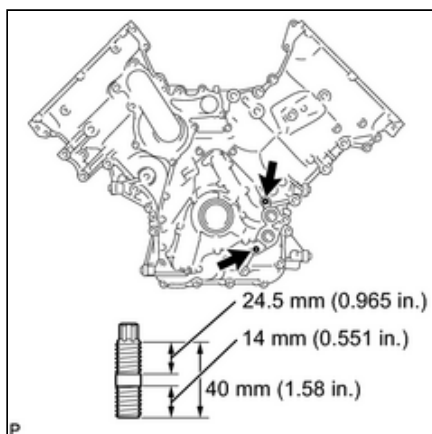


Last Modified: 4-17-2018	6.8:8.0.48	Doc ID: RM0000030XP00HX
Model Year Start: 2010	Model: Tundra	Prod Date Range: [04/2009 -]
Title: 3UR-FE ENGINE MECHANICAL: ENGINE UNIT: REASSEMBLY; 2010 MY Tundra [04/2009 -]		

REASSEMBLY

1. INSTALL STUD BOLT



(a) Install the timing chain cover stud bolt.

(1) Using an E10 "TORX" socket wrench, install the 2 stud bolts as shown in the illustration.

Torque:

20 N·m {204 kgf·cm, 15ft·lbf}

(b) Install the oil pan stud bolt.

(1) Using an E6 and E7 "TORX" socket wrench, install the 3 stud bolts as shown in the illustration.

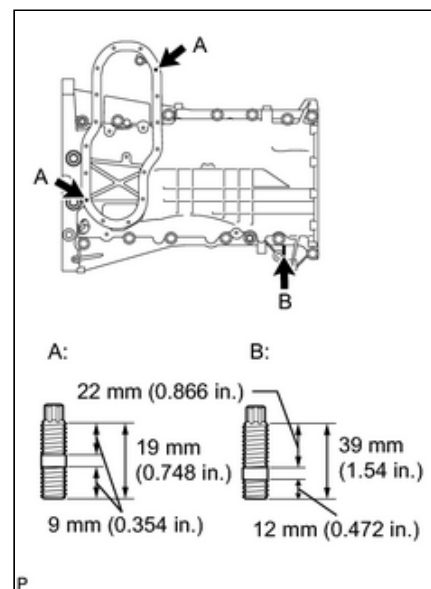
Torque:

for stud bolt A -

5.0 N·m {51 kgf·cm, 44in·lbf}

for stud bolt B -

9.0 N·m {92 kgf·cm, 80in·lbf}

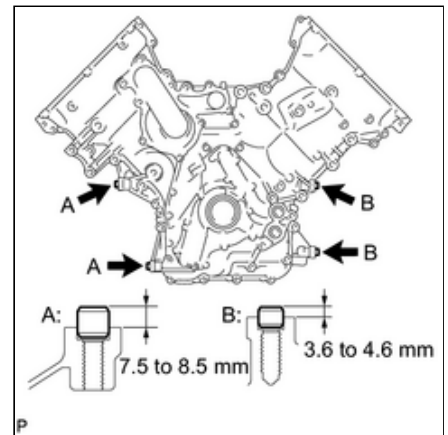


2. INSTALL RING PIN

(a) Using a plastic-faced hammer, tap in new ring pins to the timing chain cover.

Standard protrusion:

ITEM	RING PIN DIAMETER	SPECIFIED CONDITION
Ring pin A	13 mm (0.512 in.)	7.5 to 8.5 mm (0.295 to 0.335 in.)
Ring pin B	11 mm (0.433 in.)	3.6 to 4.6 mm (0.142 to 0.181 in.)



3. INSTALL REAR CRANKSHAFT OIL SEAL

- (a) Using SST, tap in a new oil seal until its surface is flush with the oil seal retainer edge.

SST: 09223-15030

SST: 09950-70010

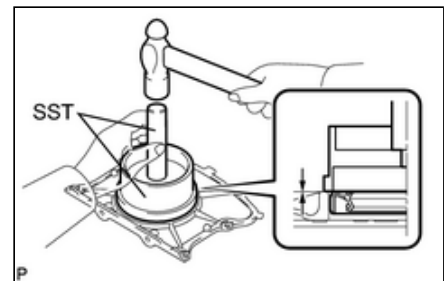
09951-07100

Standard depth:

0 to 1.0 mm (0 to 0.0394 in.)

NOTICE:

- Keep the lip free from foreign matter.
- Do not tap on the oil seal at an angle.

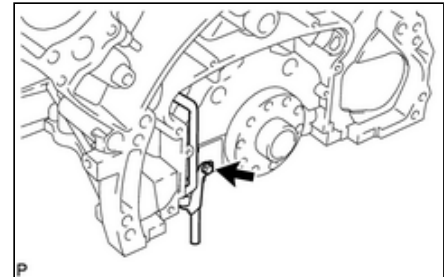


4. INSTALL OIL DRAIN PIPE SUB-ASSEMBLY

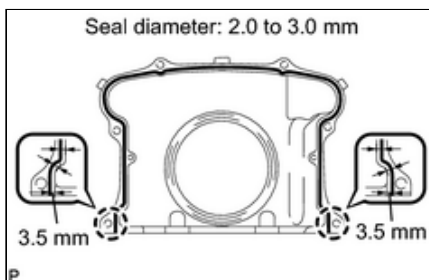
- (a) Apply a light coat of engine oil to a new O-ring.
 (b) Install the O-ring to the drain pipe.
 (c) Install the oil drain pipe with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}



5. INSTALL ENGINE REAR OIL SEAL RETAINER



- (a) Apply seal packing in a continuous line as shown in the illustration.

Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Seal diameter:

2.0 to 3.0 mm (0.0787 to 0.118 in.)

Application position from inside edge of retainer:

3.5 mm (0.138 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the engine rear oil seal retainer within 3 minutes and tighten the bolts and nuts within 15 minutes after applying seal packing.

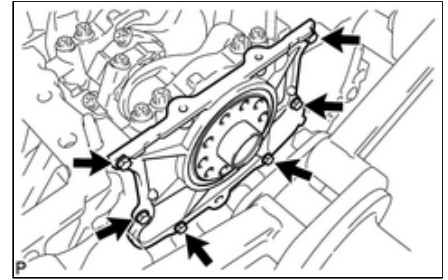
(b) Install the oil seal retainer with the 6 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

- Do not start the engine for at least 2 hours after installing.
- When installing the oil seal retainer, make sure the lip of the oil seal is not damaged.
- When installing the oil seal retainer, make sure the lip of the oil seal is not folded incorrectly.

**6. INSTALL OIL STRAINER SUB-ASSEMBLY**

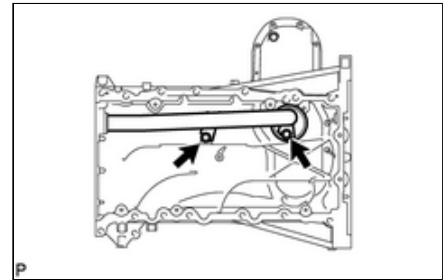
- (a) Apply a light coat of engine oil to a new O-ring.
- (b) Install the O-ring to the oil strainer.
- (c) Install the oil strainer with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

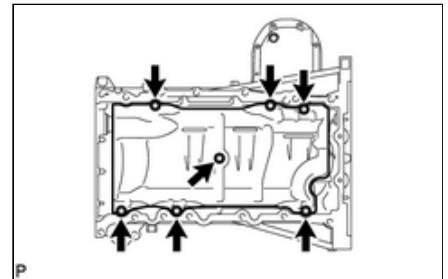
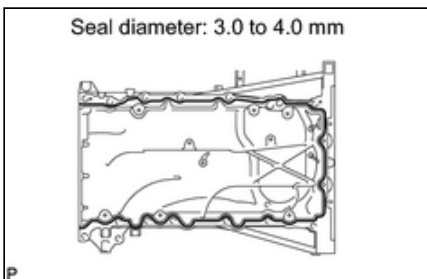
Make sure the O-ring is not twisted or damaged.

**7. INSTALL NO. 1 OIL PAN BAFFLE PLATE**

- (a) Install the baffle plate with the 7 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

**8. INSTALL NO. 1 OIL PAN SUB-ASSEMBLY**

- (a) Apply seal packing in a continuous line as shown in the illustration.

Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:

3.0 to 4.0 mm (0.118 to 0.157 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the oil pan within 3 minutes and tighten the bolts and nuts within 15 minutes after applying seal packing.

(b) Install the oil pan with the 14 bolts and 2 nuts.

Torque:

for bolt A -

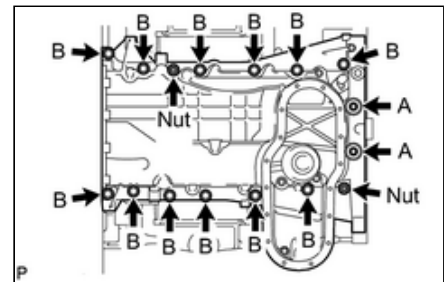
10 N·m {102 kgf·cm, 7ft·lbf}

for bolt B -

35 N·m {357 kgf·cm, 26ft·lbf}

for nut -

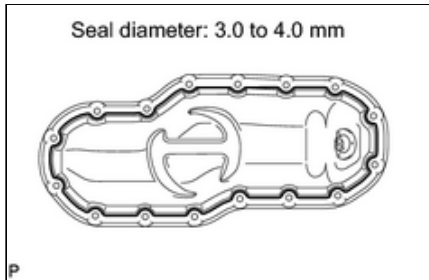
35 N·m {357 kgf·cm, 26ft·lbf}



NOTICE:

Do not start the engine for at least 2 hours after installing.

9. INSTALL NO. 2 OIL PAN SUB-ASSEMBLY



(a) Apply seal packing in a continuous line as shown in the illustration.

Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:

3.0 to 4.0 mm (0.118 to 0.156 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the oil pan within 3 minutes and tighten the bolts and nuts within 15 minutes after applying seal packing.

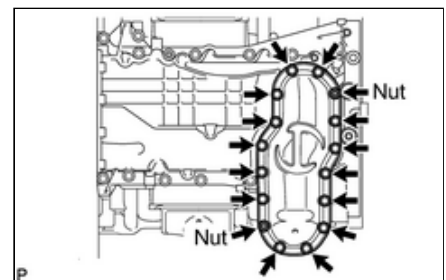
(b) Install the oil pan with the 14 bolts and 2 nuts.

Torque:

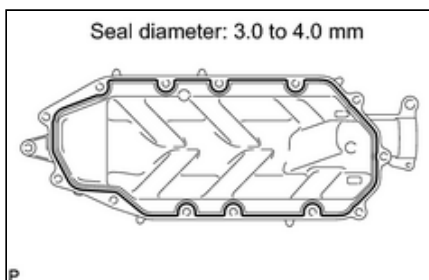
10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

Do not start the engine for at least 2 hours after installing.



10. INSTALL NO. 1 HEAT EXCHANGER COVER



(a) Apply seal packing in a continuous line as shown in the illustration.

Seal packing:

Toyota Genuine Seal Packing 1282B, Three Bond 1282B or equivalent

Standard seal diameter:

3.0 to 4.0 mm (0.118 to 0.157 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the No. 1 heat exchanger cover within 3 minutes and tighten the bolts and nuts within 15 minutes after applying seal packing.

(b) Install the heat exchanger cover with the 12 bolts and 2 nuts.

Torque:

for bolt C -

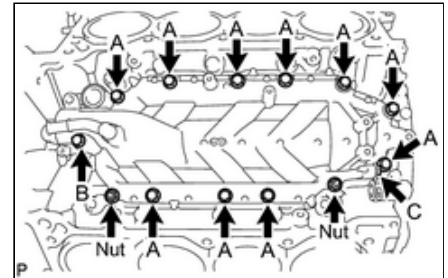
10 N·m {102 kgf·cm, 7ft·lbf}

except bolt C -

21 N·m {214 kgf·cm, 16ft·lbf}

Standard Bolt:

ITEM	LENGTH	THREAD DIAMETER
Bolt A	20 mm (0.787 in.)	8 mm (0.315 in.)
Bolt B	70 mm (2.76 in.)	8 mm (0.315 in.)
Bolt C	16 mm (0.630 in.)	6 mm (0.236 in.)



NOTICE:

Do not start the engine for at least 2 hours after installing.

11. INSTALL VENTILATION PIPE GASKET

(a) Using SST, evenly tap in a new ventilation pipe gasket until its surface is flush with the lip of the ventilation pipe.

SST: 09950-60010

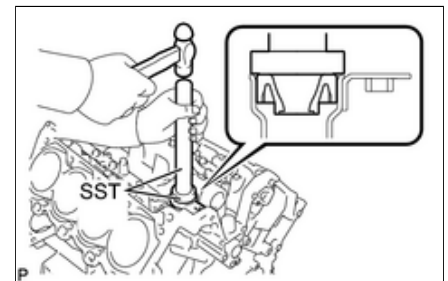
09951-00360

SST: 09950-70010

09951-07100

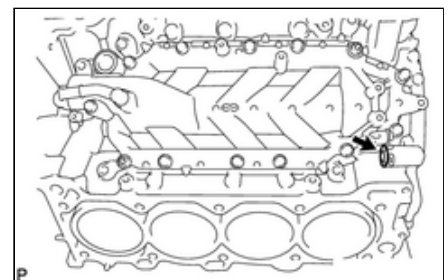
NOTICE:

- Do not tap the gasket at an angle.
- Do not tap the gasket excessively.



12. INSTALL OIL RETURN PIPE GASKET

(a) Install a new oil return pipe gasket.

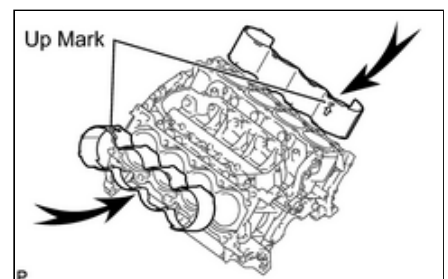


13. INSTALL CYLINDER BLOCK WATER JACKET SPACER

(a) Install the 2 water jacket spacers as shown in the illustration.

NOTICE:

- Face the cutouts indicated by the arrows in illustration away from the engine.
- Face the "up mark" as shown in the illustration.



14. INSTALL CYLINDER HEAD GASKET RH INFO

15. INSTALL CYLINDER HEAD GASKET LH INFO

16. INSTALL CYLINDER HEAD SUB-ASSEMBLY RH INFO

17. INSTALL CYLINDER HEAD SUB-ASSEMBLY LH INFO

18. INSTALL VALVE STEM CAP

- (a) Apply a light coat of engine oil to the valve stem caps.
- (b) Install the 32 valve stem caps to the cylinder head.

19. INSTALL VALVE LASH ADJUSTER ASSEMBLY

- (a) Inspect the valve lash adjuster INFO .
- (b) Install the 32 valve lash adjusters to the cylinder head.

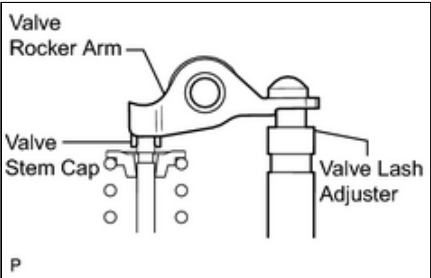
NOTICE:

Install the lash adjuster at the same place it was removed from.

20. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

- (a) Apply engine oil to the lash adjuster tips and valve stem cap ends.

- (b) Install the 32 valve rocker arms as shown in the illustration.

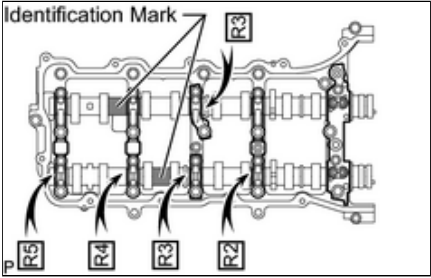


21. INSTALL CAMSHAFT BEARING CAP RH

- (a) Apply a light coat of engine oil to the camshaft journals, camshaft housings and bearing caps.
- (b) Install the No. 1 and No. 2 camshafts to the camshaft housing.

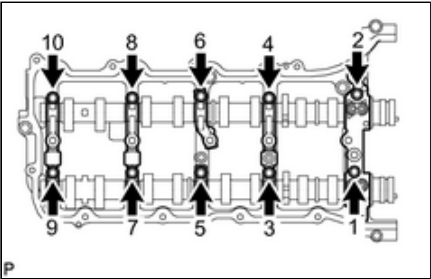
HINT:

Check the identification mark stamped on the camshaft.

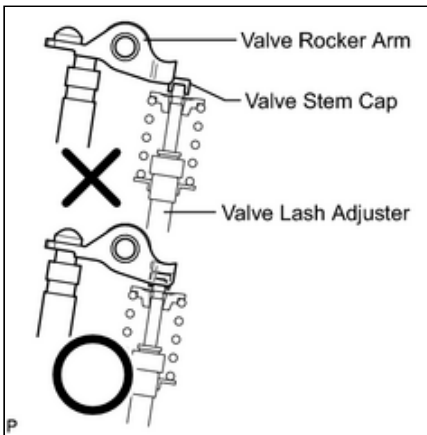


- (c) Confirm the marks and numbers on the camshaft bearing caps and place them in their proper positions and directions.

- (d) Temporarily install the 10 bolts in the order shown in the illustration.



22. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY RH



(a) Make sure that the valve rocker arms are installed as shown in the illustration.

(b) Apply seal packing in a continuous line as shown in the illustration.

Seal packing:

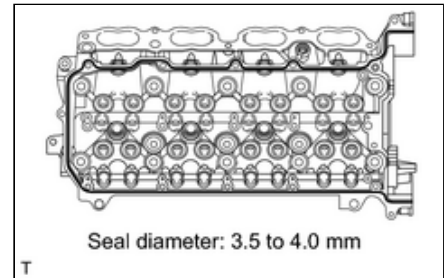
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:

3.5 to 4.0 mm (0.138 to 0.157 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the camshaft housing within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.



(c) Install the camshaft housing, and install the 18 bolts in the order shown in the illustration.

Torque:

for bolt A -

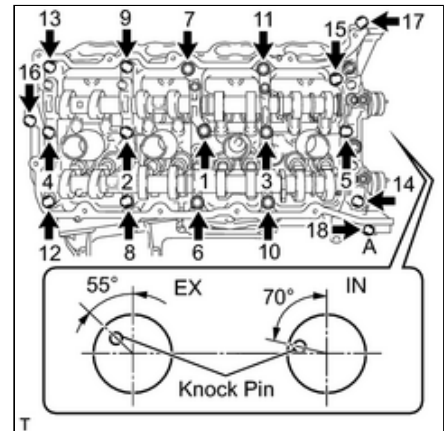
10 N·m {102 kgf·cm, 7ft·lbf}

for except bolt A -

30 N·m {306 kgf·cm, 22ft·lbf}

NOTICE:

- Do not start the engine for at least 2 hours after the installation.
- Make sure that the knock pin of the camshaft is positioned as shown in the illustration before installing the camshaft housing.



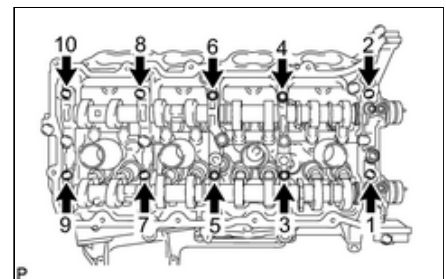
(d) Tighten the 10 bolts in the order shown in the illustration.

Torque:

16 N·m {163 kgf·cm, 12ft·lbf}

NOTICE:

Thoroughly wipe clean any seal packing.



23. INSTALL CAMSHAFT BEARING CAP LH

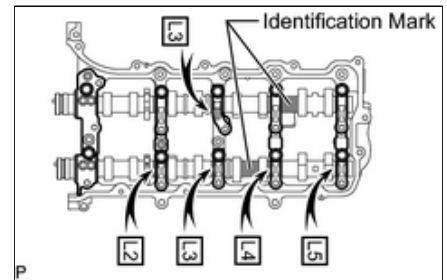
(a) Apply a light coat of engine oil to the camshaft journals, camshaft housings and bearing caps.

(b) Install the No. 3 and No. 4 camshafts to the camshaft housing.

HINT:

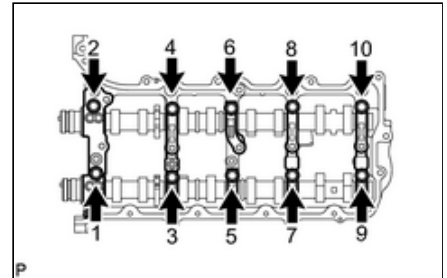
Check the identification mark stamped on the camshaft.

ITEM	MARK
for Intake Side	NO. 3
for Exhaust Side	NO. 4

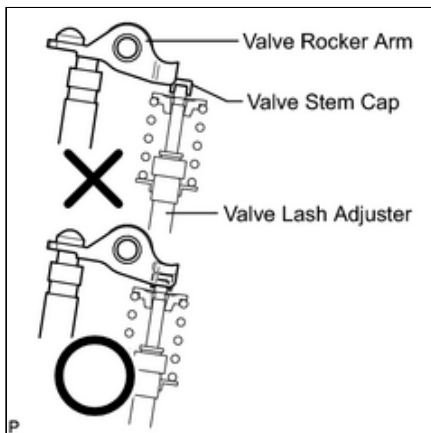


(c) Confirm the marks and numbers on the camshaft bearing caps and place them in their proper positions and directions.

(d) Temporarily install the 10 bolts in the order shown in the illustration.



24. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY LH



(a) Install the valve rocker arms as shown in the illustration.

(b) Apply seal packing in a continuous line as shown in the illustration.

Seal packing:

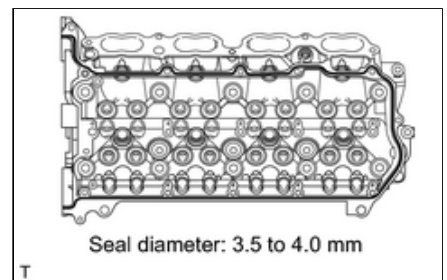
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:

3.5 to 4.0 mm (0.138 to 0.157 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the camshaft housing within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.



(c) Install the camshaft housing, and install the 18 bolts in the order shown in the illustration.

Torque:

for bolt A -

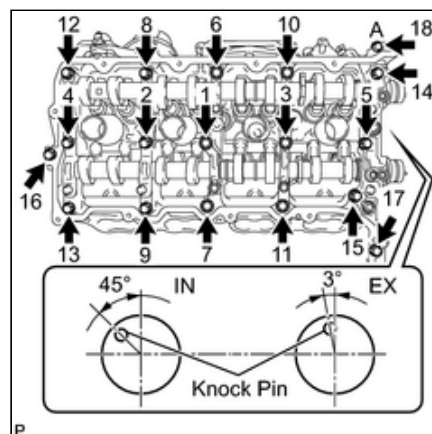
10 N·m {102 kgf·cm, 7ft·lbf}

for except bolt A -

30 N·m {306 kgf·cm, 22ft·lbf}

NOTICE:

- Do not start the engine for at least 2 hours after the installation.
- Make sure that the knock pin of the camshaft is positioned as shown in the illustration before installing the camshaft housing.



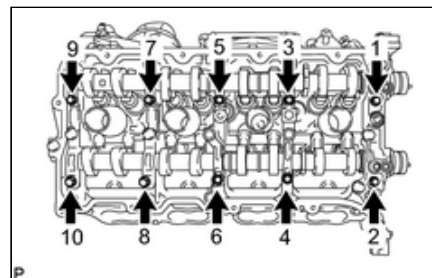
(d) Tighten the 10 bolts in the order shown in the illustration.

Torque:

16 N·m {163 kgf·cm, 12ft·lbf}

NOTICE:

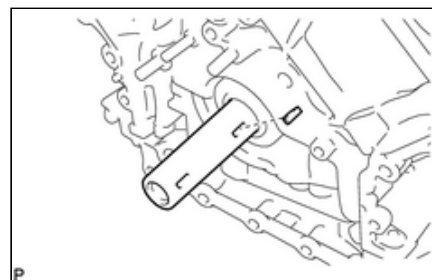
Thoroughly wipe clean any seal packing.

**25. INSTALL CRANKSHAFT TIMING GEAR KEY**

(a) Install the timing gear key.

HINT:

The other timing gear key will be installed at a later step.

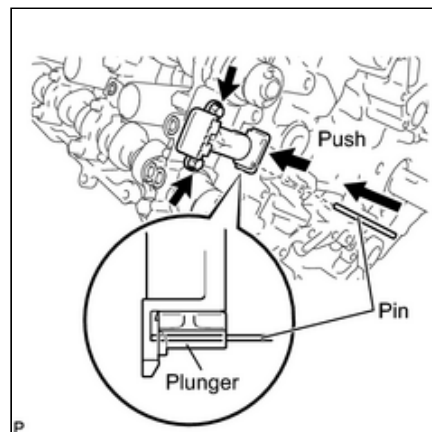
**26. INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY**

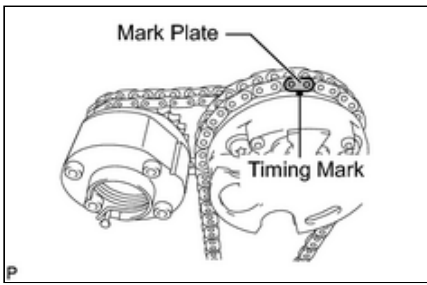
(a) Install the chain tensioner with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

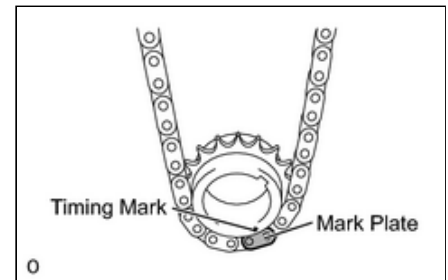
(b) While raising up the No. 2 chain tensioner, insert a pin of $\phi 1.0$ mm (0.0394 in.) into the hole to fix it in place.

**27. INSTALL NO. 1 CHAIN SUB-ASSEMBLY RH**

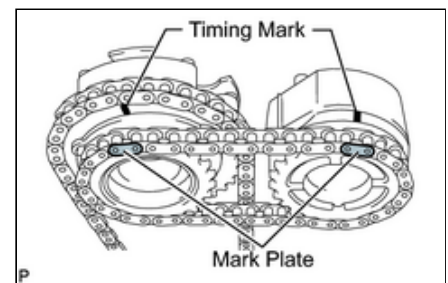


- (a) Align the No. 1 chain's orange mark plate with the camshaft timing gear's timing mark, and attach the chain to the gear as shown in the illustration.

- (b) Align the No. 1 chain's orange mark plate with the crankshaft timing gear's timing mark, and attach the chain to the gear as shown in the illustration.



- (c) Align the No. 2 chain's mark plates (yellow) with the timing marks of the camshaft timing gear and camshaft timing exhaust gear, and attach the No. 2 chain to the gears as shown in the illustration.



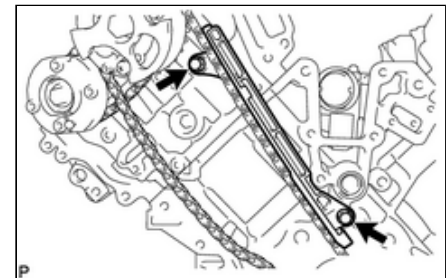
NOTICE:

The camshaft timing exhaust gear has 2 grooves. Align the mark plates of the No. 2 chain with the first groove.

HINT:

The crankshaft timing gear and camshaft exhaust gear will be installed with the No. 1 and No. 2 chains connected to the gears.

- (d) Install the crankshaft timing sprocket to the crankshaft.
- (e) Align and attach the knock pin of the No. 1 camshaft with the pin hole of the camshaft timing gear.
- (f) Using the hexagonal portion of the No. 2 camshaft, align and attach the knock pin of the No. 2 camshaft with the pin hole of the camshaft timing exhaust gear.
- (g) Remove the pin from the No. 2 chain tensioner.



28. INSTALL NO. 1 CHAIN VIBRATION DAMPER RH

- (a) Install the vibration damper with the 2 bolts.

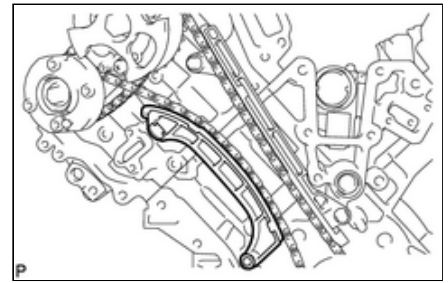
Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

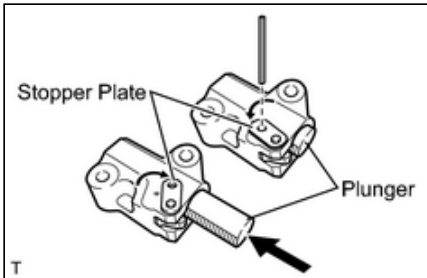
29. INSTALL NO. 1 CHAIN TENSIONER SLIPPER RH

HINT:

If you cannot install the chain tensioner slipper due to the tension of the chain, use the hexagonal portion of the camshaft to loosen the chain, and then install the chain tensioner slipper.



30. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY RH

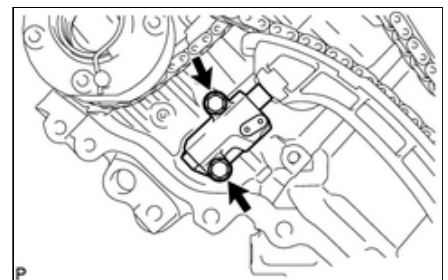


- (a) Move the stopper plate upward to release the lock, and push the plunger deep into the tensioner.
- (b) Move the stopper plate downward to set the lock, and insert a hexagon wrench into the hole of the stopper plate.

- (c) Install the chain tensioner with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}



- (d) Remove the hexagon wrench from the chain tensioner.

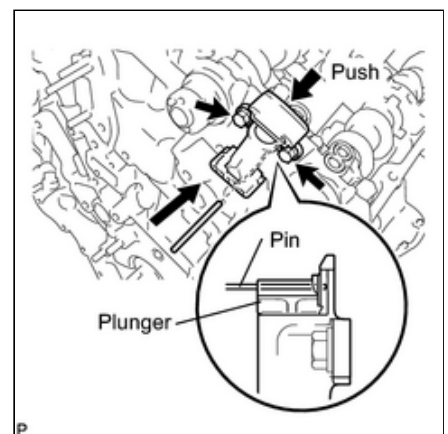
31. INSTALL NO. 3 CHAIN TENSIONER ASSEMBLY

- (a) Install the chain tensioner with the 2 bolts.

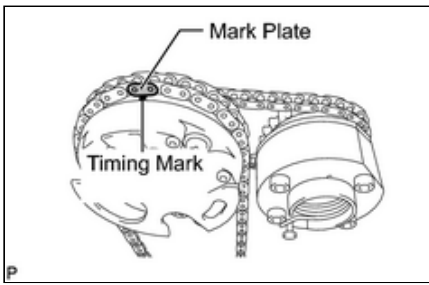
Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

- (b) While pushing down the No. 2 chain tensioner, insert a pin of $\phi 1.0$ mm (0.0394 in.) into the hole to fix it in place.

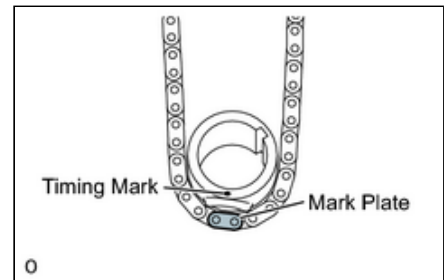


32. INSTALL NO. 1 CHAIN SUB-ASSEMBLY LH

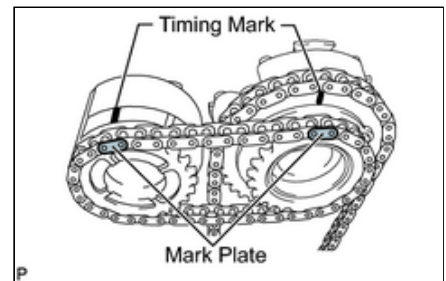


- (a) Align the No. 1 chain's orange mark plate with the camshaft timing gear's timing mark, and attach the chain to the gear as shown in the illustration.

- (b) Align the No. 1 chain's orange mark plate with the crankshaft timing gear's timing mark, and attach the chain to the gear as shown in the illustration.



- (c) Align the No. 2 chain's mark plates (yellow) with the timing marks of the camshaft timing gear and camshaft timing exhaust gear, and attach the No. 2 chain to the gears as shown in the illustration.



NOTICE:

The camshaft timing exhaust gear has 2 grooves. Align the mark plates of the No. 2 chain with the first groove.

HINT:

The crankshaft timing gear and camshaft exhaust gear will be installed with the No. 1 and No. 2 chains connected to the gears.

- (d) Install the crankshaft timing sprocket to the crankshaft.
- (e) Align and attach the knock pin of the No. 3 camshaft with the pin hole of the camshaft timing gear.
- (f) Using the hexagonal portion of the No. 4 camshaft, align and attach the knock pin of the No. 4 camshaft with the pin hole of the camshaft timing exhaust gear.

NOTICE:

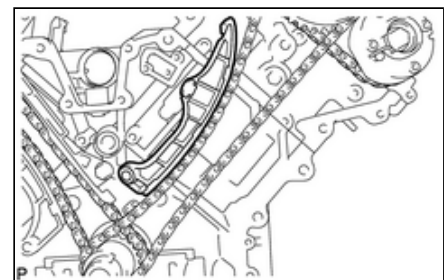
Because the gears' timing mark positions may shift due to looseness of the No. 1 chain, use the hexagonal portion of the camshaft to hold the No. 3 camshaft in place until the No. 1 chain tensioner is installed.

- (g) Remove the pin from the No. 2 chain tensioner.

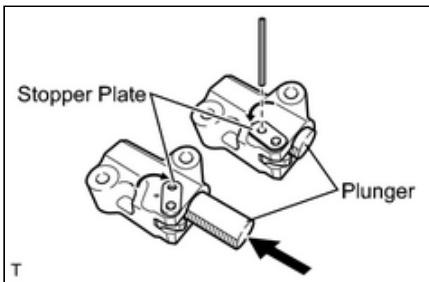
33. INSTALL NO. 1 CHAIN TENSIONER SLIPPER LH

HINT:

If you cannot install the chain tensioner slipper due to the tension of the chain, use the hexagonal portion of the camshaft to loosen the chain and install the chain tensioner.



34. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY LH

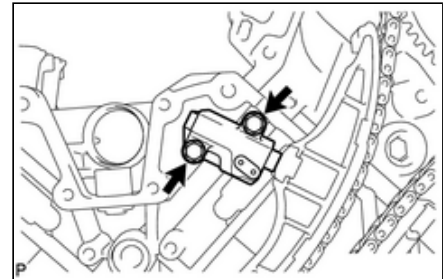


- (a) Move the stopper plate upward to release the lock, and push the plunger deep into the tensioner.
- (b) Move the stopper plate downward to set the lock, and insert a hexagon wrench into the hole of the stopper plate.

- (c) Install a new gasket and the chain tensioner with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}



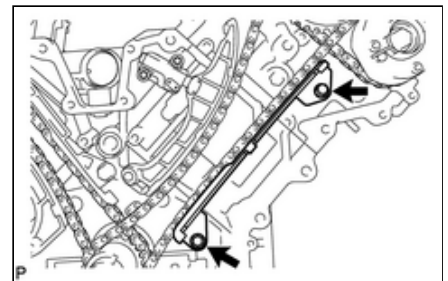
35. INSTALL NO. 1 CHAIN VIBRATION DAMPER LH

- (a) Install the vibration damper with the 2 bolts.

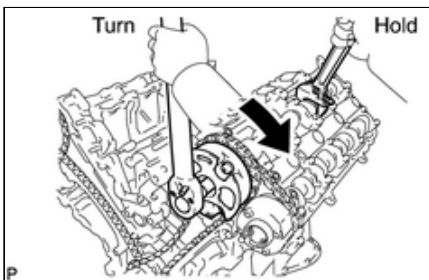
Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

- (b) Remove the hexagon wrench from the No. 1 chain tensioner.



36. TIGHTEN CAMSHAFT TIMING GEAR



- (a) LH:

- (1) Using a wrench to hold the hexagonal portion of the No. 3 camshaft, tighten the camshaft timing gear with the bolt.

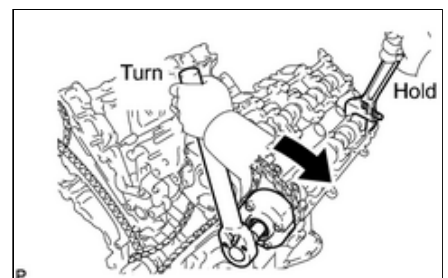
Torque:

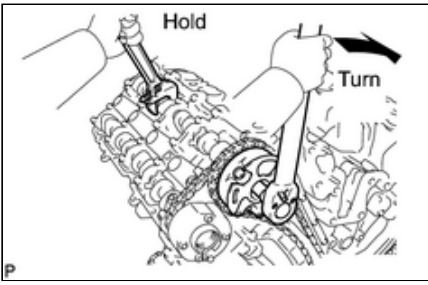
100 N·m {1020 kgf·cm, 74ft·lbf}

- (2) Using a wrench to hold the hexagonal portion of the No. 4 camshaft, tighten the camshaft timing exhaust gear with the bolt.

Torque:

100 N·m {1020 kgf·cm, 74ft·lbf}





(b) RH:

- (1) Using a wrench to hold the hexagonal portion of the No. 1 camshaft, tighten the camshaft timing gear with the bolt.

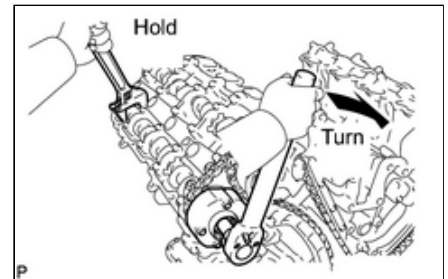
Torque:

100 N·m {1020 kgf·cm, 74ft·lbf}

- (2) Using a wrench to hold the hexagonal portion of the No. 2 camshaft, tighten the camshaft timing exhaust gear with the bolt.

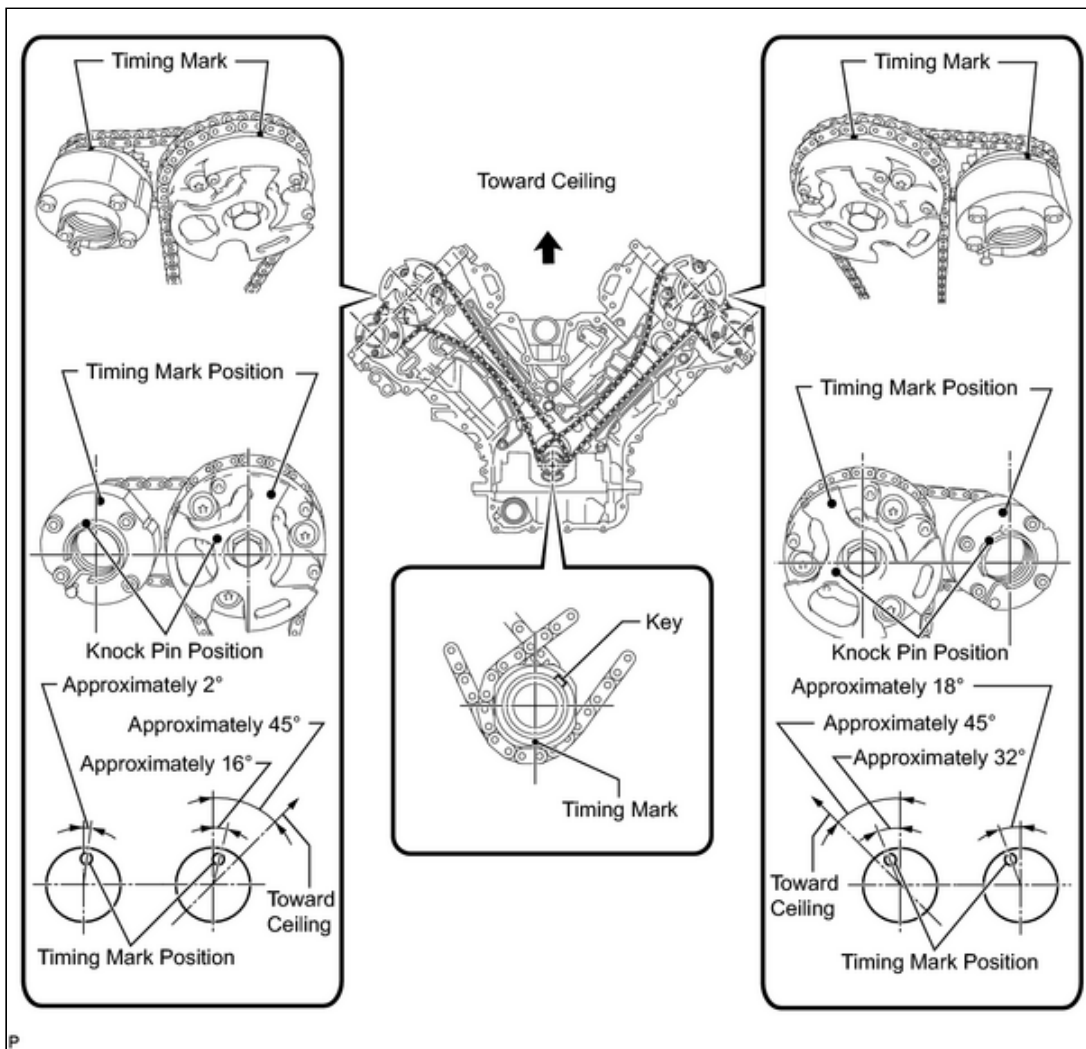
Torque:

100 N·m {1020 kgf·cm, 74ft·lbf}



37. CHECK NO. 1 CYLINDER TO TDC / COMPRESSION

- (a) Temporarily install the pulley set bolt.
- (b) Rotate the crankshaft clockwise, and check that the timing marks on the crankshaft timing gear and camshaft timing gears are as shown in the illustration.
- (c) Remove the crankshaft pulley bolt.



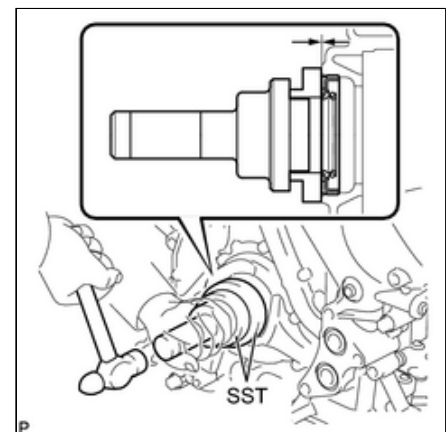
38. INSTALL WATER INLET PIPE INFO

39. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY INFO

40. INSTALL WATER PUMP ASSEMBLY INFO

41. INSTALL FRONT CRANKSHAFT OIL SEAL

(a) Apply MP grease to the lip of a new oil seal.



(b) Using SST and a hammer, tap in the oil seal to a depth between 0 to 1.0 mm (0 to 0.0394 in.) from the timing chain cover edge.

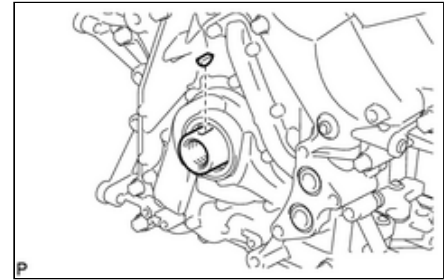
SST: 09223-22010

NOTICE:

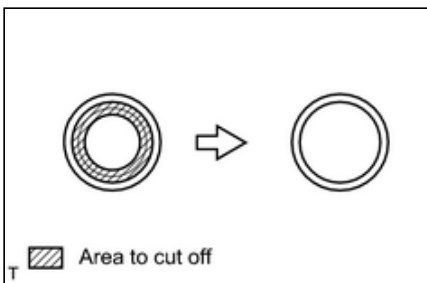
- Keep the lip free from foreign matter.
- Do not tap oil seal at an angle.

42. INSTALL CRANKSHAFT TIMING GEAR KEY

- (a) Install the crankshaft timing gear key to the crankshaft.



43. INSTALL SPARK PLUG TUBE GASKET

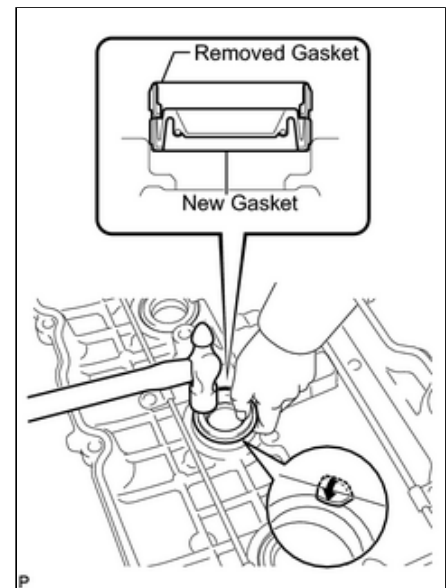


- (a) Using a cutter knife, cut off the seal part of the removed gasket.

- (b) Using the removed gasket and a hammer, tap in a new gasket until it stops.

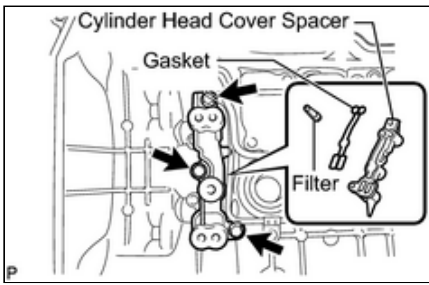
HINT:

If the removed gasket does not fit on the new one, correct the removed one with pliers.



- (c) Apply a light coat of MP grease to the gasket lip.
- (d) Return the 4 ventilation baffle plate claws to the original positions.

44. INSTALL OIL CONTROL VALVE FILTER



(a) LH:

- (1) Install the valve filter in the cylinder head cover.
- (2) Install a new gasket and the cylinder head cover spacer with the 3 bolts.

Torque:

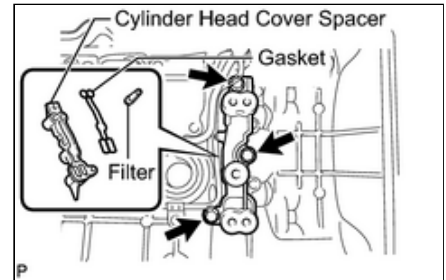
10 N·m {102 kgf·cm, 7ft·lbf}

(b) RH:

- (1) Install the valve filter in the cylinder head cover.
- (2) Install a new gasket and the cylinder head cover spacer with the 3 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}



45. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY RH INFO

46. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH INFO

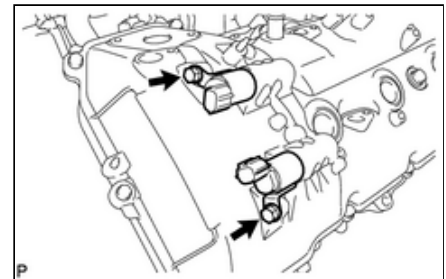
47. INSTALL CAMSHAFT OIL CONTROL VALVE ASSEMBLY

(a) LH:

- (1) Apply a light coat of engine oil to 2 new O-rings.
- (2) Install the 2 O-rings to the 2 oil control valves.
- (3) Install the 2 oil control valves with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

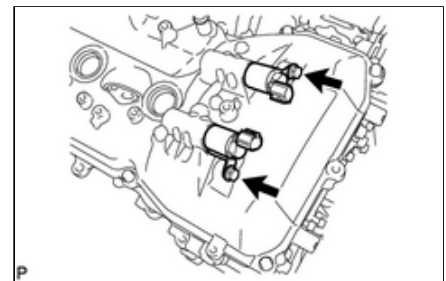


(b) RH:

- (1) Apply a light coat of engine oil to 2 new O-rings.
- (2) Install the 2 O-rings to the 2 oil control valves.
- (3) Install the 2 oil control valves with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

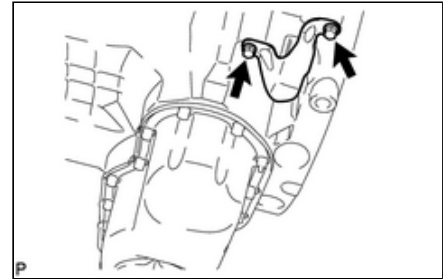
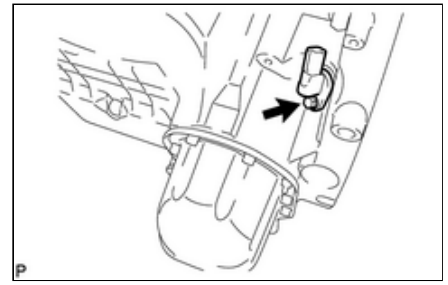


48. INSTALL CRANKSHAFT POSITION SENSOR

- (a) Install the crankshaft position sensor with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

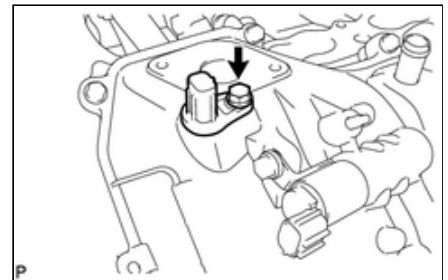


49. INSTALL CRANK POSITION SENSOR PROTECTOR

(a) Install the sensor protector with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}



50. INSTALL CAMSHAFT POSITION SENSOR

(a) Install the camshaft position sensor with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

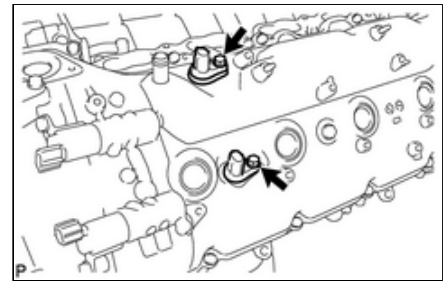
51. INSTALL VVT SENSOR

(a) LH:

(1) Install the 2 VVT sensors with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

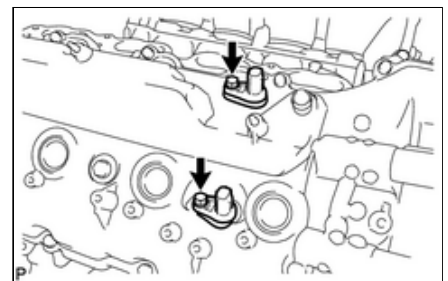


(b) RH:

(1) Install the 2 VVT sensors with the 2 bolts.

Torque:

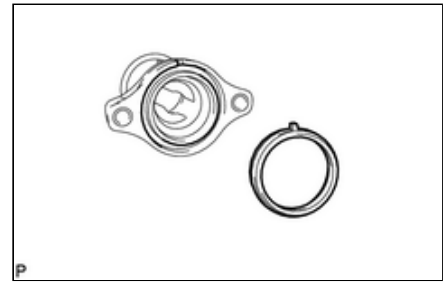
10 N·m {102 kgf·cm, 7ft·lbf}



52. INSTALL SPARK PLUG

53. INSTALL OIL FILLER CAP HOUSING

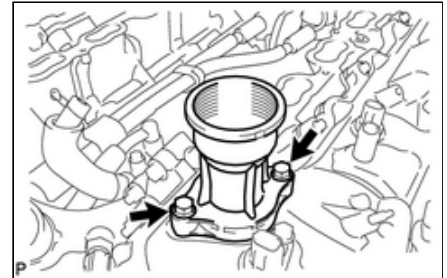
(a) Align the protrusion of a new gasket with the cutout of the oil filler cap housing, and install the gasket to the housing.



(b) Install the cap housing with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}



54. INSTALL OIL FILLER CAP SUB-ASSEMBLY

55. INSTALL CRANKSHAFT PULLEY [INFO](#)

56. INSTALL OIL FILTER BRACKET (w/o Oil Cooler) [INFO](#)

57. INSTALL OIL FILTER BRACKET (w/ Oil Cooler) [INFO](#)

58. INSTALL NO. 1 OIL COOLER BRACKET (w/ Oil Cooler) [INFO](#)

59. INSTALL OIL FILTER ELEMENT [INFO](#)

