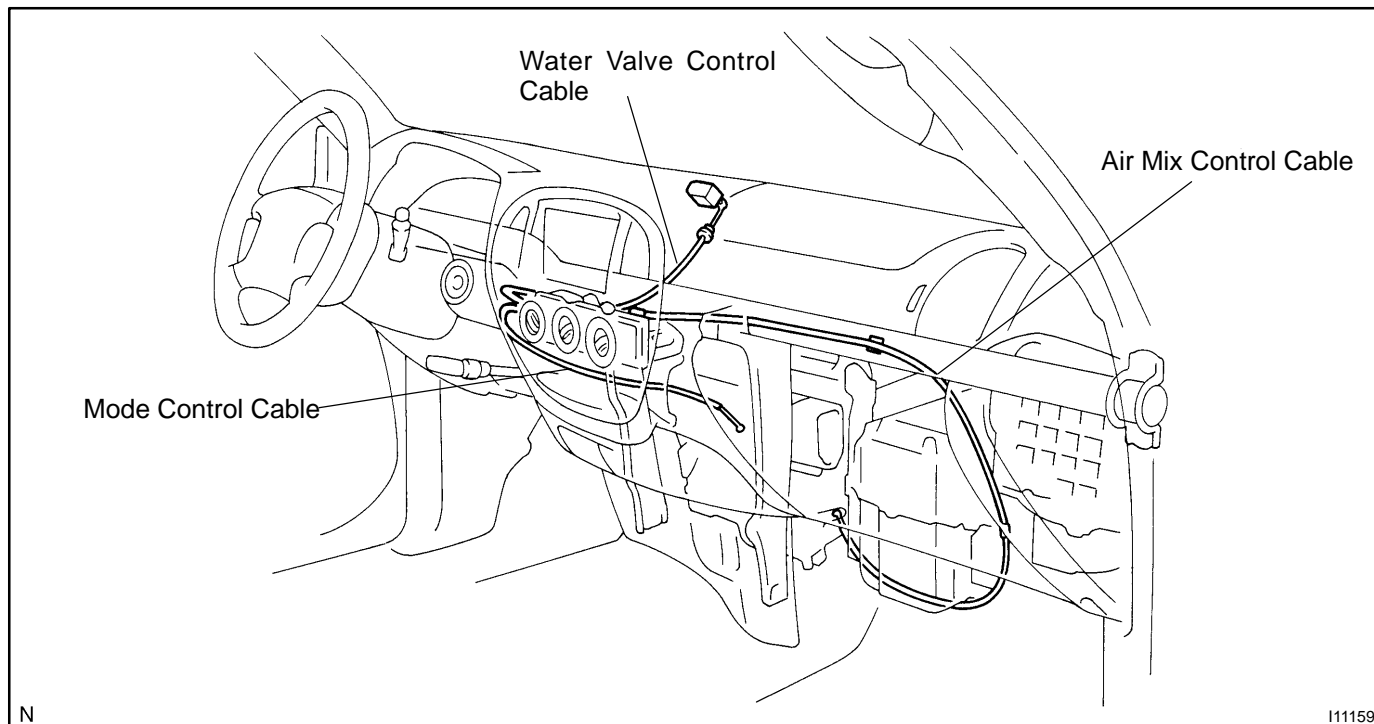
3. INSTALL HEATER CONTROL CABLES

Install the heater control cables to the heater control assembly.

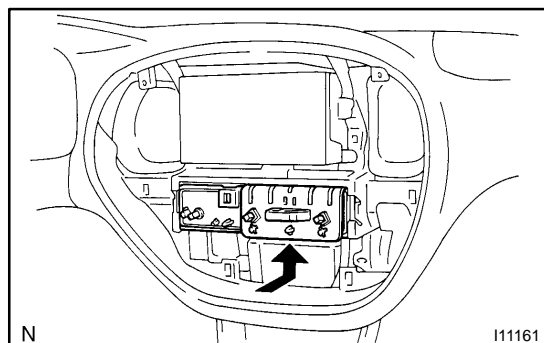
INSTALLATION

1. INSTALL HEATER CONTROL ASSEMBLY

- (a) Connect the connectors.
- (b) Pass the heater control as shown in the illustration.



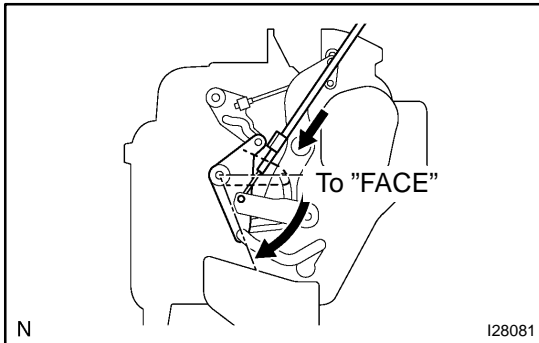
- (c) When using the removed one:
Install the heater control assembly.



- (d) When using a new one:
Install the heater control assembly.

2. ADJUST HEATER CONTROL CABLES

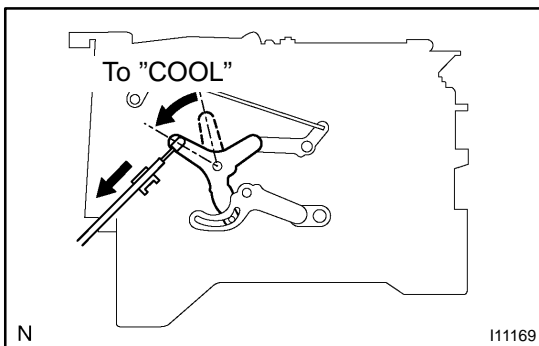
- (a) Set the mode control dial at the "FACE" position.
- (b) Set the temperature control dial at the "MAX. COOL" position.



- (c) Adjust the mode control cable.
Pull the air inlet control link to the "FACE" position, connect the control cable and lock the clamp.

HINT:

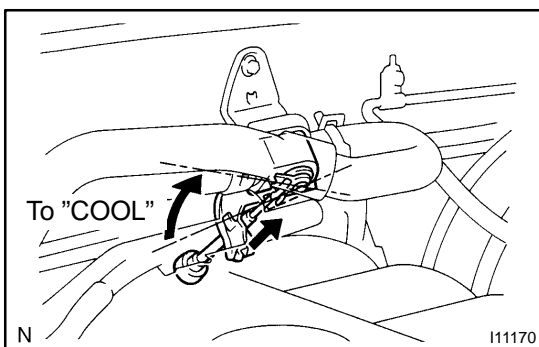
Lock the clamp while lightly pushing the outer cable in the direction shown by the arrow in the illustration.



- (d) Adjust the air mix control cable.
Pull the air inlet control link to the "COOL" position, connect the control cable and lock the clamp.

HINT:

Lock the clamp while lightly pulling the outer cable in the direction shown by the arrow in the illustration.

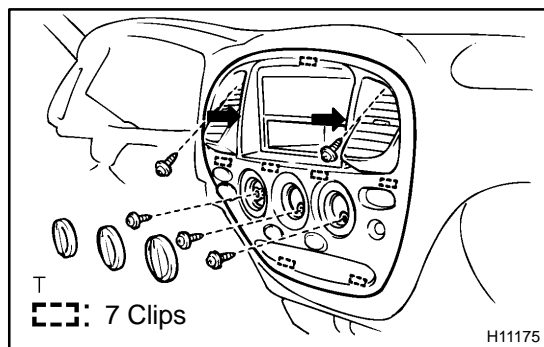


- (e) Adjust the water valve control cable.
Pull the air inlet control link to the "COOL" position, connect the control cable and lock the clamp.

HINT:

Lock the clamp while lightly pulling the outer cable in the direction, shown by the arrow in the illustration.

3. **INSTALL HEATER TO REGISTER DUCT NO. 4**
4. **INSTALL LOWER NO. 2 FINISH PANEL**
5. **INSTALL GLOVE COMPARTMENT PANEL**
6. **INSTALL HEATER TO REGISTER DUCT NO. 2**
7. **INSTALL LOWER LH FINISH PANEL**
(See page [BO-120](#))

**8. INSTALL CENTER CLUSTER INTEGRATION PANEL**

- (a) When replacing the heater control assembly:
Pull off the cover.
- (b) Install the center cluster integration panel, then connect the 2 connectors.
- (c) Install the 5 screws.
- (d) Install the 3 heater control knobs.

FOREWORD

This repair manual has been prepared to provide essential information on body panel repair methods (including cutting and welding operations, but excluding painting) for the TOYOTA TUNDRA.

Applicable models: VCK30, 40 series
UCK30, 40 series

This manual consists of body repair methods, exploded diagrams and illustrations of the body components and other information relating to body panel replacement such as handling precautions, etc. However, it should be noted that the front fenders of the TOYOTA model is bolted on and require no welding.

When repairing, don't cut and join areas that are not shown in this manual. Only work on the specified contents to maintain body strength.

Body construction will sometimes differ depending on specifications and country of destination. Therefore, please keep in mind that the information contained herein is based on vehicles for general destinations.

For the repair procedures and specifications other than collision-damaged body components of the TOYOTA TUNDRA, refer to the repair manuals.

If you require the above manuals, please contact your TOYOTA Dealer.

All information contained in this manual is the most up-to-date at the time of publication. However, specifications and procedures are subject to change without prior notice.

TOYOTA MOTOR CORPORATION

FOREWORD

This repair manual has been prepared to provide essential information on body panel repair methods (including cutting and welding operations, but excluding painting) for the TOYOTA TUNDRA.

Applicable models: UCK31, 41 series (Double Cab Models)

This manual consists of body repair methods, exploded diagrams and illustrations of the body components and other information relating to body panel replacement such as handling precautions, etc. However, it should be noted that the front fenders of the TOYOTA model is bolted on and require no welding.

When repairing, don't cut and join areas that are not shown in this manual. Only work on the specified contents to maintain body strength.

Body construction will sometimes differ depending on specifications and country of destination. Therefore, please keep in mind that the information contained herein is based on vehicles for general destinations.

For the repair procedures and specifications other than collision-damaged body components of the TOYOTA TUNDRA refer to the repair manuals.

If you require the above manuals, please contact your TOYOTA Dealer.

All information contained in this manual is the most up-to-date at the time of publication. However, specifications and procedures are subject to change without prior notice.

TOYOTA MOTOR CORPORATION

VIEWS OF THIS TEXT

Scope of the repair work explanation

- This text explains the welding panel replacement instructions from the vehicle's white body condition. We have abbreviated the explanations of the removal and reinstallation of the equipment parts up to the white body condition and of the installation, inspection, adjustment and final inspection of equipment parts after replacing the weld panel.

Section categories

- Each section has been divided as shown below.

Section Title	Contents	Examples
INTRODUCTION	Explanation of general body repair. Views of weld panel replacement instructions.	Cautionary items. Views of weld panel replacement instructions.
BODY PANEL REPLACEMENT	Instructions for replacing the weld panels from the white body condition, from which bolted parts have been removed, with individual supply parts.	Front side member replacement. Quarter panel replacement.
BODY DIMENSIONS	Body aligning measurements.	Dimension diagrams.
PAINT ◦ COATING	Scope and type of anti-rust treatment, etc. together with weld panel replacement.	Under coat. Body sealer.

Abbreviation of contents in this text.

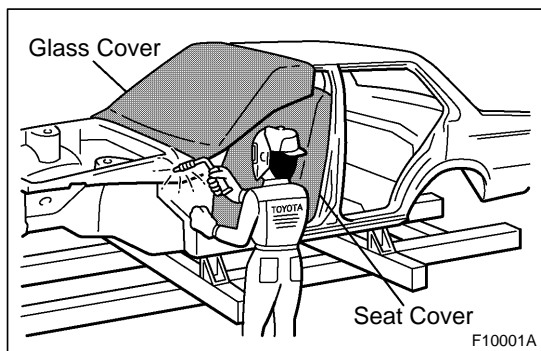
- The following essential procedures have been abbreviated. When actually working, conduct this work properly.
 - (1) Jack and lift operations.
 - (2) Clean and wash removed parts, if necessary.
 - (3) Visual inspection.

GENERAL REPAIR INSTRUCTIONS

1. WORK PRECAUTIONS

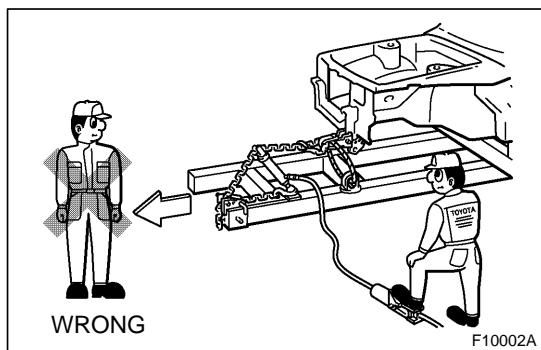
(a) VEHICLE PROTECTION

- (1) When welding, protect the painted surfaces, windows, seats and carpet with heat resistant, fire-proof covers.

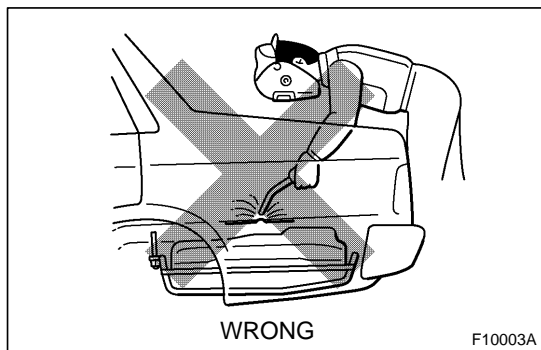


(b) SAFETY

- (1) Never stand in direct line with the chain when using a puller on the body or frame, and be sure to attach a safety cable.

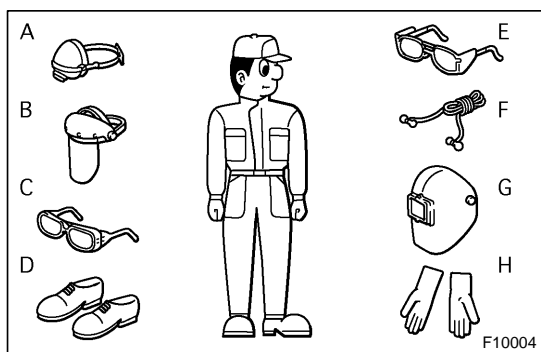


- (2) Before performing repair work, check for fuel leaks. If a leak is found, be sure to close the opening totally.
- (3) If it is necessary to use a flame in the area of the fuel tank, first remove the tank and plug the fuel line.



(c) SAFETY WORK CLOTHES

- (1) In addition to the usual mechanic's wear, cap and safety shoes, the appropriate gloves, head protector, glasses, ear plugs, face protector, dust-prevention mask, etc. should be worn as the situation demands.



Code	Name
A	Dust-Prevention Mask
B	Face Protector
C	Eye Protector
D	Safety Shoes
E	Welder's Glasses
F	Ear Plugs
G	Head Protector
H	Welder's Gloves

2. HANDLING PRECAUTIONS OF PLASTIC BODY PARTS

- (1) The repair procedure for plastic body parts must conform with the type of plastic material.
- (2) Plastic body parts are identified by the codes in the following table.
- (3) When repairing metal body parts adjoining plastic body parts (by brazing, frame cutting, welding, painting etc.), consideration must be given to the property of the plastic.

Code	Material name	Heat* resistant temperature limit •C (•F)	Resistance to alcohol or gasoline	Notes
AAS	Acrylonitrile Acrylic Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
ABS	Acrylonitrile Butadiene Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
AES	Acrylonitrile Ethylene Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
ASA	Acrylonitrile Styrene Acrylate	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
CAB	Cellulose Acetate	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
EPDM	Ethylene Propylene	100 (212)	Alcohol is harmless. Gasoline is harmless if applied only for short time in small amounts.	Most solvents are harmless but avoid dipping in gasoline, solvents, etc.
FRP	Fiber Reinforced Plastics	180 (356)	Alcohol and gasoline are harmless.	Avoid alkali.
EVA	Ethylene Acetate	70 (158)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
E/VAC	Ethylene/ Vinyl Acetate Copolymer Resin	70 (158)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
PA	Polyamide (Nylon)	80 (176)	Alcohol and gasoline are harmless.	Avoid battery acid.
PBT	Polybutylene Terephthalate	160 (320)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PC	Polycarbonate	120 (248)	Alcohol is harmless.	Avoid gasoline brake fluid, wax, wax removers and organic solvents. Avoid alkali.

*Temperatures higher than those listed here may result in material deformation during repair.

Code	Material name	Heat* resistant temperature limit • C (•F)	Resistance to alcohol or gasoline	Notes
PE	Polyethylene	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PET	Polyethylene Terephthalate	75 (167)	Alcohol and gasoline are harmless.	Avoid dipping in water.
PMMA	Polymethyl Methacrylate	80 (176)	Alcohol is harmless if applied only for short time in small amounts.	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
POM	Polyoxymethylene (Polyacetal)	100 (212)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PP	Polypropylene	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PPF	Composite Reinforced Polypropylene	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PPO	Modified Polyphenylene Oxide	100 (212)	Alcohol is harmless.	Gasoline is harmless if applied only for quick wiping to remove grease.
PS	Polystyrene	60 (140)	Alcohol and gasoline are harmless if applied only for short time in small amounts.	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
PUR	Polyurethane	80 (176)	Alcohol is harmless if applied only for very short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
PVC	Polyvinylchloride (Vinyl)	80 (176)	Alcohol and gasoline are harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
SAN	Styrene Acrylonitrile	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents etc.
TPO	Thermoplastic Olefine	80 (176)	Alcohol is harmless. Gasoline is harmless if applied only for short time in small amounts.	Most solvents are harmless but avoid dipping in gasoline, solvents, etc.
TPU	Thermoplastic Polyurethane	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
TSOP	TOYOTA Super Olefine Polymer	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
UP	Unsaturated Polyester	110 (233)	Alcohol and gasoline are harmless.	Avoid alkali.

*Temperatures higher than those listed here may result in material deformation during repair.

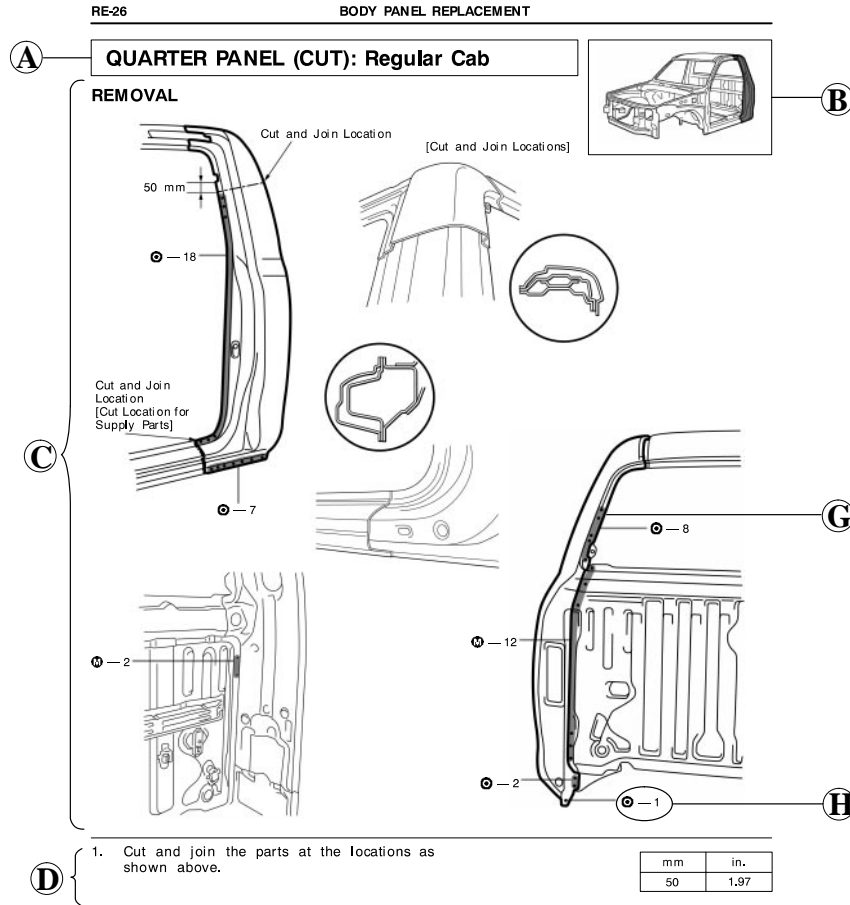
3. LOCATION OF PLASTIC BODY PARTS

Parts Name	Code
Radiator Grille	ABS
Front Bumper Cover	TSOP
Front Bumper Moulding	ABS
Front Bumper Garnish	ABS
Front Bumper Extension	TSOP
Front Fender Front Splash Shield	PP
Headlight	PC
Front Turn Signal Light	PMMA/PC
Fog Light	PC/UP
Cowl Top Ventilator Louver	TSOP
Outer Rear View Mirror	ABS/AAS
Front Fender Moulding	TSOP
Front Body Mudguard	E/VAC
Front Door Outside Handle	PC/PBT ◦ PC/PET
Front Door Outside Moulding	PPF
Rear Door Outside Handle	PC/PBT ◦ PC/PET
Rear Door Outside Moulding	PPF
Center Stop Light	PC ◦ PC/PMMA
Rear Combination Light	PMMA/ASA
License Plate Light	PC
Quarter Wheel Opening Moulding	TSOP
Rear Body Mudguard	E/VAC

- Resin material differs with model.
- / Made up of 2 or more kinds of materials.

HOW TO USE THIS MANUAL

Each repair method description provided in Section RE of this manual comprises two pages, divided into 2 blocks (REMOVAL AND INSTALLATION) and includes illustrations to facilitate body repair.



A : **REPLACEMENT PARTS AND METHOD**

QUARTER PANEL (CUT)

- Replacement method
 - (ASSY) Assembly replacement
 - (CUT) Major cutting (less than 1/2 of parts used)
 - (CUT-H) Half cutting (about 1/2 of parts used)
 - (CUT-P) Partial cutting (most of parts used)
- Replacement Parts

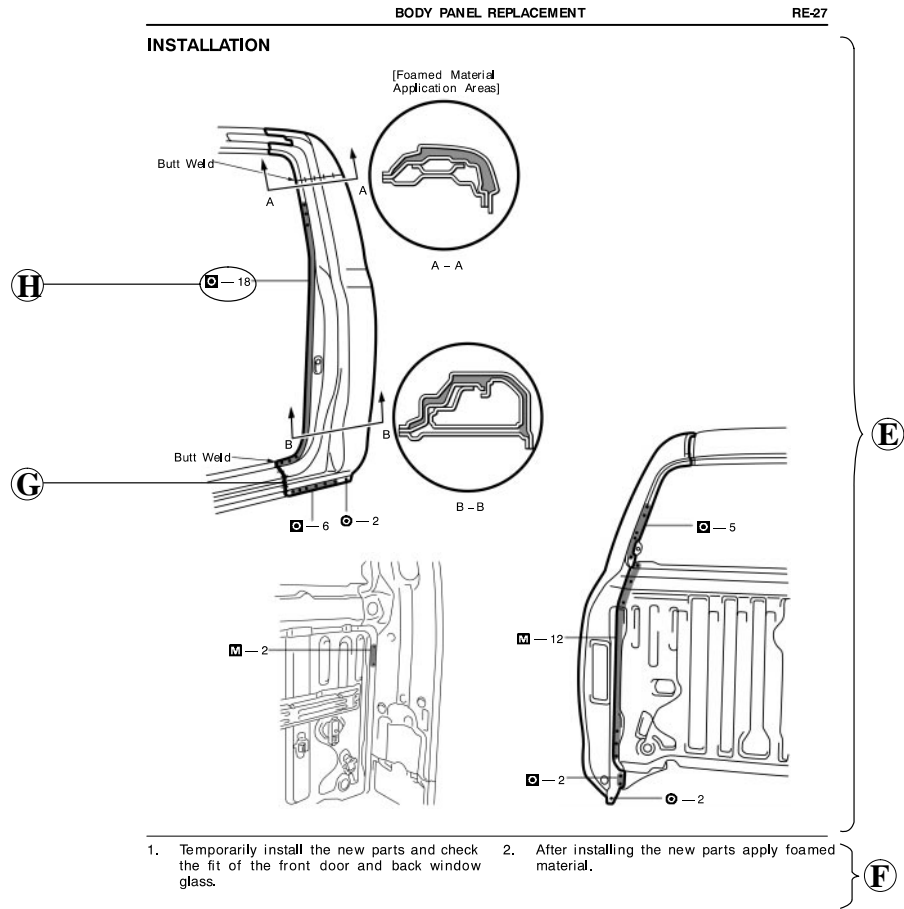
B : **PARTS LOCATION**

C : **REMOVAL DIAGRAM**

Describes in detail removal of the damaged parts involving repair by cutting.

D : **REMOVAL GUIDE**

Provides additional information to more efficiently help you perform the removal.



- E** : **INSTALLATION DIAGRAM**
Describes in detail installation of the new parts involving repair by welding and/or cutting, but excluding painting.
- F** : **INSTALLATION GUIDE**
Provides additional information to more efficiently help you perform the installation.
- G** : **SYMBOLS**
See page IN-4.
- H** : **ILLUSTRATION OF WELD POINTS**
Weld method and panel position symbols.
See page IN-5.

SYMBOLS

The following symbols are used in the Welding Diagrams in Section RE of this manual to indicate cutting areas and the types of weld required.


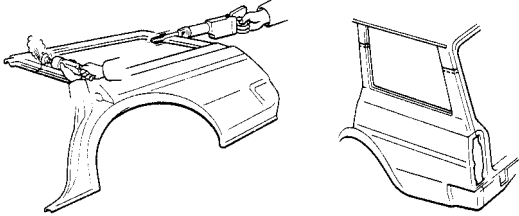

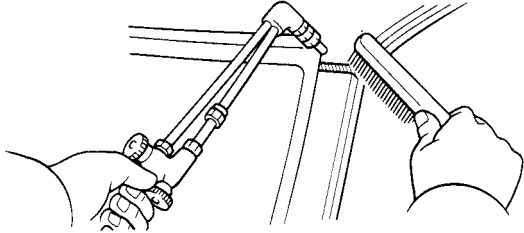
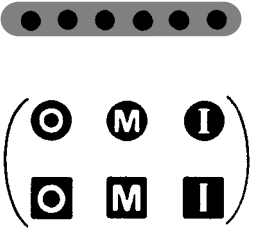
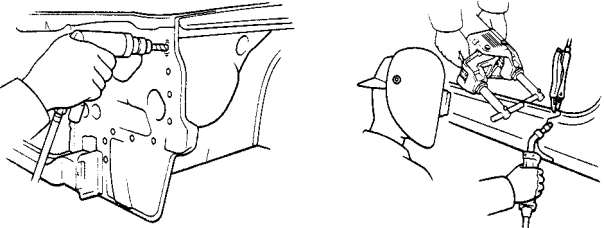

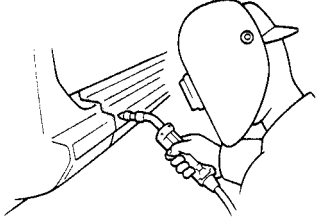

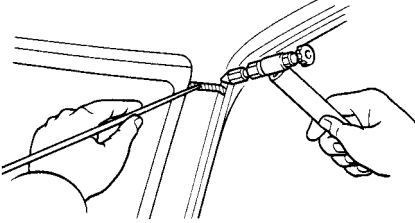

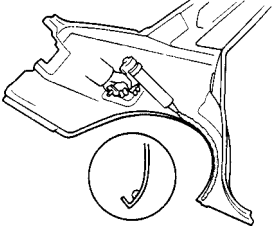
SYMBOLS	MEANING	ILLUSTRATION
	<p>SAW CUT OR ROUGH CUT</p>	
	<p>REMOVE BRAZE</p>	
	<p>WELD POINTS SPOT WELD OR MIG PLUG WELD (See page IN-5)</p>	
	<p>CONTINUOUS MIG WELD (BUTT WELD OR TACK WELD)</p>	
	<p>BRAZE</p>	
	<p>BODY SEALER</p>	

Illustration of Weld Point Symbols

EXAMPLE:


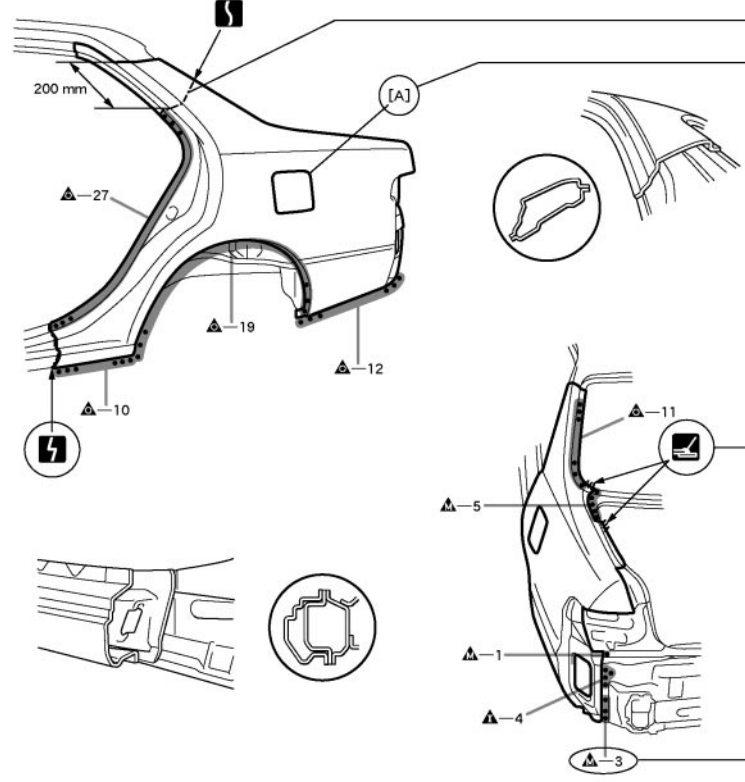
REMOVAL	INSTALLATION

SYMBOL	MEANING	ILLUSTRATION	SYMBOL	MEANING	ILLUSTRATION
 	Remove Weld Points		 	Spot Weld	
	(Outside)			Mig Plug Weld	
	(Middle)		 		
	(Inside)			Spot MIG Weld	

HINT: Panel position symbols are as seen from the working posture.

HOW TO USE THIS MANUAL

1. BODY PANEL REPLACEMENT THIS MANUAL

BP-34		BODY PANEL REPLACEMENT	
(A)	QUARTER PANEL (CUT) REPLACEMENT		(C)
(B)	REMOVAL		
(D)			(I) (K)
(E)	POINT 1. Remove the [A] at the same time. PART NAME [A] Fuel filler opening lid 200 mm (7.87 in.)		(I) (J)

(A) : REPLACEMENT PART AND METHOD
QUARTER PANEL (CUT)

- Replacement method
 (ASSY)...Assembly replacement
 (CUT)...Major cutting(less than 1/2 of part used)
 (CUT-H)...Half cutting(about 1/2 of part used)
 (CUT-P)...Partial cutting(most of part used)
- Replacement part

(B) : REMOVAL CONDITIONS

(C) : PART LOCATION

(D) : REMOVAL DIAGRAM

Describes in detail removal of the damaged part involving repair by cutting.

(E) : REMOVAL GUIDE

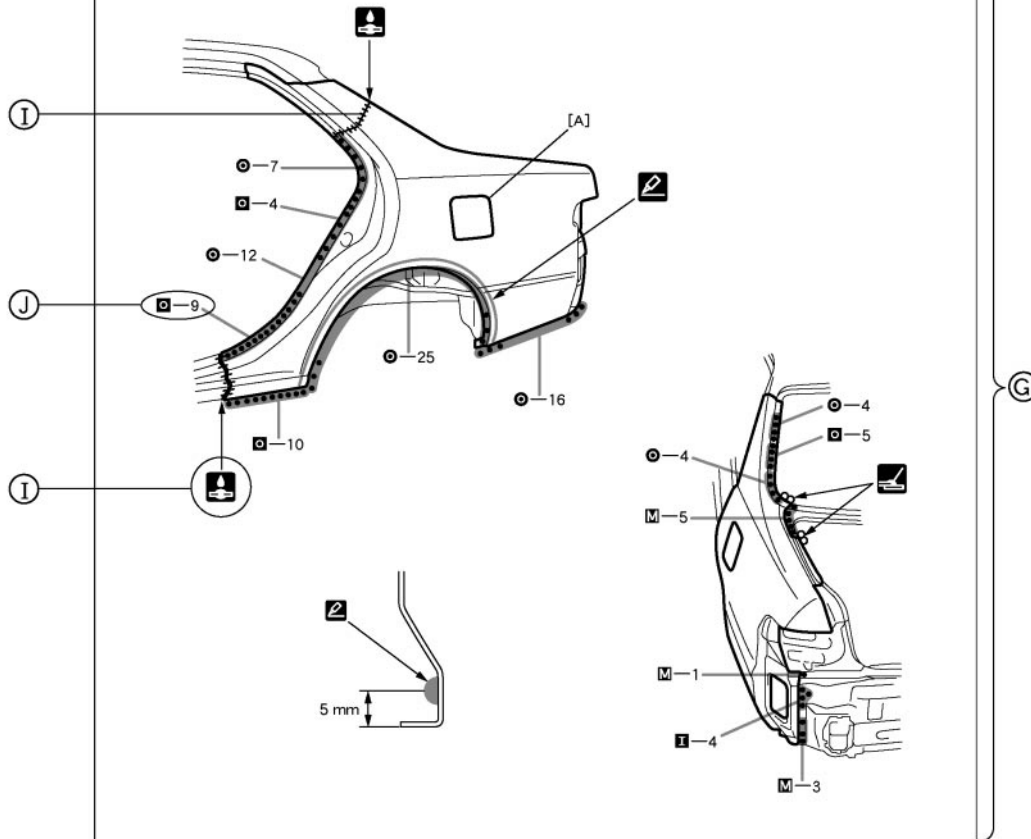
Provides additional information to more efficiently help you perform the removal.

BODY PANEL REPLACEMENT

BP-35

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam with corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



POINT

1. Before temporarily installing the new parts, apply body sealer to the wheel arch.

HINT

- 1) Apply body sealer about 5mm (0.20 in.) from the flange, avoiding any oozing.
- 2) Apply sealer evenly, about 3-4mm (0.12-0.16 in.) in diameter
- 3) For other sealing points, refer to section PC.

PART NAME

[A] Fuel filler opening lid

(F) : INSTALLATION CONDITIONS

(G) : INSTALLATION DIAGRAM

Describes in detail installation of the new parts involving repair by welding and/or cutting, but excluding painting.

(H) : INSTALLATION GUIDE

Provides additional information to more efficiently help you perform the installation.

(I) : SYMBOLS

(See page IN-7)



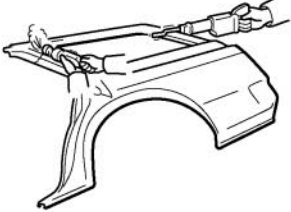






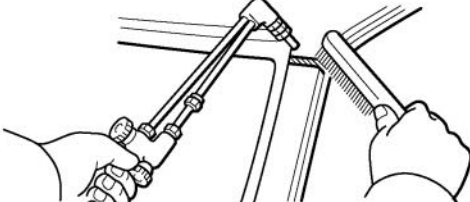


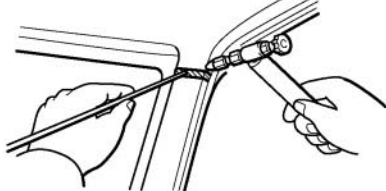

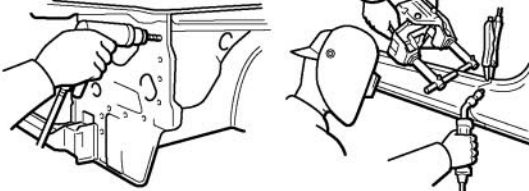
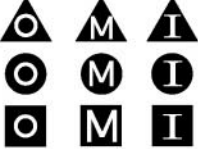


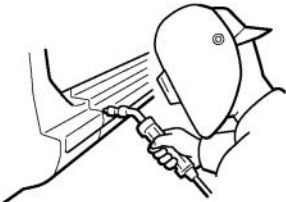



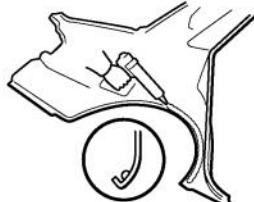
(J) : INSTALLATION OF WELD POINTS


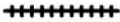


Weld method and panel position symbols (See page IN-9)

(K) : PART NAME

2. SYMBOLS

The following symbols are used in the welding diagrams in section BP of this manual to indicate cutting areas and the types of weld required.

SYMBOLS	MEANING	ILLUSTRATION
	 CUT AND JOIN LOCATION (SAW CUT)	 
	 CUT AND JOIN LOCATION (Cut Location for Supply Parts)	
	 CUT LOCATION	
	 CUT WITH DISC SANDER, ETC.	
	 BRAZE (Removal)	
	 BRAZE (Installation)	
	— WELD POINTS	
	— SPOT WELD OR MIG PLUG WELD (See Page IN-9)	
	 CONTINUOUS MIG WELD (BUTT WELD)	
	 CONTINUOUS MIG WELD (TACK WELD)	
	 BODY SEALER	

SYMBOLS		MEANING	ILLUSTRATION
—		Assembly Mark	—
	—	BODY SEALER (Flat Finishing)	
—	—	BODY SEALER (No flat Finishing)	

3. ILLUSTRATION OF WELD POINT SYMBOLS

EXAMPLE:

REMOVAL			INSTALLATION		
<p>Remove weld point and panel position</p>			<p>Weld method and panel position</p>		
SYMBOLS	MEANING	ILLUSTRATION	SYMBOLS	MEANING	ILLUSTRATION
 	Remove Weld Points		 	Spot Weld	
	(Outside)		 	MIG Plug Weld	
	(Middle)		 		
	(Inside)				
<p><i>HINT: Panel position symbols are as seen from the working posture.</i></p>				Spot MIG Weld	

HANDLING PRECAUTIONS ON RELATED COMPONENTS

1. FOR VEHICLES EQUIPPED WITH SRS AIRBAG AND SEAT BELT PRETENSIONER

The TOYOTA TUNDRA is equipped with an SRS (Supplemental Restraint System), such as the driver airbag and front passenger airbag and seat belt pretensioners.

Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy during servicing, possibly leading to a serious accident.

Further, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in this manual.

- Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshooting.
When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery.
- Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
(The supplemental restraint system is equipped with a back-up power source so that if work is started within 90 seconds of disconnecting the negative (-) terminal cable from the battery, the SRS may deploy.)
When the negative (-) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by the audio memory system.
Then when work is finished, reset the clock and audio systems as before.
To avoid erasing the memory of each memory system, never use a back-up power supply from outside the vehicle.
- Even in cases of a minor collision where the SRS does not deploy, the passenger's airbag assembly, the steering wheel pad and seat belt pretensioners should be inspected.
- Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
- Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs.
- Never disassemble and repair the airbag sensor assembly, steering wheel pad in order to reuse it.
- If the airbag sensor assembly, steering wheel pad have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
- Do not expose the airbag sensor assembly, steering wheel pad directly to hot air or flames.
- Use a volt/ohmmeter with high impedance (10 k Ω /V minimum) for troubleshooting of the electrical circuit.
- Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.
- After work on the supplemental restraint system is completed, check the SRS warning light.
- Before repairing the body, remove the SRS parts if, during repair, shocks are likely to be applied to the sensors due to vibrations of the body or direct tapping with tools or other parts.
- Do not expose the SRS parts directly to hot air or flames.

NOTICE:

- 1) *The maximum ambient temperature tolerance is 120°C (248°F) for the front airbag sensor, 105°C (221°F) for the center airbag sensor assembly and 93°C (200°F) for the steering wheel pad, and front passenger airbag assembly. If it is possible that the ambient temperature may reach or exceed the temperature limit, remove the sensors and the steering wheel pad from the vehicle or protect them with a hot insulation material before starting work.*
 - 2) *Prior to welding, remove adjacent SRS parts from the vehicle or protect them with fire-proof covers.*
- If the vehicle is damaged, visually inspect for damage to the steering wheel pad using the inspection procedures described in section RS of the repair manual for the relevant model year.

STEERING WHEEL PAD (with Airbag)

- When removing the steering wheel pad or handling a new steering wheel pad, it should be placed with the pad top surface facing up.
In this case, the twin-lock type connector lock lever should be in the locked state and care should be taken to place it so the connector will not be damaged. In addition do not store a steering wheel pad on top of another one. Storing the pad with its metallic surface up may lead to a serious accident if the airbag inflates for some reason.
- Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)
- Grease should not be applied to the steering wheel pad and the pad should not be cleaned with detergents of any kind.
- Store the steering wheel pad where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.
- When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the steering column near the combination switch connector before starting work.
- When disposing of a vehicle or the steering wheel pad alone, the airbag should be deployed using an SST before disposal.
Carry out the operation in a safe place away from electrical noise.

FRONT PASSENGER AIRBAG ASSEMBLY

- Always store a removed or new front passenger airbag assembly with the airbag deployment direction facing up. Storing the airbag assembly with the airbag deployment direction facing down could cause a serious accident if the airbag inflates.
- Never measure the resistance of the airbag squib.
(This may cause the airbag deploy, which is very dangerous.)
- Grease should not be applied to the front passenger airbag assembly and the airbag door should not be cleaned with detergents of any kind.
- Store the airbag assembly where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.
- When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) installed on the glove compartment finish plate at the left side of the glove compartment before starting work.
- When disposing of a vehicle or the airbag assembly alone, the airbag should be deployed using an SST before disposal. Perform the operation in a safe place away from electrical noise.

SEAT BELT PRETENSIONER

- Before doing any operation which will apply a strong shock to the vehicle, or before removing the seat belt pretensioner, be sure to apply the sensor shock.
- Never disassemble the seat belt pretensioner.
- Do not subject the seat belt pretensioner to shocks or bring magnets close to it.
- Do not expose the seat belt pretensioner to high temperature or fire.
- Do not drop the seat belt pretensioner. Never use a seat belt pretensioner which has been dropped.
- Never install the seat belt pretensioner in another vehicle.
- Store removed seat belt pretensioners on a flat, stable surface.
- After frontal collision, always check whether the seat belt pretensioners have been activated.
- When disposing of a vehicle or the pretensioner by itself, always activate the pretensioner before disposal.
- The seat belt pretensioner is hot when activated, so let it cool down fully before you dispose of it.
Never apply water to the seat belt pretensioner.

AIRBAG SENSOR ASSEMBLY

- Never reuse the airbag sensor assembly involved in a collision when the SRS has deployed.
- The connectors to the airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. If the connectors are connected or disconnected while the airbag sensor assembly is not mounted to the floor, it could cause undesired ignition of the supplemental restraint system.
- Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery, even if only loosening the set bolts of the airbag sensor assembly.

WIRE HARNESS AND CONNECTOR

- The SRS wire harness is integrated with the cowl wire harness assembly and floor wire harness assembly. The wires for the SRS wire harness are encased in a yellow corrugated tube. All the connectors for the system are also a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident, etc., repair or replace it as shown on page.

2. BRAKE SYSTEM

The brake system is one of the most important safety components. Always follow the directions and notes given in section BR of the repair manual for the relevant model year when handling brake system parts.

NOTICE: When repairing the brake master cylinder or TRAC system, bleed the air out of the TRAC system.

3. DRIVE TRAIN AND CHASSIS

The drive train and chassis are components that can have great effects on the running performance and vibration resistance of the vehicle. After installing components in the sections listed in the table below, perform alignments to ensure correct mounting angles and dimensions. Particularly accurate repair of the body must also be done to ensure correct alignment.

HINT: Correct procedures and special tools are required for alignment. Always follow the directions given in the repair manual for the relevant model during alignment and section DI of this manual.

Component to be aligned	Section of repair manual for relevant model
Front Wheels	Suspension and Axle (SA) section
Rear Wheels	Suspension and Axle (SA) section
Propeller Shaft	Propeller Shaft (PR) section

4. COMPONENTS ADJACENT TO THE BODY PANELS

Various types of component parts are mounted directly on or adjacently to the body panels. Strictly observe the following precautions to prevent damaging these components and the body panels during handling.

- Before repairing the body panels, remove their components or apply protective covers over the components.
- Before prying components off using a screwdriver or a scraper, etc., attach protective tape to the tool tip or blade to prevent damaging the components and the body paint.
- Before removing components from the outer surface of the body, attach protective tape to the body to ensure no damage to painted areas.

HINT: Apply touch-up paint to any damaged paint surfaces.

- Before drilling or cutting sections, make sure that there are no wires, etc. on the reverse side.

5. ECU (ELECTRONIC CONTROL UNIT)

Many ECUs are mounted in this vehicle.

Take the following precautions during body repair to prevent damage to the ECUs.

- Before starting electric welding operations, disconnect the negative (-) terminal cable from the battery.
When the negative (-) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by each memory system. Then when work is finished, reset the clock and audio systems as before.
When the vehicle has tilt and telescopic steering, power seat and outside rear view mirror, which are all equipped with memory function, it is not possible to make a record of the memory contents.
So when the operation is finished, it will be necessary to explain this fact to the customer, and request the customer to adjust the features and reset the memory.
- Do not expose the ECUs to ambient temperatures above 80°C (176°F).
NOTICE: If it is possible the ambient temperature may reach 80°C (176°F) or more, remove the ECUs from the vehicle before starting work.
- Be careful not to drop the ECUs and not to apply physical shocks to them.

GENERAL REPAIR INSTRUCTIONS

Work Precautions

SAFETY

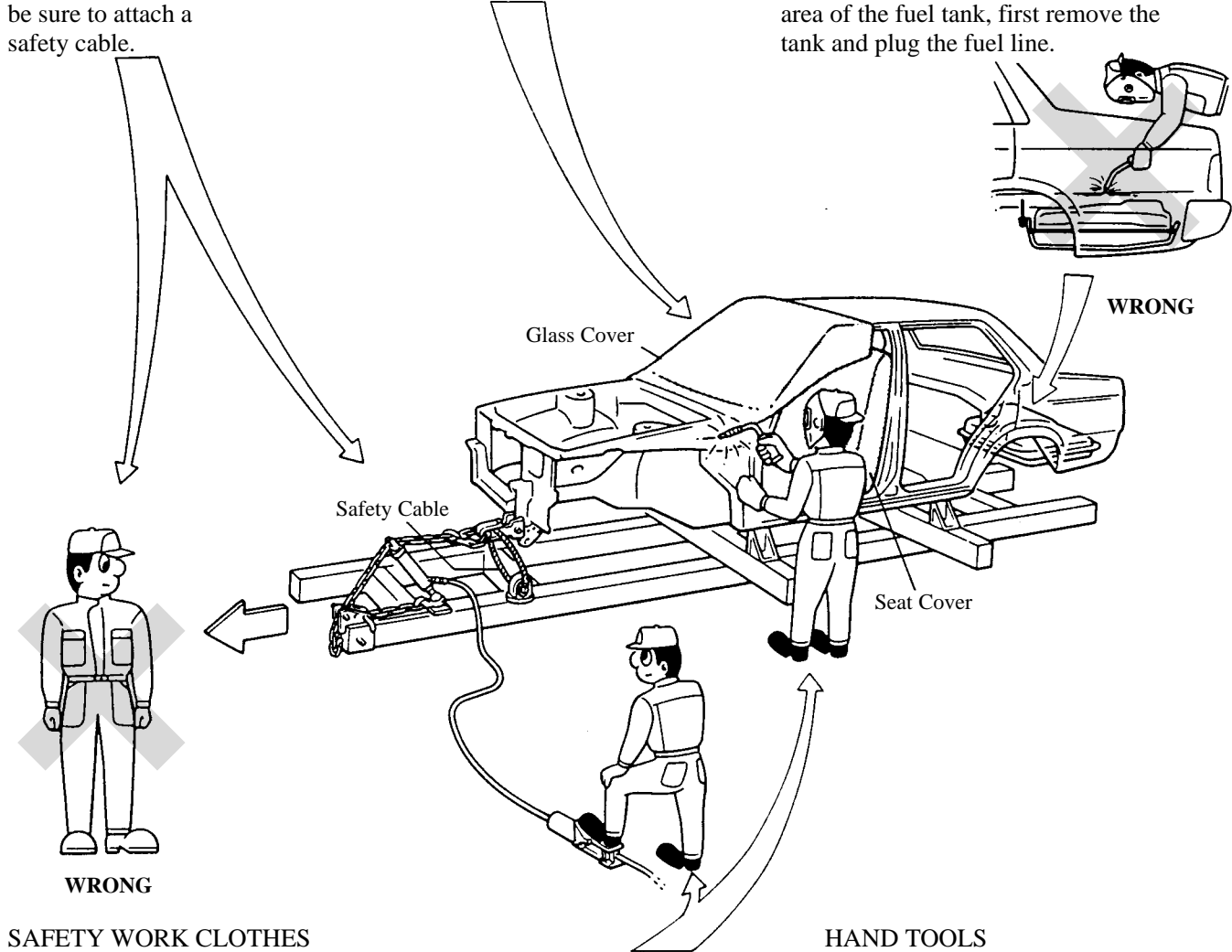
Never stand in direct line with the chain when using a puller on the body or frame, and be sure to attach a safety cable.

VEHICLE PROTECTION

When welding, protect the painted surfaces, windows, seats and carpet with heat-resistant, fire-proof covers.

SAFETY

1. Before performing repair work, check for fuel leaks. If a leak is found, be sure to close the opening totally.
2. If it is necessary to use a flame in the area of the fuel tank, first remove the tank and plug the fuel line.

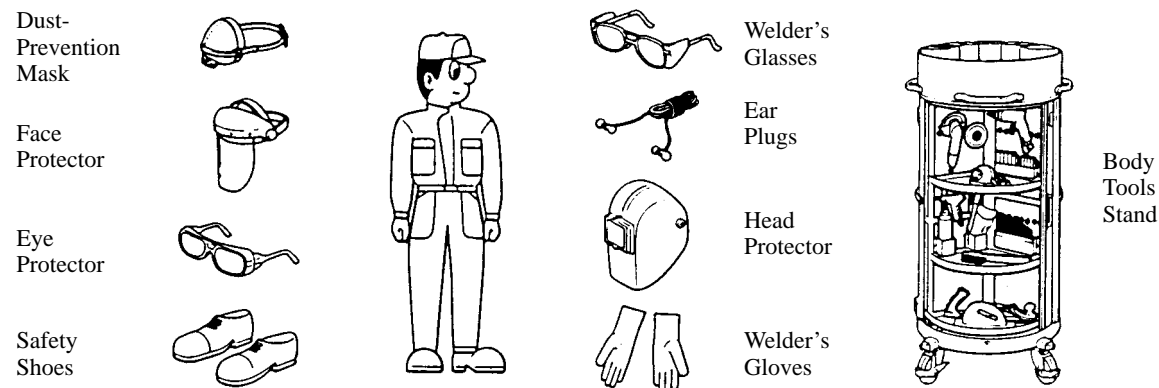


SAFETY WORK CLOTHES

In addition to the usual mechanic's wear, cap and safety shoes, the appropriate gloves, head protector, glasses, ear plugs, face protector, dust-prevention mask, etc. should be worn as the situation demands.

HAND TOOLS

Keeping your hand tools in neat order improve your work efficiency.

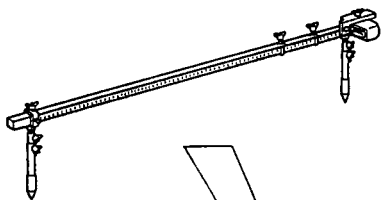


Proper and Efficient Work Procedures

REMOVAL

PRE-REMOVAL MEASURING

Before removal or cutting operations, take measurements in accordance with the dimension diagram. Always use a puller to straighten a damaged body or frame.

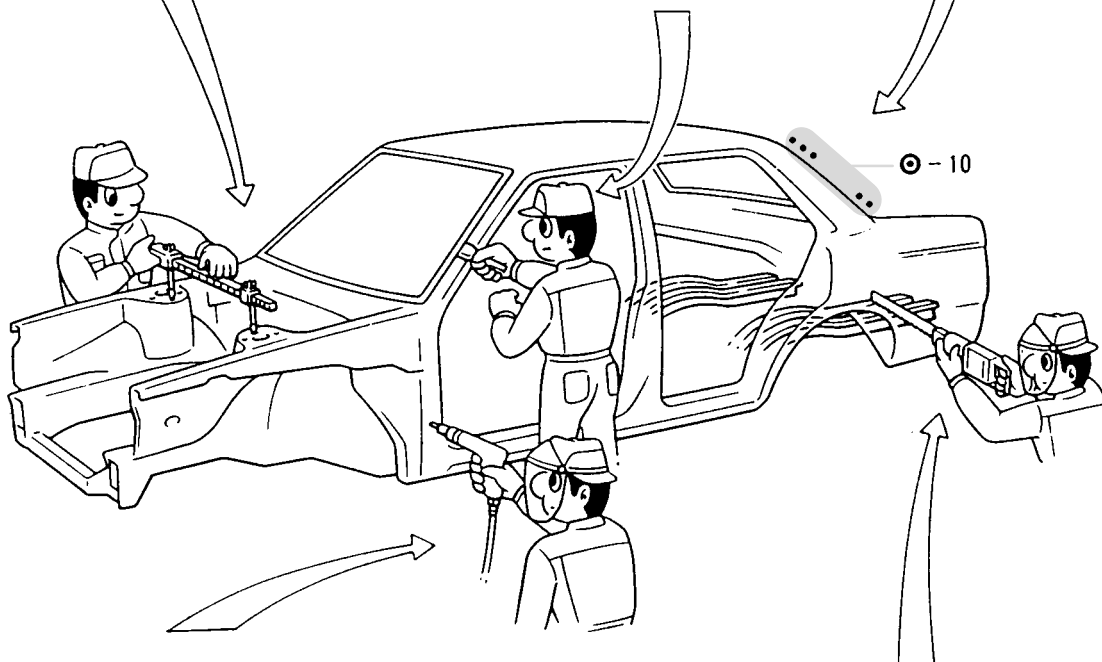


NUMBER OF SPOT WELDS AND PANEL POSITIONS

The number of spot welds and the panel positions to be removed are shown for your reference.
HINT: See "Symbols" on page IN-4,5.

REMOVAL OF ADJACENT COMPONENTS

When removing adjacent components, apply protective tape to the surrounding body and your tools to prevent damage.
HINT: See "Handling Precautions on Related Components" on page IN-6.



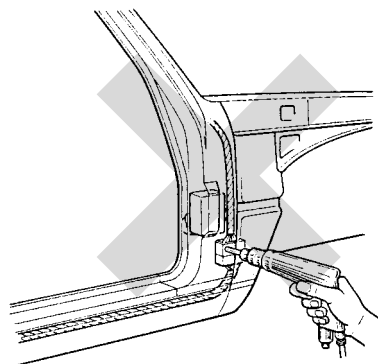
PRECAUTIONS FOR DRILLING OR CUTTING

Check behind any area to be drilled or cut to insure that there are no hoses, wires, etc., that may be damaged.

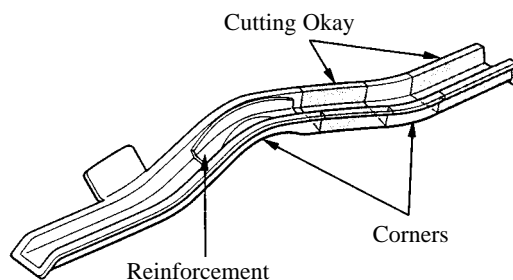
HINT: See "Handling Precautions on Related Components" on page IN-6.

CUTTING AREA

Always cut in a straight line and avoid reinforced area.



WRONG



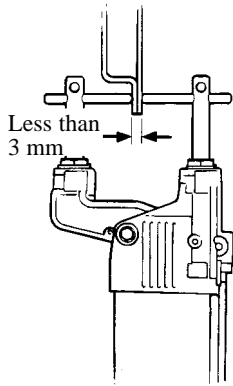
Cutting Okay

Corners

Reinforcement

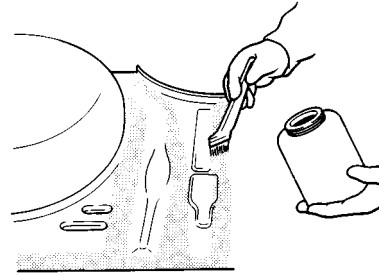
PREPARATION FOR INSTALLATION

SPOT WELD POINTS



When welding panels with a combined thickness of over 3 mm (0.12in.), use a MIG (Metal Inert Gas) welder for plug welding.
HINT: Spot welding will not provide sufficient durability for panels over 3 mm (0.12in.) thick.

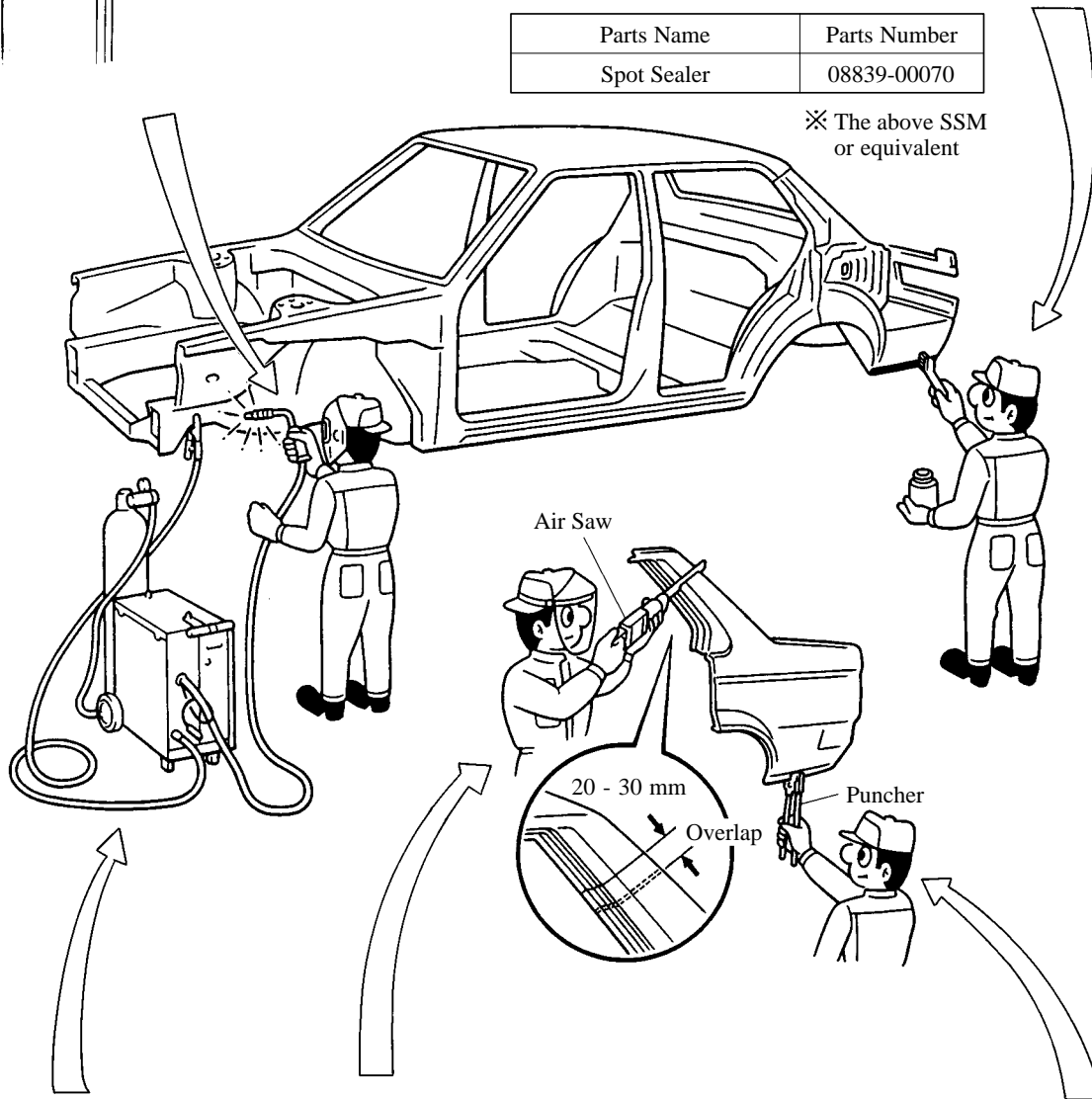
APPLICATION OF WELD-THROUGH PRIMER (SPOT SEALER)



Remove the paint from the portion of the new parts and body to be welded, and apply weld-through primer.
HINT: See "ANTI-RUST TREATMENT" on page AR-2.

Parts Name	Parts Number
Spot Sealer	08839-00070

※ The above SSM or equivalent



SAFETY PRECAUTIONS FOR ELECTRICAL COMPONENTS.
 When welding there is a danger that electrical components will be damaged by the electrical current flowing through the body.
 Before starting work disconnect the negative terminal of the battery and ground the welder near the welding location of the body.

ROUGH CUTTING OF JOINTS
 For joint areas, rough cut the new parts, leaving 20 - 30 mm (0.79 - 1.18in.) overlap.

MAKING HOLES FOR PLUG WELDING
 For areas where a spot welder cannot be used, use a puncher or drill to make holes for plug welding.

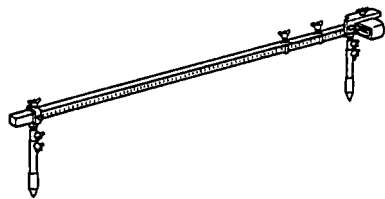
REFERENCE: mm (in.)

Thickness of welded portion	Size of plug hole
1.0 (0.04) under	5 (0.20) ϕ over
1.0 (0.04) - 1.5 (0.06)	6.5 (0.26) ϕ over
1.5 (0.06) over	8 (0.31) ϕ over

INSTALLATION

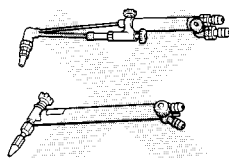
PRE-WELDING MEASUREMENTS

Always take measurements before installing underbody or engine components to insure correct assembly. After installation, confirm proper fit.



WELDING PRECAUTIONS

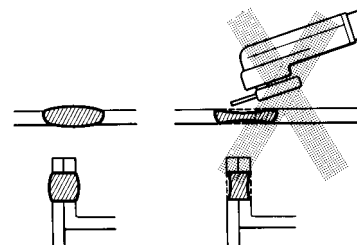
- The number of welding spots should be as follows.
Spot weld: 1.3 x No. of manufacturer's spots.
Plug weld: More than No. of manufacturer's plugs.



WRONG

POST-WELDING REFINISHING

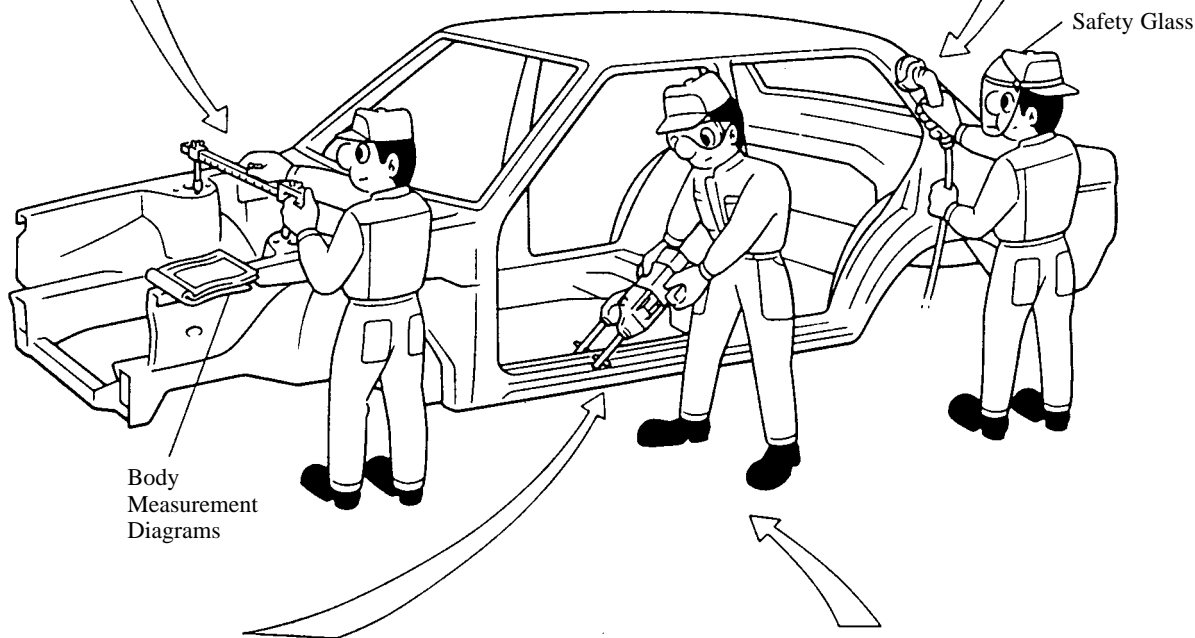
- Always check the welded spots to insure they are secure.
- When smoothing out the weld spots with a disc grinder, be careful not to grind off too much as this would weaken the weld.



OKAY

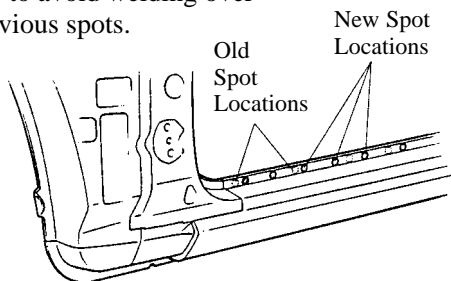
WRONG

- Plug welding should be done with a MIG (Metal Inert Gas) welder. Do not gas weld or braze panels at areas other than specified.



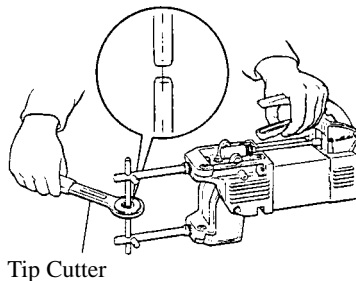
SPOT WELD LOCATIONS

Try to avoid welding over previous spots.



SPOT WELDING PRECAUTIONS

- The shape of the welding tip point has an effect on the strength of the weld.
- Always insure that the seams and welding tip are free of paint.



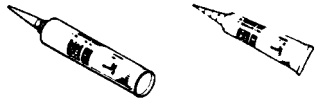
ANTI-RUST TREATMENT

When replacing body panels, always apply body sealer, anti-rust agent or undercoat according to the requirements of your country.

HINT: For further details, see the description given in Section AR of this manual.

BODY SEALER

Apply body sealer to the required areas.



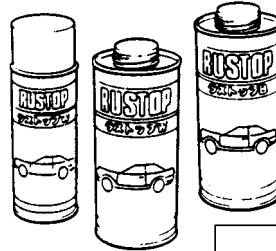
Cartridge Type

Tube Type

ANTI-RUST AGENT (WAX)

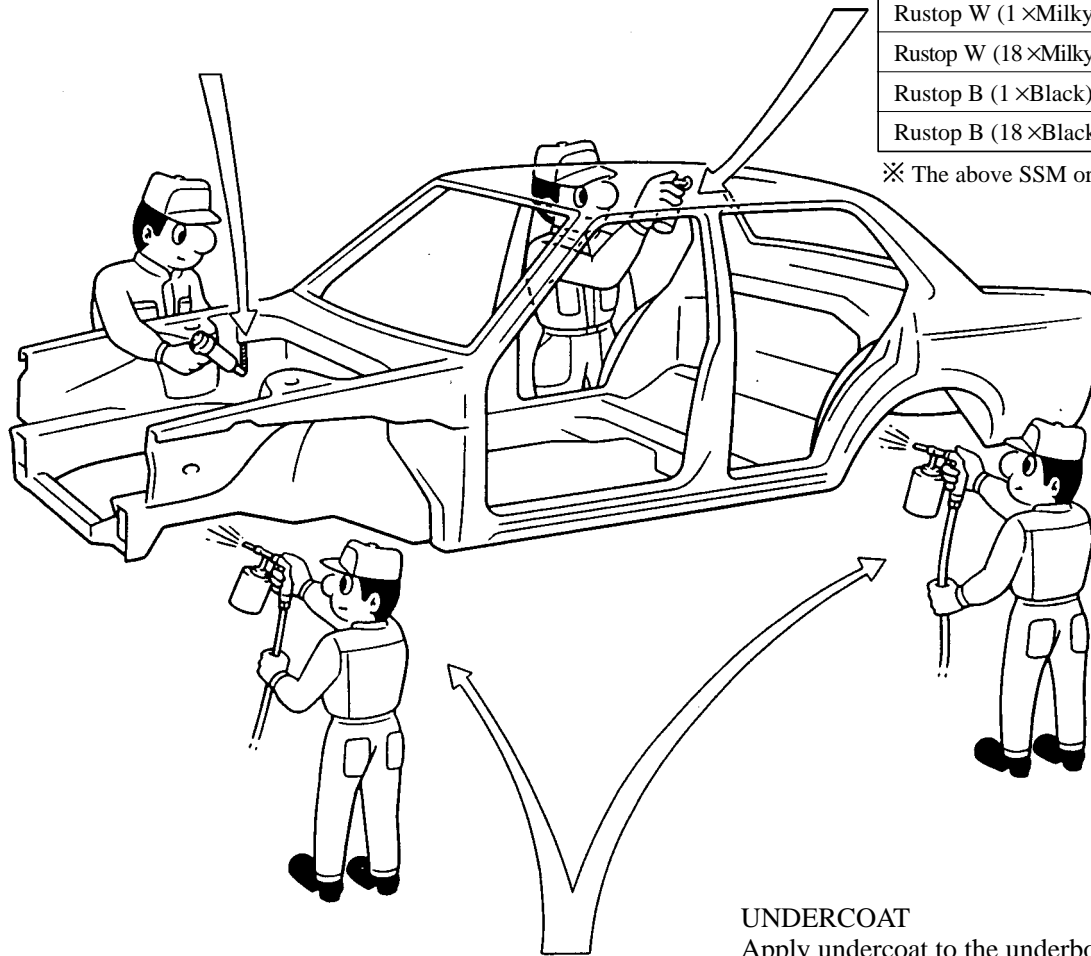
Apply anti-rust agent to following sections.

- Inside of the hems of the doors and hood.
- Around the hinges of the doors and hood.
- Inside of the welded parts with boxed cross-section.



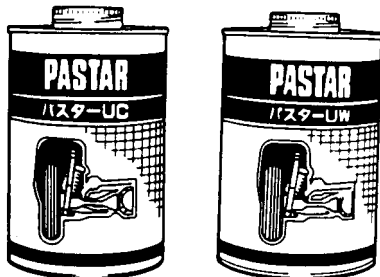
Parts Name	Parts Number
Rustop W (Aerosol)	08860-00200
Rustop W (1 ×Milky White)	08860-00210
Rustop W (18 ×Milky White)	08860-00230
Rustop B (1 ×Black)	08860-00220
Rustop B (18 ×Black)	08860-00240

※ The above SSM or equivalent



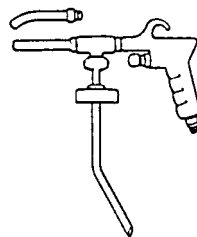
UNDERCOAT

Apply undercoat to the underbody and wheel housings.



Undercoating (Oil base)

Undercoating (Water base)



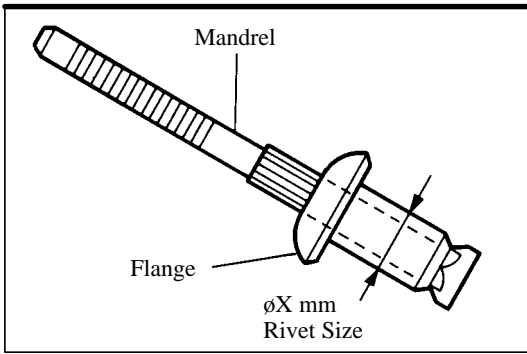
Spray Gun

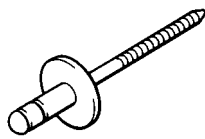
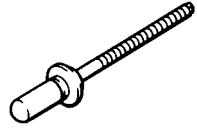
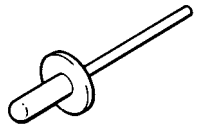
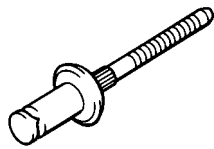
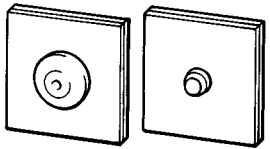
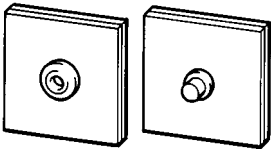
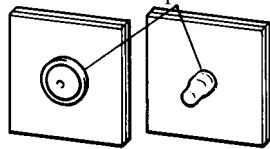
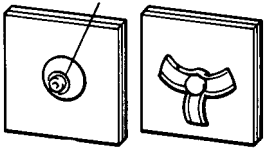
Parts Name	Parts Number
Paster UC (Oil Base)	08836-00155
Paster UW (Water Base)	08836-00115
Paster Gun (For thick application)	08836-00091

※ The above SSM or equivalent

RIVET REMOVAL AND INSTALLATION

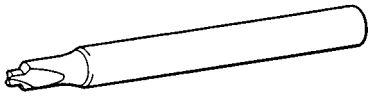
PARTS NAME AND VARIETY OF RIVET



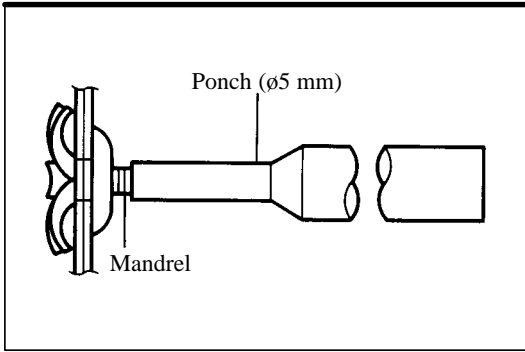
	Aluminum-Rivet	Steel-Rivet	Waterproof-Rivet	T-Rivet
External Appearance	Before installation 	Before installation 	Before installation 	Before installation 
	After installation  Outer Inner	After installation  Outer Inner	After installation Waterproof Seal  Outer Inner	After installation Mandrel  Outer Inner
Characteristics	<ul style="list-style-type: none"> Small nonwaterproof rivet No magnetic adherence 	<ul style="list-style-type: none"> Small nonwaterproof rivet Magnetic adherence 	<ul style="list-style-type: none"> Small waterproof rivet Waterproof seal 	<ul style="list-style-type: none"> Large waterproof rivet Mandrel sticks out after installation

RIVET REMOVAL

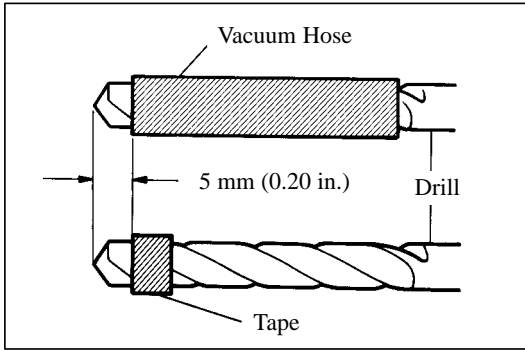
1. SELECTION OF CUTTING TOOL

	Cutting tool	Note								
Aluminum-Rivet Steel-Rivet T-Rivet with ø6.4 mm	Drill blade <table border="1"> <thead> <tr> <th>Rivet size</th> <th>Blade size</th> </tr> </thead> <tbody> <tr> <td>ø4 mm</td> <td>ø4 mm</td> </tr> <tr> <td>ø4.8 mm</td> <td>ø5 mm</td> </tr> <tr> <td>ø6.4 mm</td> <td>ø6.5 mm</td> </tr> </tbody> </table>	Rivet size	Blade size	ø4 mm	ø4 mm	ø4.8 mm	ø5 mm	ø6.4 mm	ø6.5 mm	<ul style="list-style-type: none"> Cutting can be done with drill blade or rivet cutter for an aluminum-rivet with ø4.8 mm. When a rivet cutter is used for an aluminum-rivet (except ø4.8 mm), a steel-rivet, or a T-rivet with ø6.4 mm, it is possible that the drill will spin abnormally damaging the rivet hole and breaking the rivet cutter.
Rivet size	Blade size									
ø4 mm	ø4 mm									
ø4.8 mm	ø5 mm									
ø6.4 mm	ø6.5 mm									
Aluminum-Rivet with ø4.8 mm Waterproof-Rivet with ø4.8 mm	Rivet Cutter (P/N 09060-60350) 	<ul style="list-style-type: none"> When an ordinary cutter is used for a waterproof-rivet with ø4.8 mm the rivet can not be cut as it spins with the cutter. 								

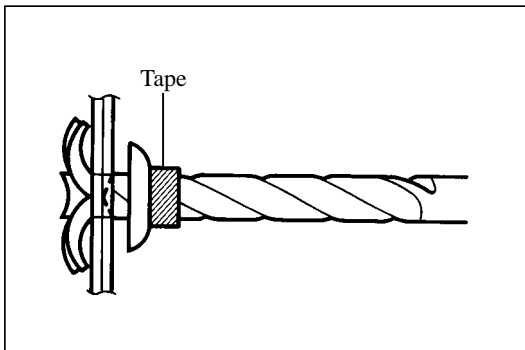
2. RIVET REMOVAL



- (1) T-Rivet with $\phi 6.4$ mm:
Using a punch with $\phi 5$ mm, stamp out the mandrel.



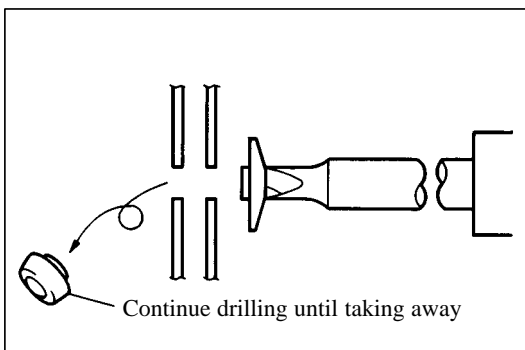
- (2) Put tape around the drill blade 5 mm (0.20 in.) from the tip to prevent damage to the rivet hole.
(3) Attach the drill blade or a rivet cutter to the drill.



- (4) Gently and vertically put the drill to the rivet, and cut the rivets flange.

NOTE:

- While upward drilling, wear a protective glasses.
- If a drill is strongly pushed deeply into a rivet, the rivet can't be cut as it spins together with the drill.
- Prizing the hole with a drill can lead to damage to the rivet hole or the breaking of the rivet cutter.
- Take care as the cut rivet is hot.

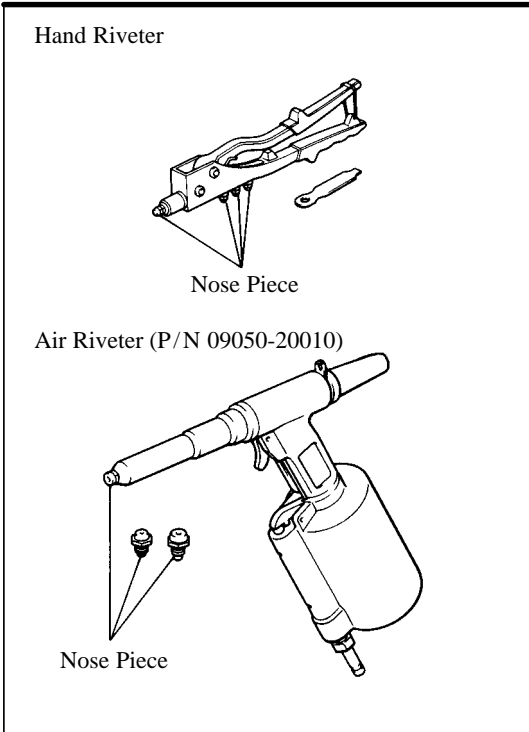


- (5) Aluminum-Rivet and Waterproof-Rivet with $\phi 4.8$ mm:
Even if flange is taken off, continue drilling and push out remaining fragments with the drill.

- (6) Steel-Rivet:
If the flange is taken off, stop drilling and pull out the remaining fragments with a pliers.

- (7) T-Rivet with $\phi 6.4$ mm:
If the flange is taken off, stop drilling and push out the remaining fragments with a punch with $\phi 5$ mm or pull out the remaining fragments with pliers.

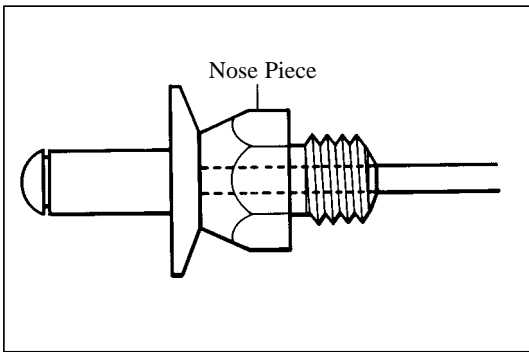
RIVET INSTALLATION



1. RIVET INSTALLATION

- (1) Apply touch-up paint at the area.
- (2) Select an installation tool.

Item	Installation tool
Aluminum-Rivet Waterproof-Rivet with $\phi 4.8$ mm	Hand Riveter or Air Riveter
Steel-Rivet T-Rivet with $\phi 6.4$ mm	Air Riveter

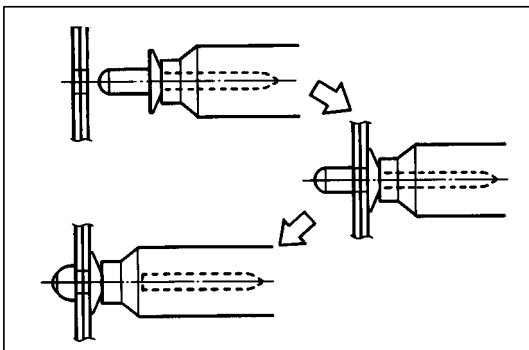


- (3) Select the smallest a nose piece possible for a rivets mandrel.

NOTE: Wrong selection of a nose piece may cause the riveter to be damaged or bad tightening.

<Reference> Nose piece of Air Riveter

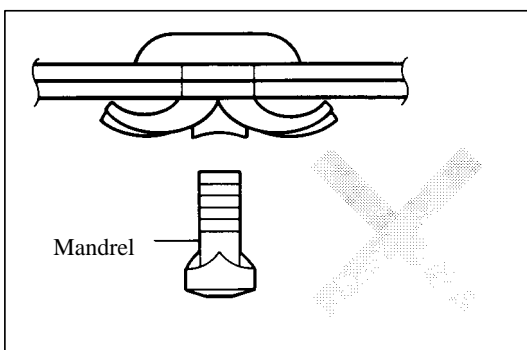
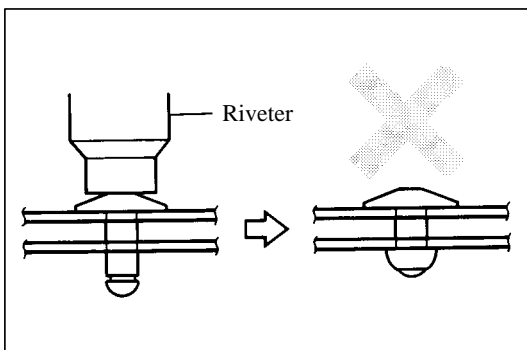
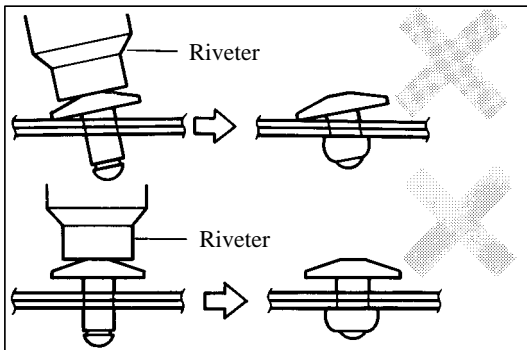
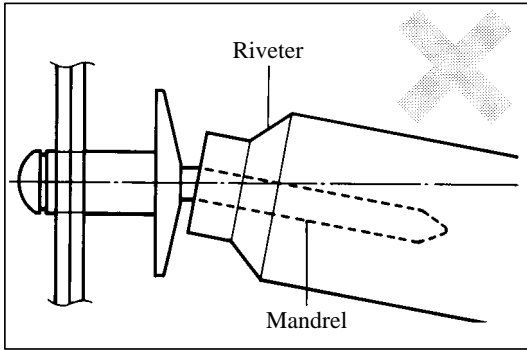
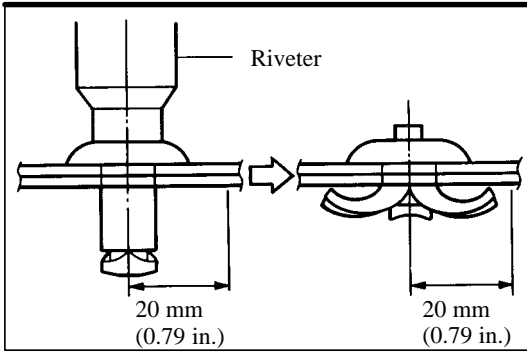
Parts Name	Parts Number	Color	Rivet type
Nose piece No. 1	09050-02020	Silver	$\phi 4.0$ mm Aluminum $\phi 4.0$ mm Steel $\phi 4.8$ mm Waterproof
Nose piece No. 2	09050-02030	Copper	$\phi 4.8$ mm Aluminum $\phi 4.8$ mm Steel
Nose piece No. 3	09050-02040	Black	$\phi 6.4$ mm T-Rivet



- (4) Insert the nose piece to the riveter and then the mandrel of the new rivet into the nose piece.
- (5) Vertically insert the rivet into a hole and keep place it strongly.

NOTE:

- If the tip of the rivet is not deformed or the mandrel is not cut, repeat process (5) again.



- **T-Rivet with $\phi 6.4$ mm:**
Do not place your hands or the wire harness within a radius of 20 mm (0.79 in.) from the rivet, as the rivet is cut and opened in this area.

- **Prizing a riveter damages the riveter showing that it is not tightened correctly and bends the mandrel.**

- **Loose tightening may result from either tilting the riveter while handling or the riveter not connecting to the material.**

- **Loose tightening also occurs when a rivet is applied between materials without touching.**

- **T-Rivet with $\phi 6.4$ mm:**
When a mandrel of a rivet is lost, the rivet should be replaced to prevent loose tightening.

HANDLING PRECAUTIONS ON RELATED COMPONENTS

1. BRAKE SYSTEM

The brake system is one of the most important safety components. Always follow the directions and notes given in brake (32) section of the repair manual for the relevant model when handling brake system parts.

NOTICE: When repairing the brake master cylinder or TRAC system, bleed the air out of the TRAC system.

2. DRIVE TRAIN AND CHASSIS

The drive train and chassis are components that can have great effects on the running performance and vibration resistance of the vehicle. After installing components in the sections listed in the table below, perform alignments to ensure correct mounting angles and dimensions. Particularly accurate repair of the body must also be done to ensure correct alignment.

HINT: Correct procedures and special tools are required for alignment. Always follow the directions given in the repair manual for the relevant model during alignment and section DI of this section.

Component to be aligned	Section of repair manual for relevant model
Front Wheels	Front Suspension (26) section
Rear Wheels	Rear Suspension (27) section
Propeller Shaft	Propeller Shaft (30) section

3. COMPONENTS ADJACENT TO THE BODY PANELS

Various types of component parts are mounted directly on or adjacently to the body panels. Strictly observe the following precautions to prevent damaging these components and the body panels during handling.

- Before repairing the body panels, remove their components or apply protective covers over the components.
- Before prying components off using a screwdriver or a scraper, etc., attach protective tape to the tool tip or blade to prevent damaging the components and the body paint.
- Before removing components from the outer surface of the body, attach protective tape to the body to ensure no damage to painted areas.

HINT: Apply touch-up paint to any damaged paint surfaces.

- Before drilling or cutting sections, make sure that there are no wires, etc. on the reverse side.

4. ECU (ELECTRONIC CONTROL UNIT)

Many ECUs are mounted in this vehicle.

Take the following precautions during body repair to prevent damage to the ECUs.

- Before starting electric welding operations, disconnect the negative (-) terminal cable from the battery.

When the negative (-) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by each memory system. Then when work is finished, reset the clock and audio systems as before.

When the vehicle has tilt and telescopic steering, power seat and outside rear view mirror, which are all equipped with memory function, it is not possible to make a record of the memory contents.

So when the operation is finished, it will be necessary to explain this fact to the customer, and request the customer to adjust the features and reset the memory.

- Do not expose the ECUs to ambient temperatures above 80°C (176°F).

NOTICE: If it is possible the ambient temperature may reach 80°C (176°F) or more, remove the ECUs from the vehicle before starting work.

- Be careful not to drop the ECUs and not to apply physical shocks to them.

ABBREVIATIONS USED IN THIS MANUAL

For convenience, the following abbreviations are used in this manual.

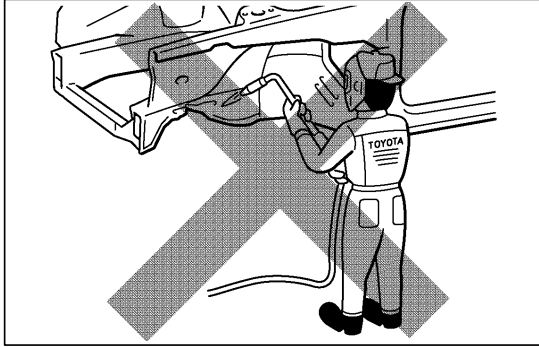
ABS	Antilock Brake System
A/C	Air Conditioner
assy	assembly
ECT	Electronic Controlled Transmission
ECU	Electronic Control Unit
e.g.	Exempli Gratia (for Example)
Ex.	Except
FWD	Front Wheel Drive Vehicles
2WD	Two Wheel Drive Vehicles
4WD	Four Wheel Drive Vehicles
in.	inch
LH	Left-hand
LHD	Left-hand Drive
MIG	Metal Inert Gas
M/Y	Model Year
PPS	Progressive Power Steering
RH	Right-hand
RHD	Right-hand Drive
SRS	Supplemental Restraint System
SSM	Special Service Materials
w/	with
w/o	without

ABBREVIATIONS USED IN THIS MANUAL

For convenience, the following abbreviations are used in this manual.

ABS	Antilock Brake System
A/C	Air Conditioner
assy	assembly
A/T	Automatic Transmission (Transaxle)
ECT	Electronic Controlled Transmission
ECU	Electronic Control Unit
e.g.	Exempli Gratia (for Example)
Ex.	Except
FWD	Front Wheel Drive Vehicles
4WD	Four Wheel Drive Vehicles
in.	inch
LH	Left-hand
LHD	Left-hand Drive
MIG	Metal Inert Gas
M/T	Manual Transmission (Transaxle)
M/Y	Model Year
PPS	Progressive Power Steering
RH	Right-hand
RHD	Right-hand Drive
SRS	Supplemental Restraint System
SSM	Special Service Materials
w/	with
w/o	without

PRECAUTIONS FOR REPAIRING BODY STRUCTURE PANELS



1. HEAT REPAIR FOR BODY STRUCTURE PANELS

Toyota prohibits the use of the heat repair method on body structure panels when repairing a vehicle damaged in a collision.

Panels that have high strength and rigidity, as well as a long life span for the automobile body are being sought after.

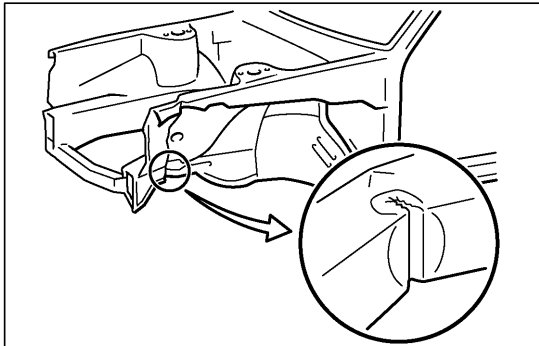
At Toyota, in order to fulfill these requirements, we use high tensile strength steel sheets and rust preventive steel sheets on the body.

High tensile steel sheets are made with alloy additives and a special heat treatment in order to improve the strength.

To prevent the occurrence of rust for a long period of time, the surface of the steel is coated with a zinc alloy.

If a body structure part is heat repaired with an acetylene torch or other heating source, the crystalline organization of the steel sheet will change and the strength of the steel sheet will be reduced.

The ability of the body to resist rust is significantly lowered as well since the rust resistant zinc coating is destroyed by heat and the steel sheet surface is oxidized.

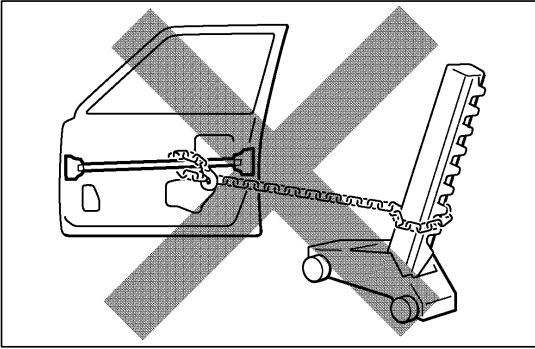
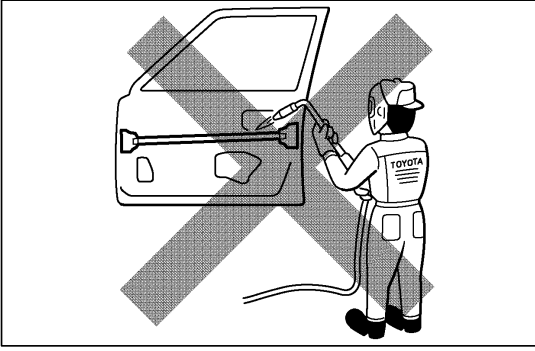


2. STRUCTURE PANEL KINKS

A sharp deformation angle on the panel that cannot be returned to its original shape by pulling or hammering is called a kink.

Since structure parts were designed to exhibit a 100% performance when they were in their original shape, if they are deformed in an accident, or if the deformed parts are repaired and reused, they become unable to exhibit the same performance as intended in the design.

It is necessary to replace the part where the kink has occurred.



3. IMPACT BEAM REPAIR

The impact beam and bracket are necessary and important parts in maintaining a survival space for passengers in a side collision.

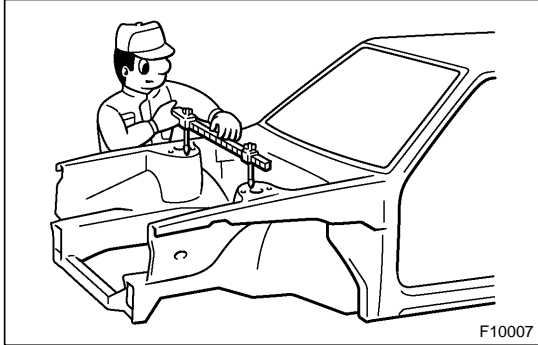
For impact beam, we use special high tensile strength steel.

The high tensile strength steel maintains its special crystal-line organization by heat treatment or alloy additives.

Since these parts were designed to exhibit a 100% performance when they were in their original shape, if they are deformed in an accident, or if the deformed parts are repaired and reused, they become unable to exhibit the same performance as intended in the design.

It is necessary to replace the door assembly when impact beam or bracket is damaged.

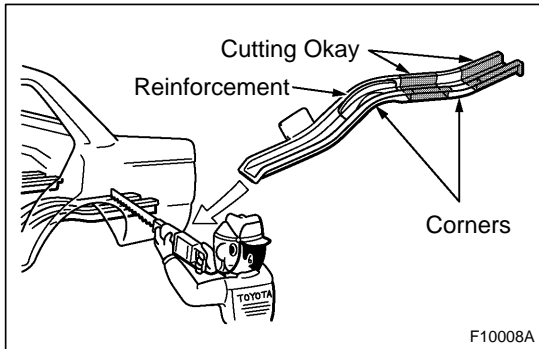
PROPER AND EFFICIENT WORK PROCEDURES



1. REMOVAL

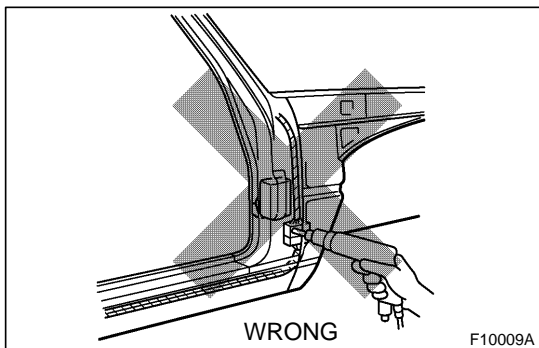
(a) PRE-REMOVAL MEASURING

- (1) Before removal or cutting operations, take measurements in accordance with the dimension diagram. Always use a puller to straighten a damaged body or frame.



(b) CUTTING AREA

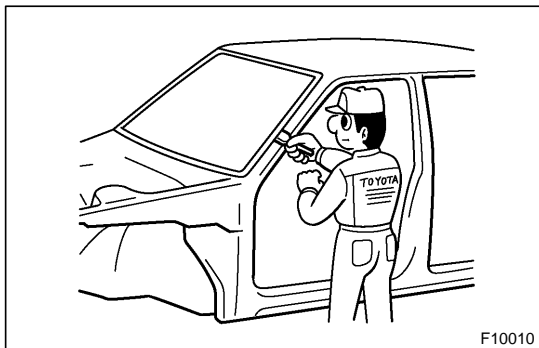
- (1) Always cut in a straight line and avoid reinforced area.



(c) PRECAUTIONS FOR DRILLING OR CUTTING

- (1) Check behind any area to be drilled or cut to insure that there are no hoses, wires, etc., that may be damaged.

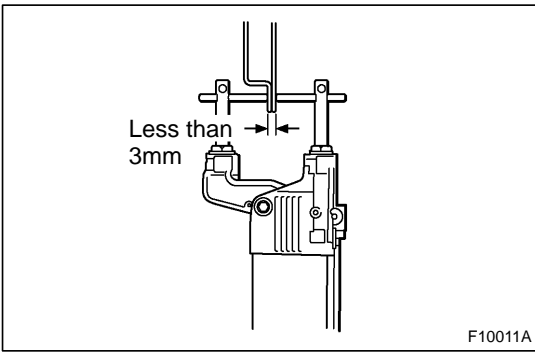
HINT: See "Handling Precautions on Related Components" on page IN-15.



(d) REMOVAL OF ADJACENT COMPONENTS

- (1) When removing adjacent components, apply protective tape to the surrounding body and your tools to prevent damage.

HINT: See "Handling Precautions on Related Components" on page IN-15.

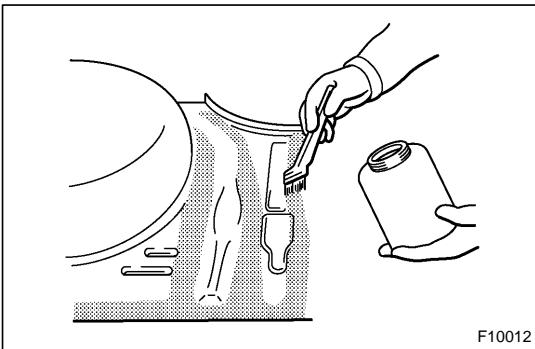


2. PREPARATION FOR INSTALLATION

(a) SPOT WELD POINTS

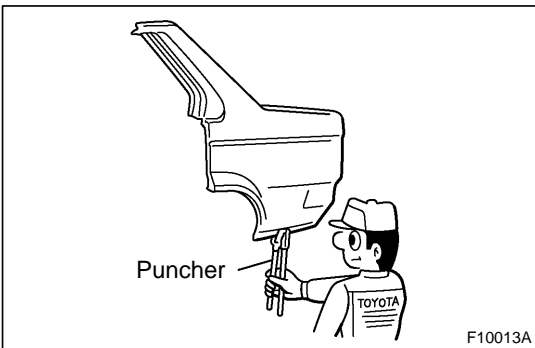
- (1) When welding panels with a combined thickness of over 3mm (0.12in.), use a MIG (Metal Inert Gas) welder for plug welding.

HINT: Spot welding will not provide sufficient durability for panels over 3mm (0.12in.) thick.



(b) APPLICATION OF WELD-THROUGH PRIMER (SPOT SEALER)

- (1) Remove the paint from the portion of the new parts and body to be welded, and apply weld-through primer.



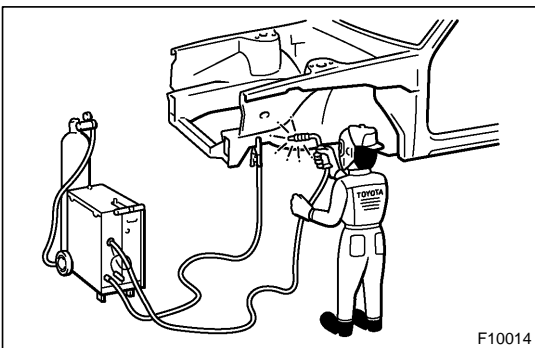
(c) MAKING HOLES FOR PLUG WELDING

- (1) For areas where a spot welder cannot be used, use a puncher or drill to make holes for plug welding.

REFERENCE:

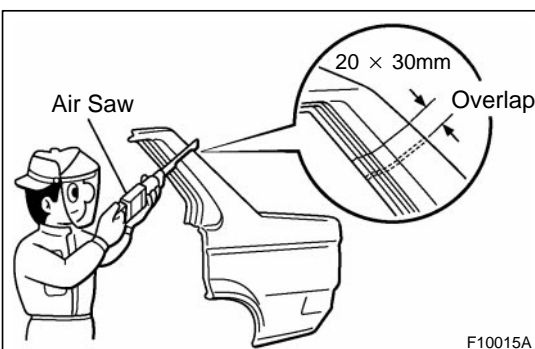
mm (in.)

Thickness of welded portion	Size of plug hole
1.0 (0.04) under	5 (0.20) ϕ over
1.0 (0.04) - 1.5 (0.06)	6.4 (0.25) ϕ over
1.5 (0.06) over	8 (0.31) ϕ over



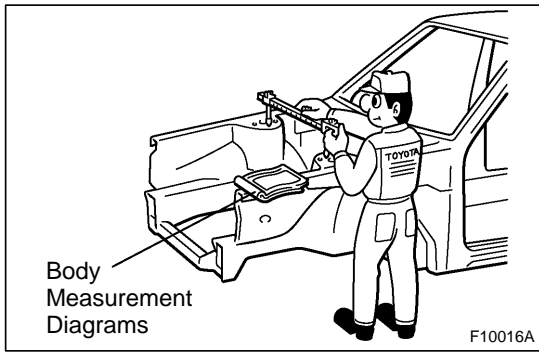
(d) SAFETY PRECAUTIONS FOR ELECTRICAL COMPONENTS

- (1) When welding, there is a danger that electrical components will be damaged by the electrical current flowing through the body.
- (2) Before starting work, disconnect the negative terminal of the battery and ground the welder near the welding location of the body.



(e) ROUGH CUTTING OF JOINTS

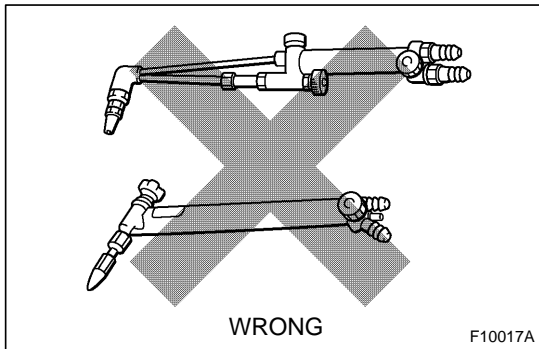
- (1) For joint areas, rough cut the new parts, leaving 20 - 30mm (0.79 - 1.18in.) overlap.



3. INSTALLATION

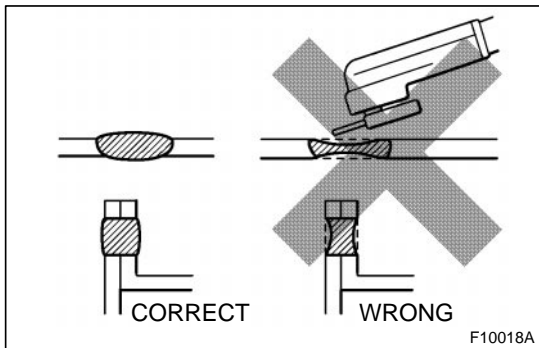
(a) PRE-WELDING MEASUREMENTS

- (1) Always take measurements before installing underbody or engine components to insure correct assembly. After installation, confirm proper fit.



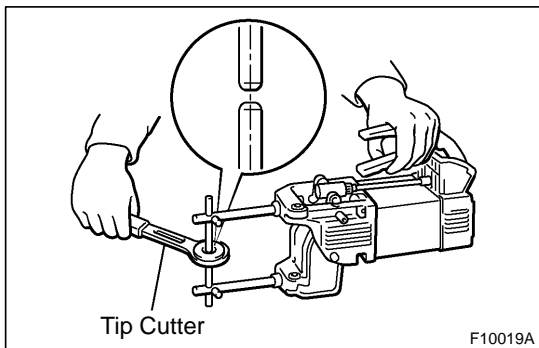
(b) WELDING PRECAUTIONS

- (1) The number of welding spots should be as follows.
Spot weld: 1.3 X No. of manufacturer's spots.
Plug weld: More than No. of manufacturer's plugs.
- (2) Plug welding should be done with a MIG (Metal Inert Gas) welder. Do not gas weld or braze panels at areas other than specified.



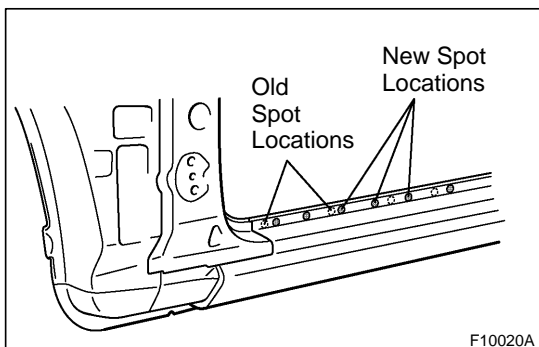
(c) POST-WELDING REFINISHING

- (1) Always check the welded spots to insure they are secure.
- (2) When smoothing out the weld spots with a disc grinder, be careful not to grind off too much as this would weaken the weld.



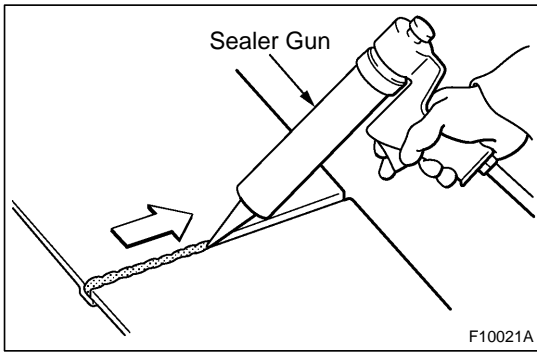
(d) SPOT WELD LOCATIONS

- (1) Try to avoid welding over previous spots.



(e) SPOT WELDING PRECAUTIONS

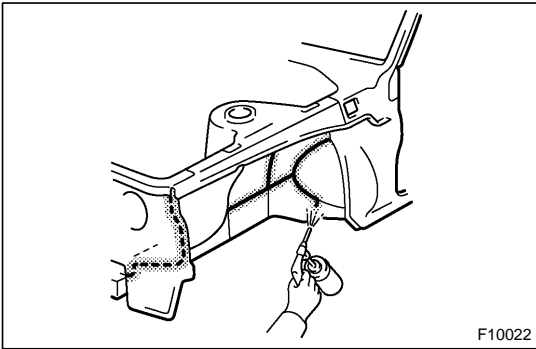
- (1) The shape of the welding tip point has an effect on the strength of the weld.
- (2) Always insure that the seams and welding tip are free of paint.



4. ANTI-RUST TREATMENT

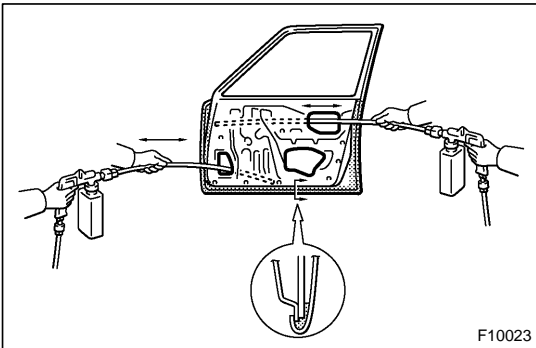
(a) BODY SEALER APPLICATION

- (1) For water-proofing and anti-corrosion measures, always apply the body sealer to the body panel seams and hems of the doors, hoods, etc.



(b) UNDERCOAT APPLICATION

- (1) To prevent corrosion and protect the body from damage by flying stones, always apply sufficient undercoat to the bottom surface of the under body and inside of the wheel housings.



5. ANTI-RUST TREATMENT AFTER PAINTING PROCESS

(a) ANTI-RUST AGENT (WAX) APPLICATION

- (1) To preserve impossible to paint areas from corrosion, always apply sufficient anti-rust agent (wax) to the inside of the hemming areas of the doors and hoods, and around the hinges, or the welded surfaces inside the boxed cross-section structure of the side member, body pillar, etc.

6. ANTI-RUST TREATMENT BY PAINTING

REFERENCE:

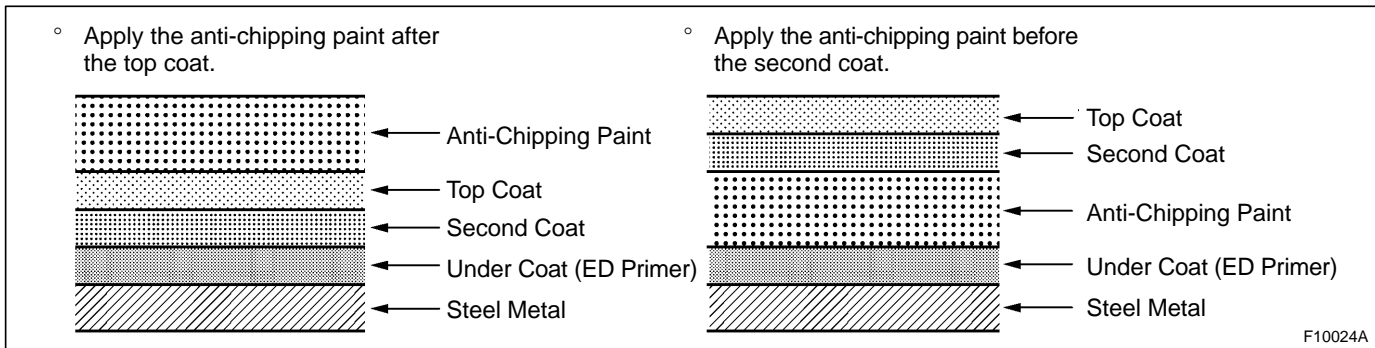
Painting prevents corrosion and protect the sheet metal from damage. In this section, anti-chipping paint only for anti-corrosion purpose is described.

(a) ANTI-CHIPPING PAINT

- (1) To prevent corrosion and protect the body from damage by flying stones, etc., apply anti-chipping paint to the rocker panel, wheel arch areas, balance panel, etc.

HINT:

Depending on the model or the application area, there are cases where the application of anti-chipping paint is necessary before the second coat or after the top coat.



HANDLING PRECAUTIONS

1. The repair procedure for plastic body parts must conform with the type of plastic material.
2. Plastic body parts are identified by the codes in the following chart.
3. When repairing metal body parts adjoining plastic body parts (by brazing, frame cutting, welding, painting etc.), consideration must given to the property of the plastic.

Code	Material name	Heat* resistant temperature limit °C (°F)	Resistance to alcohol or gasoline	Notes
AAS	Acrylonitrile Acrylic Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
ABS	Acrylonitrile Butadiene Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
AES	Acrylonitrile Ethylene Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
ASA	Acrylonitrile Styrene Acrylate	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
CAB	Cellulose Acetate	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
EPDM	Ethylene Propylene	100 (212)	Alcohol is harmless. Gasoline is harmless if applied only for short time in small amounts.	Most solvents are harmless but avoid dipping in gasoline, solvents, etc.
FRP	Fiber Reinforced Plastics	180 (356)	Alcohol and gasoline are harmless.	Avoid alkali.
EVA	Ethylene Acetate	70 (158)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
PA	Polyamide (Nylon)	80 (176)	Alcohol and gasoline are harmless.	Avoid battery acid.
PBT	Polybutylene Terephthalate	160 (320)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PC	Polycarbonate	120 (248)	Alcohol is harmless.	Avoid gasoline, brake fluid, wax, wax removers and organic solvents. Avoid alkali.

*Temperatures higher than those listed here may result in material deformation during repair.

Code	Material name	Heat* resistant temperature limit °C (°F)	Resistance to alcohol or gasoline	Notes
PE	Polyethylene	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PET	Polyethylene Terephthalate	75 (167)	Alcohol and gasoline are harmless.	Avoid dipping in water.
PMMA	Polymethyl Methacrylate	80 (176)	Alcohol is harmless if applied only for short time in small amounts.	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
POM	Polyoxymethylene (Polyacetal)	100 (212)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PP	Polypropylene	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PPO	Modified Polyphenylene Oxide	100 (212)	Alcohol is harmless.	Gasoline is harmless if applied only for quick wiping to remove grease.
PS	Polystyrene	60 (140)	Alcohol and gasoline are harmless if applied only for short time in small amounts.	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
PUR	Polyurethane	80 (176)	Alcohol is harmless if applied only for very short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
PVC	Polyvinylchloride (Vinyl)	80 (176)	Alcohol and gasoline are harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
SAN	Styrene Acrylonitrile	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents etc.
TPO	Thermoplastic Olefine	80 (176)	Alcohol is harmless. Gasoline is harmless if applied only for short time in small amounts.	Most solvents are harmless but avoid dipping in gasoline, solvents, etc.
TPU	Thermoplastic Polyurethane	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
TSOP	TOYOTA Super Olefine Polymer	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
UP	Unsaturated Polyester	110 (233)	Alcohol and gasoline are harmless.	Avoid alkali.

*Temperatures higher than those listed here may result in material deformation during repair.

LOCATION OF PLASTIC BODY PARTS

Parts Name	Code
Front Bumper Cover	TSOP
Radiator Grille	ABS
Headlight	PC
Turn Signal Light	PC
Front Fog Light	PC/PP
Cowl Top Ventilator Louver	PP/PE
Front Fender Mudguard	EVA • PP
Outer Rear View Mirror	ABS/ASA
Front Door Outside Handle	PC/PBT • PC/PET
Access Panel Outside Handle	PC/PBT
Rear Body Mudguard	EVA • PP
Center Stop Light	PC
Rear Combination Light	PP/PMMA
Tail Gate Outside Handle	PC/PET
Licence Plate Light	PC/PP
Rear Bumper	TSOP

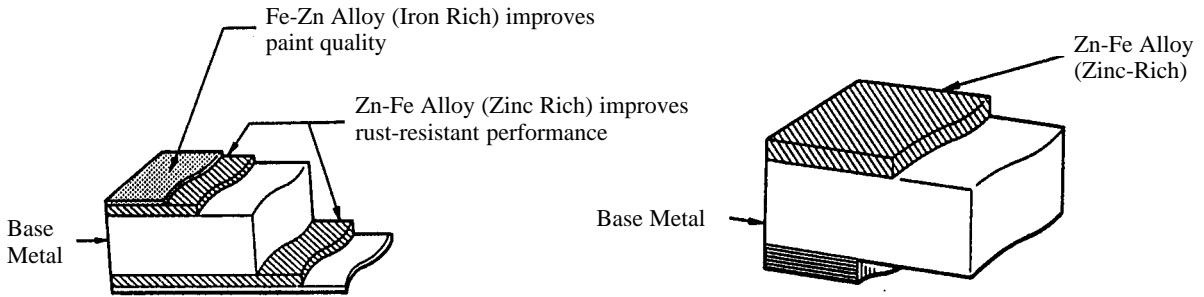
HINT:

- Resin material differs with model.
- / Made up of 2 or more kinds of materials.

RUST-RESISTANT SHEET STEEL PARTS


Rust-Resistant Sheet Steel have zinc, tin or aluminum etc, plating over the base metal surface in order to improve the corrosion resistance of the sheet metal. This sheeting is used on areas that require anti-corrosive abilities but there is no need to distinguish the differences between rust resistant sheet steel and ordinary sheet steel in body repair.

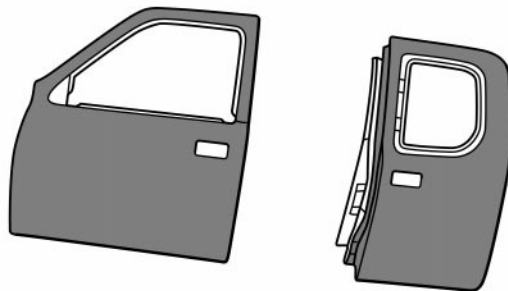
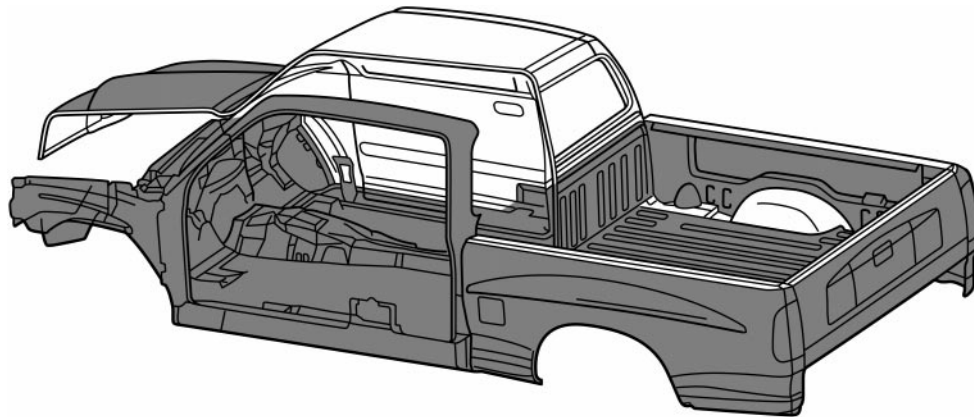
Body panels on TOYOTA models are made of two different melted galvanized sheet steel. The ordinary melted galvanized sheet has a zinc plating over the base metal surface and when heated a zinc-iron alloy plating. The zinc-iron double layered galvanized sheet has an iron rich and another zinc-rich layer above the sheet steel. These 2 layers improve paint adhesion. These two melted galvanized sheet steels are used selectively according to need.



The handling of Rust-Resistant Sheet Steel is the same as for ordinary sheet steel, but the following should be observed.

1. Panel Welding: The paint as well as the zinc portion must be removed completely from the welding area to guarantee good welding integrity.
2. Anti-Rust Treatment: Since the zinc plating is lost after welding, anti-rust treatment of the welded area must be thoroughly performed (refer to section AR).

 : Rust-Resistant Sheet Steel



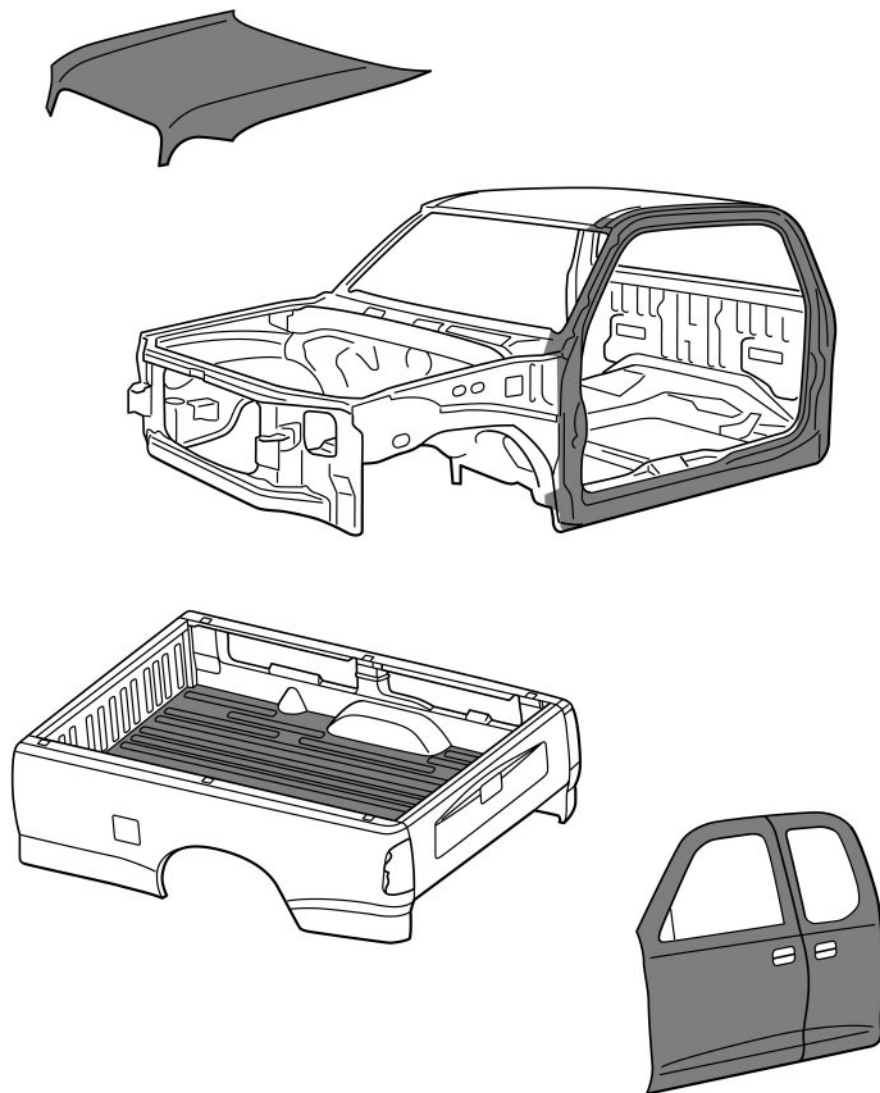
HIGH-STRENGTH STEEL (HSS) PARTS

Generally, High-Strength Steel (HSS) is that which has an intensity value of at 35 kgf/mm^2 (343 MPa), and distinguished from mild steel.

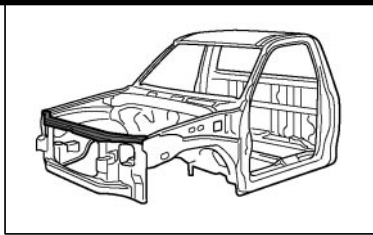
The handling of HSS is the same as for mild steel, but the following should be observed.

1. Panel Hammering: Because HSS is thinner than mild steel, care should be taken to avoid warping during hammering operations.
2. Removing Spot Welds: Because HSS is tougher than mild steel, damage will occur more easily to a regular drill. Therefore, an HSS Spot Cutter is recommended. Also, use a high-torque drill at low speed, and supply grinding oil to the drill use.
3. Panel Welding: Panel welding procedures for HSS are exactly the same as for mild steel. Plug welding should be done with MIG (Metal Inert Gas) welder. Do not gas weld or braze panels at areas other than specified.

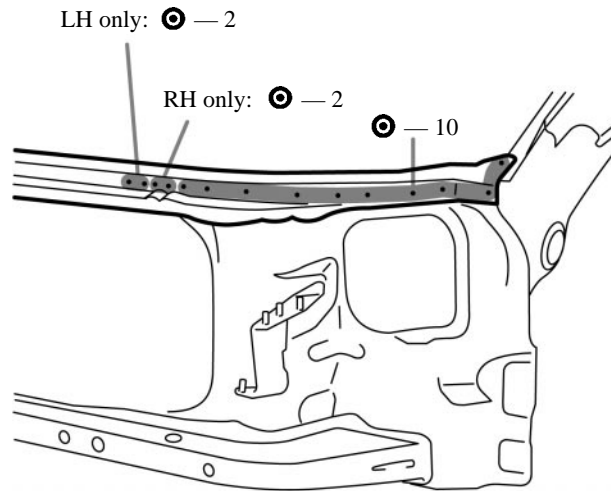
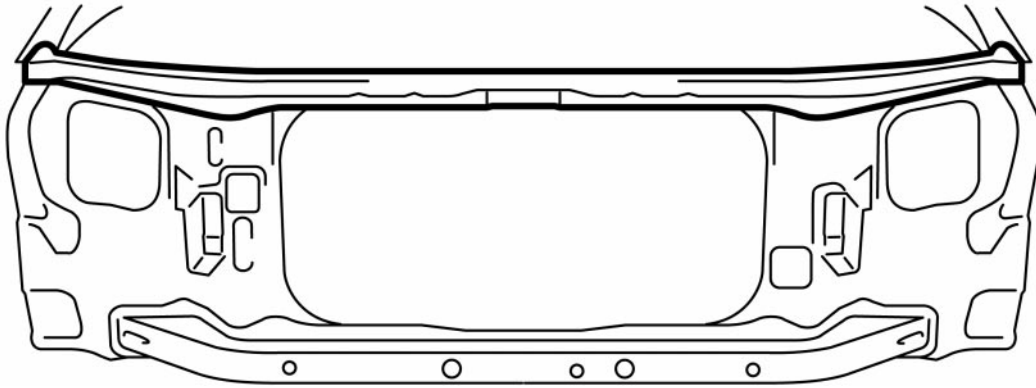
 : High Strength Sheet Steel



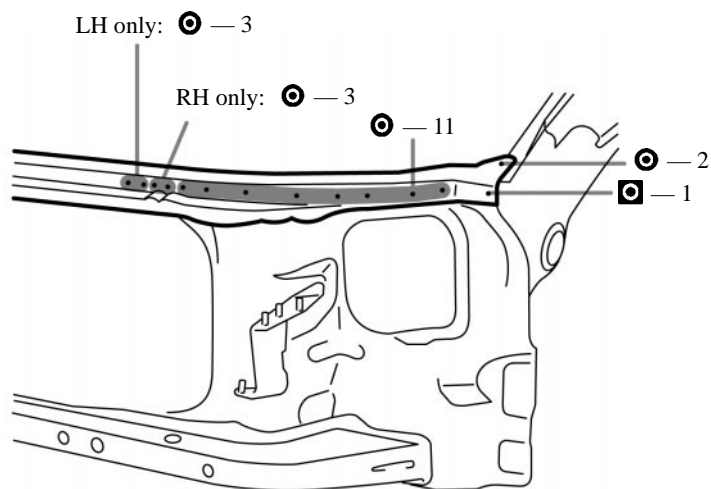
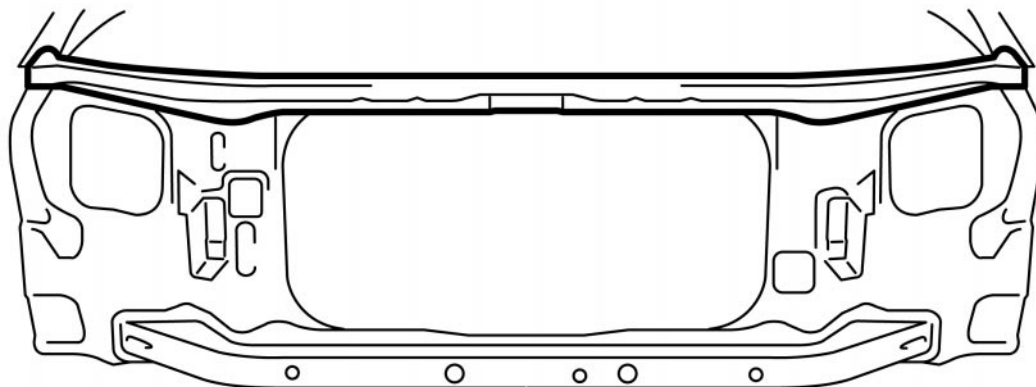
RADIATOR UPPER SUPPORT (ASSY)



REMOVAL



INSTALLATION

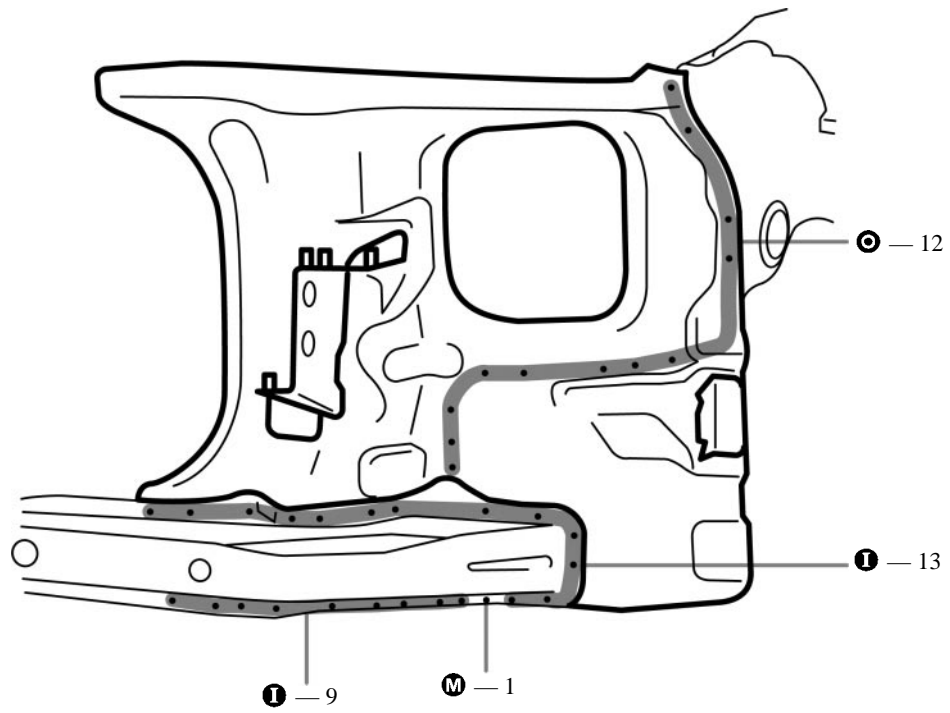
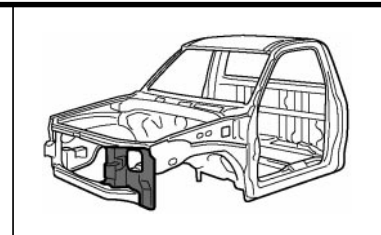


1. Temporarily install the new parts and measure each part in accordance with the body dimension diagram.

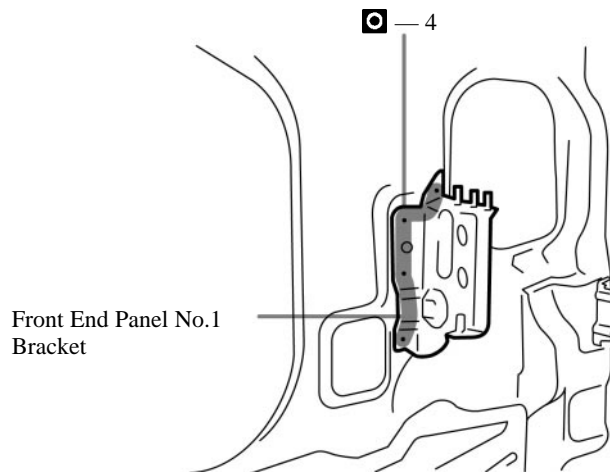
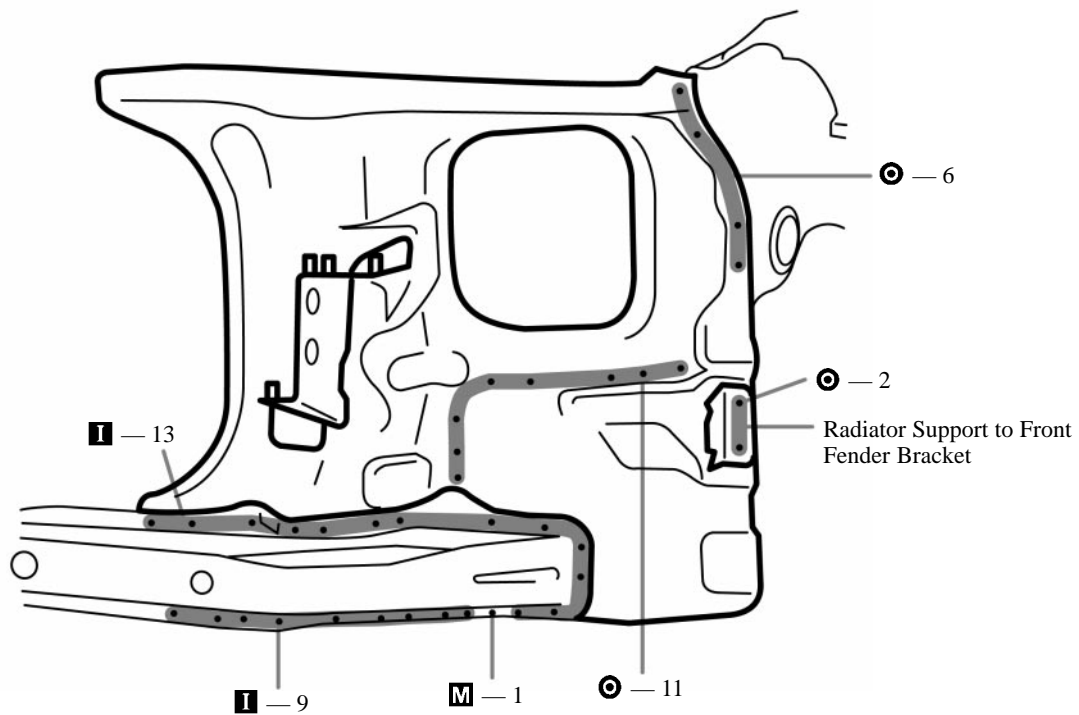
HINT: First install the hood lock support.

RADIATOR SIDE SUPPORT (ASSY)

REMOVAL (With the radiator upper support removed.)



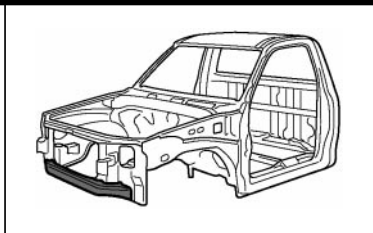
INSTALLATION



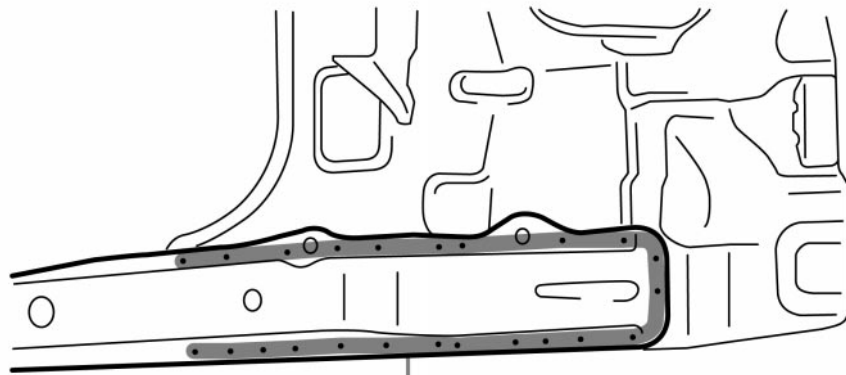
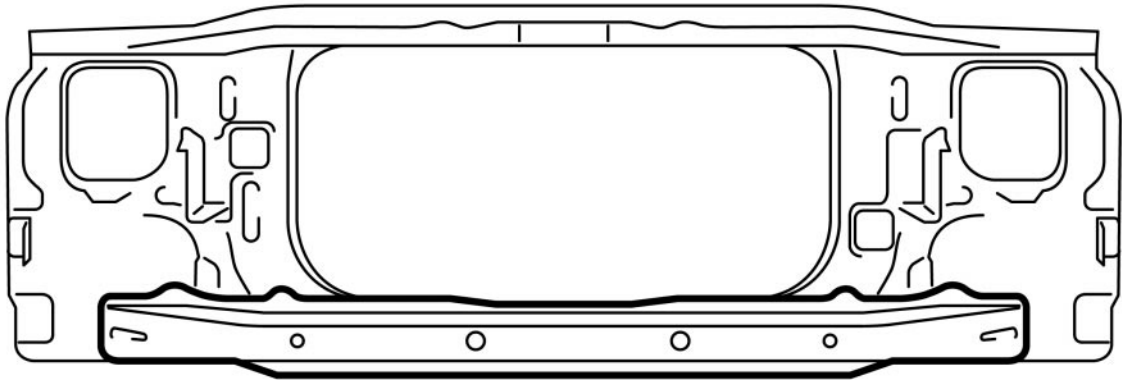
1. Temporarily install the new parts and measure each part in accordance with the body dimension diagram.

HINT: First install the radiator upper support.

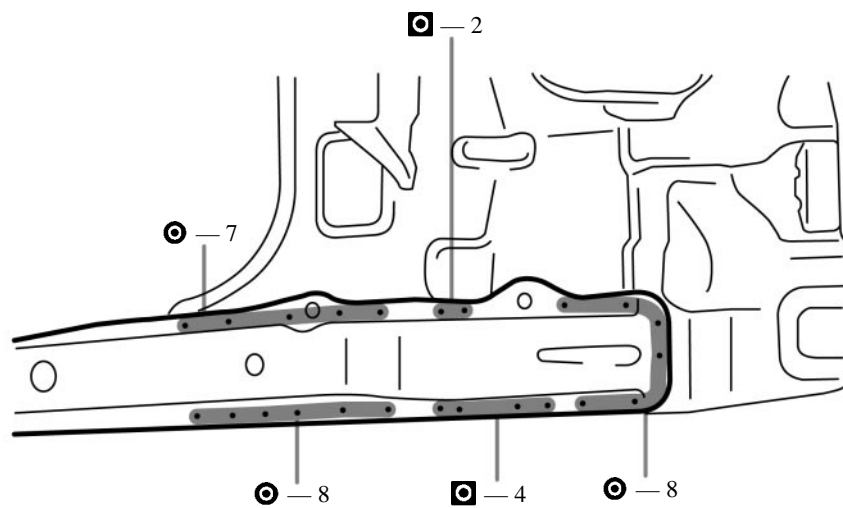
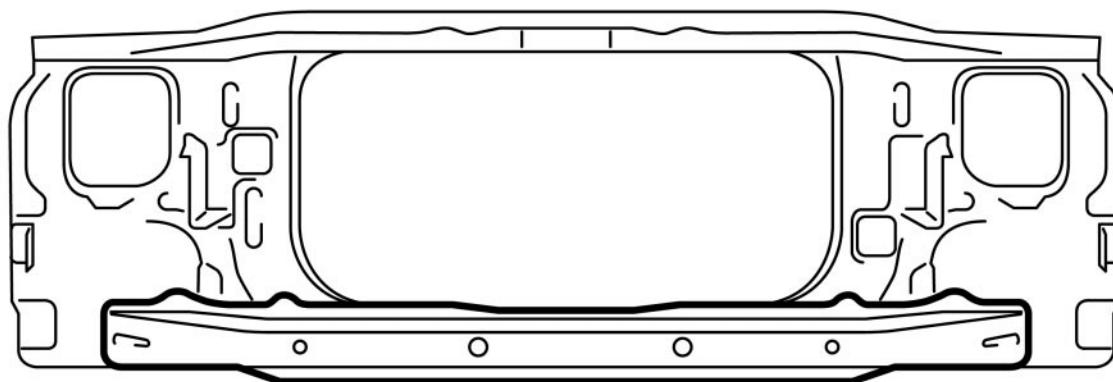
FRONT CROSSMEMBER (ASSY)



REMOVAL

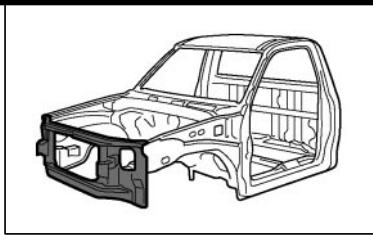


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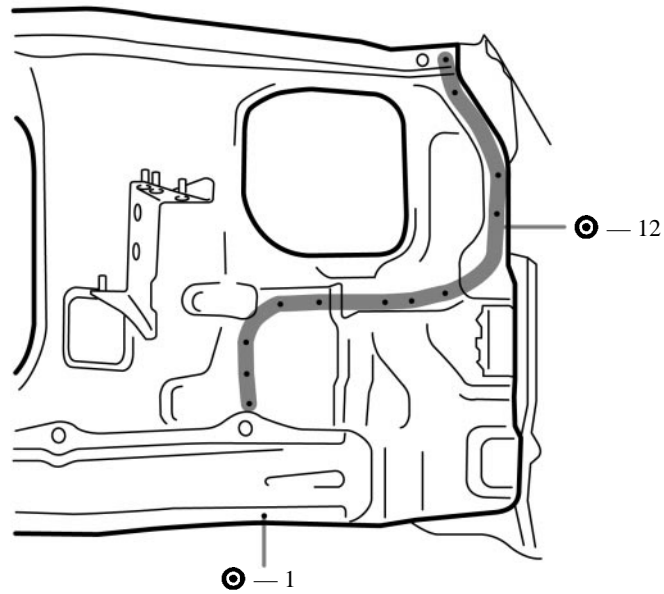
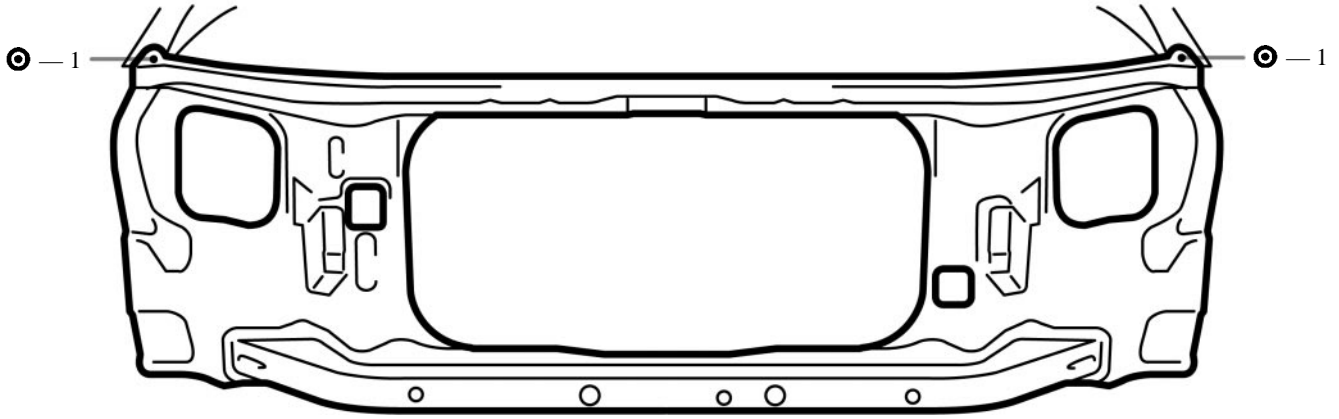


1. Temporarily install the new parts and measure each part in accordance with the body dimension diagram.

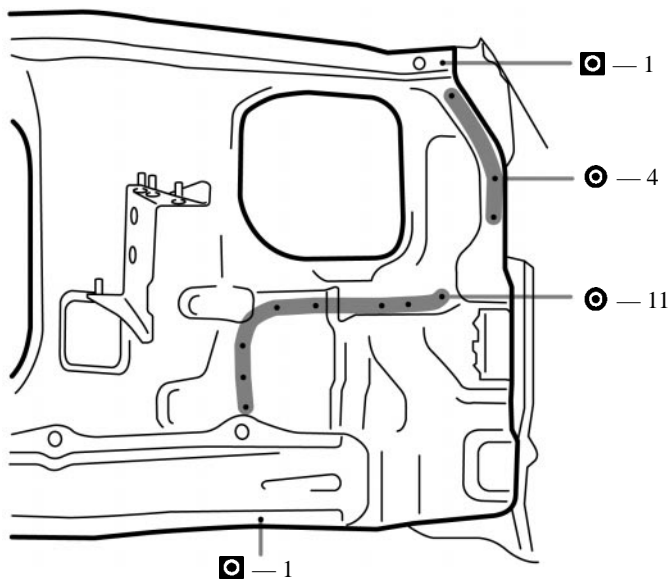
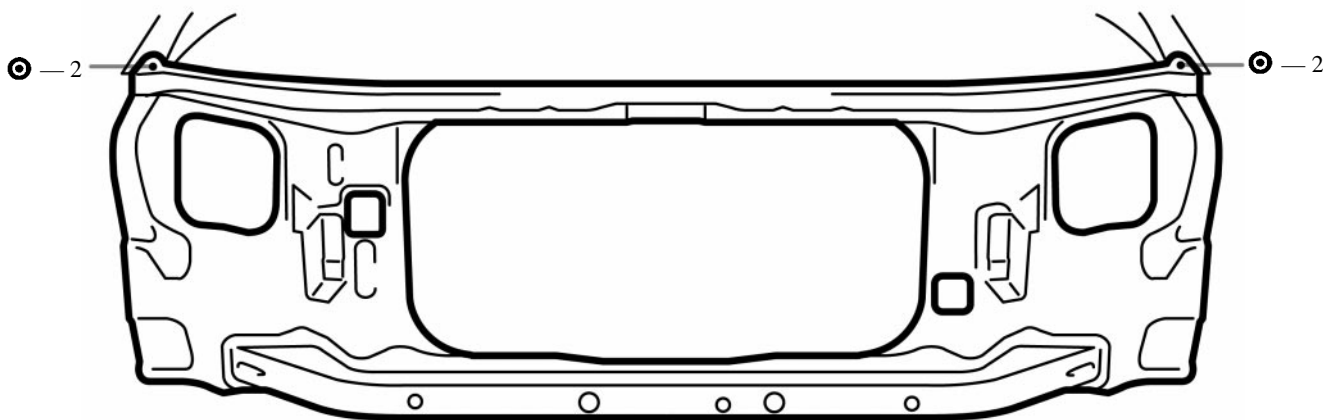
RADIATOR SUPPORT (ASSY)



REMOVAL



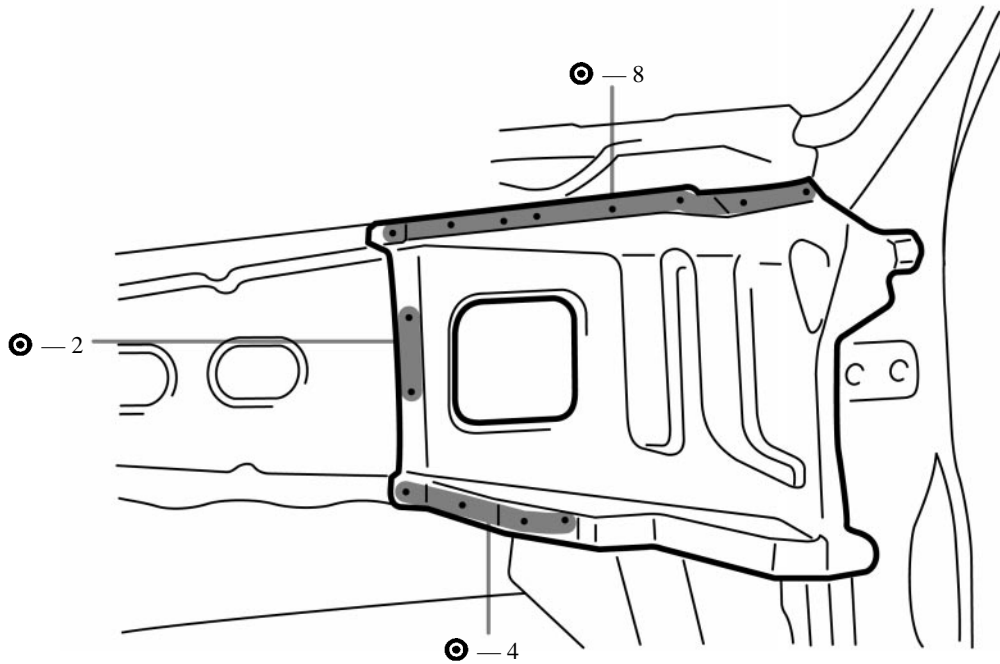
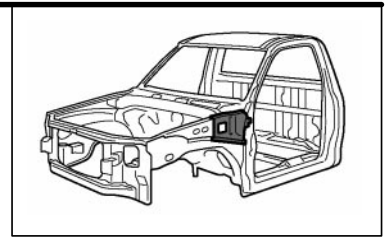
INSTALLATION



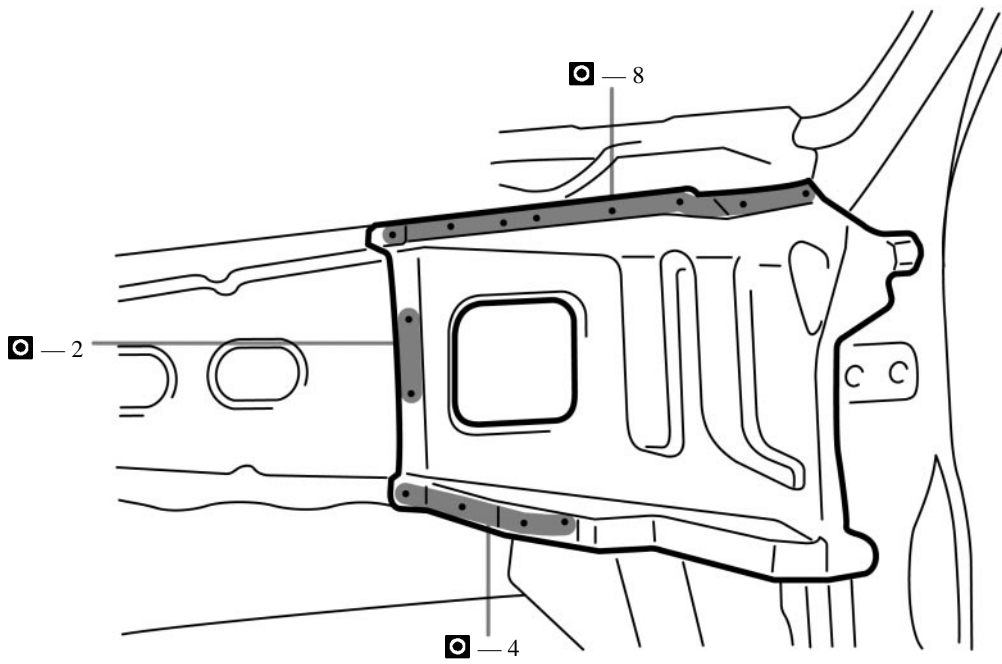
1. Temporarily install the new parts and measure each part in accordance with the body dimension diagram.

COWL TOP SIDE PANEL (ASSY)

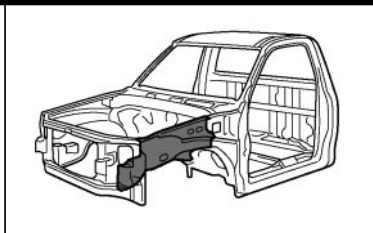
REMOVAL



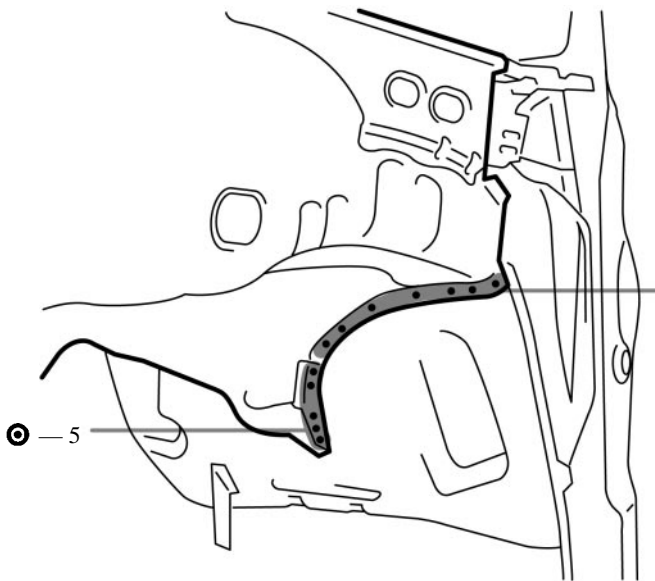
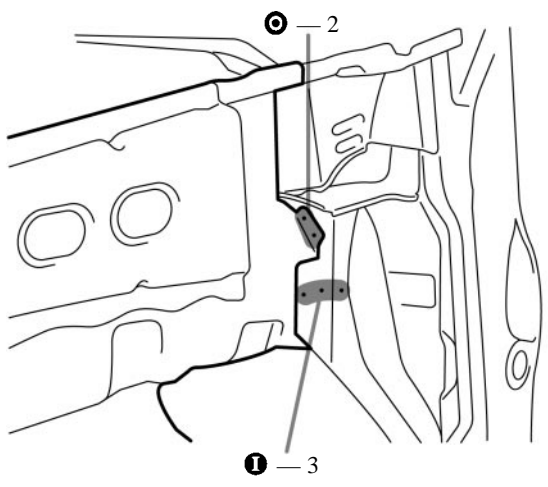
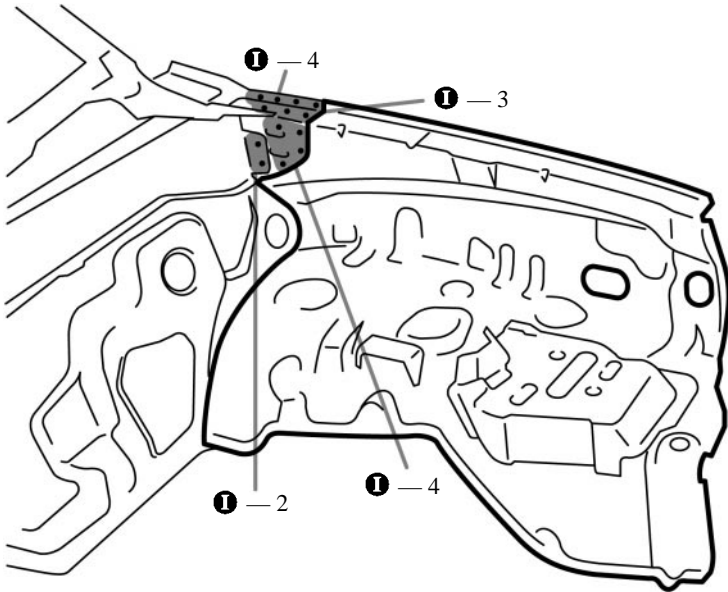
INSTALLATION



FRONT FENDER APRON (ASSY)



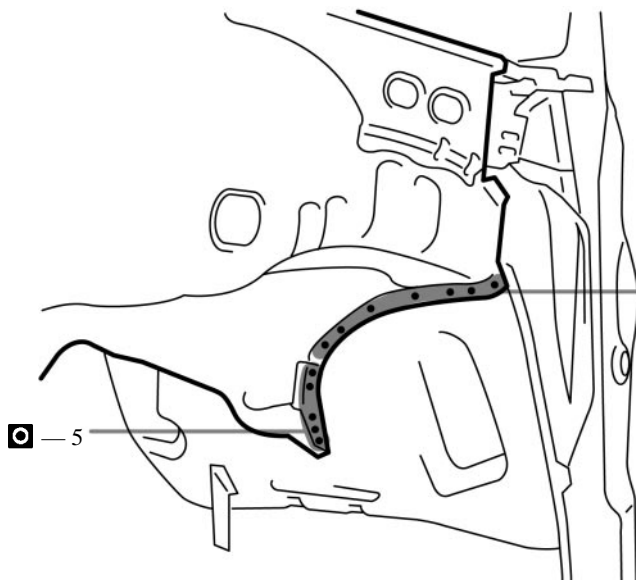
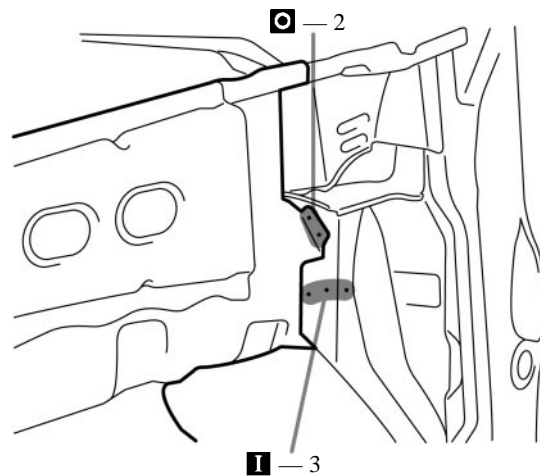
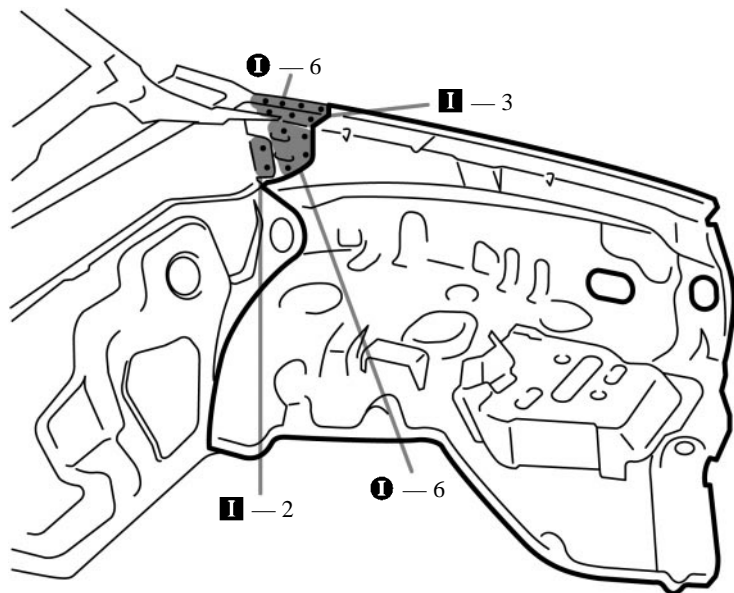
REMOVAL (With the radiator support, cowl top side panel removed.)



- RH: ⓪ — 6
- LH (M/T): ⓪ — 7
- LH (A/T): ⓪ — 8



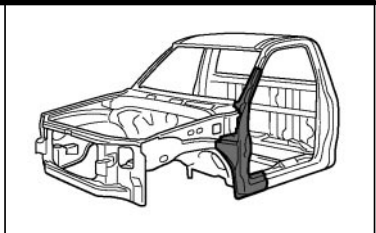
INSTALLATION



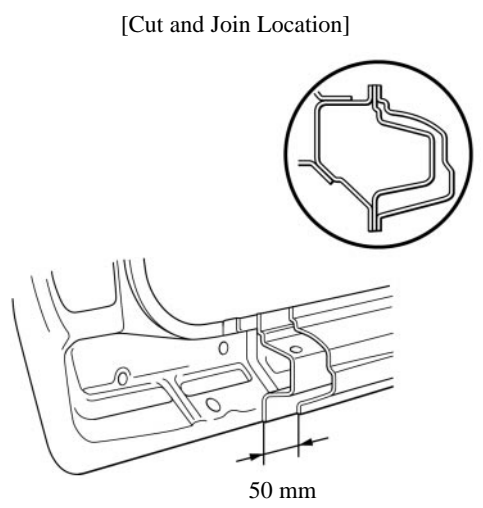
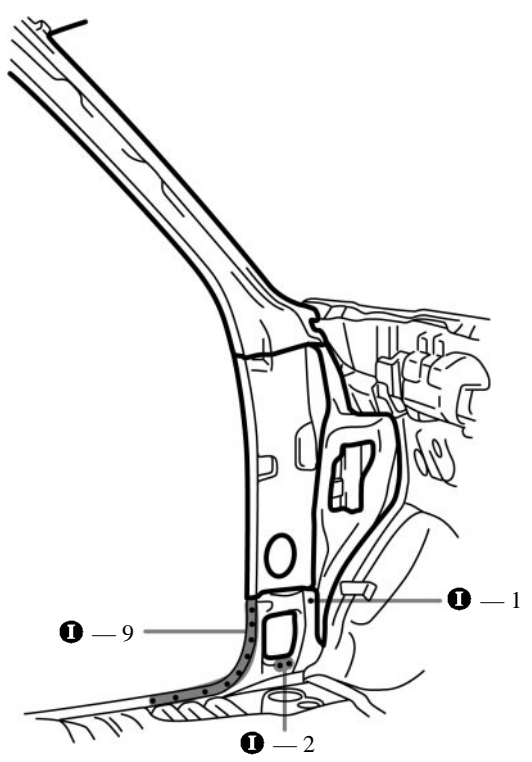
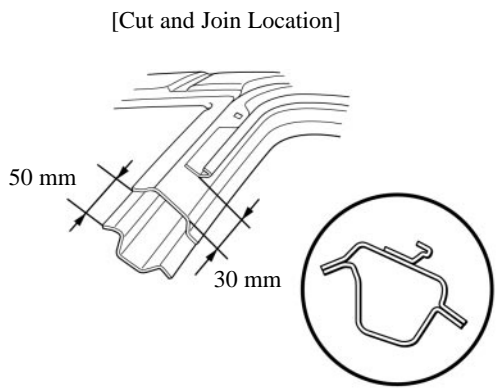
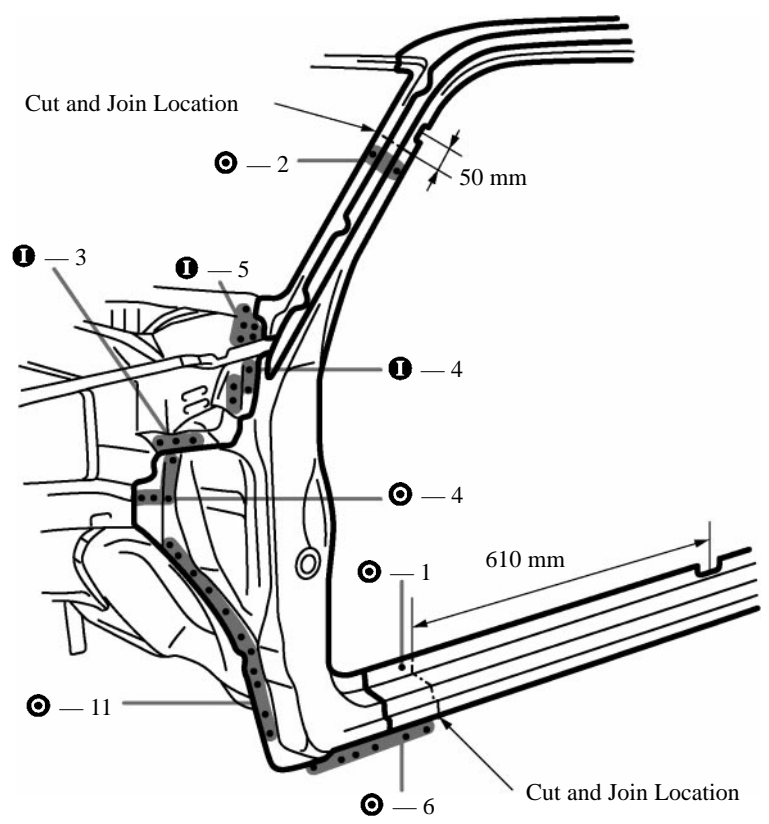
RH: □ — 6
 LH (M/T): □ — 7
 LH (A/T): □ — 8

1. Temporarily install the new parts and measure each part in accordance with the body dimension diagram.
2. Temporarily install the front fender and hood, and check the fit.

FRONT BODY PILLAR (CUT)



REMOVAL (With the cowl top side panel removed.)



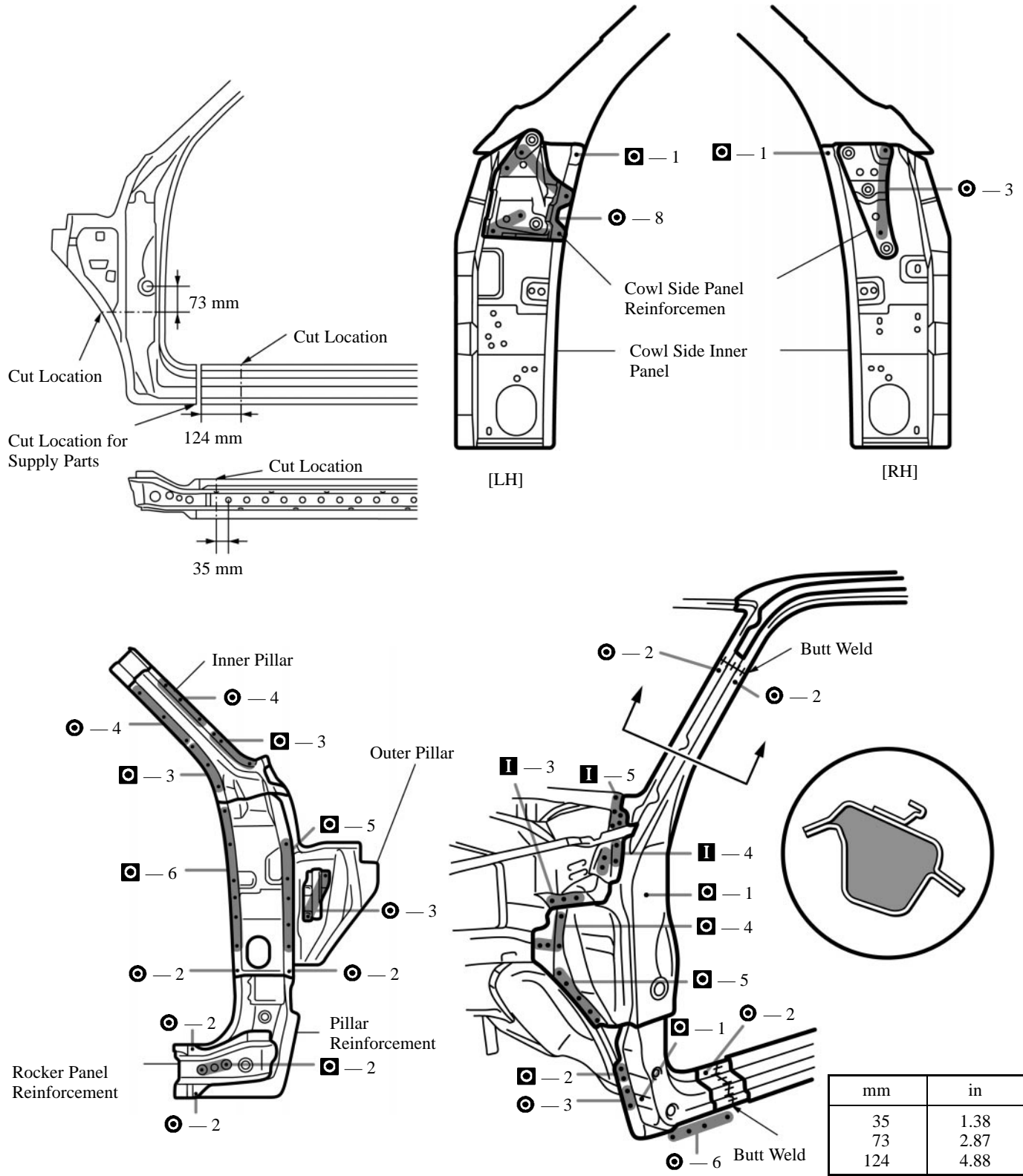
1. Cut and join the parts at the locations as shown above.

HINT:

- 1) Shift the each cut and join locations of the outer pillar, inner pillar and roof drip channel.
- 2) Cut and join the rocker outer panel and rocker panel reinforcement at position shifted about 50 mm (1.97 in.)

mm	in
30	1.18
50	1.97
610	24.02

INSTALLATION

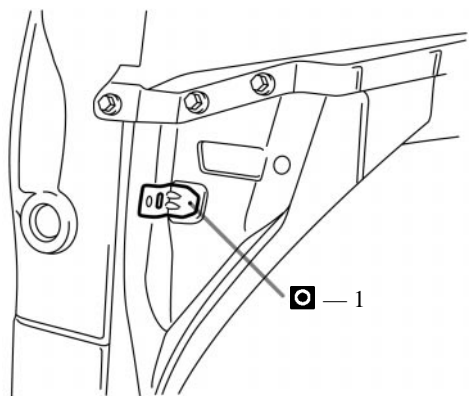
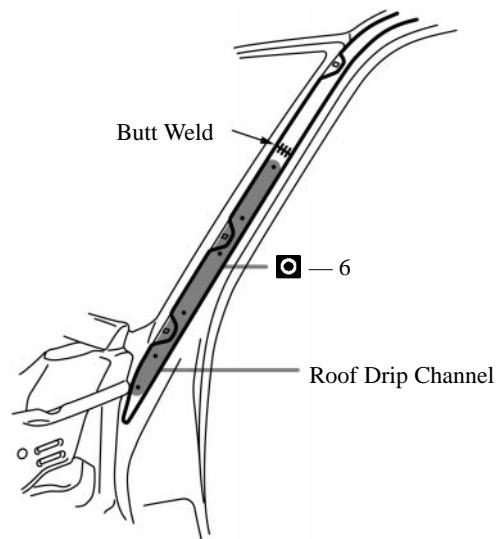
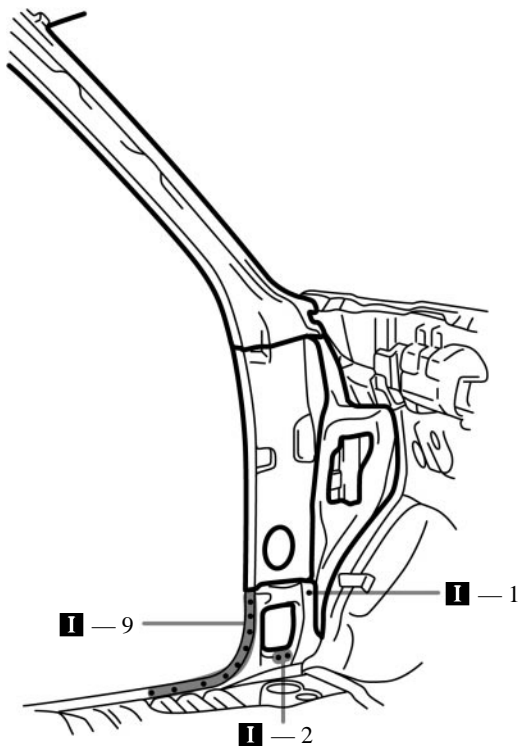


1. Cut the new parts for the outer pillar at the locations as shown above.

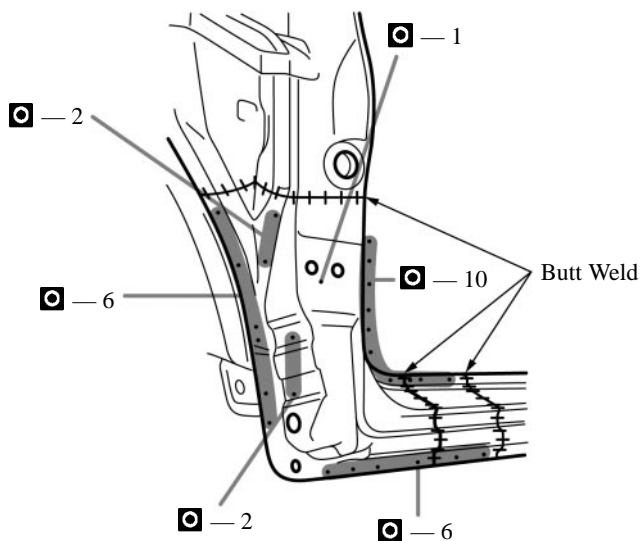
HINT: After welding the pillar reinforcement attach it to the lower area of the outer pillar.

2. After welding the cowl side panel reinforcement, cowl side inner panel, front body inner pillar, front body pillar reinforcement and rocker panel reinforcement, weld the front body outer pillar with standard points.

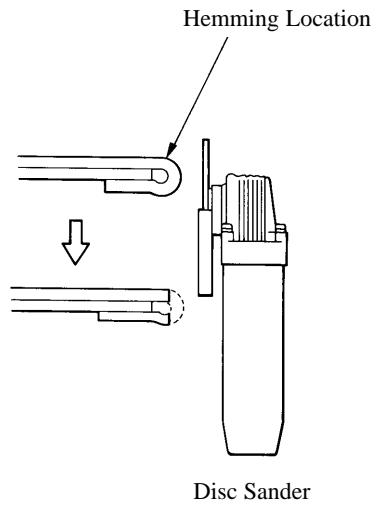
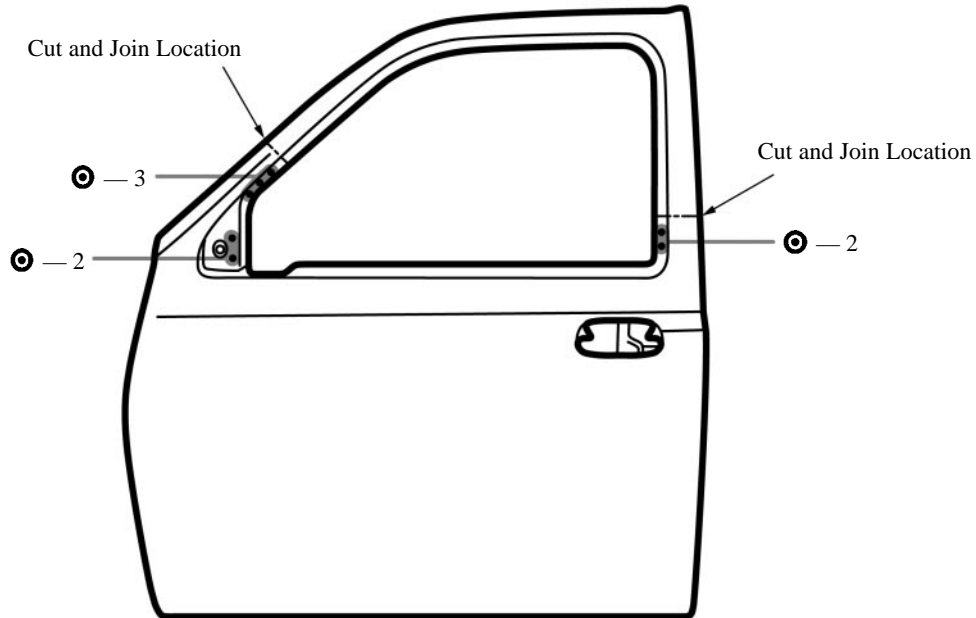
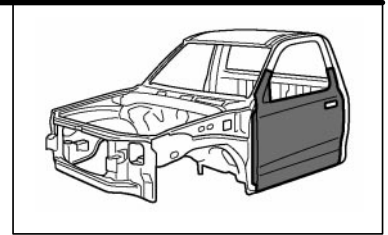
INSTALLATION



[RH only]

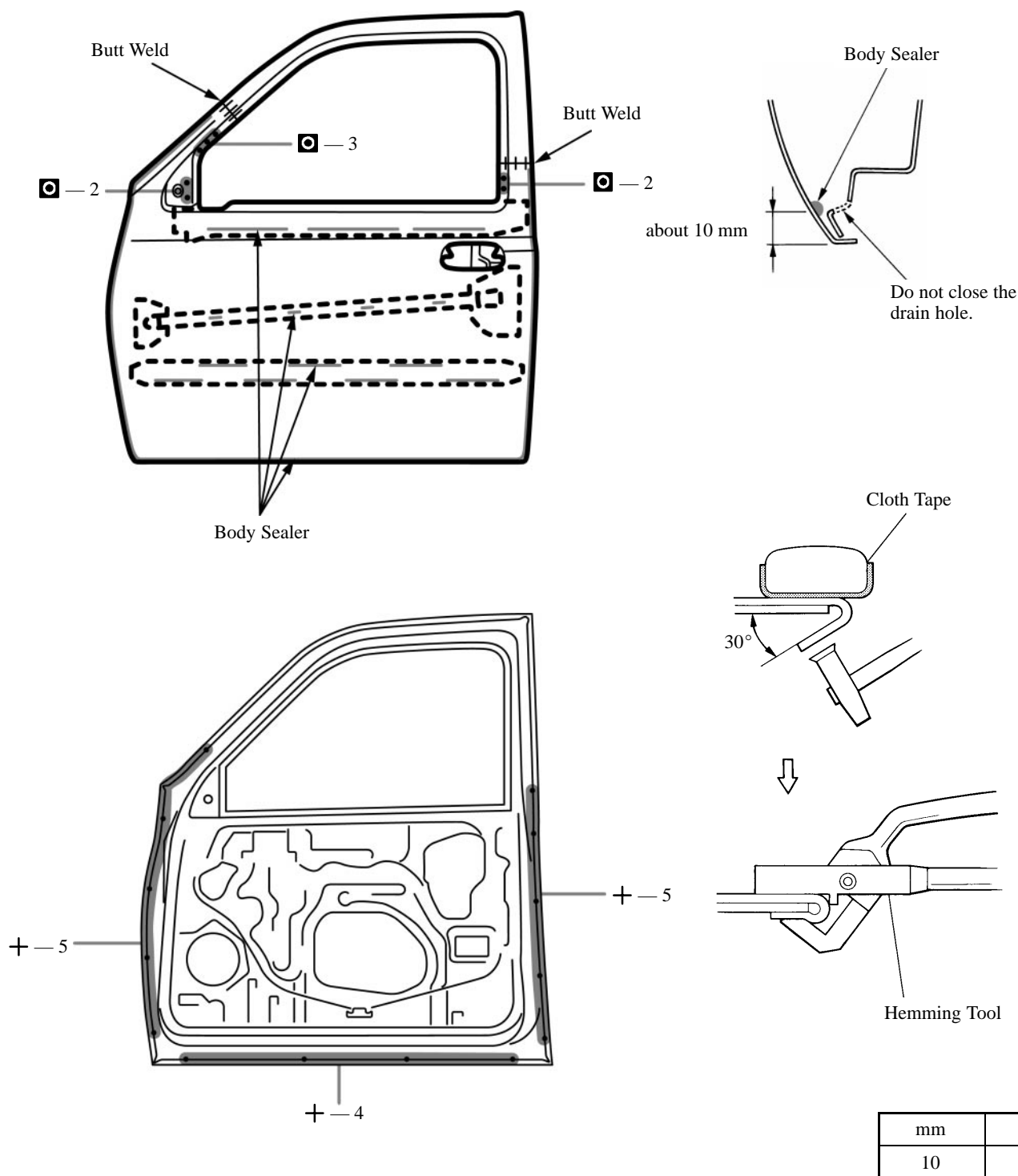


3. Before welding the new parts, check the fit of the front door, front fender and windshield glass.
4. Temporarily install the new parts and measure each part in accordance with the body dimension diagram.
5. Apply foamed material to the pillar section.

FRONT DOOR OUTER PANEL (CUT)**REMOVAL**

1. Cut and join the parts at the locations as shown above.
2. After grinding off the hemming location, remove the outer panel.

INSTALLATION



mm	in.
10	0.39

1. Before temporarily installing the new parts, apply body sealer to the reinforcement, side impact protection beam and back side of the new parts.

HINT:

- 1) Apply just enough sealer for the reinforcement and side impact beam to touch the new panel. Apply sealer evenly around the flange area, about 10 mm (0.39 in.) from the edge, as shown.
- 2) For other sealing points, refer to section AR.

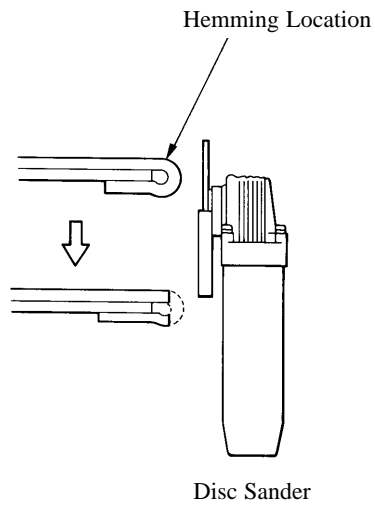
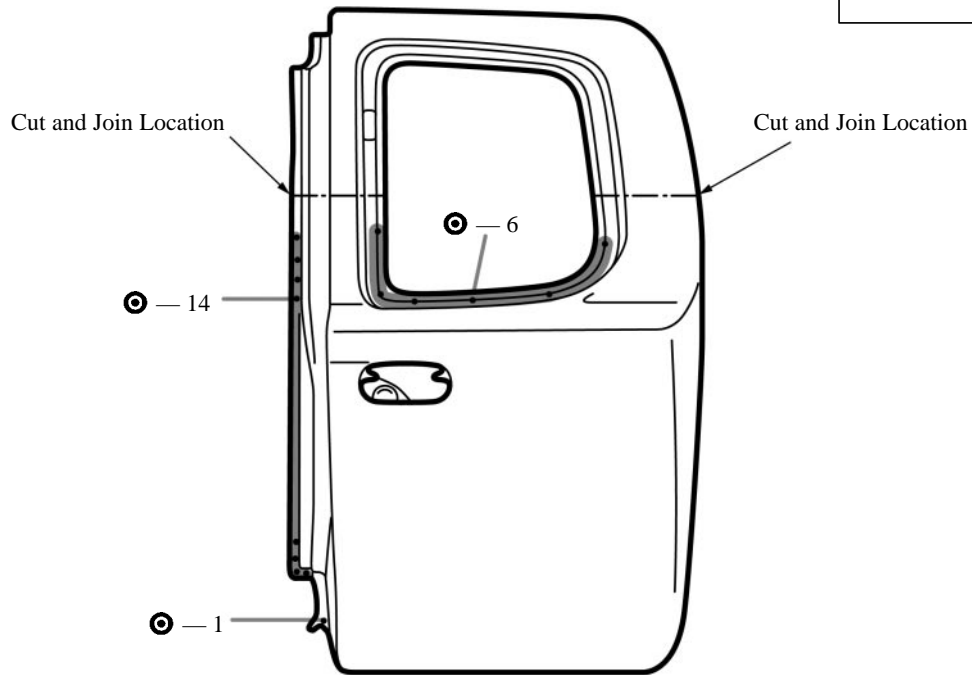
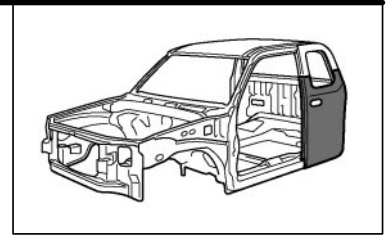
2. Bend the flange hem about 30° with a hammer and dolly, then fasten tightly with a hemming tool.

HINT:

- 1) Perform hemming in three steps, being careful not to warp the panel.
- 2) If a hemming tool cannot be used hem with a hammer and dolly.

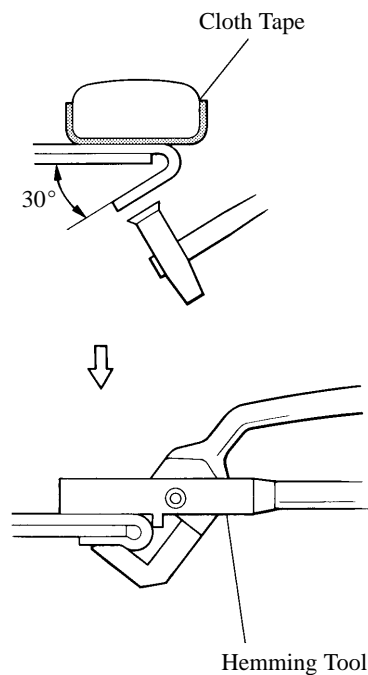
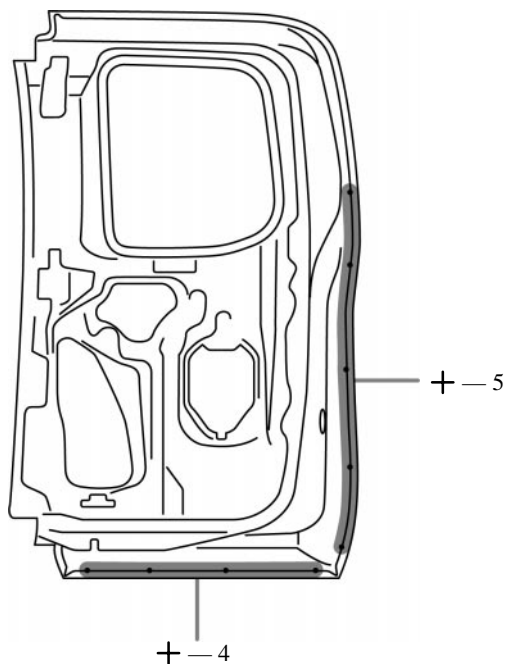
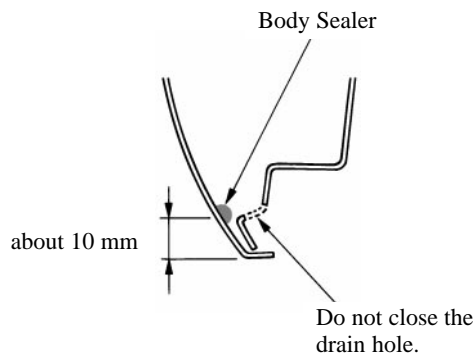
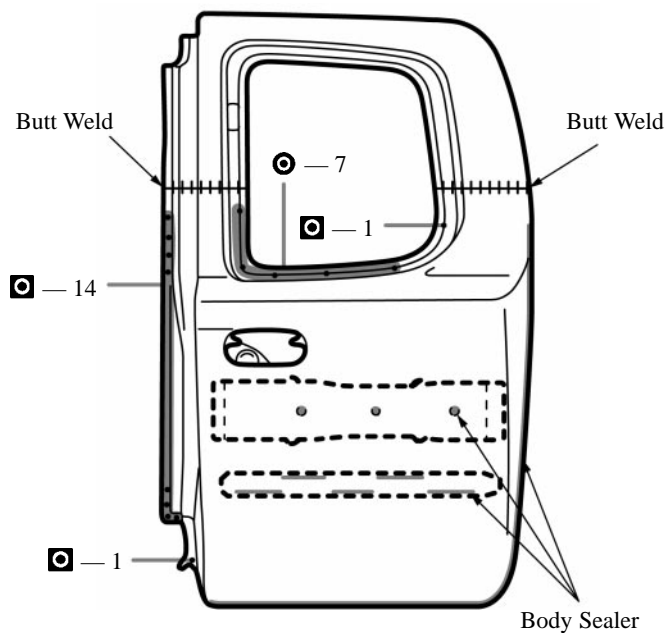
ACCESS PANEL OUTER PANEL (CUT)

REMOVAL



1. Cut and join the parts at the locations as shown above.
2. After grinding off the hemming location, remove the outer panel.

INSTALLATION



mm	in.
10	0.39

1. Before temporarily installing the new parts, apply body sealer to the reinforcement, side impact protection beam and back side of the new parts.

HINT:

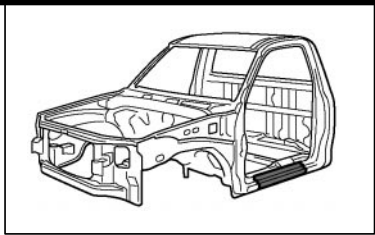
- 1) Apply just enough sealer for the reinforcement and side impact beam to touch the new panel. Apply sealer evenly around the flange area, about 10 mm (0.39 in.) from the edge, as shown.
- 2) For other sealing points, refer to section AR.

2. Bend the flange hem about 30° with a hammer and dolly, then fasten tightly with a hemming tool.

HINT:

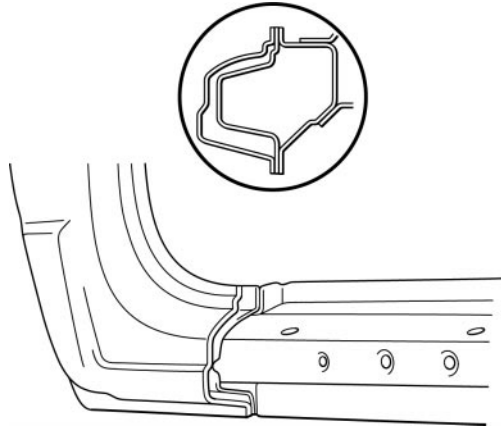
- 1) Perform hemming in three steps, being careful not to warp the panel.
- 2) If a hemming tool cannot be used hem with a hammer and dolly.

ROCKER OUTER PANEL (CUT): Regular Cab

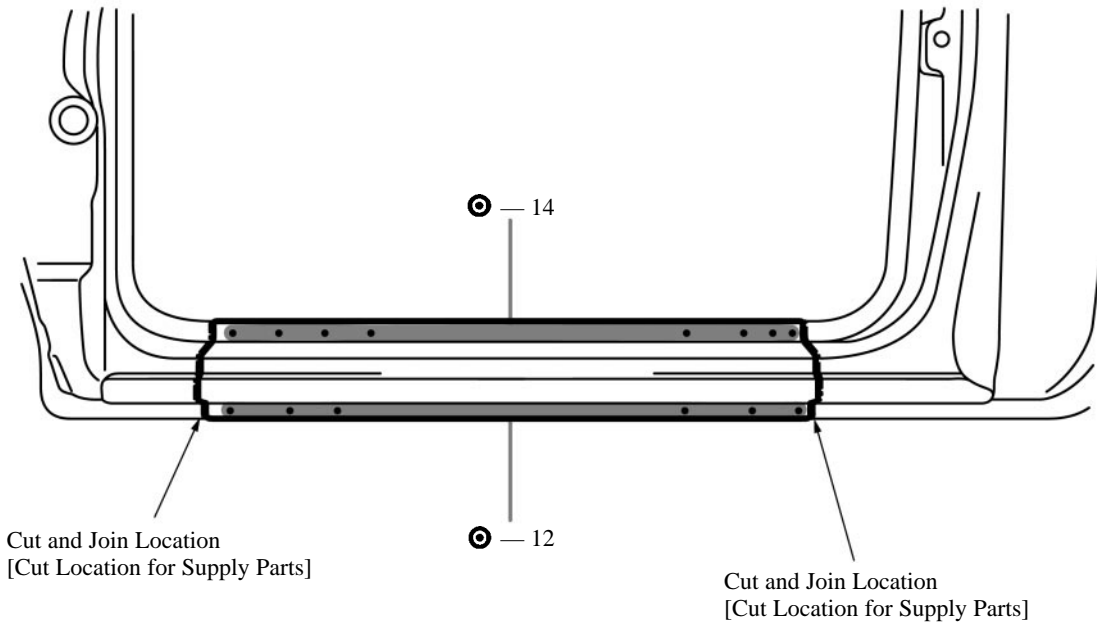
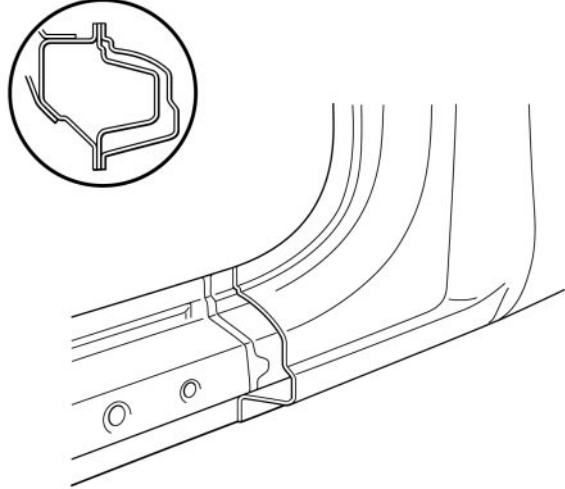


REMOVAL

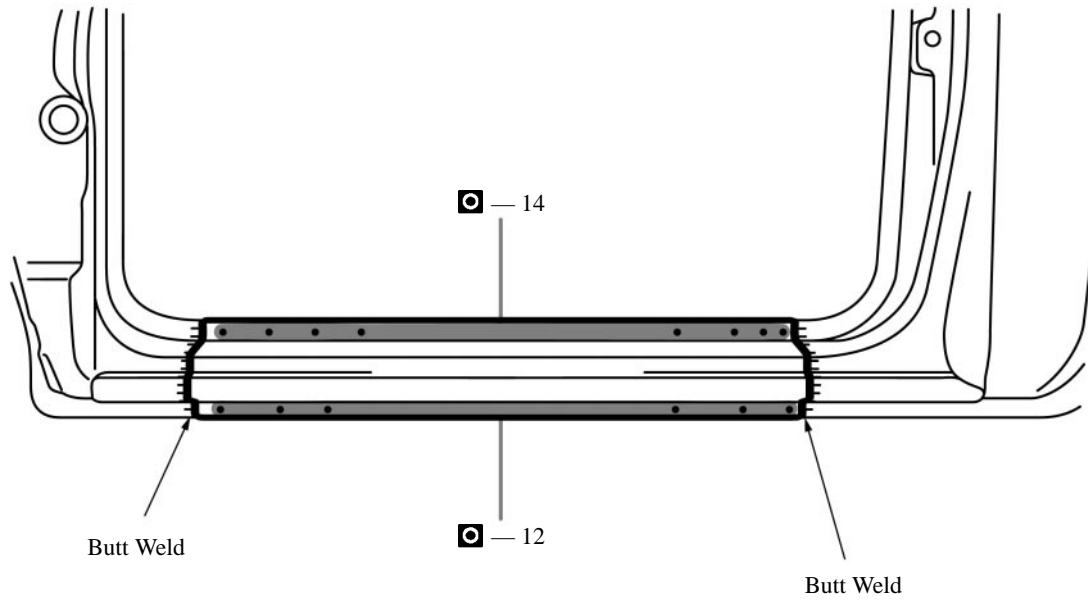
[Cut and Join Location]



[Cut and Join Location]

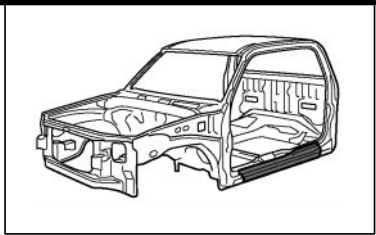


1. Cut and join the parts at the locations as shown above.

INSTALLATION

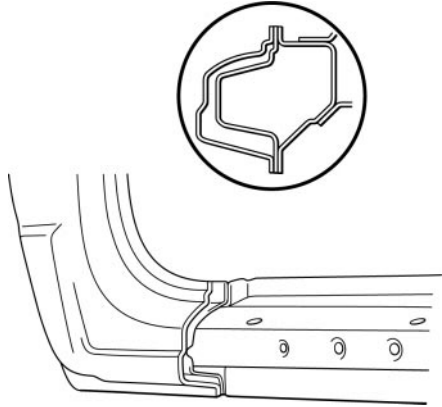
-
1. Temporarily install the new parts and check the fit of the front door.

ROCKER OUTER PANEL (CUT): Access Cab

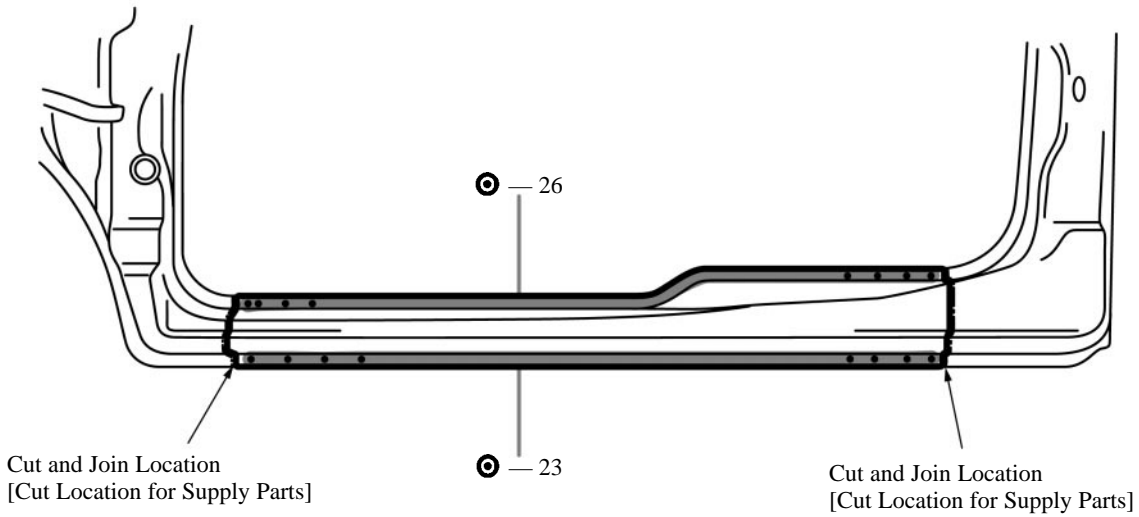
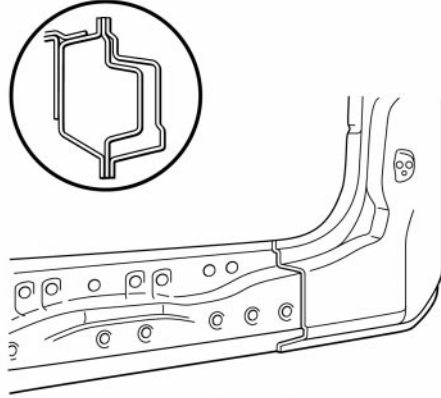


REMOVAL

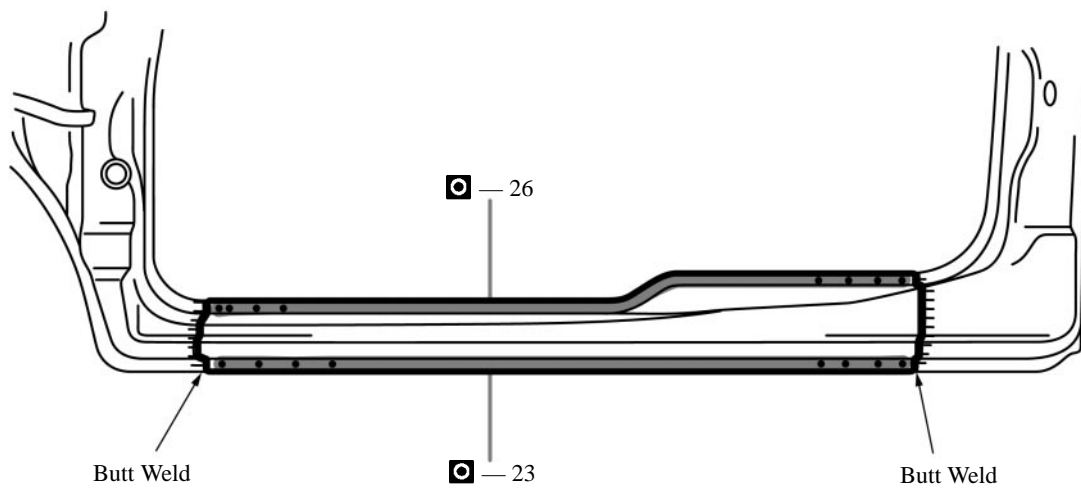
[Cut and Join Location]



[Cut and Join Location]

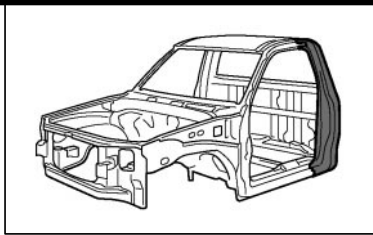


1. Cut and join the parts at the locations as shown above.

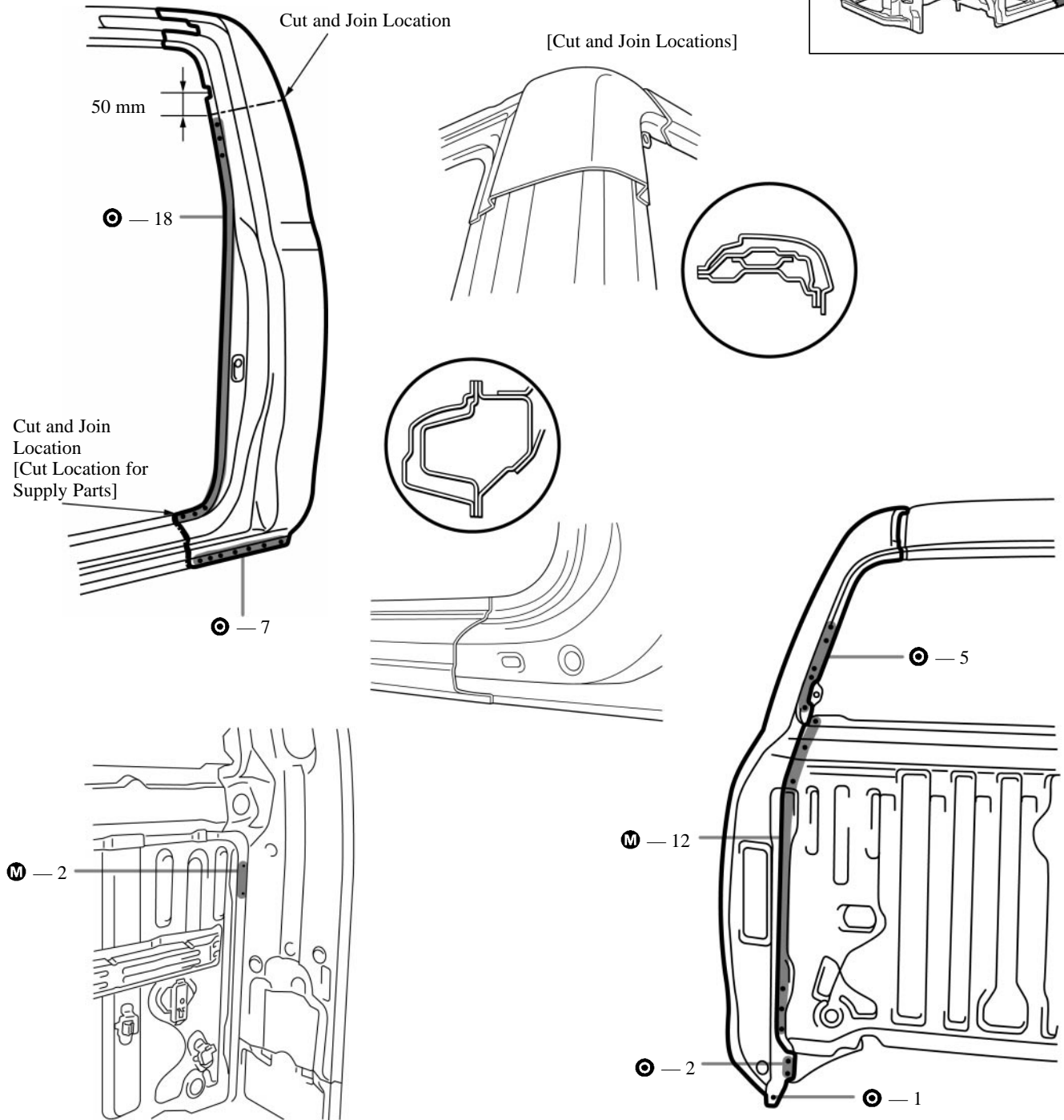
INSTALLATION

1. Temporarily install the new parts and check the fit of the front door and access panel.

QUARTER PANEL (CUT): Regular Cab



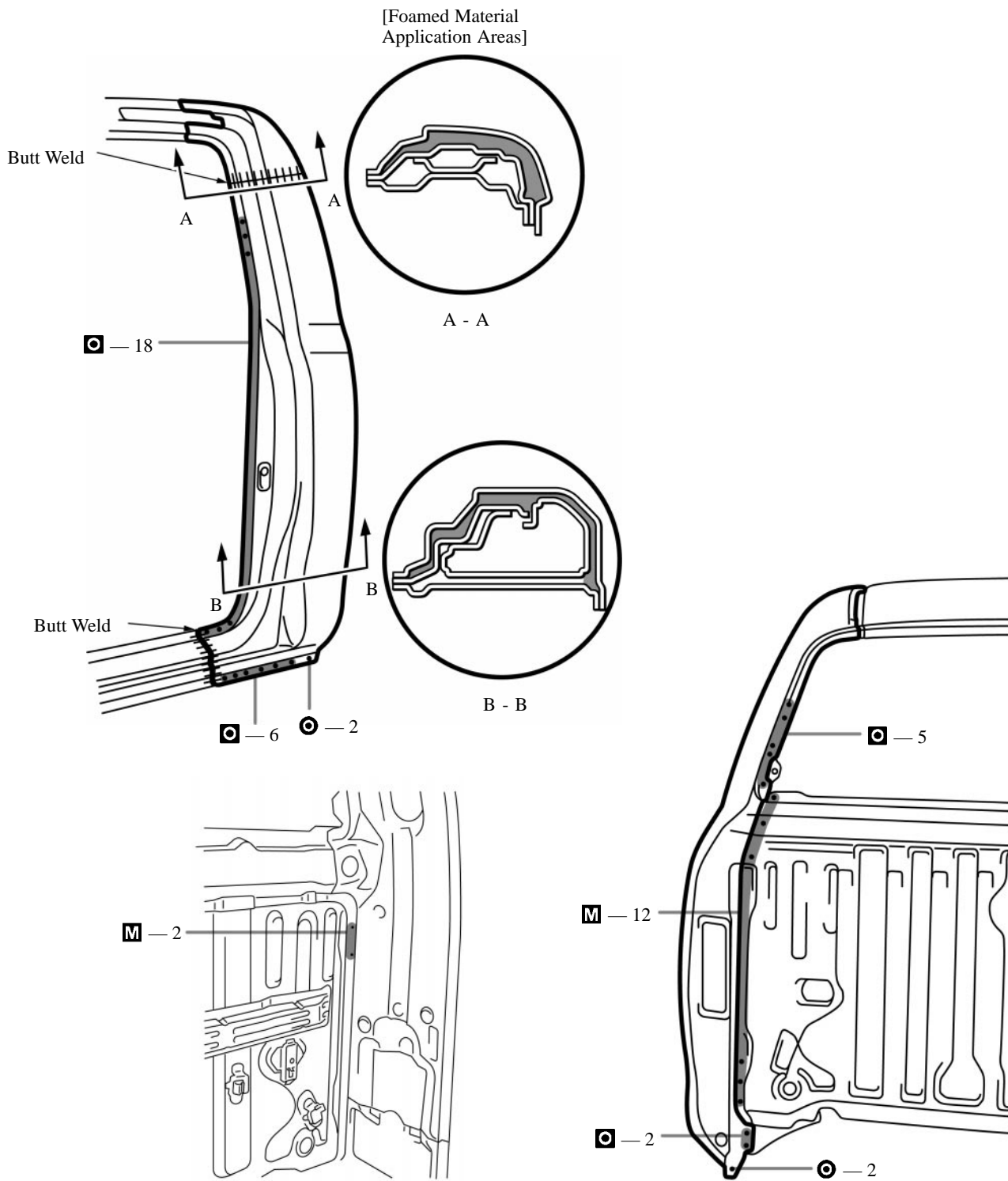
REMOVAL



1. Cut and join the parts at the locations as shown above.

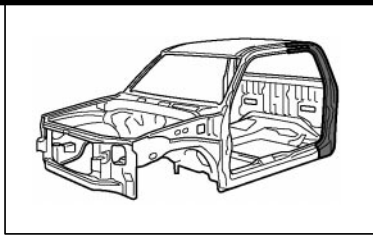
mm	in.
50	1.97

INSTALLATION

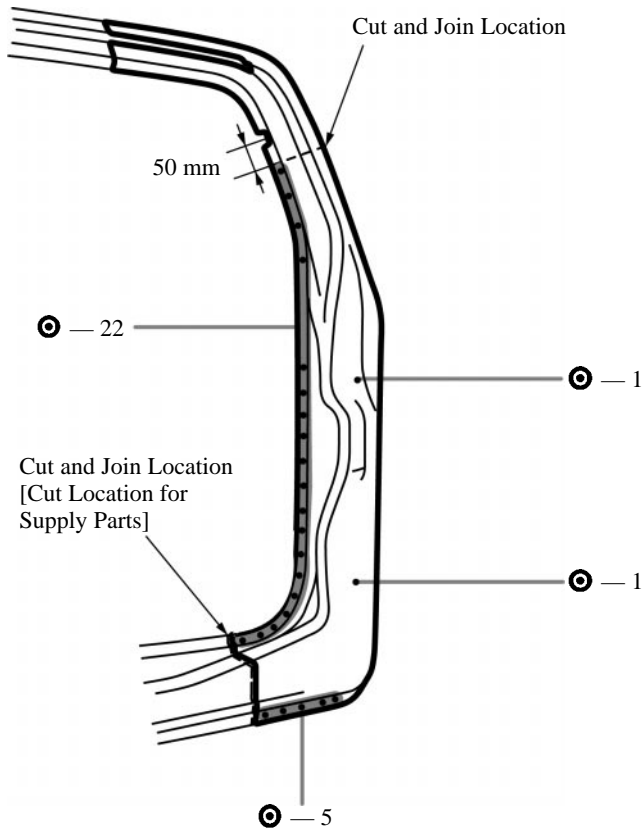


1. Temporarily install the new parts and check the fit of the front door and back window glass.
2. After installing the new parts apply foamed material.

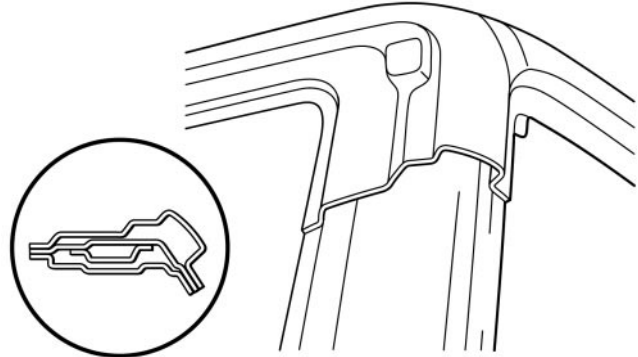
QUARTER PANEL (CUT): Access Cab



REMOVAL

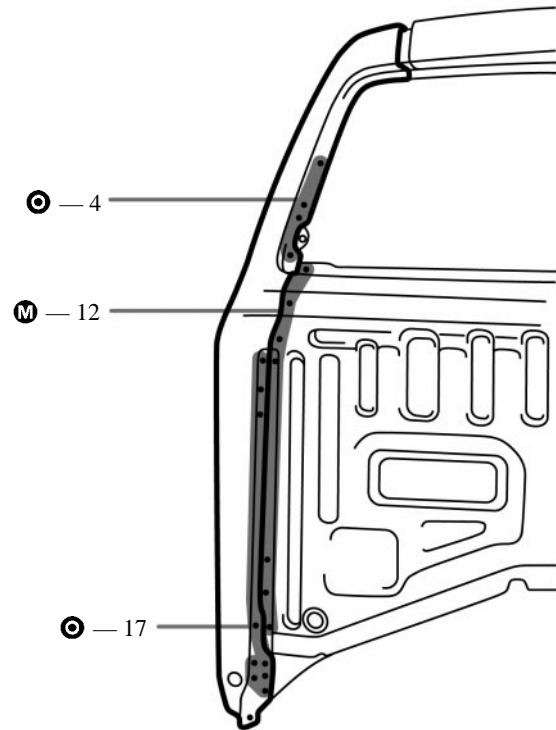
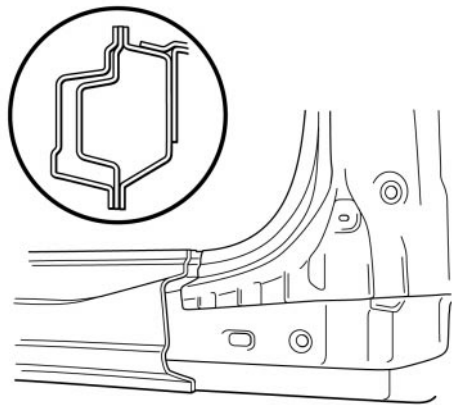


[Cut and Join Location]



Cut and Join Location
[Cut Location for
Supply Parts]

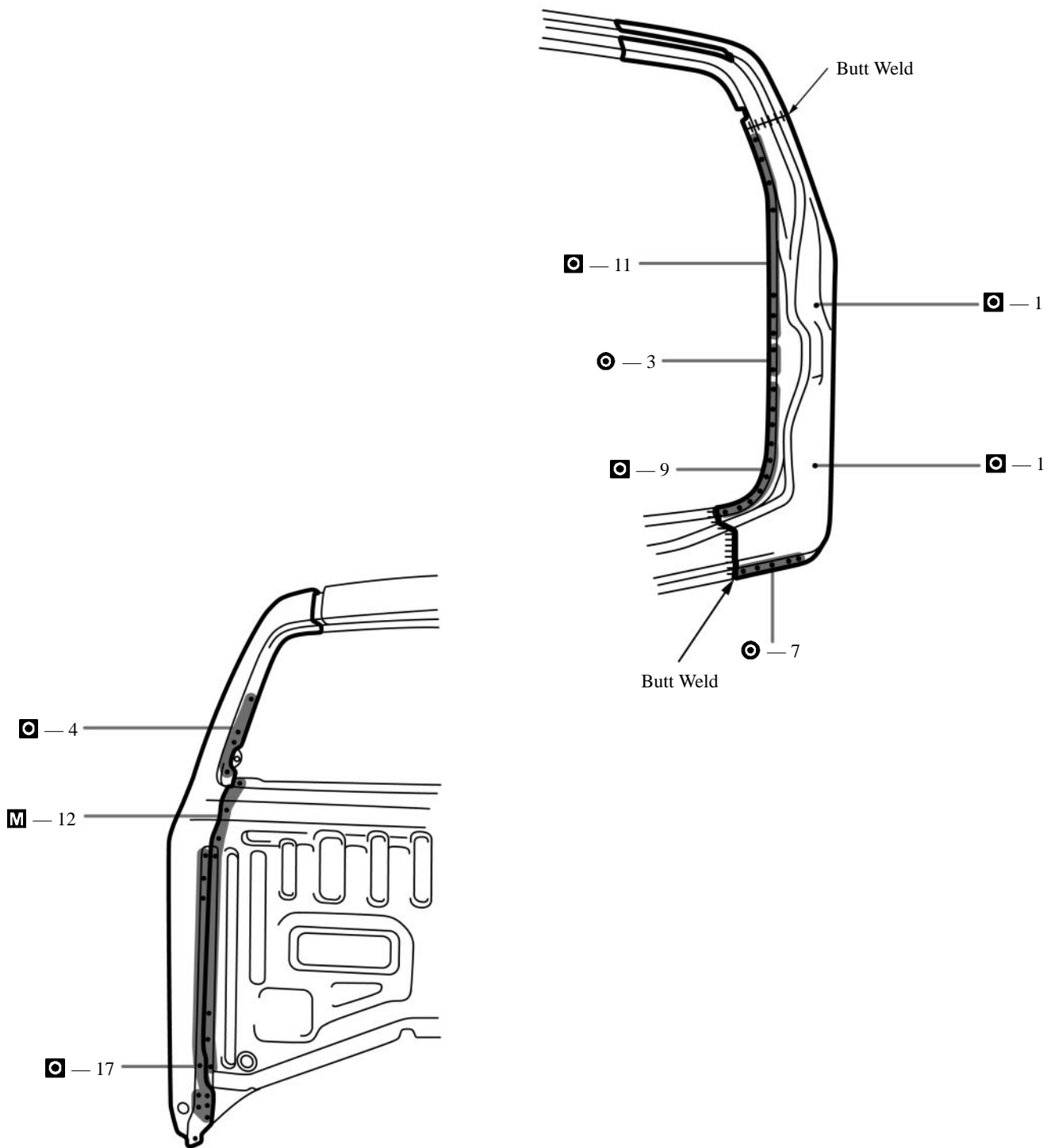
[Cut and Join Location]



1. Cut and join the parts at the locations as shown above.

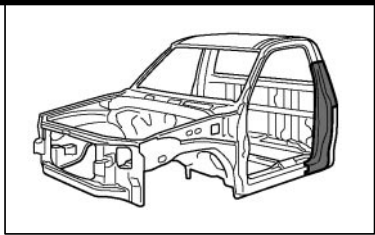
mm	in.
50	1.97

INSTALLATION

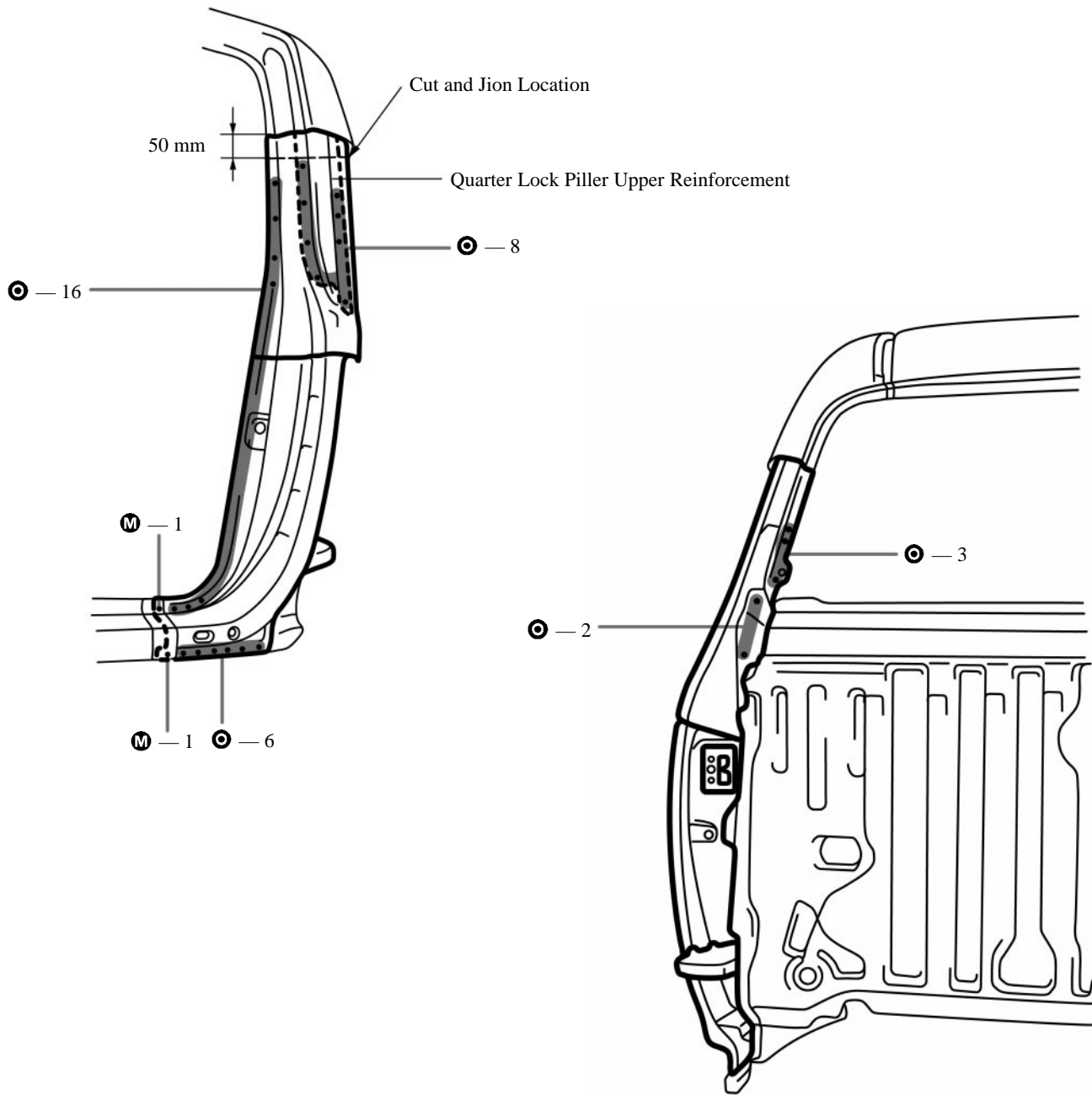


1. Temporarily install the new parts and check the fit of the access panel and back window glass.

QUARTER LOCK PILLAR REINFORCEMENT (CUT): Regular Cab



REMOVAL (With the quarter panel removed.)

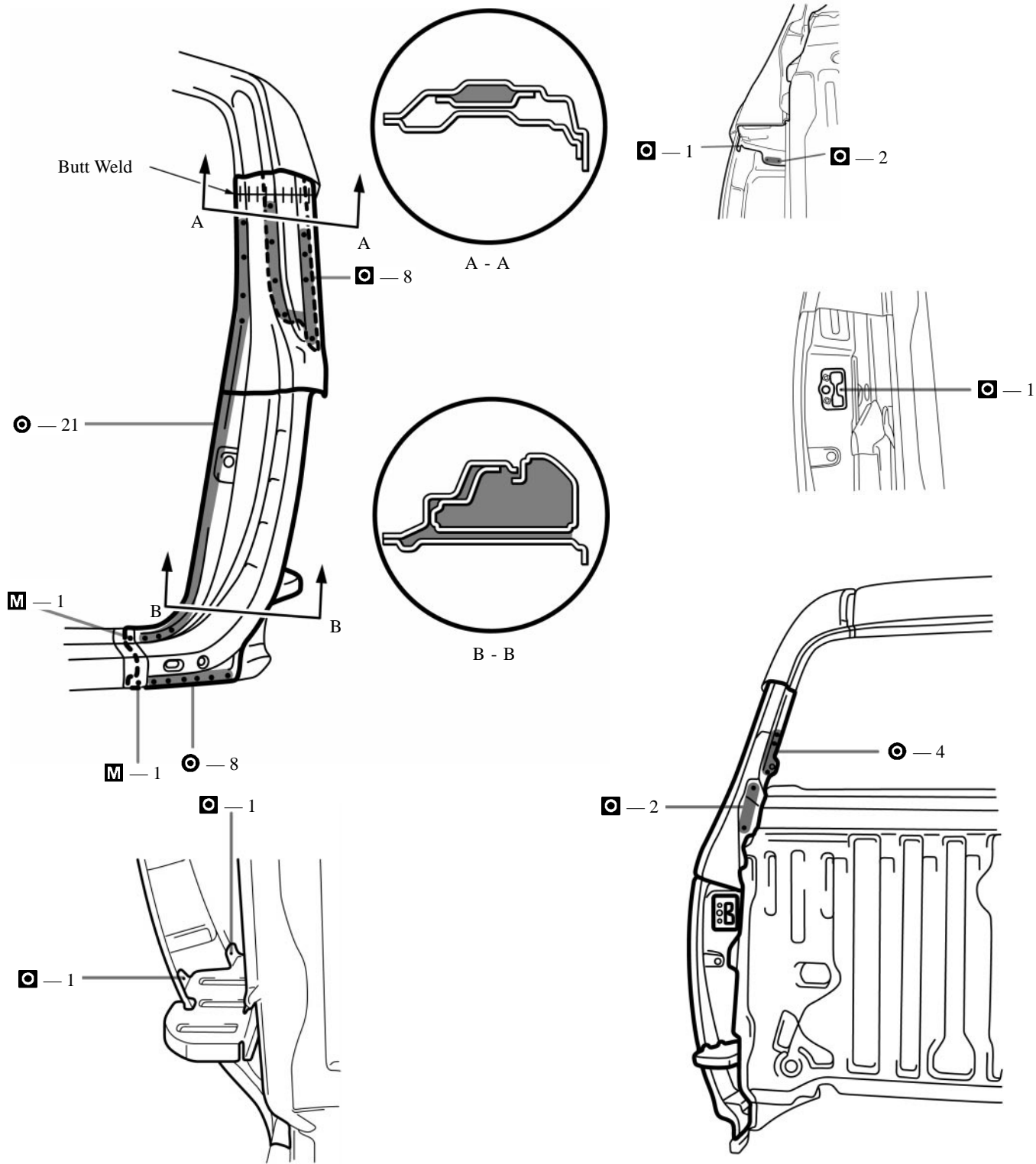


1. Cut and join the parts at the location as shown above.
2. Leave the quarter lock pillar upper reinforcement to the vehicle. Remove the quarter lock pillar reinforcement.

mm	in.
50	1.97

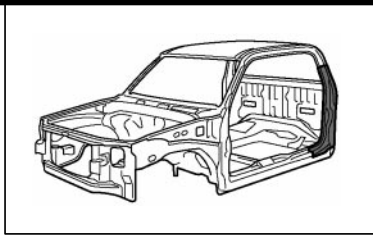
INSTALLATION

[Foamed Material Application Areas]

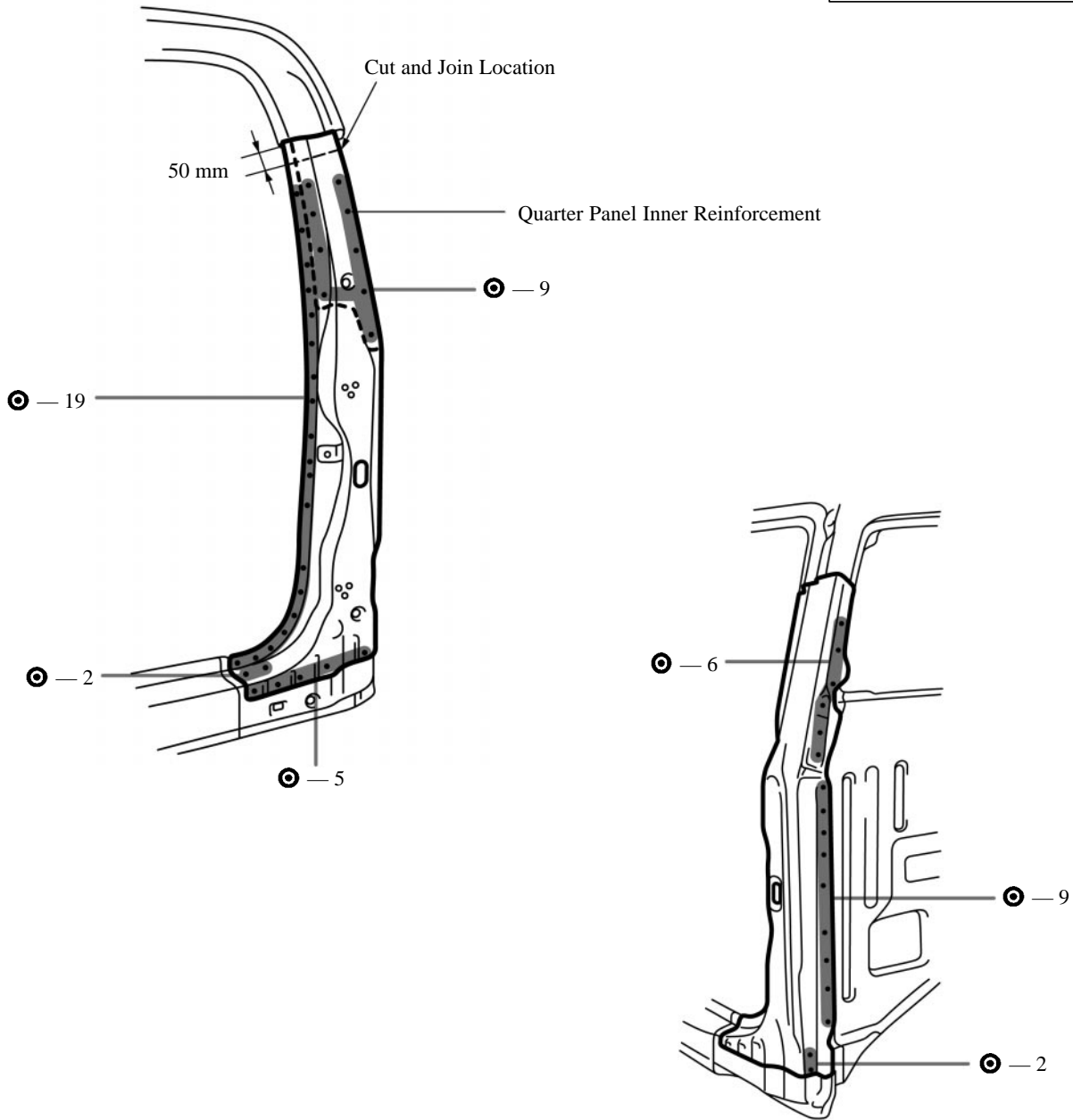


1. Before welding the new parts, temporarily install the quarter panel and check the fit.
2. After installing the new parts apply foamed material.

QUARTER LOCK PILLAR REINFORCEMENT (CUT): Access Cab



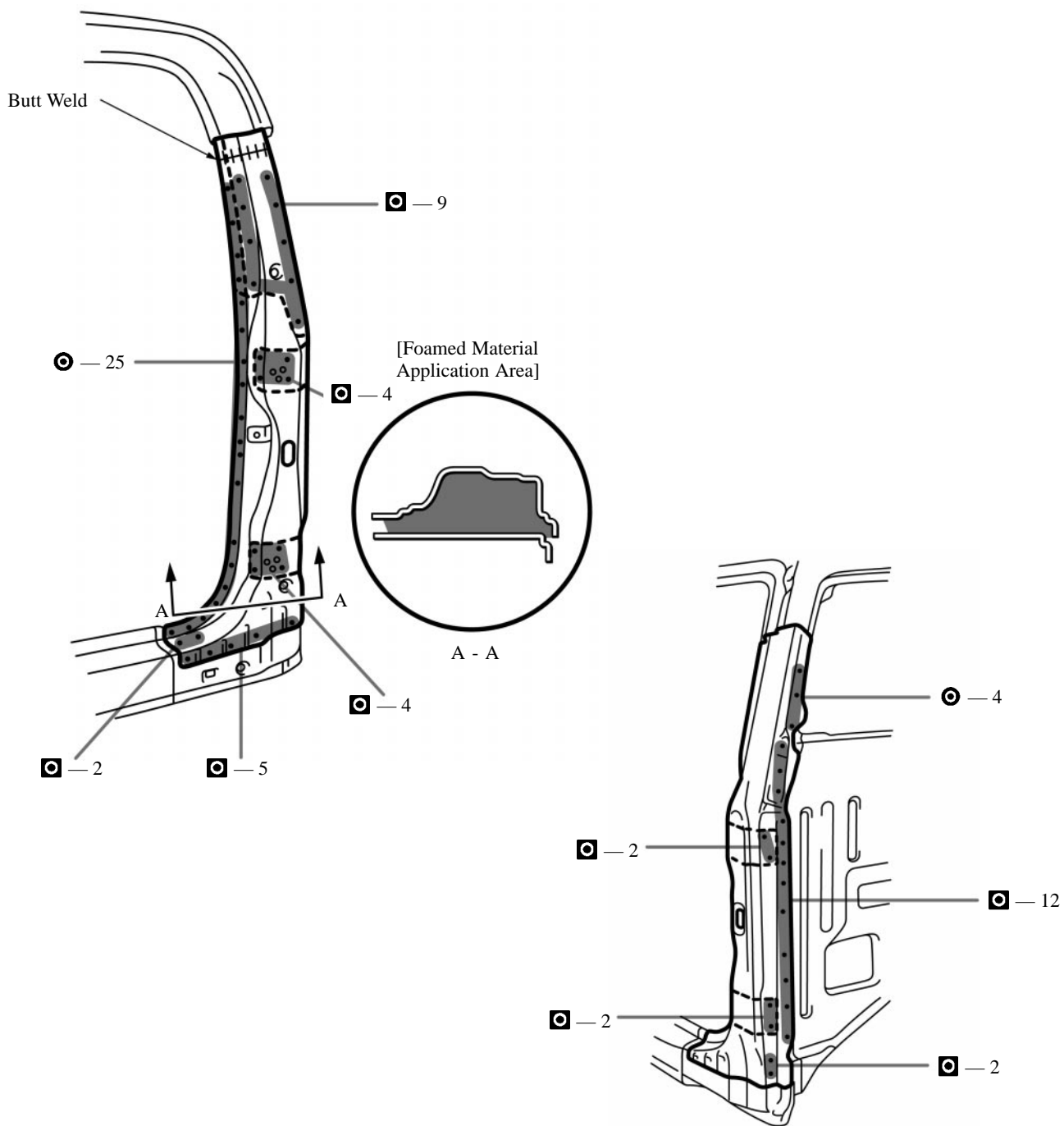
REMOVAL (With the quarter panel removed.)



1. Cut and join the parts at the location as shown above.
2. Leave the quarter panel inner reinforcement to the vehicle. Remove the quarter lock pillar reinforcement.

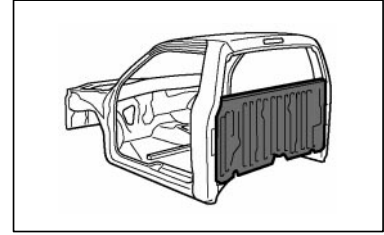
mm	in.
50	1.97

INSTALLATION

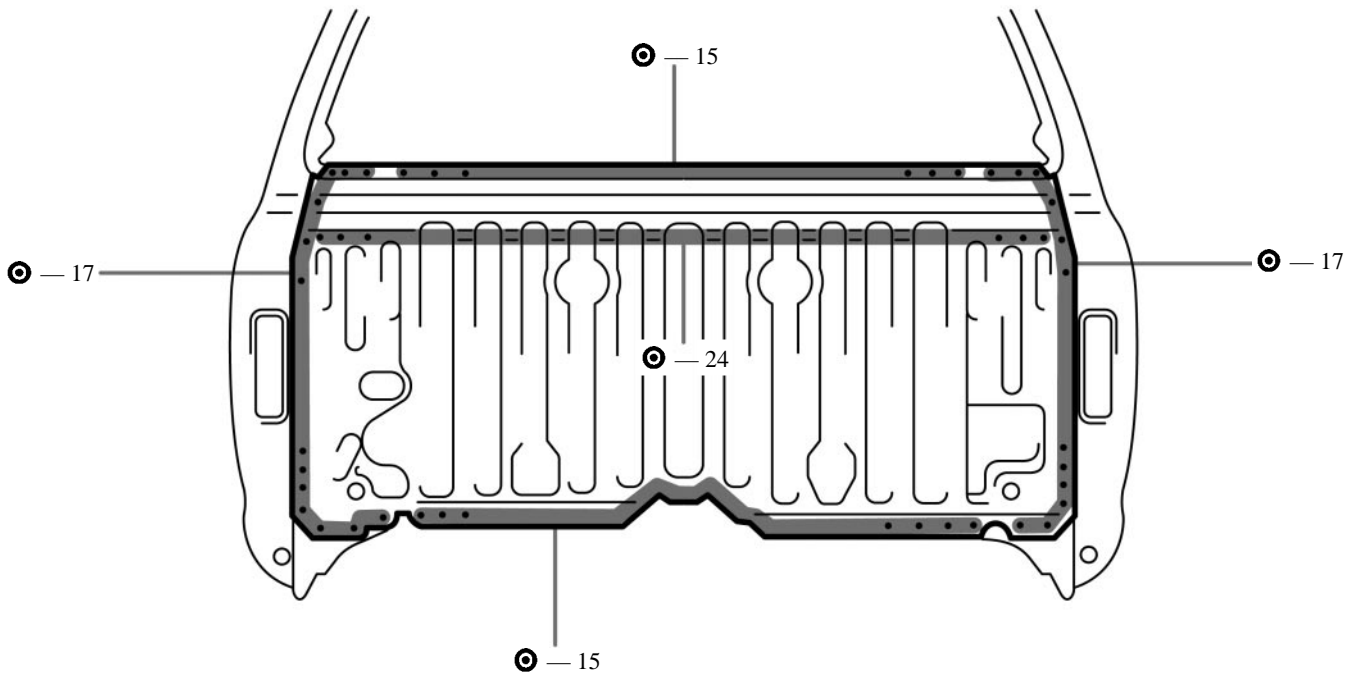


1. Before welding the new parts, temporarily install the quarter panel and check the fit.
2. After installing the new parts apply foamed material.

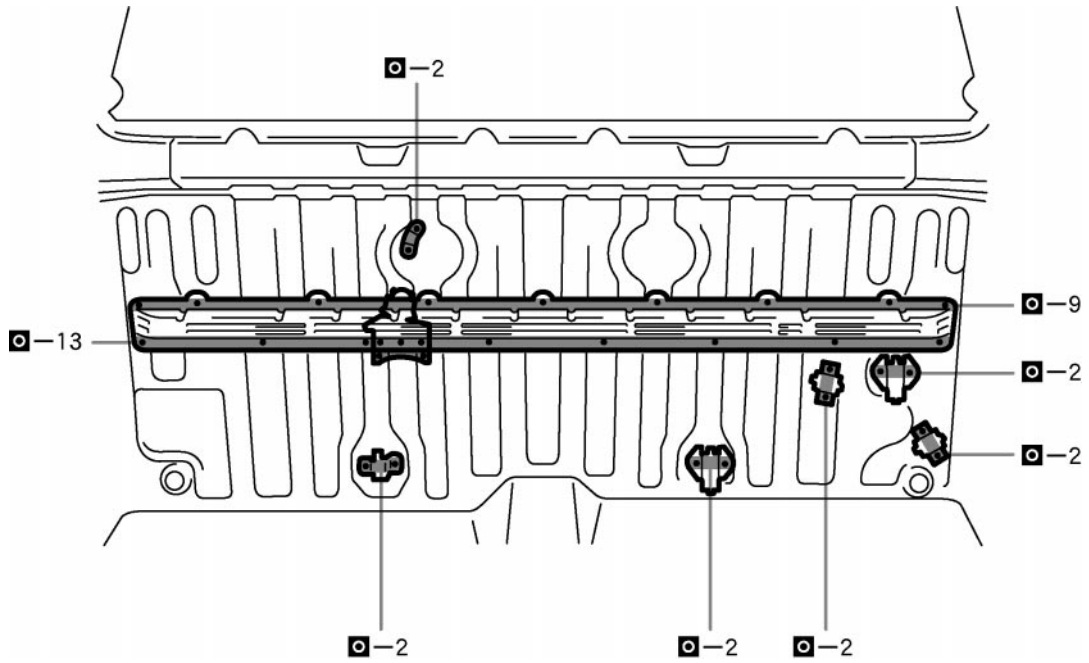
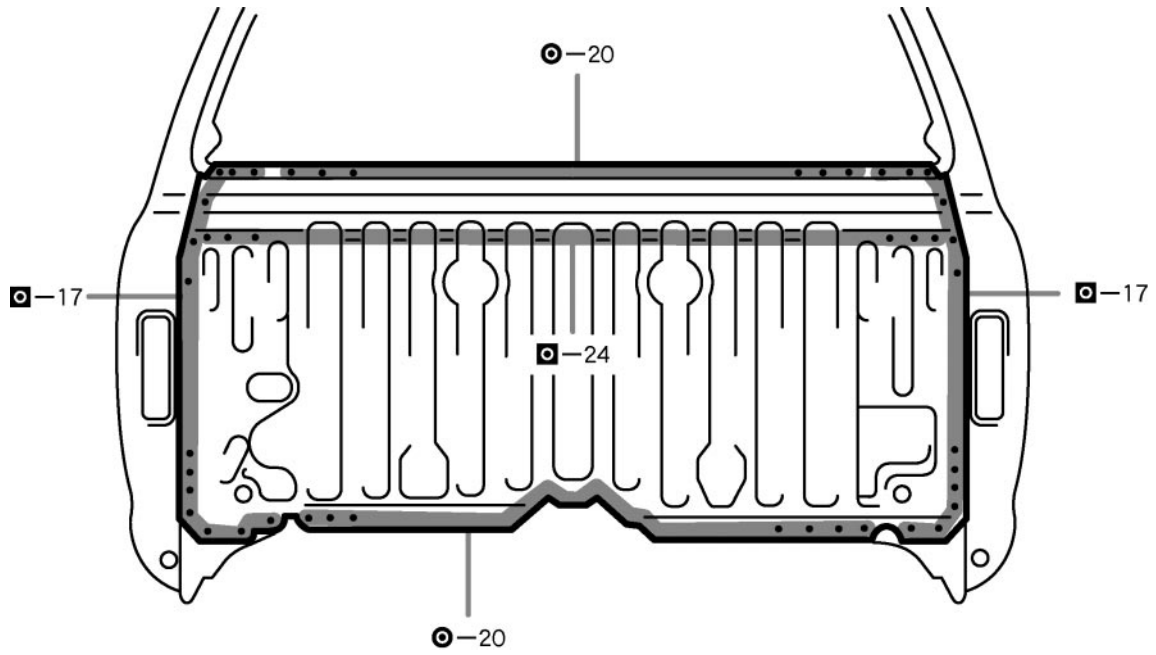
BACK PANEL (ASSY): Regular Cab



REMOVAL

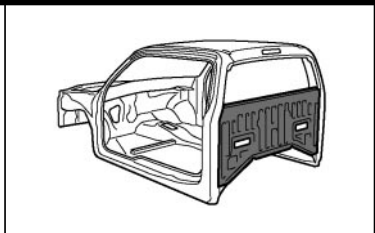


INSTALLATION

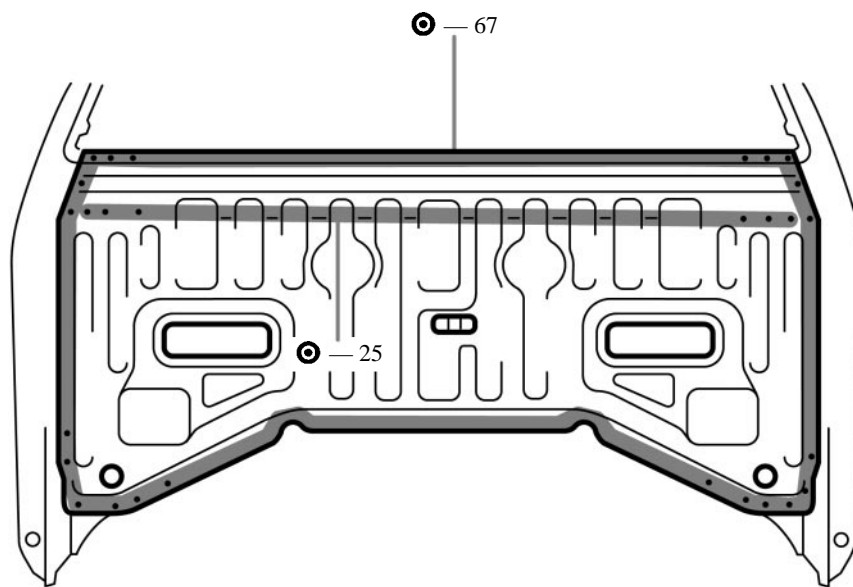


1. Temporarily install the new parts and check the fit of the back window glass.

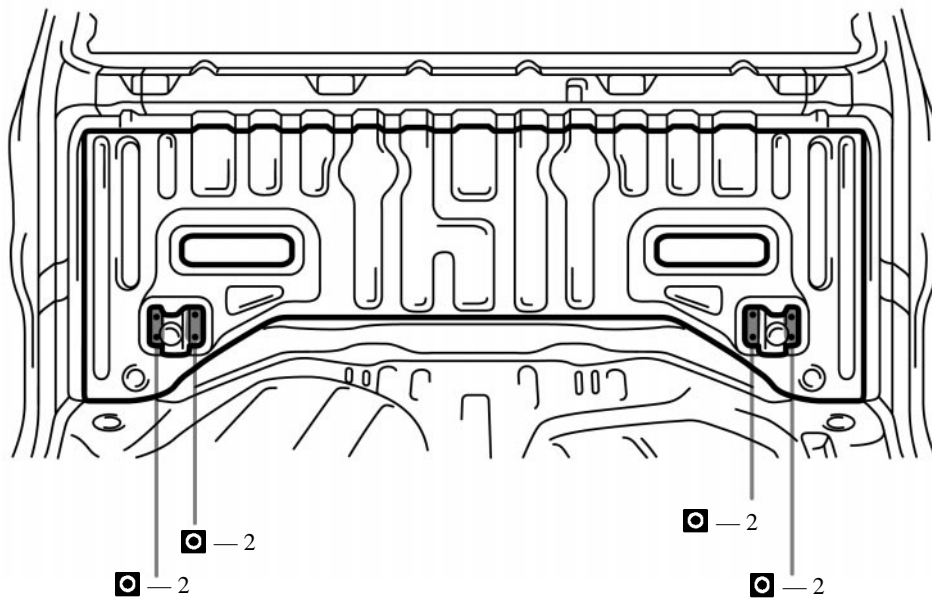
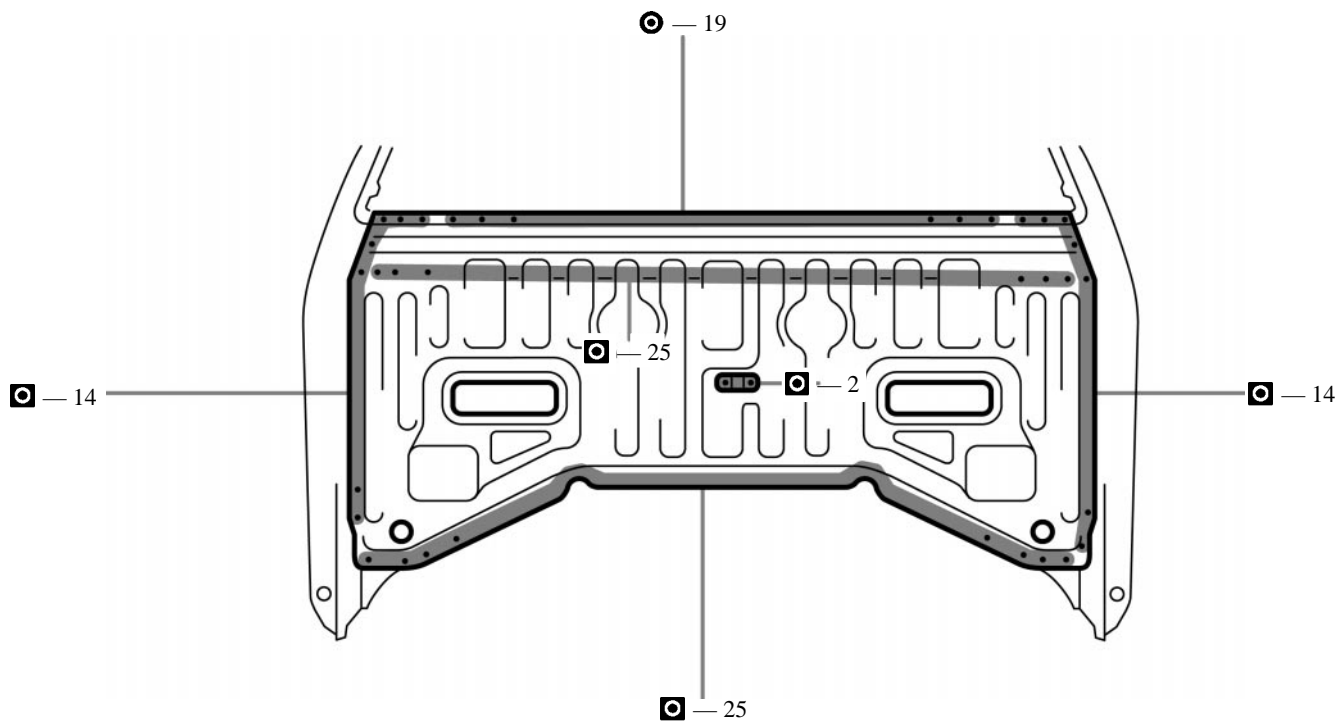
BACK PANEL (ASSY): Access Cab



REMOVAL



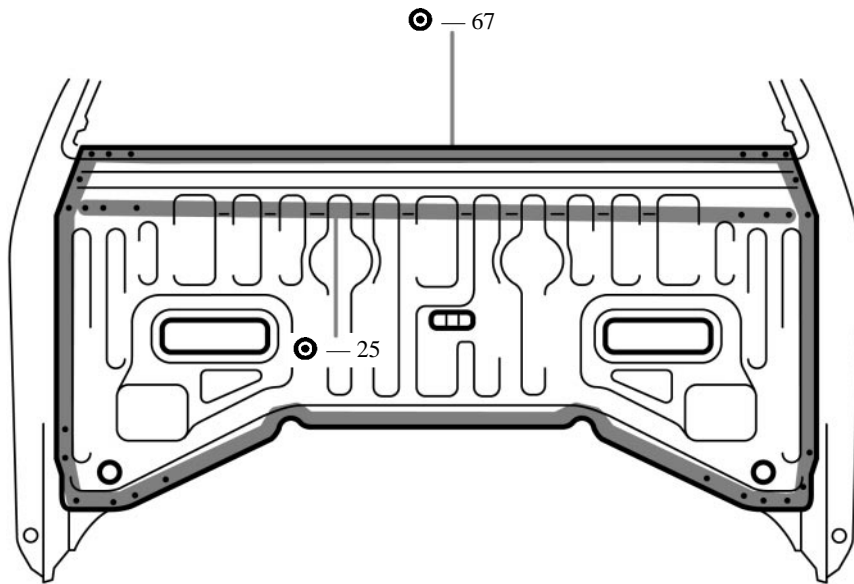
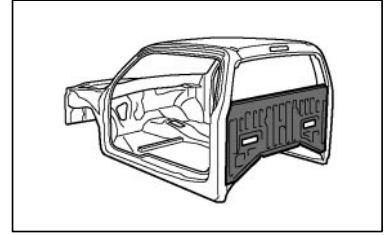
INSTALLATION



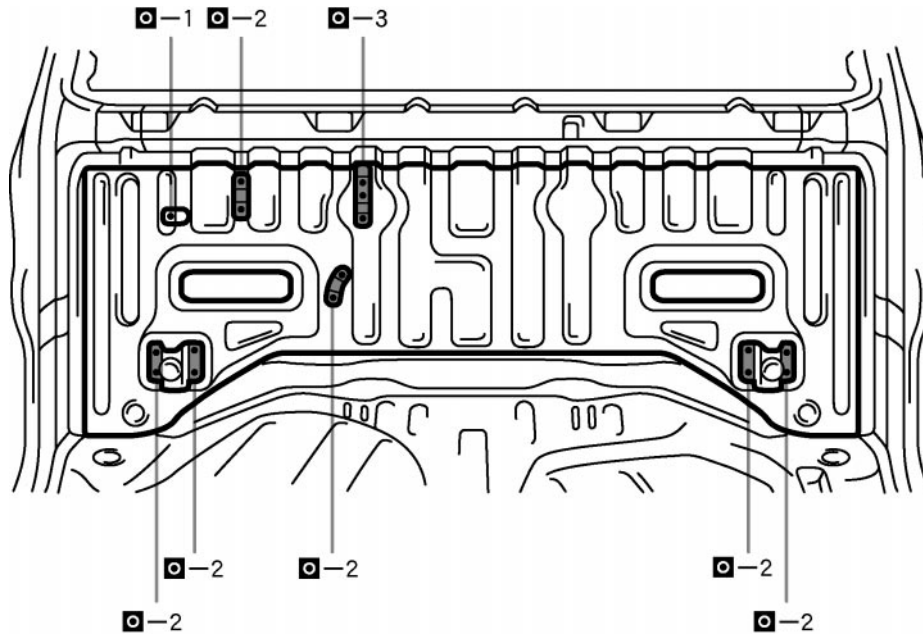
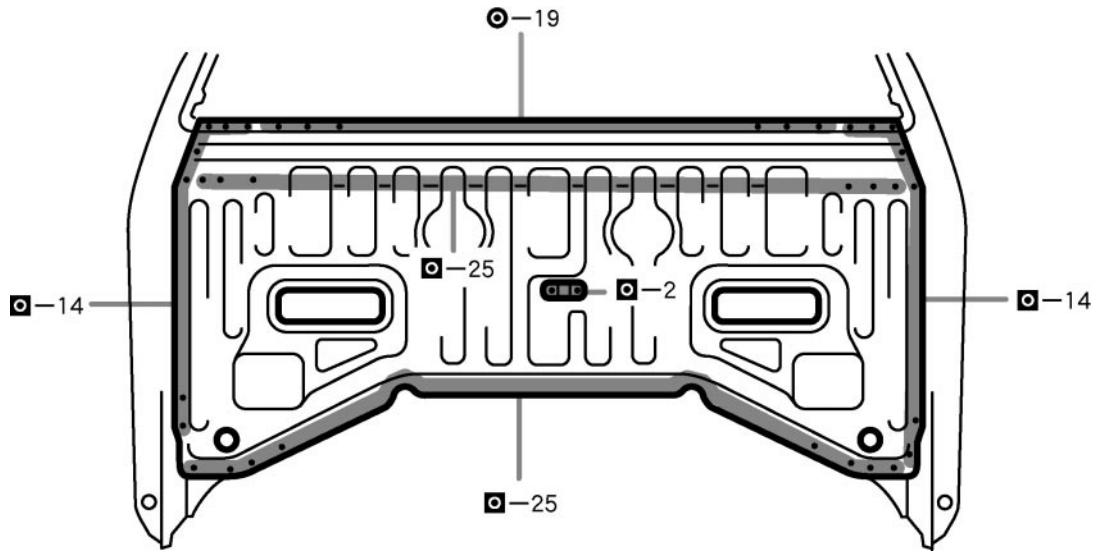
1. Temporarily install the new parts and check the fit of the back window glass.

BACK PANEL (ASSY): Access Cab

REMOVAL

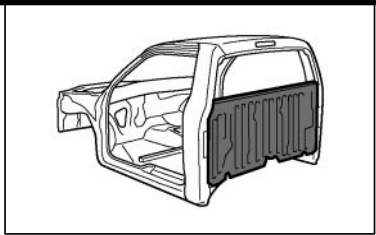


INSTALLATION

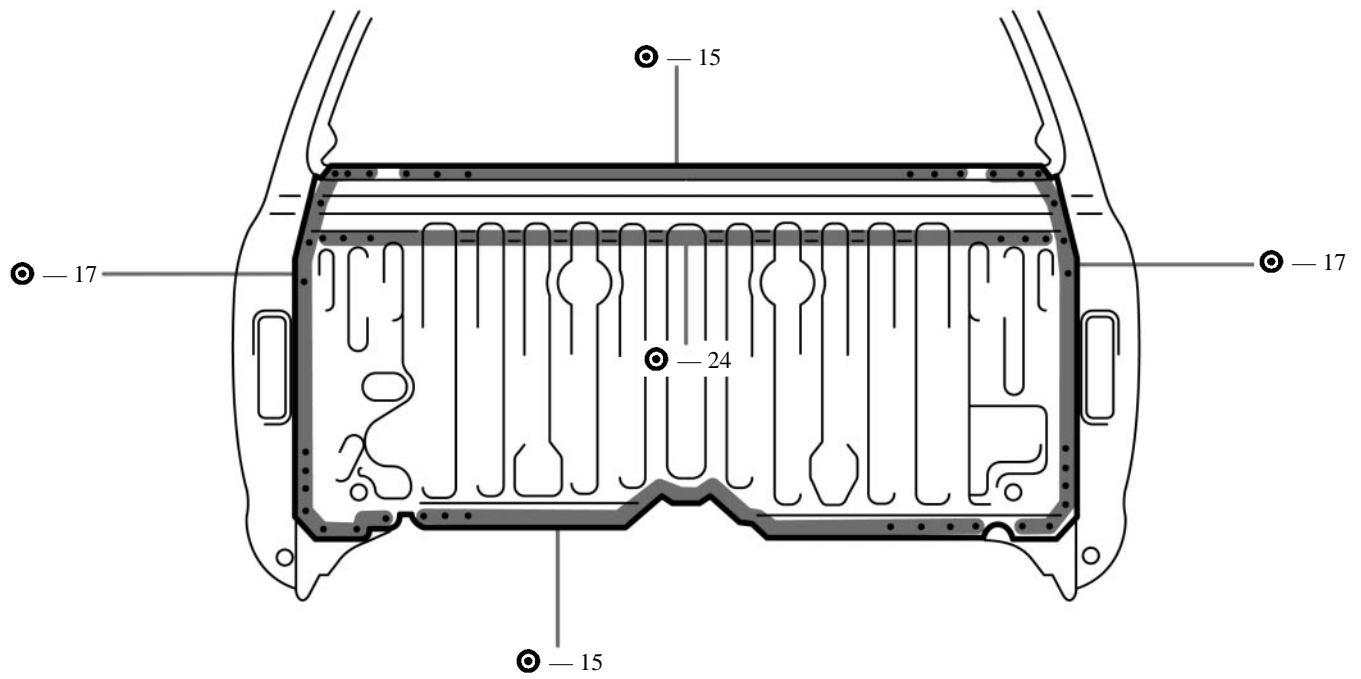


1. Temporarily install the new parts and check the fit of the back window glass.

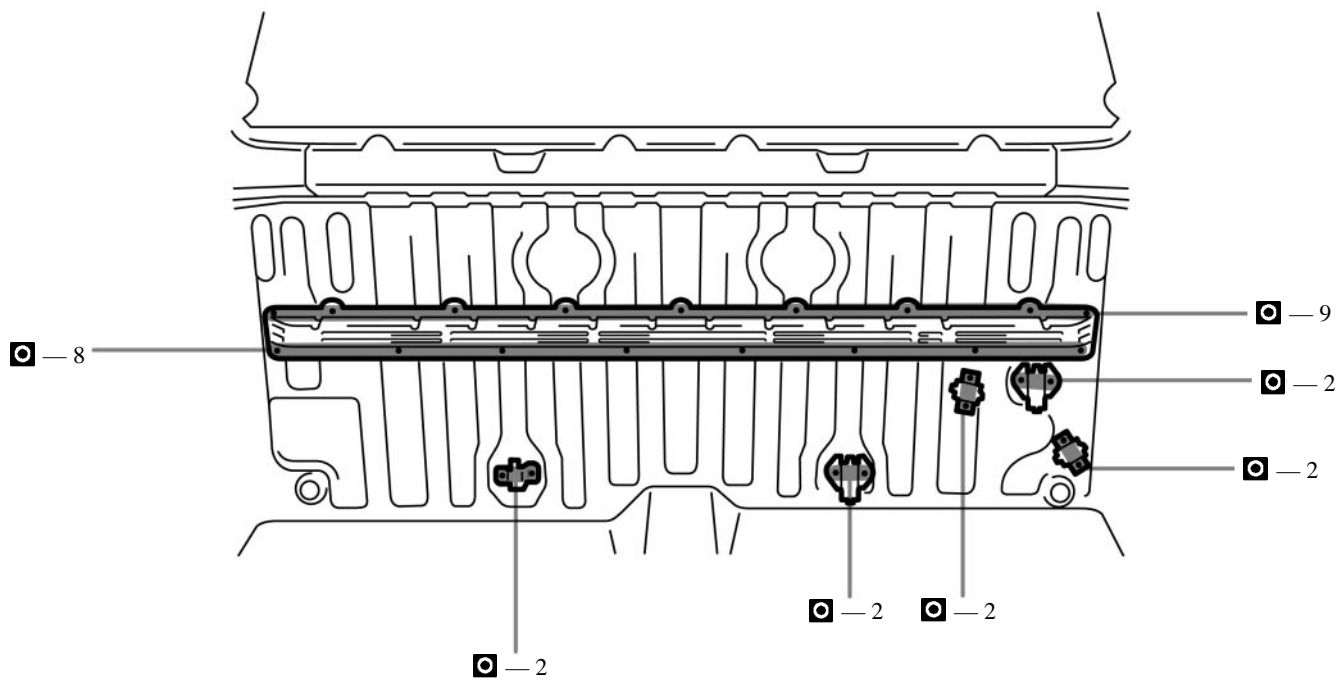
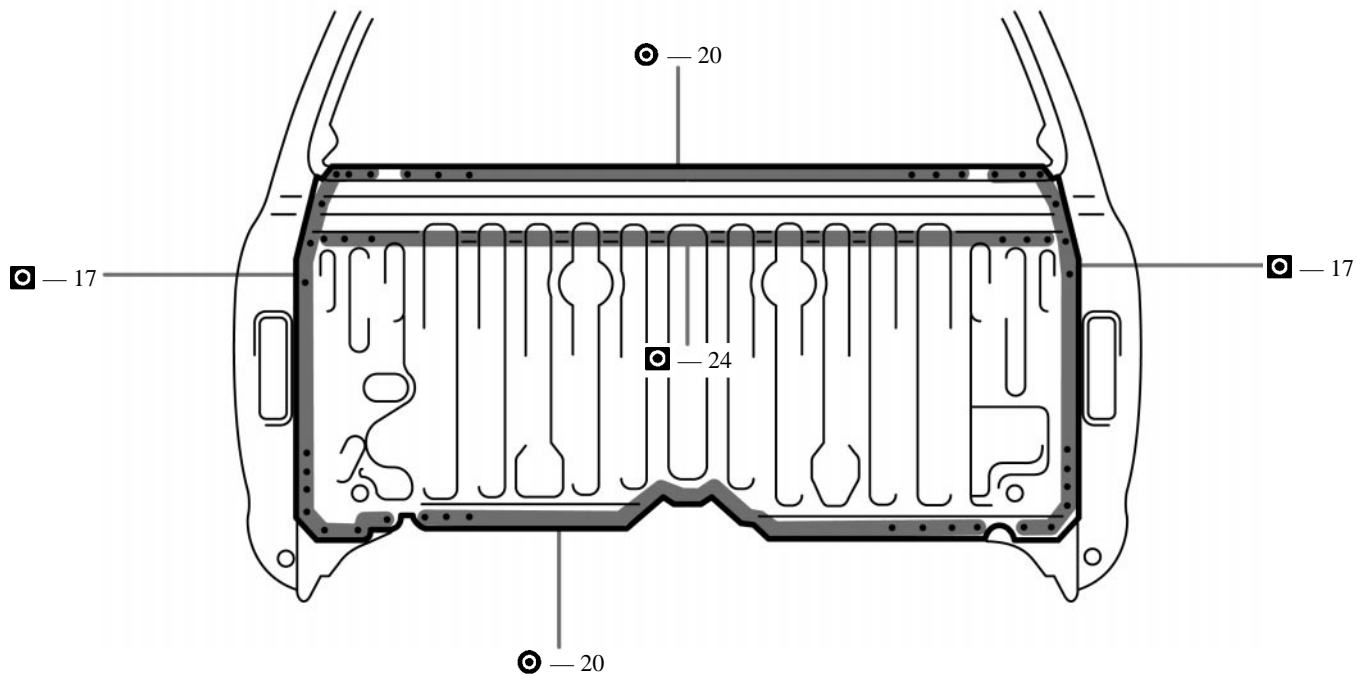
BACK PANEL (ASSY): Regular Cab



REMOVAL

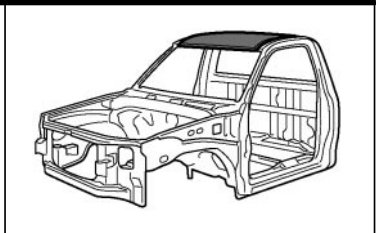


INSTALLATION

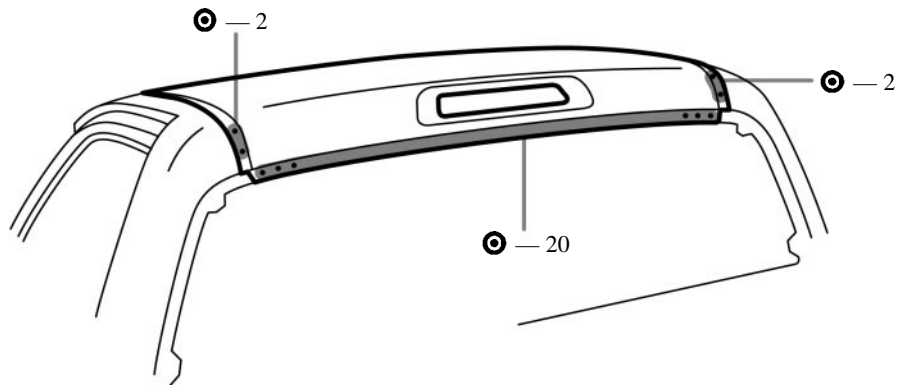
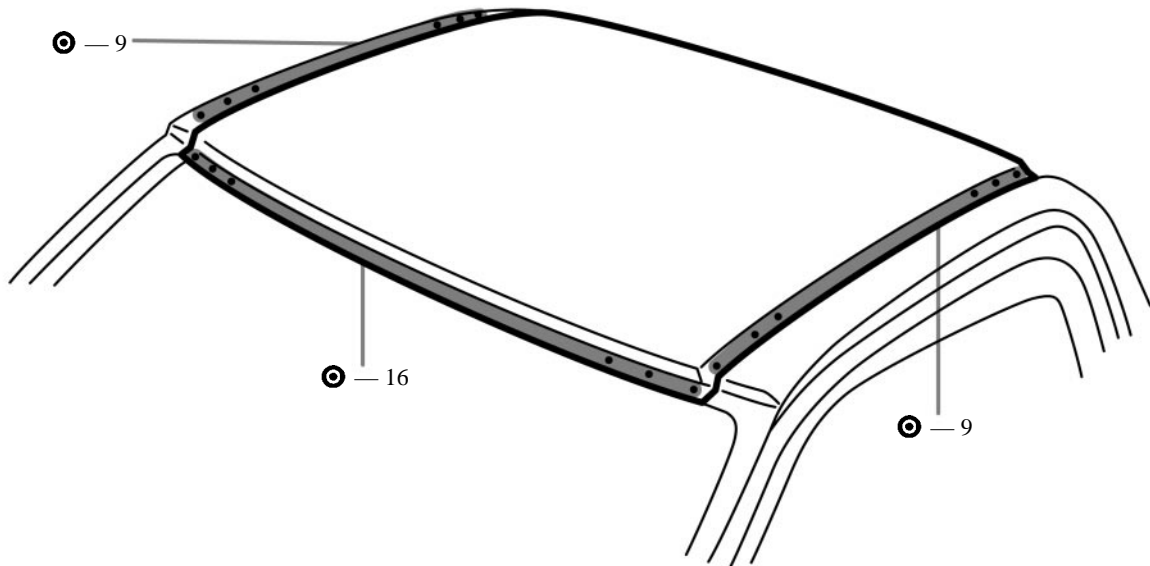


1. Temporarily install the new parts and check the fit of the back window glass.

ROOF PANEL (ASSY): Regular Cab

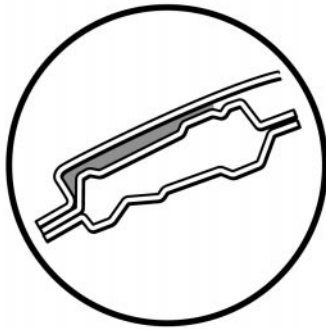


REMOVAL

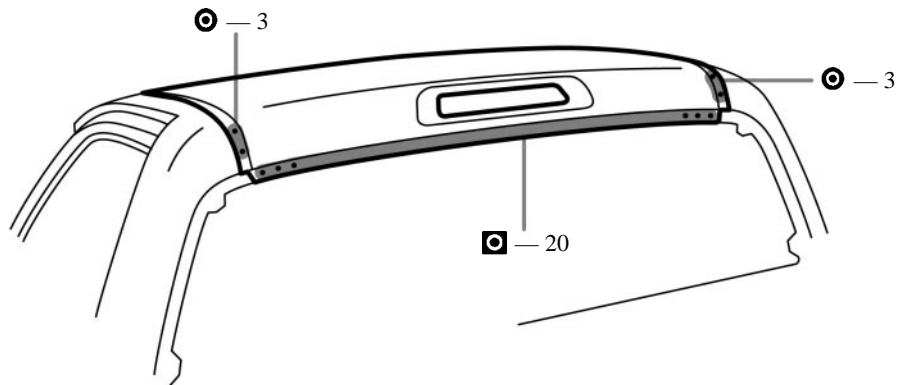
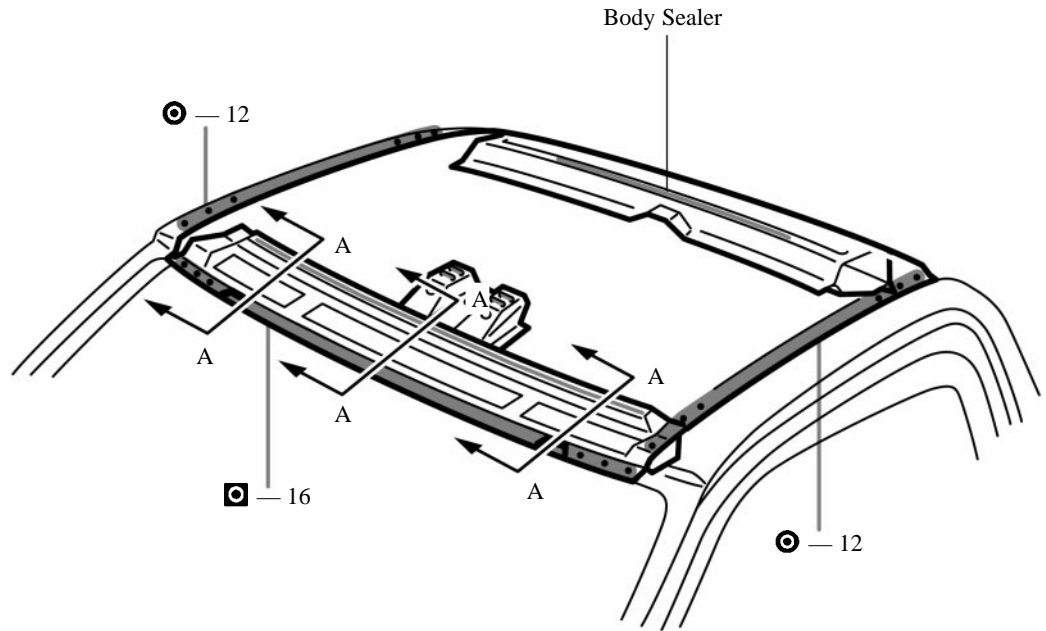


INSTALLATION

[Foamed Material Application Areas]



A - A

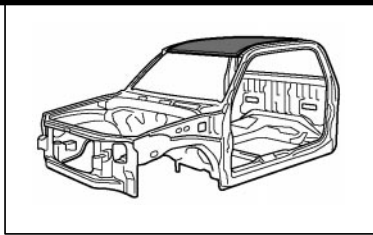


1. Before temporarily installing the new parts, apply body sealer to the windshield header panel and back window frame.
2. After installing the new parts apply foamed material.

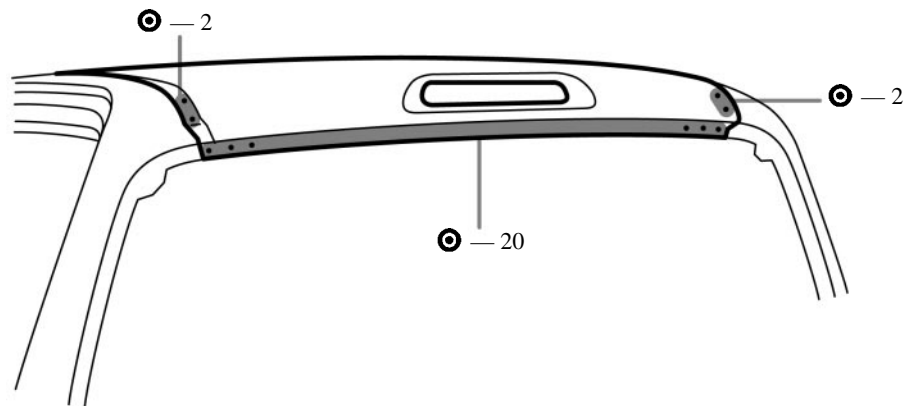
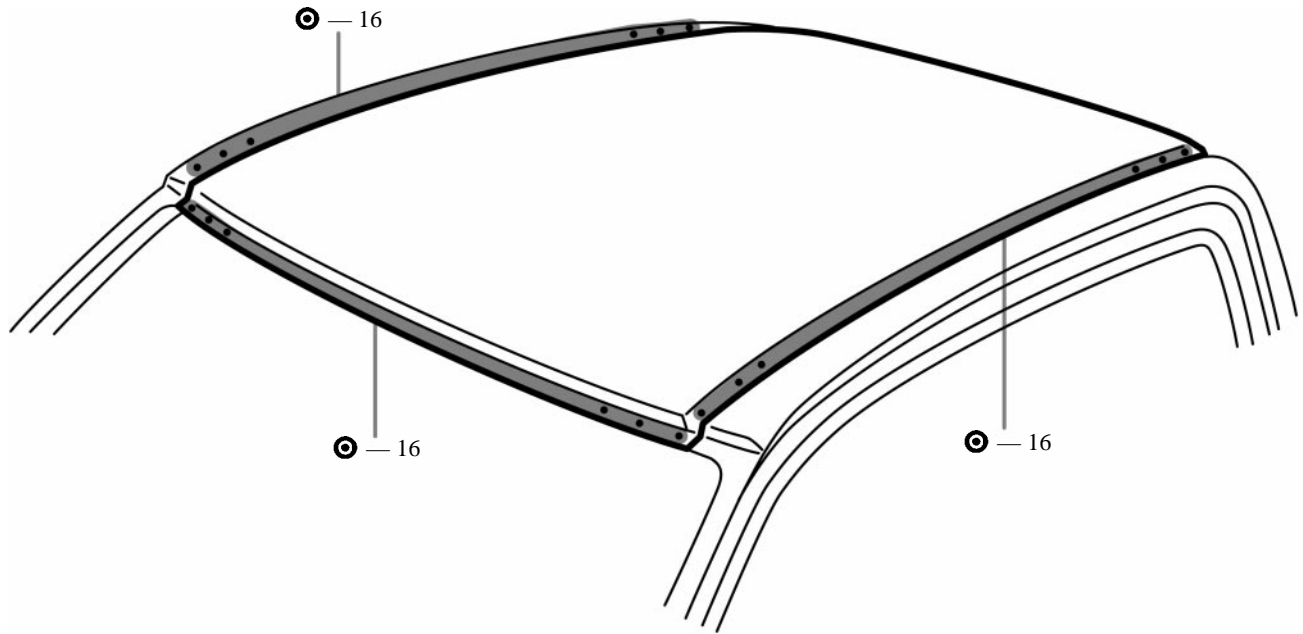
HINT:

- 1) Apply just enough sealer for the new parts to make contact.
- 2) For other sealing points, refer to Section AR.

ROOF PANEL (ASSY): Access Cab

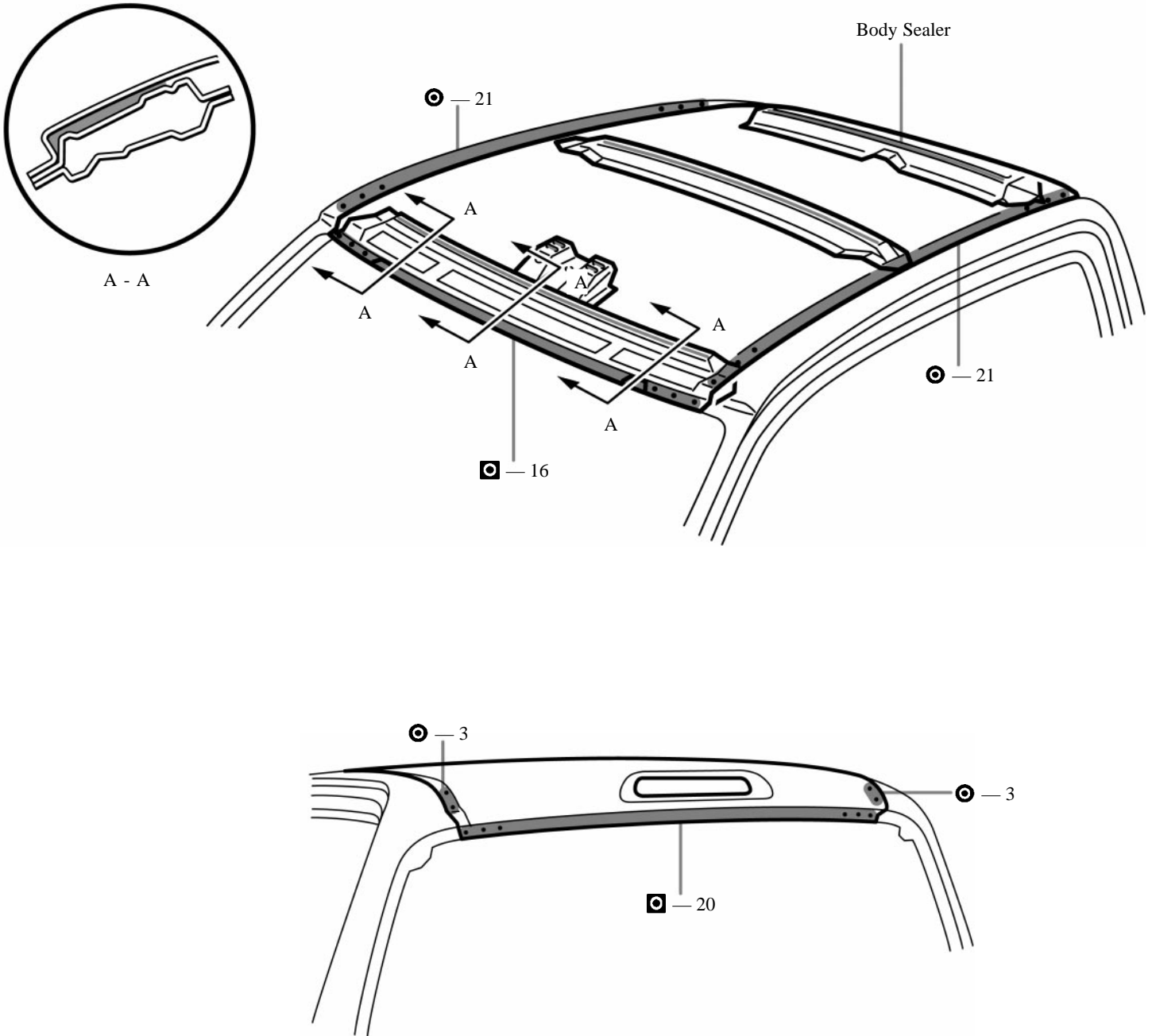


REMOVAL



INSTALLATION

[Foamed Material Application Areas]



1. Before temporarily installing the new parts, apply body sealer to the windshield header panel, roof panel reinforcement and back window frame.
2. After installing the new parts apply foamed material.

HINT:

- 1) Apply just enough sealer for the new parts to make contact.
- 2) For other sealing points, refer to Section AR.

GENERAL INFORMATION

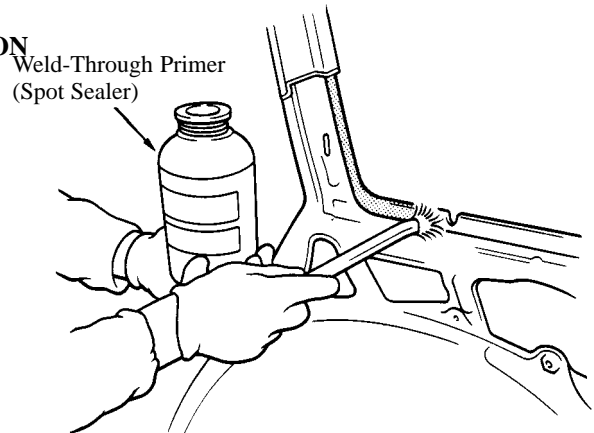
Anti-rust treatment is necessary before welding and before and after the painting process.

ANTI-RUST TREATMENT BEFORE WELDING

1. WELD-THROUGH PRIMER (SPOT SEALER) APPLICATION

For anti-corrosion measures, always apply the weld-through primer (spot sealer) to welding surfaces where the paint film has been removed.

HINT: Apply the weld-through primer (spot sealer) so that it does not ooze out from the joining surfaces.

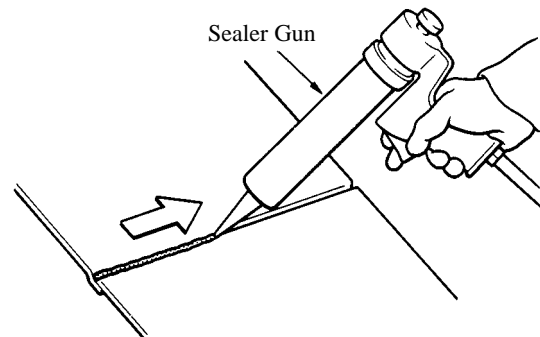


WELD-THROUGH PRIMER (SPOT SEALER) APPLICATION

ANTI-RUST TREATMENT BEFORE PAINTING PROCESS

1. BODY SEALER APPLICATION

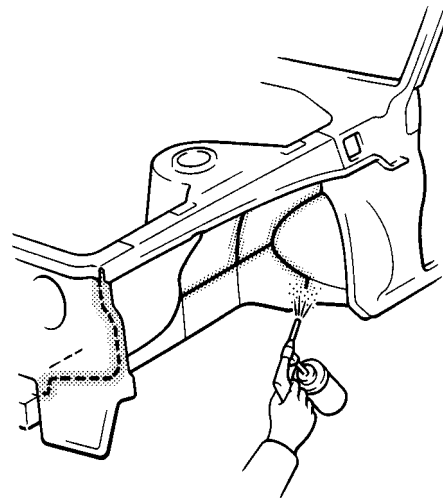
For water-proofing and anti-corrosion measures, always apply the body sealer to the body panel seams and hems of the doors, hoods, etc.



BODY SEALER APPLICATION

2. UNDERCOAT APPLICATION

To prevent corrosion and protect the body from damage by flying stones, always apply sufficient undercoat to the bottom surface of the under body and inside of the wheel housings.

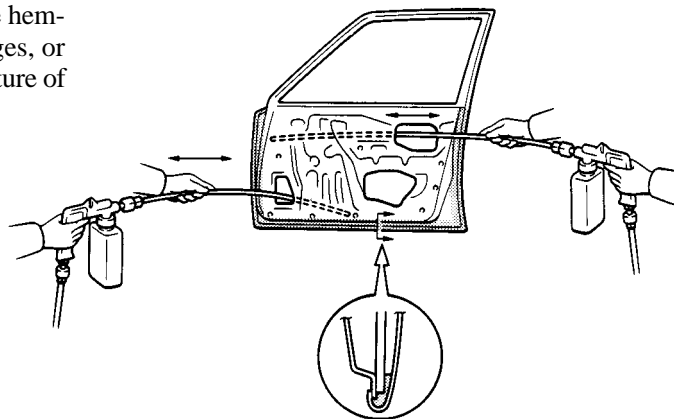


UNDERCOAT APPLICATION

ANTI-RUST TREATMENT AFTER PAINTING PROCESS

1. ANTI-RUST AGENT (WAX) APPLICATION

To preserve impossible to paint areas from corrosion, always apply sufficient anti-rust agent (wax) to the inside of the hemming areas of the doors and hoods, and around the hinges, or the welded surfaces inside the boxed cross-section structure of the side member, body pillar, etc.



ANTI-RUST AGENT (WAX) APPLICATION

REFERENCE: ANTI-RUST TREATMENT BY PAINTING

Painting prevents corrosion and protects the sheet metal from damage. In this section, anti-chipping paint only for anti-corrosion purpose is described.

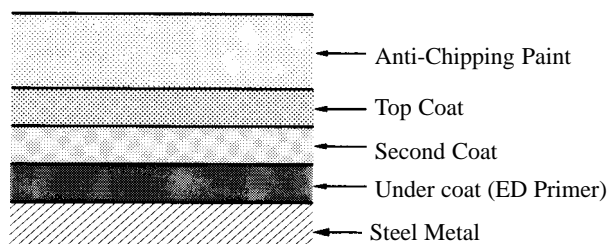
1. ANTI-CHIPPING PAINT

To prevent corrosion and protect the body from damage by flying stones, etc., apply anti-chipping paint to the rocker panel, wheel arch areas, valance panel, etc.

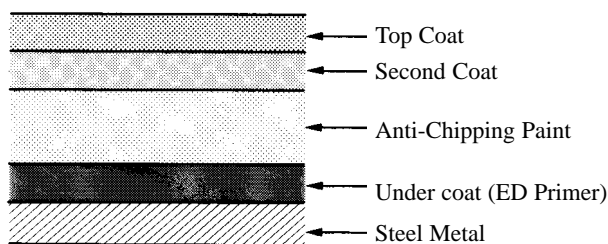
HINT:

Depending on the model or the application area, there are cases where the application of anti-chipping paint is necessary before the second coat or after the top coat.

- Apply the anti-chipping paint after the top coat.

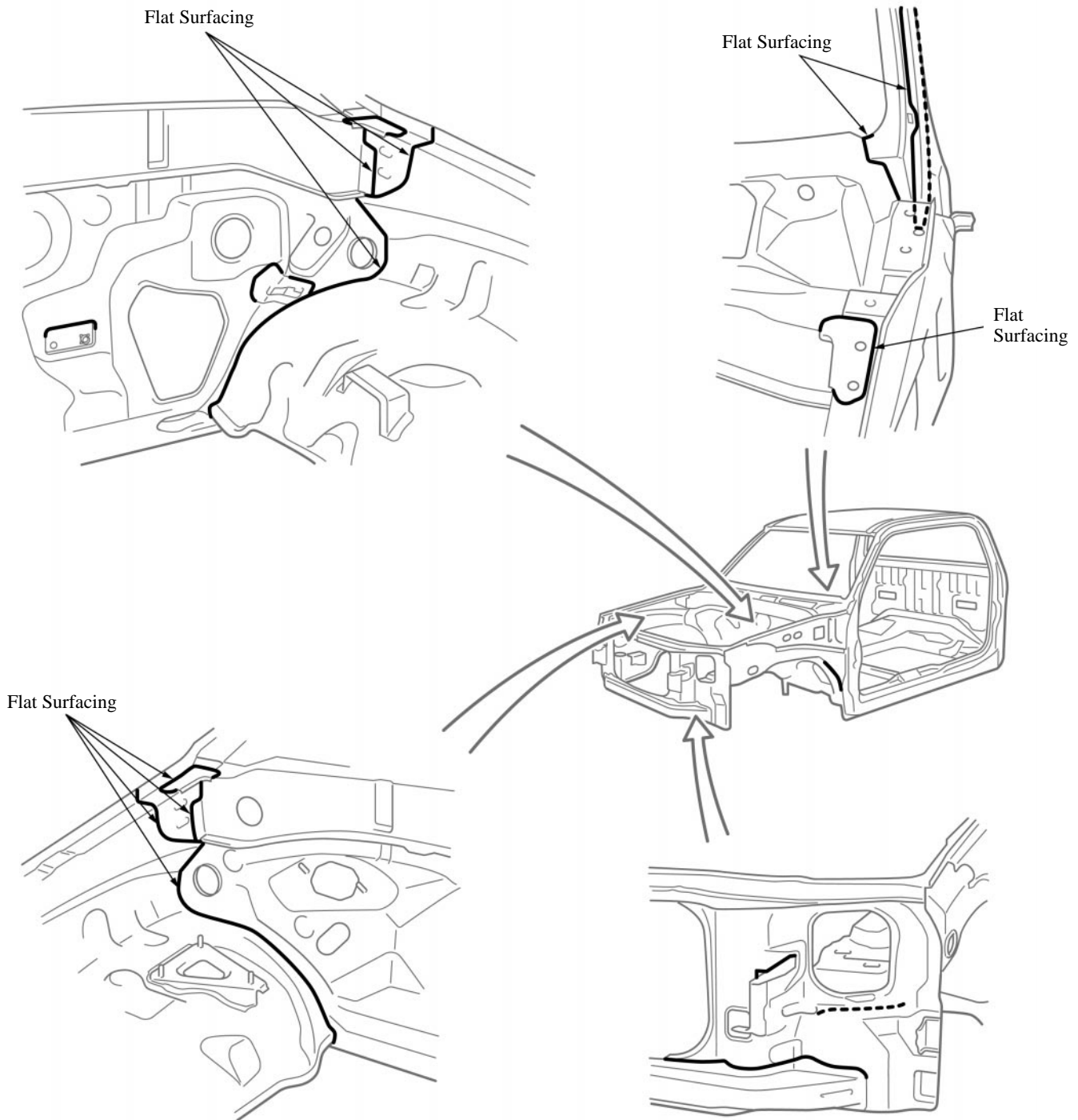


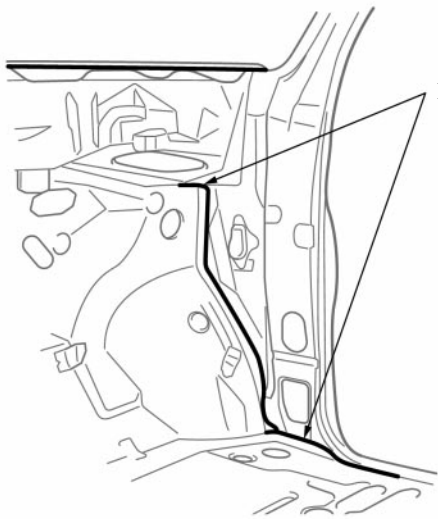
- Apply the anti-chipping paint before the second coat.



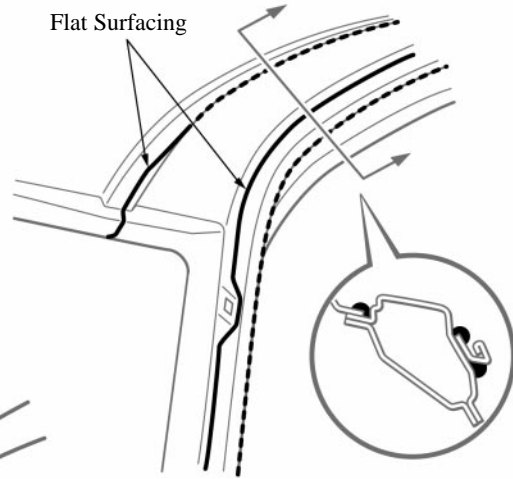
BODY PANEL SEALING AREAS**HINT:**

1. Prior to applying body sealer, clean the area with a rag soaked in a grease, wax and silicone remover.
2. If weld-through primer was used, first wipe off any excess and coat with anti-corrosion primer before applying body sealer.
3. Wipe off excess body sealer with a rag soaked in a grease, wax and silicone remover.
4. If body sealer is damaged by peeling, cracks, etc., be sure to repair as necessary.

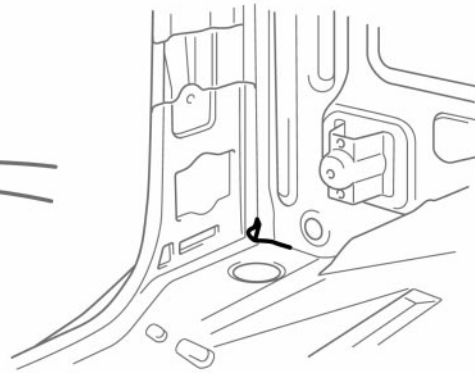
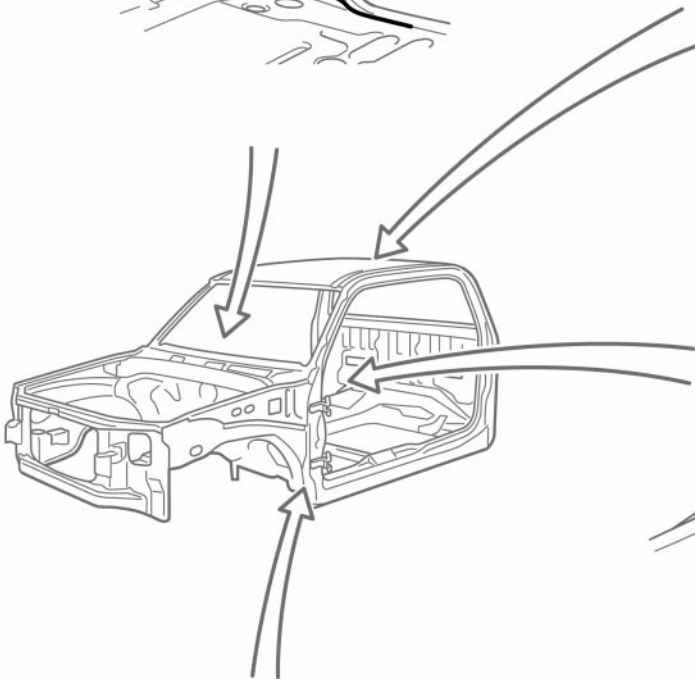
ALL



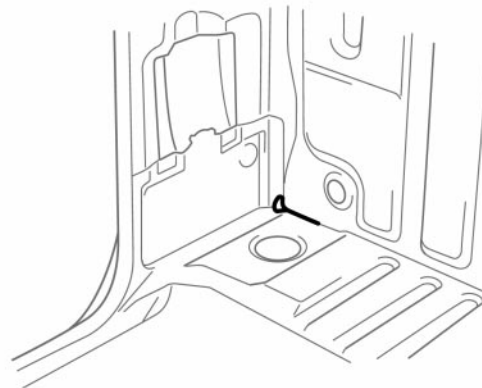
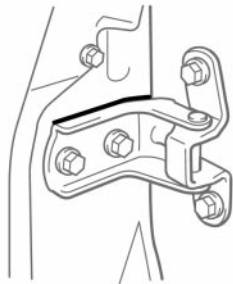
Flat Surfacing



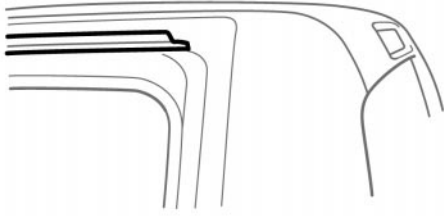
Flat Surfacing



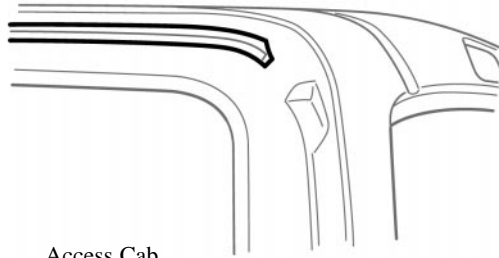
Access Cab



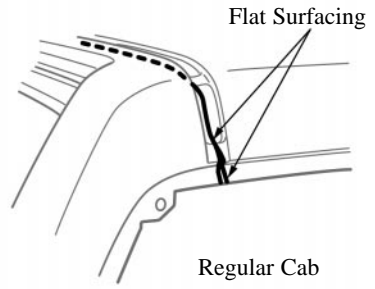
Regular Cab



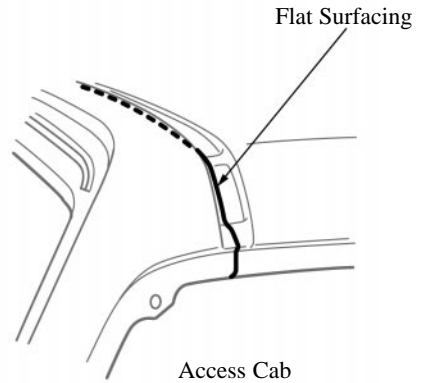
Regular Cab



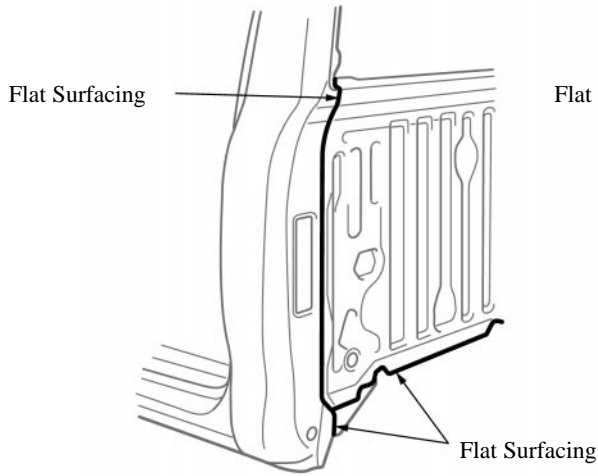
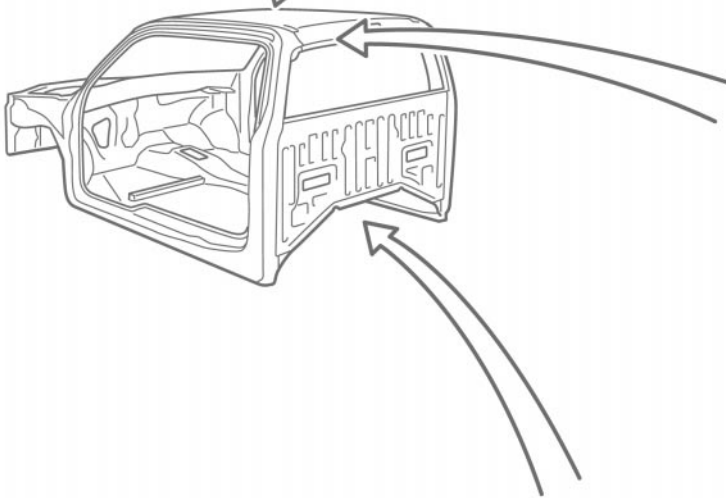
Access Cab



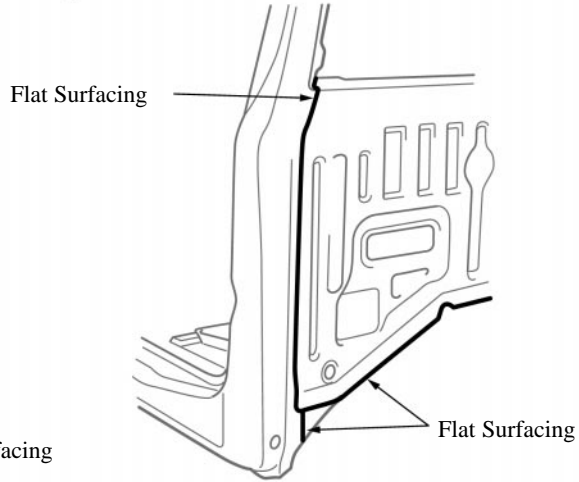
Regular Cab



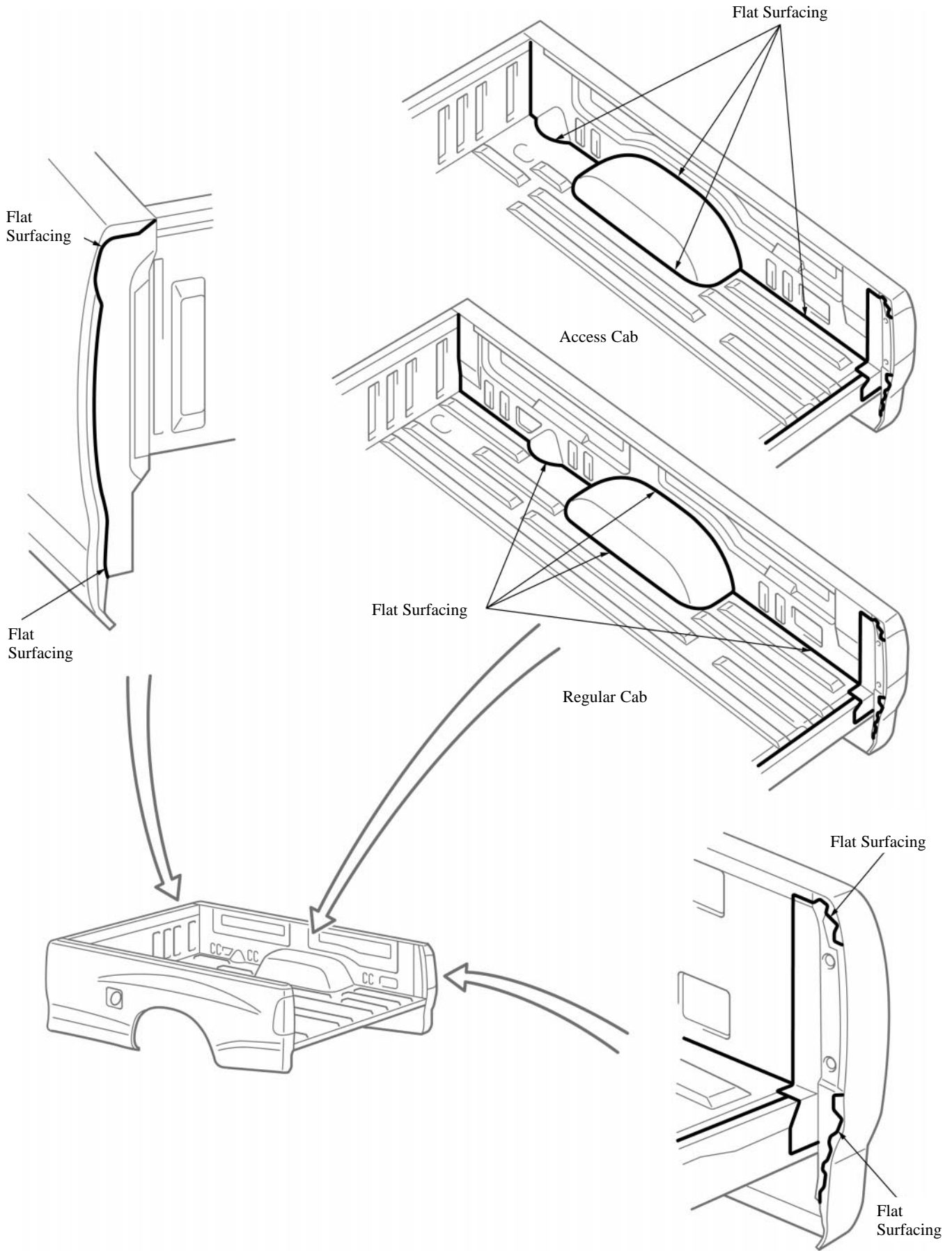
Access Cab

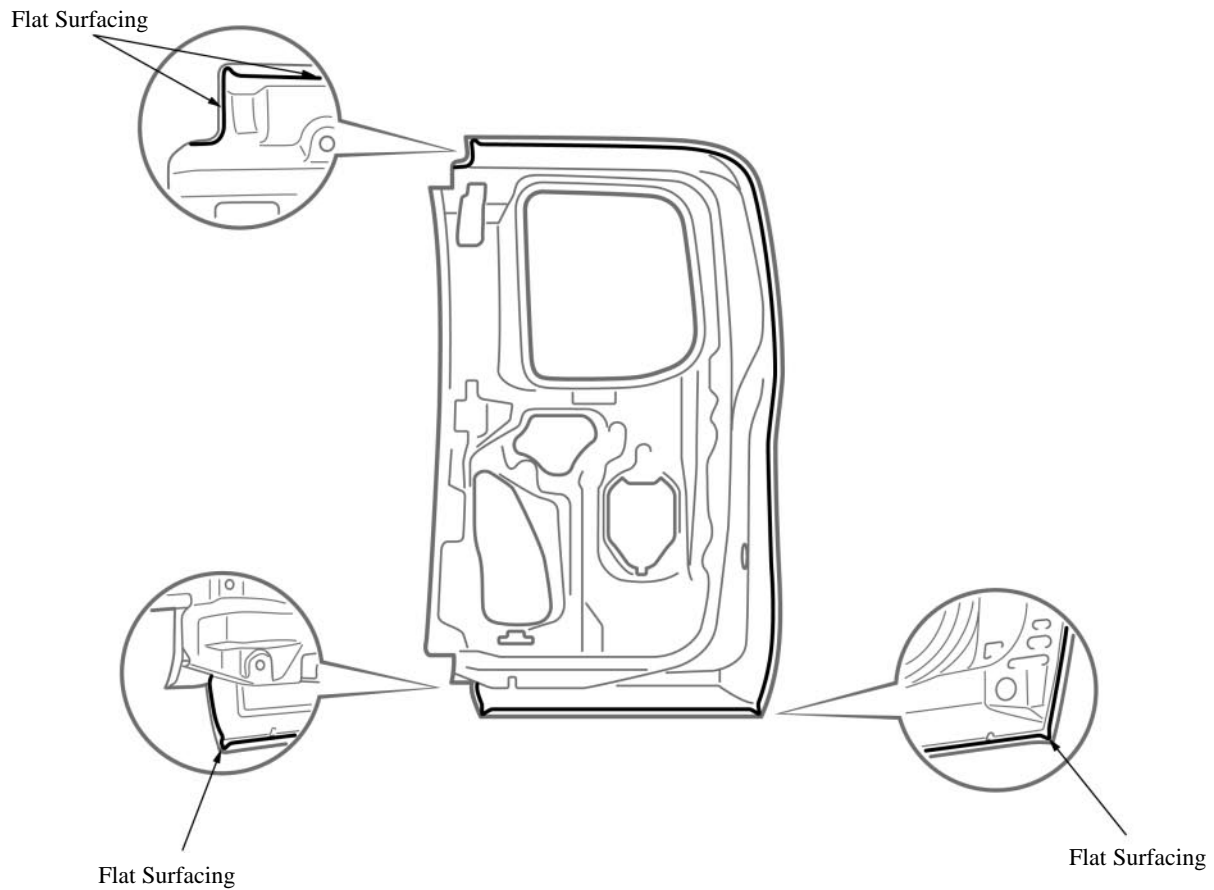
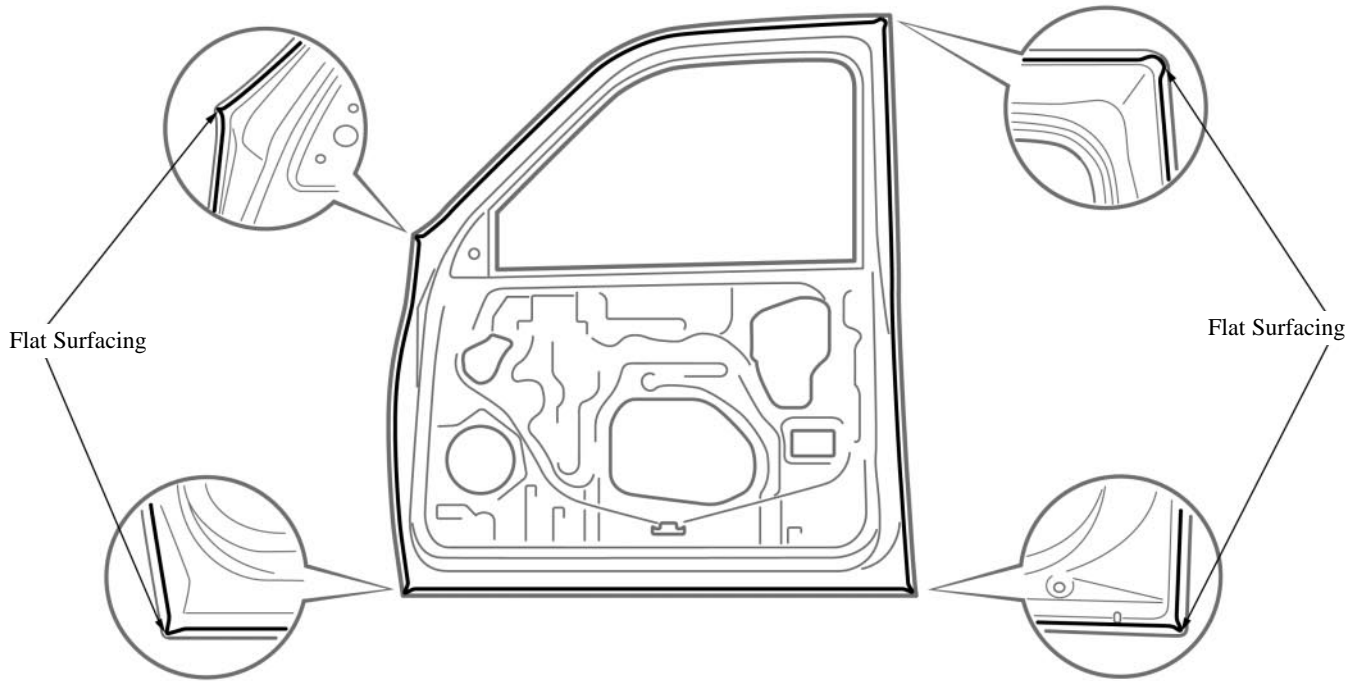


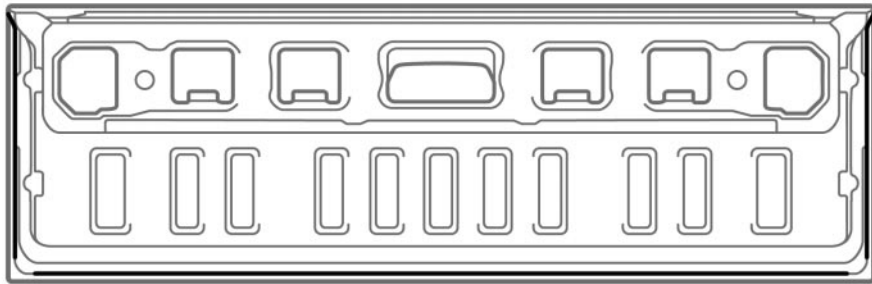
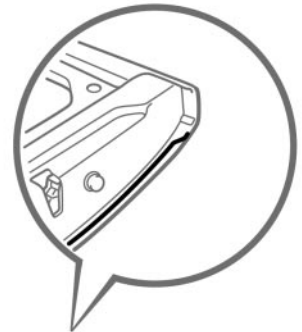
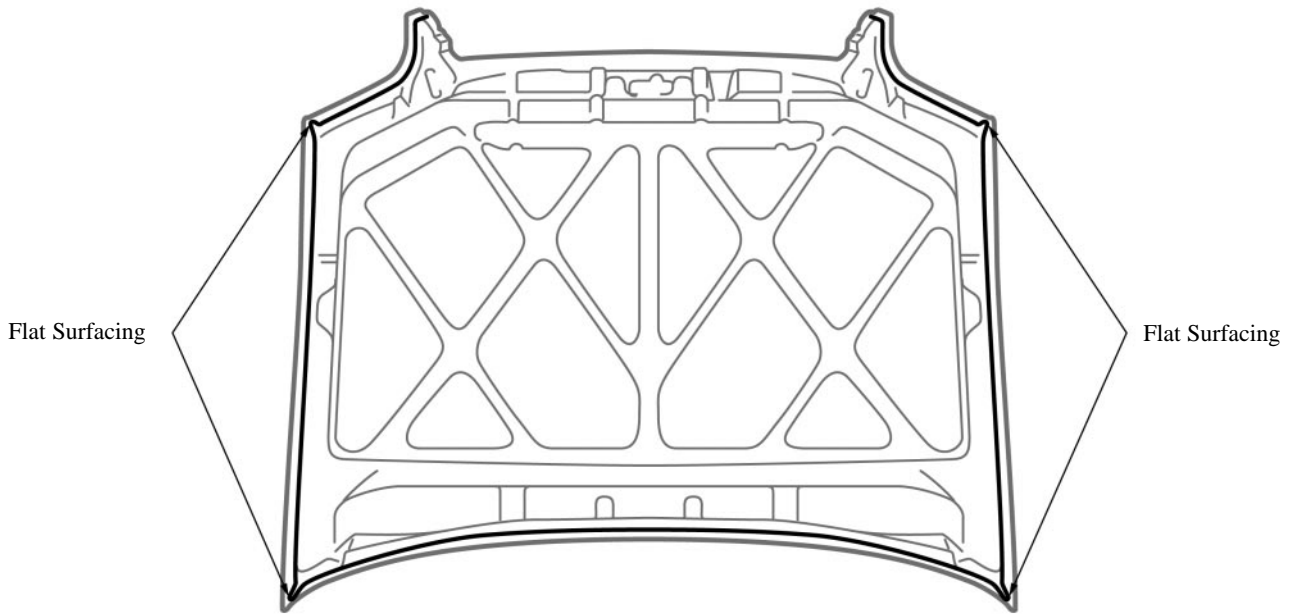
Regular Cab



Access Cab





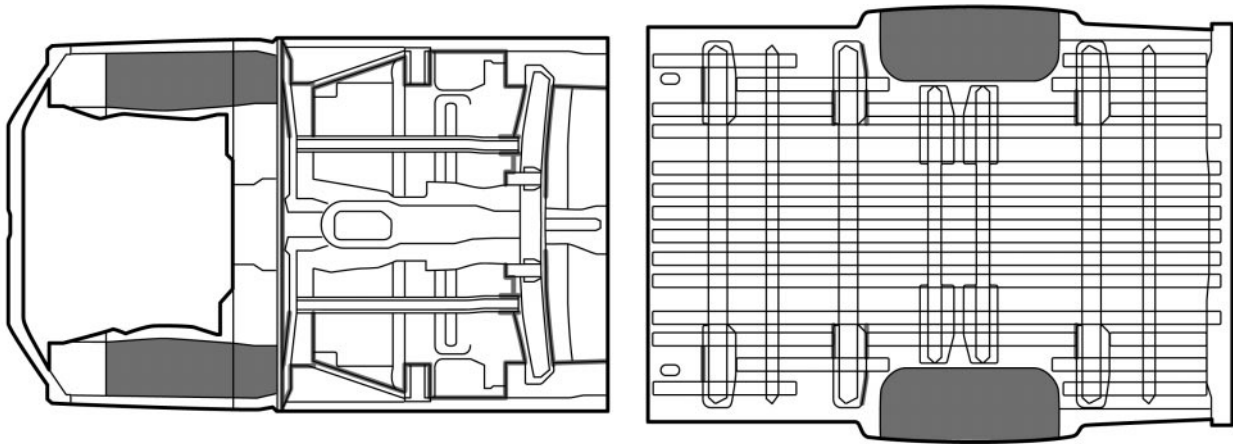


BODY PANEL UNDERCOATING AREAS

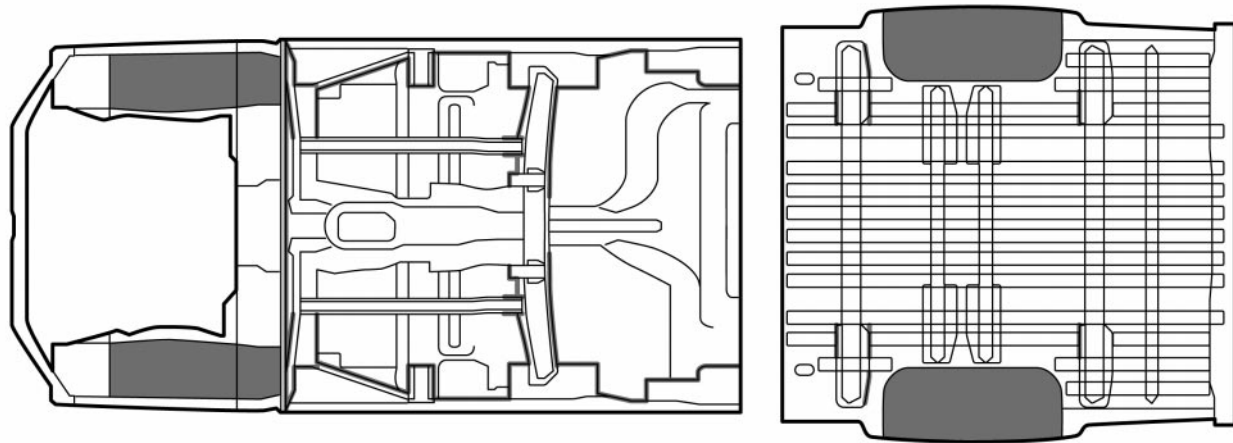
HINT:

1. First wipe off any dirt, grease or oil with a rag soaked in a grease, wax and silicone remover.
2. Cover the surrounding areas with masking paper to avoid coating unnecessary areas. If other areas are accidentally coated, wipe off the coating immediately.
3. Apply the first coating of undercoat to all welded areas and panel joints, then apply a second coat over the entire area.
4. Do not coat parts which become hot, such as the tailpipe, or moving parts, such as the propeller shaft.
5. Besides the locations described below, apply undercoating to all weld points under the body to insure corrosion prevention.
6. Be sure to seal the edge of the flange of the member and bracket with undercoating.
7. If undercoat is damaged by peeling, cracks, etc., be sure to repair as necessary.
8. Before the undercoat apply sealer allowing rust prevention to be attained.

REGULAR CAB



ACCES CAB



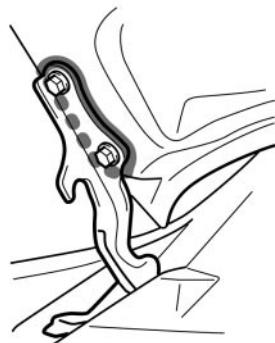
REFERENCE: Referring to the notes above, undercoating should be applied according to the specifications for your country.

BODY PANEL ANTI-RUST AGENT (WAX) APPLICATION AREAS

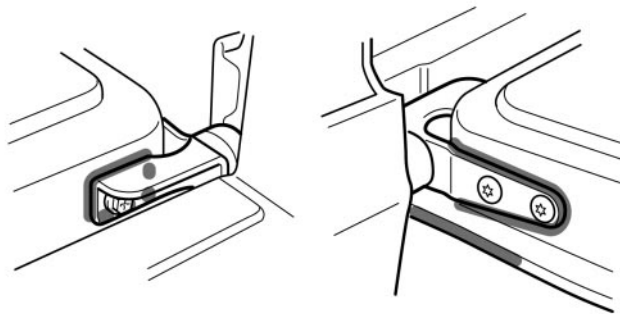
HINT:

1. Whenever adjusting the doors and hoods, apply anti-rust agent (wax) around the hinges.
2. Even if partially repairing a part, apply anti-rust agent (wax) over the entire application area of the part.
3. Wipe off the anti-rust agent immediately with a rag soaked in a grease, wax and silicone remover, if accidentally applied to other areas.

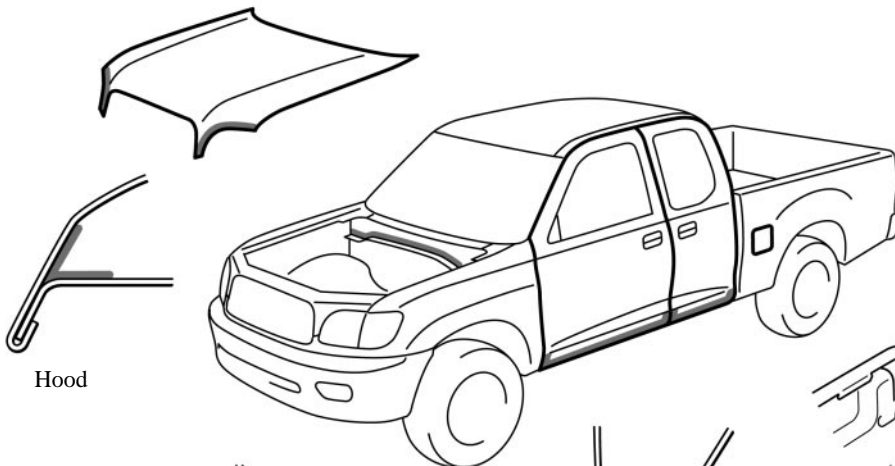
ALL



Hood Hinge

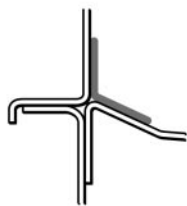


Tail Gate Hinge

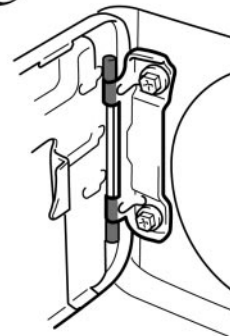


Hood

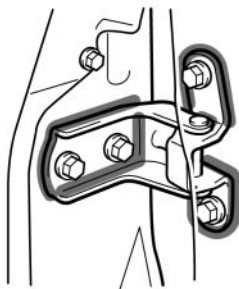
Front Door & Access Panel



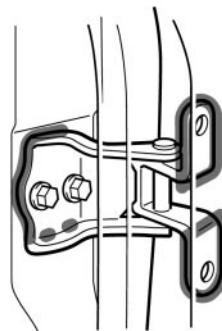
Cowl Panel



Fuel Filler Opening Lid Hinge



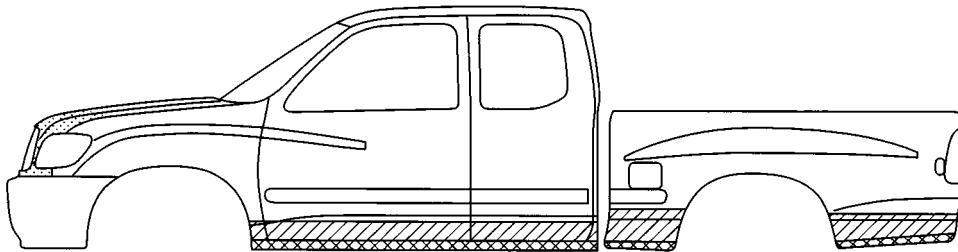
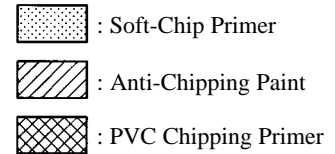
Front Door Hinge



Access Panel Hinge

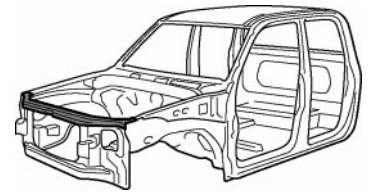
BODY PANEL ANTI-CHIPPING PAINT APPLICATION AREAS*HINT:*

1. *Anti-chipping paint should be applied to some areas before the second coat and to others after the top coat.*
2. *If other areas are accidentally coated, wipe of the paint immediately with a rag soaked in grease, wax and silicone remover.*



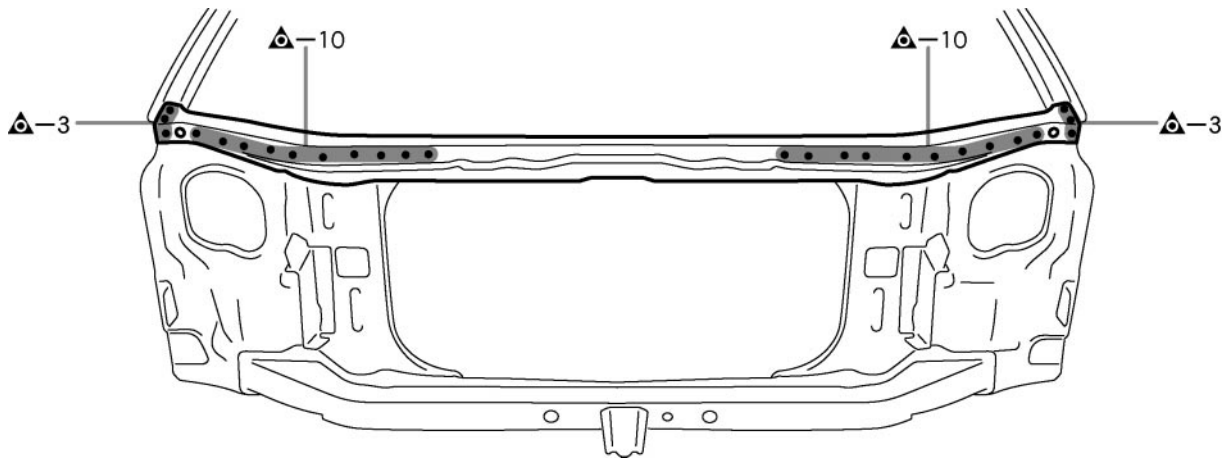
RADIATOR UPPER SUPPORT (ASSY)

REPLACEMENT



F16919A

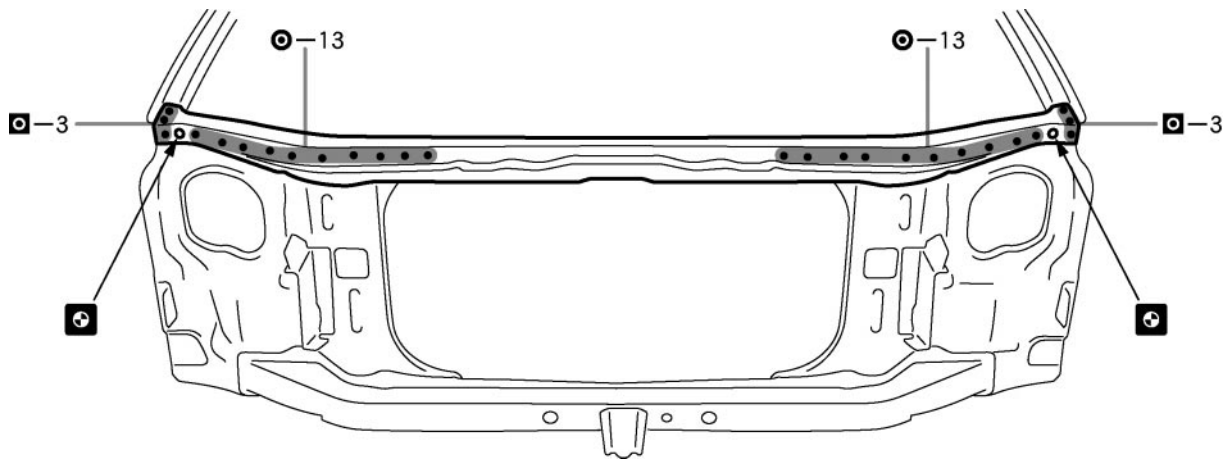
REMOVAL

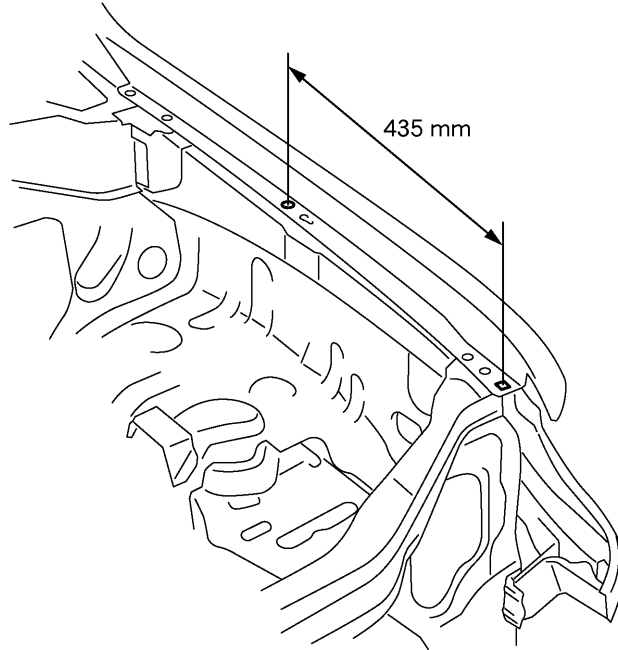
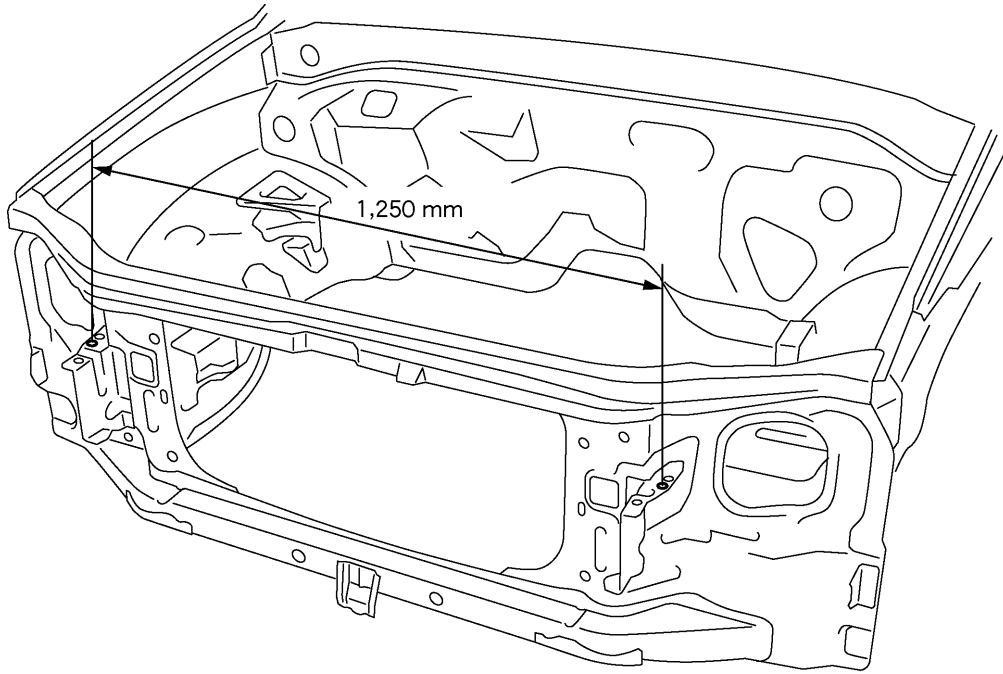


F16919

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.





F16927

POINT

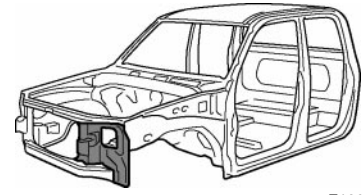
- 1 Measure the dimensions before installing headlights.
- 2 These values are reference values.

435 mm (17.13 in.) 1,250 mm (49.21 in.)

RADIATOR SIDE SUPPORT (ASSY)

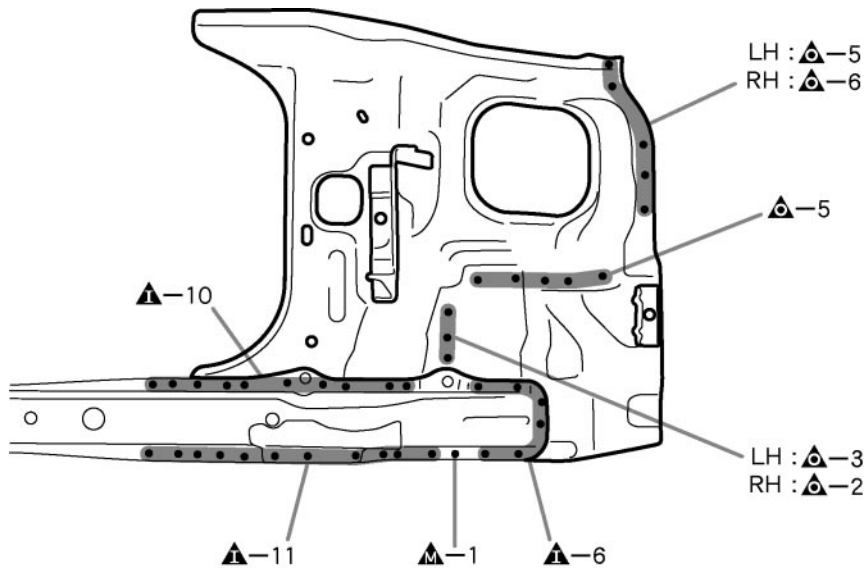
REPLACEMENT

With the radiator upper support removed.



F16921

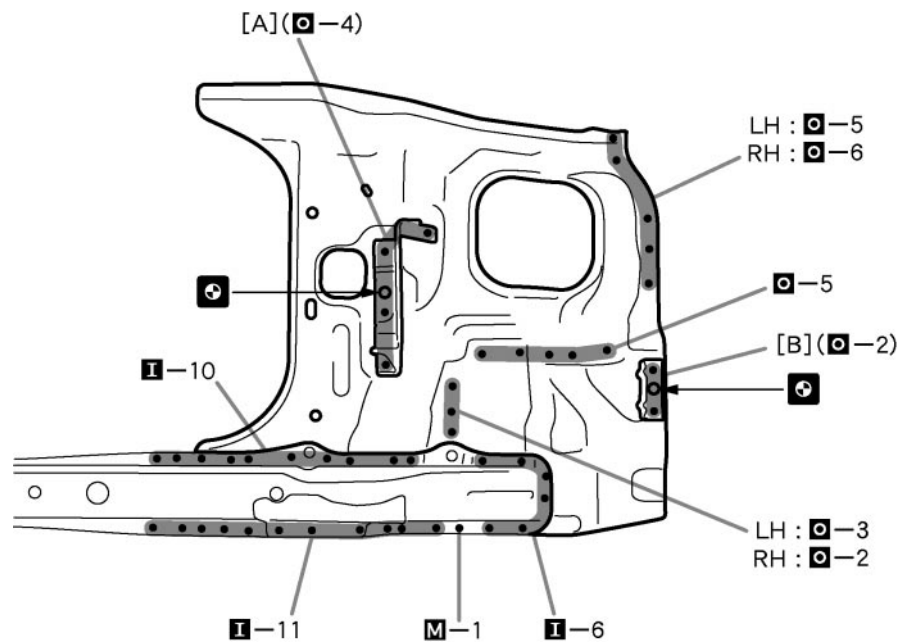
REMOVAL



F16921

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16922

POINT

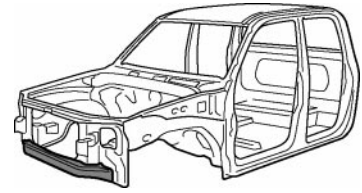
- 1 Inspect the fitting of the headlight and front fender, etc., before welding, since affects the appearance of finish.

PART NAME

- [A] Front End Panel No.1 Bracket [B] Radiator Support To Front Fender Bracket

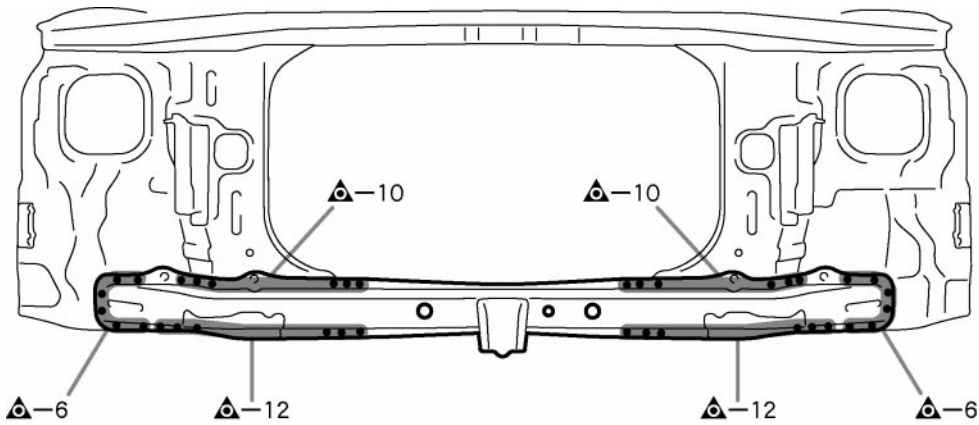
FRONT CROSSMEMBER (ASSY)

REPLACEMENT



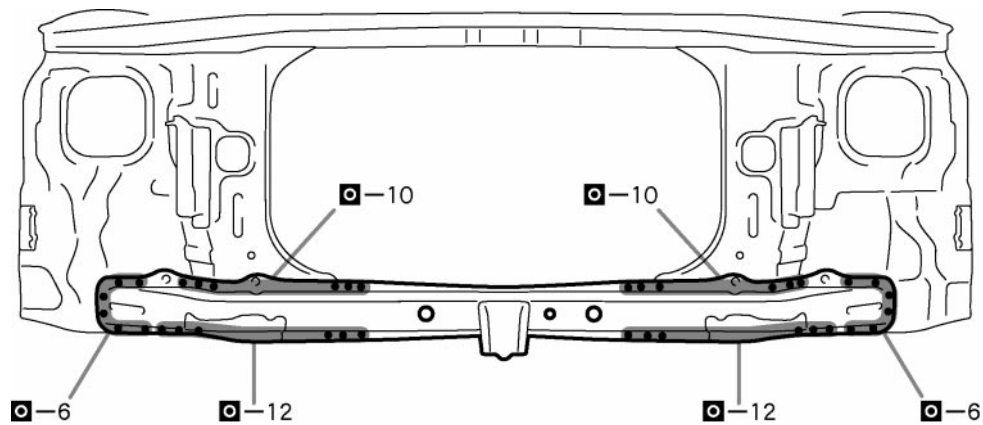
F16923A

REMOVAL



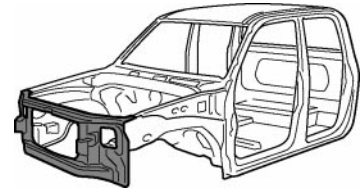
INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



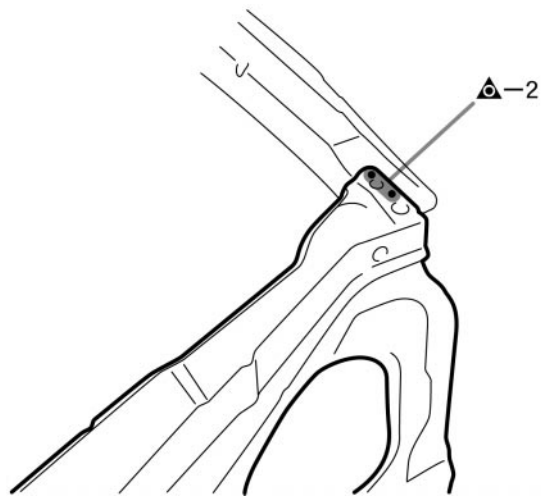
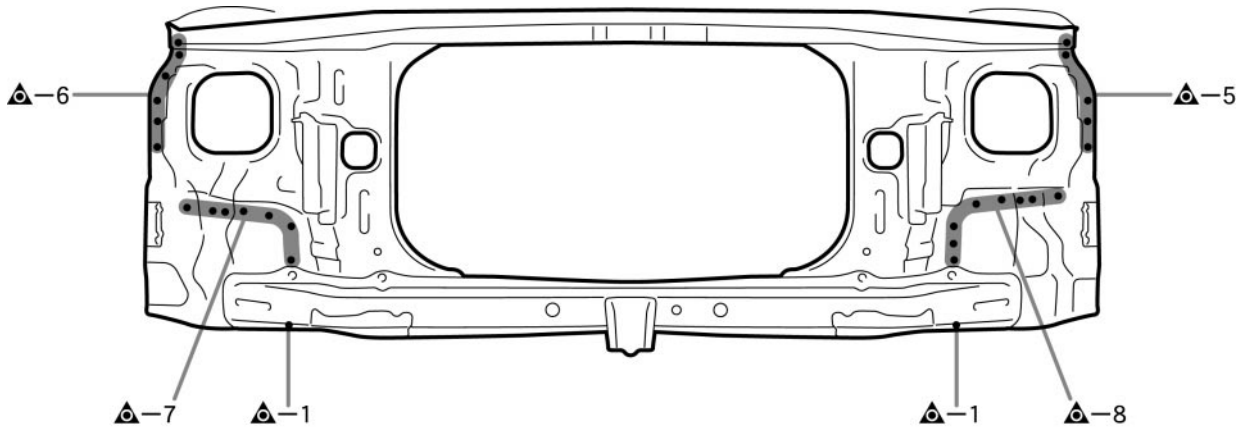
RADIATOR SUPPORT (ASSY)

REPLACEMENT



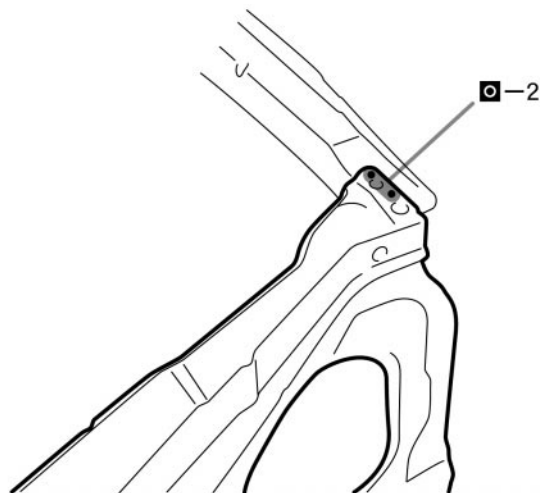
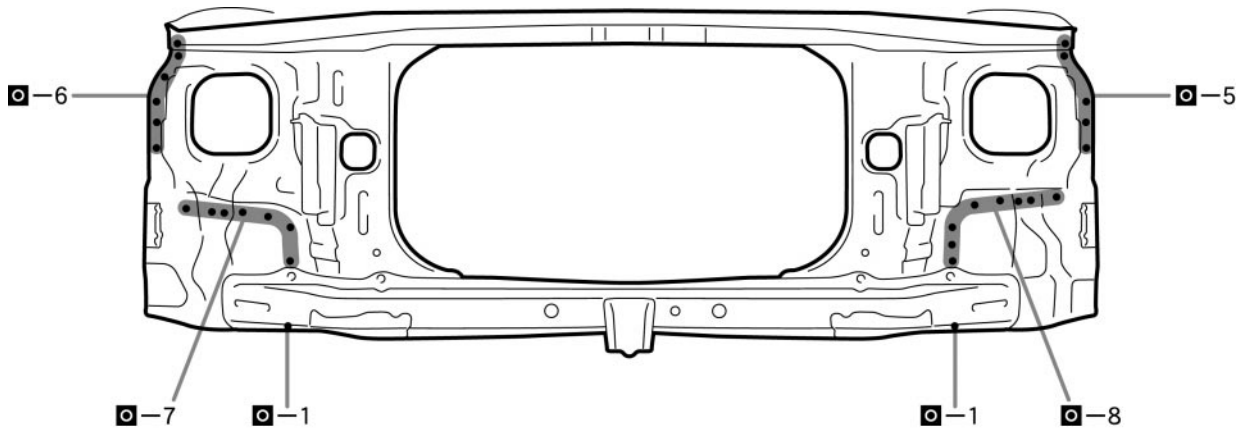
F16925A

REMOVAL



INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16926

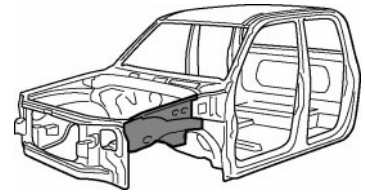
POINT

- 1 Inspect the fitting of the headlight and front fender, etc., before welding, since affects the appearance of finish.

FRONT FENDER APRON (ASSY)

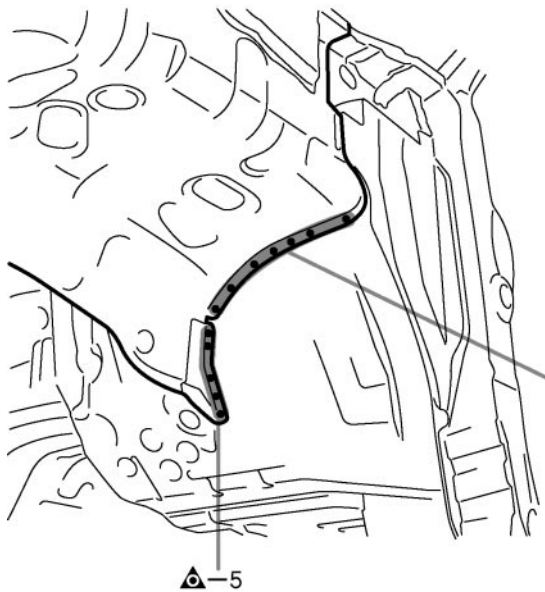
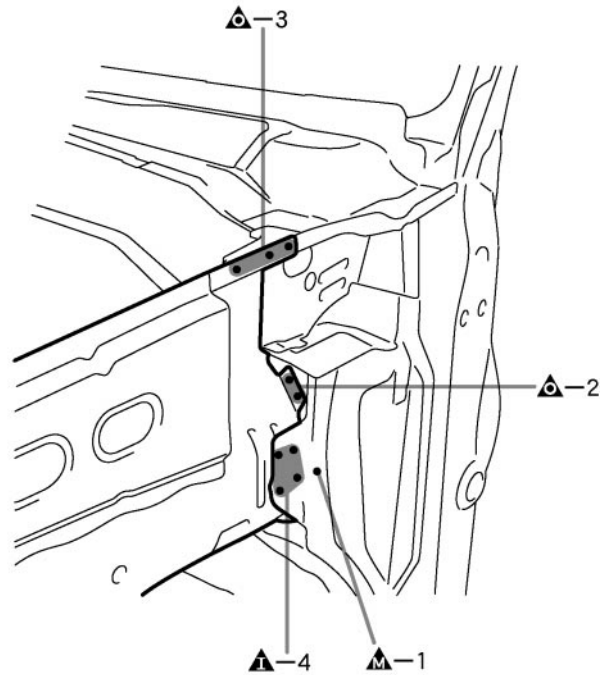
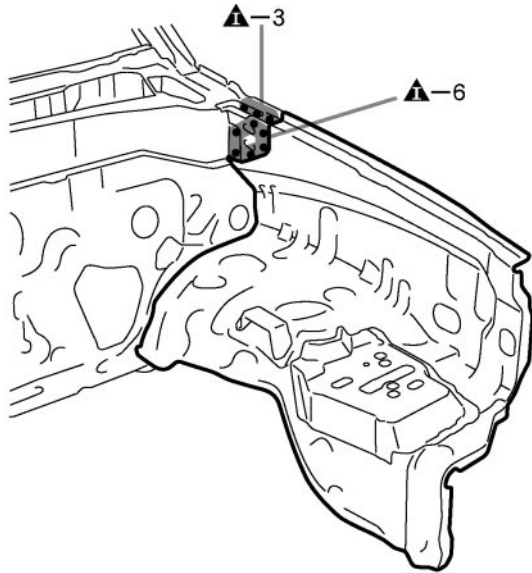
REPLACEMENT

With the radiator side support and cowl top side panel removed.



F16930A

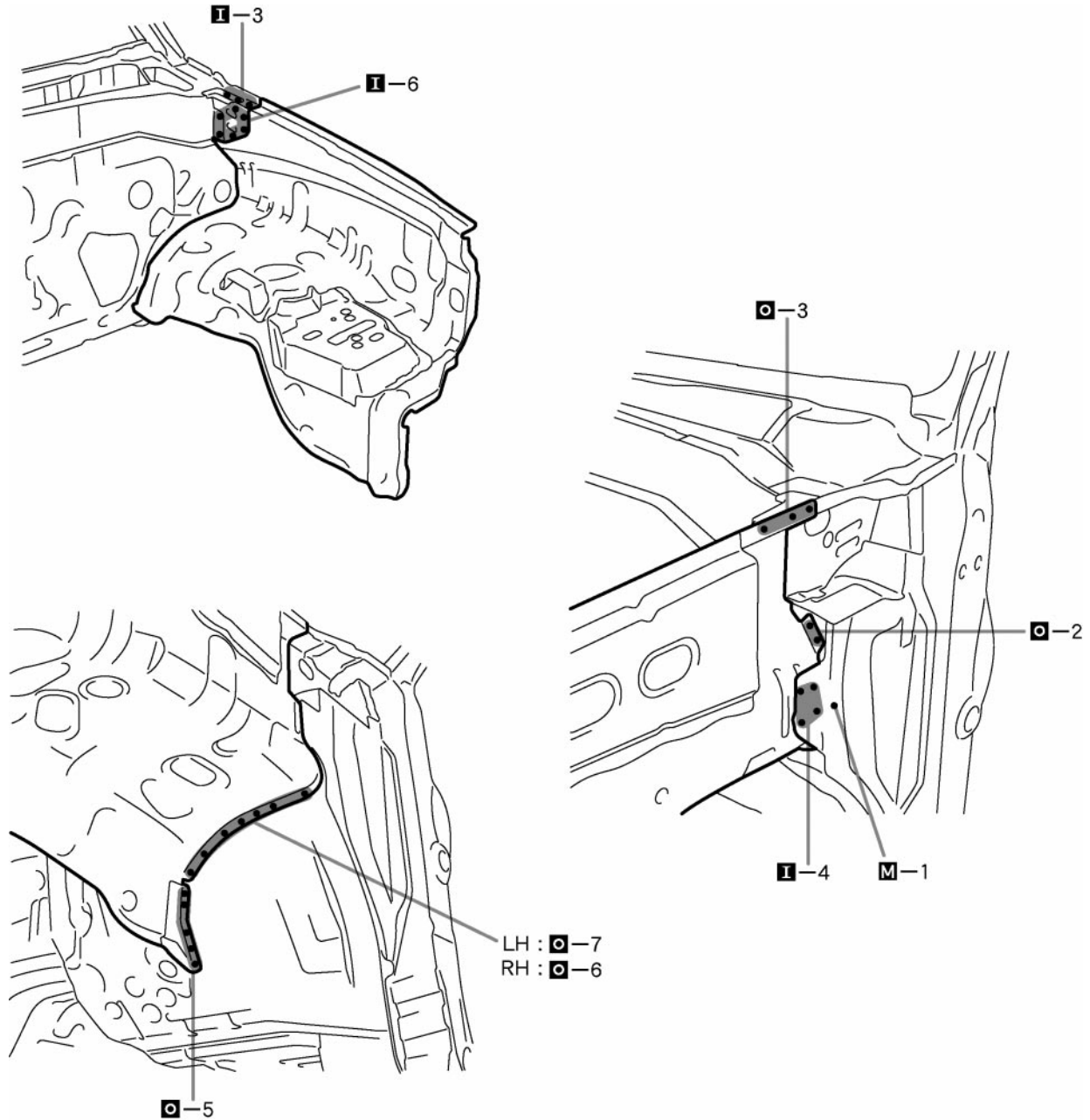
REMOVAL



LH : ▲-7
RH : ▲-6

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



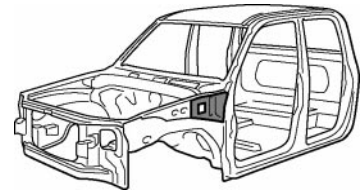
F16931

POINT

- 1 Inspect the fitting of the front fender and hood, etc., before welding, since affects the appearance of the finish.

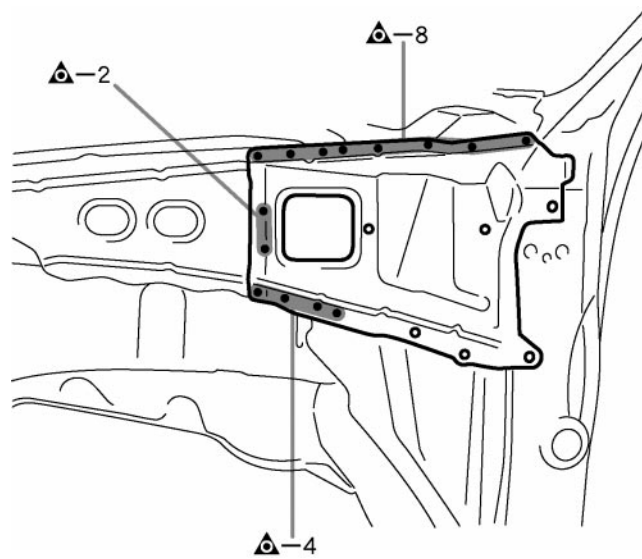
COWL TOP SIDE PANEL (ASSY)

REPLACEMENT



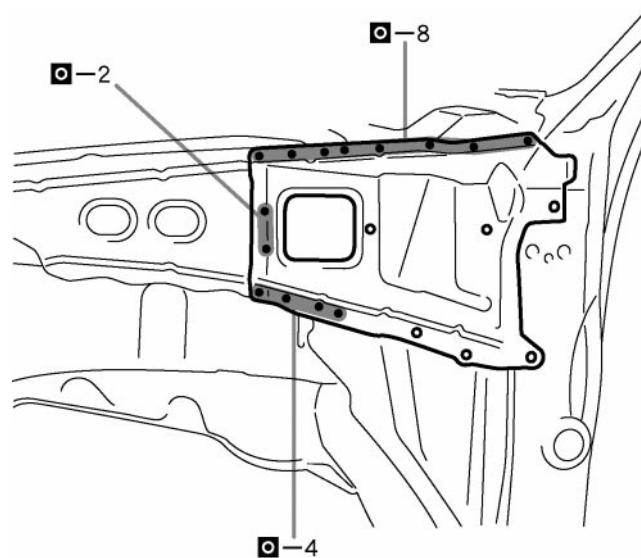
F16928A

REMOVAL



INSTALLATION

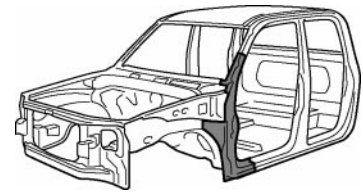
- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



FRONT BODY PILLAR (CUT)

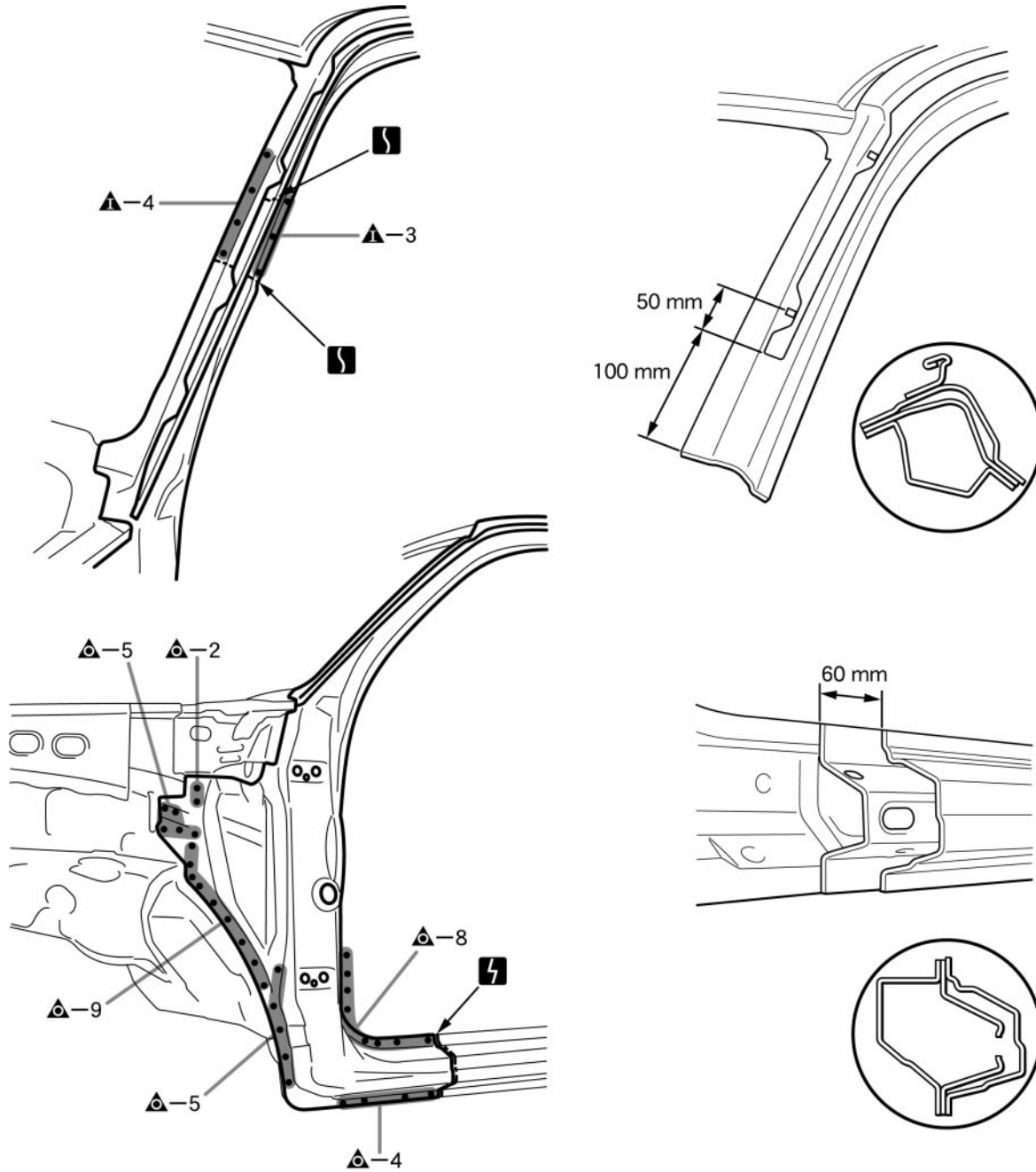
REPLACEMENT

With the cowl top side panel removed.



F16932A

REMOVAL

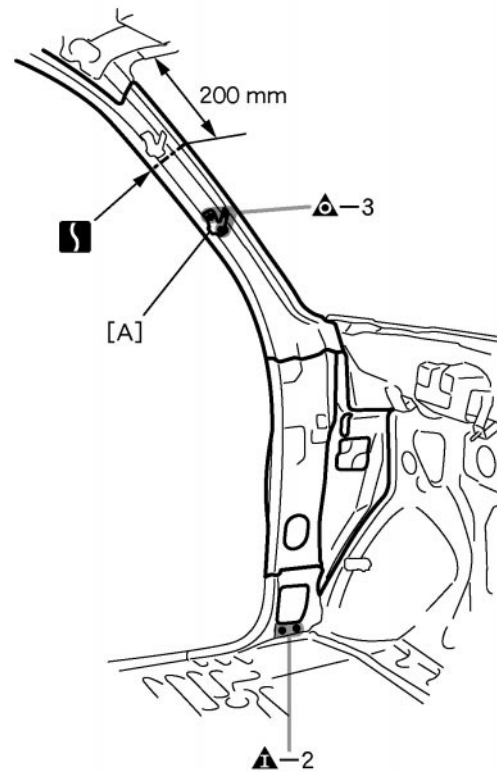
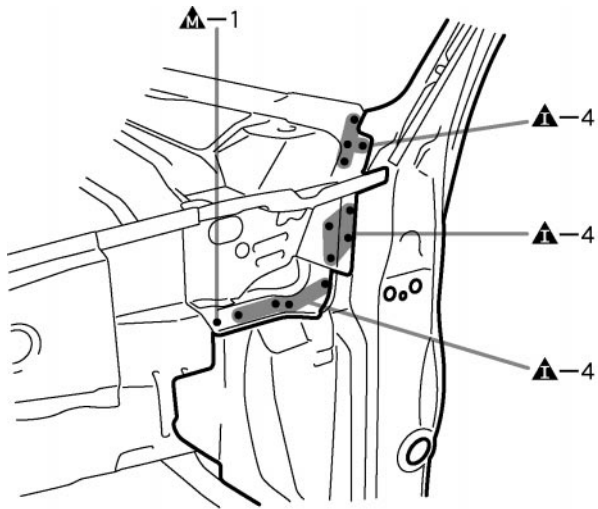


F16932

50 mm (1.97 in.)

60 mm (2.36 in.)

100 mm (3.94 in.)



F16933

POINT

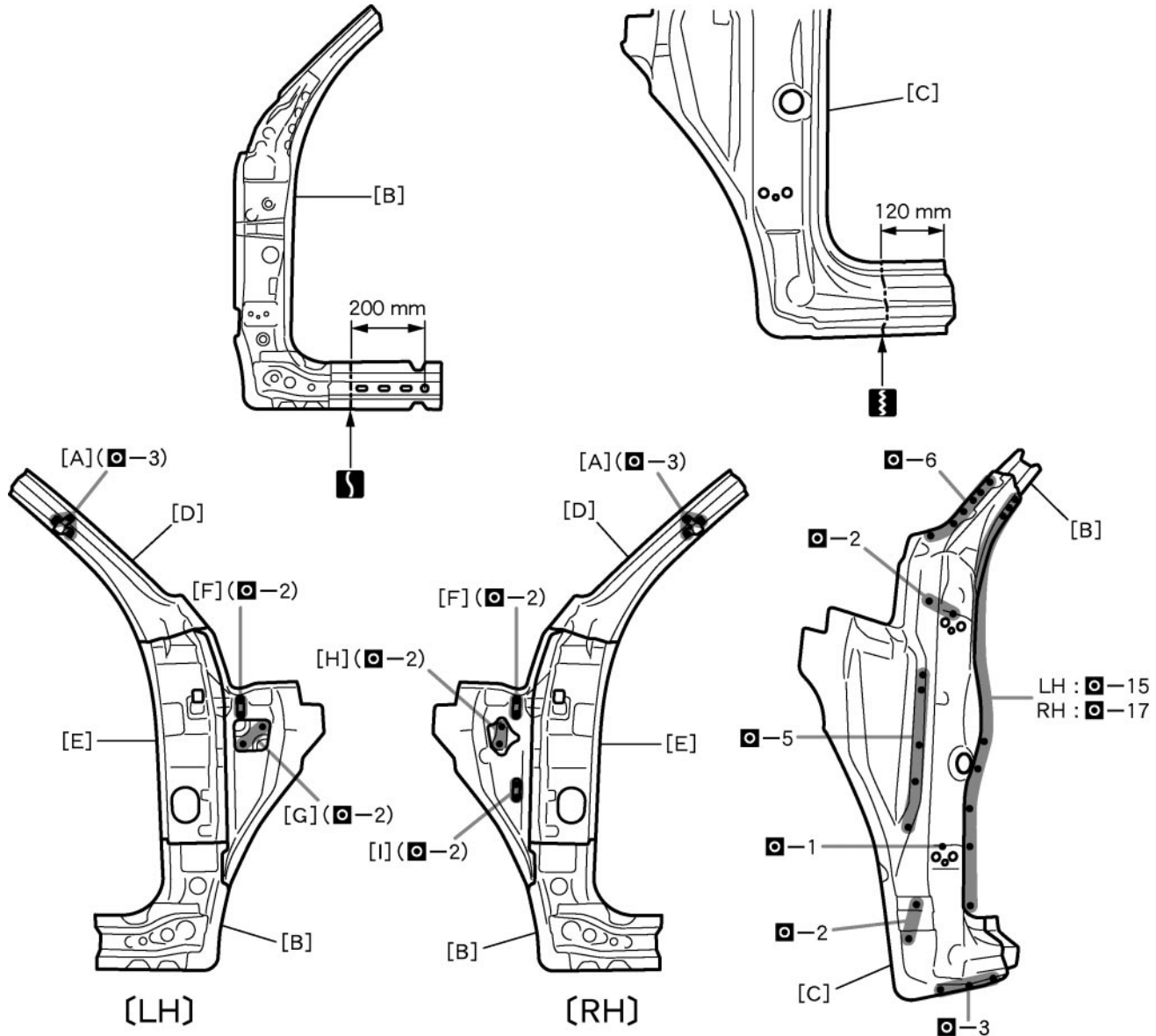
1 [A] is reuse.

PART NAME

[A] Side Panel No.1 Retainer
200 mm (7.87 in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16934

POINT

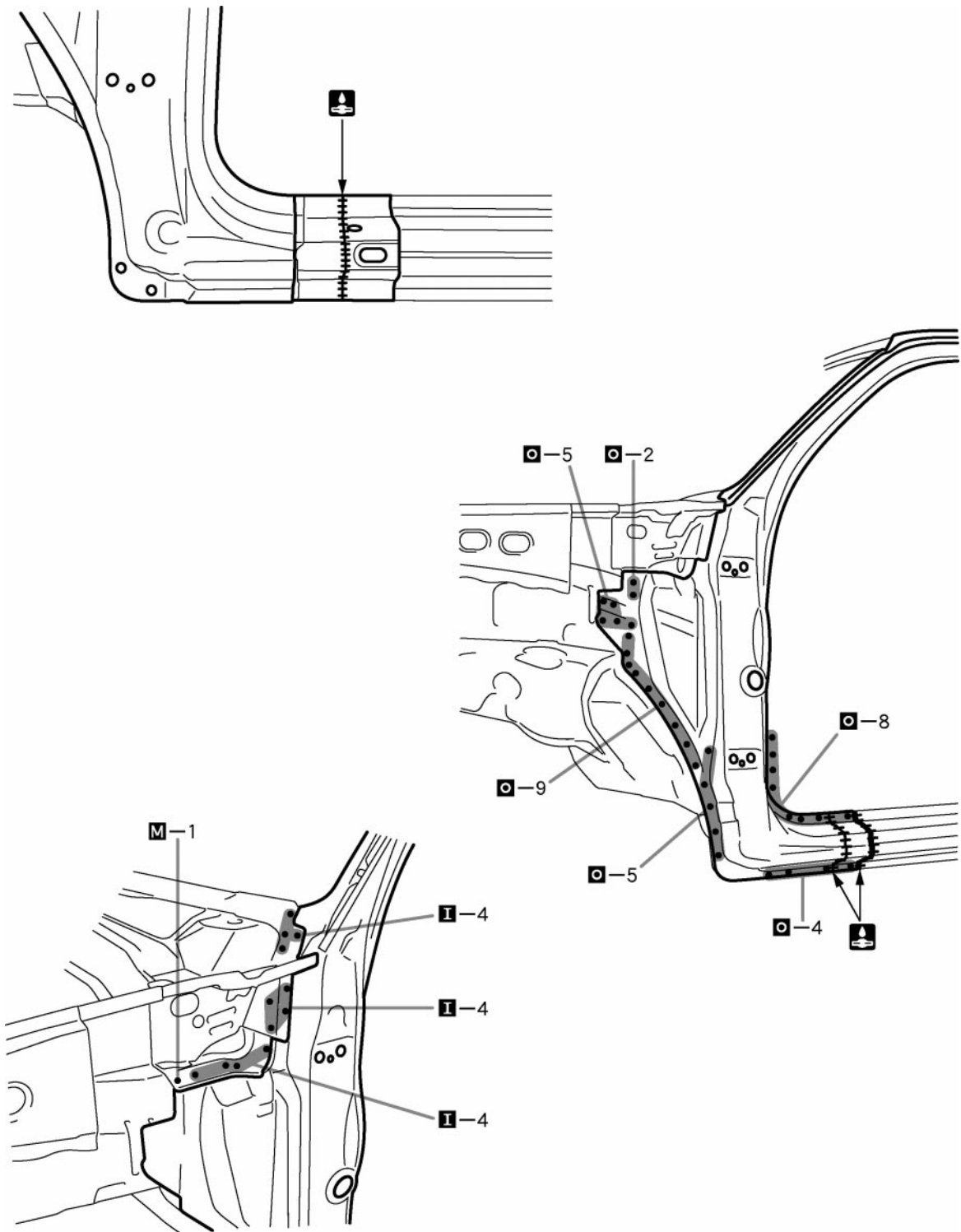
- 1 Before temporarily installing the new parts, weld the [A], [B], [C], [D], [E], [F], [G], [H] and [I] with standard points.

PART NAME

- [A] Side Panel No.1 Retainer [B] Front Body Pillar Lower Reinforce [C] Outer Panel
 [D] Front Body Upper Inner Pillar [E] Cowl Side Inner Panel
 [F] Front Pillar To Cowl Side Panel No.1 Bracket [G] Computer To Cowl Side No.5 Bracket
 [H] Fuse Box Mounting No.2 Bracket [I] Front Pillar To Cowl Side Panel No.2 Bracket

120 mm (4.72 in.)

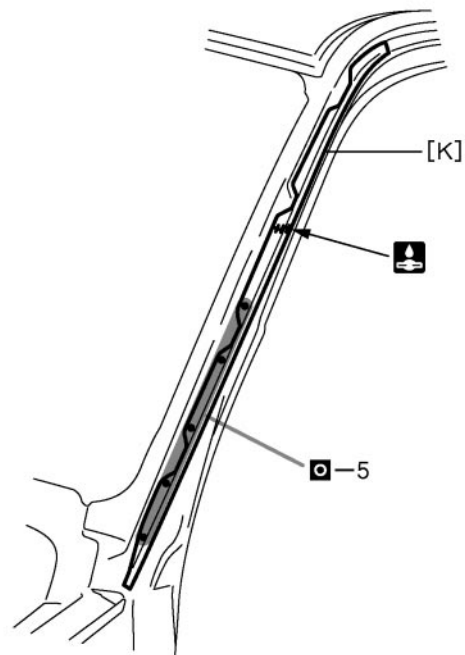
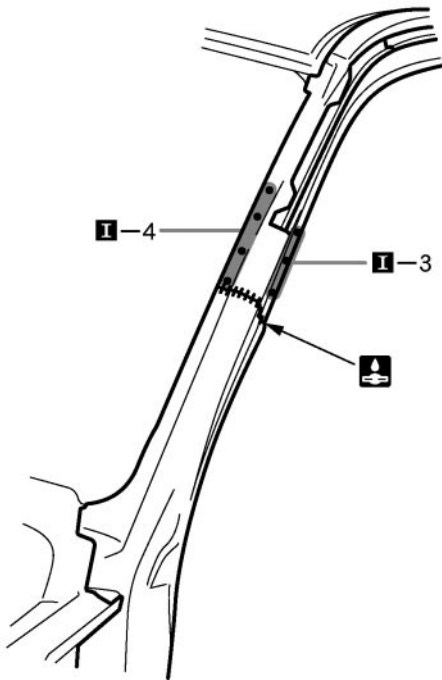
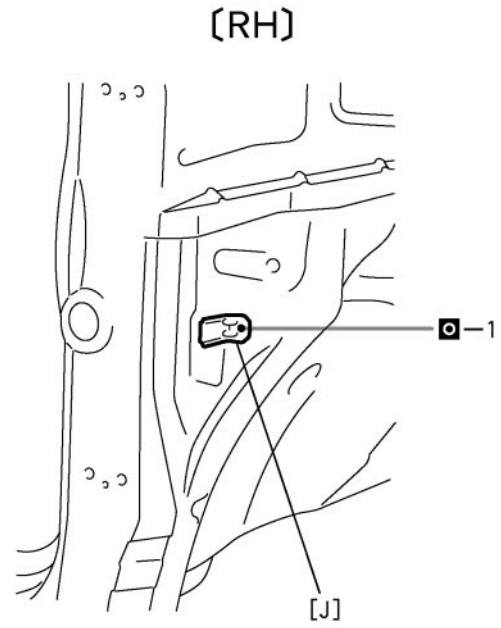
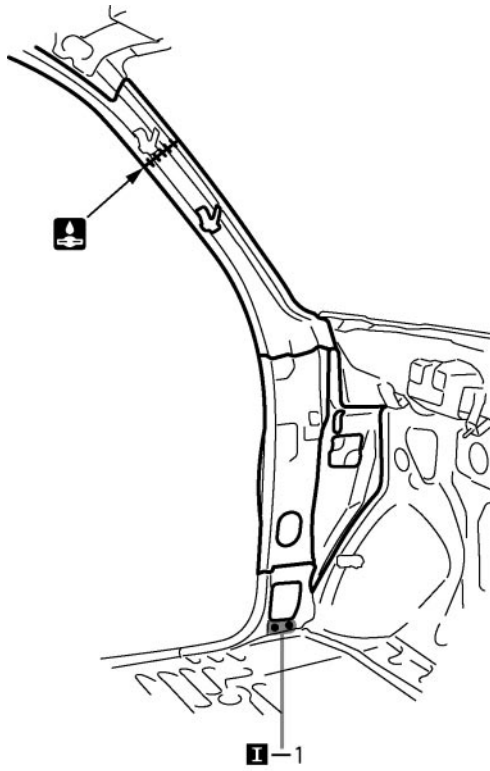
200 mm (7.87 in.)



F16935

POINT

- 1 Inspect the fitting of the front door, windshield glass and front fender, etc., before welding, since this affects the appearance of the finish.



F16936

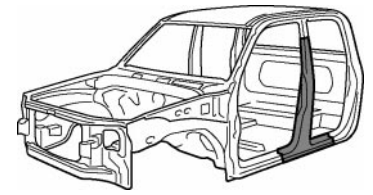
PART NAME

[J] Antenna Pole Mounting Bracket (RH Onry)

[K] Roof Drip Channel

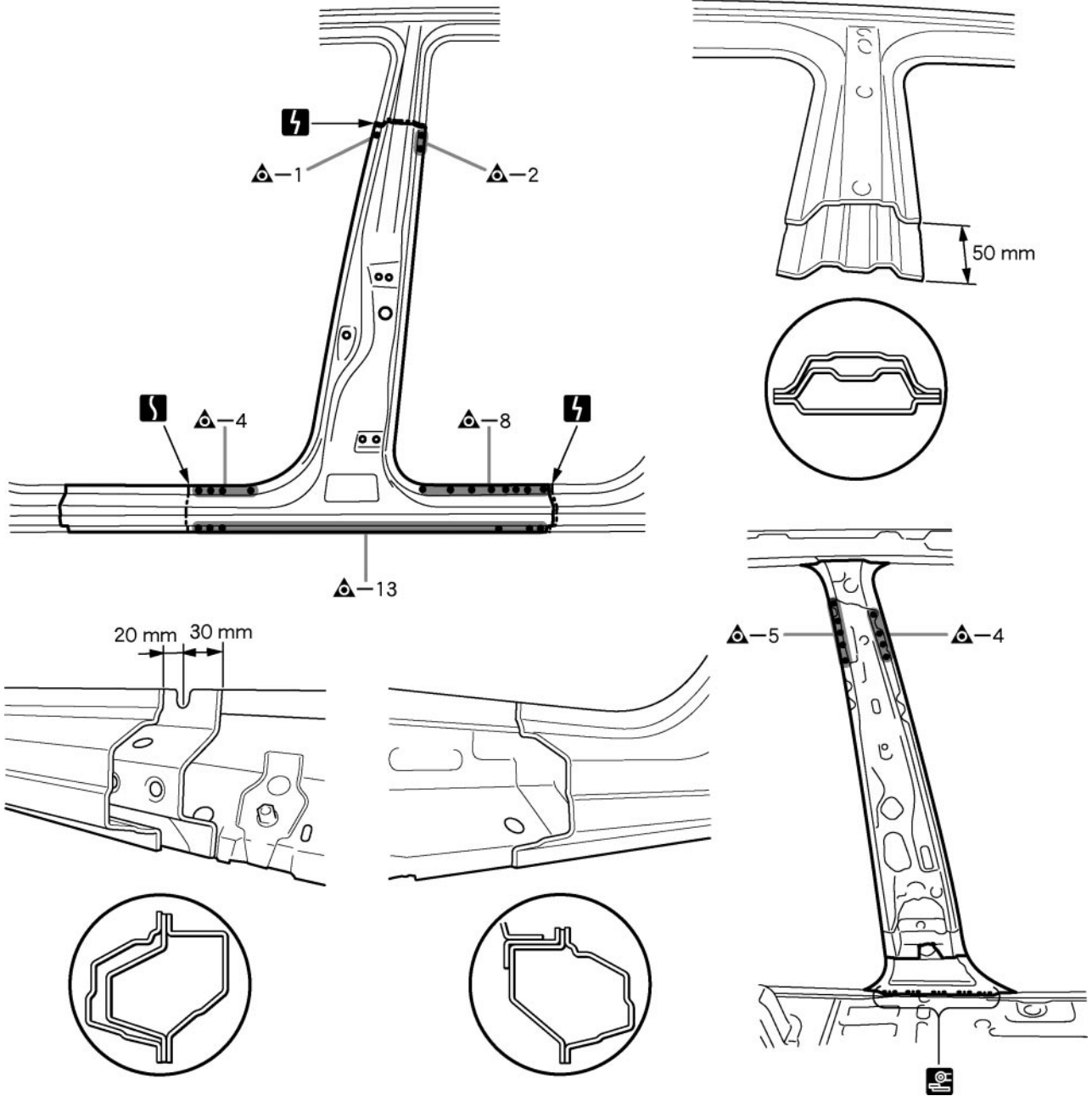
CENTER BODY PILLAR (CUT)

REPLACEMENT



F16937A

REMOVAL



F16937

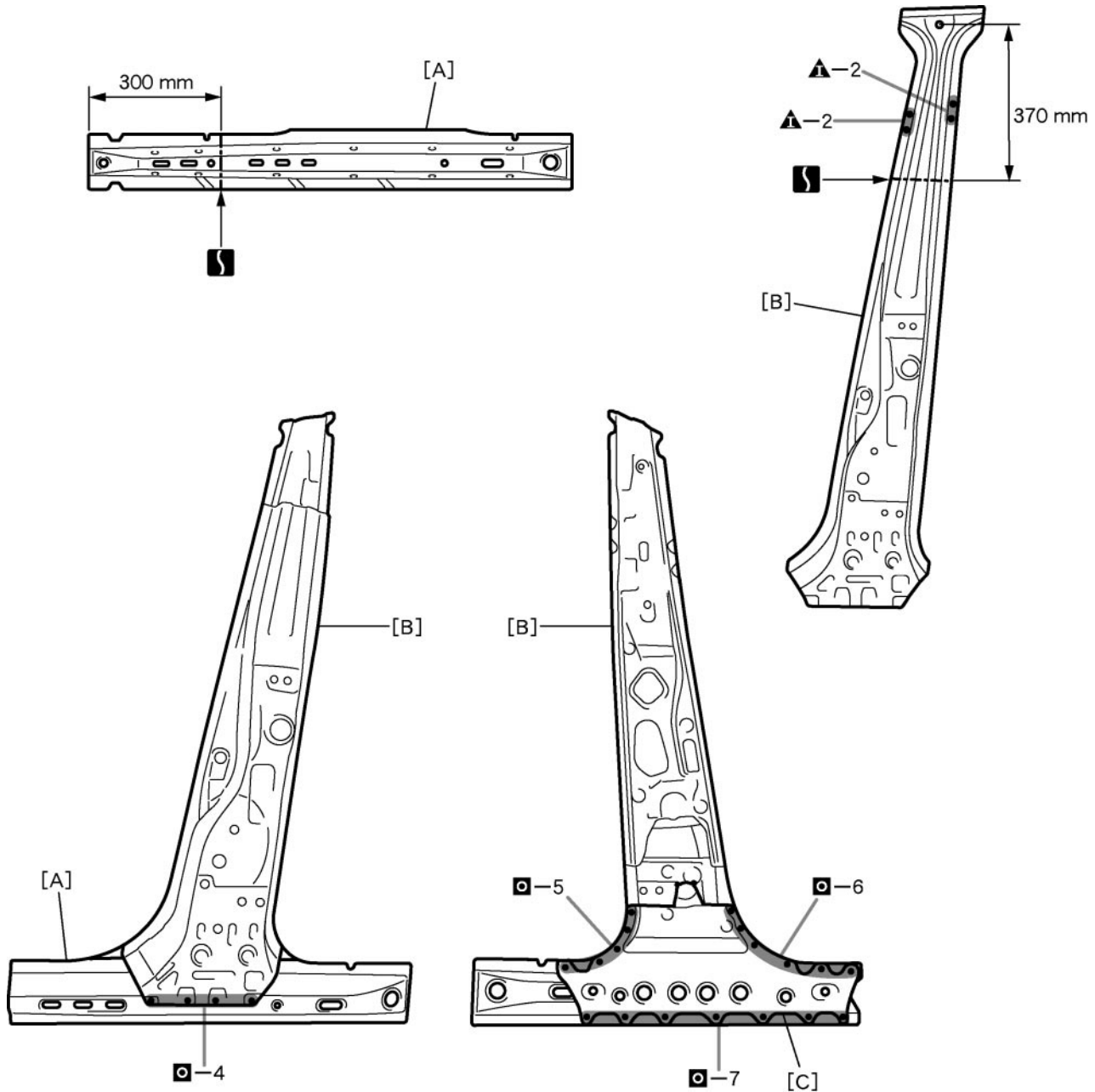
20 mm (0.79 in.)

30 mm (1.18 in.)

50 mm (1.97 in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16938

POINT

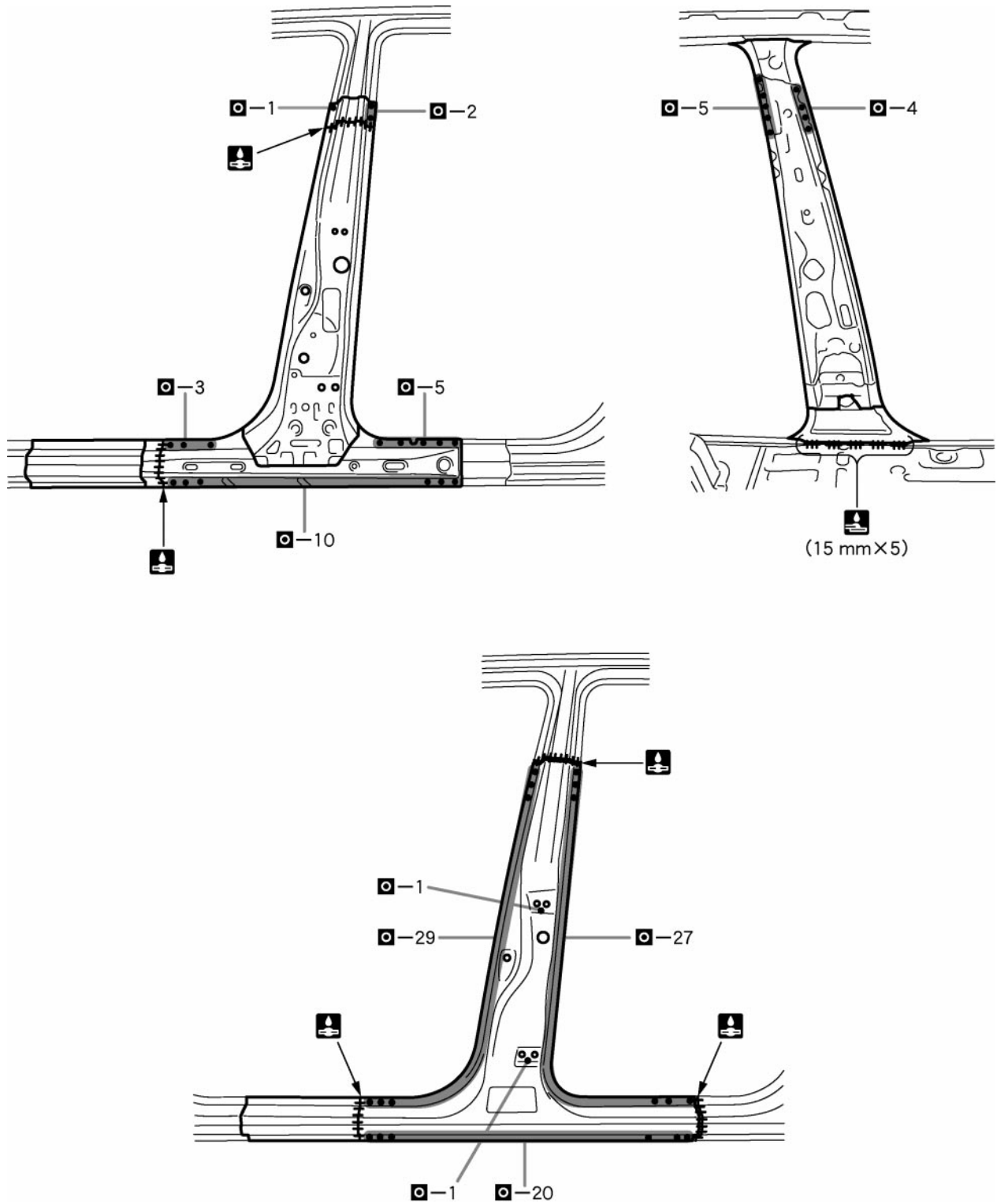
1 Before temporarily installing the new parts, weld the [A], [B] and [C] with standard points.

PART NAME

[A] Rocker Panel Reinforcement [B] Center Body Pillar Upper Reinforce

[C] Center Body Pillar Lower Reinforce

300 mm (11.81 in.) 370 mm (14.57 in.)



F16939

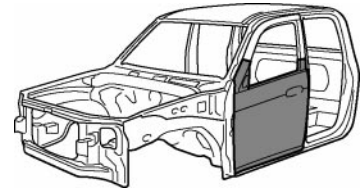
POINT

- 1 Inspect the fitting of the front door and rear door, etc., before welding, since this affects the appearance of the finish.
- 2 After welding the reinforcement to the vehicle side, install the outer panel.

15 mm (0.59 in.)

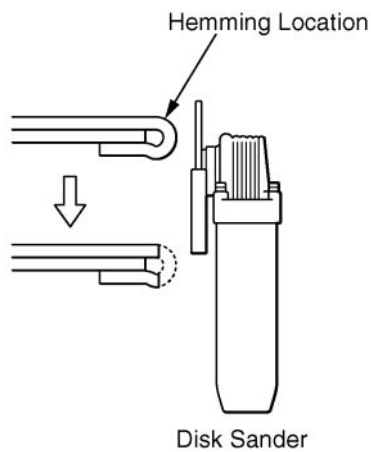
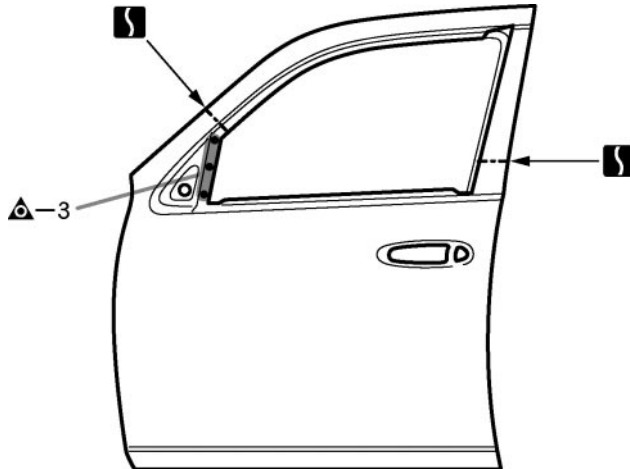
FRONT DOOR OUTER PANEL (CUT)

REPLACEMENT



F16948A

REMOVAL



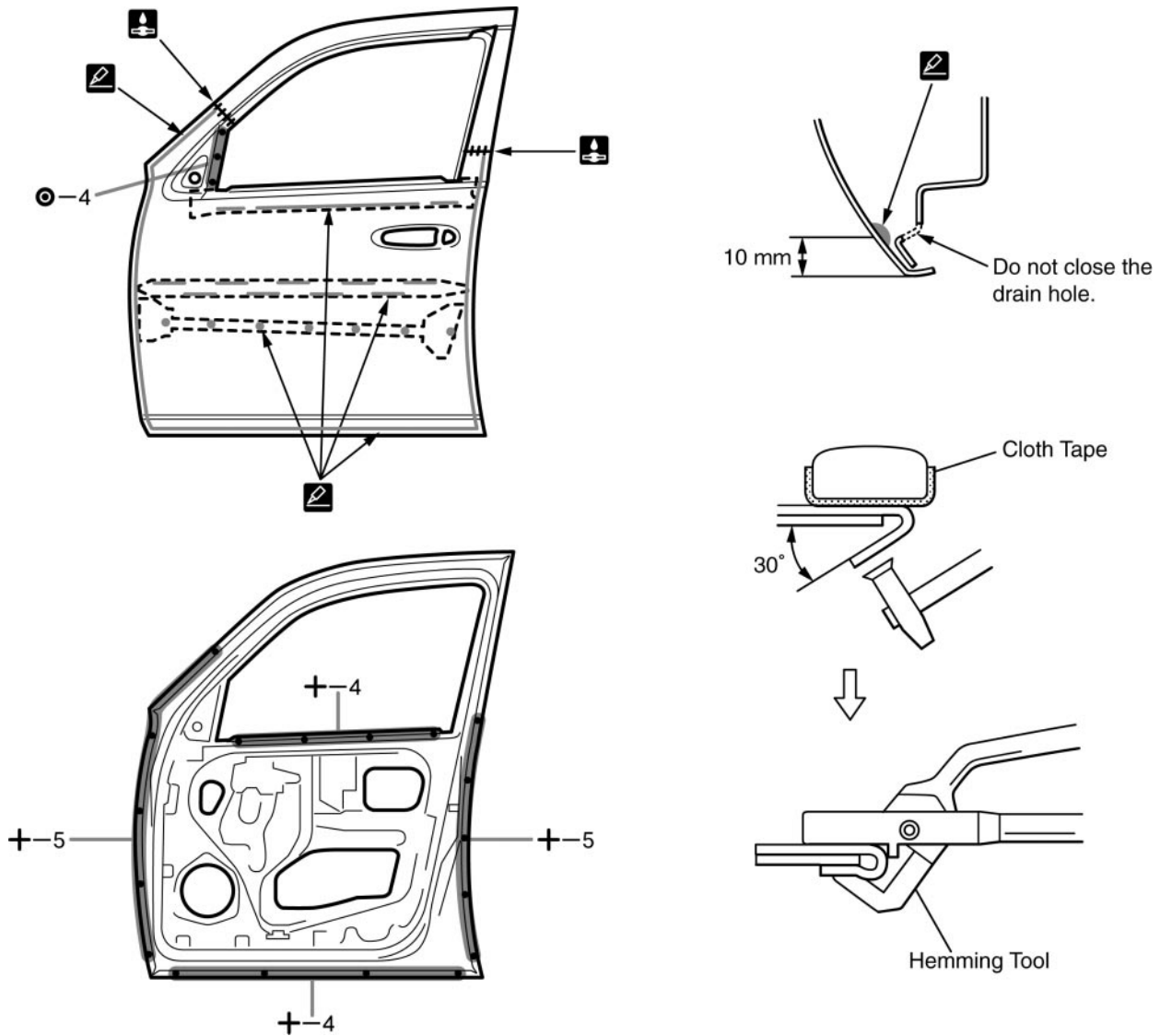
F16948

POINT

- 1 After grinding off the hemming location, remove the outer panel.

INSTALLATION

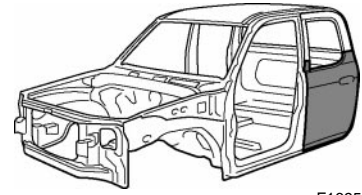
- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



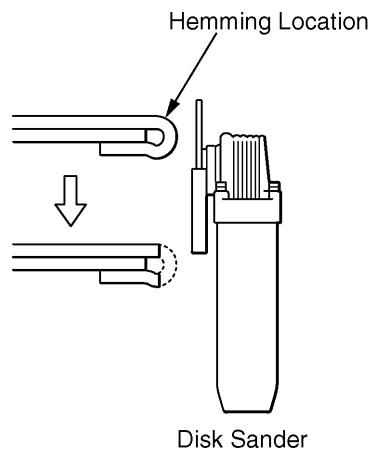
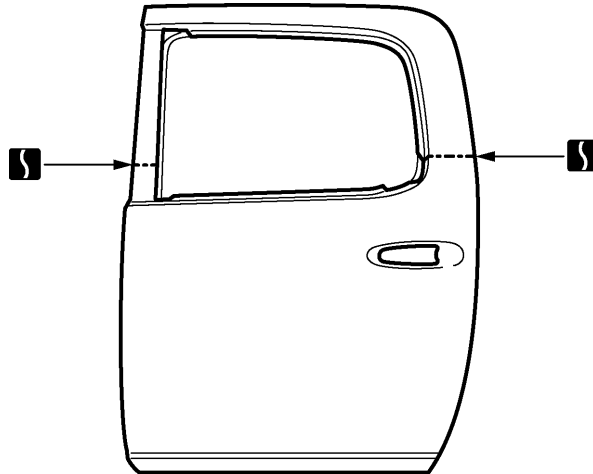
F16949

POINT

- 1 Before temporarily installing the new parts, apply body sealer to the reinforcement, side impact protection beam and back side of the new parts.
HINT:
 - 1) Apply sealer evenly about 10 mm (0.39 in.) from the flange and 3 mm (0.12 in.) in diameter to the outer panel and apply just enough sealer for the reinforcement and side impact protection beam to make contact.
- 2 Bend the flange hem about 30° with a hammer and dolly, then fasten tightly with a hemming tool.
HINT:
 - 1) Perform hemming in three steps, being careful not to warp the panel.
 - 2) If a hemming tool cannot be used, hem with a hammer and dolly.

REAR DOOR OUTER PANEL (CUT)**REPLACEMENT**

F16950A

REMOVAL

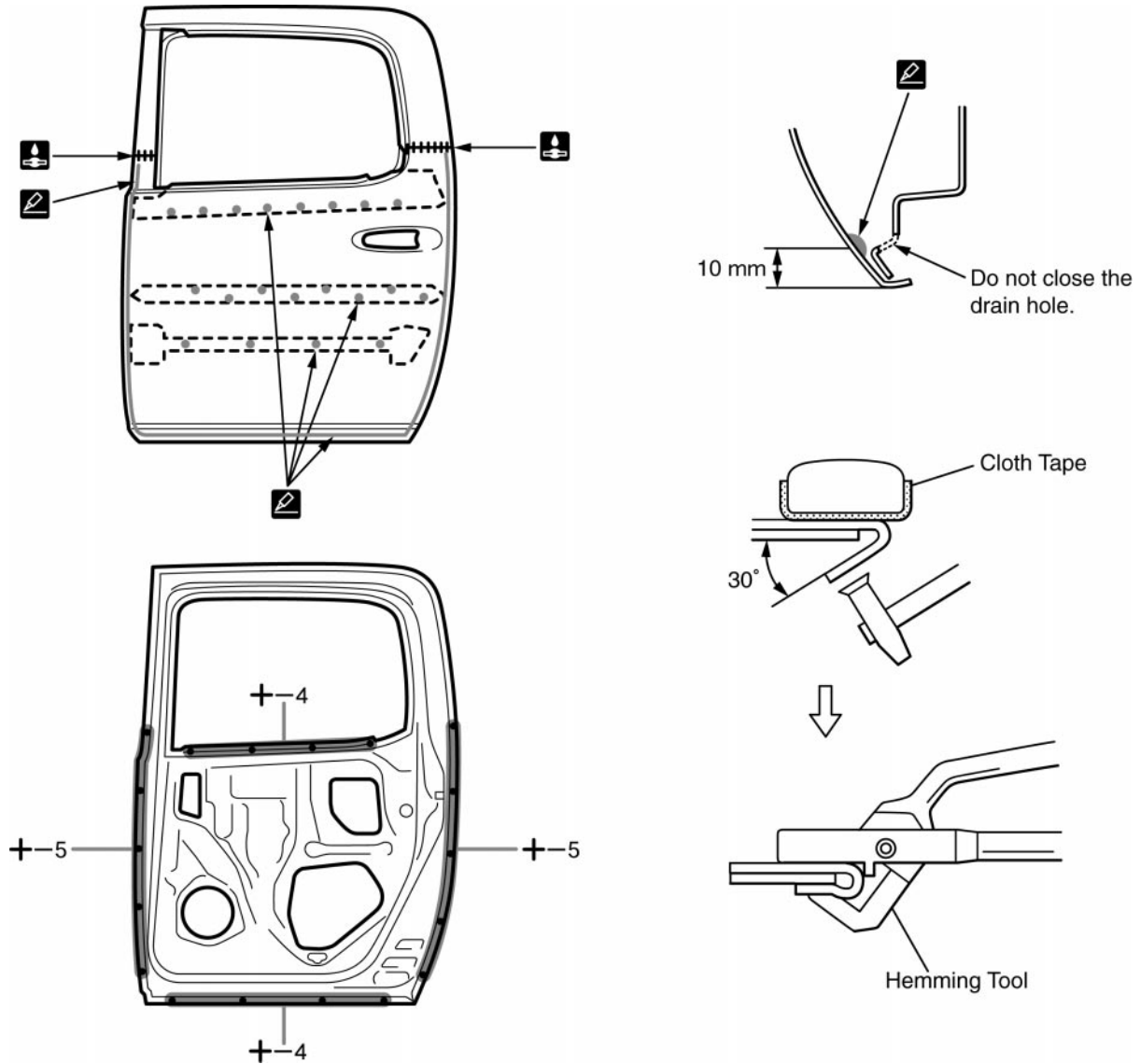
F16950

POINT

- 1 After grinding off the hemming location, remove the outer panel.

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



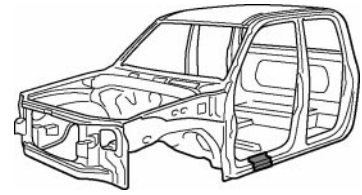
F16951

POINT

- 1 Before temporarily installing the new parts, apply body sealer to the reinforcement, side impact protection beam and back side of the new parts.
HINT:
 - 1) Apply sealer evenly about 10 mm (0.39 in.) from the flange and 3 mm (0.12 in.) in diameter to the outer panel and apply just enough sealer for the reinforcement and side impact protection beam to make contact.
- 2 Bend the flange hem about 30° with a hammer and dolly, then fasten tightly with a hemming tool.
HINT:
 - 1) Perform hemming in three steps, being careful not to warp the panel.
 - 2) If a hemming tool cannot be used, hem with a hammer and dolly.

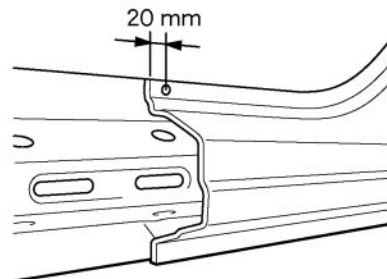
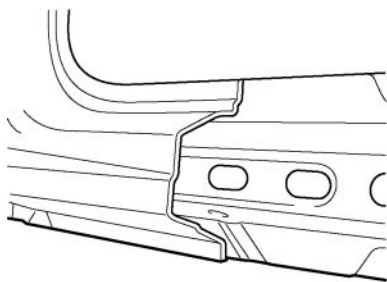
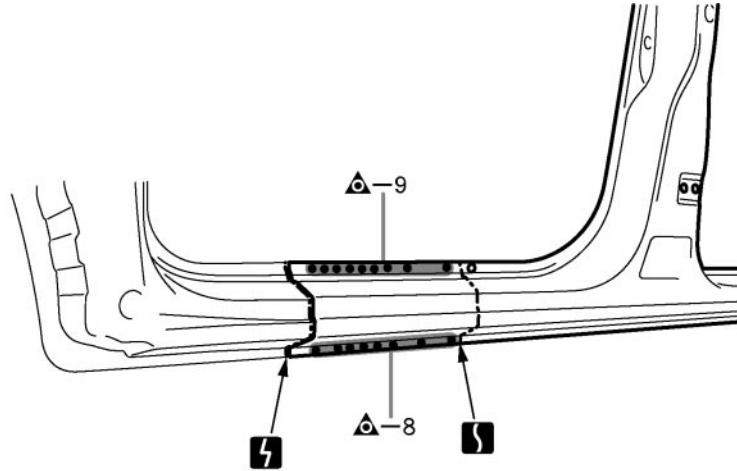
ROCKER PANEL (CUT-H)

REPLACEMENT



F16940A

REMOVAL

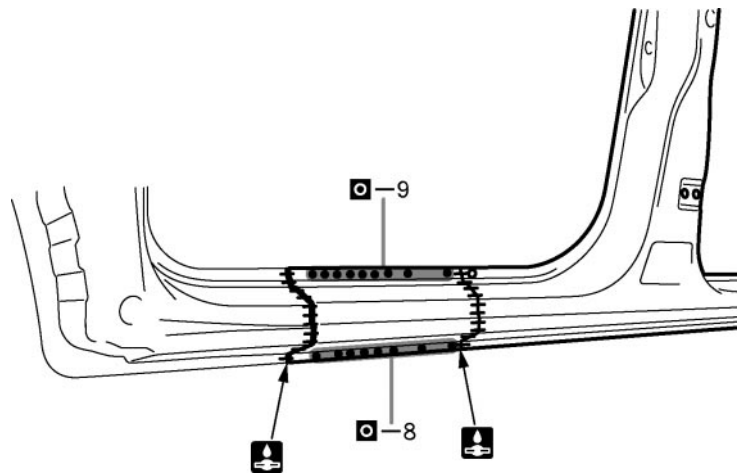


F16940

20 mm (0.79 in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



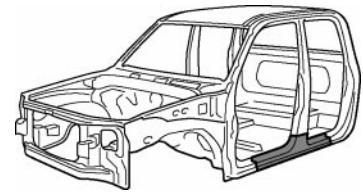
F16941

POINT

- 1 Inspect the fitting of the front door, etc., before welding, since this affects the appearance of the finish.

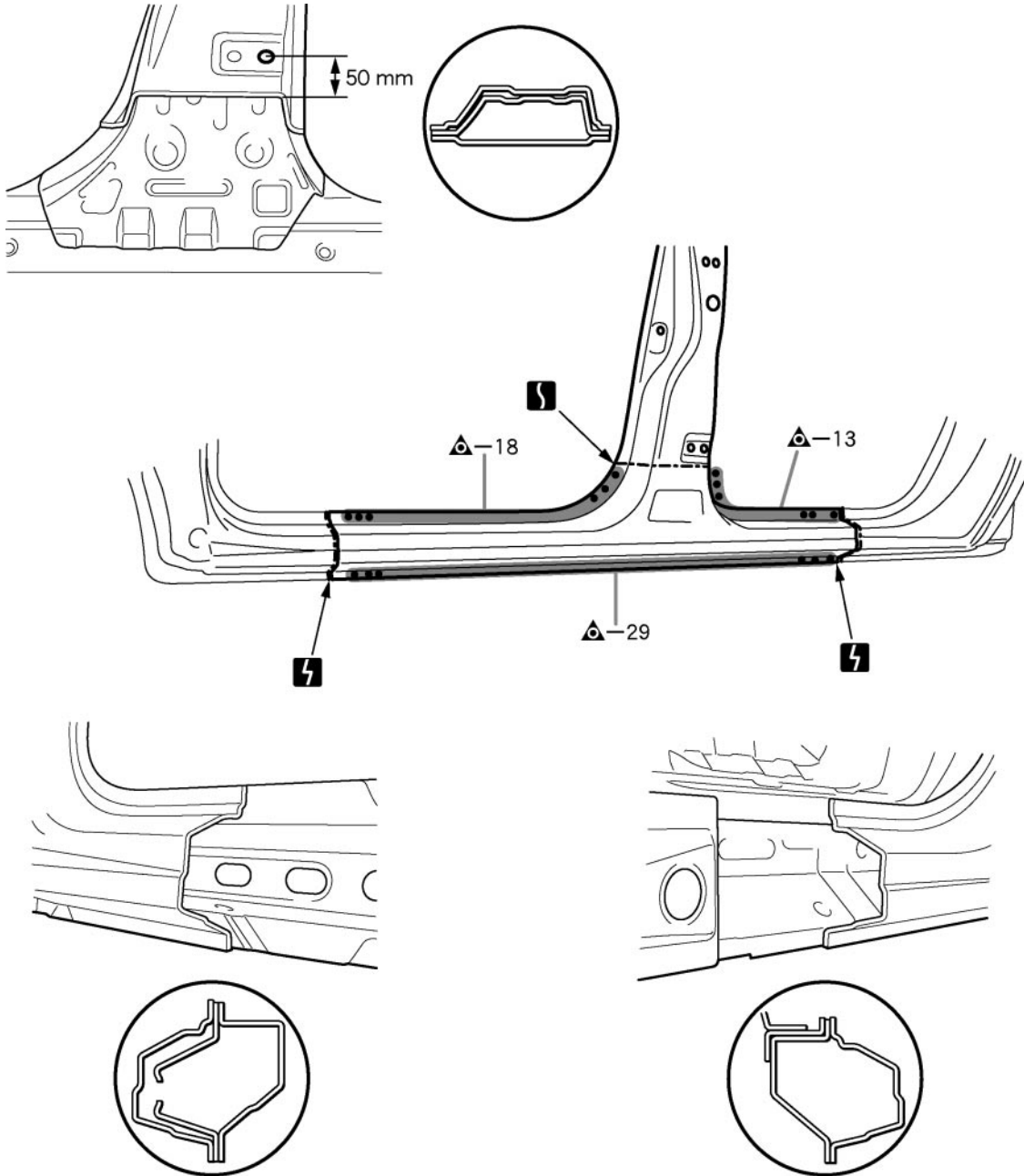
ROCKER PANEL (CUT)

REPLACEMENT



F16942A

REMOVAL

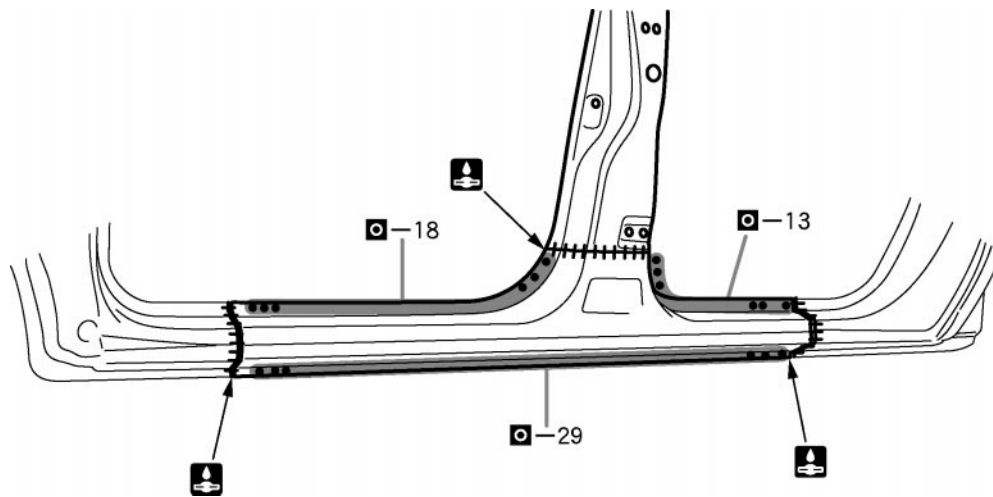


F16942

50 mm (1.97 in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



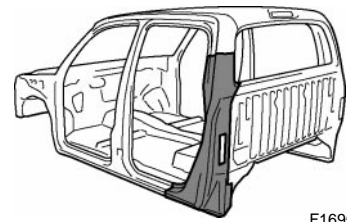
F16943

POINT

- 1 Inspect the fitting of the front door and rear door, etc., before welding, since this affects the appearance of the finish.

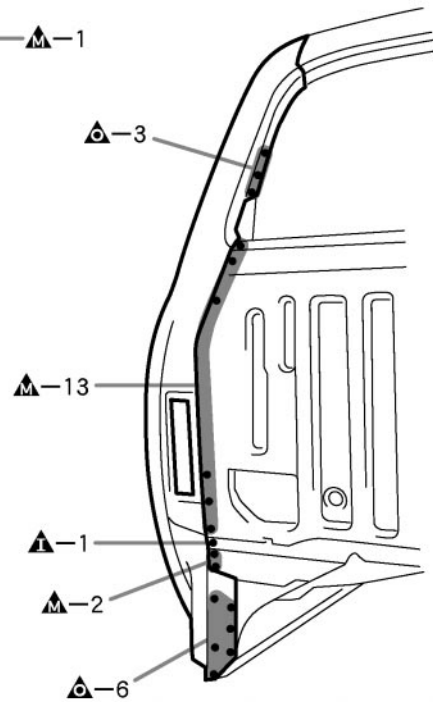
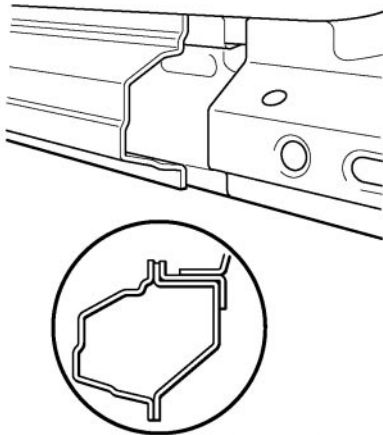
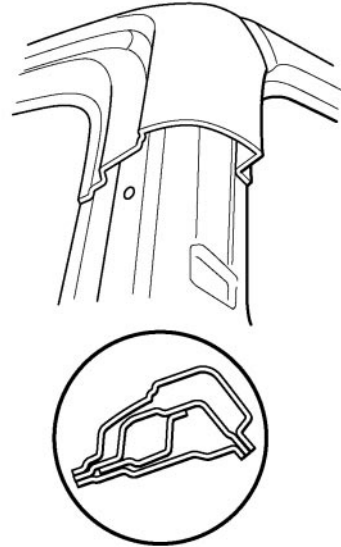
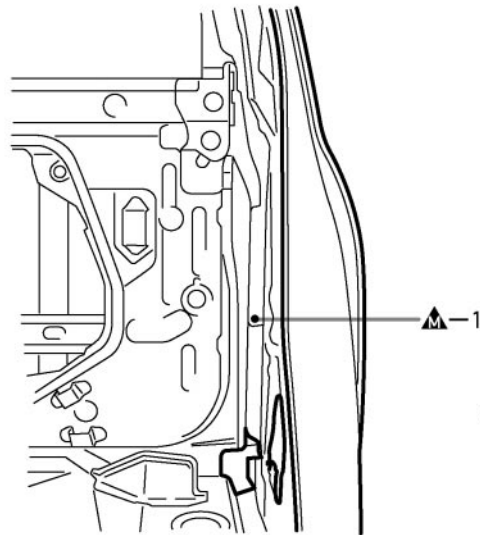
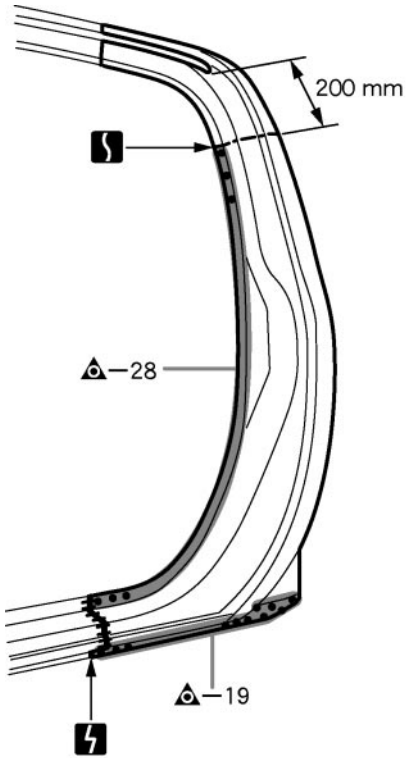
QUARTER PANEL (CUT)

REPLACEMENT



F16952A

REMOVAL

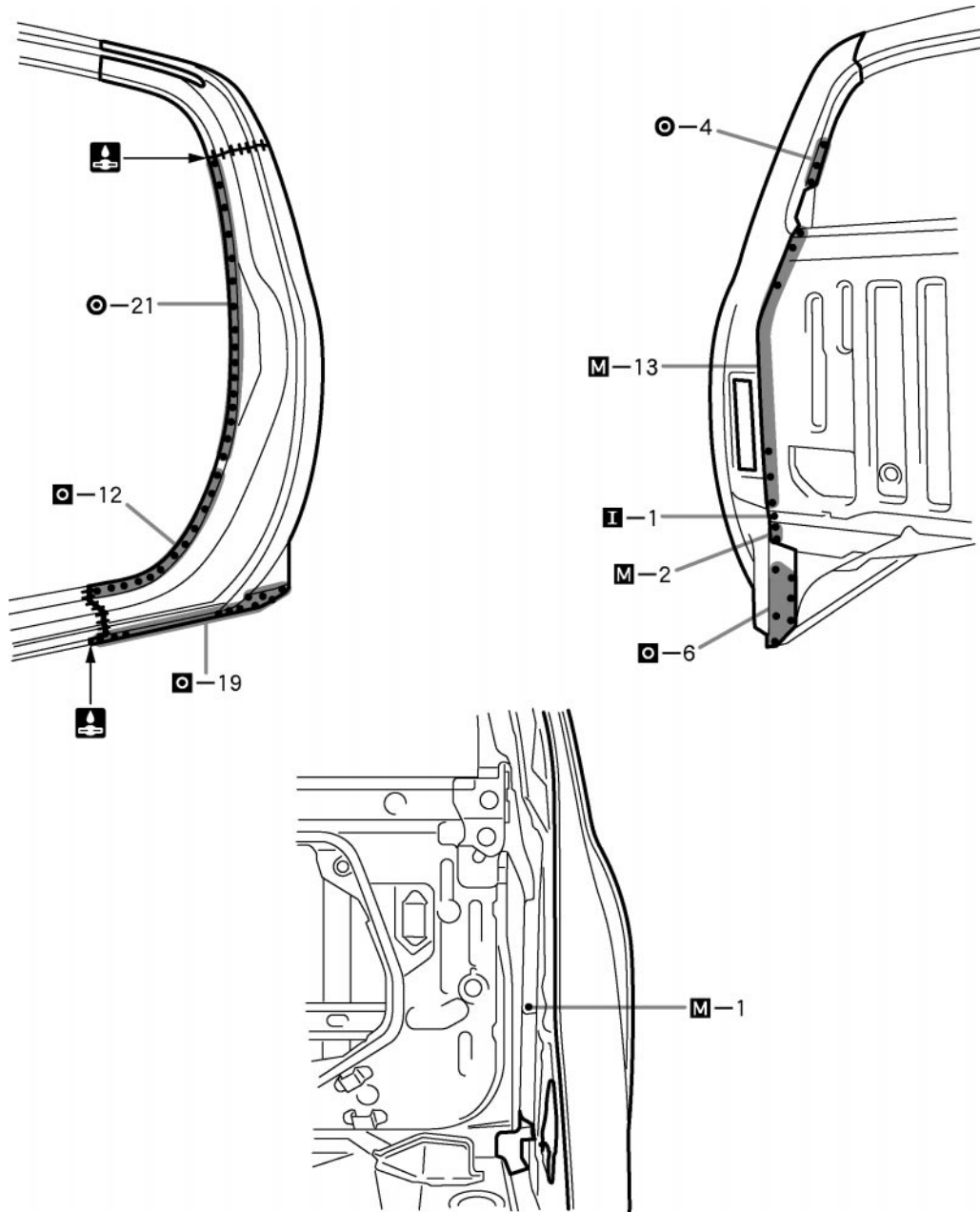


F16952

200 mm (7.87 in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16953

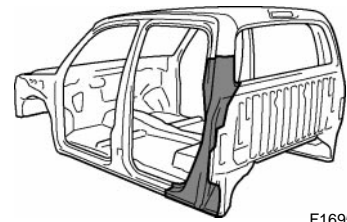
POINT

- 1 Inspect the fitting of the rear door and back window glass, etc., before welding, since this affects the appearance or the finish.

QUARTER PANEL REINFORCEMENT (CUT)

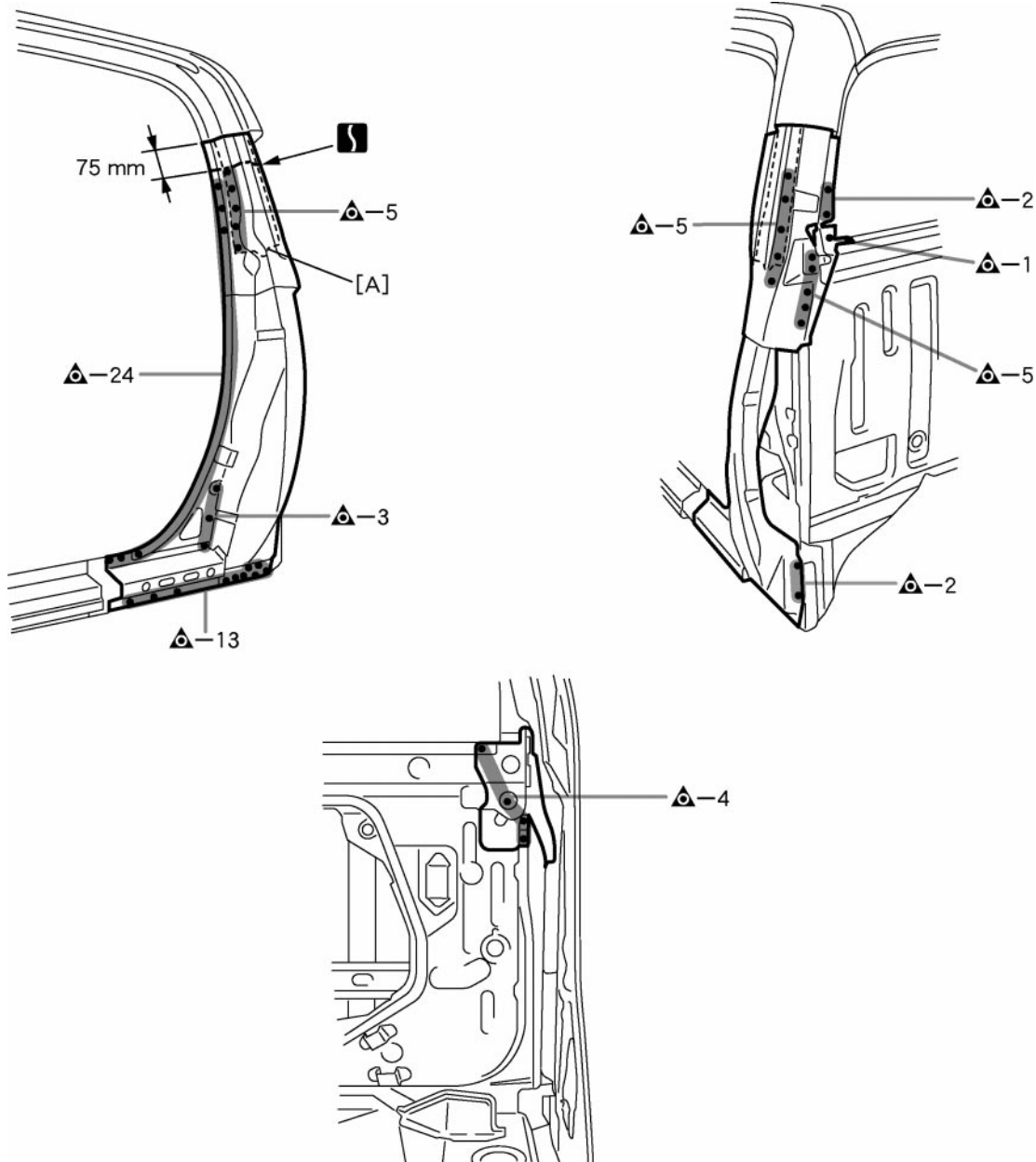
REPLACEMENT

With the quarter panel removed.



F16954A

REMOVAL



F16954

POINT

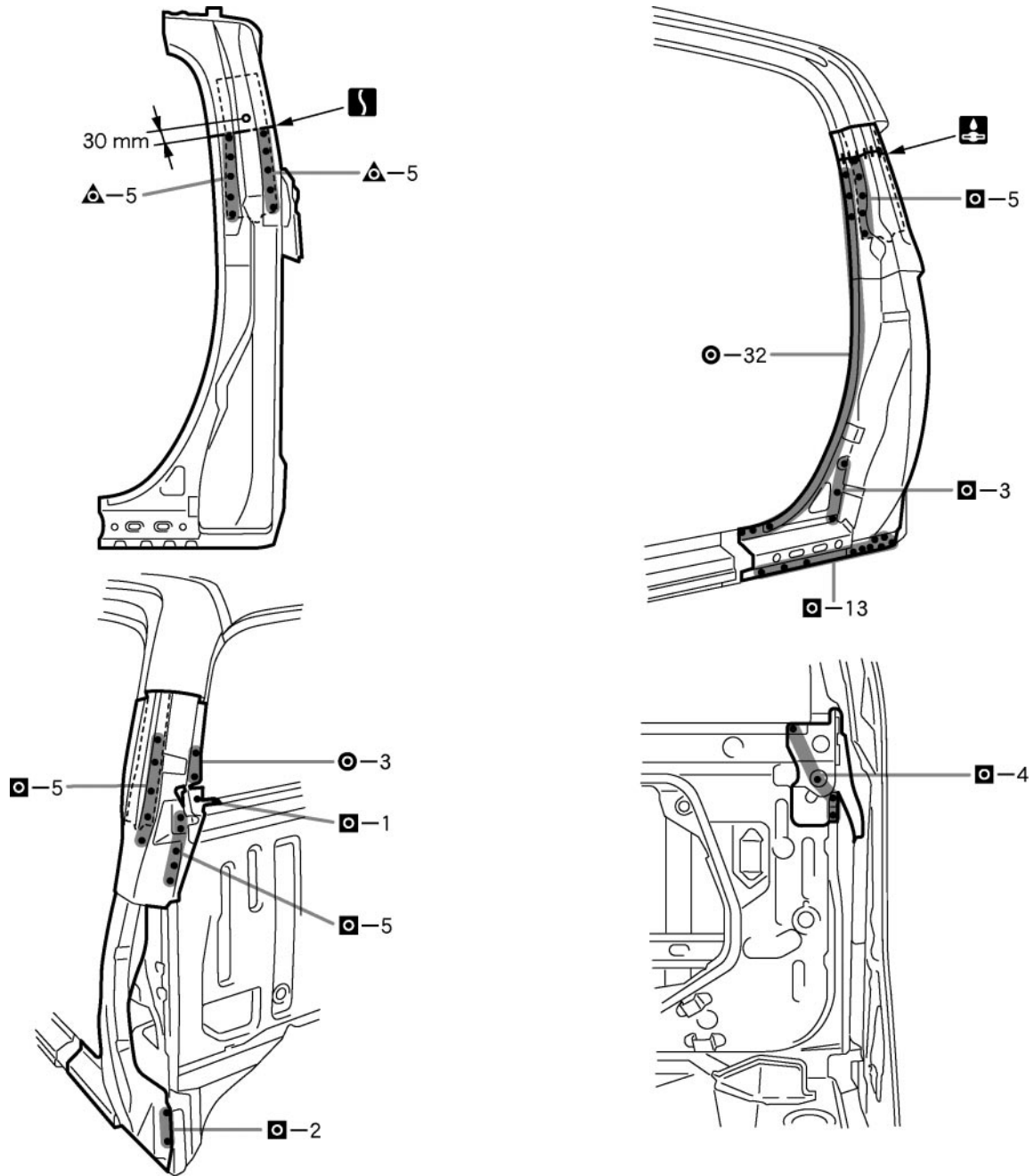
- 1 Leave the [A] to the vehicle side.
- 2 Take care not to damage the internal reinforcement.

PART NAME

[A] Quarter Lock Pillar Upper Reinforcement
75 mm (2.95 in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16955

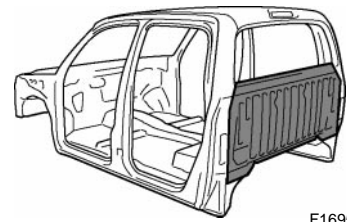
POINT

- 1 Take care not to damage the internal reinforcement.

30 mm (1.18 in.)

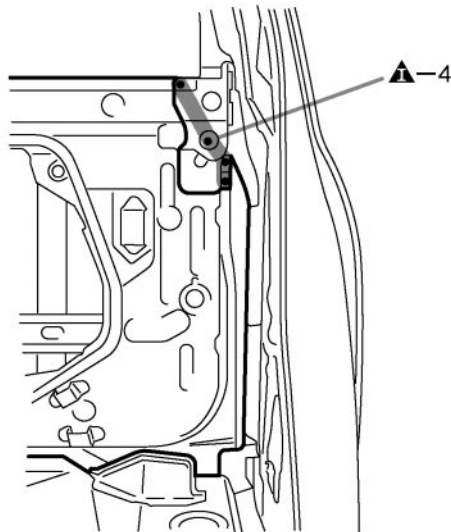
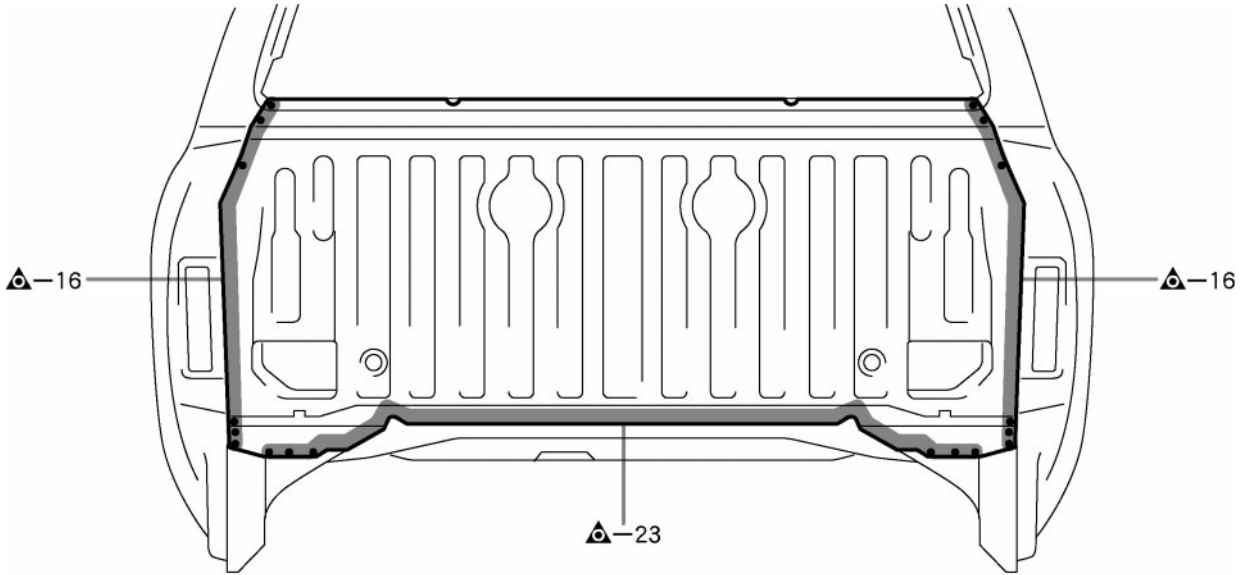
BACK PANEL (ASSY)

REPLACEMENT



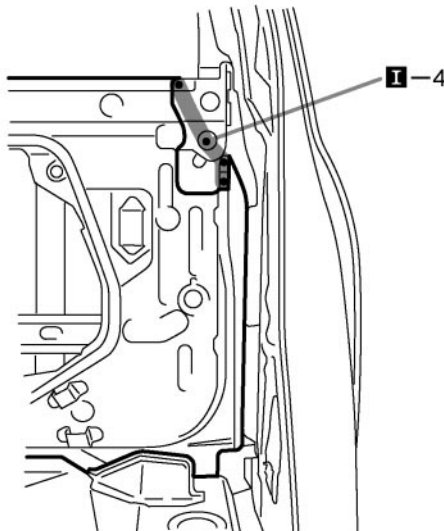
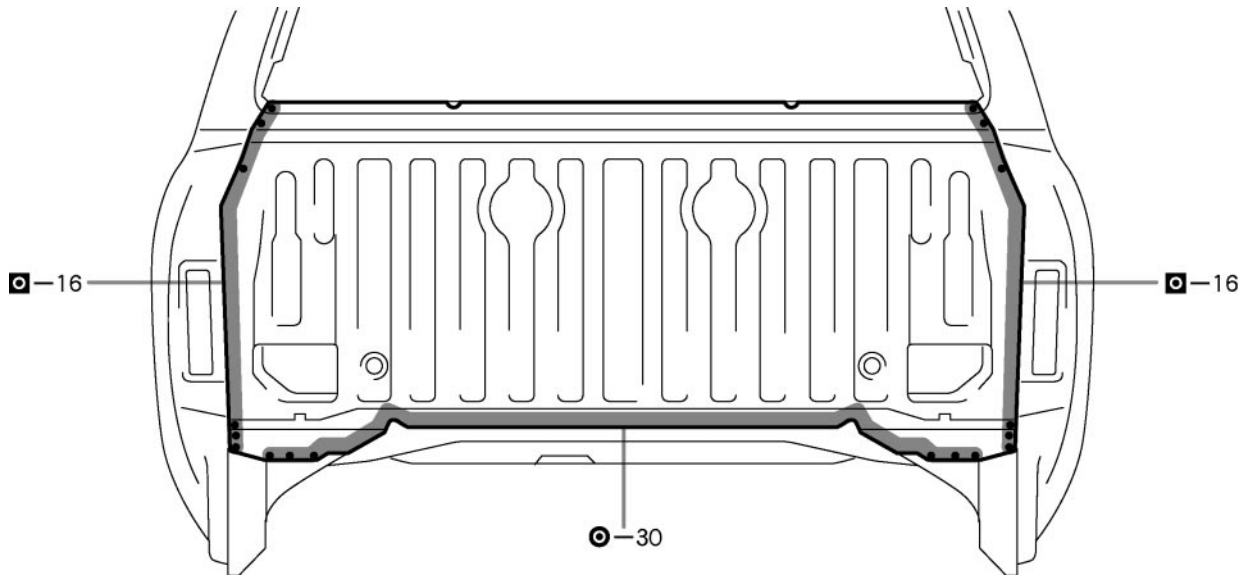
F16956A

REMOVAL



INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



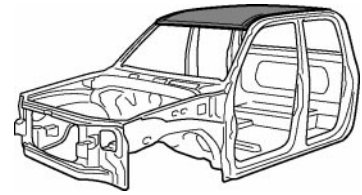
F16957

POINT

- 1 Inspect the fitting of the back window glass etc., before welding, since this affects the appearance of the finish.

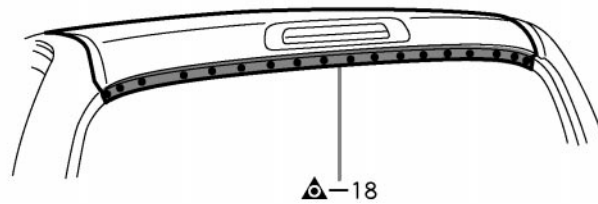
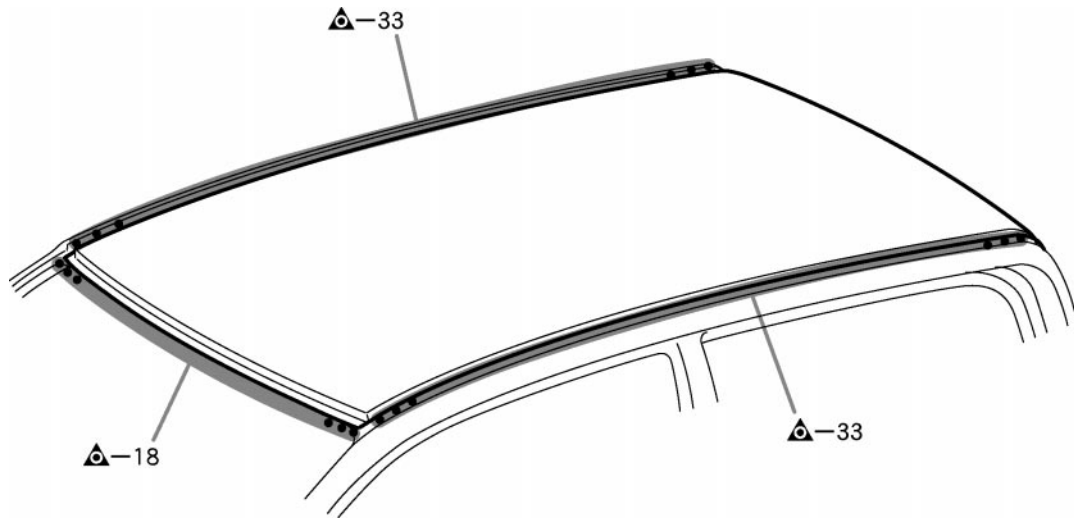
ROOF PANEL (ASSY): w/o sun roof

REPLACEMENT



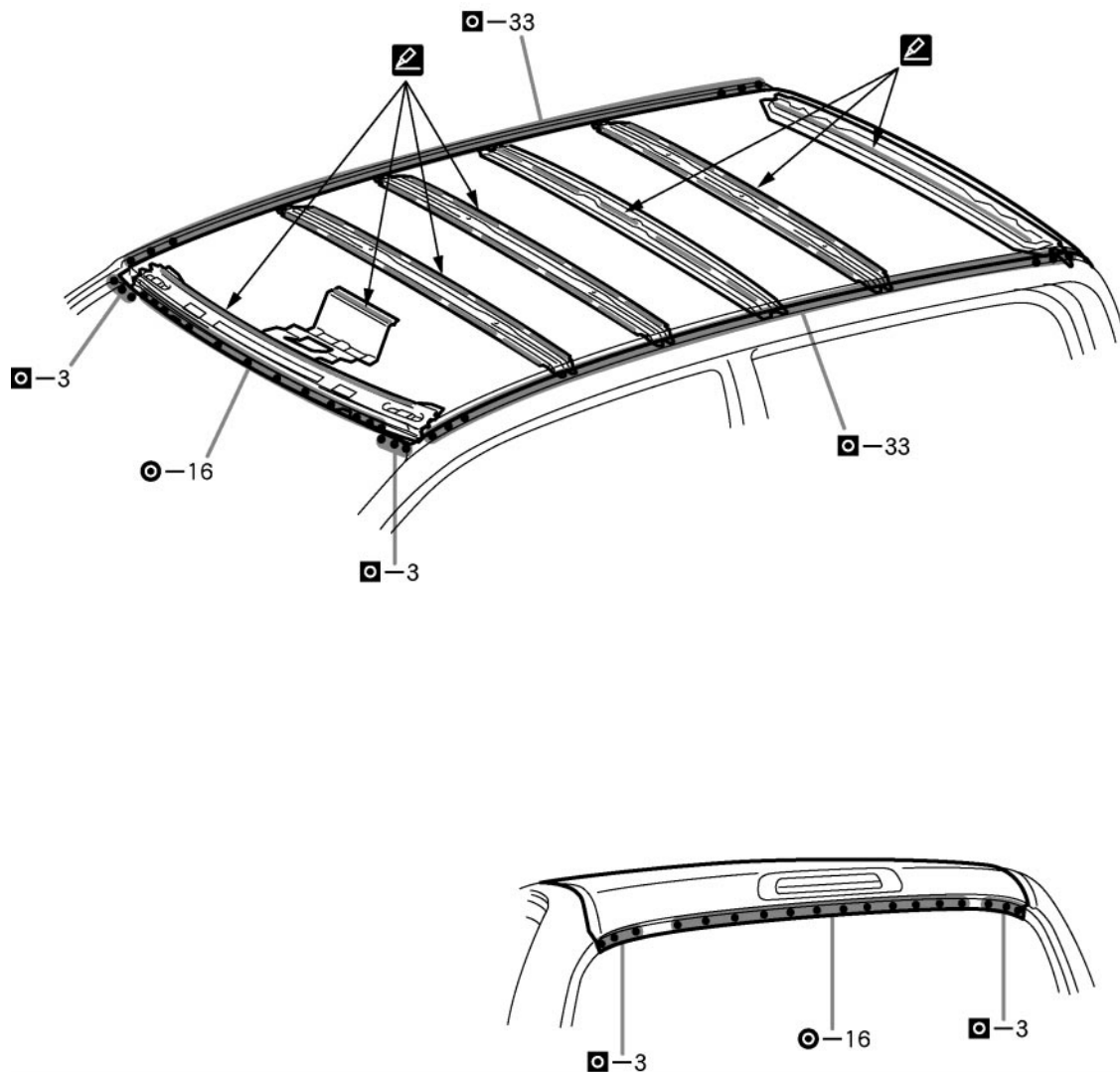
F16958A

REMOVAL



INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16959

POINT

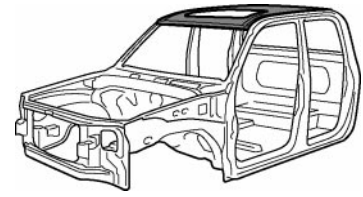
- 1 Before temporarily installing the new parts, apply body sealer to the windshield header panel, roof panel reinforcement and back window upper frame.

HINT:

- 1) Apply just enough sealer for the new parts to make contact.

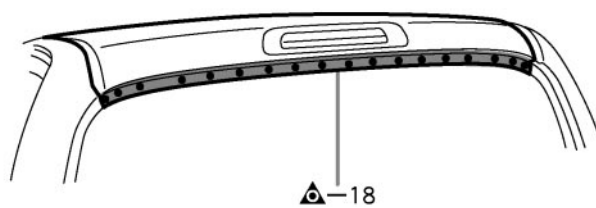
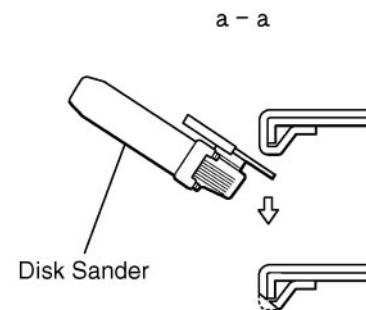
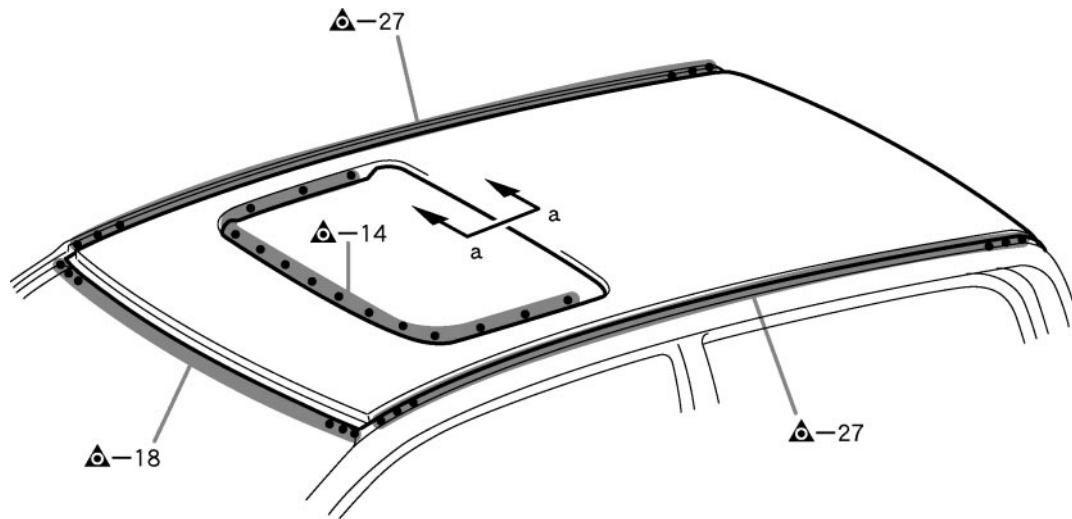
ROOF PANEL (ASSY): w/ sun roof

REPLACEMENT



F16960A

REMOVAL



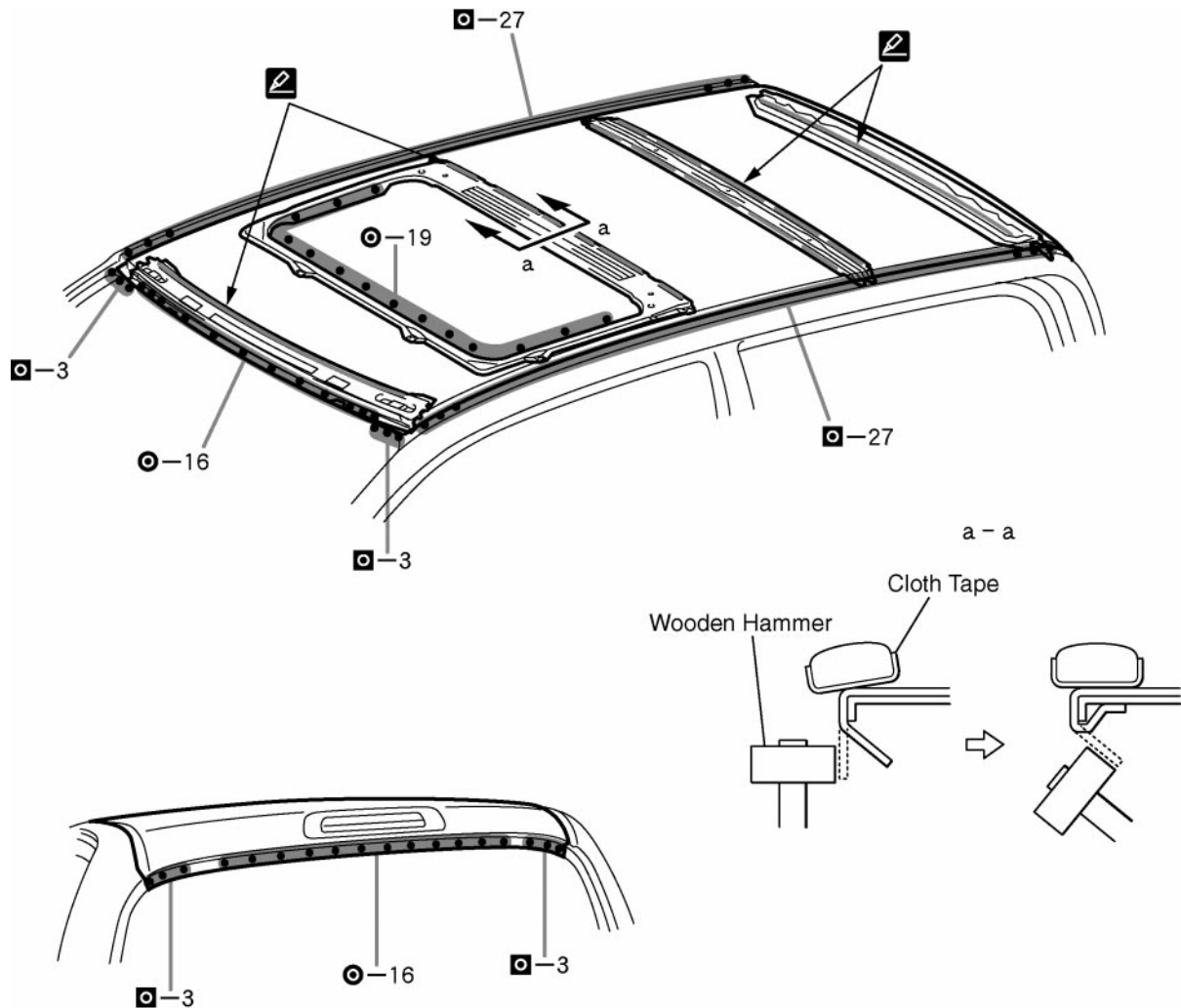
F16960

POINT

- 1 If reusing the roof panel reinforcement, trim the hemming location using a disc sander, etc.

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.

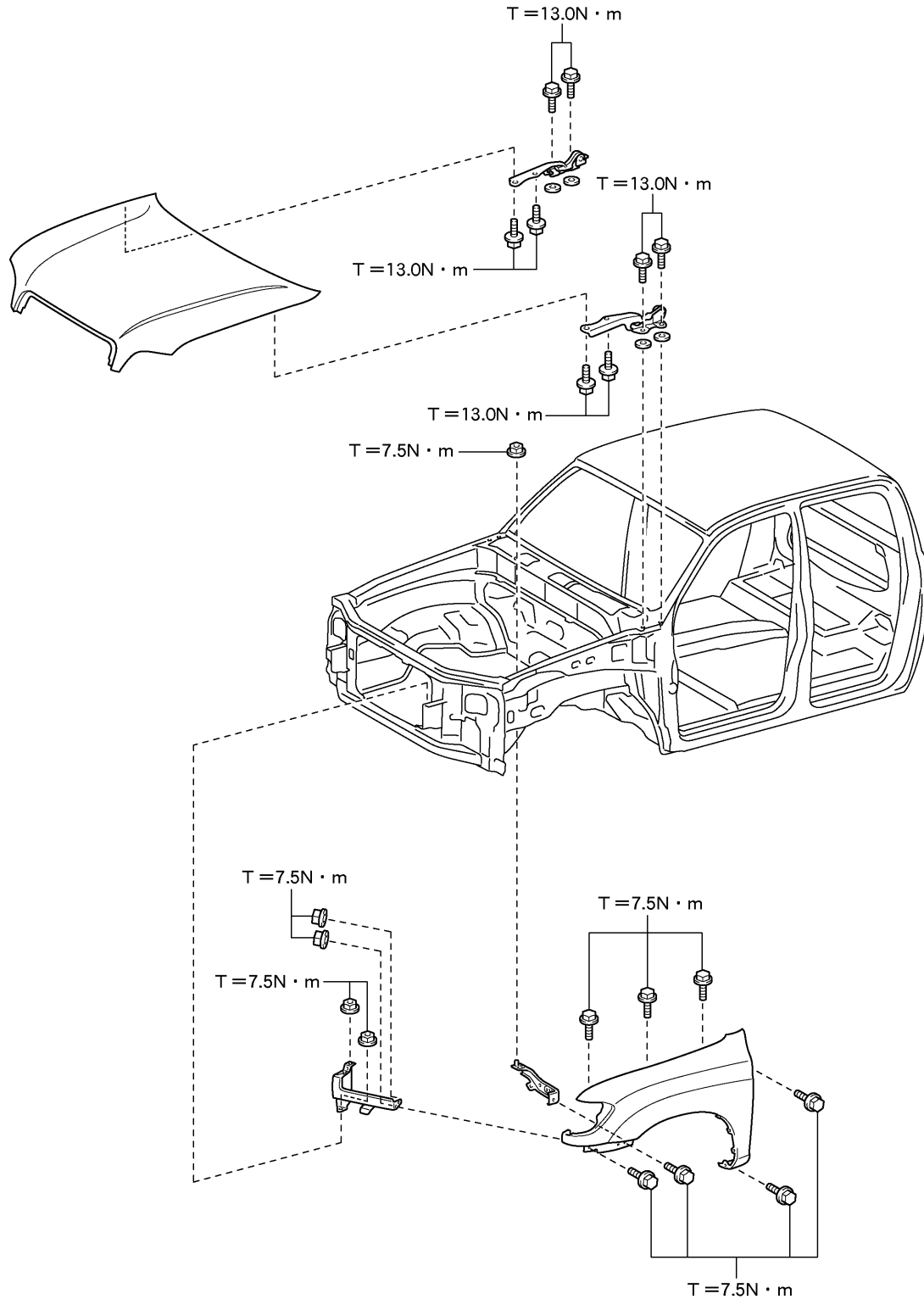


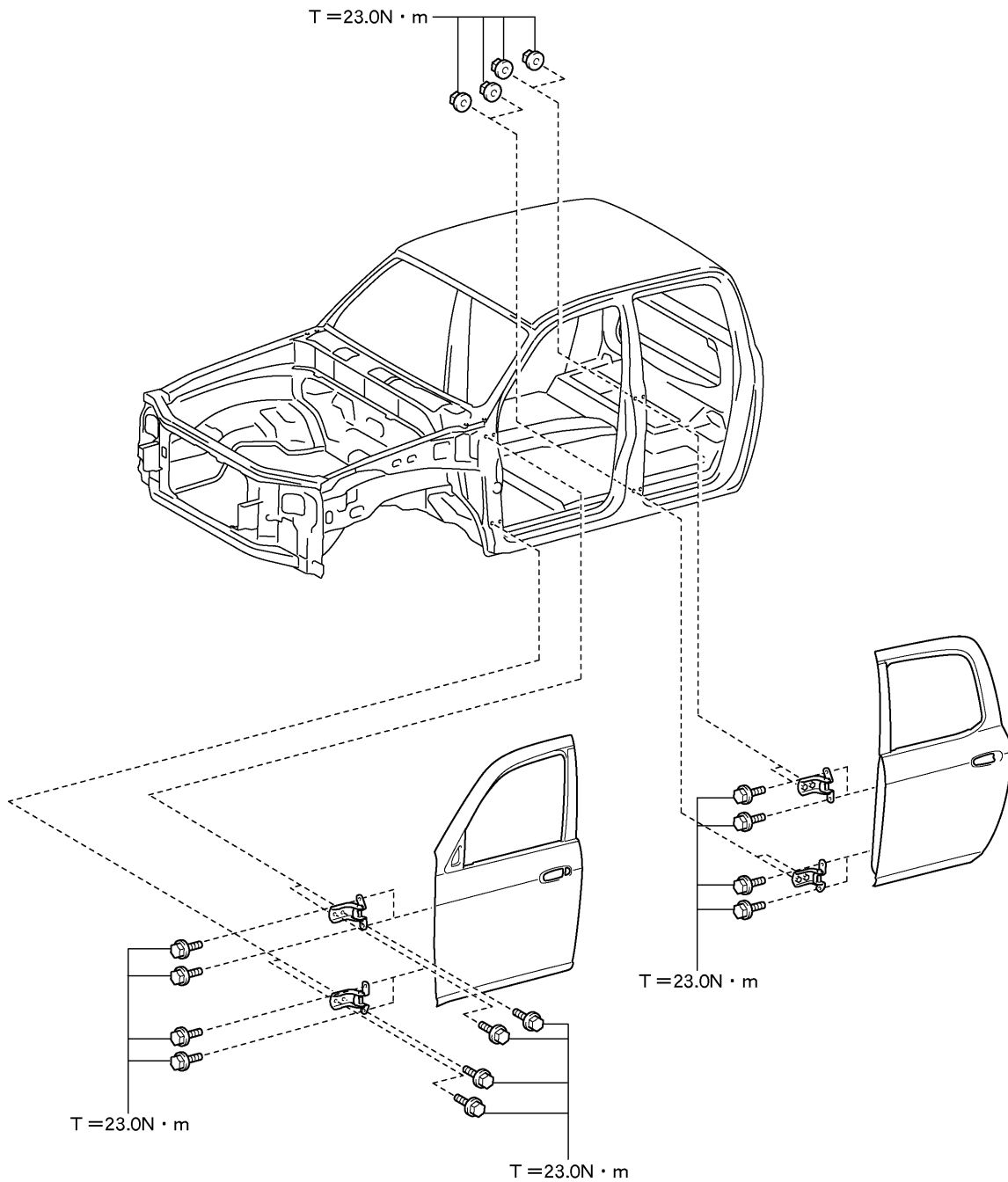
F16961

POINT

- 1 Before temporarily installing the new parts, apply body sealer to the windshield header panel, roof panel reinforcement and back window upper frame.
HINT:
 1) Apply just enough sealer for the new parts to make contact.
- 2 Bend the flange hem with a wooden hammer and dolly.
HINT:
 1) Perform hemming three steps, being careful not to warp the panel.

OUTER PANEL INSTALLATION TORQUE

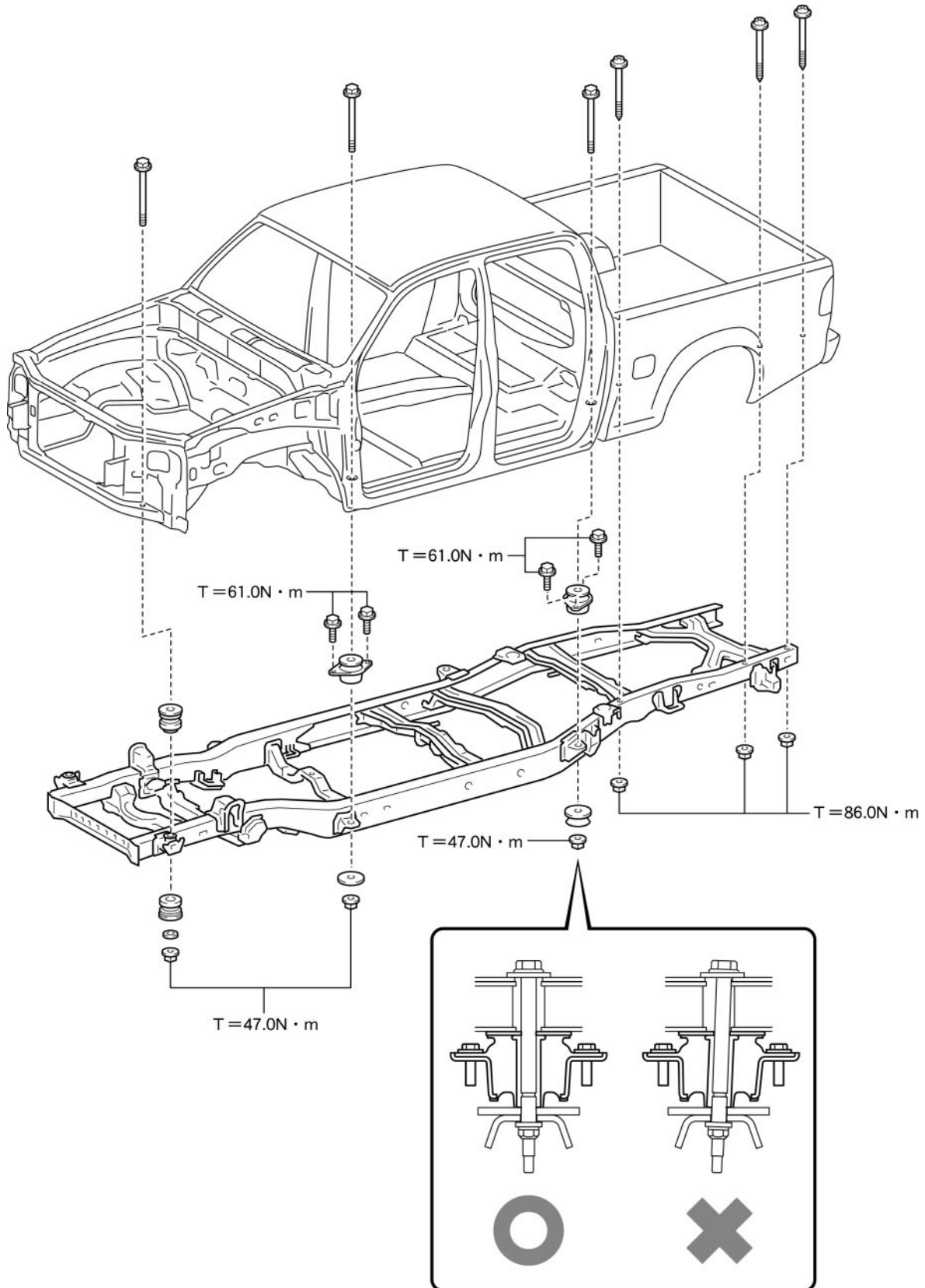




23.0 N·m (234.6 kgf·cm, 17 ft·lbf)

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F16918

47.0 N·m (479.4 kgf·cm, 35 ft·lbf)

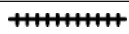
61.0 N·m (622.2 kgf·cm, 45 ft·lbf)

86.0 N·m (877.2 kgf·cm, 63 ft·lbf)

BODY PANEL SEALING AREAS

HINT:

- 1) Prior to applying body sealer, clean the area with a rag soaked in grease, wax and silicone remover.
- 2) If weld-through primer was used, first wipe off any excess and coat with anti-corrosion primer before applying body sealer.
- 3) Wipe off excess body sealer with a rag soaked in a grease, wax and silicone remover.
- 4) If body sealer is damaged by peeling, cracks, etc., be sure to repair as necessary.

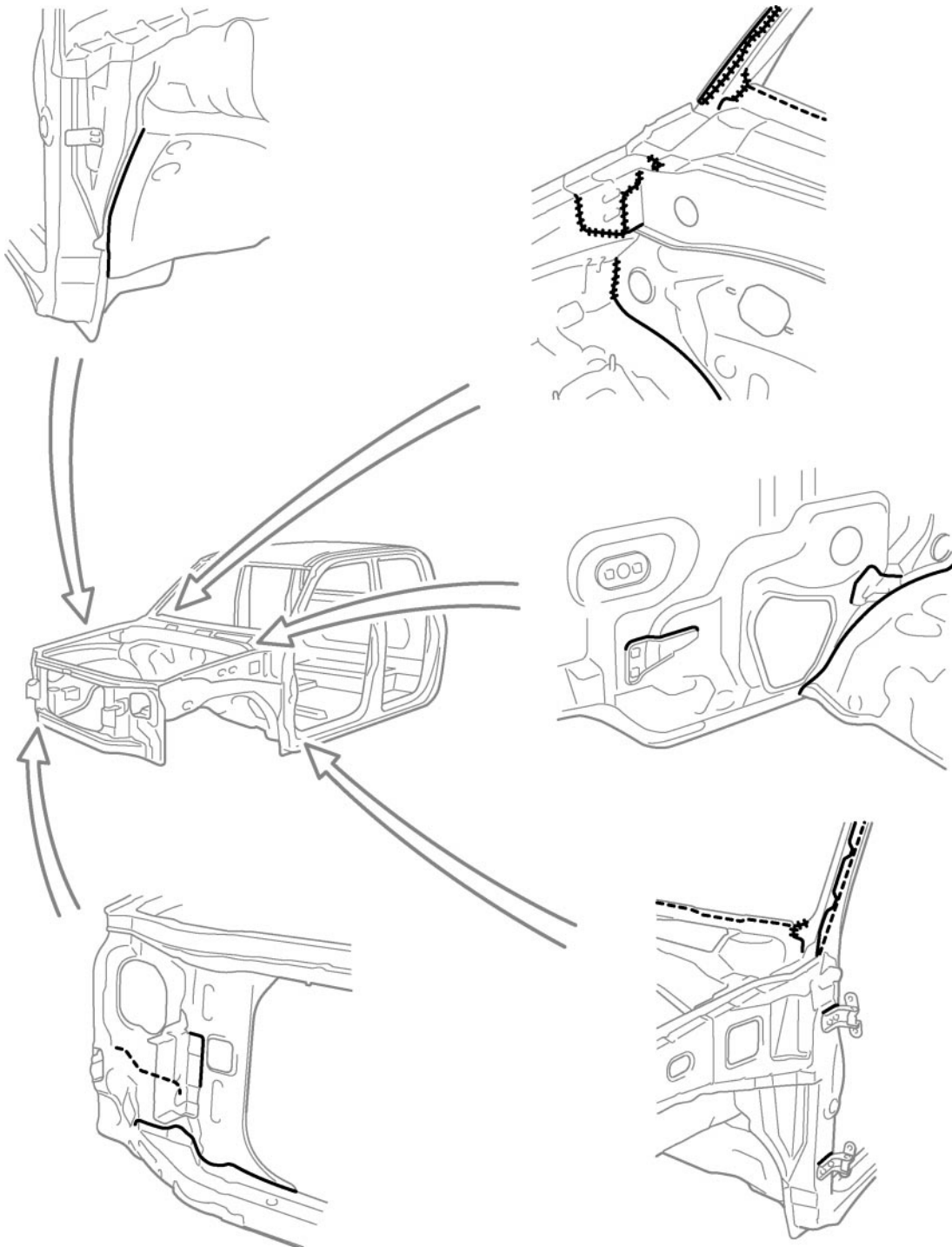


Flat Finishing

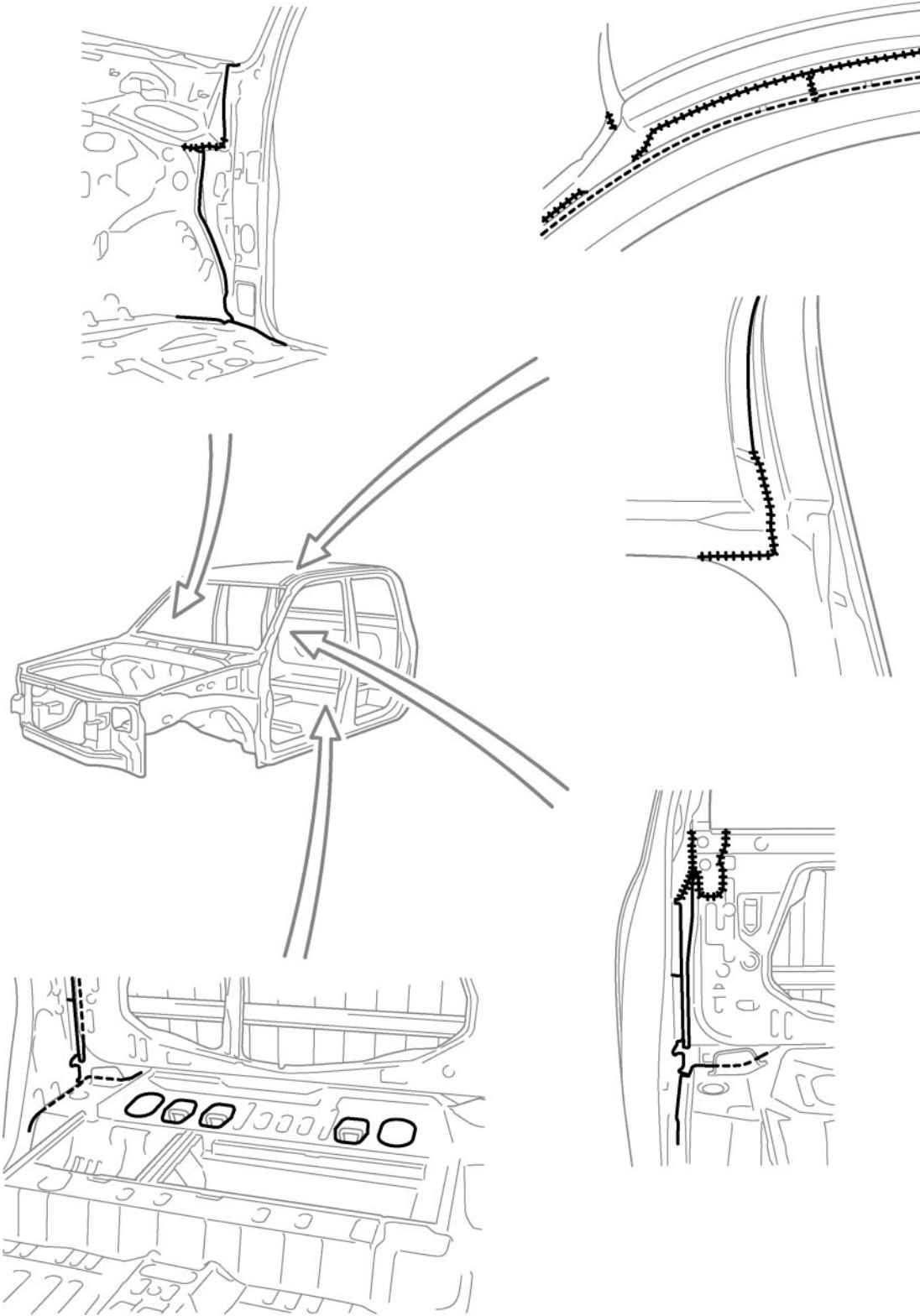


No Flat Finishing

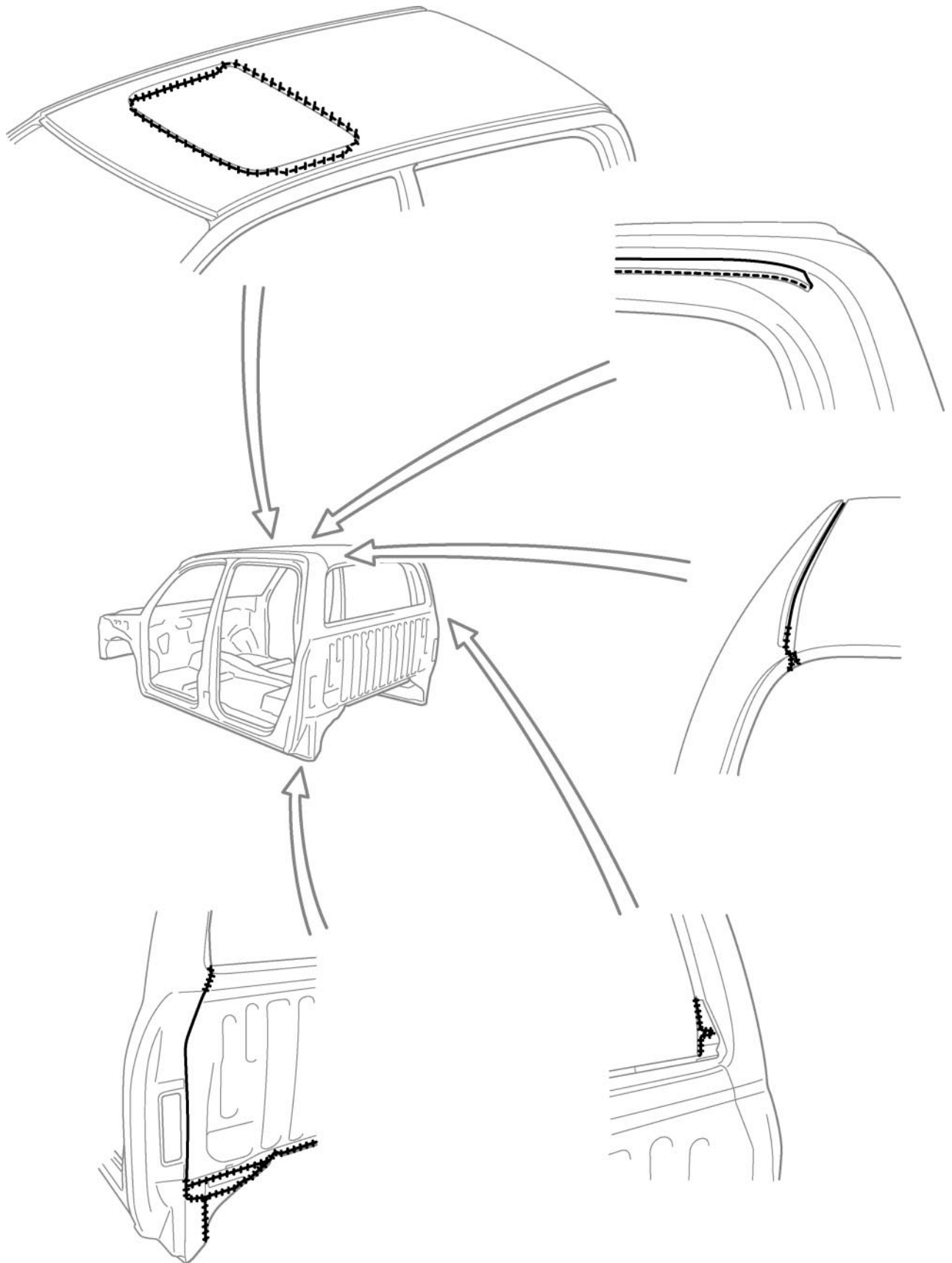
1. ENGINE COMPARTMENT

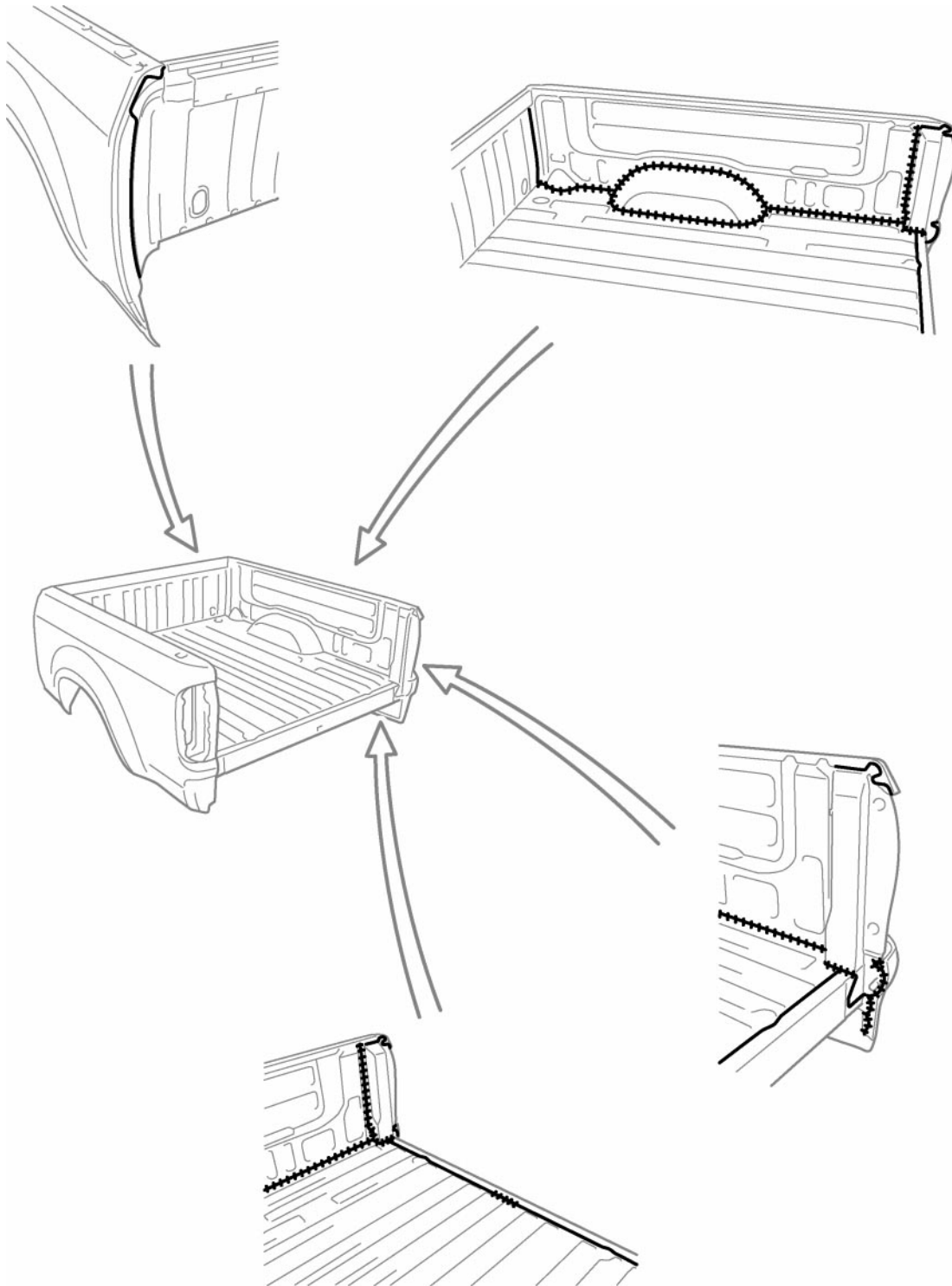


2. INSIDE

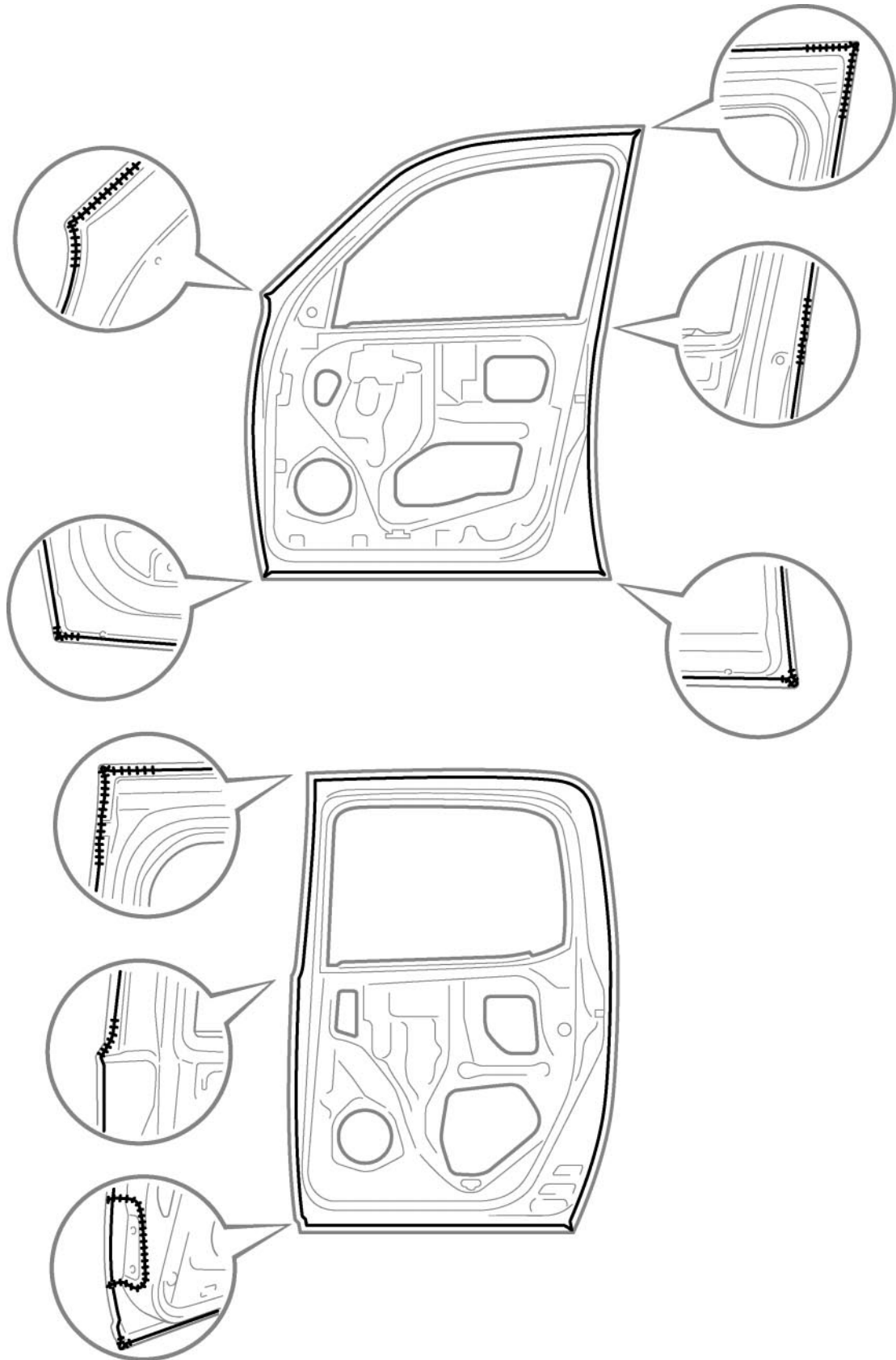


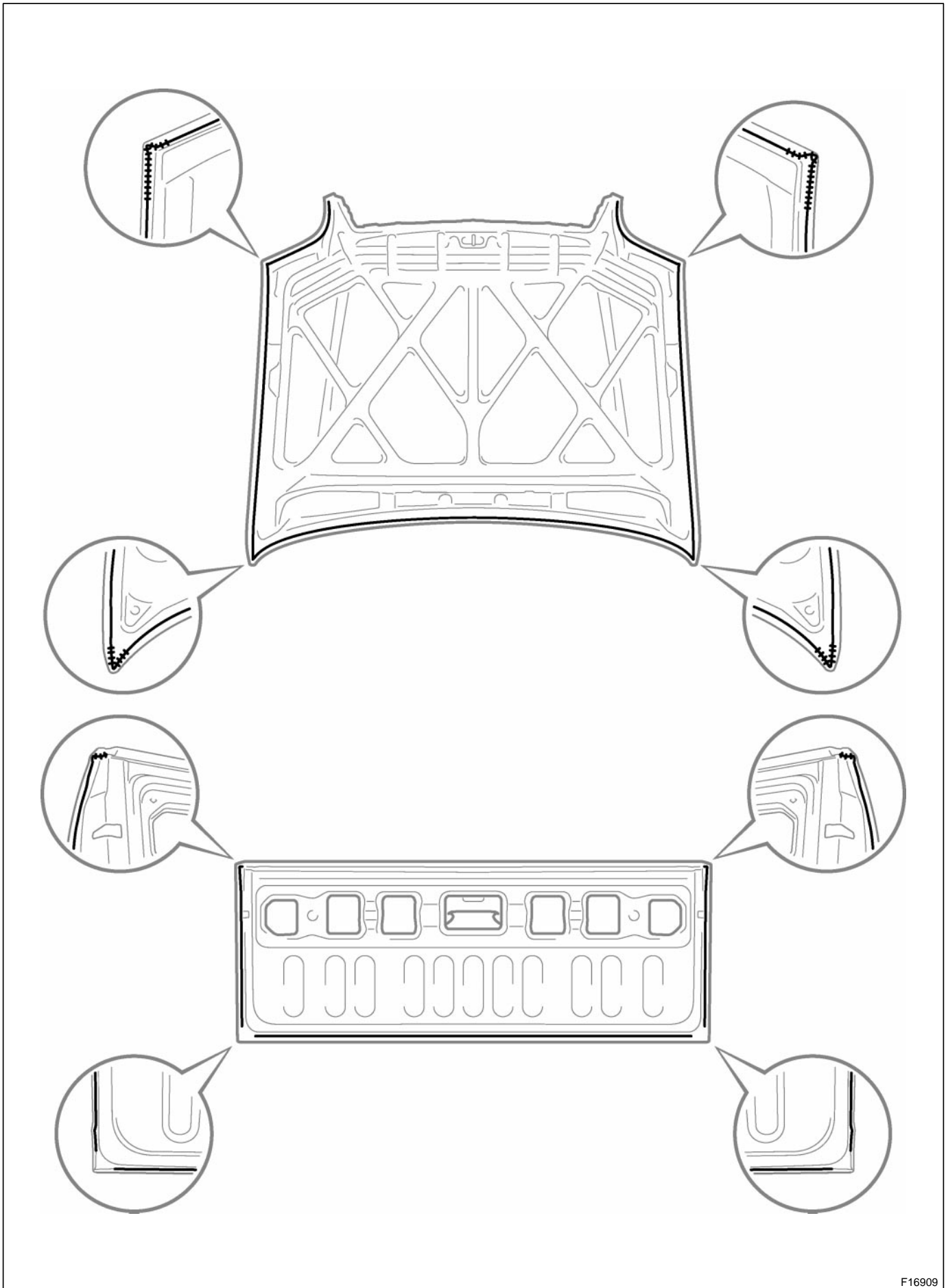
3. OUTSIDE





4. DOOR PARTS

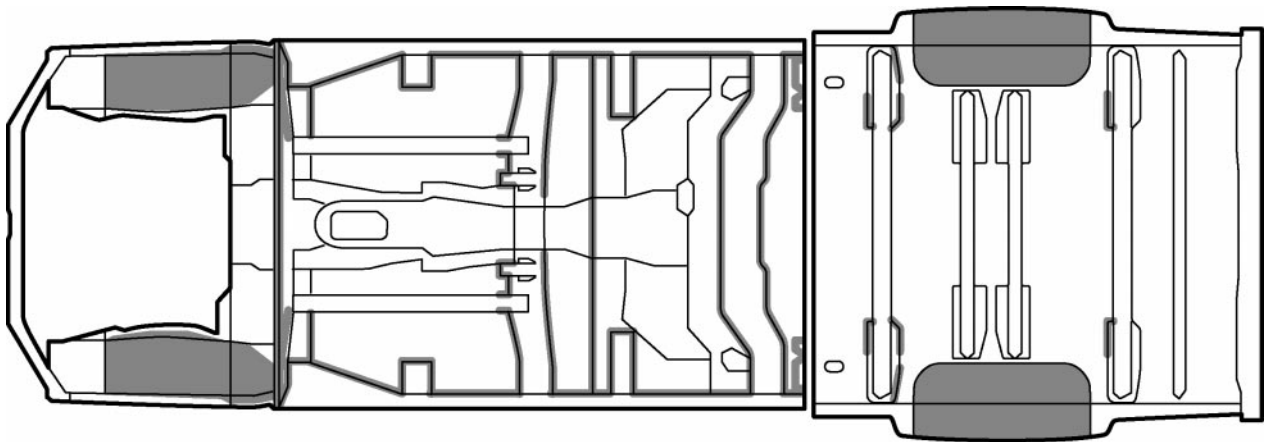




BODY PANEL UNDERCOATING AREAS

HINT:

- 1) First wipe off any dirt, grease or oil with a rag soaked in a grease, wax and silicone remover.
- 2) Cover the surrounding areas with masking paper to avoid coating unnecessary areas. If other areas are accidentally coated, wipe off the coating immediately.
- 3) Apply the first coating of undercoat to all welded areas and panel joints, then apply a second coat over the entire area.
- 4) Do not coat parts which become hot, such as the tailpipe, or moving parts, such as the propeller shaft.
- 5) Besides the locations described below, apply undercoating to all weld points under the body to insure corrosion prevention.
- 6) Be sure to seal the edge of the flange of the member and bracket with undercoating.
- 7) If undercoat is damaged by peeling, cracks, etc., be sure to repair as necessary.
- 8) Before the undercoat apply sealer allowing rust prevention to be attained.



F16910

REFERENCE

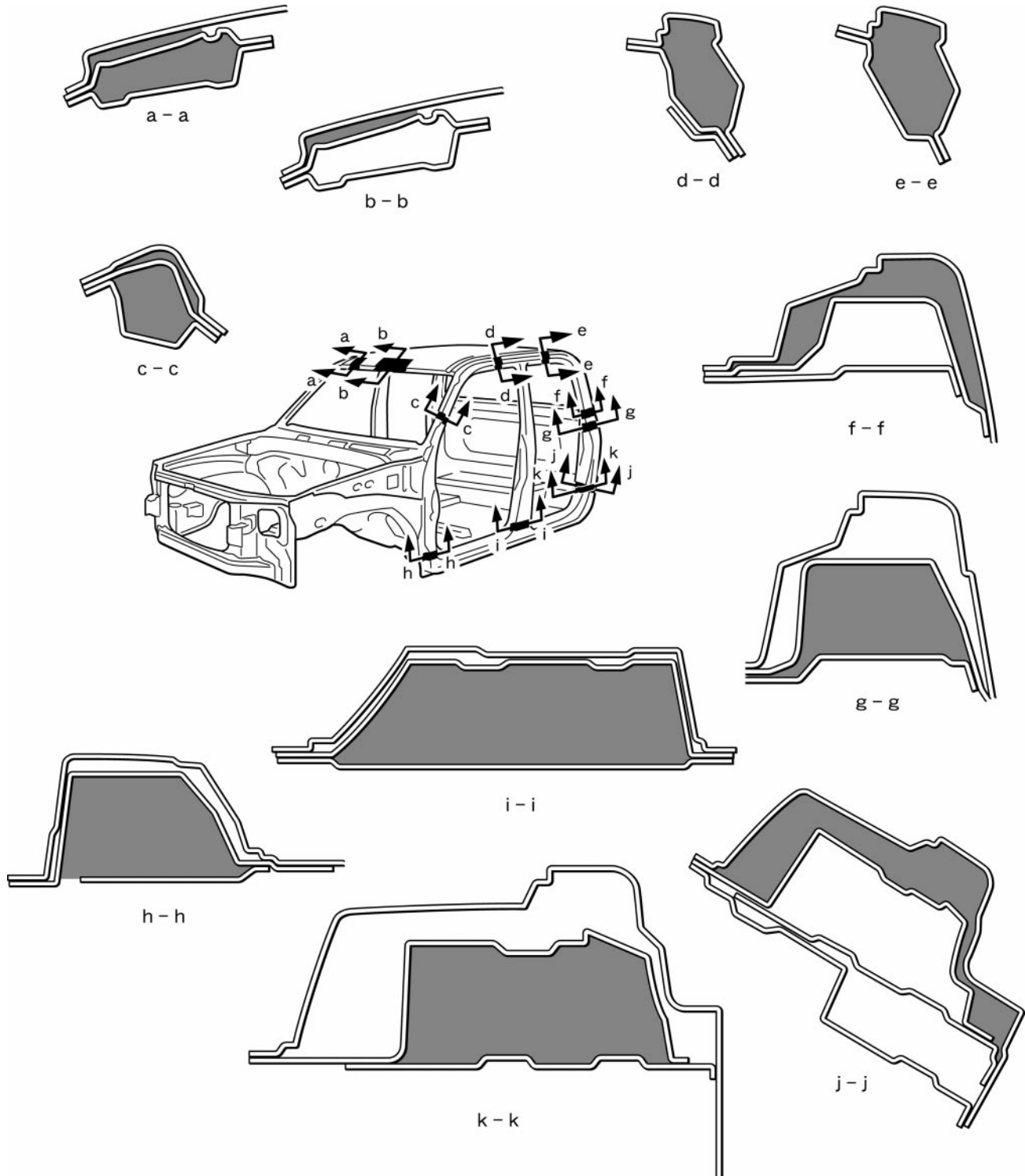
Referring to the notes above, undercoating should be applied according to the specifications for your country.

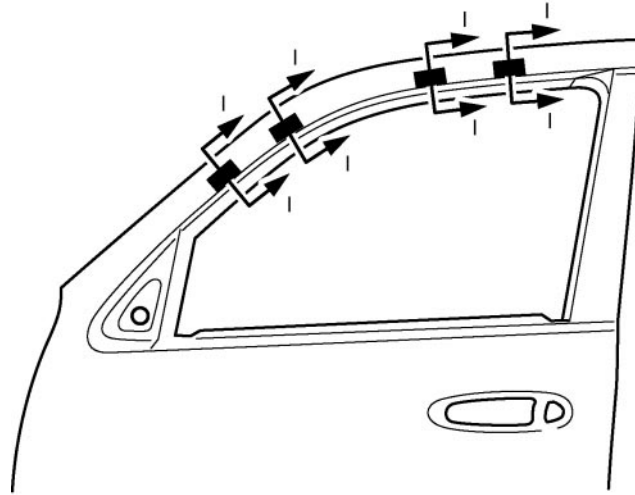
FOAMED MATERIAL APPLICATION AREAS

The sections shown in the figure below are filled with foamed material to provide noise insulation. After repairing these sections or their peripheries, refill with foamed materials

HINT:

- 1) Use the service holes located on the reverse side of the body panel to refill with foamed materials.
- 2) When handling foamed material, follow the directions of the material's manufacturer.



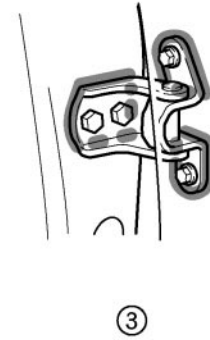
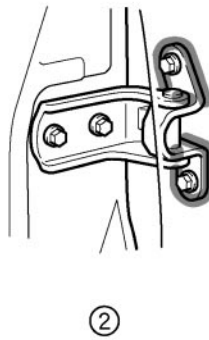
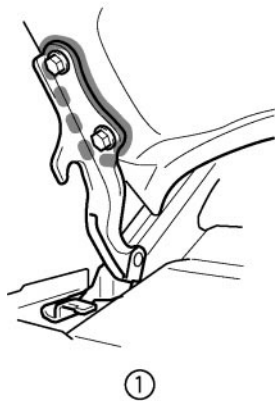
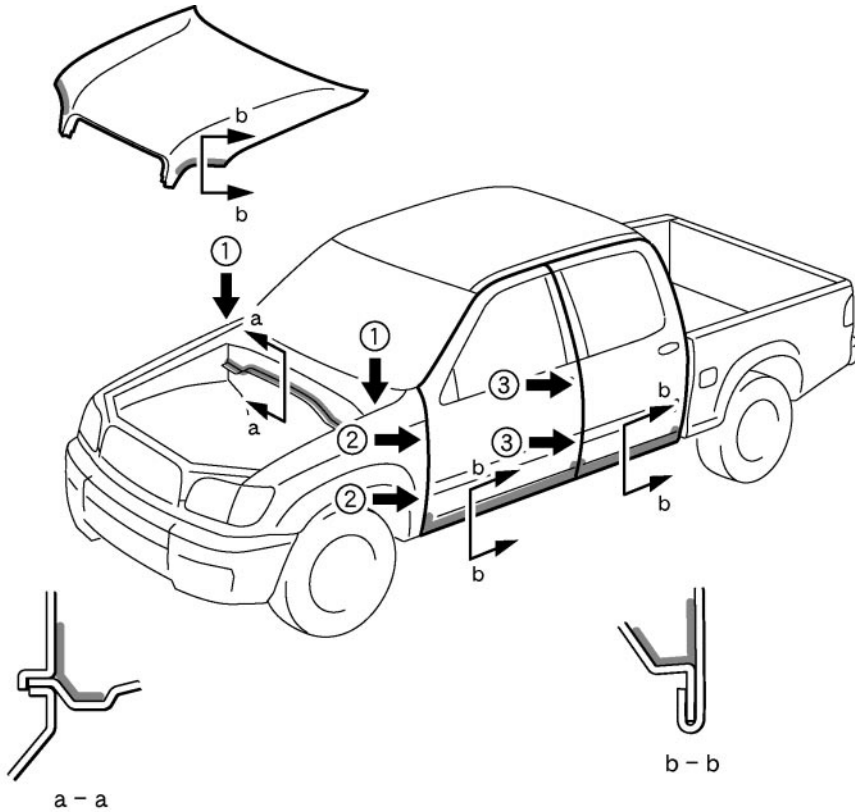


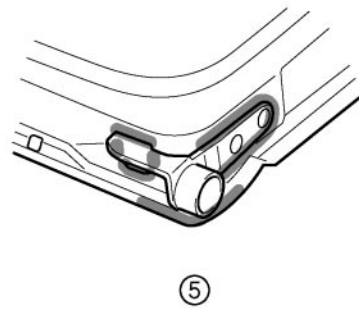
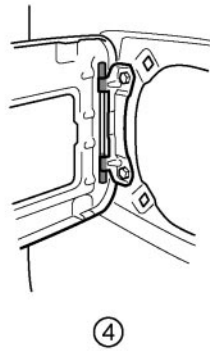
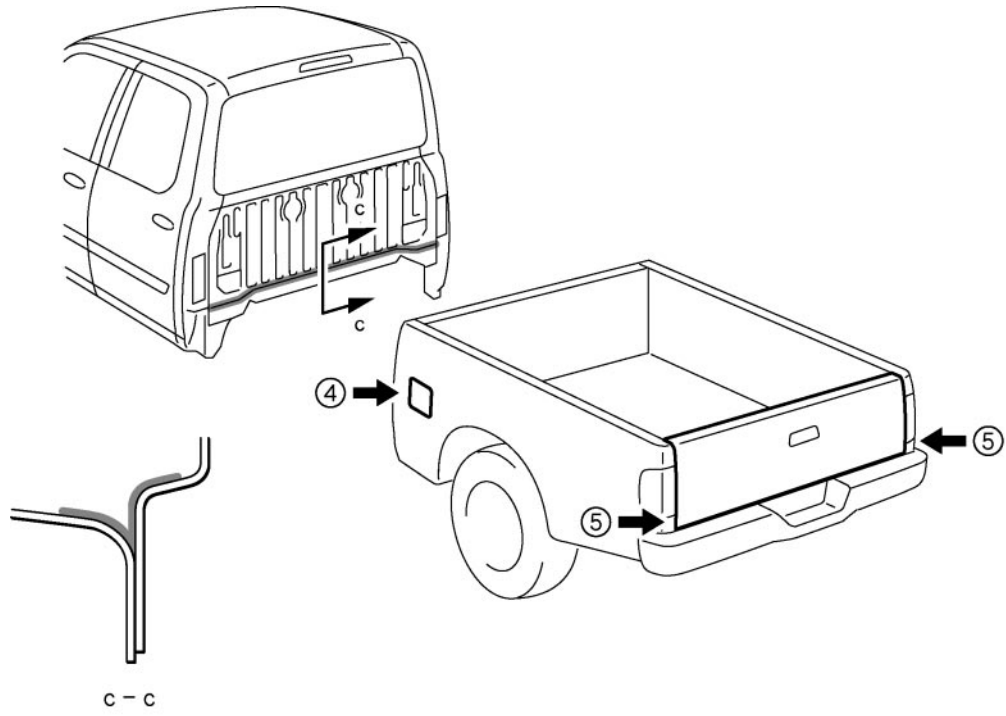
I-I

BODY PANEL ANTI-RUST AGENT (WAX) APPLICATION AREAS

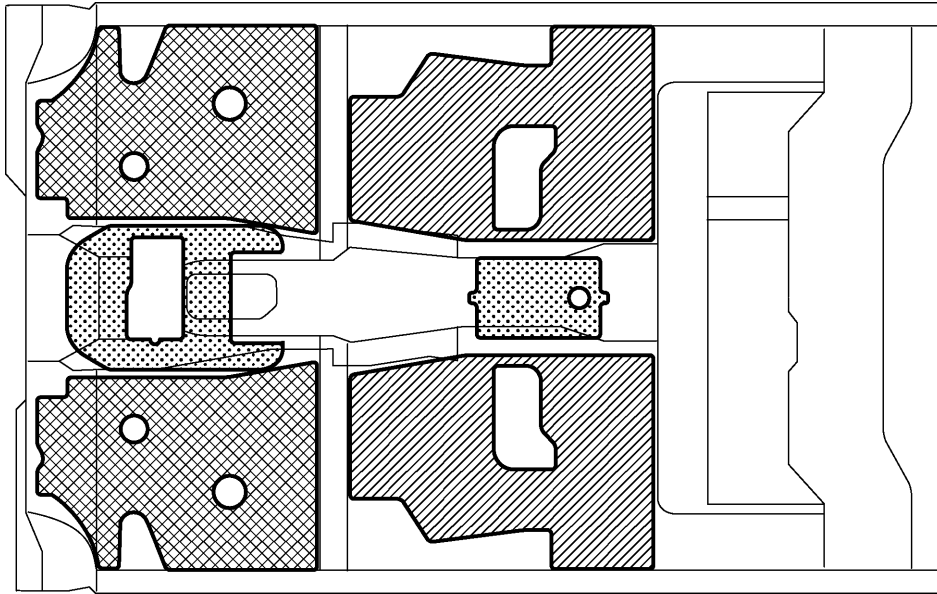
HINT:

- 1) Whenever adjusting the doors and hoods, apply anti-rust agent (wax) around the hinges.
- 2) Even if partially repairing a part, apply anti-rust agent (wax) over the entire application area of the part.
- 3) Wipe off the anti-rust agent immediately with a rag soaked in a grease, wax and silicone remover, if accidentally applied to other areas.





SILENCER SHEET INSTALLATION AREAS



F16915

Thickness of Silencer Sheet



1.5 mm (0.059 in.)



3.0 mm (0.118 in.)

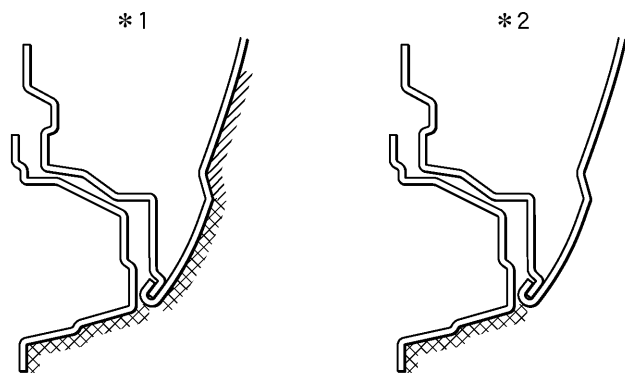
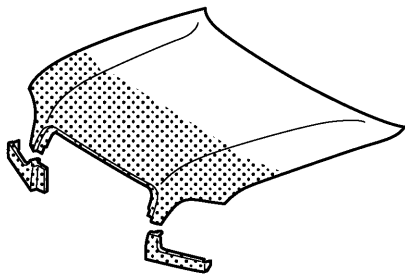
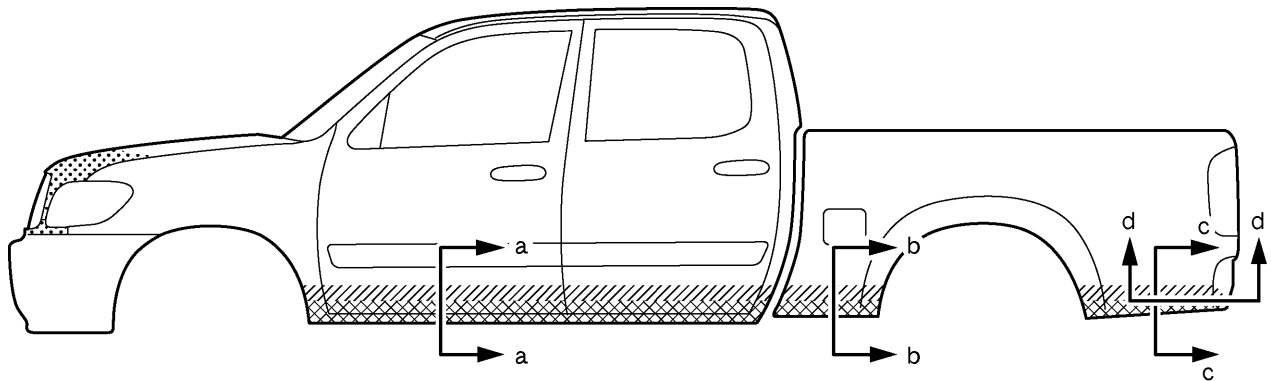


3.7 mm (0.146 in.)

BODY PANEL ANTI-CHIPPING PAINT APPLICATION AREAS

HINT:

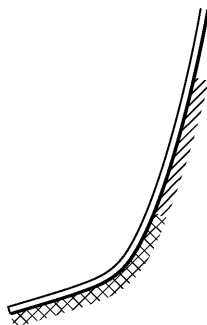
- 1) Anti-chipping paint should be applied to some areas before the second coat and to others after the top coat.
- 2) If other areas are accidentally coated, wipe off the paint immediately with a rag soaked in grease, wax and silicone remover.



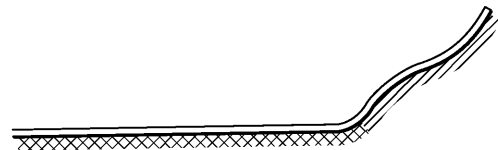
a - a



b - b



c - c



d - d



Rocker PVC



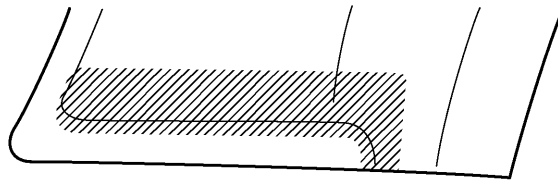
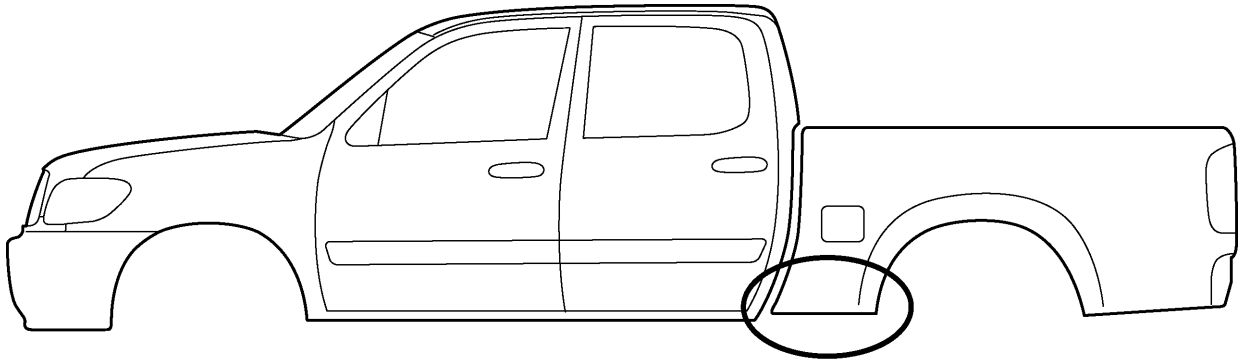
One Component Urethane



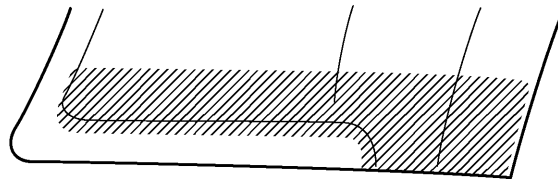
Soft Chipping Primer

*1 W/ Side Step

*2 W/O Side Step



*1



*2

F16917



Anti-Chip Film

—

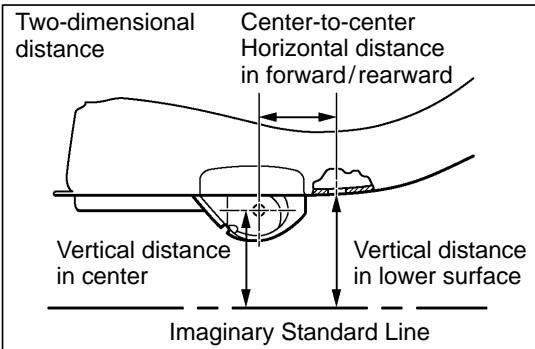
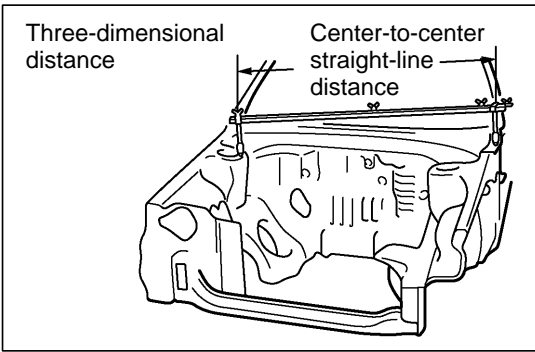
—

—

—

*1 W/ Over Fender

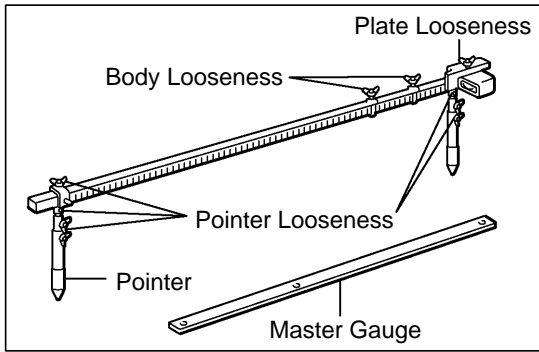
*2 W/O Over Fender



GENERAL INFORMATION

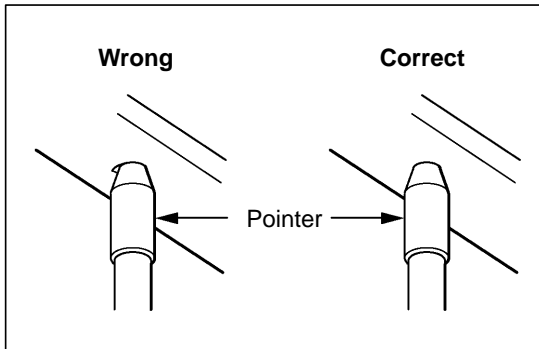
1. BASIC DIMENSIONS

- (a) There are two types of dimensions in the diagram.
 - (1) (Three-dimensional distance)
 - Straight-line distance between the centers of two measuring points.
 - (2) (Two-dimensional distance)
 - Horizontal distance in forward/rearward between the centers of two measuring points.
 - The height from an imaginary standard line.
- (b) In cases in which only one dimension is given, left and right are symmetrical.
- (c) The dimensions in the following drawing indicate actual distance. Therefore, please use the dimensions as a reference.



2. MEASURING

- (a) Basically, all measurements are to be done with a tracking gauge. For portions where it is not possible to use a tracking gauge, a tape measure should be used.
- (b) Use only a tracking gauge that has no looseness in the body, measuring plate, or pointers.



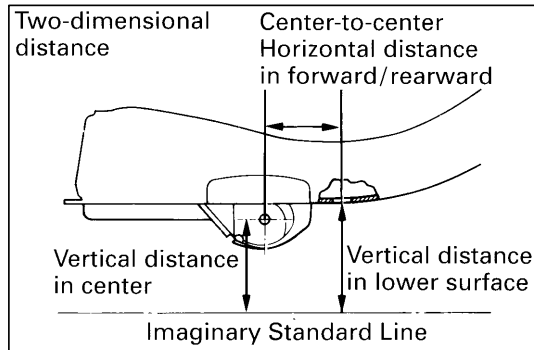
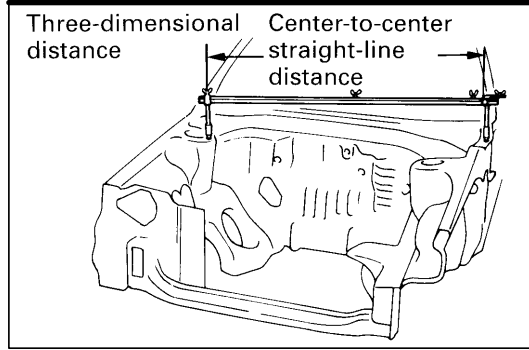
HINT:

- 1) *The height of the left and right pointers must be equal.*
 - 2) *Always calibrate the tracking gauge before measuring or after adjusting the pointer height.*
 - 3) *Take care not to drop the tracking gauge or otherwise shock it.*
 - 4) *Confirm that the pointers are securely in the holes.*
- (c) When using a tape measure, avoid twists and bends in the tape.

GENERAL INFORMATION

1. BASIC DIMENSIONS

- (a) There are two types of dimensions in the diagram.
(Three-dimensional distance)
- Straight-line distance between the centers of two measuring points.

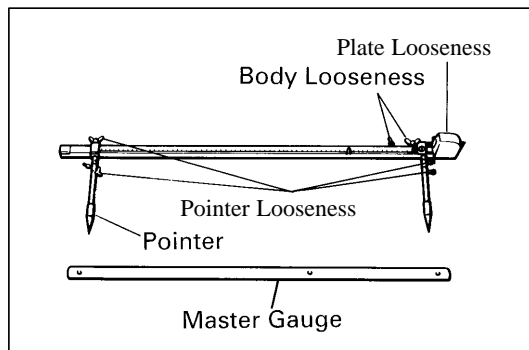


(Two-dimensional distance)

- Horizontal distance in forward/rearward between the centers of two measuring points.
 - The height from an imaginary standard line.
- (b) Incases in which only one dimension is given, left and right are symmetrical.
- (c) The dimensions in the following drawing indicate actual distance. Therefore, please use the dimensions as a reference.

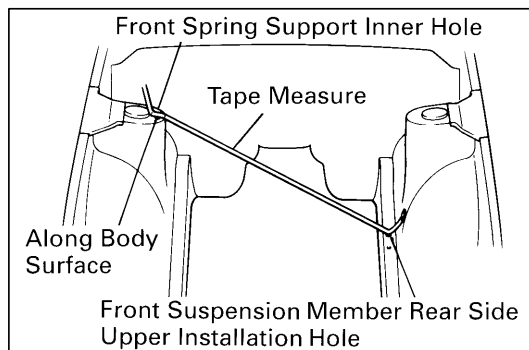
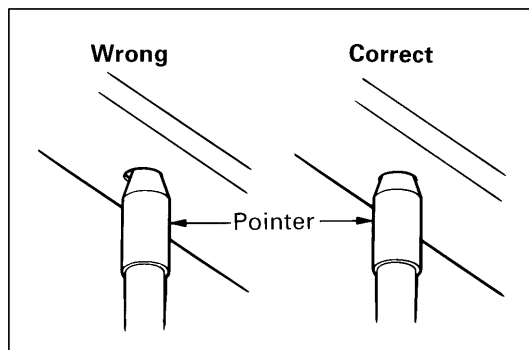
2. MEASURING

- (a) Basically, all measurements are to be done with a tracking gauge. For portions where it is not possible to use a tracking gauge, a tape measure should be used.
- (b) Use only a tracking gauge that has no looseness in the body, measuring plate, or pointers.



HINT:

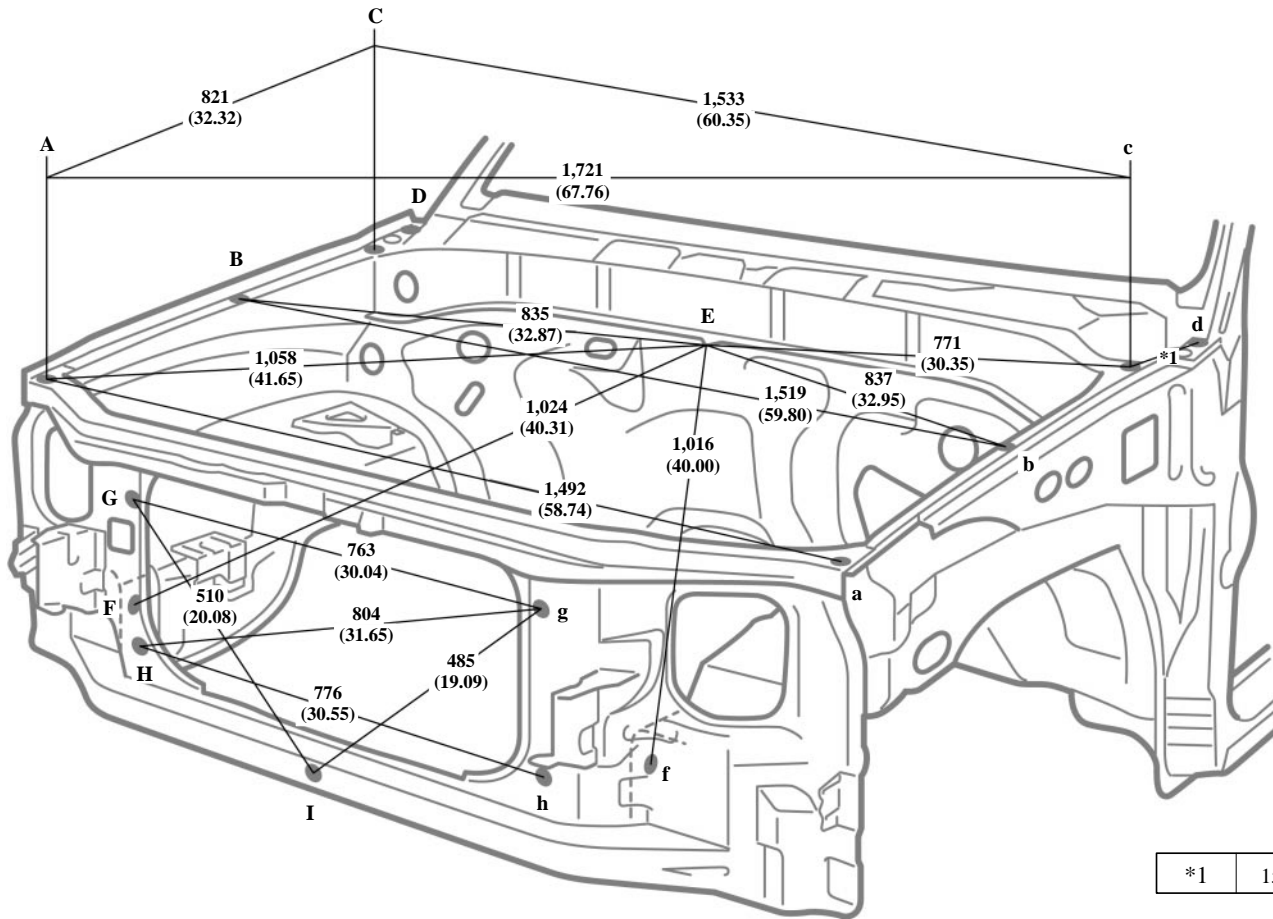
1. The height of the left and right pointers must be equal.
2. Always calibrate the tracking gauge before measuring or after adjusting the pointer height.
3. Take care not to drop the tracking gauge or otherwise shock it.
4. Confirm that the pointers are securely in the holes.



- (c) When using a tape measure, avoid twists and bends in the tape.
- (d) When tracking a diagonal measurement from the front spring support inner hole to the suspension member upper rear installation hole, measure along the front spring support panel surface.

BODY DIMENSION DRAWINGS
ENGINE COMPARTMENT

(Three-Dimensional Distance)



HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear).

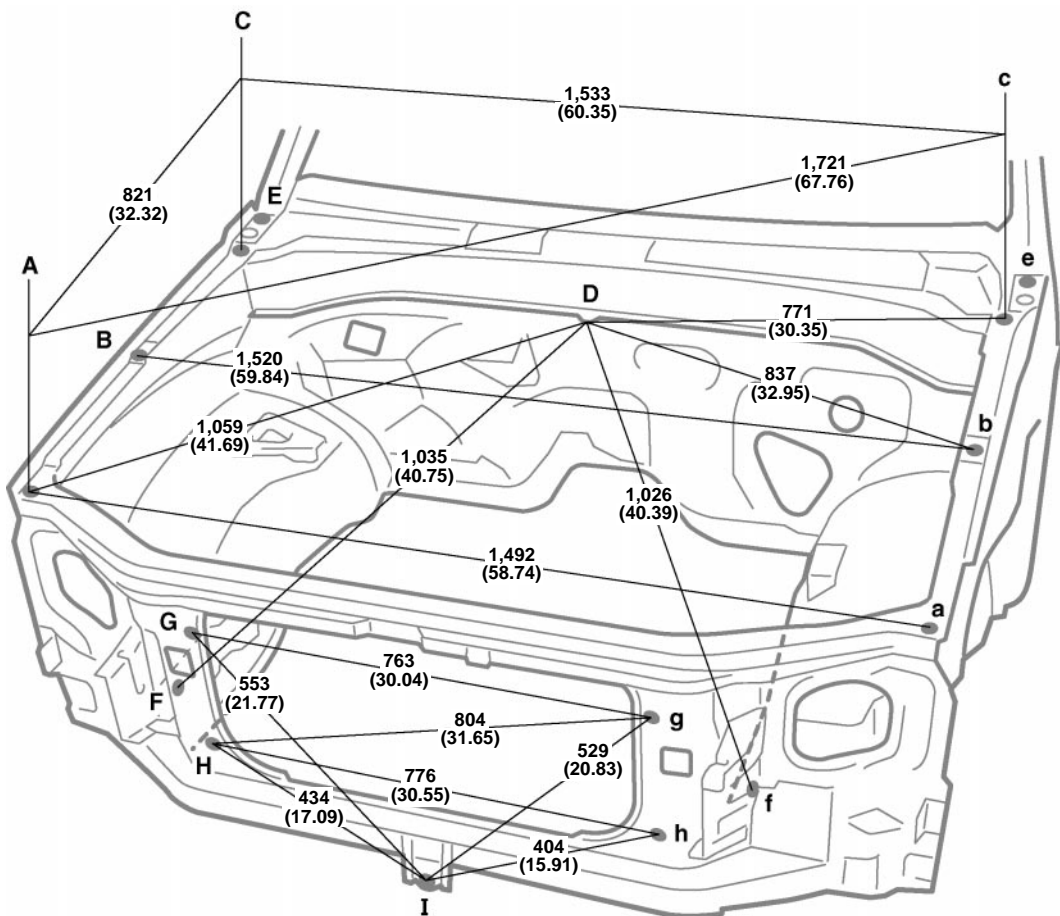
mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front fender installation nut	6 (0.24) nut	F	Front fender apron working hole	10 (0.39)
B, b	Front fender installation nut	6 (0.24) nut	f	Front fender apron standard hole	10 (0.39)
C, c	Front fender installation nut	6 (0.24) nut	G, g	Radiator installation hole	RH: 13 x 10 (0.51 x 0.39) LH: 10 (0.39)
D, d	Hood hinge installation nut-rear	8 (0.31) nut	H, h	Radiator installation hole	10 (0.39)
E	Cowl top panel vehicle center mark	—	I	Hood lock support installation nut	6 (0.24) nut

BODY DIMENSION DRAWINGS

ENGINE COMPARTMENT

(Three-Dimensional Distance)



Vehicle Dimensions

C-E or c-e
153 (6.02)

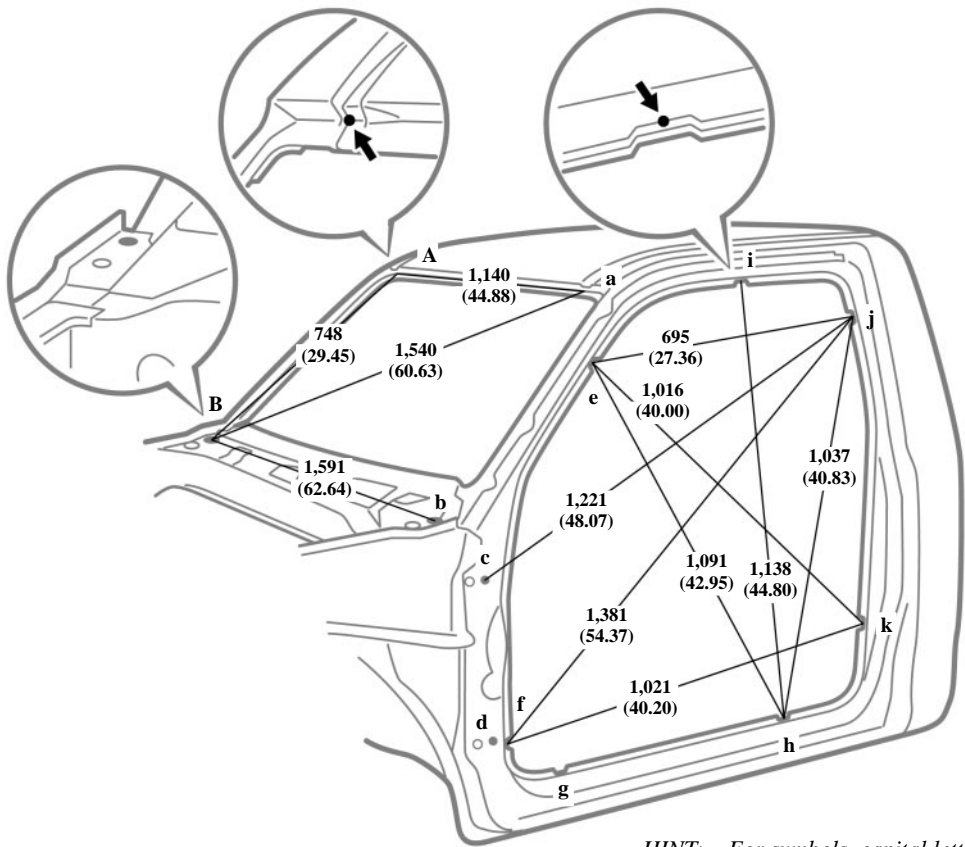
HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear.)

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front fender installation nut	6 (0.24) nut	f	Front apron standard hole	10 (0.39)
B, b	Front fender installation nut	6 (0.24) nut	G, g	Radiator installation hole	RH: 13 × 10 (0.51 × 0.39)
C, c	Front fender installation nut	6 (0.24) nut			LH: 10 (0.39)
D	Cowl top panel center mark	—	H, h	Radiator support working hole	10 (0.39)
E, e	Hood hinge installation nut	8 (0.31)	I	Hood lock support installation nut	6 (0.24) nut
F	Front apron working hole	10 (0.39)	—	—	—

BODY OPENING AREAS (Side View)
REGULAR CAB

(Three-Dimensional Distance)



HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear).

K-D or k-d
1,088 (42.83)

Vehicle Dimensions Left ↔ Right

E-e	F-f	G-g	H-h	I-i	J-j	K-k
1,408 (55.43)	1,604 (63.15)	1,606 (63.23)	1,606 (63.23)	1,270 (50.00)	1,381 (54.37)	1,600 (62.99)

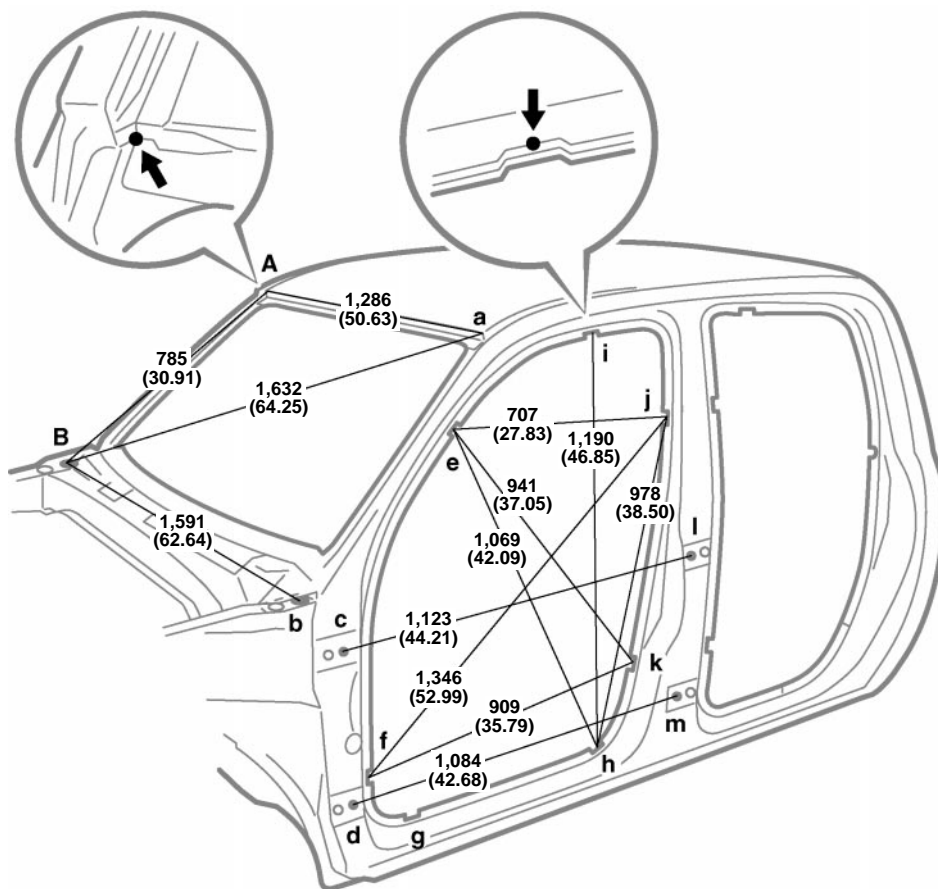
E-f or e-F	E-h or e-H	E-j or e-J	F-j or f-J	F-k or f-K	G-h or g-H	H-i or h-I	J-k or j-K
1,768 (69.61)	1,857 (73.11)	1,558 (61.34)	2,030 (79.92)	1,900 (74.80)	1,750 (68.90)	1,826 (71.89)	1,692 (66.61)

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Roof panel/Front body pillar adjoining portion	—	G, g	Rocker panel assembly mark	—
B, b	Hood hinge installation nut-rear	8 (0.31) nut	H, h	Rocker panel assembly mark	—
C, c	Front door hinge installation nut-rear	8 (0.31) nut	I, i	Roof side rail assembly mark	—
D, d	Front door hinge installation nut-rear	8 (0.31) nut	J, j	Quarter panel assembly mark	—
E, e	Front body pillar assembly mark	—	K, k	Quarter panel assembly mark	—
F, f	Front body pillar assembly mark	—	—	—	—

BODY OPENING AREAS (Side View: Front)

(Three-Dimensional Distance)



Vehicle Dimensions Left ↔ Right

E-e	F-f	G-g	H-h	I-i	J-j	K-k
1,441 (56.73)	1,603 (63.11)	1,606 (63.23)	1,606 (63.23)	1,309 (51.54)	1,494 (58.82)	1,604 (63.15)

E-f or e-F	E-h or e-H	E-j or e-J	F-j or f-J	F-k or f-K	H-i or h-I	J-k or j-K
1,795 (70.67)	1,859 (73.19)	1,629 (64.13)	2,051 (80.75)	1,843 (72.56)	1,876 (73.86)	1,710 (67.32)

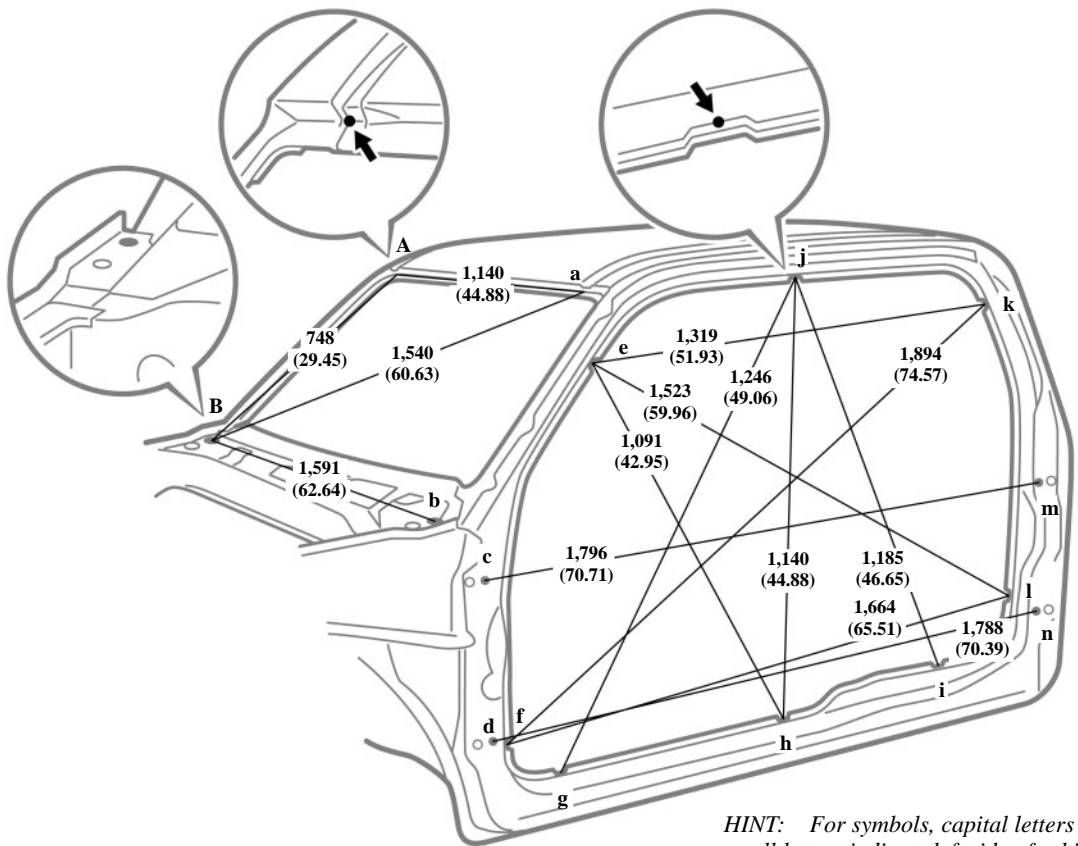
HINT: For symbols, capital letters indicate right side of vehicle,
small letters indicate left side of vehicle (Seen from rear.)

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Roof panel/Front body pillar adjoining portion	—	H, h	Rocker panel assembly mark	—
B, b	Hood hinge installation nut	8 (0.31) nut	I, i	Roof side rail assembly mark	—
C, c	Front door hinge installation nut	8 (0.31) nut	J, j	Center body pillar assembly mark	—
D, d	Front door hinge installation nut	8 (0.31) nut	K, k	Center body pillar assembly mark	—
E, e	Front body pillar assembly mark	—	L, l	Rear door hinge installation nut	8 (0.31) nut
F, f	Front body pillar assembly mark	—	M, m	Rear door hinge installation nut	8 (0.31) nut
G, g	Rocker panel assembly mark	—	—	—	—

**BODY OPENING AREAS (Side View)
ACCESS CAB**

(Tree-Dimensional Distance)



HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear).

Vehicle Dimensions Left ↔ Right

E-e	F-f	G-g	H-h	I-i	J-j	K-k	L-l
1,408 (55.43)	1,604 (63.15)	1,606 (63.23)	1,606 (63.23)	1,606 (63.23)	1,271 (50.04)	1,376 (54.17)	1,601 (63.03)

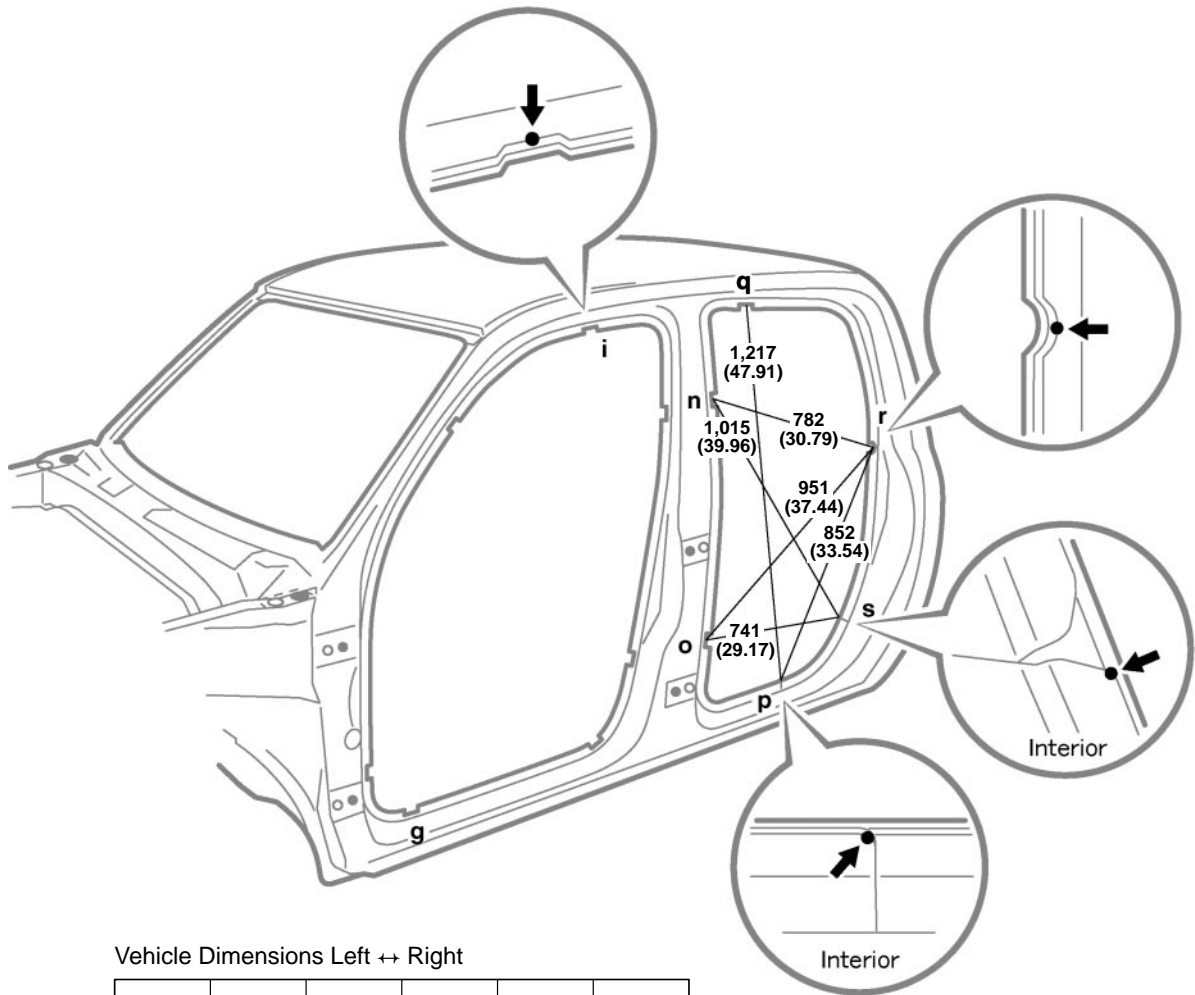
E-f or e-F	E-h or e-H	E-k or e-K	F-k or f-K	F-l or f-L	G-i or g-I	H-j or h-J	K-l or k-L
1,768 (69.61)	1,857 (73.11)	1,917 (75.47)	2,407 (94.76)	2,310 (90.94)	2,032 (80.00)	1,828 (71.97)	1,690 (66.54)

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Roof panel/Front body pillar adjoining portion	—	H, h	Rocker panel assembly mark	—
B, b	Hood hinge installation nut-rear	8 (0.31) nut	I, i	Rocker panel assembly mark	—
C, c	Front door hinge installation nut-rear	8 (0.31) nut	J, j	Roof side rail assembly mark	—
D, d	Front door hinge installation nut-rear	8 (0.31) nut	K, k	Quarter panel assembly mark	—
E, e	Front body pillar assembly mark	—	L, l	Quarter panel assembly mark	—
F, f	Front body pillar assembly mark	—	M, m	Rear door hinge installation nut-front	8 (0.31) nut
G, g	Rocker panel assembly mark	—	N, n	Rear door hinge installation nut-front	8 (0.31) nut

BODY OPENING AREAS (Side View: Rear)

(Three-Dimensional Distance)



Vehicle Dimensions Left ↔ Right

N-n	O-o	P-p	Q-q	R-r	S-s
1,497 (58.94)	1,604 (63.15)	1,598 (62.91)	1,308 (51.50)	1,570 (61.81)	1,624 (63.94)

G-p or g-P	I-q or i-Q	N-r or n-R	N-s or n-S	O-s or o-S	P-q or p-Q	R-s or r-S
2,111 (83.11)	1,410 (55.51)	1,721 (67.76)	1,861 (73.27)	1,776 (69.92)	1,890 (74.41)	1,691 (66.57)

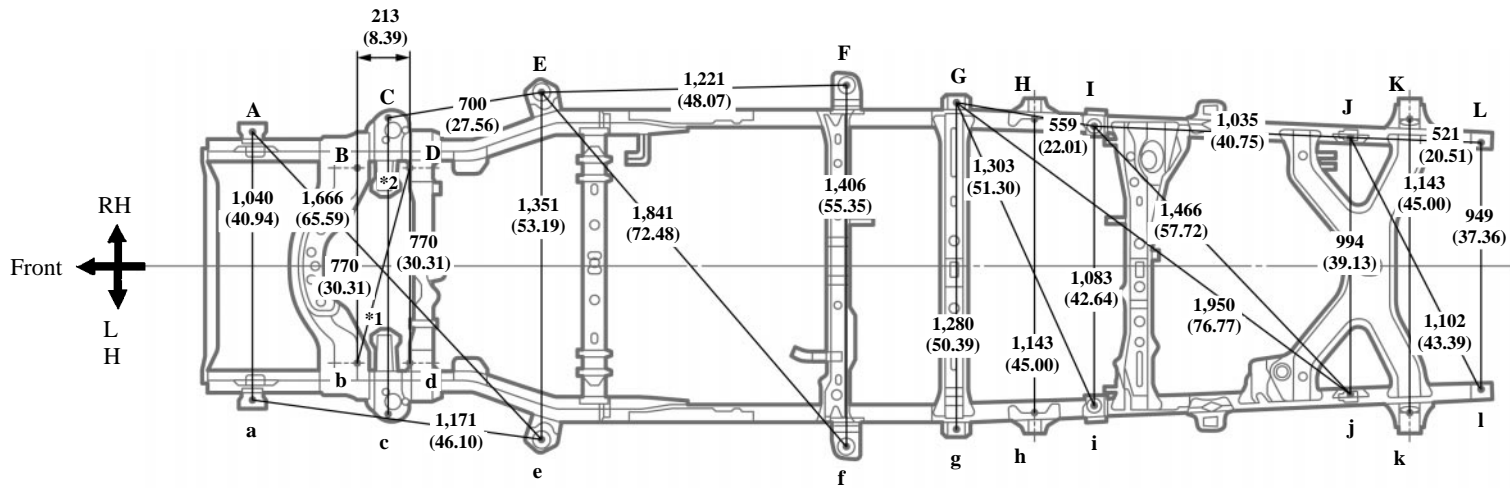
HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear.)

mm (in.)

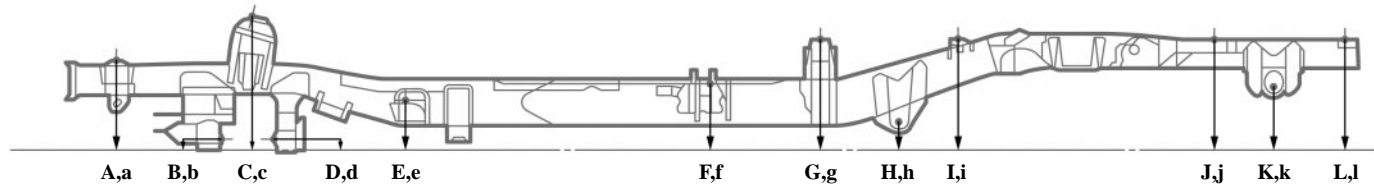
Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
G, g	Rocker panel assembly mark	—	Q, q	Roof side rail assembly mark	—
I, i	Roof side rail assembly mark	—	R, r	Quarter panel assembly mark	—
N, n	Center body pillar assembly mark	—	S, s	Rear floor side member plate/ Quarter panel adjoining portion	—
O, o	Center body pillar assembly mark	—	—	—	—
P, p	Rear floor side member plate/ Rocker panel adjoining portion	—			

**FRAME DIMENSION
REGULAR CAB**

(Three-Dimensional Distance)



*1	799 (31.46)
*2	1,154 (45.43)

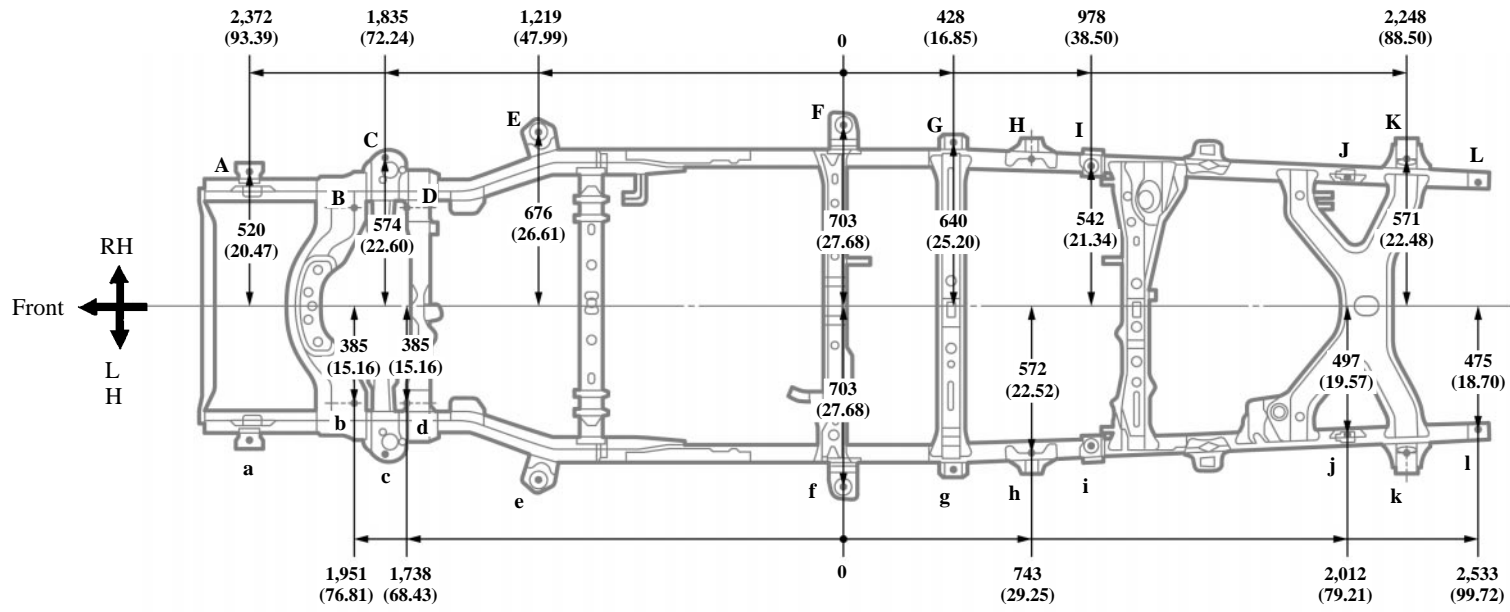


mm (in.)

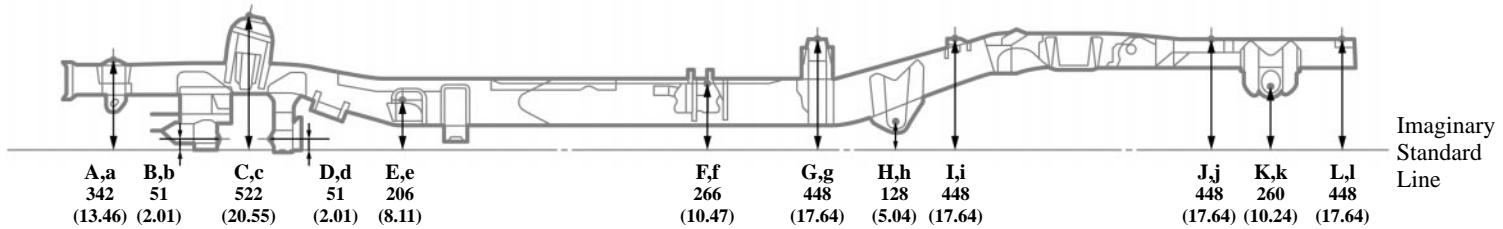
Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Body mounting hole	24 (0.94)	G, g	Rear body mounting installation nut	12 (0.47) nut
B, b	Suspension lower arm installation hole-rear	38 x 20 (1.50 x 0.79)	H, h	Rear spring front hanger hole-inner	14.6 (0.575)
C, c	Shock absorber installation hole	11.5 (0.453)	I, i	Rear body mounting installation nut	12 (0.47) nut
D, d	Suspension lower arm installation hole-front	38 x 20 (1.50 x 0.79)	J, j	Rear body mounting installation nut	12 (0.47) nut
E, e	Body mounting hole	70 (2.76)	K, k	Rear spring rear hanger hole-inner	14.3 (0.563)
F, f	Body mounting hole	70 (2.76)	L, l	Rear body mounting installation nut	12 (0.47) nut

**FRAME DIMENSION
REGULAR CAB**

(Two-Dimensional Distance)



Wheel Base 3,260 (128.35)



mm (in.)

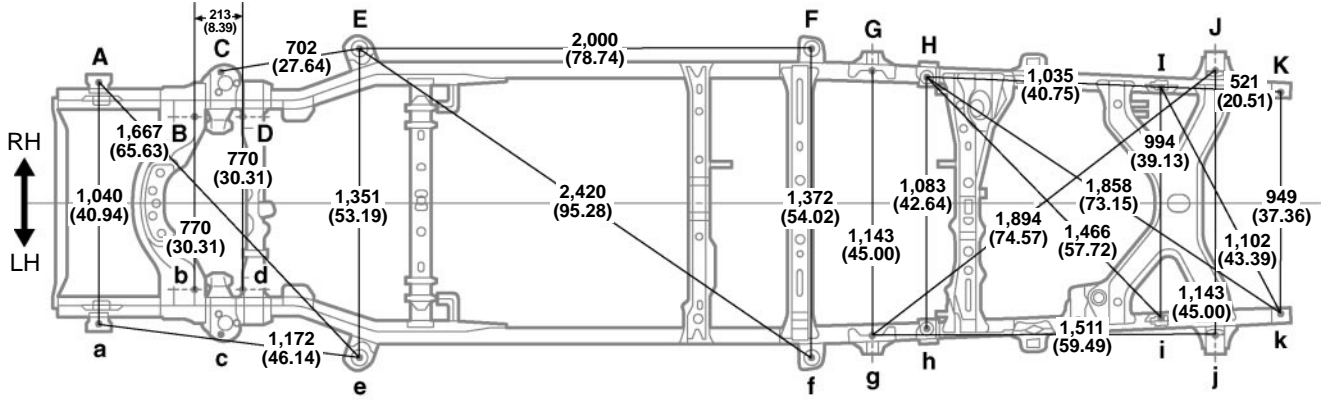
Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Body mounting hole	24 (0.94)	G, g	Rear body mounting installation nut	12 (0.47) nut
B, b	Suspension lower arm installation hole-rear	38 x 20 (1.50 x 0.79)	H, h	Rear spring front hanger hole-inner	14.6 (0.575)
C, c	Shock absorber installation hole	11.5 (0.453)	I, i	Rear body mounting installation nut	12 (0.47) nut
D, d	Suspension lower arm installation hole-front	38 x 20 (1.50 x 0.79)	J, j	Rear body mounting installation nut	12 (0.47) nut
E, e	Body mounting hole	70 (2.76)	K, k	Rear spring rear hanger hole-inner	14.3 (0.563)
F, f	Body mounting hole	70 (2.76)	L, l	Rear body mounting installation nut	12 (0.47) nut

FRAME DIMENSION

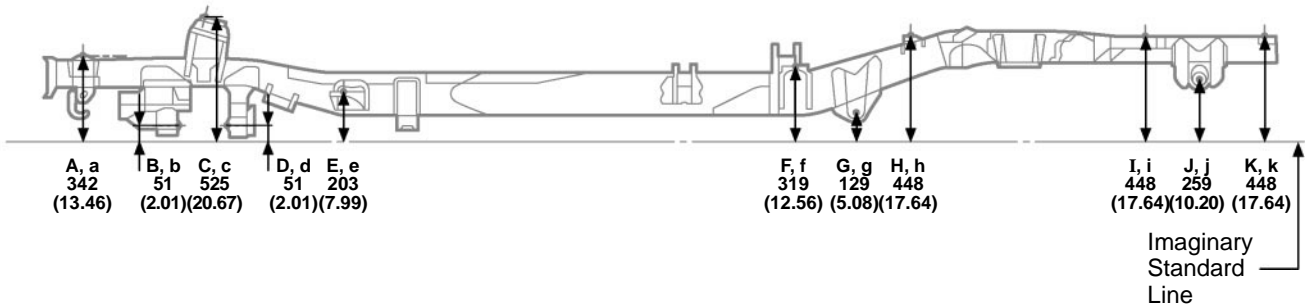
(Three-Dimensional Distance)

Vehicle Dimensions Left ↔ Right

B-d or b-D	C-c	C-e or c-E
799 (31.46)	1,150 (45.28)	1,430 (56.30)



Front ←

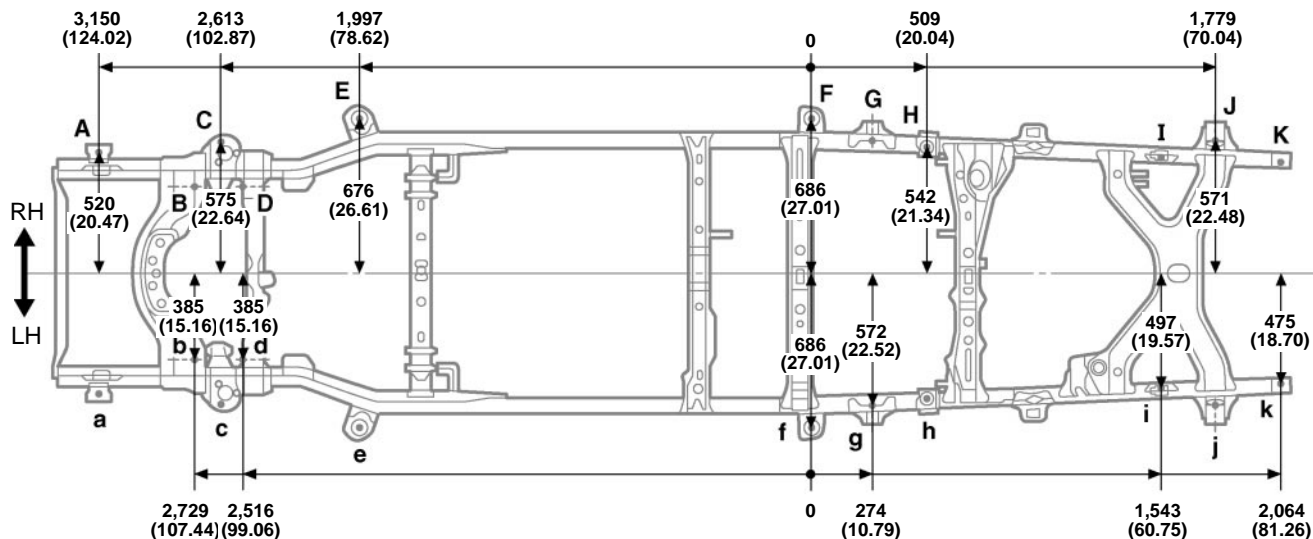


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Body mounting hole	24 (0.94)	G, g	Rear spring front hanger hole-inner	14.6 (0.575)
B, b	Suspension lower arm installation hole-rear	$\frac{38 \times 20}{(1.50 \times 0.79)}$	H, h	Rear body mounting installation nut	12 (0.47) nut
C, c	Shock absorber installation hole	11.5 (0.453)	I, i	Rear body mounting installation nut	12 (0.47) nut
D, d	Suspension lower arm installation hole-front	$\frac{38 \times 20}{(1.50 \times 0.79)}$	J, j	Rear spring rear hanger hole-inner	14.3 (0.563)
E, e	Body mounting hole	77 (3.03)	K, k	Rear body mounting installation nut	12 (0.47) nut
F, f	Body mounting hole	77 (3.03)	—	—	—

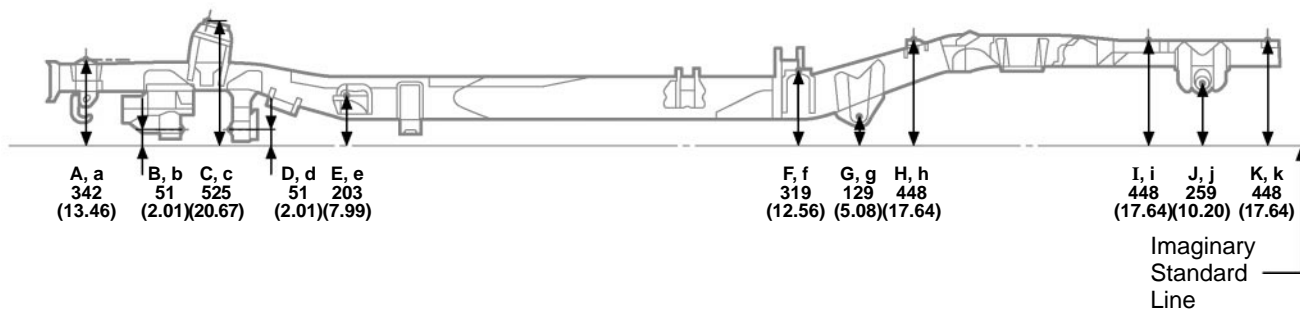
FRAME DIMENSION

(Two-Dimensional Distance)



Front ←

Wheel base	3,569 (140.51)
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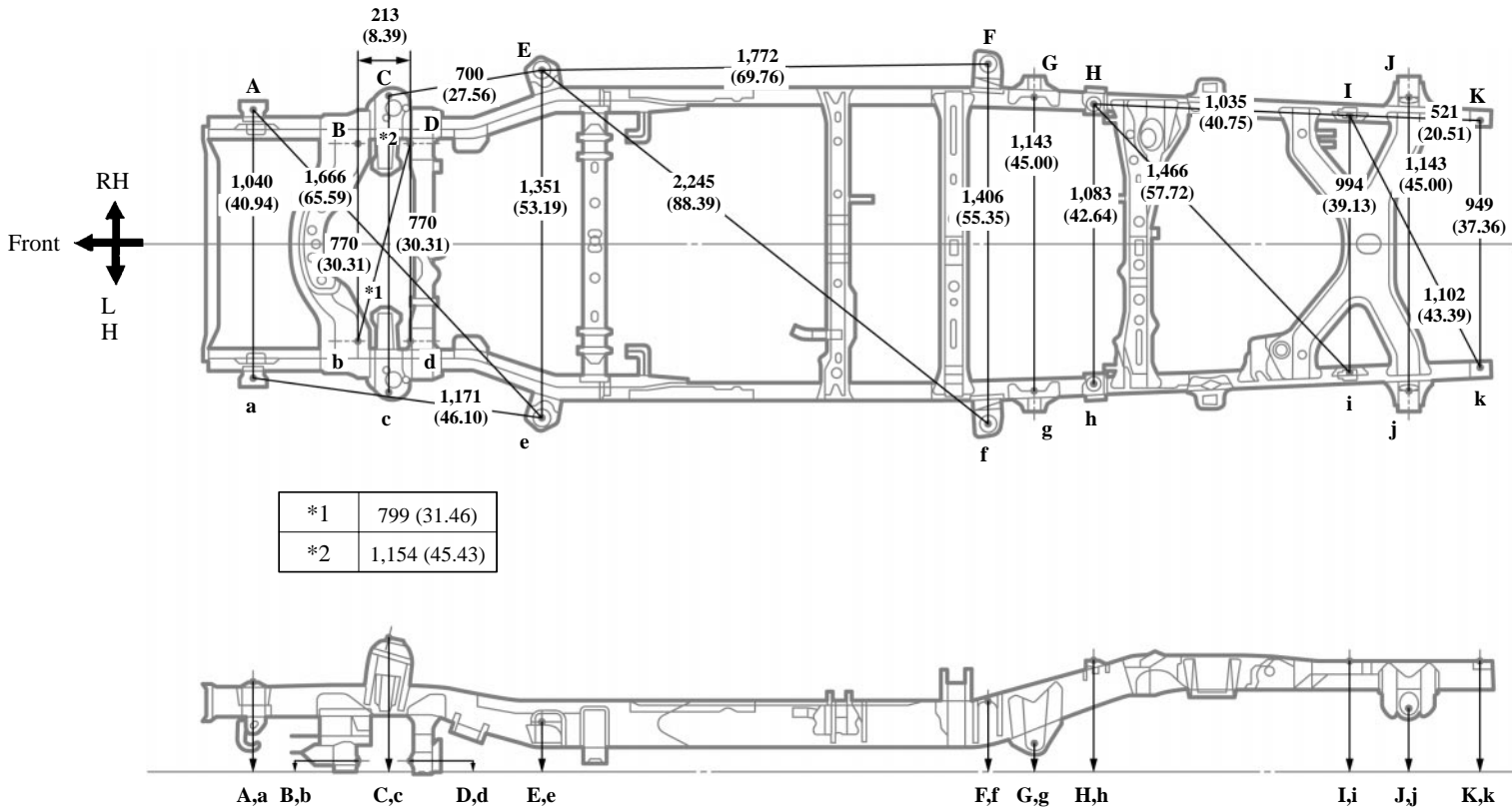


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Body mounting hole	24 (0.94)	G, g	Rear spring front hanger hole-inner	14.6 (0.575)
B, b	Suspension lower arm installation hole-rear	38 × 20 (1.50 × 0.79)	H, h	Rear body mounting installation nut	12 (0.47) nut
C, c	Shock absorber installation hole	11.5 (0.453)	I, i	Rear body mounting installation nut	12 (0.47) nut
D, d	Suspension lower arm installation hole-front	38 × 20 (1.50 × 0.79)	J, j	Rear spring rear hanger hole-inner	14.3 (0.563)
E, e	Body mounting hole	77 (3.03)	K, k	Rear body mounting installation nut	12 (0.47) nut
F, f	Body mounting hole	77 (3.03)	—	—	—

**FRAME DIMENSION
ACCESS CAB**

(Tree-Dimensional Distance)

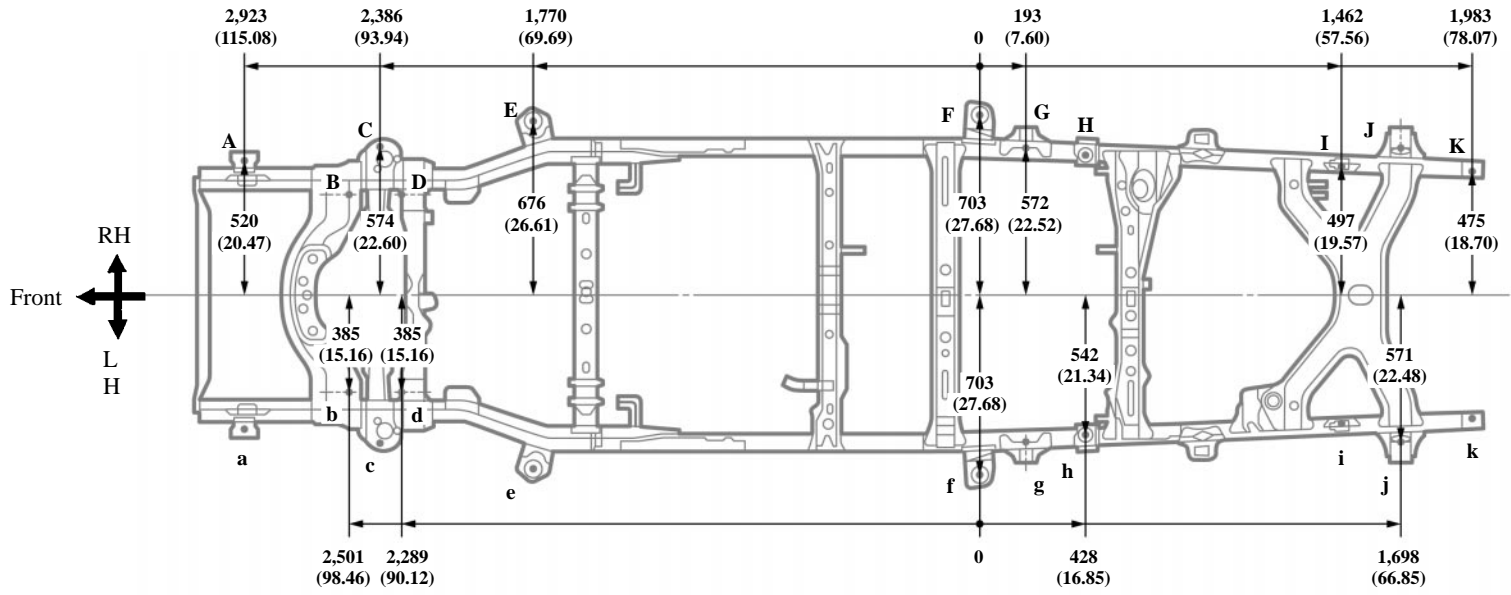


mm (in.)

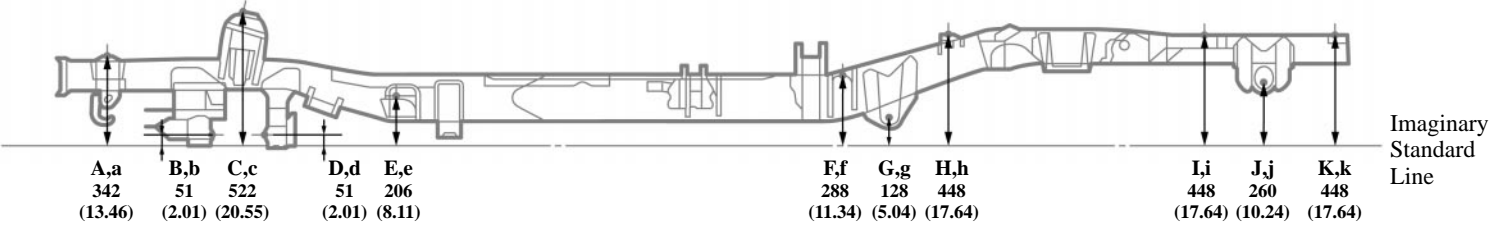
Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Body mounting hole	24 (0.94)	G, g	Rear spring front hanger hole-inner	14.6 (0.575)
B, b	Suspension lower arm installation hole-rear	38 x 20 (1.50 x 0.79)	H, h	Rear body mounting installation nut	12 (0.47) nut
C, c	Shock absorber installation hole	11.5 (0.453)	I, i	Rear body mounting installation nut	12 (0.47) nut
D, d	Suspension lower arm installation hole-front	38 x 20 (1.50 x 0.79)	J, j	Rear spring rear hanger hole-inner	14.3 (0.563)
E, e	Body mounting hole	70 (2.76)	K, k	Rear body mounting installation nut	12 (0.47) nut
F, f	Body mounting hole	70 (2.76)	—	—	—

**FRAME DIMENSION
ACCESS CAB**

(Two-Dimensional Distance)



Wheel Base 3,260 (128.35)

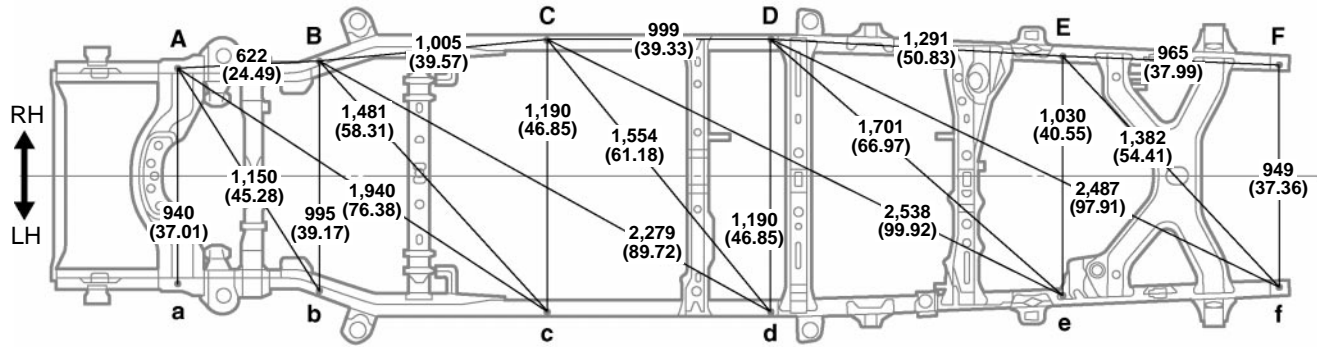


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Body mounting hole	24 (0.94)	G, g	Rear spring front hanger hole-inner	14.6 (0.575)
B, b	Suspension lower arm installation hole-rear	38 x 20 (1.50 x 0.79)	H, h	Rear body mounting installation nut	12 (0.47) nut
C, c	Shock absorber installation hole	11.5 (0.453)	I, i	Rear body mounting installation nut	12 (0.47) nut
D, d	Suspension lower arm installation hole-front	38 x 20 (1.50 x 0.79)	J, j	Rear spring rear hanger hole-inner	14.3 (0.563)
E, e	Body mounting hole	70 (2.76)	K, k	Rear body mounting installation nut	12 (0.47) nut
F, f	Body mounting hole	70 (2.76)	—	—	—

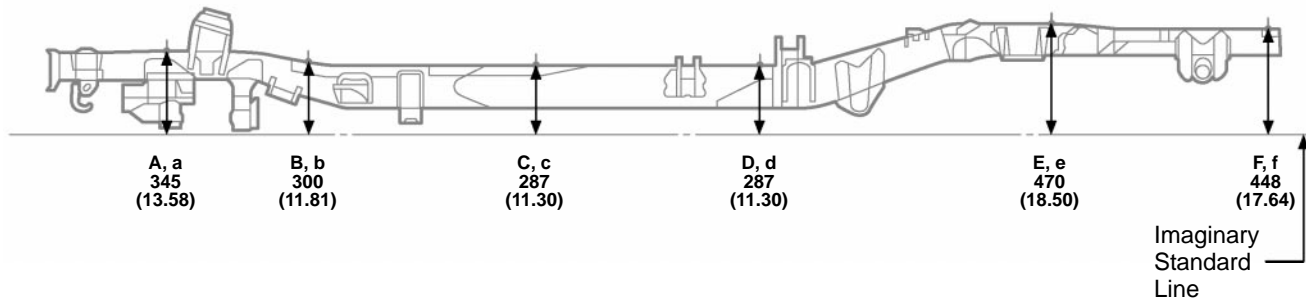
FRAME DIMENSION-Upper Face

(Three-Dimensional Distance)



RH
↑
LH
↓

Front ←



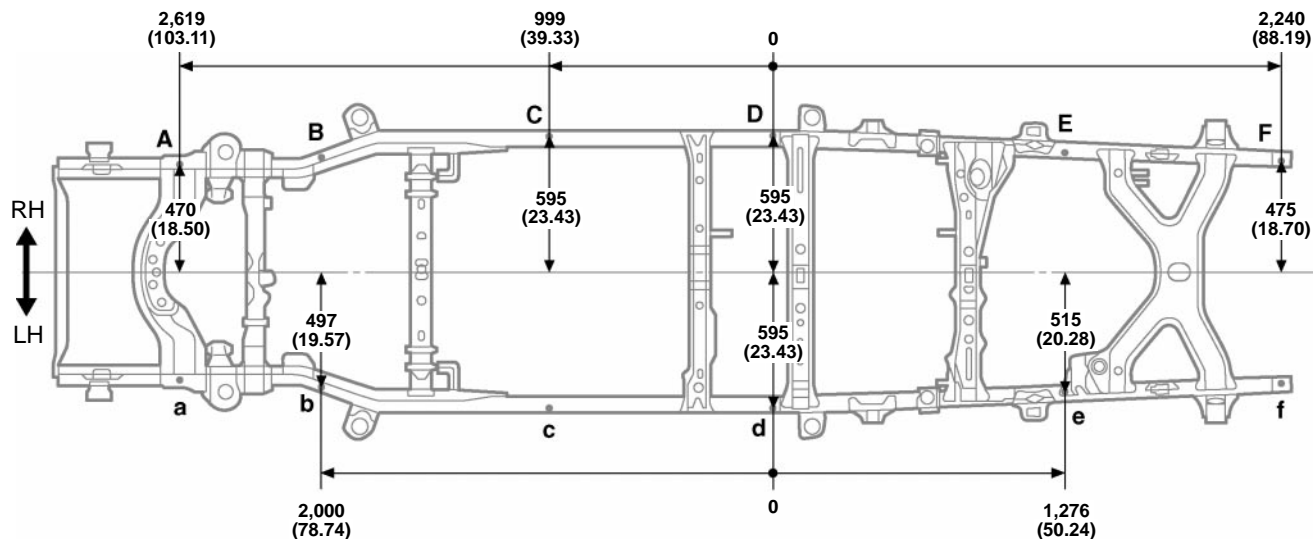
Imaginary
Standard
Line

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Wire harness installation hole	12×7 (0.47×0.28)	D, d	Wire harness installation hole	12×7 (0.47×0.28)
B, b	Frame side rail standard hole	20×15 (0.79×0.59)	E, e	Wire harness installation hole	12×7 (0.47×0.28)
C, c	Wire harness installation hole	12×7 (0.47×0.28)	F, f	Rear body mounting installation nut	12 (0.47) nut

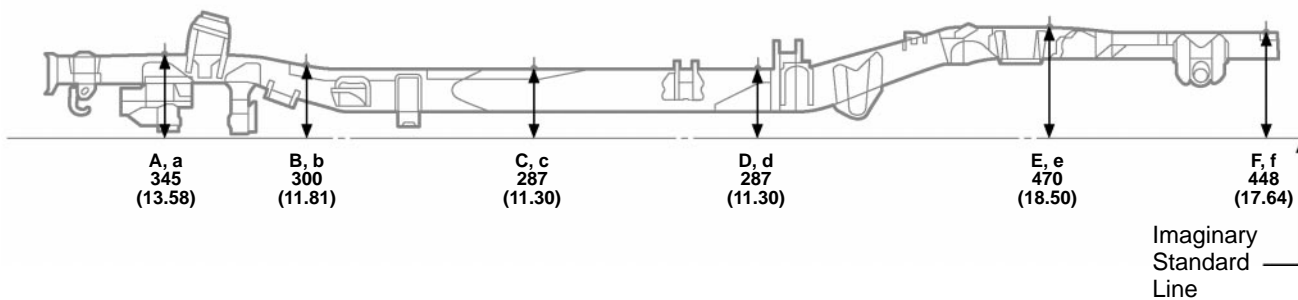
FRAME DIMENSION-Upper Face

(Two-Dimensional Distance)



Front ←

Wheel base	3,569 (140.51)
------------	----------------

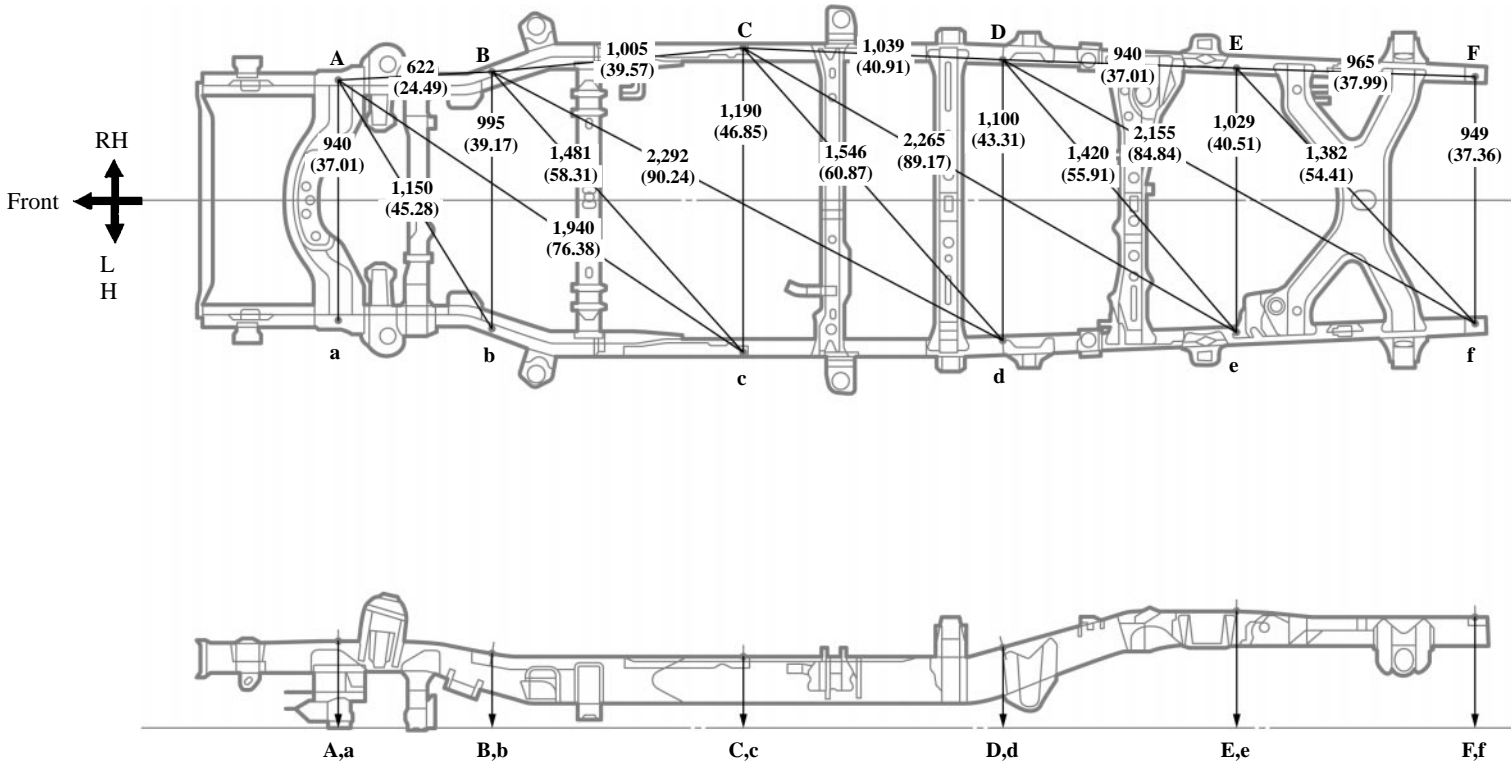


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Wire harness installation hole	12×7 (0.47×0.28)	D, d	Wire harness installation hole	12×7 (0.47×0.28)
B, b	Frame side rail standard hole	20×15 (0.79×0.59)	E, e	Wire harness installation hole	12×7 (0.47×0.28)
C, c	Wire harness installation hole	12×7 (0.47×0.28)	F, f	Rear body mounting installation nut	12 (0.47) nut

FRAME DIMENSION - Upper Face

(Three-Dimensional Distance)

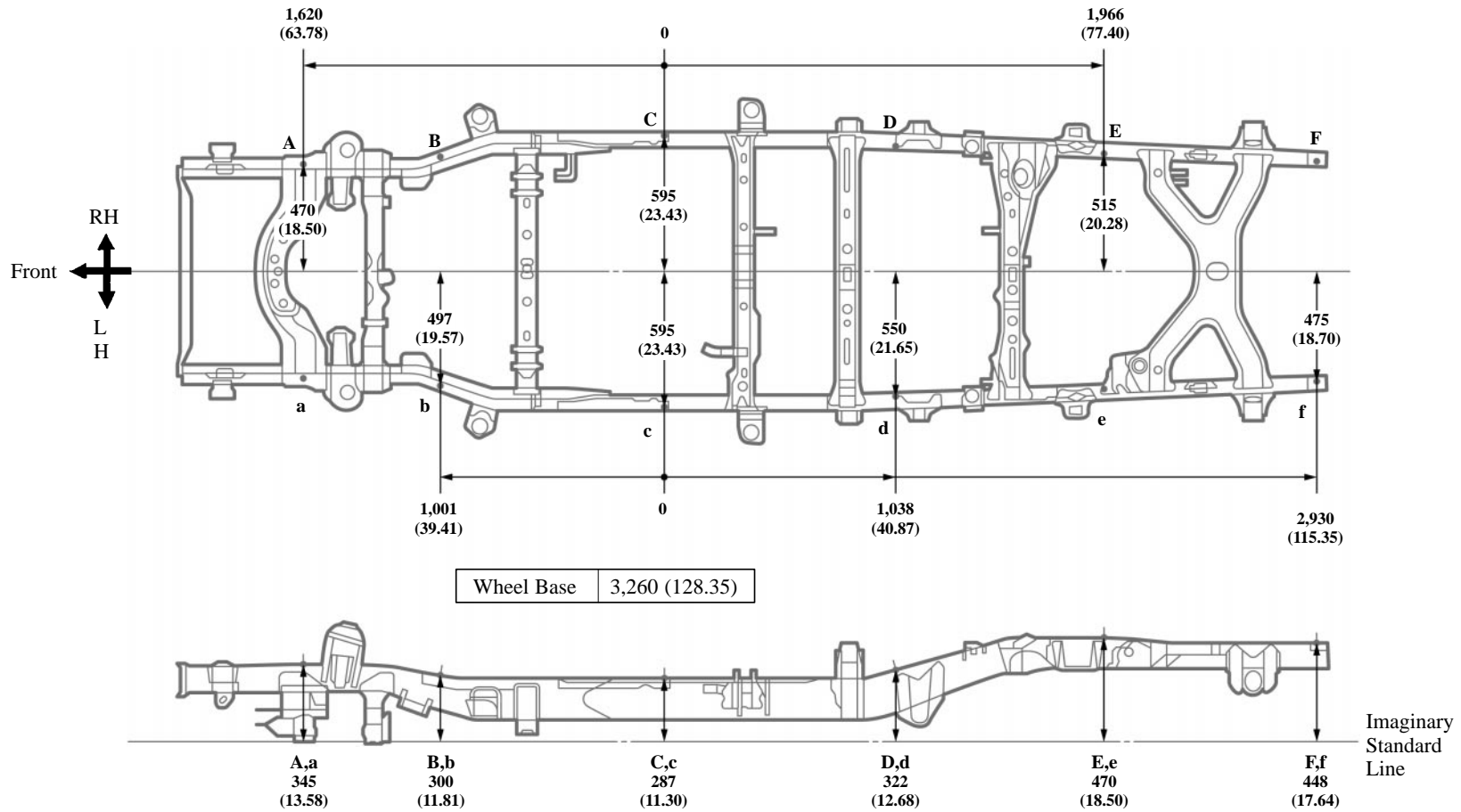


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Wire harness installation hole	12 x 7 (0.47 x 0.28)	D, d	Wire harness installation hole	12 x 7 (0.47 x 0.28)
B, b	Frame side rail standard hole	20 x 15 (0.79 x 0.59)	E, e	Wire harness installation hole	12 x 7 (0.47 x 0.28)
C, c	Wire harness installation hole	12 x 7 (0.47 x 0.28)	F, f	Rear body mounting installation nut	12 (0.47) nut

FRAME DIMENSION - Upper Face

(Two-Dimensional Distance)



mm (in.)

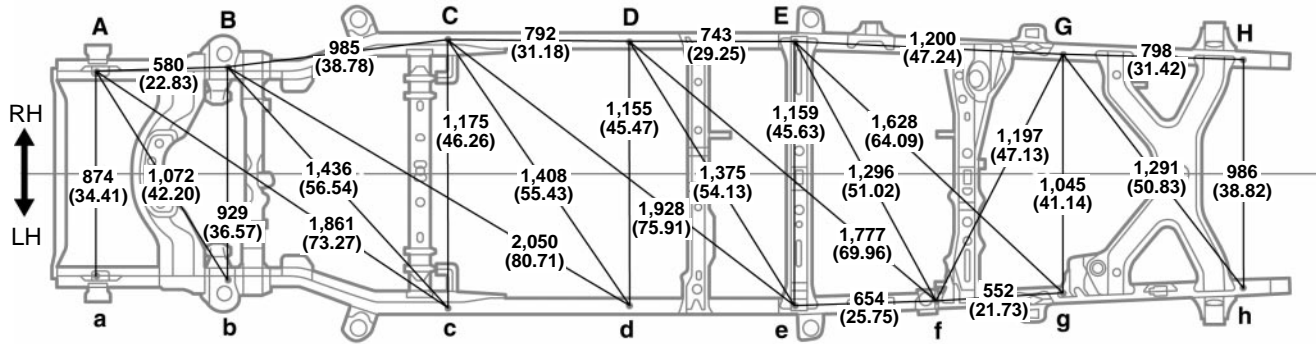
Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Wire harness installation hole	12 x 7 (0.47 x 0.28)	D, d	Wire harness installation hole	12 x 7 (0.47 x 0.28)
B, b	Frame side rail standard hole	20 x 15 (0.79 x 0.59)	E, e	Wire harness installation hole	12 x 7 (0.47 x 0.28)
C, c	Wire harness installation hole	12 x 7 (0.47 x 0.28)	F, f	Rear body mounting installation nut	12 (0.47) nut

FRAME DIMENSION-Lower Face

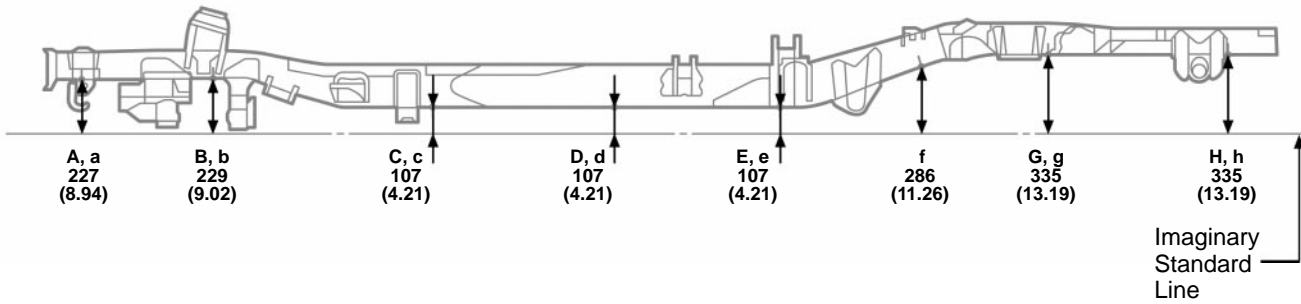
(Three-Dimensional Distance)

Vehicle Dimensions Left ↔ Right

f-H
1,698 (66.85)



Front ←

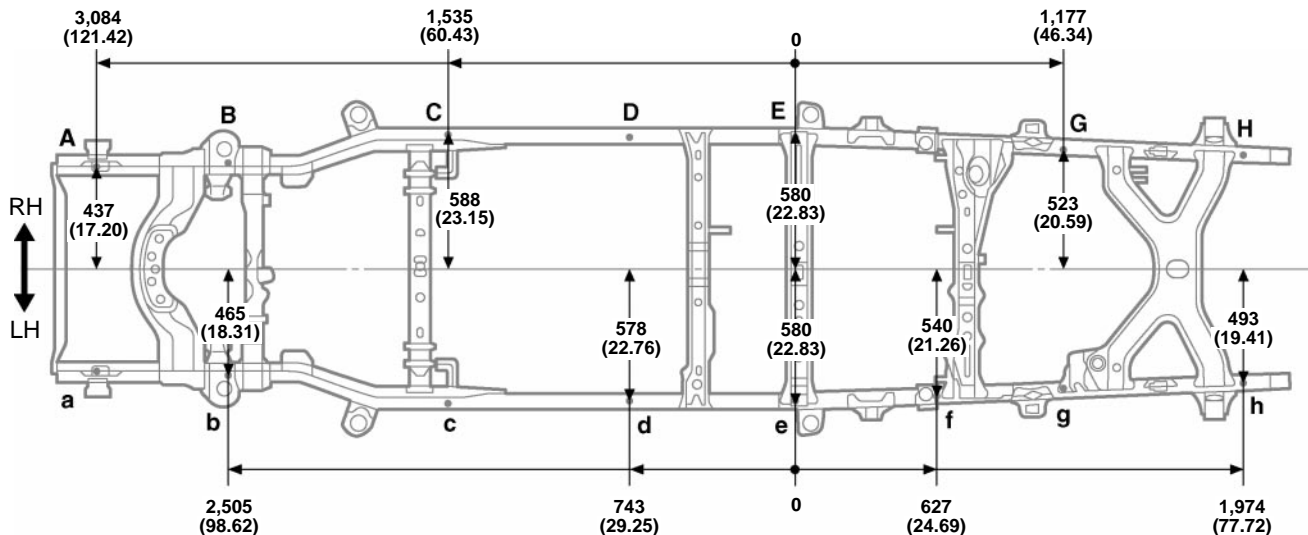


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front hook installation nut	12 (0.47) nut	E, e	Frame side rail working hole	11 (0.43)
B, b	Frame side rail standard hole	16 × 16 (0.63 × 0.63)	f	Parking brake cable installation nut	8 (0.31) nut
C, c	Frame side rail standard hole	16 × 16 (0.63 × 0.63)	G, g	Frame side rail working hole	11 (0.43)
D, d	Frame side rail standard hole	16 × 16 (0.63 × 0.63)	H, h	Towing hitch installation nut	12 (0.47) nut

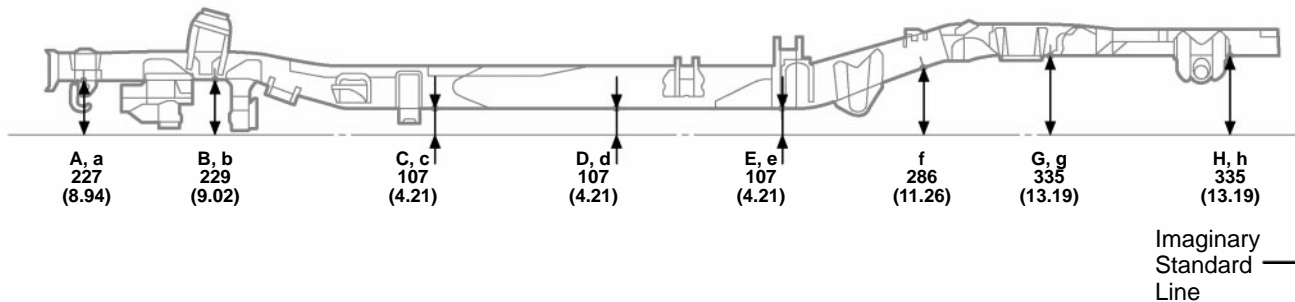
FRAME DIMENSION-Lower Face

(Two-Dimensional Distance)



Front ←

Wheel base	3,569 (140.51)
------------	----------------

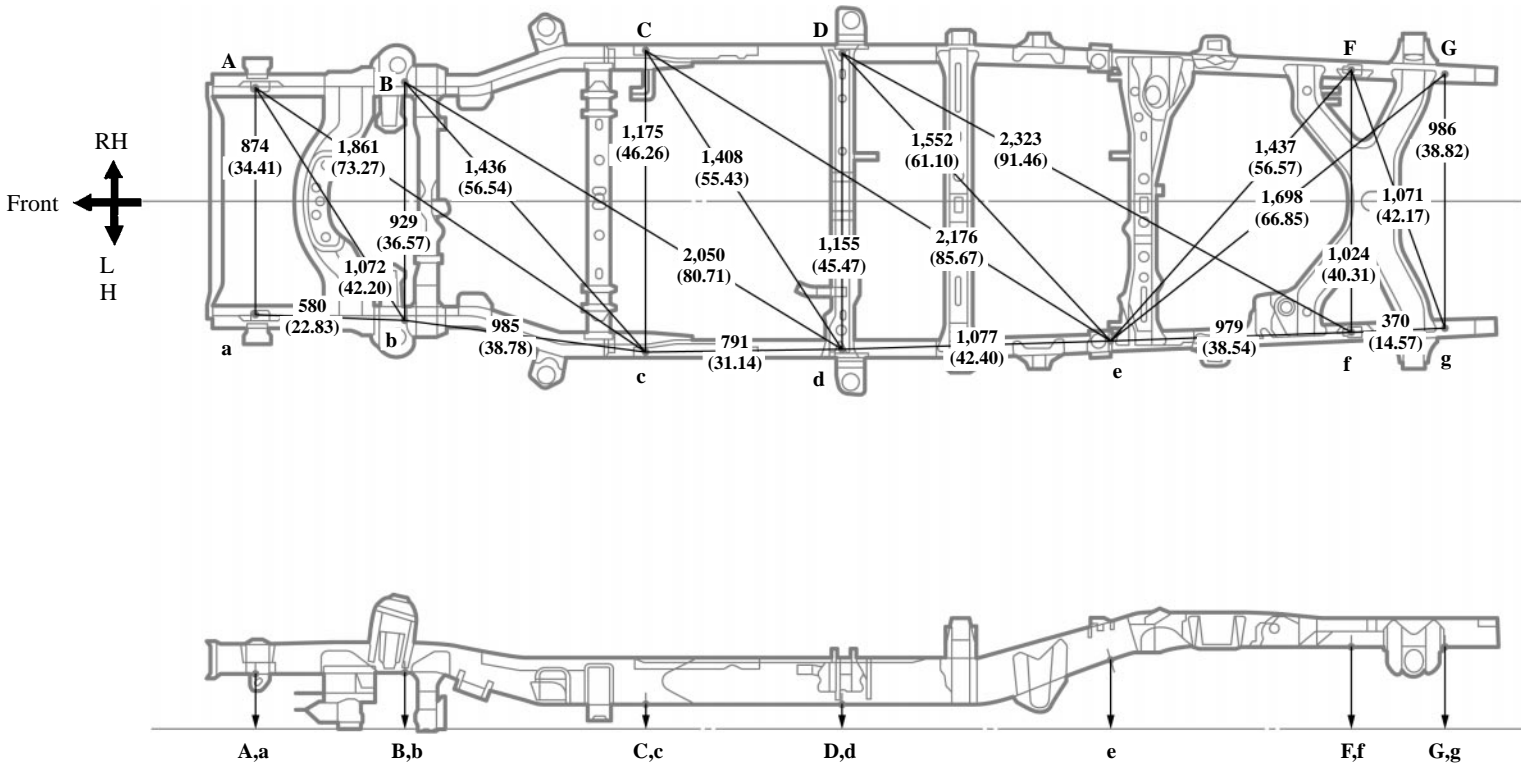


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front hook installation nut	12 (0.47) nut	E, e	Frame side rail working hole	11 (0.43)
B, b	Frame side rail standard hole	16 × 16 (0.63 × 0.63)	f	Parking brake cable installation nut	8 (0.31) nut
C, c	Frame side rail standard hole	16 × 16 (0.63 × 0.63)	G, g	Frame side rail working hole	11 (0.43)
D, d	Frame side rail standard hole	16 × 16 (0.63 × 0.63)	H, h	Towing hitch installation nut	12 (0.47) nut

FRAME DIMENSION - Lower Face

(Three-Dimensional Distance)

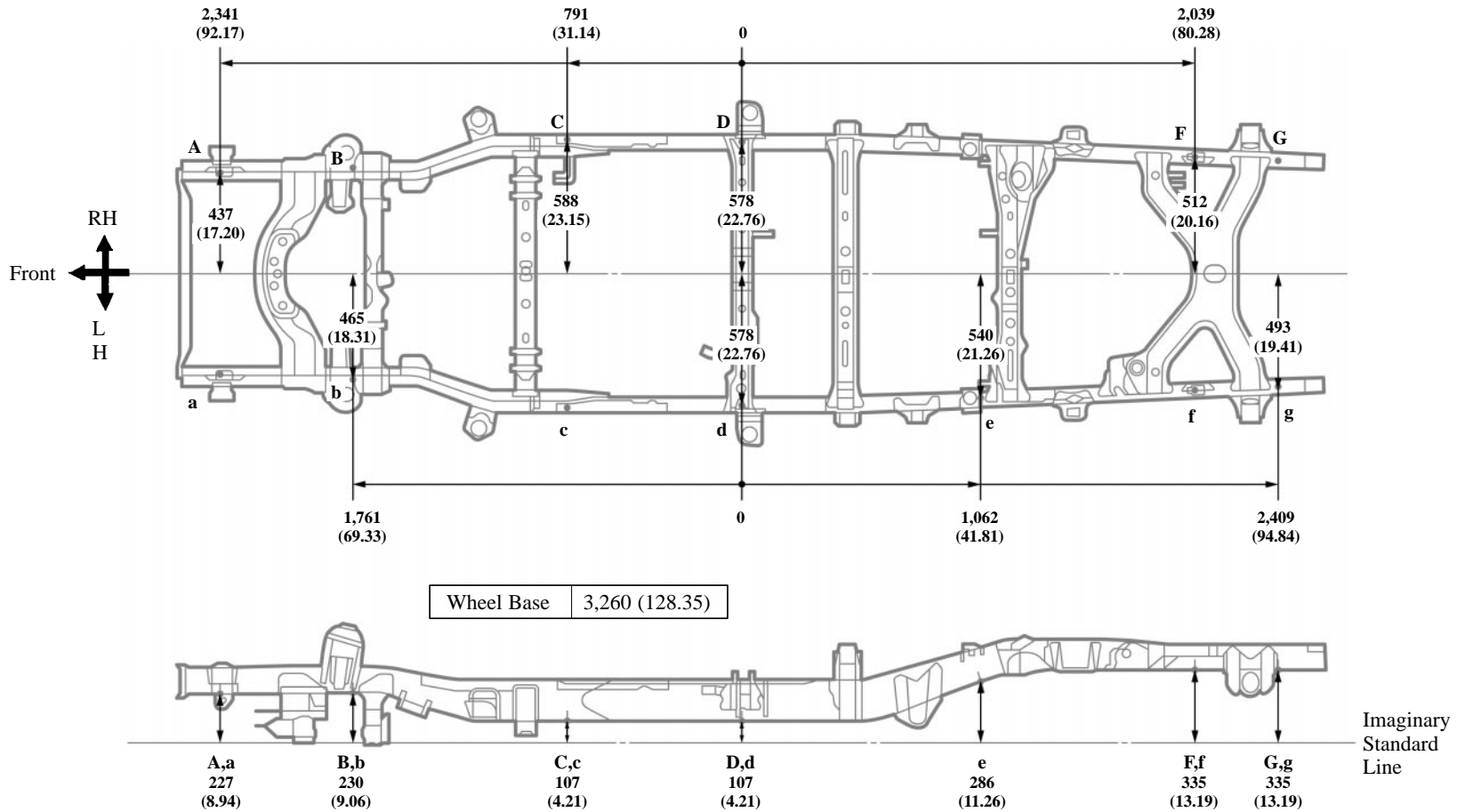


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front hook installation nut	12 (0.47) nut	e	Parking brake cable installation nut	8 (0.31) nut
B, b	Frame side rail standard hole	16 x 16 (0.63 x 0.63)	F, f	Towing hitch installation nut	12 (0.47) nut
C, c	Frame side rail standard hole	16 x 16 (0.63 x 0.63)	G, g	Towing hitch installation nut	12 (0.47) nut
D, d	Frame side rail standard hole	16 x 16 (0.63 x 0.63)	—	—	—

FRAME DIMENSION - Lower Face

(Two-Dimensional Distance)

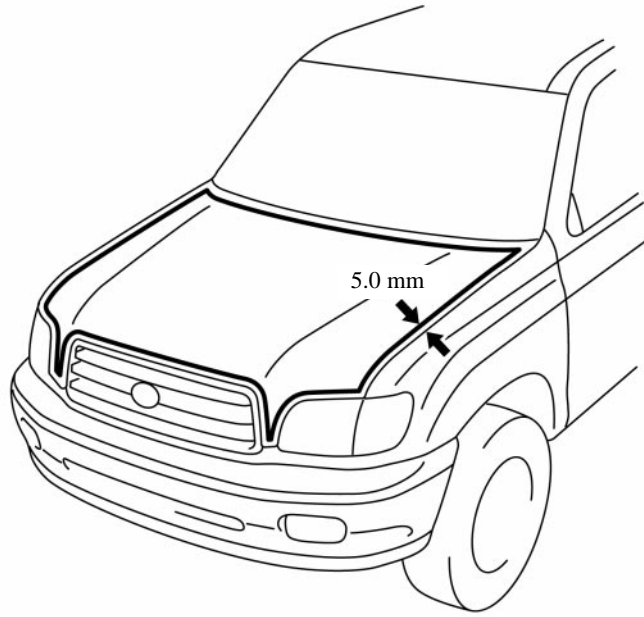


mm (in.)

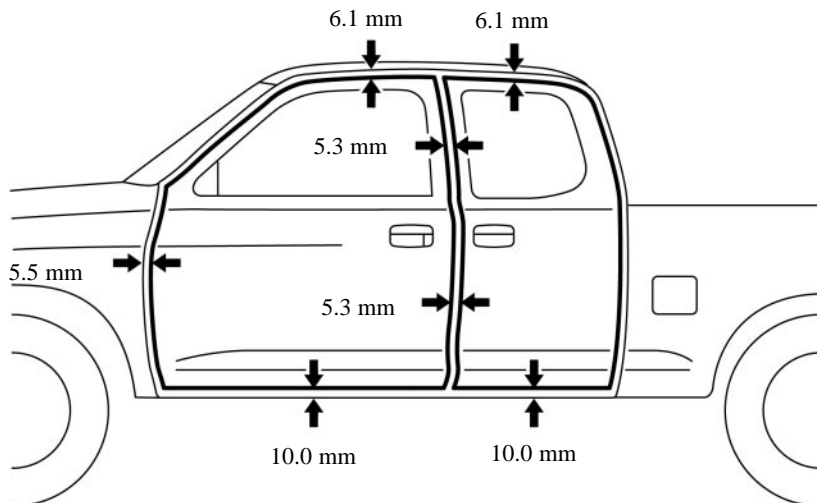
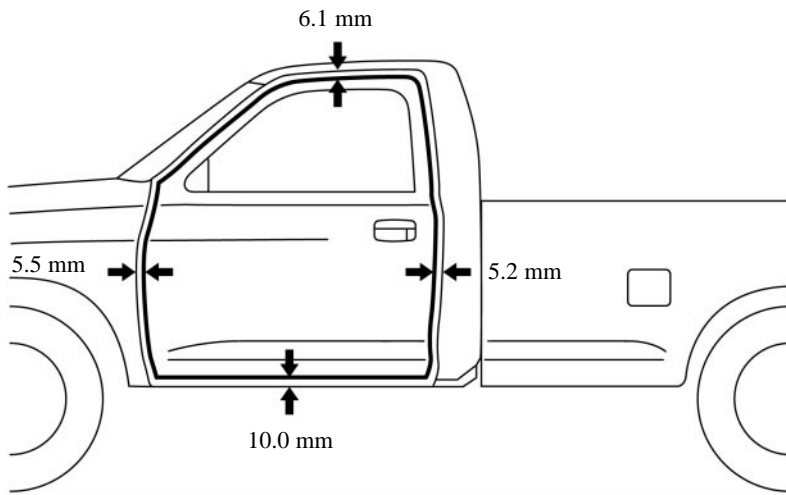
Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front hook installation nut	12 (0.47) nut	e	Parking brake cable installation nut	8 (0.31) nut
B, b	Frame side rail standard hole	16 x 16 (0.63 x 0.63)	F, f	Towing hitch installation nut	12 (0.47) nut
C, c	Frame side rail standard hole	16 x 16 (0.63 x 0.63)	G, g	Towing hitch installation nut	12 (0.47) nut
D, d	Frame side rail standard hole	16 x 16 (0.63 x 0.63)	—	—	—

FIT STANDARDS

After doors and the engine hood are installed, be sure to perform fit adjustment to prevent abnormal wind noise and ensure a good appearance.

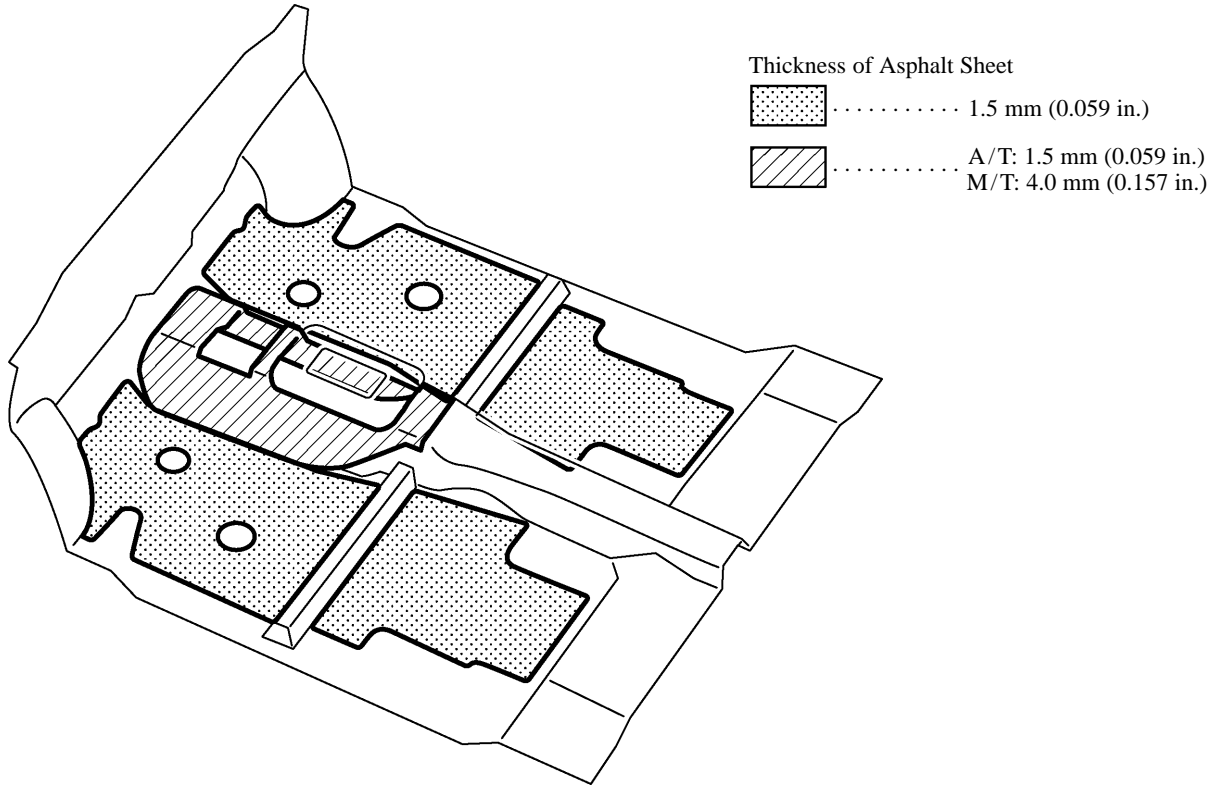


mm	in.
5.0	0.197
5.2	0.205
5.3	0.209
5.5	0.217
6.1	0.240
10.0	0.394

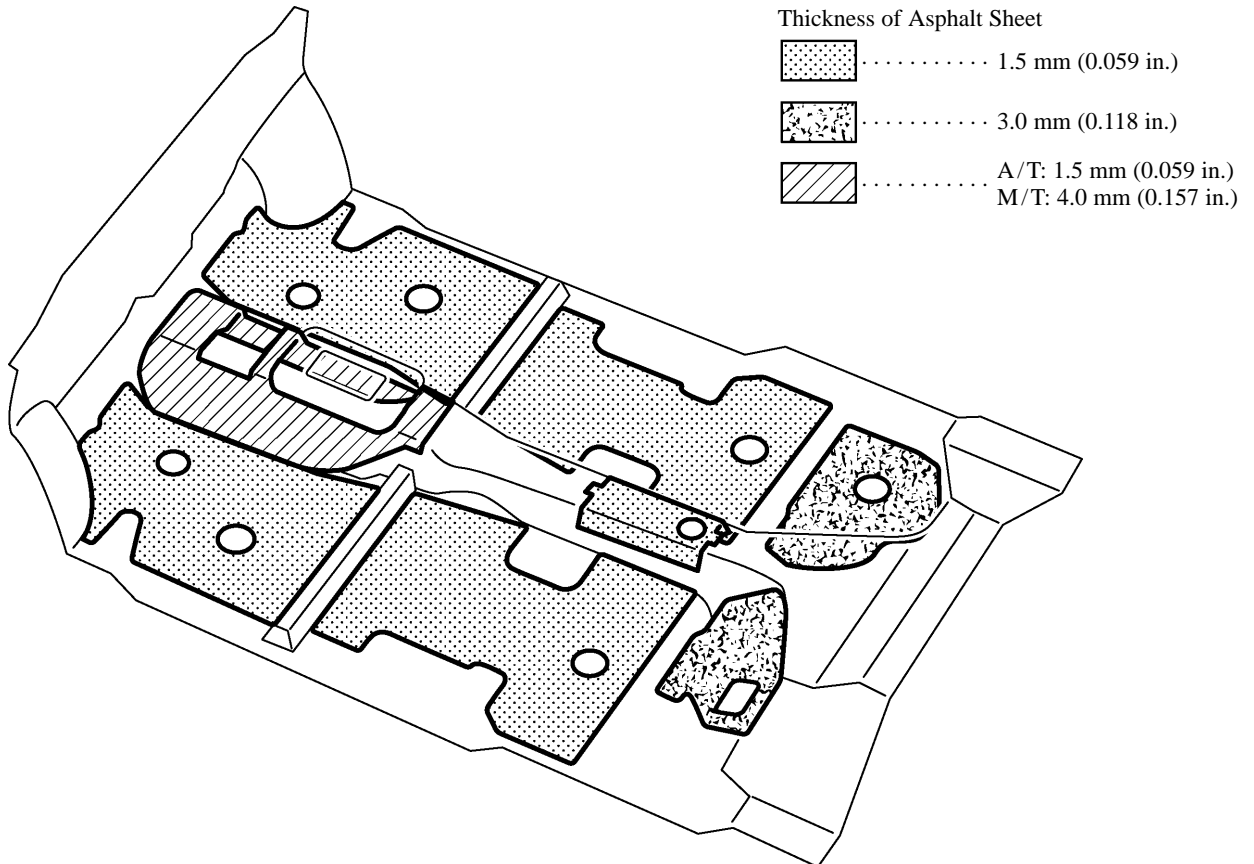


SILENCER SHEET INSTALLATION AREAS

REGULAR CAB

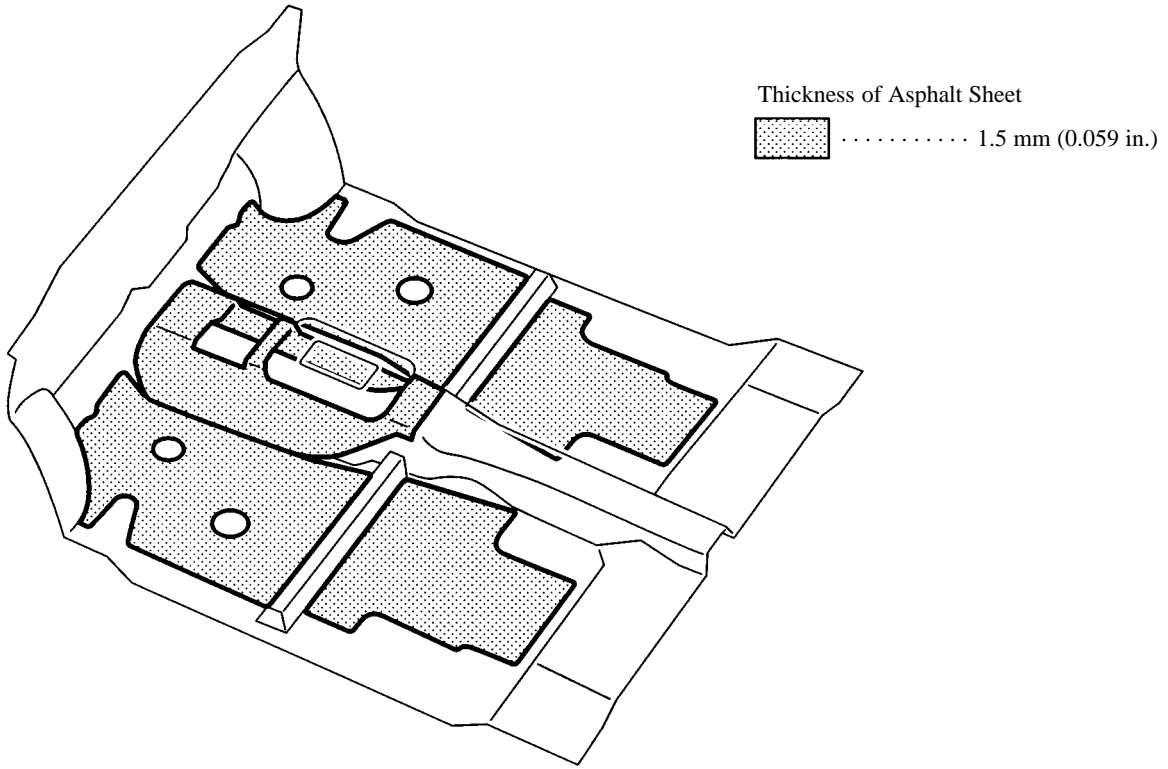


ACCESS CAB

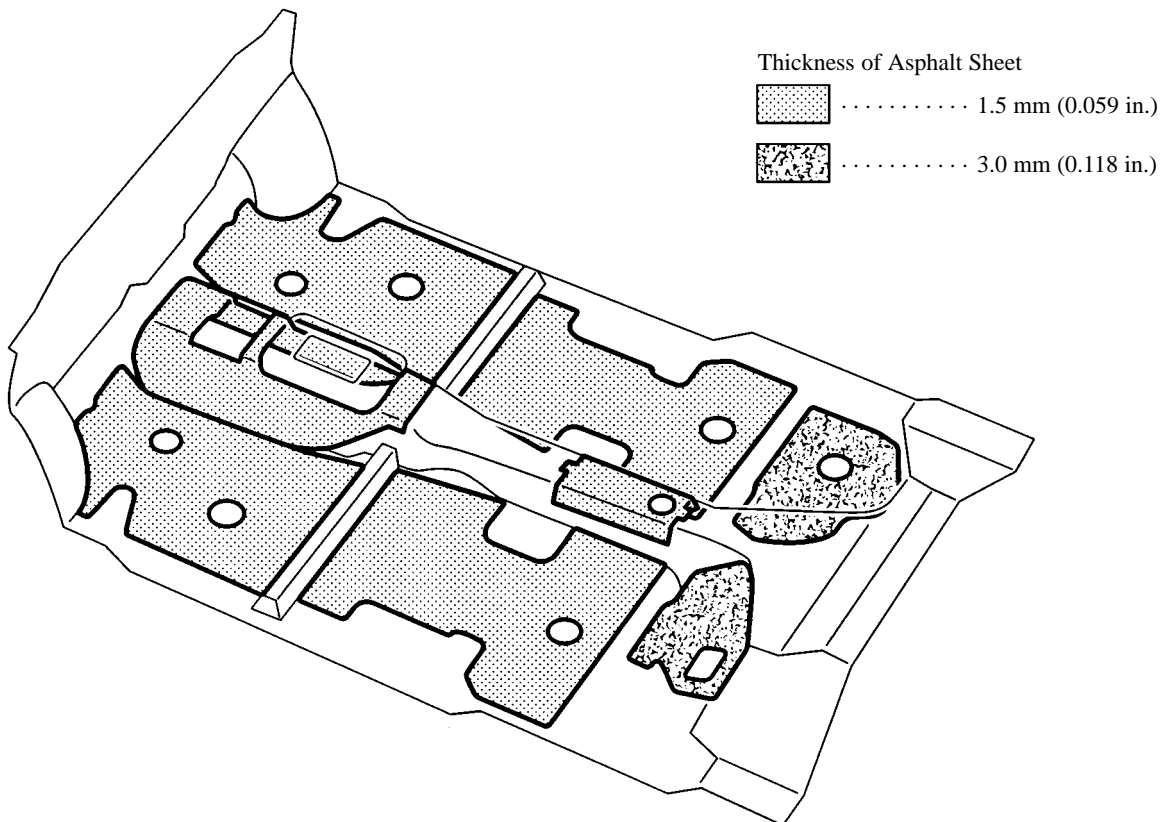


SILENCER SHEET INSTALLATION AREAS

REGULAR CAB



ACCESS CAB



FOREWORD

This wiring diagram manual has been prepared to provide information on the electrical system of the 2005 TOYOTA TUNDRA.

Applicable models: GSK30 Series
UCK30, 31, 40, 41 Series

For service specifications and repair procedures of the above models other than those listed in this manual, refer to the following manuals;

Manual Name	Pub. No.
▲ 2005 TOYOTA TUNDRA Repair Manual	RM1150U
▲ 2005 TOYOTA New Car Features	NCF275U

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION

NOTICE

When handling supplemental restraint system components (removal, installation or inspection, etc.), always follow the direction given in the repair manuals listed above to prevent accidents and supplemental restraint system malfunction.

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First Printing : Aug. 06, 2004 01-040806-00

2005 TOYOTA TUNDRA ELECTRICAL WIRING DIAGRAM

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ABBREVIATIONS	D	17
GLOSSARY OF TERMS AND SYMBOLS	E	18
RELAY LOCATIONS	F	20
ELECTRICAL WIRING ROUTING	G	52
SYSTEM CIRCUITS	H	100
GROUND POINT	I	534
POWER SOURCE (Current Flow Chart)	J	546
CONNECTOR LIST	K	562
PART NUMBER OF CONNECTORS	L	578
OVERALL ELECTRICAL WIRING DIAGRAM .	M	584

A INTRODUCTION

This manual consists of the following 13 sections:

No.	Section	Description
A	INDEX	Index of the contents of this manual.
	INTRODUCTION	Brief explanation of each section.
B	HOW TO USE THIS MANUAL	Instructions on how to use this manual.
C	TROUBLE-SHOOTING	Describes the basic inspection procedures for electrical circuits.
D	ABBREVIATIONS	Defines the abbreviations used in this manual.
E	GLOSSARY OF TERMS AND SYMBOLS	Defines the symbols and functions of major parts.
F	RELAY LOCATIONS	Shows position of the Electronic Control Unit, Relays, Relay Block, etc. This section is closely related to the system circuit.
G	ELECTRICAL WIRING ROUTING	Describes position of Parts Connectors, Splice points, Ground points, etc. This section is closely related to the system circuit.
H	INDEX	Index of the system circuits.
	SYSTEM CIRCUITS	Electrical circuits of each system are shown from the power supply through ground points. Wiring connections and their positions are shown and classified by code according to the connection method. (Refer to the section, "How to use this manual"). The "System Outline" and "Service Hints" useful for troubleshooting are also contained in this section.
I	GROUND POINT	Shows ground positions of all parts described in this manual.
J	POWER SOURCE (Current Flow Chart)	Describes power distribution from the power supply to various electrical loads.
K	CONNECTOR LIST	Describes the form of the connectors for the parts appeared in this book. This section is closely related to the system circuit.
L	PART NUMBER OF CONNECTORS	Indicates the part number of the connectors used in this manual.
M	OVERALL ELECTRICAL WIRING DIAGRAM	Provides circuit diagrams showing the circuit connections.

This manual provides information on the electrical circuits installed on vehicles by dividing them into a circuit for each system.

The actual wiring of each system circuit is shown from the point where the power source is received from the battery as far as each ground point. (All circuit diagrams are shown with the switches in the OFF position.)

When troubleshooting any problem, first understand the operation of the circuit where the problem was detected (see System Circuit section), the power source supplying power to that circuit (see Power Source section), and the ground points (see Ground Point section). See the System Outline to understand the circuit operation.

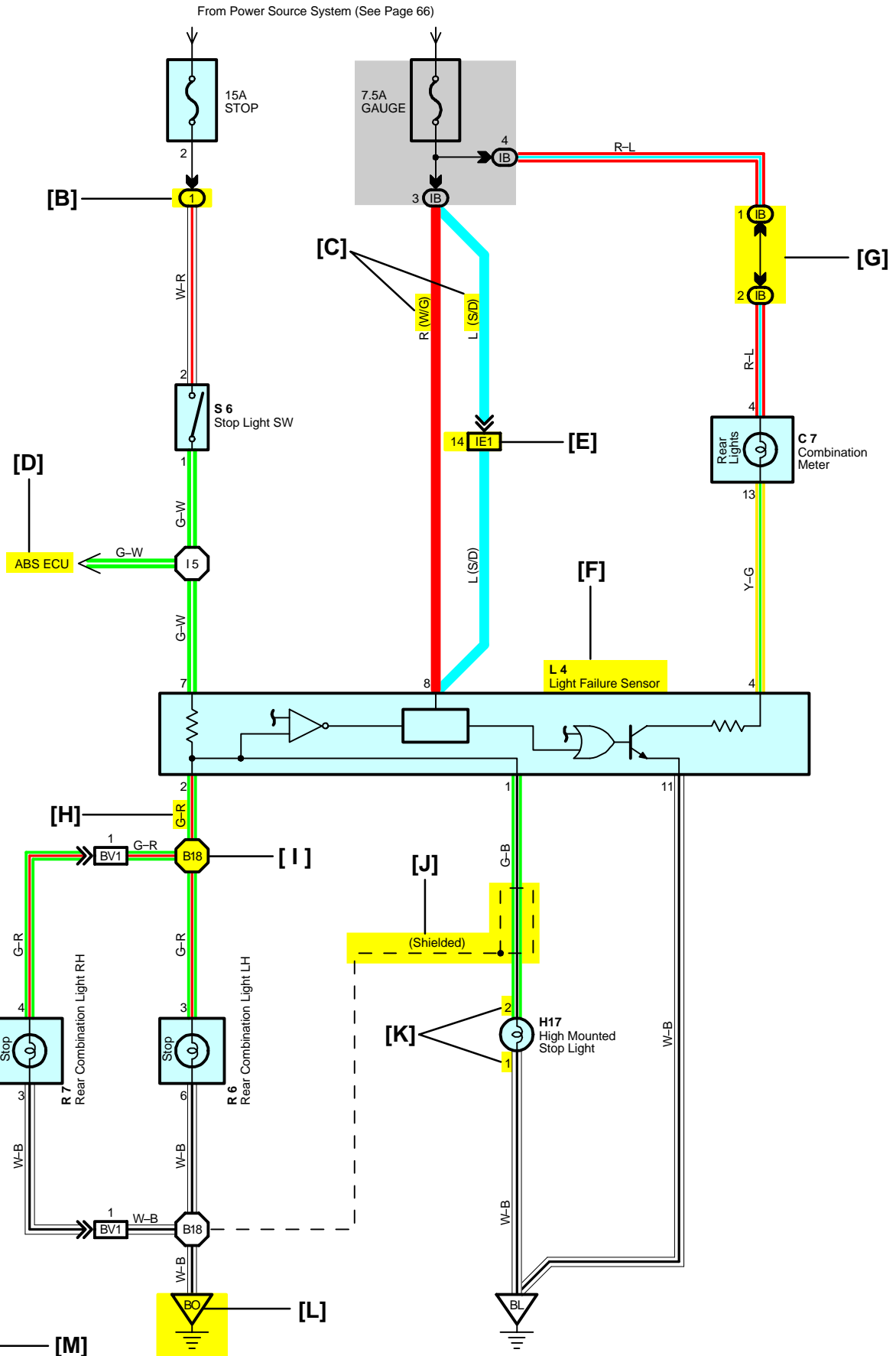
When the circuit operation is understood, begin troubleshooting of the problem circuit to isolate the cause. Use Relay Location and Electrical Wiring Routing sections to find each part, junction block and wiring harness connectors, wiring harness and wiring harness connectors, splice points, and ground points of each system circuit. Internal wiring for each junction block is also provided for better understanding of connection within a junction block.

Wiring related to each system is indicated in each system circuit by arrows (from__, to__). When overall connections are required, see the Overall Electrical Wiring Diagram at the end of this manual.

B HOW TO USE THIS MANUAL

* The system shown here is an EXAMPLE ONLY. It is different to the actual circuit shown in the SYSTEM CIRCUITS SECTION.

[A] Stop Light



[A] : System Title

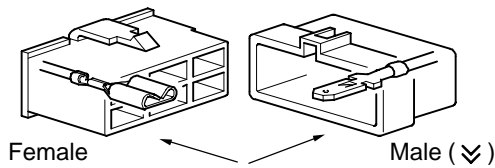
[B] : Indicates a Relay Block. No shading is used and only the Relay Block No. is shown to distinguish it from the J/B

Example: ① Indicates Relay Block No.1

[C] : () is used to indicate different wiring and connector, etc. when the vehicle model, engine type, or specification is different.

[D] : Indicates related system.

[E] : Indicates the wiring harness and wiring harness connector. The wiring harness with male terminal is shown with arrows (↗). Outside numerals are pin numbers.



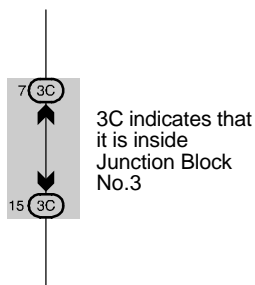
The first letter of the code for each wiring harness and wiring harness connector(s) indicates the component's location, e.g, "E" for the Engine Compartment, "I" for the Instrument Panel and Surrounding area, and "B" for the Body and Surrounding area.

When more than one code has the first and second letters in common, followed by numbers (e.g, IH1, IH2), this indicates the same type of wiring harness and wiring harness connector.

[F] : Represents a part (all parts are shown in sky blue). The code is the same as the code used in parts position.

[G] : Junction Block (The number in the circle is the J/B No. and the connector code is shown beside it). Junction Blocks are shaded to clearly separate them from other parts.

Example:



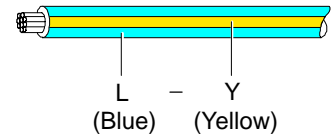
[H] : Indicates the wiring color.

Wire colors are indicated by an alphabetical code.

- B = Black W = White BR = Brown
- L = Blue V = Violet SB = Sky Blue
- R = Red G = Green LG = Light Green
- P = Pink Y = Yellow GR = Gray
- O = Orange

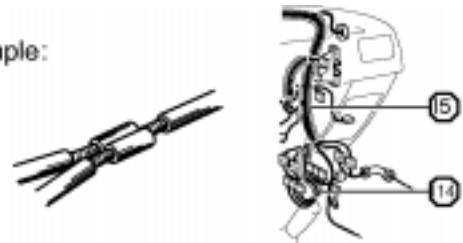
The first letter indicates the basic wire color and the second letter indicates the color of the stripe.

Example: L - Y



[I] : Indicates a wiring Splice Point (Codes are "E" for the Engine Room, "I" for the Instrument Panel, and "B" for the Body).

Example:



The Location of splice Point I 5 is indicated by the shaded section.

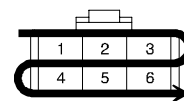
[J] : Indicates a shielded cable.



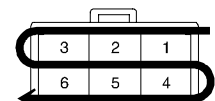
[K] : Indicates the pin number of the connector. The numbering system is different for female and male connectors.

Example: Numbered in order from upper left to lower right

Numbered in order from upper right to lower left



Female



Male

[L] : Indicates a ground point.

The first letter of the code for each ground point(s) indicates the component's location, e.g, "E" for the Engine Compartment, "I" for the Instrument Panel and Surrounding area, and "B" for the Body and Surrounding area.

[M] : Page No.

B HOW TO USE THIS MANUAL

[N] System Outline

Current is applied at all times through the STOP fuse to TERMINAL 2 of the stop light SW.
When the ignition SW is turned on, current flows from the GAUGE fuse to TERMINAL 8 of the light failure sensor, and also flows through the rear lights warning light to TERMINAL 4 of the light failure sensor.

Stop Light Disconnection Warning

When the ignition SW is turned on and the brake pedal is pressed (Stop light SW on), if the stop light circuit is open, the current flowing from TERMINAL 7 of the light failure sensor to TERMINALS 1, 2 changes, so the light failure sensor detects the disconnection and the warning circuit of the light failure sensor is activated.

As a result, the current flows from TERMINAL 4 of the light failure sensor to TERMINAL 11 to GROUND and turns the rear lights warning light on. By pressing the brake pedal, the current flowing to TERMINAL 8 of the light failure sensor keeps the warning circuit on and holds the warning light on until the ignition SW is turned off.

[O] Service Hints

S6 Stop Light SW

2-1 : Closed with the brake pedal depressed

L4 Light Failure Sensor

1, 2, 7-Ground : Approx. 12 volts with the stop light SW on

4, 8-Ground : Approx. 12 volts with the ignition SW at ON position

11-Ground : Always continuity

[P] ○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C7	34	L4	36	R7	37
H17	36	R6	37	S6	35

[Q] ○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
1	18	R/B No.1 (Instrument Panel Brace LH)

[R] ○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
IB	20	Instrument Panel Wire and Instrument Panel J/B (Lower Finish Panel)
3C	22	Instrument Panel Wire and J/B No.3 (Instrument Panel Brace LH)

[S] □ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	42	Floor Wire and Instrument Panel Wire (Left Kick Panel)
BV1	50	Luggage Room Wire and Floor Wire (Luggage Room Left)

[T] ▽ : Ground Points

Code	See Page	Ground Points Location
BL	50	Under the Left Center Pillar
BO	50	Back Panel Center

[U] ○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I5	44	Cowl Wire	B18	50	Luggage Room Wire

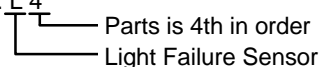
[N] : Explains the system outline.

[O] : Indicates values or explains the function for reference during troubleshooting.

[P] : Indicates the reference page showing the position on the vehicle of the parts in the system circuit.

Example : Part "L4" (Light Failure Sensor) is on page 36 of the manual.

* The letter in the code is from the first letter of the part, and the number indicates its order in parts starting with that letter.

Example : L 4


[Q] : Indicates the reference page showing the position on the vehicle of Relay Block Connectors in the system circuit.

Example : Connector "1" is described on page 18 of this manual and is installed on the left side of the instrument panel.

[R] : Indicates the reference page showing the position on the vehicle of J/B and Wire Harness in the system circuit.

Example : Connector "3C" connects the Instrument Panel Wire and J/B No.3. It is described on page 22 of this manual, and is installed on the instrument panel left side.

[S] : Indicates the reference page describing the wiring harness and wiring harness connector (the female wiring harness is shown first, followed by the male wiring harness).

Example : Connector "IE1" connects the floor wire (female) and Instrument panel wire (male). It is described on page 42 of this manual, and is installed on the left side kick panel.

[T] : Indicates the reference page showing the position of the ground points on the vehicle.

Example : Ground point "BO" is described on page 50 of this manual and is installed on the back panel center.

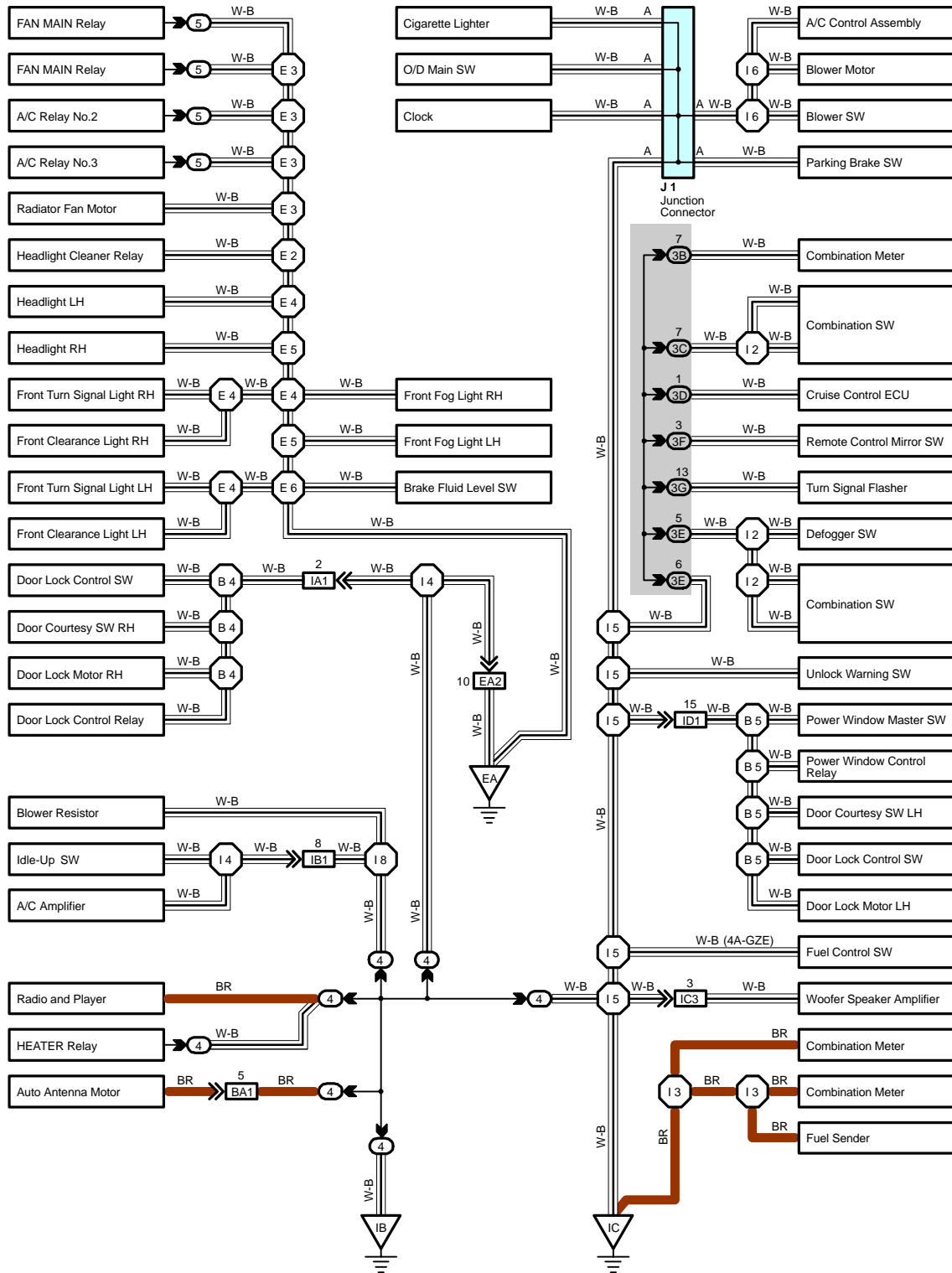
[U] : Indicates the reference page showing the position of the splice points on the vehicle.

Example : Splice point "I5" is on the Cowl Wire Harness and is described on page 44 of this manual.

B HOW TO USE THIS MANUAL

The ground points circuit diagram shows the connections from all major parts to the respective ground points. When troubleshooting a faulty ground point, checking the system circuits which use a common ground may help you identify the problem ground quickly. The relationship between ground points (∇_{EA} , ∇_{IB} and ∇_{IC} shown below) can also be checked this way.

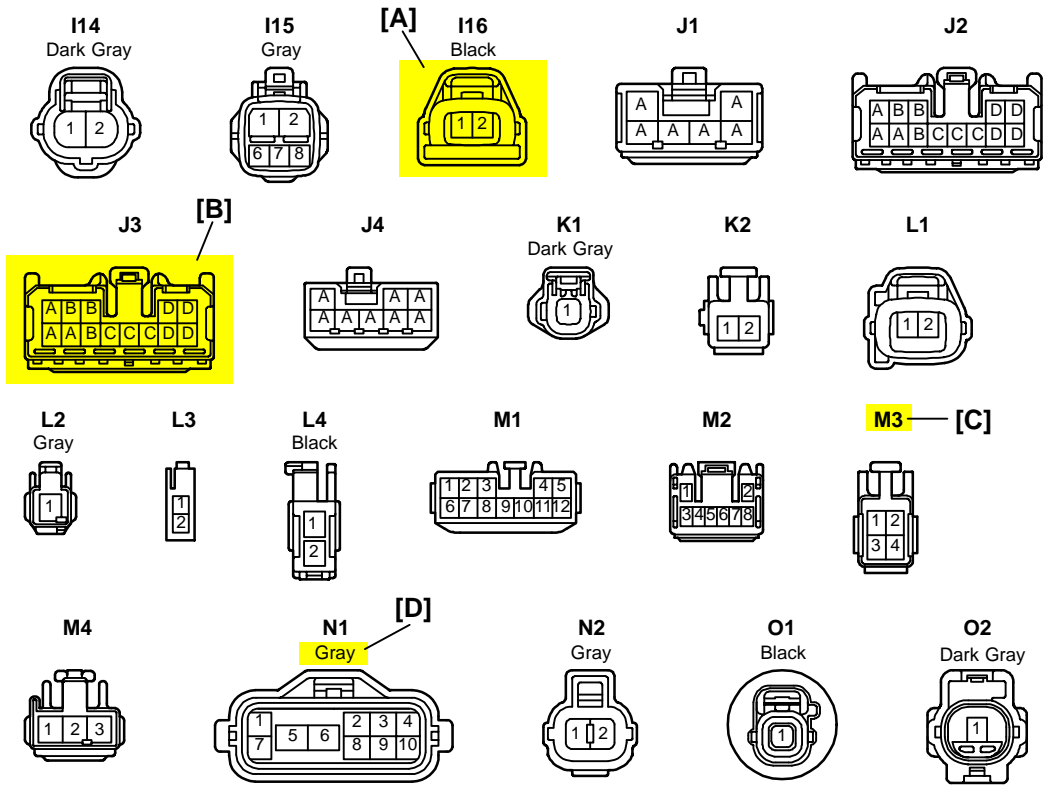
I GROUND POINT



* The system shown here is an EXAMPLE ONLY. It is different to the actual circuit shown in the SYSTEM CIRCUITS SECTION.

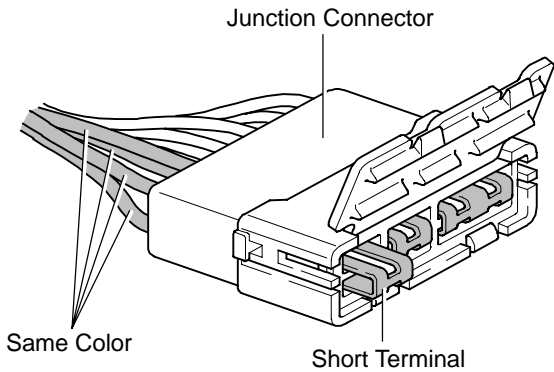
B HOW TO USE THIS MANUAL

K CONNECTOR LIST



[A] : Indicates connector to be connected to a part. (The numeral indicates the pin No.)

[B] : Junction Connector
Indicates a connector which is connected to a short terminal.



Junction connector in this manual include a short terminal which is connected to a number of wire harnesses. Always perform inspection with the short terminal installed. (When installing the wire harnesses, the harnesses can be connected to any position within the short terminal grouping. Accordingly, in other vehicles, the same position in the short terminal may be connected to a wire harness from a different part.)
Wire harness sharing the same short terminal grouping have the same color.

[C] : Parts Code
The first letter of the code is taken from the first letter of part, and the numbers indicates its order in parts which start with the same letter.

[D] : Connector Color
Connectors not indicated are milky white in color.

L PART NUMBER OF CONNECTORS

Code	Part Name	Part Number	Code	Part Name	Part Number
A 1	A/C Ambient Temp. Sensor	90980-1 1070	D 4	Diode (Courtesy)	90980-1 1608
A 2	A/C Condenser Fan Motor	90980-1 1237	D 5	Diode (Interior Light)	90980-10962
A 3	A/C Condenser Fan Relay	90980-10940	D 6	Diode (Moon Roof)	90980-1 1608
A 4	A/C Condenser Fan Resistor	90980-10928	D 7	Door Lock Control Relay	90980-10848
A 5	A/C Magnetic Clutch	90980-1 1271	D 8	Door Lock Control SW LH	90980-1 1148
A 6	A/T Oil Temp. Sensor	90980-1 1413	D 9	Door Lock Control SW RH	
[A]	ABS Actual [B]	909-151 [C]	D10	Door Courtesy SW LH	90980-1 1097
A 8	ABS Actuator	90980-1 1009	D11	Door Courtesy SW RH	
A 9	ABS Speed Sensor Front LH	90980-10941	D12	Door Courtesy SW Front LH	90980-1 1156
A10	ABS Speed Sensor Front RH	90980-1 1002	D13	Door Courtesy SW Front RH	
A11	Airbag Sensor Front LH	90980-1 1856	D14	Door Courtesy SW Rear LH	
A12	Airbag Sensor Front RH		D15	Door Courtesy SW Rear RH	
A13	Airbag Sensor Front LH	90980-1 1194	D16	Door Lock and Unlock SW LH	90980-1 1170
		90980-1 1194			

[A] : Part Code

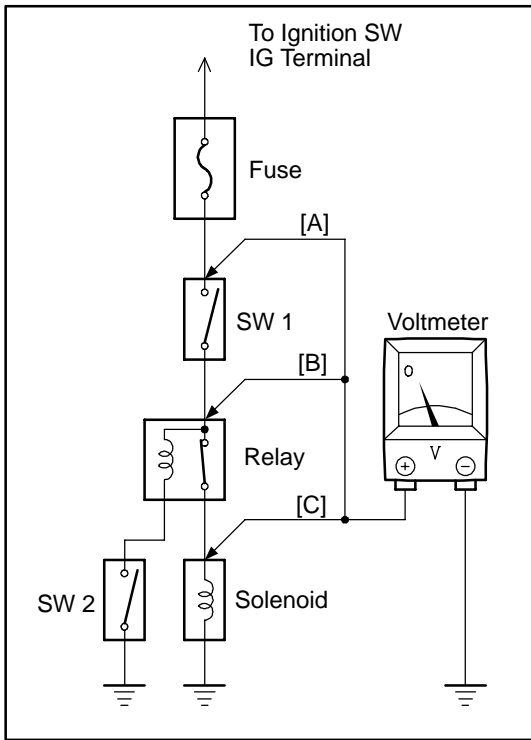
[B] : Part Name

[C] : Part Number

Toyota Part Number are indicated.

Not all of the above part numbers of the connector are established for the supply.

C TROUBLESHOOTING



VOLTAGE CHECK

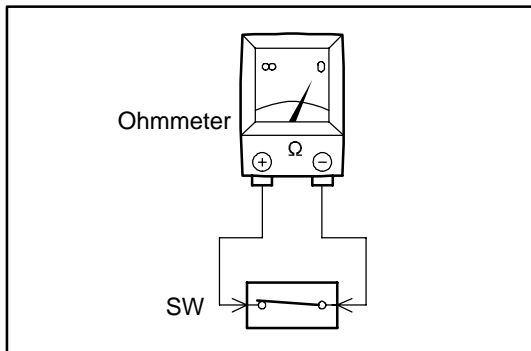
- (a) Establish conditions in which voltage is present at the check point.

Example:

- [A] - Ignition SW on
- [B] - Ignition SW and SW 1 on
- [C] - Ignition SW, SW 1 and Relay on (SW 2 off)

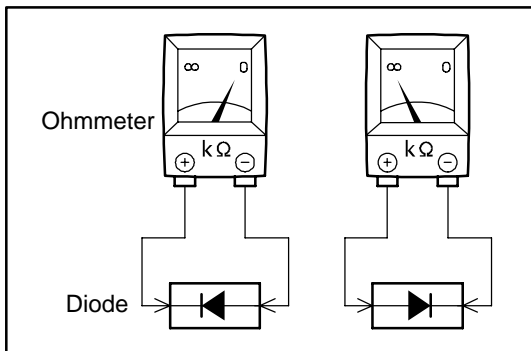
- (b) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal, and the positive lead to the connector or component terminal.

This check can be done with a test light instead of a voltmeter.



CONTINUITY AND RESISTANCE CHECK

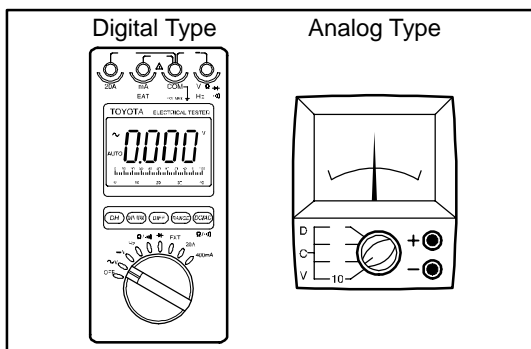
- (a) Disconnect the battery terminal or wire so there is no voltage between the check points.
- (b) Contact the two leads of an ohmmeter to each of the check points.



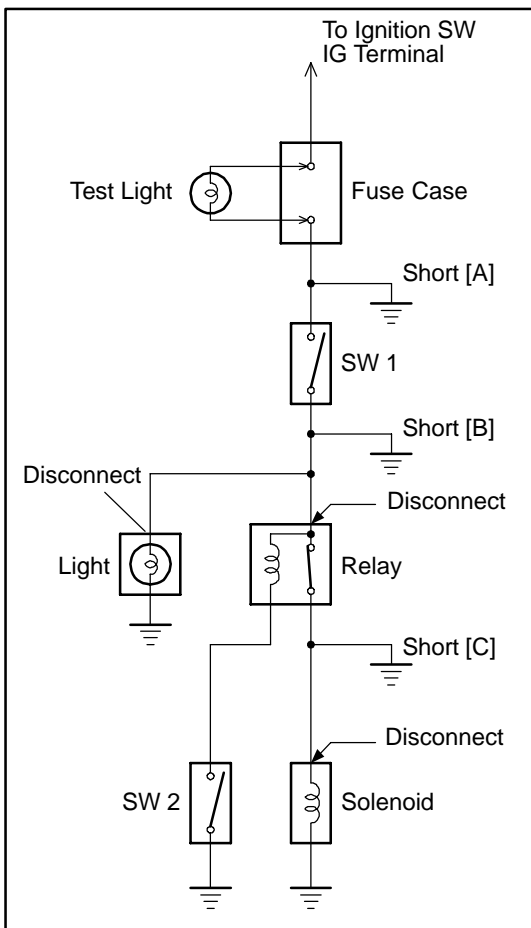
If the circuit has diodes, reverse the two leads and check again.

When contacting the negative lead to the diode positive side and the positive lead to the negative side, there should be continuity.

When contacting the two leads in reverse, there should be no continuity.



- (c) Use a volt/ohmmeter with high impedance (10 k Ω /V minimum) for troubleshooting of the electrical circuit.



FINDING A SHORT CIRCUIT

- Remove the blown fuse and disconnect all loads of the fuse.
- Connect a test light in place of the fuse.
- Establish conditions in which the test light comes on.

Example:

- [A] - Ignition SW on
 - [B] - Ignition SW and SW 1 on
 - [C] - Ignition SW, SW 1 and Relay on (Connect the Relay) and SW 2 off (or Disconnect SW 2)
- Disconnect and reconnect the connectors while watching the test light. The short lies between the connector where the test light stays lit and the connector where the light goes out.
 - Find the exact location of the short by lightly shaking the problem wire along the body.

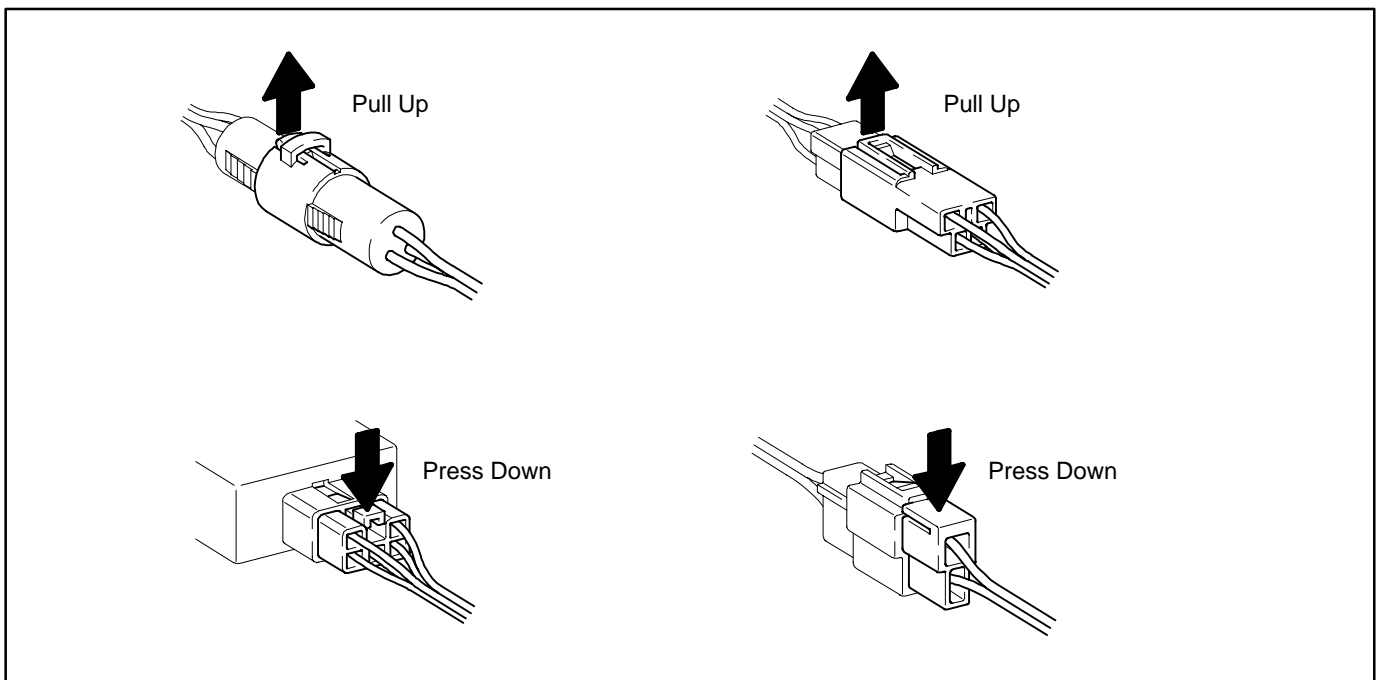
CAUTION:

- Do not open the cover or the case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)
- When replacing the internal mechanism (ECU part) of the digital meter, be careful that no part of your body or clothing comes in contact with the terminals of leads from the IC, etc. of the replacement part (spare part).

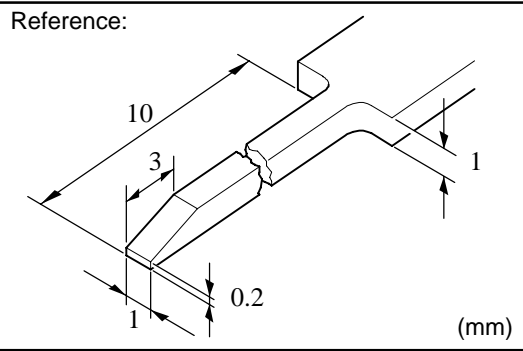
DISCONNECTION OF MALE AND FEMALE CONNECTORS

To pull apart the connectors, pull on the connector itself, not the wire harness.

HINT: Check to see what kind of connector you are disconnecting before pulling apart.



C TROUBLESHOOTING



HOW TO REPLACE TERMINAL (with terminal retainer or secondary locking device)

1. PREPARE THE SPECIAL TOOL

HINT : To remove the terminal from the connector, please construct and use the special tool or like object shown on the left.

2. DISCONNECT CONNECTOR

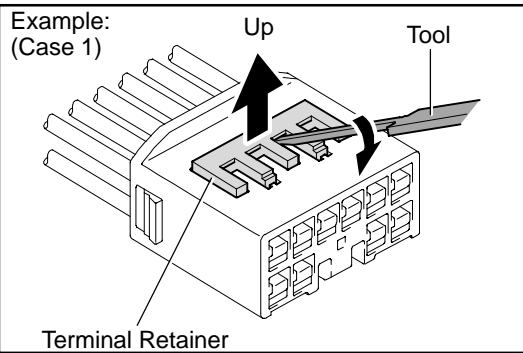
3. DISENGAGE THE SECONDARY LOCKING DEVICE OR TERMINAL RETAINER.

(a) Locking device must be disengaged before the terminal locking clip can be released and the terminal removed from the connector.

(b) Use a special tool or the terminal pick to unlock the secondary locking device or terminal retainer.

NOTICE:

Do not remove the terminal retainer from connector body.

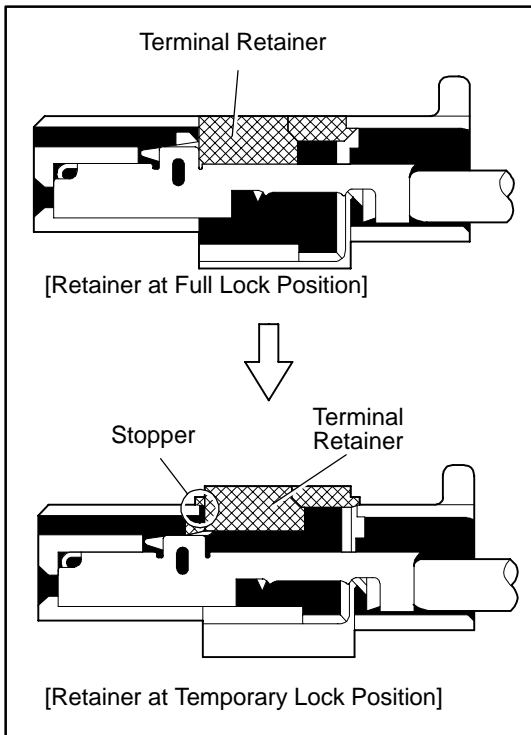


[A] For Non-Waterproof Type Connector

HINT : The needle insertion position varies according to the connector's shape (number of terminals etc.), so check the position before inserting it.

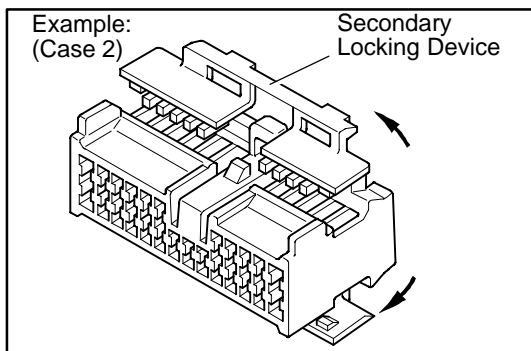
"Case 1"

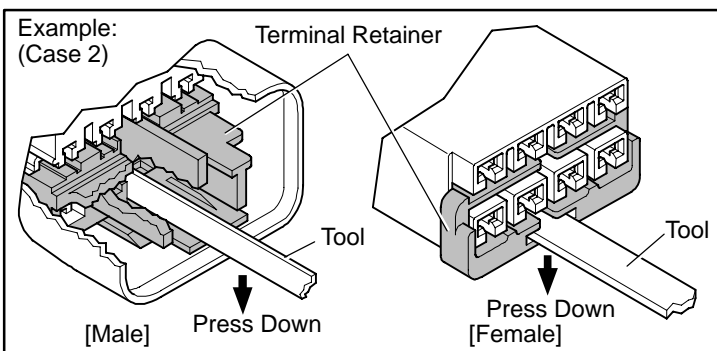
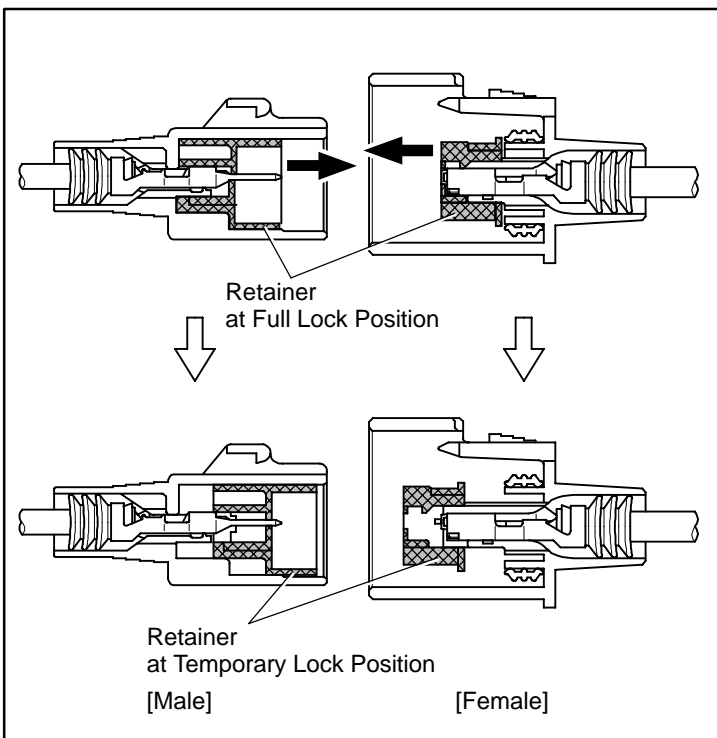
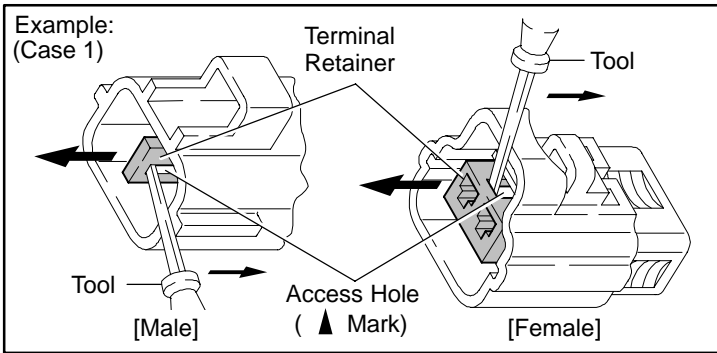
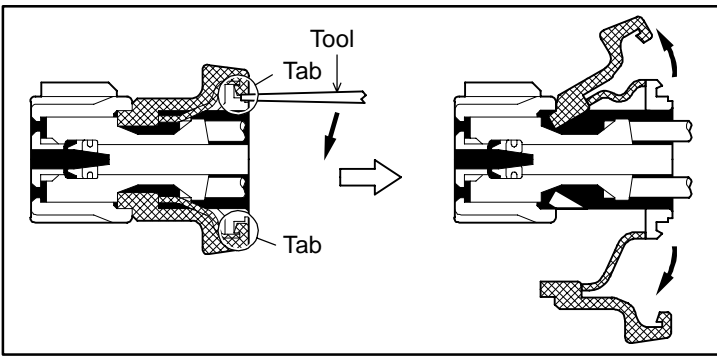
Raise the terminal retainer up to the temporary lock position.



"Case 2"

Open the secondary locking device.





[B] For Waterproof Type Connector

HINT : Terminal retainer color is different according to connector body.

Example:

Terminal Retainer : Connector Body

Black or White : Gray

Black or White : Dark Gray

Gray or White : Black

"Case 1"

Type where terminal retainer is pulled up to the temporary lock position (Pull Type).

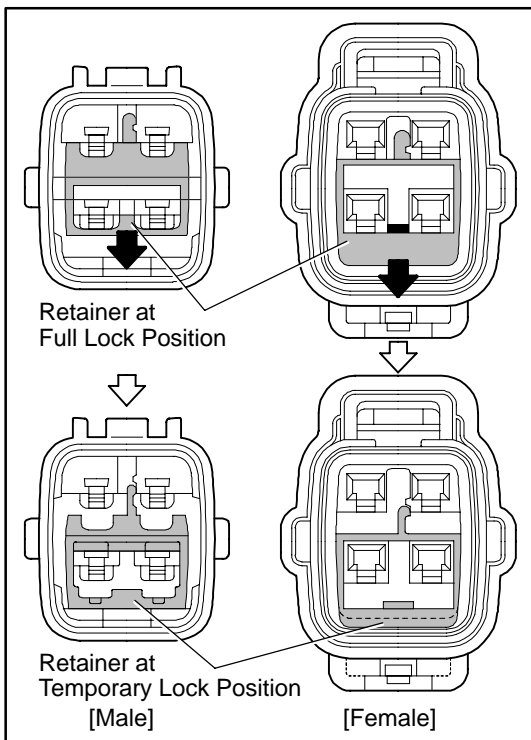
Insert the special tool into the terminal retainer access hole (▲Mark) and pull the terminal retainer up to the temporary lock position.

HINT : The needle insertion position varies according to the connector's shape (Number of terminals etc.), so check the position before inserting it.

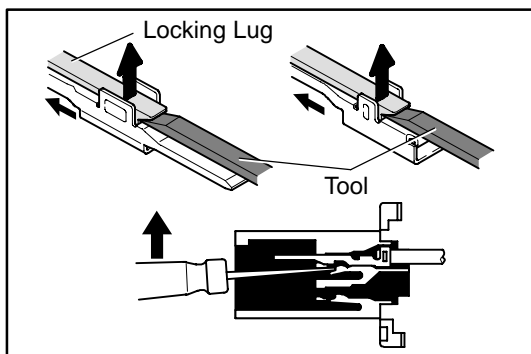
"Case 2"

Type which cannot be pulled as far as Power Lock insert the tool straight into the access hole of terminal retainer as shown.

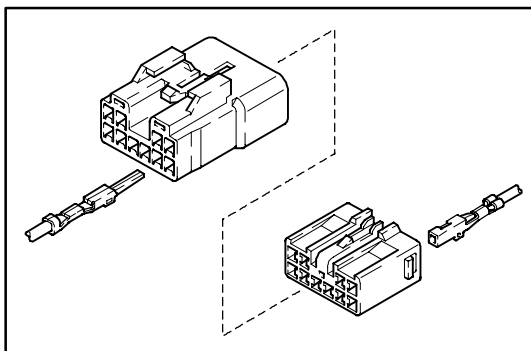
C TROUBLESHOOTING



Push the terminal retainer down to the temporary lock position.



(c) Release the locking lug from terminal and pull the terminal out from rear.

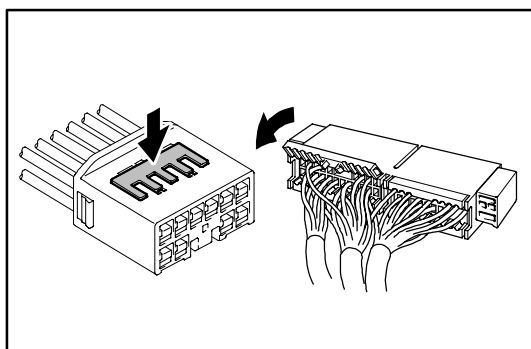


4. INSTALL TERMINAL TO CONNECTOR

(a) Insert the terminal.

HINT:

1. Make sure the terminal is positioned correctly.
2. Insert the terminal until the locking lug locks firmly.
3. Insert the terminal with terminal retainer in the temporary lock position.



(b) Push the secondary locking device or terminal retainer in to the full lock position.

5. CONNECT CONNECTOR

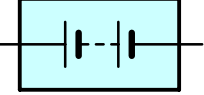

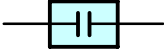
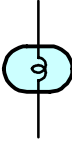

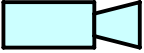



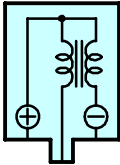




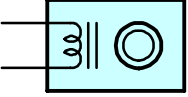

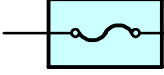

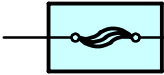
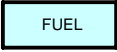

ABBREVIATIONS

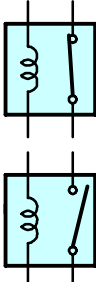

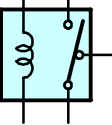
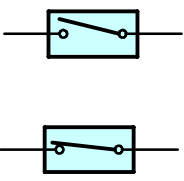
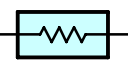
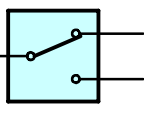
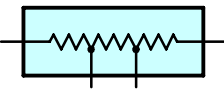
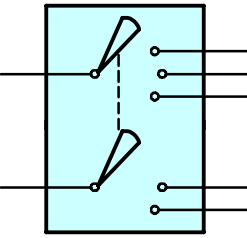

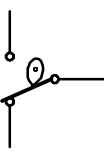

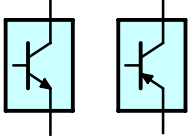
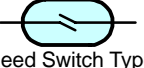
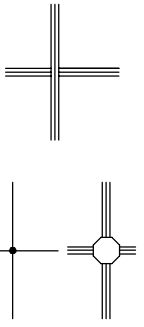
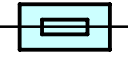
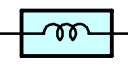
The following abbreviations are used in this manual.

2WD	=	Two Wheel Drive Vehicles
4WD	=	Four Wheel Drive Vehicles
A/C	=	Air Conditioning
A/T	=	Automatic Transmission
ABS	=	Anti-Lock Brake System
ACIS	=	Acoustic Control Induction System
ADD	=	Automatic Disconnecting Differential
BEAN	=	Body Electronics Area Network
CAN	=	Controller Area Network
DVD	=	Digital Versatile Disc
EC	=	Electrochromic
ECU	=	Electronic Control Unit
ESA	=	Electronic Spark Advance
ETCS-i	=	Electronic Throttle Control System-intelligent
EVAP	=	Evaporative Emission
FL	=	Fusible Link Block
IC	=	Integrated Circuit
INT	=	Intermittent
IPO	=	Intelligent Power Outlet
J/B	=	Junction Block
LH	=	Left-Hand
M/T	=	Manual Transmission
O/D	=	Overdrive
R/B	=	Relay Block
RH	=	Right-Hand
SFI	=	Sequential Multiport Fuel Injection
SPEC.	=	Specification
SRS	=	Supplemental Restraint System
SW	=	Switch
TEMP.	=	Temperature
TRAC	=	Traction Control
TVIP	=	TOYOTA Vehicle Intrusion Protection
VSC	=	Vehicle Stability Control
VSV	=	Vacuum Switching Valve
VVT	=	Variable Valve Timing
w/	=	With
w/o	=	Without

* The titles given inside the components are the names of the terminals (terminal codes) and are not treated as being abbreviations.

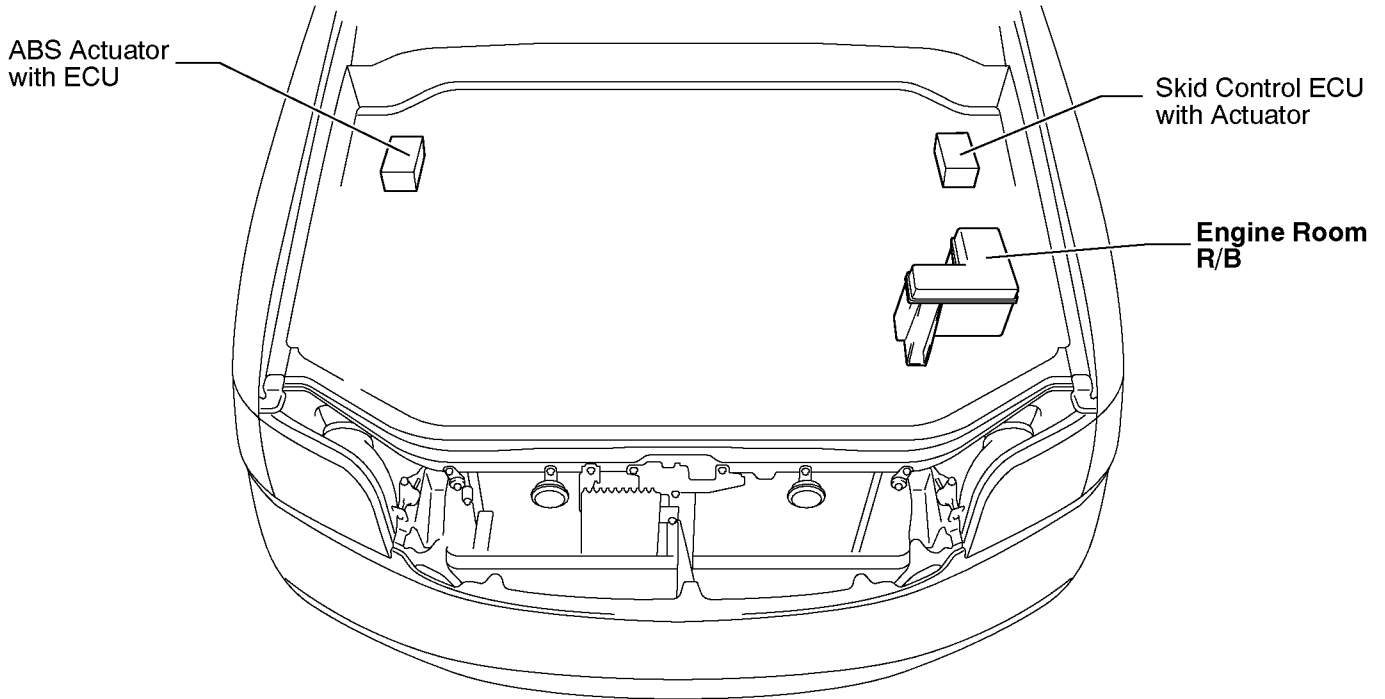
E GLOSSARY OF TERMS AND SYMBOLS

 <p>BATTERY Stores chemical energy and converts it into electrical energy. Provides DC current for the auto's various electrical circuits.</p>	 <p>GROUND The point at which wiring attaches to the Body, thereby providing a return path for an electrical circuit; without a ground, current cannot flow.</p>
 <p>CAPACITOR (Condenser) A small holding unit for temporary storage of electrical voltage.</p>	<p>HEADLIGHTS Current flow causes a headlight filament to heat up and emit light. A headlight may have either a single (1) filament or a double (2) filament</p> <p>1. SINGLE FILAMENT</p>  <p>2. DOUBLE FILAMENT</p> 
 <p>CIGARETTE LIGHTER An electric resistance heating element.</p>	
 <p>CIRCUIT BREAKER Basically a reusable fuse, a circuit breaker will heat and open if too much current flows through it. Some units automatically reset when cool, others must be manually reset.</p>	 <p>HORN An electric device which sounds a loud audible signal.</p>
 <p>DIODE A semiconductor which allows current flow in only one direction.</p>	 <p>IGNITION COIL Converts low-voltage DC current into high-voltage ignition current for firing the spark plugs.</p>
 <p>DIODE, ZENER A diode which allows current flow in one direction but blocks reverse flow only up to a specific voltage. Above that potential, it passes the excess voltage. This acts as a simple voltage regulator.</p>	 <p>LIGHT Current flow through a filament causes the filament to heat up and emit light.</p>
 <p>PHOTODIODE The photodiode is a semiconductor which controls the current flow according to the amount of light.</p>	 <p>LED (LIGHT EMITTING DIODE) Upon current flow, these diodes emit light without producing the heat of a comparable light.</p>
 <p>DISTRIBUTOR, IIA Channels high-voltage current from the ignition coil to the individual spark plugs.</p>	 <p>METER, ANALOG Current flow activates a magnetic coil which causes a needle to move, thereby providing a relative display against a background calibration.</p>
 <p>FUSE A thin metal strip which burns through when too much current flows through it, thereby stopping current flow and protecting a circuit from damage.</p>  <p>FUSIBLE LINK A heavy-gauge wire placed in high amperage circuits which burns through on overloads, thereby protecting the circuit. The numbers indicate the crosssection surface area of the wires.</p> <p>(for Medium Current Fuse)</p>  <p>(for High Current Fuse or Fusible Link)</p>	 <p>METER, DIGITAL Current flow activates one or many LED's, LCD's, or fluorescent displays, which provide a relative or digital display.</p>
	 <p>MOTOR A power unit which converts electrical energy into mechanical energy, especially rotary motion.</p>

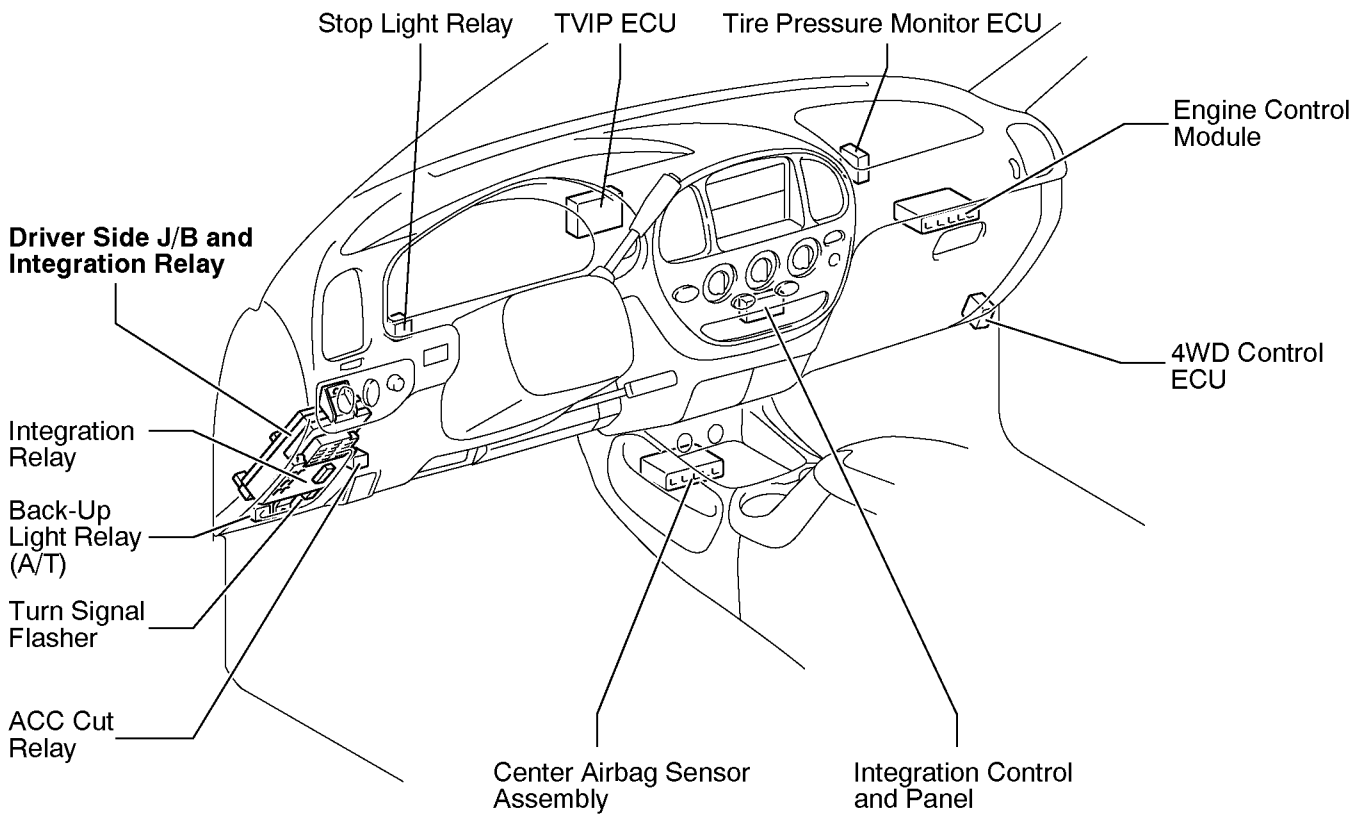
 <p>RELAY Basically, an electrically operated switch which may be normally closed (1) or open (2). Current flow through a small coil creates a magnetic field which either opens or closes an attached switch.</p> <p>1. NORMALLY CLOSED</p> <p>2. NORMALLY OPEN</p>	 <p>SPEAKER An electromechanical device which creates sound waves from current flow.</p>
 <p>RELAY, DOUBLE THROW A relay which passes current through one set of contacts or the other.</p>	<p>SWITCH, MANUAL Opens and closes circuits, thereby stopping (1) or allowing (2) current flow.</p>  <p>1. NORMALLY OPEN</p> <p>2. NORMALLY CLOSED</p>
 <p>RESISTOR An electrical component with a fixed resistance, placed in a circuit to reduce voltage to a specific value.</p>	<p>SWITCH, DOUBLE THROW A switch which continuously passes current through one set of contacts or the other.</p> 
 <p>RESISTOR, TAPPED A resistor which supplies two or more different non adjustable resistance values.</p>	<p>SWITCH, IGNITION A key operated switch with several positions which allows various circuits, particularly the primary ignition circuit, to become operational.</p> 
 <p>RESISTOR, VARIABLE or RHEOSTAT A controllable resistor with a variable rate of resistance. Also called a potentiometer or rheostat.</p>	<p>SWITCH, WIPER PARK Automatically returns wipers to the stop position when the wiper switch is turned off.</p> 
 <p>SENSOR (Thermistor) A resistor which varies its resistance with temperature.</p>	<p>TRANSISTOR A solidstate device typically used as an electronic relay; stops or passes current depending on the voltage applied at "base".</p> 
 <p>SENSOR, SPEED Uses magnetic impulses to open and close a switch to create a signal for activation of other components. (Reed Switch Type)</p>	<p>WIRES Wires are always drawn as straight lines on wiring diagrams. Crossed wires (1) without a black dot at the junction are not joined; crossed wires (2) with a black dot or octagonal mark at the junction are spliced (joined) connections.</p>  <p>(1) NOT CONNECTED</p> <p>(2) SPLICED</p>
 <p>SHORT PIN Used to provide an unbroken connection within a junction block.</p>	
 <p>SOLENOID An electromagnetic coil which forms a magnetic field when current flows, to move a plunger, etc.</p>	

F RELAY LOCATIONS

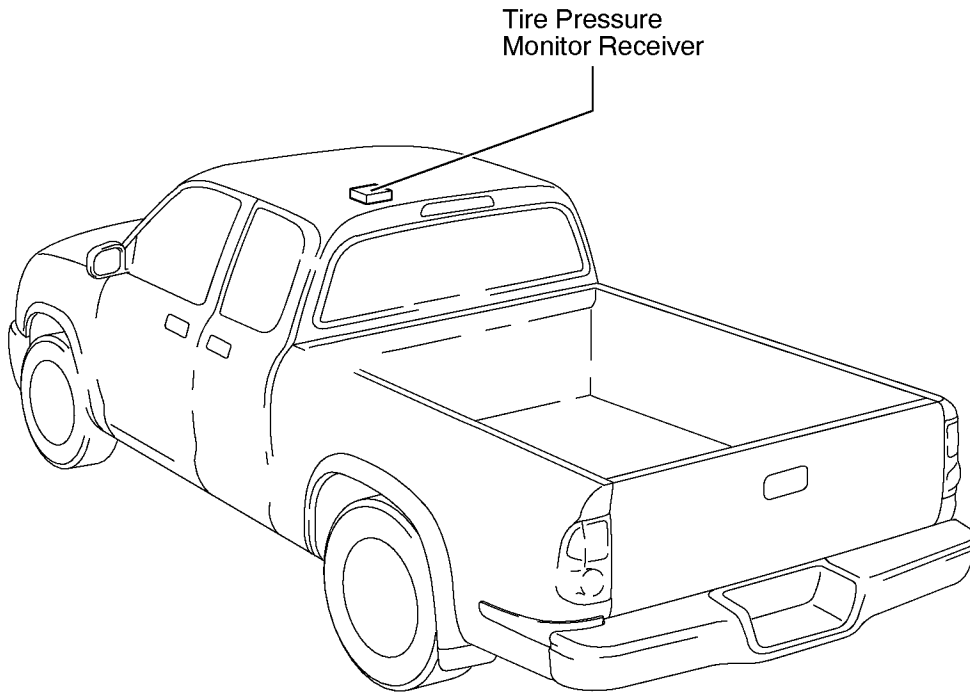
[Engine Compartment] (Access Cab, Standard Cab)



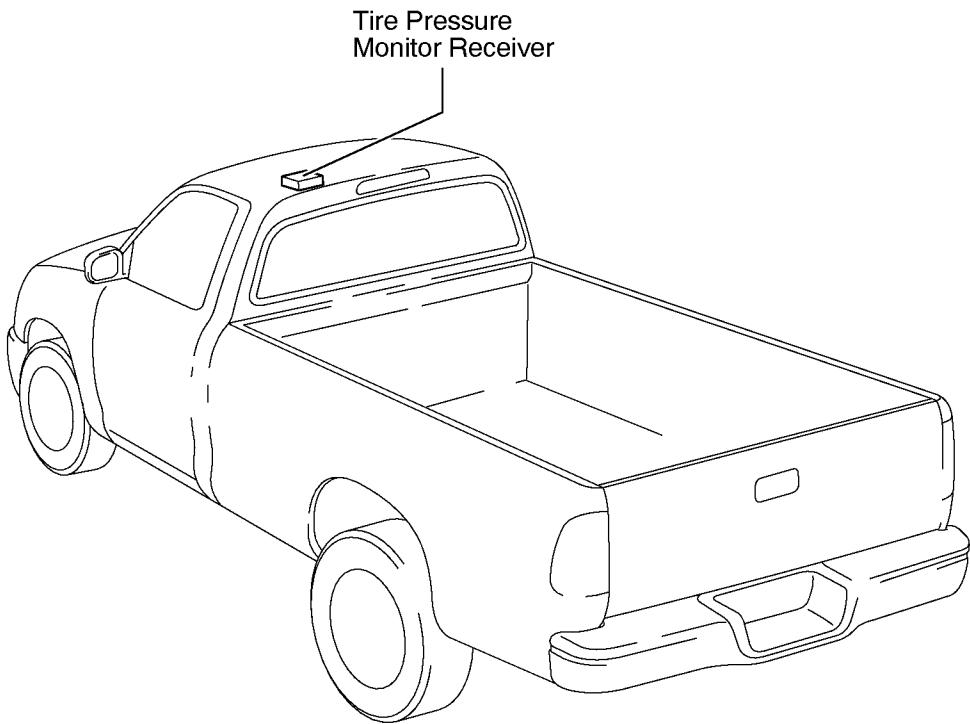
[Instrument Panel] (Access Cab, Standard Cab)



[Body]
(Access Cab)



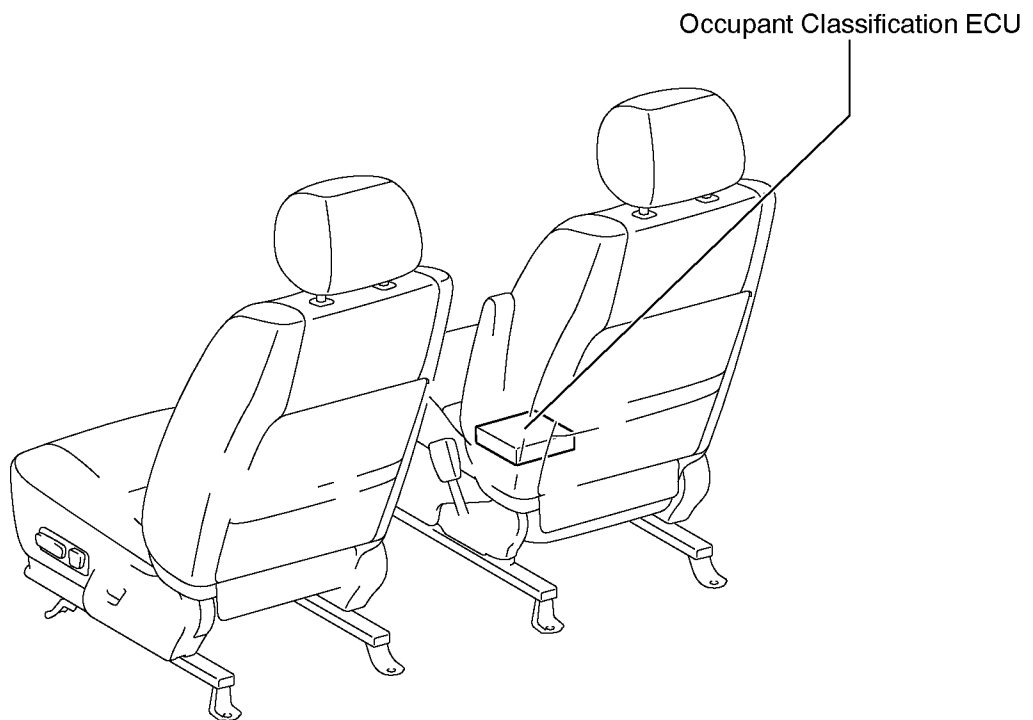
(Standard Cab)



F RELAY LOCATIONS

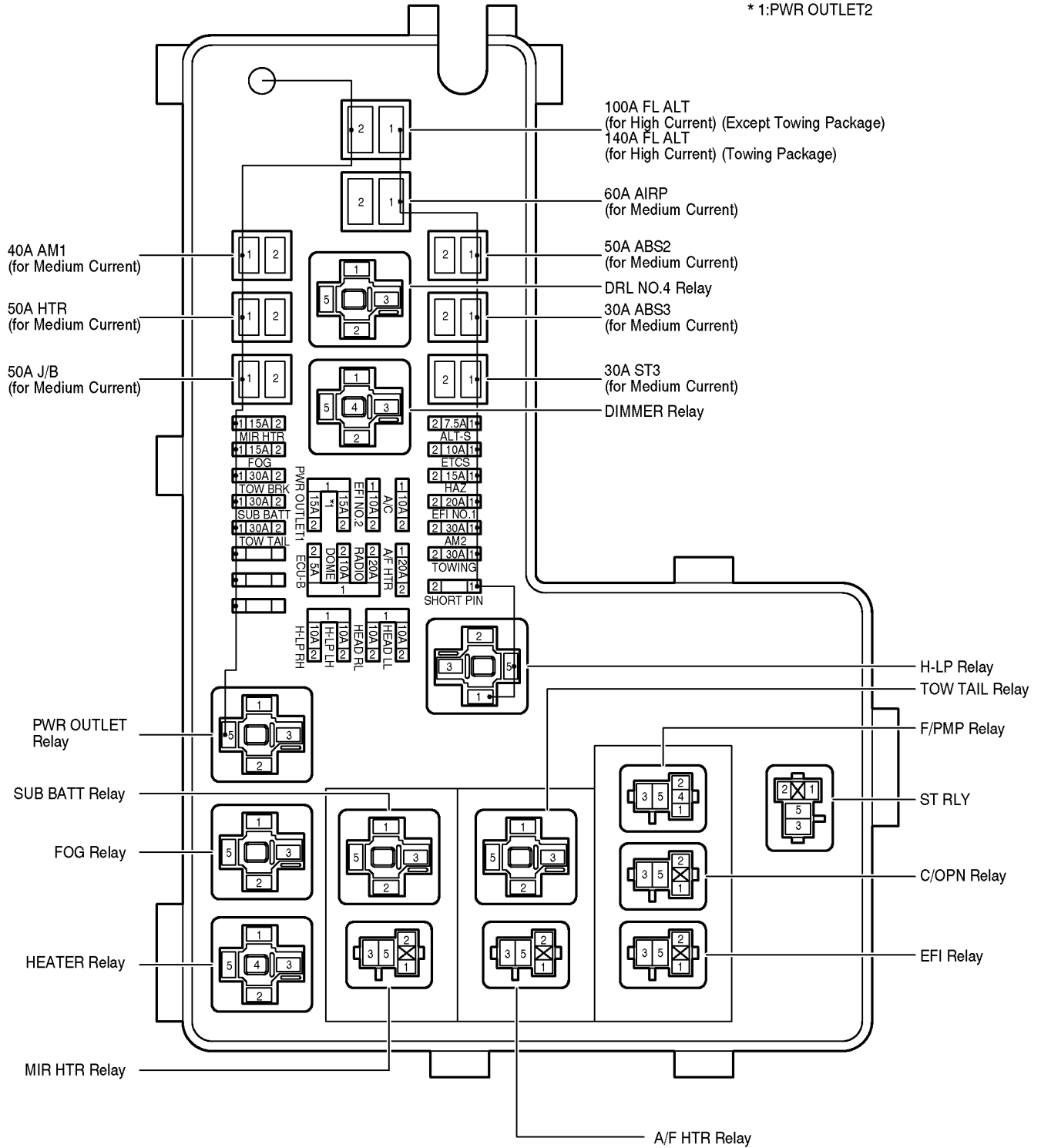
[Seat]

(Access Cab : Captain Seat)



② : Engine Room R/B Engine Compartment Left (See Page 20)
 (Access Cab, Standard Cab)

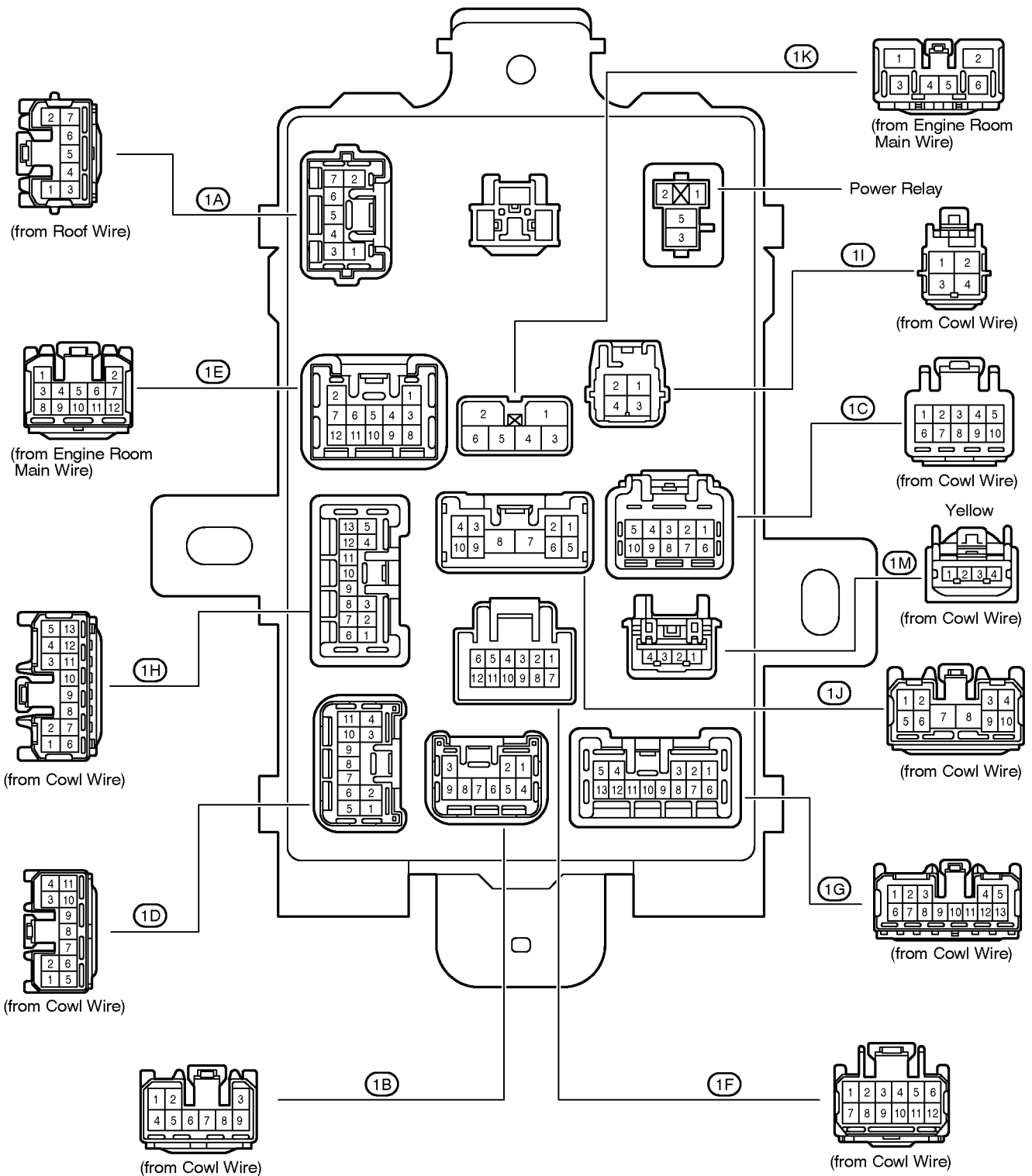
* 1:PWR OUTLET2

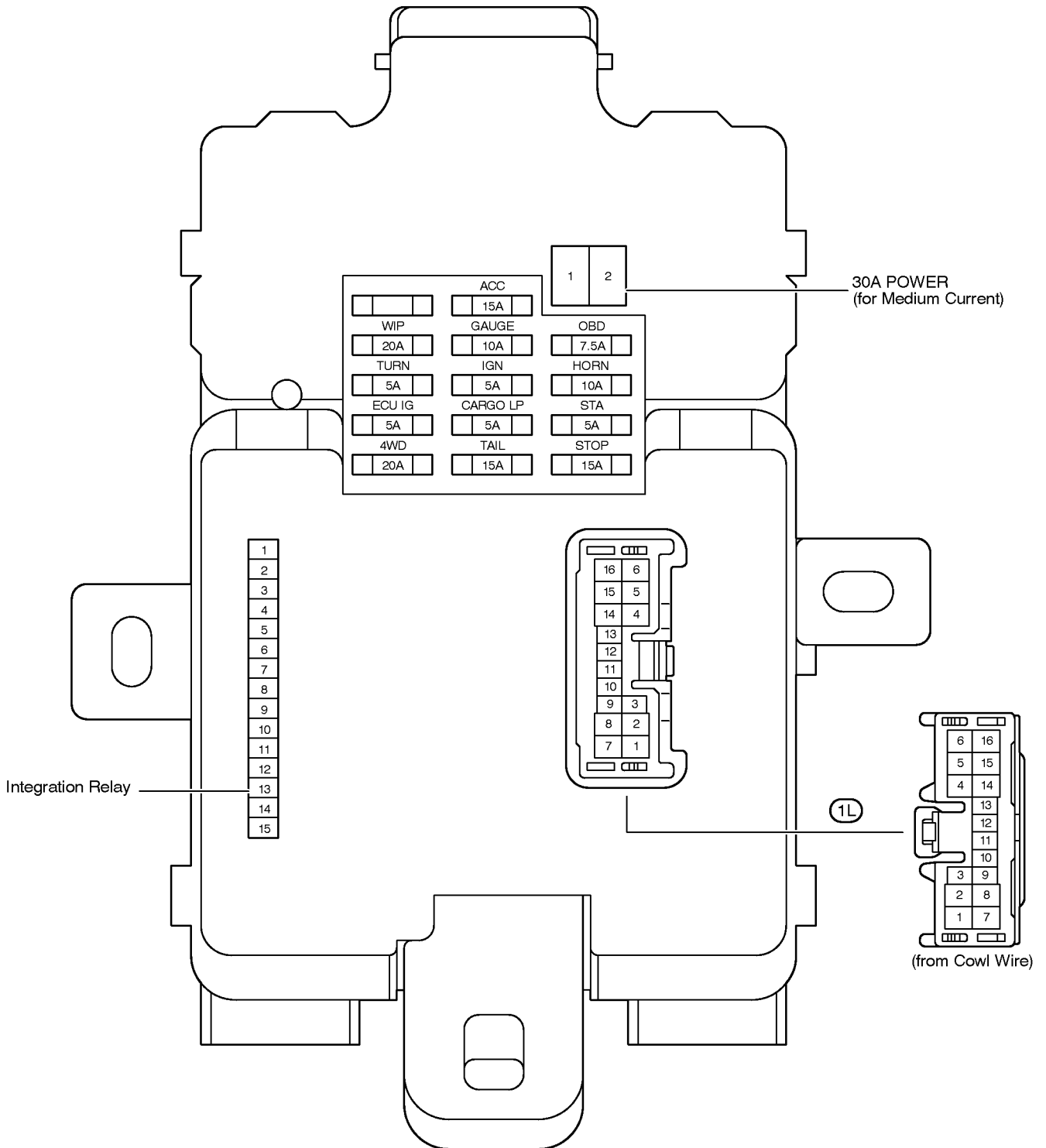


F RELAY LOCATIONS

 : Driver Side J/B and Integration Relay
 Lower Finish Panel (See Page 20)

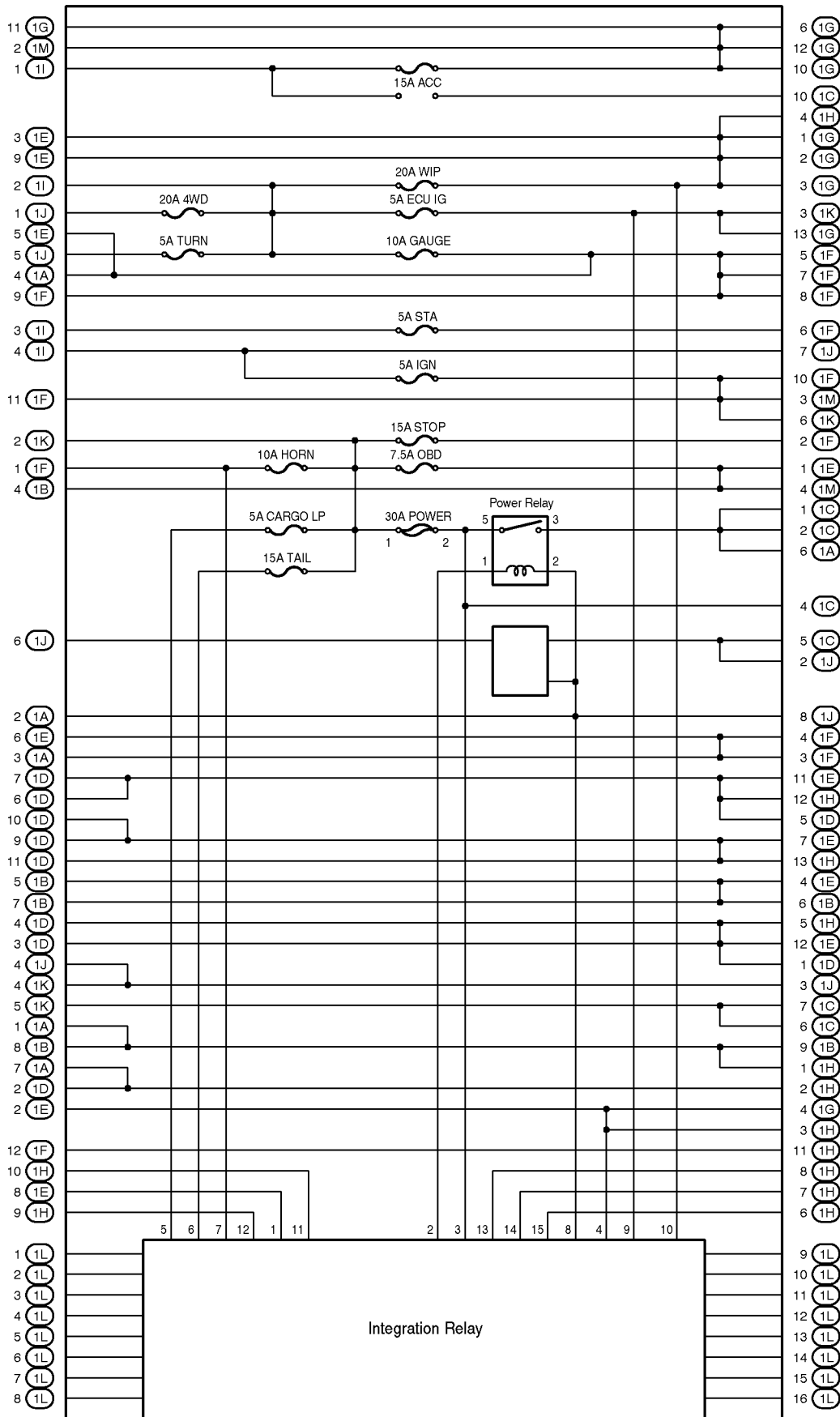
(Access Cab, Standard Cab : w/o Daytime Running Light)





F RELAY LOCATIONS

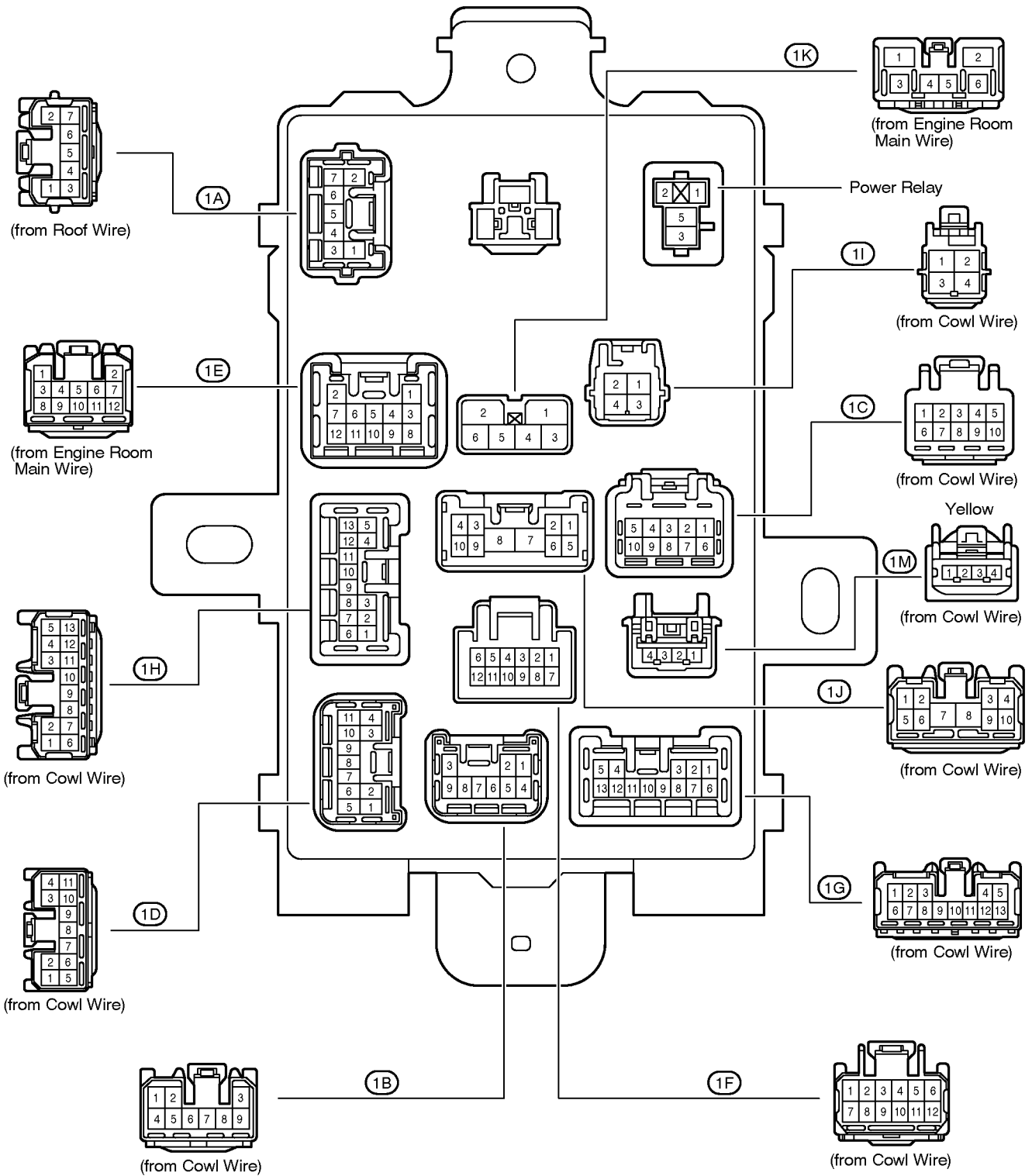
[Driver Side J/B and Integration Relay Inner Circuit] (Access Cab, Standard Cab : w/o Daytime Running Light)

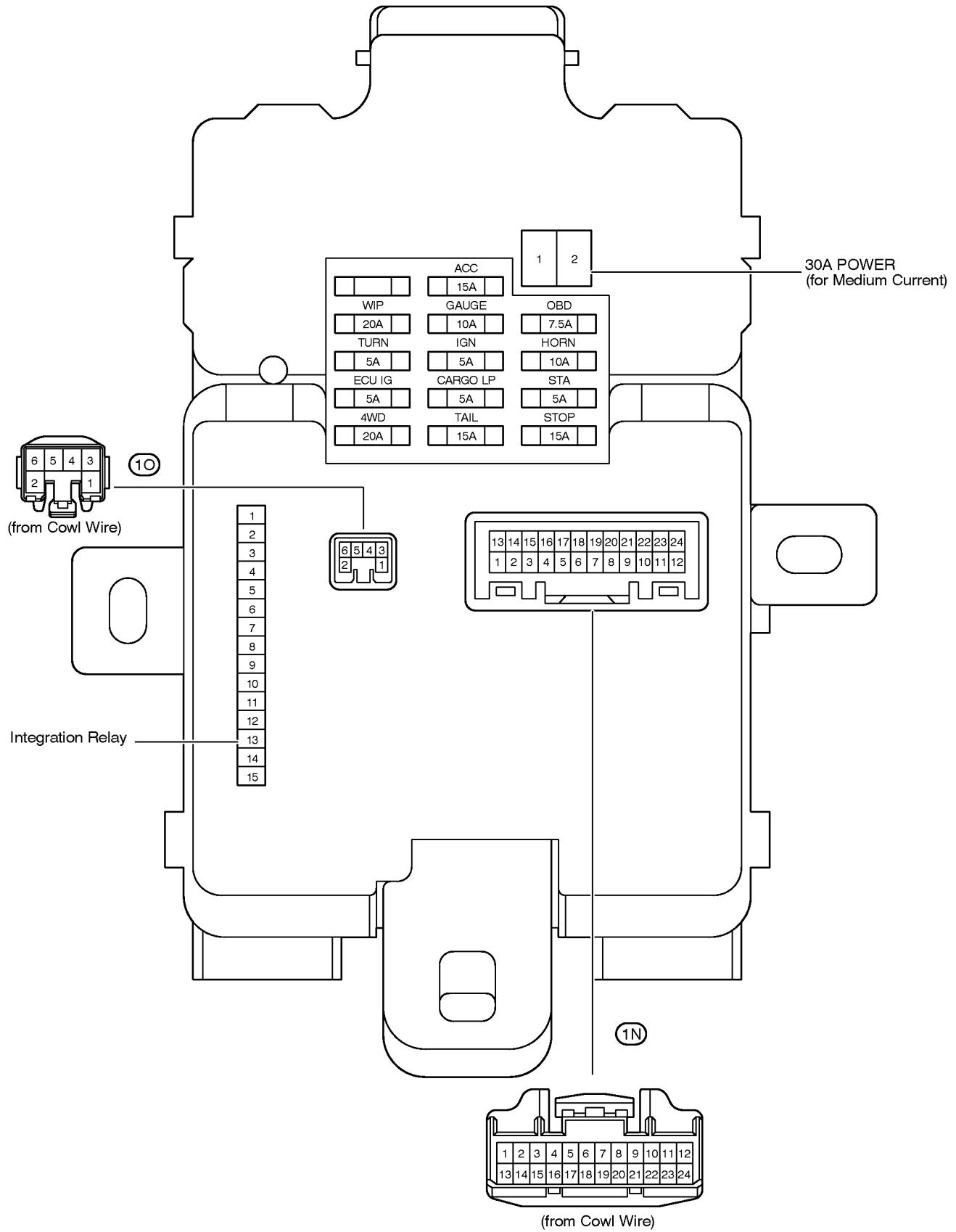


F RELAY LOCATIONS

○ : Driver Side J/B and Integration Relay
 Lower Finish Panel (See Page 20)

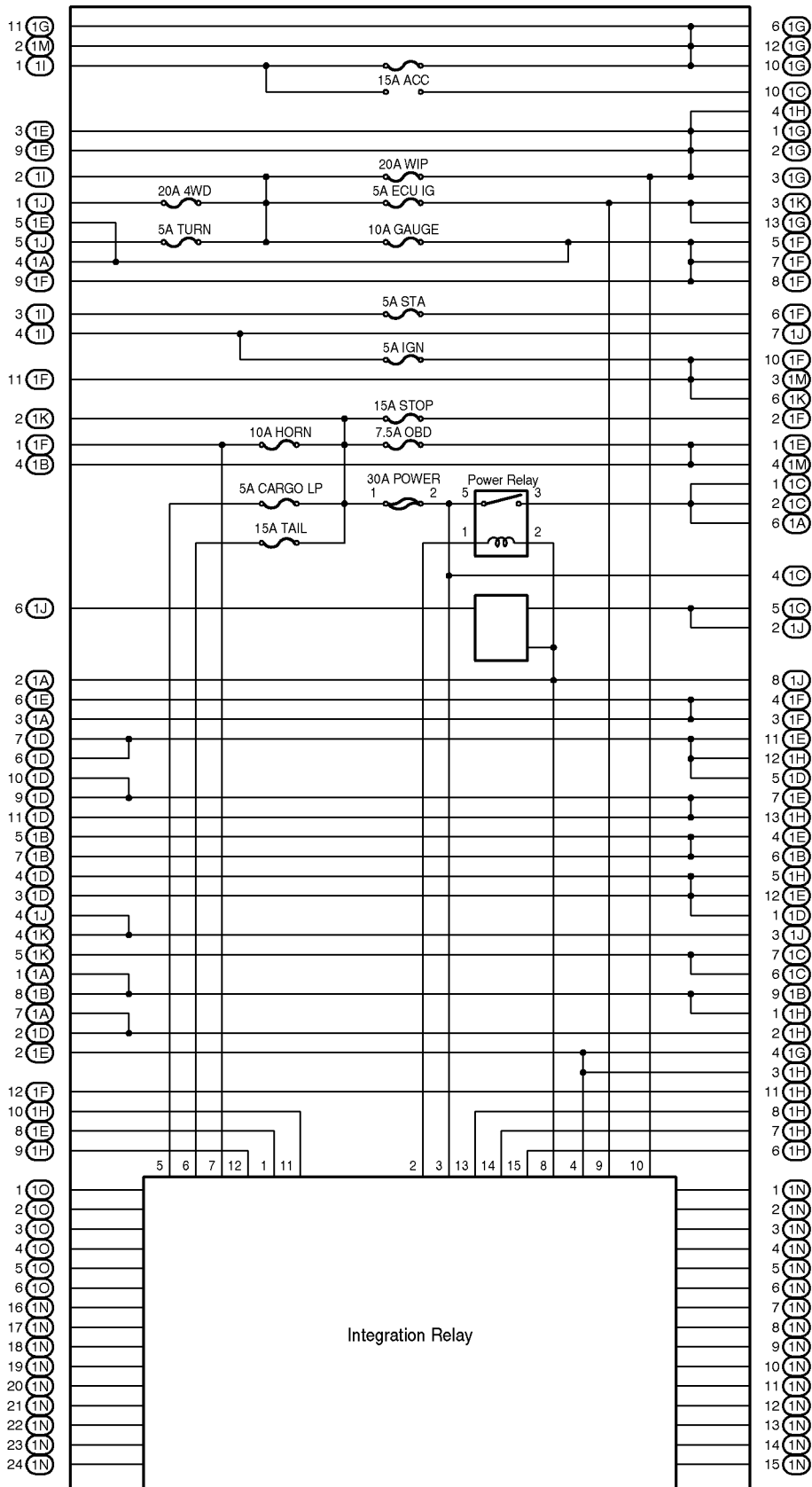
(Access Cab, Standard Cab : w/ Daytime Running Light)





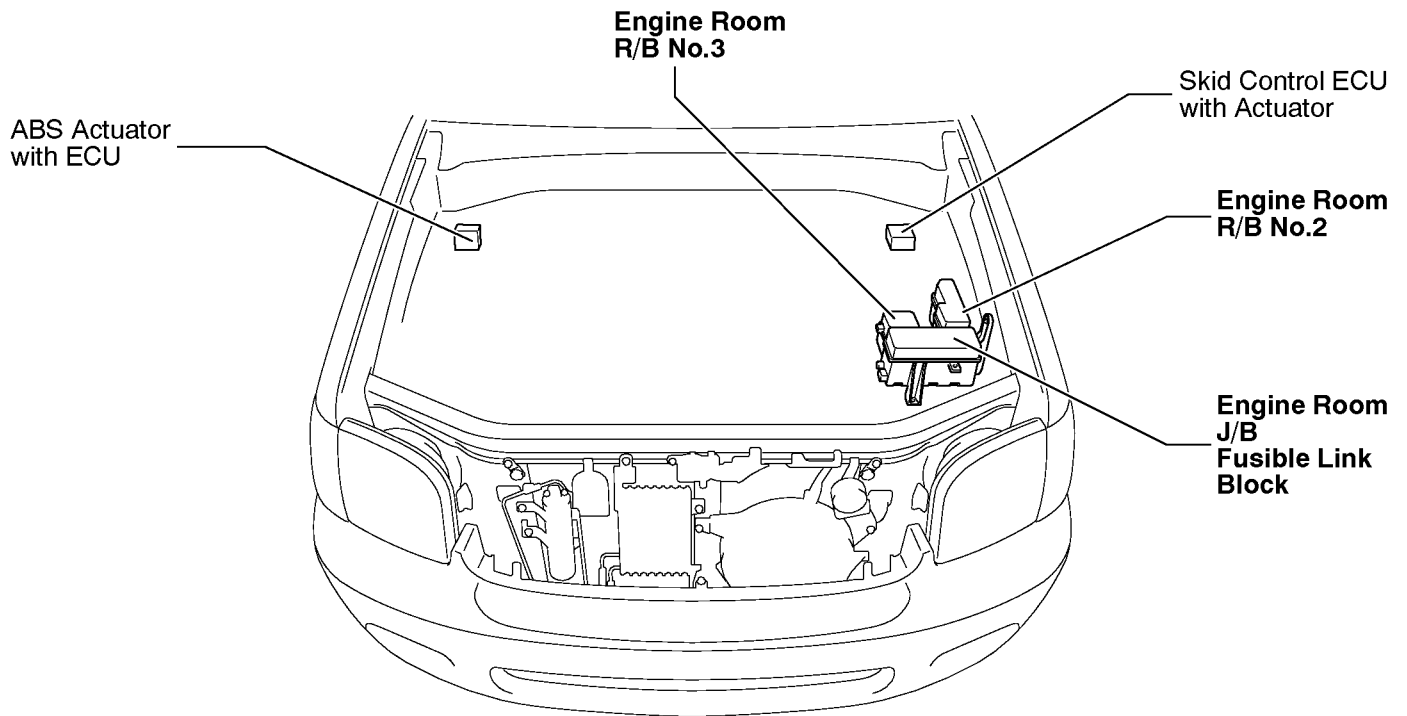
F RELAY LOCATIONS

[Driver Side J/B and Integration Relay Inner Circuit] (Access Cab, Standard Cab : w/ Daytime Running Light)

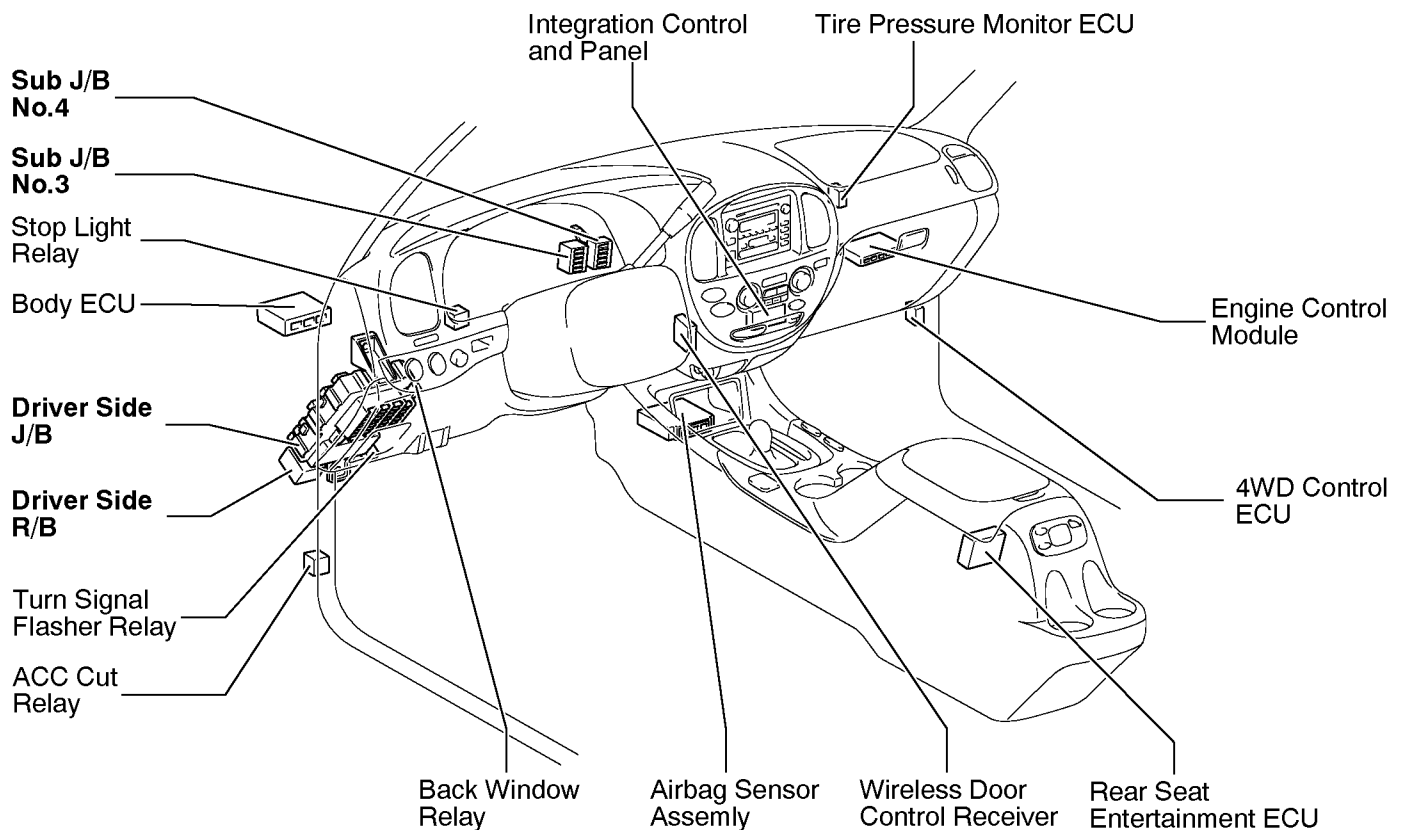


F RELAY LOCATIONS

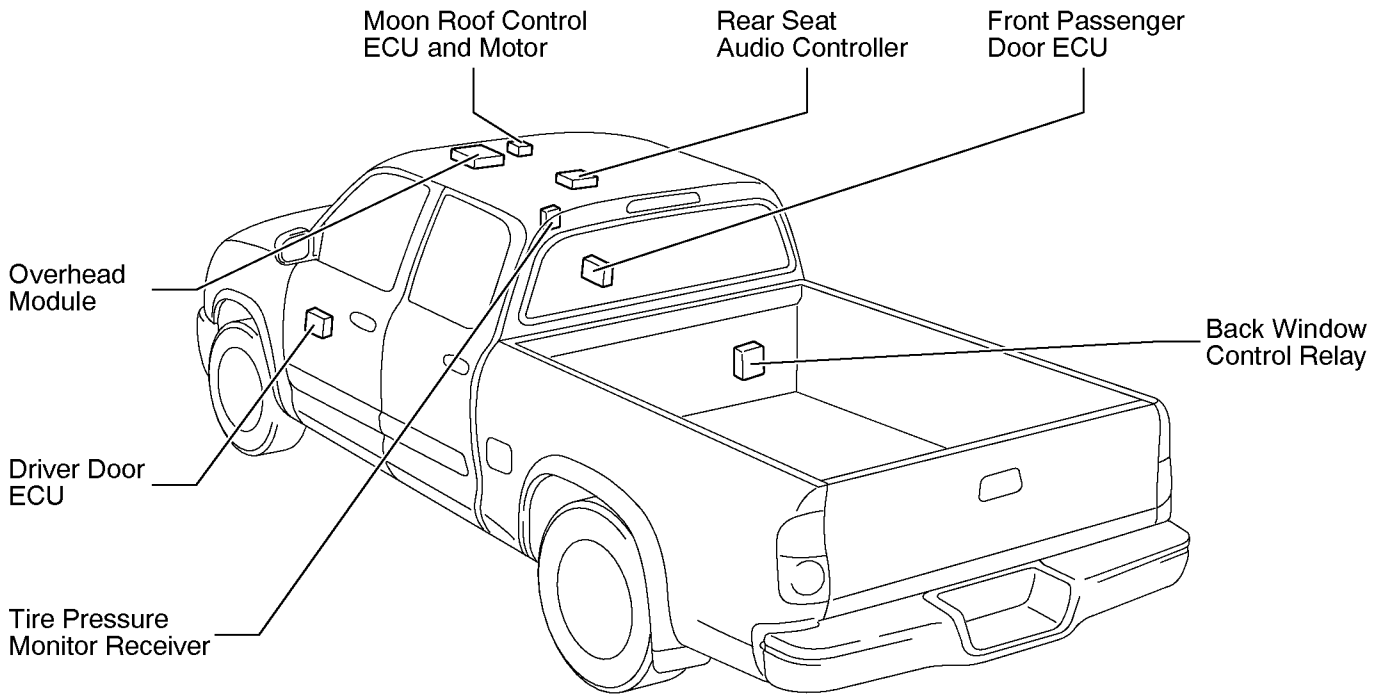
[Engine Compartment] (Double Cab)



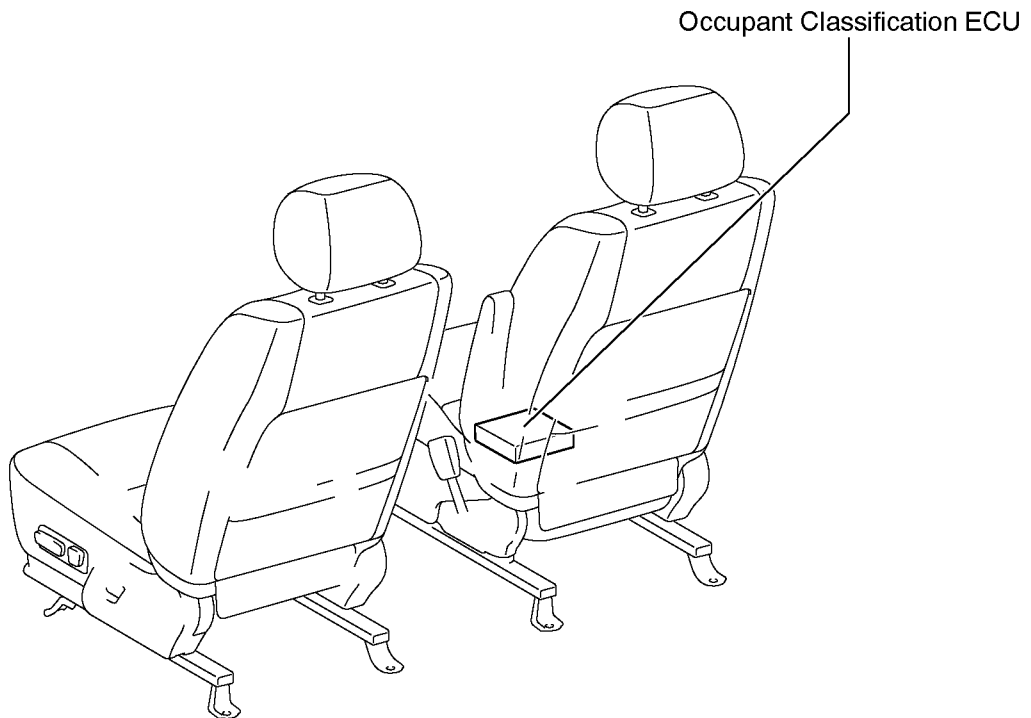
[Instrument Panel] (Double Cab)



[Body]
(Double Cab)



[Seat]
(Double Cab : Captain Seat)

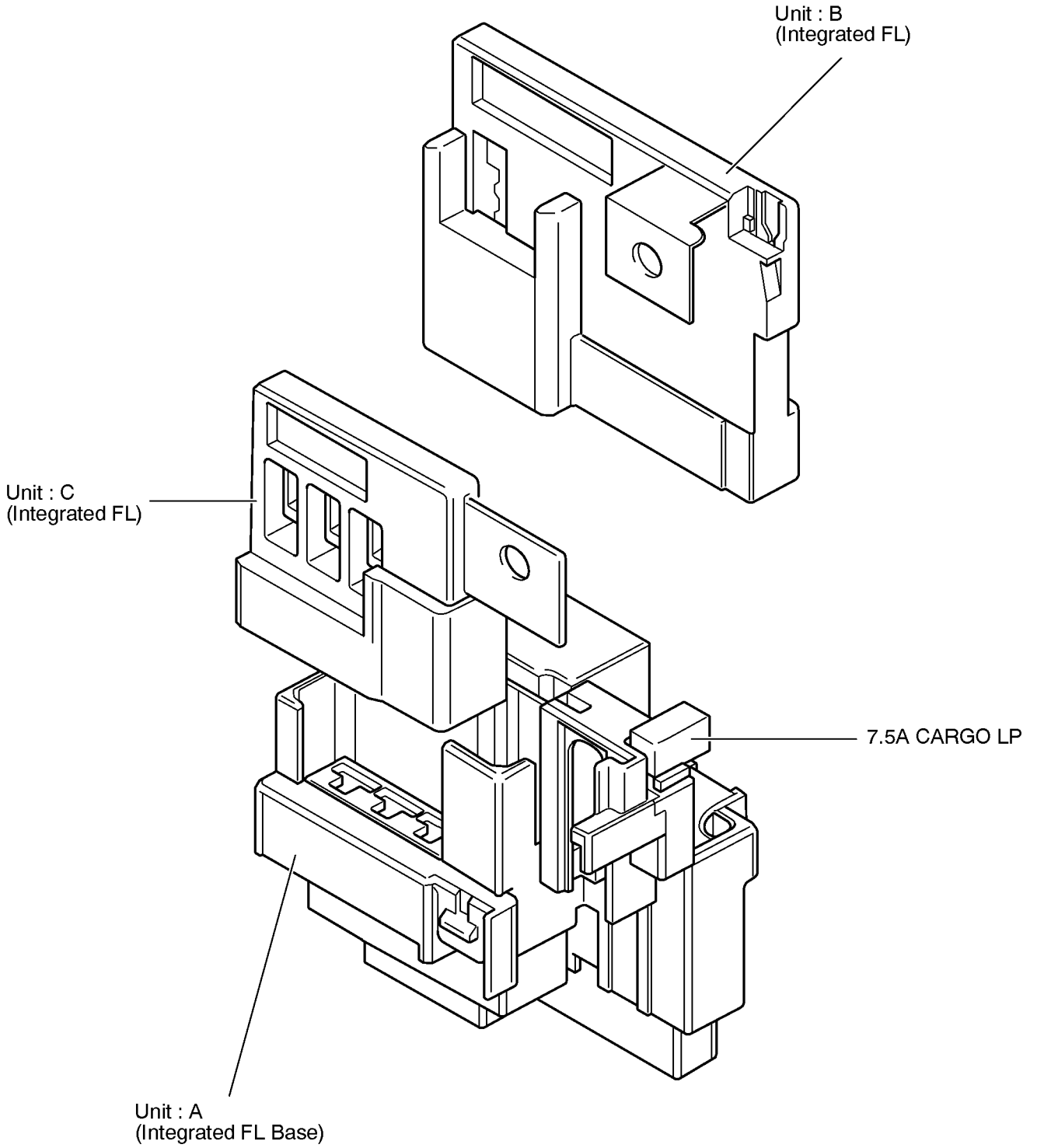


F RELAY LOCATIONS

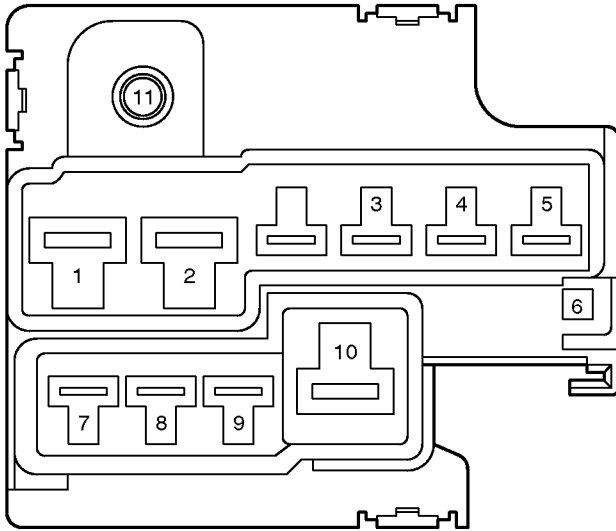
Fusible Link Block

Engine Compartment Left (See Page 32)
[Inside Engine Room J/B]

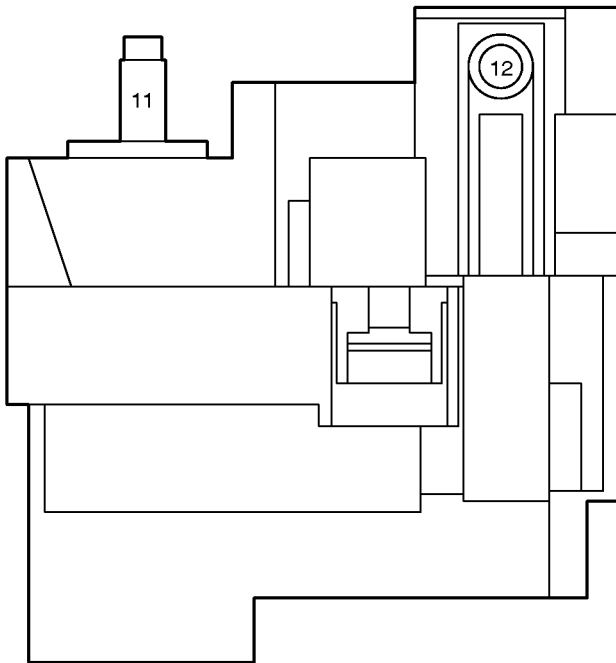
(Double Cab)



[Unit : A (Integrated FL Base)]



Top View



Side View

F RELAY LOCATIONS

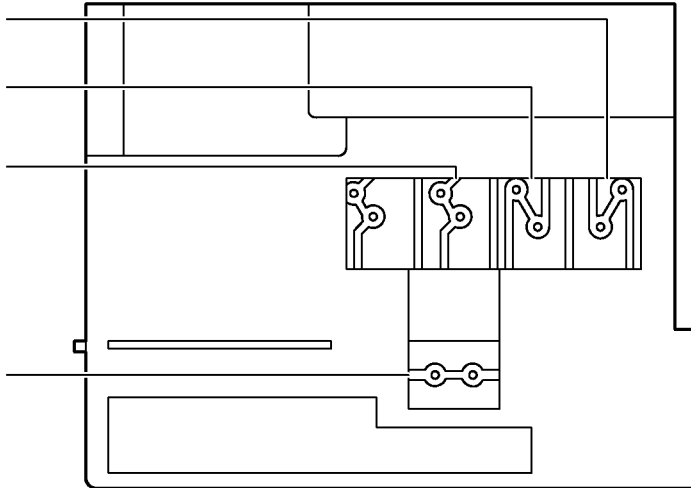
Fusible Link Block

**Engine Compartment Left (See Page 32)
[Inside Engine Room J/B]**

(Double Cab)

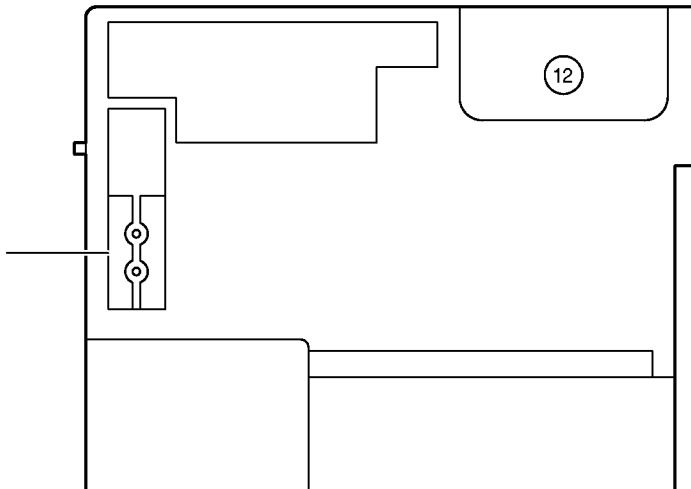
[Unit : B (Integrated FL)]

- 30A ABS NO.2
(for Medium Current)
- 40A DEFOG
(for Medium Current)
- 50A HEATER
(for High Current)

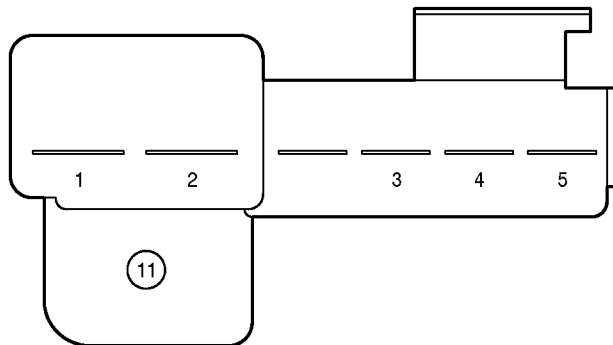


Side View

- 60A TOWING R/B
(for High Current)

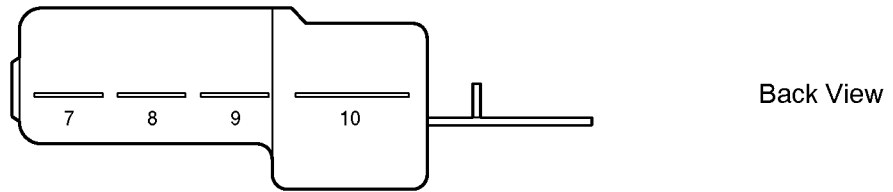
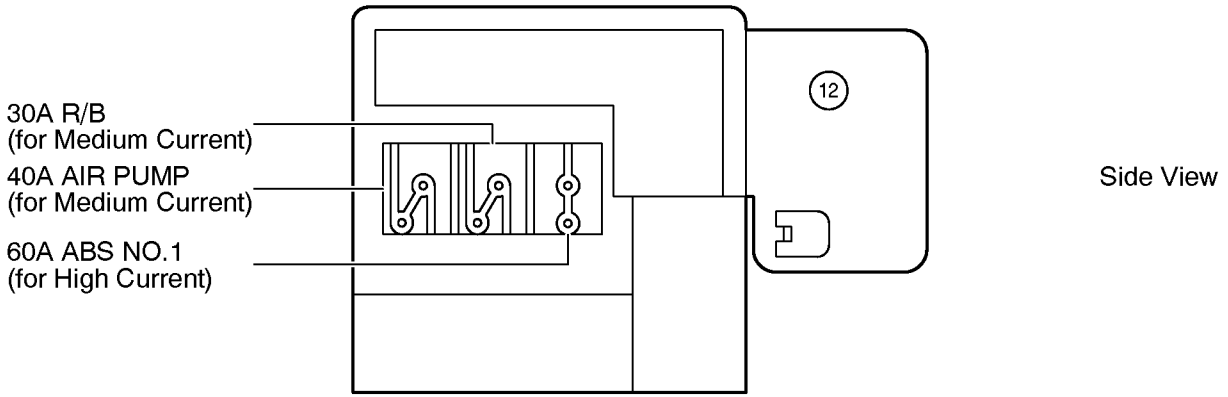


Side View

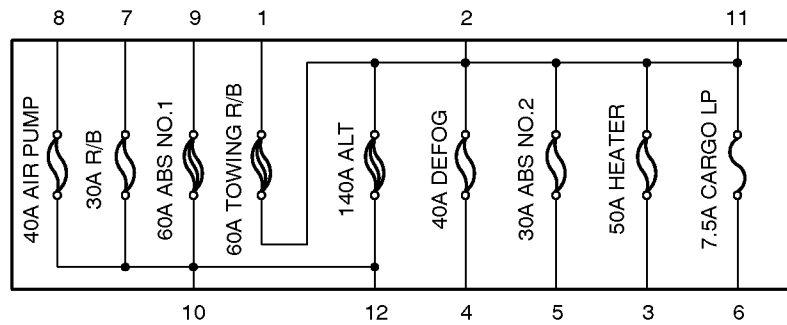


Back View

[Unit : C (Integrated FL)]



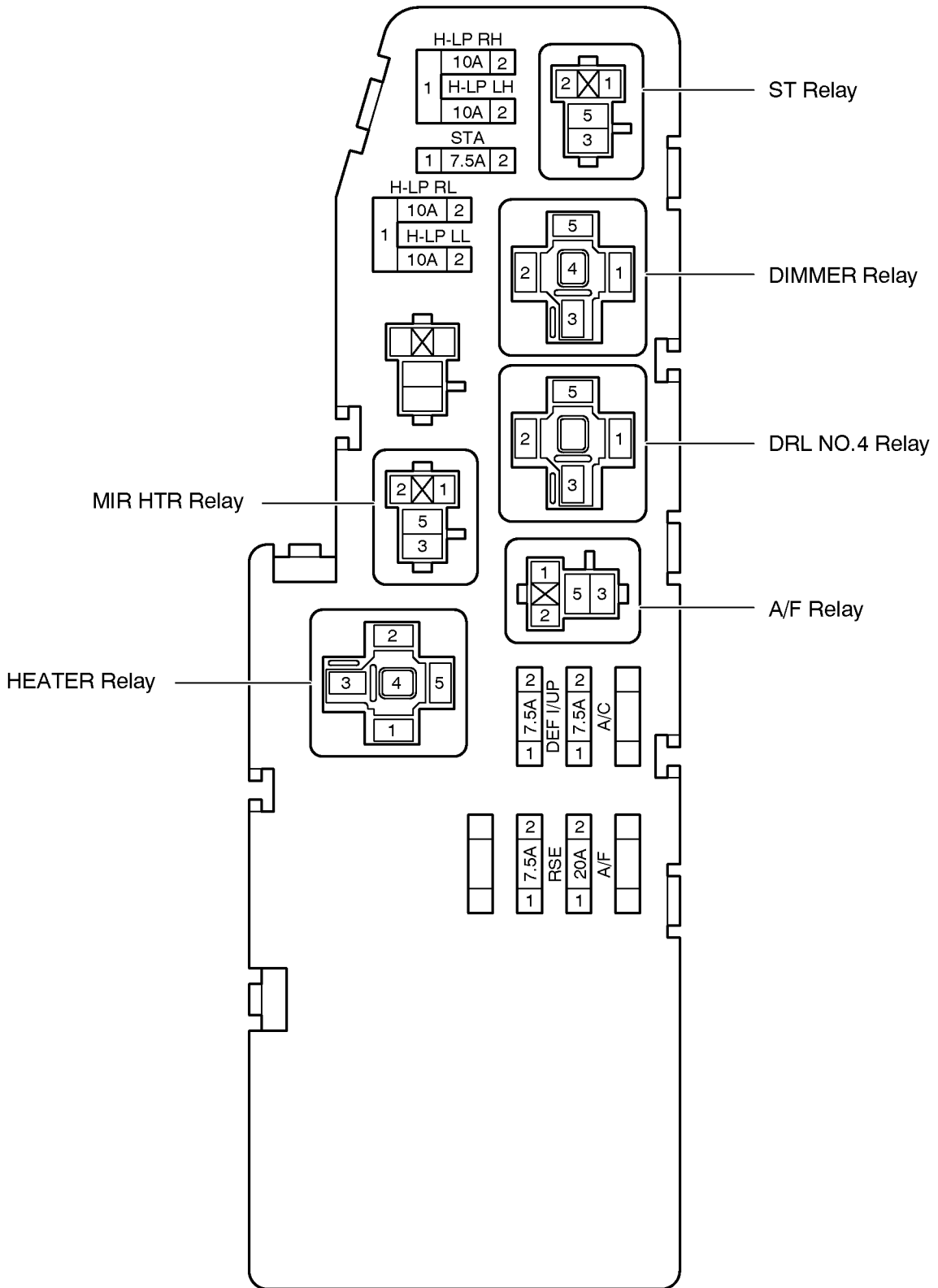
[Fusible Link Block Inner Circuit]



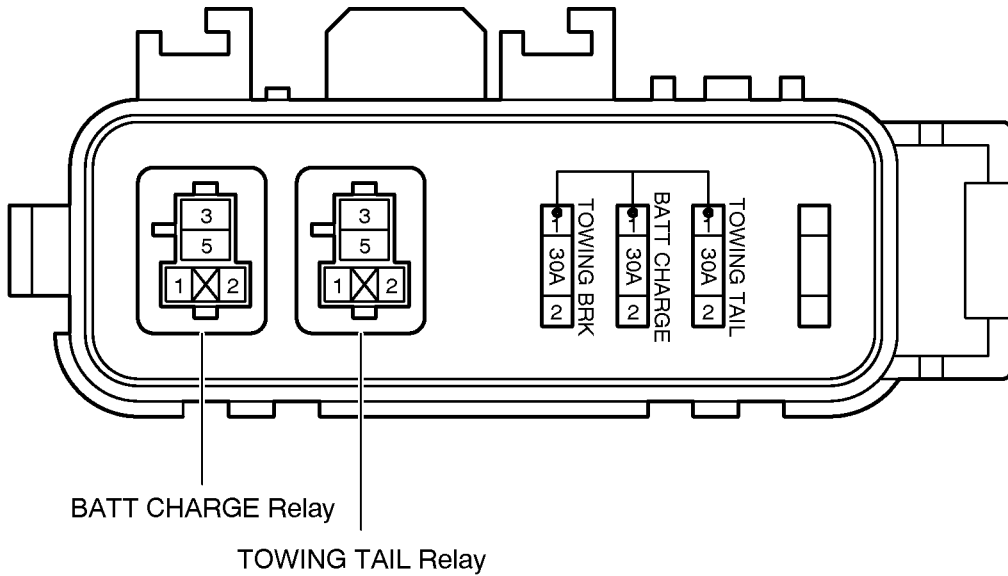
F RELAY LOCATIONS

② : Engine Room R/B No.2 **Engine Compartment Left (See Page 32)**

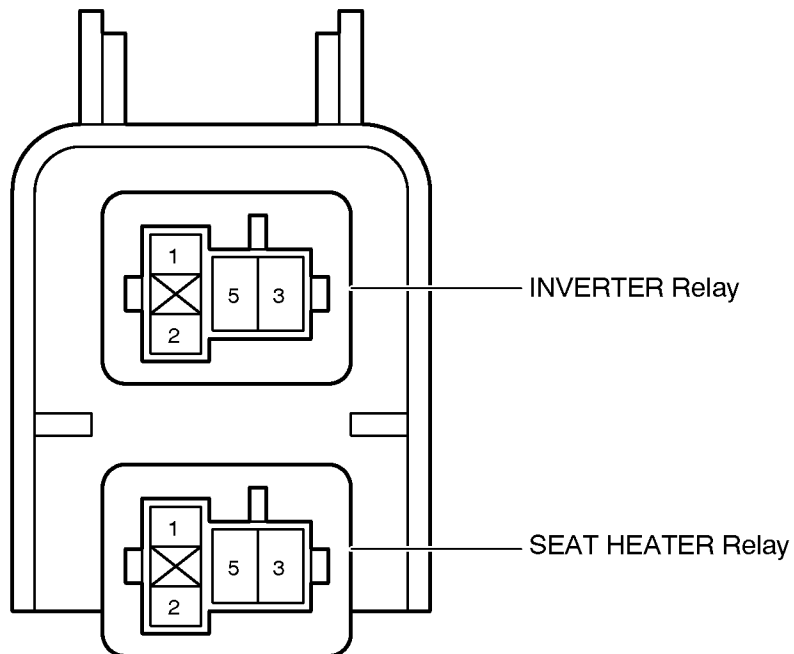
(Double Cab)



③ : Engine Room R/B No.3 **Engine Compartment Left (See Page 32)**
 (Double Cab)



⑤ : Driver Side R/B **Under the Instrument Panel J/B (See Page 32)**
 (Double Cab)

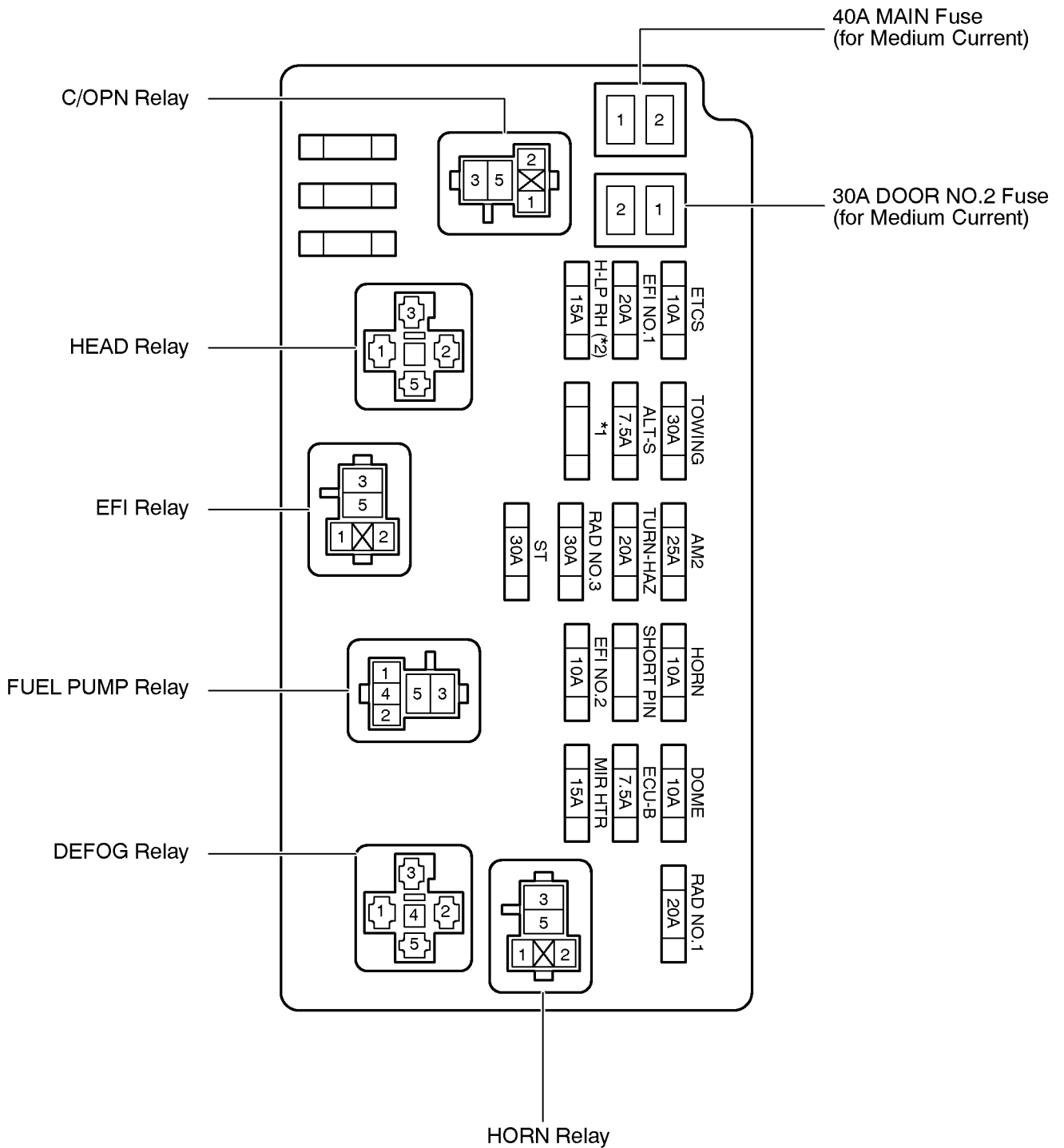


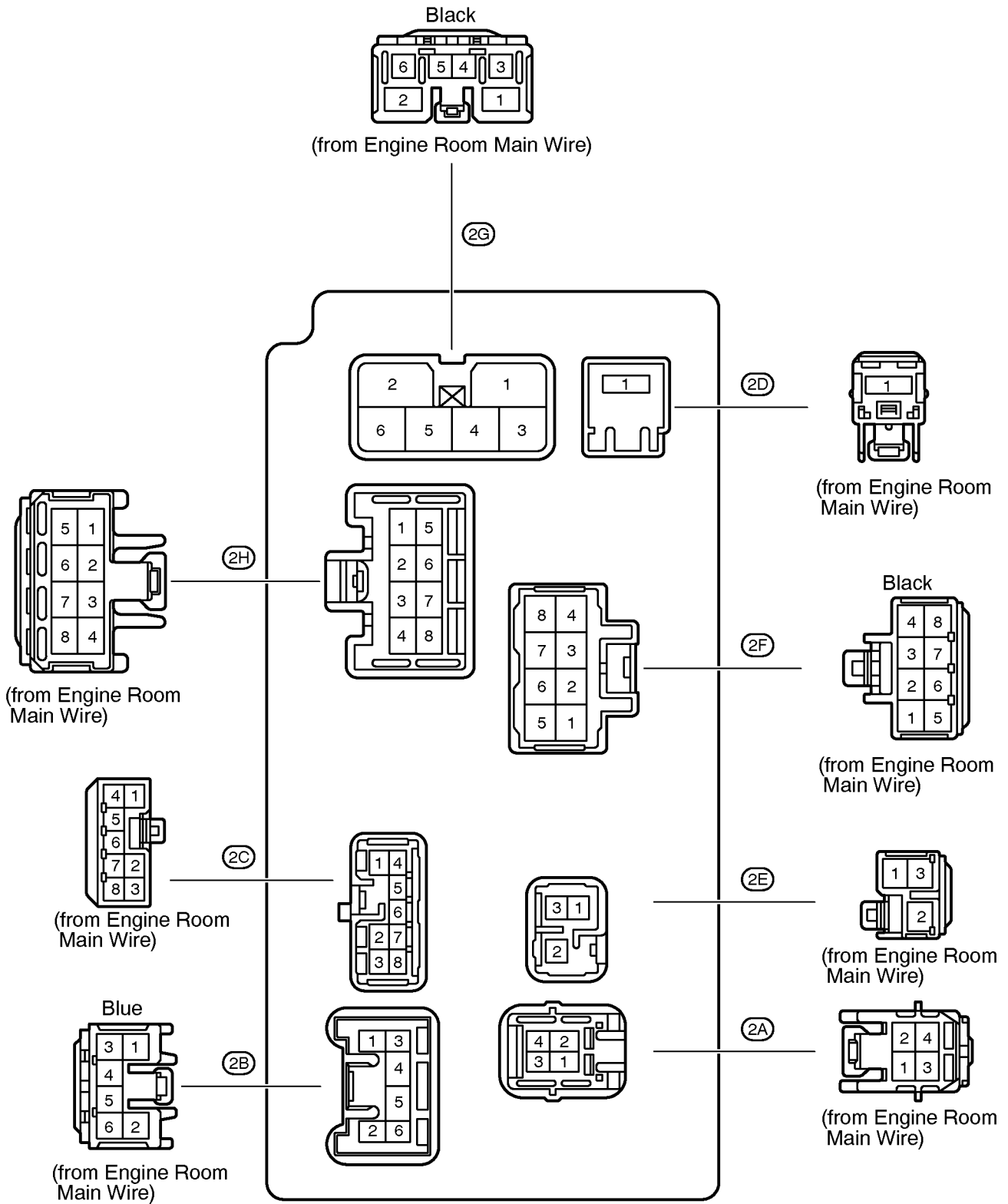
F RELAY LOCATIONS

○ : Engine Room J/B **Engine Compartment Left (See Page 32)**

(Double Cab)

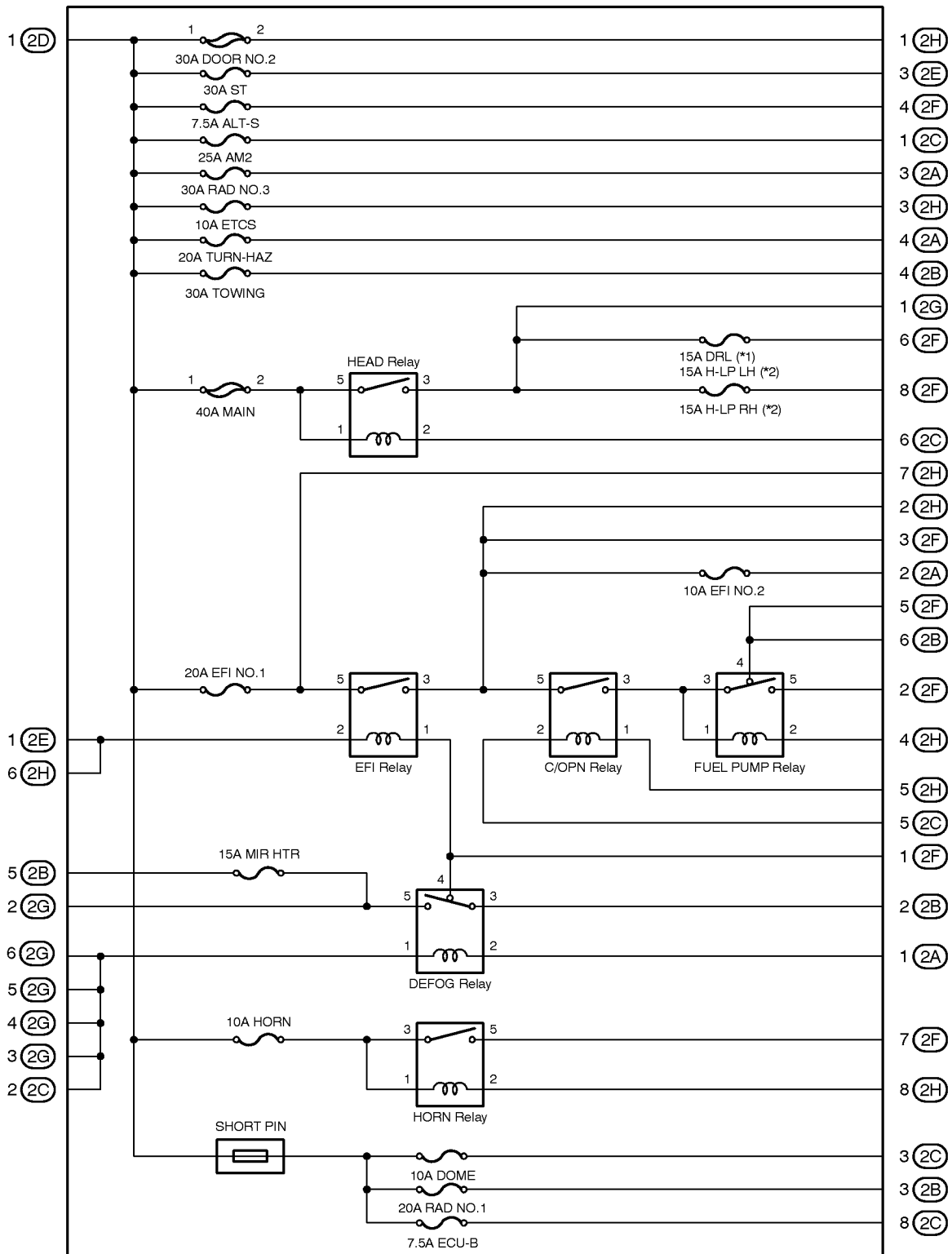
- * 1:15A DRL (w/ Daytime Running Light)
15A H-LP LH (w/o Daytime Running Light)
- * 2:w/o Daytime Running Light





F RELAY LOCATIONS

[Engine Room J/B Inner Circuit] (Double Cab)

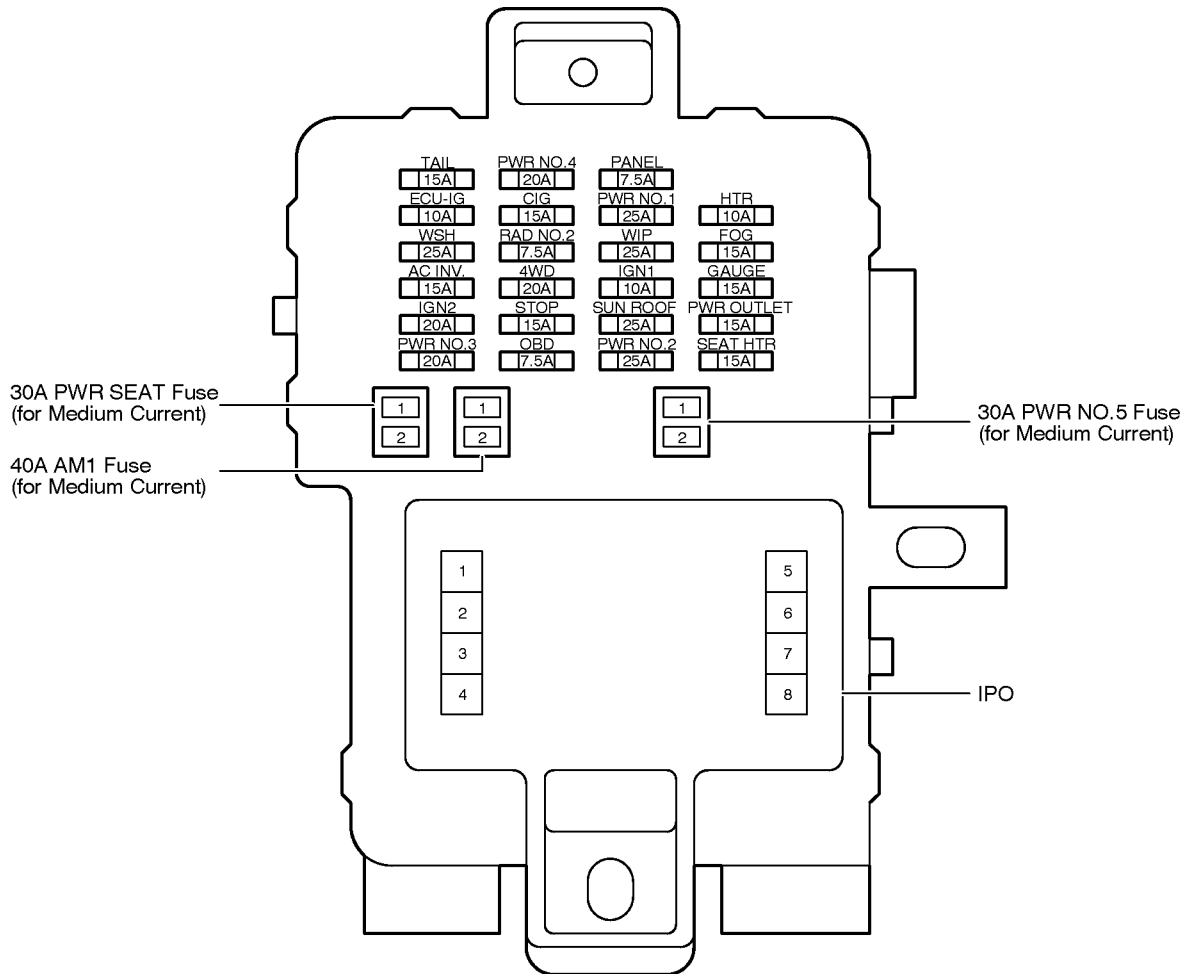


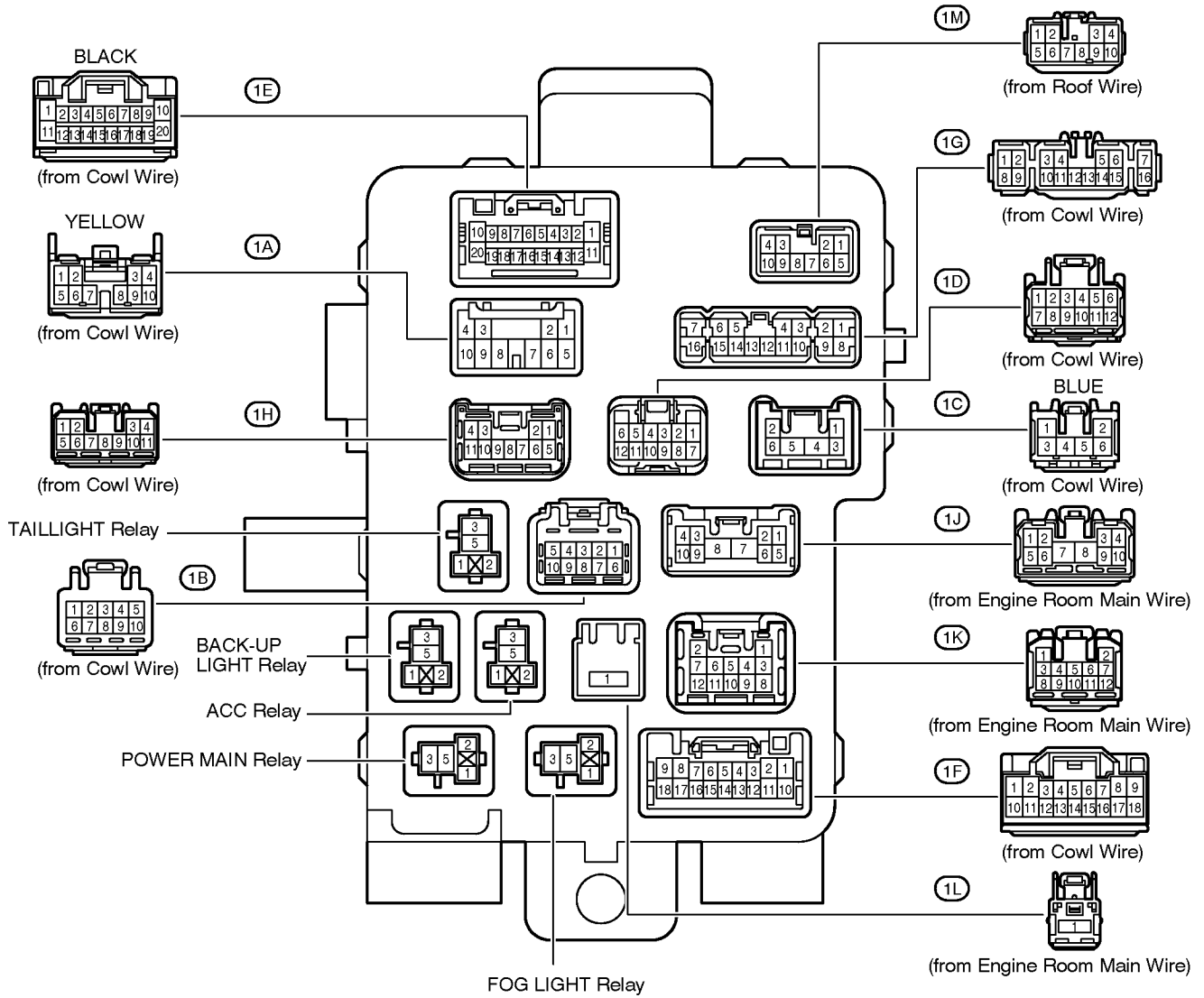
* 1:w/ Daytime Running Light
* 2:w/o Daytime Running Light

F RELAY LOCATIONS

○ : Driver Side J/B Lower Finish Panel (See Page 32)

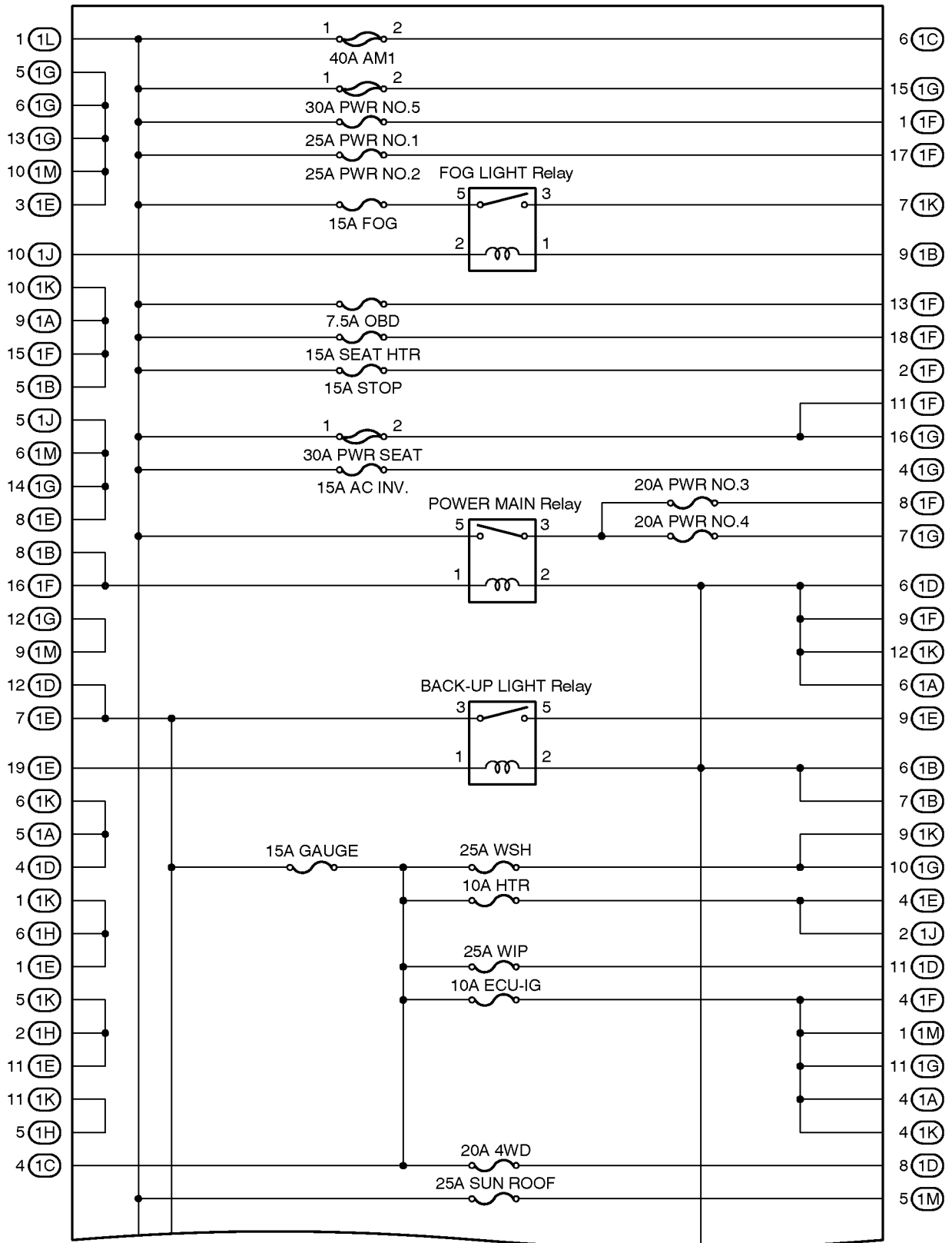
(Double Cab)





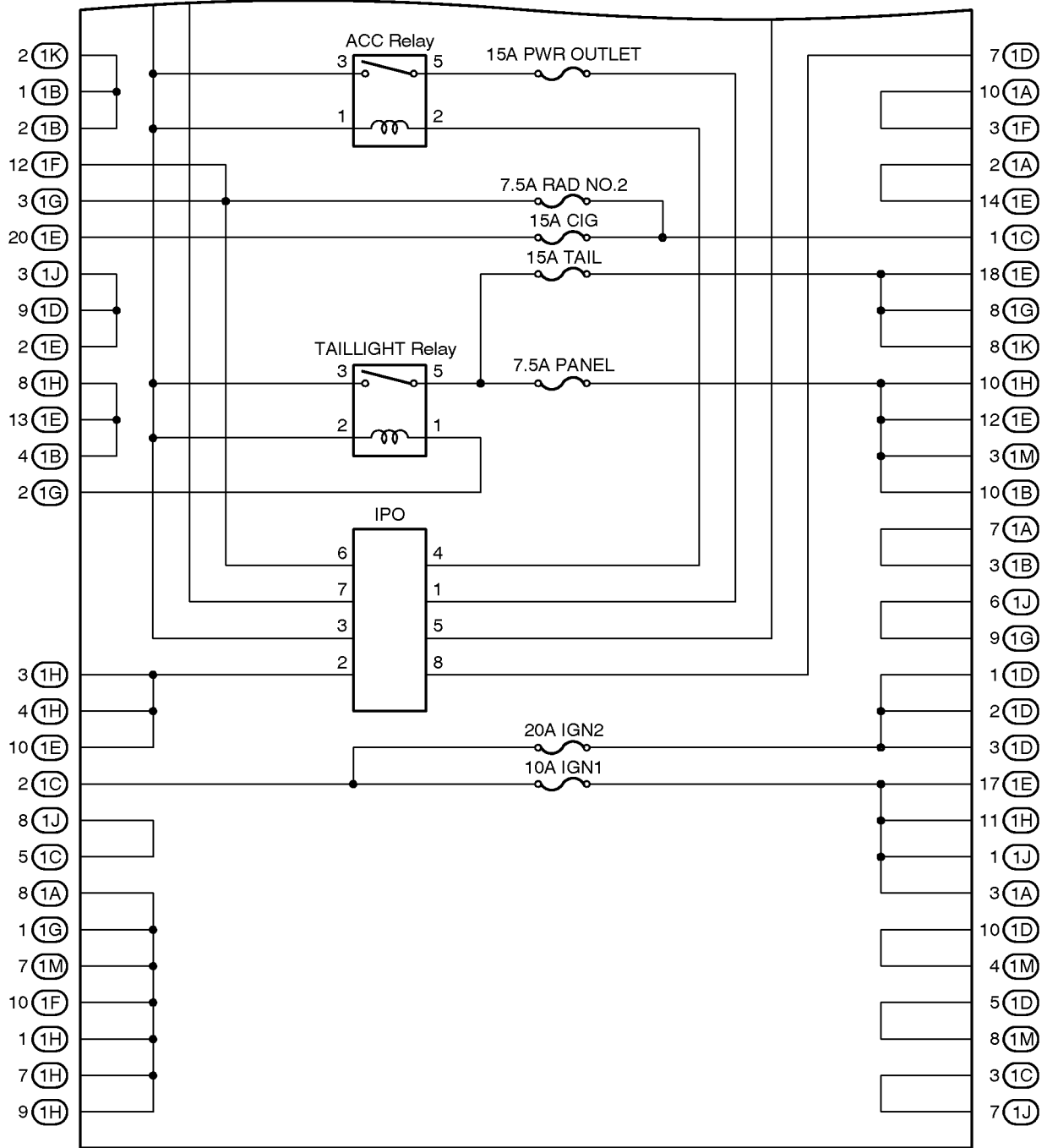
F RELAY LOCATIONS

[Driver Side J/B Inner Circuit] (Double Cab)



(Cont. Next Page)

(Cont'd)

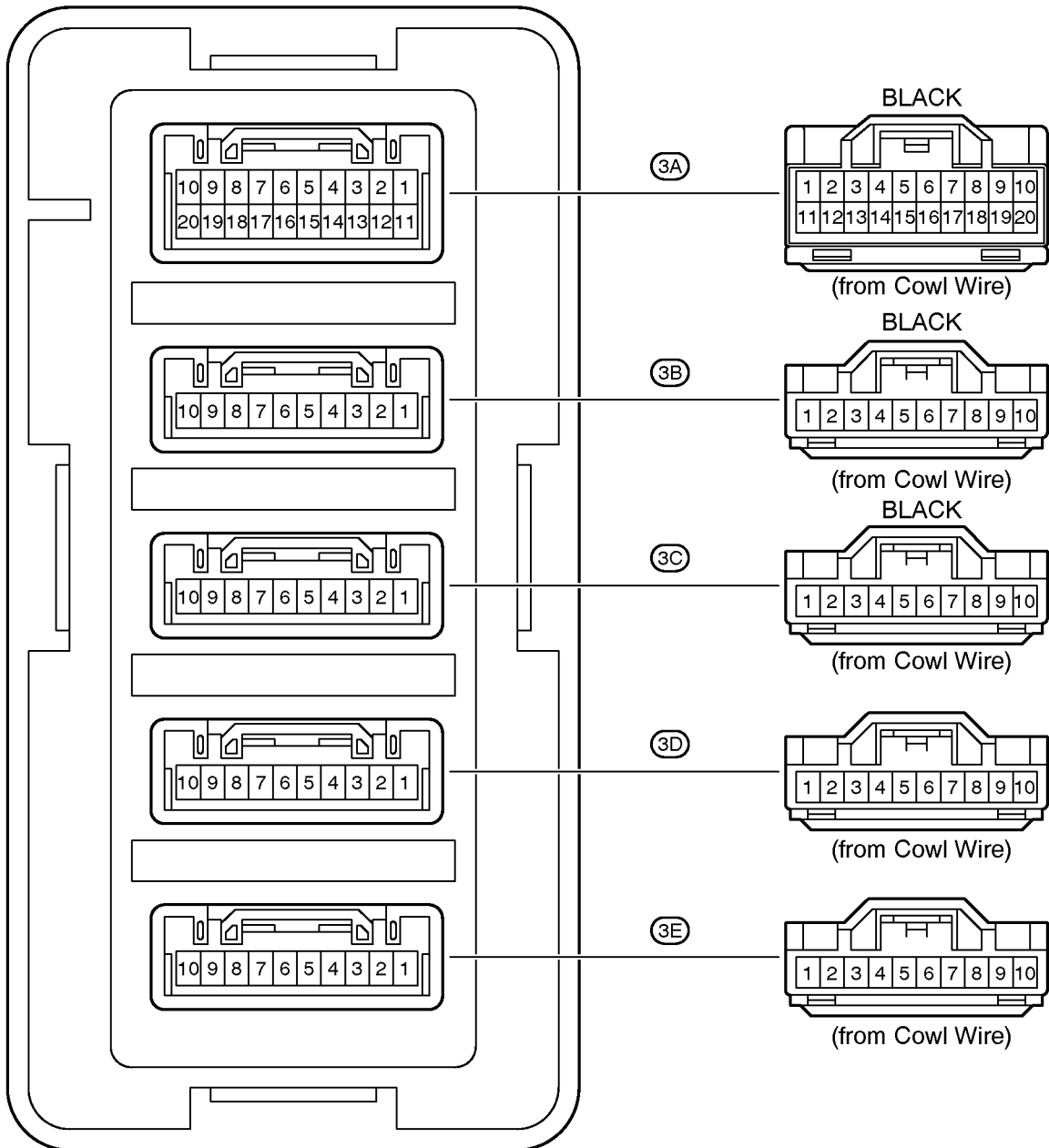


F RELAY LOCATIONS

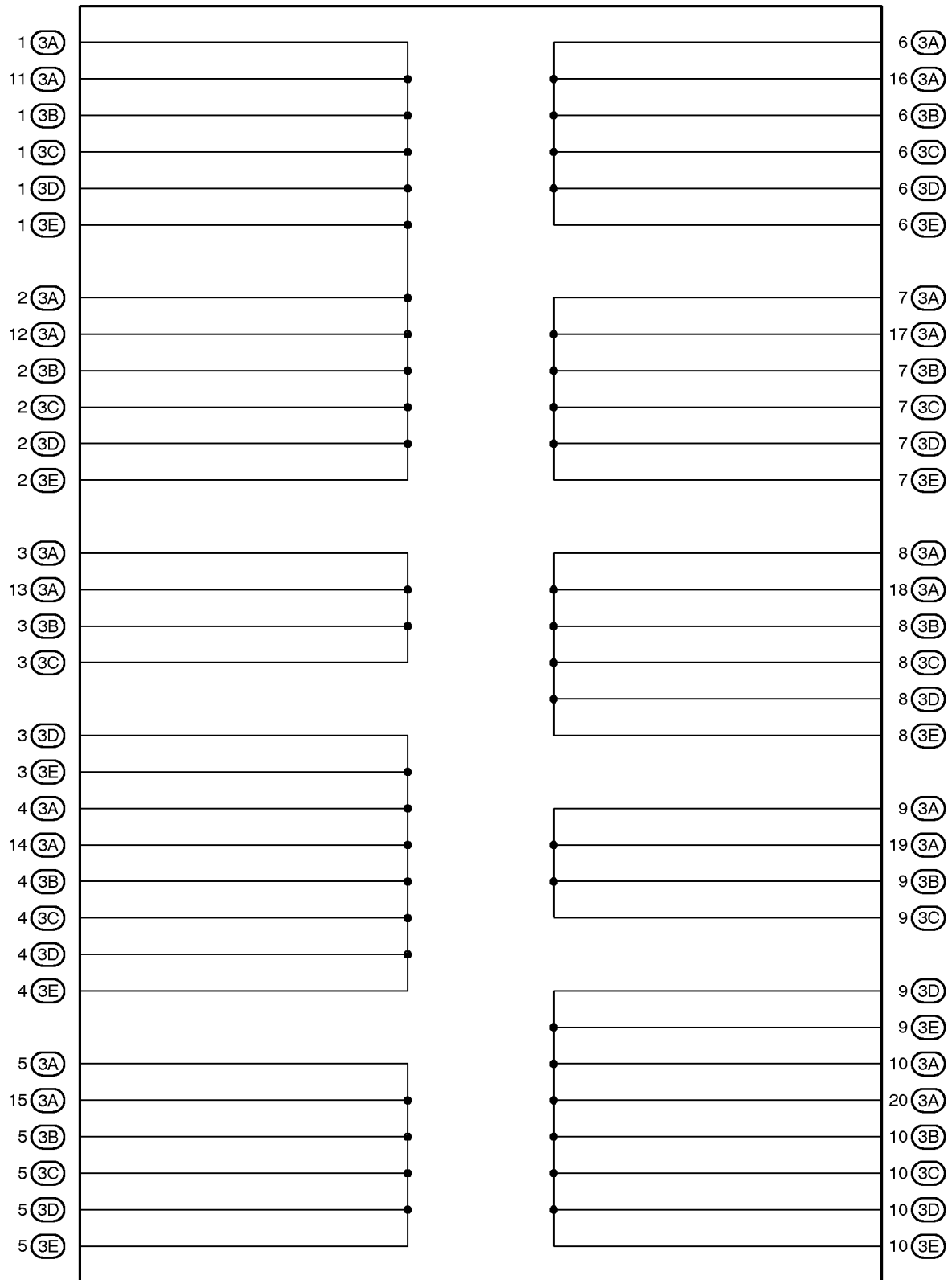
○ : Sub J/B No.3

Upper the Accelerator Pedal (See Page 32)

(Double Cab)



[Sub J/B No.3 Inner Circuit]
(Double Cab)

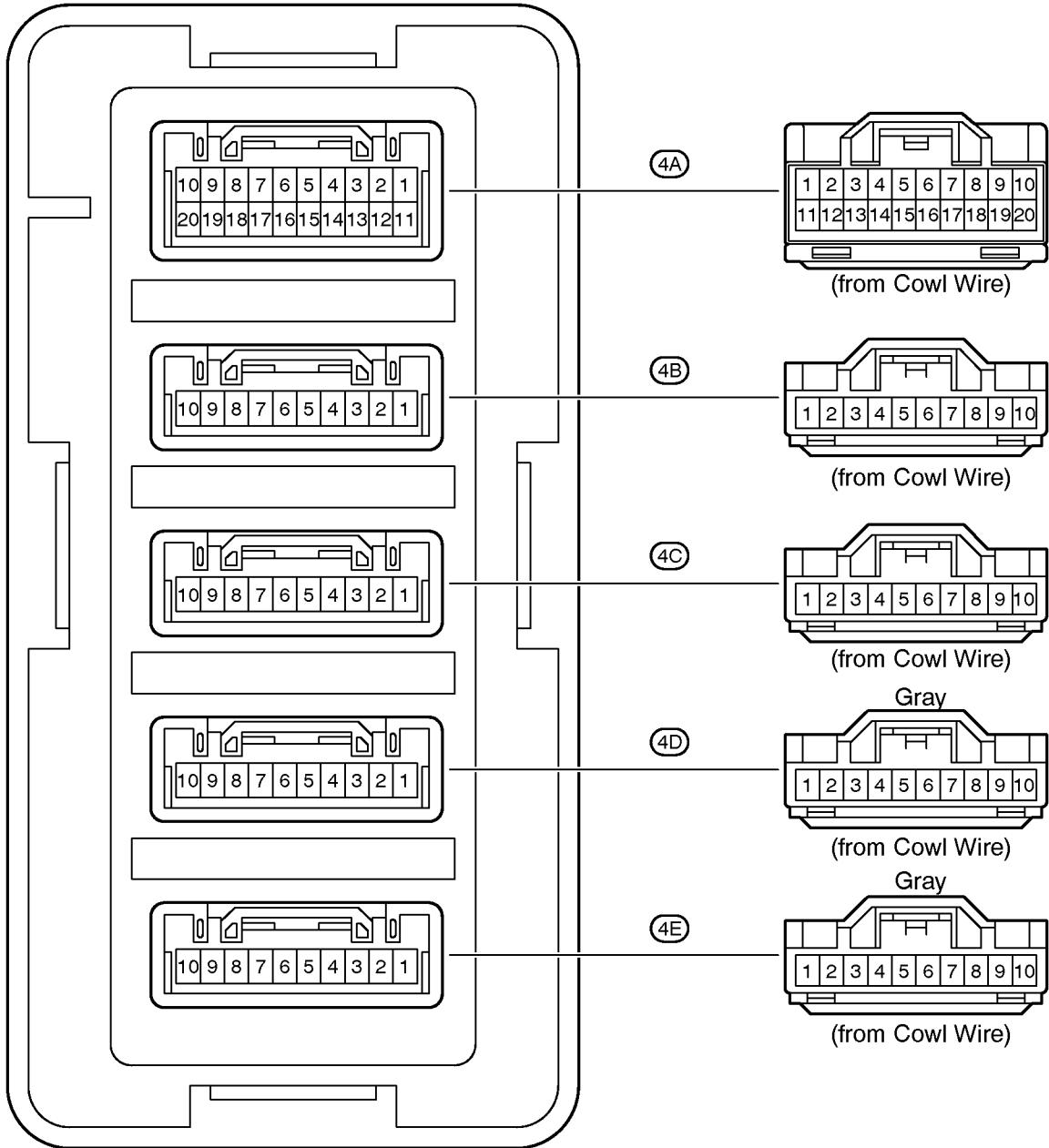


F RELAY LOCATIONS

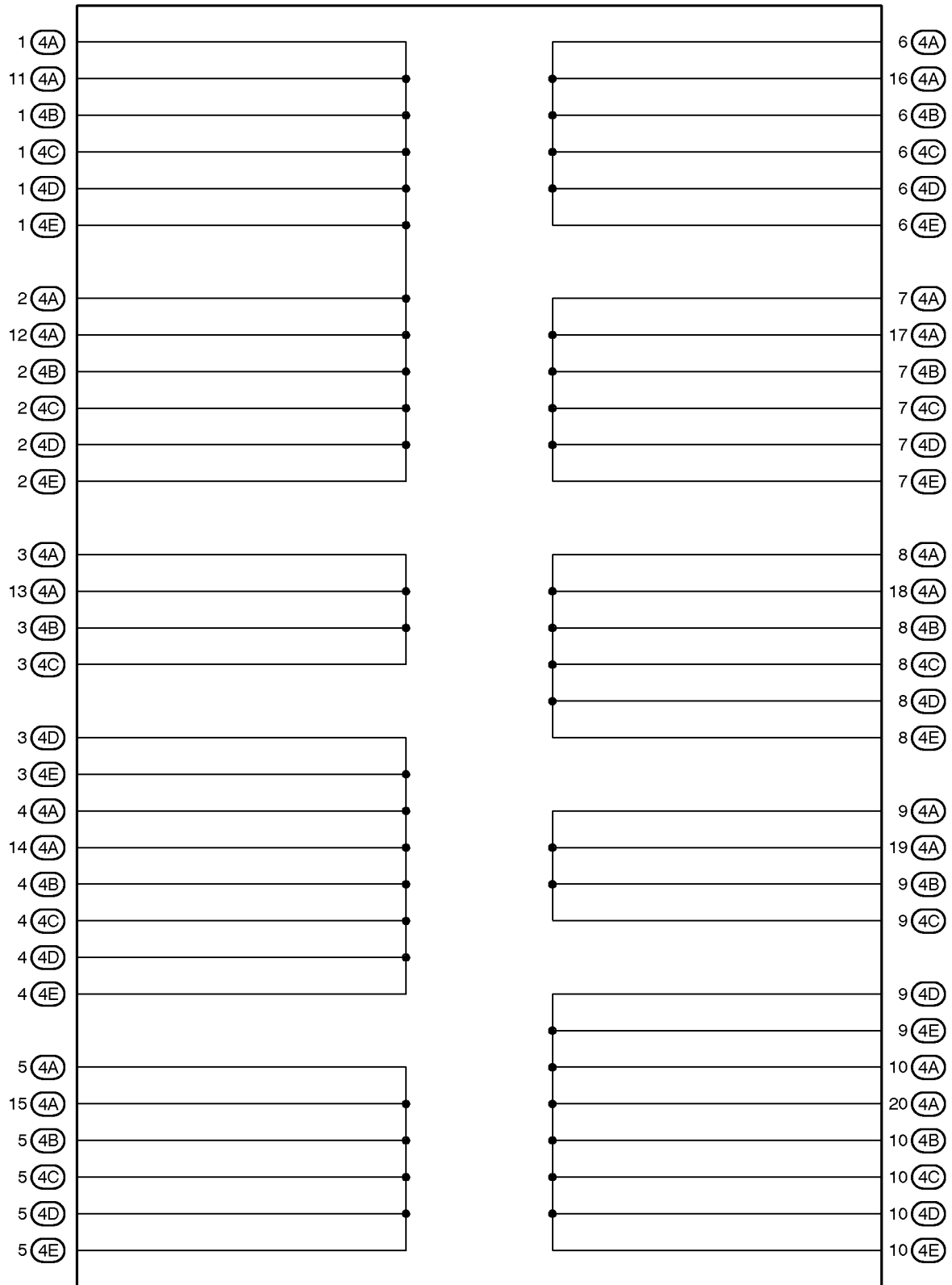
○ : Sub J/B No.4

Upper the Accelerator Pedal (See Page 32)

(Double Cab)



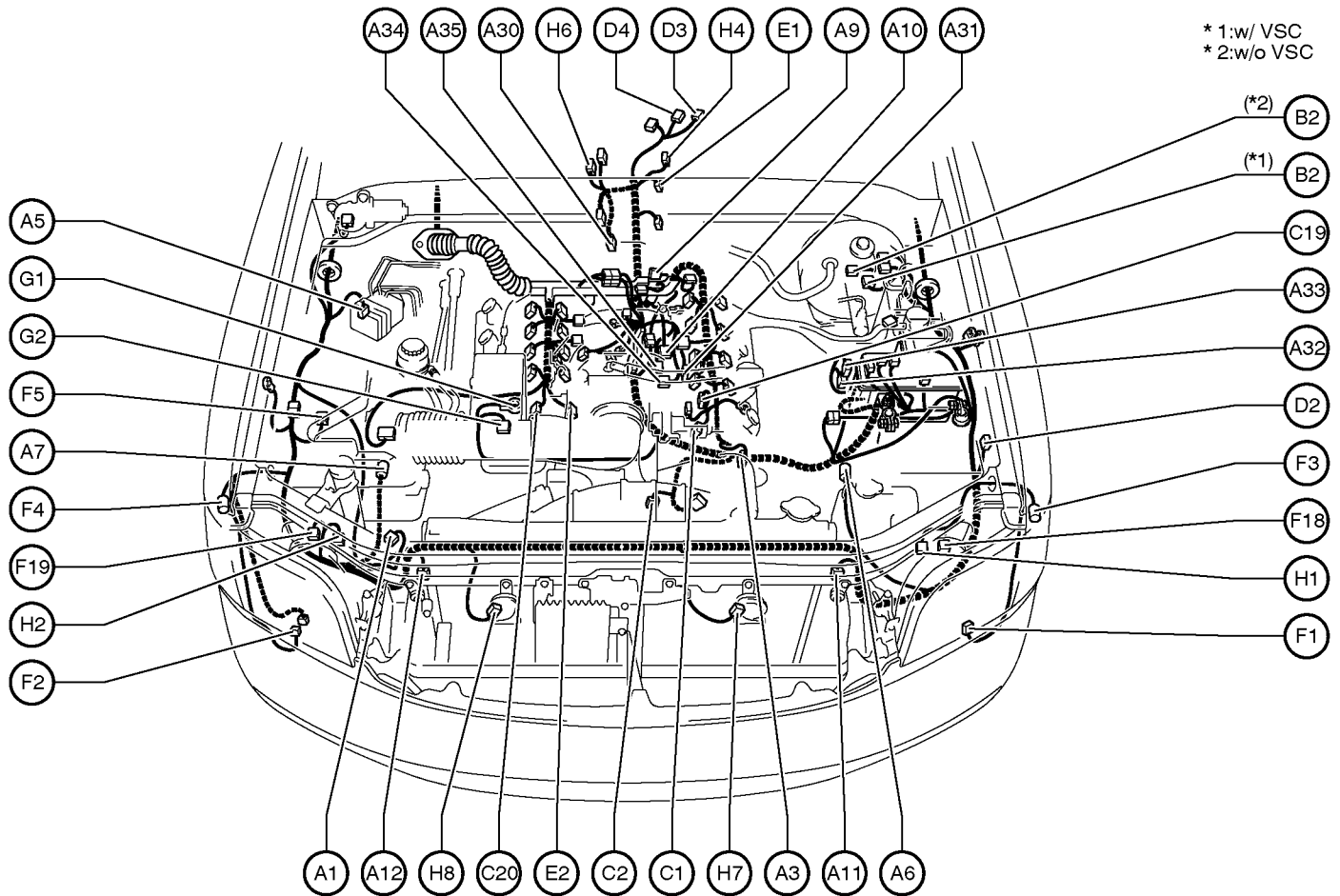
[Sub J/B No.4 Inner Circuit]
(Double Cab)



G ELECTRICAL WIRING ROUTING

Position of Parts in Engine Compartment

[Access Cab, Standard Cab : 2UZ-FE]



* 1:w/ VSC
* 2:w/o VSC

- A 1 Pressure SW
- A 3 A/C Magnetic Clutch and Lock Sensor
- A 5 ABS Actuator with ECU
- A 6 ABS Speed Sensor Front LH
- A 7 ABS Speed Sensor Front RH
- A 9 ADD Actuator
- A10 Air Fuel Ratio Sensor (Bank 1 Sensor 1)
- A11 Airbag Sensor Front LH
- A12 Airbag Sensor Front RH
- A30 Air Fuel Ratio Sensor (Bank 2 Sensor 1)
- A31 Air Switching Valve
- A32 Air Injection Control Driver
- A33 Air Injection Control Driver
- A34 Air Pressure Sensor
- A35 Air Pump

- B 2 Brake Fluid Level Warning SW

- C 1 Camshaft Position Sensor
- C 2 Crankshaft Position Sensor
- C19 Camshaft Timing Oil Control Valve LH
- C20 Camshaft Timing Oil Control Valve RH

- D 2 Daytime Running Light Resistor
- D 3 Detection SW (Transfer 4WD Position)
- D 4 Detection SW (Transfer L4 Position)

- E 1 Electronically Controlled Transmission Solenoid
- E 2 Engine Coolant Temp. Sensor

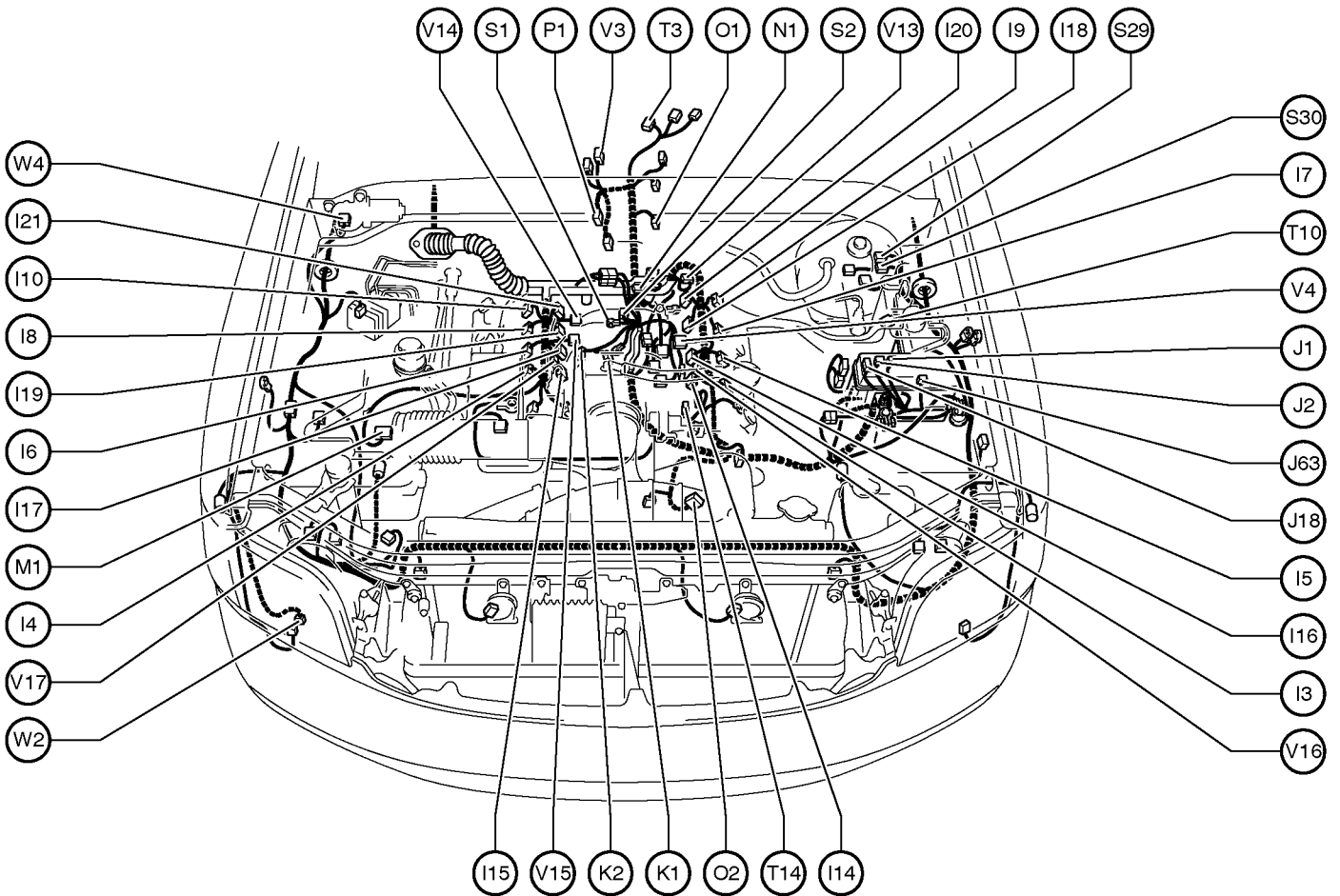
- F 1 Front Fog Light LH
- F 2 Front Fog Light RH
- F 3 Front Turn Signal Light and Parking Light LH
- F 4 Front Turn Signal Light and Parking Light RH
- F 5 Fuel Pump Resistor
- F18 Front Parking Light LH No.3
- F19 Front Parking Light RH No.3

- G 1 Generator
- G 2 Generator

- H 1 Headlight LH
- H 2 Headlight RH
- H 4 Heated Oxygen Sensor (Bank 1 Sensor 2)
- H 6 Heated Oxygen Sensor (Bank 2 Sensor 2)
- H 7 Horn LH
- H 8 Horn RH

Position of Parts in Engine Compartment

[Access Cab, Standard Cab : 2UZ-FE]



I 3 Igniter and Ignition Coil No.1
 I 4 Igniter and Ignition Coil No.2
 I 5 Igniter and Ignition Coil No.3
 I 6 Igniter and Ignition Coil No.4
 I 7 Igniter and Ignition Coil No.5
 I 8 Igniter and Ignition Coil No.6
 I 9 Igniter and Ignition Coil No.7
 I 10 Igniter and Ignition Coil No.8
 I 14 Injector No.1
 I 15 Injector No.2
 I 16 Injector No.3
 I 17 Injector No.4
 I 18 Injector No.5
 I 19 Injector No.6
 I 20 Injector No.7
 I 21 Injector No.8

J 1 Junction Connector
 J 2 Junction Connector
 J 18 Junction Connector
 J 63 Junction Connector

K 1 Knock Sensor (Bank 1)
 K 2 Knock Sensor (Bank 2)

M 1 Mass Air Flow Meter

N 1 Noise Filter

O 1 O/D Direct Clutch Speed Sensor
 O 2 Oil Pressure SW

P 1 Park/Neutral Position SW

S 1 Starter
 S 2 Starter
 S29 Skid Control ECU with Actuator
 S30 Skid Control ECU with Actuator

T 3 Transfer Shift Actuator
 T10 TVIP Buzzer
 T14 Throttle Control Motor and Throttle Position Sensor

V 3 Vehicle Speed Sensor
 (Electronically Controlled Transmission)

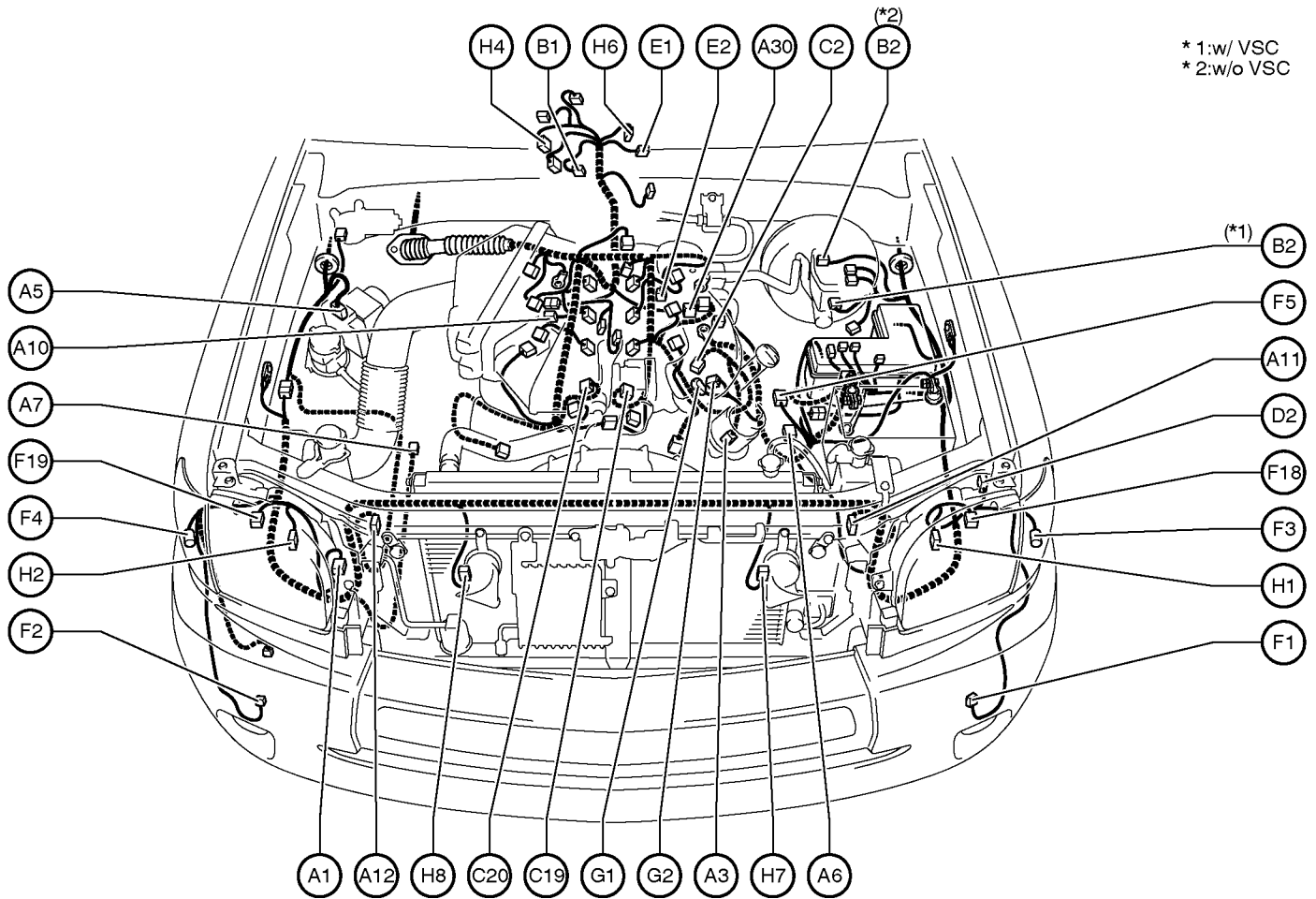
V 4 VSV (EVAP)
 V13 VSV (ACIS)
 V14 VSV (Air Switching Valve Bank 1)
 V15 VSV (Air Switching Valve Bank 2)
 V16 VVT Sensor LH
 V17 VVT Sensor RH

W 2 Washer Motor and Washer Level Sensor
 W 4 Wiper Motor

G ELECTRICAL WIRING ROUTING

Position of Parts in Engine Compartment

[Access Cab, Standard Cab : 1GR-FE]

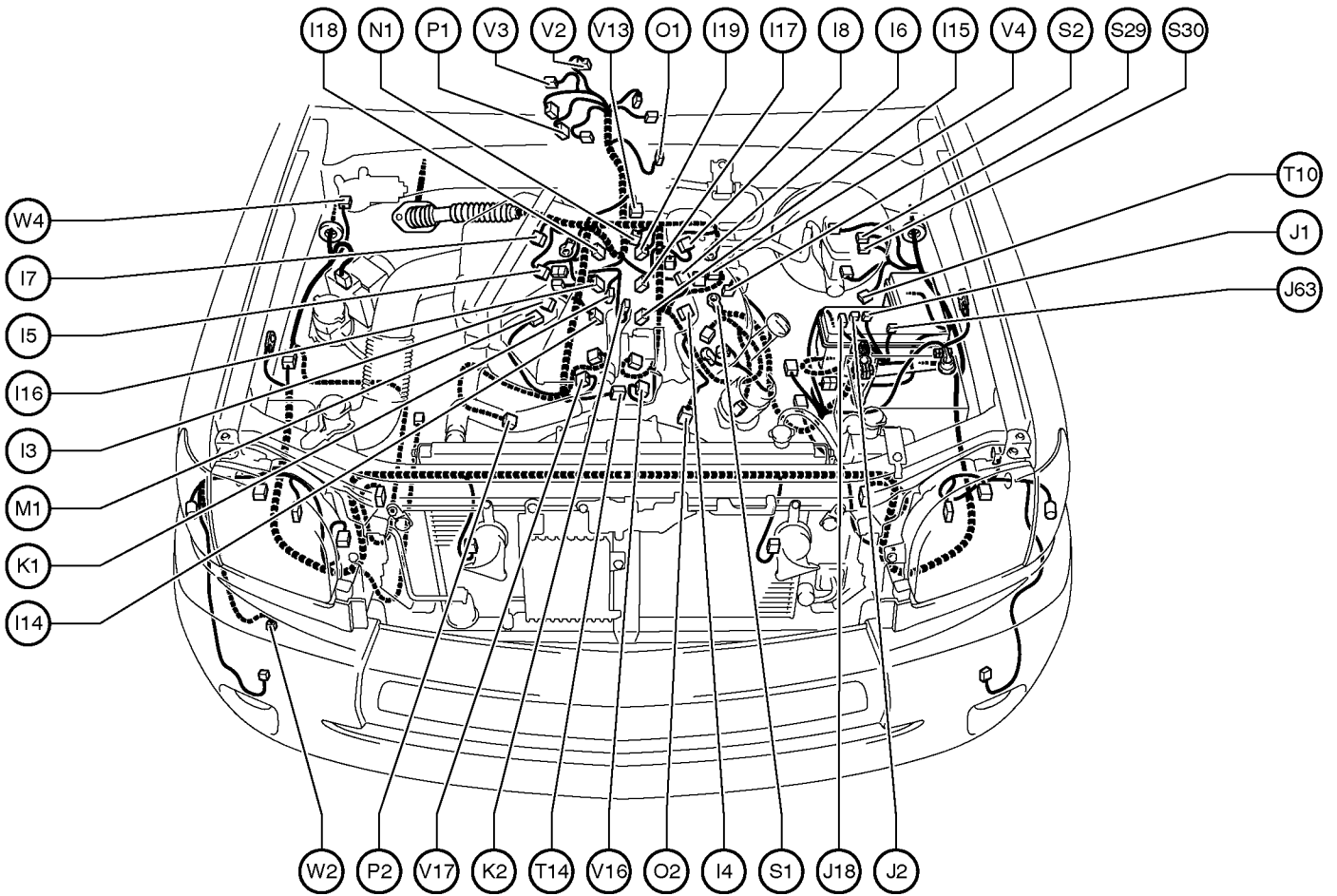


* 1:w/ VSC
* 2:w/o VSC

- | | |
|---|--|
| A 1 Pressure SW | F 1 Front Fog Light LH |
| A 3 A/C Magnetic Clutch and Lock Sensor | F 2 Front Fog Light RH |
| A 5 ABS Actuator with ECU | F 3 Front Turn Signal Light and Parking Light LH |
| A 6 ABS Speed Sensor Front LH | F 4 Front Turn Signal Light and Parking Light RH |
| A 7 ABS Speed Sensor Front RH | F 5 Fuel Pump Resistor |
| A 10 Air Fuel Ratio Sensor (Bank 1 Sensor 1) | F 18 Front Parking Light LH No.3 |
| A 11 Airbag Sensor Front LH | F 19 Front Parking Light RH No.3 |
| A 12 Airbag Sensor Front RH | |
| A 30 Air Fuel Ratio Sensor (Bank 2 Sensor 1) | G 1 Generator |
| | G 2 Generator |
| B 1 Back-Up Light SW | H 1 Headlight LH |
| B 2 Brake Fluid Level Warning SW | H 2 Headlight RH |
| C 2 Crankshaft Position Sensor | H 4 Heated Oxygen Sensor (Bank 1 Sensor 2) |
| C 19 Camshaft Timing Oil Control Valve LH | H 6 Heated Oxygen Sensor (Bank 2 Sensor 2) |
| C 20 Camshaft Timing Oil Control Valve RH | H 7 Horn LH |
| | H 8 Horn RH |
| D 2 Daytime Running Light Resistor | |
| E 1 Electronically Controlled Transmission Solenoid | |
| E 2 Engine Coolant Temp. Sensor | |

Position of Parts in Engine Compartment

[Access Cab, Standard Cab : 1GR-FE]



I 3 Igniter and Ignition Coil No.1
 I 4 Igniter and Ignition Coil No.2
 I 5 Igniter and Ignition Coil No.3
 I 6 Igniter and Ignition Coil No.4
 I 7 Igniter and Ignition Coil No.5
 I 8 Igniter and Ignition Coil No.6
 I 14 Injector No.1
 I 15 Injector No.2
 I 16 Injector No.3
 I 17 Injector No.4
 I 18 Injector No.5
 I 19 Injector No.6

J 1 Junction Connector
 J 2 Junction Connector
 J 18 Junction Connector
 J 63 Junction Connector

K 1 Knock Sensor (Bank 1)
 K 2 Knock Sensor (Bank 2)

M 1 Mass Air Flow Meter

N 1 Noise Filter

O 1 O/D Direct Clutch Speed Sensor
 O 2 Oil Pressure SW

P 1 Park/Neutral Position SW
 P 2 Power Steering Oil Pressure SW

S 1 Starter
 S 2 Starter
 S29 Skid Control ECU with Actuator
 S30 Skid Control ECU with Actuator

T 10 TVIP Buzzer
 T 14 Throttle Control Motor and Throttle Position Sensor

V 2 Vehicle Speed Sensor (Combination Meter)
 V 3 Vehicle Speed Sensor
 (Electronically Controlled Transmission)

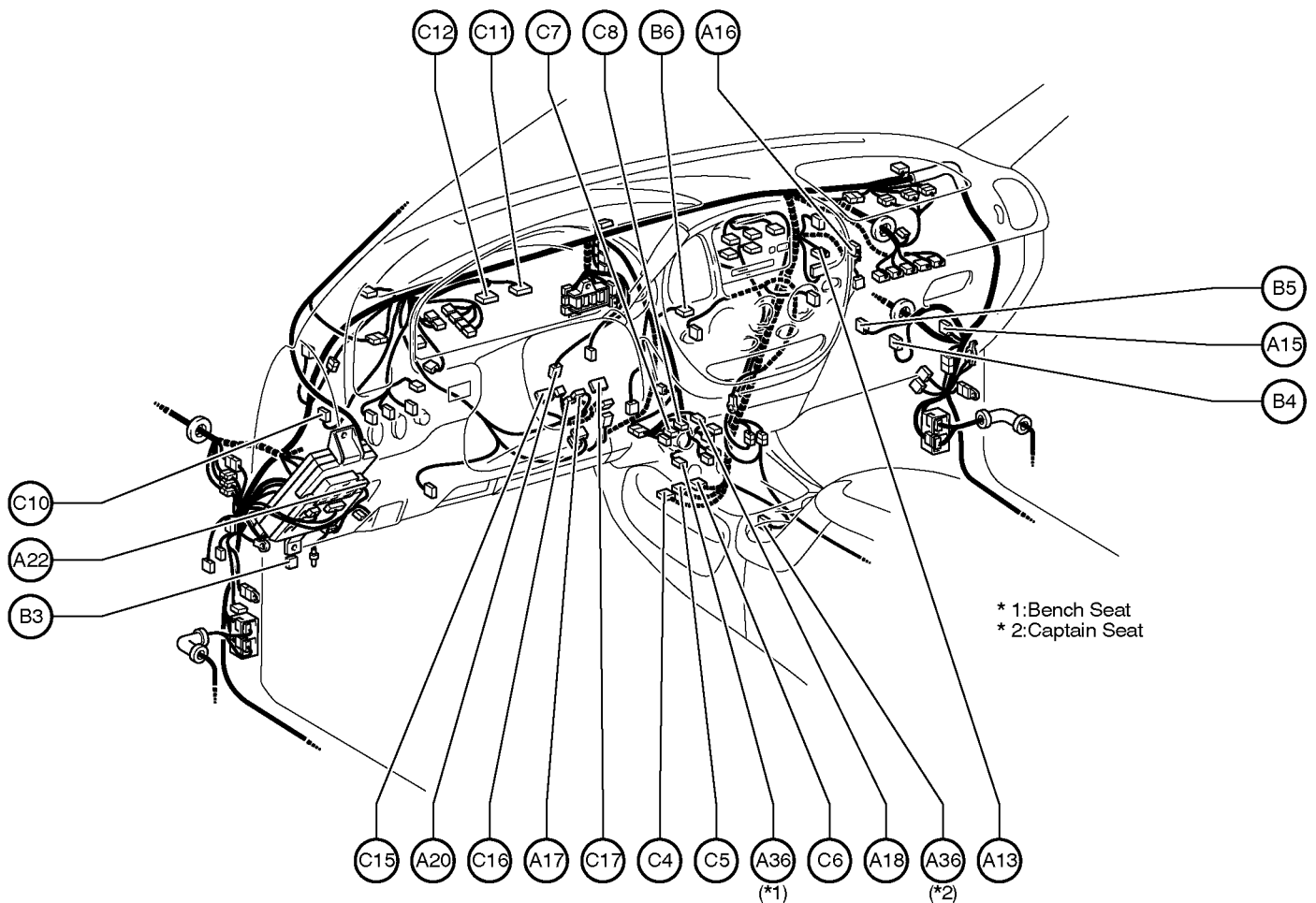
V 4 VSV (EVAP)
 V13 VSV (ACIS)
 V16 VVT Sensor LH
 V17 VVT Sensor RH

W 2 Washer Motor and Washer Level Sensor
 W 4 Wiper Motor

G ELECTRICAL WIRING ROUTING

Position of Parts in Instrument Panel

[Access Cab, Standard Cab]



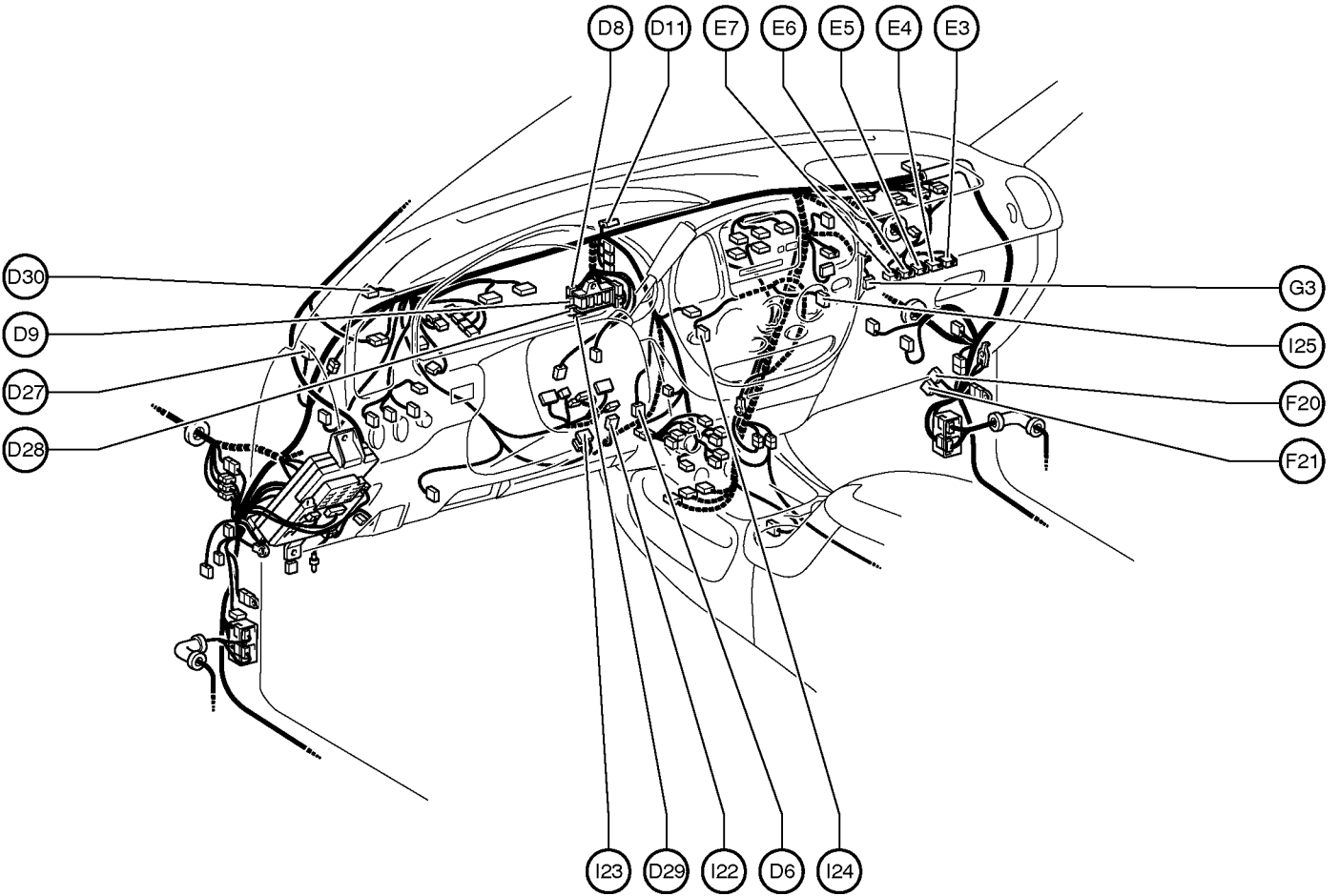
- A 13 A/C Thermistor
- A 15 Air Inlet Control Servo Motor
- A 16 Airbag Squib (Front Passenger Airbag Assembly)
- A 17 Airbag Squib (Steering Wheel Pad)
- A 18 Ashtray Illumination
- A 20 Accelerator Pedal Position Sensor
- A 22 ACC Cut Relay
- A 36 Airbag Cut Off SW

- B 3 Back-Up Light Relay
- B 4 Blower Motor
- B 5 Blower Resistor
- B 6 Blower SW and Defroster Mode SW

- C 4 Center Airbag Sensor Assembly
- C 5 Center Airbag Sensor Assembly
- C 6 Center Airbag Sensor Assembly
- C 7 Cigarette Lighter
- C 8 Cigarette Lighter Illumination
- C 10 Clutch Start Cancel SW
- C 11 Combination Meter
- C 12 Combination Meter
- C 15 Combination SW
- C 16 Combination SW
- C 17 Combination SW

Position of Parts in Instrument Panel

[Access Cab, Standard Cab]



D 6 Data Link Connector 3
 D 8 Diode (A/T)
 D 9 Diode (Door Courtesy)
 D11 Diode (Power Window System)
 D27 Diode (Step Light)
 D28 Diode (Door Lock)
 D29 Diode (TVIP)
 D30 Diode (Unlock Warning)

E 3 Engine Control Module
 E 4 Engine Control Module
 E 5 Engine Control Module
 E 6 Engine Control Module
 E 7 Engine Control Module

F 20 4WD Control ECU
 F 21 4WD Control ECU

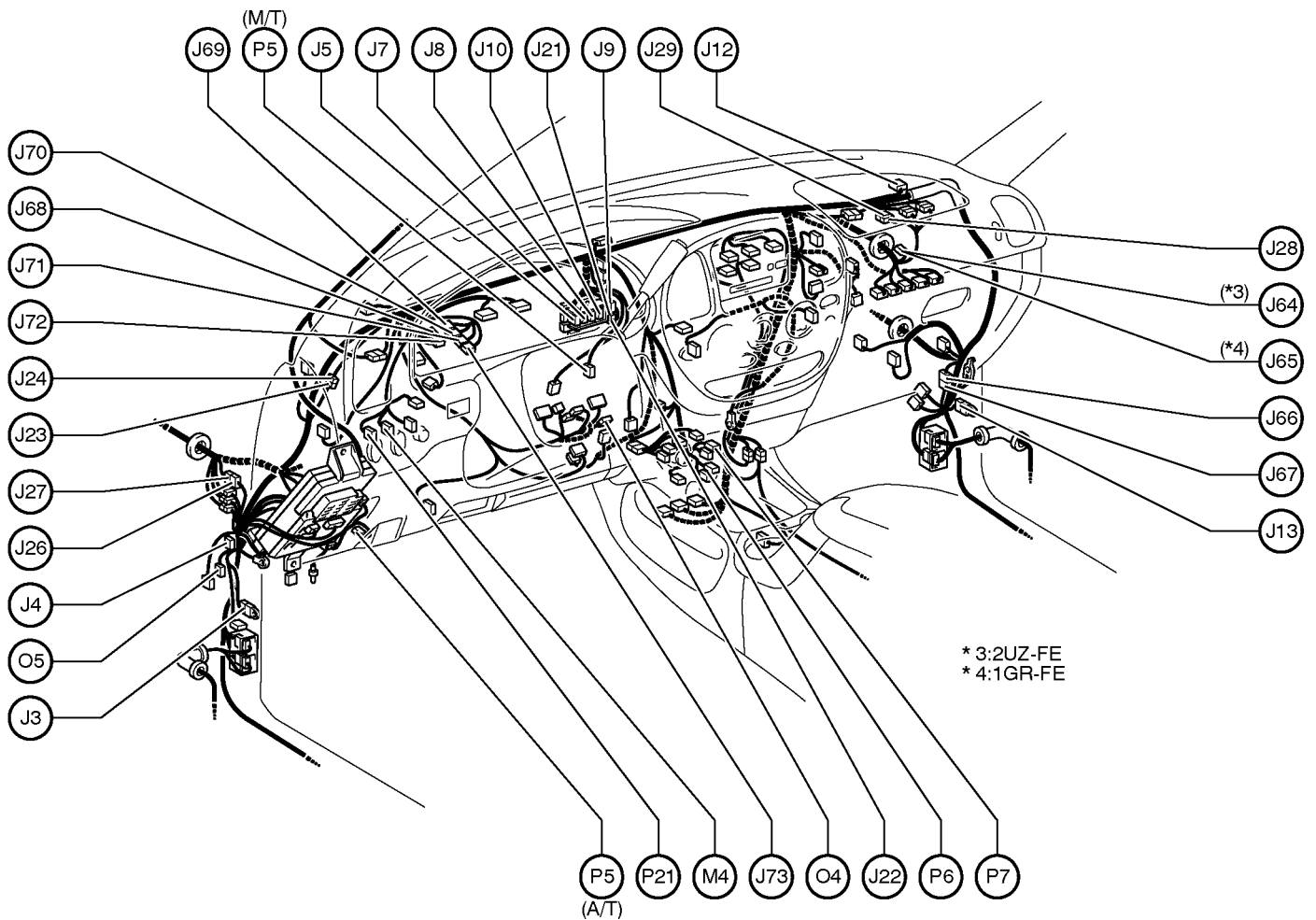
G 3 Glove Box Light

I 22 Ignition Key Cylinder Light
 I 23 Ignition SW
 I 24 Integration Control and Panel
 I 25 Integration Control and Panel

G ELECTRICAL WIRING ROUTING

Position of Parts in Instrument Panel

[Access Cab, Standard Cab]

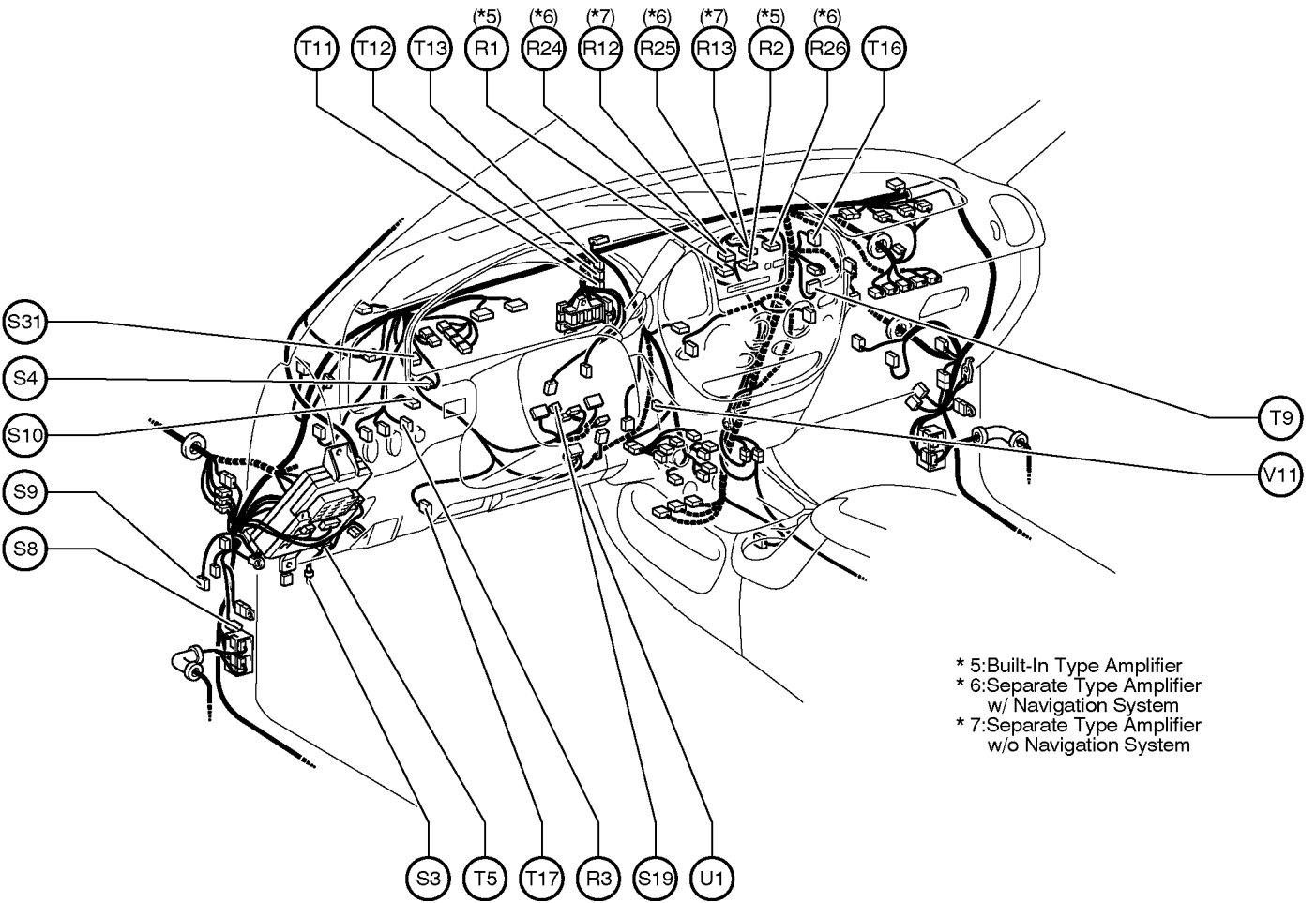


- J 3 Junction Connector
- J 4 Junction Connector
- J 5 Junction Connector
- J 7 Junction Connector
- J 8 Junction Connector
- J 9 Junction Connector
- J 10 Junction Connector
- J 12 Junction Connector
- J 13 Junction Connector
- J 21 Junction Connector
- J 22 Junction Connector
- J 23 Junction Connector
- J 24 Junction Connector
- J 26 Junction Connector
- J 27 Junction Connector
- J 28 Junction Connector
- J 29 Junction Connector
- J 64 Junction Connector
- J 65 Junction Connector
- J 66 Junction Connector
- J 67 Junction Connector
- J 68 Junction Connector
- J 69 Junction Connector
- J 70 Junction Connector
- J 71 Junction Connector
- J 72 Junction Connector
- J 73 Junction Connector

- M 4 Mirror Heater SW
- O 4 O/D Main SW
- O 5 Option Connector
- P 5 Parking Brake SW
- P 6 Power Outlet
- P 7 Power Outlet
- P21 Power Window Control SW (Back Window)

Position of Parts in Instrument Panel

[Access Cab, Standard Cab]



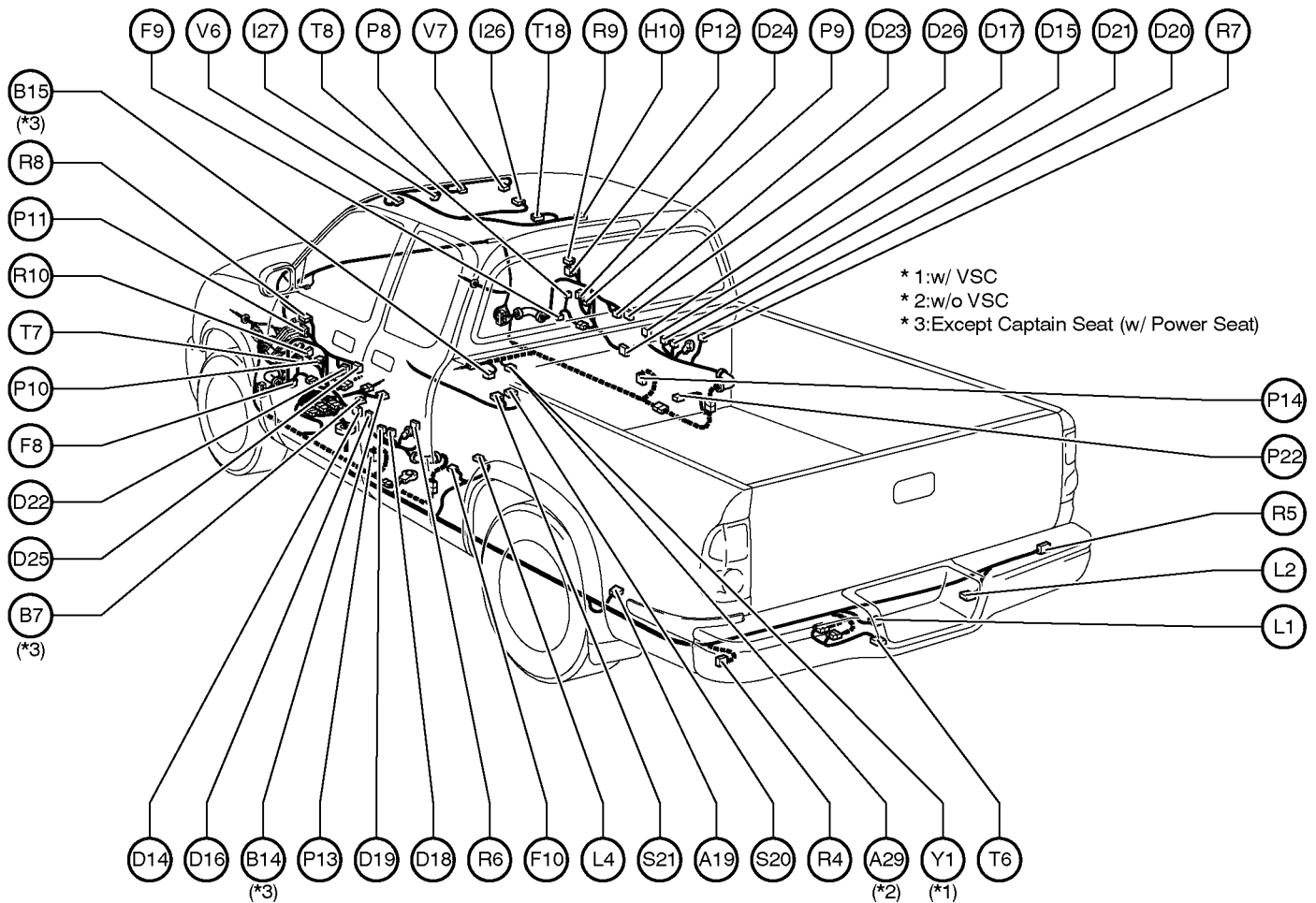
* 5: Built-In Type Amplifier
 * 6: Separate Type Amplifier w/ Navigation System
 * 7: Separate Type Amplifier w/o Navigation System

- | | |
|---|---|
| R 1 Radio and Player | T 5 Turn Signal Flasher |
| R 2 Radio and Player | T 9 Trailer Converter |
| R 3 Rheostat | T 11 TVIP ECU |
| R12 Radio and Player | T 12 TVIP ECU |
| R13 Radio and Player | T 13 TVIP ECU |
| R24 Radio and Player with Display | T 16 Tire Pressure Monitor ECU |
| R25 Radio and Player with Display | T 17 Tire Pressure Warning Standardization SW |
| R26 Radio and Player with Display | |
| S 3 Step Light | U 1 Unlock Warning SW |
| S 4 Stop Light SW | V 11 VSC Warning Buzzer |
| S 8 Short Pin | |
| S 9 Short Connector (TVIP) | |
| S10 Security Indicator and Glass Breakage Sensor Microphone | |
| S19 Steering Sensor | |
| S31 Stop Light Relay | |

G ELECTRICAL WIRING ROUTING

Position of Parts in Body

[Access Cab]



* 1:w/ VSC
 * 2:w/o VSC
 * 3:Except Captain Seat (w/ Power Seat)

A 19 ABS Speed Sensor Rear
 A 29 ABS Deceleration Sensor

B 7 Buckle SW LH
 B 14 Buckle SW LH
 Seat Position Airbag Sensor
 B 15 Buckle SW RH
 Occupant Detection SW

D 14 Door Courtesy Light Front LH
 D 15 Door Courtesy Light Front RH
 D 16 Door Courtesy SW Front LH
 D 17 Door Courtesy SW Front RH
 D 18 Door Courtesy SW Rear LH Lower
 D 19 Door Courtesy SW Rear LH Upper
 D 20 Door Courtesy SW Rear RH Lower
 D 21 Door Courtesy SW Rear RH Upper
 D 22 Door Key Lock and Unlock SW LH
 D 23 Door Key Lock and Unlock SW RH
 D 24 Door Lock Control SW RH
 D 25 Door Lock Motor and Door Unlock Detection SW LH
 D 26 Door Lock Motor and Door Unlock Detection SW RH

F 8 Front Door Speaker LH
 F 9 Front Door Speaker RH
 F 10 Fuel Pump and Sender

H 10 Cargo Light
 High Mounted Stop Light

I 26 Interior Light
 I 27 Inner Mirror

L 1 License Plate Light LH
 L 2 License Plate Light RH
 L 4 Leak Detection Pump Assembly

P 8 Personal Light
 P 9 Power Window Control SW Front RH
 P 10 Power Window Master SW
 P 11 Power Window Motor Front LH
 P 12 Power Window Motor Front RH
 P 13 Pretensioner LH
 P 14 Pretensioner RH
 P 22 Power Window Motor (Back Window)

R 4 Rear Combination Light LH
 R 5 Rear Combination Light RH
 R 6 Rear Door Speaker LH
 R 7 Rear Door Speaker RH
 R 8 Remote Control Mirror LH
 R 9 Remote Control Mirror RH
 R 10 Remote Control Mirror SW

S 20 Stereo Component Amplifier
 S 21 Stereo Component Amplifier

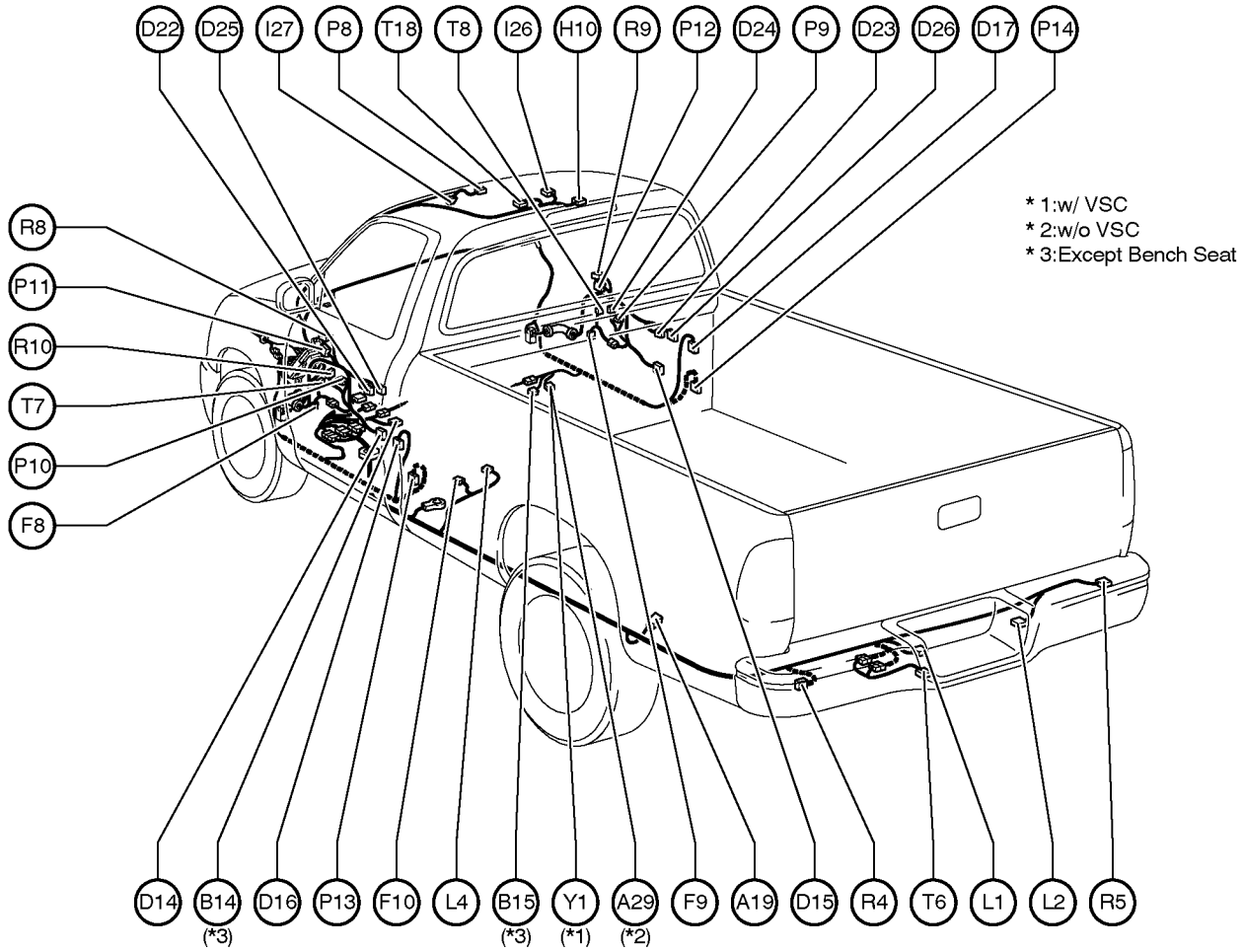
T 6 Trailer Socket
 T 7 Tweeter LH
 T 8 Tweeter RH
 T 18 Tire Pressure Monitor Receiver

V 6 Vanity Light LH
 V 7 Vanity Light RH

Y 1 Yaw Rate Sensor

Position of Parts in Body

[Standard Cab]



A 19 ABS Speed Sensor Rear
 A 29 ABS Deceleration Sensor

B 14 Buckle SW LH
 Seat Position Airbag Sensor
 B 15 Buckle SW RH
 Occupant Detection SW

D 14 Door Courtesy Light Front LH
 D 15 Door Courtesy Light Front RH
 D 16 Door Courtesy SW Front LH
 D 17 Door Courtesy SW Front RH
 D 22 Door Key Lock and Unlock SW LH
 D 23 Door Key Lock and Unlock SW RH
 D 24 Door Lock Control SW RH
 D 25 Door Lock Motor
 Door Unlock Detection SW LH
 D 26 Door Lock Motor
 Door Unlock Detection SW RH

F 8 Front Door Speaker LH
 F 9 Front Door Speaker RH
 F 10 Fuel Pump
 Sender

H 10 Cargo Light
 High Mounted Stop Light

I 26 Interior Light
 I 27 Inner Mirror

L 1 License Plate Light LH
 L 2 License Plate Light RH
 L 4 Leak Detection Pump Assembly

P 8 Personal Light
 P 9 Power Window Control SW Front RH
 P 10 Power Window Master SW
 P 11 Power Window Motor Front LH
 P 12 Power Window Motor Front RH
 P 13 Pretensioner LH
 P 14 Pretensioner RH

R 4 Rear Combination Light LH
 R 5 Rear Combination Light RH
 R 8 Remote Control Mirror LH
 R 9 Remote Control Mirror RH
 R 10 Remote Control Mirror SW

T 6 Trailer Socket
 T 7 Tweeter LH
 T 8 Tweeter RH
 T 18 Tire Pressure Monitor Receiver

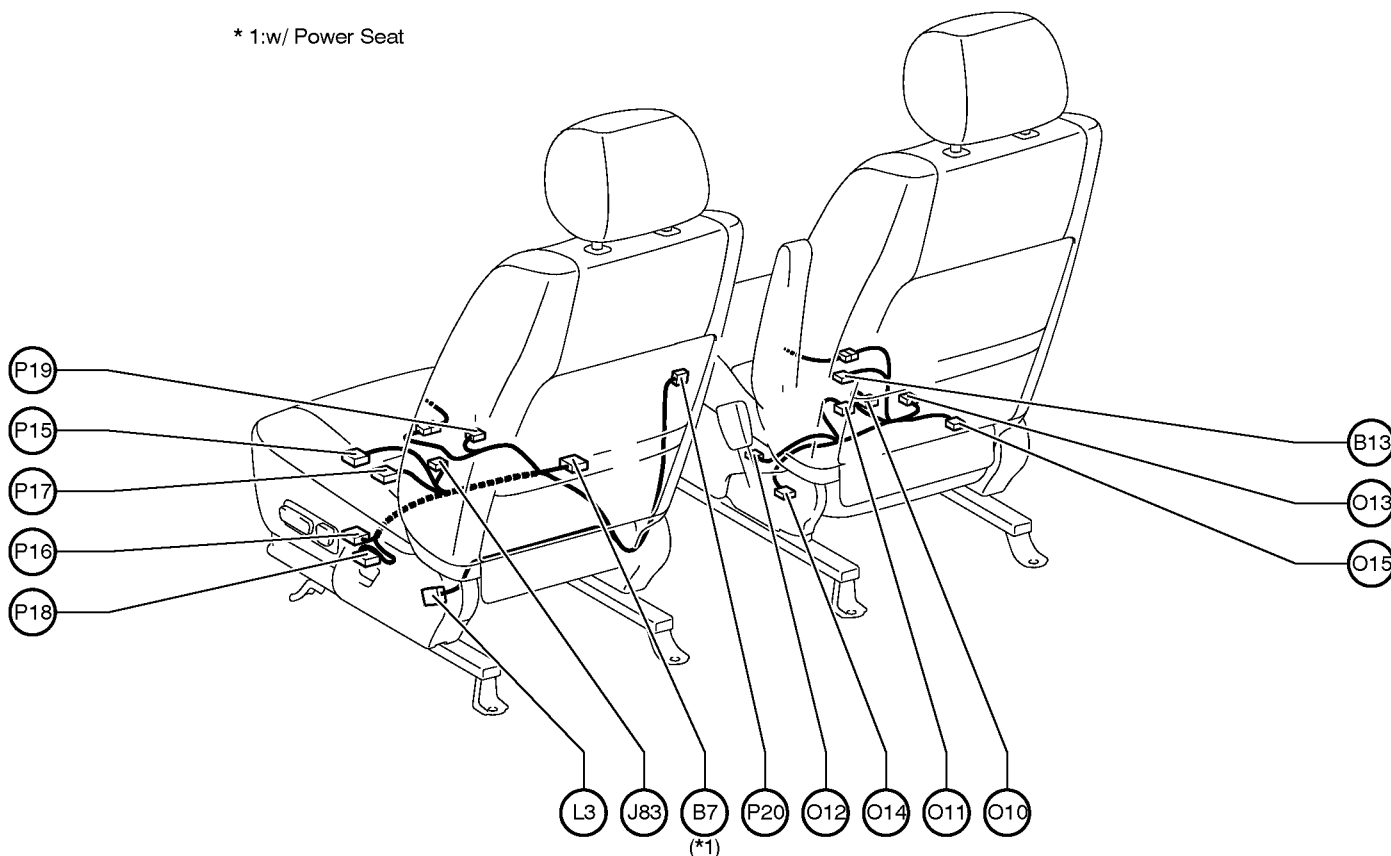
Y 1 Yaw Rate Sensor

G ELECTRICAL WIRING ROUTING

Position of Parts in Seat

[Access Cab : Captain Seat]

* 1:w/ Power Seat



B 7 Buckle SW LH
B 13 Buckle SW RH

J 83 Junction Connector

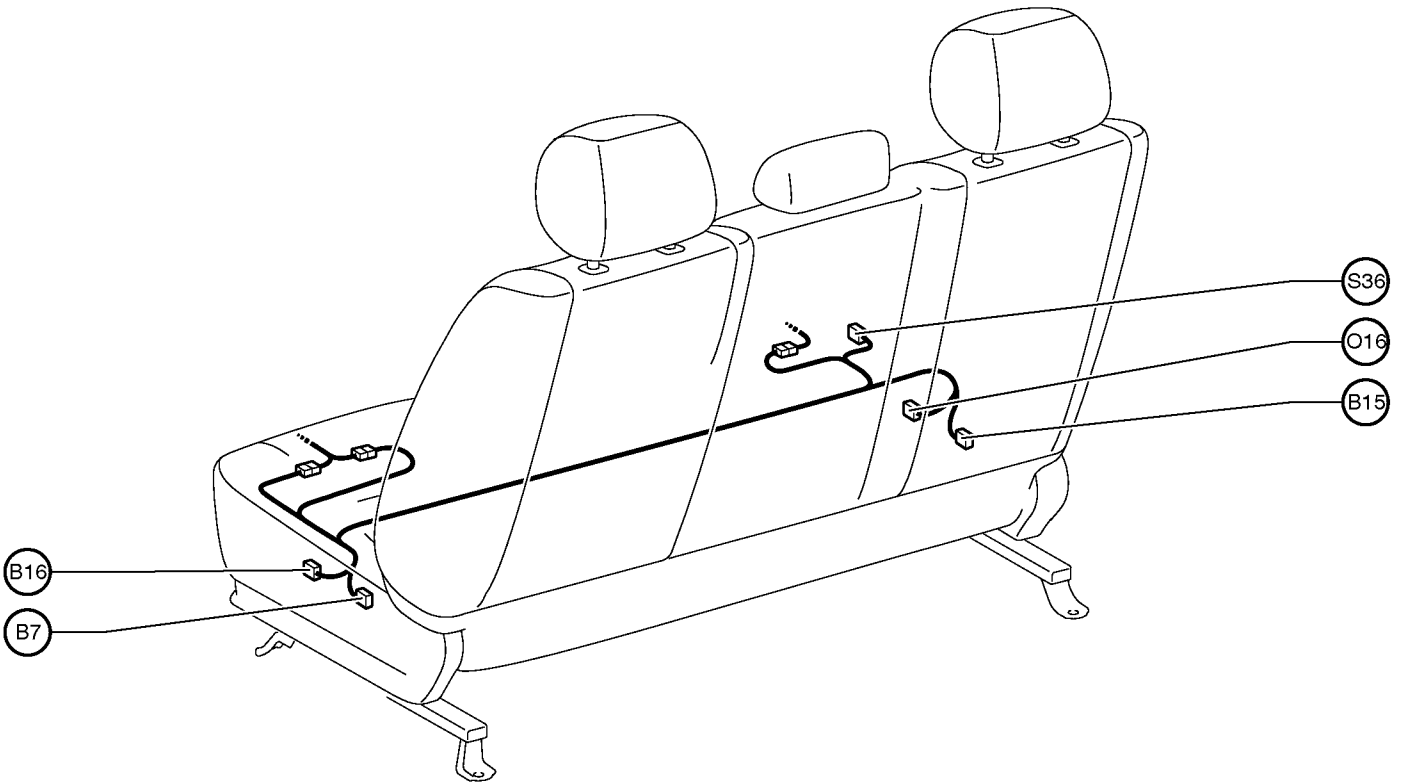
L 3 Lumbar Support Control SW (Driver's Seat)

O10 Occupant Classification ECU
O11 Occupant Classification ECU
O12 Occupant Classification Sensor Front LH
O13 Occupant Classification Sensor Front RH
O14 Occupant Classification Sensor RearLH
O15 Occupant Classification Sensor RearRH

P15 Power Seat Motor (Driver's Seat Front Vertical Control)
P16 Power Seat Control SW (Driver's Seat)
P17 Power Seat Motor (Driver's Seat Rear Vertical Control)
P18 Power Seat Motor (Driver's Seat Reclining Control)
P19 Power Seat Motor (Driver's Seat Slide Control)
P20 Power Seat Motor
(Driver's Seat Lumbar Support Control)

Position of Parts in Seat

[Standard Cab : Bench Seat]



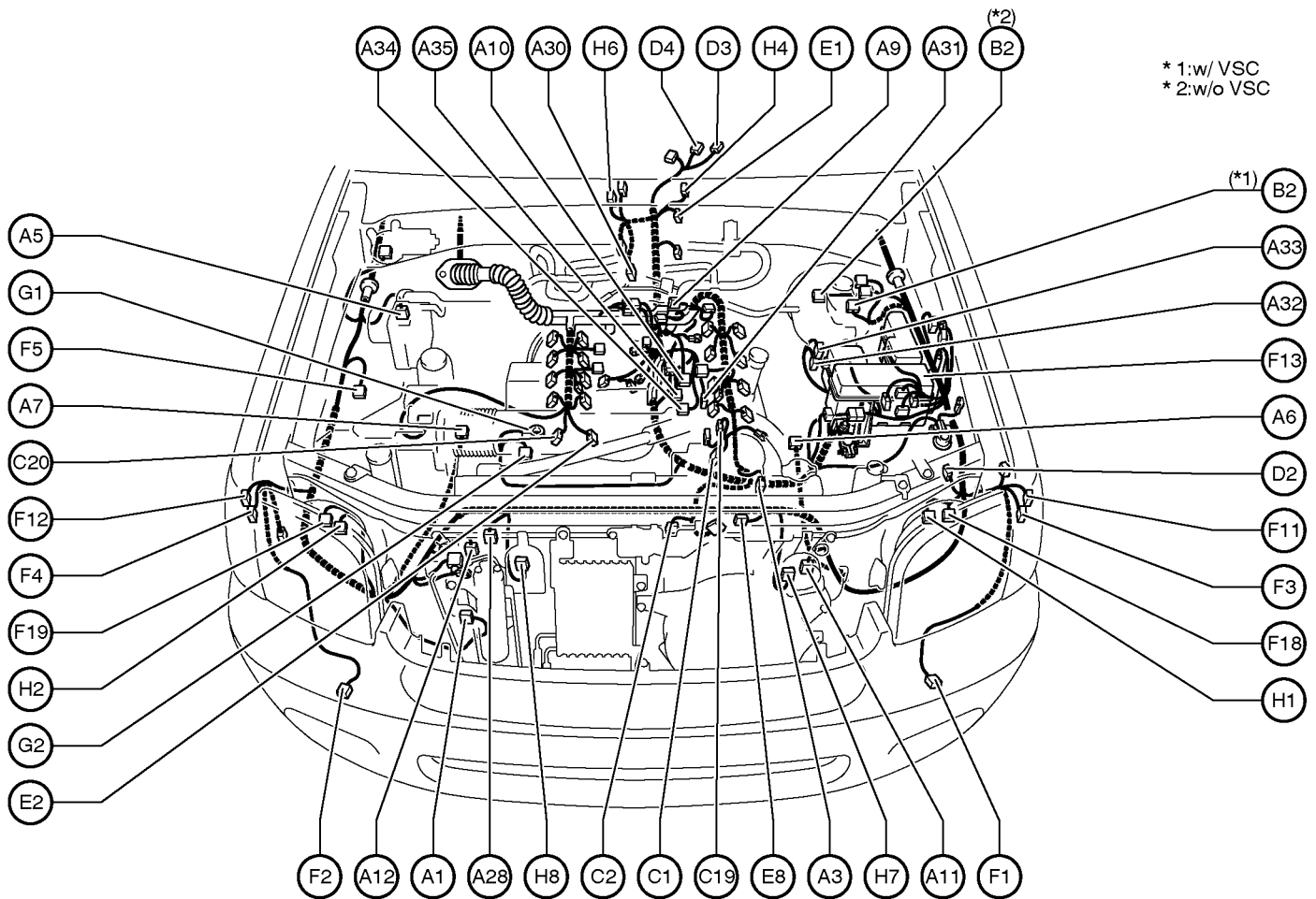
B 7 Buckle SW LH
 B15 Buckle SW RH
 Occupant Detection SW
 B16 Buckle SW LH

O16 Occupant Detection Sensor
 S36 Seat Position Airbag Sensor

G ELECTRICAL WIRING ROUTING

Position of Parts in Engine Compartment

[Double Cab]

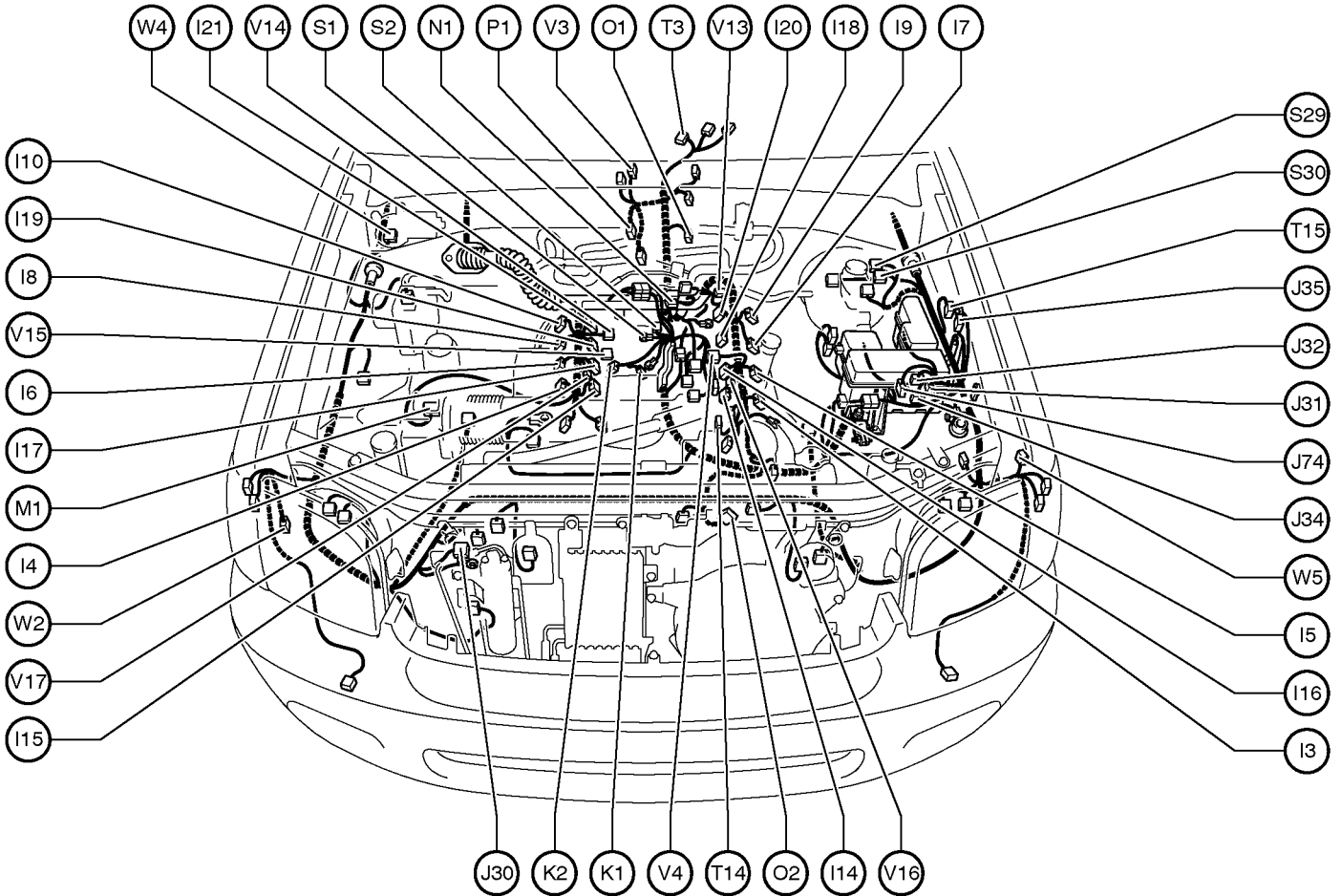


* 1:w/ VSC
* 2:w/o VSC

- | | |
|--|--|
| A 1 Pressure SW | E 1 Electronically Controlled Transmission Solenoid |
| A 3 A/C Magnetic Clutch and Lock Sensor | E 2 Engine Coolant Temp. Sensor |
| A 5 ABS Actuator with ECU | E 8 Engine Hood Courtesy SW |
| A 6 ABS Speed Sensor Front LH | F 1 Front Fog Light LH |
| A 7 ABS Speed Sensor Front RH | F 2 Front Fog Light RH |
| A 9 ADD Actuator | F 3 Front Turn Signal Light and Parking Light LH |
| A 10 Air Fuel Ratio Sensor (Bank 1 Sensor 1) | F 4 Front Turn Signal Light and Parking Light RH |
| A 11 Airbag Sensor Front LH | F 5 Fuel Pump Resistor |
| A 12 Airbag Sensor Front RH | F 11 Front Turn Signal Light and Parking Light LH No.2 |
| A 28 Ambient Temp. Sensor | F 12 Front Turn Signal Light and Parking Light RH No.2 |
| A 30 Air Fuel Ratio Sensor (Bank 2 Sensor 1) | F 13 Fusible Link Block |
| A 31 Air Switching Valve | F 18 Front Parking Light LH No.3 |
| A 32 Air Injection Control Driver | F 19 Front Parking Light RH No.3 |
| A 33 Air Injection Control Driver | G 1 Generator |
| A 34 Air Pressure Sensor | G 2 Generator |
| A 35 Air Pump | |
| B 2 Brake Fluid Level Warning SW | |
| C 1 Camshaft Position Sensor | H 1 Headlight LH |
| C 2 Crankshaft Position Sensor | H 2 Headlight RH |
| C 19 Camshaft Timing Oil Control Valve LH | H 4 Heated Oxygen Sensor (Bank 1 Sensor 2) |
| C 20 Camshaft Timing Oil Control Valve RH | H 6 Heated Oxygen Sensor (Bank 2 Sensor 2) |
| D 2 Daytime Running Light Resistor | H 7 Horn LH |
| D 3 Detection SW (Transfer 4WD Position) | H 8 Horn RH |
| D 4 Detection SW (Transfer L4 Position) | |

Position of Parts in Engine Compartment

[Double Cab]



I 3 Igniter and Ignition Coil No.1
 I 4 Igniter and Ignition Coil No.2
 I 5 Igniter and Ignition Coil No.3
 I 6 Igniter and Ignition Coil No.4
 I 7 Igniter and Ignition Coil No.5
 I 8 Igniter and Ignition Coil No.6
 I 9 Igniter and Ignition Coil No.7
 I 10 Igniter and Ignition Coil No.8
 I 14 Injector No.1
 I 15 Injector No.2
 I 16 Injector No.3
 I 17 Injector No.4
 I 18 Injector No.5
 I 19 Injector No.6
 I 20 Injector No.7
 I 21 Injector No.8

J 30 Junction Connector
 J 31 Junction Connector
 J 32 Junction Connector
 J 34 Junction Connector
 J 35 Junction Connector
 J 74 Junction Connector

K 1 Knock Sensor (Bank 1)
 K 2 Knock Sensor (Bank 2)

M 1 Mass Air Flow Meter

N 1 Noise Filter

O 1 O/D Direct Clutch Speed Sensor
 O 2 Oil Pressure SW

P 1 Park/Neutral Position SW

S 1 Starter
 S 2 Starter
 S29 Skid Control ECU with Actuator
 S30 Skid Control ECU with Actuator

T 3 Transfer Shift Actuator
 T 14 Throttle Control Motor and Throttle Position Sensor
 T 15 Theft Deterrent Horn

V 3 Vehicle Speed Sensor
(Electronically Controlled Transmission)

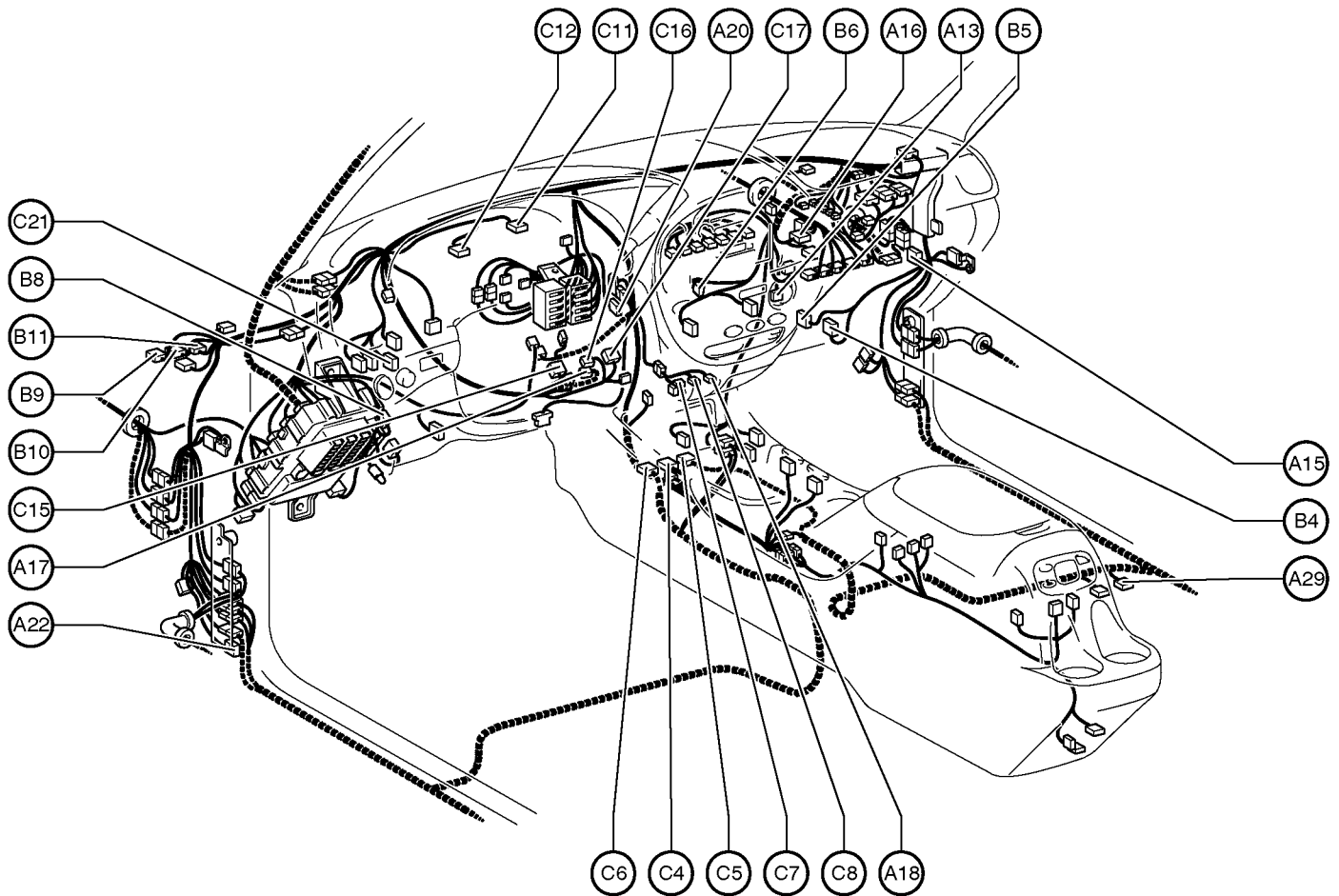
V 4 VSV (EVAP)
 V 13 VSV (ACIS)
 V 14 VSV (Air Switching Valve Bank 1)
 V 15 VSV (Air Switching Valve Bank 2)
 V 16 VVT Sensor LH
 V 17 VVT Sensor RH

W 2 Washer Motor and Washer Level Sensor
 W 4 Wiper Motor
 W 5 Wireless Door Lock Buzzer

G ELECTRICAL WIRING ROUTING

Position of Parts in Instrument Panel

[Double Cab]



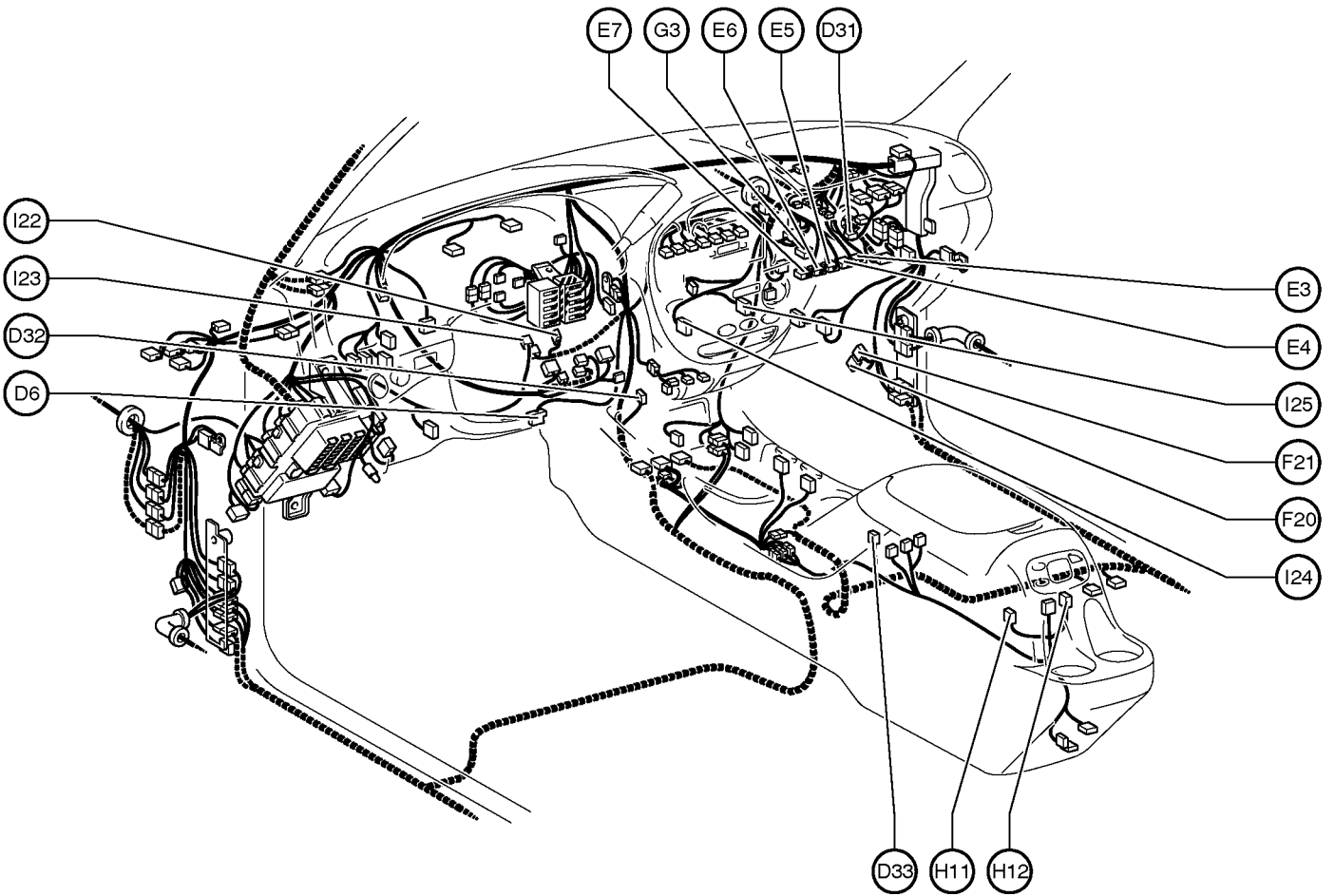
- A 13 A/C Thermistor
- A 15 Air Inlet Control Servo Motor
- A 16 Airbag Squib (Front Passenger Airbag Assembly)
- A 17 Airbag Squib (Steering Wheel Pad)
- A 18 Ashtray Illumination
- A 20 Accelerator Pedal Position Sensor
- A 22 ACC Cut Relay
- A 29 ABS Deceleration Sensor

- B 4 Blower Motor
- B 5 Blower Resistor
- B 6 Blower SW and Defroster Mode SW
- B 8 Back Window Relay
- B 9 Body ECU
- B 10 Body ECU
- B 11 Body ECU

- C 4 Center Airbag Sensor Assembly
- C 5 Center Airbag Sensor Assembly
- C 6 Center Airbag Sensor Assembly
- C 7 Cigarette Lighter
- C 8 Cigarette Lighter Illumination
- C 11 Combination Meter
- C 12 Combination Meter
- C 15 Combination SW
- C 16 Combination SW
- C 17 Combination SW
- C 21 Curtain Airbag Cut Off SW

Position of Parts in Instrument Panel

[Double Cab]



D 6 Data Link Connector 3
 D31 Diode (Parking Brake SW)
 D32 Door Lock Control Receiver
 D33 DVD Player

E 3 Engine Control Module
 E 4 Engine Control Module
 E 5 Engine Control Module
 E 6 Engine Control Module
 E 7 Engine Control Module

F20 4WD Control ECU
 F21 4WD Control ECU

G 3 Glove Box Light

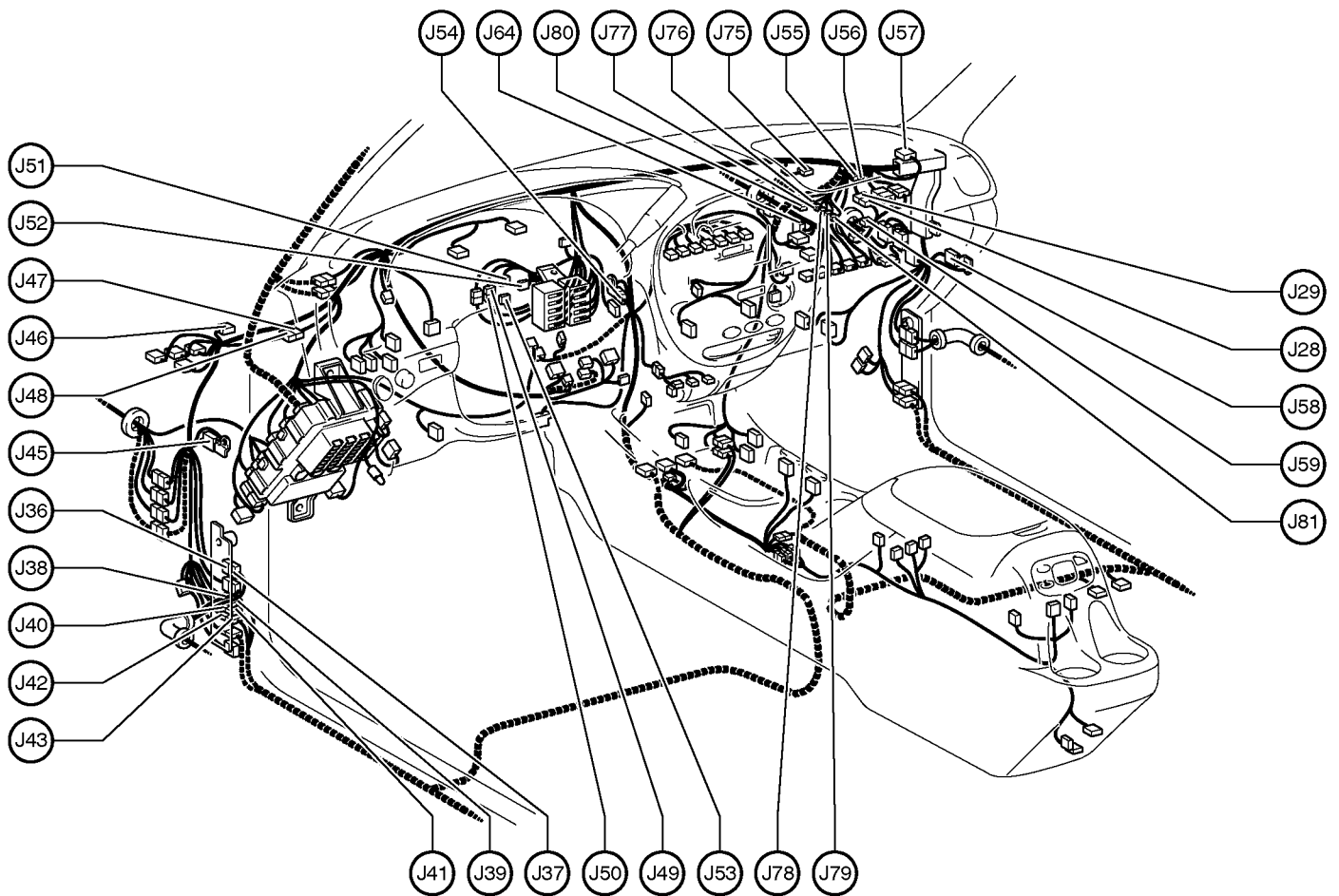
H11 Headphone Terminal LH
 H12 Headphone Terminal RH

I 22 Ignition Key Cylinder Light
 I 23 Ignition SW
 I 24 Integration Control and Panel
 I 25 Integration Control and Panel

G ELECTRICAL WIRING ROUTING

Position of Parts in Instrument Panel

[Double Cab]

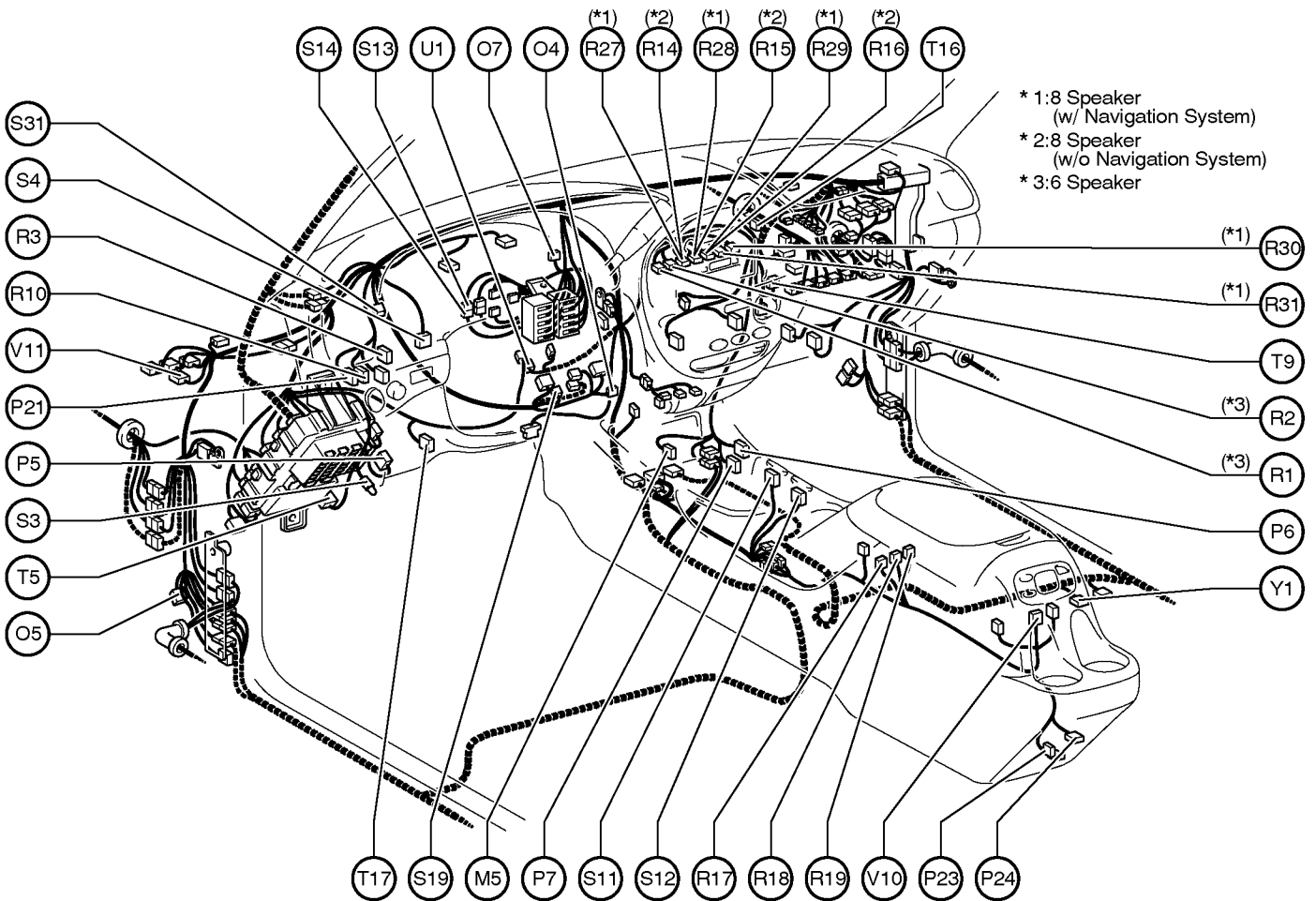


J 28 Junction Connector
 J 29 Junction Connector
 J 36 Junction Connector
 J 37 Junction Connector
 J 38 Junction Connector
 J 39 Junction Connector
 J 40 Junction Connector
 J 41 Junction Connector
 J 42 Junction Connector
 J 43 Junction Connector
 J 45 Junction Connector
 J 46 Junction Connector
 J 47 Junction Connector
 J 48 Junction Connector
 J 49 Junction Connector
 J 50 Junction Connector
 J 51 Junction Connector

J 52 Junction Connector
 J 53 Junction Connector
 J 54 Junction Connector
 J 55 Junction Connector
 J 56 Junction Connector
 J 57 Junction Connector
 J 58 Junction Connector
 J 59 Junction Connector
 J 64 Junction Connector
 J 75 Junction Connector
 J 76 Junction Connector
 J 77 Junction Connector
 J 78 Junction Connector
 J 79 Junction Connector
 J 80 Junction Connector
 J 81 Junction Connector

Position of Parts in Instrument Panel

[Double Cab]



M 5 Main SW

O 4 O/D Main SW
O 5 Option Connector
O 7 Option Connector (Grass Breakage Sensor)

P 5 Parking Brake SW
P 6 Power Outlet
P 7 Power Outlet
P21 Power Window Control SW (Back Window)
P23 Power Outlet (115V)
P24 Power Outlet (Rear)

R 1 Radio and Player
R 2 Radio and Player
R 3 Rheostat
R10 Remote Control Mirror SW
R14 Radio and Player
R15 Radio and Player
R16 Radio and Player
R17 Rear Seat Entertainment ECU
R18 Rear Seat Entertainment ECU
R19 Rear Seat Entertainment ECU
R27 Radio and Player with Display
R28 Radio and Player with Display
R29 Radio and Player with Display
R30 Radio and Player with Display
R31 Radio and Player with Display

S 3 Step Light
S 4 Stop Light SW
S 11 Seat Heater SW (Driver's Seat)
S 12 Seat Heater SW (Front Passenger's Seat)
S 13 Short Connector
S 14 Short Connector
S 19 Steering Sensor
S 31 Stop Light Relay

T 5 Turn Signal Flasher
T 9 Trailer Converter
T 16 Tire Pressure Monitor ECU
T 17 Tire Pressure Warning Standardization SW

U 1 Unlock Warning SW

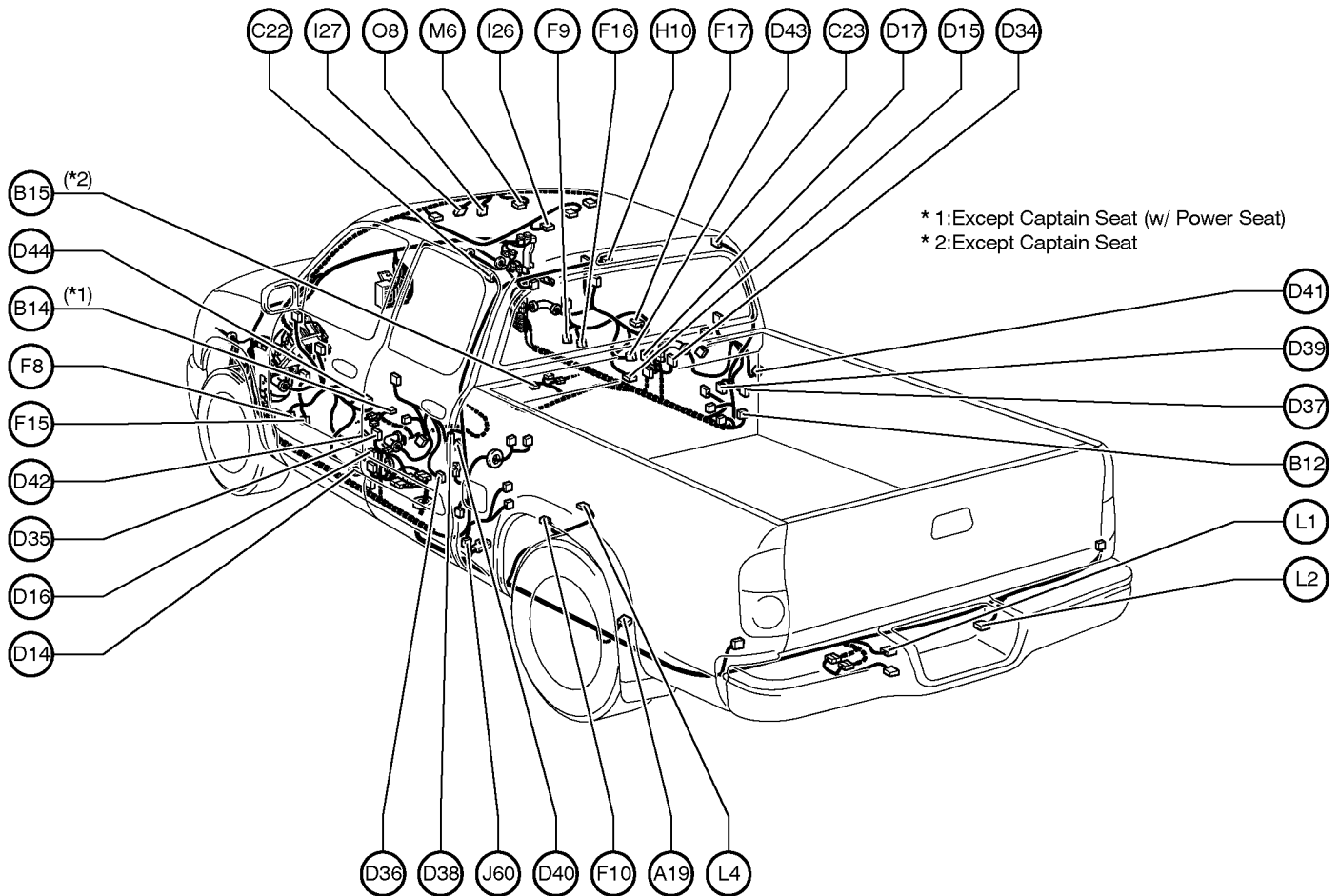
V 10 Video Terminal
V 11 VSC Warning Buzzer

Y 1 Yaw Rate Sensor

G ELECTRICAL WIRING ROUTING

Position of Parts in Body

[Double Cab]

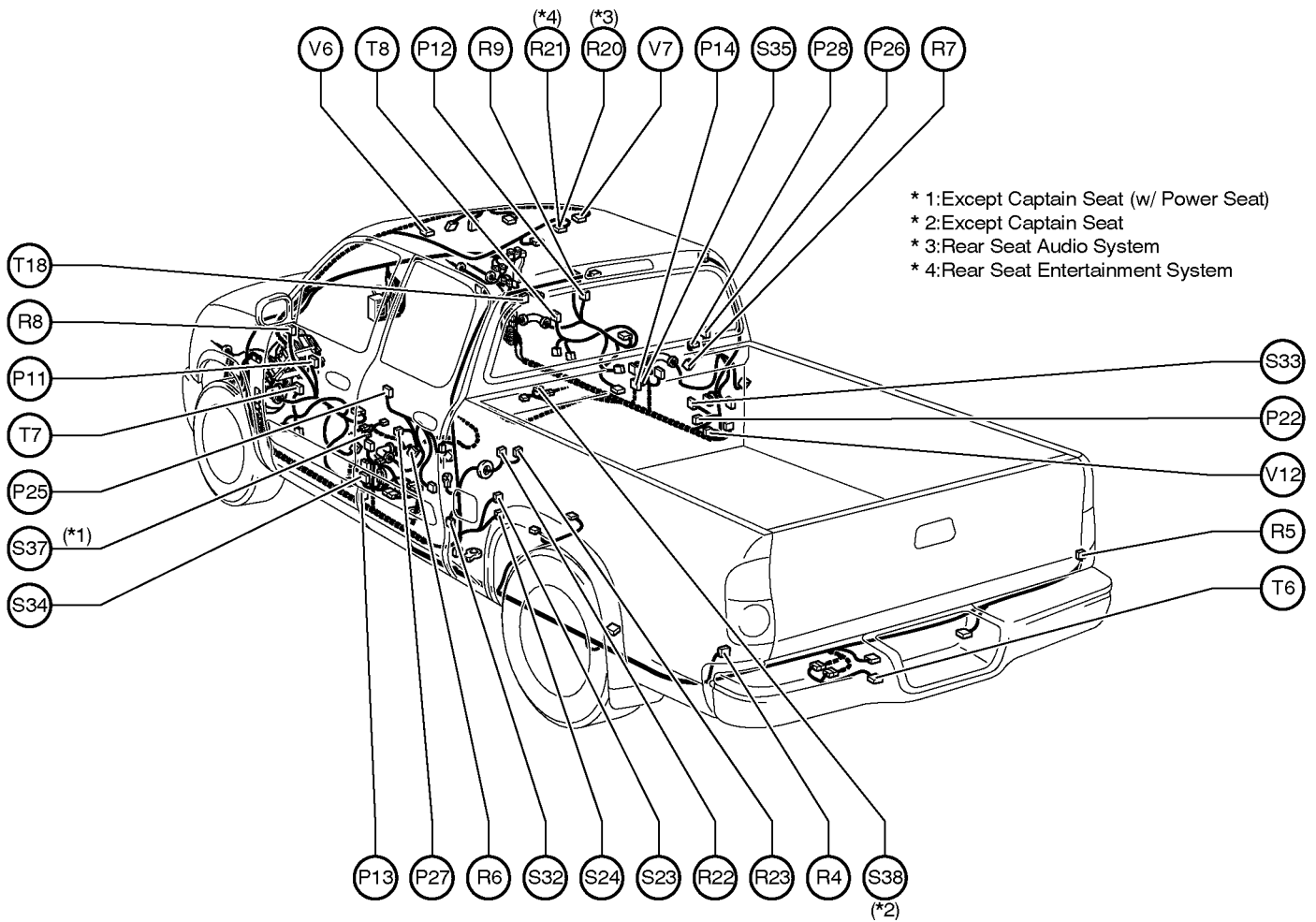


* 1:Except Captain Seat (w/ Power Seat)
* 2:Except Captain Seat

- | | |
|--|--|
| A 19 ABS Speed Sensor Rear | F 8 Front Door Speaker LH |
| B 12 Back Window Control Relay | F 9 Front Door Speaker RH |
| B 14 Buckle SW LH
Seat Position Airbag Sensor | F 10 Fuel Pump and Sender |
| B 15 Buckle SW RH
Occupant Detection SW | F 15 Front Door Speaker LH (Woofer) |
| C 22 Curtain Shield Airbag Squib LH | F 16 Front Door Speaker RH (Woofer) |
| C 23 Curtain Shield Airbag Squib RH | F 17 Front Passenger Door ECU |
| D 14 Door Courtesy Light Front LH | H 10 High Mounted Stop Light and Cargo Light |
| D 15 Door Courtesy Light Front RH | I 26 Interior Light |
| D 16 Door Courtesy SW Front LH | I 27 Inner Mirror |
| D 17 Door Courtesy SW Front RH | J 60 Junction Connector |
| D 34 Diode (Door Courtesy No.1) | L 1 License Plate Light LH |
| D 35 Diode (Door Courtesy No.2) | L 2 License Plate Light RH |
| D 36 Door Courtesy Light Rear LH | L 4 Leak Detection Pump Assembly |
| D 37 Door Courtesy Light Rear RH | M 6 Moon Roof Control ECU and Motor |
| D 38 Door Courtesy SW Rear LH | O 8 Overhead Module |
| D 39 Door Courtesy SW Rear RH | |
| D 40 Door Lock Motor
Door Unlock Detection SW Rear LH | |
| D 41 Door Lock Motor
Door Unlock Detection SW Rear RH | |
| D 42 Door Lock Motor, Door Key Lock and Unlock SW
Door Unlock Detection SW Front LH | |
| D 43 Door Lock Motor, Door Key Lock and Unlock SW
Door Unlock Detection SW Front RH | |
| D 44 Driver Door ECU | |

Position of Parts in Body

[Double Cab]



- P 11 Power Window Motor Front LH
- P 12 Power Window Motor Front RH
- P 13 Pretensioner LH
- P 14 Pretensioner RH
- P 22 Power Window Motor (Back Window)
- P 25 Power Window Control SW Rear LH
- P 26 Power Window Control SW Rear RH
- P 27 Power Window Motor Rear LH
- P 28 Power Window Motor Rear RH

- R 4 Rear Combination Light LH
- R 5 Rear Combination Light RH
- R 6 Rear Door Speaker LH
- R 7 Rear Door Speaker RH
- R 8 Remote Control Mirror LH
- R 9 Remote Control Mirror RH
- R 20 Rear Seat Audio Controller
- R 21 Rear Seat Entertainment Display
- R 22 Rear Window Defogger
- R 23 Rear Window Defogger

- S 23 Stereo Component Amplifier
- S 24 Stereo Component Amplifier
- S 32 Side Airbag Sensor Rear LH
- S 33 Side Airbag Sensor Rear RH
- S 34 Side Airbag Sensor LH
- S 35 Side Airbag Sensor RH
- S 37 Side Airbag Squib LH
- S 38 Side Airbag Squib RH

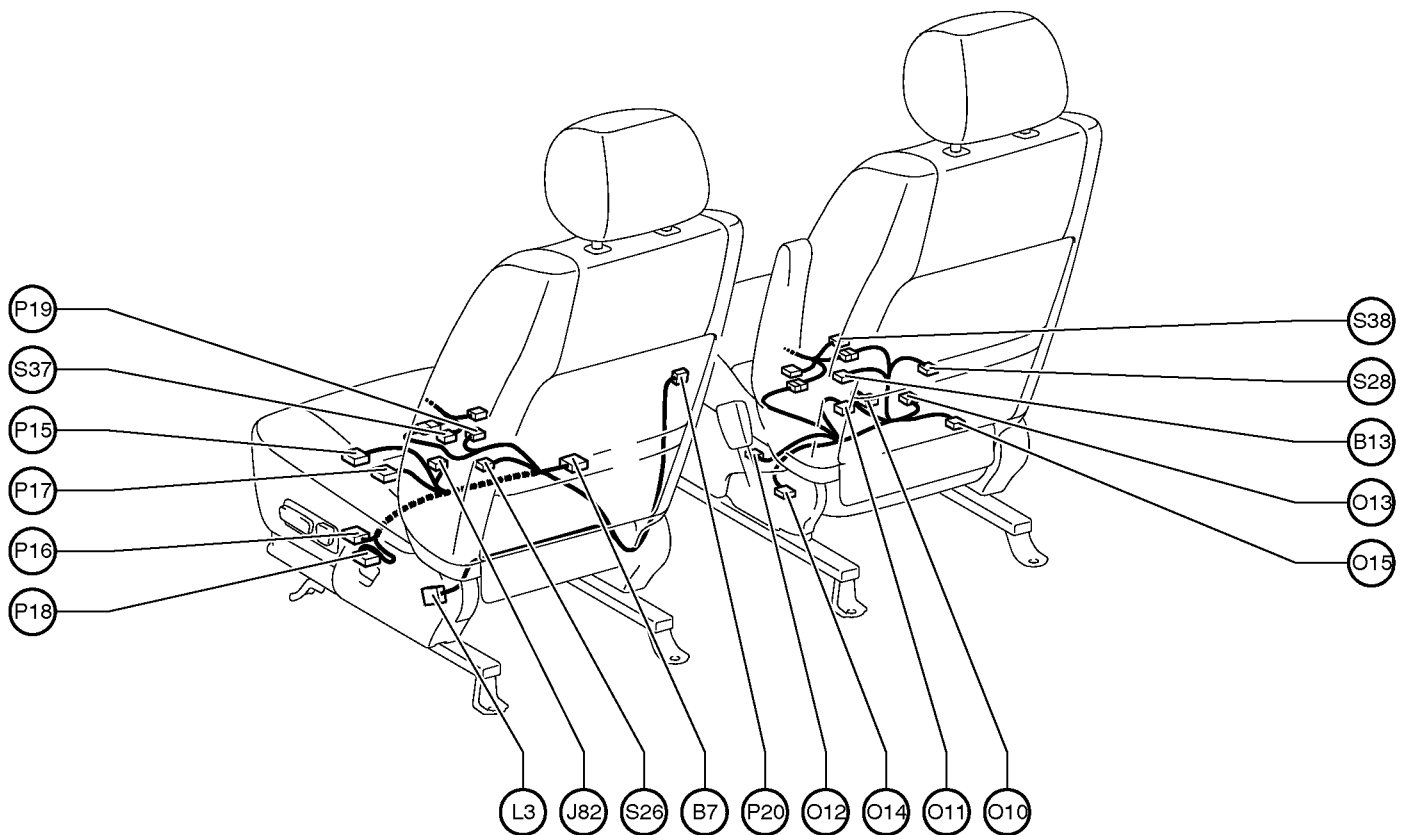
- T 6 Trailer Socket
- T 7 Tweeter LH
- T 8 Tweeter RH
- T 18 Tire Pressure Monitor Receiver

- V 6 Vanity Light LH
- V 7 Vanity Light RH
- V 12 Voltage Inverter

G ELECTRICAL WIRING ROUTING

Position of Parts in Seat

[Double Cab]



B 7 Buckle SW LH
B 13 Buckle SW RH

J 82 Junction Connector

L 3 Lumbar Support Control SW (Driver's Seat)

O10 Occupant Classification ECU
O11 Occupant Classification ECU
O12 Occupant Classification Sensor Front LH
O13 Occupant Classification Sensor Front RH
O14 Occupant Classification Sensor RearLH
O15 Occupant Classification Sensor RearRH

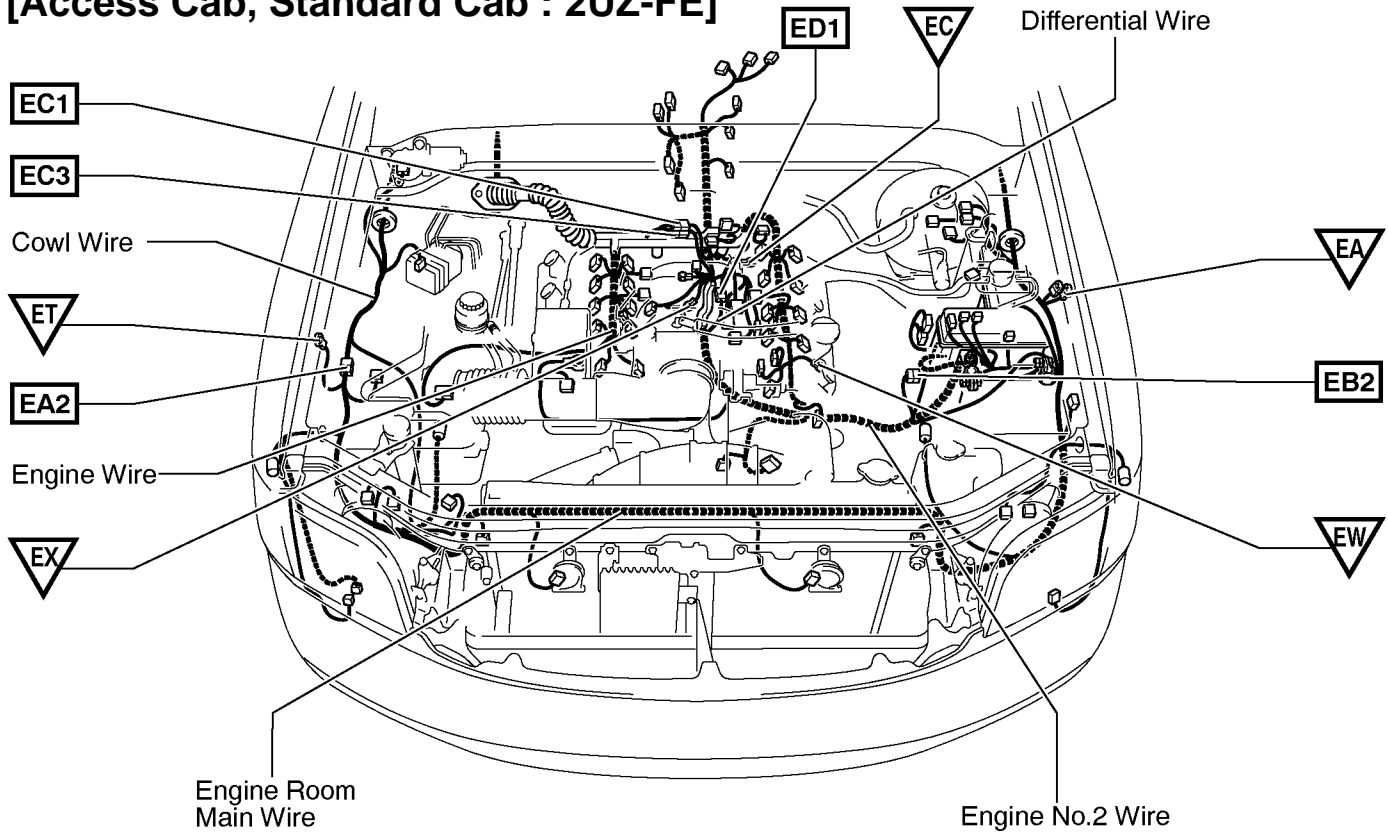
P15 Power Seat Motor (Driver's Seat Front Vertical Control)
P16 Power Seat Control SW (Driver's Seat)
P17 Power Seat Motor (Driver's Seat Rear Vertical Control)
P18 Power Seat Motor (Driver's Seat Reclining Control)
P19 Power Seat Motor (Driver's Seat Slide Control)
P20 Power Seat Motor
(Driver's Seat Lumbar Support Control)

S26 Seat Heater (Driver's Seat)
S28 Seat Heater (Front Passenger's Seat)
S37 Side Airbag Squib LH
S38 Side Airbag Squib RH

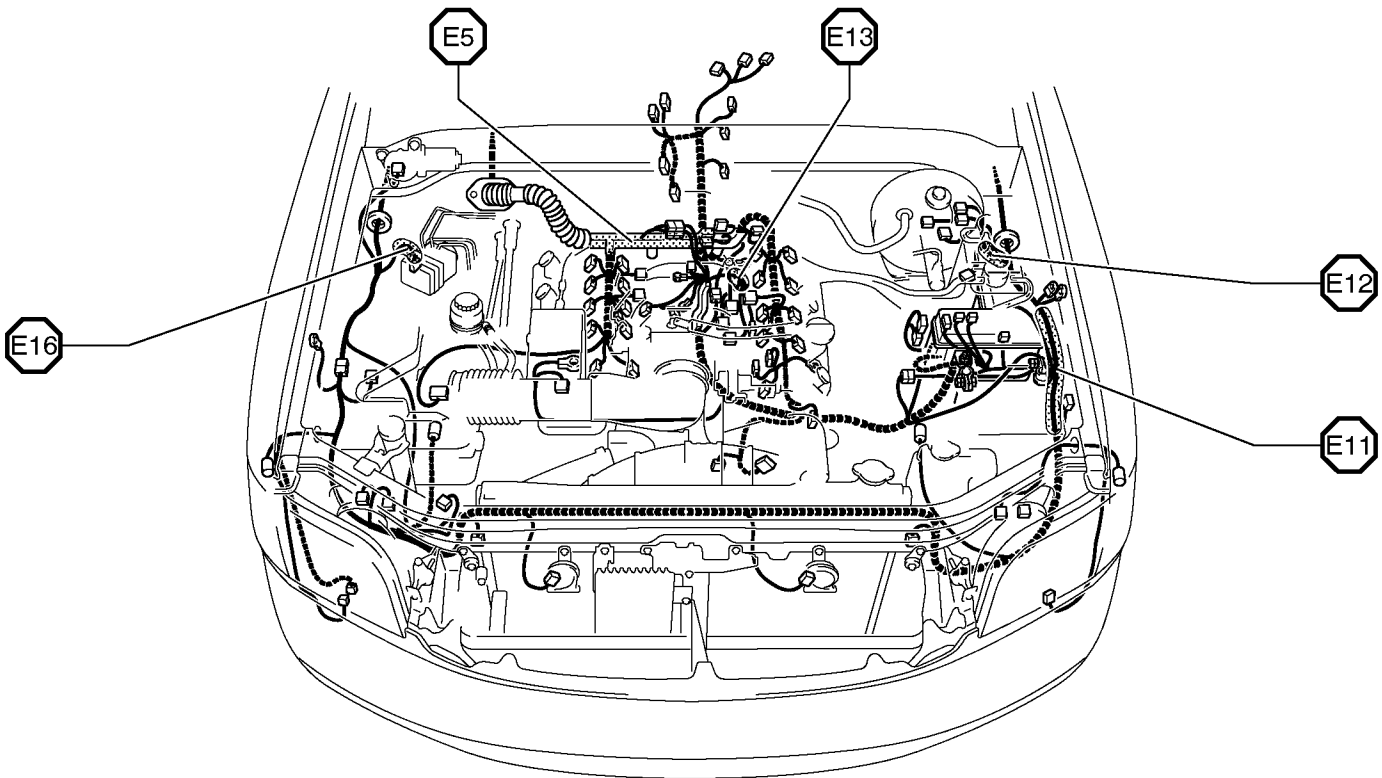
G ELECTRICAL WIRING ROUTING

- : Location of Connector Joining Wire Harness and Wire Harness
- ▽ : Location of Ground Points

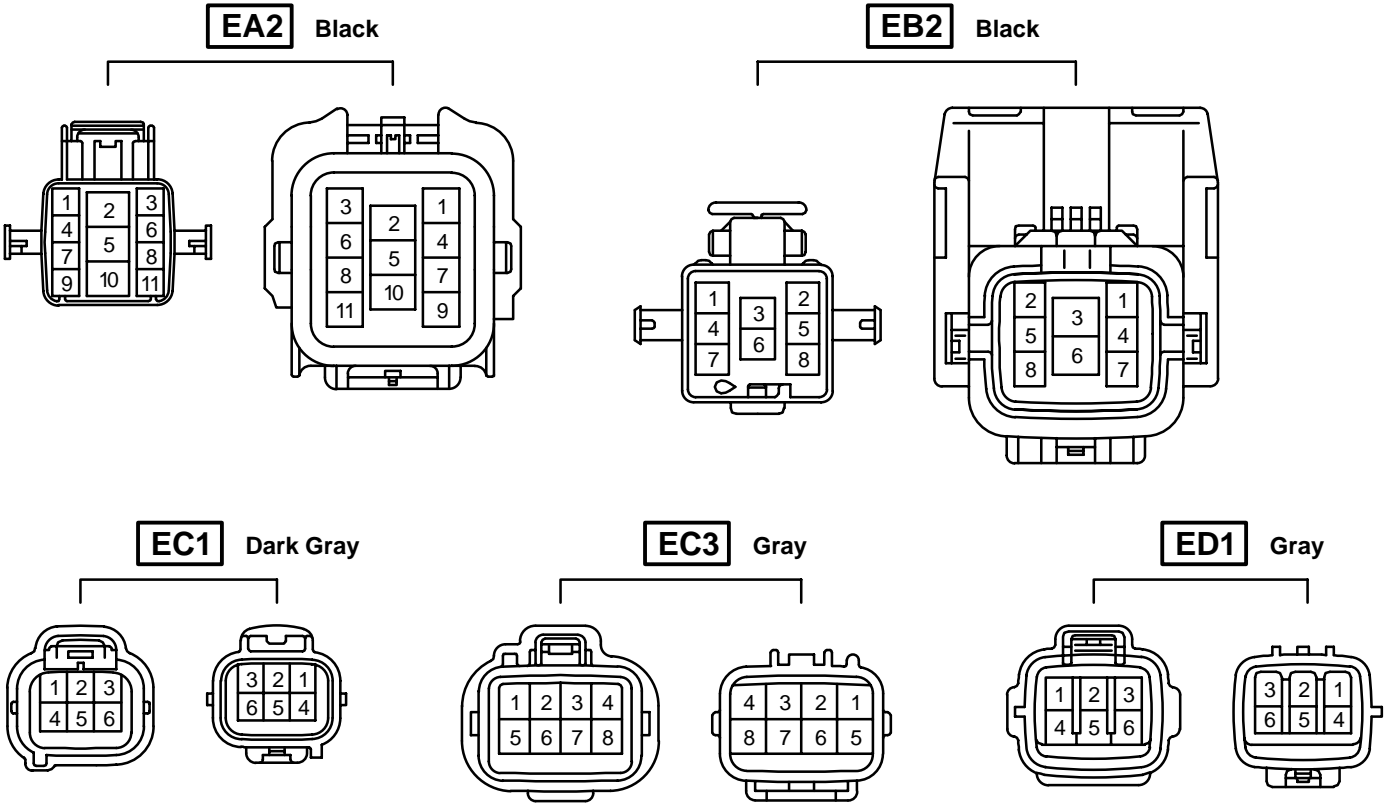
[Access Cab, Standard Cab : 2UZ-FE]



- : Location of Splice Points



Connector Joining Wire Harness and Wire Harness

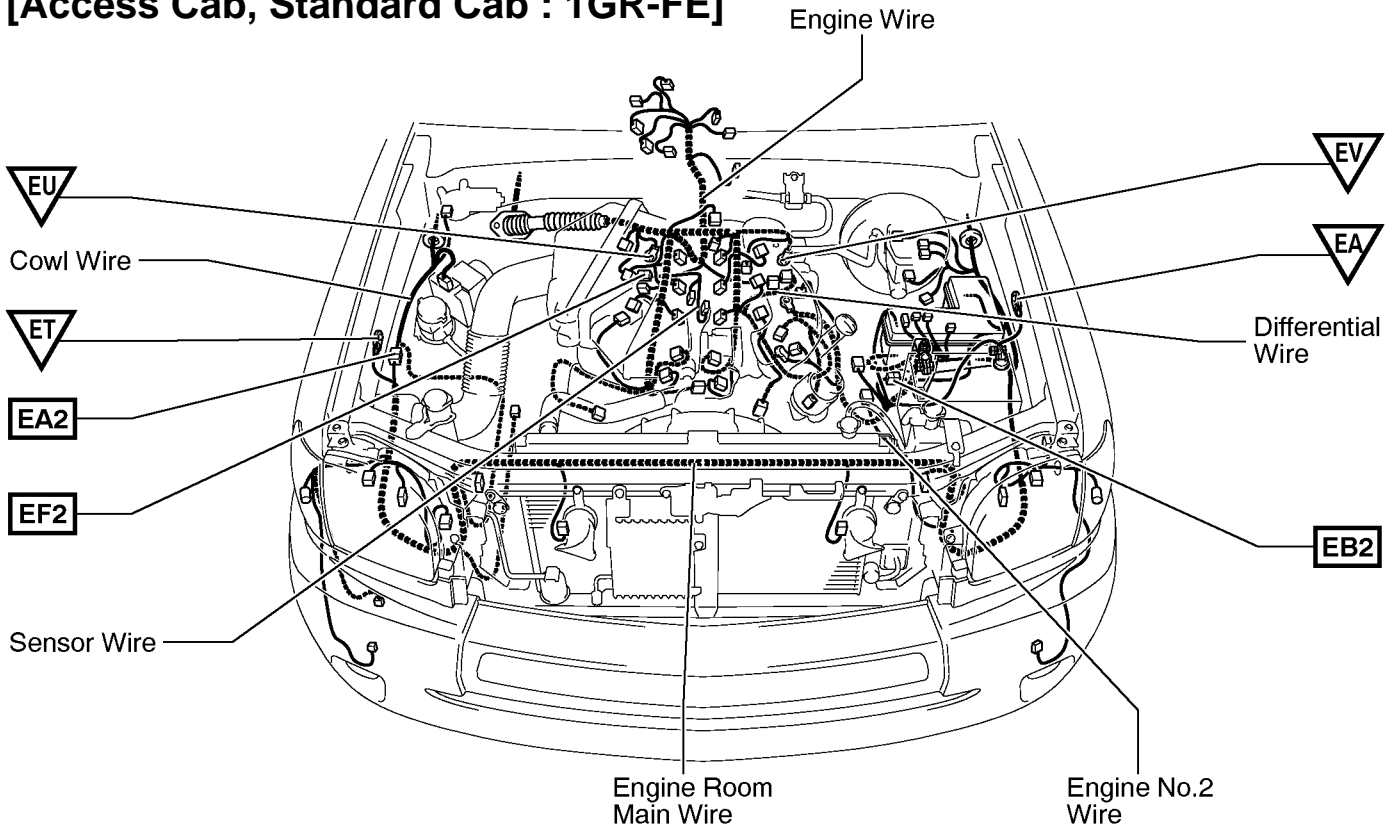


Code	Joining Wire Harness and Wire Harness (Connector Location)
EA2	Cowl Wire and Engine Room Main Wire (Right Fender)
EB2	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
EC1	Engine No.2 Wire and Engine Wire (Near the Starter)
EC3	
ED1	Engine No.2 Wire and Differential Wire (Near the Transmission)

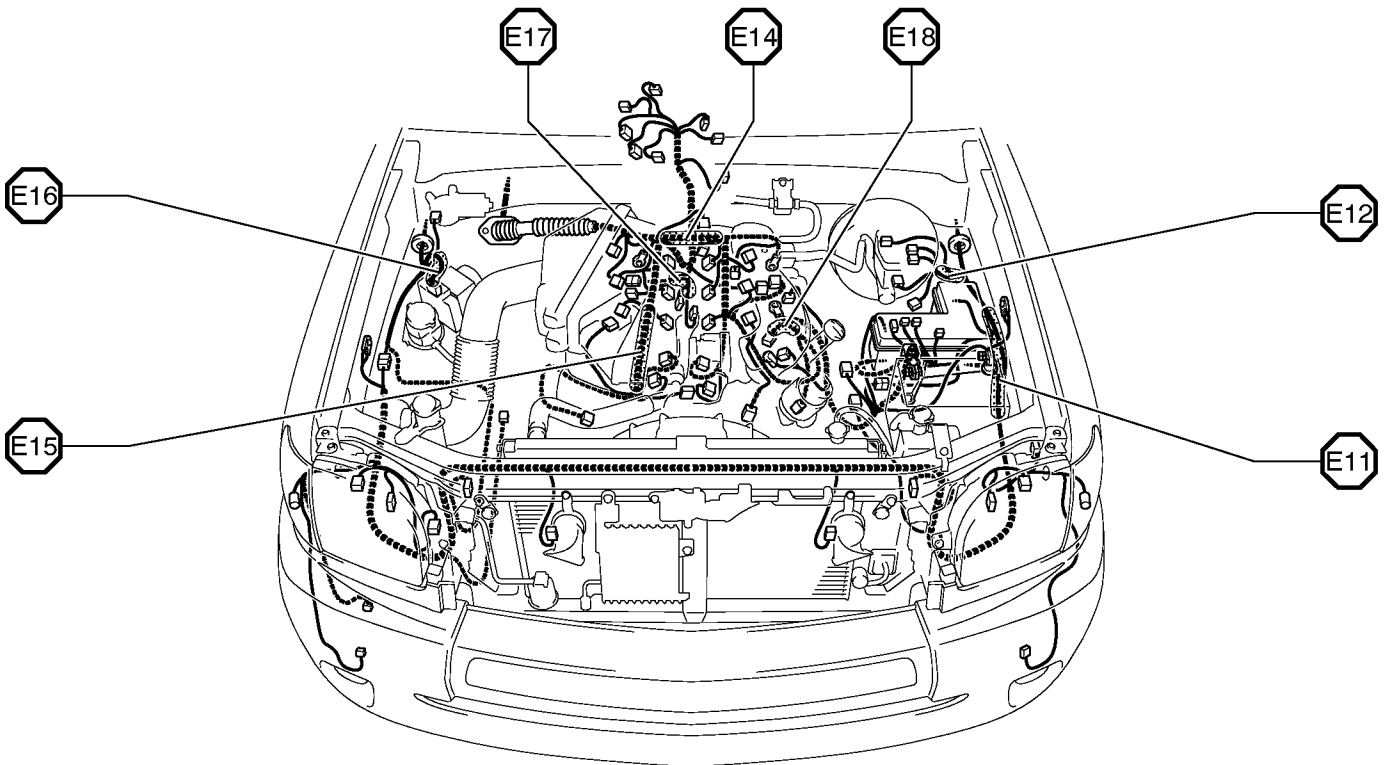
G ELECTRICAL WIRING ROUTING

- : Location of Connector Joining Wire Harness and Wire Harness
- ▽ : Location of Ground Points

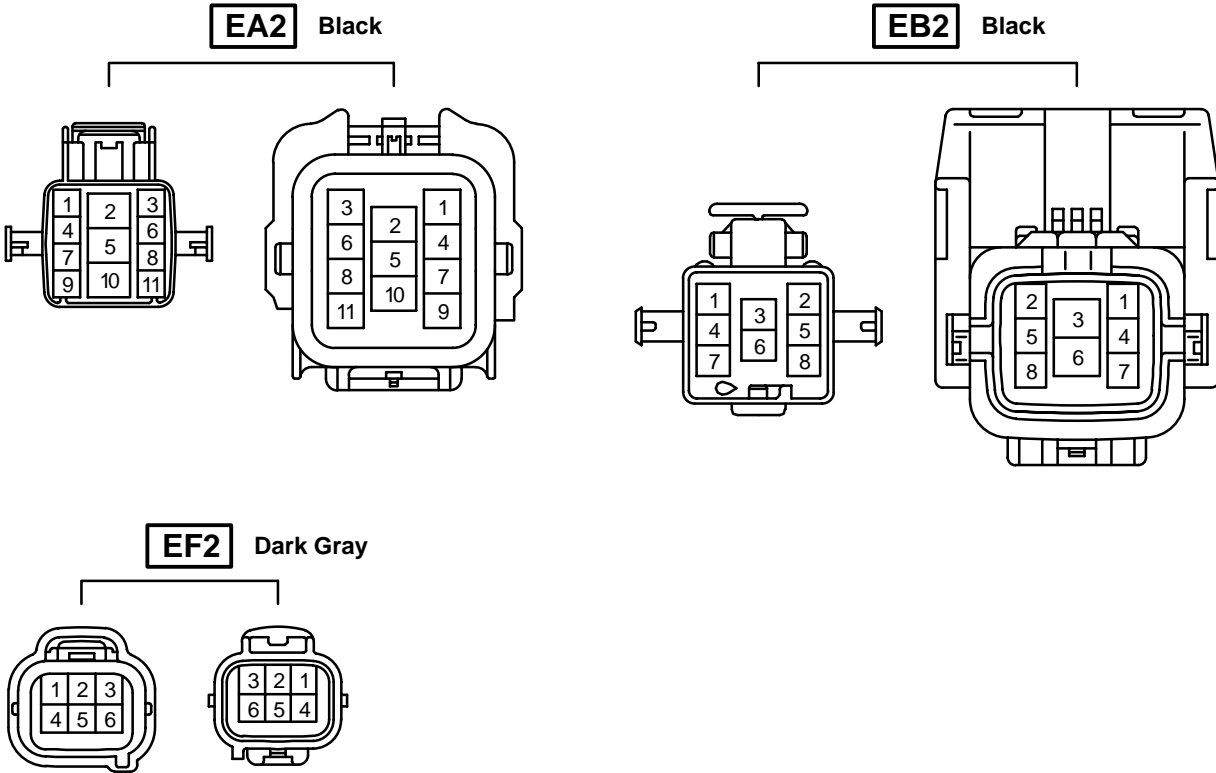
[Access Cab, Standard Cab : 1GR-FE]



- : Location of Splice Points



Connector Joining Wire Harness and Wire Harness

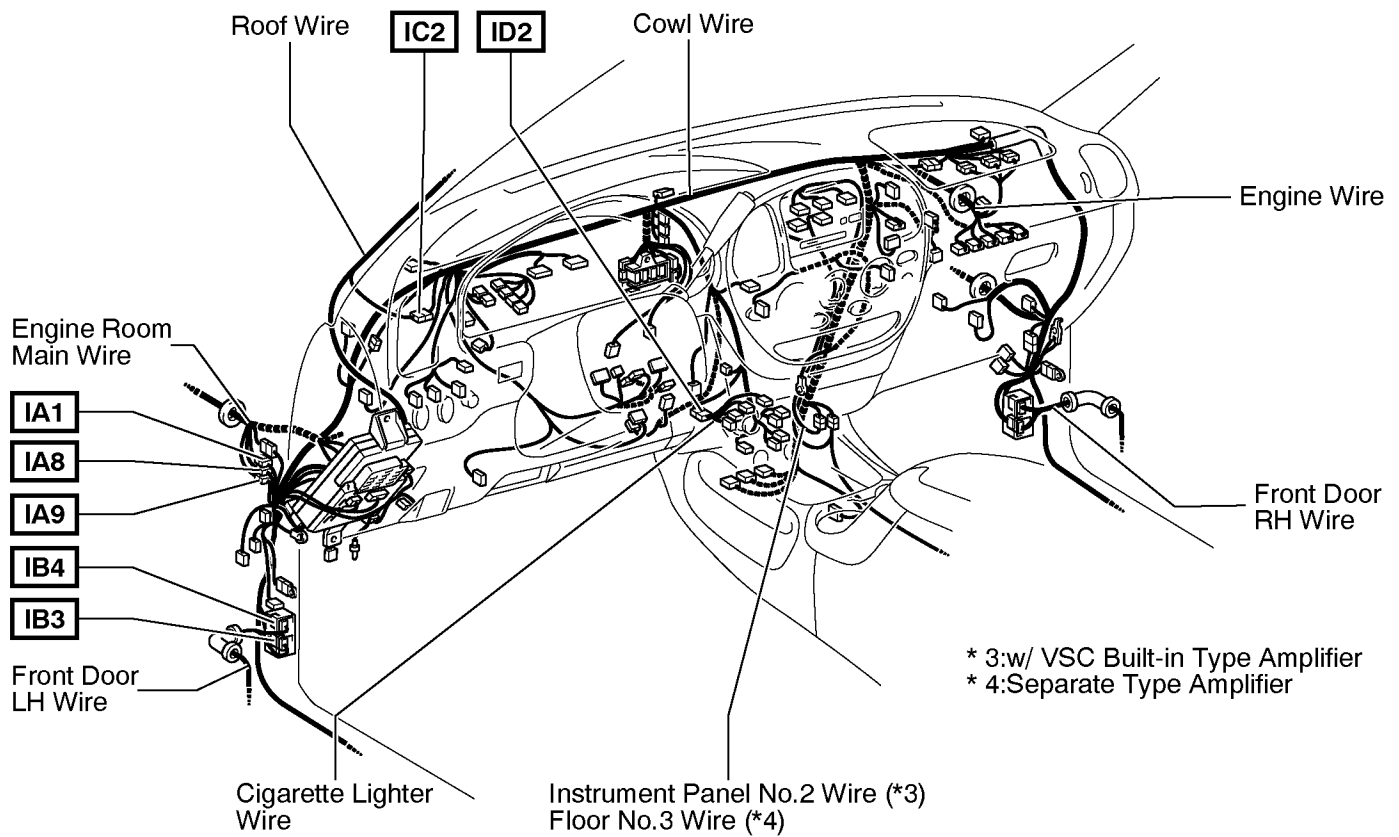


Code	Joining Wire Harness and Wire Harness (Connector Location)
EA2	Cowl Wire and Engine Room Main Wire (Right Fender)
EB2	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
EF2	Engine Wire and Sensor Wire (Over the Cylinder Head)

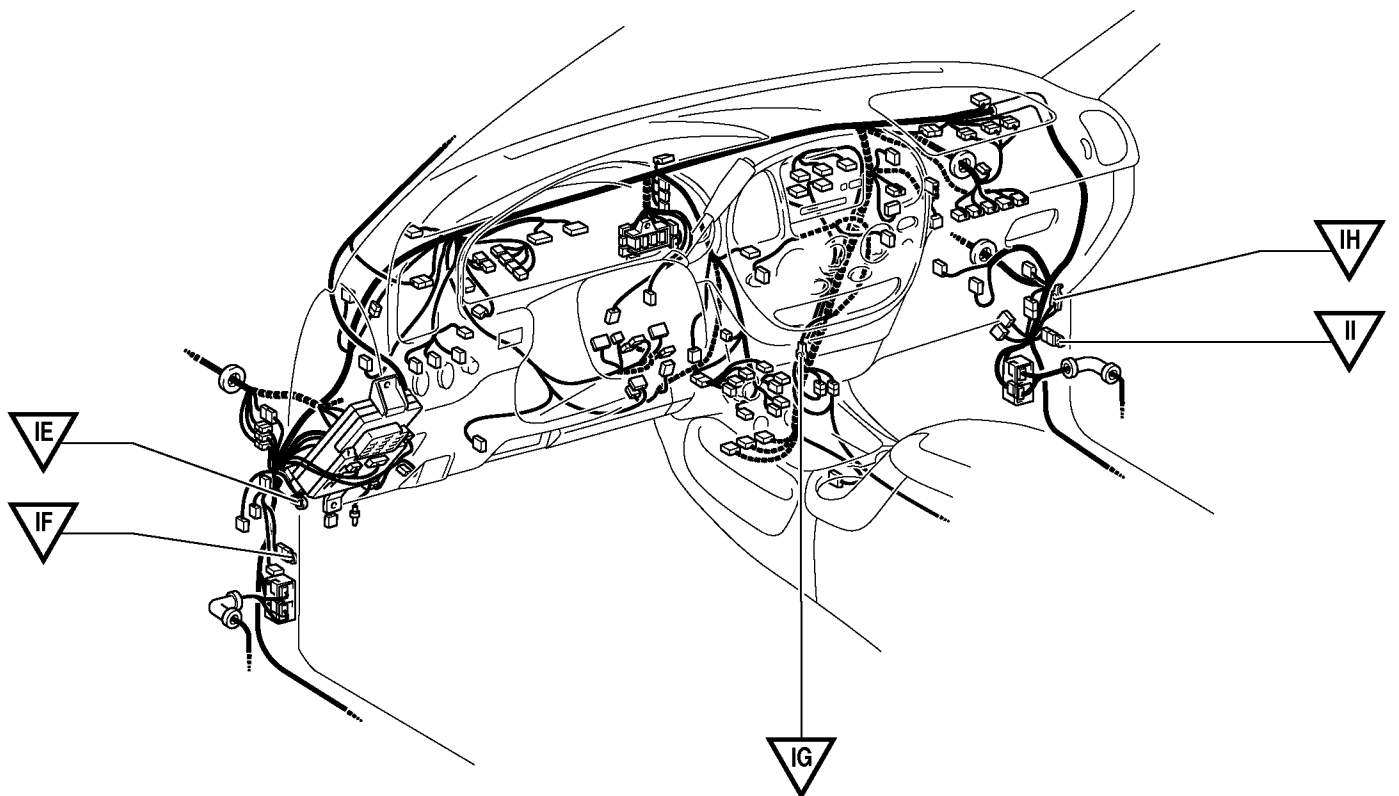
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness

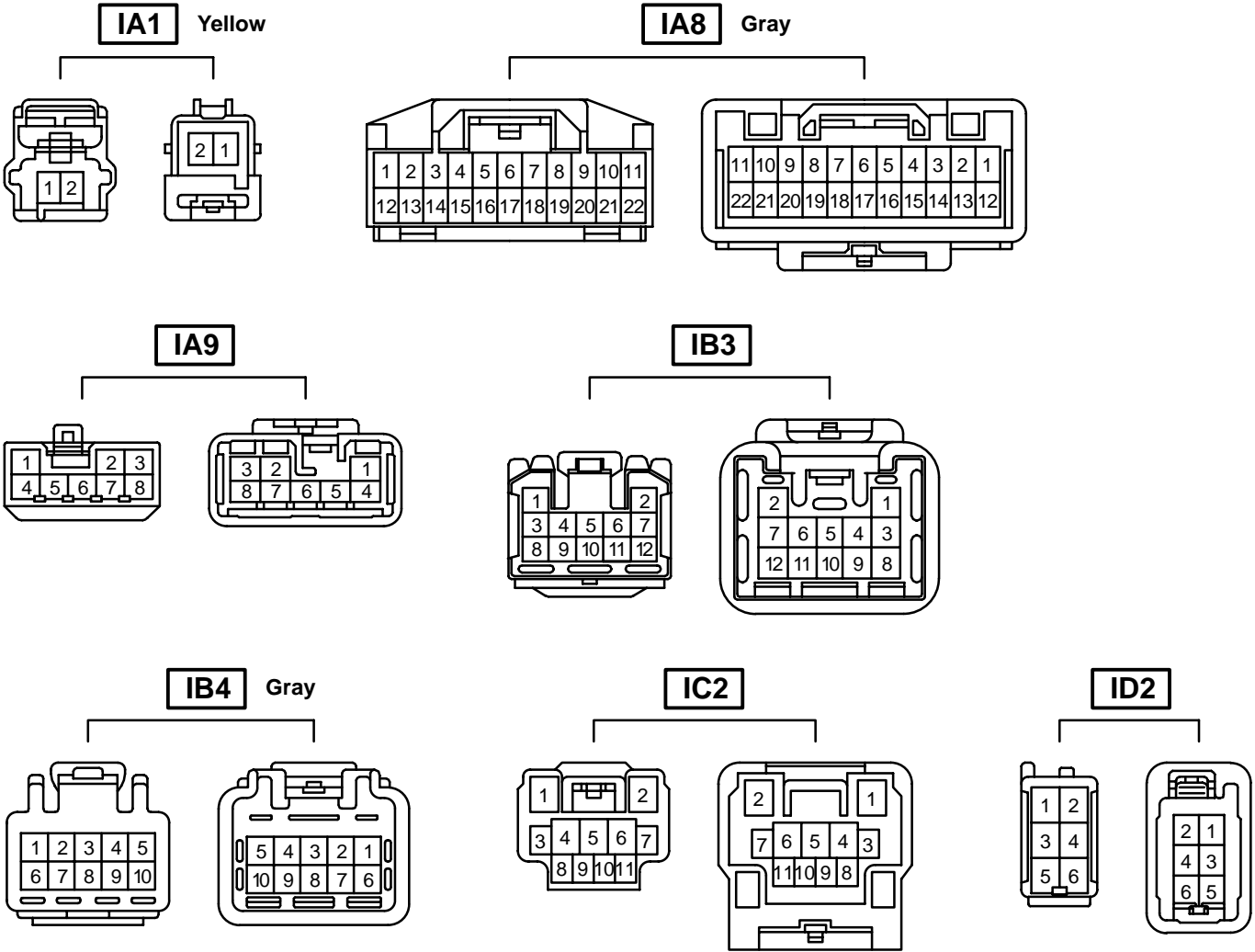
[Access Cab, Standard Cab]



▽ : Location of Ground Points



Connector Joining Wire Harness and Wire Harness

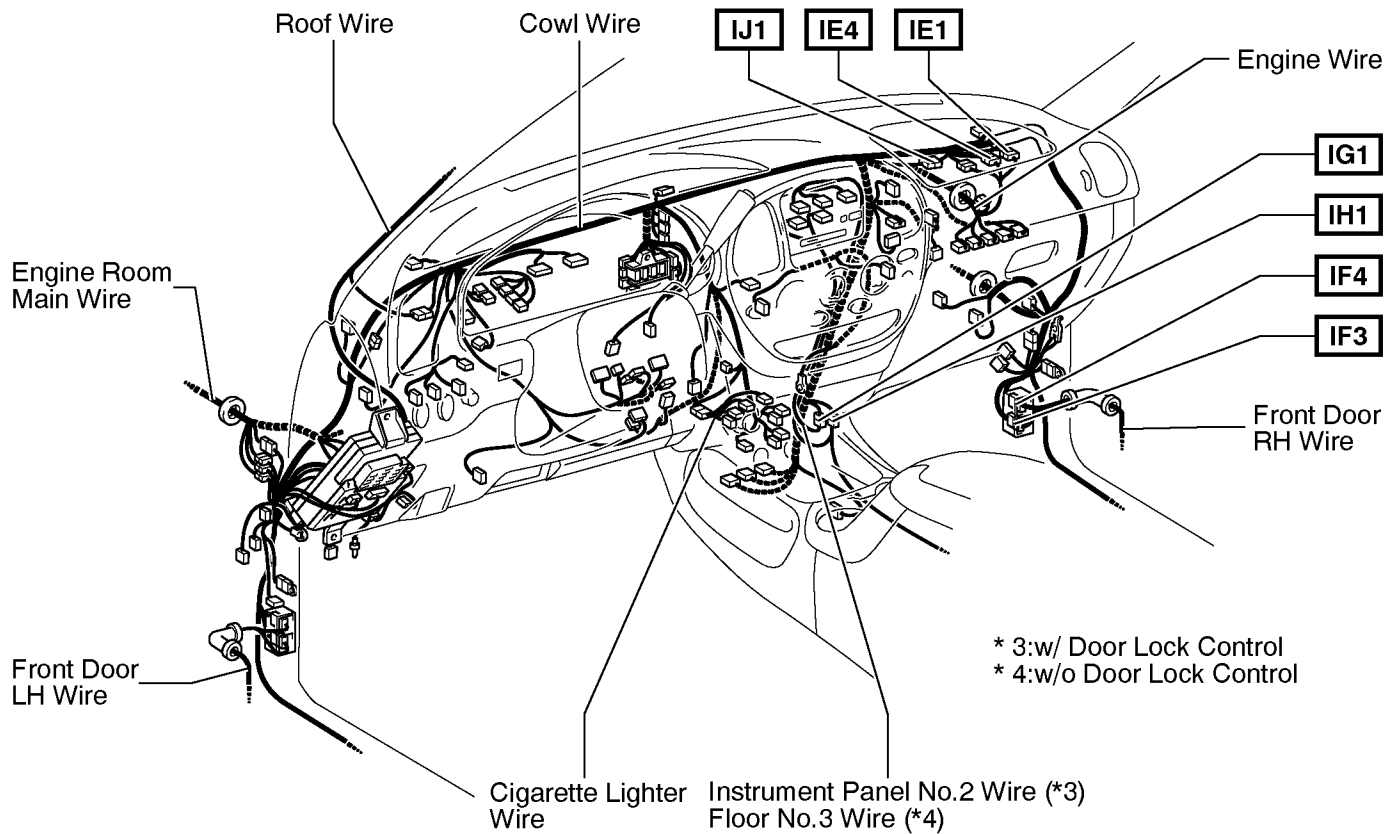


Code	Joining Wire Harness and Wire Harness (Connector Location)
IA1	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA8	
IA9	
IB3	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IB4	
IC2	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
ID2	Cigarette Lighter Wire and Cowl Wire (Instrument Panel Brace LH)

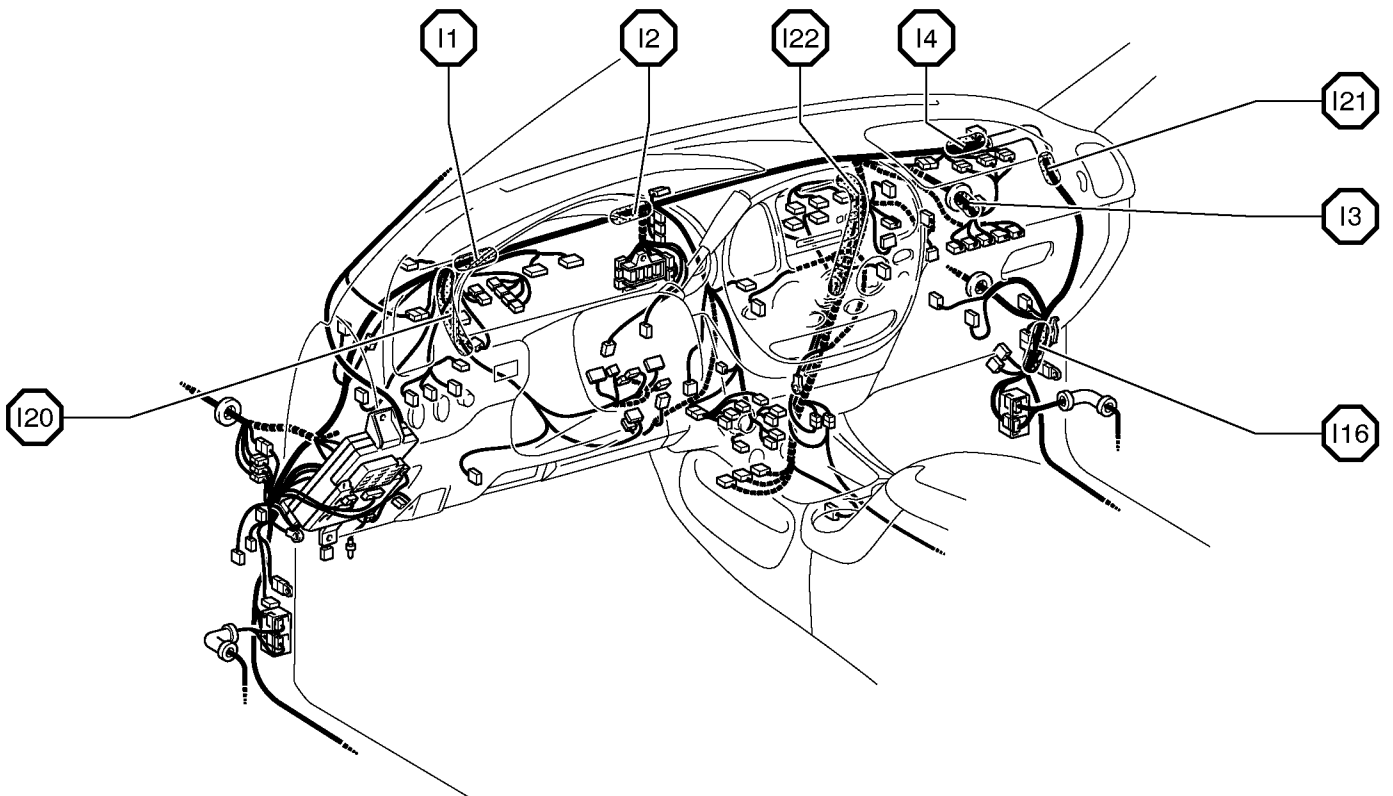
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness

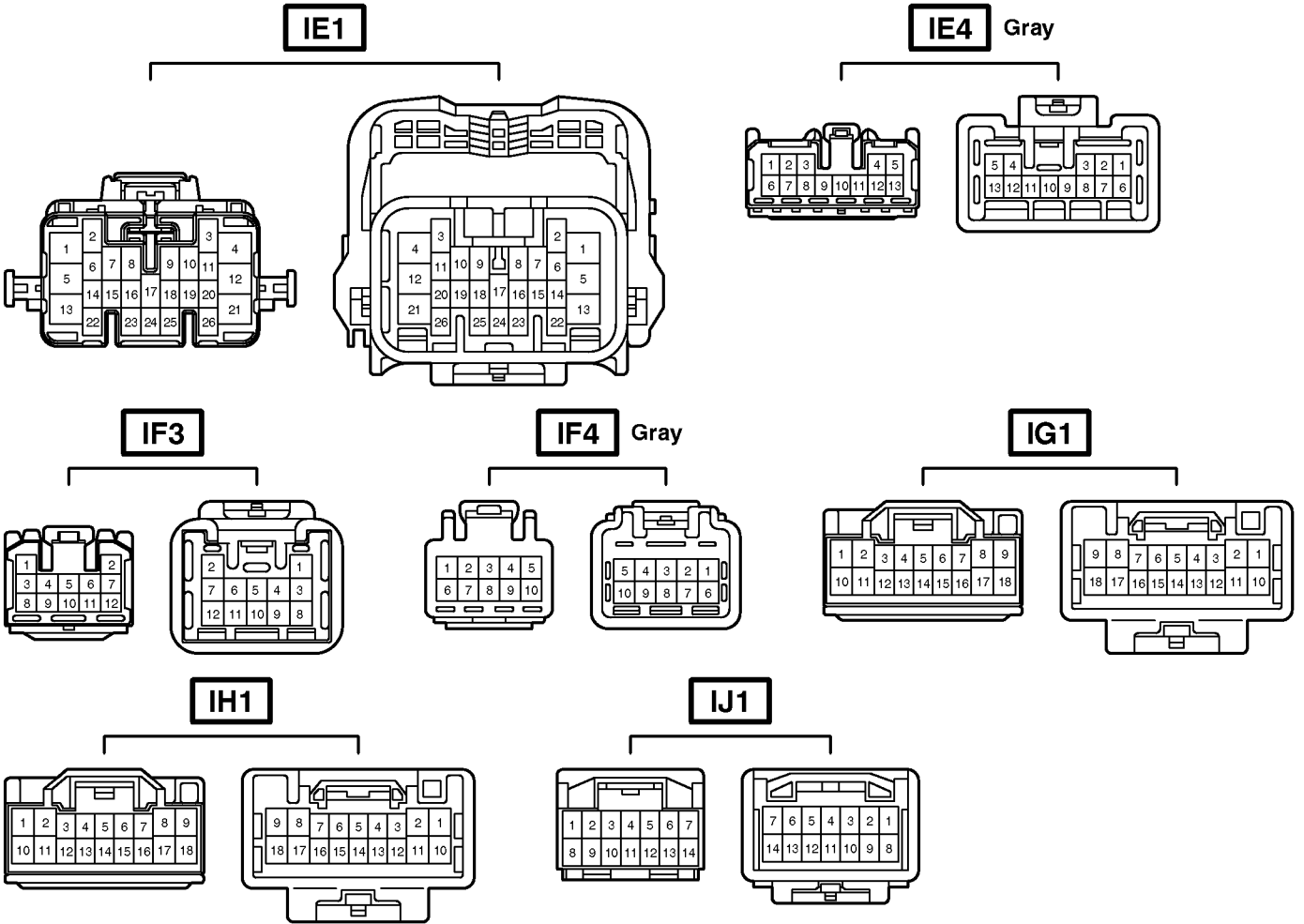
[Access Cab, Standard Cab]



○ : Location of Splice Points



Connector Joining Wire Harness and Wire Harness

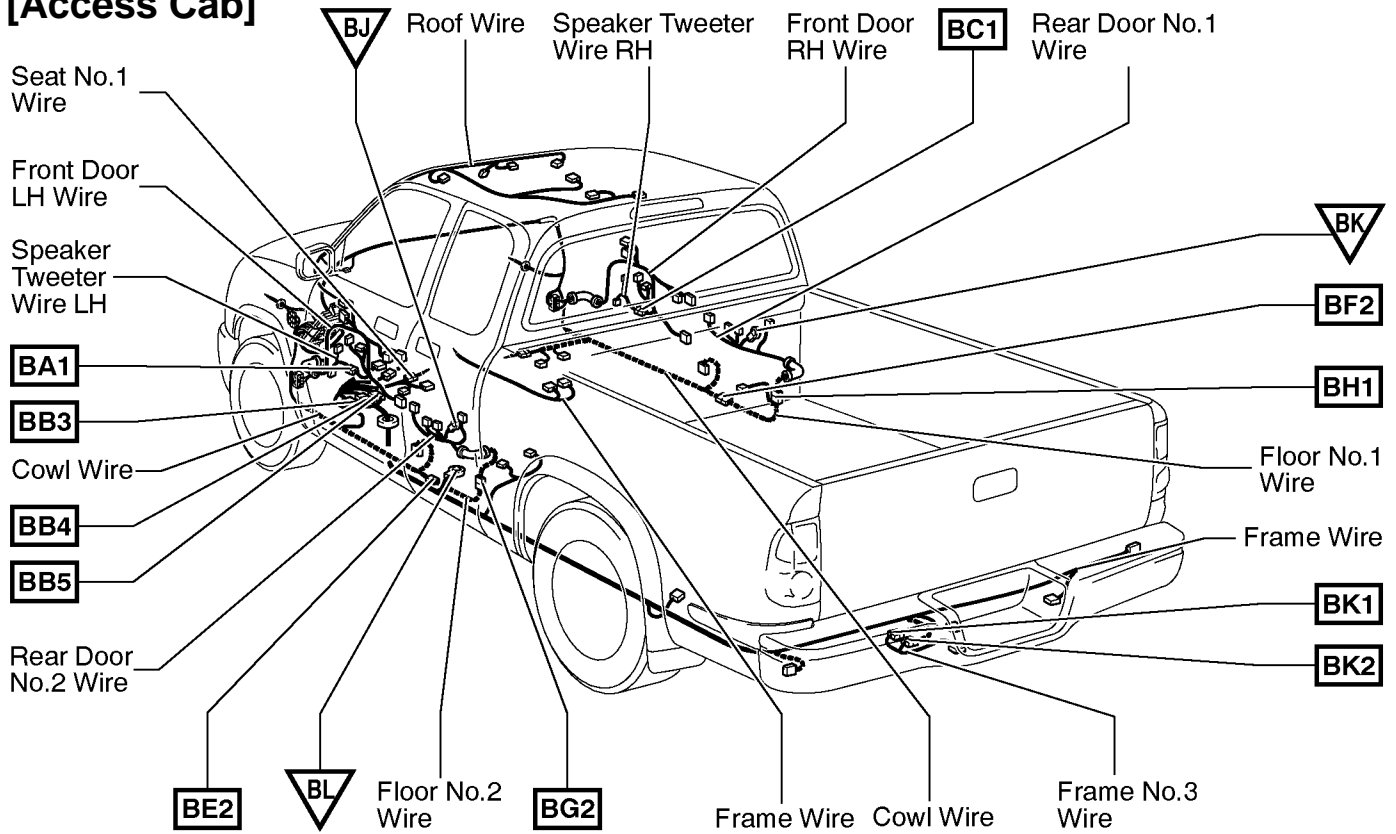


Code	Joining Wire Harness and Wire Harness (Connector Location)
IE1	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IE4	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IF3	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IF4	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IG1	Cowl Wire and Instrument Panel No.2 Wire (Instrument Panel Brace RH)
IH1	Cowl Wire and Floor No.3 Wire (Instrument Panel Brace RH)
IJ1	Cowl Wire and Cowl Wire (Right Side of Instrument Panel)

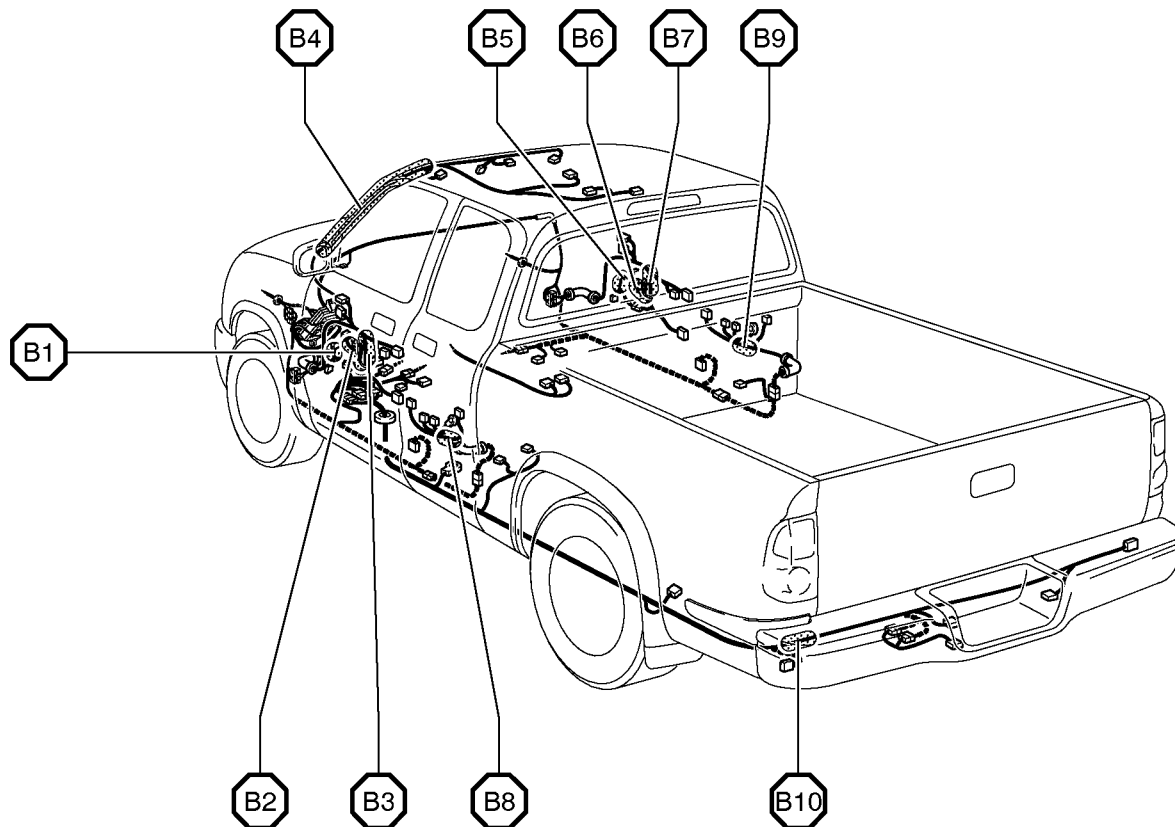
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness
 ▽ : Location of Ground Points

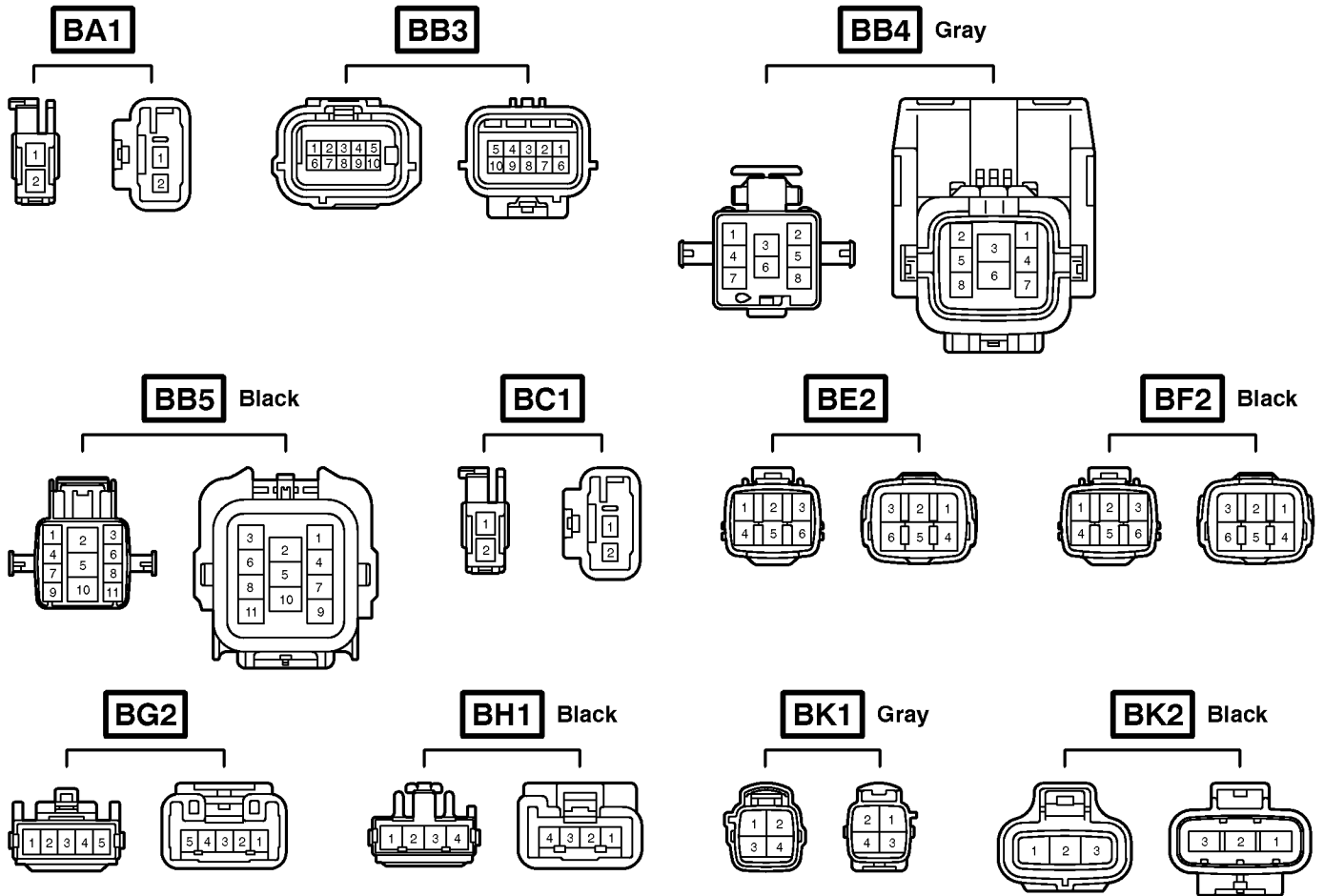
[Access Cab]



○ : Location of Splice Points



Connector Joining Wire Harness and Wire Harness

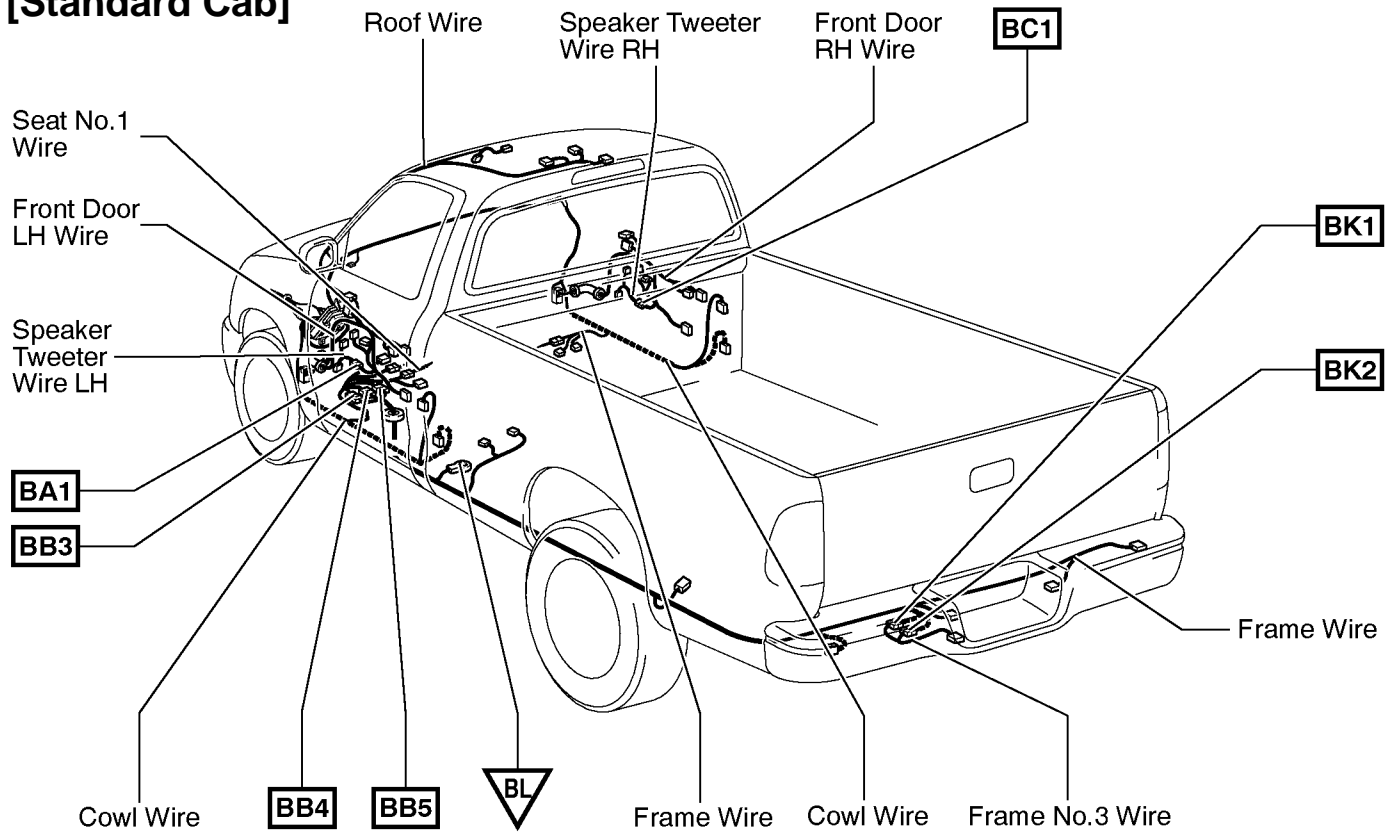


Code	Joining Wire Harness and Wire Harness (Connector Location)
BA1	Front Door LH Wire and Speaker Tweeter Wire LH (Inside of Front Door LH)
BB3	
BB4	Frame Wire and Cowl Wire (Under the Driver's Seat)
BB5	
BC1	Front Door RH Wire and Speaker Tweeter Wire RH (Inside of Front Door RH)
BE2	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)
BK1	
BK2	Frame Wire and Frame No.3 Wire (Near the License Plate Light)

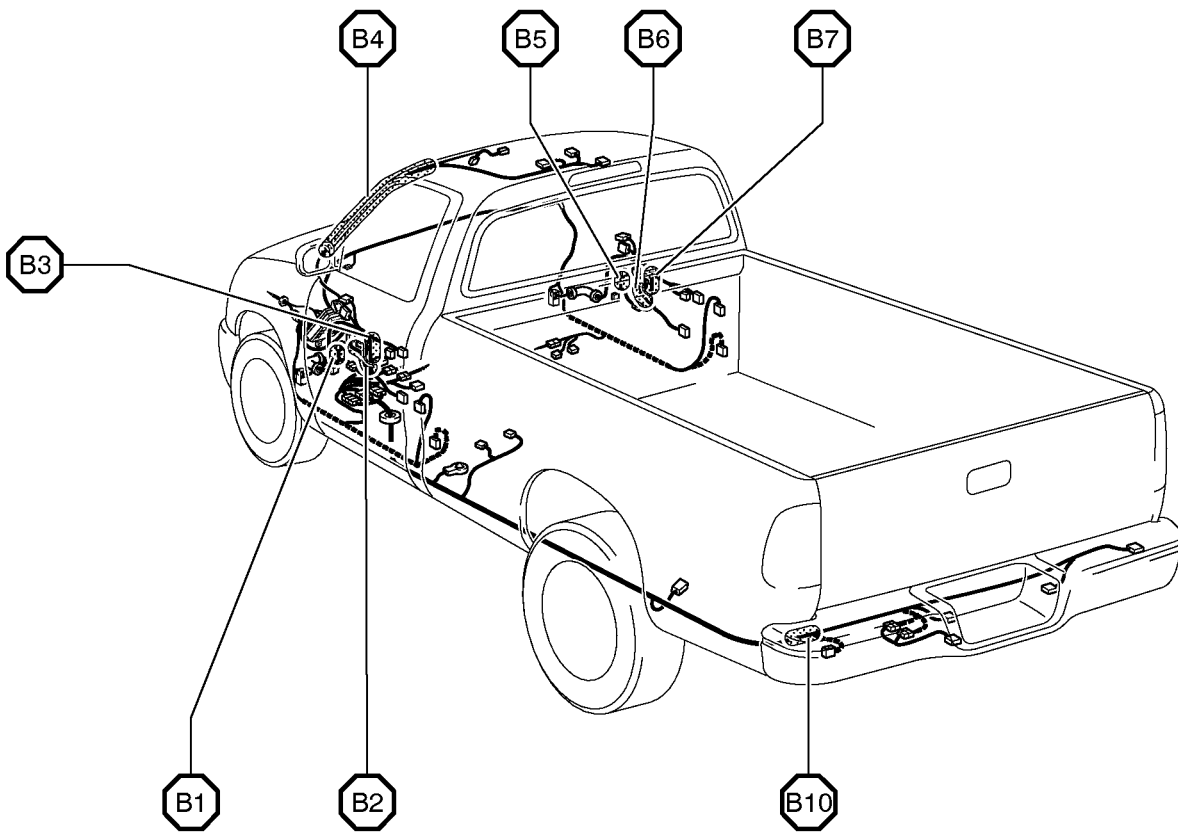
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness
 ▽ : Location of Ground Points

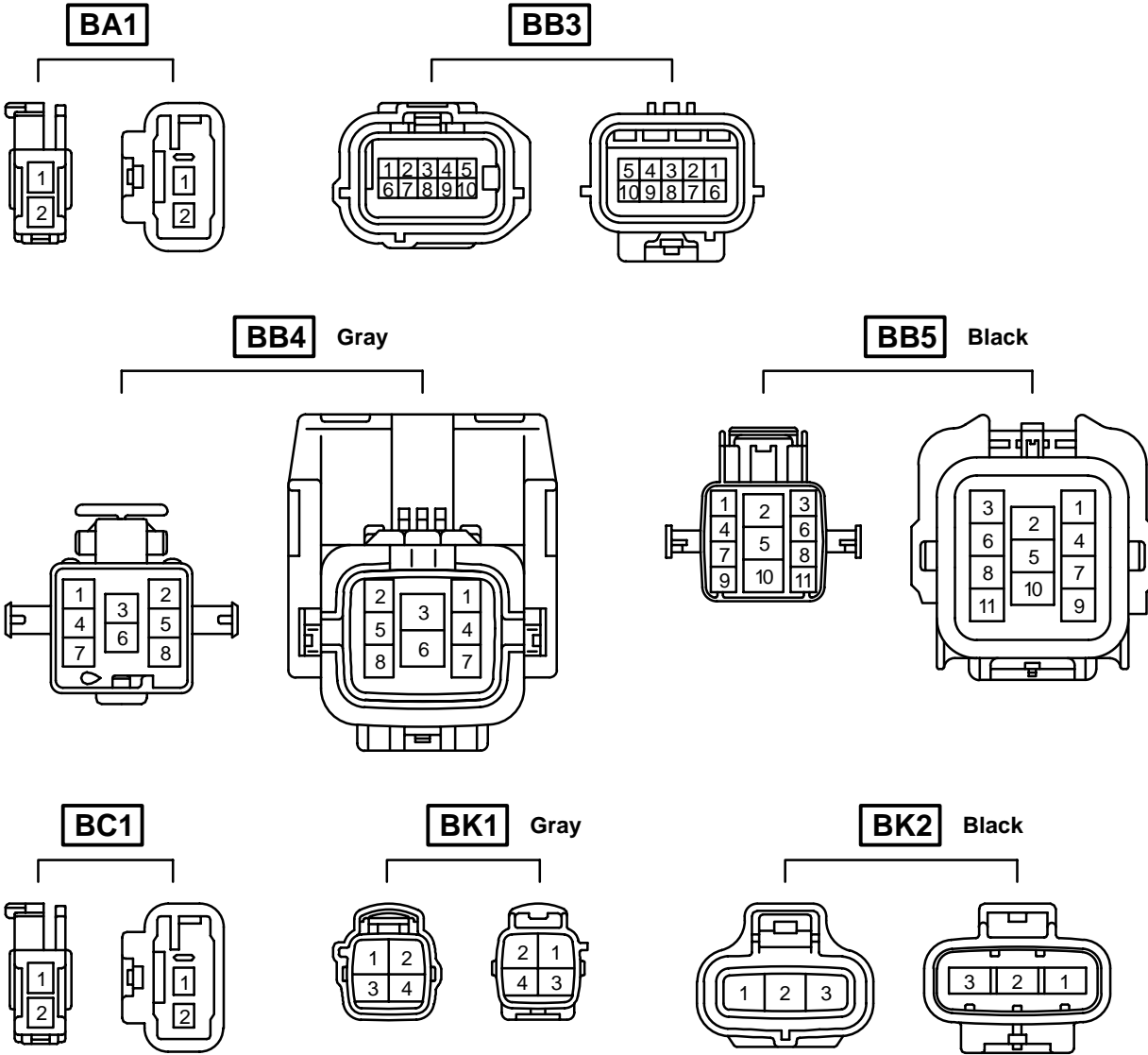
[Standard Cab]



○ : Location of Splice Points



Connector Joining Wire Harness and Wire Harness

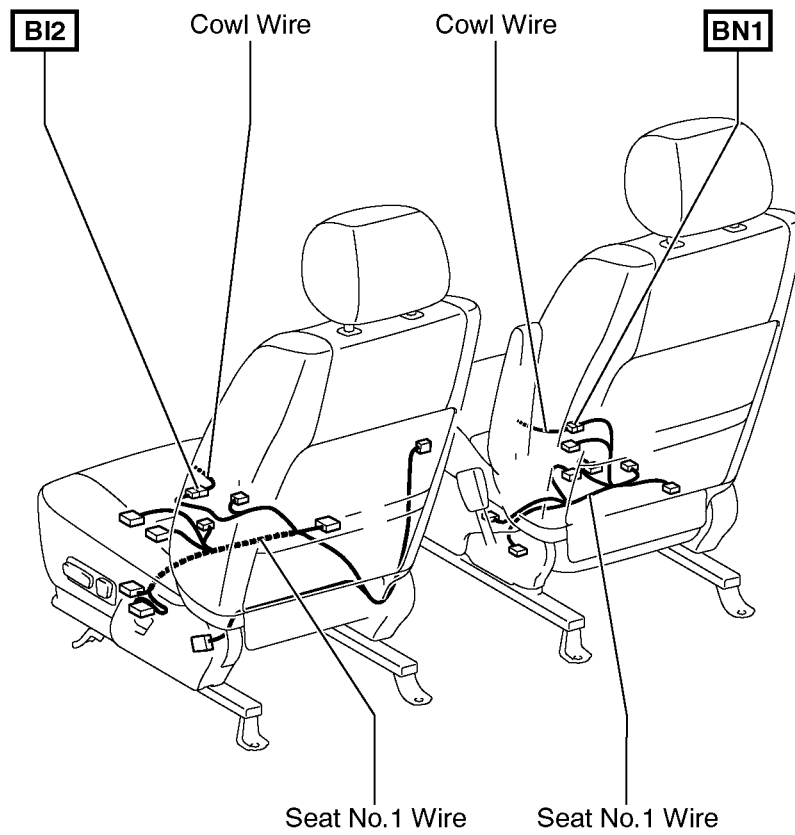


Code	Joining Wire Harness and Wire Harness (Connector Location)
BA1	Front Door LH Wire and Speaker Tweeter Wire LH (Inside of Front Door LH)
BB3	
BB4	Frame Wire and Cowl Wire (Under the Driver's Seat)
BB5	
BC1	Front Door RH Wire and Speaker Tweeter Wire RH (Inside of Front Door RH)
BK1	
BK2	Frame Wire and Frame No.3 Wire (Near the License Plate Light)

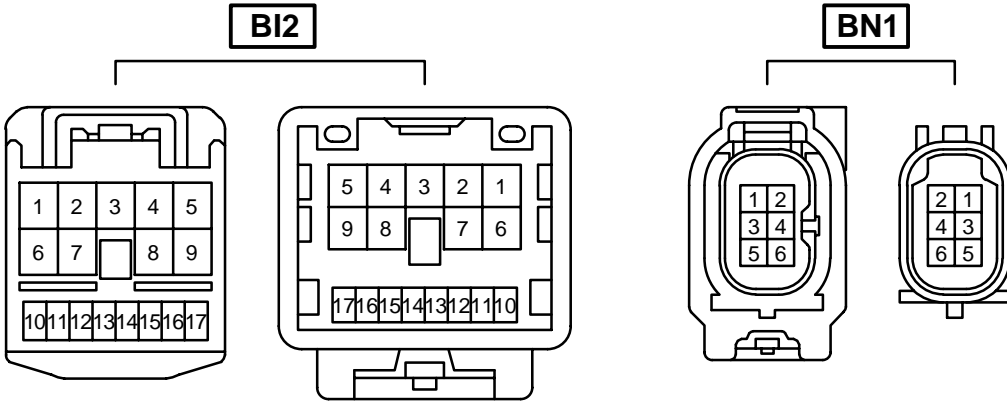
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness

[Access Cab : Captain Seat]



Connector Joining Wire Harness and Wire Harness

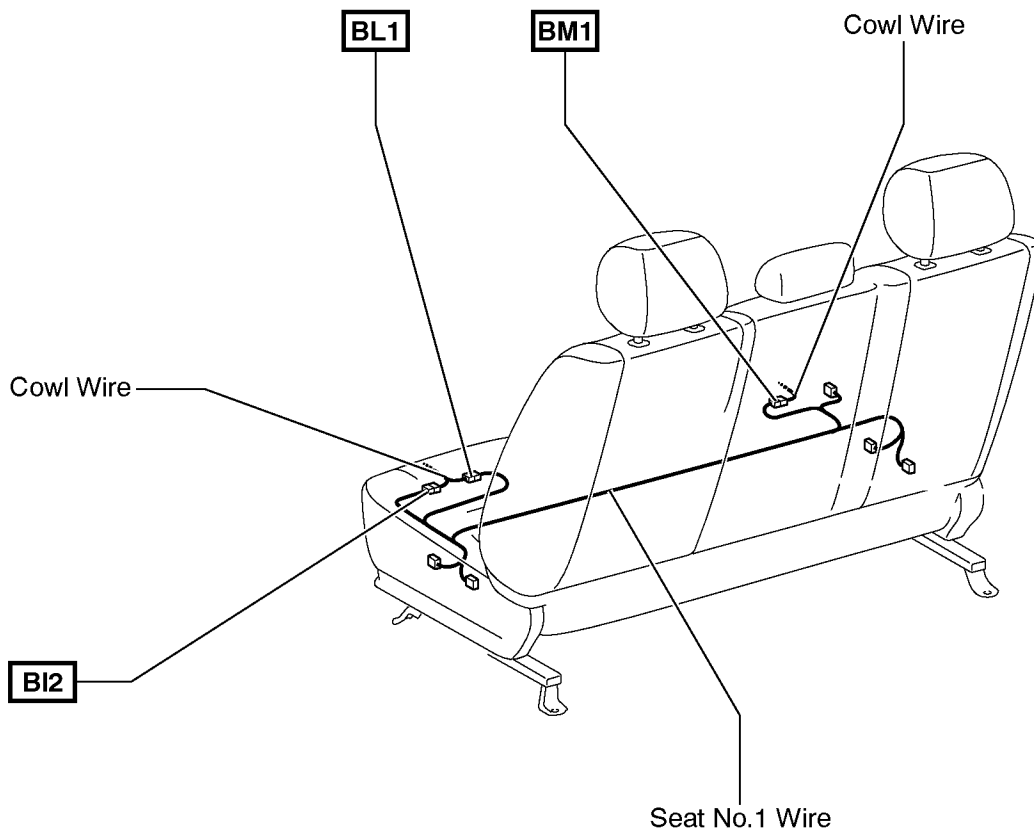


Code	Joining Wire Harness and Wire Harness (Connector Location)
B12	Cowl Wire and Seat No.1 Wire (Under the Driver's Seat)
BN1	Seat No.1 Wire and Cowl Wire (Under the Passenger's Seat)

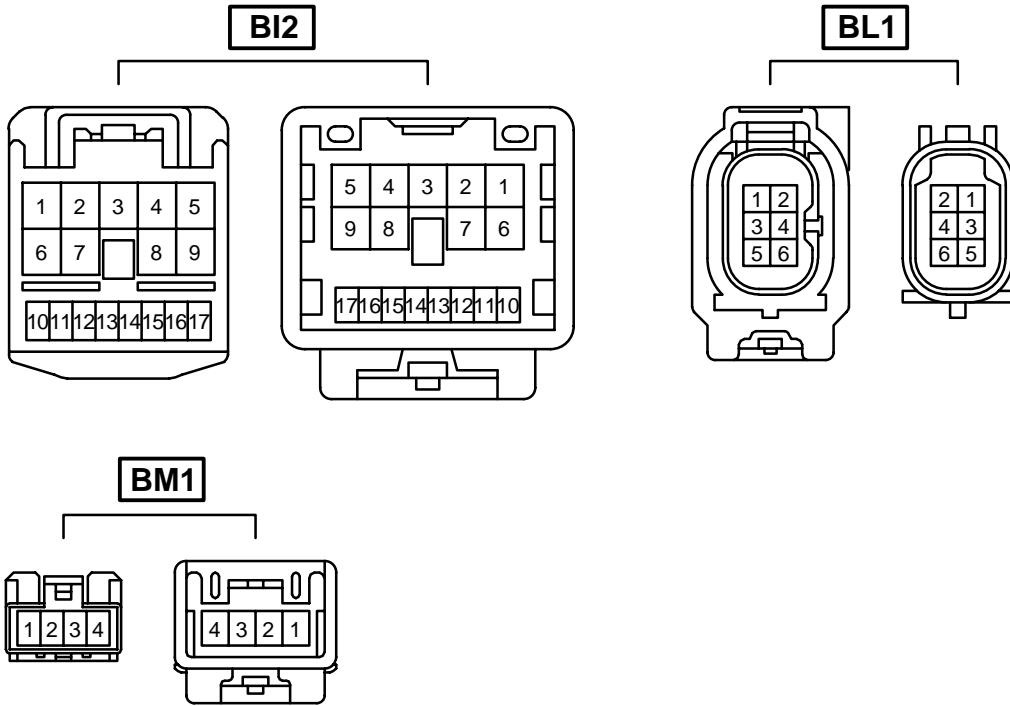
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness

[Standard Cab : Bench Seat]



Connector Joining Wire Harness and Wire Harness

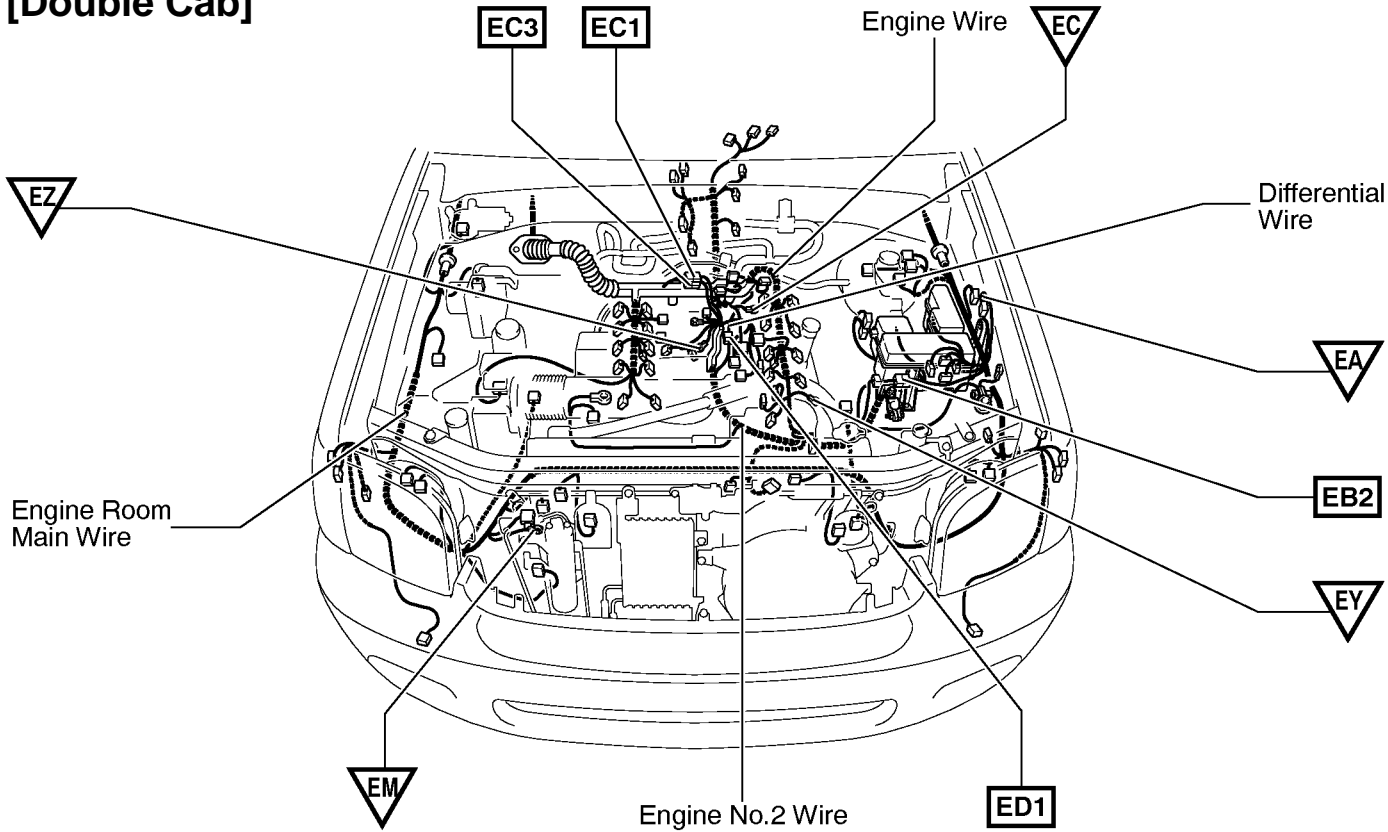


Code	Joining Wire Harness and Wire Harness (Connector Location)
BI2	Cowl Wire and Seat No.1 Wire (Under the Driver's Seat)
BL1	Seat No.1 Wire and Cowl Wire (Under the Driver's Seat)
BM1	Cowl Wire and Seat No.1 Wire (Under the Passenger's Seat)

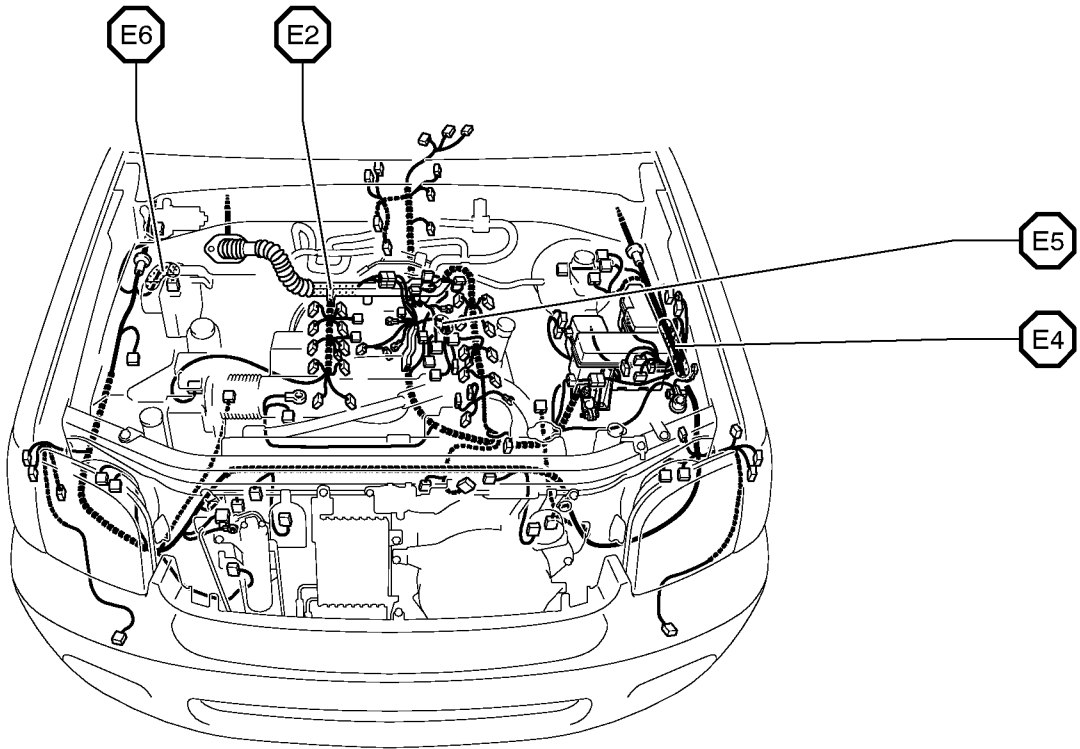
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness
 ▽ : Location of Ground Points

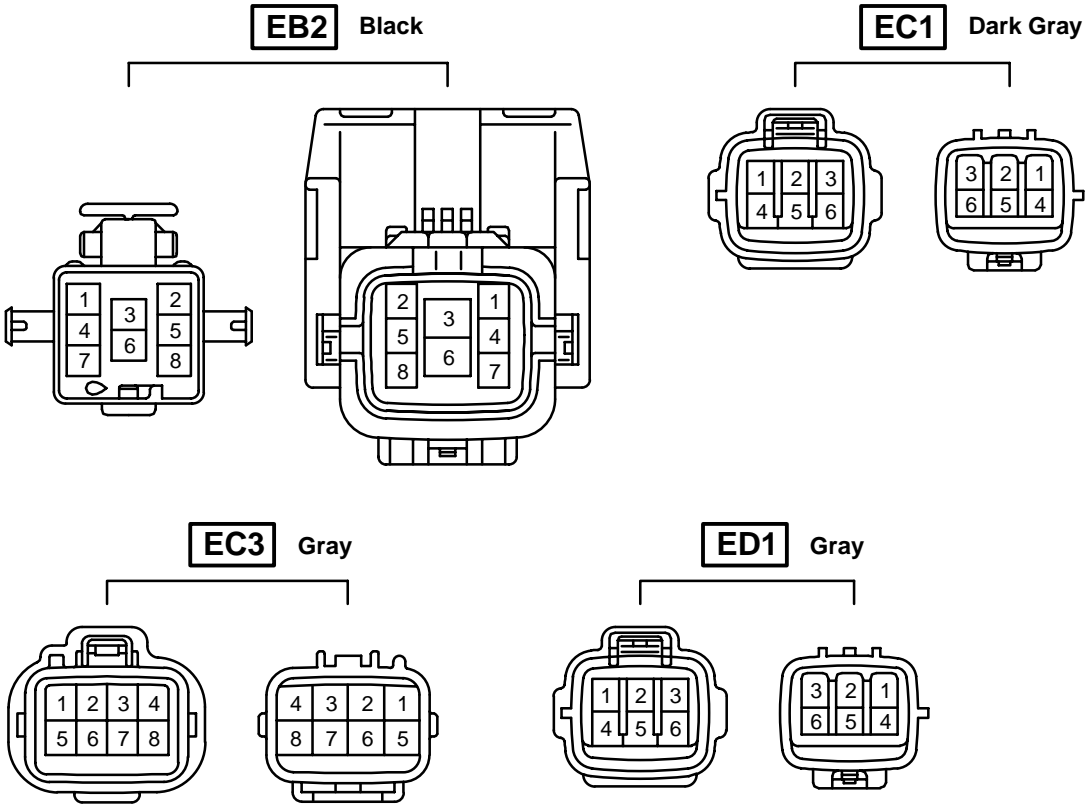
[Double Cab]



○ : Location of Splice Points



Connector Joining Wire Harness and Wire Harness

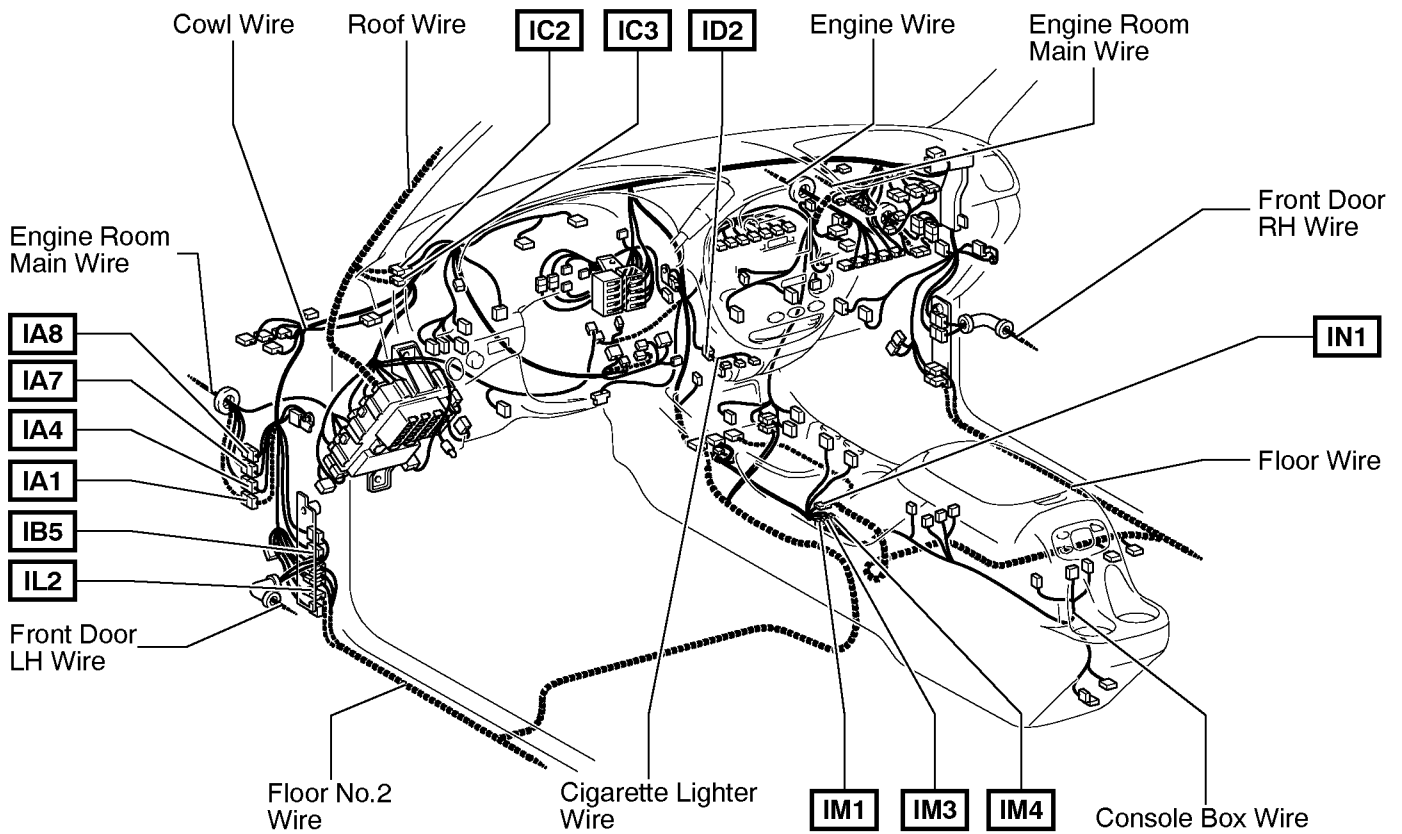


Code	Joining Wire Harness and Wire Harness (Connector Location)
EB2	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
EC1	Engine No.2 Wire and Engine Wire (Near the Starter)
EC3	
ED1	Engine No.2 Wire and Differential Wire (Near the Transmission)

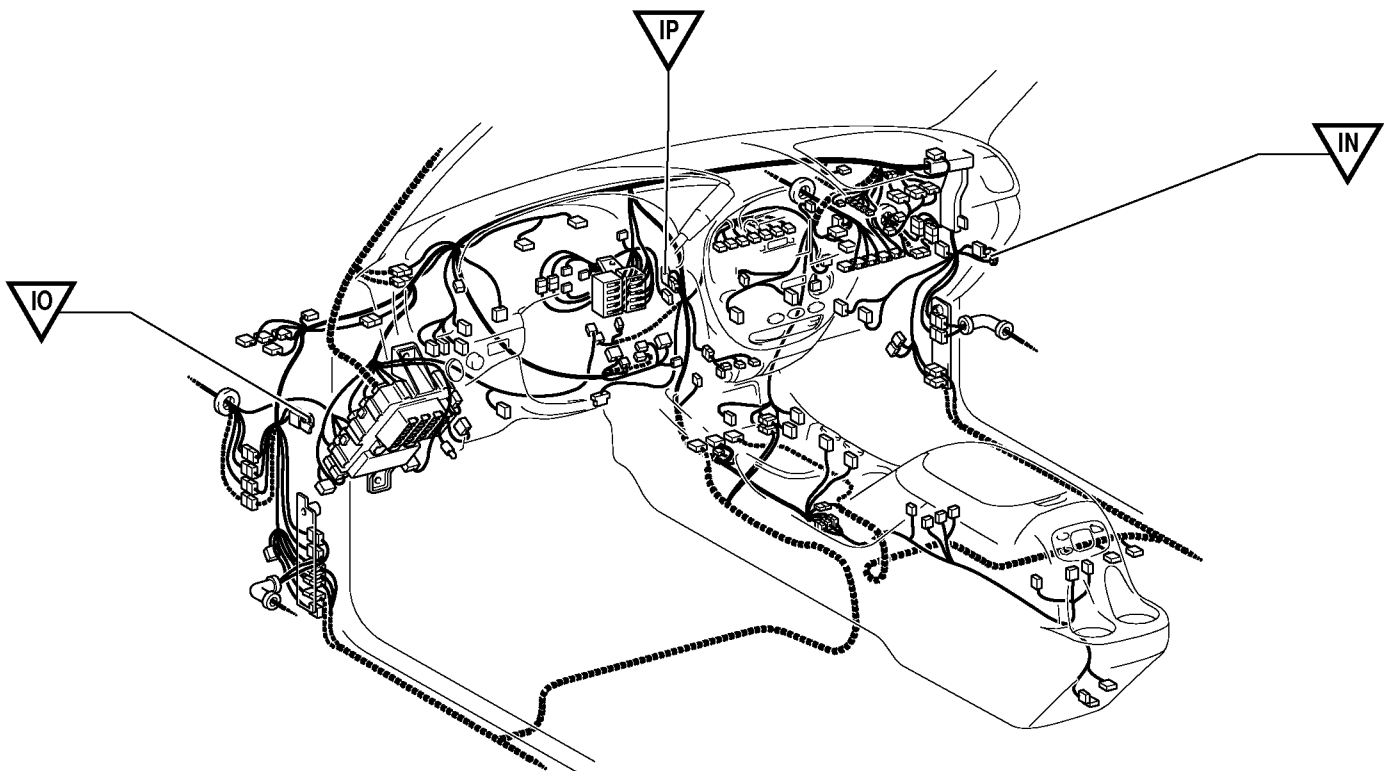
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness

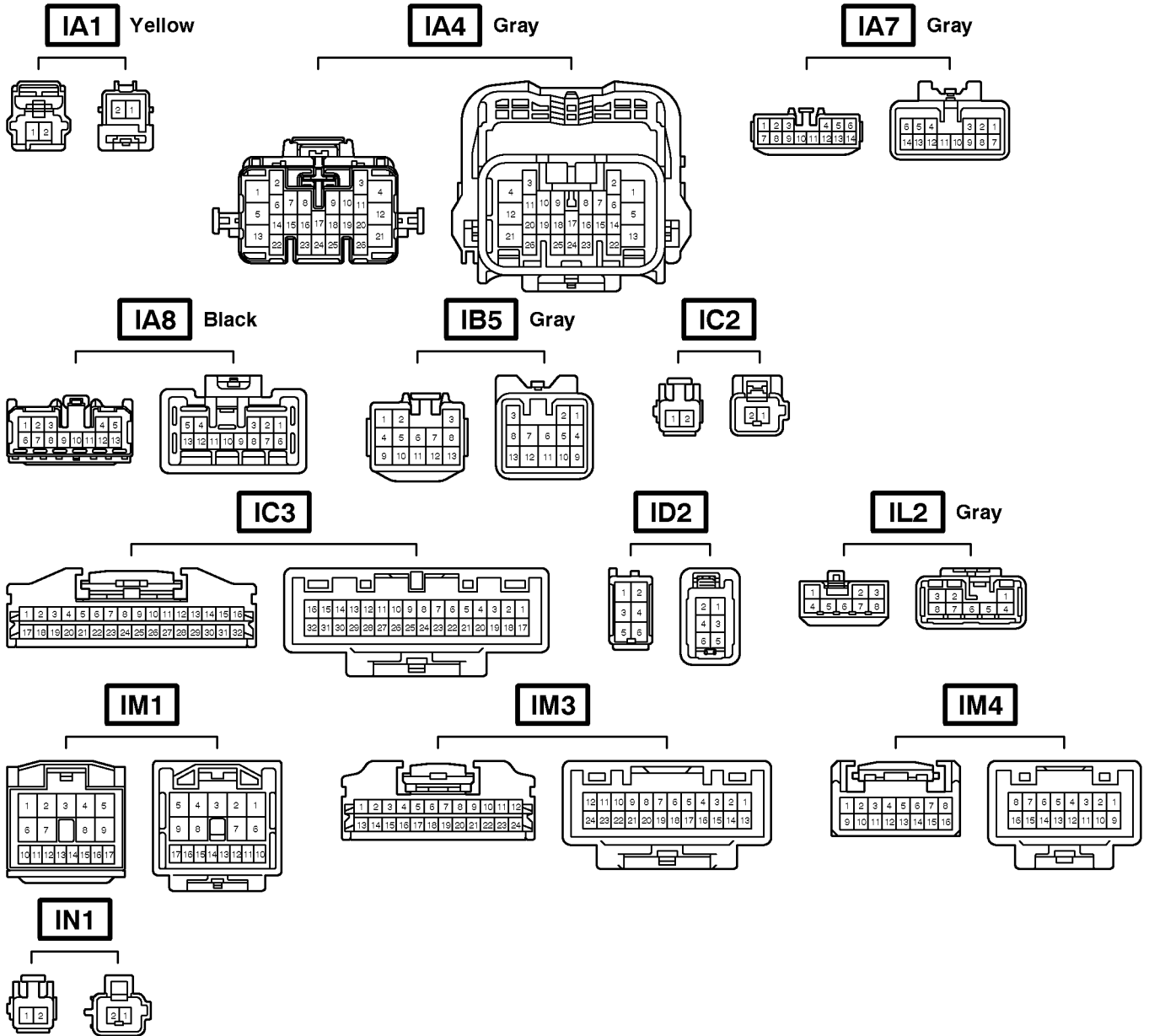
[Double Cab]



▽ : Location of Ground Points



Connector Joining Wire Harness and Wire Harness

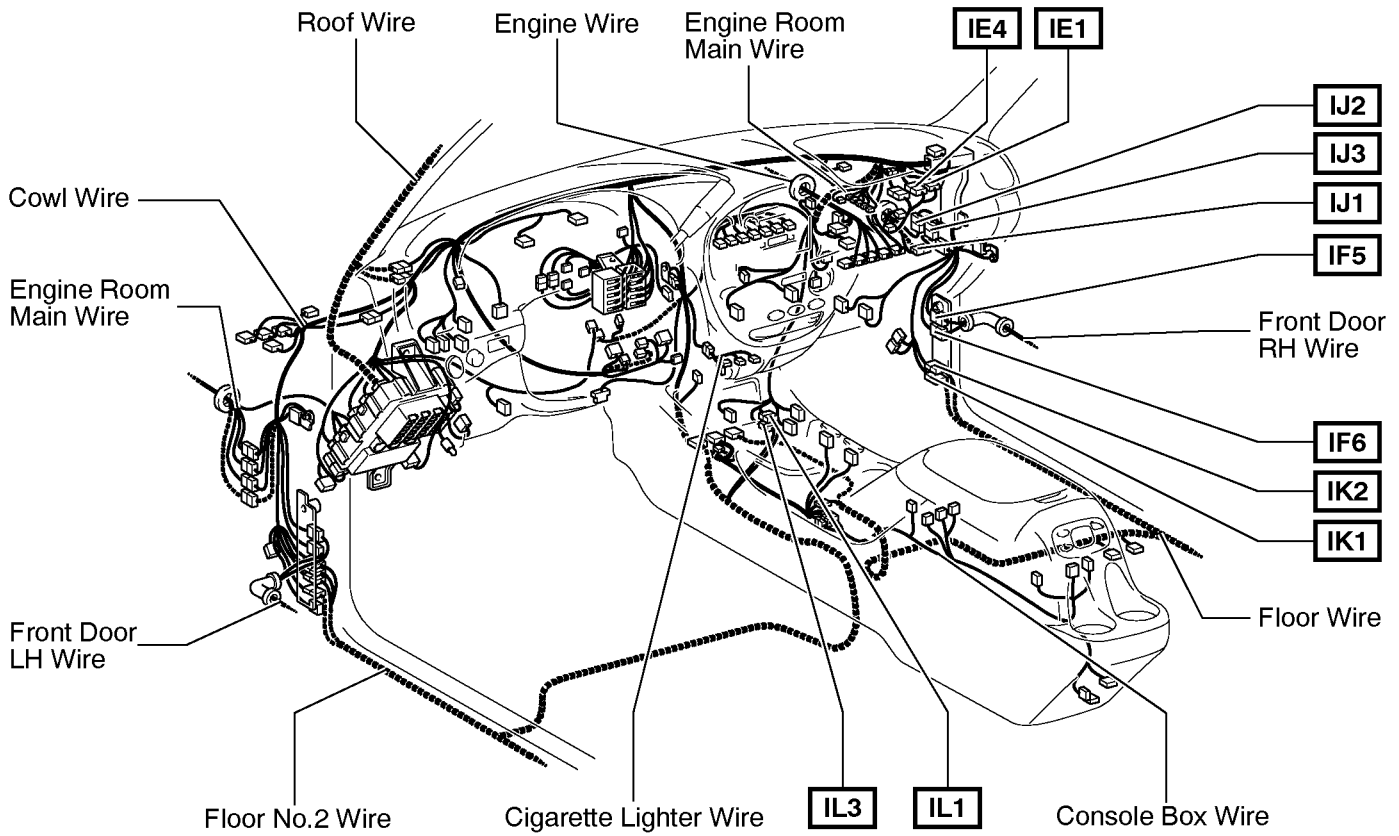


Code	Joining Wire Harness and Wire Harness (Connector Location)
IA1	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA4	
IA7	
IA8	
IB5	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IC2	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
IC3	
ID2	Cigarette Lighter Wire and Cowl Wire (Instrument Panel Brace LH)
IL2	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
IM1	Console Box Wire and Cowl Wire (Rear Console)
IM3	
IM4	
IN1	Cowl Wire and Floor Wire (Rear Console)

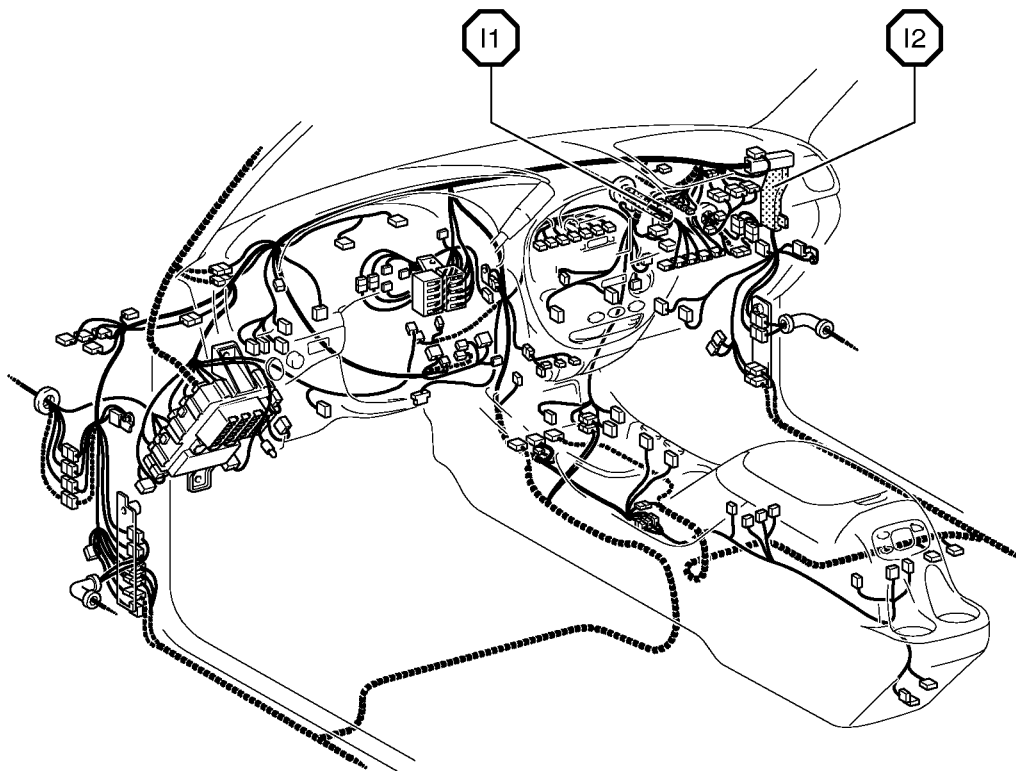
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness

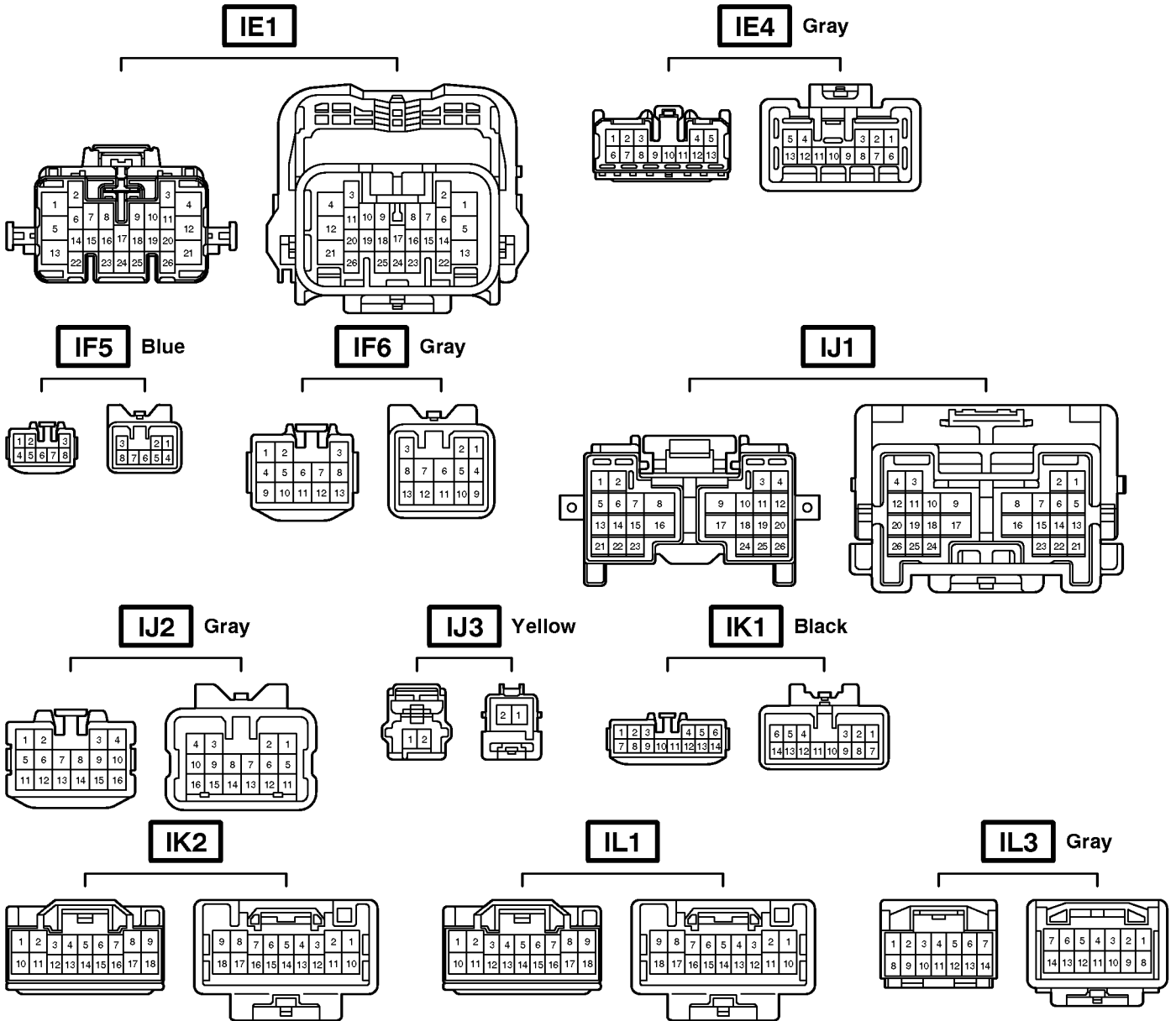
[Double Cab]



○ : Location of Splice Points



Connector Joining Wire Harness and Wire Harness

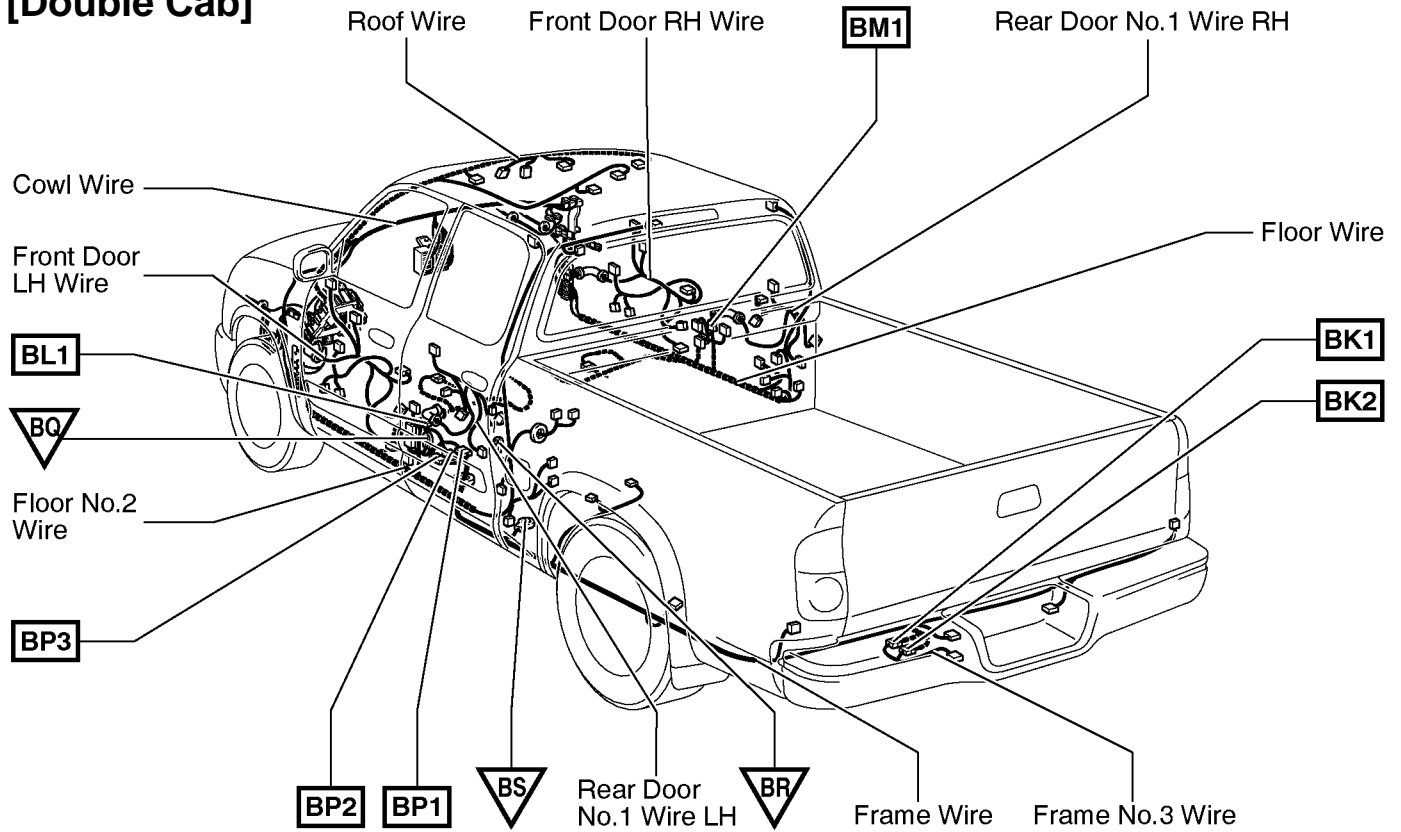


Code	Joining Wire Harness and Wire Harness (Connector Location)
IE1	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IE4	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IF5	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IF6	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IJ1	
IJ2	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
IJ3	
IK1	Floor Wire and Cowl Wire (Right Kick Panel)
IK2	Floor Wire and Cowl Wire (Right Kick Panel)
IL1	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
IL3	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)

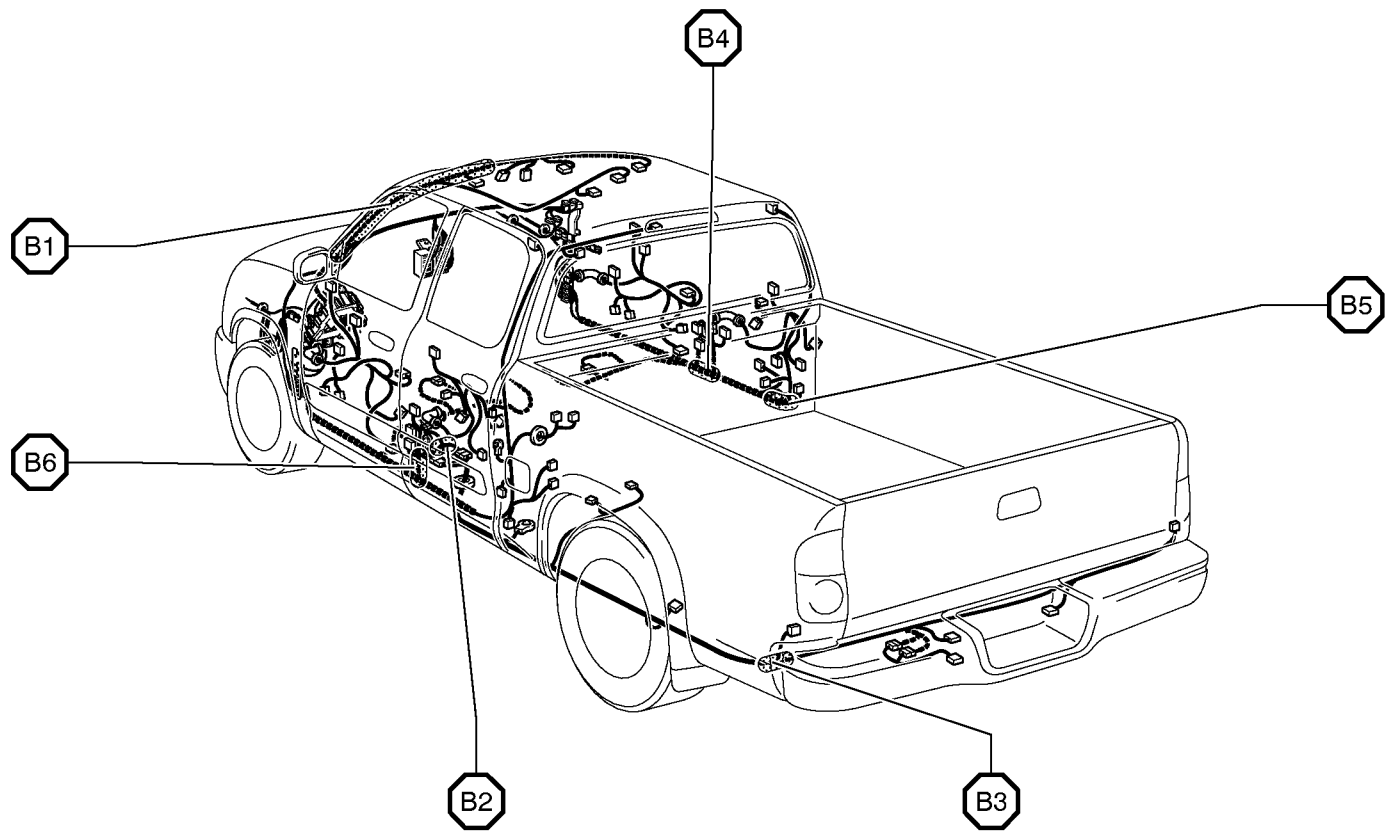
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness
 ▽ : Location of Ground Points

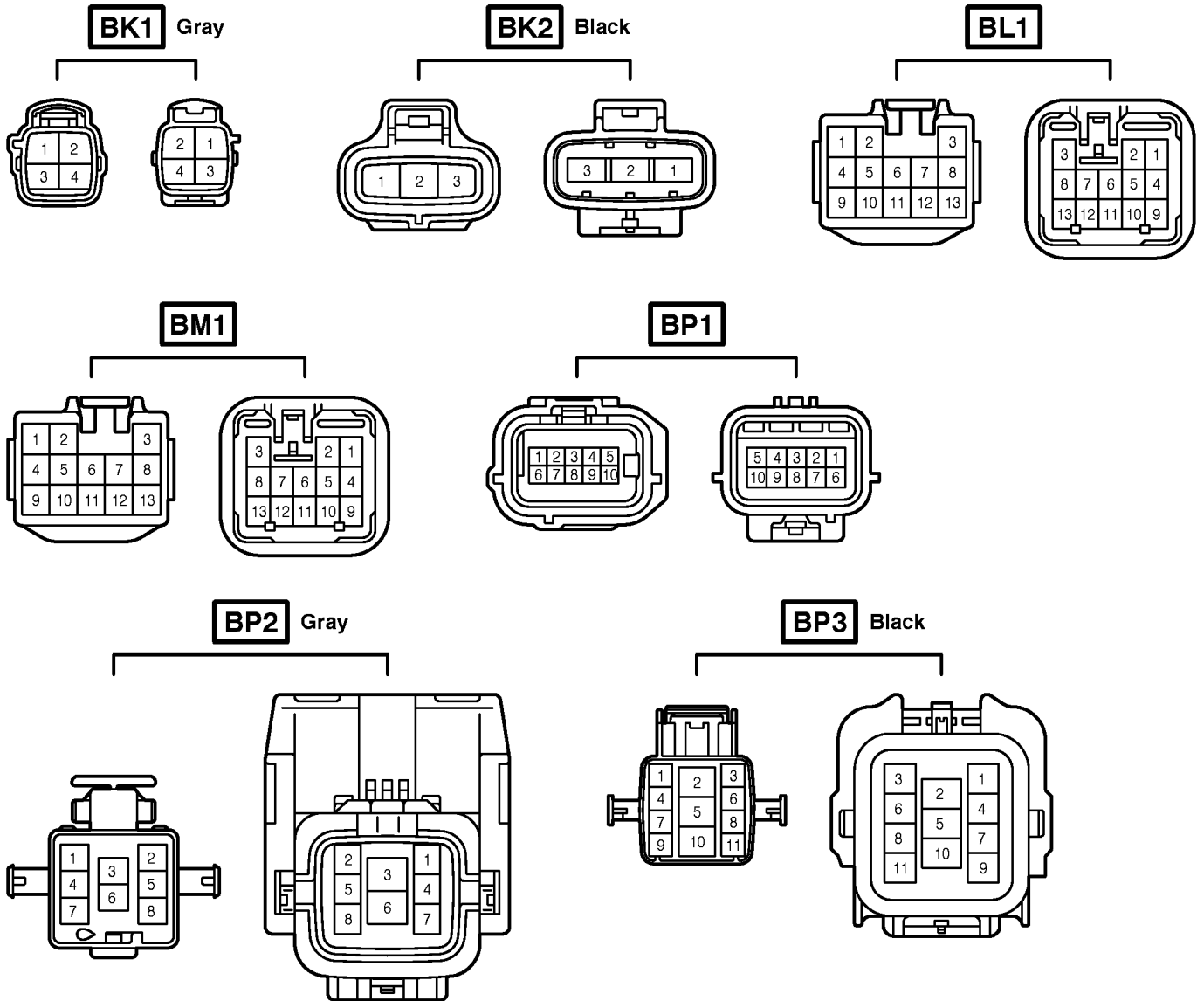
[Double Cab]



○ : Location of Splice Points



Connector Joining Wire Harness and Wire Harness

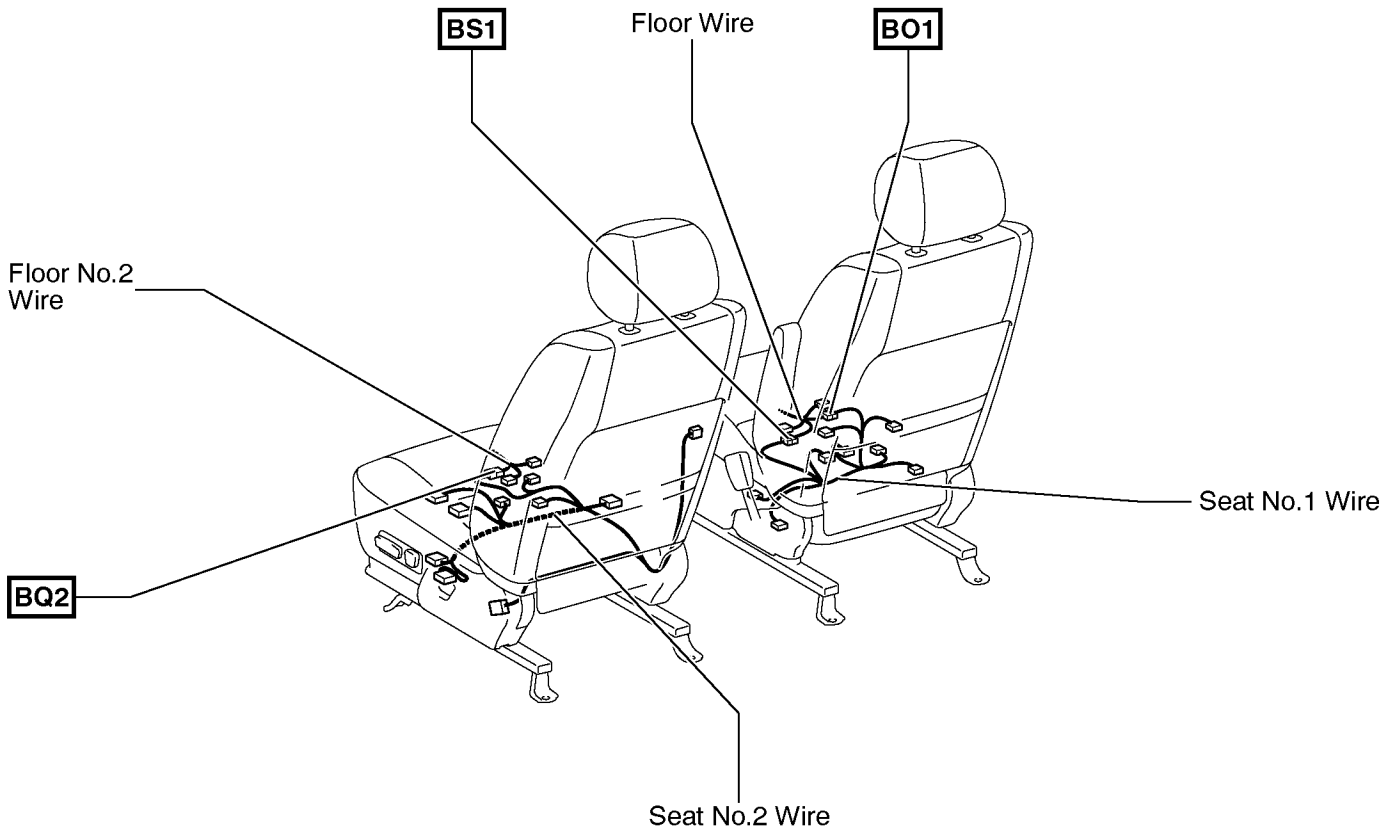


Code	Joining Wire Harness and Wire Harness (Connector Location)
BK1	Frame Wire and Frame No.3 Wire (Near the License Plate Light)
BK2	
BL1	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)
BP1	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)
BP2	
BP3	

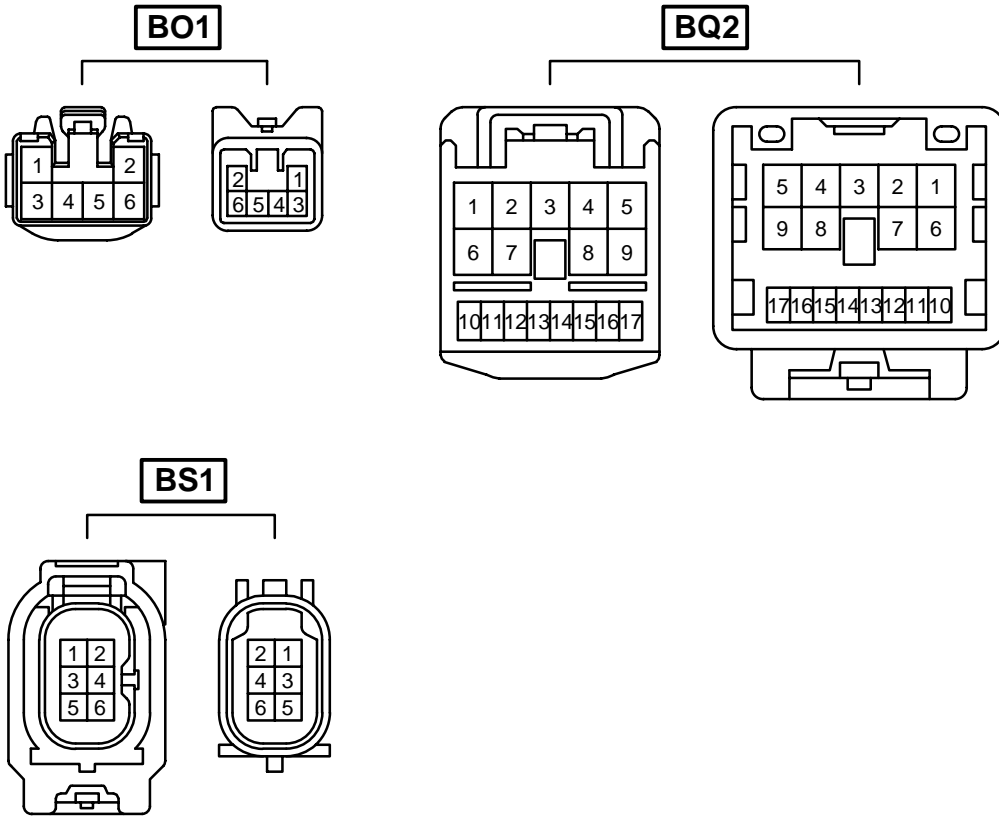
G ELECTRICAL WIRING ROUTING

□ : Location of Connector Joining Wire Harness and Wire Harness

[Double Cab]



Connector Joining Wire Harness and Wire Harness



Code	Joining Wire Harness and Wire Harness (Connector Location)
BO1	Floor Wire and Seat No.1 Wire (Under the Front Passenger's Seat)
BQ2	Floor No.2 Wire and Seat No.2 Wire (Under the Driver's Seat)
BS1	Seat No.1 Wire and Floor Wire (Under the Front Passenger's Seat)

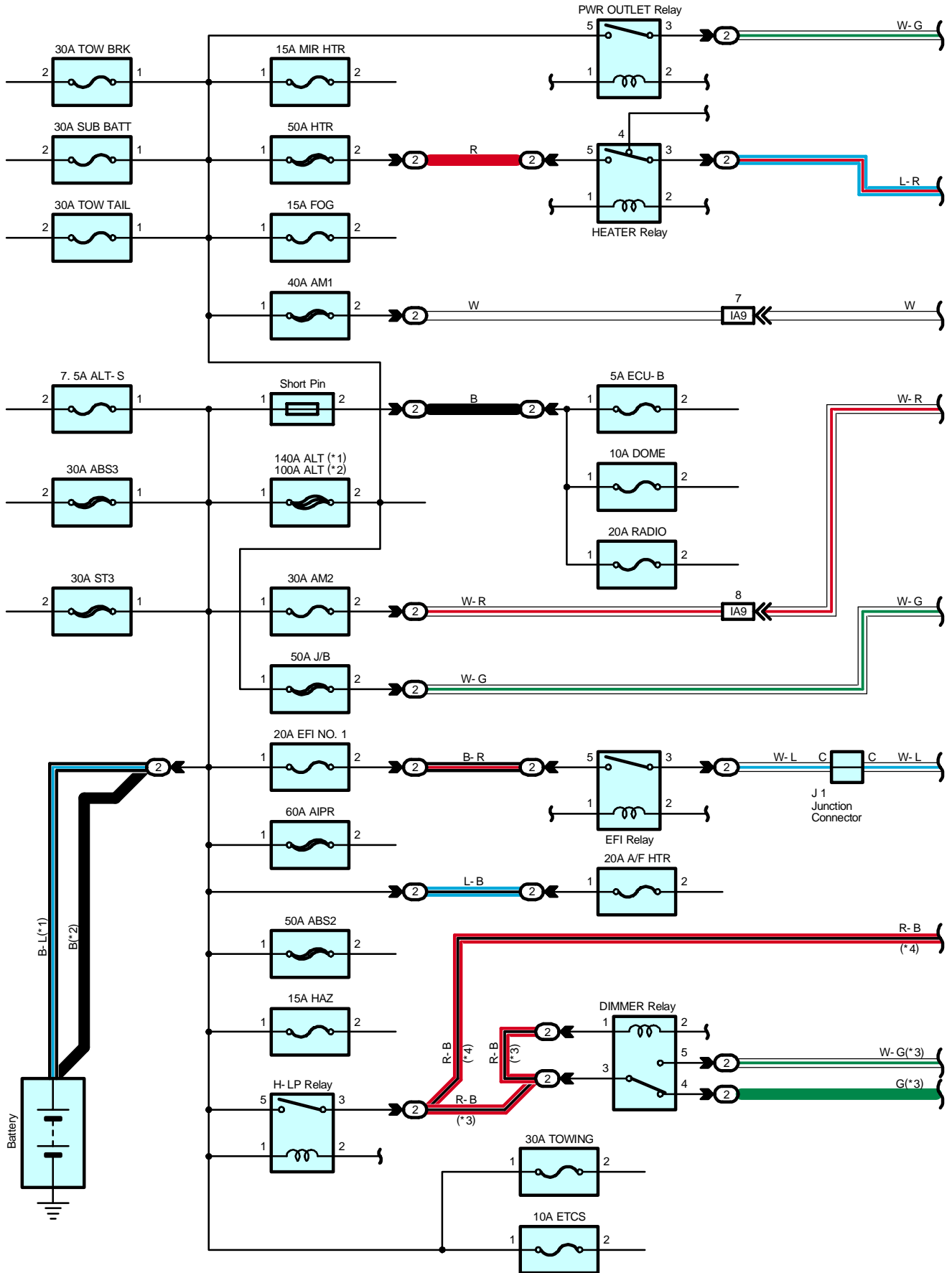
2005 TOYOTA TUNDRA ELECTRICAL WIRING DIAGRAM SYSTEM CIRCUITS

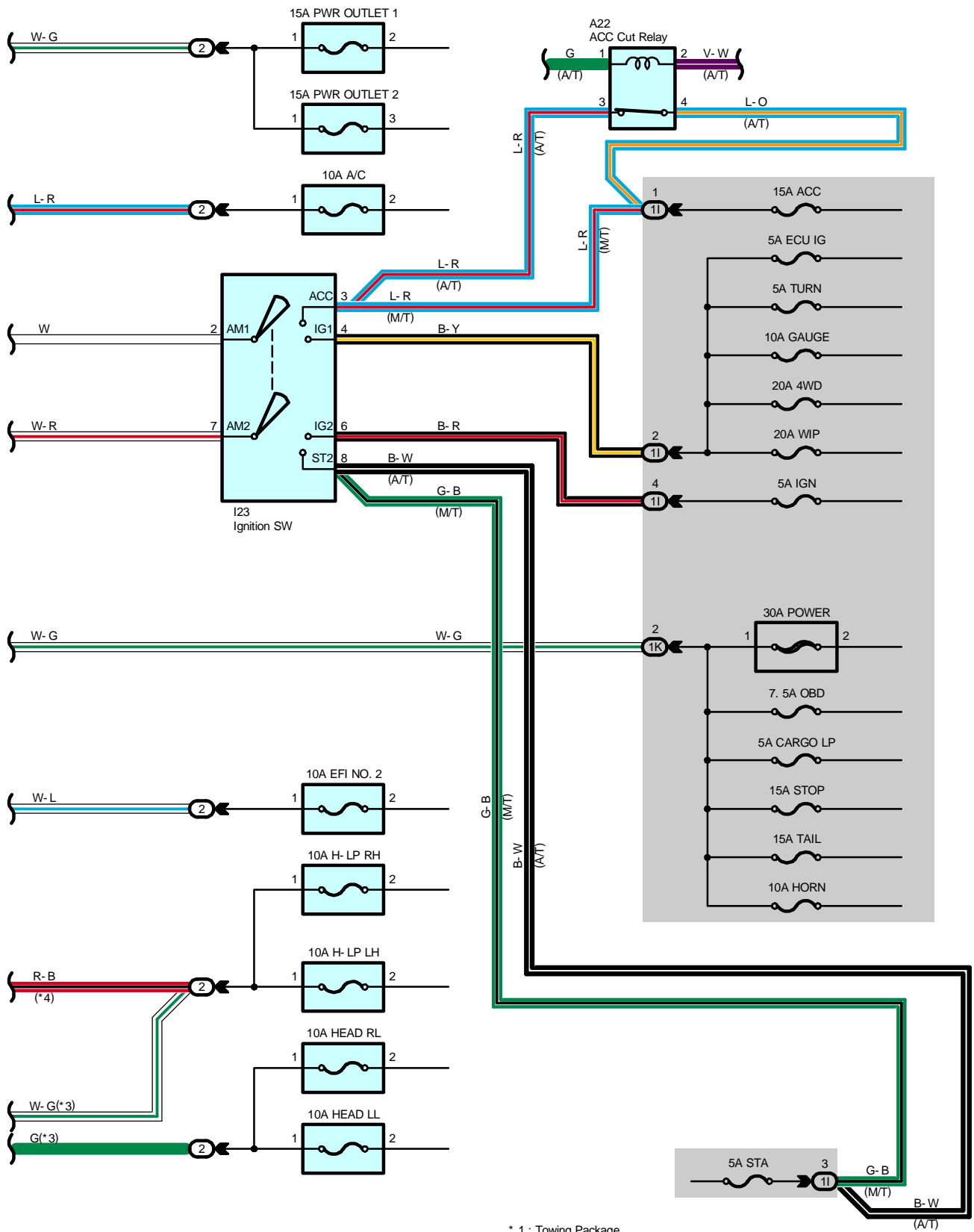
(ACCESS CAB, STANDARD CAB)

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Power Source (Access/Standard Cab)





- * 1 : Towing Package
- * 2 : Except Towing Package
- * 3 : w/ Daytime Running Light
- * 4 : w/o Daytime Running Light

Power Source (Access/Standard Cab)

Service Hints

HTR Relay

5-3 : Closed with ignition SW on and heater blower SW on

H-LP Relay

5-3 : Closed with light control SW at HEAD position or dimmer SW at FLASH position
 Closed with engine running and parking brake lever released (w/ daytime running light)

I23 Ignition SW

2-3 : Closed with ignition key at ACC or ON position
 2-4 : Closed with ignition key at ON or ST position
 7-6 : Closed with ignition key at ON or ST position

DIMMER Relay (w/ Daytime Running Light)

3-5 : Closed with HEAD relay on and dimmer SW at HIGH or FLASH position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A22	56	J1	53 (2UZ-FE)		
I23	57		55 (1GR-FE)		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

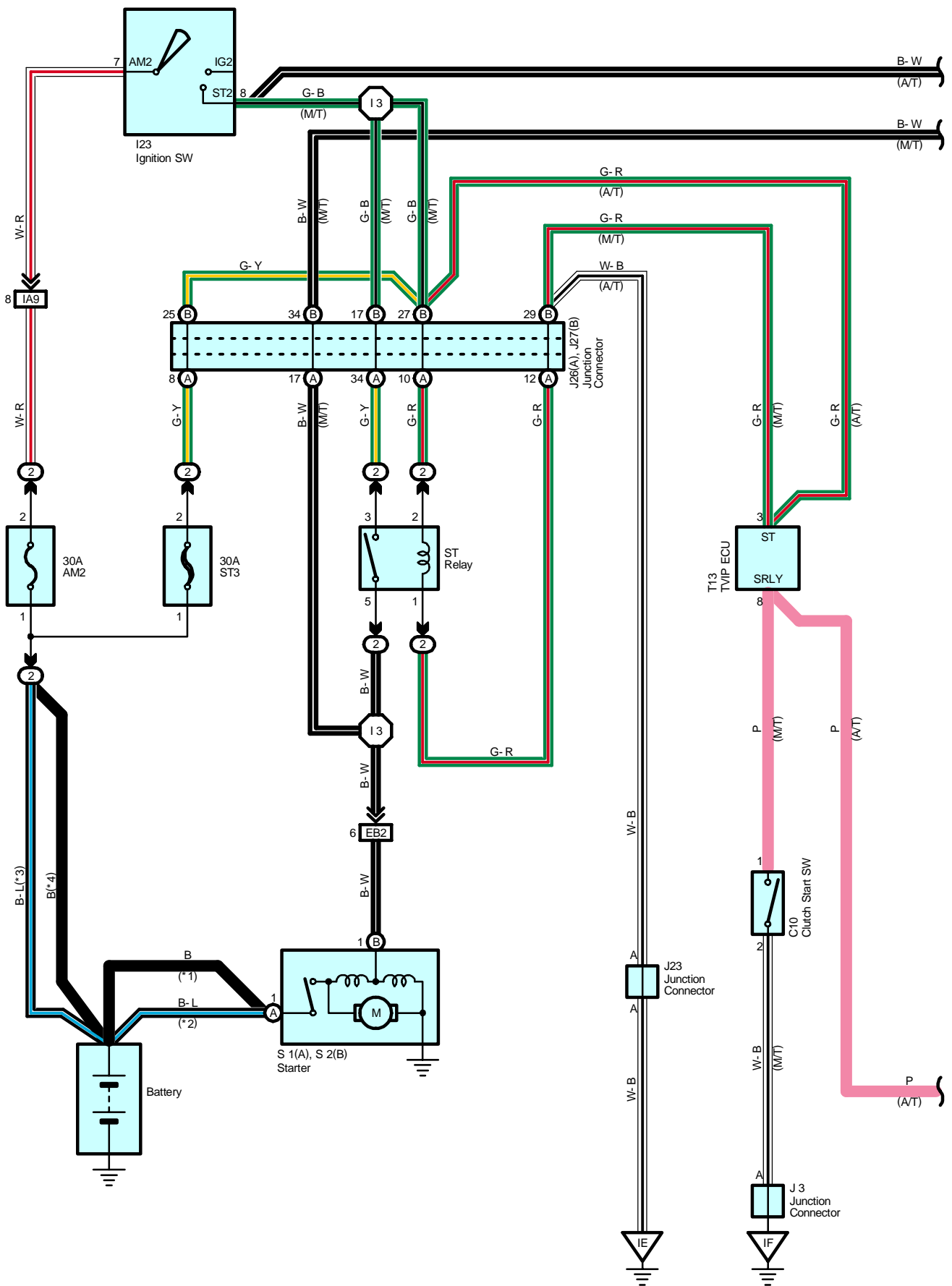
Code	See Page	Junction Block and Wire Harness (Connector Location)
1I	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1K	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

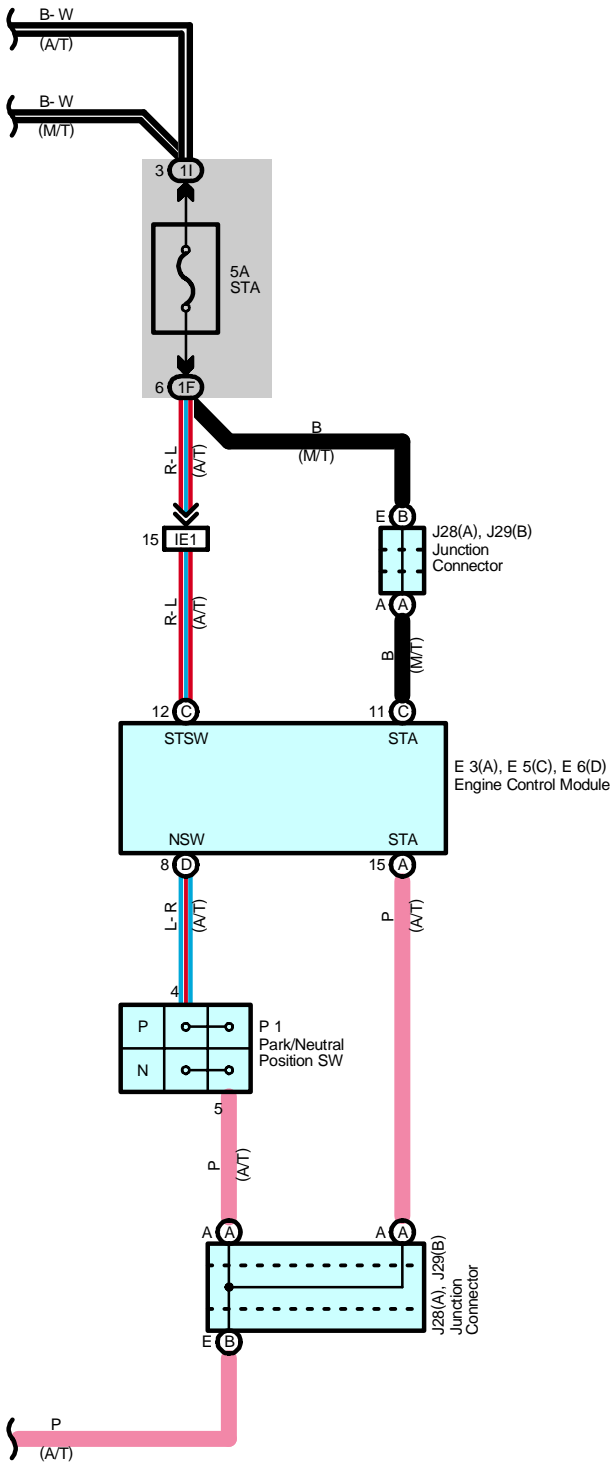
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA9	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Starting (Access/Standard Cab)



- * 1 : 1GR- FE
- * 2 : 2UZ- FE



Starting (Access/Standard Cab)

Service Hints

S1 (A), S2 (B) Starter

Points closed with Park/Neutral position SW at P or N position and ignition SW at ST position

I23 Ignition SW

7-8 : Closed with ignition SW at ST position

P1 Park/Neutral Position SW (A/T)

4-5 : Closed with A/T shift lever in P or N position

ST Relay

5-3 : Closed with Park/Neutral position SW at P or N position and ignition SW at ST position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C10	56	J23	58	P1	55 (1GR-FE)
E3	A 57	J26	A 58	S1	A 53 (2UZ-FE) 55 (1GR-FE)
E5	C 57	J27	B 58		
E6	D 57	J28	A 58	S2	B 53 (2UZ-FE) 55 (1GR-FE)
I23	57	J29	B 58		
J3	58	P1	53 (2UZ-FE)	T13	59

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1I	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB2	74 (2UZ-FE)	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
	76 (1GR-FE)	
IA9	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)

▽ : Ground Points

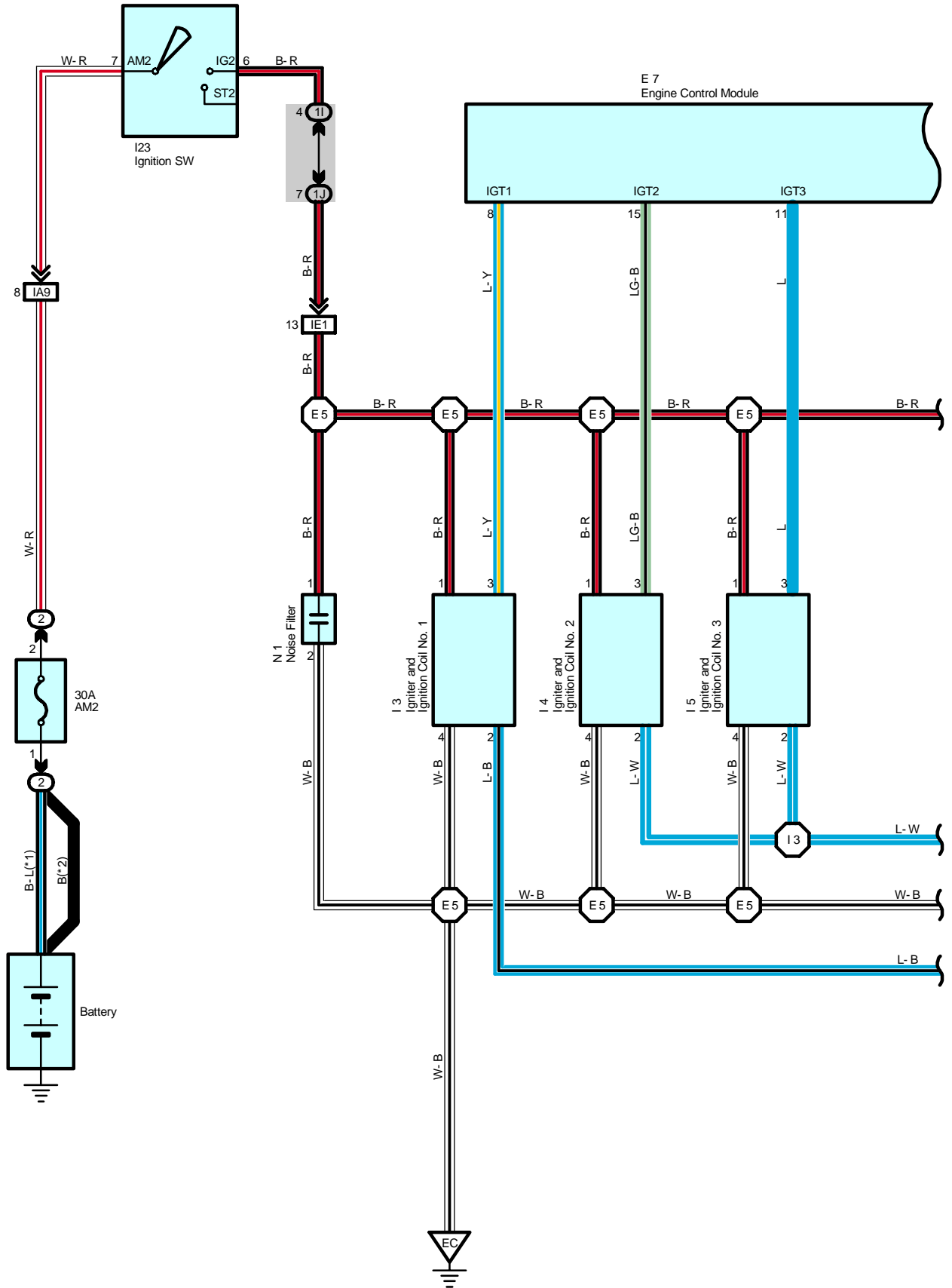
Code	See Page	Ground Points Location
IE	78	Left Kick Panel
IF		

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I3	80	Engine Wire			

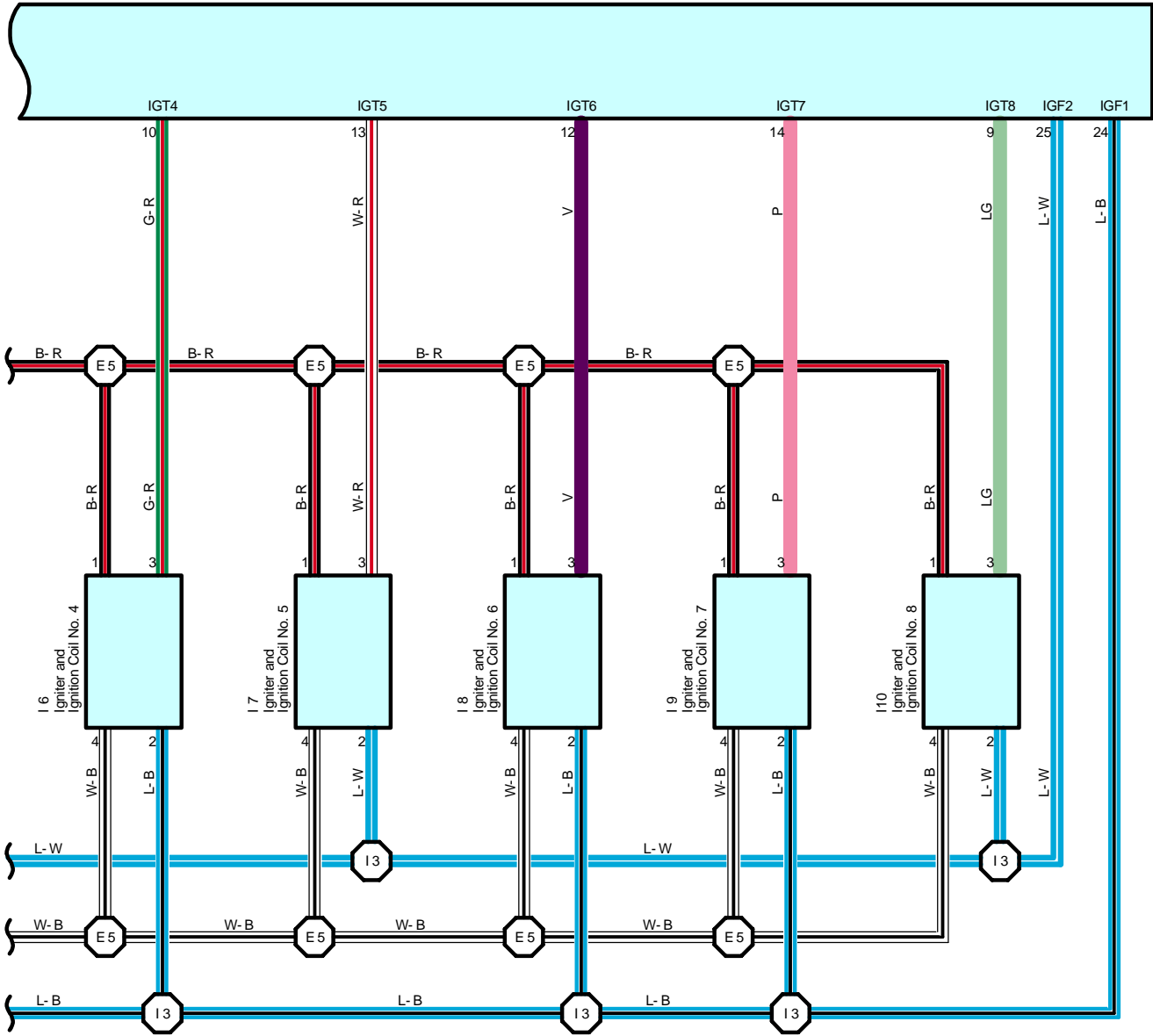
* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Ignition for 2UZ-FE (Access/Standard Cab)



- * 1 : Towing Package
- * 2 : Except Towing Package

E 7
Engine Control Module



Ignition for 2UZ-FE (Access/Standard Cab)

Service Hints

I23 Ignition SW

7-6 : Closed with ignition SW at ON or ST position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
E7	57	I6	53 (2UZ-FE)	I10	53 (2UZ-FE)
I3	53 (2UZ-FE)	I7	53 (2UZ-FE)	I23	57
I4	53 (2UZ-FE)	I8	53 (2UZ-FE)	N1	53 (2UZ-FE)
I5	53 (2UZ-FE)	I9	53 (2UZ-FE)		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1I	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1J	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA9	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)

▽ : Ground Points

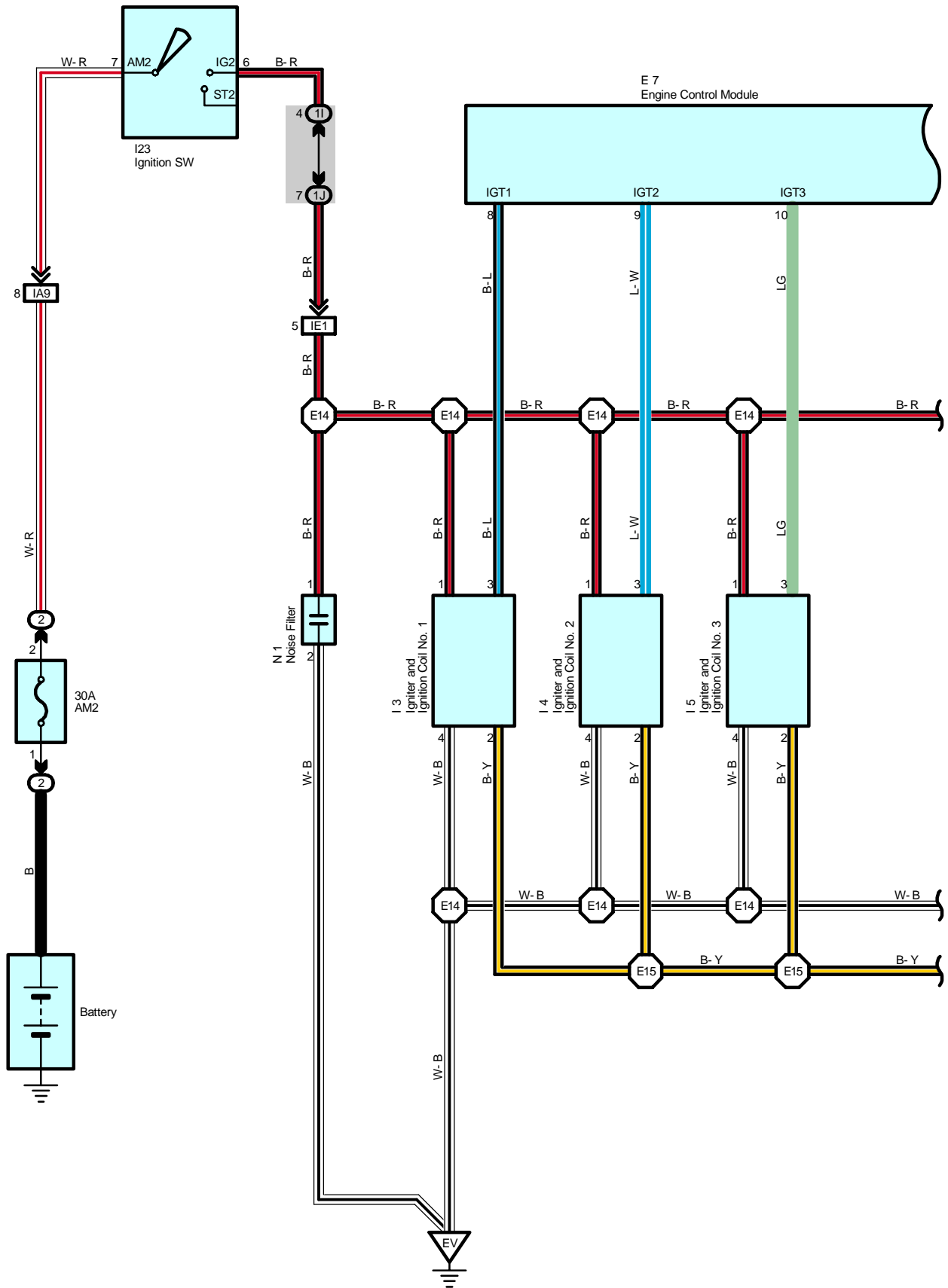
Code	See Page	Ground Points Location
EC	74 (2UZ-FE)	Rear Bank of Left Cylinder Head

○ : Splice Points

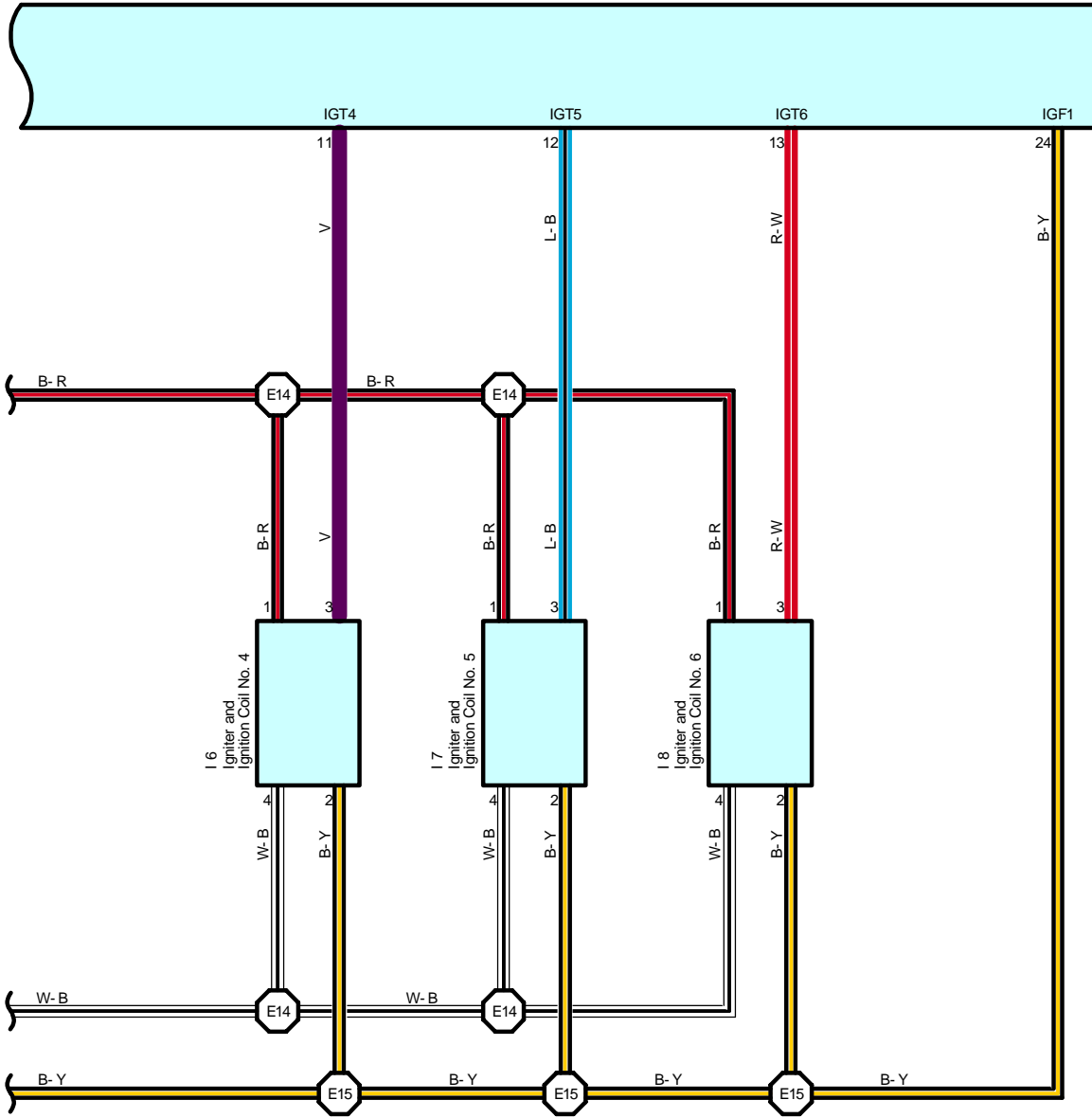
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E5	74 (2UZ-FE)	Engine Wire	I3	80	Engine Wire

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Ignition for 1GR-FE (Access/Standard Cab)



E 7
Engine Control Module



Ignition for 1GR-FE (Access/Standard Cab)

Service Hints

I23 Ignition SW

7-6 : Closed with ignition SW at ON or ST position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
E7	57	I5	55 (1GR-FE)	I8	55 (1GR-FE)
I3	55 (1GR-FE)	I6	55 (1GR-FE)	I23	57
I4	55 (1GR-FE)	I7	55 (1GR-FE)	N1	55 (1GR-FE)

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1I	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1J	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA9	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)

▽ : Ground Points

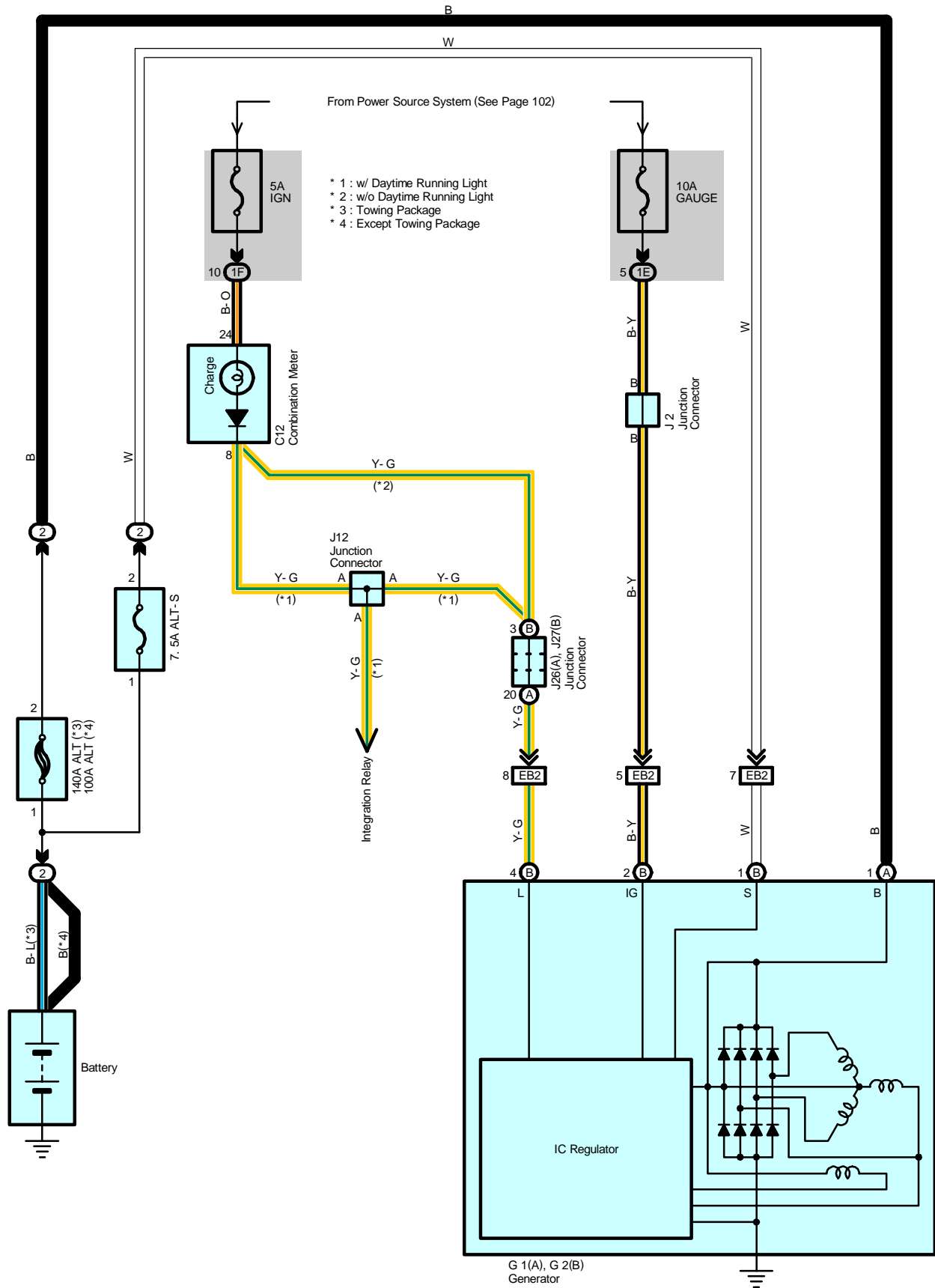
Code	See Page	Ground Points Location
EV	76 (1GR-FE)	Rear Bank of Left Cylinder Head

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E14	76 (1GR-FE)	Engine Wire	E15	76 (1GR-FE)	Engine Wire

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Charging (Access/Standard Cab)



Service Hints

G2 (B) Generator

- (B) 1-Ground : 13.9-15.1 volts with engine running at 2000 rpm and 25°C (77°F)
13.5-14.3 volts with engine running at 2000 rpm and 115°C (239°F)
- (B) 4-Ground : 0-4 volts with ignition SW at ON position and engine not running

○ : Parts Location

Code		See Page	Code		See Page	Code		See Page
C12		56	G2	B	54 (1GR-FE)	J26	A	58
G1	A	52 (2UZ-FE)	J2		53 (2UZ-FE)	J27	B	58
		54 (1GR-FE)			55 (1GR-FE)			
G2	B	52 (2UZ-FE)	J12		58			

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

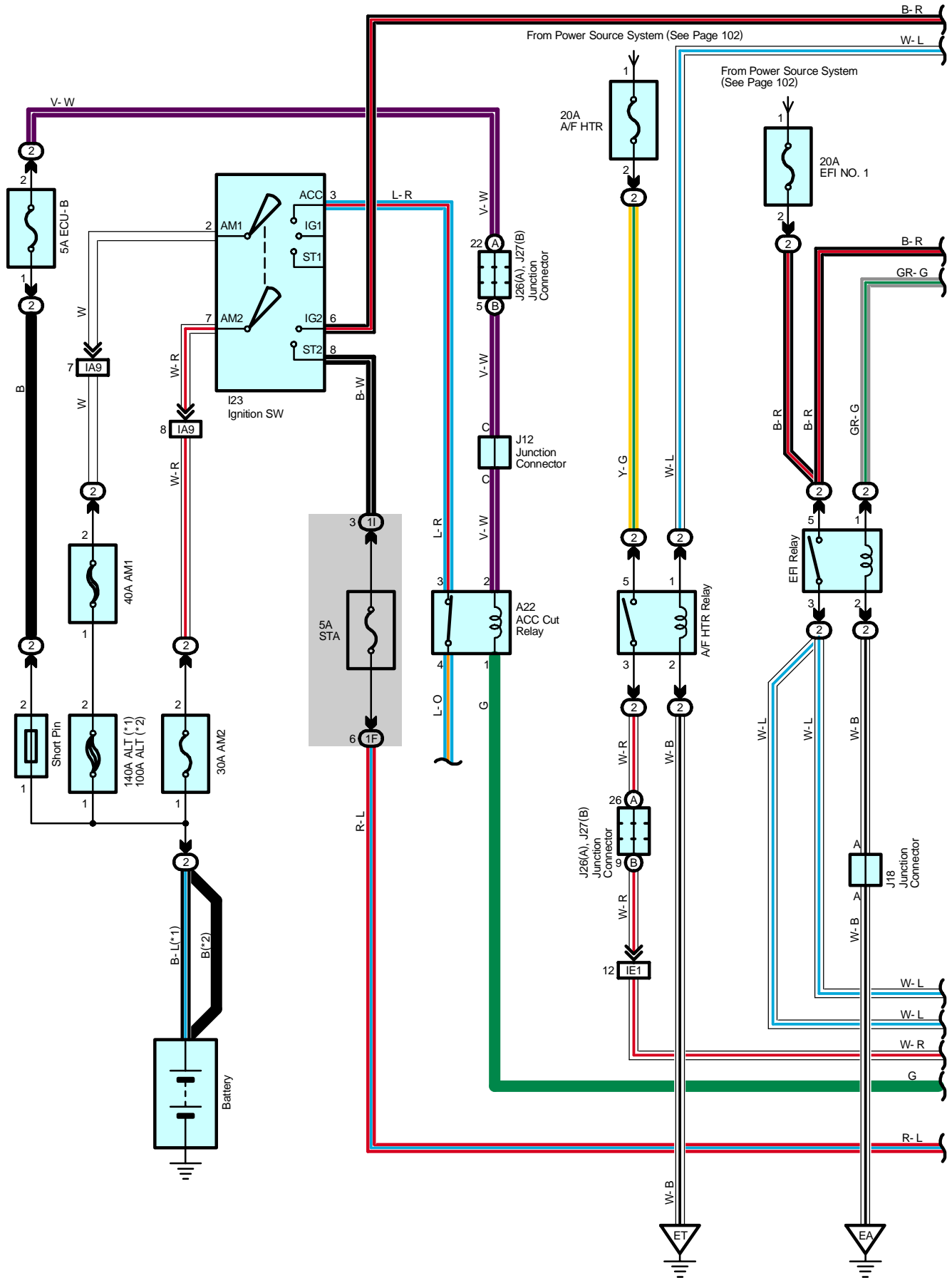
Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

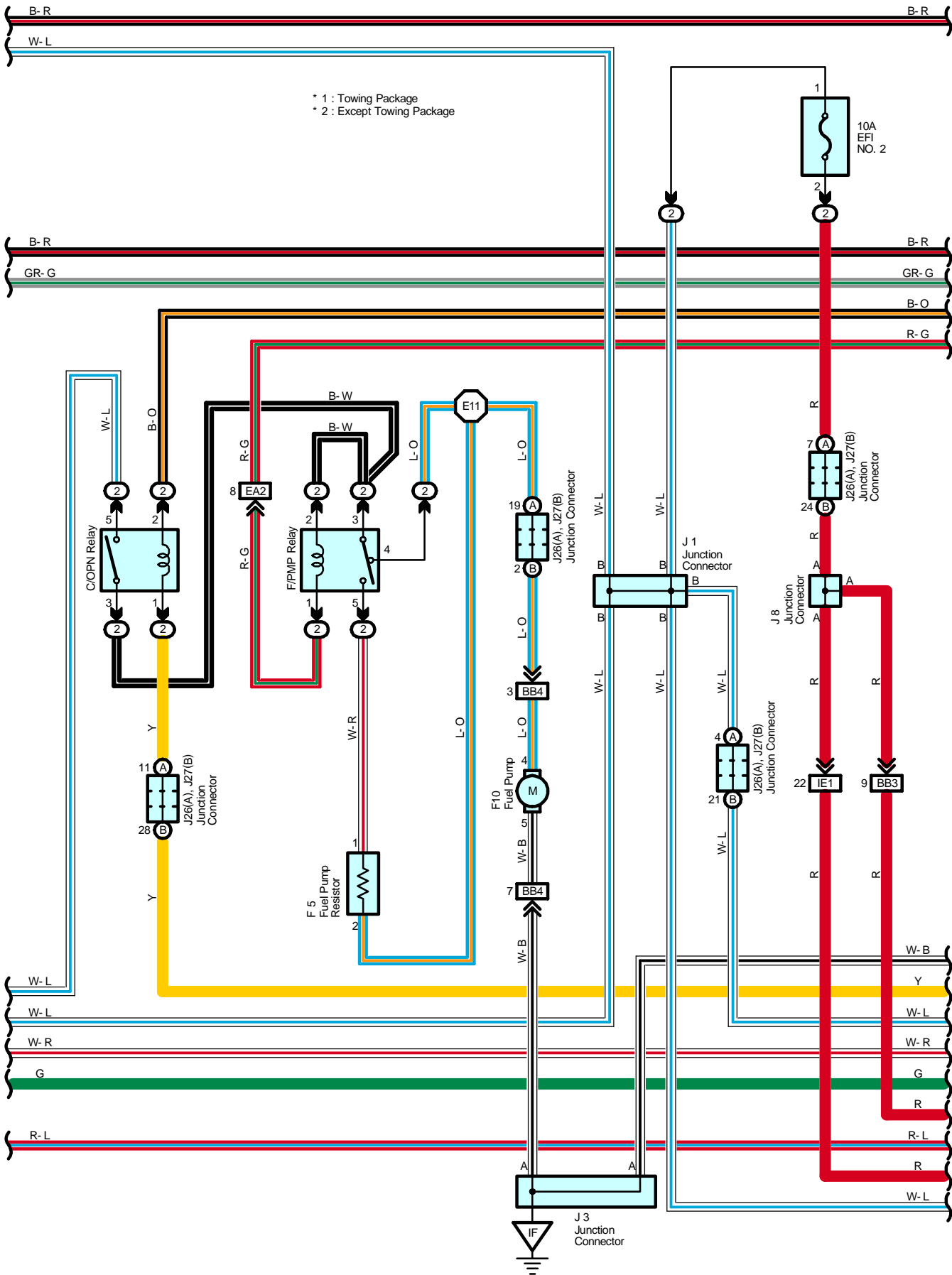
□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB2	74 (2UZ-FE)	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
	76 (1GR-FE)	

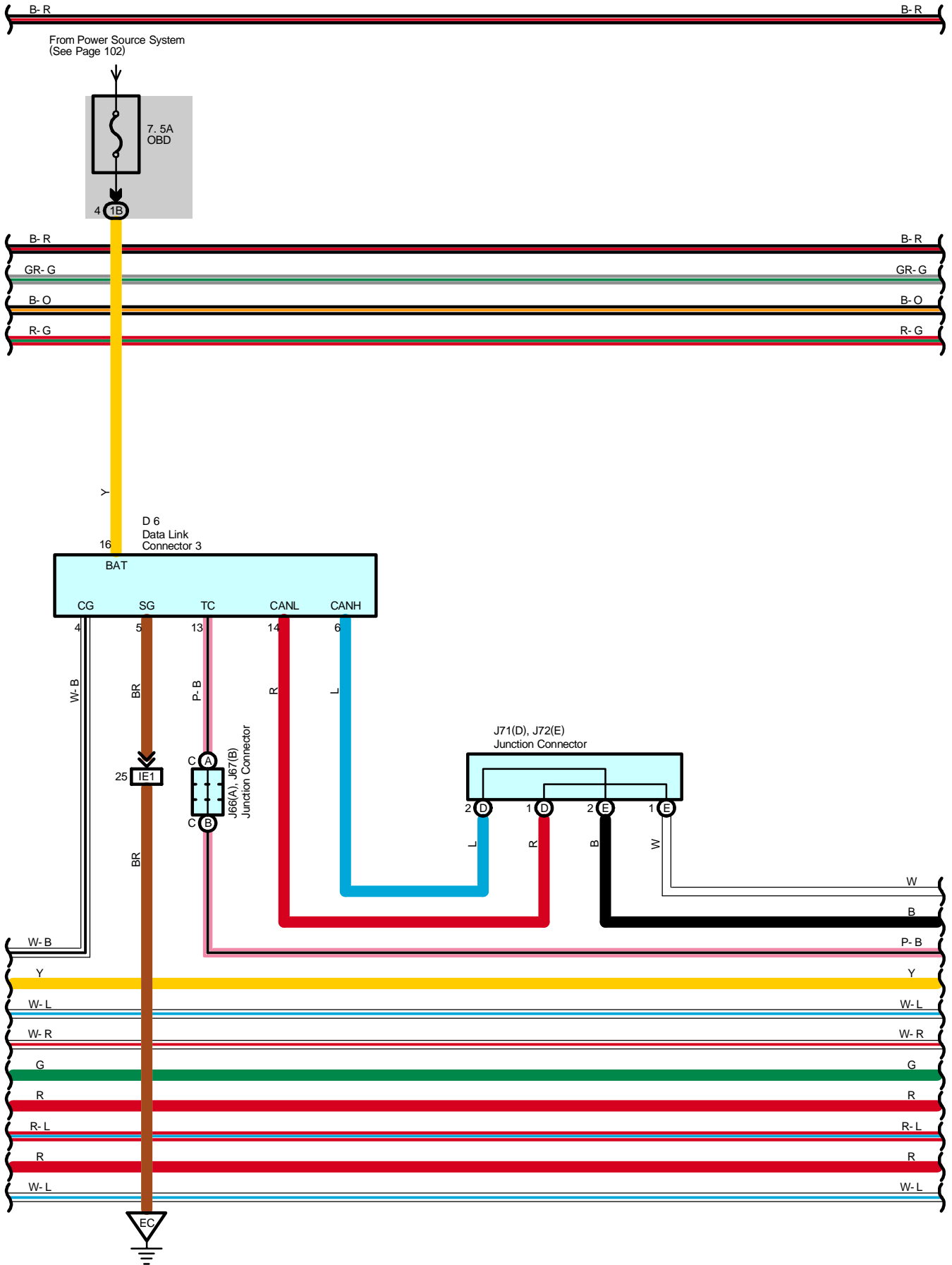
- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
- * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

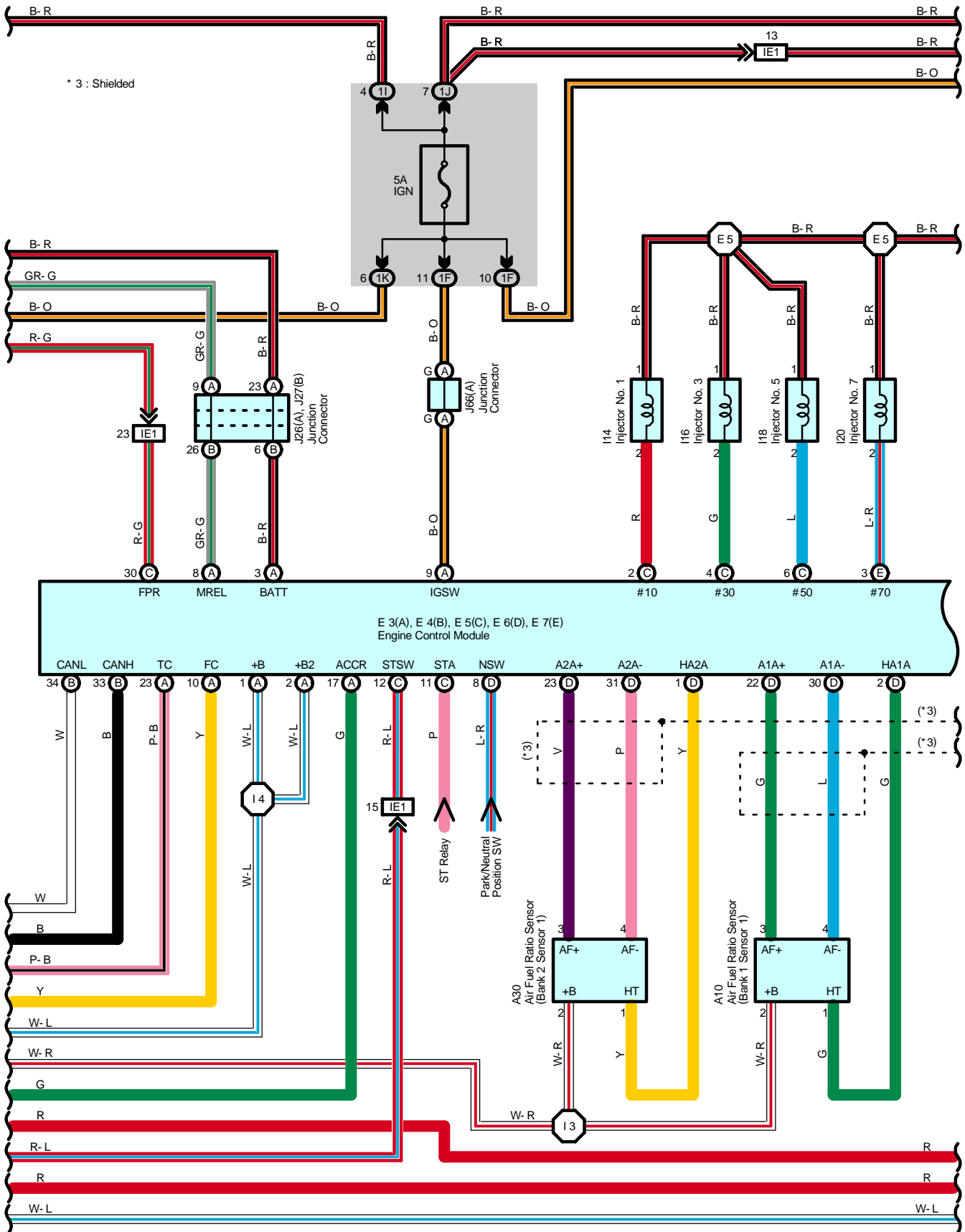
Engine Control for 2UZ-FE (Access/Standard Cab)



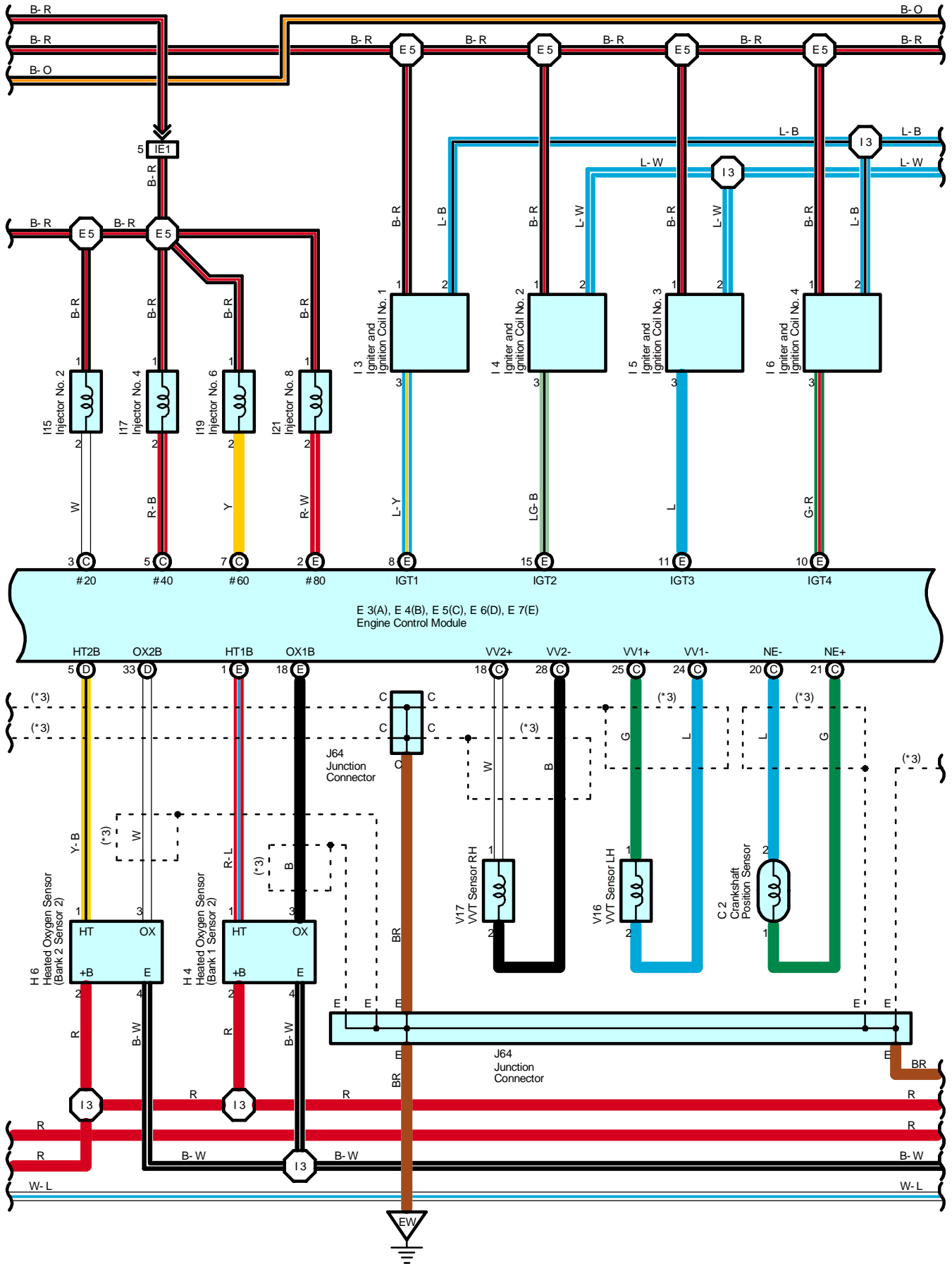


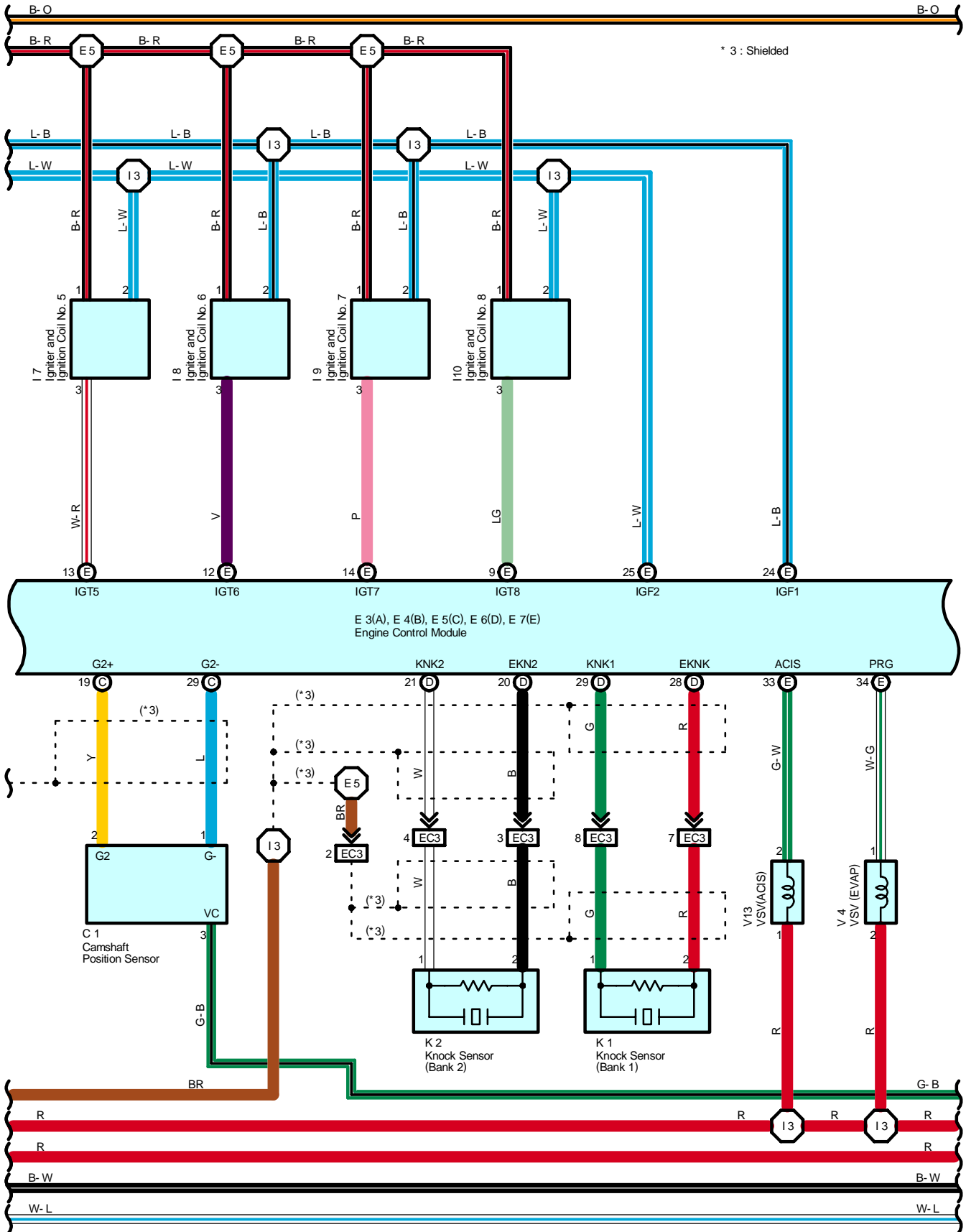
Engine Control for 2UZ-FE (Access/Standard Cab)



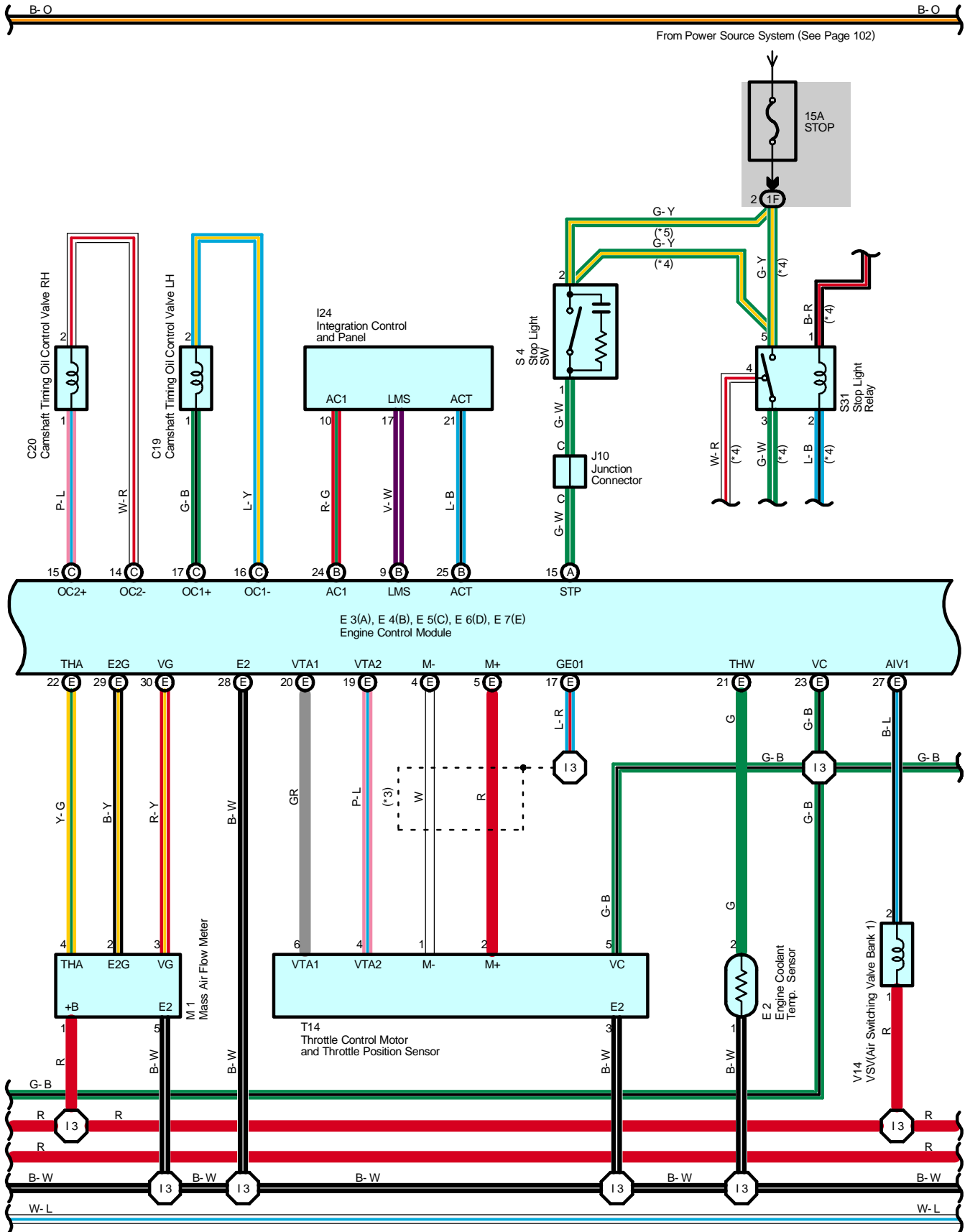


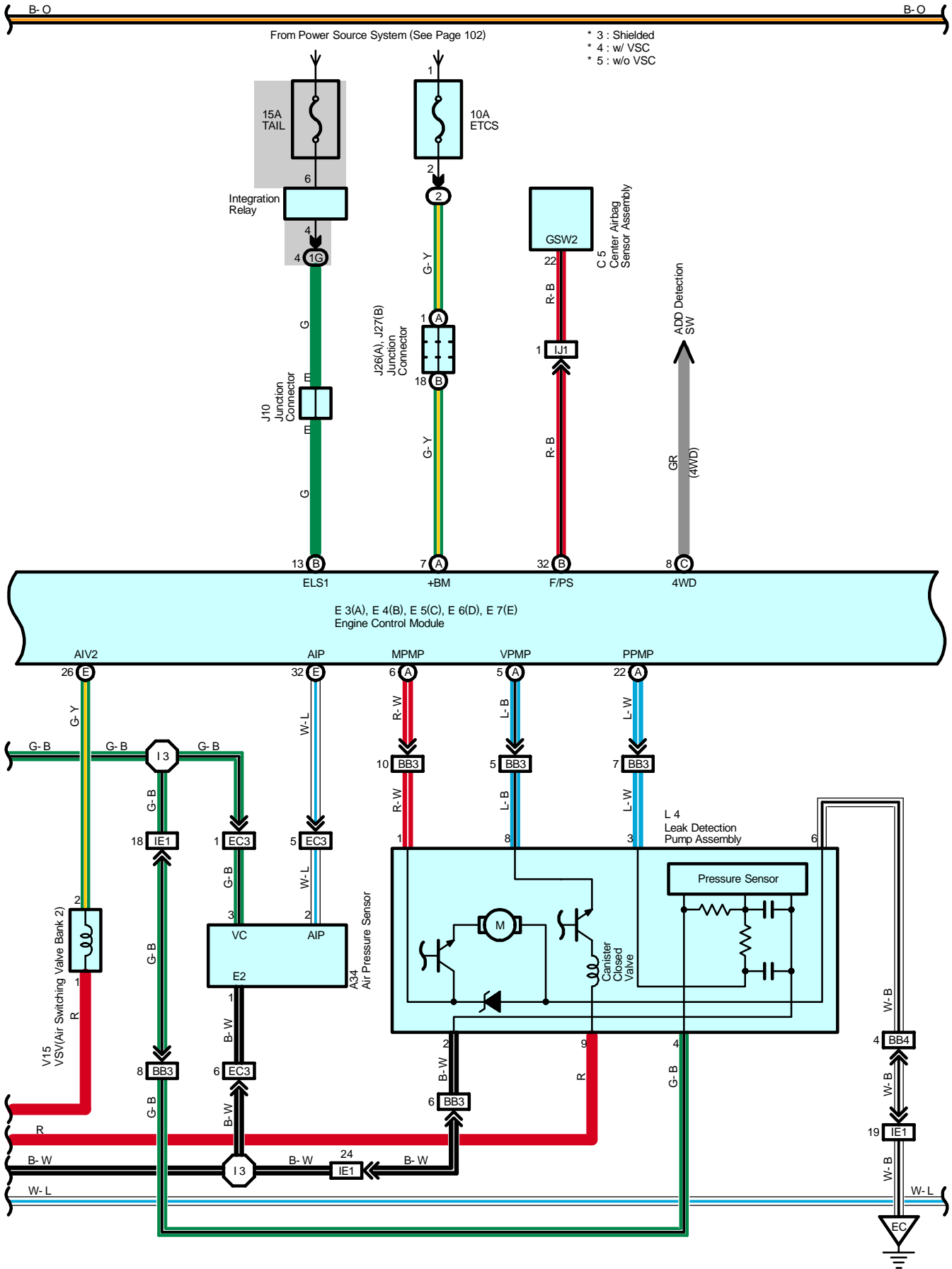
Engine Control for 2UZ-FE (Access/Standard Cab)



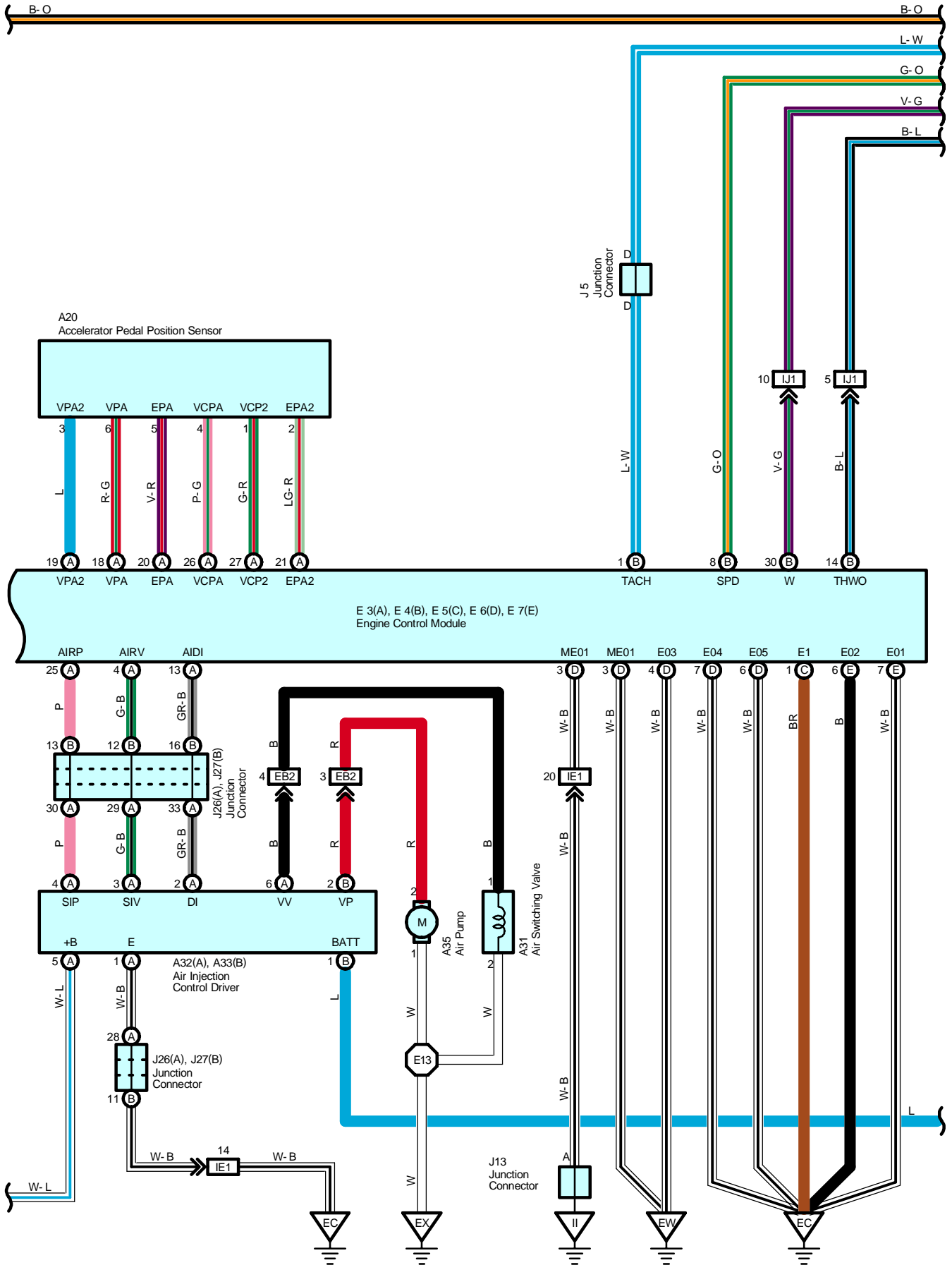


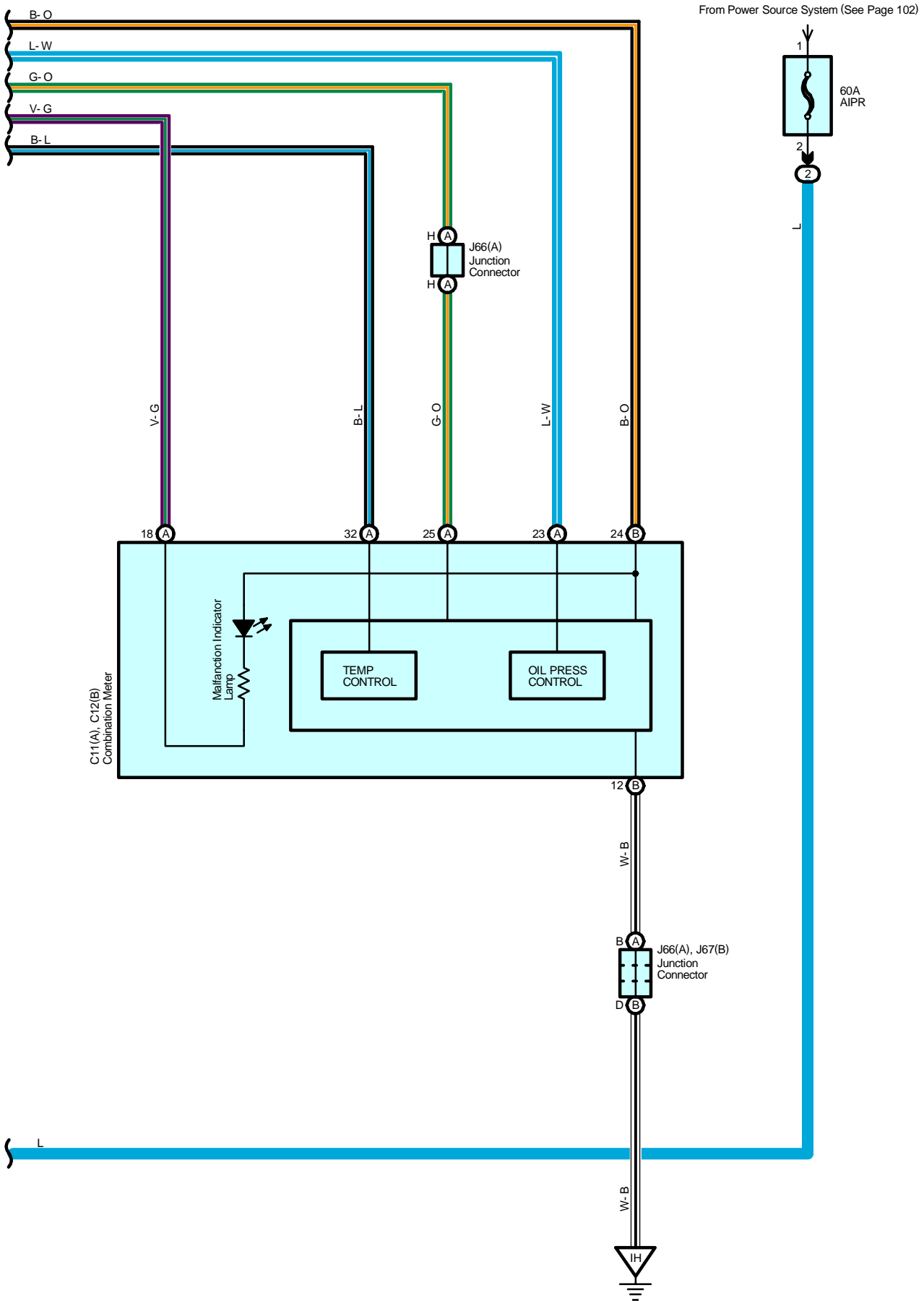
Engine Control for 2UZ-FE (Access/Standard Cab)





Engine Control for 2UZ-FE (Access/Standard Cab)





Engine Control for 2UZ-FE (Access/Standard Cab)

System Outline

The engine control system utilizes a microcomputer and maintains overall control of the engine, transmission etc. An outline of the engine control is given here.

1. Input Signals

(1) Engine coolant temp. signal circuit

The engine coolant temp. sensor detects the engine coolant temp. and has a built-in thermistor with a resistance which varies according to the engine coolant temp. The engine coolant temp. is input into TERMINAL THW of the engine control module as a control signal.

(2) Intake air temp. signal circuit

The intake air temp. sensor is installed in the mass air flow meter and detects the intake air temp., which is input as a control signal to TERMINAL THA of the engine control module.

(3) Oxygen sensor signal circuit

The oxygen density in the exhaust emission is detected and is input as a control signal from the heated oxygen sensors to TERMINALS OX1B, OX2B of the engine control module.

(4) RPM signal circuit

The camshaft position is detected by the camshaft position sensor and is input into TERMINAL G2+ of the engine control module as a control signal. Also, the engine RPM is detected by the crankshaft position sensor and the signal is input into TERMINAL NE+ of the engine control module.

(5) Throttle position sensor signal circuit

The throttle position sensor detects the throttle valve opening angle as a control signal, which is input into TERMINALS VTA1, VTA2 of the engine control module.

(6) Vehicle speed circuit

The vehicle speed sensor, detects the vehicle speed and input to the speed sensor of the skid control ECU with actuator, from skid control ECU to TERMINAL SPD of the engine control module, via combination meter.

(7) Battery signal circuit

Voltage is constantly applied to TERMINAL BATT of the engine control module. When the ignition SW is turned on, the voltage for engine control module start up power supply is applied through the EFI relay, to TERMINALS +B, +B2 of the engine control module. The current from the IGN fuse flows to TERMINAL IGSW of the engine control module, and voltage is constantly applied to TERMINAL +BM.

(8) Intake air volume signal circuit

The intake air volume is detected by the mass air flow meter, and is input as a control signal to TERMINAL VG of the engine control module.

(9) Stop light SW signal circuit

The stop light SW is used to detect whether the vehicle is braking or not, and the signal is input into TERMINAL STP of the engine control module as a control signal.

(10) Starter signal circuit

To confirm whether the engine is cranking, the voltage applied to the starter motor when the engine is cranking is detected, and is input into TERMINAL STA of the engine control module as a control signal.

(11) Engine knock signal circuit

Engine knocking is detected by the knock sensors, and is input into TERMINALS KNK1, KNK2 of the engine control module as a control signal.

2. Control System

*** SFI system**

The SFI system monitors the engine condition through the signals input from each sensors to the engine control module. The control signal is sent to the engine control module TERMINALS #10, #20, #30, #40, #50, #60, #70, #80 to operate the injector (Fuel injection). The SFI system controls the fuel injection by the engine control module in response to the driving conditions.

*** ESA system**

The ESA system monitors the engine condition through the signals input from each sensors to the engine control module. The best ignition timing is decided according to this data and the data memorized in the engine control module. The control signal is output to TERMINALS IGT1, IGT2, IGT3, IGT4, IGT5, IGT6, IGT7, IGT8, and these signals control the igniter to provide the best ignition timing.

*** Heated oxygen sensor heater control system**

The heated oxygen sensor heater control system turns the heater on when the intake air volume is low (Temp. of exhaust emission is low), and warms up the heated oxygen sensors to improve their detection performance. The engine control module evaluates the signals from each sensors, and outputs current to TERMINALS HT1B and HT2B to control the heater.

*** Air fuel ratio sensor heater control system**

The air fuel ratio sensor heater control system turns the heater on when the intake air volume is low (Temp. of exhaust emission is low) and warms up the air fuel ratio sensor to improve detection performance of the sensor.

The engine control module evaluates the signals from each sensor, current is output to TERMINALS HA1A and HA2A controlling the heater.

*** Fuel pump control system**

The engine control module supplies current to TERMINAL FPR, and controls the operation speed of the fuel pump with the F/PMP relay.

*** ETCS-i**

The ETCS-i controls the engine output at its optimal level in accordance with the opening of the accelerator pedal, under all driving conditions.

3. Diagnosis System

When there is a malfunction in the engine control module signal system, the malfunctioning system is recorded in the memory. The malfunctioning system can be found by reading the code displayed on the malfunction indicator lamp.

4. Fail-Safe System

When a malfunction has occurred in any system, there is a possibility of causing engine trouble due to continued control based on that system. In that case, the fail-safe system either controls the system using the data (Standard values) recorded in the engine control module memory, or else stops the engine.

Engine Control for 2UZ-FE (Access/Standard Cab)

Service Hints

EFI Relay

5-3 : Closed with ignition SW at ON or ST position

C/OPN Relay

5-3 : Closed with starter cranking or engine cranking

E2 Engine Coolant Temp. Sensor

1-2 : Approx. 16.2 k Ω (-20°C, -4°F)

: Approx. 2.45 k Ω (20°C, 68°F)

: Approx. 0.32 k Ω (80°C, 176°F)

E3 (A), E4 (B), E5 (C), E6 (D), E7 (E) Engine Control Module

BATT-E1 : Always 9.0-14.0 volts

+BM-E1 : Always 9.0-14.0 volts

IGSW-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

+B, +B2-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

VC-E1 : 4.5-5.5 volts with ignition SW at ON or ST position

VTA2-E1 : 2.0-2.9 volts with ignition SW on and throttle valve fully closed

: 4.7-5.1 volts with ignition SW on and throttle valve fully open

VTA1-E1 : 0.4-1.0 volts with ignition SW on and throttle valve fully closed

: 3.2-4.8 volts with ignition SW on and throttle valve fully open

VPA-E1 : 0.3-0.9 volts with ignition SW on and throttle valve fully closed

: 3.2-4.8 volts with ignition SW on and throttle valve fully open

VPA2-E1 : 1.8-2.7 volts with ignition SW on and throttle valve fully closed

: 4.7-5.1 volts with ignition SW on and throttle valve fully open

THA-E1 : 0.5-3.4 volts with idling, intake air temp. 0°C (32°F) -80°C (176°F)

THW-E1 : 0.2-1.0 volts with idling, engine coolant temp. 60°C (140°F) -120°C (248°F)

STA-E1 : 6.0 volts or more with engine cranking

W-E1 : 9.0-14.0 volts with idling and malfunction indicator lamp off

SPD-E1 : Pulse generation with vehicle moving

STP-E1 : 7.5-14.0 volts with brake pedal depressed

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A10	52 (2UZ-FE)	F10	61 (*4)	J10	58
A20	56	H4	52 (2UZ-FE)	J12	58
A22	56	H6	52 (2UZ-FE)	J18	53 (2UZ-FE)
A30	52 (2UZ-FE)	I3	53 (2UZ-FE)	J26	A 58
A31	52 (2UZ-FE)	I4	53 (2UZ-FE)	J27	B 58
A32	A 52 (2UZ-FE)	I5	53 (2UZ-FE)	J64	58
A33	B 52 (2UZ-FE)	I6	53 (2UZ-FE)	J66	A 58
A34	52 (2UZ-FE)	I7	53 (2UZ-FE)	J67	B 58
A35	52 (2UZ-FE)	I8	53 (2UZ-FE)	J71	D 58
C1	52 (2UZ-FE)	I9	53 (2UZ-FE)	J72	E 58
C2	52 (2UZ-FE)	I10	53 (2UZ-FE)	K1	53 (2UZ-FE)
C5	56	I14	53 (2UZ-FE)	K2	53 (2UZ-FE)
C11	A 56	I15	53 (2UZ-FE)	L4	60 (*3)
C12	B 56	I16	53 (2UZ-FE)		61 (*4)
C19	52 (2UZ-FE)	I17	53 (2UZ-FE)	M1	53 (2UZ-FE)
C20	52 (2UZ-FE)	I18	53 (2UZ-FE)	S4	59
D6	57	I19	53 (2UZ-FE)	S31	59
E2	52 (2UZ-FE)	I20	53 (2UZ-FE)	T14	53 (2UZ-FE)
E3	A 57	I21	53 (2UZ-FE)	V4	53 (2UZ-FE)
E4	B 57	I23	57	V13	53 (2UZ-FE)
E5	C 57	I24	57	V14	53 (2UZ-FE)
E6	D 57	J1	53 (2UZ-FE)	V15	53 (2UZ-FE)
E7	E 57	J3	58	V16	53 (2UZ-FE)
F5	52 (2UZ-FE)	J5	58	V17	53 (2UZ-FE)
F10	60 (*3)	J8	58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	
	28 (*1)	
1G	24 (*2)	
	28 (*1)	
1I	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	
1K	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Engine Control for 2UZ-FE (Access/Standard Cab)

: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA2	74 (2UZ-FE)	Cowl Wire and Engine Room Main Wire (Right Fender)
EB2	74 (2UZ-FE)	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
EC3	74 (2UZ-FE)	Engine No.2 Wire and Engine Wire (Near the Starter)
IA9	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)
BB3	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	
BB4	82 (*3)	
	84 (*4)	

: Ground Points

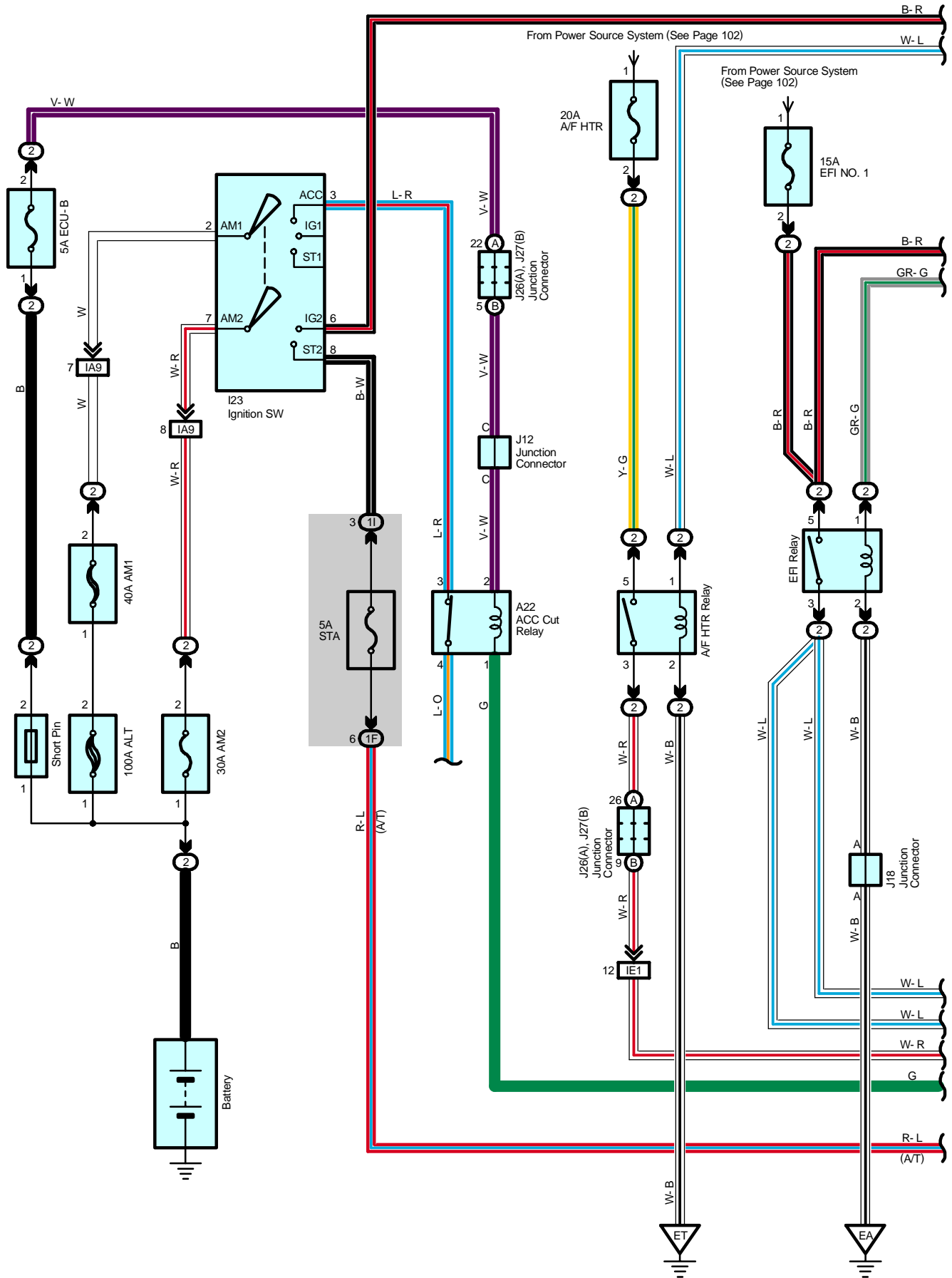
Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
EC	74 (2UZ-FE)	Rear Bank of Left Cylinder Head
ET	74 (2UZ-FE)	Front Right Fender
EW	74 (2UZ-FE)	Front Left Side of Cylinder Head
EX	74 (2UZ-FE)	Left Side of Cylinder Block
IF	78	Left Kick Panel
IH	78	Right Kick Panel

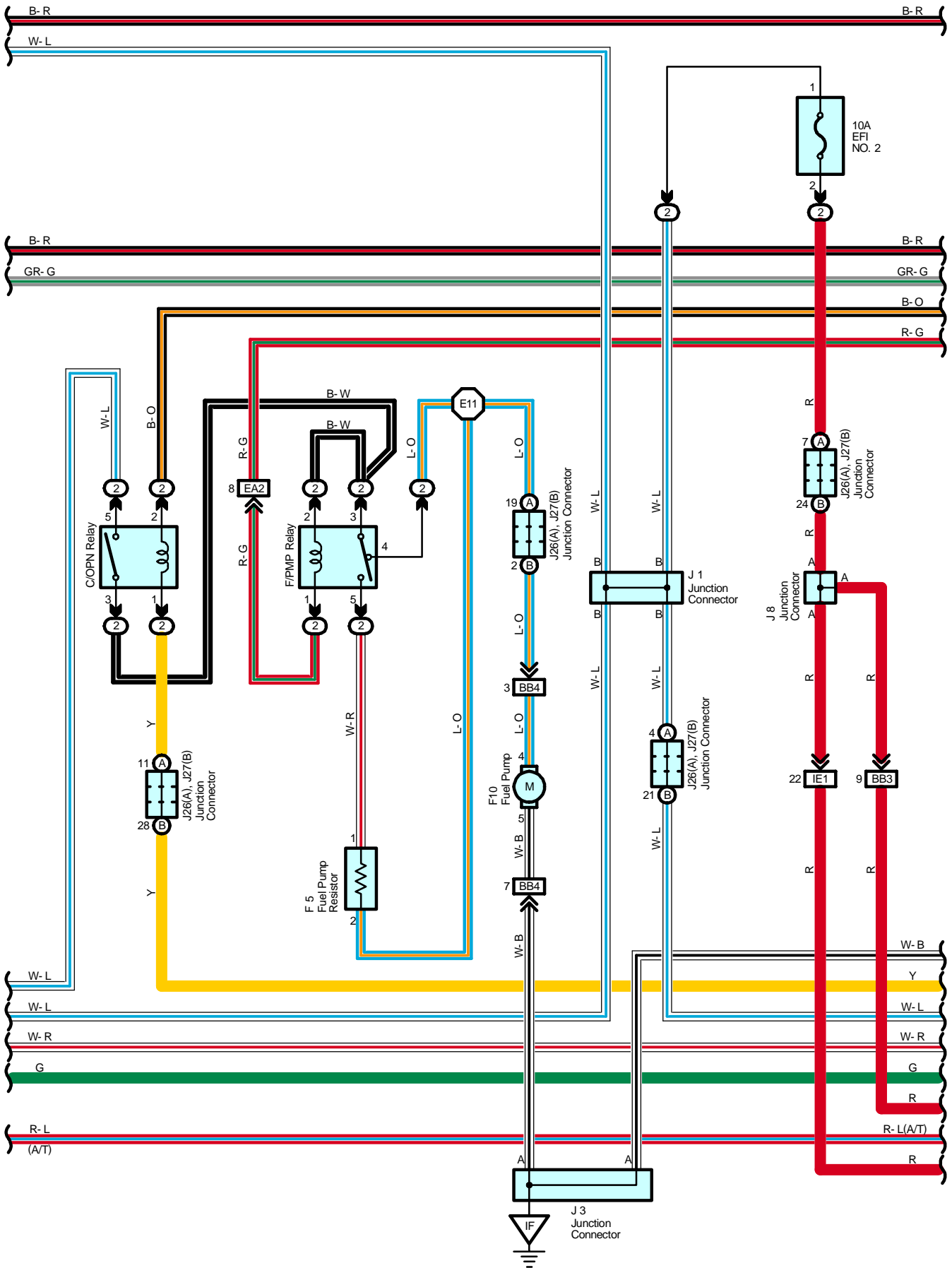
: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E5	74 (2UZ-FE)	Engine Wire	I3	80	Engine Wire
E11	74 (2UZ-FE)	Engine Room Main Wire	I4	80	Cowl Wire
E13	74 (2UZ-FE)	Engine No.2 Wire			

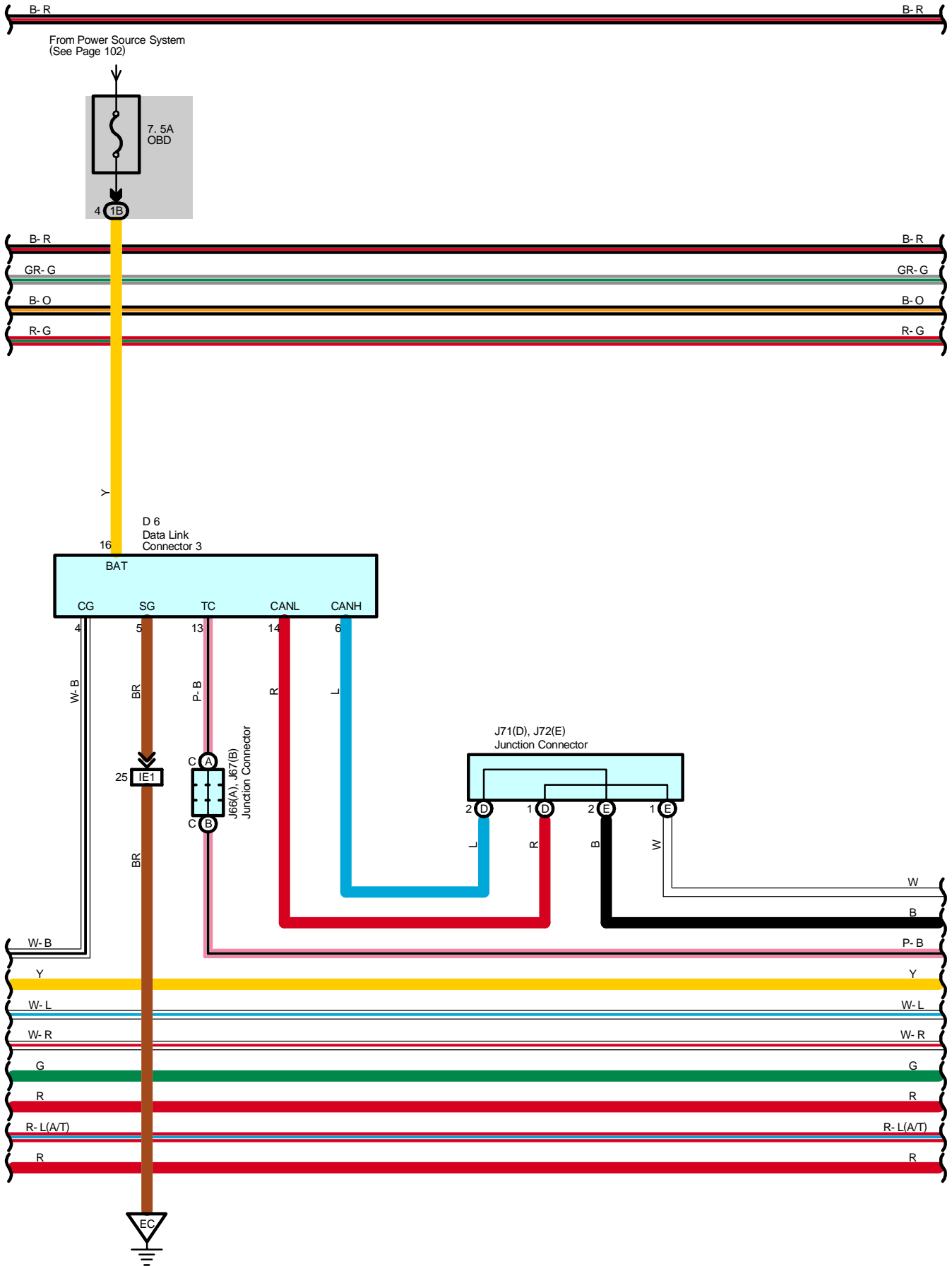
* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

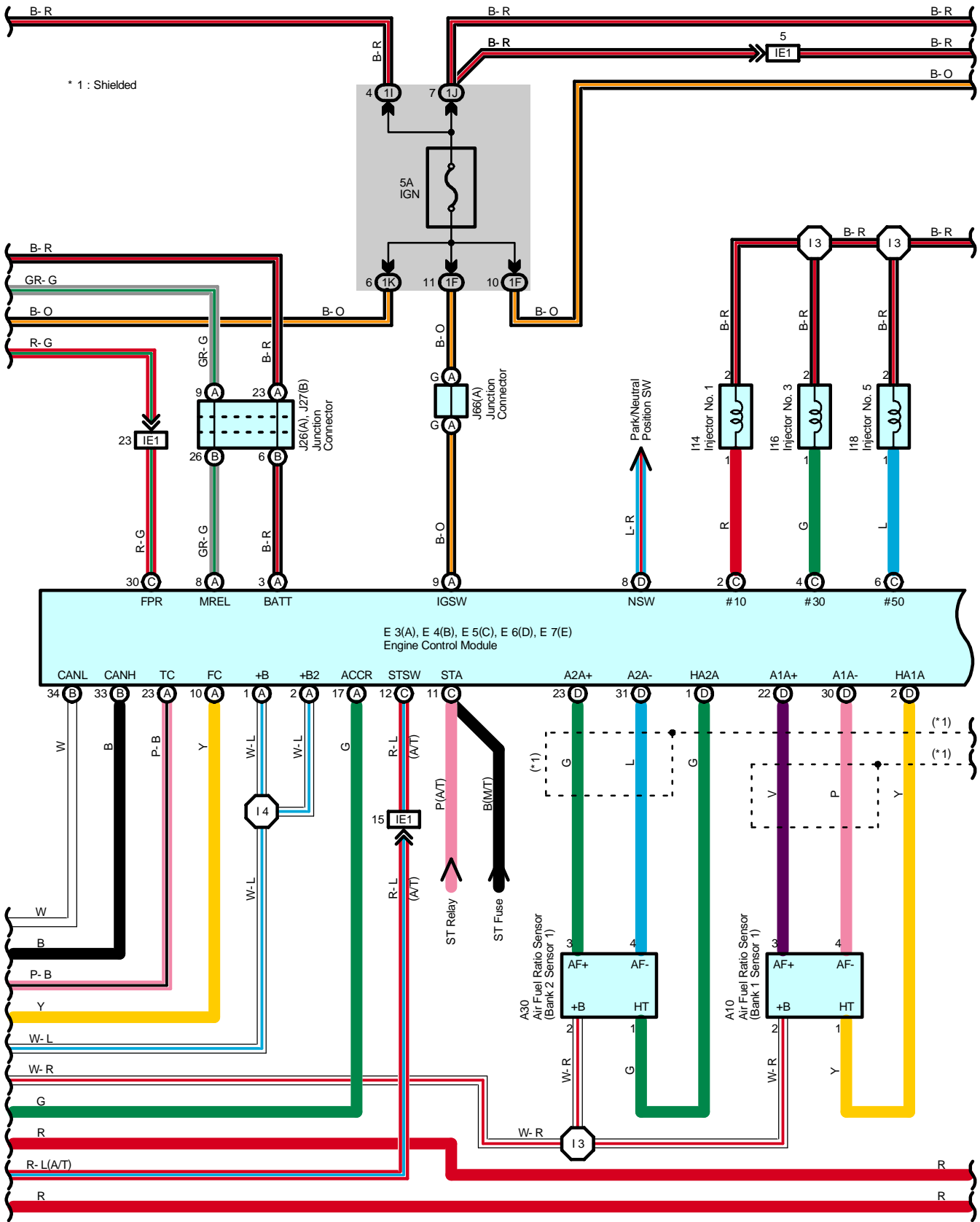
Engine Control for 1GR-FE (Access/Standard Cab)



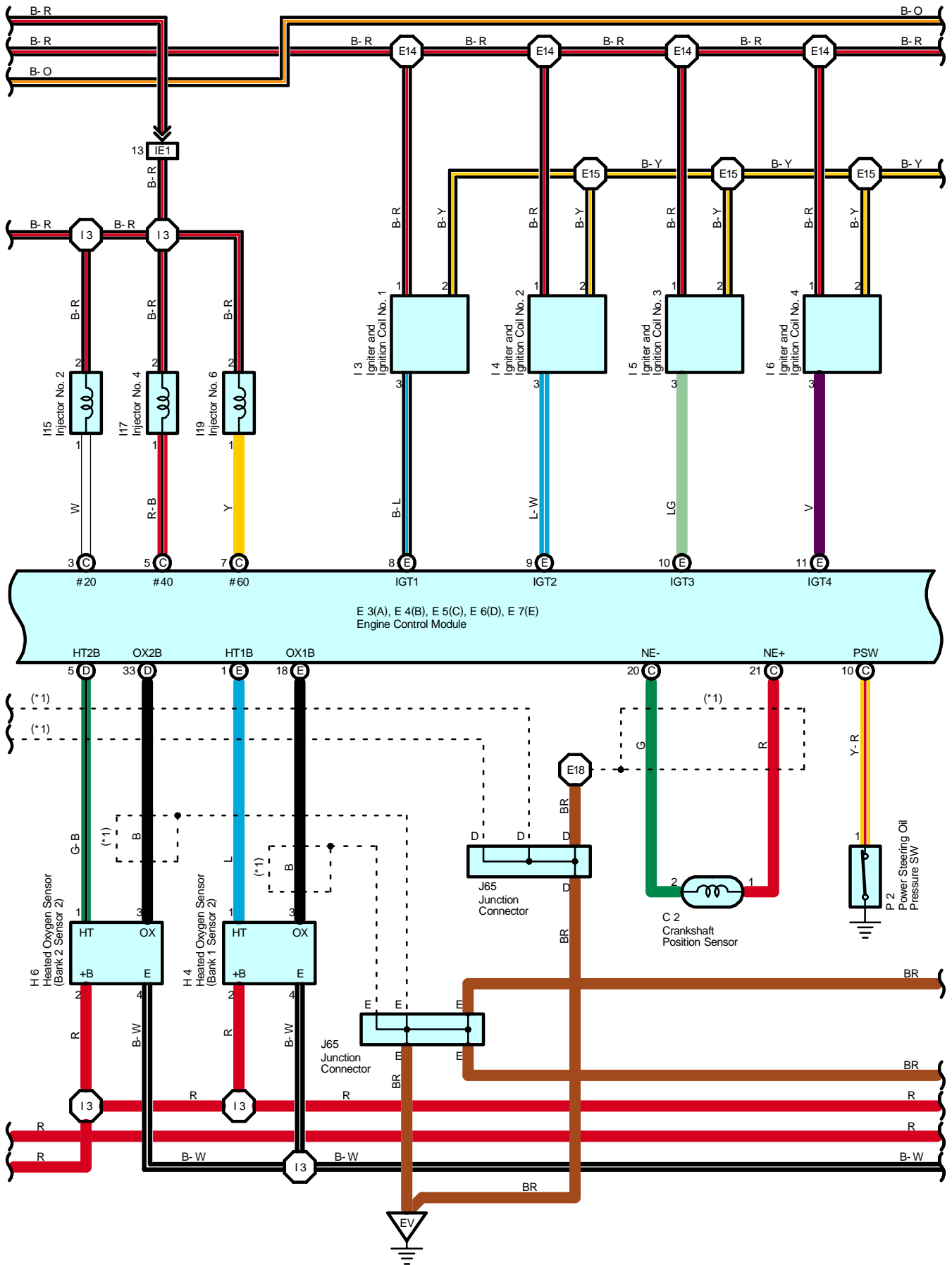


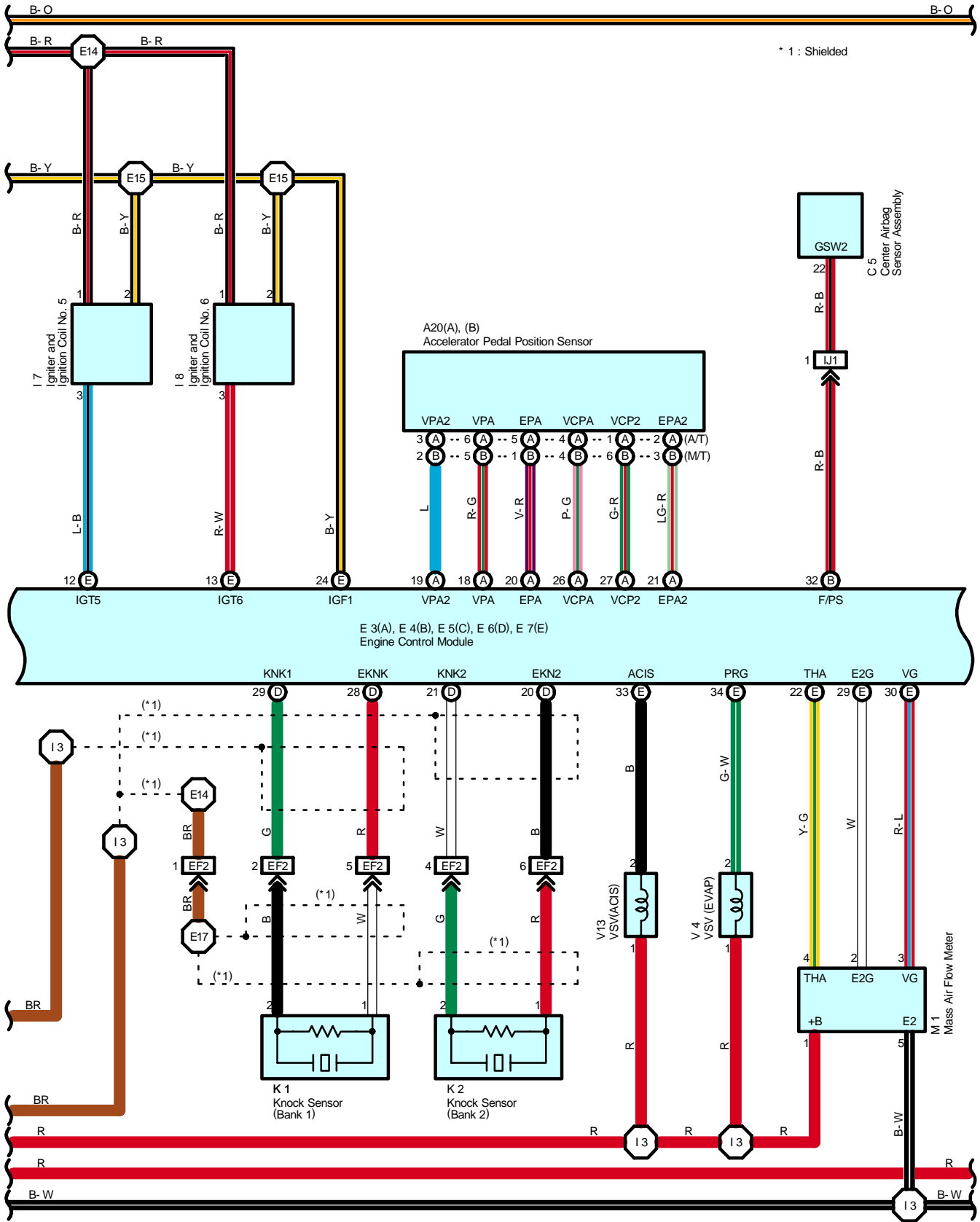
Engine Control for 1GR-FE (Access/Standard Cab)



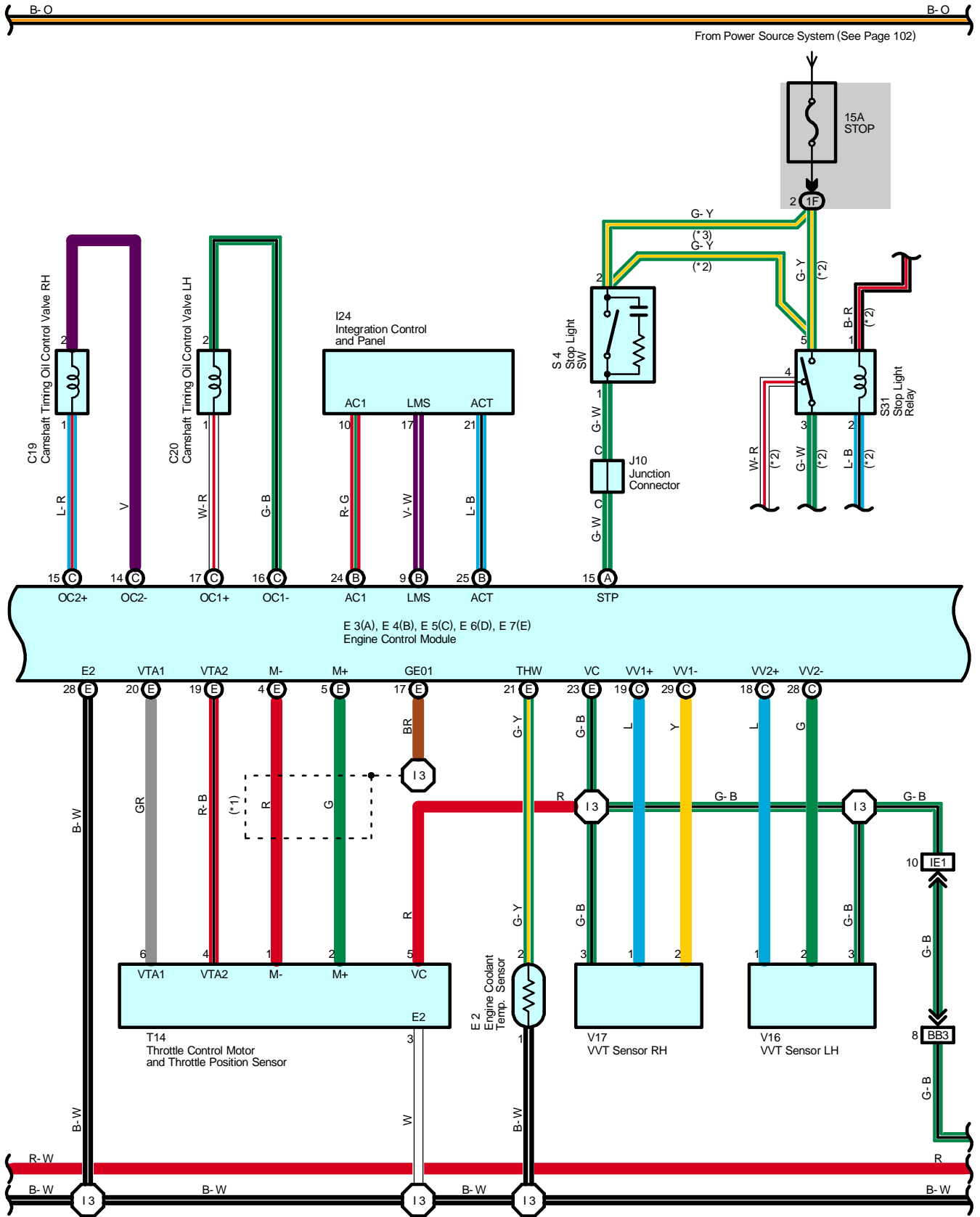


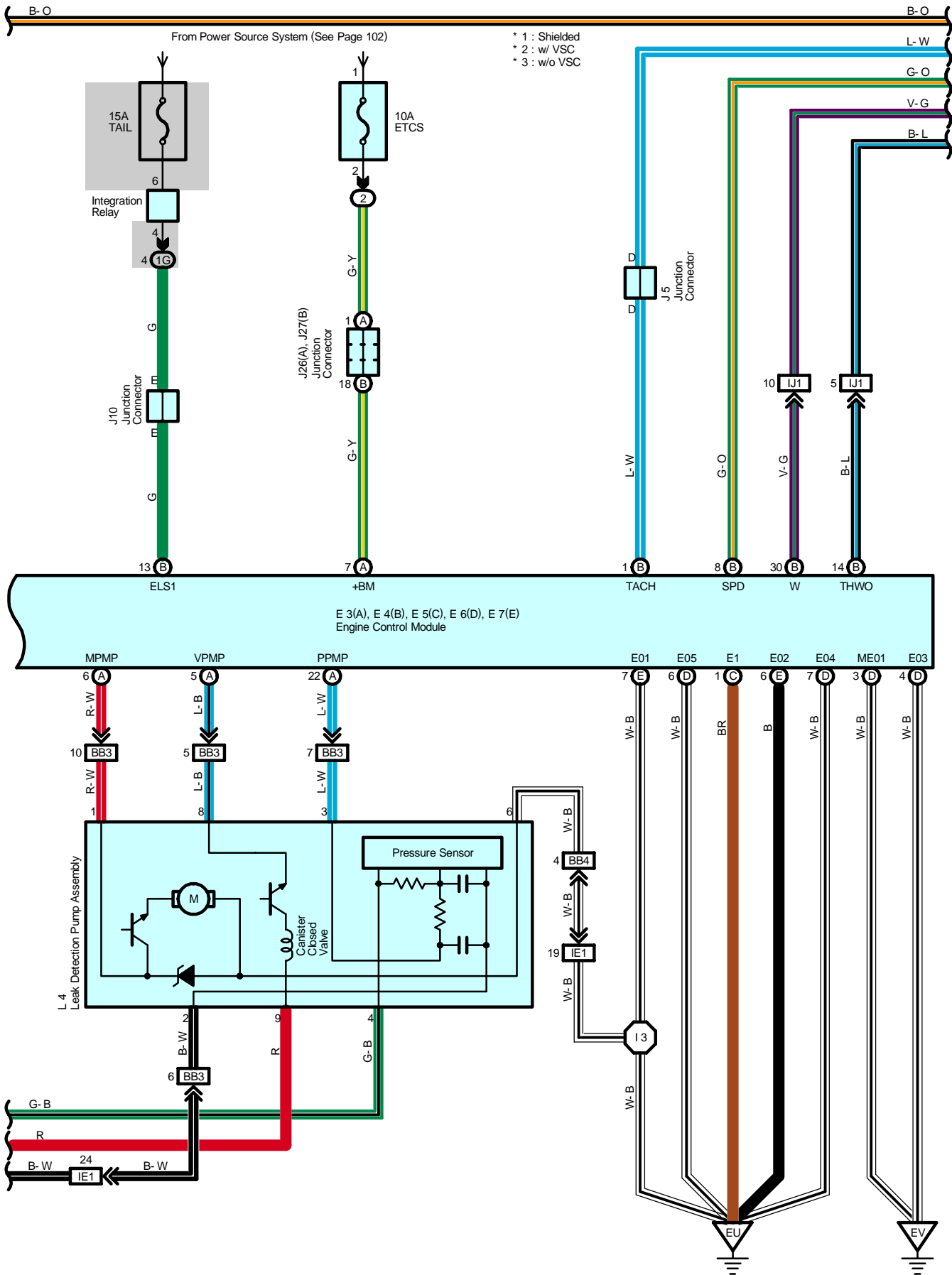
Engine Control for 1GR-FE (Access/Standard Cab)



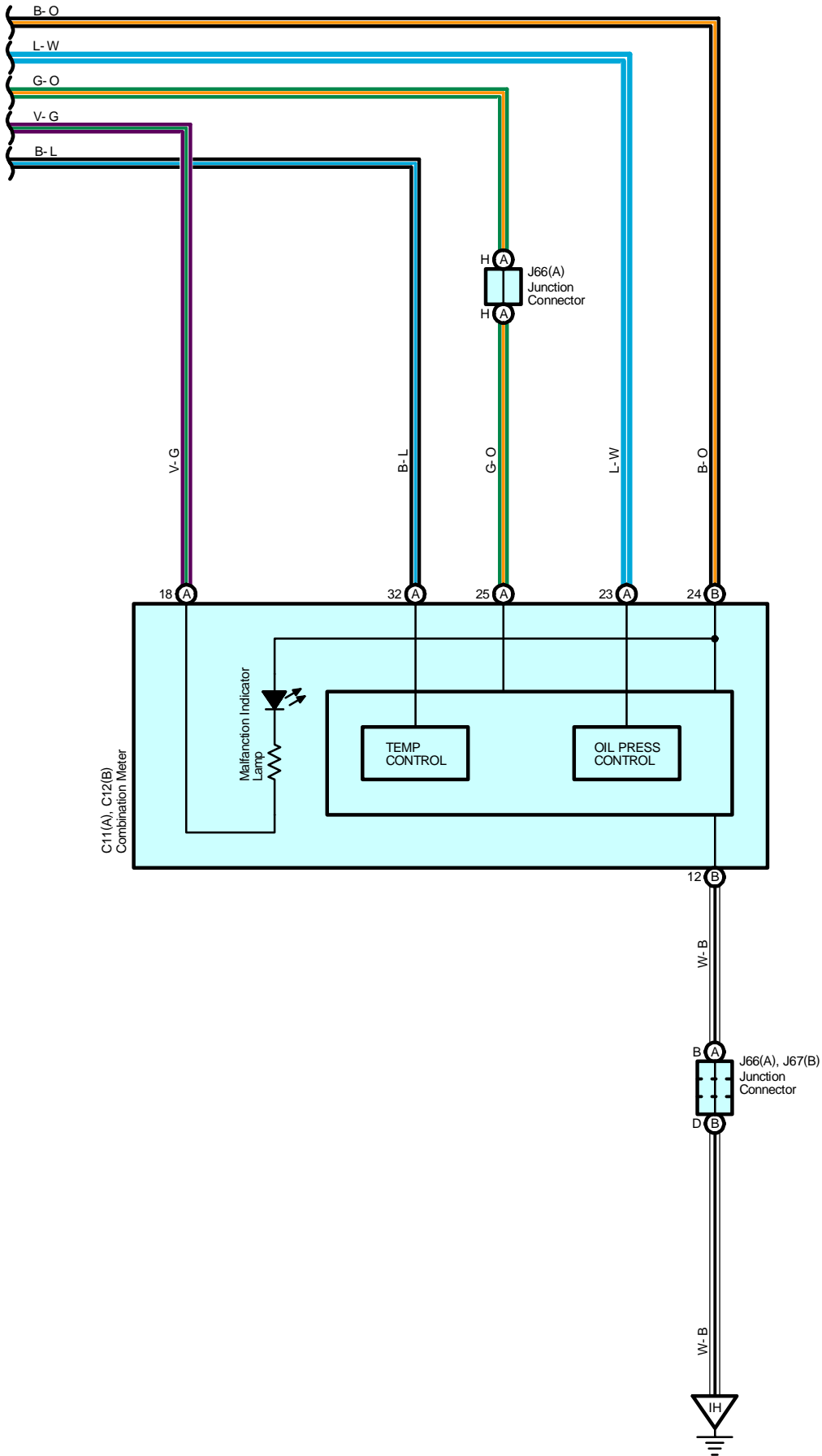


Engine Control for 1GR-FE (Access/Standard Cab)





Engine Control for 1GR-FE (Access/Standard Cab)



System Outline

The engine control system utilizes a microcomputer and maintains overall control of the engine, transmission etc. An outline of the engine control is given here.

1. Input Signals

- (1) Engine coolant temp. signal circuit
The engine coolant temp. sensor detects the engine coolant temp. and has a built-in thermistor with a resistance which varies according to the engine coolant temp. The engine coolant temp. is input into TERMINAL THW of the engine control module as a control signal.
- (2) Intake air temp. signal circuit
The intake air temp. sensor is installed in the mass air flow meter and detects the intake air temp., which is input as a control signal to TERMINAL THA of the engine control module.
- (3) Oxygen sensor signal circuit
The oxygen density in the exhaust emission is detected and is input as a control signal from the heated oxygen sensors to TERMINALS OX1B, OX2B of the engine control module.
- (4) RPM signal circuit
The camshaft position is detected by the camshaft position sensor and is input into TERMINAL G2+ of the engine control module as a control signal. Also, the engine RPM is detected by the crankshaft position sensor and the signal is input into TERMINAL NE+ of the engine control module.
- (5) Throttle position sensor signal circuit
The throttle position sensor detects the throttle valve opening angle as a control signal, which is input into TERMINALS VTA1, VTA2 of the engine control module.
- (6) Vehicle speed circuit
The vehicle speed sensor, detects the vehicle speed and input to the speed sensor of the skid control ECU with actuator, from skid control ECU to TERMINAL SPD of the engine control module, via combination meter.
- (7) Battery signal circuit
Voltage is constantly applied to TERMINAL BATT of the engine control module. When the ignition SW is turned on, the voltage for engine control module start up power supply is applied through the EFI relay, to TERMINALS +B, +B2 of the engine control module. The current from the IGN fuse flows to TERMINAL IGSW of the engine control module, and voltage is constantly applied to TERMINAL +BM.
- (8) Intake air volume signal circuit
The intake air volume is detected by the mass air flow meter, and is input as a control signal to TERMINAL VG of the engine control module.
- (9) Stop light SW signal circuit
The stop light SW is used to detect whether the vehicle is braking or not, and the signal is input into TERMINAL STP of the engine control module as a control signal.
- (10) Starter signal circuit
To confirm whether the engine is cranking, the voltage applied to the starter motor when the engine is cranking is detected, and is input into TERMINAL STA of the engine control module as a control signal.
- (11) Engine knock signal circuit
Engine knocking is detected by the knock sensors, and is input into TERMINALS KNK1, KNK2 of the engine control module as a control signal.

Engine Control for 1GR-FE (Access/Standard Cab)

2. Control System

* SFI system

The SFI system monitors the engine condition through the signals input from each sensors to the engine control module. The control signal is sent to the engine control module TERMINALS #10, #20, #30, #40, #50, #60 to operate the injector (Fuel injection). The SFI system controls the fuel injection by the engine control module in response to the driving conditions.

* ESA system

The ESA system monitors the engine condition through the signals input from each sensors to the engine control module. The best ignition timing is decided according to this data and the data memorized in the engine control module. The control signal is output to TERMINALS IGT1, IGT2, IGT3, IGT4, IGT5, IGT6 and these signals control the igniter to provide the best ignition timing.

* Heated oxygen sensor heater control system

The heated oxygen sensor heater control system turns the heater on when the intake air volume is low (Temp. of exhaust emission is low), and warms up the heated oxygen sensors to improve their detection performance. The engine control module evaluates the signals from each sensors, and outputs current to TERMINALS HT1B and HT2B to control the heater.

* Air fuel ratio sensor heater control system

The air fuel ratio sensor heater control system turns the heater on when the intake air volume is low (Temp. of exhaust emission is low) and warms up the air fuel ratio sensor to improve detection performance of the sensor. The engine control module evaluates the signals from each sensor, current is output to TERMINALS HA1A and HA2A controlling the heater.

* Fuel pump control system

The engine control module supplies current to TERMINAL FPR, and controls the operation speed of the fuel pump with the F/PMP relay.

* ETCS-i

The ETCS-i controls the engine output at its optimal level in accordance with the opening of the accelerator pedal, under all driving conditions.

3. Diagnosis System

When there is a malfunction in the engine control module signal system, the malfunctioning system is recorded in the memory. The malfunctioning system can be found by reading the code displayed on the malfunction indicator lamp.

4. Fail-Safe System

When a malfunction has occurred in any system, there is a possibility of causing engine trouble due to continued control based on that system. In that case, the fail-safe system either controls the system using the data (Standard values) recorded in the engine control module memory, or else stops the engine.

Service Hints

EFI Relay

5-3 : Closed with ignition SW at ON or ST position

C/OPN Relay

5-3 : Closed with starter cranking or engine cranking

E2 Engine Coolant Temp. Sensor

1-2 : Approx. 16.2 kΩ (-20°C, -4°F)

: Approx. 2.45 kΩ (20°C, 68°F)

: Approx. 0.32 kΩ (80°C, 176°F)

E3 (A), E4 (B), E5 (C), E6 (D), E7 (E) Engine Control Module

BATT-E1 : Always 9.0-14.0 volts

+BM-E1 : Always 9.0-14.0 volts

IGSW-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

+B, +B2-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

VC-E1 : 4.5-5.5 volts with ignition SW at ON or ST position

VTA2-E1 : 2.0-2.9 volts with ignition SW on and throttle valve fully closed

: 4.7-5.1 volts with ignition SW on and throttle valve fully open

VTA1-E1 : 0.4-1.0 volts with ignition SW on and throttle valve fully closed

: 3.2-4.8 volts with ignition SW on and throttle valve fully open

VPA-E1 : 0.3-0.9 volts with ignition SW on and throttle valve fully closed

: 3.2-4.8 volts with ignition SW on and throttle valve fully open

VPA2-E1 : 1.8-2.7 volts with ignition SW on and throttle valve fully closed

: 4.7-5.1 volts with ignition SW on and throttle valve fully open

THA-E1 : 0.5-3.4 volts with idling, intake air temp. 0°C (32°F) -80°C (176°F)

THW-E1 : 0.2-1.0 volts with idling, engine coolant temp. 60°C (140°F) -120°C (248°F)

STA-E1 : 6.0 volts or more with engine cranking

W-E1 : 9.0-14.0 volts with idling and malfunction indicator lamp off

SPD-E1 : Pulse generation with vehicle moving

STP-E1 : 7.5-14.0 volts with brake pedal depressed

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A10	54 (1GR-FE)	H6	54 (1GR-FE)	J26	A 58
A20	A 56	I3	55 (1GR-FE)	J27	B 58
	B 56	I4	55 (1GR-FE)	J65	58
A22	56	I5	55 (1GR-FE)	J66	A 58
A30	54 (1GR-FE)	I6	55 (1GR-FE)	J67	B 58
C2	54 (1GR-FE)	I7	55 (1GR-FE)	J71	D 58
C5	56	I8	55 (1GR-FE)	J72	E 58
C11	A 56	I14	55 (1GR-FE)	K1	55 (1GR-FE)
C12	B 56	I15	55 (1GR-FE)	K2	55 (1GR-FE)
C19	54 (1GR-FE)	I16	55 (1GR-FE)	L4	60 (*3)
C20	54 (1GR-FE)	I17	55 (1GR-FE)		61 (*4)
D6	57	I18	55 (1GR-FE)	M1	55 (1GR-FE)
E2	54 (1GR-FE)	I19	55 (1GR-FE)	P2	55 (1GR-FE)
E3	A 57	I23	57	S4	59
E4	B 57	I24	57	S31	59
E5	C 57	J1	55 (1GR-FE)	T14	55 (1GR-FE)
E6	D 57	J3	58	V4	55 (1GR-FE)
E7	E 57	J5	58	V13	55 (1GR-FE)
F5	54 (1GR-FE)	J8	58	V16	55 (1GR-FE)
F10	60 (*3)	J10	58	V17	55 (1GR-FE)
	61 (*4)	J12	58		
H4	54 (1GR-FE)	J18	55 (1GR-FE)		

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Engine Control for 1GR-FE (Access/Standard Cab)

: Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	
	28 (*1)	
1G	24 (*2)	
	28 (*1)	
1I	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	
1K	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA2	76 (1GR-FE)	Cowl Wire and Engine Room Main Wire (Right Fender)
EF2	76 (1GR-FE)	Engine Wire and Sensor Wire (Over the Cylinder Head)
IA9	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)
BB3	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	
BB4	82 (*3)	
	84 (*4)	

: Ground Points

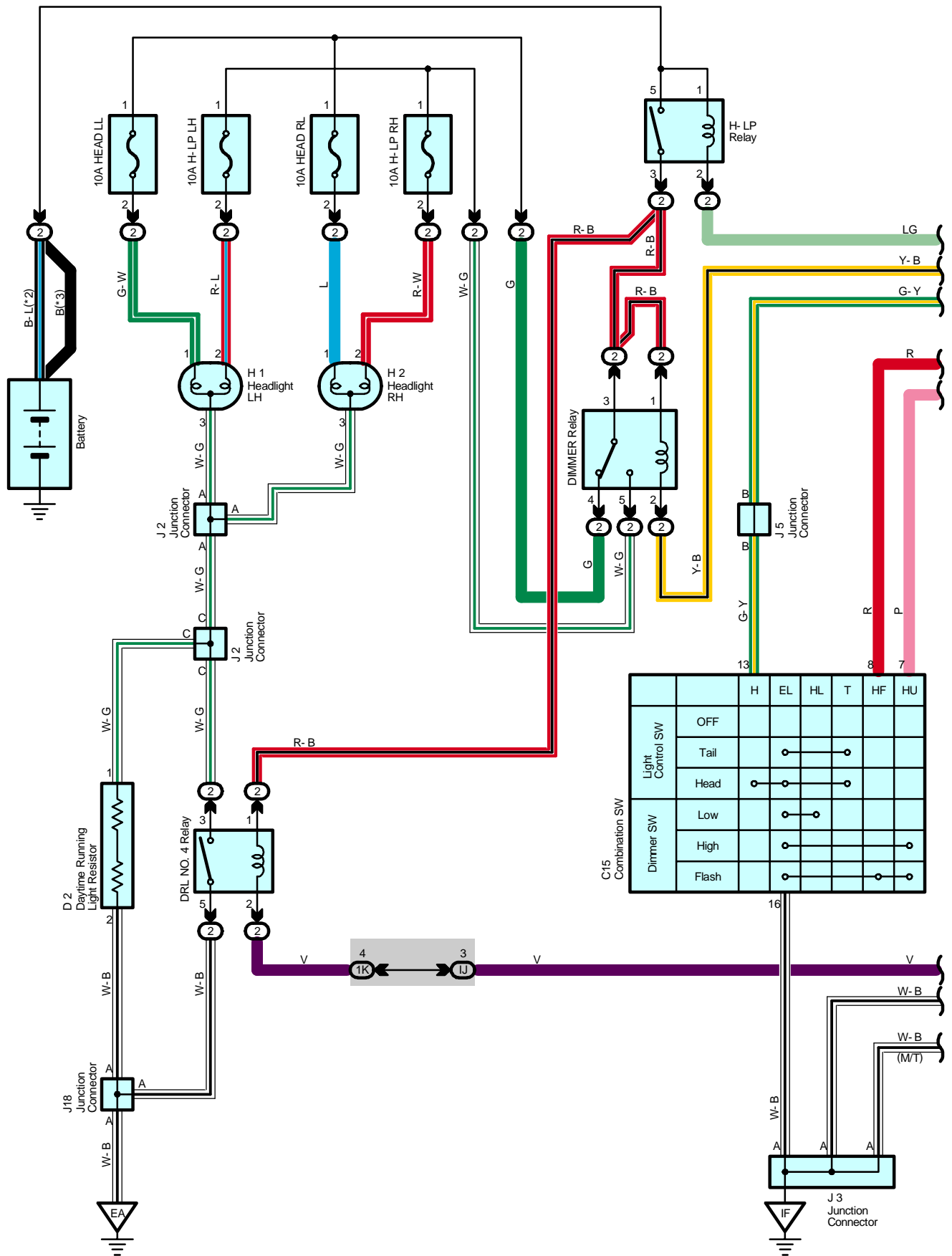
Code	See Page	Ground Points Location
EA	76 (1GR-FE)	Front Left Fender
ET	76 (1GR-FE)	Front Right Fender
EU	76 (1GR-FE)	Rear Bank of Right Cylinder Head
EV	76 (1GR-FE)	Rear Bank of Left Cylinder Head
IF	78	Left Kick Panel
IH	78	Right Kick Panel

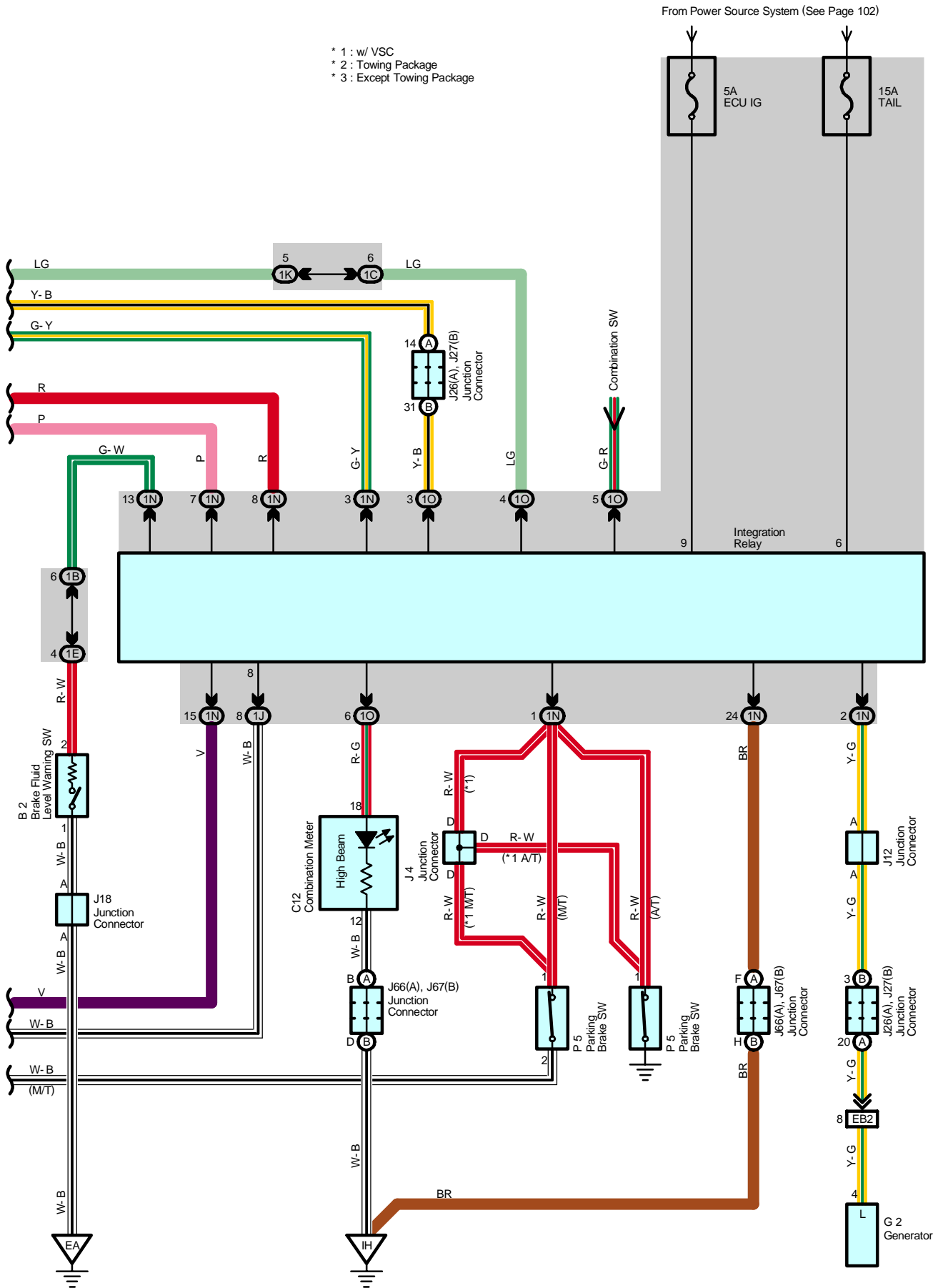
: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E11	76 (1GR-FE)	Engine Room Main Wire	E18	76 (1GR-FE)	Engine Wire
E14	76 (1GR-FE)	Engine Wire	I3	80	
E15			I4	80	Cowl Wire
E17	76 (1GR-FE)	Sensor Wire			

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Headlight with DRL (Access/Standard Cab)





Headlight with DRL (Access/Standard Cab)

System Outline

When the following conditions are met while the ignition SW is ON, and if the light control SW is at OFF or TAIL position, the daytime running light is controlled.

- * Parking brake lever is released (Parking brake SW is OFF)
- * Input signal from the generator

If any of the following conditions are met, the daytime running light control is canceled.

- * Ignition SW is turned OFF.
- * Light control SW is at HEAD position.

Service Hints

H-LP Relay

- 5-3 : Closed with light control SW at HEAD position or dimmer SW at FLASH position
- Closed with engine running and parking brake lever released

DIMMER Relay

- 3-5 : Closed with HEAD relay on and dimmer SW at HIGH or FLASH position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
B2	52 (2UZ-FE)	H1	54 (1GR-FE)	J18	53 (2UZ-FE)	
	54 (1GR-FE)	H2	52 (2UZ-FE)		55 (1GR-FE)	
C12	56			J26	A	58
C15	56	J2	53 (2UZ-FE)	J27	B	58
D2	52 (2UZ-FE)		55 (1GR-FE)	J66	A	58
	54 (1GR-FE)	J3	58	J67	B	58
G2	52 (2UZ-FE)	J4	58	P5		58
	54 (1GR-FE)	J5	58			
H1	52 (2UZ-FE)	J12	58			

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	28 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1C		
1E	28 (*1)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1J	28 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1K	28 (*1)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1N	29 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1O		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB2	74 (2UZ-FE)	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
	76 (1GR-FE)	

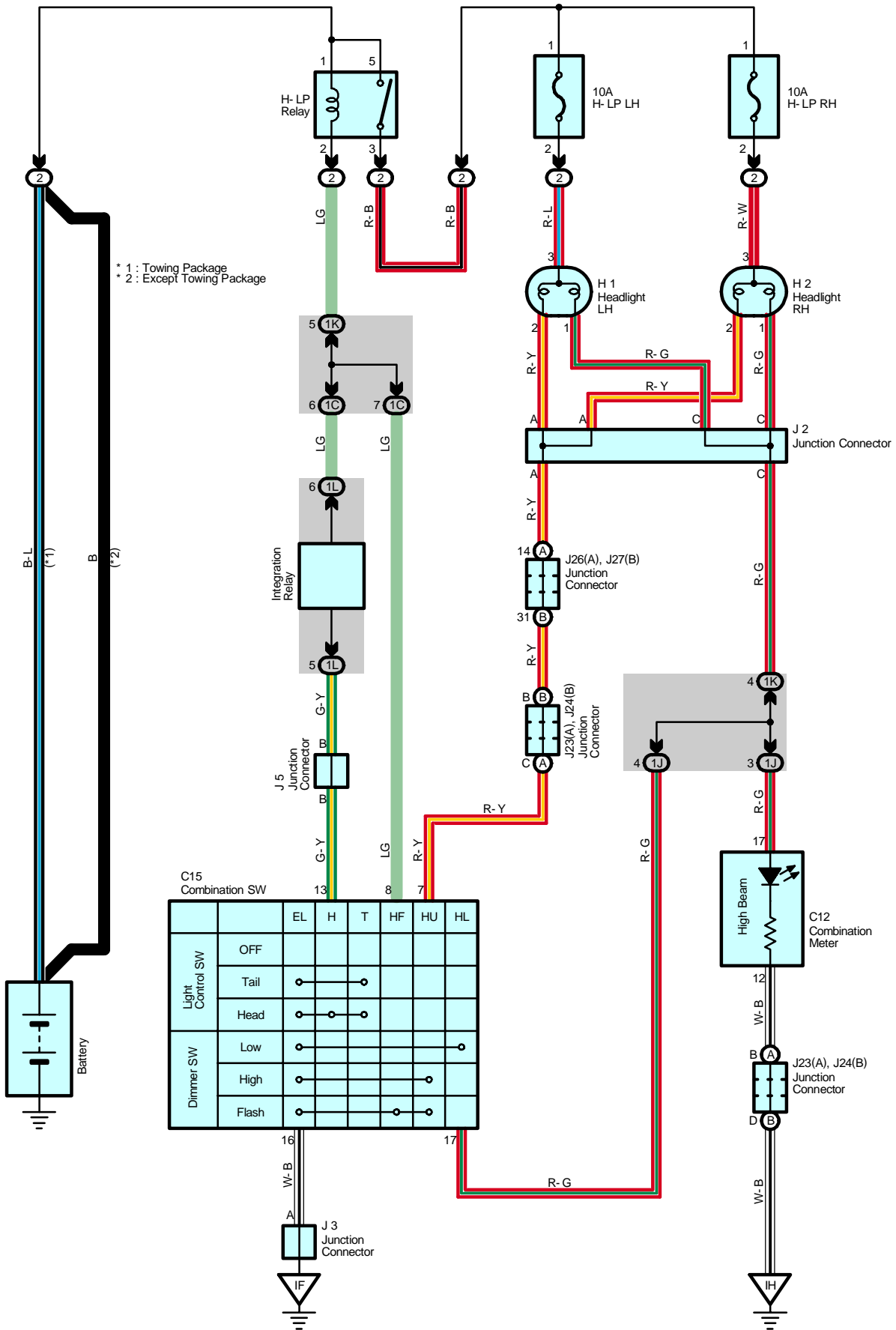
- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat



: Ground Points

Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
IF	78	Left Kick Panel
IH	78	Right Kick Panel

Headlight without DRL (Access/Standard Cab)



Service Hints**H-LP Relay**

5-3 : Closed with light control SW at HEAD position or dimmer SW at FLASH position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C12	56	H2	54 (1GR-FE)	J23	A 58
C15	56	J2	53 (2UZ-FE)	J24	B 58
H1	52 (2UZ-FE)		55 (1GR-FE)	J26	A 58
	54 (1GR-FE)	J3	58	J27	B 58
H2	52 (2UZ-FE)	J5	58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

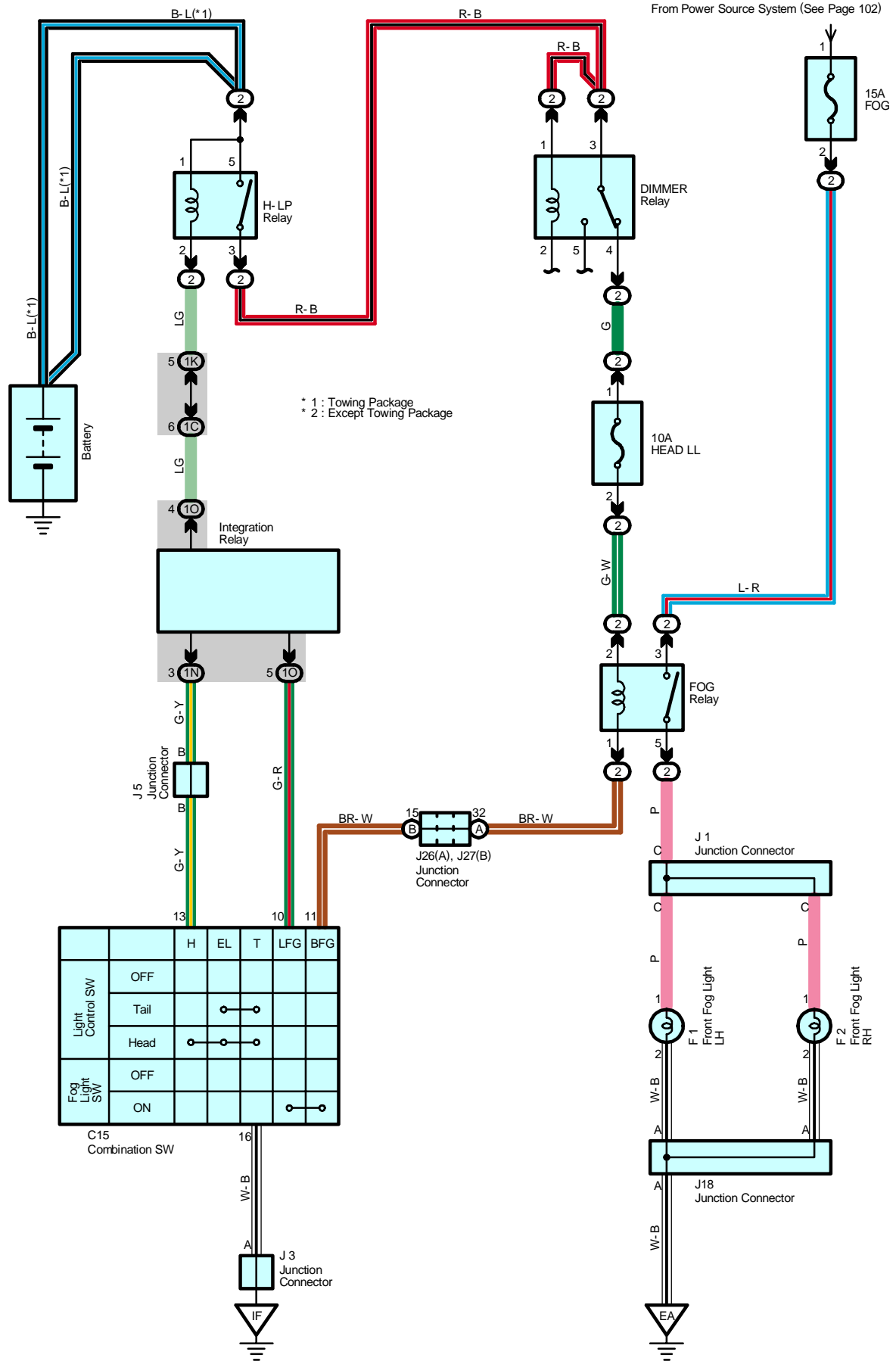
Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1J		
1K	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L	25 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)

▽ : Ground Points

Code	See Page	Ground Points Location
IF	78	Left Kick Panel
IH	78	Right Kick Panel

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Fog Light with DRL (Access/Standard Cab)



		H	EL	T	LFG	BFG
Light Control SW	OFF					
	Tail		•	•		
	Head	•	•			
Fog Light SW	OFF					
	ON				•	

C15 Combination SW

Service Hints**FOG Relay**

3-5 : Closed with light control SW at HEAD position, dimmer SW at LOW position and fog light SW at ON position

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page
C15	56	J1	53 (2UZ-FE)	J18	55 (1GR-FE)
F1	52 (2UZ-FE)		55 (1GR-FE)	J26	A
	54 (1GR-FE)	J3	58	J27	B
F2	52 (2UZ-FE)	J5	58		
	54 (1GR-FE)	J18	53 (2UZ-FE)		

 : **Relay Blocks**

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

 : **Junction Block and Wire Harness Connector**

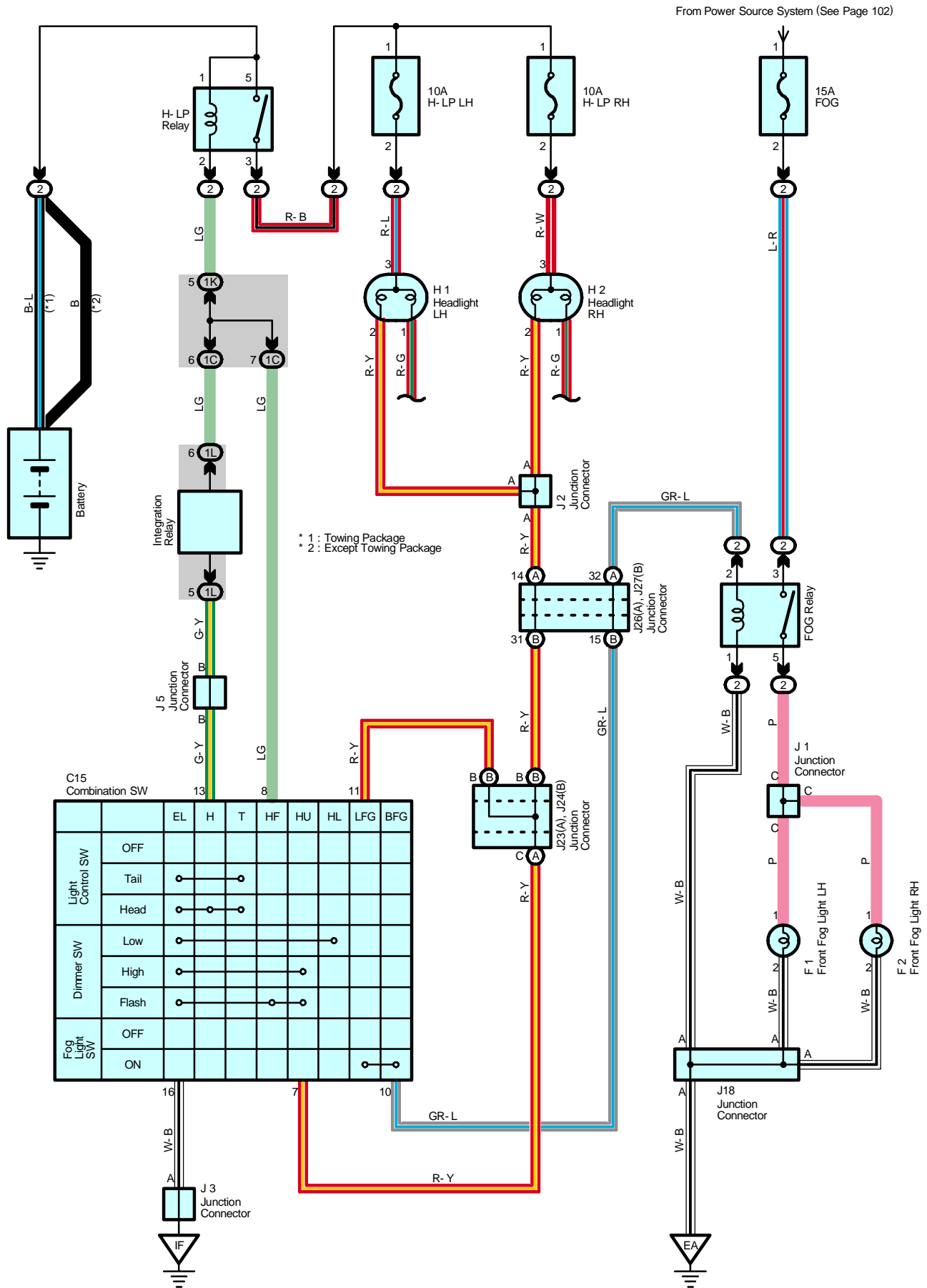
Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	28 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1K	28 (*1)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1N	29 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1O		

 : **Ground Points**

Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
IF	78	Left Kick Panel

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Fog Light without DRL (Access/Standard Cab)



Service Hints

FOG Relay

3-5 : Closed with light control SW at HEAD position, dimmer SW at LOW position and fog light SW at ON position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C15	56	H2	52 (2UZ-FE)	J5	58
F1	52 (2UZ-FE)		54 (1GR-FE)	J18	53 (2UZ-FE)
	54 (1GR-FE)	J1	53 (2UZ-FE)		55 (1GR-FE)
F2	52 (2UZ-FE)		55 (1GR-FE)	J23	A
	54 (1GR-FE)	J2	53 (2UZ-FE)	J24	B
H1	52 (2UZ-FE)		55 (1GR-FE)	J26	A
	54 (1GR-FE)	J3	58	J27	B

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

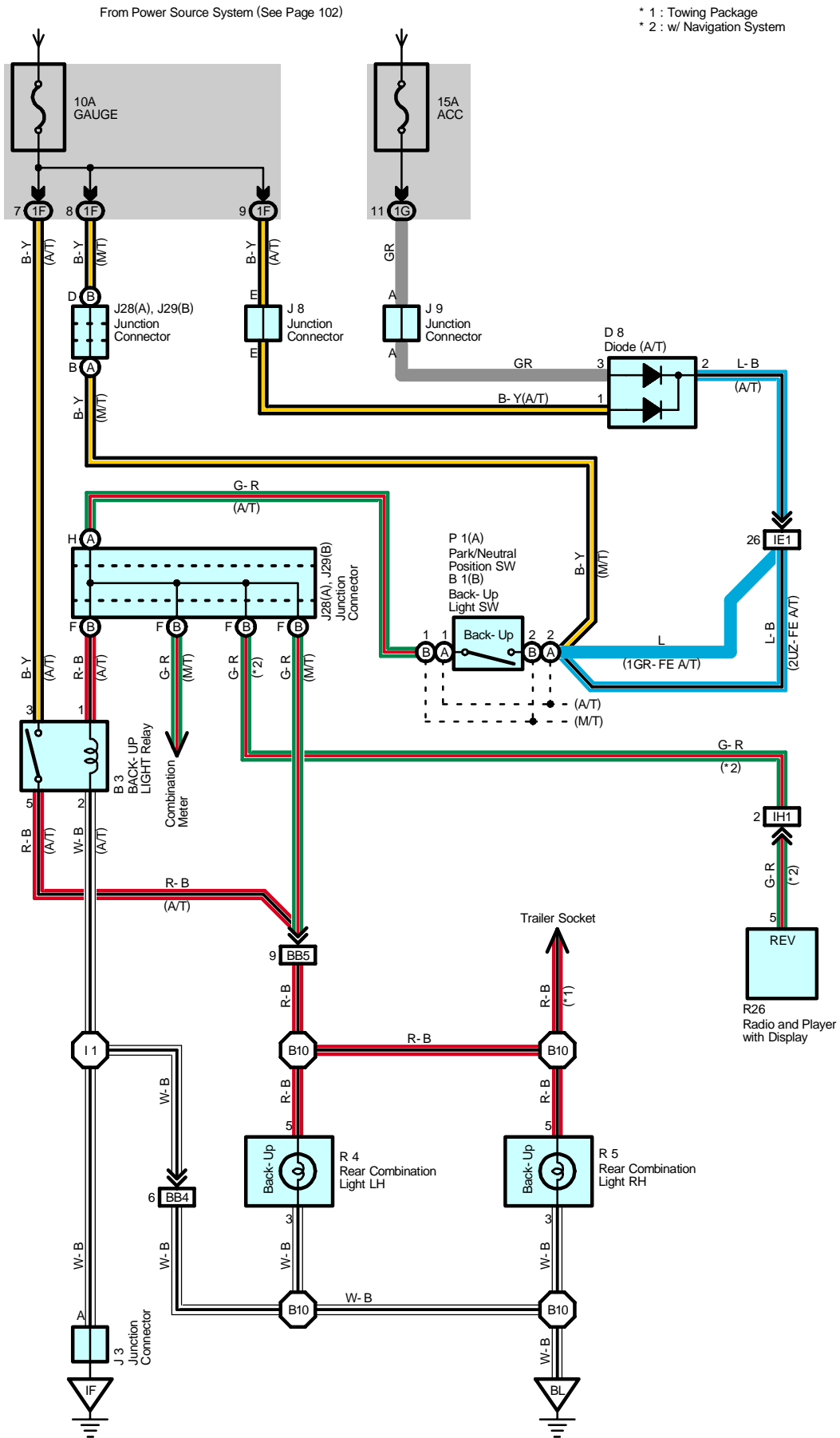
Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1K	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L	25 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)

▽ : Ground Points

Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
IF	78	Left Kick Panel

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Back-Up Light (Access/Standard Cab)



Service Hints

P1 (A) Park/Neutral Position SW (A/T),

B1 (B) Back-Up Light SW (M/T)

(A) 2-(A) 1, (B) 2-(B) 1 : Closed with shift lever in R position

B3 Back-Up Light Relay (A/T)

5-3 : Closed with shift level in R position and ignition SW at ON position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B1	B	J9	58	R4	60 (*3)
B3	54 (1GR-FE)	J28	A	58	61 (*4)
D8	56	J29	B	58	60 (*3)
J3	57	P1	A	53 (2UZ-FE)	61 (*4)
J8	58			55 (1GR-FE)	R26

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IH1	80	Cowl Wire and Floor No.3 Wire (Instrument Panel Brace RH)
BB4	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	
BB5	82 (*3)	
	84 (*4)	

▽ : Ground Points

Code	See Page	Ground Points Location
IF	78	Left Kick Panel
BL	82 (*3)	Surrounding of the Front of the Fuel Tank
	84 (*4)	

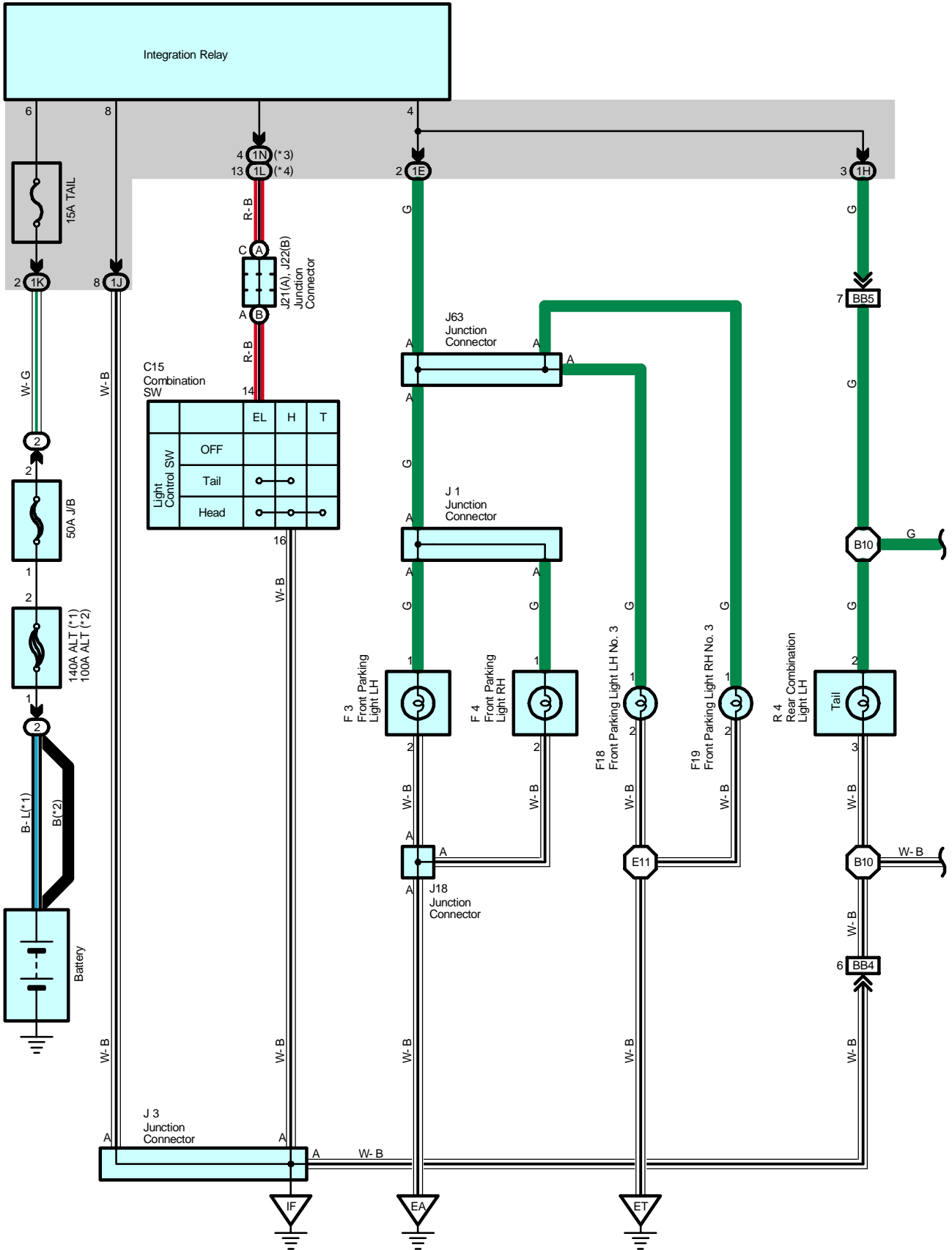
○ : Splice Points

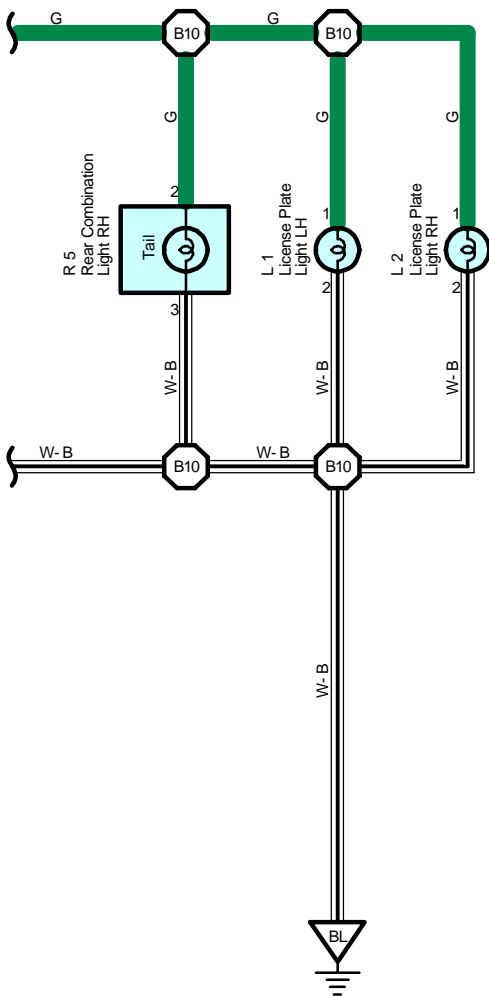
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I1	80	Cowl Wire	B10	84 (*4)	Frame Wire
B10	82 (*3)	Frame Wire			

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Taillight (Access/Standard Cab)

- * 1 : Towing Package
- * 2 : Except Towing Package
- * 3 : w/ Daytime Running Light
- * 4 : w/o Daytime Running Light





Taillight (Access/Standard Cab)

Service Hints

C15 Combination SW

14-16 : Closed with light control SW at TAIL or HEAD position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C15	56	J1	53 (2UZ-FE)	L1	60 (*3)
F3	52 (2UZ-FE)		55 (1GR-FE)		L2
		54 (1GR-FE)	J3	58	
F4	52 (2UZ-FE)	J18	53 (2UZ-FE)	R4	61 (*4)
	54 (1GR-FE)		55 (1GR-FE)		60 (*3)
F18	52 (2UZ-FE)	J21	A	58	61 (*4)
	54 (1GR-FE)	J22	B	58	60 (*3)
F19	52 (2UZ-FE)	J63	53 (2UZ-FE)	R5	61 (*4)
	54 (1GR-FE)		55 (1GR-FE)		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1H	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1J	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1K	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1L	25 (*2)	
1N	29 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
BB4	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	
BB5	82 (*3)	
	84 (*4)	

▽ : Ground Points

Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
ET	74 (2UZ-FE)	Front Right Fender
	76 (1GR-FE)	
IF	78	Left Kick Panel
BL	82 (*3)	Surrounding of the Front of the Fuel Tank
	84 (*4)	

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

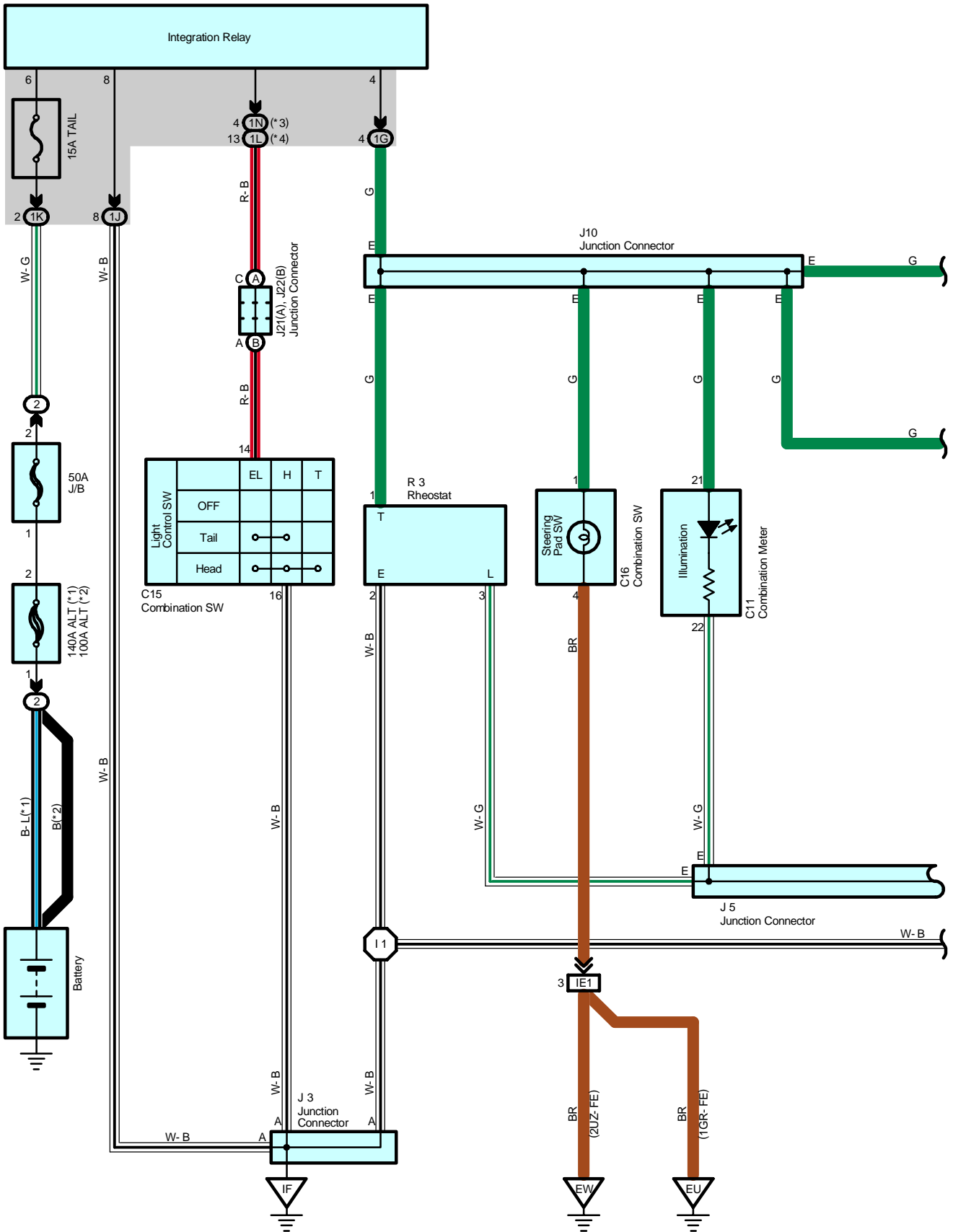


: Splice Points

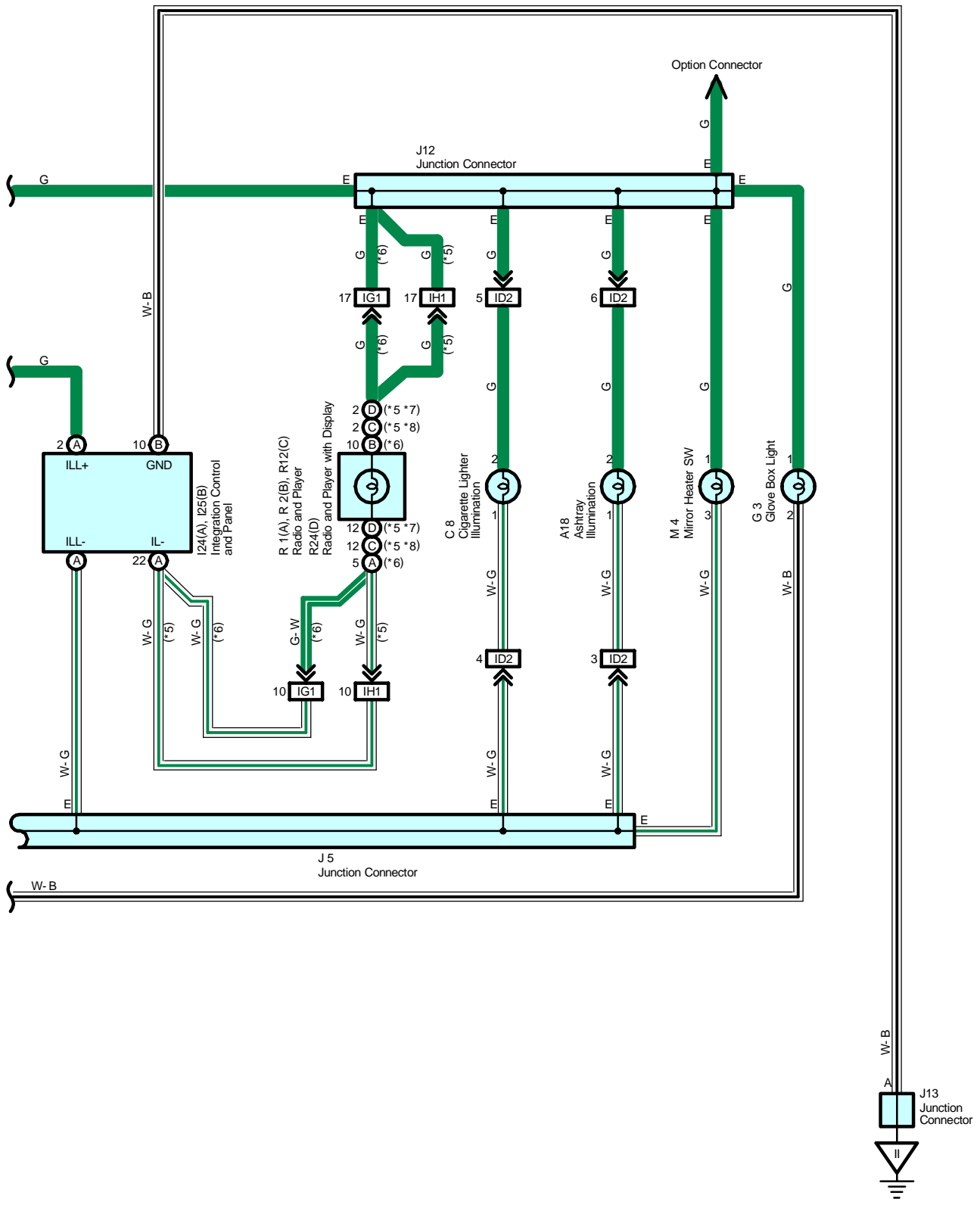
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E11	74 (2UZ-FE)	Engine Room Main Wire	B10	82 (*3)	Frame Wire
	76 (1GR-FE)			84 (*4)	

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Illumination (Access/Standard Cab)



- * 1 : Towing Package
- * 2 : Except Towing Package
- * 3 : w/ Daytime Running Light
- * 4 : w/o Daytime Running Light
- * 5 : Separate Type Amplifier
- * 6 : Built-in Type Amplifier
- * 7 : w/ Navigation System
- * 8 : w/o Navigation System



Illumination (Access/Standard Cab)

Service Hints

C15 Combination SW

14-16 : Closed with light control SW at TAIL or HEAD position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A18	56	I25 B	57	J22 B	58
C8	56	J3	58	M4	58
C11	56	J5	58	R1 A	59
C15	56	J10	58	R2 B	59
C16	56	J12	58	R3	59
G3	57	J13	58	R12 C	59
I24 A	57	J21 A	58	R24 D	59

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1J	24 (*2)	
	28 (*1)	
1K	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1L	25 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1N	29 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
ID2	78	Cigarette Lighter Wire and Cowl Wire (Instrument Panel Brace LH)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IG1	80	Cowl Wire and Instrument Panel No.2 Wire (Instrument Panel Brace RH)
IH1	80	Cowl Wire and Floor No.3 Wire (Instrument Panel Brace RH)

▽ : Ground Points

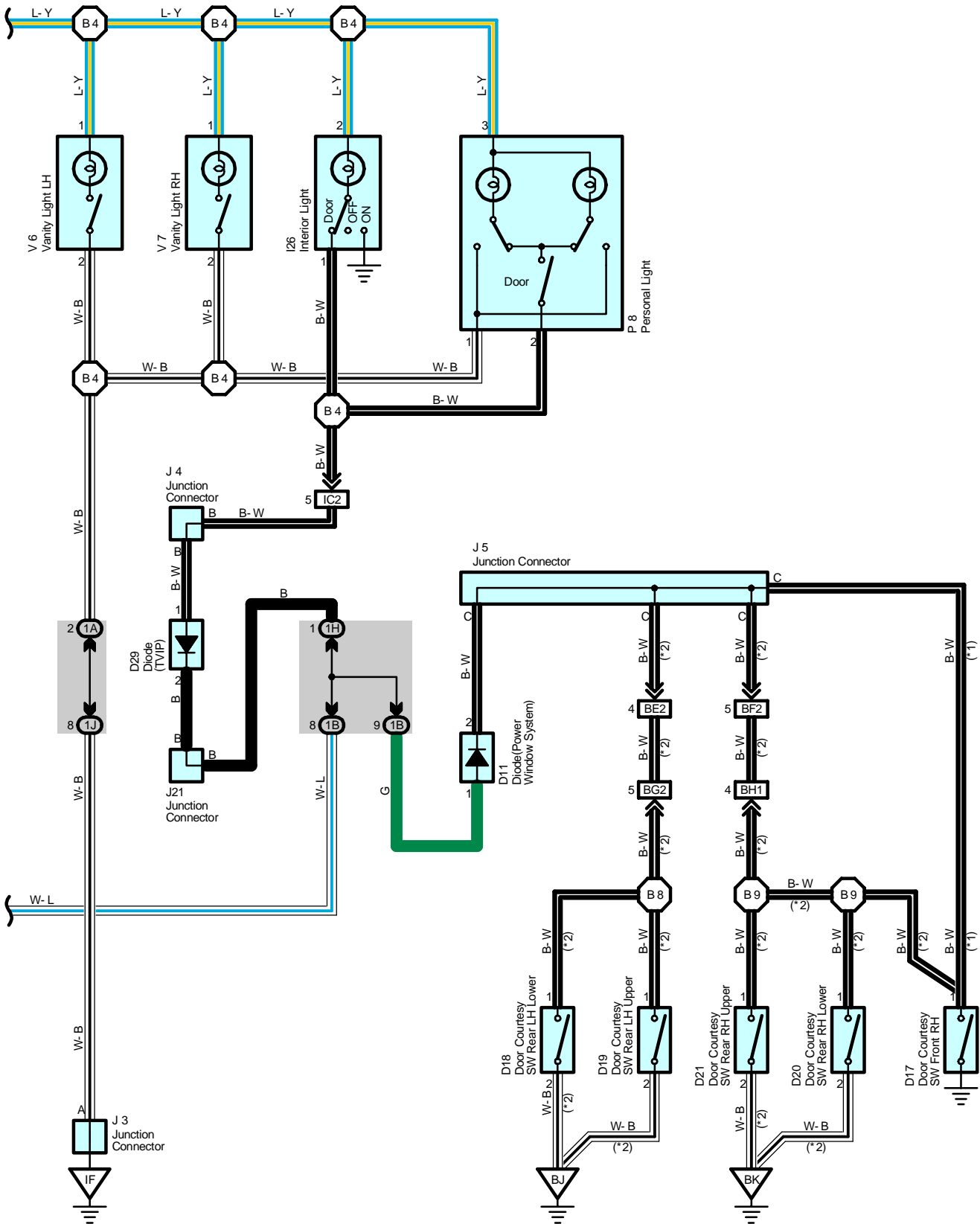
Code	See Page	Ground Points Location
EU	76 (1GR-FE)	Rear Bank of Right Cylinder Head
EW	74 (2UZ-FE)	Front Left Side of Cylinder Head
IF	78	Left Kick Panel
II	78	Right Kick Panel

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I1	80	Cowl Wire			

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

- * 1 : Standard Cab
- * 2 : Access Cab



Interior Light (Access/Standard Cab)

Service Hints

C11 (A), C12 (B) Combination Meter

- (A) 4-Ground : Continuity with each door open
- (A)30-Ground : Continuity with front LH door open
- (B)23-Ground : Always approx. 12 volts
- (B)24-Ground : Approx. 12 volts with ignition SW at ON or ST position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C11	A 56	D17	61 (*4)	J4	58
C12	B 56	D18	60 (*3)	J5	58
D9	57	D19	60 (*3)	J9	58
D11	57	D20	60 (*3)	J21	58
D14	60 (*3)	D21	60 (*3)	J23	A 58
	61 (*4)	D27	57	J24	B 58
D15	60 (*3)	D29	57	P8	60 (*3)
	61 (*4)	I22	57		61 (*4)
D16	60 (*3)	I26	60 (*3)	S3	59
	61 (*4)		61 (*4)	V6	60 (*3)
D17	60 (*3)	J3	58	V7	60 (*3)

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	24 (*2)	Roof Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1B	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1H	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB4	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IC2	78	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
IF4	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

**: Ground Points**

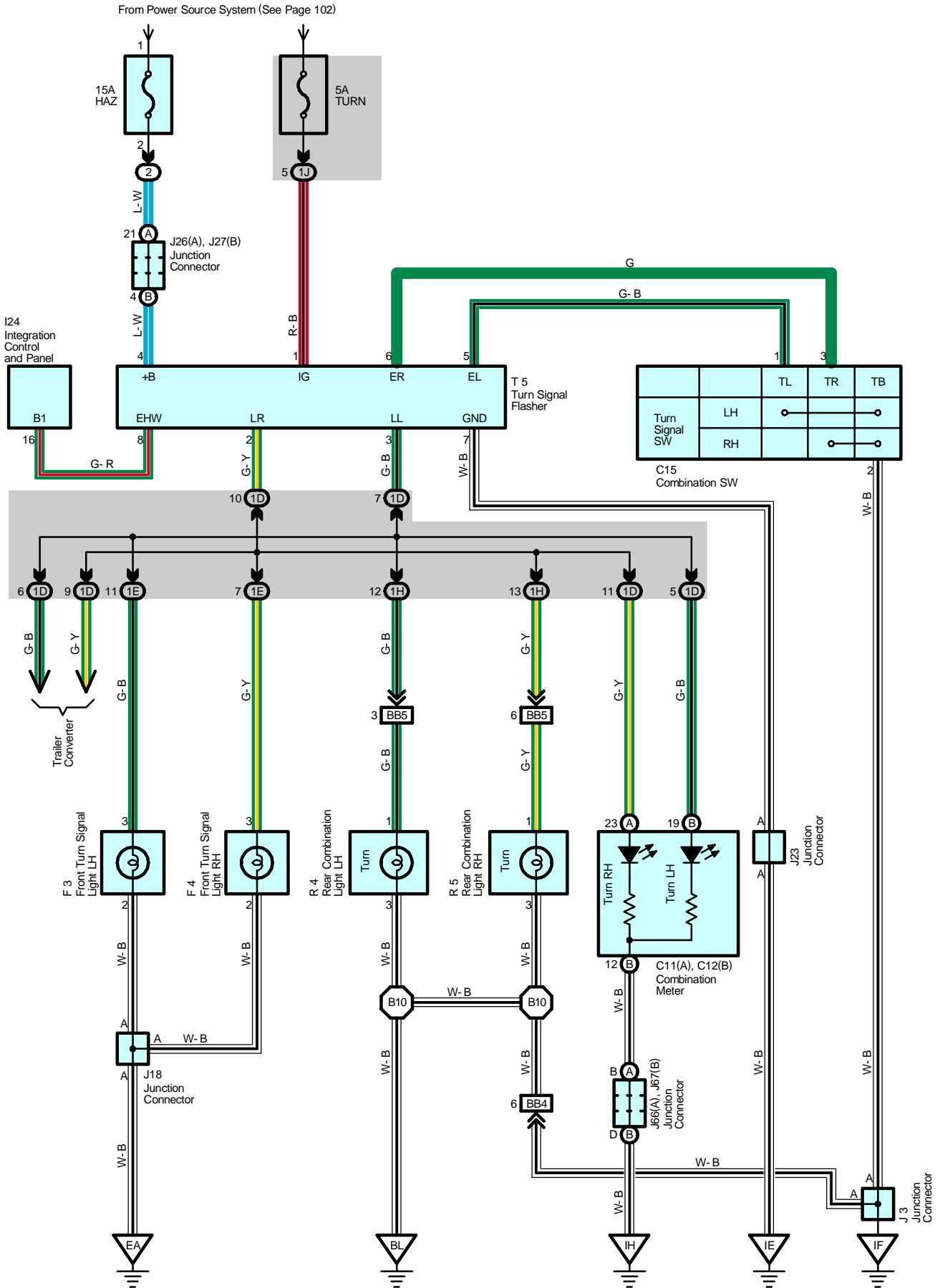
Code	See Page	Ground Points Location
IF	78	Left Kick Panel
BJ	82 (*3)	Inside of Rear Door LH
BK	82 (*3)	Inside of Rear Door RH

**: Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B4	82 (*3)	Roof Wire	B8	82 (*3)	Rear Door No.1 Wire LH
	84 (*4)		B9	82 (*3)	Rear Door No.1 Wire RH

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Turn Signal and Hazard Warning Light (Access/Standard Cab)



Service Hints

T5 Turn Signal Flasher

- 4-Ground : Always approx. 12 volts
- 1-Ground : Approx. 12 volts with ignition SW at ON or ST position
- 7-Ground : Always continuity

○ : Parts Location

Code		See Page	Code		See Page	Code		See Page
C11	A	56	I24	57	J66	A	58	
C12	B	56	J3	58	J67	B	58	
C15		56	J18	53 (2UZ-FE)	R4	60 (*3)		
F3	52 (2UZ-FE)			55 (1GR-FE)		61 (*4)		
	54 (1GR-FE)		J23	58	R5	60 (*3)		
F4	52 (2UZ-FE)		J26	A		58	61 (*4)	
	54 (1GR-FE)		J27	B	58	T5	59	

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1H	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1J	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
BB4	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	
BB5	82 (*3)	
	84 (*4)	

▽ : Ground Points

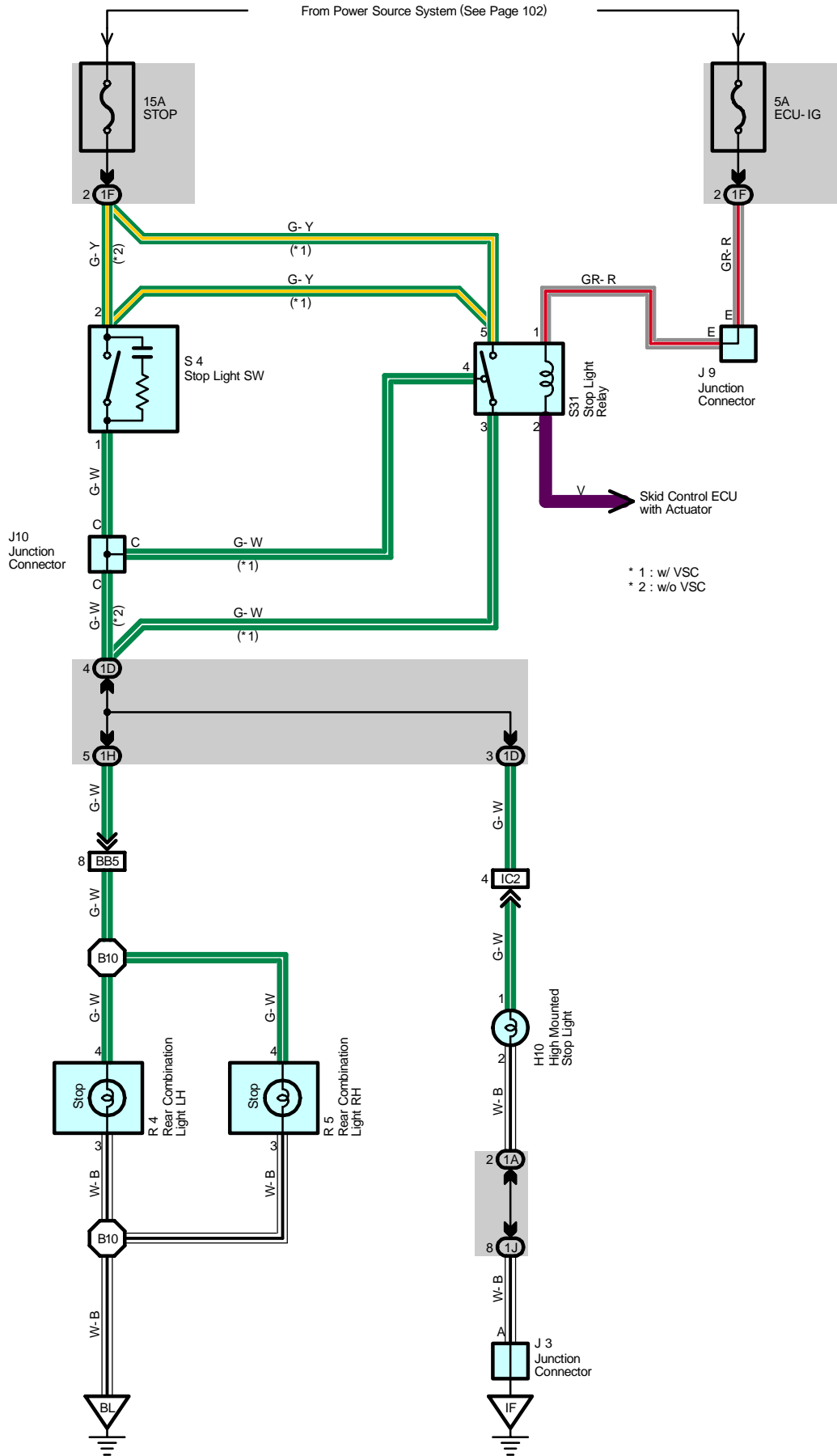
Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
IE	78	Left Kick Panel
IF		
IH	78	Right Kick Panel
BL	82 (*3)	Surrounding of the Front of the Fuel Tank
	84 (*4)	

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B10	82 (*3)	Frame Wire	B10	84 (*4)	Frame Wire

- * 1 : w/ Daytime Running Light
- * 2 : w/o Daytime Running Light
- * 3 : Access Cab
- * 4 : Standard Cab
- * 5 : Bench Seat
- * 6 : Captain Seat
- * 7 : Access Cab Captain Seat
- * 8 : Standard Cab Bench Seat
- * 9 : Access Cab w/o Power Seat

Stop Light (Access/Standard Cab)



Service Hints

S4 Stop Light SW

2-1 : Closed with brake pedal depressed

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page
H10	60 (*3)	J10	58	R5	61 (*4)
	61 (*4)	R4	60 (*3)	S4	59
J3	58		61 (*4)	S31	59
J9	58	R5	60 (*3)		

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	24 (*2)	Roof Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1D	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	
	28 (*1)	
1H	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IC2	78	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
BB5	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	

 : **Ground Points**

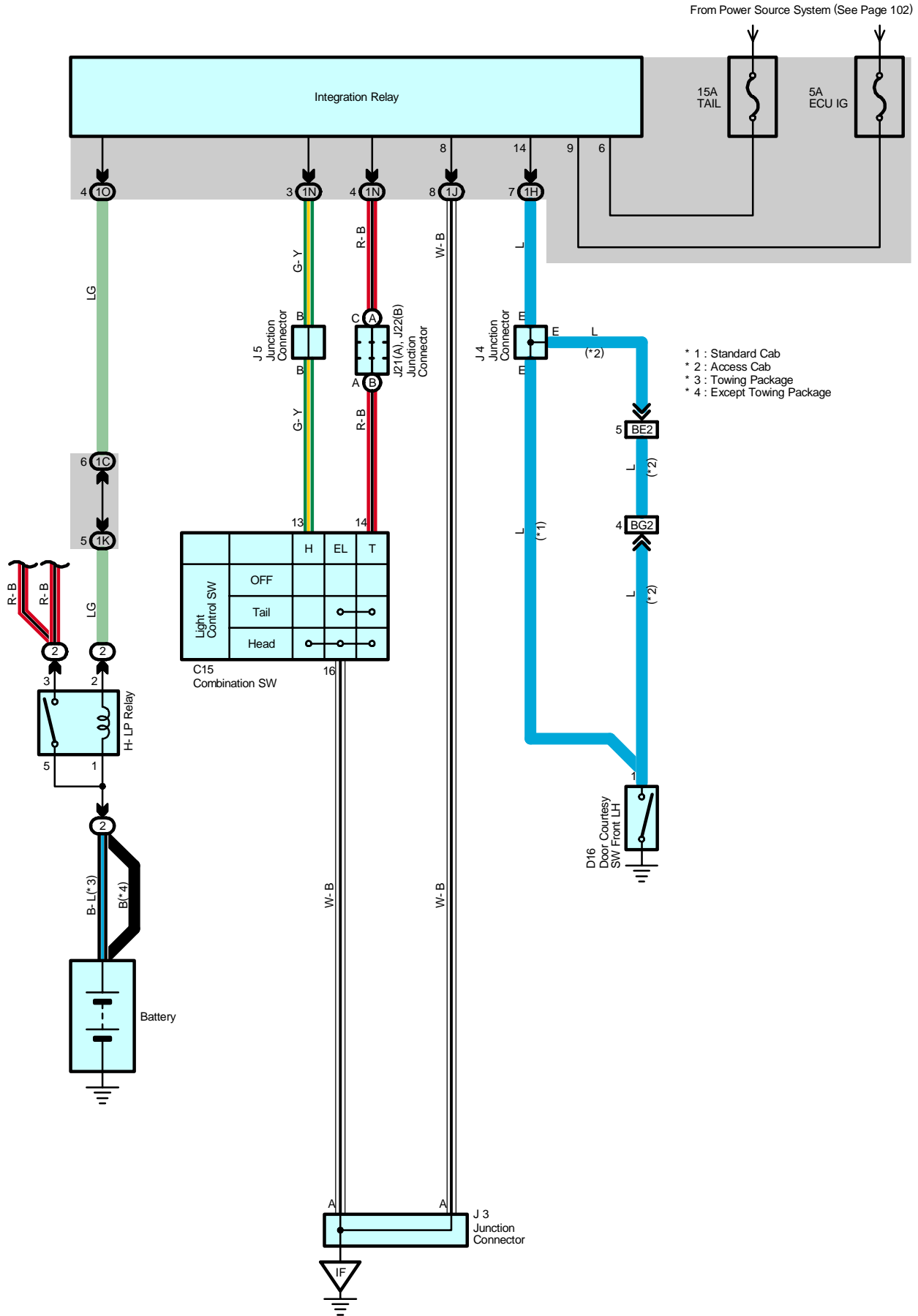
Code	See Page	Ground Points Location
IF	78	Left Kick Panel
BL	82 (*3)	Surrounding of the Front of the Fuel Tank
	84 (*4)	

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B10	82 (*3)	Frame Wire	B10	84 (*4)	Frame Wire

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Light Auto Turn Off System with DRL (Access/Standard Cab)



System Outline

With the ignition SW turned on, the current flows to TERMINAL 9 of the integration relay through ECU IG fuse. Voltage is applied at all times to TERMINAL 6 of the integration relay through the TAIL fuse, and through the H-LP relay coil side.

1. Normal Lighting Operation

<Turn taillight on>

With the light control SW turned to TAIL position, a signal is input into the integration relay. Due to this signal, the current flowing to TERMINAL 6 of the relay flows to TERMINAL 14 of the light control SW to TERMINAL 16 to GROUND, and taillights to turn on.

<Turn headlight on>

With the light control SW turned to HEAD position, a signal is input into the integration relay. Due to this signal, the current flowing to the relay flows to TERMINAL 13 of the light control SW to TERMINAL 16 to GROUND in the headlight circuit, and causes taillight and H-LP relay to turn the lights on. The taillight circuit is same as above.

2. Light Auto Turn Off Operation

With light on and ignition SW turned off (Input signal goes to TERMINAL 9 of the relay), when the driver's door is opened (Input signal goes to TERMINAL 14 of the relay), the relay operates and the current is cut off which flows from TERMINAL 6 and through the H-LP relay coil side of the relay to taillight circuit and headlight circuit.

As a result, all lights are turned off automatically.

Service Hints

H-LP Relay

- 5-3 : Closed with the light control SW at HEAD position or the dimmer SW at FLASH position
- Closed with the engine running and the parking brake lever released

C15 Combination SW

- 13-16 : Closed with light control SW at HEAD position
- 14-16 : Closed with light control SW at TAIL or HEAD position

D16 Door Courtesy SW Front LH

- 1-Ground : Continuity with the front LH door open

INTEGRATION Relay

- 9-Ground : Approx. 12 volts with the ignition SW at ON position
- 14-Ground : Continuity with the front LH door open
- 6-Ground : Always approx. 12 volts
- 8-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C15	56	J3	58	J21	A 58
D16	60 (*3)	J4	58	J22	B 58
	61 (*4)	J5	58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1C		
1H	28 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1J		
1K	28 (*1)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1N	29 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1O		

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Light Auto Turn Off System with DRL (Access/Standard Cab)

: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)

: Ground Points

Code	See Page	Ground Points Location
IF	78	Left Kick Panel

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

System Outline

With the ignition SW turned on, the current flows to TERMINAL 9 of the integration relay through ECU IG fuse. Voltage is applied at all times to TERMINAL 6 of the integration relay through the TAIL fuse, and through the H-LP relay coil side.

1. Normal Lighting Operation

<Turn taillight on>

With the light control SW turned to TAIL position, a signal is input into the integration relay. Due to this signal, the current flowing to TERMINAL 6 of the relay flows to TERMINAL 14 of the light control SW to TERMINAL 16 to GROUND, and taillights to turn on.

<Turn headlight on>

With the light control SW turned to HEAD position, a signal is input into the integration relay. Due to this signal, the current flowing to the relay flows to TERMINAL 13 of the light control SW to TERMINAL 16 to GROUND in the headlight circuit, and causes taillight and H-LP relay to turn the lights on. The taillight circuit is same as above.

2. Light Auto Turn Off Operation

With light on and ignition SW turned off (Input signal goes to TERMINAL 9 of the relay), when the driver's door is opened (Input signal goes to TERMINAL 14 of the relay), the relay operates and the current is cut off which flows from TERMINAL 6 and through the H-LP relay coil side of the relay to taillight circuit and headlight circuit.

As a result, all lights are turned off automatically.

Service Hints

H-LP Relay

5-3 : Closed with the light control SW at HEAD position or the dimmer SW at FLASH position

C15 Combination SW

13-16 : Closed with light control SW at HEAD position

14-16 : Closed with light control SW at TAIL or HEAD position

D16 Door Courtesy SW Front LH

1-Ground : Continuity with the front LH door open

INTEGRATION Relay

9-Ground : Approx. 12 volts with the ignition SW at ON position

14-Ground : Continuity with the front LH door open

6-Ground : Always approx. 12 volts

8-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C15	56	J3	58	J21	A 58
D16	60 (*3)	J4	58	J22	B 58
	61 (*4)	J5	58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1H		
1J		
1K	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L	25 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Light Auto Turn Off System without DRL (Access/Standard Cab)

: Connector Joining Wire Harness and Wire Harness

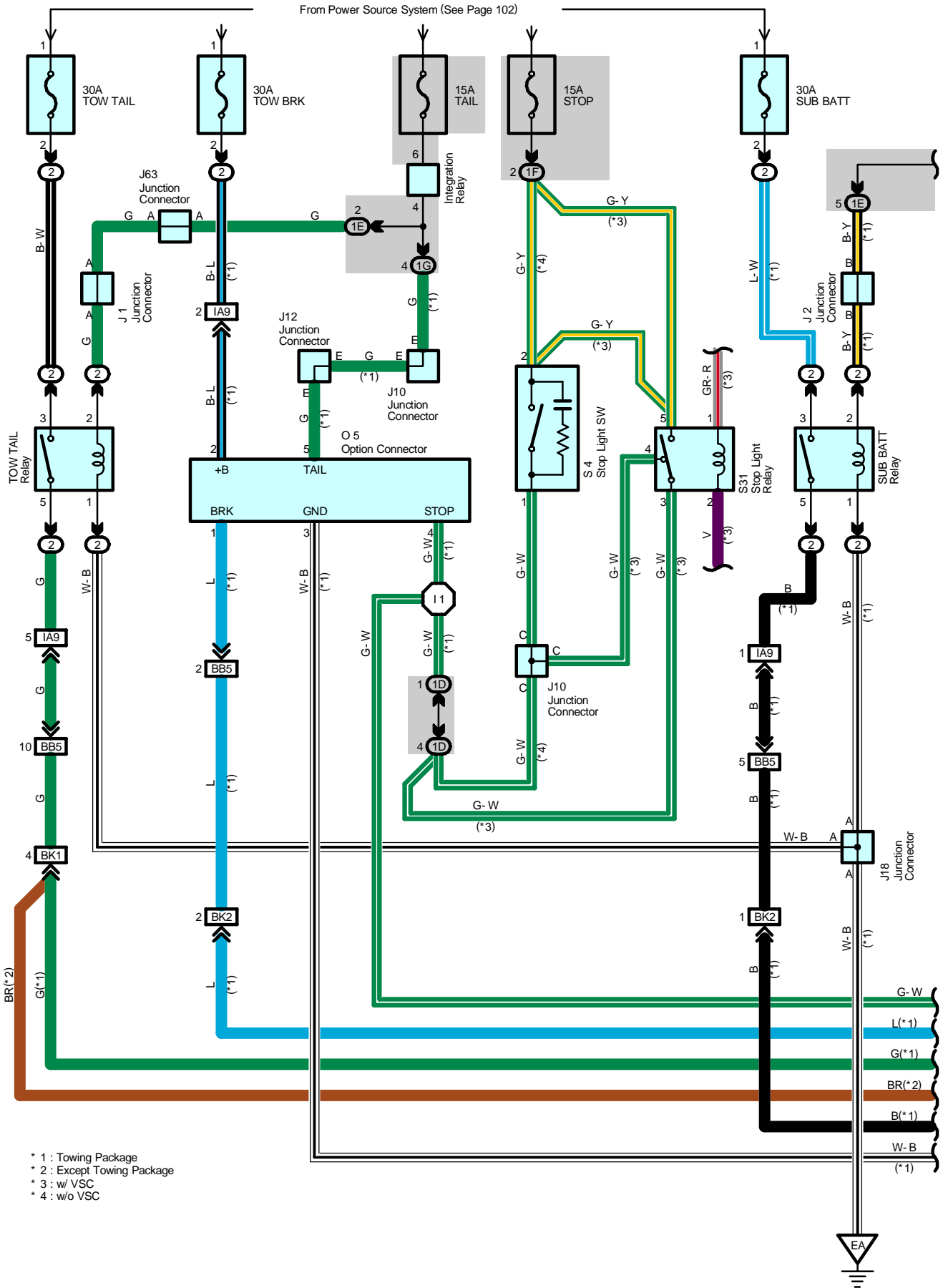
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)

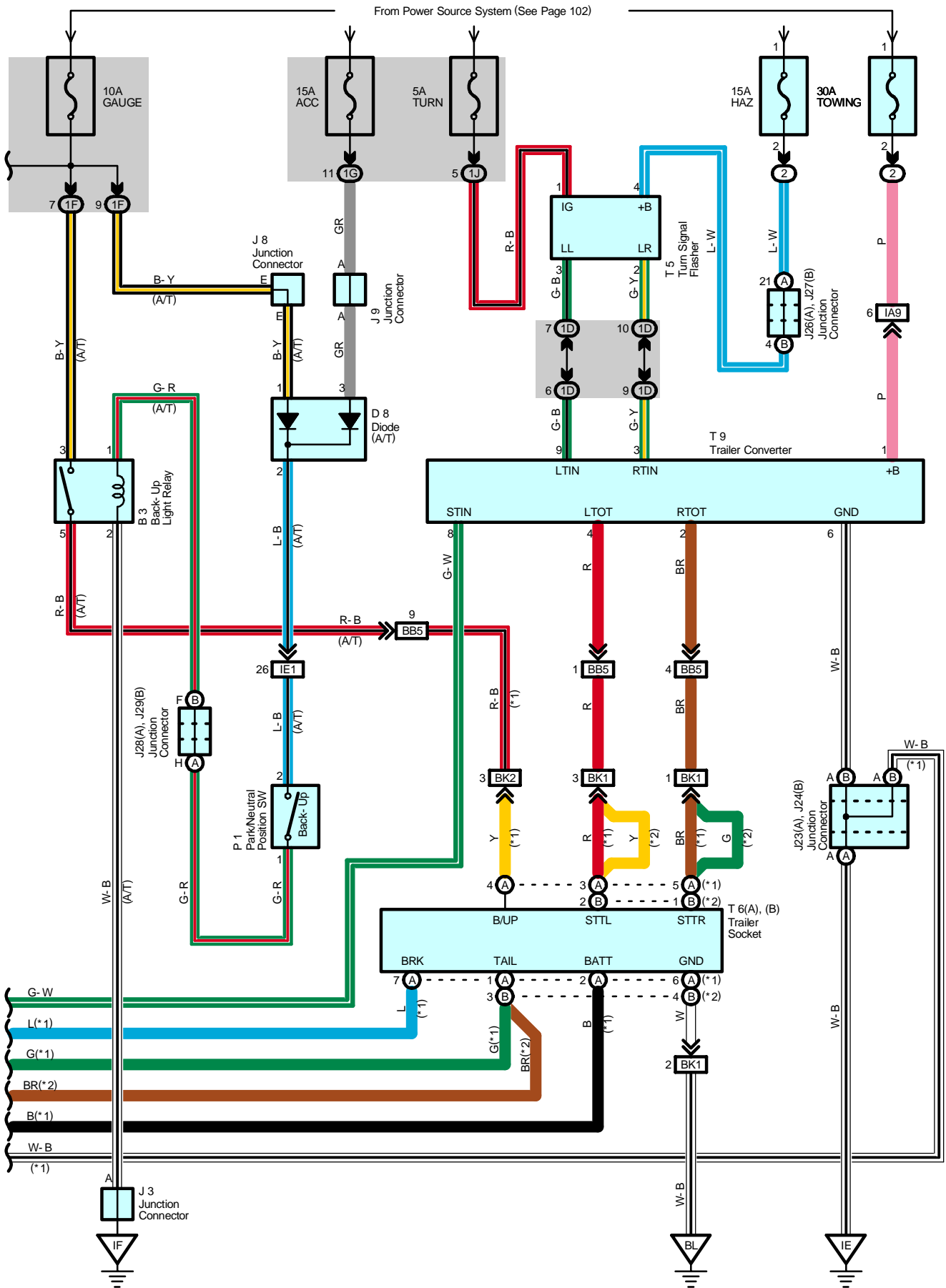
: Ground Points

Code	See Page	Ground Points Location
IF	78	Left Kick Panel

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Trailer Towing (Access/Standard Cab)





Trailer Towing (Access/Standard Cab)

Service Hints

T9 Trailer Converter

- 1-Ground : Always approx. 12 volts
- 6-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B3	56	J18	53 (2UZ-FE)	P1	53 (2UZ-FE)
D8	57		55 (1GR-FE)		55 (1GR-FE)
J1	53 (2UZ-FE)	J23	A 58	S4	59
	55 (1GR-FE)	J24	B 58	S31	59
J2	53 (2UZ-FE)	J26	A 58	T5	59
	55 (1GR-FE)	J27	B 58	T6	A 60 (*3)
J3	58	J28	A 58		61 (*4)
J8	58	J29	B 58		B 60 (*3)
J9	58	J63	53 (2UZ-FE)	T9	61 (*4)
J10	58		55 (1GR-FE)		59
J12	58	O5	58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA9	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
BB5	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	
BK1	82 (*3)	Frame Wire and Frame No.3 Wire (Near the License Plate Light)
	84 (*4)	
BK2	82 (*3)	
	84 (*4)	

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

**: Ground Points**

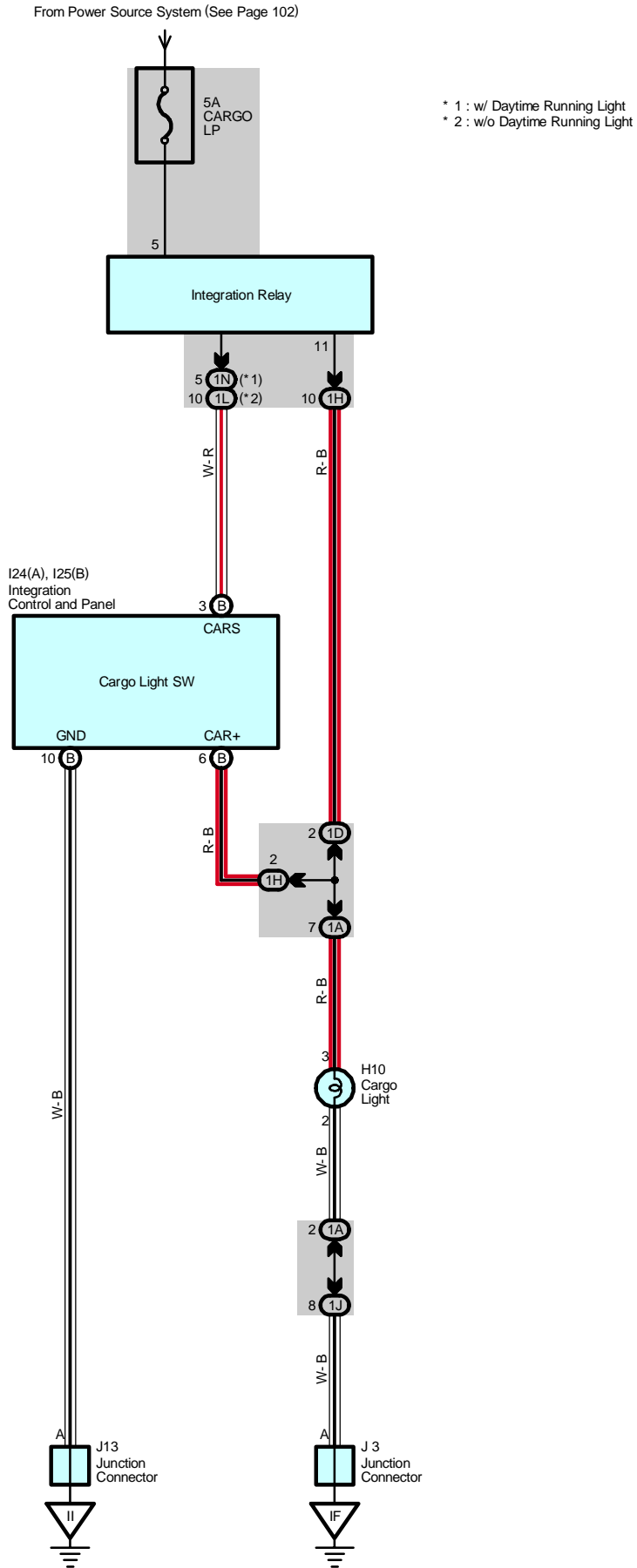
Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
IE	78	Left Kick Panel
IF		
BL	82 (*3)	Surrounding of the Front of the Fuel Tank
	84 (*4)	

**: Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I1	80	Cowl Wire			

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Cargo Light (Access/Standard Cab)



Service Hints

I24 (A), I25 (B) Integration Control and Panel

(B) 3-Ground : Always approx. 12 volts

(B)10-Ground : Always continuity

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page	
H10	60 (*3)	I24	A	57	J3	58
	61 (*4)	I25	B	57	J13	58

 : **Junction Block and Wire Harness Connector**

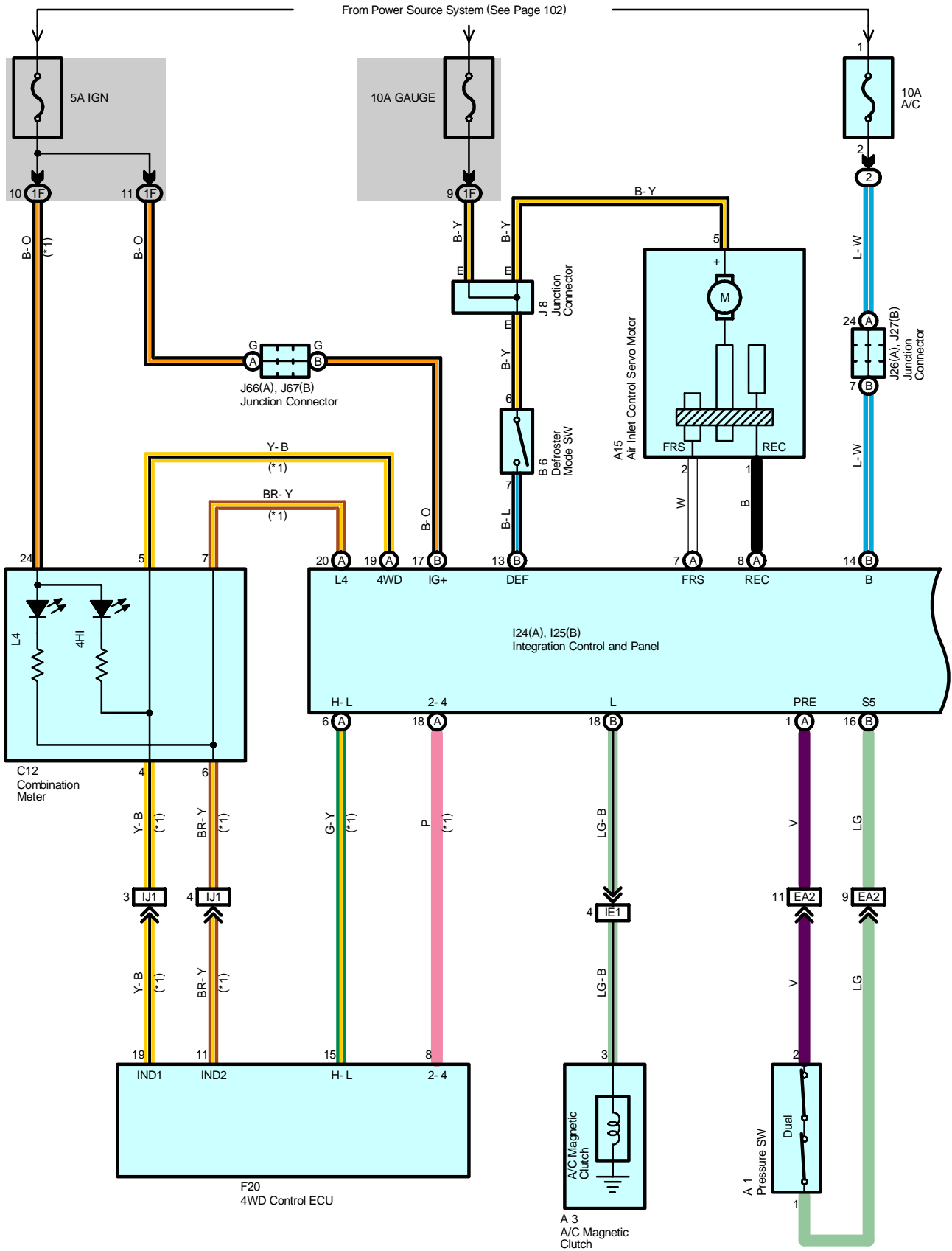
Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	24 (*2)	Roof Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1D	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1H	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	
1L	25 (*2)	
1N	29 (*1)	

 : **Ground Points**

Code	See Page	Ground Points Location
IF	78	Left Kick Panel
II	78	Right Kick Panel

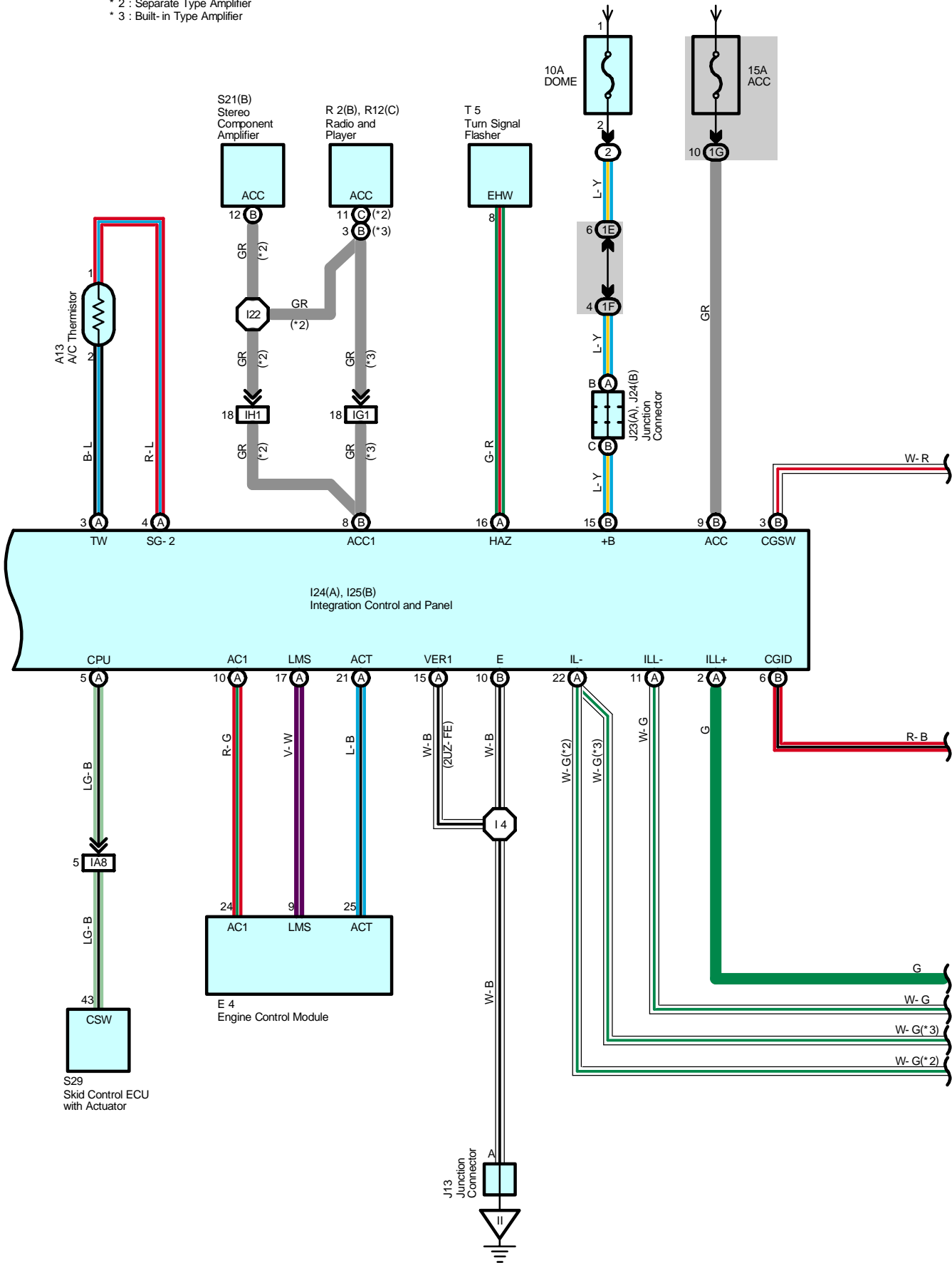
* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Center Cluster Integration Control System (Access/Standard Cab)

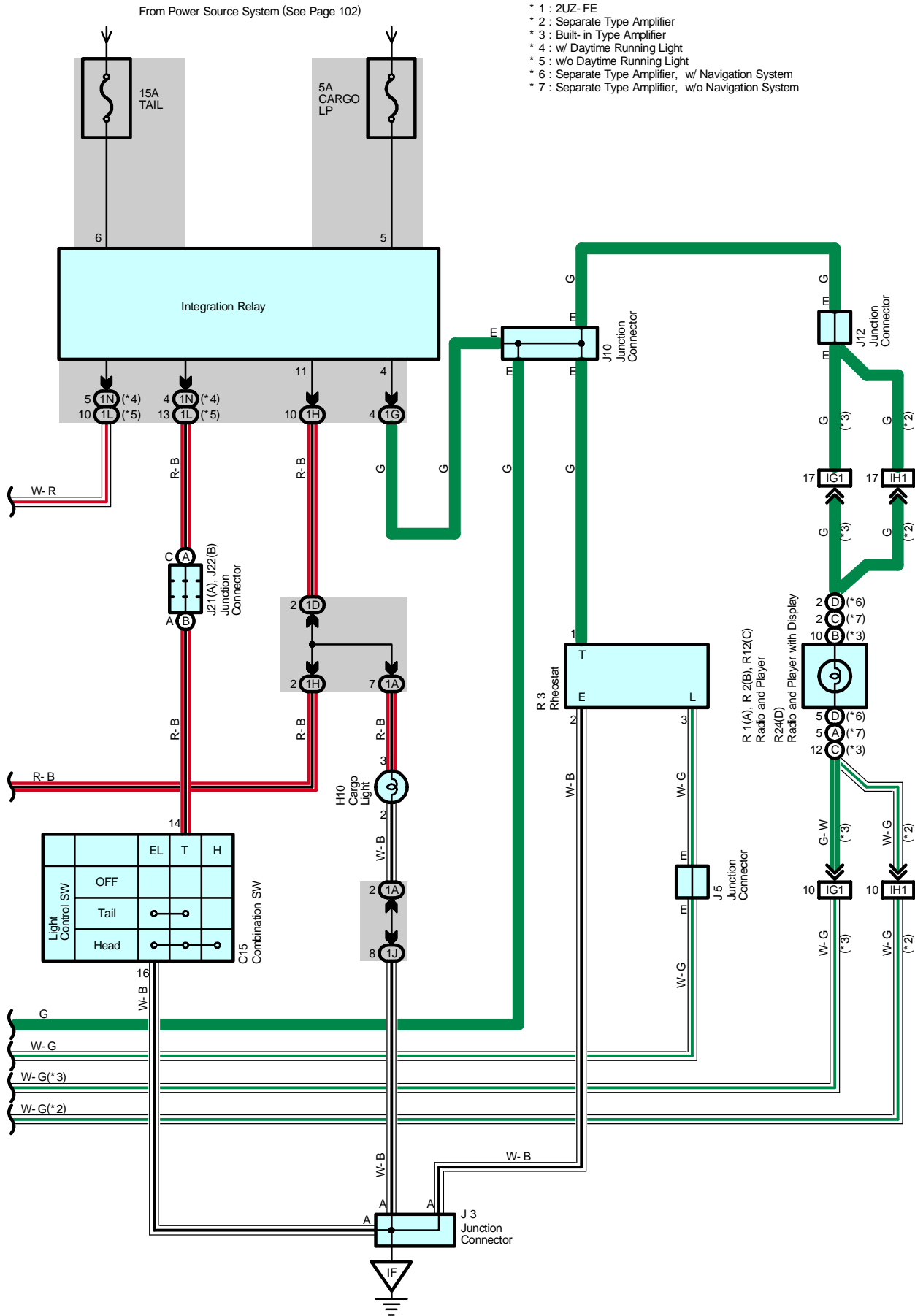


- * 1 : 2UZ- FE
- * 2 : Separate Type Amplifier
- * 3 : Built-in Type Amplifier

From Power Source System (See Page 102)



Center Cluster Integration Control System (Access/Standard Cab)



System Outline

The integration control panel is composed by design components such as the cluster, resistor, heater control panel, and SW. The integration control panel controls systems such as the air conditioning, cargo light, 4WD and hazard warning light, clock, and the SRS.

Service Hints

I24 (A), I25 (B) Integration Control and Panel

- (B)12-Ground : Approx. 12 volts with ignition SW on and blower SW on
- (B) 4-Ground : Approx. 12 volts with ignition SW at ON or ST position
- (B) 5-Ground : Always approx. 12 volts
- (B)13-Ground : Approx. 12 volts with ignition SW at ACC or ON position
- (B) 1-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A1	52 (2UZ-FE)	I24	A	57	J27 B 58
	54 (1GR-FE)	I25	B	57	J66 A 58
A3	52 (2UZ-FE)	J3		58	J67 B 58
	54 (1GR-FE)	J5		58	R1 A 59
A13	56	J8		58	R2 B 59
A15	56	J10		58	R3 59
B6	56	J12		58	R12 C 59
C12	56	J13		58	R24 D 59
C15	56	J21	A	58	S21 B 60 (*3)
E4	57	J22	B	58	S29 53 (2UZ-FE) 55 (1GR-FE)
F20	57	J23	A	58	
H10	60 (*3)	J24	B	58	T5 59
	61 (*4)	J26	A	58	

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	24 (*2)	Roof Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1D	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	
1H	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	
1L	25 (*2)	
1N	29 (*1)	

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Center Cluster Integration Control System (Access/Standard Cab)

: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA2	74 (2UZ-FE)	Cowl Wire and Engine Room Main Wire (Right Fender)
	76 (1GR-FE)	
IA8	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IG1	80	Cowl Wire and Instrument Panel No.2 Wire (Instrument Panel Brace RH)
IH1	80	Cowl Wire and Floor No.3 Wire (Instrument Panel Brace RH)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)

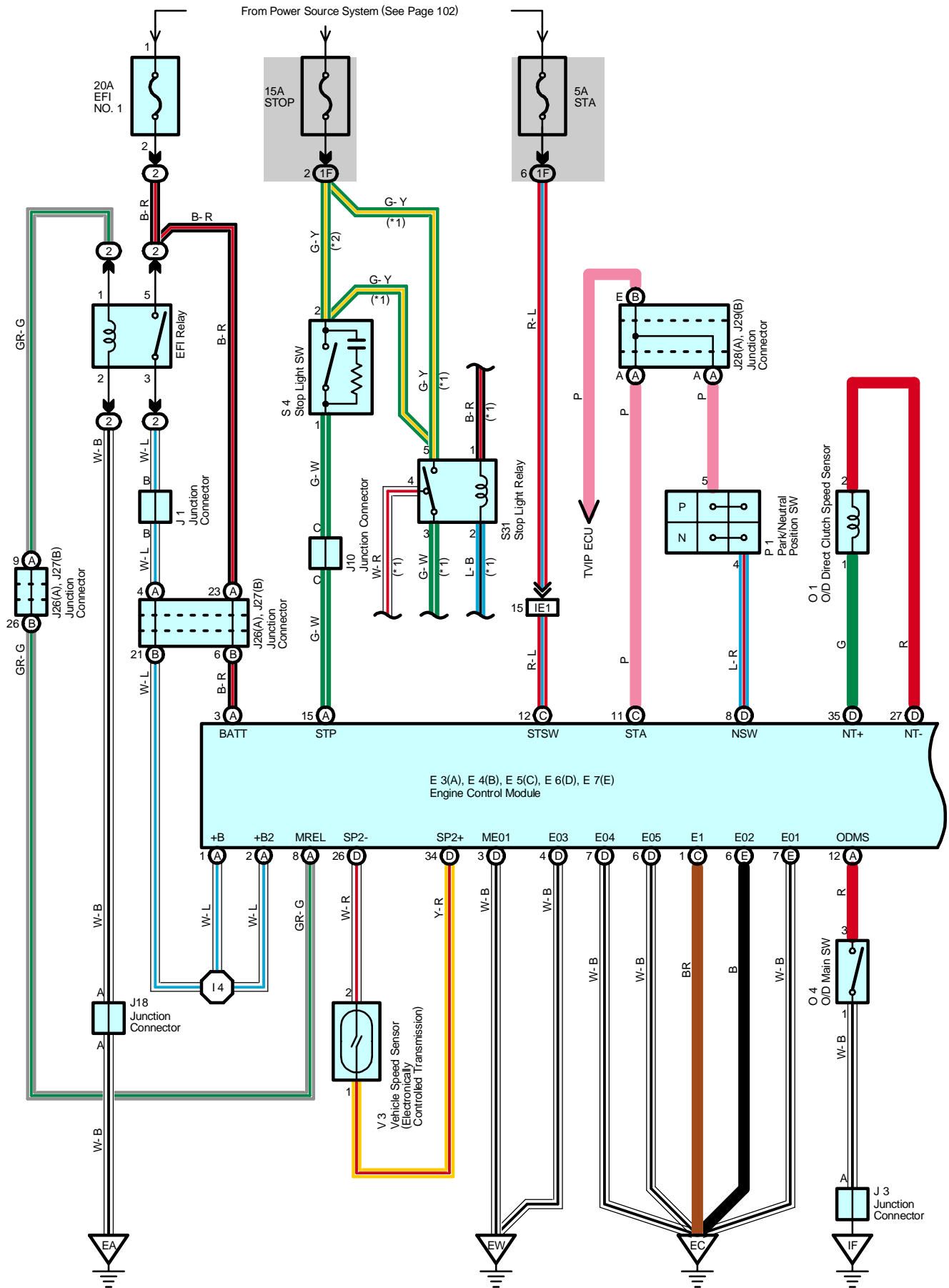
: Ground Points

Code	See Page	Ground Points Location
IF	78	Left Kick Panel
II	78	Right Kick Panel

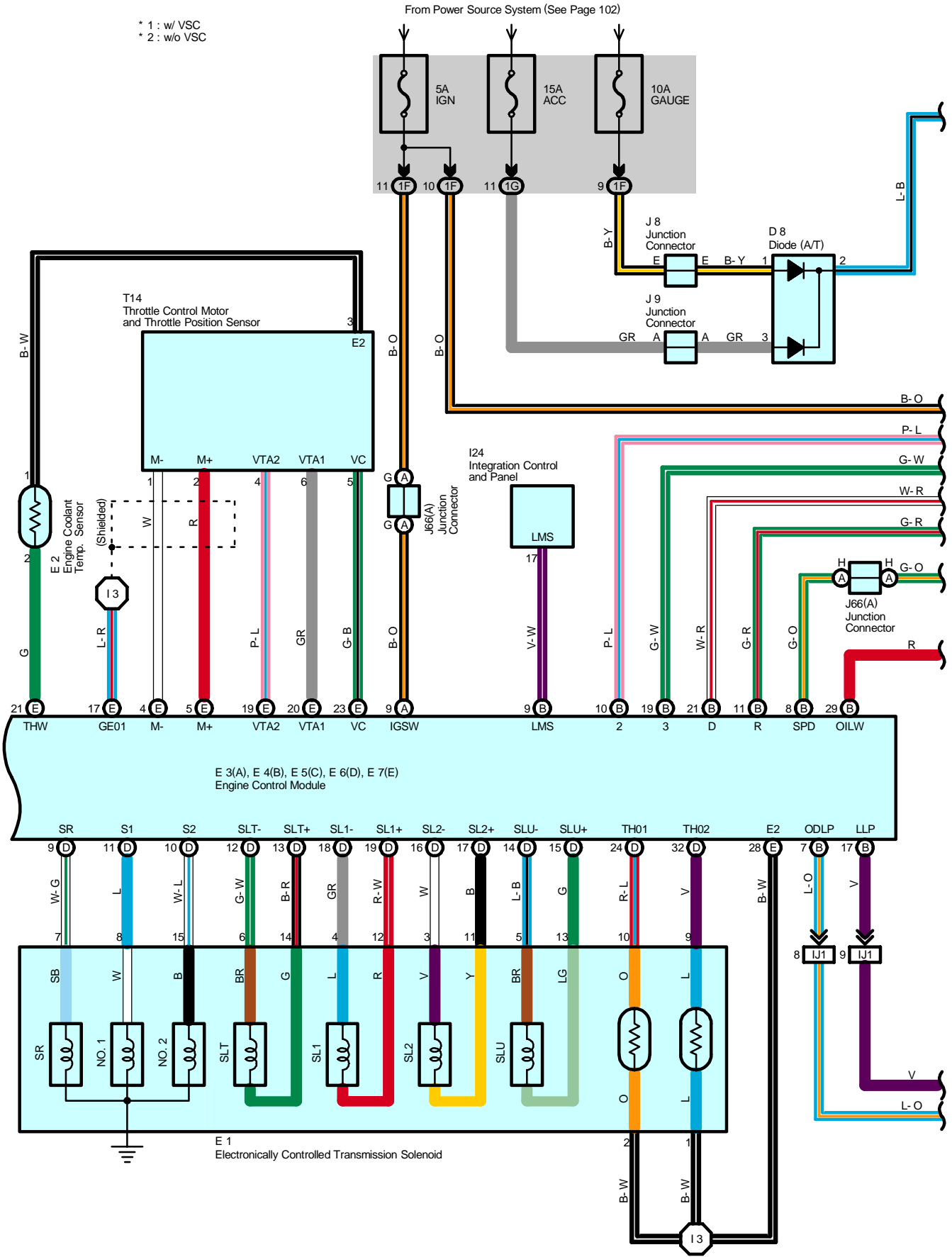
: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I4	80	Cowl Wire	I22	80	Floor No.3 Wire

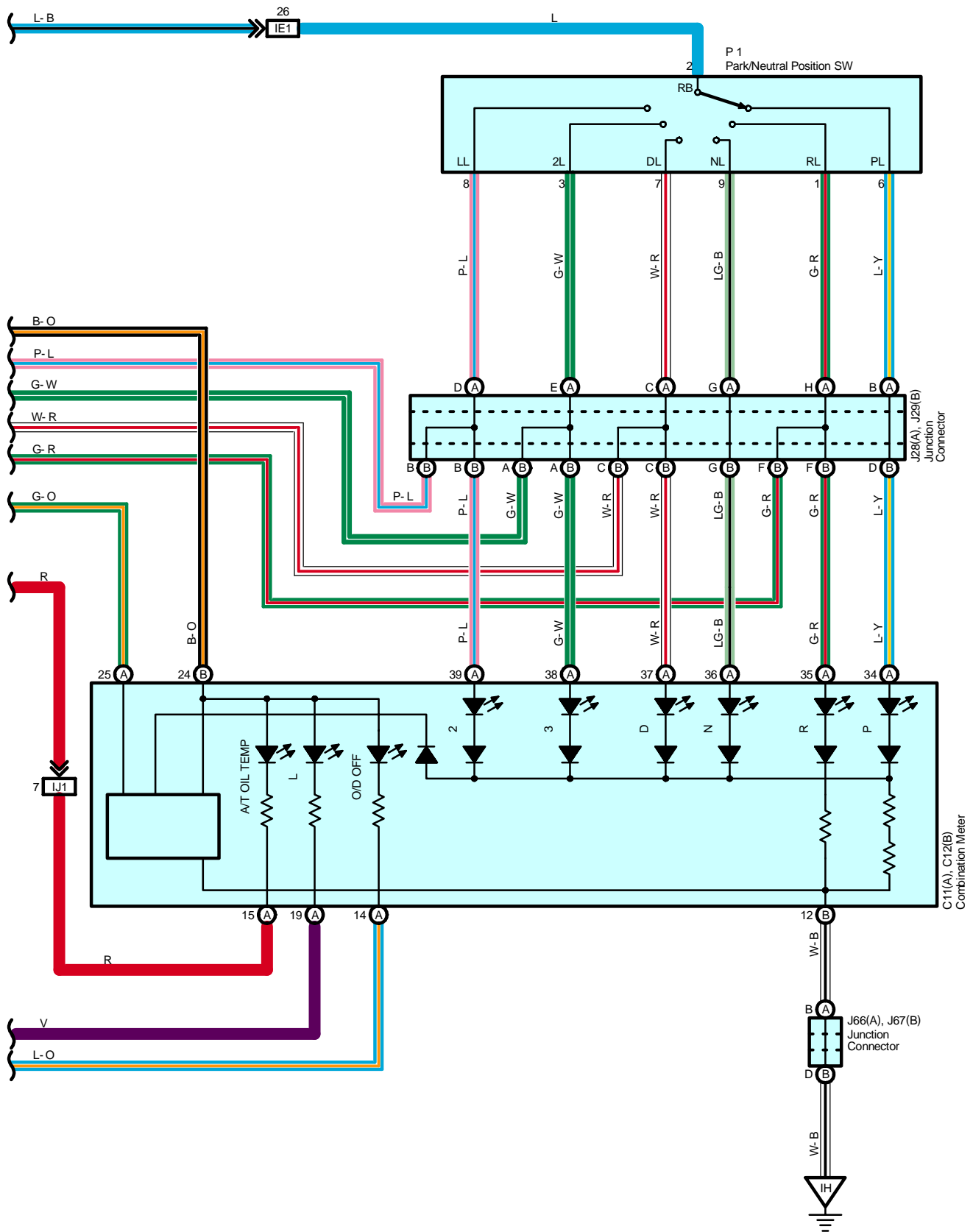
ECT and A/T Indicator for 2UZ-FE (Access/Standard Cab)



- * 1 : w/ VSC
- * 2 : w/o VSC



ECT and A/T Indicator for 2UZ-FE (Access/Standard Cab)



System Outline

The electronically controlled transmission electrically controls the, throttle pressure, lock-up pressure, and accumulator pressure etc. through the solenoid valve.

The electronically controlled transmission is a system which precisely controls the gear shift timing and lock-up timing in response to the vehicle's driving conditions and the engine condition detected by various sensors. It makes smooth driving possible by shift selection of the gear which is the most appropriate to the driving conditions at that time, and by preventing downing, squat and gear shift shock when starting off.

1. Gear Shift Operation

When driving, the engine warm up condition is input as a control signal from the engine coolant temp. sensor to TERMINAL THW of the engine control module, and the vehicle speed is input to TERMINAL SP2+ of the engine control module from the vehicle speed sensor. At the same time, the throttle valve opening signal from the throttle position sensor is input to TERMINALS VTA1, VTA2 of the engine control module as a throttle angle signal. Based on these signals, the engine control module selects the best shift position for the driving conditions and sends current to the electronically controlled transmission solenoid.

2. Lock-Up Operation

When the engine control module decides based on each signal that the lock-up condition has been met, the current flows through TERMINAL SLU+ of the engine control module to TERMINAL 5 of the electronically controlled transmission solenoid to TERMINAL 13 to TERMINAL SLU- of the engine control module to GROUND.

3. Stop Light SW Circuit

If the brake pedal is depressed (Stop light SW on) when driving in lock-up position, a signal is input to TERMINAL STP of the engine control module. As a result, the engine control module cuts the current to the solenoid to release the lock-up.

4. Overdrive Circuit

* O/D main SW on

When the O/D main SW is switched to ON position, a signal is input to TERMINAL ODMS of the engine control module, and enables shift change to the overdrive range, through the control of the engine control module.

* O/D main SW off

When the O/D main SW is switched to OFF position, a signal is input to TERMINAL ODMS of the engine control module, and prohibits shift change to the overdrive range through the control of the engine control module. When in the overdrive range already, shift down is made.

ECT and A/T Indicator for 2UZ-FE (Access/Standard Cab)

Service Hints

E1 Electronically Controlled Transmission Solenoid

7, 8, 15-Ground : Approx. 13 Ω

O4 O/D Main SW

3-1 : Open with O/D main SW at ON position
 Closed with O/D main SW at OFF position

S4 Stop Light SW

1-2 : Closed with brake pedal depressed

E3(A), E4 (B), E5 (C), E6 (D), E7 (E) Engine Control Module

S1-E1 : 9-14 volts with vehicle not move and shift lever in D position

S2, SR-E1 : 0-1.5 volts with vehicle not move

STP-E1 : 7.5-14 volts with brake pedal depressed
 : 0-1.5 volts with brake pedal released

THW-E1 : 0.2-1.0 volts with idling, engine coolant temp. 60°C (140°F)-120 °C (248°F)

VTA1, VTA2-E1 : 0.4-1.0 volts with ignition SW on and throttle valve fully closed
 : 3.2-4.8 volts with ignition SW on and throttle valve fully open

VC-E1 : 4.5-5.5 volts with ignition SW at ON or ST position

ODMS-E1 : 9-14 volts with O/D main SW turned on
 : 0-3 volts with O/D main SW turned off

SPD-E1 : Pulse generation with vehicle moving

2-E1 : 7.5-14 volts with shift lever at 2 position
 : 0-1.5 volts with shift lever at except 2 position

L-E1 : 7.5-14 volts with shift lever at L position
 : 0-1.5 volts with shift lever at except L position

+B-E1 : 9-14 volts with ignition SW at ON or ST position

BATT-E1 : Always 9-14 volts

P1 Park/Neutral Position SW

2-6 : Closed with shift lever in P position

2-1 : Closed with shift lever in R position

2-9 : Closed with shift lever in N position

2-7 : Closed with shift lever in D position

2-3 : Closed with shift lever in 2 position

2-8 : Closed with shift lever in L position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C11	A 56	I24	57	J29	B 58
C12	B 56	J1	53 (2UZ-FE)	J66	A 58
D8	57	J3	58	J67	B 58
E1	52 (2UZ-FE)	J8	58	O1	53 (2UZ-FE)
E2	52 (2UZ-FE)	J9	58	O4	58
E3	A 57	J10	58	P1	53 (2UZ-FE)
E4	B 57	J18	53 (2UZ-FE)	S4	59
E5	C 57	J26	A 58	S31	59
E6	D 57	J27	B 58	T14	53 (2UZ-FE)
E7	E 57	J28	A 58	V3	53 (2UZ-FE)

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)

 : **Ground Points**

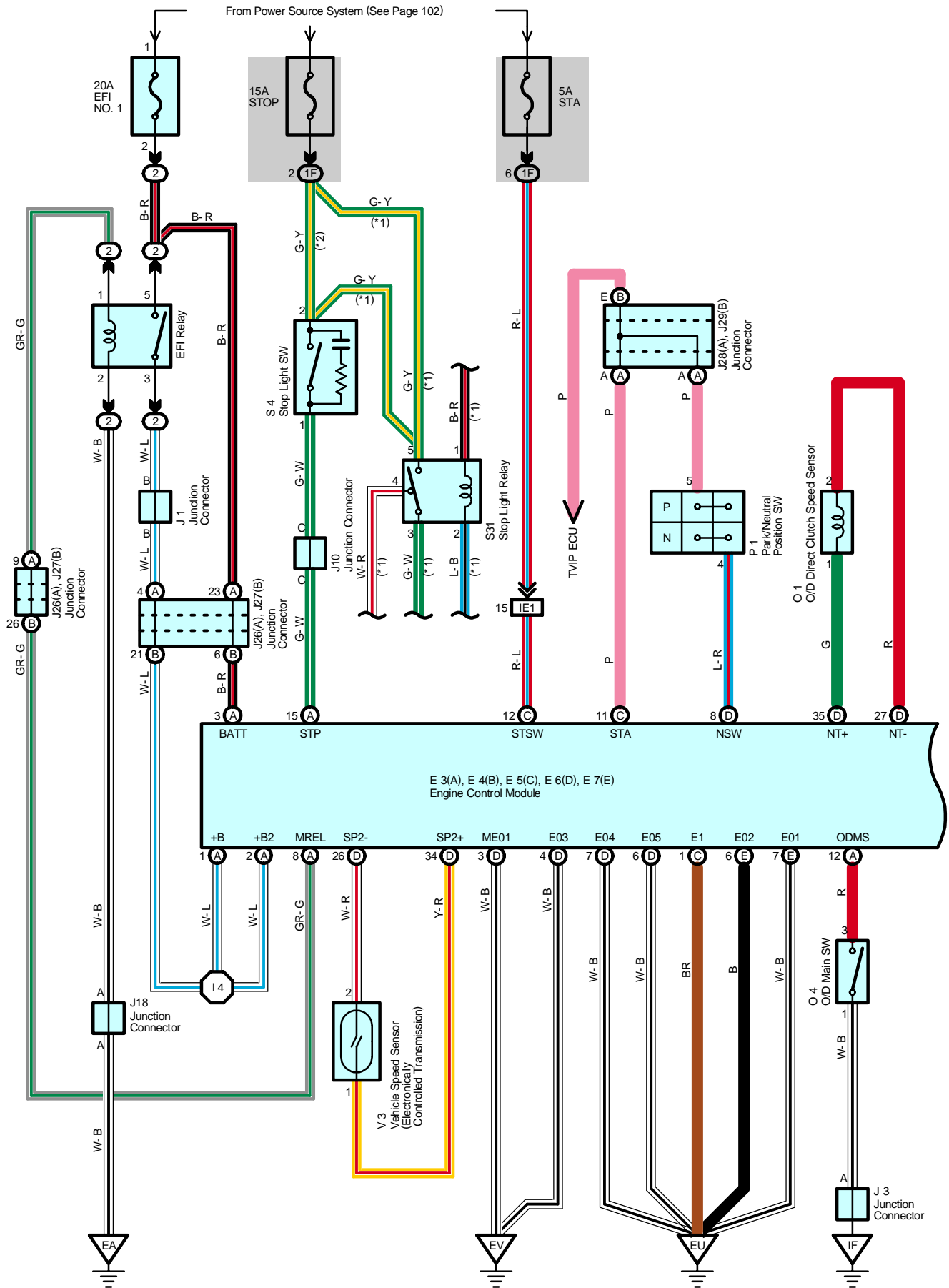
Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
EC	74 (2UZ-FE)	Rear Bank of Left Cylinder Head
EW	74 (2UZ-FE)	Front Left Side of Cylinder Head
IF	78	Left Kick Panel
IH	78	Right Kick Panel

 : **Splice Points**

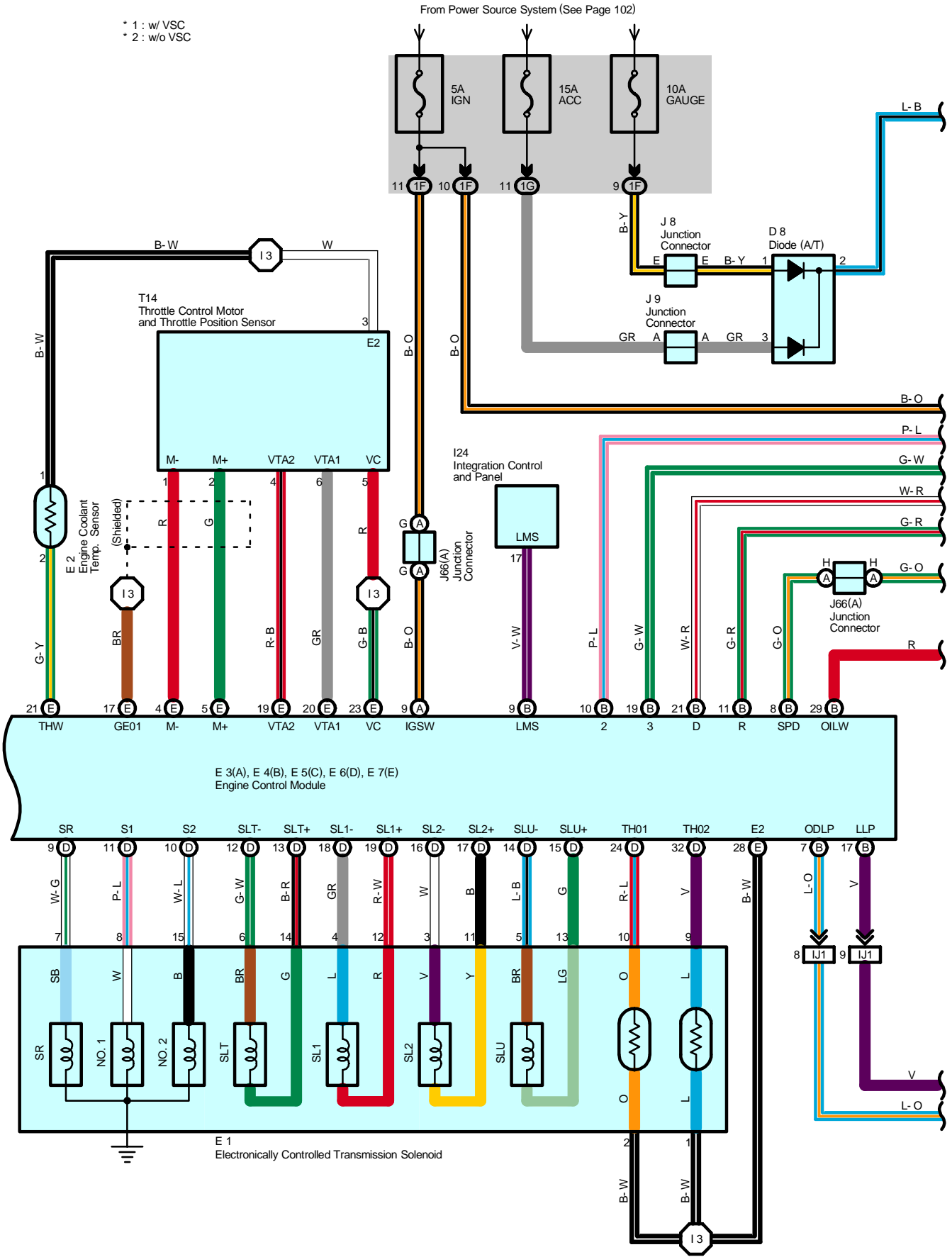
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I3	80	Engine Wire	I4	80	Cowl Wire

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

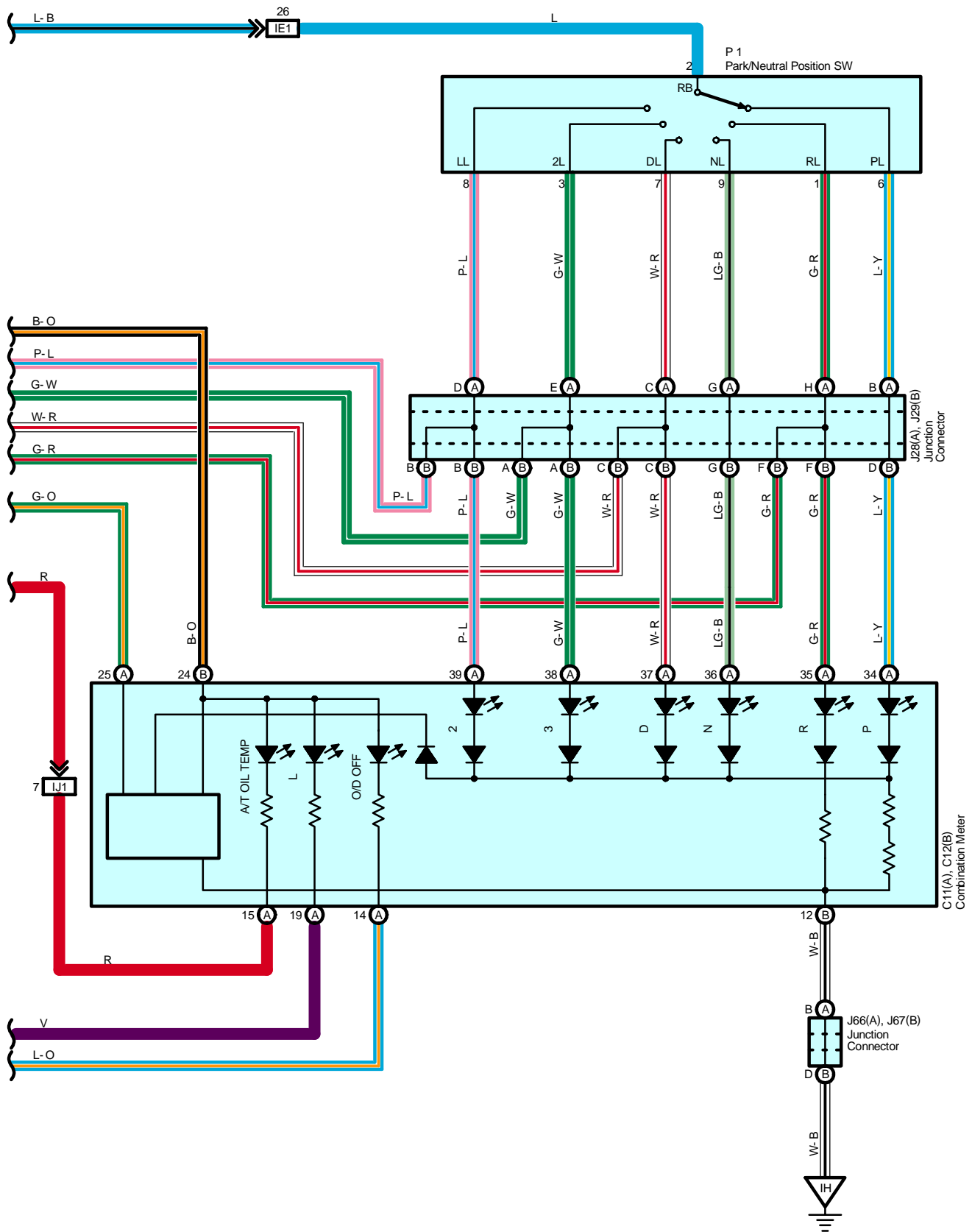
ECT and A/T Indicator for 1GR-FE (Access/Standard Cab)



* 1 : w/ VSC
 * 2 : w/o VSC



ECT and A/T Indicator for 1GR-FE (Access/Standard Cab)



System Outline

The electronically controlled transmission electrically controls the, throttle pressure, lock-up pressure, and accumulator pressure etc. through the solenoid valve.

The electronically controlled transmission is a system which precisely controls the gear shift timing and lock-up timing in response to the vehicle's driving conditions and the engine condition detected by various sensors. It makes smooth driving possible by shift selection of the gear which is the most appropriate to the driving conditions at that time, and by preventing downing, squat and gear shift shock when starting off.

1. Gear Shift Operation

When driving, the engine warm up condition is input as a control signal from the engine coolant temp. sensor to TERMINAL THW of the engine control module, and the vehicle speed is input to TERMINAL SP2+ of the engine control module from the vehicle speed sensor. At the same time, the throttle valve opening signal from the throttle position sensor is input to TERMINALS VTA1, VTA2 of the engine control module as a throttle angle signal. Based on these signals, the engine control module selects the best shift position for the driving conditions and sends current to the electronically controlled transmission solenoid.

2. Lock-Up Operation

When the engine control module decides based on each signal that the lock-up condition has been met, the current flows through TERMINAL SLU+ of the engine control module to TERMINAL 5 of the electronically controlled transmission solenoid to TERMINAL 13 to TERMINAL SLU- of the engine control module to GROUND.

3. Stop Light SW Circuit

If the brake pedal is depressed (Stop light SW on) when driving in lock-up position, a signal is input to TERMINAL STP of the engine control module. As a result, the engine control module cuts the current to the solenoid to release the lock-up.

4. Overdrive Circuit

* O/D main SW on

When the O/D main SW is switched to ON position, a signal is input to TERMINAL ODMS of the engine control module, and enables shift change to the overdrive range, through the control of the engine control module.

* O/D main SW off

When the O/D main SW is switched to OFF position, a signal is input to TERMINAL ODMS of the engine control module, and prohibits shift change to the overdrive range through the control of the engine control module. When in the overdrive range already, shift down is made.

ECT and A/T Indicator for 1GR-FE (Access/Standard Cab)

Service Hints

E1 Electronically Controlled Transmission Solenoid

7, 8, 15-Ground : Approx. 13 Ω

O4 O/D Main SW

3-1 : Open with O/D main SW at ON position
 Closed with O/D main SW at OFF position

S4 Stop Light SW

1-2 : Closed with brake pedal depressed

E3(A), E4 (B), E5 (C), E6 (D), E7 (E) Engine Control Module

S1-E1 : 9-14 volts with vehicle not move and shift lever in D position

S2, SR-E1 : 0-1.5 volts with vehicle not move

STP-E1 : 7.5-14 volts with brake pedal depressed
 : 0-1.5 volts with brake pedal released

THW-E1 : 0.2-1.0 volts with idling, engine coolant temp. 60°C (140°F)-120 °C (248°F)

VTA1, VTA2-E1 : 0.4-1.0 volts with ignition SW on and throttle valve fully closed
 : 3.2-4.8 volts with ignition SW on and throttle valve fully open

VC-E1 : 4.5-5.5 volts with ignition SW at ON or ST position

ODMS-E1 : 9-14 volts with O/D main SW turned on
 : 0-3 volts with O/D main SW turned off

SPD-E1 : Pulse generation with vehicle moving

2-E1 : 7.5-14 volts with shift lever at 2 position
 : 0-1.5 volts with shift lever at except 2 position

L-E1 : 7.5-14 volts with shift lever at L position
 : 0-1.5 volts with shift lever at except L position

+B-E1 : 9-14 volts with ignition SW at ON or ST position

BATT-E1 : Always 9-14 volts

P1 Park/Neutral Position SW

2-6 : Closed with shift lever in P position

2-1 : Closed with shift lever in R position

2-9 : Closed with shift lever in N position

2-7 : Closed with shift lever in D position

2-3 : Closed with shift lever in 2 position

2-8 : Closed with shift lever in L position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C11	A 56	I24	57	J29	B 58
C12	B 56	J1	55 (1GR-FE)	J66	A 58
D8	57	J3	58	J67	B 58
E1	54 (1GR-FE)	J8	58	O1	55 (1GR-FE)
E2	54 (1GR-FE)	J9	58	O4	58
E3	A 57	J10	58	P1	55 (1GR-FE)
E4	B 57	J18	55 (1GR-FE)	S4	59
E5	C 57	J26	A 58	S31	59
E6	D 57	J27	B 58	T14	55 (1GR-FE)
E7	E 57	J28	A 58	V3	55 (1GR-FE)

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)

 : **Ground Points**

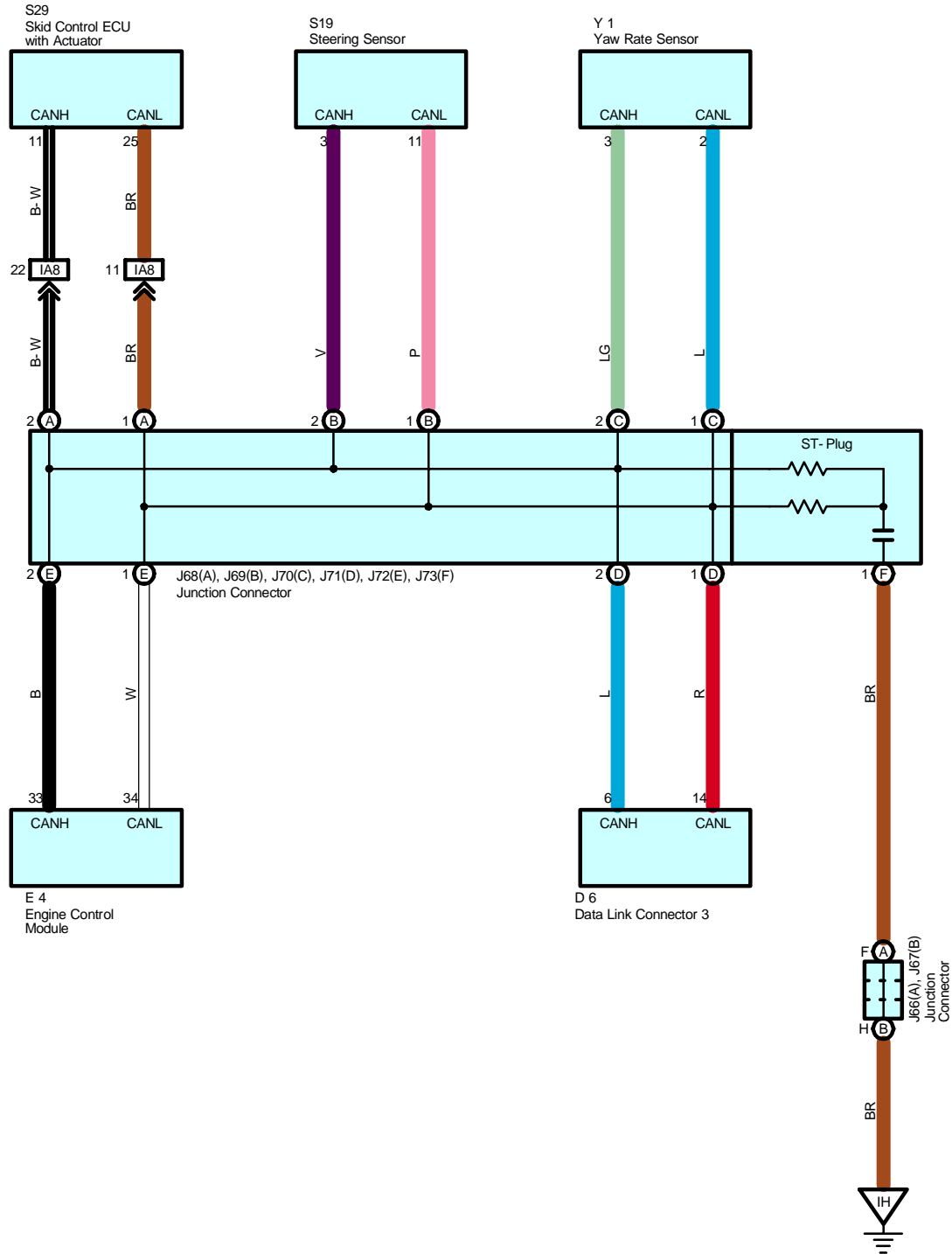
Code	See Page	Ground Points Location
EA	76 (1GR-FE)	Front Left Fender
EU	76 (1GR-FE)	Rear Bank of Right Cylinder Head
EV	76 (1GR-FE)	Rear Bank of Left Cylinder Head
IF	78	Left Kick Panel
IH	78	Right Kick Panel

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I3	80	Engine Wire	I4	80	Cowl Wire

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Multiplex Communication System - CAN (Access/Standard Cab)



System Outline

CAN has two lines as a pair which make communication with operating voltage. CAN has excellent data speed and error detecting capacity. It consists of vehicle control systems such as engine control module, data link connector 3 and skid control ECU with actuator.

This system is working for the following systems:

- * Cruise Control
- * Electronically Controlled Transmission and A/T Indicator
- * Engine Control
- * VSC

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
D6	57	J69	B	58	S19	59	
E4	57	J70	C	58	S29	53 (2UZ-FE)	
J66	A	58	J71	D		58	55 (1GR-FE)
J67	B	58	J72	E	58	Y1	60 (*3)
J68	A	58	J73	F	58		61 (*4)

□ : Connector Joining Wire Harness and Wire Harness

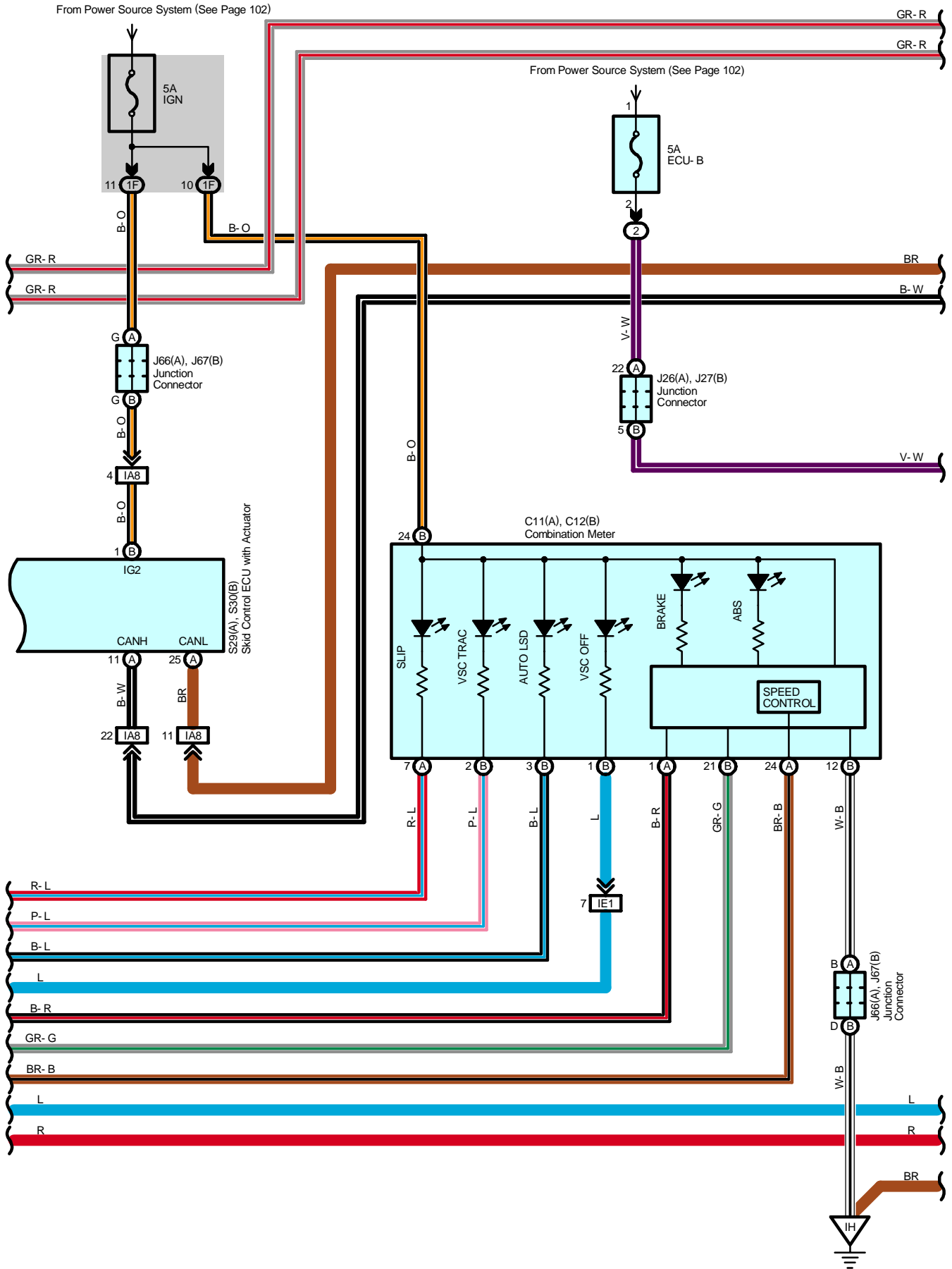
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA8	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)

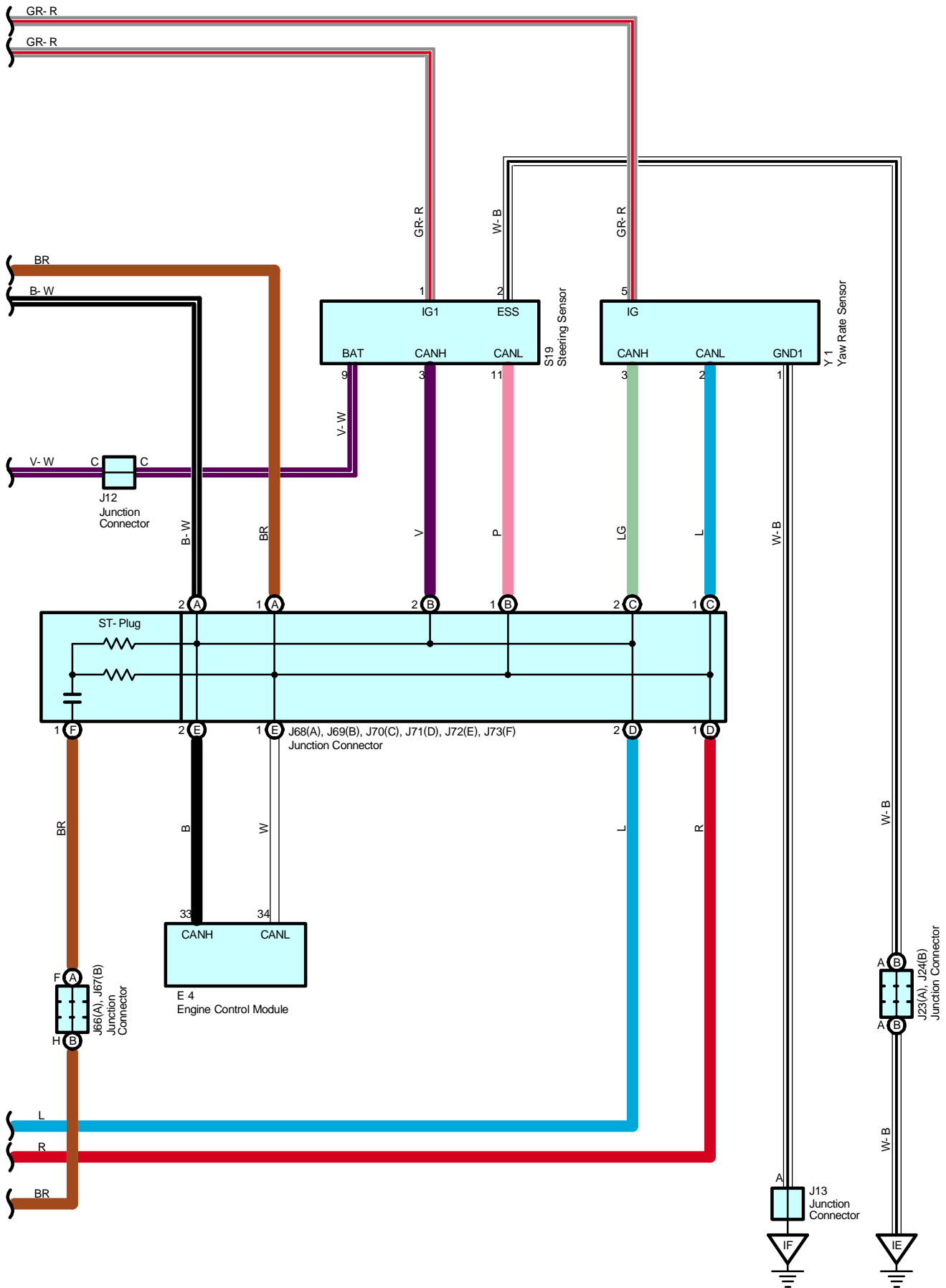
▽ : Ground Points

Code	See Page	Ground Points Location
IH	78	Right Kick Panel

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

VSC (Access/Standard Cab)





VSC (Access/Standard Cab)

System Outline

1. ABS Operation

If the brake pedal is depressed suddenly, the ABS controls the hydraulic pressure of the wheel cylinders for all the four wheels to automatically avoid wheel locking and ensure the directional and steering stability of the vehicle. If the brake pedal is depressed suddenly, the skid control ECU controls the solenoids in the actuators using the signals from the sensors to move the brake fluid to the reservoir in order to release the braking pressure applied to the wheel cylinder. If the skid control ECU detects that the fluid pressure in the wheel cylinder is insufficient, the ECU controls the solenoids in the actuators to increase the braking pressure.

2. Traction Control Operation

The traction control system controls the engine torque, the hydraulic pressure of the driving wheel cylinders, slipping of the wheels which may occur at start or acceleration of the vehicle, to ensure an optimal driving power and vehicle stability corresponding to the road conditions.

3. VSC Operation

Unexpected road conditions, vehicle speed, emergency situation, and any other external factors may cause large under- or over-steering of the vehicle. If this occurs, the VSC system automatically controls the engine power and wheel brakes to reduce the under- or over-steering.

To reduce large over-steering :

If the VSC system determines that the over-steering is large, it activates the brakes for the outer turning wheels depending on the degree of the over-steering to produce the moment toward the outside of the vehicle and reduce the over-steering.

To reduce large under-steering :

If the VSC system determines that the under-steering is large, it controls the engine power and activates the rear wheel brakes to reduce the under-steering.

Traction control SW

The traction control SW is used to stop the TRAC function. After the engine is started, the TRAC system is stopped (turned off) and the VSC OFF indicator light lights up. When the traction control SW is pressed again, the TRAC system enters the stand-by mode. If the engine is stopped and restarted, the TRAC system enters the stand-by mode regardless of the traction control SW.

4. Mutual System Control

To efficiently operate the VSC system at its optimal level, the VSC system and other control systems are mutually controlled while the VSC system is being operated.

Engine throttle control

The engine power does not interfere with the VSC brake control by controlling the opening of the throttle and reducing the engine output.

Engine control and electronically controlled transmission control

The strong braking force does not interfere with the braking force control of the VSC system by turning off the accel. and reducing changes in the driving torque at shift-down.

VSC system operation indication

The Slip indicator light flashes and the buzzer sounds intermittently to warn the driver that the current road is slippery, while the VSC system is being operated.

5. Fail Safe Function

If an error occurs in the skid control ECU with actuator, sensor signals, and/or actuators, the skid control ECU with actuator inhibits the brake actuator control and inputs the error signal to the engine control module. According to the error signal, the brake actuator turns off the solenoid and the engine control module rejects any electronically controlled throttle open request from the VSC system. As a result, the vehicle functions regardless of the ABS, TRAC, and VSC systems.

Service Hints

S29 (A), S30 (B) Skid Control ECU with Actuator

(A)46-Ground : Approx. 12 volts with ignition SW at ON position

(A)1, (A) 32, (B) 4-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A6	52 (2UZ-FE)	J9	58	J71	D 58
	54 (1GR-FE)	J10	58	J72	E 58
A7	52 (2UZ-FE)	J12	58	J73	F 58
	54 (1GR-FE)	J13	58	P1	53 (2UZ-FE)
A19	60 (*3)	J18	53 (2UZ-FE)		55 (1GR-FE)
	61 (*4)		55 (1GR-FE)	P5	58
B2	52 (2UZ-FE)	J23	A 58	S4	59
	54 (1GR-FE)	J24	B 58	S19	59
C11	A 56	J26	A 58	S29	A 53 (2UZ-FE)
C12	B 56	J27	B 58		55 (1GR-FE)
D6	57	J28	A 58	S30	B 53 (2UZ-FE)
D8	57	J29	B 58		55 (1GR-FE)
E4	57	J66	A 58	S31	59
I24	57	J67	B 58	V11	59
J3	58	J68	A 58	Y1	60 (*3)
J4	58	J69	B 58		61 (*4)
J8	58	J70	C 58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1K	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA2	74 (2UZ-FE)	Cowl Wire and Engine Room Main Wire (Right Fender)
	76 (1GR-FE)	
IA8	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA9		
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
BB3	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

VSC (Access/Standard Cab)



: Ground Points

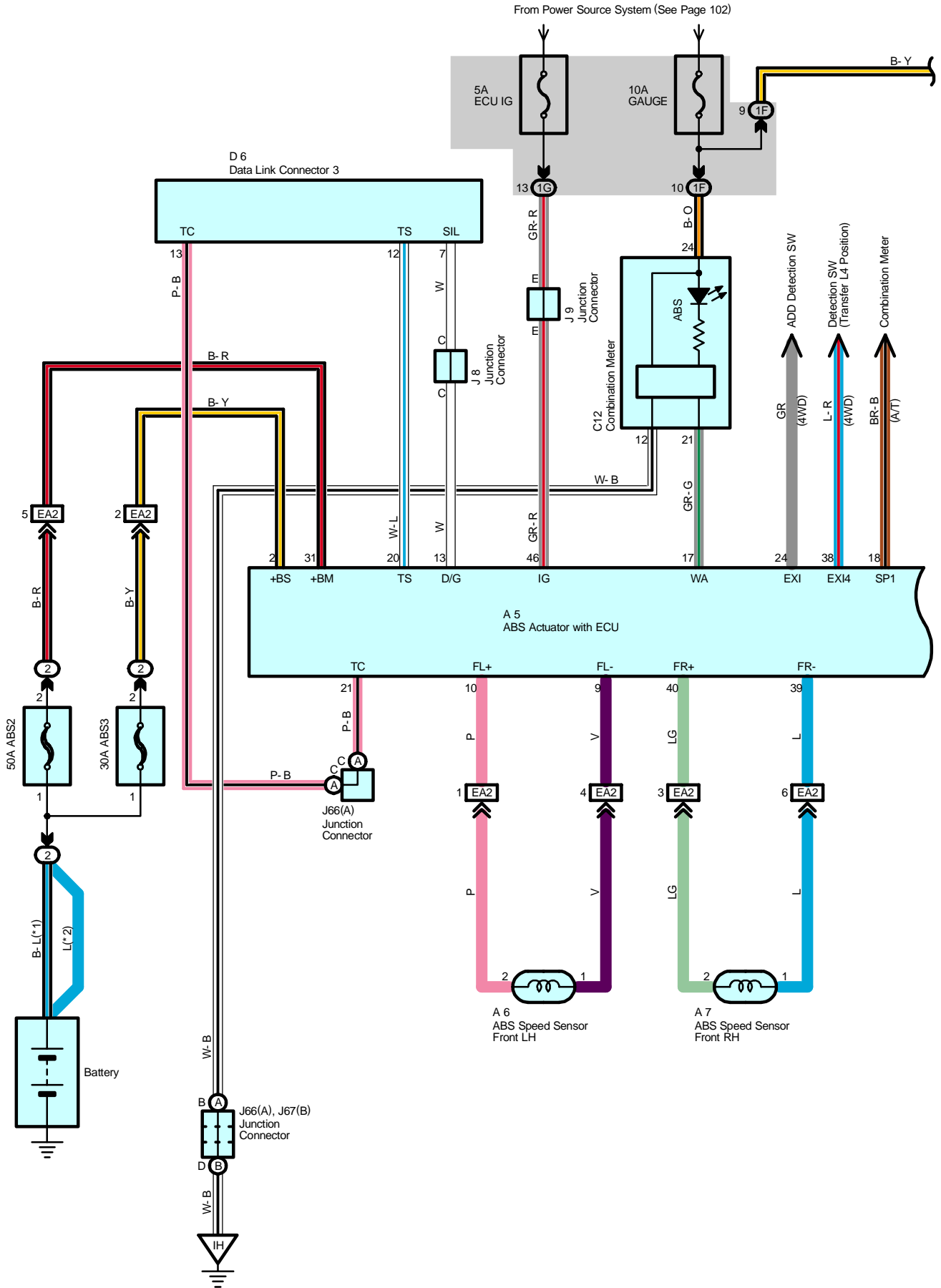
Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
ET	74 (2UZ-FE)	Front Right Fender
	76 (1GR-FE)	
IE	78	Left Kick Panel
IF		
IH	78	Right Kick Panel

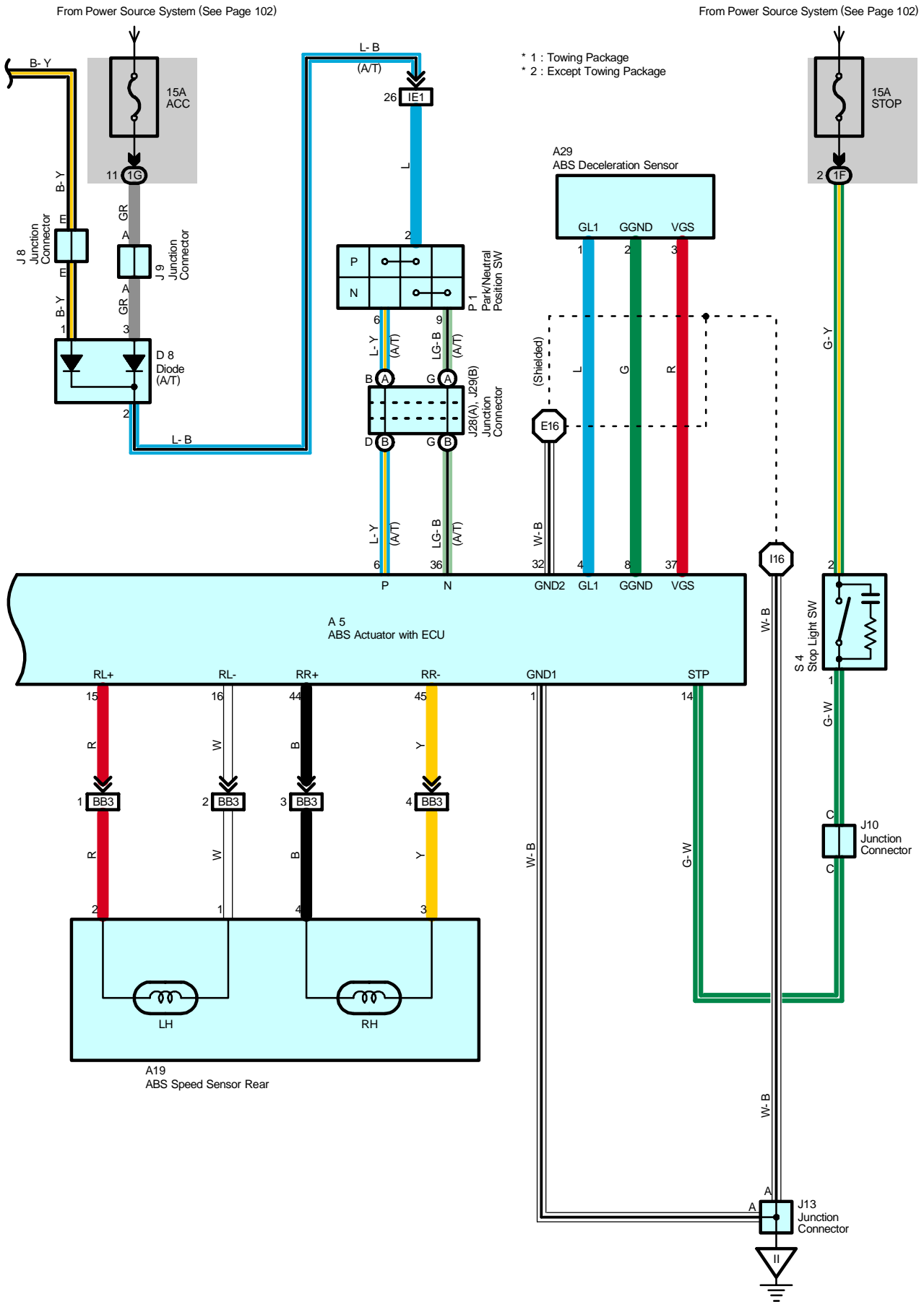


: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E11	74 (2UZ-FE)	Engine Room Main Wire	E12	74 (2UZ-FE)	Engine Room Main Wire
	76 (1GR-FE)			76 (1GR-FE)	

ABS (Access/Standard Cab)





ABS (Access/Standard Cab)

System Outline

This system controls the respective brake fluid pressures acting on the disc brake cylinders of the right front wheel, left front wheel, and rear wheels when the brakes are applied in a panic stop so that the wheels do not lock. This results in improved directional stability and steerability during panic braking.

1. Input Signal

(1) Speed sensor signal

The speed of the wheels is detected and input to TERMINALS FL+, FR+, RL+ and RR+ of the ABS actuator with ECU.

(2) Stop light SW signal

A signal is input to TERMINAL STP of the ABS actuator with ECU when the brake pedal is depressed.

2. System Operation

During sudden braking, the ABS actuator with ECU which has signals input from each sensor lets the hydraulic pressure acting on each wheel cylinder escape to the reservoir.

The pump inside the ABS actuator with ECU is also operating at this time and it returns the brake fluid from the reservoir to the master cylinder, thus preventing locking of vehicle wheels.

If the ABS actuator with ECU judges that the hydraulic pressure acting on the wheel cylinder is insufficient, the current acting on the solenoid is controlled and the hydraulic pressure is increased.

Holding of the hydraulic pressure is also controlled by the ECU, by the same method as above, by repeated pressure reduction. Holding and increase are repeated to maintain vehicle stability and to improve steerability during sudden braking.

Service Hints

A6, A7 ABS Speed Sensor Front LH, RH

1-2 : 0.92-1.22 kΩ (20°C, 68°F)

A19 ABS Speed Sensor Rear

1-2 : 0.89-1.29 kΩ (20°C, 68°F)

3-4 : 0.89-1.29 kΩ (20°C, 68°F)

A5 ABS Actuator with ECU

46-Ground : 10-14 volts with ignition SW at ON or ST position

14-Ground : 10-14 volts with stop light SW on (Brake pedal depressed)

1-Ground : Always continuity

S4 Stop Light SW

2-1 : Closed with brake pedal depressed

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A5	52 (2UZ-FE)	A29	60 (*3)	J13	58
	54 (1GR-FE)			J28 A	58
A6	52 (2UZ-FE)	C12	56	J29	B 58
	54 (1GR-FE)	D6	57	J66	A 58
A7	52 (2UZ-FE)	D8	57	J67	B 58
	54 (1GR-FE)	J8	58	P1	53 (2UZ-FE)
A19	60 (*3)	J9	58		55 (1GR-FE)
	61 (*4)	J10	58	S4	59

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA2	74 (2UZ-FE)	Cowl Wire and Engine Room Main Wire (Right Fender)
	76 (1GR-FE)	
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
BB3	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	

 : **Ground Points**

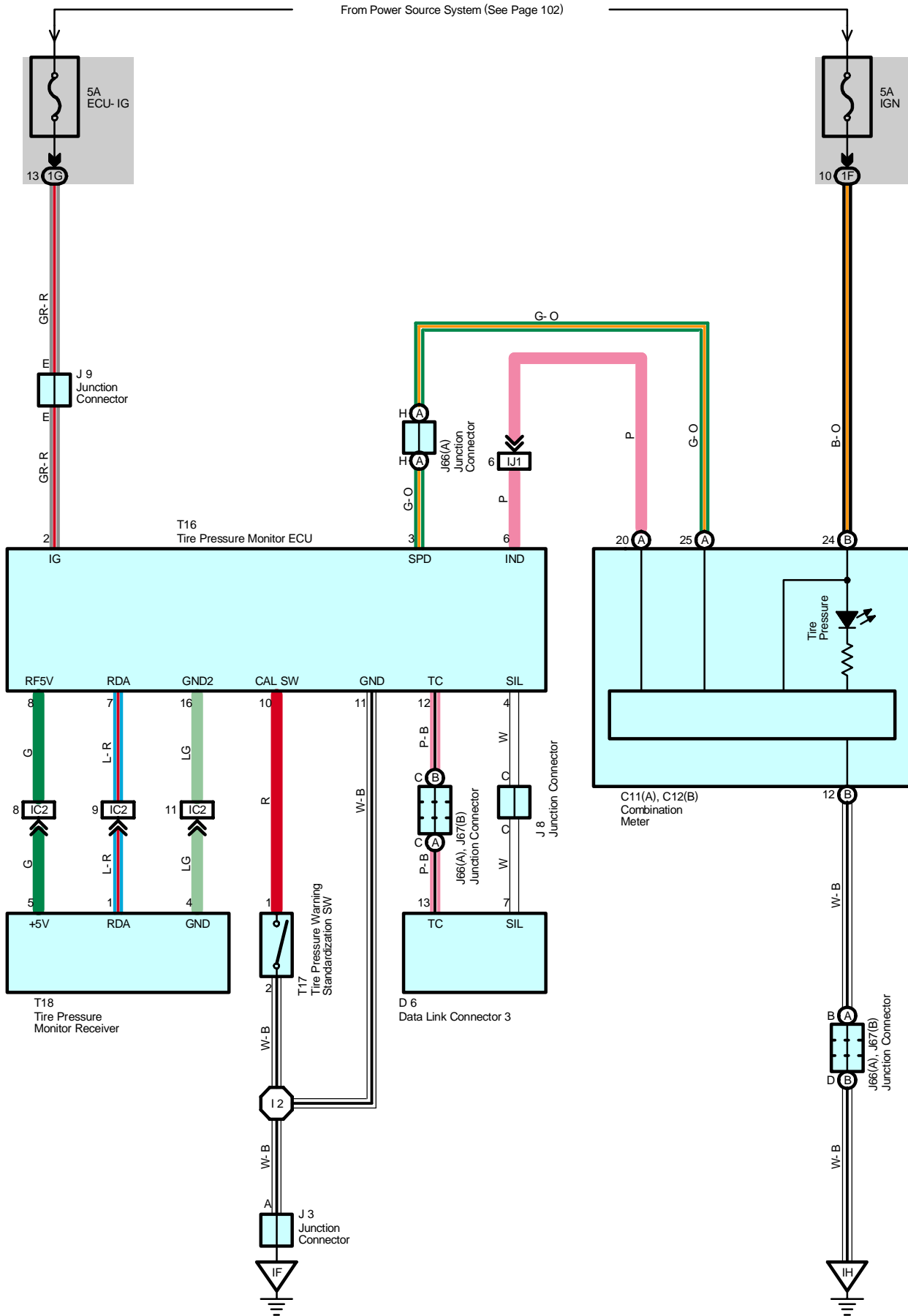
Code	See Page	Ground Points Location
IH	78	Right Kick Panel
II		

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E16	74 (2UZ-FE)	Cowl Wire	116	80	Cowl Wire
	76 (1GR-FE)				

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Tire Pressure Warning System (Access/Standard Cab)



System Outline

The air pressure sensor installed in the tire wheel detects the tire air pressure and transmits signals to the vehicle side receiver. When the detected tire air pressure is below a specified level, the warning light in the combination meter comes on to inform the driver.

Press the tire pressure warning standardization SW for 3 seconds with the ignition SW at ON position after the tire pressure is adjusted to the specified value. It will lead the tire pressure monitor ECU to control and warn the pressure according to the specified value.

Warnings when the tire pressure is low

* When the tire air pressure is below a specified level, the warning light in the combination meter comes on.

Service Hints

T16 Tire Pressure Monitor ECU

2-Ground : Approx. 12 volts with ignition SW at ON position

11-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
C11	A	56	J8	58	T16	59
C12	B	56	J9	58	T17	59
D6	57	J66	A	58	T18	60 (*3)
J3	58	J67	B	58		61 (*4)

□ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IC2	78	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)

▽ : Ground Points

Code	See Page	Ground Points Location
IF	78	Left Kick Panel
IH	78	Right Kick Panel

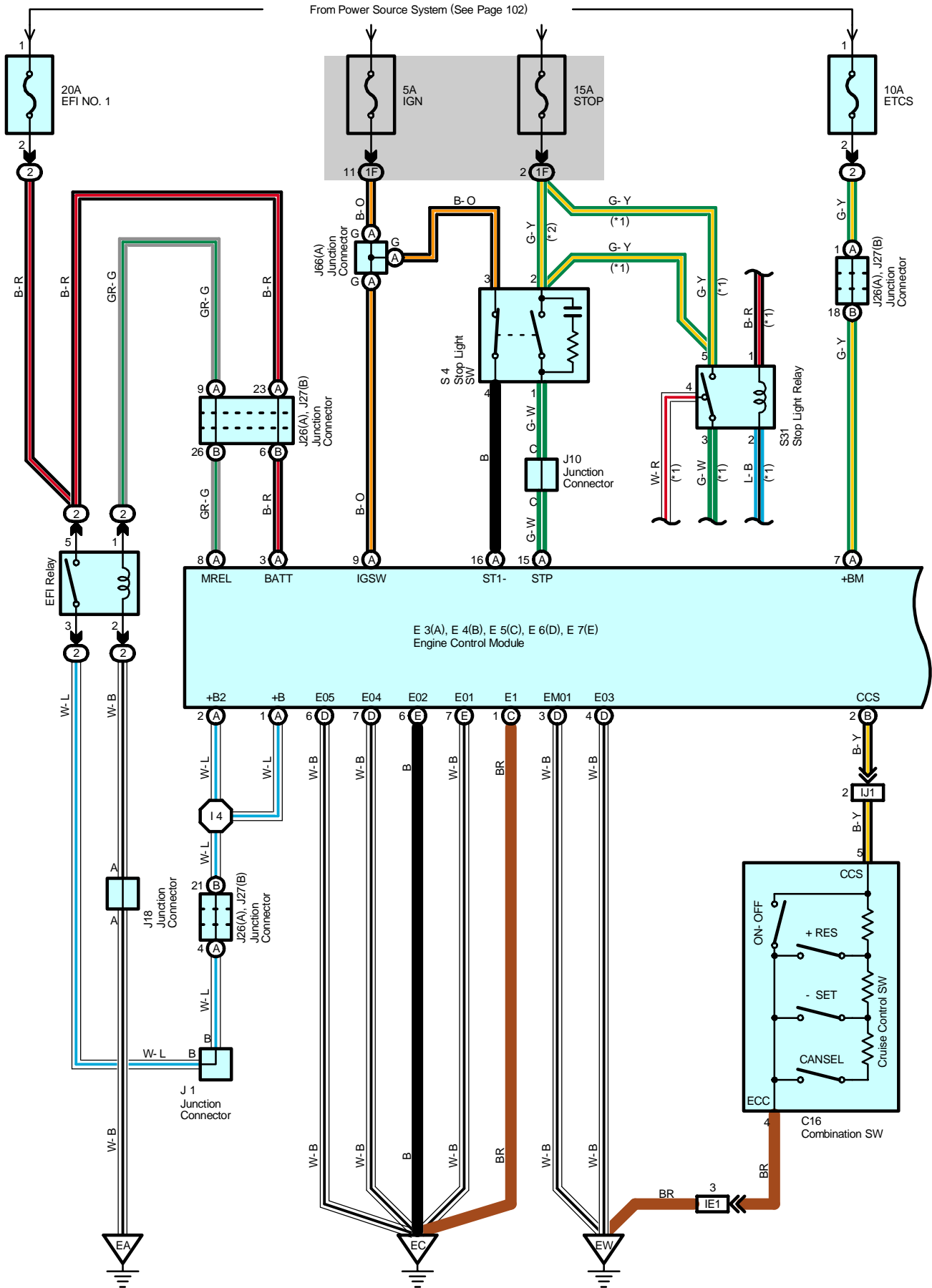
○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I2	80	Cowl Wire			

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

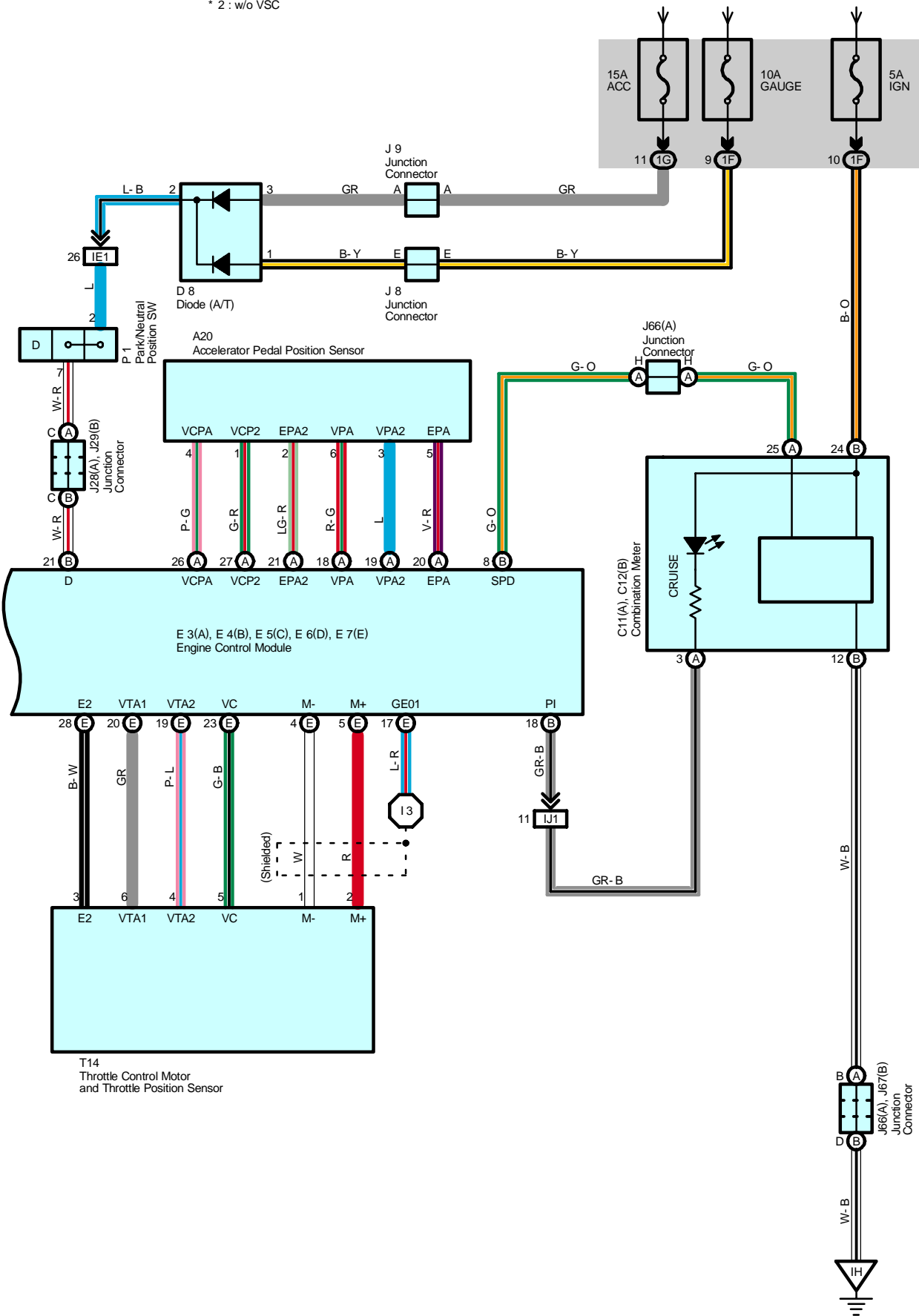
* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Cruise Control for 2UZ-FE (Access/Standard Cab)



* 1 : w/ VSC
 * 2 : w/o VSC

From Power Source System (See Page 102)



Cruise Control for 2UZ-FE (Access/Standard Cab)

System Outline

The cruise control system is a constant vehicle speed controller which controls the opening angle of the engine throttle valve by the SW, and allows driving at a constant speed without depressing the accelerator pedal.

1. Set Control

When the - SET SW is operated while traveling with the ON-OFF SW on, the speed when the - SET SW is operated to off is memorized, and the vehicle speed is controlled at that speed.

2. Coast Control

When the - SET SW is operated to on, the cruise control opening angle requirement is turned to 0 to decrease the vehicle speed, and the speed when the - SET SW is operated to off is memorized, and the vehicle speed is controlled at that speed. Furthermore, every time the - SET SW is operated momentarily (Approx. 0.5 sec.) to on, the memorized vehicle speed is decreased by approx. 1.6 km/h (1.0 mph).

3. Accel Control

When the + RES SW is operated to on, the throttle motor rotates the throttle valve to open direction to increase the vehicle speed, and the speed when the + RES SW is operated to off is memorized, and the vehicle speed is controlled at that speed.

Furthermore, every time the + RES SW is operated momentarily (Approx. 0.5 sec.) to on, the memorized vehicle speed is increased by approx. 1.6 km/h (1.0 mph).

4. Manual Cancel Mechanism

If any of the following signals are input during cruise control traveling, the current to the motor flows in the direction to close the throttle valve, and cancel the cruise control.

- (1) Stop lamp SW is on (Brake pedal is depressed)
- (2) The CANCEL SW of the control SW is on
- (3) ON-OFF SW is off
- (4) Gear is shifted from D position to other positions than D.

5. Resume Control

After canceling the cruise control (Except when the ON-OFF SW is off) if the vehicle speed is above the minimum speed limit (Approx. 40km/h, 25mph), operating the + RES SW to on from off will cause the system to accelerate and resume to the vehicle speed before manual cancellation.

6. Overdrive Function

The overdrive may be cut on an uphill grade, while traveling with the cruise control.

After the overdrive is cut, when the throttle opening information indicates the hill climbing is finished after the overdrive is canceled, the vehicle returns to overdrive mode again as the overdrive return timer is completed, and if the system determines that the uphill grade has finished, the overdrive will resume after the overdrive timer operation.

7. Auto Cancel Operation

If any of the following conditions are detected, the control is canceled.

- (1) Disconnection and/or short in the stop light SW
- (2) Malfunction in the vehicle speed signal
- (3) Malfunction in the electronic throttle parts
- (4) Malfunction in the stop light SW input circuit
- (5) Malfunction in the cancel circuit
- (6) When the vehicle speed gets slower than the low speed limit.
- (7) The actual vehicle speed becomes -16 km/h (10 mph) slower than the set speed

Service Hints

E3 (A), E4 (B), E5 (C), E7 (E) Engine Control Module

IGSW-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

BATT-E1 : Always 9.0-14.0 volts

STP-E1 : 9.0-14.0 volts with brake pedal depressed
: Below 1.5 volts with brake pedal released

C16 Combination SW

5-4 : Approx. 1540Ω with CANCEL SW on

Approx. 240Ω with + RES SW on

Approx. 630Ω with - SET SW on

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page
A20	56	E7 E	57	J29 B	58
C11 A	56	J1	53 (2UZ-FE)	J66 A	58
C12 B	56	J8	58	J67 B	58
C16	56	J9	58	P1	53 (2UZ-FE)
D8	57	J10	58	S4	59
E3 A	57	J18	53 (2UZ-FE)	S31	59
E4 B	57	J26 A	58	T14	53 (2UZ-FE)
E5 C	57	J27 B	58		
E6 D	57	J28 A	58		

 : **Relay Blocks**

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)

 : **Ground Points**

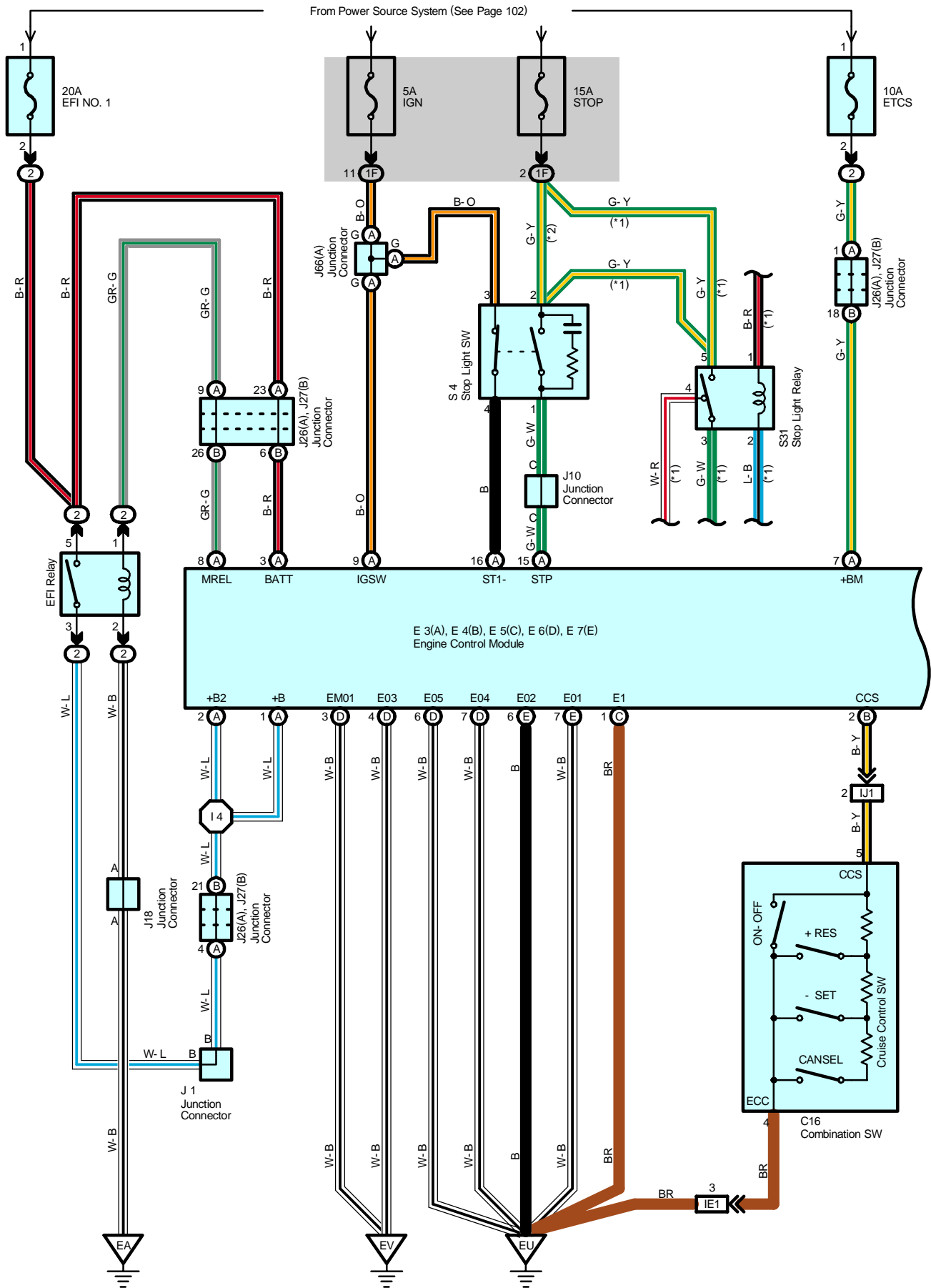
Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
EC	74 (2UZ-FE)	Rear Bank of Left Cylinder Head
EW	74 (2UZ-FE)	Front Left Side of Cylinder Head
IH	78	Right Kick Panel

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I3	80	Engine Wire	I4	80	Cowl Wire

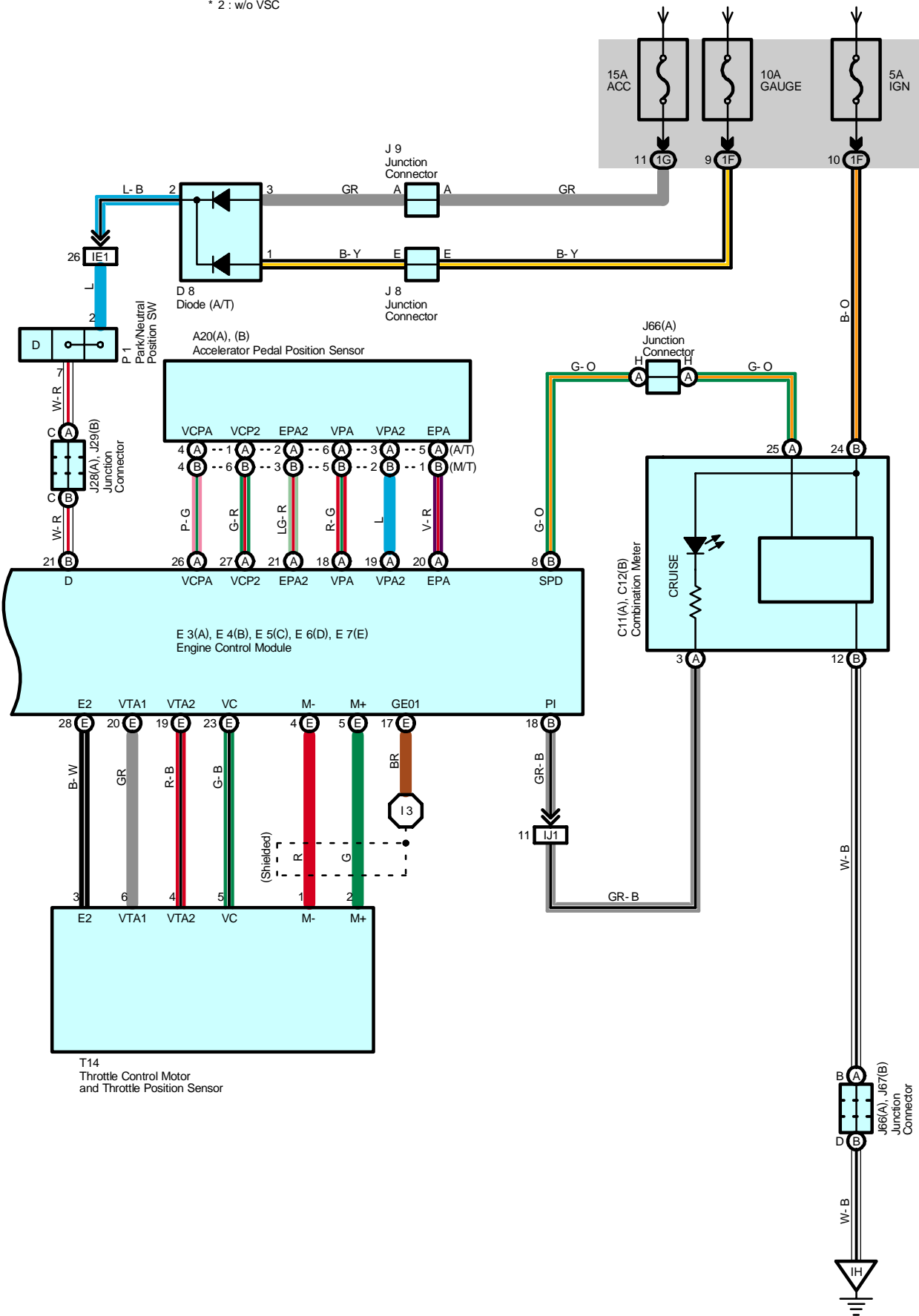
* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Cruise Control for 1GR-FE (Access/Standard Cab)



* 1 : w/ VSC
 * 2 : w/o VSC

From Power Source System (See Page 102)



Cruise Control for 1GR-FE (Access/Standard Cab)

System Outline

The cruise control system is a constant vehicle speed controller which controls the opening angle of the engine throttle valve by the SW, and allows driving at a constant speed without depressing the accelerator pedal.

1. Set Control

When the - SET SW is operated while traveling with the ON-OFF SW on, the speed when the - SET SW is operated to off is memorized, and the vehicle speed is controlled at that speed.

2. Coast Control

When the - SET SW is operated to on, the cruise control opening angle requirement is turned to 0 to decrease the vehicle speed, and the speed when the - SET SW is operated to off is memorized, and the vehicle speed is controlled at that speed. Furthermore, every time the - SET SW is operated momentarily (Approx. 0.5 sec.) to on, the memorized vehicle speed is decreased by approx. 1.6 km/h (1.0 mph).

3. Accel Control

When the + RES SW is operated to on, the throttle motor rotates the throttle valve to open direction to increase the vehicle speed, and the speed when the + RES SW is operated to off is memorized, and the vehicle speed is controlled at that speed.

Furthermore, every time the + RES SW is operated momentarily (Approx. 0.5 sec.) to on, the memorized vehicle speed is increased by approx. 1.6 km/h (1.0 mph).

4. Manual Cancel Mechanism

If any of the following signals are input during cruise control traveling, the current to the motor flows in the direction to close the throttle valve, and cancel the cruise control.

- (1) Stop lamp SW is on (Brake pedal is depressed)
- (2) The CANCEL SW of the control SW is on
- (3) ON-OFF SW is off
- (4) Gear is shifted from D position to other positions than D.

5. Resume Control

After canceling the cruise control (Except when the ON-OFF SW is off) if the vehicle speed is above the minimum speed limit (Approx. 40km/h, 25mph), operating the + RES SW to on from off will cause the system to accelerate and resume to the vehicle speed before manual cancellation.

6. Overdrive Function

The overdrive may be cut on an uphill grade, while traveling with the cruise control.

After the overdrive is cut, when the throttle opening information indicates the hill climbing is finished after the overdrive is canceled, the vehicle returns to overdrive mode again as the overdrive return timer is completed, and if the system determines that the uphill grade has finished, the overdrive will resume after the overdrive timer operation.

7. Auto Cancel Operation

If any of the following conditions are detected, the control is canceled.

- (1) Disconnection and/or short in the stop light SW
- (2) Malfunction in the vehicle speed signal
- (3) Malfunction in the electronic throttle parts
- (4) Malfunction in the stop light SW input circuit
- (5) Malfunction in the cancel circuit
- (6) When the vehicle speed gets slower than the low speed limit.
- (7) The actual vehicle speed becomes -16 km/h (10 mph) slower than the set speed

Service Hints

E3 (A), E4 (B), E5 (C), E7 (E) Engine Control Module

IGSW-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

BATT-E1 : Always 9.0-14.0 volts

STP-E1 : 9.0-14.0 volts with brake pedal depressed
: Below 1.5 volts with brake pedal released

C16 Combination SW

5-4 : Approx. 1540Ω with CANCEL SW on

Approx. 240Ω with + RES SW on

Approx. 630Ω with - SET SW on

 : **Parts Location**

Code		See Page	Code		See Page	Code		See Page
A20	A	56	E6	D	57	J28	A	58
	B	56	E7	E	57	J29	B	58
C11	A	56	J1		55 (1GR-FE)	J66	A	58
C12	B	56	J8		58	J67	B	58
C16		56	J9		58	P1		55 (1GR-FE)
D8		57	J10		58	S4		59
E3	A	57	J18		55 (1GR-FE)	S31		59
E4	B	57	J26	A	58	T14		55 (1GR-FE)
E5	C	57	J27	B	58			

 : **Relay Blocks**

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)

 : **Ground Points**

Code	See Page	Ground Points Location
EA	76 (1GR-FE)	Front Left Fender
EU	76 (1GR-FE)	Rear Bank of Right Cylinder Head
EV	76 (1GR-FE)	Rear Bank of Left Cylinder Head
IH	78	Right Kick Panel

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I3	80	Engine Wire	I4	80	Cowl Wire

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

NOTICE: When inspecting or repairing the SRS, perform service in accordance with the following precautionary instructions and the procedure, and precautions in the Repair Manual applicable for the model year.

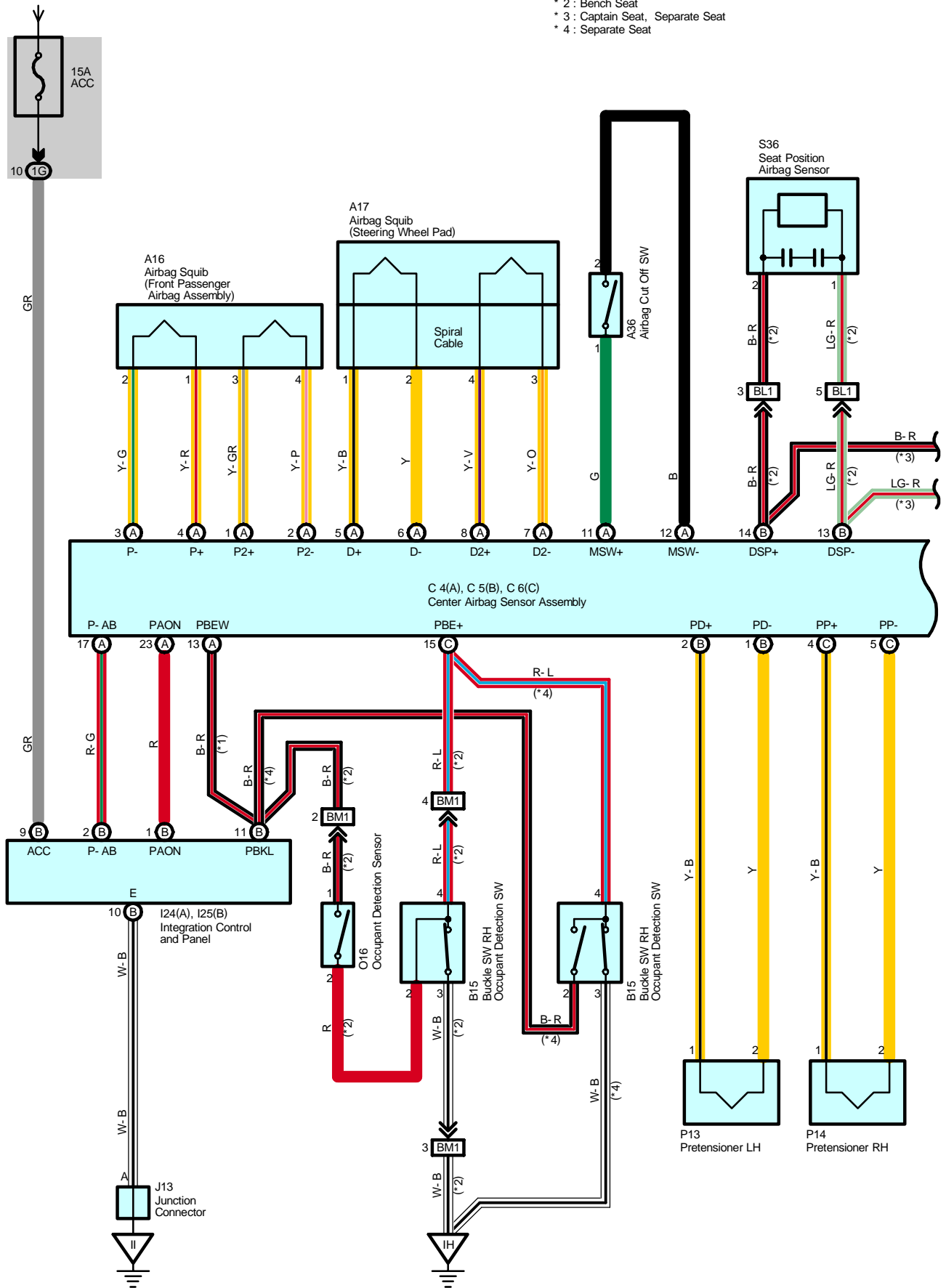
- Malfunction symptoms of the SRS are difficult to confirm, so the DTCs become the most important source of information when troubleshooting. When troubleshooting the SRS, always inspect the DTCs before disconnecting the battery.
- **Work must be started more than 90 seconds after the ignition SW is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.**
(The SRS is equipped with a back-up power source so that if work is started within 90 seconds from disconnecting the negative (-) terminal cable of the battery, the SRS may deploy.)
- When the negative (-) terminal cable is disconnected from the battery, the memory of the clock and audio system will be cleared. So before starting work, make a record of the contents in the audio memory system. When work is finished, reset the audio systems as they were before and adjust the clock. Some vehicles have power tilt steering, power telescopic steering, power seat and power outside rear view mirror which are all equipped with memory function. However, it is not possible to make a record of these memory contents. So when the work is finished, it will be necessary to explain it to your customer, and ask the customer to adjust the features and reset the memory. To avoid erasing the memory in each system, never use a back-up power supply from outside the vehicle.
- Before repair, remove the airbag sensor if shocks are likely to be applied to the sensor during repair.
- Do not expose the following parts directly to hot air or flame;
- Even in cases of a minor collision where the SRS does not deploy, the following parts should be inspected;
- Never use SRS parts from another vehicle. When replacing parts, replace with new parts.
- For the purpose of reuse, never disassemble and repair the following parts.
- If the following parts have been dropped, or have cracks, dents and other defects in their case, bracket, and connector, replace with new one.
- Use a volt/ohmmeter with high impedance (10 k Ω /V minimum) for troubleshooting electrical circuits of the system.
- Information labels are attached to the periphery of the SRS components. Follow the instructions of the notice.
- After work on the SRS is completed, check the SRS warning light.
- If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section of the Repair Manual.

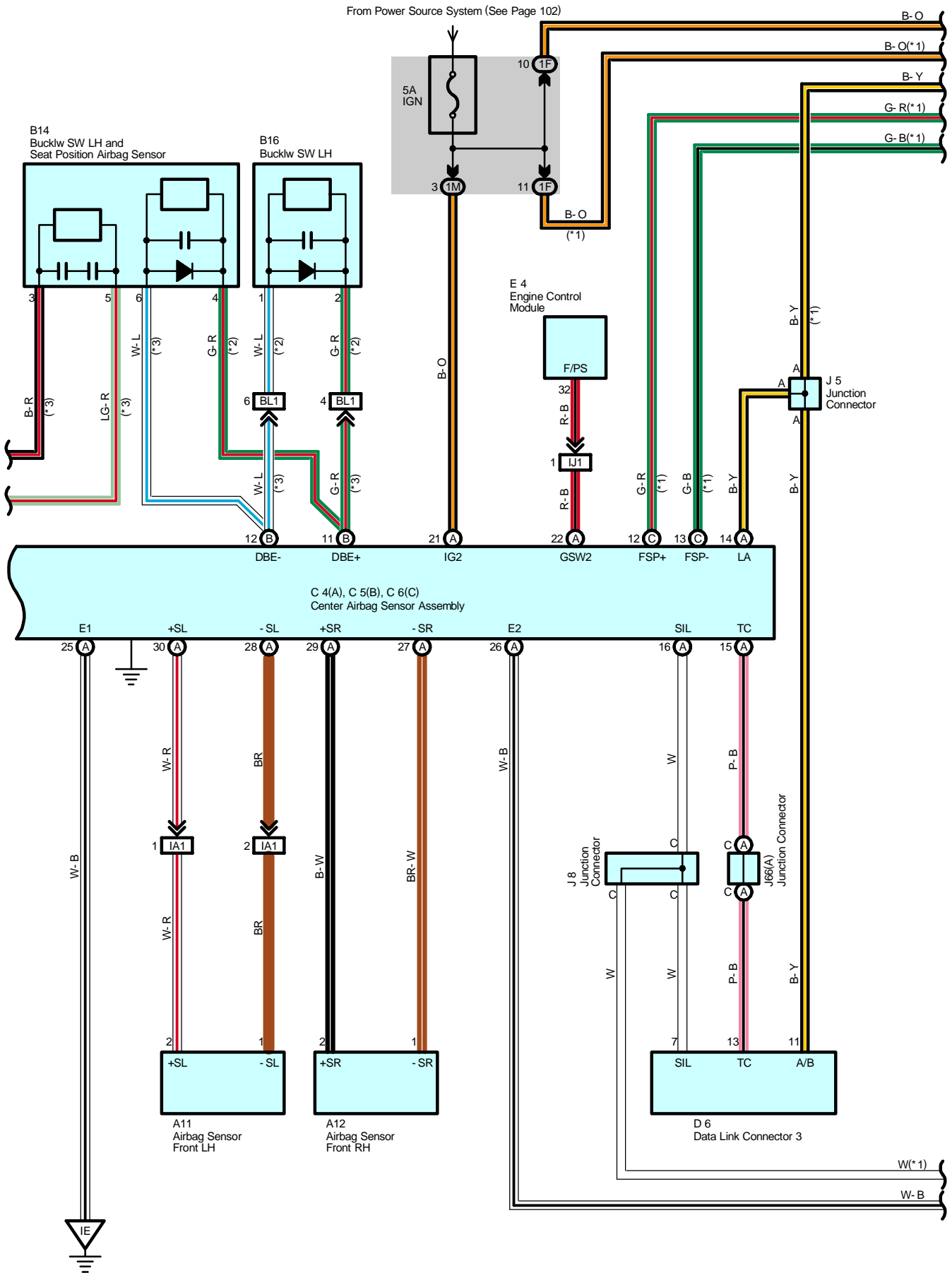
- | |
|--|
| <ul style="list-style-type: none">* Steering wheel pad* Front passenger airbag assembly* Seat belt pretensioner* Center airbag sensor assembly* Front airbag sensor assembly |
|--|

SRS (Access/Standard Cab)

From Power Source System (See Page 102)

- * 1 : Captain Seat
- * 2 : Bench Seat
- * 3 : Captain Seat, Separate Seat
- * 4 : Separate Seat





System Outline

The SRS is a driver protection device which has a supplemental role to the seat belts.

When the ignition SW on, the current from the IGN fuse flows to TERMINAL (A) 21 of the center airbag sensor assembly.

If an accident occurs while driving, deceleration caused by a frontal impact is detected (by sensor) and when the frontal impact exceeds a set level, the current from the IGN fuse flows to TERMINAL (A) 21 of the center airbag sensor assembly.

This current flows to TERMINALS (A) 4, (A) 5, (B) 2, (C) 4 to TERMINAL 1 of the airbag squib (Steering wheel pad) and pretensioners to TERMINAL 2 to TERMINALS (A) 3, (A) 6, (B) 1, (C) 5 of the center airbag sensor assembly to TERMINAL (B) 27 or (B) 28 to GROUND, causing the center airbag squibs to expand.

When the safing sensor built into the center airbag sensor assembly is on, airbag sensor is off and the current from the IGN fuse flows same as above-mentioned flowing, causing the airbag squibs to expand. When the safing sensor built into the center airbag sensor assembly is on, the airbag sensor on one of the above-mentioned circuits is activated so that current flows to the airbag squibs and causes them to operate.

The airbag stored inside the steering wheel pad is instantaneously expanded to soften the shock to the driver.

The airbag stored inside the passenger's instrument panel is instantaneously expanded to soften the shock to the passenger.

Front Passenger Airbag On/Off Operation

When the passenger airbag manual On-Off SW is on, the current flowing from the IGN fuse to the airbag squib (Front passenger airbag assembly) is same as above, causing the airbag squib (Front passenger airbag assembly) to expand in an accident.

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A11	52 (2UZ-FE)	C4	A	56	J67 B 58
	54 (1GR-FE)	C5	B	56	O10 A 62 (*7)
A12	52 (2UZ-FE)	C6	C	56	O11 B 62 (*7)
	54 (1GR-FE)	C11	A	56	O12 62 (*7)
A16	56	C12	B	56	O13 62 (*7)
A17	56	D6		57	O14 62 (*7)
A36	56	E4		57	O15 62 (*7)
B13	62 (*7)	I24	A	57	O16 63 (*8)
B14	60 (*3)	I25	B	57	P13 60 (*3)
	61 (*4)	J5		58	
B15	60 (*3)	J8		58	P14 60 (*3)
	61 (*4)	J12		58	
	63 (*8)	J13		58	S36 63 (*8)
B16	63 (*8)	J66	A	58	

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	
1M	24 (*2)	
	28 (*1)	

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

SRS (Access/Standard Cab)

: Connector Joining Wire Harness and Wire Harness

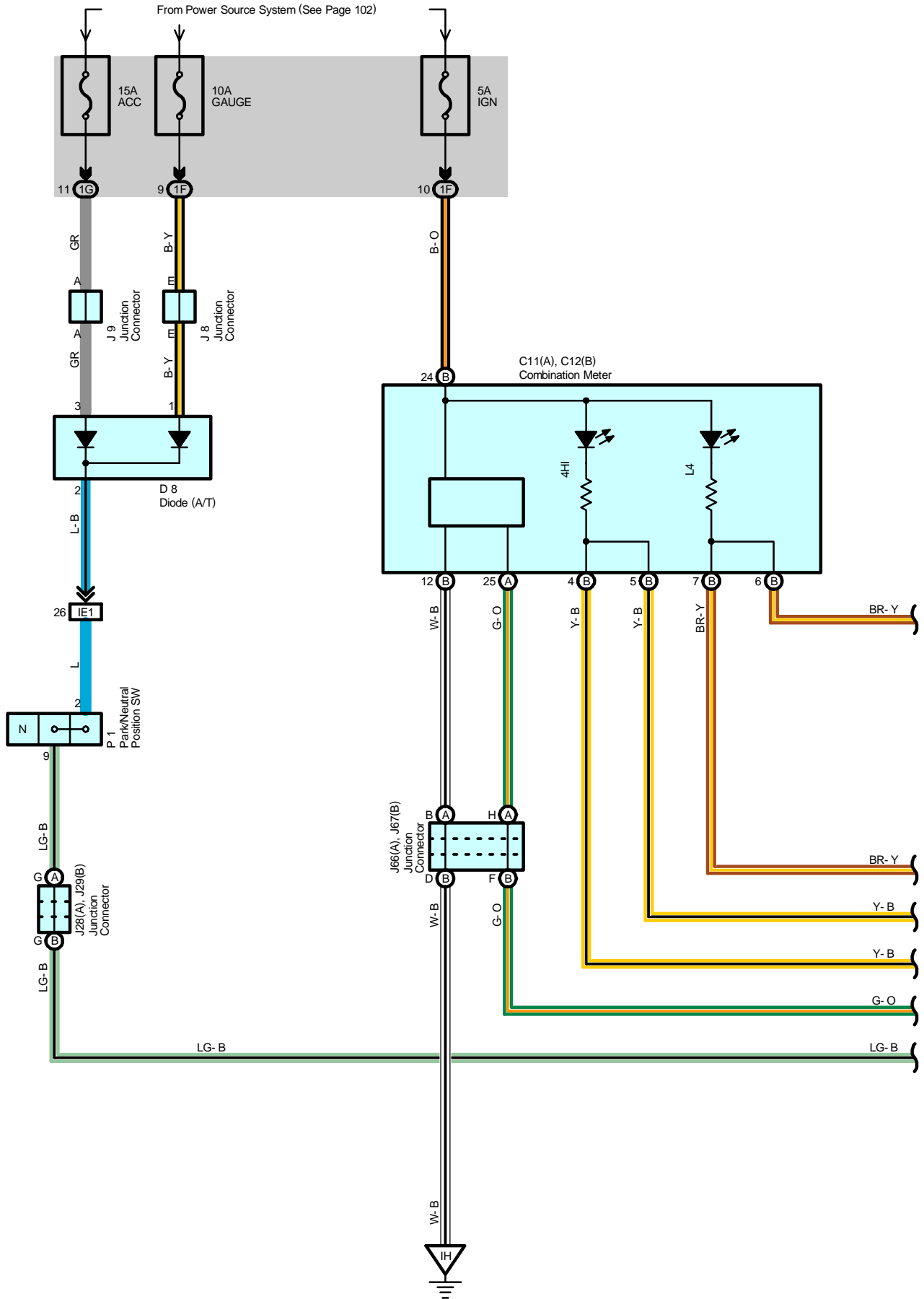
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA1	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)
BL1	88 (*5)	Seat No.1 Wire and Cowl Wire (Under the Driver's Seat)
BM1	88 (*5)	Cowl Wire and Seat No.1 Wire (Under the Passenger's Seat)
BN1	86 (*6)	Seat No.1 Wire and Cowl Wire (Under the Passenger's Seat)

: Ground Points

Code	See Page	Ground Points Location
IE	78	Left Kick Panel
IH	78	Right Kick Panel
II		

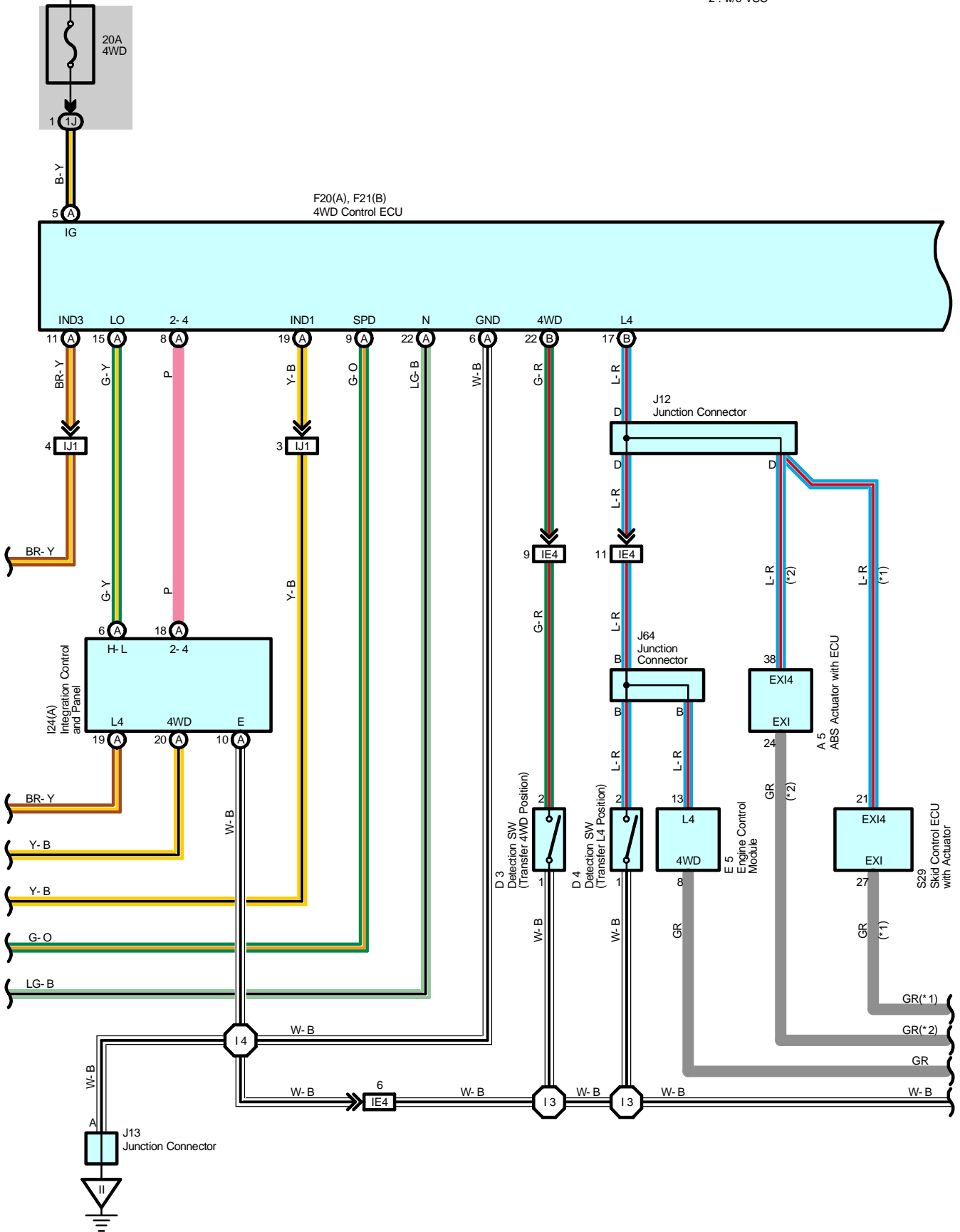
* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

4WD (Access/Standard Cab)



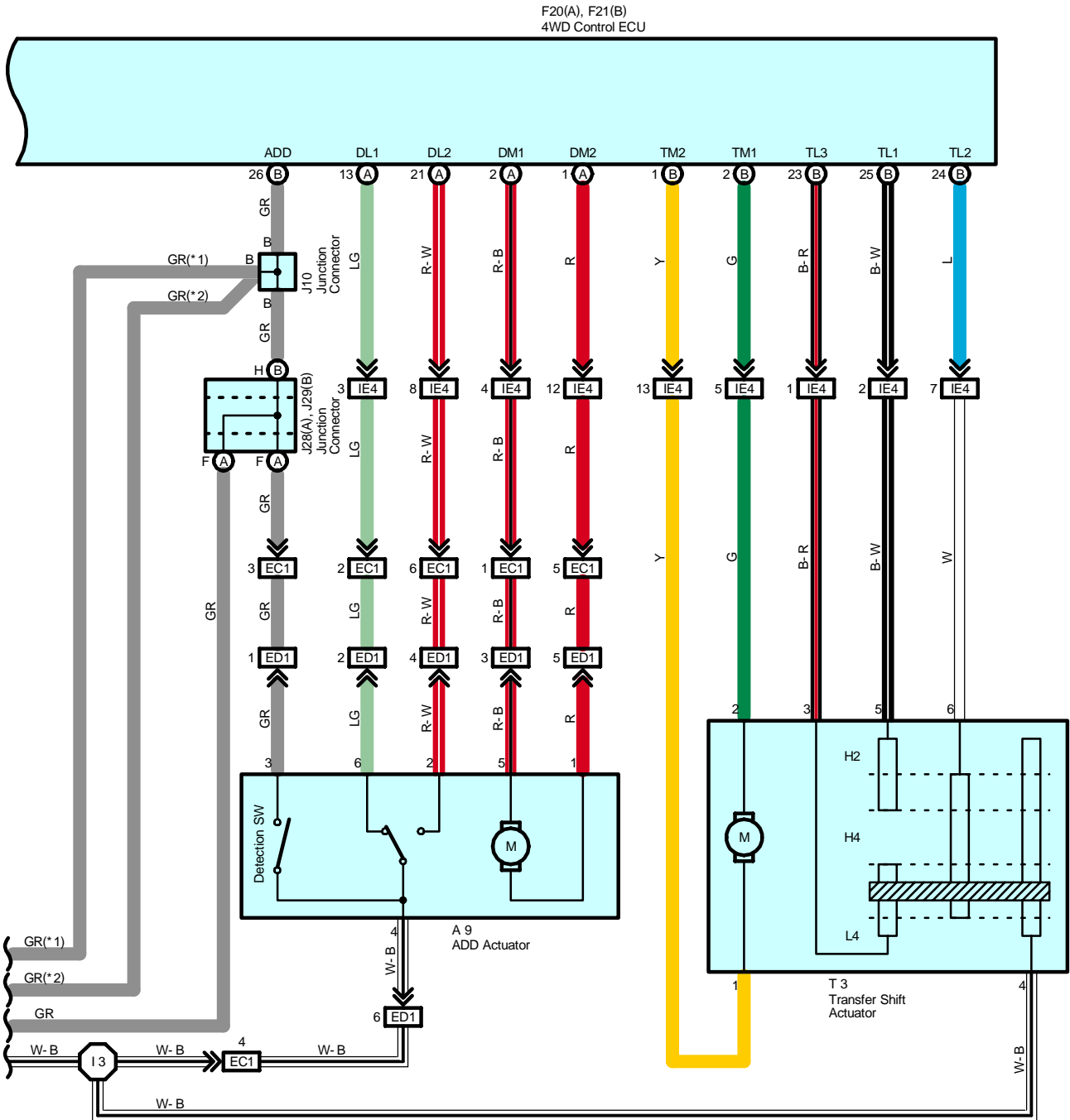
From Power Source System (See Page 102)

* 1 : w/ VSC
 * 2 : w/o VSC



4WD (Access/Standard Cab)

* 1 : w/ VSC
 * 2 : w/o VSC



System Outline

In the conventional system, the 2-4 select SW and the transfer shift lever was used to shift the mode between H-L. In this system, the transfer shift lever is not used, and the H-L mode shift can be done by the transfer shift actuator.

The mode can be changed by the touch select 2-4 SW and touch select high-low in the integration control and panel.

The shift range is controlled according to the vehicle speed sensor and Park/Neutral position SW, and the indicator light is turned ON to inform the driver if any of the following conditions are detected:

- * The shift is not completed even though 3 seconds have elapsed after transfer operation.
- * The vehicle speed is above approximately 100 km/h (63 mph) when shifting from H2 to H4.
- * The vehicle speed is below approximately 5 km/h (3 mph) or the A/T shift lever is in a position other than N position, when shifting from H4 to L4 or visa versa, and from L4 to H2.

Transfer Operation

H2 to H4

When the touch select 2-4 SW in the integration control and panel is turned ON, a signal is input into TERMINAL (A) 8 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 2 to transfer shift actuator TERMINAL 2 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (B) 1 to GROUND, and the transfer shifts to 4WD (H4 position.)

When the system shifts to 4WD, the detection SW (Transfer 4WD position) is turned ON, and the current flows from 4WD control ECU TERMINAL (A) 2 to ADD actuator TERMINAL 5 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (A) 1 to GROUND, and the ADD actuator is activated, and the ADD is connected. When the ADD is connected, the detection SW (ADD position SW) is turned ON, and the 4HI Indicator light comes ON.

H4 to H2

When the touch select 2-4 SW in the integration control and panel is turned OFF, a signal is input into TERMINAL (A) 8 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 1 to transfer shift actuator TERMINAL 1 to motor to TERMINAL 2 to 4WD control ECU TERMINAL (B) 2 to GROUND, and the transfer shifts to 2WD (H2 position.)

When the system shifts to 2WD, the detection SW (Transfer 4WD position) is turned OFF, and the current flows from 4WD control ECU TERMINAL (A) 1 to ADD actuator TERMINAL 1 to motor to TERMINAL 5 to 4WD control ECU TERMINAL (A) 2 to GROUND, and the ADD actuator is activated, and the ADD is disconnected. When the ADD is disconnected, the detection SW (ADD position SW) is turned OFF, and the 4HI indicator Light turns OFF.

H4 to L4

When the touch select high-low SW in the integration control and panel is turned ON, a signal is input into TERMINAL (A) 15 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 2 to transfer shift actuator TERMINAL 2 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (B) 1 to GROUND, and the transfer shifts to 4WD LO position (L4 position.)

The 4HI Indicator is turned OFF and the 4LO indicator is turned ON.

L4 to H4

When the touch select high-low SW in the integration control and panel is turned OFF, a signal is input into TERMINAL (A) 15 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 1 to transfer shift actuator TERMINAL 1 to motor to TERMINAL 2 to 4WD control ECU TERMINAL (B) 2 to GROUND, and the transfer shifts to 4WD HI position (H4 Position.)

The 4HI indicator is turned ON and the 4LO indicator is turned OFF.

The shift is not completed even though 3 seconds have elapsed after transfer operation.

- * The vehicle speed is above approximately 100 km/h (63 mph) when shifting from H2 to H4.
- * The vehicle speed is below approximately 5 km/h (3 mph) or the A/T Shift Lever is in a position other than N position, when shifting from H4 to L4 or visa versa, and from L4 to H2.

L4 to H2

When the touch select 2-4 SW in the integration control and panel is turned OFF, a signal is input into TERMINAL (A) 8 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 1 to transfer shift actuator TERMINAL 1 to motor to TERMINAL 2 to 4WD control ECU TERMINAL (B) 2 to GROUND, and the detection SW (Transfer L4 position) is turned OFF.

Furthermore, the motor rotates to shift the transfer to 2WD (H2 position.)

When the system shifts to 2WD, the detection SW (Transfer 4WD position) is turned OFF, and the current flows from 4WD control ECU TERMINAL (A) 1 to ADD actuator TERMINAL 1 to motor to TERMINAL 5 to 4WD control ECU TERMINAL (A) 2 to GROUND, and the ADD actuator is activated, and the ADD is disconnected. When the ADD is disconnected, the detection SW (ADD position SW) is turned OFF, and the 4LO indicator light turns OFF.

4WD (Access/Standard Cab)

H2 to L4

When the touch select 2-4 SW in the integration control and panel is turned ON, and the touch select high-low SW is turned ON, a signal is input into TERMINAL (A) 8 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 2 to transfer shift actuator TERMINAL 2 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (B) 1 to GROUND, and the transfer shifts to 4WD (H4 position.)

When the system shifts to 4WD, the detection SW (Transfer 4WD position) is turned ON, and the current flows from 4WD control ECU TERMINAL (A) 2 to ADD actuator TERMINAL 5 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (A) 1 to GROUND, and the ADD actuator is activated, and the ADD is connected. Then a signal is input into TERMINAL (A) 15 of the 4WD control ECU and the 4WD control ECU is activated by this, so the current flows from the 4WD control ECU TERMINAL (B) 2 to transfer shift actuator TERMINAL 2 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (B) 1 to GROUND. The transfer shifts to 4WD LO position (L4 position), and the 4LO indicator light comes ON.

Service Hints

F20 (A) 4WD Control ECU

(A) 5-Ground : Approx. 12 volts with ignition SW at ON or ST position

(A) 6-Ground : Always continuity

(A) 9-Ground : 4 pulses with 1 rotation

(A) 8-Ground : 2 volts or less with touch select 2-4 SW on

(A)17-Ground : 2 volts or less with detection SW (Transfer L4 position) on and transfer shift lever at L4 position

I24 (A), I25 (B) Integration Control and Panel

(A) 5-(B) 1 : Closed with touch select 2-4 SW on

P1 Park/Neutral Position SW

2-9 : Closed with A/T shift lever at N position

○ : Parts Location

Code		See Page	Code		See Page	Code		See Page
A5		52 (2UZ-FE)	F20	A	57	J29	B	58
		54 (1GR-FE)	F21	B	57	J64		58
A9		52 (2UZ-FE)	I24	A	57	J66	A	58
C11	A	56	J8		58	J67	B	58
C12	B	56	J9		58	P1		53 (2UZ-FE)
D3		52 (2UZ-FE)	J10		58			55 (1GR-FE)
D4		52 (2UZ-FE)	J12		58	S29		53 (2UZ-FE)
D8		57	J13		58			55 (1GR-FE)
E5		57	J28	A	58	T3		53 (2UZ-FE)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EC1	74 (2UZ-FE)	Engine No.2 Wire and Engine Wire (Near the Starter)
ED1	74 (2UZ-FE)	Engine No.2 Wire and Differential Wire (Near the Transmission)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IE4		
IJ1	80	Cowl Wire and Cowl Wire (Instrument Panel Reinforcement RH)

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat



: Ground Points

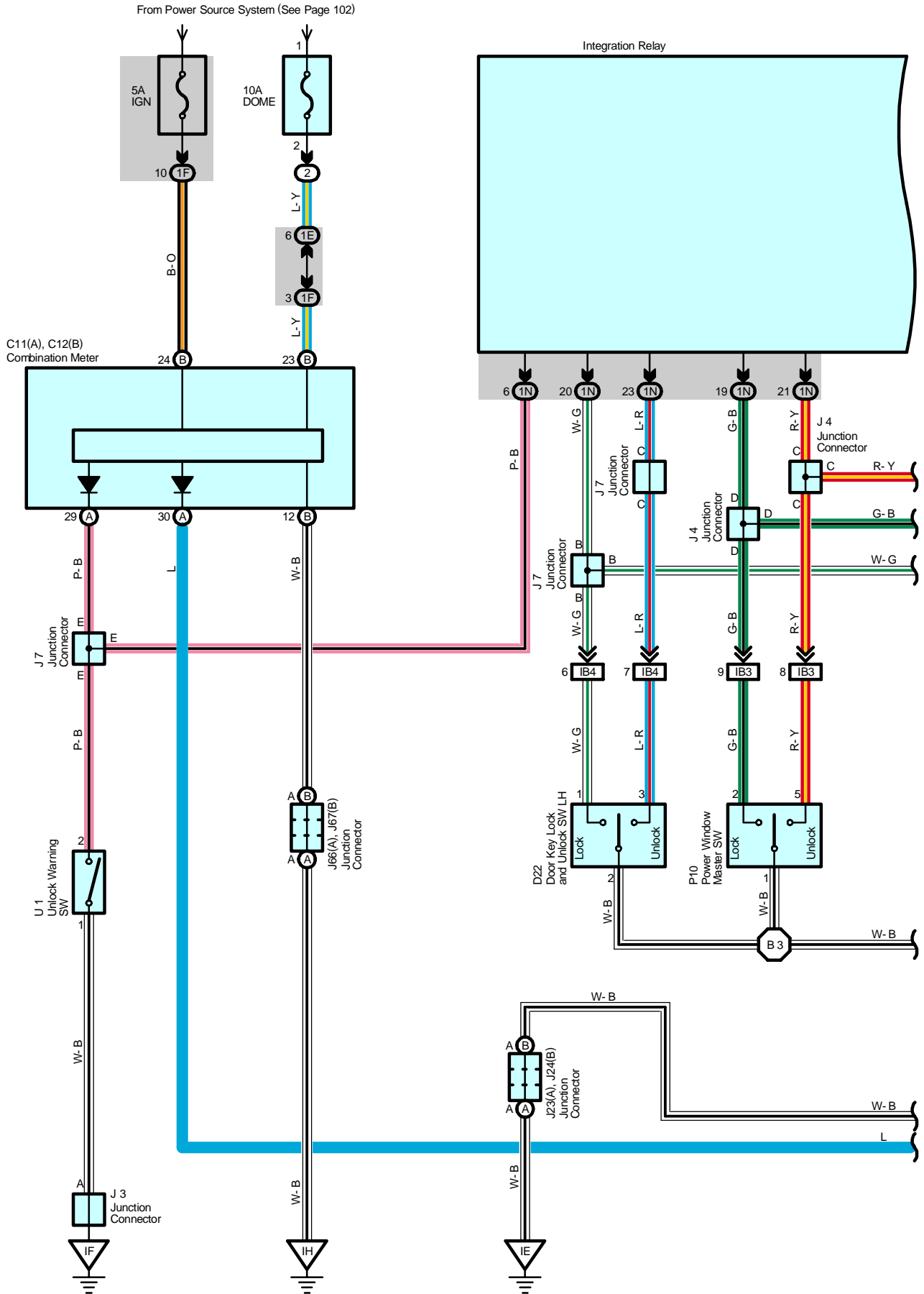
Code	See Page	Ground Points Location
IH	78	Right Kick Panel
II		

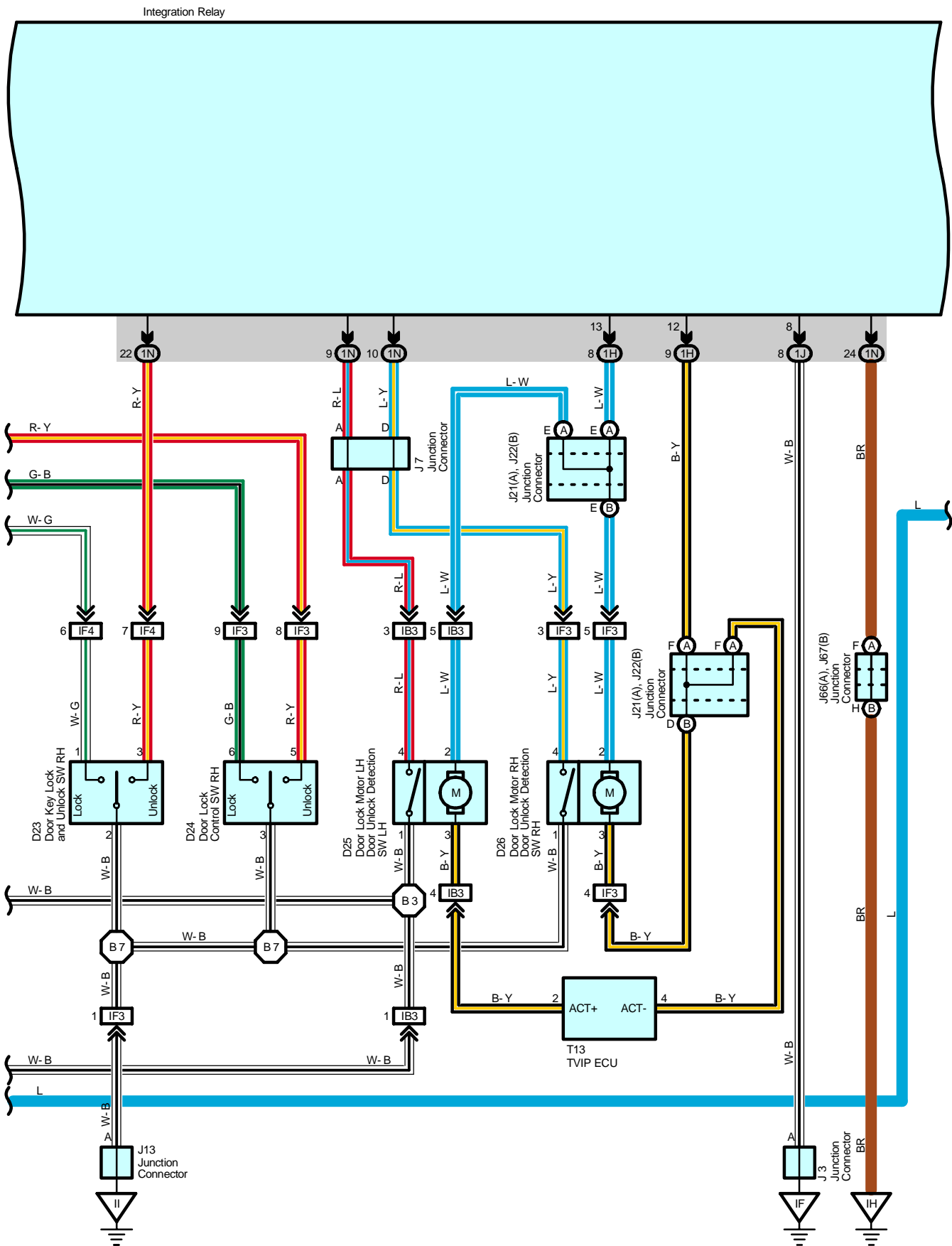


: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I3	80	Engine Wire	I4	80	Cowl Wire

Door Lock Control with DRL (Access/Standard Cab)





System Outline

Current always flows to TERMINAL 3 of the integration relay through the POWER fuse.

1. Manual Lock Operation

(Driver's door)

To push the door lock control SW or door key lock and unlock SW to LOCK position, a lock signal is input to the integration relay and causes the relay to function. Current flows from TERMINAL 3 of the relay to TERMINAL 13 to TERMINAL 2 of the door lock motor to TERMINAL 3 to TERMINAL 2 of the TVIP ECU to TERMINAL 4 to TERMINAL 12 of the integration relay to TERMINAL 8 to GROUND and the door lock motor causes the door to lock.

(Passenger's door)

To push the door lock control SW or door key lock and unlock SW to LOCK position, a lock signal is input to the integration relay and causes the relay to function. Current flows from TERMINAL 3 of the relay to TERMINAL 13 to TERMINAL 2 of the door lock motor to TERMINAL 3 to TERMINAL 12 of the relay to TERMINAL 8 to GROUND and the door lock motor causes the door to lock.

2. Manual Unlock Operation

(Driver's door)

To push the door lock control SW or door key lock and unlock SW to UNLOCK position, an unlock signal is input to the integration relay and causes the relay to function. Current flows from TERMINAL 3 of the relay to TERMINAL 12 to TERMINAL 4 of the TVIP ECU to TERMINAL 2 to TERMINAL 3 of the door lock motor to TERMINAL 2 to TERMINAL 13 of the integration relay to TERMINAL 8 to GROUND and the door lock motor causes the door to unlock.

(Passenger's door)

To push the door lock control SW or door key lock and unlock SW to UNLOCK position, an unlock signal is input to the integration relay and causes the relay to function. Current flows from TERMINAL 3 of the relay to TERMINAL 12 to TERMINAL 3 of the door lock motor to TERMINAL 2 to TERMINAL 13 of the relay to TERMINAL 8 to GROUND and the door lock motor causes the door to unlock.

3. Double Operation Unlock Operation

When the door key lock and unlock SW LH is turned to unlock position, only the front LH door is mechanically unlocked. Turning the door key lock and unlock SW LH to the unlock side causes a signal to be input to the relay, and if the signal is input again within 3 seconds by turning the door key lock and unlock SW LH to the unlock side again, current flows from TERMINAL 12 of the integration relay to TERMINAL 4 of the TVIP ECU to TERMINAL 2 to TERMINAL 3 of the door lock motor, TERMINAL 2 to TERMINAL 13 of the integration relay to TERMINAL 8 to GROUND, causing the door lock motors to operate and unlock the doors.

4. Key Confine Prevention Function

- * Operating door lock knob (In door lock motor operation)

With ignition key in cylinder (Unlock warning SW on), when any door is opened and locked using door lock knob (Door lock motor), the door is locked once but each door is unlocked soon by the function of the integration relay. As a result, current flows from TERMINAL 3 of the relay to TERMINAL 12 to TERMINAL 3 of the door lock motors to TERMINAL 2 to TERMINAL 13 of the relay to TERMINAL 8 to GROUND and causes all the doors to unlock.

- * Operating door lock control SW or door key lock and unlock SW

With ignition key in cylinder (Unlock warning SW on), when any door is opened and locked using the door lock control SW or door key lock and unlock SW, all doors are locked once but each door is unlocked by the function of the SW contained in motor, which inputs the signal to the integration relay. According to this input signal, current flows from TERMINAL 3 of the relay to TERMINAL 12 to TERMINAL 3 of the door lock motors to TERMINAL 2 to TERMINAL 13 of the relay to TERMINAL 8 to GROUND and causes all the doors to unlock.

Door Lock Control with DRL (Access/Standard Cab)

Service Hints

INTEGRATION Relay

- 8-Ground : Always continuity
- 3-Ground : Always approx. 12 volts
- 12-Ground : Approx. 12 volts for 0.2 seconds with following operations
 - * Door lock control SW unlocked
 - * Door lock control SW locked with ignition key in cylinder and LH or RH door open (Ignition key reminder function)
 - * Door lock knob locked with ignition key in cylinder and LH or RH door open. (Ignition key reminder function)
 - * Unlocking the LH, RH door cylinder with key
- 13-Ground : Approx. 12 volts for 0.2 seconds with following operations
 - * Door lock control SW locked
 - * Locking the LH, RH door cylinder with key
- 14-Ground : Continuity with front LH door open
- 15-Ground : Continuity with front RH door open (Standard cab)
- 15-Ground : Continuity with front RH, rear LH, RH door open (Access cab)

D16, D17 Door Courtesy SW Front LH, RH

- 1-Ground : Closed with door open

D22, D23 Door Key Lock and Unlock SW LH, RH

- 1-2 : Closed with door lock cylinder locked with key
- 3-2 : Closed with door lock cylinder unlocked with key

D25, D26 Door Lock Motor and Door Unlock Detection SW LH, RH

- 4-1 : Closed with door lock knob UNLOCK position

U1 Unlock Warning SW

- 1-2 : Closed with key in cylinder

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C11	A 56	D23	60 (*3)	J13	58
C12	B 56		61 (*4)	J21	A 58
D16	60 (*3)	D24	60 (*3)	J22	B 58
	61 (*4)		61 (*4)	J23	A 58
D17	60 (*3)	D25	60 (*3)	J24	B 58
	61 (*4)		61 (*4)	J66	A 58
D18	60 (*3)	D26	60 (*3)	J67	B 58
D19	60 (*3)		61 (*4)	P10	60 (*3)
D20	60 (*3)	J3	58		61 (*4)
D21	60 (*3)	J4	58	T13	59
D22	60 (*3)	J5	58	U1	59
	61 (*4)	J7	58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	28 (*1)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1F	28 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1H		
1J		
1N		

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

 : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB3	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IB4		
IF3	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IF4		
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)

 : Ground Points

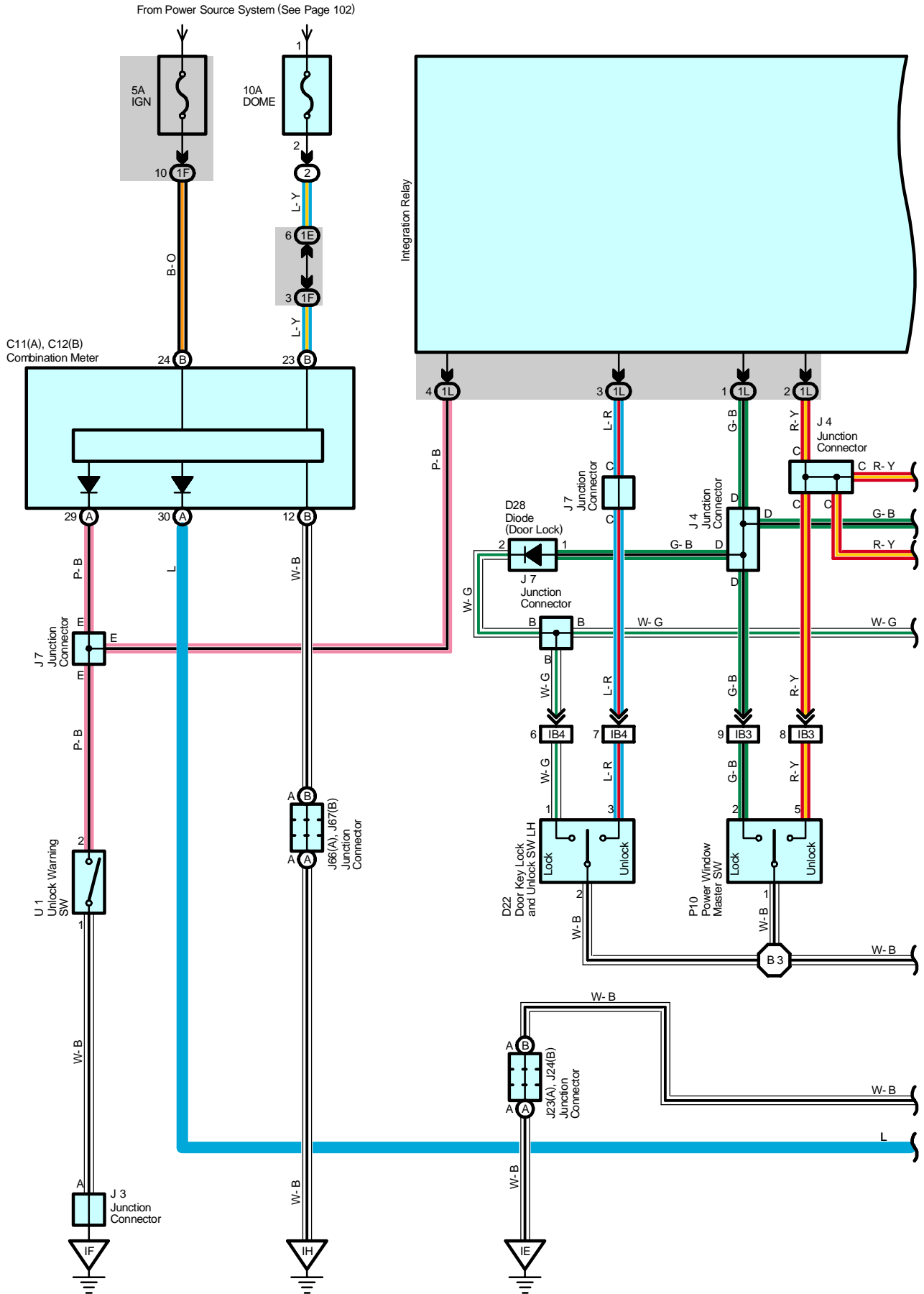
Code	See Page	Ground Points Location
IE	78	Left Kick Panel
IF		
IH	78	Right Kick Panel
II		
BJ	82 (*3)	Inside of Rear Door LH
BK	82 (*3)	Inside of Rear Door RH

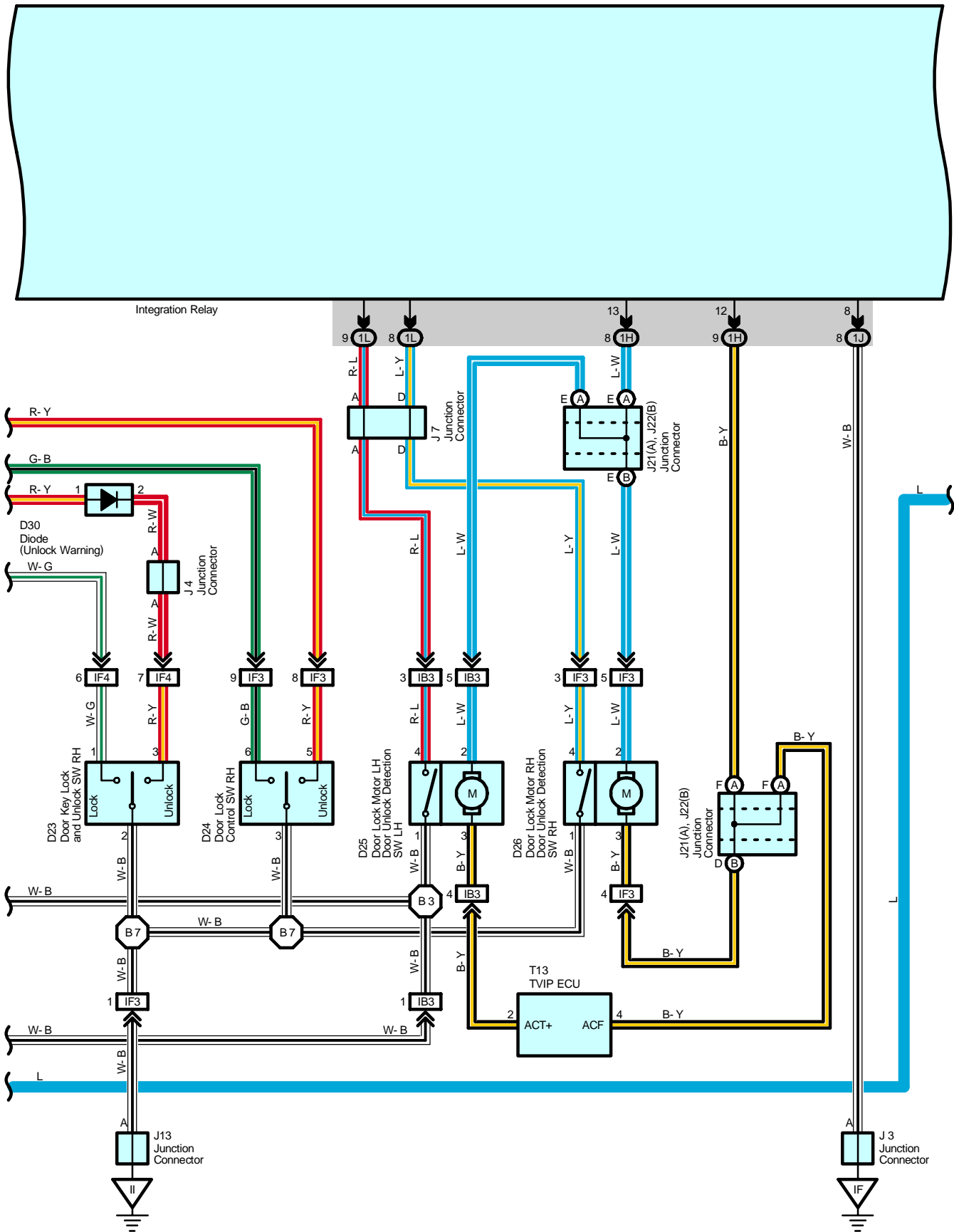
 : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B3	82 (*3)	Front Door LH Wire	B7	84 (*4)	Front Door RH Wire
	84 (*4)		B8	82 (*3)	Rear Door No.1 Wire LH
B7	82 (*3)	Front Door RH Wire	B9	82 (*3)	Rear Door No.1 Wire RH

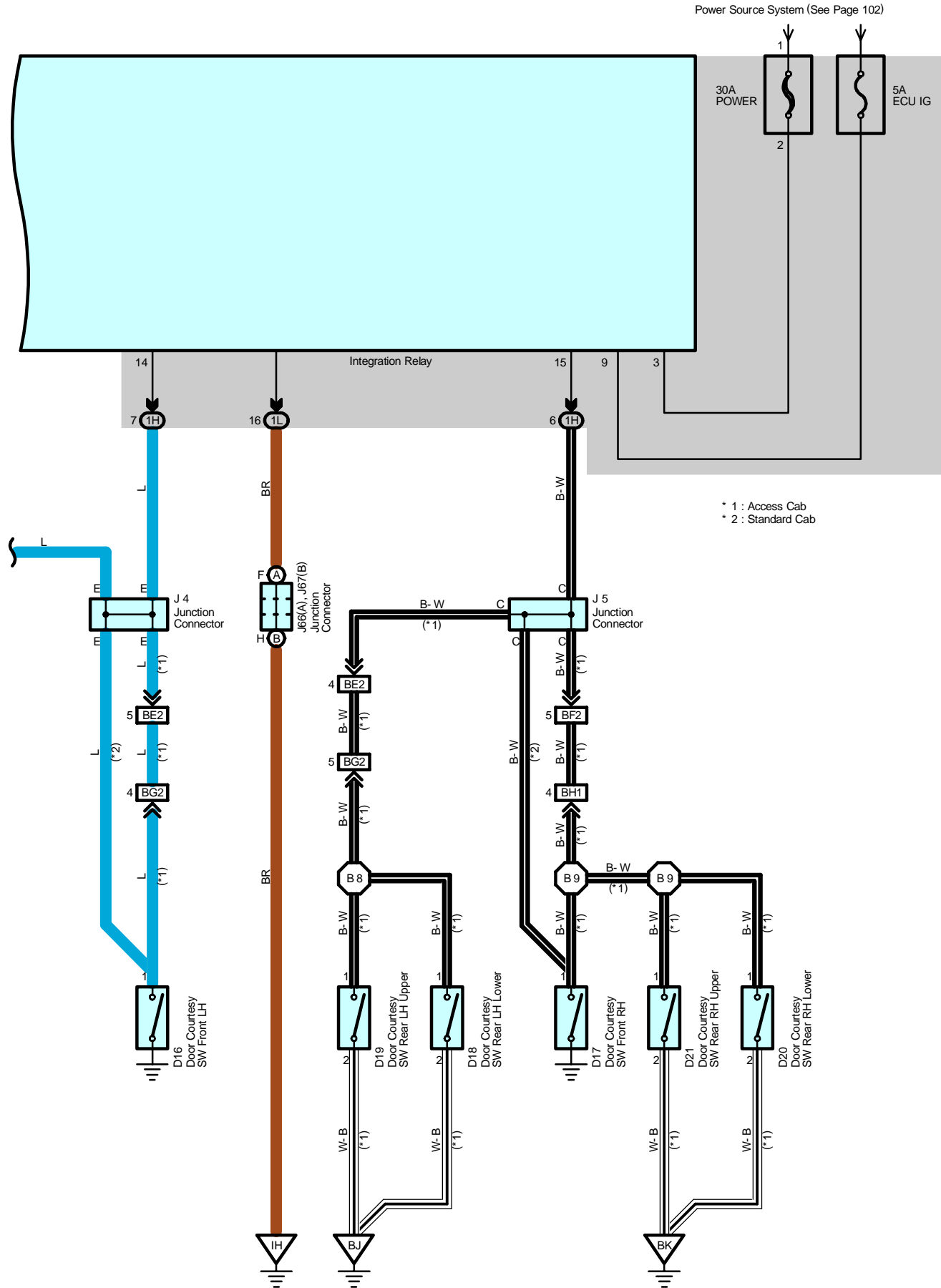
* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Door Lock Control without DRL (Access/Standard Cab)





Door Lock Control without DRL (Access/Standard Cab)



System Outline

Current always flows to TERMINAL 3 of the integration relay through the POWER fuse.

1. Manual Lock Operation

(Driver's door)

To push the door lock control SW or door key lock and unlock SW to LOCK position, a lock signal is input to the integration relay and causes the relay to function. Current flows from TERMINAL 3 of the relay to TERMINAL 13 to TERMINAL 2 of the door lock motor to TERMINAL 3 to TERMINAL 2 of the TVIP ECU to TERMINAL 4 to TERMINAL 12 of the integration relay to TERMINAL 8 to GROUND and the door lock motor causes the door to lock.

(Passenger's door)

To push the door lock control SW or door key lock and unlock SW to LOCK position, a lock signal is input to the integration relay and causes the relay to function. Current flows from TERMINAL 3 of the relay to TERMINAL 13 to TERMINAL 2 of the door lock motor to TERMINAL 3 to TERMINAL 12 of the relay to TERMINAL 8 to GROUND and the door lock motor causes the door to lock.

2. Manual Unlock Operation

(Driver's door)

To push the door lock control SW or door key lock and unlock SW to UNLOCK position, an unlock signal is input to the integration relay and causes the relay to function. Current flows from TERMINAL 3 of the relay to TERMINAL 12 to TERMINAL 4 of the TVIP ECU to TERMINAL 2 to TERMINAL 3 of the door lock motor to TERMINAL 2 to TERMINAL 13 of the integration relay to TERMINAL 8 to GROUND and the door lock motor causes the door to unlock.

(Passenger's door)

To push the door lock control SW or door key lock and unlock SW to UNLOCK position, an unlock signal is input to the integration relay and causes the relay to function. Current flows from TERMINAL 3 of the relay to TERMINAL 12 to TERMINAL 3 of the door lock motor to TERMINAL 2 to TERMINAL 13 of the relay to TERMINAL 8 to GROUND and the door lock motor causes the door to unlock.

3. Double Operation Unlock Operation

When the door key lock and unlock SW LH is turned to unlock position, only the front LH door is mechanically unlocked. Turning the door key lock and unlock SW LH to the unlock side causes a signal to be input to the relay, and if the signal is input again within 3 seconds by turning the door key lock and unlock SW LH to the unlock side again, current flows from TERMINAL 12 of the integration relay to TERMINAL 4 of the TVIP ECU to TERMINAL 2 to TERMINAL 3 of the door lock motor, TERMINAL 2 to TERMINAL 13 of the integration relay to TERMINAL 8 to GROUND, causing the door lock motors to operate and unlock the doors.

4. Key Confine Prevention Function

- * Operating door lock knob (In door lock motor operation)

With ignition key in cylinder (Unlock warning SW on), when any door is opened and locked using door lock knob (Door lock motor), the door is locked once but each door is unlocked soon by the function of the integration relay. As a result, current flows from TERMINAL 3 of the relay to TERMINAL 12 to TERMINAL 3 of the door lock motors to TERMINAL 2 to TERMINAL 13 of the relay to TERMINAL 8 to GROUND and causes all the doors to unlock.

- * Operating door lock control SW or door key lock and unlock SW

With ignition key in cylinder (Unlock warning SW on), when any door is opened and locked using the door lock control SW or door key lock and unlock SW, all doors are locked once but each door is unlocked by the function of the SW contained in motor, which inputs the signal to the integration relay. According to this input signal, current flows from TERMINAL 3 of the relay to TERMINAL 12 to TERMINAL 3 of the door lock motors to TERMINAL 2 to TERMINAL 13 of the relay to TERMINAL 8 to GROUND and causes all the doors to unlock.

Door Lock Control without DRL (Access/Standard Cab)

Service Hints

INTEGRATION Relay

- 8-Ground : Always continuity
- 3-Ground : Always approx. 12 volts
- 12-Ground : Approx. 12 volts for 0.2 seconds with following operations
 - * Door lock control SW unlocked
 - * Door lock control SW locked with ignition key in cylinder and LH or RH door open (Ignition key reminder function)
 - * Door lock knob locked with ignition key in cylinder and LH or RH door open. (Ignition key reminder function)
 - * Unlocking the LH, RH door cylinder with key
- 13-Ground : Approx. 12 volts for 0.2 seconds with following operations
 - * Door lock control SW locked
 - * Locking the LH, RH door cylinder with key
- 14-Ground : Continuity with front LH door open
- 15-Ground : Continuity with front RH door open (Standard cab)
- 15-Ground : Continuity with front RH, rear LH, RH door open (Access cab)

D16, D17 Door Courtesy SW Front LH, RH

- 1-Ground : Closed with door open

D22, D23 Door Key Lock and Unlock SW LH, RH

- 1-2 : Closed with door lock cylinder locked with key
- 3-2 : Closed with door lock cylinder unlocked with key

D25, D26 Door Lock Motor and Door Unlock Detection SW LH, RH

- 4-1 : Closed with door lock knob UNLOCK position

U1 Unlock Warning SW

- 1-2 : Closed with key in cylinder

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C11	A 56	D23	61 (*4)	J13	58
C12	B 56	D24	60 (*3)	J21	A 58
D16	60 (*3)		61 (*4)	J22	B 58
	61 (*4)	D25	60 (*3)	J23	A 58
D17	60 (*3)		61 (*4)	J24	B 58
	D18	60 (*3)	D26	60 (*3)	J66
61 (*4)		61 (*4)		J67	B 58
D19	60 (*3)	D28	57	P10	60 (*3)
D20	60 (*3)	D30	57		61 (*4)
D21	60 (*3)	J3	58	T13	59
D22	60 (*3)	J4	58	U1	59
	61 (*4)	J5	58		
D23	60 (*3)	J7	58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1H		
1J		
1L	25 (*2)	

- * 1 : w/ Daytime Running Light
- * 2 : w/o Daytime Running Light
- * 3 : Access Cab
- * 4 : Standard Cab
- * 5 : Bench Seat
- * 6 : Captain Seat
- * 7 : Access Cab Captain Seat
- * 8 : Standard Cab Bench Seat
- * 9 : Access Cab w/o Power Seat

 : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB3	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IB4		
IF3	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IF4		
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)

 : Ground Points

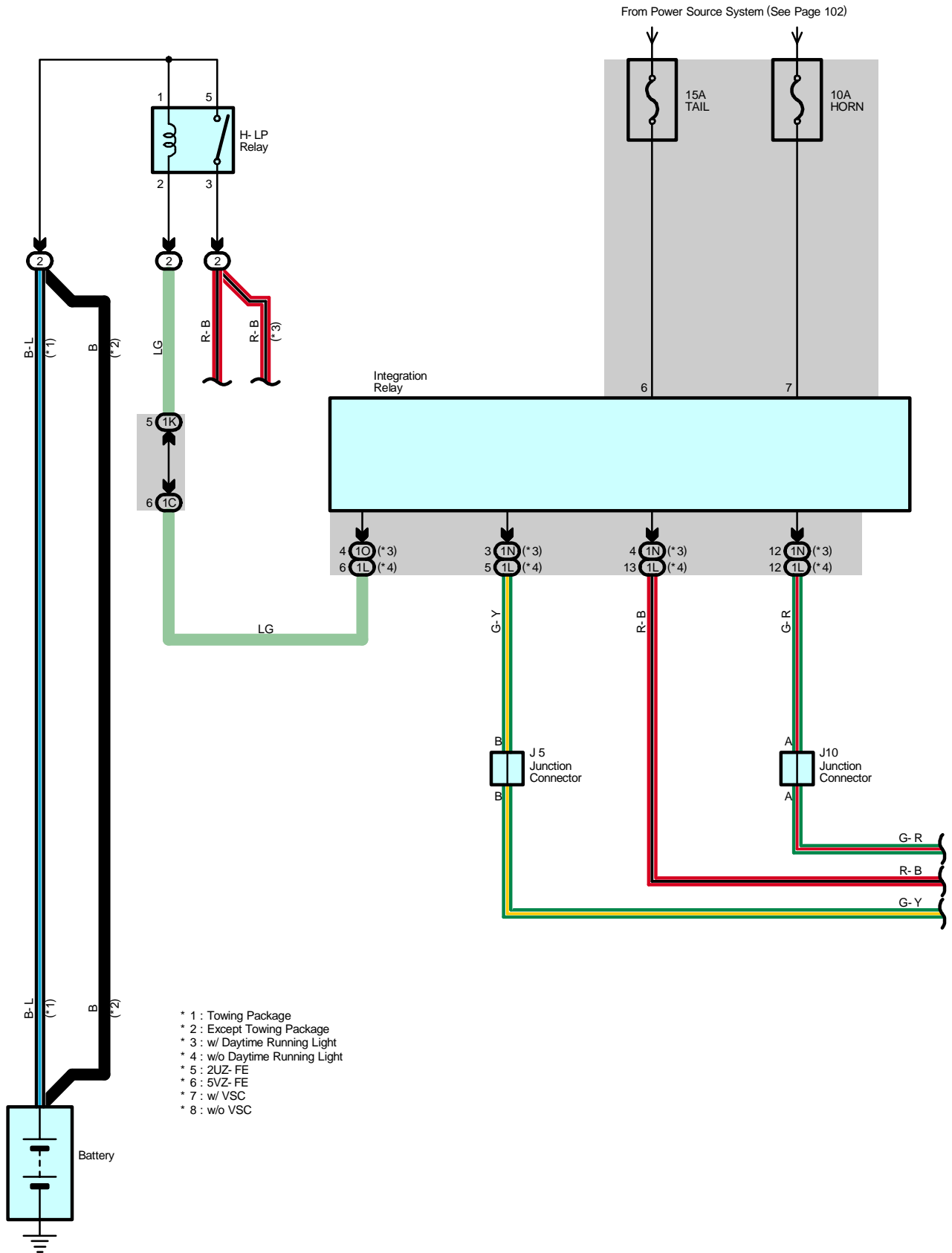
Code	See Page	Ground Points Location
IE	78	Left Kick Panel
IF		
IH	78	Right Kick Panel
II		
BJ	82 (*3)	Inside of Rear Door LH
BK	82 (*3)	Inside of Rear Door RH

 : Splice Points

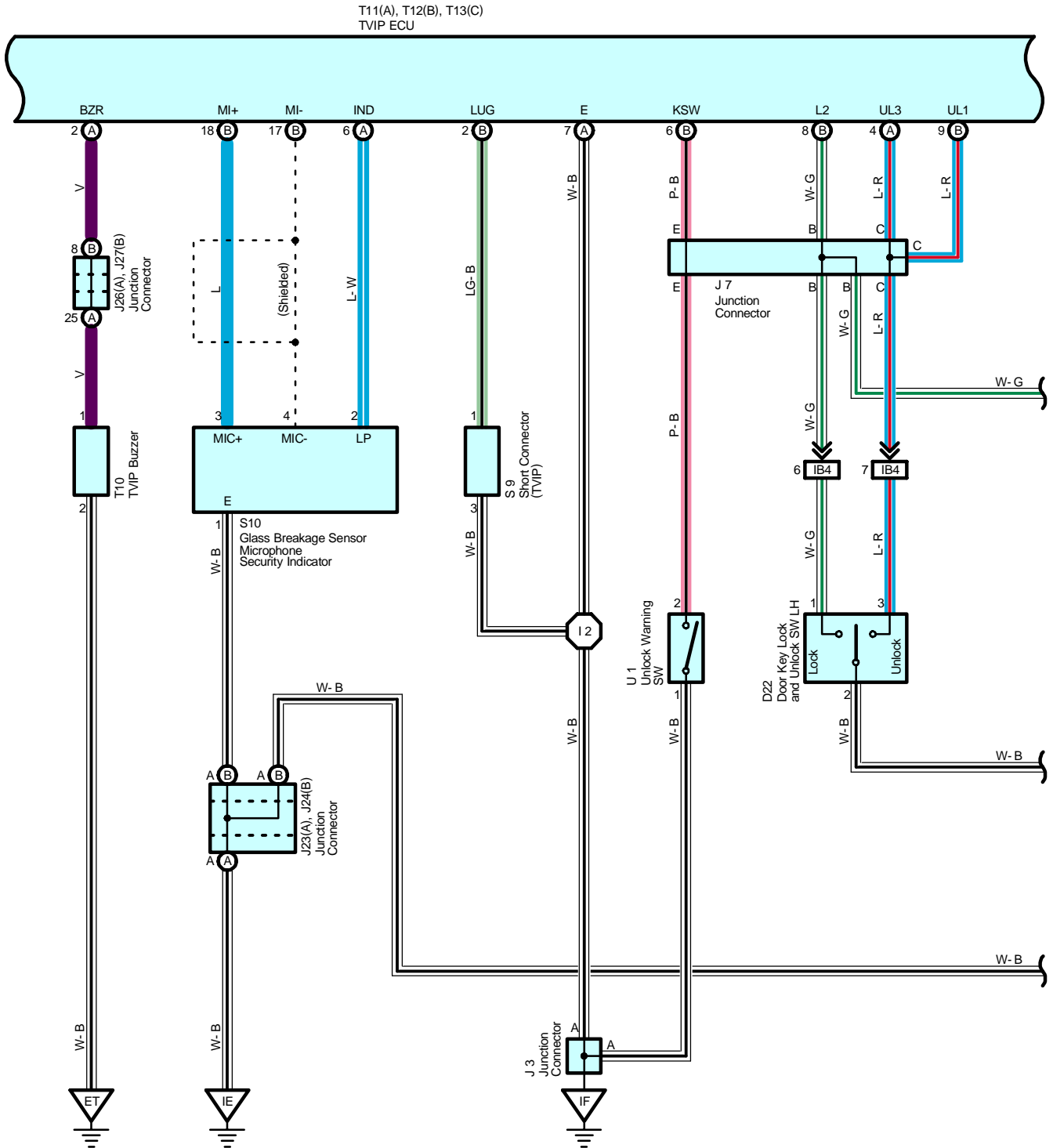
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B3	82 (*3)	Front Door LH Wire	B7	84 (*4)	Front Door RH Wire
	84 (*4)		B8	82 (*3)	Rear Door No.1 Wire LH
B7	82 (*3)	Front Door RH Wire	B9	82 (*3)	Rear Door No.1 Wire RH

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

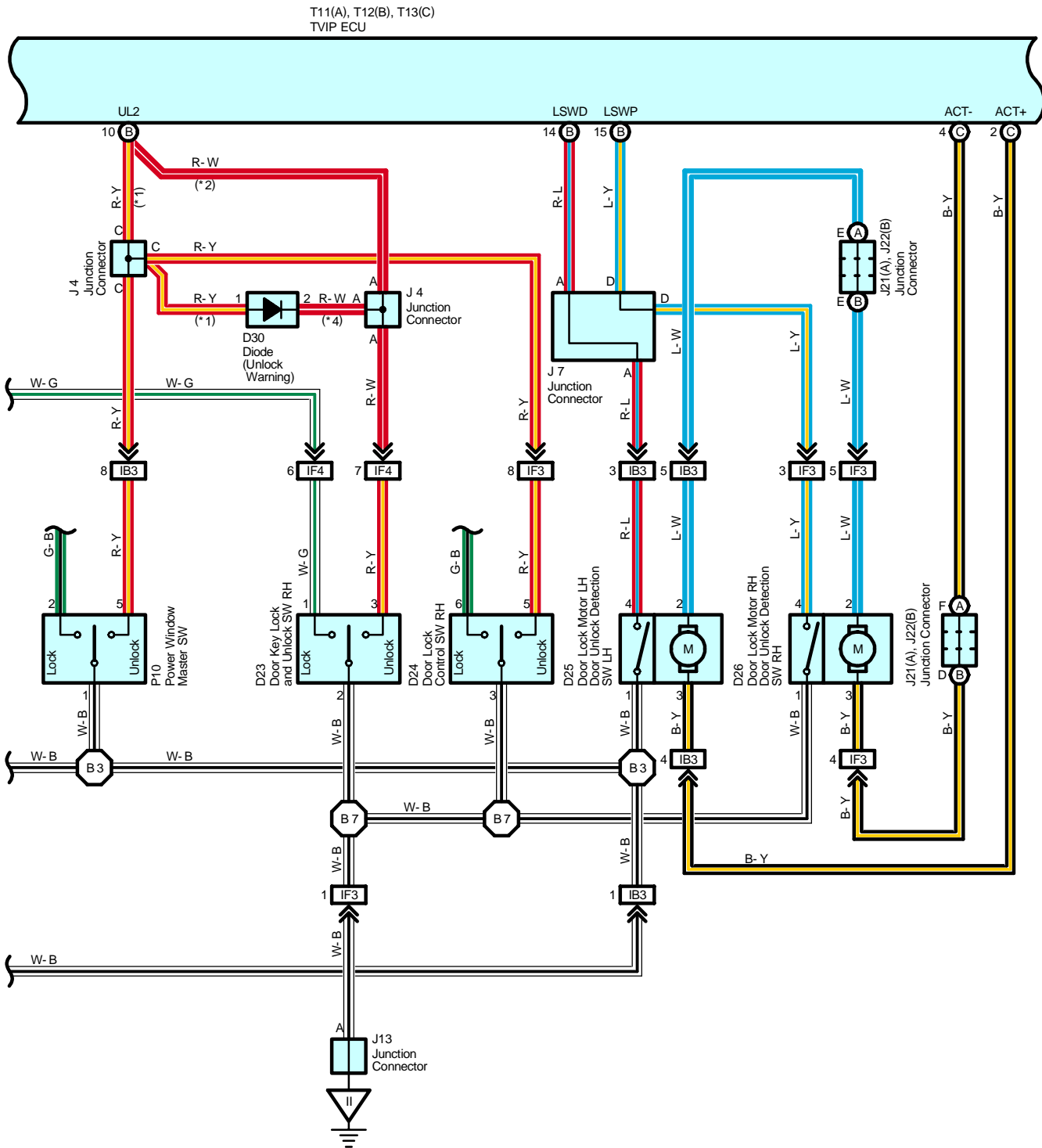
TVIP and Wireless Door Lock Control (Access/Standard Cab)



TVIP and Wireless Door Lock Control (Access/Standard Cab)

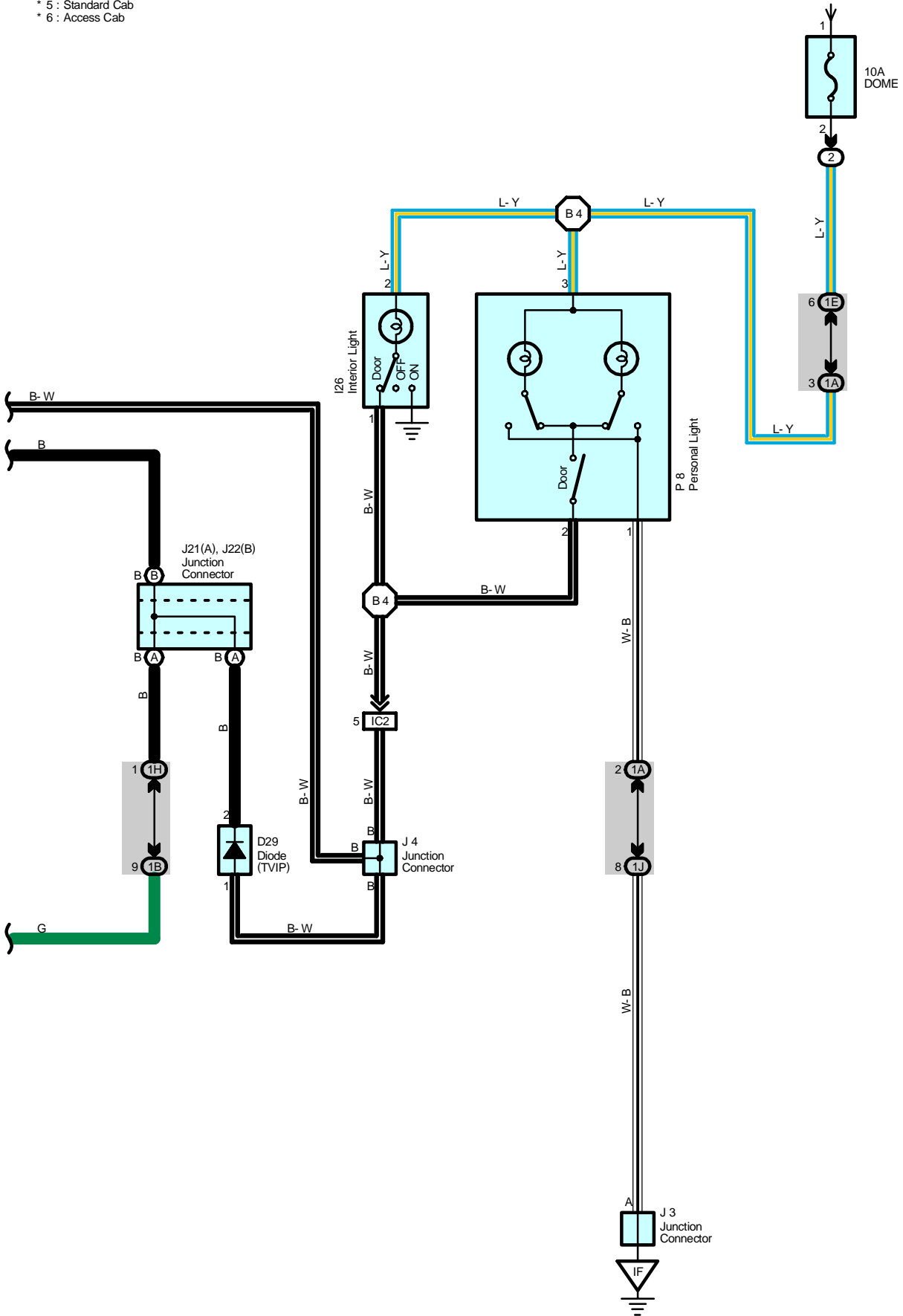


- * 1 : w/ Daytime Running Light
- * 2 : w/o Daytime Running Light



- * 5 : Standard Cab
- * 6 : Access Cab

From Power Source System (See Page 102)



TVIP and Wireless Door Lock Control (Access/Standard Cab)

Service Hints

T11 (A), T12 (B), T13 (C) TVIP ECU

(B)13-Ground : Approx. 12 volts with the ignition SW at ON position

(A) 1, (B) 11-Ground : Always approx. 12 volts

(A) 7-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
D11	57	D26	60 (*3)	J24	B 58
D16	60 (*3)		61 (*4)	J26	A 58
	61 (*4)	D29	57	J27	B 58
D17	60 (*3)	D30	57	P8	60 (*3)
	61 (*4)		60 (*3)		61 (*4)
D18	60 (*3)	I26	61 (*4)	P10	60 (*3)
D19	60 (*3)	J3	58		61 (*4)
D20	60 (*3)	J4	58	S9	59
D21	60 (*3)	J5	58	S10	59
D22	60 (*3)	J7	58	T10	53 (2UZ-FE)
	61 (*4)	J9	58		55 (1GR-FE)
D23	60 (*3)	J10	58	T11	A 59
	61 (*4)	J12	58	T12	B 59
D24	60 (*3)	J13	58	T13	C 59
	61 (*4)		J21	A 58	U1
D25	60 (*3)	J22	B 58		
	61 (*4)	J23	A 58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	24 (*2)	Roof Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1B	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1C	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1E	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1H	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1J	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1K	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1L	25 (*2)	
1N	29 (*1)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1O		

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

 : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB3	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IB4		
IC2	78	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
IF3	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IF4		
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)

 : Ground Points

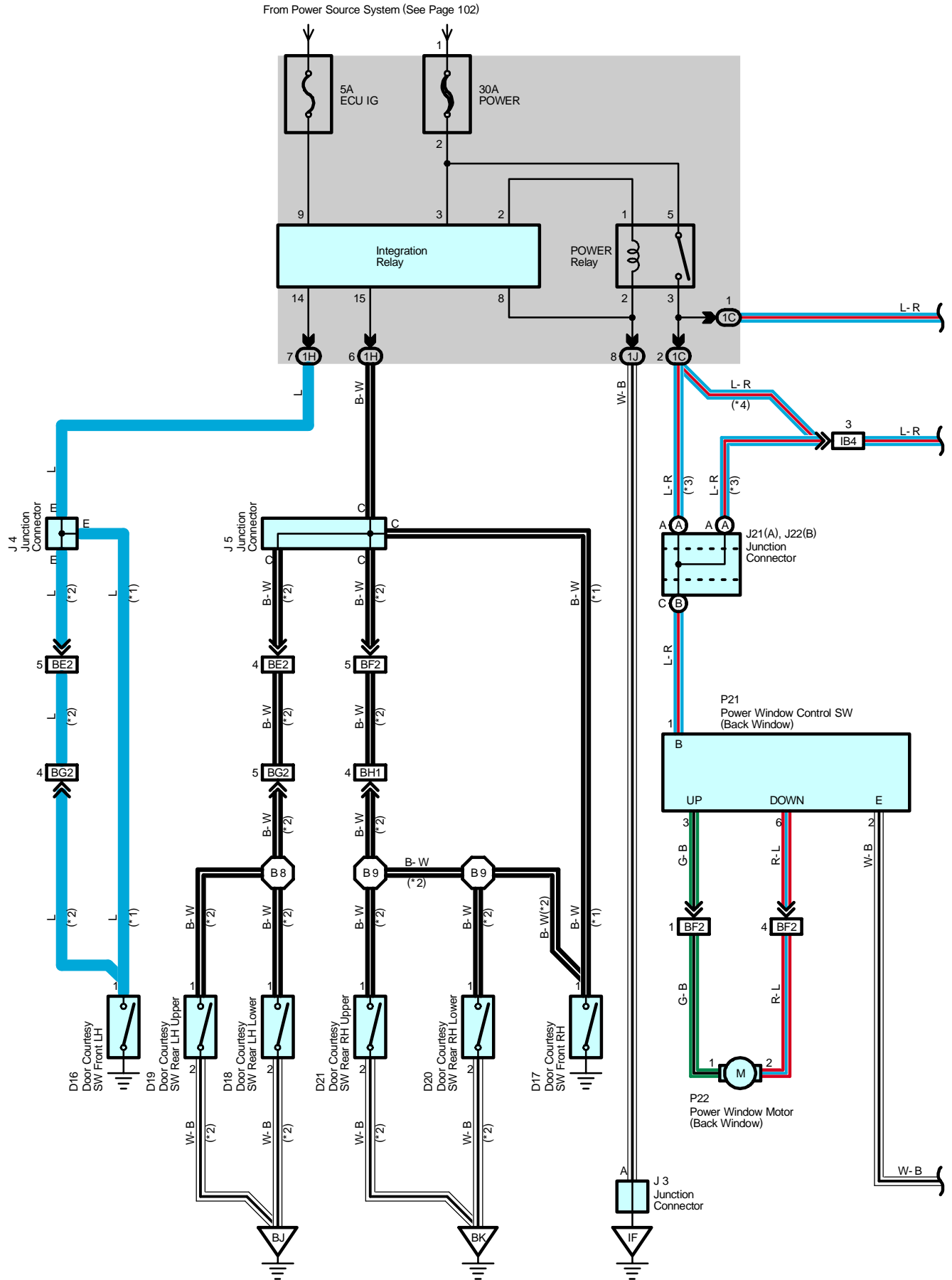
Code	See Page	Ground Points Location
ET	74 (2UZ-FE)	Front Right Fender
	76 (1GR-FE)	
IE	78	Left Kick Panel
IF		
II	78	Right Kick Panel
BJ	82 (*3)	Inside of Rear Door LH
BK	82 (*3)	Inside of Rear Door RH

 : Splice Points

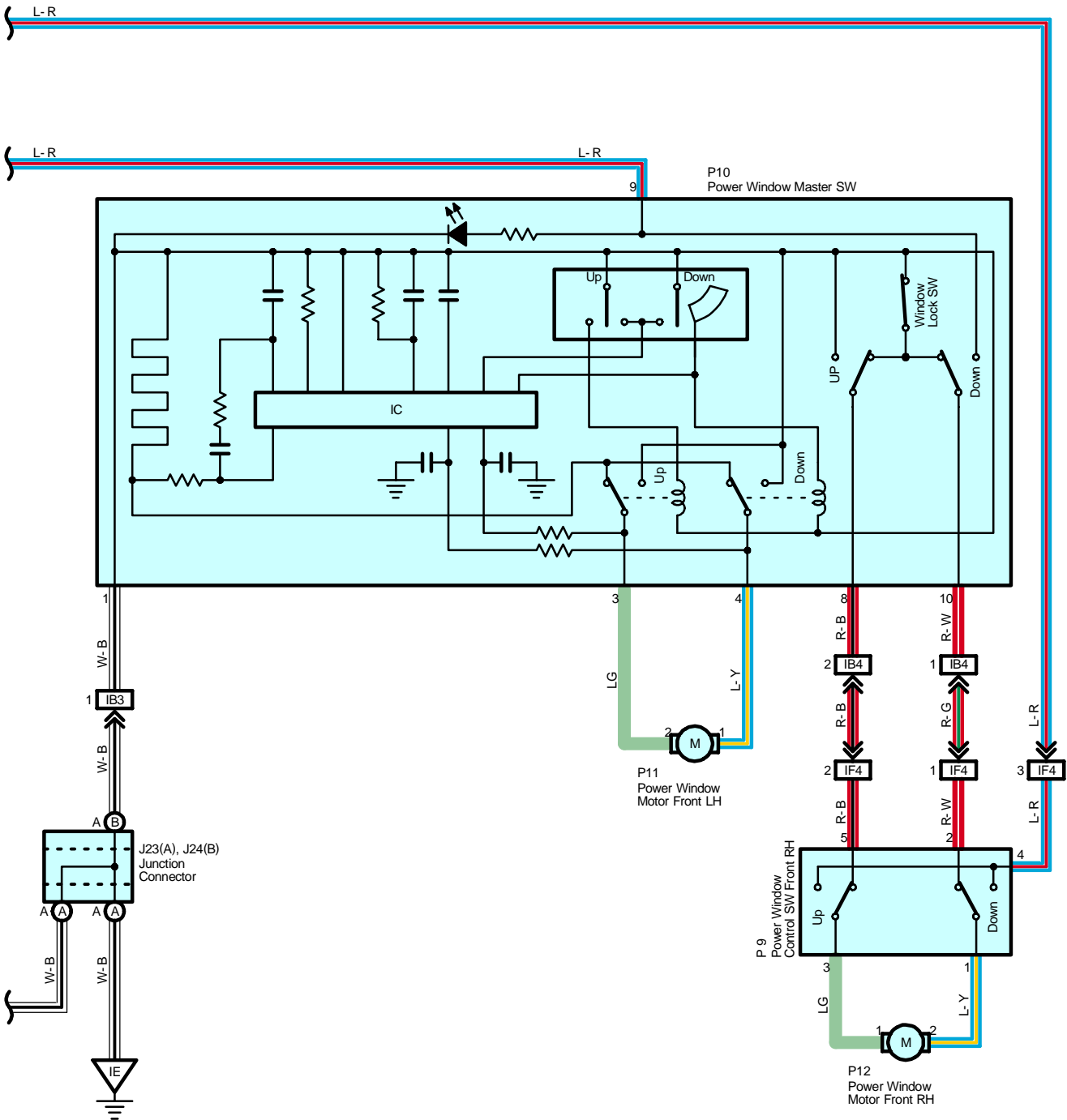
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I2	80	Cowl Wire	B7	82 (*3)	Front Door RH Wire
B3	82 (*3)	Front Door LH Wire		84 (*4)	
	B4		84 (*4)	B8	82 (*3)
B4		82 (*3)	Roof Wire	B9	82 (*3)
	84 (*4)				

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Power Window (Access/Standard Cab)



- * 1 : Standard Cab
- * 2 : Access Cab
- * 3 : w/ Power Window (Back Window)
- * 4 : w/o Power Window (Back Window)



Power Window (Access/Standard Cab)

System Outline

With the ignition SW turned on, current flows through the ECU IG fuse to TERMINAL 9 of the integration relay to TERMINAL 2 to TERMINAL 1 of the power relay to TERMINAL 2 to GROUND, activating the power relay, and the current flowing from TERMINAL 5 of the power relay flows to TERMINAL 3 to TERMINAL 9 of the power window master SW, TERMINAL 4 of the power window control SW RH and TERMINAL 1 of power window SW (Back window).

1. Manual Operation (Driver's Window)

With the ignition SW turned on and with the power window master SW (Manual SW) in UP position, the current flowing to TERMINAL 9 of the power window master SW flows to TERMINAL 3 to TERMINAL 2 of the power window motor LH to TERMINAL 1 to TERMINAL 4 of the master SW to TERMINAL 1 to GROUND and causes the power window motor to rotate in the up direction. The window ascends only while the SW is being pushed.

In down operation, the current flowing from TERMINAL 9 of the power window master SW to TERMINAL 4 flows to TERMINAL 1 of the motor LH to TERMINAL 2 to TERMINAL 3 of the master SW to TERMINAL 1 to GROUND, flowing in the opposite direction to manual up operation, causing the motor to rotate in reverse and lowering the window.

2. Auto Down Operation (Driver's Window)

With the ignition SW on and with the auto SW of the power window master SW in DOWN position, the current flowing to TERMINAL 9 of the master SW flows to TERMINAL 4 of the master SW to TERMINAL 1 of the power window motor LH to TERMINAL 2 to TERMINAL 3 of the master SW to TERMINAL 1 to GROUND, causing the motor to rotate towards the down side.

Then the solenoid in the master SW is activated and it locks the auto SW being pushed, causing the motor to continue to rotate in auto down operation.

When the window has completely descended, the current flowing between TERMINAL 3 of the master SW and TERMINAL 1 increases. As a result, the solenoid stops operating, the auto SW turns off and the flowing from TERMINAL 9 of the master SW to TERMINAL 4 is cut off, stopping the motor so that auto stop occurs.

3. Stopping of Auto Down AT Driver's Window

When the manual SW (Driver's) is pushed to the up side during auto down operation, a ground circuit opens in the master SW and current does not flow from TERMINAL 3 of the master SW to TERMINAL 1, so the motor stops, causing auto down operation to stop. If the manual SW is pushed continuously, the motor rotates in the up direction in manual up operation.

4. Manual Operation By Power Window Control SW (Passenger's Window)

With the power window control SW RH is pushed to the up side, the current flowing from TERMINAL 4 of the power window control SW RH flows to TERMINAL 3 of the power window control SW RH to TERMINAL 1 of the power window motor RH to TERMINAL 2 to TERMINAL 1 of the power window control SW RH to TERMINAL 2 to TERMINAL 10 of the master SW to TERMINAL 1 to GROUND. This causes the power window motor RH to rotate in the up direction. Up operation is continuous only while the power window control SW RH is pushed to the up side. When the window descends, the current flowing to the motor flows in the opposite direction, from TERMINAL 1 to TERMINAL 2, and the motor rotates in reverse.

When the window lock SW is pushed to the lock side, the ground circuit to the passenger's window becomes open. As a result, even if Open/Close operation of the passenger's window is tried, the current from TERMINAL 9 of the power window master SW is not grounded and the motor does not rotate, so the passenger's window can not be operated and window lock occurs.

5. Key Off Power Window Operation

With the ignition SW turned from on to off, the integration relay operates for about 43 seconds and current flows from TERMINAL 1 of the power relay to TERMINAL 2 to GROUND. For this period, current also flows TERMINAL 5 to TERMINAL 3. This current flows to TERMINAL 9 of the power window master SW and to TERMINAL 4 of the power window control SW RH. As a result, for about 43 seconds after the ignition SW is turned off, it is possible to raise and lower the power window by the functioning of the integration relay. Also, by opening the door (Door courtesy SW on) within about 43 seconds after turning the ignition SW to off, a signal is input to TERMINAL 3, 14 or 15 of the integration relay. As a result, the integration relay turns off, and up and down movement of the window stops.

Service Hints

D16, D17 Door Courtesy SW LH, RH

1-Ground : Continuity with door open

INTEGRATION Relay

9-Ground : Approx. 12 volts with ignition SW at ON position

3-Ground : Always approx. 12 volts

14-Ground : Continuity with front LH door open

15-Ground : Continuity with front RH door open (Standard cab)

15-Ground : Continuity with front RH, rear LH, RH door open (Access cab)

P9 Power Window Control SW Front RH

4-Ground : Approx. 12 volts with ignition SW on and stays at 12 volts for 41.5 -44.5 seconds after the ignition SW is turned off, but if a door is open in the approx. 43 seconds period, voltage will drop to 0 volts

P10 Power Window Master SW

1-Ground : Always continuity

9-Ground : Approx. 12 volts with ignition SW on and stays at 12 volts for 41.5 -44.5 seconds after the ignition SW is turned off, but if a door is opened in this approx. 43 seconds period, voltage will drop to 0 volts

3-Ground : Approx. 12 volts with ignition SW at ON position and master SW at UP position

4-Ground : Approx. 12 volts with ignition SW at ON position and master SW at DOWN or AUTO DOWN position

Window Lock SW

Open with window lock SW at LOCK position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
D16	60 (*3)	J4	58	P10	61 (*4)
	61 (*4)	J5	58	P11	60 (*3)
D17	60 (*3)	J21	A 58		61 (*4)
	61 (*4)	J22	B 58	P12	60 (*3)
D18	60 (*3)	J23	A 58		61 (*4)
D19	60 (*3)	J24	B 58	P21	58
D20	60 (*3)	P9	60 (*3)	P22	60 (*3)
D21	60 (*3)		61 (*4)		
J3	58	P10	60 (*3)		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1H	24 (*2)	
	28 (*1)	
1J	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB3	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IB4		
IF4	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Power Window (Access/Standard Cab)



: Ground Points

Code	See Page	Ground Points Location
IE	78	Left Kick Panel
IF		
BJ	82 (*3)	Inside of Rear Door LH
BK	82 (*3)	Inside of Rear Door RH



: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B8	82 (*3)	Rear Door No.1 Wire LH	B9	82 (*3)	Rear Door No.1 Wire RH

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Key Reminder and Seat Belt Warning (Access/Standard Cab)

System Outline

Current always flows to TERMINAL (B) 23 of the combination meter through the DOME fuse.

1. Seat Belt Warning System

When the ignition SW is turned on, current flows from the IGN fuse to TERMINAL (B) 24 of the combination meter. This current activates the combination meter and the current flowing through the seat belt warning light flows from TERMINAL (B) 12 to GROUND, causing the warning light to light up. A buckle SW off signal is input to TERMINAL (A) 5 of the combination meter to TERMINAL (B) 12 to GROUND, causing the warning light to light up. A buckle SW on signal is input to TERMINAL (A) 5 of the combination meter, the current flowing to TERMINAL (B) 23 of the combination meter flows from TERMINAL (B) 12 to GROUND and the seat belt warning buzzer sounds. However, if the seat belt is put on during this period (While the buzzer is sounding), signal input to TERMINAL (A) 5 of the combination meter stops and the current flow from TERMINAL (B) 23 of the combination meter to TERMINAL (B) 12 to GROUND is cut, causing the buzzer to stop.

2. Key Reminder System

With the ignition key inserted in the key cylinder (Unlock warning SW on), the ignition SW still off and driver's door open (Door courtesy SW on), when a signal is input to TERMINAL (A) 30 of the combination meter, the combination meter operates, current flows from TERMINAL (B) 23 of the combination meter to TERMINAL (B) 12 to GROUND and key reminder buzzer sounds.

Service Hints

B7 Buckle SW LH (Captain Seat)

2-3 : Closed with the driver's seat belt in use

B7 Buckle SW LH (Separate Seat)

13-3 : Closed with the driver's seat belt in use

B7 Buckle SW LH (Bench Seat)

2-1 : Closed with the driver's seat belt in use

D16 Door Courtesy SW Front LH

1-Ground : Closed with the front LH door open

U1 Unlock Warning SW

1-2 : Closed with the ignition key in cylinder

C11 (A), C12 (B) Combination Meter

(B)12-Ground : Always continuity

(A)30-Ground : Continuity with the front LH door open

(A)29-Ground : Continuity with the ignition key in cylinder

(A) 5-Ground : Continuity with the driver's seat belt in use

(B)23-Ground : Always approx. 12 volts

(B)24-Ground : Approx. 12 volts with the ignition SW at ON or ST position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
B7	60 (*9)	C11	A	56	J13	58
	62 (*7)	C12	B	56	J23	58
	63 (*8)	D16		60 (*3)	J66	A
			61 (*4)	J67	B	58
B13	62 (*7)					
B15	60 (*3)	I24	A	57	J83	62 (*7)
	61 (*4)	I25	B	57	O10	62 (*7)
	63 (*8)	J3		58	O16	63 (*8)
C4	A	J4		58	U1	59
C6	C	J7		58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

 : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

 : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BI2	86 (*6)	Cowl Wire and Seat No.2 Wire (Under the Driver's Seat)
	88 (*5)	
BM1	88 (*5)	Cowl Wire and Seat No.1 Wire (Under the Passenger's Seat)
BN1	86 (*6)	Seat No.1 Wire and Cowl Wire (Under the Passenger's Seat)

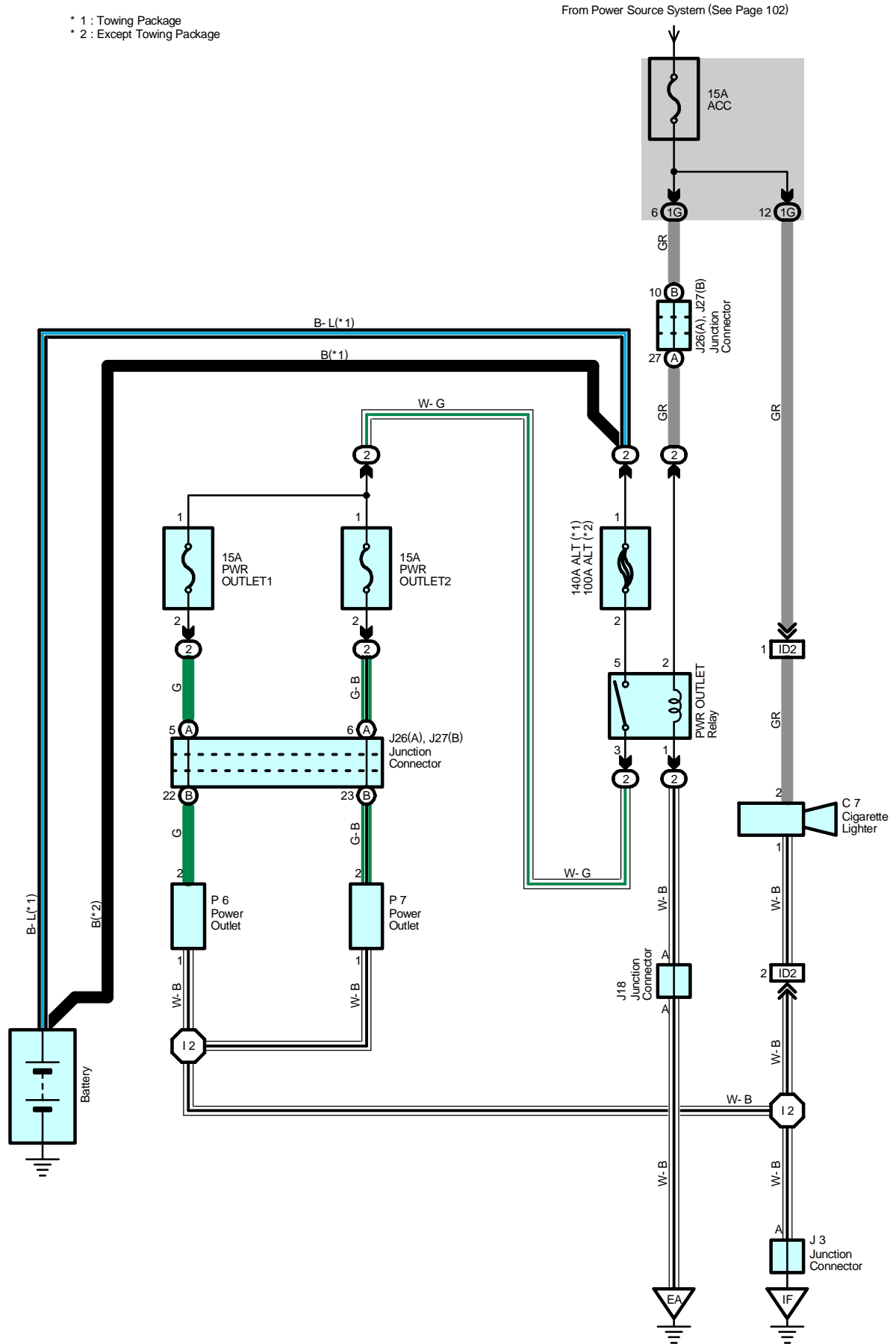
 : Ground Points

Code	See Page	Ground Points Location
IE	78	Left Kick Panel
IF		
IH	78	Right Kick Panel
II		

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Cigarette Lighter and Power Outlet (Access/Standard Cab)

- * 1 : Towing Package
- * 2 : Except Towing Package



Service Hints

C7 Cigarette Lighter

2-Ground : Approx. 12 volts with ignition SW at ON or ACC position

1-Ground : Always continuity

P6, P7 Power Outlet

2-Ground : Approx. 12 volts with the ignition SW at ON or ACC position

1-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C7	56	J18	55 (1GR-FE)	P6	58
J3	58	J26	A	P7	58
J18	53 (2UZ-FE)	J27	B		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
ID2	78	Cigarette Lighter Wire and Cowl Wire (Instrument Panel Brace LH)

▽ : Ground Points

Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
IF	78	Left Kick Panel

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I2	80	Cowl Wire			

* 1 : w/ Daytime Running Light

* 2 : w/o Daytime Running Light

* 3 : Access Cab

* 4 : Standard Cab

* 5 : Bench Seat

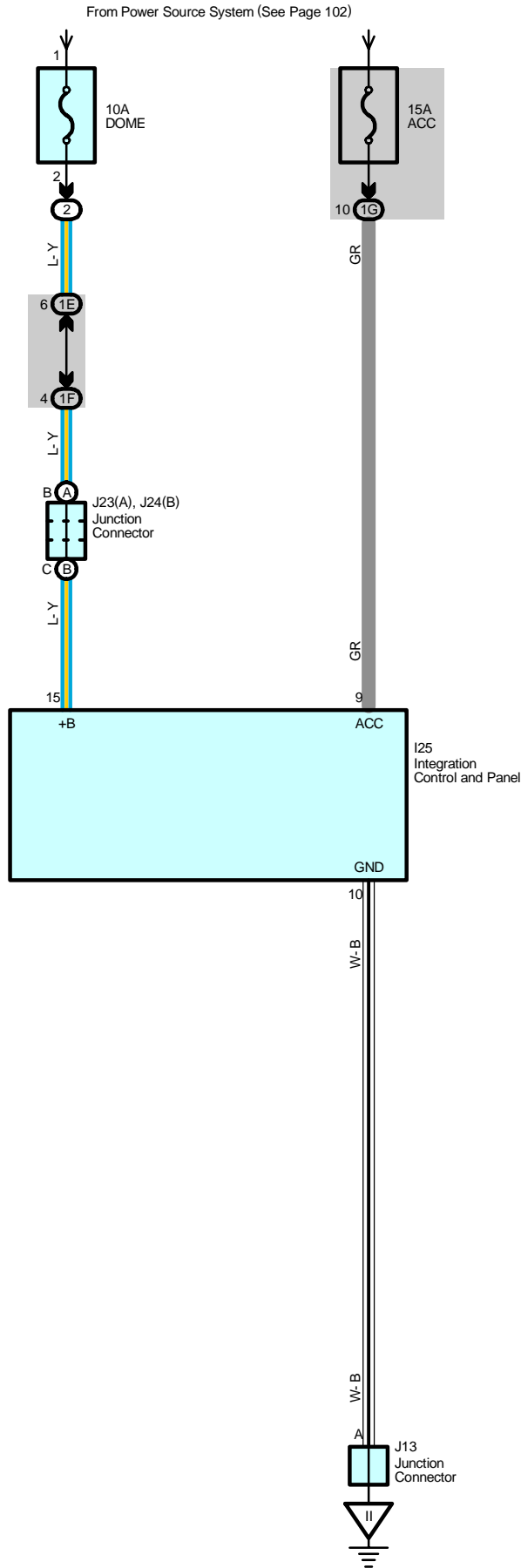
* 6 : Captain Seat

* 7 : Access Cab Captain Seat

* 8 : Standard Cab Bench Seat

* 9 : Access Cab w/o Power Seat

Clock (Access/Standard Cab)



Service Hints

I25 (B) Integration Control and Panel

- (A)10-Ground : Always continuity
- (B) 9-Ground : Approx. 12 volts with ignition SW at ON or ACC position
- (B)15-Ground : Always approx. 12 volts

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
I25	57	J23	A 58		
J13	58	J24	B 58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

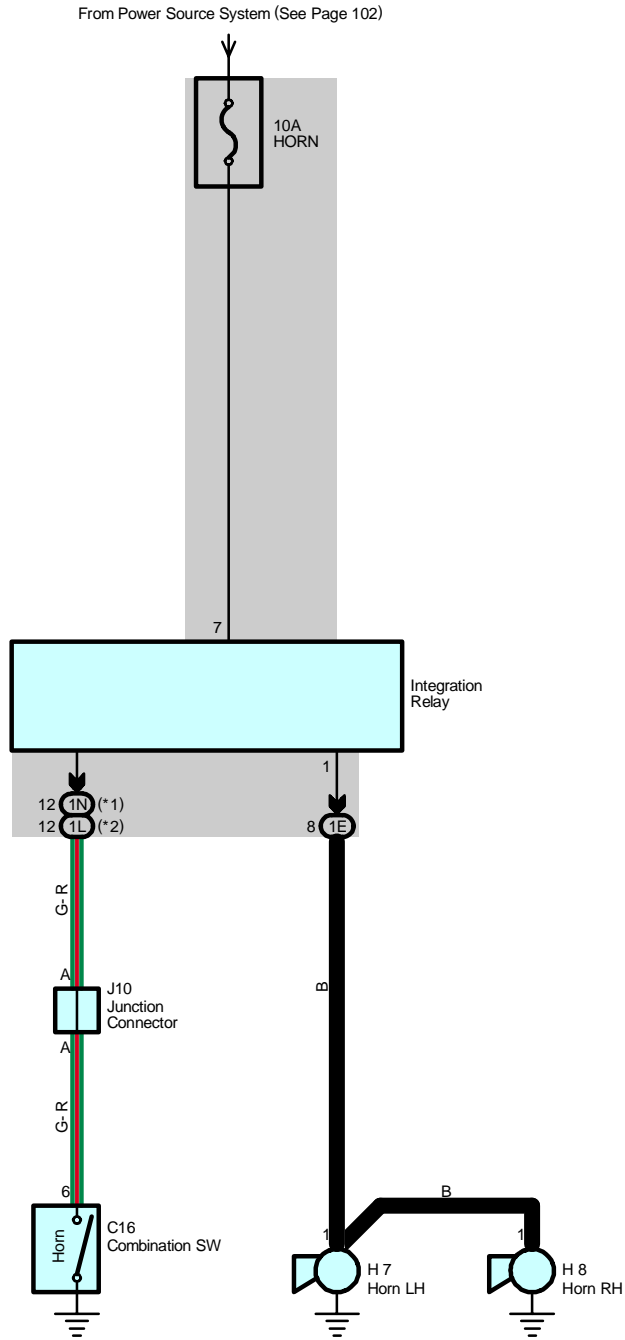
Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

▽ : Ground Points

Code	See Page	Ground Points Location
II	78	Right Kick Panel

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
- * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Horn (Access/Standard Cab)



- * 1 : w/ Daytime Running Light
- * 2 : w/o Daytime Running Light

Service Hints

C16 Combination SW

6-Ground : Continuity with horn SW on

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C16	56	H7	54 (1GR-FE)	H8	54 (1GR-FE)
H7	52 (2UZ-FE)	H8	52 (2UZ-FE)	J10	58

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1L	25 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1N	29 (*1)	

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

System Outline

With the ignition SW turned on, current flows to TERMINAL 17 of the wiper and washer SW, TERMINAL 3 of the washer motor and TERMINAL 2 of the wiper motor through the WIP fuse.

1. Low Speed Position

With wiper SW turned to LOW position, current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 7 to TERMINAL 5 of the wiper motor to TERMINAL 4 to GROUND and causes the wiper motor to run at low speed.

2. High Speed Position

With wiper SW turned to HIGH position, current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 8 to TERMINAL 3 of the wiper motor to TERMINAL 4 to GROUND and causes the motor to run at high speed.

3. INT Position

With wiper SW turned to INT position, the relay operates and the current which is connected by relay function flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 2 to GROUND. This flowing the intermittent circuit and current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 7 to TERMINAL 5 of the wiper motor to TERMINAL 4 to GROUND and the wiper functions.

The intermittent operation is controlled by charging and discharging of the condenser installed in the relay and the intermittent time is controlled by a time control SW to change the charging time of the condenser.

4. Washer Interlocking Operation

With the washer SW turned to on, current flows from TERMINAL 3 of the washer motor to TERMINAL 4 to TERMINAL 11 of the wiper and washer SW to TERMINAL 2 to GROUND and causes to the washer motor to run, and the window washer is jetted.

This causes current to flow to washer continuous operation circuit in TERMINAL 17 of the wiper and washer SW to TERMINAL 7 to TERMINAL 5 of the wiper motor to TERMINAL 4 to GROUND and the wiper functions.

Service Hints

C17 Combination SW

2-Ground : Always continuity

17-Ground : Approx. 12 volts with ignition SW at ON position

7-Ground : Approx. 12 volts with wiper and washer SW at LOW position

Approx. 12 volts every approx. 1.6 to 10.7 seconds intermittently with wiper SW at INT position

16-Ground : Approx. 12 volts with ignition SW on unless wiper motor at STOP position

8-Ground : Approx. 12 volts with ignition SW on and wiper and washer SW at HIGH position

11-2 : Continuity with washer SW on

W4 Wiper Motor

1-2 : Closed unless wiper motor at STOP position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
C11	A	56	J13	58	W2	55 (1GR-FE)
C12	B	56	J26	A	58	W4
C17		56	J27	B	58	
J3		58	W2		53 (2UZ-FE)	

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Wiper and Washer with INT TIME Switch (Access/Standard Cab)

 : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA2	74 (2UZ-FE)	Cowl Wire and Engine Room Main Wire (Right Fender)
	76 (1GR-FE)	

 : Ground Points

Code	See Page	Ground Points Location
ET	74 (2UZ-FE)	Front Right Fender
	76 (1GR-FE)	
IF	78	Left Kick Panel
II	78	Right Kick Panel

System Outline

With the ignition SW turned on, current flows to TERMINAL 17 of the wiper and washer SW, TERMINAL 3 of the washer motor and TERMINAL 2 of the wiper motor through the WIP fuse.

1. Low Speed Position

With wiper SW turned to LOW position, current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 7 to TERMINAL 5 of the wiper motor to TERMINAL 4 to GROUND and causes the wiper motor to run at low speed.

2. High Speed Position

With wiper SW turned to HIGH position, current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 8 to TERMINAL 3 of the wiper motor to TERMINAL 4 to GROUND and causes the motor to run at high speed.

3. Mist Position

With the wiper SW turned to MIST position, current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 7 to TERMINAL 5 of the wiper motor to TERMINAL 4 to GROUND and causes the wiper motor to run at low speed.

4. Washer Interlocking Operation

With the washer SW turned to on, current flows from TERMINAL 3 of the washer motor to TERMINAL 4 to TERMINAL 11 of the wiper and washer SW to TERMINAL 2 to GROUND and causes the washer motor to run, and the window washer is jetted.

Service Hints

C17 Combination SW

- 2-Ground : Always continuity
- 17-Ground : Approx. 12 volts with ignition SW at ON position
- 7-Ground : Approx. 12 volts with wiper and washer SW at LOW or MIST position
- 16-Ground : Approx. 12 volts with ignition SW on unless wiper motor at STOP position
- 8-Ground : Approx. 12 volts with ignition SW on and wiper and washer SW at HIGH position
- 11-Ground : Continuity with washer SW on

W4 Wiper Motor

- 1-2 : Closed unless wiper motor at STOP position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
C11	A	56	J13	58	W2	55 (1GR-FE)	
C12	B	56	J26	A	58	W4	53 (2UZ-FE)
C17		56	J27	B	58		55 (1GR-FE)
J3		58	W2		53 (2UZ-FE)		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA2	74 (2UZ-FE)	Cowl Wire and Engine Room Main Wire (Right Fender)
	76 (1GR-FE)	

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
- * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

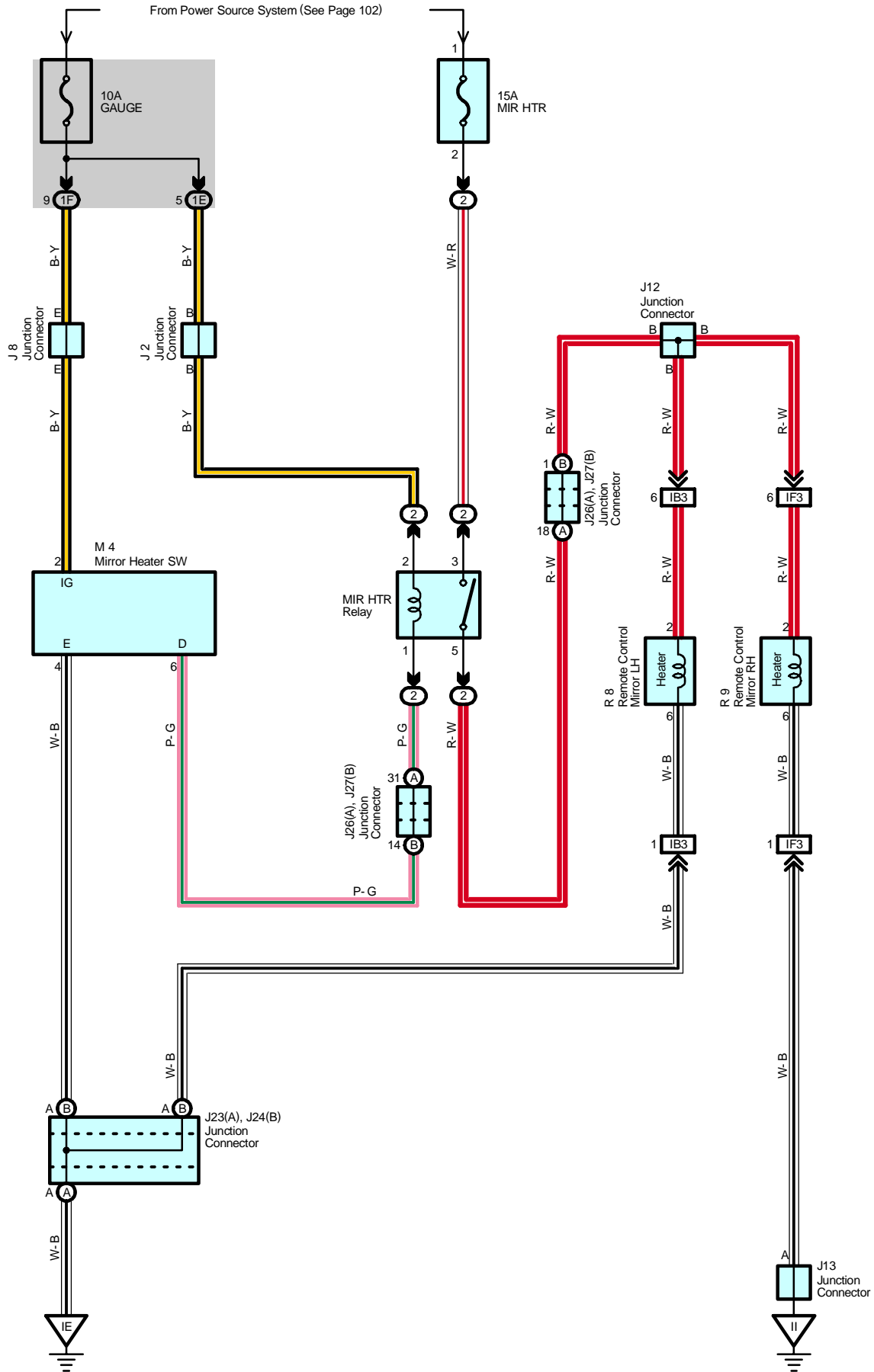
Wiper and Washer without INT TIME Switch (Access/Standard Cab)



: Ground Points

Code	See Page	Ground Points Location
ET	74 (2UZ-FE)	Front Right Fender
	76 (1GR-FE)	
IF	78	Left Kick Panel
II	78	Right Kick Panel

Mirror Heater (Access/Standard Cab)



Service Hints

MIR HTR Relay

5-3 : Closed with the ignition SW on and the mirror heater SW on

M4 Mirror Heater SW

2-Ground : Approx. 12 volts with the ignition SW on

4-Ground : Always continuity

R8, R9 Remote Control Mirror LH, RH

2-Ground : Approx. 12 volts with the ignition SW on and the mirror heater SW on

6-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
J2	53 (2UZ-FE)	J23	A	58	R8	60 (*3)
	55 (1GR-FE)	J24	B	58		61 (*4)
J8	58	J26	A	58	R9	60 (*3)
J12	58	J27	B	58		61 (*4)
J13	58	M4		58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB3	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF3	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)

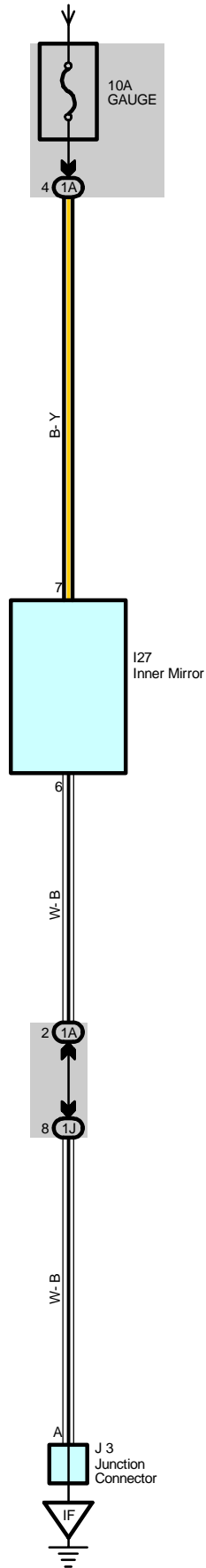
▽ : Ground Points

Code	See Page	Ground Points Location
IE	78	Left Kick Panel
II	78	Right Kick Panel

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Automatic Glare-Resistant EC Mirror (Access/Standard Cab)

From Power Source System (See Page 102)



Service Hints

I27 Inner Mirror

7-Ground : Approx. 12 volts with the ignition SW at ON or ST position

6-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
I27	60 (*3)	I27	61 (*4)	J3	58

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	24 (*2)	Roof Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1J	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

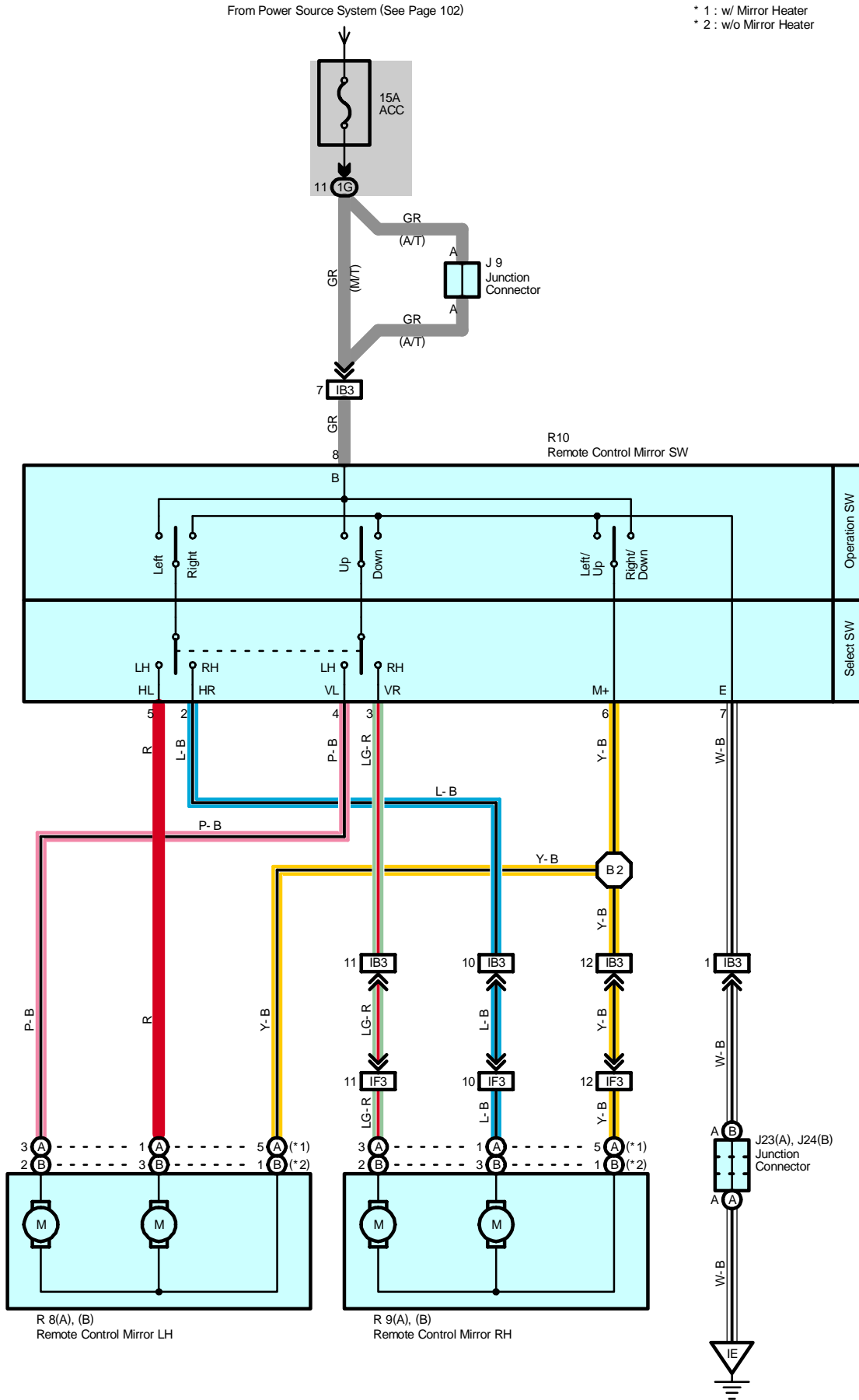
▽ : Ground Points

Code	See Page	Ground Points Location
IF	78	Left Kick Panel

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat

* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Remote Control Mirror (Access/Standard Cab)



Service Hints

R10 Remote Control Mirror SW

- 8-Ground : Approx. 12 volts with ignition SW at ACC or ON position
- 6-7 : Continuity with operation SW at UP or LEFT position
- 8-6 : Continuity with operation SW at DOWN or RIGHT position

○ : Parts Location

Code		See Page	Code		See Page	Code		See Page
J9		58	R8	B	60 (*3)	R9	B	61 (*4)
J23	A	58			61 (*4)	R10		60 (*3)
J24	B	58	R9	A	60 (*3)			61 (*4)
R8	A	60 (*3)			61 (*4)	B	60 (*3)	
		61 (*4)						

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB3	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF3	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)

▽ : Ground Points

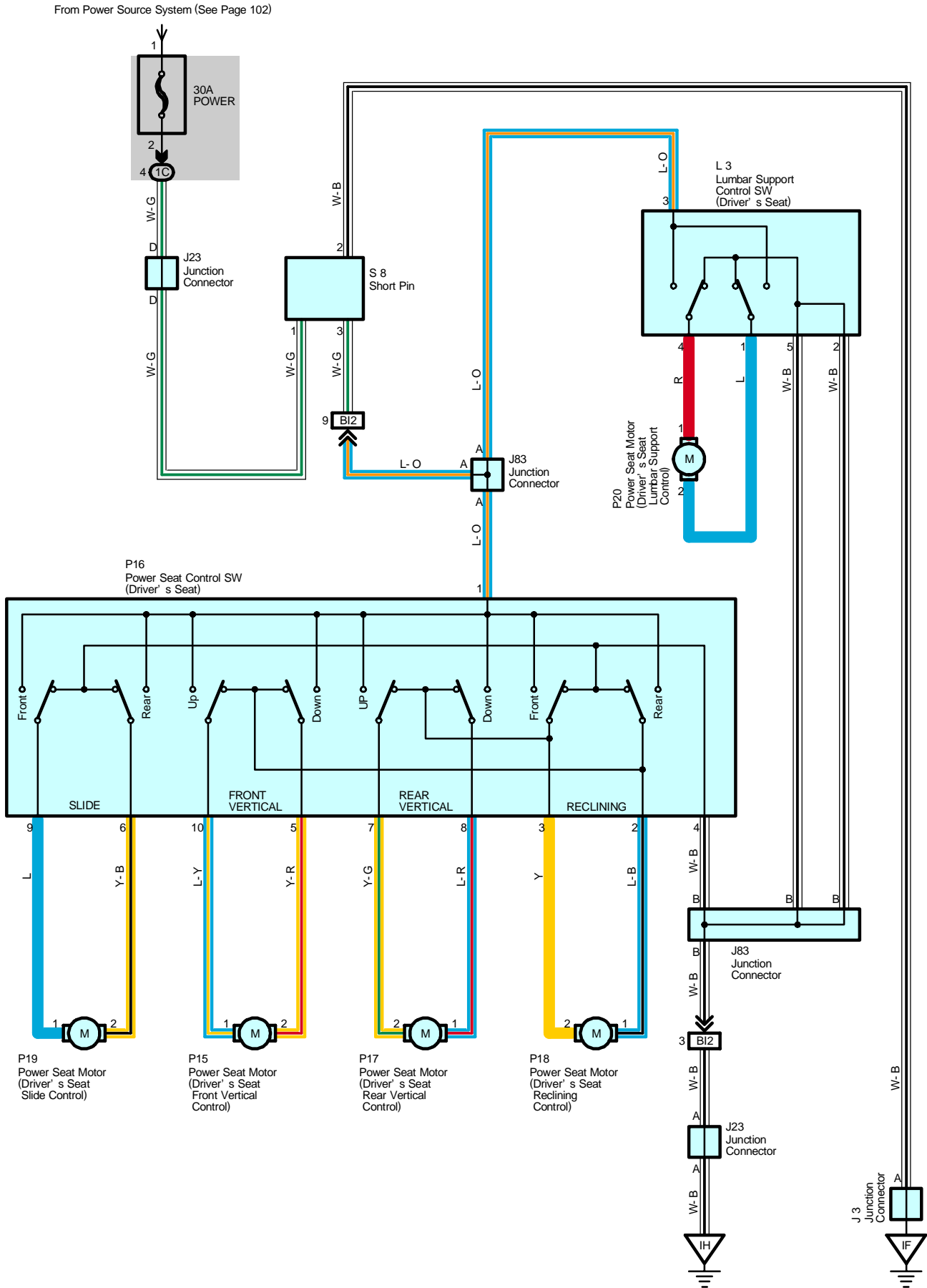
Code	See Page	Ground Points Location
IE	78	Left Kick Panel

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B2	82 (*3)	Front Door LH Wire	B2	84 (*4)	Front Door LH Wire

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
- * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Power Seat (Access/Standard Cab)



Service Hints

P16 Power Seat Control SW (Driver's Seat)

- 1-9 : Closed with driver's seat at front slide operation
- 1-6 : Closed with driver's seat at rear slide operation
- 1-3 : Closed with driver's seat at front reclining operation
- 1-2 : Closed with driver's seat at rear reclining operation
- 1-10 : Closed with driver's seat at front vertical up operation
- 1-5 : Closed with driver's seat at front vertical down operation
- 1-7 : Closed with driver's seat at rear vertical up operation
- 1-8 : Closed with driver's seat at rear vertical down operation
- 4-Ground : Always continuity

: Parts Location

Code	See Page	Code	See Page	Code	See Page
J3	58	P15	62 (*7)	P19	62 (*7)
J23	58	P16	62 (*7)	P20	62 (*7)
J83	62 (*7)	P17	62 (*7)	S8	59
L3	62 (*7)	P18	62 (*7)		

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

: Connector Joining Wire Harness and Wire Harness

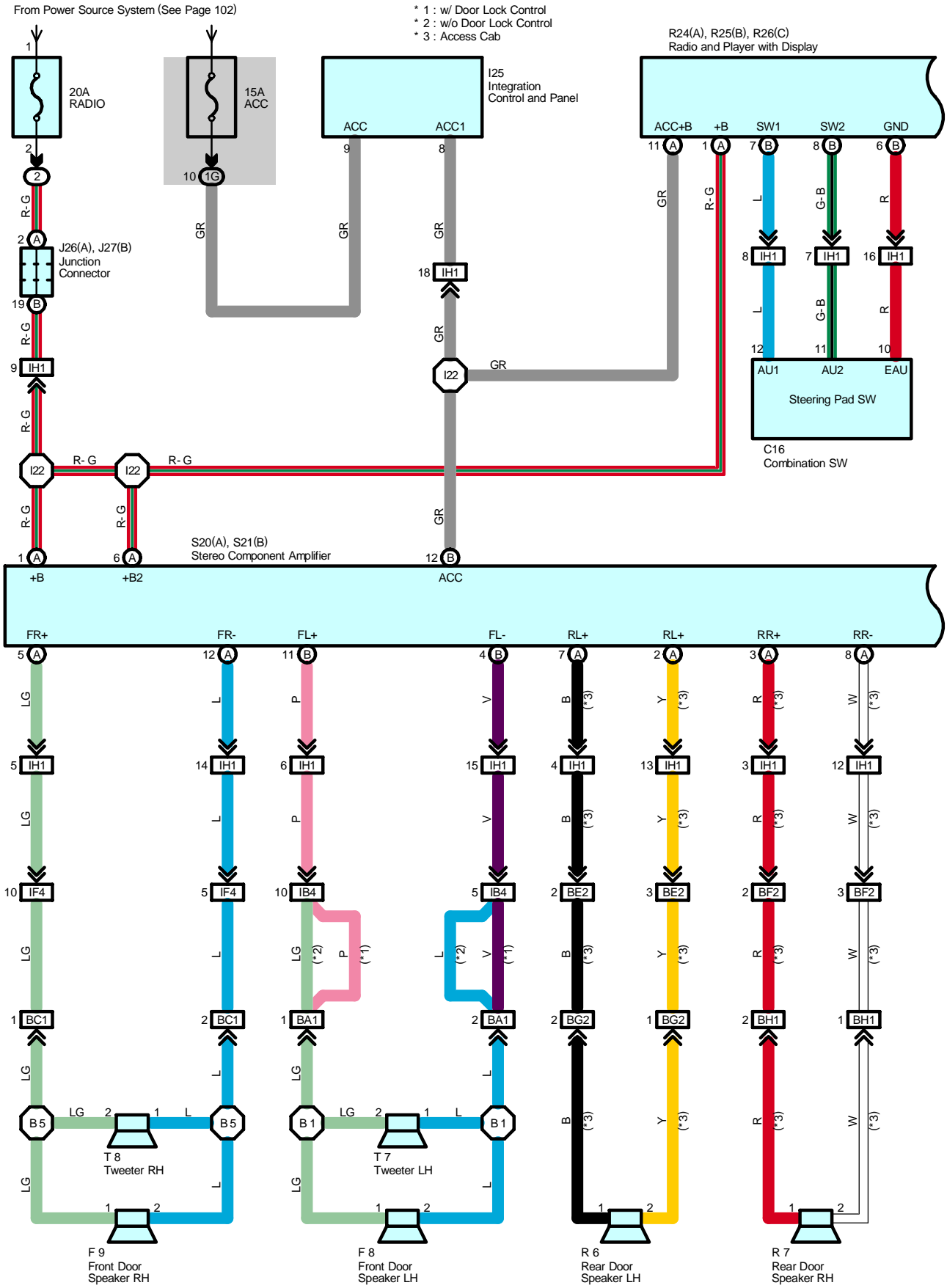
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
BI2	86 (*6)	Cowl Wire and Seat No.2 Wire (Under the Driver's Seat)
	88 (*5)	

: Ground Points

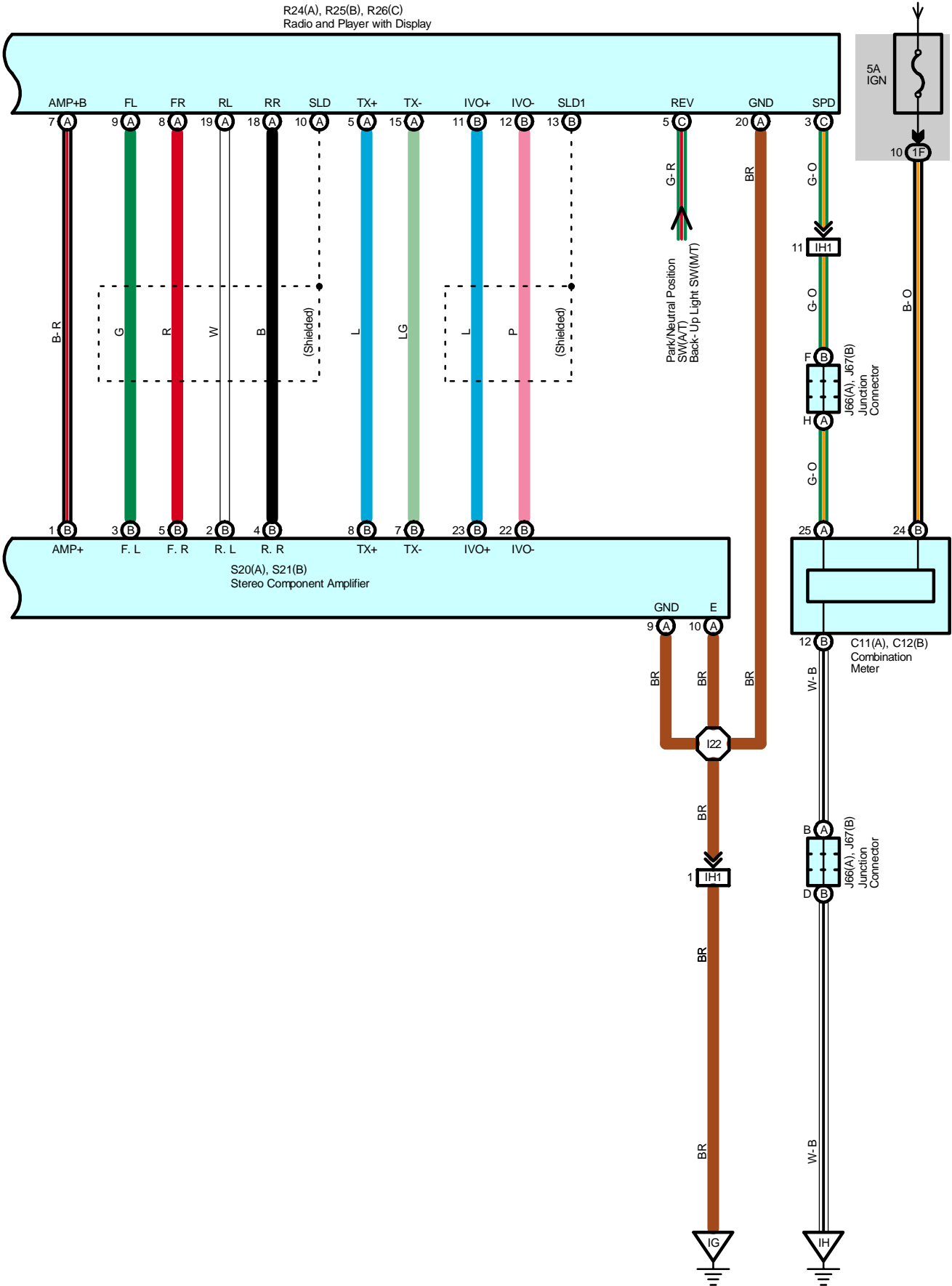
Code	See Page	Ground Points Location
IF	78	Left Kick Panel
IH	78	Right Kick Panel

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Navigation and Audio System (Access/Standard Cab)



From Power Source System (See Page 102)



Navigation and Audio System (Access/Standard Cab)

Service Hints

R24 (A) Radio and Player

- (A) 11-Ground : Approx. 12 volts with ignition SW at ON or ACC position
- (A) 1-Ground : Always approx. 12 volts
- (A) 20-Ground : Always continuity

S21 (B) Stereo Component Amplifier

- (A) 1-Ground : Always approx. 12 volts
- (A) 9, (A) 10-Ground : Always continuity
- (B) 12-Ground : Approx. 12 volts with ignition SW at ON or ACC position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C11	A 56	J26	A 58	R26	C 59
C12	B 56	J27	B 58	S20	A 60 (*3)
C16	56	J66	A 58	S21	B 60 (*3)
F8	60 (*3)	J67	B 58	T7	60 (*3)
	61 (*4)	R6	60 (*3)		61 (*4)
F9	60 (*3)	R7	60 (*3)	T8	60 (*3)
	61 (*4)	R24	A 59		61 (*4)
I25	57	R25	B 59		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1G	24 (*2)	
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB4	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF4	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IH1	80	Cowl Wire and Floor No.3 Wire (Instrument Panel Brace RH)
BA1	82 (*3)	Front Door LH Wire and Speaker Tweeter Wire LH (Inside of Front Door LH)
	84 (*4)	
BC1	82 (*3)	Front Door RH Wire and Speaker Tweeter Wire RH (Inside of Front Door RH)
	84 (*4)	
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)

▽ : Ground Points

Code	See Page	Ground Points Location
IG	78	Instrument Panel Brace RH
IH	78	Right Kick Panel

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

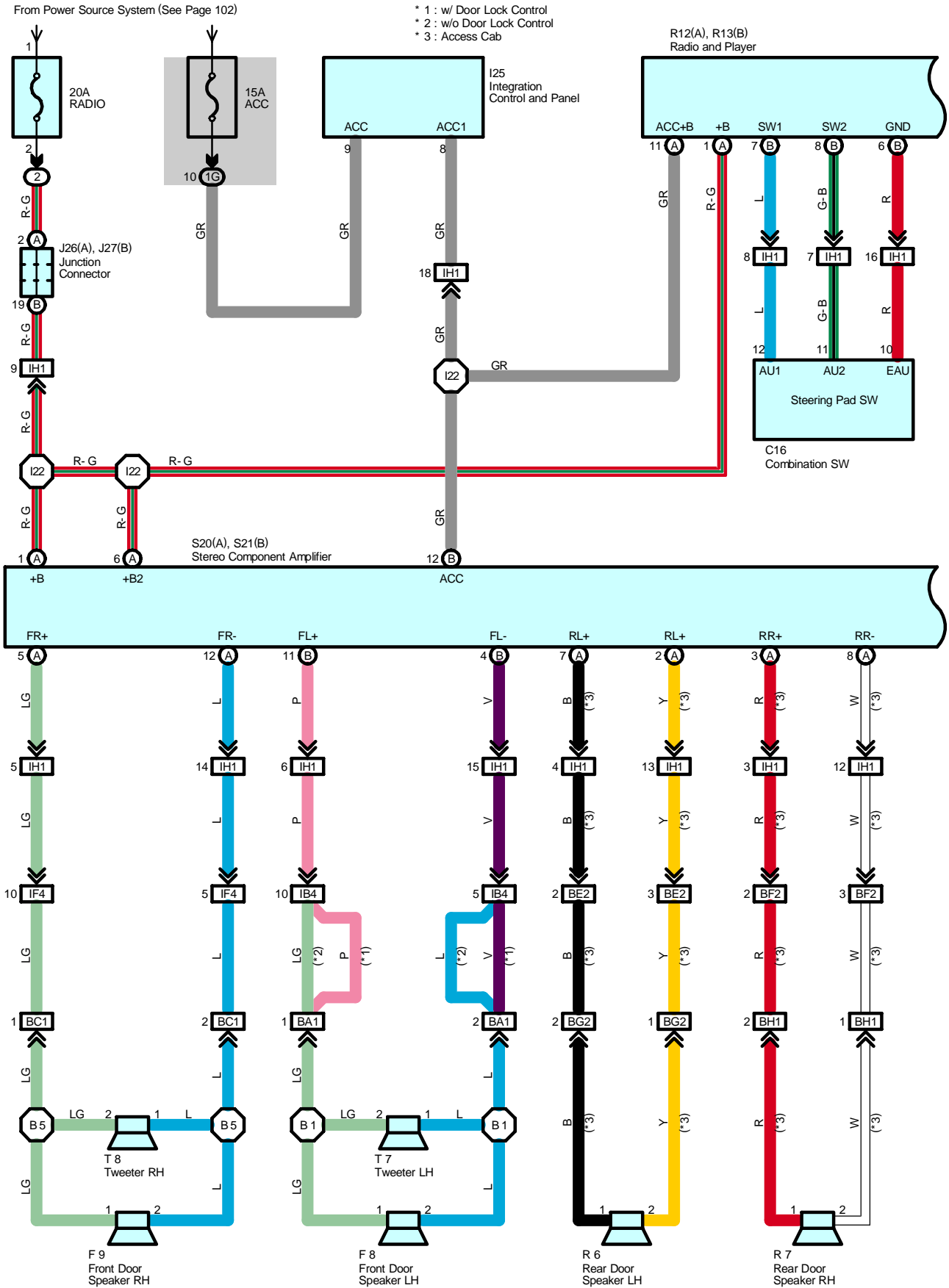


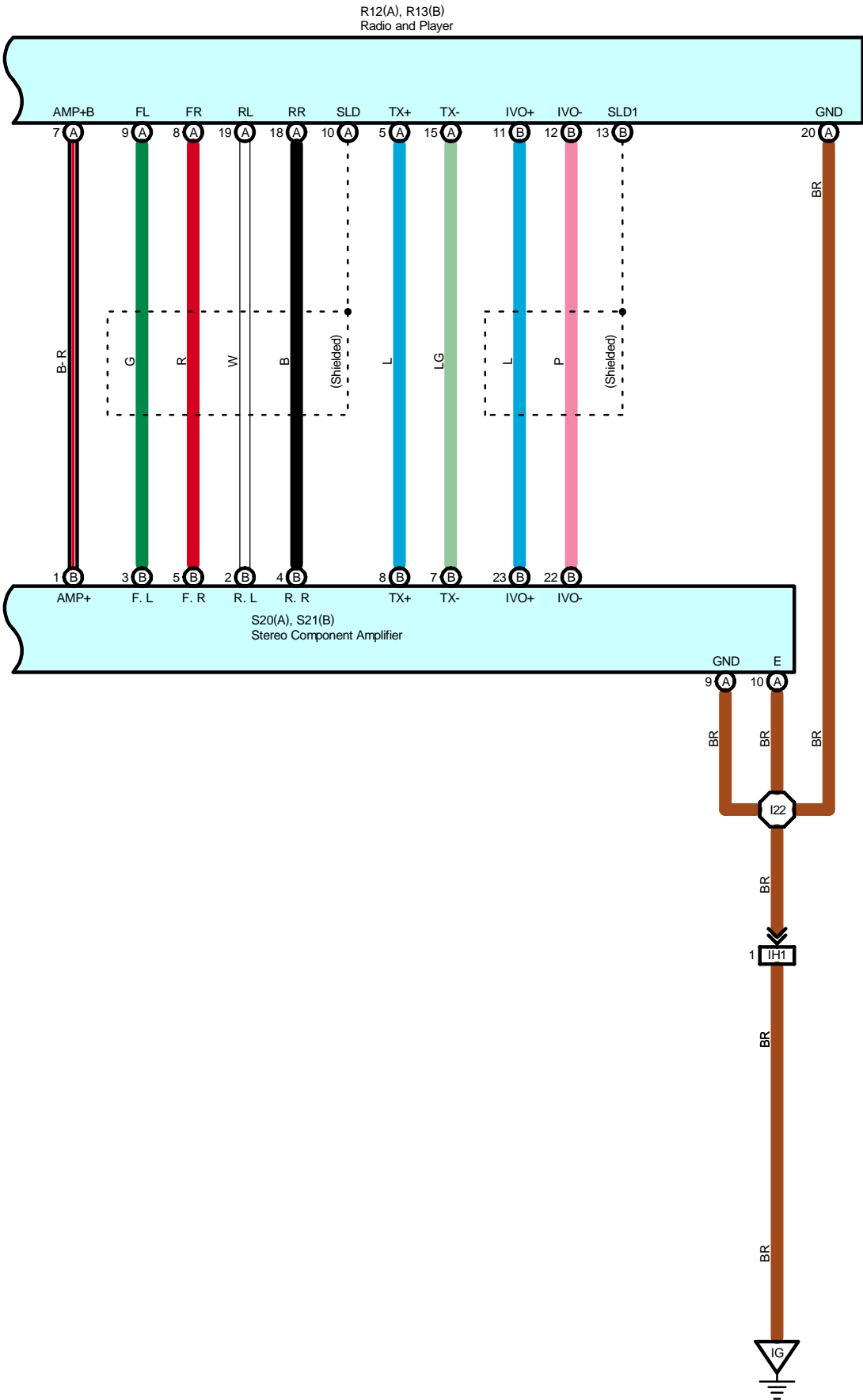
: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I22	80	Floor No.3 Wire	B5	82 (*3)	Speaker Tweeter Wire RH
B1	82 (*3)	Speaker Tweeter Wire LH		84 (*4)	
	84 (*4)				

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
* 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Audio System for Separate Amplifier (Access/Standard Cab)





Audio System for Separate Amplifier (Access/Standard Cab)

Service Hints

R12 (A) Radio and Player

- (A) 11-Ground : Approx. 12 volts with ignition SW at ON or ACC position
- (A) 1-Ground : Always approx. 12 volts
- (A) 20-Ground : Always continuity

S21 (B) Stereo Component Amplifier

- (A) 1-Ground : Always approx. 12 volts
- (A) 9, (A) 10-Ground : Always continuity
- (B) 12-Ground : Approx. 12 volts with ignition SW at ON or ACC position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C16	56	J26	A 58	S20	A 60 (*3)
F8	60 (*3)	J27	B 58	S21	B 60 (*3)
	61 (*4)	R6	60 (*3)	T7	60 (*3)
F9	60 (*3)	R7	60 (*3)		T8
	61 (*4)	R12	A 59	60 (*3)	
I25	57	R13	B 59		61 (*4)

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB4	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF4	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IH1	80	Cowl Wire and Floor No.3 Wire (Instrument Panel Brace RH)
BA1	82 (*3)	Front Door LH Wire and Speaker Tweeter Wire LH (Inside of Front Door LH)
	84 (*4)	
BC1	82 (*3)	Front Door RH Wire and Speaker Tweeter Wire RH (Inside of Front Door RH)
	84 (*4)	
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)

▽ : Ground Points

Code	See Page	Ground Points Location
IG	78	Instrument Panel Brace RH

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I22	80	Floor No.3 Wire	B5	82 (*3)	Speaker Tweeter Wire RH
B1	82 (*3)	Speaker Tweeter Wire LH		84 (*4)	
			84 (*4)		

- * 1 : w/ Daytime Running Light
- * 2 : w/o Daytime Running Light
- * 3 : Access Cab
- * 4 : Standard Cab
- * 5 : Bench Seat
- * 6 : Captain Seat
- * 7 : Access Cab Captain Seat
- * 8 : Standard Cab Bench Seat
- * 9 : Access Cab w/o Power Seat

Service Hints

R2 (B) Radio and Player

- (B) 3-Ground : Approx. 12 volts with ignition SW at ON or ACC position
- (B) 4-Ground : Always approx. 12 volts
- (B) 7-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
F8	60 (*3)	J26	A	58	R7	60 (*3)
	61 (*4)	J27	B	58	T7	60 (*3)
F9	60 (*3)	R1	A	59		61 (*4)
	61 (*4)	R2	B	59	T8	60 (*3)
I25	57	R6		60 (*3)		61 (*4)

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB4	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF4	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IG1	80	Cowl Wire and Instrument Panel No.2 Wire (Instrument Panel Brace RH)
BA1	82 (*3)	Front Door LH Wire and Speaker Tweeter Wire LH (Inside of Front Door LH)
	84 (*4)	
BC1	82 (*3)	Front Door RH Wire and Speaker Tweeter Wire RH (Inside of Front Door RH)
	84 (*4)	
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)

▽ : Ground Points

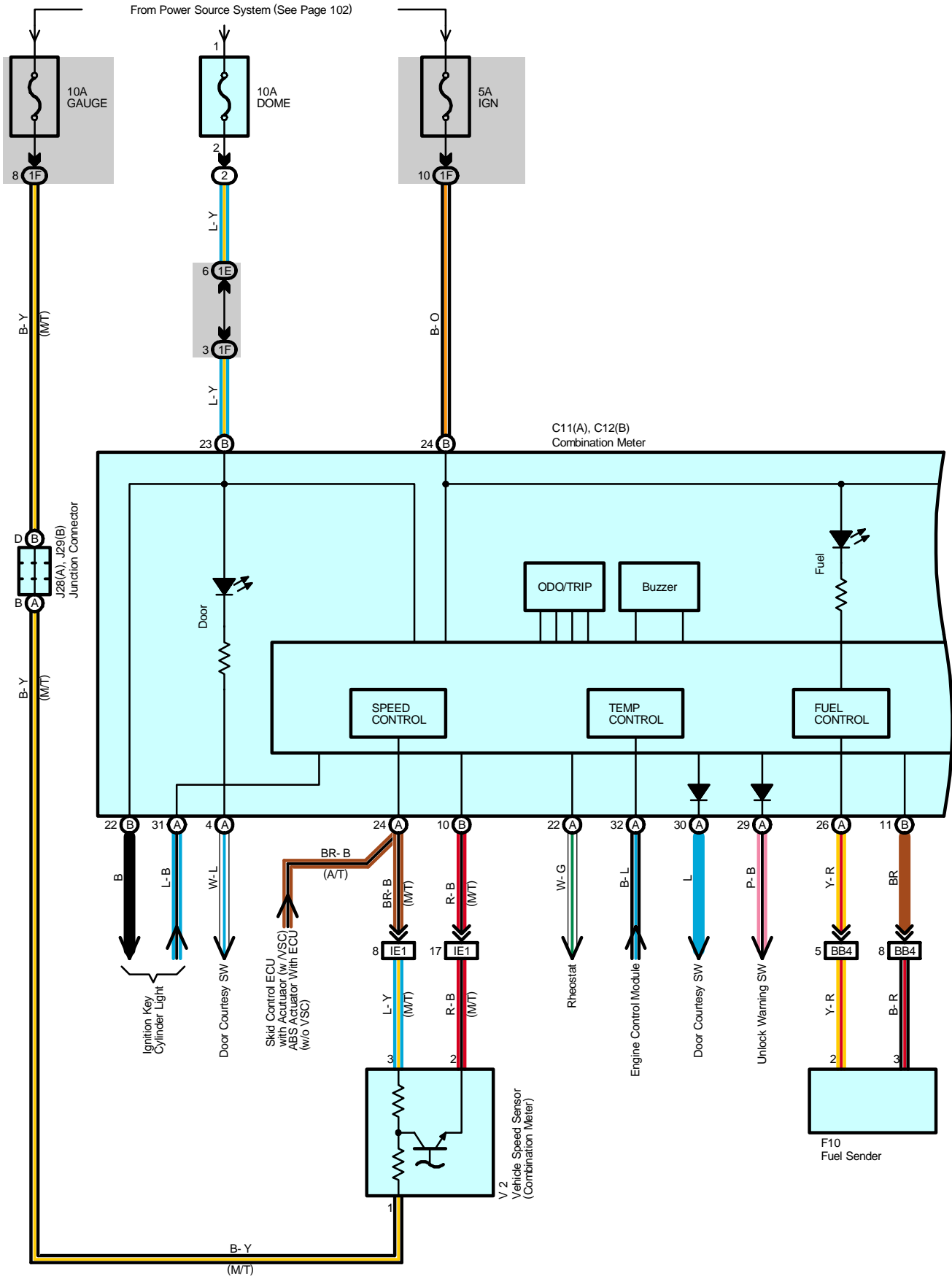
Code	See Page	Ground Points Location
IG	78	Instrument Panel Brace RH

○ : Splice Points

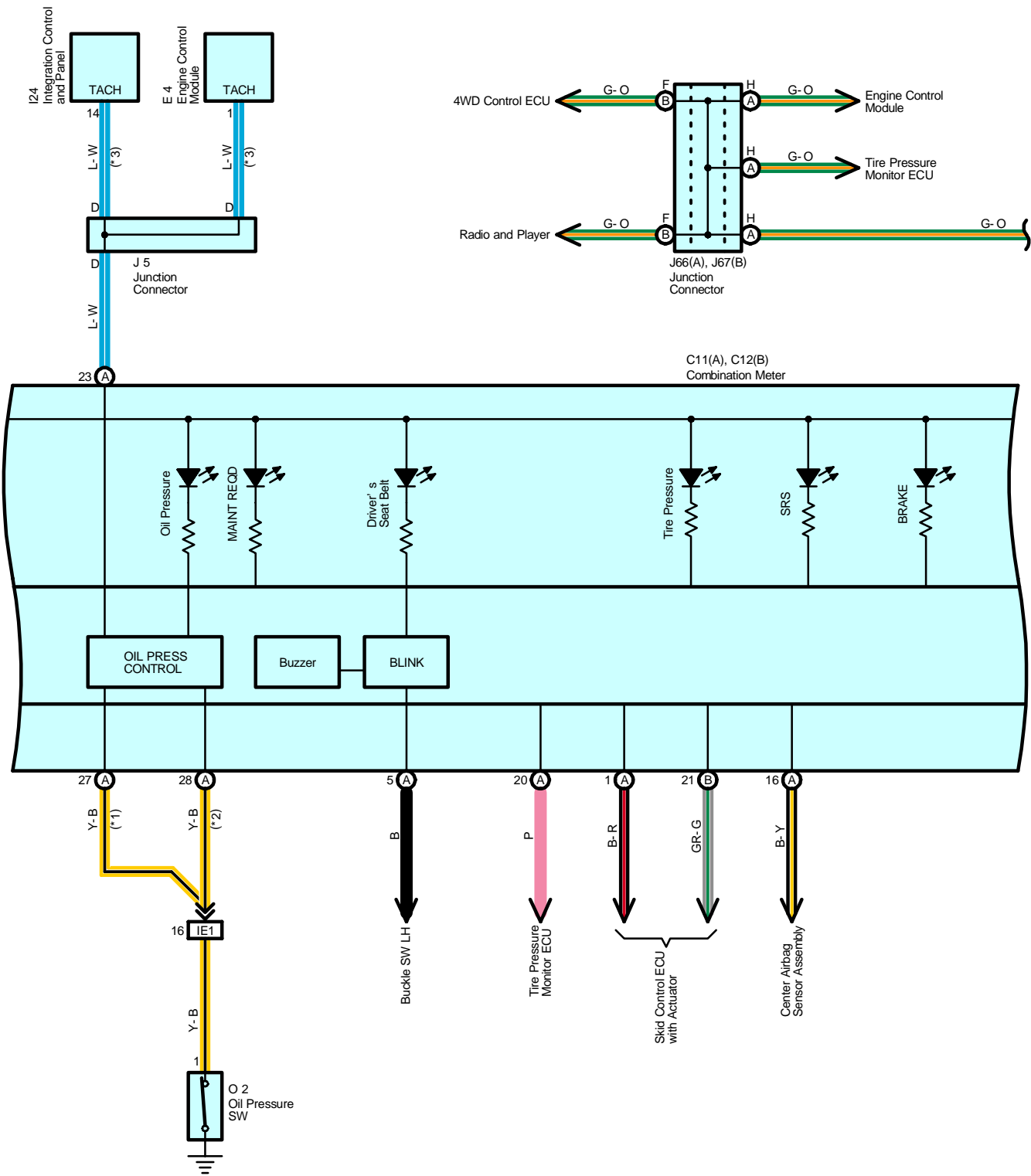
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B1	82 (*3)	Speaker Tweeter Wire LH	B5	82 (*3)	Speaker Tweeter Wire RH
	84 (*4)			84 (*4)	

- * 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
- * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

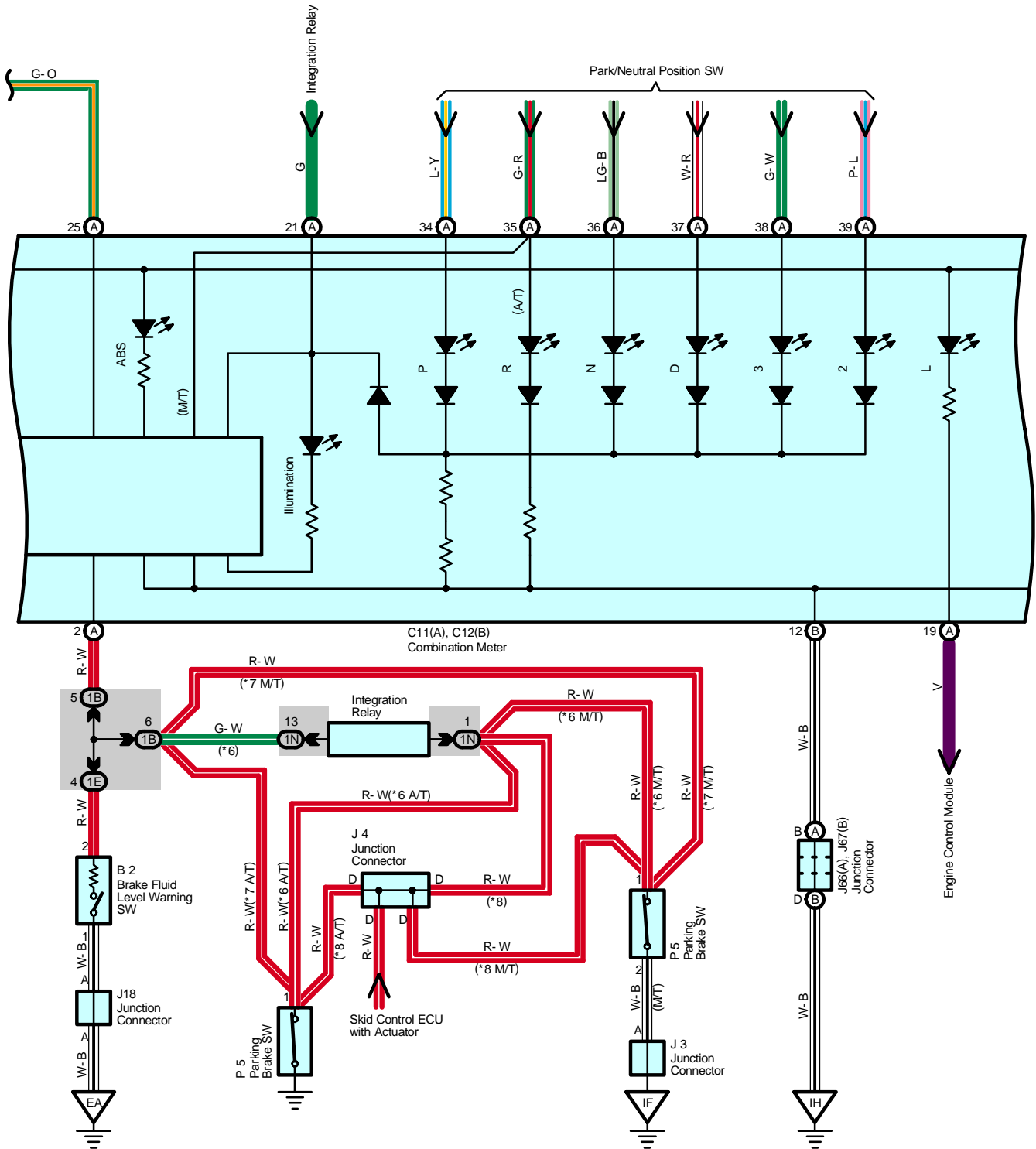
Combination Meter (Access/Standard Cab)



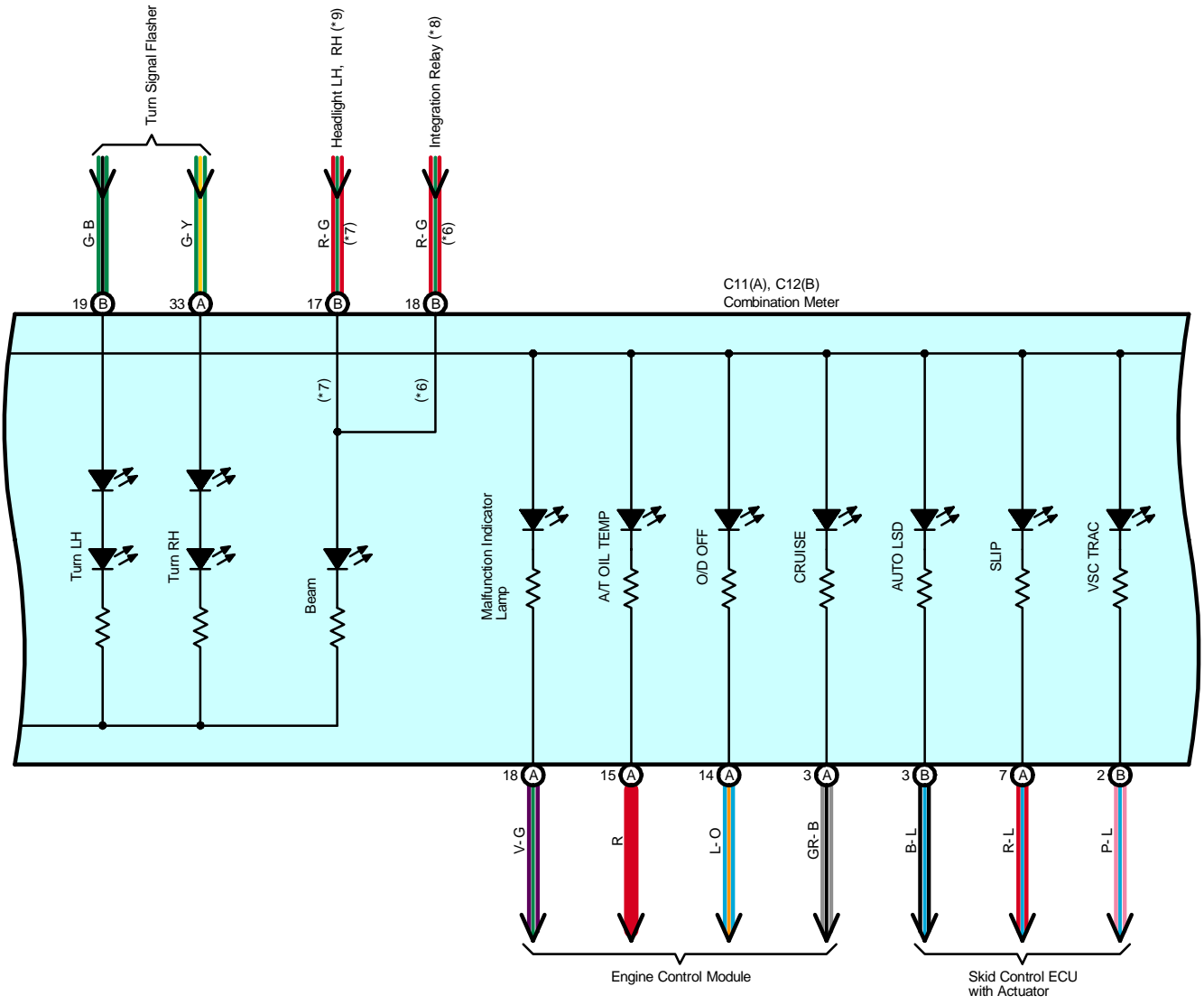
- * 1 : 2UZ- FE
- * 2 : 1GR- FE
- * 3 : w/ Steering SW



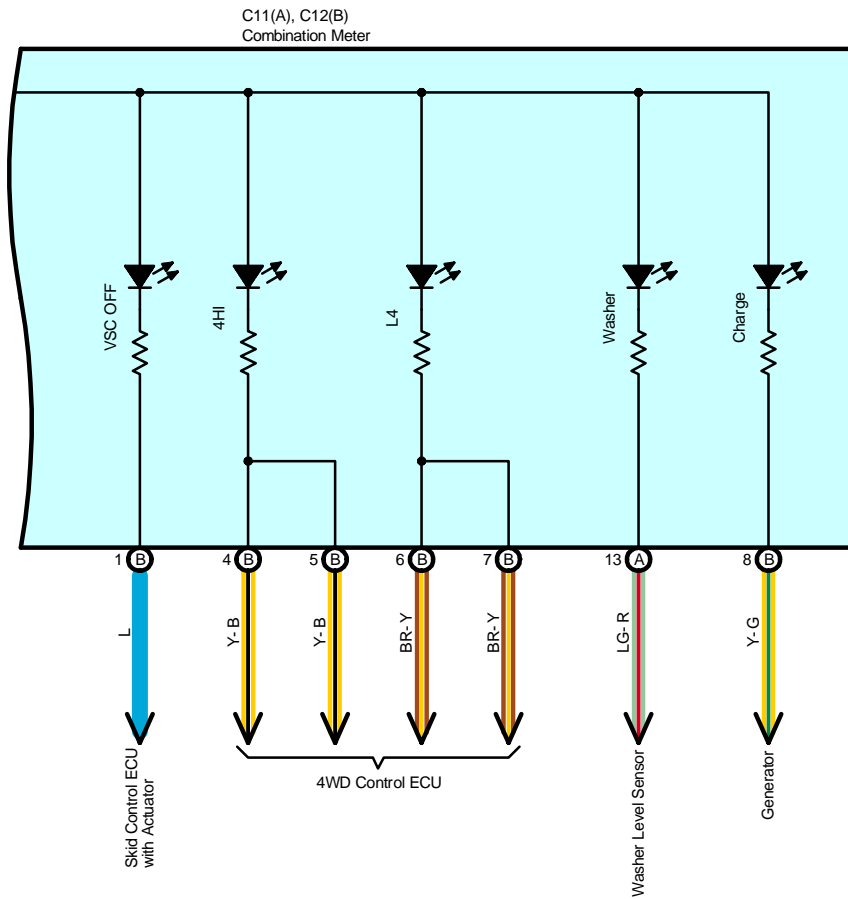
Combination Meter (Access/Standard Cab)



- * 4 : w/ VSC
- * 5 : w/o VSC
- * 6 : w/ Daytime Running Light
- * 7 : w/o Daytime Running Light
- * 8 : w/ Daytime Running Light w/ VSC



Combination Meter (Access/Standard Cab)



Service Hints

B2 Brake Fluid Level Warning SW

1-2 : Closed with float down

P5 Parking Brake SW

1-Ground : Closed with parking brake lever pulled up

C11 (A), C12 (B) Combination Meter

(B)23-Ground : Always approx. 12 volts

(B)24-Ground : Approx. 12 volts with ignition SW at ON or ST position

(B)12-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B2	52 (2UZ-FE)	I24	57	J29	B 58
	54 (1GR-FE)	J3	58	J66	A 58
C11	A 56	J4	58	J67	B 58
C12	B 56	J5	58	O2	53 (2UZ-FE)
E4	57	J18	53 (2UZ-FE)		55 (1GR-FE)
F10	60 (*3)		J28	A 58	P5
	61 (*4)	V2			55 (1GR-FE)

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1N	29 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

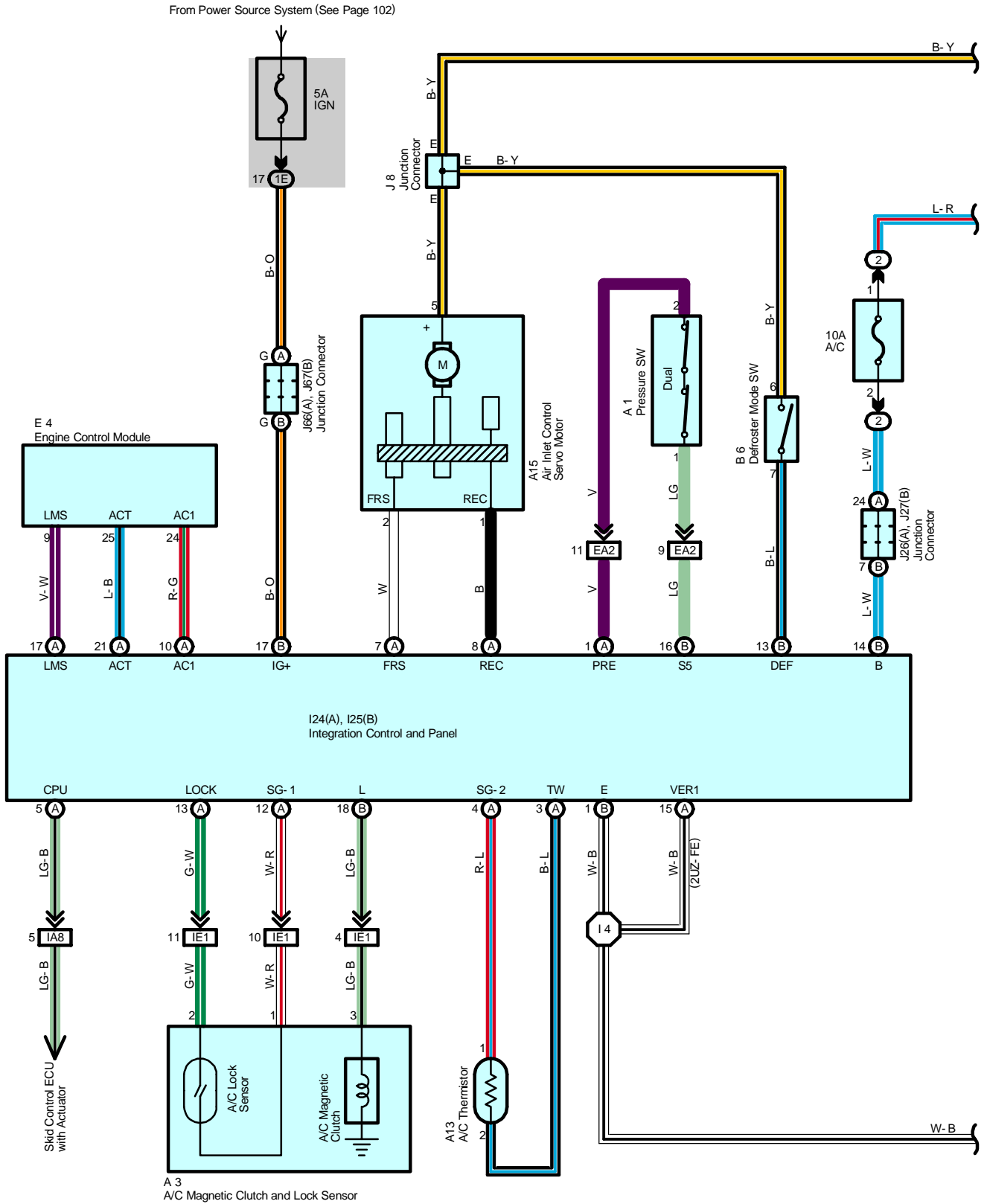
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
BB4	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	

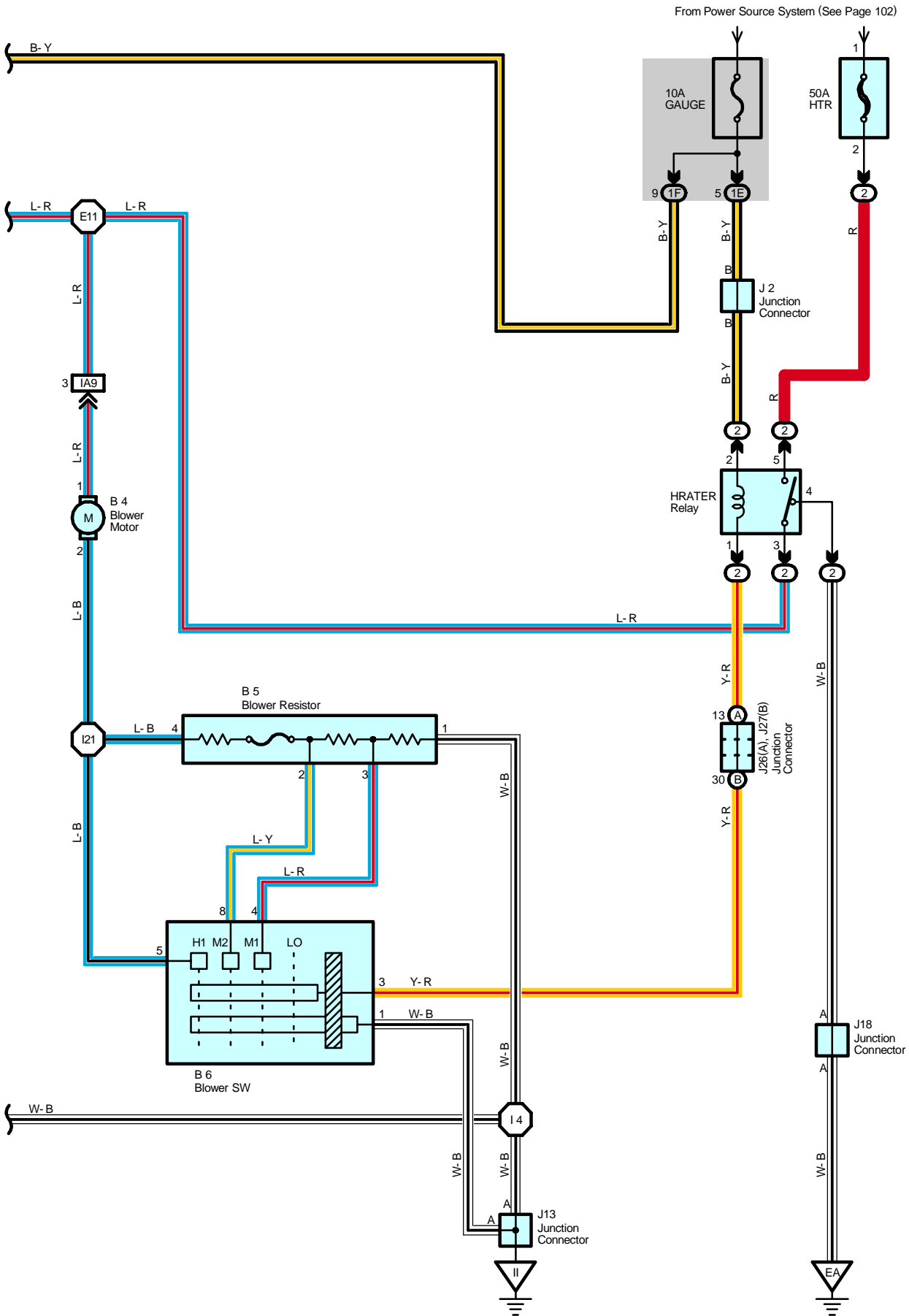
▽ : Ground Points

Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
IF	78	Left Kick Panel
IH	78	Right Kick Panel

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Air Conditioning (Access/Standard Cab)





Air Conditioning (Access/Standard Cab)

System Outline

1. Heater Blower Motor Operation

Current is applied at all times through the HTR fuse to TERMINAL 5 of the HTR relay.

When the ignition SW is turned on, current flows through the GAUGE fuse to TERMINAL 2 of the HTR relay to the coil side to TERMINAL 1 to TERMINAL 3 of the blower SW.

* Low speed operation

When the blower SW is moved to LO position, current flows to TERMINAL 3 of the blower SW to TERMINAL 1 to GROUND, causing the HTR relay to switch on. This causes the current to flow from the HTR fuse to TERMINAL 5 of the HTR relay to TERMINAL 3 to TERMINAL 1 of the blower motor to TERMINAL 2 to TERMINAL 4 of the blower resistor to TERMINAL 1 to GROUND, causing the blower motor to rotate at low speed.

* Medium speed operation (Operation at M1, M2)

When the blower SW is moved to M1 position, current flows to TERMINAL 3 of the blower SW to TERMINAL 1 to GROUND, turning the HTR relay to switch on. This causes the current to flow from the HTR fuse to TERMINAL 5 of the HTR relay to TERMINAL 3 to TERMINAL 1 of the blower motor to TERMINAL 2 to TERMINAL 4 of the blower resistor to TERMINAL 3 to TERMINAL 4 of the blower SW to TERMINAL 1 to GROUND. At this time, the blower resistance of the blower resistor is less than at low speed, so the blower motor rotates at medium low speed.

When the blower SW is moved to M2 position, current flows through the motor flows from TERMINAL 4 of the blower resistor to TERMINAL 2 to TERMINAL 8 of the blower SW to TERMINAL 1 to GROUND. At this time, resistance of the blower resistor is less than at M1 position, so the blower motor rotates at medium high speed.

* High speed operation

When the blower SW is moved to HIGH position, current flows to TERMINAL 3 of the blower SW to TERMINAL 1 to GROUND, turning the HTR relay to switch on.

This causes the current to flow from the HTR fuse to TERMINAL 5 of the HTR relay to TERMINAL 3 to TERMINAL 1 of the blower motor to TERMINAL 2 to TERMINAL 5 of the blower SW to TERMINAL 1 to GROUND, causing the blower motor to rotate at high speed.

2. Operation of Air Inlet Control Servo Motor

* Switching from FRESH to RECIRC

With the ignition SW turned on, current flows from the GAUGE fuse to TERMINAL 5 of the air inlet control servo motor. When the RECIRC/FRESH SW is switched to the RECIRC side, current flows from TERMINAL 5 of the air inlet control servo motor to TERMINAL 1 to TERMINAL (A) 8 of the integration control and panel to TERMINAL (B) 1 to GROUND. The motor rotates and the damper moves to the RECIRC side. When it is in the RECIRC position, current is cut inside the servo motor and the damper stops at that position.

* Switching from RECIRC to FRESH

With the ignition SW turned on, when the RECIRC/FRESH SW is switched to the FRESH side, current flows from TERMINAL 5 of the air inlet control servo motor to TERMINAL 2 to TERMINAL (A) 7 of the integration control and panel to TERMINAL (B) 1 to GROUND, the motor rotates and the damper moves to the FRESH side. when it is in the FRESH position, current is cut inside the servo motor and the damper stops at that position. When the ignition SW turned on, and mode SW (Integration control and panel) is at DEF or F/DEF position, it causes the damper to move to the FRESH side. Whether the RECIRC/FRESH SW (Integration control and panel) is on or not.

3. Air Conditioning Operation

When the blower SW is on, current flows from the GAUGE fuse to the HTR relay (Coil side) to TERMINAL 3 of the blower SW to TERMINAL 1 to GROUND, activating the HTR relay. This causes current to flow from the HTR fuse to the HTR relay (Point side) to A/C fuse to TERMINAL (B) 12 of the A/C SW (Integration control and panel). When the A/C SW (Integration Control and panel) is turned on. Current flows from the A/C fuse to TERMINAL (B) 14 of the integration control and panel to TERMINAL (B) 18 to A/C magnetic clutch. Causing The compressor to operate.

When blower SW is on and mode SW (Integration control and panel) is at DEF or F/DEF position, it causes A/C to run whether A/C SW (Integration control and panel) is on or not.

Service Hints

HEATER Relay

5-3 : Closed with ignition SW on and heater blower SW on

A1 A/C Dual Pressure SW

1-2 : Open with refrigerant pressure at less than approx. 2.0 kgf/cm² (196.1 kpa, 28.4 psi) or more than approx. 32.0 kgf/cm² (3138.1 kpa, 455 psi)

I25 (B) Integration Control and Panel

(B)14-Ground : Approx. 12 volts with ignition SW on and blower SW on

(B) 1-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
A1	52 (2UZ-FE)	B6	56	J18	53 (2UZ-FE)	
	54 (1GR-FE)	E4	57		55 (1GR-FE)	
A3	52 (2UZ-FE)	I24	A	J26	A	58
	54 (1GR-FE)	I25	B	J27	B	58
A13	56	J2		J66	A	58
A15	56			J67	B	58
B4	56	J8	58			
B5	56	J13	58			

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	24 (*2)	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1F	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA2	74 (2UZ-FE)	Cowl Wire and Engine Room Main Wire (Right Fender)
	76 (1GR-FE)	
IA8	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA9		
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)

▽ : Ground Points

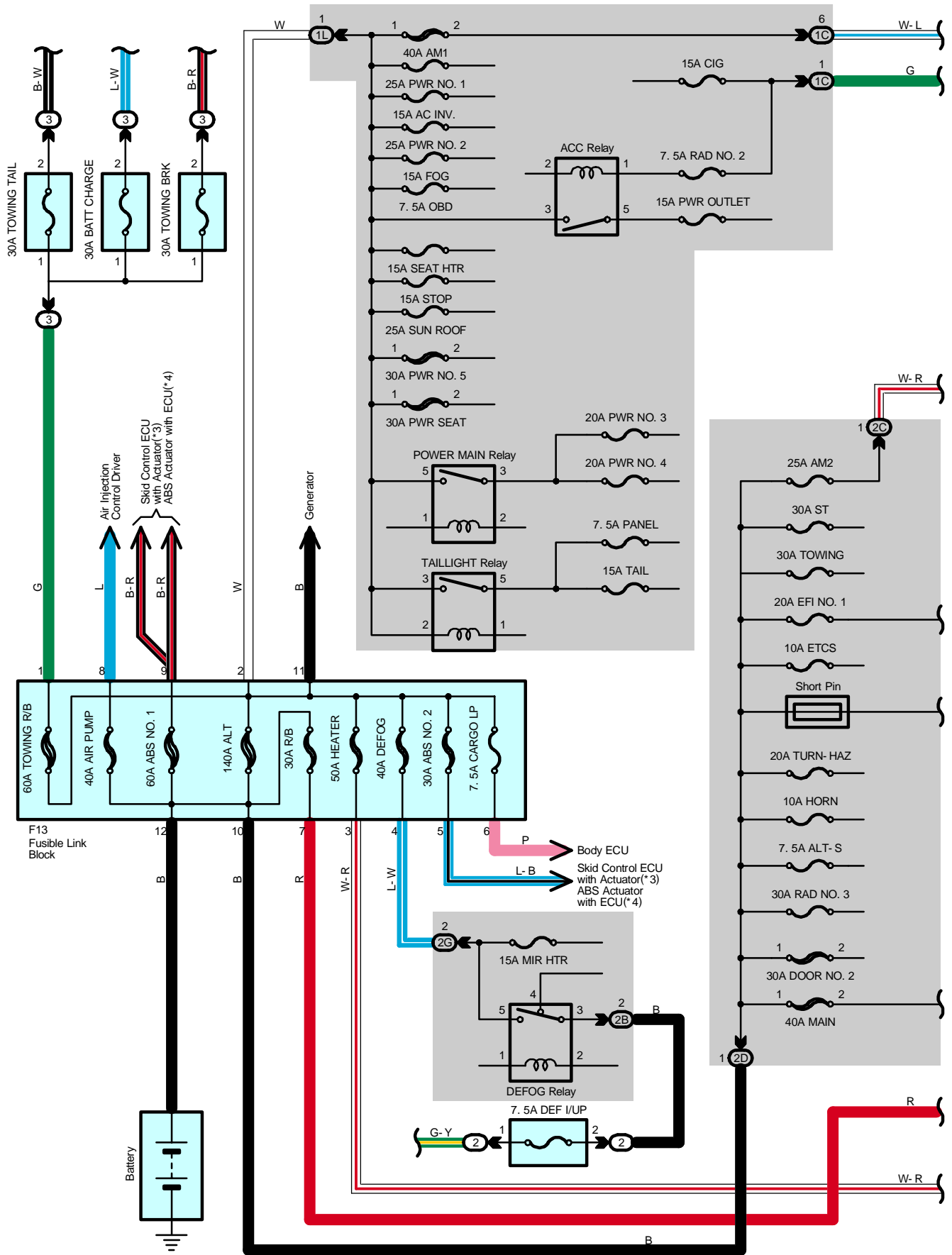
Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
II	78	Right Kick Panel

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E11	74 (2UZ-FE)	Engine Room Main Wire	I4	80	Cowl Wire
	76 (1GR-FE)		I21		

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

Power Source (Double Cab)



Power Source (Double Cab)

Service Hints

HEAD Relay

- 5-3 : Closed with the light control SW at HEAD position or dimmer SW at FLASH position
- : Closed with the engine running and the parking brake pedal released (w/ daytime running light)

I23 Ignition SW

- 1-3 : Closed with the ignition key at ACC or ON position
- 1-2 : Closed with the ignition key at ON or ST position
- 5-6 : Closed with the ignition key at ON or ST position
- 5-4 : Closed with the ignition key at ST position

DIMMER Relay (w/ Daytime Running Light)

- 3-5 : Closed with the HEAD relay on and dimmer SW at HIGH or FLASH position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A22	66	I23	67		
F13	34, 64	J31	65		

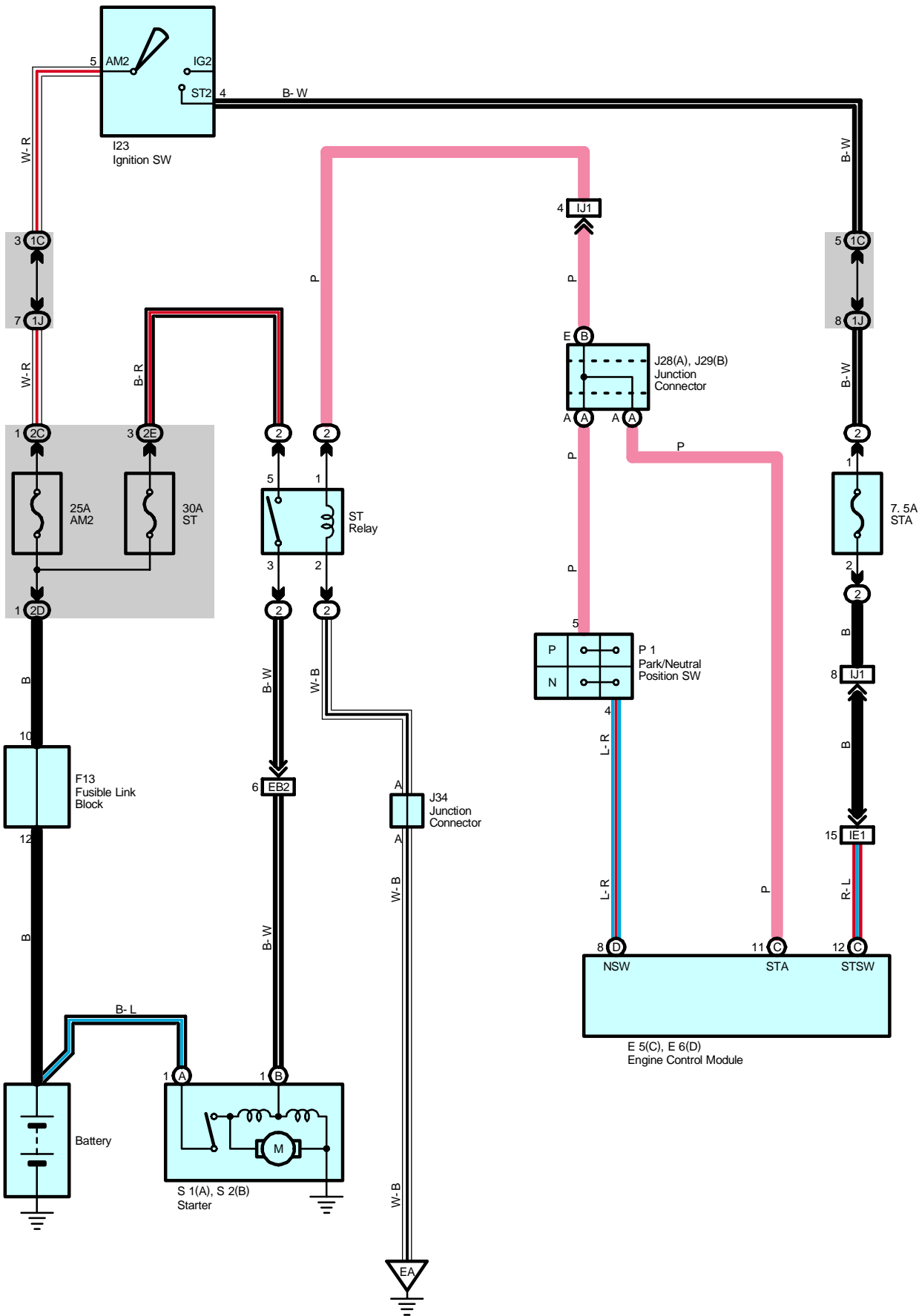
○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)
3	39	Engine Room R/B No.3 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L		
2B	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2C		
2D		
2E		
2G		

Starting (Double Cab)



Service Hints

S1 (A), S2 (B) Starter

Points closed with the Park/Neutral position SW at P or N position and ignition SW at ST position

I23 Ignition SW

5-4 : Closed with the ignition SW at ST position

P1 Park/Neutral Position SW

9-6 : Closed with the A/T shift lever in P or N position

ST Relay

5-3 : Closed with the Park/Neutral position SW at P or N position and ignition SW at ST position

: Parts Location

Code		See Page	Code		See Page	Code		See Page
E5	C	67	J28	A	68	S1	A	65
E6	D	67	J29	B	68	S2	B	65
F13		34, 64	J34		65			
I23		67	P1		65			

: Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2D		
2E		

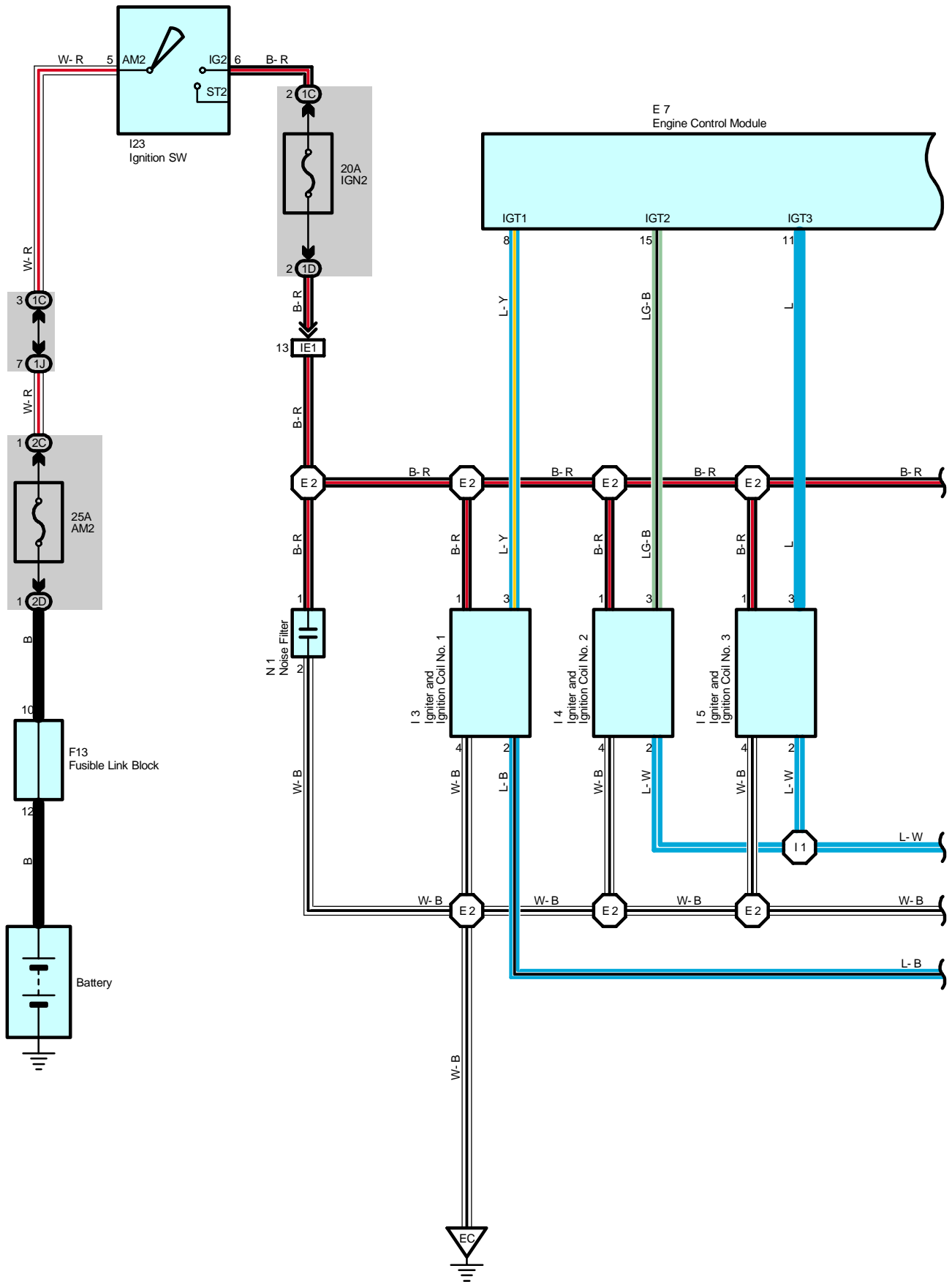
: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB2	90	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)

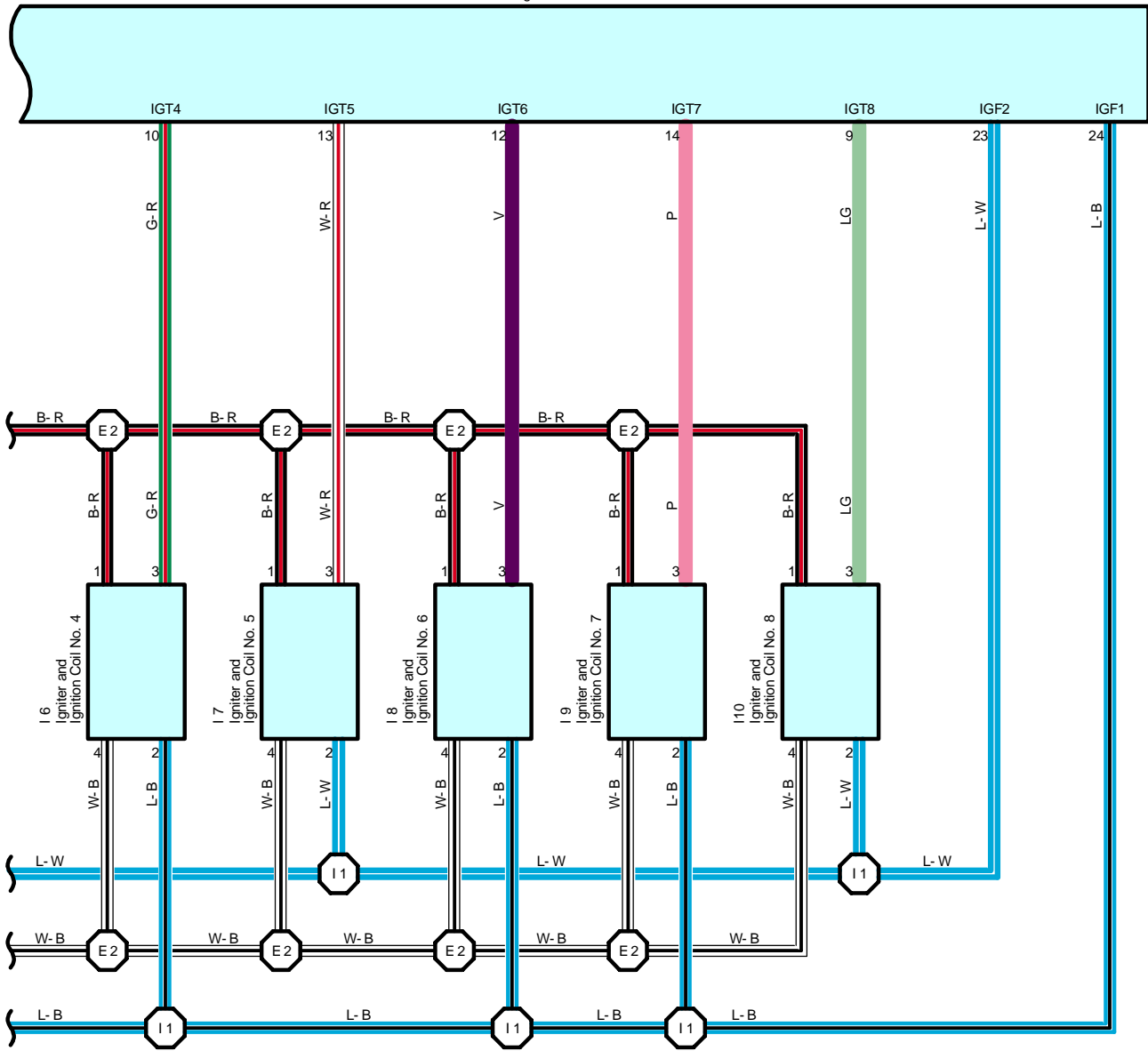
: Ground Points

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron

Ignition (Double Cab)



E 7
Engine Control Module



Ignition (Double Cab)

Service Hints

I23 Ignition SW

5-6 : Closed with the ignition SW at ON position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
E7	67	I5	65	I9	65
F13	34, 64	I6	65	I10	65
I3	65	I7	65	I23	67
I4	65	I8	65	N1	65

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1C	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1D		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2D		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)

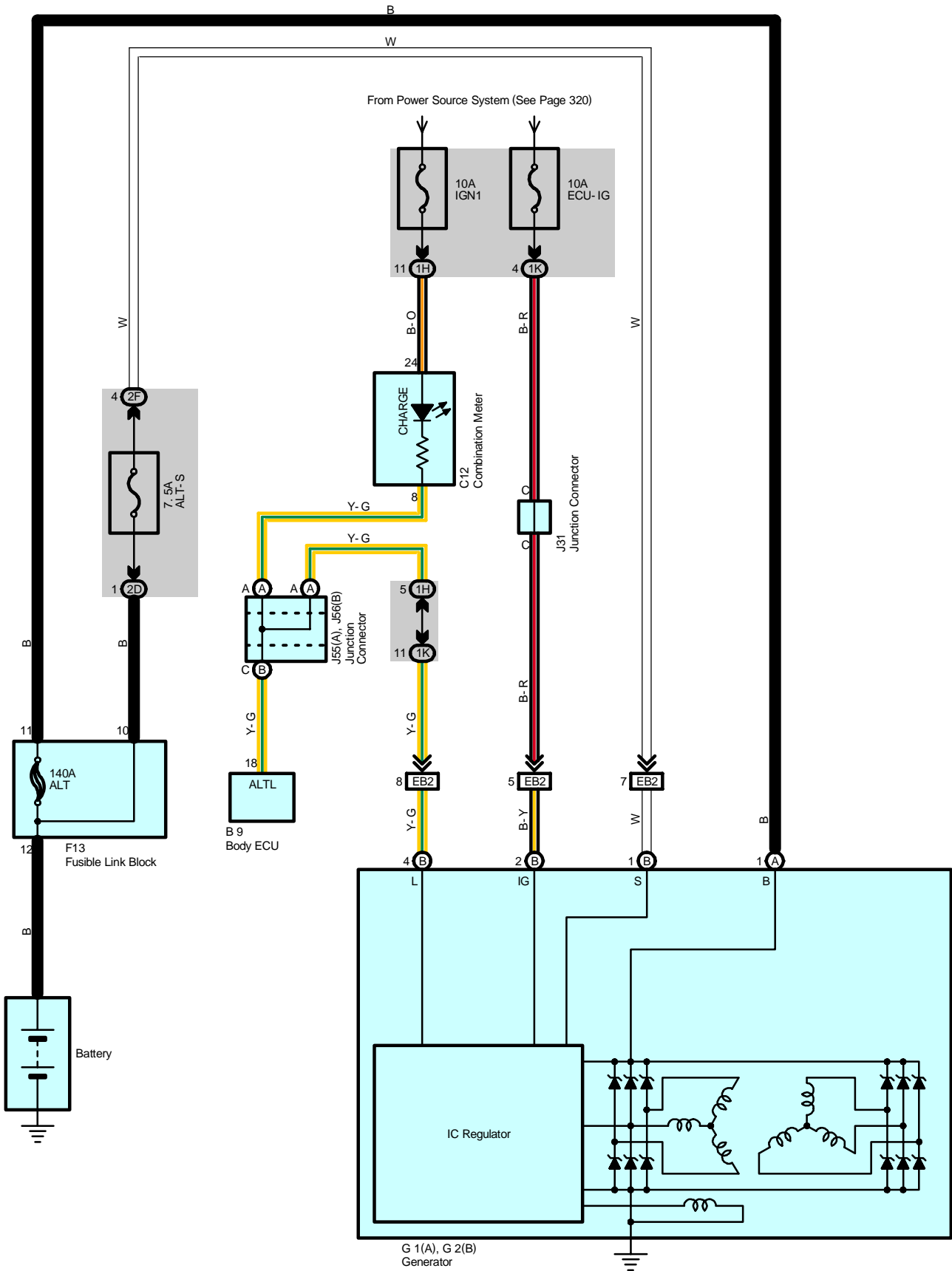
▽ : Ground Points

Code	See Page	Ground Points Location
EC	90	Rear Bank of Left Cylinder Head

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E2	90	Engine Wire	I1	94	Engine Wire

Charging (Double Cab)



Service Hints**G2 (B) Generator**

- (B) 1-Ground : 13.9-15.1 volts with the engine running at 2000 rpm and 25°C (77°F)
 13.5-14.3 volts with the engine running at 2000 rpm and 115°C (239°F)
- (B) 4-Ground : 0-4 volts with the ignition SW at ON position and engine not running

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B9	66	G1	A 64	J55	A 68
C12	66	G2	B 64	J56	B 68
F13	34, 64	J31	65		

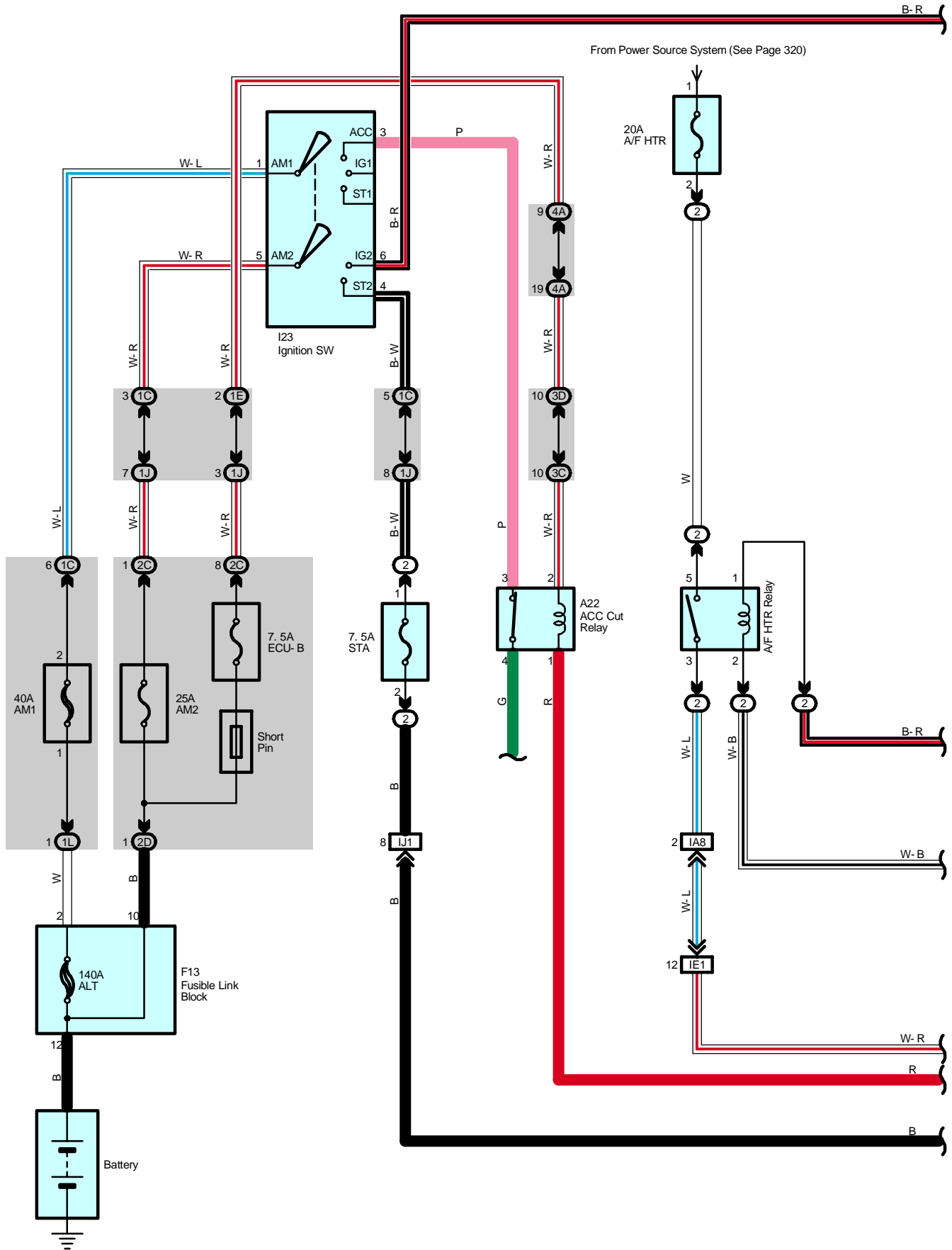
○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1H	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1K	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2D	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2F		

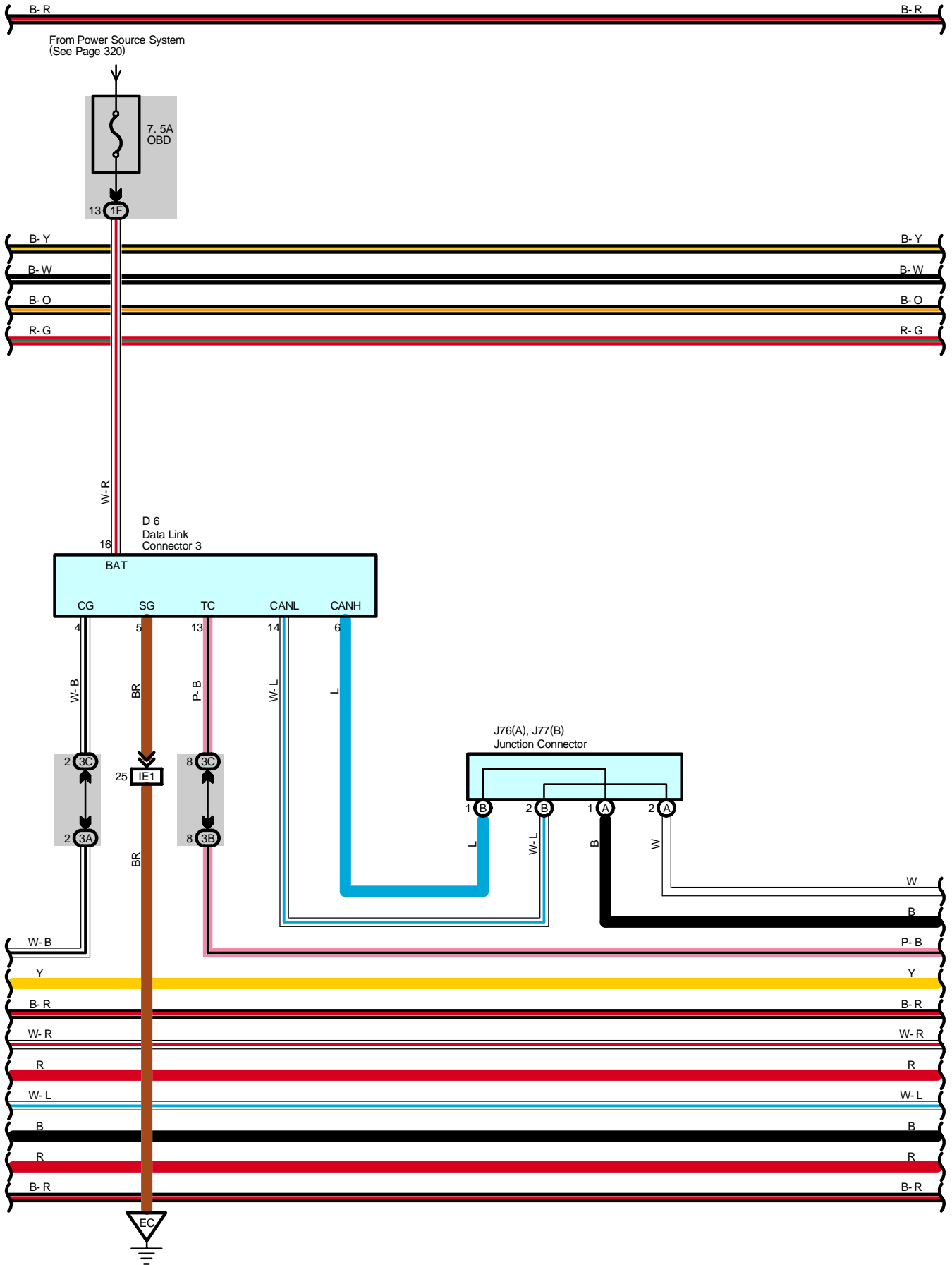
□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB2	90	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)

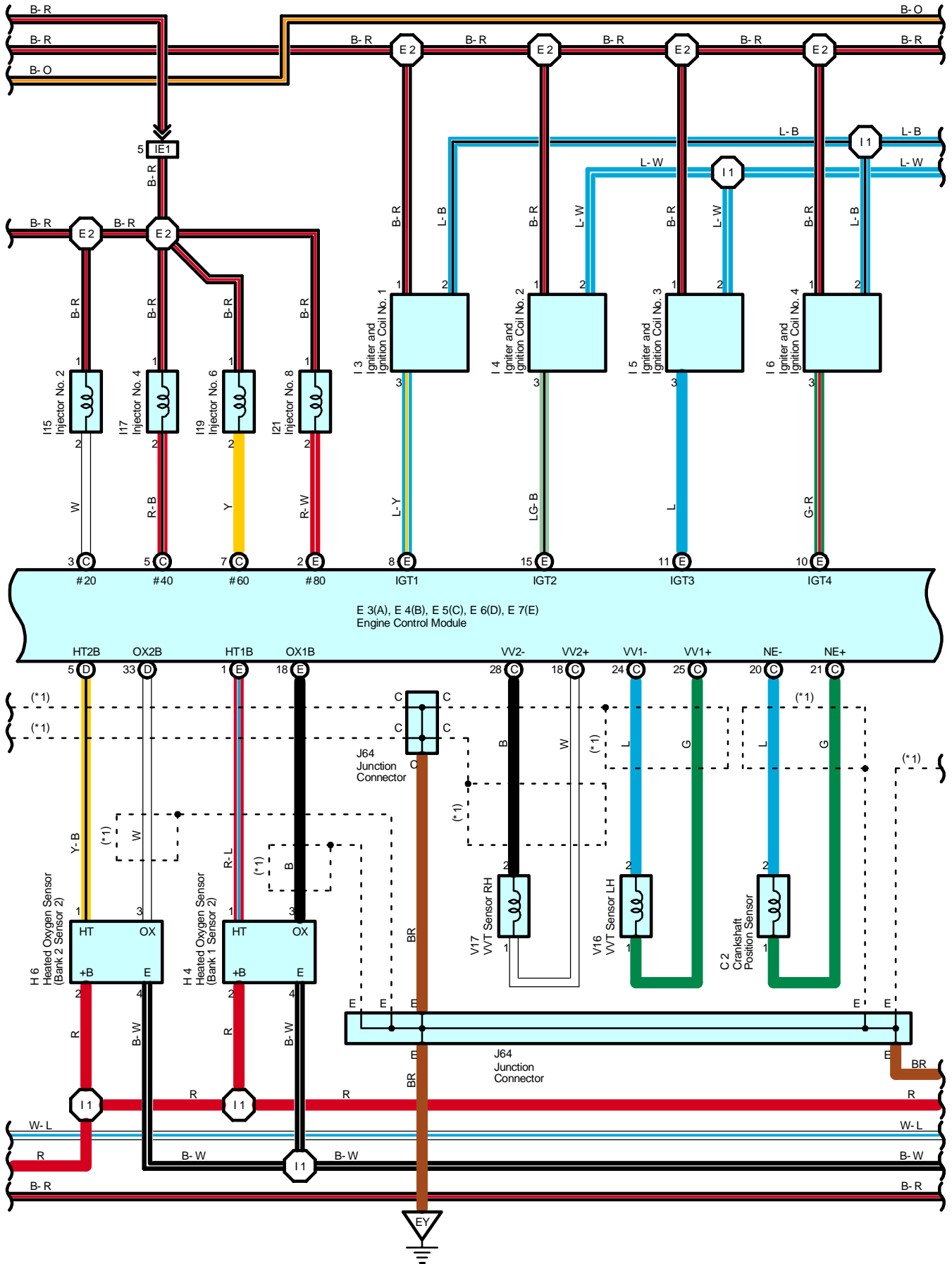
Engine Control (Double Cab)



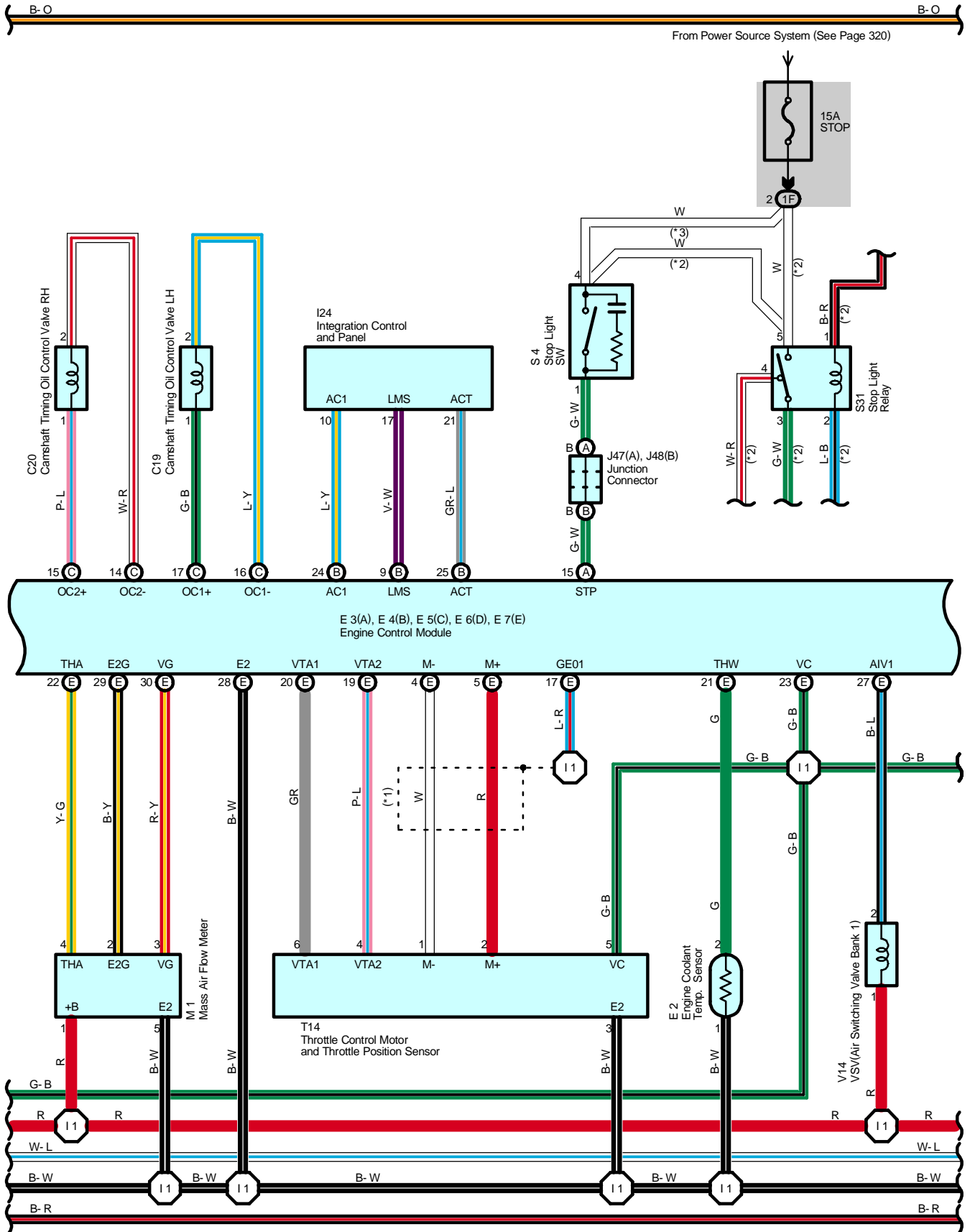
Engine Control (Double Cab)



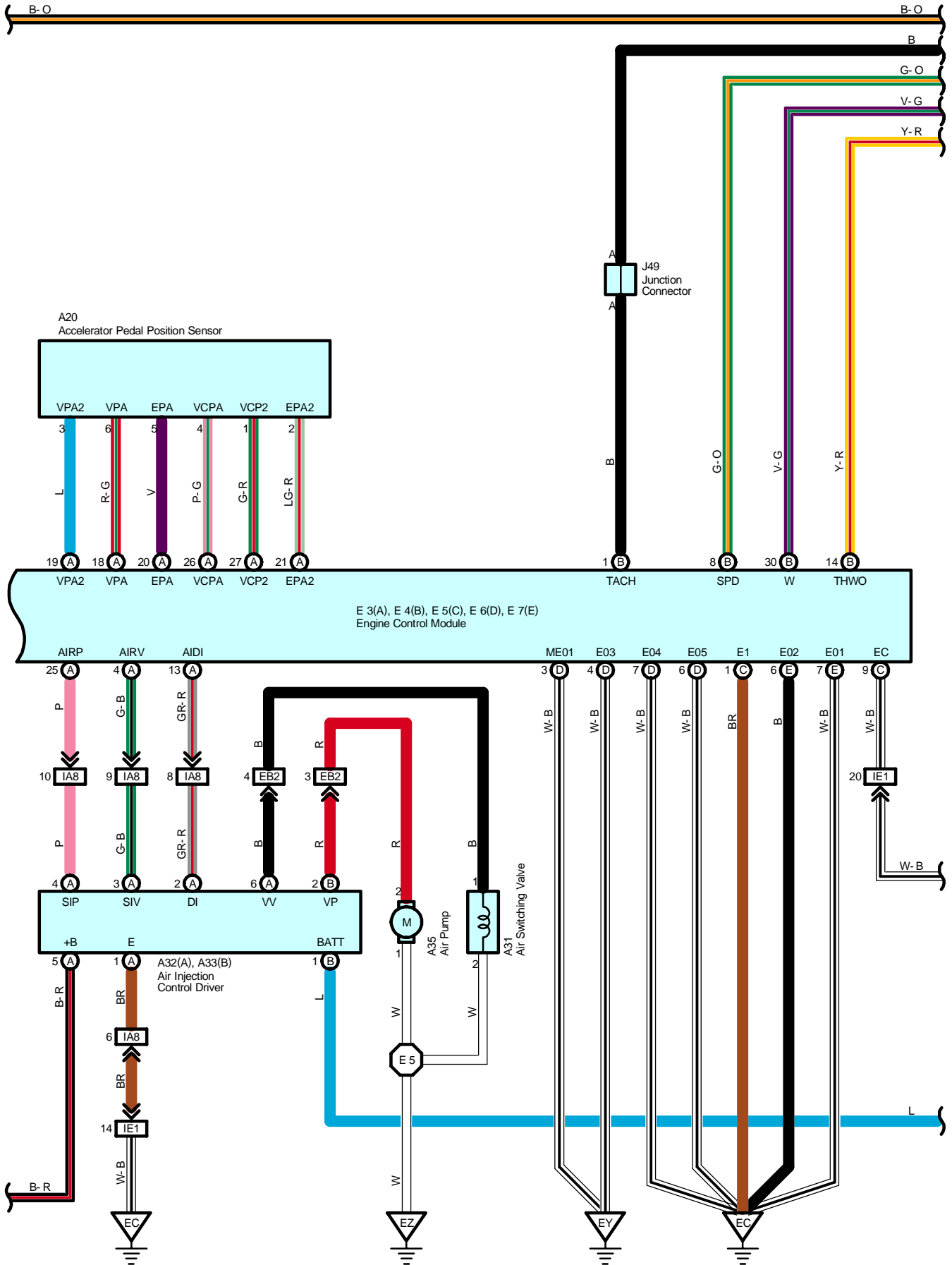
Engine Control (Double Cab)

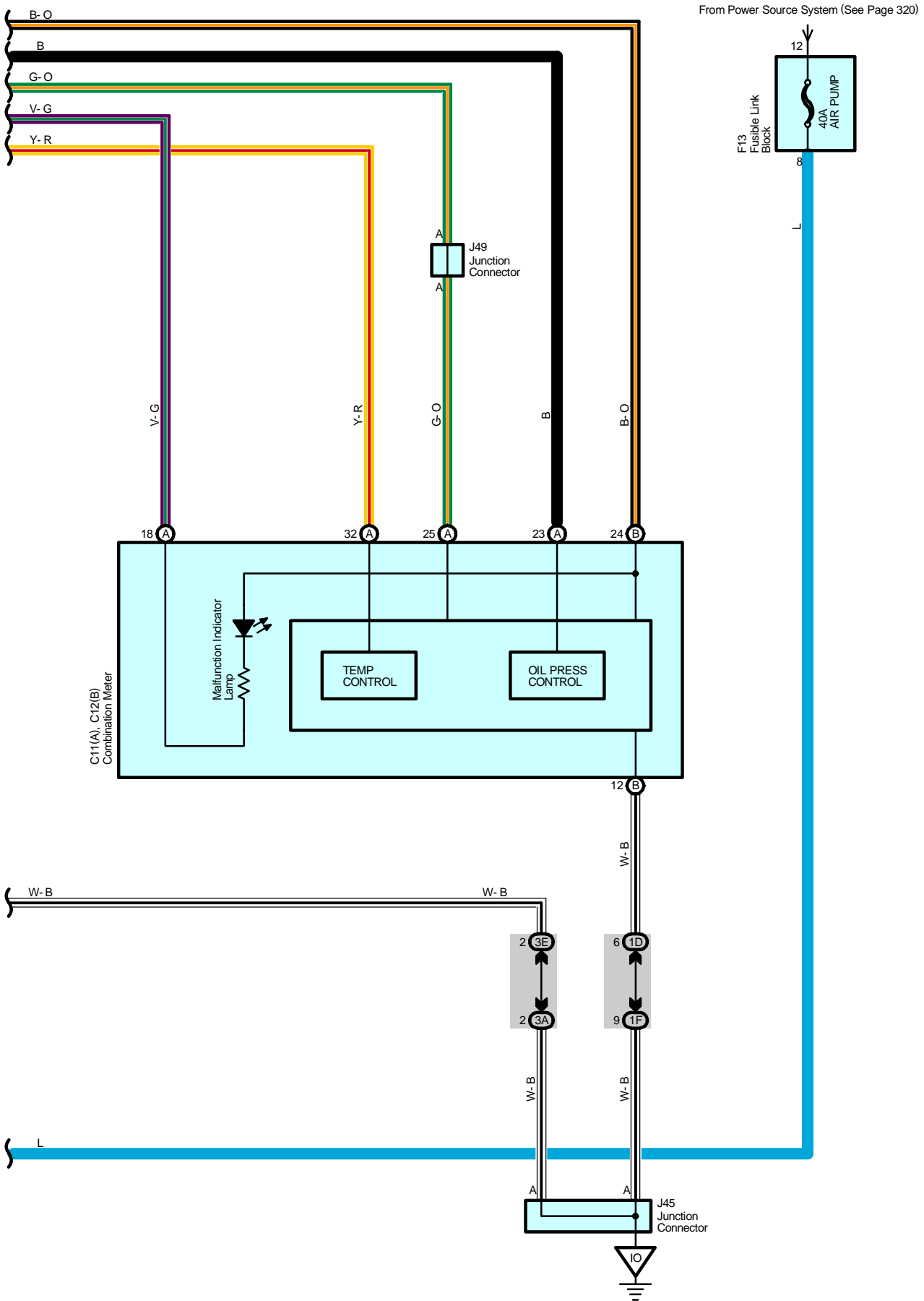


Engine Control (Double Cab)



Engine Control (Double Cab)





Engine Control (Double Cab)

System Outline

The engine control system utilizes a microcomputer and maintains overall control of the engine, transmission etc. An outline of the engine control is given here.

1. Input Signals

(1) Engine coolant temp. signal circuit

The engine coolant temp. sensor detects the engine coolant temp. and has a built-in thermistor with a resistance which varies according to the engine coolant temp. The engine coolant temp. is input into TERMINAL THW of the engine control module as a control signal.

(2) Intake air temp. signal circuit

The intake air temp. sensor is installed in the mass air flow meter and detects the intake air temp., which is input as a control signal to TERMINAL THA of the engine control module.

(3) Oxygen sensor signal circuit

The oxygen density in the exhaust emission is detected and is input as a control signal from the heated oxygen sensors to TERMINALS OX1B, OX2B of the engine control module.

(4) RPM signal circuit

The camshaft position is detected by the camshaft position sensor and is input into TERMINAL G2+ of the engine control module as a control signal. Also, the engine RPM is detected by the crankshaft position sensor and the signal is input into TERMINAL NE+ of the engine control module.

(5) Throttle position sensor signal circuit

The throttle position sensor detects the throttle valve opening angle as a control signal, which is input into TERMINALS VTA1, VTA2 of the engine control module.

(6) Vehicle speed circuit

The vehicle speed sensor, detects the vehicle speed and input to the speed sensor of the skid control ECU with actuator, from skid control ECU to TERMINAL SPD of the engine control module, via combination meter.

(7) Battery signal circuit

Voltage is constantly applied to TERMINAL BATT of the engine control module. When the ignition SW is turned on, the voltage for engine control module start up power supply is applied through the EFI relay, to TERMINALS +B, +B2 of the engine control module. The current from the IGN fuse flows to TERMINAL IGSW of the engine control module, and voltage is constantly applied to TERMINAL +BM.

(8) Intake air volume signal circuit

The intake air volume is detected by the mass air flow meter, and is input as a control signal to TERMINAL VG of the engine control module.

(9) Stop light SW signal circuit

The stop light SW is used to detect whether the vehicle is braking or not, and the signal is input into TERMINAL STP of the engine control module as a control signal.

(10) Starter signal circuit

To confirm whether the engine is cranking, the voltage applied to the starter motor when the engine is cranking is detected, and is input into TERMINAL STA of the engine control module as a control signal.

(11) Engine knock signal circuit

Engine knocking is detected by the knock sensors, and is input into TERMINALS KNK1, KNK2 of the engine control module as a control signal.

2. Control System

*** SFI system**

The SFI system monitors the engine condition through the signals input from each sensors to the engine control module. The control signal is sent to the engine control module TERMINALS #10, #20, #30, #40, #50, #60, #70, #80 to operate the injector (Fuel injection). The SFI system controls the fuel injection by the engine control module in response to the driving conditions.

*** ESA system**

The ESA system monitors the engine condition through the signals input from each sensors to the engine control module. The best ignition timing is decided according to this data and the data memorized in the engine control module. The control signal is output to TERMINALS IGT1, IGT2, IGT3, IGT4, IGT5, IGT6, IGT7, IGT8, and these signals control the igniter to provide the best ignition timing.

*** Heated oxygen sensor heater control system**

The heated oxygen sensor heater control system turns the heater on when the intake air volume is low (Temp. of exhaust emission is low), and warms up the heated oxygen sensors to improve their detection performance. The engine control module evaluates the signals from each sensors, and outputs current to TERMINALS HT1B and HT2B to control the heater.

*** Air fuel ratio sensor heater control system**

The air fuel ratio sensor heater control system turns the heater on when the intake air volume is low (Temp. of exhaust emission is low) and warms up the air fuel ratio sensor to improve detection performance of the sensor.

The engine control module evaluates the signals from each sensor, current is output to TERMINALS A1A+ and A2A+ controlling the heater.

*** Fuel pump control system**

The engine control module supplies current to TERMINAL FPR, and controls the operation speed of the fuel pump with the F/PMP relay.

*** ETCS-i**

The ETCS-i controls the engine output at its optimal level in accordance with the opening of the accelerator pedal, under all driving conditions.

3. Diagnosis System

When there is a malfunction in the engine control module signal system, the malfunctioning system is recorded in the memory. The malfunctioning system can be found by reading the code displayed on the malfunction indicator lamp.

4. Fail-Safe System

When a malfunction has occurred in any system, there is a possibility of causing engine trouble due to continued control based on that system. In that case, the fail-safe system either controls the system using the data (Standard values) recorded in the engine control module memory, or else stops the engine.

Engine Control (Double Cab)

Service Hints

EFI Relay

5-3 : Closed with ignition SW at ON or ST position

C/OPN Relay

5-3 : Closed with starter cranking or engine cranking

E2 Engine Coolant Temp. Sensor

1-2 : Approx. 16.2 kΩ (-20°C, -4°F)

: Approx. 2.45 kΩ (20°C, 68°F)

: Approx. 0.32 kΩ (80°C, 176°F)

E3 (A), E4 (B), E5 (C), E6 (D), E7 (E) Engine Control Module

BATT-E1 : Always 9.0-14.0 volts

+BM-E1 : Always 9.0-14.0 volts

IGSW-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

+B, +B2-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

VC-E1 : 4.5-5.5 volts with ignition SW at ON or ST position

VTA2-E1 : 2.0-2.9 volts with ignition SW on and throttle valve fully closed

: 4.7-5.1 volts with ignition SW on and throttle valve fully open

VTA1-E1 : 0.4-1.0 volts with ignition SW on and throttle valve fully closed

: 3.2-4.8 volts with ignition SW on and throttle valve fully open

VPA-E1 : 0.3-0.9 volts with ignition SW on and throttle valve fully closed

: 3.2-4.8 volts with ignition SW on and throttle valve fully open

VPA2-E1 : 1.8-2.7 volts with ignition SW on and throttle valve fully closed

: 4.7-5.1 volts with ignition SW on and throttle valve fully open

THA-E1 : 0.5-3.4 volts with idling, intake air temp. 0°C (32°F) -80°C (176°F)

THW-E1 : 0.2-1.0 volts with idling, engine coolant temp. 60°C (140°F) -120°C (248°F)

STA-E1 : 6.0 volts or more with engine cranking

W-E1 : 9.0-14.0 volts with idling and malfunction indicator lamp off

SPD-E1 : Pulse generation with vehicle moving

STP-E1 : 7.5-14.0 volts with brake pedal depressed

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A10	64	F5	64	J34	65
A20	66	F10	70	J45	68
A22	66	F13	34, 64	J47	A 68
A30	64	H4	64	J48	B 68
A31	64	H6	64	J49	68
A32	A 64	I3	65	J64	68
A33	B 64	I4	65	J75	68
A34	64	I5	65	J76	A 68
A35	64	I6	65	J77	B 68
C1	64	I7	65	K1	65
C2	64	I8	65	K2	65
C5	66	I9	65	L4	70
C11	A 66	I10	65	M1	65
C12	B 66	I14	65	S4	69
C19	64	I15	65	S31	69
C20	64	I16	65	T14	65
D6	67	I17	65	V4	65
E2	64	I18	65	V13	65
E3	A 67	I19	65	V14	65
E4	B 67	I20	65	V15	65
E5	C 67	I21	65	V16	65
E6	D 67	I23	67	V17	65
E7	E 67	I24	67		

 : **Relay Blocks**

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1C		
1D		
1E		
1F		
1G		
1H		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L		
2A	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2B		
2C		
2D		
2F		
2H		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		
3C		
3D		
3E		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB2	90	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
EC3	90	Engine No.2 Wire and Engine Wire (Near the Starter)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA8		
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
IL3	94	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
BP1	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)
BP2		

 : **Ground Points**

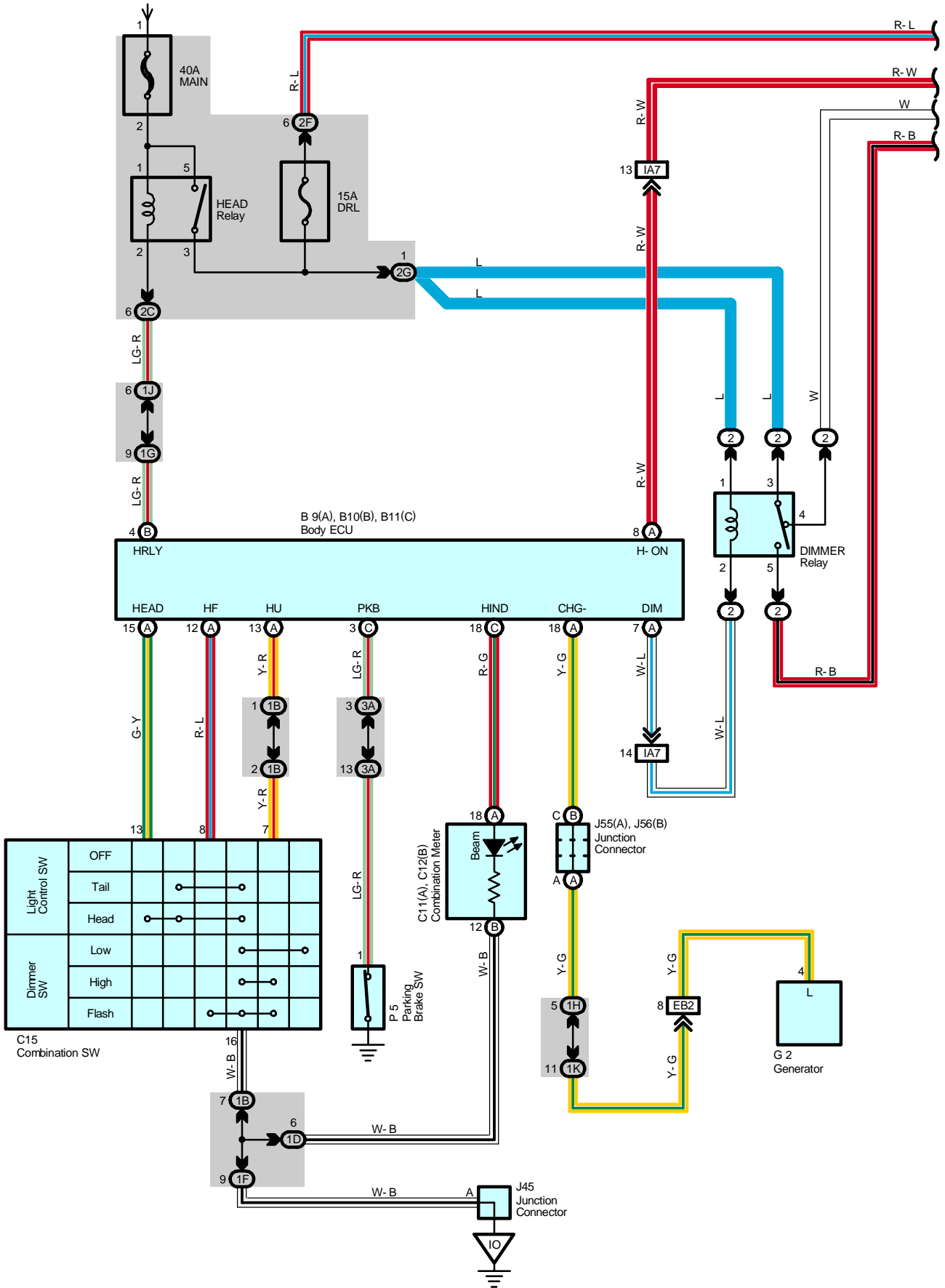
Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
EC	90	Rear Bank of Left Cylinder Head
EY	90	Front Left Side of Cylinder Head
EZ	90	Left Side of Cylinder Block
IO	92	Left Kick Panel
BQ	96	Left Side of Center Pillar

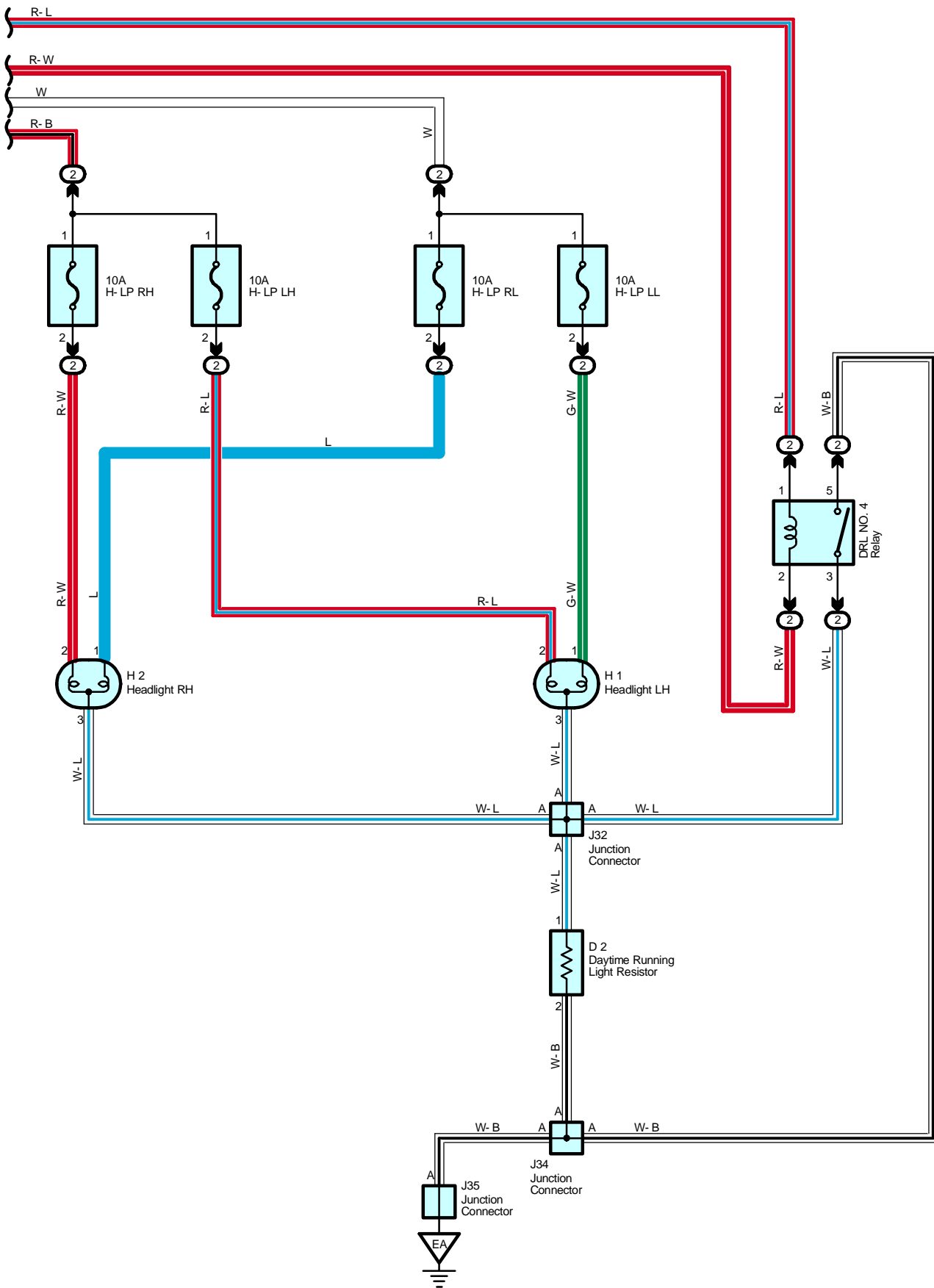
 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E2	90	Engine Wire	I1	94	Engine Wire
E5	90	Engine No.2 Wire			

Headlight with DRL (Double Cab)

From Power Source System (See Page 320)





Headlight with DRL (Double Cab)

System Outline

Daytime Running Light Operation

When the engine is started, the generator signal is input of the body ECU. At this time, if the parking brake pedal is depressed (Parking brake SW ON), the body ECU is not activated, and the daytime running light system does not operate. When the parking brake pedal is released (Parking brake SW OFF), a signal is input into TERMINAL (C) 3 of the body ECU. This activates the body ECU and the headlight turns on.

Service Hints

HEAD Relay

5-3 : Closed with the light control SW at HEAD position or dimmer SW at FLASH position
 Closed with the engine running and parking brake pedal released

DIMMER Relay

5-3 : Closed with the HEAD relay on and dimmer SW at HIGH or FLASH position

C15 Combination SW

13-16 : Closed with the light control SW at HEAD position
 8-16 : Closed with the dimmer SW at FLASH position
 7-16 : Closed with the dimmer SW at HIGH or FLASH position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B9	A 66	D2	64	J35	65
B10	B 66	G2	64	J45	68
B11	C 66	H1	64	J55	A 68
C11	A 66	H2	64	J56	B 68
C12	B 66	J32	65	P5	69
C15	66	J34	65		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1D		
1F		
1G		
1H		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1K		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2F		
2G		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)

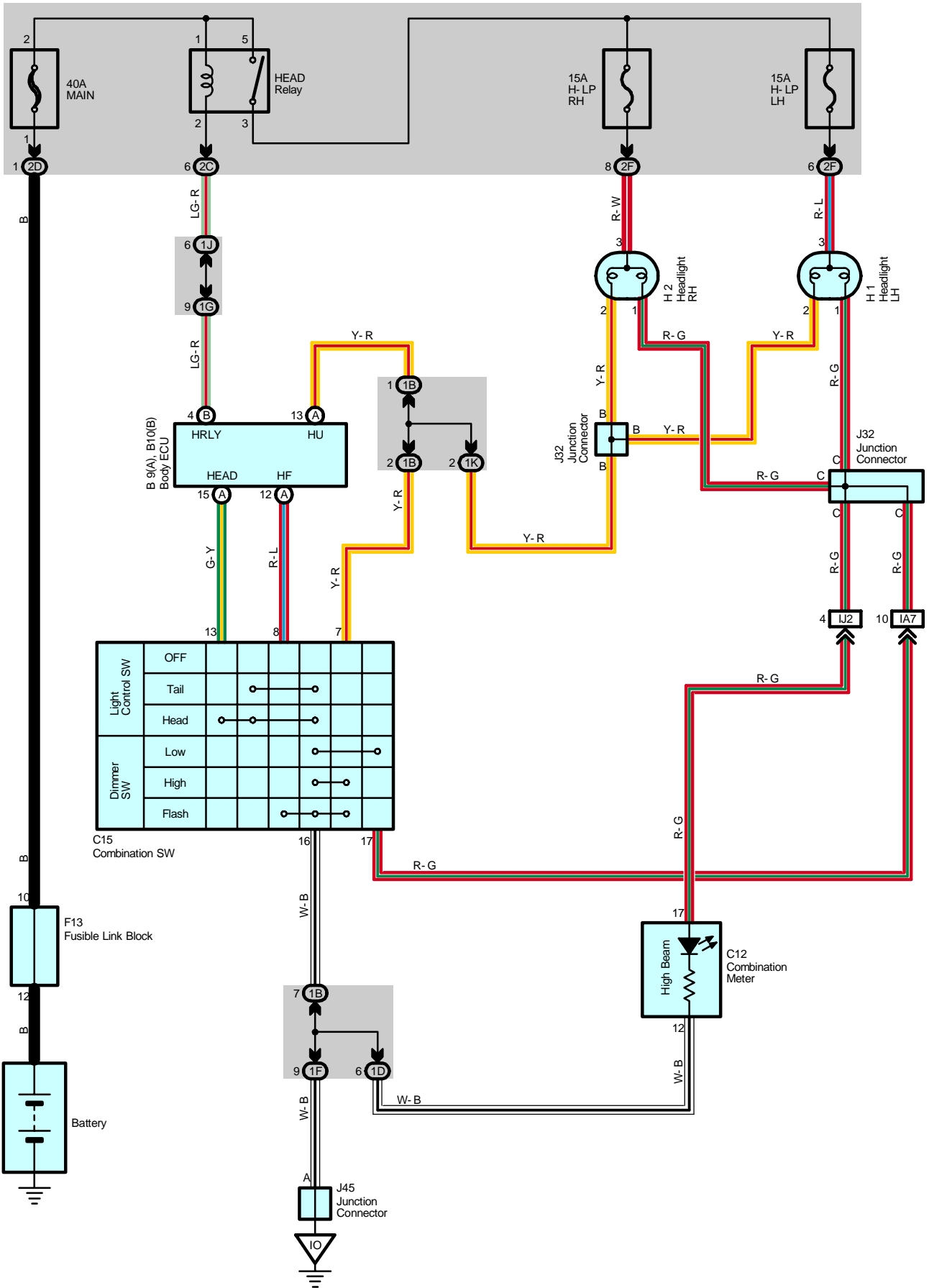
□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB2	90	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
IA7	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)

▽ : Ground Points

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
IO	92	Left Kick Panel

Headlight without DRL (Double Cab)



Service Hints**HEAD Relay**

5-3 : Closed with the light control SW at HEAD position or dimmer SW at FLASH position

 : **Parts Location**

Code		See Page	Code	See Page	Code	See Page
B9	A	66	C15	66	H2	64
B10	B	66	F13	34, 64	J32	65
C12		66	H1	64	J45	68

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1D		
1F		
1G		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1K		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2D		
2F		

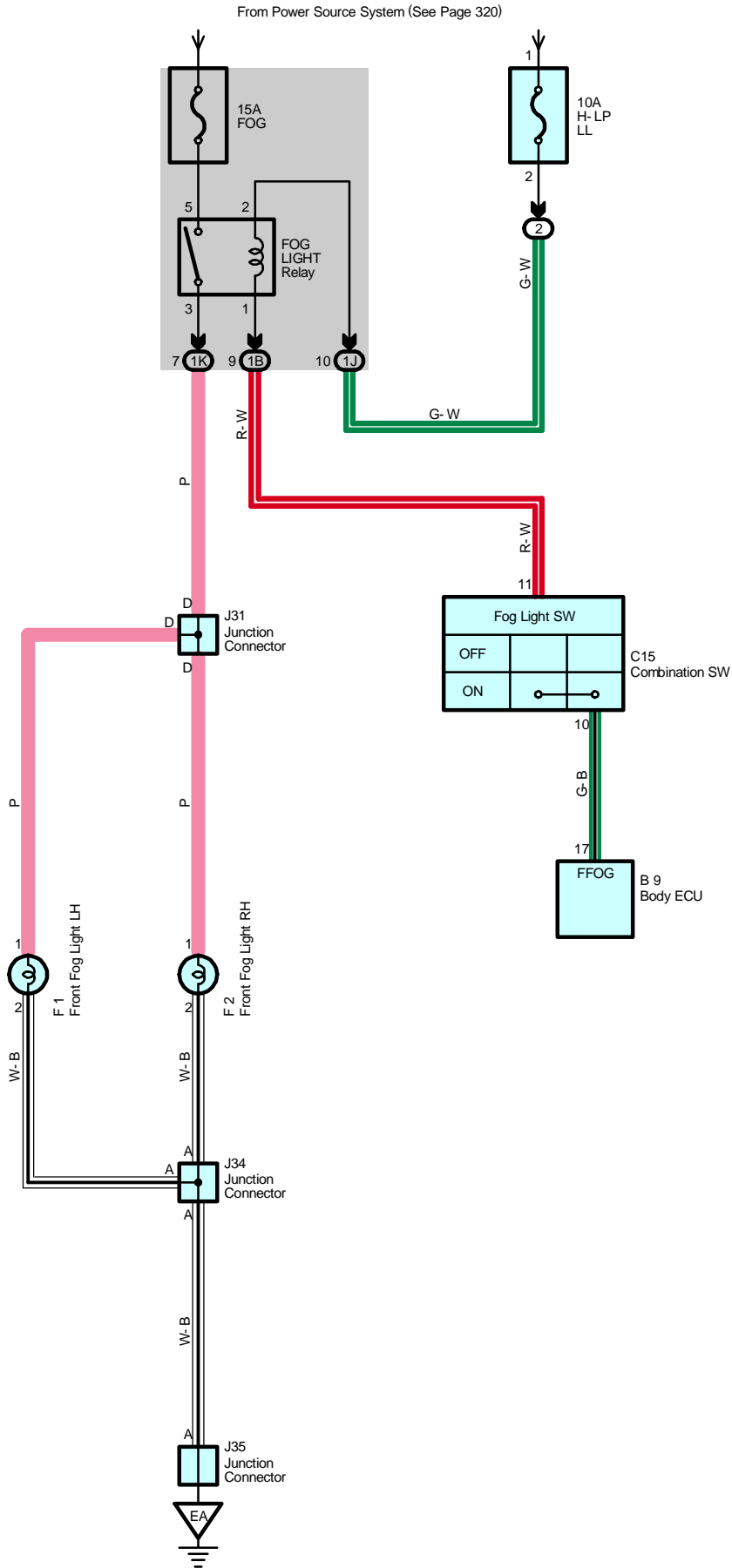
 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA7	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IJ2	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)

 : **Ground Points**

Code	See Page	Ground Points Location
IO	92	Left Kick Panel

Fog Light with DRL (Double Cab)



Service Hints**FOG LIGHT Relay**

5-3 : Closed with the light control SW at HEAD position, dimmer SW at LOW position and fog light SW on

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page
B9	66	F2	64	J35	65
C15	66	J31	65		
F1	64	J34	65		

 : **Relay Blocks**

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

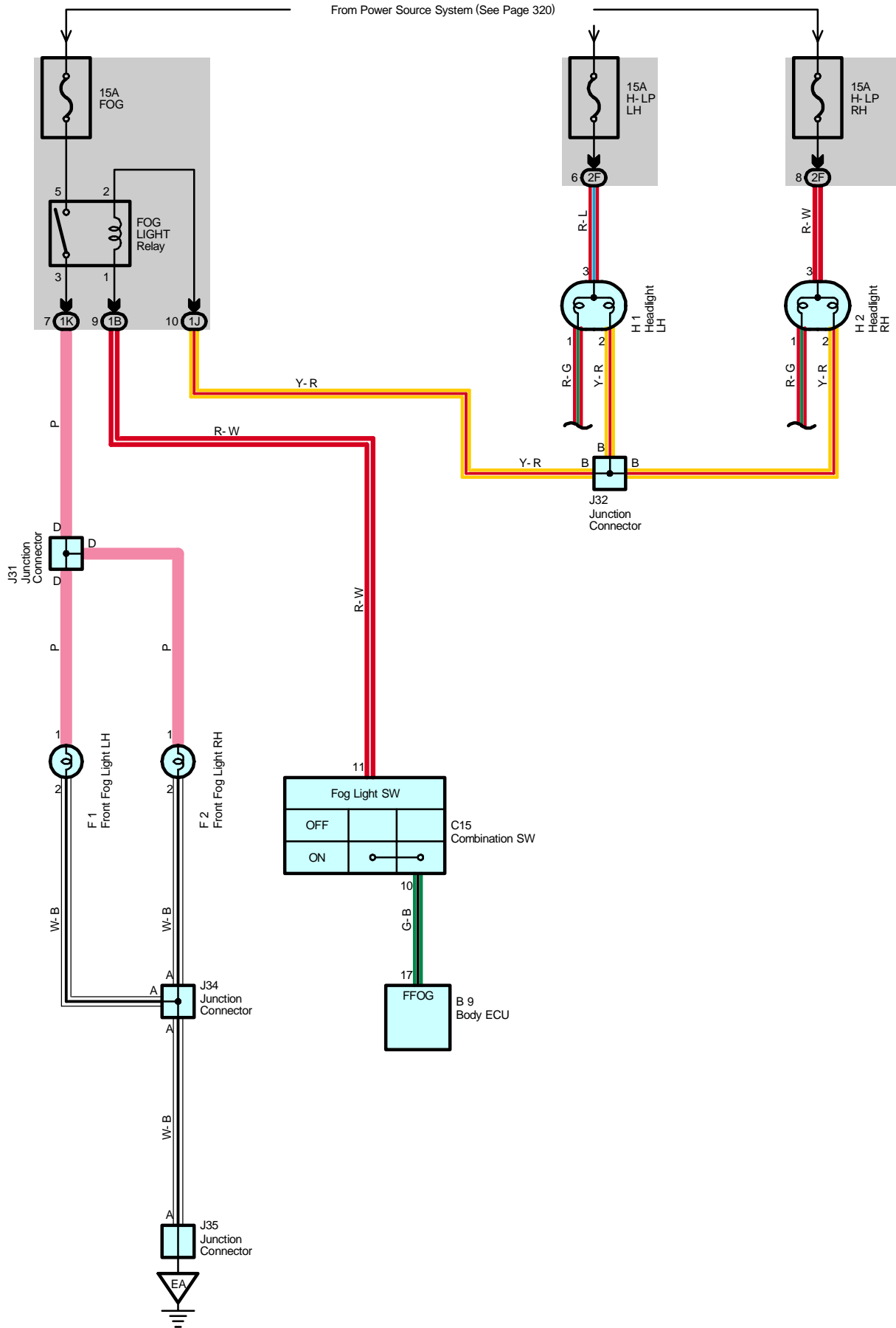
 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1K		

 : **Ground Points**

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron

Fog Light without DRL (Double Cab)



Service Hints

FOG LIGHT Relay

5-3 : Closed with the light control SW at HEAD position, dimmer SW at LOW position and fog light SW on

: Parts Location

Code	See Page	Code	See Page	Code	See Page
B9	66	H1	64	J34	65
C15	66	H2	64	J35	65
F1	64	J31	65		
F2	64	J32	65		

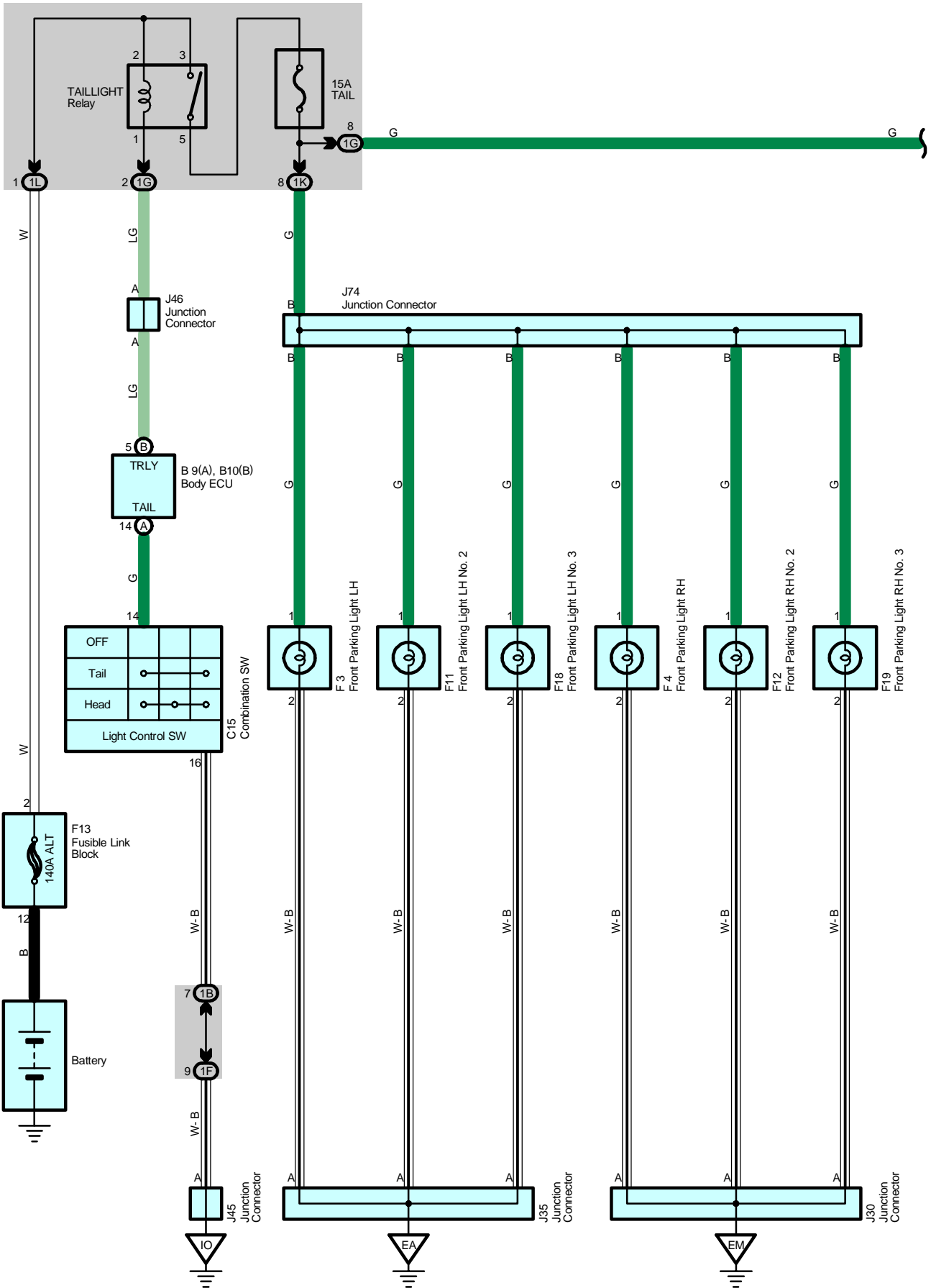
: Junction Block and Wire Harness Connector

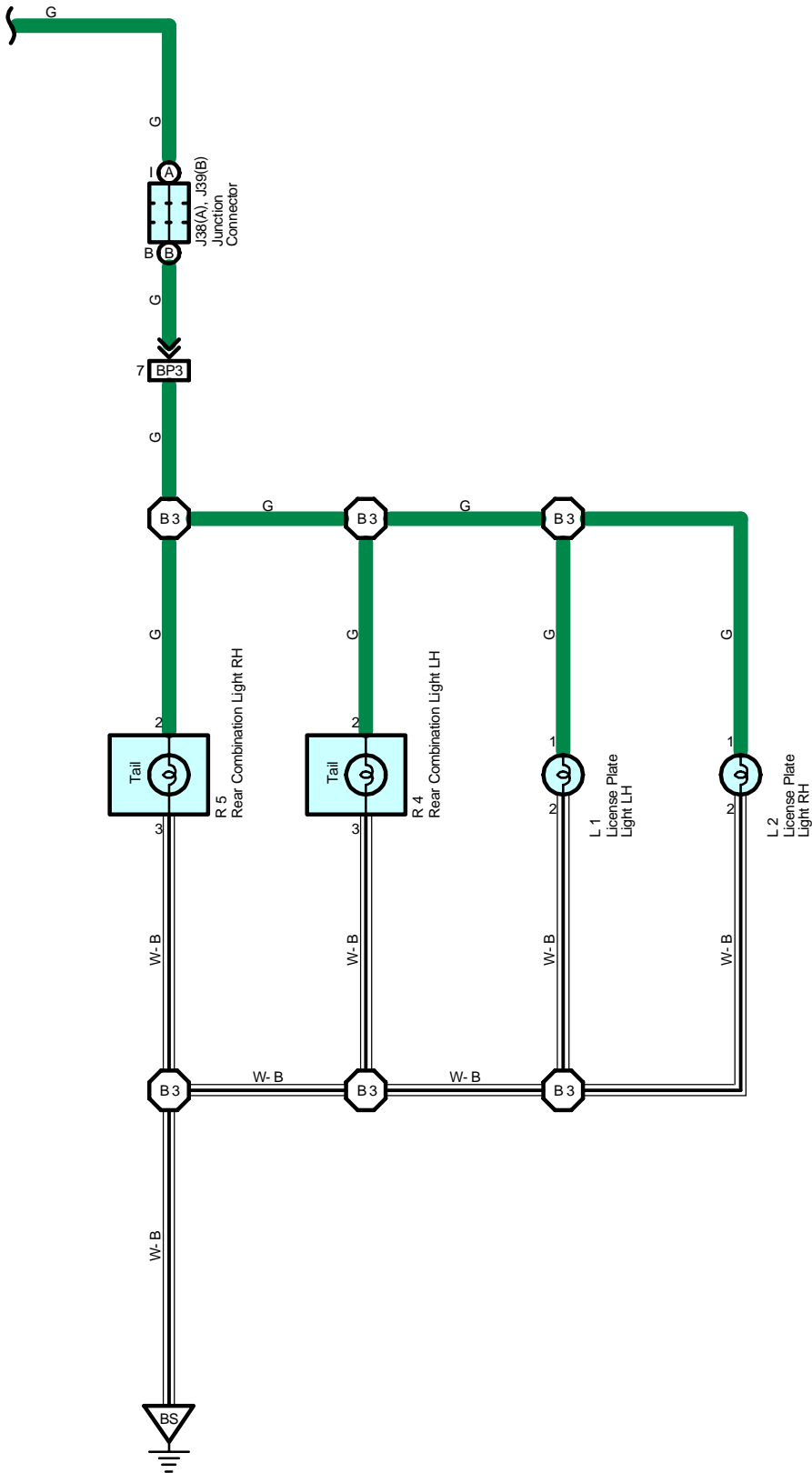
Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1K		
2F	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)

: Ground Points

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron

Taillight (Double Cab)





Taillight (Double Cab)

Service Hints

C15 Combination SW

14-16 : Closed with the light control SW at TAIL or HEAD position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
B9	A	66	F13	34, 64	J45	68
B10	B	66	F18	64	J46	68
C15	66	F19	64	J74	65	
F3	64	J30	65	L1	70	
F4	64	J35	65	L2	70	
F11	64	J38	A	68	R4	71
F12	64	J39	B	68	R5	71

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
1G		
1K	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
BP3	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

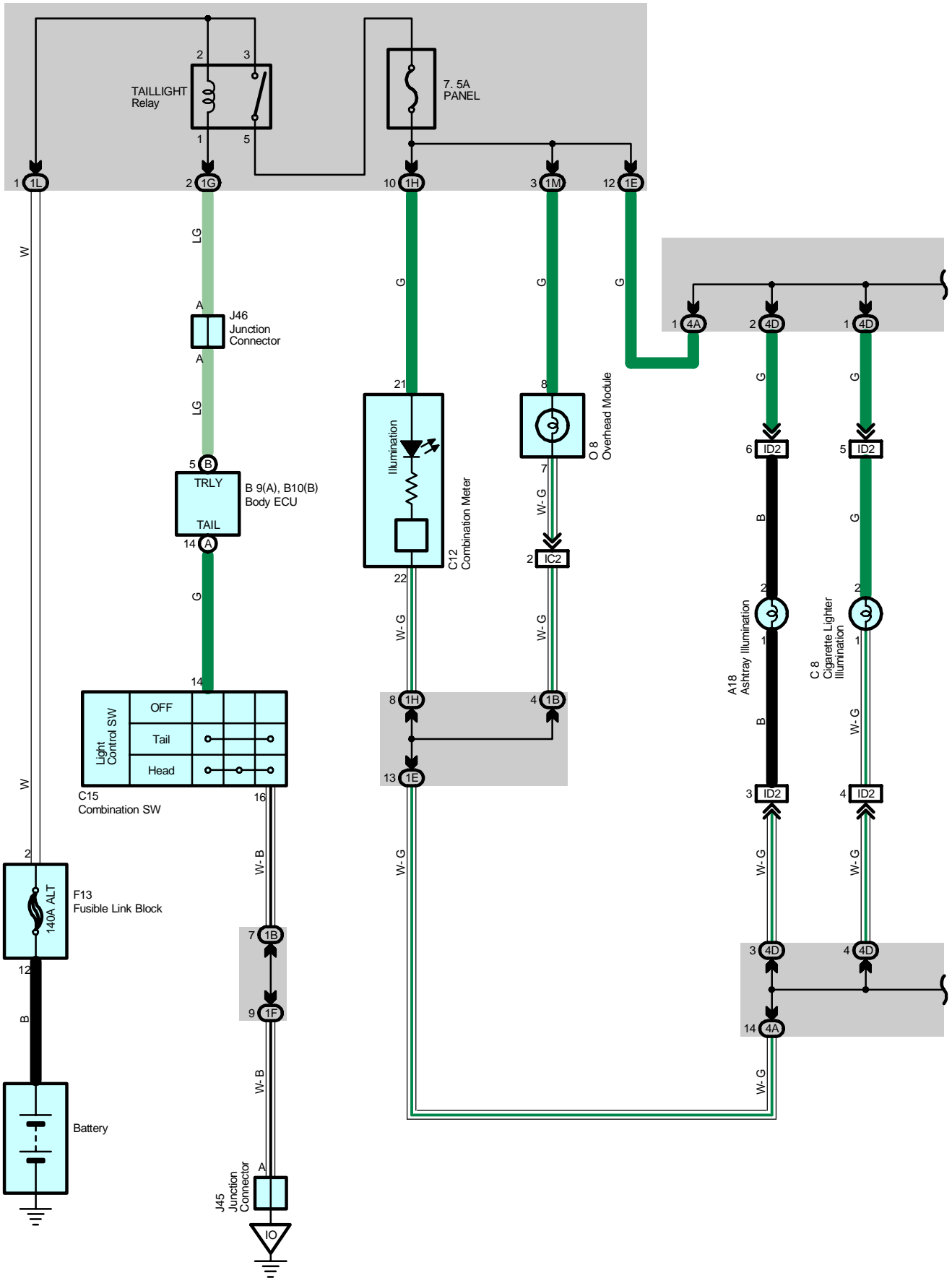
▽ : Ground Points

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
EM	90	Radiator Side Support RH
IO	92	Left Kick Panel
BS	96	Surrounding of the Front of the Fuel Tank

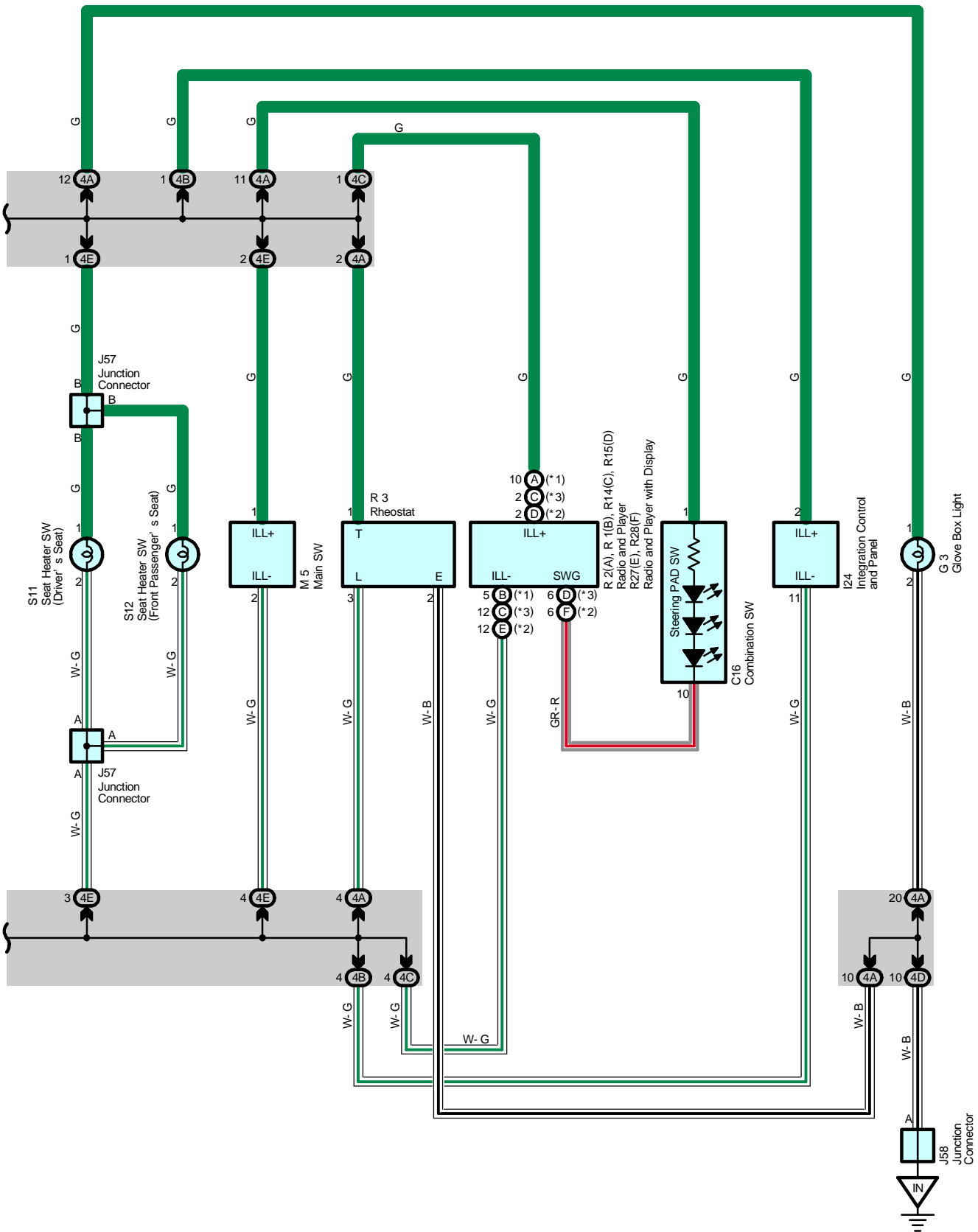
○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B3	96	Frame Wire			

Illumination (Double Cab)



- * 1 : 6 Speaker
- * 2 : 8 Speaker w/ Navigation System
- * 3 : 8 Speaker w/o Navigation System



Illumination (Double Cab)

Service Hints

C15 Combination SW

14-16 : Closed with the light control SW at TAIL or HEAD position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A18	66	I24	67	R3	69
B9	A 66	J45	68	R14	C 69
B10	B 66	J46	68	R15	D 69
C8	66	J57	68	R27	E 69
C12	66	J58	68	R28	F 69
C15	66	M5	69	S11	69
C16	66	O8	70	S12	69
F13	34, 64	R1	B 69		
G3	67	R2	A 69		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1G		
1H		
1L	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1M	45	Roof Wire and Driver Side J/B (Lower Finish Panel)
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4B		
4C		
4D		
4E		

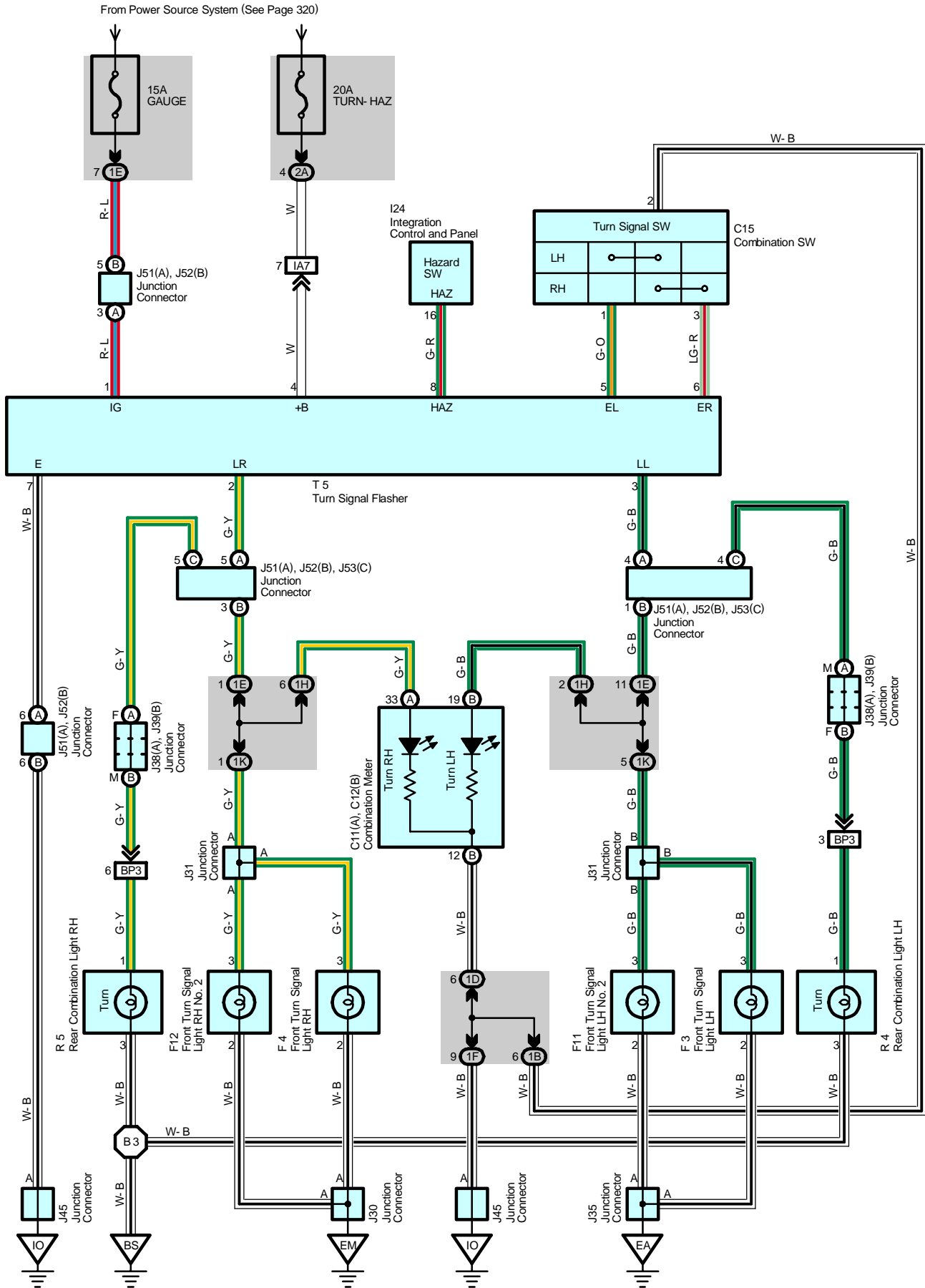
□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IC2	92	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
ID2	92	Cigarette Lighter Wire and Cowl Wire (Instrument Panel Brace LH)

▽ : Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel

Turn Signal and Hazard Warning Light (Double Cab)



Service Hints

T5 Turn Signal Flasher

4-Ground : Always approx. 12 volts

1-Ground : Approx. 12 volts with the ignition SW at ON position

7-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
C11	A	66	I24	67	J51	A	68
C12	B	66	J30	65	J52	B	68
C15	66	J31	65	J53	C	68	
F3	64	J35	65	R4	71		
F4	64	J38	A	68	R5	71	
F11	64	J39	B	68	T5	69	
F12	64	J45	68				

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1D		
1E		
1F		
1H		
1K	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2A	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA7	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
BP3	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

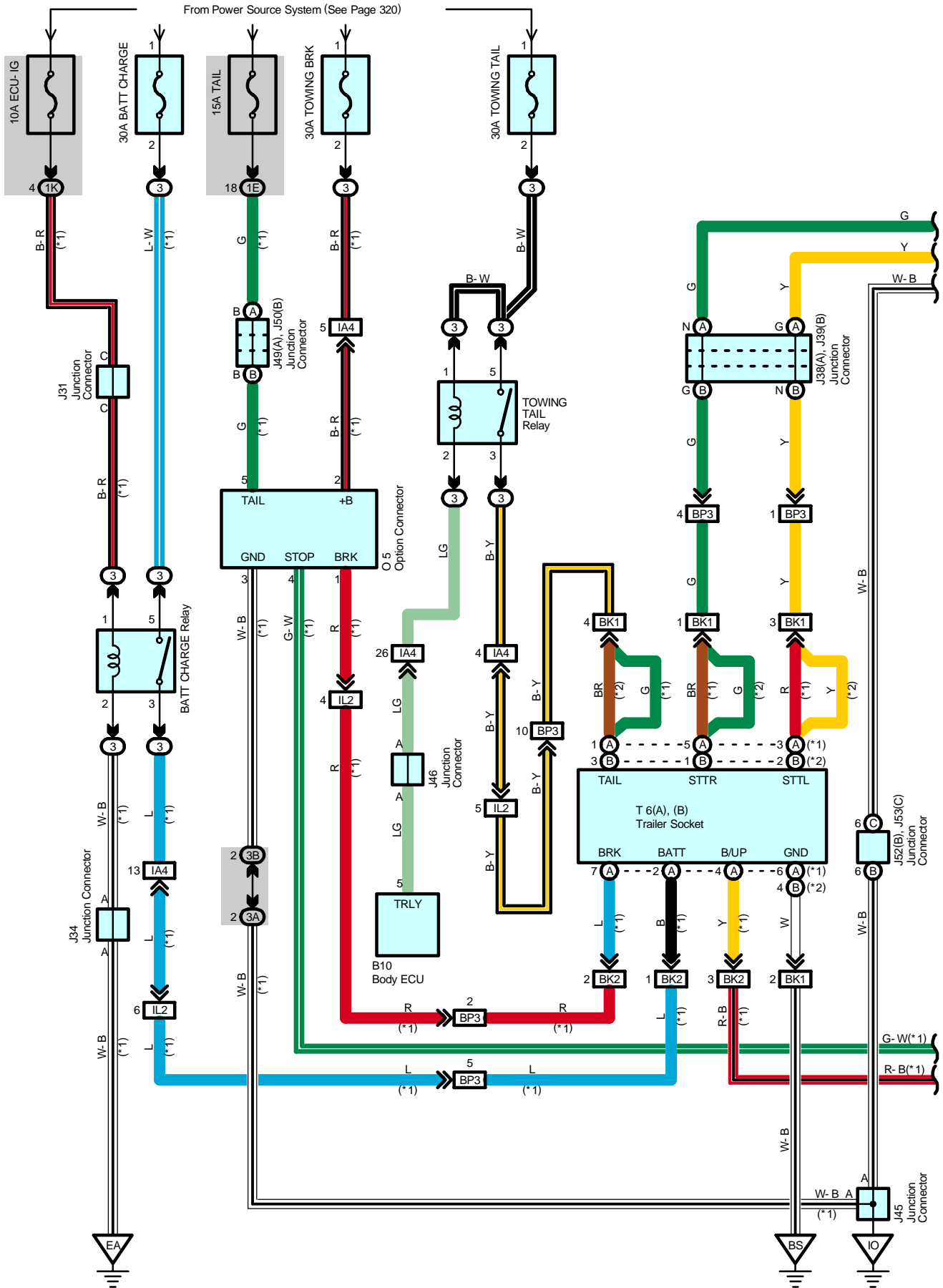
▽ : Ground Points

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
EM	90	Radiator Side Support RH
IO	92	Left Kick Panel
BS	96	Surrounding of the Front of the Fuel Tank

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B3	96	Frame Wire			

Trailer Towing (Double Cab)



Trailer Towing (Double Cab)

Service Hints

T9 Trailer Converter

8-Ground : Approx. 12 volts with the brake pedal depressed

1-Ground : Always approx. 12 volts

6-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B10	66	J46	68	O5	69
J28	A 68	J47	A 68	P1	65
J29	B 68	J48	B 68	S4	69
J31	65	J49	A 68	S31	69
J34	65	J50	B 68	T5	69
J38	A 68	J51	A 68	T6	A 71
J39	B 68	J52	B 68		B 71
J45	68	J53	C 68	T9	69

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
3	39	Engine Room R/B No.3 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1K	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2A	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2B		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA7		
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
BK1	96	Frame Wire and Frame No.3 Wire (Near the License Plate Light)
BK2		
BP3	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

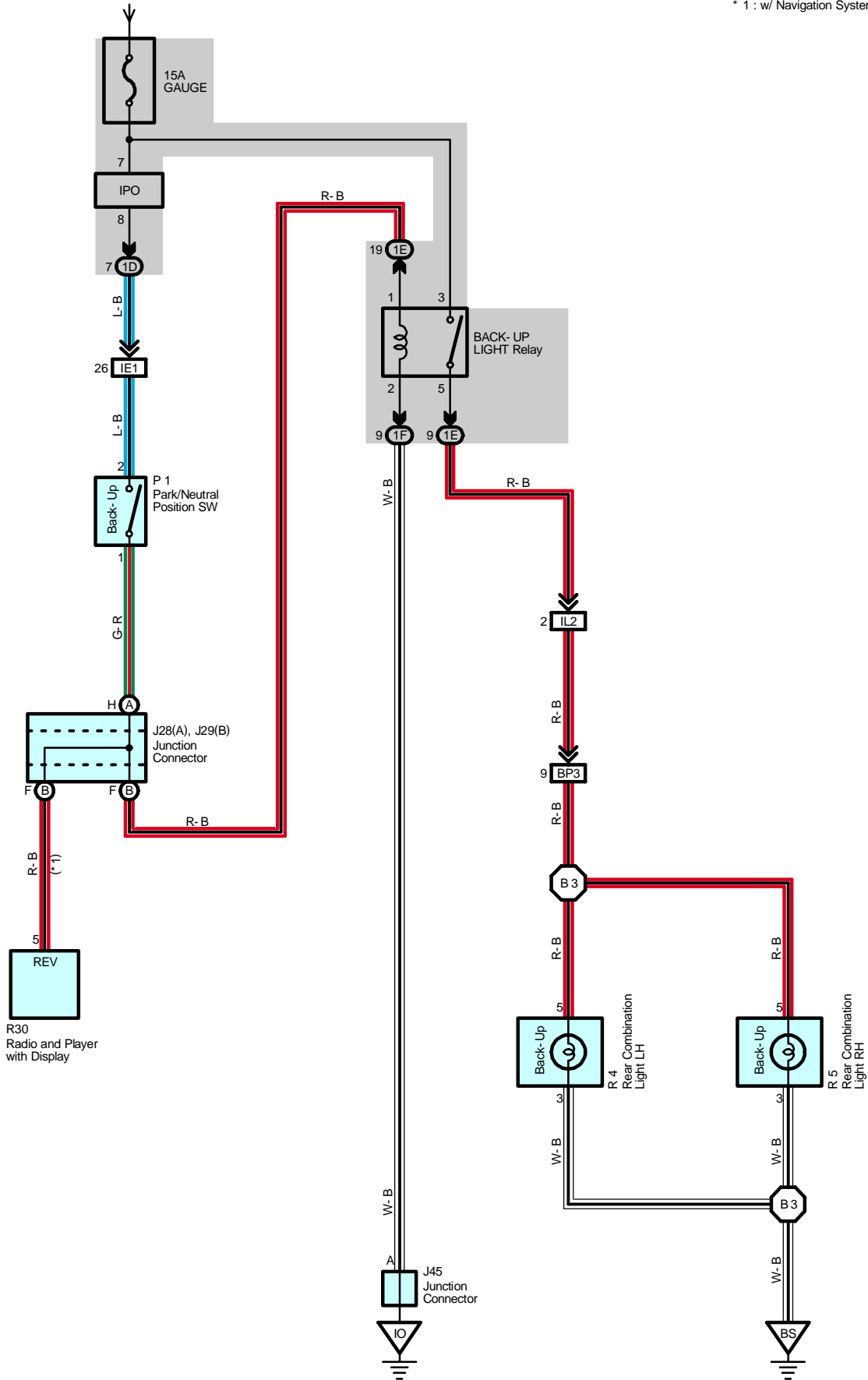
▽ : Ground Points

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
IO	92	Left Kick Panel
BS	96	Surrounding of the Front of the Fuel Tank

Back-Up Light (Double Cab)

From Power Source System (See Page 320)

* 1 : w/ Navigation System



Service Hints**P1 Park/Neutral Position SW**

2-1 : Closed with the shift lever in R position

BACK-UP LIGHT Relay

3-5 : Closed with the shift level in R position and ignition SW at ON position

 : **Parts Location**

Code		See Page	Code	See Page	Code	See Page
J28	A	68	P1	65	R30	69
J29	B	68	R4	71		
J45		68	R5	71		

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
BP3	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

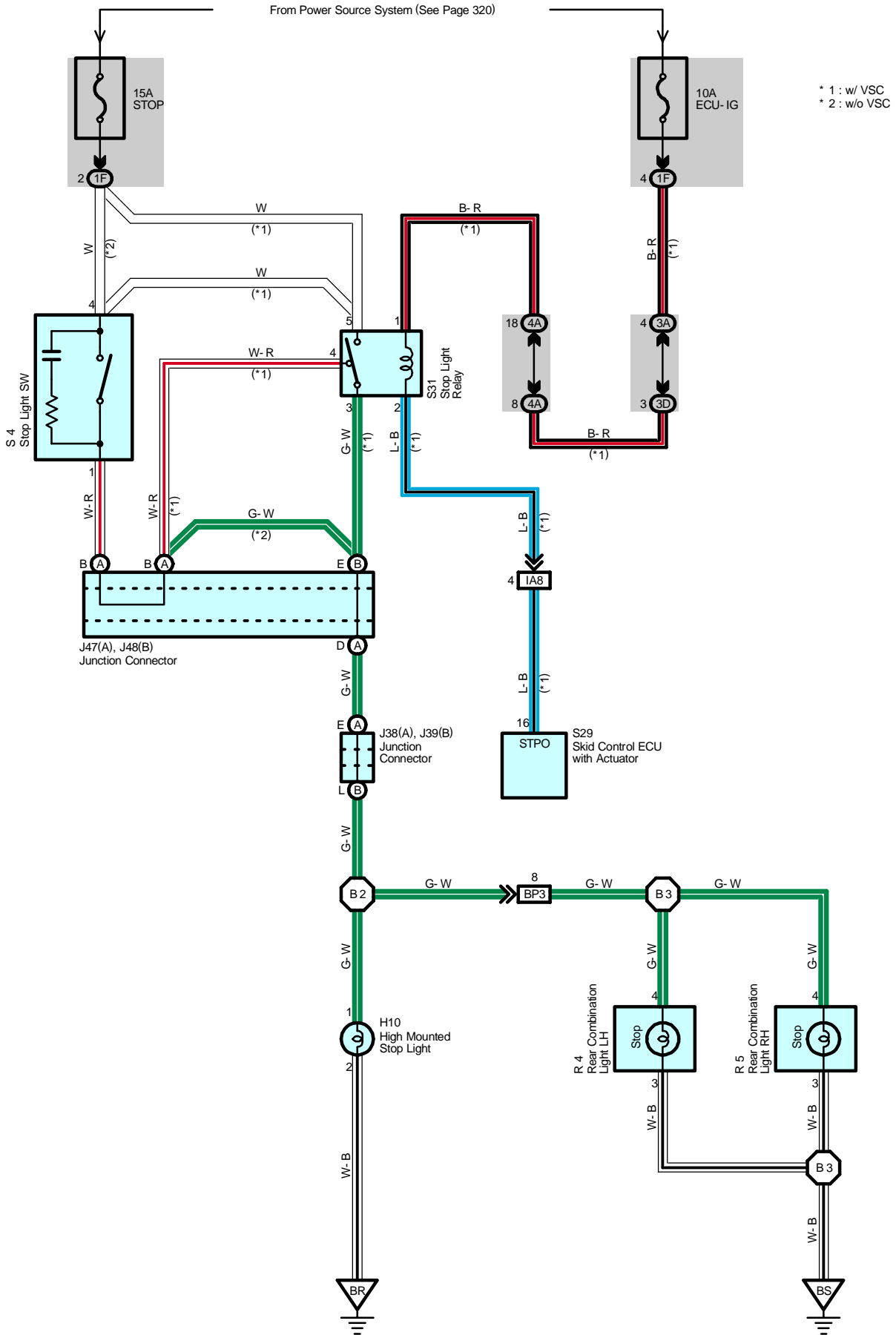
 : **Ground Points**

Code	See Page	Ground Points Location
IO	92	Left Kick Panel
BS	96	Surrounding of the Front of the Fuel Tank

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B3	96	Frame Wire			

Stop Light (Double Cab)



Service Hints**S4 Stop Light SW**

4-1 : Closed with the brake pedal depressed

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page
H10	70	J48 B	68	S29	65
J38 A	68	R4	71	S31	69
J39 B	68	R5	71		
J47 A	68	S4	69		

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3D		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA8	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
BP3	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

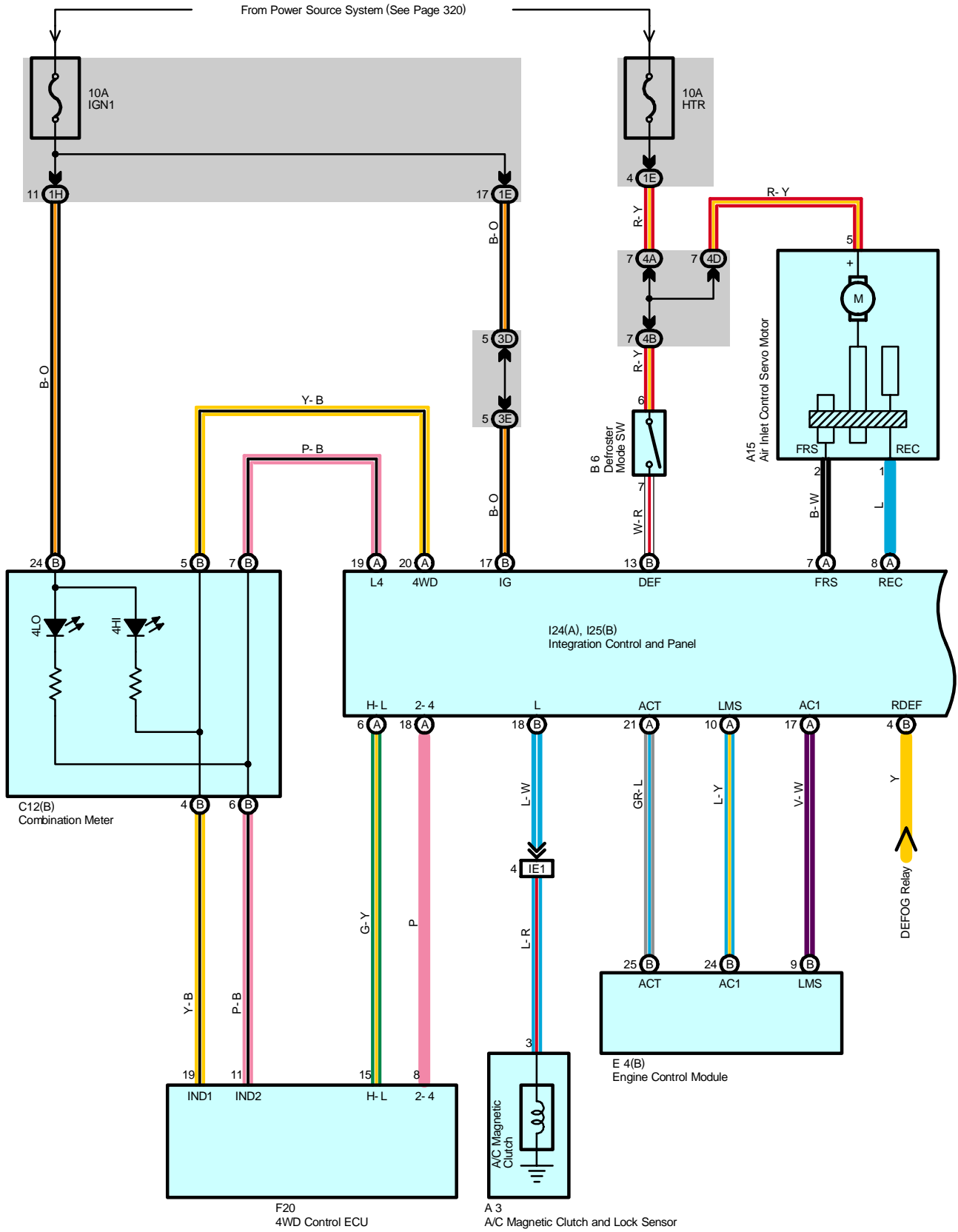
 : **Ground Points**

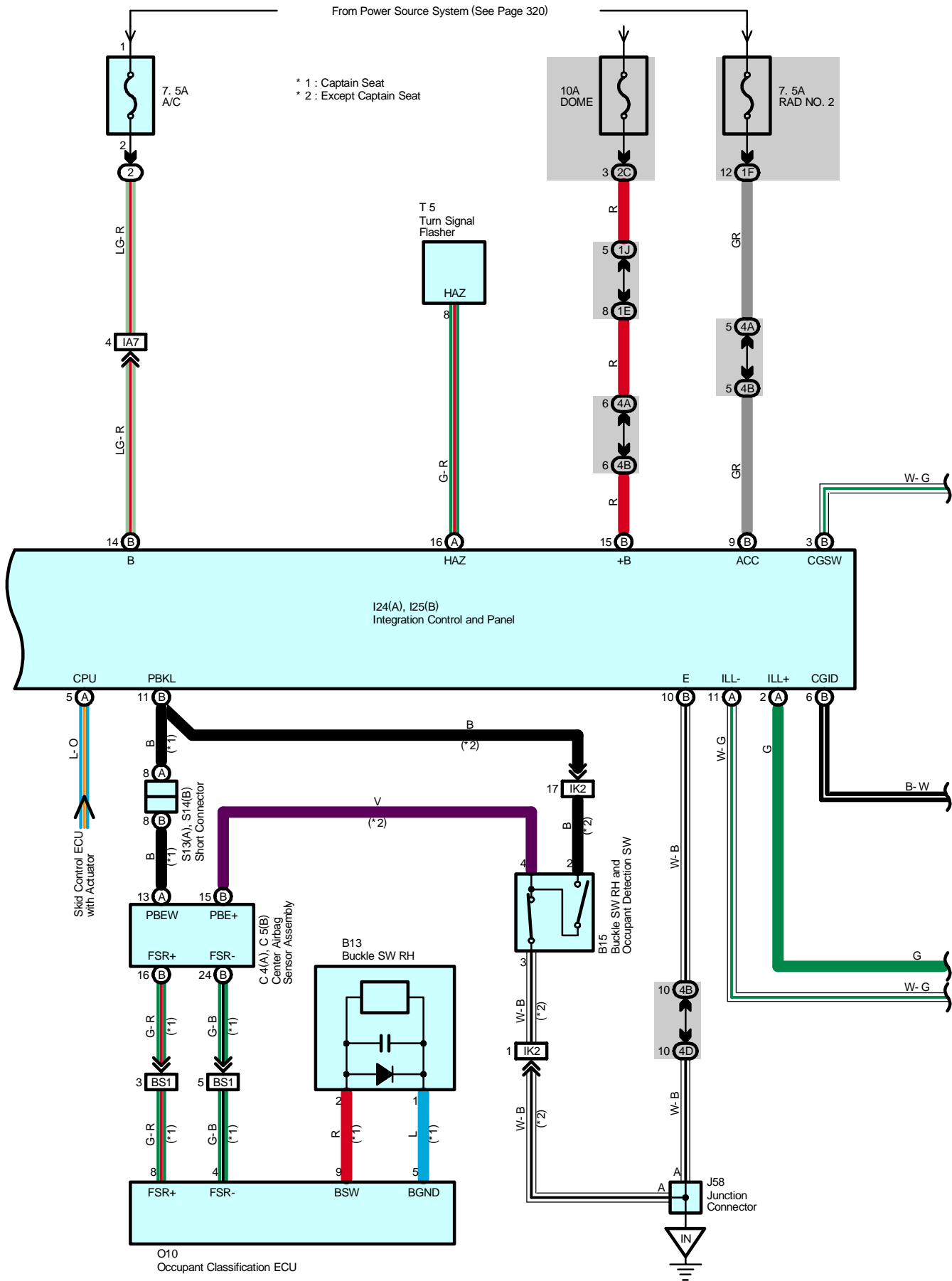
Code	See Page	Ground Points Location
BR	96	Back Panel Left
BS	96	Surrounding of the Front of the Fuel Tank

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B2	96	Floor No.2 Wire	B3	96	Frame Wire

Center Cluster Integration Control System (Double Cab)





System Outline

The integration control panel is composed by design components such as the cluster, resistor, heater control panel, and SW. The integration control panel controls systems such as the air conditioning, cargo light, 4WD and hazard warning light and clock.

Service Hints

I25 (B) Integration Control and Panel

- (B)17-Ground : Approx. 12 volts with ignition SW on and blower SW on
- (B)14-Ground : Approx. 12 volts with ignition SW at ON or ST position
- (B)15-Ground : Always approx. 12 volts
- (B) 9-Ground : Approx. 12 volts with ignition SW at ACC or ON position
- (B)10-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A3	64	C5	B 66	J46	68
A15	66	C12	B 66	J58	68
B6	66	E4	B 67	O10	72
B9	A 66	F13	34, 64	R3	69
B10	B 66	F20	67	S13	A 69
B13	72	H10	70	S14	B 69
B15	70	I24	A 67	T5	69
C4	A 66	I25	B 67		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
1H		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
3D	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3E		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4B		
4D		

□ : Connector Joining Wire Harness and Wire Harness

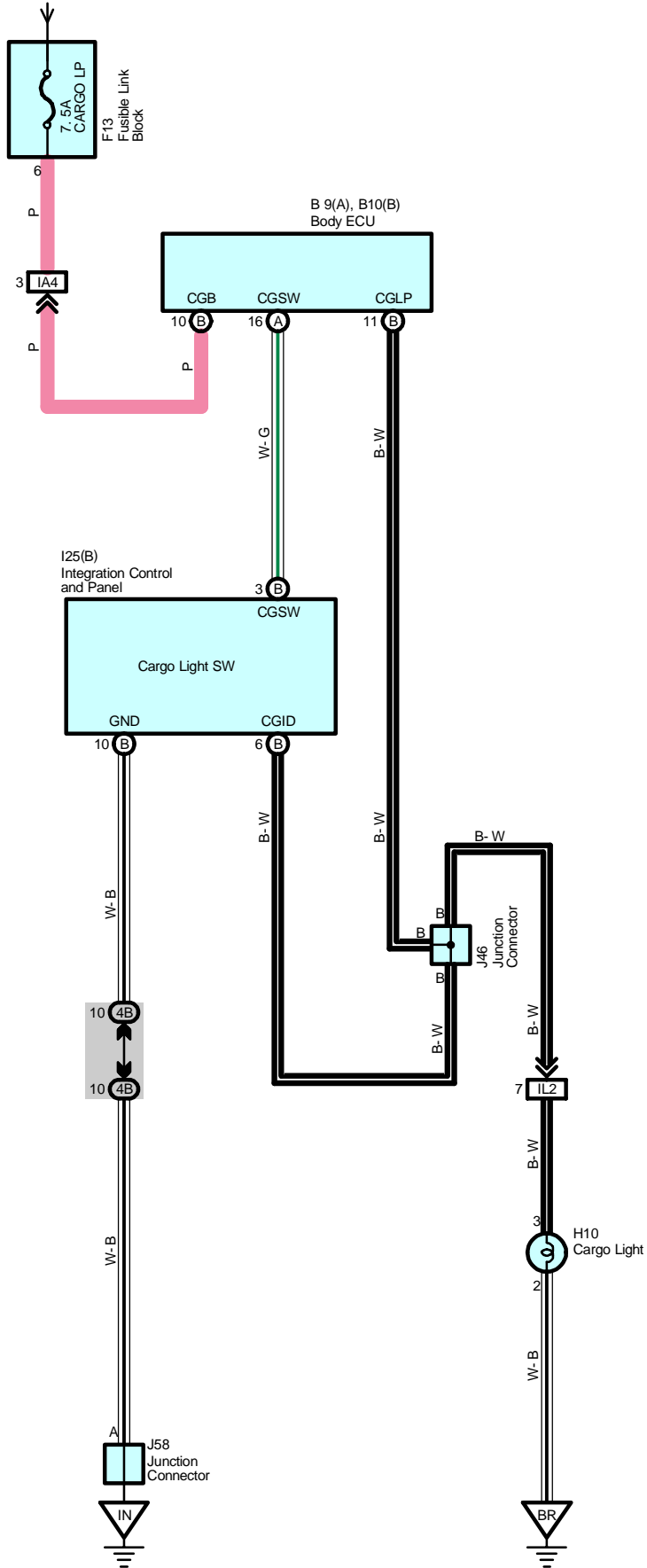
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA7		
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
BS1	98	Seat No.1 Wire and Floor Wire (Under the Front Passenger's Seat)

▽ : Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
BR	96	Back Panel Left

Cargo Light (Double Cab)

From Power Source System (See Page 320)



Service Hints

I25 (B) Integration Control and Panel

- (B)10-Ground : Always continuity
- (B) 3-Ground : Always. approx. 12 volts

: Parts Location

Code		See Page	Code		See Page	Code		See Page
B9	A	66	H10		70	J58		68
B10	B	66	I25	B	67			
F13		34, 64	J46		68			

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
4B	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)

: Connector Joining Wire Harness and Wire Harness

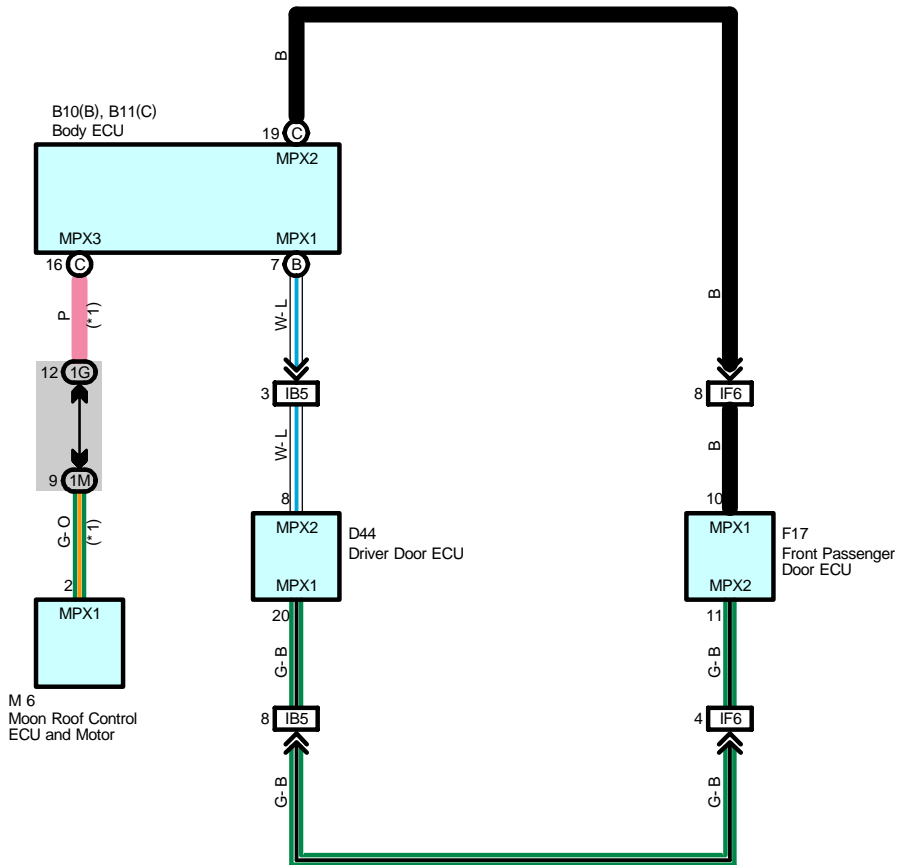
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)

: Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
BR	96	Back Panel Left

Multiplex Communication System - BEAN Bus (Double Cab)

* 1 : w/ Moon Roof



Multiplex Communication System Includes Following Systems

- * Door Lock Control
- * Fog Light
- * Headlight
- * Horn
- * Interior Light
- * Key Reminder
- * Light Auto Turn Off System
- * Power Window
- * Theft Deterrent
- * Wireless Door Lock Control

○ : Parts Location

Code		See Page	Code	See Page	Code	See Page
B10	B	66	D44	70	M6	70
B11	C	66	F17	70		

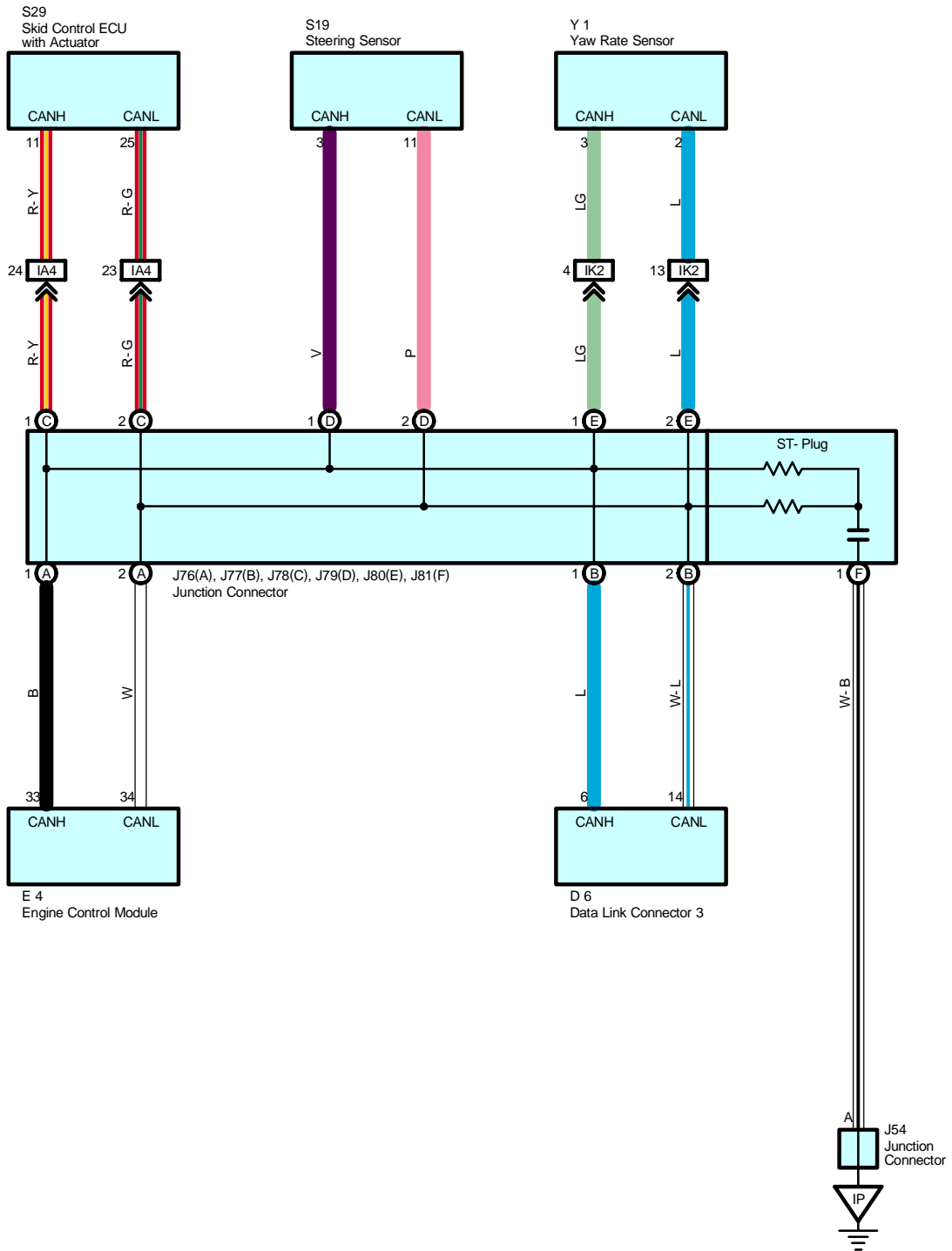
○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1M	45	Roof Wire and Driver Side J/B (Lower Finish Panel)

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)

Multiplex Communication System - CAN (Double Cab)



System Outline

CAN has two lines as a pair which make communication with operating voltage. CAN has excellent data speed and error detecting capacity. It consists of vehicle control systems such as engine control module, data link connector 3 and skid control ECU with actuator.

This system is working for the following systems:

- * Cruise Control
- * Electronically Controlled Transmission and A/T Indicator
- * Engine Control
- * VSC

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
D6	67	J77	B	68	J81	F	68
E4	67	J78	C	68	S19	69	
J54	68	J79	D	68	S29	65	
J76	A	68	J80	E	68	Y1	69

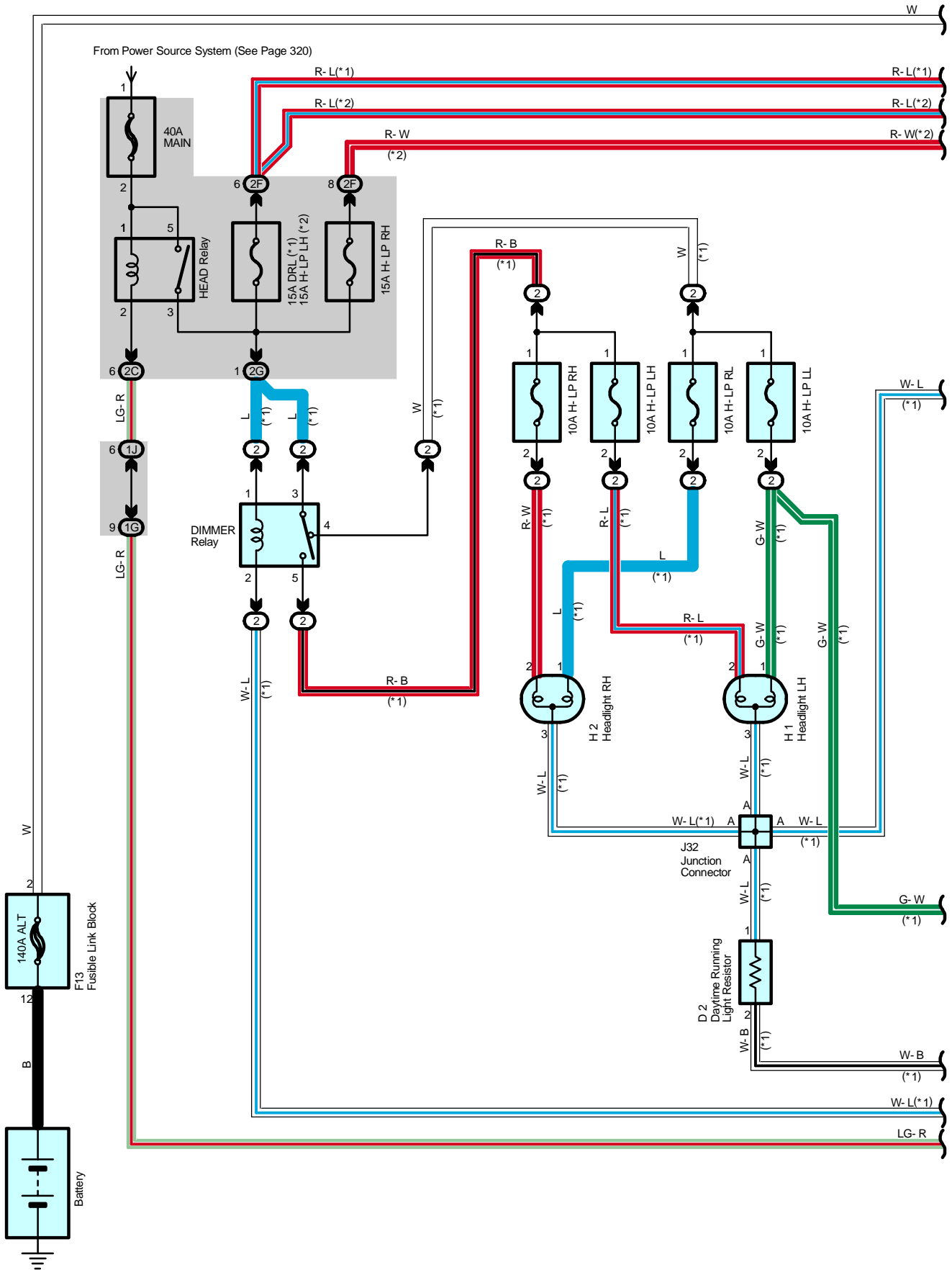
□ : Connector Joining Wire Harness and Wire Harness

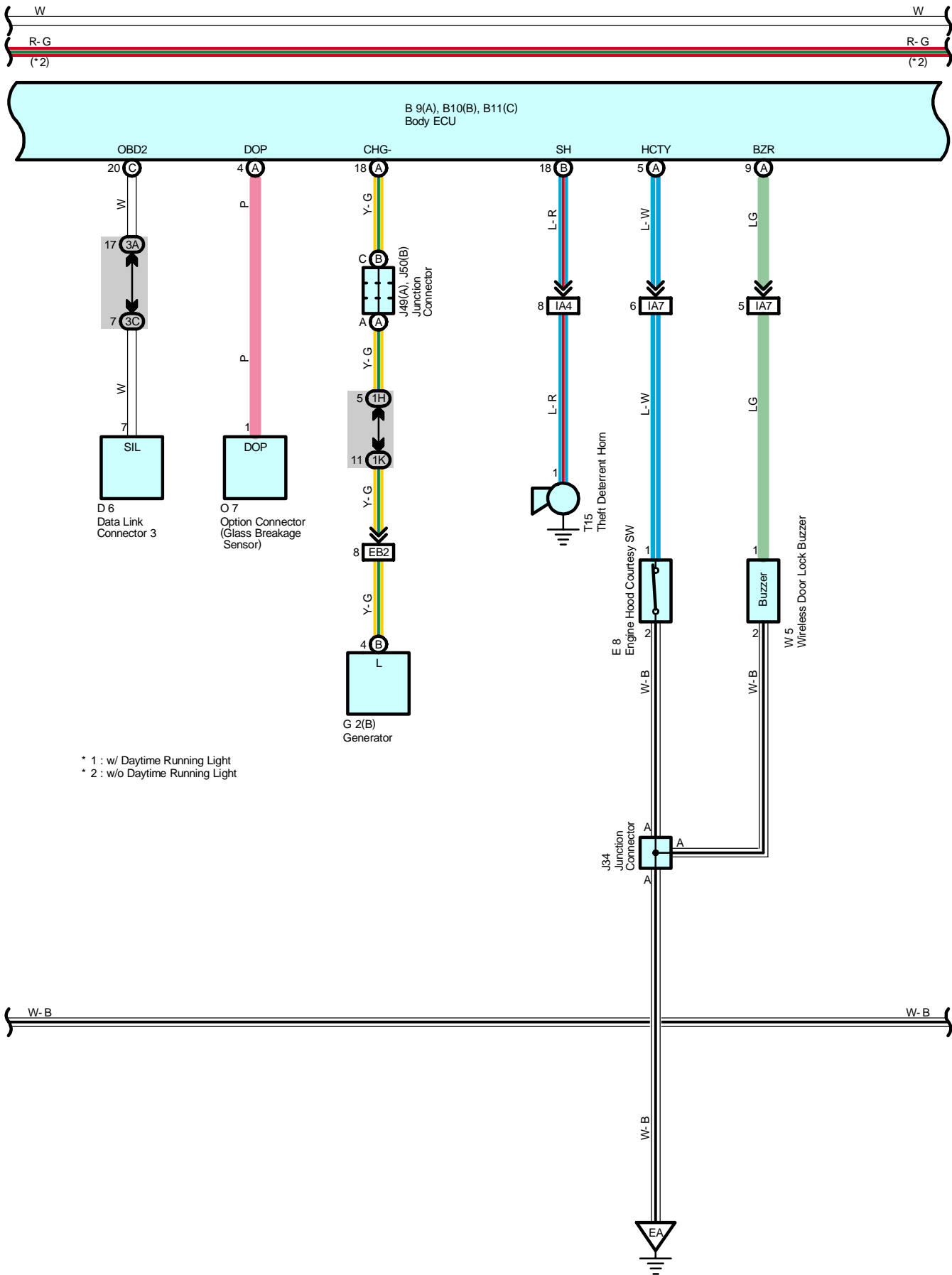
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)

▽ : Ground Points

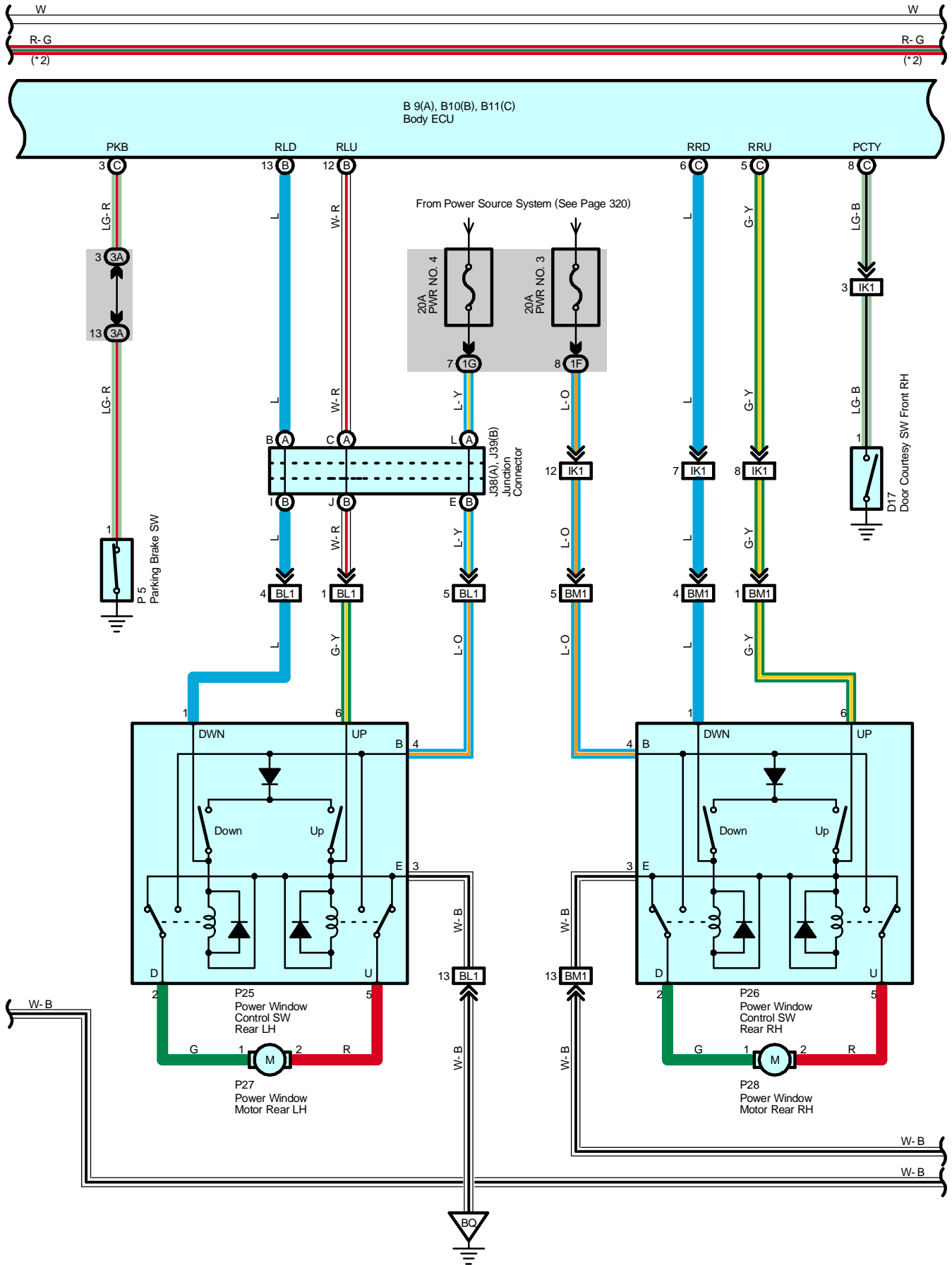
Code	See Page	Ground Points Location
IP	92	Instrument Panel Brace LH

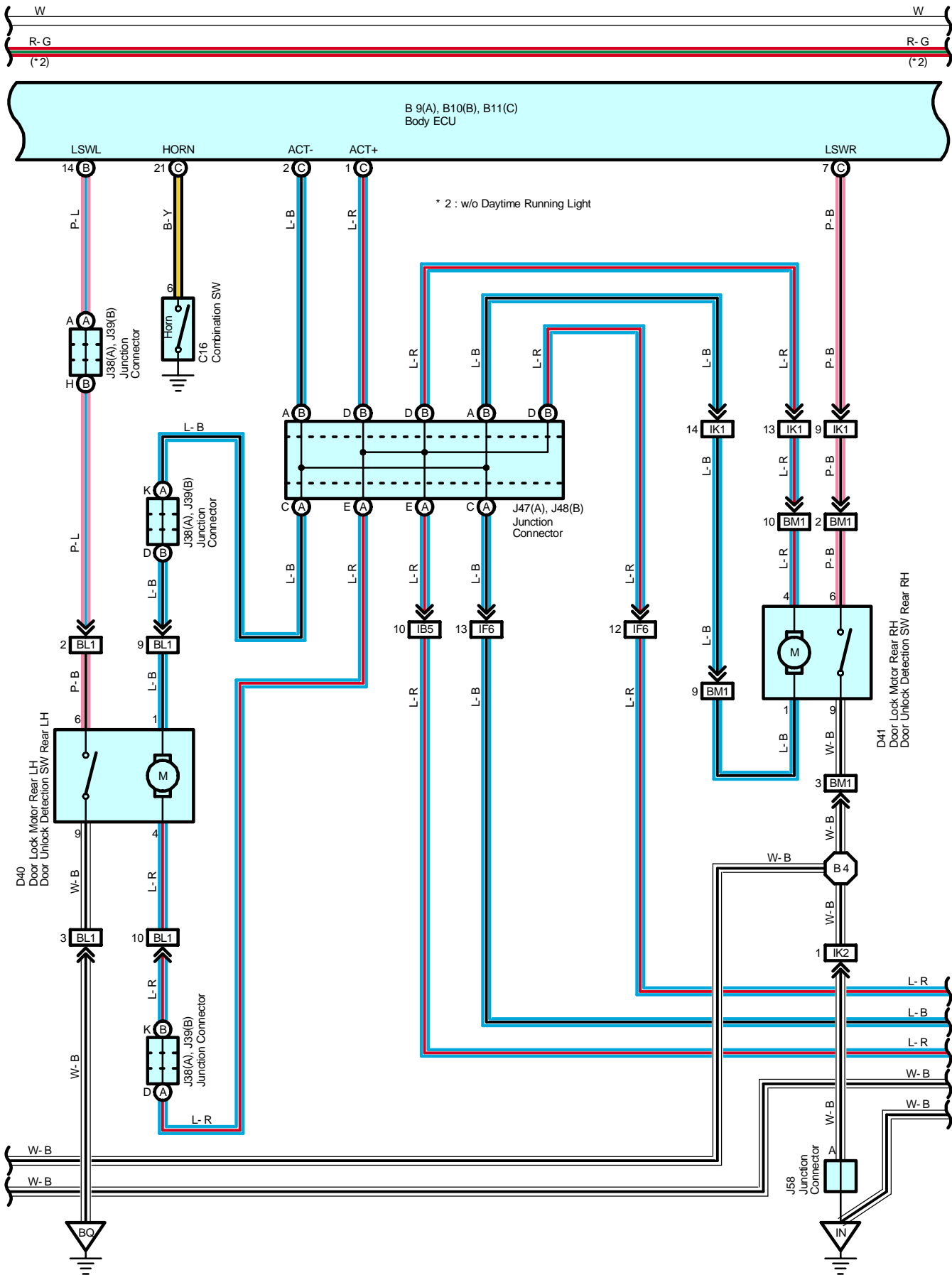
Multiplex Communication System - BEAN (Double Cab)



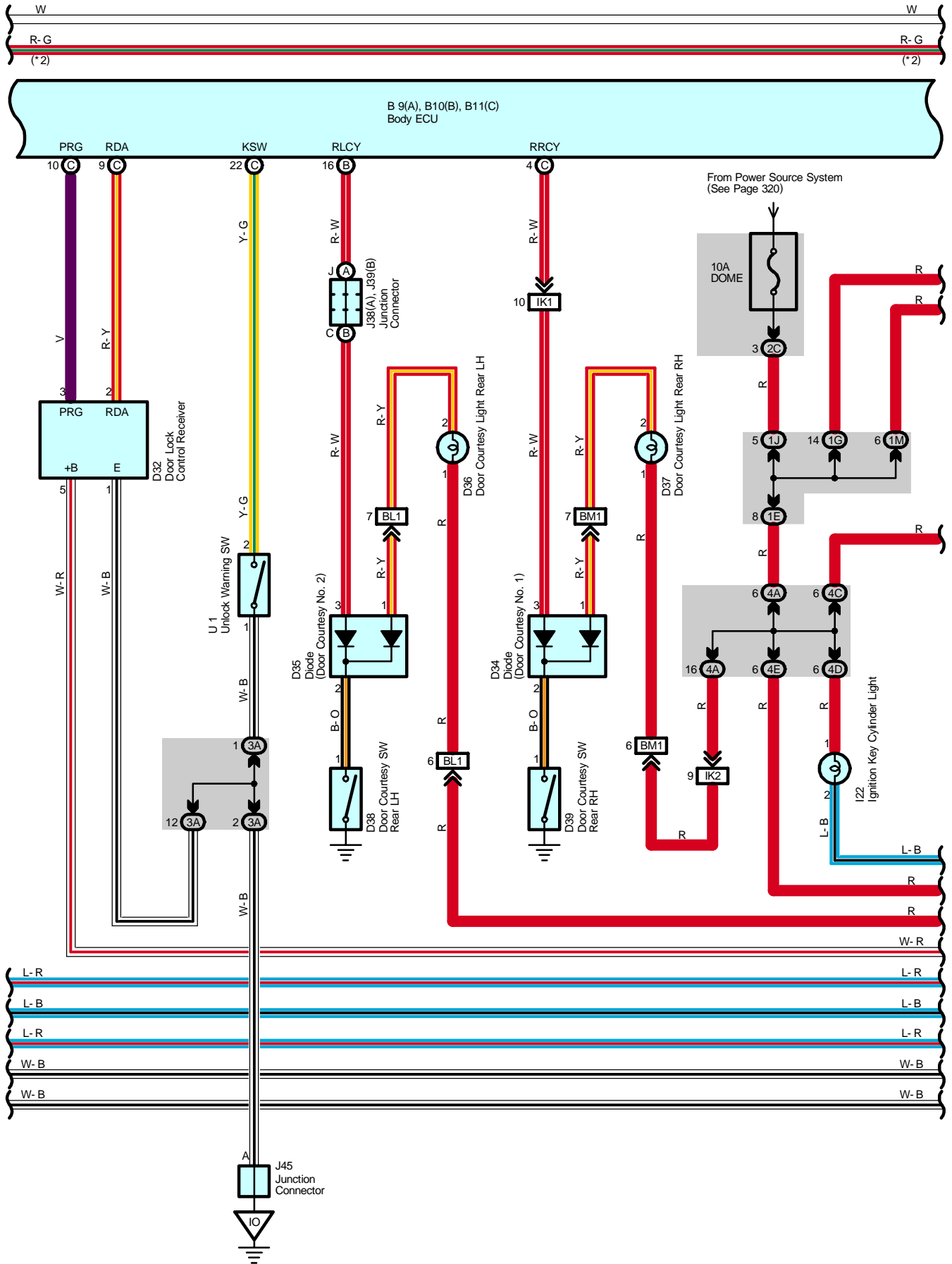


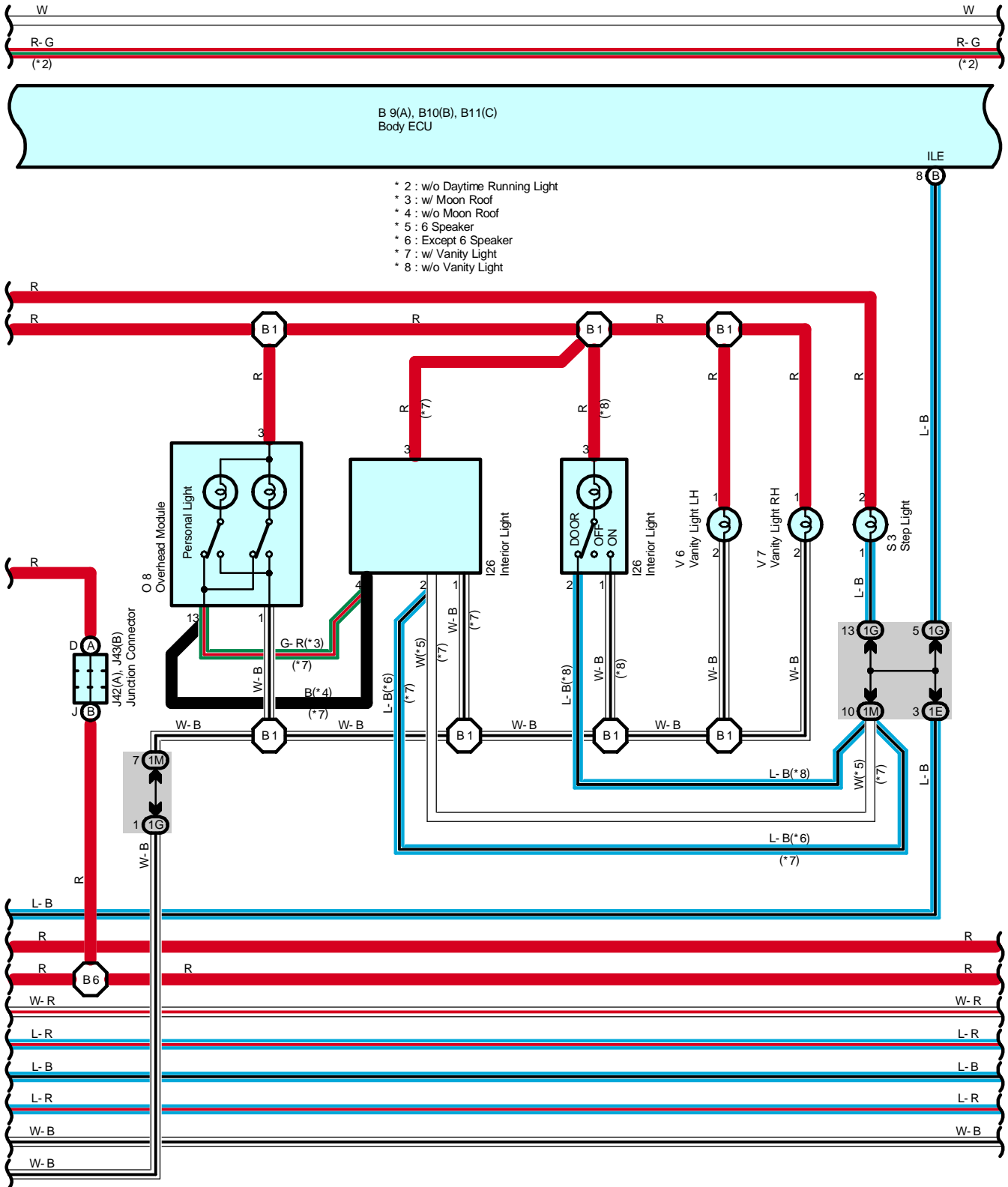
Multiplex Communication System - BEAN (Double Cab)



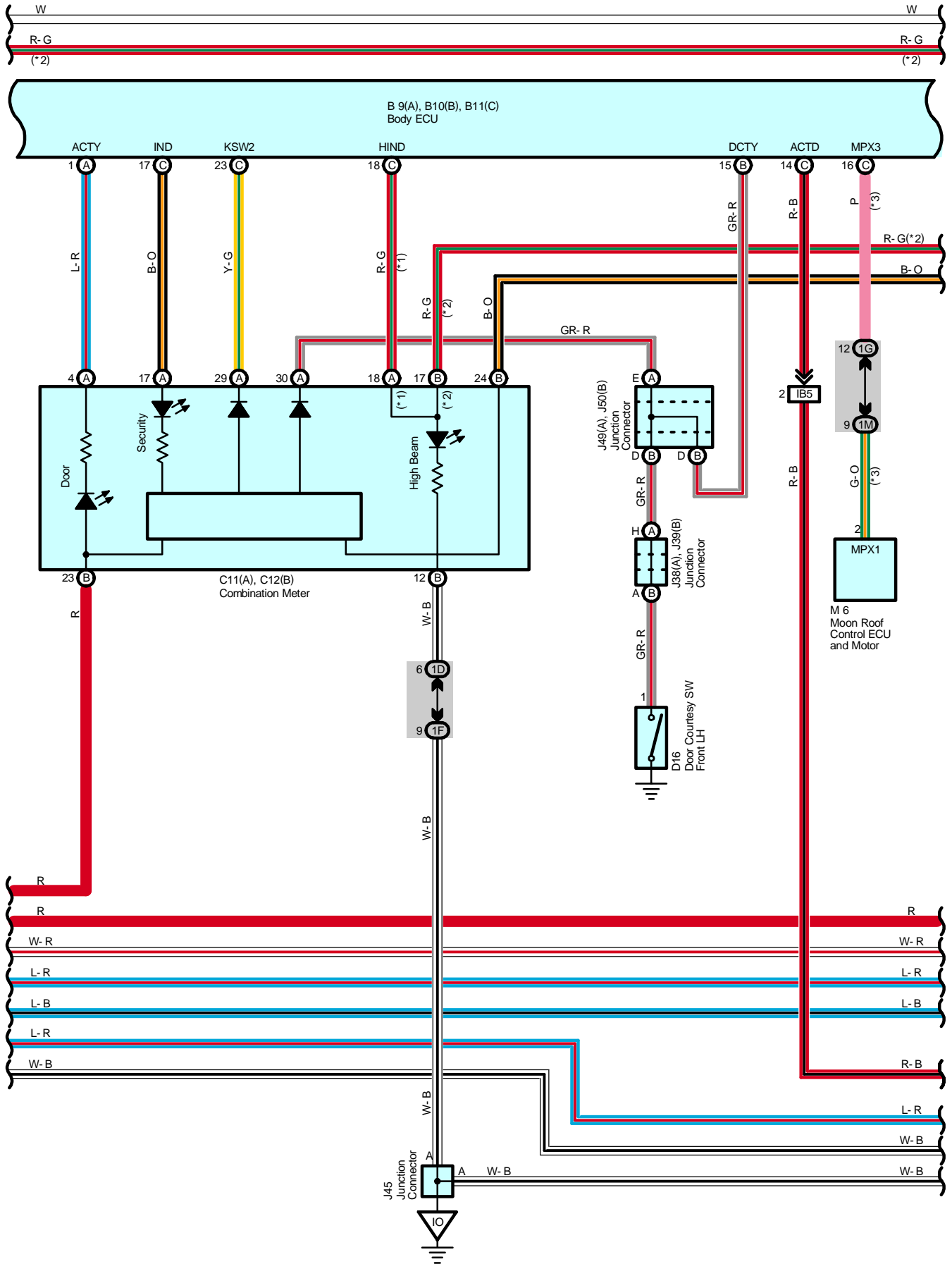


Multiplex Communication System - BEAN (Double Cab)

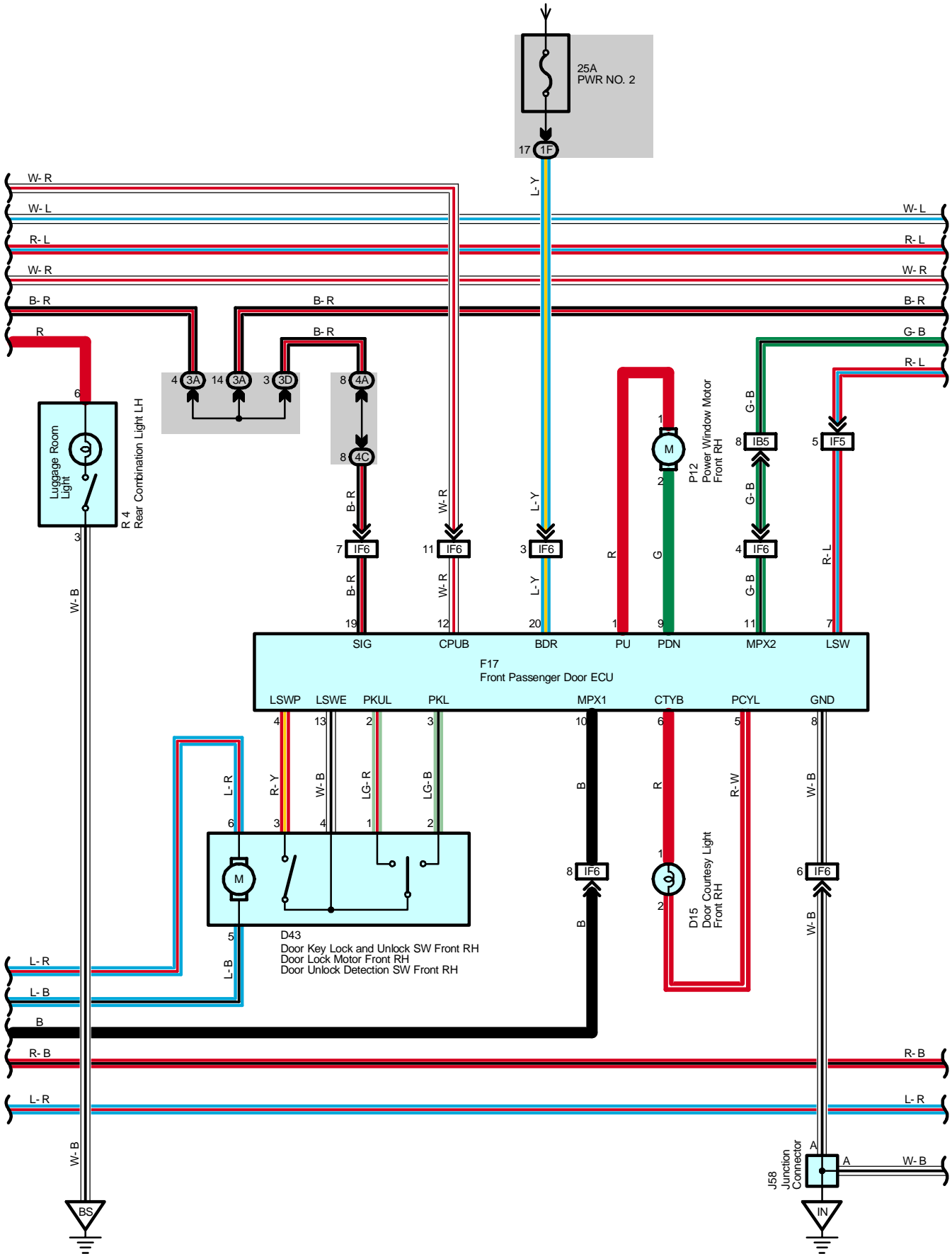




Multiplex Communication System - BEAN (Double Cab)

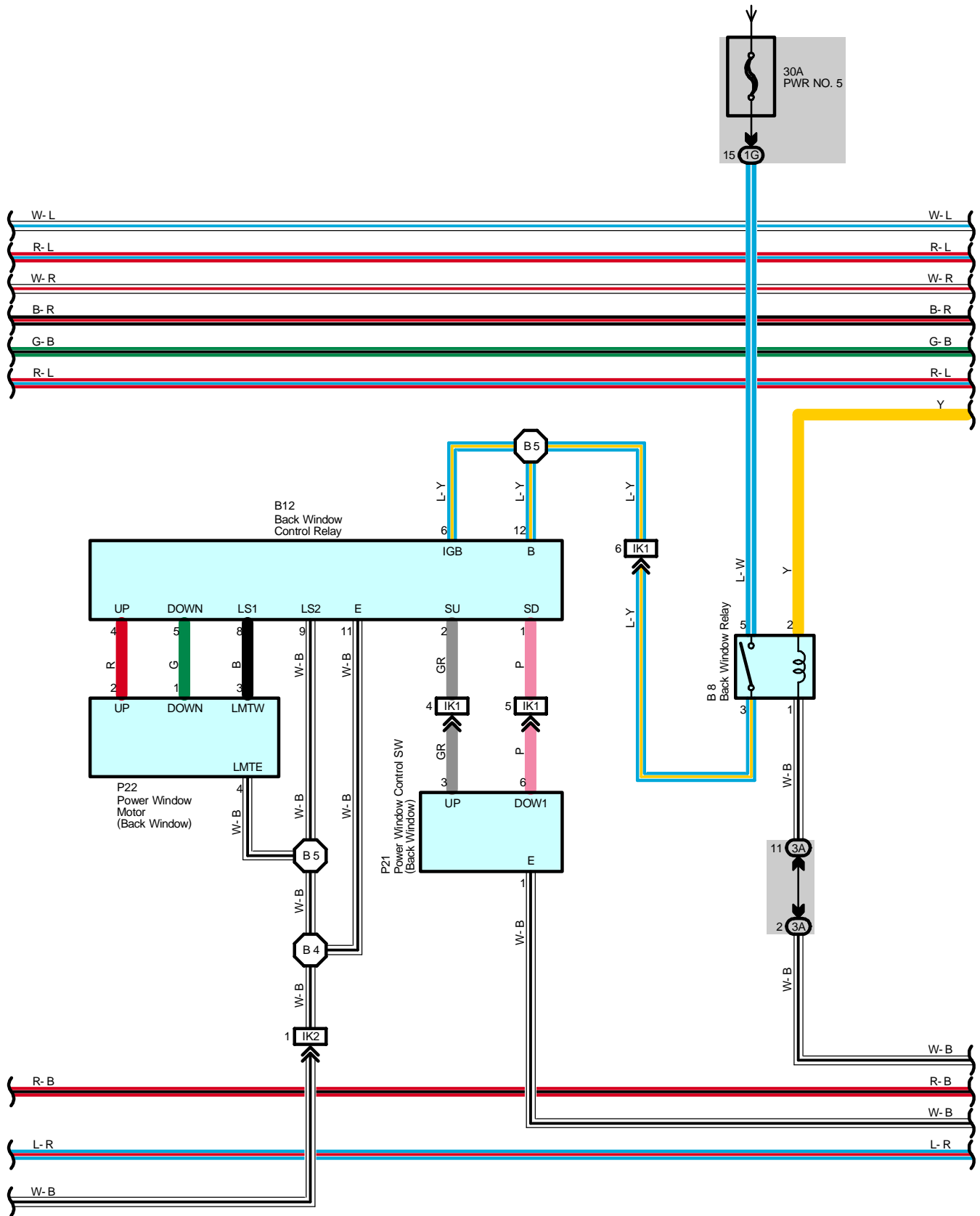


From Power Source System (See Page 320)

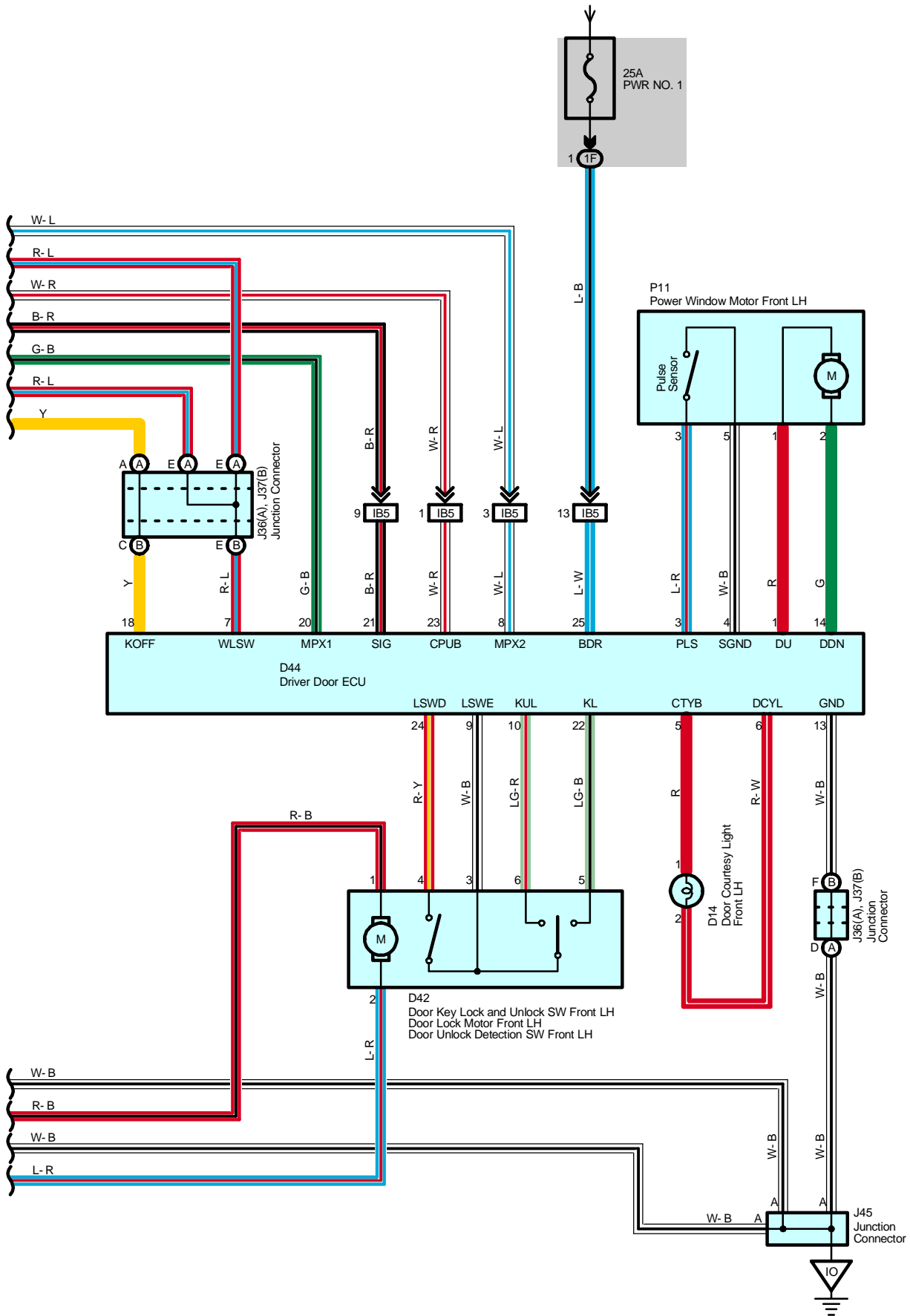


Multiplex Communication System - BEAN (Double Cab)

From Power Source System (See Page 320)



From Power Source System (See Page 320)



Multiplex Communication System - BEAN (Double Cab)

System Outline

This multiplex communication system is consisted of the BODY ECU, driver door ECU, passenger door ECU and sliding roof control ECU.

Service Hints

B10 (B), B11 (C) Body ECU

- (B) 1-Ground : Approx. 12 volts with the ignition SW at ON position
- (B) 3-Ground : Approx. 12 volts with the ignition SW at ACC or ON position
- (B) 9-Ground : Always approx. 12 volts
- (C)25-Ground : Always approx. 12 volts
- (C)15-Ground : Always continuity

D44 Driver Door ECU

- 21-Ground : Approx. 12 volts with the ignition SW at ON position
- 23-Ground : Always approx. 12 volts
- 25-Ground : Always approx. 12 volts
- 13-Ground : Always continuity

F17 Front Passenger Door ECU

- 19-Ground : Approx. 12 volts with the ignition SW at ON position
- 12-Ground : Always approx. 12 volts
- 20-Ground : Always approx. 12 volts
- 8-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B8	66	D43	70	J47	A 68
B9	A 66	D44	70	J48	B 68
B10	B 66	E8	64	J49	A 68
B11	C 66	F1	64	J50	B 68
B12	70	F2	64	J58	68
C11	A 66	F13	34, 64	M6	70
C12	B 66	F17	70	O7	69
C15	66	G2	B 64	O8	70
C16	66	H1	64	P5	69
D2	64	H2	64	P11	71
D6	67	H7	64	P12	71
D14	70	H8	64	P21	69
D15	70	I22	67	P22	71
D16	70	I26	70	P25	71
D17	70	J31	65	P26	71
D32	67	J32	65	P27	71
D34	70	J34	65	P28	71
D35	70	J36	A 68	R4	71
D36	70	J37	B 68	S3	69
D37	70	J38	A 68	T15	65
D38	70	J39	B 68	U1	69
D39	70	J42	A 68	V6	71
D40	70	J43	B 68	V7	71
D41	70	J45	68	W5	65
D42	70	J46	68		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)
3	39	Engine Room R/B No.3 (Engine Compartment Left)

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1D		
1E		
1F		
1G		
1H		
1J		
1K	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L	45	Roof Wire and Driver Side J/B (Lower Finish Panel)
1M		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2F		
2G		
2H		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3C		
3D		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		
4D		
4E		

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB2	90	Engine No.2 Wire and Engine Room Main Wire (Under the Engine Room R/B)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA7		
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF5	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IF6		
IJ2	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IK2		
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)
BP3	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

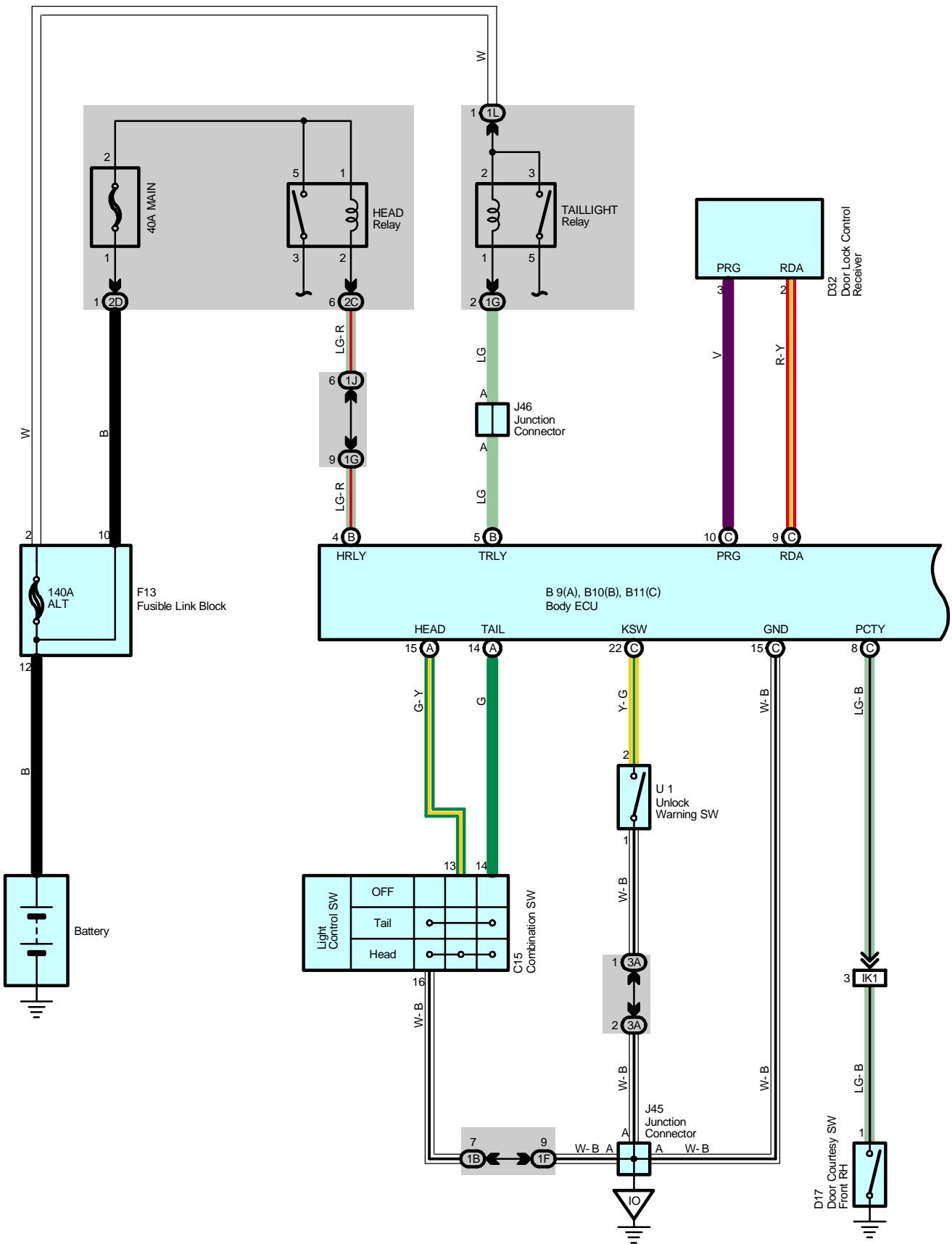
 : **Ground Points**

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
IN	92	Right Kick Panel
IO	92	Left Kick Panel
BQ	96	Left Side of Center Pillar
BS	96	Surrounding of the Front of the Fuel Tank

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B1	96	Roof Wire	B5	96	Floor Wire
B4	96	Floor Wire	B6	96	Floor No.2 Wire

Light Auto Turn Off System (Double Cab)



Light Auto Turn Off System (Double Cab)

System Outline

With the light control SW at TAIL position, and the ignition SW turned to ACC or OFF position from ON or ST position, the tail lights will be turned off when the driver's door is opened.

When the ignition SW is turned to ACC or OFF position from ON or ST position with the headlights on, the headlights will be turned off 30 seconds after all the doors are closed.

The light goes off immediately when all the doors are locked using the wireless door lock.

Service Hints

HEAD Relay

5-3 : Closed with the light control SW at HEAD position or the dimmer SW at FLASH position

Closed with the engine running and the parking brake pedal released (w/ daytime running light)

C15 Combination SW

13-16 : Closed with the light control SW at HEAD position

14-16 : Closed with the light control SW at TAIL or HEAD position

D16 Door Courtesy SW Front LH

1-Ground : Continuity with the front LH door open

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B9	A 66	D34	70	J45	68
B10	B 66	D35	70	J46	68
B11	C 66	D38	70	J49	A 68
C15	66	D39	70	J50	B 68
D16	70	F13	34, 64	U1	69
D17	70	J38	A 68		
D32	67	J39	B 68		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1G		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2D		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3D		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)

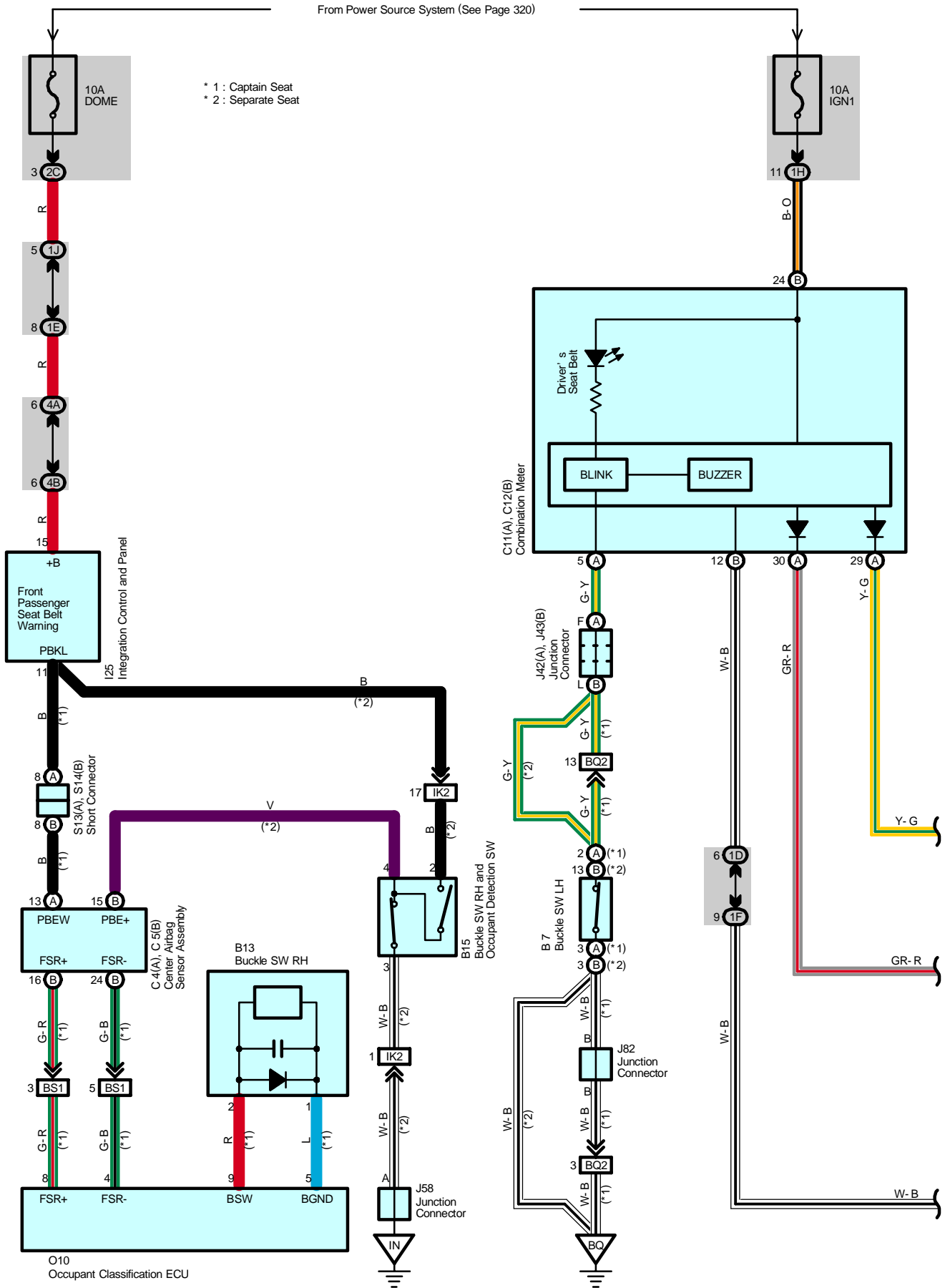
□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)

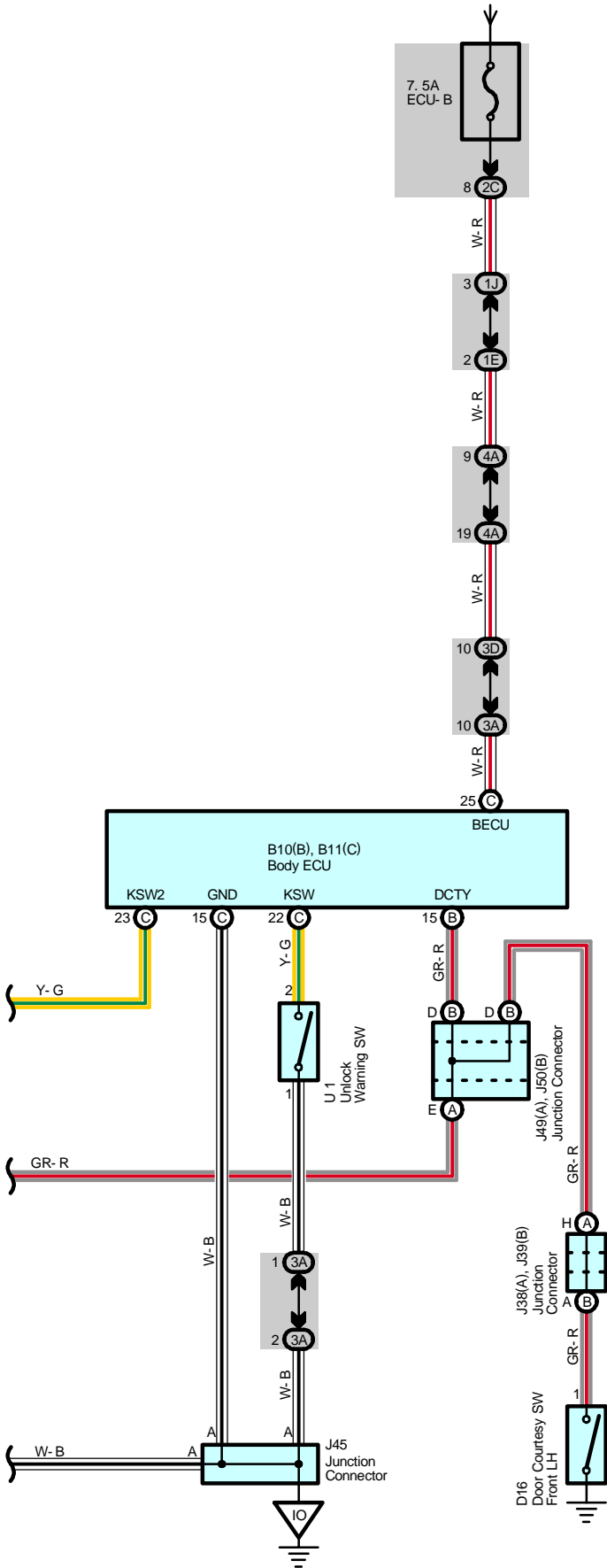
▽ : Ground Points

Code	See Page	Ground Points Location
IO	92	Left Kick Panel

Key Reminder and Seat Belt Warning (Double Cab)



From Power Source System (See Page 320)



Key Reminder and Seat Belt Warning (Double Cab)

System Outline

1. Seat Belt Warning

In case the driver has not fastened the seat belt when the ignition SW is turned ON, a warning light flashes, and the warning buzzer goes on.

2. Key Reminder

In case the driver's door is opened with the key in the key cylinder and the ignition SW at ACC or OFF position, a warning buzzer goes on.

Service Hints

B7 Buckle SW LH

2-3 : Open with the driver's seat belt in use

D16 Door Courtesy SW Front LH

1-Ground : Closed with the front LH door open

U1 Unlock Warning SW

1-2 : Closed with the ignition key in cylinder

C11 (A), C12 (B) Combination Meter

(A) 5-Ground : Continuity with the driver's seat belt not use

(B)12-Ground : Always continuity

(B)24-Ground : Approx. 12 volts with the ignition SW at ON position

B10 (B), B11 (C) Body ECU

(C)25-Ground : Always approx. 12 volts

(C)15-Ground : Always continuity

(C)22-Ground : Continuity with the ignition key in cylinder

(B)15-Ground : Continuity with the front LH door open

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B7	72	C12 B	66	J49 A	68
B10 B	66	D16	70	J50 B	68
B11 C	66	I25	67	J58	68
B13	72	J38 A	68	J82	72
B15	70	J39 B	68	O10	72
C4 A	66	J42 A	68	S13 A	69
C5 B	66	J43 B	68	S14 B	69
C11 A	66	J45	68	U1	69

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1H		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3D		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4B		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)
BQ2	98	Floor No.2 Wire and Seat No.2 Wire (Under the Driver's Seat)
BS1	98	Seat No.1 Wire and Floor Wire (Under the Front Passenger's Seat)



: Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel
BQ	96	Left Side of Center Pillar

B 9(A), B10(B), B11(C)
Body ECU

ILE

8 B

L-B

L-B

L-B

L-B

L-B

L-B

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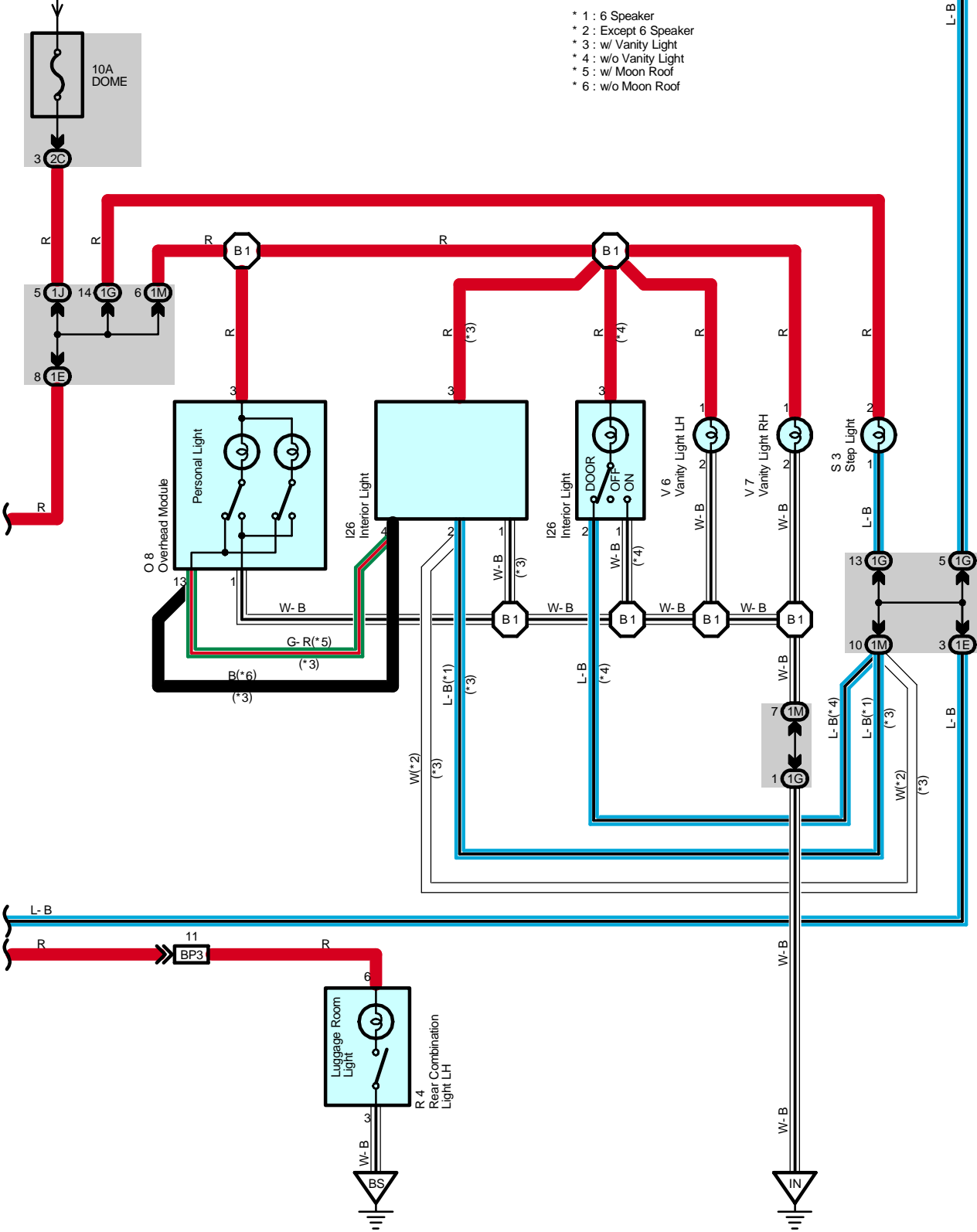
L-B

L-B

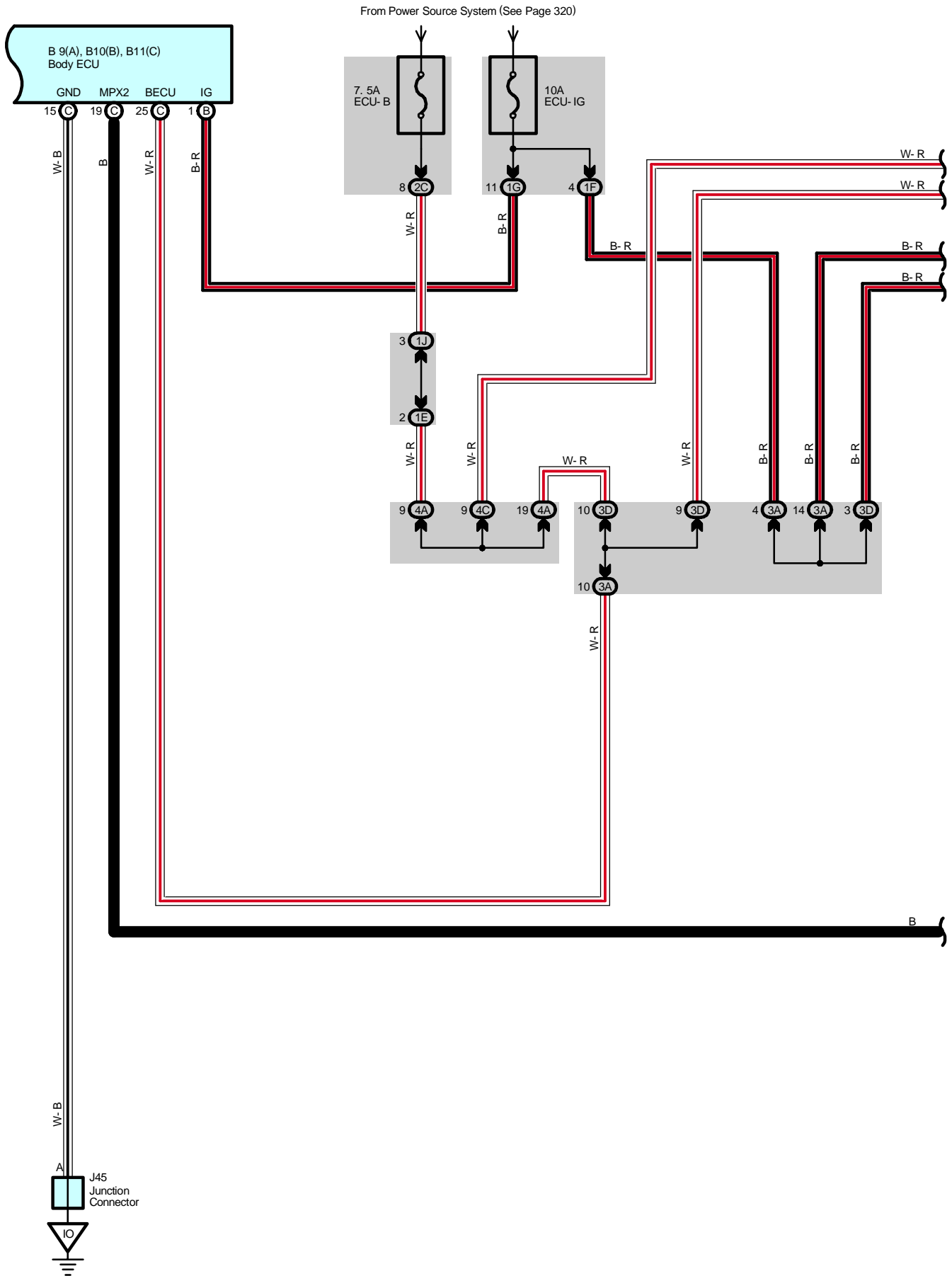
L-B

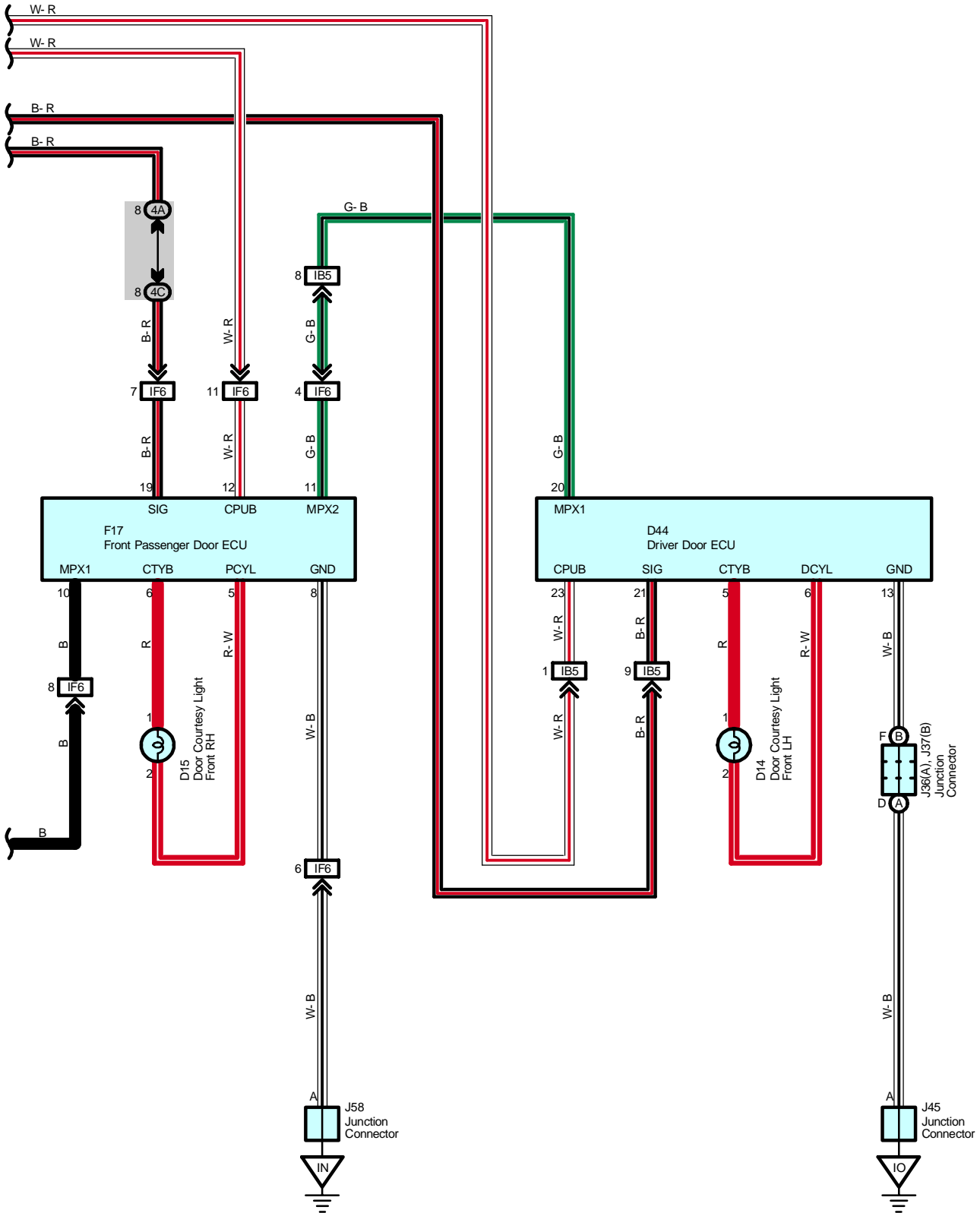
From Power Source System (See Page 320)

- * 1 : 6 Speaker
- * 2 : Except 6 Speaker
- * 3 : w/ Vanity Light
- * 4 : w/o Vanity Light
- * 5 : w/ Moon Roof
- * 6 : w/o Moon Roof



Interior Light (Double Cab)





Interior Light (Double Cab)

Service Hints

D16, D17, D38, D39 Door Courtesy SW Front LH, RH, Rear LH, RH

1-Ground : Closed with the door open

B 9 (A), B10 (B), B11 (C) Body ECU

(B) 1-Ground : Approx. 12 volts with the ignition SW at ON position

(C)15-Ground : Always continuity

(C)25-Ground : Always approx. 12 volts

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B9	A 66	D37	70	J43	B 68
B10	B 66	D38	70	J45	68
B11	C 66	D39	70	J49	A 68
C11	A 66	D44	70	J50	B 68
C12	B 66	F17	70	J58	68
D14	70	I22	67	O8	70
D15	70	I26	70	R4	71
D16	70	J36	A 68	S3	69
D17	70	J37	B 68	V6	71
D34	70	J38	A 68	V7	71
D35	70	J39	B 68		
D36	70	J42	A 68		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1G		
1H		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1M	45	Roof Wire and Driver Side J/B (Lower Finish Panel)
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3D		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		
4D		
4E		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IK2		
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)
BP3	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)



: Ground Points

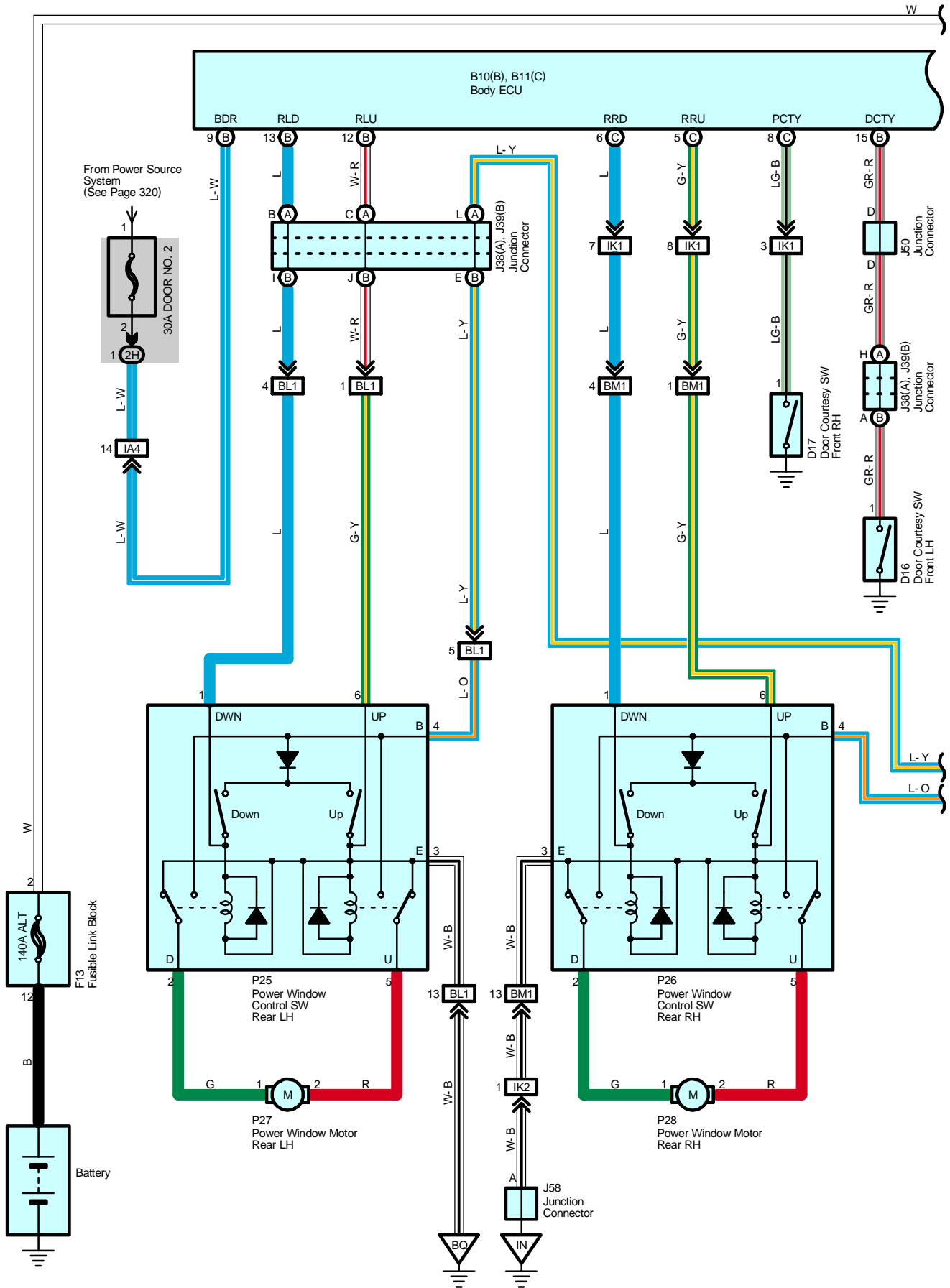
Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel
BS	96	Surrounding of the Front of the Fuel Tank

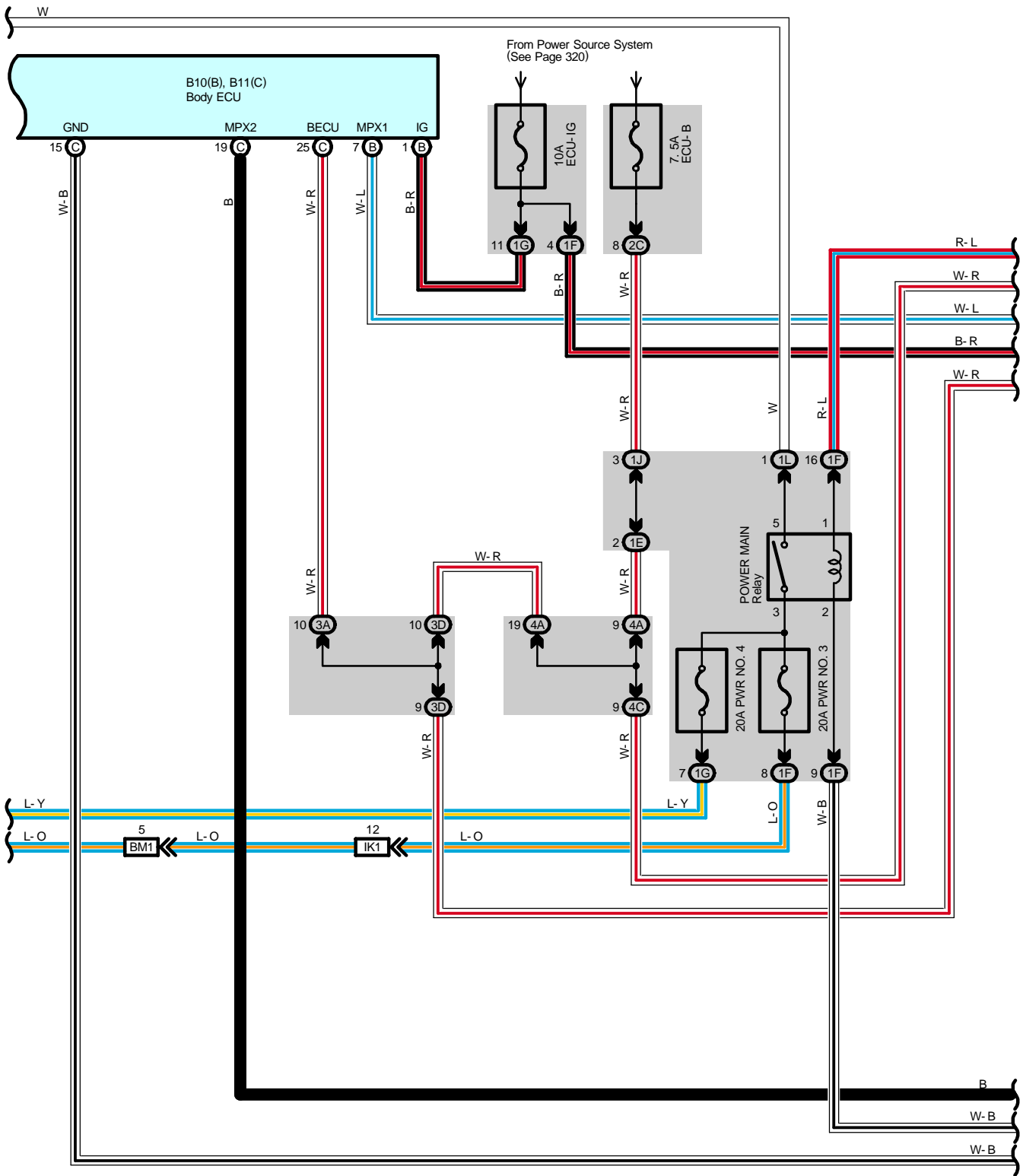


: Splice Points

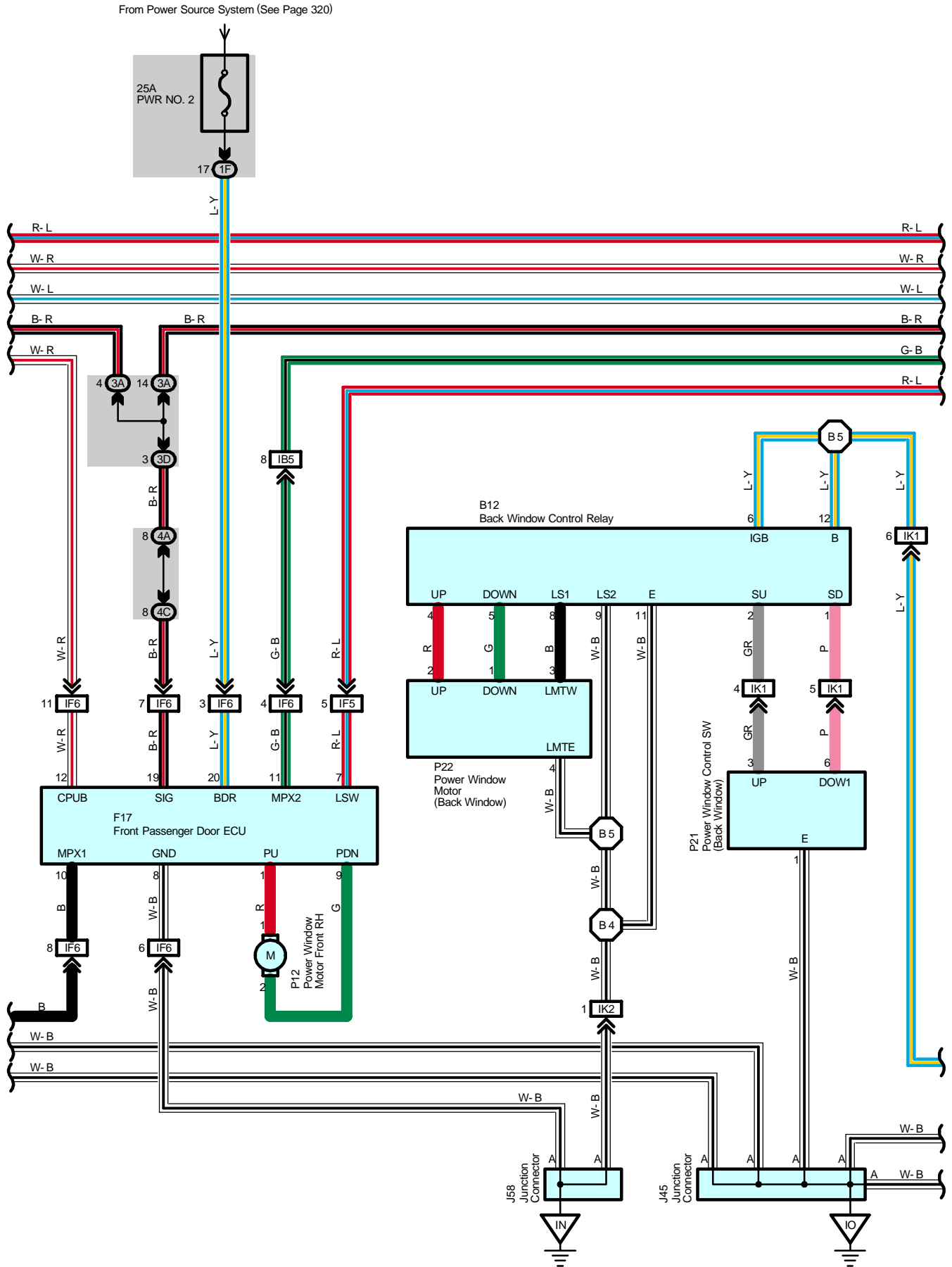
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B1	96	Roof Wire	B6	96	Floor No.2 Wire

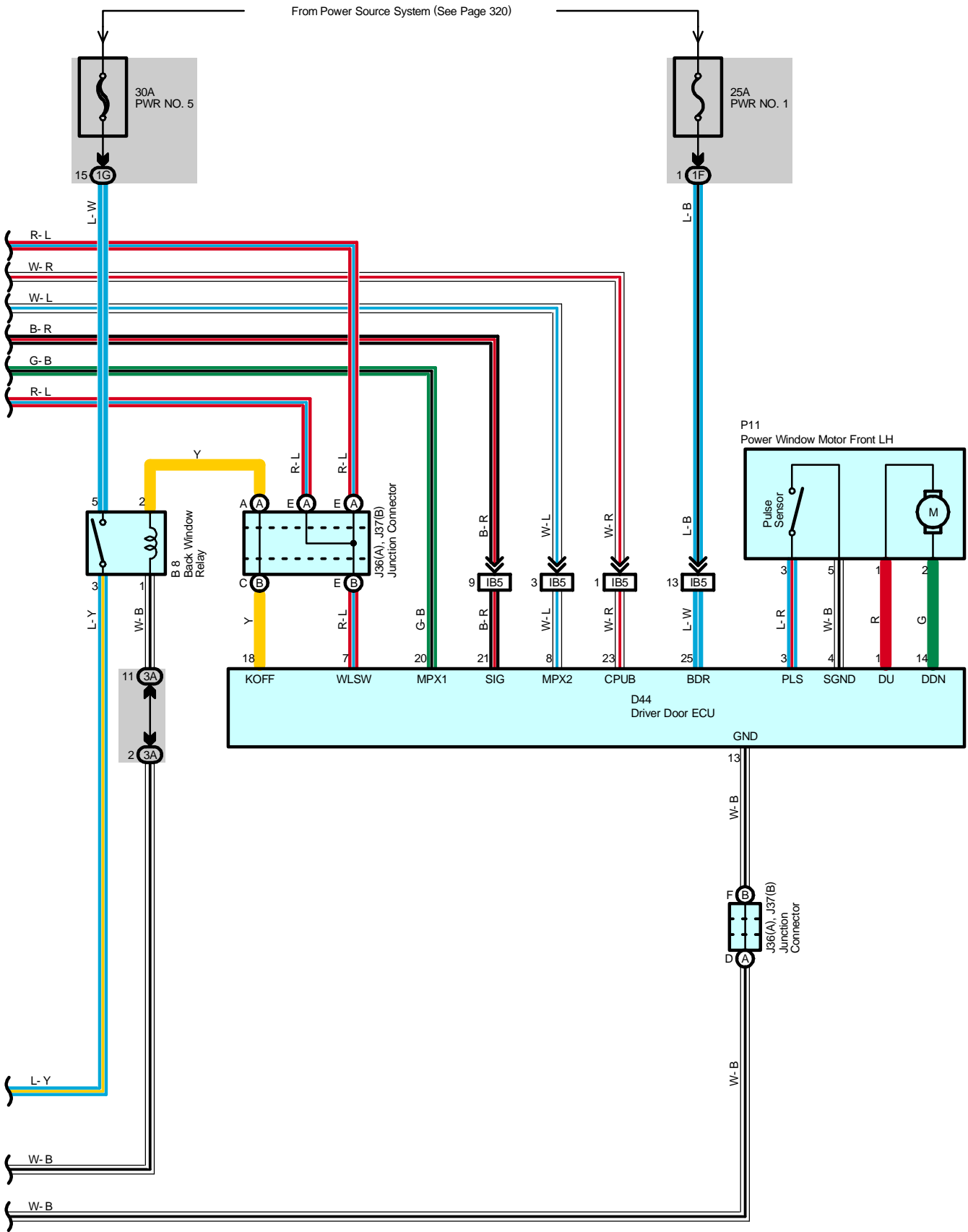
Power Window (Double Cab)





Power Window (Double Cab)





Power Window (Double Cab)

System Outline

The power window motor will operate when the power window SW, remote control SW, or the key-linked SW is operated.

1. Power Window SW Manual/Automatic Operation

When the ignition SW is turned ON, or during key-off operation stand-by mode, the power window can be operated by the power window SW.

2. Remote Control SW Manual/Automatic Operation

When the ignition SW is turned ON, or during key-off operation stand-by mode, the power window can be operated by the remote control SW. The front passenger, rear left, right windows can be operated according to the remote control signals from the DRIVER DOOR ECU.

3. Key-Off Operation

With all the doors closed, within 43 seconds after the ignition switch has been turned to OFF from ON, the power window can be operated. However, if the front door is opened, the power window cannot be operated.

Service Hints

B10 (B), B11 (C) Body ECU

- (B) 1-Ground : Approx. 12 volts with the ignition SW at ON position
- (B) 9-Ground : Always approx. 12 volts
- (C)25-Ground : Always approx. 12 volts
- (C)15-Ground : Always continuity

D44 Driver Door ECU

- 21-Ground : Approx. 12 volts with the ignition SW at ON position
- 23-Ground : Always approx. 12 volts
- 25-Ground : Always approx. 12 volts
- 13-Ground : Always continuity

F17 Front Passenger Door ECU

- 19-Ground : Approx. 12 volts with the ignition SW at ON position
- 12-Ground : Always approx. 12 volts
- 20-Ground : Always approx. 12 volts
- 8-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B8	66	F17	70	P11	71
B10	B 66	J36	A 68	P12	71
B11	C 66	J37	B 68	P21	69
B12	70	J38	A 68	P22	71
D16	70	J39	B 68	P25	71
D17	70	J45	68	P26	71
D44	70	J50	68	P27	71
F13	34, 64	J58	68	P28	71

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
1G		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2H		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3D		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF5	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IF6		
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IK2		
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)

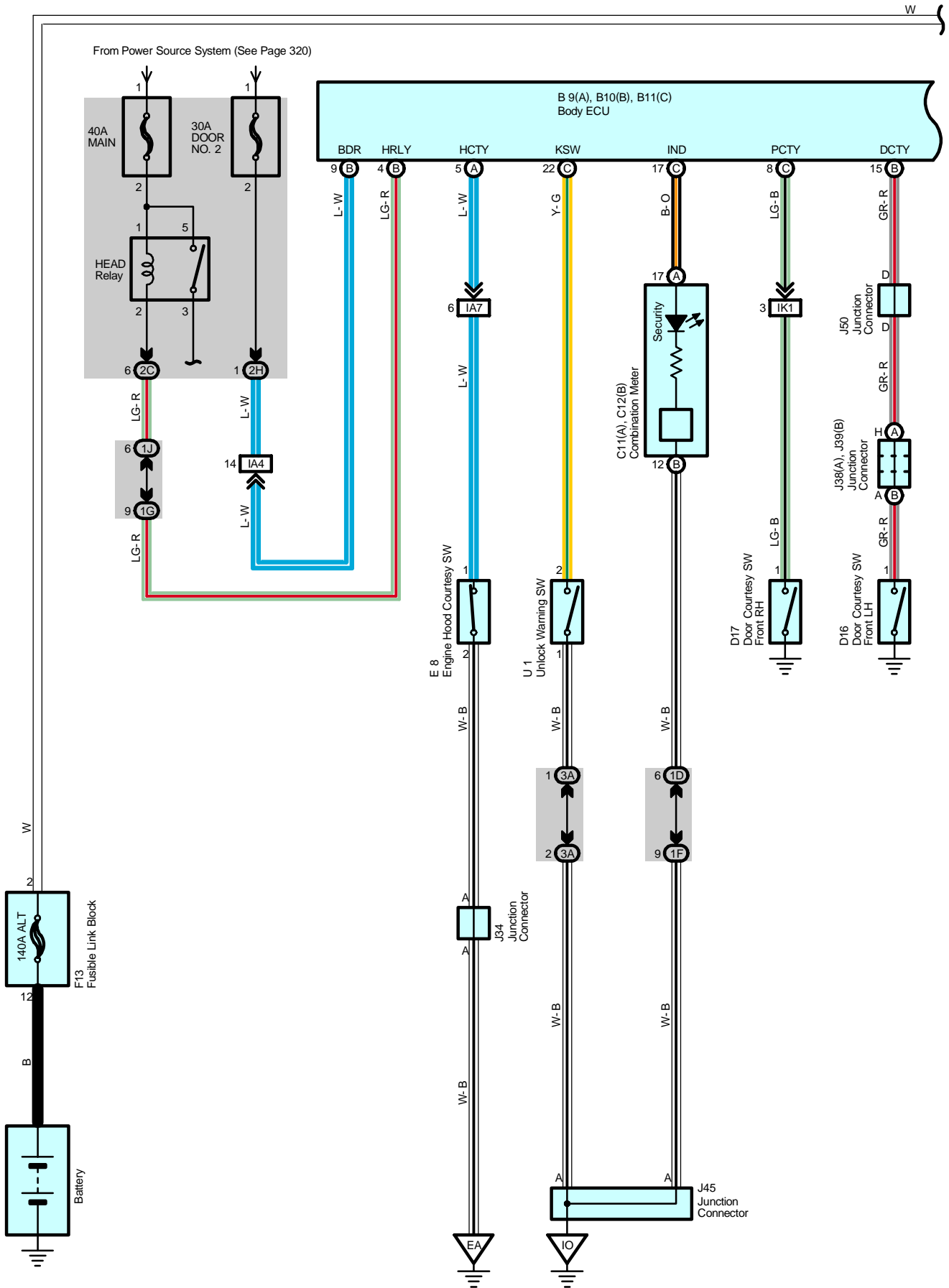
 : **Ground Points**

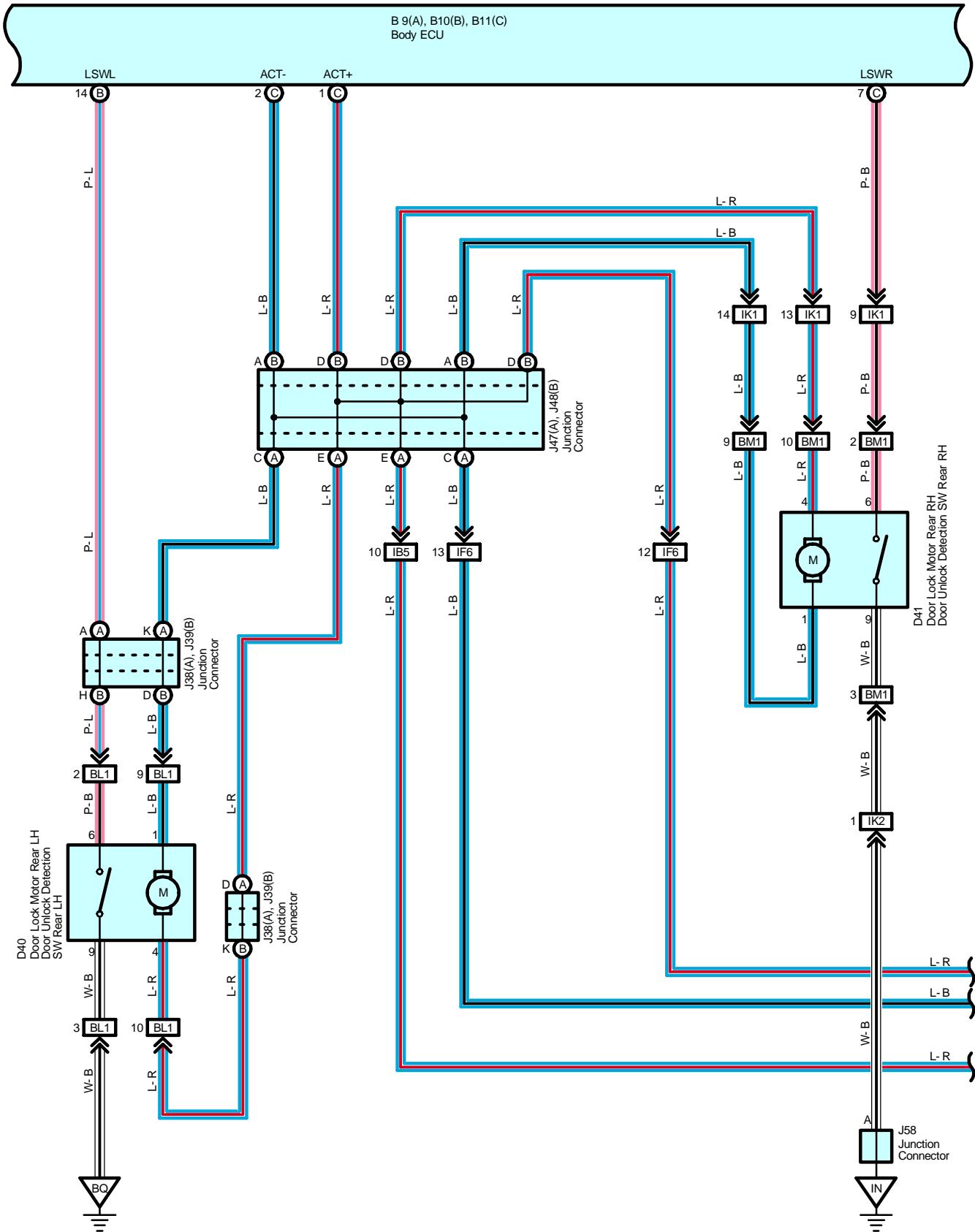
Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel
BQ	96	Left Side of Center Pillar

 : **Splice Points**

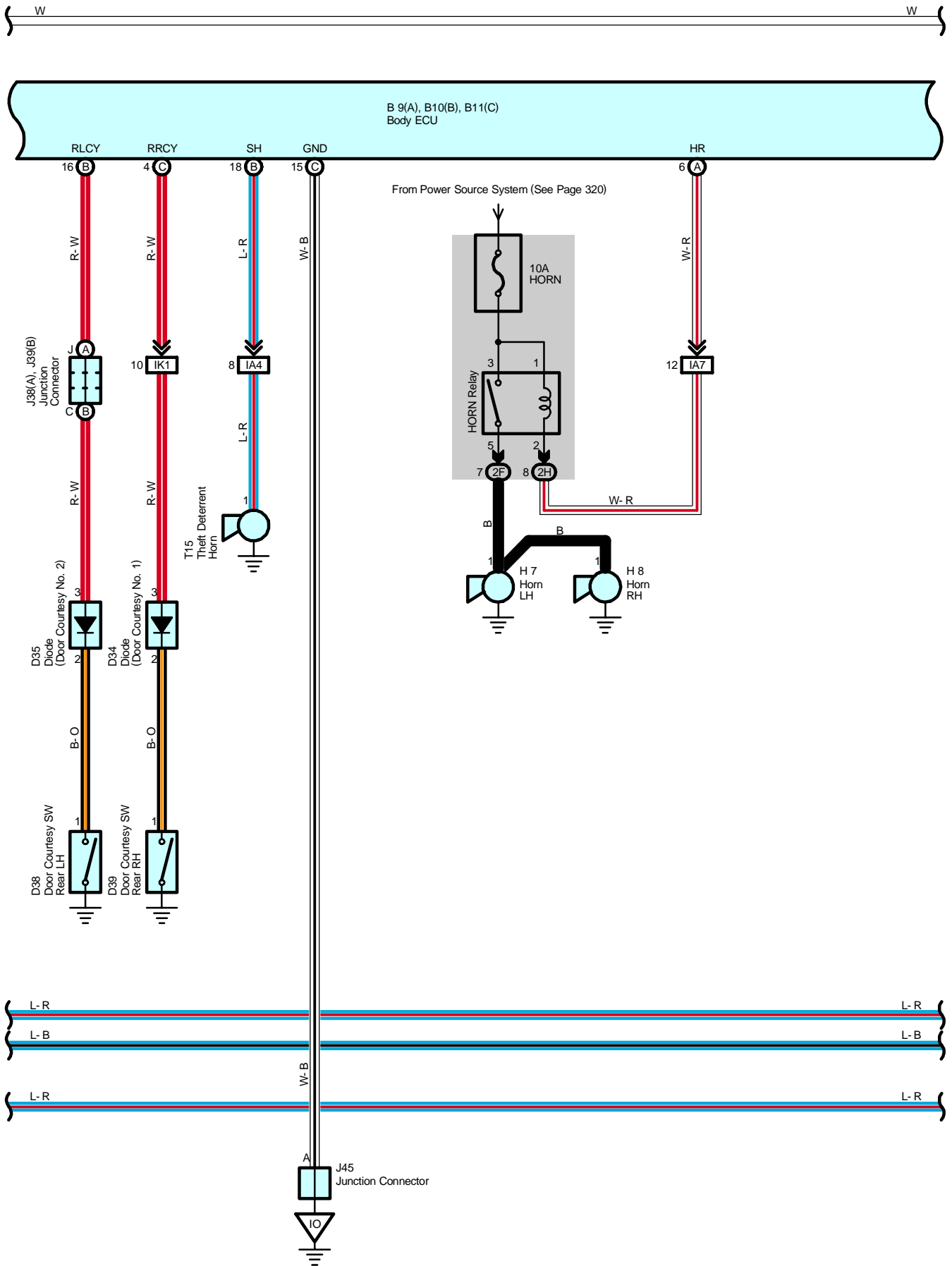
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B4	96	Floor Wire	B5	96	Floor Wire

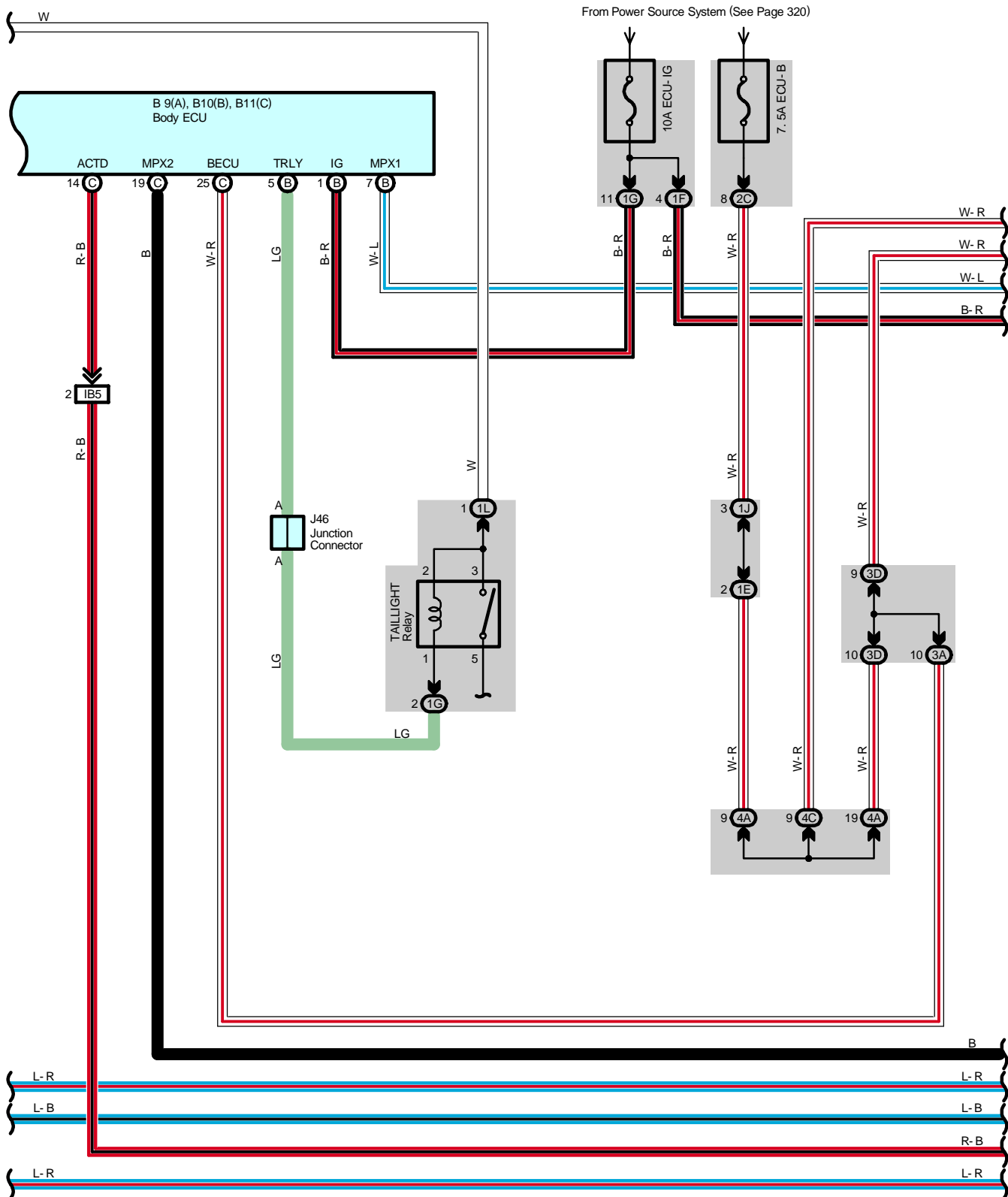
Door Lock Control and Theft Deterrent (Double Cab)



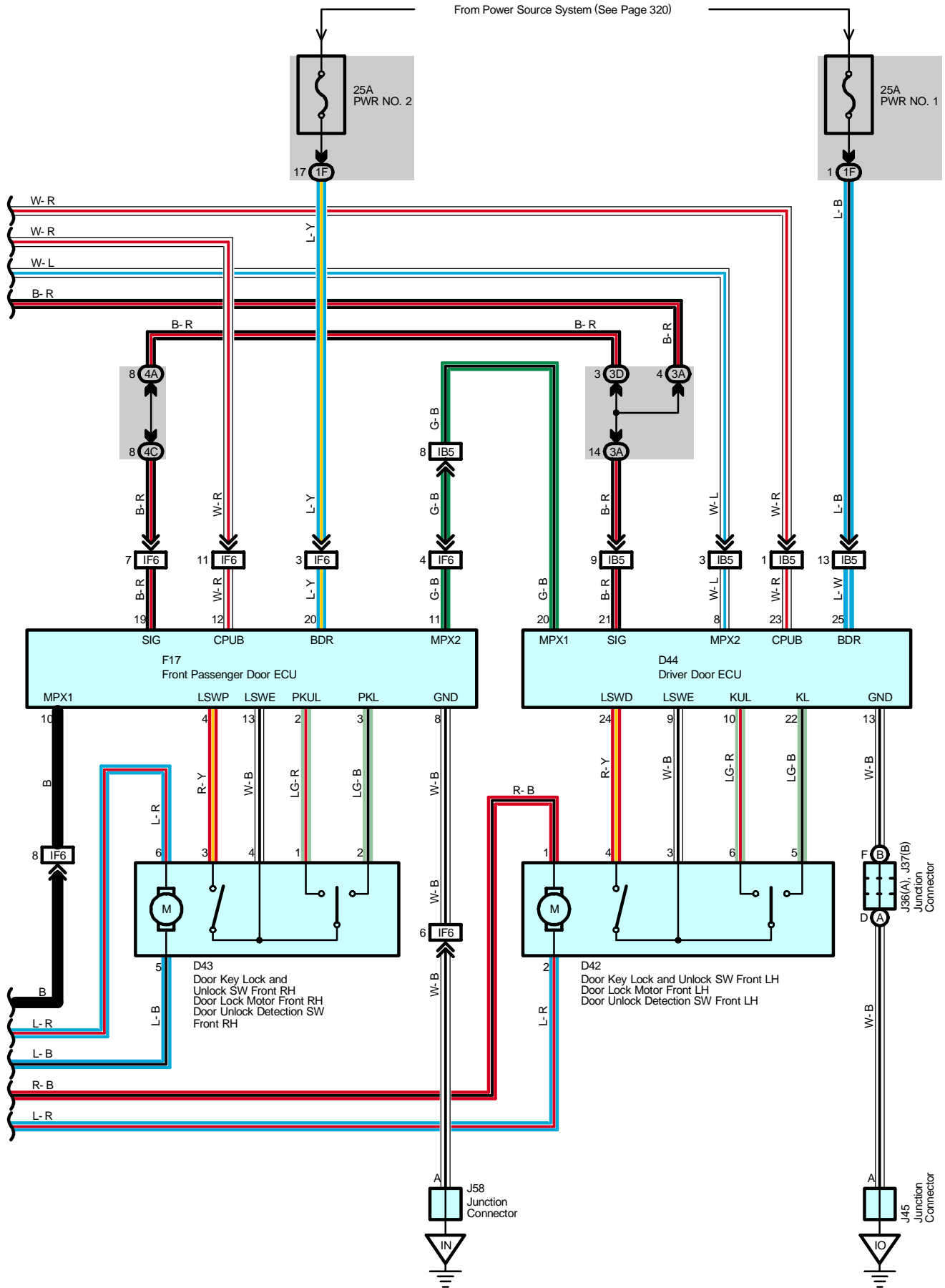


Door Lock Control and Theft Deterrent (Double Cab)





Door Lock Control and Theft Deterrent (Double Cab)



System Outline

1. Manual Unlock Operation

When the door lock control SW of the driver's or passenger's side door is pushed to UNLOCK, the door lock will unlock.

2. Manual Lock Operation

When the door lock control SW of the driver's or passenger's side door is pushed to LOCK, the door lock will lock.

3. Door Key Unlock Operation

* Unlock operation from driver's side door

When the driver's side door is unlocked once using the ignition key, only the driver's side door is unlocked. If this operation is repeated within 3 seconds, all the other doors are unlocked.

* Unlock operation from front passenger's side door

When the front passenger's side door is unlocked using the ignition key, all the other doors are unlocked, too.

Service Hints

D42 Door Lock Motor, Door Key Lock and Unlock SW and Door Unlock Detection SW Front LH

2-Ground : Approx. 12 volts with the door lock motor at lock operate

1-Ground : Approx. 12 volts with the door lock motor at unlock operate

5-3 : Closed with the door lock cylinder locked with key

6-3 : Closed with the door lock cylinder unlocked with key

D43 Door Lock Motor, Door Key Lock and Unlock SW and Door Unlock Detection SW Front RH

6-Ground : Approx. 12 volts with the door lock motor at lock operate

5-Ground : Approx. 12 volts with the door lock motor at unlock operate

2-4 : Closed with the door lock cylinder locked with key

1-4 : Closed with the door lock cylinder unlocked with key

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
B9	A	66	D41	70	J38	A	68
B10	B	66	D42	70	J39	B	68
B11	C	66	D43	70	J45		68
C11	A	66	D44	70	J46		68
C12	B	66	E8	64	J47	A	68
D16		70	F13	34, 64	J48	B	68
D17		70	F17	70	J50		68
D34		70	H7	64	J58		68
D35		70	H8	64	T15		65
D38		70	J34	65	U1		69
D39		70	J36	A			
D40		70	J37	B			

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1G		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2F		
2H		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3D		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		

Door Lock Control and Theft Deterrent (Double Cab)

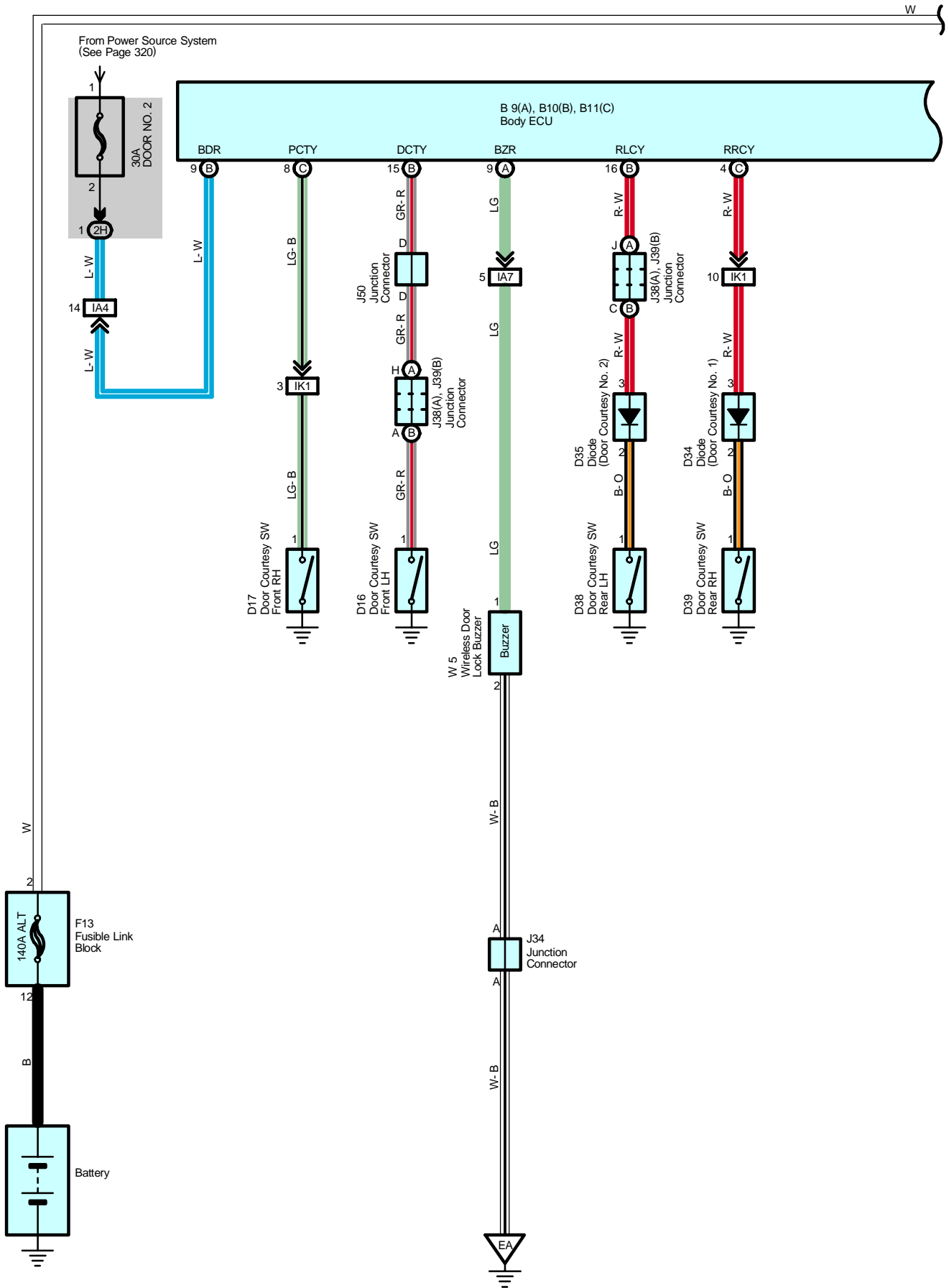
: Connector Joining Wire Harness and Wire Harness

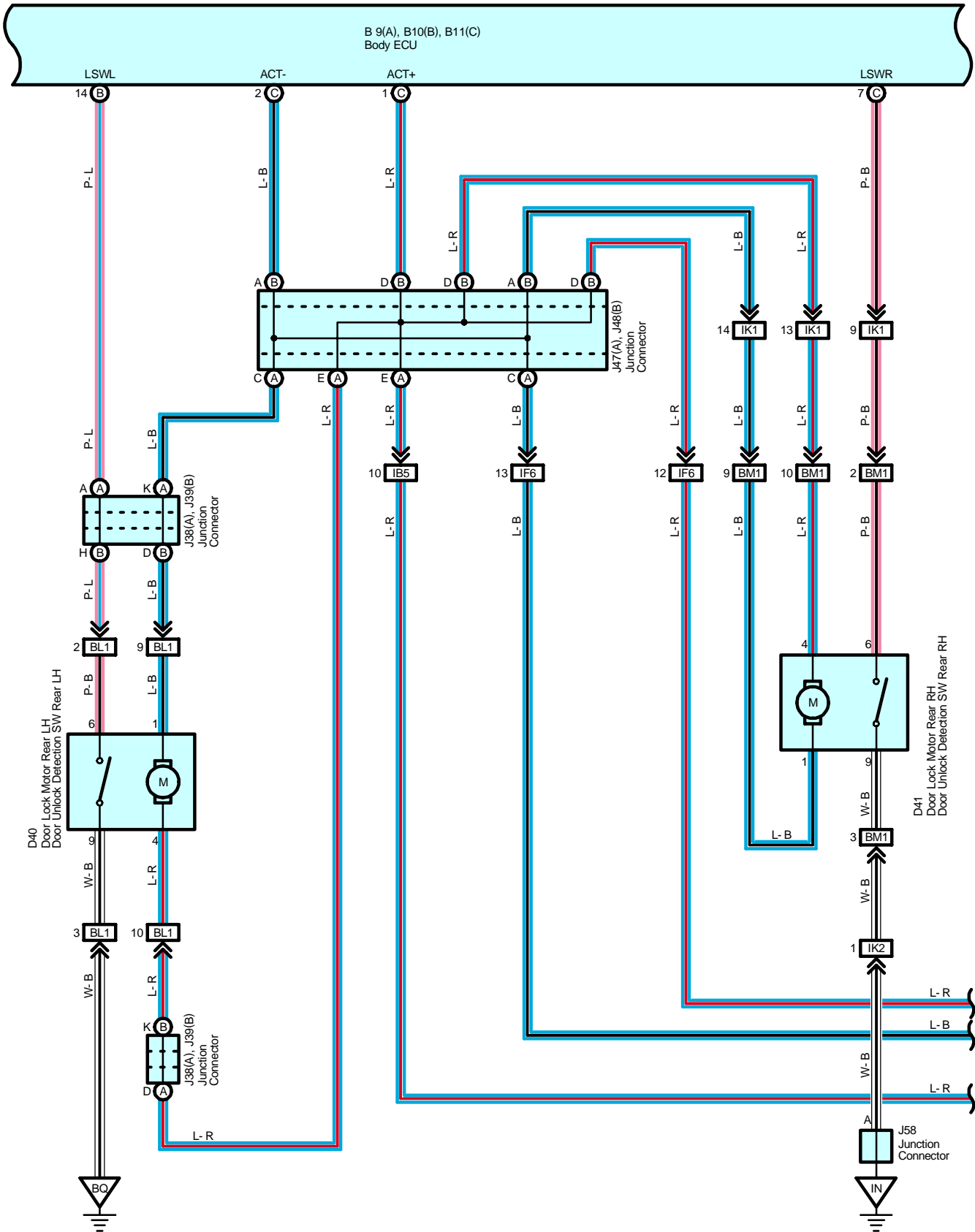
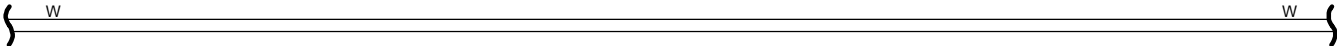
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA7		
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IK2		
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)

: Ground Points

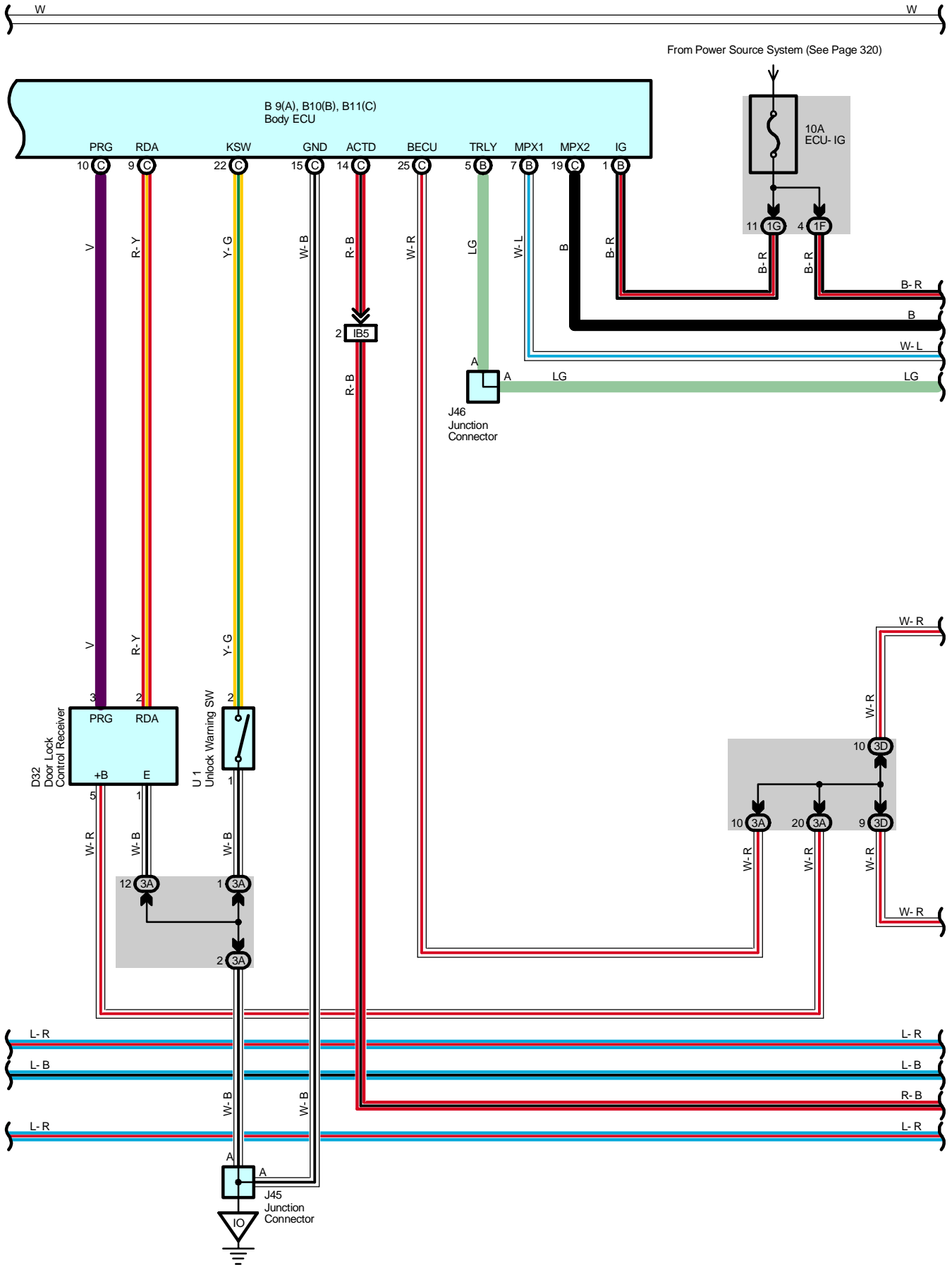
Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
IN	92	Right Kick Panel
IO	92	Left Kick Panel
BQ	96	Left Side of Center Pillar

Wireless Door Lock Control (Double Cab)





Wireless Door Lock Control (Double Cab)



System Outline

The current flows continuously from DOOR NO.2 fuse to body ECU TERMINAL BDR, from PWR NO.2 fuse to front passenger door ECU TERMINAL BDR, from PWR NO.1 fuse to driver door ECU TERMINAL BDR, and from ECU-B fuse to body ECU, front passenger ECU, driver door ECU, door control receiver.

1. Wireless Door Lock/Unlock Normal Operation:

Lock operation

All the doors are locked when the lock SW of the transmitter is operated.

Unlock operation

When the unlock SW of the transmitter is operated, the driver's door is unlocked, and if the SW is operated again within 3 seconds, all the doors are unlocked.

2. Automatic Lock Operation

When the doors are unlocked by operating the unlock SW of the transmitter, if no door is opened or the ignition key is not inserted in the key cylinder within 30 seconds, all the doors will be locked again.

3. Lock/Unlock Operation Audiovisual Effect Check

When the vehicle is locked by the transmitter, the parking light & taillight flashes once, and a buzzer sounds once. When the vehicle is unlocked by the transmitter, the parking light & taillight flashes twice, and a buzzer sounds twice.

When the unlock SW of the transmitter is operated while all the doors are locked, the doors will be unlocked and the room light will come on.

4. Output Repeat Function

If there is not change in the lock condition of the vehicle after the lock signal is output from the transmitter, the lock signal is output again.

Service Hints

D16, D17, D38, D39 Door Courtesies SW Front LH, RH, Rear LH, RH

1-Ground : Closed with the door open

D42 Door Lock Motor, Door Key Lock and Unlock SW and Door Unlock Detection SW Front LH

2-Ground : Approx. 12 volts with the door lock motor at lock operate

1-Ground : Approx. 12 volts with the door lock motor at unlock operate

5-3 : Closed with the door lock cylinder locked with key

6-3 : Closed with the door lock cylinder unlocked with key

D43 Door Lock Motor, Door Key Lock and Unlock SW and Door Unlock Detection SW Front RH

6-Ground : Approx. 12 volts with the door lock motor at lock operate

5-Ground : Approx. 12 volts with the door lock motor at unlock operate

2-4 : Closed with the door lock cylinder locked with key

1-4 : Closed with the door lock cylinder unlocked with key

D40 Door Lock Motor and Door Unlock Detection SW Rear LH

4-Ground : Approx. 12 volts with the door lock motor at lock operate

1-Ground : Approx. 12 volts with the door lock motor at unlock operate

D41 Door Lock Motor and Door Unlock Detection SW Rear RH

4-Ground : Approx. 12 volts with the door lock motor at lock operate

1-Ground : Approx. 12 volts with the door lock motor at unlock operate

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
B9	A	66	D40	70	J38	A	68
B10	B	66	D41	70	J39	B	68
B11	C	66	D42	70	J45		68
D16		70	D43	70	J46		68
D17		70	D44	70	J47	A	68
D32		67	F13	34, 64	J48	B	68
D34		70	F17	70	J50		68
D35		70	J34	65	J58		68
D38		70	J36	A	68	U1	69
D39		70	J37	B	68	W5	65

Wireless Door Lock Control (Double Cab)

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
1G		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1L		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2H		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3D		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		

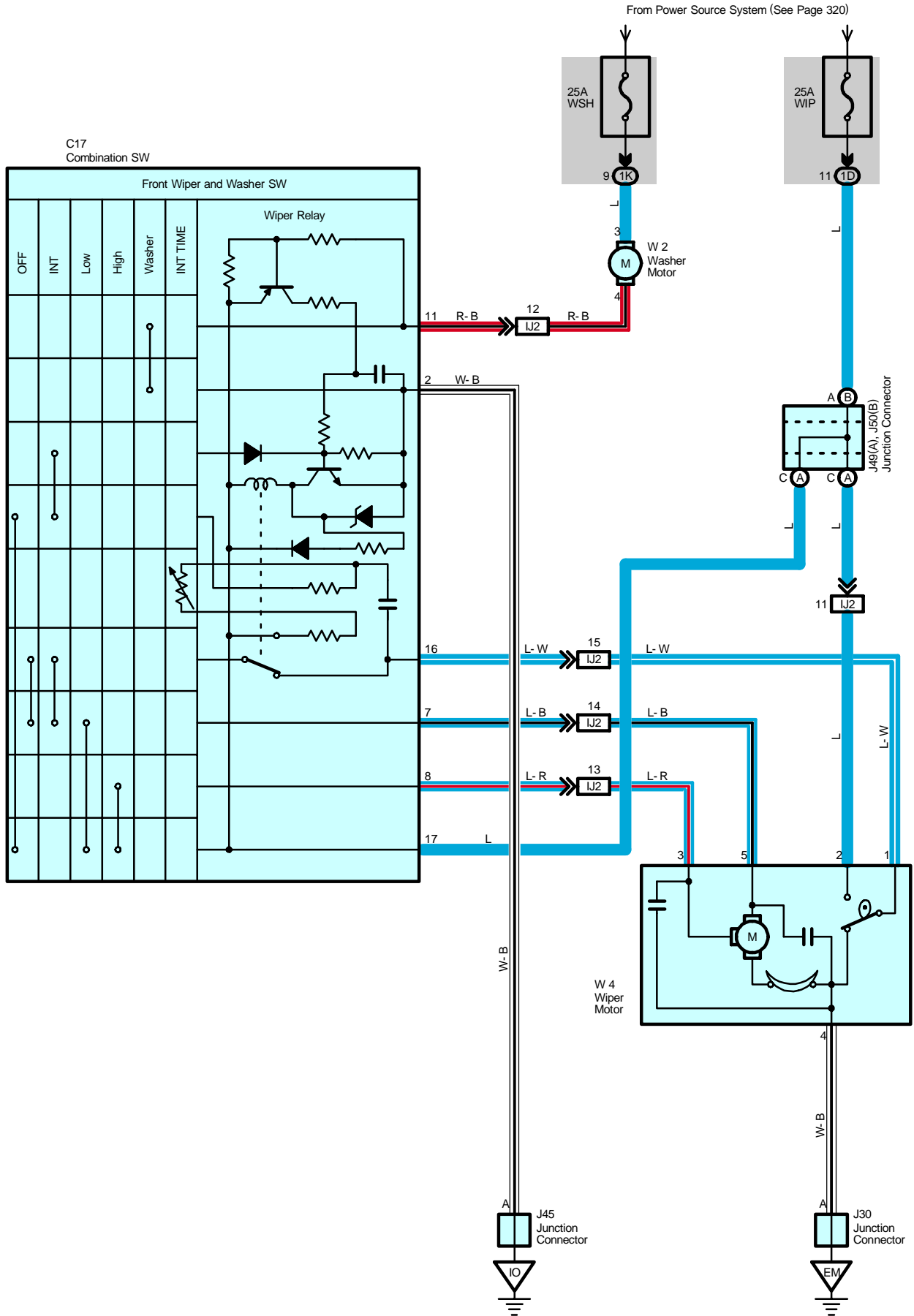
: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA7		
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IK2		
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)

: Ground Points

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
IN	92	Right Kick Panel
IO	92	Left Kick Panel
BQ	96	Left Side of Center Pillar

Wiper and Washer (Double Cab)



System Outline

With the ignition SW turned on, current flows to TERMINAL 17 of the wiper and washer SW and TERMINAL 2 of the wiper motor through the WIP fuse. The current flows to TERMINAL 3 of the washer motor through the WSH fuse.

1. Low Speed Position

With wiper SW turned to LOW position, current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 7 to TERMINAL 5 of the wiper motor to TERMINAL 4 to GROUND and causes the wiper motor to run at low speed.

2. High Speed Position

With wiper SW turned to HIGH position, current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 8 to TERMINAL 3 of the wiper motor to TERMINAL 4 to GROUND and causes the motor to run at high speed.

3. INT Position

With wiper SW turned to INT position, the relay operates and the current which is connected by relay function flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 2 to GROUND. This flowing the intermittent circuit and current flows from TERMINAL 17 of the wiper and washer SW to TERMINAL 7 to TERMINAL 5 of the wiper motor to TERMINAL 4 to GROUND and the wiper functions.

The intermittent operation is controlled by charging and discharging of the condenser installed in the relay and the intermittent time is controlled by a time control SW to change the charging time of the condenser.

4. Washer Interlocking Operation

With the washer SW pulled up, current flows from TERMINAL 3 of the washer motor to TERMINAL 4 to TERMINAL 11 of the wiper and washer SW to TERMINAL 2 to GROUND and causes to the washer motor to run, and the window washer is jetted. This causes current to flow to washer continuous operation circuit in TERMINAL 17 of the wiper and washer SW to TERMINAL 7 to TERMINAL 5 of the wiper motor to TERMINAL 4 to GROUND and the wiper functions.

Service Hints

C17 Combination SW

- 2-Ground : Always continuity
- 17-Ground : Approx. 12 volts with the ignition SW at ON position
- 7-Ground : Approx. 12 volts with the wiper and washer SW at LOW position
Approx. 12 volts every approx. 1.6 to 10.7 seconds intermittently with the wiper SW at INT position
- 16-Ground : Approx. 12 volts with the ignition SW on unless wiper motor at STOP position
- 8-Ground : Approx. 12 volts with the ignition SW on and wiper and washer SW at HIGH position
- 11-2 : Continuity with the washer SW on

W4 Wiper Motor

- 1-2 : Closed unless wiper motor at STOP position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C17	66	J49	A 68	W4	65
J30	65	J50	B 68		
J45	68	W2	65		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1K	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)

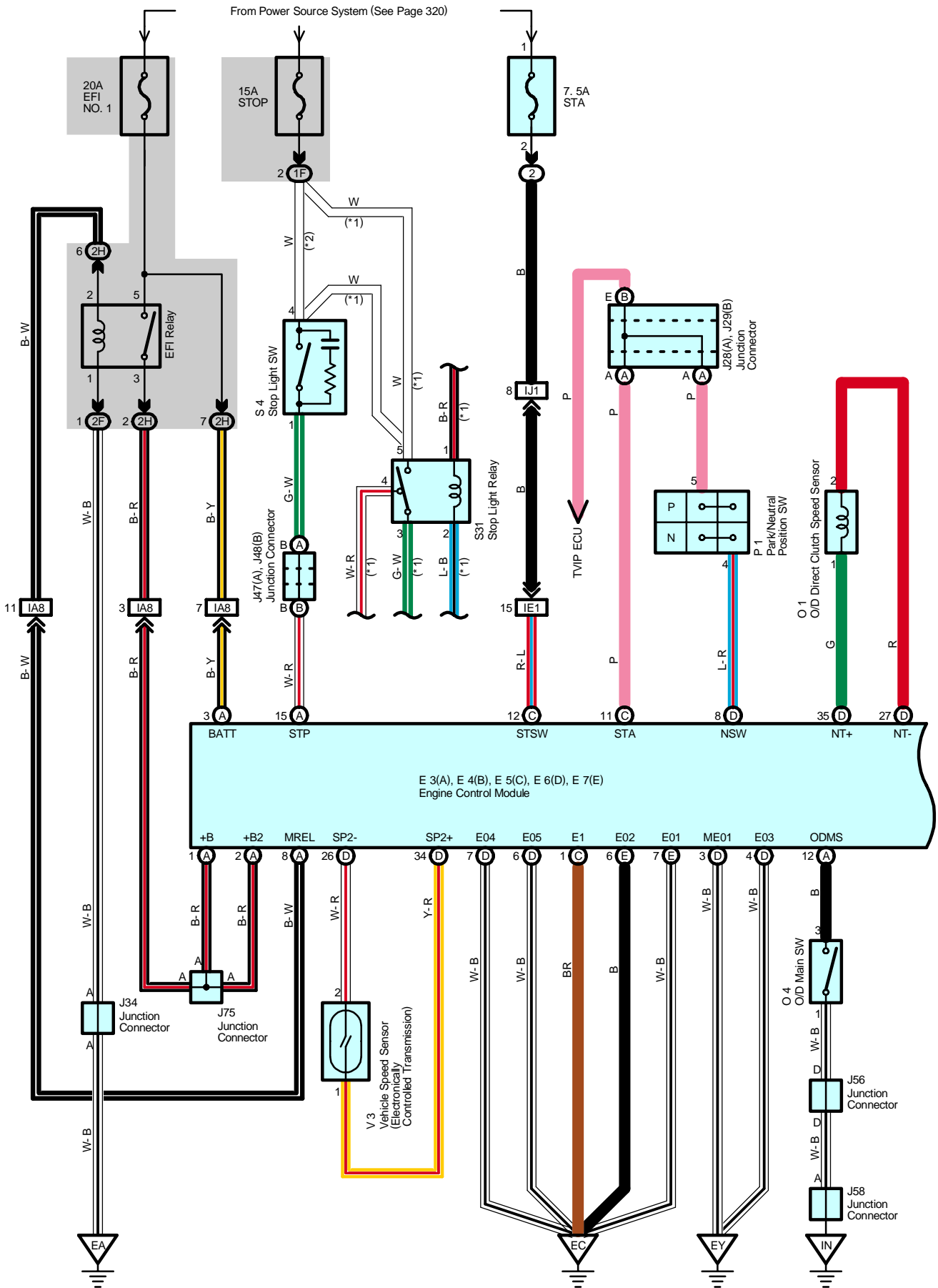
□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IJ2	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)

▽ : Ground Points

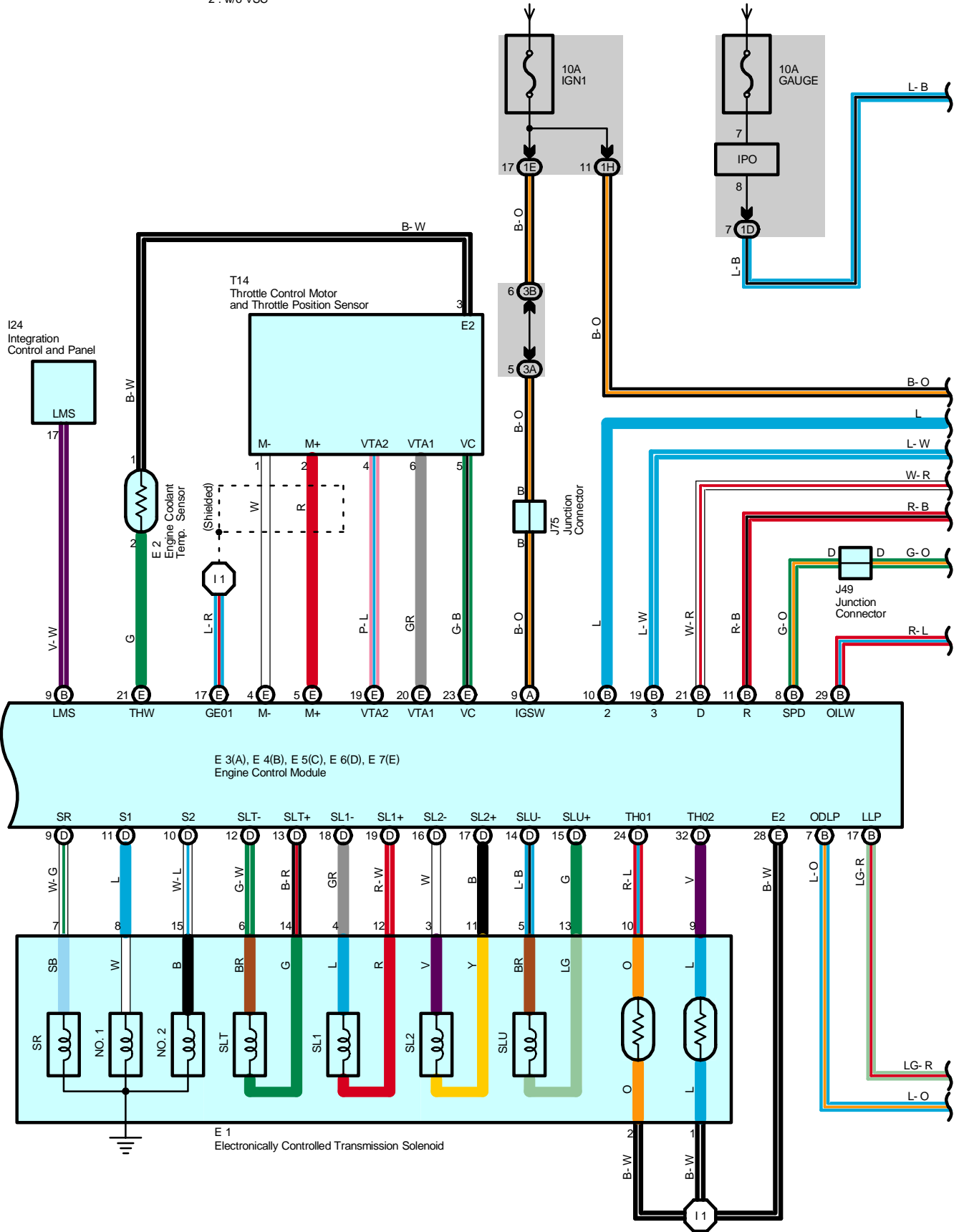
Code	See Page	Ground Points Location
EM	90	Radiator Side Support RH
IO	92	Left Kick Panel

ECT and A/T Indicator (Double Cab)

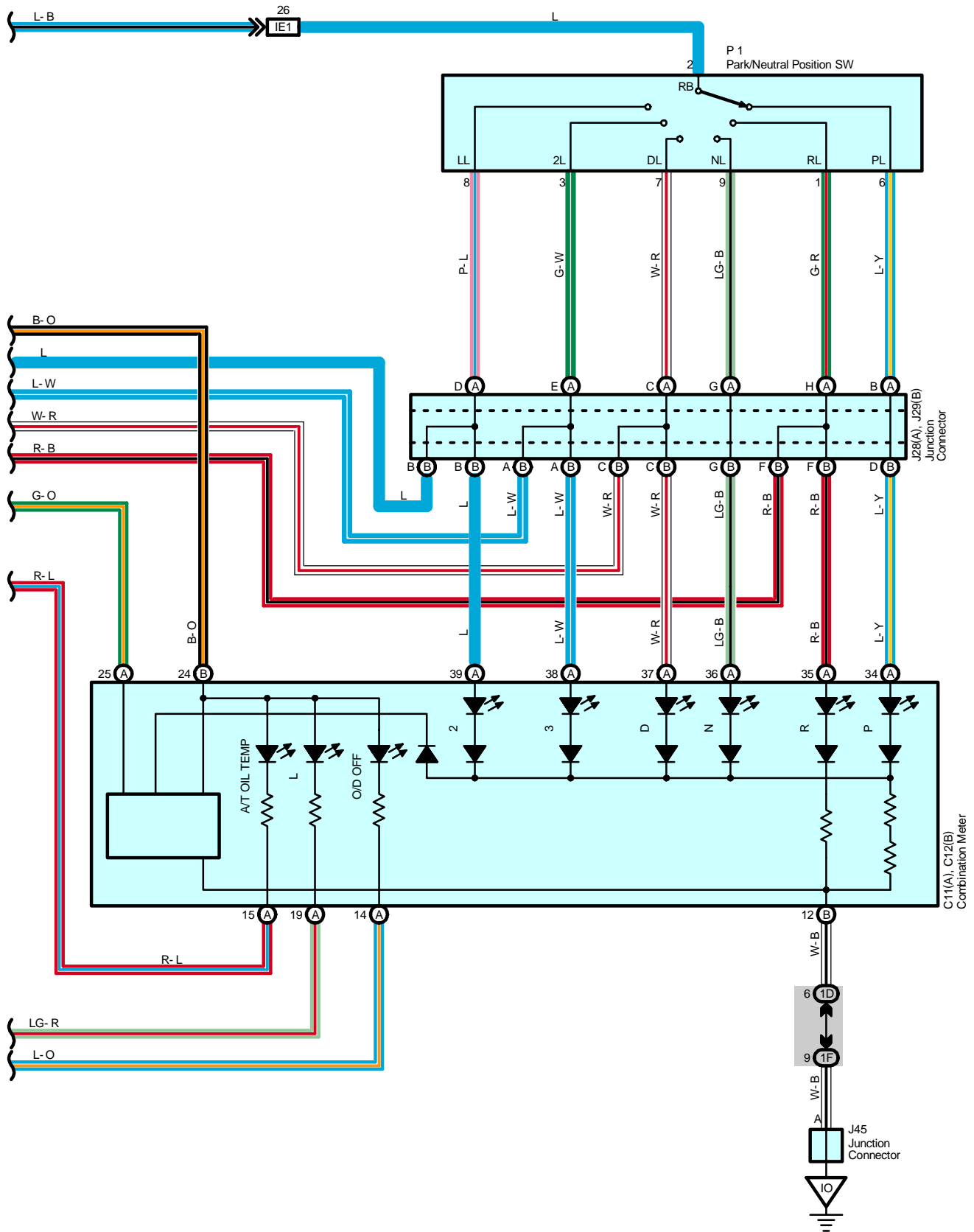


* 1 : w/ VSC
 * 2 : w/o VSC

From Power Source System (See Page 320)



ECT and A/T Indicator (Double Cab)



System Outline

The electronically controlled transmission electrically controls the, throttle pressure, lock-up pressure, and accumulator pressure etc. through the solenoid valve.

The electronically controlled transmission is a system which precisely controls the gear shift timing and lock-up timing in response to the vehicle's driving conditions and the engine condition detected by various sensors. It makes smooth driving possible by shift selection of the gear which is the most appropriate to the driving conditions at that time, and by preventing downing, squat and gear shift shock when starting off.

1. Gear Shift Operation

When driving, the engine warm up condition is input as a control signal from the engine coolant temp. sensor to TERMINAL THW of the engine control module, and the vehicle speed is input to TERMINAL SP2+ of the engine control module from the vehicle speed sensor. At the same time, the throttle valve opening signal from the throttle position sensor is input to TERMINALS VTA1, VTA2 of the engine control module as a throttle angle signal. Based on these signals, the engine control module selects the best shift position for the driving conditions and sends current to the electronically controlled transmission solenoid.

2. Lock-Up Operation

When the engine control module decides based on each signal that the lock-up condition has been met, the current flows through TERMINAL SLU+ of the engine control module to TERMINAL 5 of the electronically controlled transmission solenoid to TERMINAL 13 to TERMINAL SLU- of the engine control module to GROUND.

3. Stop Light SW Circuit

If the brake pedal is depressed (Stop light SW on) when driving in lock-up position, a signal is input to TERMINAL STP of the engine control module. As a result, the engine control module cuts the current to the solenoid to release the lock-up.

4. Overdrive Circuit

* O/D main SW on

When the O/D main SW is switched to ON position, a signal is input to TERMINAL ODMS of the engine control module, and enables shift change to the overdrive range, through the control of the engine control module.

* O/D main SW off

When the O/D main SW is switched to OFF position, a signal is input to TERMINAL ODMS of the engine control module, and prohibits shift change to the overdrive range through the control of the engine control module. When in the overdrive range already, shift down is made.

ECT and A/T Indicator (Double Cab)

Service Hints

E1 Electronically Controlled Transmission Solenoid

7, 8, 15-Ground : Approx. 13 Ω

O4 O/D Main SW

3-1 : Open with O/D main SW at ON position
 Closed with O/D main SW at OFF position

S4 Stop Light SW

1-2 : Closed with brake pedal depressed

E3(A), E4 (B), E5 (C), E6 (D), E7 (E) Engine Control Module

S1-E1 : 9-14 volts with vehicle not move and shift lever in D position

S2, SR-E1 : 0-1.5 volts with vehicle not move

STP-E1 : 7.5-14 volts with brake pedal depressed
 : 0-1.5 volts with brake pedal released

THW-E1 : 0.2-1.0 volts with idling, engine coolant temp. 60°C (140°F)-120 °C (248°F)

VTA1, VTA2-E1 : 0.4-1.0 volts with ignition SW on and throttle valve fully closed
 : 3.2-4.8 volts with ignition SW on and throttle valve fully open

VC-E1 : 4.5-5.5 volts with ignition SW at ON or ST position

ODMS-E1 : 9-14 volts with O/D main SW turned on
 : 0-3 volts with O/D main SW turned off

SPD-E1 : Pulse generation with vehicle moving

2-E1 : 7.5-14 volts with shift lever at 2 position
 : 0-1.5 volts with shift lever at except 2 position

L-E1 : 7.5-14 volts with shift lever at L position
 : 0-1.5 volts with shift lever at except L position

+B-E1 : 9-14 volts with ignition SW at ON or ST position

BATT-E1 : Always 9-14 volts

P1 Park/Neutral Position SW

2-6 : Closed with shift lever in P position

2-1 : Closed with shift lever in R position

2-9 : Closed with shift lever in N position

2-7 : Closed with shift lever in D position

2-3 : Closed with shift lever in 2 position

2-8 : Closed with shift lever in L position

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C11	A 66	I24	67	J58	68
C12	B 66	J28	A 68	J75	68
E1	64	J29	B 68	O1	65
E2	64	J34	65	O4	69
E3	A 67	J45	68	P1	65
E4	B 67	J47	A 68	S4	69
E5	C 67	J48	B 68	S31	69
E6	D 67	J49	68	T14	65
E7	E 67	J56	68	V3	65

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1H		
2F	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2H		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA8	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)

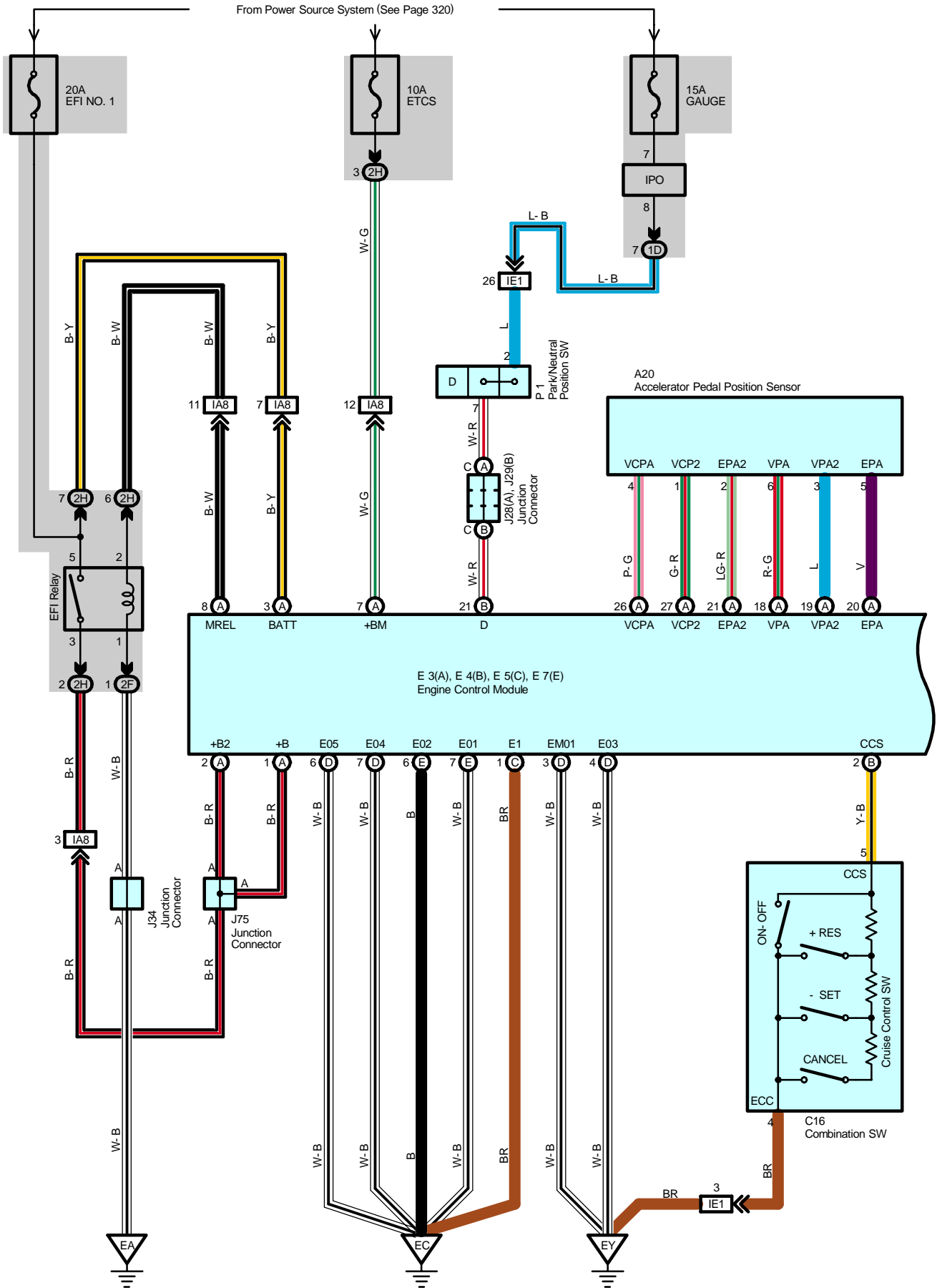
 : **Ground Points**

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
EC	90	Rear Bank of Left Cylinder Head
EY	90	Front Left Side of Cylinder Head
IN	92	Right Kick Panel
IO	92	Left Kick Panel

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I1	94	Engine Wire			

Cruise Control (Double Cab)



Cruise Control (Double Cab)

System Outline

The cruise control system is a constant vehicle speed controller which controls the opening angle of the engine throttle valve by the SW, and allows driving at a constant speed without depressing the accelerator pedal.

1. Set Control

When the - SET SW is operated while traveling with the ON-OFF SW on, the speed when the - SET SW is operated to off is memorized, and the vehicle speed is controlled at that speed.

2. Coast Control

When the - SET SW is operated to on, the cruise control opening angle requirement is turned to 0 to decrease the vehicle speed, and the speed when the - SET SW is operated to off is memorized, and the vehicle speed is controlled at that speed. Furthermore, every time the - SET SW is operated momentarily (Approx. 0.5 sec.) to on, the memorized vehicle speed is decreased by approx. 1.6 km/h (1.0 mph).

3. Accel Control

When the + RES SW is operated to on, the throttle motor rotates the throttle valve to open direction to increase the vehicle speed, and the speed when the + RES SW is operated to off is memorized, and the vehicle speed is controlled at that speed.

Furthermore, every time the + RES SW is operated momentarily (Approx. 0.5 sec.) to on, the memorized vehicle speed is increased by approx. 1.6 km/h (1.0 mph).

4. Manual Cancel Mechanism

If any of the following signals are input during cruise control traveling, the current to the motor flows in the direction to close the throttle valve, and cancel the cruise control.

- (1) Stop lamp SW is on (Brake pedal is depressed)
- (2) The CANCEL SW of the control SW is on
- (3) ON-OFF SW is off
- (4) Gear is shifted from D position to other positions than D.

5. Resume Control

After canceling the cruise control (Except when the ON-OFF SW is off) if the vehicle speed is above the minimum speed limit (Approx. 40km/h, 25mph), operating the + RES SW to on from off will cause the system to accelerate and resume to the vehicle speed before manual cancellation.

6. Overdrive Function

The overdrive may be cut on an uphill grade, while traveling with the cruise control.

After the overdrive is cut, when the throttle opening information indicates the hill climbing is finished after the overdrive is canceled, the vehicle returns to overdrive mode again as the overdrive return timer is completed, and if the system determines that the uphill grade has finished, the overdrive will resume after the overdrive timer operation.

7. Auto Cancel Operation

If any of the following conditions are detected, the control is canceled.

- (1) Disconnection and/or short in the stop light SW
- (2) Malfunction in the vehicle speed signal
- (3) Malfunction in the electronic throttle parts
- (4) Malfunction in the stop light SW input circuit
- (5) Malfunction in the cancel circuit
- (6) When the vehicle speed gets slower than the low speed limit.
- (7) The actual vehicle speed becomes -16 km/h (10 mph) slower than the set speed

Service Hints

E3 (A), E4 (B), E5 (C), E7 (E) Engine Control Module

IGSW-E1 : 9.0-14.0 volts with ignition SW at ON or ST position

BATT-E1 : Always 9.0-14.0 volts

STP-E1 : 9.0-14.0 volts with brake pedal depressed
: Below 1.5 volts with brake pedal released

C16 Combination SW

5-4 : Approx. 1540Ω with CANCEL SW on

Approx. 240Ω with + RES SW on

Approx. 630Ω with - SET SW on

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page		
A20	66	E7	E	67	J49	68	
C11	A	66	J28	A	68	J75	68
C12	B	66	J29	B	68	P1	65
C16	66	J34	65	S4	69		
E3	A	67	J45	68	S31	69	
E4	B	67	J47	A	68	T14	65
E5	C	67	J48	B	68		

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1H		
2F	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2H		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		

 : **Connector Joining Wire Harness and Wire Harness**

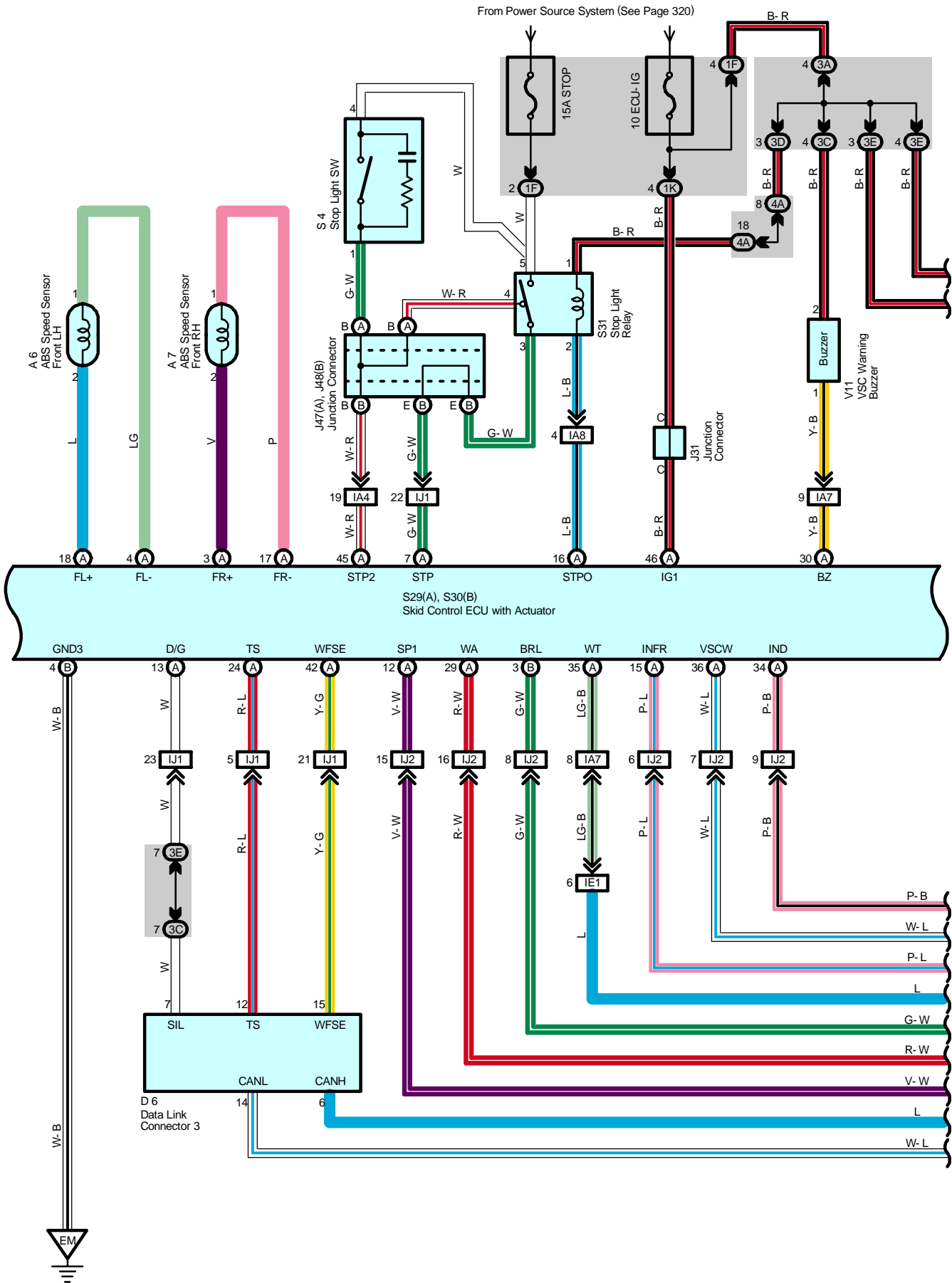
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA8	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)

 : **Ground Points**

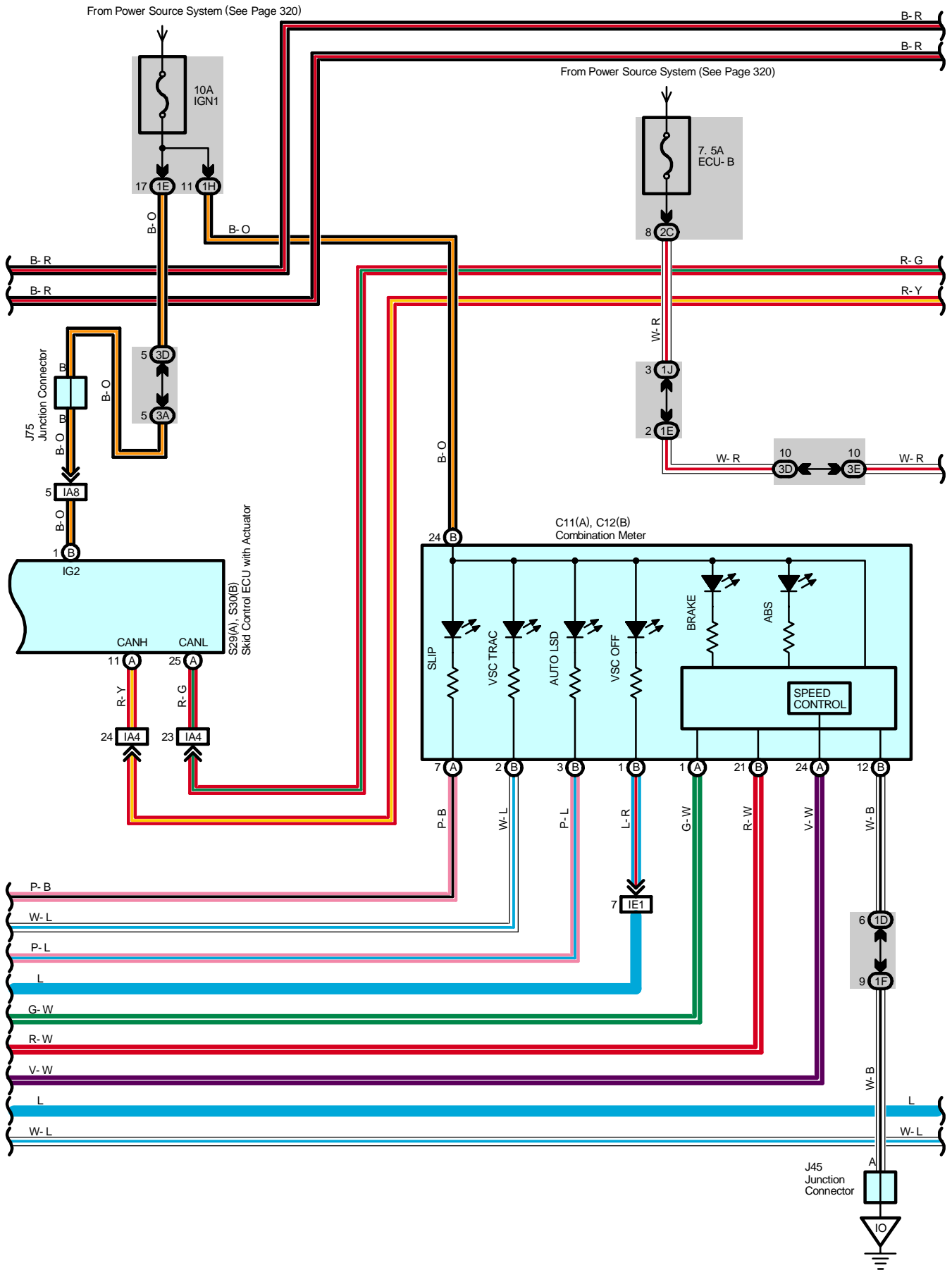
Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
EC	90	Rear Bank of Left Cylinder Head
EY	90	Front Left Side of Cylinder Head
IO	92	Left Kick Panel

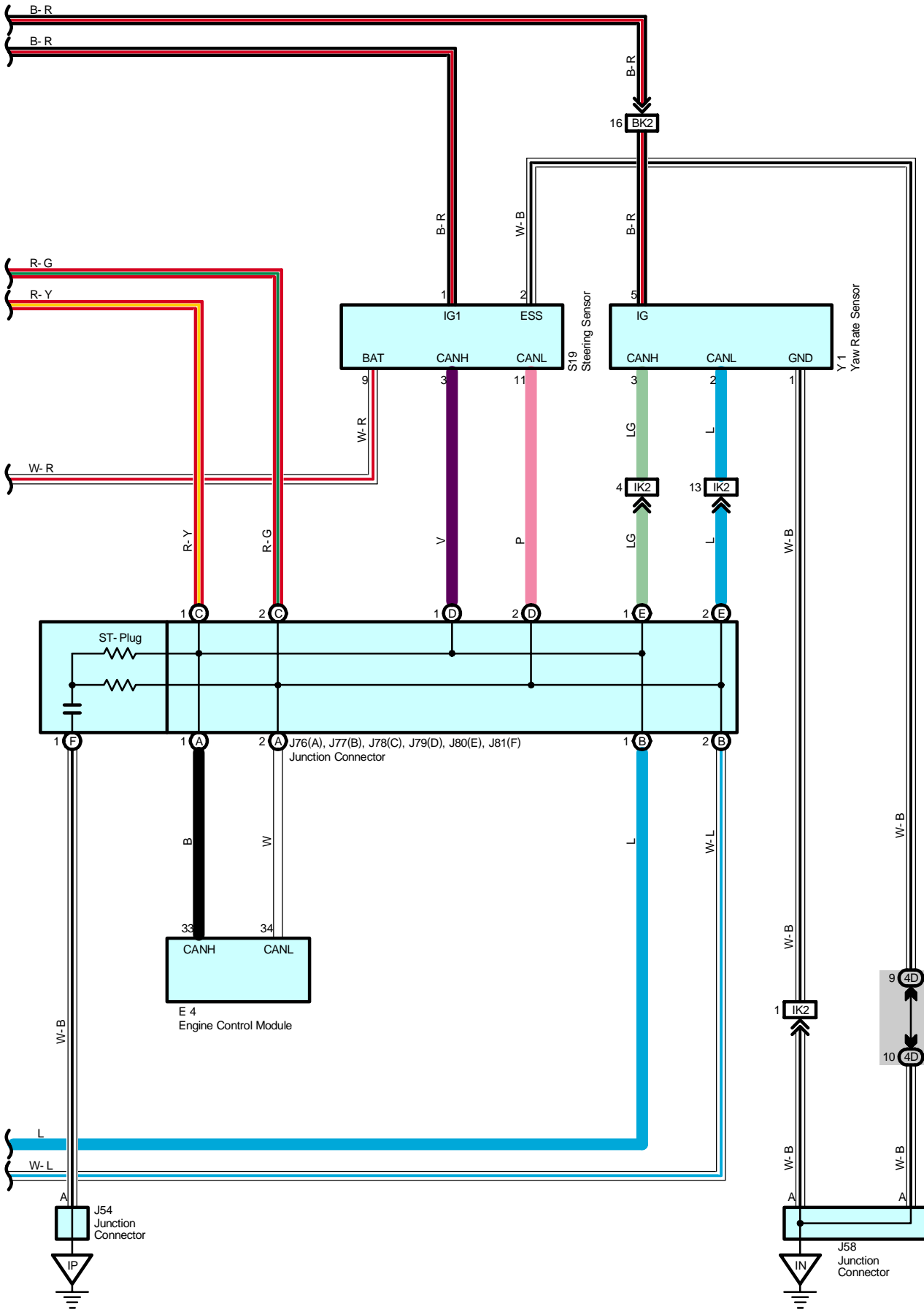
 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I1	94	Engine Wire			



VSC (Double Cab)





VSC (Double Cab)

System Outline

1. ABS Operation

If the brake pedal is depressed suddenly, the ABS controls the hydraulic pressure of the wheel cylinders for all the four wheels to automatically avoid wheel locking and ensure the directional and steering stability of the vehicle. If the brake pedal is depressed suddenly, the skid control ECU controls the solenoids in the actuators using the signals from the sensors to move the brake fluid to the reservoir in order to release the braking pressure applied to the wheel cylinder. If the skid control ECU detects that the fluid pressure in the wheel cylinder is insufficient, the ECU controls the solenoids in the actuators to increase the braking pressure.

2. Traction Control Operation

The traction control system controls the engine torque, the hydraulic pressure of the driving wheel cylinders, slipping of the wheels which may occur at start or acceleration of the vehicle, to ensure an optimal driving power and vehicle stability corresponding to the road conditions.

3. VSC Operation

Unexpected road conditions, vehicle speed, emergency situation, and any other external factors may cause large under- or over-steering of the vehicle. If this occurs, the VSC system automatically controls the engine power and wheel brakes to reduce the under- or over-steering.

To reduce large over-steering :

If the VSC system determines that the over-steering is large, it activates the brakes for the outer turning wheels depending on the degree of the over-steering to produce the moment toward the outside of the vehicle and reduce the over-steering.

To reduce large under-steering :

If the VSC system determines that the under-steering is large, it controls the engine power and activates the rear wheel brakes to reduce the under-steering.

Traction control SW

The traction control SW is used to stop the TRAC function. After the engine is started, the TRAC system is stopped (turned off) and the VSC OFF indicator light lights up. When the traction control SW is pressed again, the TRAC system enters the stand-by mode. If the engine is stopped and restarted, the TRAC system enters the stand-by mode regardless of the traction control SW.

4. Mutual System Control

To efficiently operate the VSC system at its optimal level, the VSC system and other control systems are mutually controlled while the VSC system is being operated.

Engine throttle control

The engine power does not interfere with the VSC brake control by controlling the opening of the throttle and reducing the engine output.

Engine control and electronically controlled transmission control

The strong braking force does not interfere with the braking force control of the VSC system by turning off the accel. and reducing changes in the driving torque at shift-down.

VSC system operation indication

The Slip indicator light flashes and the buzzer sounds intermittently to warn the driver that the current road is slippery, while the VSC system is being operated.

5. Fail Safe Function

If an error occurs in the skid control ECU with actuator, sensor signals, and/or actuators, the skid control ECU with actuator inhibits the brake actuator control and inputs the error signal to the engine control module. According to the error signal, the brake actuator turns off the solenoid and the engine control module rejects any electronically controlled throttle open request from the VSC system. As a result, the vehicle functions regardless of the ABS, TRAC, and VSC systems.

Service Hints

S29 (A), S30 (B) Skid Control ECU with Actuator

(A)46-Ground : Approx. 12 volts with ignition SW at ON position

(A)1, (A) 32, (B) 4-Ground : Always continuity

 : Parts Location

Code	See Page	Code	See Page	Code	See Page
A6	64	J31	65	J81 F	68
A7	64	J45	68	P1	65
A19	70	J47 A	68	P5	69
B2	64	J48 B	68	S4	69
C11 A	66	J54	68	S19	69
C12 B	66	J58	68	S29 A	65
D6	67	J75	68	S30 B	65
E4	67	J76 A	68	S31	69
F13	34, 64	J77 B	68	V11	69
I24	67	J78 C	68	Y1	69
J28 A	68	J79 D	68		
J29 B	68	J80 E	68		

 : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1H		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1K		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3C		
3D		
3E		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4D		

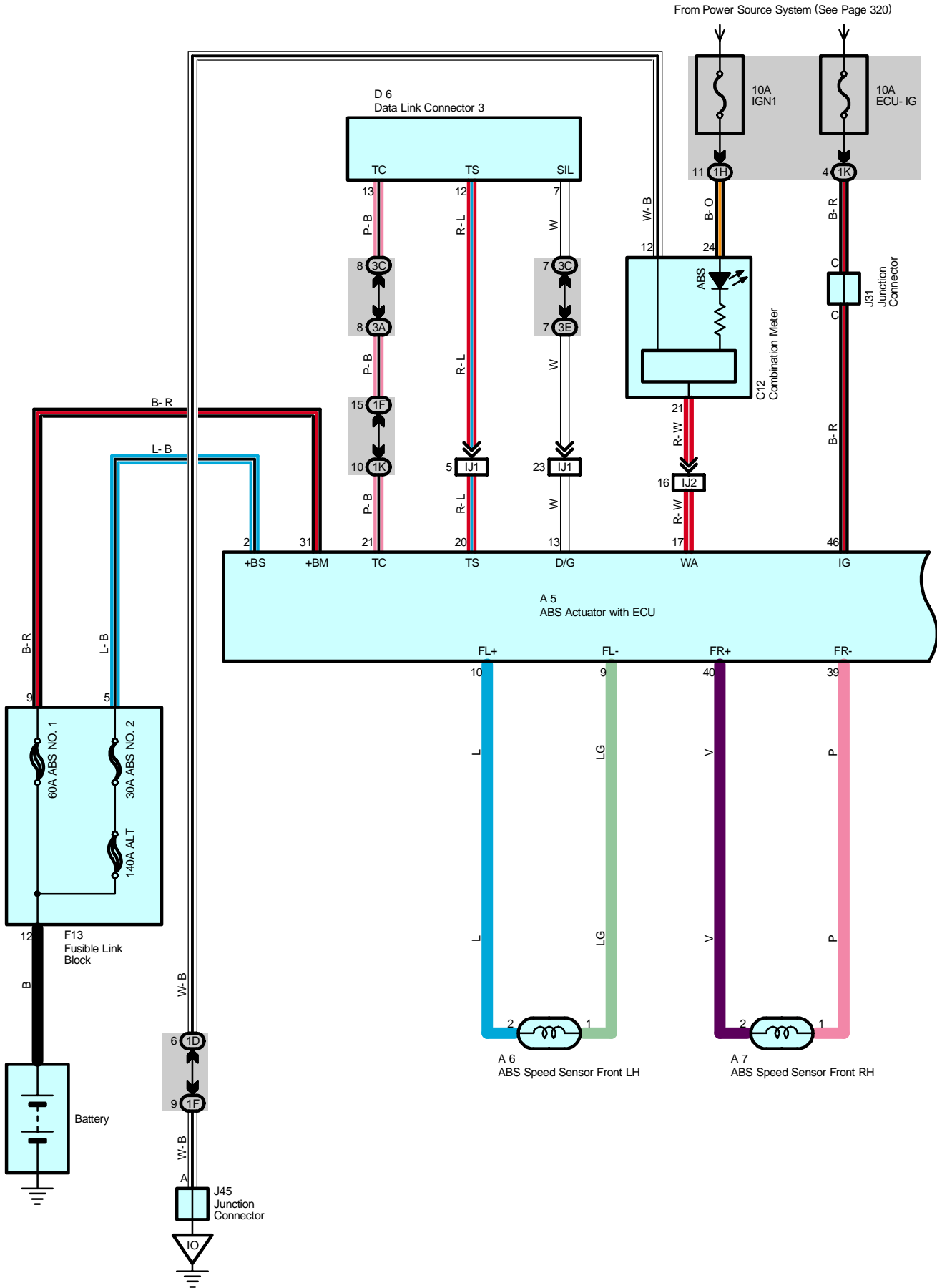
 : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA7		
IA8		
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
IJ2		
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)
IL3	94	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
BK2	96	Frame Wire and Frame No.3 Wire (Near the License Plate Light)
BP1	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

 : Ground Points

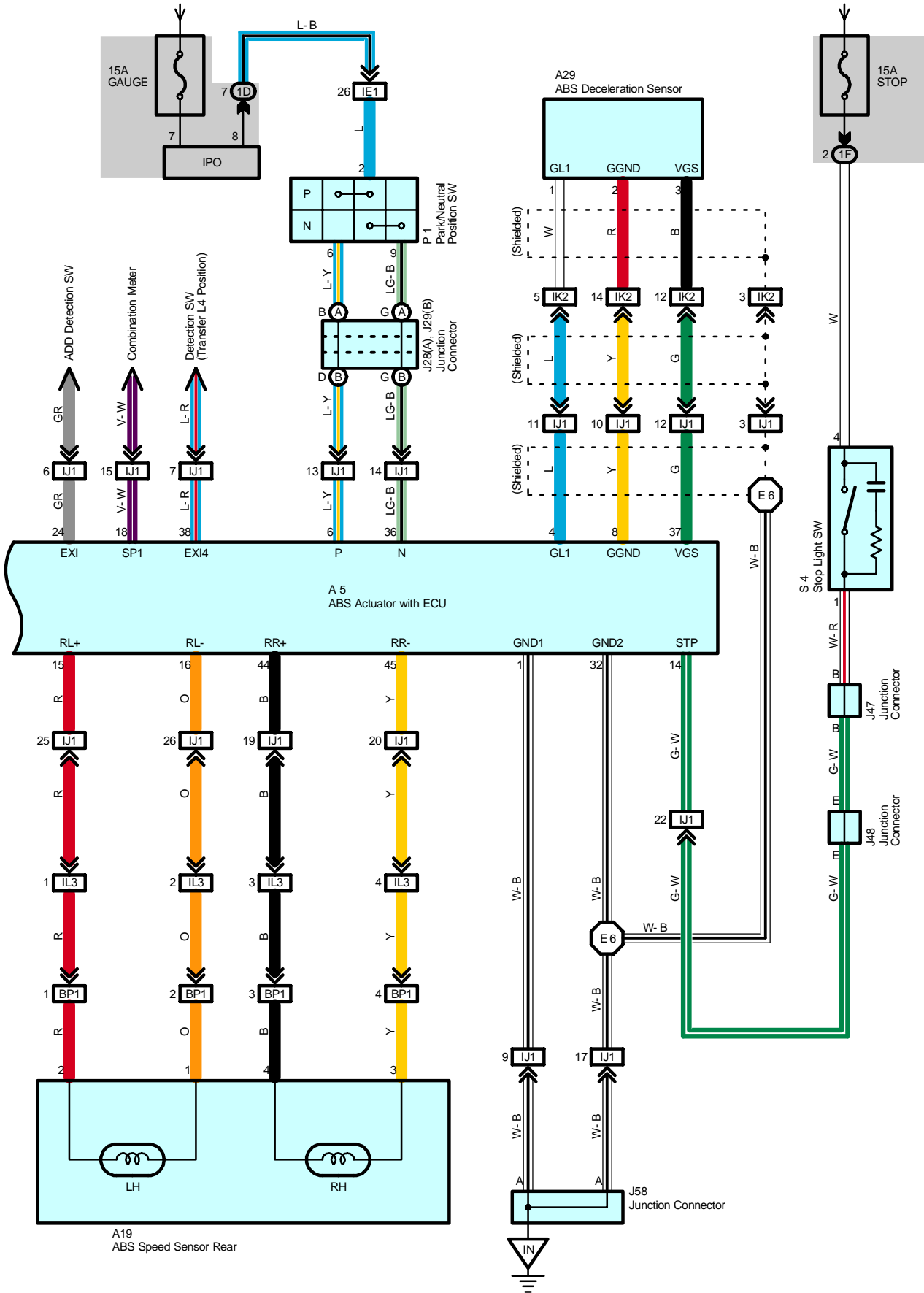
Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
EM	90	Radiator Side Support RH
IN	92	Right Kick Panel
IO	92	Left Kick Panel
IP	92	Instrument Panel Brace LH

ABS (Double Cab)



From Power Source System (See Page 320)

From Power Source System (See Page 320)



ABS (Double Cab)

System Outline

This system controls the respective brake fluid pressures acting on the disc brake cylinders of the right front wheel, left front wheel, and rear wheels when the brakes are applied in a panic stop so that the wheels do not lock. This results in improved directional stability and steerability during panic braking.

1. Input Signal

(1) Speed sensor signal

The speed of the wheels is detected and input to TERMINALS FL+, FR+, RL+ and RR+ of the ABS actuator with ECU.

(2) Stop light SW signal

A signal is input to TERMINAL STP of the ABS actuator with ECU when the brake pedal is depressed.

2. System Operation

During sudden braking, the ABS actuator with ECU which has signals input from each sensor lets the hydraulic pressure acting on each wheel cylinder escape to the reservoir.

The pump inside the ABS actuator with ECU is also operating at this time and it returns the brake fluid from the reservoir to the master cylinder, thus preventing locking of vehicle wheels.

If the ABS actuator with ECU judges that the hydraulic pressure acting on the wheel cylinder is insufficient, the current acting on the solenoid is controlled and the hydraulic pressure is increased.

Holding of the hydraulic pressure is also controlled by the ECU, by the same method as above, by repeated pressure reduction. Holding and increase are repeated to maintain vehicle stability and to improve steerability during sudden braking.

Service Hints

A6, A7 ABS Speed Sensor Front LH, RH

1-2 : 0.92-1.22 kΩ (20°C, 68°F)

A19 ABS Speed Sensor Rear

1-2 : 0.89-1.29 kΩ (20°C, 68°F)

3-4 : 0.89-1.29 kΩ (20°C, 68°F)

A5 ABS Actuator with ECU

46-Ground : 10-14 volts with ignition SW at ON or ST position

14-Ground : 10-14 volts with stop light SW on (Brake pedal depressed)

1-Ground : Always continuity

S4 Stop Light SW

2-1 : Closed with brake pedal depressed

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A5	64	D6	67	J47	68
A6	64	F13	34, 64	J48	68
A7	64	J28	A 68	J58	68
A19	70	J29	B 68	P1	65
A29	66	J31	65	S4	69
C12	66	J45	68		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
1H		
1K	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3C		
3E		

 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
IJ2		
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)
IL3	94	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
BP1	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

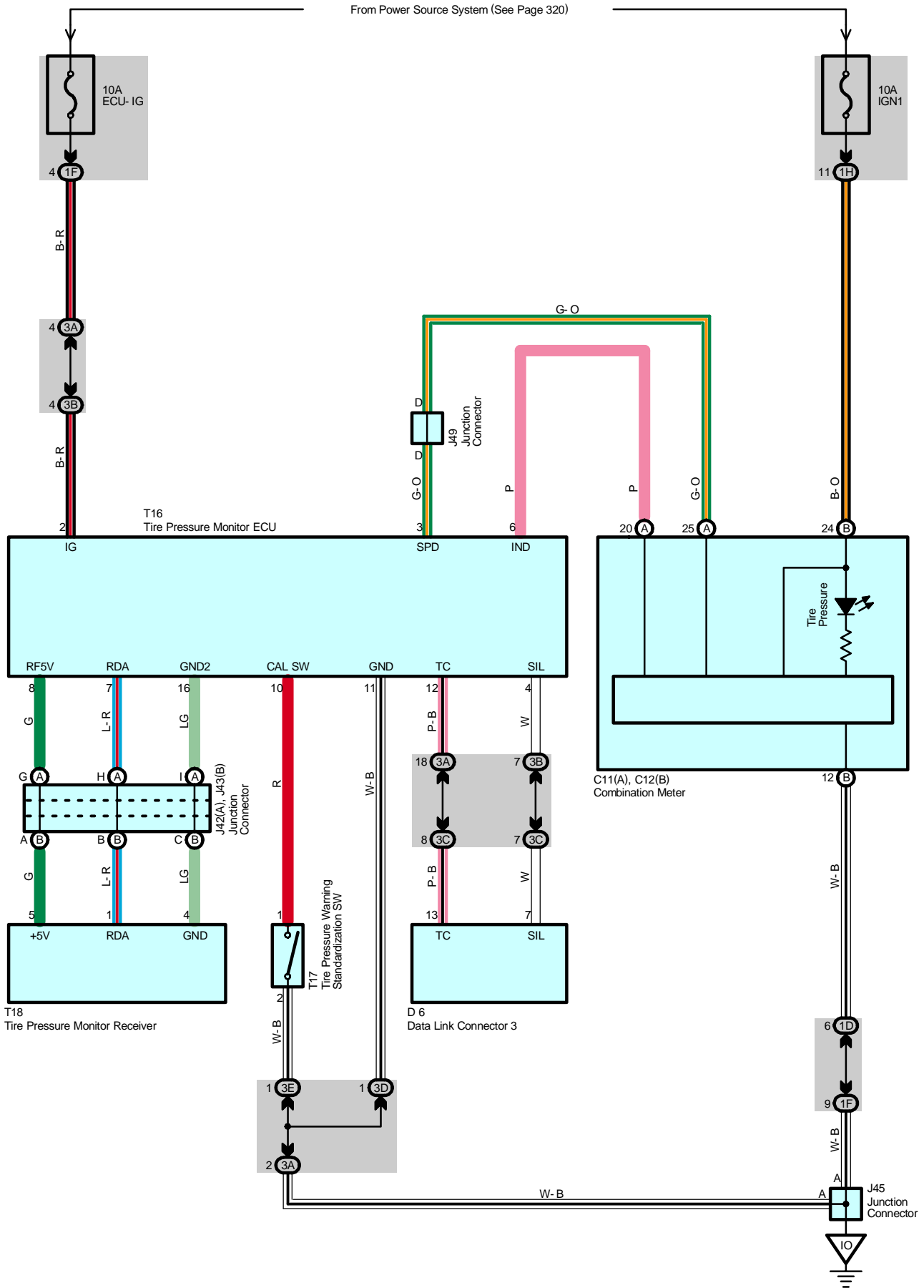
 : **Ground Points**

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel

 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E6	90	Cowl Wire			

Tire Pressure Warning System (Double Cab)



System Outline

The air pressure sensor installed in the tire wheel detects the tire air pressure and transmits signals to the vehicle side receiver. When the detected tire air pressure is below a specified level, the warning light in the combination meter comes on to inform the driver.

Press the tire pressure warning standardization SW for 3 seconds with the ignition SW at ON position after the tire pressure is adjusted to the specified value. It will lead the tire pressure monitor ECU to control and warn the pressure according to the specified value.

Warnings when the tire pressure is low

* When the tire air pressure is below a specified level, the warning light in the combination meter comes on.

Service Hints

T16 Tire Pressure Monitor ECU

2-Ground : Approx. 12 volts with ignition SW at ON position

11-Ground : Always continuity

○ : Parts Location

Code		See Page	Code		See Page	Code		See Page
C11	A	66	J43	B	68	T17	69	
C12	B	66	J45		68	T18	71	
D6		67	J49		68			
J42	A	68	T16		69			

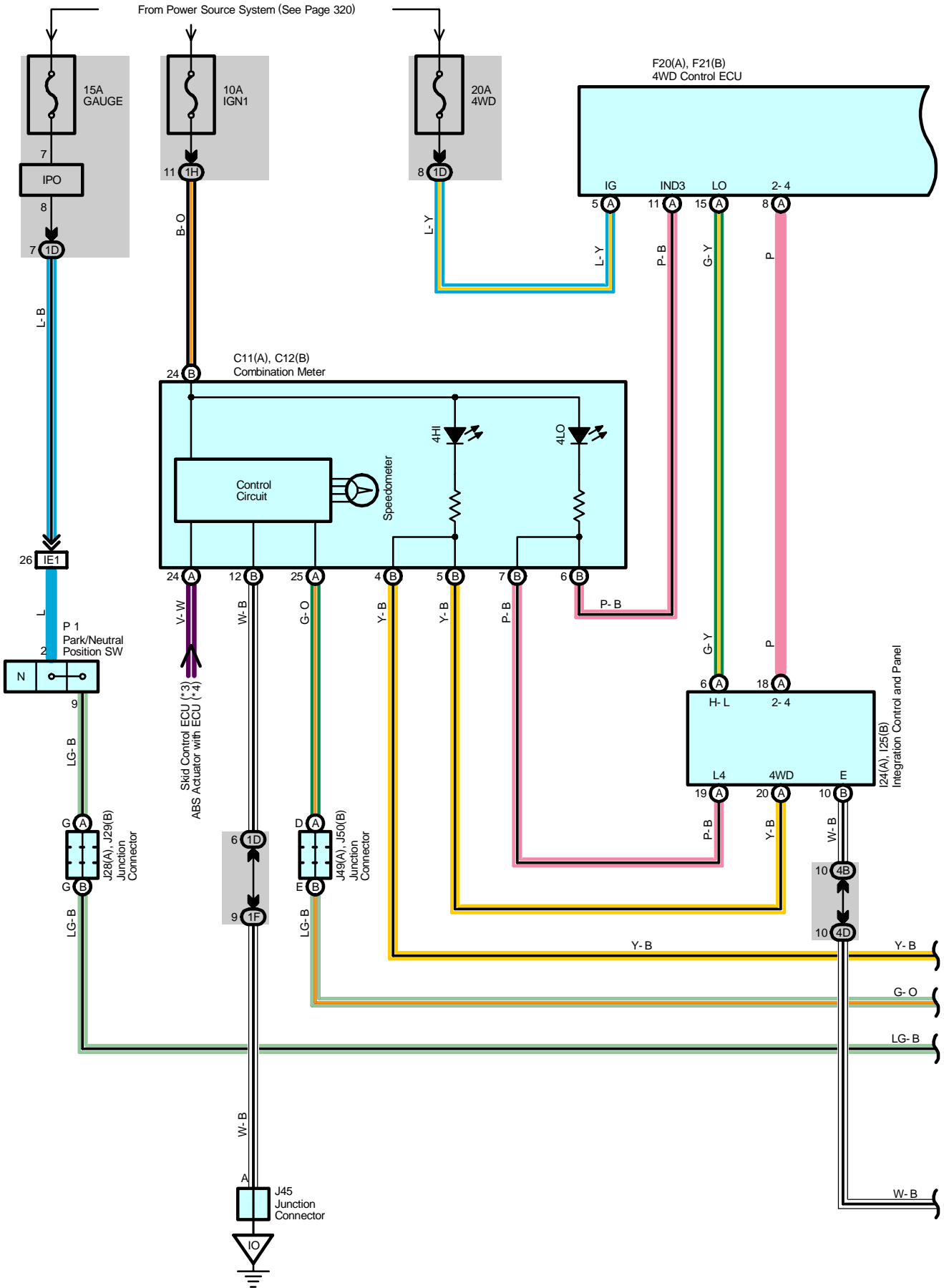
○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
1H		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		
3C		
3D		
3E		

▽ : Ground Points

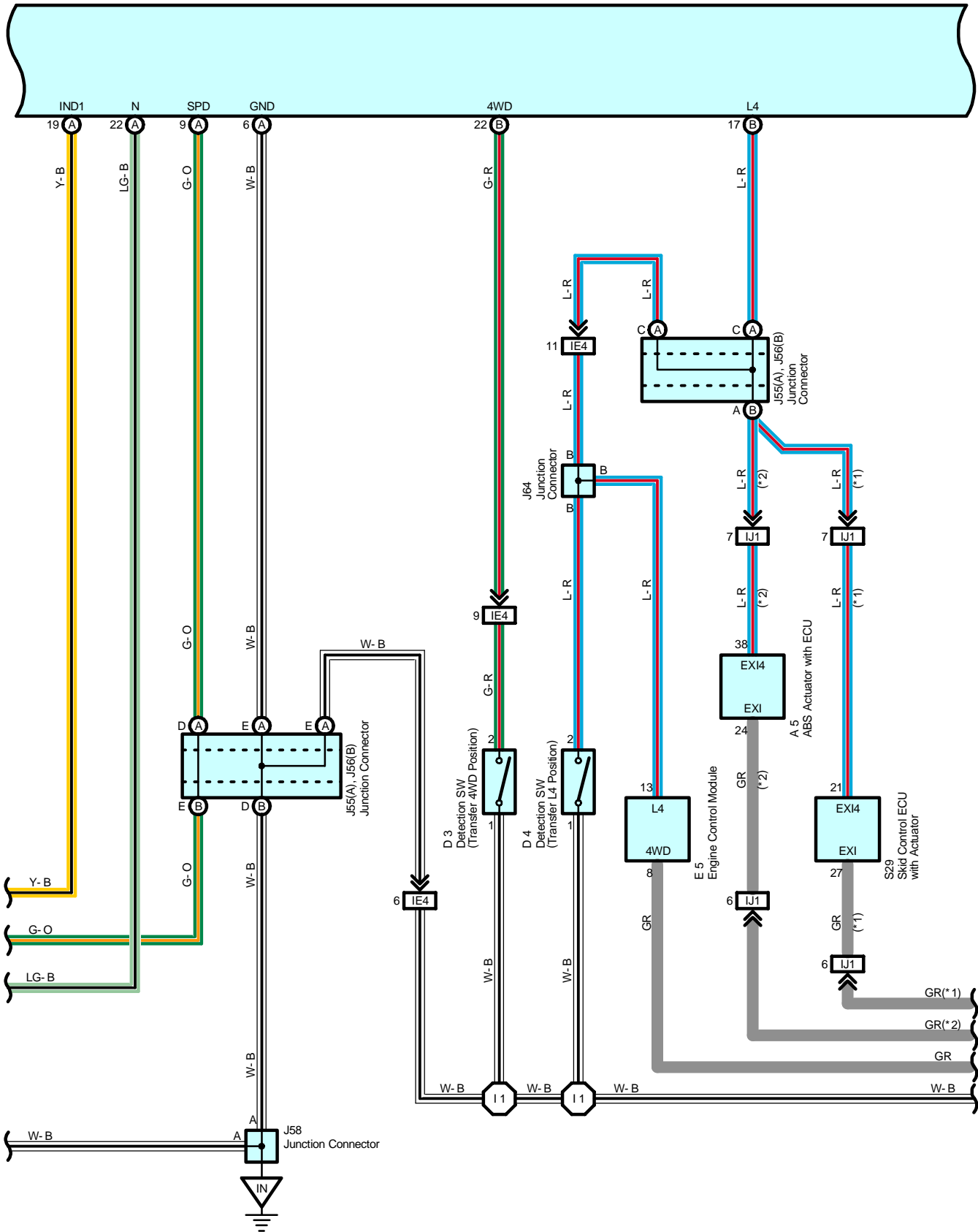
Code	See Page	Ground Points Location
IO	92	Left Kick Panel

4WD (Double Cab)



* 1 : w/ VSC
 * 2 : w/o VSC

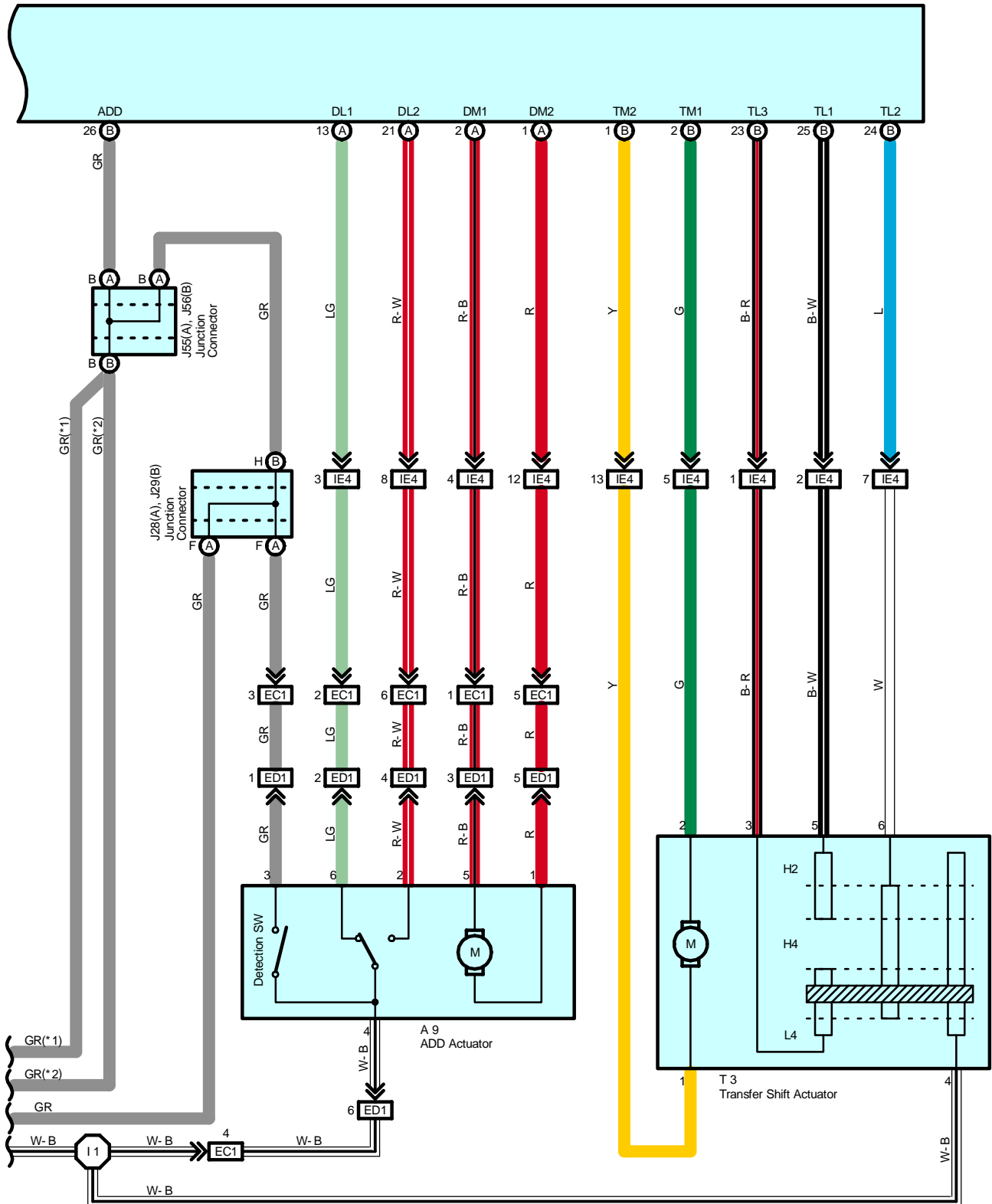
F20(A), F21(B)
 4WD Control ECU



4WD (Double Cab)

* 1 : w/ VSC
 * 2 : w/o VSC

F20(A), F21(B)
 4WD Control ECU



System Outline

In the conventional system, the 2-4 select SW and the transfer shift lever was used to shift the mode between H-L. In this system, the transfer shift lever is not used, and the H-L mode shift can be done by the transfer shift actuator.

The mode can be changed by the touch select 2-4 SW and touch select high-low in the integration control and panel.

The shift range is controlled according to the vehicle speed sensor and Park/Neutral position SW, and the indicator light is turned ON to inform the driver if any of the following conditions are detected:

- * The shift is not completed even though 3 seconds have elapsed after transfer operation.
- * The vehicle speed is above approximately 100 km/h (63 mph) when shifting from H2 to H4.
- * The vehicle speed is below approximately 5 km/h (3 mph) or the A/T shift lever is in a position other than N position, when shifting from H4 to L4 or visa versa, and from L4 to H2.

Transfer Operation

H2 to H4

When the touch select 2-4 SW in the integration control and panel is turned ON, a signal is input into TERMINAL (A) 8 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 2 to transfer shift actuator TERMINAL 2 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (B) 1 to GROUND, and the transfer shifts to 4WD (H4 position.)

When the system shifts to 4WD, the detection SW (Transfer 4WD position) is turned ON, and the current flows from 4WD control ECU TERMINAL (A) 2 to ADD actuator TERMINAL 5 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (A) 1 to GROUND, and the ADD actuator is activated, and the ADD is connected. When the ADD is connected, the detection SW (ADD position SW) is turned ON, and the 4HI Indicator light comes ON.

H4 to H2

When the touch select 2-4 SW in the integration control and panel is turned OFF, a signal is input into TERMINAL (A) 8 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 1 to transfer shift actuator TERMINAL 1 to motor to TERMINAL 2 to 4WD control ECU TERMINAL (B) 2 to GROUND, and the transfer shifts to 2WD (H2 position.)

When the system shifts to 2WD, the detection SW (Transfer 4WD position) is turned OFF, and the current flows from 4WD control ECU TERMINAL (A) 1 to ADD actuator TERMINAL 1 to motor to TERMINAL 5 to 4WD control ECU TERMINAL (A) 2 to GROUND, and the ADD actuator is activated, and the ADD is disconnected. When the ADD is disconnected, the detection SW (ADD position SW) is turned OFF, and the 4HI indicator Light turns OFF.

H4 to L4

When the touch select high-low SW in the integration control and panel is turned ON, a signal is input into TERMINAL (A) 15 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 2 to transfer shift actuator TERMINAL 2 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (B) 1 to GROUND, and the transfer shifts to 4WD LO position (L4 position.)

The 4HI Indicator is turned OFF and the 4LO indicator is turned ON.

L4 to H4

When the touch select high-low SW in the integration control and panel is turned OFF, a signal is input into TERMINAL (A) 15 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 1 to transfer shift actuator TERMINAL 1 to motor to TERMINAL 2 to 4WD control ECU TERMINAL (B) 2 to GROUND, and the transfer shifts to 4WD HI position (H4 Position.)

The 4HI indicator is turned ON and the 4LO indicator is turned OFF.

The shift is not completed even though 3 seconds have elapsed after transfer operation.

- * The vehicle speed is above approximately 100 km/h (63 mph) when shifting from H2 to H4.
- * The vehicle speed is below approximately 5 km/h (3 mph) or the A/T Shift Lever is in a position other than N position, when shifting from H4 to L4 or visa versa, and from L4 to H2.

L4 to H2

When the touch select 2-4 SW in the integration control and panel is turned OFF, a signal is input into TERMINAL (A) 8 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 1 to transfer shift actuator TERMINAL 1 to motor to TERMINAL 2 to 4WD control ECU TERMINAL (B) 2 to GROUND, and the detection SW (Transfer L4 position) is turned OFF.

Furthermore, the motor rotates to shift the transfer to 2WD (H2 position.)

When the system shifts to 2WD, the detection SW (Transfer 4WD position) is turned OFF, and the current flows from 4WD control ECU TERMINAL (A) 1 to ADD actuator TERMINAL 1 to motor to TERMINAL 5 to 4WD control ECU TERMINAL (A) 2 to GROUND, and the ADD actuator is activated, and the ADD is disconnected. When the ADD is disconnected, the detection SW (ADD position SW) is turned OFF, and the 4LO indicator light turns OFF.

4WD (Double Cab)

H2 to L4

When the touch select 2-4 SW in the integration control and panel is turned ON, and the touch select high-low SW is turned ON, a signal is input into TERMINAL (A) 8 of the 4WD control ECU.

The 4WD control ECU is activated by this, and the current flows from the 4WD control ECU TERMINAL (B) 2 to transfer shift actuator TERMINAL 2 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (B) 1 to GROUND, and the transfer shifts to 4WD (H4 position.)

When the system shifts to 4WD, the detection SW (Transfer 4WD position) is turned ON, and the current flows from 4WD control ECU TERMINAL (A) 2 to ADD actuator TERMINAL 5 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (A) 1 to GROUND, and the ADD actuator is activated, and the ADD is connected. Then a signal is input into TERMINAL (A) 15 of the 4WD control ECU and the 4WD control ECU is activated by this, so the current flows from the 4WD control ECU TERMINAL (B) 2 to transfer shift actuator TERMINAL 2 to motor to TERMINAL 1 to 4WD control ECU TERMINAL (B) 1 to GROUND. The transfer shifts to 4WD LO position (L4 position), and the 4LO indicator light comes ON.

Service Hints

F20 (A) 4WD Control ECU

(A) 5-Ground : Approx. 12 volts with ignition SW at ON or ST position

(A) 6-Ground : Always continuity

(A) 9-Ground : 4 pulses with 1 rotation

(A) 8-Ground : 2 volts or less with touch select 2-4 SW on

(A)17-Ground : 2 volts or less with detection SW (Transfer L4 position) on and transfer shift lever at L4 position

I24 (A), I25 (B) Integration Control and Panel

(A) 5-(B) 1 : Closed with touch select 2-4 SW on

P1 Park/Neutral Position SW

2-9 : Closed with A/T shift lever at N position

: Parts Location

Code	See Page	Code	See Page	Code	See Page		
A5	64	F21	B	67	J55	A	68
A9	64	I24	A	67	J56	B	68
C11	A	66	I25	B	67	J58	68
C12	B	66	J28	A	68	J64	68
D3	64	J29	B	68	P1	65	
D4	64	J45	68	S29	65		
E5	67	J49	A	68	T3	65	
F20	A	67	J50	B	68		

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
1H		
4B	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4D		

: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EC1	90	Engine No.2 Wire and Engine Wire (Near the Starter)
ED1	90	Engine No.2 Wire and Differential Wire (Near the Transmission)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IE4		
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)



: Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel



: Splice Points

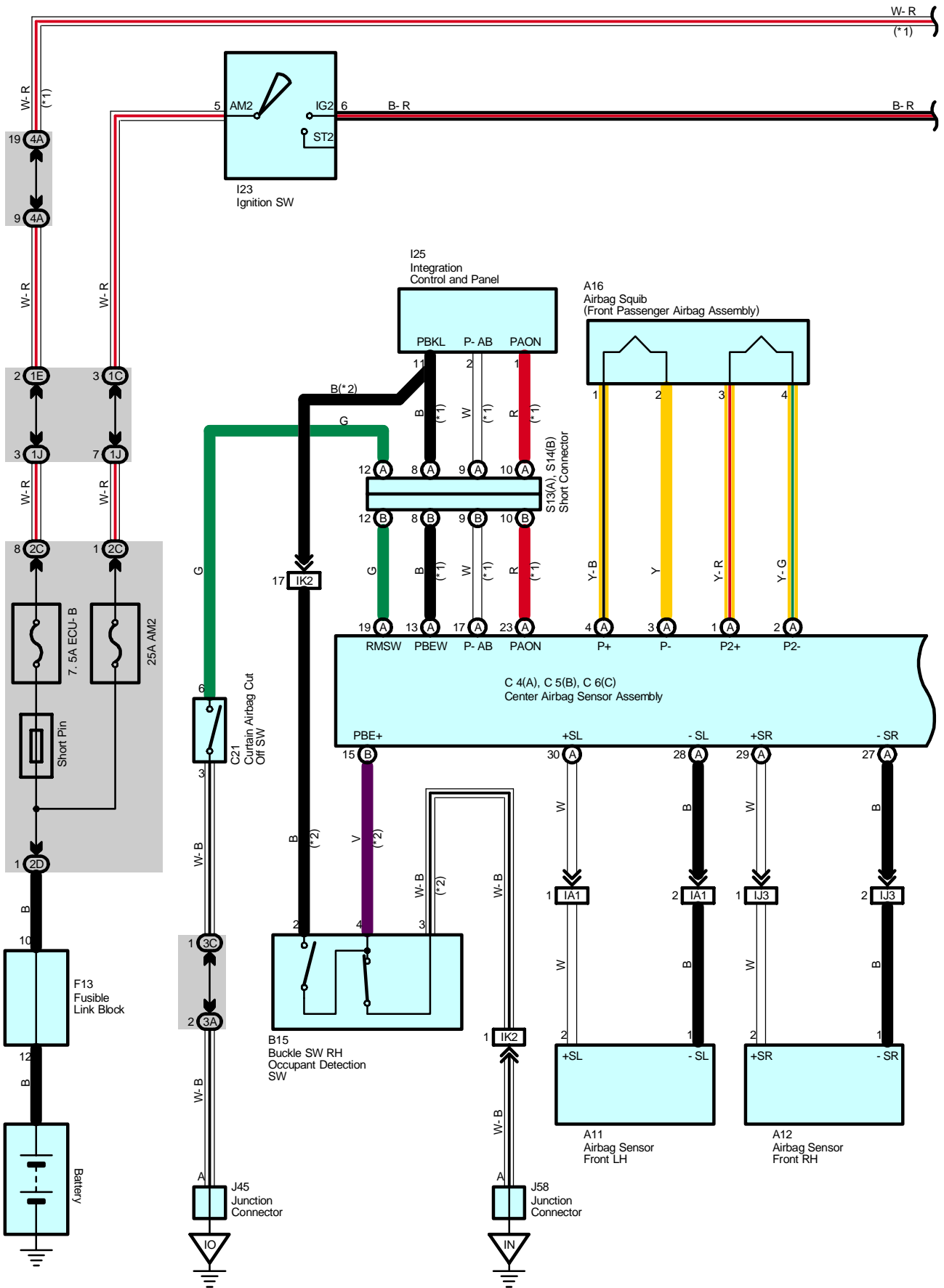
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I1	94	Engine Wire			

NOTICE: When inspecting or repairing the SRS, perform service in accordance with the following precautionary instructions and the procedure, and precautions in the Repair Manual applicable for the model year.

- Malfunction symptoms of the SRS are difficult to confirm, so the DTCs become the most important source of information when troubleshooting. When troubleshooting the SRS, always inspect the DTCs before disconnecting the battery.
- **Work must be started more than 90 seconds after the ignition SW is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.**
(The SRS is equipped with a back-up power source so that if work is started within 90 seconds from disconnecting the negative (-) terminal cable of the battery, the SRS may deploy.)
- When the negative (-) terminal cable is disconnected from the battery, the memory of the clock and audio system will be cleared. So before starting work, make a record of the contents in the audio memory system. When work is finished, reset the audio systems as they were before and adjust the clock. Some vehicles have power tilt steering, power telescopic steering, power seat and power outside rear view mirror which are all equipped with memory function. However, it is not possible to make a record of these memory contents. So when the work is finished, it will be necessary to explain it to your customer, and ask the customer to adjust the features and reset the memory. To avoid erasing the memory in each system, never use a back-up power supply from outside the vehicle.
- Before repair, remove the airbag sensor if shocks are likely to be applied to the sensor during repair.
- Do not expose the following parts directly to hot air or flame;
- Even in cases of a minor collision where the SRS does not deploy, the following parts should be inspected;
- Never use SRS parts from another vehicle. When replacing parts, replace with new parts.
- For the purpose of reuse, never disassemble and repair the following parts.
- If the following parts have been dropped, or have cracks, dents and other defects in their case, bracket, and connector, replace with new one.
- Use a volt/ohmmeter with high impedance (10 k Ω /V minimum) for troubleshooting electrical circuits of the system.
- Information labels are attached to the periphery of the SRS components. Follow the instructions of the notice.
- After work on the SRS is completed, check the SRS warning light.
- If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section of the Repair Manual.

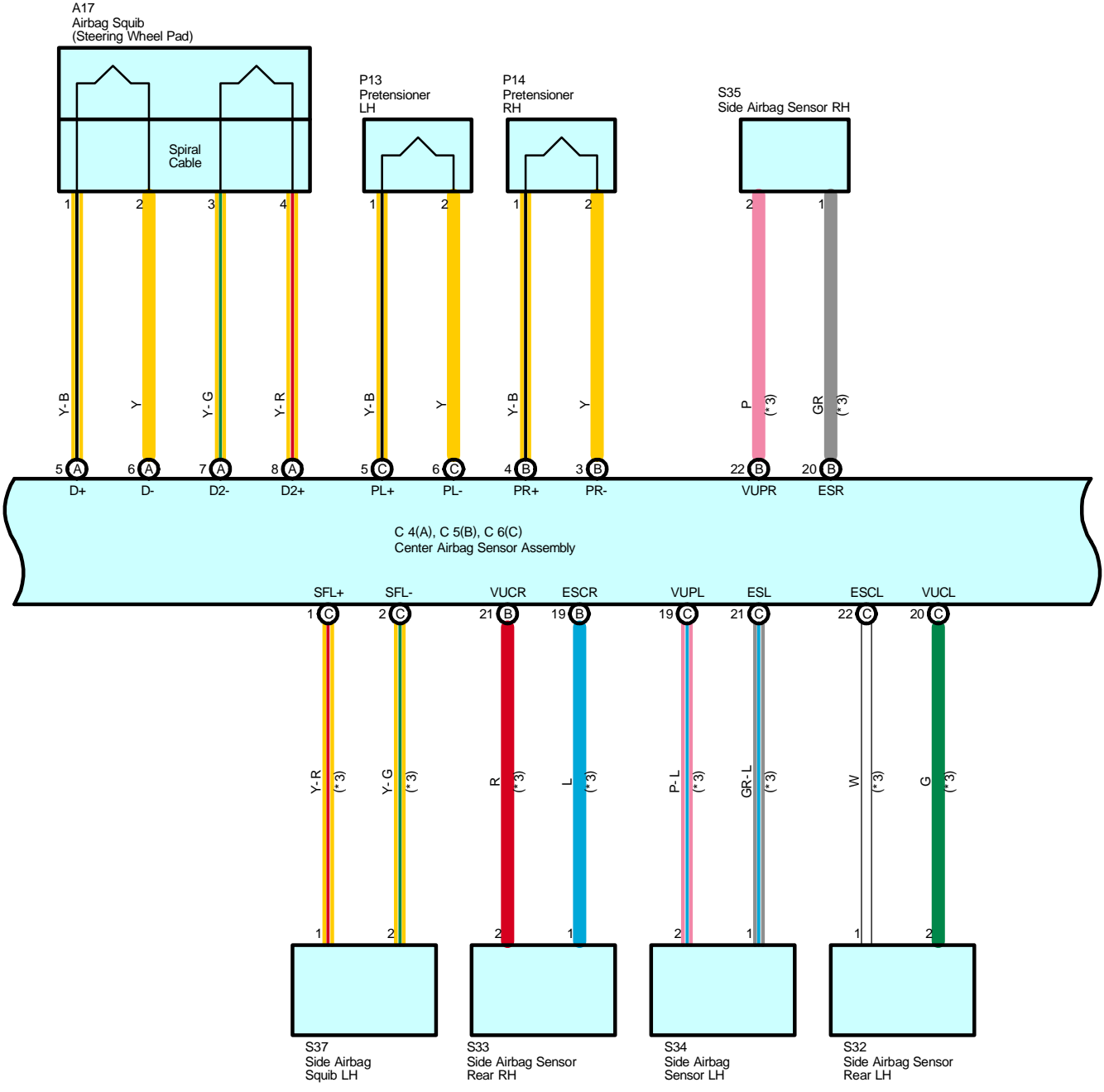
- * Steering wheel pad
- * Front passenger airbag assembly
- * Side airbag assembly
- * Curtain shield airbag assembly
- * Seat belt pretensioner
- * Center airbag sensor assembly
- * Front airbag sensor assembly
- * Side airbag sensor assembly
- * Rear airbag sensor assembly

SRS (Double Cab)

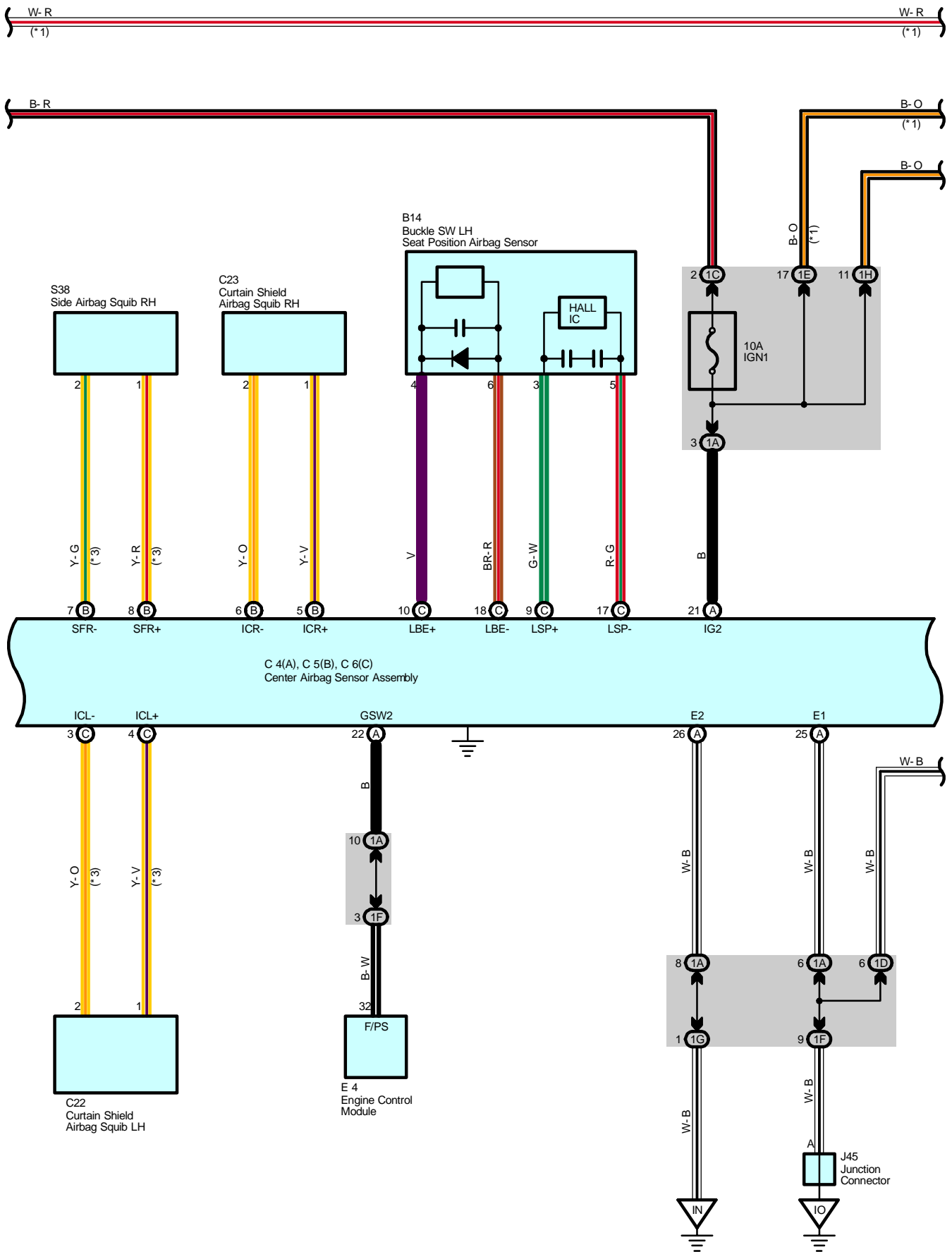


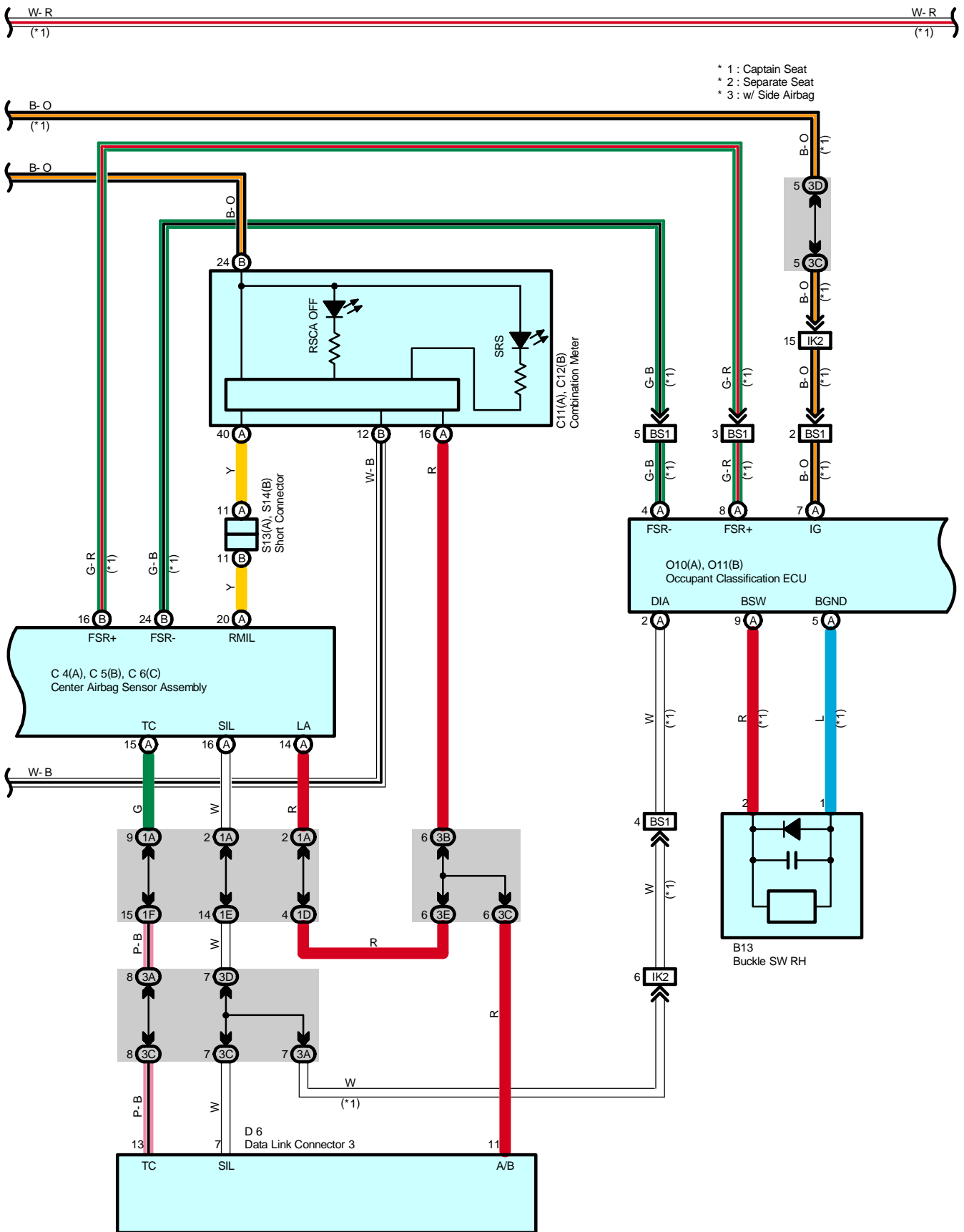


- * 1 : Captain Seat
- * 2 : Separate Seat
- * 3 : w/ Side Airbag

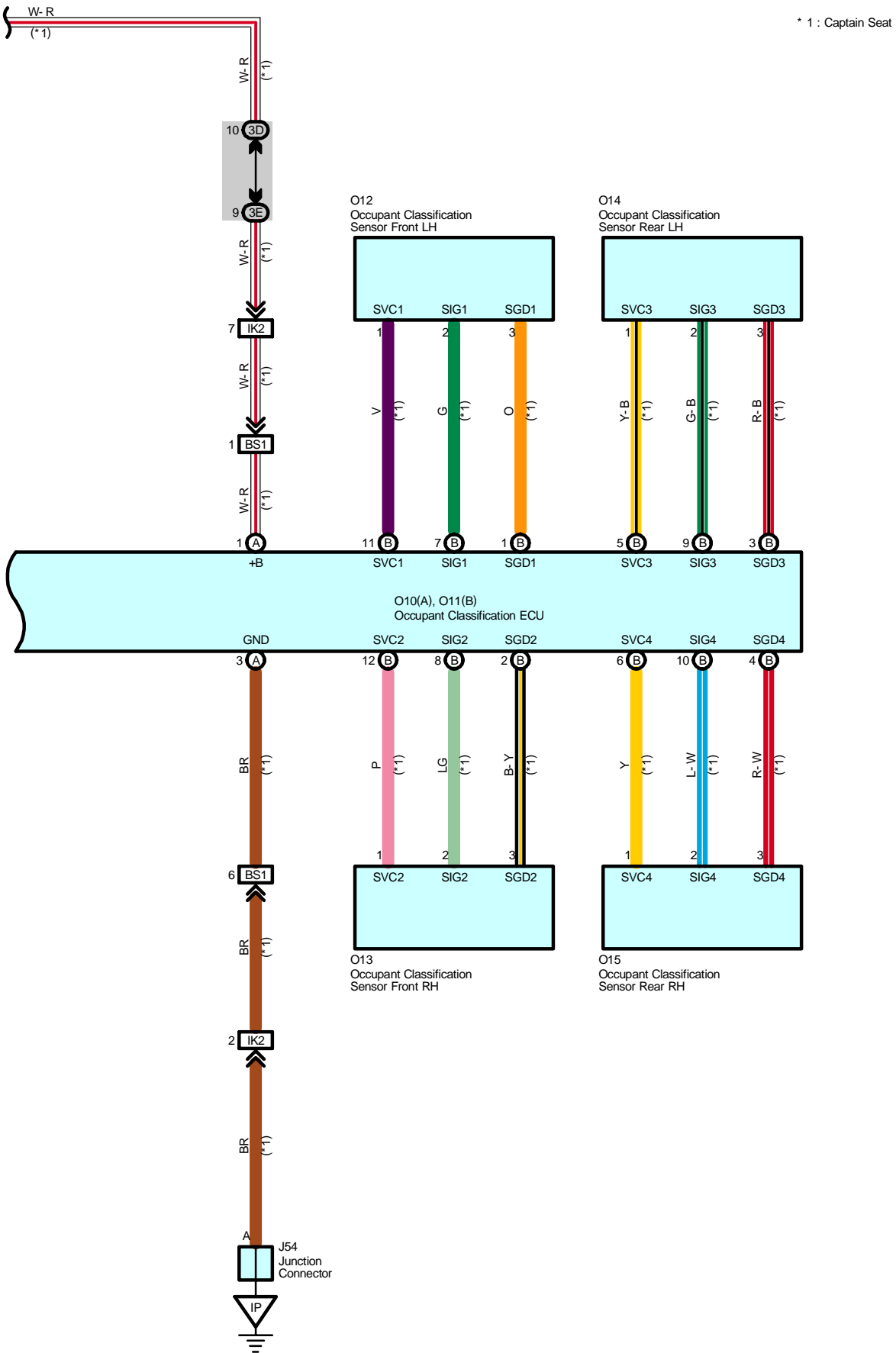


SRS (Double Cab)





SRS (Double Cab)



System Outline

The SRS is a driver protection device which has a supplemental role to the seat belts.

When the ignition SW on, the current from the IGN1 fuse flows to TERMINAL (A) 21 of the center airbag sensor assembly.

If an accident occurs while driving, deceleration caused by a frontal impact is detected (by sensor) and when the frontal impact exceeds a set level, the current from the IGN1 fuse flows to TERMINAL (A) 21 of the center airbag sensor assembly.

This current flows to TERMINALS (A) 4, (A) 5, (B) 4, (B) 5, (C) 4, (C) 5 to TERMINAL 1 of the airbag squib and Pretensioners to TERMINAL 2 to TERMINALS (A) 3, (A) 6, (B) 3, (B) 6, (C) 3, (C) 6 of the center airbag sensor assembly. Furthermore, the current flows to TERMINAL (A) 25 or (A) 26 to GROUND, causing the center airbag squibs to expand.

When the safing sensor built into the center airbag sensor assembly is on, airbag sensor is off and the current from the IGN1 fuse flows same as above-mentioned flowing, causing the airbag squibs to expand. When the safing sensor built into the center airbag sensor assembly is on, the airbag sensor on one of the above-mentioned circuits is activated so that current flows to the airbag squibs and causes them to operate.

The airbag stored inside the steering wheel pad is instantaneously expanded to soften the shock to the driver.

The airbag stored inside the passenger's instrument panel is instantaneously expanded to soften the shock to the passenger.

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A11	64	C23	70	O15	72
A12	64	D6	67	P13	71
A16	66	E4	67	P14	71
A17	66	F13	34, 64	S13	A 69
B13	72	I23	67	S14	B 69
B14	70	I25	67	S32	71
B15	70	J45	68	S33	71
C4	A 66	J54	68	S34	71
C5	B 66	J58	68	S35	71
C6	C 66	O10	A 72	S37	71 (Separate Seat)
C11	A 66	O11	B 72		72 (Captain Seat)
C12	B 66	O12	72	S38	71 (Separate Seat)
C21	66	O13	72		72 (Captain Seat)
C22	70	O14	72		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1C		
1D		
1E		
1F		
1G		
1H		
1J		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2D		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		
3C		
3D		
3E		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)

SRS (Double Cab)

 : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA1	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IJ3	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)
BS1	98	Seat No.1 Wire and Floor Wire (Under the Front Passenger's Seat)

 : Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel
IP	92	Instrument Panel Brace LH

Service Hints

O8 Overhead Module

6-Ground : Approx. 12 volts with the ignition SW at ON position

1-Ground : Always continuity

: Parts Location

Code		See Page	Code		See Page	Code		See Page
A28		64	J45		68	J56		68
C11	A	66	J49	A	68	O8		70
C12	B	66	J50	B	68			

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
1G		
1H		
1M	45	Roof Wire and Driver Side J/B (Lower Finish Panel)

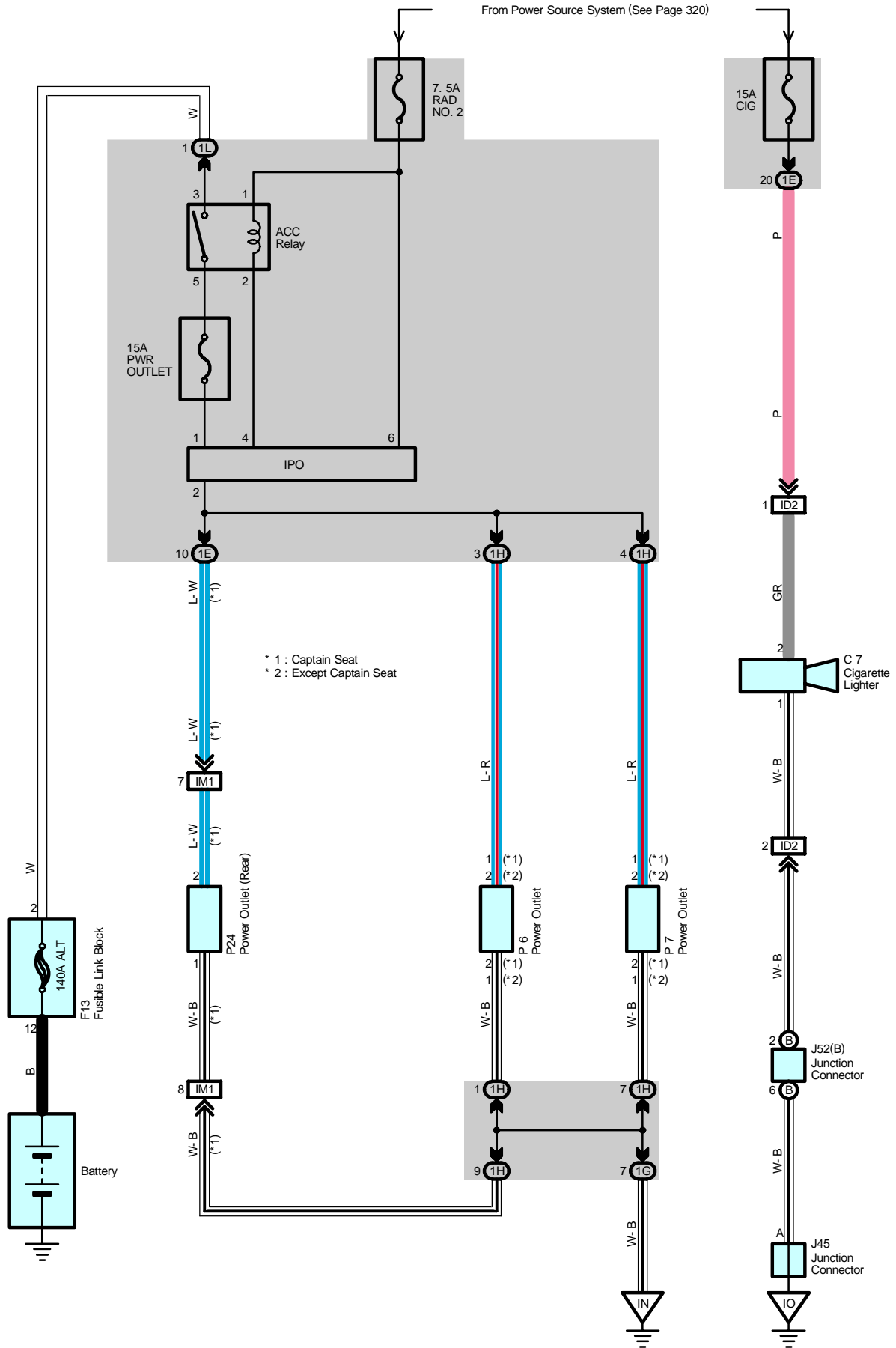
: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA7	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IC2	92	Cowl Wire and Roof Wire (Left Side of Instrument Panel)

: Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel

Cigarette Lighter and Power Outlet - 12V (Double Cab)



Service Hints

C7 Cigarette Lighter

2-Ground : Approx. 12 volts with the ignition SW at ON or ACC position

1-Ground : Always continuity

P6, P7 Power Outlet (Captain Seat)

1-Ground : Approx. 12 volts with the ignition SW at ON or ACC position

2-Ground : Always continuity

P6, P7 Power Outlet (Except Captain Seat)

1-Ground : Approx. 12 volts with the ignition SW at ON or ACC position

2-Ground : Always continuity

P24 Power Outlet (Rear)

2-Ground : Approx. 12 volts with the ignition SW at ON or ACC position

1-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page	
C7	66	J52	B	68	P24	69
F13	34, 64	P6		69		
J45	68	P7		69		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E		
1G	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1H		
1L	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)

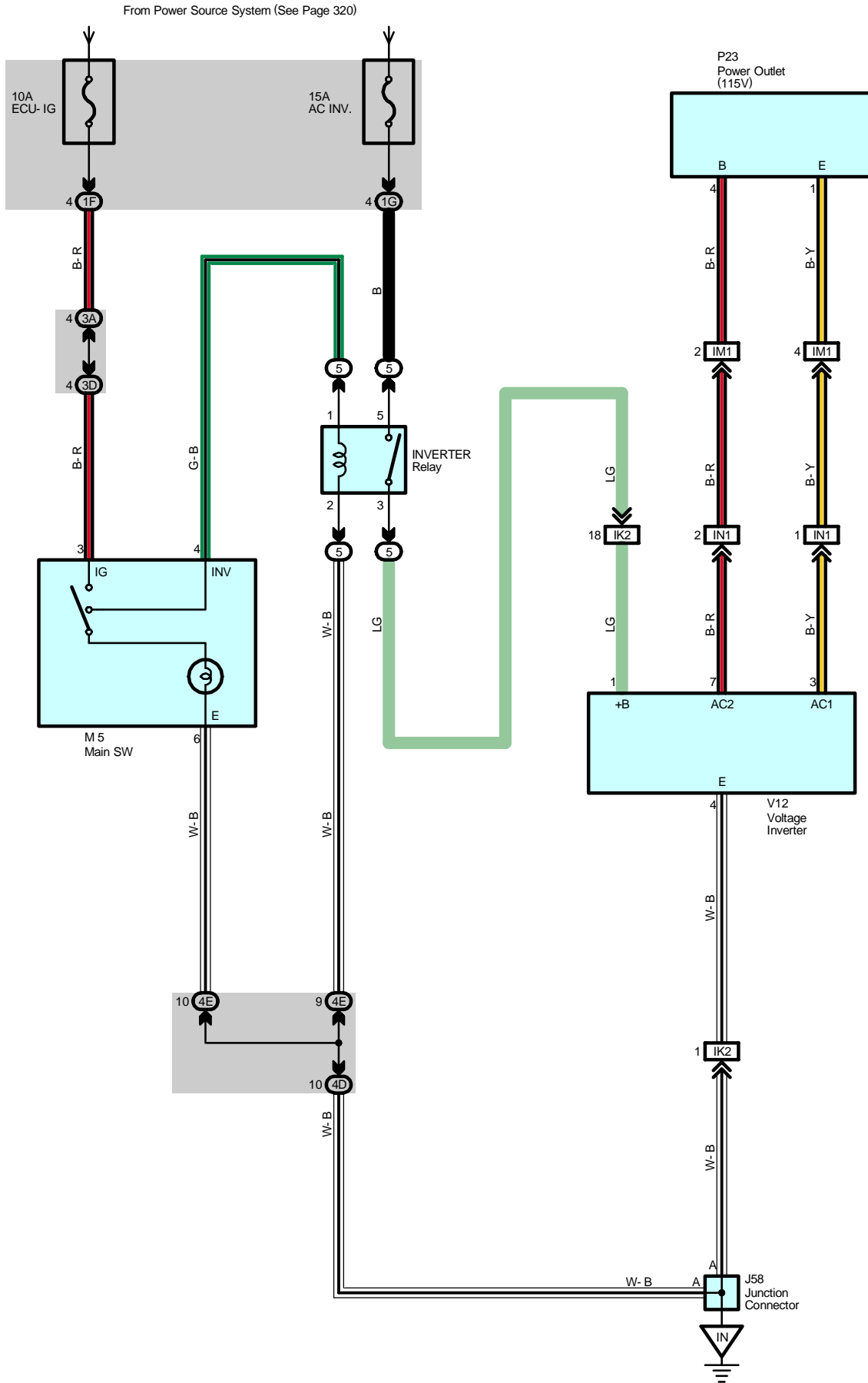
□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
ID2	92	Cigarette Lighter Wire and Cowl Wire (Instrument Panel Brace LH)
IM1	92	Console Box Wire and Cowl Wire (Rear Console)

▽ : Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel

Power Outlet - 115V (Double Cab)



Service Hints**INVERTER Relay**

5-3 : Closed with the ignition SW at ON position and the main SW at on

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page
J58	68	P23	69		
M5	69	V12	71		

 : **Relay Blocks**

Code	See Page	Relay Blocks (Relay Block Location)
5	39	Driver Side R/B (Under the Instrument Panel J/B)

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1G		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3D		
4D	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4E		

 : **Connector Joining Wire Harness and Wire Harness**

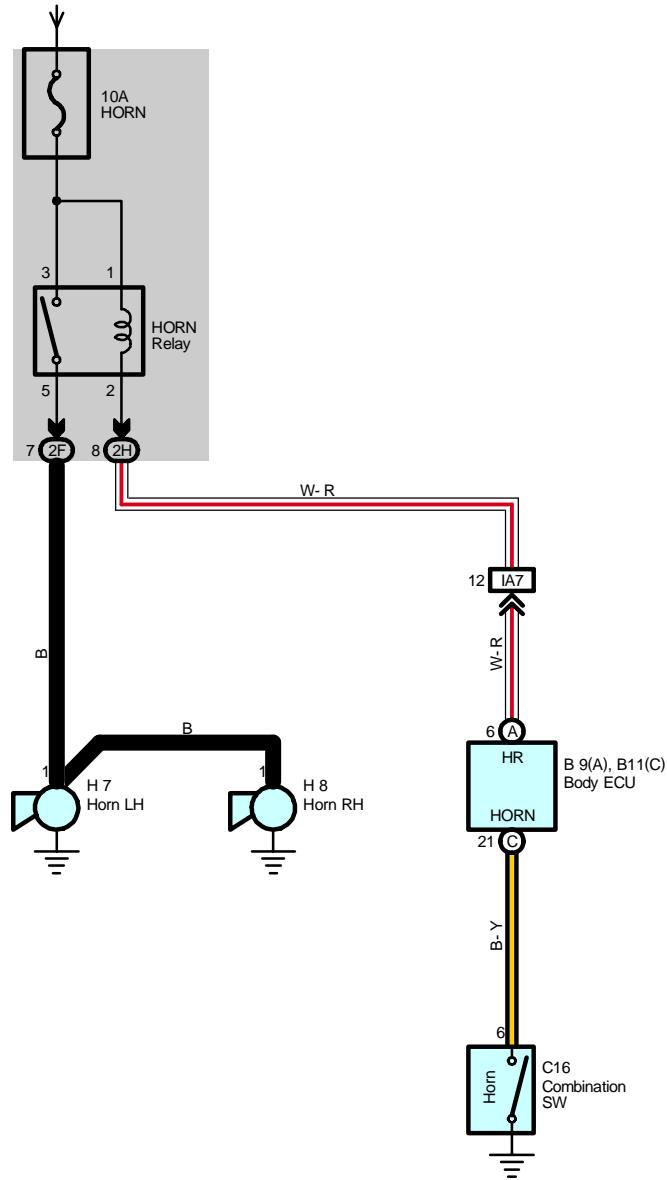
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)
IM1	92	Console Box Wire and Cowl Wire (Rear Console)
IN1	92	Cowl Wire and Floor Wire (Rear Console)

 : **Ground Points**

Code	See Page	Ground Points Location
IN	92	Right Kick Panel

Horn (Double Cab)

From Power Source System (See Page 320)



Service Hints**C16 Combination SW**

6-Ground : Continuity with the horn SW on

○ : Parts Location

Code		See Page	Code		See Page	Code		See Page
B9	A	66	C16	66	H8	64		
B11	C	66	H7	64				

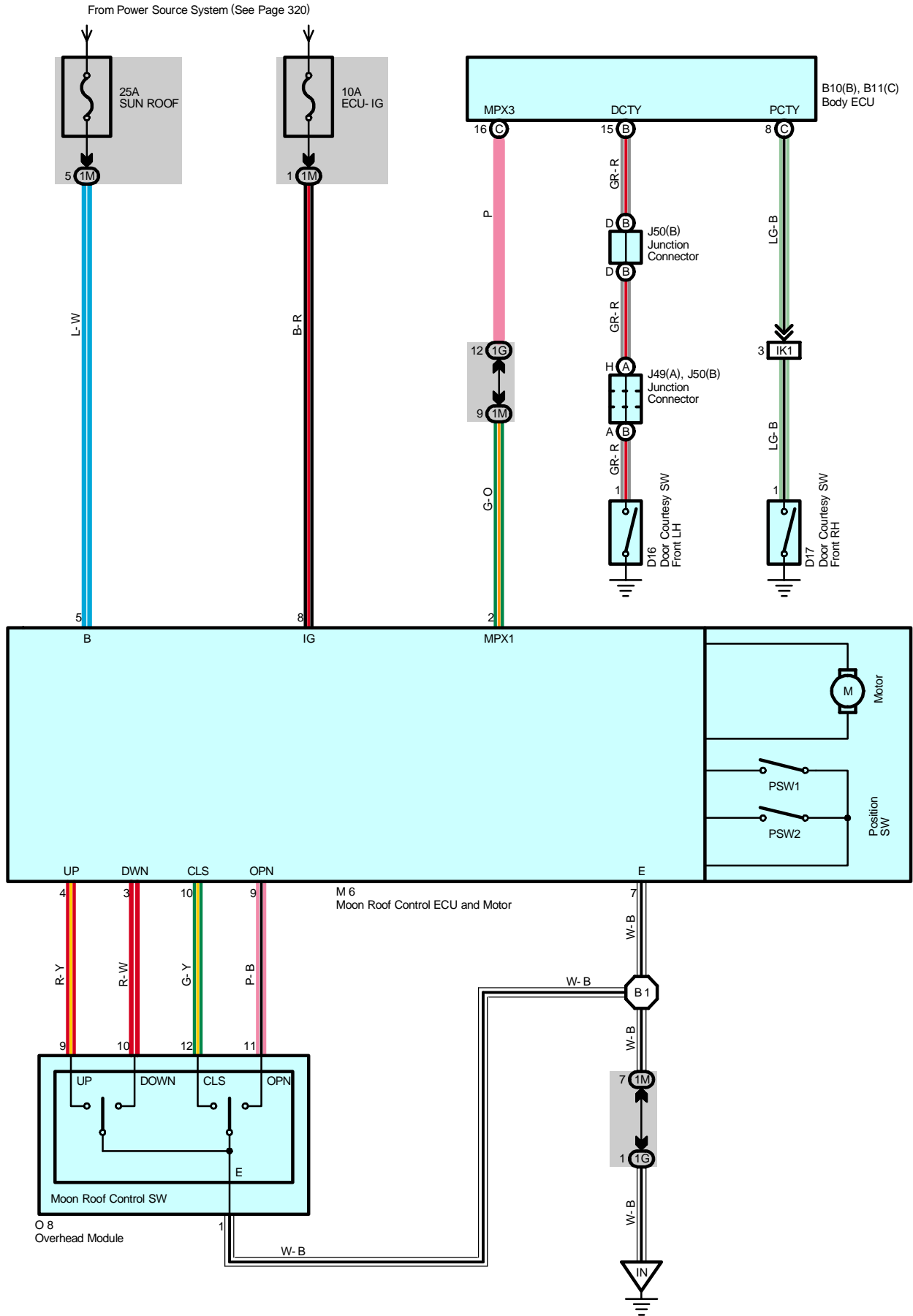
○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
2F	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2H		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA7	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)

Moon Roof (Double Cab)



System Outline

The moon roof can be operated by the moon roof control SW, when the ignition SW is at ON position or during the key-off operation.

1. Jam Protection Function

During close or tilt down operation, if the system detects a load, the motor rotates in the opposite direction.

2. Key-Off Operation

With all the doors closed, within 43 seconds after the ignition switch has been turned to OFF from ON, the moon roof can be operated. However, if the front door is opened, the moon roof cannot be operated.

Service Hints

M6 Moon Roof Control ECU and Motor

5-Ground : Always approx. 12 volts

8-Ground : Approx. 12 volts with the ignition SW at ON position
: Approx. 12 volts with the key off moon roof operation

7-Ground : Always continuity

O8 Overhead Module

9-1 : Closed with the moon roof control SW at UP position

10-1 : Closed with the moon roof control SW at DOWN position

11-1 : Closed with the moon roof control SW at OPEN position

12-1 : Closed with the moon roof control SW at CLOSE position

1-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
B10	B	66	D17	70	M6	70	
B11	C	66	J49	A	68	O8	70
D16	70	J50	B	68			

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1M	45	Roof Wire and Driver Side J/B (Lower Finish Panel)

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)

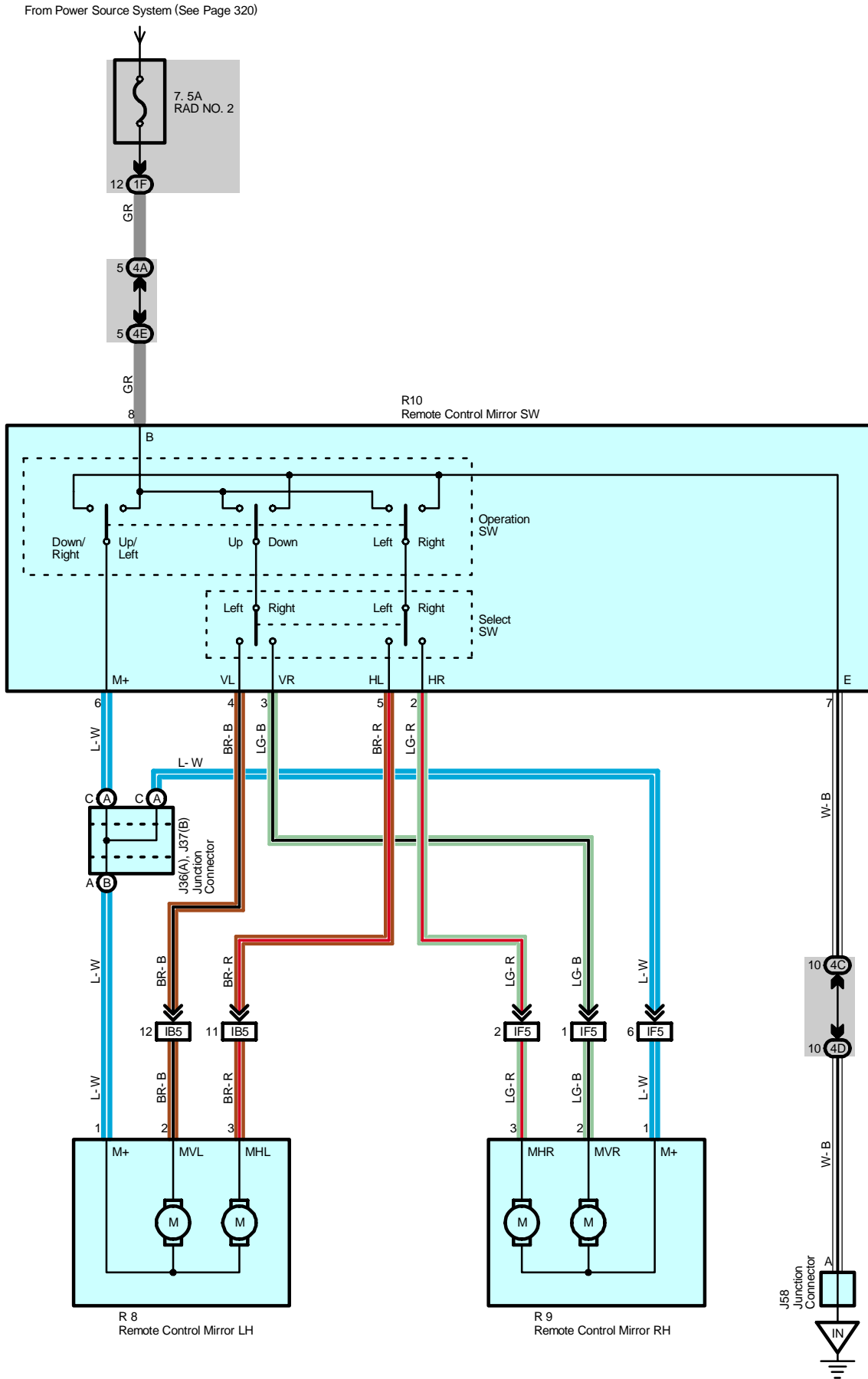
▽ : Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
B1	96	Roof Wire			

Remote Control Mirror (Double Cab)



Service Hints

R10 Remote Control Mirror SW

8-6 : Continuity with the operation SW at UP or LEFT position

6-7 : Continuity with the operation SW at DOWN or RIGHT position

8-Ground : Approx. 12 volts with the ignition SW at ACC or ON position

7-Ground : Always continuity

: Parts Location

Code		See Page	Code	See Page	Code	See Page
J36	A	68	J58	68	R9	71
J37	B	68	R8	71	R10	69

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		
4D		
4E		

: Connector Joining Wire Harness and Wire Harness

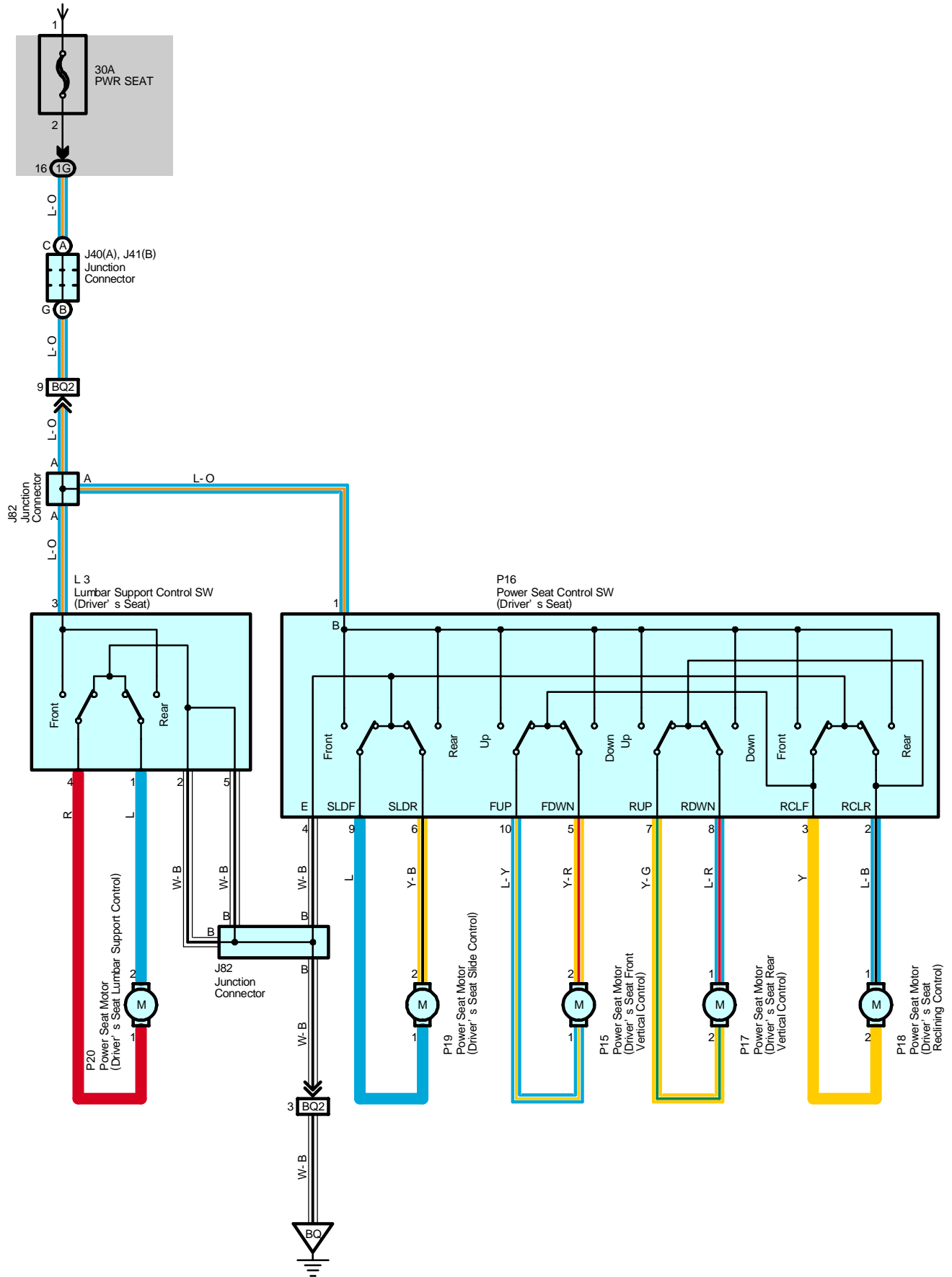
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF5	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)

: Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel

Power Seat (Double Cab)

From Power Source System (See Page 320)



Service Hints

P16 Power Seat Control SW (Driver's Seat)

- 1-9 : Closed with the driver's seat at front slide operation
- 1-6 : Closed with the driver's seat at rear slide operation
- 1-3 : Closed with the driver's seat at front reclining operation
- 1-2 : Closed with the driver's seat at rear reclining operation
- 1-10 : Closed with the driver's seat at front vertical up operation
- 1-5 : Closed with the driver's seat at front vertical down operation
- 1-7 : Closed with the driver's seat at rear vertical up operation
- 1-8 : Closed with the driver's seat at rear vertical down operation
- 4-Ground : Always continuity

: Parts Location

Code		See Page	Code	See Page	Code	See Page
J40	A	68	P15	72	P19	72
J41	B	68	P16	72	P20	72
J82		72	P17	72		
L3		72	P18	72		

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)

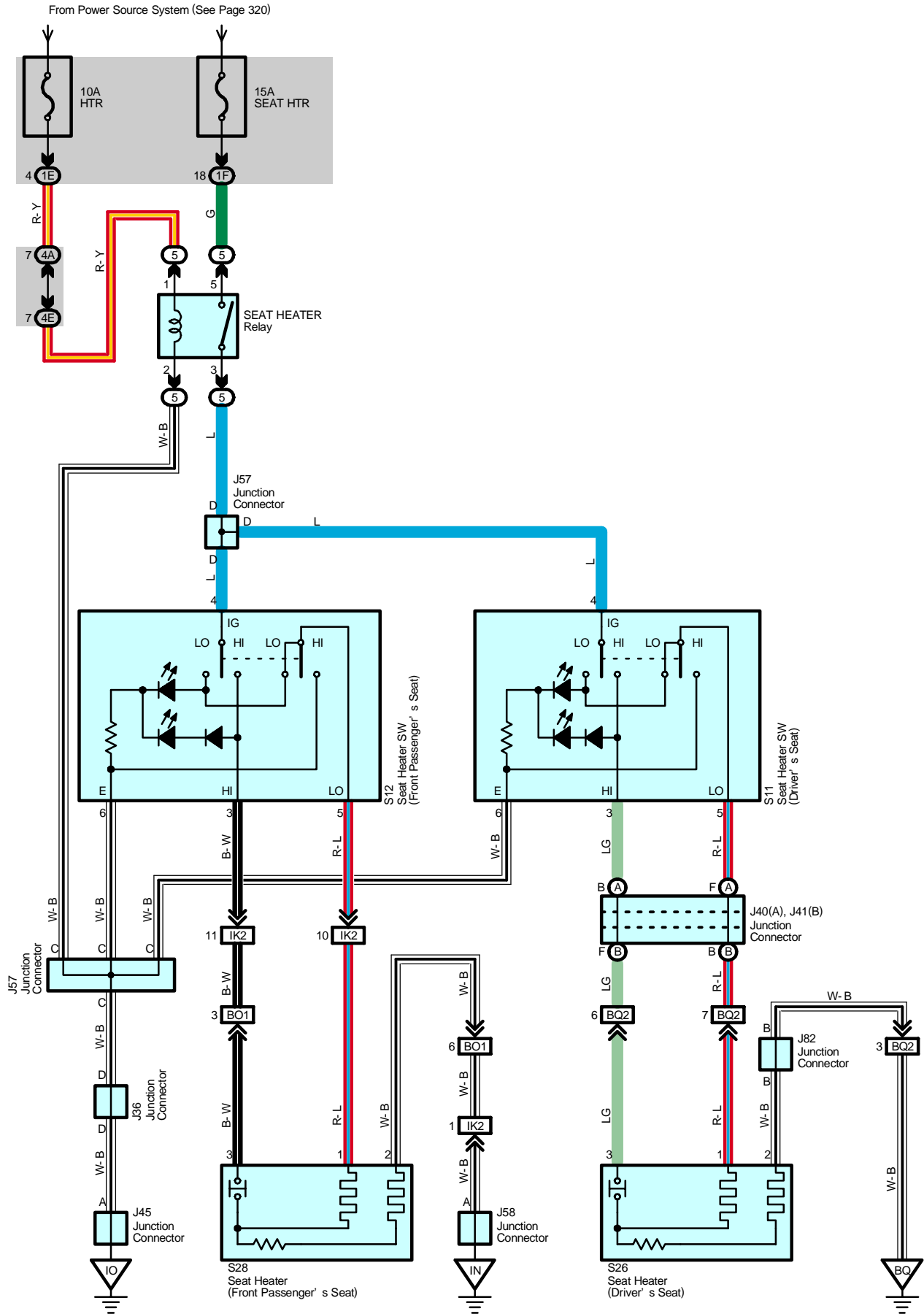
: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
BQ2	98	Floor No.2 Wire and Seat No.2 Wire (Under the Driver's Seat)

: Ground Points

Code	See Page	Ground Points Location
BQ	96	Left Side of Center Pillar

Seat Heater (Double Cab)



Service Hints

S11, S12 Seat Heater SW (Driver's Seat), (Front Passenger's Seat)

4-Ground : Approx. 12 volts with the ignition SW at ON position

6-Ground : Always continuity

: Parts Location

Code		See Page	Code		See Page	Code		See Page
J36		68	J57		68	S12		69
J40	A	68	J58		68	S26		72
J41	B	68	J82		68	S28		72
J45		68	S11		69			

: Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
5	39	Driver Side R/B (Under the Instrument Panel J/B)

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1F		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4E		

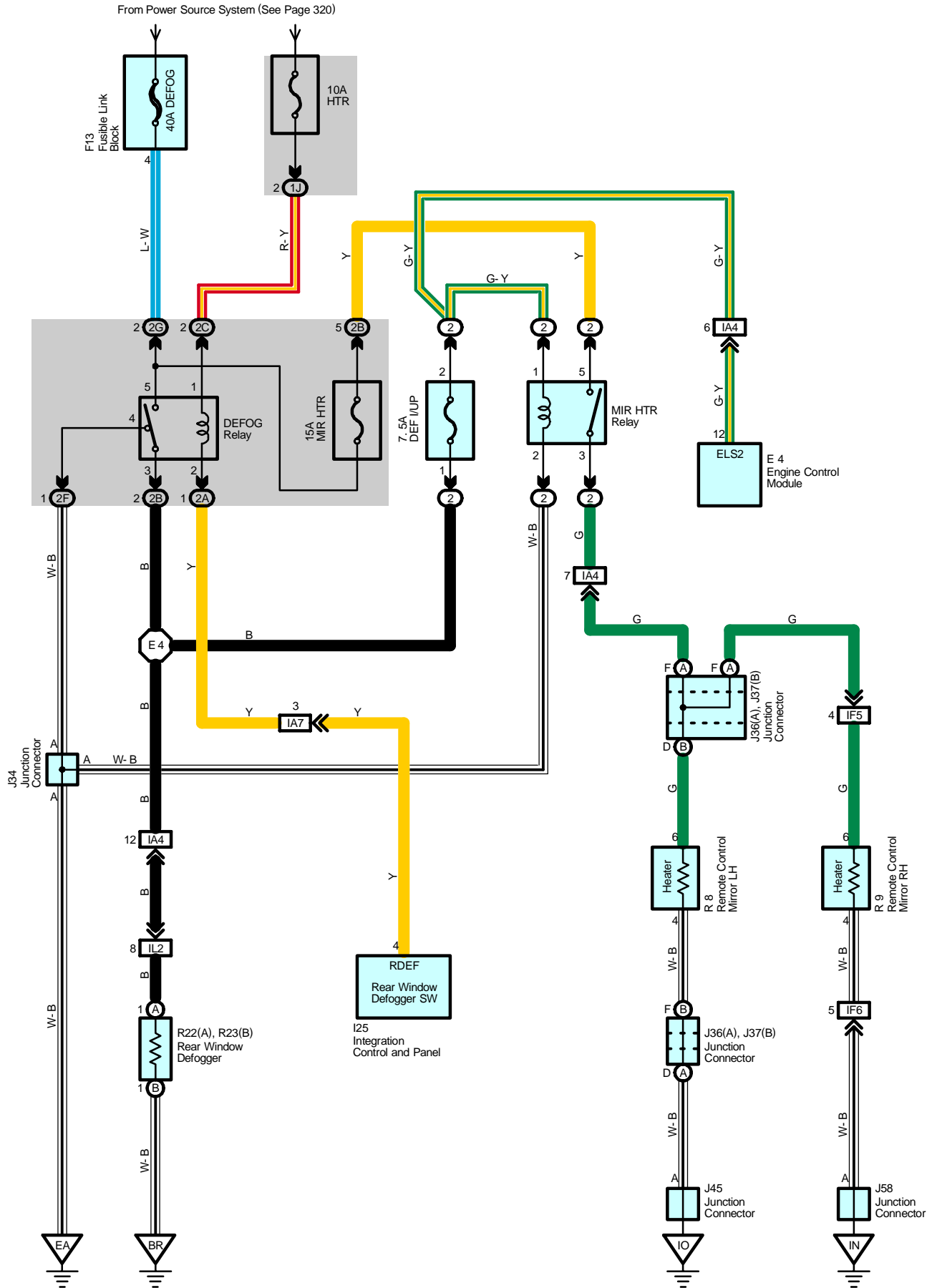
: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)
BO1	98	Floor Wire and Seat No.1 Wire (Under the Front Passenger's Seat)
BQ2	98	Floor No.2 Wire and Seat No.2 Wire (Under the Driver's Seat)

: Ground Points

Code	See Page	Ground Points Location
IN	92	Right Kick Panel
IO	92	Left Kick Panel
BQ	96	Left Side of Center Pillar

Rear Window Defogger and Mirror Heater (Double Cab)



Service Hints

DEFOG Relay

5-3 : Closed with the ignition SW at ON position and rear window defogger SW on

MIR HTR Relay

5-3 : Closed with the ignition SW at ON position and rear window defogger SW on

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
E4	67	J36	A	68	R8	71	
F13	34, 64	J37	B	68	R9	71	
I25	67	J45		68	R22	A	71
J34	65	J58		68	R23	B	71

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2A	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2B		
2C		
2F		
2G		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA7		
IF5	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IF6		
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)

▽ : Ground Points

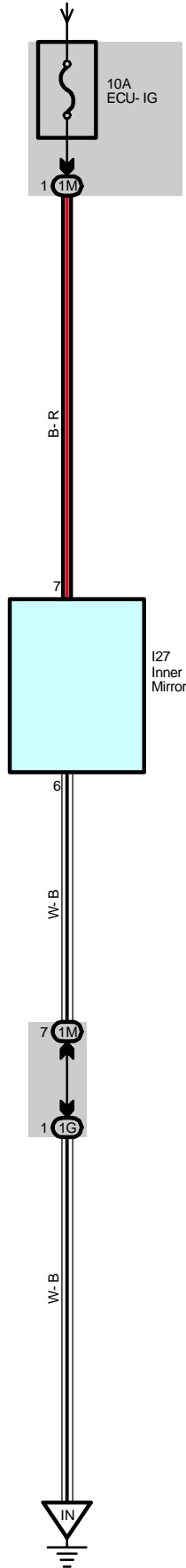
Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
IN	92	Right Kick Panel
IO	92	Left Kick Panel
BR	96	Back Panel Left

○ : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E4	90	Engine Room Main Wire			

Automatic Glare-Resistant EC Mirror (Double Cab)

From Power Source System (See Page 320)



Service Hints**I27 Inner Mirror**

7-Ground : Approx. 12 volts with the ignition SW at ON or ST position

6-Ground : Always continuity

 : **Parts Location**

Code	See Page	Code	See Page	Code	See Page
I27	70				

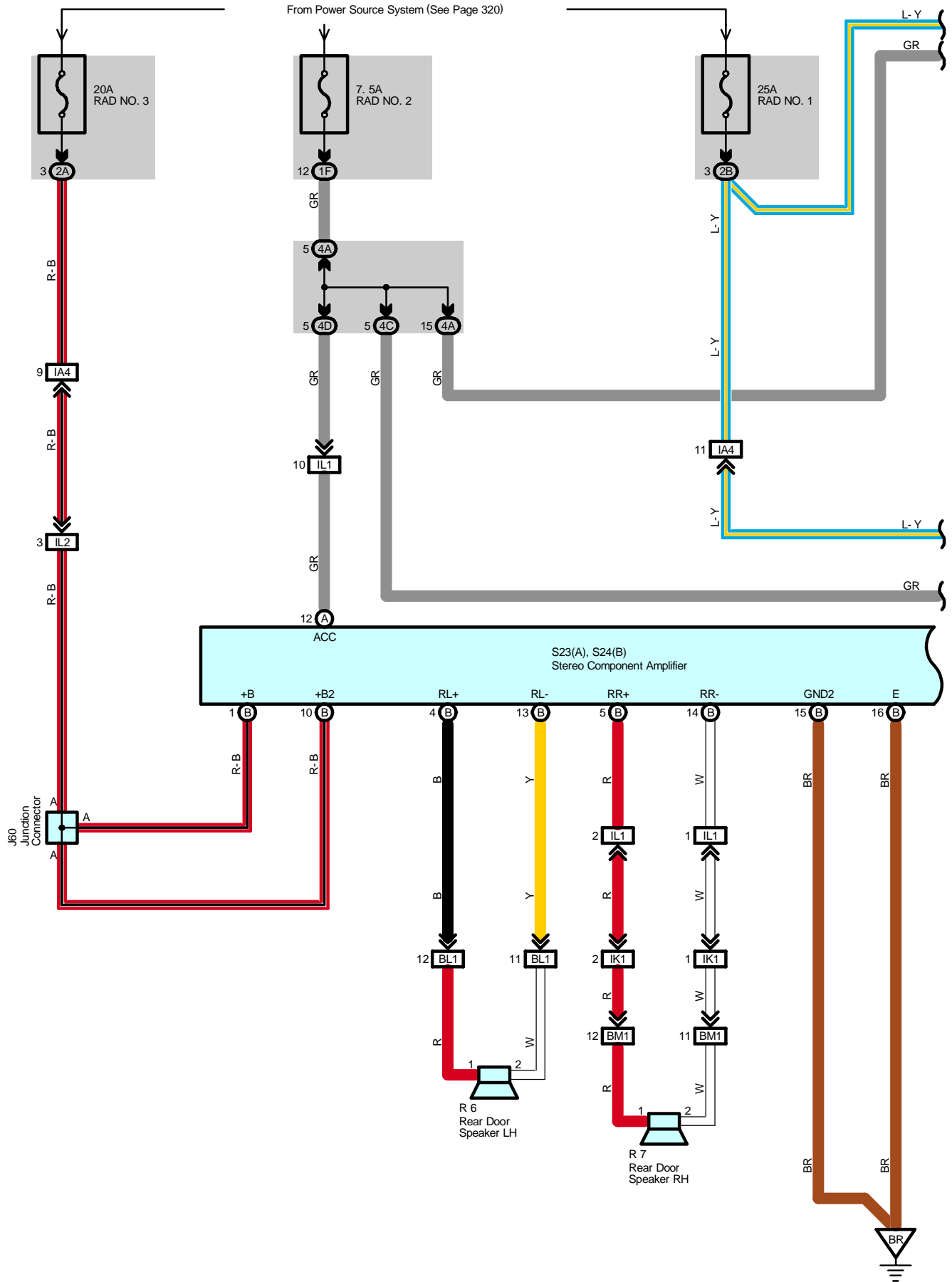
 : **Junction Block and Wire Harness Connector**

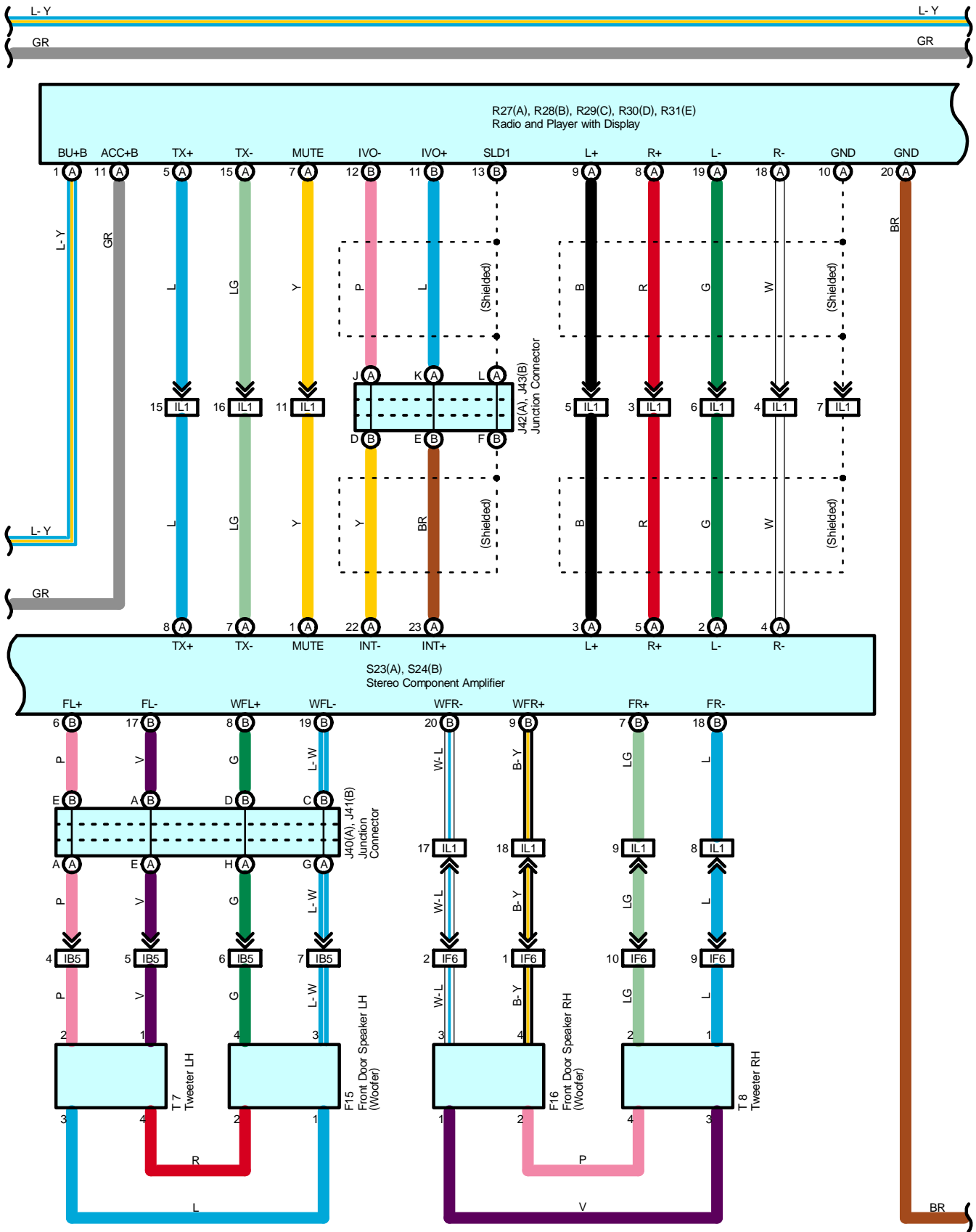
Code	See Page	Junction Block and Wire Harness (Connector Location)
1G	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1M	45	Roof Wire and Driver Side J/B (Lower Finish Panel)

 : **Ground Points**

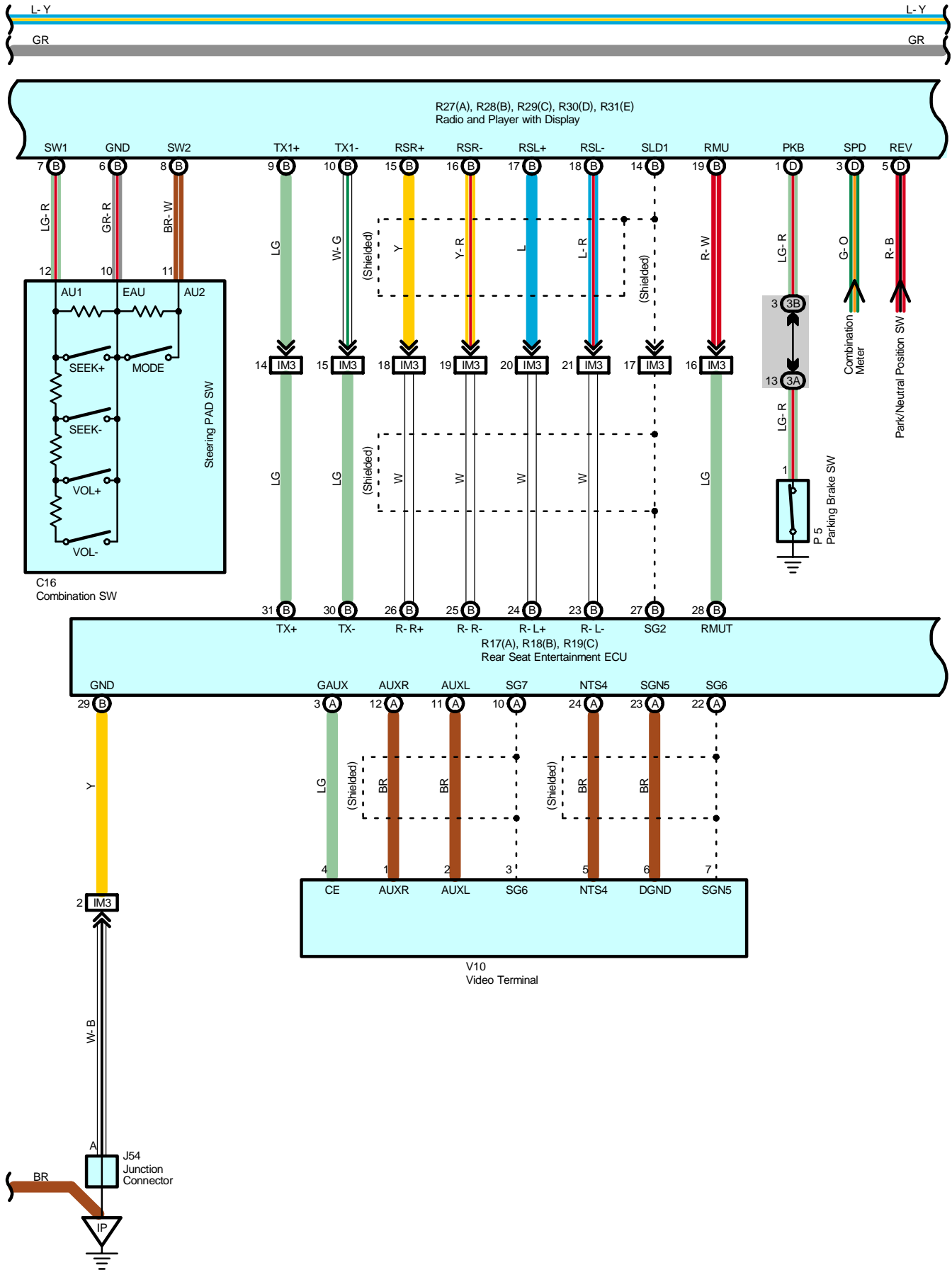
Code	See Page	Ground Points Location
IN	92	Right Kick Panel

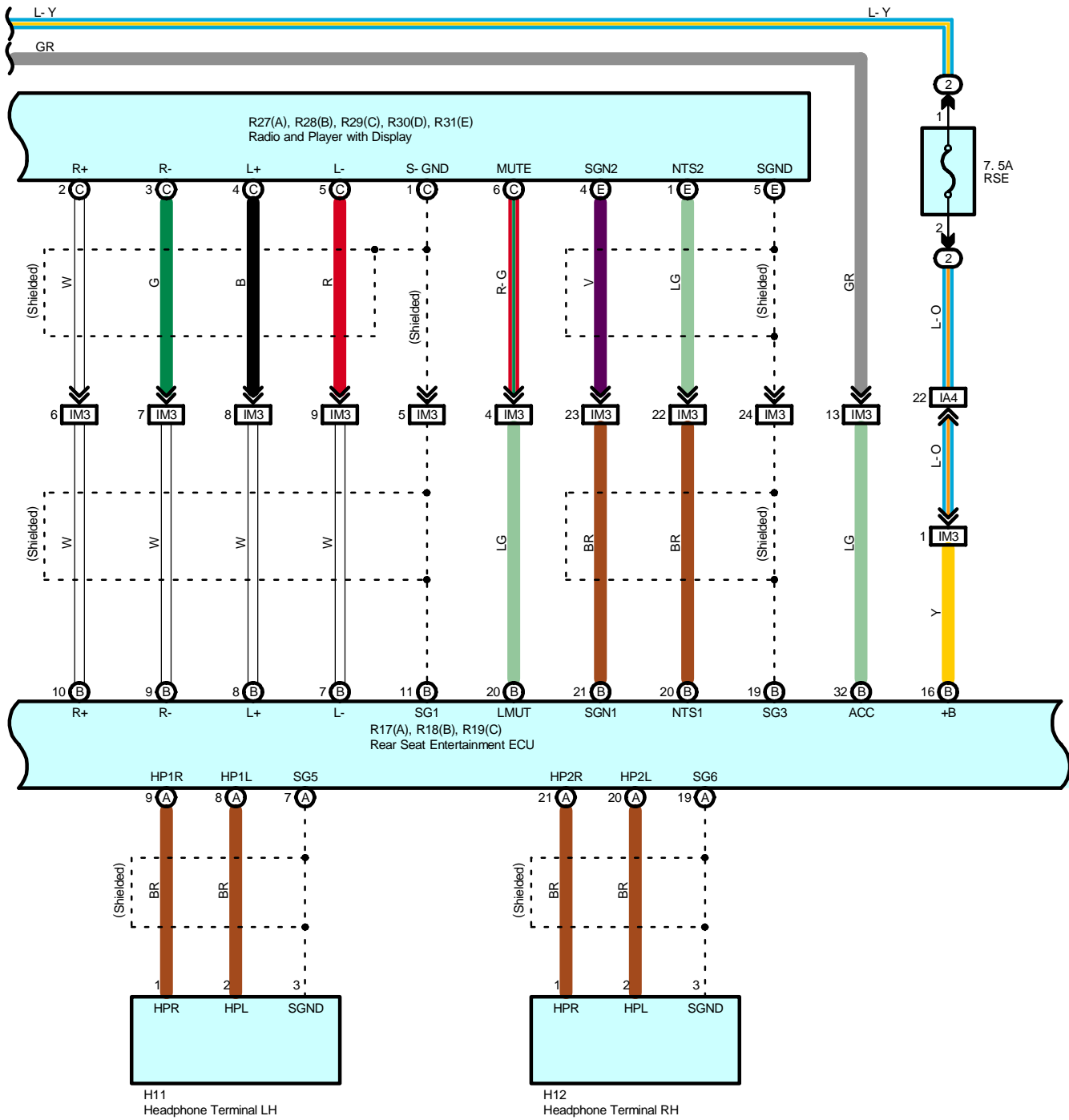
Navigation and Audio System with RSES (Double Cab)



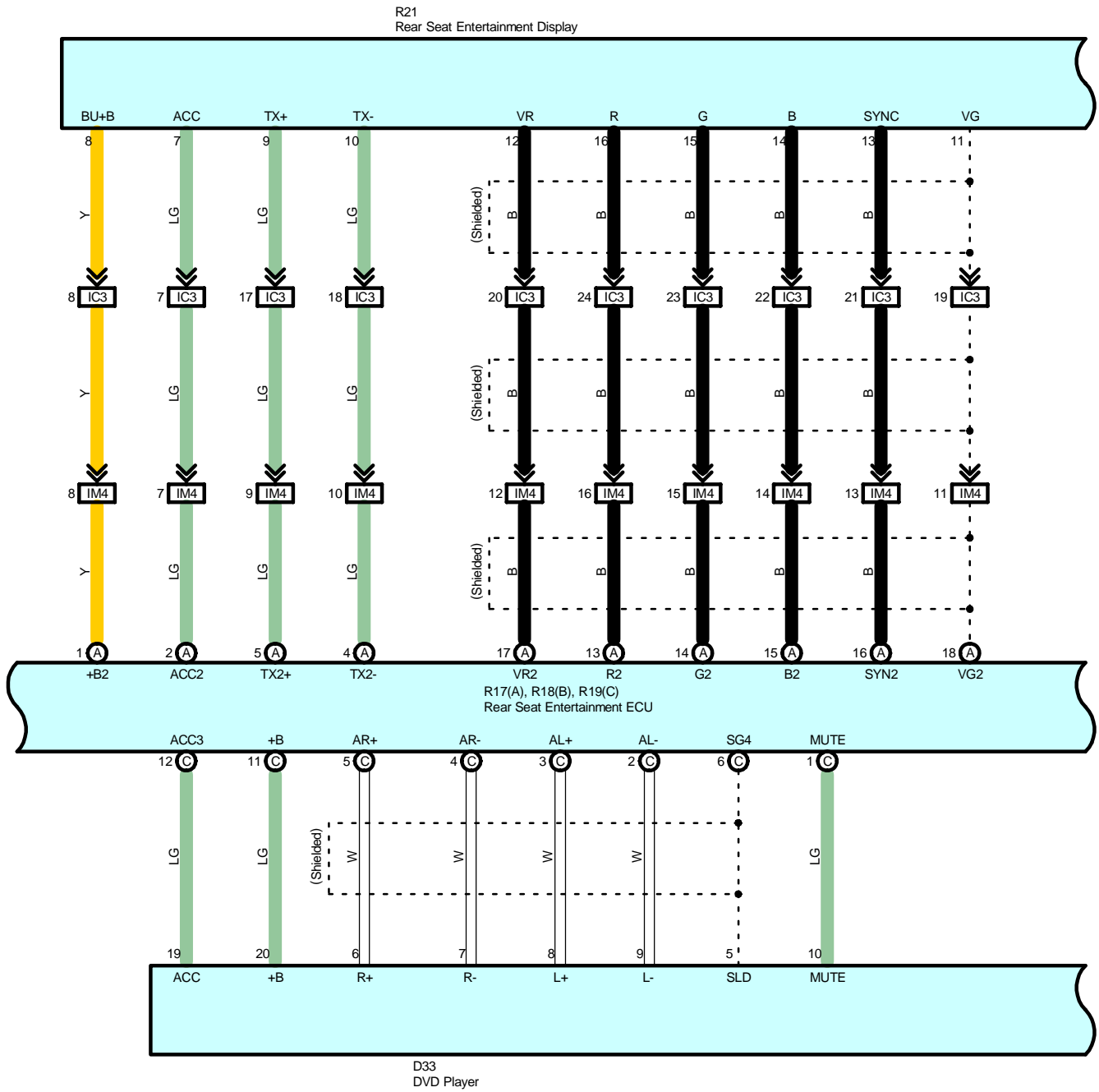


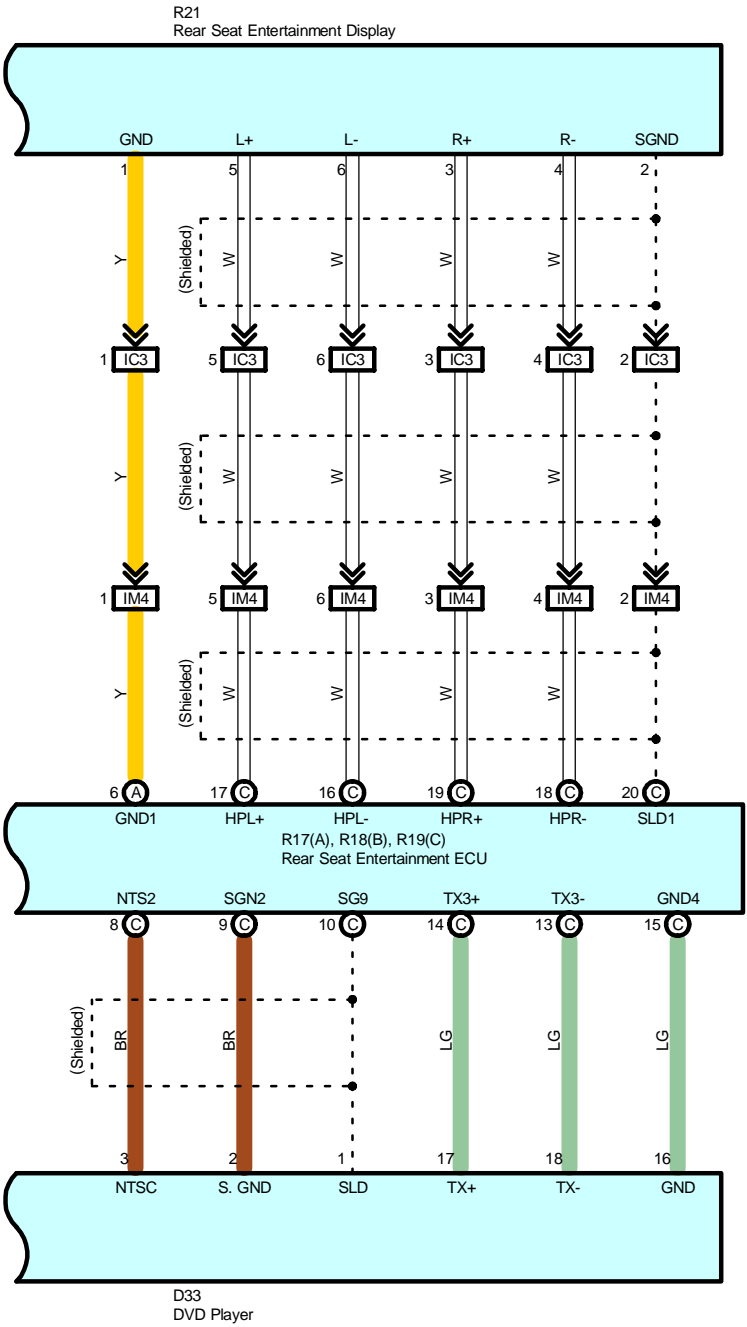
Navigation and Audio System with RSES (Double Cab)





Navigation and Audio System with RSES (Double Cab)





Navigation and Audio System with RSES (Double Cab)

Service Hints

S23 (A), S24 (B) Stereo Component Amplifier

(B) 1, (B) 10-Ground : Always approx. 12 volts

(A)12-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated

(B) 15, (B) 16-Ground : Always continuity

R27 (A) Radio and Player with Display

(A) 1-Ground : Always approx. 12 volts

(A)11-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated

(A)20-Ground : Always continuity

R17 (A) Rear Seat Entertainment ECU

(B)16-Ground : Always approx. 12 volts

(B)29-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
C16	66	J54	68	R28	B 69
D33	67	J60	70	R29	C 69
F15	70	P5	69	R30	D 69
F16	70	R6	71	R31	E 69
H11	67	R7	71	S23	A 71
H12	67	R17	A 69	S24	B 71
J40	A 68	R18	B 69	T7	71
J41	B 68	R19	C 69	T8	71
J42	A 68	R21	71	V10	69
J43	B 68	R27	A 69		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
2A	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2B		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		
4D		

□ : Connector Joining Wire Harness and Wire Harness

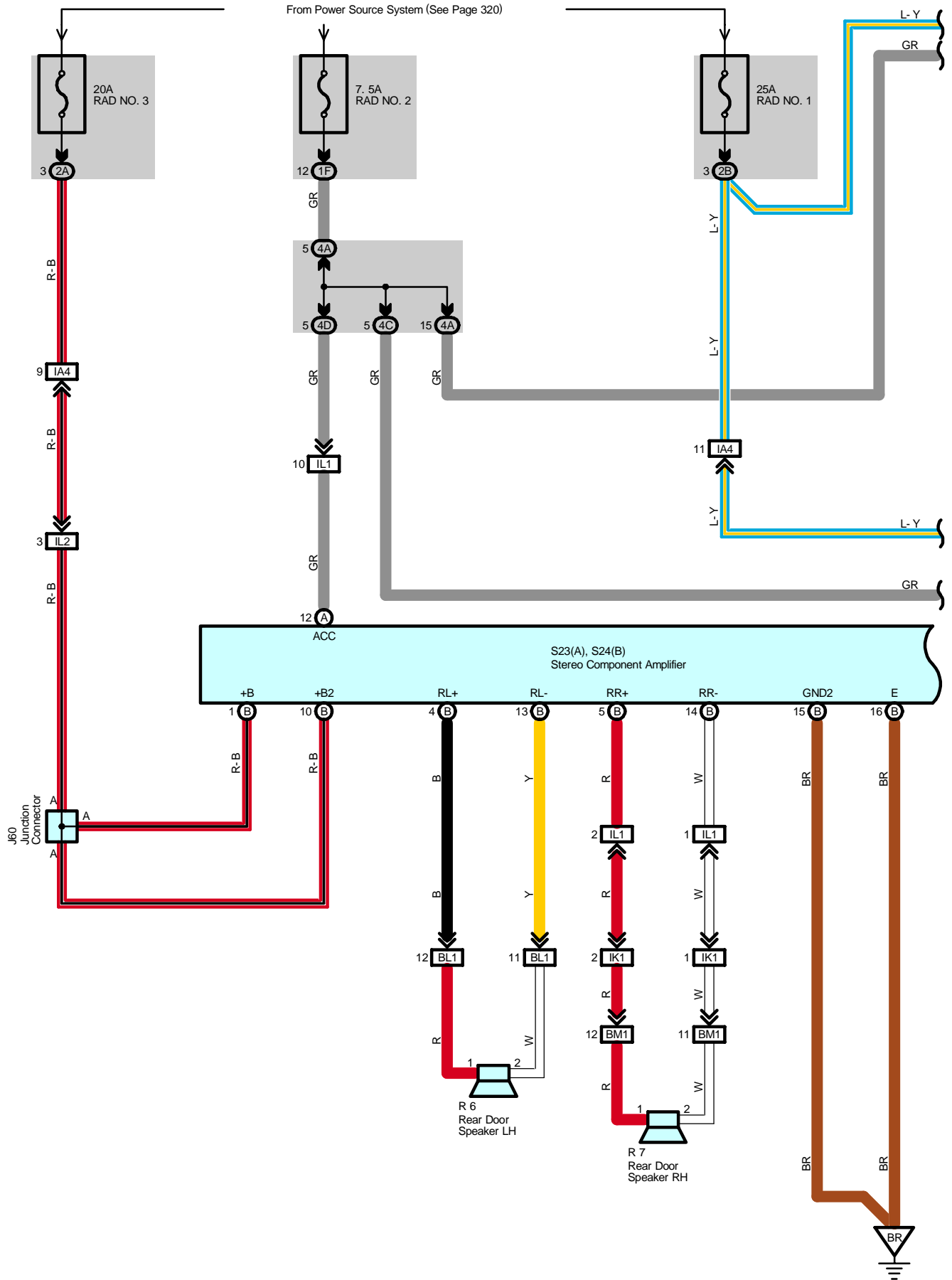
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IC3	92	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IL1	94	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
IM3	92	Console Box Wire and Cowl Wire (Rear Console)
IM4		
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)

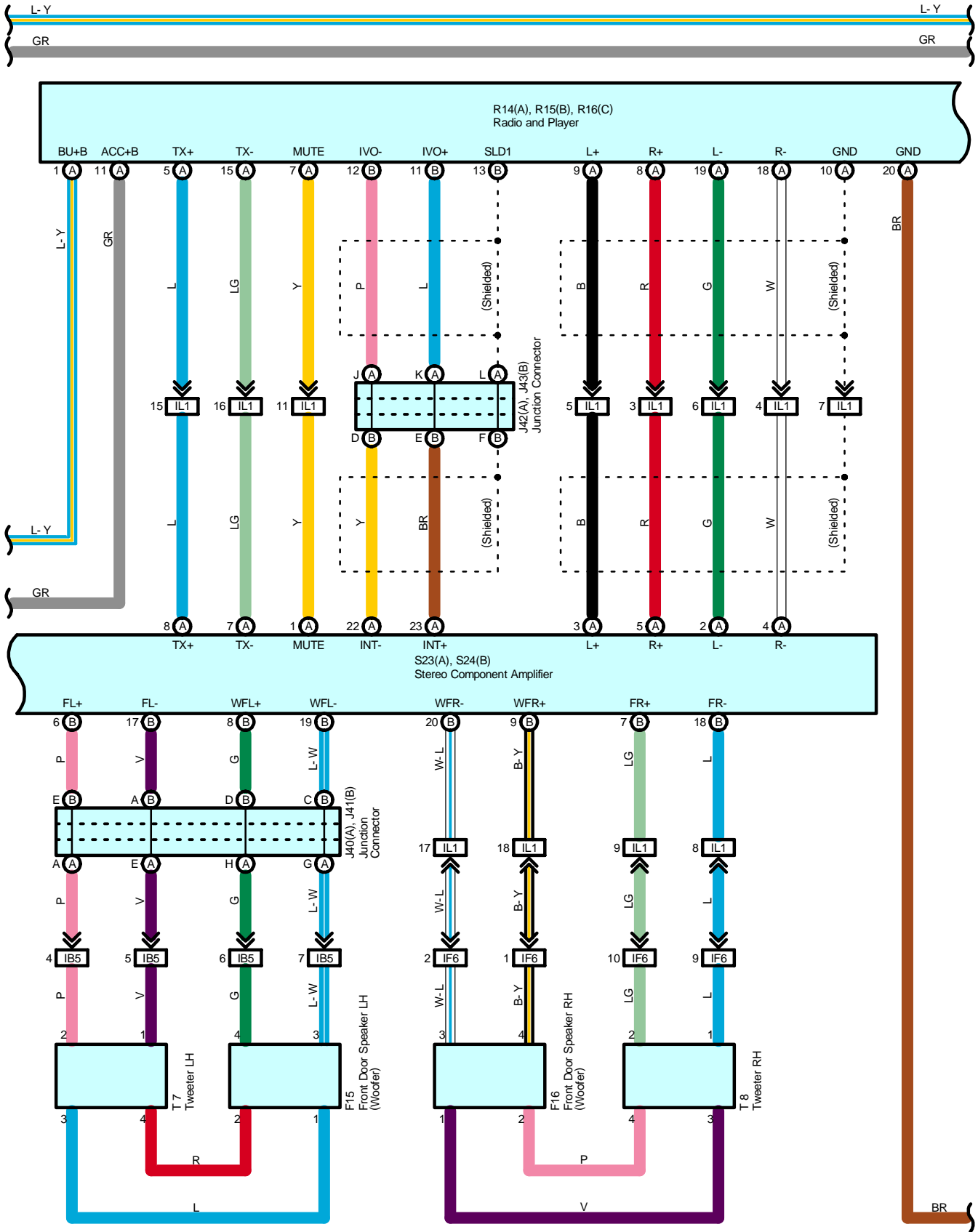


: Ground Points

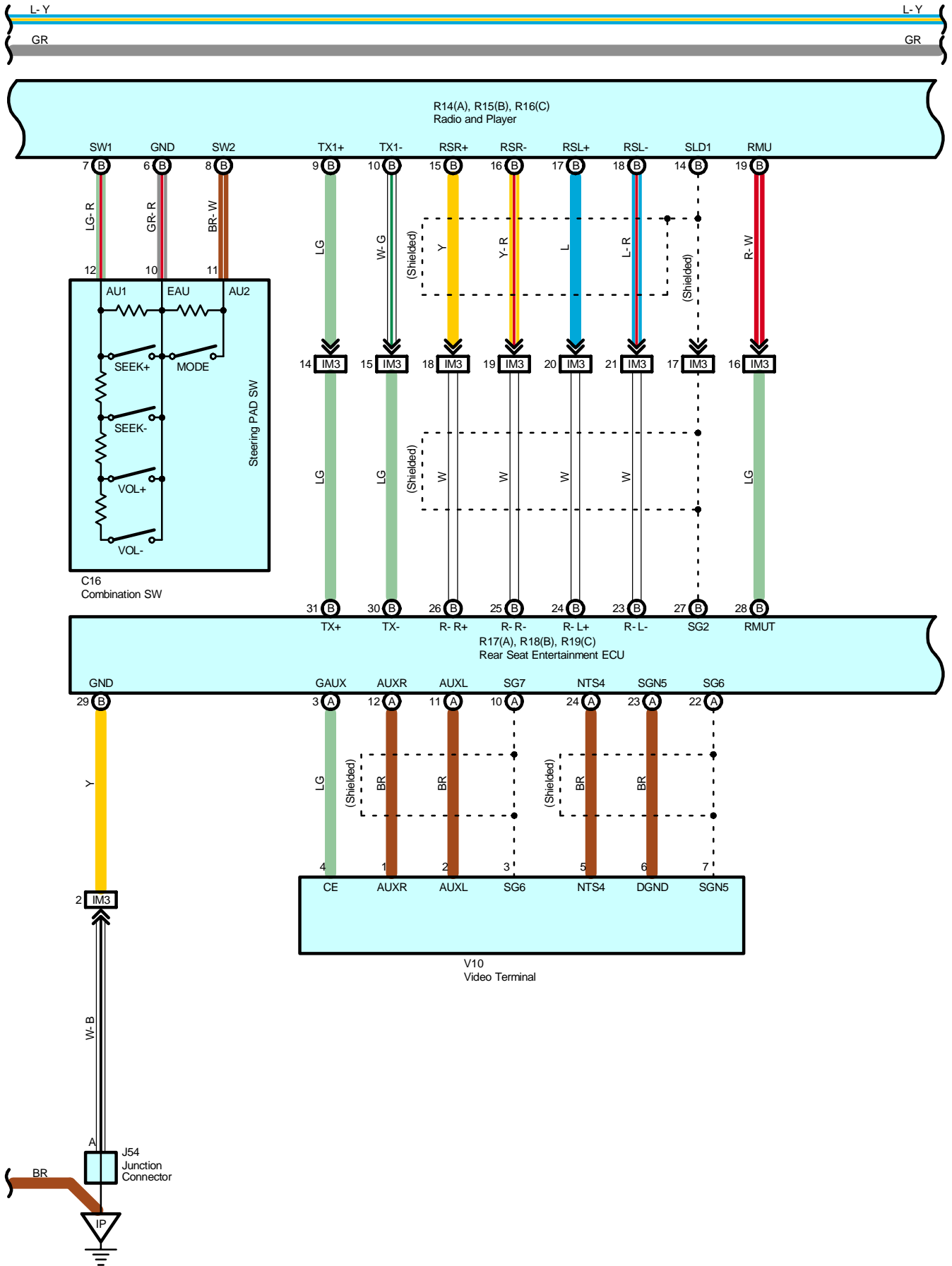
Code	See Page	Ground Points Location
IP	92	Instrument Panel Brace LH
BR	96	Back Panel Left

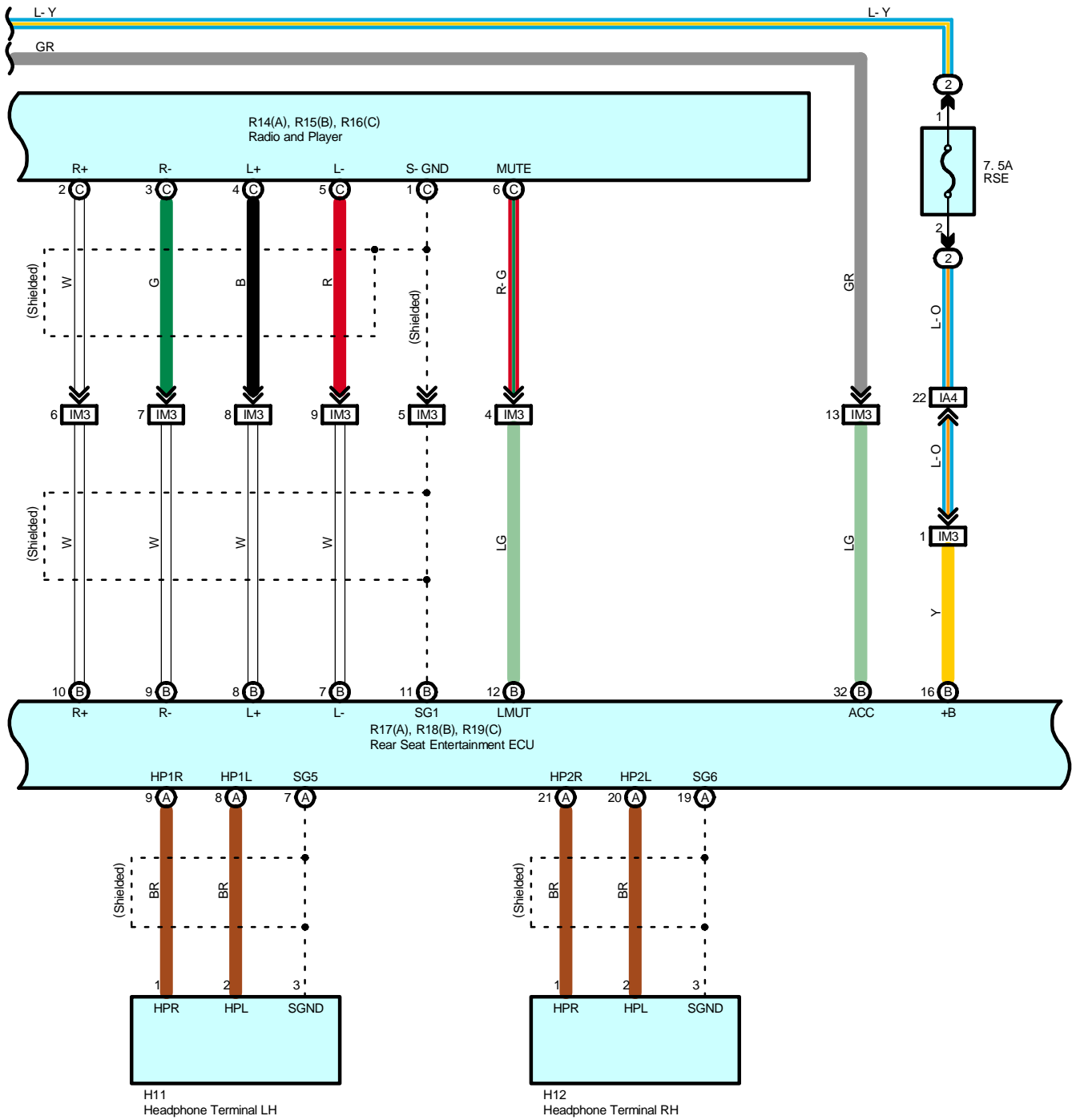
Audio System with RSES (Double Cab)



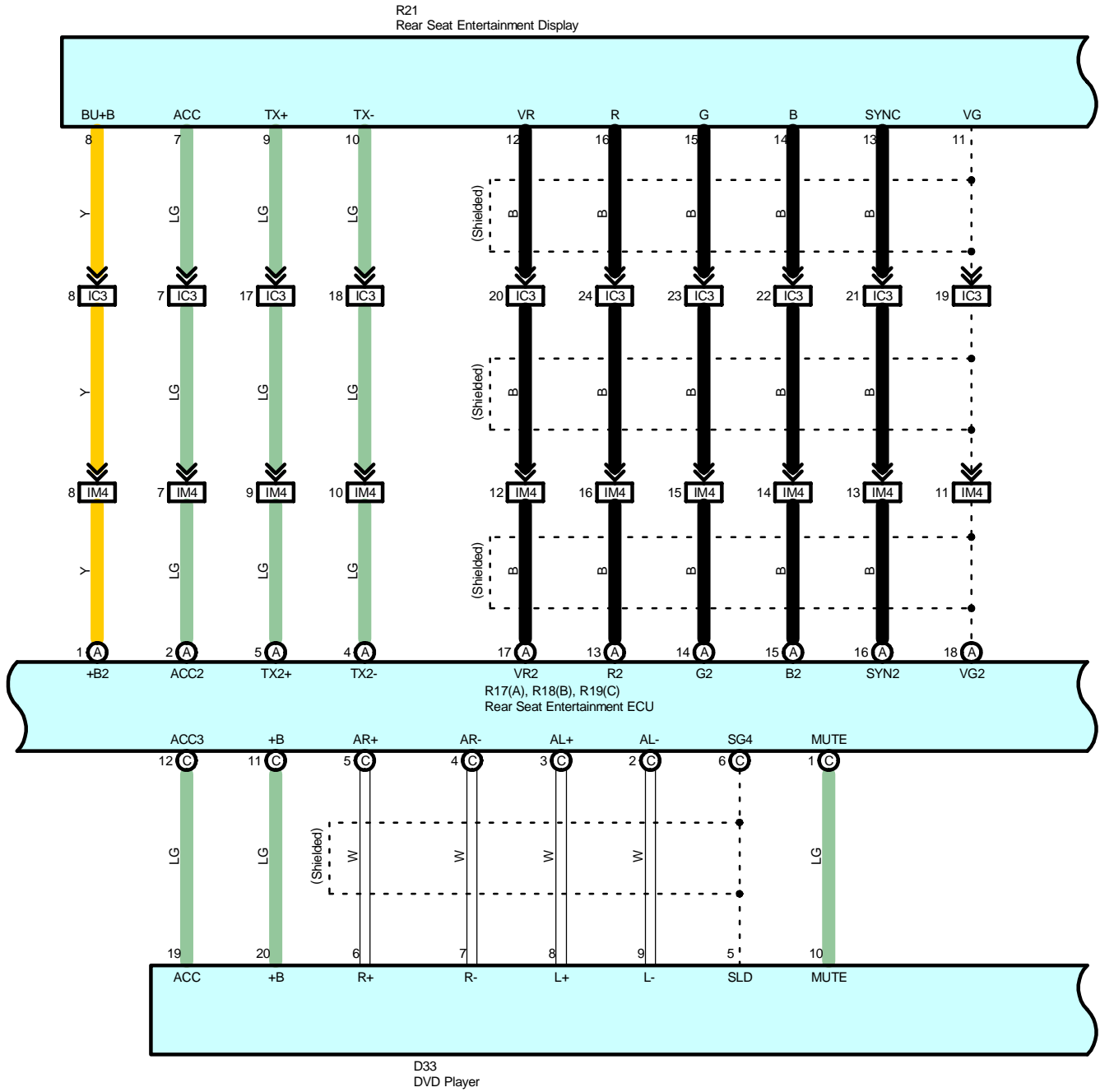


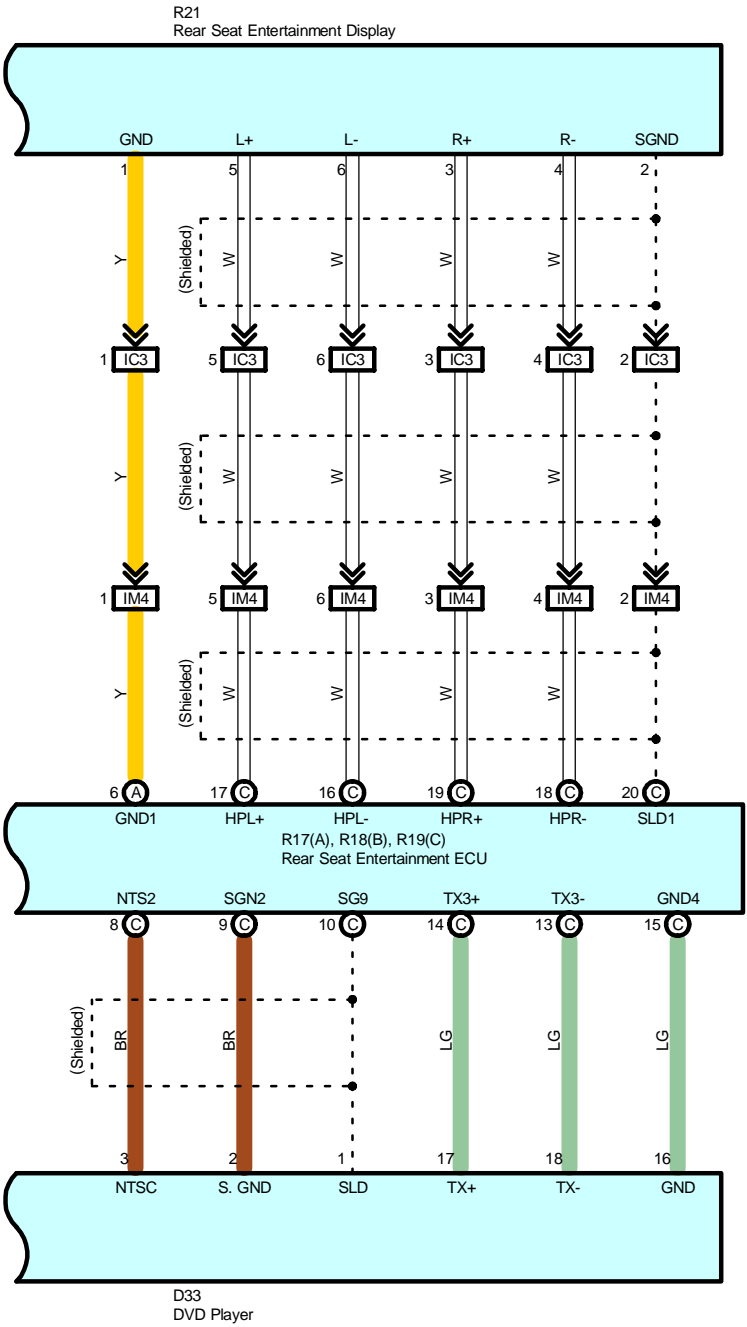
Audio System with RSES (Double Cab)





Audio System with RSES (Double Cab)





Audio System with RSES (Double Cab)

Service Hints

S23 (A), S24 (B) Stereo Component Amplifier

- (B) 1, (B) 10-Ground : Always approx. 12 volts
- (A)12-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated
- (B) 15, (B) 16-Ground : Always continuity

R14 (A) Radio and Player

- (A) 1-Ground : Always approx. 12 volts
- (A)11-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated
- (A)20-Ground : Always continuity

R17 (A) Rear Seat Entertainment ECU

- (B)16-Ground : Always approx. 12 volts
- (B)29-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
C16	66	J43	B	68	R18	B	69
D33	67	J54		68	R19	C	69
F15	70	J60		70	R21		71
F16	70	R6		71	S23	A	71
H11	67	R7		71	S24	B	71
H12	67	R14	A	69	T7		71
J40	A	R15	B	69	T8		71
J41	B	R16	C	69	V10		69
J42	A	R17	A	69			

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
2A	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2B		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		
4D		

□ : Connector Joining Wire Harness and Wire Harness

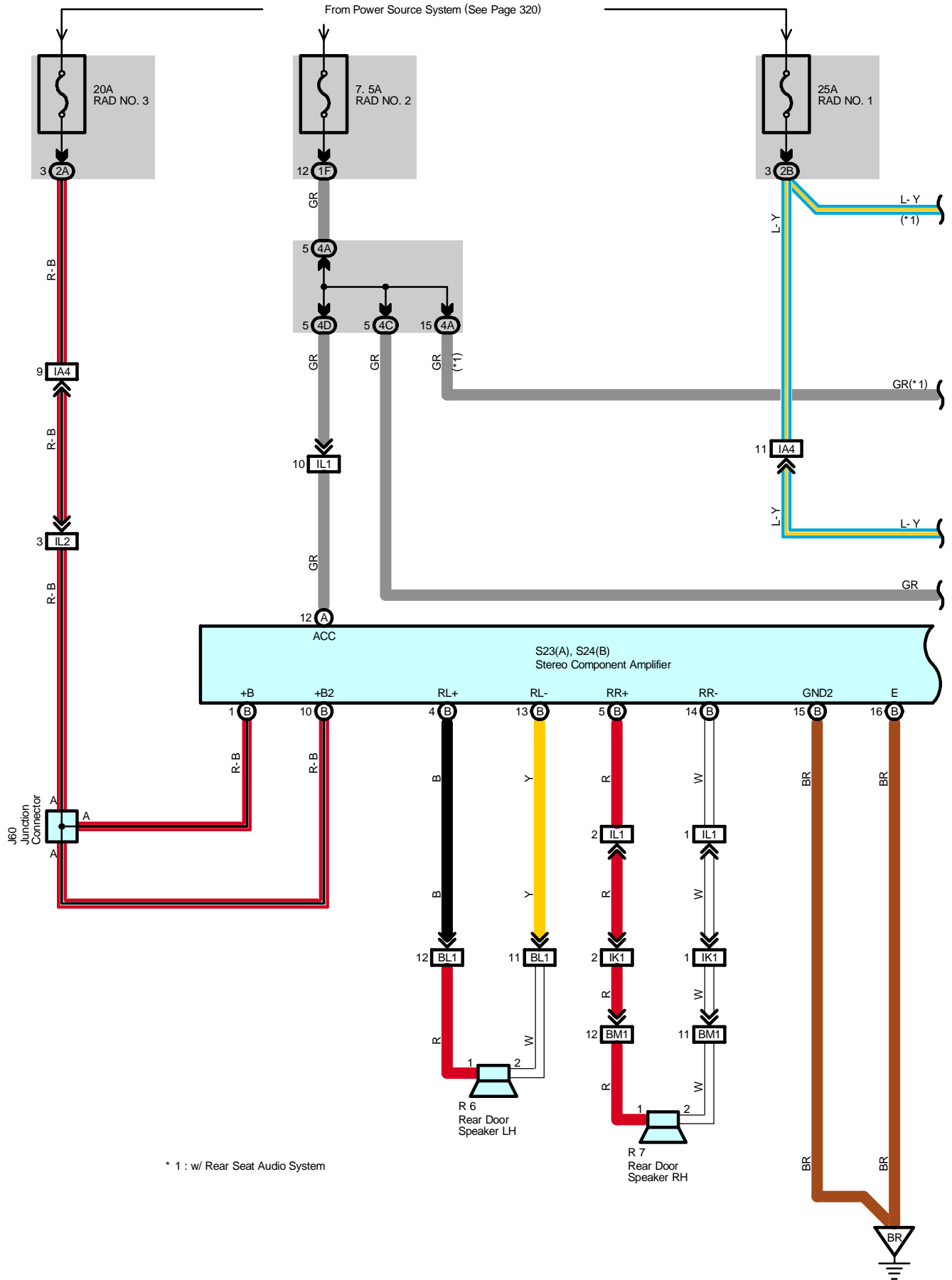
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IC3	92	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IL1	94	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
IM3	92	Console Box Wire and Cowl Wire (Rear Console)
IM4		
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)



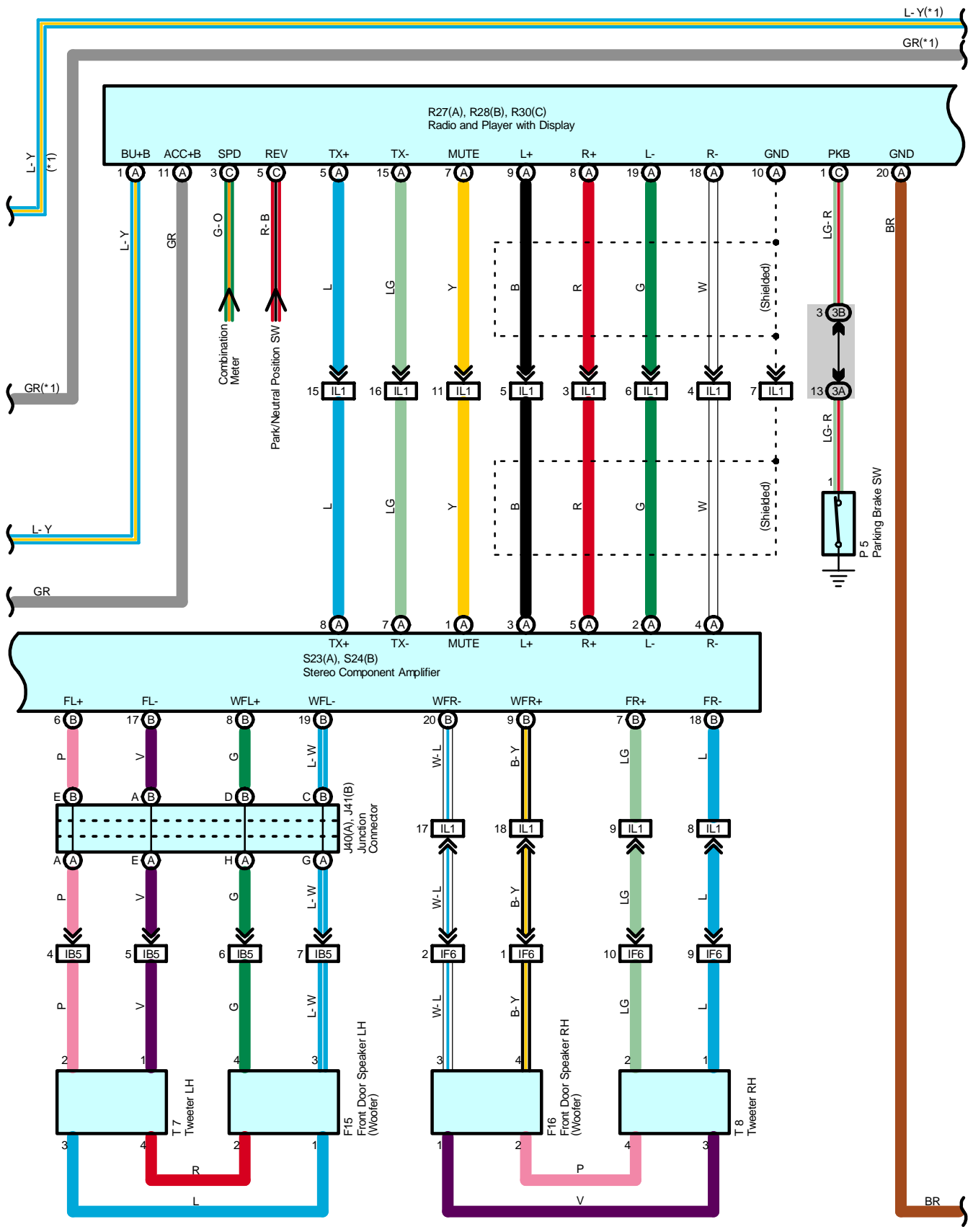
: Ground Points

Code	See Page	Ground Points Location
IP	92	Instrument Panel Brace LH
BR	96	Back Panel Left

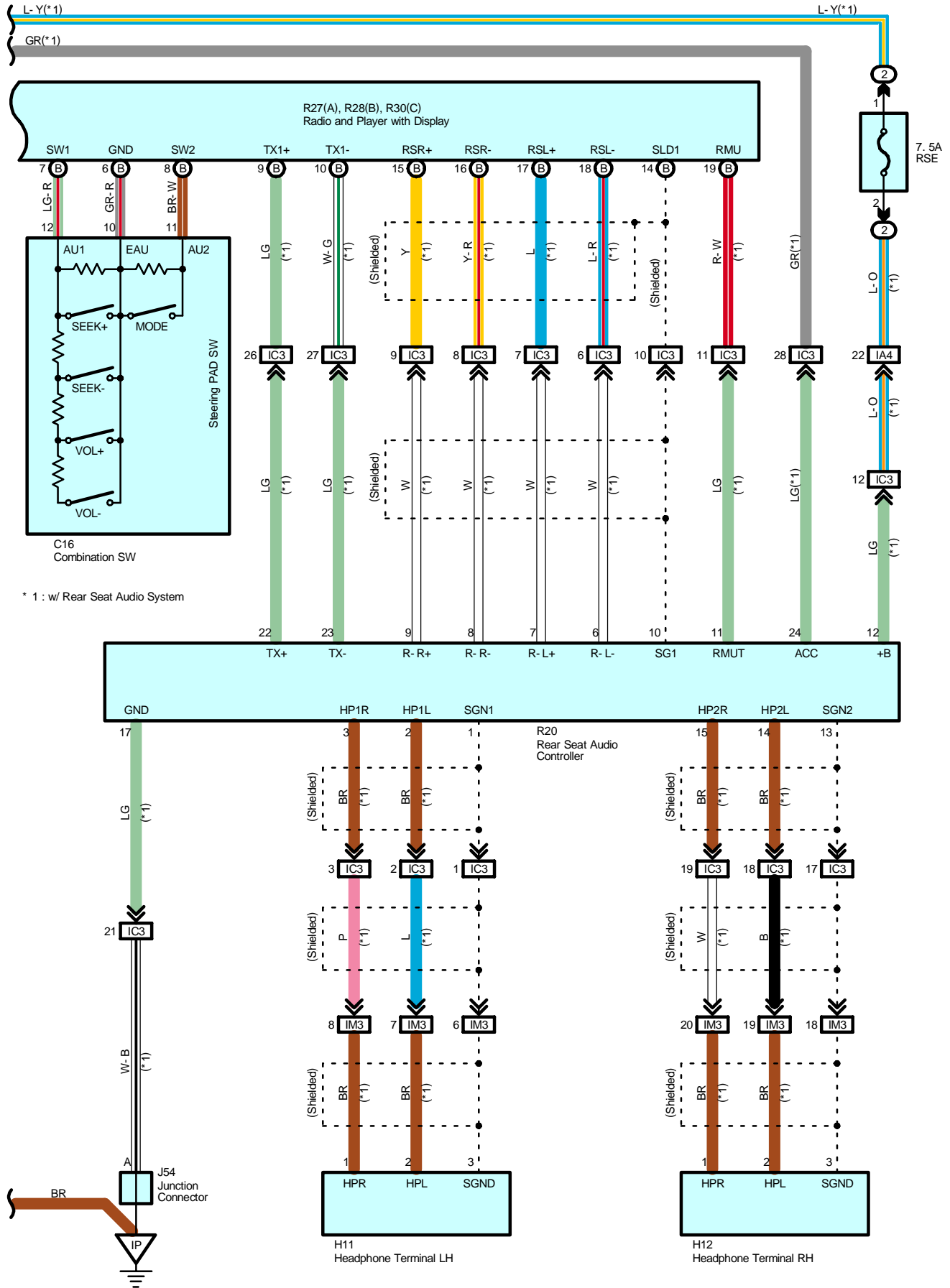
Navigation and Audio System with 8 Speaker (Double Cab)



* 1 : w/ Rear Seat Audio System



Navigation and Audio System with 8 Speaker (Double Cab)



Service Hints

S23 (A), S24 (B) Stereo Component Amplifier

(B) 1, (B) 10-Ground : Always approx. 12 volts

(A)12-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated

(B) 15, (B) 16-Ground : Always continuity

R27 (A) Radio and Player with Display

(A) 1-Ground : Always approx. 12 volts

(A)11-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated

(A)20-Ground : Always continuity

R20 Rear Seat Audio Controller

12-Ground : Always approx. 12 volts

17-Ground : Always continuity

: Parts Location

Code	See Page	Code	See Page	Code	See Page
C16	66	J54	68	R28	B 69
F15	70	J60	70	R30	C 69
F16	70	P5	69	S23	A 71
H11	67	R6	71	S24	B 71
H12	67	R7	71	T7	71
J40	A 68	R20	71	T8	71
J41	B 68	R27	A 69		

: Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
2A	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2B		
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		
4D		

: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IC3	92	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IL1	94	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
IM3	92	Console Box Wire and Cowl Wire (Rear Console)
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)

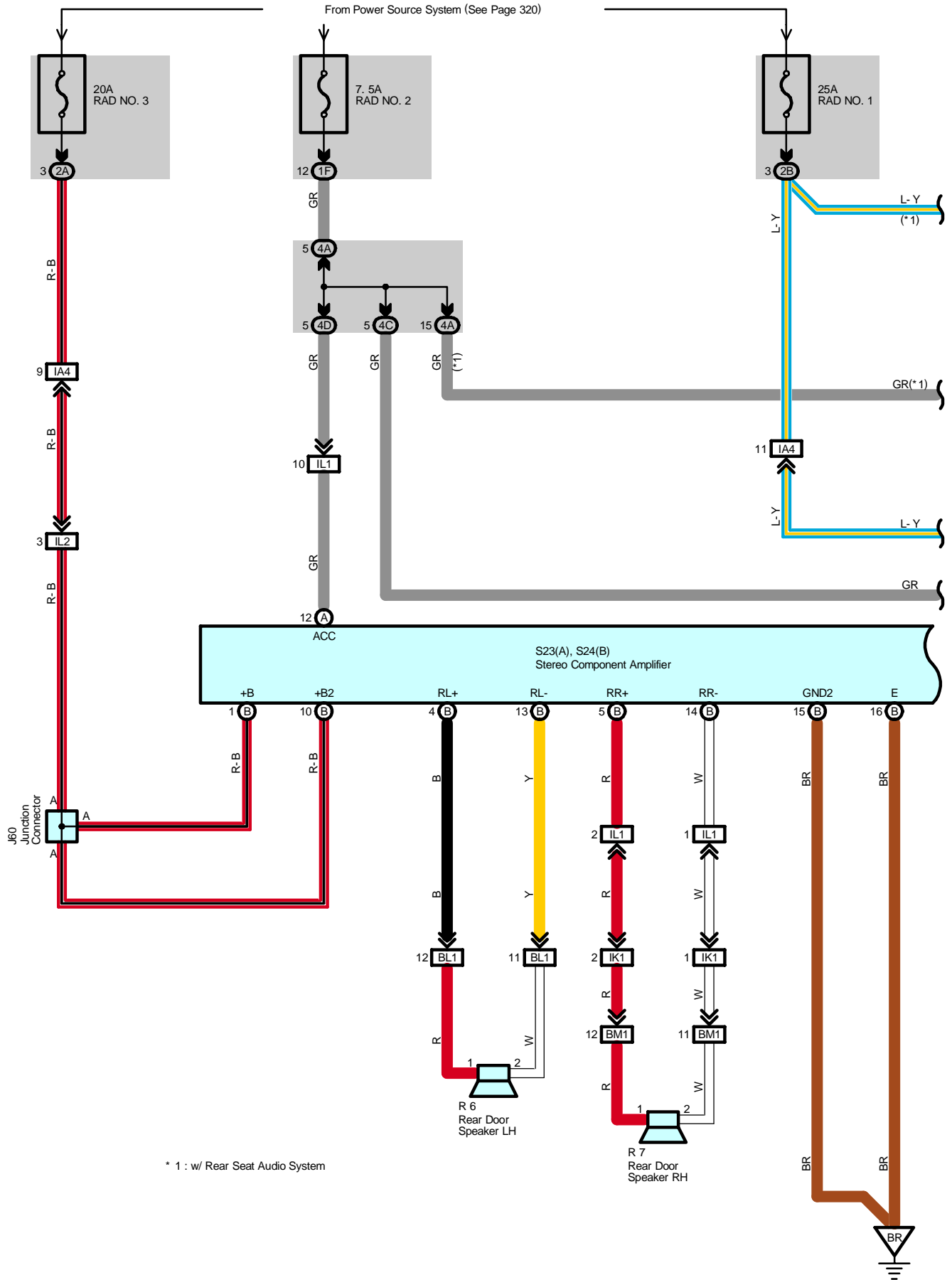
Navigation and Audio System with 8 Speaker (Double Cab)

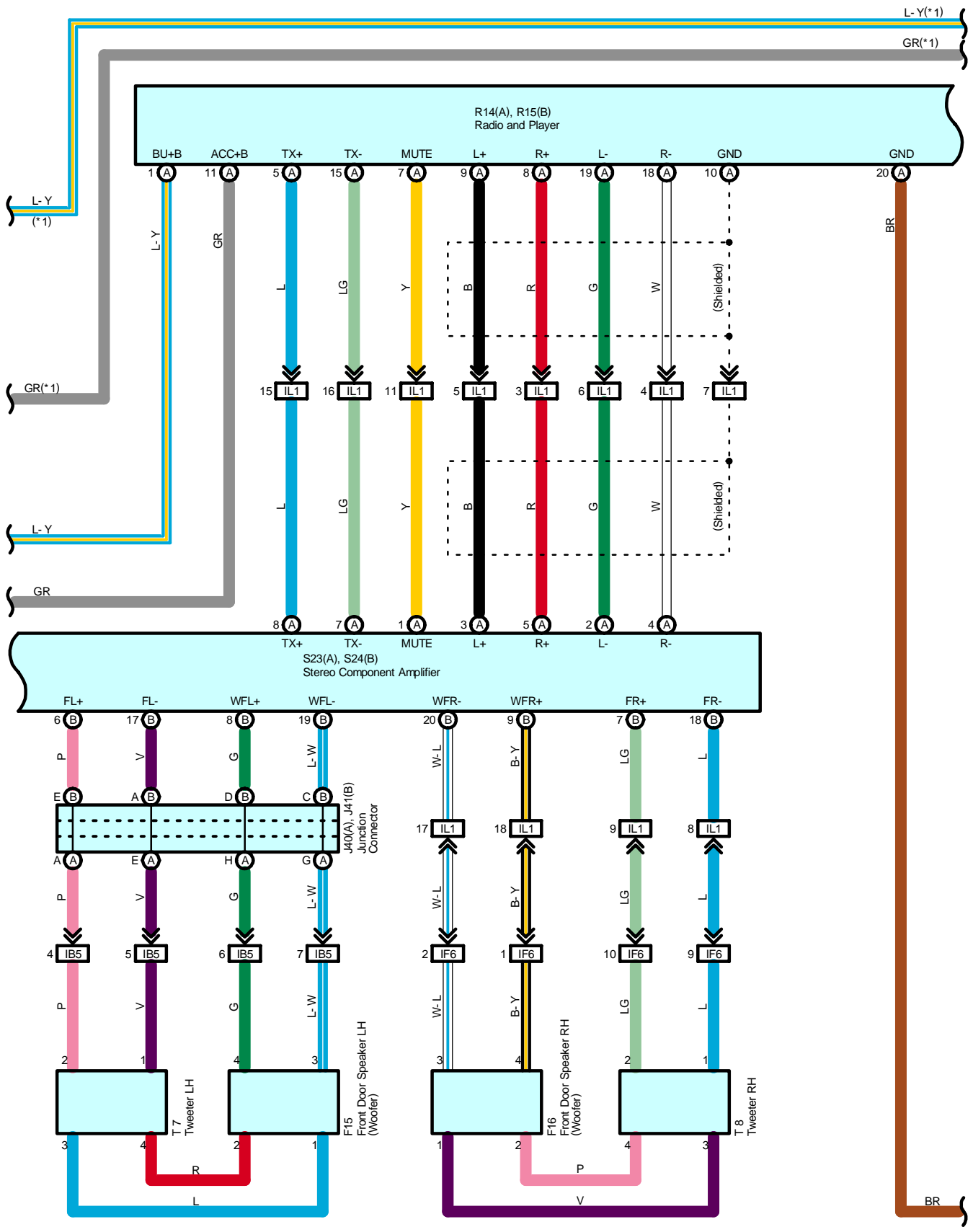


: Ground Points

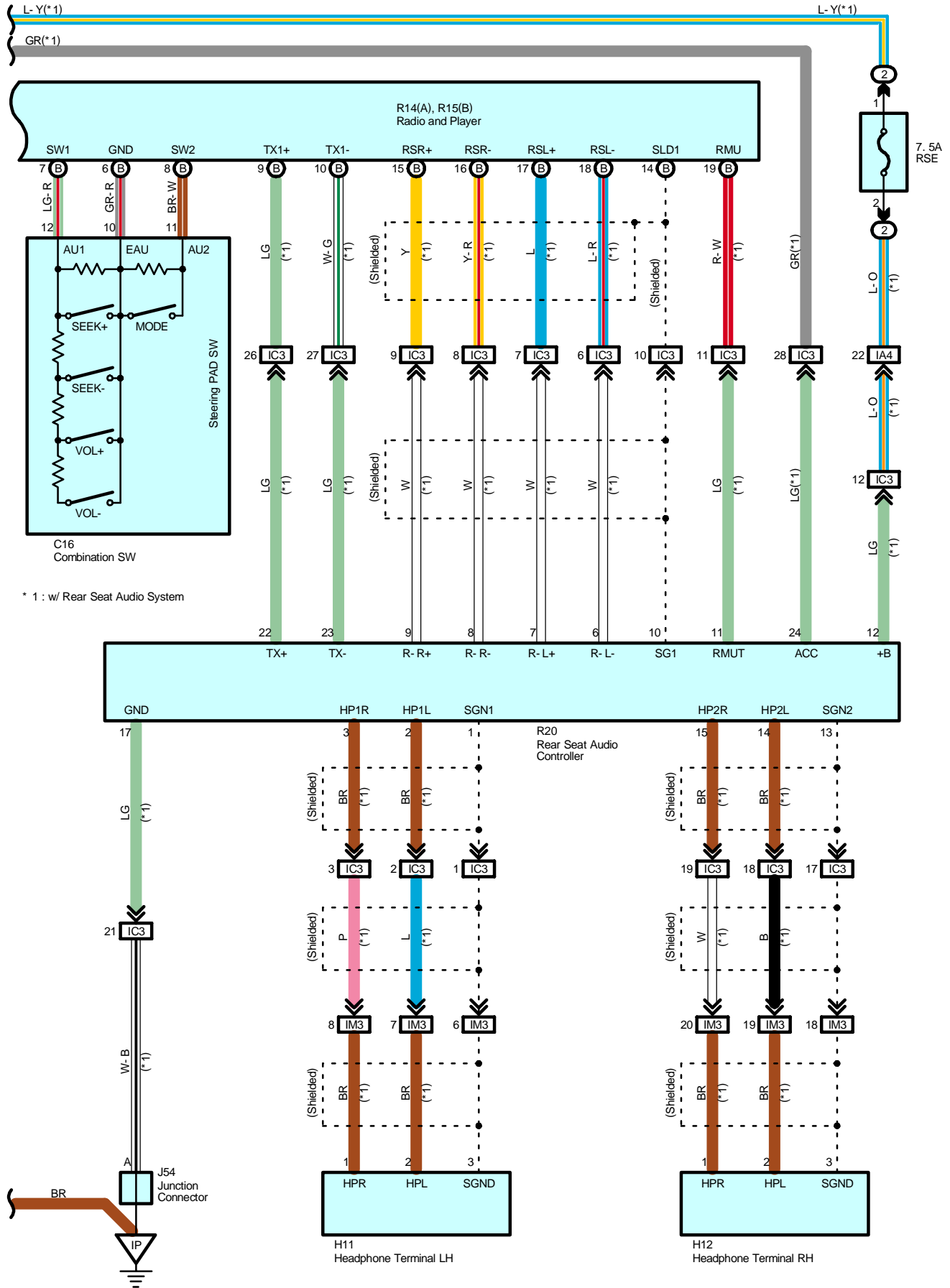
Code	See Page	Ground Points Location
IP	92	Instrument Panel Brace LH
BR	96	Back Panel Left

Audio System with 8 Speaker (Double Cab)





Audio System with 8 Speaker (Double Cab)



Service Hints

S23 (A), S24 (B) Stereo Component Amplifier

(B) 1, (B) 10-Ground : Always approx. 12 volts

(A)12-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated

(B) 15, (B) 16-Ground : Always continuity

R14 (A) Radio and Player

(A) 1-Ground : Always approx. 12 volts

(A)11-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated

(A)20-Ground : Always continuity

R20 Rear Seat Audio Controller

12-Ground : Always approx. 12 volts

17-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page		
C16	66	J41	B	68	R15	B	69
F15	70	J54		68	R20		71
F16	70	J60		70	S23	A	71
H11	67	R6		71	S24	B	71
H12	67	R7		71	T7		71
J40	A	R14	A	69	T8		71

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
2A	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2B		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		
4D		

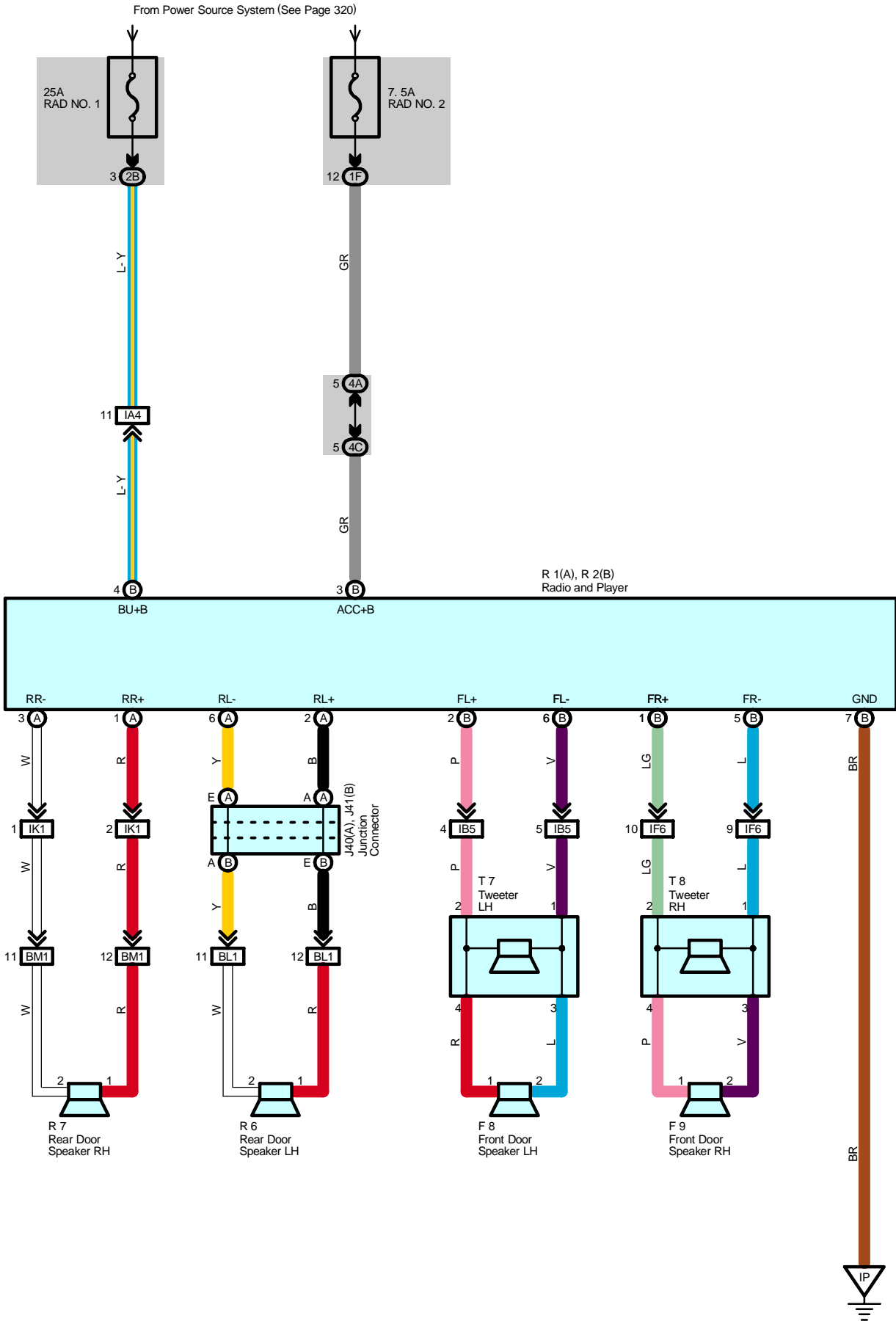
□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IC3	92	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
IL1	94	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
IL2	92	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
IM3	92	Console Box Wire and Cowl Wire (Rear Console)
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)

▽ : Ground Points

Code	See Page	Ground Points Location
IP	92	Instrument Panel Brace LH
BR	96	Back Panel Left

Audio System with 6 Speaker (Double Cab)



Service Hints

R2 (B) Radio and Player

- (B) 3-Ground : Approx. 12 volts with the ignition SW at ON or ACC position and acc cut relay not operated
- (B) 4-Ground : Always approx. 12 volts
- (B) 7-Ground : Always continuity

 : **Parts Location**

Code		See Page	Code		See Page	Code		See Page
F8		70	R1	A	69	T7		71
F9		70	R2	B	69	T8		71
J40	A	68	R6		71			
J41	B	68	R7		71			

 : **Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1F	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
2B	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4C		

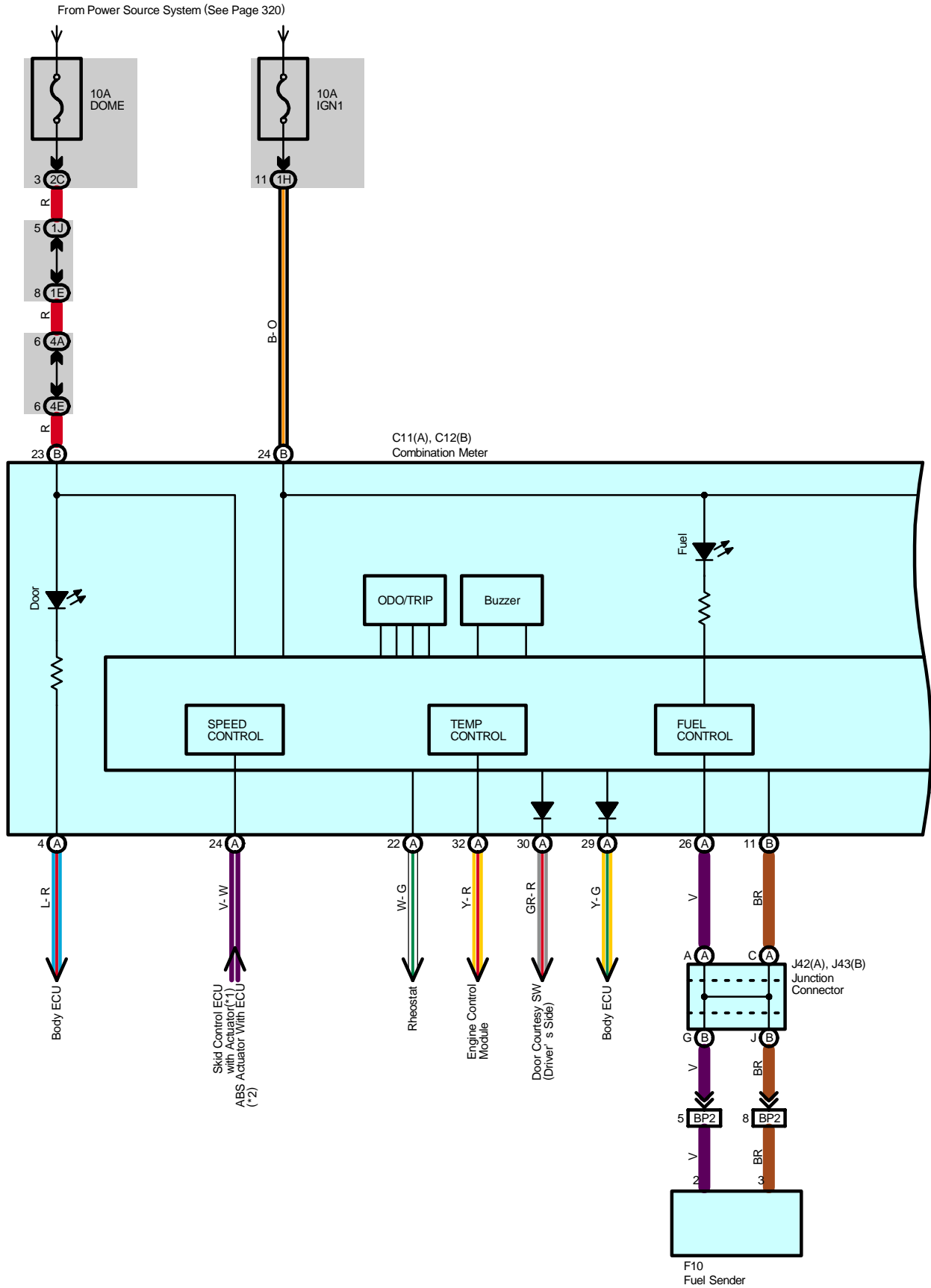
 : **Connector Joining Wire Harness and Wire Harness**

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IB5	92	Front Door LH Wire and Cowl Wire (Left Kick Panel)
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IK1	94	Floor Wire and Cowl Wire (Right Kick Panel)
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)

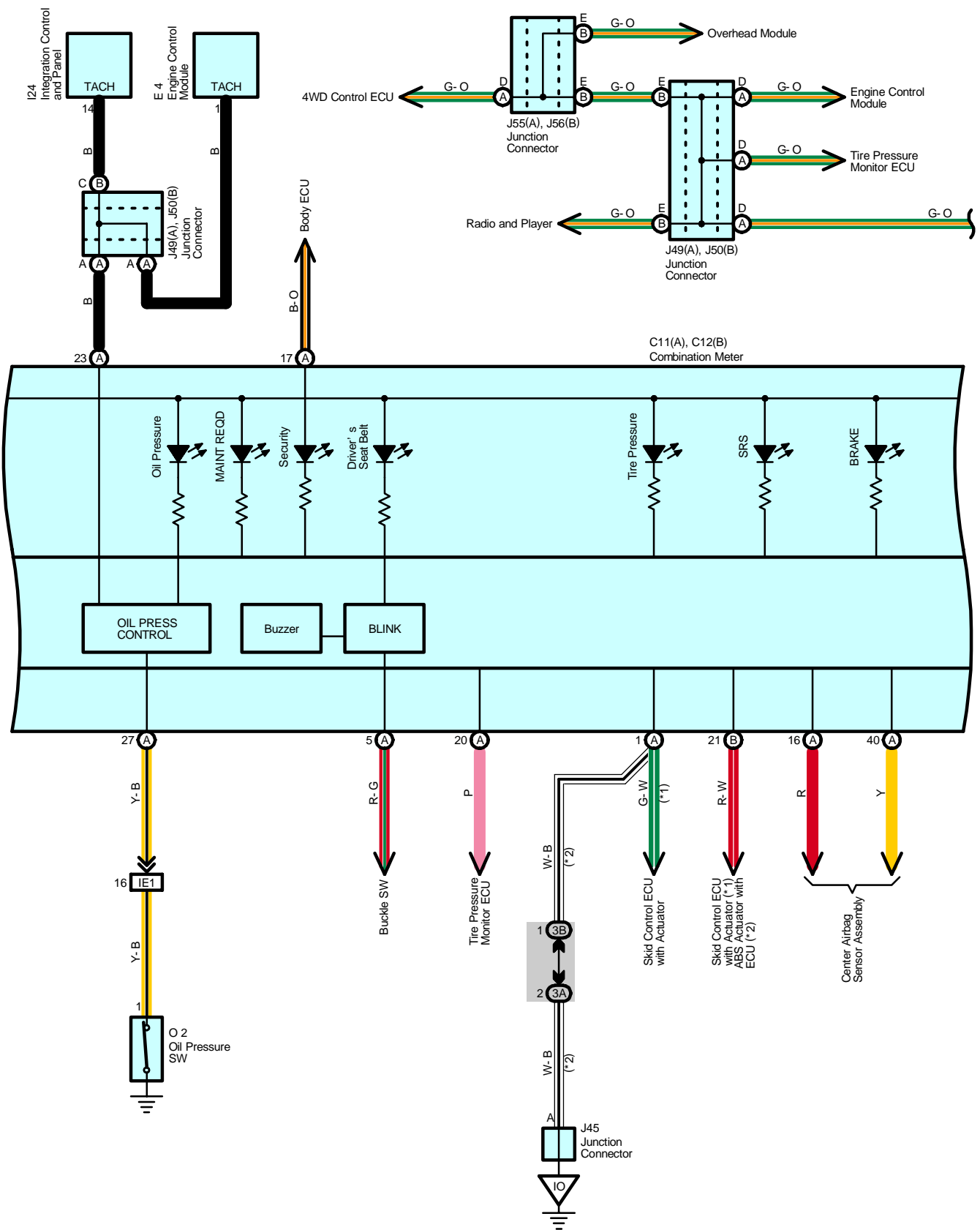
 : **Ground Points**

Code	See Page	Ground Points Location
IP	92	Instrument Panel Brace LH

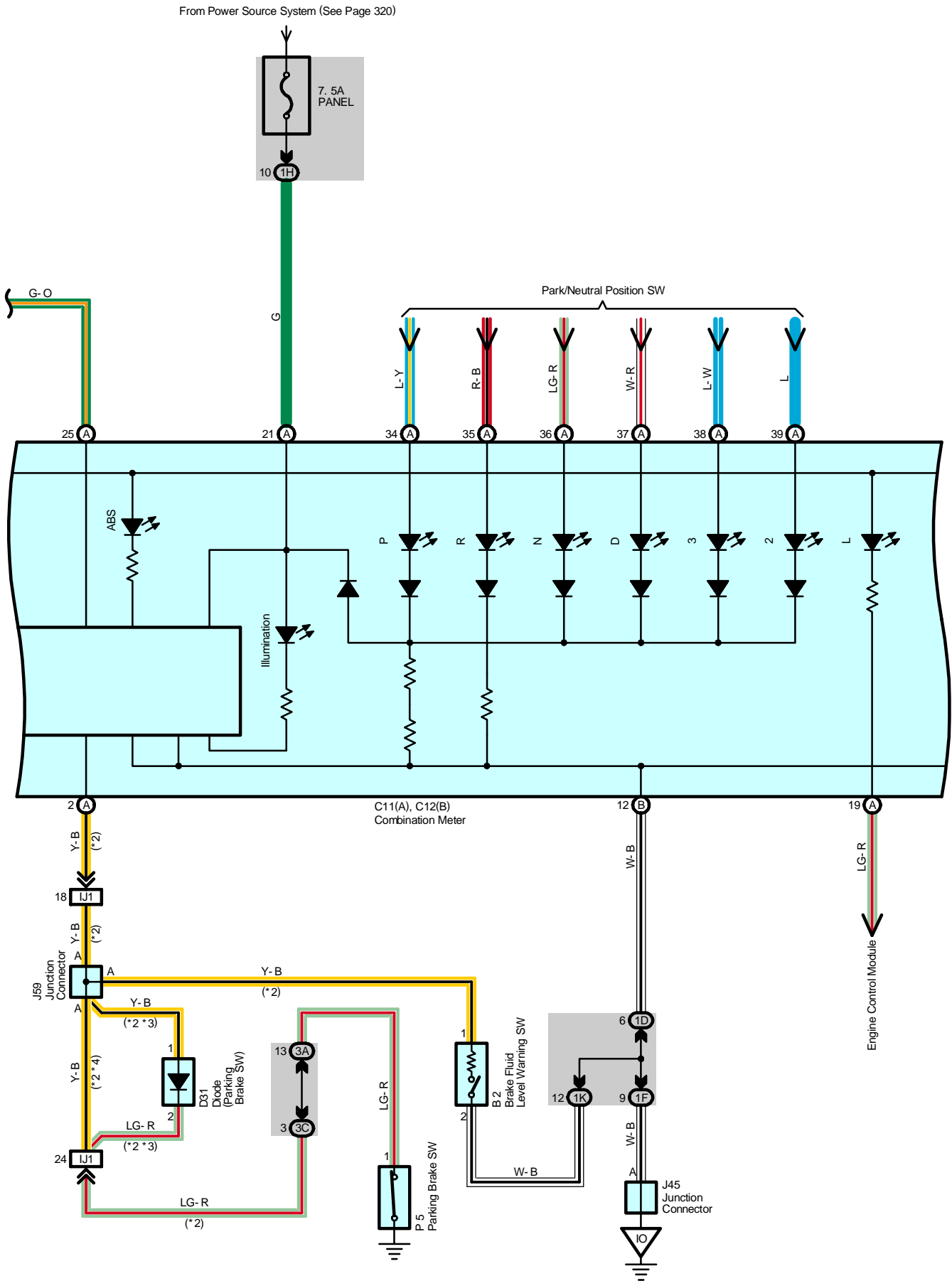
Combination Meter (Double Cab)



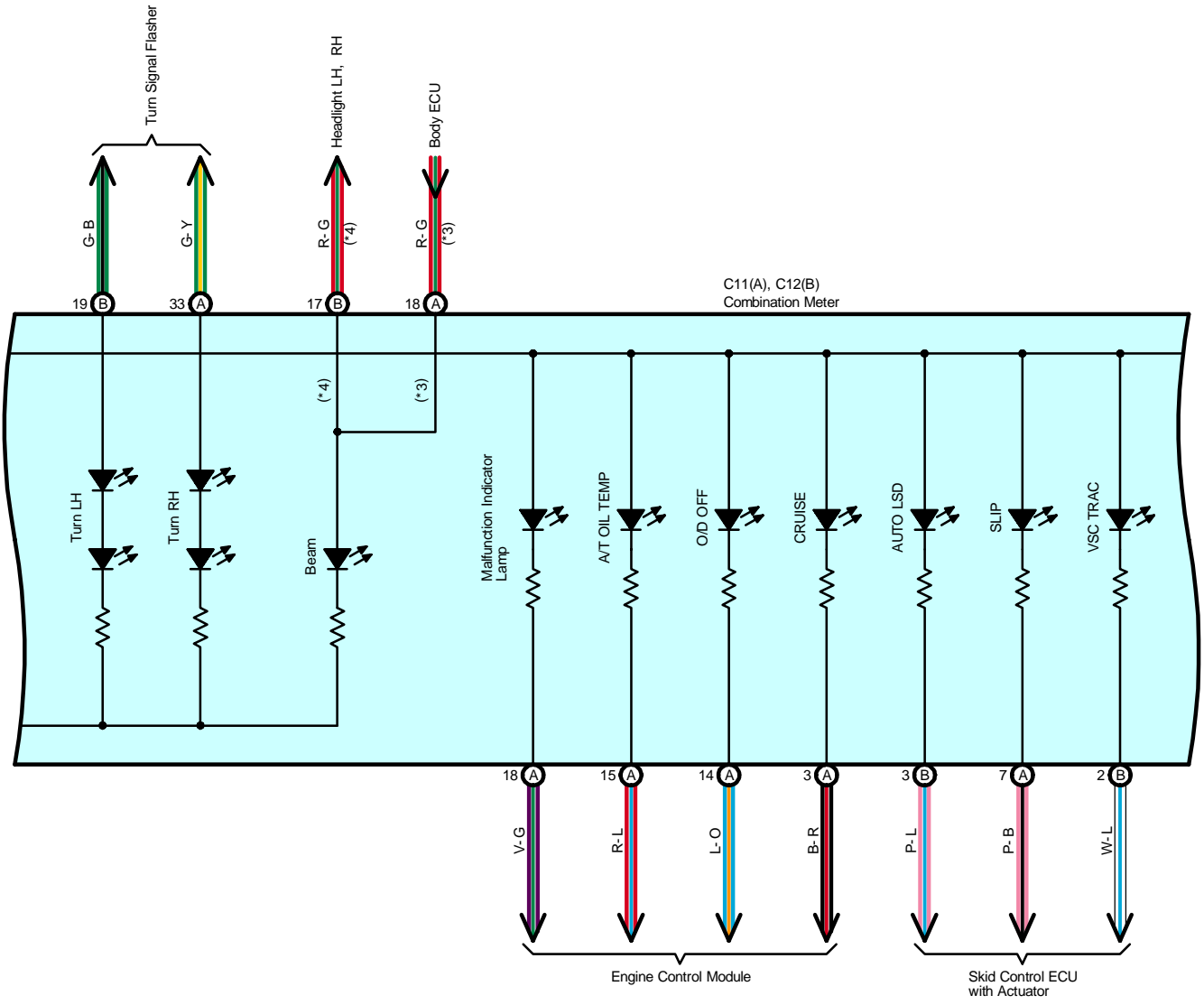
* 1 : w/ VSC
 * 2 : w/o VSC



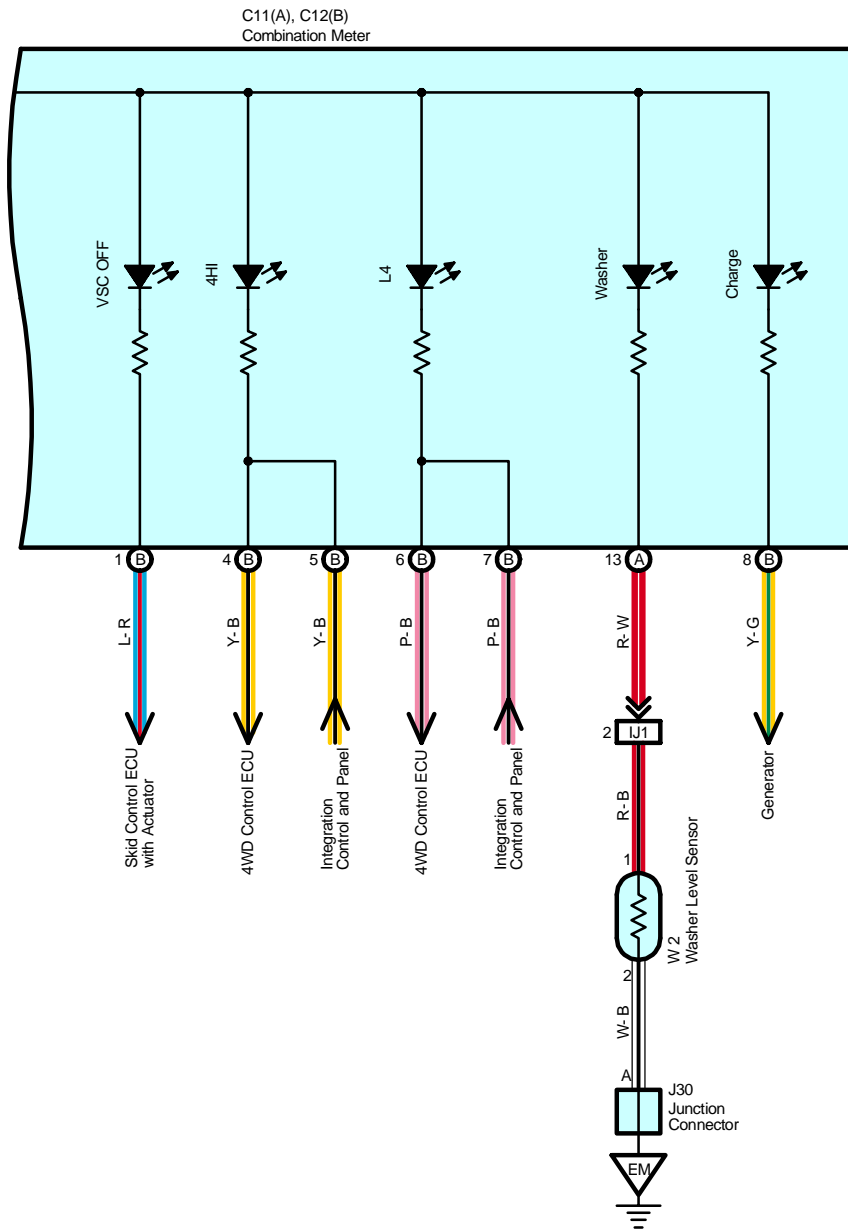
Combination Meter (Double Cab)



- * 1 : w/ VSC
- * 2 : w/o VSC
- * 3 : w/ Daytime Running Light
- * 4 : w/o Daytime Running Light



Combination Meter (Double Cab)



Service Hints

P5 Parking Brake SW

1-Ground : Closed with parking brake lever pulled up

C11 (A), C12 (B) Combination Meter

(B)23-Ground : Always approx. 12 volts

(B)24-Ground : Approx. 12 volts with ignition SW at ON or ST position

(B)12-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
B2	64	J30	65	J56 B	68
C11 A	66	J42 A	68	J59	68
C12 B	66	J43 B	68	O2	65
D31	67	J45	68	P5	69
E4	67	J49 A	68	W2	65
F10	70	J50 B	68		
I24	67	J55 A	68		

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1E		
1F		
1H		
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1K		
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		
3C		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4E		

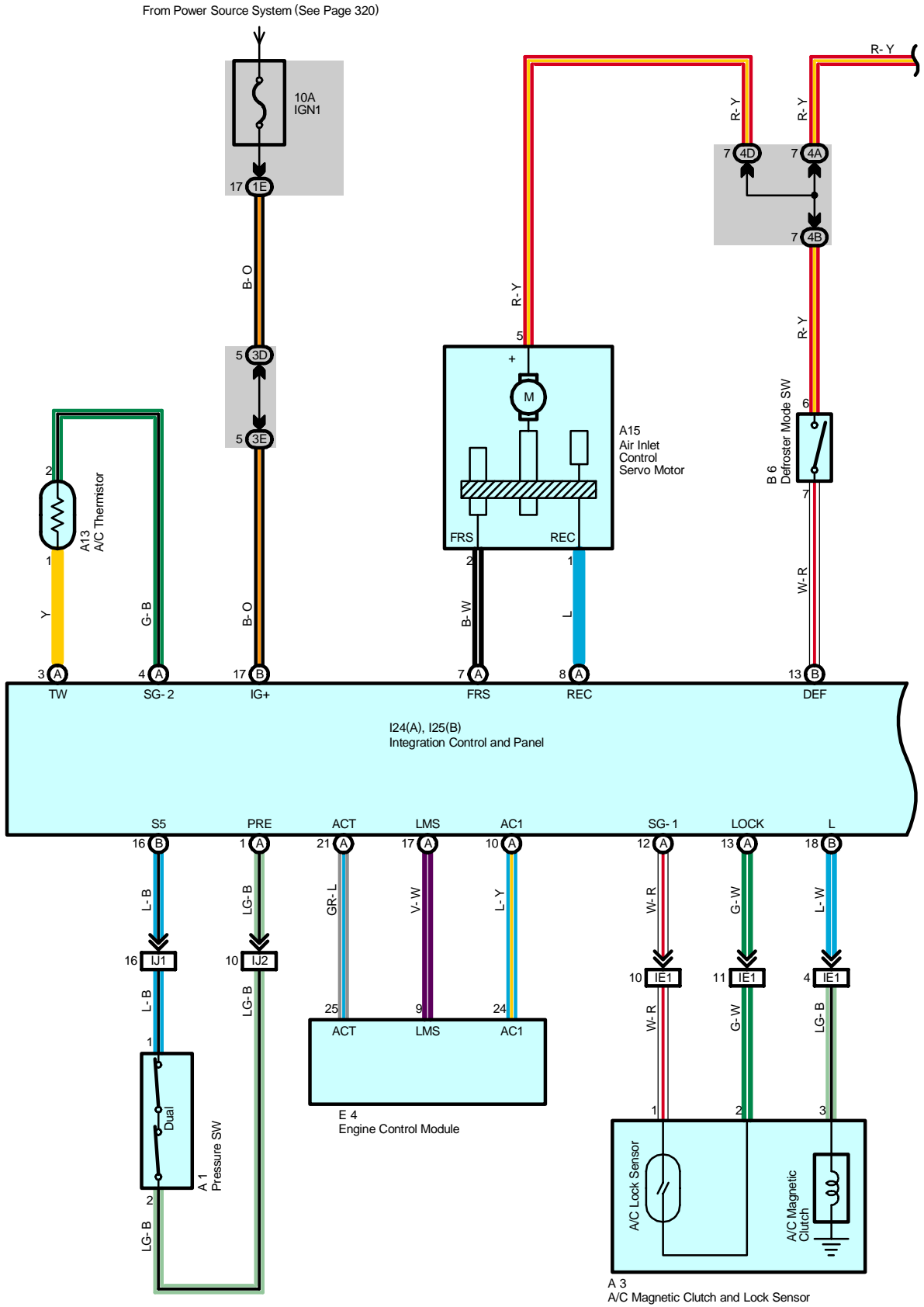
□ : Connector Joining Wire Harness and Wire Harness

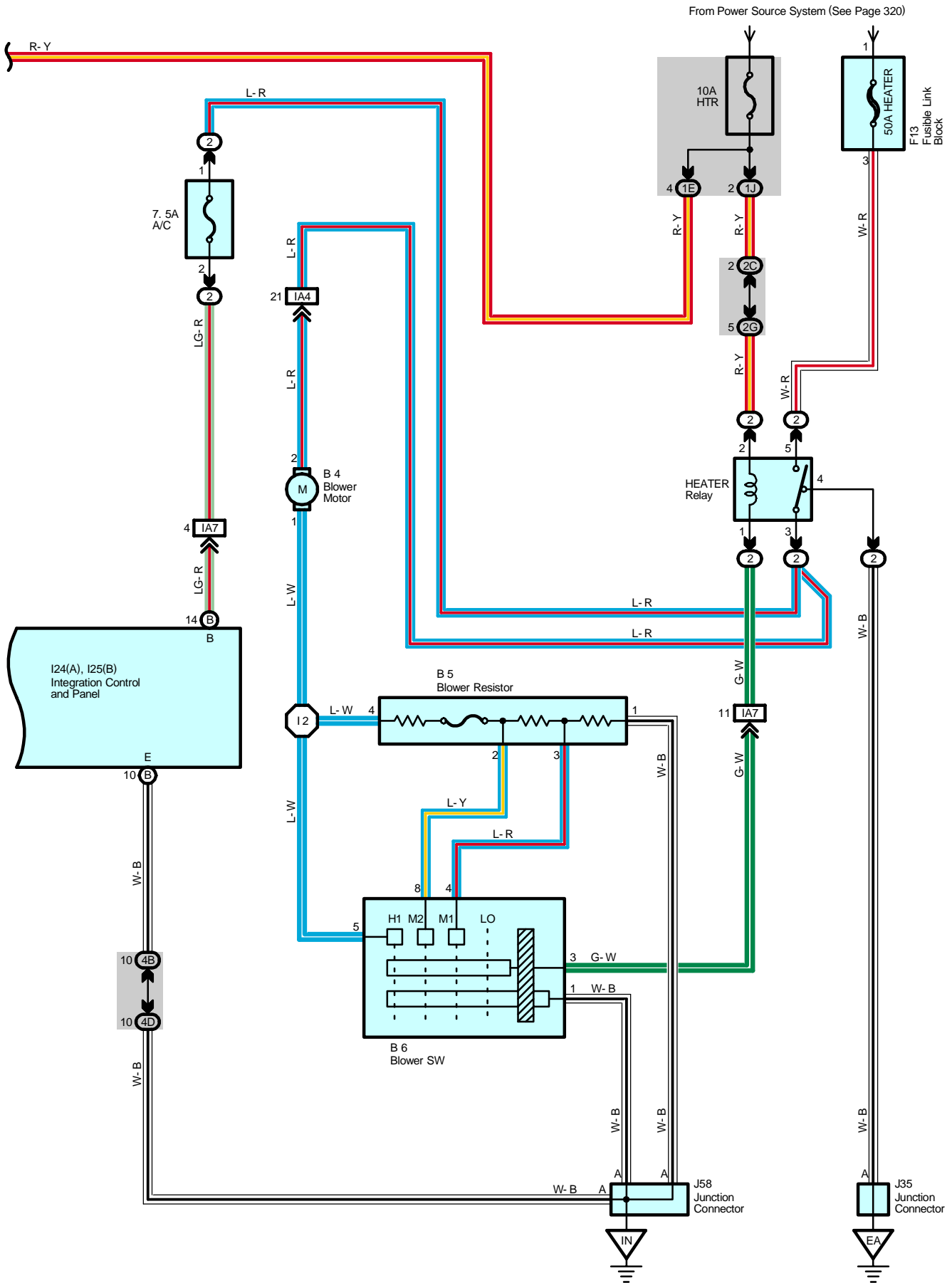
Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
BP2	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)

▽ : Ground Points

Code	See Page	Ground Points Location
EM	90	Radiator Side Support RH
IO	92	Left Kick Panel

Air Conditioning (Double Cab)





Air Conditioning (Double Cab)

System Outline

1. Heater Blower Motor Operation

Current is applied at all times through the HEATER fuse to TERMINAL 5 of the HTR relay.

When the ignition SW is turned on, current flows through the HTR fuse to TERMINAL 2 of the HTR relay to the coil side to TERMINAL 1 to TERMINAL 3 of the blower SW.

* Low speed operation

When the blower SW is moved to LO position, current flows to TERMINAL 3 of the blower SW to TERMINAL 1 to GROUND, causing the HTR relay to switch on. This causes the current to flow from the HEATER fuse to TERMINAL 5 of the HTR relay to TERMINAL 3 to TERMINAL 2 of the blower motor to TERMINAL 1 to TERMINAL 4 of the blower resistor to TERMINAL 1 to GROUND, causing the blower motor to rotate at low speed.

* Medium speed operation (Operation at M1, M2)

When the blower SW is moved to M1 position, current flows to TERMINAL 3 of the blower SW to TERMINAL 1 to GROUND, turning the HTR relay to switch on. This causes the current to flow from the HEATER fuse to TERMINAL 5 of the HTR relay to TERMINAL 3 to TERMINAL 2 of the blower motor to TERMINAL 1 to TERMINAL 4 of the blower resistor to TERMINAL 3 to TERMINAL 4 of the blower SW to TERMINAL 1 to GROUND. At this time, the blower resistance of the blower resistor is less than at low speed, so the blower motor rotates at medium low speed.

When the blower SW is moved to M2 position, current flows through the motor flows from TERMINAL 4 of the blower resistor to TERMINAL 2 to TERMINAL 8 of the blower SW to TERMINAL 1 to GROUND. At this time, resistance of the blower resistor is less than at M1 position, so the blower motor rotates at medium high speed.

* High speed operation

When the blower SW is moved to HIGH position, current flows to TERMINAL 3 of the blower SW to TERMINAL 1 to GROUND, turning the HTR relay to switch on.

This causes the current to flow from the HEATER fuse to TERMINAL 5 of the HTR relay to TERMINAL 3 to TERMINAL 2 of the blower motor to TERMINAL 1 to TERMINAL 5 of the blower SW to TERMINAL 1 to GROUND, causing the blower motor to rotate at high speed.

2. Operation of Air Inlet Control Servo Motor

* Switching from FRESH to RECIRC

With the ignition SW turned on, current flows from the HTR fuse to TERMINAL 5 of the air inlet control servo motor. When the RECIRC/FRESH SW is switched to the RECIRC side, current flows from TERMINAL 5 of the air inlet control servo motor to TERMINAL 1 to TERMINAL (A) 8 of the integration control and panel to TERMINAL (B) 10 to GROUND. The motor rotates and the damper moves to the RECIRC side. When it is in the RECIRC position, current is cut inside the servo motor and the damper stops at that position.

* Switching from RECIRC to FRESH

With the ignition SW turned on, when the RECIRC/FRESH SW is switched to the FRESH side, current flows from TERMINAL 5 of the air inlet control servo motor to TERMINAL 2 to TERMINAL (A) 7 of the integration control and panel to TERMINAL (B) 10 to GROUND, the motor rotates and the damper moves to the FRESH side. when it is in the FRESH position, current is cut inside the servo motor and the damper stops at that position. When the ignition SW turned on, and mode SW (Integration control and panel) is at DEF or F/DEF position, it causes the damper to move to the FRESH side. Whether the RECIRC/FRESH SW (Integration control and panel) is on or not.

3. Air Conditioning Operation

When the blower SW is on, current flows from the HTR fuse to the HTR relay (Coil side) to TERMINAL 3 of the blower SW to TERMINAL 1 to GROUND, activating the HTR relay. This causes current to flow from the HEATER fuse to the HTR relay (Point side) to A/C fuse to TERMINAL (B) 14 of the A/C SW (Integration control and panel). When the A/C SW (Integration Control and panel) is turned on. Current flows from the A/C fuse to TERMINAL (B) 14 of the integration control and panel to TERMINAL (B) 18 to A/C magnetic clutch. Causing The compressor to operate.

When blower SW is on and mode SW (Integration control and panel) is at DEF or F/DEF position, it causes A/C to run whether A/C SW (Integration control and panel) is on or not.

Service Hints

HEATER Relay

5-3 : Closed with ignition SW on and heater blower SW on

A1 A/C Dual Pressure SW

1-2 : Open with refrigerant pressure at less than approx. 2.0 kgf/cm² (196.1 kpa, 28.4 psi) or more than approx. 32.0 kgf/cm² (3138.1 kpa, 455 psi)

I25 (B) Integration Control and Panel

(B)17-Ground : Approx. 12 volts with ignition SW at ON or ST position

(B)14-Ground : Approx. 12 volts with ignition SW on and blower SW on

(B)10-Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A1	64	B5	66	I25 B	67
A3	64	B6	66	J35	65
A13	66	E4	67	J58	68
A15	66	F13	34, 64		
B4	66	I24 A	67		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1E	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1J	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
2C	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2G		
3D	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3E		
4A		
4B	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4D		

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA7		
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
IJ2		

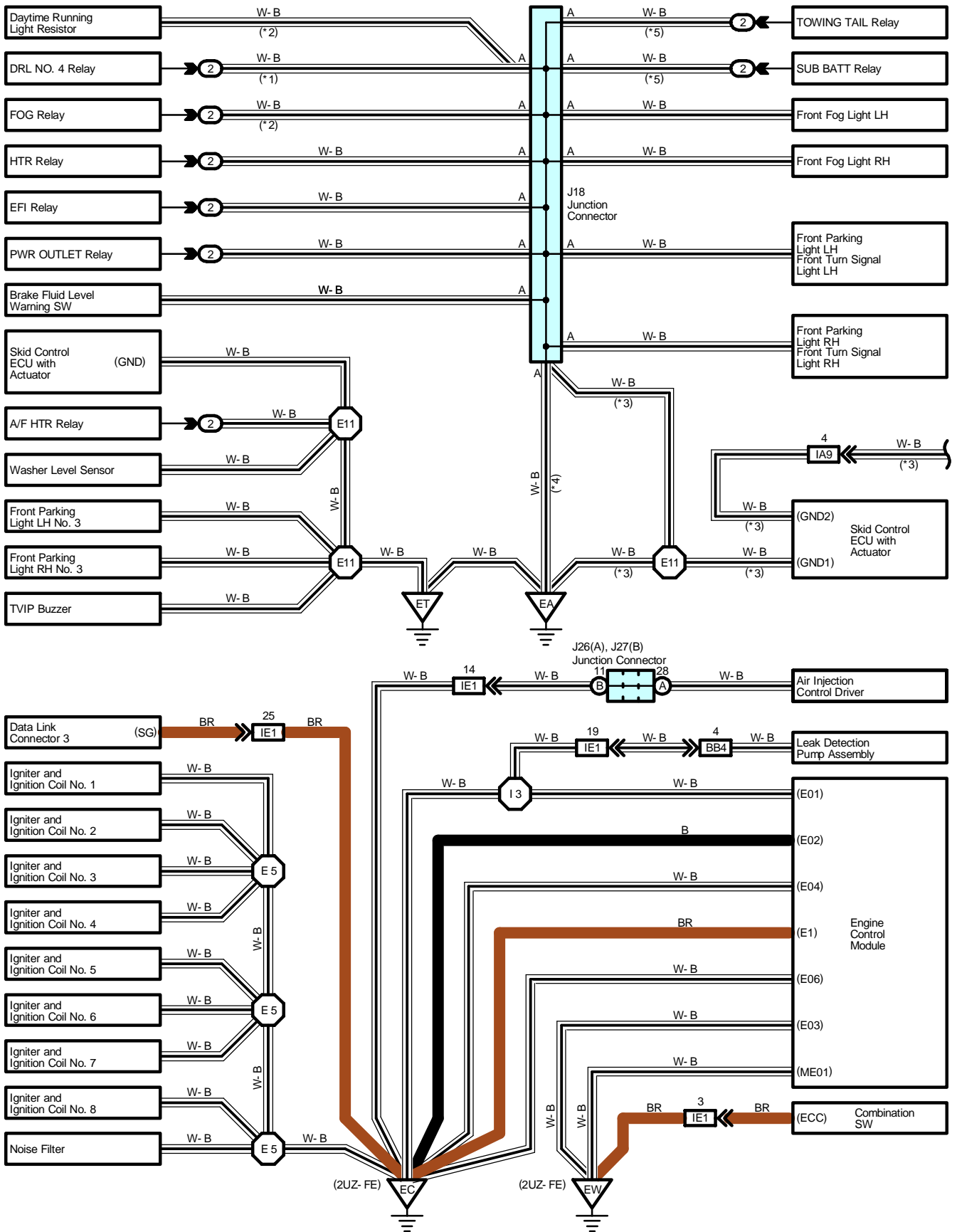
▽ : Ground Points

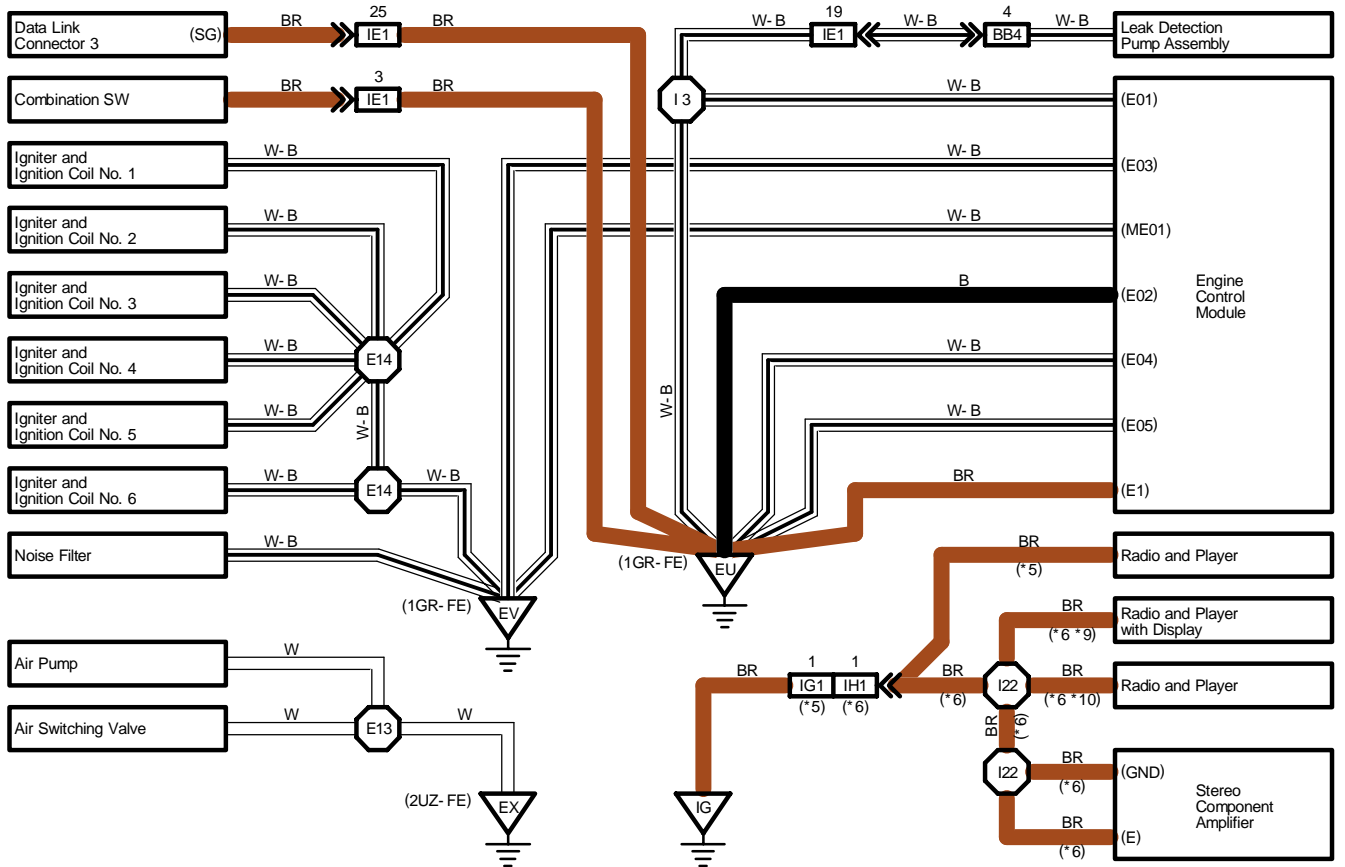
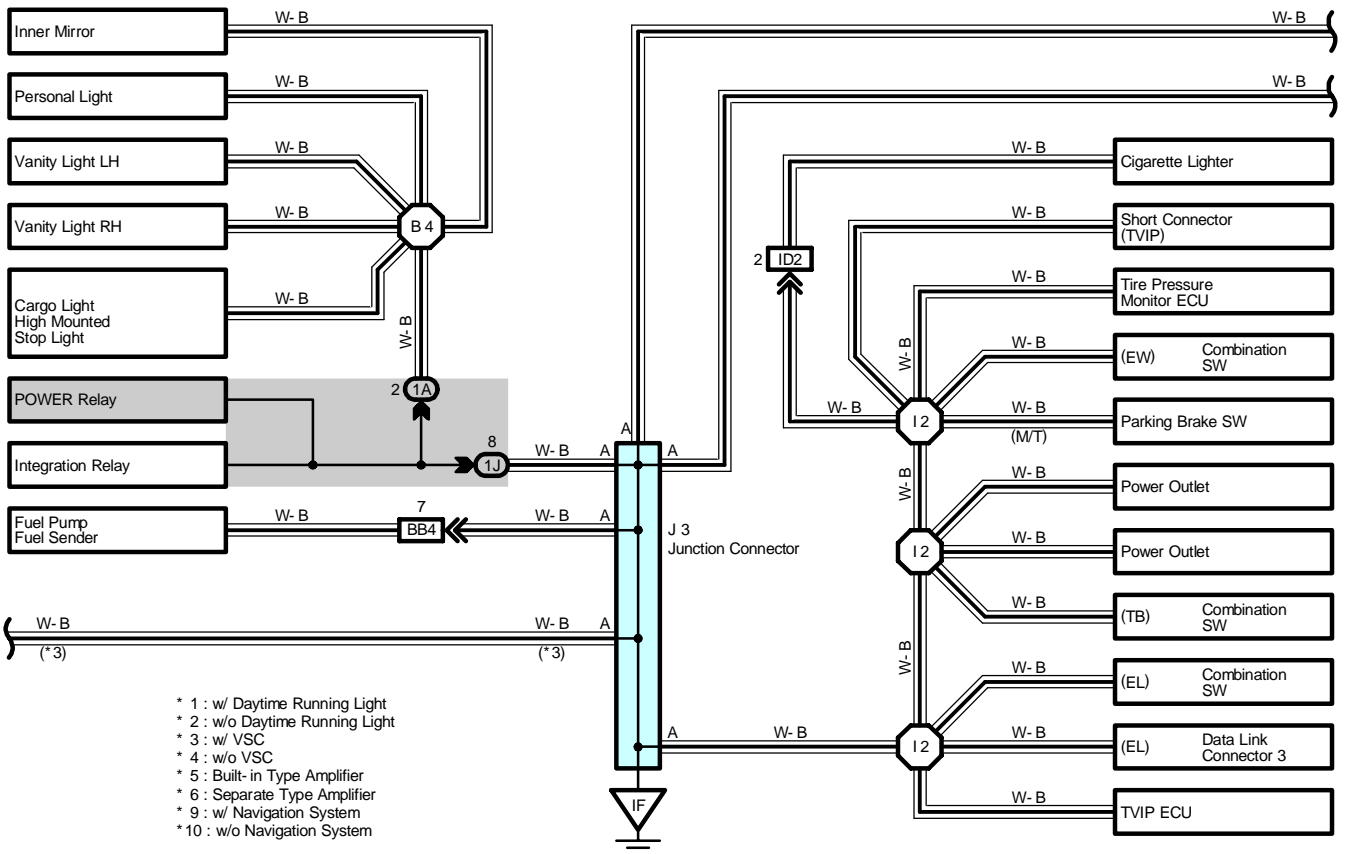
Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
IN	92	Right Kick Panel

○ : Splice Points

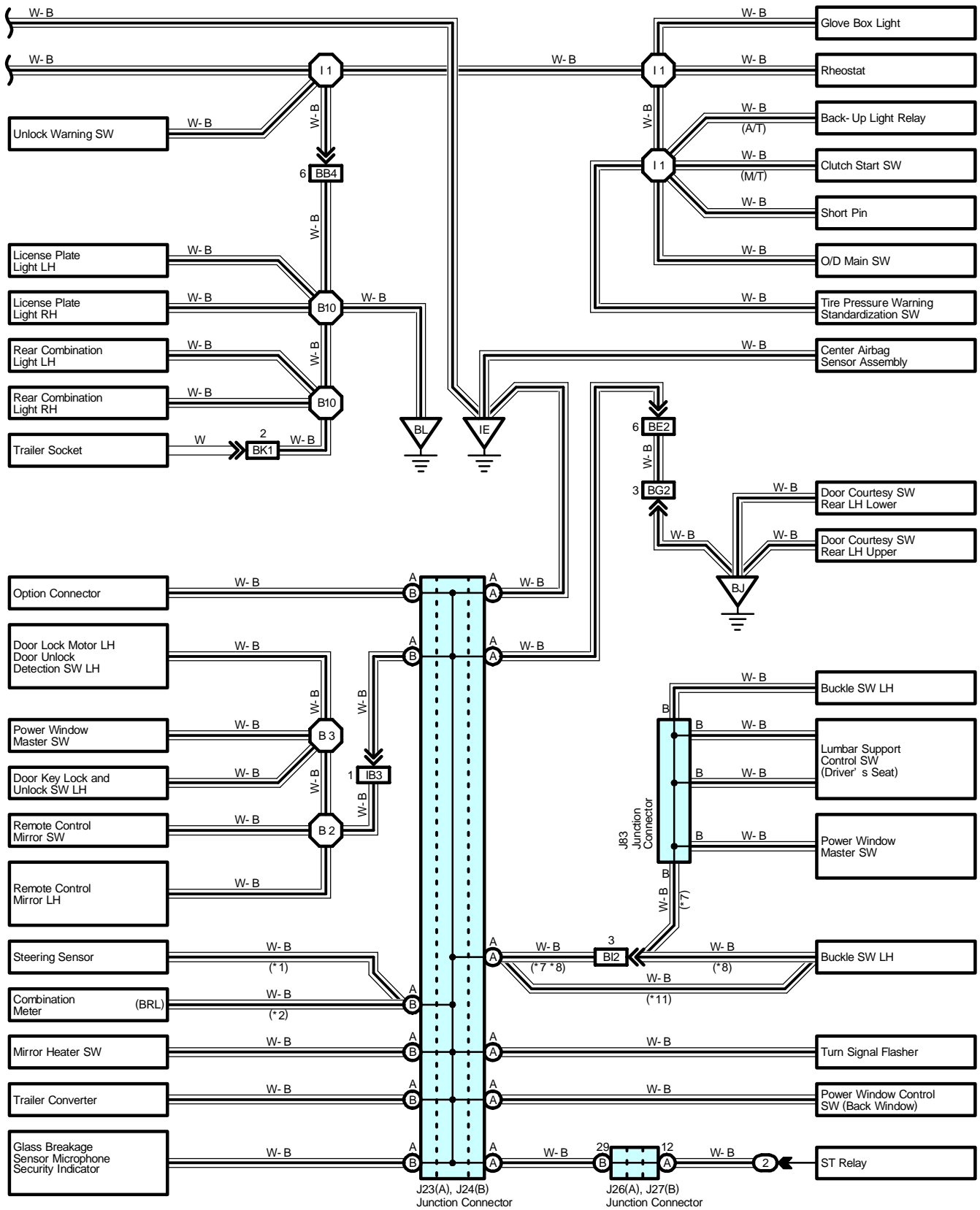
Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
I2	94	Cowl Wire			

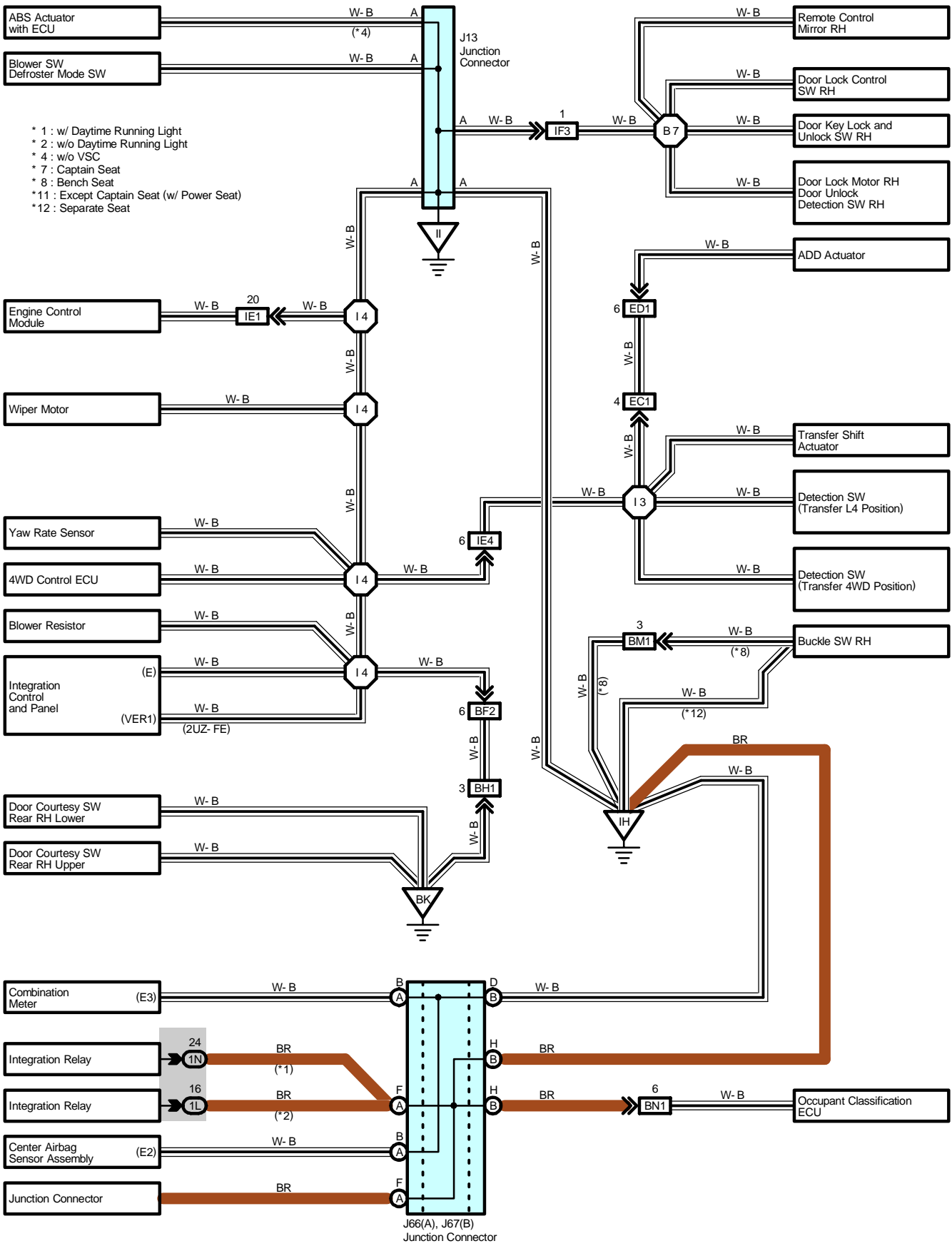
I GROUND POINT (Access/Standard Cab)





I GROUND POINT (Access/Standard Cab)





I GROUND POINT (Access/Standard Cab)

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
J3	58	J23	A 58	J66	A 58
J13	58	J24	B 58	J67	B 58
J18	53 (2UZ-FE)	J26	A 58	J83	62 (*7)
	55 (1GR-FE)	J27	B 58		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	23	Engine Room R/B (Engine Compartment Left)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	24 (*2)	Roof Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1J	24 (*2)	Cowl Wire and Driver Side J/B (Lower Finish Panel)
	28 (*1)	
1L	25 (*2)	
1N	29 (*1)	

□ : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EC1	74 (2UZ-FE)	Engine No.2 Wire and Engine Wire (Near the Starter)
ED1	74 (2UZ-FE)	Engine No.2 Wire and Differential Wire (Near the Transmission)
IA9	78	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IB3	78	Front Door LH Wire and Cowl Wire (Left Kick Panel)
ID2	78	Cigarette Lighter Wire and Cowl Wire (Instrument Panel Brace LH)
IE1	80	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IE4		
IF3	80	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IG1	80	Cowl Wire and Instrument Panel No.2 Wire (Instrument Panel Brace RH)
IH1	80	Cowl Wire and Floor No.3 Wire (Instrument Panel Brace RH)
BB4	82 (*3)	Frame Wire and Cowl Wire (Under the Driver's Seat)
	84 (*4)	
BE2	82 (*3)	Floor No.2 Wire and Cowl Wire (Center of Left Rocker Panel)
BF2	82 (*3)	Floor No.1 Wire and Cowl Wire (Center of Right Rocker Panel)
BG2	82 (*3)	Floor No.2 Wire and Rear Door No.2 Wire (Under the Left Quarter Panel)
BH1	82 (*3)	Floor No.1 Wire and Rear Door No.1 Wire (Under the Right Quarter Panel)
BI2	86 (*6)	Cowl Wire and Seat No.2 Wire (Under the Driver's Seat)
	88 (*5)	
BK1	82 (*3)	Frame Wire and Frame No.3 Wire (Near the License Plate Light)
	84 (*4)	
BM1	88 (*5)	Cowl Wire and Seat No.1 Wire (Under the Passenger's Seat)
BN1	86 (*6)	Seat No.1 Wire and Cowl Wire (Under the Passenger's Seat)

* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

 : **Ground Points**

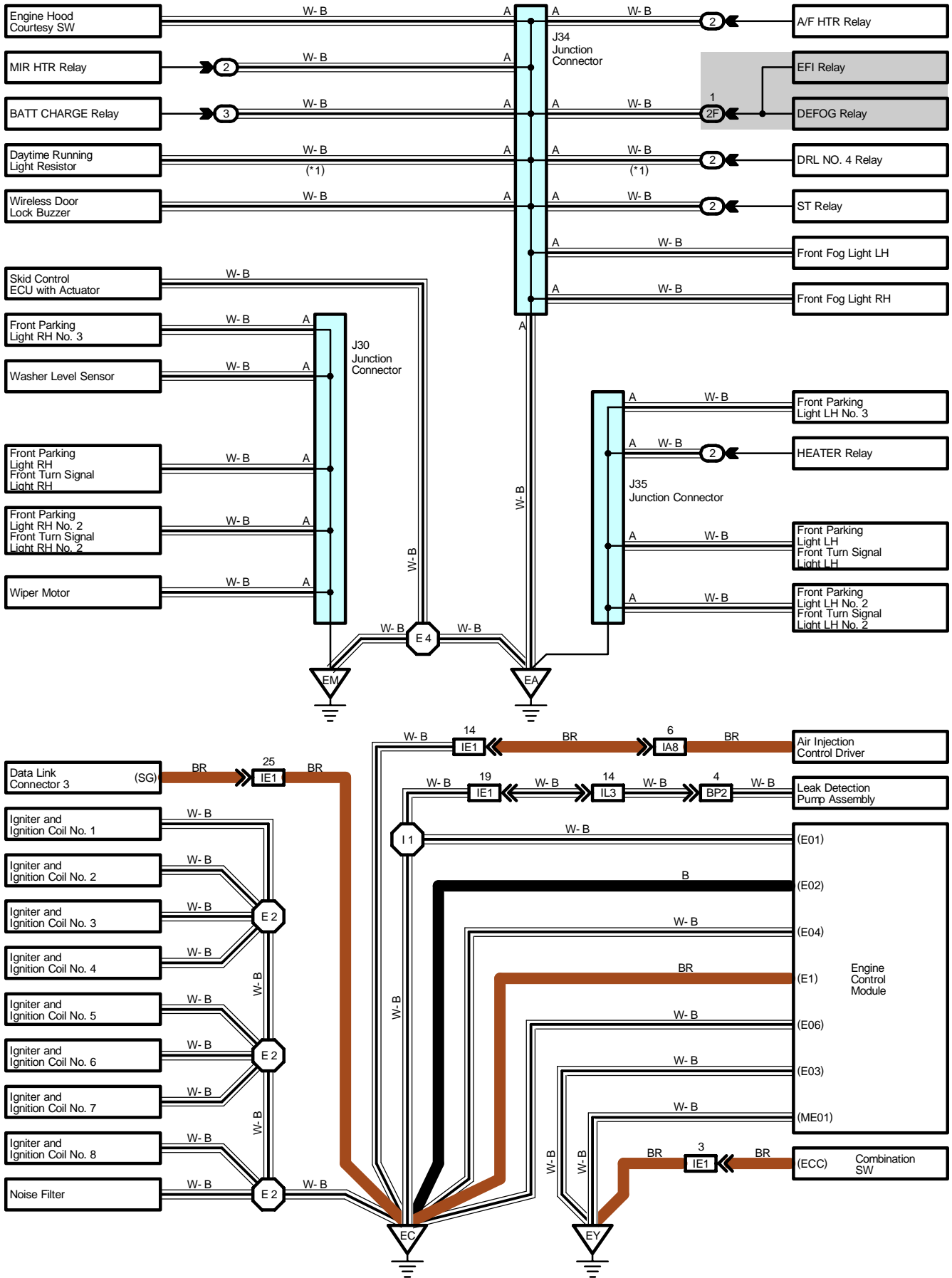
Code	See Page	Ground Points Location
EA	74 (2UZ-FE)	Front Left Fender
	76 (1GR-FE)	
EC	74 (2UZ-FE)	Rear Bank of Left Cylinder Head
ET	74 (2UZ-FE)	Front Right Fender
	76 (1GR-FE)	
EU	76 (1GR-FE)	Rear Bank of Right Cylinder Head
EV	76 (1GR-FE)	Rear Bank of Left Cylinder Head
EW	74 (2UZ-FE)	Front Left Side of Cylinder Head
EX	74 (2UZ-FE)	Left Side of Cylinder Block
IE	78	Left Kick Panel
IF		
IG	78	Instrument Panel Brace RH
IH	78	Right Kick Panel
II		
BJ	82 (*3)	Inside of Rear Door LH
BK	82 (*3)	Inside of Rear Door RH
BL	82 (*3)	Surrounding of the Front of the Fuel Tank
	84 (*4)	

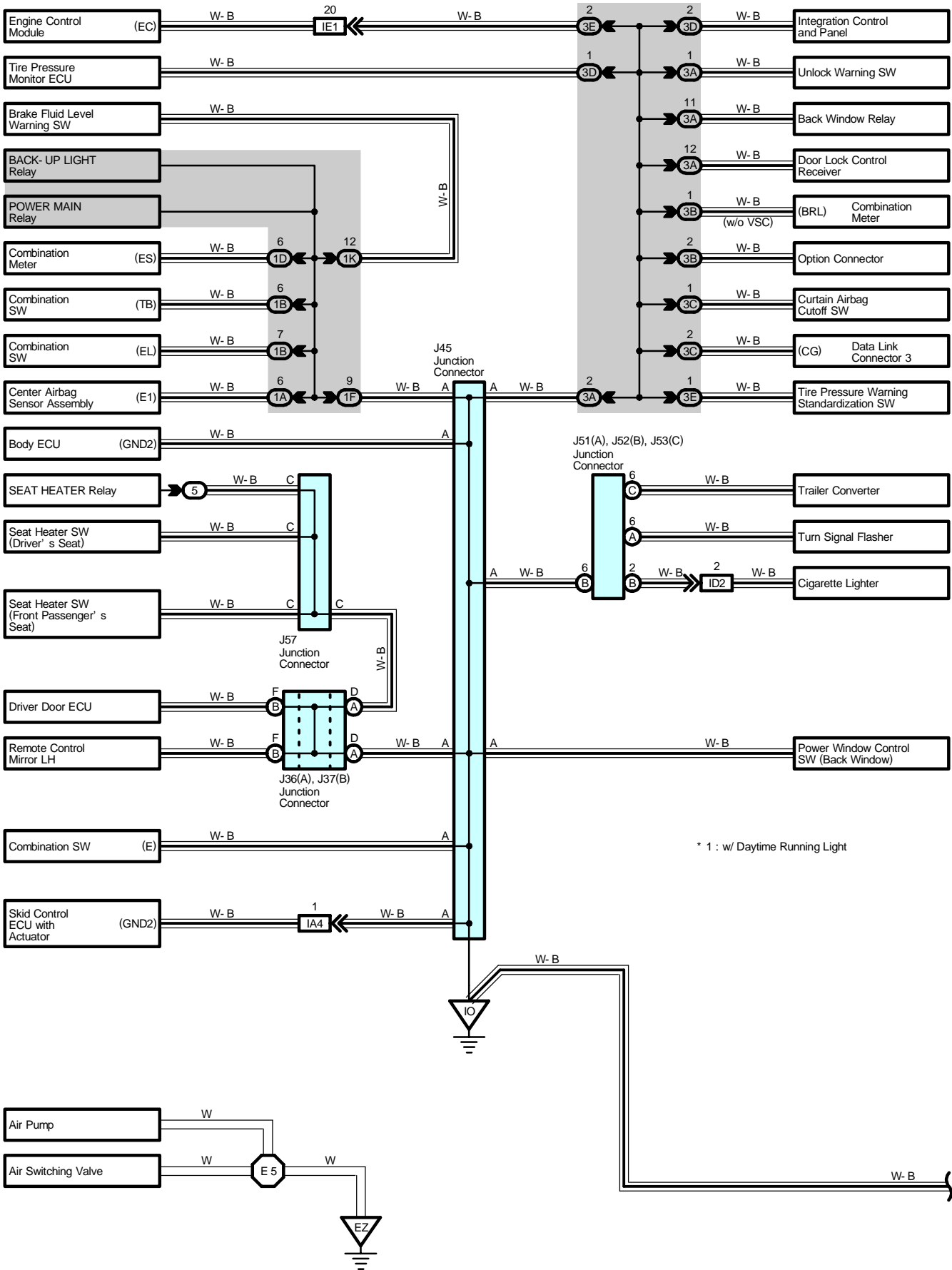
 : **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E5	74 (2UZ-FE)	Engine Wire	B2	82 (*3)	Front Door LH Wire
E11	74 (2UZ-FE)	Engine Room Main Wire		84 (*4)	
	76 (1GR-FE)				
E13	74 (2UZ-FE)	Engine No.2 Wire	B3	82 (*3)	
E14	76 (1GR-FE)	Engine Wire	B4	84 (*4)	Roof Wire
				80	Cowl Wire
I1	80	Cowl Wire	B7	82 (*3)	Front Door RH Wire
I2					
I3	80	Engine Wire	B10	84 (*4)	Frame Wire
I4	80	Cowl Wire			
I22	80	Floor No.3 Wire			

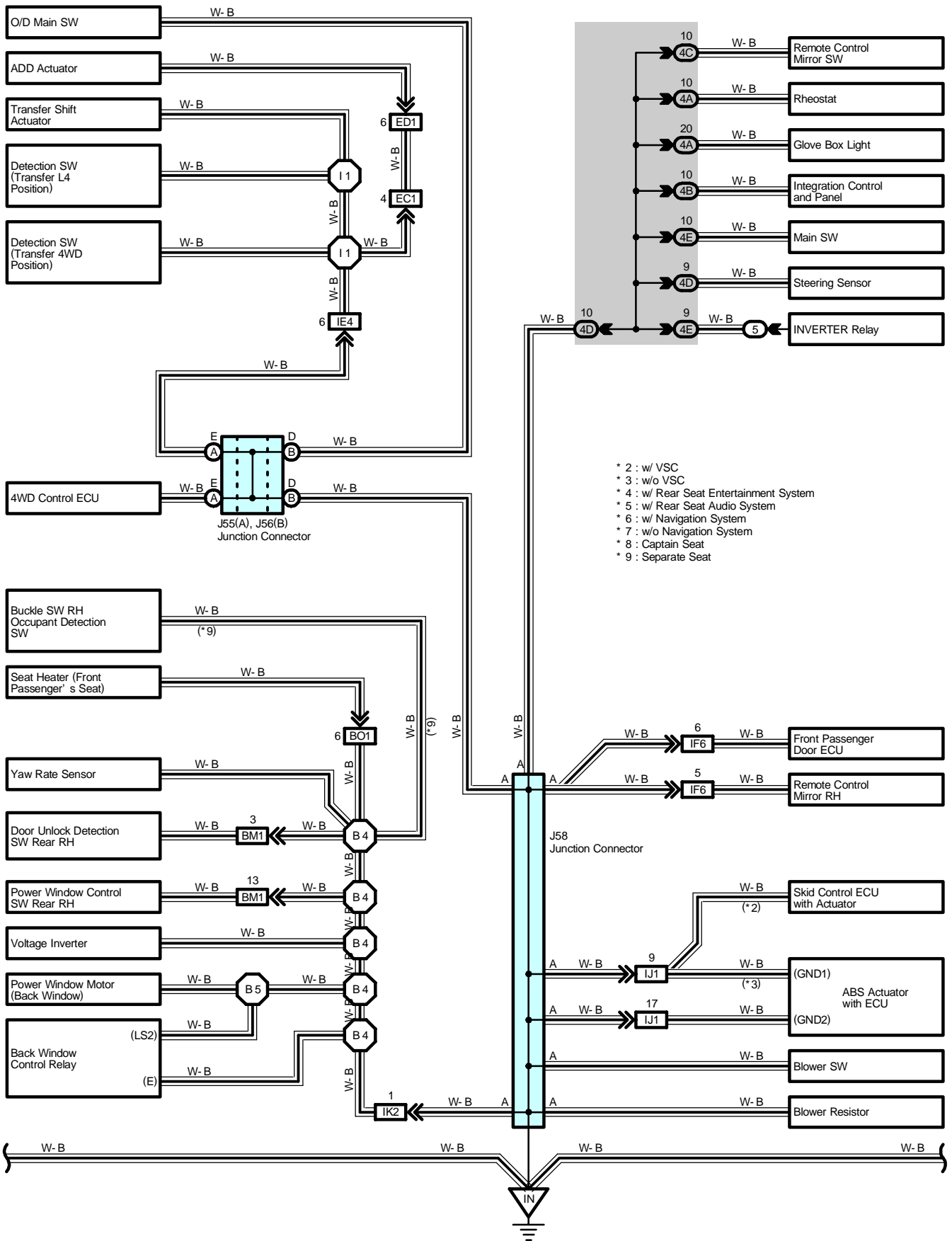
* 1 : w/ Daytime Running Light * 2 : w/o Daytime Running Light * 3 : Access Cab * 4 : Standard Cab * 5 : Bench Seat
 * 6 : Captain Seat * 7 : Access Cab Captain Seat * 8 : Standard Cab Bench Seat * 9 : Access Cab w/o Power Seat

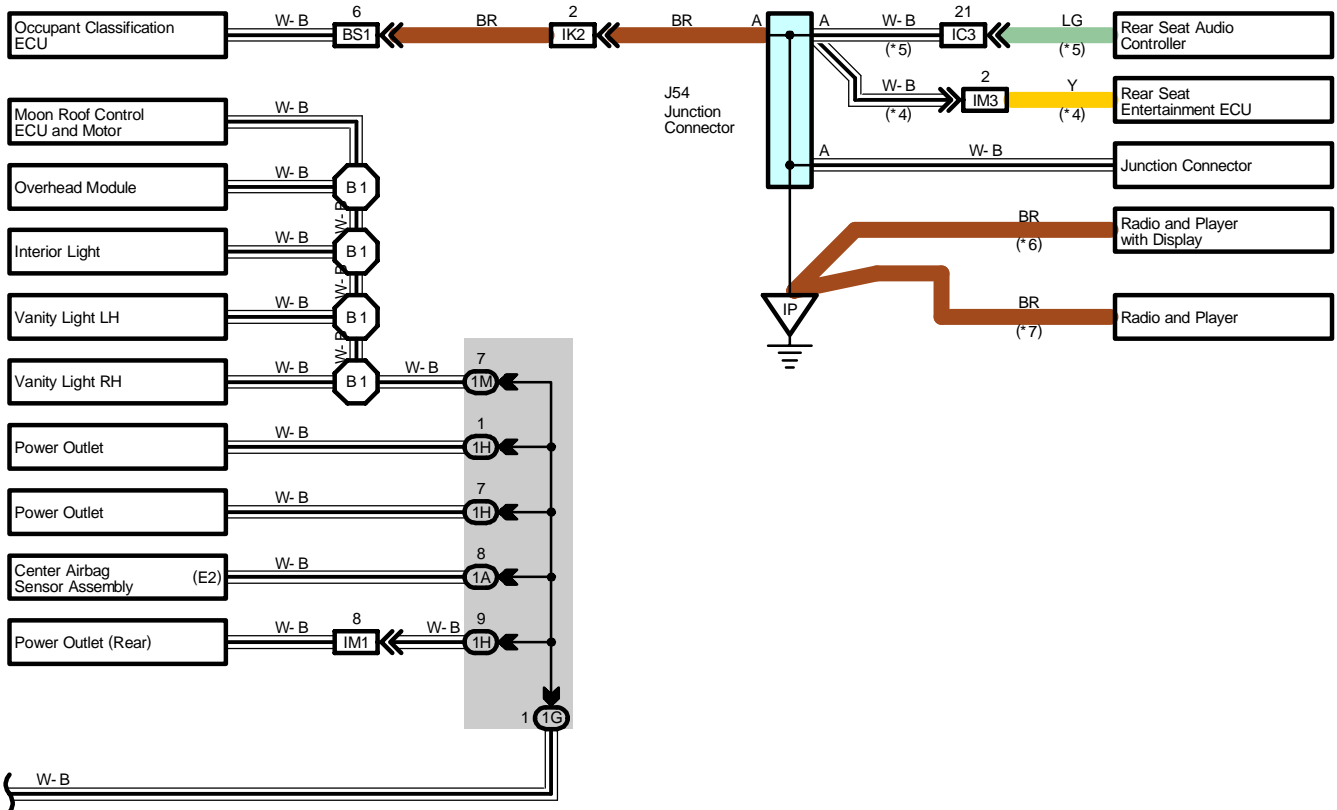
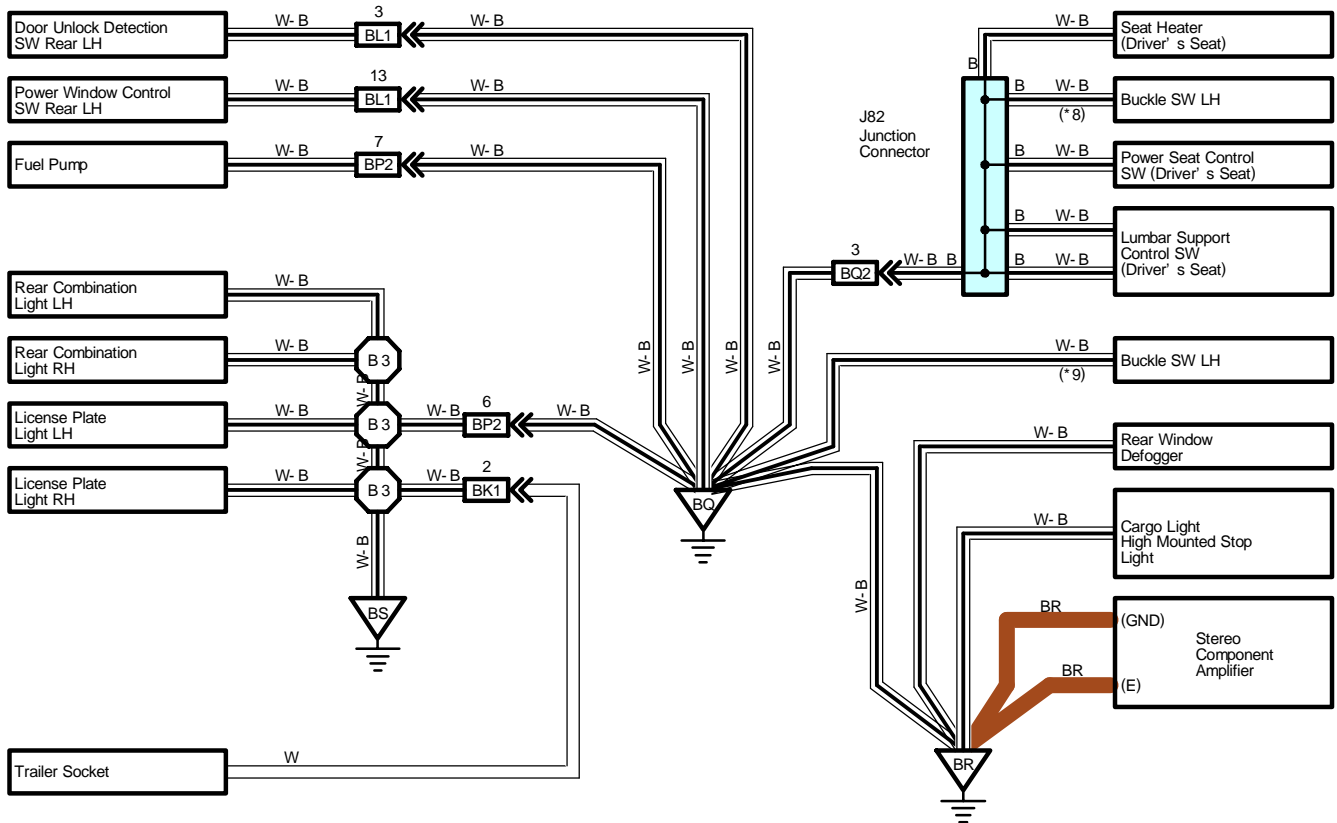
I GROUND POINT (Double Cab)





I GROUND POINT (Double Cab)





I GROUND POINT (Double Cab)

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
J30	65	J45	68	J55	A 68
J34	65	J51	A 68	J56	B 68
J35	65	J52	B 68	J57	68
J36	A 68	J53	C 68	J58	68
J37	B 68	J54	68	J82	72

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	38	Engine Room R/B No.2 (Engine Compartment Left)
3	39	Engine Room R/B No.3 (Engine Compartment Left)
5	39	Driver Side R/B (Under the Instrument Panel J/B)

○ : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	45	Cowl Wire and Driver Side J/B (Lower Finish Panel)
1B		
1D		
1F		
1G		
1H		
1K	45	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1M	45	Roof Wire and Driver Side J/B (Lower Finish Panel)
2F	41	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
3A	48	Cowl Wire and Sub J/B No.3 (Upper the Accelerator Pedal)
3B		
3C		
3D		
3E		
4A	50	Cowl Wire and Sub J/B No.4 (Upper the Accelerator Pedal)
4B		
4C		
4D		
4E		

 : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EC1	90	Engine No.2 Wire and Engine Wire (Near the Starter)
ED1	90	Engine No.2 Wire and Differential Wire (Near the Transmission)
IA4	92	Engine Room Main Wire and Cowl Wire (Left Kick Panel)
IA8		
IC3	92	Cowl Wire and Roof Wire (Left Side of Instrument Panel)
ID2	92	Cigarette Lighter Wire and Cowl Wire (Instrument Panel Brace LH)
IE1	94	Engine Wire and Cowl Wire (Right Side of Instrument Panel)
IE4		
IF6	94	Front Door RH Wire and Cowl Wire (Right Kick Panel)
IJ1	94	Engine Room Main Wire and Cowl Wire (Cowl Side Panel RH)
IK2	94	Floor Wire and Cowl Wire (Right Kick Panel)
IL3	94	Floor No.2 Wire and Cowl Wire (Instrument Panel Brace RH)
IM1	92	Console Box Wire and Cowl Wire (Rear Console)
IM3		
BK1	96	Frame Wire and Frame No.3 Wire (Near the License Plate Light)
BL1	96	Rear Door No.1 Wire LH and Floor No.2 Wire (Left Side of Center Pillar)
BM1	96	Rear Door No.1 Wire RH and Floor Wire (Right Side of Center Pillar)
BO1	98	Floor Wire and Seat No.1 Wire (Under the Front Passenger's Seat)
BP2	96	Frame Wire and Floor No.2 Wire (Under the Driver's Seat)
BQ2	98	Floor No.2 Wire and Seat No.2 Wire (Under the Driver's Seat)
BS1	98	Seat No.1 Wire and Floor Wire (Under the Front Passenger's Seat)

 : Ground Points

Code	See Page	Ground Points Location
EA	90	Front Left Fender Apron
EC	90	Rear Bank of Left Cylinder Head
EM	90	Radiator Side Support RH
EY	90	Front Left Side of Cylinder Head
EZ	90	Left Side of Cylinder Block
IN	92	Right Kick Panel
IO	92	Left Kick Panel
IP	92	Instrument Panel Brace LH
BQ	96	Left Side of Center Pillar
BR	96	Back Panel Left
BS	96	Surrounding of the Front of the Fuel Tank

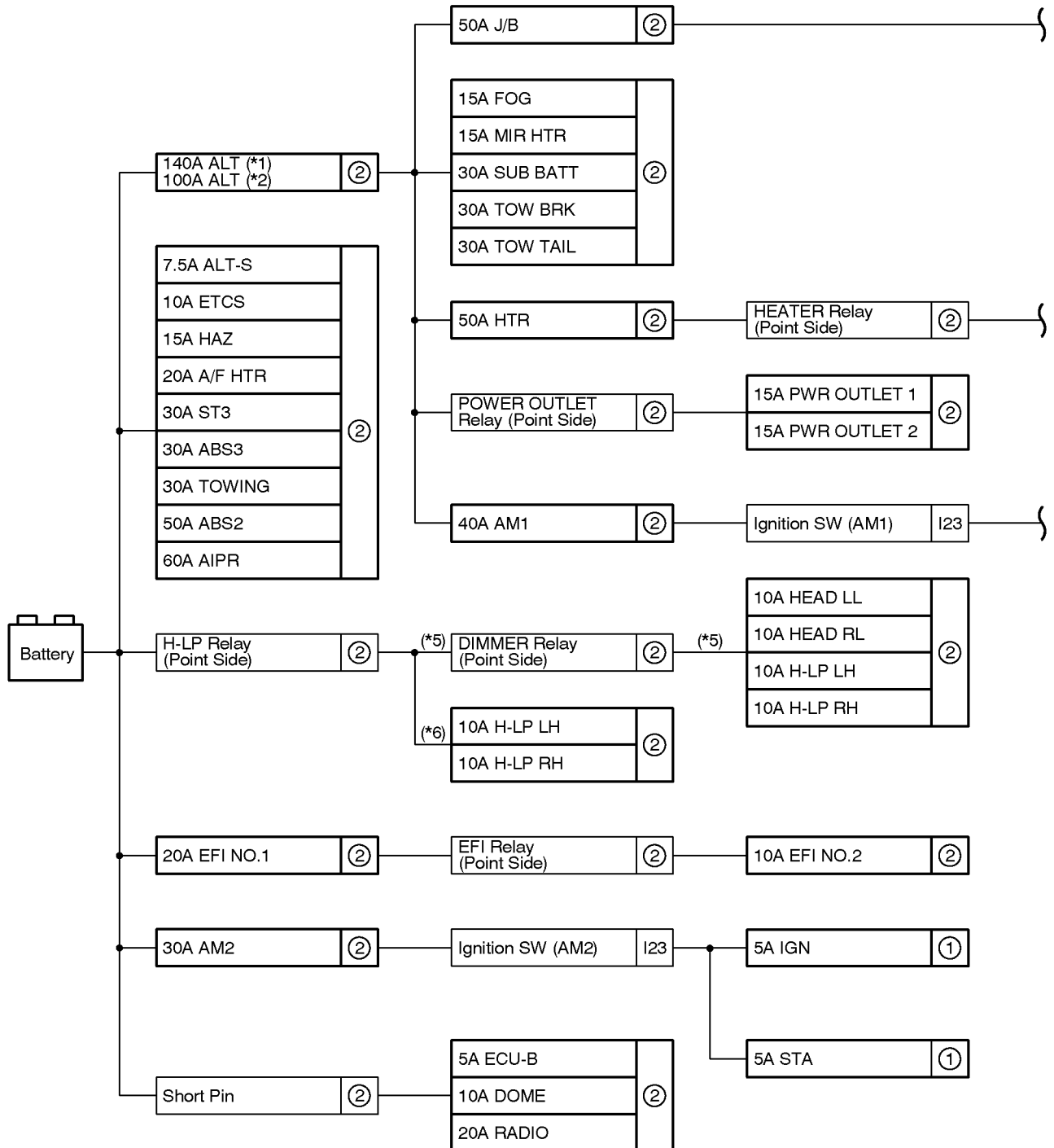
 : Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E2	90	Engine Wire	B1	96	Roof Wire
E4	90	Engine Room Main Wire	B3	96	Frame Wire
E5	90	Engine No.2 Wire	B4	96	Floor Wire
I1	94	Engine Wire	B5		

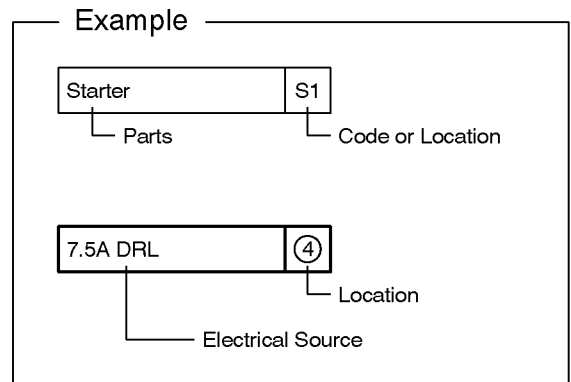
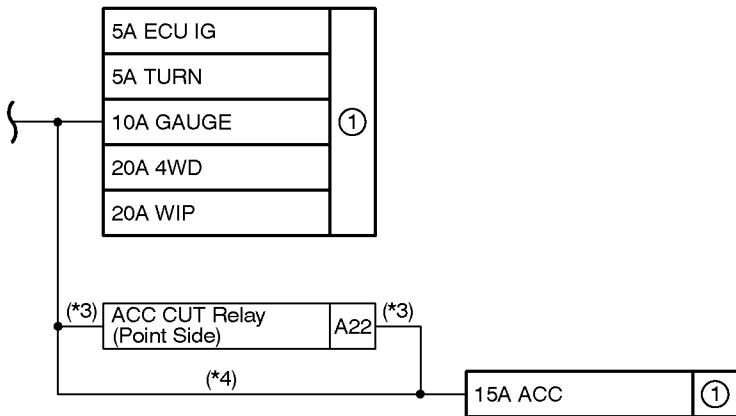
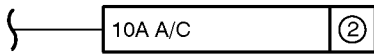
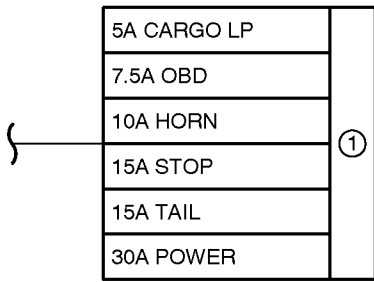
J POWER SOURCE (Current Flow Chart)

[Access Cab, Standard Cab]

The chart below shows the route by which current flows from the battery to each electrical source (Fusible Link, Circuit Breaker, Fuse, etc.) and other parts.



- [LOCATION] ① : Driver Side J/B and Integration Relay (See page 24 (*6), 28 (*5))
 ② : Engine Room R/B (See page 23)



- * 1: Towing Package
- * 2: Except Towing Package
- * 3: A/T
- * 4: M/T
- * 5: w/ Daytime Running Light
- * 6: w/o Daytime Running Light

J POWER SOURCE (Current Flow Chart)

[Access Cab, Standard Cab]

**Driver Side J/B (See Page 24 w/o Daytime Running Light,
See Page 28 w/ Daytime Running Light)**

Fuse		System	Page
5A	CARGO LP	Cargo Light	190
		Center Cluster Integration Control System	192
5A	ECU IG	ABS	220
		Door Lock Control (w/ Daytime Running Light)	248
		Door Lock Control (w/o Daytime Running Light)	254
		Headlight (w/ Daytime Running Light)	150
		Light Auto Turn Off System (w/ Daytime Running Light)	178
		Light Auto Turn Off System (w/o Daytime Running Light)	182
		Power Window	268
		Stop Light	176
		Tire Pressure Warning System	224
		TVIP and Wireless Door Lock Control	260
		VSC	212
5A	IGN	Air Conditioning	316
		Audio System (Separate Type Amplifier w/ Navigation System)	300
		Center Cluster Integration Control System	192
		Charging	118
		Combination Meter	310
		Cruise Control (1GR-FE)	230
		Cruise Control (2UZ-FE)	226
		Door Lock Control (w/ Daytime Running Light)	248
		Door Lock Control (w/o Daytime Running Light)	254
		Electronically Controlled Transmission and A/T Indicator (1GR-FE)	204
		Electronically Controlled Transmission and A/T Indicator (2UZ-FE)	198
		Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
		Interior Light	170
		Key Reminder and Seat Belt Warning	274
		SRS	236
		Tire Pressure Warning System	224
		VSC	212
		Wiper and Washer (w/ INT TIME SW)	284
		Wiper and Washer (w/o INT TIME SW)	288
		4WD	242
5A	STA	Electronically Controlled Transmission and A/T Indicator (1GR-FE)	204
		Electronically Controlled Transmission and A/T Indicator (2UZ-FE)	198
		Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
		Starting	106

* These are the page numbers of the first page on which the related system is shown.

Fuse		System	Page
5A	TURN	Trailer Towing	186
		Turn Signal and Hazard Warning Light	174
7.5A	OBD	Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
10A	GAUGE	ABS	220
		Air Conditioning	316
		Automatic Glare-Resistant EC Mirror	294
		Back-Up Light	160
		Center Cluster Integration Control System	192
		Charging	118
		Combination Meter	310
		Cruise Control (1GR-FE)	230
		Cruise Control (2UZ-FE)	226
		Electronically Controlled Transmission and A/T Indicator (1GR-FE)	204
		Electronically Controlled Transmission and A/T Indicator (2UZ-FE)	198
		Mirror Heater	292
		Trailer Towing	186
VSC	212		
4WD	242		
10A	HORN	Horn	282
		TVIP and Wireless Door Lock Control	260
15A	ACC	ABS	220
		Audio System (Built-In Type Amplifier)	308
		Audio System (Separate Type Amplifier w/ Navigation System)	300
		Audio System (Separate Type Amplifier w/o Navigation System)	304
		Back-Up Light	160
		Center Cluster Integration Control System	192
		Cigarette Lighter and Power Outlet	278
		Clock	280
		Cruise Control (1GR-FE)	230
		Cruise Control (2UZ-FE)	226
		Electronically Controlled Transmission and A/T Indicator (1GR-FE)	204
		Electronically Controlled Transmission and A/T Indicator (2UZ-FE)	198
		Key Reminder and Seat Belt Warning	274
		Remote Control Mirror	296
		SRS	236
Trailer Towing	186		
VSC	212		
4WD	242		
15A	STOP	ABS	220
		Cruise Control (1GR-FE)	230
		Cruise Control (2UZ-FE)	226
		Electronically Controlled Transmission and A/T Indicator (1GR-FE)	204
Electronically Controlled Transmission and A/T Indicator (2UZ-FE)	198		

* These are the page numbers of the first page on which the related system is shown.

J POWER SOURCE (Current Flow Chart)

[Access Cab, Standard Cab]

Fuse		System	Page
15A	STOP	Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
		Stop Light	176
		Trailer Towing	186
		VSC	212
15A	TAIL	Center Cluster Integration Control System	192
		Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
		Headlight (w/ Daytime Running Light)	150
		Illumination	166
		Light Auto Turn Off System (w/ Daytime Running Light)	178
		Light Auto Turn Off System (w/o Daytime Running Light)	182
		Taillight	162
		Trailer Towing	186
TVIP and Wireless Door Lock Control	260		
20A	WIP	Wiper and Washer (w/ INT TIME SW)	284
		Wiper and Washer (w/o INT TIME SW)	288
20A	4WD	4WD	242
30A	POWER	Door Lock Control (w/ Daytime Running Light)	248
		Door Lock Control (w/o Daytime Running Light)	254
		Power Seat	298
		Power Window	268
		TVIP and Wireless Door Lock Control	260

Engine Room R/B (See Page 23)

Fuse		System	Page
5A	ECU-B	Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
		SRS	236
		TVIP and Wireless Door Lock Control	260
		VSC	212
7.5A	ALT-S	Charging	118
10A	A/C	Air Conditioning	316
		Center Cluster Integration Control System	192
10A	DOME	Center Cluster Integration Control System	192
		Clock	280
		Combination Meter	310
		Door Lock Control (w/ Daytime Running Light)	248
		Door Lock Control (w/o Daytime Running Light)	254
		Interior Light	170
		Key Reminder and Seat Belt Warning	274
		TVIP and Wireless Door Lock Control	260

* These are the page numbers of the first page on which the related system is shown.

Fuse		System	Page
10A	EFI NO.2	Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
10A	ETCS	Cruise Control (1GR-FE)	230
		Cruise Control (2UZ-FE)	226
		Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
10A	HEAD LL	Fog Light (w/ Daytime Running Light)	156
		Headlight (w/ Daytime Running Light)	150
10A	HEAD RL	Headlight (w/ Daytime Running Light)	150
10A	H-LP LH	Fog Light (w/o Daytime Running Light)	158
		Headlight (w/ Daytime Running Light)	150
		Headlight (w/o Daytime Running Light)	154
10A	H-LP RH	Fog Light (w/o Daytime Running Light)	158
		Headlight (w/ Daytime Running Light)	150
		Headlight (w/o Daytime Running Light)	154
15A	FOG	Fog Light (w/ Daytime Running Light)	156
		Fog Light (w/o Daytime Running Light)	158
15A	HAZ	Trailer Towing	186
		Turn Signal and Hazard Warning Light	174
15A	MIR HTR	Mirror Heater	292
15A	PWR OUTLET1	Cigarette Lighter and Power Outlet	278
15A	PWR OUTLET2	Cigarette Lighter and Power Outlet	278
20A	A/F HTR	Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
20A	EFI NO.1	Cruise Control (1GR-FE)	230
		Cruise Control (2UZ-FE)	226
		Electronically Controlled Transmission and A/T Indicator (1GR-FE)	204
		Electronically Controlled Transmission and A/T Indicator (2UZ-FE)	198
		Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
20A	RADIO	Audio System (Built-In Type Amplifier)	308
		Audio System (Separate Type Amplifier w/ Navigation System)	300
		Audio System (Separate Type Amplifier w/o Navigation System)	304
30A	ABS3	ABS	220
		VSC	212
30A	AM2	Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
		Ignition (1GR-FE)	114
		Ignition (2UZ-FE)	110
		Starting	106
30A	ST3	Starting	106
30A	SUB BATT	Trailer Towing	186
30A	TOW BRK	Trailer Towing	186

* These are the page numbers of the first page on which the related system is shown.

J POWER SOURCE (Current Flow Chart)

[Access Cab, Standard Cab]

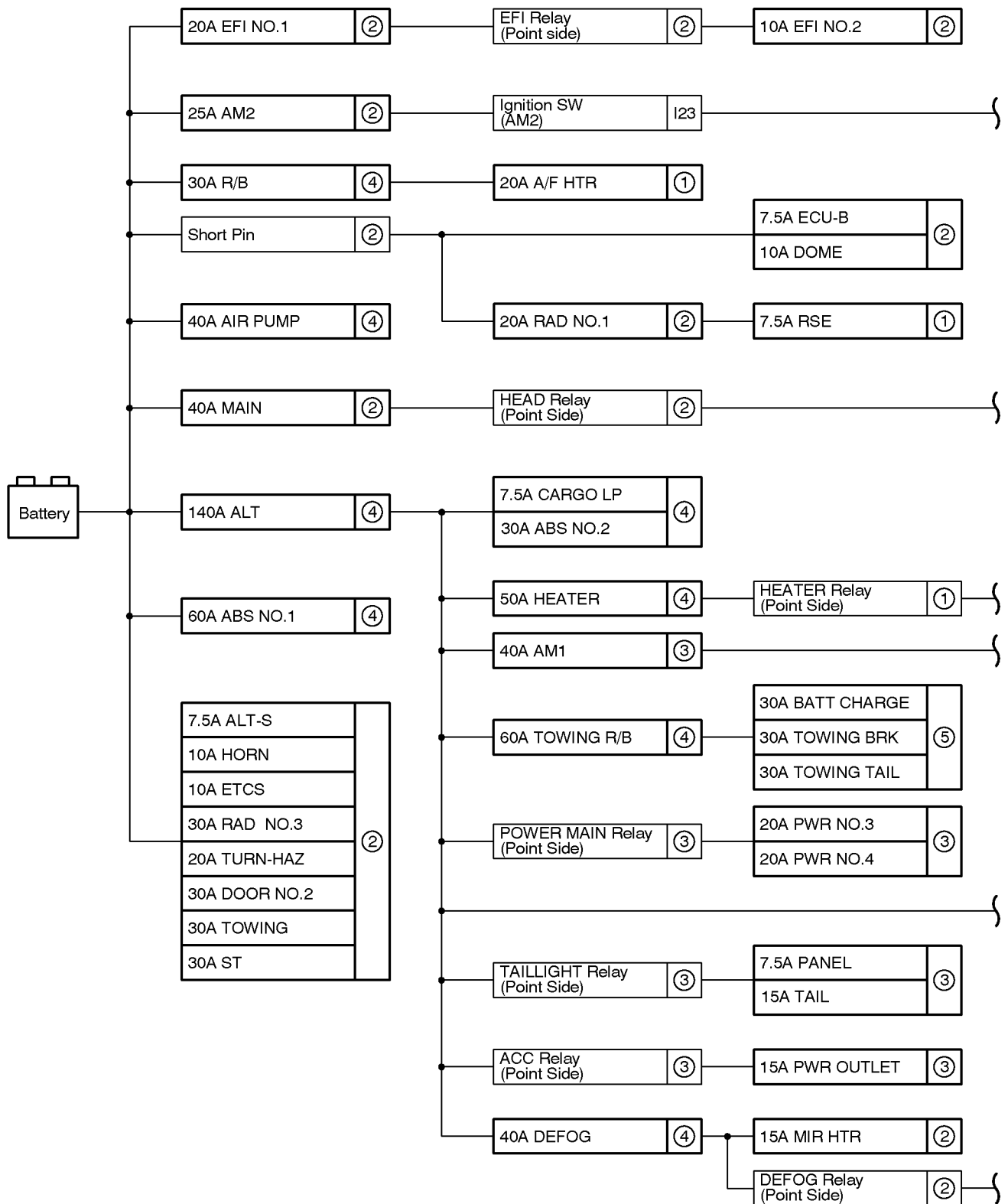
Fuse		System	Page
30A	TOW TAIL	Trailer Towing	186
30A	TOWING	Trailer Towing	186
40A	AM1	Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
50A	ABS2	ABS	220
		VSC	212
50A	HTR	Air Conditioning	316
50A	J/B	Illumination	166
		Taillight	162
60A	AIPR	Engine Control (2UZ-FE)	120
100A	ALT (Except Towing Package)	Charging	118
		Cigarette Lighter and Power Outlet	278
		Engine Control (1GR-FE)	136
		Engine Control (2UZ-FE)	120
		Illumination	166
140A	ALT (Towing Package)	Taillight	162
		Charging	118
		Cigarette Lighter and Power Outlet	278
		Engine Control (2UZ-FE)	120
		Illumination	166
		Taillight	162

* These are the page numbers of the first page on which the related system is shown.

J POWER SOURCE (Current Flow Chart)

[Double Cab]

The chart below shows the route by which current flows from the battery to each electrical source (Fusible Link, Circuit Breaker, Fuse, etc.) and other Parts.

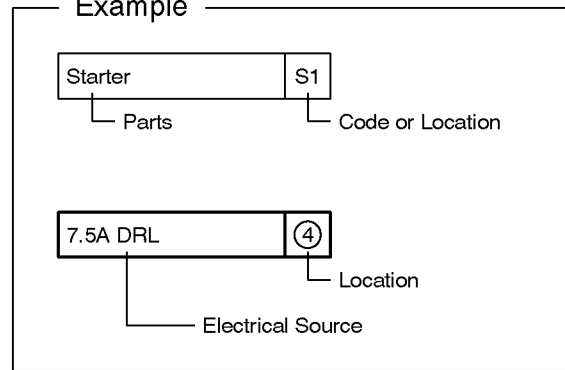


[LOCATION] ① : Engine Room R/B No.2 (See Page 38)

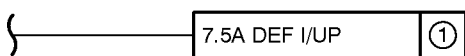
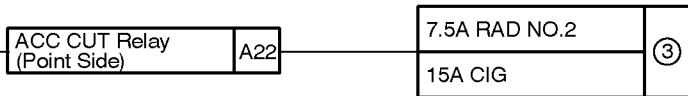
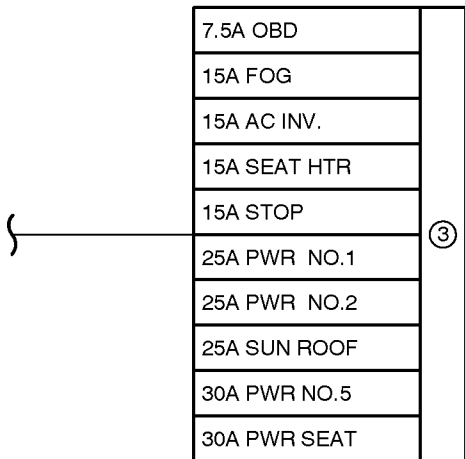
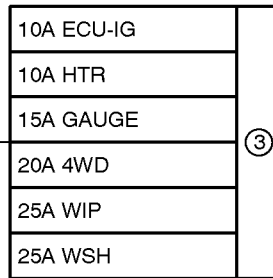
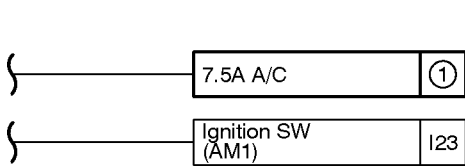
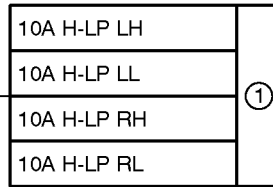
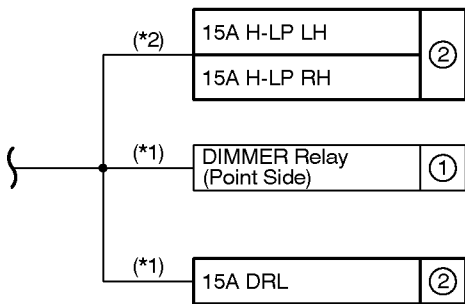
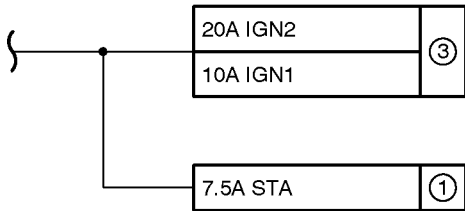
② : Engine Room J/B (See Page 40)

⑤ : Engine Room R/B No.3 (See Page 39)

Example



* 1:w/ Daytime Running Light
 * 2:w/o Daytime Running Light



③ : Driver Side J/B (See Page 44)

④ : Fusible Link Block (F13 on See Page 34)

J POWER SOURCE (Current Flow Chart)

[Double Cab]

Engine Room R/B No.2 (See Page 38)

Fuse		System	Page
7.5A	A/C	Air Conditioning	530
		Center Cluster Integration Control System	374
7.5A	DEF I/UP	Engine Control	332
		Rear Window Defogger and Mirror Heater	492
7.5A	STA	Electronically Controlled Transmission and A/T Indicator	438
		Engine Control	332
		Starting	324
10A	H-LP LH	Headlight (w/ Daytime Running Light)	346
		Multiplex Communication System (BEAN)	384
10A	H-LP LL	Fog Light (w/ Daytime Running Light)	352
		Headlight (w/ Daytime Running Light)	346
		Multiplex Communication System (BEAN)	384
10A	H-LP RH	Headlight (w/ Daytime Running Light)	346
		Multiplex Communication System (BEAN)	384
10A	H-LP RL	Headlight (w/ Daytime Running Light)	346
		Multiplex Communication System (BEAN)	384
20A	A/F HTR	Engine Control	332

Engine Room J/B (See Page 40)

Fuse		System	Page
7.5A	ALT-S	Charging	
7.5A	ECU-B	Door Lock Control and Theft Deterrent	420
		Engine Control	332
		Interior Light	408
		Key Reminder and Seat Belt Warning	404
		Light Auto Turn Off System	400
		Multiplex Communication System (BEAN)	384
		Power Window	414
		VSC	448
10A	DOME	Wireless Door Lock Control	428
		Center Cluster Integration Control System	374
		Combination Meter	524
		Interior Light	408
		Key Reminder and Seat Belt Warning	404
10A	EFI NO.2	Multiplex Communication System (BEAN)	384
10A	ETCS	Engine Control	332
10A	HORN	Cruise Control	444
		Engine Control	332
10A	HORN	Door Lock Control and Theft Deterrent	420
		Horn	482
		Multiplex Communication System (BEAN)	384

* These are the page numbers of the first page on which the related system is shown.

Fuse		System	Page
15A	DRL	Headlight (w/ Daytime Running Light)	346
		Multiplex Communication System (BEAN)	384
15A	H-LP LH	Fog Light (w/o Daytime Running Light)	354
		Headlight (w/o Daytime Running Light)	350
		Multiplex Communication System (BEAN)	384
15A	H-LP RH	Fog Light (w/o Daytime Running Light)	354
		Headlight (w/o Daytime Running Light)	350
		Multiplex Communication System (BEAN)	384
15A	MIR HTR	Rear Window Defogger and Mirror Heater	492
20A	EFI NO.1	Cruise Control	444
		Electronically Controlled Transmission and A/T Indicator	438
		Engine Control	332
20A	RAD NO.3	Audio System (Rear Seat Entertainment System)	504
		Audio System (w/ Navigation and Rear Seat Entertainment System)	496
		Audio System (8 Speaker)	518
		Audio System (8 Speaker w/ Navigation System)	512
20A	TURN-HAZ	Trailer Towing	366
		Turn Signal and Hazard Warning Light	364
25A	AM2	Engine Control	332
		Ignition	326
		SRS	467
		Starting	324
25A	RAD NO.1	Audio System (Rear Seat Entertainment System)	504
		Audio System (w/ Navigation and Rear Seat Entertainment System)	496
		Audio System (6 Speaker)	522
		Audio System (8 Speaker)	518
		Audio System (8 Speaker w/ Navigation System)	512
30A	DOOR NO.2	Door Lock Control and Theft Deterrent	420
		Multiplex Communication System (BEAN)	384
		Power Window	414
		Wireless Door Lock Control	428
30A	ST	Starting	324
30A	TOWING	Trailer Towing	366
40A	MAIN	Door Lock Control and Theft Deterrent	420
		Headlight (w/ Daytime Running Light)	346
		Headlight (w/o Daytime Running Light)	350
		Light Auto Turn Off System	400
		Multiplex Communication System (BEAN)	384

Driver Side J/B (See Page 44)

Fuse		System	Page
7.5A	ECU-B	SRS	467
7.5A	OBD	Engine Control	332

* These are the page numbers of the first page on which the related system is shown.

J POWER SOURCE (Current Flow Chart)

[Double Cab]

Fuse		System	Page
7.5A	PANEL	Center Cluster Integration Control System	374
		Combination Meter	524
		Illumination	360
7.5A	RAD NO.2	Audio System (Rear Seat Entertainment System)	504
		Audio System (w/ Navigation and Rear Seat Entertainment System)	496
		Audio System (6 Speaker)	522
		Audio System (8 Speaker)	518
		Audio System (8 Speaker w/ Navigation System)	512
		Center Cluster Integration Control System	374
		Cigarette Lighter and Power Outlet (12V)	478
		Multiplex Communication System (BEAN)	384
Remote Control Mirror	486		
10A	ECU-IG	ABS	454
		Accessory Meter and Garage Door Opener	476
		Automatic Glare-Resistant EC Mirror	494
		Charging	330
		Door Lock Control and Theft Deterrent	420
		Interior Light	408
		Light Auto Turn Off System	400
		Moon Roof	484
		Multiplex Communication System (BEAN)	384
		Power Outlet (115V)	480
		Power Window	414
		Stop Light	372
		Tire Pressure Warning System	458
Trailer Towing	366		
VSC	448		
Wireless Door Lock Control	428		
10A	HTR	Air Conditioning	530
		Center Cluster Integration Control System	374
		Rear Window Defogger and Mirror Heater	492
		Seat Heater	490
10A	IGN	ABS	454
10A	IGN1	Accessory Meter and Garage Door Opener	476
		Air Conditioning	530
		Center Cluster Integration Control System	374
		Charging	330
		Combination Meter	524
		Cruise Control	444
		Electronically Controlled Transmission and A/T Indicator	438
		Engine Control	332
Key Reminder and Seat Belt Warning	404		

* These are the page numbers of the first page on which the related system is shown.

Fuse		System	Page
10A	IGN1	Multiplex Communication System (BEAN)	384
		Tire Pressure Warning System	458
		VSC	448
		4WD	460
15A	AC INV.	Power Outlet (115V)	480
15A	CIG	Cigarette Lighter and Power Outlet (12V)	478
15A	FOG	Fog Light (w/ Daytime Running Light)	352
		Fog Light (w/o Daytime Running Light)	354
		Multiplex Communication System (BEAN)	384
15A	GAUGE	ABS	454
		Back-Up Light	370
		Cruise Control	444
		Electronically Controlled Transmission and A/T Indicator	438
		Trailer Towing	366
		Turn Signal and Hazard Warning Light	364
		VSC	448
4WD	460		
15A	IGN1	Interior Light	408
15A	PWR OUTLET	Cigarette Lighter and Power Outlet (12V)	478
15A	SEAT HTR	Seat Heater	490
15A	STOP	ABS	454
		Cruise Control	444
		Electronically Controlled Transmission and A/T Indicator	438
		Engine Control	332
		Stop Light	372
		Trailer Towing	366
VSC	448		
15A	TAIL	Engine Control	332
		Taillight	356
		Trailer Towing	366
20A	IGN2	Engine Control	332
		Ignition	326
20A	PWR NO.3	Multiplex Communication System (BEAN)	384
		Power Window	414
20A	PWR NO.4	Multiplex Communication System (BEAN)	384
		Power Window	414
20A	4WD	4WD	460
25A	PWR NO.1	Door Lock Control and Theft Deterrent	420
		Multiplex Communication System (BEAN)	384
		Power Window	414
		Wireless Door Lock Control	428
25A	PWR NO.2	Door Lock Control and Theft Deterrent	420
		Multiplex Communication System (BEAN)	384

* These are the page numbers of the first page on which the related system is shown.

J POWER SOURCE (Current Flow Chart)

[Double Cab]

Fuse		System	Page
25A	PWR NO.2	Power Window	414
		Wireless Door Lock Control	428
25A	SUN ROOF	Moon Roof	484
25A	WIP	Wiper and Washer	436
25A	WSH	Wiper and Washer	436
30A	PWR NO.5	Multiplex Communication System (BEAN)	384
		Power Window	414
30A	PWR SEAT	Power Seat	488
40A	AM1	Engine Control	332

Fusible Link Block (F13 on See Page 34)

Fuse		System	Page
7.5A	CARGO LP	Cargo Light	378
		Center Cluster Integration Control System	374
30A	ABS NO.2	ABS	454
		VSC	448
40A	AIR PUMP	Engine Control	332
40A	DEFOG	Rear Window Defogger and Mirror Heater	492
50A	HEATER	Air Conditioning	530
60A	ABS NO.1	ABS	454
		VSC	448
140A	ALT	ABS	454
		Charging	330
		Cigarette Lighter and Power Outlet (12V)	478
		Door Lock Control and Theft Deterrent	420
		Engine Control	332
		Illumination	360
		Light Auto Turn Off System	400
		Multiplex Communication System (BEAN)	384
		Power Window	414
		Taillight	356
Wireless Door Lock Control	428		

Engine Room R/B No.3 (See Page 39)

Fuse		System	Page
7.5A	RSE	Audio System (Rear Seat Entertainment System)	504
		Audio System (w/ Navigation and Rear Seat Entertainment System)	496
		Audio System (8 Speaker)	518
		Audio System (8 Speaker w/ Navigation System)	512
30A	BATT CHARGE	Trailer Towing	366
30A	TOWING BRK	Trailer Towing	366

* These are the page numbers of the first page on which the related system is shown.

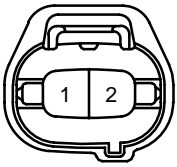
Fuse		System	Page
30A	TOWING TAIL	Multiplex Communication System (BEAN) Trailer Towing	384 366

* These are the page numbers of the first page on which the related system is shown.

K CONNECTOR LIST

*1 : Access Cab, Standard Cab

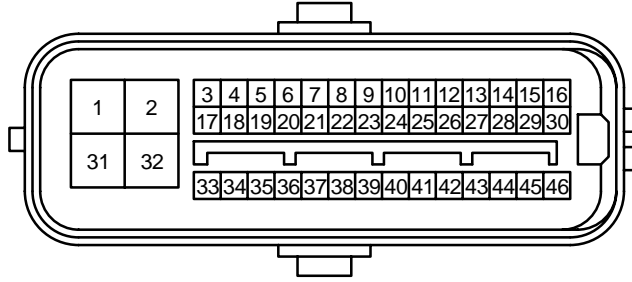
A 1
Gray



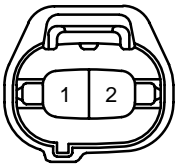
A 3
Gray



A 5
Gray



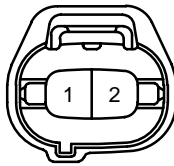
A 6
(w/ VSC)



A 6
(w/o VSC) Gray



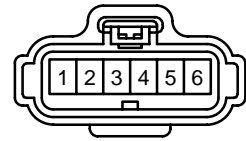
A 7
(w/ VSC)



A 7
(w/o VSC) Gray



A 9
Black



A10
Dark Gray



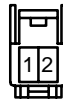
A11
Yellow



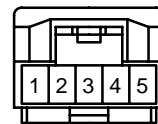
A12
Yellow



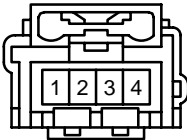
A13



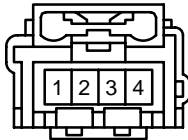
A15
Black



A16
Yellow



A17
Yellow



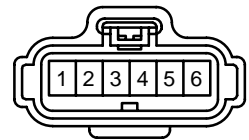
A18
Black



A19
Gray



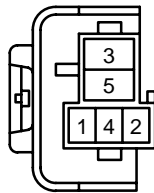
A20
(A/T) Black



A20
(M/T) Black



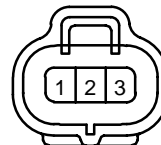
A22
Gray



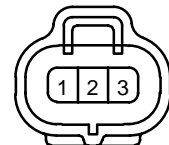
A28
Black



A29
(*1) Black



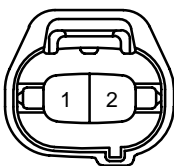
A29
(Double Cab)



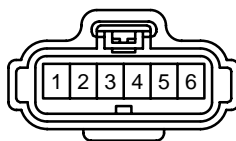
A30
Dark Gray



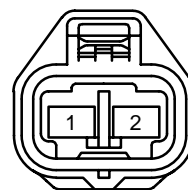
A31
Black



A32
Black



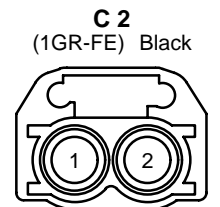
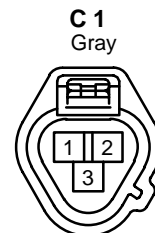
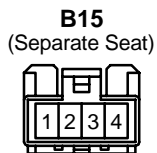
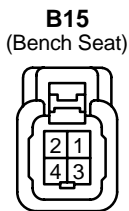
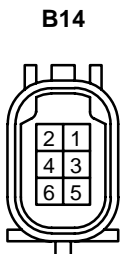
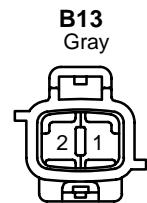
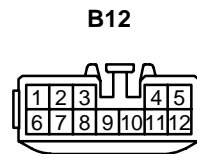
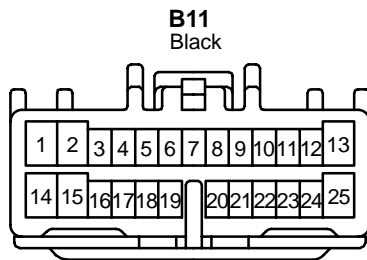
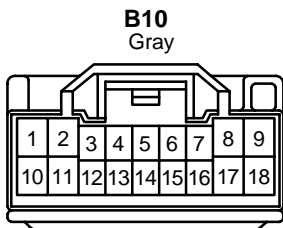
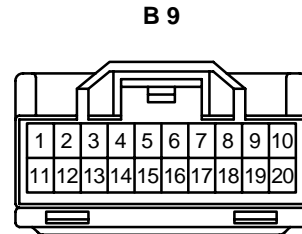
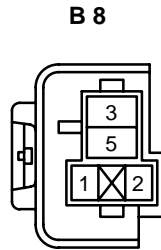
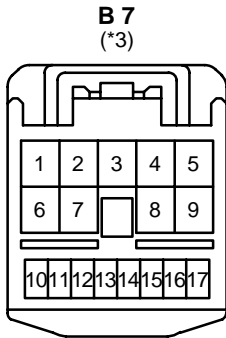
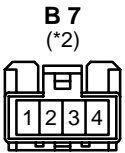
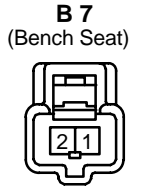
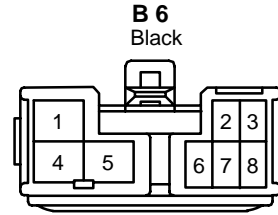
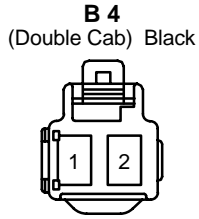
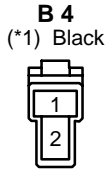
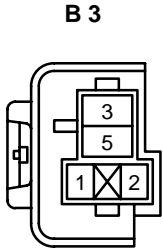
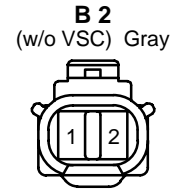
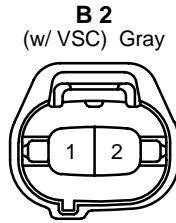
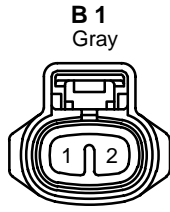
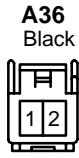
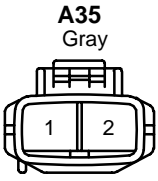
A33
Gray



A34
Black



*1 : Access Cab, Standard Cab
 *2 : Captain Seat (w/ Power Seat)
 *3 : Separate Seat, Captain Seat (w/o Power Seat)



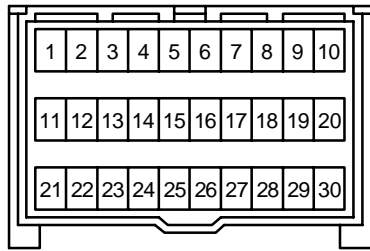
K CONNECTOR LIST

*1 : Access Cab, Standard Cab

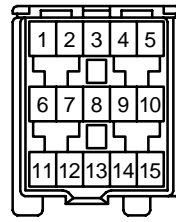
C 2
(2UZ-FE) Dark Gray



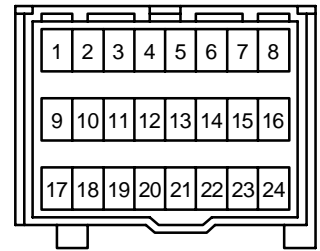
C 4
Yellow



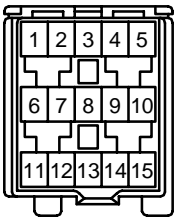
C 5
(*1) Yellow



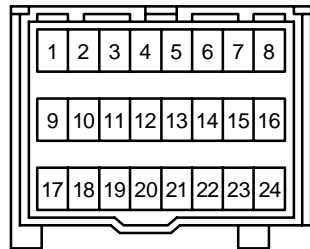
C 5
(Double Cab) Yellow



C 6
(*1) Yellow



C 6
(Double Cab) Yellow



C 7



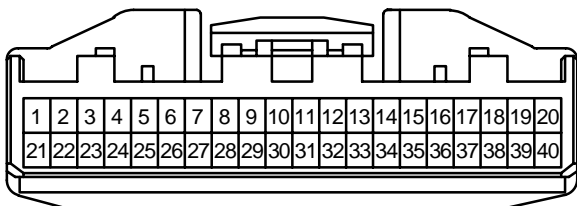
C 8
Gray



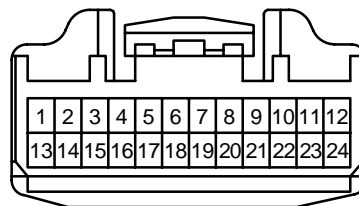
C 10



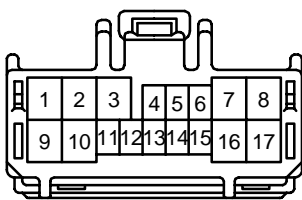
C 11



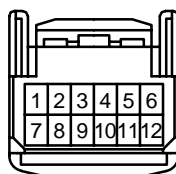
C 12



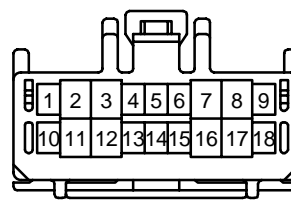
C 15



C 16
Black



C 17
Black



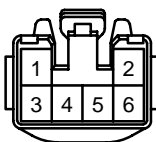
C 19
Black



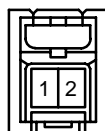
C 20
Black



C 21
Black



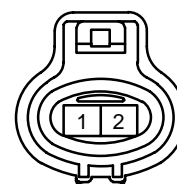
C 22
Yellow



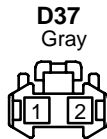
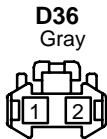
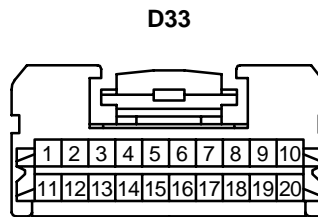
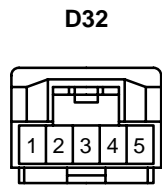
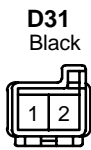
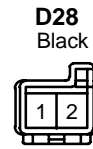
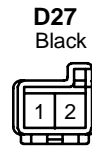
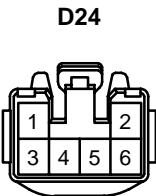
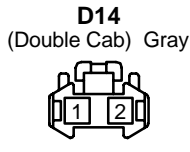
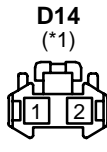
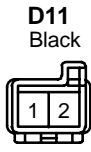
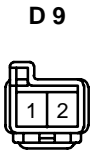
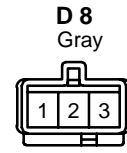
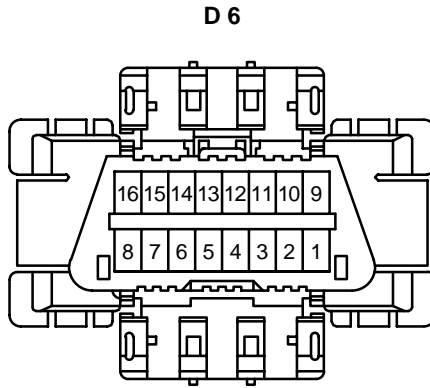
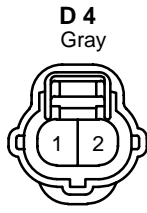
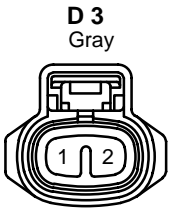
C 23
Yellow



D 2
Gray



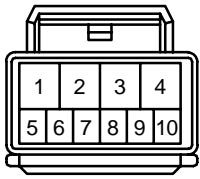
*1 : Access Cab, Standard Cab



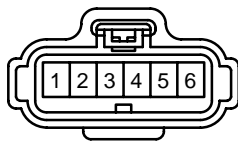
K CONNECTOR LIST

*1 : Access Cab, Standard Cab

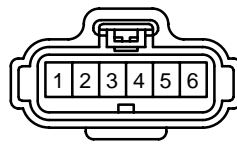
D41



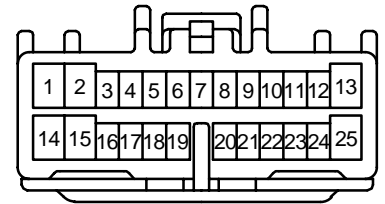
D42
Black



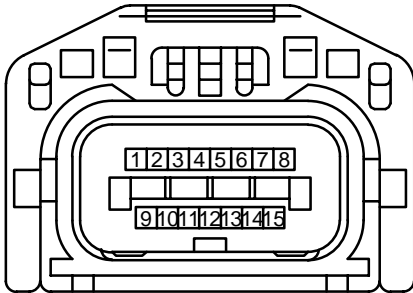
D43
Black



D44



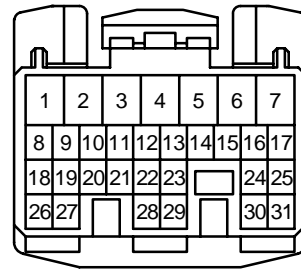
E 1
Gray



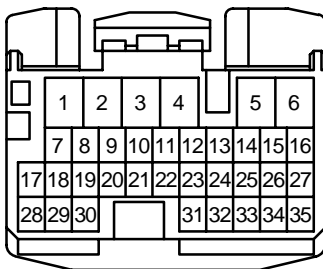
E 2
(1GR-FE) Dark Gray (2UZ-FE) Gray



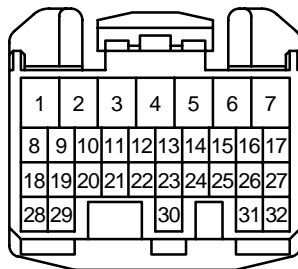
E 3



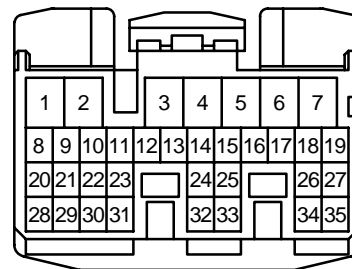
E 4



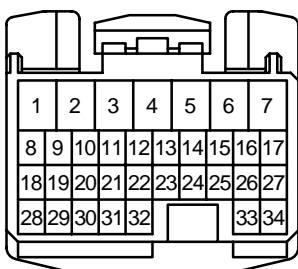
E 5



E 6



E 7



E 8
Black



F 1
Brown



F 2
Brown



F 3
Gray



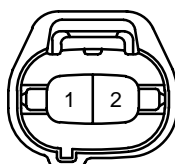
F 4
Gray



F 5
(1GR-FE) Dark Gray



F 5
(2UZ-FE) Black



F 8
(*1)



F 8
(Double Cab) Gray



F 9
(*1)



*1 : Access Cab, Standard Cab

F 9
(Double Cab) Gray



F10



F11
Gray



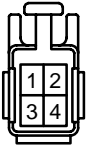
F12
Gray



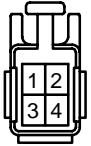
F13

(See Page 34)

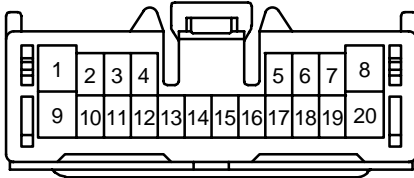
F15



F16



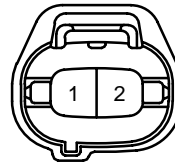
F17



F18
(*1) Gray



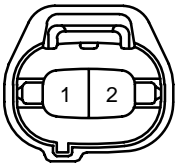
F18
(Double Cab) Gray



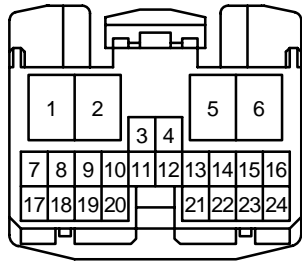
F19
(*1) Gray



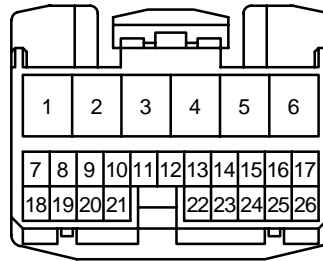
F19
(Double Cab) Gray



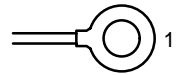
F20



F21
Black



G 1
(1GR-FE)



G 1
(2UZ-FE)



G 2
(1GR-FE) Green



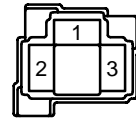
G 2
(2UZ-FE) Black



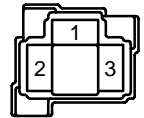
G 3



H 1



H 2



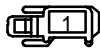
H 4
Dark Gray



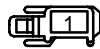
H 6
Dark Gray



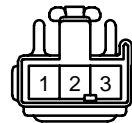
H 7
Black



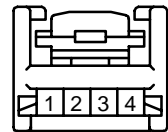
H 8
Black



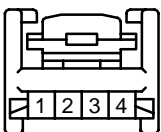
H10



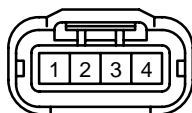
H11



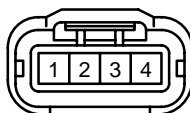
H12



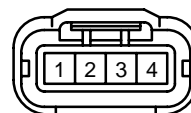
I 3
Black



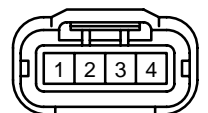
I 4
Black



I 5
Black



I 6
Black

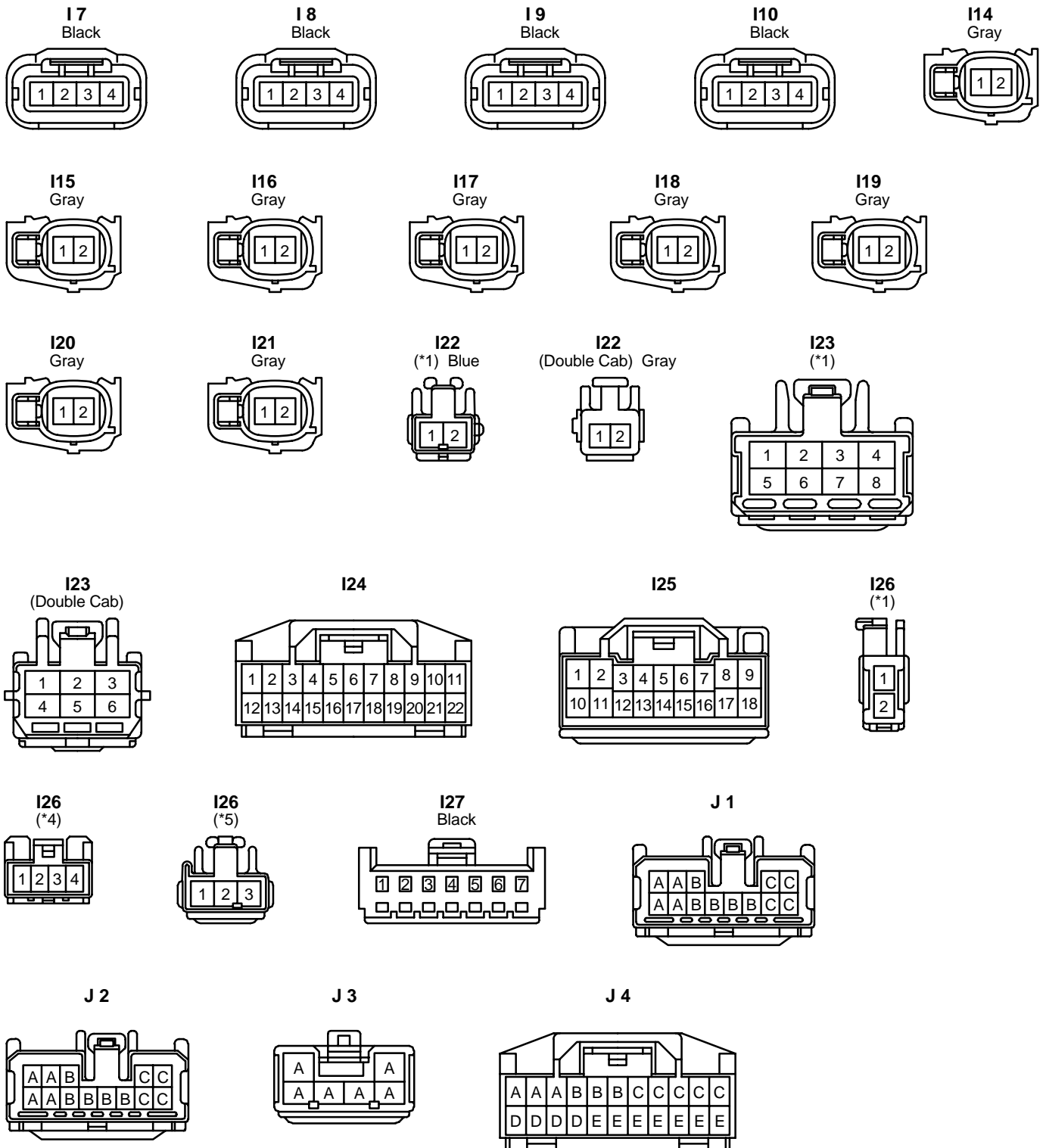


K CONNECTOR LIST

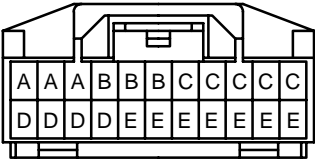
*1 : Access Cab, Standard Cab

*4 : Double Cab w/ Vanity Light

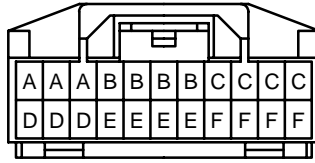
*5 : Double Cab w/o Vanity Light



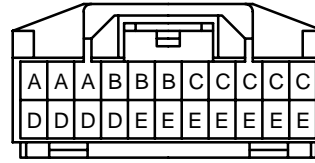
J5



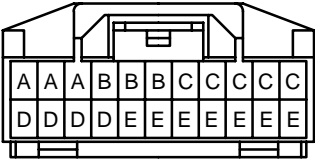
J7



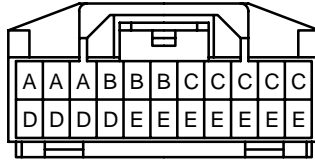
J8



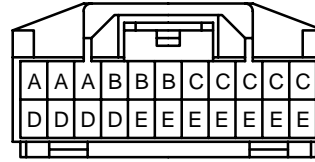
J9



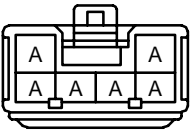
J10



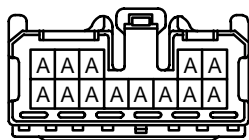
J12



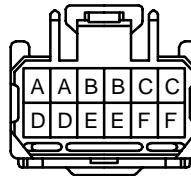
J13



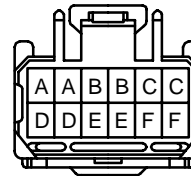
J18



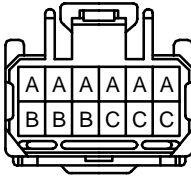
J21



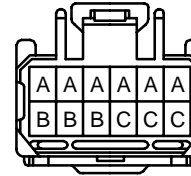
J22



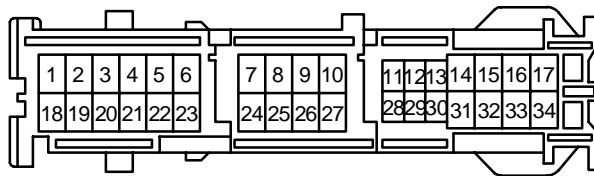
J23
Gray



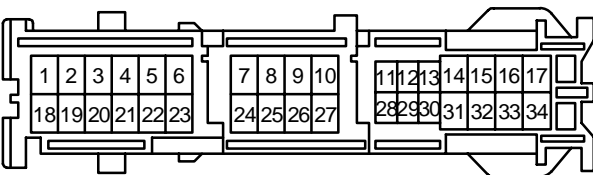
J24
Gray



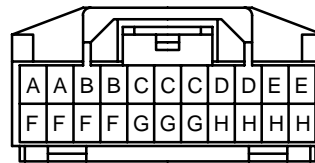
J26



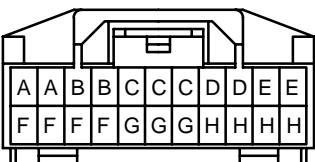
J27



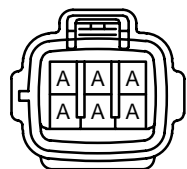
J28
Blue



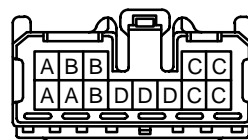
J29
Blue



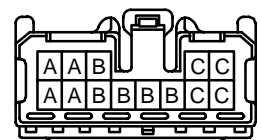
J30
Gray



J31
Blue

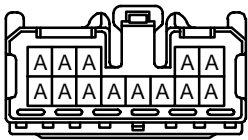


J32

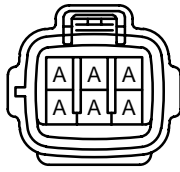


K CONNECTOR LIST

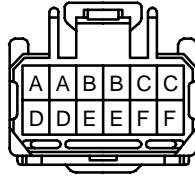
J34
Black



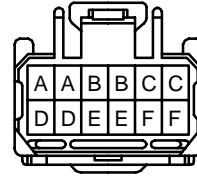
J35
Gray



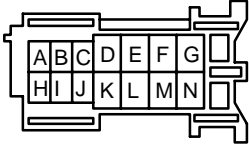
J36



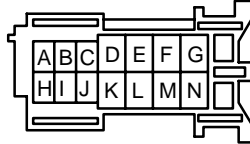
J37



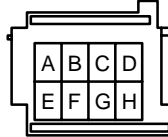
J38



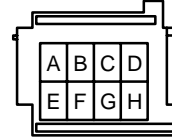
J39



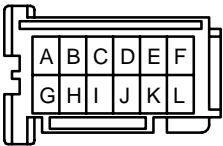
J40



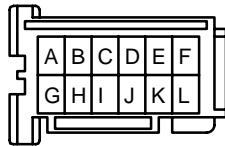
J41



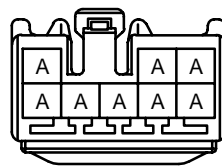
J42



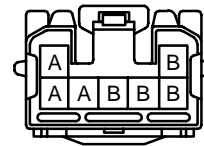
J43



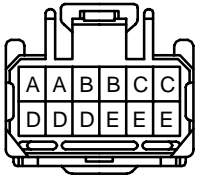
J45



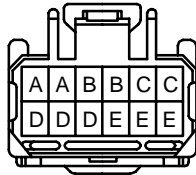
J46



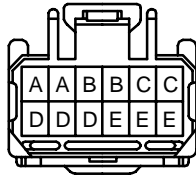
J47
Black



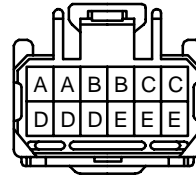
J48
Black



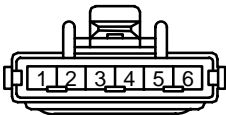
J49
Black



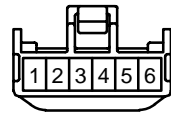
J50
Black



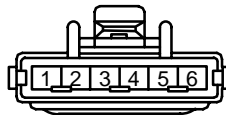
J51



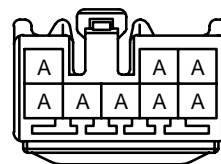
J52
Black



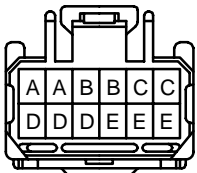
J53



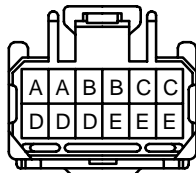
J54



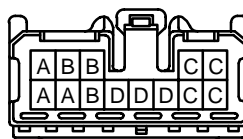
J55
Black



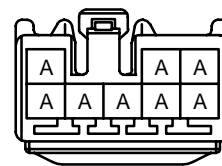
J56
Black



J57
Blue



J58



J59
Black



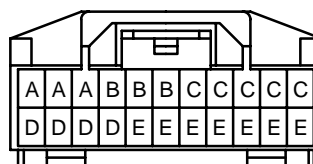
J60
Black



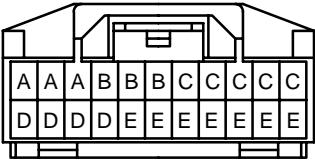
J63
Black



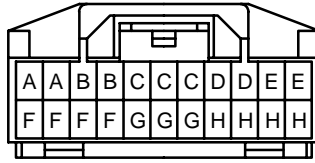
J64



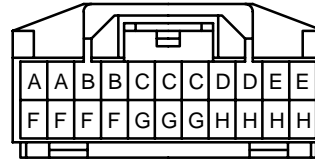
J65



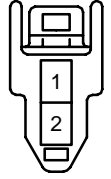
J66
Blue



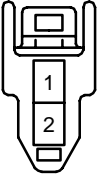
J67
Blue



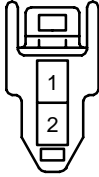
J68



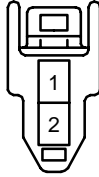
J69



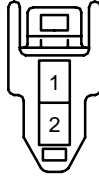
J70



J71



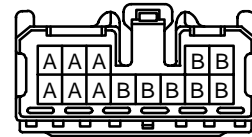
J72



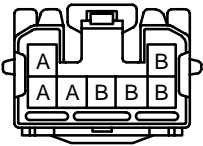
J73



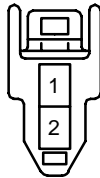
J74
Gray



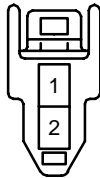
J75



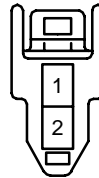
J76



J77



J78



J79



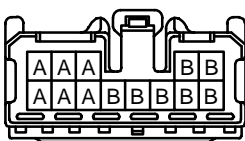
J80



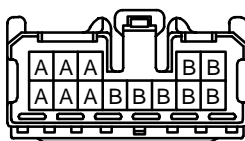
J81



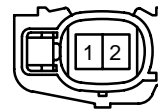
J82
Gray



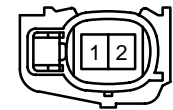
J83
Gray



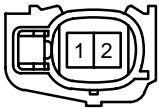
K 1
Black



K 2
(1GR-FE) Black



K 2
(2UZ-FE) Gray



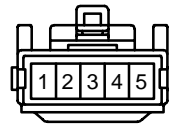
L 1
Gray



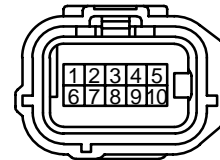
L 2
Gray



L 3



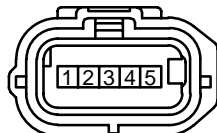
L 4
Black



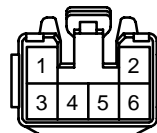
M 1
(1GR-FE) Black



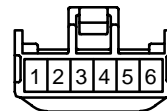
M 1
(2UZ-FE) Black



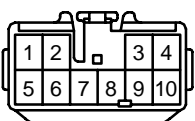
M 4
Black



M 5
Black



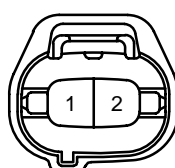
M 6



N 1
Gray



O 1
Black



O 2
Gray



O 4



K CONNECTOR LIST

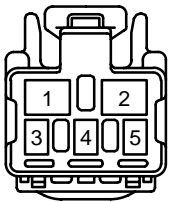
*1 : Access Cab, Standard Cab

*7 : Double Cab Except Captain seat

*6 : Double Cab Captain seat

*8 : Access Cab, Standard Cab, Double Cab Except Captain seat

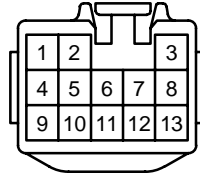
O 5



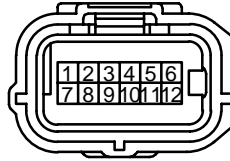
O 7



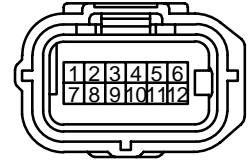
O 8



O10
Black



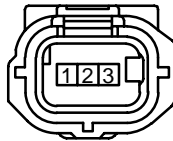
O11
Gray



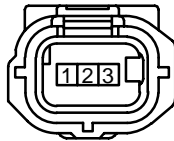
O12
Gray



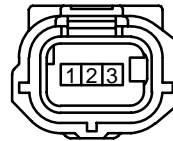
O13
Black



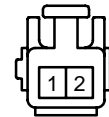
O14
Black



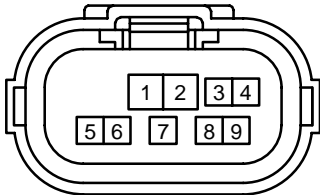
O15
Gray



O16



P 1
Gray



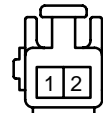
P 2
Black



P 5
(A/T)



P 5
(M/T)



P 6
(*1) Blue



P 6
(*6)



P 6
(*7)



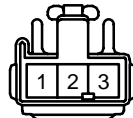
P 7
(*8)



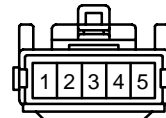
P 7
(*6)



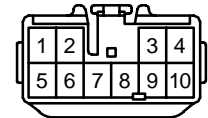
P 8



P 9



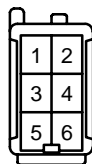
P10



P11
(*1)



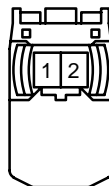
P11
(Double Cab)



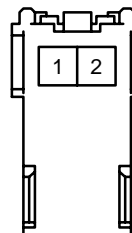
P12



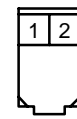
P13
(Access Cab) Black



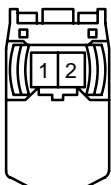
P13
(Double Cab) Yellow



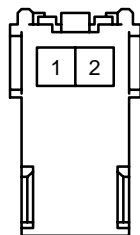
P13
(Standard Cab) Yellow



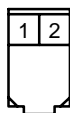
P14
(Access Cab) Black



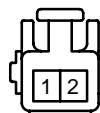
P14
(Double Cab) Yellow



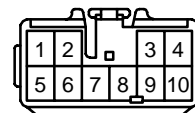
P14
(Standard Cab) Yellow



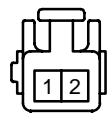
P15
Black



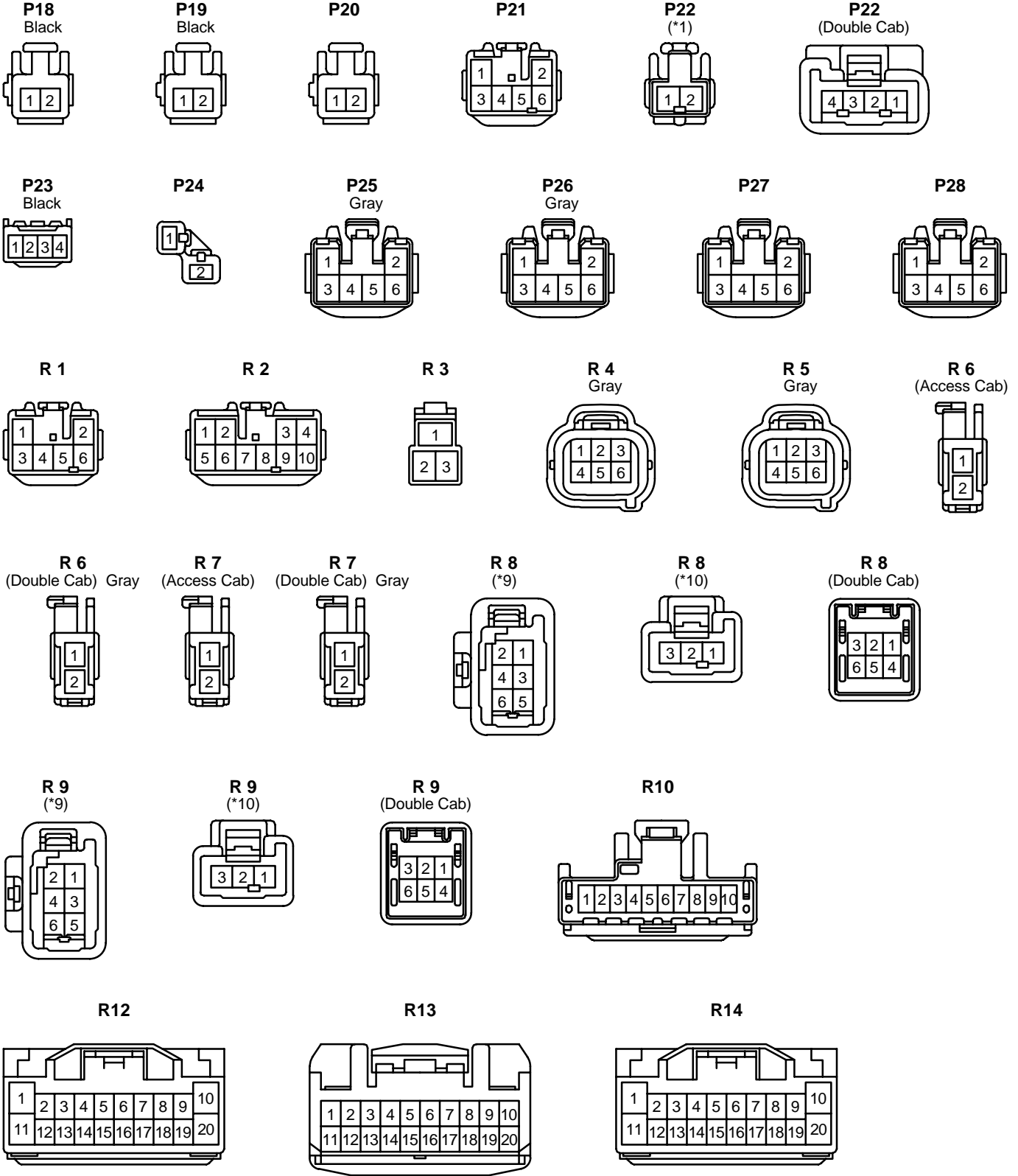
P16



P17
Black



*1 : Access Cab, Standard Cab
 *9 : Access Cab, Standard Cab w/ Mirror Heater
 *10 : Access Cab, Standard Cab w/o Mirror Heater

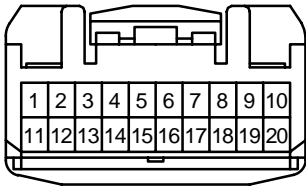


K CONNECTOR LIST

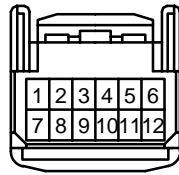
*11 : 1GR-FE (Cold Area Spec.)

*12 : 1GR-FE (Except Cold Area Spec.)

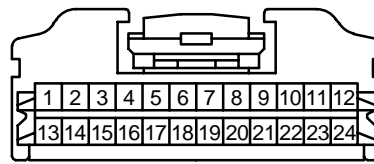
R15



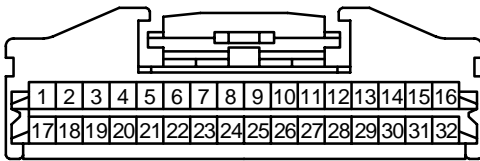
R16



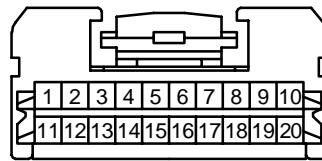
R17



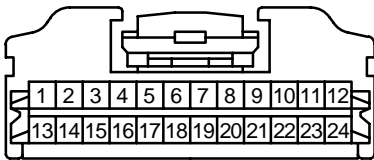
R18



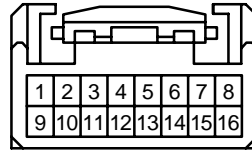
R19



R20



R21



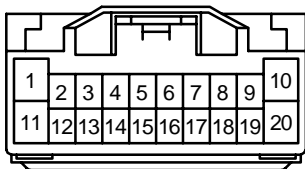
R22
Gray



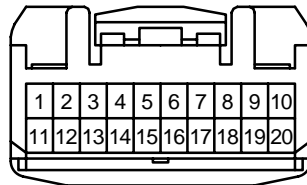
R23



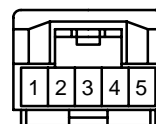
R24



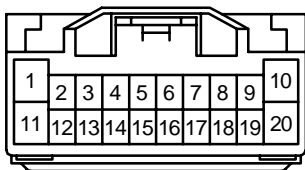
R25



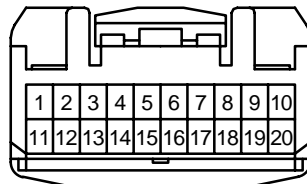
R26
Gray



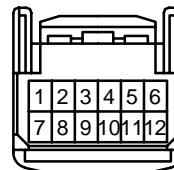
R27



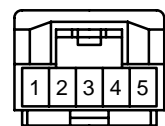
R28



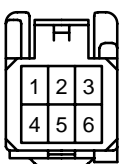
R29



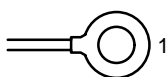
R30
Gray



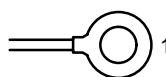
R31
Blue



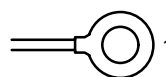
S 1
(*11)



S 1
(*12)



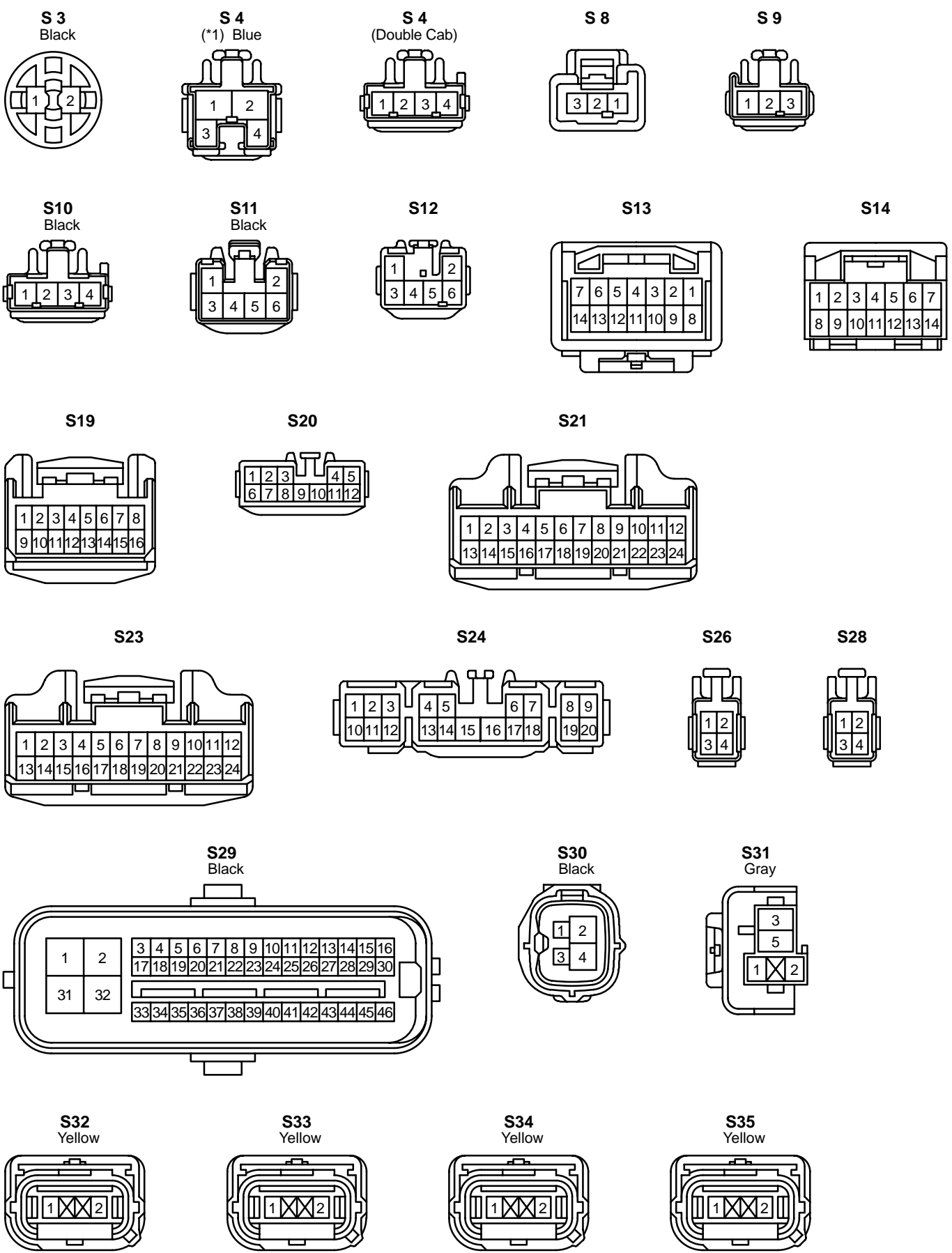
S 1
(2UZ-FE)



S 2
Black



*1 : Access Cab, Standard Cab



K CONNECTOR LIST

*1 : Access Cab, Standard Cab

*13 : Except Towing Package

S36
Black



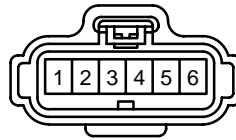
S37
Yellow



S38
Yellow



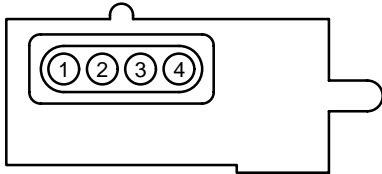
T 3
Black



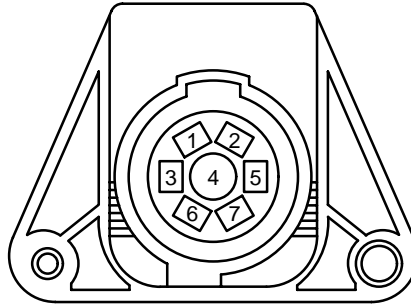
T 5
Black



T 6
(*13) Black



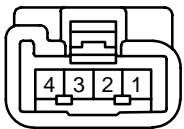
T 6
(Towing Package) Black



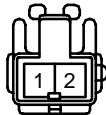
T 7
(*1)



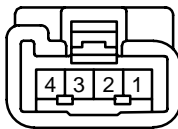
T 7
(Double Cab)



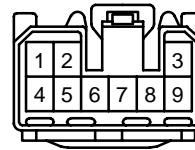
T 8
(*1)



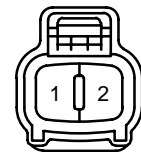
T 8
(Double Cab)



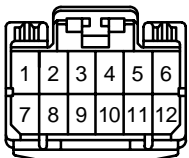
T 9



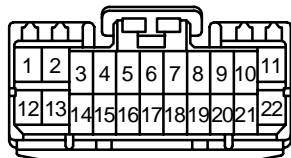
T10
Gray



T11



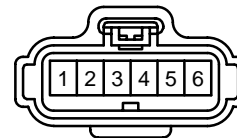
T12



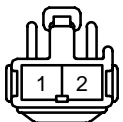
T13
Black



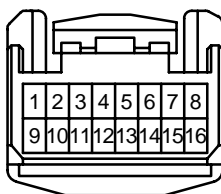
T14
Black



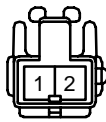
T15
Black



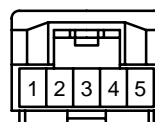
T16



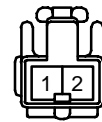
T17
Black



T18



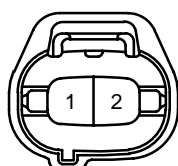
U 1



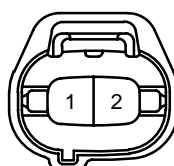
V 2
Black



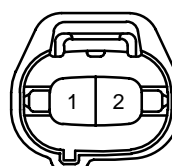
V 3
Black



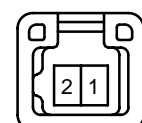
V 4
(1GR-FE) Gray



V 4
(2UZ-FE) Black



V 6
(*1) Blue

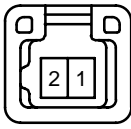


*1 : Access Cab, Standard Cab

V 6
(Double Cab)



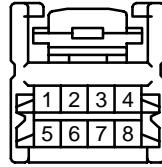
V 7
(*1) Blue



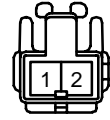
V 7
(Double Cab)



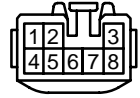
V10



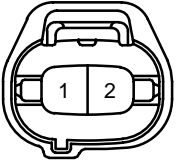
V11
Black



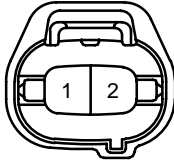
V12



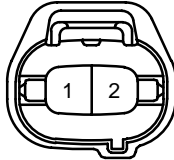
V13
Black



V14
Brown



V15
Brown



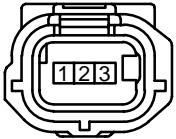
V16
(1GR-FE) Black



V16
(2UZ-FE) Dark Gray



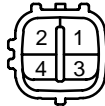
V17
(1GR-FE) Black



V17
(2UZ-FE) Dark Gray



W 2
Dark Gray



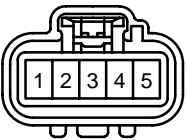
W 4
Black



W 5
Black



Y 1
Black



L PART NUMBER OF CONNECTORS

Code	Part Name	Part Number	Code	Part Name	Part Number
A 1	Pressure SW	90980-11149	B11	Body ECU	90980-11877
A 3	A/C Magnetic Clutch and Lock Sensor	90980-11016	B12	Back Window Control Relay	90980-10803
A 5	ABS Actuator with ECU	90980-12426	B13	Buckle SW RH	90980-11486
A 6	ABS Speed Sensor Front LH (w/ VSC)	90980-11156	B14	Buckle SW LH	90980-12381
	ABS Speed Sensor Front LH (w/o VSC)	90980-11075		Seat Position Airbag Sensor	
A 7	ABS Speed Sensor Front RH (w/ VSC)	90980-11156	B15	Buckle SW RH (Bench Seat)	90980-10794
	ABS Speed Sensor Front RH (w/o VSC)	90980-11075		Buckle SW RH (Separate Seat)	90980-11950
A 9	ADD Actuator	90980-11858		Occupant Detection SW (Bench Seat)	90980-10794
A10	Air Fuel Ratio Sensor (Bank 1 Sensor 1)	90980-10869		Occupant Detection SW (Separate Seat)	90980-11950
A11	Airbag Sensor Front LH	90980-11856	B16	Buckle SW LH	90980-11486
A12	Airbag Sensor Front RH		C 1	Camshaft Position Sensor	90980-11016
A13	A/C Thermistor	90980-11918	C 2	Crankshaft Position Sensor (1GR-FE)	90980-12028
A15	Air Inlet Control Servo Motor	90980-11909		Crankshaft Position Sensor (2UZ-FE)	90980-11162
A16	Airbag Squib (Front Passenger Airbag Assembly)	90980-12160	C 4	Center Airbag Sensor Assembly	90980-12391
A17	Airbag Squib (Steering Wheel Pad)		C 5	Center Airbag Sensor Assembly (Access Cab, Standard Cab)	90980-12449
A18	Ashtray Illumination	-		Center Airbag Sensor Assembly (Double Cab)	90980-12390
A19	ABS Speed Sensor Rear	90980-10942	C 6	Center Airbag Sensor Assembly (Access Cab, Standard Cab)	90980-12450
A20	Accelerator Pedal Position Sensor (A/T)	90980-11858		Center Airbag Sensor Assembly (Double Cab)	90980-12392
	Accelerator Pedal Position Sensor (M/T)	90980-11144	C 7	Cigarette Lighter	90980-10760
A22	ACC Cut Relay	82660-53010	C 8	Cigarette Lighter Illumination	90980-11148
A28	Ambient Temp. Sensor	90980-11070	C10	Clutch Start SW	90980-10825
A29	ABS Deceleration Sensor	90980-10845	C11	Combination Meter	90980-12557
A30	Air Fuel Ratio Sensor (Bank 2 Sensor 1)	90980-10869	C12	Combination Meter	90980-12554
A31	Air Switching Valve	90980-11149	C15	Combination SW	90980-11672
A32	Air Injection Control Driver	90980-11858	C16	Combination SW	90980-12552
A33	Air Injection Control Driver	90980-12068	C17	Combination SW	90980-11594
A34	Air Pressure Sensor	90980-10845	C19	Camshaft Timing Oil Control Valve LH	90980-11162
A35	Air Pump	90980-11032	C20	Camshaft Timing Oil Control Valve RH	
A36	Airbag Cut Off SW	90980-12063	C21	Curtain Airbag Cut Off SW	90980-10797
B 1	Back-Up Light SW	90980-11250	C22	Curtain Shield Airbag Squib LH	90980-11886
B 2	Brake Fluid Level Warning SW (w/ VSC)	90980-11156	C23	Curtain Shield Airbag Squib RH	
	Brake Fluid Level Warning SW (w/o VSC)	90980-11207	D 2	Daytime Running Light Resistor	90980-10928
B 3	Back-Up Light Relay	82660-20340	D 3	Detection SW (Transfer 4WD Position)	90980-11250
B 4	Blower Motor (Access Cab, Standard Cab)	90980-10214	D 4	Detection SW (Transfer L4 Position)	90980-11025
	Blower Motor (Double Cab)	90980-10903	D 6	Data Link Connector 3	90980-11665
B 5	Blower Resistor	90980-10171	D 8	Diode (A/T)	90980-11071
B 6	Blower SW	90980-10877	D 9	Diode (Door Courtesy)	90980-11608
	Defroster Mode SW		D11	Diode (Power Window System)	90980-10962
B 7	Buckle SW LH (Bench Seat)	90980-10859	D14	Door Courtesy Light Front LH	90980-11148
	Buckle SW LH (Captain Seat (w/ Power Seat))	90980-11950	D15	Door Courtesy Light Front RH	
	Buckle SW LH (Separate Seat, Captain Seat (w/o Power Seat))	90980-12374	D16	Door Courtesy SW Front LH	90980-10871
B 8	Back Window Relay	82660-20340	D17	Door Courtesy SW Front RH	
B 9	Body ECU	90980-11974			
B10	Body ECU	90980-11973			

Note: Not all of the above part numbers of the connector are established for the supply.

Code	Part Name	Part Number	Code	Part Name	Part Number	
D18	Door Courtesy SW Rear LH Lower	90980-11003	F 3	Front Parking Light LH	90980-11020	
D19	Door Courtesy SW Rear LH Upper			Front Turn Signal Light LH		
D20	Door Courtesy SW Rear RH Lower		F 4	Front Parking Light RH		
D21	Door Courtesy SW Rear RH Upper			Front Turn Signal Light RH		
D22	Door Key Lock and Unlock SW LH	90980-11245	F 5	Fuel Pump Resistor (1GR-FE)	90980-10901	
D23	Door Key Lock and Unlock SW RH			Fuel Pump Resistor (2UZ-FE)	90980-11156	
D24	Door Lock Control SW RH	90980-10797	F 8	Front Door Speaker LH	90980-10935	
D25	Door Lock Motor LH	90980-11150	F 9	Front Door Speaker RH		
	Door Unlock Detection SW LH		F10	Fuel Pump	90980-11077	
D26	Door Lock Motor RH			Fuel Sender		
	Door Unlock Detection SW RH		F11	Front Parking Light LH No.2	90980-11020	
D27	Diode (Step Light)	Front Turn Signal Light LH No.2				
D28	Diode (Door Lock)	90980-10962	F12	Front Parking Light RH No.2		
D29	Diode (TVIP)			Front Turn Signal Light RH No.2		
D30	Diode (Unlock Warning)	90980-10962	F13	Fusible Link Block	82620-0C010	
D31	Diode (Parking Brake SW)		F15	Front Door Speaker LH (Woofer)	90980-10795	
D32	Door Lock Control Receiver	90980-11909	F16	Front Door Speaker RH (Woofer)		
D33	DVD Player	90980-12266	F17	Front Passenger Door ECU	90980-11469	
D34	Diode (Door Courtesy No.1)	90980-11071	F18	Front Parking Light LH No.3 (Access Cab, Standard Cab)	90980-11075	
D35	Diode (Door Courtesy No.2)			Front Parking Light LH No.3 (Double Cab)	90980-11156	
D36	Door Courtesy Light Rear LH	90980-11148	F19	Front Parking Light RH No.3 (Access Cab, Standard Cab)	90980-11075	
D37	Door Courtesy Light Rear RH			Front Parking Light RH No.3 (Double Cab)	90980-11156	
D38	Door Courtesy SW Rear LH	90980-10871	F20	4WD Control ECU	90980-12149	
D39	Door Courtesy SW Rear RH		F21	4WD Control ECU	90980-12150	
D40	Door Lock Motor Rear LH	90980-12226	G 1	Generator (1GR-FE)	90980-09372	
	Door Unlock Detection SW Rear LH			Generator (2UZ-FE)	90980-09365	
D41	Door Lock Motor Rear RH		G 2	Generator	90980-11964	
	Door Unlock Detection SW Rear RH		G 3	Glove Box Light	90980-11148	
D42	Door Key Lock and Unlock SW Front LH	90980-11858	H 1	Headlight LH	90980-11314	
	Door Lock Motor Front LH		H 2	Headlight RH		
	Door Unlock Detection SW Front LH		H 4	Heated Oxygen Sensor (Bank 1 Sensor 2)	90980-11028	
D43	Door Key Lock and Unlock SW Front RH			H 6		Heated Oxygen Sensor (Bank 2 Sensor 2)
	Door Lock Motor Front RH			H 7		Horn LH
D44	Door Unlock Detection SW Front RH		H 8	Horn RH		
	D44	Driver Door ECU	90980-11877	H10	Cargo Light	90980-11296
E 1	Electronically Controlled Transmission Solenoid	90980-12293	High Mounted Stop Light			
E 2	Engine Coolant Temp. Sensor	90980-10735	H11	Headphone Terminal LH	90980-12263	
E 3	Engine Control Module	90980-12525	H12	Headphone Terminal RH		
E 4	Engine Control Module	90980-12529	I 3	Igniter and Ignition Coil No.1	90980-11885	
E 5	Engine Control Module	90980-12526		I 4		Igniter and Ignition Coil No.2
E 6	Engine Control Module	90980-12528		I 5		Igniter and Ignition Coil No.3
E 7	Engine Control Module	90980-12527		I 6		Igniter and Ignition Coil No.4
E 8	Engine Hood Courtesy SW	90980-11189		I 7		Igniter and Ignition Coil No.5
F 1	Front Fog Light LH	90980-11096		I 8		Igniter and Ignition Coil No.6
F 2	Front Fog Light RH					

L PART NUMBER OF CONNECTORS

Code	Part Name	Part Number	Code	Part Name	Part Number
I 9	Igniter and Ignition Coil No.7	90980-11885	J36	Junction Connector	90980-11661
I10	Igniter and Ignition Coil No.8		J37	Junction Connector	
I14	Injector No.1	90980-11875	J38	Junction Connector	90980-12319
I15	Injector No.2		J39	Junction Connector	
I16	Injector No.3		J40	Junction Connector	90980-12078
I17	Injector No.4		J41	Junction Connector	
I18	Injector No.5		J42	Junction Connector	90980-12076
I19	Injector No.6		J43	Junction Connector	
I20	Injector No.7		J45	Junction Connector	90980-11686
I21	Injector No.8		J46	Junction Connector	90980-11529
I22	Ignition Key Cylinder Light (Access Cab, Standard Cab)	90980-10906	J47	Junction Connector	90980-11661
	Ignition Key Cylinder Light (Double Cab)	90980-10825	J48	Junction Connector	
I23	Ignition SW (Access Cab, Standard Cab)	90980-11615	J49	Junction Connector	
	Ignition SW (Double Cab)	90980-11778	J50	Junction Connector	
I24	Integration Control and Panel	90980-11915	J51	Junction Connector	90980-10957
I25	Integration Control and Panel	90980-11973	J52	Junction Connector	90980-10933
I26	Interior Light (Access Cab, Standard Cab)	90980-10935	J53	Junction Connector	90980-11686
	Interior Light (Double Cab w/ Vanity Light)	90980-11950	J54	Junction Connector	90980-11661
	Interior Light (Double Cab w/o Vanity Light)	90980-10908	J55	Junction Connector	
I27	Inner Mirror	90980-11794	J56	Junction Connector	90980-11542
J 1	Junction Connector	90980-11714	J57	Junction Connector	90980-11686
J 2	Junction Connector		J58	Junction Connector	
J 3	Junction Connector	90980-10976	J59	Junction Connector	90980-11398
J 4	Junction Connector	90980-11915	J60	Junction Connector	
J 5	Junction Connector		J63	Junction Connector	90980-11915
J 7	Junction Connector		J64	Junction Connector	
J 8	Junction Connector		J65	Junction Connector	
J 9	Junction Connector		J66	Junction Connector	
J10	Junction Connector		J67	Junction Connector	90980-12355
J12	Junction Connector		J68	Junction Connector	
J13	Junction Connector		90980-10976	J69	
J18	Junction Connector	90980-11542	J70	Junction Connector	
J21	Junction Connector	90980-11661	J71	Junction Connector	90980-10871
J22	Junction Connector		J72	Junction Connector	
J23	Junction Connector		J73	Junction Connector	90980-11542
J24	Junction Connector		J74	Junction Connector	90980-11529
J26	Junction Connector	90980-12320	J75	Junction Connector	90980-12355
J27	Junction Connector		J76	Junction Connector	
J28	Junction Connector	90980-11915	J77	Junction Connector	
J29	Junction Connector	J78	Junction Connector	90980-10871	
J30	Junction Connector	90980-11194	J79		Junction Connector
J31	Junction Connector	90980-11542	J80	Junction Connector	90980-11542
J32	Junction Connector		J81	Junction Connector	
J34	Junction Connector		J82	Junction Connector	
J35	Junction Connector	90980-11194	J83	Junction Connector	

Note: Not all of the above part numbers of the connector are established for the supply.

Code	Part Name	Part Number	Code	Part Name	Part Number
K 1	Knock Sensor (Bank 1)	90980-11875	P14	Pretensioner RH (Access Cab)	90980-12452
K 2	Knock Sensor (Bank 2)			Pretensioner RH (Double Cab)	90980-12253
L 1	License Plate Light LH	90980-11162		Pretensioner RH (Standard Cab)	90980-11862
L 2	License Plate Light RH		P15	Power Seat Motor (Driver's Seat Front Vertical Control)	90980-10825
L 3	Lumbar Support Control SW (Driver's Seat)	90980-10789	P16	Power Seat Control SW (Driver's Seat)	90980-10997
L 4	Leak Detection Pump Assembly	90980-12380	P17	Power Seat Motor (Driver's Seat Rear Vertical Control)	90980-10825
M 1	Mass Air Flow Meter (1GR-FE)	90980-11317	P18	Power Seat Motor (Driver's Seat Reclining Control)	
	Mass Air Flow Meter (2UZ-FE)	90980-12292	P19	Power Seat Motor (Driver's Seat Slide Control)	
M 4	Mirror Heater SW	90980-10797	P20	Power Seat Motor (Driver's Seat Lumbar Support Control)	
M 5	Main SW	90980-10957	P21	Power Window Control SW (Back Window)	90980-10996
M 6	Moon Roof Control ECU and Motor	90980-10997	P22	Power Window Motor (Back Window) (Access Cab, Standard Cab)	90980-10860
N 1	Noise Filter	90980-10843		Power Window Motor (Back Window) (Double Cab)	90980-11012
O 1	O/D Direct Clutch Speed Sensor	90980-11156	P23	Power Outlet (115V)	90980-10601
O 2	Oil Pressure SW	90980-11363	P24	Power Outlet (Rear)	90980-10760
O 4	O/D Main SW	90980-11470	P25	Power Window Control SW Rear LH	90980-10797
O 5	Option Connector	90980-11603	P26	Power Window Control SW Rear RH	
O 7	Option Connector (Glass Breakage Sensor)	90980-10871	P27	Power Window Motor Rear LH	
O 8	Overhead Module	90980-10805	P28	Power Window Motor Rear RH	
O10	Occupant Classification ECU	90980-12356	R 1	Radio and Player	90980-10996
O11	Occupant Classification ECU	90980-12357	R 2	Radio and Player	90980-10997
O12	Occupant Classification Sensor Front LH	90980-12353	R 3	Rheostat	90980-10216
O13	Occupant Classification Sensor Front RH	90980-12354	R 4	Rear Combination Light LH	90980-10988
O14	Occupant Classification Sensor RearLH		R 5	Rear Combination Light RH	
O15	Occupant Classification Sensor RearRH	90980-12353	R 6	Rear Door Speaker LH	90980-10935
O16	Occupant Detection Sensor	90980-10825	R 7	Rear Door Speaker RH	
P 1	Park/Neutral Position SW	90980-12362	R 8	Remote Control Mirror LH (Access Cab, Standard Cab w/ Mirror Heater)	90980-11452
P 2	Power Steering Oil Pressure SW	90980-11428		Remote Control Mirror LH (Access Cab, Standard Cab w/o Mirror Heater)	90980-10907
P 5	Parking Brake SW (A/T)	90980-10871		Remote Control Mirror LH (Double Cab)	90980-11487
	Parking Brake SW (M/T)	90980-10825	R 9	Remote Control Mirror LH (Access Cab, Standard Cab w/ Mirror Heater)	90980-11452
P 6	Power Outlet (Access Cab, Standard Cab)	90980-10760		Remote Control Mirror RH (Access Cab, Standard Cab w/o Mirror Heater)	90980-10907
	Power Outlet (Double Cab Captain seat)	90980-10905		Remote Control Mirror RH (Double Cab)	90980-11487
	Power Outlet (Double Cab Except Captain seat)		R10	Remote Control Mirror SW	90980-11657
P 7	Power Outlet	90980-10905	R12	Radio and Player	90980-12038
P 8	Personal Light	90980-10908	R13	Radio and Player	90980-12259
P 9	Power Window Control SW Front RH	90980-10789	R14	Radio and Player	90980-12038
P10	Power Window Master SW	90980-10997	R15	Radio and Player	90980-12259
P11	Power Window Motor Front LH (Access Cab, Standard Cab)	90980-10860			
	Power Window Motor Front LH (Double Cab)	90980-11011			
P12	Power Window Motor Front RH	90980-10860			
P13	Pretensioner LH (Access Cab)	90980-12452			
	Pretensioner LH (Double Cab)	90980-12253			
	Pretensioner LH (Standard Cab)	90980-11862			

L PART NUMBER OF CONNECTORS

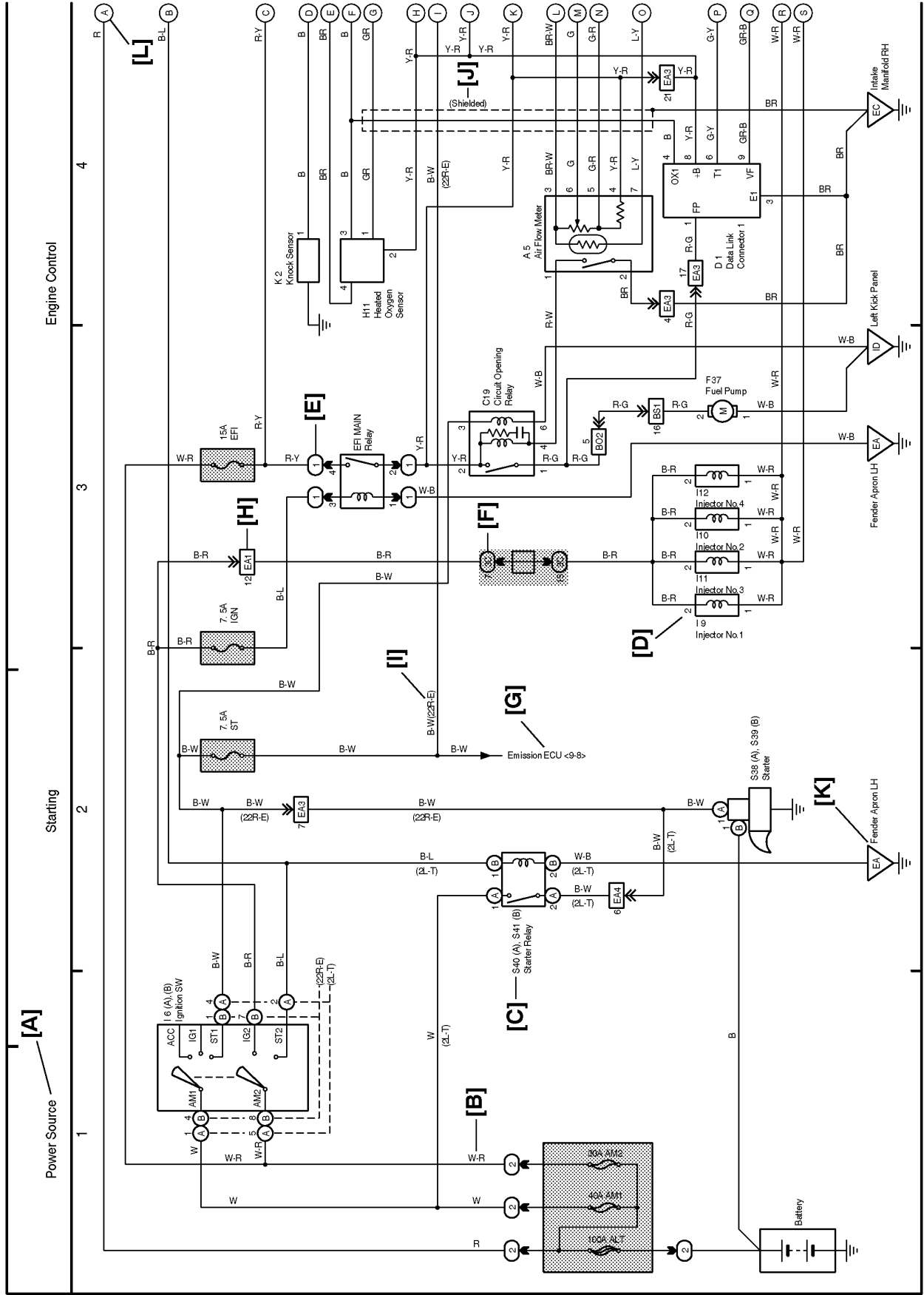
Code	Part Name	Part Number	Code	Part Name	Part Number
R16	Radio and Player	90980-12552	S37	Side Airbag Squib LH	90980-11864
R17	Rear Seat Entertainment ECU	90980-12267	S38	Side Airbag Squib RH	
R18	Rear Seat Entertainment ECU	90980-12268	T 3	Transfer Shift Actuator	90980-11858
R19	Rear Seat Entertainment ECU	90980-12266	T 5	Turn Signal Flasher	90980-10799
R20	Rear Seat Audio Controller	90980-12267	T 6	Trailer Socket (Except Towing Package)	82824-34040
R21	Rear Seat Entertainment Display	90980-12156		Trailer Socket (Towing Package)	82824-34050
R22	Rear Window Defogger	90980-10359	T 7	Tweeter LH (Access Cab, Standard Cab)	90980-10906
R23	Rear Window Defogger		Tweeter LH (Double Cab)	90980-11012	
R24	Radio and Player with Display	90980-12038	T 8	Tweeter RH (Access Cab, Standard Cab)	90980-10906
R25	Radio and Player with Display	90980-12259		Tweeter RH (Double Cab)	90980-11012
R26	Radio and Player with Display	90980-11909	T 9	Trailer Converter	90980-11535
R27	Radio and Player with Display	90980-12038	T10	TVIP Buzzer	90980-11051
R28	Radio and Player with Display	90980-12259	T11	TVIP ECU	90980-11424
R29	Radio and Player with Display	90980-12552	T12	TVIP ECU	90980-11392
R30	Radio and Player with Display	90980-11909	T13	TVIP ECU	90980-10799
R31	Radio and Player with Display	90980-12209	T14	Throttle Control Motor and Throttle Position Sensor	90980-11858
S 1	Starter (1GR-FE (Cold Area Spec.))	90980-09507	T15	Theft Deterrent Horn	90980-10916
	Starter (1GR-FE (Except Cold Area Spec.))	90980-09463	T16	Tire Pressure Monitor ECU	90980-12553
	Starter (2UZ-FE)	90980-09585	T17	Tire Pressure Warning Standardization SW	90980-10906
S 2	Starter	90980-11400	T18	Tire Pressure Monitor Receiver	90980-11909
S 3	Step Light	81945-33010	U 1	Unlock Warning SW	90980-10860
S 4	Stop Light SW (Access Cab, Standard Cab)	90980-11118	V 2	Vehicle Speed Sensor (Combination Meter)	90980-11143
	Stop Light SW (Double Cab)	90980-11013	V 3	Vehicle Speed Sensor (Electronically Controlled Transmission)	90980-11156
S 8	Short Pin	90980-10907	V 4	VSV (EVAP)	
S 9	Short Connector (TVIP)	90980-10908	V 6	Vanity Light LH (Access Cab, Standard Cab)	90980-11368
S10	Glass Breakage Sensor Microphone	90980-11013		Vanity Light LH (Double Cab)	90980-11369
	Security Indicator				
S11	Seat Heater SW (Driver's Seat)	90980-10797	V 7	Vanity Light RH (Access Cab, Standard Cab)	90980-11368
S12	Seat Heater SW (Front Passenger's Seat)	90980-10996		Vanity Light RH (Double Cab)	90980-11369
S13	Short Connector	90980-11910	V10	Video Terminal	90980-12264
S14	Short Connector	90980-11911	V11	VSC Warning Buzzer	90980-10906
S19	Steering Sensor	90980-12553	V12	Voltage Inverter	90980-10799
S20	Stereo Component Amplifier	90980-10803	V13	VSV (ACIS)	90980-11156
S21	Stereo Component Amplifier	90980-12200	V14	VSV (Air Switching Valve Bank 1)	90980-11149
S23	Stereo Component Amplifier				
S24	Stereo Component Amplifier	90980-10821	V15	VSV (Air Switching Valve Bank 2)	
S26	Seat Heater (Driver's Seat)	90980-10795	V16	VVT Sensor LH (1GR-FE)	90980-12353
S28	Seat Heater (Front Passenger's Seat)			VVT Sensor LH (2UZ-FE)	90980-10947
S29	Skid Control ECU with Actuator	90980-12297	V17	VVT Sensor RH (1GR-FE)	90980-12353
S30	Skid Control ECU with Actuator	90980-12294		VVT Sensor RH (2UZ-FE)	90980-10947
S31	Stop Light Relay	82660-53010	W 2	Washer Level Sensor	90980-11177
S32	Side Airbag Sensor Rear LH	90980-12241		Washer Motor	
S33	Side Airbag Sensor Rear RH		W 4	Wiper Motor	90980-11599
S34	Side Airbag Sensor LH			W 5	Wireless Door Lock Buzzer
S35	Side Airbag Sensor RH		Y 1	Yaw Rate Sensor	90980-11904
S36	Seat Position Airbag Sensor	90980-12416			

Note: Not all of the above part numbers of the connector are established for the supply.

M OVERALL ELECTRICAL WIRING DIAGRAM

* The system shown here is an EXAMPLE ONLY. It is different to the actual circuit shown in the wiring diagram section.

HOW TO READ THIS SECTION



[A] : System Title

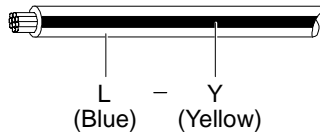
[B] : Indicates the wiring color.

Wire colors are indicated by an alphabetical code.

- | | | |
|------------|------------|------------------|
| B = Black | W = White | BR = Brown |
| L = Blue | V = Violet | SB = Sky Blue |
| R = Red | G = Green | LG = Light Green |
| P = Pink | Y = Yellow | GR = Gray |
| O = Orange | | |

The first letter indicates the basic wire color and the second letter indicates the color of the stripe.

Example: L - Y

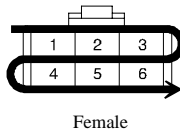


[C] : The position of the parts is the same as shown in the wiring diagram and wire routing.

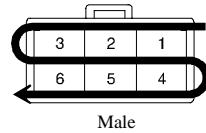
[D] : Indicates the pin number of the connector. The numbering system is different for female and male connectors.

Example : Numbered in order from upper left to lower right

Numbered in order from upper right to lower left



Female



Male

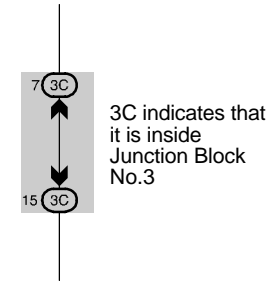
The numbering system for the overall wiring diagram is the same as above

[E] : Indicates a Relay Block. No shading is used and only the Relay Block No. is shown to distinguish it from the J/B.

Example :  Indicates Relay Block No.1

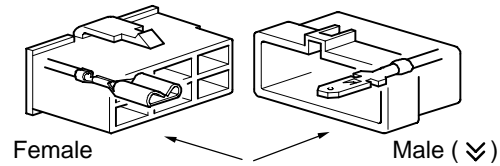
[F] : Junction Block (The number in the circle is the J/B No. and the connector code is shown beside it). Junction Blocks are shaded to clearly separate them from other parts.

Example:



[G] : Indicates related system.

[H] : Indicates the wiring harness and wiring harness connector. The wiring harness with male terminal is shown with arrows (↘). Outside numerals are pin numbers.



[I] : () is used to indicate different wiring and connector, etc. when the vehicle model, engine type, or specification is different.

[J] : Indicates a shielded cable.



[K] : Indicates and located on ground point.

[L] : The same code occurring on the next page indicates that the wire harness is continuous.

SYSTEM INDEX [Access Cab, Standard Cab]

SYSTEMS	LOCATION	SYSTEMS	LOCATION
ABS	17-2	Ignition (2UZ-FE)	2-2
Air Conditioning	32-2	Illumination	9-2
Audio System (Built-in Type Amplifier)	30-2	Interior Light	10-2
Audio System (Separate Type Amplifier w/ Navigation System) ..	28-2	Key Reminder	26-4
Audio System (Separate Type Amplifier w/o Navigation System) .	29-2	Light Auto Turn Off System (w/ Daytime Running Light)	20-4
Automatic Glare-Resistant EC Mirror	34-2	Light Auto Turn Off System (w/o Daytime Running Light)	21-4
Back-Up Light	12-3	Mirror Heater	13-2
Cargo Light	32-8	Multiplex Communication System (CAN)	16-8
Center Cluster Integration Control System	32-6	Power Outlet	24-2
Charging	1-4	Power Seat	25-2
Cigarette Lighter	24-3	Power Source	1~34-1
Clock	24-4	Power Window	22-2
Combination Meter	31-2	Remote Control Mirror	27-2
Cruise Control (1GR-FE)	5-16	Seat Belt Warning	26-4
Cruise Control (2UZ-FE)	4-16	SRS	18-2
Door Lock Control (w/ Daytime Running Light)	20-2	Starting	1-2
Door Lock Control (w/o Daytime Running Light)	21-2	Stop Light	13-4
Electronically Controlled Transmission and A/T Indicator (1GR-FE)	15-2	Taillight	8-2
Electronically Controlled Transmission and A/T Indicator (2UZ-FE)	14-2	Tire Pressure Warning System	34-3
Engine Control (1GR-FE)	5-2	Trailer Towing	33-3
Engine Control (2UZ-FE)	4-2	Turn Signal and Hazard Warning Light	11-2
Fog Light (w/ Daytime Running Light)	12-2	TVIP	23-2
Fog Light (w/o Daytime Running Light)	7-4	VSC	16-2
Headlight (w/ Daytime Running Light)	6-2	Wiper and Washer	26-2
Headlight (w/o Daytime Running Light)	7-2	Wireless Door Lock Control	23-2
Horn	27-4	4WD (2UZ-FE)	19-2
Ignition (1GR-FE)	3-2		

SYSTEM INDEX [Double Cab]

SYSTEMS	LOCATION	SYSTEMS	LOCATION
ABS	48-2	* Headlight	
Accessory Meter	44-4	* Horn	
Air Conditioning	62-2	* Interior Light	
Audio System (Rear Seat Entertainment System)	57-2	* Key Reminder	
Audio System (w/ Navigation and Rear Seat Entertainment System)	56-2	* Light Auto Turn Off System	
Audio System (6 Speaker)	60-2	* Power Window	
Audio System (8 Speaker)	59-2	* Theft Deterrent	
Audio System (8 Speaker w/ Navigation System)	58-2	* Wireless Door Lock Control	
Automatic Glare-Resistant EC Mirror	63-2	Multiplex Communication System (CAN)	47-8
Back-Up Light	42-2	Power Outlet (115V)	55-2
Cargo Light	62-8	Power Outlet (12V)	54-2
Center Cluster Integration Control System	62-6	Power Seat	45-2
Charging	35-4	Power Source	35~63-1
Cigarette Lighter	54-2	Rear Window Defogger	53-2
Combination Meter	61-2	Remote Control Mirror	51-2
Cruise Control	37-16	Seat Belt Warning	54-3
Electronically Controlled Transmission and A/T Indicator	46-2	Seat Heater	53-4
Engine Control	37-2	SRS	49-2
Garage Door Opener	44-4	Starting	35-2
Ignition	36-2	Stop Light	42-3
Illumination	41-2	Taillight	40-2
Mirror Heater	53-2	Tire Pressure Warning System	63-3
Moon Roof	44-2	Trailer Towing	52-3
Multiplex Communication System (BEAN)	38-2	Turn Signal and Hazard Warning Light	39-2
* Door Lock Control		VSC	47-2
* Fog Light		Wiper and Washer	43-2
		4WD	50-2

Foreword

Welcome to the growing group of value-conscious people who drive Toyotas. We are proud of the advanced engineering and quality construction of each vehicle we build.

This Owner's Manual explains the operation of your new Toyota. Please read it thoroughly and have all the occupants follow the instructions carefully. Doing so will help you enjoy many years of safe and trouble-free motoring. For important information about this manual and your Toyota, read the following pages carefully.

When it comes to service, remember that your Toyota dealer knows your vehicle very well and is interested in your complete satisfaction. Your Toyota dealer will provide quality maintenance and any other assistance you may require.

If there is not a Toyota dealer near you, or you need emergency assistance for any reason, please call the following number:

▶ U.S. OWNERS:	Toyota Customer Assistance Center	Toll-free: 1-800-331-4331
▶ CANADIAN OWNERS:	Toyota Canada Customer Interaction Centre	Toll-free: 1-888-TOYOTA-8 (1-888-869-6828)

Please leave this Owner's Manual in this vehicle at the time of resale. The next owner will need this information also.

All information and specifications in this manual are current at the time of printing. However, because of Toyota's policy of continual product improvement, we reserve the right to make changes at any time without notice.

Please note that this manual applies to all models and explains all equipment, including options. Therefore, you may find some explanations for equipment not installed on your vehicle.

TOYOTA MOTOR CORPORATION

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SECTION 1-1

OPERATION OF INSTRUMENTS AND CONTROLS

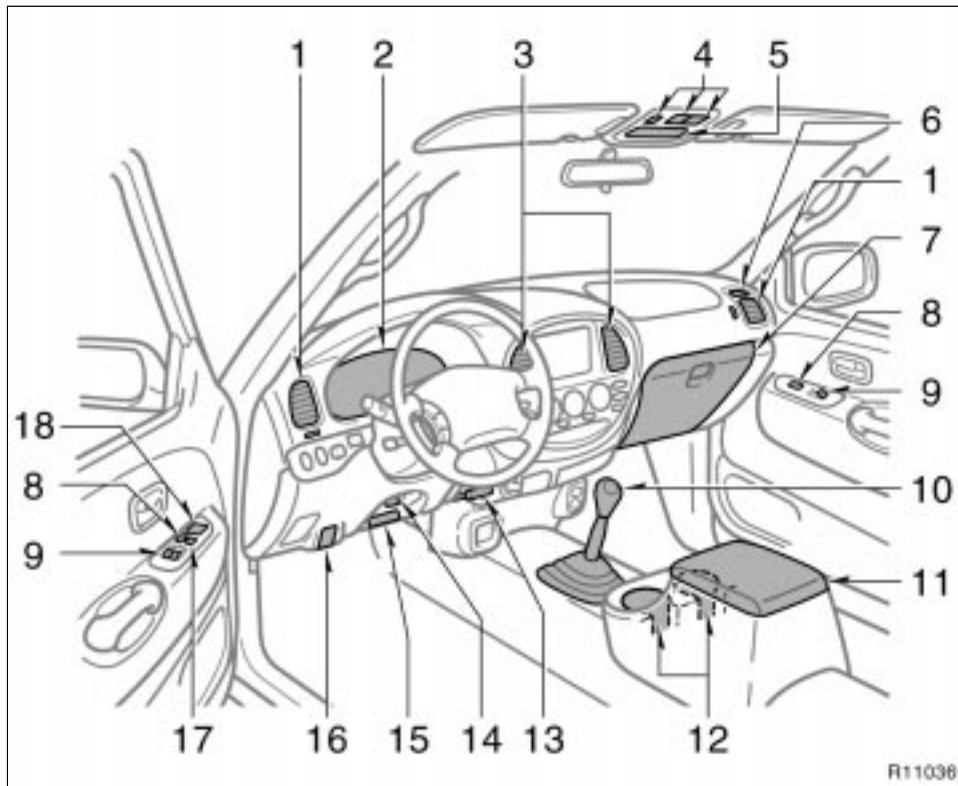
Overview of instruments and controls

Instrument panel overview	2
Instrument cluster overview	11
Indicator symbols on the instrument panel	13

'05 TUNDRA_U (L/O 0409)

Instrument panel overview (standard and access cab models)

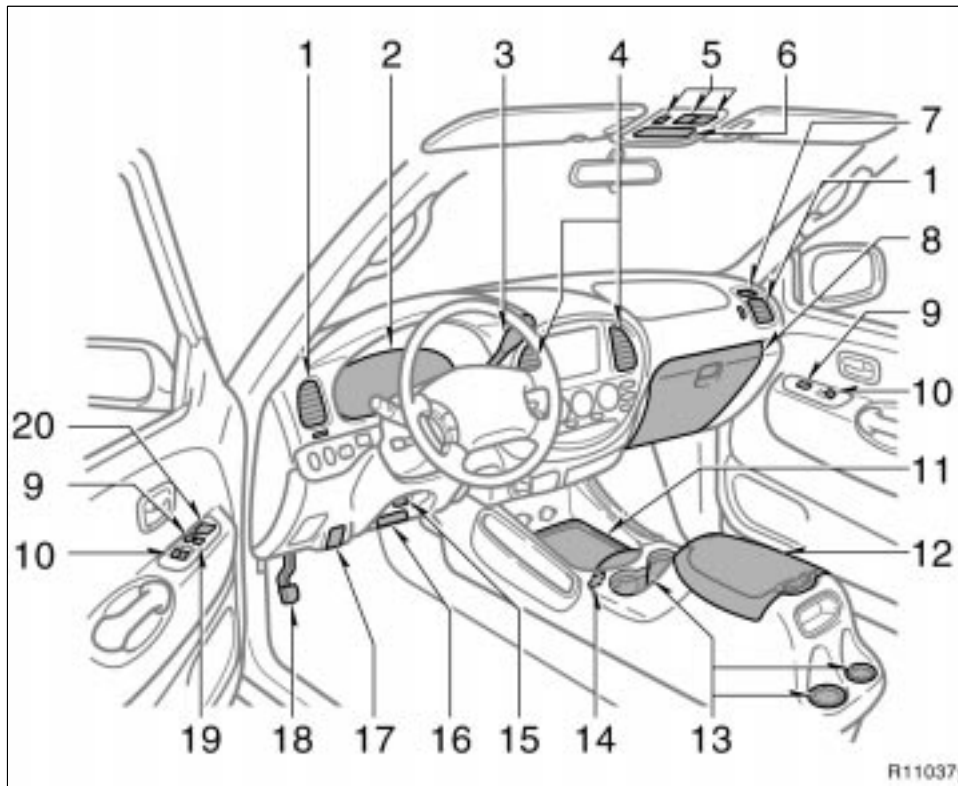
► Vehicles with manual transmission



1. Side vents
2. Instrument cluster
3. Center vents
4. Personal lights
5. Garage door opener box or auxiliary box
6. Side defroster outlet
7. Glove box
8. Power door lock switches
9. Power window switches
10. Manual transmission gear shift lever
11. Rear console box
12. Cup holders
13. Parking brake lever
14. Tire pressure warning system reset switch
15. Lower vent
16. Hood lock release lever
17. Window lock switch
18. Power rear view mirror control switches

'05 TUNDRA_U (L/O 0409)

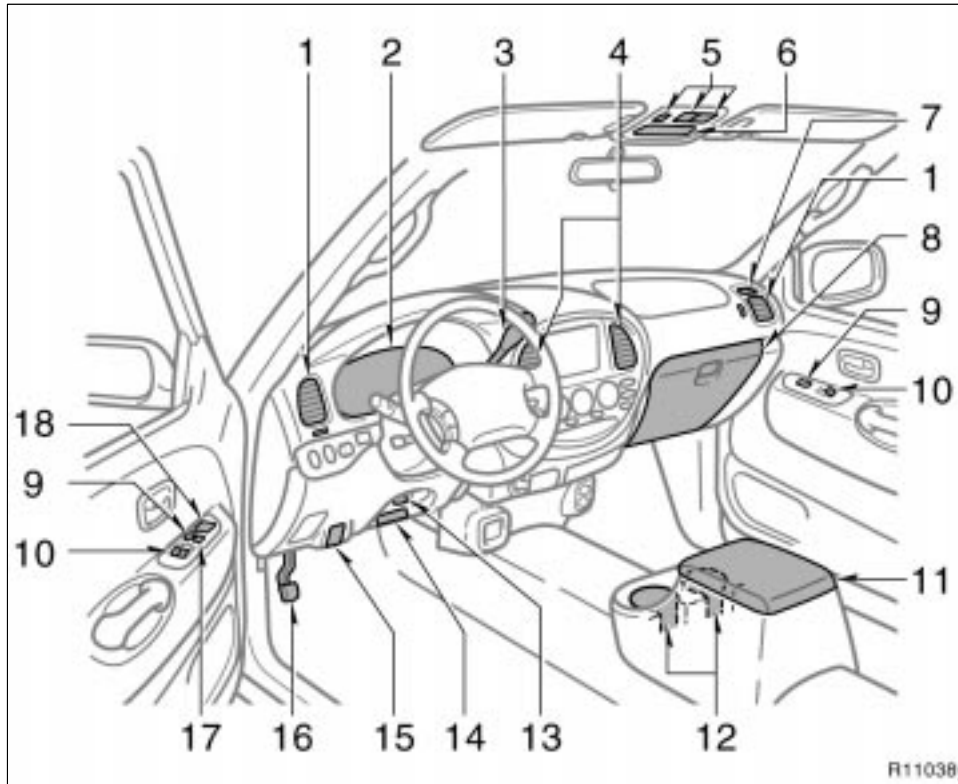
► Vehicles with automatic transmission (type A)



1. Side vents
2. Instrument cluster
3. Automatic transmission selector lever
4. Center vents
5. Personal lights
6. Garage door opener box or auxiliary box
7. Side defroster outlet
8. Glove box
9. Power door lock switches
10. Power window switches
11. Auxiliary box
12. Rear console box
13. Cup holders
14. Passenger airbag manual on-off switch
15. Tire pressure warning system reset switch
16. Lower vent
17. Hood lock release lever
18. Parking brake pedal
19. Window lock switch
20. Power rear view mirror control switches

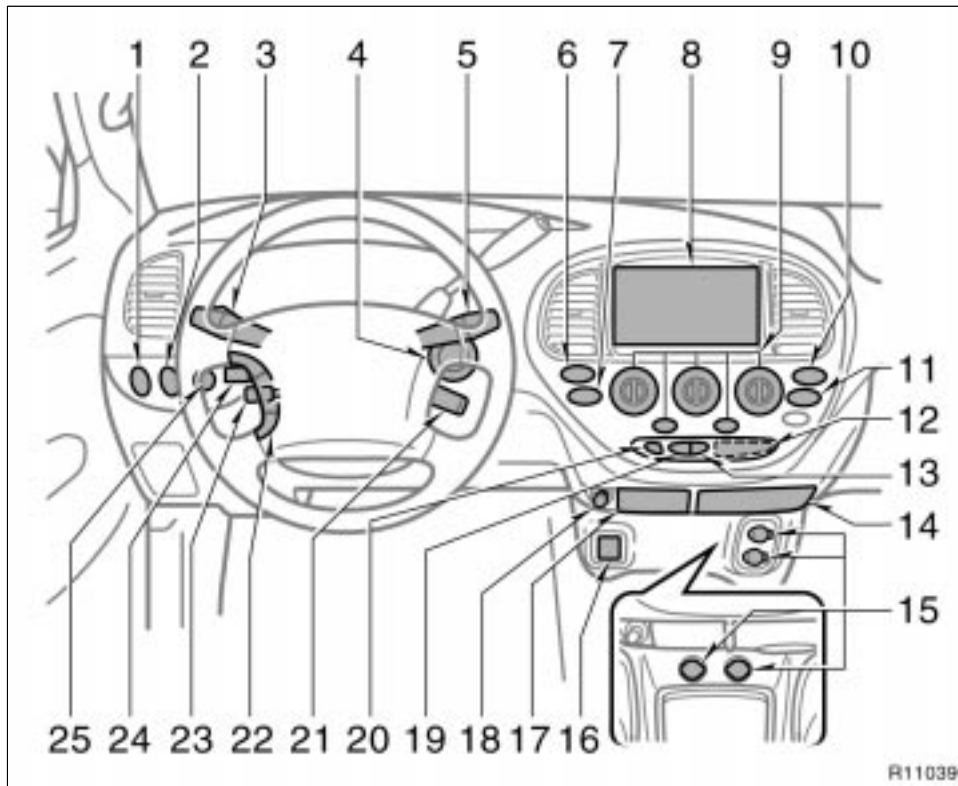
'05 TUNDRA_U (L/O 0409)

► Vehicles with automatic transmission (type B)



1. Side vents
2. Instrument cluster
3. Automatic transmission selector lever
4. Center vents
5. Personal lights
6. Garage door opener box or auxiliary box
7. Side defroster outlet
8. Glove box
9. Power door lock switches
10. Power window switches
11. Rear console box
12. Cup holders
13. Tire pressure warning system reset switch
14. Lower vent
15. Hood lock release lever
16. Parking brake pedal
17. Window lock switch
18. Power rear view mirror control switches

'05 TUNDRA_U (L/O 0409)



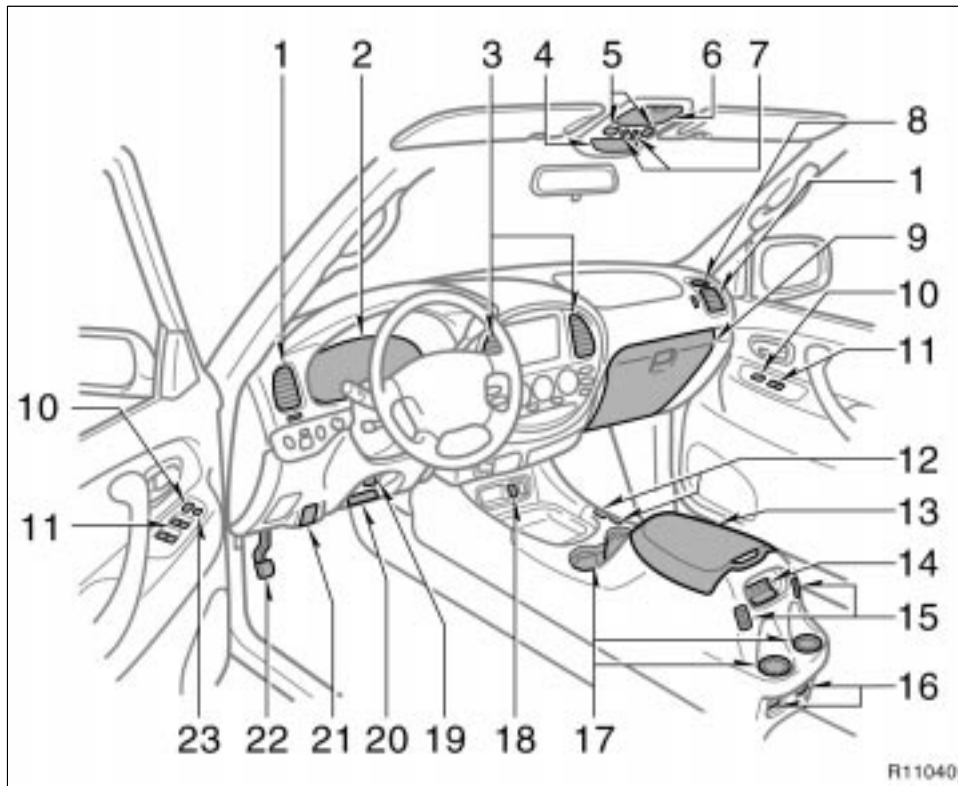
1. Outside rear view mirror heater switch
2. Power back window switch
3. Headlight, turn signal and front fog light switches
4. Ignition switch
5. Wiper and washer switches
6. Automatic transmission shift position "L" switch ("SHIFT L" switch)
7. Emergency flasher switch
8. Audio system or navigation system including audio system (For the navigation system, see the separate "Navigation System Owner's Manual")
9. Air conditioning controls
10. Front passenger's occupant classification indicator light/front passenger's seat belt reminder light/passenger airbag on-off indicator light
11. Cargo lamp switch
12. Clock
13. "4LO" switch (transfer mode selector switch)
14. Cup holder

'05 TUNDRA_U (L/O 0409)

15. Power outlets
16. Passenger airbag manual on-off switch
17. Ashtray
18. Cigarette lighter
19. "2WD/4HI" switch
(transfer mode selector switch)
20. "AUTO LSD" switch
21. Cruise control switch
22. Audio remote control switches
23. Tilt steering lock release lever
24. Toyota vehicle intrusion protection
system (TVIP) indicator light
25. Instrument panel light control knob

'05 TUNDRA_U (L/O 0409)

Instrument panel overview (double cab models)

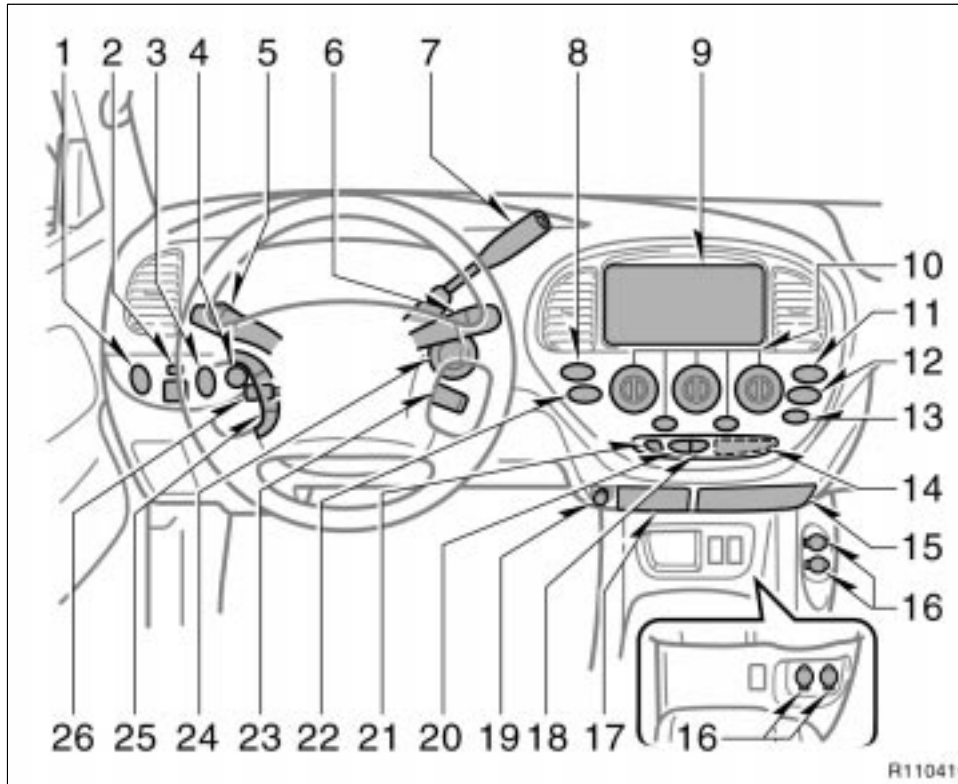


1. Side vents
2. Instrument cluster
3. Center vents
4. Multi- information display
5. Personal lights
6. Auxiliary box
7. Electric moon roof switches
8. Side defroster outlet
9. Glove box
10. Power door lock switches
11. Power window switches
12. Seat heater switches
13. Rear console box
14. Input terminal adapter
15. Headphone input jacks and headphone volume control dials
16. Power outlets
17. Cup holders
18. Power outlet main switch
19. Tire pressure warning system reset switch
20. Lower vent

'05 TUNDRA_U (L/O 0409)

21. Hood lock release lever
22. Parking brake pedal
23. Window lock switch

'05 TUNDRA_U (L/O 0409)



1. Power back window switch
2. Power rear view mirror control switches
3. Roll sensing of curtain shield airbags off switch ("RSCA OFF" switch)
4. Instrument panel light control knob
5. Headlight, turn signal and front fog light switches
6. Wiper and washer switches
7. Automatic transmission selector lever
8. Automatic transmission shift position "L" switch ("SHIFT L" switch)
9. Audio system or navigation system including audio system
(For the navigation system, see the separate "Navigation System Owner's Manual")
10. Air conditioning controls
11. Front passenger's occupant classification indicator light/front passenger's seat belt reminder light
12. Cargo lamp switch
13. Back window and outside rear view mirror defogger switch
14. Clock
15. Cup holder
16. Power outlets
17. Ashtray

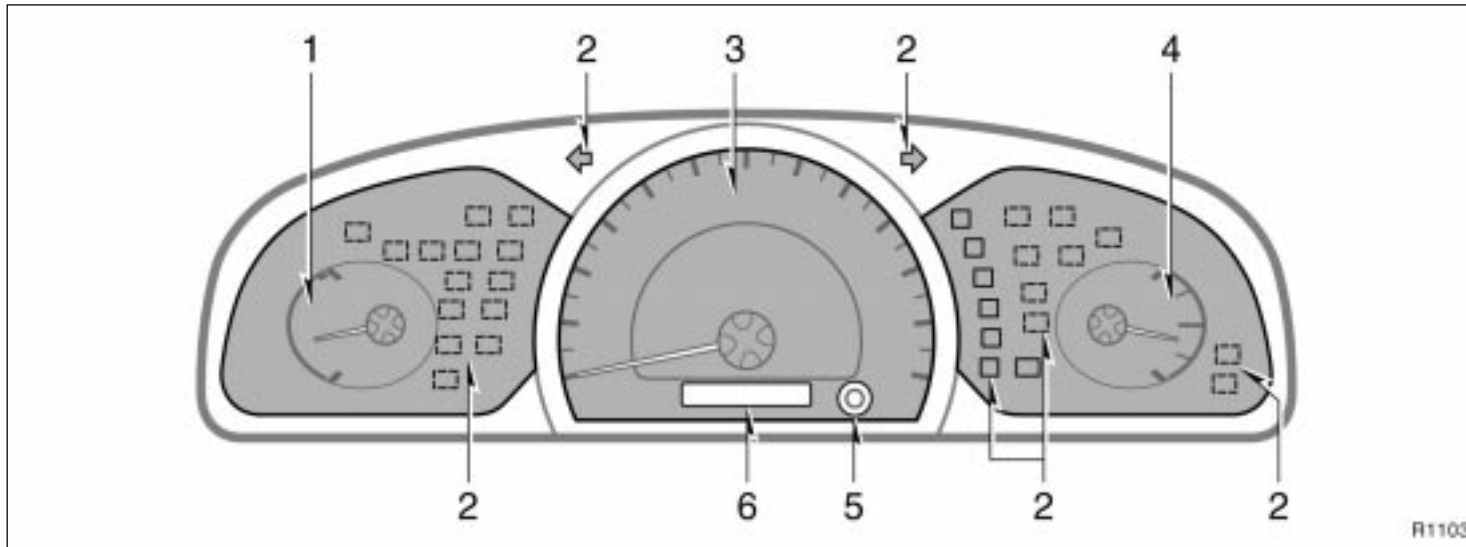
'05 TUNDRA_U (L/O 0409)

18. "4LO" switch
(transfer mode selector switch)
19. Cigarette lighter
20. "2WD/4HI" switch
(transfer mode selector switch)
21. "AUTO LSD" switch
22. Emergency flasher switch
23. Cruise control switch
24. Ignition switch
25. Audio remote control switches
26. Tilt steering lock release lever

'05 TUNDRA_U (L/O 0409)

Instrument cluster overview

► Without tachometer



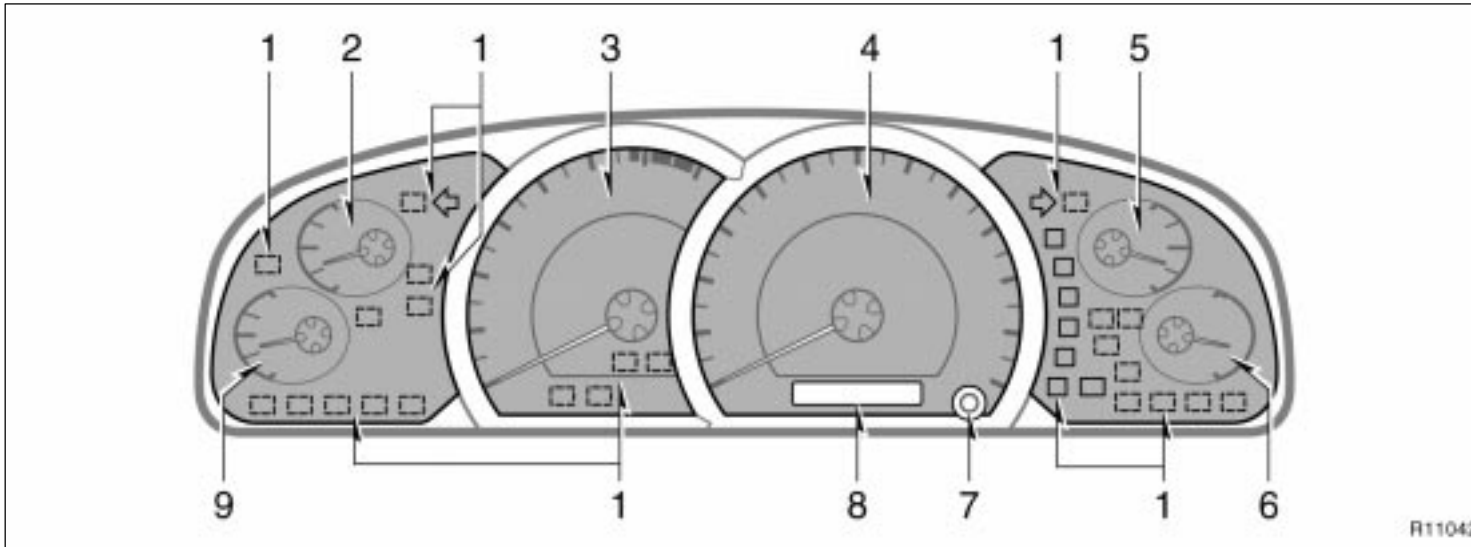
1. Engine coolant temperature gauge
2. Service reminder indicators and indicator lights

3. Speedometer
4. Fuel gauge

5. Trip meter reset knob
6. Odometer and two trip meters

'05 TUNDRA_U (L/O 0409)

►With tachometer
















- 1. Service reminder indicators and indicator lights
- 2. Oil pressure gauge
- 3. Tachometer

- 4. Speedometer
- 5. Fuel gauge
- 6. Engine coolant temperature gauge






- 7. Trip meter reset knob
- 8. Odometer and two trip meters
- 9. Voltmeter


'05 TUNDRA_U (L/O 0409)

Indicator symbols on the instrument panel

	Brake system warning light*1		<ul style="list-style-type: none"> ◀ Vehicle stability control system warning light*1 ◀ Traction control system warning light*1 ◀ "AUTO LSD" system warning light*1
	Driver's seat belt reminder light*1		Open door warning light*1
PASSENGER 	Front passenger's seat belt reminder light*1		SRS warning light*1
	Discharge warning light*1		Low tire pressure warning light*1
	Low engine oil pressure warning light*1	A/T P	Unengaged "Park" warning light*1
	Malfunction indicator lamp*1	A/T OIL TEMP	Automatic transmission fluid temperature warning light*1 (four-wheel drive models)
	Low fuel level warning light*1		Low windshield washer fluid level warning light*1
ABS or 	Anti-lock brake system warning light*1	MAINT REQD	Engine oil replacement reminder light*1 (for vehicles sold in U.S.A.)

'05 TUNDRA_U (L/O 0409)

PASSENGER AIRBAG OFF ON	 Front passenger occupant classification indicator light  Passenger airbag on-off indicator light
	Theft deterrent system indicator light
RSCA OFF	Roll sensing of curtain shield airbags off indicator light*2
	Headlight high beam indicator light
	Turn signal indicator lights
O/D OFF	Overdrive-off indicator light
PRND 3 2 > L	Automatic transmission indicator lights
4 HI	High speed four-wheel drive indicator light*3 (four-wheel drive models)

4 LO	Low speed four-wheel drive indicator light*3 (four-wheel drive models)
	Slip indicator light
VSC OFF	Vehicle stability control system off indicator light
AUTO LSD	"AUTO LSD" indicator light
CRUISE	Cruise control indicator light*4

*1: For details, see "Service reminder indicators and warning buzzers" in Section 1-6.

*2: For details, see "Roll sensing of curtain shield airbags off switch" in Section 1-3.

*3: If this light flashes, see "Four-wheel drive system" in Section 1-7.

*4: If this light flashes, see "Cruise control" in Section 1-7.

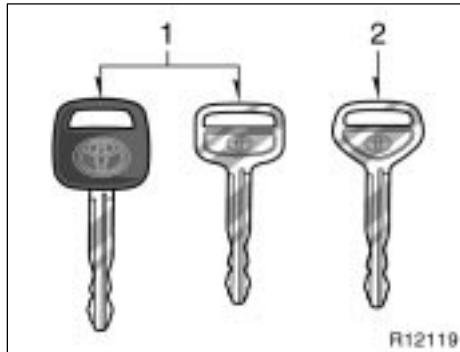
SECTION 1-2

OPERATION OF INSTRUMENTS AND CONTROLS

Keys and Doors

Keys	16
Front doors	16
Side doors	18
Access doors	20
Wireless remote control	21
Power windows	31
Rear side windows	34
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Power back window	35
Tailgate	37
Hood	38
Toyota vehicle intrusion protection system (TVIP)	39
Theft deterrent system	41
Fuel tank cap	42
Electric moon roof	45

Keys



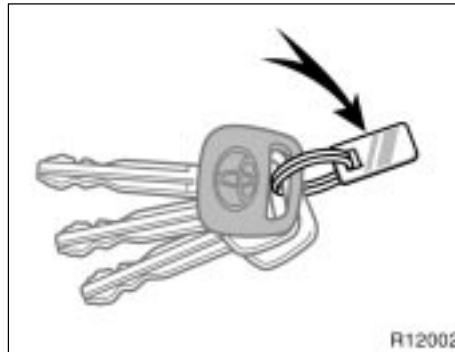
These keys work in every lock.

Your vehicle is supplied with two kinds of keys.

1. Master keys—These keys work in every lock.
2. Sub key—This key will not work in the glove box.

To protect items locked in the glove box when using valet parking, leave the sub key with the attendant.

Since the side doors can be locked without a key, you should always carry a spare key in case you accidentally lock your keys inside the vehicle.



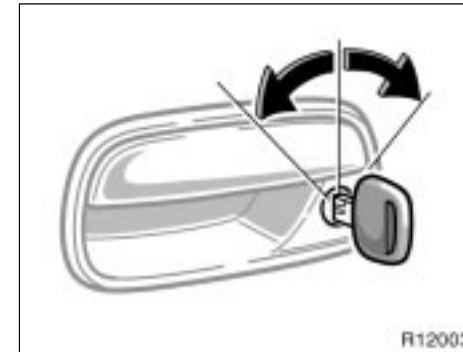
KEY NUMBER PLATE

Your key number is shown on the plate. Keep the plate in a safe place such as your wallet, not in the vehicle.

If you should lose your keys or if you need additional keys, duplicates can be made by a Toyota dealer using the key number.

We recommend writing down the key number and storing it in a safe place.

Front doors (standard and access cab models)



LOCKING AND UNLOCKING WITH KEY

Insert the key into the keyhole and turn it.

To lock: Turn the key forward.

To unlock: Turn the key backward.

Vehicles with power door lock system— Both doors lock and unlock simultaneously with either door. In the driver's door lock, turning the key once will unlock the driver's door and twice in succession will unlock the driver's door and passenger's door simultaneously.



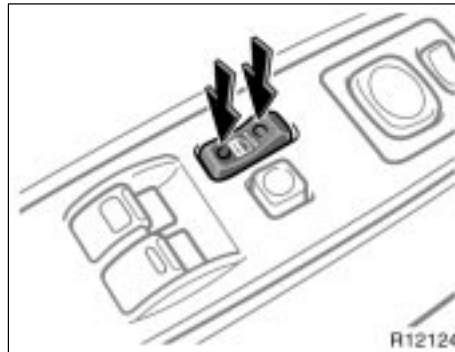
LOCKING AND UNLOCKING WITH INSIDE LOCK KNOB

Move the lock knob.

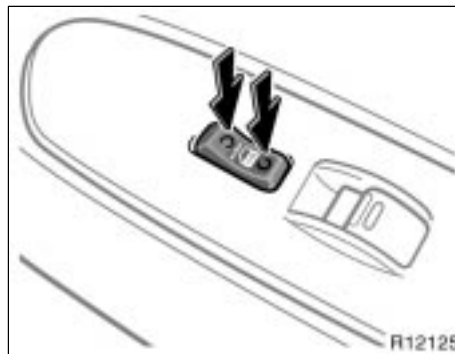
To lock: Push the knob forward.
To unlock: Pull the knob backward.

Closing the door with the lock knob in the lock position will also lock the door. Be careful not to lock your keys in the vehicle.

Vehicles with power door lock system—
The door will not lock if the key is left in the ignition switch when closing the front doors.



Driver's side



Passenger's side

LOCKING AND UNLOCKING WITH POWER DOOR LOCK SWITCH

Push the switch.

To lock: Push the switch down on the front side.

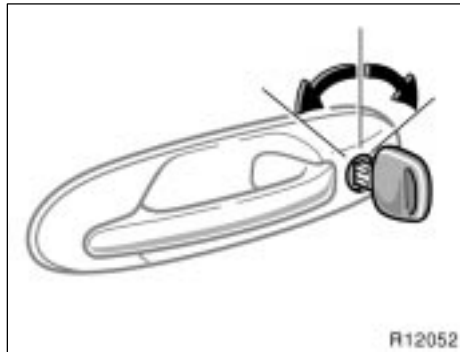
To unlock: Push the switch down on the rear side.

Both doors lock or unlock simultaneously.

CAUTION

Before driving, be sure that the doors are closed and locked, especially when small children are in the vehicle. Along with the proper use of seat belts, locking the doors helps prevent the driver and passengers from being thrown out from the vehicle during an accident. It also helps prevent the doors from being opened unintentionally.

**Side doors
(double cab models)**



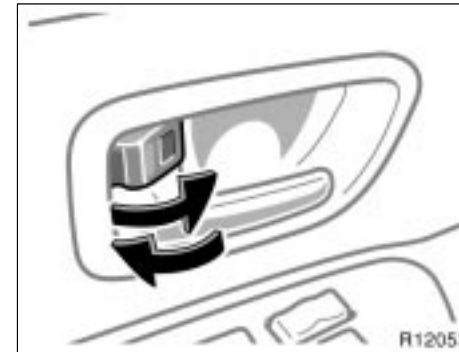
LOCKING AND UNLOCKING WITH KEY
Insert the key into the keyhole and turn it.

To lock: Turn the key forward.
To unlock: Turn the key backward.

All the doors lock and unlock simultaneously with either front door. In the driver's door lock, turning the key once will unlock the driver's door and twice in succession will unlock all the doors simultaneously.

This double key turning operation to unlock all the doors can be changed to a single key turning operation. For details, contact your Toyota dealer.

When all the doors are unlocked simultaneously using a key, the interior light, ignition switch light, step light come on for about 15 seconds and cargo lamp for about 20 seconds before fading out. (For details, see "Center interior and personal lights", "Ignition switch and step lights" and "Cargo lamp" in Section 1-5.)



**LOCKING AND UNLOCKING WITH
INSIDE LOCK KNOB**

Move the lock knob.

To lock: Push the knob forward.
To unlock: Pull the knob backward.

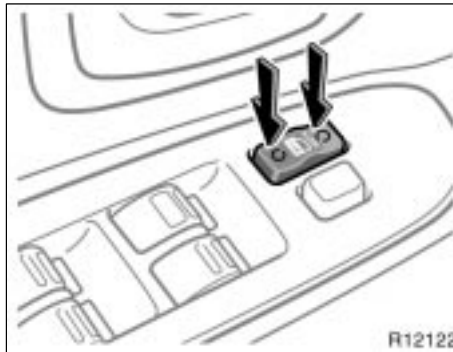
The front doors can be opened by pulling the inside handles even if the lock knobs are in the locked position.

CAUTION

Do not pull the inside handle of the front doors while driving. The doors will open and an accident may occur. Toyota strongly recommends that all children be placed in the rear seat of the vehicle.

Closing the door with the lock knob in the lock position will also lock the door. Be careful not to lock your keys in the vehicle.

Doors cannot be locked when either front door is open and the key is in the ignition.



Driver's side



Passenger's side

LOCKING AND UNLOCKING WITH POWER DOOR LOCK SWITCH

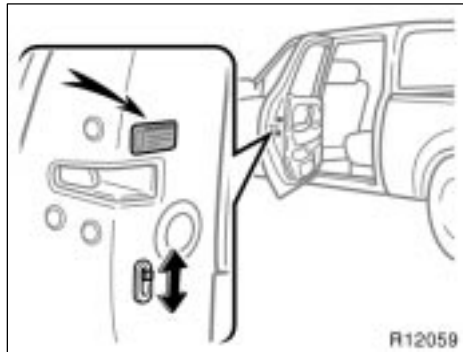
Push the switch.

To lock: Push the switch down on the front side.

To unlock: Push the switch down on the rear side.

All the doors lock or unlock simultaneously.

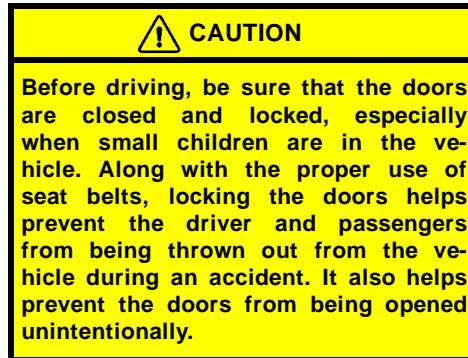
When the front doors are locked with the inside lock knob, the key or the wireless remote control transmitter, the power door lock switch will not work until either front door is unlocked with the key, lock knob, or wireless remote control transmitter.



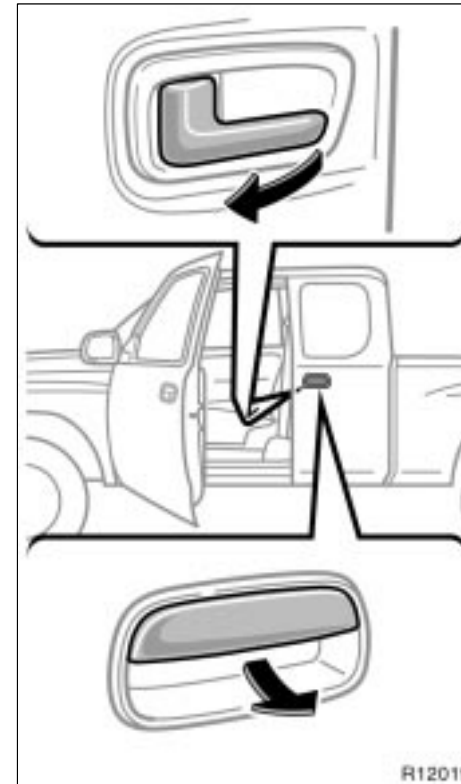
REAR DOOR CHILD-PROTECTORS

Move the lock lever to the "LOCK" position as shown on the label.

When the child-protector is locked, you cannot open the rear door by the inside door handle. We recommend using this feature whenever small children are in the vehicle.



**Access doors
(access cab models)**



**Wireless remote control
(standard and access cab
models for U.S.A. only)—**

For easy access to the rear seat, open the access door (rear door).

To open: First, open the front door widely. Then pull the outside handle or inside lever of the access door.

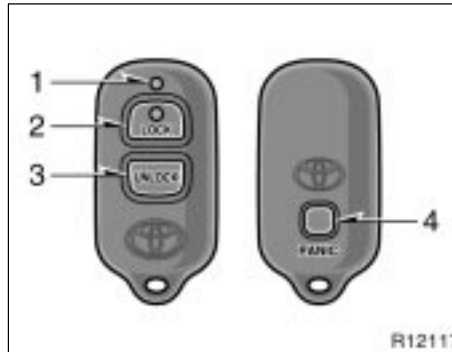
If you try to open the front and rear doors simultaneously, they will not open.

To close: First, close the access door completely. Then close the front door.

You can open and close the access door only when the front door is widely opened.

NOTICE

The front door and access door could be damaged if they hit each other when being opened or closed. Be sure to follow the above instructions.



1. Indicator light
2. "LOCK" switch
3. "UNLOCK" switch
4. "PANIC" switch

The wireless remote control system is designed to lock or unlock all the doors or activate the "PANIC" mode from a distance within approximately 1 m (3 ft.) of the vehicle.

When you operate any switch, push it slowly and securely.

The wireless remote control transmitter is an electronic component. Observe the following instructions in order not to cause damage to the transmitter.

- ▶ Do not leave the transmitter in places where the temperature becomes high such as on the dashboard.
- ▶ Do not disassemble it.
- ▶ Avoid knocking it hard against other objects or dropping it.
- ▶ Avoid putting it in water.

You can use up to 4 wireless remote control transmitters for the same vehicle. Contact your Toyota dealer for detailed information.

'05 TUNDRA_U (L/O 0409)

If the wireless remote control transmitter does not actuate the doors or alarm, or operate from a normal distance, or the indicator light on the transmitter is dimmed or does not come on:

- ▶ Check for closeness to a radio transmitter such as a radio station or an airport which can interfere with normal operation of the transmitter.
- ▶ The battery may have been consumed. Check the battery in the transmitter. To replace the battery, see “—Replacing battery”.

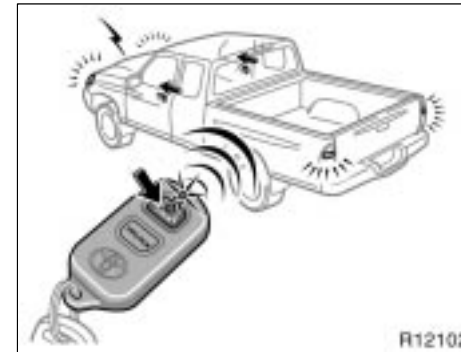
If you lose your transmitter, contact your Toyota dealer as soon as possible to avoid the possibility of theft, or an accident. (See “If you lose your wireless remote control transmitter” in Section 4.)

MODEL/FCC ID: BAB237131-056
CAN: 2024 102 1519
ASSEMBLED IN U.S.A.

This complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

—Locking and unlocking doors



Locking operation



Unlocking operation

To lock and unlock all the doors, push the switches slowly and securely. At this time, the indicator light on the transmitter flash once.

To lock: Push the "LOCK" switch. All the doors are locked simultaneously. At this time one beep will be heard, and the tail lights and front side marker lights will flash once.

Check to see that the doors are securely locked.

If any door is not securely closed, locking cannot be performed by the "LOCK" switch and a beep will sound continuously for 5 seconds. However, if the key is in the ignition, a beep will not sound.

To stop the beep, close all the doors securely or push the "UNLOCK" switch.

To unlock: Push the "UNLOCK" switch once to unlock the driver's door alone. Pushing the switch twice within 3 seconds unlocks all the doors simultaneously. Each time the "UNLOCK" switch is pushed, two beeps will be heard, and the tail lights and front side marker lights will flash twice.

When the "UNLOCK" switch is pressed, the interior light, personal light come on. The lights remain on for about 30 seconds unless any door is opened and closed. (For details, see "Interior light" and "Personal lights" in Section 1-5.)

You have 30 seconds to open a door after using the wireless remote unlock feature. If a door is not opened by then, all the doors will be automatically locked again.

If the "LOCK" or "UNLOCK" switch is kept pressed in, the locking or unlocking operation is not repeated. Release the switch and then push again.

—Activating panic mode



Pushing the "PANIC" switch blows the horn intermittently, flashes the tail lights, and turns on the interior light.

The "PANIC" switch is used to deter vehicle theft when you witness anyone attempting to break into or damage your vehicle.

The alarm will last for one minute. To stop alarm midway, push the "PANIC" switch once again, lock or unlock any door with the key or transmitter, or turn the ignition key from the "LOCK" to "ON" position.

The "PANIC" mode does not work when the ignition key is in the ignition switch.

—Replacing battery

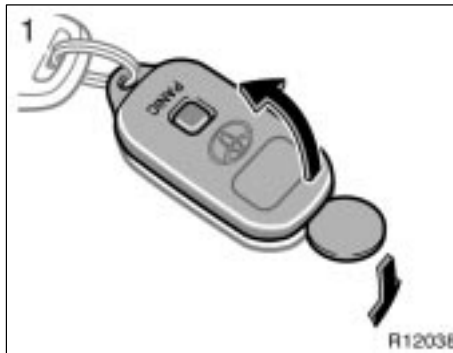
For replacement, use a CR2025 lithium battery or equivalent.

CAUTION
Special care should be taken to prevent small children from swallowing the removed transmitter battery or components.

NOTICE

- ◆ *When replacing the battery, be careful not to lose the components.*
- ◆ *Replace only with the same or equivalent type recommended by a Toyota dealer.*
- ◆ *Dispose of used batteries according to the local laws.*

Replace the transmitter battery by following these procedures:

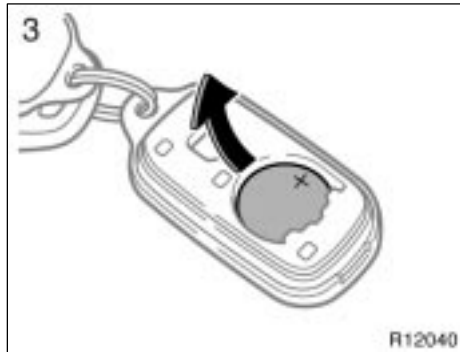


1. Using a coin or equivalent, open the transmitter case.



2. Remove the rubber gasket and set it aside.

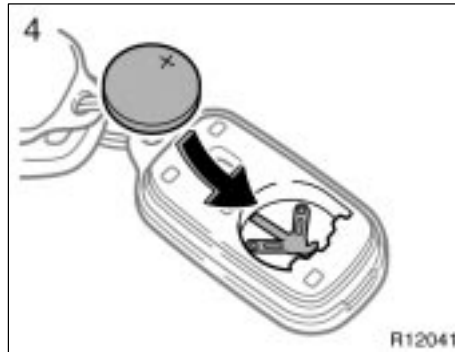
'05 TUNDRA_U (L/O 0409)



3. Remove the discharged transmitter battery.

NOTICE

Do not bend the terminals.



4. Put in a new transmitter battery with positive (+) side up.

Place the rubber gasket back on the transmitter. Then close the transmitter case securely.

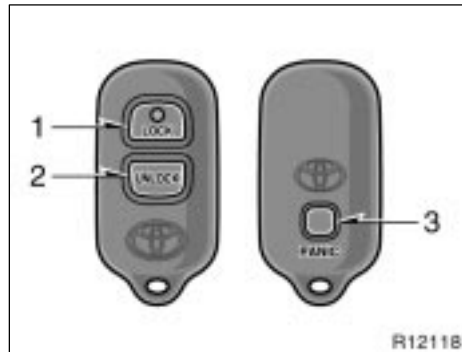
NOTICE

- ◆ ***Make sure the positive side and negative side of the transmitter battery are faced correctly.***
- ◆ ***Do not replace the battery with wet hands. Water may cause unexpected rust.***

- ◆ ***Do not touch or move any components inside the transmitter, or it may interfere with proper operation.***
- ◆ ***Be careful not to bend the electrode when inserting the transmitter battery and that dust or oils do not adhere to the transmitter case.***
- ◆ ***Close the transmitter case securely.***

After replacing the battery, check that the transmitter operates properly. If the transmitter still does not operate properly, contact your Toyota dealer.

**Wireless remote control
(double cab models)—**



1. "LOCK" switch
2. "UNLOCK" switch
3. "PANIC" switch

The wireless remote control system is designed to lock or unlock all the doors or activate the "PANIC" mode from a distance within approximately 1 m (3 ft.) of the vehicle.

When you operate any switch, push it slowly and securely.

The wireless remote control transmitter is an electronic component. Observe the following instructions in order not to cause damage to the transmitter.

- ▶ Do not leave the transmitter in places where the temperature becomes high such as on the dashboard.
- ▶ Do not disassemble it.
- ▶ Avoid knocking it hard against other objects or dropping it.
- ▶ Avoid putting it in water.

You can use up to 4 wireless remote control transmitters for the same vehicle. Contact your Toyota dealer for detailed information.

If the wireless remote control transmitter does not actuate the doors or alarm, or operate from a normal distance:

- ▶ Check for closeness to a radio transmitter such as a radio station or an airport which can interfere with normal operation of the transmitter.
- ▶ The battery may have been consumed. Check the battery in the transmitter. To replace the battery, see "—Replacing battery".

If you lose your transmitter, contact your Toyota dealer as soon as possible to avoid the possibility of theft, or an accident. (See "If you lose your wireless remote control transmitter" in Section 4.)

For vehicles sold in U.S.A.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTICE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ▶ Reorient or relocate the receiving antenna.
- ▶ Increase the separation between the equipment and receiver.

- ▶ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ▶ Consult the dealer or an experienced radio / TV technician for help.

FCC WARNING:

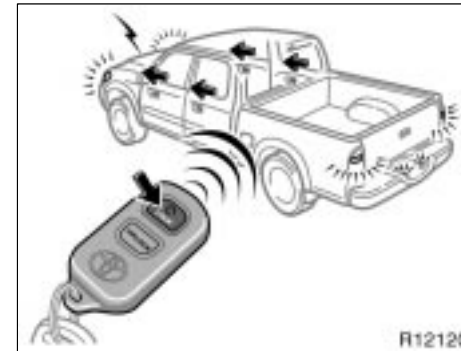
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For vehicles sold in Canada

Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

—Locking and unlocking doors



Locking operation



Unlocking operation

'05 TUNDRA_U (L/O 0409)

To lock and unlock all the doors, push the switches slowly and securely.

To lock: Push the "LOCK" switch. All the doors are locked simultaneously. At this time one beep will be heard, and the parking lights, tail lights and license plate lights flash once.

Check to see that all the doors are securely locked.

If any of the doors is not securely closed, locking cannot be performed by the "LOCK" switch and a beep will sound continuously for 10 seconds. However, if the key is in the ignition, a beep will not sound.

To stop the beep, close all the doors securely or push the "UNLOCK" switch.

The beep can be disabled. For details, contact your Toyota dealer.

To unlock: Push the "UNLOCK" switch once to unlock the driver's door alone. Pushing the switch twice within 3 seconds unlocks all the doors simultaneously. Each time the "UNLOCK" switch is pushed, two beeps will be heard, and the parking lights, tail lights and license plate lights flash twice.

This double switch operation to unlock all the doors can be changed to a single switch operation. For details, contact your Toyota dealer.

When all the doors are unlocked simultaneously with a wireless remote control transmitter, the interior light, ignition switch light, step light come on for about 15 seconds and cargo lamp for about 20 seconds before fading out, even if the door is not opened. (For details, see "Center interior and personal lights", "Ignition switch and step lights" and "Cargo lamp" in Section 1-5.)

You have 30 seconds to open a door after using the wireless remote unlock feature. If a door is not opened by then, all the doors will be automatically locked again.

The timing for the automatic door lock function can be changed. For details, contact your Toyota dealer.

If the "LOCK" or "UNLOCK" switch is kept pressed in, the locking or unlocking operation is not repeated. Release the switch and then push again.

The wireless door locking or unlocking function can be erased. For details, contact your Toyota dealer.

SWITCHING BEEP SOUND ON AND OFF

You can switch the beep on and off. (The beep is on initially and after battery replacement.)

To switch the beep on and off:

With the driver's door opened—

1. Insert the ignition key and remove it.
2. Within 5 seconds, insert the ignition key again and turn it to the "ON" position.
3. After 10 seconds, push the same "LOCK", "UNLOCK" or "PANIC" switch twice within 10 seconds.

Two beep sounds inform you that the program has been switched on or off.

If this procedure is not followed exactly, the beep will not operate as expected.

Check the beep ON/OFF operation by pushing the transmitter switch after you finish this procedure. If the beep does not operate as expected, repeat this procedure from step 1.

—Activating panic mode



Pushing the “PANIC” switch blows the horn intermittently and flashes the headlights and tail lights.

The “PANIC” switch is used to deter vehicle theft when you witness anyone attempting to break into or damage your vehicle.

The alarm will last for one minute. To stop alarm midway, do the following:

- ▶ Push any of the switches on the wireless remote control transmitter.
- ▶ Unlock any of the doors with the key.
- ▶ Turn the ignition key from the “LOCK” to the “ON” position.

The “PANIC” mode does not work when the ignition key is in the “ON” position.

This alarm function can be disabled. For details, contact your Toyota dealer.

—Replacing battery

For replacement, use a CR2016 lithium battery or equivalent.

CAUTION

Special care should be taken to prevent small children from swallowing the removed battery or components.

NOTICE

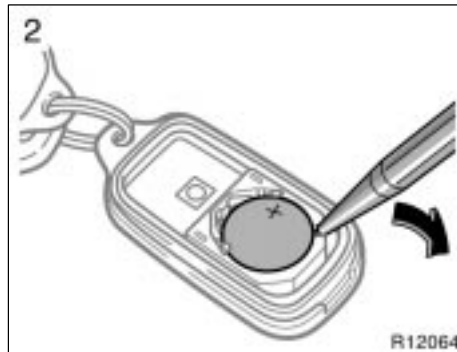
- ◆ *When replacing the transmitter battery, be careful not to lose the components.*
- ◆ *Replace only with the same or equivalent type recommended by a Toyota dealer.*
- ◆ *Dispose of used batteries according to the local laws.*

Replace the battery by following these procedures:

'05 TUNDRA_U (L/O 0409)



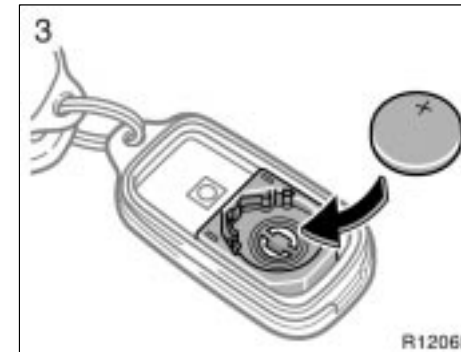
1. Using a coin or equivalent, open the transmitter case.



2. Remove the discharged transmitter battery.

NOTICE

Do not bend the terminals.



3. Put in a new transmitter battery with positive (+) side up.

Close the transmitter case securely.

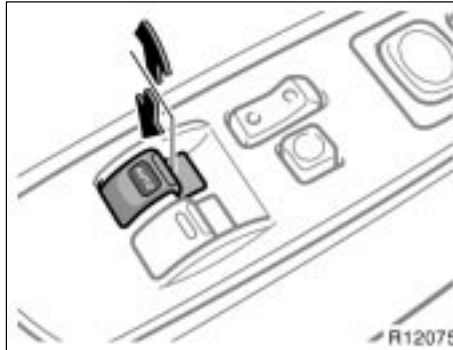
NOTICE

- ◆ *Make sure the positive side and negative side of the transmitter battery are faced correctly.*
- ◆ *Do not replace the battery with wet hands. Water may cause unexpected rust.*
- ◆ *Do not touch or move any components inside the transmitter, or it may interfere with proper operation.*

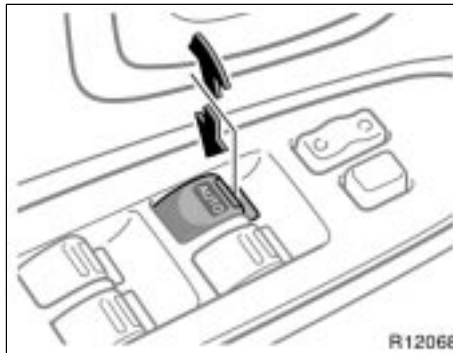
- ◆ *Be careful not to bend the electrode when inserting the transmitter battery and that dust or oils do not adhere to the transmitter case.*
- ◆ *Close the transmitter case securely.*

After replacing the battery, check that the transmitter operates properly. If the transmitter still does not operate properly, contact your Toyota dealer.

Power windows



Standard and access cab models



Double cab models

The windows can be operated with the switch on either front door (standard and access cab models)/each door (double cab models).

The power windows work when the ignition switch is in the "ON" position.

Key off operation: If both front doors are closed, they work for 43 seconds even after the ignition switch is turned off. They stop working when either front door is opened.

OPERATING THE DRIVER'S WINDOW

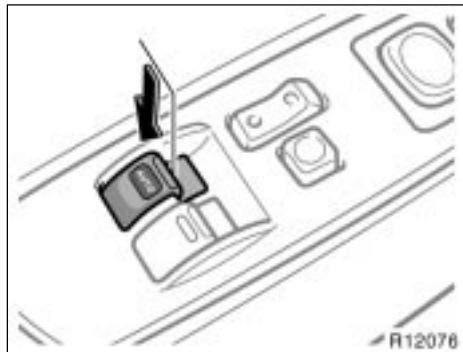
Use the switch on the driver's door.

Normal operation: The window moves as long as you hold the switch.

To open: Lightly push down the switch.

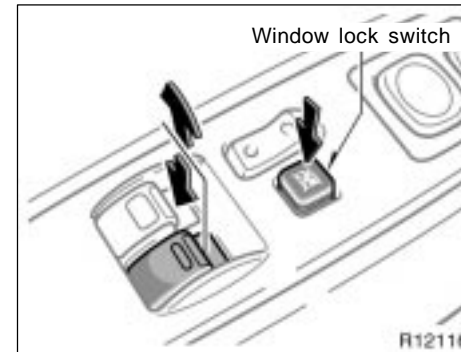
To close: Pull up the switch.

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Standard and access cab models

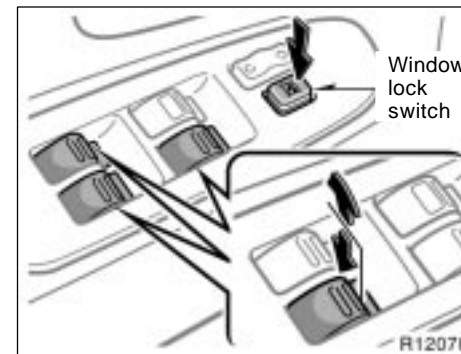
Automatic operation (to open only): Push the switch completely down and then release it. The window will fully open. To stop the window partway, lightly pull the switch up and then release it.



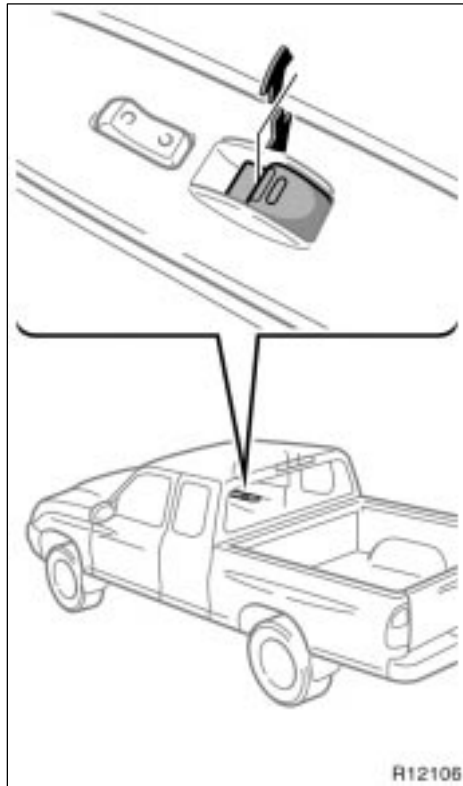
Driver's door switch (standard and access cab models)



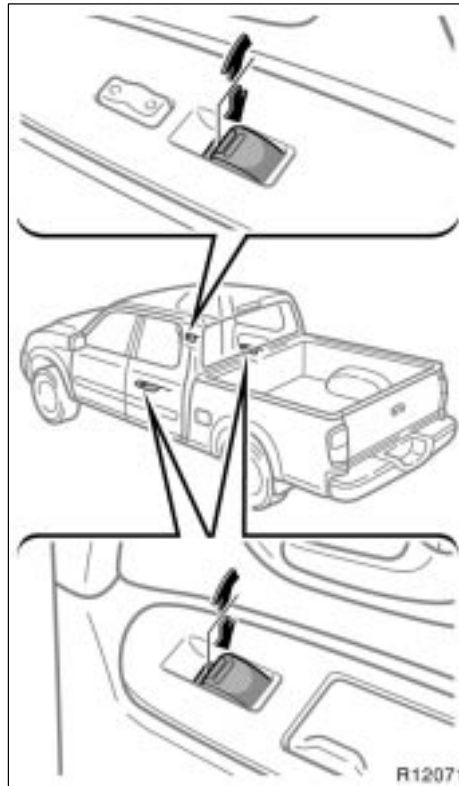
Double cab models



Driver's door switches (double cab models)



Passenger's door switch (Standard and access cab models)



Passenger's door switches (Double cab models)

OPERATING THE PASSENGERS' WINDOWS

Use the switches on the passenger's door (standard and access cab models)/passengers' doors (double cab models) or the switch on the driver's door that controls each passenger's window.

The window moves as long as you hold the switch.

To open: Push down the switch.

To close: Pull up the switch.

If you push in the window lock switch on the driver's door, the passenger's (standard and access cab models)/passengers' (double cab models) windows and power back window cannot be operated.

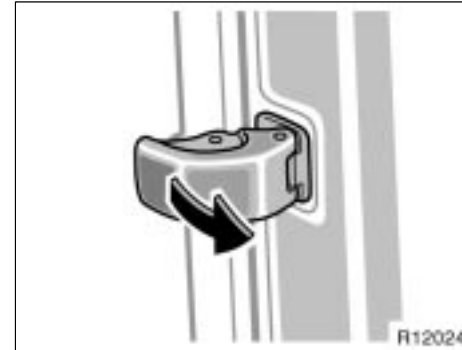
 CAUTION

To avoid serious personal injury, you must do the following.

- ▶ Before you close the power windows, always make sure there is nobody around the power windows. You must also make sure the heads, hands and other parts of the bodies of all occupants are kept completely inside the vehicle. If someone's neck, head or hands get caught in a closing window, it could result in a serious injury. When anyone closes the power windows, make sure he or she operates the windows safely.
- ▶ When small children are in the vehicle, never let them use the power window switches without supervision. Use the window lock switch to prevent them from making unexpected use of the switches.

- ▶ Be sure to remove the ignition key when you leave your vehicle.
- ▶ Never leave anyone (particularly a small child) alone in your vehicle, especially with the ignition key still inserted. Otherwise, he/she could use the power window switches and get trapped in a window. Unattended person (particularly a small child) can be involved in a serious accident.

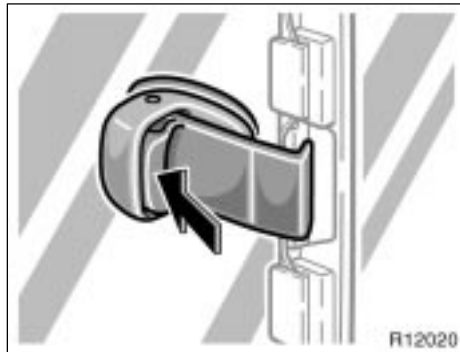
**Rear side windows
(access cab models)**



To open the rear side window, pull the latch handle toward you and swing it fully out.

After closing the window, make sure it is completely closed.

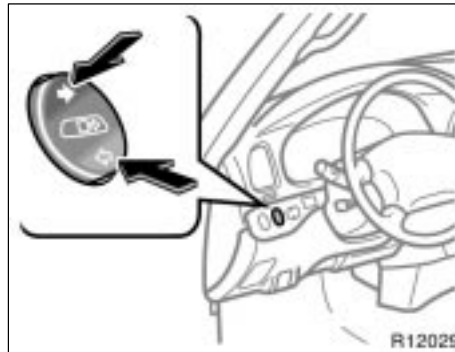
Back window



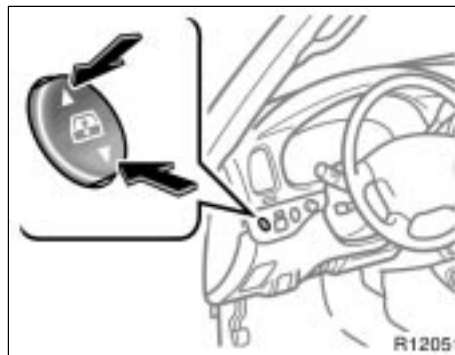
To open the back window, push the lever and slide the window.

After closing the window, make sure it is completely closed.

Power back window



Access cab models



Double cab models

The back window can be operated with the switch on the instrument panel.

The ignition key must be in the "ON" position.

Key off operation: If both front doors are closed, they work 43 seconds even after the ignition switch is turned off. The power back window stops working when either front door is opened.

The back window moves as long as you hold the switch.

Access cab models—

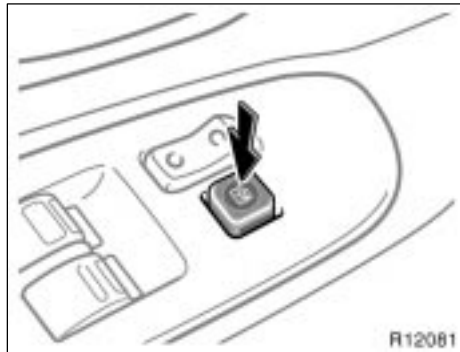
To open: Push the switch on the "➡" side.

To close: Push the switch on the "⬅️" side.

Double cab models—

To open: Push the switch on the "▼" side.

To close: Push the switch on the "▲" side. At this time, the window will stop partway. Push the switch again to fully close the window.



Access cab models only—If you push in the window lock switch on the driver's door, the back window cannot be operated.

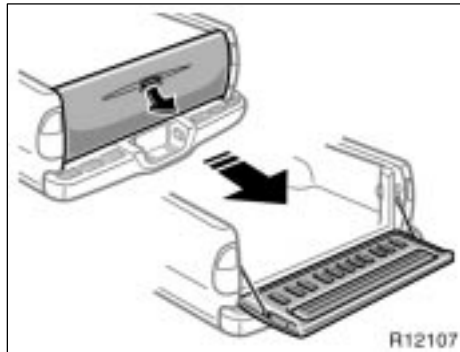
⚠ CAUTION

To avoid serious personal injury, you must do the following.

- ▶ Before you close the power back window, always make sure there is nobody around the power back window. You must also make sure the heads, hands and other parts of the bodies of all occupants are kept completely inside the vehicle. If someone's neck, head or hands get caught in a closing window, it could result in a serious injury. When anyone closes the power back window, make sure he or she operates the window safely.
- ▶ When small children are in the vehicle, never let them use the power back window switch without supervision.
- ▶ Be sure to remove the ignition key when you leave your vehicle.

- ▶ Never leave anyone (particularly a small child) alone in your vehicle, especially with the ignition key still inserted. Otherwise, he/she could use the power back window switch and get trapped in a window. Unattended person (particularly a small child) can be involved in a serious accident.
- ▶ Keep the back window closed while driving. This not only keeps the luggage from being thrown out but also prevents exhaust gases from entering the vehicle.

Tailgate



OPENING

To open the tailgate, pull the handle up.

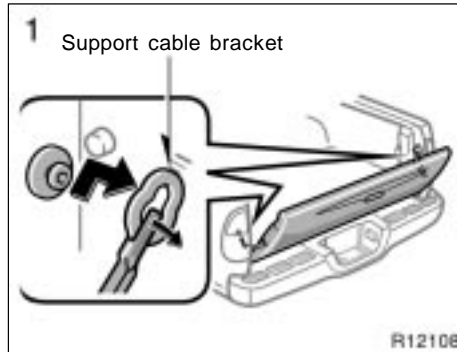
The support cables will hold the tailgate horizontal.

See “—Stowage precautions” in Section 2 for precautions when loading luggage.

After closing the tailgate, try pulling and pushing it to make sure it is securely closed.

NOTICE

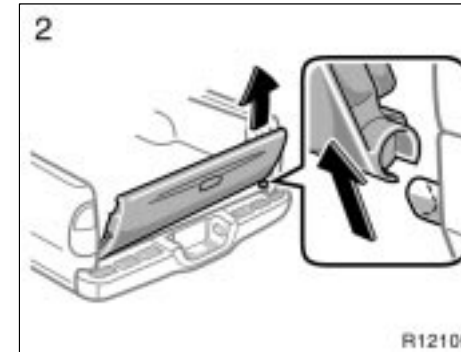
Avoid driving with the tailgate open.



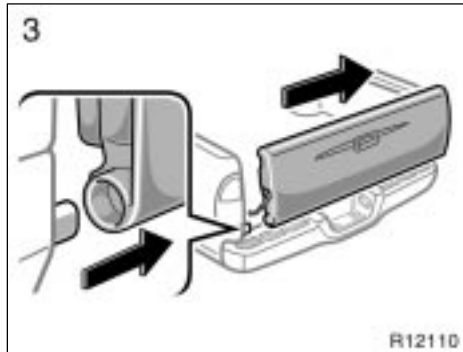
REMOVAL

1. Open the tailgate to the angle where you can release the brackets on the support cables from the lugs on both sides.

To release the support cable bracket, lift it up and slide it off.



2. Tilt the tailgate to about 30° from vertical and pull up the right side of the tailgate to unhook the right side.



3. Slide the tailgate a little to the right to unhook the left side.

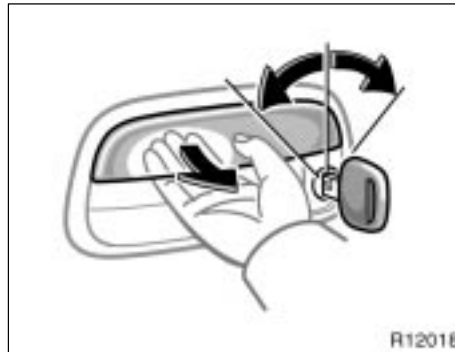
To attach the tailgate, follow the removal procedure in reverse order.

After closing the tailgate, try pulling it toward you to make sure it is securely closed.

We recommend you keep the tailgate closed when not in use.

NOTICE

Make sure the support brackets are securely latched on both side panels when installing the tailgate.

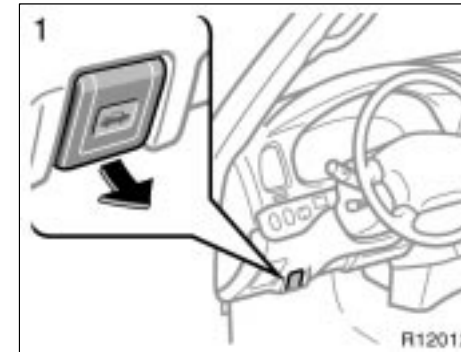


LOCKING AND UNLOCKING WITH KEY
Insert the key into the keyhole and turn it to lock or unlock the tailgate.

To lock: Turn the key clockwise.

To unlock: Turn the key counterclockwise.

Hood



To open the hood:

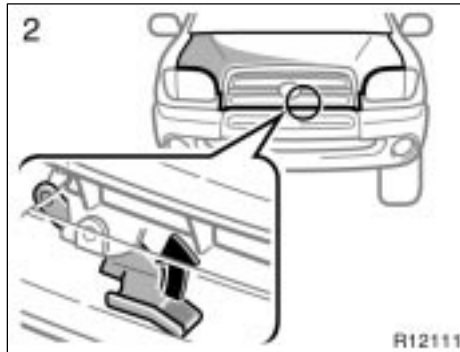
1. Pull the hood lock release lever. The hood will spring up slightly.

CAUTION

Before driving, be sure that the hood is closed and securely locked. Otherwise, the hood may open unexpectedly while driving and an accident may occur.

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Toyota vehicle intrusion protection system (TVIP) (standard and access cab models for U.S.A. only)

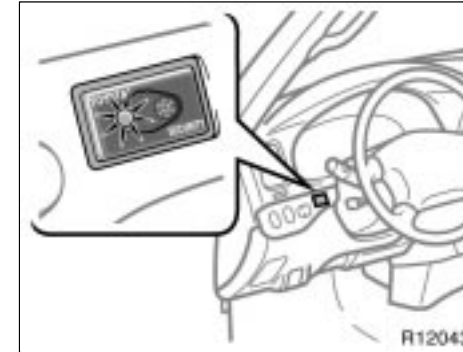


2. In front of the vehicle, pull up the auxiliary catch lever and lift the hood.

Before closing the hood, check to see that you have not forgotten any tools, rags, etc. Then lower the hood and make sure it locks into place. If necessary, press down gently on the front edge to lock it.



TVIP is a theft deterrent system. If someone attempts to damage or break into your vehicle, the system sounds the alarm while flashing the lights.



SETTING THE SYSTEM

You can set the system as follows.

1. Remove the key from the ignition switch.
2. Have all passengers get out of the vehicle.
3. Close all the doors securely.
4. Lock all the doors with the key or remote keyless entry transmitter. At this time, the TVIP indicator light comes on.

The system will be set in 30 seconds. When the system is set, the indicator light will start to flash.

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5. Make sure that the indicator light flashes. Then you may leave the vehicle.

Never leave anyone in the vehicle when you set the system because unlocking from the inside activates the alarm.

Activating the alarm

If the system detects a threat to the vehicle, blows the horn intermittently for one minute while flashing tail lights and front side marker lights, and turns on the interior light.

The system detects a threat under any of the following conditions:

- ▶ Either of the front doors is unlocked by means other than the key or remote keyless entry transmitter.

If the key is not in the ignition switch, all the doors will be automatically locked again.

- ▶ Any door is forcibly opened.
- ▶ The side windows are tapped or broken.
- ▶ The battery terminal is disconnected and then reconnected.
- ▶ The ignition is hotwired.

After one minute, the alarm automatically stops and the indicator light starts flashing again.

Reactivating the alarm

Once set, until you cancel the system, the system automatically resets the alarm after the alarm has stopped.

The alarm will activate again under the same circumstances described in "Activating the alarm".

Stopping the alarm

You can stop the alarm in either of the following ways:

- ▶ Unlock any of the doors with the key or remote keyless entry transmitter.
- ▶ Place the ignition switch in the "ON" position.

CANCELLING THE SYSTEM

You can cancel the system as described in "Stopping the alarm".

If you cancel the system by unlocking any of the doors but no door is opened within 30 seconds, all the doors lock automatically and the system will be set again.

NOTE: If your vehicle's tail lights and front side marker lights turn on and the buzzer sounds for 2 seconds when the system is canceled, the trigger memory was activated; an alarm was triggered while you were away from the vehicle.

TESTING THE SYSTEM

You can check the system operation as follows.

1. Open all the windows.
2. Set the system as described in "SETTING THE SYSTEM".
3. Unlock the driver's door with the inside lock knob. The system should activate and the alarm should sound.
4. Stop the alarm as described in "Stopping the alarm".
5. Repeat steps 2 to 4 for the passenger's door.

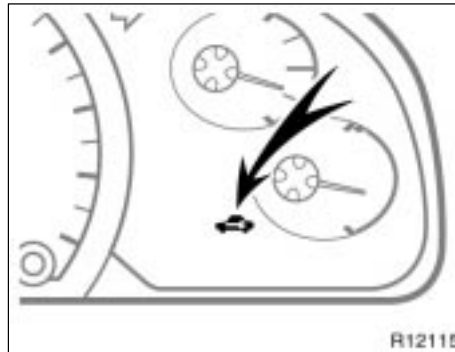
If the system does not work properly, have it checked by your Toyota dealer.

Theft deterrent system (double cab models)



To deter vehicle theft, the system is designed to sound an alarm if any of the doors or hood is forcibly unlocked or opened or the battery terminal is disconnected and then reconnected when the vehicle is locked.

The alarm blows the horn intermittently and flashes the headlights and tail lights.



SETTING THE SYSTEM

1. Turn the ignition key to the "LOCK" position and remove it.

The indicator light will start flashing when the key is removed from the ignition switch.

2. Have all passengers get out of the vehicle.
 3. Close and lock all the doors and hood.
- The indicator light will remain on when all the doors and hood are closed and locked.

The system will automatically be set after 30 seconds. When the system is set, the indicator light will start flashing again.

4. After making sure the indicator light starts flashing, you may leave the vehicle.

Never leave anyone in the vehicle when you set the system, because unlocking from the inside will activate the system.

WHEN THE SYSTEM IS SET

Activating the system

The system will sound the alarm under the following conditions:

- ▶ If any of the doors is unlocked or opened without the key or wireless remote control transmitter, or if the hood is forcibly opened
- ▶ If the battery terminal is disconnected and then reconnected

The indicator light will come on when the system is activated.

If the alarm has been activated and the key is not in the ignition switch, all the doors will re-lock automatically.

After one minute, the alarm will automatically stop and the indicator light will start flashing again.

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Reactivating the alarm

Once set, the system automatically resets the alarm after the alarm stops.

The alarm will activate again under the same circumstances described in "Activating the system".

Stopping the alarm

The alarm will be stopped by the following two ways:

- ▶ Turn the ignition key from the "LOCK" to "ON" position.
- ▶ Unlock any of the doors with the key or wireless remote control transmitter.

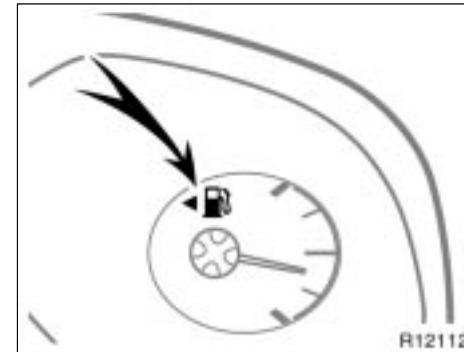
These ways cancel the system at the same time.

TESTING THE SYSTEM

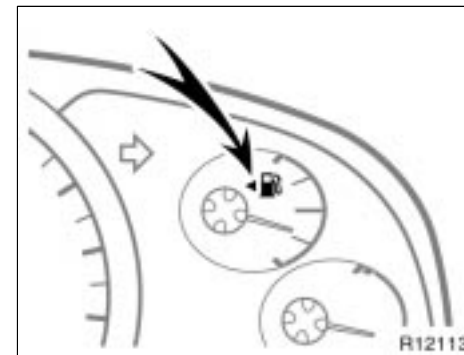
1. Open all the windows.
2. Set the system as described above. The doors should be locked with the key or wireless remote control transmitter. Be sure to wait until the indicator light goes off or starts flashing.
3. Unlock any door from the inside. The system should activate the alarm.
4. Stopping the alarm as described above.
5. Repeat this operation for the other doors and hood. When testing the hood, also check that the system is activated when the battery terminal is disconnected and then reconnected.

If the system does not work properly, have it checked by your Toyota dealer.

Fuel tank cap



Without tachometer



With tachometer

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This indicates that the fuel filler door is on the left side of your vehicle.



Type A



Type B

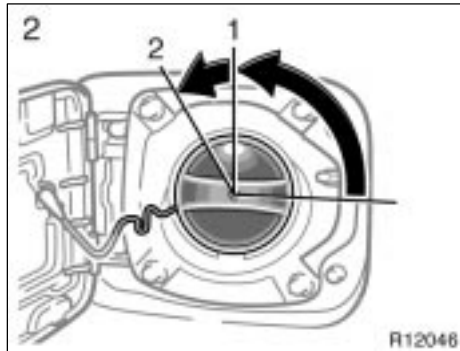
1. To open the fuel filler door, pull the door toward out as shown.

When refueling, turn off the engine.

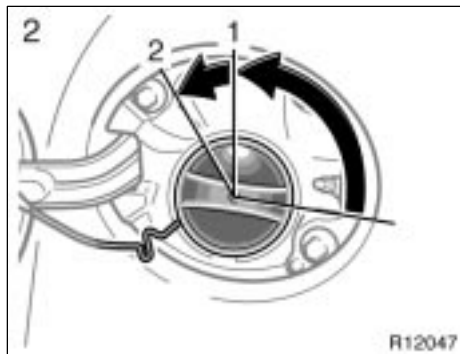
 CAUTION

- ▶ Do not smoke, cause sparks or allow open flames when refueling. The fumes are flammable.
- ▶ When opening the cap, do not remove the cap quickly. In hot weather, fuel under pressure could cause injury by spraying out of the filler neck if the cap is suddenly removed.
- ▶ Do not fill a fuel container on a plastic truck bed liner, a rubber truck bed mat, or any other insulating material. A static electricity charge could cause a spark and fire hazard. The proper procedure is to place an approved fuel container on the ground away from the truck for filling.

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Type A



Type B

2. To remove the fuel tank cap, turn the cap counterclockwise by 90 degrees (to the pressure point 1), and then turn it an additional 30 degrees (to point 2). Pause slightly before removing it.

It is not unusual to hear a slight swoosh when the cap is opened.

When installing the cap, turn the cap clockwise until you hear a click. When you hear the click, the cap is fully closed.

If the cap is not tightened securely, the malfunction indicator lamp comes on. Make sure the cap is tightened securely.

The indicator lamp goes off after driving several times. If the indicator lamp does not go off, contact your Toyota dealer as soon as possible.

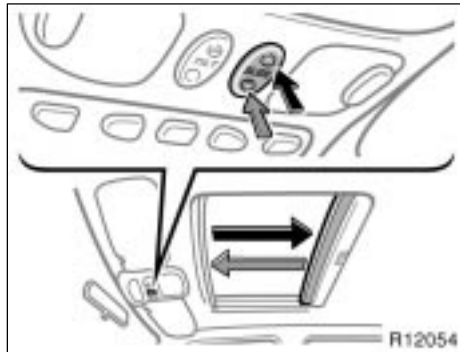
CAUTION

- ▶ Make sure the cap is tightened securely to prevent fuel spillage in the event of an accident.
- ▶ Use only a genuine Toyota fuel tank cap for replacement. It is designed to regulate fuel tank pressure.

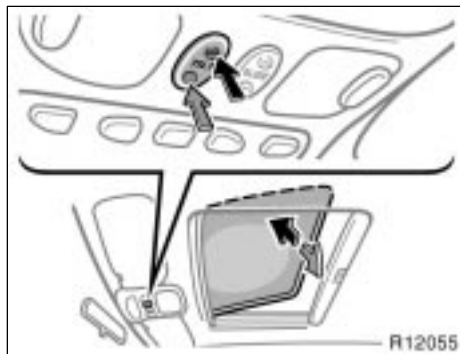
NOTICE

To prevent damage to the cap, apply force only in the turning direction to the cap. Do not pull or pry it.

Electric moon roof



Sliding operation



Tilting operation

To operate the moon roof, use the switches between the personal lights.

The moon roof works when the ignition switch is in the "ON" position.

The sun shade can be opened or closed by hand.

Sliding operation—

To open: Push the "SLIDE" switch on the "x" (rear) side.

The roof will open and stop partway 135 mm (5.3 in.) from the fully opened position. When you push "x" (rear) side again, the moon roof will open fully. To stop the roof partway, push the same side or "v" (front) side while the roof is moving.

As driving with the moon roof opened fully will cause wind throbs, we recommend you to drive with the moon roof partway 135 mm (5.3 in.) from the fully opened position.

The sun shade will be opened together with the roof.

To close: Push the "SLIDE" switch on the "v" (front) side.

The roof will fully close. To stop the roof partway, push the same side or "x" (rear) side briefly.

Tilting operation—

To tilt up: Push the "TILT" switch on the "UP" side.

To lower: Push the "TILT" switch on the opposite side of "UP".

You may stop the moon roof at any desired position. The roof will move while the switch is being pushed and stop when released.

Key off operation: If all the doors are closed, it works for 43 seconds even after the ignition switch is turned off. It stops working when any of the doors is opened.

Jam protection function: If something gets caught between the moon roof and frame during closing operation, the moon roof stops and opens half way.

If the moon roof receives a strong impact, this function may work even if nothing is caught.



CAUTION

To avoid serious personal injury, you must do the following.

- ▶ While the vehicle is moving, always keep the heads, hands and other parts of the bodies of all occupants away from the roof opening. Otherwise, they could be seriously injured if the vehicle stops suddenly or if the vehicle is involved in an accident.
- ▶ Before you close the moon roof, always make sure there is nobody around the moon roof. You must also make sure nobody places his or her head, hands and other parts of the body in the roof opening. If someone's neck, head or hands get caught in the closing roof, it could result in a serious injury. When anyone closes the moon roof, first make sure it is safe to do so.
- ▶ Be sure to remove the ignition key when you leave your vehicle.

- ▶ Never leave anyone (particularly a small child) alone in your vehicle, especially with the ignition key still inserted. Otherwise, he/she could use the moon roof switches and get trapped in the roof opening. Unattended person (particularly a small child) can be involved in a serious accident.
- ▶ Never sit on top of the vehicle around the roof opening.
- ▶ Never try jamming any part of your body to activate the jam protection function intentionally.
- ▶ The jam protection function may not work if something gets caught just before the window is fully closed.

SECTION 1-3

OPERATION OF INSTRUMENTS AND CONTROLS

Occupant restraint systems

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Seats

While the vehicle is being driven, all vehicle occupants should have the seatback upright, sit well back in the seat and properly wear the seat belts provided.

CAUTION

- ▶ Do not drive the vehicle unless the occupants are properly seated. Do not allow any passengers to sit on top of a folded-down seatback, or in the luggage compartment or cargo area. Persons not properly seated and/or not properly restrained by seat belts can be severely injured in the event of emergency braking or a collision.
- ▶ During driving, do not allow any passengers to stand up or move around between seats. Otherwise, severe injuries can occur in the event of emergency braking or a collision.

Front seats— —Front seat precautions

Driver seat

CAUTION

The SRS driver airbag deploys with considerable force, and can cause death or serious injury especially if the driver is very close to the airbag. The National Highway Traffic Safety Administration (“NHTSA”) advises:

Since the risk zone for driver airbag is the first 50—75 mm (2—3 in.) of inflation, placing yourself 250 mm (10 in.) from your driver airbag provides you with a clear margin of safety. This distance is measured from the center of the steering wheel to your breastbone. If you sit less than 250 mm (10 in.) away now, you can change your driving position in several ways:

- ▶ Move your seat to the rear as far as you can while still reaching the pedals comfortably.

- ▶ Slightly recline the back of the seat. Although vehicle designs vary, many drivers can achieve the 250 mm (10 in.) distance, even with the driver seat all the way forward, simply by reclining the back of the seat somewhat. If reclining the back of your seat makes it hard to see the road, raise yourself by using a firm, non-slippery cushion, or raise the seat if your vehicle has that feature.

- ▶ If your steering wheel is adjustable, tilt it downward. This points the airbag toward your chest instead of your head and neck.

The seat should be adjusted as recommended by NHTSA above, while still maintaining control of the foot pedals, steering wheel, and your view of the instrument panel controls.

Front passenger seats

CAUTION

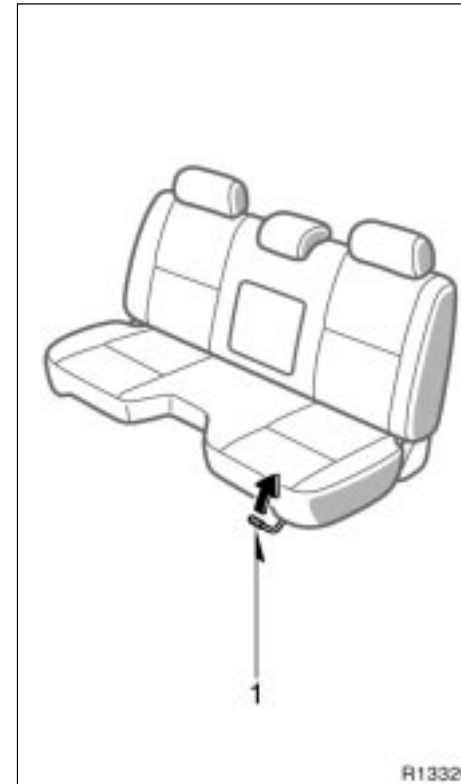
The SRS front passenger airbag also deploys with considerable force, and can cause death or serious injury especially if the front passenger is very close to the airbag. The front passenger seat should be as far from the airbag as possible with the seatback adjusted, so the front passenger sits upright.

—Seat adjustment precautions

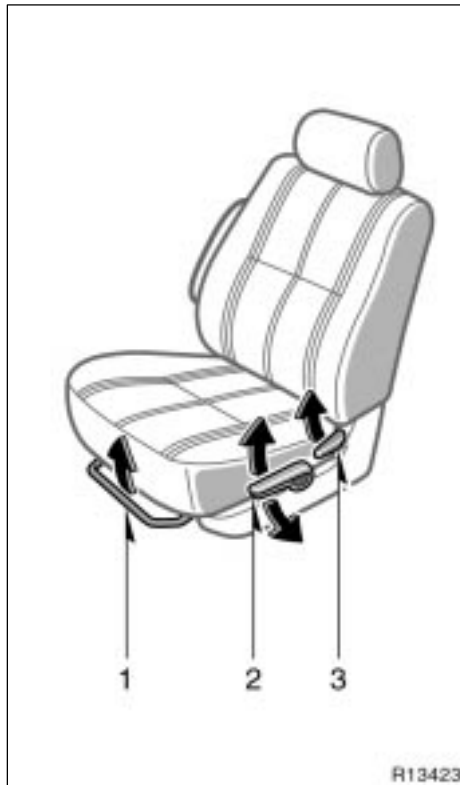
CAUTION

- ▶ Do not adjust the seat while the vehicle is moving as the seat may unexpectedly move and cause the driver to lose control of the vehicle.
- ▶ Be careful that the seat does not hit a passenger or luggage.
- ▶ After adjusting the seat position, release the lever and try sliding the seat forward and backward to make sure it is locked in position.
- ▶ After adjusting the seatback, push your body back against the seat to make sure the seat is locked in position.
- ▶ Do not put objects under the seats. Otherwise, the objects may interfere with the seat-lock mechanism or unexpectedly push up the seat position adjusting lever and the seat may suddenly move, causing the driver to lose control of the vehicle.
- ▶ While adjusting the seat, do not put your hands under the seat or near the moving parts. Otherwise, your hands or fingers may be caught and injured.

—Adjusting front seats (manual seat)



Non-split bench seat



Separate seat and split bench seat

1. SEAT POSITION ADJUSTING LEVER

Non-split bench seat: Pull the lever up. Then slide the seat to the desired position with slight body pressure and release the lever.

Separate seat and split bench seat: Hold the center of the lever and pull it up. Then slide the seat to the desired position with slight body pressure and release the lever.

2. SEAT CUSHION HEIGHT ADJUSTING LEVER

Pull up or push down the lever.

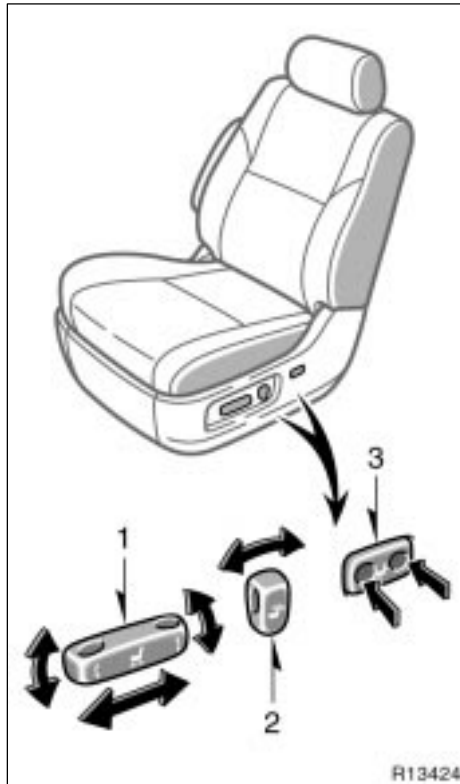
3. SEATBACK ANGLE ADJUSTING LEVER

Lean forward and pull the lever up. Then lean back to the desired angle and release the lever.

⚠ CAUTION

Avoid reclining the seatback any more than needed. The seat belts provide maximum protection in a frontal or rear collision when the driver and the front passenger are sitting up straight and well back in the seats. If you are reclined, the lap belt may slide past your hips and apply restraint forces directly to the abdomen or your neck may contact the shoulder belt. In the event of a frontal collision, the more the seat is reclined, the greater the risk of death or personal injury.

—Adjusting front seats (power seats)



1. SEAT POSITION AND SEAT CUSHION ANGLE ADJUSTING SWITCH

Move the control switch in the desired direction.

Releasing the switch will stop the seat at that position.

Do not place anything under the front seats, as this might interfere with the seat movement.

2. SEATBACK ANGLE ADJUSTING SWITCH

Move the control switch in the desired direction.

Releasing the switch will stop the seatback at that position.

CAUTION

Avoid reclining the seatback any more than needed. The seat belts provide maximum protection in a frontal or rear collision when the driver and the front passenger are sitting up straight and well back in the seats. If you are reclined, the lap belt may slide past your hips and apply restraint forces directly to the abdomen or your neck may contact the shoulder belt. In the event of a frontal collision, the more the seat is reclined, the greater the risk of death or personal injury.

3. SEAT LUMBAR SUPPORT ADJUSTING SWITCH

Push the control switch on either way.

The amount of lumbar support will change while the switch is pushed.

**—Tilting passenger's seatback
for rear seat entry
(access cab models)**



For easy access to the rear seat, do this.

Lift the seatback angle adjusting lever or press the pedal behind the seatback.

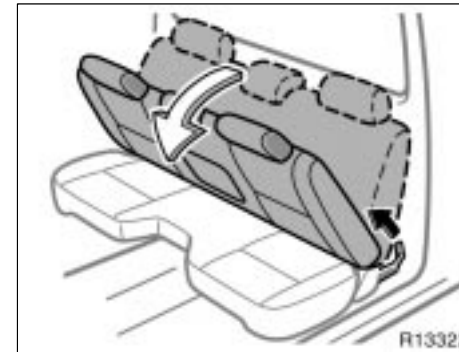
The seatback will tilt forward.

After passengers are in, lift up the seatback until it locks.

CAUTION

- ▶ After putting back the seatback, try pushing the seatback forward and rearward to make sure it is secured in place.
- ▶ Never allow anyone to rest their foot on the press pedal while the vehicle is moving.

**—Folding seatback
(non-split bench seat)**



Pull the seatback lock release lever and fold down the seatback.

Hold the lever until you have swung the seatback forward slightly.



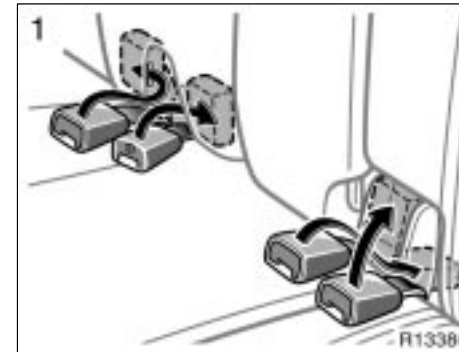
Make sure the shoulder belt pass through the guide when returning the seatback.

CAUTION

When returning the seatback to the upright position, observe the following precautions in order to prevent personal injury in a collision or sudden stop:

- ▶ Make sure the seatback is securely locked by pushing forward and rearward on the top of the seatback. Failure to do so will prevent the seat belt from operating properly.
- ▶ Make sure the seat belts are not twisted or caught in the seatback and are arranged in their proper position and are ready to use.

Swing-up rear seats (access cab models)

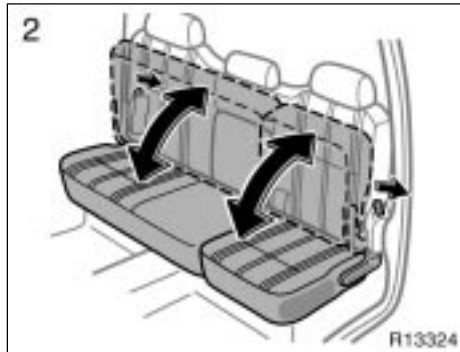


1. Stow the rear seat belt buckles as shown in the illustration.

This prevents the belt buckles from falling out when you swing up the rear seat.

NOTICE

The seat belt buckles must be stowed before you swing up the rear seat.



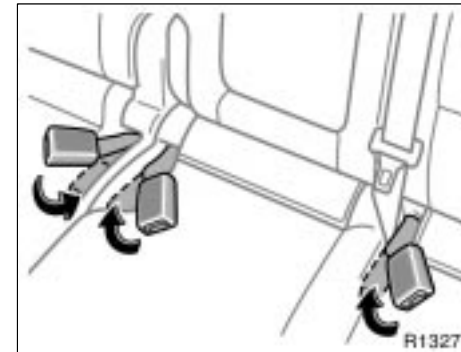
2. Raise the bottom cushion while pushing the lock release lever.

CAUTION

When returning the bottom cushion to its original position, observe the following precautions in order to prevent personal injury in a collision or sudden stop:

- ▶ Make sure the bottom cushion is securely locked by trying to pull up the edge of the bottom cushion. Failure to do so will prevent the seat belt from operating properly.
- ▶ Make sure the seat belts are not twisted or caught under the bottom cushion and are arranged in their proper position and are ready to use.

Tumbling rear seats (double cab models)



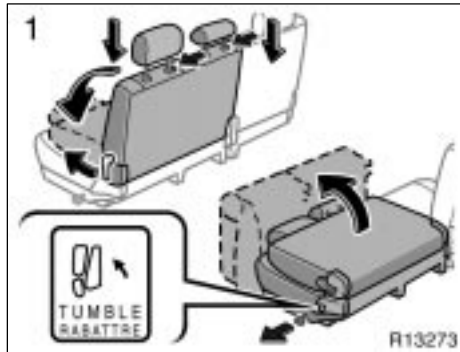
BEFORE TUMBLING REAR SEATS

Stow the rear seat belt buckles as shown in the illustration.

This prevents the buckles from falling out when you tumble the seatback.

NOTICE

The seat belt buckles must be stowed before you tumble the rear seat.



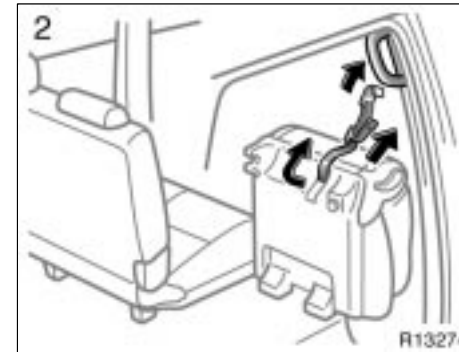
TUMBLING REAR SEATS

1. Lower the head restraints to the lowest position. Fold down the seatback while pulling the seatback angle adjusting lever and swing the whole seat up and forward while pulling the seat lock release lever on the side.

To return the tumbled seat to the original position, reverse the above operation.

CAUTION

- ▶ Make sure people or luggage are clear of the seat. Then, hold the seat and slowly move it. Otherwise, people may be injured or luggage may be damaged, if the seat hits them.
- ▶ To avoid serious injury, do not sit on the folded seatback.
- ▶ Use the seat lock release lever on the side only when tumbling the seat.

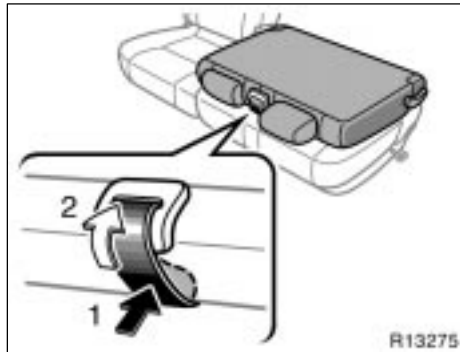


2. Take the holding strap out of its hole, and hook the strap onto the assist grip. Then, pull the strap on the free end to secure the seat.

When returning the rear seat to its original position, put the holding strap into the hole.

CAUTION

When tumbling the rear seats, fix the seats securely by adjusting the length of the holding strap. Failure to do so may cause an unexpected accident or severe injury in the event of emergency braking or a collision.



WHEN RETURNING THE REAR SEATS

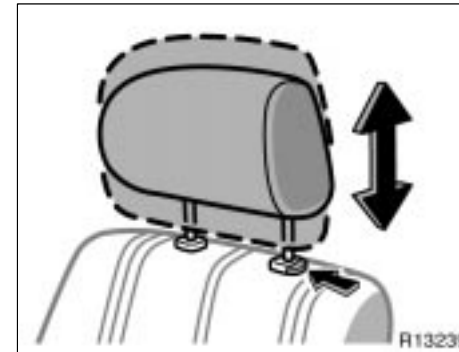
If you cannot raise the seatback because of the locked seat belt, do not try it forcibly. Release the lock of the seat belt in the following way. Push in the lower front edge of the seatback cushion to slacken the seat belt (1) and let the seat belt retract a little (2).

CAUTION

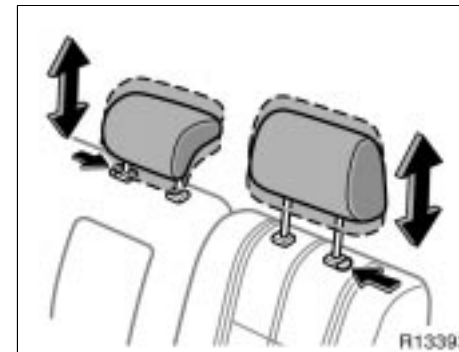
When returning seats to their original position, observe the following precautions in order to prevent personal injury in a collision or sudden stop:

- ▶ Be careful not to get your hands or feet pinched in the seat.
- ▶ Make sure the seat is securely locked by pushing forward and rearward on the top of the seatback or by trying to pull up the edge of the bottom cushion. Failure to do so will prevent the seat belt from operating properly.
- ▶ Make sure the seat belts are not twisted or caught in the seatback and are arranged in their proper position and are ready to use.

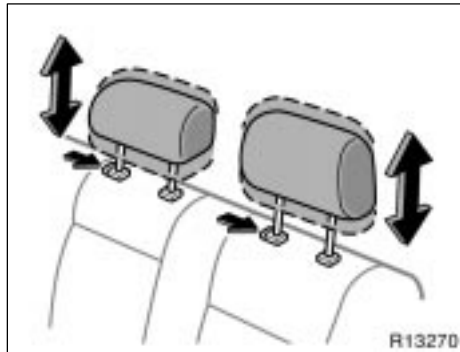
Head restraints



Front (separate seat and non-split bench seat)



Front (split bench seat)



Rear

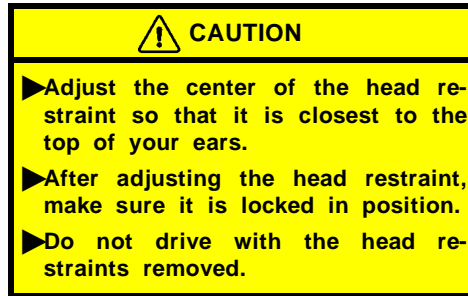
For your safety and comfort, adjust the head restraint before driving.

To raise: Pull it up.

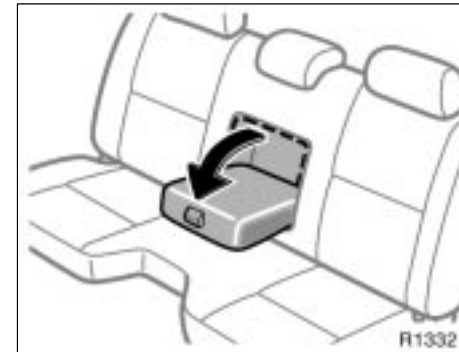
To lower: Push it down while pressing the lock release button.

Center head restraint—When an occupant sits on the center position of the seats, always pull up the center head restraint to the lock position.

The head restraint is most effective when it is close to your head. Therefore, using a cushion on the seatback is not recommended.



Armrest



Non-split bench seat



Split bench seat

Seat heaters



Separate seat

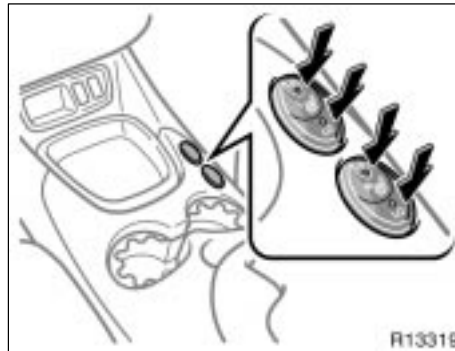
To use the armrest, do this.

Non-split and split bench seat—Pull the armrest out as shown in the illustration.

Separate seat—Pull the armrest down as shown in the illustration.

NOTICE

To prevent damage to the armrest, avoid putting heavy loads on it.



To turn on the seat heater, push the switch ("L" switch for the left front seat and "R" switch for the right seat).

At this time, the indicator light will illuminate to indicate the seat heater is operating.

The seat heater switches have the following positions.

"HI"—High heating temperature

"LO"—Low heating temperature

The key must be in the "ON" position to operate seat heaters.

Pushing lightly on the opposite side will turn it off.

CAUTION

Occupants must use caution when operating the seat heater because it may make them feel too hot or cause burns at low temperatures (erythema, varicella). Use extra caution for;

- ▶ Babies, small children, elderly persons, sick persons or persons with physical disabilities
- ▶ Persons who have delicate skin
- ▶ Persons who are exhausted
- ▶ Person who have taken alcohol or drugs which induce sleep (sleeping drug, cold remedy, etc.)

To prevent the seat overheating, do not use the seat heater with a blanket, cushion, or other insulating objects which cover the seat.

**Seat belts—
—Seat belt precautions**

Toyota strongly urges that the driver and passengers in the vehicle be properly restrained at all times with the seat belts provided. Failure to do so could increase the chance of injury and/or the severity of injury in accidents.

The seat belts provided for your vehicle are designed for people of adult size, large enough to properly wear them.

Child. Use a child restraint system appropriate for the child until the child becomes large enough to properly wear the vehicle's seat belts. See "Child restraint" in this Section for details.

STANDARD CAB MODELS—

If a child is too large for a child restraint system, the child should sit in the seat and must be restrained using the vehicle's seat belt.

ACCESS CAB AND DOUBLE CAB MODELS—

If a child is too large for a child restraint system, the child should sit in the rear seat and must be restrained using the vehicle's seat belt. According to accident statistics, the child is safer when properly restrained in the rear seat than in the front seat.

If a child must sit in the front seat, the seat belts should be worn properly. If an accident occurs and the seat belts are not worn properly, the force of the rapid inflation of the airbag may cause death or serious injury to the child.

Do not allow any children to stand up or kneel on either rear or front seats. An unrestrained child could suffer serious injury or death during emergency braking or a collision. Also, do not let the child sit on your lap. Holding a child in your arms does not provide sufficient restraint.

Pregnant woman. Toyota recommends the use of a seat belt. Ask your doctor for specific recommendations. The lap belt should be worn securely and as low as possible over the hips and not on the waist.

Injured person. Toyota recommends the use of a seat belt. Depending on the injury, first check with your doctor for specific recommendations.

 **CAUTION**

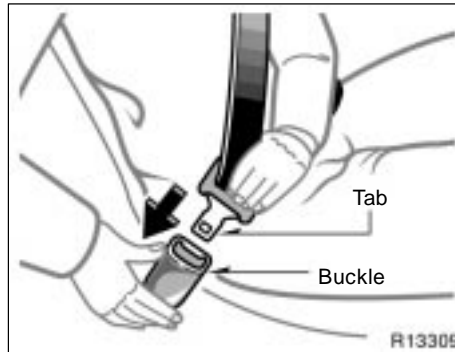
Persons should ride in their seats properly wearing their seat belts whenever the vehicle is moving. Otherwise, they are much more likely to suffer serious bodily injury or death in the event of sudden braking or a collision.

When using the seat belts, observe the following:

- ▶ **Use the belt for only one person at a time. Do not use a single belt for two or more people—even children.**
- ▶ **Avoid reclining the seatback any more than needed. The seat belts provide maximum protection in a frontal or rear collision when the driver and the front passenger are sitting up straight and well back in the seats. If you are reclined, the lap belt may slide past your hips and apply restraint forces directly to the abdomen or your neck may contact the shoulder belt. In the event of a frontal collision, the more the seat is reclined, the greater the risk of death or personal injury.**

—Fastening front and rear seat belts

- ▶ Be careful not to damage the belt webbing or hardware. Take care that they do not get caught or pinched in the seat or side doors.
- ▶ Inspect the belt system periodically. Check for cuts, fraying, and loose parts. Damaged parts should be replaced. Do not disassemble or modify the system.
- ▶ Keep the belts clean and dry. If they need cleaning, use a mild soap solution or lukewarm water. Never use bleach, dye, or abrasive cleaners, or allow them to come into contact with the belt—they may severely weaken the belts. (See “Cleaning the interior” in Section 5.)
- ▶ Replace the belt assembly (including bolts) if it has been used in a severe impact. The entire assembly should be replaced even if damage is not obvious.



Adjust the seat as needed and sit up straight and well back in the seat. To fasten your belt, pull it out of the retractor and insert the tab into the buckle.

You will hear a click when the tab locks into the buckle.

The seat belt length automatically adjusts to your size and the seat position.

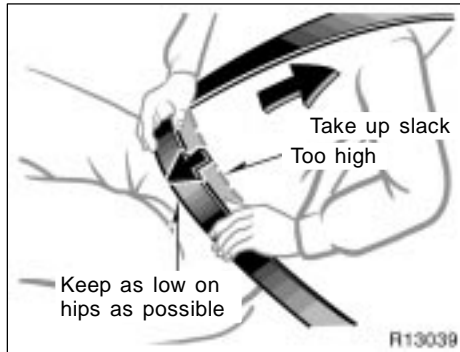
The retractor will lock the belt during a sudden stop or on impact. It also may lock if you lean forward too quickly. A slow, easy motion will allow the belt to extend, and you can move around freely.

When a passenger's shoulder belt is completely extended and is then retracted even slightly, the belt is locked in that position and cannot be extended. This feature is used to hold the child restraint system securely. (For details, see “Child restraint” in this Section.) To free the belt again, fully retract the belt and then pull the belt out once more.

If the seat belt cannot be pulled out of the retractor, firmly pull the belt and release it. You will then be able to smoothly pull the belt out of the retractor.

 CAUTION

- ▶ After inserting the tab, make sure the tab and buckle are locked and that the belt is not twisted.
- ▶ Do not insert coins, clips, etc. in the buckle as this may prevent you from properly latching the tab and buckle.
- ▶ If the seat belt does not function normally, immediately contact your Toyota dealer. Do not use the seat until the seat belt is fixed, because it cannot protect an adult occupant or your child from injury.

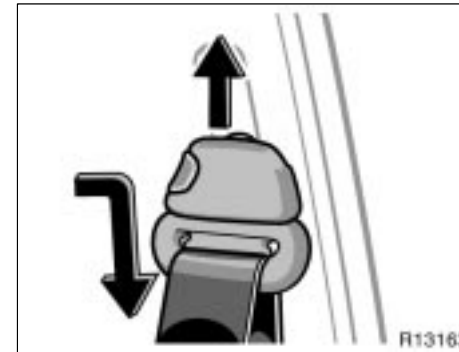


Adjust the position of the lap and shoulder belts.

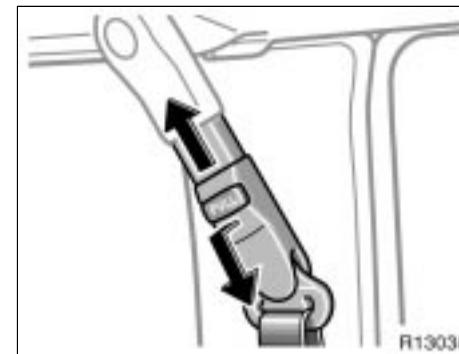
Position the lap belt as low as possible on your hips—not on your waist, then adjust it to a snug fit by pulling the shoulder portion upward through the latch plate.

CAUTION

- ▶ Both high-positioned lap belts and loose-fitting belts could cause serious injuries due to sliding under the lap belt during a collision or other unintended event. Keep the lap belt positioned as low on hips as possible.
- ▶ Do not place the shoulder belt under your arm.



Standard and double cab models



Access cab models

Seat belts with an adjustable shoulder anchor—

Adjust the shoulder anchor position to your size.

Standard and double cab models—

To raise: Slide the anchor up.

To lower: Push in the lock release button and slide the anchor down.

Access cab models—

To raise: Slide the anchor up.

To lower: Pull the lock release knob and slide the anchor down.

After adjustment, make sure the anchor is locked in position.



To release the belt, press the buckle release button and allow the belt to retract.

If the belt does not retract smoothly, pull it out and check for kinks or twists. Then make sure it remains untwisted as it retracts.

FRONT CENTER SEAT BELT (standard cab models with non-split bench seat) AND REAR CENTER SEAT BELT (access cab models)

The center seat belt is a 3-point type restraint with 2 buckles. Both seat belt buckles must be correctly located and securely latched for proper operation.

Make sure buckle 1 (with light gray buckle-release button) is securely latched for ready use of the center seat belt.

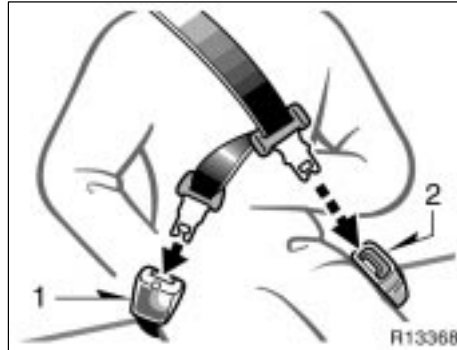
⚠ CAUTION

Always make sure the shoulder belt is positioned across the center of your shoulder. The belt should be kept away from your neck, but not falling off your shoulder. Failure to do so could reduce the amount of protection in an accident and cause severe injuries in a collision.

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**Front center seat belt only—
Make sure the shoulder belt pass
through the guide when using the seat
belt for front center seat.**



**Two buckles and tabs for center seat
belt**

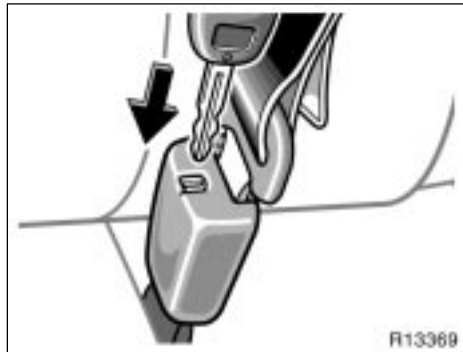
The 2 buckles for the center seat belt are distinguished with colors of the buckle release button. Also the 2 tabs have different shape for its end so that the belt is not buckled in the wrong place.

Buckle 1 (with light gray buckle-release button)—Properly matches with concave end tab

Buckle 2 (with red buckle-release button)—Properly matches with round end tab

CAUTION

Make sure the both buckles are correctly located and securely latched. Failure to properly match the buckle and tab may cause severe injury in case of an accident or a collision.



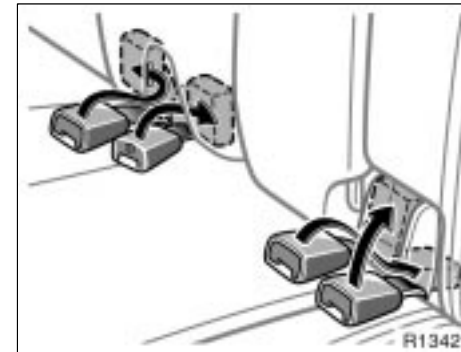
To release the concave end tab, insert the key into the hole on buckle 1 (with light gray buckle-release button) and allow the belt to retract.



! CAUTION

Do not use the center seat belt with either buckle released. Fastening only the shoulder belt or lap belt may cause severe personal injury in case of sudden braking or a collision.

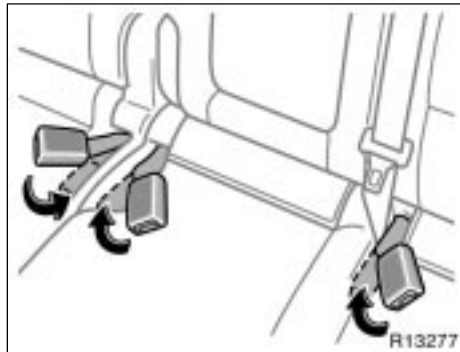
—Stowing the rear seat belt buckles (access cab models)



The rear seat belt buckles can be stowed when not in use.

Seat belt buckles must be stowed before you swing up the bottom cushion. (See “Swing-up rear seats” in this Section.)

—Stowing the rear seat belt buckles (double cab models)



The rear seat belt buckles can be stowed when not in use.

Seat belt buckles must be stowed before you fold the seatback. (See “Tumbling rear seats” in this Section.)

—Seat belt extender

If your seat belts cannot be fastened securely because they are not long enough, a personalized seat belt extender is available from your Toyota dealer free of charge.

Please contact your local Toyota dealer to order the proper required length for the extender. Bring the heaviest coat you expect to wear for proper measurement and selection of length. Additional ordering information is available at your Toyota dealer.



! CAUTION

When using the seat belt extender, observe the following precautions. Failure to follow these instructions could reduce the effectiveness of the seat belt restraint system in case of an accident, increasing the chance of personal injury.

▶ Remember that the extender provided for you may not be safe when used on a different vehicle, for another person, or at a different seating position than the one originally intended.

▶ If the seat belt extender has been connected to the driver's seat belt buckle without wearing the seat belt when using the extender in the driver's seat, the SRS driver's airbag system will judge that the driver wears the seat belt even if not wearing it. In this case, the driver's airbag may not activate correctly, causing death or serious injury in the event of collision. Be sure to wear the seat belt with the seat belt extender.

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▶ Vehicles with separate seat—Make sure the front passenger occupant classification indicator light indicates “ON” when using the seat belt extender for the front passenger seat. If the indicator light indicates “OFF”, disconnect the extender tongue from the seat belt buckle, then reconnect the seat belt. Reconnect the seat belt extender after making sure the indicator light indicates “ON”. If you use the seat belt extender while the indicator light indicates “OFF”, the front passenger airbag and side airbag on the front passenger side may not activate correctly, which could cause death or serious injury in the event of collision.

▶ Be sure to wear the seat belt without the seat belt extender if you can fasten the seat belt without the extender.

▶ Do not use the seat belt extender when installing a child restraint system on the front or rear passenger seat. If installing a child restraint system with the seat belt extender connected to the seat belt, the seat belt will not securely hold the child restraint system, which could cause death or serious injury to the child or other passengers in the event of collision.



To connect the extender to the seat belt, insert the tab into the seat belt buckle so that the “PRESS” signs on the buckle release buttons of the extender and the seat belt are both facing outward as shown.

You will hear a click when the tab locks into the buckle.

When releasing the seat belt, press on the buckle release button on the extender, not on the seat belt. This helps prevent damage to the vehicle interior and extender itself.

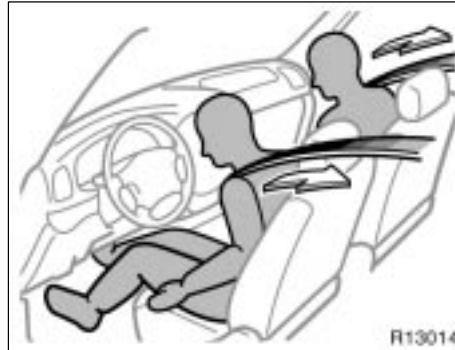
Vehicles with separate seat—As far as the seat belt extender on the front passenger side is concerned, do not fail to disconnect the extender from the seat belt after the above operation in order to activate the front passenger airbag correctly when getting into the vehicle next time.

When not in use, remove the extender and store in the vehicle for future use.

! CAUTION

- ▶ **After inserting the tab, make sure the tab and buckle are locked and that the lap and shoulder portions of the belt and the seat belt extender are not twisted.**
- ▶ **Do not insert coins, clips, etc. in the buckle as this may prevent you from properly latching the tab and buckle.**
- ▶ **If the seat belt does not function normally, immediately contact your Toyota dealer. Do not use the seat until the seat belt is fixed, because it cannot protect an adult occupant or your child from injury.**

—Seat belt pretensioners



The driver and front passenger seat belt pretensioners are designed to be activated in response to a severe frontal impact. On vehicles equipped with curtain shield airbags, the pretensioners are also activated during vehicle rollover.

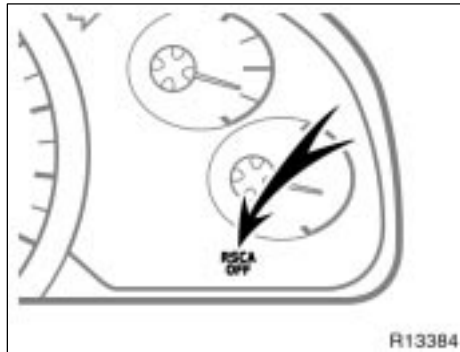
When the sensor detects a severe frontal impact or a vehicle rollover, the front seat belts are quickly drawn back by the retractors so that the belts snugly restrain the occupants.

Vehicles with bench seat—The seat belt pretensioners are activated even with no passenger in the front seat.

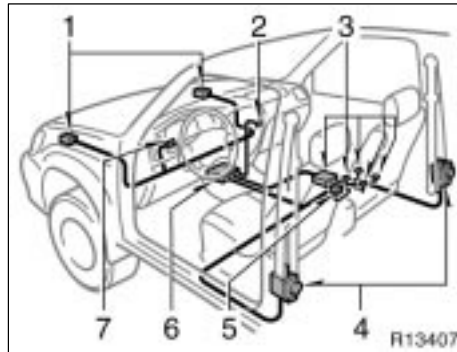
Vehicles with separate seat—The front passenger's seat belt pretensioner will not activate if no passenger is detected in the front passenger seat by the front passenger occupant classification system. However, the front passenger's seat belt pretensioner may activate if luggage is put on the seat, or the seat belt is buckled up regardless of the presence of an occupant in the seat. (As for the front passenger occupant classification system, see "Front passenger occupant classification system" in this Section.)

The seat belt pretensioners and SRS airbags may not operate together in all collisions.

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The seat belt pretensioners will not operate in a vehicle rollover if the "RSCA OFF" indicator light is on. For details, see "Roll sensing of curtain shield airbags off switch" in this Section.



The seat belt pretensioner system consists mainly of the following components and their locations are shown in the illustration.

1. Front airbag sensors
2. Separate seat only—Front passenger occupant classification indicator light
3. Separate seat only—Front passenger occupant classification system (ECU and sensors)
4. Seat belt pretensioner assemblies
5. Front passenger's seat belt buckle switch
6. Airbag sensor assembly
7. SRS warning light

The seat belt pretensioners are controlled by the airbag sensor assembly. The airbag sensor assembly consists of a safing sensor and airbag sensor.

When the seat belt pretensioners are activated, an operating noise may be heard and a small amount of non-toxic gas may be released. This does not indicate that a fire is occurring. This gas is normally harmless.

Once the seat belt pretensioners have been activated, the seat belt retractors remain locked.

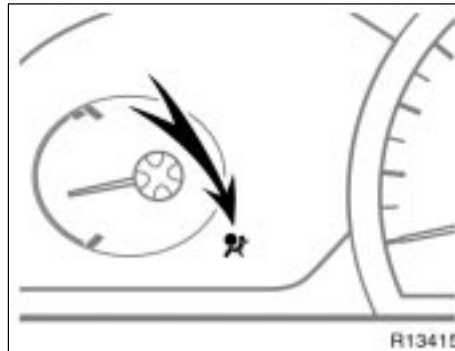
CAUTION

Do not modify, remove, strike or open the seat belt pretensioner assemblies, airbag sensor or surrounding area or wiring. Failure to follow these instructions may prevent the seat belt pretensioners from activating correctly, cause sudden operation of the system or disable the system, which could result in death or serious injury. Consult your Toyota dealer about any repair and modification.

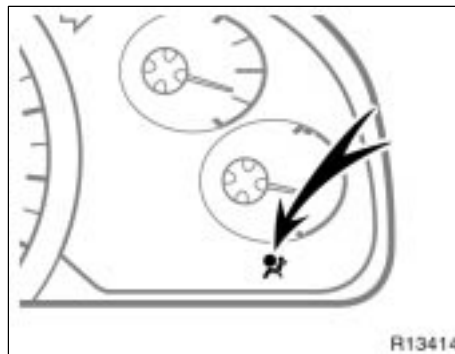
NOTICE

Do not perform any of the following changes without consulting your Toyota dealer. Such changes can interfere with proper operation of the seat belt pretensioners in some cases.

- ◆ *Installation of electronic devices such as a mobile two-way radio, cassette tape player or compact disc player*
- ◆ *Repairs on or near the front seat belt pretensioner assemblies*
- ◆ *Modification of the suspension system*
- ◆ *Modification of the front end structure*
- ◆ *Attachment of a grille guard (bull bar, kangaroo bar, etc.), snowplow, winches or any other equipment to the front end*
- ◆ *Repairs made on or near the front fenders, front end structure or console*



Without tachometer



With tachometer

This indicator comes on when the ignition key is turned to the "ON" position. It goes off after about 6 seconds. This means the seat belt pretensioners are operating properly.

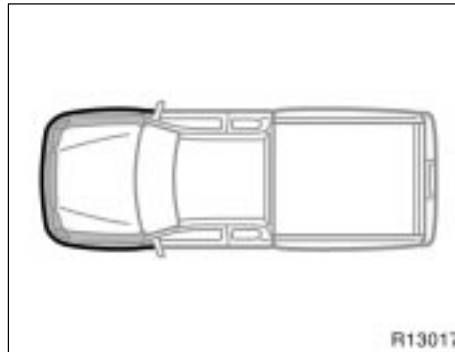
This warning light system monitors the airbag sensor assembly, front airbag sensors, side and curtain shield airbag sensors, curtain shield airbag sensors, driver's seat position sensor, driver's seat belt buckle switch, front passenger occupant classification system and indicator light, passenger airbag manual on-off switch, front passenger's seat belt buckle switch, seat belt pretensioner assemblies, inflators, warning light, interconnecting wiring and power sources. (For details, see "Service reminder indicators and warning buzzers" in Section 1-6.)

If any of the following conditions occurs, this indicates a malfunction of the airbags or seat belt pretensioners. Contact your Toyota dealer as soon as possible.

- ▶ The light does not come on when the ignition key is turned to the "ON" position or remains on for more than 6 seconds.
- ▶ The light comes on while driving.

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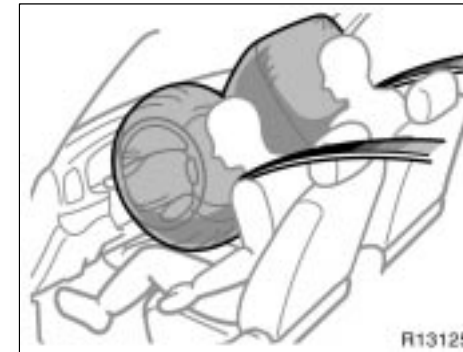
- ▶ If any seat belt does not retract or can not be pulled out due to a malfunction or activation of the relevant seat belt pretensioner.
- ▶ The seat belt pretensioner assembly or surrounding area has been damaged.



In the following cases, contact your Toyota dealer as soon as possible:

- ▶ The front of the vehicle (shaded in the illustration) was involved in an accident that was not severe enough to cause the seat belt pretensioners to operate.
- ▶ Either seat belt pretensioner assembly or surrounding area is scratched, cracked, or otherwise damaged.

SRS driver airbag and front passenger airbag (standard and access cab models)



The SRS (Supplemental Restraint System) airbags are designed to provide further protection for the driver and right front passenger in addition to the primary safety protection provided by the seat belts.


Vehicles with bench seat—The SRS airbags are designed to protect the driver and right front passenger and they are not designed to protect an occupant in the front center seating position.

In response to a severe frontal impact, the SRS airbags work together with the seat belts to help reduce injury by inflating. The SRS airbags help reduce injuries mainly to the driver's or front passenger's head or chest caused by hitting the vehicle interior.

Vehicles with bench seat—The SRS front passenger airbag is activated even with no passenger in the front seat.

Vehicles with separate seat—The SRS front passenger airbag will not activate if there is no passenger sitting in the front passenger seat. However, the front passenger airbag may deploy if luggage is put in the seat, or the seat belt is buckled up, regardless of the presence of an occupant in the seat. (As for the front passenger occupant classification system, see "Front passenger occupant classification system" in this Section.)

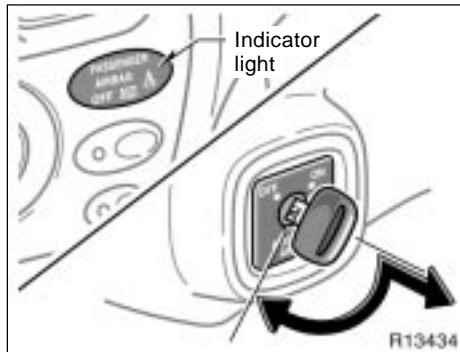
Always wear your seat belt properly.

 **CAUTION**

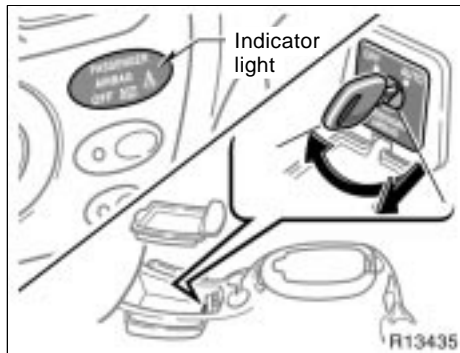
▶ **The SRS airbag system is designed only as a supplement to the primary protection of the driver and front passenger seat belt systems. The driver and front passenger can be killed or seriously injured by the inflating airbags if they do not wear the available seat belts properly. During sudden braking just before a collision, an unrestrained driver or front passenger can move forward into direct contact with or close proximity to the airbag which may then deploy during the collision. To ensure maximum protection in an accident, the driver and all passengers in the vehicle must wear their seat belts properly. Wearing a seat belt properly during an accident reduces the chances of death or serious injury or being thrown out of the vehicle. For instructions and precautions concerning the seat belt system, see "Seat belts" in this Section.**

▶ **Improperly seated and/or restrained infants and children can be killed or seriously injured by the deploying airbags. An infant or child who is too small to use a seat belt should be properly secured using a child restraint system. Toyota strongly recommends that all infants and children be placed in the rear seat of the vehicle and properly restrained. The rear seat is the safest for infants and children. For instructions concerning the installation of a child restraint system, see "Child restraint" in this Section.**

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Except for separate seat with automatic transmission



For separate seat with automatic transmission

The passenger airbag system is equipped with a manual on-off switch and indicator light. Turning the passenger airbag manual on-off switch clockwise to the “ON” or “AUTO” position makes the passenger airbag system operational. To disable the passenger airbag system, turn the manual on-off switch counterclockwise to the “OFF” position and remove the key. The indicator light on the passenger airbag manual on-off switch will come on when the passenger airbag system has been disabled.

See “Passenger airbag manual on-off switch” in this Section for detail.

▶When the passenger airbag manual on-off switch is turned off, the passenger airbag will not inflate in a collision and turning off the passenger airbag can reduce the occupant protection which your vehicle safety systems can provide to you in certain accidents and increase the likelihood of death or serious personal injuries.

CAUTION

▶Do not turn off the passenger airbag manual on-off switch except when a member of a passenger risk group identified in TABLE 1 is occupying the right front passenger seating position.

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TABLE 1: A PASSENGER RISK GROUP
<p>Infant. An infant (less than 1 year old) who must ride in the front seat because:</p> <ul style="list-style-type: none"> ▶ Vehicle has no rear seat; ▶ Vehicle has a rear seat too small to accommodate a rear-facing infant seat; or ▶ The infant has a medical condition which, according to the infant's physician, makes it necessary for the infant to ride in the front seat so that the driver can constantly monitor the child's condition.
<p>Child age 1 to 12. A child age 1 to 12 must ride in the front seat because:</p> <ul style="list-style-type: none"> ▶ Vehicle has no rear seat; ▶ Although children ages 1 to 12 ride in the rear seat(s) whenever possible, children ages 1 to 12 sometimes must ride in the front because no space is available in the rear seat(s) of vehicle; or ▶ The child has a medical condition which, according to the child's physician, makes it necessary for the child to ride in the front seat so that the driver can constantly monitor the child's condition.
<p>Medical condition. A passenger has a medical condition which according to his or her physician:</p> <ul style="list-style-type: none"> ▶ Causes the passenger airbag to pose a special risk for the passenger: and ▶ Makes the potential harm from the passenger airbag in a crash greater than the potential harm from turning off the airbag and allowing the passenger, even if belted, to hit the dashboard, or windshield in a crash.

For more detailed information concerning about the passenger risk group, please contact NHTSA at 1-800-424-9393 or Transport Canada at 1-800-333-0371.

The SRS airbags are designed to deploy in severe (usually frontal) collisions where the magnitude and duration of the forward deceleration of the vehicle exceeds the designed threshold level.

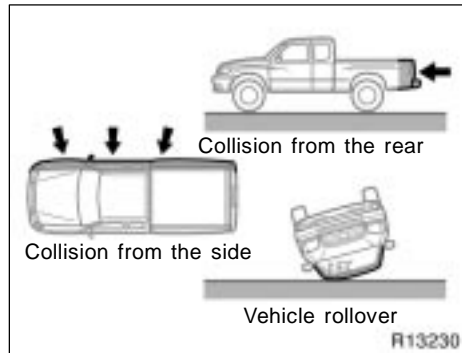
The SRS airbags will deploy if the severity of the impact is above the designed threshold level, comparable to an approximate 25 km/h (15 mph) collision when the vehicle has the impact straight into a fixed barrier that does not move or deform.

However, this threshold velocity will be considerably higher if the vehicle strikes an object, such as a parked vehicle or sign pole, which can move or deform on impact, or if the vehicle is involved in an underride collision (e.g. a collision in which the front of the vehicle "underrides", or goes under, the bed of a truck, etc.).

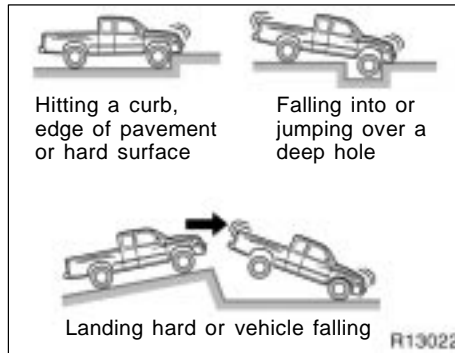
It is possible that in some collisions where the forward deceleration of the vehicle is very close to the designed threshold level, the SRS airbags and front seat belt pretensioners may not activate together.

Always wear your seat belts properly.

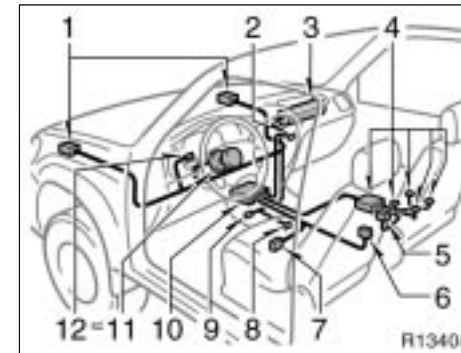
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The SRS airbags are generally not designed to inflate if the vehicle is involved in a side or rear collision, if it rolls over, or if it is involved in a low-speed frontal collision. But, whenever a collision of any type causes sufficient forward deceleration of the vehicle, deployment of the SRS airbags may occur.



The SRS airbags may also deploy if a serious impact occurs to the underside of your vehicle. Some examples are shown in the illustration.



The SRS airbag system consists mainly of the following components, and their locations are shown in the illustration.

1. Front airbag sensors
2. Front passenger occupant classification indicator light or passenger airbag on-off indicator light
3. Airbag module for right front passenger (airbag and inflator)
4. Separate seat only—Front passenger occupant classification system (ECU and sensors)
5. Front passenger's seat belt buckle switch
6. Driver's seat belt buckle switch

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7. Driver's seat position sensor
8. For separate seat with automatic transmission—Passenger airbag manual on-off switch
9. Except for separate seat with automatic transmission—Passenger airbag manual on-off switch
10. Airbag sensor assembly
11. Airbag module for driver (airbag and inflator)
12. SRS warning light

The airbag sensor assembly consists of a safing sensor and airbag sensor.

The front airbag sensors constantly monitor the forward deceleration of the vehicle. If an impact results in a forward deceleration beyond the designed threshold level, the system triggers the airbag inflators. At this time a chemical reaction in the inflators very quickly fills the airbags with non-toxic gas to help restrain the forward motion of the occupants. The airbags then quickly deflate, so that there is no obstruction of the driver's vision should it be necessary to continue driving.

When the airbags inflate, they produce a loud noise and release some smoke and residue along with non-toxic gas. This does not indicate a fire. This smoke may remain inside the vehicle for some time, and may cause some minor irritation to the eyes, skin or breathing. Be sure to wash off any residue as soon as possible to prevent any potential skin irritation with soap and water. If you can safely exit from the vehicle, you should do so immediately.

Deployment of the airbags happens in a fraction of a second, so the airbags must inflate with considerable force. While the system is designed to reduce serious injuries, primarily to the head and chest, it may also cause other, less severe injuries to the face, chest, arms and hands. These are usually in the nature of minor burns or abrasions and swelling, but the force of a deploying airbag can cause more serious injuries, especially if an occupant's hands, arms, chest or head is in close proximity to the airbag module at the time of deployment. This is why it is important for the occupant to: avoid placing any object or part of the body between the occupant and the airbag module; sit straight and well back into the seat; wear the available seat belt properly; and sit as far as possible from the airbag module, while still maintaining control of the vehicle.

Parts of the airbag module (steering wheel hub, airbag cover and inflator) may be hot for several minutes after deployment, so do not touch! The airbags inflate only once. The windshield may be damaged by absorbing some of the force of the inflating airbag.

 CAUTION

The driver or front passenger who is too close to the steering wheel or dashboard during airbag deployment can be killed or seriously injured. Toyota strongly recommends that:

- ▶ The driver sit as far back as possible from the steering wheel while still maintaining control of the vehicle.
- ▶ The front passenger sit as far back as possible from the dashboard.
- ▶ All vehicle occupants be properly restrained using the available seat belts.

For instructions and precautions concerning the seating position, see “—Front seat precautions” in this Section.

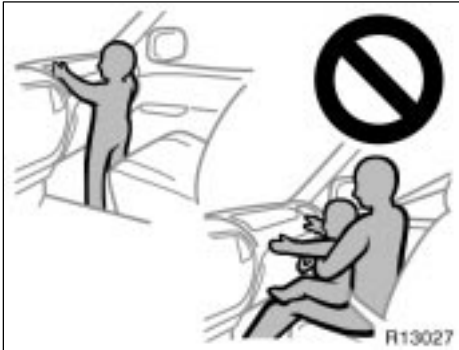
 CAUTION

A member of a passenger risk group should never sit or be occupied in the front outside passenger seat with airbag manual on-off switch in the “ON” or “AUTO” position. (For details, see “SRS driver airbag and front passenger airbag” in this Section.)



- ▶ Do not sit on the edge of the seat or lean against the dashboard when the vehicle is in use, since the front passenger airbag could inflate with considerable speed and force. Anyone who is up against, or very close to, an airbag when it inflates, can be killed or seriously injured. Sit up straight and well back in the seat, and always use your seat belt properly.

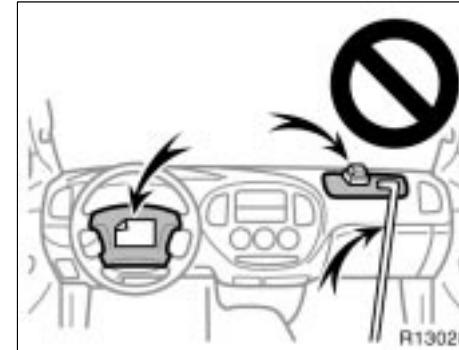
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▶ Do not hold a child on your lap or in your arms. Use a child restraint system in the rear seat. For instructions concerning the installation of a child restraint system, see "Child restraint" in this Section.

▶ Toyota strongly recommends that all infants and children be placed in the rear seat of the vehicle and be properly restrained.

▶ Vehicles with bench seat—Do not allow a child to stand up or kneel on the front passenger seat, since the front passenger airbag could inflate with considerable speed and force. Otherwise, the child may be killed or seriously injured.



▶ Do not put anything or any part of your body on or in front of the dashboard or steering wheel pad that houses the airbag system. They might restrict inflation or cause death or serious injury as they are projected rearward by the force of the deploying airbags. Likewise, the driver and front passenger should not hold objects in their arms or on their knees.

▶ Do not modify or remove any wiring. Do not modify, remove, strike or open any components such as the steering wheel pad, steering wheel, column cover, dashboard near the front passenger airbag, front passenger airbag cover, front passenger airbag or airbag sensor assembly. Doing so may prevent the front airbag system from activating correctly, cause sudden activation of the system or disable the system, which could result in death or serious injury.

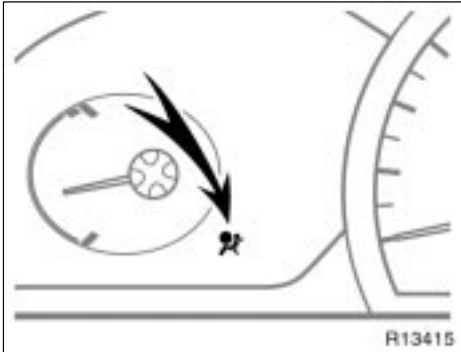
Failure to follow these instructions can result in death or serious injury. Consult your Toyota dealer about any repair and modification.

If you wish to modify your vehicle for a person with physical disability, consult your Toyota dealer. It may dangerously interfere with the SRS front airbags operation.

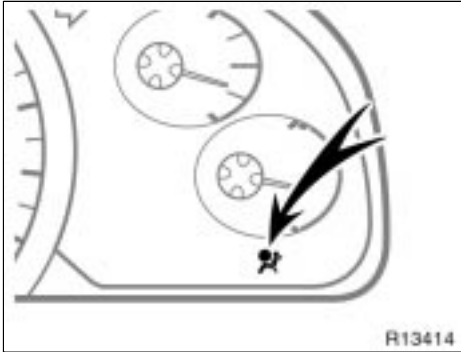
NOTICE

Do not perform any of the following changes without consulting your Toyota dealer. Such changes can interfere with proper operation of the SRS airbag system in some cases.

- ◆ *Installation of electronic devices such as a mobile two-way radio, cassette tape player or compact disc player*
- ◆ *Modification of the suspension system*
- ◆ *Modification of the front end structure*
- ◆ *Attachment of a grille guard (bull bar, kangaroo bar, etc.), snowplow, winches or any other equipment to the front end*
- ◆ *Repairs made on or near the front fenders, front end structure, console, steering column, steering wheel or dashboard near the front passenger airbag*



Without tachometer



With tachometer

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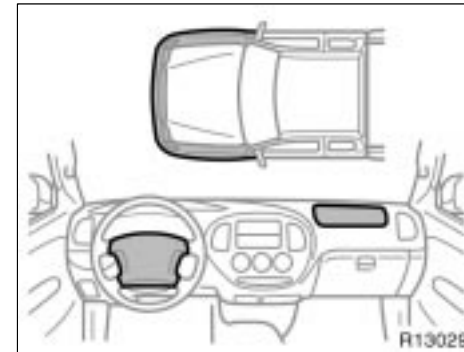
This indicator comes on when the ignition key is turned to the "ON" position. It goes off after about 6 seconds. This means the SRS airbags are operating properly.

This warning light system monitors the airbag sensor assembly, front airbag sensors, side and curtain shield airbag sensors, curtain shield airbag sensors, driver's seat position sensor, driver's seat belt buckle switch, front passenger occupant classification system and indicator light, passenger airbag manual on-off switch, front passenger's seat belt buckle switch, seat belt pretensioner assemblies, inflators, warning light, interconnecting wiring and power sources. (For details, see "Service reminder indicators and warning buzzers" in Section 1-6.)

If either of the following conditions occurs, this indicates a malfunction of the airbags or seat belt pretensioners. Contact your Toyota dealer as soon as possible.

- ▶ The light does not come on when the ignition key is turned to the "ON" position or remains on for more than 6 seconds.
- ▶ The light comes on while driving.

Vehicles with separate seat—The SRS warning light will come on and front passenger occupant classification indicator light will indicate "OFF" if there is a malfunction in the front passenger occupant classification system.



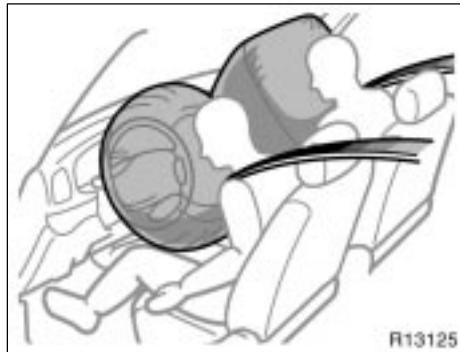
In the following cases, contact your Toyota dealer as soon as possible:

- ▶ The SRS airbags have been inflated.
- ▶ The front of the vehicle (shaded in the illustration) was involved in an accident that was not severe enough to cause the SRS airbags to inflate.
- ▶ The pad section of the steering wheel or front passenger airbag cover (shaded in the illustration) is scratched, cracked, or otherwise damaged.

NOTICE

Do not disconnect the battery cables before contacting your Toyota dealer.

SRS driver airbag and front passenger airbag (double cab models)



The SRS (Supplemental Restraint System) airbags are designed to provide further protection for the driver and front passenger in addition to the primary safety protection provided by the seat belts.

In response to a severe frontal impact, the SRS front airbags work together with the seat belts to help reduce injury by inflating. The SRS front airbags help reduce injuries mainly to the driver's or front passenger's head or chest caused by hitting the vehicle interior.

Vehicles with split bench seat—The SRS front passenger airbag is activated even with no passenger in the front seat.

Vehicles with separate seat—The SRS front passenger airbag will not activate if there is no passenger sitting in the front passenger seat. However, the front passenger airbag may deploy if luggage is put in the seat, or the seat belt is buckled up, regardless of the presence of an occupant in the seat. (As for the front passenger occupant classification system, see "Front passenger occupant classification system" in this Section.)

Always wear your seat belt properly.

CAUTION

▶ The SRS front airbag system is designed only as a supplement to the primary protection of the driver and front passenger seat belt systems. The driver and front passenger can be killed or seriously injured by the inflating airbags if they do not wear the available seat belts properly. During sudden braking just before a collision, an unrestrained driver or front passenger can move forward into direct contact with or close proximity to the airbag which may then deploy during the collision. To ensure maximum protection in an accident, the driver and all passengers in the vehicle must wear their seat belts properly. Wearing a seat belt properly during an accident reduces the chances of death or serious injury or being thrown out of the vehicle. For instructions and precautions concerning the seat belt system, see "Seat belts" in this Section.

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► Improperly seated and/or restrained infants and children can be killed or seriously injured by the deploying airbags. An infant or child who is too small to use a seat belt should be properly secured using a child restraint system. Toyota strongly recommends that all infants and children be placed in the rear seat of the vehicle and properly restrained. The rear seat is the safest for infants and children. For instructions concerning the installation of a child restraint system, see "Child restraint" in this Section.

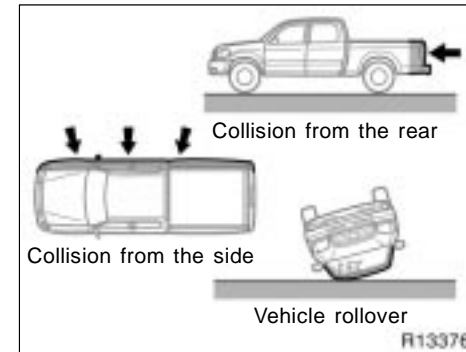
The SRS front airbags are designed to deploy in severe (usually frontal) collisions where the magnitude and duration of the forward deceleration of the vehicle exceeds the designed threshold level.

The SRS front airbags will deploy if the severity of the impact is above the designed threshold level, comparable to an approximate 25 km/h (15 mph) collision when the vehicle has the impact straight into a fixed barrier that does not move or deform.

However, this threshold velocity will be considerably higher if the vehicle strikes an object, such as a parked vehicle or sign pole, which can move or deform on impact, or if the vehicle is involved in an underride collision (e.g. a collision in which the front of the vehicle "underrides", or goes under, the bed of a truck, etc.).

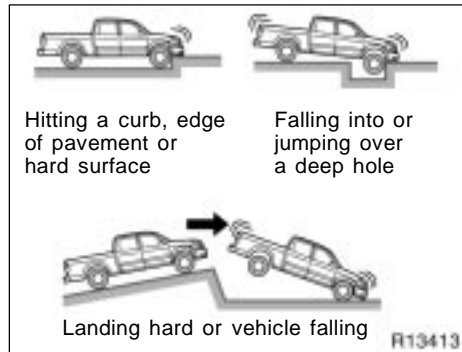
It is possible that in some collisions where the forward deceleration of the vehicle is very close to the designed threshold level, the SRS front airbags and the seat belt pretensioners may not activate together.

Always wear your seat belts properly.

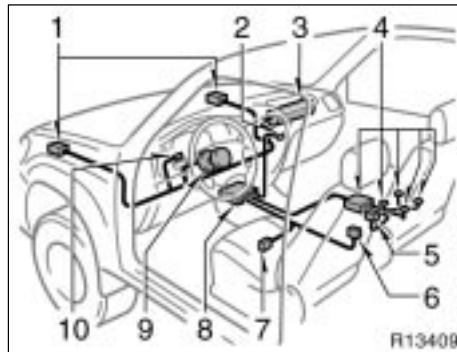


The SRS front airbags are generally not designed to inflate if the vehicle is involved in a side or rear collision, if it rolls over, or if it is involved in a low-speed frontal collision. But, whenever a collision of any type causes sufficient forward deceleration of the vehicle, deployment of the SRS front airbags may occur.

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The SRS front airbags may also deploy if a serious impact occurs to the underside of your vehicle. Some examples are shown in the illustration.



The SRS front airbag system consists mainly of the following components, and their locations are shown in the illustration.

1. Front airbag sensors
2. Separate seat only—Front passenger occupant classification indicator light
3. Airbag module for front passenger (airbag and inflator)
4. Separate seat only—Front passenger occupant classification system (ECU and sensors)
5. Front passenger's seat belt buckle switch
6. Driver's seat belt buckle switch

7. Driver's seat position sensor
8. Airbag sensor assembly
9. Airbag module for driver (airbag and inflator)
10. SRS warning light

The airbag sensor assembly consists of a safing sensor and airbag sensor.


The front airbag sensors constantly monitor the forward deceleration of the vehicle. If an impact results in a forward deceleration beyond the designed threshold level, the system triggers the airbag inflators. At this time a chemical reaction in the inflators very quickly fills the airbags with non-toxic gas to help restrain the forward motion of the occupants. The airbags then quickly deflate, so that there is no obstruction of the driver's vision should it be necessary to continue driving.

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When the airbags inflate, they produce a loud noise and release some smoke and residue along with non-toxic gas. This does not indicate a fire. This smoke may remain inside the vehicle for some time, and may cause some minor irritation to the eyes, skin or breathing. Be sure to wash off any residue as soon as possible to prevent any potential skin irritation with soap and water. If you can safely exit from the vehicle, you should do so immediately.

Deployment of the airbags happens in a fraction of a second, so the airbags must inflate with considerable force. While the system is designed to reduce serious injuries, primarily to the head and chest, it may also cause other, less severe injuries to the face, chest, arms and hands. These are usually in the nature of minor burns or abrasions and swelling, but the force of a deploying airbag can cause more serious injuries, especially if an occupant's hands, arms, chest or head is in close proximity to the airbag module at the time of deployment. This is why it is important for the occupant to: avoid placing any object or part of the body between the occupant and the airbag module; sit straight and well back into the seat; wear the available seat belt properly; and sit as far as possible from the airbag module, while still maintaining control of the vehicle.

Parts of the airbag module (steering wheel hub, airbag cover and inflator) may be hot for several minutes after deployment, so do not touch! The airbags inflate only once. The windshield may be damaged by absorbing some of the force of the inflating airbag.

 **CAUTION**

The driver or front passenger who is too close to the steering wheel or dashboard during airbag deployment can be killed or seriously injured. Toyota strongly recommends that:

- ▶ **The driver sit as far back as possible from the steering wheel while still maintaining control of the vehicle.**
- ▶ **The front passenger sit as far back as possible from the dashboard.**
- ▶ **All vehicle occupants be properly restrained using the available seat belts.**

For instructions and precautions concerning the seating position, see “—Front seat precautions” in this Section.



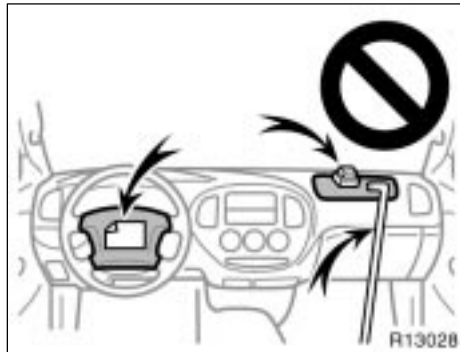
▶ Do not sit on the edge of the seat or lean against the dashboard when the vehicle is in use, since the front passenger airbag could inflate with considerable speed and force. Anyone who is up against, or very close to, an airbag when it inflates, can be killed or seriously injured. Sit up straight and well back in the seat, and always use your seat belt properly.



▶ Toyota strongly recommends that all infants and children be placed in the rear seat of the vehicle and be properly restrained.

▶ Vehicles with split bench seat—Do not allow a child to stand up or kneel on the front passenger seat, since the front passenger airbag could inflate with considerable speed and force. Otherwise, the child may be killed or seriously injured.

▶ Do not hold a child on your lap or in your arms. Use a child restraint system in the rear seat. For instructions concerning the installation of a child restraint system, see “Child restraint” in this Section.



▶ Do not put anything or any part of your body on or in front of the dashboard or steering wheel pad that houses the airbag system. They might restrict inflation or cause death or serious injury as they are projected rearward by the force of the deploying airbags. Likewise, the driver and front passenger should not hold objects in their arms or on their knees.

▶ Do not modify or remove any wiring. Do not modify, remove, strike or open any components such as the steering wheel pad, steering wheel, column cover, dashboard near the front passenger airbag, front passenger airbag cover, front passenger airbag or airbag sensor assembly. Doing so may prevent the front airbag system from activating correctly, cause sudden activation of the system or disable the system, which could result in death or serious injury.

Failure to follow these instructions can result in death or serious injury. Consult your Toyota dealer about any repair and modification.

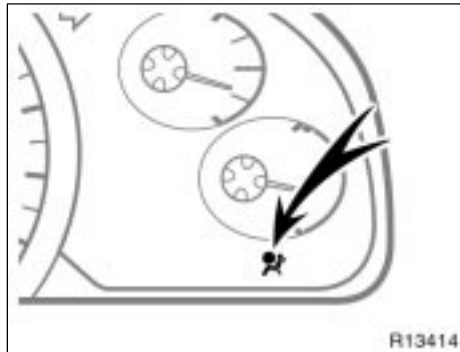
If you wish to modify your vehicle for a person with physical disability, consult your Toyota dealer. It may dangerously interfere with the SRS front airbags operation.

NOTICE

Do not perform any of the following changes without consulting your Toyota dealer. Such changes can interfere with proper operation of the SRS front airbag system in some cases.

- ◆ *Installation of electronic devices such as a mobile two-way radio, cassette tape player or compact disc player*
- ◆ *Modification of the suspension system*
- ◆ *Modification of the front end structure*
- ◆ *Attachment of a grille guard (bull bar, kangaroo bar, etc.), snowplow, winches or any other equipment to the front end*
- ◆ *Repairs made on or near the front fenders, front end structure, console, steering column, steering wheel or dashboard near the front passenger airbag*

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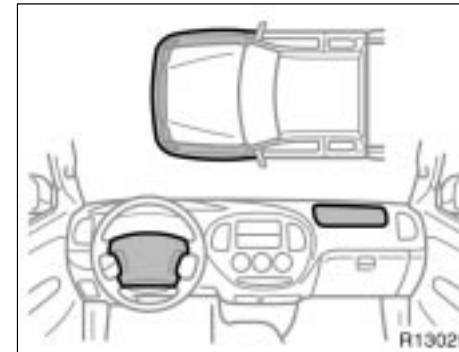
This indicator comes on when the ignition key is turned to the "ON" position. It goes off after about 6 seconds. This means the SRS front airbags are operating properly.

This warning light system monitors the airbag sensor assembly, front airbag sensors, side and curtain shield airbag sensors, curtain shield airbag sensors, driver's seat position sensor, driver's seat belt buckle switch, front passenger occupant classification system and indicator light, front passenger's seat belt buckle switch, seat belt pretensioner assemblies, inflators, warning light, interconnecting wiring and power sources. (For details, see "Service reminder indicators and warning buzzers" in Section 1-6.)

If either of the following conditions occurs, this indicates a malfunction of the airbags or seat belt pretensioners. Contact your Toyota dealer as soon as possible.

- ▶ The light does not come on when the ignition key is turned to the "ON" position or remains on for more than 6 seconds.
- ▶ The light comes on while driving.

Vehicles with separate seat—The SRS warning light will come on and front passenger occupant classification indicator light will indicate "OFF" if there is a malfunction in the front passenger occupant classification system.



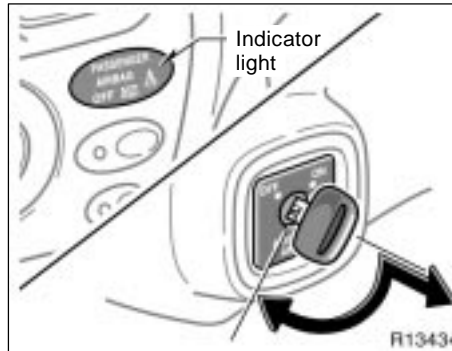
In the following cases, contact your Toyota dealer as soon as possible:

- ▶ The SRS front airbags have been inflated.
- ▶ The front of the vehicle (shaded in the illustration) was involved in an accident that was not severe enough to cause the SRS front airbags to inflate.
- ▶ The pad section of the steering wheel or front passenger airbag cover (shaded in the illustration) is scratched, cracked, or otherwise damaged.

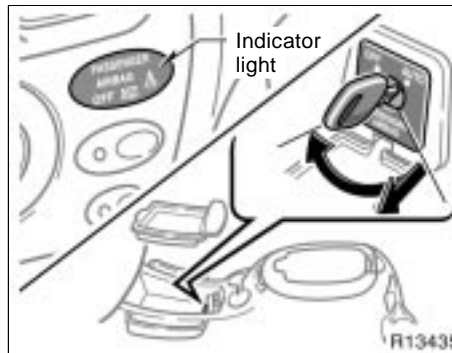
**Passenger airbag manual
on-off switch (standard cab
and access cab models only)**

NOTICE

*Do not disconnect the battery cables
before contacting your Toyota dealer.*



Except for separate seat with automatic transmission



For separate seat with automatic transmission

This on-off switch is designed to disable the passenger airbag in order to allow usage, if necessary, of a member of a passenger risk group identified in TABLE 1 is occupying the right front passenger seating position. (For details, see “SRS driver airbag and front passenger airbag” in this Section.)

Operate on-off switch as follows:

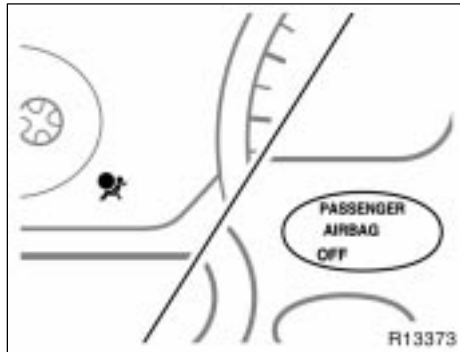
Insert key into the keyhole.

To turn passenger airbag on—

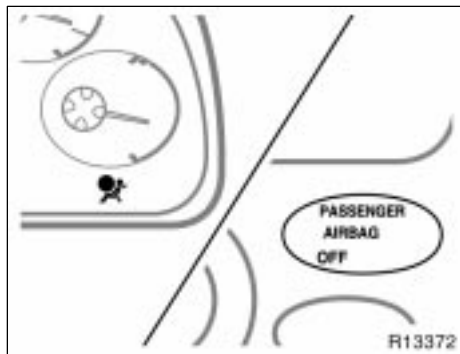
Except for separate seat with automatic transmission: Turn the key clockwise to the “ON” position. At this time, the “ON” indicator light comes on.

For separate seat with automatic transmission: Turn the key clockwise to the “AUTO” position. At this time, the indicator light condition varies depending on the occupant in the right front seat. (For details, see “Front passenger occupant classification system” in the Section.)

To turn passenger airbag off—Turn the key counterclockwise to the “OFF” position and remove it. At this time, the “OFF” indicator light comes on. If the key is removed at any other position than “OFF”, the switch will automatically return to the “ON” or “AUTO” position.



Without tachometer



With tachometer

The SRS warning light and the front passenger occupant classification indicator light or passenger airbag manual on-off indicator light will indicate "OFF" if there is a malfunction in the passenger airbag manual on-off switch.

CAUTION

▶ Do not turn off the passenger airbag manual on-off switch except when a member of a passenger risk group identified in TABLE 1 is occupying the right front passenger seating position.

▶ When the passenger airbag manual on-off switch is turned off, the passenger airbag will not inflate in a collision and turning off the passenger airbag can reduce the occupant protection which your vehicle safety systems can provide to you in certain accidents and increase the likelihood of serious personal injuries.

For details, see "SRS driver airbag and front passenger airbag" in this Section.

SRS side airbags and curtain shield airbags



The SRS (Supplemental Restraint System) side airbags and curtain shield airbags are designed to provide further protection for the driver, front passenger and rear outside passengers in addition to the primary safety protection provided by the seat belts.

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In response to a severe side impact, the SRS side airbags and curtain shield airbags work with the seat belts to help reduce injury by inflating. The SRS side airbags help reduce injuries mainly to the driver's or front passenger's chest and the SRS curtain shield airbags help reduce injuries mainly to the driver's, front passenger's or rear outside passenger's head.

Vehicles with separate seat—The SRS side airbag on the passenger seat will not activate if there is no passenger sitting in the front passenger seat. However, the side airbag on the passenger seat may deploy if luggage is put in the seat, or the seat belt is buckled up, regardless of the presence of an occupant in the seat. (As for the front passenger occupant classification system, see "Front passenger occupant classification system" in this Section.)

Roll sensing function:

In response to a vehicle rollover, the curtain shield airbags on both sides work with the seat belts to help reduce injury by inflating. The curtain shield airbags help reduce injuries mainly to the driver's or front passenger's head and help prevent them from being thrown out of the vehicle. (This function can be turned off if inflation is not desired. See "Roll sensing of curtain shield airbags off switch" in this Section.)

The SRS curtain shield airbag on the passenger side are activated even with no passenger in the front seat or rear outside seat.

The SRS curtain shield airbags may activate even when the side airbags are not activated.

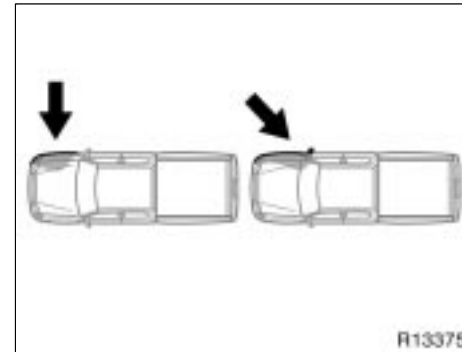
Always wear your seat belt properly.

CAUTION

► **The SRS side airbag and curtain shield airbag system is designed only as a supplement to the primary protection of the driver, front passenger and rear outside passenger seat belt systems. To ensure maximum protection in an accident, the driver and all passengers in the vehicle must wear their seat belts properly. Wearing a seat belt properly during an accident reduces the chances of death or serious injury or being thrown out of the vehicle. For instructions and precautions concerning the seat belt system, see "Seat belts" in this Section.**

▶ Do not allow anyone to lean his/her head or any part of his/her body against the door or the area of the seat, front pillar, rear pillar or roof side rail from which the SRS side airbag and curtain shield airbag deploy even if he/she is a child seated in the child restraint system. It is dangerous if the SRS side airbag and curtain shield airbag inflate, and the impact of the deploying airbag could cause death or serious injury to the occupant.

▶ Improperly seated and/or restrained infants and children can be killed or seriously injured by the deploying airbags. An infant or child who is too small to use a seat belt should be properly secured using a child restraint system. Toyota strongly recommends that all infants and children be placed in the rear seats of the vehicle and properly restrained. The rear seats are the safest for infants and children. For instructions concerning the installation of a child restraint system, see "Child restraint" in this Section.



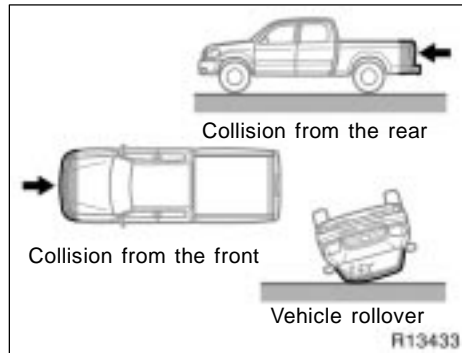
The SRS side airbag and curtain shield airbag system may not activate if the vehicle is subjected to a collision from the side at certain angles, or a collision to the side of the vehicle body other than the passenger compartment as shown in the illustration.

The SRS side airbags are designed to inflate when the passenger compartment area suffers a severe impact from the side.

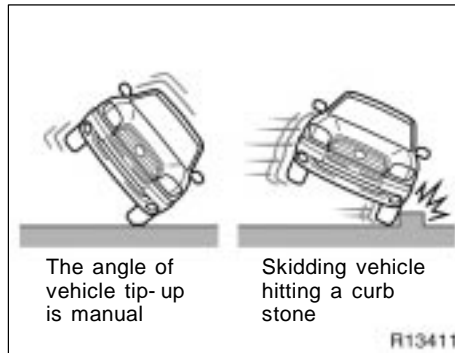
The curtain shield airbags are designed to inflate when the passenger compartment area suffers a severe impact from the side or vehicle rollover.

Always wear your seat belts properly.

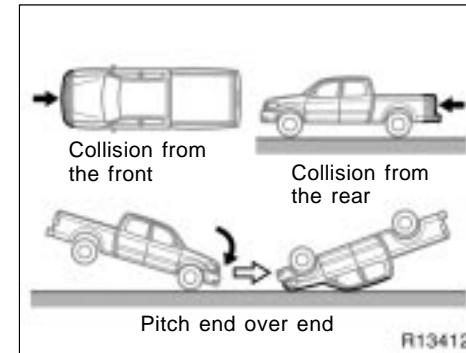
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The SRS side airbags are not generally designed to inflate if the vehicle is involved in a front or rear collision, if it rolls over, or if it is involved in a low-speed side collision.

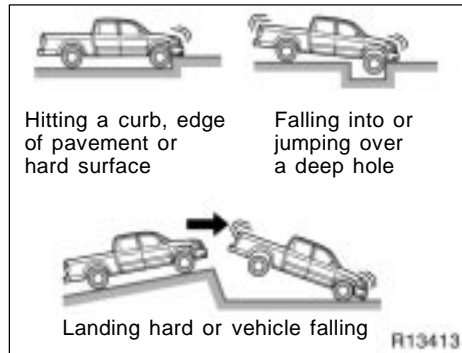


The curtain shield airbags may inflate if the angle of vehicle tip-up is marginal or if the skidding vehicle's tires hit a curb stone laterally as shown in the illustration.

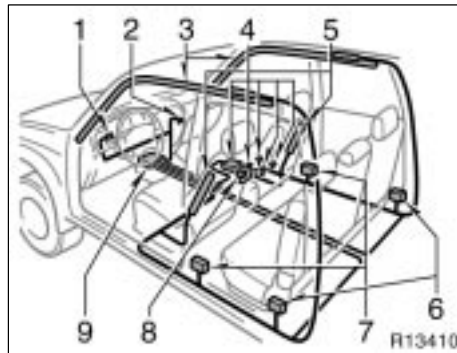


The curtain shield airbags are not generally designed to inflate if the vehicle is involved in a front or rear collision, if it pitches end over end, or if it is involved in a low-speed side collision.

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The SRS side and curtain shield airbags may deploy if a serious impact occurs to the underside of your vehicle. Some examples are shown in the illustration.



The SRS side airbag and curtain shield airbag system consists mainly of the following components, and their locations are shown in the illustration.

1. SRS warning light
2. Separate seat only—Front passenger occupant classification indicator light
3. Curtain shield airbag modules (airbag and inflator)
4. Separate seat only—Front passenger occupant classification system (ECU and sensors)
5. Side airbag modules (airbag and inflator)
6. Curtain shield airbag sensors

7. Side and curtain shield airbag sensors
8. Front passenger's seat belt buckle switch
9. Airbag sensor assembly

The SRS side airbag and curtain shield airbag system is controlled by the airbag sensor assembly. The airbag sensor assembly consists of a safing sensor and airbag sensor.

In a severe side impact, the side and curtain shield airbag sensor and/or the curtain shield airbag sensor trigger(s) the side airbag inflators and/or the curtain shield airbag inflators. At this time a chemical reaction in the inflators quickly fills the airbags with non-toxic gas to help restrain the lateral motion of the occupants.

In a vehicle rollover, the airbag sensor assembly triggers the curtain shield airbag inflator. At this time, a chemical reaction in the inflators quickly fills the airbags with non-toxic gas to help restrain the lateral motion of the occupants.

When the airbags inflate, they produce a fairly loud noise and release some smoke and residue along with non-toxic gas. This does not indicate a fire. This smoke may remain inside the vehicle for some time, and may cause some minor irritation to the eyes, skin or breathing. Be sure to wash off any residue as soon as possible to prevent any potential skin irritation with soap and water. If you can safely exit from the vehicle, you should do so immediately.

Deployment of the airbags happens in a fraction of a second, so the airbags must inflate with considerable force. While the system is designed to reduce serious injuries, it may also cause minor burns or abrasions and swelling.

Front seats as well as parts of the front and rear pillars, and roof side rail may be hot for several minutes, but the airbags themselves will not be hot. The airbags are designed to inflate only once.

⚠ CAUTION

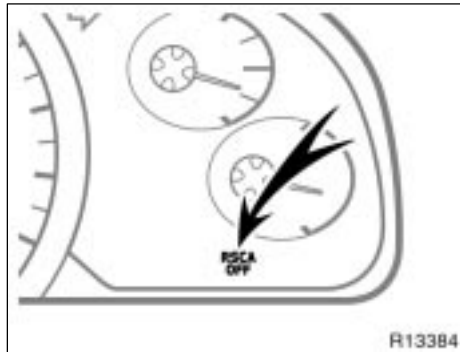
SRS side airbags and curtain shield airbags inflate with considerable force. To reduce the possibility of death or serious injury when they inflate, the driver, front passenger and rear outside passengers must:

- ▶ **Wear their seat belts properly.**
- ▶ **Remain properly seated with their backs upright and against the seats at all times.**



- ▶ **Do not allow anyone to lean against the door when the vehicle is in use, since the side airbag and curtain shield airbag could inflate with considerable speed and force. Otherwise, he/she may be killed or seriously injured. Special care should be taken especially when you have a small child in the vehicle.**
- ▶ **Sit up straight and well back in the seat, distributing your weight evenly in the seat. Do not apply excessive weight to the outer side of the seats with a side airbag, and to the front pillar, rear pillar and roof side rail with a curtain shield airbag.**

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► Make sure the "RSCA OFF" indicator light is off. The curtain shield airbags will not inflate in a vehicle rollover if this indicator light is on and you may be killed or seriously injured. For details, see "Roll sensing of curtain shield airbags off switch" in this Section.



► Do not allow anyone to get his/her head closer to the area where the side airbag and curtain shield airbag inflate, since these airbags could inflate with considerable speed and force. Otherwise, he/she may be killed or seriously injured. Special care should be taken especially when you have a small child in the vehicle.

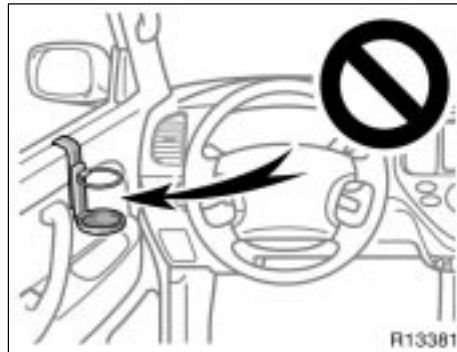


► Do not allow anyone to kneel on the passenger seat, facing the passenger's side door, since the side airbag and curtain shield airbag could inflate with considerable speed and force. Otherwise, he/she may be killed or seriously injured. Special care should be taken especially when you have a small child in the vehicle.

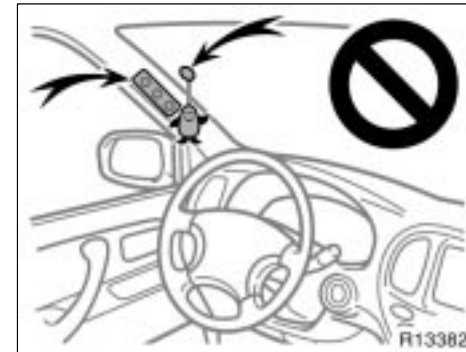
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▶ Do not allow anyone to get his/her head or hands out of windows since the curtain shield airbags could inflate with considerable speed and force. Otherwise, he/she may be killed or seriously injured. Special care should be taken especially when you have a small child in the vehicle.



▶ Do not attach a cup holder or any other device or object on or around the door. When the side airbag inflates, the cup holder or any other device or object will be thrown with great force or the side airbag may not activate correctly, resulting in death or serious injury. Likewise, the driver and front passenger should not hold objects in their arms or on their knees.



▶ Do not attach a microphone or any other device or object around the area where the curtain shield airbag activates such as on the windshield glass, side door glass, front and rear pillars, roof side rail and assist grips. When the curtain shield airbag inflates, the microphone or other device or object will be thrown away with great force or the curtain shield airbag may not activate correctly, resulting in death or serious injury.

- ▶ Do not hook a hanger, heavy or sharp pointed objects on the coat hook. If the curtain shield airbag inflates, those items will be thrown away with great force or the curtain shield airbag may not activate correctly, resulting in death or serious injury. When you hang clothes, hang them on the coat hook directly.
- ▶ Do not use seat accessories which cover the parts where the side airbags inflate. Such accessories may prevent the side airbags from activating correctly, causing death or serious injury.
- ▶ Do not modify or replace the seats or upholstery of the seats with side airbags. Such changes may prevent the side airbag system from activating correctly, disable the system or cause the side airbags to inflate accidentally, resulting in death or serious injury.

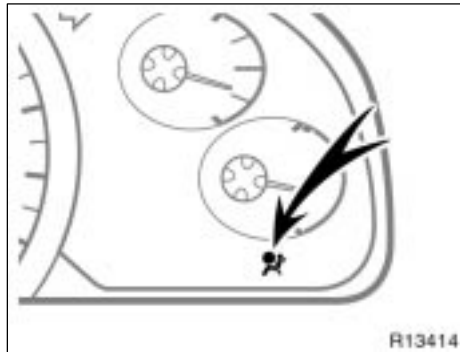
- ▶ Do not disassemble or repair the front and rear pillars and roof side rails containing the curtain shield airbags. Such changes may disable the system or cause the curtain shield airbags to inflate accidentally, resulting in death or serious injury.
 - ▶ Do not use tires or wheels other than the manufacturer's recommended size. Such a use may cause the curtain shield airbags to inflate accidentally, which could result in death or serious injury. For details, see "Checking and replacing tires" in Section 7-2.
- Failure to follow these instructions can result in death or serious injury. Consult your Toyota dealer about any repair and modification.
- If you wish to modify your vehicle for a person with physical disability, consult your Toyota dealer. It may dangerously interfere with the SRS side airbags and curtain shield airbags operation.

NOTICE

Do not perform any of the following changes without consulting your Toyota dealer. Such changes can interfere with proper operation of the SRS side airbag and curtain shield airbag system in some cases.

- ◆ *Installation of electronic devices such as a mobile two-way radio, cassette tape player or compact disc player*
- ◆ *Modification of the suspension system*
- ◆ *Modification of the side structure of the passenger compartment*
- ◆ *Repairs made on or near the console or front seat*

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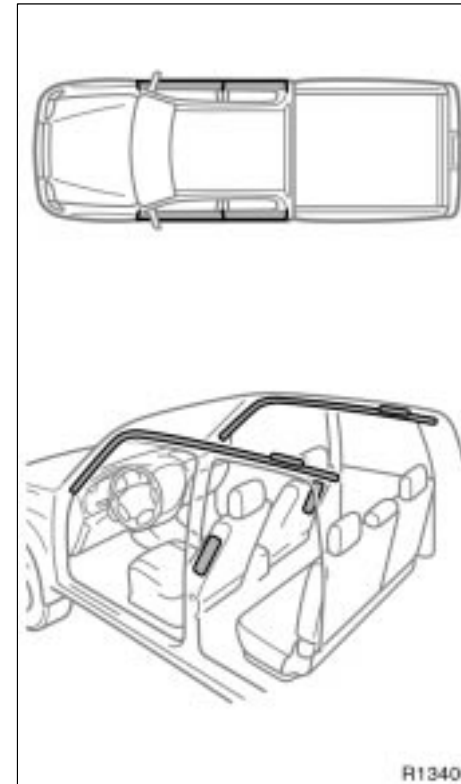
This indicator comes on when the ignition key is turned to the "ON" position. It goes off after about 6 seconds. This means the SRS side airbags and curtain shield airbags are operating properly.

This warning light system monitors the airbag sensor assembly, front airbag sensors, side and curtain shield airbag sensors, curtain shield airbag sensors, driver's seat position sensor, driver's seat belt buckle switch, front passenger occupant classification system and indicator light, front passenger's seat belt buckle switch, seat belt pretensioner assemblies, inflators, warning light, "RSCA OFF" indicator light, interconnecting wiring and power sources. (For details, see "Service reminder indicators and warning buzzers" in Section 1-6.)

If either of the following conditions occurs, this indicates a malfunction of the airbags or seat belt pretensioners. Contact your Toyota dealer as soon as possible.

- ▶ The light does not come on when the ignition key is turned to the "ON" position or remains on for more than 6 seconds.
- ▶ The light comes on while driving.

Vehicles with separate seat only—The SRS warning light will come on and front passenger occupant classification indicator light will indicate "OFF" if there is a malfunction in the front passenger occupant classification system.



In the following cases, contact your Toyota dealer as soon as possible:

- ▶ Any of the SRS side airbags and curtain shield airbags have been inflated.
- ▶ The portion of the doors (shaded in the illustration) was involved in an accident that was not severe enough to cause the SRS side airbags and curtain shield airbags to inflate.
- ▶ The surface of the seats with the side airbag (shaded in the illustration) is scratched, cracked, or otherwise damaged.
- ▶ The portion of the front pillars, rear pillars or roof side rail garnishes (padding) containing the curtain shield airbags inside (shaded in the illustration) is scratched, cracked, or otherwise damaged.

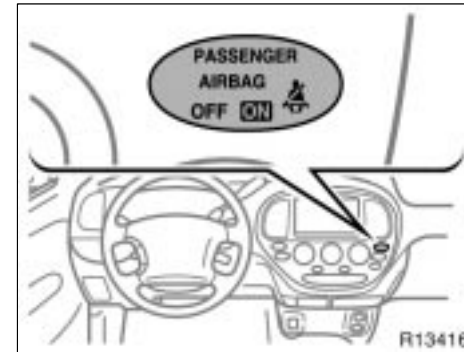
NOTICE

Do not disconnect the battery cables before contacting your Toyota dealer.

Front passenger occupant classification system (separate seat only)

Your vehicle is equipped with a front passenger occupant classification system. This system detects the conditions 1—4 in the table and based on these conditions activates or deactivates front passenger airbags. The system monitors the weight and load on the front passenger seat, and the seat belt buckle switch to determine conditions 1—4. In order for the system to detect the conditions correctly, do not do any of the following.

- ▶ Put a heavy load on the front passenger seat.
- ▶ Attach a seatback table to the front passenger seatback.
- ▶ Put weight on the front passenger by putting your hands or feet on the front passenger seatback from the rear passenger seat.



The front passenger occupant classification indicator light indicates the actuation of the front passenger airbag, side airbag on the front passenger seat and front passenger's seat belt pretensioner.

The indicator light will indicate "OFF" when the ignition switch is in the "ON" position with the condition 2 in the table shown below.

If the front passenger occupant classification system determines that a person of adult size sits in the front passenger seat but the "OFF" indicator is illuminated, one of the following is likely to have occurred:

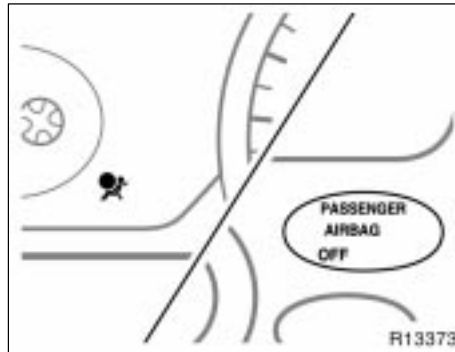
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- ▶ A rear passenger lifts the front passenger seat cushion with their legs.
- ▶ Objects are placed under the front passenger seat.
- ▶ The front passenger seatback is in contact with the rear seat.

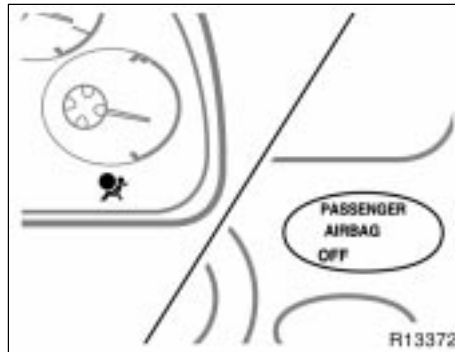
To ensure the system correctly detects an adult sitting in the front passenger seat, make sure the above do not occur.

Make sure that the "ON" indicator is illuminated when an adult is seated in the front passenger seat. If the "OFF" indicator is illuminated, ask the passenger to sit up straight, well back in the seat, and with the seat belt worn correctly. If the "OFF" indicator still remains illuminated, either ask the passenger to move to the rear seat, or if that is not possible, move the front passenger seat fully rearward.

The front passenger occupant classification indicator light will indicate "ON" and "OFF" when the ignition key is turned to the "ON" position. After about four seconds, it will go off. After that, the front passenger occupant classification system operates and judges whether to indicate "ON" or "OFF".



Without tachometer



With tachometer

The SRS warning light will come on and front passenger occupant classification indicator light will indicate "OFF" if there is a malfunction in the front passenger occupant classification system.

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Condition and operation in the front passenger occupant classification system

Access cab models

Condition detected by the front passenger occupant classification system	Passenger airbag on-off switch position	Indicator/warning light			Devices	
		Front passenger occupant classification indicator light	SRS warning light	Front passenger's seat belt reminder light	Front passenger airbag	Front passenger's seat belt pretensioner
1. Adult*1	"AUTO"	"ON"	Off	Flashing*4	Activated	Activated
	"OFF"	"OFF"			Deactivated	
2. Child*2 or child restraint system*3	"AUTO"	"OFF"	Off	Flashing*4	Deactivated	Activated
	"OFF"					
3. Unoccupied	"AUTO"	Not illuminated	Off	Off	Deactivated	
	"OFF"	"OFF"				
4. There is a malfunction in the system	"AUTO"	"OFF"	On	Off	Deactivated	Activated
	"OFF"					

*1: The system judges a person of adult size as an adult. When a smaller adult sits in the front passenger seat, the system may recognize him/her as a child depending on his/her physique and posture.

*2: When a larger child who has outgrown a child restraint system sits in the front passenger seat, the system may recognize him/her as an adult depending on his/her physique or posture.

*3: Never install a rear-facing child restraint system on the front passenger seat. A forward-facing child restraint system should only be installed on the front passenger seat when it is unavoidable. (See "Child restraint" in this Section as for installing the child restraint system.)

*4: In the event the front passenger does not wear a seat belt.

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Condition and operation in the front passenger occupant classification system

Double cab models

Condition detected by the front passenger occupant classification system	Indicator/warning light			Devices			
	Front passenger occupant classification indicator light	SRS warning light	Front passenger's seat belt reminder light	Front passenger airbag	Side airbag on the front passenger seat	Curtain shield airbag in the front passenger side	Front passenger's seat belt pretensioner
1. Adult*1	"ON"	Off	Flashing*4	Activated			
2. Child*2 or child restraint system*3	"OFF"	Off	Flashing*4	Deactivated		Activated	Activated
3. Unoccupied	Not illuminated	Off	Off	Deactivated			Deactivated
4. There is a malfunction in the system	"OFF"	On	Off	Deactivated			Activated

*1: The system judges a person of adult size as an adult. When a smaller adult sits in the front passenger seat, the system may recognize him/her as a child depending on his/her physique and posture.

*2: When a larger child who has outgrown a child restraint system sits in the front passenger seat, the system may recognize him/her as an adult depending on his/her physique or posture.

*3: Never install a rear-facing child restraint system on the front passenger seat. A forward-facing child restraint system should only be installed on the front passenger seat when it is unavoidable. (See "Child restraint" in this Section as for installing the child restraint system.)

*4: In the event the front passenger does not wear a seat belt.

 CAUTION

To avoid potential death or serious injury when the front passenger occupant classification system does not detect the conditions correctly, observe the following.

- ▶ Make sure the front passenger occupant classification indicator light indicates "ON" when using the seat belt extender for the front passenger seat. If the indicator light indicates "OFF", disconnect the extender tongue from the seat belt buckle, then reconnect the seat belt. Reconnect the seat belt extender after making sure the indicator light indicates "ON". If you use the seat belt extender while the indicator light indicates "OFF", the front passenger airbag and side airbag on the front passenger side may not activate correctly, which could cause death or serious injury in the event of collision.

- ▶ Do not recline the front passenger seatback so far that it touches a rear seat. This may cause the "OFF" indicator to be illuminated, which indicates that the passenger's airbags will not deploy in the event of a severe accident. If the seatback touches the rear seat, return the seatback to a position where it does not touch the rear seat.

Keep the front passenger seatback as upright as possible when the vehicle is moving. Reclining the seatback excessively may lessen the effectiveness of the seat belt system.

- ▶ If an adult sits in the front passenger seat, the occupant classification indicator light should indicate "ON". If the "OFF" indicator is illuminated, ask the passenger to sit up straight, well back in the seat, feet on the floor, and with the seat belt worn correctly. If the "OFF" indicator still remains illuminated, either ask the passenger to move to the rear seat, or if that is not possible, move the front passenger seat fully rearward.

- ▶ Wear the seat belt properly.

- ▶ Make sure the front passenger's seat belt tab has not been left inserted into the buckle before someone sits in the front passenger seat.

- ▶ Do not put a heavy load in the front passenger seatback pocket or attach a seatback table to the front passenger seat seatback.

- ▶ Do not put weight on the front passenger seat by putting your hands or feet on the front passenger seat seatback from the rear passenger seat.

- ▶ Do not let a rear passenger lift the front passenger seat with their feet or press on the seatback with their legs.

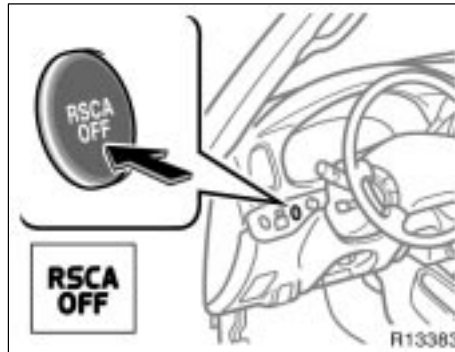
- ▶ Do not put objects under the front passenger seat.

- ▶ Child restraint systems installed on the rear seat should not contact the front seatbacks.

Roll sensing of curtain shield airbags off switch

- ▶ When it is unavoidable to install the forward-facing child restraint system on the front passenger seat, install the child restraint system on the front passenger seat in the proper order. (As for the installation order, see “—Installation with seat belt” in this Section.)
- ▶ Do not remove the front seats.
- ▶ Do not kick the front passenger seat or subject it to severe impact. Otherwise, the SRS warning light may come on to indicate a malfunction of the detection system. In this case, contact your Toyota dealer immediately.

The front passenger occupant classification indicator light may indicate “ON” (the front passenger airbag and side airbag on the front passenger seat may deploy) even if observing the above cautions, when a child sits in, or a forward-facing child restraint system is installed on the front passenger seat. Refer to all the cautions in “SRS driver airbag and front passenger airbag”, “SRS side airbags and curtain shield airbags” and “Child restraint” in this Section.




The roll sensing of curtain shield airbags off switch (“RSCA OFF” switch) can turn off the curtain shield airbags and seat belt pretensioners in a vehicle rollover. This switch should only be used if inflation is not desired (such as extreme off-road driving).

When you push the “RSCA OFF” switch for a few seconds with the ignition switch on, the “RSCA OFF” indicator light comes on and the roll sensing function is turned off. When you push the switch again, the indicator light goes off and the roll sensing function is turned on. (For details about the roll sensing function, see “SRS side airbags and curtain shield airbags” in this Section.)

In a severe side impact, the curtain shield airbags on impacted side will inflate even if the roll sensing function is turned off. (For details about the curtain shield airbags, see “SRS side airbags and curtain shield airbags” in this Section.)

In a severe frontal impact, the seat belt pretensioners will work even if the roll sensing function is turned off. (For details about the seat belt pretensioners, see “—Seat belt pretensioners” in this Section.)

If the ignition switch is turned to “ACC” or “LOCK” with the roll sensing function off and then the ignition switch is turned back to “ON”, the roll sensing function will turn back on automatically.

 **CAUTION**

- ▶ Before normal driving, make sure the "RSCA OFF" indicator light is off.
- ▶ When the roll sensing function is turned off (and the "RSCA OFF" indicator light is on), the curtain shield airbags and seat belt pretensioners will not work in a vehicle rollover. Turning off the curtain shield airbags and seat belt pretensioners reduces occupant protection which your vehicle safety systems can provide in accidents and increase the likelihood of death or serious injuries.


**Child restraint—
—Child restraint precautions**

Toyota strongly urges the use of appropriate child restraint systems for children.

The laws of all 50 states in the U.S.A. and Canada now require the use of a child restraint system.

Your vehicle conforms to SAEJ1819.

If a child is too large for a child restraint system, the child should sit in the rear seat and must be restrained using the vehicle's seat belt. See "Seat belts" in this Section for details.

 **CAUTION**

- ▶ For effective protection in automobile accidents and sudden stops, a child must be properly restrained, using a seat belt or child restraint system depending on the age and size of the child. Holding a child in your arms is not a substitute for a child restraint system. In an accident, the child can be crushed against the windshield, or between you and the vehicle's interior.

Standard and access cab models—

- ▶ **STANDARD CAB MODELS—**
Toyota strongly urges use of a proper child restraint system which conforms to the size of the child.
- ▶ **ACCESS CAB MODELS—**
Toyota strongly urges use of a proper child restraint system which conforms to the size of the child, installed on the rear seat. According to accident statistics, the child is safer when properly restrained in the rear seat than in the front seat.

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▶ Never put infant or child age 1 to 12 in a passenger risk group on the right front passenger seat with the passenger airbag manual on-off switch in the "ON" or "AUTO" position. In the event of an accident, the force of the rapid inflation of the front passenger airbag can cause death or serious injury to the child.

If you must put infant or child age 1 to 12 in a passenger risk group on the right front seat, make sure that the passenger airbag manual on-off switch is in the "OFF" position with the key removed and that the indicator light is on. (For details, see "SRS driver airbag and front passenger airbag" in this Section.)

▶ Do not use the seat belt extender when installing a child restraint system on the front or rear passenger seat. If installing a child restraint system with the seat belt extender connected to the seat belt, the seat belt will not securely hold the child restraint system, which could cause death or serious injury to the child or other passengers in the event of collision.

▶ Make sure you have complied with all installation instructions provided by the child restraint manufacturer and that the system is properly secured. If it is not secured properly, it may cause death or serious injury to the child in the event of a sudden stop or accident.

Double cab models—

▶ Toyota strongly urges use of a proper child restraint system which conforms to the size of the child, installed on the rear seat. According to accident statistics, the child is safer when properly restrained in the rear seat than in the front seat.

▶ Vehicles with separate seat—Never install a rear-facing child restraint system on the front passenger seat even if the front passenger occupant classification indicator light indicates "OFF". In the event of an accident, the impact of the rapid inflation of the front passenger airbag could cause death or serious injury to the child if the rear-facing child restraint system is installed on the front passenger seat.

- ▶ **Vehicles with separate seat**—A forward-facing child restraint system should be allowed to be installed on the front passenger seat only when it is unavoidable. Always move the seat as far back as possible even if the front passenger occupant classification indicator light indicates “OFF”, because the front passenger airbag could inflate with considerable speed and force. Otherwise, the child may be killed or seriously injured.
- ▶ **On vehicles with side airbags and curtain shield airbags**, do not allow the child to lean his/her head or any part of his/her body against the door or the area of the seat, front or rear pillar or roof side rail from which the side airbags or curtain shield airbags deploy even if the child is seated in the child restraint system. It is dangerous if the side airbag and curtain shield airbag inflate, and the impact could cause death or serious injury to the child.

- ▶ **Do not use the seat belt extender** when installing a child restraint system on the front or rear passenger seat. If installing a child restraint system with the seat belt extender connected to the seat belt, the seat belt will not securely hold the child restraint system, which could cause death or serious injury to the child or other passengers in the event of collision.
- ▶ **Make sure you have complied with all installation instructions provided by the child restraint manufacturer and that the system is properly secured.** If it is not secured properly, it may cause death or serious injury to the child in the event of a sudden stop or accident.

—Child restraint system

A child restraint system for a small child or baby must itself be properly restrained on the seat with the lap portion of the lap/shoulder belt. You must carefully consult the manufacturer’s instructions which accompany the child restraint system.

To provide proper restraint, use a child restraint system following the manufacturer’s instructions about the appropriate age and size of the child for the child restraint system.

Install the child restraint system correctly following the instructions provided by its manufacturer. General directions are also provided under the following illustrations.

The child restraint system should be installed on the rear seat if your vehicle is equipped with rear seats. According to accident statistics, the child is safer when properly restrained in the rear seat than in the front seat.

When not using the child restraint system, keep it secured with the seat belt or place it somewhere other than the passenger compartment. This will prevent it from injuring passengers in the event of a sudden stop or accident.

—Types of child restraint system

Child restraint systems are classified into the following 3 types depending on the child's age and size.

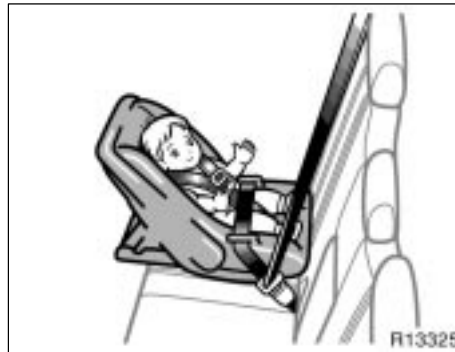
- (A) Infant seat
- (B) Convertible seat
- (C) Booster seat

Install the child restraint system following the instructions provided by its manufacturer.

Your vehicle has anchor brackets for securing the top strap of a child restraint system.

For instructions about how to use the anchor bracket, see “—Using a top strap” in this Section.

The child restraint lower anchorages approved for your vehicle may also be used. See “—Installation with child restraint lower anchorages” in this Section.



(A) Infant seat

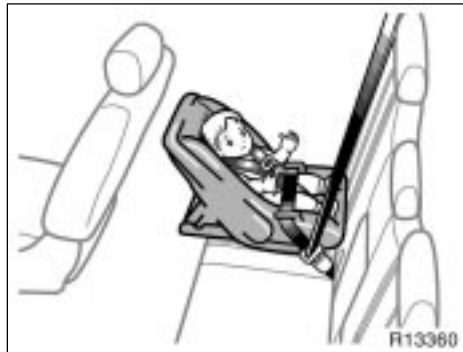


(C) Booster seat



(B) Convertible seat

—Installation with seat belt
(standard cab models and
access cab models)



(A) INFANT SEAT INSTALLATION

An infant seat must be used in rear-facing position only.



Except for separate seat with automatic transmission

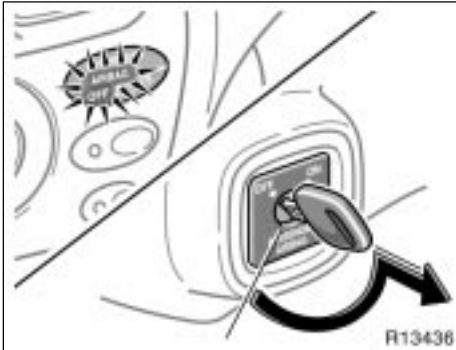


For separate seat with automatic transmission

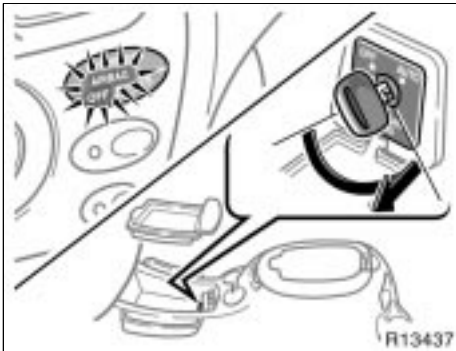
CAUTION

Never install a rear-facing child restraint system on the front seat with the passenger airbag manual on-off switch in the "ON" or "AUTO" position. In the event of an accident, the force of the rapid inflation of the front passenger airbag can cause death or serious injury to the child if the rear-facing child system is installed on the front passenger seat.

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Except for separate seat with automatic transmission



For separate seat with automatic transmission

When you install a rear-facing child restraint system which belongs to a passenger risk group on the right front seat, turn the passenger airbag manual on-off switch counterclockwise to the "OFF" position and remove the key. (For details, see "SRS driver airbag and front passenger airbag" in this Section.)

The indicator light comes on when the system is off.

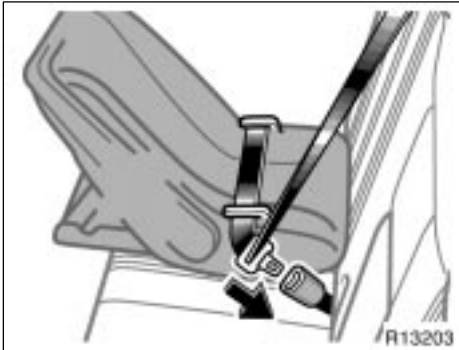
CAUTION

If you must install a rear-facing child restraint system on the right front seat, make sure that the passenger airbag manual on-off switch is in the "OFF" position with the key removed and that the indicator light is on.



CAUTION

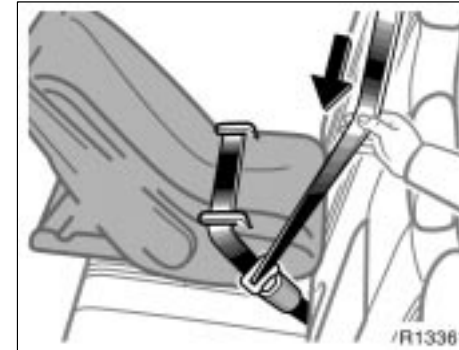
- ▶ Do not install a child restraint system on the rear seat if it interferes with the lock mechanism of the front seats. Otherwise, the child or front seat occupants, may be killed or seriously injured in case of sudden braking or a collision.
- ▶ If the driver's seat position does not allow sufficient space for safe installation, install the child restraint system on the rear right seat.



1. Run the lap and shoulder belt through or around the infant seat following the instructions provided by its manufacturer and insert the tab into the buckle taking care not to twist the belt. Keep the lap portion of the belt tight.

⚠ CAUTION

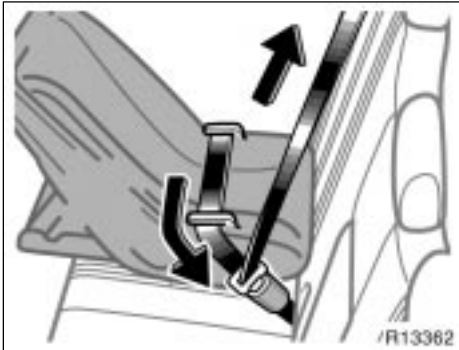
- ▶ After inserting the tab, make sure the tab and buckle are locked and that the lap and shoulder portions of the belt are not twisted.
- ▶ Do not insert coins, clips, etc. in the buckle as this may prevent your child from properly latching the tab and buckle.
- ▶ If the seat belt does not function normally, it cannot protect your child from death or serious injury. **Contact your Toyota dealer immediately. Do not install the child restraint system on the seat until the seat belt is fixed.**



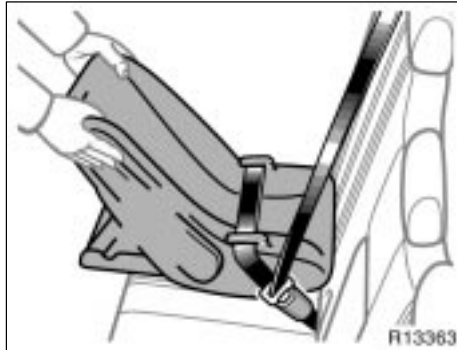
2. Fully extend the shoulder belt to put it in the lock mode. When the belt is then retracted even slightly, it cannot be extended.

To hold the infant seat securely, make sure the belt is in the lock mode before letting the belt retract.

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3. While pressing the infant seat firmly against the seat cushion and seatback, let the shoulder belt retract as far as it will go to hold the infant seat securely.



4. To remove the infant seat, press the buckle release button and allow the belt to retract completely. The belt will move freely again and be ready to work for an adult or older child passenger.

CAUTION

Push and pull the child restraint system in different directions to be sure it is secure. Follow all the installation instructions provided by its manufacturer.



(B) CONVERTIBLE SEAT INSTALLATION

A convertible seat must be used in forward-facing or rear-facing position depending on the child's age and size. When installing, follow the manufacturer's instruction about the applicable child's age and size as well as directions for installing the child restraint system.



Except for separate seat with automatic transmission

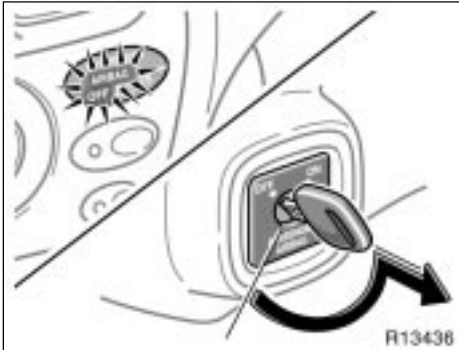


For separate seat with automatic transmission

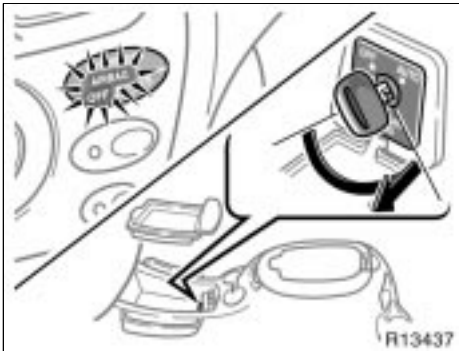
CAUTION

Rear-facing child restraint system: Never install a rear-facing child restraint system on the front seat with the passenger airbag manual on-off switch in the "ON" or "AUTO" position. In the event of an accident, the force of the rapid inflation of the front passenger airbag can cause death or serious injury to the child if the rear-facing child system is installed on the front passenger seat.

'05 TUNDRA_U (L/O 0409)



Except for separate seat with automatic transmission



For separate seat with automatic transmission

When you install a rear-facing child restraint system which belongs to a passenger risk group on the right front seat, turn the passenger airbag manual on-off switch counterclockwise to the "OFF" position and remove the key. (For details, see "SRS driver airbag and front passenger airbag" in this Section.)

The indicator light comes on when the system is off.

! CAUTION

If you must install a rear-facing child restraint system on the right front seat, make sure that the passenger airbag manual on-off switch is in the "OFF" position with the key removed and that the indicator light is on.

! CAUTION

Forward-facing child restraint system:
A forward-facing child restraint system which belongs to a passenger risk group should never be installed on the right front passenger seat with the passenger airbag manual on-off switch in the "ON" or "AUTO" position, because the force of the deploying airbag could cause death or serious injury to the child in forward seating position. (For details, see "SRS driver airbag and front passenger airbag" in this Section.)



CAUTION

- ▶ Do not install a child restraint system on the rear seat if it interferes with the lock mechanism of the front seats. Otherwise, the child or front seat occupants, may be killed or seriously injured in case of sudden braking or a collision.
- ▶ If the driver's seat position does not allow sufficient space for safe installation, install the child restraint system on the rear right seat.

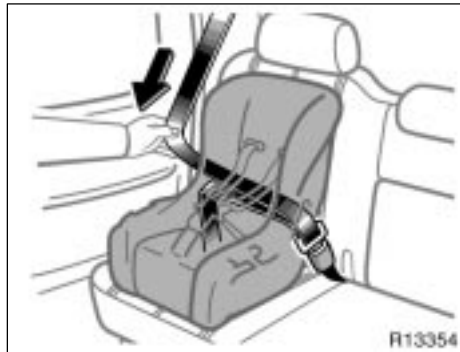


1. Run the lap and shoulder belt through or around the convertible seat following the instructions provided by its manufacturer and insert the tab into the buckle taking care not to twist the belt. Keep the lap portion of the belt tight.

CAUTION

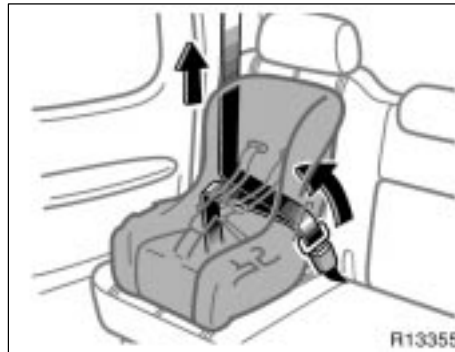
- ▶ After inserting the tab, make sure the tab and buckle are locked and that the lap and shoulder portions of the belt are not twisted.
- ▶ Do not insert coins, clips, etc. in the buckle as this may prevent your child from properly latching the tab and buckle.
- ▶ If the seat belt does not function normally, it cannot protect your child from death or serious injury. Contact your Toyota dealer immediately. Do not install the child restraint system on the seat until the seat belt is fixed.

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2. Fully extend the shoulder belt to put it in the lock mode. When the belt is then retracted slightly, it cannot be extended.

To hold the convertible seat securely, make sure the belt is in the lock mode before letting the belt retract.

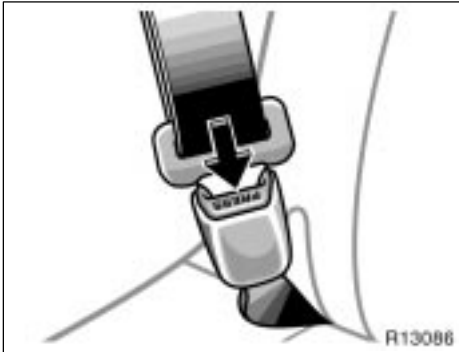


3. While pressing the convertible seat firmly against the seat cushion and seatback, let the shoulder belt retract as far as it will go to hold the convertible seat securely.



 **CAUTION**

Push and pull the child restraint system in different directions to be sure it is secure. Follow all the installation instructions provided by its manufacturer.



4. To remove the convertible seat, press the buckle release button and allow the belt to retract completely. The belt will move freely again and be ready to work for an adult or older child passenger.



(C) BOOSTER SEAT INSTALLATION

A booster seat must be used in forward-facing position only.

⚠ CAUTION

A forward-facing child restraint system which belongs to a passenger risk group should never be installed on the front outside passenger seat with the passenger airbag manual on-off switch in the "ON" or "AUTO" position, because the force of the deploying airbag could cause death or serious injury to the child in forward seating position. (For details, see "SRS driver airbag and front passenger airbag" in this Section.)



1. Sit the child on a booster seat. Run the lap and shoulder belt through or around the booster seat and across the child following the instructions provided by its manufacturer and insert the tab into the buckle taking care not to twist the belt.

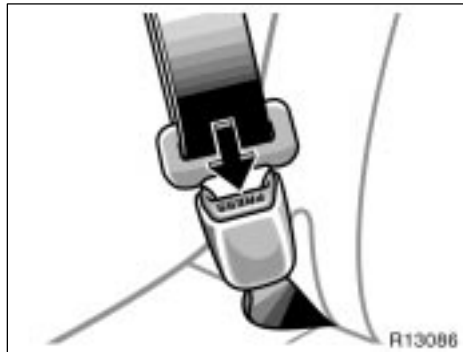
Make sure the shoulder belt is correctly across the child's shoulder and that the lap belt is positioned as low as possible on the child's hips. See "Seat belts" in this Section for details.

CAUTION

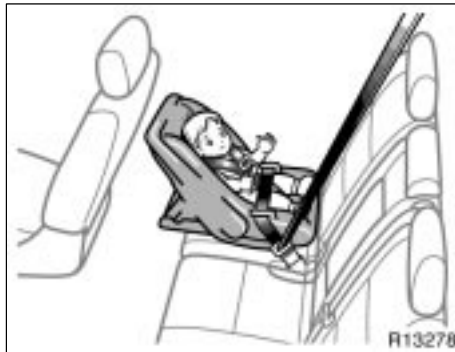
- ▶ Always make sure the shoulder belt is positioned across the center of child's shoulder. The belt should be kept away from child's neck, but not falling off child's shoulder. Otherwise, the child may be killed or seriously injured in case of sudden braking or a collision.
- ▶ Both high-positioned lap belts and loose-fitting belts could cause death or serious injuries due to sliding under the lap belt during a collision or other unintended event. Keep the lap belt positioned as low on a child's hips as possible.
- ▶ For child's safety, do not place the shoulder belt under child's arm.
- ▶ After inserting the tab, make sure the tab and buckle are locked and that the lap and shoulder portions of the belt are not twisted.
- ▶ Do not insert coins, clips, etc. in the buckle as this may prevent your child from properly latching the tab and buckle.

▶ If the seat belt does not function normally, it cannot protect your child from death or serious injury. Contact your Toyota dealer immediately. Do not install the child restraint system on the seat until the seat belt is fixed.

—Installation with seat belt
(double cab models)



2. To remove the child restraint system, press the buckle release button and allow the belt to retract.



(A) INFANT SEAT INSTALLATION

An infant seat must be used in rear-facing position only.



⚠ CAUTION

▶ Vehicles with split bench seat—Never install a rear-facing child restraint system on the front passenger seat. In the event of an accident, the force of the rapid inflation of the front passenger airbag can cause death or serious injury to the child if the rear-facing child restraint system is installed on the front passenger seat.

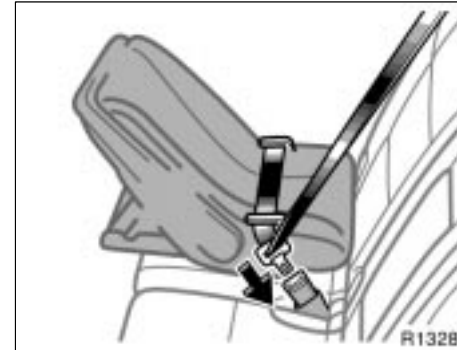
'05 TUNDRA_U (L/O 0409)

▶ Vehicles with separate seat—Never install a rear-facing child restraint system on the front passenger seat even if the front passenger occupant classification indicator light indicates “OFF”. In the event of an accident, the impact of the rapid inflation of the front passenger airbag could cause death or serious injury to the child if the rear-facing child restraint system is installed on the front passenger seat.



▶ Do not install a child restraint system on the rear seat if it interferes with the lock mechanism of the front seats. Otherwise, the child or front seat occupants, may be killed or seriously injured in case of sudden braking or a collision.

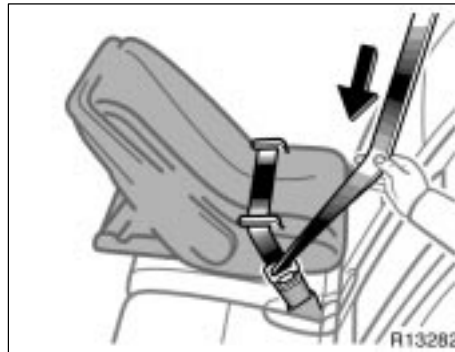
▶ If the driver's seat position does not allow sufficient space for safe installation, install the child restraint system on the rear right seat.



1. Run the lap and shoulder belt through or around the infant seat following the instructions provided by its manufacturer and insert the tab into the buckle taking care not to twist the belt. Keep the lap portion of the belt tight.

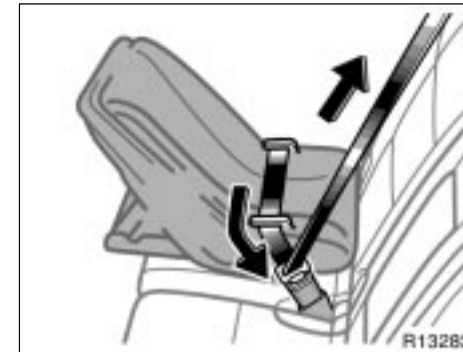
CAUTION

- ▶ After inserting the tab, make sure the tab and buckle are locked and that the lap and shoulder portions of the belt are not twisted.
- ▶ Do not insert coins, clips, etc. in the buckle as this may prevent your child from properly latching the tab and buckle.
- ▶ If the seat belt does not function normally, it cannot protect your child from death or serious injury. Contact your Toyota dealer immediately. Do not install the child restraint system on the seat until the seat belt is fixed.

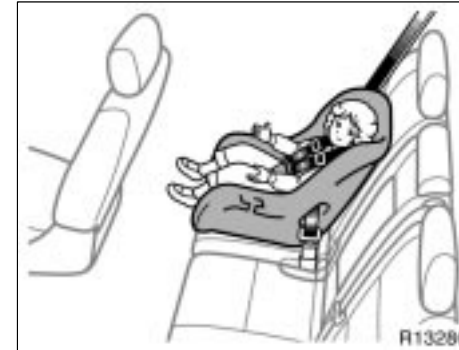
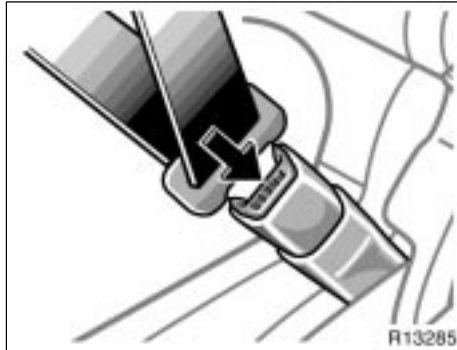
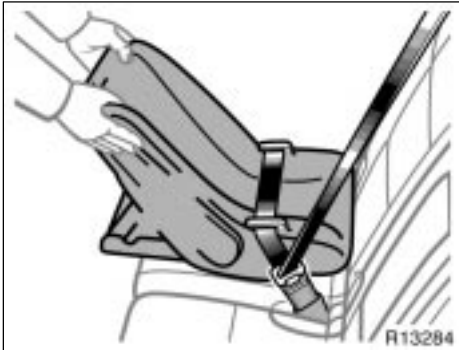


2. Fully extend the shoulder belt to put it in the lock mode. When the belt is then retracted even slightly, it cannot be extended.

To hold the infant seat securely, make sure the belt is in the lock mode before letting the belt retract.



3. While pressing the infant seat firmly against the seat cushion and seatback, let the shoulder belt retract as far as it will go to hold the infant seat securely.



⚠ CAUTION
Push and pull the child restraint system in different directions to be sure it is secure. Follow all the installation instructions provided by its manufacturer.

4. To remove the infant seat, press the buckle release button and allow the belt to retract completely. The belt will move freely again and be ready to work for an adult or older child passenger.

(B) CONVERTIBLE SEAT INSTALLATION
A convertible seat must be used in forward-facing or rear-facing position depending on the age and size of the child. When installing, follow the manufacturer's instructions about the applicable age and size of the child as well as directions for installing the child restraint system.

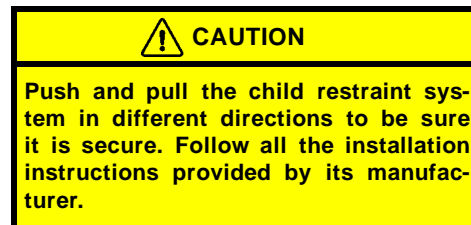
'05 TUNDRA_U (L/O 0409)

Vehicles with separate seat only—

Install the child restraint system on the front passenger seat only when it is unavoidable. Your vehicle is equipped with a front passenger occupant classification system. In order to activate the occupant classification system correctly, install the forward-facing child restraint system on the front passenger seat in the following order:

1. Turn the ignition key to the "ON" position.
2. Move the front passenger seat to the rearward position.
3. Put the child restraint system on the front passenger seat without putting your weight on the front passenger seat.
4. Insert the seat belt tab into the seat belt buckle.
5. Fully extend the shoulder belt to put it in the lock mode. When the belt is then retracted even slightly, it cannot be extended. To hold the seat securely, make sure the belt is in the lock mode before letting the belt retract.

6. While pressing the convertible seat firmly against the seat cushion and seatback, let the shoulder belt retract as far as it will go to hold the convertible seat securely.



7. Put a child on the child restraint system and secure the child, complying with the instructions provided by the child restraint system manufacturer.

The occupant classification indicator light should indicate "OFF" when the ignition key is in the "ON" position and the child is in the child restraint system after following these procedures. The "OFF" indicator indicates the SRS front passenger airbag and side airbag on the passenger side will not deploy. If the indicator light indicates "ON", remove the child restraint system and reinstall it with the ignition key in the "ACC" or "LOCK" position. If the indicator light still indicates "ON" when the ignition key is turned to the "ON" position, then the SRS front passenger airbag and side airbag on the passenger side may deploy in an accident. Do not drive the vehicle in this condition. Remove the child restraint system and contact your Toyota dealer.

 CAUTION

▶ Vehicles with separate seat—Never install a rear-facing child restraint system on the front passenger seat. A forward-facing child restraint system should only be installed on the front passenger seat when unavoidable. If you must install the child restraint system on the front passenger seat, put the seat in its most rearward position, and install the forward-facing child restraint system in the proper order. Otherwise, the front passenger occupant classification system can not detect the presence of the child restraint system and the front passenger airbag and side airbag on the front passenger seat could deploy.



▶ Vehicles with split bench seat—Never install a rear-facing child restraint system on the front passenger seat. In the event of an accident, the force of the rapid inflation of the front passenger airbag can cause death or serious injury to the child if the rear-facing child restraint system is installed on the front passenger seat.

▶ Vehicles with separate seat—Never install a rear-facing child restraint system on the front passenger seat even if the front passenger occupant classification indicator light indicates "OFF". In the event of an accident, the impact of the rapid inflation of the front passenger airbag could cause death or serious injury to the child if the rear-facing child restraint system is installed on the front passenger seat.



▶Vehicles with split bench seat—A forward-facing child restraint system should be allowed to be installed on the front passenger seat only when it is unavoidable. Always move the seat as far back as possible, because the front passenger airbag could inflate with considerable speed and force. Otherwise, the child may be killed or seriously injured.

▶Vehicles with separate seat—A forward-facing child restraint system should be allowed to be installed on the front passenger seat only when it is unavoidable. Always move the seat as far back as possible even if the front passenger occupant classification indicator light indicates “OFF”, because the front passenger airbag could inflate with considerable speed and force. Otherwise, the child may be killed or seriously injured.

▶On vehicles with side airbags and curtain shield airbags, do not allow the child to lean his/her head or any part of his/her body against the door or the area of the seat, front or rear pillar or roof side rail from which the side airbags or curtain shield airbags deploy even if the child is seated in the child restraint system. It is dangerous if the side airbag and curtain shield airbag inflate, and the impact could cause death or serious injury to the child.



▶Do not install a child restraint system on the rear seat if it interferes with the lock mechanism of the front seats. Otherwise, the child or front seat occupants, may be killed or seriously injured in case of sudden braking or a collision.

▶If the driver's seat position does not allow sufficient space for safe installation, install the child restraint system on the rear right seat.

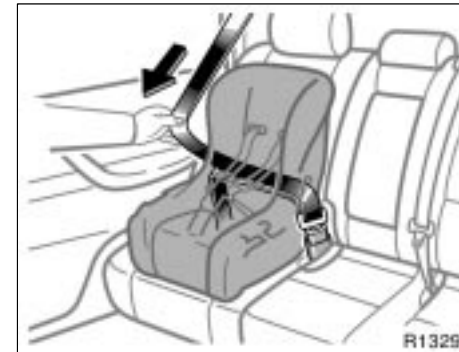
'05 TUNDRA_U (L/O 0409)



1. Run the lap and shoulder belt through or around the convertible seat following the instructions provided by its manufacturer and insert the tab into the buckle taking care not to twist the belt. Keep the lap portion of the belt tight.

CAUTION

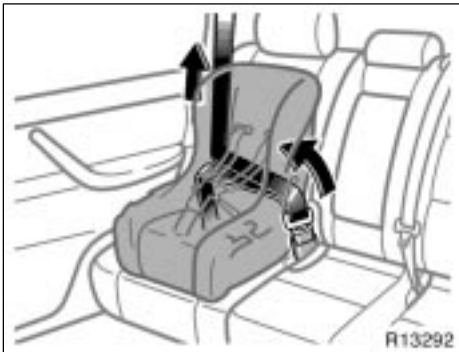
- ▶ After inserting the tab, make sure the tab and buckle are locked and that the lap and shoulder portions of the belt are not twisted.
- ▶ Do not insert coins, clips, etc. in the buckle as this may prevent your child from properly latching the tab and buckle.
- ▶ If the seat belt does not function normally, it cannot protect your child from death or serious injury. **Contact your Toyota dealer immediately. Do not install the child restraint system on the seat until the seat belt is fixed.**



2. Fully extend the shoulder belt to put it in the lock mode. When the belt is then retracted slightly, it cannot be extended.

To hold the convertible seat securely, make sure the belt is in the lock mode before letting the belt retract.

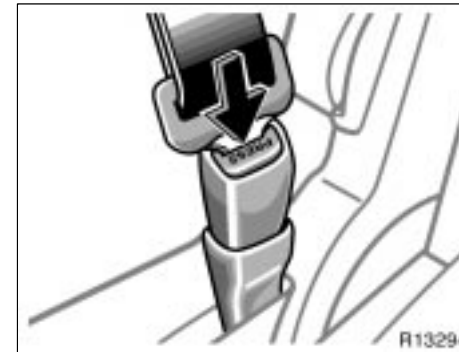
'05 TUNDRA_U (L/O 0409)



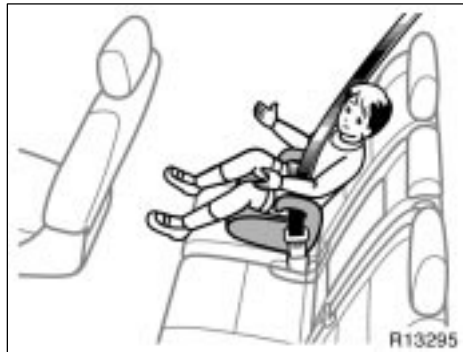
3. While pressing the convertible seat firmly against the seat cushion and seatback, let the shoulder belt retract as far as it will go to hold the convertible seat securely.



⚠ CAUTION
Push and pull the child restraint system in different directions to be sure it is secure. Follow all the installation instructions provided by its manufacturer.



4. To remove the convertible seat, press the buckle release button and allow the belt to retract completely. The belt will move freely again and be ready to work for an adult or older child passenger.



(C) BOOSTER SEAT INSTALLATION

A booster seat must be used in forward-facing position only.



Move seat fully back

! CAUTION

▶ Vehicles with split bench seat—A forward-facing child restraint system should be allowed to be installed on the front passenger seat only when it is unavoidable. Always move the seat as far back as possible, because the front passenger airbag could inflate with considerable speed and force. Otherwise, the child may be killed or seriously injured.

▶ Vehicles with separate seat—A forward-facing child restraint system should be allowed to be installed on the front passenger seat only when it is unavoidable. Always move the seat as far back as possible even if the front passenger occupant classification indicator light indicates “OFF”, because the front passenger airbag could inflate with considerable speed and force. Otherwise, the child may be killed or seriously injured.

▶ On vehicles with side airbags and curtain shield airbags, do not allow the child to lean his/her head or any part of his/her body against the door or the area of the seat, front or rear pillar or roof side rail from which the side airbags or curtain shield airbags deploy even if the child is seated in the child restraint system. It is dangerous if the side airbag and curtain shield airbag inflate, and the impact could cause death or serious injury to the child.



1. Sit the child on a booster seat. Run the lap and shoulder belt through or around the booster seat and across the child following the instructions provided by its manufacturer and insert the tab into the buckle taking care not to twist the belt.

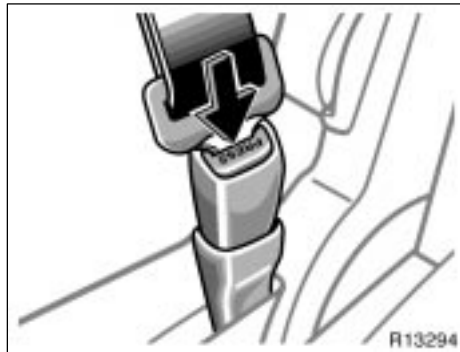
Make sure the shoulder belt is correctly across the child's shoulder and that the lap belt is positioned as low as possible on the child's hips. See "Seat belts" in this Section for details.

⚠ CAUTION

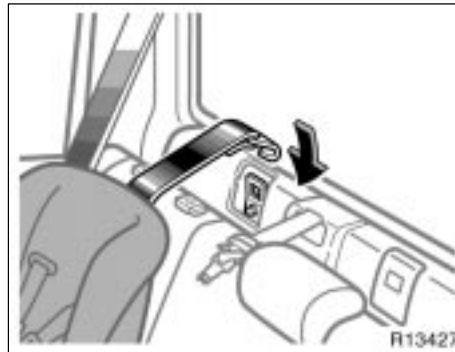
- ▶ Always make sure the shoulder belt is positioned across the center of child's shoulder. The belt should be kept away from child's neck, but not falling off child's shoulder. Otherwise, the child may be killed or seriously injured in case of sudden braking or a collision.
- ▶ Both high-positioned lap belts and loose-fitting belts could cause death or serious injuries due to sliding under the lap belt during a collision or other unintended event. Keep the lap belt positioned as low on a child's hips as possible.
- ▶ For child's safety, do not place the shoulder belt under child's arm.
- ▶ After inserting the tab, make sure the tab and buckle are locked and that the lap and shoulder portions of the belt are not twisted.
- ▶ Do not insert coins, clips, etc. in the buckle as this may prevent your child from properly latching the tab and buckle.

▶ If the seat belt does not function normally, it cannot protect your child from death or serious injury. Contact your Toyota dealer immediately. Do not install the child restraint system on the seat until the seat belt is fixed.

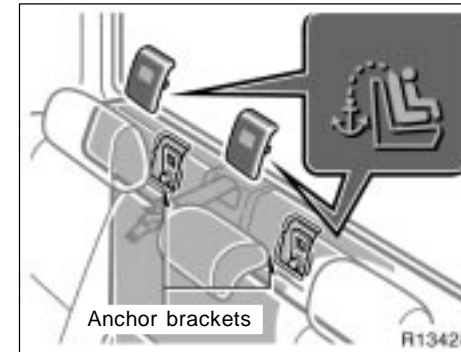
**—Using a top strap
(standard cab models)**



2. To remove the child restraint system, press the buckle-release button and allow the belt to retract.



Follow the procedure below for a child restraint system that requires the use of a top strap.

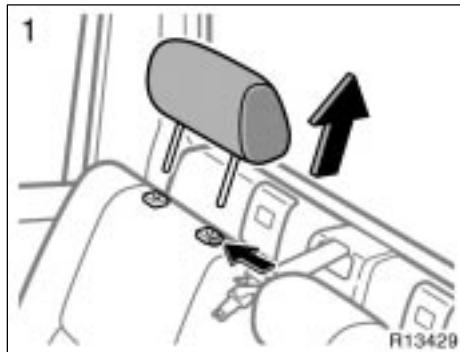


Use the anchor bracket on the back panel to attach the top strap.

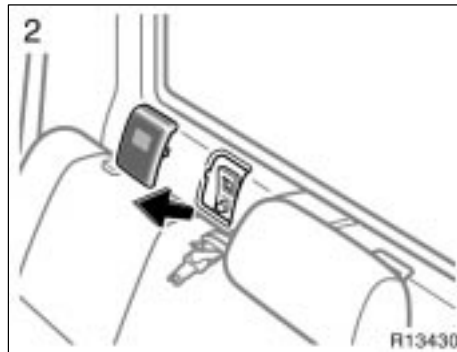
Anchor brackets are installed for each passenger seating position.

This symbol indicates the locations of user ready anchor brackets.

'05 TUNDRA_U (L/O 0409)



TO USE THE ANCHOR BRACKET:
1. Remove the passenger head restraint.



2. Lightly push down on the top surface of the anchor bracket cover, then pull it forward to remove.



3. Fix the child restraint system with the seat belt.

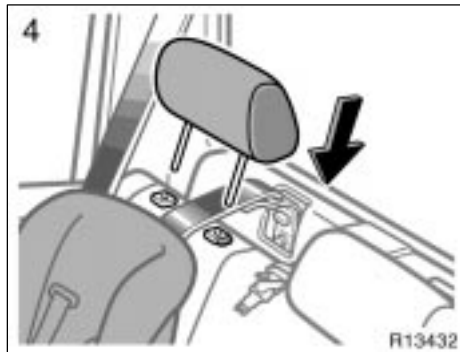
Latch the hook onto the anchor bracket and tighten the top strap.

For instructions to install the child restraint system, see "Child restraint" in this Section.

⚠ CAUTION

Make sure the top strap is securely latched, and check that the child restraint system is secure by pushing and pulling it in different directions. Follow all the installation instructions provided by its manufacturer.

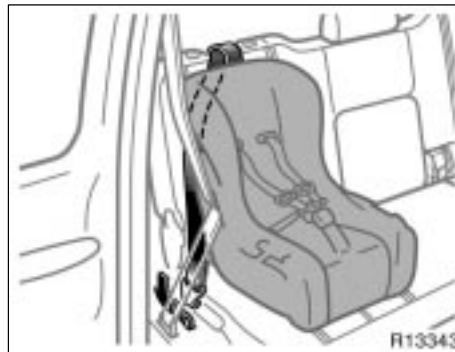
**—Using a top strap
(access cab models)**



4. Replace the passenger head restraint.

Store any removed covers in a safe place such as the glove box.

Be sure to replace all covers when the anchor bracket is not in use.



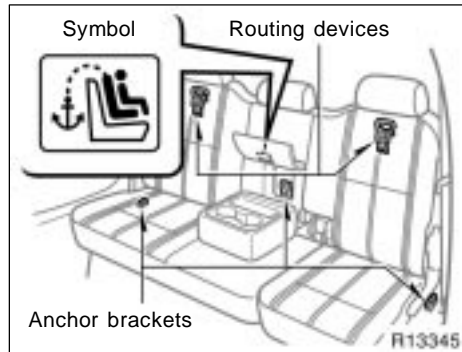
Outside position



Center position

Follow the procedure below for a child restraint system that requires the use of a top strap.

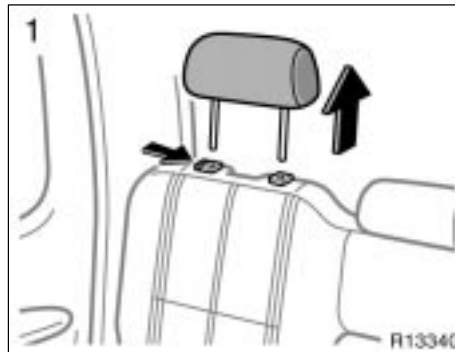
'05 TUNDRA_U (L/O 0409)



Use the routing device on the rear of the seat back and the anchor bracket on the side floor to attach the top strap.

Anchor brackets are installed for each rear seating position.

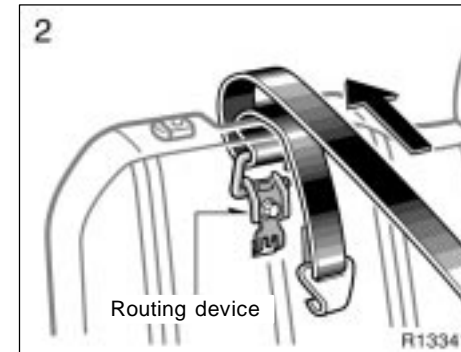
This symbol indicates the locations of user ready anchor brackets.



TO USE THE ANCHOR BRACKET:

Outside position

1. Remove the head restraint.



2. Route the top strap through the routing device as shown in the illustration.

CAUTION

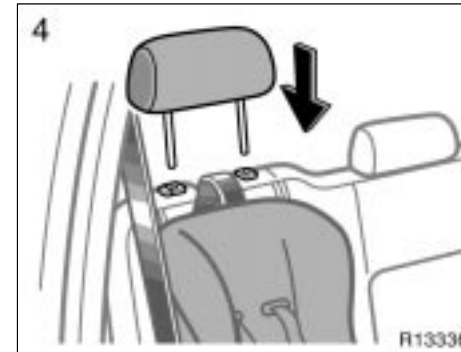
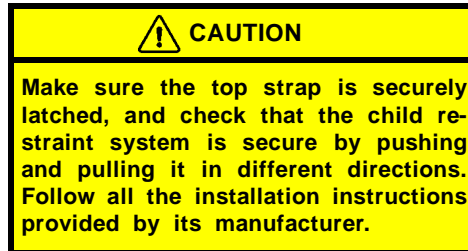
Make sure the top strap is not twisted.



3. Fix the child restraint system with the seat belt.

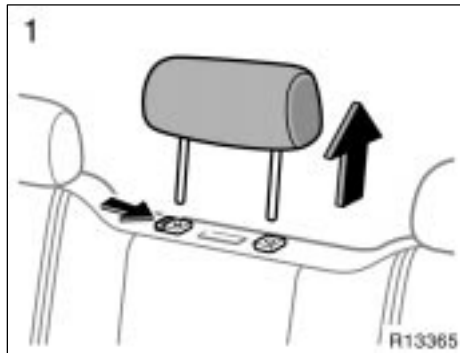
Latch the hook onto the anchor bracket on the side floor and tighten the top strap.

For instructions to install the child restraint system, see "Child restraint" in this Section.

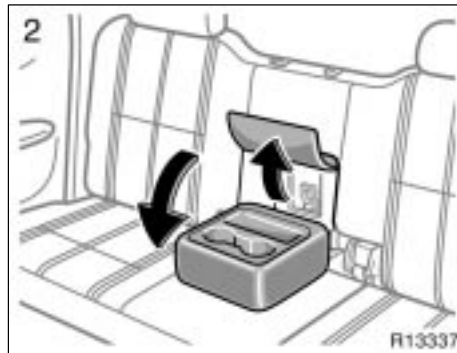


4. Replace the head restraint.

'05 TUNDRA_U (L/O 0409)



- Center position**
1. Remove the head restraint.



2. Fold down the cup holder, unfasten the Velcro that attaches the anchor bracket cover, and lift the cover.

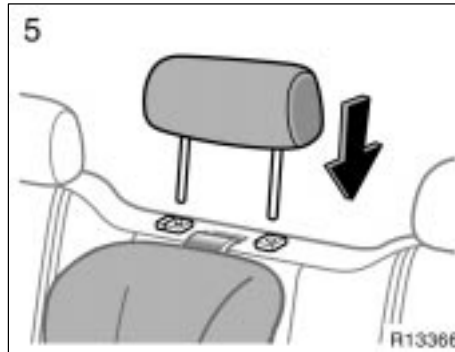


3. Route the top strap through the slot on top of the seat, pass the strap through the seat, then latch the hook onto the anchor bracket.
Close the cover and return the cup holder to the original position.



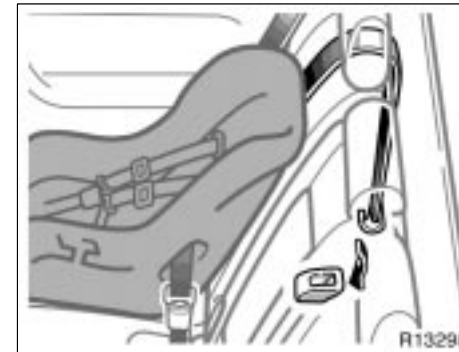
4. Move the child restraint system to the correct position.

Then fix the child restraint system with the seat belt and tighten the top strap.



5. Replace the head restraint.

—Using a top strap
(double cab models)

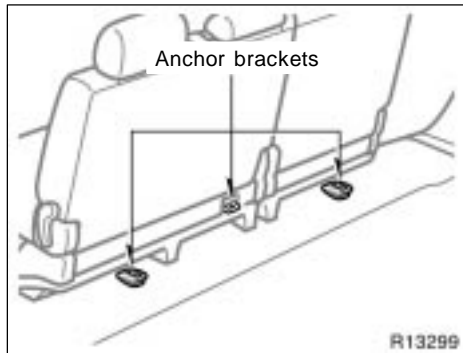


Follow the procedure below for a child restraint system that requires the use of a top strap.

 **CAUTION**

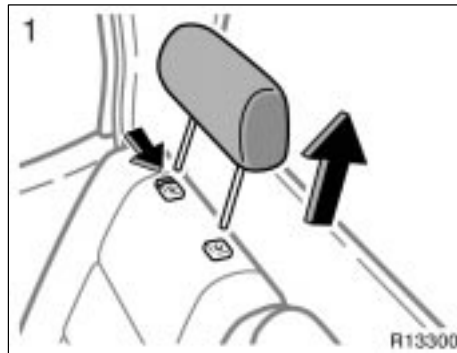
Make sure the top strap is securely latched, and check that the child restraint system is secure by pushing and pulling it in different directions. Follow all the installation instructions provided by its manufacturer.

'05 TUNDRA_U (L/O 0409)

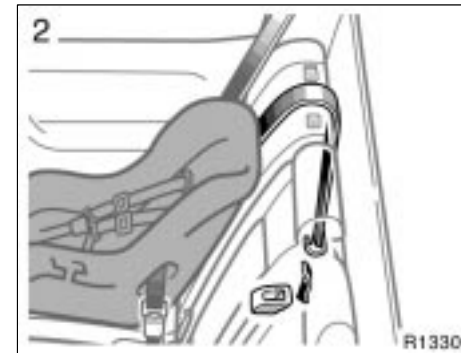


Use one anchor bracket on the back of rear seats and two anchor brackets on the floor as shown above to attach the top strap.

Anchor brackets are installed for each rear seating position.



TO USE THE ANCHORAGES:
1. Remove the head restraint.



Outside position



Center position

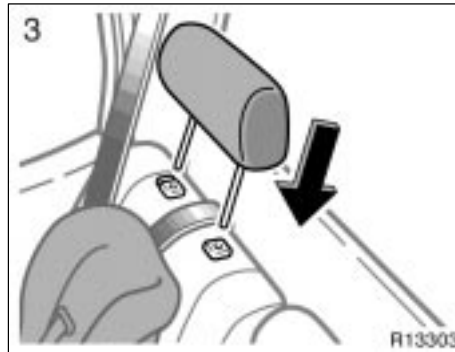
2. Fix the child restraint system with the seat belt.

Latch the hook onto the anchorages and tighten the top strap.

For instructions to install the child restraint system, see "Child restraint" in this Section.

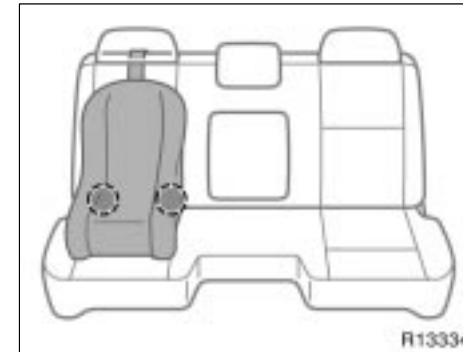
CAUTION

Make sure the top strap is securely latched, and check that the child restraint system is secure by pushing and pulling it in different directions. Follow all the installation instructions provided by its manufacturer.



3. Replace the head restraint.

—Installation with child restraint lower anchorages (standard cab models)

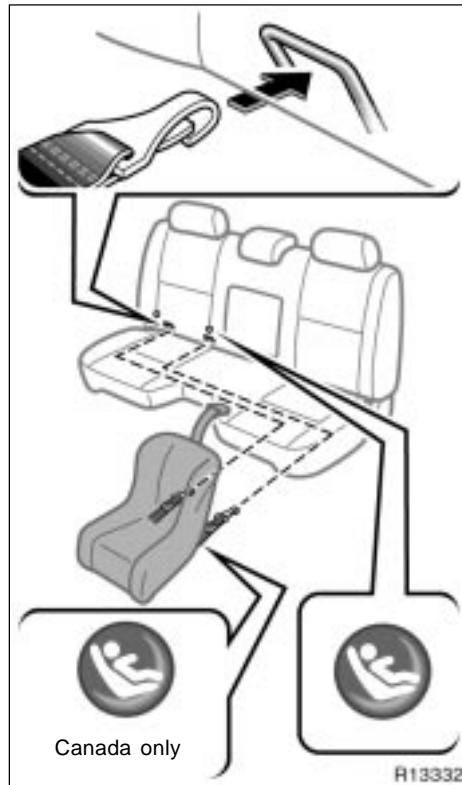


Lower anchorages for the child restraint systems complying with the FMVSS225 or CMVSS210.2 specifications are installed in the front seat.

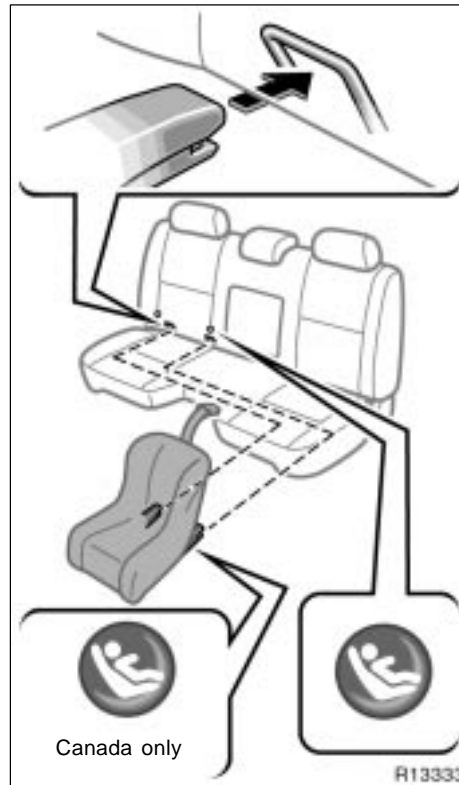
The anchorages are installed in the gap between the seat cushion and seatback of the right side of the seat as shown in the illustration.

Child restraint systems complying with the FMVSS213 or CMVSS213 specification can be fixed to these anchorages. In this case, it is not necessary to fix the child restraint system with a seat belt on the vehicle.

'05 TUNDRA_U (L/O 0409)



Type A



Type B

For owners in Canada

The symbol on a child restraint system indicates the presence of a lower connector system.

CHILD RESTRAINT SYSTEM INSTALLATION

Type A—

1. Widen the gap between the seat cushion and seatback slightly and confirm the position of the lower anchorages near the button on the seatback.
2. Latch the hooks of lower straps onto the anchorages and tighten the lower straps.

Type B—

1. Widen the gap between the seat cushion and seatback slightly and confirm the position of the lower anchorages near the button on the seatback.
2. Latch the buckles onto the anchorages.

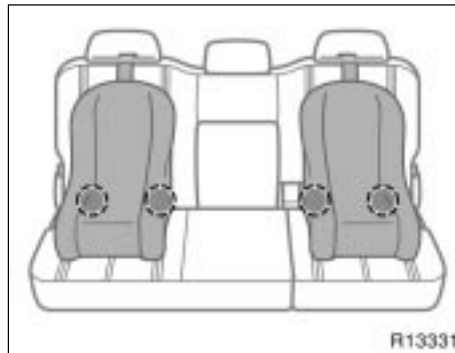
—Installation with child restraint lower anchorages (access cab models)

If your child restraint system has a top strap, it should be anchored. (For the installation of the top strap, see “—Using a top strap” in this Section.)

For installation details, refer to the instruction manual equipped with each product.

CAUTION

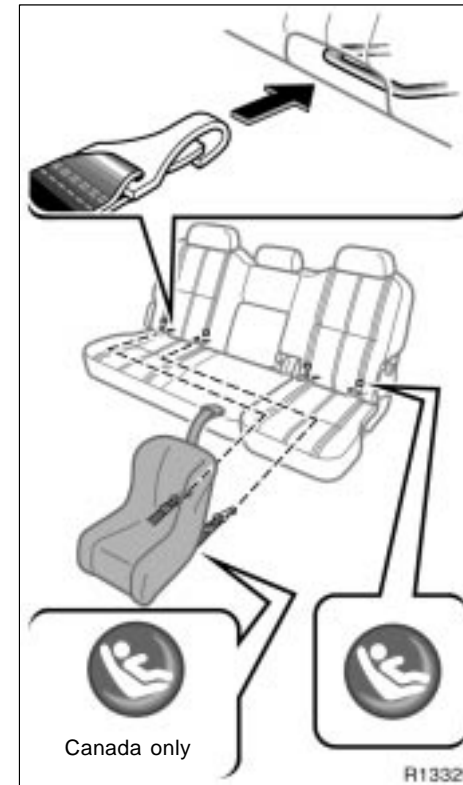
- ▶ When using the lower anchorages for the child restraint system, be sure that there are no irregular objects around the anchorages or that the seat belt is not caught.
- ▶ Push and pull the child restraint system in different directions to be sure it is secure. Follow all the installation instructions provided by its manufacturer.
- ▶ After securing the child restraint system, never slide or recline the seat.



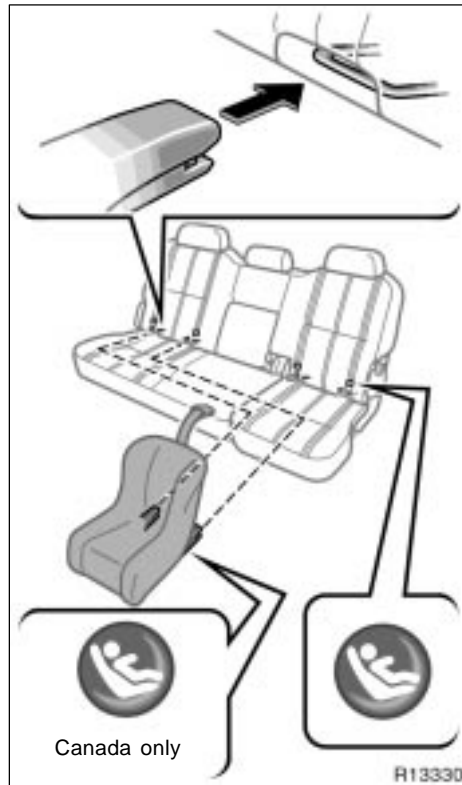
Lower anchorages for the child restraint systems complying with the FMVSS225 or CMVSS210.2 specifications are installed in the rear seat.

The anchorages are installed in the gap between the seat cushion and seatback of the outsides of the rear seat as shown in the illustration.

Child restraint systems complying with the FMVSS213 or CMVSS213 specification can be fixed to these anchorages. In this case, it is not necessary to fix the child restraint system with a seat belt on the vehicle.



Type A



Type B

For owners in Canada

The symbol on a child restraint system indicates the presence of a lower connector system.

CHILD RESTRAINT SYSTEM INSTALLATION

Type A—

1. Widen the gap between the seat cushion and seatback slightly and confirm the position of the lower anchorages near the button on the seatback.
2. Latch the hooks of lower straps onto the anchorages and tighten the lower straps.

Type B—

1. Widen the gap between the seat cushion and seatback slightly and confirm the position of the lower anchorages near the button on the seatback.
2. Latch the buckles onto the anchorages.

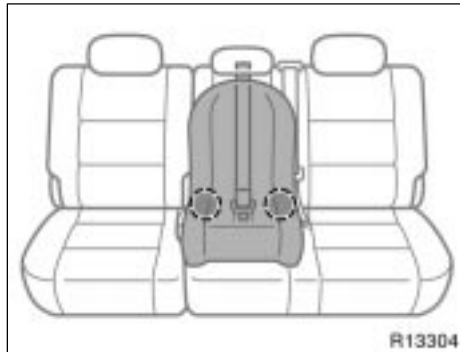
If your child restraint system has a top strap, it should be anchored. (For the installation of the top strap, see “—Using a top strap” in this Section.)

For installation details, refer to the instruction manual equipped with each product.

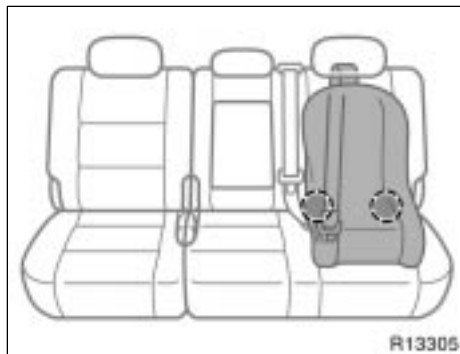
CAUTION

- ▶ When using the lower anchorages for the child restraint system, be sure that there are no irregular objects around the anchorages or that the seat belt is not caught.
- ▶ Push and pull the child restraint system in different directions to be sure it is secure. Follow all the installation instructions provided by its manufacturer.
- ▶ After securing the child restraint system, never slide or recline the seat.
- ▶ Do not install a child restraint system on the rear seat if it interferes with the lock mechanism of the front seats. Otherwise, the child or front seat occupant(s) may be killed or seriously injured in case of sudden braking or a collision.

—Installation with child restraint lower anchorages (double cab models)



Center

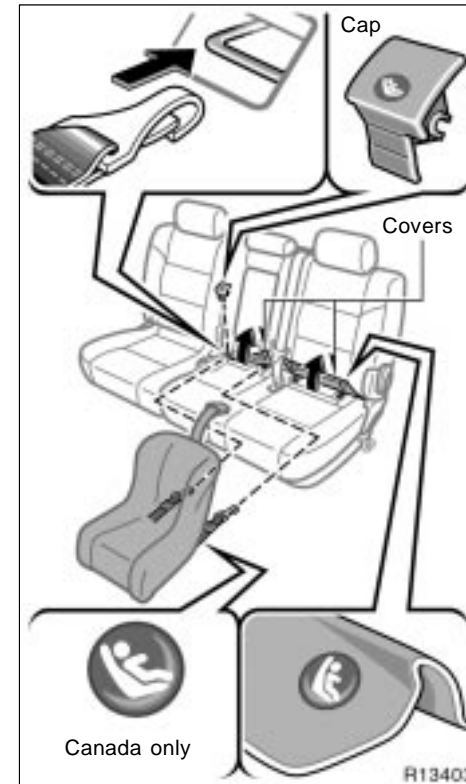


Left

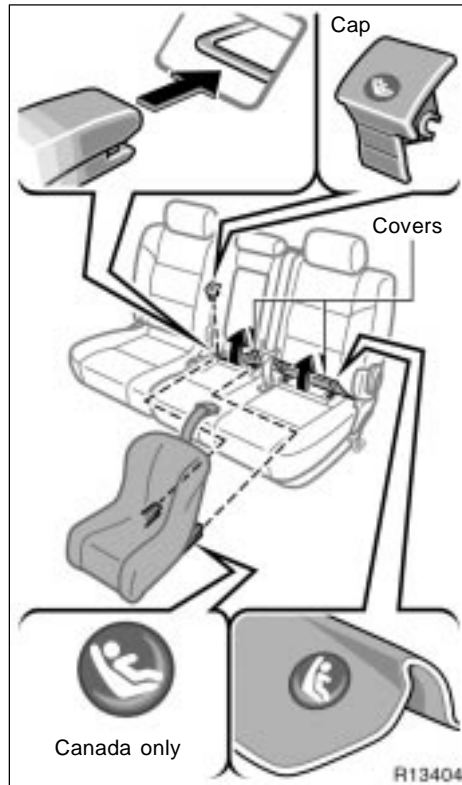
Lower anchorages for the child restraint systems complying with the FMVSS225 or CMVSS210.2 specifications are installed in the center and left positions of the rear seats.

The anchorages are installed in the gap between the seat cushion and seatback for center and left positions of rear seats.

Child restraint systems complying with the FMVSS213 or CMVSS213 specification can be fixed to these anchorages. In this case, it is not necessary to fix the child restraint system with a seat belt on the vehicle.



Type A



Type B

For owners in Canada

The symbol on a child restraint system indicates the presence of a lower connector system.

CHILD RESTRAINT SYSTEM INSTALLATION

Type A—


1. Turn up the covers for left lower anchorage on the center position of the seats and for anchorages on the left side position of the seats, and remove the cap for the right lower anchorage of the center position of the seat as shown in the illustration.
2. Widen the gap between the seat cushion and seatback slightly and confirm the position of the lower anchorages below the button and cap in the seat cushion.
3. Latch the hooks of lower straps onto the anchorages and tighten the lower straps.

Type B—

1. Turn up the covers for left lower anchorage on the center position of the seats and for anchorages on the left side position of the seat, and remove the cap for the right lower anchorage of the center position of the seat as shown in the illustration.
2. Widen the clearance gap the seat cushion and seatback slightly and confirm the position of the lower anchorages below the button and cap in the seat cushion.
3. Latch the buckles onto the anchorages.

If your child restraint system has a top strap, it should be anchored. (For the installation of the top strap, see “—Using a top strap” in this Section.)

For installation details, refer to the instruction manual equipped with each product.

 **CAUTION**

- ▶ When using the lower anchorages for the child restraint system, be sure that there are no irregular objects around the anchorages or that the seat belt is not caught.
- ▶ Push and pull the child restraint system in different directions to be sure it is secure. Follow all the installation instructions provided by its manufacturer.
- ▶ After securing the child restraint system, never recline the seat.
- ▶ Do not install a child restraint system on the rear seat if it interferes with the lock mechanism of the front seats. Otherwise, the child or front seat occupant(s) may be killed or seriously injured in case of sudden braking or a collision.

'05 TUNDRA_U (L/O 0409)

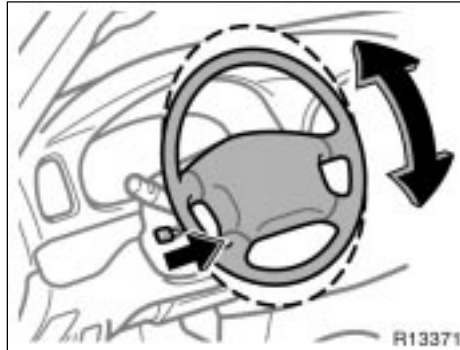
SECTION 1-4

OPERATION OF INSTRUMENTS AND CONTROLS

Steering wheel and Mirrors

Tilt steering wheel	146
Outside rear view mirrors	146
Anti- glare inside rear view mirror	148
Auto anti- glare inside rear view mirror	149
Sun visors	150

Tilt steering wheel



To change the steering wheel angle, hold the steering wheel, pull the lock release lever toward you, tilt the steering wheel to the desired angle and release the lever.

When the steering wheel is in a low position, it will spring up as you release the lock release lever.

CAUTION

- ▶ Do not adjust the steering wheel while the vehicle is moving. Doing so may cause the driver to mishandle the vehicle and an accident may occur resulting in death or serious injuries.
- ▶ After adjusting the steering wheel, try moving it up and down to make sure it is locked in position.

Outside rear view mirrors—



Adjust the mirror so that you can just see the side of your vehicle in the mirror.

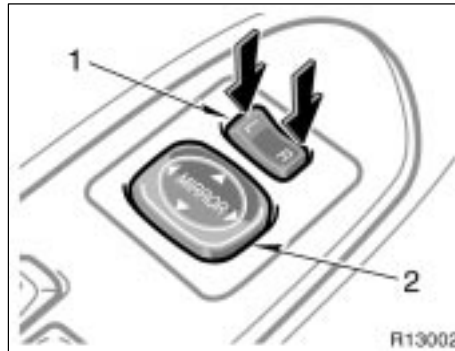
Be careful when judging the size or distance of any object seen in the outside rear view mirror on the passenger's side because it is a convex mirror. Any object seen in a convex mirror will look smaller and farther away than when seen in a flat mirror.

—Power rear view mirror control

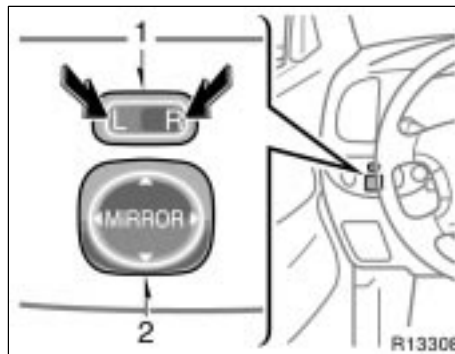
On some models, when you push the outside rear view mirror heater switch or outside rear view mirror defogger switch, the heater panels in the outside rear view mirrors will quickly clear the mirror surface. (See “Back window and outside rear view mirror defoggers” in Section 1-5 and “Outside rear view mirror heaters” in Section 1-5.)

CAUTION

- ▶ Do not adjust the mirror while the vehicle is moving. Doing so may cause the driver to mishandle the vehicle and an accident may occur resulting in death or serious injuries.
- ▶ On some models, since the mirror surfaces can get hot, do not touch them when the outside rear view mirror heater or defogger switch is on.



Standard and access cab models



Double cab models

To adjust a mirror, use the switches.

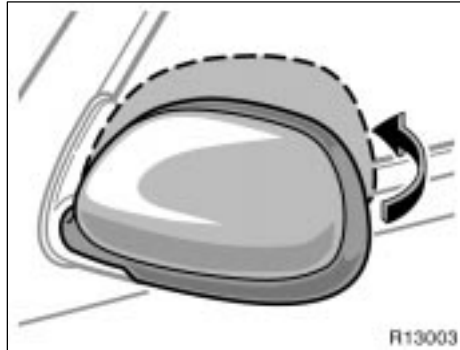
1. Master switch—To select the mirror to be adjusted
Push the switch to “L” (left) or “R” (right).
2. Control switch—To move the mirror
Push the switch in the desired direction.

Mirrors can be adjusted when the key is in the “ACC” or “ON” position.

NOTICE

If ice should jam the mirror, do not operate the control or scrape the mirror face. Use a spray de-icer to free the mirror.

—Folding rear view mirrors

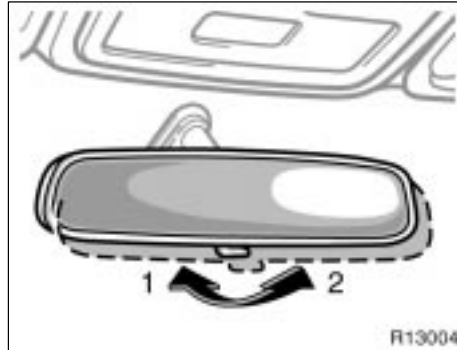


The rear view mirrors can be folded backward for parking in compact areas. To fold the rear view mirror, push backward.

CAUTION

Do not drive with the mirrors folded backward. Both the driver and passenger side rear view mirrors must be extended and properly adjusted before driving.

Anti-glare inside rear view mirror



Adjust the mirror so that you can just see the rear of your vehicle in the mirror.

To reduce glare from the headlights of the vehicle behind you during night driving, operate the lever on the lower edge of the mirror.

Daylight driving—Lever at position 1

The reflection in the mirror has greater clarity at this position.

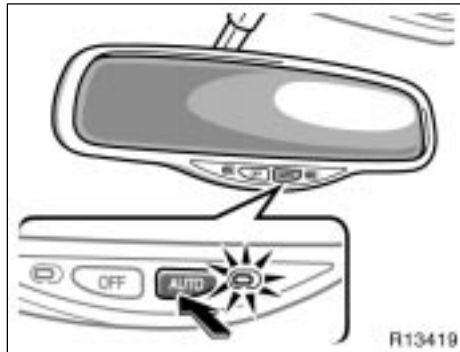
Night driving—Lever at position 2

Remember that by reducing glare you also lose some rear view clarity.

CAUTION

Do not adjust the mirror while the vehicle is moving. Doing so may cause the driver to mishandle the vehicle and an accident may occur resulting in death or serious injuries.

Auto anti-glare inside rear view mirror



Adjust the mirror so that you can just see the rear of your vehicle in the mirror.

This mirror is equipped with auto anti-glare function. The function is designed to reduce glare from the headlights of the vehicle behind you during night driving.

When the ignition key is inserted and turned on, the inside rear view mirror always turns on in the automatic function mode.

The indicator illuminates to show you that the function is on.


In automatic function mode, if the mirror detects light from the headlights of the vehicle behind you, the mirror surface darkens slightly to reduce the reflected light.

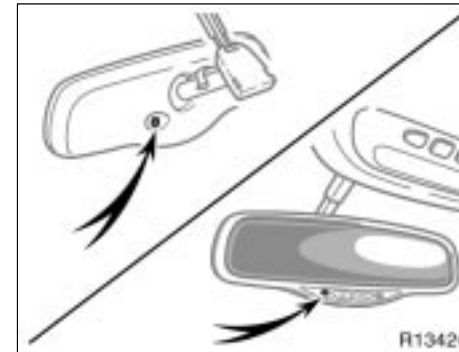
To turn off the automatic function, push the "OFF" switch.

To turn on the automatic function again, push the "AUTO" switch.

Adjust it before driving so that the rear view is in the best condition.

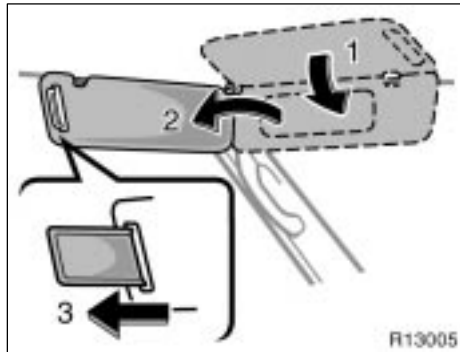
When the inside air temperature is low, it may take a little longer for the mirror to darken in response to the detection of headlights.

 CAUTION
Do not adjust the mirror while the vehicle is moving. Doing so may cause the driver to mishandle the vehicle and an accident may occur resulting in death or serious injuries.



To ensure correct functioning of anti-glare mirror sensors located on both sides of the mirror, do not touch or cover the sensors with your finger or a piece of cloth, etc.

Sun visors—



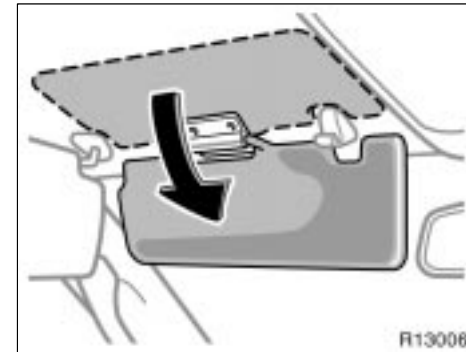
Standard and access cab models

To block out glare, move the sun visor.

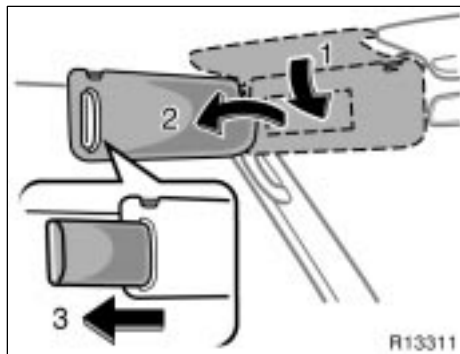
To block out glare from the front—Swing down the sun visor (position 1).

To block out glare from the side—Swing down the sun visor, remove it from the hook and swing it to the lateral side (position 2).

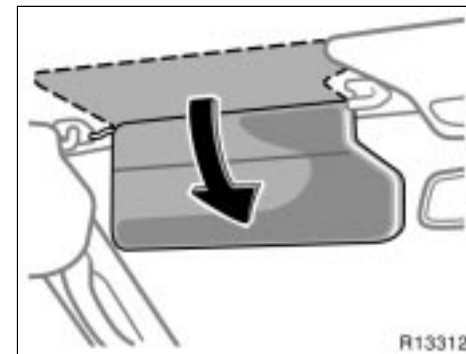
If glare comes from obliquely behind you, extend the plate at the end of the visor (to position 3).



Standard and access cab models



Double cab models



Double cab models

'05 TUNDRA_U (L/O 0409)

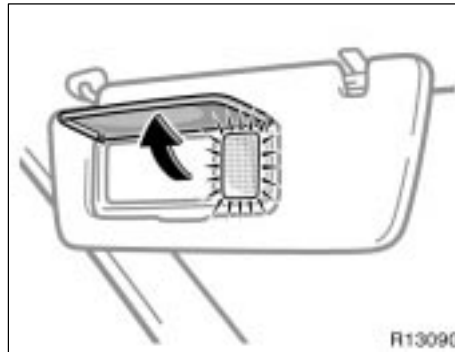
To block the glare from the front when the main sun visor is swung to the lateral side (position 2), swing down the sub visor.



CAUTION

Do not extend the plate at the end of the sun visor when the visor is in the position 1. It can cover the anti-glare inside rear view mirror and obstruct the rear view.

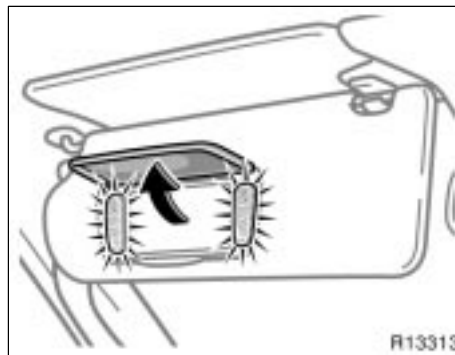
—Vanity mirrors



Standard and access cab models

To use the vanity mirrors, swing down the sun visor and open the cover.

The vanity light(s) comes on when you open the cover.



Double cab models

'05 TUNDRA_U (L/O 0409)

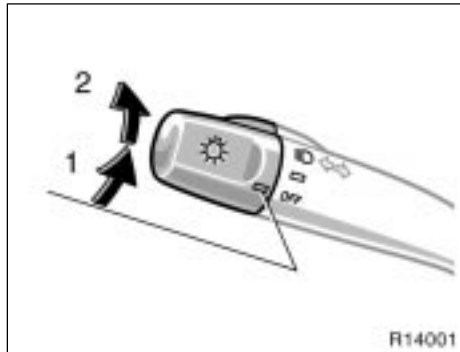
SECTION 1-5

OPERATION OF INSTRUMENTS AND CONTROLS

Lights and Wipers

Headlights and turn signals	154
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Instrument panel light control	156
Front fog lights	156
Interior light	157
Personal lights	157
Center interior and personal lights	158
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Cargo lamp	160
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Outside rear view mirror heaters	162
Back window and outside rear view mirror defoggers	163

Headlights and turn signals



HEADLIGHTS

To turn on the following lights: Twist the headlight/turn signal lever knob.

Position 1—Parking, tail, license plate and instrument panel lights

Position 2—Headlights and all of the above

The lights automatically turn off when the driver's door is opened with the ignition turned off. To turn them on again, turn the key to the "ON" position or actuate the headlight switch. If you are going to park for over one week, make sure the headlight switch is off.

NOTICE

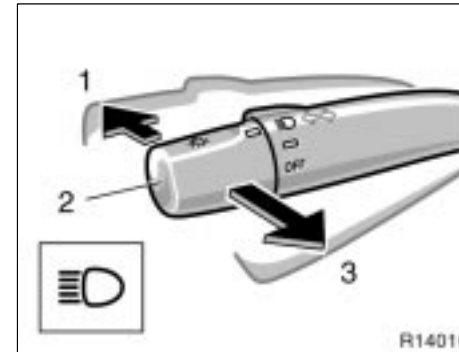
To prevent the battery from being discharged, do not leave the lights on for a long period when the engine is not running.

Daytime running light system (on some models)

The headlights turn on at reduced intensity when the parking brake is released with the engine started, even with the light switch in the "OFF" position. They will not go off until the ignition switch is turned off.

To turn on the other exterior lights and instrument panel lights, twist the knob to the position 1.

Twist the knob to the position 2 to turn the headlights to full intensity for driving at night.



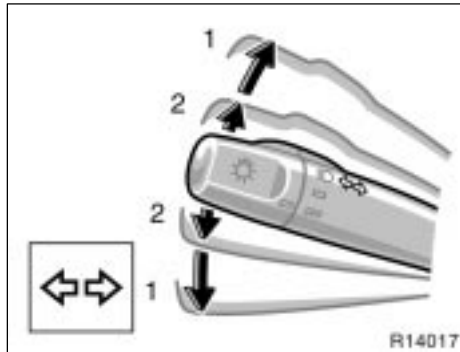
High-Low beams—For high beams, turn the headlights on and push the lever away from you (position 1). Pull the lever toward you (position 2) for low beams.

The headlight high beam indicator light (blue light) on the instrument panel will tell you that the high beams are on.

Flashing the high beam headlights (position 3)—Pull the lever all the way back. The high beam headlights turn off when you release the lever.

You can flash the high beam headlights with the knob turned to "OFF".

Emergency flashers



TURN SIGNALS

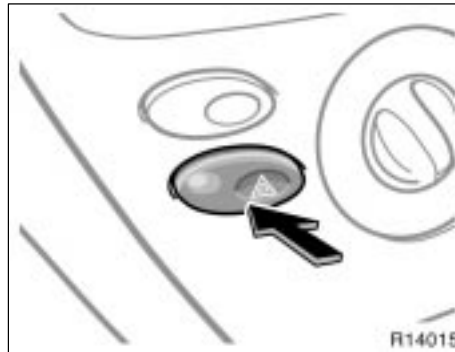
To signal a turn, push the headlight/turn signal lever up or down to position 1.

The key must be in the "ON" position.

The lever automatically returns after you make a turn, but you may have to return it by hand after you change lanes.

To signal a lane change, move the lever up or down to the pressure point (position 2) and hold it.

If the turn signal indicator lights (green lights) on the instrument panel flash faster than normal, a front or rear turn signal bulb is burned out.



To turn on the emergency flashers, push the switch.

All the turn signal lights will flash. To turn them off, push the switch once again.

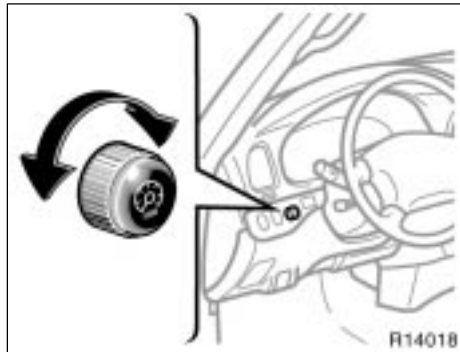
Turn on the emergency flashers to warn other drivers if your vehicle must be stopped where it might be a traffic hazard. Always pull as far off the road as possible.

The turn signal light switch will not work when the emergency flashers are operating.

NOTICE

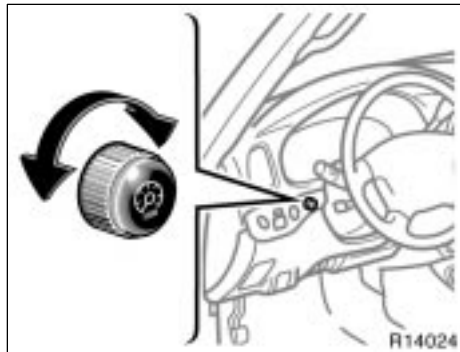
To prevent the battery from being discharged, do not leave the switch on longer than necessary when the engine is not running.

Instrument panel light control



Standard and access cab models

To adjust the brightness of the instrument panel lights, turn the knob.



Double cab models

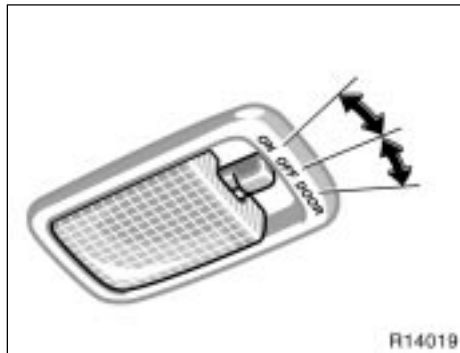
Front fog lights



To turn on the front fog lights, twist the band of the headlight/turn signal lever. They will come on only when the headlights are on low beam.

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Interior light



To turn on the interior light, slide the switch.

The interior light switch has the following positions:

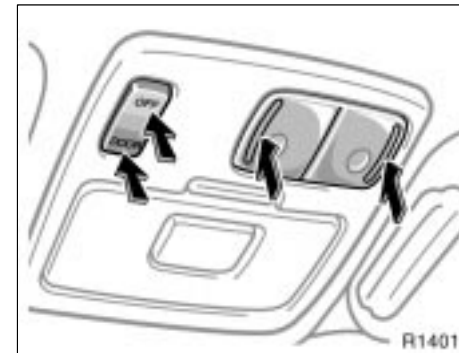
“ON”—Keeps the light on all the time.

“OFF”—Turns the light off.

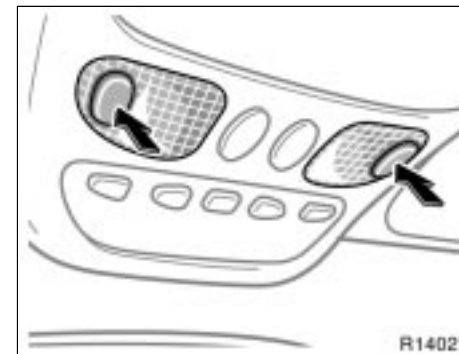
“DOOR”—Turns the light on when any door is opened. The light goes off when all the doors are closed.

Standard cab and access cab models only (with wireless remote control)—When the switch is in the “DOOR” position and all the door are unlocked using the wireless remote control transmitter simultaneously, the lights will come on and remain for about 30 seconds unless any door is opened or closed.

Personal lights



Standard and access cab models



Double cab models

Center interior and personal lights

Standard and access cab models—

To turn on the light, push the lens on your side. To turn the light off, push the lens once again.

The personal light switch has the following positions:

“OFF”—Turns the lights off.

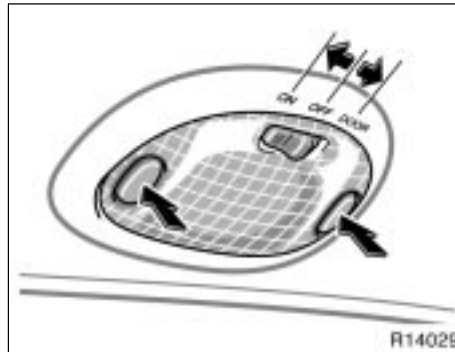
“DOOR”—Turns the lights on when any of the doors are opened.

With wireless remote control—When the switch is in the “DOOR” position and all the door are unlocked using the wireless remote control transmitter simultaneously, the lights will come on and remain for about 30 seconds unless any door is opened or closed.

Double cab models—

To turn on the personal light, push the switch. To turn the light off, push the switch once again.

Turn the light on when any door is opened. The light goes off when all the doors are closed.



Type A



Type B

CENTER INTERIOR LIGHT

Type A—

To turn on the interior light, slide the switch.

The interior light switch has the following positions:

“ON”—Keeps the light on all the time.

“OFF”—Turns the light off.

“DOOR”—Turns the light on when any of the doors is opened. The light remains on when all the doors are closed.

Type B—

To turn on the interior lights, push the switch.

The interior light switch has the following positions:

“DOOR”—Turns the lights on when any of the doors is opened. The light remains on when all the doors are closed.

“OFF”—The lights are off unless you operate either outside switch.

ILLUMINATED ENTRY SYSTEM

When the switch is in the "DOOR" position and any of the doors is opened, the light will come on. After all the doors are closed, the light remains on for a certain time before fading out.

However, in the following cases, the light goes out immediately:

- ▶ All the doors are closed when the ignition key is in "ACC" or "ON" position.
- ▶ The ignition key is turned to "ACC", "ON" or "START" after all the doors are closed.
- ▶ All the doors are locked when the light is still on.

When all the doors are unlocked using either the key or the wireless remote control transmitter simultaneously, the lights come on for about 15 seconds before fading out.

The following adjustments can be made in this system. For details, contact your Toyota dealer.

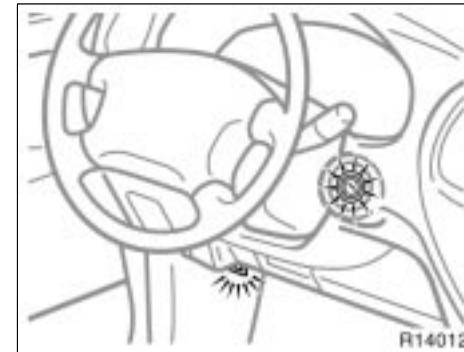
- ▶ Cancelling the door key or wireless remote control transmitter linked operation
- ▶ Changing the timing for the light turning off

To prevent the battery being discharged, the light will automatically turn off when the key is removed and the door is left opened with the switch at "DOOR" position for 20 minutes or more.

CENTER PERSONAL LIGHTS

To turn on the center personal light, push the switch. To turn the light off, push the switch once again.

Ignition switch and step lights



Standard and access cab models—

For easy access to the ignition switch, the ignition switch light comes on when the driver's door is opened. The step light also comes on when the driver's door is opened.

The ignition switch light remains on for some time after the driver's door is closed.

Double cab models—

For easy access to the ignition switch, the ignition switch light comes on when any of the doors are opened. The step light also comes on when any of the doors are opened.

Cargo lamp

The lights remain on for some time after all the doors are closed.

However, in the following cases, the lights go off immediately.

- ▶ All the doors are closed when the ignition key is in the "ACC" or "ON" position.
- ▶ The ignition key is turned to the "ACC", "ON", or "START" position after all the doors are closed.
- ▶ All the doors are closed and locked.

When all the doors are unlocked using either the key or the wireless remote control transmitter simultaneously, the lights will come on and remain on for about 15 seconds before fading out.

To prevent the battery being discharged, the lights will automatically turn off when the key is removed and the door is left opened for 20 minutes or more.

The following adjustments can be made in this system. For details, contact your Toyota dealer.

- ▶ Cancelling the door key or wireless remote control transmitter linked operation
- ▶ Changing the timing for the light turning off



The cargo lamp is designed to light up the rear deck of your vehicle.

CARGO LAMP OPERATION

By pushing the "CARGO LAMP" switch

To turn on: Push the "CARGO LAMP" switch once.

At this time, the indicator light on the instrument panel will come on.

To turn off: Push the "CARGO LAMP" switch once again.

By locking and unlocking the doors (vehicles with the power door lock system)

You can operate the cargo lamp by this method when all the doors are closed and the ignition switch is in the "ACC" or "LOCK" position or the key is removed.

To turn on: Unlock the doors with the key, the power door lock switch or the wireless remote control transmitter (double cab models).

The cargo lamp will automatically turn off after 20 seconds.

To turn off: Lock the doors with the key, the power door lock switch or the wireless remote control transmitter (double cab models).

By opening and closing the doors

To turn on: Open any of the doors.

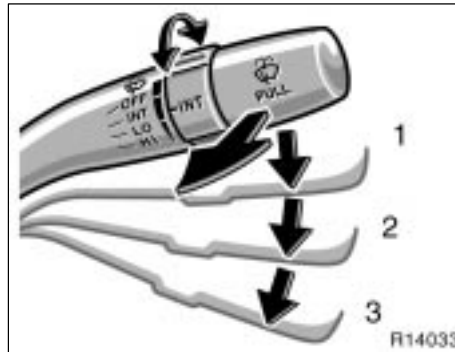
To turn off: Close all the doors:

- ▶ When the ignition switch is in the "ON" position, the cargo lamp will go off immediately.
- ▶ When the ignition switch is in the "ACC" or "LOCK" position or the key is removed, the cargo lamp will automatically go off after 20 seconds.

CARGO LAMP AUTOMATIC POWER-OFF FUNCTION

To prevent the battery being discharged, the cargo lamp will automatically go off when the lamp remains on for 30 minutes or more.

Windshield wipers and washer (intermittent type)



To turn on the windshield wipers, move the lever to the desired setting.

The key must be in the "ON" position.

Lever position	Speed setting
Position 1	Intermittent
Position 2	Slow
Position 3	Fast

The "INT" band lets you adjust the wiping time interval when the wiper lever is in the intermittent position (position 1). Twist the band upward to increase the time between sweeps, and downward to decrease it.

To squirt washer fluid, pull the lever toward you and release it.

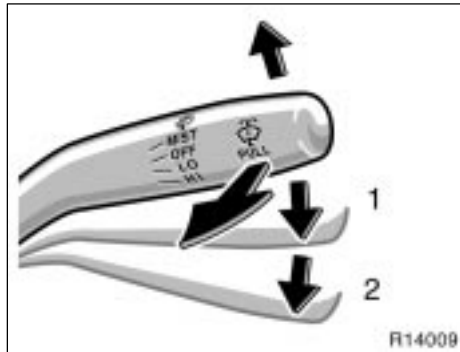
If the windshield wipers are off, they will operate a couple of times after the washer squirts.

For instructions on adding washer fluid, see "Adding washer fluid" in Section 7-3. In freezing weather, warm the windshield with the defroster before using the washer. This will help prevent the washer fluid from freezing on your windshield, which can block your vision.

NOTICE

Do not operate the wipers if the windshield is dry. It may scratch the glass.

Windshield wipers and washer (mist type)



In freezing weather, warm the windshield with the defroster before using the washer. This will help prevent the washer fluid from freezing on your windshield, which can block your vision.

NOTICE

Do not operate the wipers if the windshield is dry. It may scratch the glass.

To turn on the windshield wipers, move the lever to the desired setting.

The key must be in the "ON" position.

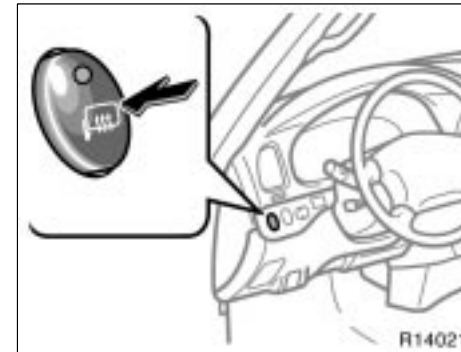
Lever position	Speed setting
Position 1	Slow
Position 2	Fast

For a single sweep of the windshield, push the lever up and release it.

To squirt washer fluid, pull the lever toward you and release it.

For instructions on adding washer fluid, see "Adding washer fluid" in Section 7-3.

Outside rear view mirror heaters



To defog or defrost the outside rear view mirrors, push the switch.

The key must be in the "ON" position.

The heater panels in the outside rear view mirrors will quickly clear the mirror surfaces. An indicator light will illuminate to indicate the mirror heaters are operating.

Push the switch once again to turn the mirror heaters off.

The system will automatically shut off after the mirror heaters have operated about 15 minutes.

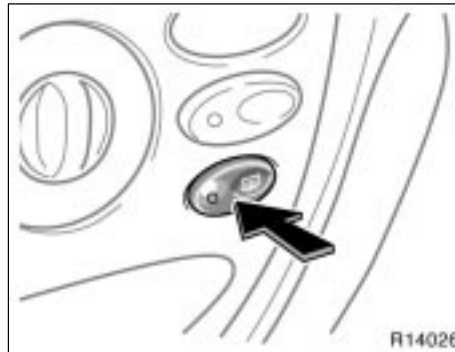
CAUTION

Since the mirror surfaces can get hot, do not touch them when the switch is on.

Make sure you turn the mirror heaters off when the mirror surfaces are clear. Leaving the mirror heaters on for a long time could cause the battery to discharge, especially during stop-and-go driving. The mirror heaters are not designed for drying rain water or for melting snow.

If the outside rear view mirrors are heavily coated with ice, use a spray de-icer before operating the switch.

Back window and outside rear view mirror defoggers



To defog or defrost the back window, push the switch with the back window closed.

The key must be in the "ON" position.

The thin heater wires on the inside of the back window will quickly clear the surface. An indicator light will illuminate to indicate the defogger is operating.

Heater panels in the outside rear view mirrors will also quickly clear the surfaces.

Push the switch once again to turn the defogger off.

The system will automatically shut off after the defoggers have operated about 15 minutes.

Make sure you turn the defoggers off when the surfaces are clear. Leaving the defoggers on for a long time could cause the battery to discharge, especially during stop-and-go driving. The defoggers are not designed for drying rain water or for melting snow.

CAUTION

Since the mirror surfaces can get hot, do not touch them when the defogger switch is on.

NOTICE

When cleaning the inside of the back window, be careful not to scratch or damage the heater wires or connectors.

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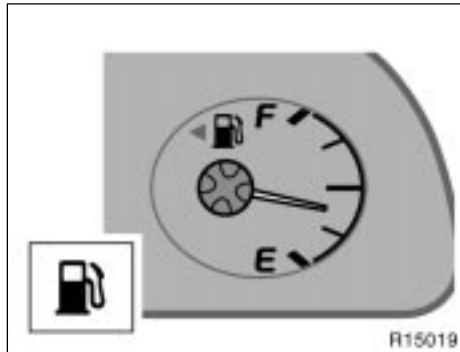
SECTION 1-6

OPERATION OF INSTRUMENTS AND CONTROLS

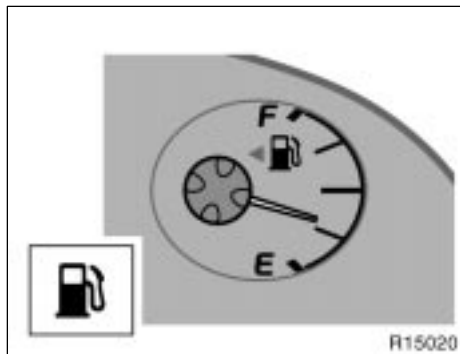
Gauges, Meters and Service reminder indicators

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Voltmeter	168
Tachometer	168
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Fuel gauge



Without tachometer



With tachometer

The gauge indicates the approximate quantity of fuel remaining in the tank when the ignition switch is on.

Nearly full—Needle at “F”
Nearly empty—Needle at “E”

It is a good idea to keep the tank over 1/4 full.

The needle moves when braking, accelerating or making turns. This is caused by the movement of the fuel in the tank.

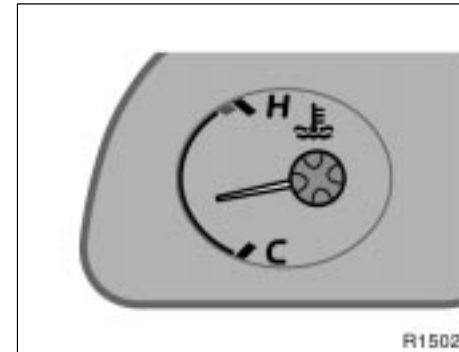
If the fuel level approaches “E” or the low fuel level warning light comes on, fill the fuel tank as soon as possible.

On inclines or curves, due to the movement of fuel in the tank, the fuel gauge needle may fluctuate or the low fuel level warning light may come on earlier than usual.

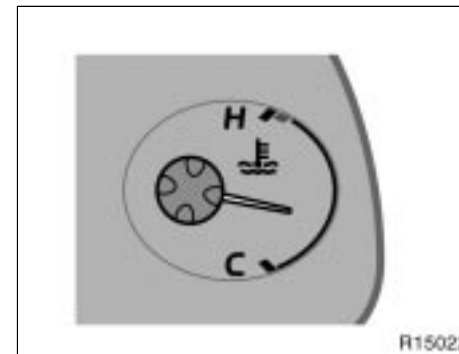
If the fuel tank is completely empty, the malfunction indicator lamp comes on. Fill the fuel tank immediately.

The indicator lamp goes off after driving several times. If the indicator lamp does not go off, contact your Toyota dealer as soon as possible.

Engine coolant temperature gauge



Without tachometer



With tachometer

The gauge indicates the engine coolant temperature when the ignition switch is on. The engine operating temperature will vary with changes in weather and engine load.

If the needle moves into the red zone, your engine is too hot. If your vehicle overheats, stop your vehicle and allow the engine to cool.

Your vehicle may overheat during severe operating conditions, such as:

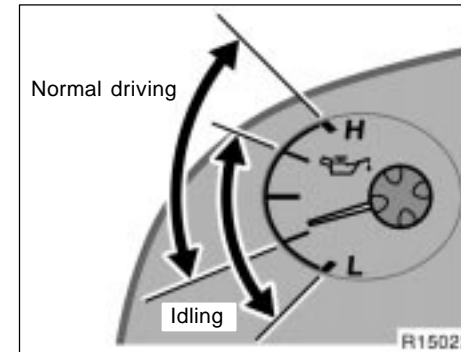
- ▶ Driving up a long hill on a hot day.
- ▶ Reducing speed or stopping after high speed driving.
- ▶ Idling for a long period with the air conditioning on in stop-and-go traffic.
- ▶ Towing a trailer.

NOTICE

◆ *Do not remove the thermostat in the engine cooling system as this may cause the engine to overheat. The thermostat is designed to control the flow of coolant to keep the temperature of the engine within the specified operating range.*

◆ *Do not continue driving with an overheated engine. See "If your vehicle overheats" in Section 4.*

Oil pressure gauge



The oil pressure gauge indicates engine oil pressure when the ignition switch is on. Check it while driving to make sure that the needle is in the proper range.

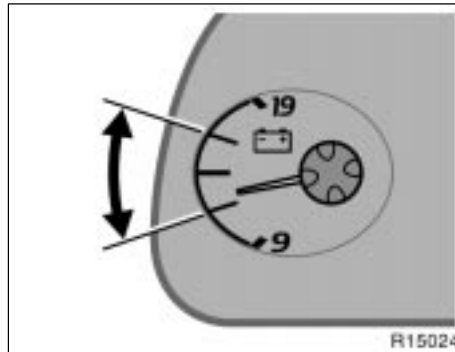
If the oil pressure should stay below the normal range, pull off the road to a safe place and stop the engine immediately. Call a Toyota dealer or qualified repair shop for assistance.

Oil pressure may not build up when the oil level is too low. The oil pressure gauge is not designed to indicate oil level, and the oil level must be checked using the level dipstick.

NOTICE

Do not drive the vehicle with the oil pressure below the normal range until the cause is fixed—it may ruin the engine.

Voltmeter

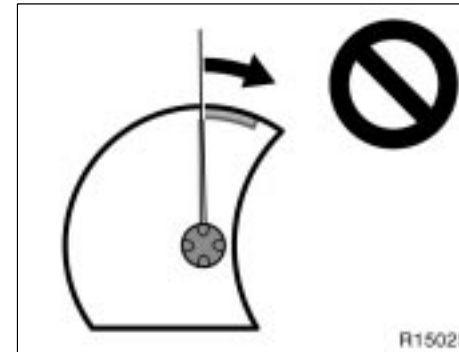


The voltmeter tells whether the battery is charged or discharged. Check it while the engine is running—the needle should always indicate as shown above.

If the needle reads below or above the normal range while the engine is running, it indicates the charging system needs immediate repair.

However, it is normal for the needle to drop below the normal range during engine starting.

Tachometer



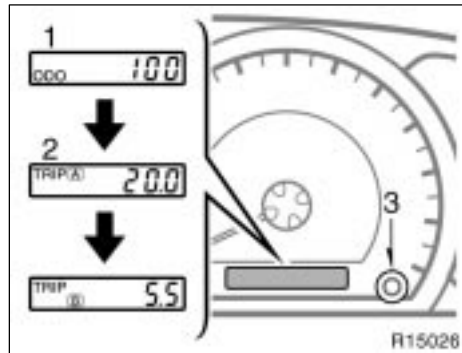
The tachometer indicates engine speed in thousands of rpm (revolutions per minute). Use it while driving to select correct shift points and to prevent engine lugging and over-revving.

Driving with the engine running too fast causes excessive engine wear and poor fuel economy. Remember, in most cases the slower the engine speed, the greater the fuel economy.

NOTICE

Do not let the indicator needle get into the red zone. This may cause severe engine damage.

Odometer and two trip meters



This meter displays the odometer and two trip meters.

1. Odometer—Shows the total distance the vehicle has been driven.
2. Two trip meters—Show two different distances independently driven since the last time each trip meter was set to zero.

You can use one trip meter to calculate the fuel economy and the other to measure the distance on each trip. All trip meter data is cancelled if the electrical power source is disconnected.








3. Trip meter reset knob—Resets the two trip meters to zero, and also change the meter display.

To change the meter display, quickly push and release the knob. The meter display changes in the order from the odometer to trip meter A to trip meter B, then back to the odometer each time you push.






To reset the trip meter A to zero, display the meter A reading, then push and hold the knob until the meter is set to zero. The same process can be applied for resetting the trip meter B.

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Service reminder indicators and warning buzzers

If the indicator or buzzer comes on...		Do this.
(a)	 BRAKE (indicator and buzzer*)	If parking brake is off, stop immediately and contact Toyota dealer. *: For vehicles with the vehicle stability control system only
(b)	 (indicator and buzzer)	Fasten driver's seat belt.
(c)	PASSENGER 	Fasten front passenger's seat belt.
(d)		Stop and check.
(e)		Stop and check.
(f)	 CHECK	Take vehicle to Toyota dealer.
(g)		Fill up tank.

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If the indicator or buzzer comes on...		Do this.
(h)	ABS or 	Take vehicle to Toyota dealer.
(i)	VSC TRAC	Take vehicle to Toyota dealer.
(j)		Close all doors.
(k)		Take vehicle to Toyota dealer immediately.
(l)		Adjust tire inflation pressure (including spare tire). If the light blinks, contact Toyota dealer.
(m)	A/T OIL TEMP	Stop and check.
(n)		Add washer fluid.
(o)	MAINT REQD	Replace engine oil.

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If the indicator or buzzer comes on...		Do this.
(p)	Key reminder buzzer	Remove key.
(q)	Four-wheel drive system warning buzzer	Shift the transfer mode correctly.

(a) Brake System Warning Light and Buzzer


This light comes on in the following cases when the ignition key is in the "ON" position.

►When the parking brake is applied...

With the vehicle stability control system—

This light comes on for a few seconds when the ignition key is turned to the "ON" position even after the parking brake is released.

►When the brake fluid level is low...

 **CAUTION**

It is dangerous to continue driving normally when the brake fluid level is low.

►When the hydraulic brake booster fails (with the vehicle stability control system)...

If the hydraulic booster causes a problem resulting in poor braking performance, the warning light comes on and buzzer sounds continuously.


Have your vehicle checked at your Toyota dealer in the following cases:

►The light does not come on even if the parking brake is applied when the ignition key is in the "ON" position.

With the vehicle stability control system—

►The light does not come on even if the ignition key is turned on with the parking brake released.

A warning light turning on briefly during operation does not indicate a problem.

 **CAUTION**

Without the vehicle stability control system—

If the light does not turn off even after the parking brake is released while the engine is running, immediately stop your vehicle at a safe place and contact your Toyota dealer. In this case, the brakes may not work properly and your stopping distance will become longer. Depress the brake pedal firmly and bring the vehicle to an immediate stop.

With the vehicle stability control system—

If any of the following conditions occurs, immediately stop your vehicle at a safe place and contact your Toyota dealer.

►The light does not turn off even after the parking brake is released while the engine is running.

►The warning buzzer comes on together with the warning light.

In either case, this can indicate that the brakes may not work properly and your stopping distance will become longer. Depress the brake pedal firmly and bring the vehicle to an immediate stop.

►The brake system warning light remains on together with the "ABS" warning light.

In this case, not only the anti-lock brake system will fail but also the vehicle will become extremely unstable during braking.

With the vehicle stability control system—

Any of the following conditions may occur, but do not indicate the malfunction:

- ▶ The light may stay on for about 60 seconds after the ignition key is turned to the "ON" position. It is normal if it turns off after a while.
- ▶ Depressing the brake pedal repeatedly may turn on the warning light and buzzer. It is normal if the light turns off and the buzzer stops sounding after a few seconds.
- ▶ You may hear a small sound in the engine compartment after the engine is started or the brake pedal is depressed repeatedly. This is a pump pulsating sound of the brake system, and it is not a malfunction.

(b) Driver's Seat Belt Reminder Light and Buzzer

The light and buzzer act as a reminder to buckle up the driver's seat belt.

Once the ignition key is turned to "ON" or "START", the reminder light flashes and buzzer sounds if the driver's seat belt is not fastened. Unless the driver fastens the belt, the light continues flashing and the buzzer stops after about 4 to 8 seconds.

(c) Front Passenger's Seat Belt Reminder Light

The light acts as a reminder to have the front passenger buckle up the seat belt.

Vehicles with bench seat—

Once the ignition key is turned to "ON" or "START", the reminder light flash if a passenger sits in the front passenger seat and does not fasten the seat belt. However, if a front passenger uses an additional seat cushion, the light may not flash even when the seat belt is not buckled up.

If luggage or other load is placed on the front passenger seat, depending on its weight and how it is placed on the seat, built-in sensors in the seat cushion may detect the pressure, causing the reminder light to flash.

Vehicles with separate seat—

Once the ignition key is turned to "ON", the reminder light flashes if a passenger sits in the front passenger seat and does not fasten the seat belt.

If luggage or other load is placed on the front passenger seat, depending on its weight, the reminder light may come on.

(d) Discharge Warning Light

This light warns that the battery is being discharged.

If it comes on while you are driving, there is a problem somewhere in the charging system.

The engine ignition will continue to operate, however, until the battery is discharged. Turn off the air conditioning, blower, radio, etc., and drive directly to the nearest Toyota dealer or repair shop.

NOTICE

Do not continue driving if the engine drive belt is broken or loose.

(e) Low Engine Oil Pressure Warning Light

This light warns that the engine oil pressure is too low.

If it flickers or stays on while you are driving, pull off the road to a safe place and stop the engine immediately. Call a Toyota dealer or qualified repair shop for assistance.

The light may occasionally flicker when the engine is idling or it may come on briefly after a hard stop. There is no cause for concern if it then goes out when the engine is accelerated slightly.

The light may come on when the oil level is extremely low. It is not designed to indicate low oil level, and the oil level must be checked using the level dipstick.

NOTICE

Do not drive the vehicle with the warning light on—even for one block. It may ruin the engine.

(f) Malfunction Indicator Lamp

This lamp comes on when the ignition key is turned to the “ON” position and goes off after the engine starts. This means that the warning light system is operating properly.

If the lamp remains on, or the lamp comes on while driving, first check the followings.

▶ Empty fuel tank

If the fuel tank is empty, refuel immediately.

▶ Loose fuel tank cap

If the fuel tank cap is loose, securely tighten it.

These cases are temporary malfunctions. The malfunction indicator lamp will go off after taking several driving trips.

If the lamp does not go off even after several trips, contact your Toyota dealer as soon as possible.

If the fuel tank is not empty or the fuel tank cap is not loose...

▶ There is a problem somewhere in the engine, emission control system, electronic throttle control system, automatic transmission electrical system or warning light system itself.

Contact your Toyota dealer as soon as possible to service the vehicle.

If engine speed does not increase when the accelerator pedal is depressed, there may be a problem somewhere in the electronic throttle control system.

At this time, vibration may occur. However, if you depress the accelerator pedal more firmly and slowly, you can drive your vehicle at low speeds. Have your vehicle checked by your Toyota dealer as soon as possible.

Even if the abnormality of the electronic throttle control system is corrected during low speed driving, the system may not be recovered until the engine is stopped and the ignition key is turned to “ACC” or “LOCK” position.



Emissions Inspection and Maintenance (I/M) programs

Your vehicle may not pass a state emission inspection if the malfunction indicator lamp remains on. Contact your Toyota dealer to check your vehicle's emission control system and OBD (On-Board Diagnostics) system before taking your vehicle for the inspection.

For details, see "Emissions Inspection and Maintenance (I/M) programs" in Section 6.

(g) Low Fuel Level Warning Light

This light comes on when the fuel level in the tank becomes nearly empty. Fill up the tank as soon as possible.

On inclines or curves, due to the movement of fuel in the tank, the low fuel level warning light may come on earlier than usual.

(h) "ABS" Warning Light

Vehicles without vehicle stability control system—

The light comes on when the ignition key is turned to the "ON" position. If the anti-lock brake system works properly, the light turns off after a few seconds. Thereafter, if the system malfunctions, the light comes on again.

When the "ABS" warning light is on (and the brake system warning light is off), the anti-lock brake system does not operate, but the brake system still operates conventionally.

When the "ABS" warning light is on (and the brake system warning light is off), the anti-lock brake system does not operate so that the wheels could lock up during a sudden braking or braking on slippery road surfaces.

If either of the following conditions occurs, this indicates a malfunction somewhere in the components monitored by the warning light system. Contact your Toyota dealer as soon as possible to service the vehicle.

▶ The light does not come on when the ignition key is turned to the "ON" position, or the light remains on.

▶ The light comes on while you are driving.

A warning light turning on briefly during operation does not indicate a problem.

Vehicles with vehicle stability control system—

The light comes on when the ignition key is turned to the "ON" position. If the anti-lock brake system and the brake assist system work properly, the light turns off after a few seconds. Thereafter, if either of the systems malfunctions, the light comes on again.

When the "ABS" warning light is on (and the brake system warning light is off), the following systems do not operate, but the brake system still operates conventionally.

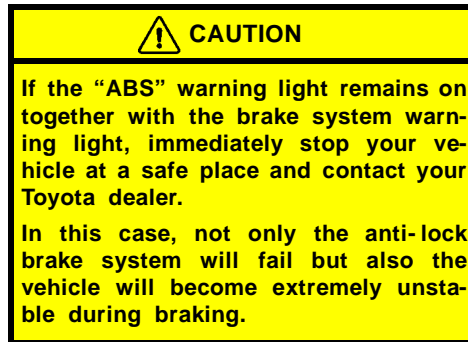
- ▶ Anti-lock brake system
- ▶ Brake assist system
- ▶ Traction control system
- ▶ "AUTO LSD" system
- ▶ Vehicle stability control system

When the "ABS" warning light is on (and the brake system warning light is off), the anti-lock brake system does not operate, so that the wheels will lock up during a sudden braking or braking on slippery road surfaces.

If either of the following conditions occurs, this indicates a malfunction somewhere in the components monitored by the warning light system. Contact your Toyota dealer as soon as possible to service the vehicle.

- ▶ The light does not come on when the ignition key is turned to the "ON" position, or remains on.
- ▶ The light comes on while you are driving.

A warning light turning on briefly during operation does not indicate a problem.



Either of the following conditions may occur, but do not indicate a malfunction:

- ▶ The light may stay on for about 60 seconds after the ignition key is turned to the "ON" position. It is normal if it turns off after a while.
- ▶ Depressing the brake pedal repeatedly may turn on the light. It is normal if it turns off after a few seconds.

(i) "VSC TRAC" Warning Light

The light warns that there is a problem somewhere in the following.

- ▶ Vehicle stability control system
- ▶ Traction control system
- ▶ "AUTO LSD" system

The light will come on when the ignition key turned to "ON", and will go off after a few seconds.

It is not a malfunction that the warning light may stay on for 60 seconds after the ignition key is turned to the "ON" position.

Depressing the brake pedal repeatedly may turn on the lights. It is normal if they go out after a few seconds.

If the light comes on while driving, the above mentioned systems do not work. However, as the brakes operate normally when applied, it is no problem to continue your driving.

In the following cases, contact your Toyota dealer:

- ▶ The warning light does not come on after the ignition key is turned to "ON".
- ▶ The warning light remains on after the ignition key is turned to "ON".
- ▶ The warning light comes on while driving.

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When the brake fluid level is too low, the traction control system, "AUTO LSD" system and vehicle stability control system will not operate and the warning light comes on.

(j) Open Door Warning Light

This light remains on until all the doors are completely closed.

(k) SRS Warning Light

This light will come on when the ignition key is turned to the "ON" position. After about 6 seconds, the light will go off. This means the system of the airbag and front seat belt pretensioners are operating properly.

This warning light system monitors the airbag sensor assembly, front airbag sensors, side and curtain shield airbag sensors, curtain shield airbag sensors, driver's seat position sensor, driver's seat belt buckle switch, front passenger occupant classification system and indicator light, passenger airbag manual on-off switch, front passenger's seat belt buckle switch, seat belt pretensioner assemblies, inflators, warning light, "RSCA OFF" indicator light, interconnecting wiring and power sources.

If either of the following conditions occurs, this indicates a malfunction somewhere in the parts monitored by the warning light system. Contact your Toyota dealer as soon as possible to service the vehicle.

▶The light does not come on when the ignition key is turned to the "ON" position or remains on for more than 6 seconds.

▶The light comes on while driving.

(l) Low Tire Pressure Warning Light

This light warns that the tire pressure of one or more of your tires (including the spare tire) is low. The light comes on when the ignition key is turned to the "ON" position. It goes off after a few seconds. This indicates that the tire pressure warning system is functioning properly.

If the warning light comes on, stop your vehicle in a safe place as soon as possible and check that the inflation pressure of all tires (including the spare tire) is as specified on the tire and loading information label. (See "Checking tire inflation pressure" in Section 7-2.) The light should go off a few minutes after the tire pressure is adjusted.

If the warning light blinks, the tire pressure warning system may be malfunctioning. Contact your Toyota dealer.

For details, see "Tire pressure warning system" in Section 1-7.

(m) Automatic Transmission Fluid Temperature Warning Light (four-wheel drive models)

This light warns that the automatic transmission fluid temperature is too high.

If this light comes on while you are driving, slow down and pull off the road. Stop the vehicle at a safe place and put the selector lever in "P". With the engine idling, wait until the light goes off. If the light goes off, you may start the vehicle again. If the light does not go off, call a Toyota dealer or qualified repair shop for assistance.

(n) Low Windshield Washer Fluid Level Warning Light

This light warns that the windshield washer fluid level is too low. Add washer fluid at your earliest opportunity. (For instructions, see "Adding washer fluid" in Section 7-3.)

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(o) Engine Oil Replacement Reminder Light (for vehicles sold in U.S.A.)

This light acts as a reminder when to replace the engine oil.

This light will come on when the ignition key is turned to "ON" and will go off after about a few seconds.

When you drive for about 7200 km (4500 miles) after the engine oil replacement, this light illuminates for about 3 seconds and then flashes for about 12 seconds with the ignition key turned to the "ON" position. If you continue driving without replacing the engine oil, and if the distance driven exceeds 8000 km (5000 miles), the light will come on after the ignition key is turned to "ON" position. The light will remain on thereafter.

If the light is flashing, we recommend that you replace the engine oil at an early opportunity depending on the driving and road conditions. If the light comes on, replace it as soon as possible.

The system must be reset after the engine oil replacement. Reset the system by the following procedure:

1. Turn the ignition key to the "ACC" or "LOCK" position with the odometer reading shown. (For details, see "Odometer and two trip meters" in this Section.)
2. Turn the ignition key to the "ON" position while holding down the trip meter reset knob.

Hold down the knob for at least 5 seconds. The odometer indicates "000000" and the light goes off.

If the system fails to reset, the light will continue flashing.

(p) Key Reminder Buzzer

This buzzer acts as a reminder to remove the key when you open the driver's door with the ignition key in the "ACC" or "LOCK" position.

(q) Four-wheel Drive System Warning Buzzer

This buzzer reminds you that the transfer mode is not selected correctly.

If the buzzer sounds when you shift the transfer from "2WD" to "4HI", "4LO" to "4HI", "4HI" to "4LO", or "4LO" to "2WD" mode, follow the instructions in "Four-wheel drive system" in Section 1-7.

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CHECKING SERVICE REMINDER INDICATORS (except the low fuel level warning light and low windshield washer fluid level warning light)

1. Apply the parking brake.
2. Open one of the doors.
The open door warning light should come on.
3. Close the door.
The open door warning light should go off.
4. Turn the ignition key to "ON", but do not start the engine.
All the service reminder indicators except the open door warning light should come on.

The following service reminder indicators go off after a few seconds:

- ▶ "ABS" warning light
- ▶ "VSC TRAC" warning light
- ▶ Low tire pressure warning light
- ▶ Engine oil replacement reminder light
- ▶ Roll sensing of curtain shield airbag off indicator light
- ▶ "AUTO LSD" indicator light
- ▶ "VSC OFF" indicator light (four-wheel drive models)

▶ Slip indicator light

The SRS warning light goes off after about 6 seconds.

There may be the case that the "ABS" warning light (brake assist system warning light), "VSC TRAC" warning light, slip indicator light and "VSC OFF" (four-wheel drive models) indicator light stay on for about 60 seconds after the ignition key is turned to the "ON" position. It is normal if they go out after a while.

If any service reminder indicator or warning buzzer does not function as described above, have it checked by your Toyota dealer as soon as possible.

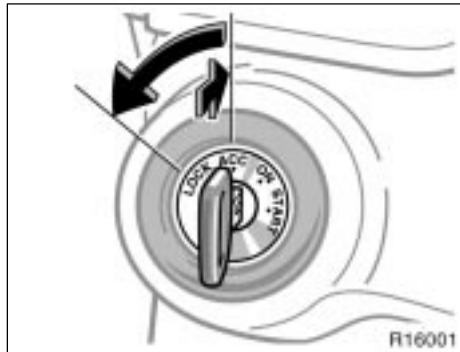
SECTION 1-7

OPERATION OF INSTRUMENTS AND CONTROLS

Ignition switch, Transmission and Parking brake

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Ignition switch with steering lock



“START”—Starter motor on. The key will return to the “ON” position when released.

For starting tips, see Section 3.

“ON”—Engine on and all accessories on.

This is the normal driving position.

It is not a malfunction if the needle on all meters and gauges move slightly when the ignition switch is turned to the “ON” position.

“ACC”—Accessories such as the radio operate, but the engine is off.

If you leave the key in the “ACC” or “LOCK” position and open the driver’s door, a buzzer will remind you to remove the key.

“LOCK”—Engine is off and the steering wheel is locked. The key can be removed only at this position.

You must push in the key to turn the key from “ACC” to the “LOCK” position. On vehicles with an automatic transmission, the selector lever must be in the “P” position before pushing the key.

When starting the engine, the key may seem stuck at the “LOCK” position. To free it, first be sure the key is pushed all the way in, and then rock the steering wheel slightly while turning the key gently.

Approximately five hours after the engine is turned off, you may hear sound coming from underneath the rear deck for several minutes. This is normal operation and does not indicate a malfunction. (See “Leak detection pump.”)

CAUTION

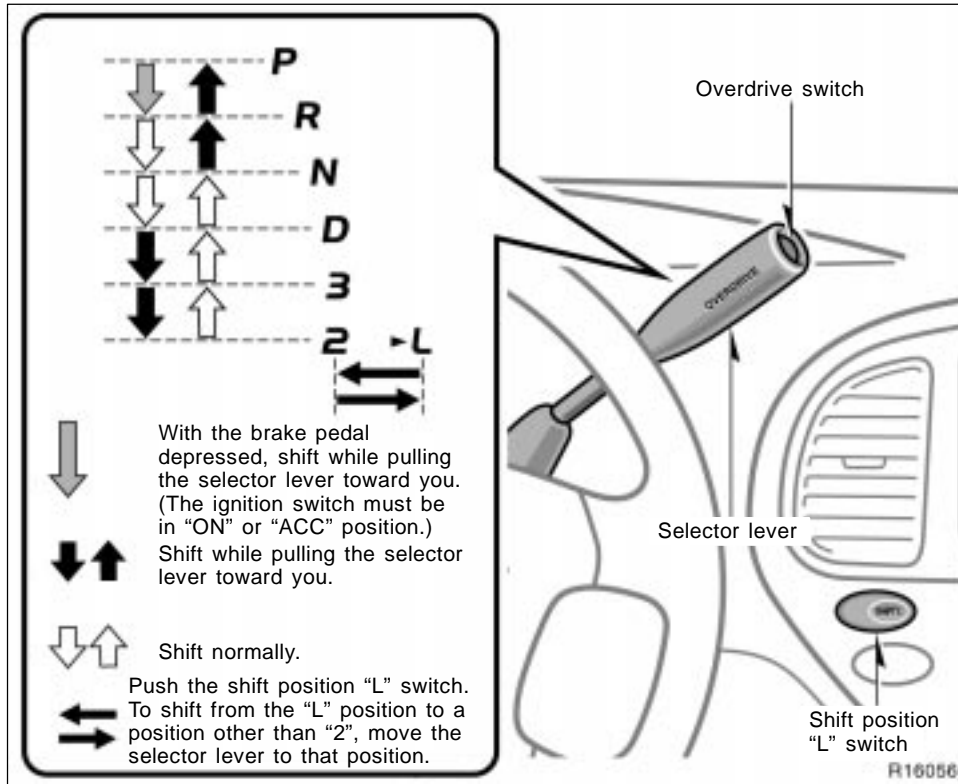
For manual transmission:

Never remove the key when the vehicle is moving, as this will lock the steering wheel and result in loss of steering control.

NOTICE

Do not leave the key in the “ON” position if the engine is not running. The battery will discharge and the ignition could be damaged.

Automatic transmission



Your automatic transmission has a shift lock system to minimize the possibility of incorrect operation. This means you can only shift out of "P" position when the brake pedal is depressed (with the ignition switch in "ON" or "ACC" position and the selector lever pulled toward you).

(a) Selector lever

The shift position is displayed on the instrument cluster.

P: Parking, engine starting and key removal

R: Reverse

N: Neutral

D: Normal driving (with overdrive on)

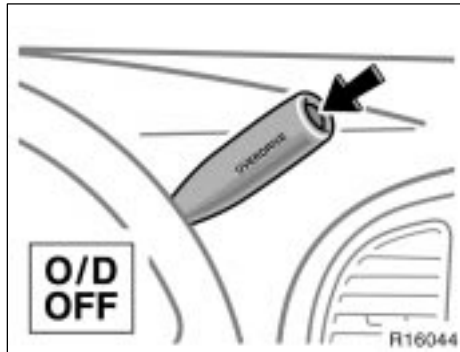
3,2: Stronger engine braking

(b) Shift position "L" switch ("SHIFT L" switch)

To down shift to first gear ("L" position), push this switch with the shift lever in the "2" position. The "►L" is displayed on the instrument cluster and engine braking will be maximized.

To shift up to the "2" position, push this switch again.

To shift up to a position other than "2", move the selector lever to that position.



(c) Overdrive switch

You can select either fourth gear (with overdrive off) or fifth gear (with overdrive on) by pushing this switch.

To turn the overdrive off, push the switch. The "O/D OFF" indicator light should come on. To turn the overdrive on again, push the switch again. The "O/D OFF" indicator light should go off.

Always drive your vehicle with the overdrive on for better fuel economy and quieter driving.

If the engine is turned off when the overdrive is off and restarted, the overdrive will automatically be on.

Vehicles with cruise control—When the cruise control is being used, even if you downshift the transmission by pushing and releasing the overdrive switch, engine braking will not be enabled because the cruise control is not cancelled.

For ways to decrease the vehicle speed, see "Cruise control" in this Section.

(d) Normal driving

1. Start the engine as instructed in "How to start the engine" in Section 3. The transmission must be in "P" or "N".
2. With your foot holding down the brake pedal, shift the selector lever to "D".

When the lever is in the "D" position, the automatic transmission system will select the most suitable gear for running conditions such as normal cruising, hill climbing, hard towing, etc.

Always turn the overdrive on for better fuel economy and quieter driving. If the engine coolant temperature is low, the transmission will not shift into the overdrive gear even with the overdrive on.

 **CAUTION**

Never put your foot on the accelerator pedal while shifting.

3. Release the parking brake and brake pedal. Depress the accelerator pedal slowly for smooth starting.

(e) Using engine braking

To use engine braking, you can downshift the transmission as follows:

- ▶ Push the overdrive switch. The "O/D OFF" indicator light will come on and the transmission will downshift to third gear.
- ▶ Shift into the "3" position. The transmission will downshift to third gear when the vehicle speed drops down to or lower than the following speed, and stronger engine braking will be enabled.

- Two-wheel drive models
127 km/h (79 mph)
- Four-wheel drive models
 - "4HI" mode is selected
127 km/h (79 mph)
 - "4LO" mode is selected
49 km/h (30 mph)

- ▶ Shift into the "2" position. The transmission will downshift to second gear when the vehicle speed drops down to or lower than the following speed, and stronger engine braking will be enabled.

Two-wheel drive models
84 km/h (52 mph)

Four-wheel drive models
"4HI" mode is selected
84 km/h (52 mph)

"4LO" mode is selected
32 km/h (20 mph)

- ▶ Push the "SHIFT L" switch. The transmission will downshift to first gear when the vehicle speed drops down to or lower than the following speed, and maximum engine braking will be enabled.

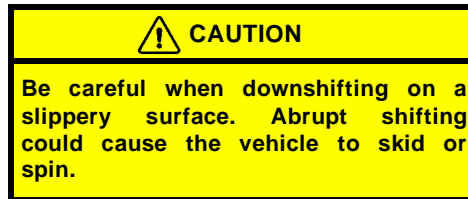
Two-wheel drive models
1GR-FE engine 40 km/h (25 mph)

2UZ-FE engine
"2WD" or "4HI" mode is selected
36 km/h (22 mph)

"4LO" mode is selected
14 km/h (8 mph)

Vehicles with cruise control—When the cruise control is being used, even if you downshift the transmission by pushing and releasing the overdrive switch, engine braking will not be enabled because the cruise control is not cancelled.

For ways to decrease the vehicle speed, see "Cruise control" in this Section.



(f) Using "3", "2" and "L" positions

The "3", "2" and "L" positions are used for strong engine braking as described previously.

With the selector lever in "3", "2" or "SHIFT L" switch depressed, the vehicle can move just as if the lever was in "D".

With the selector lever in "3", "2", the vehicle will start in first gear and automatically shift to second gear.

With the "SHIFT L" switch depressed, the transmission is engaged in first gear.

NOTICE

◆ **Be careful not to over-rev the engine. Watch the tachometer to keep engine rpm from going into the red zone. The approximate maximum allowable speed for each position is given below for your reference:**

Two-wheel drive models

1GR-FE engine—

"3" 140 km/h (87 mph)
"2" 95 km/h (59 mph)
"L" 55 km/h (34 mph)

2UZ-FE engine—

Access cab models

"3" 140 km/h (87 mph)
"2" 95 km/h (59 mph)
"L" 55 km/h (34 mph)

Double cab models

"3" 135 km/h (84 mph)
"2" 90 km/h (56 mph)
"L" 50 km/h (31 mph)

Four-wheel drive models
"2WD" or "4HI" mode is selected
Standard and access cab models
"3" 140 km/h (87 mph)
"2" 95 km/h (59 mph)
"L" 55 km/h (34 mph)
Double cab models
"3" 135 km/h (84 mph)
"2" 90 km/h (56 mph)
"L" 50 km/h (31 mph)
"4LO" mode is selected
"3" 55 km/h (34 mph)
"2" 35 km/h (22 mph)
"L" 20 km/h (12 mph)
◆ **Do not continue hill climbing or hard towing for a long time in the "3", "2" or "L" position. This may cause severe automatic transmission damage from overheating. To prevent such damage, "D" position should be used in hill climbing or hard towing.**

(g) Backing up

1. Bring the vehicle to a complete stop.
2. With the brake pedal held down with your foot, shift the selector lever to the "R" position.

NOTICE
Never shift into reverse while the vehicle is moving.

(h) Parking

1. Bring the vehicle to a complete stop.
2. With the brake pedal pressed down, fully depress the parking brake pedal to apply the parking brake securely.
3. With the brake pedal pressed down, shift the selector lever to the "P" position.

CAUTION
Never attempt to move the selector lever into "P" position under any circumstances while the vehicle is moving. Serious mechanical damage and loss of vehicle control may result.

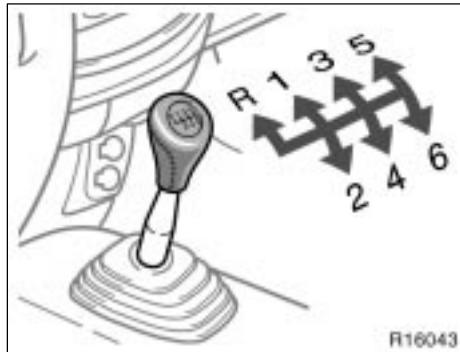
(i) Good driving practice

- ▶ If the transmission repeatedly shifts up and down between fourth gear and overdrive when climbing a gentle slope, the overdrive should be turned off. Be sure to turn the switch on immediately afterward.
- ▶ When towing a trailer, in order to maintain engine braking efficiency, do not use overdrive.

CAUTION
Always keep your foot on the brake pedal while stopped with the engine running. This prevents the vehicle from creeping.

NOTICE
Always use the brake pedal or the parking brake to hold the vehicle on an upgrade. Do not attempt to hold the vehicle using the accelerator pedal, as this can cause the transmission to overheat.

Manual transmission



The shift pattern is as shown above.

In case of driving your vehicle, the buzzer will sound when you shift the gear into "R" (reverse).

Press the clutch pedal down fully while shifting, and then release it slowly. Do not rest your foot on the pedal while driving, because it will cause clutch trouble. Do not use the clutch to hold the vehicle when stopped on an uphill grade—use the parking brake.

Recommended shifting speeds

The transmission is fully synchronized and upshifting or downshifting is easy.

For the best compromise between fuel economy and vehicle performance, you should upshift or downshift at the following speeds:

gear	km/h (mph)
1 to 2 or 2 to 1	24 (15)
2 to 3 or 3 to 2	40 (25)
3 to 4 or 4 to 3	64 (40)
4 to 5 or 5 to 4	72 (45)
5 to 6 or 6 to 5	80 (50)

Downshift to the appropriate gear if acceleration is needed when you are cruising below the above downshifting speeds.

Upshifting too soon or downshifting too late will cause lugging, and possibly pinging. Regularly revving the engine to maximum speed in each gear will cause excessive engine wear and high fuel consumption.

Maximum allowable speeds

To get on a highway or to pass slower traffic, maximum acceleration may be necessary. Make sure you observe the following maximum allowable speeds in each gear:

gear	km/h (mph)
1	45 (28)
2	90 (56)
3	130 (81)
4	165 (112)

NOTICE

Do not downshift if you are going faster than the maximum allowable speed for the next lower gear.

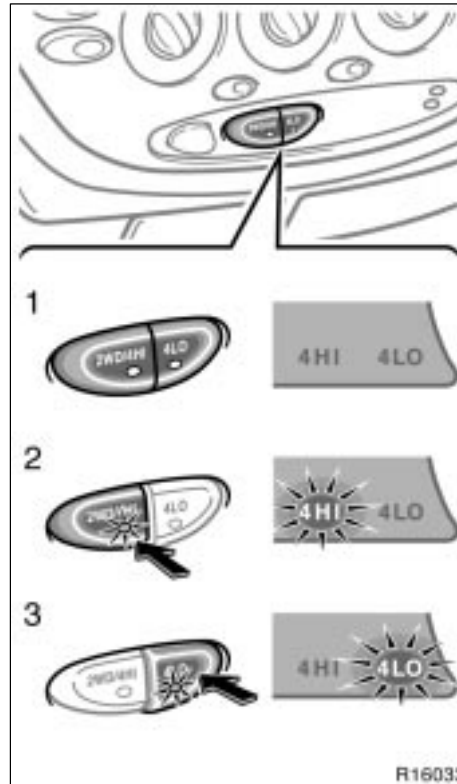
**Four-wheel drive system—
(a) Front drive control**

Good driving practice

- ▶ If it is difficult to shift into reverse, put the transmission in neutral, release the clutch pedal momentarily, and then try again.
- ▶ When towing a trailer, in order to maintain engine braking efficiency, do not use sixth gear.

CAUTION
Be careful when downshifting on a slippery surface. Abrupt shifting could cause the vehicle to skid or spin.

NOTICE
Make sure the vehicle is completely stopped before shifting into reverse.



Use the “2WD/4HI” and “4LO” switches to select the following transfer modes.

1. “2WD” (high speed position, two-wheel drive): “2WD/4HI” and “4LO” switches left out
Use this for normal driving on dry, hard-surfaced roads. This position gives greater economy, the quietest ride and least wear.

2. “4HI” (high speed position, four-wheel drive): “2WD/4HI” switch pushed in
The “4HI” (high speed four-wheel drive) indicator light comes on when the “4HI” mode is selected.
Use this for normal driving on wet, icy or snow-covered roads. This position provides greater traction than two-wheel drive.

In this mode, the vehicle stability control system is off. (See “Vehicle stability control system” in this Section.)

3. **“4LO” (low speed position, four-wheel drive):** With the “2WD/4HI” switch pressed in, push the “4LO” switch

The “4LO” (low speed four-wheel drive) indicator light comes on when the “4LO” mode is selected.

Use this for maximum power and traction. Use “4LO” mode for climbing or descending steep hills, off-road driving, and hard pulling in sand, mud or deep snow.

In this mode, the vehicle stability control system is off. (See “Vehicle stability control system” in this Section.)

See “(c) Shifting procedure” for further instructions.

**(b) A.D.D.
(automatic disconnecting
differential)**

The A.D.D. can be engaged or disengaged by the shifting operations described in “(c) Shifting procedure”.

You should drive in four-wheel drive for at least 16 km (10 miles) each month. This will assure that the front drive components are lubricated.

(c) Shifting procedure

SHIFTING BETWEEN “2WD” AND “4HI”

To shift from “2WD” to “4HI”, reduce the vehicle speed to less than 100 km/h (62 mph) and push in the “2WD/4HI” switch.

If the “4HI” (high speed four-wheel drive) indicator light flashes when you push in the “2WD/4HI” switch, this reminds you that the transfer mode is not securely in “4HI” mode. Drive straight ahead while accelerating or decelerating.

If the “4HI” (high speed four-wheel drive) indicator light flashes and the buzzer sounds when you push in the “2WD/4HI” switch, this reminds you that the transfer mode is not in “4HI” mode. Reduce the vehicle speed to less than 100 km/h (62 mph). Push the switch to turn it off, then once again to turn it back on.



Never push the “2WD/4HI” switch if the wheels are slipping. Stop the slipping or spinning before shifting.

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To shift from "4HI" to "2WD", push the "2WD/4HI" switch again to turn it off.

This can be done at any speed.

If the "4HI" (high speed four-wheel drive) indicator light flashes when you push the "2WD/4HI" switch again to return to "2WD" mode, this reminds you that the transfer mode is not securely in "2WD" mode. Drive straight ahead while accelerating or decelerating, or drive forward or backward in a short distance.

SHIFTING BETWEEN "4HI" AND "4LO"

To shift from "4HI" to "4LO", stop the vehicle and put the transmission into "N". With the brake pedal depressed, push the "4LO" switch. If the "2WD/4HI" switch left out, push in the "2WD/4HI" switch to select the "4HI" mode.

If the "4LO" (low speed four-wheel drive) indicator light flashes and the buzzer sounds for three times when you push the "4LO" switch, this reminds you that the transfer mode is not in "4LO" mode. Drive forward or backward in a short distance, then stop the vehicle completely, put the transmission securely into "N" and push the switch again.

To shift from "4LO" to "4HI", stop the vehicle and put the transmission into "N". With the brake pedal depressed, push the "4LO" switch.

If the "4LO" (low speed four-wheel drive) indicator light flashes and the buzzer sounds for three times when you push the "4LO" switch, this reminds you that the transfer mode is not in "4HI" mode. Drive forward or backward in a short distance, then stop the vehicle completely, put the transmission securely into "N" and push the switch again.

SHIFTING BETWEEN "2WD" AND "4LO"

To shift from "2WD" to "4LO", stop the vehicle and put the transmission into "N". With the brake pedal depressed, push the "2WD/4HI" switch in to select the "4HI" mode, then push the "4LO" switch.

If the "4LO" (low speed four-wheel drive) indicator light flashes and the buzzer sounds for three times when you push the "4LO" switch, this reminds you that the transfer mode is not in "4LO" mode. Drive forward or backward in a short distance, then stop the vehicle completely, put the transmission securely into "N" and push the switch again.

To shift from "4LO" to "2WD", stop the vehicle and put the transmission into "N". With the brake pedal depressed, push the "2WD/4HI" switch again to turn it off.

If the "4LO" (low speed four-wheel drive) indicator light flashes and the buzzer sounds when you push the "2WD/4HI" switch, this reminds you that the transfer mode is not in "2WD" mode. Push the "2WD/4HI" switch in to return to "4LO" mode, drive forward or backward in a short distance, then stop the vehicle completely, put the transmission securely into "N" and push the "2WD/4HI" switch once again.

If the "4LO" (low speed four-wheel drive) indicator light flashes when you push the "2WD/4HI" switch, this reminds you that the transfer mode is not in "2WD" mode. Drive straight ahead while accelerating or decelerating, or drive forward or backward in a short distance.

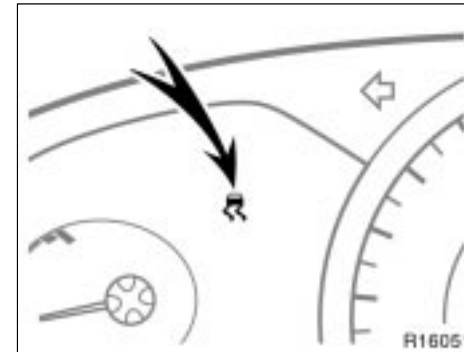
Traction control system

The traction control system automatically helps prevent the spinning of rear wheels (two-wheel drive models) or 4 wheels (four-wheel drive models) when the vehicle is started or accelerated on slippery road surfaces.

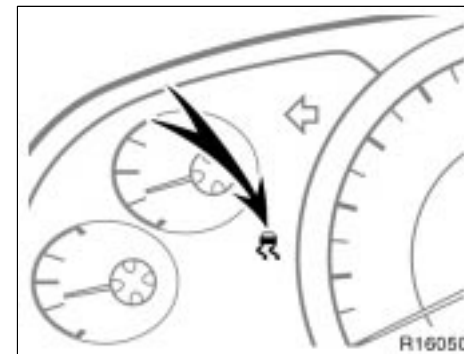
When the ignition key is turned to "ON", the system automatically turns on.

CAUTION

Under certain slippery road conditions, full traction of the vehicle and power to the rear wheels (two-wheel drive models) or 4 wheels (four-wheel drive models) cannot be maintained, even though the traction control system is in operation. Do not drive the vehicle under any speed or maneuvering conditions which may cause the vehicle to lose traction control. In situations where the road surface is covered with ice or snow, your vehicle should be fitted with snow tires or tire chains. Always drive at an appropriate and cautious speed for the present road conditions.



Without tachometer



With tachometer

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Leave the system on during the ordinary driving so that it can operate when needed.

You may hear a sound in the engine compartment for a few seconds when the engine is started or just after the vehicle begins to move. This means that the traction control system is in the self-check mode, but does not indicate a malfunction.

When the traction control system is operating, the following conditions occur:

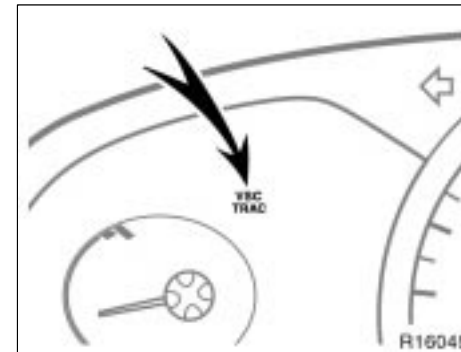
- ▶ The system controls the spinning of the rear wheels (two-wheel drive models) or 4 wheels (four-wheel drive models). At this time, the slip indicator light blinks.
- ▶ You may feel vibration or noise in your vehicle, caused by operation of the brakes. This indicates the system is functioning properly.

The slip indicator light comes on for a few seconds when the ignition key is turned to "ON". If the indicator light does not come on when the ignition is turned on, contact your Toyota dealer.

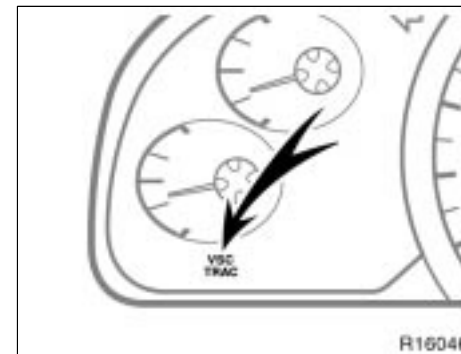
The brake actuator temperature increases during the traction control system, vehicle stability control system or "AUTO LSD" system operating. If the brake actuator temperature becomes too high while any of the systems is operating, a buzzer will start to sound intermittently to indicate that the traction control system can no longer operate. In this case, immediately stop your vehicle at a safe place.

If the system continues to operate, the buzzer sound changes from intermittent to continuous. (The continuous buzzer sounds for about 3 seconds.)

At the time, the slip indicator light will come on and the traction control system temporarily stops operating in order to protect the brake actuator. (Although the traction control system does not operate, it is no problem to continue driving.) The system will be automatically restored after a short time and the slip indicator light goes off.



Without tachometer



With tachometer

'05 TUNDRA_U (L/O 0409)

“VSC TRAC” warning light

This light warns that there is a problem somewhere in the following.

- ▶ Traction control system
- ▶ Vehicle stability control system
- ▶ “AUTO LSD” system

When the system is normal and the ignition key is turned to “ON”, the light will come on and will go off after a few seconds.

It is not a malfunction that the warning light may stay on for 60 seconds after the ignition key is turned to “ON”.

Depressing the brake pedal repeatedly may turn on the light. It is normal if it goes out after a few seconds.

If the “VSC TRAC” warning light and slip indicator light comes on while driving, the traction control system does not work. However, as the brakes operate normally when applied, it is no problem to continue your driving.

In the following cases, contact your Toyota dealer:

- ▶ The warning light does not come on after the ignition key is turned to “ON”.
- ▶ The warning light remains on after the ignition key is turned to “ON”.
- ▶ The warning light comes on while driving.

“AUTO LSD” system



The “AUTO LSD” system aids traction by using the traction control system to control engine performance and braking when one of the rear wheels begins to spin.

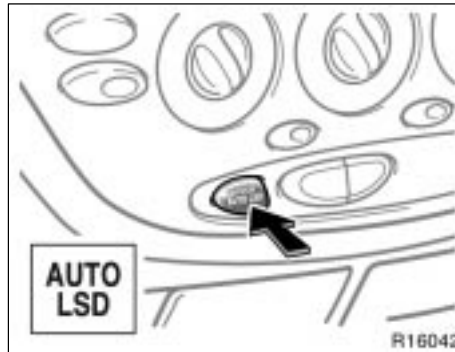
This system is used only when wheel spinning occurs in a ditch or rough surface.

This system is effective in case one of the rear wheels is spinning.

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NOTICE

Do not use the "AUTO LSD" system in conditions other than the above. A much greater steering effort and more careful cornering control will be required.



If the engine is turned off while the "AUTO LSD" indicator light is on and then restarted, the indicator light will turn off automatically.

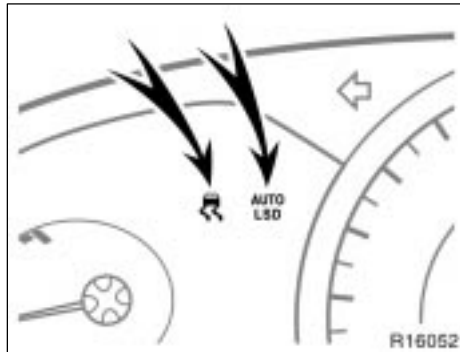
To activate the system, push the "AUTO LSD" switch with the vehicle stopped.

The "AUTO LSD" is activated under the following condition. At this time, the "AUTO LSD" indicator light will come on.

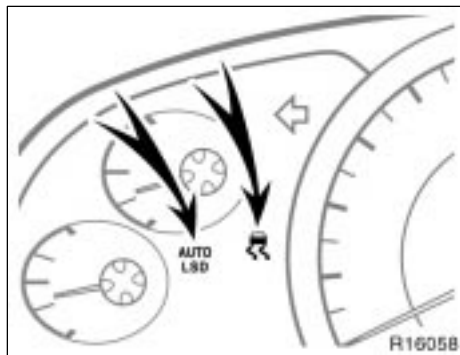
- ▶ The driving mode is set in the two-wheel drive mode (in the four-wheel drive mode, the system does not work.)
- ▶ Driving at a speed under 100 km/h (62 mph)

To cancel the system, push the "AUTO LSD" switch once again.

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Without tachometer



With tachometer

Make sure the "AUTO LSD" indicator light comes on under the above condition when you use the "AUTO LSD" system.

The slip indicator light blinks when the system is controlling the spinning of the rear wheels.

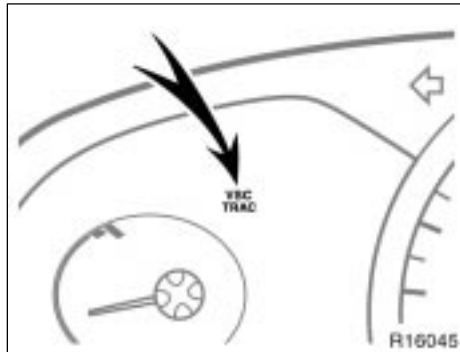
The "AUTO LSD" and slip indicator lights come on for a few seconds when the ignition key is turned to "ON". If the indicator lights does not come on when the ignition key is turned to "ON", contact your Toyota dealer.

The brake actuator temperature increases during the traction control system, vehicle stability control system or "AUTO LSD" system operating. If the brake actuator temperature becomes too high while any of the systems is operating, a buzzer will start to sound intermittently to indicate that the "AUTO LSD" system can no longer operate. In this case, immediately stop your vehicle at a safe place.

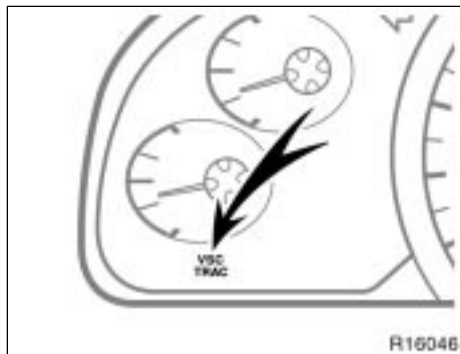
If the system continues to operate, the buzzer sound changes from intermittent to continuous. (The continuous buzzer sounds for about 3 seconds.)

At the time the slip indicator light will come on and the "AUTO LSD" system temporarily stops operating in order to protect the brake actuator. (Although the "AUTO LSD" system does not operate, it is no problem to continue driving.) The system will be automatically restored after a short time and the slip indicator light goes off.

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Without tachometer



With tachometer

“VSC TRAC” warning light

This light warns that there is a problem somewhere in the following.

- ▶ “AUTO LSD” system
- ▶ Traction control system
- ▶ Vehicle stability control system

When the system is normal and the ignition key is turned to “ON”, the light will come on and will go off after a few seconds.

It is not a malfunction that the warning light may stay on for 60 seconds after the ignition key is turned to “ON”.

Depressing the brake pedal repeatedly may turn on the light. It is normal if it goes out after a few seconds.

If the “VSC TRAC” warning light and slip indicator light comes on while driving, the “AUTO LSD” system does not work. However, as the brakes operate normally when applied, it is no problem to continue your driving.

In the following cases, contact your Toyota dealer:

- ▶ The warning light does not come on after the ignition key is turned to “ON”.
- ▶ The warning light remains on after the ignition key is turned to “ON”.
- ▶ The warning light comes on while driving.

NOTICE

Do not drive with the “AUTO LSD” switch continuously turned on.

Vehicle stability control system

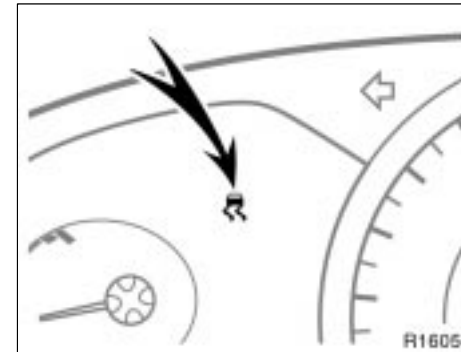
The vehicle stability control system helps provide integrated control of the systems such as anti-lock brake system, traction control, engine control, etc. This system automatically controls the output of the brakes or engine to help prevent the vehicle from skidding when cornering on a slippery road surface or operating steering wheel abruptly.

The vehicle stability control activates when the vehicle speed is more than 15 km/h (9 mph).

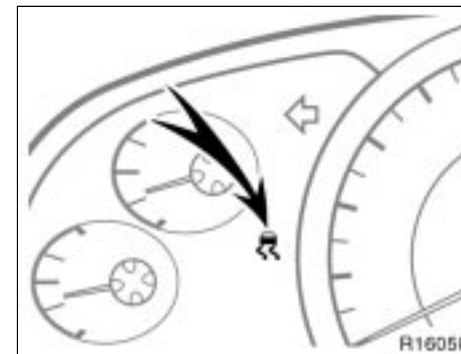
You may hear a sound in the engine compartment for a few seconds when the engine is started or just after the vehicle begins to move. This means that the system is in the self-check mode, but does not indicate a malfunction.

CAUTION

- ▶ Do not rely excessively on the vehicle stability control system. Even if the vehicle stability control system is operating, you must always drive carefully and attentively to avoid serious injury. Reckless driving will result in an unexpected accident. If the slip indicator light blinks and an alarm sounds, special care should be taken while driving.
- ▶ Only use tires of specified size. The size, manufacturer, brand and tread pattern for all 4 tires should be the same. If you use the tires other than specified, or different type or size, the vehicle stability control system may not function correctly. When replacing the tires or wheels, contact your Toyota dealer. (See "Checking and replacing tires" in Section 7-2.)



Without tachometer



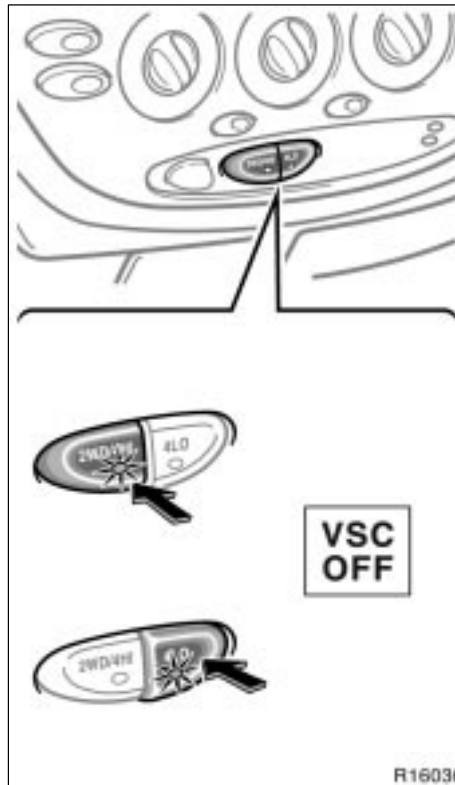
With tachometer

'05 TUNDRA_U (L/O 0409)

If the vehicle is going to skid during driving, the slip indicator light blinks and an alarm sounds intermittently. Special care should be taken while driving.

If the brake pedal is depressed while the vehicle stability control system is active, the brake pedal will become hard at an earlier position than usual. However, the brakes will respond to the pedal force if depressed further.

The slip indicator light comes on for a few seconds when the ignition key is turned to "ON". If the indicator light does not come on when the ignition is turned on, contact your Toyota dealer.



Four-wheel drive models only—

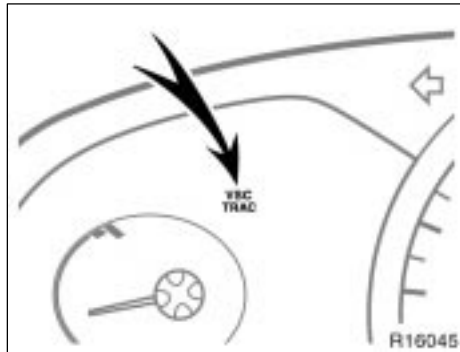
Shifting the driving mode into the four-wheel drive mode automatically turns the vehicle stability control system off. At this time, the "VSC OFF" indicator comes on.

"VSC OFF" indicator light comes on for a few seconds when the ignition key is turned to "ON". It will come on again when you shift the driving mode into the four-wheel drive mode.

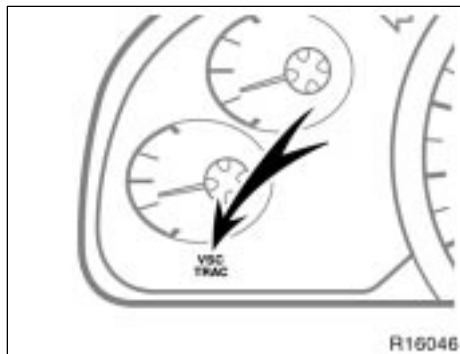
In the following cases, contact your Toyota dealer:

- ▶ The indicator light does not come on when the ignition key is turned to "ON".
- ▶ The indicator light remains on after the ignition key is turned to "ON".
- ▶ The indicator light comes on when the system is on while driving.

'05 TUNDRA_U (L/O 0409)



Without tachometer



With tachometer

“VSC TRAC” warning light

This light warns that when there is a problem somewhere in the following.

- ▶ Vehicle stability control system
- ▶ Traction control system
- ▶ “AUTO LSD” system

The light will come on when the ignition key is turned to “ON”, and will go off after about a few seconds.

The light may come on for 60 seconds after the ignition key is turned to “ON”. It is normal if they go out after a while.

Depressing the brake pedal repeatedly may turn on the light. It is normal if they go out after a few seconds.

If the light comes on while driving, the vehicle stability control system does not work. However, as the brakes operate normally when applied, it is no problem to continue your driving.

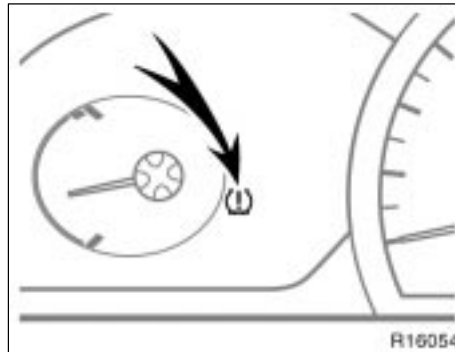
In the following cases, contact your Toyota dealer:

- ▶ The warning light does not come on after the ignition key is turned to “ON”.
- ▶ The warning light remains on after the ignition key is turned to “ON”.
- ▶ The warning light comes on while driving.

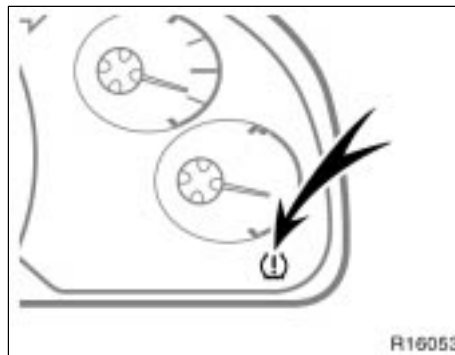
The “VSC OFF” indicator light will come on when the “VSC TRAC” warning light comes on even if the “2WD/4HI” or “4LO” switch is not pushed.

Tire pressure warning system—

The tire pressure warning system is designed to provide warning when tire inflation pressure of one or more of your tires (including the spare tire) is low. The low tire pressure warning light comes on to inform you that low tire inflation pressure may hamper driving.



Without tachometer



With tachometer

LOW TIRE PRESSURE WARNING LIGHT

This light comes on when the ignition key is turned to the "ON" position. It goes off after a few seconds. This indicates that the tire pressure warning system is functioning properly.


If the low tire pressure warning light comes on or blinks, do the following.

If the warning light comes on:

Stop your vehicle in a safe place as soon as possible and check that the inflation pressure of all tires (including the spare tire) is as specified on the tire and loading information label. (See "Checking tire inflation pressure" in Section 7-2.) If the warning light comes on even after tire inflation pressure adjustment, you may have a flat tire. If you have a flat tire, replace it with the spare tire. For details, see "If you have a flat tire" in Section 4.

The warning light goes off a few minutes after air is put into the deflated tire.

This warning light may turn on due to natural causes such as natural air leaks or tire pressure changes caused by temperature. In this case, adjusting the tire pressure will turn off the warning light.

 **CAUTION**

When the tire pressure warning light comes on, observe the following instructions:

- ▶ Depending on the conditions, reduce to an appropriate speed as soon as possible.
- ▶ Adjust the tire pressure to the specified level as soon as possible.
- ▶ Avoid abrupt steering wheel maneuvering and braking. Tire deterioration may reduce steering wheel control and brake effectiveness. This may lead to serious injury or death.
- ▶ The tire pressure warning system may not activate immediately if sudden bursts of air leakage occur.

NOTICE

- ◆ *Do not use liquid sealants for a flat tire as air pressure sensors will be damaged.*
- ◆ *When the tires must be repaired or replaced, have them repaired or replaced by the nearest Toyota dealer or authorized tire dealer. The tire pressure sensors will be affected by the installation or removal of tires.*
- ◆ *The tire pressure warning system is not to be used as a substitute for regular inspections. Be sure to check the air pressure in the tires on a regular basis.*
- ◆ *When the tires must be replaced, replace the grommets for air pressure sensors as well.*

If the warning light blinks:

The tire pressure warning system may be malfunctioning. Contact your Toyota dealer.

SYSTEM MALFUNCTION

The tire pressure warning system does not function properly under certain circumstances. In the following cases, the low tire pressure warning light may not come on even if the tire inflation pressure is low, or it may come on when the tire inflation pressure is actually normal.

- ▶ Electric devices or facilities using similar radio wave frequencies are nearby.
- ▶ A radio set to similar frequencies is in use.
- ▶ A lot of snow or ice covers the vehicle, in particular, around the wheels or wheel housings.
- ▶ The tires are not equipped with an air pressure sensor.
- ▶ Snow tires or tire chains are used.
- ▶ Non-genuine Toyota wheels are used.
- ▶ The sensor battery is expired.
- ▶ Radio waves from the air pressure sensor installed on the spare tire cannot be received.

'05 TUNDRA_U (L/O 0409)

⚠ CAUTION

- ▶ The use of non-genuine wheels will cause the air pressure sensors to transmit the electronic code in different manner, resulting in the system failure.
- ▶ The use of different type of tires with genuine wheels may also cause the malfunction of the system.



⚠ CAUTION

When the tire pressure monitoring system warning light is lit, one or more of your tires is significantly under-inflated. You should stop and check your tires as soon as possible, and inflate them to the proper pressure as indicated on the vehicle's tire information placard. Driving on a significantly under-inflated tire causes the tire to overheat and can lead to tire failure. Under-inflation also reduces fuel efficiency and tire tread life, and may affect the vehicle's handling and stopping ability. Each tire, including the spare, should be checked monthly when cold and set to the recommended inflation pressure as specified in the vehicle placard and owner's manual.

'05 TUNDRA_U (L/O 0409)

For vehicles sold in U.S.A.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTICE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ▶ Reorient or relocate the receiving antenna.
- ▶ Increase the separation between the equipment and receiver.
- ▶ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ▶ Consult the dealer or an experienced radio/TV technician for help.

FCC WARNING:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For vehicles sold in Canada

Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

—Replacing tires and wheels

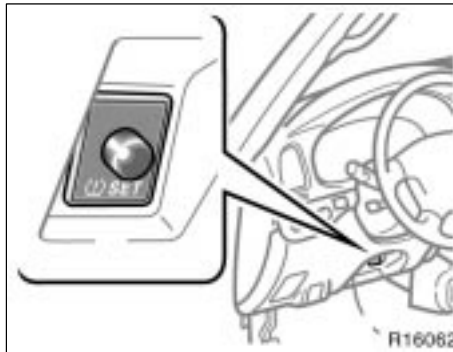
When replacing the wheels, be sure to install air pressure sensors on the wheels.

There are 3 ways to set up the air pressure sensors:

- a. Remove the sensor from the old wheel and install it to the new wheel.
- b. Keep the same wheel with air pressure sensor and replace only the tire.
- c. Use a new wheel and sensor. In this case, you have to register an ID code for a new sensor.

CAUTION

Have the tires, wheels or sensors replaced and ID codes registered by a Toyota dealer. If you need sensors, purchase from a Toyota dealer.



TIRE PRESSURE WARNING SYSTEM RESET SWITCH

The tire pressure warning system need to be initialized in the following conditions:

- ▶ After replacing or rotating tires or wheels
- ▶ After replacing an air pressure sensor.

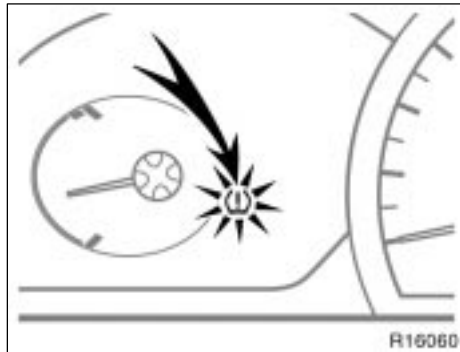
When initializing the system, the present tire condition is stored as a standard.

To initialize the system, perform the following:

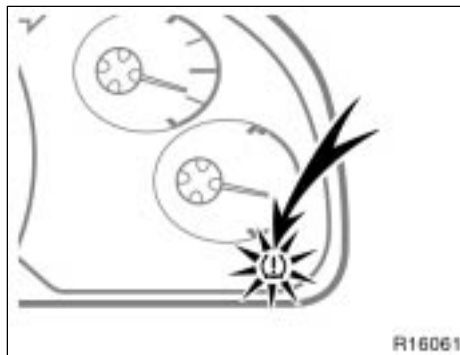
1. Park the vehicle at a safe place and apply the parking brake. Stop the engine.
2. Adjust the pressure of all the installed tires to the specified level. (See "Tires" in Section 8.)
3. Turn the ignition key to "ON".
4. Push and hold the reset switch until the low tire pressure warning light blinks three times.

Initialization is completed over for more than 20 minute.

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Without tachometer



With tachometer

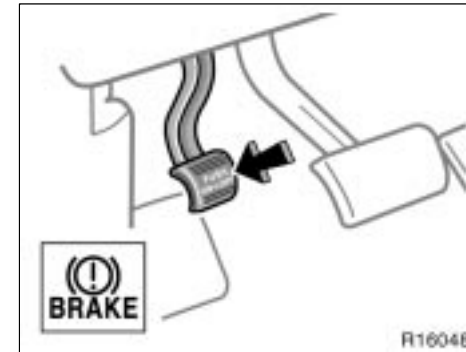
When initializing the system, make sure the low tire pressure warning light blinks three times. If the warning light does not blink three times, initialization failed and the tire pressure warning system will not function properly. In this case, initialize the system again.

Do not push the reset switch without adjusting the tire inflation pressure to the specified level. Otherwise, the low tire pressure warning light may not come on even if the tire pressure is low, or it may come on when the tire inflation pressure is actually normal.

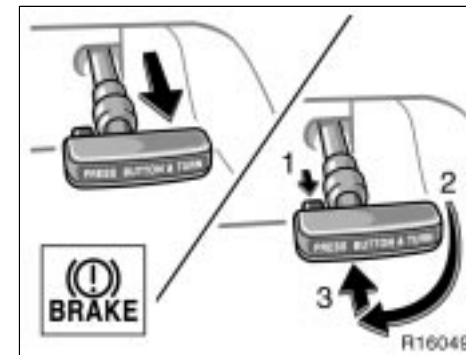
If you push the reset switch while the vehicle is moving, initialization is not performed.

If the low tire pressure warning light does not blink when you push and hold the reset switch, have the low pressure warning system checked at your Toyota dealer.

Parking brake



Pedal type



Lever type

When parking, firmly apply the parking brake to avoid inadvertent creeping.

Pedal type—

To set: Fully depress the parking brake pedal. For better holding power, first depress the brake pedal and hold it while setting the parking brake.

To release: Depress the parking brake pedal once again.

Lever type—

To set: Pull out on the lever. For better holding power, first depress the brake pedal and hold it while setting the parking brake.

To release: Press the lock release button (1), turn the lever (2), then push it in (3).

To remind you that the parking brake is set, the parking brake reminder light in the instrument panel remains on until you release the parking brake.

CAUTION
Before driving, be sure the parking brake is fully released and the parking brake reminder light is off.

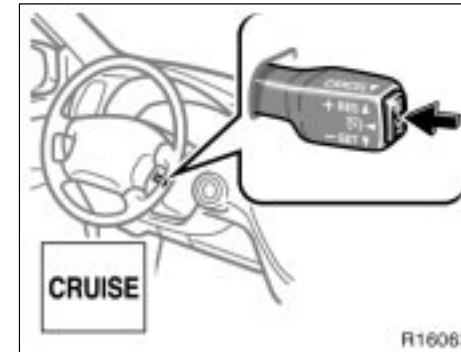
Cruise control

The cruise control allows you to cruise the vehicle at a desired speed over 40 km/h (25 mph) even with your foot off the accelerator pedal.

Your cruising speed can be maintained up or down grades within the limits of engine performance, although a slight speed change may occur when driving up or down the grades. On steeper hills, a greater speed change will occur so it is better to drive without the cruise control.

CAUTION

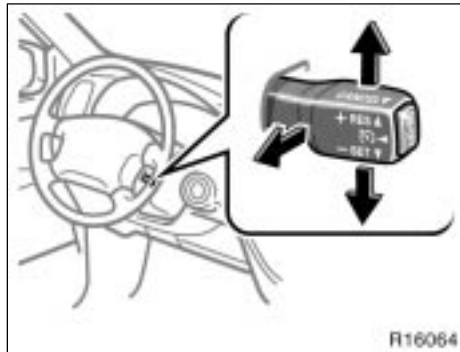
- ▶ **To help maintain maximum control of your vehicle, do not use the cruise control when driving in heavy or varying traffic, or on slippery (rainy, icy or snow-covered) or winding roads.**
- ▶ **Avoid vehicle speed increases when driving downhill. If the vehicle speed is too fast in relation to the cruise control set speed, cancel the cruise control then downshift the transmission to use engine braking to slow down.**



TURNING THE SYSTEM ON

To operate the cruise control, press the "ON-OFF" button. This turns the system on. The indicator light in the instrument panel shows that you can now set the vehicle at a desired cruising speed. Another press will turn the system completely off.

CAUTION
To avoid accidental cruise control engagement, keep the "ON-OFF" button off when not using the cruise control.



SETTING AT A DESIRED SPEED

The transmission must be in "D" before you set the cruise control speed.

Bring your vehicle to the desired speed, push the lever down in the "- SET" direction and release it. This sets the vehicle at that speed. If the speed is not satisfactory, tap the lever up for a faster speed, or tap it down for a slower speed. Each tap changes the set speed by 1.6 km/h (1.0 mph). You can now take your foot off the accelerator pedal.

If you need acceleration—for example, when passing—depress the accelerator pedal enough for the vehicle to exceed the set speed. When you release it, the vehicle will return to the speed set prior to the acceleration.

CANCELLING THE PRESET SPEED

You can cancel the preset speed by:

- Pulling the lever in the "CANCEL" direction and releasing it
- Depressing the brake pedal
- Pushing the "ON-OFF" button.

If the vehicle speed falls below about 40 km/h (25 mph), the preset speed will automatically cancel out.

If the vehicle speed drops 16 km/h (10 mph) below the preset speed, the preset speed will also automatically cancel out.

If the preset speed automatically cancels out other than for the above cases, have your vehicle checked by your Toyota dealer at the earliest opportunity.

RESETTING TO A FASTER SPEED

Push the lever up in the "+ RES" direction and hold it. Release the lever when the desired speed is attained. While the lever is held up, the vehicle will gradually gain speed.

However, a faster way to reset is to accelerate the vehicle and then push the lever down in the "- SET" direction.

RESETTING TO A SLOWER SPEED

Push the lever down in the "- SET" direction and hold it. Release the lever when the desired speed is attained. While the lever is held down, the vehicle speed will gradually decrease.

However, a faster way to reset is to depress the brake pedal and then push the lever down in the "- SET" direction.

Even if you turn off the overdrive switch with the cruise control on, engine braking will not be applied because the cruise control is not cancelled. To decrease the vehicle speed, reset to a slower speed with the cruise control lever or depress the brake pedal. If you use the brake pedal, cruise control is cancelled.

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RESUMING THE PRESET SPEED

If the preset speed is cancelled by pulling the control lever or by depressing the brake pedal, pushing the lever up in the "+ RES" direction will restore the speed set prior to cancellation.

CRUISE CONTROL FAILURE WARNING

If the "CRUISE" indicator light in the instrument cluster flashes when using the cruise control, press the "ON-OFF" button to turn the system off and then press it again to turn it on.

If any of the following conditions then occurs, there is some trouble in the cruise control system.

- ▶ The indicator light does not come on.
- ▶ The indicator light flashes again.
- ▶ The indicator light goes out after it comes on.

If this is the case, contact your Toyota dealer and have your vehicle inspected.

SECTION 1-8

OPERATION OF INSTRUMENTS AND CONTROLS

Audio system

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Using your audio system	211
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Rear seat entertainment system	243
Audio/video system operating hints	291

For vehicle equipped with Navigation system, please refer to the separate "Navigation System Owner's Manual".

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Reference



Type 1: AM-FM radio/compact disc player (with compact disc changer controller)



Type 2: AM-FM radio/cassette player/compact disc player (with compact disc changer controller)



Type 3: AM-FM radio/cassette player/compact disc player with changer

Using your audio system— —Some basics

This section describes some of the basic features on Toyota audio systems. Some information may not pertain to your system.

Your audio system works when the ignition key is in the “ACC” or “ON” position.

TURNING THE SYSTEM ON AND OFF

Push “PWR·VOL” to turn the audio system on and off.

Push “AM”, “FM”, “FM1”, “FM2”, “TAPE”, “DISC” or “LOAD” to turn on that function without pushing “PWR·VOL”. To turn on the cassette or compact disc player, a cassette or compact disc must be loaded in the player.

You can turn on each player by inserting a cassette tape or compact disc.

You can turn off each player by ejecting the cassette tape or compact disc. If the audio system was previously off, then the entire audio system will be turned off when you eject the cassette tape or compact disc. If another function was previously playing, it will come on again.

SWITCHING BETWEEN FUNCTIONS

Push “AM”, “FM”, “FM1”, “FM2”, “TAPE”, “DISC” or “LOAD” if the system is already on but you want to switch from one function to another.

TONE AND BALANCE

For details about your system’s tone and balance controls, see the description of your own system.

Tone

How good an audio program sounds to you is largely determined by the mix of the treble, midrange, and bass levels. In fact, different kinds of music and vocal programs usually sound better with different mixes of treble, midrange and bass.

Balance

A good balance of the left and right stereo channels and of the front and rear sound levels is also important.

Keep in mind that if you are listening to a stereo recording or broadcast, changing the right/left balance will increase the volume of one group of sounds while decreasing the volume of another.

YOUR RADIO ANTENNA

To remove an antenna, carefully turn it counterclockwise.

YOUR CASSETTE PLAYER

When you insert a cassette, the exposed tape should face to the right.

NOTICE

Do not oil any part of the player and do not insert anything other than cassette tapes into the slot, or the tape player may be damaged.

YOUR COMPACT DISC PLAYER (type 1 and type 2)

When you insert a disc, gently push it in with the label side up. (The player will automatically eject a disc if the label side is down.) The player will play from track 1 through the end of the disc. Then it will play from track 1 again.

NOTICE

Never try to disassemble or oil any part of the compact disc player. Do not insert anything other than compact discs into the slot.

8 cm (3 in.) compact disc singles

Type 1—

Your compact disc player does not need an adaptor to play compact disc singles. Compact disc singles are about 8 cm (3 in.) in diameter—smaller than standard discs.

After you eject a compact disc single, do not insert a standard 12 cm (4.7 in.) disc until “DISC” disappears from the display.

NOTICE

Do not use an adaptor for compact disc singles—it could cause tracking errors or interfere with the ejection of compact discs.

Type 2—

The player is intended for use with 12 cm (4.7 in.) discs only.

YOUR COMPACT DISC PLAYER WITH CHANGER (type 3)

When you insert a disc, push the “LOAD” button and gently push the disc in with the label side up. (The player will automatically eject a disc if the label side is down.) This compact disc player can store up to six discs. The player will play from track 1 through the end of the disc. Then it will play from track 1 of the next disc.

The player is intended for use with 12 cm (4.7 in.) discs only.



NOTICE

- ◆ *Do not stack up two discs for insertion, or it will cause damage to the compact disc changer. Insert only one compact disc into slot at a time.*
- ◆ *Never try to disassemble or oil any part of the compact disc player. Do not insert anything other than compact discs into the slot.*

'05 TUNDRA_U (L/O 0409)

—Controls and features

►Type 1



Details of specific buttons, controls and features are described in the alphabetical list that follows.

1 2 3 4 5 6 (Preset buttons)

These buttons are used to preset and tune in radio stations.

To preset a station to a button: Tune in the desired station. (See "TUNE" or "SEEK/TRACK".) Push and hold down the button until you hear a beep—this will set the station to the button. The button number will appear on the display.

To recall a preset station: Push the button for the station you want. The button number and station frequency will appear on the display.

These systems can store one AM and two FM stations for each button. (The display will show "AM", "FM1" or "FM2" when you push "AM", "FM1" or "FM2" button.)

▲ (Eject button)

Push the compact disc eject button to eject a compact disc.

◀◀/▶▶ (Reverse/Fast-forward button)

Push and hold "▶▶" (preset button 6) or "◀◀" (preset button 5) to fast forward or reverse within a compact disc. When you release the button, the compact disc player will resume playing.

AM

Push the "AM" button to turn on the radio and select the AM band. "AM" will appear on the display.

AUDIO CONTROL (Tone and sound balance adjustment function)

Each time you push the "AUDIO CONTROL" knob, the mode changes. To adjust the tone and balance, turn the knob.

BAS: Adjusts low-pitched tones. The display ranges from -5 to 5.

TRE: Adjusts high-pitched tones. The display ranges from -5 to 5.

FAD: Adjusts the sound balance between the front and rear speakers. The display ranges from F7 to R7.

BAL: Adjusts the sound balance between the right and left speakers. The display ranges from L7 to R7.

DISC (Compact disc)

Push the "DISC" button to play a compact disc.

When the audio system is set into compact disc operation, the display shows the track, or track and disc number currently being played.

Vehicles with rear seat entertainment system—

The "DISC" button may also be used to operate a DVD player when a disc is loaded in the DVD player. Pressing the "DISC" button changes between the CD player and DVD player. When the DVD player is in operation, "AUX" appears on the display.

Error messages

If the player malfunctions, your audio system will display one of the following error messages.

"WAIT": The compact disc player unit may be too hot. Allow the player to cool down.

"ERROR 1": The disc may be dirty, damaged or inserted incorrectly (up-side down). Clean the disc and re-insert it.

"NO DISC": The compact disc changer of separate unit is empty. Insert a disc.

'05 TUNDRA_U (L/O 0409)

“ERROR 3”: There is a problem inside the system. Eject the disc or magazine. Set the disc or magazine again.

“ERROR 4”: Over-current. Ask your Toyota dealer to inspect.

“CD OPEN”: The compact disc changer lid of separate unit is open. Close the compact disc changer lid.

If the malfunction still exists, take your vehicle to your Toyota dealer.

∨ DISC ×

With compact disc changer only—

Use these buttons to select a disc you want to listen to.

Push “∨” (preset button 3) or “×” (preset button 4) until the number of the disc you want to listen appears on the display.

FM1 FM2

Push the “FM1” or “FM2” button to turn on the radio and select the FM band. “FM1” or “FM2” will appear on the display. This system allows you to set twelve FM stations, two for each of the preset button.


PWR-VOL (Power and Volume)

Push “PWR-VOL” to turn the audio system on and off. Turn “PWR-VOL” to adjust the volume.

RAND (Random)


There are two random features—you can either listen to the tracks on one compact disc in random order, or listen to the tracks on all the compact discs in the magazine in random order.

To play the tracks on one disc in random order:

Quickly push and release “RAND” (preset button 1). “ RAND” will appear on the display and the player will perform the tracks on the disc you are listening to in random order. To turn off the random feature, push this button again.

With compact disc changer only—


To play all the tracks in the magazine in random order:

Push and hold “RAND” (preset button 1) until you hear a beep. “ RAND” will appear on the display and the player will perform all the tracks on all the discs in the magazine in random order. To turn off the random feature, push this button again.

RPT (Repeat)


There are two repeat features—you can either replay a disc track or a whole compact disc.

Repeating a track:

Quickly push and release “RPT” (preset button 2) while the track is playing. “ RPT” will appear on the display. When the track ends, it will automatically replay. To turn off the repeat feature, push this button again.

With compact disc changer only—

Repeating a disc:

Push and hold “RPT” (preset button 2) until you hear a beep. “ RPT” will appear on the display. The player will repeat all the tracks on the disc you are listening to. When the disc ends, the player will automatically go back to the first track on the disc and replay. To turn off the repeat feature, push this button again.

SCAN

Radio

You can either scan all the frequencies on a band or scan only the preset stations for that band.

To scan the preset stations:

Push and hold the "SCAN" button until you hear a beep. The radio will tune in the next preset station up the band, stay there for 5 seconds, and then move to the next preset station. To stop scanning, push this button again.

To scan all the frequencies:

Quickly push and release the "SCAN" button. The radio will find the next station up the station band, stay there for 5 seconds, and then scan again to the next station. To stop scanning, push this button again.

Compact disc player

There are two scan features—you can either scan the tracks on a specific disc or scan the first tracks of all the discs in the magazine.

Scanning the tracks on a disc:

Quickly push and release the "SCAN" button. "SCAN" will appear on the display and the player will scan all the tracks on the disc you are listening to. To stop scanning, push this button again. If the player scanned all the tracks on the disc, it will stop scanning.

With compact disc changer only—

Scanning the first tracks of all the discs in the magazine:

Push the "SCAN" button until you hear a beep. "SCAN" will appear on the display and the player will scan the first track of the next disc. To stop scanning, push this button again. If the player has scanned all the discs, it will stop scanning.

SEEK/TRACK (Seeking/Track up/down)

Radio

In the seek mode, the radio finds and plays the next station up or down the station band.

To seek the next station, quickly push and release "x" or "v" side of the "SEEK/TRACK" button. Do this again to find the station after that.

Compact disc player

Use this button to skip up or down to a different track.

Push "x" or "v" side of the "SEEK/TRACK" button until the number of the track you want to listen to appears on the display. If you want to return to the beginning of the current track, quickly push the down side of the button one time.

Vehicles with rear seat entertainment system—

While the DVD player is in operation, the chapter or track can be changed by pushing the "x" or "v" side of the "SEEK/TRACK" button.

'05 TUNDRA_U (L/O 0409)

ST (Stereo reception) display

Your radio automatically changes to stereo reception when a stereo broadcast is received. "ST" appears on the display. If the signal becomes weak, the radio reduces the amount of channel separation to prevent the weak signal from creating noise. If the signal becomes extremely weak, the radio switches from stereo to mono reception.

TEXT

This button is used to change the display for the compact disc that contains text data.

To change the display, quickly push and release the "TEXT" button while the compact disc is playing. The display changes in the order from the elapsed time to disc title to track title, then back to the elapsed time.

If this button is pushed while a compact disc that does not contain text data is playing, "NO TITLE" will appear on the display.

If the entire disc or track title does not appear on the display, push and hold the button until you hear a beep. The rest of the title will appear.

TUNE (Tuning)

Turn the "TUNE" knob clockwise to step up the frequency. Turn the knob counterclockwise to step down the frequency.

'05 TUNDRA_U (L/O 0409)

►Type 2



Details of specific buttons, controls and features are described in the alphabetical list that follows.

1 2 3 4 5 6 (Preset buttons)

These buttons are used to preset and tune in radio stations.

To preset a station to a button: Tune in the desired station. (See "TUNE" or "SEEK/TRACK".) Push and hold down the button until you hear a beep—this will set the station to the button. The button number will appear on the display.

To recall a preset station: Push the button for the station you want. The button number and station frequency will appear on the display.

These systems can store one AM and two FM stations for each button. (The display will show "AM", "FM1" or "FM2" when you push "AM" or "FM" button.)

▲ (Eject button)

Push the cassette tape eject button to eject a cassette. Push the compact disc eject button to eject a compact disc.

◀▶ (Program)

Push "◀▶" (preset button 4) to select the other side of a cassette tape. The display indicates which side is currently selected ("▲" indicates the top side, "▼" indicates the bottom side).

Auto-reverse feature: After the cassette player reaches the end of a tape side, it automatically reverses and begins to play the other side. This is true whether the cassette was playing or fast forwarding.

◀◀/▶▶ (Reverse/Fast-forward button)

Cassette player

Push "▶▶" (preset button 6) to fast-forward a cassette tape. "FF" will appear on the display. Push "◀◀" (preset button 5) to rewind a tape. "REW" will appear on the display.

To stop the tape while it is fast-forwarding, push "▶▶" or "TAPE" button. To stop the tape while it is rewinding, push "◀◀" or "TAPE" button.

If a tape rewinds completely, the cassette player will stop and then play that same side. If a tape fast-forwards completely, the cassette will play the other side of the tape using the auto-reverse feature.

Compact disc player

Push and hold "▶▶" (preset button 6) or "◀◀" (preset button 5) to fast forward or reverse within a compact disc. When you release the button, the compact disc player will resume playing.

AM

Push the "AM" button to turn on the radio and select the AM band. "AM" will appear on the display.

AUDIO CONTROL (Tone and sound balance adjustment function)

Each time you push the "AUDIO CONTROL" knob, the mode changes. To adjust the tone and balance, turn the knob.

BAS: Adjusts low-pitched tones. The display ranges from -5 to 5.

MID (access cab models): Adjusts mid-pitched tones. The display ranges from -5 to 5.

TRE: Adjusts high-pitched tones. The display ranges from -5 to 5.

FAD: Adjusts the sound balance between the front and rear speakers. The display ranges from F7 to R7.

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BAL: Adjusts the sound balance between the right and left speakers. The display ranges from L7 to R7.

DISC (Compact disc)

Push the "DISC" button to play a compact disc.

When the audio system is set into compact disc operation, the display shows the track, or track and disc number currently being played.

Vehicles with rear seat entertainment system—

The "DISC" button may also be used to operate a DVD player when a disc is loaded in the DVD player. Pressing the "DISC" button changes between the CD player and DVD player. When the DVD player is in operation, "AUX" appears on the display.

Error messages

If the player malfunctions, your audio system will display one of the six following error messages.

"WAIT": The compact disc player unit may be too hot. Allow the player to cool down.

"ERROR 1": The disc may be dirty, damaged or inserted incorrectly (up-side down). Clean the disc and re-insert it.

220

"NO DISC": The compact disc changer of separate unit is empty. Insert a disc.

"ERROR 3": There is a problem inside the system. Eject the disc or magazine. Set the disc or magazine again.

"ERROR 4": Over-current. Ask your Toyota dealer to inspect.

"CD OPEN": The compact disc changer lid of separate unit is open. Close the compact disc changer lid.

If the malfunction still exists, take your vehicle to your Toyota dealer.

∨ **DISC** ×

With compact disc changer only—

Use these buttons to select the disc you want to listen to.

Push "∨" (preset button 3) or "×" (preset button 4) until the number of the disc you want to listen appears on the display.

Dolby® DD B NR*

If you are listening to a tape that was recorded with Dolby® B Noise Reduction, push "DD" (preset button 3). "DD" will appear on the display. Push the button again to turn off Dolby® B NR.

The Dolby NR mode reduces tape noise by about 10 dB. For best sound reproduction, play your tapes with this button on or off according to the mode used to record the tape.

*: Dolby noise reduction manufactured under license from Dolby Laboratories Licensing Corporation. "DOLBY" and the double D symbol DD are trademarks of Dolby Laboratories Licensing Corporation.

FM

Push the "FM" button to turn on the radio and select the FM band. "FM1" or "FM2" will appear on the display. This system allows you to set twelve FM stations, two for each of the preset button.


PWR·VOL (Power and Volume)

Push "PWR·VOL" to turn the audio system on and off. Turn "PWR·VOL" to adjust the volume.

RAND (Random)


There are two random features—you can either listen to the tracks on one compact disc in random order, or listen to the tracks on all the compact discs in the magazine in random order.

To play the tracks on one disc in random order:

Quickly push and release “RAND” (preset button 1). “RAND” will appear on the display and the player will perform the tracks on the disc you are listening to in random order. To turn off the random feature, push this button again.


With compact disc changer only—

To play all the tracks in the magazine in random order:

Push and hold “RAND” (preset button 1) until you hear a beep. “RAND” will appear on the display and the player will perform all the tracks on all the discs in the magazine in random order. To turn off the random feature, push this button again.

RPT (Repeat)

Cassette player


Push “RPT” (preset button 2) while the track is playing. “RPT” will appear on the display. When the track ends, it will automatically rewind and replay. To turn off the repeat feature, push this button again.

There must be at least 3 seconds of blank space between tracks in order for the repeat feature to work correctly.

Compact disc player


There are two repeat features—you can either replay a disc track or a whole compact disc.

Repeating a track:

Quickly push and release “RPT” (preset button 2) while the track is playing. “RPT” will appear on the display. When the track ends, it will automatically replay. To turn off the repeat feature, push this button again.

With compact disc changer only—

Repeating a disc:

Push and hold “RPT” (preset button 2) until you hear a beep. “RPT” will appear on the display. The player will repeat all the tracks on the disc you are listening to. When the disc ends, the player will automatically go back to the first track on the disc and replay. To turn off the repeat feature, push this button again.

SCAN

Radio

You can either scan all the frequencies on a band or scan only the preset stations for that band.

To scan the preset stations:

Push and hold the “SCAN” button until you hear a beep. The radio will tune in the next preset station up the band, stay there for 5 seconds, and then move to the next preset station. To stop scanning, push this button again.

To scan all the frequencies:

Quickly push and release the “SCAN” button. The radio will find the next station up the station band, stay there for 5 seconds, and then scan again to the next station. To stop scanning, push this button again.

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Compact disc player


There are two scan features—you can either scan the tracks on a specific disc or scan the first tracks of all the discs in the magazine.

Scanning the tracks on a disc:

Quickly push and release the “SCAN” button. “SCAN” will appear on the display and the player will scan all the tracks on the disc you are listening to. To stop scanning, push this button again. If the player scanned all the tracks on the disc, it will stop scanning.

With compact disc changer only—

Scanning the first tracks of all the discs in the magazine:

Push the “SCAN” button until you hear a beep. “SCAN” will appear on the display and the player will scan the first track of the next disc. To stop scanning, push this button again. If the player has scanned all the discs, it will stop scanning.

SEEK/TRACK (Seeking/Track up/down)

Radio

In the seek mode, the radio finds and plays the next station up or down the station band.

To seek the next station, quickly push and release “x” or “v” side of the “SEEK/TRACK” button. Do this again to find the station after that.

Cassette Player

Use this button to skip up or down to locate a song or recording.

You can select up to nine recordings (including current one).

A blank space of at least 3 seconds is considered to be a start of a recording.

When the beginning of a tape is reached, the player automatically resumes play.

When the end of the tape is reached, the player automatically reverses sides and resumes normal play.

In addition, the feature may not work well with some spoken word, live, or classical recordings.

Compact disc player

Use this button to skip up or down to a different track.

Push “x” or “v” side of the “SEEK/TRACK” button until the number of the track you want to listen to appears on the display. If you want to return to the beginning of the current track, quickly push the down side of the button one time.

Vehicles with rear seat entertainment system—

While the DVD player is in operation, the chapter or track can be changed by pushing the “x” or “v” side of the “SEEK/TRACK” button.

ST (Stereo reception) display

Your radio automatically changes to stereo reception when a stereo broadcast is received. “ST” appears on the display. If the signal becomes weak, the radio reduces the amount of channel separation to prevent the weak signal from creating noise. If the signal becomes extremely weak, the radio switches from stereo to mono reception.

TAPE

Push the “TAPE” button to play a cassette tape.

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TEXT

This button is used to change the display for the compact disc that contains text data.

To change the display, quickly push and release the "TEXT" button while the compact disc is playing. The display changes in the order from the elapsed time to disc title to track title, then back to the elapsed time.

If this button is pushed while a compact disc that does not contain text data is playing, "NO TITLE" will appear on the display.

If the entire disc or track title does not appear on the display, push and hold the button until you hear a beep. The rest of the title will appear.

TUNE (Tuning)

Turn the "TUNE" knob clockwise to step up the frequency. Turn the knob counter-clockwise to step down the frequency.

'05 TUNDRA_U (L/O 0409)

►Type 3



Details of specific buttons, controls and features are described in the alphabetical list that follows.

1 2 3 4 5 6 (Preset buttons)

These buttons are used to preset and tune in radio stations.

To preset a station to a button: Tune in the desired station. (See "TUNE" or "SEEK/TRACK".) Push and hold down the button until you hear a beep—this will set the station to the button. The preset button number will appear on the display.

RDS stations will be preset to the buttons when you turn on the RDS. (See "RDS" button.)

To recall a preset station: Push the button for the station you want. The preset button number and station frequency will appear on the display.

This radio can store one AM, two FM and RDS stations for each button. (The display will show "AM", "FM1", "FM2" or "FM TYPE" when you push "AM" or "FM" button.)

▲ (Eject button)

Cassette player

This button is used to eject a cassette.

Compact disc player

This button is used to eject one or all compact discs.

To eject the current compact disc, push and release the compact disc eject button.

To eject a specific disc, push "√" (preset button 3) or "×" (preset button 4) until the number of the disc you want to eject is displayed. Push and release the eject button.

To eject all discs at a time, press and hold the eject button until you hear a beep. The last compact disc played before pushing the button will be ejected first. If the ejected disc is not removed for a long time, the eject function will be cancelled.

◀▶ (Program)

Push "◀▶" (preset button 4) to select the other side of a cassette tape. The display indicates which side is currently selected ("▲" indicates the top side, "▼" indicates the bottom side).

Auto-reverse feature: After the cassette player reaches the end of a tape side, it automatically reverses and begins to play the other side. This is true whether the cassette was playing or fast forwarding.

◀◀/▶▶ (Reverse/Fast-forward button)

Cassette player

Push "▶▶" (preset button 6) to fast-forward a cassette tape. "FF" will appear on the display. Push "◀◀" (preset button 5) to rewind a tape. "REW" will appear on the display.

To stop the tape while it is fast-forwarding, push "▶▶" or "TAPE" button. To stop the tape while it is rewinding, push "◀◀" or "TAPE" button.

If a tape rewinds completely, the cassette player will stop and then play that same side. If a tape fast-forwards completely, the cassette will play the other side of the tape using the auto-reverse feature.

Compact disc player

Push and hold "▶▶" (preset button 6) or "◀◀" (preset button 5) to fast forward or reverse within a compact disc. When you release the button, the compact disc player will resume playing.

AM

Push the "AM" button to turn on the radio and select the AM band. "AM" will appear on the display.

AUDIO CONTROL (Tone and sound balance adjustment function)

Each time you push the "AUDIO CONTROL" knob, the mode changes. To adjust the tone and balance, turn the knob.

BAS: Adjusts low-pitched tones. The display ranges from -5 to 5.

MID: Adjusts mid-pitched tones. The display ranges from -5 to 5.

TRE: Adjusts high-pitched tones. The display ranges from -5 to 5.

FAD: Adjusts the sound balance between the front and rear speakers. The display ranges from F7 to R7.

BAL: Adjusts the sound balance between the right and left speakers. The display ranges from L7 to R7.

DISC (Compact disc)

Push the "DISC" button to play a compact disc.

When the audio system is set into compact disc operation, the display shows the track, or track and disc number currently being played.

Vehicles with rear seat entertainment system—

The "DISC" button may also be used to operate a DVD player when a disc is loaded in the DVD player. Pressing the "DISC" button changes between the CD player and DVD player. When the DVD player is in operation, "AUX" appears on the display.

Error messages

If the player malfunctions, your audio system will display one of the six following error messages.

"**WAIT**": The compact disc player unit may be too hot. Allow the player to cool down.

"**ERROR 1**": The disc may be dirty, damaged or inserted incorrectly (up-side down). Clean the disc and re-insert it.

"**NO DISC**": The compact disc changer of separate unit is empty. Insert a disc.

"**ERROR 3**": There is a problem inside the system. Eject the disc or magazine. Set the disc or magazine again.

"**ERROR 4**": Over-current. Ask your Toyota dealer to inspect.

"**CD OPEN**": The compact disc changer lid of separate unit is open. Close the compact disc changer lid.

If the malfunction still exists, take your vehicle to your Toyota dealer.



∨ DISC ×

Use these buttons to select a disc you want to listen to.


Push "∨" (preset button 3) or "×" (preset button 4) until the number of the disc you want to listen appears on the display.

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Dolby® B NR*

If you are listening to a tape that was recorded with Dolby® B Noise Reduction, push “” (preset button 3). “” will appear on the display. Push the button again to turn off Dolby® B NR.

The Dolby NR mode reduces tape noise by about 10 dB. For best sound reproduction, play your tapes with this button on or off according to the mode used to record the tape.

*: Dolby noise reduction manufactured under license from Dolby Laboratories Licensing Corporation. “DOLBY” and the double D symbol  are trademarks of Dolby Laboratories Licensing Corporation.

FM

Push the “FM” button to turn on the radio and select the FM band. “FM1”, “FM2” or “FM TYPE” will appear on the display. This system allows you to set twelve FM and six RDS stations, three for each of the preset button. If the RDS is off or RDS stations are not preset to the preset buttons, “FM TYPE” will not appear on the display.

LOAD

This button is used to load the compact discs in the compact disc player. This player can store up to six discs.

To load one compact disc only, quickly push and release the button, then insert a compact disc. After the disc is loaded, the shutter of the slot will close.

If no compact disc is inserted, the shutter will close after 15 seconds.

To load multiple compact discs, push and hold the button (until you hear a beep when the audio system is on), then insert the first compact disc. After the disc is loaded, the shutter of the slot will close. After a few seconds, the shutter will automatically open again so the next disc can be inserted. The same process can be applied for loading the rest of the discs. If the player is full of discs, “DISC FULL” will appear on the display.

If no compact disc is inserted, the shutter will close after 15 seconds.


PWR·VOL (Power and Volume)

Push “PWR·VOL” to turn the audio system on and off. Turn “PWR·VOL” to adjust the volume.


RAND (Random)

There are two random features—you can either listen to the tracks on one compact disc in random order, or listen to the tracks on all the compact discs in the magazine in random order.

To play the tracks on one disc in random order:

Quickly push and release “RAND” (preset button 1). “” will appear on the display and the player will perform the tracks on the disc you are listening to in random order. To turn off the random feature, push this button again.

To play all the tracks in the magazine in random order:

Push and hold “RAND” (preset button 1) until you hear a beep. “” will appear on the display and the player will perform all the tracks on all the discs in the magazine in random order. To turn off the random feature, push this button again.

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RDS (Radio Data System)

Your audio system is equipped with Radio Data System (RDS). RDS station providing good reception is automatically selected if current reception worsens.

The "RDS" button turns the RDS on and off. This button is operational except in AM mode.

To turn on the RDS, push and hold this button until you hear a beep and "RDS" will appear on the display. At this time, the radio starts to search the RDS stations and "RDS SEARCH" will flash on the display.

Quickly push and release this button when the RDS turns on, the radio starts to search the RDS stations and "RDS SEARCH" will flash on the display.

When the RDS stations are found, "FOUND" and the number of the RDS stations will appear on the display, and you will hear two beeps. The stations will be preset to the preset buttons.

If the RDS stations can not be found, "NO RDS ST" will appear on the display and you will hear a beep, and the display returns to the previous mode.

To turn the RDS off, push the button until you hear a beep again.

RPT (Repeat)

Cassette player

Push "RPT" (preset button 2) while the track is playing. "RPT" will appear on the display. When the track ends, it will automatically rewind and replay. To turn off the repeat feature, push this button again.

There must be at least 3 seconds of blank space between tracks in order for the repeat feature to work correctly.

Compact disc player

There are two repeat features—you can either replay a disc track or a whole compact disc.

Repeating a track:

Quickly push and release "RPT" (preset button 2) while the track is playing. "RPT" will appear on the display. When the track ends, it will automatically replay. To turn off the repeat feature, push this button again.

Repeating a disc:

Push and hold "RPT" (preset button 2) until you hear a beep. "RPT" will appear on the display. The player will repeat all the tracks on the disc you are listening to. When the disc ends, the player will automatically go back to the top track of the disc and replay. To turn off the repeat feature, push this button again.

SCAN

Radio

You can either scan all the frequencies on a band or scan only the preset stations for that band.

To scan the preset stations:

Push and hold the "SCAN" button until you hear a beep. The radio will tune in the next preset station up the band, stay there for 5 seconds, and then move to the next preset station. To stop scanning, push this button again.

To scan all the frequencies:

Quickly push and release the "SCAN" button. The radio will find the next station up the station band, stay there for 5 seconds, and then scan again to the next station. To stop scanning, push this button again.


Compact disc player

There are two scan features—you can either scan the tracks on a specific disc or scan the first tracks of all the discs in the magazine.

Scanning the tracks on a disc:

Quickly push and release the “SCAN” button. “SCAN” will appear on the display and the player will scan all the tracks on the disc you are listening to. To stop scanning, push this button again. If the player scanned all the tracks on the disc, it will stop scanning.

Scanning the first tracks of all the discs in the magazine:

Push the “SCAN” button until you hear a beep. “SCAN” will appear on the display and the player will scan the first track of the next disc. To stop scanning, push this button again. If the auto changer has scanned all the discs, it will stop scanning.

SEEK/TRACK (Seeking/Track up/down)

Radio

In the seek mode, the radio finds and plays the next station up or down the station band.

To seek the next station, quickly push and release “x” or “v” side of the “SEEK/TRACK” button. Do this again to find the station after that.

Cassette Player

Use this button to skip up or down to locate a song or recording.

You can select up to nine recordings (including current one).

A blank space of at least 3 seconds is considered to be a start of a recording.

When beginning of a tape is reached, the player automatically resumes play.

When the end of the tape is reached, the player automatically reverses sides and resumes normal play.

In addition, the feature may not work well with some spoken word, live, or classical recordings.

Compact disc player

Use this button to skip up or down to a different track.

Push “x” or “v” side of the “SEEK/TRACK” button until the number of the track you want to listen to appears on the display. If you want to return to the beginning of the current track, quickly push the down side of the button one time.

Vehicles with rear seat entertainment system—

While the DVD player is in operation, the chapter or track can be changed by pushing the “x” or “v” side of the “SEEK/TRACK” button.

ST (Stereo reception) display

Your radio automatically changes to stereo reception when a stereo broadcast is received. “ST” appears on the display. If the signal becomes weak, the radio reduces the amount of channel separation to prevent the weak signal from creating noise. If the signal becomes extremely weak, the radio switches from stereo to mono reception.

TAPE

Push the “TAPE” button to play a cassette tape.

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TEXT

Radio

This button is operational only in RDS mode.

When an RDS radio station transmits a text message, "TEXT" will be displayed. At this time, push the "TEXT" button to view the text message. The message display will be canceled if any button that affects the display is pushed. To view the message again, push this button again. After the entire message has been displayed, the message will disappear.

The RDS audio system has memory to store three 64-character messages. To store a message in memory, push and hold the "TEXT" button until you hear a beep.

If three messages are already stored in memory, the oldest message will be overwritten by the new message.

To recall a radio text message, push the "TEXT" button momentarily. This will display the most recent message. Each push of the button will display messages in the order of most to least recent.

If no messages have been stored, or if there are no more messages to be recalled, "NO MESSAGE" will appear on the display, and the message display will be canceled.

The message display will be canceled if you activate any function that affects the display.

Compact disc player

This button is used to change the display for the compact disc that contains text data.

To change the display, quickly push and release the "TEXT" button while the compact disc is playing. The display changes in the order from the elapsed time to disc title to track title, then back to the elapsed time.

If this button is pushed while a compact disc that does not contain text data is playing, "NO TITLE" will appear on the display.

If the entire disc or track title does not appear on the display, push and hold the button until you hear a beep. The rest of the title will appear.

TRAF (Traffic)

This button turns the traffic announcement (TA) feature on and off. This button is operational only in FM mode.

By pushing the "TRAF" button, "TRAF SEEK" will flash on the display and the radio will start seeking any traffic program station.

When a traffic program station is found, "TRAF" will be displayed and you will hear a beep.

After the traffic announcement program is over, the display returns to the previous mode.

If no traffic program station is found, "NO TRAF INFO" appears on the display for a few seconds and the display returns to the previous mode.

To cancel the traffic announcement, push this button again.

TUNE (Tuning)

Turn the "TUNE" knob clockwise to step up the frequency. Turn the knob counter-clockwise to step down the frequency.

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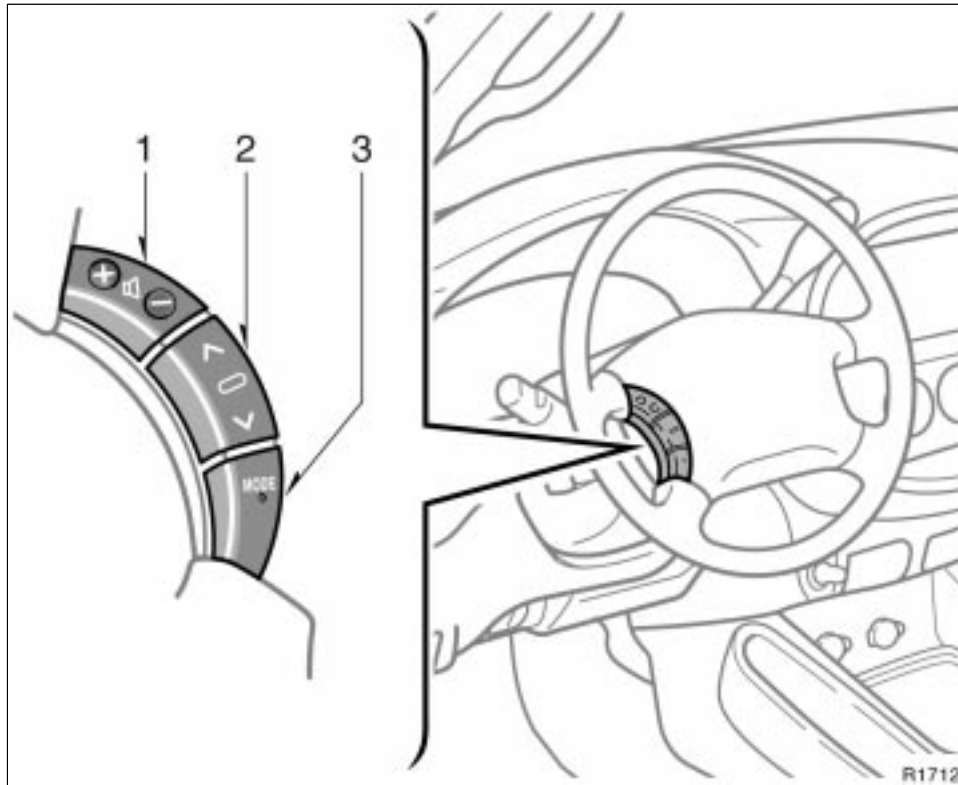
TYPE (Program Types)

When you push the "TYPE" button while receiving an RDS station, the current program type appears on the display.

Each time you push this button, the program type changes as in the following:

- ▼ROCK
- ▼EASY LIS (Easy listening)
- ▼CLS/JAZZ (Classical music and Jazz)
- ▼R&B (Rhythm and Blues)
- ▼INFORM (Information)
- ▼RELIGION
- ▼MISC (Miscellaneous)
- ▼ALERT (Emergency message)

Audio remote controls (steering switches)



Some parts of the audio system can be adjusted using the switches on the steering wheel.

Details of the specific switches, controls, and features are described below.

1. Volume control switch
2. "x v" switch
3. "MODE" switch

1. Volume control switch

Push "+" to increase the volume. The volume continues to increase while the switch is being pushed.

Push "-" to decrease the volume. The volume continues to decrease while the switch is being pushed.

2. "× √" switch

Radio

This switch has the following features—

To select a preset station:

Quickly push and release the "×" or "√" side of the switch. Do this again to select the next preset station.

To seek a station:

Push and hold the "×" or "√" side of the switch until you hear a beep. Do this again to find the next station. If you push the switch on either side during the seek mode, seeking will be cancelled.

Cassette player

This switch has the following features—

To skip to a different track in either direction:

Quickly push and release the "×" or "√" side of the switch. "FF 1" or "REW 1" will appear on the display.

Next, push either side of the track switch until the track you want to listen to is set. If you push the switch ten times, the skip function will turn off. (You can skip up to nine tracks at a time.)

When counting the number of the tracks you want to rewind, remember to count the current track as well. For example, if you want to rewind to a song that is two tracks before the song you are listening to, push the "√" side of the switch three times.

If you push the track switch further than you wanted to, push the other side of the switch. The track number will be increased or reduced.

The track number you select is not valid if it is higher than the number of the tracks remaining on the current side of the cassette.

▼When the tape reaches to the beginning, the player will automatically start playing that side.

▼After the tape reaches to the end, the player will automatically reverse and start playing the other side.

There must be at least 3 seconds of blank space between tracks for the track switch to work correctly. In addition, the feature may not work well with some spoken, live, or classical recordings.

To fast-forward or reverse:

Push and hold the "×" side of the switch to fast-forward a cassette tape. "FF" will appear on the display. Push and hold the "√" side of the switch to rewind a tape. "REW" will appear on the display.

To stop the tape while it is fast-forwarding, push the "×" side of the switch. To stop the tape while it is rewinding, push the "√" side of the switch.

If a tape rewinds completely, the cassette player will stop and then play that same side. If a tape fast-forwards completely, the cassette will play the other side of the tape using the auto-reverse feature.

Compact disc player

Use this switch to skip up or down to a different track in either direction.

Quickly push and release the "×" or "√" side of the switch until the track you want to listen to is set. If you want to return to the beginning of the current track, push the "√" side of the switch once, quickly.

With compact disc changer only—

Push and hold the “×” or “√” side of the switch until the disc you want to listen to is set.

3. “MODE” switch

Push “MODE” switch to select an audio mode. Each push changes the mode sequentially if the desired mode is ready to use. The DVD player will be selectable if a rear seat entertainment system is installed in your vehicle.

To turn the audio system on, push the “MODE” switch.

To turn the audio system off, push and hold the “MODE” switch until the system turns off.

Rear seat audio system—

The rear seat audio system is designed for the rear seat passengers to enjoy the audio sound separately between the front seats and the rear seats.

The rear seat audio system can be turned on with the rear audio system controller even if the front audio system is off. When the front audio is turned off, the rear audio system will be turned off simultaneously.

The rear passengers can enjoy all the modes (AM and FM radio, cassette tape player and compact disc player with changer) with the rear seat audio system when a cassette tape and a compact disc are loaded in the front audio system.

When the same mode is selected on the front and rear audio systems at the same time, the system can be operated on the front audio system.

If the radio mode is selected on the front and rear audio systems at the same time, AM and FM modes cannot be changed on the rear seat audio system.

You can enjoy the rear seat entertainment system with commercial headphone. See “—Headphone input jacks” in this Section for details.

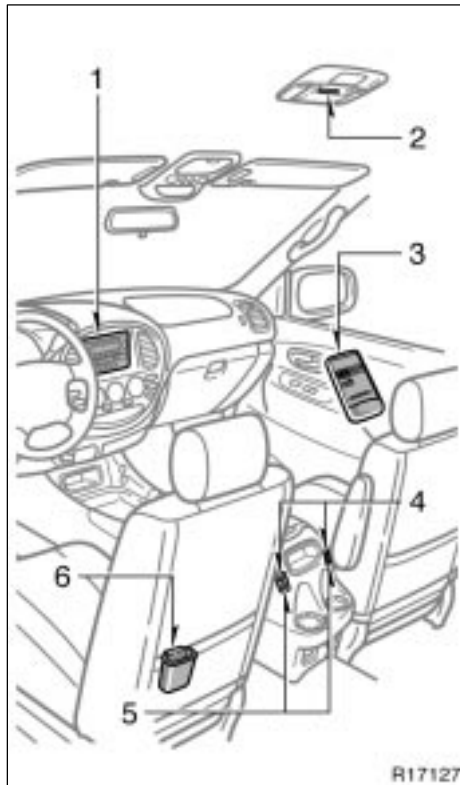
You can also enjoy the rear seat entertainment system with a wireless headphone. The wireless headphone can be used within rear seat. If the signal becomes weak, the headphone will mute. For details, refer to the manufacturer's instructions.

With some wireless headphone generally available in the market, it may be difficult to catch sound properly. Toyota recommends the use of Toyota genuine wireless headphone.

You can purchase a wireless headphone at a Toyota dealer.

CAUTION

Do not drive with using the headphone. Otherwise, you may be hard to hear the sound from the outside while using the headphone and may cause an accident.



The rear seat audio system consists of following components.

1. Front audio system
2. Rear seat audio system display
3. Rear seat audio system controller
4. Headphone volume control dials
5. Headphone input jacks
6. Controller holder

—Rear seat audio system controller

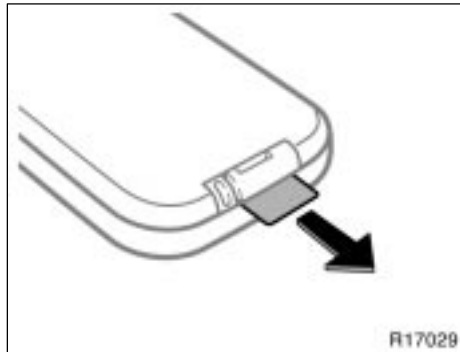
The rear seat audio system can be operated with the rear seat audio system controller.

CAUTION

Do not disassemble or modify the controller. It may cause an accident, fire or electric shock.

NOTICE

Keep the controller away from direct sunlight, high heat and high humidity. These conditions could cause the case to deform or the battery to explode or leak.



**BEFORE USING THE CONTROLLER
(for new vehicle owners)**

A battery is already set in the controller with an insulating sheet, which prevents the battery from being discharged. Before using the controller, remove the insulating sheet.



USING THE CONTROLLER

To use the rear seat audio system controller, direct the signal output portion of the controller to the signal reception portion of the rear seat audio system display.

The rear seat audio system controller can be operated when the ignition switch is in the "ACC" or "ON" position.

The controller does not operate properly when the signal reception portion of the display is exposed to direct sunlight. Block the display from direct sunlight.

Details of specific buttons, controls, and features of the controller, see "CONTROLLER FEATURES" in this Section.

NOTICE

Observe the followings, otherwise the controller may be damaged.

- ◆ *Do not drop or strongly knock the controller against hard objects.*
- ◆ *Do not sit on or place heavy objects on the controller.*



CONTROLLER HOLDER

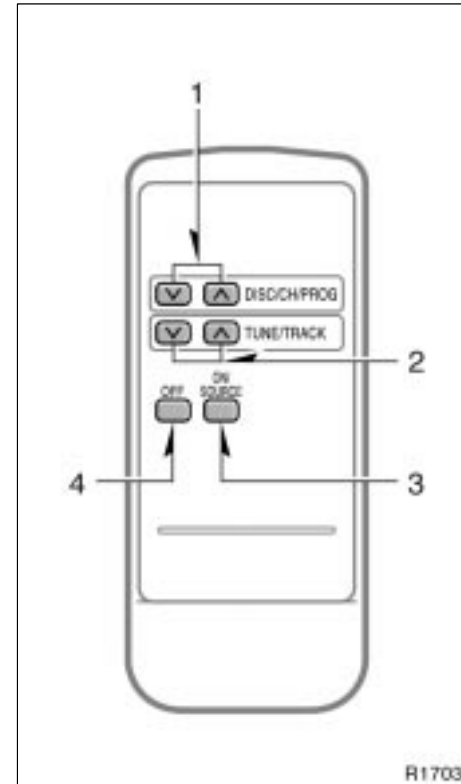
The controller can be stowed in the holder when it is not in use. The holder can be hooked on the back of the driver's or front passenger's seatback.

⚠ CAUTION

To reduce the chance of injury in case of an accident or a sudden stop while driving, stow the controller in the holder when it is not in use.

NOTICE

Do not leave the controller exposed to high temperatures (such as on the instrument panel) for a long time, otherwise the controller may be damaged.



CONTROLLER FEATURES

1. "▼" and "▲" (DISC/CH/PROG) buttons
2. "▼" and "▲" (TUNE/TRACK) buttons
3. "ON/SOURCE" button
4. "OFF" button

1. "▼" and "▲" (DISC/CH/PROG) buttons

Radio

You can scan only the preset stations for the band of the front audio system. (For instructions, see "—Controls and features" in this Section.)

To scan the preset stations:

Push the "▼" or "▲" (DISC/CH/PROG) button. The radio will tune in the next preset station up or down the band. The station frequency will appear on the display.

Cassette tape player

Push the "▼" or "▲" (DISC/CH/PROG) button to select the other side of a cassette tape. The display indicates which side is currently selected. ("▲" indicates the top side, "▼" indicates the bottom side.)

Auto-reverse feature: After the cassette player reaches the end of a tape side, it automatically reverses and begins to play the other side. This is true whether the cassette was playing or fast forwarding.

Compact disc player with changer

Use these buttons to select a disc you want to listen to.

Push the "▼" or "▲" (DISC/CH/PROG) button until the number of the disc you want to listen appears on the display.

2. "▼" and "▲" (TUNE/TRACK) buttons

Radio

Push the "▼" or "▲" (TUNE/TRACK) button to tune or seek.

Tuning:

Quickly push and release the "▼" or "▲" (TUNE/TRACK) button. Each time you push the button, the radio will step up or down to another frequency. If you push and hold the button, and the radio will go into the seek mode.

Seeking:

Push and hold the "▼" or "▲" (TUNE/TRACK) button. The radio will seek up or down for a station of the nearest frequency and will stop on reception. Each time you push the button, the stations will be searched one after another.

Cassette tape player

This button has the following features—

To fast forward or reverse:

Push and hold the “^” (TUNE/TRACK) button until “FF” will appears on the display to forward a tape. Push and hold the “v” (TUNE/TRACK) button until “REW” appears on the display to rewind a tape.

To stop the tape while it is fast forwarding, push the “^” (TUNE/TRACK) button. To stop the tape while it is rewinding, push the “v” (TUNE/TRACK) button.

If a tape rewinds completely, the cassette player will stop and then play that same side. If a tape fast forwards completely, the cassette will play the other side of the tape using the auto-reverse feature.

To skip up or down to locate a song or recording:

You can select up to nine recordings (including current one).

Push the “v” or “^” (TUNE/TRACK) button. “FF 1” or “REW 1” will appear on the display.

Next, push either side of the track button until the number on the display reaches the number of tracks you want to skip. If you push the button 10 times, the skip feature will be turned off.

For the skip feature to work correctly a blank space of at least 3 seconds is considered to be a start of a recording.

When a beginning of a tape is reached, the player automatically resumes play.

When the end of the tape is reached, the player automatically reverses sides and resumes normal play.

In addition, the feature may not work well with some spoken, live, or classical recordings.

Compact disc player

This button has the following features—

To skip up or down to a different track: Push the “v” or “^” (TUNE/TRACK) button until the number of the track you want to listen to appears on the display. If you want to return to the beginning of the current track, quickly push the “v” (TUNE/TRACK) button one time.

To fast forward or reverse:

Push and hold the “v” or “^” (TUNE/TRACK) button to fast forward or reverse within a compact disc. When you release the button, the compact disc player will resume playing.

3. “ON/SOURCE” button

Push “ON/SOURCE” button to turn on the rear seat audio system.

Use “ON/SOURCE” button to select an audio mode when the rear seat audio system is on. Each time you push this button, the system changes between the radio, cassette player and compact disc player.

When you change the mode, the display indicates which mode is selected.

When a cassette tape and compact discs are not loaded in the front audio system, only a radio mode can be selected in the rear seat audio system.

If you push “ON/SOURCE” button to select the cassette tape player mode or compact disc player mode in that case, a beep sounds from front audio system and “INVALID” flashes on the screen for 6 seconds, and then the rear audio system returns to the radio mode.

If you push “ON/SOURCE” button while receiving an emergency broadcast, a beep sounds and “INVALID” appears on the screen to indicate that no button can be operated.

Radio

AM mode

When you select the AM mode, "AM" will appear on the screen.

FM mode

When you select the FM mode, "FM1" or "FM2" will appear on the display.

If the front audio system receives a traffic announcement (TA) while the rear seat audio system is in the radio mode, "TRAF" will flash on the screen and the rear seat audio system will turn off. When the front audio receives a traffic announcement (TA), the rear seat audio system cannot select the AM/FM mode.

Tape mode

"TAPE" appears on the screen while this mode is selected.

Compact disc mode

"CD" appears on the screen while this mode is selected.

The screen shows the track, or track and disc number currently being played.

Error messages

If the player malfunctions, your audio system will screen one of the four following error messages.

"WAIT": The compact disc player unit may be too hot. Allow the player to cool down.

"ERR 1": The disc may be dirty, damaged or inserted incorrectly (up-side down). Clean the disc and re-insert it.

"ERR 3": There is a problem inside the system. Eject the disc. Set the disc again.

"ERR 4": Over-current. Ask your Toyota dealer to inspect.

If the malfunction still exists, take your vehicle to your Toyota dealer.

4. "OFF" button

Push "OFF" button to turn off the rear seat audio system.

REPLACING CONTROLLER BATTERY

For replacement, use a CR2025 lithium battery or equivalent.

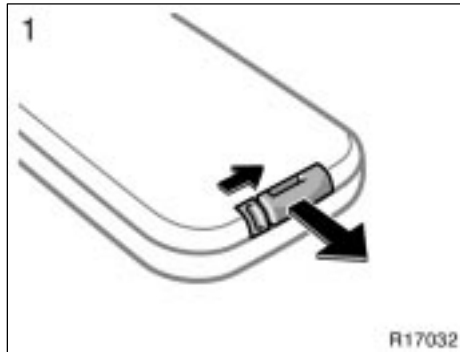


Special care should be taken that small children do not swallow the removed battery or components.

NOTICE

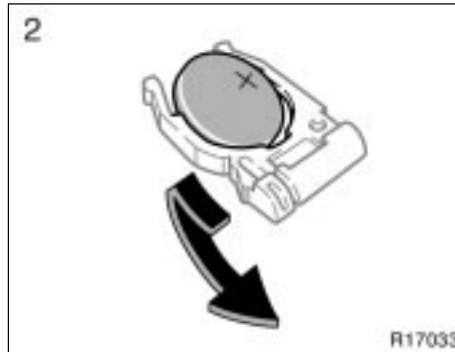
- ◆ *When replacing the battery, be careful not to lose the components.*
- ◆ *Replace only with the same or equivalent type of battery recommended by a Toyota dealer.*
- ◆ *Dispose of used batteries according to the local regulations.*

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Replace the battery by using the following procedures:

1. Pull the case out while pushing the lock release button to the side.



2. Remove the discharged battery.
3. Put in a new battery with the positive (+) side up.
Put in the case securely.

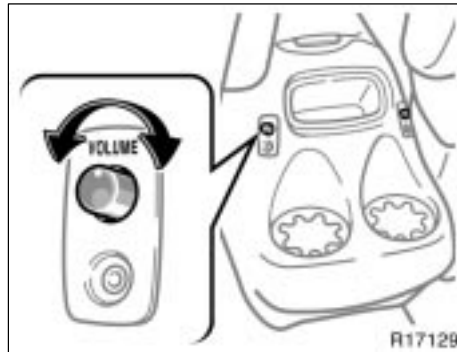
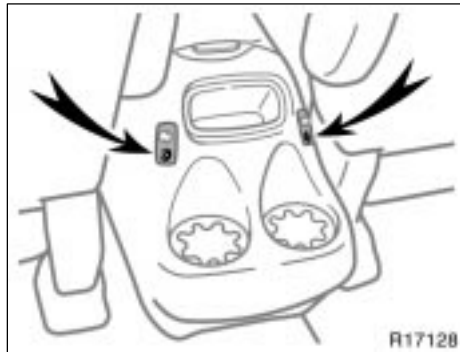
NOTICE

- ◆ **Make sure that the positive side of the controller battery is facing correctly.**
- ◆ **Do not replace the battery with wet hands. Water may cause rust.**
- ◆ **Do not touch or move any components inside of the controller, or it may interfere with proper operation.**

- ◆ **Be careful not to bend the electrode of the controller battery insertion and that dust or oil does not adhere to the transmitter case.**
- ◆ **Close the battery case securely.**

After replacing the battery, check that the controller operates properly. If the controller still does not operate properly, contact your Toyota dealer.

—Headphone input jacks



CAUTION

Adjust the volume when you connect the headphones to the jack. Loud sounds may have a significant impact on the human body.

You can enjoy the rear seat audio system with commercial headphone.

To use the headphones, connect them to the jack.

The key must be in the "ACC" or "ON" position.

To adjust the volume of the headphones, turn the knob. Turn right to increase the volume. Turn left to decrease the volume.

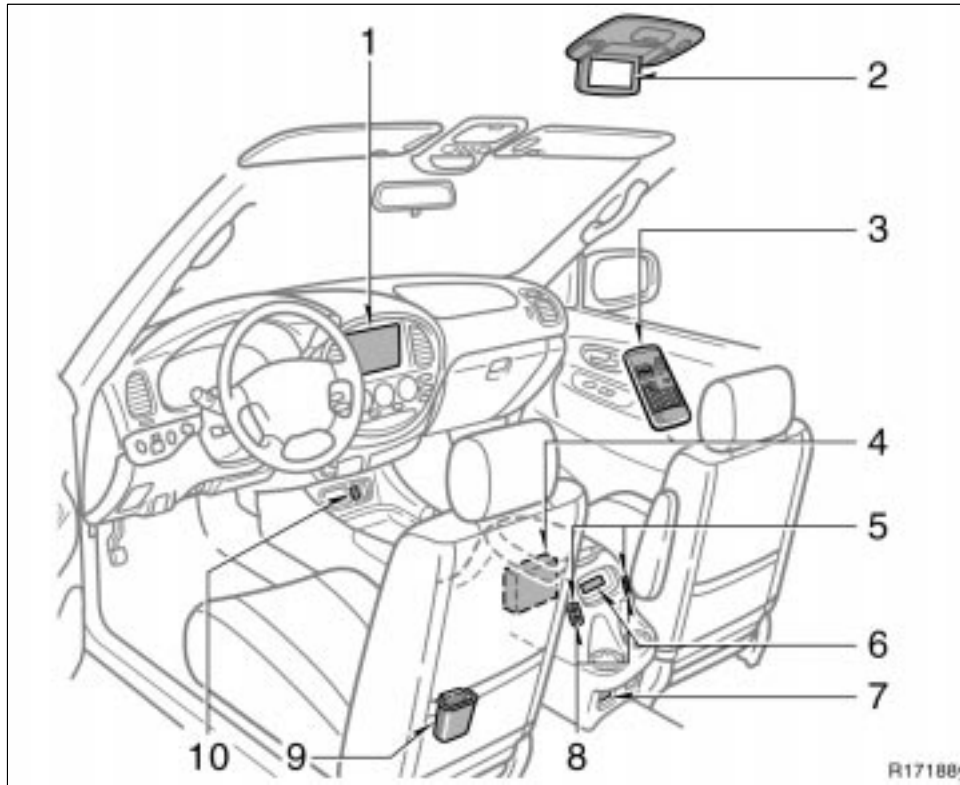
The maximum volume depends on the type of headphones.

With some headphone generally available in the market, it may be difficult to catch sound properly. Toyota recommends the use of Toyota genuine headphone.

Please contact your Toyota dealer for further details.

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Rear seat entertainment system—



The rear seat entertainment system consists of the following components.

1. Front audio system
2. Rear seat entertainment system display
3. Rear seat entertainment system controller
4. DVD player
5. Headphone input jacks
6. Input terminal adapter
7. Power outlet
8. Headphone volume control dials
9. Controller holder
10. Power outlet main switch

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The rear seat entertainment system is designed for the rear passengers to enjoy audio and DVD video separately from the front audio system.

The rear seat entertainment system can be operated when the ignition key is in the "ACC" or "ON" position.

The rear passengers can enjoy all modes (AM and FM radio, cassette tape player, compact disc player with changer and DVD player) on the rear seat entertainment system only if a cassette tape and a compact disc are loaded in the front audio system.

The rear seat entertainment system can play DVD video, audio CD, video CD, CD text, dts-CD or DVD audio only when a disc is loaded in the DVD player.

You can enjoy videos and sound when your personal audio system is connected to the input terminal adapter on the rear console box. For details, refer to the manufacturer's instructions.

You can enjoy the rear seat entertainment system with commercial headphone. See "—Headphone input jacks" in this Section for details.

You can also enjoy the rear seat entertainment system with a wireless headphone. The wireless headphone can be used within rear seat. If the signal becomes weak, the headphone will mute. For details, refer to the manufacturer's instructions.

With some wireless headphone generally available in the market, it may be difficult to catch sound properly. Toyota recommends the use of Toyota genuine wireless headphone.

You can purchase a wireless headphone at a Toyota dealer.

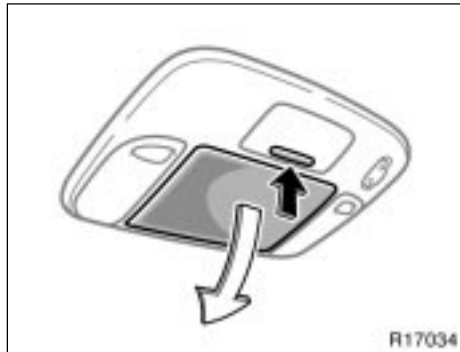
CAUTION

▼Do not drive with using the headphone. Otherwise, you may be hard to hear the sound from the outside while using the headphone and may cause an accident.

▼Conversational speech on some DVDs is recorded at a low volume to emphasize the impact of sound effects. If you adjust the volume assuming that the conversations represent the maximum volume level that the DVD will play, you may be startled by louder sound effects or when you change to a different audio source. Be sure to adjust the volume with this in mind.

Make sure the volume is not increased, before you turn on the headphone.

—Display



To open the display, push the lock release button.



Push down the display to the desired angle.



To close, push up the display until you hear a click.

The illumination of the screen is automatically turned off when the display is closed. However, the rear seat entertainment system is not turned off.

NOTICE

The screen should be cleaned with a dry soft cloth. If the screen is pushed by hand or wiped with a hard cloth, the surface of the screen may be scratched.

CAUTION

To reduce the chance of injury in case of an accident or sudden stop while driving, close the display when it is not in use.

NOTICE

- ◆ *The screen should be cleaned with a dry soft cloth. If the screen is pushed by hand or wiped with a hard cloth, the surface of the screen may be scratched.*
- ◆ *Benzene or alkaline solutions may damage the coated surface of the screen.*
- ◆ *To prevent the battery from being discharged, do not turn on the rear seat entertainment system longer than necessary when the engine is not running.*

—Rear seat entertainment system controller

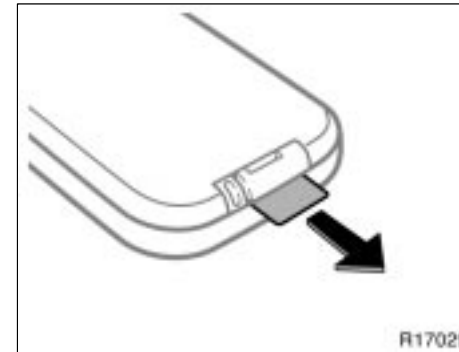
The rear seat entertainment system can be operated with the rear seat entertainment system controller. The system cannot be operated by touching the switches on the screen directly.

CAUTION

Do not disassemble or modify the controller. It may cause an accident, fire or electric shock.

NOTICE

Keep the controller away from direct sunlight, high heat and high humidity. These conditions could cause the case to deform or the battery to explode or leak.



BEFORE USING THE CONTROLLER
(for new vehicle owners)

A battery is already set in the controller with an insulating sheet, which prevents the battery from being discharged. Before using the controller, remove the insulating sheet.



USING THE CONTROLLER

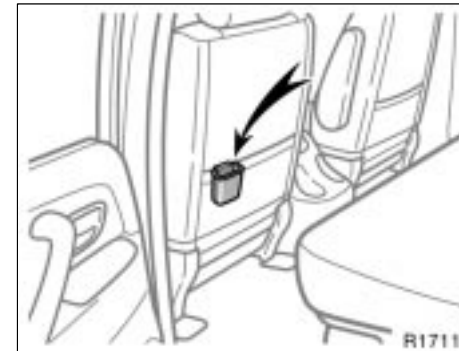
To use the rear seat entertainment system controller, direct the signal output portion of the controller to the signal reception portion of the rear seat entertainment system display.

The controller does not operate properly when the signal reception portion of the display is exposed to direct sunlight. Block the display from direct sunlight.

NOTICE

Observe the followings, otherwise the controller may be damaged.

- ◆ *Do not drop or strongly knock the controller against hard objects.*
- ◆ *Do not sit on or place heavy objects on the controller.*



CONTROLLER HOLDER

The controller can be stowed in the holder when it is not in use. The holder can be hooked on the back of the driver's or front passenger's seatback.

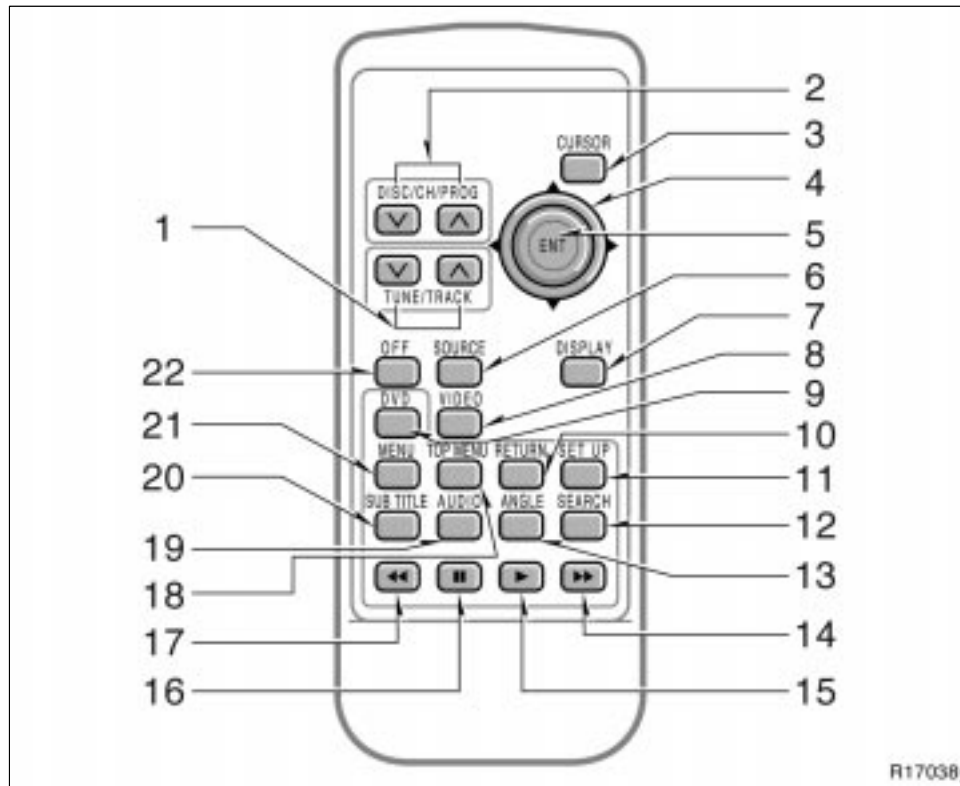
CAUTION

To reduce the chance of injury in case of an accident or a sudden stop while driving, stow the controller in the holder when it is not in use.

NOTICE

Do not leave the controller exposed to high temperatures (such as on the instrument panel) for a long time, otherwise the controller may be damaged.

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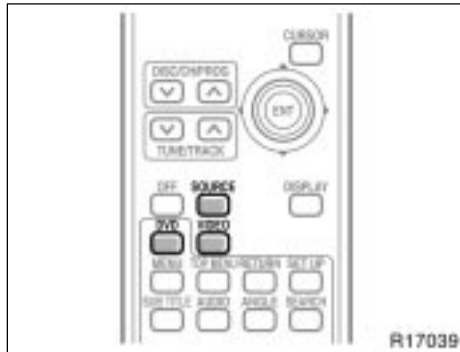
CONTROL BUTTONS

1. "V" and "A" (TUNE/TRACK) buttons
These buttons operate the front audio system or select the track/chapter when the DVD player is operated.
2. "V" and "A" (DISC/CH/PROG) buttons
These buttons skip directly to a desired preset station, disc, track or chapter.
3. "CURSOR" button
This button indicates the control switches on the screen when the DVD player is operated.
4. Joy stick
This joy stick selects a control switch, mode switch on the screen or the menu for the disc.
5. "ENT" button
This button inputs the selected switch or the selected menu for the disc.
6. "SOURCE" button
This button turns on the rear seat entertainment system and selects the mode.
7. "DISPLAY" button
This button adjusts the color, tone, contrast and brightness of the screen.

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8. "VIDEO" button
This button turns on the video mode when your personal audio device is connected.
9. "DVD" button
This button turns on the DVD mode.
10. "RETURN" button
This button skips to the predetermined scene for the disc when the DVD player is operated.
11. "SET UP" button
This button indicates the initial set up screen when the DVD player is operated.
12. "SEARCH" button
This button indicates the title search screen when the DVD player is operated.
13. "ANGLE" button
This button selects the angle of the screen when the DVD player is operated.
14. "▶▶" button
This button fast forwards a screen when the DVD player is operated.
15. "▶" button
This button plays a screen when the DVD player is operated.
16. "▮▮" button
This button pauses a screen when the DVD player is operated.
17. "◀◀" button
This button reverse a screen when the DVD player is operated.
18. "TOP MENU" button
This button indicates the title selection screen for DVD video when the DVD player is operated.
19. "AUDIO" button
This button indicates the changing audio screen when the DVD player is operated.
20. "SUB TITLE" button
This button indicates the changing subtitle screen when the DVD player is operated.
21. "MENU" button
This button indicates the menu screen for DVD video when the DVD player is operated.
22. "OFF" button
This button turns off the rear seat entertainment system.

—Turning the rear seat entertainment system on and off

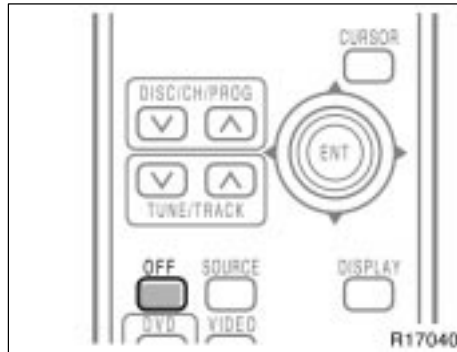


To turn on the system, push the “SOURCE” button.

The screen indicates which mode can be selected. Push the “DVD” or “VIDEO” button when the connected DVD player or your personal audio machine is on. The rear seat entertainment system will be turned on.

The rear seat entertainment system can select all the modes.

When a cassette tape, a compact disc, a DVD video disc, an audio CD, a video CD, a CD text, a dts-CD or a DVD audio disc is not loaded on the front audio system or the DVD player, only the radio mode can be selected on the rear seat entertainment system.



To turn off the system, push the “OFF” button.

When the front audio system is turned off, the rear audio system and the DVD player will be turned off simultaneously.

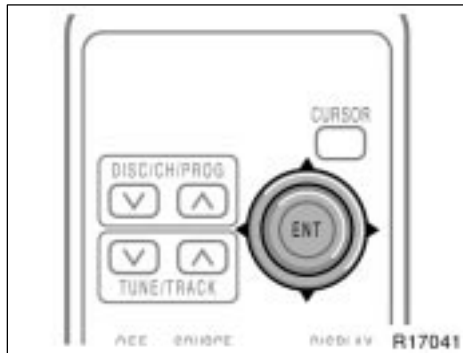
—Front audio system operation

All the modes of the front audio system can be operated on the rear seat entertainment system.

When the same mode is selected on the front and rear audio systems simultaneously, the system can be operated on the front audio system.

If the radio mode is selected on the front and rear audio systems at the same time, AM and FM modes cannot be changed on the rear seat audio system.

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SELECTING THE MODE

Use the joy stick to select the mode. Push the "ENT" button to enter the mode.

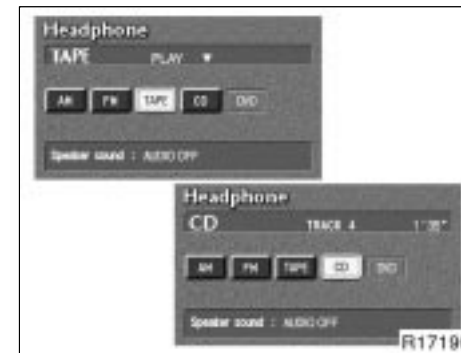


The mode display which is selected by the joy stick is colored blue. When the "ENT" button is pushed, the mode display changes to green. If the mode display is gray, it cannot be selected.

The "Speaker sound" on the mode display is selected on the front audio system.



Radio



Cassette tape player and compact disc player

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When you select a mode, the screen indicates which is selected.

Radio

AM mode:

When you select the AM mode, "AM" will appear on the screen.

FM mode:

When you select the FM mode, "FM1" or "FM2" will appear on the screen.

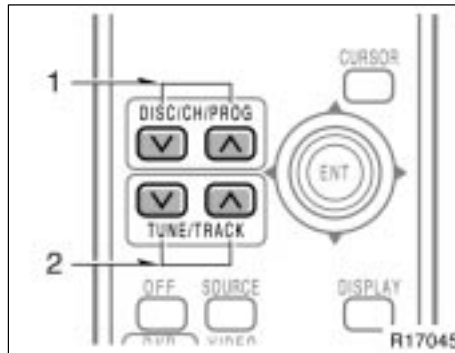
Tape mode

"TAPE" appears on the screen while this mode is selected.

Compact disc mode

"CD" appears on the screen while this mode is selected.

The screen shows the track, or track and disc number currently being played.



OPERATING FRONT AUDIO SYSTEM

To operate the front audio system, use the following switches.

1. "V" and "^" (DISC/CH/PROG) buttons

Radio

You can scan only the preset stations for the band of the front audio system. (For instructions, see "—Controls and features" in this Section.)

To scan the preset stations:

Push the "V" or "^" (DISC/CH/PROG) button. The radio will tune in the next preset station up or down the band. The station frequency will appear on the screen.

Cassette tape player

Push the "V" or "^" (DISC/CH/PROG) button to select the other side of a cassette tape. The screen indicates which side is currently selected. ("^" indicates the top side, "V" indicates the bottom side.)

Auto-reverse feature: After the cassette player reaches the end of a tape side, it automatically reverses and begins to play the other side. This is true whether the cassette was playing or fast forwarding.

Compact disc player with changer

Use these buttons to select a disc you want to listen to.

Push the "V" or "^" (DISC/CH/PROG) button until the number of the disc you want to listen appears on the display.

2. “V” and “^” (TUNE/TRACK) buttons Radio

Push the “V” or “^” (TUNE/TRACK) button to tune or seek.

Tuning:

Quickly push and release the “V” or “^” (TUNE/TRACK) button. Each time you push the button, the radio will step up or down to another frequency. If you push and hold the button, and the radio will go into the seek mode.

Seeking:

Push and hold the “V” or “^” (TUNE/TRACK) button. The radio will seek up or down for a station of the nearest frequency and will stop on reception. Each time you push the button, the stations will be searched one after another.

Cassette tape player

This button has the following features—

To fast forward or reverse:

Push and hold the “^” (TUNE/TRACK) button until “FF” will appear on the display to forward a tape. Push and hold the “V” (TUNE/TRACK) button until “REW” appears on the display to rewind a tape.

To stop the tape while it is fast forwarding, push the “^” (TUNE/TRACK) button. To stop the tape while it is rewinding, push the “V” (TUNE/TRACK) button.

If a tape rewinds completely, the cassette player will stop and then play that same side. If a tape fast forwards completely, the cassette will play the other side of the tape using the auto-reverse feature.

To skip up or down to locate a song or recording:

You can select up to nine recordings (including current one).

Push the “V” or “^” (TUNE/TRACK) button. “FF 1” or “REW 1” will appear on the screen.

Next, push either side of the track button until the number on the screen reaches the number of tracks you want to skip. If you push the button 10 times, the skip feature will be turned off.

For the skip feature to work correctly a blank space of at least 3 seconds is considered to be a start of a recording.

When a beginning of a tape is reached, the player automatically resumes play.

When the end of the tape is reached, the player automatically reverses sides and resumes normal play.

In addition, the feature may not work well with some spoken, live, or classical recordings.

Compact disc player

This button has the following features—

To skip up or down to a different track: Push the “V” or “^” (TUNE/TRACK) button until the number of the track you want to listen to appears on the display. If you want to return to the beginning of the current track, quickly push the “V” (TUNE/TRACK) button one time.

To fast forward or reverse:

Push and hold the “V” or “^” (TUNE/TRACK) button to fast forward or reverse within a compact disc. When you release the button, the compact disc player will resume playing.

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REPLACING CONTROLLER BATTERY

For replacement, use a CR2025 lithium battery or equivalent.

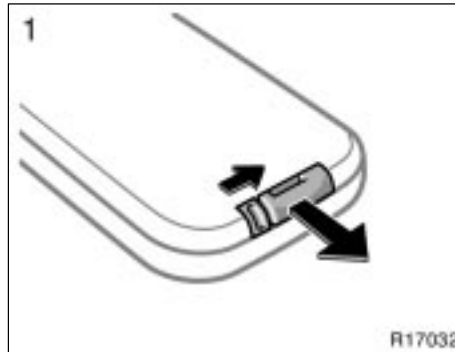


CAUTION

Special care should be taken that small children do not swallow the removed battery or components.

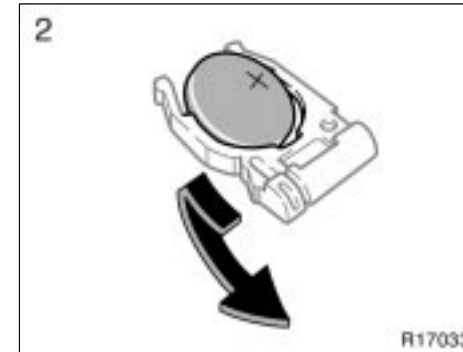
NOTICE

- ◆ *When replacing the battery, be careful not to lose the components.*
- ◆ *Replace only with the same or equivalent type of battery recommended by a Toyota dealer.*
- ◆ *Dispose of used batteries according to local regulations.*



Replace the battery by using the following procedures:

1. Pull the case out while pushing the lock release button to the side.



2. Remove the discharged battery.
3. Put in a new battery with the positive (+) side up.
Put it in the case securely.

NOTICE

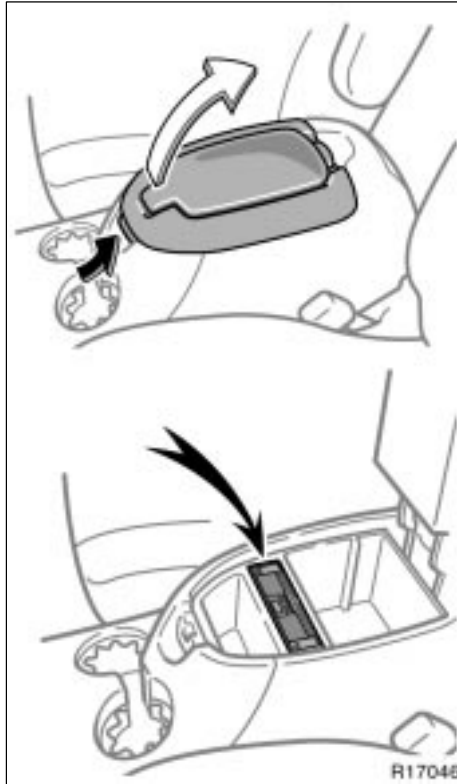
- ◆ *Be sure that the positive side of the controller battery is facing correctly.*
- ◆ *Do not replace the battery with wet hands. Water may cause rust.*
- ◆ *Do not touch or move any components inside of the controller, or it may interfere with proper operation.*

◆ *Be careful not to bend the electrode of the controller battery insertion and that dust or oil does not adhere to the transmitter case.*

◆ *Close the battery case securely.*

After replacing the battery, check that the controller operates properly. If the controller still does not operate properly, contact your Toyota dealer.

—DVD player



The DVD player is set in the console box.

The DVD player can play audio CDs, DVD video discs, CD texts, dts-CDs and video CDs.

For appropriate discs for this player, see "Audio/video system operating hints".

To access the DVD player, pull up the console box lid while pushing the lock release button.

The DVD player works when the ignition key is in the "ACC" or "ON" position.

To turn on the DVD player, a disc must be loaded in the player.

To turn off the player, eject the disc.

Error messages

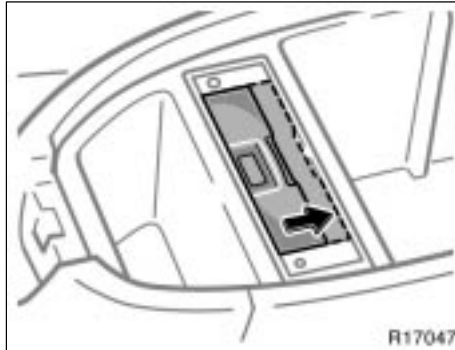
If the player malfunctions, your audio system will display one of the three following error messages.

If "DISC CHECK" appears on the screen: It indicates that the disc is dirty, damaged or it was inserted upside down. Clean the disc or insert it correctly.

If "REGION CODE ERROR" appears on the screen: It indicates that the DVD region code is not set properly.

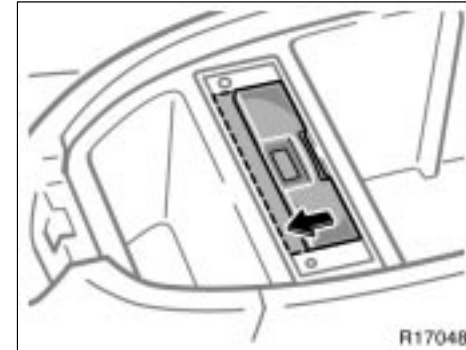
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If “DVD ERROR” appears on the screen: There is a problem inside the player. Eject the disc. Set the disc again. If the malfunction still exists, take your vehicle to your Toyota dealer.



INSERTING THE DISC

To open the DVD player, push the lid backward.



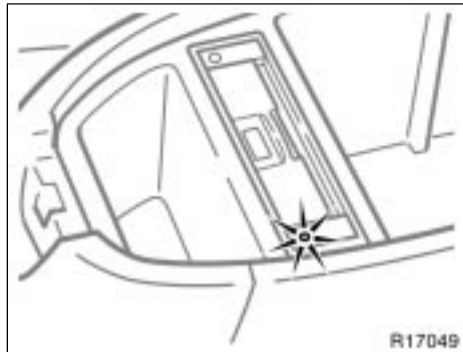
Insert a disc and push the lid forward to close the DVD player.

When you insert a disc, push it in gently with the label side up.

If the label faces down, the disc cannot be played. In this case, “DISC CHECK” and disc number appear on the screen.

If a disc which is not playable is inserted, “DISC CHECK” will also appear on the screen. For appropriate discs for this player, see “Audio/video system operating hints”.

The player is intended for the use with 12 cm (4.7 in.) discs only.

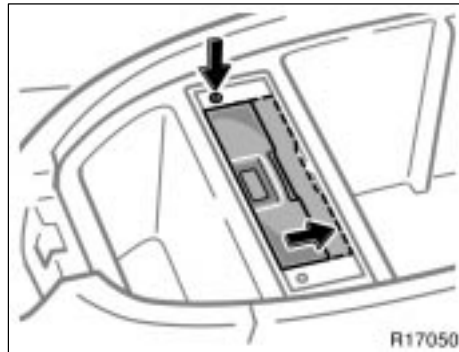


The indicator light turns on while the disc is loaded.

The player will play the track or chapter, and it will play from the beginning of the track or chapter again after it reaches the end.

NOTICE

Never try to disassemble or oil any part of the DVD player. Do not insert anything other than a disc into the slot.



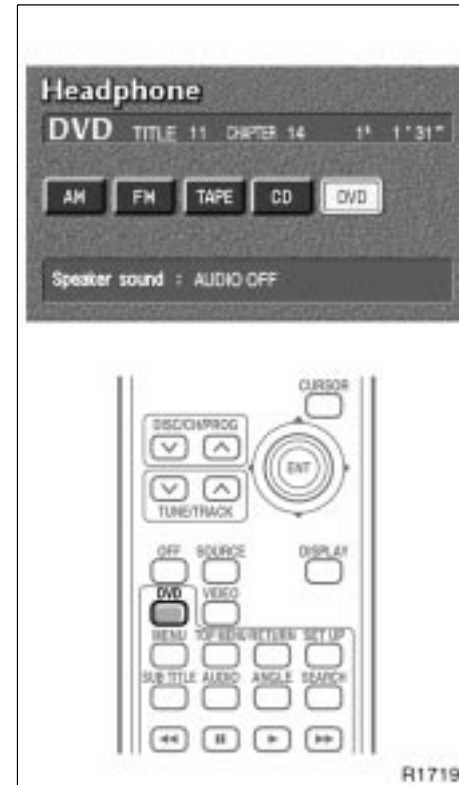
EJECTING THE DISC

Push the lid backward to open the DVD player. Push the disc eject button to eject a disc.

CAUTION

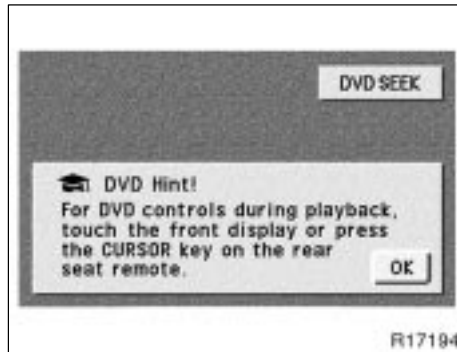
To reduce the chance of injury in case of an accident or a sudden stop, always keep the console box closed while driving.

—Selecting the DVD mode



To select the DVD mode, push the "DVD" button on the controller.

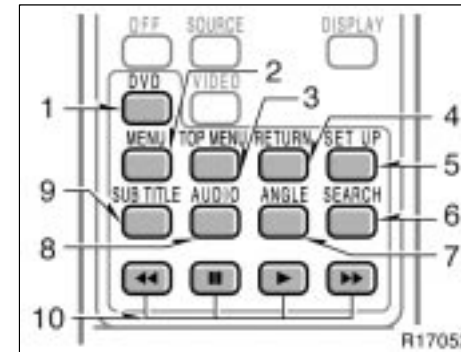
You can also select the DVD mode on the mode selection screen mentioned above.



Vehicles with navigation system—The "DVD Hint!" screen appears when the DVD mode is first selected after you turn the ignition key to the "ACC" or "ON" position.

Push the "OK" switch when you read the message.

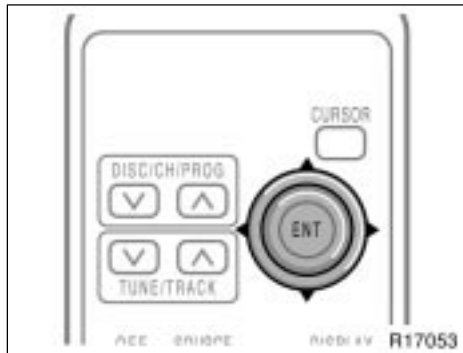
—DVD player operation switches



The DVD player can be operated with the controller buttons directly.

1. "DVD" button
2. "MENU" button
3. "TOP MENU" button
4. "RETURN" button
5. "SET UP" button
6. "SEARCH" button
7. "ANGLE" button
8. "AUDIO" button
9. "SUB TITLE" button
10. "||", "▶", "◀◀" and "▶▶" buttons

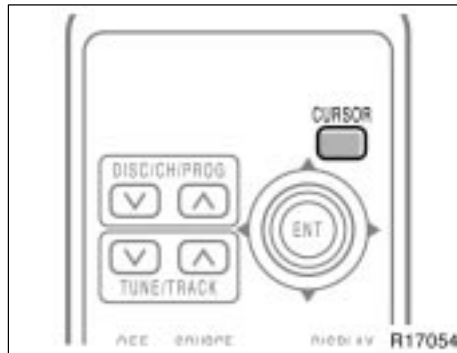
'05 TUNDRA_U (L/O 0409)



The player can also be operated with the switches on the screen.

To operate the switches on the screen, select the switch by the joy stick and push the "ENT" button. You cannot select the switches on the screen by touching them directly.

When the switch is selected by the joy stick, the outline of the switch changes to blue. Push the "ENT" button, and the switch will be highlighted in green.

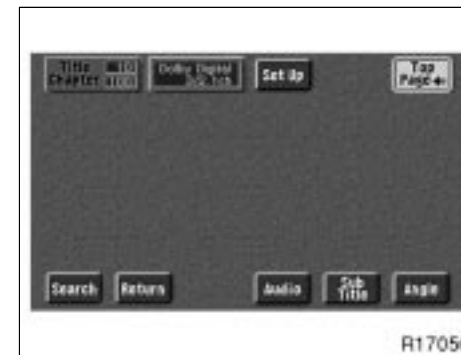


TURNING THE OPERATION SWITCHES ON AND OFF

To turn on the operation switches, push the "CURSOR" button on the controller.

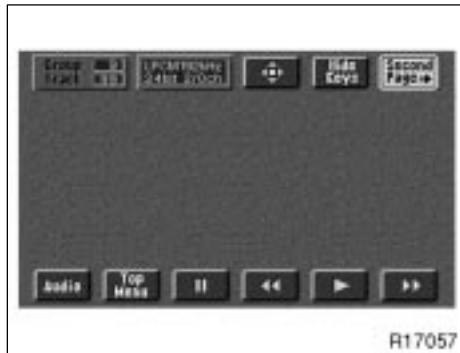


Top page (DVD video operation switch)

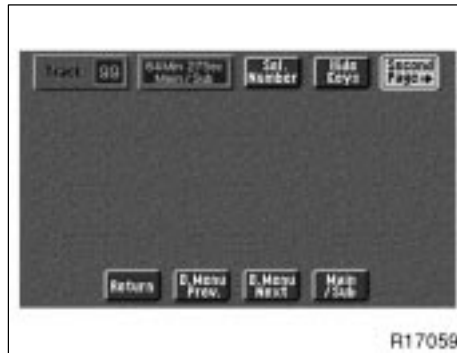


Second page (DVD video operation switch)

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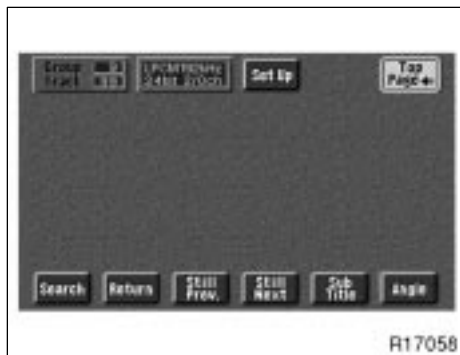
Top page (DVD audio operation switch)



Top page (video CD)

There are operation switches on the "Top Page" and "Second Page" screens.

To change the screen, push the "Top Page" or "Second Page" switch on the screen.

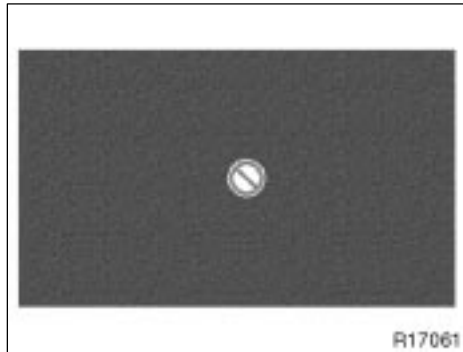


Second page (DVD audio operation switch)



Second page (video CD)

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If “⊘” appears on the screen when you select a switch, it indicates that the switch cannot work.



To turn off the switches on the screen, push the “CURSOR” button on the controller once again or push the “Hide Keys” on the screen.

—DVD player operation (DVD video/DVD audio)

NOTE: The playback condition of some DVD video discs may be determined by a DVD video software producer. This DVD player plays a disc as the software producer intended. So, some functions may not work properly. Be sure to read the instruction manual for the DVD video disc separately provided. For detailed information about DVD video discs, see “—DVD video disc information” in this Section.

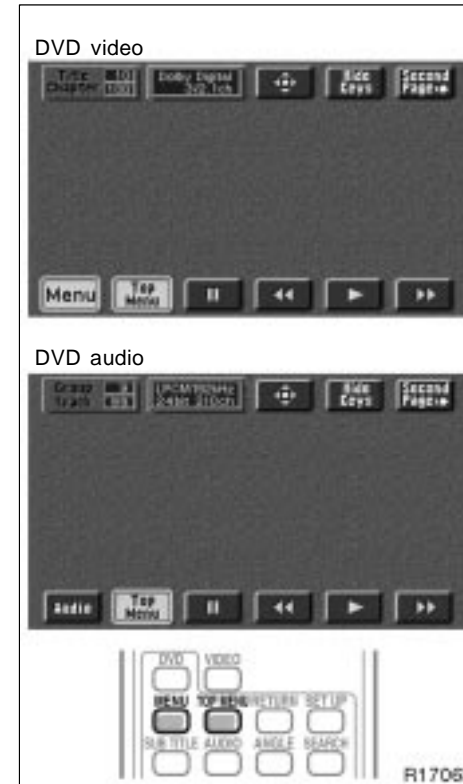
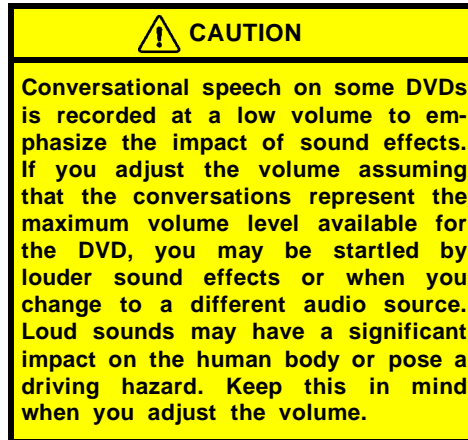
Precautions for DVD video discs

When recording on a DVD video, DVD audio, video CD or audio tracks may not record in some cases while the menu is displayed. As audio will not play in this case, verify that the video tracks are playing and then activate playback.

When playback of a disc is completed:

- ▼ If an audio CD is playing, the first track starts.
- ▼ If a DVD video, DVD audio or video CD is playing, playback will stop or the menu screen will be displayed.

The title/chapter number and playback time display may not appear while playing back certain DVD video discs.



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TURNING THE MENU SCREEN FOR THE DISC ON OR OFF

DVD video—

To turn on the menu screen for the disc, push the "Top Menu" or the "Menu" switch on the screen. You can also turn on the menu screen by pushing the "MENU" or "TOP MENU" switch on the controller.

DVD audio—

To turn on the menu screen for the disc, push the "Top Menu" switch on the screen. You can also turn on the menu screen by pushing the "TOP MENU" switch on the controller.

For the operation of the menu screen, see the separate manual for the DVD disc.



To turn on the selecting switch, push the "SELECT" switch.



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To select the menu for the disc, push the “◀”, “▲”, “▶” or “▼” switches on the screen. Push the “Enter” switch to select the menu for the disc.

You can also select the menu for the disc by the joy stick and the “ENT” button on the controller when the control switches are not indicated on the screen.

Push the “Shift Keys” on the screen, and the switches (“◀”, “▲”, “▶”, “▼”, “Enter” and “Shift Keys” switches) will move up and down.

To turn off the switch, push the “OFF” switch on the screen. To turn on the switch again, push the “ON” switch on the screen.

To return to the previous screen, push the “Back” switch on the screen.



OPERATING THE “II”, “▶”, “◀◀” AND “▶▶” SWITCHES/BUTTONS

“II” switch/button: Push this switch/button to pause the disc.

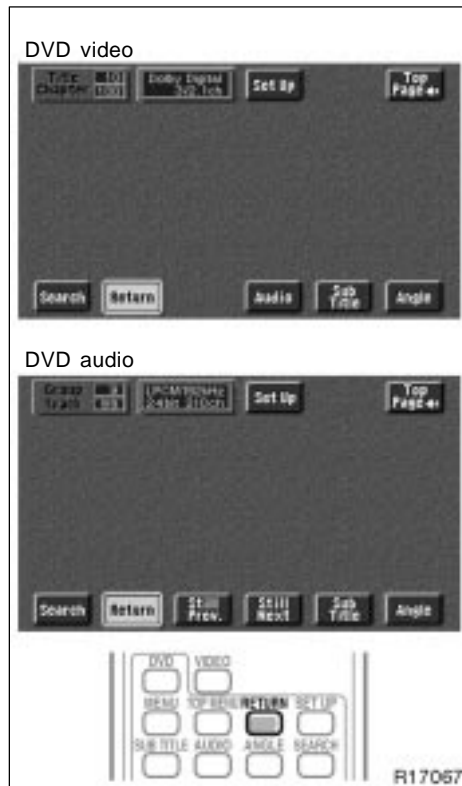
“▶” switch/button: Push this switch/button to cancel the pause and return to normal playing.

“◀◀” and “▶▶” switches/buttons: Push and hold the “◀◀” or “▶▶” switch/button to fast forward or reverse. When you release the switch/button, the DVD player will resume playing.

DVD video only—

Push the “◀◀” or “▶▶” switch/button while pausing, the DVD video plays the slow-motion video replay or the slow-motion video replay in reverse.

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SKIPPING TO THE PREDETERMINED SCREEN

To skip to the predetermined screen, push the "Return" switch. The DVD player starts playing from the beginning of the predetermined screen. You can also display the screen by pushing the "RETURN" button on the controller.

For further details of the predetermined screen, see the separate manual for the DVD disc.



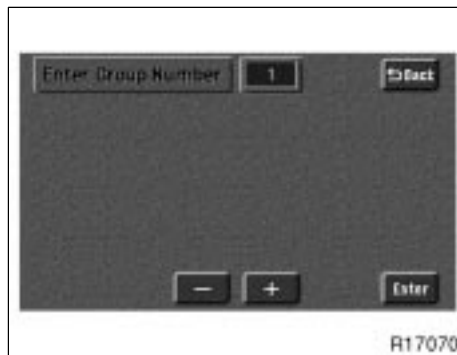
'05 TUNDRA_U (L/O 0409)

SELECTING THE TITLE/GROUP

To display the searching title (DVD video) or group (DVD audio) screen, push the "Search" switch on the screen. You can also display the screen by pushing the "SEARCH" button on the controller.



DVD video



DVD audio

DVD video—

Select the title number by using the "-", "+" and "+10" switches and push the "Enter" switch to enter the number. The player starts playing disc for that title number. The selected title number will appear on the screen.

Push the "Back" switch to return to the menu screen.

DVD audio—

Enter the group number by using the "-" and "+" switches. The selected group number will appear on the screen. Push the "Enter" switch. The player starts playing the disc from the entered group number.

Push the "Back" switch to return to the previous screen.

'05 TUNDRA_U (L/O 0409)

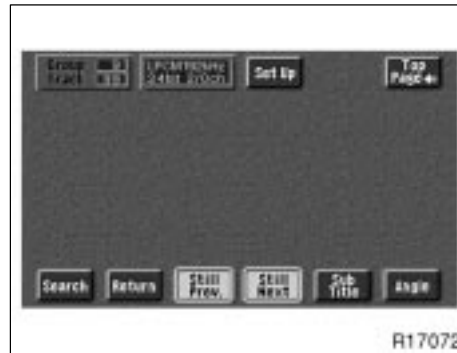


SELECTING THE BONUS GROUP

DVD audio only—

Enter the bonus group number on the searching group screen and push the “Enter” switch. The “Enter Key Code” screen will appear. To enter the number of the group you want to play, push the group number. If you enter the wrong number, push the “Clear” switch to delete the number.

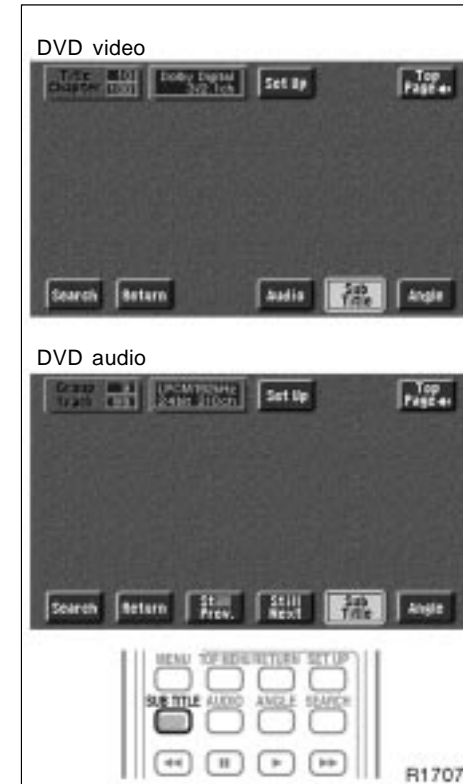
Push the “Enter” switch on the screen. The player starts playing the disc from the selected bonus group number.



CHANGING THE STILL PICTURE

DVD audio only—

Push the “Still Prev.” or “Still Next” switch on the screen to forward or reverse the still pictures.



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CHANGING THE SUBTITLE LANGUAGE

Push the "Sub Title" switch on the screen, and then the changing subtitle language screen will appear. You can also display the screen by pushing the "SUB TITLE" button on the controller.

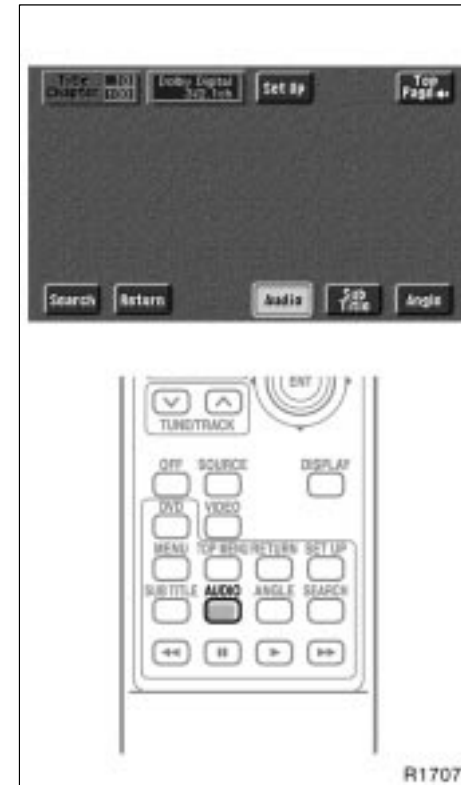


Each time you push the "Sub Title" switch, another language stored on the disc is selected.

To turn off the subtitles, push the "Hide" switch.

Push the "Back" switch to return to the previous screen.

The selected subtitle language will appear on the screen.



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CHANGING AUDIO LANGUAGE (DVD video only)

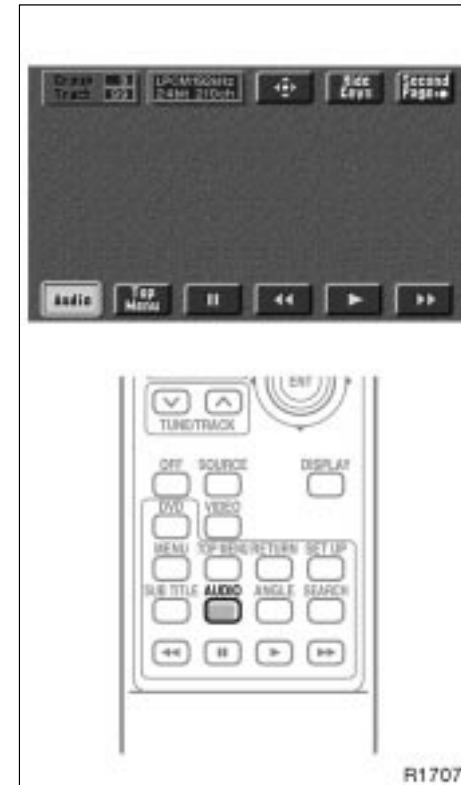
Push the "Audio" switch on the screen and then the changing audio language screen will appear. You can also display the screen by pushing the "AUDIO" button on the controller.



Each time you push the "Audio" switch, another language stored on the disc is selected.

The selected audio language will appear on the screen.

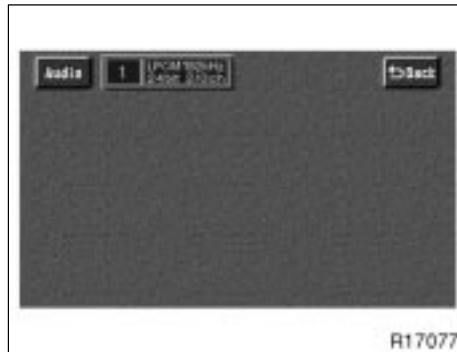
Push the "Back" switch to return to the previous screen.



'05 TUNDRA_U (L/O 0409)

CHANGING AUDIO FORMAT (DVD audio only)

Push the "Audio" switch on the screen or the "AUDIO" button on the controller and the changing audio format screen will appear.



Each time you touch the "Audio" switch, another audio format stored on the disc is selected.

Push the "Back" switch to return to the previous screen.



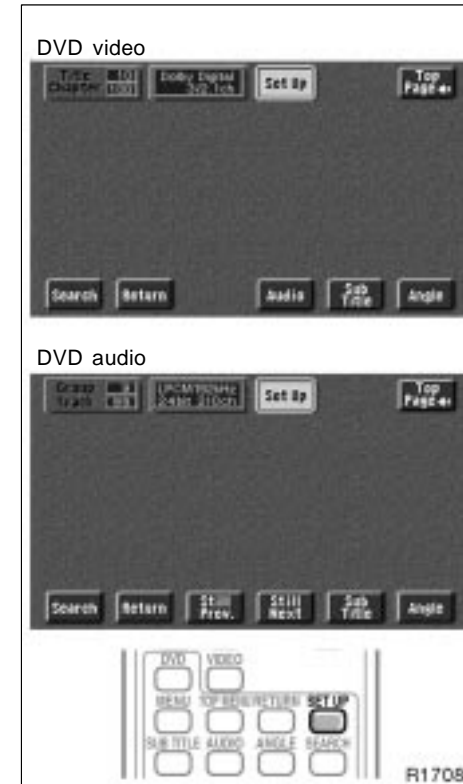
'05 TUNDRA_U (L/O 0409)

CHANGING ANGLE SCREEN

Push the "Angle" switch on the screen, and then the changing angle screen will appear. You can also display the screen by pushing the "ANGLE" button on the controller.



The angle can be selected for discs that are multi-angle compatible when the "📹" mark appears on the screen. Each time you push the "Angle" switch, the angle changes. The angle number which you can select will appear on the screen. Push the "Back" switch to return to the previous screen.



'05 TUNDRA_U (L/O 0409)

CHANGING THE INITIAL SETTING

Push the "Set Up" switch on the screen, and then the initial setting screen will appear. You can also display the screen by pushing the "SET UP" button on the controller. You can change the initial setting.

After the setting is done, the player plays from the beginning of the chapter or the track.



Setup Menu 1 screen



Setup Menu 2 screen

There are initial setting switches on the "Setup Menu 1" and "Setup Menu 2" screens.

To change the screen, push the "Top Page" or "Second Page" switch on the screen.

After you change the initial setting, push the "Enter" switch. The initial setting switch will be turned off and return to the picture previously.

When the "Initial Setting" switch on "Setup Menu 2" is pushed, all menus are initialized.

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CHANGING THE AUDIO LANGUAGE

Push the "Audio Lang." switch on the "Setup Menu 1" and the "Select Audio Language" screen appear.

Select the language you want to hear on the screen.

To return to the "Setup Menu 1" screen, push the "Back" switch.

If you cannot find a language you want to hear, push the "Others" switch. The "Enter Audio Lang. Code" screen will appear.



To enter the code of the language you want to hear, push the number of the language code. For details about the language codes, see the language code list. If you enter a wrong number, push the "Clear" switch to delete the number.

If numbers which are not on the list are entered and the "Enter" switch is pushed, the "Incorrect Code" screen will appear. Push the language code you want to hear again.

To return to the "Select Audio Language" screen, push the "Back" switch.



CHANGING THE SUBTITLE LANGUAGE

To display the "Select Subtitle Lang.", push the "Subtitle Lang." switch on the "Setup Menu 1" screen.

Select the language you want to read on the screen.

To return to the "Setup Menu 1" screen, push the "Back" switch.

If you cannot find a language you want to read, push the "Others" switch. The "Enter Subtitle Lang. Code" screen will appear.



To enter the code of the language you want to read, push the number of the language code. For details about the language codes, see the language code list. If you enter a wrong number, push the "Clear" switch to delete the number.

Push the "Enter" switch on the screen. If numbers which are not on the list are entered and the "Enter" switch is pushed, the "Incorrect code" screen will appear. Push the language code you want to read again.

To return to the "Select Subtitle Lang." screen, push the "Back" switch on the screen.



CHANGING THE DVD LANGUAGE

To display the "Select DVD Language" screen, push the "DVD Language" switch on the "Setup Menu 1" screen.

Select the language you want to read on the screen.

To return to the "Setup Menu 1" screen, push the "Back" switch.

If you cannot find a language you want to read, push the "Others" switch. The "Enter DVD Language Code" screen will appear.



To enter the code of the language you want to read, push the number of the language code. For details about the language codes, see the language code list. If you enter a wrong number, push the "Clear" switch to delete the number.

Push the "Enter" switch on the screen. If numbers which are not on the list are entered and the "Enter" switch is pushed, the "Incorrect code" screen will appear. Push the language code you want to read again.

To return to the "Select DVD Language" screen, push the "Back" switch on the screen.

'05 TUNDRA_U (L/O 0409)



TURNING THE ANGLE MARK ON OR OFF

The angle mark can be turned on for discs that are multi-angle compatible.

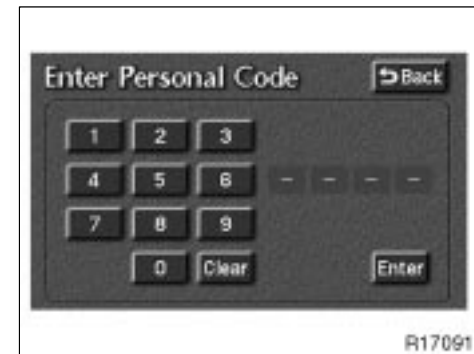
Each time you push the "Angle Mark" switch on the screen, the angle mark turns on or off alternately.



SETTING LEVEL OF VIEWER RESTRICTIONS

You can restrict the play back screen by setting the viewer restrictions. You can prevent the restriction with a password. Some discs do not supply a restriction.

To set the level of viewer restriction, push the "Parental" switch on the "Setup Menu 1" screen. The "Enter Personal Code" screen will appear.



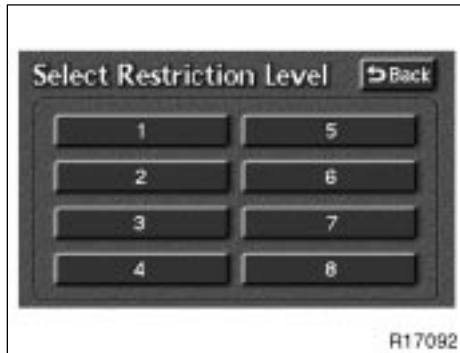
Push the number for the password and the "Enter" switch. The "Select Restriction Level" screen will appear.

If you enter a wrong number, push the "Clear" switch to delete the number.

You cannot change the setting without inputting the password. When you forget or change the password, push the "Clear" switch ten times to initialize the password.

To return to the "Setup Menu 1" screen, push the "Back" switch.

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Push a parental level (1—8). The smaller the level number, the stricter the age limit. Push the “Back” switch to return to the “Setup Menu 1” screen.



SETTING THE DISPLAY MODE

Each time you push the “Display Mode” switch on the “Setup Menu 2” screen, the display mode is changed from wide mode to auto mode.

LANGUAGE CODE LIST

Code	Language
1001	Japanese
0514	English
0618	French
0405	German
0920	Italian
0519	Spanish
2608	Chinese
1412	Dutch
1620	Portuguese
1922	Swedish
1821	Russian
1115	Korean
0512	Greek
0101	Afar
0102	Abkhazian
0106	Afrikaans
0113	Amharic
0118	Arabic
0119	Assamese

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0125	Aymara
0126	Azerbaijani
0201	Bashkir
0205	Byelorussian
0207	Bulgarian
0208	Bihari
0209	Bislama
0214	Bengali
0215	Tibetan
0218	Breton
0301	Catalan
0315	Corsican
0319	Czech
0325	Welsh
0401	Danish
0426	Bhutani
0515	Esperanto
0520	Estonian
0521	Basque
0601	Persian
0609	Finnish

0610	Fiji
0615	Faroese
0625	Frisian
0701	Irish
0704	Scots- Gaelic
0712	Galician
0714	Guarani
0721	Gujarati
0801	Hausa
0809	Hindi
0818	Croatian
0821	Hungarian
0825	Armenian
0901	Interlingua
0905	Interlingue
0911	Inupiak
0914	Indonesian
0919	Icelandic
0923	Hebrew
1009	Yiddish
1023	Javanese

1101	Georgian
1111	Kazakh
1112	Greenlandic
1113	Cambodian
1114	Kannada
1119	Kashmiri
1121	Kurdish
1125	Kirghiz
1201	Latin
1214	Lingala
1215	Laothian
1220	Lithuanian
1222	Latvian
1307	Malagasy
1309	Maori
1311	Macedonian
1312	Malayalam
1314	Mongolian
1315	Moldavian
1318	Marathi
1319	Malay

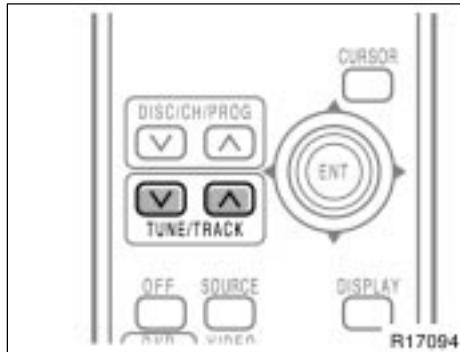
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1320	Maltese
1325	Burmese
1401	Nauru
1405	Nepali
1415	Norwegian
1503	Occitan
1513	(Afan) Oromo
1518	Oriya
1601	Punjabi
1612	Polish
1619	Pashto, Pushto
1721	Quechua
1813	Rhaeto- Romance
1814	Kirundi
1815	Romanian
1823	Kinyarwanda
1901	Sanskrit
1904	Sindhi
1907	Sangho
1908	Serbo- Croatian
1909	Sinhalese

1911	Slovak
1912	Slovenian
1913	Samoan
1914	Shona
1915	Somali
1917	Albanian
1918	Serbian
1919	Siswati
1920	Sesotho
1921	Sundanese
1923	Swahili
2001	Tamil
2005	Telugu
2007	Tajik
2008	Thai
2009	Tigrinya
2011	Turkmen
2012	Tagalog
2014	Setswana
2015	Tonga
2018	Turkish

2019	Tsonga
2020	Tatar
2023	Twi
2111	Ukrainian
2118	Urdu
2126	Uzbek
2209	Vietnamese
2215	Volapük
2315	Wolof
2408	Xhosa
2515	Yoruba
2621	Zulu

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SELECTING THE CHAPTER/TRACK

To select the chapter/track, push the “V” or “^” (TUNE/TRACK) button on the controller until the number of the chapter/track you want to select appears on the screen.



DVD video



DVD audio

USING THE CONTROL SCREEN

When playing a disc, push the “DVD” button on the controller. The control screen will appear on the screen.

Details of the specific switches, controls and features are described below.

1. “PICTURE” switch

Push the “PICTURE” switch to turn off the control screen and return to the picture previously displayed.

2. “RPT” switch (DVD audio only)

Push the “RPT” switch while the track is playing. When the track ends, it will automatically replay. To turn off the repeat feature, push this switch again.

3. “RAND” switch (DVD audio only)

Push the “RAND” switch. The player will play the tracks on the disc in random order. To turn off the random feature, push this switch again.

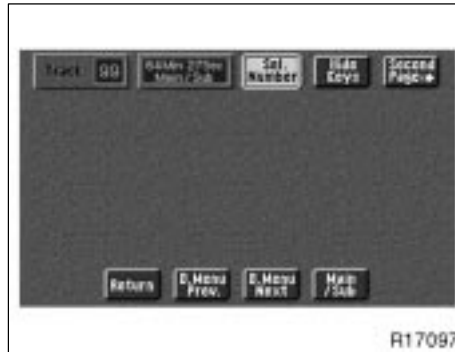
4. “SCAN” switch (DVD audio only)

Push the “SCAN” switch. The player will scan all the tracks on the disc you are listening to. To stop scanning, push this switch again. If the player scanned all the tracks on the disc, it will stop scanning.

—DVD player operation (video CD/audio CD/CD text)

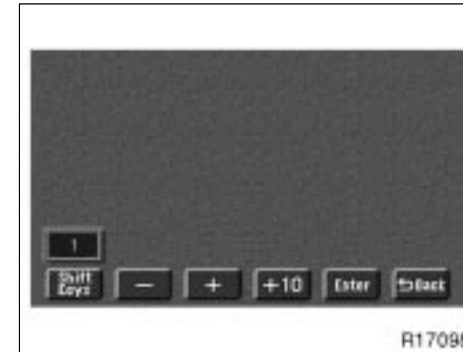
5. “▲” and “▼” switches

Push and hold the “▲” or “▼” switch to fast forward or reverse a disc. When you release the switch, the DVD player will resume playing.



SELECTING THE DISC MENU NUMBER (video CD only)

Push the “Sel. Number” switch and then the disc menu number search screen will appear. You can also display the screen by pushing the “SEARCH” switch on the controller.

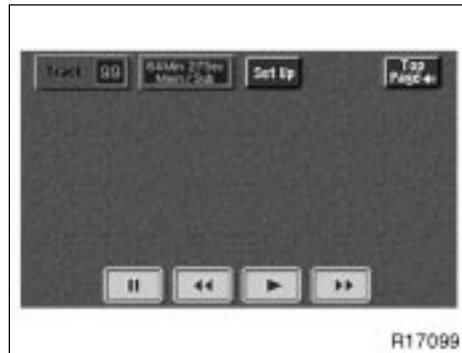


Enter the disc menu number by using the “-”, “+” and “+10” switches and push the “Enter” switch. The player starts playing the disc from the entered disc menu number. The entered disc menu number will appear on the screen.

Push the “Back” switch to return to the menu screen.

Move up and down the switches by pushing “Shift keys” on the screen.

'05 TUNDRA_U (L/O 0409)



OPERATING THE “||”, “▶”, “◀◀” AND “▶▶” SWITCHES

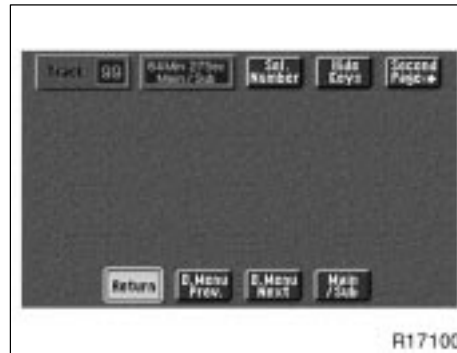
“||” switch: Push this switch to pause the disc.

“▶” switch: Push this switch to cancel the pause and return to normal playing.

“◀◀” and “▶▶” switches: Push this switch to fast forward or reverse. When you release the switch/button, the DVD player will resume playing.

Video CD only—

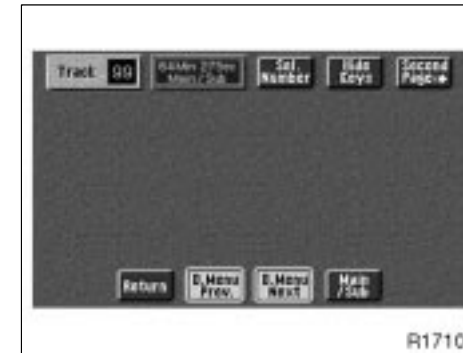
Push the “▶▶” switch/button while pausing, the video CD plays the slow-motion video replay.



TURNING ON THE DISC MENU (video CD only)

Push the “Return” switch to turn on the menu screen for the disc. You can also turn on the menu screen by pushing the “RETURN” button on the controller.

For the operation of the menu screen, see the manual for the video CD.

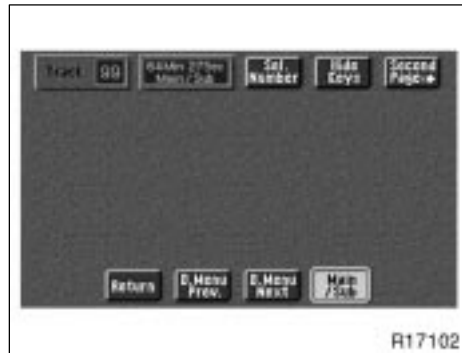


CHANGING MENU PAGE OR TRACK (video CD only)

Push the “D. Menu Next” or “D. Menu Prev.” switch while the disc menu is displayed. The next or previous page will appear on the screen.

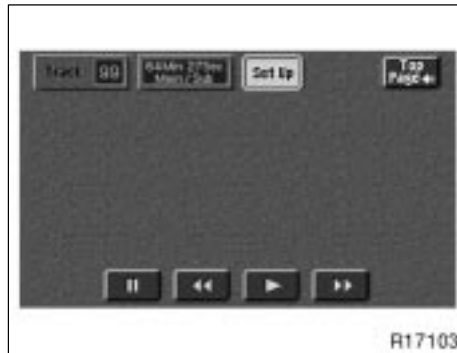
Push the “D. Menu Next” or “D. Menu Prev.” switch while the player is playing video. The next or previous track will be searched and played.

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CHANGING A MULTIPLEX TRANSMISSION (video CD only)

Push the "Main/Sub" switch to change a multiplex transmission. The mode changes from Main/Sub to Main to Sub and back to Main/Sub by pushing the "Main/Sub" switch.



CHANGING THE INITIAL SETTING (video CD only)

Push the "Set Up" switch on the screen and then the initial setting screen will appear. You can also display the screen by pushing the "SET UP" button on the controller. You can change the initial setting. (See "CHANGING THE INITIAL SETTING" in this Section for details.)

After the setting is done, the player plays from the beginning of the chapter or the track.



Video CD



Audio CD



CD text

USING THE CONTROL SCREEN

When playing a disc, push the "DVD" button on the controller. The control screen will appear on the screen.

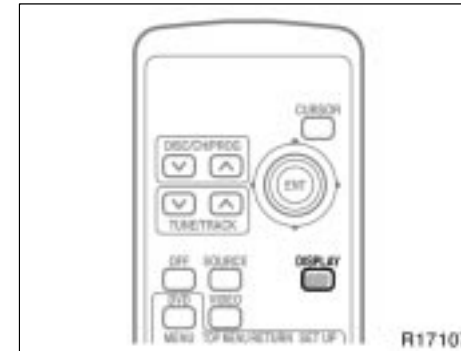
CD text only—

The disc title and track title will appear on the screen when pushing the "DVD" button.

Details of the specific switches, controls and features are described below.

1. "PICTURE" switch (video CD only)
Push the "PICTURE" switch to turn off the control screen and return to the picture previously displayed.
2. "RPT" switch (audio CD and CD text)
Push the "RPT" switch while the track is playing. When the track ends, it will automatically replay. To turn off the repeat feature, push this switch again.
3. "RAND" switch (audio CD and CD text)
Push the "RAND" switch. The player will play the tracks on the disc in random order. To turn off the random feature, push this switch again.
4. "SCAN" switch (audio CD and CD text)
Push the "SCAN" switch. The player will scan all the tracks on the disc. To stop scanning, push this switch again. When the player has scanned all the tracks on the disc, it will stop scanning.
5. "▲" and "▼" switches
Push the "▲" or "▼" switch to fast forward or reverse the disc. When you push the switch again, the DVD player will resume playing.

—Screen adjustment



You can adjust the color, contrast, tone and brightness of the screen.

Push the "DISPLAY" switch on the controller and then the "Display" screen will appear.

The screen may turn purple to deflect the sunlight. This is not a malfunction.

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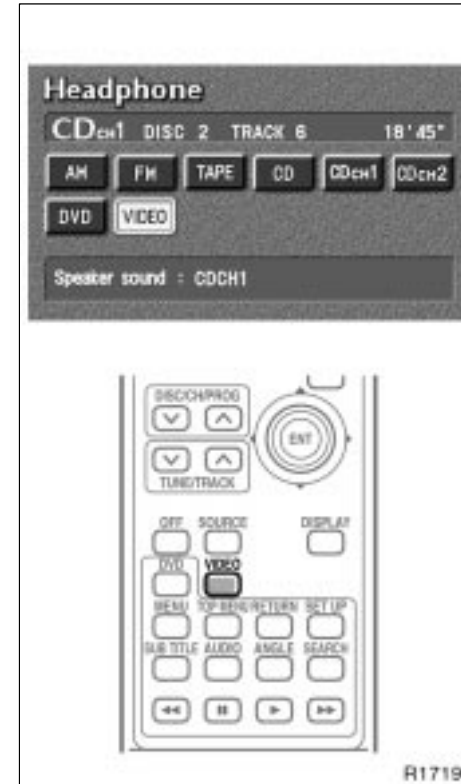


After adjusting the screen, push the “OK” switch to return to the previous screen.

Each time you push the “+” or “-” switch, you can adjust the color, contrast, tone and brightness of the screen.

	+ or GREEN	- or RED
COLOR	Strengthens the green color	Strengthens the red color
CONTRAST	Strengthens the contrast	Weakens the contrast
TONE	Strengthens the tone	Weakens the tone
BRIGHTNESS	Brightens	Darkens

—Selecting the video mode



—DVD video disc information

The audio machine connected to the input terminal adapter can be played in the video mode.







To select the video mode, push the "VIDEO" button on the controller. You can also select the video mode on the mode selection screen mentioned above.

DVD PLAYER AND DVD VIDEO DISCS

This DVD player conforms to NTSC color TV formats. DVD video discs conforming to other formats such as PAL or SECAM cannot be used.

Region codes: Some DVD video discs have a region code indicating where you can use. If the DVD video disc is not labeled "ALL" or "1", you cannot use it in this DVD player. If you attempt to play an inappropriate DVD video disc in this player, "REGION CODE ERROR" appears on the screen. Even if the DVD video disc does not have a region code, in some cases you cannot use it.

Marks shown on DVD video discs:

	Indicates NTSC format of color TV.
	Indicates the number of audio tracks.
	Indicates the number of language subtitles.
	Indicates the number of angles.
	Indicates the screen to be selected. Wide screen: 16:9 Standard: 4:3
	Indicates regions in which this video disc can be played. ALL: all countries Number: region code

DVD VIDEO DISC GLOSSARY

DVD video discs: Digital Versatile Disc that holds video. DVD video discs have adopted "MPEG2", one of the world standards of digital compression technologies. The picture data is compressed by 1/40 on average and stored. Variable rate encoded technology in which the volume of data assigned to the picture is changed depending on the picture format has also been adopted. Audio data is stored using PCM and Dolby digital, which enables higher quality of sound. Furthermore, multi-angle and multi-language features will also help you enjoy the more advanced technology of DVD video.

Viewer restrictions: This feature limits what can be viewed in conformity with the level of restrictions of the country. The level of restrictions varies depending on the DVD video disc. Some DVD video discs cannot be played at all, or violent scenes are skipped or replaced with other scenes.

Level 1: DVD video discs for children can be played.

Level 2—7: DVD video discs for children and G-rated movies can be played.

Level 8: All types of DVD video discs can be played.

Multi-angle feature: You can enjoy the same scene at different angles.

Multi-language feature: You can select the language of the subtitles and audio.

Region codes: Region codes are provided on DVD players and DVD discs. If the DVD video disc does not have the same region code as the DVD player, you cannot play the disc on the DVD player. For region codes.

Audio: This DVD player can play liner PCM, Dolby digital, dts and MPEG audio format DVD. Other decoded type cannot be played.

Title and chapter: Video and audio programs stored on DVD video discs are divided in parts by title and chapter.

Title: The largest unit of the video and audio programs stored on DVD video discs. Usually, one piece of a movie, one album, or one audio program is assigned as a title.

Chapter: A unit smaller than a title. A title comprises plural chapters.

Manufactured under license from Dolby Laboratories. "Dolby", "Pro Logic", and the double-D symbol are trademarks of Dolby Laboratories. Confidential unpublished works.

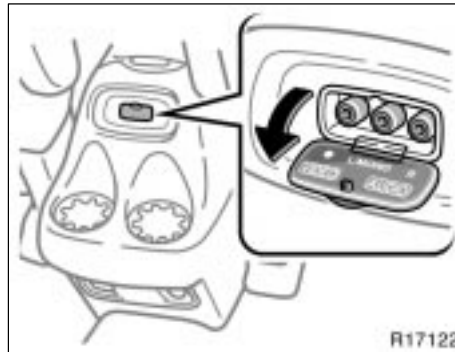
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This product incorporates copyright protection technology that is protected by method claims of certain U.S. patents and other intellectual property rights owned by Macrovision Corporation and other rights owners. Use of this copyright protection technology must be authorized by Macrovision Corporation, and is intended for home and other limited viewing uses only unless otherwise authorized by Macrovision Corporation. Reverse engineering or disassembly is prohibited.

"dts" is a trademark of Digital Theater Systems, Inc.

—Input terminal adapter

The rear entertainment system plays videos and sound when your audio system is connected to the input terminal adapter on the rear console box. For details, refer to the manufacturer's instructions.



To use the input terminal adapter, open the lid.

The input terminal adapter is composed of 3 input terminal adapters.

Yellow: Image input adapter

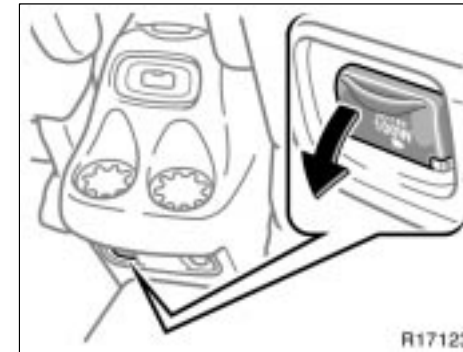
Red: Audio input adapter

White: Audio input adapter

NOTICE

Close the input terminal adapter lid when the input terminal adapter is not in use. Inserting anything other than an appropriate plug that fits the adapter may cause electrical failure or short circuit.

—Power outlet



This power outlet is designed for use as a power supply for the audio device connected to the input terminal adapter.

The key must be in the "ON" position for the power outlet to be used.

The maximum capacity for this power outlet is 115 VAC/100W. If you attempt to use an appliance that requires more than 115 VAC or 100W, the protection circuit will activate and cut the power supply. The power supply will restart automatically when you use an appliance that operates within the 115 VAC/100W limits.



Main switch

To use the power outlet, push the main switch on the instrument panel.

An indicator light will illuminate to indicate that the power outlet is ready for use.

Push the main switch once again to turn the power outlet off. When the power outlet is not in use, make sure that the main switch is turned off.

NOTICE

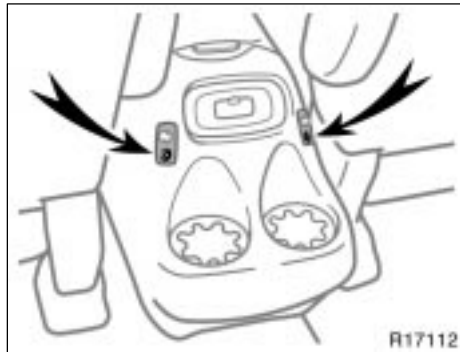
- ◆ To prevent the battery from being discharged, do not use the power outlet longer than necessary when the engine is not running.
- ◆ Close the power outlet lid when the power outlet is not in use. Inserting anything other than an appropriate plug that fits the outlet may cause electrical failure or short circuit.

The power outlet is not designed for the following electric appliances even if their power consumption is under 115 VAC/100W. These appliances may not operate properly.

- ▼ Appliances with high initial peak wattage: cathode-ray tube type televisions, compressor-driven refrigerators, electric pumps, electric tools, etc.
- ▼ Measuring devices which process precise data: medical equipment, measuring instruments, etc.
- ▼ Other appliances requiring an extremely stable power supply: microcomputer-controlled electric blankets, touch sensor lamps, etc.

Certain electrical appliances may cause radio noise.

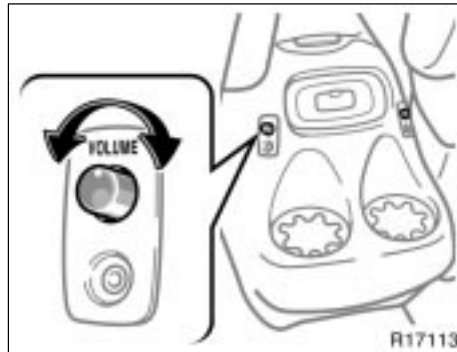
—Headphone input jacks



You can enjoy the rear seat entertainment system with commercial headphones.

To use the headphones, connect them to the jack.

The key must be in the "ACC" or "ON" position.



To adjust the volume of the headphones, turn the knob. Turn right to increase the volume. Turn left to decrease the volume.

The maximum volume depends on the type of headphones.

With some headphones generally available in the market, it may be difficult to catch sound properly. Toyota recommends the use of Toyota genuine headphone.

Please contact your Toyota dealer for further details.

CAUTION

Adjust the volume when you connect the headphones to the jack. Loud sounds may have a significant impact on the human body.

Audio/video system operating hints

NOTICE

To ensure correct audio/video system operations:

- ◆ *Be careful not to spill beverages over the audio system.*
- ◆ *Do not put anything other than a cassette tape or Compact Disc into the slot.*
- ◆ *Do not put anything other than a DVD video, DVD audio, video CD, dts-CD and audio CD into the DVD player.*
- ◆ *The use of a cellular phone inside or near the vehicle may cause a noise from the speakers of the audio system which you are listening to. However, this does not indicate a malfunction.*

RADIO RECEPTION

Usually, a problem with radio reception does not mean there is a problem with your radio—it is just the normal result of conditions outside the vehicle.

For example, nearby buildings and terrain can interfere with FM reception. Power lines or telephone wires can interfere with AM signals. And of course, radio signals have a limited range. The farther you are from a station, the weaker its signal will be. In addition, reception conditions change constantly as your vehicle moves.

Here are some common reception problems that probably do not indicate a problem with your radio:

FM

Fading and drifting stations—Generally, the effective range of FM is about 40 km (25 miles). Once outside this range, you may notice fading and drifting, which increase with the distance from the radio transmitter. They are often accompanied by distortion.

Multi-path—FM signals are reflective, making it possible for two signals to reach your antenna at the same time. If this happens, the signals will cancel each other out, causing a momentary flutter or loss of reception.

Static and fluttering—These occur when signals are blocked by buildings, trees, or other large objects. Increasing the bass level may reduce static and fluttering.

Station swapping—If the FM signal you are listening to is interrupted or weakened, and there is another strong station nearby on the FM band, your radio may tune in the second station until the original signal can be picked up again.

AM

Fading—AM broadcasts are reflected by the upper atmosphere—especially at night. These reflected signals can interfere with those received directly from the radio station, causing the radio station to sound alternately strong and weak.

Station interference—When a reflected signal and a signal received directly from a radio station are very nearly the same frequency, they can interfere with each other, making it difficult to hear the broadcast.

Static—AM is easily affected by external sources of electrical noise, such as high tension power lines, lightning, or electrical motors. This results in static.

CARING FOR YOUR CASSETTE PLAYER AND TAPES

For the best performance for your cassette player and tapes:

Clean the tape head and other parts regularly.

- ▼ A dirty tape head or tape path can decrease sound quality and tangle your cassette tapes. The easiest way to clean them is by using a cleaning tape. (A wet type is recommended.)

Use high-quality cassettes.

- ▼ Low-quality cassette tapes can cause many problems, including poor sound, inconsistent playing speed, and constant auto-reversing. They can also get stuck or tangled in the cassette player.
- ▼ Do not use a cassette if it has been damaged or tangled or if its label is peeling off.
- ▼ Do not leave a cassette in the player if you are not listening to it, especially if it is hot outside.
- ▼ Store cassettes in their cases and out of direct sunlight.
- ▼ Avoid using cassettes with a total playing time longer than 100 minutes (50 minutes per side). The tape used in these cassettes is thin and could get stuck or tangled in the cassette player.

CARING FOR YOUR COMPACT DISC PLAYER AND DISCS

- ▼ Type 2 and 3—Your compact disc player is intended for use with 12 cm (4.7 in.) discs only.
- ▼ Extremely high temperatures can keep your compact disc player from working. On hot days, use the air conditioning to cool the vehicle interior before you listen to a disc.
- ▼ Bumpy roads or other vibrations may cause your compact disc player to skip.
- ▼ If moisture gets into your compact disc player, you may not hear any sound even though your compact disc player appears to be working. Remove the disc from the player and wait until it dries.

 **CAUTION**

Compact disc players use an invisible laser beam which could cause hazardous radiation exposure if directed outside the unit. Be sure to operate the player correctly.

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Compact disc player

▼Use only compact discs marked as shown above. The following products may not be playable on your compact disc player.

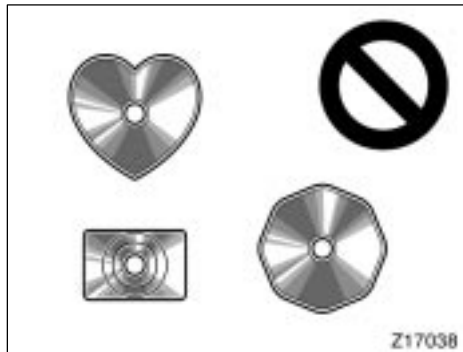
- Copy-protected CD
- CD-R (CD-Recordable)
- CD-RW (CD-Re-writable)
- CD-ROM

Audio CDs	 
DVD video discs	 
DVD audio discs	
Video CDs	 

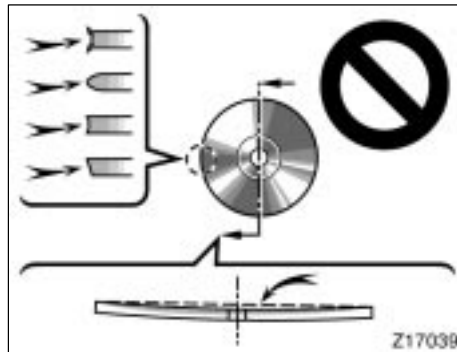
DVD player

▼Use only discs marked as shown above. The following products may not be playable on your DVD player.

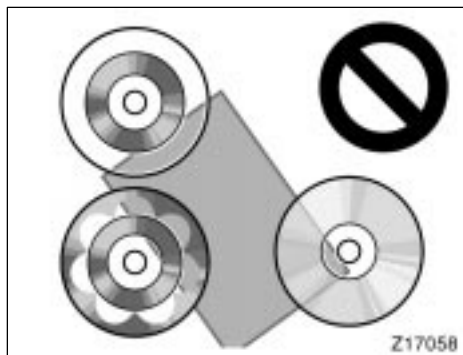
- SACD
- Copy-protected CD
- CD-R (CD-Recordable)
- CD-RW (CD-Re-writable)
- CD-ROM
- DVD-R
- DVD+R
- DVD+RW
- DVD-RW
- DVD-ROM
- DVD-RAM



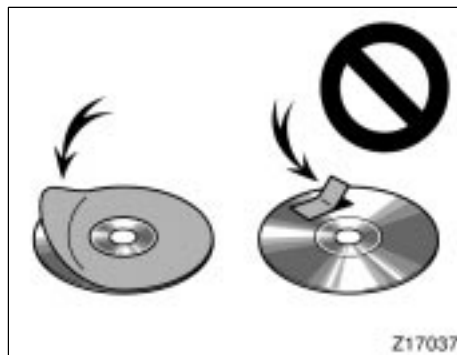
Special shaped discs



Low quality discs



Transparent/translucent discs

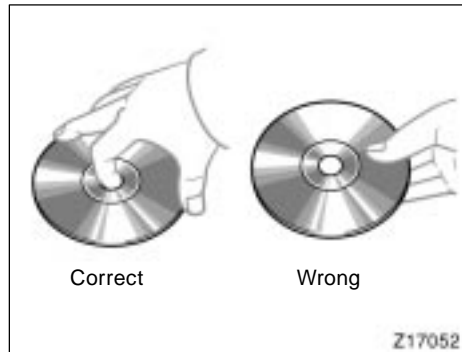


Labeled discs

NOTICE

Do not use special shaped, transparent/translucent, low quality or labeled discs such as those shown in the illustrations. The use of such discs may damage the player or changer, or it may be impossible to eject the disc.

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▼ Handle compact discs carefully, especially when you are inserting them. Hold them on the edge and do not bend them. Avoid getting fingerprints on them, particularly on the shiny side.

▼ Dirt, scratches, warping, pin holes, or other disc damage could cause the player to skip or to repeat a section of a track. (To see a pin hole, hold the disc up to the light.)

▼ Remove discs from the compact disc player when you are not listening to them. Store them in their plastic cases away from moisture, heat, and direct sunlight.

To clean a compact disc: Wipe it with a soft, lint-free cloth that has been dampened with water. Wipe in a straight line from the center to the edge of the disc (not in circles). Dry it with another soft, lint-free cloth. Do not use a conventional record cleaner or anti-static device.

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SECTION 1-9

OPERATION OF INSTRUMENTS AND CONTROLS

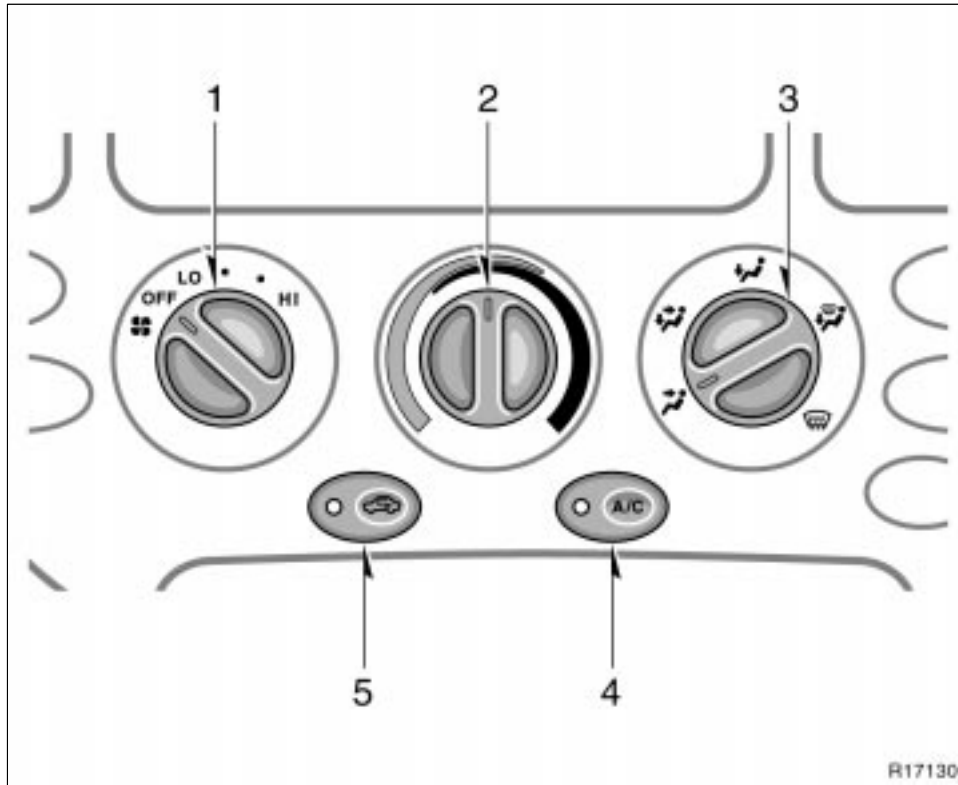
Air conditioning system

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'05 TUNDRA_U (L/O 0409)

Controls



1. Fan speed selector
2. Temperature selector
3. Air flow selector
4. "A/C" button (on some models)
5. Air intake selector button

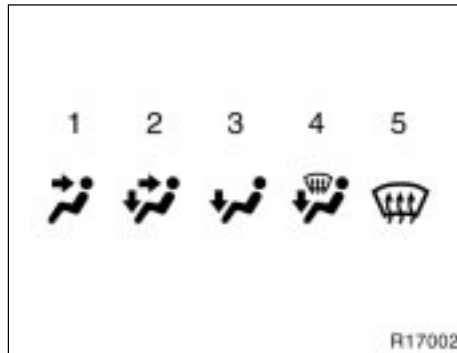
'05 TUNDRA_U (L/O 0409)

Fan speed selector

Turn the knob to adjust the fan speed—to the right to increase, to the left to decrease.

Temperature selector

Turn the knob to adjust the temperature—to the right to warm, to the left to cool.



Air flow selector

Turn the knob to select the vents used for air flow.

- 1. Panel**—Air flows mainly from the instrument panel vents.
- 2. Bi-level**—Air flows from both the floor vents and the instrument panel vents.
- 3. Floor**—Air flows mainly from the floor vents.

It is recommended that you close the lower vent. For details about this, see “Instrument panel vents” in this Section.

- 4. Floor/Windshield**—Air flows mainly from the floor vents and windshield vents.

Turning the air flow selector to the floor/windshield position turns on the defogging function with the purpose of clearing the front view.

This position allows the air intake to select FRESH automatically. This is to clean up the front view more quickly. If you want to return the setting to RECIRCULATE mode, press the air intake selector button once again.

It is recommended that you close the lower vent. For details about this, see “Instrument panel and rear vents” in this Section.

Vehicles with “A/C” button—

Press the “A/C” button for dehumidified heating or cooling. This setting clears the front view more quickly.

5. Windshield—Air flows mainly from the windshield vents.

Turning the air flow selector to the windshield position turns on the defogging function with the purpose of clearing the front view.

In this position, air intake selector mode changes to FRESH automatically to clean up the front view quickly. It is not possible to return to RECIRCULATE in this position.

It is recommended that you close the lower vent. For details about this, see “Instrument panel vents” in this Section.

Vehicles with “A/C” button—

Press the “A/C” button for dehumidified heating or cooling. This setting clears the front view more quickly.

For details about air flow selector settings, see “Air flow selector settings” described below.

Air intake selector button

The air intake selector button is used to switch the air intake FRESH mode that draws outside air into the system and RECIRCULATED mode that recirculates the air inside vehicle.

To turn the air source to RECIRCULATED mode, press the button. The indicator will come on. To turn the air source to FRESH mode, press the button again. The indicator will go off.

To prevent fogging up of the windshield, the air intake mode may change automatically to FRESH depending on the condition of the air conditioning system.

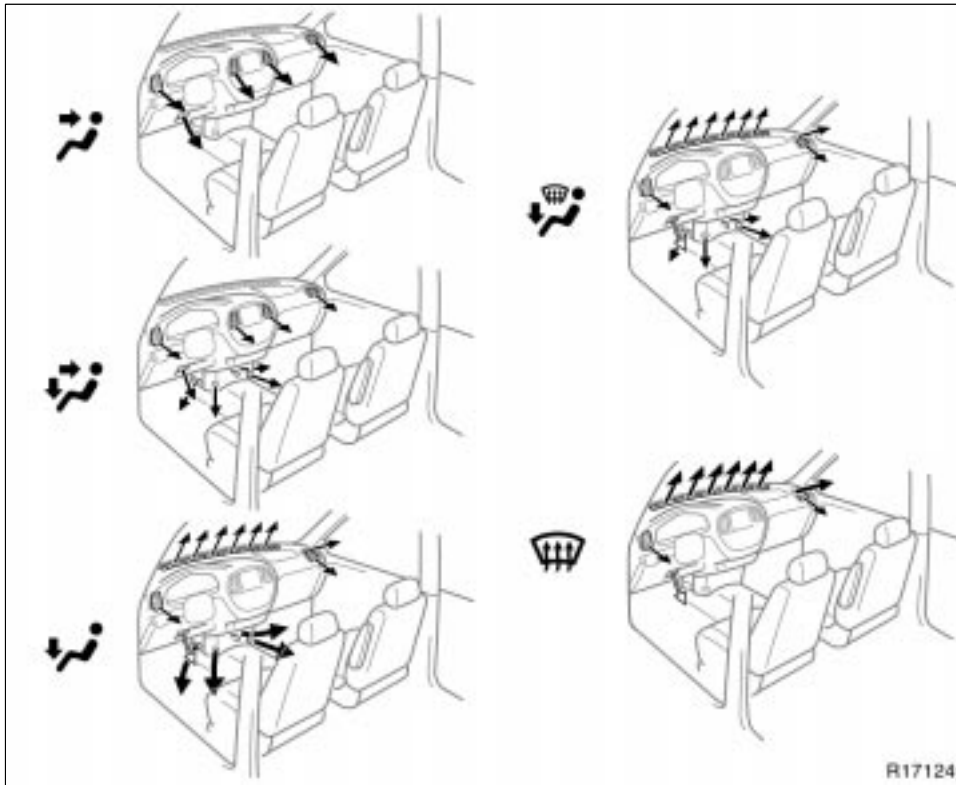
“A/C” button (on some models)

To turn on the air conditioning, press the “A/C” button. The “A/C” button indicator will come on. To turn the air conditioning off, press the button again.

If the “A/C” button indicator flashes, there is a problem in the air conditioning system and the air conditioning automatically shuts off. If this happens, take your vehicle to a Toyota dealer for service.

Air flow selector settings

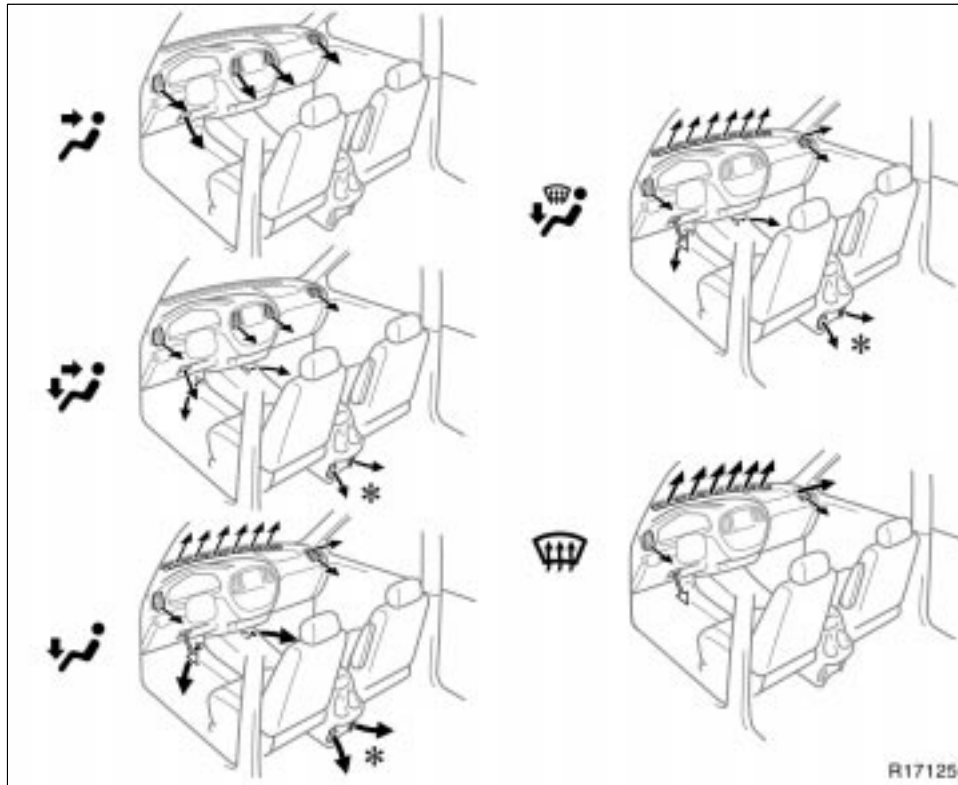
► Standard and access cab models without rear console box



⇒ : See "Instrument panel vents" in this Section.

'05 TUNDRA_U (L/O 0409)

► Standard and access cab models with rear console box

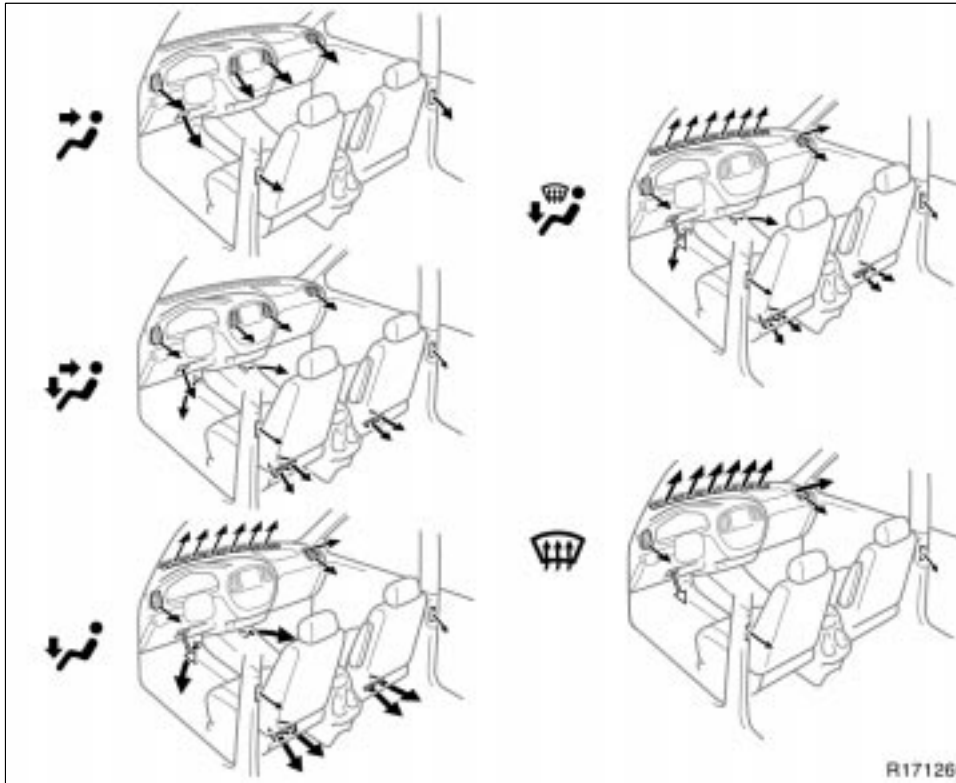


⇒ : See "Instrument panel vents" in this Section.

*: On some models

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► Double cab models



⇒ : See "Instrument panel vents" in this Section.

Operating tips

- ◀ To cool off your Toyota after it has been parked in the hot sun, drive with the windows open for a few minutes. This vents the hot air, allowing the air conditioning to cool the interior more quickly.
- ◀ Make sure the air intake grilles in front of the windshield are not blocked (by leaves or snow, for example).
- ◀ On humid days, do not blow cold air on the windshield. The windshield could fog up because of the difference in air temperature on the inside and outside of the windshield.
- ◀ Keep the area under the front seats clear to allow air to circulate throughout the vehicle.
- ◀ On cold days, set the fan speed to high for a minute to help clear the intake ducts of snow or moisture. This can reduce the amount of fogging on the windows.
- ◀ When driving on dusty roads, close all windows. If dust thrown up by the vehicle is still drawn into the vehicle after closing the windows, it is recommended that the air intake selector be set to FRESH and the fan speed selector to any setting except "OFF".

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◀ If following another vehicle on a dusty road, or driving in windy and dusty conditions, it is recommended that the air intake selector be temporarily set to RECIRCULATE, which will close off the outside passage and prevent outside air and dust from entering the vehicle interior.

Heating

For best results, set controls to:

Fan speed—Any setting except "OFF"
Temperature—Towards **WARM**
(red zone)
Air intake—**FRESH** (outside air)
Air flow—**FLOOR**
Lower vent—**CLOSED**
Air conditioning—**OFF**

◀ For quick heating, select recirculated air for a few minutes. To keep the windows from fogging, select fresh after the vehicle interior has been warmed.

◀ Press the "A/C" button on for dehumidified heating.

◀ Choose floor/windshield air flow to heat the vehicle interior while defrosting or defogging the windshield.

Air conditioning

For best results, set controls to:

Fan speed—Any setting except "OFF"
Temperature—Towards **COLD**
(blue zone)
Air intake—**FRESH** (outside air)
Air flow—**PANEL**
Air conditioning—**ON**

◀ For quick cooling, move the air intake selector to recirculate for a few minutes.

Ventilation

For best results, set controls to:

Fan speed—Any setting except "OFF"
Temperature—Towards **COLD**
(blue zone)
Air intake—**FRESH** (outside air)
Air flow—**PANEL**
Air conditioning—**OFF**

Defogging

The inside of the windshield

For best results, set controls to:

Fan speed—Any setting except "OFF"
Temperature—Towards **WARM** (red zone) to heat; **COLD**
(blue zone) to cool
Air intake—**FRESH** (outside air)
Air flow—**WINDSHIELD**
Lower vent—**CLOSED**

Turning the air flow selector to the windshield or floor/windshield position turns on the defogging function and fan speed may increase with the purpose of clearing the front view.

When turning the air flow selector to windshield position, the air intake selects FRESH automatically. This is to clean up the front view more quickly. It is not possible to return to RECIRCULATE in this position.

Vehicles with "A/C" button—

Press the "A/C" button for dehumidified heating or cooling. This setting clears the front view more quickly.

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◀ On humid days, do not blow cold air on the windshield—the difference between the outside and inside temperatures could make the fogging worse.

Defrosting

The outside of the windshield

For best results, set controls to:

Fan speed—Any setting except “OFF”
Temperature—Towards **WARM**
(red zone)
Air intake—**FRESH** (outside air)
Air flow—**WINDSHIELD**
Lower vent—**CLOSED**

Turning the air flow selector to the windshield or floor/windshield position turns on the defrosting function and fan speed may with the purpose of clearing the front view.

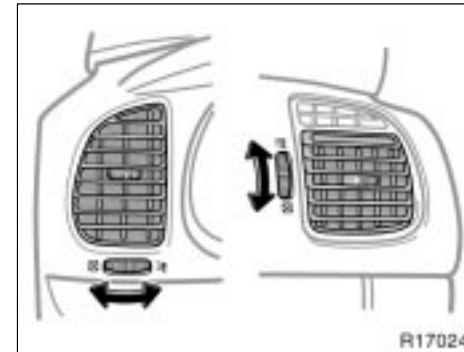
When turning the air flow selector to windshield position, the air intake selects FRESH automatically. This is to clean up the front view more quickly. It is not possible to return to RECIRCULATE in this position.

Vehicles with “A/C” button—

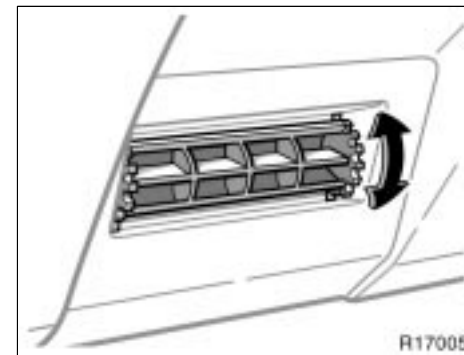
Press the “A/C” button for dehumidified heating or cooling. This setting clears the front view more quickly.

◀ To heat the vehicle interior while defrosting the windshield, choose floor/windshield air flow.

Instrument panel and rear vents

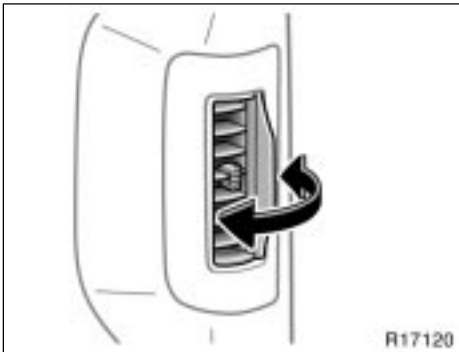


Side vents



Lower vent

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Rear vents (double cab models only)

If air flow control is not satisfactory, check the instrument panel and rear vents. The instrument panel and rear vents may be opened or closed as shown.

For removing frost or fog, it is recommended that you close the lower vent when using the "Floor", "Floor/Windshield" or "Windshield" mode.

SECTION 1- 10

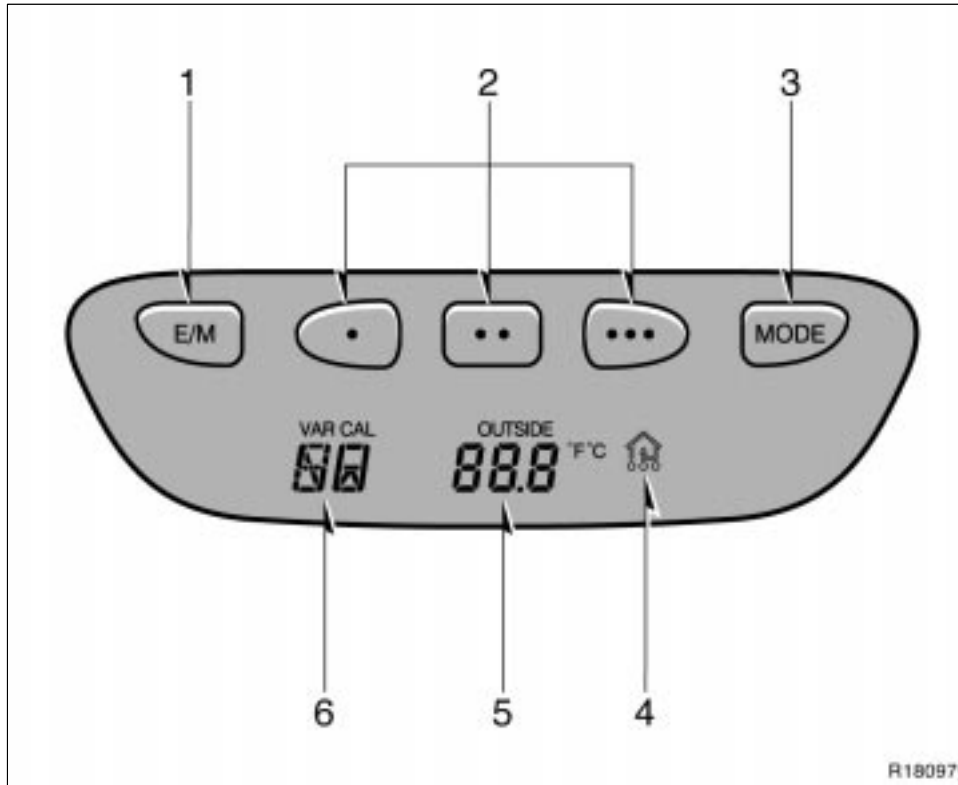
OPERATION OF INSTRUMENTS AND CONTROLS

Other equipment

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Multi-information display—



—Before using the multi-information display

Operate the multi-information display with the ignition switch on.

When the ignition switch is turned to "ON", the last previously used mode displayed just before the ignition switch is turned off will appear.

When the instrument panel lights are turned on, the brightness of the display will be reduced.

"E/M" button

This button is used to switch between English/U.S. Customary System and metric units of the outside temperature display.

Each time you push this button, the display switches. This is also linked to the multi-information display. The display variations are as follows;

Indication	Outside temperature
English/U.S. Customary System (E)	°F
Metric (M)	°C

The initial mode will be English/U.S. Customary System units, however, if the unit is switched to metric and the ignition switch is off, it will display metric units when the ignition switch is turned to "ON".

"MODE" button

This button is used to select the item.

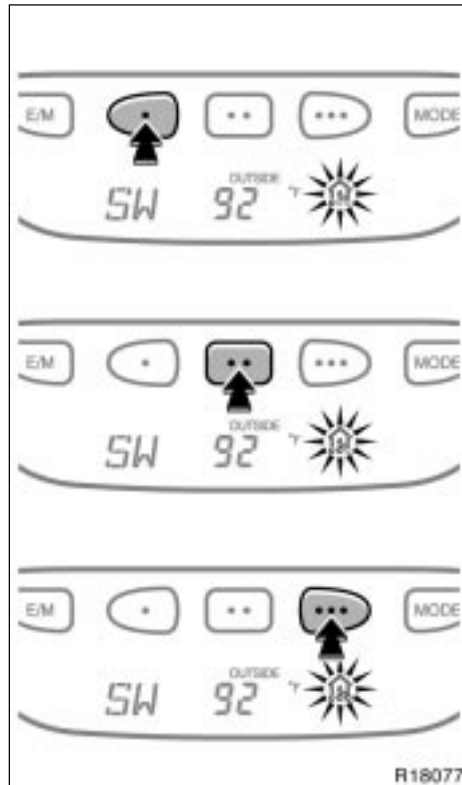
Every time you push the "MODE" button, the display toggles.

For more details, see "—Outside temperature display" in this Section.



Do not adjust the display while the vehicle is moving. Be sure to adjust the display only when the vehicle is stopped.

—Garage door opener



The garage door opener (**HomeLink** Universal Transceiver) is manufactured under license from HomeLink and can be programmed to operate garage doors, gates, entry doors, door locks, home lighting systems, and security systems, etc.

(a) Programming the HomeLink

The HomeLink in your vehicle has 3 buttons and you can store one program for each button.

To ensure correct programming into the HomeLink, install a new battery in the hand-held transmitter prior to programming.

The battery side of the hand-held transmitter must be pointed away from the HomeLink during the programming process.

For Canadian users, follow the procedure in "Programming an entrance gate/programming all devices in the Canadian market".

1. Decide which of 3 HomeLink buttons you want to program. Push and hold down one of the buttons until the indicator corresponding to the selected channel begins to flash.

2. Place your hand-held garage transmitter 25 to 75 mm (1 to 3 in.) away from the surface of the HomeLink.

Keep the indicator light on the HomeLink in view while programming.

3. Simultaneously press and hold the hand-held garage transmitter button along with the selected HomeLink button.

4. When the indicator light on the HomeLink changes from a slow to a rapid flash after 20 seconds, you can release both buttons.

5. Test the operation of the HomeLink by pressing the newly programmed button. If programming a garage door opener, check to see if the garage door opens and closes.

If the garage door does not operate, identify if your garage transmitter is of the "Rolling Code" type. Press and hold the programmed HomeLink button. The garage door has the rolling code feature if the indicator light (on the HomeLink) flashes rapidly and then remains lit after 2 seconds. If your garage transmitter is the "Rolling Code" type, proceed to the heading "Programming a rolling code system".

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6. Repeat steps 2 through 5 for each remaining HomeLink▼ button to program another device.

Programming a rolling code system

If your device is “Rolling Code” equipped, it is necessary to follow steps 1 through 4 under the heading “Programming the HomeLink▼” before proceeding with the steps listed below.

1. Locate the “training” button on the ceiling mounted garage door opener motor. The exact location and color of the button may vary by brand of garage door opener. Refer to the owner’s guide supplied by the garage door opener manufacturer for the location of this “training” button.
2. Press the “training” button on the ceiling mounted garage door opener motor.

Following this step, you have 30 seconds in which to initiate step 3 below.

3. Press and release the vehicle’s programmed HomeLink▼ button twice. The garage door may open. If the door does open, the programming process is complete. If the door does not open, press and release the button a third time. This third press and release will complete the programming process by opening the garage door.

The ceiling mounted garage door opener motor should now recognize the HomeLink▼ unit and be able activate the garage door up/down.

4. Repeat steps 1 through 3 for each remaining HomeLink▼ button to program another rolling code system.

Programming an entrance gate/programming all devices in the Canadian market

1. Decide which of the 3 HomeLink▼ buttons you want to program.
2. Place your hand-held gate/device transmitter 25 to 75 mm (1 to 3 in.) away from the surface of the HomeLink▼.

Keep the indicator light on the HomeLink▼ in view while programming.

3. Press and hold the selected HomeLink▼ button.

4. Continuously press and release (cycle) the hand-held gate/device transmitter button every two seconds until step 5 is complete.
5. When the indicator light on the HomeLink▼ changes from a slow to a rapid flash after 20 seconds, you can release both buttons.
6. Test the operation of the HomeLink▼ by pressing the newly programmed button. Check to see if the gate/device operates correctly.
7. Repeat steps 1 through 6 for each remaining HomeLink▼ button to program another device.

Programming other devices

To program other devices such as home security systems, home door locks or lighting, contact your authorized Toyota dealer for assistance.

Reprogramming a button

Individual HomeLink▼ buttons cannot be erased, however, to reprogram a single button, follow the procedure “Programming the HomeLink▼”.


(b) Operating the HomeLink▼

To operate the HomeLink▼, press the appropriate HomeLink▼ button to activate the programmed device. The HomeLink▼ indicator light should come on. The HomeLink▼ continues to send the signal for up to 20 seconds as long as the button is pressed.

(c) Erasing the entire HomeLink▼ memory (all three programs)

To erase all previously programmed codes at one time, press and hold down the 2 outside buttons for 20 seconds until the indicator light flashes.

If you sell your vehicle, be sure to erase the programs stored in the HomeLink▼ memory.

 **CAUTION**

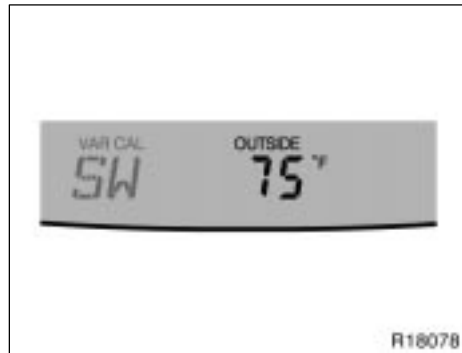
◀ **When programming the HomeLink▼ Universal Transceiver, you may be operating a garage door or other device. Make sure people and objects are out of the way of the garage door or other device to prevent potential harm or damage.**

◀ **Do not use this HomeLink▼ Universal Transceiver with any garage door opener that lacks the safety stop and reverse feature as required by federal safety standards. (This includes any garage door opener model manufactured before April 1, 1982.) A garage door opener which cannot detect an object (signaling the door to stop and reverse), does not meet current federal safety standards. Using a garage door opener without these features increases risk of serious injury or death.**

This device complies with Part 15 of the FCC Rules and with RSS-210 of the IC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING: This transmitter has been tested and complies with FCC and IC rules. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the device.

—Outside temperature display



The outside temperature display indicates the outside air temperature.

Every time you push the "MODE" button, the display toggles through the following information. To use the outside temperature display, push the "MODE" button until the outside air temperature is displayed.

1. Compass and outside temperature
2. Display off (no compass)
3. Compass
4. Outside temperature

To set the unit, push the "E/M" button until the desired unit display appears.

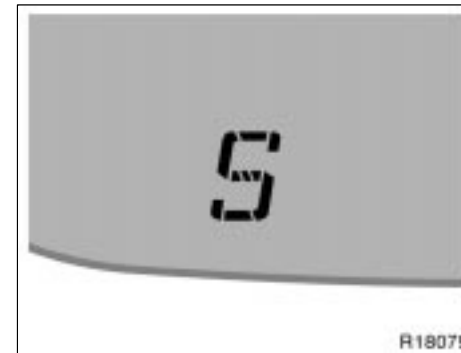
The displayed value is updated every 2 second.

The displayed temperature ranges from -30°C (-22°F) up to 50°C (122°F).

If an abnormality exists in the connection of the outside air temperature sensor, "-- °C" ("-- °F") will appear on the display. If "-- °C" ("-- °F") appears on the display, contact your Toyota dealer.

There may be a case that "-- °C" ("-- °F") appears momentarily when the ignition is quickly turned to "ON". It is normal if it goes out soon.

—Compass



The compass indicates the direction that the vehicle is heading. In the above case, it shows that the vehicle is heading south.

The direction display is updated every 2 seconds.

Displays	Directions
N	North
NE	Northeast
E	East
SE	Southeast
S	South
SW	Southwest
W	West
NW	Northwest

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The compass may not show the correct direction in the following conditions:

◀ The vehicle is stopped immediately after turning.

The compass does not adjust while the vehicle is stopped.

◀ The ignition switch is turned off immediately after turning.

◀ The vehicle is on an inclined surface.

◀ The vehicle is in a place where the earth's magnetic field is subject to interference by artificial magnetic fields (underground parking, under a steel tower, between buildings, roof parking, near a crossing, near a large vehicle, etc.).

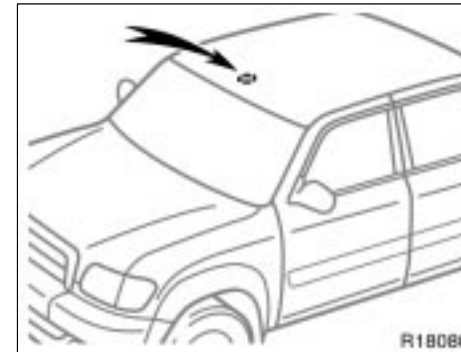
◀ The vehicle is magnetized. (There is a magnet or a metal object on or near the roof.)

◀ The battery has been disconnected.

The compass works to calibrate the direction automatically while the vehicle is in motion, if deviation is small.

For additional precision or for complete calibrating, see "CALIBRATING THE COMPASS" below.

If the direction is not indicated or the system does not operate properly, contact your Toyota dealer.



Compass sensor

The compass sensor is on the inside of the roof.

NOTICE

Do not put magnets or a metal object on or near the roof of the vehicle. Doing this may cause malfunction of the compass sensor.

CALIBRATING THE COMPASS (deviation calibration)

The direction display on the compass deviates from the true direction determined by the earth's magnetic field. The angle of deviation varies according to the geographic position of the vehicle.

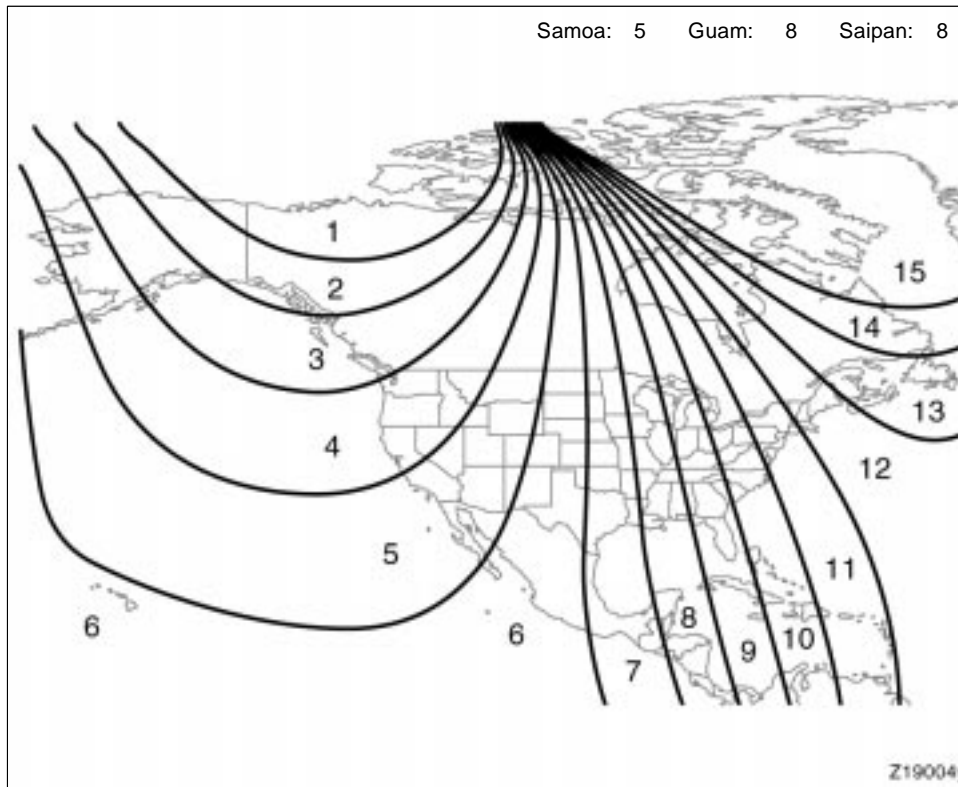
To adjust for this deviation;

1. Stop the vehicle in a level place and switch the display to the outside temperature. (To switch to this mode, see "—Outside temperature display" in this Section.)
2. Push and hold both the "MODE" and "E/M" buttons simultaneously for 5 seconds until the "VAR" indication appears on the compass display.
3. Push the "E/M" button several times until the desired zone number appears on the compass display.

If the button is not pushed for 10 seconds, the display returns to the compass/outside temperature mode and the number that is last set is memorized.

To select the zone where the vehicle is currently located, refer to the following map.

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Zone numbers

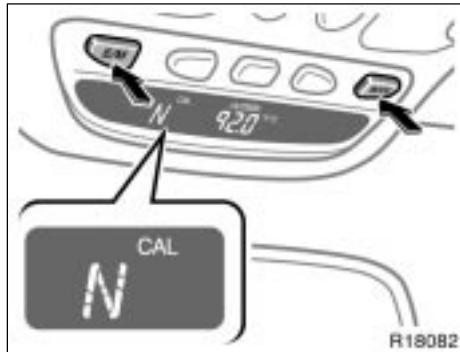
316

After calibration, leaving the system for several seconds returns to the compass mode.

⚠ CAUTION

Do not adjust the display while the vehicle is moving. Be sure to adjust the display only when the vehicle is stopped.

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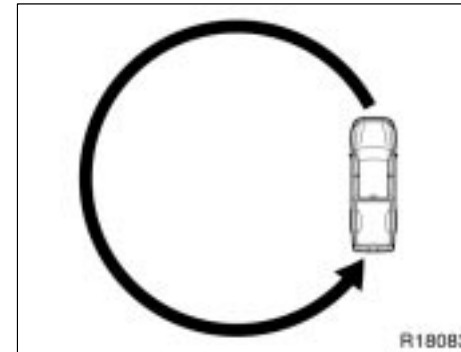
CALIBRATING THE COMPASS (circling calibration)

Sometimes the direction display on the compass may not change after a turn. In this case, the compass needs to be calibrated.

To calibrate the compass manually, do the following;

1. Stop the vehicle in a level place and switch the display to the outside temperature. (To switch to this mode, see “—Outside temperature display” in this Section.)

2. Push and hold both the “MODE” and “E/M” buttons simultaneously for 10 seconds until the “CAL” indication appears on the compass display. (At this time, the compass display is locked in “N”.)



3. Drive the vehicle in a circle at 8 km/h (5 mph) or less. If there is not enough space to drive in a circle, drive around the block.

When the “CAL” indication goes off and the compass returns to the normal mode, calibration is complete.

If you want to restart the calibration before it is complete, push both of the “MODE” and “E/M” buttons simultaneously for 10 seconds again.

Perform circling calibration just after you have purchased your Toyota. And then always perform circling calibration after the battery has been removed, replaced or disconnected.

◀ Do not perform circling calibration of the compass in a place where the earth's magnetic field is subject to interference by artificial magnetic fields (underground parking, under a steel tower, between buildings, roof parking, near a crossing, near a large vehicle, etc.).

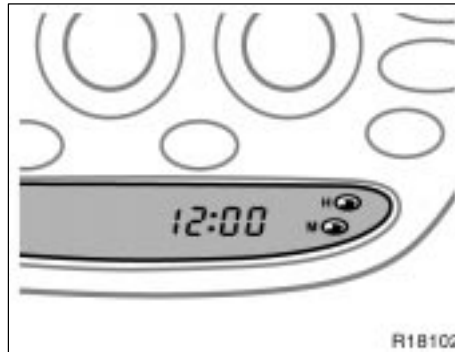
◀ During calibration, do not operate electric systems (moon roof, power windows, etc.) as they may interfere with the calibration.

⚠ CAUTION

◀ When doing the circling calibration, be sure to secure a wide space, and watch out for people and vehicles in the neighborhood. Do not violate any local traffic rules while performing circling calibration.

◀ Do not adjust the display while the vehicle is moving. Be sure to adjust the display only when the vehicle is stopped.

Clock

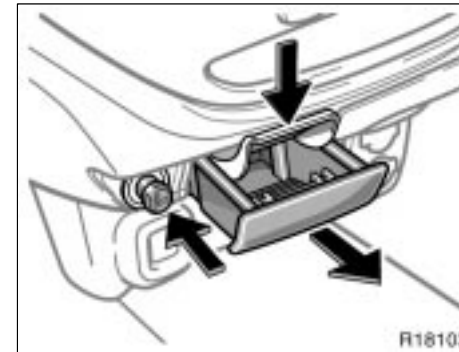


To reset the hour: Push the "H" button.
To reset the minutes: Push the "M" button.
The key must be in the "ACC" or "ON" position.

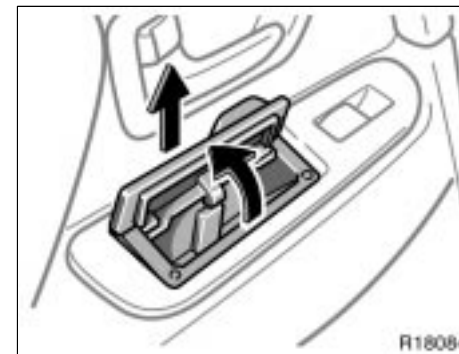
If the electrical power source has been disconnected from the clock, the time display will automatically be set to 1:00 (one o'clock).

When the instrument panel lights are turned on, the brightness of the time indication will be reduced.

Cigarette lighter and ashtrays



Cigarette lighter and front ashtray



Rear ashtray

CIGARETTE LIGHTER

To use the cigarette lighter, press it in. After it finishes heating up, it automatically pops out ready for use.

Do not hold the cigarette lighter pressed in.

Use a Toyota genuine cigarette lighter or equivalent for replacement.

ASHTRAYS

Front: To use the ashtray, pull it out.

Rear: To use the ashtray, raise the lid.

When finished with your cigarette, thoroughly extinguish it in the ashtray to prevent other cigarette butts from catching fire. After using the ashtray, push it back in completely.

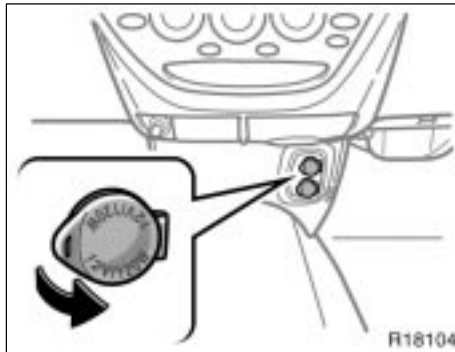
Front—To remove the ashtray, press down on the lock spring plate and pull out.

Rear—To remove the ashtray, pull it out.

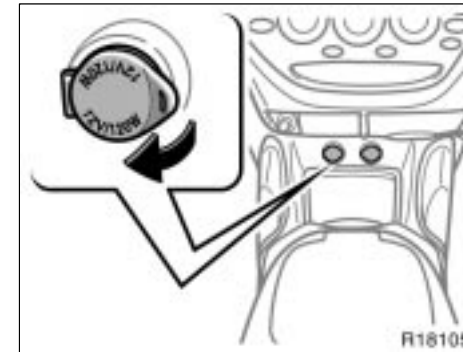
⚠ CAUTION

To reduce the chance of injury in case of an accident or sudden stop while driving, always completely close the ashtray after use.

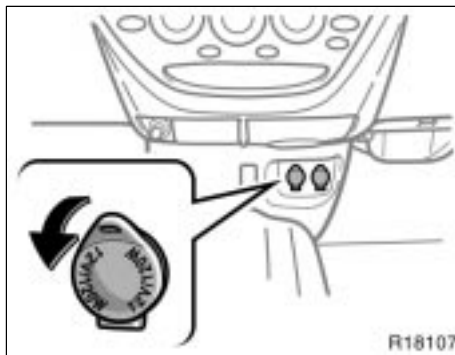
Power outlets (12 VDC)



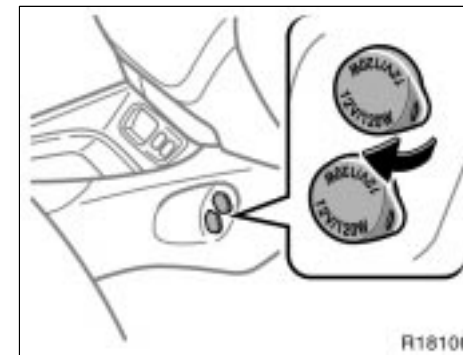
Type A



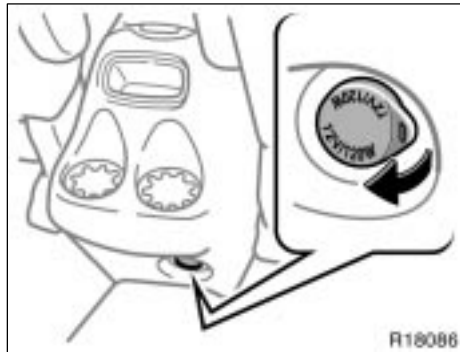
Type C



Type B



Type D



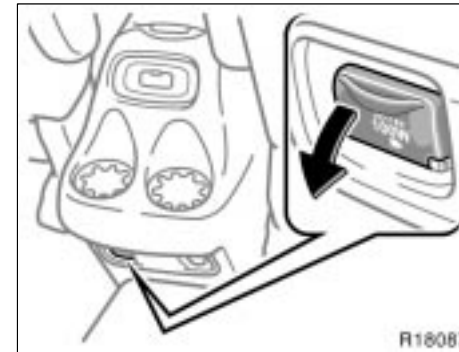
Type E

The power outlets (12 VDC) are designed for power supply for car accessories.

NOTICE

- ◆ *To prevent the fuse from being blown, do not use the electricity over the total vehicle capacity of 12V/120W.*
- ◆ *To prevent the battery from being discharged, do not use the power outlets longer than necessary when the engine is not running.*
- ◆ *Close the power outlet lids when the power outlets are not in use. Inserting anything other than an appropriate plug that fits the outlet, or allowing any liquid to get into the outlet may cause electrical failure or short circuits.*

Power outlet (115 VAC)



This power outlet (115 VAC) is designed for use as a power supply for electric appliances in the vehicle.

The key must be in the "ON" position for the power outlet to be used.

The maximum capacity for this power outlet is 115 VAC/100W. If you attempt to use an appliance that requires more than 115 VAC or 100W, the protection circuit will activate and cut the power supply. The power supply will restart automatically when you use an appliance that operates within the 115 VAC/100W limits.



Main switch

To use the power outlet, push the main switch on the instrument panel.

An indicator light will illuminate to indicate that the power outlet is ready for use.

Push the main switch once again to turn the power outlet off. When the power outlet is not in use, make sure that the main switch is turned off.

NOTICE

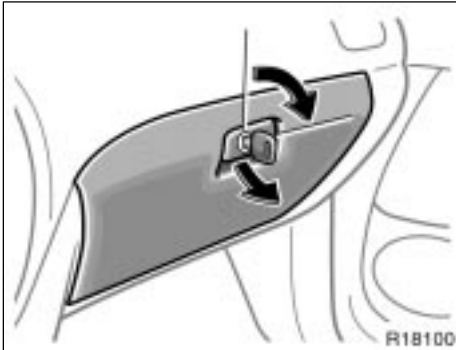
- ◆ To prevent the battery from being discharged, do not use the power outlet longer than necessary when the engine is not running.
- ◆ Close the power outlet lid when the power outlet is not in use. Inserting anything other than an appropriate plug that fits the outlet may cause electrical failure or short circuits.

The power outlet is not designed for the following electric appliances even though their power consumption is under 115 VAC/100W. These appliances may not operate properly.

- ◀ Appliances with high initial peak wattage: cathode-ray tube type televisions, compressor-driven refrigerators, electric pumps, electric tools, etc.
- ◀ Measuring devices which process precise data: medical equipment, measuring instruments, etc.
- ◀ Other appliances requiring an extremely stable power supply: microcomputer-controlled electric blankets, touch sensor lamps, etc.

Certain electrical appliances may cause radio noise.

Glove box



To use the glove box, do this.

To open: Pull the lever.

To lock: Insert the master key and turn it clockwise.

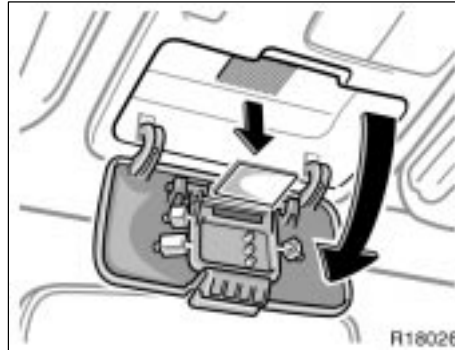
On some models, the glove box light will come on when the glove box is opened with the headlight switch on.



CAUTION

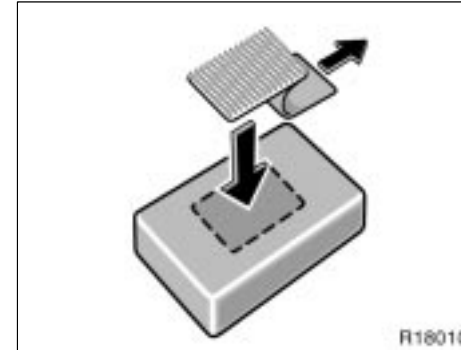
To reduce the chance of injury in case of an accident or a sudden stop, always keep the glove box door closed while driving.

Garage door opener box



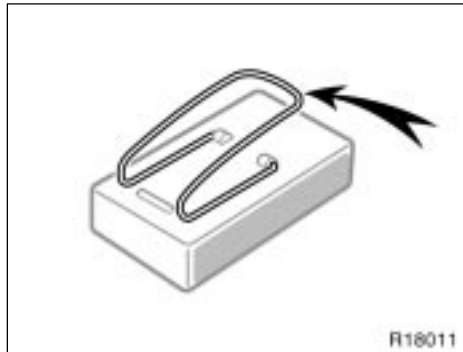
The box is designed to store a garage door opener transmitter.

Open the cover and remove the Velcro square.

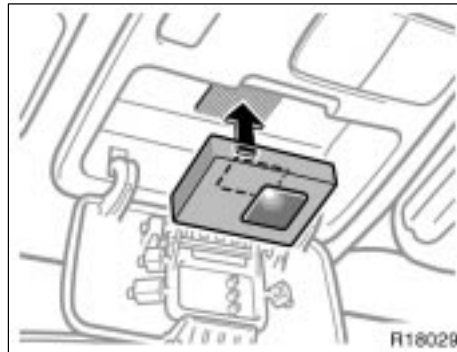


Remove the paper strip covering the adhesive on back side of square and adhere the square to back side of the transmitter near the center.

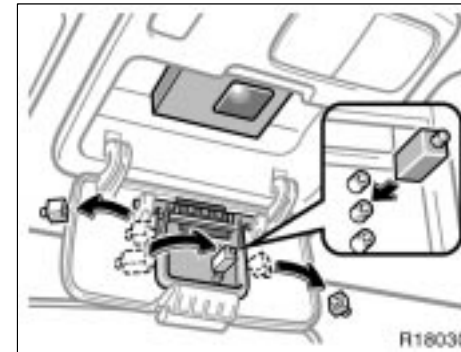
'05 TUNDRA_U (L/O 0409)



Please note if transmitter has wire clip for sun visor, this clip must be removed prior to adhesion of the Velcro.

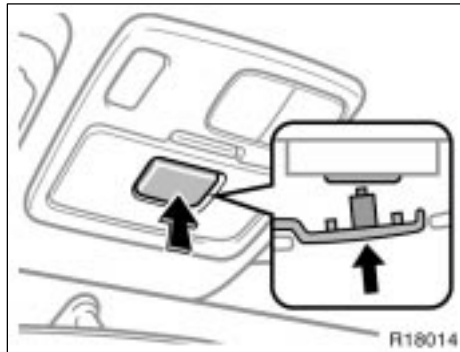


Place the transmitter with Velcro square facing inside of box into the box. Make sure the transmitter button is located above button pins.

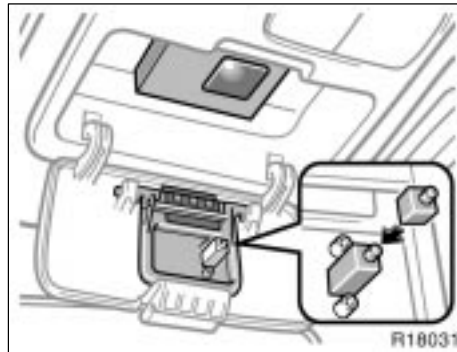


Remove spacers from the center panel. Place the largest spacer on the pin that would be below transmitter button when the cover is closed. Close the cover.

'05 TUNDRA_U (L/O 0409)



When the garage door opener transmitter is properly installed, you can operate the transmitter by pushing the center panel of the cover.



If the center panel does not contact your garage door opener transmitter:

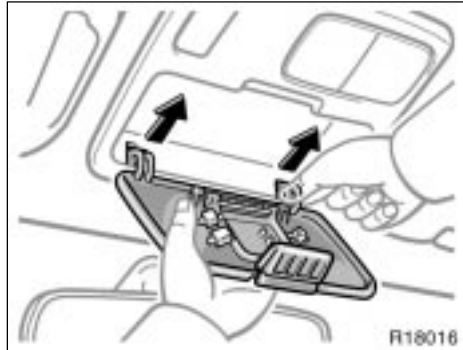
- ◀ Check to see if spacer is on the correct pin.
- ◀ Attach another spacer to the top of original spacer. Check operation. If required, continue to add spacers until contact is achieved.

If the transmitter is clattering during driving, fill in a piece of felt or pad to prevent the transmitter from clattering.

CAUTION

◀ To reduce the chance of injury in case of an accident or a sudden stop, always keep the garage door opener box closed while driving.

◀ Keep the remaining spacers away from children.

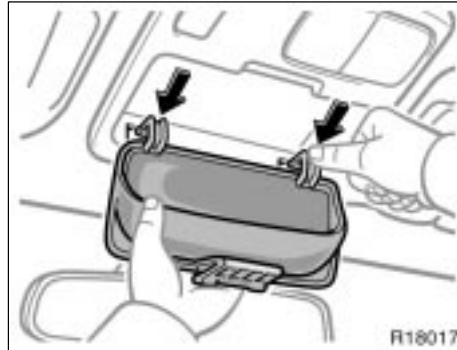


Standard and access cab models only—
The auxiliary box (stored in the glove box) and garage door opener box are interchangeable.

Removing the cover—

Half open the cover. Pinch each hinge and pull it out of its pivot one at a time as shown above.

Do not remove the cover forcibly.



Installing the cover—

Align the hinges to the pivots, and press each hinge until you hear a click.

Make sure that the cover opens and closes smoothly.

Auxiliary boxes

To use the auxiliary boxes, open the lids as shown in the following illustrations.

⚠ CAUTION

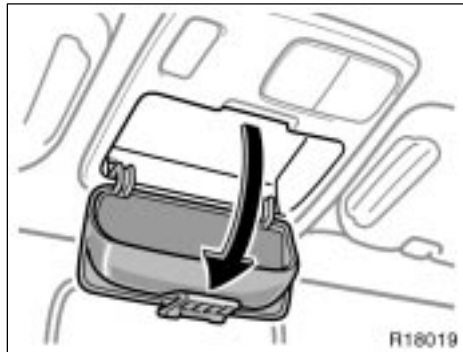
◀ To reduce the chance of injury in case of an accident or a sudden stop, always keep the auxiliary box closed while driving.

◀ Type A and B only—As these holders are designed for holding a light object such as an eyeglass, do not place any heavy objects in them. Heavy objects may cause the holder to open and contents to fly out resulting in injuries.

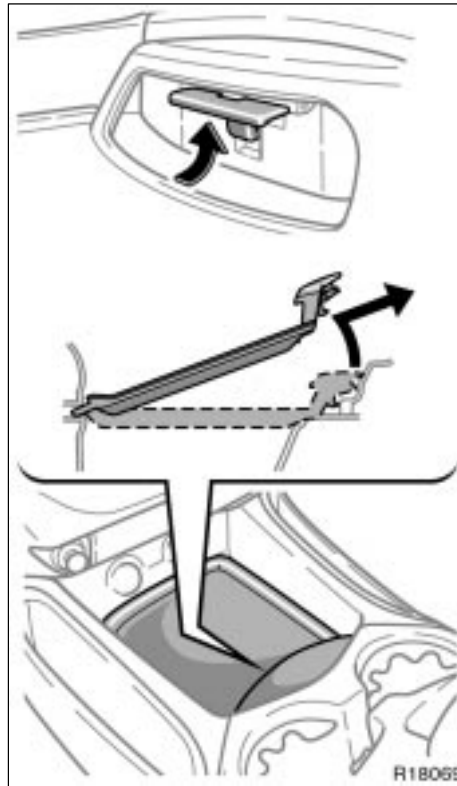
NOTICE

Type A and B only—During hot weather, the interior of the vehicle becomes very hot. Do not leave anything flammable or deformable such as a lighter, glasses, etc. inside.

'05 TUNDRA_U (L/O 0409)



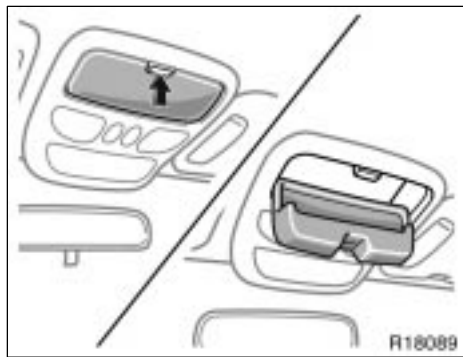
Type A



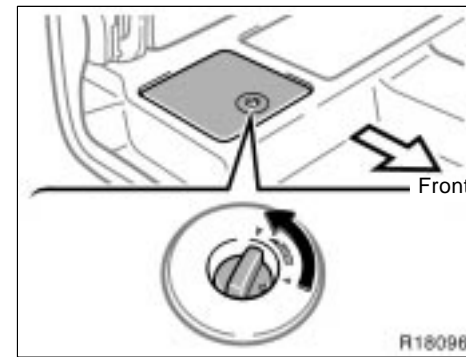
Type C



Type D

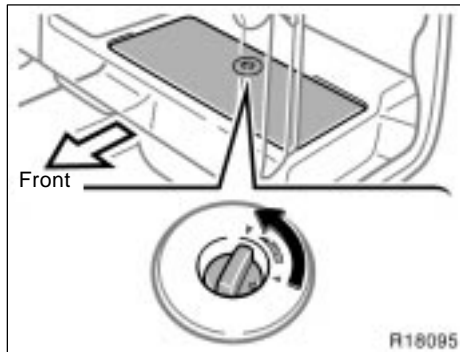


Type B

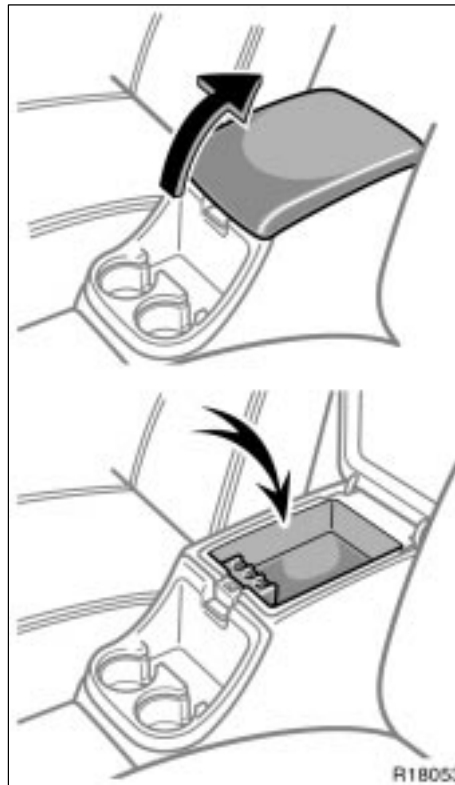


Type E (under the rear seat of access cab models)

Rear console box (type A)



Type F (under the rear seat of double cab models)



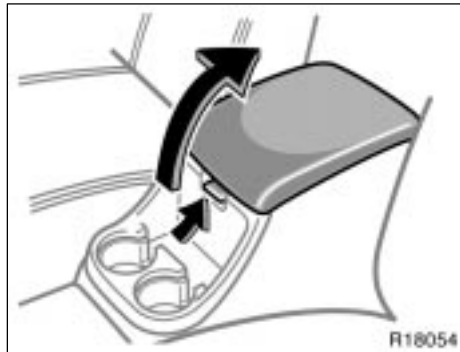
UPPER TRAY

To access the upper tray, raise the console box lid.

 CAUTION

To reduce the chance of injury in case of an accident or a sudden stop, always keep the upper tray closed while driving.

Rear console box (type B)

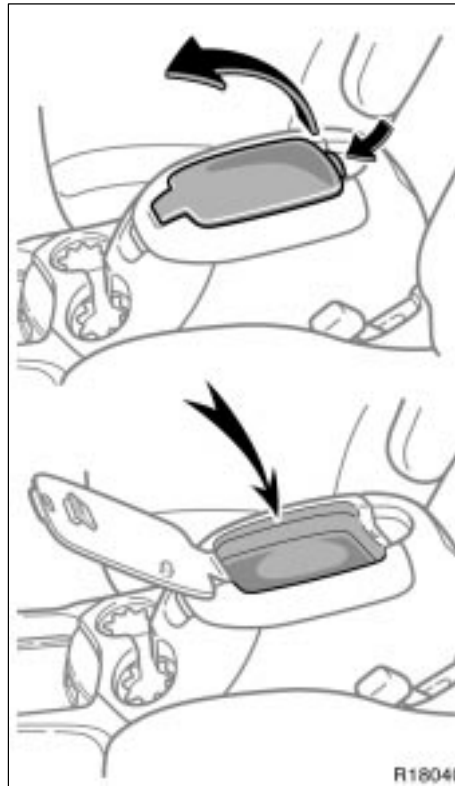


CONSOLE BOX

To access the rear console box, raise the upper tray by pulling up the lock release lever.

! CAUTION

To reduce the chance of injury in case of an accident or a sudden stop, always keep the console box closed while driving.

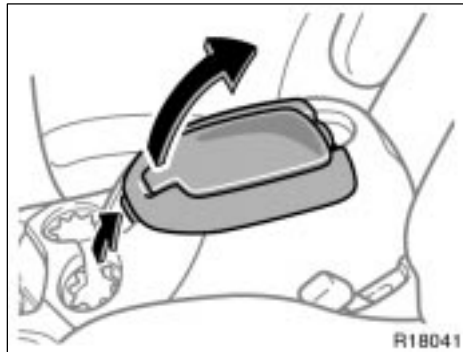


UPPER TRAY

To access the upper tray, raise the console box upper lid while pushing the lock release button.

! CAUTION

To reduce the chance of injury in case of an accident or a sudden stop, always keep the upper tray closed while driving.

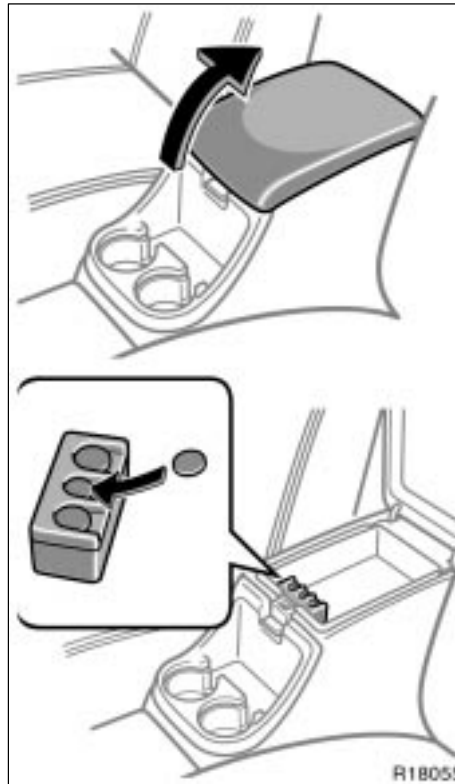


CONSOLE BOX

To access the rear console box, raise the console box lid by pulling up the lock release lever.

⚠ CAUTION
To reduce the chance of injury in case of an accident or a sudden stop, always keep the console box closed while driving.

Coin holder (type A)

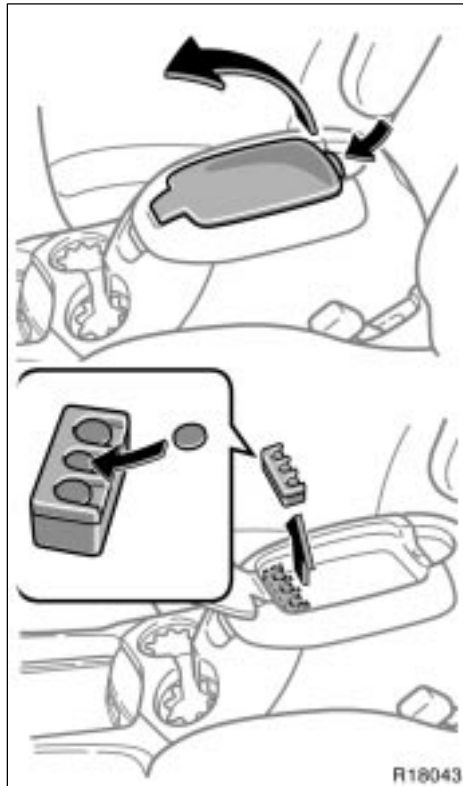


The rear console box is equipped with a coin holder.

To use the coin holder:

1. Raise the console box lid.
2. Push coins down into the holder.

Coin holder (type B)

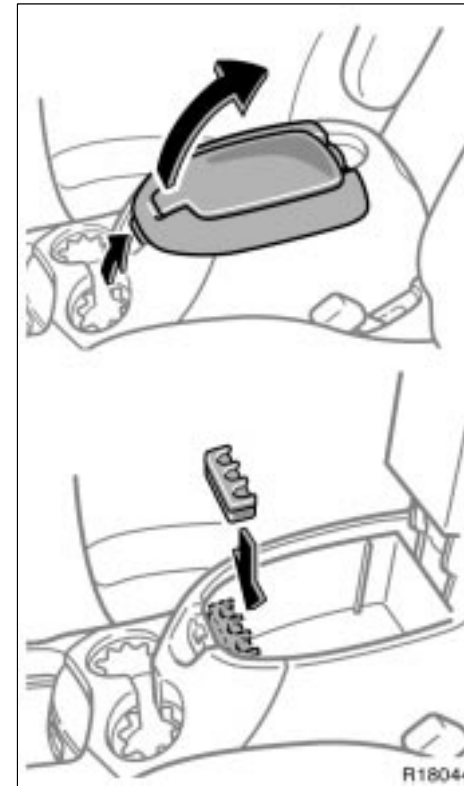


The rear console box is equipped with a coin holder.

To use the coin holder:

1. Raise the console box upper lid while pushing the lock release button.
2. Push coins down into the holder.

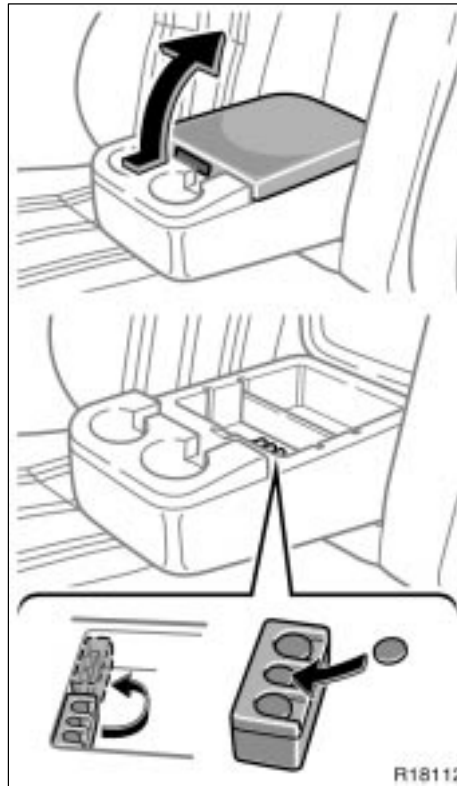
The coin holder is detachable.



Coin holder (type C)

The coin holder can be set in the console box.

To set the coin holder in the console box, raise the console box lid by pulling up the lock release lever.



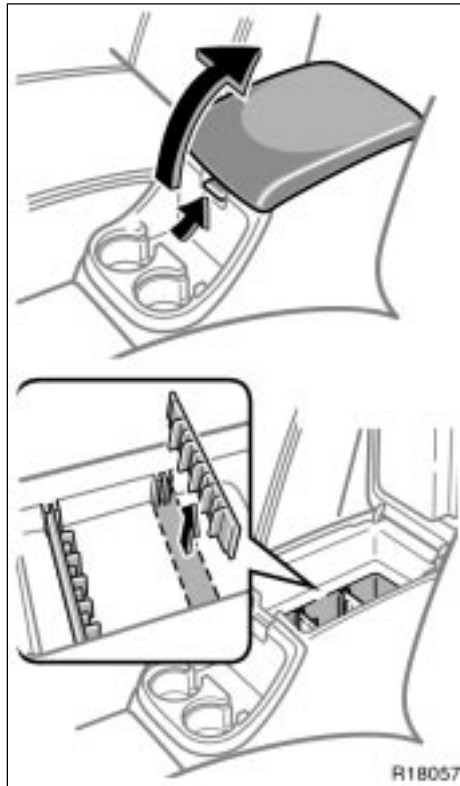
The auxiliary box is equipped with a coin holder.

To use the coin holder:

1. Raise the auxiliary box lid while pushing the lock release button.
2. Push coins down into the holder.

The coin holder is detachable.

**Compact disc and cassette
tape holder (type A)**

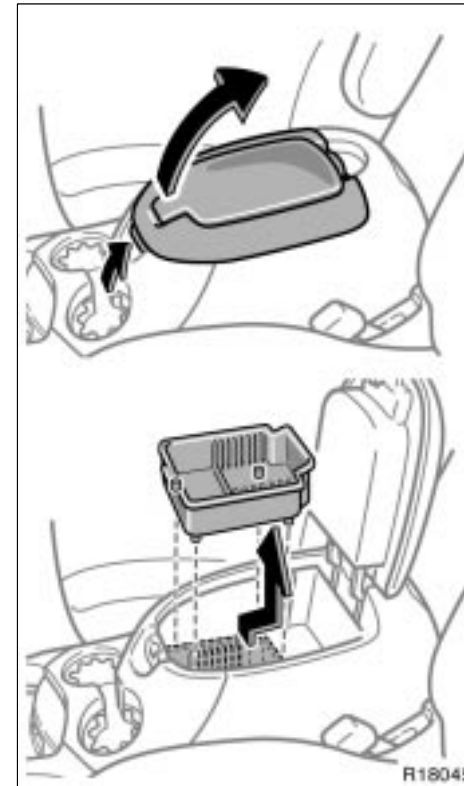


The rear console box is equipped with compact disc and cassette tape holders.

To use the holders, raise the console box lid and upper tray by pulling up the lock release lever.

The plates for the compact disc and cassette tape holders are detachable.

**Compact disc and cassette
tape holder (type B)**

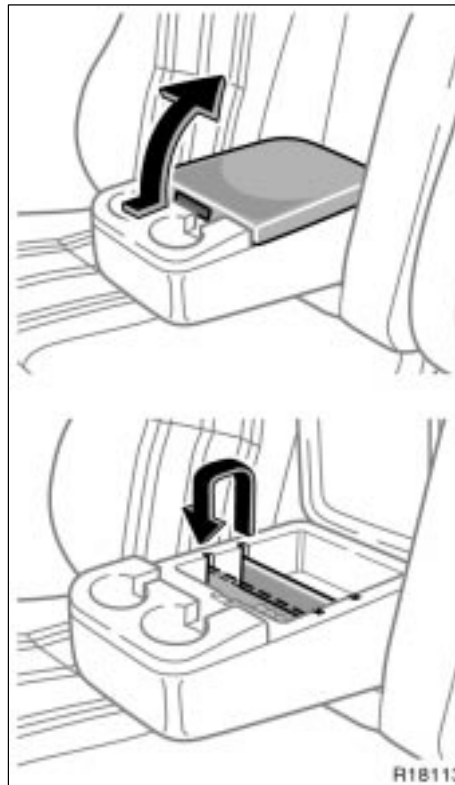


Cassette tape holder

The rear console box is equipped with a compact disc and cassette tape holder.

To use the holder, raise the console box lid by pulling up the lock release lever.

The compact disc and cassette tape holder is detachable.



The auxiliary box is equipped with a cassette tape holder.

To use the holder, raise the auxiliary box lid while pushing the lock release button.

The plate for the cassette tape holder is detachable.

Cup holders

The cup holder is designed for holding cups or drink-cans securely. To use them, observe the following illustrations.

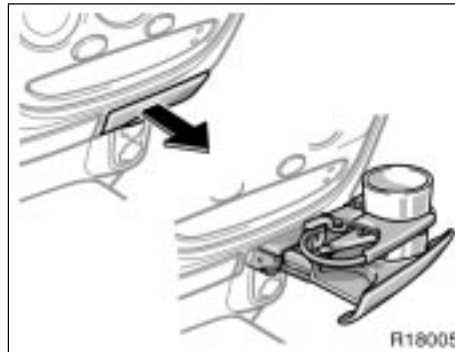
CAUTION

Do not place anything else other than cups or drink-cans in the cup holder, as such items may be thrown about and possibly injure people in the vehicle during sudden braking or in an accident.

To reduce the chance of injury in case of an accident or a sudden stop while driving, keep the cup holder closed when it is not in use.

NOTICE

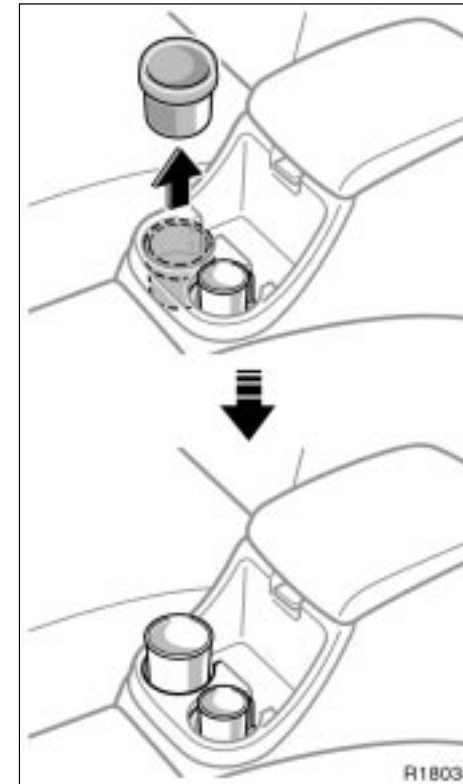
Type A only—As this holder is designed for holding soft cups only, do not place too heavy a cup, drink-can or bottle in it.



Type A



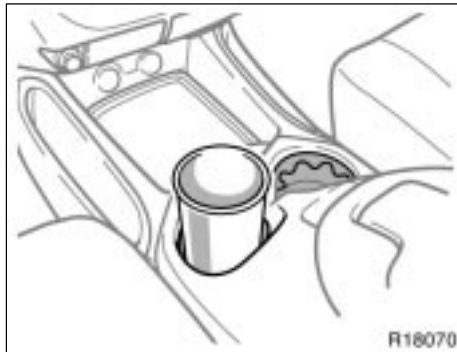
Type B



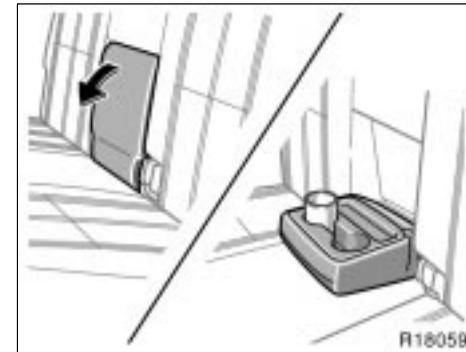
Type C

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Type C cup holders are equipped with a detachable adapter for each holder. When you remove the adapter, a bigger cup can be held in the holder.



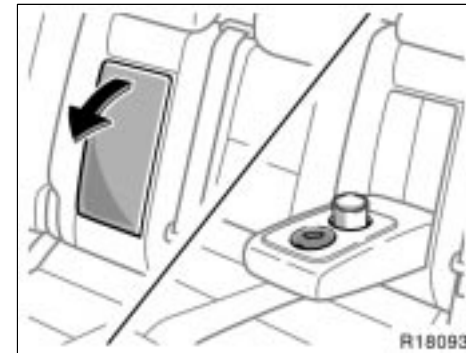
Type D



Type F

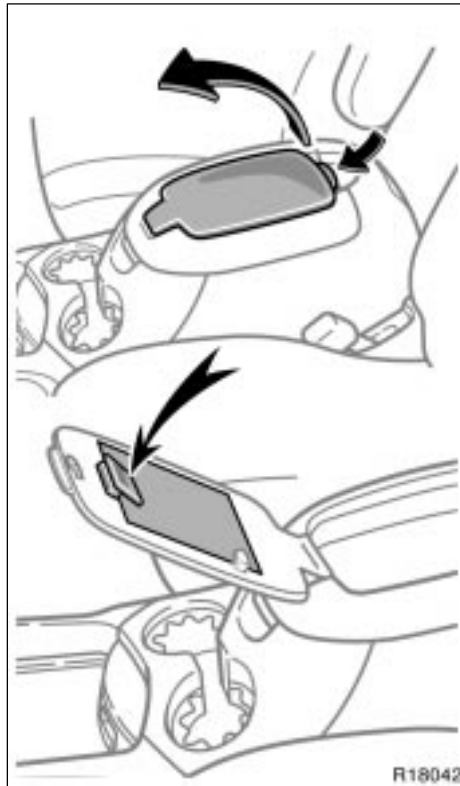


Type E



Type G

Note pad holder



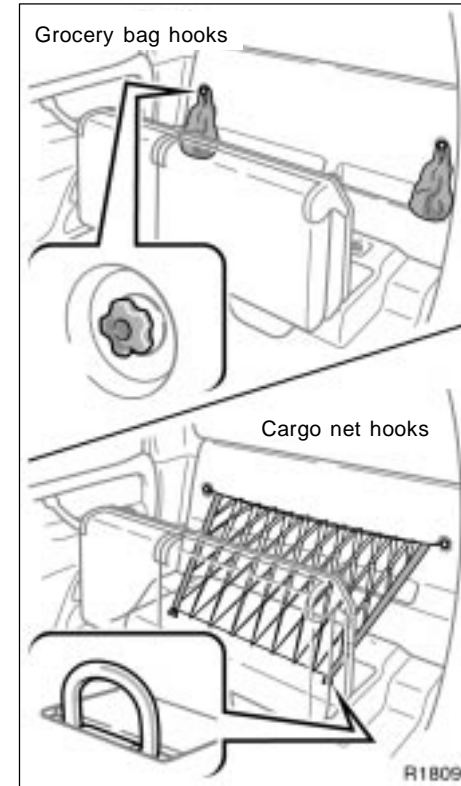
The rear console box is equipped with a note pad holder. This is designed to hold small paper such as note pads.

To use the holder, raise the console box upper lid while pushing the lock release button.

! CAUTION

- ◀ Do not write on the note pad holder while the vehicle is moving.
- ◀ Do not place anything else on the note pad holder. Such items may be thrown about in the compartment and possibly cause injury during sudden braking or an accident.
- ◀ To reduce the chance of injury in case of an accident or a sudden stop while driving, keep the console box upper lid closed when it is not in use.

Grocery bag/cargo net hooks



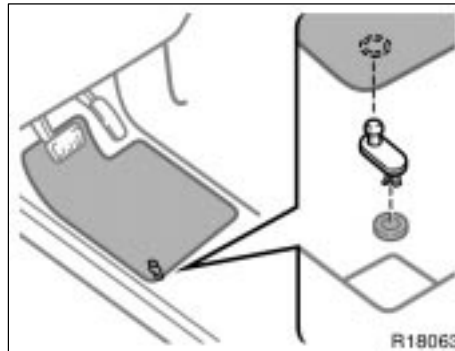
These hooks are designed to hang things like grocery bags or cargo net.

Although the cargo net itself is not included as an original equipment, these hooks can be used to hang the cargo net.

NOTICE

- ◆ *To prevent damage to the hooks, avoid hanging heavy loads on them when using them as grocery bag hooks.*
- ◆ *To prevent damage to the hook, avoid hanging things other than a cargo net on it when using them as cargo net hooks.*

Floor mat



Use a floor mat of the correct size.

If the floor carpet and floor mat have a hole, then it is designed for use with a locking clip. Fix the floor mat with locking clip into the hole in the floor carpet.



CAUTION

Make sure the floor mat is properly placed on the floor carpet. If the floor mat slips and interferes with the movement of the pedals during driving, it may cause an accident.

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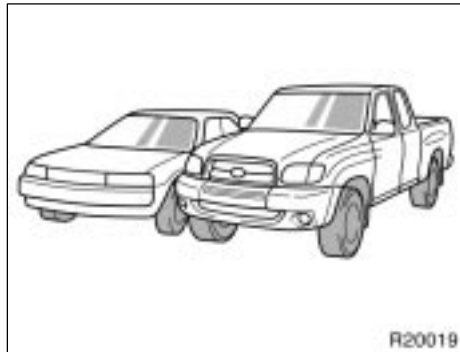
SECTION 2

INFORMATION BEFORE DRIVING YOUR TOYOTA

Information before driving your Toyota

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Off-road vehicle precautions



This vehicle has higher ground clearance and narrower tread in relation to the height of its center of gravity to make it capable of performing in a wide variety of off-road applications. Specific design characteristics give it a higher center of gravity than ordinary passenger cars. This vehicle design feature causes this type of vehicle to be more likely to rollover. And, it has a significantly higher rollover rate than other types of vehicles. An advantage of the higher ground clearance is a better view of the road allowing you to anticipate problems. It is not designed for cornering at the same speeds as ordinary passenger cars any more than low-slung sports cars designed to perform satisfactorily under off-road conditions. Therefore, sharp turns at excessive speeds may cause rollover.

CAUTION

Always observe the following precautions to minimize the risk of serious personal injury or damage to your vehicle:

- ▶ In a rollover crash, an unbelted person is significantly more likely to die than a person wearing a seat belt. Therefore, the driver and all passengers should fasten their seat belts whenever the vehicle is moving.
- ▶ Avoid sharp turns or abrupt maneuvers, if at all possible. Failure to operate this vehicle correctly may result in loss of control or vehicle rollover causing death or serious injury.
- ▶ Avoid loading any items on the roof that will raise the vehicle's center of gravity.
- ▶ Always slow down in gusty crosswinds. Because of its profile and higher center of gravity, your vehicle is more sensitive to side winds than an ordinary passenger car. Slowing down will allow you to have better control.

▶When driving off-road or in rugged terrain, do not drive at excessive speeds, jump, make sharp turns, strike objects, etc. This may cause loss of control or vehicle rollover causing death or serious injury. You are also risking expensive damage to your vehicle's suspension and chassis.

▶Do not drive horizontally across steep slopes. Driving straight up or straight down is preferred. Your vehicle (or any similar off-road vehicle) can tip over sideways much more easily than forward or backward.

Break-in period

Drive gently and avoid high speeds.

Your vehicle does not need an elaborate break-in. But following a few simple tips for the first 1600 km (1000 miles) can add to the future economy and long life of your vehicle:

- ▶Avoid full throttle acceleration when starting and driving.
- ▶Avoid racing the engine.
- ▶Try to avoid hard stops during the first 300 km (200 miles).
- ▶Do not drive slowly with the manual transmission in a high gear.
- ▶Do not drive for a long time at any single speed, either fast or slow.
- ▶Do not tow a trailer during the first 800 km (500 miles).

Fuel

FUEL TYPE

Your new vehicle must use only unleaded gasoline.

To help prevent gas station mix-ups, your Toyota has a smaller fuel tank opening. The special nozzle on pumps with unleaded fuel will fit it, but the larger standard nozzle on pumps with leaded gas will not.

At a minimum, the gasoline you use should meet specifications of ASTM D4814 in the U.S.A. and CGSB 3.5-M93 in Canada.

NOTICE

Do not use leaded gasoline. Use of leaded gasoline will cause the three-way catalytic converter to lose its effectiveness and the emission control system to function improperly. Also, this can increase maintenance costs.

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OCTANE RATING

1GR-FE engine: Select Octane Rating 87 (Research Octane Number 91) or higher. For improved vehicle performance, the use of premium unleaded gasoline with an Octane Rating of 91 (Research Octane Number 96) or higher is recommended.

2UZ-FE engine: Select Octane Rating 87 (Research Octane Number 91) or higher.

Use of unleaded gasoline with an octane rating or research octane number lower than stated above will cause persistent heavy knocking. If it is severe, this will lead to engine damage.

If your engine knocks...

If you detect heavy knocking even when using the recommended fuel, or if you hear steady knocking while holding a steady speed on level roads, consult your Toyota dealer.

However, occasionally, you may notice light knocking for a short time while accelerating or driving up hills. This is normal and there is no need for concern.

GASOLINE CONTAINING DETERGENT ADDITIVES

Toyota recommends the use of gasoline that contains detergent additives to avoid build-up of engine deposits.

However, all gasoline sold in the U.S. contains detergent additives to keep clean and/or clean intake systems.

QUALITY GASOLINE

Automotive manufacturers in the U.S., Europe and Japan have developed a specification for quality fuel named World-Wide Fuel Charter (WWFC) that is expected to be applied world wide. The WWFC consists of four categories that depend on required emission levels. In the U.S., category 4 has been adopted. The WWFC improves air quality by providing for better emissions in vehicle fleets, and customer satisfaction through better vehicle performance.

CLEANER BURNING GASOLINE

Cleaner burning gasoline, including reformulated gasoline that contains oxygenates such as ethanol or MTBE is available in many areas.

Toyota recommends the use of cleaner burning gasoline and appropriately blended reformulated gasoline. These types of gasoline provide excellent vehicle performance, reduce vehicle emissions, and improve air quality.

OXYGENATES IN GASOLINE

Toyota allows the use of oxygenate blended gasoline where the oxygenate content is up to 10% ethanol or 15% MTBE. If you use gasohol in your Toyota, be sure that it has an octane rating no lower than 87.

Toyota does not recommend the use of gasoline containing methanol.

GASOLINE CONTAINING MMT

Some gasoline contain an octane enhancing additive called MMT (Methylcyclopentadienyl Manganese Tricarbonyl).

Toyota does not recommend the use of gasoline that contains MMT. If fuel containing MMT is used, your emission control system may be adversely affected. The Malfunction Indicator Lamp on the instrument cluster may come on. If this happens, contact your Toyota dealer for service.

GASOLINE QUALITY

In a very few cases, you may experience driveability problems caused by the particular gasoline that you are using. If you continue to have unacceptable driveability, try changing gasoline brands. If this does not rectify your problem, then consult your Toyota dealer.

NOTICE

- ◆ *Do not use gasohol other than stated above. It will cause fuel system damage or vehicle performance problems.*
- ◆ *If driveability problems occur (poor hot starting, vaporizing, engine knock, etc.), discontinue the use.*
- ◆ *Take care not to spill gasohol during refueling. Gasohol may cause paint damage.*

FUEL TANK CAPACITY

100 L (26.4 gal., 22.0 Imp. gal.)

Fuel pump shut off system

The fuel pump shut off system stops supplying fuel to the engine to minimize the risk of fuel leakage when the engine stalls or an airbag inflates upon collision. To restart the engine after the fuel pump shut off system activates, turn the ignition switch to "ACC" or "LOCK" once and start it.

CAUTION

Inspect the ground under the vehicle before restarting the engine. If you find that liquid has leaked onto the ground, it is the fuel system has been damaged and it is in need of repair. In this case, do not restart the engine.

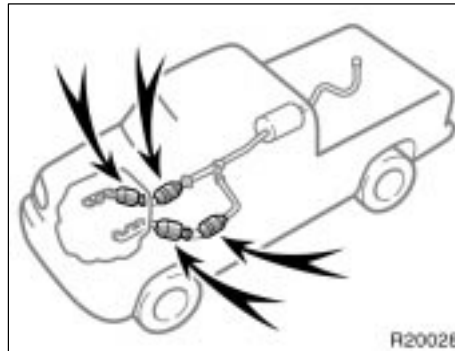
Operation in foreign countries

If you plan to drive your Toyota in another country...

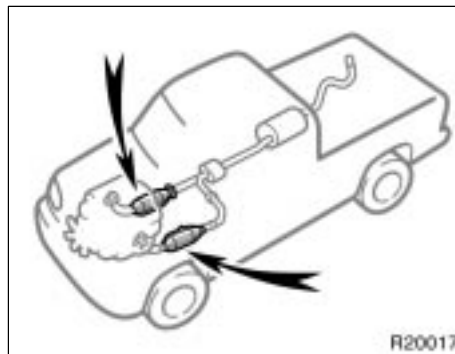
First, comply with the vehicle registration laws.

Second, confirm the availability of the correct fuel (unleaded and minimum octane number).

Three- way catalytic converters



1GR-FE engine



2UZ-FE engine

The three-way catalytic converter is an emission control device installed in the exhaust system.

The purpose is to reduce pollutants in the exhaust gas.

CAUTION

- ▶ Keep people and combustible materials away from the exhaust pipe while the engine is running. The exhaust gas is very hot.
- ▶ Do not idle or park your vehicle over anything that might burn easily such as grass, leaves, paper or rags.

NOTICE

A large amount of unburned gases flowing into the three-way catalytic converter may cause it to overheat and create a fire hazard. To prevent this and other damage, observe the following precautions:

- ◆ Use only unleaded gasoline.
- ◆ Do not drive with an extremely low fuel level; running out of fuel could cause the engine to misfire, creating an excessive load on the three-way catalytic converter.
- ◆ Do not allow the engine to run at idle speed for more than 20 minutes.
- ◆ Avoid racing the engine.
- ◆ Do not push-start or pull-start your vehicle.
- ◆ Do not turn off the ignition while the vehicle is moving.

- ◆ Keep your engine in good running order. Malfunctions in the engine electrical system, electronic ignition system/distributor ignition system or fuel systems could cause an extremely high three-way catalytic converter temperature.
- ◆ If the engine becomes difficult to start or stalls frequently, take your vehicle in for a check-up as soon as possible. Remember, your Toyota dealer knows your vehicle and its three-way catalytic converter system best.
- ◆ To ensure that the three-way catalytic converter and the entire emission control system operate properly, your vehicle must receive the periodic inspections required by the Toyota Maintenance Schedule. For scheduled maintenance information, refer to the "Scheduled Maintenance Guide" or "Owner's Manual Supplement".

Engine exhaust cautions

 **CAUTION**

- ▶ Avoid inhaling the engine exhaust. It contains carbon monoxide, which is a colorless and odorless gas. It can cause unconsciousness or even death.
- ▶ Make sure the exhaust system has no holes or loose connections. The system should be checked from time to time. If you hit something, or notice a change in the sound of the exhaust, have the system checked immediately.
- ▶ Do not run the engine in a garage or enclosed area except for the time needed to drive the vehicle in or out. The exhaust gases cannot escape, making this a particularly dangerous situation.
- ▶ Do not remain for a long time in a parked vehicle with the engine running. If it is unavoidable, however, do so only in an unconfined area and adjust the heating or cooling system to force outside air into the vehicle.

- ▶ To allow proper operation of your vehicle's ventilation system, keep the inlet grilles in front of the windshield clear of snow, leaves, or other obstructions.
- ▶ If you smell exhaust fumes in the vehicle, drive with the windows open. Have the cause immediately located and corrected.
- ▶ Toyota does not recommend occupying the rear cargo area when it is fitted with a slide-in camper, camper shell or other type cover while the engine is running. This caution applies to both driving and stopped or parked situations with the engine running. Particular care should be taken to prevent exhaust gases from entering camper bodies, trailers or other enclosures on or around your vehicle. If exhaust fumes are detected, open all windows and thoroughly ventilate the area.

Facts about engine oil consumption

FUNCTIONS OF ENGINE OIL

Engine oil has the primary functions of lubricating and cooling the inside of the engine, and plays a major role in maintaining the engine in proper working order.

ENGINE OIL CONSUMPTION

It is normal that an engine should consume some engine oil during normal engine operation. The causes of oil consumption in a normal engine are as follows.

- ▶ Oil is used to lubricate pistons, piston rings and cylinders. A thin film of oil is left on the cylinder wall when a piston moves downwards in the cylinder. High negative pressure generated when the vehicle is decelerating sucks some of this oil into the combustion chamber. This oil as well as some part of the oil film left on the cylinder wall is burned by the high temperature combustion gases during the combustion process.
- ▶ Oil is also used to lubricate the stems of the intake valves. Some of this oil is sucked into the combustion chamber together with the intake air and is burned along with the fuel. High temperature exhaust gases also burn the oil used to lubricate the exhaust valve stems.

The amount of engine oil consumed depends on the viscosity of the oil, the quality of the oil and the conditions the vehicle is driven under.

More oil is consumed by high-speed driving and frequent acceleration and deceleration.

A new engine consumes more oil, since its pistons, piston rings and cylinder walls have not become conditioned.

Oil consumption: Max. 1.0 L per 1000 km (1.1 qt./600 miles, 0.9 Imp. qt./600 miles)

When judging the amount of oil consumption, note that the oil may become diluted and make it difficult to judge the true level accurately.

As an example, if a vehicle is used for repeated short trips, and consumes a normal amount of oil, the dipstick may not show any drop in the oil level at all, even after 1000 km (600 miles) or more. This is because the oil is gradually becoming diluted with fuel or moisture, making it appear that the oil level has not changed.

The diluting ingredients evaporate out when the vehicle is then driven at high speeds, as on an expressway, making it appear that oil is excessively consumed after driving at high speeds.

IMPORTANCE OF ENGINE OIL LEVEL CHECK

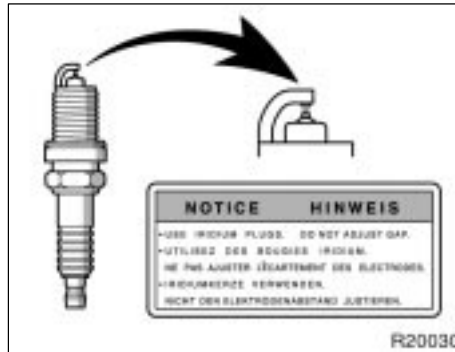
One of the most important points in proper vehicle maintenance is to keep the engine oil at the optimum level so that oil function will not be impaired. Therefore, it is essential that the oil level be checked regularly. Toyota recommends that the oil level be checked every time you refuel the vehicle.

NOTICE

Failure to check the oil level regularly could lead to serious engine trouble due to insufficient oil.

For detailed information on oil level check, see "Checking the engine oil level" in Section 7-2.

Iridium-tipped spark plugs (2UZ- FE engine)



Your engine is fitted with iridium-tipped spark plugs.

NOTICE

Use only iridium-tipped spark plugs and do not adjust gaps for your engine performance and smooth driveability.

Brake system

Without the vehicle stability control system—

The tandem master cylinder brake system is a hydraulic system with two separate sub-systems. If either sub-system should fail, the other will still work. However, the pedal will be harder to press, and your stopping distance will increase. Also, the brake system warning light may come on.

CAUTION

Do not drive your vehicle with only a single brake system. Have your brakes fixed immediately.

With the vehicle stability control system—


This brake system has 2 independent hydraulic circuits. If either circuit should fail, the other will still work. However, the pedal will be harder to press, and your stopping distance will increase. Also, the brake system warning light may come on.

CAUTION

Do not drive your vehicle with only a single brake system. Have your brakes fixed immediately.

BRAKE BOOSTER (without the vehicle stability control system)

The brake booster uses engine vacuum to power-assist the brakes. If the engine should quit while you are driving, you can bring the vehicle to a stop with normal pedal pressure. There is enough reserved vacuum for one or two stops—but no more!

 **CAUTION**

- ▶ **Do not pump the brake pedal if the engine stalls. Each push on the pedal uses up your reserved vacuum.**
- ▶ **Even if the power assist is completely lost, the brakes will still work. But you will have to push the pedal hard, much harder than normal. And your braking distance will increase.**


BRAKE BOOSTER (with the vehicle stability control system)

The brake booster uses brake fluid pressurized by the pump to power-assist the brakes. If the brake booster fails during driving, the brake system warning light comes on and buzzer sounds continuously. In this case, the brakes may not work properly. If they do not work well, depress the brake pedal firmly. If the brake system warning light comes on, immediately stop your vehicle and contact your Toyota dealer.

The brake system warning light may stay on for about 60 seconds after the ignition key is turned to the "ON" position. It is normal if the light turns off after a while.

Depressing the brake pedal repeatedly may turn on the brake system warning light and buzzer. It is normal if the light turns off and the buzzer stops sounding after a few seconds.

You may hear a small sound in the engine compartment after the engine is started or the brake pedal is depressed repeatedly. This is a pump pulsating sound of the brake system, and it is not a malfunction.

 **CAUTION**

- ▶ **Do not pump the brake pedal if the engine stalls. Each push on the pedal uses up your brake fluid pressure reserve.**
- ▶ **Even if the power assist is completely lost, the brakes will still work. But you will have to push the pedal hard, much harder than normal. And your braking distance will increase.**

ANTI-LOCK BRAKE SYSTEM (without the vehicle stability control system)

The anti-lock brake system is designed to help prevent lock-up of the wheels during a sudden braking or braking on slippery road surfaces. This assists in providing directional stability and steering performance of the vehicle under these circumstances.

Effective way to press the ABS brake pedal: When the anti-lock brake system function is in action, you may feel the brake pedal pulsating and hear a noise. In this situation, to let the anti-lock brake system work for you, just hold the brake pedal down more firmly. Do not pump the brake in a panic stop. This will result in reduced braking performance.

The anti-lock brake system becomes operative after the vehicle has accelerated to a speed in excess of approximately 10 km/h (6 mph). It stops operating when the vehicle decelerates to a speed below approximately 5 km/h (3 mph).

Depressing the brake pedal on slippery road surfaces such as on a manhole cover, a steel plate at a construction site, joints in a bridge, etc. on a rainy day tends to activate the anti-lock brake system.

You may hear a click or motor sound in the engine compartment for a few seconds when the engine is started or just after the vehicle begins to move. This means that the anti-lock brake system is in the self-check mode, and does not indicate a malfunction.

When the anti-lock brake system is activated, the following conditions may occur. They do not indicate a malfunction of the system:

- ▶ You may hear the anti-lock brake system operating and feel the brake pedal pulsating and the vibrations of the vehicle body and steering wheel. You may also hear the motor sound in the engine compartment even after the vehicle is stopped.
- ▶ At the end of the anti-lock brake system activation, the brake pedal may move a little forward.

 **CAUTION**

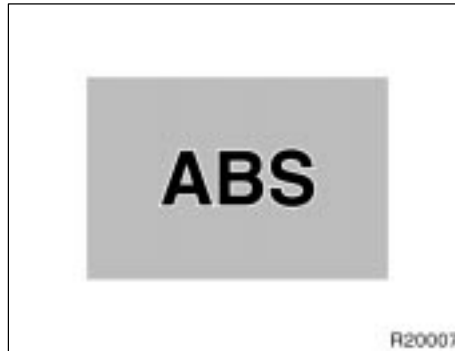
Do not overestimate the anti-lock brake system: Although the anti-lock brake system assists in providing vehicle control, it is still important to drive with all due care and maintain a moderate speed and safe distance from the vehicle in front of you, because there are limits to the vehicle stability and effectiveness of steering wheel operation even with the anti-lock brake system on.

If tire grip performance exceeds its capability, or if hydroplaning occurs during high speed driving in the rain, the anti-lock brake system does not provide vehicle control.

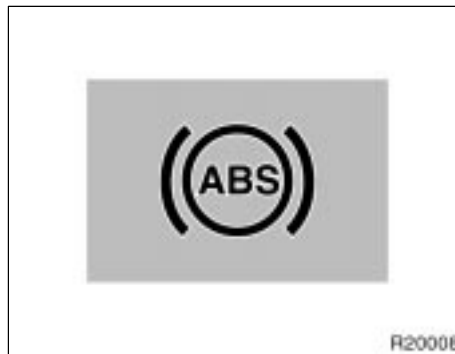
Anti-lock brake system is not designed to shorten the stopping distance: Always drive at a moderate speed and maintain a safe distance from the vehicle in front of you. Compared with vehicles without an anti-lock brake system, your vehicle may require a longer stopping distance in the following cases:

- ▶ Driving on rough, gravel or snow-covered roads.
- ▶ Driving with tire chains installed.
- ▶ Driving over the steps such as the joints on the road.
- ▶ Driving on roads where the road surface is pitted or has other differences in surface height.

Install all 4 tires of specified size at appropriate pressure: The anti-lock brake system detects vehicle speeds using the speed sensors for respective wheels' turning speeds. The use of tires other than specified may fail to detect the accurate turning speed resulting in a longer stopping distance.



Type A



Type B

“ABS” Warning light

The light comes on when the ignition key is turned to the “ON” position. If the anti-lock brake system works properly, the light turns off after a few seconds. Thereafter, if the system malfunctions, the light comes on again.

When the “ABS” warning light is on (and the brake system warning light is off), the anti-lock brake system does not operate, but the brake system still operates conventionally.

When the “ABS” warning light is on (and the brake system warning light is off), the anti-lock brake system does not operate so that the wheels could lock up during a sudden braking or braking on slippery road surfaces.

If either of the following conditions occurs, this indicates a malfunction somewhere in the components monitored by the warning light system. Contact your Toyota dealer as soon as possible to service the vehicle.

- ▶ The light does not come on when the ignition key is turned to the “ON” position, or remains on.
- ▶ The light comes on while you are driving.

A warning light turning on briefly during operation does not indicate a problem.

ANTI-LOCK BRAKE SYSTEM (with the vehicle stability control system)

The anti-lock brake system is designed to help prevent lock-up of the wheels during a sudden braking or braking on slippery road surfaces. This assists in providing directional stability and steering performance of the vehicle under these circumstances.

Effective way to press the ABS brake pedal: When the anti-lock brake system function is in action, you may feel the brake pedal pulsating and hear a noise. In this situation, to let the anti-lock brake system work for you, just hold the brake pedal down more firmly. Do not pump the brake in a panic stop. This will result in reduced braking performance.

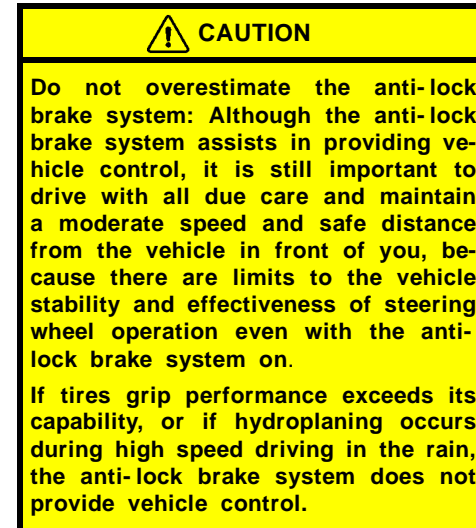
The anti-lock brake system becomes operative after the vehicle has accelerated to a speed in excess of approximately 10 km/h (6 mph). It stops operating when the vehicle decelerates to a speed below approximately 5 km/h (3 mph).

Depressing the brake pedal on slippery road surfaces such as on a manhole cover, a steel plate at a construction site, joints in a bridge, etc. on a rainy day tends to activate the anti-lock brake system.

You may hear a click or motor sound in the engine compartment for a few seconds when the engine is started or just after the vehicle begins to move. This means that the anti-lock brake system is in the self-check mode, and does not indicate a malfunction.

When the anti-lock brake system is activated, the following conditions may occur. They do not indicate a malfunction of the system:

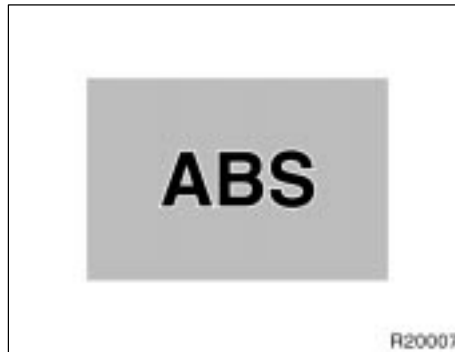
- ▶ You may hear the anti-lock brake system operating and feel the brake pedal pulsating and the vibrations of the vehicle body and steering wheel. You may also hear the motor sound in the engine compartment even after the vehicle is stopped.
- ▶ At the end of the anti-lock brake system activation, the brake pedal may move a little forward.



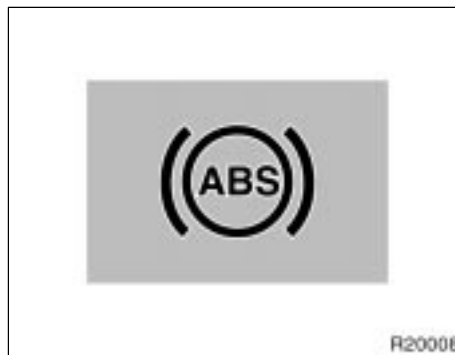
Anti-lock brake system is not designed to shorten the stopping distance: Always drive at a moderate speed and maintain a safe distance from the vehicle in front of you. Compared with vehicles without an anti-lock brake system, your vehicle may require a longer stopping distance in the following cases:

- ▶ Driving on rough, gravel or snow-covered roads.
- ▶ Driving with tire chains installed.
- ▶ Driving over the steps such as the joints on the road.
- ▶ Driving on roads where the road surface is pitted or has other differences in surface height.

Install all 4 tires of specified size at appropriate pressure: The anti-lock brake system detects vehicle speeds using the speed sensors for respective wheels' turning speed. The use of tires other than specified may fail to detect the accurate turning speed resulting in a longer stopping distance.



Type A



Type B

“ABS” warning light

The light comes on when the ignition key is turned to the “ON” position. If the anti-lock brake system and the brake assist system work properly, the light turns off after a few seconds. Thereafter, if the systems malfunction, the light comes on again.

When the “ABS” warning light is on (and the brake system warning light is off), the anti-lock brake system, the brake assist system, the traction control system, “AUTO LSD” system, the vehicle stability control system do not operate, but the brake system still operates conventionally.

When the “ABS” warning light is on (and the brake system warning light is off), the anti-lock brake system does not operate so that the wheels could lock up during a sudden braking or braking on slippery road surfaces.

“VSC TRC” warning light may come on with the “ABS” warning light (brake assist system warning light) when there is a malfunction somewhere in the anti-lock brake system (brake assist system).

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If either of the following conditions occurs, this indicates a malfunction somewhere in the components monitored by the warning light system. Contact your Toyota dealer as soon as possible to service the vehicle.

- ▶ The light does not come on when the ignition key is turned to the "ON" position, or remains on.
- ▶ The light comes on while you are driving.

A warning light turning on briefly during operation does not indicate a problem.



CAUTION

If the "ABS" warning light remains on together with the brake system warning light, immediately stop your vehicle at a safe place and contact your Toyota dealer.

In this case, not only the anti-lock brake system will fail but also the vehicle will become extremely unstable during braking.

Either of the following conditions may occur, but do not indicate a malfunction:

- ▶ The light may stay on for about 60 seconds after the ignition key is turned to the "ON" position. It is normal if it turns off after a while.
- ▶ Depressing the brake pedal repeatedly may turn on the light. It is normal if it turns off after about a few seconds.

BRAKE ASSIST SYSTEM (with the vehicle stability control system)

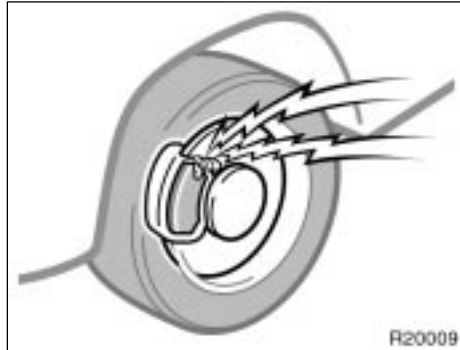
When you slam the brakes on, the brake assist system judges as an emergency stop and provides more powerful braking for a driver who cannot hold down the brake pedal firmly.

When you slam the brakes on, more powerful braking will be applied. At this time, you may hear a sound in the engine compartment and feel the vibrations of the brake pedal. This does not indicate a malfunction.

The brake assist system becomes operative after the vehicle has accelerated to a speed in excess of approximately 10 km/h (6 mph). It stops operating when the vehicle decelerates to a speed below approximately 5 km/h (3 mph).

For an explanation of this system's warning light, see "Service reminder indicators and warning buzzers" in Section 1-6.

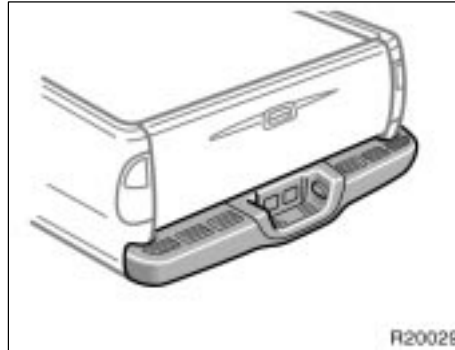
Brake pad wear limit indicators



The brake pad wear limit indicators on your disc brakes give a warning noise when the brake pads are worn to where replacement is required.

If you hear a squealing or scraping noise while driving, have the brake pads checked and replaced by your Toyota dealer as soon as possible. Expensive rotor damage can result if the pads are not replaced when necessary.

Rear step bumper

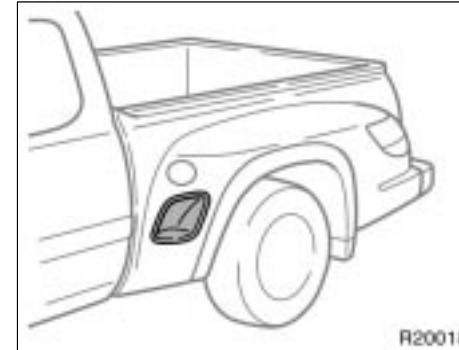


The rear step bumper is for rear end protection and easier step-up loading.

⚠ CAUTION

- ▶ Do not allow more than one person to get on the rear step bumper at a time. It is designed for only one person.
- ▶ Never drive the vehicle with anyone on the rear step bumper.

StepSide bed



The side step is for easier step-up loading.

⚠ CAUTION

For models equipped with a StepSide bed:

- ▶ Do not allow more than one person to get on the side step. Do not exceed the maximum weight limit of 136 kg (300 lb.) on the side step.
- ▶ Never drive the vehicle with anyone on the side steps.
- ▶ Do not stand on the side steps while the vehicle is moving.

Limited-slip differential

Some Toyotas are equipped with a limited-slip differential. If one of the rear wheels begins to spin, the limited-slip differential is designed to aid traction by automatically transmitting driving force to the other rear wheel. If you are not sure whether your vehicle is equipped with one, you can ask your Toyota dealer.

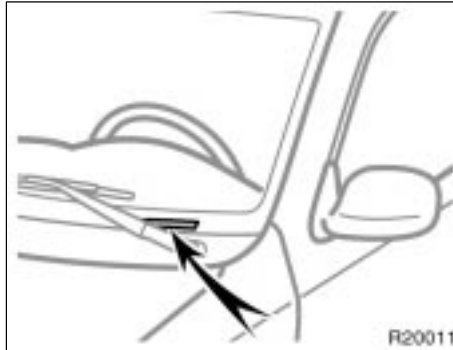
CAUTION

Do not start or run the engine while your vehicle is supported by a jack. The vehicle could be driven off the jack and could pose a danger or result in serious injury.

NOTICE

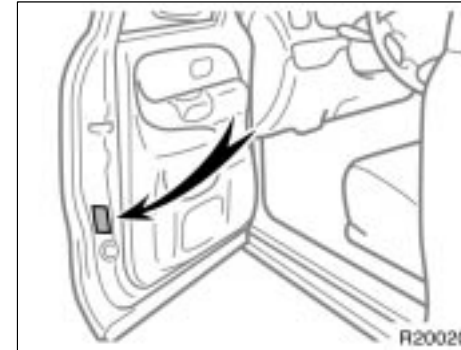
Use only a spare tire of the same size, construction and load capacity as the original tires on your Toyota because damage to the limited-slip differential could possibly occur with another tire type.

Your Toyota's identification— —Vehicle identification number



The vehicle identification number (VIN) is the legal identifier for your vehicle. This number is on the left top of the instrument panel, and can be seen through the windshield from outside.

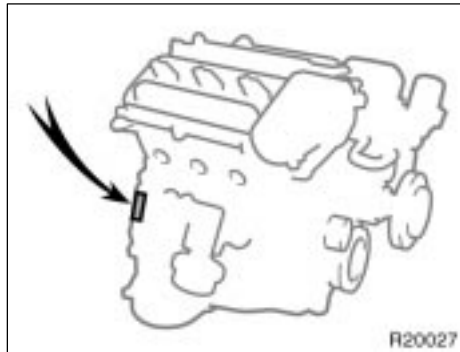
This is the primary identification number for your Toyota. It is used in registering the ownership of your vehicle.



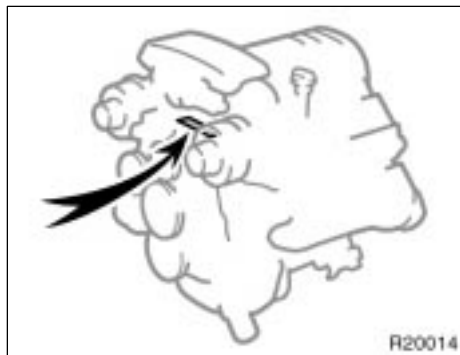
The vehicle identification number (VIN) is also on the Certification Label.

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—Engine number



1GR-FE engine



2UZ-FE engine

The engine number is stamped on the engine block as shown.

Theft prevention labels (except for Canada)

Your new vehicle carries theft prevention labels which are approximately 47 mm (1.85 in.) by 12 mm (0.47 in.).

The purpose of these labels is to reduce the incidence of vehicle thefts by facilitating the tracing and recovery of parts from stolen vehicles. The label is designed so that once it is applied to a surface, any attempt to remove it will result in destroying the integrity of the label. Transferring these labels intact from one part to another, will be impossible.

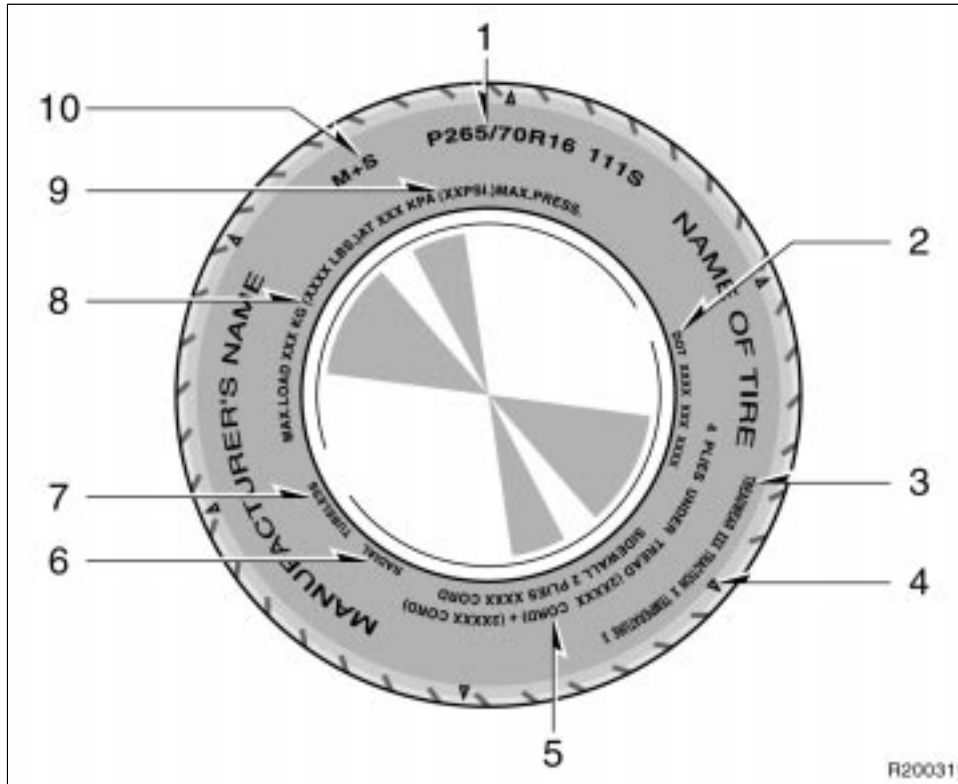
NOTICE

You should not attempt to remove the theft prevention labels as it may violate certain state or federal laws.

Suspension and chassis



**Tire information—
—Tire symbols**

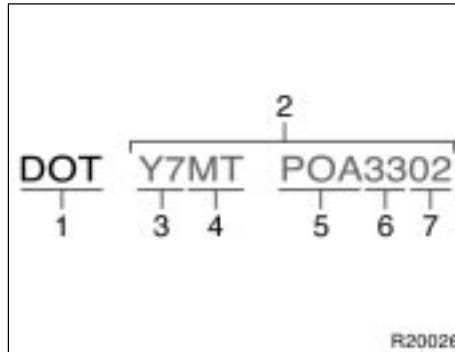


This illustration indicates typical tire symbols.

- 1. Tire size**—For details, see “—Tire size” in this Section.
- 2. DOT and Tire Identification Number (TIN)**—For details, see “—DOT and Tire Identification Number (TIN)” in this Section.
- 3. Uniform tire quality grading**—For details, see “Uniform tire quality grading” that follows
- 4. The location of the tread wear indicators**—For details, see “Checking and replacing tires” in Section 7- 2.
- 5. Tire ply composition and materials**—Plies mean a layer of rubber- coated parallel cords. Cords mean the strands forming the plies in the tire.
- 6. Radial tires or bias- ply tires**—A radial tire has “RADIAL” on the sidewall. A tire not marked with “RADIAL” is a bias- ply tire.

—DOT and Tire Identification Number (TIN)

7. **“TUBELESS” or “TUBE TYPE”**—A tubeless tire does not have a tube inside the tire and air is directly filled in the tire. A tube type tire has a tube inside the tire and the tube maintains the air pressure.
8. **Load limit at maximum cold tire inflation pressure**—For details, see “Checking and replacing tires” in Section 7- 2.
9. **Maximum cold tire inflation pressure**—This means the pressure to which a tire may be inflated. For details about recommended cold tire inflation pressure, see “Tires” in Section 8.
10. **Summer tire or all season tire**—An all season tire has “M+S” on the sidewall. The tire not marked with “M+S” is a summer tire. For details, see “Types of tires” in this Section.

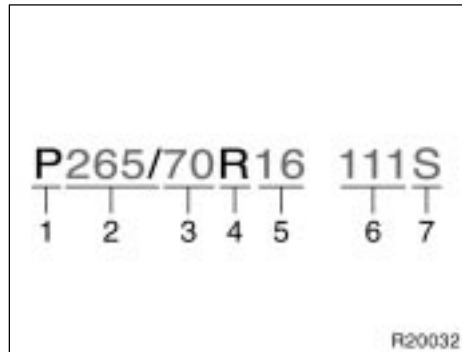


The “DOT” symbol certifies that the tire conforms to applicable Federal Motor Vehicle Safety Standards.

This illustration indicates typical DOT and Tire Identification Number (TIN).

1. “DOT” symbol
2. Tire Identification Number (TIN)
3. Tire manufacturer’s identification mark
4. Tire size code
5. Manufacturer’s optional tire type code
6. Manufacturing week
7. Manufacturing year

—Tire size



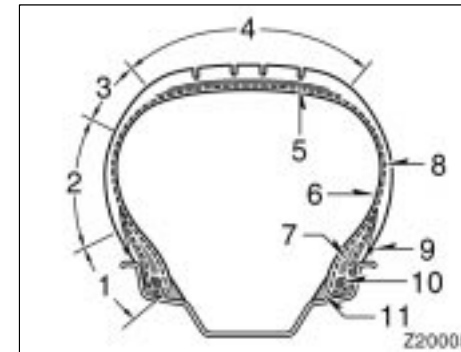
This illustration indicates typical tire size.

1. Tire use (P=Passenger car, T=Temporary use)
2. Section width (in millimeters)
3. Aspect ratio (tire height to section width)
4. Tire construction code (R=Radial, D=Diagonal)
5. Wheel diameter (in inches)
6. Load index (2 digits or 3 digits)
7. Speed symbol (alphabet with one letter)



1. Section width
2. Tire height
3. Wheel diameter

—Name of each section of tire



1. Bead
2. Sidewall
3. Shoulder
4. Tread
5. Belt
6. Inner liner
7. Reinforcing rubber
8. Carcass
9. Rim lines
10. Bead wires
11. Chafer

—Uniform tire quality grading

This information has been prepared in accordance with regulations issued by the National Highway Traffic Safety Administration of the U.S. Department of Transportation. It provides the purchasers and/or prospective purchasers of Toyota vehicles with information on uniform tire quality grading.

Your Toyota dealer will help answer any questions you may have as you read this information.

DOT quality grades—All passenger vehicle tires must conform to Federal Safety Requirements in addition to these grades. Quality grades can be found where applicable on the tire sidewall between tread shoulder and maximum section width. For example: Treadwear 200 Traction AA Temperature A

Treadwear—The treadwear grade is a comparative rating based on the wear rate of the tire when tested under controlled conditions on a specified government test course. For example, a tire graded 150 would wear one and a half (1- 1/2) times as well on the government course as a tire graded 100. The relative performance of tires depends upon the actual conditions of their use, however, and may depart significantly from the norm due to variations in driving habits, service practices and differences in road characteristics and climate.

Traction AA, A, B, C—The traction grades, from highest to lowest, are AA, A, B, and C, and they represent the tire's ability to stop on wet pavement as measured under controlled conditions on specified government test surfaces of asphalt and concrete. A tire marked C may have poor traction performance.

Warning: The traction grade assigned to this tire is based on braking (straight ahead) traction tests and does not include cornering (turning) traction.

Temperature A, B, C—The temperature grades are A (the highest), B, and C, representing the tire's resistance to the generation of heat and its ability to dissipate heat when tested under controlled conditions on a specified indoor laboratory test wheel. Sustained high temperature can cause the material of the tire to degenerate and reduce tire life, and excessive temperature can lead to sudden tire failure. The grade C corresponds to a level of performance which all passenger car tires must meet under the Federal Motor Vehicle Safety Standard No.109. Grades B and A represent higher levels of performance on the laboratory test wheel than the minimum required by law.

Warning: The temperature grades for this tire are established for a tire that is properly inflated and not overloaded. Excessive speed, underinflation, or excessive loading, either separately or in combination, can cause heat buildup and possible tire failure.

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—Glossary of tire terminology

Tire related term	Meaning
Accessory weight	the combined weight (in excess of those standard items which may be replaced) of automatic transmission, power steering, power brakes, power windows, power seats, radio, and heater, to the extent that these items are available as factory-installed equipment (whether installed or not)
Cold tire inflation pressure	tire inflation pressure when the vehicle has been parked for at least 3 hours or more, or it has not been driven more than 1.5 km or 1 mile under that condition
Curb weight	the weight of a motor vehicle with standard equipment including the maximum capacity of fuel, oil, and coolant, and, if so equipped, air conditioning and additional weight optional engine
Intended outboard sidewall	(A) the sidewall that contains a whitewall, bears white lettering or bears manufacturer, brand, and/or model name molding that is higher or deeper than the same molding on the other sidewall of the tire, or (B) the outward facing sidewall of an asymmetrical tire that has a particular side that must always face outward when mounted on a vehicle
Maximum inflation pressure	the maximum cold inflation pressure to which a tire may be inflated and it is shown on the sidewall of the tire
Maximum loaded vehicle weight	the sum of— (a) curb weight; (b) accessory weight; (c) vehicle capacity weight; and (d) production options weight

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Tire related term	Meaning
Normal occupant weight	68 kg (150 lb.) times the number of occupants specified in the second column of Table 1 that follows
Occupant distribution	distribution of occupants in a vehicle as specified in the third column of Table 1 that follows
Production options weight	the combined weight of those installed regular production options weighing over 2.3 kg (5 lb.) in excess of those standard items which they replace, not previously considered in curb weight or accessory weight, including heavy duty brakes, ride levelers, roof rack, heavy duty battery, and special trim
Recommended inflation pressure	cold tire inflation pressure recommended by a manufacturer
Rim	a metal support for a tire or a tire and tube assembly upon which the tire beads are seated
Rim diameter (Wheel diameter)	nominal diameter of the bead seat
Rim size designation	rim diameter and width
Rim type designation	the industry of manufacturer's designation for a rim by style or code
Rim width	nominal distance between rim flanges
Vehicle capacity weight (Total load capacity or payload)	the rated cargo and luggage load plus 68 kg (150 lb.) times the vehicle's designated seating capacity
Vehicle maximum load on the tire	the load on an individual tire that is determined by distributing to each axle its share of the maximum loaded vehicle weight and dividing by two

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Tire related term	Meaning
Vehicle normal load on the tire	the load on an individual tire that is determined by distributing to each axle its share of the curb weight, accessory weight, and normal occupant weight (distributed in accordance with Table 1 that follows) and dividing by two
Weather side	the surface area of the rim not covered by the inflated tire

Table 1—Occupant loading and distribution for vehicle normal load for various designated seating capacities

Designated seating capacity, number of occupants	Vehicle normal load, number of occupants	Occupant distribution in a normally loaded vehicle
2 through 4	2	2 in front
5 through 10	3	2 in front, 1 in second seat

Vehicle load limits

Vehicle load limits include total load capacity, seating capacity, towing capacity and cargo capacity. Follow the load limits shown below.

Total load capacity (payload)

Total load capacity means combined weight of occupants, cargo and luggage. Tongue load is included when trailer towing. For the total load capacity about your vehicle, see "Payload" in Section 8.

Seating capacity:

Standard cab models
Total 3

Access cab and double cab models
Models with bench type front seats:

Total 6 (Front 3, Rear 3)
Models with separate front seats:
Total 5 (Front 2, Rear 3)

Seating capacity means the maximum number of occupants whose estimated average weight is 68 kg (150 lb.) per person. Depending on the weight of each person, the seating capacity given may exceed the total load capacity.

NOTICE

Even if the number of occupants are within the seating capacity, do not exceed the total load capacity.

Towing capacity

Towing capacity means the maximum gross trailer weight (trailer weight plus its cargo weight) that your vehicle is able to tow. For the towing capacity about your vehicle, see "Towing capacity" in Section 8.

Cargo capacity

Cargo capacity may increase or decrease depending on the size (weight) and the number of occupants. For details, see "Capacity and distribution" that follows.

CAUTION

Do not apply the load more than each load limit. That may cause not only damage to the tires, but also deterioration to the steering ability and braking ability, which may cause an accident.

**Cargo and luggage—
—Stowage precautions**

When stowing cargo and luggage in the vehicle, observe the following:

- ▶ Put cargo and luggage in the rear deck when at all possible. Be sure all items are secured in place.
- ▶ Be careful to keep the vehicle balanced. Locating the weight as far forward as possible helps maintain balance.
- ▶ For better fuel economy, do not carry unneeded weight.

 **CAUTION**

- ▶ **To prevent cargo and luggage from sliding forward during braking, do not stack anything behind the front seats higher than the seatbacks (access and double cab models). Keep cargo and luggage low, as close to the floor as possible.**

- ▶ **Never allow anyone to ride in the rear deck or luggage compartment (double cab models only). It is not designed for passengers. They should ride in their seats with their seat belts properly fastened. Otherwise, they are much more likely to suffer serious bodily injury, in the event of sudden braking or a collision.**
- ▶ **Do not drive with objects left on top of the instrument panel. They may interfere with the driver's field of view. Or they may move during sharp vehicle acceleration or turning, and impair the driver's control of the vehicle. In an accident they may injure the vehicle occupants.**

—Capacity and distribution

Cargo capacity depends on the total weight of the occupants.

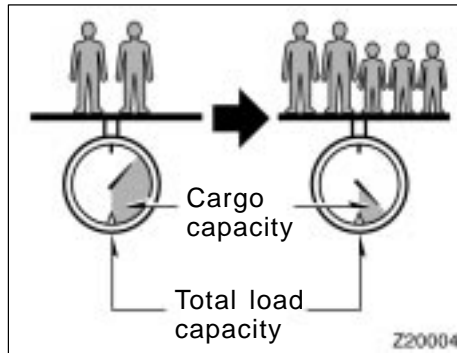
(Cargo capacity) = (Total load capacity) – (Total weight of occupants)

**STEPS FOR DETERMINING
CORRECT LOAD LIMIT**

1. Locate the statement “The combined weight of occupants and cargo should never exceed XXX pounds” on your vehicle’s placard.
2. Determine the combined weight of the driver and passengers that will be riding in your vehicle.
3. Subtract the combined weight of the driver and passengers from XXX kilograms or XXX pounds.
4. The resulting figure equals the available amount of cargo and luggage load capacity. For example, if the “XXX” amount equals 1400 lbs. and there will be five 150 lb. passengers in your vehicle, the amount of available cargo and luggage load capacity is 650 lbs. (1400–750 (5x150)=650 lbs).

5. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity calculated in Step 4.
6. If your vehicle will be towing a trailer, load from your trailer will be transferred to your vehicle. Consult this manual to determine how this reduces the available cargo and luggage load capacity of your vehicle.

For details about trailer towing, see "Trailer towing" in Section 3.



EXAMPLE ON YOUR VEHICLE

In case that 2 people with the combined weight of A kg (lb.) are riding in your vehicle with the total load capacity of B kg (lb.), the available amount of cargo and luggage load capacity will be C kg (lb.) as follows:

$$B \text{ kg (lb.)} - A \text{ kg (lb.)} = C \text{ kg (lb.)}$$

From this condition, if 3 more passengers with the combined weight of D kg (lb.) get on, the available cargo and luggage load will be reduced E kg (lb.) as follows:

$$C \text{ kg (lb.)} - D \text{ kg (lb.)} = E \text{ kg (lb.)}$$

As shown in the above example, if the number of occupants increases, the cargo and luggage load equaling the combined weight of occupants who got on later must be reduced. In other words, if the increase in the number of occupants causes the excess of the total load capacity (combined weight of occupants plus cargo and luggage load), you have to reduce the cargo and luggage on your vehicle.

For details about total load capacity, see "Vehicle load limits" in this Section.

CAUTION

Even if the total load of occupant's weight and the cargo load is less than the total load capacity, do not apply the load unevenly. That may cause not only damage to the tire but also deterioration to the steering ability due to unbalance of the vehicle, causing an accident.

Types of tires

Determine what kind of tires your vehicle is originally equipped with.

1. Summer tires

Summer tires are high- speed capability tires best suited to highway driving under dry conditions.

Since summer tires do not have the same traction performance as snow tires, summer tires are inadequate for driving on snow- covered or icy roads. For driving on snow- covered or icy roads, we recommend using snow tires. If installing snow tires, be sure to replace all four tires.

2. All season tires

All season tires are designed to provide better traction in snow and to be adequate for driving in most winter conditions, as well as for use all year round.

All season tires, however, do not have adequate traction performance compared with snow tires in heavy or loose snow. Also, all season tires fall short in acceleration and handling performance compared with summer tires in highway driving.

The details about how to distinguish summer tires from all season tires are described “—Tire symbols” in Section 2.

CAUTION

- ▶ **Do not mix summer and all season tires on your vehicle as this can cause dangerous handling characteristics, resulting in loss of control.**
- ▶ **Do not use tires other than the manufacturer's designated tires, and never mix tires or wheels of the sizes different from the originals.**

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SECTION 3

STARTING AND DRIVING

Starting and driving

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Before starting the engine

1. Check the area around the vehicle before entering it.
2. Adjust seat position, seatback angle, seat cushion angle, head restraint height and steering wheel angle.
3. Adjust the inside and outside rear view mirrors.
4. Lock all doors.
5. Fasten seat belts.

How to start the engine— —Cranking hold function (with automatic transmission)

Once you turn the ignition key to "START" position and release it, the cranking hold function continues to crank the engine in "ON" position until it starts.

The function stops cranking the engine after about 25 seconds maximum if the engine has not started yet. When you crank the engine again, wait a few seconds and restart it.

If you hold the key in "START" position, the function will keep cranking for about 30 seconds maximum.

(a) Before cranking

1. Apply the parking brake firmly.
2. Turn off unnecessary lights and accessories.
3. **Manual transmission:** Press the clutch pedal to the floor and shift the transmission into neutral. Hold the clutch pedal to the floor until the engine is started. A starter safety device will prevent the starter from operating if the clutch pedal is not fully depressed.
Automatic transmission: Put the selector lever in "P". If you need to restart the engine while the vehicle is moving, put the selector lever in "N". A starter safety device will prevent the starter from operating if the selector lever is in any drive position.
4. **Automatic transmission only:** Depress the brake pedal and hold it to the floor until driving off.

(b) Starting the engine

Before starting the engine, be sure to follow the instructions in "(a) Before cranking".

Normal starting procedure

The multiport fuel injection system/sequential multiport fuel injection system in your engine automatically controls the proper air-fuel mixture for starting. You can start a cold or hot engine as follows:

With manual transmission—With your foot off the accelerator pedal, crank the engine by turning the ignition key to "START" position. Release it when the engine starts.

With automatic transmission—With your foot off the accelerator pedal, turn the ignition key to "START" position, then release it.

Engine should be warmed up by driving, not in idle. For warming up, drive with smoothly turning engine until engine coolant temperature is within normal range.

If the engine stalls...

Simply restart it, using the correct procedure given in normal starting.

If the engine will not start...

See "If your vehicle will not start" in Section 4.

NOTICE

◆ *With manual transmission only—Do not crank for more than 30 seconds at a time. This may overheat the starter and wiring systems.*

◆ *Do not race a cold engine.*


◆ *If the engine becomes difficult to start or stalls frequently, have the engine checked immediately.*

Tips for driving in various conditions

- ▶ Always slow down in gusty crosswinds. This will allow you much better control.
- ▶ Drive slowly onto curbs and, if possible, at a right angle. Avoid driving onto high, sharp-edged objects and other road hazards. Failure to do so can lead to severe tire damage such as a tire burst.

Drive slowly when passing over bumps or travelling on a bumpy road. Otherwise, the impact could cause severe damage to the tires and/or wheels.
- ▶ When parking on a hill, turn the front wheels until they touch the curb so that the vehicle will not roll. Apply the parking brake, and place the transmission in "P" (automatic) or in first or reverse (manual). If necessary, block the wheels.

- ▶ Washing your vehicle or driving through deep water may get the brakes wet. To see whether they are wet, check that there is no traffic near you, and then press the pedal lightly. If you do not feel a normal braking force, the brakes are probably wet. To dry them, drive the vehicle cautiously while lightly pressing the brake pedal with the parking brake applied. If they still do not work safely, pull to the side of the road and call a Toyota dealer for assistance.
- ▶ Four-wheel drive models only—Toyota recommends not using four-wheel drive on dry hard-surfaced roads, because four-wheel driving will cause unnecessary noise and wear, and poor fuel economy.
- ▶ Four-wheel drive models only—In cold temperatures, noise may occur when driving in two-wheel drive before the transfer is warmed up. Therefore, first drive in four-wheel drive until the transfer is warmed up.

 **CAUTION**

- ▶ Before driving off, make sure that the parking brake is fully released and the parking brake reminder light is off.
- ▶ Do not leave your vehicle unattended while the engine is running.
- ▶ Do not rest your foot on the brake pedal while driving. It can cause dangerous overheating, needless wear, and poor fuel economy.
- ▶ To drive down a long or steep hill, reduce your speed and downshift. Remember, if you ride the brakes excessively, they may overheat and not work properly.
- ▶ Be careful when accelerating, upshifting, downshifting or braking on a slippery surface. Sudden acceleration or engine braking could cause the vehicle to skid or spin.

- ▶ Do not drive in excess of the speed limit. Even if the legal speed limit permits it, do not drive over 140 km/h (85 mph) unless your vehicle has high-speed capability tires. Driving over 140 km/h (85 mph) may result in tire failure, loss of control and possible injury. Be sure to consult a tire dealer to determine whether the tires on your vehicle are high-speed capability tires or not before driving at such speeds.
- ▶ Do not continue normal driving when the brakes are wet. If they are wet, your vehicle will require a longer stopping distance, and it may pull to one side when the brakes are applied. Also, the parking brake will not hold the vehicle securely.

Off-road driving precautions

When driving your vehicle off-road, please observe the following precautions to ensure your driving enjoyment and to help prevent the closure of areas to off-road vehicles.


- a. Drive your vehicle only in areas where off-road vehicles are permitted to travel.
- b. Respect private property. Get owner's permission before entering private property.
- c. Do not enter areas that are closed. Honor gates, barriers and signs that restrict travel.
- d. Stay on established roads. When conditions are wet, driving techniques should be changed or travel delayed to prevent damage to roads.

For owners in U.S. mainland, Hawaii and Puerto Rico:

To obtain additional information pertaining to driving your vehicle off-road, consult the following organizations.

- ▶ State and Local Parks and Recreation Departments
- ▶ State Motor Vehicle Bureau
- ▶ Recreational Vehicle Clubs

- ▶ U.S. Forest Service and Bureau of Land Management

 **CAUTION**

Always observe the following precautions to minimize the risk of serious personal injury or damage to your vehicle:

- ▶ Drive carefully when off the road. Do not take unnecessary risks by driving in dangerous places.
- ▶ Do not grip the steering wheel spokes when driving off-road. A bad bump could jerk the wheel and injure your hands. Keep both hands and especially your thumbs on the outside of the rim.
- ▶ Always check your brakes for effectiveness immediately after driving in sand, mud, water or snow.

- ▶ After driving through tall grass, mud, rock, sand, rivers, etc., check that there is no grass, bush, paper, rags, stone, sand, etc. adhering or trapped on the underbody. Clear off any such matter from the underbody. If the vehicle is used with these materials trapped or adhering to the underbody, a breakdown or fire could occur.
 - ▶ In a rollover crash, an unbelted person is significantly more likely to die than a person wearing a seat belt. Therefore, the driver and all passengers should fasten their seat belts whenever the vehicle is moving.
 - ▶ When driving off-road or in rugged terrain, do not drive at excessive speeds, jump, make sharp turns, strike objects, etc. This may cause loss of control or vehicle rollover causing death or serious injury. You are also risking expensive damage to your vehicle's suspension and chassis.

NOTICE

- ◆ *If driving through water, such as when crossing shallow streams, first check the depth of the water and the bottom of the river bed for firmness. Drive slowly and avoid deep water.*
- ◆ *Take all necessary safety measures to ensure that water damage to the engine or other components does not occur.*

Water entering the engine air intake will cause severe engine damage.

Water can wash the grease from wheel bearings, causing rusting and premature failure, and may also enter the differentials, transmission and transfer case, reducing the gear oil's lubricating qualities.
- ◆ *Sand and mud that has accumulated in brake drums and around brake discs may affect braking efficiency and may damage brake system components.*

◆ *Always perform a maintenance inspection after each day of off-road driving that has taken you through rough terrain, sand, mud, or water. For scheduled maintenance information, refer to the "Scheduled Maintenance Guide" or "Owner's Manual Supplement".*

Winter driving tips

Make sure your coolant is properly protected against freezing.

Only use "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology. (Coolant with long-life hybrid organic acid technology is a combination of low phosphates and organic acids.)

See "Checking the engine coolant level" in Section 7-2 for details of coolant type selection.

For the U.S.A.—"Toyota Super Long Life Coolant" is a mixture of 50% coolant and 50% deionized water. This coolant provides protection down to about -35◄ (-31◄).

For Canada—"Toyota Super Long Life Coolant" is a mixture of 55% coolant and 45% deionized water. This coolant provides protection down to about -42◄ (-44◄).

NOTICE

Do not use plain water alone.

Check the condition of the battery and cables.

Cold temperatures reduce the capacity of any battery, so it must be in top shape to provide enough power for winter starting. Section 7-3 tells you how to visually inspect the battery. Your Toyota dealer and most service stations will be pleased to check the level of charge.

Make sure the engine oil viscosity is suitable for the cold weather.

See Section 7-2 for recommended viscosity. Leaving a heavy summer oil in your vehicle during winter months may cause harder starting. If you are not sure about which oil to use, call your Toyota dealer—they will be pleased to help.

Keep the door locks from freezing.

Squirt lock de-icer or glycerine into the locks to keep them from freezing. To open a frozen lock, try heating the key before inserting it.

Use a washer fluid containing an anti-freeze solution.

This product is available at your Toyota dealer and most auto parts stores. Follow the manufacturer's directions for how much to mix with water.

NOTICE

Do not use engine antifreeze or any other substitute because it may damage your vehicle's paint.

Do not use your parking brake when there is a possibility it could freeze.

When parking, put the transmission into "P" (automatic) or into first or reverse (manual) and block the front wheels. Do not use the parking brake, or snow or water accumulated in and around the parking brake mechanism may freeze, making it hard to release.

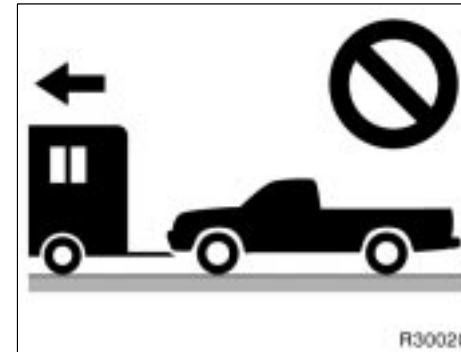
Keep ice and snow from accumulating under the fenders.

Ice and snow built up under your fenders can make steering difficult. During bad winter driving, stop and check under the fenders occasionally.

Depending on where you are driving, we recommend you carry some emergency equipment.

Some of the things you might put in the vehicle are tire chains, window scraper, bag of sand or salt, flares, small shovel, jumper cables, etc.

Dinghy towing



Your vehicle is not designed to be dinghy towed (with four wheels on the ground) behind a motorhome.

NOTICE

Do not tow your vehicle with four wheels on the ground. This may cause serious damage to your vehicle.

Trailer towing

Your vehicle is designed primarily as a passenger- and load-carrying vehicle. Towing a trailer will have an adverse effect on handling, performance, braking, durability and driving economy (fuel consumption, etc.). Your safety and satisfaction depend on the proper use of correct equipment and cautious driving habits. For your safety and the safety of others, you must not overload your vehicle or trailer. Ask your local Toyota dealer for further details before towing.

We recommend you use a weight distributing hitch when towing to keep your vehicle level with the ground.

NOTICE

When towing a trailer, be sure to consult your Toyota dealer for further information on additional requirements such as a towing kit, etc.

WEIGHT LIMITS

Before towing, make sure the total trailer weight, gross combination weight, gross vehicle weight, gross axle weight and trailer tongue load are all within the limits.

The total trailer weight and tongue load can be measured with platform scales found at highway weighing stations, building supply companies, trucking companies, junk yards, etc.

CAUTION

▶ **The maximum gross trailer weight (trailer weight plus cargo weight) must never exceed the following.**

1GR-FE engine

Standard cab models
2358 kg (5200 lb.)
Access cab models
2268 kg (5000 lb.)

2UZ-FE engine

Two-wheel drive models

Standard cab models

Without towing package
2494 kg (5500 lb.)

With towing package
3311 kg (7300 lb.)

Access cab models

Without towing package
2494 kg (5500 lb.)

With towing package
3311 kg (7300 lb.)

Double cab models

Without towing package
2358 kg (5200 lb.)

With towing package
3175 kg (7000 lb.)

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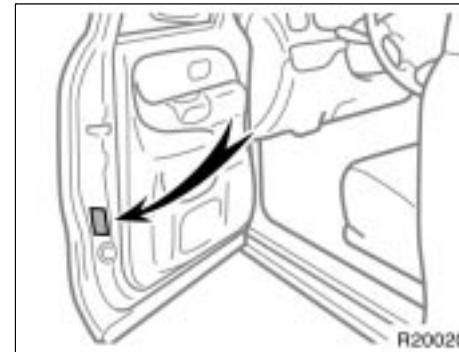
Four-wheel drive models	
Standard cab models	
Without towing package	2494 kg (5500 lb.)
With towing package	3311 kg (7300 lb.)
Access cab models	
Without towing package	2358 kg (5200 lb.)
With towing package	3175 kg (7000 lb.)
Double cab models	
Without towing package	2222 kg (4900 lb.)
With towing package	3039 kg (6700 lb.)

If towing a trailer and cargo weighing over 907 kg (2000 lb.), it is necessary to use a sway control device with sufficient capacity. The combination of the gross trailer weight added to the total weight of the vehicle, occupants and vehicle cargo must never exceed a total of the following.

1GR-FE engine
4173 kg (9200 lb.)

2UZ-FE engine
Without towing package
4536 kg (10000 lb.)
With towing package
5352 kg (11800 lb.)

Exceeding the maximum weight of the trailer, the vehicle, or the vehicle and trailer combination, can cause an accident resulting in serious personal injuries.

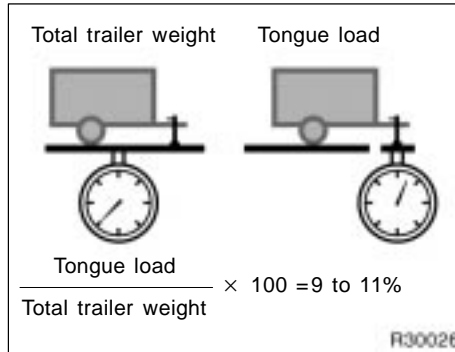


► Trailer hitch assemblies have different weight capacities established by the hitch manufacturer. Even though the vehicle may be physically capable of towing a higher weight, the operator must determine the maximum weight rating of the particular hitch assembly and never exceed the maximum weight rating specified for the trailer-hitch. Exceeding the maximum weight rating set by the trailer hitch manufacturer can cause an accident resulting in serious personal injuries.

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► The gross vehicle weight must not exceed the Gross Vehicle Weight Rating (GVWR) indicated on the Certification Label. The gross vehicle weight is the sum of weights of the unloaded vehicle, driver, passengers, luggage, hitch and trailer tongue load. It also includes the weight of any special equipment installed on your vehicle.

► The load on either the front or rear axle resulting from distribution of the gross vehicle weight on both axles must not exceed the Gross Axle Weight Rating (GAWR) listed on the Certification Label.



► The trailer cargo load should be distributed so that the tongue load is 9 to 11% of the total trailer weight, not exceeding the maximum load of the following.

Weight carrying hitch or distributing hitch

1GR-FE engine

Standard cab models

236 kg (520 lb.)

Access cab models

227 kg (500 lb.)

2UZ-FE engine

Two-wheel drive models

Standard cab models

Without towing package

249 kg (550 lb.)

With towing package

331 kg (730 lb.)

Access cab models

Without towing package

249 kg (550 lb.)

With towing package

331 kg (730 lb.)

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Double cab models

Without towing package
236 kg (520 lb.)

With towing package
318 kg (700 lb.)

Four-wheel drive models

Standard cab models

Without towing package
249 kg (550 lb.)

With towing package
331 kg (730 lb.)

Access cab models

Without towing package
236 kg (520 lb.)

With towing package
318 kg (700 lb.)

Double cab models

Without towing package
222 kg (490 lb.)

With towing package
304 kg (670 lb.)

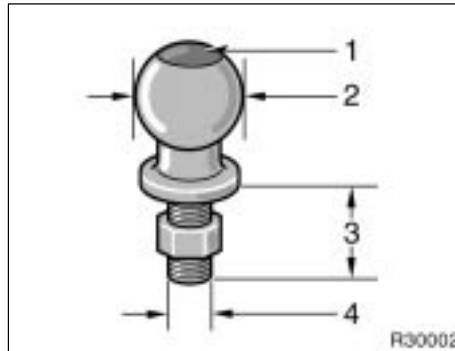
However, if towing with a fifth wheel trailer, the cargo load must be distributed so that the tongue load is 19 to 21% of the total trailer weight. Never load the trailer with more weight in the back than in the front. About 60% of the trailer load should be in the front half of the trailer and the remaining 40% in the rear.

HITCHES

- ▶ If you wish to install a trailer hitch, you should consult with your Toyota dealer.
- ▶ Use only a hitch recommended by the hitch manufacturer and the one which conforms to the total trailer weight requirement.
- ▶ The hitch must be bolted securely to the vehicle frame and installed according to the hitch manufacturer's instructions.
- ▶ The hitch ball and king pin should have a light coat of grease.
- ▶ Toyota recommends removing the trailer hitch whenever you are not towing a trailer to reduce the possibility of additional damage caused by the hitch if your vehicle is struck from behind. After removing the hitch, seal any mounting holes in the vehicle body to prevent entry of pollutants such as exhaust fumes, dirt, water, etc.

NOTICE

Do not use axle-mounted hitches as they can cause damage to the axle housing, wheel bearings, wheels or tires. Also, never install a hitch which may interfere with the normal function of an Energy Absorbing Bumper, if so equipped.



- 1 Trailer ball load rating
- 2 Ball diameter
- 3 Shank length
- 4 Shank diameter

TRAILER BALL

Follow these easy steps to properly determine the correct trailer ball for your application:

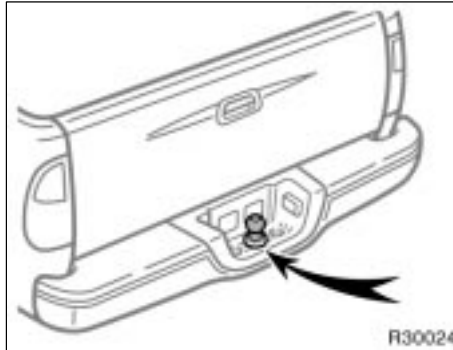
1. Determine the correct trailer ball size for the trailer coupler. Most couplers are stamped with the required trailer ball size. The sizes you will most likely find stamped on the coupler are:

Trailer class	Typical trailer ball size
IV	2 5/16 in.
II and III	2 in.
I	1 7/8 in.

2. Select the appropriate trailer ball to match or exceed the gross trailer weight rating of the trailer. The trailer ball load rating should be printed on the top of the ball.
3. When mounted in the ball mount, the threaded ball shank must protrude beyond the bottom of the lock washer and nut at least 2 threads. The trailer ball shank must be matched to the ball mount hole diameter size.

NOTICE

Vehicles with 2UZ-FE engine (with towing package)—Only use a ball mount attachment specified for the Toyota Tundra.



BUMPER TOWING

The rear bumper of your vehicle is equipped with a hole to install a trailer ball. The maximum gross trailer weight is 2268 kg (5000 lb.).

! CAUTION

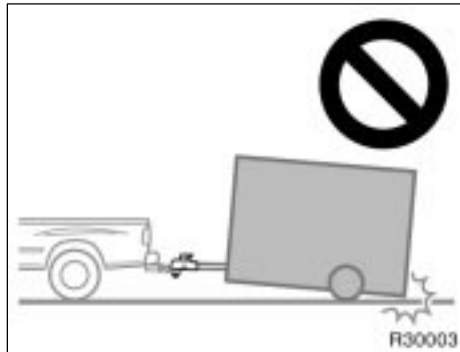
The maximum gross trailer weight (trailer weight plus cargo weight) when towing with the bumper must never exceed 2268 kg (5000 lb.).



FIFTH WHEEL TRAILER

NOTICE

When towing a fifth wheel trailer, be careful not to hit the cabin or deck by the trailer while making a sharp turn.

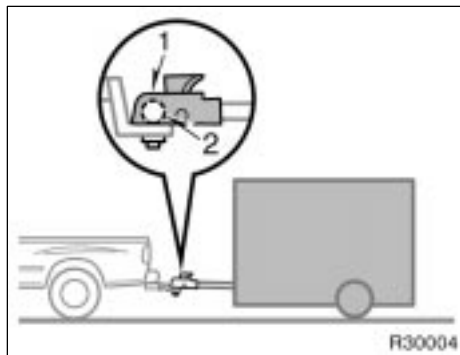


MATCHING TRAILER BALL HEIGHT TO TRAILER COUPLER HEIGHT

No matter which class of tow hitch applies, for a safe trailer hookup, the trailer ball setup on must be the proper height for the coupler on the trailer.

BRAKES AND SAFETY CHAINS

- ▶ Toyota recommends trailers with brakes that conform to any applicable federal and state/provincial regulations.
- ▶ A safety chain must always be used between the towing vehicle and the trailer. Leave sufficient slack in the chain for turns. The chain should cross under the trailer tongue to prevent the tongue from dropping to the ground in case it becomes damaged or separated. For correct safety chain procedures, follow the hitch or trailer manufacturer's recommendations.

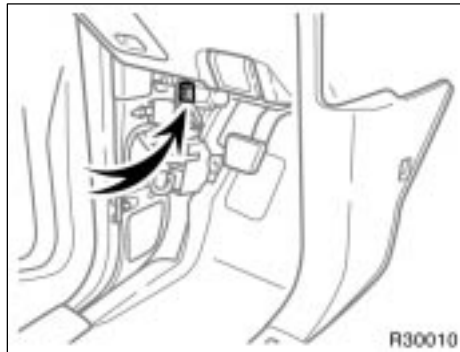


- 1 Coupler
- 2 Trailer ball

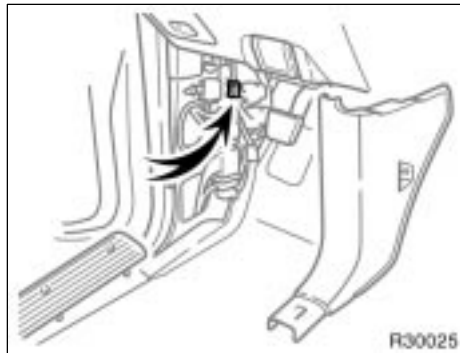
CAUTION

- ▶ If the total trailer weight exceeds 453 kg (1000 lb.), trailer brakes are required.
- ▶ Never tap into your vehicle's hydraulic system as it would lower its braking effectiveness.
- ▶ Never tow a trailer without using a safety chain securely attached to both the trailer and the vehicle. If damage occurs to the coupling unit or hitch ball, there is danger of the trailer wandering over into another lane.

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Standard and access cab models



Double cab models

SERVICE CONNECTOR FOR TOWING BRAKE CONTROLLER (with towing package)

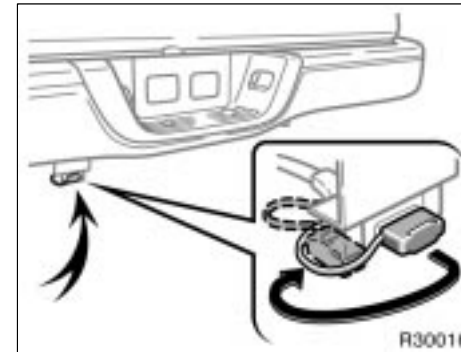
Your vehicle is equipped with a service connector for the trailer brake controller as shown. Link the connector to the trailer brake controller via the sub wire harness stored in the glove box. The detailed explanation of the sub wire harness circuit is packed together with the sub wire harness.

Be sure to position the trailer brake controller where it does not prevent the driver from operating the pedal.

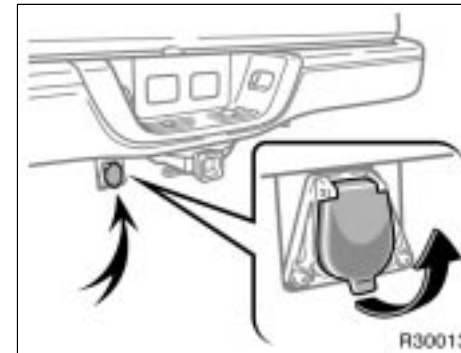
Toyota recommends that the sub wire harness be stored in the glove box when it is not in use.

TIRES

- ▶ Ensure that your vehicle's tires are properly inflated. See Section 7-2 and Section 8 for instructions.
- ▶ The trailer tires should be inflated to the pressure recommended by the trailer manufacturer in respect to the total trailer weight.



4-pin connector



7-pin connector

TOWING CONNECTOR FOR TRAILER LIGHTS

- ▶ Your vehicle is equipped with a wire harness stored in the rear end under body. Some models are fitted with a socket for trailer lights under the rear bumper. Use either of them to connect and operate the trailer lights. However, the trailer lights must comply with federal, state/provincial and local regulations. See your local recreational vehicle dealer or rental agency for the correct type of wiring and relays for your trailer. Check for correct operation of the turn signals and stop lights each time you hitch up. Direct splicing may damage your vehicle's electrical system and cause a malfunction of your lights. 7-pin connector (with towing package)—This can be also connected to the trailer brake and trailer sub battery.

BREAK-IN SCHEDULE

- ▶ Toyota recommends that you do not tow a trailer with a new vehicle or a vehicle with any new power train component (engine, transmission, differential, wheel bearings, etc.) for the first 800 km (500 miles) of driving.

MAINTENANCE

- ▶ If you tow a trailer, your vehicle will require more frequent maintenance due to the additional load. For this information, please refer to the scheduled maintenance information in the "Scheduled Maintenance Guide" or "Owner's Manual Supplement".
- ▶ Retighten all fixing bolts of the towing ball and bracket after approximately 1000 km (600 miles) of trailer driving.

PRE-TOWING SAFETY CHECK

- ▶ Check that your vehicle remains level when a loaded or unloaded trailer is hitched. Do not drive if the vehicle has an abnormal nose-up or nose-down condition, and check for improper tongue load, overload, worn suspension or other possible causes.
- ▶ Make sure the trailer cargo is securely loaded so that it cannot shift.

- ▶ Check that your rear view mirrors conform to any applicable federal, state/provincial or local regulations. If not, install the rear view mirrors required for towing purposes.

TRAILER TOWING TIPS

When towing a trailer, your vehicle will handle differently than when not towing. The three main causes of vehicle-trailer accidents are driver error, excessive speed and improper trailer loading. Keep these in mind when towing:

- ▶ Before starting out, check operation of the lights and all vehicle-trailer connections. After driving a short distance, stop and recheck the lights and connections. Before actually towing a trailer, practice turning, stopping and backing with a trailer in an area away from traffic until you learn the feel.

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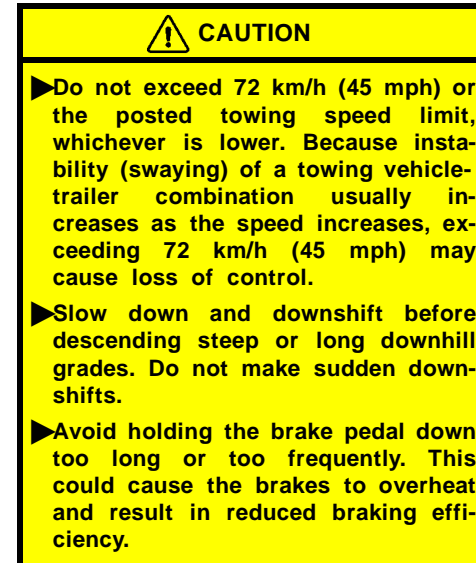
- ▶ Backing with a trailer is difficult and requires practice. Grip the bottom of the steering wheel and move your hand to the left to move the trailer to the left. Move your hand to the right to move the trailer to the right. (This procedure is generally opposite to that when backing without a trailer). Also, just turn the steering wheel a little at a time, avoiding sharp or prolonged turning. Have someone guide you when backing to reduce the risk of an accident.
- ▶ Because stopping distance may be increased, vehicle-to-vehicle distance should be increased when towing a trailer. For each 16 km/h (10 mph) of speed, allow at least one vehicle and trailer length between you and the vehicle ahead. Avoid sudden braking as you may skid, resulting in jackknifing and loss of control. This is especially true on wet or slippery surfaces.
- ▶ Avoid jerky starts or sudden acceleration. If your vehicle has a manual transmission, prevent excessive clutch slippage by keeping engine rpm low and not racing the engine. Always start out in first gear.
- ▶ Avoid jerky steering and sharp turns. The trailer could hit your vehicle in a tight turn. Slow down before making a turn to avoid the necessity of sudden braking.
- ▶ Remember that when making a turn, the trailer wheels will be closer than the vehicle wheels to the inside of the turn. Therefore, compensate for this by making a larger than normal turning radius with your vehicle.
- ▶ Crosswinds and rough roads will adversely affect handling of your vehicle and trailer, causing sway. Pay attention to the rear from time to time to prepare yourself for being passed by large trucks or buses, which may cause your vehicle and trailer to sway. If swaying happens, firmly grip the steering wheel and reduce speed immediately but gradually. Never increase speed. Steer straight ahead. If you make no extreme correction with the steering or brakes, the vehicle and trailer will stabilize.
- ▶ Be careful when passing other vehicles. Passing requires considerable distance. After passing a vehicle, do not forget the length of your trailer and be sure you have plenty of room before changing lanes.
- ▶ In order to maintain engine braking efficiency, do not use sixth gear (manual transmission) or overdrive (automatic transmission).
- ▶ Because of the added load of the trailer, your vehicle's engine may overheat on hot days (at temperatures over 30°C [85°F]) when going up a long or steep grade with a trailer. If the engine coolant temperature gauge indicates overheating, immediately turn off the air conditioning (if in use), pull off the road and stop in a safe spot. Refer to "If your vehicle overheats" in Section 4.

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- Always place wheel blocks under both the vehicle and trailer wheels when parking. Apply the parking brake firmly. Put the transmission in "P" (automatic) or in first or reverse (manual). Avoid parking on a slope with a trailer, but if it cannot be avoided, do so only after performing the following:
1. Apply the brakes and hold.
 2. Have someone place wheel blocks under both the vehicle and trailer wheels.
 3. When the wheel blocks are in place, release your brakes slowly until the blocks absorb the load.
 4. Apply the parking brake firmly.
 5. Shift into first or reverse (manual) or "P" (automatic) and turn off the engine.

When restarting out after parking on a slope:

1. With the transmission in "P" position (automatic) or the clutch pedal depressed (manual), start the engine. (With an automatic transmission, be sure to keep the brake pedal depressed.)
2. Shift into gear.
3. Release the parking brake (also foot brake on automatic transmission vehicles) and slowly pull or back away from the wheel blocks. Stop and apply your brakes.
4. Have someone retrieve the blocks.



How to save fuel and make your vehicle last longer

Improving fuel economy is easy—just take it easy. It will help make your vehicle last longer, too. Here are some specific tips on how to save money on both fuel and repairs:

- ▶ **Keep your tires inflated at the correct pressure.** Underinflation causes tire wear and wastes fuel. See Section 7-2 for instructions.
- ▶ **Do not carry unneeded weight in your vehicle.** Excess weight puts a heavier load on the engine, causing greater fuel consumption.
- ▶ **Avoid lengthy warm-up idling.** Once the engine is running smoothly, begin driving—but gently. Remember, however, that on cold winter days this may take a little longer.
- ▶ **Always keep the automatic transmission overdrive switch turned on.** Driving with the overdrive switch off will reduce the fuel economy. (For details, see “Automatic transmission” in Section 1-7.)
- ▶ **Accelerate slowly and smoothly.** Avoid jackrabbit starts. Get into high gear as quickly as possible.
- ▶ **Avoid long engine idling.** If you have a long wait and you are not in traffic, it is better to turn off the engine and start again later.
- ▶ **Avoid engine lugging or over-revving.** Use a gear position suitable for the road on which you are travelling.
- ▶ **Avoid continuous speeding up and slowing down.** Stop-and-go driving wastes fuel.
- ▶ **Avoid unnecessary stopping and braking.** Maintain a steady pace. Try to time the traffic signals so you only need to stop as little as possible or take advantage of through streets to avoid traffic lights. Keep a proper distance from other vehicles to avoid sudden braking. This will also reduce wear on your brakes.
- ▶ **Avoid heavy traffic or traffic jams whenever possible.**
- ▶ **Do not rest your foot on the clutch or brake pedal.** This causes premature wear, overheating and poor fuel economy.
- ▶ **Maintain a moderate speed on highways.** The faster you drive, the greater the fuel consumption. By reducing your speed, you will cut down on fuel consumption.
- ▶ **Keep the front wheels in proper alignment.** Avoid hitting the curb and slow down on rough roads. Improper alignment not only causes faster tire wear but also puts an extra load on the engine, which, in turn, wastes fuel.
- ▶ **Keep the bottom of your vehicle free from mud, etc.** This not only lessens weight but also helps prevent corrosion.
- ▶ **Keep your vehicle tuned-up and in top shape.** A dirty air cleaner, improper valve clearance, dirty plugs, dirty oil and grease, brakes not adjusted, etc. all lower engine performance and contribute to poor fuel economy. For longer life of all parts and lower operating costs, keep all maintenance work on schedule, and if you often drive under severe conditions, see that your vehicle receives more frequent maintenance. (For scheduled maintenance information, please refer to the “Scheduled Maintenance Guide” or “Owner’s Manual Supplement”.)



CAUTION

Never turn off the engine to coast down hills. Your power steering and brake booster will not function without the engine running. Also, the emission control system operates properly only when the engine is running.

SECTION 4

IN CASE OF AN EMERGENCY

In case of an emergency

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**If your vehicle will not start—
(a) Simple checks**

Before making these checks, make sure you have followed the correct starting procedure given in "How to start the engine" in Section 3 and that you have sufficient fuel.

If the engine is not turning over or is turning over too slowly—

1. Check that the battery terminals are tight and clean.
2. If the battery terminals are O.K., switch on the interior light.
3. If the light is out, dim or goes out when the starter is cranked, the battery is discharged. You may try jump starting. See "(c) Jump starting" for further instructions.

If the light is O.K., but the engine still will not start, it needs adjustment or repair. Call a Toyota dealer or qualified repair shop.

NOTICE

Do not pull- or push-start the vehicle. Your vehicle may suddenly move when the engine starts, and may damage itself or cause a collision. Also the three-way catalytic converter may overheat and become a fire hazard.

If the engine turns over at its normal speed but will not start—

1. Turn the ignition key to "ACC" or "LOCK" and try starting the engine again.
2. If the engine will not start, the engine may be flooded because of repeated cranking. See "(b) Starting a flooded engine" for further instructions.
3. If the engine still will not start, it needs adjustment or repair. Call a Toyota dealer or qualified repair shop.

(b) Starting a flooded engine

If the engine will not start, your engine may be flooded because of repeated cranking.

With manual transmission—

If this happens, turn the ignition key to "START" with the accelerator pedal fully depressed. Keep the key and accelerator pedal in these positions for 15 seconds and release them. Then try starting the engine with your foot off the accelerator pedal.

If the engine does not start after 15 seconds of cranking, release the key, wait a few minutes and try again.

If the engine still will not start, it needs adjustment or repair. Call a Toyota dealer or qualified repair shop for assistance.

NOTICE

Do not crank for more than 30 seconds at a time. This may overheat the starter and wiring systems.

With automatic transmission—

If this happens, turn the ignition key to "START" with the accelerator pedal fully depressed, and hold the key at this position for about 30 seconds. Then the cranking hold function stops cranking automatically, and you can try starting the engine with your foot off the accelerator pedal.


If the engine does not start, wait a few minutes and try again.

If the engine still will not start, it needs adjustment or repair. Call a Toyota dealer or qualified repair shop for assistance.

(c) Jump starting

To avoid serious personal injury and damage to your vehicle which might result from battery explosion, acid burns, electrical burns, or damaged electronic components, these instructions must be followed precisely.

If you are unsure about how to follow this procedure, we strongly recommend that you seek the help of a competent mechanic or towing service.

 CAUTION
<p>▶ Batteries contain sulfuric acid which is poisonous and corrosive. Wear protective safety glasses when jump starting, and avoid spilling acid on your skin, clothing, or vehicle.</p> <p>▶ If you should accidentally get acid on yourself or in your eyes, remove any contaminated clothing and flush the affected area with water immediately. Then get immediate medical attention. If possible, continue to apply water with a sponge or cloth while en route to the medical office.</p>

▶ **The gas normally produced by a battery will explode if a flame or spark is brought near. Use only standardized jumper cables and do not smoke or light a match while jump starting.**

NOTICE
<p><i>The battery used for boosting must be 12 V. Do not jump start unless you are sure that the booster battery is correct.</i></p>

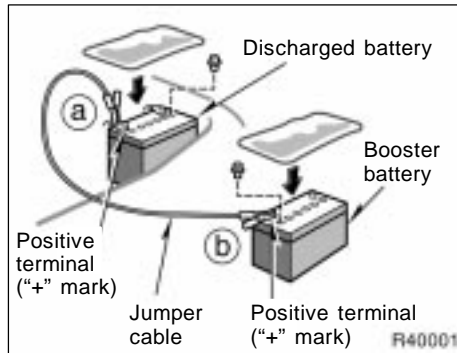
JUMP STARTING PROCEDURE

1. If the booster battery is installed in another vehicle, make sure the vehicles are not touching. Turn off all unnecessary lights and accessories.

When boosting, use the battery of matching or higher quality. Any other battery may be difficult to jump start with.

If jump starting is difficult, charge the battery for several minutes.

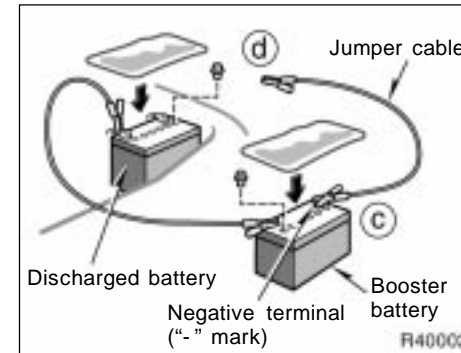
2. If required, remove all the vent plugs from the booster and discharged batteries. Lay a cloth over the open vents on the batteries. (This helps reduce the explosion hazard, personal injuries and burns.)
3. If the engine in the vehicle with the booster battery is not running, start it and let it run for a few minutes. During jump starting, run the engine at about 2000 rpm with the accelerator pedal lightly depressed.



4. Make the cable connections in the order a, b, c, d.

a. Connect the clamp of the positive (red) jumper cable to the positive (+) terminal on the discharged battery.

b. Connect the clamp at the other end of the positive (red) jumper cable to the positive (+) terminal on the booster battery.

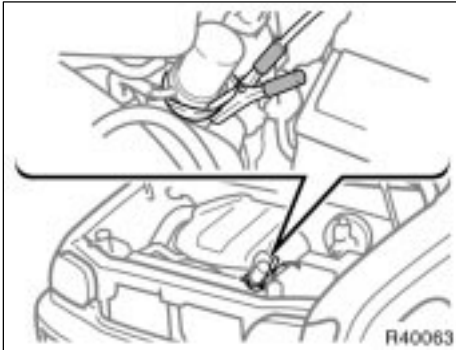


c. Connect the clamp of the negative (black) jumper cable to the negative (-) terminal on the booster battery.

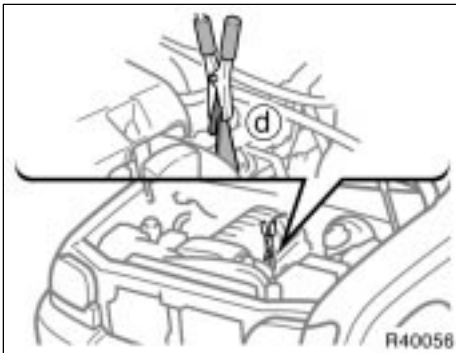
d. Connect the clamp at the other end of the negative (black) jumper cable to a solid, stationary, unpainted, metallic point of the vehicle with the discharged battery.

The recommended connecting points are shown in the following illustrations:

'05 TUNDRA_U (L/O 0409)



Connecting point for 1GR-FE engine



Connecting point for 2UZ-FE engine

Do not connect the cable to or near any part that moves when the engine is cranked.

CAUTION

When making the connections, to avoid serious injury, do not lean over the battery or accidentally let the jumper cables or clamps touch anything except the correct battery terminals or the ground.

5. With automatic transmission—Charge the discharged battery with the jumper cables connected for approximately 5 minutes. At this time, run the engine in the vehicle with the booster battery at about 2000 rpm with the accelerator pedal lightly depressed.
6. Start your engine in the normal way. After starting, run it at about 2000 rpm for several minutes with the accelerator pedal lightly depressed.
7. Carefully disconnect the cables in the exact reverse order: the negative cable and then the positive cable.
8. Carefully dispose of the battery cover cloths—they may now contain sulfuric acid.

9. If removed, replace all the battery vent plugs.

If the cause of your battery discharging is not apparent (for example, lights left on), you should have it checked at your Toyota dealer.

If the first start attempt is not successful...

Check that the clamp on the jumper cables are tight. Recharge the discharged battery with the jumper cables connected for several minutes and restart your engine in the normal way.

If the another attempt is not successful, the battery may be depleted. Have it checked at your Toyota dealer.

If your engine stalls while driving

If your engine stalls while driving...

1. Reduce your speed gradually, keeping a straight line. Move cautiously off the road to a safe place.
2. Turn on your emergency flashers.
3. Turn the ignition key to "ACC" or "LOCK", and try starting the engine again.

If the engine will not start, see "If your vehicle will not start".



If the engine is not running, the power assist for the brakes and steering will not work, so steering and braking will be much harder than usual.

If you cannot increase engine speed

If engine speed does not increase when the accelerator pedal is depressed, there may be a problem somewhere in the electronic throttle control system.

At this time, vibration may occur. However, if you depress the accelerator pedal more firmly and slowly, you can drive your vehicle at low speeds. Have your vehicle checked by your Toyota dealer as soon as possible.

Even if the abnormality of the electronic throttle control system is corrected during low speed driving, the system may not be recovered until the engine is stopped and the ignition key is turned to "ACC" or "LOCK" position.



Be especially careful to prevent erroneous pedal operation.

If your vehicle overheats

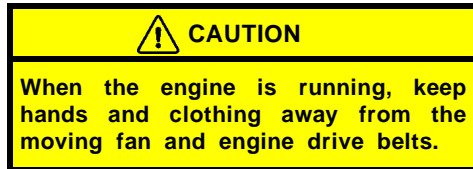
If your engine coolant temperature gauge indicates overheating, if you experience a loss of power, or if you hear a loud knocking or pinging noise, the engine has probably overheated. You should follow this procedure...

1. Pull safely off the road, stop the vehicle and turn on your emergency flashers. Put the transmission in "P" (automatic) or neutral (manual) and apply the parking brake. Turn off the air conditioning if it is being used.
2. If coolant or steam is boiling out of the radiator or reservoir, stop the engine. Wait until the steam subsides before opening the hood. If there is no coolant boiling over or steam, leave the engine running.

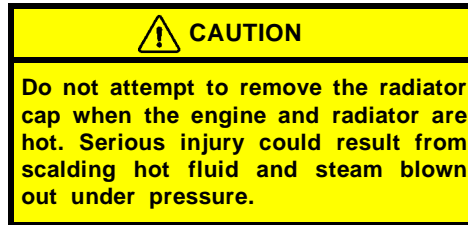


To help avoid personal injury, keep the hood closed until there is no steam. Escaping steam or coolant is a sign of very high pressure.

3. Visually check to see if the engine drive belt (fan belt) is broken or loose. Look for obvious coolant leaks from the radiator, hoses, and under the vehicle. However, note that water draining from the air conditioning is normal if it has been used.



4. If the engine drive belt is broken or the coolant is leaking, stop the engine immediately. Call a Toyota dealer for assistance.
5. If the engine drive belt is O.K. and there are no obvious leaks, you may help the engine cool down more quickly by running it at about 1500 rpm for a few minutes with the accelerator pedal lightly depressed.
6. Check the coolant reservoir. If it is dry, add coolant to the reservoir while the engine is running. Fill it about half full. For the coolant type, see "Coolant type selection" in Section 7-2.



7. After the engine coolant temperature has cooled to normal, again check the coolant level in the reservoir. If necessary, bring it up to half full again. Serious coolant loss indicates a leak in the system. You should have it checked as soon as possible at your Toyota dealer.

If you have a flat tire—

1. Reduce your speed gradually, keeping a straight line. Move cautiously off the road to a safe place well away from the traffic. Avoid stopping on the center divider of a highway. Park on a level spot with firm ground.
2. Stop the engine and turn on your emergency flashers.
3. Firmly set the parking brake and put the transmission in "P" (automatic) or reverse (manual).
4. Have everyone get out of the vehicle on the side away from traffic.
5. Read the following instructions thoroughly.

 CAUTION

When jacking, be sure to observe the following to reduce the possibility of personal injury:

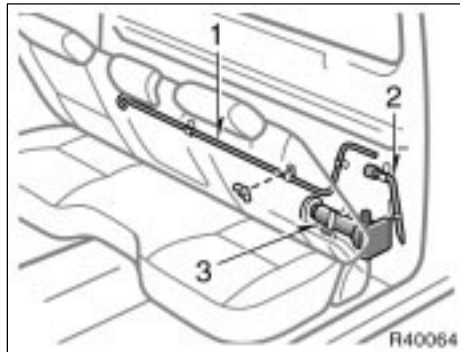
- ▶ Follow jacking instructions.
- ▶ Do not put any part of your body under the vehicle supported by the jack. Otherwise, personal injury may occur.
- ▶ Do not start or run the engine while your vehicle is supported by the jack.
- ▶ Stop the vehicle on a level firm ground, firmly set the parking brake and put the transmission in "P" (automatic) or reverse (manual). Block the wheel diagonally opposite to the one being changed if necessary.

- ▶ Make sure to set the jack properly in the jack point. Raising the vehicle with jack improperly positioned will damage the vehicle or may allow the vehicle to fall off the jack and cause personal injury.
- ▶ Never get under the vehicle when the vehicle is supported by the jack alone.
- ▶ Use the jack only for lifting your vehicle during wheel changing.
- ▶ Do not raise the vehicle with someone in the vehicle.
- ▶ When raising the vehicle, do not place any objects on top of or underneath the jack.
- ▶ Raise the vehicle only high enough to remove and change the tire.

NOTICE

Do not continue driving with a deflated tire. Driving even a short distance can damage a tire and wheel beyond repair.

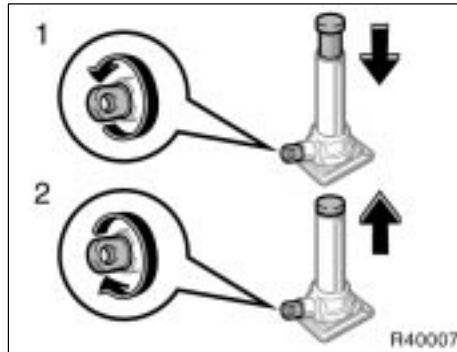
—Required tools and spare tire
(standard cab models)



1. Get the required tools and spare tire.

- 1 Jack handle
- 2 Wheel nut wrench
- 3 Jack

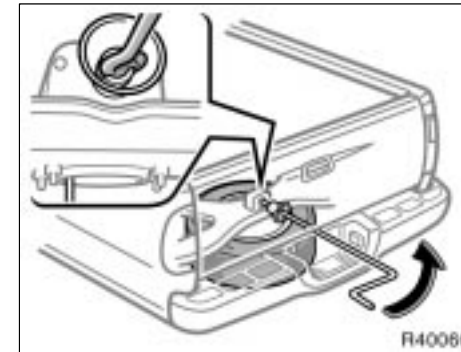
To prepare yourself for an emergency, you should familiarize yourself with the use of the jack, each of the tools and their storage locations.



Turn the jack joint by hand.

To remove: Turn the joint in direction 1 until the jack is free.

To store: Turn the joint in direction 2 until the jack is firmly secured to prevent it flying forward during a collision or sudden braking.

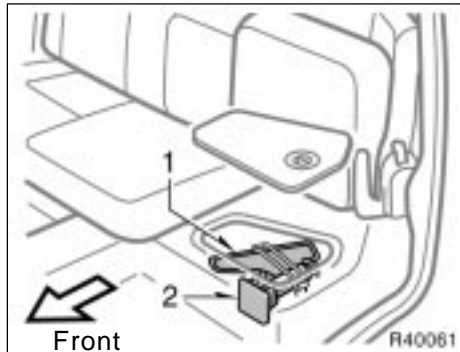


To remove the spare tire:

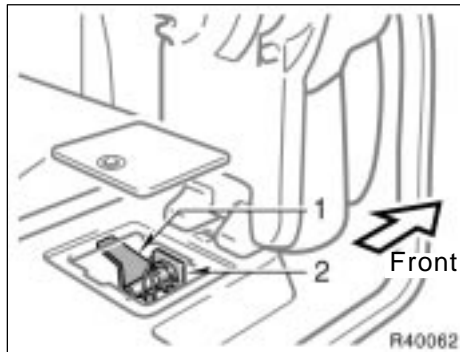
- 1. Insert the end of the jack handle into the lowering screw and turn it counterclockwise.
- 2. After the tire is lowered completely to the ground, remove the holding bracket.

When storing the spare tire, put it in place with the outer side of the wheel facing up. Then secure the tire, taking care that the tire goes straight up without catching on any other part, to prevent it from flying forward during a collision or sudden braking.

—Required tools and spare tire
(access and double cab models)



Access cab models

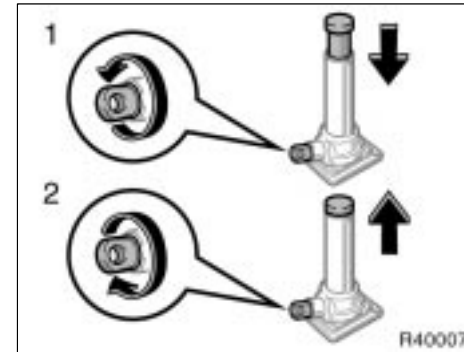


Double cab models

1. Get the required tools and spare tire.

- 1 Tool bag
- 2 Jack

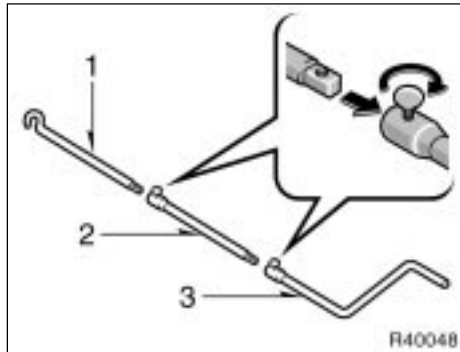
To prepare yourself for an emergency, you should familiarize yourself with the use of the jack, each of the tools and their storage locations.



Turn the jack joint by hand.

To remove: Turn the joint in direction 1 until the jack is free.

To store: Turn the joint in direction 2 until the jack is firmly secured to prevent it flying forward during a collision or sudden braking.



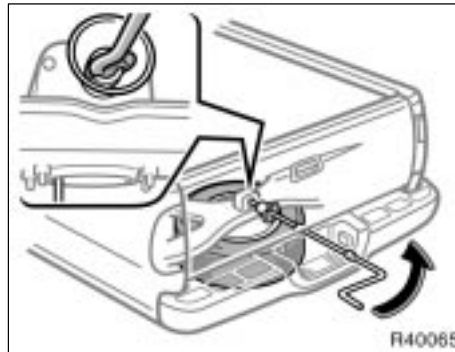
To remove the spare tire:

1. Put a jack handle, jack handle extension and jack handle end together as shown in the illustration.

- 1 Jack handle end
- 2 Jack handle extension
- 3 Jack handle

⚠ CAUTION

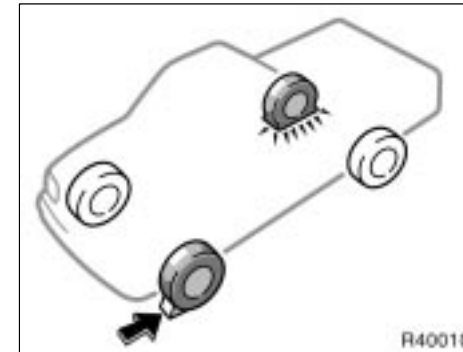
Make sure they are securely fixed with the screw.



2. Insert the end of the jack handle extension into the lowering screw and turn it counterclockwise with the handle.
3. After the tire is lowered completely to the ground, remove the holding bracket.

When storing the spare tire, put it in place with the outer side of the wheel facing up. Then secure the tire, taking care that the tire goes straight up without catching on any other part, to prevent it from flying forward during a collision or sudden braking.

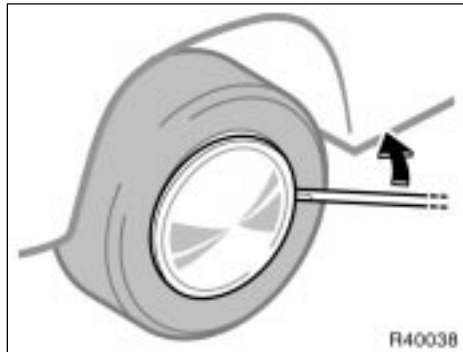
—Blocking the wheel



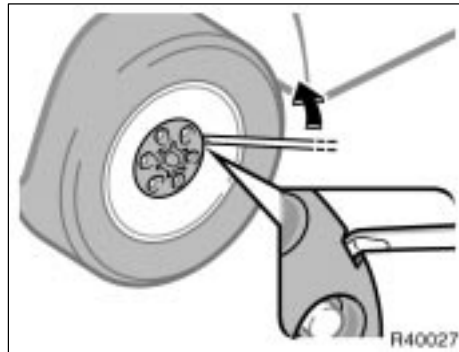
2. **Block the wheel diagonally opposite the flat tire to keep the vehicle from rolling when it is jacked up.**

When blocking the wheel, place a wheel block in front of one of the front wheels or behind one of the rear wheels.

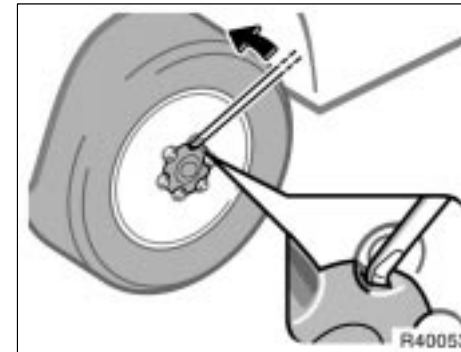
—Removing wheel ornament



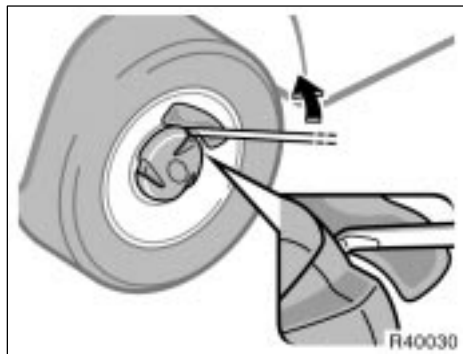
Type A



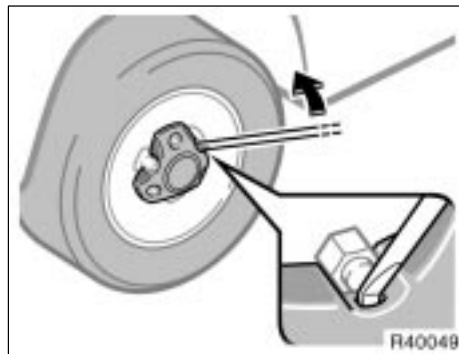
Type C



Type E



Type B



Type D

3. Remove the wheel ornament.

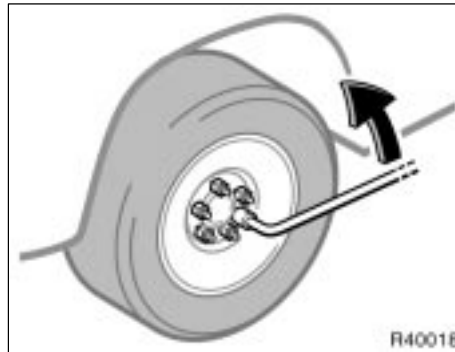
Pry off the wheel ornament, using the beveled end of the wheel nut wrench as shown.

Type B only—To protect the wheel surface, place sufficient paper or cloth between the wheel and wrench.

⚠ CAUTION

Do not try to pull off the ornament by hand. Take due care in handling the ornament to avoid unexpected personal injury.

—Loosening wheel nuts



⚠ CAUTION

Never use oil or grease on the bolts or nuts. The nuts may loose and the wheels may fall off, which could cause a serious accident.

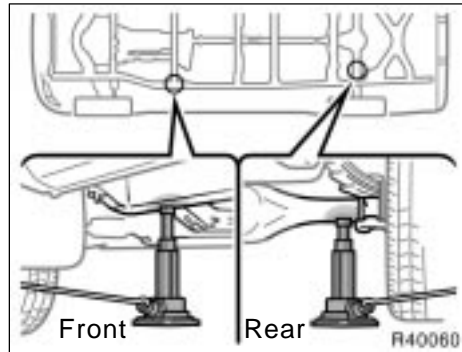
4. Loosen all the wheel nuts.

Always loosen the wheel nuts before raising the vehicle.

Turn the wheel nuts counterclockwise to loosen. To get maximum leverage, fit the wrench to the nut so that the handle is on the right side, as shown above. Grab the wrench near the end of the handle and pull up on the handle. Be careful that the wrench does not slip off the nut.

Do not remove the nuts yet—just unscrew them about one-half turn.

—Positioning the jack

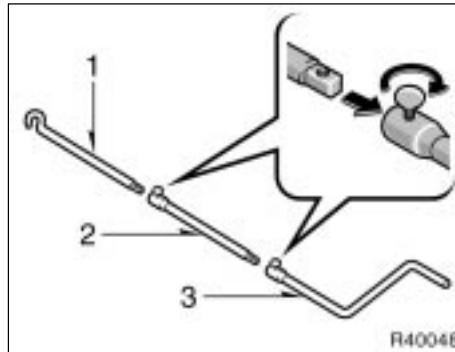


5. Position the jack at the correct jack point as shown.

Make sure the jack is positioned on a level and solid place.

JACK POINTS:

- Front—Under the frame side rail
- Rear—Under the rear axle housing

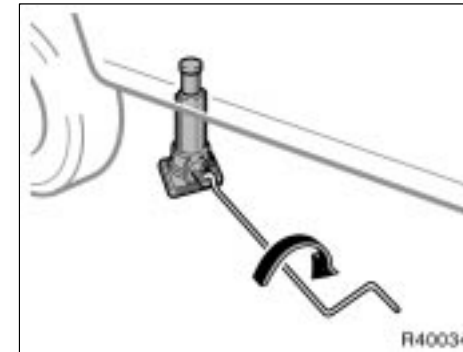


Access and double cab models—Put a jack handle, jack handle extension and jack handle end together as shown in the illustration.

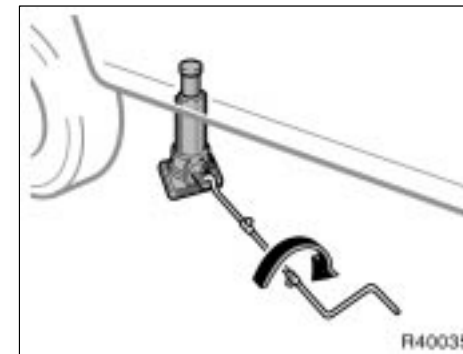
- 1 Jack handle end
- 2 Jack handle extension
- 3 Jack handle

CAUTION
Make sure they are each securely fixed with screws.

—Raising your vehicle



Standard cab models



Access and double cab models

6. After making sure that no one is in the vehicle, raise it high enough so that the spare tire can be installed.

Remember you will need more ground clearance when putting on the spare tire than when removing the flat tire.

Standard cab models—To raise the vehicle, insert the jack handle into the jack (it is a loose fit) and turn it clockwise. As the jack touches the vehicle and begins to lift, double-check that it is properly positioned.

Access cab and double cab models—To raise the vehicle, insert the jack handle extension into the jack (it is a loose fit) and turn it clockwise with the handle, making sure the handle remains firmly fitted onto the jack handle extension. As the jack touches the vehicle and begins to lift, double-check that it is properly positioned.



Never get under the vehicle when the vehicle is supported by the jack alone.

—Changing wheels



7. Remove the wheel nuts and change tires.

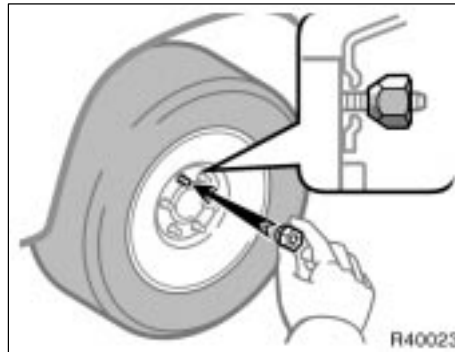
Lift the flat tire straight off and put it aside.

Roll the spare wheel into position and align the holes in the wheel with the bolts. Then lift up the wheel and get at least the top bolt started through its hole. Wiggle the tire and press it back over the other bolts.

—Reinstalling wheel nuts



Before putting on wheels, remove any corrosion on the mounting surfaces with a wire brush or such. Installation of wheels without good metal- to- metal contact at the mounting surface can cause wheel nuts to loosen and eventually cause a wheel to come off while driving.



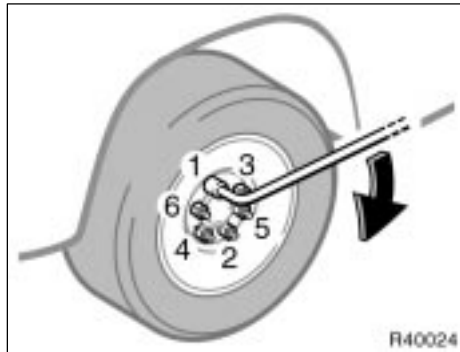
8. Reinstall all the wheel nuts finger tight.

Reinstall the wheel nuts (tapered end inward) and tighten them as much as you can by hand. Press back on the tire back and see if you can tighten them more.

⚠ CAUTION

Never use oil or grease on the bolts or nuts. Doing so may lead to overtightening the nuts and damaging the bolts. The nuts may loose and the wheels may fall off, which could cause a serious accident. If there is oil or grease on any bolt or nut, clean it.

—Lowering your vehicle



9. Lower the vehicle completely and tighten the wheel nuts.

Standard cab models—Turn the jack handle counterclockwise to lower the vehicle.

Access cab and double cab models—Turn the jack handle extension counterclockwise with handle to lower the vehicle, making sure the handle remains firmly fitted onto the jack handle extension.

Use only the wheel nut wrench and turn it clockwise to tighten the nuts. Do not use other tools or any additional leverage other than your hands, such as a hammer, pipe or your foot. Make sure the wrench is securely engaged over the nut.

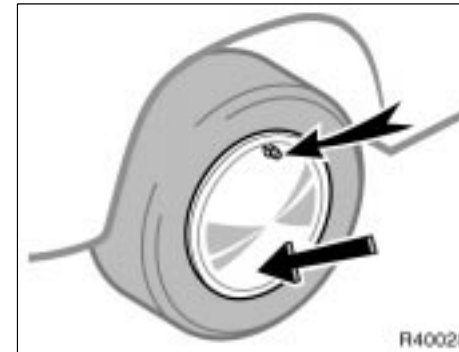
Tighten each nut a little at a time in the order shown. Repeat the process until all the nuts are tight.

⚠ CAUTION

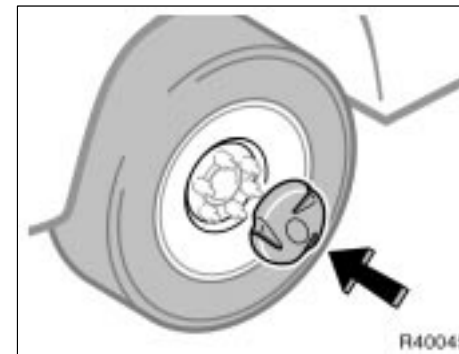
▶ **When lowering the vehicle, make sure all portions of your body and all other persons around will not be injured as the vehicle is lowered to the ground.**

▶ **Have the wheel nuts tightened with torque wrench to 110 N·m (11.5 kgf·m, 83 ft·lbf), as soon as possible after changing wheels. Otherwise, the nuts may loosen and the wheels may fall off, which could cause a serious accident.**

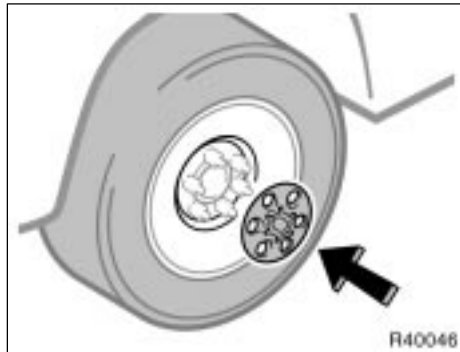
—Reinstalling wheel ornament



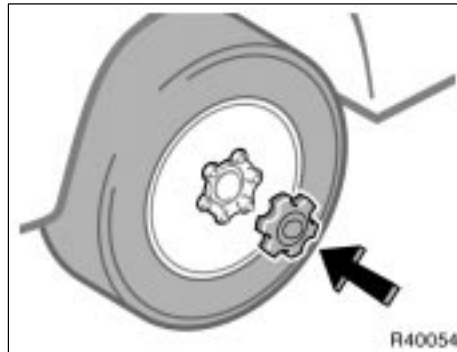
Type A



Type B



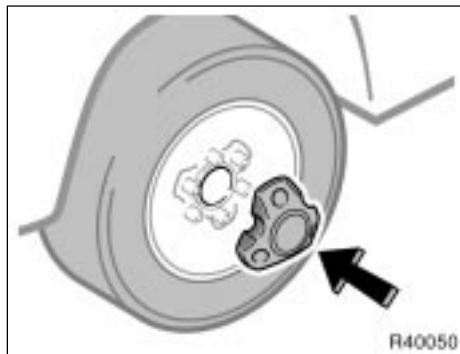
Type C



Type E

 CAUTION

Take due care in handling the ornament to avoid unexpected personal injury.



Type D

10. Reinstall the wheel ornament.

1. Put the wheel ornament in position.

Type A—Align the cutout of the wheel ornament with the valve stem as shown.

2. Then firmly tap the outer edge of the wheel cap with the side or heel of your hand to snap it into place.

—After changing wheels

11. Check the air pressure of the replaced tire.

Adjust the air pressure to the specification designated in Section 8. If the pressure is lower, drive slowly to the nearest service station and fill to the correct pressure.

Do not forget to reinstall the tire inflation valve cap as dirt and moisture could get into the valve core and possibly cause air leakage. If the cap is missing, have a new one put on as soon as possible.


12. Restow all the tools, jack and flat tire securely.

With a spare tire of the same wheel type as the installed tires—

As soon after changing wheels as possible, tighten the wheel nuts to the torque specified in Section 8 with a torque wrench. Have a technician repair the flat tire.

With a spare tire of different wheel type from the installed tires—

As soon after changing wheels as possible, tighten the wheel nuts to the torque specified in Section 8 with a torque wrench. Have a technician repair the flat tire and replace the spare tire with it.


 CAUTION
Before driving, make sure all the tools, jack and flat tire are securely in place in their storage location to reduce the possibility of personal injury during a collision or sudden braking.

Initial adjustment of the tire pressure warning system is necessary after you have rotated your tires. See “Tire pressure warning system” in Section 1-7.

If your vehicle becomes stuck

If your vehicle becomes stuck in snow, mud, sand, etc., then you may attempt to rock the vehicle free by moving it forward and backward.

If your vehicle is equipped with the “AUTO LSD” system, you can use it in this situation. (For details, see “AUTO LSD system” in Section 1-7.)

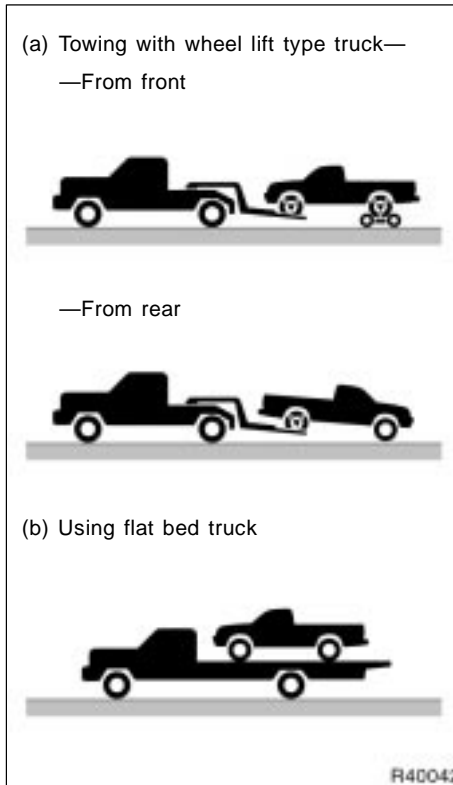
 CAUTION
Do not attempt to rock the vehicle free by moving it forward and backward if people or objects are anywhere near the vehicle. During the rocking operation the vehicle may suddenly move forward or backward as it becomes unstuck, causing injury or damage to nearby people or objects.

If your vehicle needs to be towed—

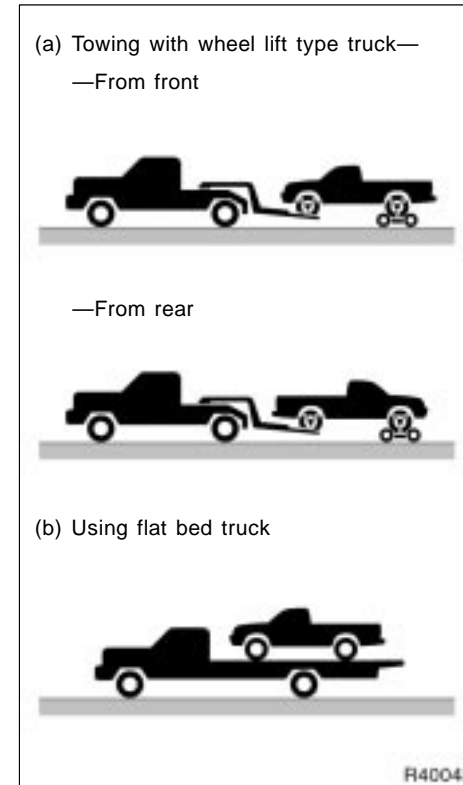
NOTICE

If you rock your vehicle, observe the following precautions to prevent damage to the transmission and other parts.

- ◆ *Do not depress the accelerator pedal while shifting the selector lever or before the transmission is completely shifted to forward or reverse gear.*
- ◆ *Do not race the engine and avoid spinning the wheels.*
- ◆ *If your vehicle remains stuck after rocking the vehicle several times, consider other ways such as towing.*



Two-wheel drive models



Four-wheel drive models

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If towing is necessary, we recommend you have it done by your Toyota dealer or a commercial tow truck service. In consultation with them, have your vehicle towed using either (a) or (b).

Only when you cannot receive a towing service from a Toyota dealer or commercial tow truck service, tow your vehicle carefully in accordance with the instructions given in “—Emergency towing” in this Section.

Proper equipment will help ensure that your vehicle is not damaged while being towed. Commercial operators are generally aware of the state/provincial and local laws pertaining to towing.

Your vehicle can be damaged if it is towed incorrectly. Although most operators know the correct procedure, it is possible to make a mistake. To avoid damage to your vehicle, make sure the following precautions are observed. If necessary, show this page to the tow truck driver.

TOWING PRECAUTIONS:

Use a safety chain system for all towing, and abide by the state/provincial and local laws. The wheels and axle on the ground must be in good condition. If they are damaged, use a towing dolly.

Two-wheel drive models—

(a) Towing with wheel lift type truck

From front—

▶ Manual transmission:

We recommend using a towing dolly under the rear wheels. If you do not use a towing dolly, release the parking brake and put the transmission in neutral.

▶ Automatic transmission:

Use a towing dolly under the rear wheels.

NOTICE

Never tow a vehicle with an automatic transmission from the front with the rear wheels on the ground, as this may cause serious damage to the transmission.

From rear—Place the ignition key in the “ACC” position.

NOTICE

◆ **When lifting wheels, take care to ensure adequate ground clearance for towing at the opposite end of the raised vehicle. Otherwise, the bumper and/or underbody of the towed vehicle will be damaged during towing.**

◆ **Do not tow with the key removed or in the “LOCK” position, as the steering lock mechanism is not strong enough to hold the front wheels straight while towing.**

(b) Using flat bed truck

Four-wheel drive models—

(a) Towing with wheel lift type truck

From front—Use a towing dolly under the rear wheels.

NOTICE

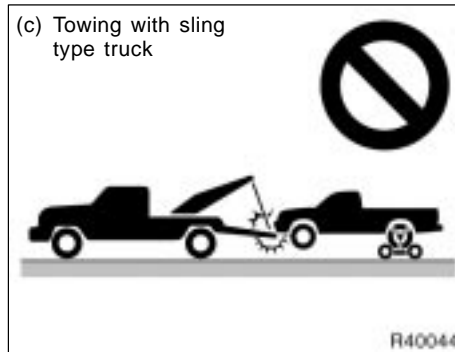
Never tow a vehicle from the front with the rear wheels on the ground, as this may cause serious damage to the transmission.

From rear—We recommend using a towing dolly under the front wheels. If you do not use a towing dolly, place the ignition key in the “ACC” position, put the transmission in neutral and set the transfer in “2WD” mode.

NOTICE

Do not tow with the key removed or in the “LOCK” position when towing from the rear without a towing dolly. The steering lock mechanism is not strong enough to hold the front wheels straight.

(b) Using flat bed truck



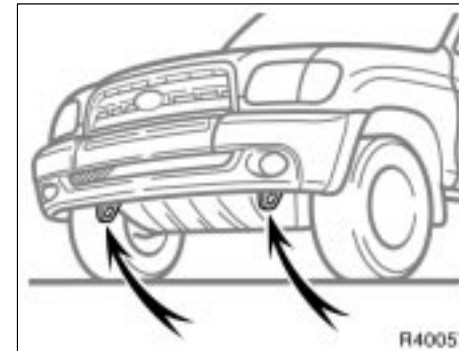
All models—

(c) Towing with sling type truck

NOTICE

Do not tow with sling type truck, either from the front or rear. This may cause body damage.

**—Emergency towing
(two-wheel drive models
without off-road package)**



If towing is necessary, we recommend you to have it done by your Toyota dealer or a commercial tow truck service.

If towing service is not available in an emergency, your vehicle may be temporarily towed by a cable or chain secured to one of the emergency towing eyelets under the front of the vehicle. Use extreme caution when towing the vehicle.

NOTICE

Only use specified towing eyelet; otherwise your vehicle may be damaged.

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A driver must be in the vehicle to steer it and operate the brakes.

Towing in this manner may be done only on hard-surfaced roads for a short distance and at low speeds. Also, the wheels, axles, drive train, steering and brakes must all be in good condition.

CAUTION

Use extreme caution when towing the vehicle. Avoid sudden starts or erratic driving maneuvers which would place excessive stress on the emergency towing eyelet and towing cable or chain. The eyelet and towing cable or chain may break and cause serious injury or damage.

NOTICE

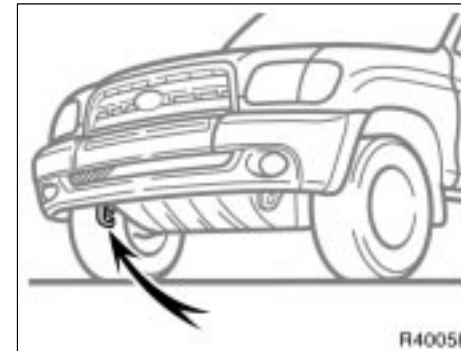
Use only a cable or chain specifically intended for use in towing vehicles. Securely fasten the cable or chain to the towing eyelet provided.

Before towing, release the parking brake and put the transmission in neutral (manual) or "N" (automatic). The key must be in "ACC" (engine off) or "ON" (engine running).

CAUTION

If the engine is not running, the power assist for the brakes and steering will not work so steering and braking will be much harder than usual.

—Emergency towing (four-wheel drive models and two-wheel drive models with off-road package)



If towing is necessary, we recommend you to have it done by your Toyota dealer or a commercial tow truck service.


If towing service is not available in an emergency, your vehicle may be temporarily towed by a cable or chain secured to the emergency towing hook under the front of the vehicle. Use extreme caution when towing the vehicle.

NOTICE

Only use specified towing hook; otherwise your vehicle may be damaged.


A driver must be in the vehicle to steer it and operate the brakes.

Towing in this manner may be done only on hard-surfaced roads for a short distance and at low speeds. Also, the wheels, axles, drive train, steering and brakes must all be in good condition.

 CAUTION
<p>Use extreme caution when towing the vehicle. Avoid sudden starts or erratic driving maneuvers which would place excessive stress on the emergency towing hook and towing cable or chain. The hook and towing cable or chain may break and cause serious injury or damage.</p>


NOTICE
<p><i>Use only a cable or chain specifically intended for use in towing vehicles. Securely fasten the cable or chain to the towing hook provided.</i></p>

Before towing, release the parking brake, put the transmission in neutral (manual) or "N" (automatic) and set the transfer in "2WD" mode. The key must be in "ACC" (engine off) or "ON" (engine running).

 CAUTION
<p>If the engine is not running, the power assist for the brakes and steering will not work so steering and braking will be much harder than usual.</p>

—Emergency towing hook precautions

- ▶ Before emergency towing, check that the hook is not broken or damaged and that the installation bolts are not loose.
- ▶ Fasten the towing cable or chain securely to the hook.
- ▶ Do not jerk the hook. Apply steady and even force.
- ▶ To avoid damaging the hook, do not pull from the side or at a vertical angle. Always pull straight ahead.

 **CAUTION**

If the emergency towing hook is used to get out when your vehicle becomes stuck in the mud, sand or other condition from which the vehicle cannot be driven out under its own power, make sure to observe the precautions mentioned below. Otherwise, excessive stress will be put on the hook and the towing cable or chain may break, causing serious injury or damage.

- ▶ If the towing vehicle can hardly move, do not forcibly continue the towing. Contact your Toyota dealer or a commercial tow truck service for assistance.
- ▶ Tow the vehicle as straight ahead as possible.
- ▶ Keep away from the vehicle during towing.

—Tips for towing a stuck vehicle

The following methods are effective to use when your vehicle is stuck in the mud, sand or other condition from which the vehicle cannot be driven out under its own power. Use extreme caution when towing the vehicle. In addition, keep away from the vehicles and towing cable or chain when towing.

- ▶ Remove the sand and soil in the front and the back of the tires.
- ▶ Place stones or wood under the tires.

If you lose your keys

You can purchase a new key at your Toyota dealer if you can give them the key number.

See the suggestion given in “Keys” in Section 1-2.

If your keys are locked in the vehicle and you cannot get a duplicate, many Toyota dealers can still open the door for you, using their special tools. If you must break a window to get in, we suggest breaking the smallest side window because it is the least expensive to replace. Be extremely cautious to avoid cuts from the glass.

If you lose your wireless remote control transmitter

You can purchase a new wireless remote control transmitter at your Toyota dealer.

Have the registered identification numbers of your transmitters deleted from your vehicle by your Toyota dealer as soon as possible to avoid the possibility of theft or an accident. Then, have the identification number of your new transmitter registered. At the same time, you must bring all of the remaining transmitters to have them registered again as well.

You can use the wireless remote control system with the new transmitter. Contact your Toyota dealer for detailed information.

SECTION 5

CORROSION PREVENTION AND APPEARANCE CARE

Corrosion prevention and appearance care

Protecting your Toyota from corrosion	418
Washing and waxing your Toyota	419
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Protecting your Toyota from corrosion

Toyota, through the diligent research, design and use of the most advanced technology available, helps prevent corrosion and provides you with the finest quality vehicle construction. Now, it is up to you. Proper care of your Toyota can help ensure long-term corrosion prevention.

The most common causes of corrosion to your vehicle are:

- ▶ The accumulation of road salt, dirt and moisture in hard-to-reach areas under the vehicle.
- ▶ Chipping of paint, or undercoating caused by minor accidents or by stones and gravel.

Care is especially important if you live in particular areas or operate your vehicle under certain environmental conditions:

- ▶ Road salt or dust control chemicals will accelerate corrosion, as will the presence of salt in the air near the seacoast or in areas of industrial pollution.
- ▶ High humidity accelerates corrosion especially when temperatures range just above the freezing point.

- ▶ Wetness or dampness to certain parts of your vehicle for an extended period of time, may cause corrosion even though other parts of the vehicle may be dry.
- ▶ High ambient temperatures can cause corrosion to those components of the vehicle which do not dry quickly due to lack of proper ventilation.

The above signifies the necessity to keep your vehicle, particularly the underside, as clean as possible and to repair any damage to paint or protective coatings as soon as possible.

To help prevent corrosion on your Toyota, follow these guidelines:

Wash your vehicle frequently. It is, of course, necessary to keep your vehicle clean by regular washing, but to prevent corrosion, the following points should be observed:

- ▶ If you drive on salted roads in the winter or if you live near the ocean, you should hose off the undercarriage at least once a month to minimize corrosion.

- ▶ High pressure water or steam is effective for cleaning the vehicle's underside and wheel housings. Pay particular attention to these areas as it is difficult to see all the mud and dirt. It will do more harm than good to simply wet the mud and debris without removing. The lower edge of doors, rocker panels and frame members have drain holes which should not be allowed to clog with dirt as trapped water in these areas can cause corrosion.

- ▶ Wash the underside of the vehicle thoroughly when winter is over.

See "Washing and waxing your Toyota" for more tips.

Check the condition of your vehicle's paint and trim. If you find any chips or scratches in the paint, touch them up immediately to prevent corrosion from starting. If the chips or scratches have gone through the bare metal, have a qualified body shop make the repair.

Check the interior of your vehicle. Water and dirt can accumulate under the floor mats and could cause corrosion. Occasionally check under the mats to make sure the area is dry. Be particularly careful when transporting chemicals, cleansers, fertilizers, salt, etc.; these should be transported in proper containers. If a spill or leak should occur, immediately clean and dry the area.

Use mud shields on your wheels. If you drive on salted or gravel roads, mud shields help protect your vehicle. Full-size shields, which come as near to the ground as possible, are the best. We recommend that the fittings and the area where the shields are installed be treated to resist corrosion. Your Toyota dealer will be happy to assist in supplying and installing the shields if they are recommended for your area.

Keep your vehicle in a well ventilated garage or a roofed place. Do not park your vehicle in a damp, poorly ventilated garage. If you wash your vehicle in the garage, or if you drive it covered with water or snow, your garage may be so damp as to cause corrosion. Even if your garage is heated, a wet vehicle can corrode if the ventilation is poor.

Washing and waxing your Toyota

Washing your Toyota

Keep your vehicle clean by regular washing.

The following cases may cause weakness to the paint or corrosion to the body and parts. Wash your vehicle as soon as possible.

- ▶ When driving in a coastal area
- ▶ When driving on a road sprinkled with antifreeze
- ▶ When exposed to coal tar, tree sap, bird droppings and carcass of an insect
- ▶ When driving in areas where there is a lot of smoke, soot, dust, iron dust or chemical substances
- ▶ When the vehicle becomes remarkably dirty with dust and mud

Hand-washing your Toyota

Work in the shade and wait until the vehicle body is not hot to the touch.



When cleaning under floor or chassis, be careful not to injure your hands.

1. Rinse off loose dirt with a hose. Remove any mud or road salt from the underside of the vehicle or in the wheel wells.
2. Wash with a mild car-wash soap, mixed according to the manufacturer's instructions. Use a soft cotton mitt and keep it wet by dipping it frequently into the wash water. Do not rub hard—let the soap and water remove the dirt.

Fuel filler door: Do not apply water (high-pressure car wash, for example) at or near the fuel tank inlet with the fuel filler door opened. If the water enters the air vent, you may experience trouble with refueling or rough engine idling.

Plastic wheel ornaments: The plastic wheel ornaments are damaged easily by organic substances. If any organic substances splashes an ornament, be sure to wash it off with water and check if the ornament is damaged.



Do not attach the heavily damaged plastic wheel ornament. It may fly off the wheel and cause accidents while the vehicle is moving.

Aluminum wheels: Use only a mild soap or neutral detergent.

Plastic bumpers: Wash carefully. Do not scrub with abrasive cleaners. The bumper faces are soft.

Road tar: Remove with turpentine or cleaners that are marked safe for painted surfaces.

NOTICE

Do not use organic substances (gasoline, kerosene, benzine or strong solvents), which may be toxic or cause damage.

3. Rinse thoroughly—dried soap can cause streaking. In hot weather you may need to rinse each section right after you wash it.
4. To prevent water spots, dry the vehicle using a clean soft cotton towel. Do not rub or press hard—you might scratch the paint.

Waxing your Toyota

Polishing and waxing is recommended to maintain the original beauty of your Toyota's finish.

Apply wax once a month or if the vehicle surface does not repel water well.

1. Always wash and dry the vehicle before you begin waxing, even if you are using a combined cleaner and wax.
2. Use a good quality polish and wax. If the finish has become extremely weathered, use a car-cleaning polish, followed by a separate wax. Carefully follow the manufacturer's instructions and precautions. Be sure to polish and wax the chrome trim as well as the paint.
3. Wax the vehicle again when water does not bead but remains on the surface in large patches.

NOTICE

Always remove the plastic bumpers if your vehicle is re-painted and placed in a high heat paint waxing booth. High temperatures could damage the bumpers.

Cleaning the interior

CAUTION

▶ **Vehicles with side airbags and curtain shield airbags:**

Be careful not to splash water or spill liquid on the floor. This may prevent the side airbags and curtain shield airbags from activating correctly, resulting in serious injury.

▶ **Do not wash the vehicle floor with water, or allow water to get onto the floor when cleaning the vehicle interior or exterior. Water may get into audio components or other electrical components above or under the floor carpet (or mat) and cause a malfunction; and it may cause body corrosion.**

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Vinyl interior

The vinyl upholstery may be easily cleaned with a mild soap or detergent and water.

First vacuum over the upholstery to remove loose dirt. Then, using a sponge or soft cloth, apply the soap solution to the vinyl. After allowing it to soak in for a few minutes to loosen the dirt, remove the dirt and wipe off the soap with a clean damp cloth. If all the dirt do not come off, repeat the procedure. Commercial foaming-type vinyl cleaners are also available which work well. Follow the manufacturer's instructions.

NOTICE

Do not use solvent, thinner, gasoline or window cleaner on the interior.

Carpets

Use a good foam-type shampoo to clean the carpets.

Begin by vacuuming thoroughly to remove as much dirt as possible. Several types of foam cleaners are available; some are in aerosol cans and others are powders or liquids which you mix with water to produce a foam. To shampoo the carpets, use a sponge or brush to apply the foam. Rub in overlapping circles.

Do not apply water—the best results are obtained by keeping the carpet as dry as possible. Read the shampoo instructions and follow them closely.

Seat belts

The seat belts may be cleaned with mild soap and water or with lukewarm water.

Use a cloth or sponge. As you are cleaning, check the belts for excessive wear, fraying, or cuts.

NOTICE

- ◆ *Do not use dye or bleach on the belts—it may weaken them.*
- ◆ *Do not use the belts until they become dry.*

Windows

The windows may be cleaned with any household window cleaner.

NOTICE

When cleaning the inside of the back window, be careful not to scratch or damage the heater wires or connectors.

Air conditioning control panel, audio panel, instrument panel, console panel, and switches

Use a soft damp cloth for cleaning.

Soak a clean soft cloth in water or lukewarm water then lightly wipe off dirt.

NOTICE

- ◆ *Do not use organic substances (solvents, kerosene, alcohol, gasoline, etc.) or alkaline or acidic solutions. These chemicals can cause discoloring, staining or peeling of the surface.*
- ◆ *If you use cleaners or polishing agents, make sure their ingredients do not include the substances mentioned above.*

◆ *If you use a liquid car freshener, do not spill the liquid onto the vehicle's interior surfaces. It may contain the ingredients mentioned above. Immediately clean any spill using the method mentioned above.*

Leather Interior

The leather upholstery may be cleaned with neutral detergent for wool.

Remove dirt using a soft cloth dampened with 5% solution of neutral detergent for wool. Then thoroughly wipe off all traces of detergent with a clean damp cloth.

After cleaning or whenever any part of the leather gets wet, dry with a soft clean cloth. Allow the leather to dry in a ventilated shaded area.

NOTICE

- ◆ *If a stain should fail to come out with a neutral detergent, apply a cleaner that does not contain an organic solvent.*
- ◆ *Never use organic substances such as benzene, alcohol or gasoline or alkaline or acid solutions for cleaning the leather as these could cause discoloring.*
- ◆ *Use of a nylon brush or synthetic fiber cloth, etc. may scratch the fine grained surface of the leather.*
- ◆ *Mildew may develop on soiled leather upholstery. Be especially careful to avoid oil spots. Try to keep your upholstery always clean.*
- ◆ *Long exposure to direct sunlight may cause the leather surface to harden and shrink. Keep your vehicle in a shaded area, especially in the summer.*

- ◆ *The interior of your vehicle is apt to heat up on hot summer days, so avoid placing on the upholstery items made of vinyl or plastic or containing wax as these tend to stick to leather when warm.*
- ◆ *Improper cleaning of the leather upholstery could result in discoloration or staining.*

If you have any questions about the cleaning of your Toyota, your local Toyota dealer will be pleased to answer them.

SECTION 6

VEHICLE MAINTENANCE AND CARE

Vehicle maintenance and care

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For scheduled maintenance information, please refer to the “Scheduled Maintenance Guide” or “Owner’s Manual Supplement”.



Maintenance requirements

Your Toyota vehicle has been designed for fewer maintenance requirements with longer service intervals to save both your time and money. However, each regular maintenance, as well as day-to-day care, is more important than ever before to ensure smooth, trouble-free, safe, and economical drivings.

It is the owner's responsibility to make sure the specified maintenance, including general maintenance service, is performed. Note that both the new vehicle and emission control system warranties specify that proper maintenance and care must be performed. See "Owner's Warranty Information Booklet" or "Owner's Manual Supplement" for complete warranty information.

General maintenance

General maintenance items are those day-to-day care practices that are important to your vehicle for proper operation. It is the owner's responsibility to ensure that the general maintenance items are performed regularly.

These checks or inspections can be done either by yourself or a qualified technician, or if you prefer, your Toyota dealer will be pleased to do them at a nominal cost.

Scheduled maintenance

The scheduled maintenance items listed in the "Scheduled Maintenance Guide" or "Owner's Manual Supplement" are those required to be serviced at regular intervals.

For details of your maintenance schedule, read the "Scheduled Maintenance Guide" or "Owner's Manual Supplement".

It is recommended that any replacement parts used for maintenance or for the repair of the emission control system be Toyota supplied.

The owner may elect to use non-Toyota supplied parts for replacement purposes without invalidating the emission control system warranty. However, use of replacement parts which are not of equivalent quality may impair the effectiveness of the emission control systems.

You may also elect to have maintenance, replacement, or repair of the emission control devices and system performed by any automotive repair establishment or individual without invalidating this warranty. See "Owner's Warranty Information Booklet" or "Owner's Manual Supplement" for complete warranty information.

Where to go for service?

Toyota technicians are well-trained specialists and are kept up to date with the latest service information through technical bulletins, service tips, and in-dealership training programs. They learn to work on Toyotas before they work on your vehicle, rather than while they are working on it.

You can be confident that your Toyota dealer's service department performs the best job to meet the maintenance requirements on your vehicle—reliably and economically.

Your copy of the repair order is proof that all required maintenance has been performed for warranty coverage. If any problems should arise with your vehicle while under warranty, your Toyota dealer will promptly take care of it. Again, be sure to keep a copy of the repair order for any service performed on your Toyota.

What about do-it-yourself maintenance?

Many of the maintenance items are easy to do yourself if you have a little mechanical ability and a few basic automotive tools. Simple instructions for how to perform them are presented in Section 7.

If you are a skilled do-it-yourself mechanic, the Toyota service manuals are recommended. Please be aware that do-it-yourself maintenance can affect your warranty coverage. See "Owner's Warranty Information Booklet" or "Owner's Manual Supplement" for the details.

General maintenance

Listed below are the general maintenance items that should be performed as frequently as specified. In addition to checking the items listed, if you notice any unusual noise, smell or vibration, you should investigate the cause or take your vehicle to your Toyota dealer or a qualified service shop immediately. It is recommended that any problem you notice be brought to the attention of your dealer or the qualified service shop for their advice.



IN THE ENGINE COMPARTMENT

Items listed below should be checked from time to time, e.g. each time when refueling.

Washer fluid

Make sure there is sufficient fluid in the tank. See Section 7-3 for additional information.

Engine coolant level

Make sure the coolant level is between the "F" and "L" lines on the see-through reservoir when the engine is cold. See Section 7-2 for additional information.

Radiator, condenser and hoses

Check that the front of the radiator and condenser are clean and not blocked with leaves, dirt, or insects. See Section 7-2 for additional information.

Battery condition

Check the battery condition by the indicator color. See Section 7-3 for additional information.

Brake fluid level

Make sure the brake fluid level is correct. See Section 7-2 for additional information.

Engine oil level

Check the level on the dipstick with the engine turned off and the vehicle parked on a level spot. See Section 7-2 for additional information.

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Power steering fluid level

Check the level through the reservoir. The level should be in the "HOT" or "COLD" range depending on the fluid temperature. See Section 7-2 for additional information.

Exhaust system

If you notice any change in the sound of the exhaust or smell exhaust fumes, have the cause located and corrected immediately. (See "Engine exhaust cautions" in Section 2.)

INSIDE THE VEHICLE

Items listed below should be checked regularly, e.g. while performing periodic services, cleaning the vehicle, etc.

Lights

Make sure the headlights, stop lights, tail lights, turn signal lights, and other lights are all working. Check headlight aim.

Service reminder indicators and warning buzzers

Check that all service reminder indicators and warning buzzers function properly.

Steering wheel

Be alert for changes in steering condition, such as hard steering or strange noise.

Seats

Check that all seat controls such as seat adjusters, seatback recliner, etc. operate smoothly and that all latches lock securely in any position. Check that the head restraints move up and down smoothly and that the locks hold securely in any latched position. For folding-down seatback, check that the latches lock securely.

Seat belts

Check that the seat belt system such as buckles, retractors and anchors operate properly and smoothly. Make sure the belt webbing is not cut, frayed, worn or damaged.

Accelerator pedal

Check the pedal for smooth operation and uneven pedal effort or catching.

Clutch pedal

Check the pedal for smooth operation.

Brake pedal

Check the pedal for smooth operation and that the pedal has the proper clearance. Check the brake booster function.

Brakes

In a safe place, check that the brakes do not pull to one side when applied.

Parking brake (pedal type)

Check that the pedal has the proper travel and that, on a safe incline, your vehicle is held securely with only the parking brake applied.

Parking brake (lever type)

Check that the lever has the proper travel and that, on a safe incline, your vehicle is held securely with only the parking brake applied.

Automatic transmission "Park" mechanism

On a safe incline, check that your vehicle is held securely with the selector lever in "P" position and all brakes released.

OUTSIDE THE VEHICLE

Items listed below should be performed from time to time, unless otherwise specified.

Fluid leaks

Check underneath for leaking fuel, oil, water or other fluid after the vehicle has been parked for a while. If you smell fuel fumes or notice any leak, have the cause found and corrected immediately.

Doors and engine hood

Check that all doors including tailgate operate smoothly and all latches lock securely. Make sure the engine hood secondary latch secures the hood from opening when the primary latch is released.

Tire inflation pressure

Check the pressure with a gauge every two weeks, or at least once a month. See Section 7- 2 for additional information.

Tire surface and wheel nuts

Check the tires carefully for cuts, damage or excessive wear. See Section 7-2 for additional information. When checking the tires, make sure no nuts are missing, and check the nuts for looseness. Tighten them if necessary.

Tire rotation

Rotate the tires according to the maintenance schedule. (For scheduled maintenance information, please refer to the "Scheduled Maintenance Guide" or "Owner's Manual Supplement".) See Section 7- 2 for additional information.

Does your vehicle need repairing?

Be on the alert for changes in performance, sounds, and visual tip-offs that indicate service is needed. Some important clues are as follows:

- ▶ Engine missing, stumbling, or pinging
- ▶ Appreciable loss of power
- ▶ Strange engine noises
- ▶ A leak under the vehicle (however, water dripping from the air conditioning after use is normal.)
- ▶ Change in exhaust sound (This may indicate a dangerous carbon monoxide leak. Drive with the windows open and have the exhaust system checked immediately.)
- ▶ Flat-looking tire; excessive tire squeal when cornering; uneven tire wear
- ▶ Vehicle pulls to one side when driving straight on a level road
- ▶ Strange noises related to suspension movement
- ▶ Loss of brake effectiveness; spongy feeling brake or clutch pedal; pedal almost touches floor; vehicle pulls to one side when braking
- ▶ Engine coolant temperature continually higher than normal

- ▶ Engine continually runs hot; oil pressure gauge stays low

If you notice any of these clues, take your vehicle to your Toyota dealer as soon as possible. It probably needs adjustment or repair.



Do not continue driving with the vehicle unchecked. It could result in serious vehicle damage and possibly personal injury.

Emissions Inspection and Maintenance (I/M) programs

Some states have vehicle emission inspection programs which include OBD (On-Board Diagnostics) checks.

The OBD system monitors the operation of the emission control system. When the OBD system determines that a problem exists somewhere in the emission control system, the malfunction indicator lamp comes on. In this case, your vehicle may not pass the I/M test and need to be repaired. Contact your Toyota dealer to service the vehicle.

Even if the malfunction indicator lamp does not come on, your vehicle may not pass the I/M test as readiness codes have not been set in the OBD system.

Readiness codes are automatically set during ordinary driving. However, when the battery is disconnected or run down, the codes are erased. Also, depending on your driving habits, the codes may not be completely set.

Also, if the malfunction indicator lamp had come on recently due to temporary malfunction such as a loose fuel tank cap, your vehicle may not pass the I/M test.

The malfunction indicator lamp will go off after taking several driving trips, but the error code in the OBD system will not be cleared unless about 40 trips or more are taken.

If your vehicle does not pass the I/M test even the malfunction indicator lamp does not come on, contact your Toyota dealer to prepare the vehicle for re-testing.

SECTION 7-1

DO- IT- YOURSELF MAINTENANCE

Introduction

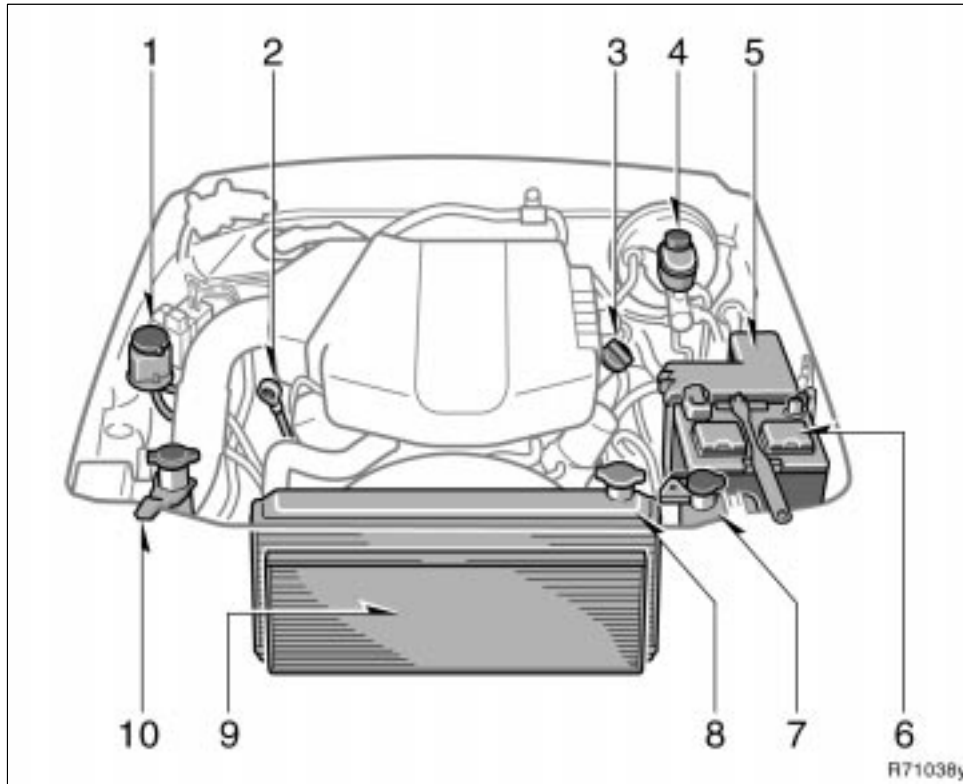
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Engine compartment overview

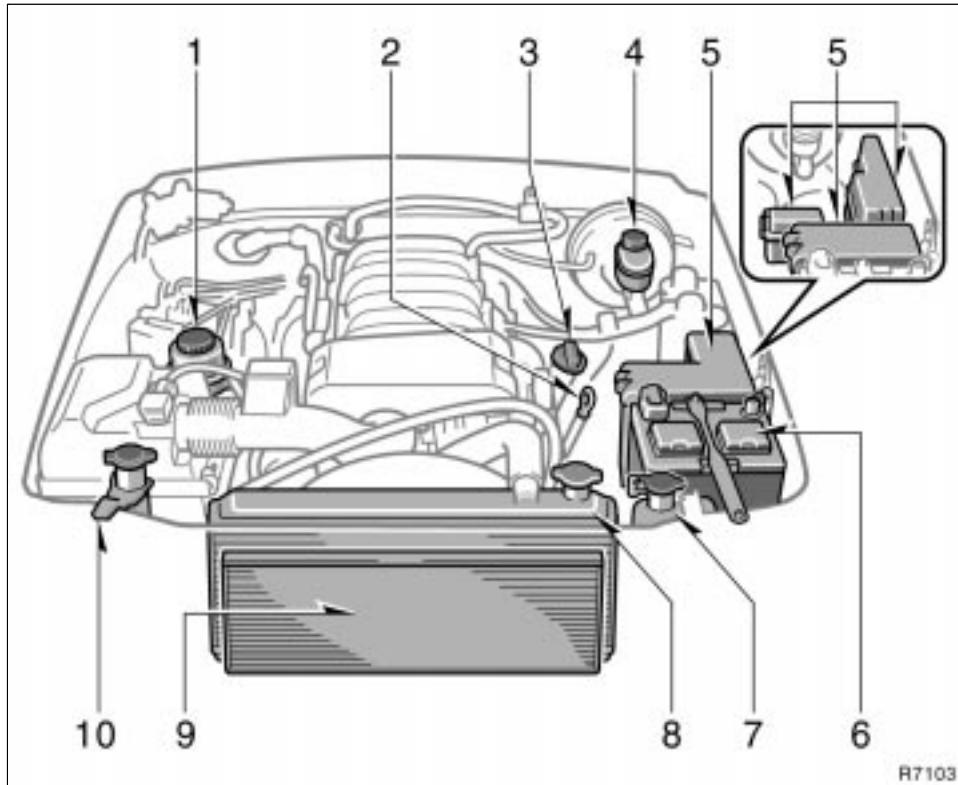
►1GR- FE engine



1. Power steering fluid reservoir
2. Engine oil level dipstick
3. Engine oil filler cap
4. Brake fluid reservoir
5. Fuse block
6. Battery
7. Engine coolant reservoir
8. Radiator
9. Condenser
10. Windshield washer fluid tank

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►2UZ- FE engine



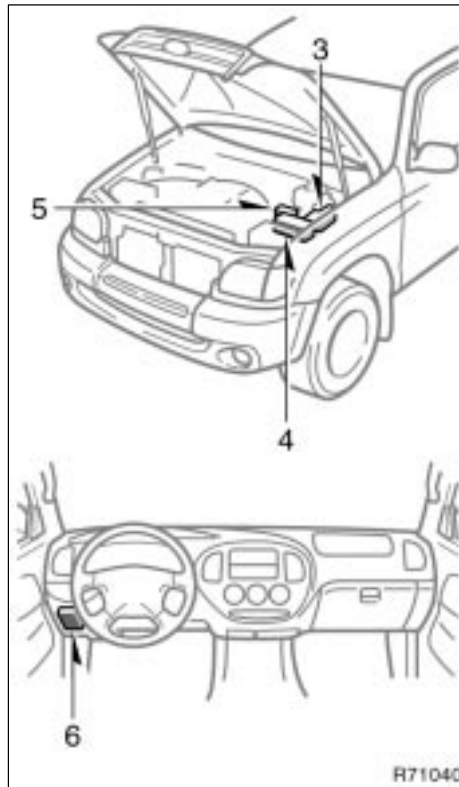
1. Power steering fluid reservoir
2. Engine oil level dipstick
3. Engine oil filler cap
4. Brake fluid reservoir
5. Fuse blocks
6. Battery
7. Engine coolant reservoir
8. Radiator
9. Condenser
10. Windshield washer fluid tank

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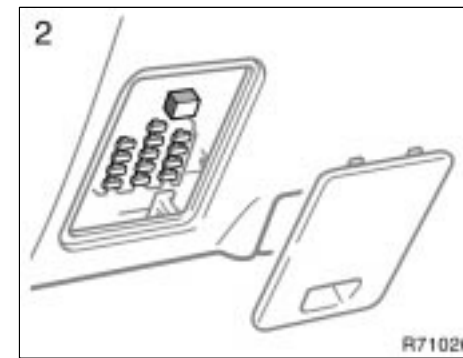
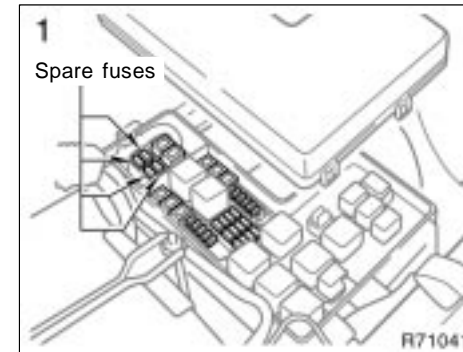
Fuse locations

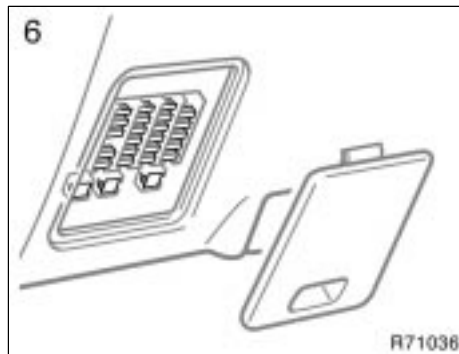
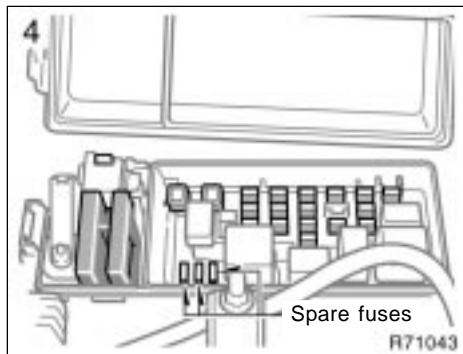
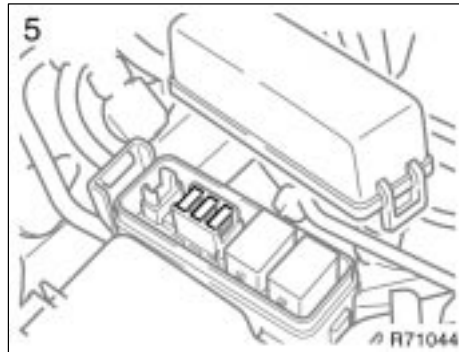
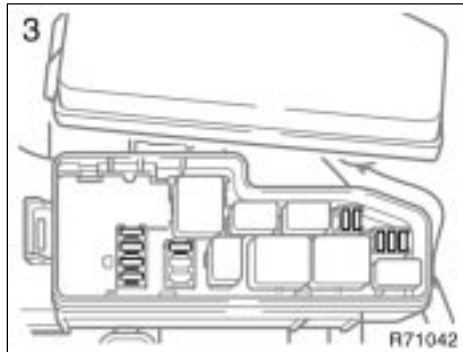


Standard and access cab models



Double cab models





Do-it-yourself service precautions

If you perform maintenance by yourself, be sure to follow the correct procedure given in this Section.

You should be aware that improper or incomplete servicing may result in operating problems.

Performing do-it-yourself maintenance during the warranty period may affect your warranty coverage. Read the separate Toyota Warranty statement for details and suggestions.

This Section gives instructions only for those items that are relatively easy for an owner to perform. As explained in Section 6, there are still a number of items that must be done by a qualified technician with special tools.

For information on tools and parts for do-it-yourself maintenance, see "Parts and tools".

Utmost care should be taken when working on your vehicle to prevent accidental injury. Here are a few precautions that you should be especially careful to observe:

 CAUTION

- ◀ When the engine is running, keep hands, clothing, and tools away from the moving fan and engine drive belts. (Removing rings, watches, and ties is advisable.)
- ◀ Right after driving, the engine compartment—the engine, radiator, exhaust manifold, power steering fluid reservoir and spark plug boots, etc.—will be hot. So be careful not to touch them. Oil, fluids and spark plugs may also be hot.
- ◀ If the engine is hot, do not remove the radiator cap or loosen the drain plugs to prevent burning yourself.
- ◀ Do not leave anything that may burn easily, such as paper or rags, in the engine compartment.
- ◀ Do not smoke, cause sparks or allow open flames around fuel or the battery. Their fumes are flammable.
- ◀ Do not get under your vehicle with just the body jack supporting it. Always use automotive jack stands or other solid supports.

- ◀ Use eye protection whenever you work on or under your vehicle where you may be exposed to flying or falling material, fluid spray, etc.
- ◀ Used engine oil contains potentially harmful contaminants which may cause skin disorders such as inflammation or skin cancer, so care should be taken to avoid prolonged and repeated contact with it. To remove used engine oil from your skin, wash thoroughly with soap and water.
- ◀ Do not leave used oil within the reach of children.
- ◀ Dispose of used oil and filter only in a safe and acceptable manner. Do not dispose of used oil and filter in household trash, in sewers or onto the ground. Call your dealer or a service station for information concerning recycling or disposal.
- ◀ Be extremely cautious when working on the battery. It contains poisonous and corrosive sulfuric acid.

NOTICE

- ◆ Remember that battery and ignition cables carry high currents or voltages. Be careful of accidentally causing a short circuit.
- ◆ Add only “Toyota Super Long Life Coolant” or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology to fill the radiator. “Toyota Super Long Life Coolant” is a mixture of 50% coolant and 50% deionized water (for the U.S.A.) or 55% coolant and 45% deionized water (for Canada).
- ◆ If you spill some of the coolant, be sure to wash it off with water to prevent it from damaging the parts or paint.
- ◆ Do not allow dirt or anything else to fall through the spark plug holes.
- ◆ Do not pry the outer electrode of a spark plug against the center electrode.

- ◆ *Use only spark plugs of the specified type. Using other types will cause engine damage, loss of performance or radio noise.*
- ◆ *Do not reuse iridium-tipped spark plugs by cleaning or regapping.*
- ◆ *Do not overfill automatic transmission fluid, or the transmission could be damaged.*
- ◆ *Do not drive with the air cleaner filter removed, or excessive engine wear could result. Also backfiring could cause a fire in the engine compartment.*
- ◆ *Be careful not to scratch the glass surface with the wiper frame.*
- ◆ *When closing the engine hood, check to see that you have not forgotten any tools, rags, etc.*

Parts and tools

Here is a list of parts and tools you will need to perform do-it-yourself maintenance. Remember all Toyota parts are designed in metric sizes, so your tools must be metric.

CHECKING THE ENGINE OIL LEVEL

Parts (if level is low):

- ◀ "Toyota Genuine Motor Oil" or equivalent

See Section 7-2 for details about engine oil selection.

Tools:

- ◀ Rag or paper towel
- ◀ Funnel (only for adding oil)

CHECKING THE ENGINE COOLANT LEVEL

Parts (if level is low):

- ◀ "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology.

"Toyota Super Long Life Coolant" is a mixture of 50% coolant and 50% deionized water (for the U.S.A.) or 55% coolant and 45% deionized water (for Canada).

Tools:

- ◀ Funnel (only for adding coolant)

CHECKING BRAKE FLUID

Parts (if level is low):

- ◀ SAE J1703 or FMVSS No.116 DOT 3 brake fluid

Tools:

- ◀ Rag or paper towel
- ◀ Funnel (only for adding fluid)

CHECKING POWER STEERING FLUID

Parts (if level is low):

- ◀ Automatic transmission fluid DEXRON[®]VI or III

Tools:

- ◀ Rag or paper towel
- ◀ Funnel (only for adding fluid)

CHECKING BATTERY CONDITION

Tools:

- ◀ Warm water
- ◀ Baking soda
- ◀ Grease
- ◀ Conventional wrench (for terminal clamp bolts)

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CHECKING AND REPLACING FUSES

Parts (if replacement is necessary):

- ◀ Fuse with same amperage rating as original

ADDING WASHER FLUID

Parts:

- ◀ Water
- ◀ Washer fluid containing antifreeze (for winter use)

Tools:

- ◀ Funnel

REPLACING LIGHT BULBS

Parts:

- ◀ Bulb with same number and wattage rating as original (See charts in "Replacing light bulbs" in Section 7-3.)

Tools:

- ◀ Screwdriver
- ◀ Wrench

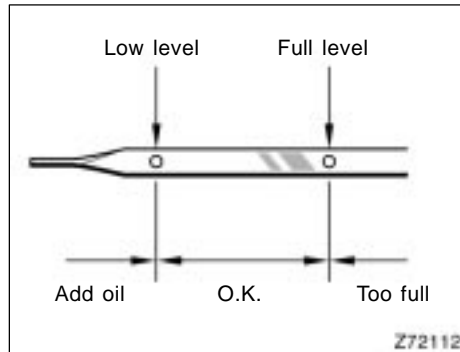
SECTION 7-2

DO- IT- YOURSELF MAINTENANCE

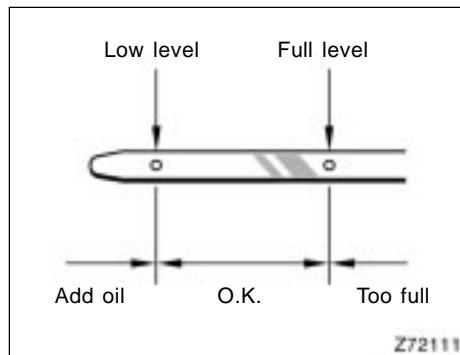
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Checking the engine oil level



1GR-FE engine



2UZ-FE engine

With the engine at operating temperature and turned off, check the oil level on the dipstick.

1. To get a correct reading, the vehicle should be on level ground. After turning off the engine, wait a few minutes for the oil to drain back into the bottom of the engine.
2. Pull the dipstick out, hold a rag under the end and wipe it clean.
3. Reinsert the dipstick—push it in as far as it will go, or the reading will not be correct.
4. Pull the dipstick out and look at the oil level while holding a rag under the end.

CAUTION
Be careful not to touch the hot exhaust manifold.

NOTICE
Be careful not to drop engine oil on the vehicle components.

If the oil level is below or only slightly above the low level, add engine oil of the same type as already in the engine.

Remove the oil filler cap and add engine oil in small quantities at a time, checking the dipstick. We recommend that you use a funnel when adding oil.

The approximate quantity of oil needed to raise the level between low and full on the dipstick is indicated below for reference.

When the level reaches within the correct range, install the filler cap hand-tight.

Oil quantity, L (qt., Imp. qt.):

1.5 (1.6, 1.3)

NOTICE

- ◆ Be careful not to spill engine oil on the vehicle components.
- ◆ Avoid overfilling, or the engine could be damaged.
- ◆ Check the oil level on the dipstick once again after adding the oil.

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Engine oil selection

"Toyota Genuine Motor Oil" is used in your Toyota vehicle. Use Toyota approved "Toyota Genuine Motor Oil" or equivalent to satisfy the following grade and viscosity.

Oil grade:

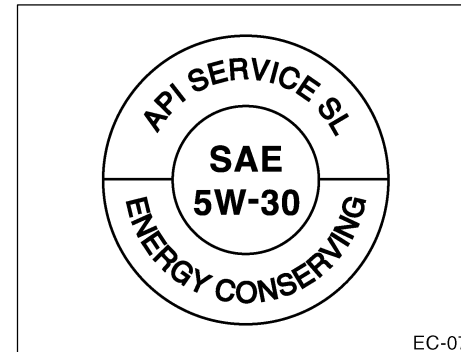
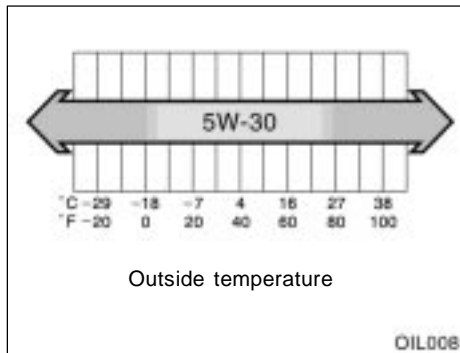
API grade SL "Energy-Conserving" or ILSAC multigrade engine oil

Recommended viscosity:

SAE 5W-30

SAE 5W-30 is the best choice for good fuel economy and good starting in cold weather.

If SAE 5W-30 is not available, SAE 10W-30 may be used. However, it should be replaced with SAE 5W-30 at the next oil change.



EC-07

API service symbol



API-02

ILSAC certification mark

Oil identification marks

Either or both API registered marks are added to some oil containers to help you select the oil you should use.

The API Service Symbol is located anywhere on the outside of the container.

The top portion of the label shows the oil quality by API (American Petroleum Institute) designations such as SL. The center portion of the label shows the SAE viscosity grade such as SAE 5W-30. "Energy-Conserving" shown in the lower portion, indicates that the oil has fuel-saving capabilities.

The ILSAC (International Lubricant Standardization and Approval Committee) Certification Mark is displayed on the front of the container.



To ensure excellent lubrication performance for your engine, "Toyota Genuine Motor Oil" is available, which has been specifically tested and approved for all Toyota engines.

Please contact your Toyota dealer for further details about "Toyota Genuine Motor Oil".

Checking the engine coolant level

Look at the see-through coolant reservoir when the engine is cold. The coolant level is satisfactory if it is between the "F" and "L" lines on the reservoir. If the level is low, add the coolant. (For the coolant type, see "Coolant type selection" described below.)

The coolant level in the reservoir will vary with engine temperature. However, if the level is on or below the "L" line, add coolant. Bring the level up to the "F" line.

If the coolant level drops within a short time after replenishing, there may be a leak in the system. Visually check the radiator, hoses, radiator cap and drain cock and water pump.

If you can find no leak, have your Toyota dealer test the cap pressure and check for leaks in the cooling system.

CAUTION

To prevent burning yourself, do not remove the radiator cap when the engine is hot.

Coolant type selection

Use of improper coolants may damage your engine cooling system.

Only use "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology. (Coolant with long-life hybrid organic acid technology is a combination of low phosphates and organic acids.)

For the U.S.A.—"Toyota Super Long Life Coolant" is a mixture of 50% coolant and 50% deionized water. This coolant provides protection down to about -35°F (-31°C).

For the Canada—"Toyota Super Long Life Coolant" is a mixture of 55% coolant and 45% deionized water. This coolant provides protection down to about -42°F (-44°C).

NOTICE

Do not use plain water alone.



Toyota recommends "Toyota Super Long Life Coolant", which has been tested to ensure that it will not cause corrosion nor result in malfunction of your engine coolant system with proper usage. "Toyota Super Long Life Coolant" is formulated with long-life hybrid organic acid technology and has been specifically designed to avoid engine cooling system malfunction on Toyota vehicles.

Please contact your Toyota dealer for further details.

Checking the radiator and condenser

If any of the above parts are extremely dirty or you are not sure of their condition, take your vehicle to a Toyota dealer.

CAUTION

To prevent burning yourself, be careful not to touch the radiator or condenser when the engine is hot.

NOTICE

To prevent damage to the radiator and condenser, do not perform the work by yourself.

**Checking brake fluid
(without vehicles stability
control system)**



To check the fluid level, simply look at the see-through reservoir. The level should be between the “MAX” and “MIN” lines on the reservoir.

It is normal for the brake fluid level to go down slightly as the brake pads wear. So be sure to keep the reservoir filled.

If the reservoir needs frequent refilling, it may indicate a serious mechanical problem.

If the level is low, add SAE J1703 or FMVSS No.116 DOT 3 brake fluid to the brake reservoir.

Remove and replace the reservoir cap by hand. Fill the brake fluid to the dotted line. This brings the fluid to the correct level when you put the cap back on.

Use only newly opened brake fluid. Once opened, brake fluid absorbs moisture from the air, and excess moisture can cause a dangerous loss of braking.

When the brake fluid must be replaced, contact your Toyota dealer.

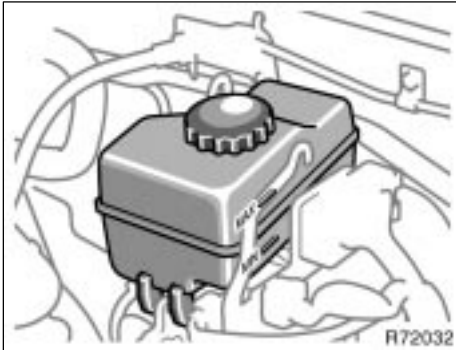
NOTICE

If you spill the fluid, be sure to wash it off with water to prevent it from damaging the parts or paint.

CAUTION

Take care when filling the reservoir because brake fluid can harm your hands or eyes. If fluid gets on your hands or in your eyes, flush the affected area with clean water immediately. If you still feel uncomfortable with your hands or eyes, go to the doctor.

**Checking brake fluid
(with vehicle stability control
system)**



To check the fluid level, simply look at the see-through reservoir. The level should be between the "MAX" and "MIN" lines on the reservoir.

It is normal for the brake fluid level to go down slightly as the brake pads wear or when the fluid level in the accumulator is high.

If the reservoir needs frequent refilling, it may indicate a serious mechanical problem.

If the level is low, add SAE J1703 or FMVSS No.116 DOT 3 brake fluid to the brake reservoir.

Refilling brake fluid:

1. Turn the ignition switch off.
2. Depress the brake pedal more than 20 times (until the brake pedal resistance decreases and pedal travel increases).
3. Remove the reservoir cover by hand. Add brake fluid up to the "MAX" line.

If you do not follow the procedure above, the reservoir may overflow.

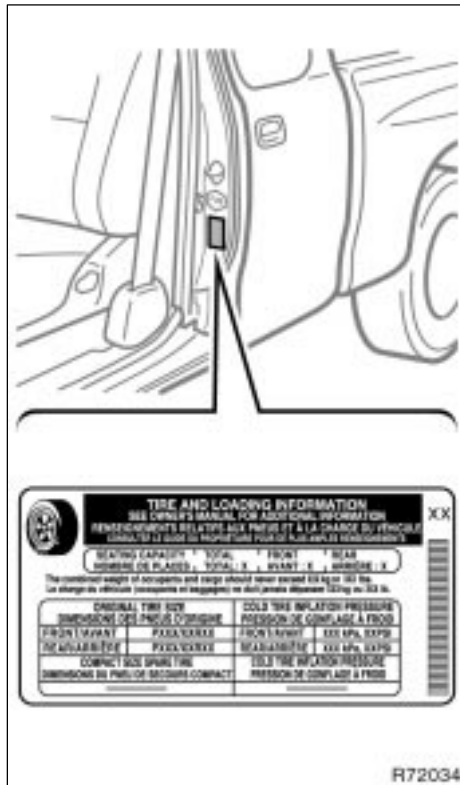
Use only newly opened brake fluid. Once opened, brake fluid absorbs moisture from the air, and excess moisture can cause a dangerous loss of braking.

NOTICE

If you spill the fluid, be sure to wash it off with water to prevent it from damaging the parts or paint.

CAUTION

Take care when filling the reservoir because brake fluid can harm your hands or eyes. If fluid gets on your hands or in your eyes, flush the affected area with clean water immediately. If you still feel uncomfortable with your hands or eyes, go to the doctor.



Access cab models

Keep your tire inflation pressures at the proper level.

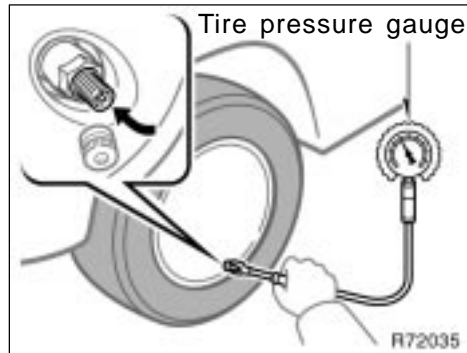
The recommended cold tire inflation pressures, tire sizes and the combined weight of occupants and cargo (payload) are described in Section 8. The recommended tire inflation pressures and tire sizes are also on the tire and loading information label.

You should check the tire inflation pressure every two weeks, or at least once a month. And do not forget the spare!

The following instructions for checking tire inflation pressure should be observed:

- ▶ **The pressure should be checked only when the tires are cold.** If your vehicle has been parked for at least 3 hours and has not been driven for more than 1.5 km or 1 mile since, you will get an accurate cold tire inflation pressure reading.

- ▶ **If you cannot adjust the tire pressure when the tires are cold,** add 20 to 30 kPa more to the front tires and rear tires than the cold tire pressure, but never exceed the maximum cold tire pressure molded on the tire sidewall.
- ▶ **Always use a tire pressure gauge.** The appearance of a tire can be misleading. Besides, tire inflation pressures that are even just a few pounds off can degrade ride and handling.
- ▶ **Do not bleed or reduce tire inflation pressure after driving.** It is normal for the tire inflation pressure to be higher after driving.
- ▶ **Never exceed the vehicle capacity weight.** Passenger and luggage weight should be located so that the vehicle is balanced.



INSPECTION AND ADJUSTMENT PROCEDURE

1. Remove the tire valve cap.
2. Press the tip of the tire pressure gauge to the tire valve.
3. Read the pressure using the graduations of the gauge.
4. In case the tire inflation pressure is not within the prescribed range, insert the compressed air from the valve. In case of applying too much air, press the center of the valve and release the air to adjust.

5. After completing the tire inflation pressure measurement and adjustment, apply soapy water to the valve and check for leakage.

6. Install the tire valve cap.

If a gauge and air pump are not available, have your vehicle checked by your Toyota dealer.

CAUTION

Be sure to reinstall the tire valve caps. Without the valve caps, dirt or moisture could get into the valve core and cause air leakage. If the caps have been lost, have new ones put on as soon as possible.

Incorrect tire inflation pressure may waste fuel, reduce the comfort of driving, reduce tire life and make your vehicle less safe to drive.

If a tire frequently needs refilling, have it checked by your Toyota dealer.

CAUTION

Keep your tires properly inflated. Otherwise, the following conditions may occur and cause an accident resulting in death or serious injuries.

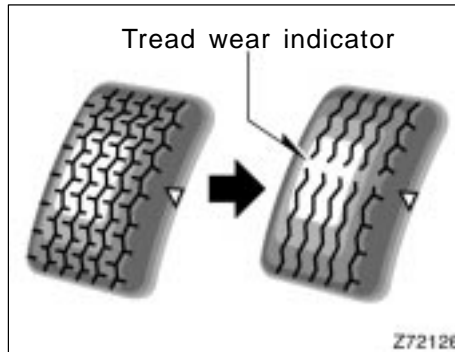
Low tire pressure (underinflation)—

- ▶ Excessive wear
- ▶ Uneven wear
- ▶ Poor handling
- ▶ Possibility of blowouts from an overheated tire
- ▶ Poor sealing of the tire bead
- ▶ Wheel deformation and/or tire separation
- ▶ A greater possibility of tire damage from road hazards

High tire pressure (overinflation)—

- ▶ **Poor handling**
- ▶ **Excessive wear**
- ▶ **Uneven wear**
- ▶ **A greater possibility of tire damage from road hazards**

Checking and replacing tires



CHECKING YOUR TIRES

Check the tire's tread for tread wear indicators. If the indicators show, replace the tires. The location of tread wear indicators is shown by the "TWI" or "△" marks, etc., molded on the sidewall of each tire.

The tires on your Toyota have built-in tread wear indicators to help you know when the tires need replacement. When the tread depth wears to 1.6 mm (0.06 in.) or less, the indicators will appear. If you can see the indicators in two or more adjacent grooves, the tire should be replaced. The lower the tread, the higher the risk of skidding.

The effectiveness of snow tires is lost if the tread wears down below 4 mm (0.16 in.).

If you have tire damage such as cuts, splits, cracks deep enough to expose the fabric, or bulges indicating internal damage, the tire should be replaced.

If a tire often goes flat or cannot be properly repaired due to the size or location of a cut or other damage, it should be replaced. If you are not sure, consult with your Toyota dealer.

If air loss occurs while driving, do not continue driving. Driving even a short distance can damage a tire beyond repair.

Any tires which are over 6 years old must be checked by a qualified technician even if damage is not obvious.

Tires deteriorate with age even if they have never or seldom been used.

This applies also to the spare tire and tires stored for future use.

REPLACING YOUR TIRES

When replacing a tire, use a tire of the same size and construction, and the same or greater maximum load as the originally installed tires. Also, on four-wheel drive models, all the tires must be the same brand and have the same tread patterns.

Using any other size or type of tire may seriously affect handling, ride, speedometer/odometer calibration, ground clearance, and clearance between the body and tires or snow chains.

Check that the maximum load of the replaced tire is greater than 1/2 of the Gross Axle Weight Ratings (GAWR) of either the front axle or the rear axle, whichever is greater. As for the maximum load of the tire, see the load limit at maximum cold tire inflation pressure mentioned on the sidewall of the tire, and as for the Gross Axle Weight Ratings (GAWR), see the Certification Label.

For details about the side wall of the tire and the Certification Label.

CAUTION

Observe the following instructions. Otherwise, an accident may occur resulting in death or serious injuries.

- ▶ **Do not mix radial, bias belted, or bias-ply tires on your vehicle, as this may cause dangerous handling characteristics resulting in loss of control.**
- ▶ **Do not use tires other than the manufacturer's recommended size, as this may cause dangerous handling characteristics resulting in loss of control.**
- ▶ **Four-wheel drive models: Do not use tires of different brands, sizes, construction or tread patterns, as this may cause dangerous handling characteristics resulting in loss of control.**

For vehicles with vehicle stability control system—

▶ **Do not use tires of different brands, sizes and constructions. This may damage the drive system and prevent the vehicle stability control system from functioning correctly.**

Toyota recommends all four tires, or at least both of the front or rear tires be replaced at a time as a set.

See “If you have a flat tire” in Section 4 for tire change procedure.

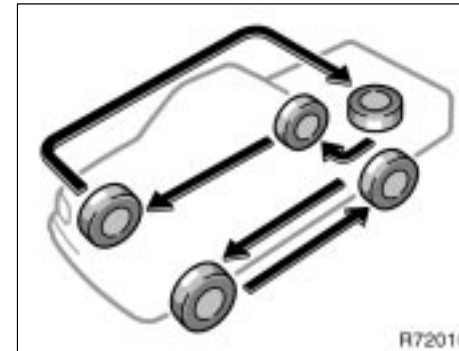
When a tire is replaced, the wheel should always be balanced.

An unbalanced wheel may affect vehicle handling and tire life. Wheels can get out of balance with regular use and should therefore be balanced occasionally.

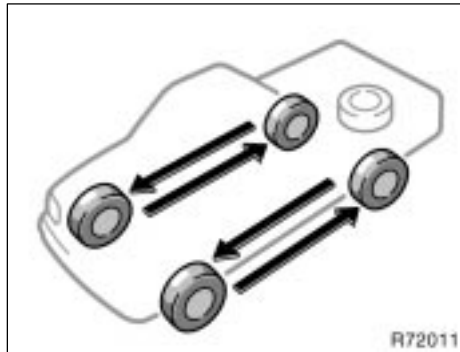
When replacing a tubeless tire, the air valve should also be replaced with a new one.

Initial adjustment of the tire pressure warning system is necessary after you have rotated your tires. See “Tire pressure warning system” in Section 1-7.

Rotating tires



With a spare tire of the same wheel type as the installed tires



With a spare tire of different wheel type from the installed tires

To equalize the wear and help extend tire life, Toyota recommends that you rotate your tires according to the maintenance schedule. (For scheduled maintenance information, please refer to the “Scheduled Maintenance Guide” or “Owner’s Manual Supplement”.) However, the most appropriate timing for tire rotation may vary according to your driving habits and road surface conditions.

See “If you have a flat tire” in Section 4 for tire change procedure.

When rotating tires, check for uneven wear and damage. Abnormal wear is usually caused by incorrect tire pressure, improper wheel alignment, out-of-balance wheels, or severe braking.

Initial adjustment of the tire pressure warning system is necessary after you have rotated your tires. See “Tire pressure warning system” in Section 1-7.

Installing snow tires and chains

WHEN TO USE SNOW TIRES OR CHAINS


Snow tires or chains are recommended when driving on snow or ice.

On wet or dry roads, conventional tires provide better traction than snow tires.

SNOW TIRE SELECTION

If you need snow tires, select tires of the same size, construction and load capacity as the originally installed tires. Also, on four-wheel drive models, all the tires must be the same brand and have the same tread patterns.

Do not use tires other than those mentioned above. Do not install studded tires without first checking local regulations for possible restrictions.

 **CAUTION**

Observe the following instructions. Otherwise, an accident may occur resulting in death or serious injuries.

- ▶ Do not use snow tires other than the manufacturer's recommended size, as this may cause dangerous handling characteristics resulting in loss of control.
- ▶ Four-wheel drive models:
Do not use snow tires of different brands, sizes, construction or tread patterns, as this may cause dangerous handling characteristics resulting in loss of control.


SNOW TIRE INSTALLATION

Snow tires should be installed on all wheels.

Installing snow tires on the rear wheels only can lead to an excessive difference in road grip capability between the front and rear tires which could cause loss of vehicle control.

When storing removed tires, you should store them in a cool dry place.

Mark the direction of rotation and be sure to install them in the same direction when replacing.

 **CAUTION**

- ▶ Do not drive with the snow tires incorrectly inflated.
- ▶ Never drive over 120 km/h (75 mph) with any type of snow tires.

TIRE CHAIN SELECTION

Use the tire chains of correct size.


Regulations regarding the use of tire chains vary according to location or type of road, so always check local regulations before installing chains.

CHAIN INSTALLATION

Install the chains on the rear tires as tightly as possible. Do not use tire chains on the front tires. Retighten chains after driving 0.5—1.0 km (1/4—1/2 mile).

When installing chains on your tires, carefully follow the instructions of the chain manufacturer.

If wheel covers are used, they will be scratched by the chain band, so remove the covers before putting on the chains.

 **CAUTION**

- ▶ Do not exceed 50 km/h (30 mph) or the chain manufacturer's recommended speed limit, whichever is lower.
- ▶ Drive carefully avoiding bumps, holes, and sharp turns, which may cause the vehicle to bounce.
- ▶ Avoid sharp turns or locked-wheel braking, as use of chains may adversely affect vehicle handling.
- ▶ When driving with chains installed, be sure to drive carefully. Slow down before entering curves to avoid losing control of the vehicle. Otherwise an accident may occur.

Replacing wheels

WHEN TO REPLACE YOUR WHEELS

If you have wheel damage such as bending, cracks or heavy corrosion, the wheel should be replaced.

If you fail to replace a damaged wheel, the tire may slip off the wheel or cause loss of handling control.

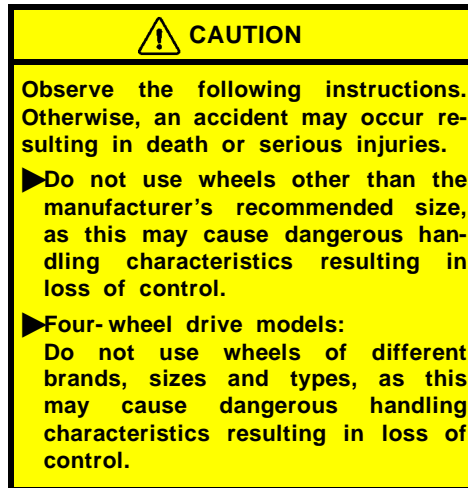
WHEEL SELECTION

When replacing wheels, care should be taken to ensure that the wheels are replaced by ones with the same load capacity, diameter, rim width, and offset.

Correct replacement wheels are available at your Toyota dealer.

A wheel of a different size or type may adversely affect handling, wheel and bearing life, brake cooling, speedometer/odometer calibration, stopping ability, headlight aim, bumper height, vehicle ground clearance, and tire or snow chain clearance to the body and chassis.

Replacement with used wheels is not recommended as they may have been subjected to rough treatment or high mileage and could fail without warning. Also, bent wheels which have been straightened may have structural damage and therefore should not be used. Never use an inner tube in a leaking wheel which is designed for a tubeless tire.



Aluminum wheel precautions

- ▶ When installing aluminum wheels, check that the wheel nuts are tight after driving your vehicle the first 1600 km (1000 miles).
- ▶ If you have rotated, repaired, or changed your tires, check that the wheel nuts are still tight after driving 1600 km (1000 miles).
- ▶ When using tire chains, be careful not to damage the aluminum wheels.
- ▶ Use only Toyota wheel nuts and wrench designed for your aluminum wheels.
- ▶ When balancing your wheels, use only Toyota balance weights or equivalent and a plastic or rubber hammer.
- ▶ As with any wheel, periodically check your aluminum wheels for damage. If damaged, replace immediately.

SECTION 7-3

DO- IT- YOURSELF MAINTENANCE

Electrical components

Checking battery condition	454
Battery recharging precautions	455
Checking and replacing fuses	456
Adding washer fluid	457
Replacing light bulbs	458



**Checking battery condition—
—Precautions**

⚠ CAUTION

BATTERY PRECAUTIONS

The battery produces flammable and explosive hydrogen gas.

- ▶ Do not cause a spark from the battery with tools.
- ▶ Do not smoke or light a match near the battery.

The electrolyte contains poisonous and corrosive sulfuric acid.

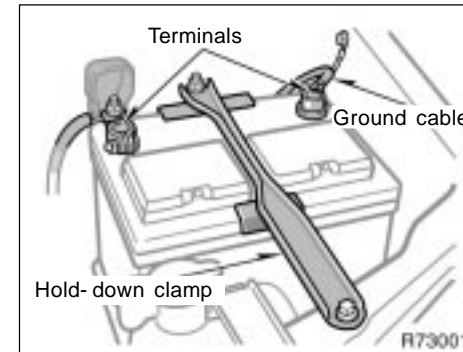
- ▶ Avoid contact with eyes, skin or clothes.
- ▶ Never ingest electrolyte.
- ▶ Wear protective safety glasses when working near the battery.
- ▶ Keep children away from the battery.

EMERGENCY MEASURES

- ▶ If electrolyte gets in your eyes, flush your eyes with clean water immediately and get immediate medical attention. If possible, continue to apply water with a sponge or cloth while en route to the medical office.

- ▶ If electrolyte gets on your skin, thoroughly wash the contact area. If you feel pain or burning, get medical attention immediately.
- ▶ If electrolyte gets on your clothes, there is a possibility of its soaking through to your skin, so immediately take off the exposed clothing and follow the procedure above, if necessary.
- ▶ If you accidentally swallow electrolyte, drink a large quantity of water or milk. Follow with milk of magnesia, beaten raw egg or vegetable oil. Then go immediately for emergency help.

—Checking battery exterior



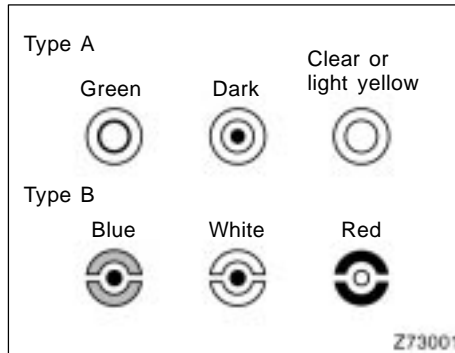
Check the battery for corroded or loose terminal connections, cracks, or loose hold-down clamp.

- If the battery is corroded, wash it off with a solution of warm water and baking soda. Coat the outside of the terminals with grease to prevent further corrosion.
- If the terminal connections are loose, tighten their clamp nuts—but do not overtighten.
- Tighten the hold-down clamp only enough to keep the battery firmly in place. Overtightening may damage the battery case.

NOTICE

- ◆ *Be sure the engine and all accessories are off before performing maintenance.*
- ◆ *When checking the battery, remove the ground cable from the negative terminal (“-” mark) first and reinstall it last.*
- ◆ *Be careful not to cause a short circuit with tools.*
- ◆ *Take care no solution gets into the battery when washing it.*

—Checking battery condition



CHECKING BY INDICATOR

Check the battery condition by the indicator color.

Indicator color		Condition
Type A	Type B	
Green	Blue	Good
Dark	White	Charging necessary. Have battery checked by your Toyota dealer.
Clear or Light Yellow	Red	Have battery checked by your Toyota dealer.

Battery recharging precautions

During recharging, the battery is producing hydrogen gas.

Therefore, before recharging:

1. If recharging with the battery installed on the vehicle, be sure to disconnect the ground cable.
2. Be sure the power switch on the recharger is off when connecting the charger cables to the battery and when disconnecting them.

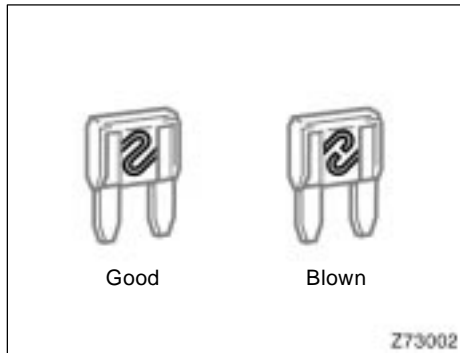
CAUTION

- ▶ **Always charge the battery in an unconfined area. Do not charge the battery in a garage or closed room where there is not sufficient ventilation.**
- ▶ **Only do a slow charge (5 A or less). Charging at a quicker rate is dangerous. The battery may explode, causing personal injuries.**

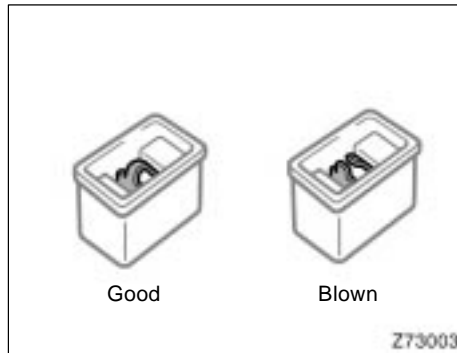
NOTICE

Never recharge the battery while the engine is running. Also, be sure all accessories are turned off.

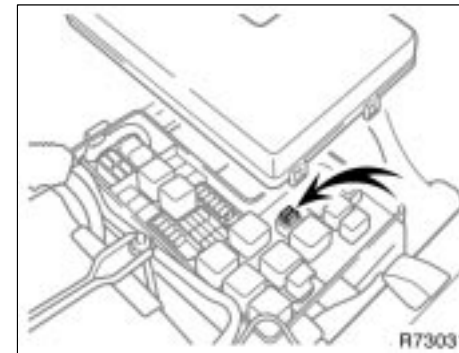
Checking and replacing fuses



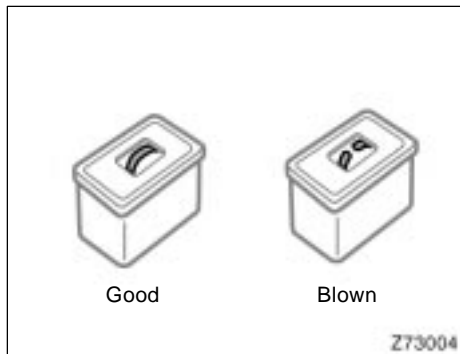
Type A



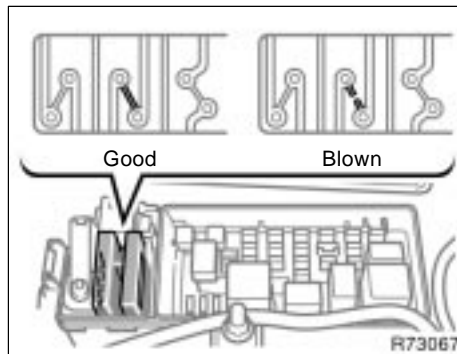
Type C



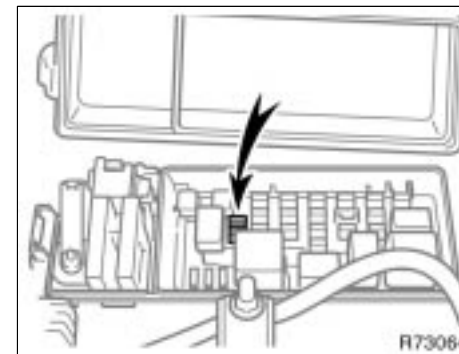
Standard and access cab models



Type B



Type D



Double cab models

If the headlights or other electrical components do not work, check the fuses. If any of the fuses are blown, they must be replaced.

See "Fuse locations" in Section 7-1 for locations of the fuses.

Turn the ignition switch and inoperative component off. Pull the suspected fuse straight out and check it.

Determine which fuse may be causing the problem. The lid of the fuse box shows the name of the circuit for each fuse. See Section 8 for the functions controlled by each circuit.

Type D—When any of the fuses are blown, contact your Toyota dealer.

Type A fuses can be pulled out by the pull-out tool. The location of the pull-out tool is shown in the illustration.

If you are not sure whether the fuse has blown, try replacing the suspected fuse with one that you know is good.

If the fuse has blown, push a new fuse into the clip.

Only install a fuse with the amperage rating designated on the fuse box lid.

If you do not have a spare fuse, in an emergency you can pull out the "DOME" or "A/C" fuse, which may be dispensable for normal driving, and use it if its amperage rating is the same.

If you cannot use one of the same amperage, use one that is lower, but as close to the rating as possible. If the amperage is lower than that specified, the fuse might blow out again but this does not indicate anything wrong. Be sure to get the correct fuse as soon as possible and return the substitute to its original clip.

It is a good idea to purchase a set of spare fuses and keep them in your vehicle for emergencies.

If the new fuse immediately blows out, there is a problem with the electrical system. Have your Toyota dealer correct it as soon as possible.

 **CAUTION**

Never use a fuse with a higher amperage rating, or any other object, in place of a fuse. This may cause extensive damage and possibly a fire.

Adding washer fluid

If any washer does not work or the low windshield washer fluid level warning light comes on, the washer tank may be empty. Add washer fluid.

You may use plain water as washer fluid. However, in cold areas where temperatures range below the freezing point, use washer fluid containing antifreeze. This product is available at your Toyota dealer and most auto parts stores. Follow the manufacturer's directions for how much to mix with water.


NOTICE

Do not use engine antifreeze or any other substitute because it may damage your vehicle's paint.

'05 TUNDRA_U (L/O 0409)

Replacing light bulbs—

The following illustrations show how to gain access to the bulbs. When replacing a bulb, make sure the ignition switch and light switch are off. Use bulbs with the wattage ratings given in the table.

 CAUTION
<p>▶ To prevent burning yourself, do not replace the light bulbs while they are hot.</p> <p>▶ Halogen bulbs have pressurized gas inside and require special handling. They can burst or shatter if scratched or dropped. Hold a bulb only by its plastic or metal case. Do not touch the glass part of a bulb with bare hands.</p>

NOTICE
<i>Only use a bulb of the listed type.</i>

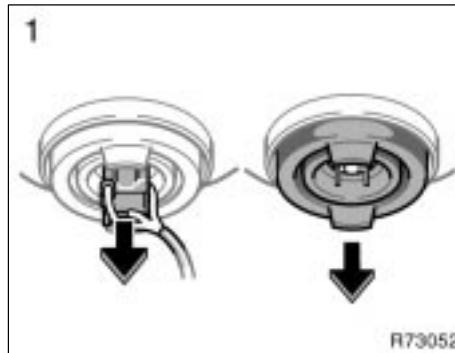
The inside of the lens of exterior lights such as headlights may temporarily fog up when the lens becomes wet in the rain or in a car wash. This is not a problem because the fogging is caused by the temperature difference between the outside and inside of the lens, just like the windshield fogs up in the rain. However, if there is a large drop of water on the inside of the lens, or if there is water pooled inside the light, contact your Toyota dealer.

Light bulbs	Bulb No.	W	Type
Headlights	—	60/55	A
Front fog lights	9006	51	B
Parking lights	168	5	D
Front turn signal/front side marker lights	3157A	27/8	C
Rear turn signal lights	—	21	C
Stop/tail/rear side marker lights	—	21/5	D
Back-up lights	921	18	D
License plate lights	168	5	D
High mounted stoplight and cargo lamps	921	18	D
Interior light	—	8	E
Front personal lights			
Type A and C	—	10	E
Type B	—	3.8	D
Center personal lights	—	3.8	D

Light bulbs	Bulb No.	W	Type
Vanity light	—	1.5	E
Door courtesy lights	194	3.4	D
Glove box light	—	1.2	D
Step light	—	1.4	D

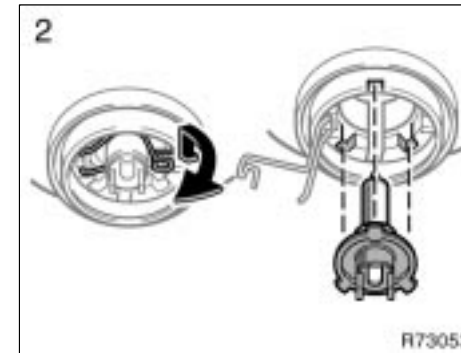
A: HB2 halogen bulbs
B: HB4 halogen bulbs
C: Wedge base bulbs (amber)
D: Wedge base bulbs (clear)
E: Double end bulbs

—Headlights



1. Open the hood. Unplug the connector. Remove the rubber cover.

If the connector is tight, wiggle it.



2. Release the bulb retaining spring and remove the bulb. Install a new bulb and the bulb retaining spring.

To install a bulb, align the tabs of the bulb with the cutouts of the mounting hole.

—Front fog lights

If either the left or right front fog lights burns out, contact your Toyota dealer.

NOTICE

Do not try to replace the front fog light bulbs by yourself. You may damage the vehicle.

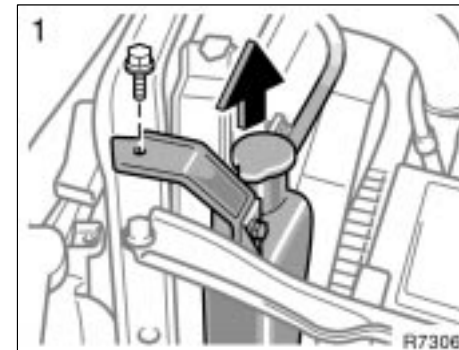


3. Install the rubber cover as shown, and fit it securely on the boss. Then plug in the connector.

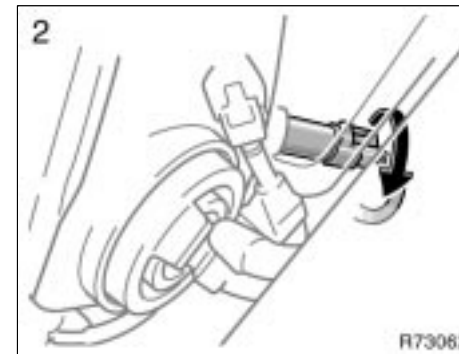
Make sure the rubber cover fits securely on the bulb base and the mounting body.

Aiming is not necessary after replacing the bulb. When aiming adjustment is necessary, contact your Toyota dealer.

—Parking lights

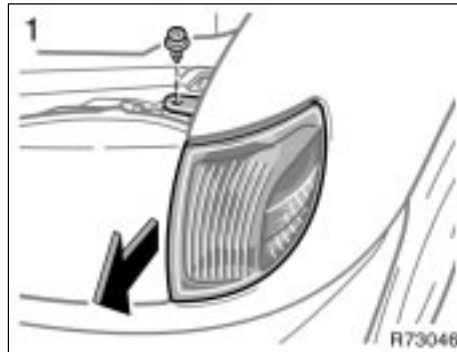
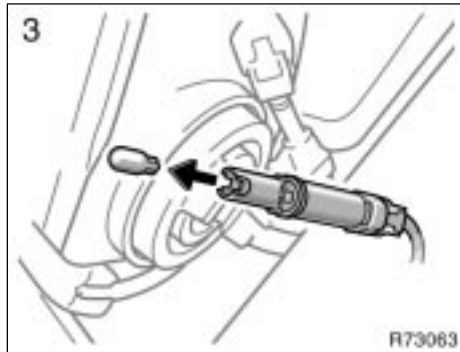


LEFT SIDE PARKING LIGHT—Loosen the bolt and remove the engine coolant reservoir.

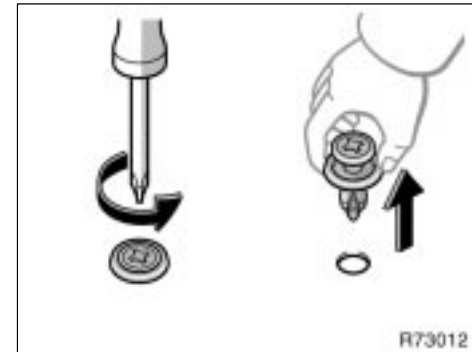


'05 TUNDRA_U (L/O 0409)

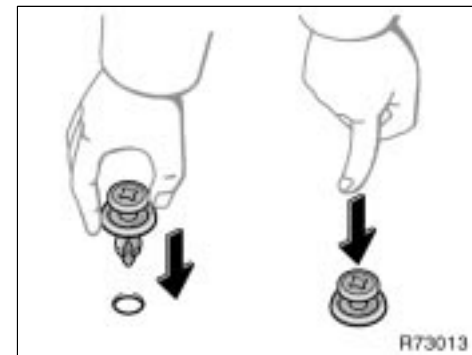
—Front turn signal/front side marker lights (standard and access cab models)



Use a Phillips-head screwdriver. Remove and install the clip as shown in the following illustrations.



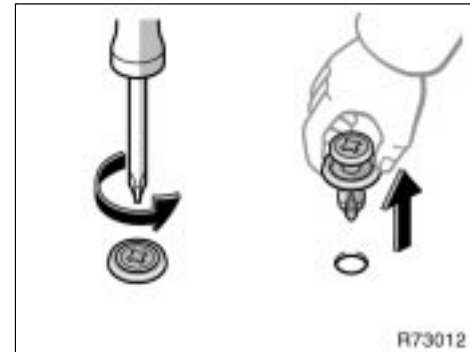
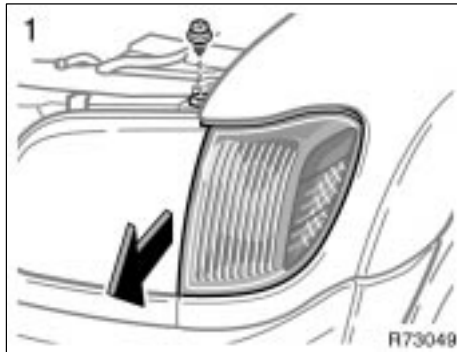
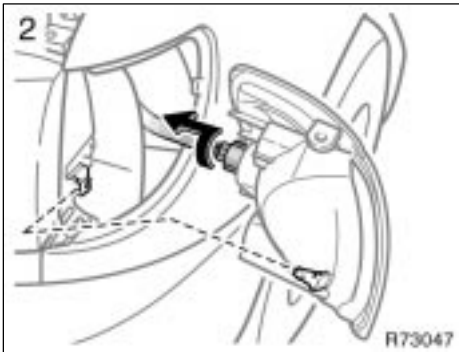
Removing clip



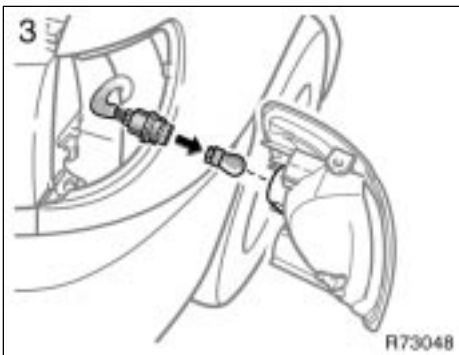
Installing clip

'05 TUNDRA_U (L/O 0409)

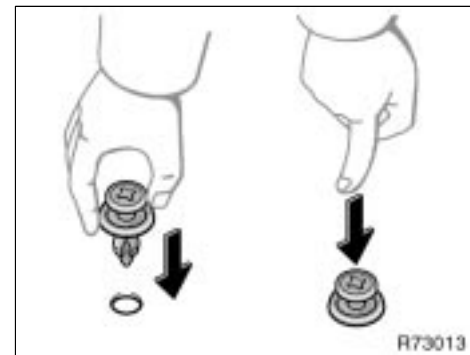
—Front side marker/front turn
signal lights
(double cab models)



Removing clip



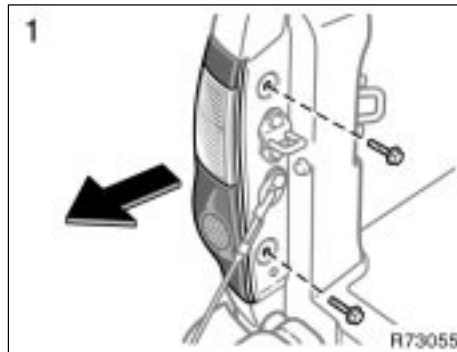
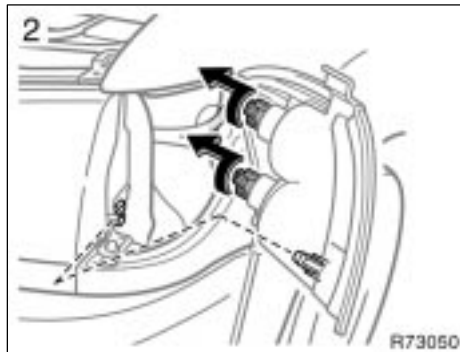
Use a Phillips-head screwdriver. Remove and install the clip as shown in the following illustrations.



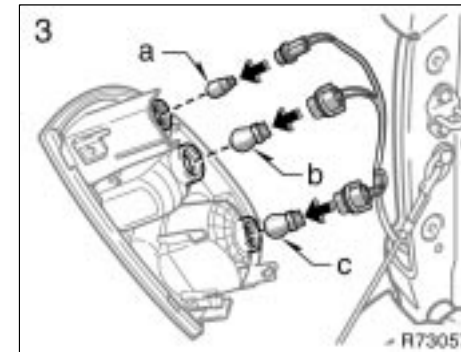
Installing clip

'05 TUNDRA_U (L/O 0409)

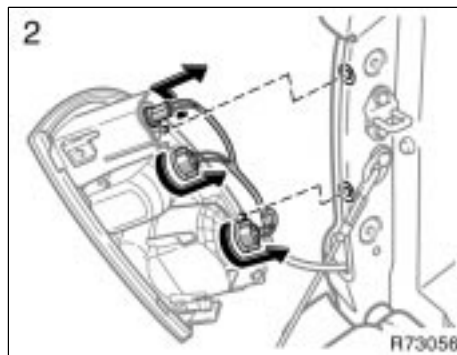
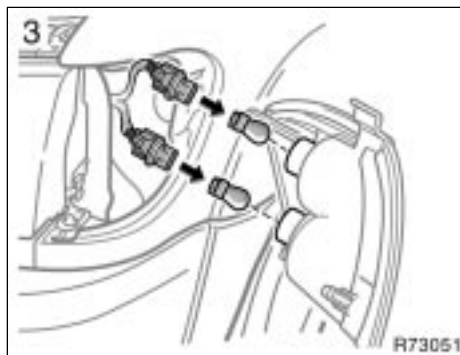
—Rear turn signal,
stop/tail/rear side marker and
back-up lights (type A)



Remove the bolts.

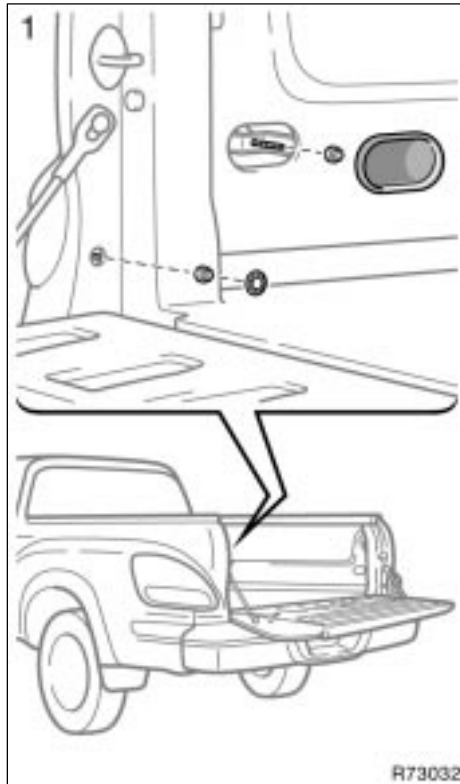


a: Back-up light
b: Rear turn signal light
c: Stop/tail/rear side marker light

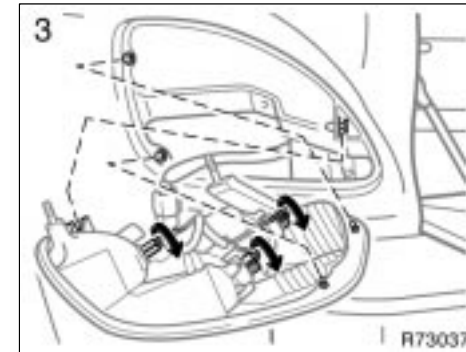


'05 TUNDRA_U (L/O 0409)

—Rear turn signal,
stop/tail/rear side marker and
back- up lights (type B)

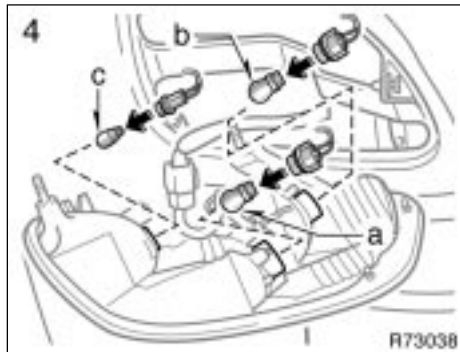


Remove the bolts.

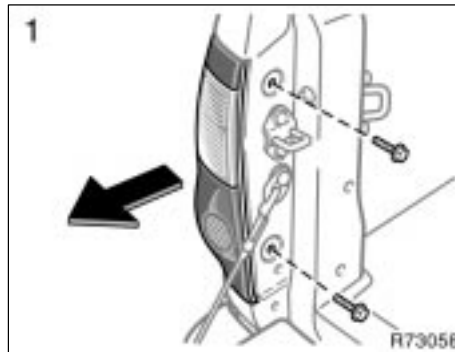


'05 TUNDRA_U (L/O 0409)

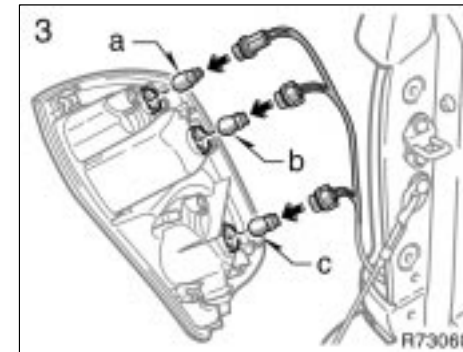
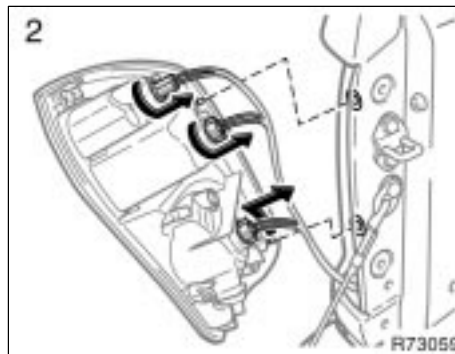
—Rear turn signal,
stop/tail/rear side marker and
back-up lights (type C)



- a: Rear turn signal light
- b: Stop/tail/rear side marker light
- c: Back-up light



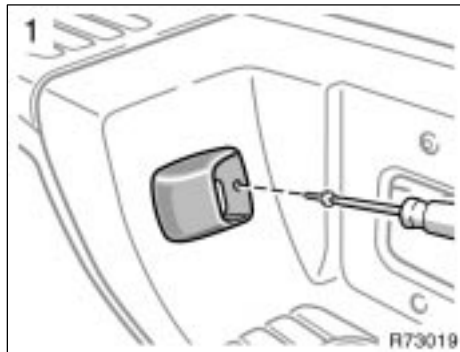
Remove the bolts.



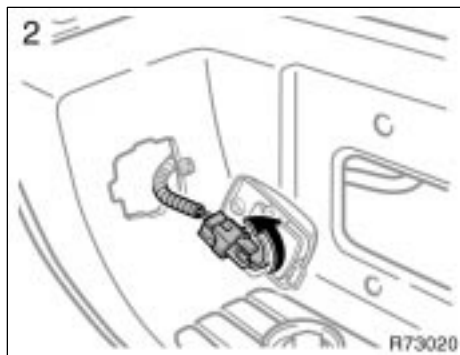
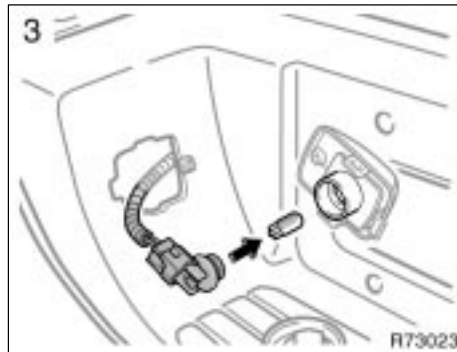
- a: Back-up light
- b: Rear turn signal light
- c: Stop/tail/rear side marker light

Remove the bulb of the back-up light at first when removing that of the rear turn signal light.

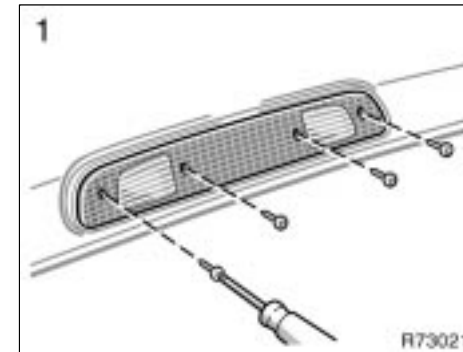
—License plate lights



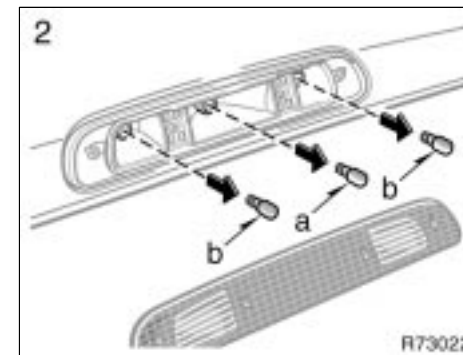
Use a Phillips-head screwdriver.



—High mounted stoplight and cargo lamps



Use a Phillips-head screwdriver.



a: High mounted stoplight
b: Cargo lamps

SECTION 8

SPECIFICATIONS

Specifications

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'05 TUNDRA_U (L/O 0409)

Dimensions

Two-wheel drive models

mm (in.)

	Standard cab models	Access cab models		Double cab models
		Standard bed	StepSide bed	
Overall length	5525 (217.5)*1 5545 (218.3)*2	5525 (217.5)*1 5545 (218.3)*2	5525 (217.5)*1 5545 (218.3)*2	5845 (230.1)
Overall width	1910 (75.2)	1910 (75.2) 1945 (76.6)*3 2015 (79.3)*4	2015 (79.3)	2015 (79.3)*3 2025 (79.7)*4
Overall height*5	1795 (70.7)	1790 (70.5)*6 1800 (70.9)*7 or 8	1790 (70.5)	1880 (74.0)*6 1890 (74.4)*7 1895 (74.6)*8
Wheelbase	3260 (128.3)	3260 (128.3)	3260 (128.3)	3570 (140.5)
Front tread	1680 (66.1)	1680 (66.1)	1680 (66.1)	1680 (66.1)
Rear tread	1648 (64.9)	1648 (64.9)	1648 (64.9)	1710 (67.3)

*1: With steel bumper

*2: With plastic bumper

*3: With wheel arch moulding

*4: With over fender

*5: Unladen vehicle

*6: With P245/70R16 tires

*7: With P265/70R16 tires

*8: With P265/65R17 tires

'05 TUNDRA_U (L/O 0409)

Four-wheel drive models

mm (in.)

	Standard cab models	Access cab models		Double cab models
		Standard bed	StepSide bed	
Overall length	5525 (217.5)*1 5545 (218.3)*2	5525 (217.5)*1 5545 (218.3)*2	5525 (217.5)*1 5545 (218.3)*2	5845 (230.1)
Overall width	1910 (75.2) 1945 (76.6)*3	1910 (75.2) 1945 (76.6)*3 2015 (79.3)*4	2015 (79.3)	2015 (79.3)*3 2025 (79.7)*4
Overall height*5	1805 (71.1)*6 1815 (71.5)*7 or 8	1810 (71.3)*6 1820 (71.7)*7 or 8	1810 (71.3)	1890 (74.4)*6 1900 (74.8)*7 1905 (75.0)*8
Wheelbase	3260 (128.3)	3260 (128.3)	3260 (128.3)	3570 (140.5)
Front tread	1675 (65.9)	1675 (65.9)	1675 (65.9)	1675 (65.9)
Rear tread	1648 (64.9)	1648 (64.9)	1648 (64.9)	1710 (67.3)

- *1: With steel bumper
- *2: With plastic bumper
- *3: With wheel arch moulding
- *4: With over fender
- *5: Unladen vehicle
- *6: With P245/70R16 tires
- *7: With P265/70R16 tires
- *8: With P265/65R17 tires

'05 TUNDRA_U (L/O 0409)

Payload

kg (lb.)

Cab type	Engine	Driving system	Transmission type	Deck type	Grade*4	Payload*5, 6
Standard cab models	1GR- FE	Two- wheel drive	Manual transmission	Standard bed	Standard	650 (1435)
			Automatic transmission	Standard bed	Standard	637 (1405)
	2UZ- FE	Two- wheel drive	Automatic transmission	Standard bed	Standard	853 (1882) 832 (1836)*1 900 (1985)*3
						Four- wheel drive
Access cab models	1GR- FE	Two- wheel drive	Manual transmission	Standard bed	SR5	630 (1391)
			Automatic transmission	Standard bed	SR5	608 (1342)
	2UZ- FE	Two- wheel drive	Automatic transmission	Standard bed	SR5	734 (1620) 713 (1574)*1
					Limited	781 (1722) 760 (1676)*1
				StepSide bed	SR5	597 (1318) 576 (1272)*1
					Limited	645 (1422) 624 (1376)*1

'05 TUNDRA_U (L/O 0409)

kg (lb.)

Cab type	Engine	Driving system	Transmission type	Deck type	Grade*4	Payload*5, 6
Access cab models	2UZ- FE	Four- wheel drive	Automatic transmission	Standard bed	SR5	614 (1355) 593 (1309)*1
					Limited	669 (1477) 649 (1431)*1
			Automatic transmission	StepSide bed	SR5	486 (1073) 465 (1027)*1
					Limited	533 (1177) 513 (1131)*1
Double cab models	2UZ- FE	Two- wheel drive	Automatic transmission	Standard bed	SR5	772 (1702) 753 (1661)*1 or 2 734 (1620)*1, 2
			Automatic transmission	Standard bed	Limited	761 (1678) 742 (1637)*1 or 2 723 (1596)*1, 2
		Four- wheel drive	Automatic transmission	Standard bed	SR5	663 (1462) 644 (1421)*1 or 2 625 (1380)*1, 2
			Automatic transmission	Standard bed	Limited	652 (1438) 633 (1397)*1 or 2 615 (1356)*1, 2

'05 TUNDRA_U (L/O 0409)

*1: With towing package

*2: With electric moon roof

*3: Without optional equipment

*4: See "Model code" on page xi in the beginning of this manual if you are not sure of which model your vehicle is.
*5:

Maximum payload including weight of driver, passengers, optional equipment and cargo

*6: Installing accessories in addition to those installed at the factory increases the weight of the vehicle, thereby reducing payload. Contact your Toyota dealer about the weight of accessory parts.

'05 TUNDRA_U (L/O 0409)

Towing capacity*

kg (lb.)

Standard cab models	1GR- FE engine	Two- wheel drive models	Without towing package	2358 (5200)
			With towing package	3311 (7300)
	2UZ- FE engine	Two- wheel drive models	Without towing package	2494 (5500)
			With towing package	3311 (7300)
2UZ- FE engine	Four- wheel drive models	Without towing package	2494 (5500)	
		With towing package	3311 (7300)	
Access cab models	1GR- FE engine	Two- wheel drive models	Without towing package	2268 (5000)
			With towing package	3311 (7300)
	2UZ- FE engine	Two- wheel drive models	Without towing package	2494 (5500)
			With towing package	3311 (7300)
2UZ- FE engine	Four- wheel drive models	Without towing package	2358 (5200)	
		With towing package	3175 (7000)	
Double cab models	2UZ- FE engine	Two- wheel drive models	Without towing package	2358 (5200)
			With towing package	3175 (7000)
	2UZ- FE engine	Four- wheel drive models	Without towing package	2222 (4900)
			With towing package	3039 (6700)

*: Trailer weight + cargo weight

'05 TUNDRA_U (L/O 0409)

Engine

Model:

1GR-FE and 2UZ-FE

Type:

1GR-FE engine

6 cylinder V type, 4 cycle, gasoline

2UZ-FE engine

8 cylinder V type, 4 cycle, gasoline

Bore and stroke, mm (in.):

1GR-FE engine

94.0 × 95.0 (3.70 × 3.74)

2UZ-FE engine

94.0 × 84.0 (3.70 × 3.31)

Displacement, cm³ (cu. in.):

1GR-FE engine 3956 (241.4)

2UZ-FE engine 4664 (284.6)

Fuel

Fuel type:

1GR-FE engine

Unleaded gasoline, Octane Rating 87 (Research Octane Number 91) or higher. For improved vehicle performance, the use of premium unleaded gasoline with an Octane Rating of 91 (Research Octane Number 96) or higher is recommended.

2UZ-FE engine

Unleaded gasoline, Octane Rating 87 (Research Octane Number 91) or higher

Fuel tank capacity, L (gal., Imp. gal.):

100 (26.4, 22.0)

Service specifications

ENGINE

Valve clearance (engine cold), mm (in.):

1GR-FE engine

Intake 0.15—0.25 (0.006—0.010)

Exhaust 0.29—0.39 (0.011—0.015)

2UZ-FE engine

Intake 0.15—0.25 (0.006—0.010)

Exhaust 0.25—0.35 (0.010—0.014)

Spark plug type:

1GR-FE engine

DENSO K20HR-U11

NGK LFR6C11

2UZ-FE engine

DENSO KS20R11

NGK IFR6A11

Spark plug gap, mm (in.):

1.1 (0.043)

'05 TUNDRA_U (L/O 0409)

ENGINE LUBRICATION

Oil capacity (drain and refill), L (qt., Imp. qt.):

1GR- FE engine	
With filter	4.5 (4.8, 4.0)
Without filter	4.2 (4.4, 3.7)
2UZ- FE engine	
With filter	6.2 (6.5, 5.5)
Without filter	5.7 (6.0, 5.0)

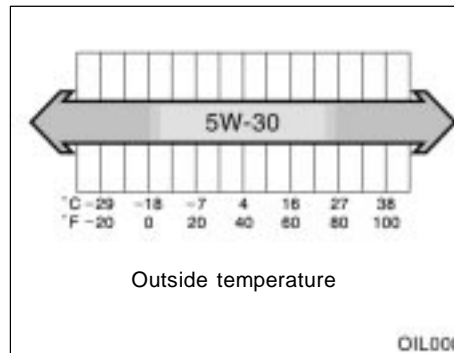
"Toyota Genuine Motor Oil" is used in your Toyota vehicle. Use Toyota approved "Toyota Genuine Motor Oil" or equivalent to satisfy the following grade and viscosity.

Oil grade:

API grade SL "Energy-Conserving" or ILSAC multigrade engine oil

Recommended oil viscosity:

SAE 5W-30



Please contact your Toyota dealer for further details.

COOLING SYSTEM

Total capacity, L (qt., Imp. qt.):

With manual transmission	
	10.4 (11.0, 9.2)
With automatic transmission	
1GR- FE engine	10.3 (10.9, 9.1)
2UZ- FE engine	
Standard and access cab models	12.6 (13.0, 11.1)
Double cab models	12.8 (13.5, 11.3)

Coolant type:

"Toyota Super Long Life Coolant" is used in your Toyota vehicle at factory fill. In order to avoid technical problems, only use "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology. (Coolant with long-life hybrid organic acid technology is a combination of low phosphates and organic acids.)

Do not use plain water alone.

Please contact your Toyota dealer for further details.

BATTERY

Open voltage* at 20°C (68°F):

12.6—12.8 V	Fully charged
12.2—12.4 V	Half charged
11.8—12.0 V	Discharged

*: Voltage that is checked 20 minutes after the key is removed with all the lights turned off

Charging rates:

5 A max.

'05 TUNDRA_U (L/O 0409)

CLUTCH

Pedal free play, mm (in.):
5—15 (0.2—0.6)

Fluid type:
SAE J1703 or FMVSS No.116 DOT 3

MANUAL TRANSMISSION

Oil capacity, L (qt., Imp. qt.):
1.8 (1.9, 1.6)

Oil type:
Gear oil API GL-4 or GL-5

Recommended oil viscosity:
SAE 75W-90

AUTOMATIC TRANSMISSION

Fluid capacity (drain and refill),
L (qt., Imp. qt.):
Up to 3.0 (3.2, 2.6)

Fluid type:
Toyota Genuine ATF WS

Change automatic transmission fluid only
as necessary.

Generally, it is necessary to change automatic transmission fluid only if your vehicle is driven under one of the Special Operating Conditions listed in your "Scheduled Maintenance Guide" or "Owner's Manual Supplement". When changing the automatic transmission fluid, use only "Toyota Genuine ATF WS" (ATF JWS3324 or NWS9638) to aid in assuring optimum transmission performance.

Notice: Using automatic transmission fluid other than "Toyota Genuine ATF WS" may cause deterioration in shift quality, locking up of your transmission accompanied by vibration, and ultimately damage the automatic transmission of your vehicle.

Please contact your Toyota dealer for further details.

TRANSFER

Oil capacity, L (qt., Imp. qt.):
1.0 (1.1, 0.9)

Oil type:
Gear oil API GL-4 or GL-5

Recommended oil viscosity:
SAE 75W-90

DIFFERENTIAL

Oil capacity, L (qt., Imp. qt.):

Front
1.15 (1.2, 1.0)

Rear

Standard and access cab models

Two-wheel drive models
Standard differential
3.80 (4.0, 3.3)
Limited-slip differential
3.15 (3.3, 2.8)

Four-wheel drive models
Standard differential
3.50 (3.7, 3.1)
Limited-slip differential
2.85 (3.0, 2.5)

Double cab models
Standard differential
4.00 (4.2, 3.5)
Limited-slip differential
3.35 (3.5, 2.9)

Oil type:

Standard differential
Hypoid gear oil API GL-5

Limited-slip differential
Hypoid gear oil for limited-slip differential API GL-5

'05 TUNDRA_U (L/O 0409)

Recommended oil viscosity:

- Front
 - SAE 75W-90
- Rear
 - Standard differential
 - Synthetic oil SAE 75W-140
 - Limited-slip differential
 - Above -18°C (0°F)
 - SAE 90
 - Below -18°C (0°F)
 - SAE 80W or 80W-90

CHASSIS LUBRICATION (Four-wheel drive models)

Propeller shafts:

- Spiders
 - Lithium base chassis grease, NLGI No.2
- Double cardan joint
 - Molybdenum-disulfide lithium base chassis grease, NLGI No.2
- Slide yokes
 - Lithium base chassis grease, NLGI No.2 or Molybdenum-disulfide lithium base chassis grease, NLGI No.2

BRAKES

Minimum pedal clearance when depressed with the force of 490 N (50 kgf, 110 lbf) with the engine running, mm (in.):

- Without vehicle stability control system
 - 95 (3.7)
- With vehicle stability control system
 - 80 (3.1)

Pedal free play, mm (in.):
1—6 (0.04—0.24)

Pad wear limit, mm (in.):
1.0 (0.04)

Lining wear limit, mm (in.):
1.0 (0.04)

Parking brake adjustment:

- Pedal type—when depressed with the force of 300 N (30.6 kgf, 67.1 lbf)
 - 8—10 clicks
- Lever type—when pulled with the force of 200 N (20.4 kgf, 45 lbf)
 - 8—12 clicks

Fluid type:
SAE J1703 or FMVSS No.116 DOT 3

STEERING

Wheel free play:

Less than 30 mm (1.2 in.)

Power steering fluid type:

Automatic transmission fluid DEXRON◀
or III

'05 TUNDRA_U (L/O 0409)

Tires

Tire size, cold tire inflation pressure and wheel size:

Standard and access cab models

Tire size	Tire inflation pressure kPa (kgf/cm ² or bar, psi)			Wheel size
	Front	Rear	Spare tire	
P245/70R16 106S	200 (2.0, 29)	240 (2.4, 35)	240 (2.4, 35)	7J or 7JJ × 16
P265/70R16 111S	180 (1.8, 26) ^{*1} 200 (2.0, 29) ^{*2}	200 (2.0, 29) ^{*1} 210 (2.1, 30) ^{*2}	200 (2.0, 29) ^{*1} 210 (2.1, 30) ^{*2}	7J or 7JJ × 16
P265/65R17 110S	200 (2.0, 29)	220 (2.2, 32)	220 (2.2, 32)	7 1/2JJ × 17

*1: Vehicles without off-road package

*2: Vehicles with off-road package

Double cab models

Tire size	Tire inflation pressure kPa (kgf/cm ² or bar, psi)			Wheel size
	Front	Rear	Spare tire	
P245/70R16 106S	220 (2.2, 32)	240 (2.4, 35)	240 (2.4, 35)	7J or 7JJ × 16
P265/70R16 111S	200 (2.0, 29) ^{*1} 220 (2.2, 32) ^{*2}	220 (2.2, 32) ^{*1} 230 (2.3, 33) ^{*2}	220 (2.2, 32) ^{*1} 230 (2.3, 33) ^{*2}	7J or 7JJ × 16
P265/65R17 110S	200 (2.0, 29)	220 (2.2, 32)	220 (2.2, 32)	7 1/2JJ × 17

*1: Vehicles without off-road package

*2: Vehicles with off-road package

NOTE: For a complete information on tires (e.g. replacing tires or replacing wheels), see "Checking tire inflation pressure" through "Aluminum wheel precautions" in Section 7-2.

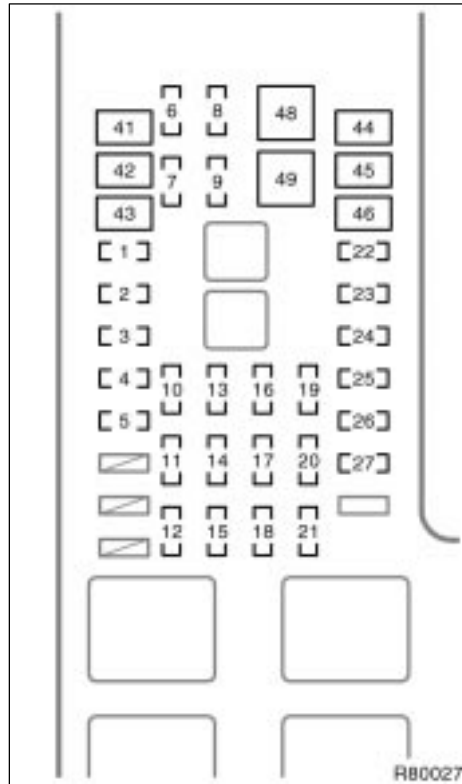
Wheel nut torque, N·m (kgf·m, ft·lbf):

110 (11.5, 83)

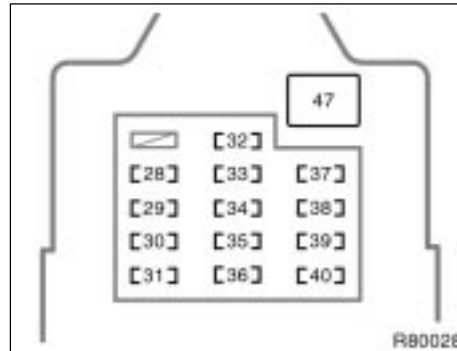
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'05 TUNDRA_U (L/O 0409)

Fuses (standard and access cab models)



Engine compartment



Instrument panel

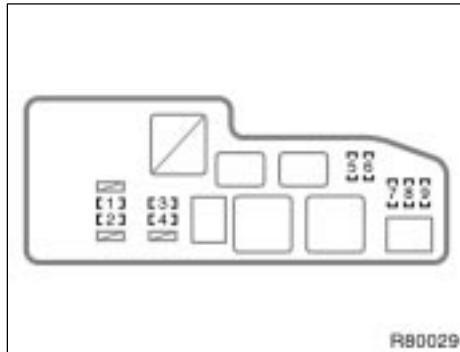
Fuses (type A)

1. **MIR HTR 15 A:** Outside rear view mirror heaters
2. **FOG 15 A:** Front fog lights
3. **TOW BRK 30 A (with towing package):** Trailer brake controller
4. **SUB BATT 30 A (with towing package):** Trailer sub battery
5. **TOW TAIL 30 A:** Trailer lights (tail lights)
6. **SPARE 30 A:** Spare fuse
7. **SPARE 15 A:** Spare fuse
8. **SPARE 20 A:** Spare fuse
9. **SPARE 10 A:** Spare fuse
10. **PWR OUTLET 1 15 A:** Power outlets
11. **ECU-B 5 A:** Vehicle stability control system, front passenger occupant classification system
12. **H-LP RH 10 A:** Right-hand headlight (high beam)
13. **PWR OUTLET 2 15 A:** Power outlet
14. **DOME 10 A:** Interior light, personal lights, vanity light, ignition switch light, step light, door courtesy lights, open door warning light
15. **H-LP LH 10 A :** Left-hand headlight (high beam)
16. **EFI NO.2 10 A:** Multiport fuel injection system/sequential multiport fuel injection system, leak detection pump, emission control system
17. **RADIO 25 A:** Audio system
18. **HEAD RL 10 A (with daytime running light system):** Right-hand headlight (low beam)
19. **A/C 10 A:** Air conditioning system
20. **A/F 20 A:** A/F sensor
21. **HEAD LL 10 A (with daytime running light system):** Left-hand headlight (low beam)

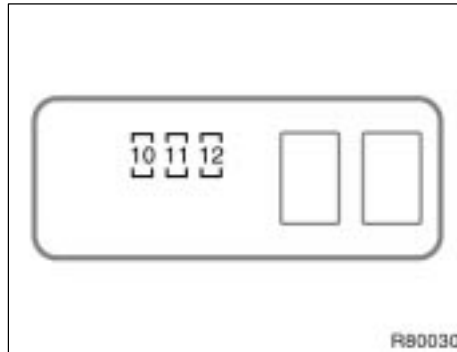
'05 TUNDRA_U (L/O 0409)

- 22. ALT-S 7.5 A:** Charging system
- 23. ETCS 10 A:** Multiport fuel injection system/sequential multiport fuel injection system, electronic throttle control system
- 24. HAZ 15 A:** Emergency flashers, turn signal lights, towing converter
- 25. EFI NO.1 20 A:** Multiport fuel injection system/sequential multiport fuel injection system, fuel pump, "EFI NO.2" fuse
- 26. AM2 30 A:** Ignition system, starting system, "IGN" and "STA" fuses
- 27. TOWING 30 A:** Towing converter
- 28. WIP 20 A:** Windshield wipers and washer
- 29. TURN 5 A:** Turn signal lights
- 30. ECU IG 5 A:** Anti-lock brake system, vehicle stability control system, multiplex communication system, tire pressure warning system
- 31. 4WD 20 A:** Four-wheel drive control system, A.D.D. control system
- 32. ACC 15 A:** Cigarette lighter, audio system, power rear view mirrors, "PWR OUTLET 1" and "PWR OUTLET 2" fuses
- 33. GAUGE 10 A:** Gauges and meters, back-up lights, starting system, air conditioning system, auto anti-glare inside rear view mirror, outside rear view mirror heaters
- 34. IGN 5 A:** SRS airbag system, multiport fuel injection system/sequential multiport fuel injection system, discharge warning light, ignition system, vehicle stability control system, front passenger occupant classification system
- 35. CARGO LP 5 A:** Cargo lamp
- 36. TAIL 15 A:** Tail lights, turn signal lights, license plate lights, instrument panel lights, parking lights, glove box light
- 37. OBD 7.5 A:** On-board diagnosis system
- 38. HORN 10 A:** Horns
- 39. STA 5 A:** Multiport fuel injection system/sequential multiport fuel injection system, gauges and meters
- 40. STOP 15 A:** Stoplights, high mounted stoplight, anti-lock brake system, vehicle stability control system, towing converter
- Fuses (type B)**
- 41. AM1 40 A:** Starting system, "ACC", "WIP", "4WD", "ECU-IG", "GAUGE" and "TURN" fuses
- 42. HTR 50 A:** Air conditioning system, "A/C" fuse
- 43. J/B 50 A:** "POWER", "CARGO LP", "TAIL", "OBD", "HORN" and "STOP" fuses
- 44. ABS 2 50 A:** Anti-lock brake system, vehicle stability control system
- 45. ABS 3 30 A:** Anti-lock brake system, vehicle stability control system
- 46. ST3 30 A:** Starting system, "STA" fuse
- 47. POWER 30 A:** Power door lock system, power windows, power back window, power seat
- Fuse (type C)**
- 48. FL ALT 100 A (without towing package) or 140 A (with towing package):** "AM1", "HTR", "J/B", "MIR HTR", "FOG", "TOW BRK", "SUB BATT", "TOW TAIL", "PWR OUTLET 1" and "PWR OUTLET 2" fuses
- 49. A/PUMP 60 A:** Multiport fuel injection system/sequential multiport fuel injection system

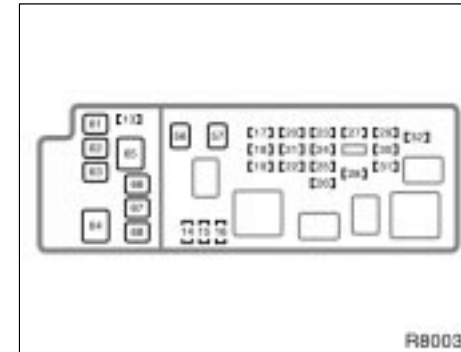
Fuses (double cab models)



Engine compartment



Engine compartment



Engine compartment

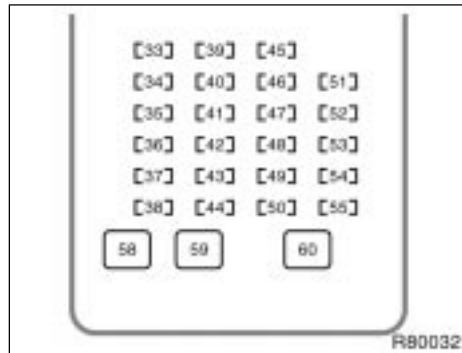
Fuses (type A)

1. **RSE 7.5 A:** Rear seat audio system, rear seat entertainment system
2. **A/F 20 A:** A/F sensor
3. **DEF/UP 7.5 A:** Outside rear view mirror heaters, multiport fuel injection system/sequential multiport fuel injection system
4. **A/C 7.5 A:** Air conditioning system
5. **H-LP LL 10 A (with daytime running light system):** Left-hand headlight (low beam)

6. **H-LP RL 10 A (with daytime running light system):** Right-hand headlight (low beam)
7. **STA 7.5 A:** Multiport fuel injection system/sequential multiport fuel injection system
8. **H-LP LH 10 A (with daytime running light system):** Left-hand headlight (high beam)
9. **H-LP RH 10 A (with daytime running light system):** Right-hand headlight (high beam)
10. **TOWING TAIL 30 A:** Trailer lights (tail lights)

11. **BATT CHARGE 30 A:** Trailer sub battery
12. **TOWING BRK 30 A:** Trailer brake controller
13. **CARGO LP 7.5 A:** Cargo lamp
14. **SPARE 15 A:** Spare fuse
15. **SPARE 20 A:** Spare fuse
16. **SPARE 30 A:** Spare fuse
17. **ETCS 10 A:** Multiport fuel injection system/sequential multiport fuel injection system, electronic throttle control system

'05 TUNDRA_U (L/O 0409)



Instrument panel

- 18. **EFI NO.1 20 A:** Multiport fuel injection system/sequential multiport fuel injection system
- 19. **H-LP RH 15 A (without daytime running light system):** Right-hand headlight
- 20. **TOWING 30 A:** Towing converter
- 21. **ALT-S 7.5 A:** Charging system
- 22. **DRL 15 A (with daytime running light system):** Daytime running light system
H-LP LH 15 A (without daytime running light system): Left-hand headlight
- 23. **AM2 25 A:** Starting system
- 24. **TURN-HAZ 20 A:** Turn signal lights, emergency flashers, towing converter
- 25. **RAD NO.3 30 A:** Audio system/video system
- 26. **ST 30 A:** Starting system, "STA" fuse
- 27. **HORN 10 A:** Horns
- 28. **EFI NO.2 10 A:** Multiport fuel injection system/sequential multiport fuel injection system, leak detection pump
- 29. **DOME 10 A:** Center interior and personal lights, personal lights, gauges and meters, clock, ignition switch light, door courtesy lights, step light, vanity lights
- 30. **ECU-B 7.5 A:** Multiplex communication system, front passenger occupant classification system, driver and front passenger door lock system, gauges and meters, wireless door lock system
- 31. **MIR HTR 15 A:** Outside rear view mirror heaters
- 32. **RAD NO.1 20 A:** Audio system, rear seat entertainment system
- 33. **TAIL 15 A:** Tail lights, trailer lights (tail lights), parking lights, multiport fuel injection system/sequential multiport fuel injection system, license plate lights
- 34. **ECU-IG 10 A:** Charging system, stop lights, anti-lock brake system, vehicle stability control system, traction control system, electric moon roof, driver and front passenger door lock system, gauges and meters, multi-information display, power outlets, multiplex communication system, tire pressure warning system, auto anti-glare inside rear view mirror
- 35. **WSH 25 A:** Wipers and washer
- 36. **AC INV 15 A:** Power outlets
- 37. **IGN 2 20 A:** Starting system, multiport fuel injection system/sequential multiport fuel injection system
- 38. **PWR NO.3 20 A:** Rear passenger's power window (right side)
- 39. **PWR NO.4 20 A:** Rear passenger's power window (left side)
- 40. **CIG 15 A:** Cigarette lighter
- 41. **RAD NO.2 7.5 A:** Audio system/video system, rear seat audio system, rear seat entertainment system, multiplex communication system, clock, shift position indicator lights
- 42. **4WD 20 A:** A.D.D. control system, four-wheel drive system

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- 43. **STOP 15 A:** Stop lights, high-mounted stop lights, multiport fuel injection system/sequential multiport fuel injection system, anti-lock brake system, vehicle stability control system, traction control system, trailer light (stop lights), trailer brake controller, towing converter, multiplex communication system
 - 44. **OBD 7.5 A:** On-board diagnosis system
 - 45. **PANEL 7.5 A:** Instrument panel lights, glove box light, lights of seat heaters, cigarette lighter, ashtrays, multi-information display, audio system/video system, gauges and meters, air conditioning systems, power outlets
 - 46. **PWR NO.1 25 A:** Driver's door lock system, driver's power window
 - 47. **WIP 25 A:** Wiper and washers
 - 48. **IGN 1 10 A:** Charging system, SRS airbag system, multiport fuel injection system/sequential multiport fuel injection system, vehicle stability control system, gauges and meters, air conditioning system, front passenger occupant classification system
 - 49. **SUN ROOF 25 A:** Electric moon roof
 - 50. **PWR NO.2 25 A:** Front passengers' door lock system, front passenger's power window
 - 51. **HTR 10 A:** Air conditioning systems, electric cooling fan, back window defogger, seat heaters
 - 52. **FOG 15 A:** Front fog lights
 - 53. **GAUGE 15 A:** Back-up lights, gauge and meters, emergency flashers, slip indicator light, vehicle stability control system, four-wheel drive system, trailer lights (back-up lights), multiport fuel injection system/sequential multiport fuel injection system, shift position indicator lights
 - 54. **PWR OUTLET 15 A:** Power outlets
 - 55. **SEAT HTR 15 A:** Seat heaters
- Fuses (type B)**
- 56. **MAIN 40 A:** "H-LP RH", "H-LP LH" "H-LP LL" and "H-LP RL" fuses
 - 57. **DOOR NO.2 30 A:** Multiplex communication system (power door lock system, security system)
 - 58. **PWR SEAT 30 A:** Power front seats
 - 59. **AM1 40 A:** "HTR", "CIG", "GAUGE", "RAD NO.2", "ECU-IG", "WIP", "WSH", "IGN 1", "IGN 2" and "4WD" fuses
 - 60. **PWR NO.5 30 A:** Power back window
- Fuses (type D)**
- 61. **ABS NO.2 30 A:** Anti-lock brake system, vehicle stability control system
 - 62. **DEFOG 40 A:** Back window defogger
 - 63. **HEATER 50 A:** Air conditioning system
 - 64. **TOWING R/B 60 A:** "TOWING TAIL", "BATT CHARGE" and "TOWING BRK" fuses
 - 65. **ALT 140 A:** "DEFOG", "ABS NO.2", "CARGO LP", "HEATER", "AM1", "PWR SEAT", "TAIL", "STOP", "SUN ROOF", "PANEL", "OBD", "FOG", "PWR NO.1", "PWR NO.2", "PWR NO.5", "AC INV", "PWR NO.3", "PWR NO.4", "PWR OUTLET" and "SEAT HTR" fuses
 - 66. **ABS NO.1 40 A:** Anti-lock brake system, vehicle stability control system
 - 67. **A/PUMP 50 A:** Multiport fuel injection system/sequential multiport fuel injection system
 - 68. **R/B 30 A:** "A/F" fuse

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SECTION 9

REPORTING SAFETY DEFECTS FOR U.S. OWNERS AND CAMPER INFORMATION

Reporting safety defects for U.S. owners and camper information

Reporting safety defects for U.S. owners	486
Camper information	486

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Reporting safety defects for U.S. owners

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Toyota Motor Sales, U.S.A., Inc. (Toll-free: 1-800-331-4331).

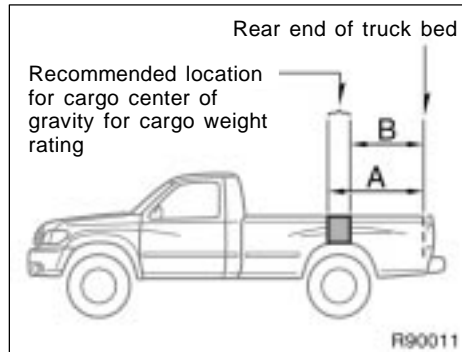
If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Toyota Motor Sales, U.S.A., Inc.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in Washington, D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington, D.C. 20590. You can also obtain other information about motor vehicle safety from the Hotline.

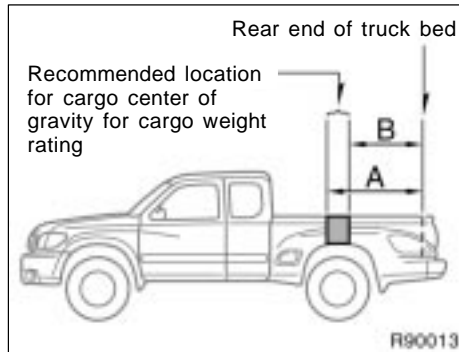
Camper information—

This information has been prepared in accordance with regulation issued by the National Highway Traffic Safety Administration of the U.S. Department of Transportation. It provides the purchasers and/or prospective purchasers of Toyota vehicles with information on truck-camper loading. Your Toyota dealer will help answer any questions you may have as you read this information.

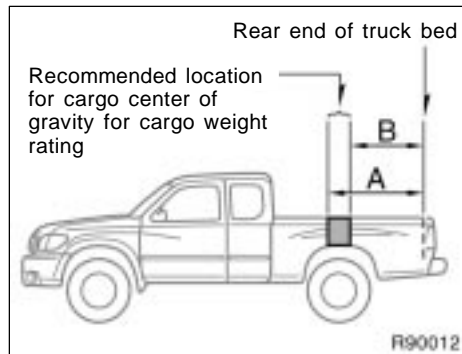
—Center of gravity location



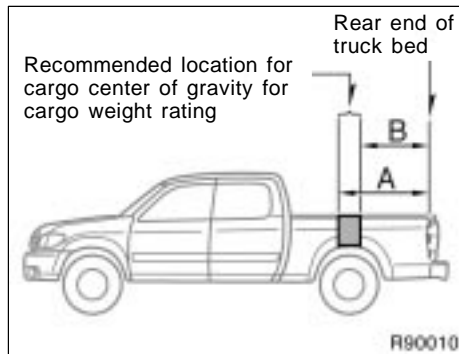
Standard cab models



Access cab models (StepSide bed)



Access cab models (standard bed)



Double cab models

The figures given in the illustration indicate the recommended center of gravity zone.

Standard cab models

- A: 1186 mm (46.7 in.)
- B: 1058 mm (41.7 in.)

Access cab models

Standard bed

- A: 1186 mm (46.7 in.)
- B: 1058 mm (41.7 in.)

StepSide bed

- A: 1158 mm (45.6 in.)
- B: 1030 mm (40.6 in.)

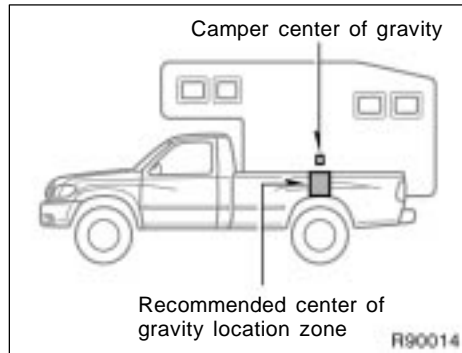
Double cab models

- A: 1189 mm (46.8 in.)
- B: 1062 mm (41.8 in.)

⚠ CAUTION

If a load is too far back, it can cause dangerous handling. If it is too far forward, the front axle may be overloaded.

—Cargo weight rating and proper matching



CARGO WEIGHT RATING

Standard cab models

3 people, V6,	453 kg (1000 lb.)
3 people, V8,	476 kg (1050 lb.)

Access cab models

5 people, V6,	295 kg (650 lb.)
6 people, V6,	204 kg (450 lb.)
6 people, V8, 2WD, Standard bed	295 kg (650 lb.)
6 people, V8, 2WD, StepSide bed	204 kg (450 lb.)
6 people, V8, 4WD, Standard bed	159 kg (350 lb.)
6 people, V8, 4WD, StepSide bed	91 kg (200 lb.)

Double cab models

5 people, V8, 2WD,	385 kg (850 lb.)
5 people, V8, 4WD,	272 kg (600 lb.)

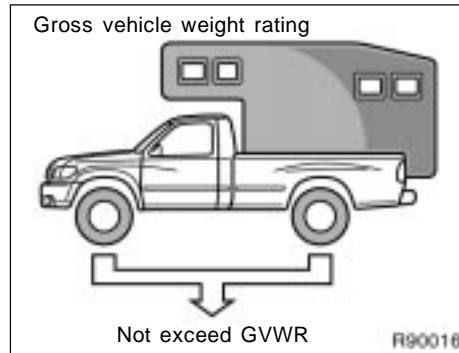
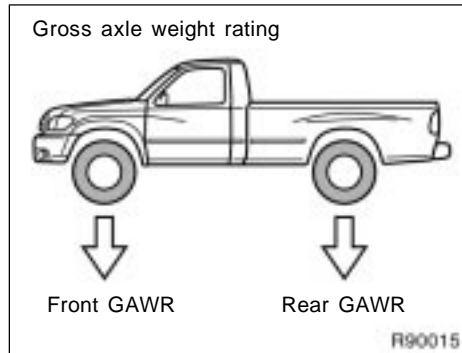
When the truck is used to carry a slide-in camper, the total cargo load of the truck consists of the manufacturer's camper weight figure, the weight of installed additional camper equipment not included in the manufacturer's camper weight figure, the weight of camper cargo, and the weight of passengers in the camper.

The total cargo load should not exceed the truck's cargo weight rating and the camper's center of gravity should fall within the truck's recommended center of gravity zone when installed.

⚠ CAUTION

Be careful—overloading can cause dangerous braking and handling problems, and can damage your vehicle and its tires.

—Gross axle and vehicle weight ratings



Secure loose items to prevent weight shifts that could affect the balance of your vehicle. When the truck camper is loaded, drive to a scale and weigh on the front and on the rear wheels separately to determine axle loads. Individual axle loads should not exceed either of the Gross Axle Weight Ratings (GAWR). The total of the axle loads should not exceed the Gross Vehicle Weight Rating (GVWR). These ratings are given on the vehicle Certification Label which is located on the door latch post on the left side of the vehicle. See "Your Toyota's identification" in Section 2 for the Certification Label location. If weight ratings are exceeded, move or remove items to bring all weights below the ratings.

GAWR

Front	1588 kg (3500 lb.)
Rear	
Standard and access cab models	
V6	1615 kg (3560 lb.)
V8	
Standard bed	1656 kg (3650 lb.)
StepSide bed	1615 kg (3560 lb.)
Double cab models	1706 kg (3760 lb.)

GVWR

Two-wheel drive models

Standard cab models

V6	2494 kg (5500 lb.)
V8	2858 kg (6300 lb.)

Access cab models

V6	2585 kg (5700 lb.)
V8	

Standard bed

2858 kg (6300 lb.)

StepSide bed

2726 kg (6010 lb.)

Double cab models

2993 kg (6600 lb.)

Four-wheel drive models

Standard cab models

2858 kg (6300 lb.)

Access cab models

Standard bed

2858 kg (6300 lb.)

StepSide bed

2726 kg (6010 lb.)

Double cab models

2993 kg (6600 lb.)

If weight ratings are exceeded, move or remove items to bring all weights below the ratings.

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TU-2

Quick index

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Gas station information

Fuel type:

1GR-FE engine: UNLEADED gasoline, Octane Rating 87 (Research Octane Number 91) or higher

For improved vehicle performance, the use of premium unleaded gasoline with an Octane Rating of 91 (Research Octane Number 96) or higher is recommended.

2UZ-FE engine: UNLEADED gasoline, Octane Rating 87 (Research Octane Number 91) or higher

See page 341 for detailed information.

Fuel tank capacity:

100 L (26.4 gal., 22.0 Imp. gal.)

Engine oil:

API grade SL "Energy-Conserving" or ILSAC multigrade engine oil is recommended.

See page 439 for detailed information.

Tire information: See pages 444 through 452.

Tire inflation pressure: See page 478.

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Important information about this manual

Safety and vehicle damage warnings

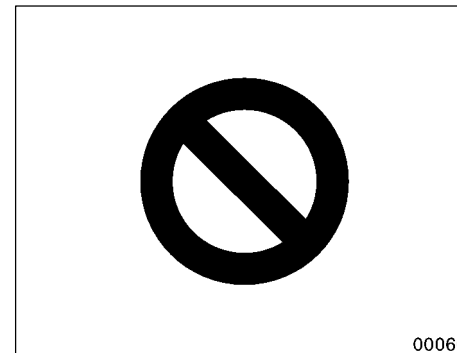
Throughout this manual, you will see safety and vehicle damage warnings. You must follow these warnings carefully to avoid possible injury or damage.

The types of warnings, what they look like, and how they are used in this manual are explained as follows:

 CAUTION
<p>This is a warning against anything which may cause injury to people if the warning is ignored. You are informed about what you must or must not do in order to reduce the risk of injury to yourself and others.</p>

NOTICE
<p><i>This is a warning against anything which may cause damage to the vehicle or its equipment if the warning is ignored. You are informed about what you must or must not do in order to avoid or reduce the risk of damage to your vehicle and its equipment.</i></p>

Safety symbol



When you see the safety symbol shown above, it means: “Do not...”; “Do not do this”; or “Do not let this happen”.

Important information about your Toyota

Occupant restraint systems

Toyota encourages you and your family to take the time to read Section 1-3 of this Owner's Manual carefully. In terms of helping you understand how you can receive the maximum benefit of the occupant restraint systems this vehicle provides, Section 1-3 of this Owner's Manual is the most important Section for you and your family to read.

Section 1-3 describes the function and operation concerning seats, seat belts, SRS airbags and child restraint systems of this vehicle and some potential hazards you should be aware of. These systems work together along with the overall structure of this vehicle in order to provide occupant restraint in the event of a crash. The effect of each system is enhanced when it is used properly and together with other systems. No single occupant restraint system can, by itself, provide you or your family with the equal level of restraint which these systems can provide when used together. That is why it is important for you and your family to understand the purpose and proper use of each of these systems and how they relate to each other.

The purpose of all occupant restraint systems is to help reduce the possibility of death or serious injury in the event of a collision. None of these systems, either individually or together, can ensure that there is no injury in the event of collision. However, the more you know about these systems and how to use them properly, the greater your chances become of surviving an accident without death or serious injury.

Seat belts provide the primary restraint to all occupants of the vehicle, and every occupant of the vehicle should wear seat belts properly at all times. Children should always be secured in child restraint systems that are appropriate for their age and size. SRS (Supplemental Restraint System) airbags are, as their names imply, designed to work with, and be supplemental to, seat belts and are not substitutes for them. SRS airbags can be very effective in reducing the risk of head and chest injuries by preventing contact of the head and chest with interior portions of the vehicle.

In order to be effective, the SRS airbags must deploy with tremendous speed. The rapid deployment of the SRS airbags makes the SRS airbags themselves potential sources of serious injury if an occupant is too close to an airbag, or if an object or some part of his or her body has been placed between the occupant and the airbag at the time of deployment. This is just one example of how the instructions in Section 1-3 of this Owner's Manual will help ensure proper use of the occupant restraint systems, and increase the safety they can provide to you and your family in the event of an accident.

Toyota recommends you to read the provisions in Section 1-3 carefully and refer to them as needed during your time of ownership of this vehicle.

Event data recorder

Your vehicle has computers that monitor and control certain aspects of your vehicle. These computers assist in driving and maintaining optimal vehicle performance. Besides storing data useful for troubleshooting, there is a system to record data in a crash or a near car crash event. This is called an Event Data Recorder (EDR).

The SRS airbag sensor assembly contains the EDR. In a crash or a near car crash event, this device records some or all of the following information:

- ▶ Engine speed
- ▶ Whether the brake pedal was applied or not
- ▶ Vehicle speed
- ▶ To what extent the accelerator pedal was depressed
- ▶ Position of the transmission selector lever
- ▶ Whether the driver and front passenger wore the seat belts or not
- ▶ Driver's seat position
- ▶ Front passenger's occupant classification

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- ▶ SRS airbag deployment data
- ▶ SRS airbag system diagnostic data

The information above is intended to be used for the purpose of improving vehicle safety performance. Unlike general data recorders, the EDR does not record sound data such as conversation between passengers.

Toyota will not disclose the data recorded in an EDR to a third party except when:

- ▶ An agreement from the vehicle's owner (or the leasing company for a leased vehicle) is obtained
- ▶ Officially requested by the police or other authorities
- ▶ Used as a defense for Toyota in a law suit
- ▶ Ordered by the court

However, if necessary Toyota will:

- ▶ Use the data for research on Toyota vehicle safety performance
- ▶ Disclose the data to a third party for research purposes without disclosing details of the vehicle owner, and only when it is deemed necessary
- ▶ Disclose summarized data cleared of vehicle identification information to a non-Toyota organization for research purposes

New vehicle warranty

Your new vehicle is covered by the following Toyota limited warranties:

- ▶ New vehicle warranty
- ▶ Emission control systems warranty
- ▶ Others

For further information, please refer to the "Owner's Warranty Information Booklet" or "Owner's Manual Supplement".

v

Your responsibility for maintenance

It is the owner's responsibility to make sure that the specified maintenance is performed. Section 6 gives details of these maintenance requirements. Also included in Section 6 is general maintenance. For scheduled maintenance information, please refer to the "Scheduled Maintenance Guide" or "Owner's Manual Supplement".

Important health and safety information about your Toyota



- ▶ **WARNING:** Engine exhaust, some of its constituents, and a wide variety of automobile components contain or emit chemicals known to the State of California to cause cancer and birth defects and other reproductive harm. In addition, oils, fuels and fluids contained in vehicles as well as waste produced by component wear contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
- ▶ **Battery posts, terminals and related accessories** contain lead and lead compounds. Wash your hands after handling. Used engine oil contains chemicals that have caused cancer in laboratory animals. Always protect your skin by washing thoroughly with soap and water.

Accessories, spare parts and modification of your Toyota

A wide variety of non-genuine spare parts and accessories for Toyota vehicles are currently available in the market. You should know that Toyota does not warrant these products and is not responsible for their performance, repair, or replacement, or for any damage they may cause to, or adverse effect they may have on, your Toyota vehicle.

This vehicle should not be modified with non-genuine Toyota products. Modification with non-genuine Toyota products could affect its performance, safety or durability, and may even violate governmental regulations. In addition, damage or performance problems resulting from the modification may not be covered under warranty.

Spark ignition system of your Toyota

The spark ignition system in your Toyota meets all requirements of the Canadian Interference-Causing Equipment Standard.

Installation of a mobile two-way radio system

As the installation of a mobile two-way radio system in your vehicle could affect electronic systems such as follows, be sure to check with your Toyota dealer for precautionary measures or special instructions regarding installation.

- ▶ Multiport fuel injection system/sequential multiport fuel injection system
- ▶ Electronic throttle control system
- ▶ SRS airbag system
- ▶ Seat belt pretensioner system
- ▶ Anti-lock brake system
- ▶ Traction control system
- ▶ "AUTO LSD" system
- ▶ Vehicle stability control system
- ▶ Cruise control system
- ▶ Tire pressure warning system

Tires and loading on your Toyota

Underinflated or overinflated tire pressure and the excess load may result in the deterioration of steering ability and braking ability, leading to an accident. Check the tire inflation pressure periodically and be sure to keep the load limits given in this Owner's Manual. For details about tire inflation pressure and load limits, see "Checking tire inflation pressure" in Section 7-2 and "Vehicle load limits" in Section 2.

Scrapping of your Toyota

The SRS airbag and seat belt pretensioner devices in your Toyota contain explosive chemicals. If the vehicle is scrapped with the airbags and pretensioners left as they are, this may cause an accident such as fire. Be sure to have the systems of the SRS airbag and seat belt pretensioner removed and disposed of by a qualified service shop or by your Toyota dealer before you dispose of your vehicle.

On- pavement and off- road driving tips

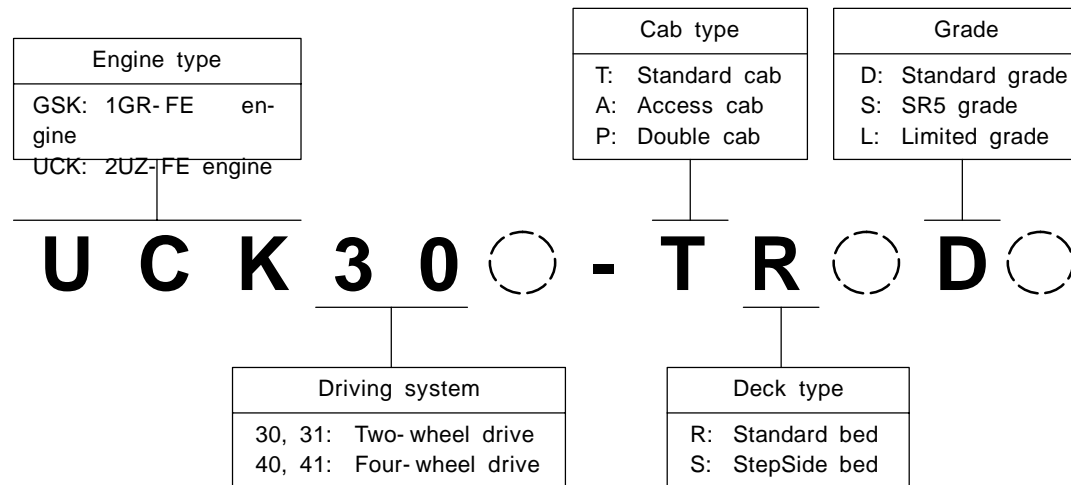
This vehicle will handle and maneuver differently from an ordinary passenger car because it is designed for off-road use also. It has a significantly higher rollover rate than other types of vehicles. In addition, this vehicle has a higher ground clearance and center of gravity than that of an ordinary passenger car. This vehicle design feature causes this type of vehicle to be more likely to rollover. Failure to operate this vehicle correctly may result in loss of control, accidents or vehicle rollover causing death or serious injury. Be sure to read "Off-road vehicle precautions" in Section 2 and "Off-road driving precautions" in Section 3.

Leak detection pump

This pump performs fuel evaporation leakage check. This check is done approximately five hours after the engine is turned off. So you may hear sound coming from underneath the rear deck for several minutes. It does not indicate a malfunction.

Model code

Check the model code to see what type of model your vehicle is.



The model code appears on the Certification Label with the heading "MODEL".
See "Your Toyota's identification" in Section 2 for the Certification Label location.

You should know as much about the quality and importance of proper maintenance of your new vehicle as the people who built it.

The Toyota authorized Repair Manual tells you how to maintain your vehicle and enables you to correctly perform your own maintenance.



The best way to keep your new vehicle in top running order is to maintain it properly from the moment you drive it off the showroom floor.

The Toyota authorized Repair Manual is packed with literally everything you need to know to perform your own maintenance in virtually every area of your new vehicle.

Maintenance procedures for the engine, chassis, body, electrical system, and more, are clearly explained and illustrated.

Periodic maintenance and tune-up

Periodic maintenance and tune-up helps to prevent small problems from growing into larger ones later on. The repair manual outlines exactly what maintenance is required and clearly explains how to do the work yourself step-by-step.

Areas covered include such things as spark plug replacement, valve clearance adjustment and engine oil and filter replacement.

**Where to obtain the
Repair Manual**

The repair manual for TOYOTA TUNDRA may be purchased from any Toyota dealer or the Material Distribution Center. To purchase the repair manual, please contact your Toyota dealer or call the Material Distribution Center toll-free at 1-800-622-2033.

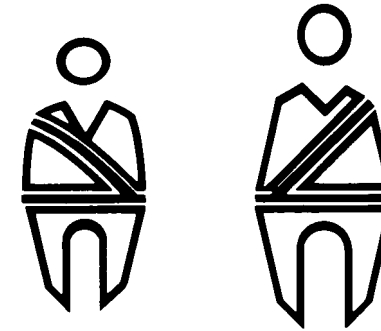
WE REALLY CARE ABOUT YOU — PLEASE BUCKLE UP

Toyota has made a special effort to encourage use of seat belts.

Toyota belts are:

- ▶ **Comfortable**
- ▶ **Easy to use**
- ▶ **Convenient**

We encourage you to use your belts every time you drive.



SECTION I

BASIC FUNCTIONS

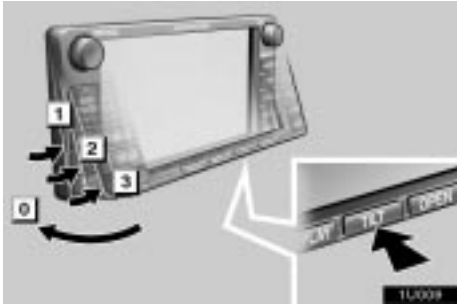
Basic information before operation

Display operation 2
Touch switch operation 2
Inputting letters and numbers 3
Current position display 5
Screen scroll operation (one-touch scroll) 5
Map scale 9
Orientation of the map 9
Limitations of the navigation system 10
Map database information and updates 12



BASIC FUNCTIONS

Display operation



You can adjust the angle of the display by pushing the “TILT” button. Each push of the “TILT” button will tilt the display to positions 1, 2, 3 and then back to 0 in the reverse order.

If you turn the ignition switch off, the display will automatically move back to position 0. The display will automatically resume the previous position when the ignition switch is turned to the “ACC” or “ON” position.

CAUTION

Take care not to jam your hand while the display is moving. Otherwise, you could be injured.

NOTICE

Do not obstruct the display while it is moving. It could damage your navigation system.

INFORMATION

Under extremely cold conditions, the display may react slowly or operation sound may become louder.

Touch switch operation

This system is operated mainly by the switches on the screen. To prevent damage to the screen, lightly touch switches on the screen with your finger. When you touch a switch on the screen, a beep sounds.

Do not use objects other than your finger to touch the screen.

INFORMATION

- ▶ *If the system does not respond to a touch of a switch, move your finger away from the screen and then touch it again.*
- ▶ *You cannot operate dimmed switches.*
- ▶ *Wipe off fingerprints on the surface of the display using a glass cleaning cloth.*
- ▶ *The displayed image may become darker and moving images may be slightly distorted when the display is cold.*
- ▶ *Under extremely cold conditions, the map may not be displayed and the data input by a user may be deleted. Also, the switches may be harder than usual to depress.*

Inputting letters and numbers


When searching for an address or a name, or entering a memo, you can input letters and numbers via the touch screen.

► To input letters

To display the alphabet keys, touch the “A-Z” switch or the “A-Y” switch.



Enter letters by touching the alphabet keys directly.


 : Touching this switch erases one letter. Holding this switch will continue to erase letters.


► To input numerals and symbols

To display the number keys and symbol keys, touch the “0-9” switch.



Enter numerals and symbols by touching the number keys and symbol keys directly.

 : Touching this switch erases one letter. Holding this switch will continue to erase letters.

 : Touching this switch displays other symbols.

► To display the list



To search for an address or a name, touch the “List” switch. Matching items from the database are listed even if the entered address or name is incomplete.

If the number of matches is four or less, the list is displayed without touching the “List” switch.



BASIC FUNCTIONS




INFORMATION

*The number of matching items is shown to the right side of the screen. If the number of matching items is more than 9,999, the system displays “****” on the screen.*


► List screen operation

When a list is displayed, you can scroll or page through the list by using the appropriate switch.






 To shift to the next or previous page.




 To scroll up or down one item at a time.



This expresses a displayed screen position.

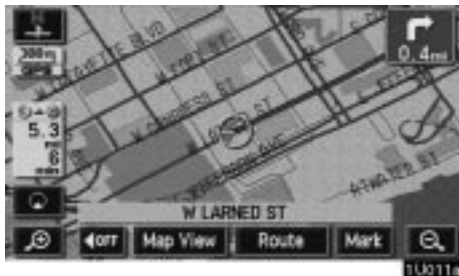
 If  appears to the right of the item name, the complete name is too long for the display. Touch  to scroll to the end of the name.

Touch  to scroll to the beginning of the name.

Current position display

When starting the navigation system, the current position is displayed first.

This screen displays the current vehicle position and a map of the surrounding local area.



The current vehicle position mark appears in the center or bottom center of the map screen. You can return to this map screen showing your current position at any time from any screen by touching the “**MAP/VOICE**” button.

During driving, the current vehicle position mark is fixed in the screen and the map moves.

The current position is automatically set as your vehicle receives signals from the GPS (Global Positioning System). If your current position is not correct, it is automatically corrected after your vehicle receives signals from the GPS.

INFORMATION

- ▶ *After the battery disconnection, or on a new vehicle, the current position may not be correct. As soon as the system receives signals from the GPS, the correct current position is displayed.*
- ▶ *To correct the current position manually, see page 77.*

Screen scroll operation (one-touch scroll)

Touch any point on the map and that point moves to the center of the screen and is shown by the cursor mark.



If you wish to look at a point on the map which is different to your current vehicle position, you can bring the desired point to the center of the screen by using the scroll feature.

If you continue to hold your finger on the screen, the map will continue scrolling in that direction until you lift your finger.

BASIC FUNCTIONS

After you scroll the screen, the map remains centered at the selected location until you activate another function. The current vehicle position mark will continue to move along your actual route and may move off the screen. When you touch the **“MAP/VOICE”** button, the current vehicle position mark returns to the center of the screen and the map moves as you proceed along the designated route.

INFORMATION

*When you use the one-touch scroll feature, the current vehicle position mark may disappear from the screen. Move the map with a one-touch scroll again or push the **“MAP/VOICE”** button to return to the current vehicle position map location display.*

► To set the cursor position as a destination

You can set a specific point on the map as a destination using the one-touch scroll function.



Touch the **“Enter”** switch.

The screen changes and displays the map location of the selected destination and the route preference. (See **“ — Entering destination”** on page 38.)

If there is already a preset destination, touch the **“Add to”** switch or the **“Replace”** switch.

When there is already a preset destination, using the **“Add to”** switch to set an additional destination, will set the new one as the first point of arrival.

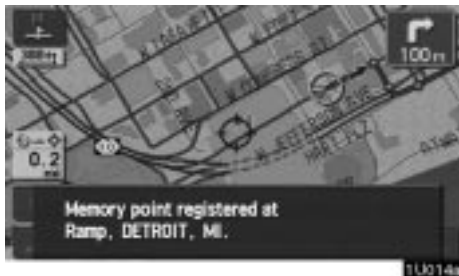
► To register the cursor position as a memory point


Memory point registration enables easy access to a specific point.



Touch the **“Mark”** switch.

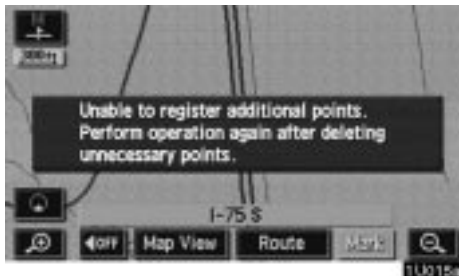
When you touch the **“Mark”** switch, the following screen appears for a few seconds, and then the map screen returns.



The registered point is shown by  on the map.

To change the icon or name, etc., see page 68.

You can register up to 106 memory points. If you attempt to register more than 106, a message appears for confirmation.



► To see information about the icon where the cursor is set



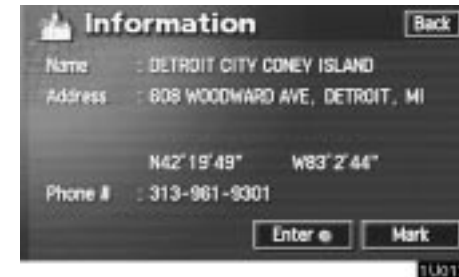
To display information about an icon, set the cursor on it.

POI INFORMATION

When the cursor is set on a POI icon, the name and “Info.” switch are displayed on the top of the screen.



Touch the “Info.” switch.



Information such as the name, address, and phone number are displayed.

If you touch the “Enter” switch, the position of cursor is set as a destination.

If there is already a preset destination, the “Add to” switch and the “Replace” switch are displayed.

When there is already a preset destination, using the “Add to” switch to set an additional destination, will set the new one as the first point of arrival.

To register this POI as a memory point, touch the “Mark” switch. (For details, see page 66.)



BASIC FUNCTIONS

INFORMATION

The desired Point of Interest can be displayed on the map screen. (For details, see page 49.)

MEMORY POINT INFORMATION

When the cursor is set on a memory point icon, the name and “Info.” switch are displayed on the top of screen.



Touch the “Info.” switch.



Information such as the name, location, and phone number are displayed.

If you touch the “Enter” switch, the position of cursor is set as a destination.

If there is already a set destination, the “Add to” switch and the “Replace” switch are displayed.

When there is already a preset destination, using the “Add to” switch to set an additional destination, will set the new one as the first point of arrival.

To edit a memory point, touch the “Edit” switch. (For details, see page 68.)

Map scale



Touch the or switch to change the scale of the map display. The scale bar and indicator at the bottom of the screen indicates the map scale menu. The scale ranges 150 feet (50 m) to 250 miles (400 km).

Touch the or switch until the scale bar changes normally. If you continue to touch on the switch, the scale bar changes smoothly.

You can change the scale of the map display by touching the scale bar directly. It is not available during driving.

The map scale is displayed under the north-up symbol or heading-up symbol at the top left of the screen.

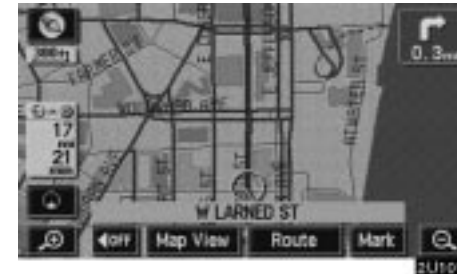
INFORMATION

When the map scale is at the maximum range of 250 miles (400 km), is not shown. When the map scale is at the minimum range of 150 feet (50 m), is not shown. However, in the area where the foot print map is contained, when the map scale is changed to 150 feet (50 m), the switch changes to the switch.

Orientation of the map



North-up screen



Heading-up screen



BASIC FUNCTIONS

You can change the orientation of the map from north-up to heading-up by touching the orientation symbol at the top left of the screen.



North-up symbol

Regardless of the direction of vehicle travel, North is always up.



Heading-up symbol

The direction of vehicle travel is always up. A red arrow indicates North.

Limitations of the navigation system

This navigation system calculates the current vehicle position using satellite signals, various vehicle signals, map data, etc. However, the accurate position may not be shown depending on the satellite condition, road configuration, vehicle condition or other circumstances.

The Global Positioning System (GPS) developed and operated by the U.S. Department of Defense provides an accurate current vehicle position using 3 to 4 satellites. The GPS system has a certain level of inaccuracy. While the navigation system will compensate for this most of the time, occasional positioning errors up to 300 feet (100 m) can and should be expected. Generally, position errors will be corrected within a few seconds.



When your vehicle is receiving signals from the satellites, the "GPS" mark appears at the top left of the screen.

The GPS signal may be physically obstructed, leading to inaccurate vehicle position on the map display. Tunnels, tall buildings, trucks, or even the placement of objects on the instrument panel may obstruct the GPS signals.

The installation of window tinting may also obstruct the GPS signals. Most window tinting contains some metallic content that will interfere with the GPS signal reception. We advise against the use of window tinting on vehicles equipped with navigation systems.

The GPS satellites may not send signals due to repairs or improvements being made to them.

Even when the navigation system is receiving clear GPS signals, the vehicle position may not be shown accurately or inappropriate route guidance may occur in some cases.

(a) Accurate current vehicle position may not be shown in the following cases:

- ▶ When driving on a small angled Y-shaped road.
- ▶ When driving on a winding road.
- ▶ When driving on a slippery road such as in sand, gravel, snow, etc.
- ▶ When driving on a long straight road.
- ▶ When freeway and surface streets run in parallel.
- ▶ After moving by ferry or vehicle carrier.
- ▶ When a long route is searched during high speed driving.
- ▶ When driving without setting the current position calibration correctly.
- ▶ After repeating a change of direction by going forward and backward, or turning on a turntable in the parking lot.
- ▶ When leaving a covered parking lot or parking garage.
- ▶ When a roof carrier is installed.
- ▶ When driving with tire chains installed.
- ▶ When the tires are worn.
- ▶ After replacing a tire or tires.
- ▶ When using tires that are smaller or larger than the factory specifications.

- ▶ When the tire pressure in any of the four tires is not correct.

INFORMATION

If your vehicle cannot receive GPS signals, you can correct the current position manually. For information on setting the current position calibration, see page 77.

BASIC FUNCTIONS

(b) Inappropriate route guidance may occur in the following cases:

- ▶ When turning at an intersection off the designated route guidance.
- ▶ If you set more than one destination but skip any of them, auto reroute will display a route returning to the destination on the previous route.
- ▶ When turning at an intersection, there is no route guidance.
- ▶ When passing through the intersection, there is no route guidance.
- ▶ During auto reroute, the route guidance may not be available for the next turn to the right or left.
- ▶ It may take a long time to operate auto reroute during high speed driving. In auto reroute, a detour route may be shown.
- ▶ After auto reroute, the route may not be changed.
- ▶ An unnecessary U-turn may be shown or announced.
- ▶ A location may have multiple names and the system will announce one or more.
- ▶ Some routes may not be searched.
- ▶ If the route to your destination includes gravel, unpaved roads or alleys, the route guidance may not be shown.

- ▶ Your destination point might be shown on the opposite side of the street.
- ▶ When a portion of the route has regulations prohibiting the entry of the vehicle that vary by time or season or other reason.
- ▶ The road and map data stored in your navigation system may not be complete or may not be the latest version.

After replacing the tire, implement the operation described in the “▶Tire change calibration”. (For details, see page 78.)

This navigation system uses the tire turning data and is designed to work with factory-specified tires for your vehicle. Installing tires that are larger or smaller than the originally equipped diameter may cause inaccurate display of the vehicle's position. The tire pressure also affects the diameter of the tires so please make sure the tire pressure of all four tires is correct.

Map database information and updates

This system uses the maps of DENSO.

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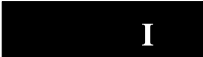
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BASIC FUNCTIONS

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There are two types of areas available for route guidance. In one type of area, primarily around metropolitan centers, detailed route guidance is available for the entire area. In the other type of area, all roads are displayed on the map but route guidance is limited. The navigation route might lack precision because the data (no right turns, one-way traffic, etc.) is not complete. It is still possible to reach the destination by following the arrow direction and distance as shown on the bottom left of the screen. The arrow points in the direction of the destination. The distance shown is as measured in a straight line from the current vehicle position to the destination area.

In order to provide you with as accurate map information as possible, we are always gathering information such as road repairs and doing site investigation. However, the names of roads, streets, facilities, and their locations are often changed. In some places, construction on roads may be in progress. For that reason, information on some areas in this system might be different from the actual location.



The map database is normally updated once a year. Contact your dealer for information about the availability and pricing of an update.

► **To confirm the database version and disc coverage area**

1. Push the **“MENU”** button.



2. Touch the **“Map DVD”** switch.



Make sure the version of the database on this screen. (The database version on the screen above may be different from the actual screen.)

To display the disc coverage area, touch the **“Covered Area”** switch. Confirm the covered area on the screen.

Contact your dealer to find out if there is a more recent update released.



BASIC FUNCTIONS

► To replace map disc

The slot for the map disc is behind the display.



To lower the display, push the “OPEN” button. After replacing map disc, push the button again to close the display.

CAUTION

- Do not place anything on the opened display, as such items may be thrown about in the compartment and possibly injure people in the vehicle during sudden braking or in an accident.
- To reduce the chance of injury in the case of an accident or sudden stopping while driving, keep the display closed.
- Take care not to jam your hand while the display is moving. Otherwise, you could be injured.

NOTICE

Do not obstruct the display while it is moving. It could damage your navigation system.

INFORMATION

Under extremely cold conditions, the display may react slowly or operation sound may become louder.

SECTION II

DESTINATION INPUT AND ROUTE GUIDANCE

Basic functions in frequent use

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DESTINATION INPUT AND ROUTE GUIDANCE

Destination input —

Push the “DEST” button and the “Destination” screen appears.



You can use one of 13 different methods to enter your destination. (See pages 22 through 37.)

INFORMATION

- ◀ *When inputting the destination, the response to the switch may be slow.*
- ◀ *The route for returning may not be the same as that for going.*
- ◀ *The route guidance to the destination may not be the shortest route nor a route without traffic congestion.*

◀ *Route guidance may not be available if there is no road data for the specified location.*

◀ *When setting the destination on a map with a scale larger than 0.5 mile (800 m), the map scale changes to 0.5 mile (800 m) automatically. Set the destination again.*

◀ *To select an “Address”, “POI Name”, “Freeway Ent./Exit”, “Intersection” or “Phone #” in a different area, it is necessary to change the search area.*

◀ *If you enter a destination, the road nearest to the point you selected is set as the destination.*

CAUTION

While you are driving, be sure to obey traffic regulations and keep the road conditions in mind. If a traffic sign on the road has been changed, the route guidance may provide wrong information.

— Selecting the search area

The “Destination” screen allows you to select the area to search for your destination.

Touch the “Change” switch on the “Destination” screen to display a map of the United States and Canada divided into 11 areas. See page 12 for map database information and updates.



Touch one of the “US1” through “CAN” switches to select a search area. Touch the “OK” switch and the “Destination” screen returns.

DESTINATION INPUT AND ROUTE GUIDANCE

U.S.A.	
Switch	States included in the search area
"US1"	Idaho Oregon Washington
"US2"	California Nevada
"US3"	Arizona Colorado Montana New Mexico Utah Wyoming
"US4"	Iowa Kansas Minnesota Missouri North Dakota Nebraska South Dakota
"US5"	Oklahoma Texas
"US6"	Illinois Indiana Kentucky Michigan Ohio Wisconsin

"US7"	Arkansas Alabama Louisiana Mississippi Tennessee
"US8"	Connecticut Massachusetts Maine New Hampshire New Jersey New York Rhode Island Vermont
"US9"	Washington, D.C. Delaware Maryland New Jersey Pennsylvania Virginia West Virginia
"US10"	Florida Georgia North Carolina South Carolina

Canada	
Switch	Provinces and regions included in the search area
"CAN"	All provinces and regions in Canada included in this switch.



DESTINATION INPUT AND ROUTE GUIDANCE

— Destination input by Home



Touch the home switch on the “Destination” screen.

The screen changes and displays the map location of your home and the route preference. (See “ — Entering destination” on page 38.)

To use this function, it is necessary to set the “Attribute” for the memory point. (To register the “Home”, see page 70.)

INFORMATION

Guidance starts from your current position to your home if you touch the “Enter” switch even while driving.

— Destination input by Quick access



Touch any of the quick access switches on the “Destination” screen.

The screen changes and displays the map location of the quick access point and the route preference. (See “ — Entering destination” on page 38.)

To use this function, it is necessary to set the “Attribute” for each memory point. (To register the “Quick Access”, see page 70.)

INFORMATION

Guidance starts from your current position to the quick access point if you touch the “Enter” switch even while driving.

— Destination input by “Address”

There are 2 ways to input a destination by address.

Touch the “Address” switch on the “Destination” screen.



(a) Inputting a house number and a street name

Touch numerals directly on the screen to input a house number.

After inputting a house number, touch the “OK” switch to display the screen for inputting a street name.

It is possible to input a street name first. Touch the “Street” switch to display the screen for inputting a street name.



Input the street name.



When you find your desired street name, touch the corresponding switch.

The screen changes and displays the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)

If the same address exists in more than one city, the current screen changes to the city list screen.

DESTINATION INPUT AND ROUTE GUIDANCE



Select or enter your desired city.

“Input Name”: To narrow down the listed items by inputting the city name.



If you input a street name first, the screen changes. You can then input the house number.



If the above screen appears, you can select an address range on the screen.

(b) Selecting a city to search

Touch the “City” switch.



To search by city, the following three methods are possible.

1. Selecting from the last 5 cities
2. Selecting from the nearest 5 cities
3. Inputting the city name

INFORMATION

To cancel the city setting, touch the “Any City” switch.

SELECTING FROM THE LAST 5 CITIES



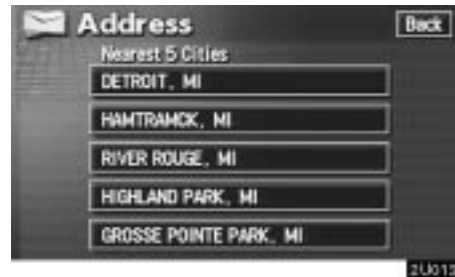
Touch the switch of the desired city name.

If you have not used the navigation yet, no cities will be displayed on the screen.

The current screen changes to the screen for inputting a house number or a street name. (See page 23.)

SELECTING FROM THE NEAREST 5 CITIES

Touch the “Nearest 5 Cities” switch.



Touch the switch of the desired city name from the displayed list.

The current screen changes to the screen for inputting a house number or a street name. (See page 23.)

INPUTTING THE CITY NAME

Touch the “Input City Name” switch.



Input a city name.



DESTINATION INPUT AND ROUTE GUIDANCE



Touch the switch of the desired city name from the displayed list.

“Map”: To display the selected destination and the route preference. (See “ — Entering destination” on page 38.)

The current screen changes to the screen for inputting a house number or a street name. (See page 23.)

— Destination input by “POI Name”

Touch the “POI Name” switch on the “Destination” screen.



Input the name of Point of Interest.



Touch the switch of the desired destination. The screen changes and displays the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)

If you input the name of a specific Point of Interest and there are more than two sites with the same name, the list screen appears.



Touch the switch of the desired destination.

“Dist. Sort”: In the order of distance from your current position. The distance from your current position up to the destination is displayed on the right of the name.

“Name Sort”: In alphabetical order by name. If the same name exists in more than one city, you can search for it more easily with the **“City”** and **“Category”** switches. (See “(a) Selecting a city to search” and “(b) Selecting from the categories”.)

INFORMATION

The desired Point of Interest can be displayed on the map screen. (For details, see page 49.)

(a) Selecting a city to search

Touch the **“City”** switch.



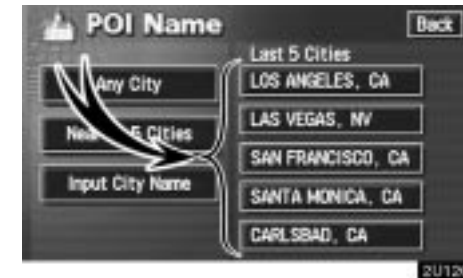
To search by city, the following three methods are possible.

1. Selecting from the last 5 cities
2. Selecting from the nearest 5 cities
3. Inputting the city name

INFORMATION

*To cancel the city setting, touch the **“Any City”** switch.*

SELECTING FROM THE LAST 5 CITIES



Touch the switch of the desired city name.

If you have not used the navigation yet, no cities will be displayed on the screen.



DESTINATION INPUT AND ROUTE GUIDANCE

SELECTING FROM THE NEAREST 5 CITIES

Touch the “Nearest 5 Cities” switch.



Touch the switch of the desired city name.

INPUTTING THE CITY NAME

Touch the “Input City Name” switch.



Input the city name.



Touch the switch of the desired city name from the displayed list.

(b) Selecting from the categories

Touch the “Category” switch.



If the desired POI category is on the screen, touch the name to display a detailed list of the POI category.

If the desired POI category is not on the screen, touch the “List All Categories” switch to list all POI categories.



When you touch the desired category, the POI name list screen appears.

— Destination input by “POI Category”

The destination can be set by selecting the POI category and the search point.

Touch the “POI Category” switch on the “Destination” screen.



(a) Selecting the POI category

If the desired POI category is on the screen, touch the name to display a detailed list of the POI category.

If the desired POI category is not on the screen, touch the “List All Categories” switch to list all POI categories.



Touch the desired POI category from the list.

The selected category icon appears on the top left of the screen.

If you wish to delete the selected category, touch the “Delete” switch.

If you wish to select another category, touch the “OK” switch to return the previous screen.

If you wish to select a destination from the category displayed by the icon, touch the “List” switch.

(b) Setting a search point

It is possible to display the names of POIs located within approximately 20 miles (30 km) from the selected search point.

Touch the “Search Point” switch.



To set search points, the following four methods are possible.

1. Inputting city center
2. Setting the current position as the search point
3. Setting the search point via the map screen
4. Setting the search point from the destinations

INPUTTING CITY CENTER

Touch the “Input City Center” switch.



Input the city center name.



Touch the switch of the desired city center name.

DESTINATION INPUT AND ROUTE GUIDANCE



When you touch an arrow facing the desired point, the map scrolls in that direction. When you release your finger, scrolling stops.

To set the position of the cursor, touch the **“Enter”** switch.

SETTING THE CURRENT POSITION AS THE SEARCH POINT

Touch the **“Current Position”** switch.



When you touch an arrow facing the desired point, the map scrolls in that direction. When you release your finger, scrolling stops.

To set the position of the cursor, touch the **“Enter”** switch.

SETTING THE SEARCH POINT VIA THE MAP SCREEN

Touch the **“Map”** switch.



When you touch an arrow facing the desired point, the map scrolls in that direction. When you release your finger, scrolling stops.

To set the position of the cursor, touch the **“Enter”** switch.

DESTINATION INPUT AND ROUTE GUIDANCE

SETTING THE SEARCH POINT FROM THE DESTINATIONS

Touch the destination switches at the bottom of the screen.



When you touch an arrow facing the desired point, the map scrolls in that direction. When you release your finger, scrolling stops.

To set the position of the cursor, touch the “Enter” switch.

(c) Selecting from a list

You can select the desired destination from the listed POI names.



When you touch the switch of the desired item, the screen changes and displays the map location of the selected destination and the route preference. (See “— Entering destination” on page 38.)

“Dist.”: To sort in the order of distance from your current location.

“Icon”: To sort in the order of the POI icons.

“Name”: To sort in alphabetical order by name.

“On Route”: When the indicator is illuminated by touching this switch, the list of the items searched along the route is displayed.

— Destination input by “Emergency”

By touching the “Emergency” switch on the “Destination” screen, the display changes to a screen to select dealers, hospitals or police stations. During driving, only nearby police stations, hospitals or dealers are shown. The current position is shown with an address, the latitude and the longitude at the top of the screen.



When you touch the desired emergency category, the selected emergency category list is displayed.



Touch the switch of the desired destination. The screen changes and displays the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)

“**Dist. Sort**”: To sort in the order of distance from your current position. The distance from your current position up to the destination is displayed on the right of the name.

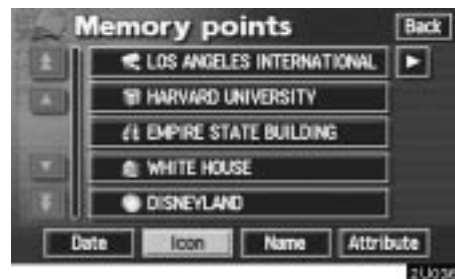
“**Name Sort**”: To sort in alphabetical order by name.

INFORMATION

The navigation system does not guide in areas where route guidance is unavailable. (See page 12.)

— Destination input by “Memory”

Touching the “**Memory**” switch on the “**Destination**” screen displays your list of registered memory points. See page 66 for registering and editing memory points.



When you touch the switch of your desired memory point, the screen changes and displays the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)

There are 4 ways to list the memory point by touching switches on the bottom of the screen.

“**Date**”: To list the memory points in order of registered date.

“**Icon**”: To list the memory points by the registered icon.

“**Name**”: To list the memory points in alphabetical order.

“**Attribute**”: To list the memory points by the registered attribute.



— Destination input by “Previous”

Touch the “Previous” switch on the “Destination” screen.



The previous starting point and up to 99 previously set destinations are displayed on the screen.

Touch the switch of the desired destination. The screen changes and displays the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)

“Date”: To list the previous destinations in order of registered date.

“Name”: To list the previous destinations in alphabetical order.

INFORMATION

You can delete the list of previous destinations while your vehicle is stopped, if you no longer need them. (See page 91.)

— Destination input by “Map”

Touch the “Map” switch on the “Destination” screen.



The screen changes and displays the map location that was previously displayed just before the destination input operation and the route preference. (See “ — Entering destination” on page 38.)

INFORMATION

Guidance starts if you touch the “Enter” switch even while driving. However, the cursor cannot be moved.

— Destination input by “Intersection”

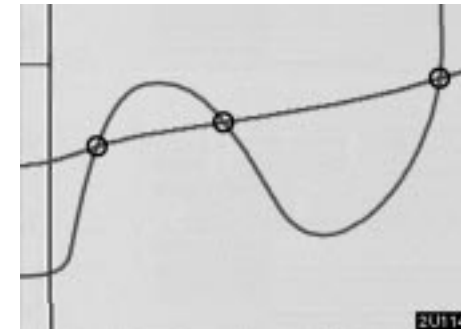
Touch the “Intersection” switch on the “Destination” screen.



Input the name of the two intersecting streets which are located near the destination to be set.



Touch the switch of the desired item. After inputting the two intersecting streets, the screen changes and displays the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)



If the same two streets cross at more than one intersection, the screen changes and displays the menu to select the city name where the streets intersect. Select the city, and the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)



DESTINATION INPUT AND ROUTE GUIDANCE

— Destination input by “Freeway Ent./Exit”

To input a freeway entrance or exit, touch the “Freeway Ent./Exit” switch on the “Destination” screen.



Be sure to use the complete name of the freeway or highway, including the hyphen, when entering the destination. Freeways and interstates use an “I” (I-405). US highways use the state designation before the number (CA-118).



Select the desired freeway by touching the switch.



You can then select either a freeway “Entrance” or “Exit”.



Touch the switch of the desired entrance or exit name. The screen changes and displays the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)

“Dist. Sort”: In the order of distance from your current position. The distance from your current position up to the destination is displayed on the right of the name.

“Name Sort”: In alphabetical order by name.

“Input Name”: An applicable list is displayed by touching this switch and inputting name.

— Destination input by “Coordinates”

Touch the “Coordinates” switch on the “Destination” screen.



Input the latitude and the longitude.

When the input is finished, touch the “OK” switch.

When you touch the switch of the desired point, the screen changes and displays the map location of the selected destination and the route preference. (See “ — Entering destination” on page 38.)

— Destination input by “Phone #”

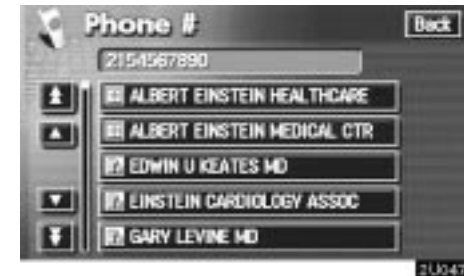
Touch the “Phone #” switch on the “Destination” screen.



Input a telephone number.

After inputting a telephone number, touch the “OK” switch, and the screen changes and displays the map location of the selected destination and the road preference. (See “ — Entering destination” on page 38.)

If there is more than one site having the same number, the following screen appears.



INFORMATION

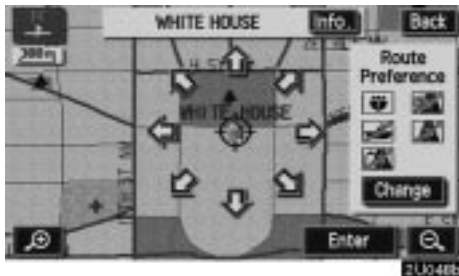
- ◀ If there is no match for the telephone number inputted, a list of identical numbers but with different area codes will be displayed.
- ◀ To set a memory point as a destination using the phone number, the number must be registered previously. (See page 72.)



DESTINATION INPUT AND ROUTE GUIDANCE

Starting route guidance — — Entering destination



After you input the destination, the screen changes and displays the map location of the selected destination and the route preference.





SCREEN A

1. When you touch an arrow facing the desired point, the map scrolls in that direction. When you release your finger, scrolling stops.

2. To set the destination and display SCREEN B, touch the “Enter” switch.

When the destination is already set, the “Add to ” switch and the “Replace ” switch are displayed.

“Add to ”: To add a destination.

“Replace ”: To delete the existing destinations and set a new one.

“Change”: To change the route preference. (See page 39.)

“Info.”: If this switch is displayed on the top of the screen, touch the switch to see name, address, and phone number, etc.



SCREEN B

3. To start guidance, touch the “Guide” switch.

“3 Routes”: To select the desired route from three possible routes. (See page 39.)

“Route”: To change the route. (See pages 42 and 44.)

INFORMATION

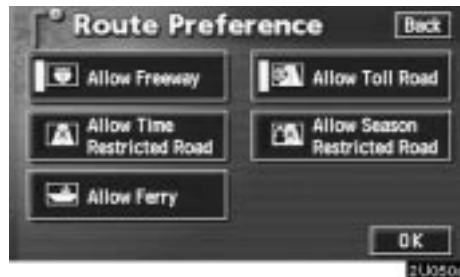
◀ *Guidance can be suspended or resumed. (See page 62.)*

◀ *If you keep touching the “Guide” switch until a beep sounds, Demo mode will start.*

◀ To change the route before starting guidance

ROUTE PREFERENCE

You can change route preference by touching the **“Change”** switch on SCREEN A.



You can turn the indicator on or off by touching the switch.

When searching for a route, the system avoids routes where the indicator is dimmed as much as possible.

After choosing conditions, touch the **“OK”** switch.

INFORMATION

◀ Even if the **“Allow Freeway”** indicator is dimmed, the route cannot avoid including a freeway in some cases.

◀ If the calculated route includes a trip by ferry, the route guidance shows a sea route. After you travel by ferry, the current vehicle position may be incorrect. Upon reception of GPS signals, it is automatically corrected.

3 ROUTES SELECTION

To select the desired route from three routes, touch the **“3 Routes”** switch on SCREEN B.



Touch the **“Quick1”**, **“Quick2”** or **“Short”** switch to select the desired route.

“Quick1”: Recommended route.

This route is indicated by an orange line.

“Quick2”: Other route.

This route is indicated by a purple line.

“Short”: A route by which you can reach the destination in the shortest distance.

This route is indicated by a green line.



DESTINATION INPUT AND ROUTE GUIDANCE

“Info.”: To display the following information about each of the 3 routes.



- 1 Time necessary for entire trip
- 2 Distance of entire trip
- 3 Toll road
- 4 Freeway
- 5 Ferry

— Route guidance screen

When starting route guidance, the following screen is displayed.



This screen displays the route that guides the driver to the destination.

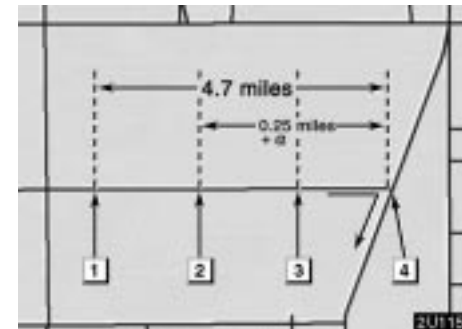
The route to the destination is indicated by a highlighted line. Drive along the guided route.

When the vehicle approaches a guidance point such as an intersection or a freeway, the screen automatically divides in two to display the guidance screen. (For details, see page 53.)

The current street name will be displayed at the bottom of the screen.

In some areas, the roads have not been completely digitized in our database yet. For this reason, the route guidance may guide the road that is not allowed to pass.

— Typical voice guidance prompts

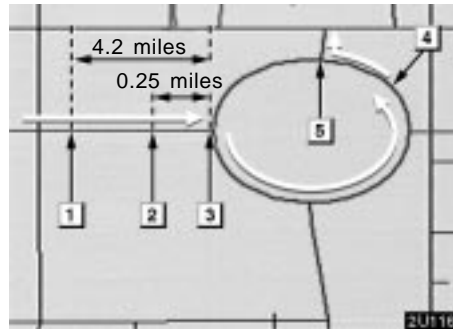


The voice guidance provides various messages as you approach an intersection, or other point where you need to maneuver the vehicle.

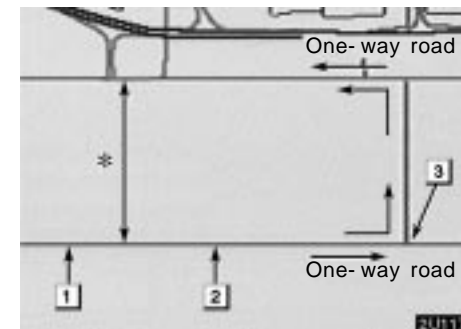
- 1 “Proceed about 5 miles.”
- 2 “In a quarter of a mile, right turn.”
- 3 “Right turn.”
- 4 (Beep sound only)

INFORMATION

On freeways, interstates or other highways with higher speed limits, the voice guidance will be made at earlier points than on city streets in order to allow time to maneuver.



- 1 "Proceed about 4 miles to the traffic circle."
- 2 "In a quarter of a mile, traffic circle ahead, and then 3rd exit ahead."
- 3 "The 3rd exit ahead."
- 4 "The exit ahead."
- 5 (Beep sound only)

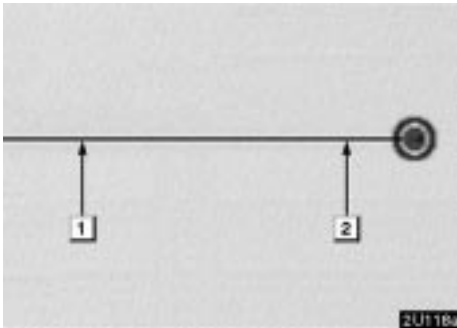


*: The system indicates a U-turn if the distance between two one-way roads (of opposite directions) is less than 50 feet (15 m) in residential areas or 164 feet (50 m) in non-residential areas.



- 1 "In half of a mile, make a legal U-turn."
- 2 "Make a legal U-turn ahead."
- 3 (Beep sound only)



DESTINATION INPUT AND ROUTE GUIDANCE



The system announces your approach to the final destination.

- 1  "Your destination is ahead."
- 2  "You have arrived at your destination. The route guidance is now finished."

INFORMATION

- ◀ If the system cannot determine the current vehicle position correctly (in cases of poor GPS signal reception), the voice guidance may be made early or delayed.
- ◀ If you did not hear the voice guidance command, touch the "MAP/VOICE" button to hear it again.
- ◀ To adjust the voice guidance volume, see page 63.

Setting and deleting destination

(a) Adding destinations

You can add destinations and search again for the routes.



1. Touch the "Route" switch.



2. Touch the "Add" switch of "Destination".

3. Input an additional destination in the same way as the destination input. (See page 20.)



4. Touch the desired “Add” switch to determine the arrival order of the additional destination.

(b) Reordering destinations

When more than one destination is set, you can change the arrival order of the destinations.

1. Touch the “Route” switch.



2. Touch the “Reorder” switch of “Destination”.



3. Select the destination in the order of arrival by touching the switch of destinations.

Reordered number of arrival is displayed on the right side of the screen.

When you finish selecting the destinations, touch the “OK” switch. The system searches for the guidance route again, and displays the entire route. Even if you do not touch the “OK” switch, the entire route is displayed automatically within a few seconds when order is fixed.



DESTINATION INPUT AND ROUTE GUIDANCE

(c) Deleting destination

You can delete a set destination.

1. Touch the “Route” switch.



2. Touch the “Delete” switch of “Destination”.



3. When more than one destination is set, a list will appear on the screen. Touch the destination on the screen you wish to delete.

“Delete All”: To delete all destinations on the list.

4. A message appears to confirm your request to delete. To delete the destination(s), touch the “Yes” switch.

If you touch the “Yes” switch, the data cannot be recovered.

If you touch the “No” switch, the previous screen will return.

5. If more than one destination is set, touch the “OK” switch after deleting the destinations. The system searches for the guidance route again, and displays the entire route.

Setting and deleting route

(a) Adding preferred road

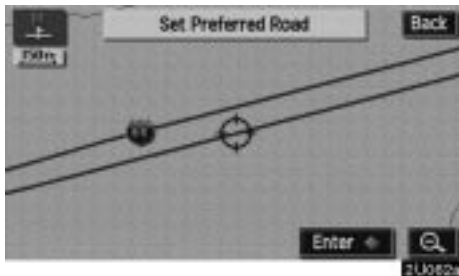
You can add points you wish to pass through.



1. Touch the “Route” switch.



2. Touch the “Add” switch of “Preferred road”.



3. Select the preferred road which you wish to modify and touch the “Enter ▼” switch.

4. A message appears to confirm your request. To add the preferred road, touch the “OK” switch.

Touch the “Next” switch to use another road.



5. If more than one destination is set, the “Add Preferred Road” screen appears. Touch the “Add” switch where you wish to add a preferred road.

(b) Deleting preferred road

You can delete a set preferred road.

1. Touch the “Route” switch.



2. Touch the “Delete” switch of “Preferred road”.



3. When more than one preferred road is set, a list will appear on the screen. Touch the switch of the preferred road to be deleted.



DESTINATION INPUT AND ROUTE GUIDANCE

“Delete All”: To delete all the listed preferred road.

4. A message appears to confirm your request to delete. To delete the preferred road, touch the **“Yes”** switch.

If you touch the **“Yes”** switch, the data cannot be recovered.

If you want to try again or cancel deletion, touch the **“No”** switch. The previous screen will return.

5. If more than one preferred road is set, touch the **“OK”** switch after deleting the preferred road. The system searches for the guidance route again, and displays entire route.

(c) Search condition

You can designate the route conditions of the route to the destination.

1. Touch the **“Route”** switch.



2. Touch the **“Search Condition”** switch. The **“Search Condition”** screen appears.



3. Touch the **“Quick”**, **“Quick1”**, **“Quick2”** or **“Short”** switch and touch the **“OK”** switch.



The entire route from the starting point to the destination is displayed.

“Guide”: To start guidance.

“Route”: To add or change a route. (For details, see pages 42 and 44.)

(d) Detour setting

While the route guidance is operating, you can change the route to detour around a section of the route where a delay is caused by road repairs, an accident, etc.

1. Touch the “Route” switch.



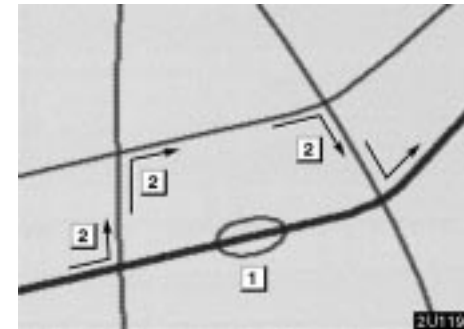
2. Touch the “Detour” switch.



3. Select the switch below to select the desired detour distance.

“1 mile (km)”, “3 miles (km)” or “5 miles (km)”: Touch one of these switches to start the detour process. After detouring, the system returns to the original guidance route.

“Whole Route”: If you touch this switch, the system will calculate an entire new route to the destination.



This picture shows an example of how the system would guide you around a delay caused by a traffic jam.

- 1 This position indicates the location of a traffic jam caused by road repairs or an accident.
- 2 This route indicates the detour suggested by the system.

INFORMATION

- ◀ When your vehicle is on a freeway, the detour distance selections are 5, 15, and 25 miles (km).
- ◀ The system may not be able to calculate a detour route depending on the selected distance and surrounding road conditions.



(e) Route preference

You are given a number of choices on the conditions which the system uses to determine the route to your destination.

1. Touch the “Route” switch.



2. Touch the “Route Preference” switch to change the conditions which are to determine the route to your destination.



3. You can turn the indicator on or off by touching the switch.

When searching for a route, the system avoids routes where the indicator is dimmed as much as possible.

After choosing the conditions, touch the “OK” switch.

(f) Starting route from adjacent road

You can start the route guidance from the adjacent road.

(ex. When the route guidance guides the route on the freeway, but you drive on the parallel way along a freeway.)

1. Touch the “Route” switch.



2. Touch the “Start from Adjacent Road” switch.

When there is no adjacent road, this switch will not appear.

Show POI icons

Points of Interest such as gas stations and restaurants can be displayed on the map screen. You can also set their location as a destination and use them for route guidance.



1. Touch the “Map View” switch.



2. Touch the “Show POI Icon” switch to display a particular type of Point of Interest on the screen.



A screen with a limited choice of Points of Interest will be displayed. (To change the displayed POI, see page 90.) When you touch the desired Point of Interest category, symbols will appear on the map screen indicating where the POI addresses are located.

To turn off the symbols of the Points of Interest on the map screen, touch the “POI Off” switch.



“More”: If you cannot find your desired Point of Interest on the limited choice screen, touch this switch. The screen then displays the complete POI listing screen.

You can display up to 5 categories of icons on the screen.

DESTINATION INPUT AND ROUTE GUIDANCE



When you select a Point of Interest type from either the limited list or the complete list, the screen will display symbols at those locations on the map screen.

Touching the **“Delete”** switch will delete the last selected icon.

“Local POI List”: If you want to search for the nearest Point of Interest, touch this switch. Then choose one of the categories. The system will list the points within 20 miles (30 km).



Touch the switch of your desired Point of Interest. Selected Points of Interest are displayed on the map screen.

“Dist.”: To sort in the order of distance from your current location.

“Icon”: To sort in the order of the POI icons.

“Name”: To sort in alphabetical order by name.


“On Route”: When the indicator is illuminated by touching this switch, the list of the items searched along the route is displayed.


◀ To set a POI as a destination

You can select one of the Points of Interest icons on the map screen as a destination and use it as route guidance.



Directly touch the Point of Interest icon that you wish to set as a destination.

The map will shift so that the icon is centered on the screen and overlaps with the cursor . At this time, the distance from your current position can be displayed on the screen. The distance shown is measured as a straight line from the current vehicle position to the POI.

When your desired Point of Interest overlaps with the cursor, touch the “Enter”  switch. The screen changes and displays the map location of the selected destination and route preference. (See “ — Entering destination” on page 38.)

Route overview



1. Touch the “Map View” switch.



2. Touch the “Route Overview” switch.



The entire route from the current position to the destination is displayed.

“Guide”: To start guidance.

“Route”: To change the route. (For details, see pages 42 and 44.)

“Turn List”: The following screen displays the list of the roads up to your destination.



You can scroll through the list of roads by touching ▲ or ▼. However, not all road names in the route may appear on the list. If a road changes its name without requiring a turn (such as on a street that runs through two or more cities), the name change will not appear on the list. The street name closest to the starting point will be displayed with a mileage to the next turn.



These marks indicate the direction in which you should turn at an intersection.



DESTINATION INPUT AND ROUTE GUIDANCE

Touch the “Map” switch of your desired point. The point which you choose is displayed on the map screen.



Route preview










1. Touch the “Map View” switch.



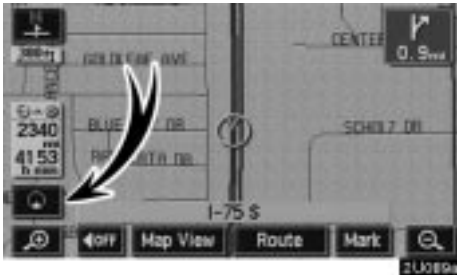
2. Touch the “Route Preview” switch.



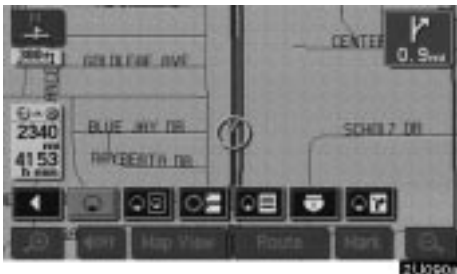
-  : To indicate the next destination.
-  : To preview the route to the next destination.
-  : To preview the route to the next destination in fast-forward mode.
-  : To stop the preview.
-  : To review the route to the previous destination or starting point.
-  : To review the route to the previous destination or starting point in fast-forward mode.
-  : To indicate the previous destination or starting point.

Screen configuration

You can choose any one of the screen configurations.










1. Touch this switch to display the following screen.



2. To select the desired screen configuration, touch one of the following switches.

Depending on the conditions, it may not be possible to select certain screen configuration switches.

-  : To display single map screen. (See page 53.)
-  : To display dual map screen. (See page 54.)
-  : To display compass mode screen. (See page 54.)
-  : To display turn list screen. (See page 55.)
-  : To display arrow screen. (See page 55.)
-  : To display freeway information screen. (See page 55.)
-  : To display intersection guidance screen or guidance screen on freeway. (See page 56.)

(a) Single map



The screen shows the single map.



(b) Dual map



The screen shows the dual map. The map on the left is the main map.

You can edit the right side map by touching any specific point on the right side map.



This screen can perform the following procedures.

- ◀ Changing the map scale
- ◀ Displaying the POI icon
- ◀ Changing the orientation of the map

Touch the “OK” switch when you complete editing. The screen returns to the dual map screen.

(c) Compass mode



Information about the destination and current position, as well as a compass, is displayed on the screen.

The destination mark is displayed in the direction of the destination. When driving, refer to the longitude and latitude coordinates and the compass, to make sure that your vehicle is headed in the direction of the destination.

INFORMATION

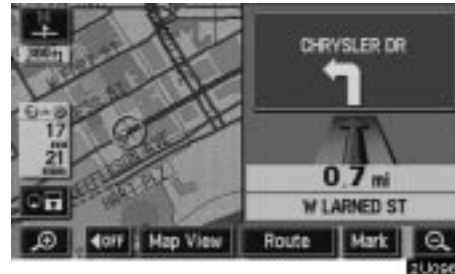
When the vehicle goes out of the disc area, the guidance screen changes into compass mode.

(d) Turn list screen



The screen shows the turn list. You cannot scroll through the list of roads.

(e) Arrow screen



The screen shows the current road name and the distance to the next corner.

(f) Freeway information screen



This screen displays the distance to the next junction and exit, or POIs in the vicinity of the freeway exit.

“**Map**”: To display the selected map of the exit vicinity.

On the left side of the “**Map**” switch, up to five POIs around the selected exit are displayed.

- ▲ : To scroll for farther junctions or exits.
- ▼ : To scroll for closer junctions or exits.
- ▼ : To scroll for the closest three junctions or exits.



DESTINATION INPUT AND ROUTE GUIDANCE

INFORMATION

When you drive on a freeway, the screen is automatically divided into two parts, with freeway information screen on the right side.

(g) Intersection guidance screen/guidance screen on freeway

◀ Intersection guidance screen

This screen automatically appears when the vehicle approaches an intersection on the road.



The distance to the intersection is shown at the bottom of the screen.

“▶OFF”: The intersection guidance screen disappears and the map screen appears.

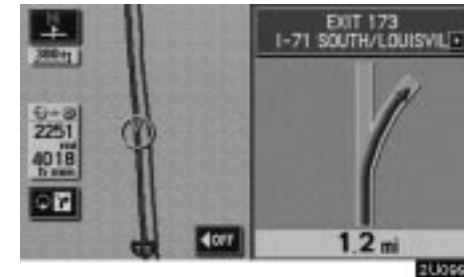
When touching the  switch or pushing the “MAP/VOICE” button, the intersection guidance screen reappears.

INFORMATION

Intersection guidance can be turned on or off. (See page 85.)

◀ Guidance screen on freeway

This screen automatically appears when the vehicle approaches a junction or exit on a freeway.



The distance to the junction or exit is shown at the bottom of the screen.

“▶OFF”: The guidance screen on freeway disappears and the map screen appears.

When touching the  switch or pushing the “MAP/VOICE” button, the guidance screen on freeway reappears.

INFORMATION

Guidance screen on freeway can be turned on or off. (See page 86.)

Distance and time to destination



When the vehicle is on the guidance route, the distance and the estimated travel time to the destination are displayed. When the vehicle is not on the guidance route, the distance to and the direction of the destination are displayed.

When driving on the guidance route and more than one destination is set, the distance and the estimated travel time from current position to each destination are displayed.

1. Touch this switch to display the following screen.



2. Touch the number switch of the destination you wish to display.

The distance and the estimated travel time from the current position to the selected destination are displayed.



Displayed while driving along the guidance route.



Displayed while driving off the guidance route. The destination direction is indicated by an arrow.

INFORMATION



When the vehicle is on the guidance route, the distance measured along the route is displayed. Travel time is calculated based on the set vehicle speed information. (For details, see page 79.) However, when the vehicle is not on the guidance route, the distance is the linear distance between the current position and the destination.

DESTINATION INPUT AND ROUTE GUIDANCE


Foot print map

For the area which is covered by the foot print map (Some areas in the following cities; Detroit, Chicago, N.Y., L.A), you can switch to the foot print map on a scale of 75 feet (25 m).

◀ To switch to the foot print map

The  switch changes into the  switch when the map is scaled down to 150 feet (50 m).



To display the foot print map, touch the  switch.

◀ To delete the foot print map display

Touch the  switch.

INFORMATION

◀ *If the map or the current position is moved to the area which is not covered by the foot print map, the screen scale automatically changes to 150 feet (50 m).*

◀ *On the foot print map, a one way street is displayed by .*

◀ *It is not possible to perform scrolling on the foot print map (one-touch scroll) while driving.*

◀ To display building information

Information is available only for buildings for which information is recorded on the map disc.



1. Touch the “Info.” switch while the foot print map is displayed.

If the map is displayed in split screen, it turned into a single map display.



2. Using an eight-direction arrow, move the cursor to the position of the building you wish to display information.
3. Touch the “Building Info.” switch.



4. Details of POIs in some buildings may be displayed. If you wish to see detailed POI information, touch the building name. You can see the detail of the selected POIs.




DESTINATION INPUT AND ROUTE GUIDANCE

SECTION III

ADVANCED FUNCTIONS

Descriptions of functions for more effective use

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ADVANCED FUNCTIONS

Suspending and resuming guidance

► To suspend guidance

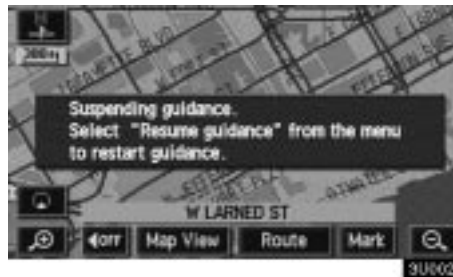
You can suspend route guidance.



Push the “MENU” button to display the “Menu” screen and touch the “Suspend Guidance” switch.

INFORMATION

When you do not have route guidance, the “Suspend Guidance” switch cannot be used.



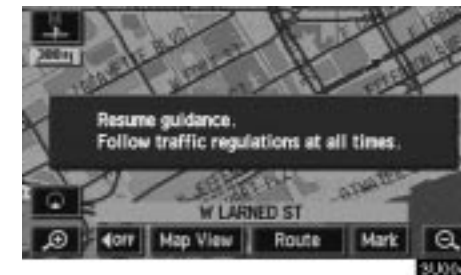
The screen will return to the current position map without route guidance.

► To resume guidance

You can resume the suspended route guidance.



Push the “MENU” button to display the “Menu” screen and touch the “Resume Guidance” switch.



The screen will change to the current position map with route guidance.

Volume

You can use voice guidance when approaching a destination.

You can adjust the volume of the voice or turn off voice guidance.



Push the “MENU” button to display the “Menu” screen, and touch the “Volume” switch.



To adjust the volume, select the desired level by touching the appropriate number.

If you do not need voice guidance, touch the “Off” switch.

The selected item is highlighted in green.

INFORMATION

During route guidance, the voice guidance continues even if the navigation screen is changed to other screens.

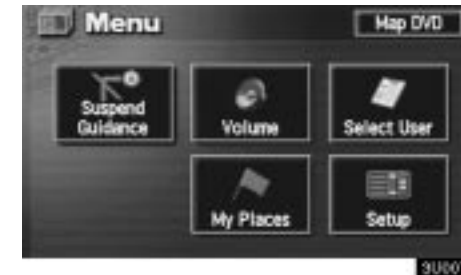
“Adaptive Volume Control”: If you turn the “Adaptive Volume Control” on, the volume is turned up automatically when the vehicle speed exceeds 50 mph (80 km/h).

To turn the “Adaptive Volume Control” system on, touch the switch. The indicator will be highlighted.

User selection

The system can memorize the following settings for up to three users.

- ▶ Map direction
- ▶ Map scale
- ▶ Guidance mode
- ▶ Setup
- ▶ Volume
- ▶ Language



Push the “MENU” button to display the “Menu” screen. Then touch the “Select User” switch.



ADVANCED FUNCTIONS

► To register



Touch the “**Memorize**” switch of your desired “User number”.

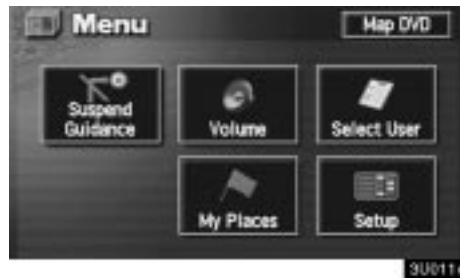


The confirmation screen will appear. To register, touch the “**Yes**” switch. To return to the previous screen, touch the “**No**” or “**Back**” switch.



When you touch the switch already registered, this screen appears. To replace, touch the “**Yes**” switch. To cancel the replacement, touch the “**No**” or “**Back**” switch.

► To change user



Push the “MENU” button to display the “Menu” screen. Then touch the “Select User” switch.



Touch the “User number” switch you wish to change.



The above message appears, then the map screen will be displayed.

► To delete user



Touch the “Delete” switch of “User number” you wish to delete.



ADVANCED FUNCTIONS

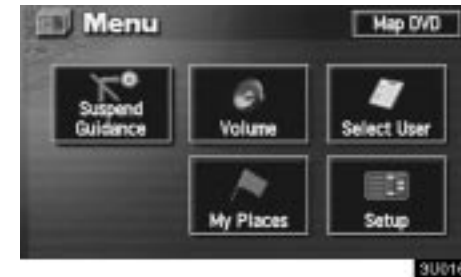


The confirmation screen appears. To delete, touch the “Yes” switch. To return to the previous screen, touch the “No” or “Back” switch.

My places

You can register and keep your own memory points (like restaurants, sports facilities, etc.) and use the memory points to input a destination.

(a) Registering memory points



1. Push the “MENU” button to display the “Menu” screen and touch the “My Places” switch.



2. Touch the “Register” switch of the “Memory Points”.



A screen similar to the destination input screen appears. Input the desired point in the same way as inputting a destination. (See page 20.)

When you finish memory point registration, the memory point data screen will appear.



You can set the icon, attribute, name, location and phone number.

Touch your desired switch you want to set. (For details, see “(b) Editing memory points”.)



INFORMATION

Up to 106 memory points can be registered.

ADVANCED FUNCTIONS

(b) Editing memory points

The icon, attribute, name, location and/or telephone number of a registered memory point can be edited.

1. Push the “MENU” button to display the “Menu” screen and touch the “My Places” switch.



2. Touch the “Edit” switch of the “Memory Points”.



The screen lists the memory points.

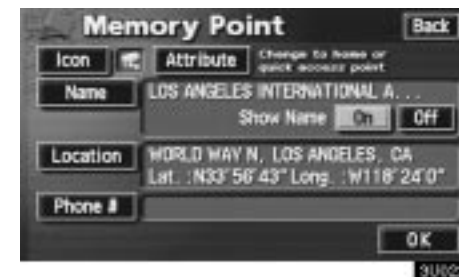
“Date”: Touch this switch to list the memory points in order of the registered date.

“Icon”: Touch this switch to list the memory points in order of the icon type.

“Name”: Touch this switch to list the memory points in alphabetical order.

“Attribute”: Touch this switch to list the memory points in order of the home and quick access number.

Touch the desired memory point switch to display the memory point data screen.



3. Touch the switch which you wish to edit.

► To change “Icon”



Touch the desired icon.

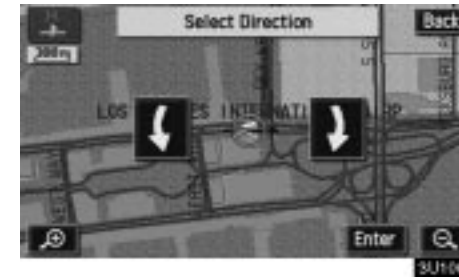
You can turn the page by touching “**Page 1**”, “**Page 2**” or “**With Sound**” switch.

“**With Sound**”: To display sound icons. When your vehicle approaches the memory point, the sound which you chose will sound.



Touch the desired sound icon.

The next screen appears when you touch the “**Bell (with direction)**” switch.



Touch the direction switches and adjust the direction. Touch the “**Enter**” switch. The bell sounds only when your vehicle approaches this point in the direction that you set.



ADVANCED FUNCTIONS

► To change “Attribute”

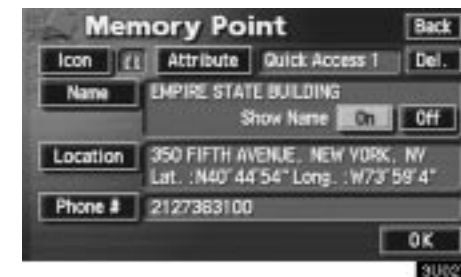
For easy destination input, set the attribute of the memory points as Home or Quick access 1 to 5.



Touch the desired attribute. It is possible to replace a registered attribute.



To replace the attribute, touch the “Yes” switch. To return to the previous screen, touch the “No” or “Back” switch.



To delete the attribute, touch the “Del.” switch.



To delete an attribute, touch the “Yes” switch. To return to the previous screen, touch the “No” or “Back” switch.

► To change “Name”



Touch the alphabet and/or numeral keys. When the entry has been completed, touch the “OK” switch on the screen. The previous screen will be displayed.

► “Show Name”

You can set the name of a memory point to be displayed or not on the map.

To show the name, touch the “On” switch. Not to show it, touch the “Off” switch.

► To change “Location”



Touch the eight direction switch to move the cursor to the desired point on the map.

Touch the “Enter” switch and the previous screen will be displayed.



ADVANCED FUNCTIONS

- To change “Phone #” (telephone number)



Touch numeral keys.

When the entry has been completed, touch the “OK” switch on the screen.

The previous screen will be displayed.

(c) Deleting memory points

1. Push the “MENU” button to display the “Menu” screen and touch the “My Places” switch.



2. Touch the “Delete” switch of the “Memory Points”.



3. Touch the corresponding switch. To delete all memory points, touch the “Delete All” switch.

For efficient memory point search, memory points can be sorted by the “Date”, “Icon”, “Name” or “Attribute” switch.

To delete, touch the “Yes” switch. To cancel the deletion, touch the “No” switch.

Area to avoid

Areas you wish to avoid because of traffic jams, construction work or other reasons can be registered as areas to avoid.

Push the “MENU” button to display the “Menu” screen and then touch the “My Places” switch to display the following screen.



INFORMATION

If a destination is inputted in the area to avoid or the route calculation cannot be made without running through the area to avoid, a route passing through the area to avoid may be shown.

(a) Registering area to avoid

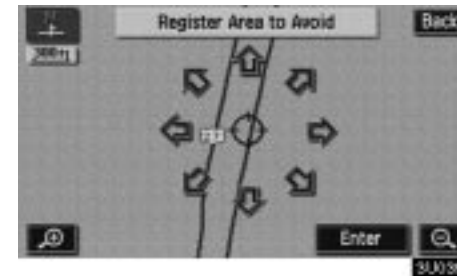
1. Touch the “Register” switch of the “Areas to avoid”.



2. Enter the location in the same way as inputting a destination, or display the map of the area you wish to avoid. (See page 20.)

INFORMATION

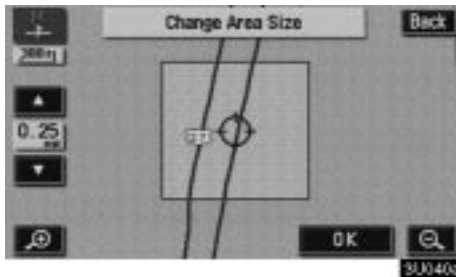
Up to 10 locations can be registered as point/area to avoid. If there are 10 locations already registered, the message “Unable to register additional points. Perform operation again after deleting unnecessary points.” appears on the screen.



3. Set the cursor in the center of the area to avoid, and touch the “Enter” switch.



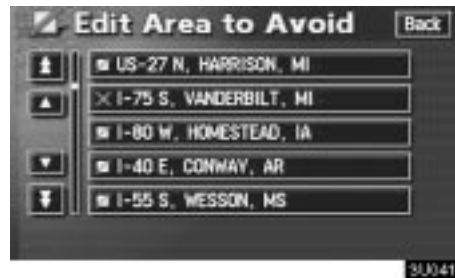
ADVANCED FUNCTIONS



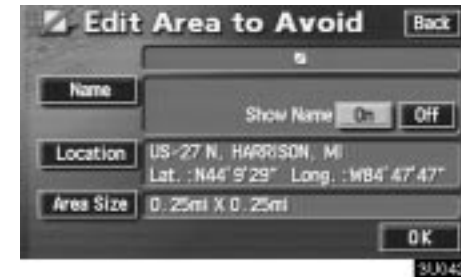
4. Touch either  or  switch to change the size of the area to avoid.

(b) Editing area to avoid

1. Touch the “Edit” switch of the “Areas to Avoid” to display the “Edit Area to Avoid” screen.



2. To edit an area to avoid, touch the corresponding switch.



3. Touch the “Name”, “Location” or “Area Size” switch on this screen.

► To change “Name”



Touch alphabet or numeral keys.

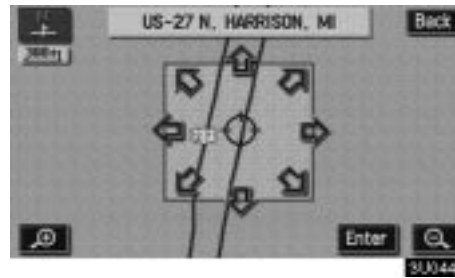
When the entry has been completed, touch the “OK” switch on the screen.


The previous screen will be displayed.

► “Show Name”

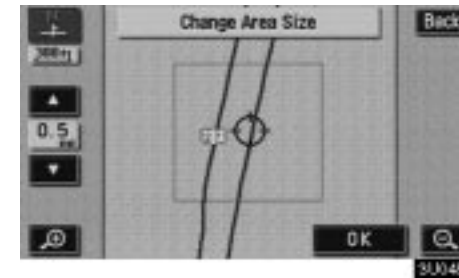
The avoid area name can be set to be displayed or not on the map. To show the name, touch the “On” switch. Not to show it, touch the “Off” switch.



► To change “Location”



Set the cursor  to the desired location, then touch the “Enter” switch. The previous screen will be displayed.

► To change “Area size”



Touch either  or  switch to change the size of area you want to avoid, and touch the “OK” switch. The previous screen will be displayed.



ADVANCED FUNCTIONS

(c) Deleting area to avoid

1. Touch the “Delete” switch of the “Areas to Avoid” to display the “Delete Area to Avoid” screen.



2. Touch the area you wish to delete from the list.

“Delete all”: To delete all registered areas to avoid in the system.

3. To delete, touch the “Yes” switch. To cancel the deletion, touch the “No” switch.

Setup

You can set the items shown on the “Set-up” screen.

1. Push the “MENU” button.



2. To display the “Set up” menu screen, touch the “Setup” switch. Touch the items you wish to set.



3. Touch the “OK” switch on the screen and then the previous screen will be displayed.

“Default”: This switch initializes all of the settings.

“Calibration”: You can adjust the current vehicle position mark manually.

“Distance”: You can select “km” or “miles” as the distance unit.

“Estimated Travel Time”: You can set the system to display the travel time to the destination on the route guidance screen.

“Auto Reroute”: You can set the system to automatically search for a new route to the destination.

“Adjust Time Zone”: You can select your desired time zone.

“Auto Voice Guidance”: You can set the automatic voice guidance.

“Voice Guidance in All Modes”: You can set the voice guidance in all modes.

“Notify Traffic Restriction”: You can select notification of seasonal restrictions.

“Intersection Guidance”: You can select ON or OFF to display of intersection guidance.

“Guidance Screen on Freeway”: You can select ON or OFF to display the guidance screen on the freeway.

“Street Name on Scroll Map”: You can select ON or OFF to display the street name on the scroll map.

“Display Building Shape”: You can select ON or OFF to display the building shape on the map screen.

“Map Function”: You can set to display or not to display each switches and current street name on the map screen.

“Show POI Icons”: You can choose 6 icons displayed on “Show POI Icons” top screen.

“Previous Point”: You can delete the previous destination.

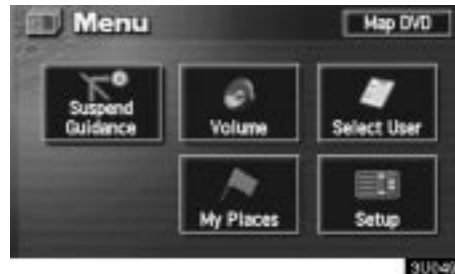
“Map Color (Day)”: You can select the desired map color.

“Map Color (Night)”: You can select the desired map color.

“Screen Animation”: You can set some screen displays to be animated.

Current position calibration

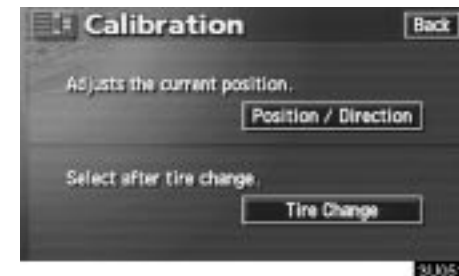
When driving, the current vehicle position mark will be automatically corrected by GPS signals. If GPS reception is poor due to location, you can manually adjust the current vehicle position mark.



1. Push the **“MENU”** button to display the **“Menu”** screen, and then touch the **“Setup”** switch.



2. Touch the **“Adjust”** switch of **“Calibration”**.



3. Touch the **“Position/Direction”** switch.

INFORMATION


For additional information on the accuracy of a current vehicle position, see “Limitations of the navigation system” on page 10.



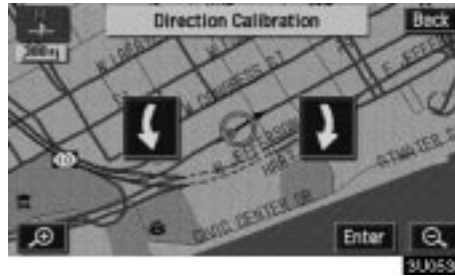
ADVANCED FUNCTIONS



► Position/direction calibration



1. Touch the scroll arrows to move the cursor  to your desired location.

Touch the “Enter” switch.



2. Touch either the  or  switch to adjust the direction of the current vehicle position mark.

Touch the “Enter” switch and the map screen will be displayed.

► Tire change calibration

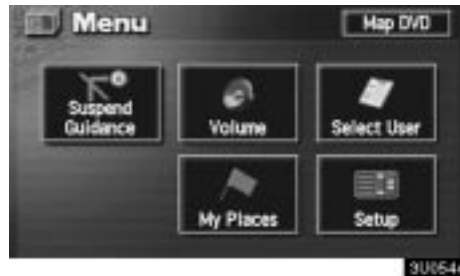
The tire change calibration function will be used when replacing the tires. This function will adjust the mis-calculation caused by the circumference difference between the old tires and new ones. If this procedure is not performed when tires are replaced, the current vehicle position mark may be incorrectly displayed.

To perform a distance calibration procedure, touch the “**Tire Change**” switch on the “Calibration” screen.

The message appears and the quick distance calibration is automatically started. A few seconds later, a map screen will be displayed.

Distance unit

1. Push the “MENU” button.



2. Touch the “Setup” switch.



3. Touch the “km” or “miles” switch of “Distance” to choose the distance unit. The selected switch is highlighted in green.

4. Touch the “OK” switch.

Estimated travel time

You can set the speed that is used for the calculation of the estimated travel time.



1. Push the “MENU” button.



ADVANCED FUNCTIONS



2. Touch the “Setup” switch.



3. Touch the “Set Speed” switch of the “Estimated Travel Time”.



4. Touch ◀ or ▶ to set the average vehicle speeds for driving on a Freeway, Main street, and Residential.

To set the default speeds, touch the “Default” switch.

5. When you finish setting the desired speeds, touch the “OK” switch.

INFORMATION

- ▶ The displayed time to the destination is the approximate driving time that is calculated based on the speeds you selected and your actual position along the guidance route.
- ▶ The time shown on the screen may vary greatly depending on your progress along the route, which may be affected by road conditions such as traffic jams, construction work.
- ▶ It is possible to display up to 99 hours 59 minutes.

Auto reroute

When the “Auto Reroute” feature is turned on, the system will automatically search for a new route to the destination if you stray from the guidance route. This feature does not operate while you are driving on roads where guidance is not available.

To turn the “Auto Reroute” mode on:

1. Push the “MENU” button.



2. Touch the “Setup” switch.



3. Touch the “On” switch of “Auto Reroute”.

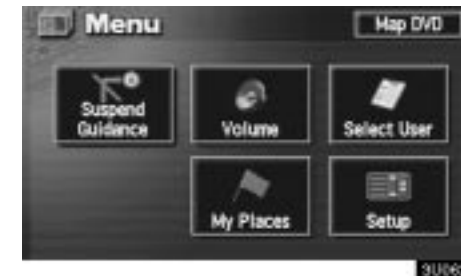
The selected switch is highlighted in green.

INFORMATION

If your vehicle strays from the guidance route, the system searches for a new route to the destination. The new route may or may not take you back to the previous route depending on how far you are off the original guidance route.

Adjusting time zone

1. Push the “MENU” button.



2. Touch the “Setup” switch.



ADVANCED FUNCTIONS



3. Touch the “Change” switch. The “Adjust Time Zone” screen appears on the display.



4. Touch the desired time zone.

The selected switch is highlighted in green.

5. Touch the “OK” switch on the screen and the “Setup” screen will be displayed.

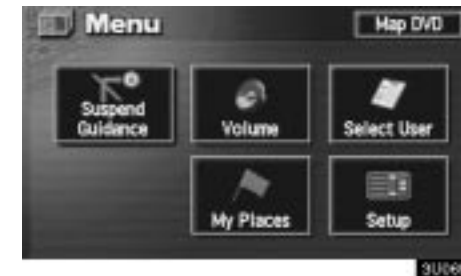
Auto voice guidance


When the “Auto Voice Guidance” feature is turned on, the voice guidance can be heard automatically.

When the “Auto Voice Guidance” feature is turned off, the voice guidance can be heard only if you push the “MAP/VOICE” button.

To turn the “Auto Voice Guidance” mode on:

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch to display page 2 of the “Setup” screen.



3. Touch the “On” switch of “Auto Voice Guidance”.
The selected switch is highlighted in green.

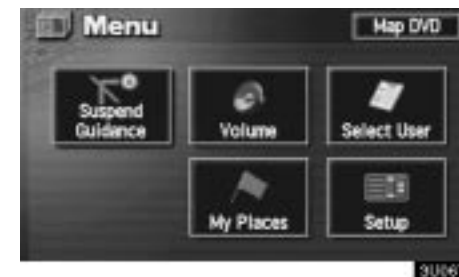
Voice guidance in all modes


When the “Voice Guidance in All Modes” feature is turned on, you can hear the voice guidance in all modes.

When the “Voice Guidance in All Modes” feature is turned off, voice guidance cannot be heard when you using the audio system.

To turn the “Voice Guidance in All Modes” on:

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch to display page 2 of the “Setup” screen.



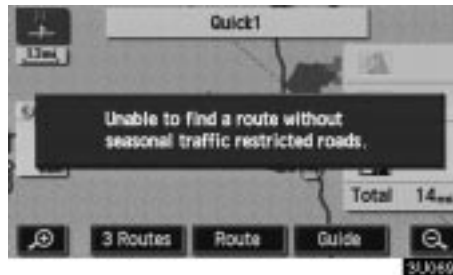
ADVANCED FUNCTIONS



3. Touch the “On” switch of “Voice Guidance in All Modes” and touch the “OK” switch.

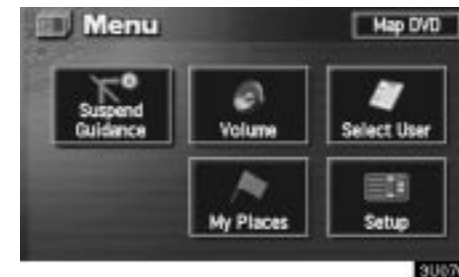
Notifying traffic restriction


When the “Notify Traffic Restriction” feature is turned on, the system notifies you of traffic or seasonal restriction.



To turn the “Notify Traffic Restriction” mode on:

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch to display page 2 of the “Setup” screen.



3. Touch the “On” switch of “Notify Traffic Restriction” and touch the “OK” switch.

Intersection guidance


When the “Intersection Guidance” feature is turned on, the system will display the intersection guidance screen if you drive with route guidance.



To turn the “Intersection Guidance” mode on:

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch to display page 2 of the “Setup” screen.



ADVANCED FUNCTIONS



3. Touch the “On” switch of “Intersection Guidance” and touch the “OK” switch.

Guidance screen on freeway


When the “Guidance Screen on Freeway” feature is turned on, the system will display the lane guidance screen if you drive on a freeway with route guidance.



To turn the “Guidance Screen on Freeway” mode on:

1. Push the “MENU” button.




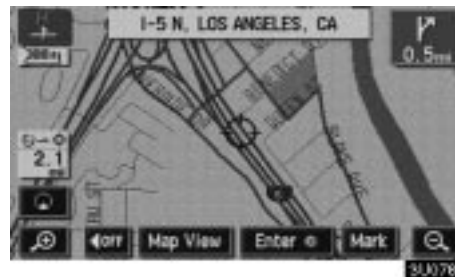
2. Touch the “Setup” switch. Then touch  switch to display page 2 of the “Setup” screen.



3. Touch the “On” switch of “Guidance Screen on Freeway” and touch the “OK” switch.

Street name on scroll map


When the “Street Name on Scroll Map” feature is turned on, the system will display the name of a street where the cursor  is positioned on the scroll map.



To turn the “Street Name on Scroll Map” mode on:

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch twice to display page 3 of the “Setup” screen.



ADVANCED FUNCTIONS



3. Touch the “On” switch of “Street Name on Scroll Map” and touch the “OK” switch.

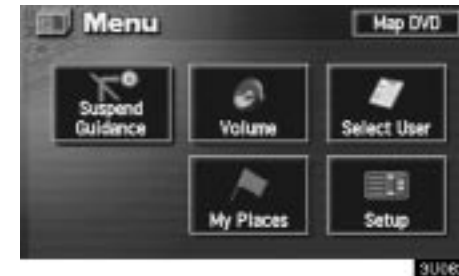
Display of building shape


When the “Display Building Shape” feature is turned on, the system will display the building shape on the map screen using a scale of 150 feet (50 m) to 300 feet (100 m).



To turn the “Display Building Shape” mode on:

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch twice to display page 3 of the “Setup” screen.



3. Touch the “On” switch of “Display Building Shape” and touch the “OK” switch.

Screen layout function (**4OFF** Function)

You can set display or hide each switch and current street name on the map screen.

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch **4OFF** switch twice to display page 3 of the “Setup” screen.



3. Touch the “Change” switch of the “**4OFF** Function”.



4. Touch the switch corresponding to the desired setting. Then touch the “OK” switch.

ADVANCED FUNCTIONS


POI category change (Show POI Icons)

You can choose 6 icons displayed on the “Show POI Icons” top screen, so that you can easily set which icons to display on the map screen.



1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch twice to display page 3 of the “Setup” screen.



3. Touch the “Change” switch of “Show POI Icons”.



4. Touch the category switch you wish to change.

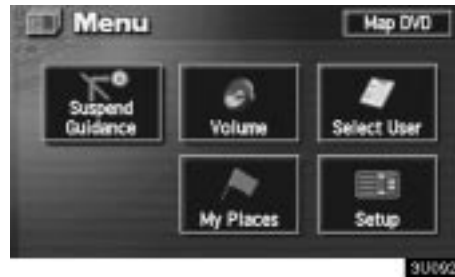



5. Touch the switch corresponding to the desired category. Then touch the “OK” switch.

Delete previous point

You can delete your previous destination.

1. Push the “MENU” button.



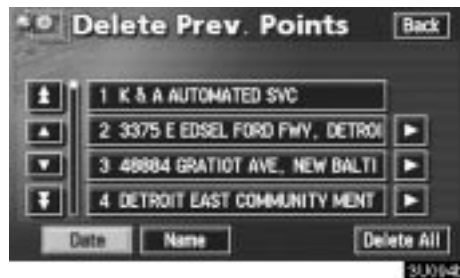
2. Touch the “Setup” switch. Then touch  switch twice to display page 3 of the “Setup” screen.



3. Touch the “Delete” switch of “Previous Point”.



ADVANCED FUNCTIONS



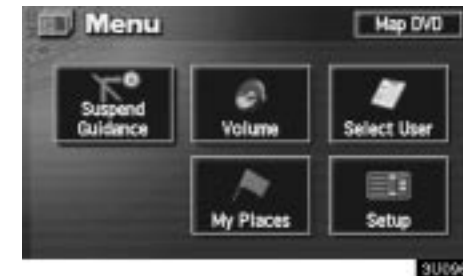
4. Touch the switch you want to delete.
For efficient previous point search, previous points can be sorted by the “Date” or “Name” switch.




5. To delete the point, touch the “Yes” switch.
To cancel the deletion, touch the “No” switch.

Map color

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch three times to display page 4 of the “Setup” screen.



3. Touch the desired color for day and/or night map color and then touch the “OK” switch to return the map screen.

Touch the “Normal” switch to return to the default map color.


Screen animation

When the “Screen Animation” feature is turned on, some switches and screens become animated. (e.g.: change map guidance on the map screen)

To turn the “Screen Animation” mode on:

1. Push the “MENU” button.



2. Touch the “Setup” switch. Then touch  switch three times to display page 4 of the “Setup” screen.



3. Touch the “On” switch of “Screen Animation” and touch the “OK” switch.



ADVANCED FUNCTIONS

SECTION IV

OTHER FUNCTIONS

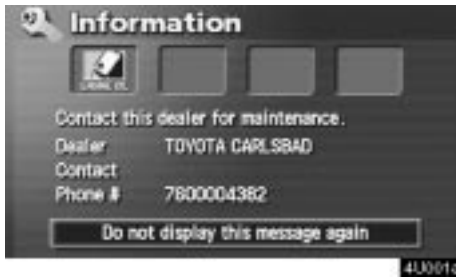
Other functions

Maintenance information	96
Calendar with memo	101
Screen adjustment	108
Screen setting	110



OTHER FUNCTIONS

Maintenance information



This system informs you when to replace certain parts or components and shows dealer information (if registered) on the screen. (See “Information items” on page 97.) When the navigation system begins operating after either the information item’s date comes or the driving distance reaches the “Information” screen will be displayed. This screen will appear every time the system is turned on until you touch the “Do not display this message again” switch.

To prevent this information screen from being displayed again, touch the “Do not display this message again” switch.



1. Push the “INFO” button to display the “Information Menu” screen. Touch the “Maintenance” switch to display the “Maintenance” screen.




2. Touch the desired icon and input the conditions.



Notice of “Date”: You can input the next maintenance date.

Notice of “Distance”: You can input the driving distance until the next maintenance check.

When you touch the  switch on the “Maintenance” screen, the screen changes to the “Personal Event” screen. Touch the keys to input the desired name and then input conditions.

After you input the date and/or distance, touch the **“OK”** switch. The screen then returns to the “Maintenance” screen.

The following switches appear.

“Delete All”: To cancel all conditions which have been inputted.

“Reset All”: To reset the item which has satisfied a condition.



Touch the **“Off”** switch at the top of the “Maintenance” screen to turn off the information screen.

When your vehicle needs to be serviced, the icon color will change to orange.

INFORMATION

- ▶ *For scheduled maintenance information, please refer to the “Scheduled Maintenance Guide” or “Owner’s Manual Supplement”.*
- ▶ *Depending on the driving or the road conditions, the actual date and distance may differ from the stored date and distance in the system.*

Information items

-  Oil change
-  Replace oil filter
-  Rotate tires
-  Replace tires
-  Replace battery
-  Replace brake linings
-  Replace wiper blades

OTHER FUNCTIONS



Replace engine coolant



Replace brake fluid



Replace ATF



Scheduled maintenance



Replace air filter



Personal event

(a) Register dealer

You can register the dealer name, staff, location and phone number.



1. Touch the “Set Dealer” switch on the “Maintenance” screen.



2. Enter the location of the dealer in the same way as for destination input. (See page 20.)

OTHER FUNCTIONS

► To edit “Dealer” or “Contact”




To input the name, touch the alphabet, numeral and/or umlaut keys. You can input up to 24 letters.

After inputting, touch the “OK” switch at the bottom right of the screen. The previous screen will be displayed.

► To edit “Location”



Set the cursor  to the desired point, and touch the “Enter” switch on the screen.

► To edit “Phone #” (telephone number)




Touch numeral keys.

After inputting, touch the “OK” switch. The previous screen will be displayed.

(c) Delete dealer

1. Touch the “Delete Dealer” switch on the screen.
2. A message will appear on the screen. To delete, touch the “Yes” switch. To cancel the deletion, touch the “No” or “Back” switch.

(d) Set as destination

Touch the “Enter ” switch on “Set Dealer” screen. The screen changes and displays the map location of the registered dealer and the “Route Preference”. (See “— Entering destination” on page 38.)

Calendar with memo

This system informs you of the memo entry. At the specified date, the memo information will be displayed, when the navigation system is in operation. The memo information screen will appear every time the system is turned on. To disable this screen, touch the “Do not display this message again” switch.

OTHER FUNCTIONS



To display the "Information Menu" screen, push the "INFO" button. Then touch the "Calendar" switch.



The current date is circled in yellow. If the current date is not displayed on the screen, touch the "Today" switch to display the current month calendar.

(a) Inputting a memo



1. Touch the day you want to add a memo.



2. To display the "Memo" screen, touch the "Add Memo" switch.

▶ Memo



Touch the “Memo” switch to enter text.



Enter text using the keys. You can enter text up to 24 letters.

After entering the text, touch the “OK” switch at the bottom right of the screen.

▶ Location



Touch the “Location” switch to set location.

A screen similar to the destination input screen appears. Input the same way as inputting a destination. (See page 20.)

You can add the memos up to 100 until December 31, 2022.

OTHER FUNCTIONS



The date inputted is marked as shown above.

You can choose the desired mark and/or date color.

▶ Mark color



Touch the “Mark” switch.



Touch your desired color for the mark.

▶ Date color



Touch the “Date” switch.



Touch your desired color for the date.

You can set a color of the mark and/or date for the date you added the memo and/or location.

To default the date color, touch the “Delete” switch on the screen. After you choose the date and/or mark color, touch the “OK” switch to display the previous screen.

(b) Adding a memo



To add a memo, touch the corresponding date.

The “Memo” screen appears on the display. Touch the “Add Memo” switch. (See page 102 for inputting a memo.)

You can add the memo up to 100.

(c) Deleting a memo



Touch the corresponding date. Touch the corresponding memo switch, and then touch the “Delete” switch on the screen. A message appears on the display. To delete, touch the “Yes” switch. To cancel the deletion, touch the “No” switch.

OTHER FUNCTIONS

(d) Editing a memo



To edit the memo, touch the corresponding date, and then touch the memo you wish to edit.



Touch the "Memo" or "Location" switch.

(e) Memo list



1. To list the memos you added, touch the "List" switch.



2. Touch the desired search condition to list the memos. The “Memo list” is displayed on the screen.



To display the memos listed in a desired period, touch the “Period” switch.

Touch the number keys.

After setting the period, touch the “OK” switch. The “Memo list” screen will be displayed.

You can set a period from January 1, 2003, through December 31, 2022, for searching.



To delete and/or edit the memo, touch the desired memo switch.

To delete all memos, touch the “Delete All” switch. A message appears on the display. To delete, touch the “Yes” switch. To cancel the deletion, touch the “No” switch.

OTHER FUNCTIONS



To edit: Touch the corresponding “Memo” or “Location” switch. (See page 106 for details.)

To delete: Touch the “Delete” switch. (See page 105 for details.)

Screen adjustment

The brightness or contrast of the screen can be adjusted depending on the brightness of your surroundings. You can also turn the display off.

To display the “Display” screen push the “DISPLAY” button.



Contrast and brightness adjustment

“CONTRAST” “+”:

Strengthens the contrast of the screen.

“CONTRAST” “-”:

Weakens the contrast of the screen.

“BRIGHTNESS” “+”:

Brightens the screen.

“BRIGHTNESS” “-”:

Darkens the screen.

After adjusting the screen, touch the “OK” switch.

The screen goes off when you touch the “SCREEN OFF” switch. To turn the display screen back on, push any button such as “INFO”, etc. The selected screen appears.

INFORMATION

When you do not touch any switch on the screen for 20 seconds the “Display” screen goes off.



Color and tone adjustment (with rear seat entertainment system)

You can adjust the color and the tone while the DVD video, DVD audio and video CD are being played.

“COLOR” “RED”:

Strengthens the red color of the screen.

“COLOR” “GREEN”:

Strengthens the green color of the screen.

“TONE” “+”: Strengthens the tone of the screen.

“TONE” “-”: Weakens the tone of the screen.

After adjusting the screen, touch the “OK” switch.

The rear screen turns off when you touch “Rear OFF”.

The screen turns off when you touch “SCREEN OFF”. To turn the screen back on, push any button such as “INFO”, etc. The selected screen appears.

INFORMATION

When you do not touch any switch on the screen for 20 seconds the “Display” screen goes off.



Depending on the position of the headlight switch, the screen changes to the day mode or night mode.

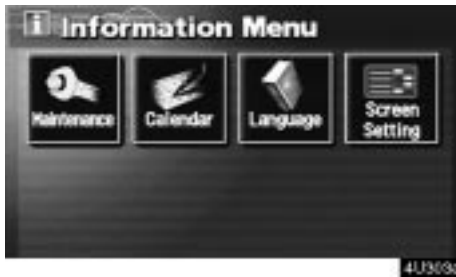
To display the screen in the day mode even with the headlight switch on, touch the “DAY MODE” switch on the adjustment screen for brightness and contrast control.

If the screen is set in the day mode with the headlight switch turned to on, this condition is memorized in the system even with the engine turned off.

OTHER FUNCTIONS

Screen setting

1. Push the "INFO" button to display the "Information Menu" screen.



2. Touch the "Screen Setting" switch.

(a) Automatic transition

You can select a function that enables automatic return to the navigation screen from the audio screen.



Select "ON" or "OFF" and then touch the "OK" switch.

"ON": The navigation screen automatically returns from the audio screen 20 seconds after the end of audio operation.

"OFF": The audio screen remains on.

(b) Background color

You can select a background color.



Select the desired background color and then touch the "OK" switch.

SECTION V

AUDIO SYSTEM

Audio system

Quick reference	112
Using your audio system	113
Audio system operating hints	140



Quick reference



- 1 Function switch display screen**
Touch the switches displayed on the screen to control the radio and disc players. For details, see page 114.
- 2 “TUNE” knob**
Turn this knob to move the station band up or down. For details, see page 116.
- 3 “AM-SAT” button**
Push this button to choose an AM station. For details, see pages 114 and 116.
- 4 “FM” button**
Push this button to choose a FM station. For details, see pages 114 and 116.
- 5 “DISC” button**
Push this button to turn the compact disc player and DVD player on. For details, see pages 114, 121 and 125.
- 6 “SCAN” button**
Push this button to scan radio stations or the tracks on discs. For details, see pages 117, 122 and 126.
- 7 “OPEN” button**
Push this button to open the display to access the slot for the compact disc player. For details, see page 119.

- 8** “**AUDIO**” button
Push this button to display the audio control screen. For details, see page 113.
- 9** “**SEEK/TRACK**” button
Push either side of this button to seek up or down for a station, or to access a desired program or track. For details, see pages 117, 121 and 126.
- 10** “**PWR-VOL**” knob
Push this knob to turn the audio system on and off, and turn it to adjust the volume. For details, see page 113.

Using your audio system — — Some basics

This section describes some of the basic features of your audio system. Some information may not pertain to your system.

Your audio system works when the ignition switch is in the “ACC” or “ON” position.

NOTICE

To prevent the battery from being discharged, do not leave the audio system on longer than necessary when the engine is not running.



(a) Turning the system on and off

“**PWR-VOL**”: Push this knob to turn the audio system on and off. Turn this knob to adjust the volume. The system turns on in the last mode used.

“**AUDIO**”: Push this button to display switches for audio system (audio control mode).

You can select the function that enables automatic return to the previous screen from the audio screen. See page 110 for details.

AUDIO SYSTEM



Push “AM-SAT”, “FM” or “DISC” button to turn on the desired mode. The selected mode turns on immediately.

Push these buttons if you want to switch from one mode to another.

If the disc is not set, the compact disc player does not turn on.

You can turn off the compact disc player by ejecting the compact disc. If the audio system was previously off, then the entire audio system will be turned off when you eject the compact disc. If the another function was previously playing, it will come on again.



The switches for radio, compact disc player and DVD player (with rear seat entertainment system) operation are displayed on the function switch display screen when the audio control mode is selected. Touch them lightly and directly on the screen.

The selected switch is highlighted in green or yellow.

INFORMATION

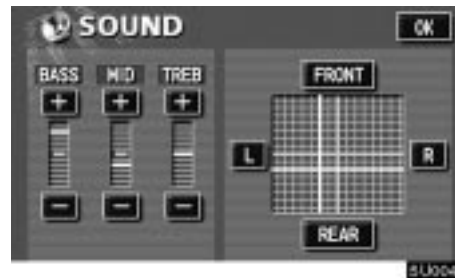
- *If the system does not respond to a touch of a switch, move your finger away from the screen and then touch it again.*
- *You cannot operate dimmed switches.*
- *Wipe off fingerprints on the surface of the display using a glass cleaning cloth.*

(b) Tone and balance

How good an audio program sounds to you is largely determined by the mix of the treble, midrange, and bass levels. In fact, different kinds of music and vocal programs usually sound better with different mixes of treble, mid-range, and bass.

A good balance of the left and right stereo channels and of the front and rear sound levels is also important.

Keep in mind that if you are listening to a stereo recording or broadcast, changing the right/left balance will increase the volume of one group of sounds while decreasing the volume of another.



Touching the “SOUND” switch displayed on the screen at the audio control mode will display the sound control mode. Adjust the tone and balance as follows.

To adjust the tone, touch the “+” or “-” switch on the screen. To adjust the balance between the front and rear speakers, touch the “FRONT” or “REAR” switch on the screen, and to adjust the balance between the left and right, touch the “L” or “R” switch on the screen.

“BASS”: Adjusts low-pitched tones.

“MID”: Adjusts mid-pitched tones.

“TREB”: Adjusts high-pitched tones.

As the yellow display goes up, each tone is more emphasized.

(c) Your compact disc player

When you insert a compact disc, insert it with the label side up. The compact disc player will play from track 1 through the end of the disc. Then it will play from track 1 again.

NOTICE

Never try to disassemble or oil any part of the compact disc player. Do not insert anything other than compact discs into the slot.

The player is intended for use with 12 cm (4.7 in.) discs only.

AUDIO SYSTEM

(d) Your DVD player (with rear seat entertainment system)

You can enjoy the sound of the rear seat entertainment system by pushing the "DISC" button.

— Radio operation



(a) Listening to the radio

Push these buttons to choose either an AM or FM station.

"AM", "FM1" or "FM2" appears on the screen.



Turn the knob clockwise to step up the station band or counterclockwise to step down.

Your radio automatically changes to stereo reception when a stereo broadcast is received. "ST" appears on the screen. If the signal becomes weak, the radio reduces the amount of channel separation to prevent the weak signal from creating noise. If the signal becomes extremely weak, the radio switches from stereo to mono reception. In this case, "ST" disappears from the screen.



(b) Presetting a station

1. Tune in the desired station.
2. Touch one of the switches (1 — 6) you want and hold it until a beep is heard. This sets the station to the switch and the frequency appears on the switch.

Each radio mode (AM, FM1 or FM2) can store up to 6 stations. To change the preset station to a different one, follow the same procedure.

The preset station memory is cancelled when the power source is interrupted by battery disconnection or a blown fuse.

(c) Selecting a station

Tune in the desired station using one of the following methods.

Preset tuning: Touch the switch (1 — 6) for the station you want. The switch is highlighted in green and the station frequency appears on the screen.

Seek tuning: Push the “SEEK/TRACK” button on either side. The radio will begin seeking up or down for a station of the nearest frequency and will stop on reception. Each time you push the button, the stations will be searched automatically one after another.

To scan all the frequencies: Touch the “SCAN” switch on the screen or push the “SCAN” button briefly. “SCAN” appears on the screen. The radio will find the next station and stay there for a few seconds, and then scan again. To select a station, touch the “SCAN” switch or push the “SCAN” button again.

To scan the preset stations: Touch the “SCAN” switch on the screen or push the “SCAN” button for longer than approximately a second. “P. SCAN” appears on the screen. The radio will tune in the next preset station, stay there for a few seconds, and then move to the next preset station. To select a station, touch the “SCAN” switch or push the “SCAN” button again.

(d) Radio Data System

Your audio system is equipped with Radio Data Systems (RDS). RDS mode provides you to receive text messages from radio stations that utilize RDS transmitters.

When RDS is on, the radio can

- only select stations of a particular program type,
- display messages from radio stations,
- search for a stronger signal station.

RDS features are available for the use only on FM stations which broadcast RDS information.

AUDIO SYSTEM



“TYPE ◀▶” switch

If the system receives no RDS stations, “NO PTY” appears on the display.

Each time you touch the “TYPE ◀” or “TYPE ▶” switch, the program type changes as in the following:

- ROCK
- MISC (Miscellaneous)
- Inform (Information)
- Easy Lis (Easy listening)
- Cls/Jazz (Classical music and Jazz)
- R & B (Rhythm and Blues)
- Religion
- Alert (Emergency message)



“TYPE SEEK” switch

When a program is set, “TYPE SEEK” switch appears. Touch the switch and the system starts to seek the station in the relevant program type.

If any type program station is not found, “NOTHING” appears on the display.



“MSG” (MESSAGE) switch

If the system receives a radio text from RDS station, “MSG” appears on the display. Touch the “MSG” switch, and a text message is displayed on the screen.

In case a text message is not accepted in a screen, you can touch the “MSG” switch and hold it to display the rest of the message.

When the system can show the station name, “RDS” appears on the display. Each time you touch the “MSG” switch, indication on the display changes from the band to the station name, a radio text in this order. After six seconds passes, indication returns to the band.



(e) Traffic announcement

“TRAF” switch

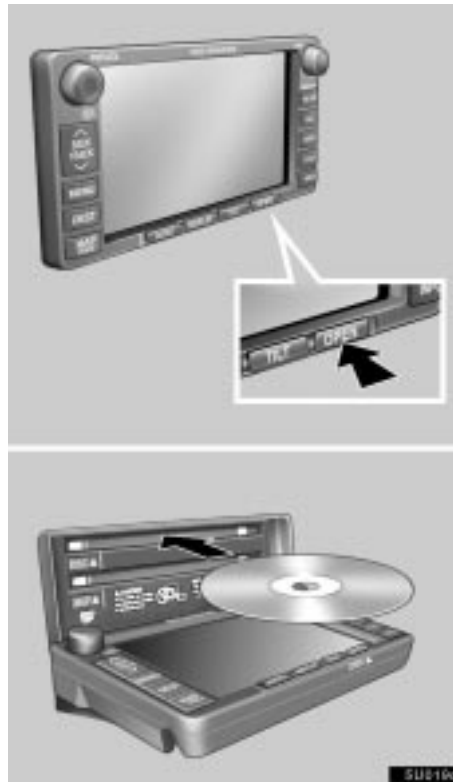
A station that regularly broadcasts traffic information is automatically located.

When you push the “TRAF” switch, “TRAF SEEK” appears on the display and the radio will start seeking any traffic program station.

If no traffic program station is found, “NOTHING” appears on the display.

If a traffic program station is found, the name for traffic program station is displayed and “TRAF” is lit for a while until a traffic announcement is received.

— Compact disc player operation



(a) Playing a compact disc

The slot for the compact disc player is behind the display.

To insert a compact disc, push the “OPEN” button to lower the display. Put the compact disc in the slot with the label side up.

The player will automatically start when you insert the compact disc. At this time, “CD” appears on the screen.

If the label faces down, the disc cannot be played. In this case, “CD CHECK” appears on the screen.

CAUTION

- Do not place anything on the opened display, as such items may be thrown about in the compartment and possibly injure people in the vehicle during sudden braking or in an accident.
- To reduce the chance of injury in case of an accident or sudden stop while driving, keep the display closed.
- Take care not to jam your hand while the display is moving. Otherwise, you could be injured.



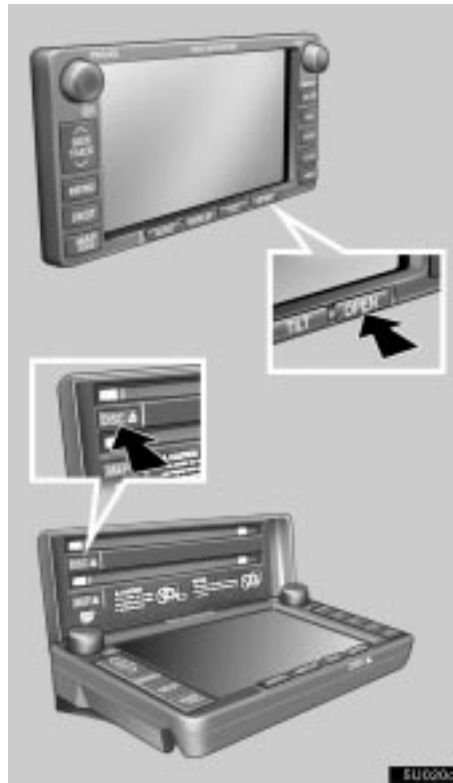
AUDIO SYSTEM

NOTICE

Do not obstruct the display while it is moving. It could damage your audio system.

INFORMATION

Under extremely cold conditions, the display may react slowly or operation sound may become louder.



To stop and eject the compact disc, push the “OPEN” button to lower the display. Push the “DISC ▲” button.



Push the “DISC” button if a compact disc is already loaded in the slot.

“CD” appears on the screen.

Vehicles with rear entertainment system —

If the DVD player is turned on, push the “DISC” button again to switch to the compact disc player.

If the rear seat entertainment system is on, pushing the “DISC” button switches the sound of the front audio system and that of the rear seat entertainment system.




(b) Selecting a desired track


“SEEK/TRACK” button: Use for a direct access to a desired track.

Push either side of the “SEEK/TRACK” button and hold it until the desired track number appears on the screen. As you release the button, the player will start playing the selected track from the beginning.

Vehicles with rear entertainment system —

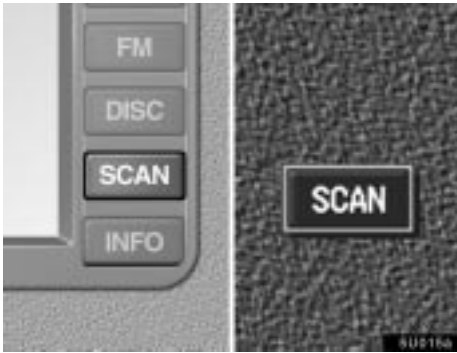
While the DVD player is in operation, the chapter or track can be changed by pushing either side of the “SEEK/TRACK” button.

Fast forward: Touch the  switch and hold it to fast forward the disc. When you release the switch, the compact disc player will resume playing from that position.

Reverse: Touch the  switch and hold it to reverse the disc. When you release the switch, the compact disc player will resume playing.



AUDIO SYSTEM



(c) Searching for a desired track

Touch the “SCAN” switch on the screen or push the “SCAN” button.

The compact disc player will play the next track for 10 seconds, then scan again. To select a track, touch the “SCAN” switch on the screen or push the “SCAN” button a second time. If the player reaches the end of the disc, it will continue scanning at track 1.

After all the tracks are scanned in one pass, normal play resumes.



(d) Other compact disc player functions

“RPT” switch: Use it for automatic repeat of the track you are currently listening to.

Touch the switch while the track is playing. When the track is finished, the player will automatically go back to the beginning of the track and play the track again. To cancel it, touch the switch once again.

“RAND” switch: Use it for automatic and random selection.

When the switch is touched, the system selects a track in the disc. To cancel it, touch the switch once again.

If a CD-TEXT disc is inserted, the title of the disc and track will be displayed. Up to 29 letters can be displayed.

(e) If the player malfunctions

If “CD ERROR” appears on the screen, audio signals of the disc cannot be read or the system has trouble. Push the “DISC” button once again.

If the player does not operate, check that the disc surface is not soiled or damaged. If the disc is O.K., the temperature of the player’s internal mechanism may be raised because of high external temperature. Remove the disc from the player to cool it.

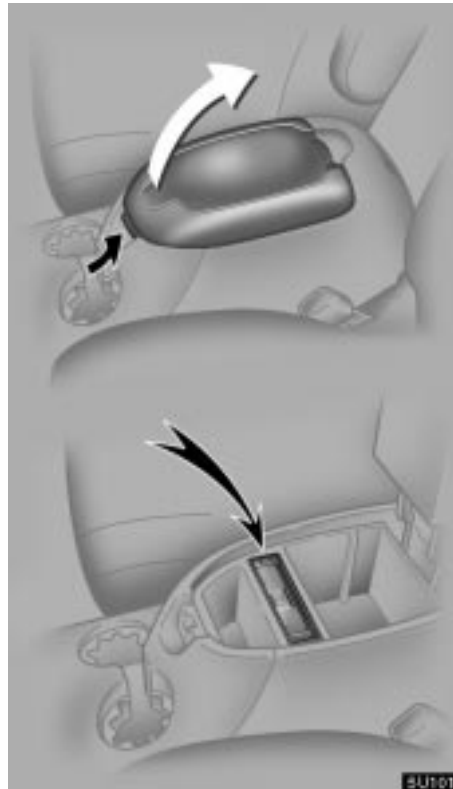
If the player still does not operate, have it checked by your dealer.

**—DVD player operation
(with rear seat entertainment system)**

The DVD player can play DVD video, audio CD, video CD, CD text, dts-CD or DVD audio only when a disc is loaded in the DVD player.

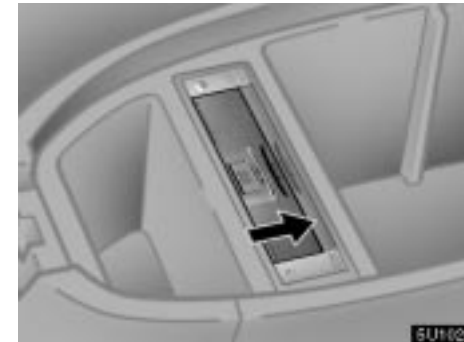
Refer to “Rear seat entertainment system” for details.

For appropriate discs for this player, see “Audio system operating hints” on page 140.



(a) Inserting the disc

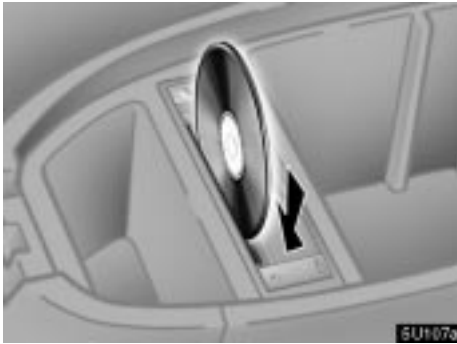
1. Pull up the console box lid while pushing the lock release button.



2. Slide the lid backward.



AUDIO SYSTEM



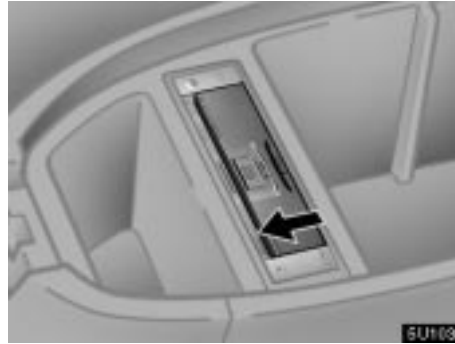
3. Insert a disc.

When you insert a disc, push it in gently with the label side up.

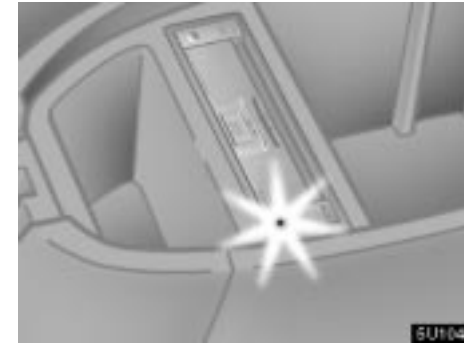
If the label faces down, the disc cannot be played. In this case, "DISC CHECK" appears on the screen.

If a disc which is not playable is inserted, "DISC CHECK" will also appear on the screen. For appropriate discs for this player, see "Audio system operating hints" on page 140.

An adapter must be used for 8 cm (3 in.) discs which are loaded in the same manner as for 12 cm (4.7 in.) discs.



4. Slide the lid forward to close the DVD player.

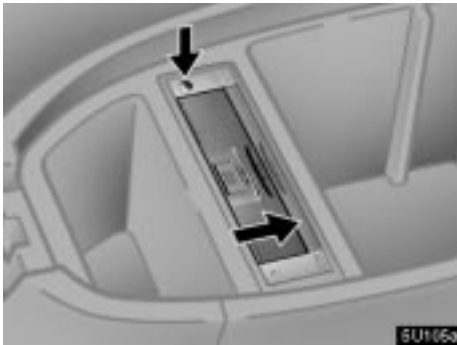


The indicator light turns on while the disc is loaded.

NOTICE


Never try to disassemble or oil any part of the DVD player. Do not insert anything other than a disc into the slot.

5. Close the console box.



(b) Ejecting a disc

Slide the lid backward to open the DVD player. Push the disc eject button to eject a disc.

 CAUTION
<p>To reduce the chance of injury in case of an accident or a sudden stop, always keep the console box closed while driving.</p>



(c) Playing a disc

Push the “DISC” button if a disc is already loaded in the player.

“DVD” appears on the screen. (If the CD player is turned on, push the “DISC” button again to switch to the DVD player.)



(d) Operating an audio CD

PLAYING AN AUDIO CD

CD text only — The disc title and track title will appear on the screen when pushing the “DISC” button.

Push the “AUDIO” button to display this screen.




AUDIO SYSTEM




SELECTING A DESIRED TRACK

“SEEK/TRACK” button: Use for direct access to a desired track.

Push either side of the “SEEK/TRACK” button and hold it until the desired track number appears on the display. As you release the button, the player will start playing the selected track from the beginning.

Fast forward: Touch the  switch and hold it to fast forward the disc. When you release the switch, the player will resume playing from that position.

Reverse: Touch the  switch and hold it to reverse the disc. When you release the switch, the player will resume playing.



SEARCHING FOR A DESIRED TRACK

Touch the “SCAN” switch on the screen or push the “SCAN” button.

“SCAN” will be highlighted in yellow on the screen. The player will play the next track for 10 seconds, then scan again. To select a track, touch the “SCAN” switch on the screen or push the “SCAN” button a second time. If the player reaches the end of the disc, it will continue scanning at track 1.

After all the tracks are scanned in one pass, normal play resumes.



OTHER FUNCTIONS

“RPT” switch: Use it for automatic repeat of the track you are currently listening to.

Touch the switch while the track is playing. When the track is finished, the player will automatically go back to the beginning of the track and play the track again. To cancel it, touch the switch once again.

“RAND” switch: Use it for automatic and random selection of the disc which you are currently listening to.

When the switch is touched, the system selects a track in the disc you are currently listening to. To cancel it, touch the switch once again.

If a CD-TEXT disc is inserted, the title of the disc and track will be displayed. Up to 29 letters can be displayed.

(e) Operating a DVD video disc

NOTE: The playback condition of some DVD video discs may be determined by a DVD video software producer. This DVD player plays a disc as the software producer intended. So some functions may not work properly. Be sure to read the instruction manual for the DVD video disc separately provided. For the detailed information about DVD video discs, see “(h) DVD player and DVD video disc information”.

Precautions on DVD video disc

When recording with a DVD video or video CD, audio tracks may not record in some cases while the menu is displayed. As audio will not play in this case, verify that the video tracks are playing and then activate playback.

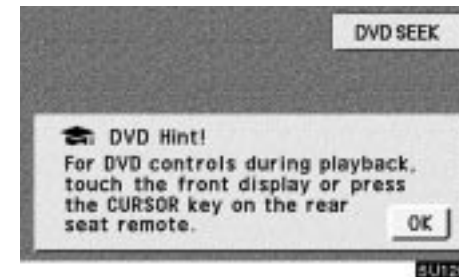
When playback of a disc is completed:

- If an audio CD is playing, the first track starts.
- If a DVD video or video CD is playing, playback will stop or the menu screen will be displayed.

The title/chapter number and playback time display may not appear while playing back certain DVD video discs.

 **CAUTION**

Conversational speech on some DVDs is recorded at a low volume to emphasize the impact of sound effects. If you adjust the volume assuming that the conversations represent the maximum volume level that the DVD will play, you may be startled by louder sound effects or when you change to a different audio source. The louder sounds may have a significant impact on the human body or pose a driving hazard. Keep this in mind when you adjust the volume.



This “DVD Hint!” screen appears when the video screen is first displayed after you turn the ignition key to “ACC” or “ON”.

Touch “OK” when you read the message.

AUDIO SYSTEM



DVD video



DVD audio

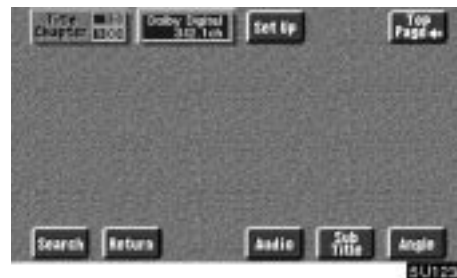
PLAYING A DVD DISC

Push the “AUDIO” button to display this screen.

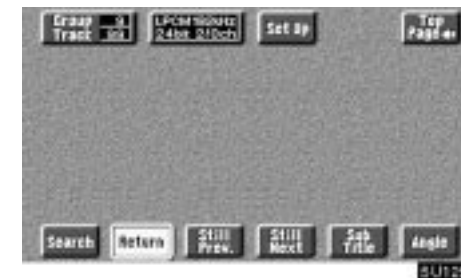
If you touch the “PICTURE” switch when the vehicle is completely stopped and the parking brake is applied, the video screen returns.



DVD video



DVD audio




DISPLAYING DVD CONTROLS

If you touch a part of the screen, where controls are not located while you are watching video, DVD controls will appear.

“**Second Page**”: Touching this will display on the second page of DVD controls.

“**Top Page**”: Touching this will display the top page of DVD controls.


“Hide Keys” switch: Touching this will turn off the controls from the screen.


If “” appears on the screen when you touch a control, the operation relevant to the control is not permitted.


DESCRIPTION OF DVD CONTROLS


◦ Top page of DVD video controls


“Menu” and “Top Menu”: If you touch any of the above controls, the menu screen for DVD video appears. (For the operation, see the manual that come with the DVD video disc provided separately.)

“”: The menu control key appears on the screen. (See page 130.)

“”: Touching this will pause the video screen. When you touch this again, the video screen advances frame by frame.

“”: Touching this will fast reverse during playback and reverse slowly during pause.

“”: Touching this switch will resume normal play after stop or pause.

“”: Touching this will fast forward during playback and forward slowly during pause.

◦ Second page of DVD video controls

“Set Up”: The initial set up screen appears. (See page 133.)

“Search”: The title search screen appears. (See page 130.)

“Return”: Touching this will display the pre-determined scene and start playing from there.

“Audio”: The audio changing screen appears. (See page 132.)


“Sub Title”: The subtitle changing screen appears. (See page 131.)

“Angle”: The angle selection screen appears. (See page 132.)


◦ Top page of DVD audio controls


“Top Menu”: If you touch this switch, the menu screen for DVD audio appears. (For operation, refer to the DVD audio disc manual that is provided separately.)


“Audio”: The audio changing screen appears. (See page 132.)

“”: The menu control key appears on the screen. (See page 130.)

“”: Touch this switch to pause the disc.

“”: Touching this will fast reverse.

“”: Touching this will resume normal play after stop or pause.

“”: Touching this will fast forward.

◦ Second page of DVD audio controls

“Set Up”: The initial set up screen appears. (See page 133.)

“Search”: The group search screen appears. (See page 130.)

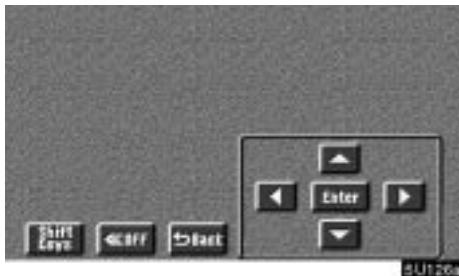
“Return”: Touching this will display the pre-determined scene and start playing from there.

“Still Prev.”: Touch this switch to reverse the still pictures. (See page 131.)

“Still Next”: Touch this switch to forward the still pictures. (See page 131.)

“Sub Title”: The subtitle changing screen appears. (See page 131.)

“Angle”: The angle selection screen appears. (See page 132.)



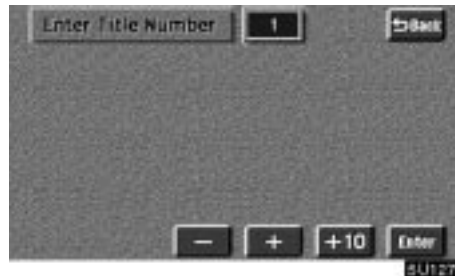
SELECTING A MENU ITEM

Enter the menu item using “▲”, “▶”, “▼” and “◀” switches and touch “Enter”. The player starts playing video for that menu item. (For details, see the manual that comes with the DVD video disc provided separately.)

Each time you touch “Shift Keys”, the controls on the screen move upward and downward.

When you touch “<<OFF”, the controls will disappear. To display them again, touch “ON” switch.

When you touch “Back”, the previous screen returns.



DVD video

SEARCHING BY TITLE

Enter the title number using “-”, “+” and “+10” and touch “Enter”. The player starts playing video for that title number.

When you push either side of the “SEEK/TRACK × V” button, you can select a chapter.

When you touch “Back”, the previous screen returns.



DVD audio

SEARCHING BY GROUP

Enter the group number by using the “-” and “+” switches. The selected group number will appear on the screen. Touch the “Enter” switch. The player starts playing the disc from the entered group number.

When you push either side of the “SEEK/TRACK × V” button, you can select a track.

When you touch “Back”, the previous screen returns.

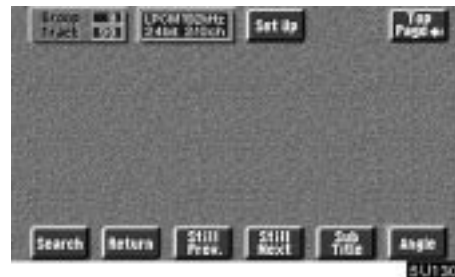


SELECTING THE BONUS GROUP

DVD audio only —

Enter the bonus group number on the searching group screen and touch the “Enter” switch. The “Enter Key Code” screen will appear. To enter the number of the group you want to play, touch the group number. If you enter the wrong number, touch the “Clear” switch to delete the number.

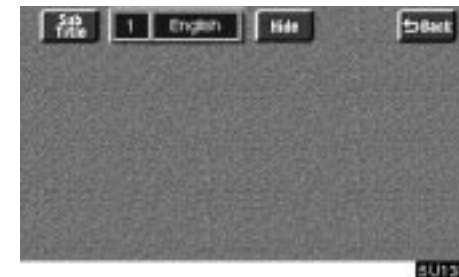
Touch the “Enter” switch on the screen. The player starts playing the disc from the selected bonus group number.



CHANGING THE STILL PICTURE

DVD audio only —

Touch the “Still Prev.” or “Still Next” switch on the screen to forward or reverse the still pictures.



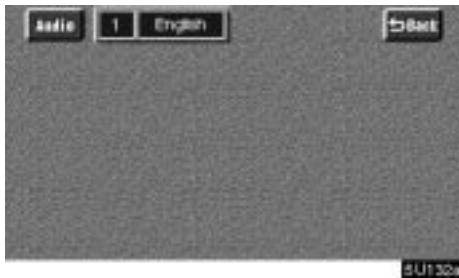
CHANGING THE SUBTITLE LANGUAGE

Each time you touch “Sub Title”, the language is selected from the ones stored in the discs and changed.

To turn off the subtitle, touch “Hide”.

When you touch “Back”, the previous screen returns.

AUDIO SYSTEM

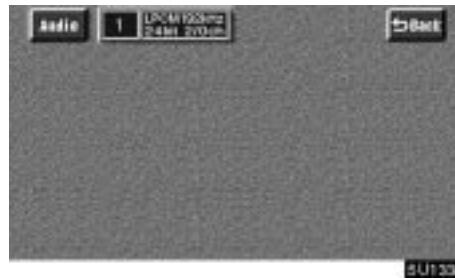


CHANGING THE AUDIO LANGUAGE

DVD video only —

Each time you touch “Audio”, the language is selected from the ones stored in the discs and changed.

When you touch “Back”, the previous screen returns.

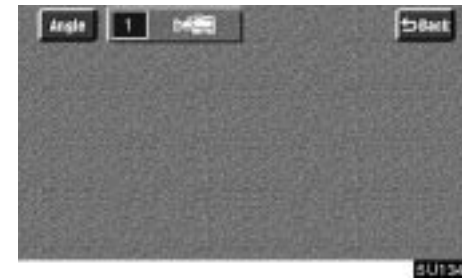


CHANGING THE AUDIO FORMAT

DVD audio only -

Each time you touch “Audio”, another audio format stored on the disc is selected.

When you touch “Back”, the previous screen returns.



CHANGING THE ANGLE

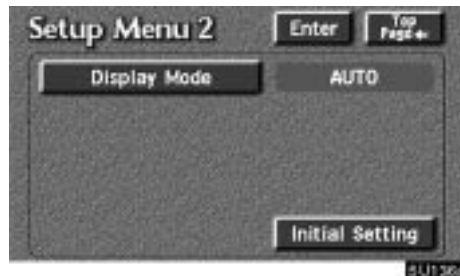
The angle can be selected for discs that are multi-angle compatible when the angle mark appears on the screen.

Each time you touch “Angle”, the angle changes.

When you touch “Back”, and the previous screen returns.



Setup Menu 1 screen



Setup Menu 2 screen

SETUP MENU

There are initial setting switches on the “Setup Menu 1” screen and “Setup Menu 2” screen.

To change the screen, touch the “Top Page” or “Second Page” switch on the screen.

After you change the initial setting, touch the “Enter” switch. The initial setting switch will be turned off and return to the picture previously.

When the “Initial Setting” switch on “Setup Menu 2” is touched, all menus are initialized.

The initial setting can be changed.

- **Audio language**

You can change the audio language.

1. Touch “Audio Lang.”.
2. Touch the language you want to hear on the “Select Audio Lang.” screen.

If you cannot find the language you want to hear on this screen, touch “Others” and enter a language code. For the entry of language code, see the following “ENTER LANGUAGE CODE”.

- **Subtitle language**

You can change the subtitle language.

1. Touch “Subtitle Lang.”.
2. Touch a language you want to read on the “Select Subtitle Lang.” screen.

If you cannot find the language you want to read on this screen, touch “Others” and enter a language code. For the entry of language code, see the following “ENTER LANGUAGE CODE”.

To return to the “Setup Menu 1” screen, touch the “Back” switch.

- **DVD language**

You can change the language on the DVD video menu.

1. Touch “DVD Language”.
2. Touch the language you want to read on the “Select DVD Language” screen.

If you cannot find the language you want to read on this screen, touch “Others” and enter a language code. For the entry of language code, see the following “ENTER LANGUAGE CODE”.

To return to the “Setup Menu 1” screen, touch the “Back” switch.

- **Angle mark**

The multi-angle mark can be turned on or off on the screen while the disc which is multi-angle compatible is being played.

Each time you touch “Angle Mark”, the angle mark on the screen turns on or off alternately.

- **Parental lock**

The level of viewer restrictions can be changed.



AUDIO SYSTEM

1. Touch “Parental”.
2. Enter the 4-digit personal code on the “Enter personal code” screen.

If you enter the wrong numbers, touch “Clear” to delete the numbers.

10 touches of “Clear” will initialize the personal code.

To return to the “Setup Menu 1” screen, touch the “Back” switch.

3. Touch a parental level (1 — 8) on the “Select Restriction Level”. Touch the “Back” switch to return to the “Setup Menu 1” screen.

Each time you touch the “Display Mode” on the “Setup Menu 2” screen, the display mode is changed from wide mode to auto mode.

ENTER LANGUAGE CODE



If you touch “Others” on the “Select Audio Lang.” screen, “Select Subtitle Lang.” screen or “Select DVD language” screen, you can select the language you want to hear or read by entering a language code.

1. Enter the 4-digit language code.

If you enter the wrong numbers, touch “Clear” to delete the numbers.

2. Touch “Enter”.

Code	Language
1001	Japanese
0514	English
0618	French
0405	German

0920	Italian
0519	Spanish
2608	Chinese
1412	Dutch
1620	Portuguese
1922	Swedish
1821	Russian
1115	Korean
0512	Greek
0101	Afar
0102	Abkhazian
0106	Afrikaans
0113	Amharic
0118	Arabic
0119	Assamese
0125	Aymara
0126	Azerbaijani
0201	Bashkir
0205	Byelorussian
0207	Bulgarian
0208	Bihari

AUDIO SYSTEM

0209	Bislama
0214	Bengali
0215	Tibetan
0218	Breton
0301	Catalan
0315	Corsican
0319	Czach
0325	Welsh
0401	Danish
0426	Bhutani
0515	Esperanto
0520	Estonian
0521	Basque
0601	Persian
0609	Finnish
0610	Fiji
0615	Faroese
0625	Frisian
0701	Irish
0704	Scots-Gaelic
0712	Galician

0714	Guarani
0721	Gujarati
0801	Hausa
0809	Hindi
0818	Croatian
0821	Hungarian
0825	Armenian
0901	Interlingua
0905	Interlingue
0911	Inupiak
0914	Indonesian
0919	Icelandic
0923	Hebrew
1009	Yiddish
1023	Javanese
1101	Georgian
1111	Kazakh
1112	Greenlandic
1113	Cambodian
1114	Kannada
1119	Kashmiri

1121	Kurdish
1125	Kirghiz
1201	Latin
1214	Lingala
1215	Laothian
1220	Lithuanian
1222	Latvian
1307	Malagasy
1309	Maori
1311	Macedonian
1312	Malayalam
1314	Mongolian
1315	Moldavian
1318	Marathi
1319	Malay
1320	Maltese
1325	Burmese
1401	Nauru
1405	Nepali
1415	Norwegian
1503	Occitan



AUDIO SYSTEM

1513	(Afan)Oromo
1518	Oriya
1601	Panjabi
1612	Polish
1619	Pashto, Pushto
1721	Quechua
1813	Rhaeto-Romance
1814	Kirundi
1815	Romanian
1823	Kinyarwanda
1901	Sanskrit
1904	Sindhi
1907	Sangho
1908	Serbo-Croatian
1909	Sinhalese
1911	Slovak
1912	Slovenian
1913	Samoaan
1914	Shona
1915	Somali
1917	Albanian

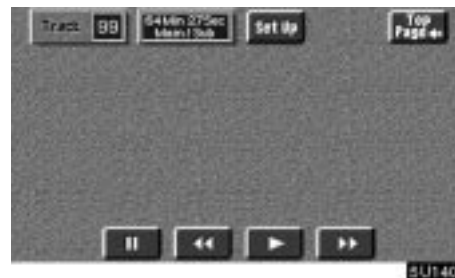
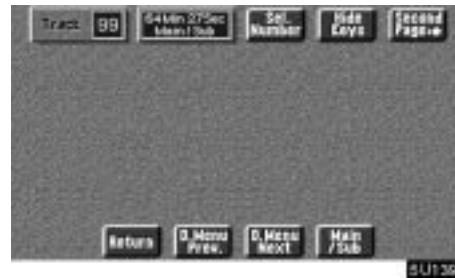
1918	Serbian
1919	Siswati
1920	Sesotho
1921	Sundanese
1923	Swahili
2001	Tamil
2005	Telugu
2007	Tajik
2008	Thai
2009	Tigrinya
2011	Turkmen
2012	Tagalog
2014	Setswana
2015	Tonga
2018	Turkish
2019	Tsonga
2020	Tatar
2023	Twi
2111	Ukrainian
2118	Urdu
2126	Uzbek

2209	Vietnamese
2215	Volapük
2315	Wolof
2408	Xhosa
2515	Yoruba
2621	Zulu



(f) Operating a video CD
PLAYING A VIDEO CD
 Push the “AUDIO” button to display this screen.

If you touch the “PICTURE” switch when the vehicle is completely stopped and the parking brake is applied, the video screen returns.




DISPLAYING OPERATION SWITCHES

If you touch the part where switches are not located while you are watching video on the video CD, video CD operation switches will appear.

“**Second Page**” switch: Use this switch to display the operation switches on the second page.

“**Top Page**” switch: Use this switch to display the operation switches on the top page.

“**Hide Keys**” switch: Use this switch to turn off the operation switches from the display.

If “” appears on the display when you touch the switch, the operation is not permitted.

DESCRIPTION OF EACH SWITCH

◦ **Switches on top page**

“**Sel. Number**” switch: The track or number search screen appears. (See “SEARCHING BY TRACK” on page 138.)

“**D. Menu Prev.**” switch: When you touch this switch while the disc menu is displayed, the previous page appears on the screen. If you touch this switch while the player is playing video, the previous track is searched and played.

“**D. Menu Next**” switch: When you touch this switch while the disc menu is displayed, the next page appears on the display. If you touch this switch while the player is playing video, the next track is searched and played.

“**Main/Sub**” switch: A multiplex transmission changing switch. The mode changes from Main/Sub to Main, to Sub and back to Main/Sub by touching this switch.



AUDIO SYSTEM

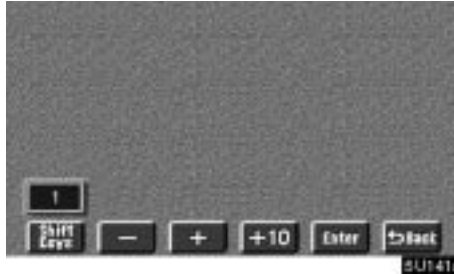
◦ Switches on second page

“**II**” **switch**: Use this switch to pause the video screen. When you touch this switch again, the video screen advance frame by frame.

“**◀◀**” **switch**: Touch this switch to fast reverse during playback.

“**▶**” **switch**: Touch this switch during pause to resume playing.

“**▶▶**” **switch**: Touch this switch to fast forward during the playback and start playing slowly during pause.



SEARCHING BY TRACK

Enter the track numbers using “-”, “+” and “+10” switches and touch “Enter”. The player starts playing video for that title number.

You can select a track number by pushing “x” or “v” on the “SEEK/TRACK” button.

Touch “Back”, and the previous screen returns.

(g) If the player malfunctions

If the player or another unit equipped with the player malfunction, your audio system will display one of the three following messages.

If “DISC CHECK” appears on the display: It indicates that the disc dirty, damaged, or it was inserted upside down. Clean the disc or insert it correctly. If a disc which is not playable is inserted, “DISC CHECK” will also appear on the screen. For appropriate discs for this player, see “Audio system operating hints” on page 140.

If “REGION CODE ERROR” appears on the display: It indicates that the DVD region code is not set properly.

If “DVD ERROR” appears on the display: It indicates that the inside of the player unit may be too hot due to the very high ambient temperature. Remove the magazine from the player and allow the player to cool down.

If the malfunction is not rectified: Take your vehicle to your dealer.







(h) DVD player and DVD video disc information

DVD VIDEO DISCS

This DVD player conforms to NTSC color TV formats. The DVD video disc conforming to another formats such as PAL or SE-CAM cannot be used.

Region codes: Some DVD video discs have a region code indicating a country where you can use the DVD video disc on this DVD player. If the DVD video disc is not labeled as “ALL” or “1”, you cannot use it on this DVD player. If you attempt to play an inappropriate DVD video disc on this player, “REGION CODE ERROR” appears on the screen. Even if the DVD video disc does not have a region code, there is a case that you cannot use it.

Marks shown on DVD video discs:

	Indicates NTSC format of color TV.
	Indicates the number of audio tracks.
	Indicates the number of language subtitles.
	Indicates the number of angles.
	Indicates the screen to be selected. Wide screen: 16:9 Standard: 4:3
	Indicates a region code by which this video disc can be played. ALL: in all countries Number: region code

DVD VIDEO DISC GLOSSARY

DVD video discs: Digital versatile Disc that holds video. DVD video discs have adopted "MPEG2", one of the world standards of digital compression technologies. The picture data is compressed by 1/40 on average and stored. Variable rate encoded technology in which the volume of data assigned to the picture is changed depending on the picture format has also been adopted. Audio data is stored using PCM and Dolby digital, which enables higher quality of sound. Furthermore, multi-angle and multi-language features will also help you enjoy the more advanced technology of DVD video.

Viewer restrictions: This feature limits what can be viewed in conformity with a level of restrictions of the country. The level of restrictions varies depending on the DVD video disc. Some DVD video discs cannot be played at all, or violent scenes are skipped or replaced with other scenes.

Level 1: DVD video discs for children can be played.

Level 2 - 7: DVD video discs for children and G-rated movie can be played.

Level 8: All types of the DVD video discs can be played.

Multi-angle feature: You can enjoy the same scene at different angles.

Multi-language feature: You can select a language of the subtitle and audio.

Region codes: The region codes are provided on DVD players and DVD discs. If the DVD video disc does not have the same region code as the DVD player, you cannot play the disc on the DVD player. For region codes, see page 139.

Audio: This DVD player can play liner PCM, Dolby digital and MPEG audio format DVD. Other decoded type cannot be played.

Title and chapter: Video and audio programs stored in DVD video disc are divided in parts by title and chapter.

Title: The largest unit of the video and audio programs stored on DVD video discs. Usually, one piece of movie, one album, or one audio program is assigned as a title.

Chapter: The unit smaller than that of title. A title comprises plural chapters.

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“DTS” is a trademark of Digital Theater Systems, Inc.

Audio system operating hints

NOTICE

To ensure correct audio system operations:

- *Be careful not to spill beverages over the audio system.*
- *Do not put anything other than a Compact Disc into the slot.*
- *Do not put anything other than an appropriate disc into the DVD player.*
- *The use of a cellular phone inside or near the vehicle may cause a noise from the speakers of the audio system which you are listening to. However, this does not indicate a malfunction.*

RADIO RECEPTION

Usually, a problem with radio reception does not mean there is a problem with your radio — it is just the normal result of conditions outside the vehicle.

For example, nearby buildings and terrain can interfere with FM reception. Power lines or telephone wires can interfere with AM signals. And of course, radio signals have a limited range. The farther you are from a station, the weaker its signal will be. In addition, reception conditions change constantly as your vehicle moves.

Here are some common reception problems that probably do not indicate a problem with your radio:

FM

Fading and drifting stations — Generally, the effective range of FM is about 40 km (25 miles). Once outside this range, you may notice fading and drifting, which increase with the distance from the radio transmitter. They are often accompanied by distortion.

Multi-path — FM signals are reflective, making it possible for two signals to reach your antenna at the same time. If this happens, the signals will cancel each other out, causing a momentary flutter or loss of reception.

Static and fluttering — These occur when signals are blocked by buildings, trees, or other large objects. Increasing the bass level may reduce static and fluttering.

Station swapping — If the FM signal you are listening to is interrupted or weakened, and there is another strong station nearby on the FM band, your radio may tune in the second station until the original signal can be picked up again.

AM


Fading — AM broadcasts are reflected by the upper atmosphere — especially at night. These reflected signals can interfere with those received directly from the radio station, causing the radio station to sound alternately strong and weak.

Station interference — When a reflected signal and a signal received directly from a radio station are very nearly the same frequency, they can interfere with each other, making it difficult to hear the broadcast.

Static — AM is easily affected by external sources of electrical noise, such as high tension power lines, lightening, or electrical motors. This results in static.

CARING FOR YOUR COMPACT DISC PLAYER, DVD PLAYER AND DISCS

- Your compact disc player is intended for use with 12 cm (4.7 in.) discs only.
- Extremely high temperatures can keep your compact disc player and DVD player from working. On hot days, use the air conditioning to cool the vehicle interior before you use the players.
- Bumpy roads or other vibrations may make your compact disc player and DVD player skip.
- If moisture gets into your compact disc player and DVD player, you may not play even though they appear to be working. Remove the disc from the player and wait until it dries.

 **CAUTION**

Compact disc players and DVD players use an invisible laser beam which could cause hazardous radiation exposure if directed outside the unit. Be sure to operate the players correctly.



Compact disc player

- Use only compact discs marked as shown above. The following products may not be playable on your compact disc player.

Copy-protected CD
 CD-R (CD-Recordable)
 CD-R W (CD-Re-writable)
 CD-ROM

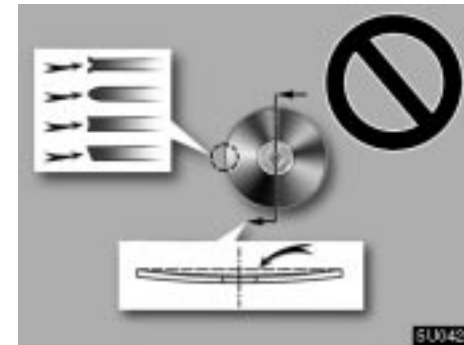


AUDIO SYSTEM

Audio CDs	
DVD video discs	
DVD audio discs	
Video CDs	



► Special shaped discs

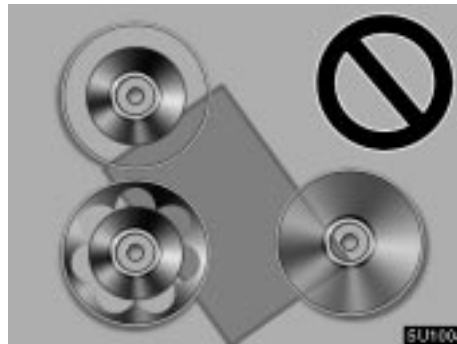


► Low quality discs

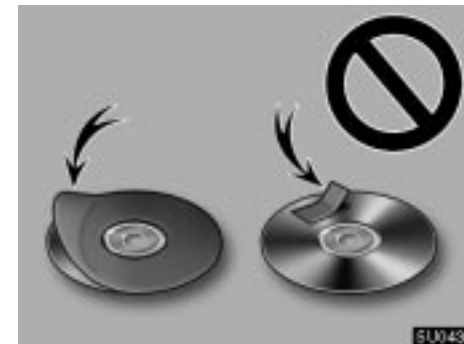
DVD player

- Use only discs marked as shown above. The following products may not be playable on your DVD player.

SACD
 Copy-protected CD
 CD-R (CD-Recordable)
 CD-R W (CD-Re-writable)
 CD-ROM
 DVD-R
 DVD+R
 DVD-R W
 DVD+RW
 DVD-ROM
 DVD-RAM



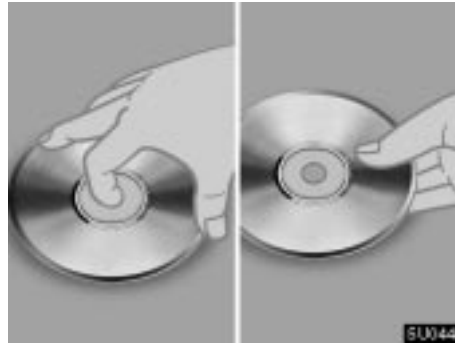
► Transparent/translucent discs



► Labeled discs

NOTICE

Do not use special shaped, transparent/translucent, low quality or labeled discs such as those shown in the illustrations. The use of such discs may damage the player or changer, or it may be impossible to eject the disc.



▶ Correct

▶ Wrong

- Handle discs carefully, especially when you are inserting them. Hold them on the edge and do not bend them. Avoid getting fingerprints on them, particularly on the shiny side.
- Dirt, scratches, warping, pin holes, or other disc damage could cause the player to skip or to repeat a section of a track. (To see a pin hole, hold the disc up to the light.)
- Remove discs from the players when you are not using them. Store them in their plastic cases away from moisture, heat, and direct sunlight.



To clean a compact disc: Wipe it with a soft, lint-free cloth that has been dampened with water. Wipe in a straight line from the center to the edge of the disc (not in circles). Dry it with another soft, lint-free cloth. Do not use a conventional record cleaner or anti-static device.

AUDIO SYSTEM

Introduction

Thank you for your purchase of the Navigation System. Please read this manual carefully to ensure proper use. Keep this manual in your vehicle at all times.

The Navigation System is one of the most technologically advanced vehicle accessories ever developed. The system receives satellite signals from the Global Positioning System (GPS) operated by the U.S. Department of Defense. Using these signals and other vehicle sensors, the system indicates your present position and assists in locating a desired destination.

The navigation system is designed to select efficient routes from your present starting location to your destination. The system is designed to direct you to a destination that is unfamiliar to you in an efficient manner. The system uses the maps of DENSO. The calculated routes may not be the shortest nor the least traffic congested. Your own personal local knowledge or "short cut" may at times be faster than the calculated routes.


The navigation system's database includes about 75 Point of Interest categories to allow you to easily select destinations such as restaurants and banks. If a destination is not in the database, you can enter the street address or a major intersection close to it and the system will guide you there. The system will provide both a visual map and audio instructions. The audio instructions will announce the distance remaining and the direction to turn in approaching a fork or intersection. These voice instructions will help you keep your eyes on the road and are timed to provide enough time to allow you to maneuver, change lanes or slow down.

Please be aware that all current vehicle navigation systems have certain limitations that may affect their ability to perform properly. The accuracy of the vehicle's position depends on the satellite condition, road configuration, vehicle condition or other circumstances. For more information on the limitations of the system, refer to pages 10 through 12.

TOYOTA MOTOR CORPORATION

Important information about this manual

For safety reasons, this manual indicates items requiring particular attention with the following marks.

 CAUTION
This is a warning against anything which may cause injury to people if the warning is ignored. You are informed about what you must or must not do in order to reduce the risk of injury to yourself and others.

NOTICE
<i>This is a warning against anything which may cause damage to the vehicle or its equipment if the warning is ignored. You are informed about what you must or must not do in order to avoid or reduce the risk of damage to your vehicle and its equipment.</i>

INFORMATION
<i>This provides additional information.</i>

Initial screen

When you start the engine or turn the ignition switch to the “ACC” position, the initial screen appears and the system begins operating.

 CAUTION
When the vehicle is stopped with the engine running, always apply the parking brake for safety.

After a few seconds, the “CAUTION” screen appears.



Touch either “English” or “Français” to select a language. Read and follow the instructions.

When you touch the “I Agree” switch on the screen, the map screen appears.

You can access this screen when you push the “INFO” button and touch the “Language” switch. Then you can select a language.

Safety Instruction




To use your system in the safest possible manner, follow all the safety tips shown below.

This system is intended to assist you in reaching your destination and, if used properly, can do so. You, as the driver, are solely responsible for the safe operation of your vehicle and the safety of your passengers.

Do not use any feature of this system to the extent it distracts you from safe driving. Your first priority while driving should always be the safe operation of your vehicle. While you are driving, be sure to observe all traffic regulations.

Prior to the actual use of this system, learn how to use it and become thoroughly familiar with it. Read the entire Navigation System Owner's Manual to make sure you understand the system. Do not allow others to use this system until they have read and understood the instructions in this manual.

For your safety, some functions may become inoperable when you start driving. Unavailable switches are dimmed. You can input your destination and select your route only when the vehicle is not moving.

 CAUTION	
▶	For safety, the driver should not operate the navigation system while he/she is driving. Inattention to the road and traffic may cause an accident.
▶	While you are driving, be sure to obey the traffic regulations and maintain awareness of the road conditions. If a traffic sign on the road has been changed, route guidance may provide wrong information such as the direction of a one way street.

While you are driving, listen to the voice instructions as much as possible and glance at the screen briefly and only when it is safe. However, do not totally rely on voice guidance. Use it just for your information. If the system cannot determine your current position correctly, there is a possibility of incorrect, late or non-voice guidance.

The data in the system may occasionally be incomplete. Road conditions, including driving restrictions (no left turns, street closures, etc.) frequently change. Therefore, before you follow any instruction from the system, look to see whether you can comply with the instruction safely and legally.

This system cannot warn you about such things as the safety of an area, condition of streets, and availability of emergency services. If you are unsure about the safety of an area, do not drive into it. **Under no circumstances is this system a substitute for the driver's personal judgement.**

Use this system only in locations where it is legal to do so. Some states/provinces may have laws prohibiting video screens within sight of the driver.

**Your navigation system —
— Quick reference**



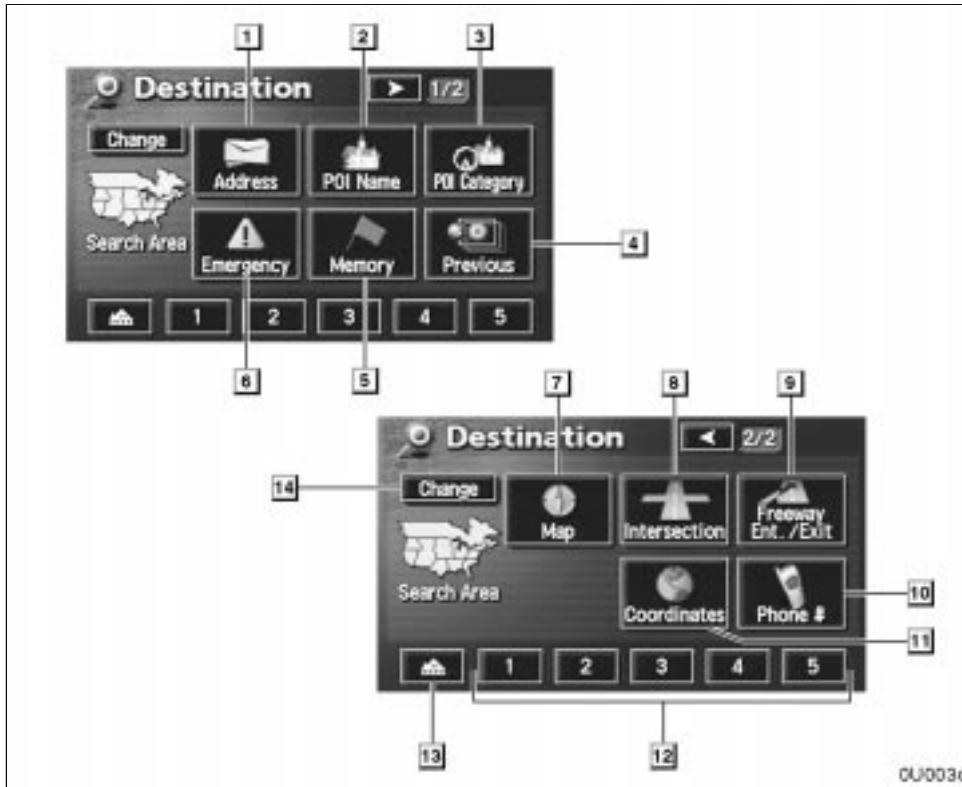
- 1 North-up or heading-up symbol**
This symbol indicates a map view with north-up or heading-up. Touching this symbol changes the map orientation. 9
- 2 Scale indicator**
This figure indicates the map scale. 9
- 3 “INFO” button**
Push this button to display the “Information Menu” screen. ii, 96, 101, 110
- 4 Zoom out switch**
Touch this switch to reduce the map scale. 9
- 5 “Mark” switch**
Touch this switch to register the cursor position as a memory point. 6
- 6 “Route” switch**
Touch this switch to change the route. 42, 44
- 7 “DISPLAY” button**
Push this button to display the “Display” screen. 108

- 8 “Map View” switch**
Touch this switch to obtain information regarding the route to the destination and information about the POI (Points of Interest) on map screen. 49, 51, 52
- 9 “◀OFF” switch**
Touch this switch to obtain a broader view, some of the switches on the screen are not displayed. They reappear by touching the “ON ▶” switch. 89
- 10 Zoom in switch**
Touch this switch to magnify the map scale. 9
- 11 Foot print map switch**
Touch this switch to display the foot print map and the building information. 58
- 12 “MAP/VOICE” button**
Push this button to repeat a voice guidance, cancel one touch scroll, start guidance and display the current position. 5, 6, 42
- 13 “DEST” button**
Push this button to display the “Destination” screen. x, 20
- 14 Screen configuration switch**
Touch this switch to change the screen mode. 53

- 15 “MENU” button**
Push this button to display the “Menu” screen. xii, 17, 61
- 16 Distance and time to destination**
Displays the distance and the estimated travel time to the destination. 57
- 17 “GPS” mark (Global Positioning System)**
Whenever your vehicle is receiving signals from the GPS, this mark is displayed. 10



— “Destination” screen



To search for a destination, the switches below perform the following operations.

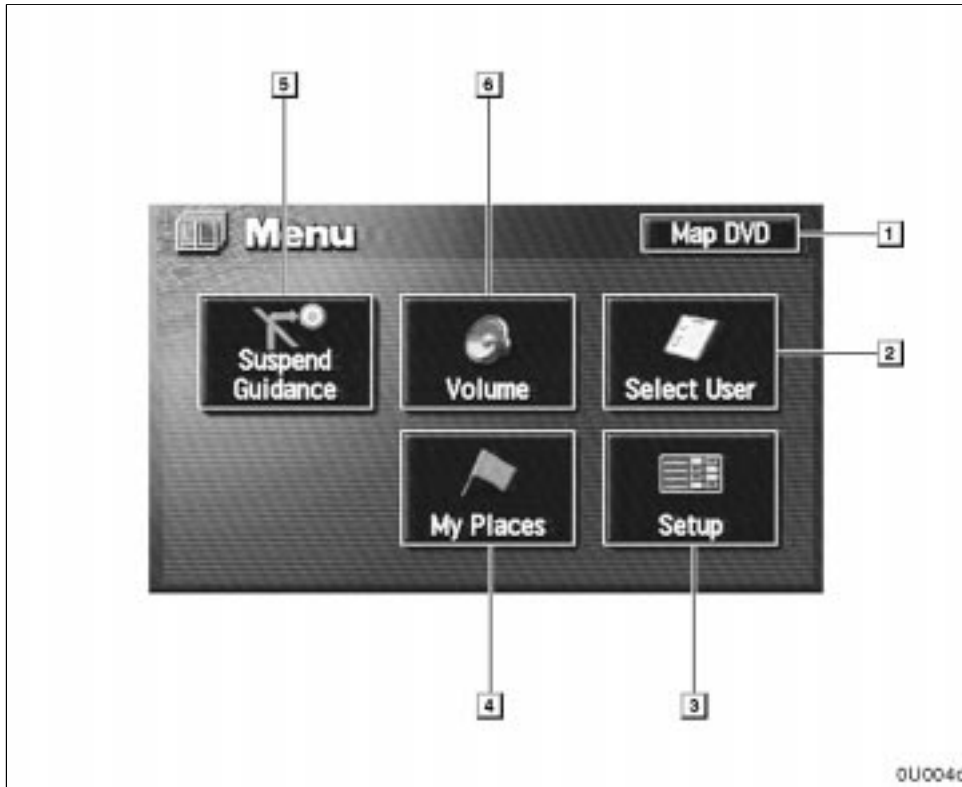
- 1 “Address” switch**
You can input the house number and the street address by using the input keys. 22
- 2 “POI Name” switch**
You can select one of the many POIs (Points of Interest) that have been already stored in the system’s database. 26
- 3 “POI Category” switch**
You can select a destination from the POI category. 29
- 4 “Previous” switch**
You can select a destination from any of the last 99 previously set destinations and from the previous starting point. 34
- 5 “Memory” switch**
You can select the location from those registered as the “Memory points”. (To register memory points, see page 66.) 33
- 6 “Emergency” switch**
You can select one of the three categories of emergency service points that have been already stored in the system’s database. 32

- 7 “Map” switch**
You can select a destination simply by touching the location on the displayed map. 34
- 8 “Intersection” switch**
You can enter the names of two intersecting streets. This is helpful if you do not know the specific street address of your destination but know the general vicinity. 35
- 9 “Freeway Ent./Exit” switch**
You can enter the name of a freeway (interstate) entrance or exit. 36
- 10 “Phone #” switch**
You can enter a destination by the telephone number. 37
- 11 “Coordinates” switch**
You can set a destination using latitude and longitude coordinates. 37
- 12 Quick access switch**
You can select one of 5 preset destinations directly. To use this function, it is necessary to set the “Attribute” for each memory point. (To register the “Quick Access”, see page 70.) 22

- 13 Home switch**
You can select your own home without entering the address each time. To use this function, it is necessary to set the “Attribute” for the memory point. (To register the “Home”, see page 70.) 22
- 14 “Change” switch**
To change the search area, touch this switch. 20



— “Menu” screen



The switches below perform the following operations.

- 1 “Map DVD” switch**
Displays information regarding the disc version or covered area. 12
- 2 “Select User” switch**
Enables recall of up to three memorized user setting patterns. 63
- 3 “Setup” switch**
Enables various settings for the navigation system. 76
- 4 “My Places” switch**
Enables changes to “Memory points” and “Areas to avoid”. 66
- 5 “Suspend Guidance” and “Resume Guidance” switch**
Suspends or resumes the guidance. 62
- 6 “Volume” switch**
Sets the volume of the voice guidance. 63

Regular maintenance is essential to obtaining the highest level of performance from your Toyota. It can also increase your vehicle's resale value. This booklet presents Toyota's maintenance recommendations in convenient checklists, so you can easily see what type of maintenance your vehicle needs and document that the work was performed.

To ensure that your vehicle receives first-quality service and parts, Toyota recommends having maintenance performed by an authorized Toyota dealership. Toyota dealership technicians are experts on Toyota vehicles, and they use Genuine Toyota Parts designed to your vehicle's exact specifications. When you go to a Toyota dealership, you can be confident of the quality that is going on your vehicle as well as the qualifications of the person under the hood.

Documenting Your Investment

To help you verify that you've invested in proper maintenance, each maintenance checklist includes space for your Toyota dealership to certify that you obtained Genuine Toyota Service for your vehicle. The dealership will mark the dealer service verification area with the following stamp (which may be customized with the dealership's name):



Additional Maintenance

In addition to scheduled maintenance, your Toyota requires ongoing general maintenance such as fluid checks and visual inspections. These procedures are explained in the "Vehicle Maintenance and Care" section of the *Owner's Manual*. Be sure to perform these procedures regularly to ensure the most trouble-free operation of your vehicle.

Maintenance Records

Maintaining your vehicle according to the recommendations in this booklet is required to ensure that your warranty coverage remains intact. You should keep detailed records of vehicle maintenance, including date of service, mileage at time of service and a description of service and/or parts installation performed. The scheduled maintenance log in this booklet can help you document this information. If you sell your vehicle, be sure to give your maintenance records to the new owner.

Toyota will not deny a warranty claim solely because you do not have records to show that you maintained your vehicle. However, damage or failures caused by lack of proper maintenance are not covered under warranty.

Maintenance Providers

Maintenance and repair services may be performed by you or by any automotive service provider you choose. Toyota will not deny a warranty claim solely because you used a service provider other than a Toyota dealership for maintenance and repairs. However, damage or failures caused by improper maintenance or repairs are not covered under warranty.

Dealer-Recommended Maintenance

Your dealer may recommend more frequent maintenance intervals or more maintenance services than those listed in the scheduled maintenance log. These additional services are not required to maintain your warranty coverage. Ask your dealer for an explanation of any recommended maintenance not included in the scheduled maintenance log.

For a complete description of Toyota warranty coverages, see the booklet entitled *2005 Owner's Warranty Information* located in your vehicle's glove box.

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ONLINE INFORMATION

For your convenience, scheduled maintenance information for your vehicle is also available at www.toyota.com.

From the site's home page, select the "Owners" link, then select "Service & Maintenance." This will bring you to the screen shown below, where you will select your vehicle's model name, year and current mileage/time interval. After you click "Submit," you'll be able to view your vehicle's recommended maintenance for that interval.

Vehicle Service Maintenance

Your vehicle represents a significant investment, and taking an active role in maintaining your vehicle will help you protect this investment. Proper maintenance will help extend the life of your Toyota and preserve its value. In addition to helping you avoid costly repairs down the road, regular maintenance will optimize your Toyota's performance, safety and fuel efficiency.

To help you determine when your Toyota requires servicing, we've provided a factory-recommended maintenance schedule (see pull-down menu below) that includes mileage as well as time intervals since your last service. Both intervals are equally important for properly maintaining your vehicle. Remember, all Toyota dealerships offer a broad range of parts and service support including trained Toyota technicians who have the technology at hand to provide expert care for your vehicle.

VEHICLE: **VEHICLE YEAR:** **MILEAGE / TIME INTERVAL:**

If you have any questions about service intervals or don't see your vehicle's maintenance schedule, please refer to your Owner's Manual, Owner's Manual Supplement or the Scheduled Maintenance Guide that came with your vehicle. You can also contact our Toyota dealer or the Toyota Customer Assistance Center at 1-888-431-4331 or by email to toyota@toyota.com. [Click here.](#)

VEHICLE IDENTIFICATION

Model _____

In-service date _____

Selling dealership _____

Key number _____

Body style _____

Mileage at delivery _____

Selling dealership phone number _____

Vehicle Identification Number _____

Miles or Months?

Toyota recommends obtaining scheduled maintenance for your vehicle every 5,000 miles or six months, whichever comes first.

For example:

- If you drive 5,000 miles in less than six months, you should obtain maintenance at **5,000 miles** – don't wait until six months.
- If at six months you have driven less than 5,000 miles, you should obtain maintenance at **six months** – don't wait until 5,000 miles.

Be sure to keep an eye on your mileage so that you obtain maintenance when recommended. If you are a low-mileage driver, mark your calendar to remind yourself to obtain maintenance every six months.

Special Operating Conditions

In addition to standard maintenance items, the maintenance log indicates services that should be performed on vehicles that are driven under especially demanding conditions. These “special operating conditions” and their required maintenance items are clearly indicated in each chart.

Note: You should perform these additional maintenance services if you drive *primarily* under any of the special operating conditions indicated. If you drive only occasionally under these conditions, it is not necessary to perform the additional services.

5,000 Miles or 6 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

10,000 Miles or 12 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

15,000 Miles or 18 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Clean cabin air filter (Camry)
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Visually inspect brake linings/drums and brake pads/discs
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Rear differential oil ⁴
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive shaft boots	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Engine coolant ³	<input type="checkbox"/> Transfer case oil ⁴
<input type="checkbox"/> Exhaust pipes and mountings	

Note: Driving in heavy traffic, on dirt roads or in urban, dusty or desert areas may shorten the life of the cabin air filter. Replacement may be needed if you notice reduced air flow from the air conditioner and heater or if the windows fog easily when you use the "Fresh" mode. Consult your dealer if any of these conditions occur.

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect engine air filter
- Tighten nuts and bolts on chassis

Driving while towing:

- Replace rear differential oil⁴
- Replace transfer case oil⁴
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ See page 37 for details.

⁴ Applies to Corolla Matrix 4WD and Sienna 4WD.

20,000 Miles or 24 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Replace cabin air filter (Corolla and Corolla Matrix, if equipped)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

25,000 Miles or 30 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

30,000 Miles or 36 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Replace cabin air filter (Camry and Camry Solara)
- Replace engine air filter
- Replace spark plugs (ECHO)³
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Fuel tank cap gasket
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Radiator core and condenser
<input type="checkbox"/> Brake linings/drums and brake pads/discs ⁴	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Differential oil ⁵	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Drive shaft boots	<input type="checkbox"/> Transfer case oil ⁷
<input type="checkbox"/> Engine coolant ⁶	<input type="checkbox"/> Transmission fluid or oil
<input type="checkbox"/> Exhaust pipes and mountings	
<input type="checkbox"/> Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses	

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil (all models with manual transmission except Corolla Matrix 4WD)
- Replace manual transmission oil
- Replace rear differential oil⁸
- Replace transfer case oil⁷
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Required under the terms of the Emission Control Warranty.

⁴ Inspect thickness measurement and disc runout.

⁵ Except front differential of Corolla Matrix 4WD with manual transmission.

⁶ See page 37 for details.

⁷ Applies to Corolla Matrix 4WD and Sienna 4WD.

⁸ Applies to Corolla Matrix 4WD, MR2 Spyder and Sienna 4WD.

35,000 Miles or 42 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

40,000 Miles or 48 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Replace cabin air filter (Corolla and Corolla Matrix, if equipped)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

45,000 Miles or 54 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Clean cabin air filter (Camry)
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Visually inspect brake linings/drums and brake pads/discs
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Rear differential oil ⁴
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive shaft boots	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Engine coolant ³	<input type="checkbox"/> Transfer case oil ⁴
<input type="checkbox"/> Exhaust pipes and mountings	

Note: Driving in heavy traffic, on dirt roads or in urban, dusty or desert areas may shorten the life of the cabin air filter. Replacement may be needed if you notice reduced air flow from the air conditioner and heater or if the windows fog easily when you use the "Fresh" mode. Consult your dealer if any of these conditions occur.

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect engine air filter
- Tighten nuts and bolts on chassis

Driving while towing:

- Replace rear differential oil⁴
- Replace transfer case oil⁴
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ See page 37 for details.

⁴ Applies to Corolla Matrix 4WD and Sienna 4WD.

50,000 Miles or 60 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

55,000 Miles or 66 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

60,000 Miles or 72 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Replace cabin air filter (if equipped)
- Replace engine air filter
- Replace spark plugs (ECHO)³
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Fuel tank cap gasket
<input type="checkbox"/> Brake linings/drums and brake pads/discs ⁴	<input type="checkbox"/> Radiator core and condenser
<input type="checkbox"/> Differential oil ⁵	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive belts ⁶	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Drive shaft boots	<input type="checkbox"/> Transfer case oil ⁸
<input type="checkbox"/> Engine coolant ⁷	<input type="checkbox"/> Transmission fluid or oil
<input type="checkbox"/> Engine valve clearance	
<input type="checkbox"/> Exhaust pipes and mountings	

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil
- Replace rear differential oil⁹
- Replace transfer case oil⁸
- Replace transmission fluid or oil
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Required under the terms of the Emission Control Warranty.

⁴ Inspect thickness measurement and disc runout.

⁵ Except front differential of Corolla Matrix 4WD with manual transmission.

⁶ Initial inspection at 60,000 miles/72 months. Inspect every 15,000 miles/18 months thereafter.

⁷ See page 37 for details.

⁸ Applies to Corolla Matrix 4WD and Sienna 4WD.

⁹ Applies to Corolla Matrix 4WD, MR2 Spyder and Sienna 4WD.

65,000 Miles or 78 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

70,000 Miles or 84 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

75,000 Miles or 90 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Clean cabin air filter (Camry)
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Visually inspect brake linings/drums and brake pads/discs
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Exhaust pipes and mountings
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Rear differential oil ⁴
<input type="checkbox"/> Drive belts	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive shaft boots	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Engine coolant ³	<input type="checkbox"/> Transfer case oil ⁴

Note: Driving in heavy traffic, on dirt roads or in urban, dusty or desert areas may shorten the life of the cabin air filter. Replacement may be needed if you notice reduced air flow from the air conditioner and heater or if the windows fog easily when you use the "Fresh" mode. Consult your dealer if any of these conditions occur.

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect engine air filter
- Tighten nuts and bolts on chassis

Driving while towing:

- Replace rear differential oil⁴
- Replace transfer case oil⁴
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ See page 37 for details.

⁴ Applies to Corolla Matrix 4WD and Sienna 4WD.

80,000 Miles or 96 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Replace cabin air filter (Corolla and Corolla Matrix, if equipped)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

85,000 Miles or 102 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

90,000 Miles or 108 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Replace cabin air filter (Camry and Camry Solara)
- Replace engine air filter
- Replace spark plugs (ECHO)³
- Replace timing belt (Camry with 1MZ-FE or 3MZ-FE, Camry Solara with 3MZ-FE, Sienna)
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Fuel tank cap gasket
<input type="checkbox"/> Brake linings/drums and brake pads/discs ⁴	<input type="checkbox"/> Radiator core and condenser
<input type="checkbox"/> Differential oil ⁵	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive belts	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Drive shaft boots	<input type="checkbox"/> Transfer case oil ⁷
<input type="checkbox"/> Engine coolant ⁶	<input type="checkbox"/> Transmission fluid or oil
<input type="checkbox"/> Exhaust pipes and mountings	

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil (all models with manual transmission except Corolla Matrix 4WD)
- Replace manual transmission oil
- Replace rear differential oil⁸
- Replace transfer case oil⁷
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Required under the terms of the Emission Control Warranty.

⁴ Inspect thickness measurement and disc runout.

⁵ Except front differential of Corolla Matrix 4WD with manual transmission.

⁶ See page 37 for details.

⁷ Applies to Corolla Matrix 4WD and Sienna 4WD.

⁸ Applies to Corolla Matrix 4WD, MR2 Spyder and Sienna 4WD.

95,000 Miles or 114 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

100,000 Miles or 120 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Replace cabin air filter (Corolla and Corolla Matrix, if equipped)
- Replace engine coolant³
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

105,000 Miles or 126 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Clean cabin air filter (Camry)
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Visually inspect brake linings/drums and brake pads/discs
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Exhaust pipes and mountings
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Rear differential oil ⁵
<input type="checkbox"/> Drive belts	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive shaft boots	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Engine coolant ⁴	<input type="checkbox"/> Transfer case oil ⁵

Note: Driving in heavy traffic, on dirt roads or in urban, dusty or desert areas may shorten the life of the cabin air filter. Replacement may be needed if you notice reduced air flow from the air conditioner and heater or if the windows fog easily when you use the "Fresh" mode. Consult your dealer if any of these conditions occur.

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect engine air filter
- Tighten nuts and bolts on chassis

Driving while towing:

- Replace rear differential oil⁵
- Replace transfer case oil⁵
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Initial replacement at 100,000 miles/120 months. Replace every 50,000 miles/60 months thereafter. See page 37 for additional information.

⁴ See page 37 for details.

⁵ Applies to Corolla Matrix 4WD and Sienna 4WD.

110,000 Miles or 132 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

115,000 Miles or 138 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots
- Inspect engine air filter
- Inspect steering linkage and boots
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Tighten nuts and bolts on chassis

Driving while towing:

- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

120,000 Miles or 144 Months

- Replace engine oil and oil filter¹
- Rotate tires (except MR2 Spyder)
- Replace cabin air filter (if equipped)
- Replace engine air filter
- Replace spark plugs³
- Tighten drive shaft bolt (Corolla and Corolla Matrix)
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Fuel tank cap gasket
<input type="checkbox"/> Brake linings/drums and brake pads/discs ⁴	<input type="checkbox"/> Radiator core and condenser
<input type="checkbox"/> Differential oil ⁵	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive belts	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Drive shaft boots	<input type="checkbox"/> Transfer case oil ⁷
<input type="checkbox"/> Engine coolant ⁶	<input type="checkbox"/> Transmission fluid or oil
<input type="checkbox"/> Engine valve clearance	
<input type="checkbox"/> Exhaust pipes and mountings	

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil
- Replace rear differential oil⁸
- Replace transfer case oil⁷
- Replace transmission fluid or oil
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Required under the terms of the Emission Control Warranty. Does not apply to Camry PZEV with 2AZ-FE in California, New York, Massachusetts, Maine and Vermont. For this model, replacement interval is 150,000 miles.

⁴ Inspect thickness measurement and disc runout.

⁵ Except front differential of Corolla Matrix 4WD with manual transmission.

⁶ See page 37 for details.

⁷ Applies to Corolla Matrix 4WD and Sienna 4WD.

⁸ Applies to Corolla Matrix 4WD, MR2 Spyder and Sienna 4WD.

5,000 Miles or 6 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

10,000 Miles or 12 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Applies to Highlander, Land Cruiser, RAV4, 4WD Sequoia, 4WD Tacoma, 4WD Tundra and 4WD 4Runner.

15,000 Miles or 18 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Visually inspect brake linings/drums and brake pads/discs
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Radiator core and condenser
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Rear differential oil (all models except 2WD Highlander and 2WD RAV4)
<input type="checkbox"/> Drive shaft boots ³	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Engine coolant ⁵	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Exhaust pipes and mountings	<input type="checkbox"/> Transfer case oil (4WD Highlander, 4WD RAV4)
<input type="checkbox"/> Front differential oil (all 4WD except Highlander and RAV4)	

Note: Driving in heavy traffic, on dirt roads or in urban, dusty or desert areas may shorten the life of the cabin air filter. Replacement may be needed if you notice reduced air flow from the air conditioner and heater or if the windows fog easily when you use the "Fresh" mode. Consult your dealer if any of these conditions occur.

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect engine air filter
- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil (all 4WD except Highlander and RAV4)
- Replace rear differential oil, including limited-slip (all models except 2WD Highlander, 2WD RAV4, Sequoia and non-limited-slip Tundra)
- Replace transfer case oil (4WD Highlander, 4WD RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

⁴ Applies to Land Cruiser, 4WD Sequoia, 4WD Tundra and 4WD 4Runner.

⁵ See page 37 for details.

20,000 Miles or 24 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

25,000 Miles or 30 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Applies to Highlander, Land Cruiser, RAV4, 4WD Sequoia, 4WD Tacoma, 4WD Tundra and 4WD 4Runner.

⁴ Applies to Land Cruiser, 4WD Sequoia, 4WD Tundra and 4WD 4Runner.

⁵ Applies to Land Cruiser, 4WD Tacoma, Tacoma PreRunner and Tundra.

30,000 Miles or 36 Months

- | | |
|---|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> Replace engine oil and oil filter¹ <input type="checkbox"/> Rotate tires <input type="checkbox"/> Lubricate drive shaft bushing (Land Cruiser) <input type="checkbox"/> Lubricate propeller shaft⁴ <input type="checkbox"/> Lubricate wheel bearings (Land Cruiser) <input type="checkbox"/> Replace limited-slip differential oil, if equipped⁵ <input type="checkbox"/> Replace spark plugs⁶ <input type="checkbox"/> Re-torque drive shaft bolt (4WD RAV4) <input type="checkbox"/> Re-torque propeller shaft bolt (all models except Highlander and RAV4) <input type="checkbox"/> Inspect the following: <ul style="list-style-type: none"> ___ Automatic transmission fluid ___ Ball joints and dust covers ___ Brake lines and hoses ___ Brake linings/drums and brake pads/discs⁷ ___ Drive shaft boots³ ___ Engine coolant⁸ ___ Exhaust pipes and mountings ___ Front differential oil (4WD models, Highlander and RAV4) ___ Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses | <ul style="list-style-type: none"> <input type="checkbox"/> Replace engine air filter <input type="checkbox"/> Replace cabin air filter (if equipped) ___ Fuel tank cap gasket ___ Manual transmission oil (RAV4, Tundra) ___ Radiator core and condenser ___ Rear differential oil (all models except 2WD Highlander and 2WD RAV4) ___ Steering gear box ___ Steering linkage and boots ___ Transfer case oil (all 4WD models) |
|---|--|

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil (2WD RAV4 with manual transmission, all 4WD models except RAV4 with automatic transmission and Highlander)
- Replace manual transmission oil (RAV4, Tundra)
- Replace rear differential oil, including limited-slip (all models except 2WD Highlander and 2WD RAV4)
- Replace transfer case oil (4WD models)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

⁶ Applies to Tacoma with 1GR-FE, Tundra with 1GR-FE and 4Runner with 1GR-FE. Required under the terms of the Emission Control Warranty.

⁷ Inspect thickness measurement and disc runout.

⁸ See page 37 for details.

35,000 Miles or 42 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

40,000 Miles or 48 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Applies to Highlander, Land Cruiser, RAV4, 4WD Sequoia, 4WD Tacoma, 4WD Tundra and 4WD 4Runner.

45,000 Miles or 54 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Visually inspect brake linings/drums and brake pads/discs
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Radiator core and condenser
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Rear differential oil (all models except 2WD Highlander and 2WD RAV4)
<input type="checkbox"/> Drive shaft boots ³	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Engine coolant ⁵	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Exhaust pipes and mountings	<input type="checkbox"/> Transfer case oil (4WD Highlander, 4WD RAV4)
<input type="checkbox"/> Front differential oil (all 4WD except Highlander and RAV4)	

Note: Driving in heavy traffic, on dirt roads or in urban, dusty or desert areas may shorten the life of the cabin air filter. Replacement may be needed if you notice reduced air flow from the air conditioner and heater or if the windows fog easily when you use the "Fresh" mode. Consult your dealer if any of these conditions occur.

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect engine air filter
- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil (all 4WD except Highlander and RAV4)
- Replace rear differential oil, including limited-slip (all models except 2WD Highlander, 2WD RAV4, Sequoia and non-limited-slip Tundra)
- Replace transfer case oil (4WD Highlander, 4WD RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

⁴ Applies to Land Cruiser, 4WD Sequoia, 4WD Tundra and 4WD 4Runner.

⁵ See page 37 for details.

50,000 Miles or 60 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

55,000 Miles or 66 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Applies to Highlander, Land Cruiser, RAV4, 4WD Sequoia, 4WD Tacoma, 4WD Tundra and 4WD 4Runner.

⁴ Applies to Land Cruiser, 4WD Sequoia, 4WD Tundra and 4WD 4Runner.

⁵ Applies to Land Cruiser, 4WD Tacoma, Tacoma PreRunner and Tundra.

⁶ Applies to Tacoma with 1GR-FE, Tundra with 1GR-FE and 4Runner with 1GR-FE. Required under the terms of the Emission Control Warranty.

60,000 Miles or 72 Months

- | | | | |
|---|---|---|---|
| <ul style="list-style-type: none"> <input type="checkbox"/> Replace engine oil and oil filter¹ <input type="checkbox"/> Rotate tires <input type="checkbox"/> Lubricate drive shaft bushing (Land Cruiser) <input type="checkbox"/> Lubricate propeller shaft⁴ <input type="checkbox"/> Lubricate wheel bearings (Land Cruiser) <input type="checkbox"/> Replace limited-slip differential oil, if equipped⁵ <input type="checkbox"/> Replace spark plugs⁶ <input type="checkbox"/> Re-torque drive shaft bolt (4WD RAV4) <input type="checkbox"/> Re-torque propeller shaft bolt (all models except Highlander and RAV4) <input type="checkbox"/> Inspect the following: <table border="0" style="width: 100%; margin-left: 20px;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <input type="checkbox"/> Automatic transmission fluid <input type="checkbox"/> Ball joints and dust covers <input type="checkbox"/> Brake lines and hoses <input type="checkbox"/> Brake linings/drums and brake pads/discs⁷ <input type="checkbox"/> Charcoal canister⁸ <input type="checkbox"/> Drive belts⁹ <input type="checkbox"/> Drive shaft boots³ <input type="checkbox"/> Engine coolant¹⁰ <input type="checkbox"/> Engine valve clearance (except Tacoma with 2TR-FE) <input type="checkbox"/> Front differential oil (4WD models, Highlander, RAV4) </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <input type="checkbox"/> Exhaust pipes and mountings <input type="checkbox"/> Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses <input type="checkbox"/> Fuel tank cap gasket <input type="checkbox"/> Manual transmission oil (RAV4, Tundra) <input type="checkbox"/> Radiator core and condenser <input type="checkbox"/> Rear differential oil (all models except 2WD Highlander and 2WD RAV4) <input type="checkbox"/> Steering gear box <input type="checkbox"/> Steering linkage and boots <input type="checkbox"/> Transfer case oil (all 4WD models) </td> </tr> </table> | <ul style="list-style-type: none"> <input type="checkbox"/> Automatic transmission fluid <input type="checkbox"/> Ball joints and dust covers <input type="checkbox"/> Brake lines and hoses <input type="checkbox"/> Brake linings/drums and brake pads/discs⁷ <input type="checkbox"/> Charcoal canister⁸ <input type="checkbox"/> Drive belts⁹ <input type="checkbox"/> Drive shaft boots³ <input type="checkbox"/> Engine coolant¹⁰ <input type="checkbox"/> Engine valve clearance (except Tacoma with 2TR-FE) <input type="checkbox"/> Front differential oil (4WD models, Highlander, RAV4) | <ul style="list-style-type: none"> <input type="checkbox"/> Exhaust pipes and mountings <input type="checkbox"/> Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses <input type="checkbox"/> Fuel tank cap gasket <input type="checkbox"/> Manual transmission oil (RAV4, Tundra) <input type="checkbox"/> Radiator core and condenser <input type="checkbox"/> Rear differential oil (all models except 2WD Highlander and 2WD RAV4) <input type="checkbox"/> Steering gear box <input type="checkbox"/> Steering linkage and boots <input type="checkbox"/> Transfer case oil (all 4WD models) | <ul style="list-style-type: none"> <input type="checkbox"/> Replace engine air filter <input type="checkbox"/> Replace cabin air filter (if equipped) |
| <ul style="list-style-type: none"> <input type="checkbox"/> Automatic transmission fluid <input type="checkbox"/> Ball joints and dust covers <input type="checkbox"/> Brake lines and hoses <input type="checkbox"/> Brake linings/drums and brake pads/discs⁷ <input type="checkbox"/> Charcoal canister⁸ <input type="checkbox"/> Drive belts⁹ <input type="checkbox"/> Drive shaft boots³ <input type="checkbox"/> Engine coolant¹⁰ <input type="checkbox"/> Engine valve clearance (except Tacoma with 2TR-FE) <input type="checkbox"/> Front differential oil (4WD models, Highlander, RAV4) | <ul style="list-style-type: none"> <input type="checkbox"/> Exhaust pipes and mountings <input type="checkbox"/> Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses <input type="checkbox"/> Fuel tank cap gasket <input type="checkbox"/> Manual transmission oil (RAV4, Tundra) <input type="checkbox"/> Radiator core and condenser <input type="checkbox"/> Rear differential oil (all models except 2WD Highlander and 2WD RAV4) <input type="checkbox"/> Steering gear box <input type="checkbox"/> Steering linkage and boots <input type="checkbox"/> Transfer case oil (all 4WD models) | | |

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Tighten nuts and bolts on chassis

Driving while towing:

- Replace automatic transmission fluid
- Replace front differential oil (Highlander, RAV4 and all 4WD models)
- Replace manual transmission oil (RAV4, Tundra)
- Replace rear differential oil, including limited slip (all models except 2WD Highlander and 2WD RAV4)
- Replace transfer case oil (4WD models)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

⁷ Inspect thickness measurement and disc runout.

⁸ Applies to Land Cruiser, Sequoia, Tundra and 4Runner with 2UZ-FE. Required only for vehicles in California, Massachusetts and New York.

⁹ Initial inspection at 60,000 miles/72 months. Inspect every 15,000 miles/18 months thereafter.

¹⁰ See page 37 for details.

65,000 Miles or 78 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

70,000 Miles or 84 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Applies to Highlander, Land Cruiser, RAV4, 4WD Sequoia, 4WD Tacoma, 4WD Tundra and 4WD 4Runner.

75,000 Miles or 90 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Visually inspect brake linings/drums and brake pads/discs
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Radiator core and condenser
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Rear differential oil (all models except 2WD Highlander and 2WD RAV4)
<input type="checkbox"/> Drive belts	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive shaft boots ³	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Engine coolant ⁵	<input type="checkbox"/> Transfer case oil (4WD Highlander, 4WD RAV4)
<input type="checkbox"/> Exhaust pipes and mountings	
<input type="checkbox"/> Front differential oil (all 4WD except Highlander and RAV4)	

Note: Driving in heavy traffic, on dirt roads or in urban, dusty or desert areas may shorten the life of the cabin air filter. Replacement may be needed if you notice reduced air flow from the air conditioner and heater or if the windows fog easily when you use the "Fresh" mode. Consult your dealer if any of these conditions occur.

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect engine air filter
- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil (all 4WD except Highlander and RAV4)
- Replace rear differential oil, including limited-slip (all models except 2WD Highlander, 2WD RAV4, Sequoia and non-limited-slip Tundra)
- Replace transfer case oil (4WD Highlander, 4WD RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

⁴ Applies to Land Cruiser, 4WD Sequoia, 4WD Tundra and 4WD 4Runner.

⁵ See page 37 for details.

80,000 Miles or 96 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

85,000 Miles or 102 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Applies to Highlander, Land Cruiser, RAV4, 4WD Sequoia, 4WD Tacoma, 4WD Tundra and 4WD 4Runner.

⁴ Applies to Land Cruiser, 4WD Sequoia, 4WD Tundra and 4WD 4Runner.

⁵ Applies to Land Cruiser, 4WD Tacoma, Tacoma PreRunner and Tundra.

90,000 Miles or 108 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Lubricate drive shaft bushing (Land Cruiser)
- Lubricate propeller shaft⁴
- Lubricate wheel bearings (Land Cruiser)
- Replace limited-slip differential oil, if equipped⁵
- Replace spark plugs⁶
- Replace timing belt⁷
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Inspect the following:
 - Automatic transmission fluid
 - Ball joints and dust covers
 - Brake lines and hoses
 - Brake linings/drums and brake pads/discs⁸
 - Drive belts
 - Drive shaft boots³
 - Engine coolant⁹
 - Exhaust pipes and mountings
 - Front differential oil (4WD models, Highlander and RAV4)
 - Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses
 - Fuel tank cap gasket
 - Manual transmission oil (RAV4, Tundra)
 - Radiator core and condenser
 - Rear differential oil (all models except 2WD Highlander and 2WD RAV4)
 - Steering gear box
 - Steering linkage and boots
 - Transfer case oil (all 4WD models)

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil (2WD RAV4 with manual transmission, all 4WD models except RAV4 with automatic transmission and Highlander)
- Replace manual transmission oil (RAV4, Tundra)
- Replace rear differential oil, including limited slip (all models except 2WD Highlander and 2WD RAV4)
- Replace transfer case oil (4WD models)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

⁶ Applies to Tacoma with 1GR-FE, Tundra with 1GR-FE and 4Runner with 1GR-FE. Required under the terms of the Emission Control Warranty.

⁷ Applies to Highlander with 3MZ-FE, Land Cruiser, Sequoia, Tundra with 2UZ-FE and 4Runner with 2UZ-FE.

⁸ Inspect thickness measurement and disc runout.

⁹ See page 37 for details.

95,000 Miles or 114 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

100,000 Miles or 120 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Replace engine coolant⁵
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Applies to Highlander, Land Cruiser, RAV4, 4WD Sequoia, 4WD Tacoma, 4WD Tundra and 4WD 4Runner.

⁴ Applies to Land Cruiser, 4WD Sequoia, 4WD Tundra and 4WD 4Runner.

105,000 Miles or 126 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Visually inspect brake linings/drums and brake pads/discs
- Inspect the following:

<input type="checkbox"/> Ball joints and dust covers	<input type="checkbox"/> Radiator core and condenser
<input type="checkbox"/> Brake lines and hoses	<input type="checkbox"/> Rear differential oil (all models except 2WD Highlander and 2WD RAV4)
<input type="checkbox"/> Drive belts	<input type="checkbox"/> Steering gear box
<input type="checkbox"/> Drive shaft boots ³	<input type="checkbox"/> Steering linkage and boots
<input type="checkbox"/> Engine coolant ⁶	<input type="checkbox"/> Transfer case oil (4WD Highlander, 4WD RAV4)
<input type="checkbox"/> Exhaust pipes and mountings	
<input type="checkbox"/> Front differential oil (all 4WD except Highlander and RAV4)	

Note: Driving in heavy traffic, on dirt roads or in urban, dusty or desert areas may shorten the life of the cabin air filter. Replacement may be needed if you notice reduced air flow from the air conditioner and heater or if the windows fog easily when you use the "Fresh" mode. Consult your dealer if any of these conditions occur.

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect engine air filter
- Tighten nuts and bolts on chassis

Driving while towing:

- Replace front differential oil (all 4WD except Highlander and RAV4)
- Replace rear differential oil, including limited-slip (all models except 2WD Highlander, 2WD RAV4, Sequoia and non-limited-slip Tundra)
- Replace transfer case oil (4WD Highlander, 4WD RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

⁵ Initial replacement at 100,000 miles/120 months. Replace every 50,000 miles/60 months thereafter. See page 37 for additional information.

⁶ See page 37 for details.

110,000 Miles or 132 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

115,000 Miles or 138 Months

- Replace engine oil and oil filter¹
- Rotate tires
- Visually inspect brake linings/drums and brake pads/discs

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Inspect ball joints and dust covers
- Inspect drive shaft boots³
- Inspect engine air filter
- Inspect steering linkage and boots
- Lubricate propeller shaft⁴
- Re-torque drive shaft bolt (4WD RAV4)
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

Driving on salted roads:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)

Driving while towing:

- Lubricate propeller shaft⁴
- Re-torque propeller shaft bolt (all models except Highlander and RAV4)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

¹ Reset the oil replacement reminder ("MAINT REQD") light after replacing engine oil, if vehicle is equipped with this light.

² Perform these service items only if you drive primarily under the conditions indicated.

³ Applies to Highlander, Land Cruiser, RAV4, 4WD Sequoia, 4WD Tacoma, 4WD Tundra and 4WD 4Runner.

⁴ Applies to Land Cruiser, 4WD Sequoia, 4WD Tundra and 4WD 4Runner.

⁵ Applies to Land Cruiser, 4WD Tacoma, Tacoma PreRunner and Tundra.

120,000 Miles or 144 Months

- | | |
|---|--|
| <input type="checkbox"/> Replace engine oil and oil filter ¹ | <input type="checkbox"/> Replace engine air filter |
| <input type="checkbox"/> Rotate tires | <input type="checkbox"/> Replace cabin air filter (if equipped) |
| <input type="checkbox"/> Lubricate drive shaft bushing (Land Cruiser) | |
| <input type="checkbox"/> Lubricate propeller shaft ⁴ | |
| <input type="checkbox"/> Lubricate wheel bearings (Land Cruiser) | |
| <input type="checkbox"/> Replace limited-slip differential oil, if equipped ⁵ | |
| <input type="checkbox"/> Replace spark plugs (all models) ⁶ | |
| <input type="checkbox"/> Re-torque drive shaft bolt (4WD RAV4) | |
| <input type="checkbox"/> Re-torque propeller shaft bolt (all models except Highlander and RAV4) | |
| <input type="checkbox"/> Inspect the following: | |
| ___ Automatic transmission fluid | ___ Exhaust pipes and mountings |
| ___ Ball joints and dust covers | ___ Fuel lines and connections, fuel tank band and fuel tank vapor vent system hoses |
| ___ Brake lines and hoses | ___ Fuel tank cap gasket |
| ___ Brake linings/drums and brake pads/discs ⁷ | ___ Manual transmission oil (RAV4, Tundra) |
| ___ Charcoal canister ⁸ | ___ Radiator core and condenser |
| ___ Drive belts | ___ Rear differential oil (all models except 2WD Highlander and 2WD RAV4) |
| ___ Drive shaft boots ³ | ___ Steering gear box |
| ___ Engine coolant ⁹ | ___ Steering linkage and boots |
| ___ Engine valve clearance (except Tacoma with 2TR-FE) | ___ Transfer case oil (all 4WD models) |
| ___ Front differential oil (4WD models, Highlander, RAV4) | |

Additional Maintenance Items for Special Operating Conditions²

Driving in desert or on dirt roads:

- Tighten nuts and bolts on chassis

Driving while towing:

- Replace automatic transmission fluid
- Replace front differential oil (Highlander, RAV4 and all 4WD models)
- Replace manual transmission oil (RAV4, Tundra)
- Replace rear differential oil, including limited slip (all models except 2WD Highlander and 2WD RAV4)
- Replace transfer case oil (4WD models)
- Tighten nuts and bolts on chassis

DEALER SERVICE VERIFICATION:

DATE:

MILEAGE:

⁶ Required under the terms of the Emission Control Warranty.

⁷ Inspect thickness measurement and disc runout.

⁸ Applies to Land Cruiser, Sequoia, Tundra and 4Runner with 2UZ-FE. Required only for vehicles in California, Massachusetts and New York.

⁹ See page 37 for details.

The following descriptions are provided to give you a better understanding of the maintenance items that should be performed on your vehicle. The scheduled maintenance log indicates at which mileage/time intervals each item should be performed. Please note that many maintenance items should be performed only by a qualified technician.

For further information on maintenance items you can perform yourself, see the "Vehicle Maintenance and Care" and "Do-It-Yourself Maintenance" sections of your *Owner's Manual*.

Automatic Transmission Fluid or Manual Transmission Oil

Inspect or replace at specified intervals. When performing inspections, check each component for signs of leakage. If you discover any leakage, have it repaired by a qualified technician immediately.

Ball Joints and Dust Covers

Check the suspension and steering linkage ball joints for looseness and damage. Check all dust covers for deterioration and damage. Replace any deteriorated or damaged parts. A qualified technician should perform these operations.

Brake Lines and Hoses

Visually inspect for proper installation. Check for chafing, cracks, deterioration and signs of leakage. Replace any deteriorated or damaged parts. A qualified technician should perform these operations.

Brake Linings/Drums and Brake Pads/Disks

Check the brake linings (shoes) and drums for scoring, burning, fluid leakage, broken parts and excessive wear. Check the pads for excessive wear and the discs for runout, excessive wear and fluid leakage. Replace any deteriorated or damaged parts. A qualified technician should perform these operations.

Cabin Air Filter

Replace at specified intervals. Driving in heavy traffic, on dirt roads or in urban, desert or dusty areas may shorten filter's life. More frequent replacement may be necessary.

Charcoal Canister (CA, MA and NY vehicles)

Check for internal damage and clogging. If necessary, clean with compressed air or replace. A qualified technician should perform these operations.

Differential Oil

Replace at specified intervals. When performing inspections, check each component for signs of leakage. If you discover any leakage, have it repaired by a qualified technician immediately.

Drive Belts

Inspect for cracks, excessive wear and oiliness. Check the belt tension and adjust if necessary. Replace the belts if they are damaged.

Drive Shaft Boots

Check the drive shaft boots and clamps for cracks, deterioration and damage. Replace any deteriorated or damaged parts and, if necessary, repack the grease. Selected models also require periodic inspection of the drive shaft bolt for proper torque. A qualified technician should perform these operations.

Engine Air Filter

Replace at specified intervals. When performing inspections, check for damage, excessive wear and oiliness, and replace if necessary.

Engine Coolant

Drain and flush the cooling system and refill with an ethylene-glycol type coolant. Inspect the radiator, condenser and/or intercooler for leaves, dirt and insects and clean if necessary. Inspect hoses and connections for corrosion and leaks. Tighten connections and replace parts as necessary. A qualified technician should perform these operations. (For further details, refer to "Radiator, Condenser and Hoses" in the "Vehicle Maintenance and Care" section of the *Owner's Manual*.)

Note: Your Toyota is equipped with Genuine Toyota Super Long-Life Coolant. The replacement intervals for engine coolant recommended in this booklet are based on replacement with Genuine Toyota Super Long-Life Coolant or similar high-quality non-silicate, non-amine, non-borate ethylene-glycol coolant with long-life hybrid organic acid technology (i.e., a combination of low phosphates and organic acids). If another type of ethylene-glycol coolant is used, replacement intervals may be different.

Engine Oil and Oil Filter

Replace the oil filter and drain and refill the engine oil at specified intervals. For recommended oil grade and viscosity, refer to the *Owner's Manual*.

Engine Valve Clearance

Inspect for excessive lifter noise and engine vibration and adjust if necessary. A qualified technician should perform this operation.

Exhaust Pipes and Mountings

Visually inspect the exhaust pipes, muffler and hangers for cracks, deterioration and damage. Start the engine and listen carefully for any exhaust gas leakage. Tighten connections or replace parts as necessary.

Fuel Lines and Connections, Fuel Tank Band and Fuel Tank Vapor Vent System Hoses

Visually inspect for corrosion, damage, cracks and loose or leaking connections. Tighten connections or replace parts as necessary.

Fuel Tank Cap Gasket

Visually inspect for cracks, deterioration and damage and replace if necessary.

Nuts and Bolts on Chassis and Body

Re-tighten the seat-mounting bolts and front/rear suspension member retaining bolts to specified torque.

Propeller Shaft

Lubricate the propeller shaft spiders and slide yokes with lithium-base chassis grease and the double cardan joint with molybdenum-disulfide lithium-base chassis grease, and re-torque the bolt. Only a qualified technician should re-torque the bolt.

Radiator Core and Condenser

Inspect for debris and signs of damage. Have any problem repaired immediately by a qualified technician.

Spark Plugs

Replace at specified intervals. Install new plugs of the same type as originally equipped. A qualified technician should perform this operation.

Steering Gear Box

Inspect for signs of leakage. If you discover any leakage, have it repaired immediately by a qualified technician.

Steering Linkage and Boots

With the vehicle stopped, check for excessive freeplay in the steering wheel. Inspect the linkage for bending and damage and the dust boots for deterioration, cracks and damage. Replace any damaged parts. A qualified technician should perform these operations.

Timing Belt

Replace every 90,000 miles. A qualified technician should perform this operation.

Tire Rotation

Tires should be rotated at specified intervals according to the instructions in the *Owner's Manual*. When rotating tires, check for damage and uneven wear. Replace if necessary.

Transfer Case Oil

Inspect or replace at specified intervals. When performing inspections, check for signs of leakage. If you discover any leakage, have it repaired by a qualified technician immediately.

Wheel Bearing and Drive Shaft Bushing Grease

Repack the wheel bearings with wheel bearing grease and the drive shaft bushing with molybdenum-disulfide lithium-base chassis grease. A qualified technician should perform these operations.

