



Performance/Competition Products

Product: Computer, Fuel-PFC F-Con

Product: FCD (Fuel Cut Defencer)

Application: 1987 Toyota Supra Turbo

Part Number: 4012XX-11026L

Part Number: 4035XX-11026L

NOTICE:

This manual assumes that you have and know how to use the tools and equipment which are necessary to safely and efficiently perform service and installation operations on your vehicle. This manual also assumes that you are familiar with typical automotive systems and terminology and basic service and repair procedures. **DO NOT** attempt to carry out the operations described herein unless these assumptions are correct.

Always have access to a factory shop manual as many of the procedures and specifications required for the proper installation of this product will be referenced to the shop manual.

To avoid the risk of personal injury to yourself and/or others and to avoid the possibility of damaging your vehicle or rendering it unsafe, follow the safety precautions contained in the factory shop manual for the vehicle that you are working on.

1. INTRODUCTION:**A. HKS FCD (FUEL CUT DEFENCER):**

The Toyota Supra Turbo uses an actuator activated wastegate to control the maximum boost pressure. The Supra is also equipped with a secondary boost limiting circuit, or fuel cut circuit, to limit the amount of possible boost pressure in the case of actuator or wastegate failure or malfunction. The safety fuel cut system is activated by the ECU (brain box). The ECU receives input signals from both the air flow meter (air volume) and the crank angle sensor (engine rpm). These input signals are monitored by the ECU to determine if the engine is receiving a correct intake air volume. If the intake air volume is determined by the ECU to be incorrect, the fuel cut circuit will momentarily shut off the injector pulses to the injectors which will momentarily interrupt the combustion process. By momentarily interrupting the combustion process, thereby releasing the load from the engine, the boost pressure will not be able to exceed the fuel cut point. To raise the boost pressure past the fuel cut point the use of the HKS FCD will be required. The function of the HKS FCD is to modify the **intake air volume signal** to the ECU. By modifying the intake air volume signal, the ECU will "think" that the intake air volume is lower than level required to activate the fuel cut circuit. By modifying the intake air volume signal to the ECU, the air/fuel ratio will be altered thereby requiring the use of the HKS PFC F-Con. Without the use of the HKS PFC F-Con, the air/fuel ratio will be too lean resulting in detonation, poor performance and possible engine damage. The HKS FCD **must** be used with the HKS PFC F-Con.

ORIGINAL BOOST PRESSURE (wastegate controlled)-approximately 5.0 to 6.0 psi

ORIGINAL FUEL CUT POINT-approximately 11.4 to 12.8 psi

B. HKS PFC F-Con (ELECTRONIC FUEL MANAGEMENT SYSTEM):

The HKS PFC F-Con is an 8 bit, 64K byte fuel management microcomputer that is interfaced with the original ECU using the PFC F-Con interface cable (wire harness). The PFC F-Con PROM (programed read only memory) is specifically programmed to calculate the proper injector pulse durations using engine rpm input from the original ECU and voltage input from the manifold vacuum/pressure sensor included in the PFC F-Con package. Using this data, the PFC F-Con will modify each original injector pulse from the ECU to provide accurate fuel compensation even at high engine speeds after peak boost has been reached. By maintaining an accurate air/fuel ratio throughout the entire engine rpm and boost pressure range, maximum engine performance and reliability can be maintained. Unlike primitive water injection systems, using the correct amount of fuel to control combustion temperatures will not only help in controlling detonation, but will also yield appreciable horsepower gains.

2. USER NOTES:

A. Before installing and adjusting these components, read through the entire manual and familiarize yourself with the terms used herein. Pay special attention to the following precautions and information.

1. The HKS FCD and PFC F-Con **MUST** be installed TOGETHER. This is why the PFC F-con wire harness has the FCD connectors pre-installed on it. Do not attempt to use the FCD without the PFC F-Con or severe engine damage may result. Additionally, these HKS electronic components were carefully designed, programmed and tested to function **ONLY** on the Supra Turbo and **ONLY** on a Supra Turbo that has the HKS Turbo Exhaust System and the HKS VBC System already installed. Use of these components on other vehicles or on a vehicle using other manufacturers performance products may result in poor vehicle performance, damaged OEM and/or HKS electronic components and/or a damaged engine or turbocharger. Additionally, any implied HKS warranties on any and all HKS products used on the vehicle will become void due to misapplication.

2. Additional horsepower and performance will result from raising the boost pressure in the Supra Turbo, however, the adjustment specifications specified herein and in the HKS VBC manual must be closely adhered to to avoid the possibility of detonation (knocking, pinging) which will cause severe engine damage.

3. Due to the small size of the turbocharger on the Supra Turbo (for low end response), the boost pressure will start to decrease at about 4500 rpm when the boost pressure is raised from the original setting. Under average driving conditions, maximum boost pressure will peak at about 4000 rpm.

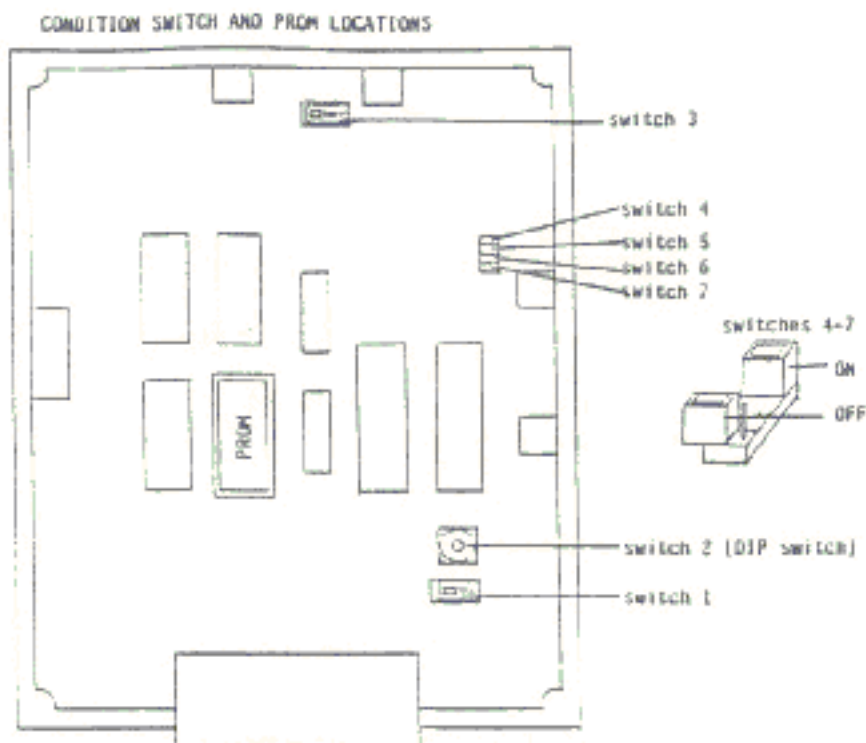
4. When **ANY** performance modifications are performed on the Supra Turbo, 92 or higher octane fuel must be used. The use of high octane fuel will reduce the possibility of detonation.

5. **DO NOT** attempt to perform these modifications without first installing an accurate vacuum/boost gauge with a 20 psi range. **DO NOT** rely on the original gauge for a reference when adjusting the boost pressure in the Supra Turbo. Installation of the HKS FCD will not allow the original boost gauge to function above the original fuel cut point.

6. The HKS PFC F-Con is a very precise and delicate electronic component. Handle the unit with extreme care and adhere to the installation and adjusting procedures shown herein. Failure to do so may result in permanent damage to the unit.

7. The PFC F-Con contains a variety of mode condition switches (see fig. 1). These switches are preset by HKS to interface the computer with your vehicle. **DO NOT** alter the position of any of these switches except for the channel selecting switch (DIP switch) as explained in the adjustment section of this manual.

8. The PROM (I.C. or chip) should never have to be removed (see fig. 1). If, however, the PROM does have to be removed (under HKS supervision) **NEVER** touch any part of the contact pins and **NEVER** place the PROM on a magnetized or static electricity charged surface. **NEVER** remove the sticker covering the top of the PROM and always install the PROM so the notch in the end matches up with the notch in the end of the PROM plug on the circuit board. Failure to follow these precautions will result in deprogramming of the PROM.



9. The HKS products described in this manual were designed and tested on a California specification Supra Turbo. Some installation and adjustment procedures may differ slightly on federal vehicles. Different climate conditions (elevation, temperature, humidity, etc.) will also affect the adjustment of these products. Vehicles subjected to extreme continuous loads should run slightly lower boost pressure to reduce the thermal load on the engine components. It is also advisable to install an accurate EGT (exhaust gas temperature) gauge (pyrometer) to monitor engine operating conditions (air/fuel ratio).

3. INSTALLATION PROCEDURES:

A. OEM ECU ACCESS:

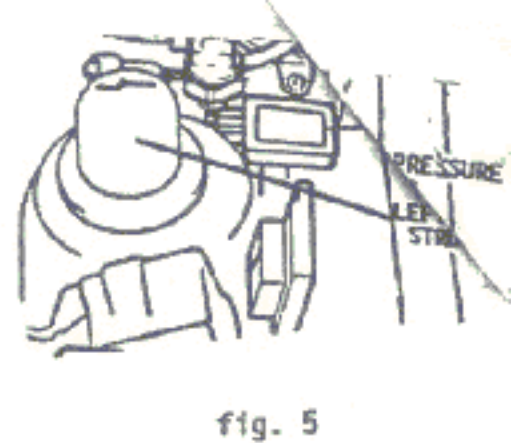
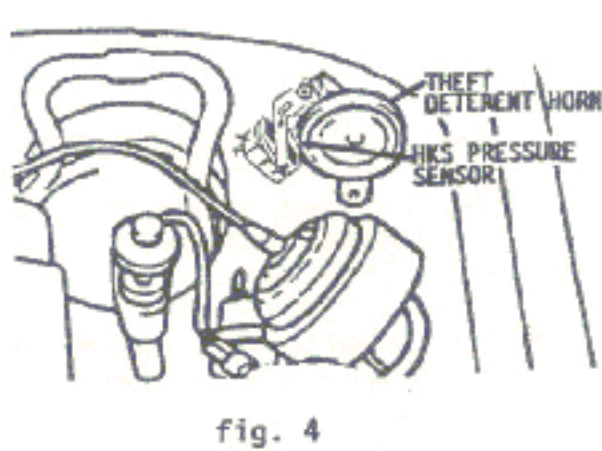
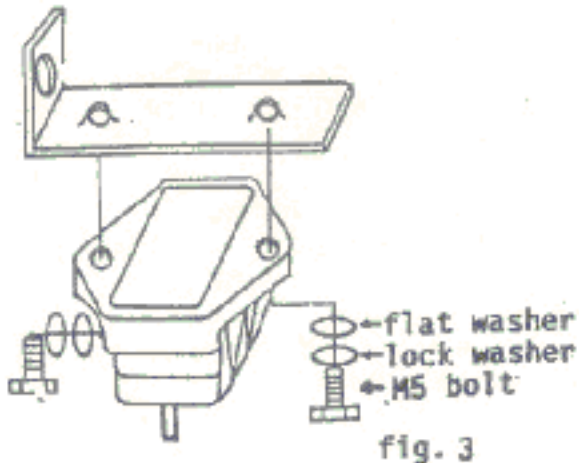
1. The original ECU is located above the glove box inside the dash. Refer to the following procedures and fig. 2 to gain access to the ECU.

- a. Remove the cover panel below the glove box.
- b. Remove the glove box.
- c. Remove the glove box inner panel.



B. PRESSURE SENSOR INSTALLATION:

1. Attach the sensor to the "L" bracket as shown in fig. 3 with the two M5 X 10mm Phillips pan head bolts. Mount the unit in the engine compartment under the theft deterrent horn mounting bolt as shown in fig. 4. Make sure that the pressure sensor nose fitting is pointing downward as much as possible (to prevent oil, moisture, etc. from entering the sensor).



2. Splice the HKS pressure sensor hose into the OEM pressure sensor hose (located on the left front strut tower) as close to the intake manifold as possible (see fig.5).

NOTE: If for some reason there is not enough room to mount the pressure sensor in the suggested location, mount it in an alternate location taking into account the following....

- a. To prevent oil, moisture, etc. from entering the sensor, the sensor hose fitting should be pointing downward as much as possible and the sensor should be mounted slightly higher than the throttle body. If you cannot use an existing mounting bolt, use either the M6 x20mm sheet metal screw, or the M6 x 20mm bolt, lock washer, flat washer and nut.
- b. The sensor should be mounted away from extreme heat, moisture and dust.
- c. The hose layout to the sensor must be done with the length of hose and the length of the wire harness supplied in the kit. Use of a longer hose or wire will cause an excessive time delay which will throw off the accuracy of the PFC F-Con. The existing pressure sensor wire harness should not be modified, but the 4mm silicone hose should be kept as short as possible.
- d. If you cannot use the original boost sensor hose for the vacuum/pressure source for the PFC F-Con pressure sensor, use a raw source coming from the intake manifold after the throttle body. DO NOT tap into the pressure source that runs to the fuel pressure regulator. The Supra Turbo uses a high temperature compensator device which can change the amount of pressure in the line.

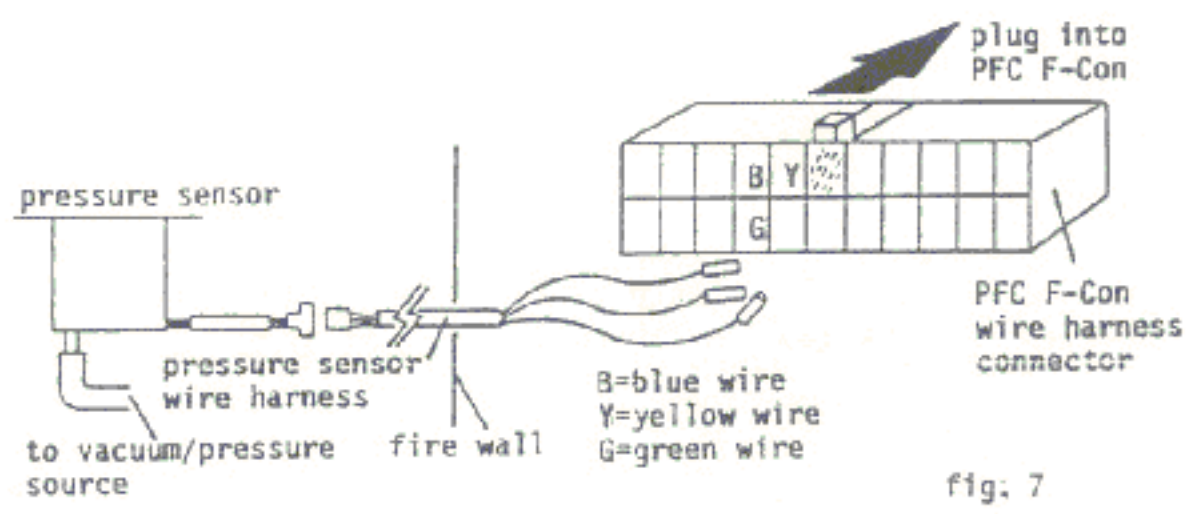
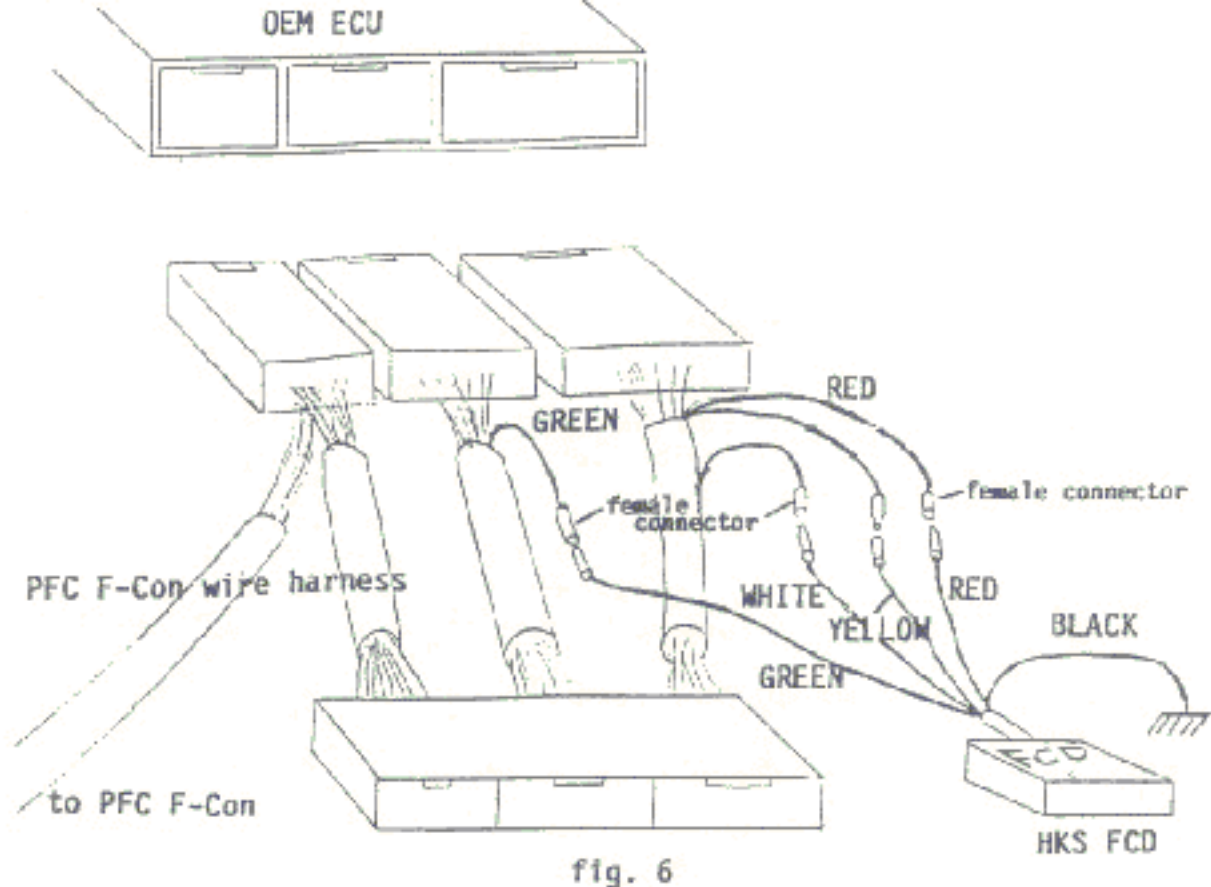
C. PRESSURE SENSOR WIRE HARNESS INSTALLATION:

1. Connect the pressure sensor harness to the pressure sensor connector. Feed the other end of the harness (three loose wires with female connectors) through the firewall so it can reach the final mounting location of the PFC F-Con. To facilitate ease of insertion through the firewall, the wire ends can be taped together and lightly lubricated before feeding them through. Exercise caution when feeding the wires through the firewall as the connectors can easily become damaged.

D. PFC F-CON HARNESS INSTALLTION:

1. The PFC F-Con harness will interface between the original ECU and the original wire harness as shown in fig. 6 (the FCD installation will be covered in step F).
 - a. Carefully disconnect the original wire harness form the ECU.
 - b. Insert the male PFC F-Con harness connectors into the original female connectors.
 - c. Insert the female PFC F-Con harness connectors into the original male connectors.
 - d. Push the connectors into place until they lock securely.

CAUTION: Do not bend the wire harness wires between the connectors as the wires can break off of the back of the connector pins.
2. Install the pressure sensor connectors into the back of the wire harness connector to the PFC F-Con as shown in fig. 7.



a. Make sure that the female connectors are properly installed into the harness connector. If the connections are in the wrong location or making poor contact, the PFC F-Con will not function properly.
 NOTE: If a connector is installed in the wrong location, it can be removed by inserting a small piece of wire (1mm or .04" dia.) through the front of the connector to push the lock tab down while the wire is gently pulled from the back of the connector.

E. PFC F-CON INSTALLATION:

1. Use the M5 x 8mm phillips/hex head bolts to mount the 'L' brackets to the PFC F-Con body. Mount the body in a convenient location within reach of the PFC F-Con wire harness and the pressure sensor wire harness. Use the M5 x 15mm sheet metal screws to securely mount the PFC F-Con 'L' brackets (see Fig.8).
 IMPORTANT: Mount the unit away from direct sunlight and away from heater ducts or where there may be excessive temperature. Also, make sure that the unit is securely mounted. Failure to fasten it down properly can cause internal damage to the unit while driving. Remember to mount it so you can access the top cover screws later when the adjustment of the unit is necessary.



B. FINAL PFC F-CON CHANNEL ADJUSTMENT:

1. To increase the low end response and maintain a proper air/fuel ratio under high boost/high rpm conditions, the optimum channel should be selected while driving the vehicle. Adjust the PFC F-Con channel as shown in section 4 step D taking into account the following.
2. For normal driving conditions running 10 psi of boost pressure, use channels 1 through 4.
3. For normal driving conditions running 10 to 15 psi of boost pressure, use channels 5 through 8.
4. For hard driving conditions (heavy loads, extended boost usage) up to 15 psi of boost pressure use channel 7 through 9.

a. It is possible to run too rich. Too rich of a fuel mixture can cause poor low end response and can also cause premature engine wear due to oil contamination caused by excess fuel.

b. It is also possible to run too lean. Too lean of a fuel mixture, as mentioned before, will elevate combustion temperatures which can lead to engine damage.

c. The use of a high quality EGT (exhaust gas temperature gauge) is highly recommended to determine the final PFC F-Con channel. The exhaust gas temperature should be within the following limits when the vehicle is under a full load.

IMMEDIATELY BEFORE THE TURBOCHARGER: 1650 degrees F (900 degrees C).

IMMEDIATELY AFTER THE TURBOCHARGER: 1500 degrees F (800 degrees C).

D. FINAL ASSEMBLY:

1. If you have not already done so, affix the octane warning stickers to their appropriate locations.
2. Secure the FCD assembly to a suitable location using the double sided adhesive tape included in the FCD kit. Mount the FCD so there is not a strain on the wires.
3. Install the interior parts that were removed in step 3A.

6. FCD TROUBLE SHOOTING SECTION:

SYMPTOM: ENGINE NOT RUNNING CORRECTLY (ROUGH IDLE/ ROUGH RUNNING) OR "CHECK ENGINE" LIGHT IS ILLUMINATED.

POSSIBLE CAUSE: Poor FCD connections, faulty FCD unit.

PERFORM VOLTAGE TEST ON FCD:

1. Check the voltage at the red FCD wire. 12 volts with ignition key on.
2. Check that the black wire is properly grounded.
3. Check the voltage at the green FCD wire 0.7 to 1.0 volts with the engine idling.
4. Check the voltage at the yellow and white FCD wires. 2 to 4 volts at idle or engine cranking.

7. PFC F-CON TROUBLE SHOOTING:

A. SYMPTOM: ENGINE WILL NOT START

POSSIBLE SOLUTION:

1. With the ignition key in the "on" position, check the condition of the green light in the front of the PFC F-Con body.

If the light is not illuminated, check the following:

- a. Main ECU fuse
- b. PFC F-Con wire harness connections
- c. PFC F-Con harness wire to connector pin connections (on the wire harness)
- d. PFC F-Con main circuit board (check to make sure that there is no obvious damage or missing parts)

If the light is illuminated, suspect the following:

- a. Possible memory loss in the main PROM
- b. Improperly interfaced (condition switch positions)

Isolation procedure:

To isolate the problem, disconnect the PFC F-Con wire harness and check the OEM wire harness pin connectors. If all appear to be making proper contact, reconnect the OEM wire harness to the OEM ECU (stock condition) and start the engine. If the engine starts, contact your HKS dealer for warranty procedures.

B. SYMPTOM: ENGINE WILL START BUT DRIVEABILITY IS POOR

POSSIBLE SOLUTION:

1. Check the position of the channel selector inside of the PFC F-Con. An excessively rich condition can cause poor driveability primarily in the lower rpm ranges.

2. Check the connections from the pressure sensor at the sensor and at the PFC F-Con.

3. Check for possible poor connections between the PFC F-Con wire harness and the OEM wire harness, the OEM ECU and the PFC F-Con.

4. Check for any possible malfunctions in the OEM fuel injection system.

5. Check for any possible engine malfunctions or vacuum leaks (check all added on hoses and their connections (VBC, PFC F-Con pressure sensor, boost gauge, etc)).

6. If none of the above conditions exist, suspect improper interfacing of the PFC F-Con (condition switch positions)

Perform the isolation procedures as described above.

If the problem still cannot be diagnosed, contact HKS USA, Inc. for trouble shooting assistance.

HKS PERFORMANCE PARTS NOTICE

These parts have been designed and are intended for off-highway application only. Federal and many State laws prohibit the removal, modification, or rendering inoperable of any device or element of design affecting vehicle emission or safety in a vehicle used on public highways. Violation of such laws may subject the owner or user to a fine or penalty. Installation of this product may void the warranty coverage, if any, on your vehicle. Vehicles modified by the use of performance products may no longer be lawfully be used on public highways. This product is not legal for sale or use in California on any pollution controlled motor vehicles.

HKS USA, INC. LIMITED WARRANTY

HKS FCD: All HKS FCD units are bench tested for proper operation prior to being shipped. Inspect the contents of this package prior to installation. HKS USA, Inc. warrants this product, prior to the point of installation, against defects in materials and workmanship. NO WARRANTY WILL BE HONORED AFTER THE PRODUCT HAS BEEN INSTALLED ON THE VEHICLE. (continued below)

HKS PFC F-CON: HKS USA, Inc. warrants this product for a period of ninety (90) days, from the date of original purchase, against defects in materials and workmanship.

THE FOLLOWING WARRANTY INFORMATION APPLIES TO BOTH ABOVE LISTED HKS PRODUCTS: HKS's sole obligation under this warranty shall be limited to repair, replacement or credit, at HKS's option, provided, however, that this warranty shall apply only if HKS's examination of the returned product discloses a manufacturing defect. This warranty extends only to the original retail purchaser of the product.

IN NO EVENT SHALL HKS USA, INC. OR ANY HKS DEALER OR DISTRIBUTOR, BE LIABLE FOR ANY LOSS, INCONVENIENCE OR DAMAGE, WHETHER DIRECT, INCIDENTAL, CONSEQUENTIAL OR OTHERWISE RESULTING FROM BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, WITH RESPECT TO ANY HKS PRODUCT, EXCEPT AS EXPRESSLY SET FORTH HEREIN. NO ACTION FOR BREACH OF IMPLIED WARRANTY OR MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, MAY BE COMMENCED AFTER THE END OF THE PERIOD OF THE EXPRESS WARRANTY SET FORTH ABOVE.

Some States do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

When making a claim under this warranty, contact the dealer from whom the product was purchased to obtain a Returned Goods Authorization (RGA) number. Attach to the product your name, address, telephone number with area code, a description of the problem and proof of date of retail purchase (invoice copy).

Return the product, freight charges prepaid, to the HKS dealer from whom the product was purchased, or in the event the product was purchased directly from HKS, to HKS USA, Inc. at the address shown below.

This warranty does not include the cost of removal or reinstallation of the product, and does not apply if the product has been damaged by accident, abuse, misuse or misapplication, or as a result of service or modification by a party other than HKS USA, Inc. No person or representative is authorized to extend any warranties, on behalf of HKS, other than the warranty expressed herein. This warranty gives you specific legal rights and you may also have other rights which vary from State to State.