# Fuel System

# GENERAL

EFHA0010

## GENERAL SPECIFICATIONS

| Items | | | | Specifications |
|---|---|---|---|---|
| Throttle body | Throttle position sensor (TPS) | Type | | Variable resistor |
| | | Resistance at curb idle | 2.0 I4 | 3.5 ~ 6.5 KΩ |
| | | | 2.7 V6 | 1.6 ~ 2.4 KΩ |
| | | Output voltage at curb idle | 2.0 I4 | 300 ~ 900 mV |
| | | | 2.7 V6 | 250 ~ 800 mV |
| | Idle speed control (ISC) actuator | Type | | Double Coil |
| | | Resistance | | 90 ~ 110 Hz |
| Sensors | Air flow sensor | Type | 2.0 I4 | MAP sensor |
| | | | 2.7 V6 | HOT Film sensor |
| | Intake air temperature (IAT) sensor | Type | 2.0 I4 & 2.7 V6 | Thermistor type |
| | | Resistance | | 2.33 ~ 2.97 KΩ at 20°C (68°F) |
| | Engine coolant temperature (ECT) sensor | Type | | Thermistor type |
| | | Resistance | | 2.5 KΩ at 20°C (68°F) |
| | | | | 0.3 KΩ at 80°C (176°F) |
| | Heated oxygen sensor (HO2S) | Type | 2.0 I4 | Zirconia type |
| | | | 2.7 V6 | Titania type |
| | Vehicle speed sensor | Type | | Hall effect type |
| | Camshaft position (CMP) sensor | Type | | Hall effect sensor |
| | Crankshaft position (CKP) sensor | Type | | Hall effect sensor |
| Actuators | Injector | Type, number | 2.0 I4 | Electromagnetic type, 4 |
| | | | 2.7 V6 | Electromagnetic type, 6 |
| | | Resistance | | 13 ~ 16Ω at 20°C (68°F) |
| | Evaporative emission purge solenoid | Type | | Duty cycle type |
| Fuel pressure regulator | Pressure regulator | | | 300 ± 1.5 kPa (3.35 ± 0.06 kg/cm$^2$) |
| Fuel tank | Tank capacity (2.0 I4)<br>Tank capacity (2.7 V6)<br>Return system | | | 65 lit (14.3 Imp.gal)<br>75 lit (16.5 Imp.gal)<br>Equipped |
| Canister | Volume/Nominal working capacity | | | 3.0 liter/150g |

## SEALANT

EFA90020

| Item | Specified sealant |
|---|---|
| Engine coolant temperature sensor | LOCTITE 962T or equivalent |

## SERVICE STANDARDS

EFHA0030

| Items | | | Standard value |
|---|---|---|---|
| Basic ignition timing | 2.0 I4 | | BTDC 10° ± 5° at curb idle |
| | 2.7 V6 | | BTDC 12° ± 8° at curb idle |
| Curb idle speed (rpm) | 2.0 I4 | D-range (A/T) | 750 ± 100 |
| | | P,N-range | 800 ± 100 (A/CON OFF) |
| | | (A/T, M/T) | 900 ± 100 (A/CON ON) |
| | 2.7 V6 | D-range (A/T) | 725 ± 100 |
| | | P,N-range | 725 ± 100 (A/CON OFF) |
| | | (A/T, M/T) | 900 ± 100 (A/CON ON) |
| Fuel pressure kPa (psi) | Vacuum hose disconnection | | 330 ~ 350 (47-50) at curb idle |
| | Vacuum hose connection | | Approx. 270 (38) at curb idle |
| Evap canister purge solenoid valve resistance | | | 20-32Ω |

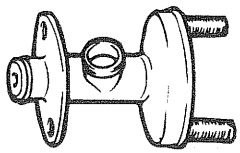
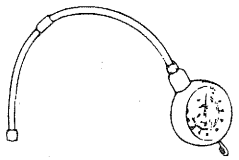
## TIGHTENING TORQUE

EFA90040

| Item | Nm | Kg.cm | lb.ft |
|---|---|---|---|
| Delivery pipe installation bolt | 10-15 | 100-150 | 7-11 |
| Engine coolant temperature sensor | 20-40 | 200-400 | 14-29 |
| Heated oxygen sensor | 40-50 | 400-500 | 29-36 |
| Heated oxygen sensor connector bracket bolt | 8-12 | 80-120 | 5.8-8.7 |
| Fuel pressure regulator installation bolt | 4-6 | 40-60 | 2.9-4.4 |
| High pressure hose and fuel main pipe | 30-40 | 300-400 | 22-29 |
| High pressure hose and fuel filter | 25-35 | 250-350 | 18-25 |
| High pressure hose to delivery pip | 3-4 | 30-40 | 2.2-3 |
| Fuel pump assembly to fuel tank | 2-3 | 20-30 | 1.4-2.2 |
| High pressure hose at fuel tank | 30-40 | 300-400 | 22-29 |
| Throttle body to surge tank | 15-20 | 150-200 | 11-14 |
| Fuel tank drain plug | 15-25 | 150-250 | 11-18 |
| Fuel filter mounting bolts | 9-14 | 90-140 | 6.5-10 |
| Accelerator arm bracket bolts | 8-12 | 80-120 | 5.8-8.7 |
| ISC actuator | 6-8 | 60-80 | 4.4-5.8 |
| Fuel sender to fuel tank | 2-3 | 20-30 | 1.4-2.2 |

## SPECIAL TOOLS

EFA90050

| Tool (Number and name) | Illustration | Use |
|---|---|---|
| 09353-38000<br>Fuel pressure gauge adapter |  <br>EFA9005A | Connection of fuel pressure gauge to delivery pipe for measurement of fuel pressure. |
| 09353-24100<br>Fuel pressure gauge & hose |  <br>EFA9005B | |

## TROUBLESHOOTING EFA90060

When checking engine trouble, it is important to start with an inspection of the basic systems. If one of the following conditions exists, (A) engine start failure, (B) unstable idling or (C) poor acceleration, begin by checking the following basic systems.

1. Power supply
    - Battery
    - Fusible link
    - Fuse
2. Body ground
3. Fuel supply
    - Fuel line
    - Fuel filter
    - Fuel pump
4. Ignition system
    - Spark plug
    - High-tension cable
    - Ignition coil
5. Emission control system
    - PCV system
    - Vacuum leak
6. Others
    - ignition timing
    - Idle speed

Trouble with the MFI system is often caused by poor contact of the harness connectors. It is important to check all harness connectors and verify that they are securely connected.

## TROUBLESHOOTING GUIDE

## CHART EFDA0070

| Main Symptoms / Sub-Symptoms / Check points | STARTING | | | | | | | Poor Idling | | | | | Poor Driving | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unable to start | | | Difficult to start | | | | | | | | | | |
| | Engine does not turn over | Starter runs but engine does not turn over | Incomplete combustion | Engine turns over | Always | When the engine is cold | When the engine is hot | Incorrect fast idle | High idle speed | Low idle speed | Rough idling | Engine hesitates or accelerates poorly | Surging | Knocking |
| Starter relay | 1 | | | | | | | | | | | | | |
| Starter | 2 | 2 | | 1 | | | | | | | | | | |
| PNP SW [A/T] or Clutch start SW [M/T] | 3 | | | | | | | | | | | | | |
| Flywheel [M/T] or Drive plate [A/T] | | 4 | | | | | | | | | | | | |
| Mass air flow sensor circuit | | | 3 | | | | | | | 3 | 10 | 7 | | |
| Idle speed control actuator | | | 4 | | 3 | 3 | 3 | 3 | 3 | 2 | 7 | | | 2 |
| Fuel pressure regulator | | | 5 | | 5 | 5 | 5 | | | | 4 | 11 | 1 | |
| ECT sensor circuit | | | 6 | | 4 | 1 | 1 | 2 | 2 | 1 | 2 | 8 | 6 | |
| Compression | | | 7 | | 8 | | | | | | 8 | 5 | | |
| Piston ring | | | 8 | | 9 | | | | | | 9 | | | |
| Ignition timing | | | | | 10 | | | | | | 11 | 14 | | |
| Timing mark | | | 9 | | | | | | | | 12 | | | |
| Injectors | | | 10 | | 13 | 8 | 8 | | 7 | 4 | 13 | 15 | 4 | |
| ECM | | | 11 | | 14 | 9 | 9 | 4 | 8 | 5 | 14 | 16 | 5 | |
| A/C circuit | | | | 2 | | | | | 6 | | | | | |
| Connecting rod bearing | | | | 3 | | | | | | | | | | |
| Crankshaft bearing | | | | 4 | | | | | | | | | | |
| Fuel quality | | | | | 1 | 2 | 2 | | | | 1 | 3 | 3 | |
| Spark plugs | | | | | 2 | | | | | | 3 | 4 | 2 | |
| Fuel pump | | | | | 6 | 6 | 6 | | | | 5 | 12 | | |
| Fuel lines | | | | | 7 | 7 | 7 | | | | 6 | 13 | | |
| Ignition circuit | | | 2 | | 11 | | | | | | | | | 3 |
| Intake air temp. sensor circuit | | | | | 12 | 4 | 4 | | 4 | | | 9 | | 1 |
| Accelerator pedal link | | | | | | | | 1 | 1 | | | | | |
| TP Sensor circuit | | | | | | | | | 5 | | | 6 | | |
| Cylinder head | | | | | | | | | | | 15 | | | |
| Clutch [M/T] | | | | | | | | | | | | 1 | | |
| Brakes not releasing properly | | | | | | | | | | | | 2 | | |
| Oxygen sensor circuit | | | | | | | | | | | | 10 | | |
| Crankshaft position sensor | | 3 | | | | | | | | | | | | |
| Battery voltage | | 1 | 1 | | | | | | | | | | | |

EFDA007A

| Main Symptoms / Sub-Symptoms / Check points | Engine Stalls | | | | Others | | | Refueling |
|---|---|---|---|---|---|---|---|---|
| | Soon after starting | After accelerator pedal is depressed | After accelerator pedal is released | During A/C ON | Excessive fuel consumption | Engine overheats | Engine too cool | Hard to refuel Overflowing spit-Back |
| Fuel quality | 1 | | | | | | | |
| Fuel pressure regulator | 2 | 4 | | | 2 | | | |
| Fuel pump | 3 | | | | | | | |
| Fuel lines | 4 | 5 | | | | | | |
| ISC actuator | 5 | | 1 | 2 | | | | |
| MAF sensor circuit | 6 | 1 | 2 | | 13 | | | |
| ECT sensor circuit | 7 | | | | 11 | | | |
| Injectors | 8 | 6 | | | 10 | | | |
| ECM | 9 | 7 | 3 | 3 | 17 | | | |
| TP Sensor circuit | | 2 | | | 12 | | | |
| Spark plug | | 3 | | | 6 | 8 | | |
| A/C circuit | | | | 1 | 14 | | | |
| Fuel leakage | | | | | 1 | | | |
| Accelerator pedal link | | | | | 3 | | | |
| Clutch [M/T] | | | | | 4 | | | |
| Brakes drag when released | | | | | 5 | | | |
| Compression | | | | | 7 | | | |
| Piston ring | | | | | 8 | | | |
| Ignition timing | | | | | 9 | | | |
| Oxygen sensor circuit | | | | | 15 | | | |
| Intake air temp. sensor circuit | | | | | 16 | | | |
| Coolant leakage | | | | | | 1 | | |
| Cooling fan | | | | | | 2 | 1 | |
| Thermo switch | | | | | | 3 | | |
| Radiator and radiator cap | | | | | | 4 | 2 | |
| Thermostat | | | | | | 5 | | |
| Timing belt | | | | | | 6 | | |
| Engine coolant pump | | | | | | 7 | | |
| Oil pump | | | | | | 9 | | |
| Cylinder head | | | | | | 10 | | |
| Cylinder block | | | | | | 11 | | |
| ECT sender | | | | | | 12 | 3 | |
| Crankshaft position sensor | 11 | 8 | 4 | 4 | | | | |
| Fill vent valve hose-clogging | | | | | | | | 1 |
| Canister fillter-Contamination | | | | | | | | 2 |
| Fuel shut off valve-operation | | | | | | | | 3 |

EFDA007B

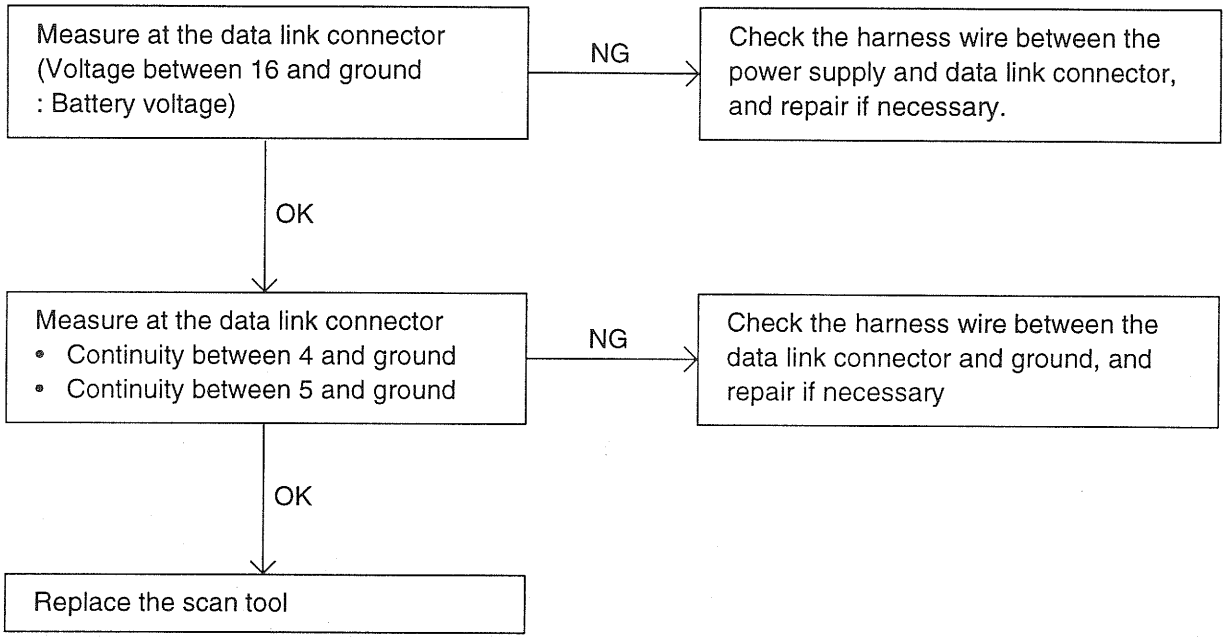
## NOTE

**The number herein means the check order.**

## MFI TROUBLESHOOTING PROCEDURES EFA90080

### PROBLEM

**Communication with scan tool is not possible.**
**(Communication with all system is not possible)**

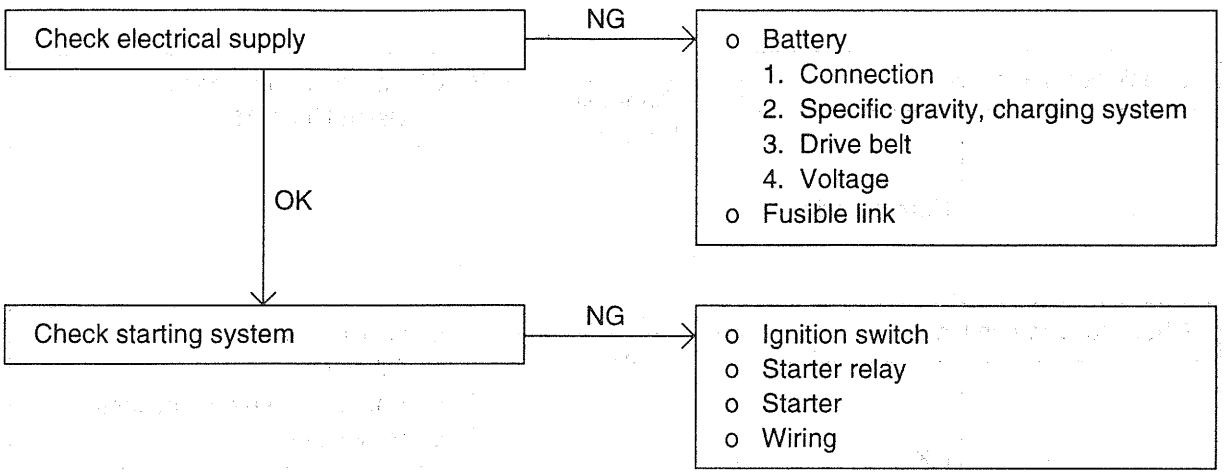



EFA9008A

## SCAN TOOL COMMUNICATION WITH ECM IS NOT POSSIBLE EFA90090

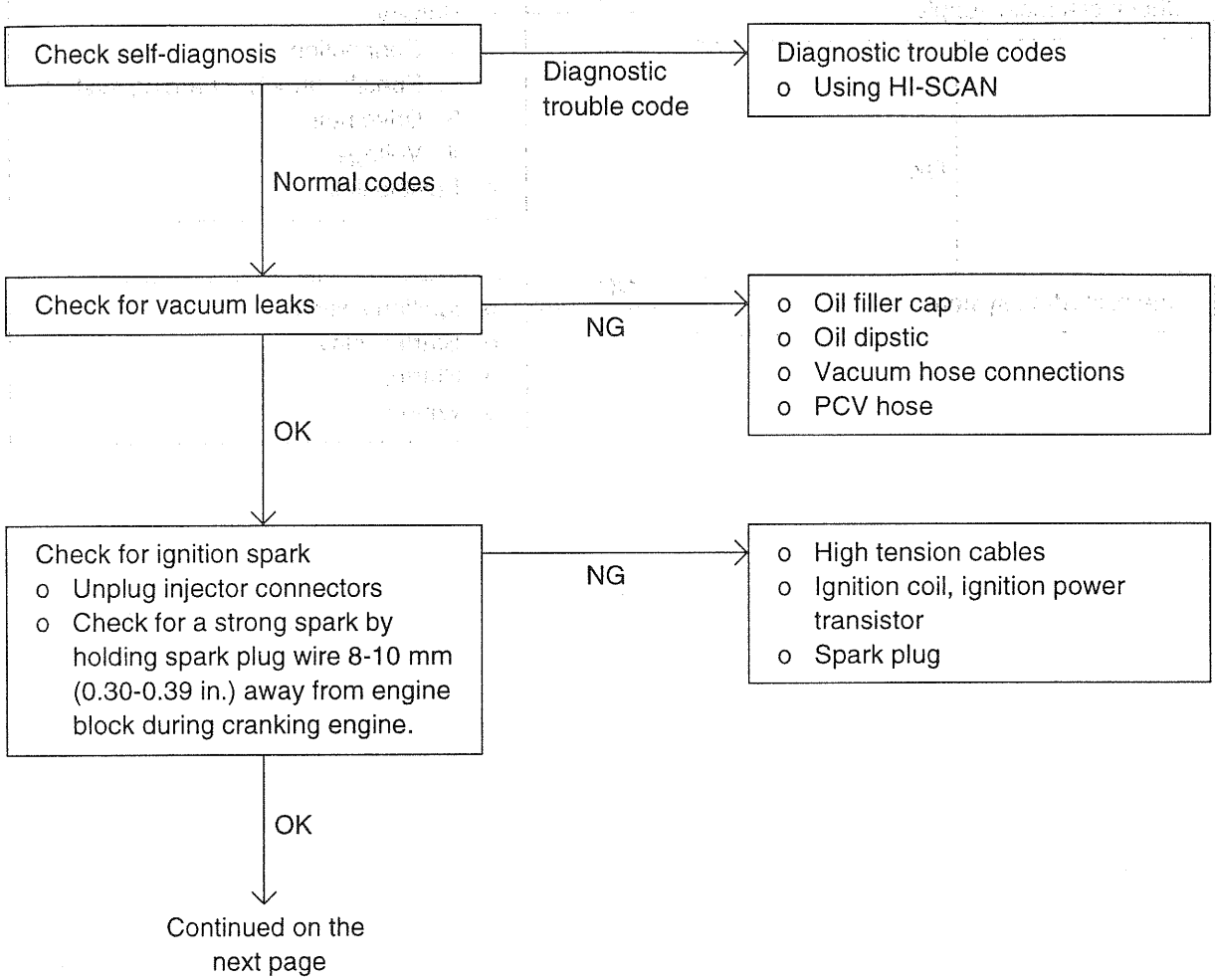
| Comment | Probable cause |
|---|---|
| One of the following causes may be suspected<br>• No power supply to ECM<br>• Defective ground circuit of ECM<br>• Defective ECM<br>• Improper communication line between ECM and scan tool | • Malfunction of ECM power supply circuit.<br>• Malfunction of the ECM.<br>• Open circuit between ECM and DLC. |

## ENGINE WILL NOT START EFA90100

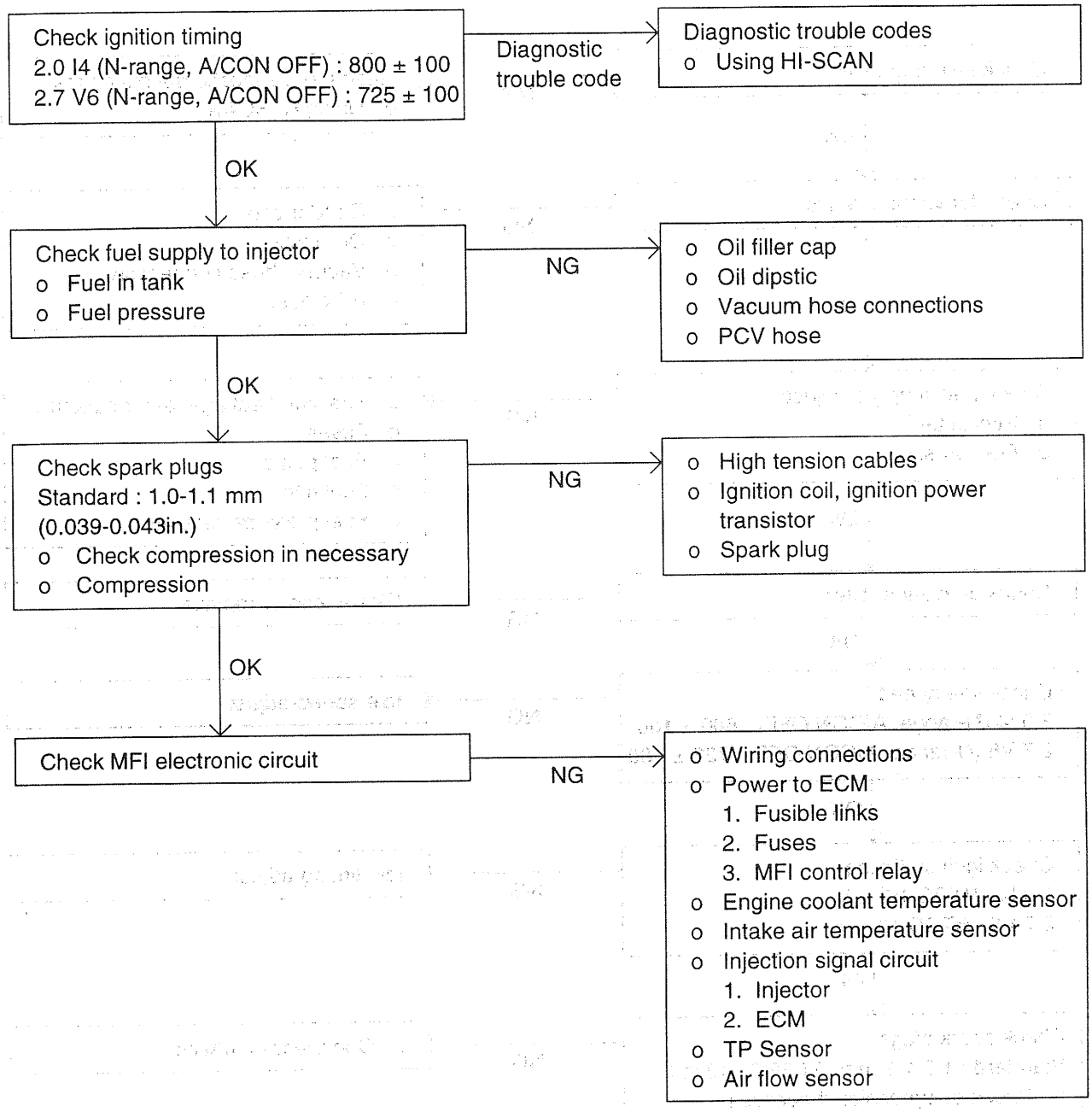



EFA9010A

## DIFFICULT TO START (ENGINE TURNS OVER) EFHA0110

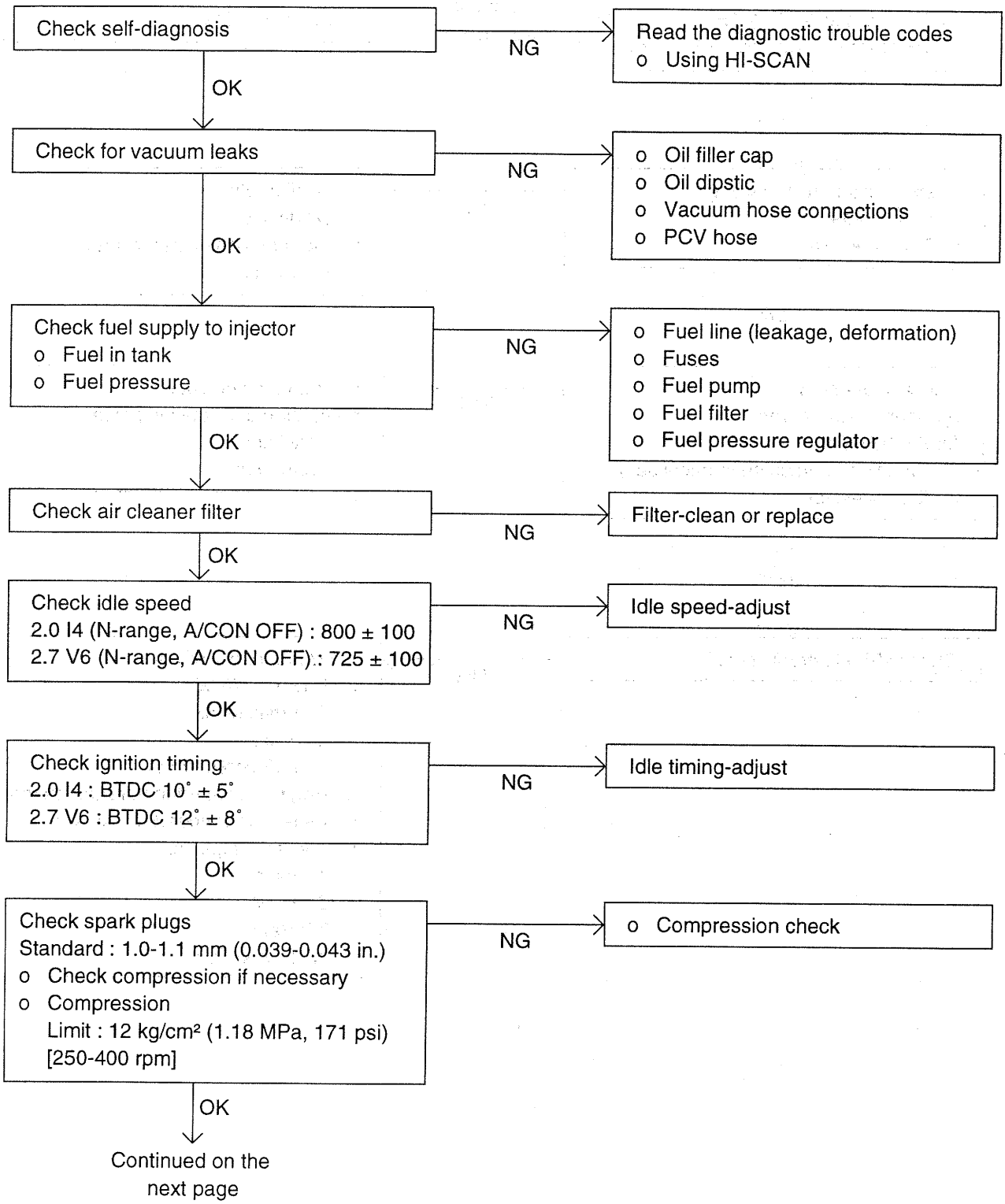



EFA9011A

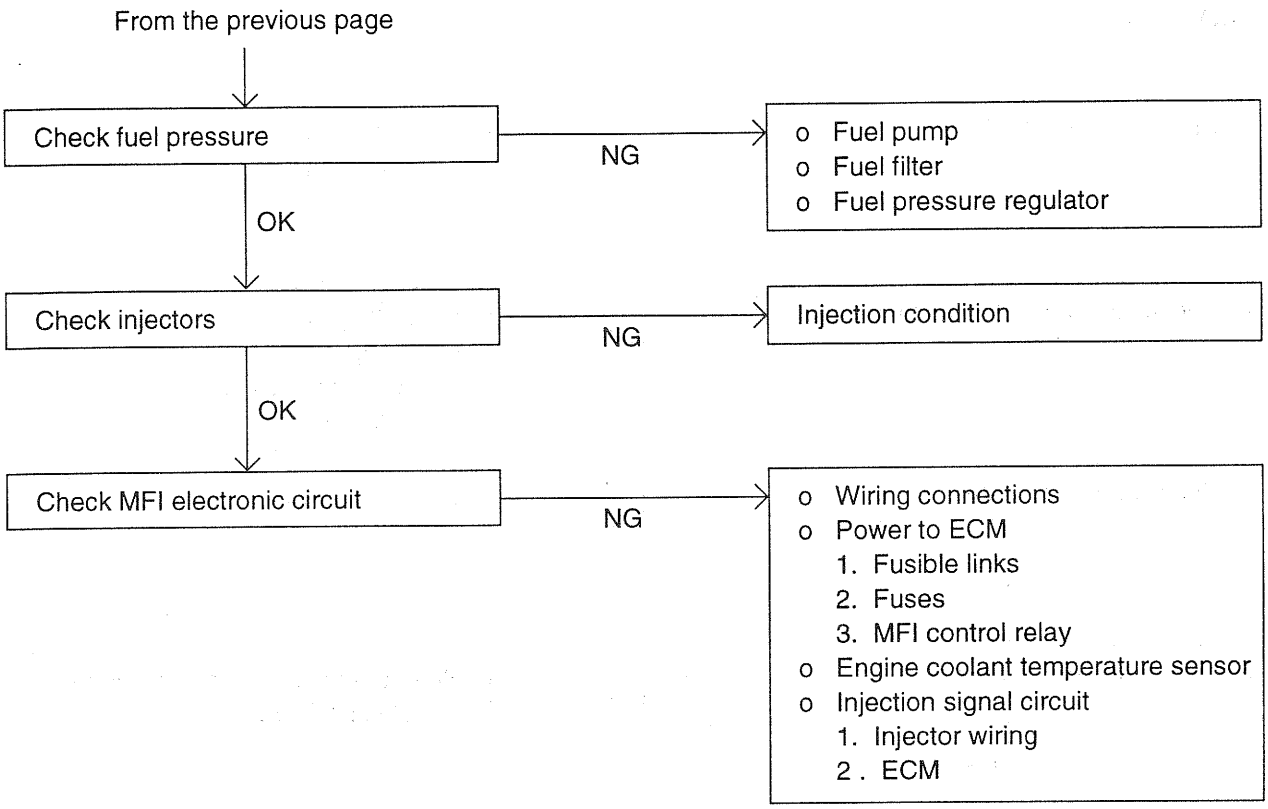

Check ignition timing
2.0 I4 (N-range, A/CON OFF) : 800 ± 100
2.7 V6 (N-range, A/CON OFF) : 725 ± 100
Diagnostic trouble code
Diagnostic trouble codes
o Using HI-SCAN
OK
Check fuel supply to injector
o Fuel in tank
o Fuel pressure
NG
o Oil filler cap
o Oil dipstic
o Vacuum hose connections
o PCV hose
OK
Check spark plugs
Standard : 1.0-1.1 mm
(0.039-0.043in.)
o Check compression in necessary
o Compression
NG
o High tension cables
o Ignition coil, ignition power transistor
o Spark plug
OK
Check MFI electronic circuit
NG
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Intake air temperature sensor
o Injection signal circuit
1. Injector
2. ECM
o TP Sensor
o Air flow sensor

EFHA011B

## ROUGH IDLE OR ENGINE STALLS EFHA0120

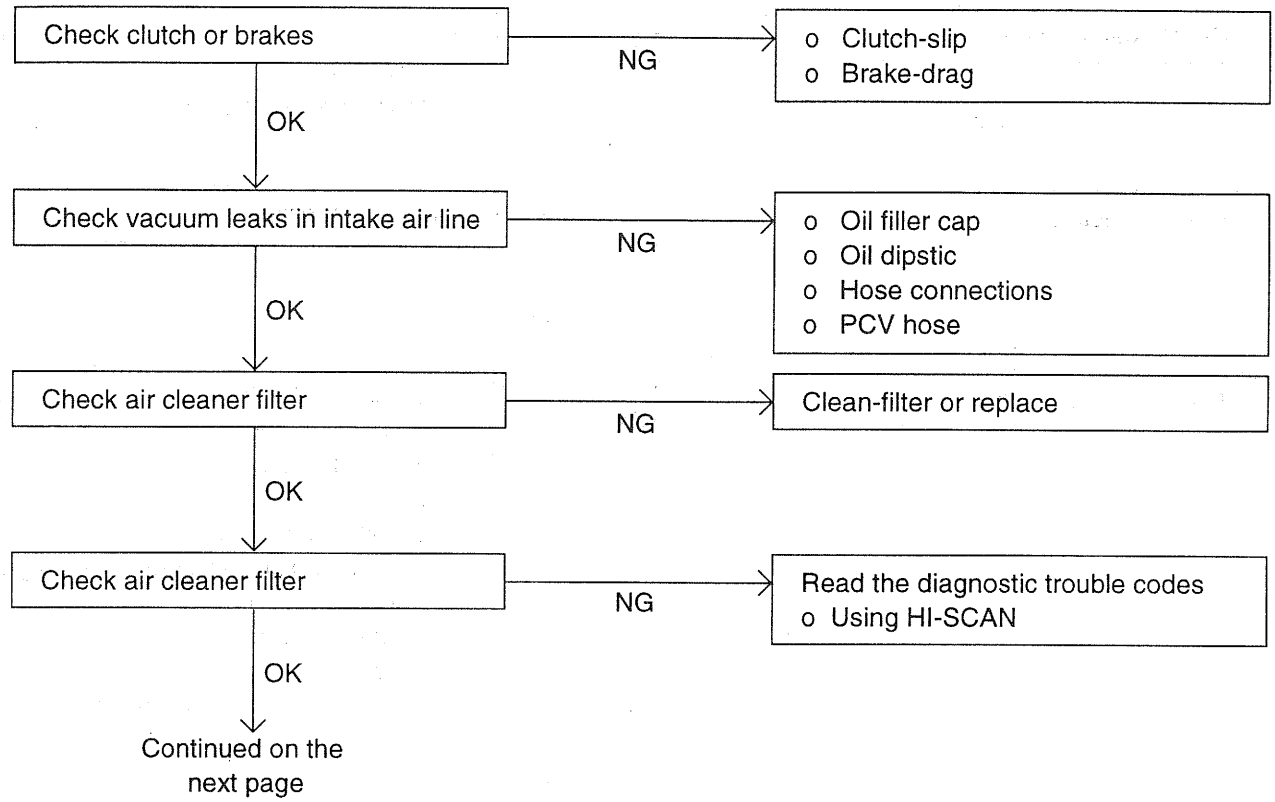



EFHA012A

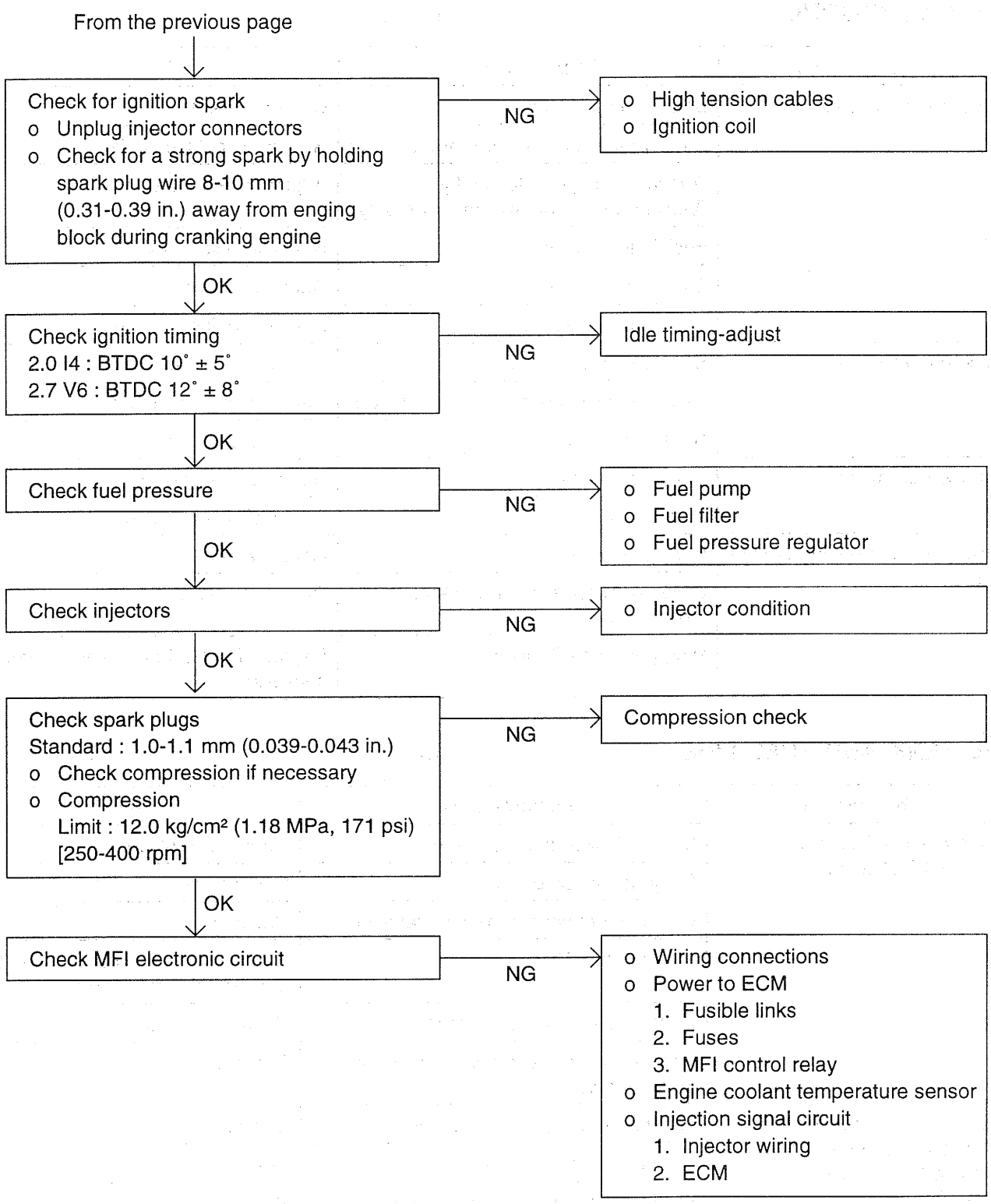

From the previous page
Check fuel pressure
NG
o Fuel pump
o Fuel filter
o Fuel pressure regulator
OK
Check injectors
NG
Injection condition
OK
Check MFI electronic circuit
NG
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Injection signal circuit
1. Injector wiring
2 . ECM

EFA9012B

## ENGINE HESITATES OR ACCELERATES POORLY EFHA0130




EFA9013A


From the previous page
Check for ignition spark
o Unplug injector connectors
o Check for a strong spark by holding spark plug wire 8-10 mm (0.31-0.39 in.) away from enging block during cranking engine
NG
o High tension cables
o Ignition coil
OK
Check ignition timing
2.0 I4 : BTDC 10° ± 5°
2.7 V6 : BTDC 12° ± 8°
NG
Idle timing-adjust
OK
Check fuel pressure
NG
o Fuel pump
o Fuel filter
o Fuel pressure regulator
OK
Check injectors
NG
o Injector condition
OK
Check spark plugs
Standard : 1.0-1.1 mm (0.039-0.043 in.)
o Check compression if necessary
o Compression
Limit : 12.0 kg/cm² (1.18 MPa, 171 psi) [250-400 rpm]
NG
Compression check
OK
Check MFI electronic circuit
NG
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Injection signal circuit
1. Injector wiring
2. ECM

EFHA013B

## TROUBLESHOOTING

EFA90140

| Trouble symptom | Probable cause | Remedy |
|---|---|---|
| Engine will not crank. | Battery charge low | Charge or replace battery |
| | Battery cables loose, corroded or worn | Repair or replace cables |
| | Transaxle range switch faulty (Vehicle with automatic transaxle only) | Adjust or replace switch |
| | Fusible link blown | Replace fusible link |
| | Starter motor faulty | Repair starter motor |
| | Ignition switch faulty | Replace ignition switch |
| Engine cranks slowly | Battery charge low | Charge or replace battery |
| | Battery cables loose, corroded or worn | Repair or replace cables |
| | Starter motor faulty | Repair starter motor |
| Starter keeps running | Starter motor faulty | Repair starter motor |
| | Ignition switch faulty | Replace ignition switch |
| Starter spins but engine will not crank | Short in wiring | Repair wiring |
| | Pinion gear teeth broken or starter motor faulty | Repair starter motor |
| | Ring gear teeth broken | Replace flywheel ring gear or torque converter |

## FUEL TANK AND FUEL LINE

EFA90150

| Trouble symptom | Probable cause | Remedy |
|---|---|---|
| Engine malfunctions due to insufficient fuel supply | Bent or kinked fuel pipe or hose | Repair or replace |
| | Clogged fuel pipe or hose | Clean or replace. |
| | Clogged fuel filter of in-tank fuel filter | Replace |
| | Water in fuel filter | Replace the fuel filter or clean the fuel tank and fuel lines |
| | Dirty or rusted fuel tank interior | Clean or replace |
| | Malfunctioning fuel pump (Clogged filter in the pump) | Replace |
| Evaporative emission system malfunctions (when fuel filler cap is removed, pressure is released) | Incorrect routing of a vapor line | Correct |
| | Disconnected vapor line | Correct |
| | Folded, bent, cracked or clogged vapor line | Replace |
| | Faulty fuel tank cap | Replace |
| | Malfunctioning overfill limiter (Two-way valve) | Replace |

## MULTIPORT FUEL INJECTION (MFI) EFA90160

### GENERAL INFORMATION

The Multiport Fuel Injection System consists of sensors which detect the engine conditions, the ENGINE CONTROL MODULE (ECM) which controls the system based on signals from these sensors, and actuators which operate under the control of the ECM. The ECM carries out activities such as fuel injection control, idle air control and ignition timing control. In addition, the ECM is equipped with several diagnostic test modes which simplify troubleshooting when a problem occurs.

### FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions. A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank by the fuel pump. with the pressure being regulated by the fuel pressure regulator. The fuel thus regulated is distributed to each of the injectors. Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2. This is called multiport. The ECM provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance. In addition, when the engine is warm or operating under normal conditions, the ECM controls the air/fuel mixture by using the heated oxygen sensor signal to carry out "closed-loop" control in order to obtain the theoretical air/fuel mixture ratio that provides the maximum cleaning performance from the three way catalyst.

### IDLE SPEED CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling. The ECM drives the idle speed control (ISC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and air conditioning load. In addition, when the air conditioning switch is turned off and on while the engine is idling, the ISC motor operates to adjust the throttle valve bypass air amount in accordance with the engine load conditions in order to avoid fluctuations in the engine speed.

### IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing in order to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the ECM from the engine speed, intake air volume, engine coolant temperature and atmospheric pressure.

## OTHER CONTROL FUNCTIONS EFA90170

1. Fuel Pump Control. :
   Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Compressor Clutch Relay Control. :
   Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control. :
   The radiator fan and condenser fan speeds are controlled in response to the engine coolant temperature and vehicle speed.
4. Evaporative Emission Purge Control (Refer to GROUP EC).

## DIAGNOSTIC TEST MODE EFA90180

- When an abnormality is detected in one of the sensors or actuators related to emission control, the CHECK ENGINE/MALFUNCTION INDICATOR LAMP illuminates as a warning to the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the abnormality is output.
- The RAM data inside the ECM that is related to the sensors and actuators can be read by means of the scan tool In addition, the actuators can be controlled under certain circumstances.

## HOW TO COPE WITH INTERMITTENT MALFUNCTIONS EFA90190

Most intermittent malfunctions occur under certain conditions. If those conditions can be identified, the cause will be easier to find.

### TO COPE WITH INTERMITTENT MALFUNCTION;

1. Ask the customer about the malfunction.
   Ask what it feels like, what it sounds like, etc. Then ask about driving conditions, weather, frequency of occurrence, and so on.
2. Determine the conditions from the customer's responses.
   Typically, almost all intermittent malfunctions occur from conditions like vibration, temperature and/or moisture change, poor connections. From the customer's replies, it should be reasoned which condition is influenced.
3. Use the simulation test

In the cases of vibration or poor connections, use the simulation tests below to attempt to duplicate the customer's complaint. Determine the most likely circuit(s) and perform the simulation tests on the connectors and parts of that circuit(s). Be sure to use the inspection procedures provided for diagnostic trouble codes and trouble symptoms. For temperature and/or moisture conditions related intermittent malfunctions, using common sense, try to change the conditions of the suspected circuit components, then use the simulation tests below.

4. Verify the intermittent malfunction is eliminated. Repair the malfunctioning part and try to duplicate the condition(s) again to verify the intermittent malfunction has been eliminated.

### SIMULATION TESTS

For these simulation tests, shake, then gently bend, pull and twist the wiring of each of these examples to duplicate the intermittent malfunction.

- Shake the connector up-and-down, right-and-left.
- Shake the wiring harness up-and-down, right-and-left.
- Vibrate the part or sensor.

## SERVICE POINTS IN INSPECTING A BLOWN FUSE EFAA0200

Remove the fuse and measure the resistance between the load side of the fuse and ground. Set the switches of all circuits which are connected to this fuse to a condition of continuity. If the resistance is almost 0Ω at this time, there is a shortage somewhere between these switches and the load. If the resistance is not 0Ω, there is no shortage at the present time, but a momentary shortage has probably caused the fuse to blow.

The main causes of a short circuit are the following.

- Harness being clamped by the vehicle body.
- Damage to the outer casing of the harness due to wear or heat.
- Water getting into the connector or circuitry.
- Human error (mistakenly shorting a circuit, etc.).

## INSPECTING THE MFI SYSTEM EFHA0210

If the MFI system components (sensors, ECM, injector, etc.) fail, the interruption or failure to supply the proper amount of fuel for various engine operating conditions will result. The following situations may be encountered:

1. Engine is hard to start or does not start at all
2. Unstable idle
3. Poor driveability

If any of the above conditions is noted, first perform an inspection by self-diagnosis and subsequent basic engine checks (ignition system malfunction, incorrect engine adjustment, etc.), and then inspect the MFI system components.

### ON-BOARD DIAGNOSTICS

- The recording condition of diagnostic trouble code. After the ECM first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. (Malfunction is detected in driving cycle). However, for fuel system rich/lean misfiring, a diagnostic trouble code is recorded on the first detection of the malfunction.
- The erasing condition of diagnostic trouble code. After recording the diagnostic trouble code, if the ECM does not re-detect the malfunction for 40 driving cycles, the diagnostic trouble code will be erased from the ECM memory. However, for fuel system rich/lean or misfiring, the diagnostic trouble code will be erased under the following conditions.
  - When driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.
  - When the ECM does not re-detect the malfunction for 80 driving cycles.

### NOTE

**A "driving cycle" consists of the engine start, vehicle operation beyond the beginning of closed loop operation.**

### MALFUNCTION INDICATOR LIGHT (MIL)

An On Board Diagnostic lamp lights up to notify the driver that there is a problem with the vehicle.

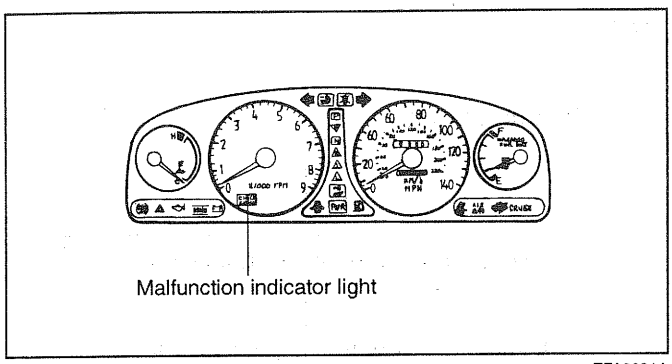
However MIL will go off automatically after 3 subsequent sequential driving cycles that do not redetected the same malfunctions.

Immediately after the ignition switch is turned on, the malfunction indicator light is lit for 5 seconds to indicate that the malfunction indicator light operates normally.

Following Items will be indicated by the MIL

- Catalyst
- Fuel system
- Air flow sensor (MAF sensor)
- Intake Air Temperature Sensor (IAT sensor)
- Engine Coolant Temperature Sensor (ECT sensor)
- Throttle Position Sensor (TPS)
- Upstream Oxygen Sensor
- Downstream Oxygen Sensor Heater
- Downstream Oxygen Sensor
- Upstream Oxygen Sensor Heater

- Injector
- Misfire
- Crankshaft Position Sensor (CKP sensor)
- Camshaft Position Sensor (CMP sensor)
- Evaporative Emission Control System
- Vehicle Speed Sensor (VSS)
- Idle Speed Control
- ECM
- Manifold Absolute Pressure (MAP) Sensor (Except 2.5L V6 engine)
- Idle Switch
- EGR System (Except 2.5L V6 engine)




EFA9021A

## INSPECTING THE MALFUNCTION INDICATOR LAMP (MIL)

1. After turning on the ignition key, check that the light illuminates for 5 seconds without the engine running.
2. If the light does not illuminate, check for an open circuit in harness, blown fuse and blown bulb.

## SELF-DIAGNOSIS

The ECM monitors the input/output signals (some signals at all times and others under specified conditions). When the ECM detects that an irregularity, it memorizes the diagnostic trouble code, and outputs the signal to the self-diagnosis output terminal. The diagnosis results can be read by the Generic Scan Tool (GST). Diagnostic trouble code (DTC) will remain in the ECM as long as battery power is maintained. The diagnostic trouble code will however be erased when the battery terminal or the engine control module (ECM) connector is disconnected or erased by the Generic Scan Tool.

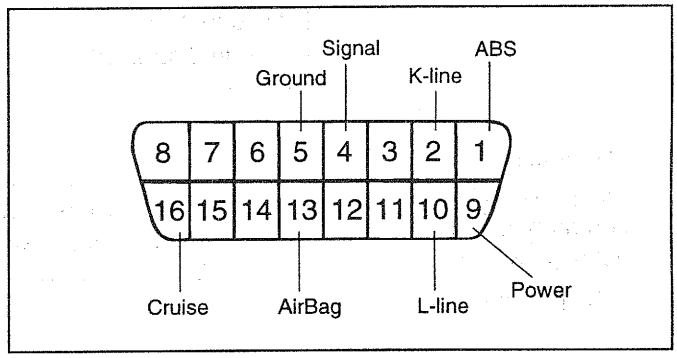
## CHECKING PROCEDURE (SELF-DIAGNOSIS)

### NOTE

1. **When battery voltage is low, diagnostic trouble codes can not be read. Be sure to check the battery for voltage and charging system before starting the test.**
2. **Diagnosis memory is erased if the battery or the ECM connector is disconnected. Do not disconnect the battery before the diagnostic trouble codes are completely read and recorded.**

### Inspection Procedure (Using Generic Scan Tool)

1. Turn OFF the ignition switch.
2. Connect the scan tool to the data link connector on the lower crash pad.
3. Turn ON the ignition switch.
4. Use the GST to check the diagnostic trouble code.
5. Repair the faulty part from the diagnosis chart.
6. Erase the diagnostic trouble code.
7. Disconnect the GST.

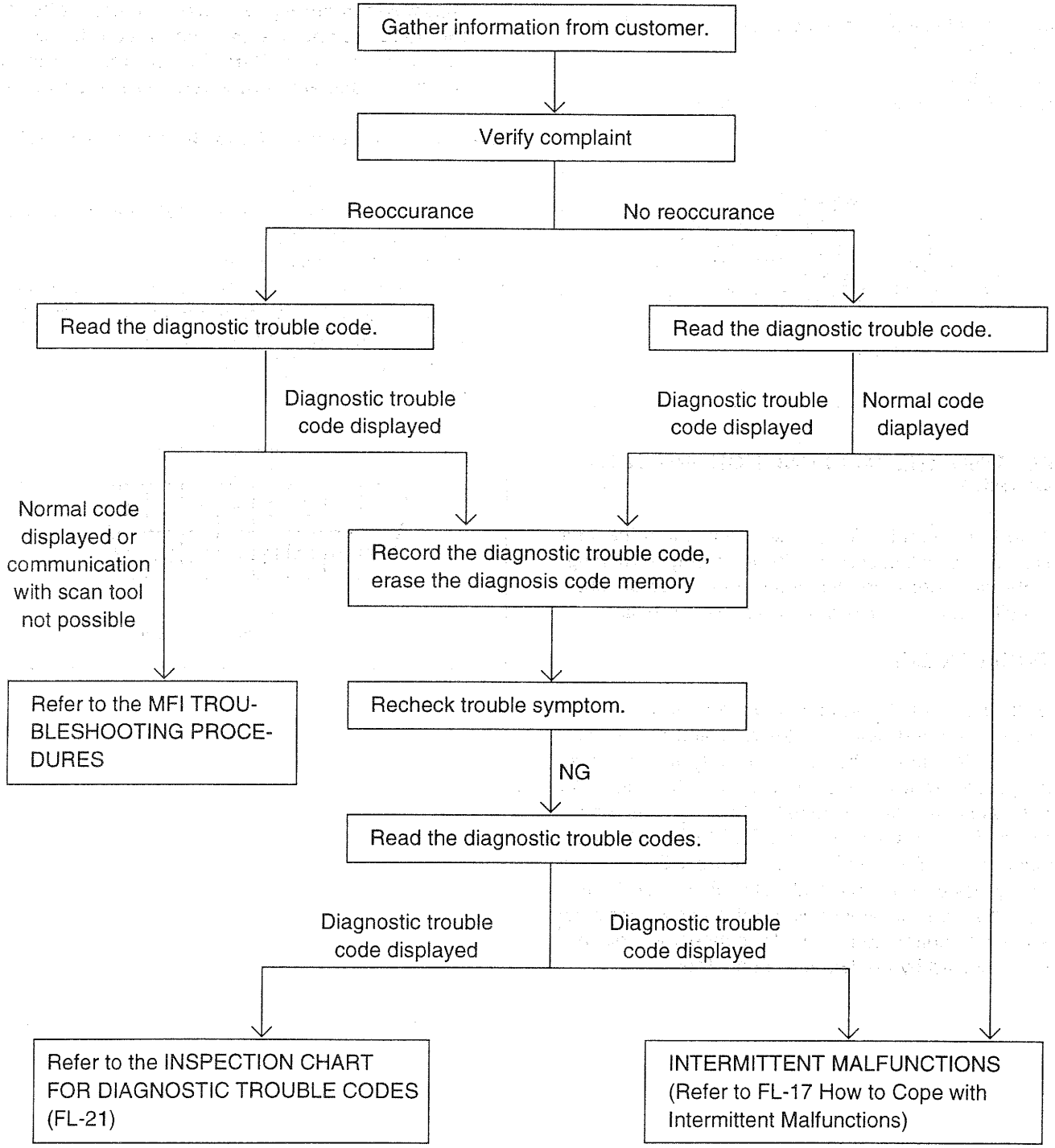



EFHA021B

# MFI CONTROL SYSTEM

## TROUBLESHOOTING EFHA0220

### DIAGNOSTIC TROUBLESHOOTING FLOW




EFHA022A

## INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR 2.0 I4 OBD-II) EFHA0240

[FOR 2.0 I4 OBD-II]

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0107 | Manifold Absolute Pressure Sensor Low Voltage | O | O |
| P0108 | Manifold Absolute Pressure Sensor High Voltage | O | O |
| P0112 | Intake Air Temp. Low Voltage | O | O |
| P0113 | Intake Air Temp. High Voltage | O | O |
| P0115 (FL-106) | Engine Coolant Temp. Circuit Malfunction | O | O |
| P0116 | Engine Coolant Temp. Sensor Drift | O | O |
| P0122 | Throttle Position Sensor Low Voltage | O | O |
| P0123 | Throttle Position Sensor High Voltage | O | O |
| P0132 | Oxygen Sensor Circuit Open (Bank 1, Sensor 1) | O | O |
| P0133 (FL-114) | Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1) | O | O |
| P0134 (FL-119) | Excessive Time to Enter Closed Loop Fuel Control | O | O |
| P0135 (FL-122) | Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 1) | O | O |
| P0136 (FL-125) | Oxygen Sensor Circuit Open (Bank 1, Sensor 2) | O | O |
| P0140 | Oxygen Sensor Circuit Short (Bank 1, Sensor 2) | O | O |
| P0141 (FL-130) | Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 2) | O | O |
| P0171 | Fuel System Too Lean | O | O |
| P0172 | Fuel System Too Rich | O | O |
| P0201 (FL-133) | Injector Circuit Malfunction (Cylinder -1,) | O | O |
| P0202 (FL-133) | Injector Circuit Malfunction (Cylinder -2) | O | O |
| P0203 (FL-133) | Injector Circuit Malfunction (Cylinder -3) | O | O |
| P0204 (FL-133) | Injector Circuit Malfunction (Cylinder -4) | O | O |
| P0300 (FL-137) | Random Misfire Detected | O | O |
| P0301 (FL-142) | Misfire Detected (Cylinder -1) | O | O |
| P0302 (FL-142) | Misfire Detected (Cylinder -2) | O | O |
| P0303 (FL-142) | Misfire Detected (Cylinder -3) | O | O |
| P0304 (FL-142) | Misfire Detected (Cylinder -4) | O | O |
| P0325 | Knock Sensor Circuit Malfunction | O | X |
| P0335 (FL-145) | Crankshaft Position Sensor Circuit Malfunction | O | O |
| P0340 (FL-148) | Camshaft Position Sensor Circuit Malfunction | O | O |
| P0350 | Ignition Coil Malfunction | O | O |
| P0421 (FL-150) | Warm-up Catalyst Efficiency Below Threshold | O | O |

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0443 (FL-152) | Evaporative Emission Control System Purge Control Valve Circuit Malfunction | O | O |
| P0500 (FL-155) | Vehicle Speed Sensor Malfunction | O | O |
| P0507 | Idle Speed Control - High RPM | O | O |
| P1330 | Spark Timing Adjust Malfunction | O | O |

**[FOR 2.0 I4 NON OBD-II]**

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0105 (FL-99) | Manifold Absolute Pressure Sensor Malfunction | O | O |
| P0110 (FL-103) | Intake Air Temp. Circuit Malfunction | O | O |
| P0115 (FL-106) | Engine Coolant Temp. Circuit Malfunction | O | O |
| P0120 (FL-110) | Throttle Position Circuit Malfunction | O | O |
| P0130 (FL-114) | Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1) | O | O |
| P0136 (FL-125) | Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 2) | O | O |
| P0201 (FL-133) | Injector Circuit Malfunction (Cylinder -1,) | O | O |
| P0202 (FL-133) | Injector Circuit Malfunction (Cylinder -2) | O | O |
| P0203 (FL-133) | Injector Circuit Malfunction (Cylinder -3) | O | O |
| P0204 (FL-133) | Injector Circuit Malfunction (Cylinder -4) | O | O |
| P0325 | Knock Sensor Circuit Malfunction | O | X |
| P0335 (FL-145) | Crankshaft Position Sensor Circuit Malfunction | O | O |
| P0340 (FL-148) | Camshaft Position Sensor Circuit Malfunction | O | O |
| P0350 | Ignition Coil Malfunction | O | O |
| P0500 (FL-155) | Vehicle Speed Sensor Malfunction | O | X |
| P1330 | Spark Timing Adjust Malfunction | O | O |

## INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR 2.7 V6) EFHA0242

**[FOR 2.7 V6 OBD-II]**

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0100 | Mass or Volume Air Flow Circuit Malfunction | O | O |
| P0101 | Mass or volume Air Flow Circuit Range/Performance Problem | O | X |
| P0110 | Intake Air Temperature Circuit Malfunction | O | O |
| P0115 | Engine Coolant Temperature Circuit Malfunction | O | O |
| P0120 | Throttle Pedal Position Circuit Malfunction | O | O |
| P0121 | Throttle/Pedal Position Circuit Range/Performance problem | O | X |
| P0130 | O2 Sensor Circuit Malfunction (Bank 1 Sensor 1) | O | O |

## INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR 2.0 I4 OBD-II) EFHA0240

[FOR 2.0 I4 OBD-II]

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0107 | Manifold Absolute Pressure Sensor Low Voltage | O | O |
| P0108 | Manifold Absolute Pressure Sensor High Voltage | O | O |
| P0112 | Intake Air Temp. Low Voltage | O | O |
| P0113 | Intake Air Temp. High Voltage | O | O |
| P0115 (FL-106) | Engine Coolant Temp. Circuit Malfunction | O | O |
| P0116 | Engine Coolant Temp. Sensor Drift | O | O |
| P0122 | Throttle Position Sensor Low Voltage | O | O |
| P0123 | Throttle Position Sensor High Voltage | O | O |
| P0132 | Oxygen Sensor Circuit Open (Bank 1, Sensor 1) | O | O |
| P0133 (FL-114) | Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1) | O | O |
| P0134 (FL-119) | Excessive Time to Enter Closed Loop Fuel Control | O | O |
| P0135 (FL-122) | Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 1) | O | O |
| P0136 (FL-125) | Oxygen Sensor Circuit Open (Bank 1, Sensor 2) | O | O |
| P0140 | Oxygen Sensor Circuit Short (Bank 1, Sensor 2) | O | O |
| P0141 (FL-130) | Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 2) | O | O |
| P0171 | Fuel System Too Lean | O | O |
| P0172 | Fuel System Too Rich | O | O |
| P0201 (FL-133) | Injector Circuit Malfunction (Cylinder -1,) | O | O |
| P0202 (FL-133) | Injector Circuit Malfunction (Cylinder -2) | O | O |
| P0203 (FL-133) | Injector Circuit Malfunction (Cylinder -3) | O | O |
| P0204 (FL-133) | Injector Circuit Malfunction (Cylinder -4) | O | O |
| P0300 (FL-137) | Random Misfire Detected | O | O |
| P0301 (FL-142) | Misfire Detected (Cylinder -1) | O | O |
| P0302 (FL-142) | Misfire Detected (Cylinder -2) | O | O |
| P0303 (FL-142) | Misfire Detected (Cylinder -3) | O | O |
| P0304 (FL-142) | Misfire Detected (Cylinder -4) | O | O |
| P0325 | Knock Sensor Circuit Malfunction | O | X |
| P0335 (FL-145) | Crankshaft Position Sensor Circuit Malfunction | O | O |
| P0340 (FL-148) | Camshaft Position Sensor Circuit Malfunction | O | O |
| P0350 | Ignition Coil Malfunction | O | O |
| P0421 (FL-150) | Warm-up Catalyst Efficiency Below Threshold | O | O |

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0443 (FL-152) | Evaporative Emission Control System Purge Control Valve Circuit Malfunction | O | O |
| P0500 (FL-155) | Vehicle Speed Sensor Malfunction | O | O |
| P0507 | Idle Speed Control - High RPM | O | O |
| P1330 | Spark Timing Adjust Malfunction | O | O |

**[FOR 2.0 I4 NON OBD-II]**

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0105 (FL-99) | Manifold Absolute Pressure Sensor Malfunction | O | O |
| P0110 (FL-103) | Intake Air Temp. Circuit Malfunction | O | O |
| P0115 (FL-106) | Engine Coolant Temp. Circuit Malfunction | O | O |
| P0120 (FL-110) | Throttle Position Circuit Malfunction | O | O |
| P0130 (FL-114) | Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1) | O | O |
| P0136 (FL-125) | Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 2) | O | O |
| P0201 (FL-133) | Injector Circuit Malfunction (Cylinder -1,) | O | O |
| P0202 (FL-133) | Injector Circuit Malfunction (Cylinder -2) | O | O |
| P0203 (FL-133) | Injector Circuit Malfunction (Cylinder -3) | O | O |
| P0204 (FL-133) | Injector Circuit Malfunction (Cylinder -4) | O | O |
| P0325 | Knock Sensor Circuit Malfunction | O | X |
| P0335 (FL-145) | Crankshaft Position Sensor Circuit Malfunction | O | O |
| P0340 (FL-148) | Camshaft Position Sensor Circuit Malfunction | O | O |
| P0350 | Ignition Coil Malfunction | O | O |
| P0500 (FL-155) | Vehicle Speed Sensor Malfunction | O | X |
| P1330 | Spark Timing Adjust Malfunction | O | O |

## INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR 2.7 V6) EFHA0242

**[FOR 2.7 V6 OBD-II]**

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0100 | Mass or Volume Air Flow Circuit Malfunction | O | O |
| P0101 | Mass or volume Air Flow Circuit Range/Performance Problem | O | X |
| P0110 | Intake Air Temperature Circuit Malfunction | O | O |
| P0115 | Engine Coolant Temperature Circuit Malfunction | O | O |
| P0120 | Throttle Pedal Position Circuit Malfunction | O | O |
| P0121 | Throttle/Pedal Position Circuit Range/Performance problem | O | X |
| P0130 | O2 Sensor Circuit Malfunction (Bank 1 Sensor 1) | O | O |

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0150 | O2 Sensor Circuit Malfunction (Bank 2 Sensor 1) | O | O |
| P0133 | O2 Sensor Circuit Slow Response (Bank 1 Sensor 1) | O | O |
| P0153 | O2 Sensor Circuit Slow Response (Bank 2 Sensor 1) | O | O |
| P0134 | O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1) | O | X |
| P0154 | O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1) | O | X |
| P0135 | O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 1) | O | O |
| P0155 | O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 1) | O | O |
| P0136 | O2 Sensor Circuit Malfunction (Bank 1 Sensor 2) | O | O |
| P0156 | O2 Sensor Circuit Malfunction (Bank 2 Sensor 2) | O | O |
| P0140 | Downstream O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2) | O | X |
| P0160 | Downstream O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2) | O | X |
| P0141 | O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 2) | O | O |
| P0161 | O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 2) | O | O |
| P0170 | Fuel Trim Malfunction (Bank 1) | O | O |
| P0173 | Fuel Trim Malfunction (Bank 2) | O | O |
| P0201 | Cylinder 1 - Injector Circuit Malfunction | O | O |
| P0202 | Cylinder 2 - Injector Circuit Malfunction | O | O |
| P0203 | Cylinder 3 - Injector Circuit Malfunction | O | O |
| P0204 | Cylinder 4 - Injector Circuit Malfunction | O | O |
| P0205 | Cylinder 5 - Injector Circuit Malfunction | O | O |
| P0206 | Cylinder 6 - Injector Circuit Malfunction | O | O |
| P0230 | Fuel Pump Circuit Malfunction | O | X |
| P0301 | Cylinder 1 - Misfire Detected | O | O |
| P0302 | Cylinder 2 - Misfire Detected | O | O |
| P0303 | Cylinder 3 - Misfire Detected | O | O |
| P0304 | Cylinder 4 - Misfire Detected | O | O |
| P0305 | Cylinder 5 - Misfire Detected | O | O |
| P0306 | Cylinder 6 - Misfire Detected | O | O |
| P0325 | Knock Sensor 1 Circuit Malfunction | O | X |
| P0330 | Knock Sensor 2 Circuit Malfunction | O | X |
| P0335 | Crankshaft Position Sensor 'A' Circuit Malfunction | O | O |
| P0340 | Camshaft Position Sensor (TDC Sensor) Circuit Malfunction | O | O |
| P0350 | Ignition Coil Primary/Secondary Circuit Malfunction | O | X |
| P0351 | Ignition Coil 'A' Primary/Secondary Circuit Malfunction | O | X |
| P0352 | Ignition Coil 'B' Primary/Secondary Circuit Malfunction | O | X |

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0353 | Ignition Coil 'C' Primary/Secondary Circuit Malfunction | O | X |
| P0354 | Ignition Coil 'D' Primary/Secondary Circuit Malfunction | O | X |
| P0355 | Ignition Coil 'E' Primary/Secondary Circuit Malfunction | O | X |
| P0356 | Ignition Coil 'F' Primary/Secondary Circuit Malfunction | O | X |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1) | O | O |
| P0430 | Catalyst System Efficiency Below Threshold (Bank 2) | O | O |
| P0443 | Purge Control Valve Circuit Malfunction | O | O |
| P0500 | For OBD2 Rough Road Detection, Vehicle Speed Malfunction From ABS/TCS | O | O |
| | For OBD2 Rough Road Detection, Vehicle Speed Malfunction From Front Right Inductive Wheel Sensor | O | O |
| P0505 | Idle Control System Malfunction (Mechanical Error) | O | X |
| P0506 | Idle Speed Control RPM Lower Than Expected | O | X |
| P0507 | Idle Speed Control RPM Higher Than Expected | O | X |
| P0550 | Powersteering Pressure Sensor Circuit Malfunction | O | X |
| P1134 | O2 Sensor Circuit - Transition Switch Time Malfunction/Slop (Bank 1 Sensor 1) | O | O |
| P1154 | O2 Sensor Circuit - Transition Switch Time Malfunction/Slop (Bank 2 Sensor 1) | O | O |
| P1166 | O2 Sensor - Controller Adaption Diagnosis Malfunction (Bank 1) | O | O |
| P1167 | O2 Sensor - Controller Adaption Diagnosis Malfunction (Bank 2) | O | O |
| P1372 | Segment Time Acquisition Incorrect | O | O |
| P1510 | Idle Charge Actuator Command Signal Incorrect (Coil 1) | O | O |
| P1511 | Idle Charge Actuator Command Signal Incorrect (Coil 2) | O | O |
| P1529 | Customer Snapshot (MIL Request/Freeze Frame) Request VIA CAN | O | O |
| P1602 | Serial Communication Problem With TCU (TIMEOUT) | O | O |
| P1613 | ECU - Selftest Failed | O | X |
| P1616 | Main Relay Malfunction | O | X |
| P1623 | Diagnostic Lamp powerstage Malfunction | O | X |
| P1624 | Cooling Fan Relay - Circuit Malfunction ("LOW" Circuit) | O | X |
| P1625 | Cooling Fan Relay - Circuit Malfunction ("HIGH" Circuit) | O | X |

**[FOR 2.7 V6 NON OBD-II]**

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0100 | Mass or Volume Air Flow Circuit Malfunction | O | X |
| P0110 | Intake Air Temperature Circuit Malfunction | O | X |
| P0115 | Engine Coolant Temperature Circuit Malfunction | O | X |

| DTC NO. | CONTENT | Memory | MIL |
|---|---|---|---|
| P0120 | Throttle Pedal Position Circuit Malfunction | O | X |
| P0130 | O2 Sensor Circuit Malfunction (Bank 1 Sensor 1) | O | X |
| P0150 | O2 Sensor Circuit Malfunction (Bank 2 Sensor 1) | O | X |
| P0134 | O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1) | O | X |
| P0154 | O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1) | O | X |
| P0135 | O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 1) | O | X |
| P0155 | O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 1) | O | X |
| P0201 | Cylinder 1 - Injector Circuit Malfunction | O | X |
| P0202 | Cylinder 2 - Injector Circuit Malfunction | O | X |
| P0203 | Cylinder 3 - Injector Circuit Malfunction | O | X |
| P0204 | Cylinder 4 - Injector Circuit Malfunction | O | X |
| P0205 | Cylinder 5 - Injector Circuit Malfunction | O | X |
| P0206 | Cylinder 6 - Injector Circuit Malfunction | O | X |
| P0230 | Fuel Pump Circuit Malfunction | O | X |
| P0325 | Knock Sensor 1 Circuit Malfunction | O | X |
| P0330 | Knock Sensor 2 Circuit Malfunction | O | X |
| P0335 | Crankshaft Position Sensor 'A' Circuit Malfunction | O | X |
| P0340 | Camshaft Position Sensor (TDC Sensor) Circuit Malfunction | O | X |
| P0350 | Ignition Coil Primary/Secondary Circuit Malfunction | O | X |
| P0351 | Ignition Coil 'A' Primary/Secondary Circuit Malfunction | O | X |
| P0352 | Ignition Coil 'B' Primary/Secondary Circuit Malfunction | O | X |
| P0353 | Ignition Coil 'C' Primary/Secondary Circuit Malfunction | O | X |
| P0354 | Ignition Coil 'D' Primary/Secondary Circuit Malfunction | O | X |
| P0355 | Ignition Coil 'E' Primary/Secondary Circuit Malfunction | O | X |
| P0356 | Ignition Coil 'F' Primary/Secondary Circuit Malfunction | O | X |
| P0500 | For OBD2 Rough Road Detection, Vehicle Speed Malfunction From ABS/TCS | O | X |
| | For OBD2 Rough Road Detection, Vehicle Speed Malfunction From Front Right Inductive Wheel Sensor | O | X |
| P1166 | O2 Sensor - Controller Adaption Diagnosis Malfunction (Bank 1) | O | X |
| P1167 | O2 Sensor - Controller Adaption Diagnosis Malfunction (Bank 2) | O | X |
| P1510 | Idle Charge Actuator Command Signal Incorrect (Coil 1) | O | X |
| P1511 | Idle Charge Actuator Command Signal Incorrect (Coil 2) | O | X |
| P1602 | Serial Communication Problem With TCU (TIMEOUT) | O | X |
| P1613 | ECU - Self-test Failed | O | X |
| P1616 | Main Relay Malfunction | O | X |

## TROUBLE AREA RELATED TO DTC (FOR 2.0 I4)

EFHA0243

| DTC No. | Diagnostic items | Check items (Remedy) |
|---|---|---|
| P0110 | Intake Air Temperature Circuit Malfunction | • Harness and connector<br>• Intake air temperature sensor<br>• Open or short in intake air temp. sensor circuit<br>• Intake air temp. sensor<br>• ECM |
| P0115 | Engine Coolant Temperature Circuit Malfunction | • Harness and connector<br>• Engine coolant temperature sensor<br>• Open or short in engine coolant temp. sensor circuit<br>• ECM |
| P0120 | Throttle Position Circuit Malfunction | • Harness and connector<br>• Throttle position sensor<br>• Idle switch<br>• Open or short in throttle position sensor circuit<br>• ECM |
| P0130 | Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1) | • Harness and connector<br>• Oxygen sensor |
| P0133 | Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1) | |
| P0136 | Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2) | • Harness and connector<br>• Oxygen sensor (rear) |
| P0201 | Injector Circuit Malfunction - Cylinder 1 | • Harness and connector<br>• Injector |
| P0202 | Injector Circuit Malfunction - Cylinder 2 | |
| P0203 | Injector Circuit Malfunction - Cylinder 3 | |
| P0204 | Injector Circuit Malfunction - Cylinder 4 | |
| P0325 | Knock Sensor 1 Circuit Malfunction | • Open or short between knock sensor and ECM<br>• Harness and connector<br>• Knock sensor |
| P0335 | Crankshaft Position Sensor Circuit Malfunction | • Harness and connector<br>• Open or short in crankshaft position sensor<br>• Crankshaft position sensor<br>• ECM |
| P0340 | Camshaft Position Sensor Circuit Malfunction | • Harness and connector (If harness and connector are normal replace camshaft position sensor) |
| P0500 | Vehicle Speed Sensor Malfunction | • Harness and connector<br>• Vehicle speed sensor |

## TROUBLE AREA RELATED TO DTC (FOR 2.7 V6)

EFHA0244

| DTC No. | Diagnostic items | Trouble Area (Check Point) |
|---|---|---|
| P0100 | Mass or Volume Air Flow Circuit Malfunction | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor |
| P0101 | Mass or Volume Air Flow Circuit Range/ Performance Problem | • Foreign material deposit in the sensor<br>• Bad connection of connectors/bad wiring |
| P0110 | Intake Air Temperature Circuit Malfunction | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor |
| P0115 | Engine Coolant Temperature Circuit Malfunction | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor |
| P0120 | Throttle/Pedal Position Circuit Malfunction | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor |
| P0121 | Throttle/Pedal Position Circuit Range/ Performance Problem | • Sensor's wearness or improper installation<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor |
| P0130 | O2 Sensor Circuit Malfunction (Bank 1 Sensor 1) | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor (B1/S1) |
| P0150 | O2 Sensor Circuit Malfunction (Bank 2 Sensor 1) | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor (B2/S1) |
| P0133 | O2 Sensor Circuit Slow Response (Bank 1 Sensor 1) | • Sensor deteriorated or contamination deposit<br>• Sensor pin corrosion |
| P0153 | O2 Sensor Circuit Slow Response (Bank 2 Sensor 1) | • Sensor deteriorated or contamination deposit (B2/S1)<br>• Sensor pin corrosion |
| P0134 | O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1) | • Sensor deteriorated or contamination deposit (B1/S1)<br>• Sensor pin corrosion |
| P0154 | O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1) | • Sensor deteriorated or foreign material deposit (B2/S1)<br>• Sensor pin corrosion |
| P0135 | O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 1) | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor (B1/S1) |
| P0155 | O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 1) | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor (B2/S1) |
| P0136 | O2 Sensor Circuit Malfunction (Bank 1 Sensor 2) | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor (B1/S2) |
| P0156 | O2 Sensor Circuit Malfunction (Bank 2 Sensor 2) | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor (B2/S2) |

| DTC No. | Diagnostic items | Trouble Area (Check Point) |
|---|---|---|
| P0140 | Downstream O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2) | • Sensor deteriorated or contamination deposit |
| P0160 | Downstream O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2) | • Sensor deteriorated or contamination deposit |
| P0141 | O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 2) | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor (B1/S2) |
| P0161 | O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 2) | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Malfunction of the sensor (B2/S2) |
| P0170 | Fuel Trim Malfunction (Bank 1) | • Fuel system (Fuel tank/Press. regulator/Fuel pump/ PCSV)<br>• Connection of the fuel line hose/sealing/cut<br>• Sealing beween the purge valve and fuel tank<br>• Air leak in the exhaust system<br>• Ignition system<br>• Engine |
| P0173 | Fuel Trim Malfunction (Bank 2) | • Fuel system (Fuel tank/Press. regulator/Fuel pump/ PCSV)<br>• Connection of the fuel line hose/seatling/cut<br>• Sealing beween the purge valve and fuel tank<br>• Air leak in the exhaust system<br>• Ignition system<br>• Engine |
| P0201 | Cylinder 1 - Injector Circuit Malfunction | • Open or short between the injector and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad No.1 injector |
| P0202 | Cylinder 2 - Injector Circuit Malfunction | • Open or short between the injector and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad No.2 injector |
| P0203 | Cylinder 3 - Injector Circuit Malfunction | • Open or short between the injector and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad No.3 injector |
| P0204 | Cylinder 4 - Injector Circuit Malfunction | • Open or short between the injector and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad No.4 injector |
| P0205 | Cylinder 5 - Injector Circuit Malfunction | • Open or short between the injector and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad No.5 injector |
| P0206 | Cylinder 6 - Injector Circuit Malfunction | • Open or short between the injector and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad No.6 injector |
| P0230 | Fuel Pump Circuit Malfunction | • Open or short between the pump and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad pump relay |
| P0301 | Cylinder 1 - Misfire Detected | • Bad ignition system (Spark plug to ECM)<br>• Check the injector #1<br>• Check the moving time of HLA plunger |

| DTC No. | Diagnostic items | Trouble Area (Check Point) |
|---|---|---|
| P0302 | Cylinder 2 - Misfire Detected | • Bad ignition system (Spark plug to ECM)<br>• Check the injector #2<br>• Check the moving time of HLA plunger |
| P0303 | Cylinder 3 - Misfire Detected | • Bad ignition system (Spark plug to ECM)<br>• Check the injector #3<br>• Check the moving time of HLA plunger |
| P0304 | Cylinder 4 - Misfire Detected | • Bad ignition system (Spark plug to ECM)<br>• Check the injector #4<br>• Check the moving time of HLA plunger |
| P0305 | Cylinder 5 - Misfire Detected | • Bad ignition system (Spark plug to ECM)<br>• Check the injector #5<br>• Check the moving time of HLA plunger |
| P0306 | Cylinder 6 - Misfire Detected | • Bad ignition system (Spark plug to ECM)<br>• Check the injector #6<br>• Check the moving time of HLA plunger |
| P0325 | Knock Sensor 1 Circuit Malfunction | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad knock sensor in bank 1 |
| P0330 | Knock Sensor 2 Circuit Malfunction | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad knock sensor in bank 2 |
| P0335 | Crankshaft Position Sensor 'A' Circuit Malfunction | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad CKP sensor |
| P0340 | Camshaft Position Sensor (TDC Sensor) Circuit Malfunction | • Open or short between the sensor and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad CMP sensor |
| P0350 | Ignition Coil Primary/Secondary Circuit Malfunction | • Bad ignition system (Spark plug to ECM)<br>• Bad connection of connectors/bad wiring |
| P0351 | Ignition Coil 'A' Primary/Secondary Circuit Malfunction | • Bad ignition system (Spark plug to ECM)<br>• Bad connection of connectors/bad wiring |
| P0352 | Ignition Coil 'B' Primary/Secondary Circuit Malfunction | • Bad ignition system (Spark plug to ECM)<br>• Bad connection of connectors/bad wiring |
| P0353 | Ignition Coil 'C' Primary/Secondary Circuit Malfunction | • Bad ignition system (Spark plug to ECM)<br>• Bad connection of connectors/bad wiring |
| P0354 | Ignition Coil 'D' Primary/Secondary Circuit Malfunction | • Bad ignition system (Spark plug to ECM)<br>• Bad connection of connectors/bad wiring |
| P0355 | Ignition Coil 'E' Primary/Secondary Circuit Malfunction | • Bad ignition system (Spark plug to ECM)<br>• Bad connection of connectors/bad wiring |
| P0356 | Ignition Coil 'F' Primary/Secondary Circuit Malfunction | • Bad ignition system (Spark plug to ECM)<br>• Bad connection of connectors/bad wiring |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1) | • Catalytic converter melting/broken |
| P0430 | Catalyst System Efficiency Below Threshold (Bank 2) | • Catalytic converter melting/broken |

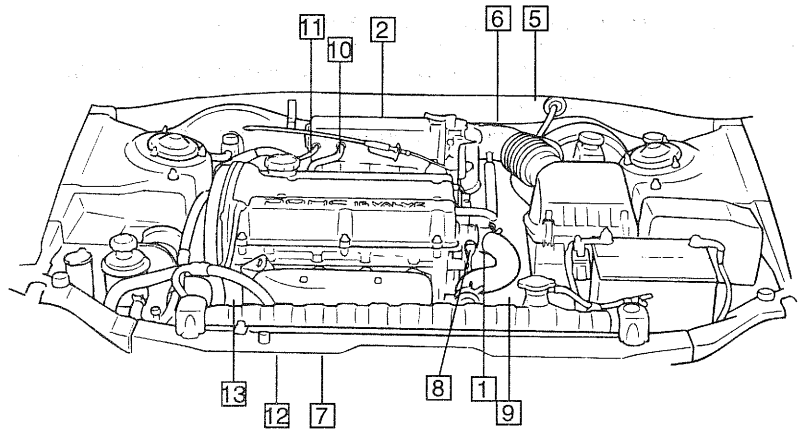
| DTC No. | Diagnostic items | Trouble Area (Check Point) |
|---|---|---|
| P0443 | Evap. Emission Control System - Purge Control Valve Circuit Malfunction | • Open or short between the PCSV and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad PCSV |
| P0500 | For OBD2 Rough Road Detection, Vehicle Speed Malfunction From ABS/ TCS | • Open or short between the TCS or ABS and ECM<br>• Check the connection of related parts<br>• Check the open or short<br>• Bad wheel sensor or TCS/ABS |
| | For OBD2 Rough Road Detection, Vehicle Speed Malfunction From Front Right Inductive Wheel Sensor | • Check the connection of related parts<br>• Check the open or short<br>• Bad wheel sensor |
| P0505 | Idle Control System Malfunction (Mechanical Error) | • ISA stick in the open position |
| P0506 | Idle Speed Control RPM Lower Than Expected | • Bad return spring of ISA or foreign material deposit |
| P0507 | Idle Speed Control RPM Higher Than Expected | • Bad return spring of ISA or foreign material deposit |
| P1134 | O2 Sensor circuit - Transition Switch Time Mulfunction/Slop (B1/S1) | • O2 sensor deteriorated or foreign material deposit |
| P1154 | O2 Sensor circuit - Transition Switch Time Mulfunction/Slop (B2/S1) | • O2 sensor deteriorated or foreign material deposit |
| P1166 | O2 Sensor - Controller Adaption diagnosis Malfunction (Bank 1) | • Fuel system (Fuel tank/Press. regulator/Fuel pump/ PCSV)<br>• Connection of the fuel line hose/sealing/cut<br>• Sealing beween the purge valve and fuel tank<br>• Air leak in the exhaust system<br>• Ignition system<br>• Engine |
| P1167 | O2 Sensor - Controller Adaption diagnosis Malfunction (Bank 2) | • Fuel system (Fuel tank/Press. regulator/Fuel pump/ PCSV)<br>• Connection of the fuel line hose/sealing/cut<br>• Sealing beween the purge valve and fuel tank<br>• Air leak in the exhaust system<br>• Ignition system<br>• Engine |
| P1372 | Segment Time Acquisition Incorrect | • Bad installation of tarqet wheel in crankshaft<br>• Bad signal of the CKP sensor<br>• Bad connection of connectors/bad wiring |
| P1510 | Idle Charge Actuator Command Signal Incorrect (Coil 1) | • Open or short between the ISA and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad ISA |
| P1511 | Idle Charge Actuator Command Signal Incorrect (Coil 2) | • Open or short between the ISA and ECM<br>• Bad connection of connectors/bad wiring<br>• Bad ISA |
| P1529 | Customer Snapshot (MIL Request/ Freeze Frame) Request Via Can | • TCM error (check the TCM DTC) |
| P1602 | Serial Communication Problem With TCU (Timeout) | • Open or short of CAN wire<br>• Bad TCM |

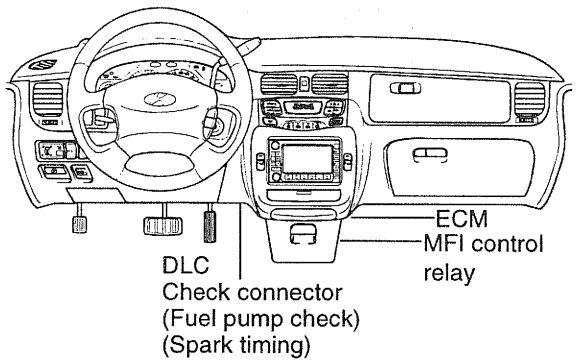
| DTC No. | Diagnostic items | Trouble Area (Check Point) |
|---|---|---|
| P1616 | Main Relay Malfunction | • Bad main relay<br>• Open battery fuse<br>• Bad connection of connectors/bad wiring |
| P1623 | Diagnostic Lamp Powerstage Malfunction | • Open or short between the MIL lamp and ECM<br>• Bad MIL lamp<br>• Bad connection of connectors/bad wiring |
| P1624 | Cooling Fan Relay - Circuit Malfunction ("LOW" Circuit) | • Open or short between the cooling fan and ECM<br>• Bad main relay<br>• Bad connection of connectors/bad wiring |
| P1625 | Cooling Fan Relay - Circuit Malfunction ("HIGH" Circuit) | • Open or short between the cooling fan and ECM<br>• Bad main relay<br>• Bad connection of connectors/bad wiring |

## MFI COMPONENT INSPECTION EFHA0250

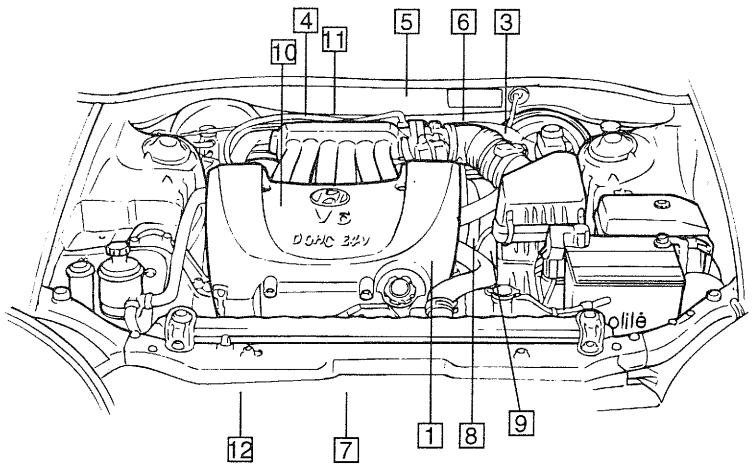
### LOCATION OF MFI COMPONENTS

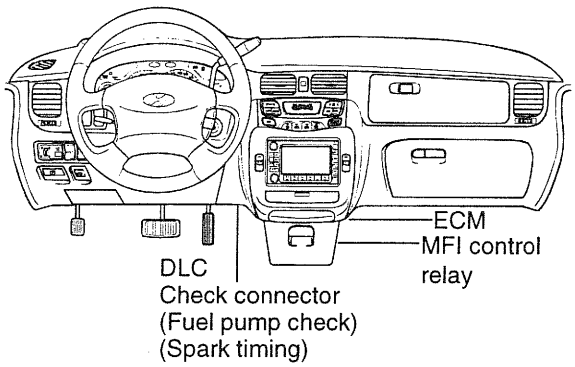
[2.0 I4]




[2.7 V6]



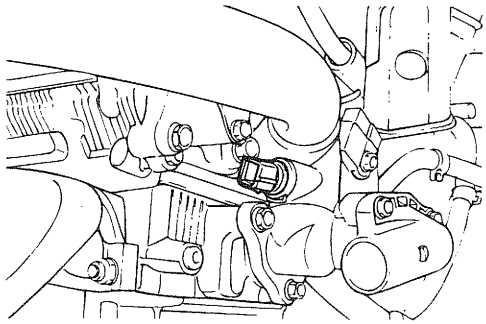

EFHA025A

1 Engine coolant temperature (ECT) sensor. (FL-36)
2 Manifold absolute (MAP) sensor. (FL-40)
3 Mass air flow sensor (Hot film sensor) (FL-43)
4 Intake air temperature (IAT) sensor (FL-40, 46)
5 Throttle position sensor (TPS) (FL-49)
6 Idle speed actuator (ISA) (FL-52)
7 Heated oxygen sensor (HO2S) (FL-55, 58)
8 Camshaft position sensor (CMP) (FL-61)
9 Crankshaft position sensor (CKP) (FL-65)
10 Injector (FL-69, 71)
11 Evap. canister purge control solenoid valve (PCSV) (FL-74)
12 Knock sensor (FL-77)
13 Power steering oil pressure switch (FL-80)



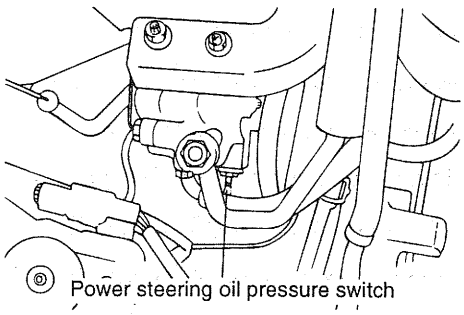
EFHA025B

ECT Sensor



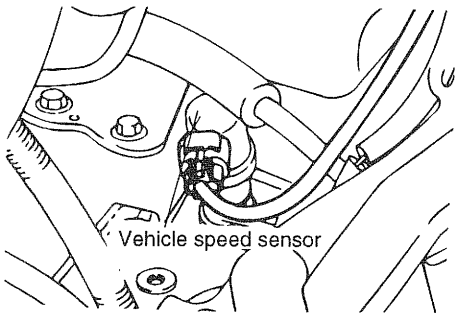
EFA9025C

Power Steering Oil Pressure Switch



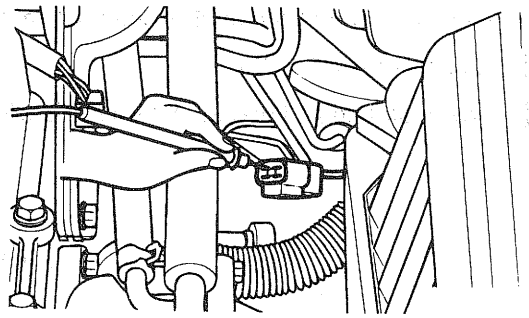

EFA9025D

Vehicle Speed Sensor



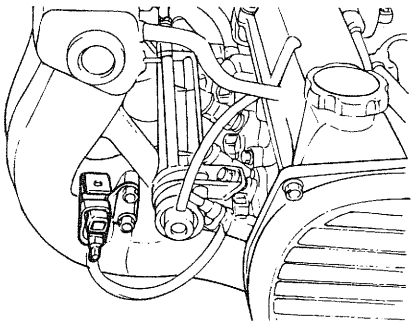

EFA9025E

Ignition Timing Adjustment Terminal



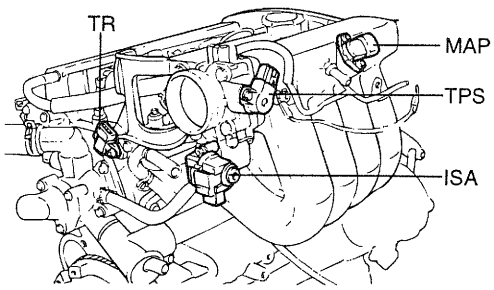
HEW31002

EVAP Solenoid Valve



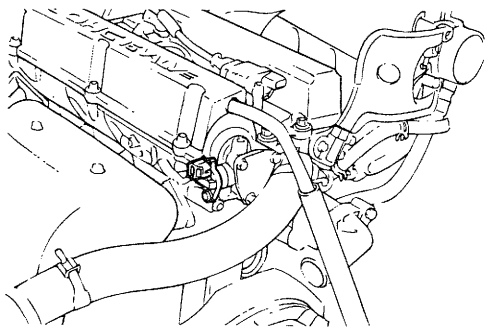
EFA9025G

MAP, TPS, ISA, TR



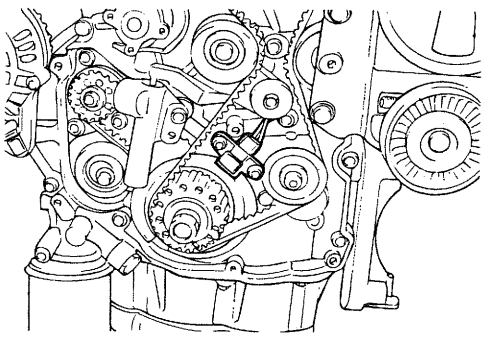

EFA9025H

CMP Sensor

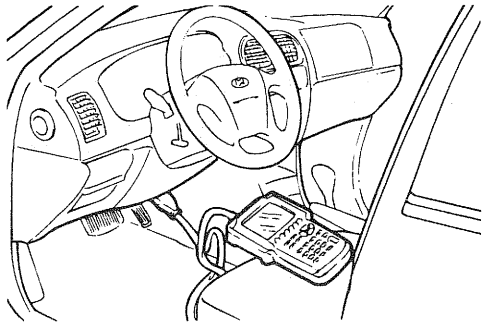
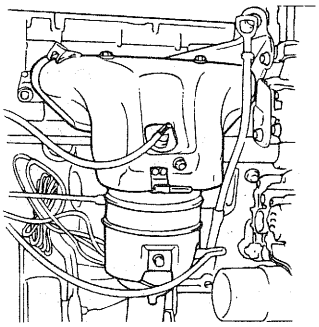
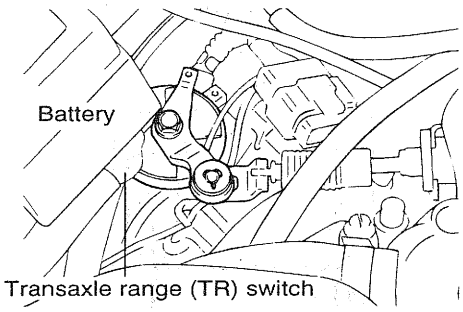
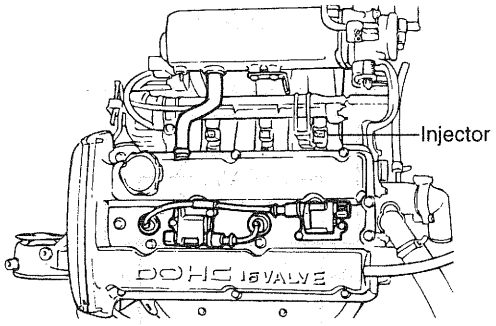
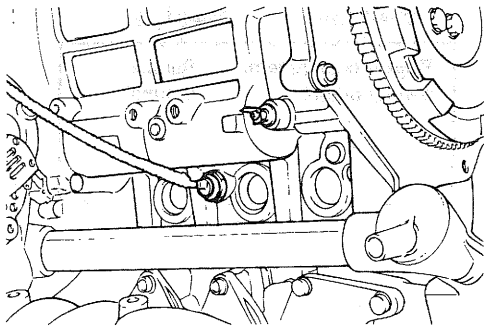


EFA9025I

CKP

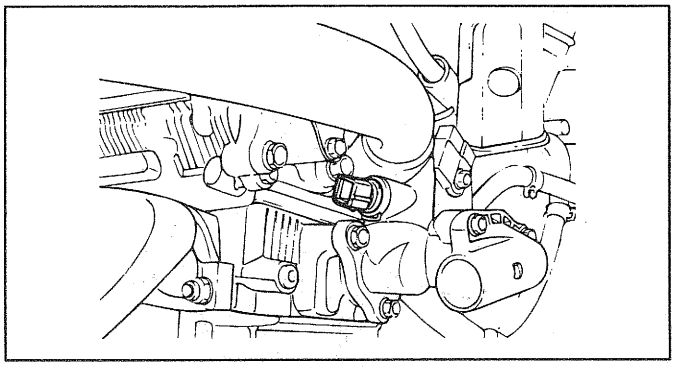


EFA9025J

| Data Link Connector | Heated Oxygen Sensor (HO2S) |
|---|---|
|  EFA9025K |  EFA9025L |
| **Transaxle Range (TR) Switch** | **Injectors** |
|   EFA9025M |   EFA9025N |
| **Knock** | |
|  EFA9025O | |

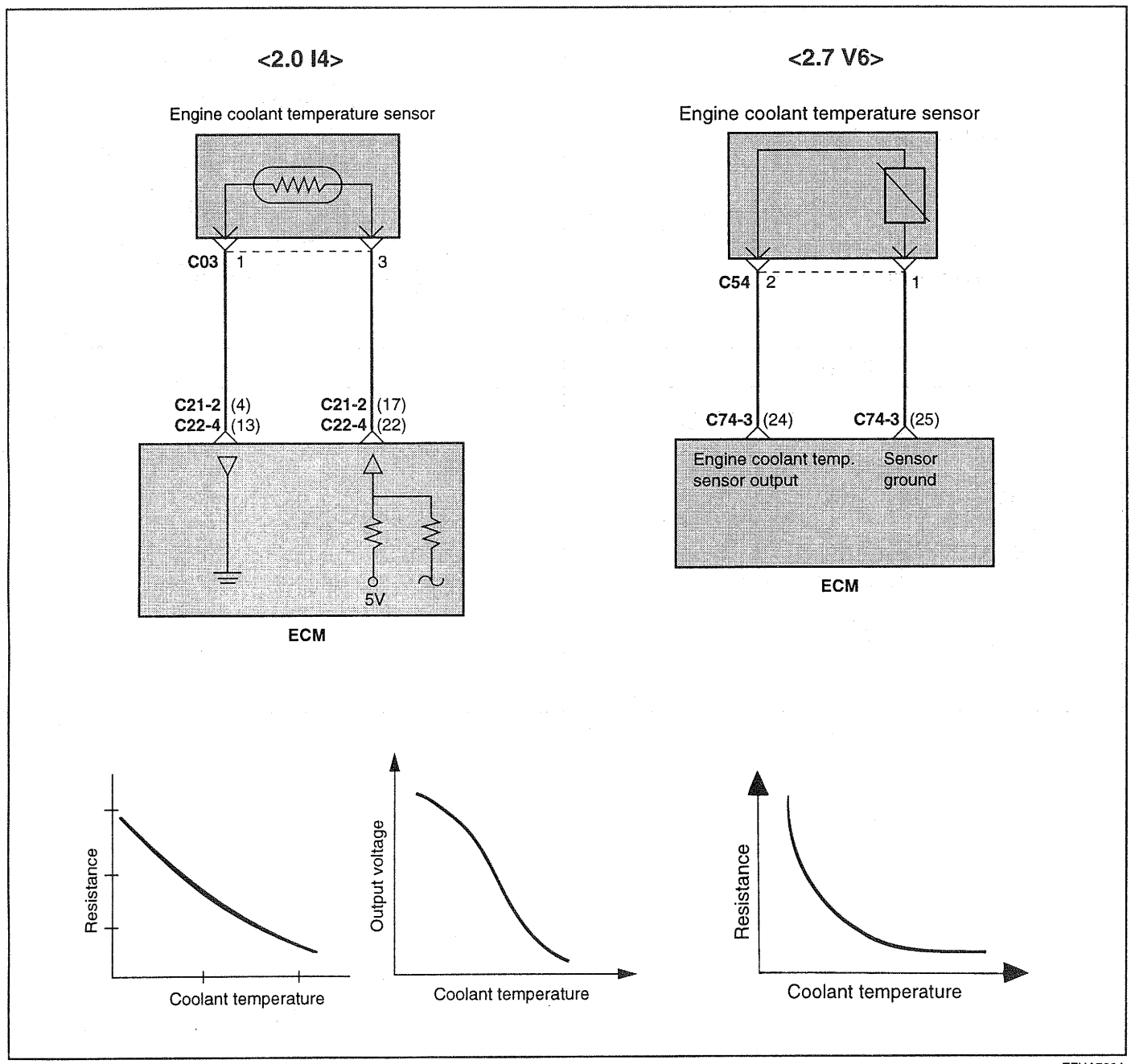
## ENGINE COOLANT TEMPERATURE (ECT) SENSOR EFHA7030

The engine coolant temperature sensor installed in the engine coolant passage of the cylinder head detects the engine coolant temperature and emits signals to the ECM. This part employs a thermistor which is sensitive to changes in temperature. The electric resistance of the thermistor decreases in response to a temperature rise. The ECM determines engine coolant temperature by the sensor output voltage and provides optimum fuel enrichment when the engine is cold.



EFA9026A

### CIRCUIT DIAGRAM




EFHA703A

## SENSOR CHECKING

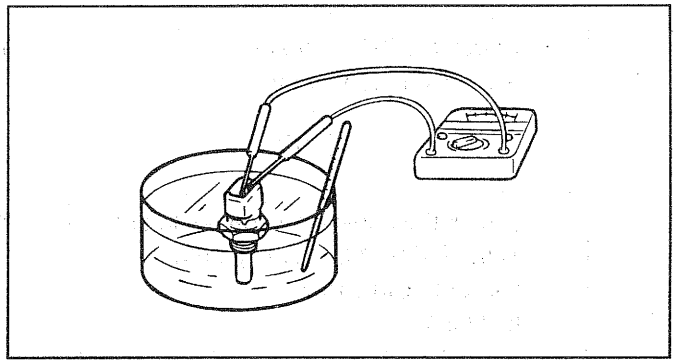
### USING HI-SCAN

| Check item | Data display | Check conditions | Intake air temperature | Test specification |
|---|---|---|---|---|
| Engine coolant temperature sensor | Sensor temperature | Ignition switch : ON or engine running | When -20°C (-4°F) | -20°C |
| | | | When 0°C (32°F) | 0°C |
| | | | When 20°C (68°F) | 20°C |
| | | | When 40°C (104°F) | 40°C |
| | | | When 80°C (176°F) | 80°C |

### USING MULTI-METER

1. Remove the engine coolant temperature sensor from the intake manifold.
2. With temperature sensing portion of engine coolant temperature sensor immersed in hot engine coolant, check resistance.

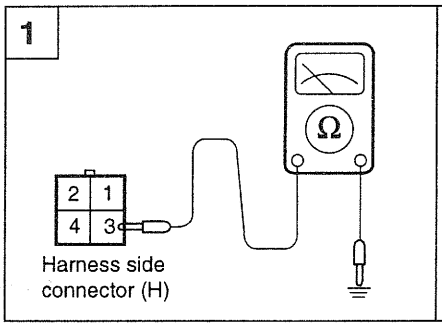
| Temperature [°C (°F)] | Resistance (kΩ) |
|---|---|
| 0 (32) | 5.9 |
| 20 (68) | 2.5 |
| 40 (104) | 1.1 |
| 80 (176) | 0.3 |



EFA9028A

3. If the resistance deviates from the standard value greatly, replace the sensor.

### HARNESS INSPECTION

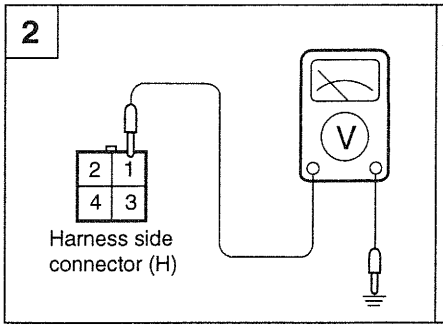



Check for continuity of the ground circuit.
o Connector: Disconnected

OK ⇒ 2

NG ⇒ Repair the harness.

EFHA703B



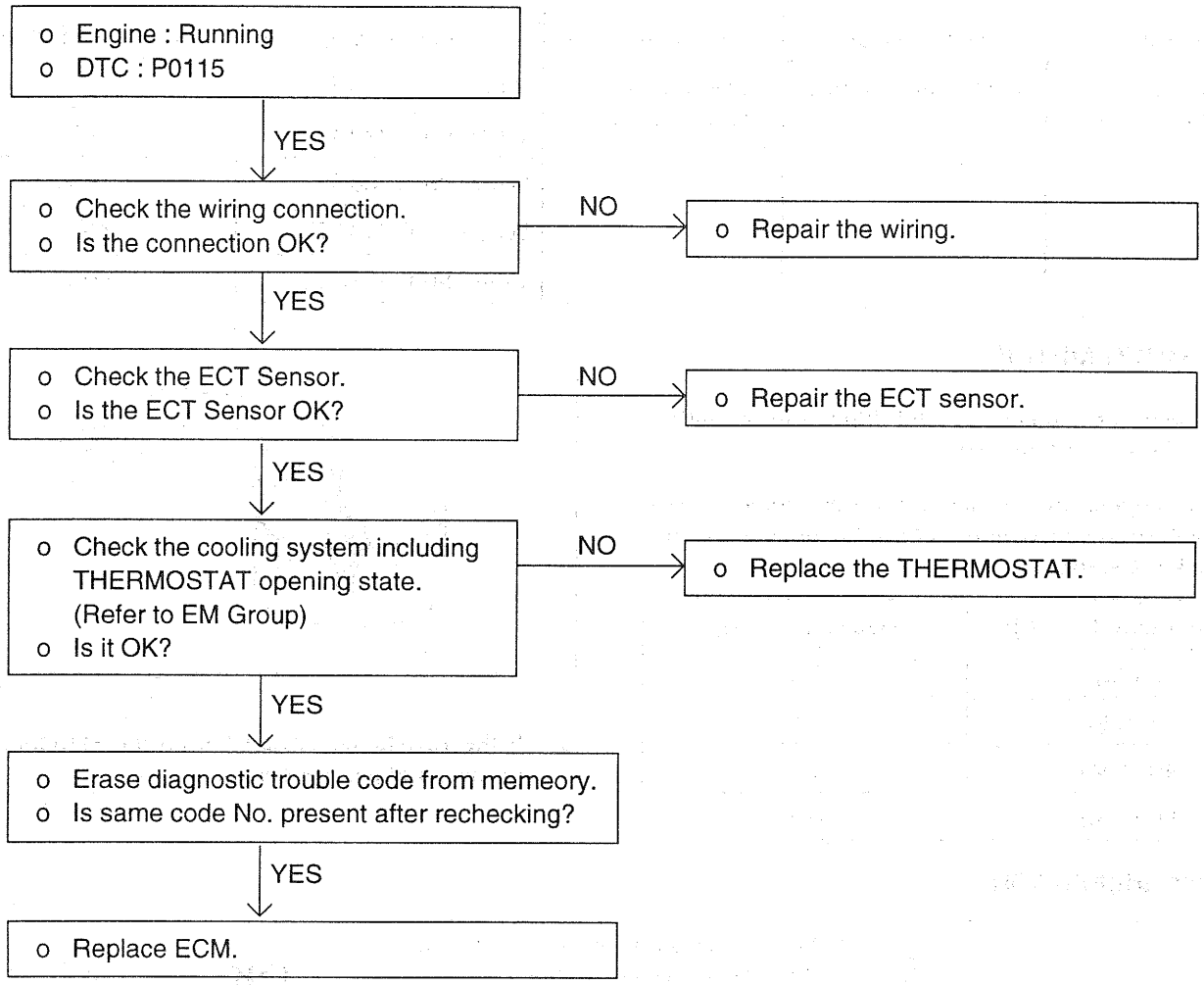

Measure the power supply voltage.
o Connector: Disconnected
o Ignition switch: ON
o Voltage (V): 4.5-4.9V

OK ⇒ END !

NG ⇒ Repair the harness.

EFHA703C

## TROUBLESHOOTING PROCEDURES




DTC : Diagnosis Trouble Code
ECM : Engine Control Module
ECT : Engine coolant Temperature

EFA9030A

### USING VOLTMETER

| Check item | Coolant temperature | Test specification |
|---|---|---|
| Engine coolant temperature sensor output voltage | When 0°C | 4.05V |
| | When 20°C | 3.44V |
| | When 40°C | 2.72V |
| | When 80°C | 1.25V |

### TROUBLEHSOOTING HINTS

If the fast idle speed is not enough or the engine gives off dark smoke during the warming-up of the engine, the engine coolant temperature sensor might be the cause.

### INSTALLATION

1. Apply sealant LOCTITE 962T or the equivalent to threaded portion.
2. Install the engine coolant temperature sensor and tighten it to specified torque.

**Tightening torque**
Engine coolant temperature sensor :
20-40 Nm (200-400 kg.cm, 14-29 lb.ft)

3. Securely connect the harness connector.

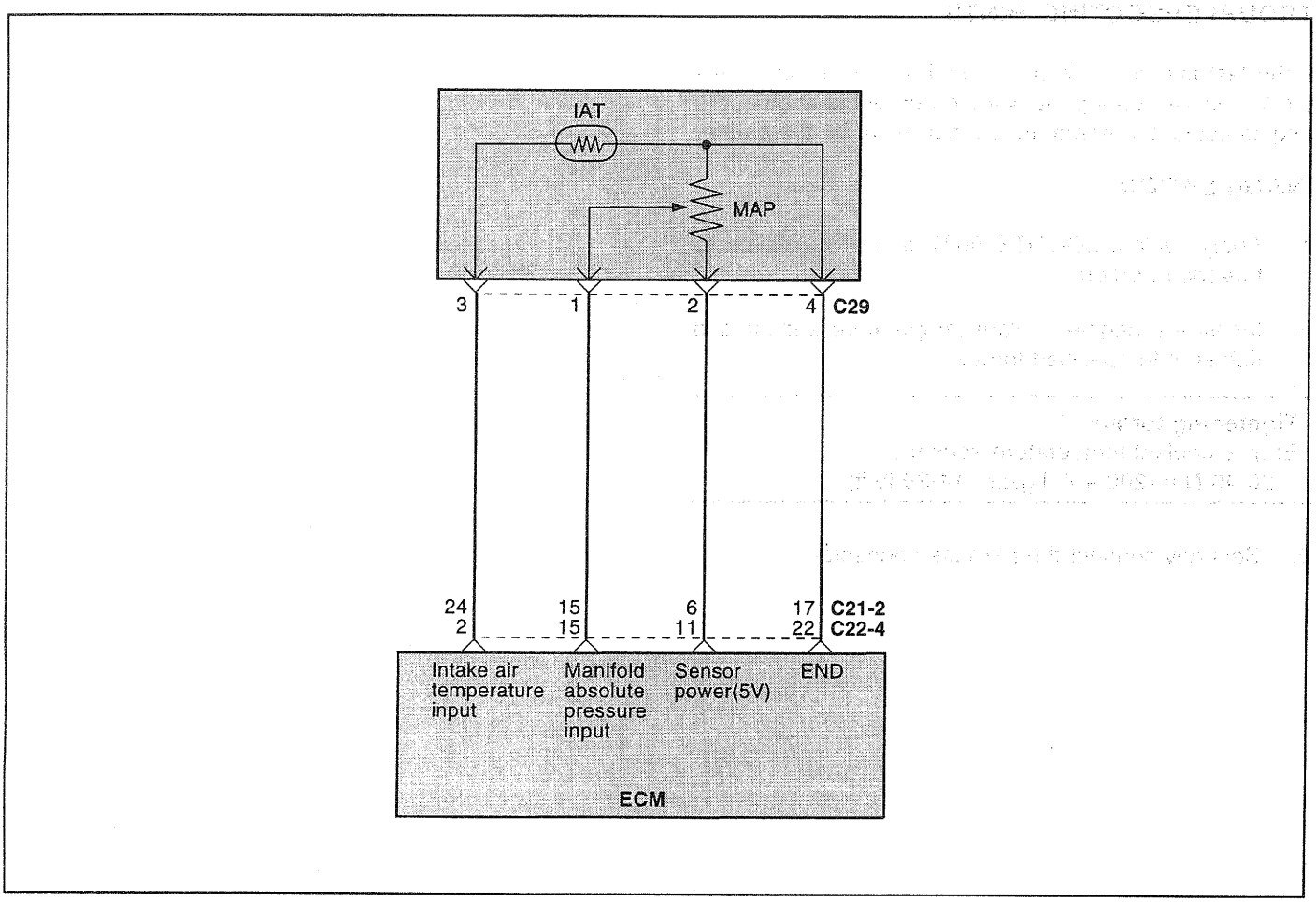
## MANIFOLD ABSOLUTE PRESSURE(MAP) & INTAKE AIR TEMPERATURE(IAT) SENSOR EFHA7050

The manifold absolute pressure(MAP) sensor converts intake manifold pressure into a voltage signal. The engine control module(ECM) uses this signal to determine the condition of the engine load.

The intake air temperature(IAT) sensor, built in the MAP sensor, is a resistor-based sensor for detecting the intake air temperature.

According to the intake air temperature information from the sensor, the ECM provides necessary fuel injection amount control.

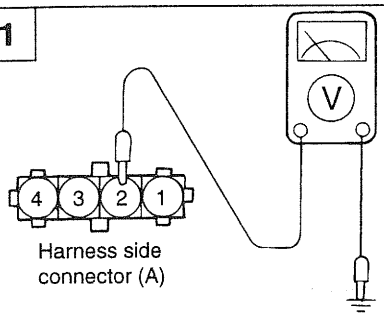
### CIRCUIT DIAGRAM <2.0 I4>



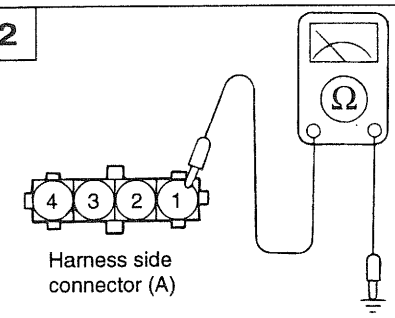

EFHA705A

| Check item | Data display | Check conditions | Engine state | Test specification |
|---|---|---|---|---|
| MAP sensor | Inlet manifold pressure | • Engine coolant temperature : 18°C (65.4°F)<br>• Lamps, electric cooling fan, accessory units: All OFF<br>• Transaxle: Neutral (P range for vehicle with A/T)<br>• Steering wheel: Neutral | Idle | 0.8-2.4V |
| | | | When the accel pedal is depressed suddenly at idle | Rise from 0.8-2.4V |

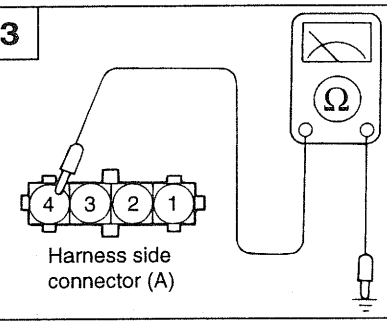
## HARNESS INSPECTION PROCEDURE

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage.<br>o Connector: Disconnected.<br>o Ignition switch : ON.<br>o Voltage (V) : 4.8-5.2 V. | OK ⇨<br>NG ⇨ | 2<br>Repair the harness. |

EFAA705B

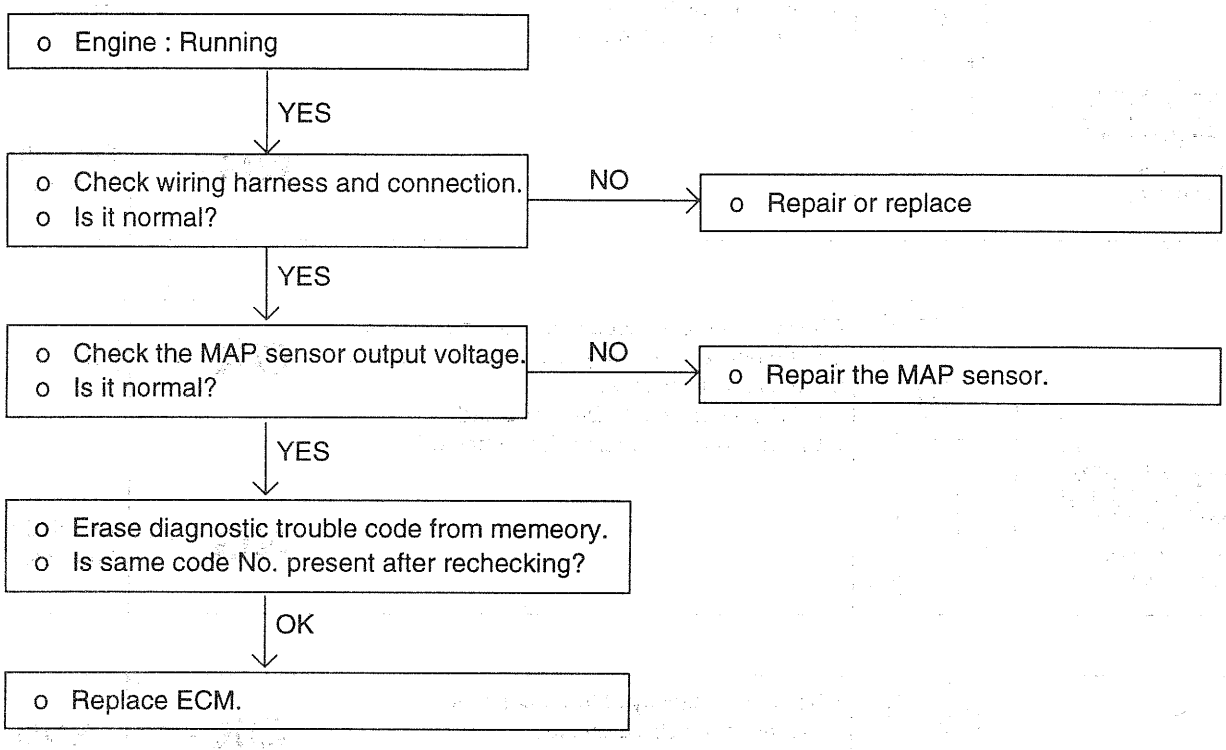
| | | | |
|---|---|---|---|
| 2   | Check for an open-circuit, or a short-circuit ot ground between the engine control module and the mass air flow sensor.<br>o MAP sensor circuit : Disconnected<br>o Engine control module : Disconnected | OK ⇨<br>NG ⇨ | 3<br>Repair the harness. |

EFAA705C

| | | | |
|---|---|---|---|
| 3   | Check for continuity of the ground circuit.<br>o Connector : Disconnected. | OK ⇨<br>NG ⇨ | END !<br>Repair the harness. |

EFAA705D

## TROUBLESHOOTING PROCEDURES [MAP SENSOR]




DTC : Diagnosis Trouble Code
ECM : Engine Control Module

EFAA705E

## TROUBLESHOOTING HINTS

The MIL (Malfunction Indicator Lamp) is ON or the DTC (Diagnostic Trouble Code) is displayed on the HI-SCAN under the following conditions:

1. When the manifold pressure is 4.5V or more for 4 second.
2. When the manifold pressure is 0.2V or lower for 4 second.

## SENSOR INSPECTION [MAP SENSOR]

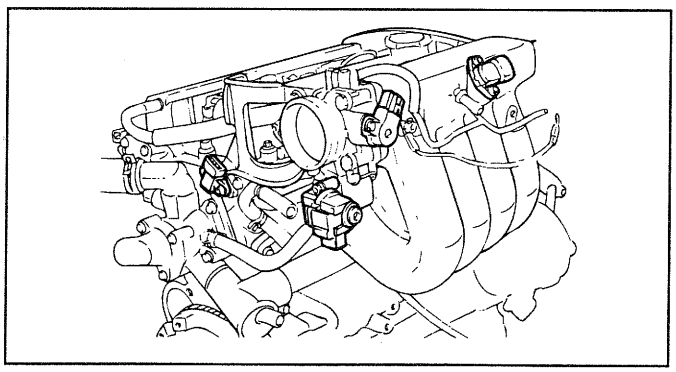
1. Connect the voltmeter between 1 and 4 of the MAP sensor connector

   Terminal 4 : MAP sensor ground

   Terminal 1 : MAP sensor output

2. Measure the voltage of terminals.

| Engine state | Test specification |
|---|---|
| Ignition SW. ON. | 4 - 5V |
| At idle | 0.8 - 2.4V |

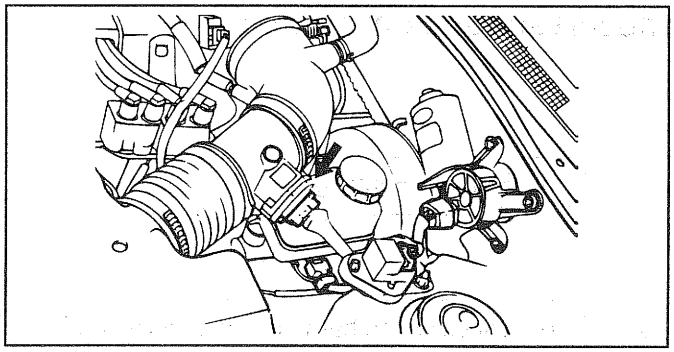


EFAA705F

3. If the voltage deviates from the standard value, replace the MAP sensor assembly.

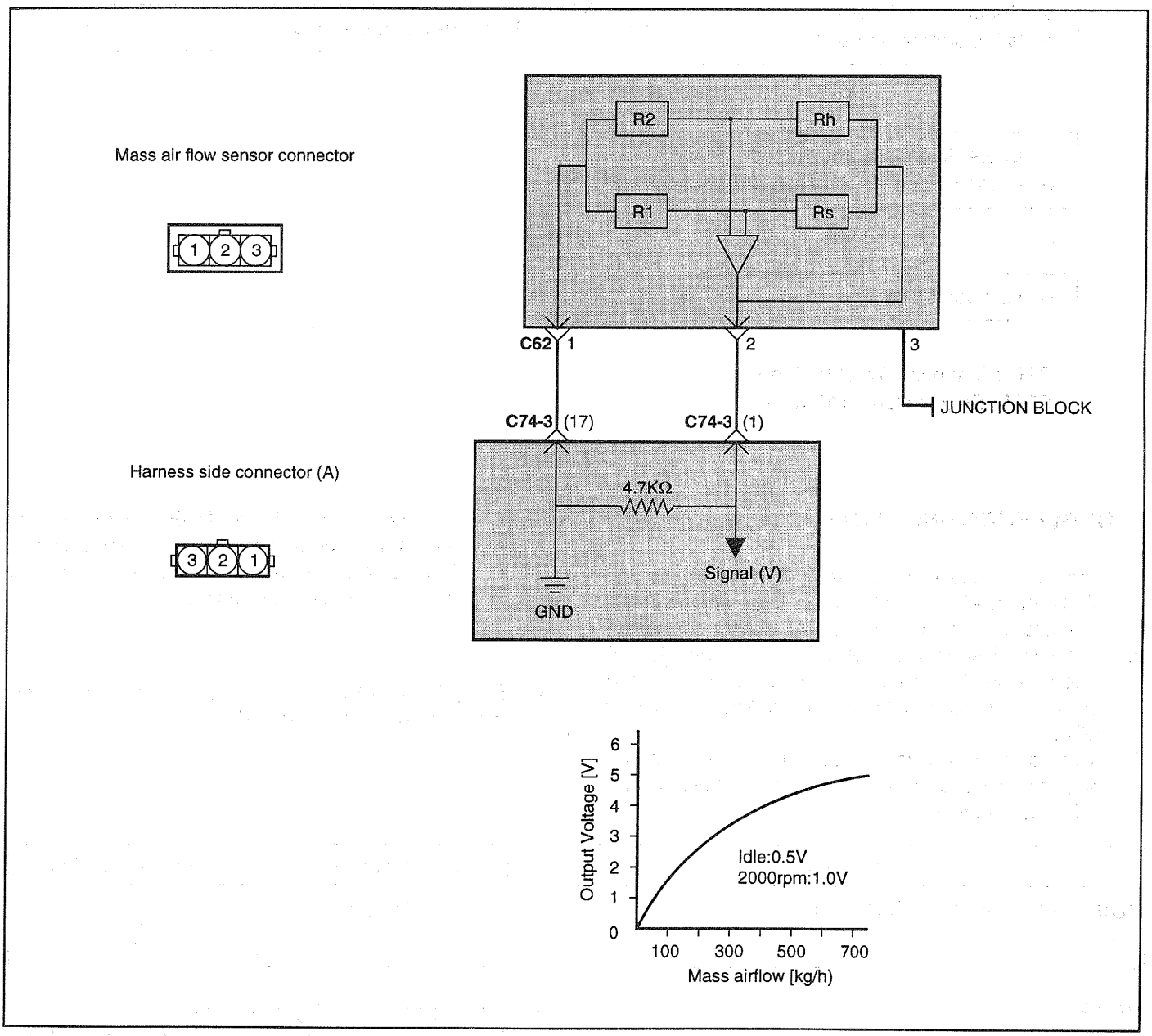
## MASS AIR FLOW (MAF) SENSOR EFHA7090

This hot film type air flow sensor is composed of a hot film sensor, housing and metering duct (hybrid, sensor element). Mass air flow rate is measured by detection of heat transfer from a hot film probe because the change of the mass air flow rate causes change in the amount of heat being transferred from the hot film probe surface to the air flow. The air flow sensor generates a pulse so it repeatedly opens and closes between the 5V voltage supplied from the engine control module. This results in the change of the temperature of the hot film probe and in the change of resistance.



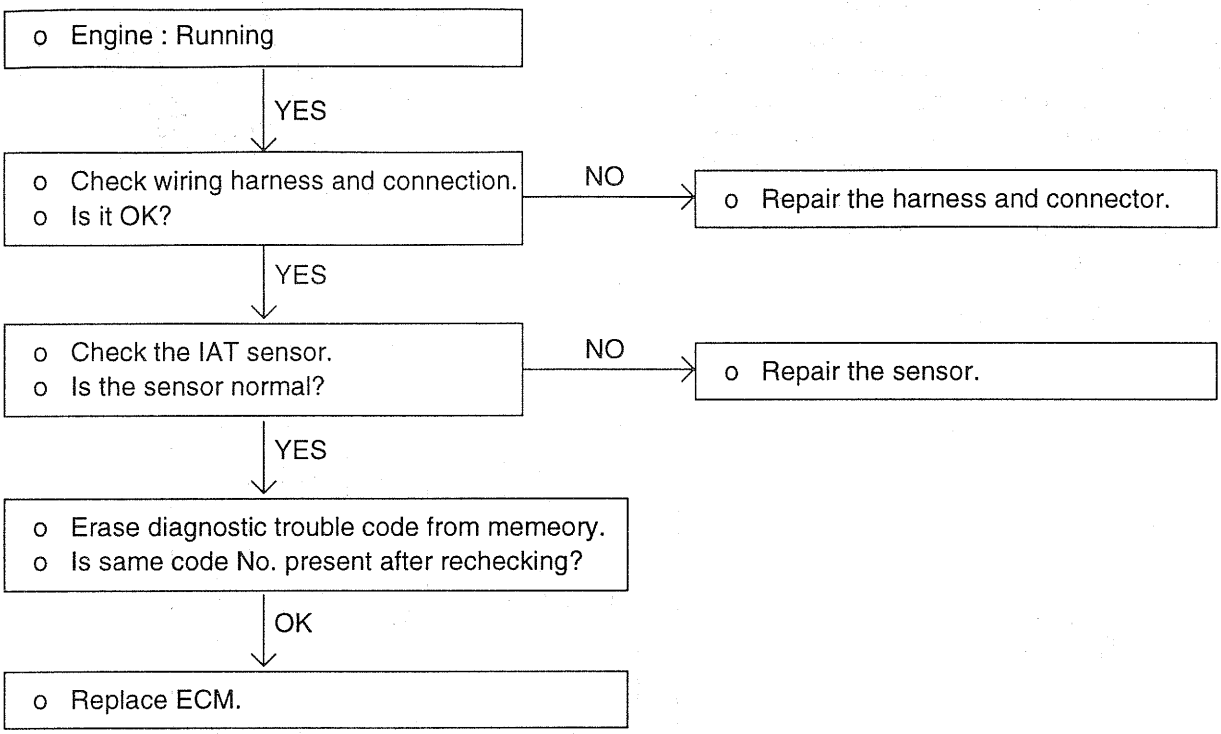
EFA9040A

### CIRCUIT DIAGRAM <2.7 V6>




EFHA709A

## TROUBLESHOOTING PROCEDURES




DTC : Diagnosis Trouble Code
ECM : Engine Control Module

EFAA709E

## TROUBLESHOOTING HINTS

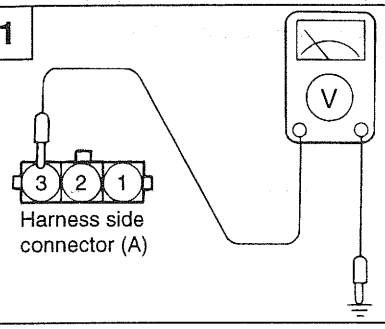
1. If the engine stalls occasionally, start the engine and shake the MAF sensor harness. If the engine stalls, check for poor contact at the MAF sensor connector.
2. If the MAF sensor output voltage is other than 0 when the ignition switch is turned on (do not start the engine). Check for the faulty MAF sensor or ECM.
3. If the engine can be idle even if the MAF sensor output voltage is out of specification, check for the following conditions;
   - Disturbed air flow in the MAF sensor, disconnected air duct, and clogged air cleaner filter.
   - Poor combustion in the cylinder, faulty ignition plug, ignition coil, injector, and incorrect comparison.
4. Even if no AFS malfunction occurs, check the mounting direction of the AFS.

| Check item | Check condition | Test specification |
|---|---|---|
| Mass air flow sensor output voltage | Idle rpm | 0.5V |
| | 2000 rpm | 1.0V |

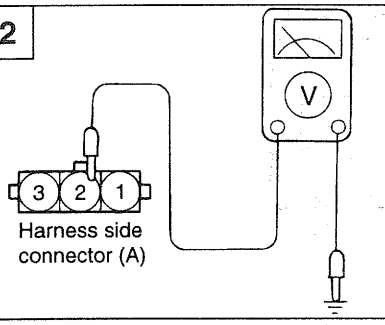
## NOTE

1. **When the vehicle is new [within initial operation of about 500 km (300 miles)], the mass air flow sensor air quantity will be about 10% higher.**
2. **Use an accurate digital voltmeter.**
3. **Before checking, warm up the engine until the engine coolant temperature reaches 80 to 90°C (176 to 198°F).**

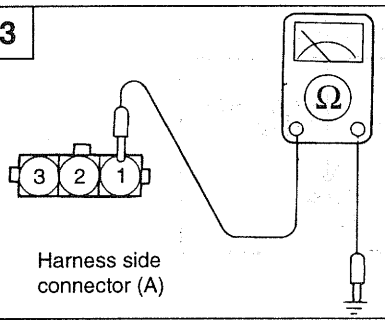
## HARNESS INSPECTION PROCEDURE

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage.<br>o Connector : Disconnected.<br>o Ignition switch : ON.<br>o Voltage (V) : Battery voltage. | OK ⇒<br>NG ⇒ | 2<br>Repair the harness |

EFHA709B

| | | | |
|---|---|---|---|
| 2   | Check for an open-circuit, or a short-circuit to ground between the engine control module and the mass air flow sensor.<br>o Engine control module connector : Disconnected.<br>o Mass air sensor connector : Disconnected. | OK ⇒<br>NG ⇒ | 3<br>Repair the harness |

EFAA709C

| | | | |
|---|---|---|---|
| 3   | Check for continuity of the ground circuit.<br>o Connector : Disconnected. | OK ⇒<br>NG ⇒ | END !<br>Repair the harness |

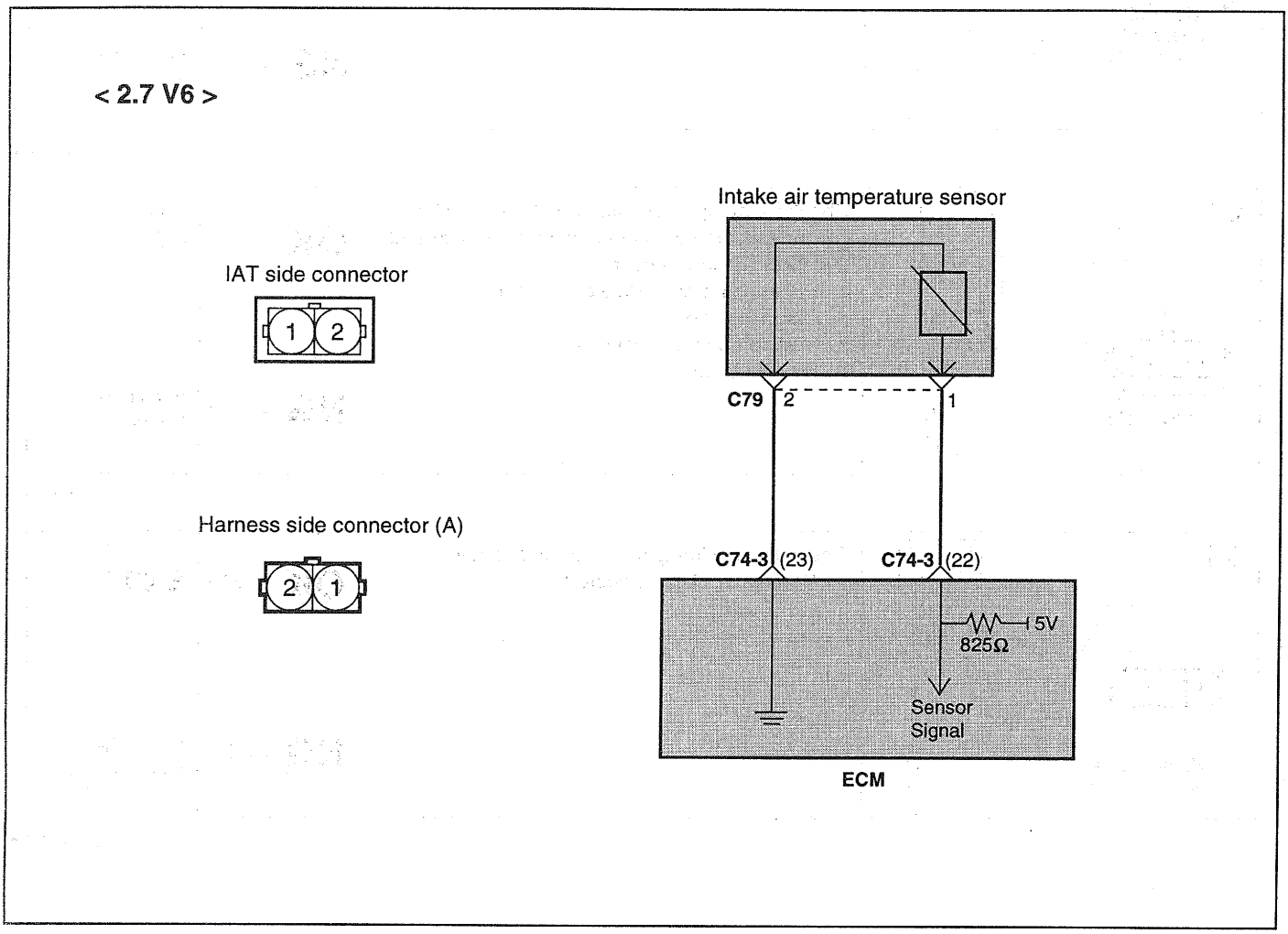
EFAA709D

## INTAKE AIR TEMPERATURE (IAT) SENSOR EFHA7110

The intake air temperature sensor (IAT Sensor), located in the intake air hose, is a resistor-based sensor for detecting the intake air temperature. According to the intake air temperature information from the sensor, the ECM provides the necessary fuel injection.

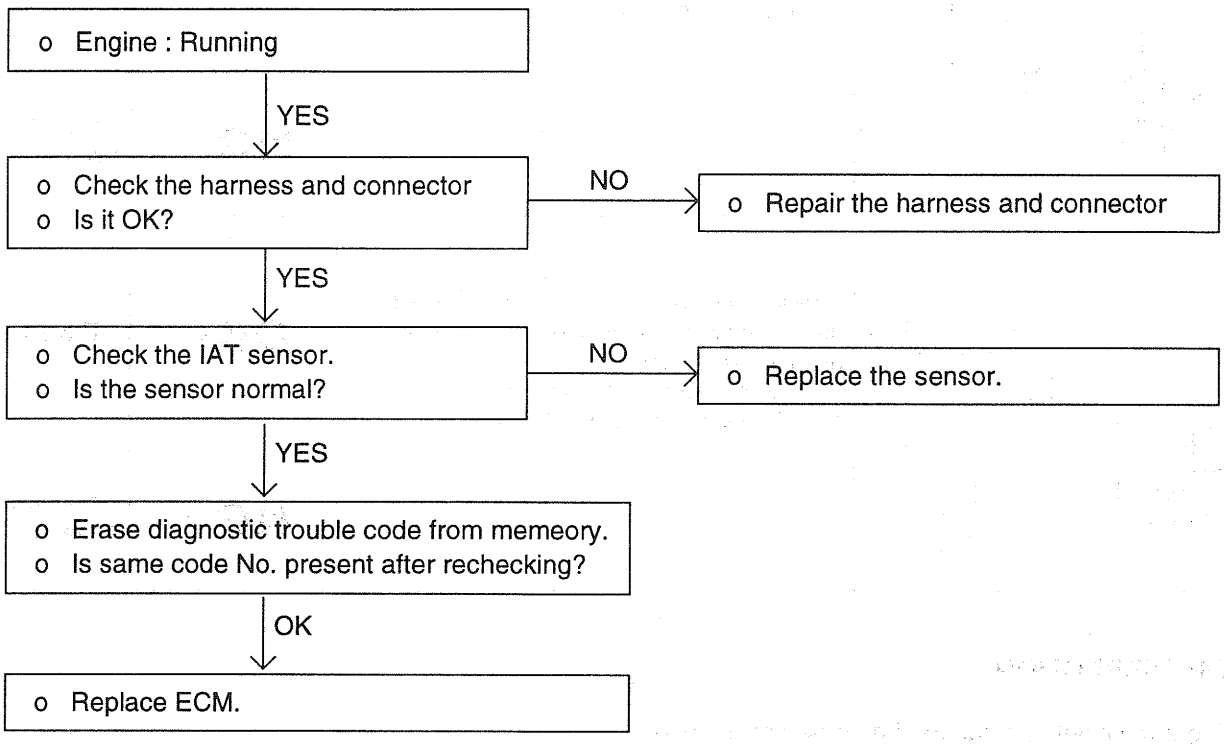
### CIRCUIT DIAGRAM

< 2.7 V6 >




EFHA711A

## TROUBLESHOOTING PROCEDURES




DTC : Diagnosis Trouble Code
ECM : Engine Control Module

EFAA711D

## TROUBLESHOOTING HINTS

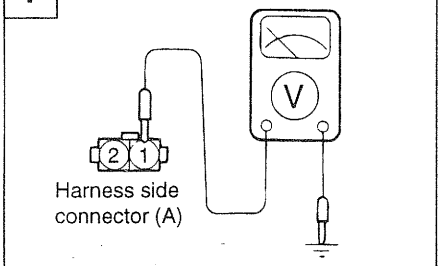
The MIL is ON or the DTC is displayed on the HI-SCAN under the following condition:

1. When the intake air temperature is detected as below -40°C or higher than 120°C
2. Input from intake air temperature sensor is below 0.1V or above 4.8V when engine is in a full warm-up condition.

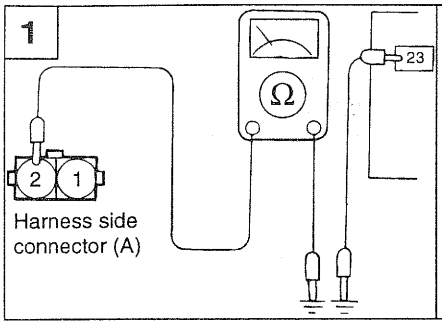
### USING HI-SCAN

| Check item | Data display | Check conditions | Intake air temperature | Test specification |
|---|---|---|---|---|
| Intake air temperature sensor | Air temperature | Ignition switch : ON or engine running | When -20°C (-4°F) | -20°C |
| | | | When 0°C (32°F) | 0°C |
| | | | When 20°C (68°F) | 20°C |
| | | | When 40°C (104°F) | 40°C |
| | | | When 80°C (176°F) | 80°C |

## HARNESS INSPECTION PROCEDURE <2.7 V6>

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage of the IAT Sensor.<br>o Connector : Disconnected.<br>o Ignition switch : ON.<br>o Voltage : 4.8-5.2 V. | OK ⇨<br><br>NG ⇨ | 2<br><br>Repair the harness. |

EFAA711B

| | | | |
|---|---|---|---|
| 1   | Check for an open-circuit, or a short-circuit to ground between the engine control module and the IAT sensor<br>o ECM connector : Disconnected<br>o IAT sensor connector : Disconnected | OK ⇨<br><br>NG ⇨ | END !<br><br>Repair the harness. |

EFAA711C

## SENSOR INSPECTION

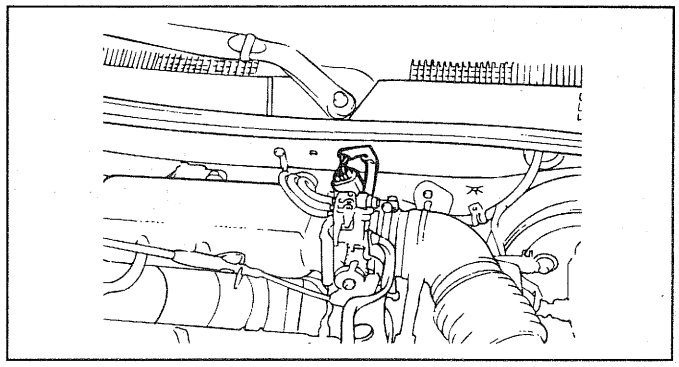
1. Using a multimeter, measure the sensor resistance.
2. Measure the rersistance between the IAT sensor terminal 1 and 2.

| IG.SW. ON | Temperature °C (°F) | Resistance (Ω) |
|---|---|---|
| | 0 (32) | 3.3 - 3.7V |
| | 20 (68) | 2.4 - 2.8V |
| | 40 (104) | 1.6 - 2.0V |
| | 80 (176) | 0.5 - 0.9V |

3. If the resistance deviates from the standard value, replace the intake air temperature sensor assembly.

## THROTTLE POSITION (TP) SENSOR EFHA7130

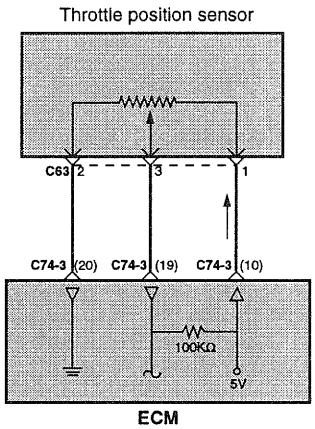
The TPS is a variable resistor type that rotates with the throttle shaft of the throttle body to sense the throttle valve angle. As the throttle shaft rotates, the output voltage of the TP Sensor changes. The ECM detects the throttle valve opening based on voltage change.

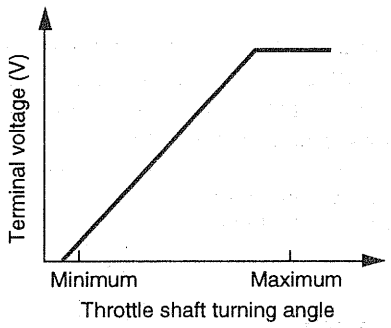


EFA9049A

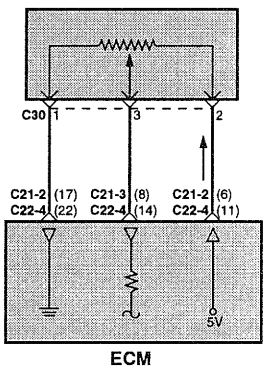
### CIRCUIT DIAGRAM

**< 2.7 V6>**




**< 2.0 I4 >**




EFHA713A

## SENSOR CHECKING

### USING HI-SCAN

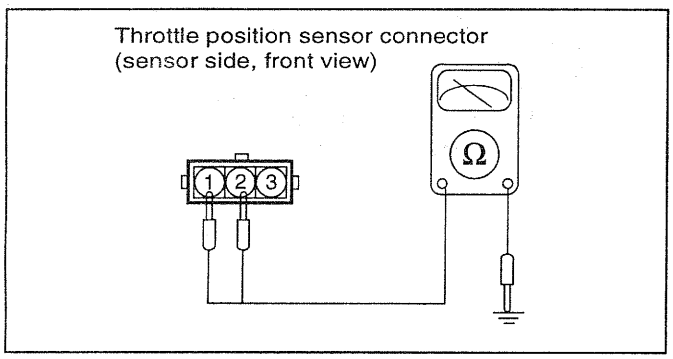
| Check item | Data display | Check conditions | Throttle valve | Test specification |
|---|---|---|---|---|
| Throttle position sensor | Sensor voltage | Ignition switch : ON | At idle position | 300-900 mV (2.0 I4)<br>250-800 mV (2.7 V6) |
| | | | Open slowly | Increases with valve opening |
| | | | Open widely | 4,250-4,700 mV |

### USING VOLTMETER

1. Disconnect the throttle position sensor connector.
2. Measure resistance between terminal 1 (sensor ground) and terminal 2 (sensor power) for 2.0 I4, between terminal 2 (sensor ground) and terminal 1 (sensor power) for 2.7 V6.

Standard value : 3.5 - 6.5 kΩ

3. Connect a pointer type ohmmeter between terminal 1 (sensor ground) and terminal 3 (sensor output) for 2.0 I4 and between terminal 2 (sensor ground) and terminal 3 (sensor output) for 2.7 V6.

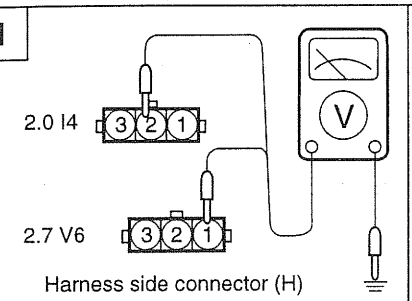



EFHA713E

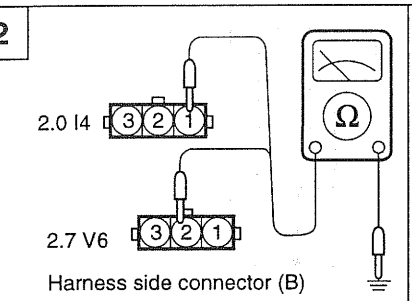
4. Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
5. If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

**Tightening torque**
TP Sensor : 1.5-2.5 Nm (15-25 kg.cm, 1.1-1.8 lb.ft)

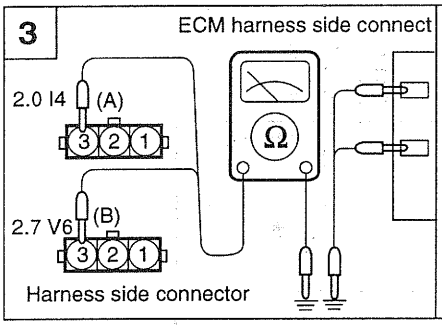
## HARNESS INSPECTION

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage of the throttle position sensor.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): 4.25-4.7 | OK ⇨<br>NG ⇨ | 2<br>Repair the harness. |

EFHA713B

| | | | |
|---|---|---|---|
| 2   | Check for continuity of the ground circuit.<br>o Connector : Disconnected | OK ⇨<br>NG ⇨ | 3<br>Repair the harness. |

EFHA713C

| | | | |
|---|---|---|---|
| 3   | Check for an open-circuit, or a short-circuit or ground between the engine control module and the throttle position sensor.<br>o Throttle position sensor connector : Disconnected<br>o Engine control module connector : Disconnected | OK ⇨<br>NG ⇨ | END !<br>Repair the harness.<br>A3-C21-3 (8)<br>A3-C22-4 (14)<br>B3-C74-3 (19) |

EFHA713D

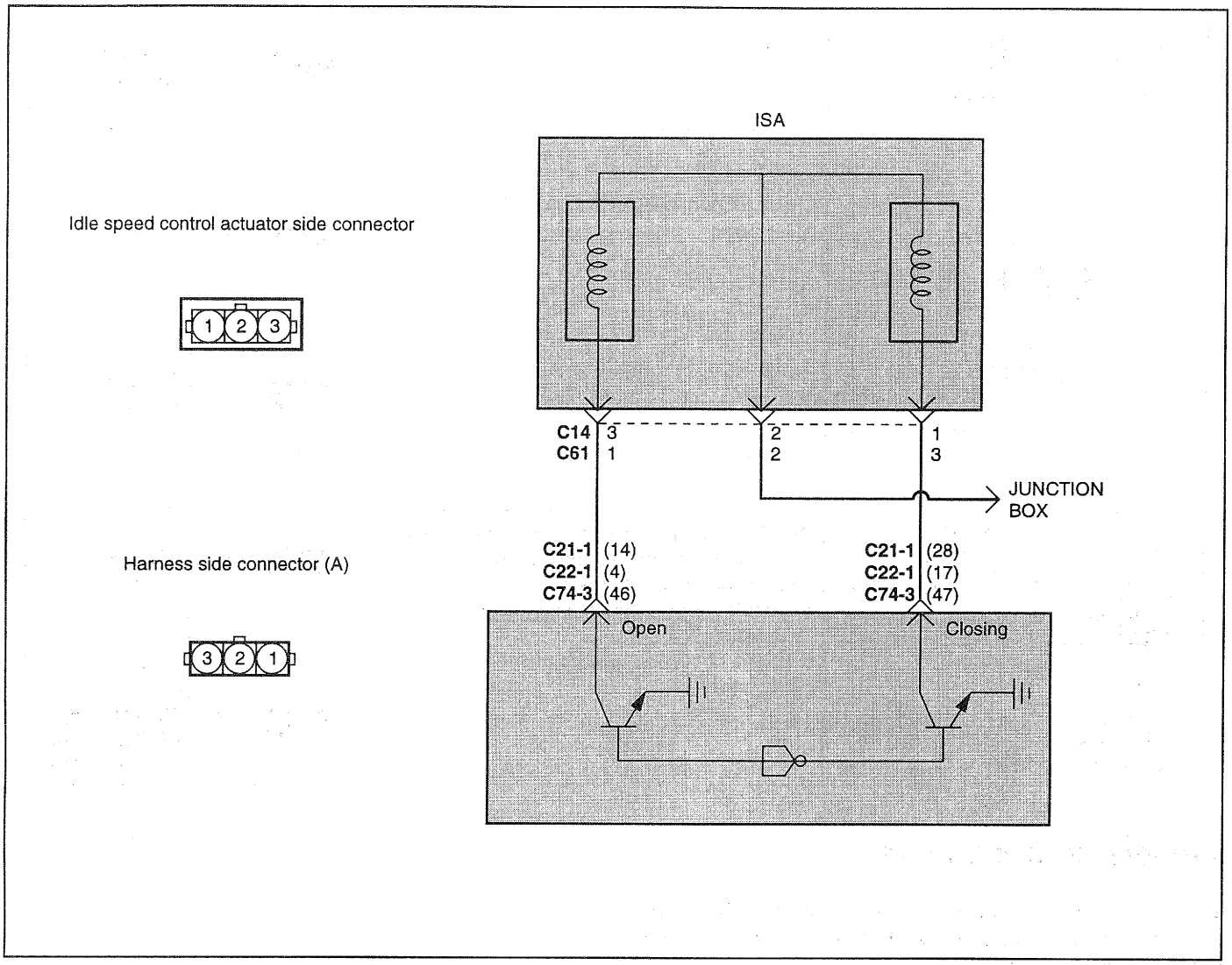
## TROUBLESHOOTING HINTS

The TPS signal is important in the control of the automatic transaxle. Shift shock and other trouble will occur if the sensor is defective.

## IDLE SPEED CONTROL ACTUATOR EFHA7170

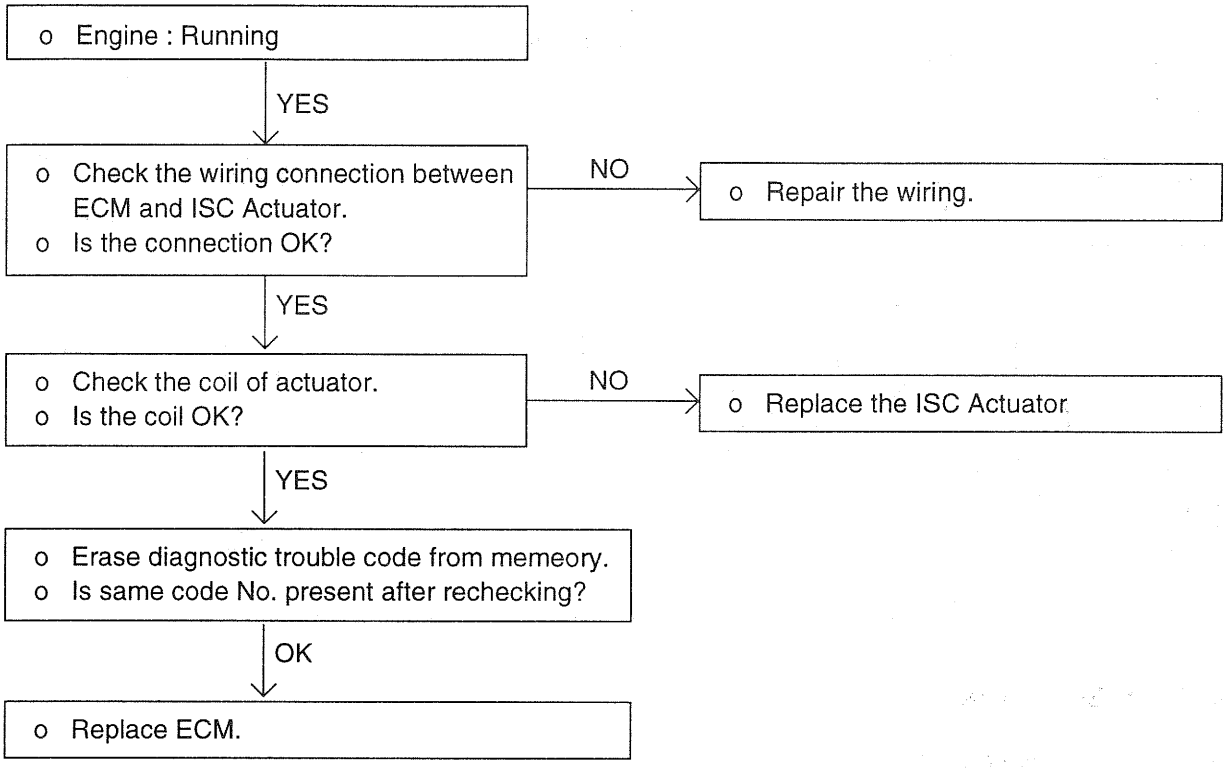
The idle speed control actuator is the double coil type and has two coils. The two coils are driven by separate driver stages in the ECM. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different angles of the motor. In parallel to the throttle valve, a bypass hose line is arranged, where the idle speed actuator is inserted in side.

### CIRCUIT DIAGRAM




EFHA717A

## TROUBLESHOOTING PROCEDURES




DTC : Diagnosis Trouble Code
ECM : Engine Control Module

EFAA717E

## TROUBLESHOOTING HINTS

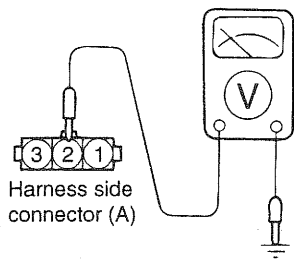
The MIL is ON or the DTC is displayed on the HI-SCAN under the following conditions;

- When the primary voltage side in ECM is in short or open circuit.
- The ignition closed loop control in the ECM is out of order.
- Open or short circuit is observed in idle air control system when ignition switch is turned on.

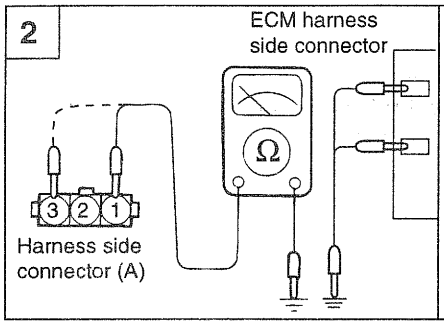
### USING HI-SCAN

| Check item | Check condition | HI-SCAN display | Type |
|---|---|---|---|
| Idle speed control actuator<br>o Actuator | Start the engine | ISA | Activate |

## HARNESS INSPECTION PROCEDURE

| | | |
|---|---|---|
| 1<br>  <br> | Measure the power supply voltage of the actuator.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage<br>OK ⇨<br>NG ⇨ | 2<br>Repair the harness. Check the power supply |

EFHA717B

| | | |
|---|---|---|
| 2<br>  <br> | Check for an open-circuit, or a short-circuit to ground between the ECM and the idle speed control actuator.<br>o ECM connector : Disconnected<br>o Idle speed actuator connector : Disconnected<br>OK ⇨<br>NG ⇨ | END !<br>Repair the harness.<br><CLOSING><br>A1-C21-1(28)<br>A1-C22-1(17)<br>A1-C74-3(47)<br><OPEN><br>A1-C21-1(14)<br>A1-C22-1(4)<br>A1-C74-3(46) |

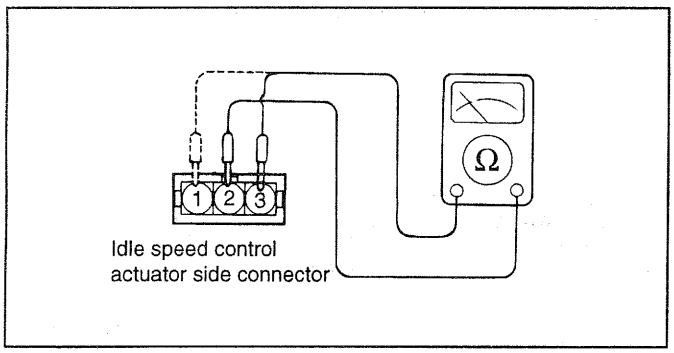
EFHA717C

## ACTUATOR INSPECTION

1. Disconnect the connector at the idle speed control actuator.
2. Measure the resistance between terminals.

Standard value
Terminal 3 and 2 : 10.5 - 14Ω
Terminal 1 and 3 : 10 - 12.5Ω [at 20°C (68°F)]

3. Connector the connector to the idle speed control actuator

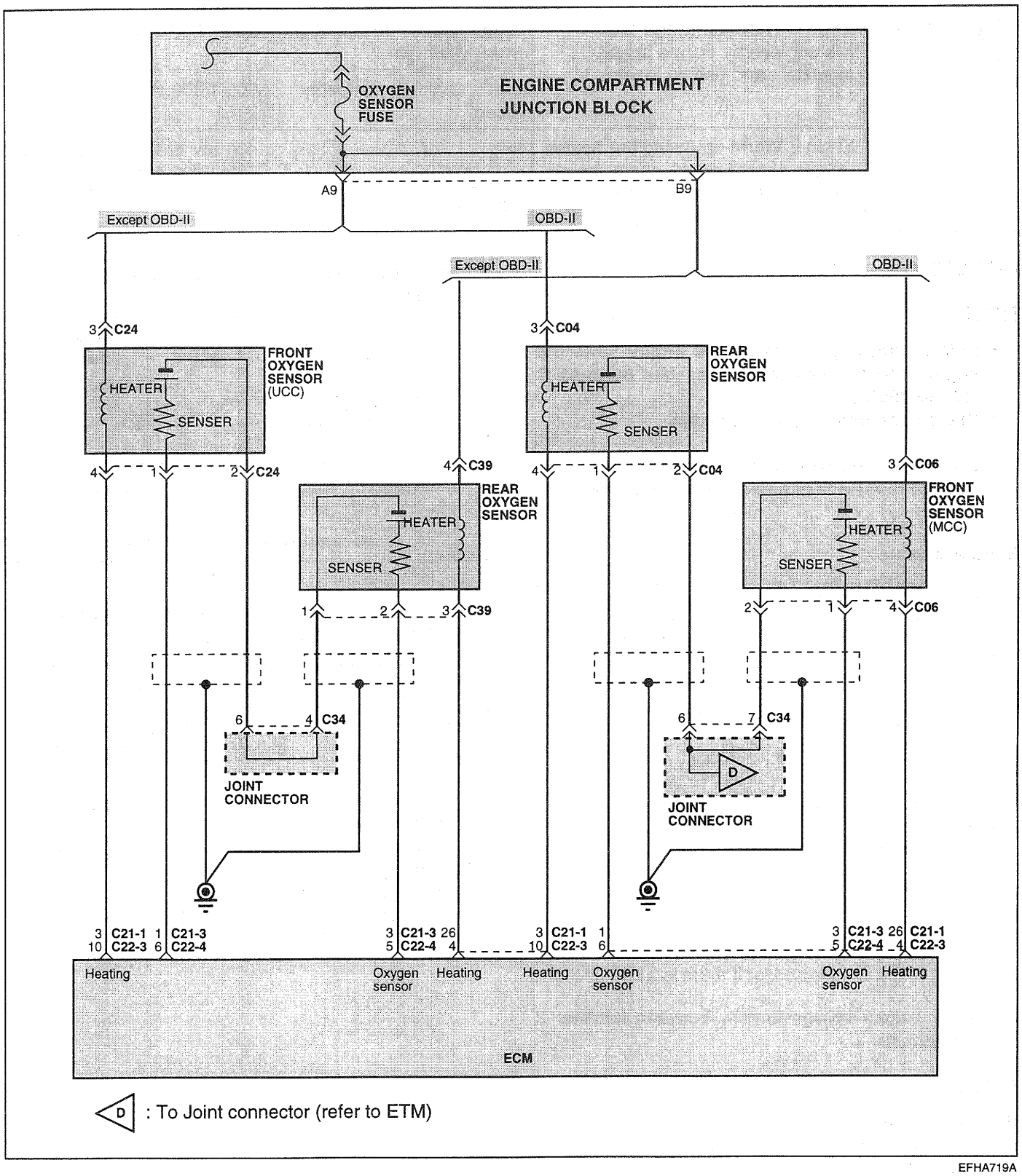



EFAA717D

## HEATED OXYGEN SENSOR (HO2S) EFHA7190

The heated oxygen sensor senses the oxygen concentration in exhaust gas, converts it into a voltage, which is sent to the ECM. The oxygen sensor outputs about 1V when the air fuel ratio is richer than the theoretical ratio, and outputs about 0V when the ratio is leaner (higher oxygen concentration in exhaust gas.). The ECM controls the fuel injection ratio based on this signal so that the air fuel ratio is maintained at the theoretical ratio. The oxygen sensor has a heating element which ensures the sensor performance during all driving conditions.

### CIRCUIT DIAGRAM <2.0 I4>




EFHA719A

1. If the HO2S is defective, abnormally high emissions may occur.
2. If the HO2S check results are normal, but the sensor output voltage is out of specification, check for the following items (related to air fuel ratio control system):
   - Defective injector
   - Air leaks in the intake manifold
   - Defective volume air flow sensor, intake air temperature sensor, barometric pressure sensor and engine coolant temperature sensor.

| Check item | Check conditions | Engine state | Test specification |
|---|---|---|---|
| Oxygen sensor | Engine: Warm-up (make the mixture lean by engine speed reduction, and rich by racing) | When sudden deceleration from 4,000 rpm | 200mV or lower |
| | | When engine is suddenly raced | 600-1,000 mV |
| | Engine: Warm-up (using the heated oxygen sensor signal, check the air/ fuel mixture ratio, and also check the condition of control by the ECU) | Idle | 400 mV or lower - (oscilate) 600-1,000 mV |
| | | 2,000 rpm | |

## INSPECTION

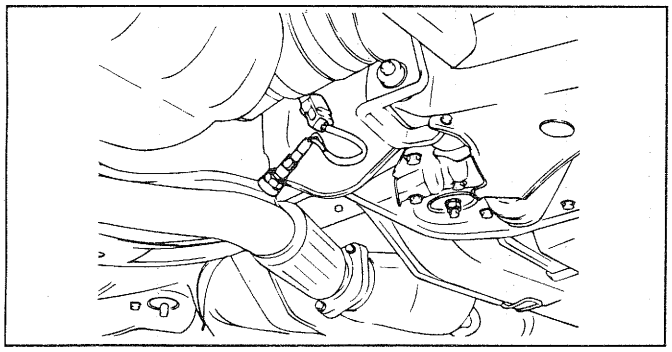
## NOTE

- **Before checking, warm up the engine until the engine coolant temperature reaches 80 to 95°C (176 to 205°F).**
- **Use an accurate digital voltmeter.**

1. Disconnect the oxygen sensor connector, and measure the resistance between terminal 3 and terminal 4.

**Standard value**

| Temperature °C (°F) | Resistance (Ω) |
|---|---|
| 400 (752) | 30 or more |



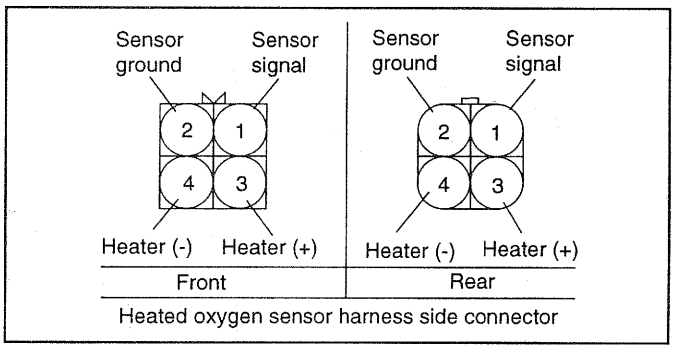
EFAA719E

2. Replace the oxygen sensor if there is a malfunction.
3. Apply battery voltage directly between terminal 3 and terminal 4.

## NOTE

**Be careful when applying the voltage. Damage will result if the terminals are incorrect or are short circuited.**

4. Connect a digital-type volmeter between terminal 1 and terminal 2.



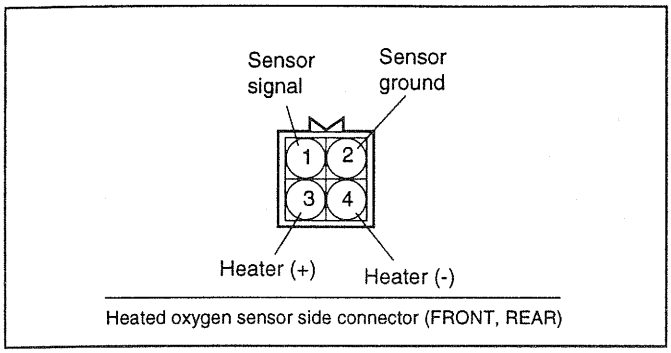

EFAA719F

5. While repeatedly racing the engine, measure the oxygen sensor output voltage.

| Engine | Oxygen sensor output voltage | Resistance (Ω) |
|---|---|---|
| Race | Min. 0.6V | 30 or more |

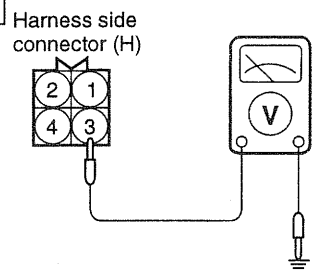
6. If there is a problem, there may be an oxygen sensor malfunction.

**Tightening torque**
Heated oxygen sensor :
40-50 Nm (400-500 kg.cm, 29-36 lb.ft)

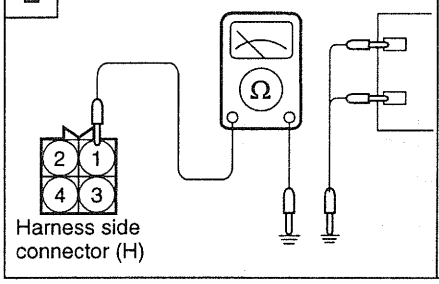



EFAA719G

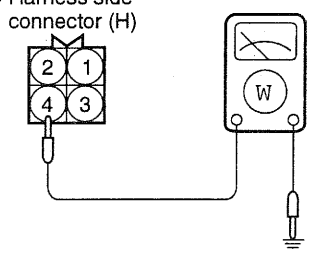
## HARNESS INSPECTION PROCEDURES

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage of the heated oxygen sensor.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage | OK ⇒ | 2 |
| | | NG ⇒ | Repair the harness. |

EFHA719B

| | | | |
|---|---|---|---|
| 2   | Check for open-circuit, or a short-circuit to ground between the ECM and the oxygen sensor.<br>o Oxygen sensor connector : Disconnected<br>o ECM connector : Disconnected | OK ⇒ | 3 |
| | | NG ⇒ | Repair the harness. |

EFHA719C

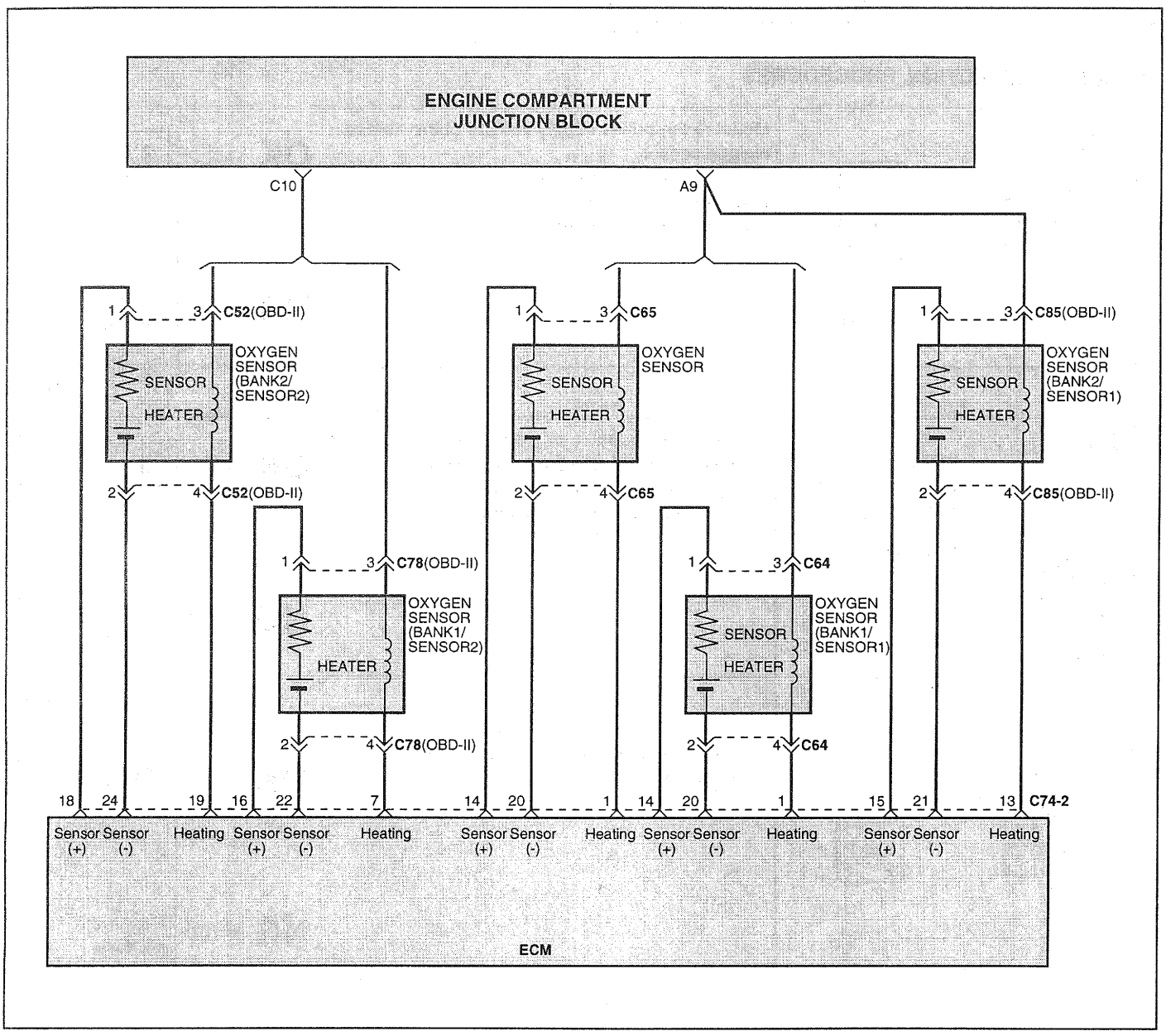
| | | | |
|---|---|---|---|
| 3   | Check for continuity of the ground circuit.<br>o Connector : Disconnected | OK ⇒ | END ! |
| | | NG ⇒ | Repair the harness. |

EFHA719D

## HEATED OXYGEN SENSOR (HO2S) [2.7 V6] EFHA7210

The heated oxygen sensor senses the oxygen concentration in exhaust gas and converts it into a voltage, which is sent to the ECM. The oxygen sensor outputs about 0V when the air fuel ratio is richer than the theoretical ratio, and outputs about 5V when the ratio is more lean (higher oxygen concentration in exhaust gas.). The ECM controls the fuel injection ratio based on this signal so that the air fuel ratio is maintained at the theoretical ratio. The oxygen sensor has a heating element which ensures the sensor performance during all driving conditions.

### CIRCUIT DIAGRAM




EFHA721A

### TROUBLESHOOTING HINTS

1. If the HO2S is defective, abnormally high emissions may occur.
2. If the HO2S check results were normal, but the sensor output voltage is out of specification, check for the following items (related to air fuel ratio control system):
   - Defective injector
   - Air leaks in the intake manifold.
   - Defective air flow sensor, intake air temperature sensor, and engine coolant temperature sensor.

### USING GST

| Check Item | Check conditions | Engine state | Test specification |
|---|---|---|---|
| Oxygen sensor | Engine: Warm-up (make the mixture lean by engine speed reduction, and rich by racing) | When sudden deceleration from 4,000 rpm | 300-900 mV |
| | | When engine is suddenly raced | 4000-4800 mV |
| | Engine: Warm-up (using the heated oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the ECU) | At Idle rpm | 300-4800 mV |
| | | 2,000 rpm | 300-4800 mV |

## INSPECTION (USING VOLTMETER)

### NOTE

**Before checking, warm up the engine until the engine coolant temperature reaches 80 to 95°C (176 to 205°F).**

1. Apply battery voltage directly between terminal 3 and terminal 4.

### NOTE

**Be careful when applying the voltage. Damage will result if the terminals are incorrect or are short circuited.**

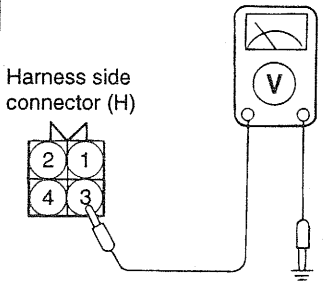
2. Connect a digital-type voltmeter between terminal 1 and terminal 2.
3. While repeatedly racing the engine, measure the oxygen sensor output voltage.

| Engine | Oxygen sensor output voltage | Remarks |
|---|---|---|
| Race | 4000-4800mV | Makes the air/fuel mixture rich by increasing engine speed |

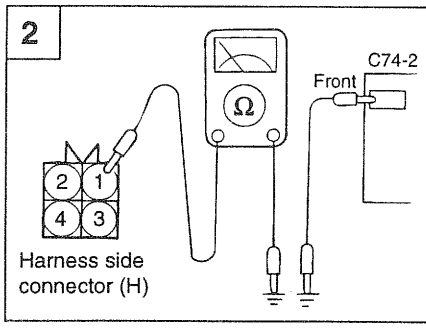
4. If there is a problem, there may be an oxygen sensor malfunction.

Tightening torque
Heated oxygen sensor :
40-50 Nm (400-500 kg·cm, 29-36 lb·ft)

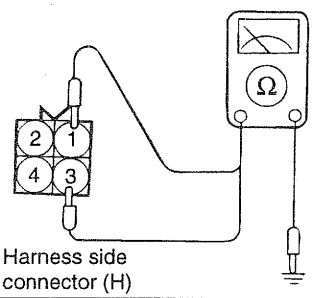
## HARNESS INSPECTION PROCEDURES

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage of the heated oxygen sensor.<br>o Connector : Disconnected<br>o Ignition switch : ON<br>o Voltage (V) : Battery voltage | OK ⇒<br>NG ⇒ | 2<br>Repair the harness. |

EFHA721B

| | | | |
|---|---|---|---|
| 2   | Check for open-circuit, or a short-circuit to ground between the engine control module and the heated oxygen sensor.<br>o Heated oxygen sensor connector: Disconnected<br>o ECM connector : Disconnected | OK ⇒<br>NG ⇒ | 3<br>Repair the harness. |

EFHA721C

| | | | |
|---|---|---|---|
| 3   | Check for continuity of the ground circuit.<br>o Connector : Disconnected | OK ⇒<br>NG ⇒ | END !<br>Repair the harness. |

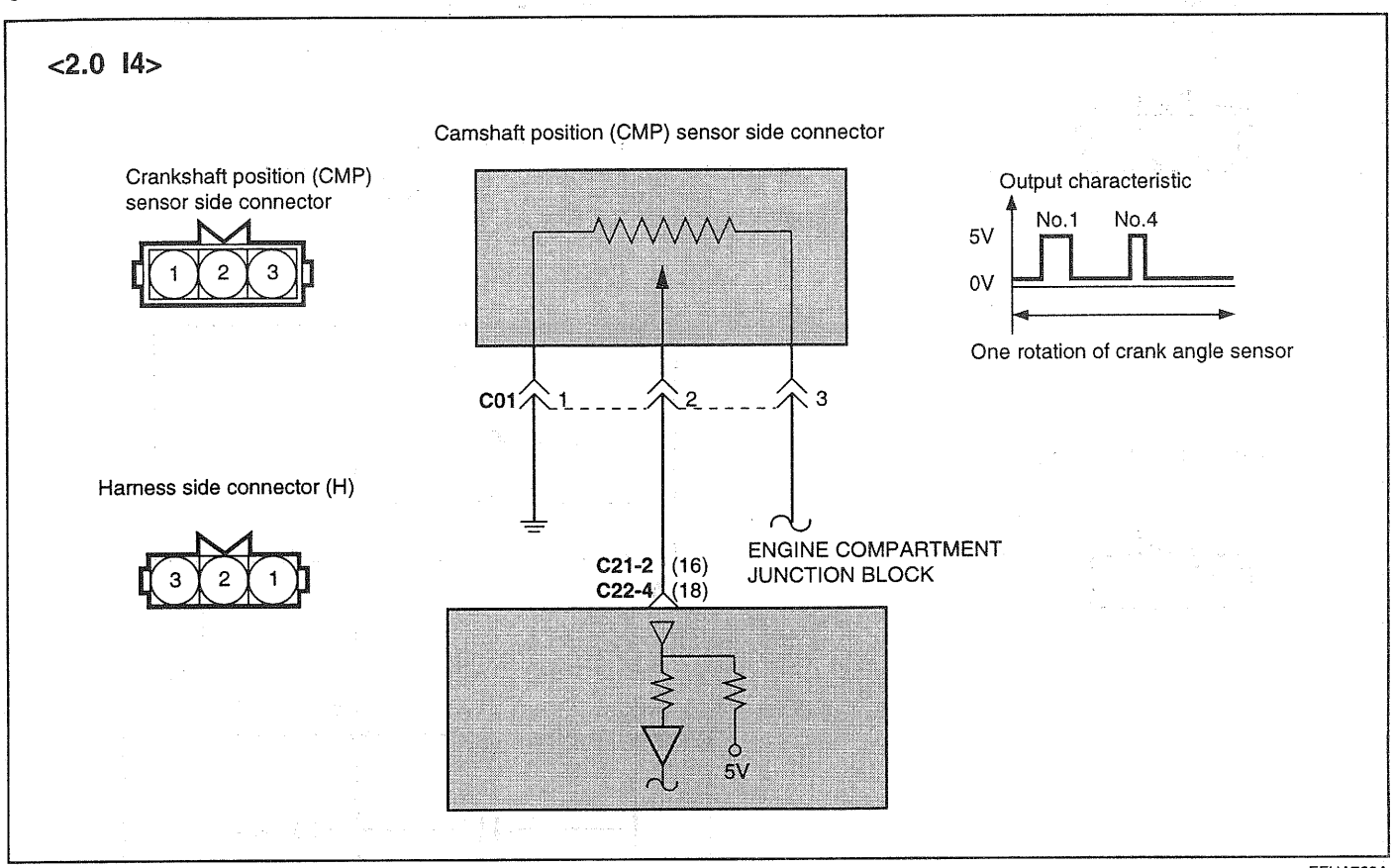
EFHA721D

## CAMSHAFT POSITION SENSOR EFHA7230

The CMP sensor senses the camshaft position sensor on, the compression stroke of the No.1 and No.4 cylinders, converts it into a pulse signal, and inputs it to the ECM. The ECM then computes the fuel injection sequence, etc. based on the input signal.

### CIRCUIT DIAGRAM

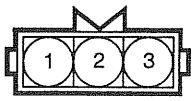
<2.0 I4>

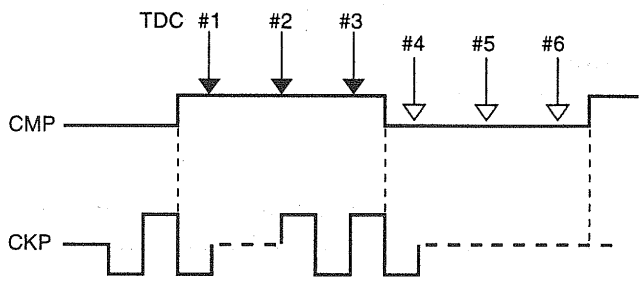



EFHA723A

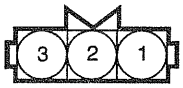
<2.7 V6>

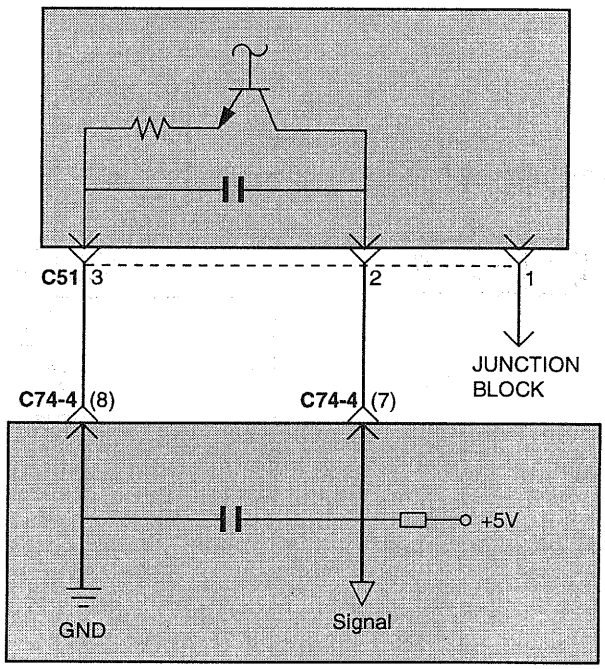
CMP Sensor side connector



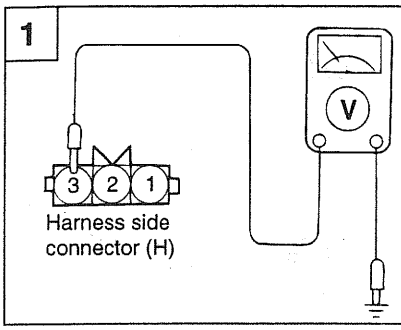

Harness side connector (H)



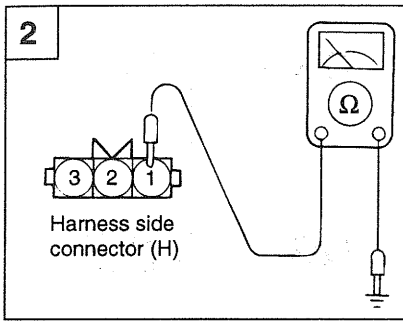




EFHA723E

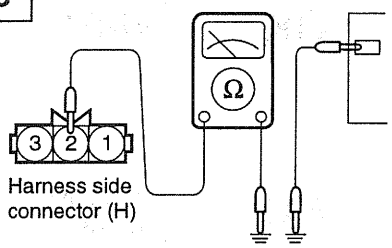
## HARNESS INSPECTION PROCEDURE [2.0 I4]

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage | OK ⇒<br>NG ⇒ | 2<br>Repair the harness. |

EFHA723B

| | | | |
|---|---|---|---|
| 2   | Check for continuity of the ground circuit.<br>o Connector : Disconnected | OK ⇒<br>NG ⇒ | 3<br>Repair the harness. |

EFHA723C

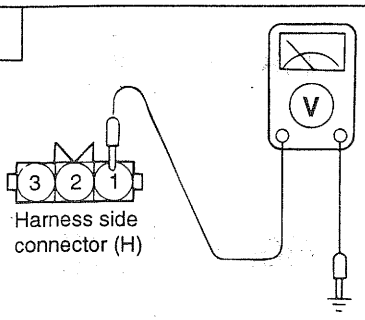
| | | | |
|---|---|---|---|
| 3   | Check the signal voltage.<br>o Connector: Disconnected<br>o Ignition switch : ON<br>o Voltage : 4.8-5.2 V | OK ⇒<br>NG ⇒ | END !<br>Repair the harness. |

EFHA723D

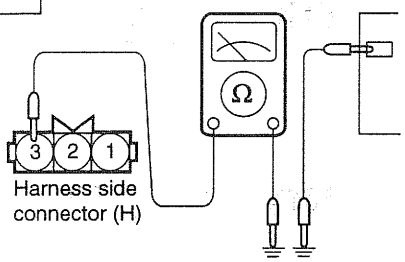
## TROUBLESHOOTING HINTS

If the CMP Sensor does not operate correctly, correct sequential injection is not made so that the engine may stall or run irregularly at idle or fail to accelerate normally.

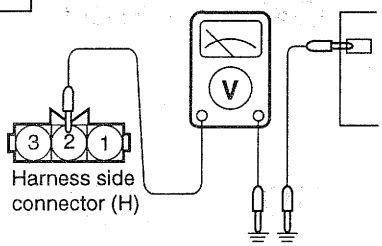
## HARNESS INSPECTION PROCEDURE [2.7 V6]

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage | OK ⇒<br>NG ⇒ | 2<br>Repair the harness. |

EFAA723F

| | | | |
|---|---|---|---|
| 2   | Check for continuity of the ground circuit.<br>o Connector : Disconnected | OK ⇒<br>NG ⇒ | 3<br>Repair the harness. |

EFHA723G

| | | | |
|---|---|---|---|
| 3   | Check the signal voltage.<br>o Connector : Disconnected<br>o Ignition ON<br>o Voltage : 4.8-5.2V | OK ⇒<br>NG ⇒ | END !<br>Repair the harness. |

EFHA723H

## TROUBLESHOOTING HINTS

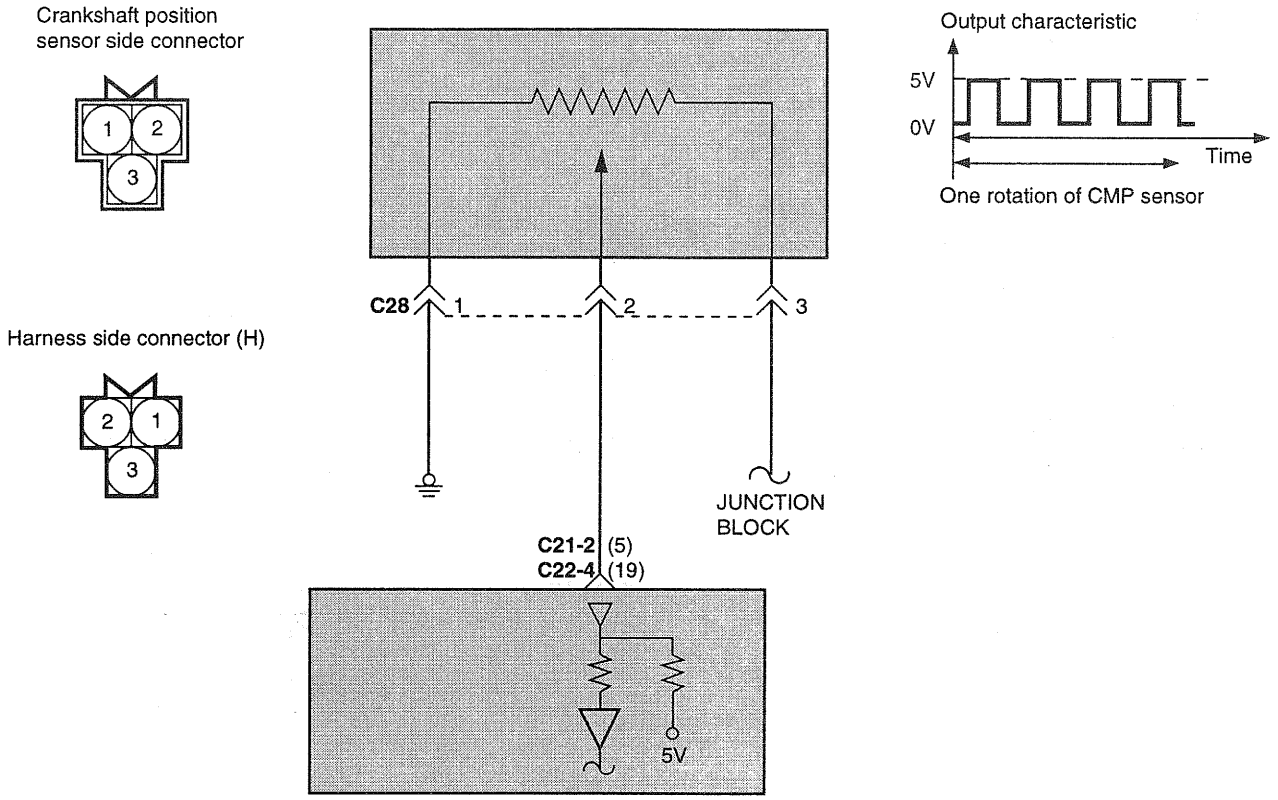
If the camshaft position sensor does not operate correctly, correct sequential injection is not made so that the engine may stall or run irregularly at idle or fail to accelerate normally.

## CRANKSHAFT POSITION SENSOR EFHA7250

The crankshaft position sensor senses the crank angle (piston position) of each cylinder and converts it into a pulse signal. Based on the input signal, the ECM computes the engine speed and controls the fuel injection timing and ignition timing.

### CIRCUIT DIAGRAM

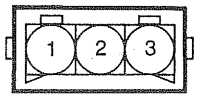
[2.0 I4]

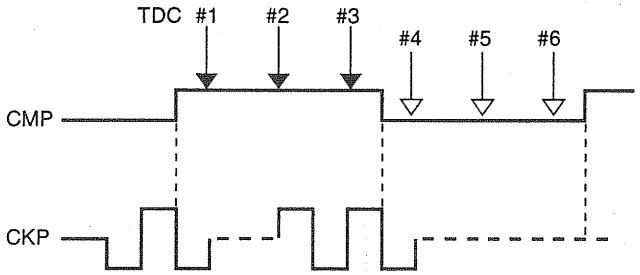



EFHA725A

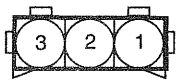
<2.7 V6>

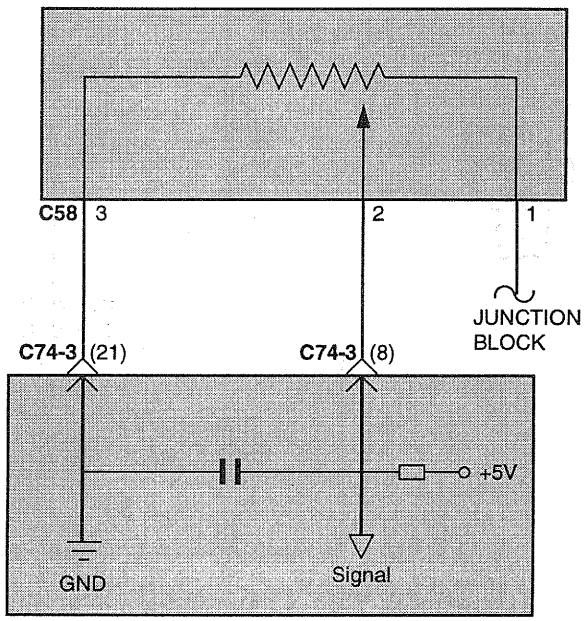
CMP Sensor side connector




Harness side connector (H)




EFHA725B

## TROUBLESHOOTING HINTS

1. If unexpected shocks are felt during driving or the engine stalls suddenly, shake the crankshaft position sensor harness. If this causes the engine to stall, check for poor sensor connector contact.
2. If the tachometer reads 0 rpm when the engine is cranked, check for faulty crank angle sensor, broken timing belt or ignition system problems.
3. If the engine can be run at idle even if the crank angle sensor reading is out of specification, check the following:
   - Faulty engine coolant temperature sensor
   - Faulty idle speed control motor
   - Poorly adjusted reference idle speed

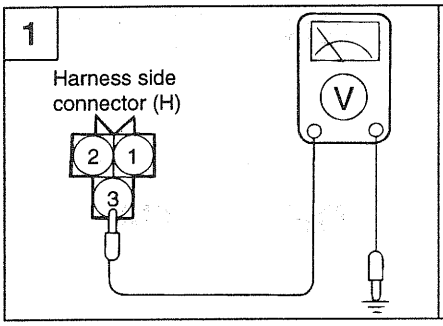
## USING GST

| Check Item | Check conditions | Check content | Normal state |
|---|---|---|---|
| Crankshaft position sensor | • Engine cranking<br>• Tachometer connected (check on and off ignition coil by tachometer) | Compare cranking speed and multi-tester reading | Indicated speed agrees |

| Check Item | Check conditions | Coolant temperature | Test specification |
|---|---|---|---|
| Crankshaft position sensor | • Engine: Running at idle<br>• Idle position switch: ON | When -20°C (-4°F) | 1,500-1,700 rpm |
| | | When 0°C (-32°F) | 1,350-1,550 rpm |
| | | When 20°C (-68°F) | 1,200-1,400 rpm |
| | | When 40°C (-104°F) | 1,000-1,200 rpm |
| | | When 80°C (-176°F) | Idle rpm |

## HARNESS INSPECTION PROCEDURE <2.0 I4>

1



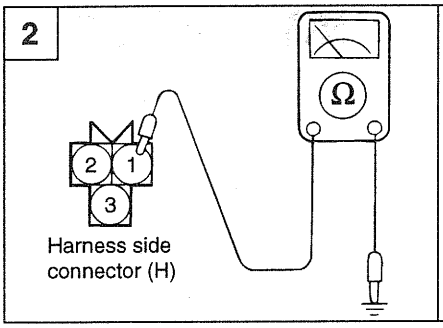

Measure the power supply voltage.
o Connector: Disconnected
o Ignition switch: ON
o Voltage (V): Battery voltage

OK ⇒ 2

NG ⇒ Repair the harness.

EFAA725C

2



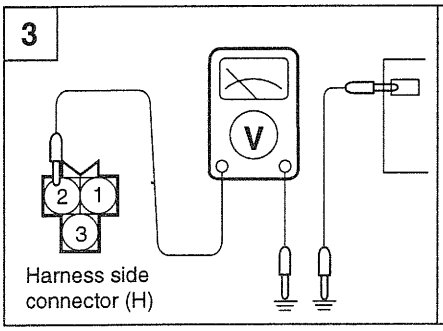

Check for continuity of the ground circuit.
o Connector : Disconnected

OK ⇒ 3

NG ⇒ Repair the harness.

EFAA725D

3



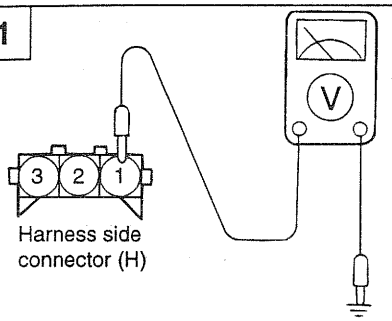

Check for continuity of the ground circuit.
o Connector : Disconnected
o Ignition switch : ON
o Voltage : 4.8-5.2 V

OK ⇒ END !

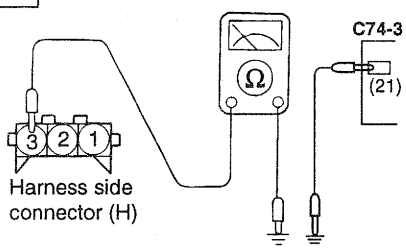
NG ⇒ Repair the harness.

EFHA725E

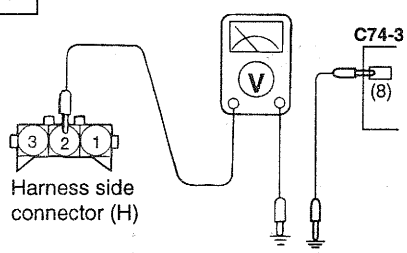
## HARNESS INSPECTION PROCEDURE <2.7 V6>

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage | OK ⇒<br>NG ⇒ | 2<br>Repair the harness. |

EFAA725F

| | | | |
|---|---|---|---|
| 2   | Check for continuity of the ground circuit.<br>o Connector : Disconnected<br>o Continuity | OK ⇒<br>NG ⇒ | 3<br>Repair the harness. |

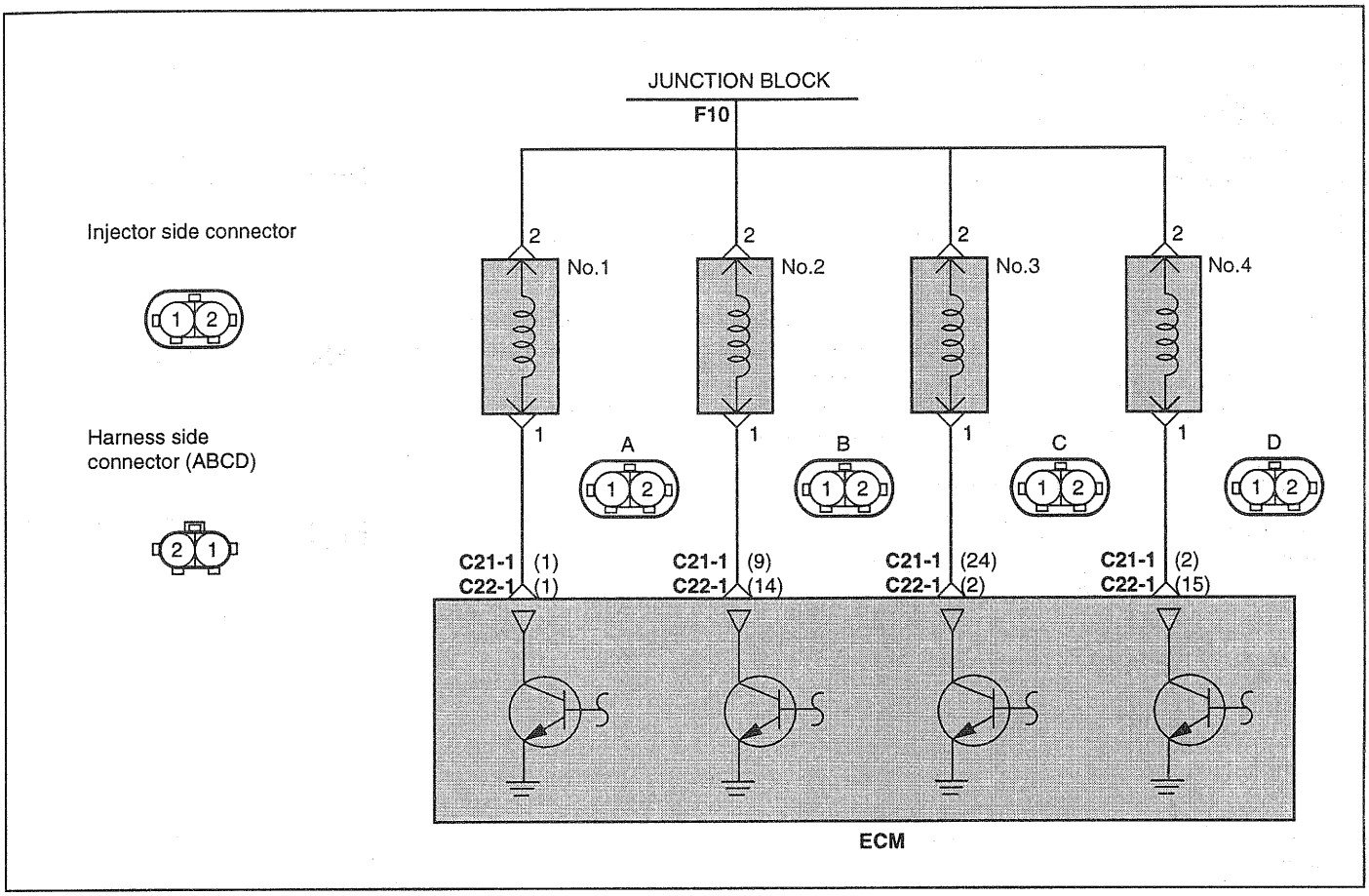
EFHA725G

| | | | |
|---|---|---|---|
| 3   | Check for continuity of the ground circuit.<br>o Connector : Disconnected<br>o Ignition switch : ON<br>o Voltage : 4.8-5.2 V | OK ⇒<br>NG ⇒ | END !<br>Repair the harness. |

EFHA725H

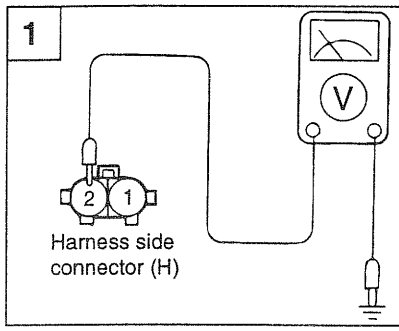
## FUEL INJECTOR [2.0 I4] EFHA7270

The injectors inject fuel according to a signal coming from the ECM. The amount of fuel injected by the injectors is determined by the time which the solenoid valve is energized.

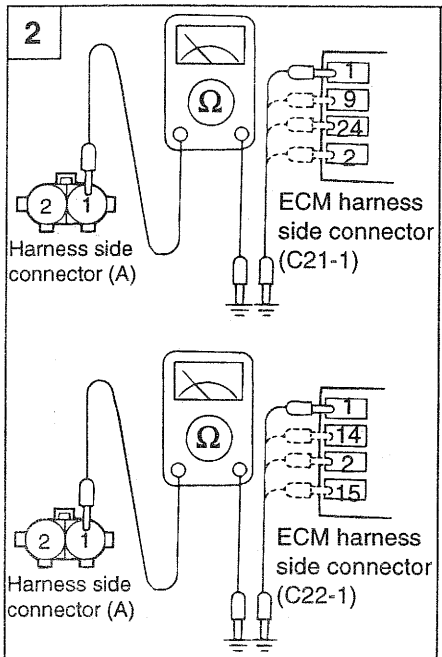



EFHA727A

## HARNESS INSPECTION

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage | OK ⇒<br>NG ⇒ | 2<br>Repair the harness. |

EFAA727B

| | | | |
|---|---|---|---|
| 2   | Check for an open-circuit, or a short-circuit to ground between the engine control module and the injector.<br>o ECM connector : Disconnected<br>o Injector connector : Disconnected | OK ⇒<br>NG ⇒ | END !<br>Repair the harness. |

EFHA727C

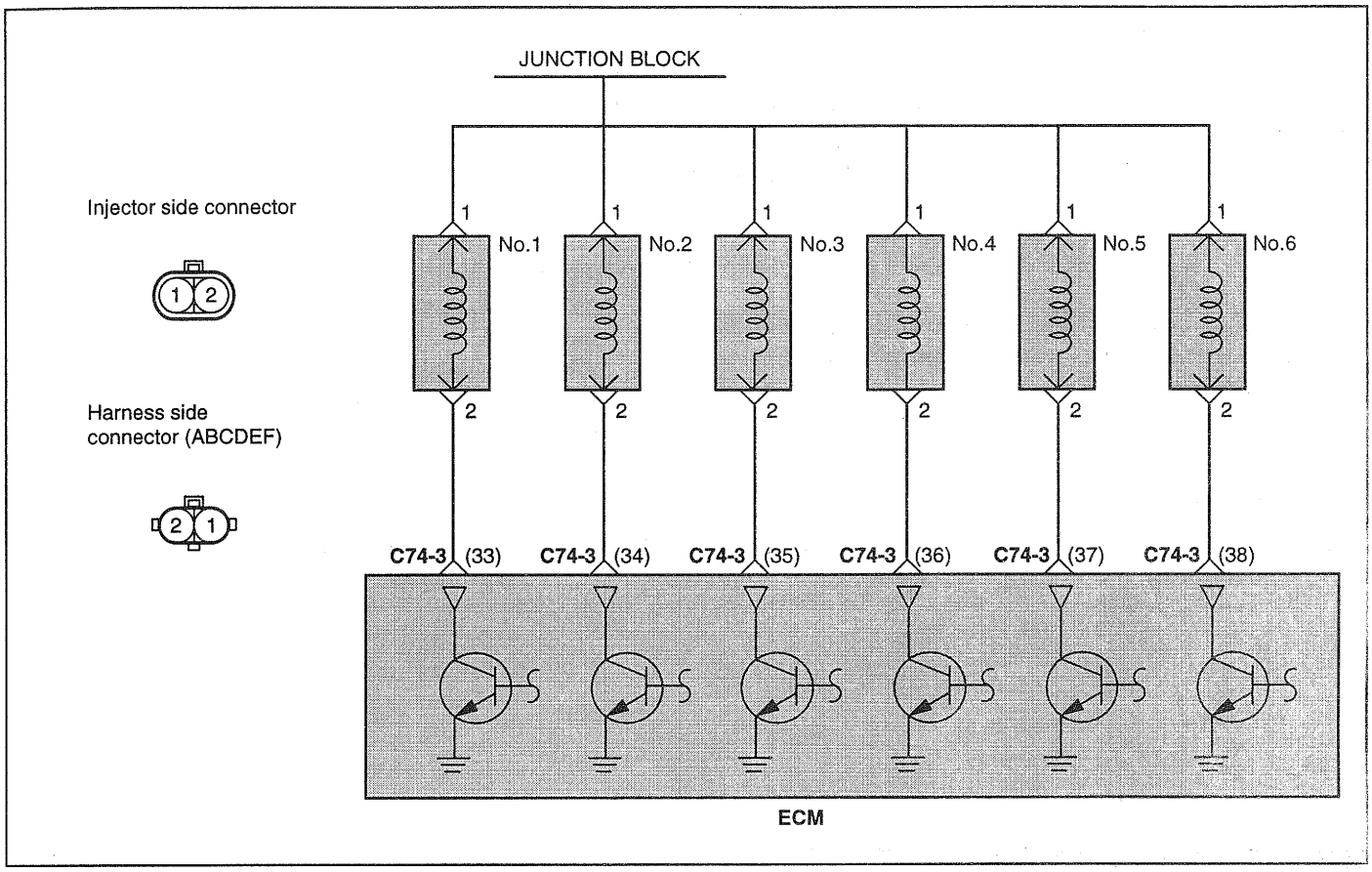
## TROUBLESHOOTING HINTS

1. If the engine is hard to start when hot, check for fuel pressure and injector leaks.
2. If the injector does not operate when the engine is cranked, then check the followings:
   - Defective power supply circuit to the ECM, faulty ground circuit
   - Defective control relay
   - Defective crankshaft position (CKP) sensor, camshaft position (CMP) sensor
3. If there is any cylinder whose idle state remains unchanged when the fuel injection of injectors is cut one after another during idling, check for the following items about such a cylinder.
   - Injector and harness
   - Ignition plug and high tension cable
   - Compression pressure
4. If the injection system is ok but the injector drive time is out of specification, check for the following items.
   - Poor combustion in the cylinder (faulty ignition plug, ignition coil, compression pressure, etc.)
   - Loose EGR valve seating

## FUEL INJECTOR [2.7 V6] EFHA7290

The injectors inject fuel according to a signal coming from the ECM. The amount of fuel injected by the injectors is determined by the time during which the solenoid valve is energized.

### CIRCUIT DIAGRAM




EFHA729A

## INJECTOR CHECKING

### USING HI-SCAN

| Check Item | Data display | Check conditions | Check content | Test specification |
|---|---|---|---|---|
| Injector | Drive time | Engine: Cranking | 0°C (32°F) | Approx. 17 ms |
| | | | 20°C (68°F) | Approx. 35 ms |
| | | | 80°C (176°F) | Approx. 8.5 ms |

| Check Item | Data display | Check conditions | Engine state | Test specification |
|---|---|---|---|---|
| Injector | Drive time | • Engine coolant temperature: 80 to 95°C (176 to 205°F)<br>• Lamps, electric cooling fan, accessory modules: All OFF<br>• Transaxle: Neutral (P range for vehicle with A/T)<br>• Steering wheel: Neutral | Idle rpm | 2.2-2.9 ms |
| | | | 2,000 rpm | 1.8-2.6 ms |
| | | | Rapid racing | To increase |

## NOTE

1. **The injector drive time is when the supply voltage is 11V and the cranking speed is less than 250 rpm.**
2. **When engine coolant temperature is lower than 0°C (32°F), the ECM fires all four cylinders simultaneously.**
3. **When the vehicle is new (within initial operation of about 500 km [300 miles]), the injector drive time may be about 10% longer.**

| Check Item | Item No. | Drive content | Check condition | Normal state |
|---|---|---|---|---|
| Injector<br>• Actuator test | 01 | No. 1 injector shut off | Engine: Idling after warm-up (Shut off the injectors in sequence during and after engine warm-up; check the idle condition) | Idle should become unstable as injector shuts off. |
| | 02 | No. 2 injector shut off | | |
| | 03 | No. 3 injector shut off | | |
| | 04 | No. 4 injector shut off | | |
| | 05 | No. 5 injector shut off | | |
| | 06 | No. 6 injector shut off | | |

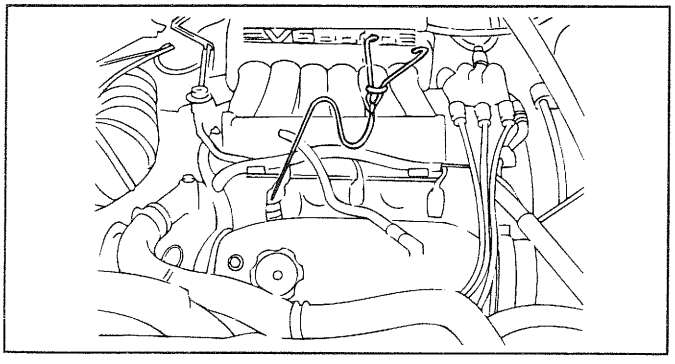
## USING STETHOSCOPE AND VOLTMETER

Operation Sound Check

1. Using a stethoscope, check the injectors for clicking sound at idle. Check that the sound is produced at shorter intervals as the engine speed increases.

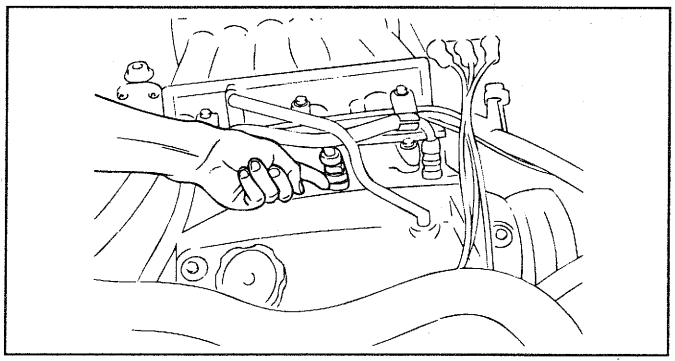
## NOTE

**Ensure that the sound from an adjacent injector is not being transmitted along with the delivery pipe to an inoperative injector.**



EFA9087A

2. If a stethoscope is not available, check the injector operation with your finger. If no vibration is felt, check the wiring connector, injector or injection signal from the ECM.



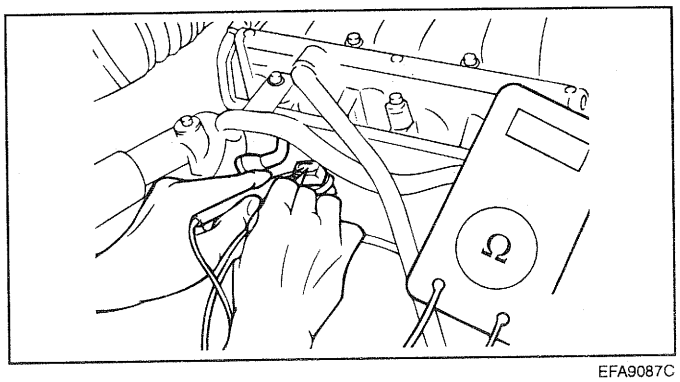
EFA9087B

Resistance Measurement Between Terminals

3. Disconnect the connector at the injector.
4. Measure the resistance between terminals.

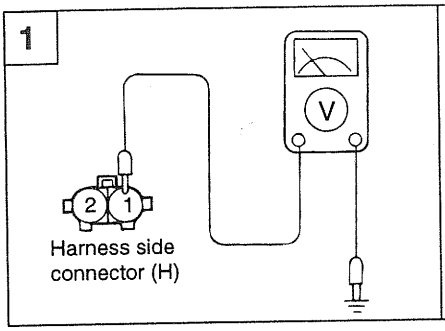
Standard value : 13–16Ω[at20°C(68°F)]

5. Connect the connector to the injector.

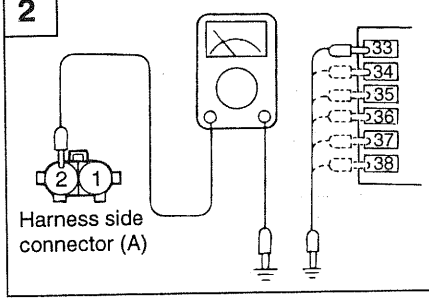



EFA9087C

## HARNESS INSPECTION

| | | | |
|---|---|---|---|
| 1<br>  <br><br>Harness side connector (H) | Measure the power supply voltage.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage | OK ⇒<br>NG ⇒ | 2<br>Repair the harness. |

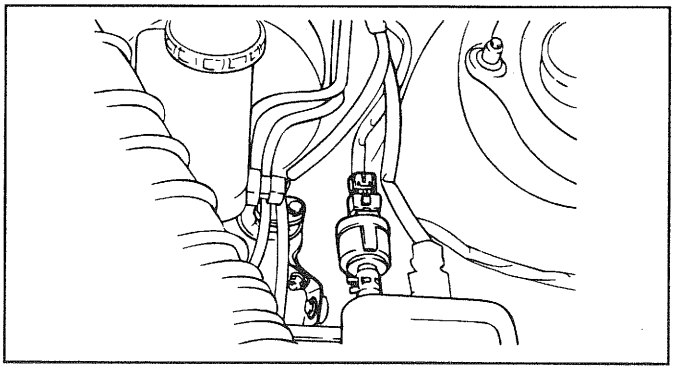
EFHA729B

| | | | |
|---|---|---|---|
| 2<br>  <br><br>Harness side connector (A) | Check for an open-circuit, or a short-circuit to ground between the engine control module and the injector.<br>o ECM connector : Disconnected<br>o Injector connector : Disconnected | OK ⇒<br>NG ⇒ | END !<br>Repair the harness. |

EFHA729C

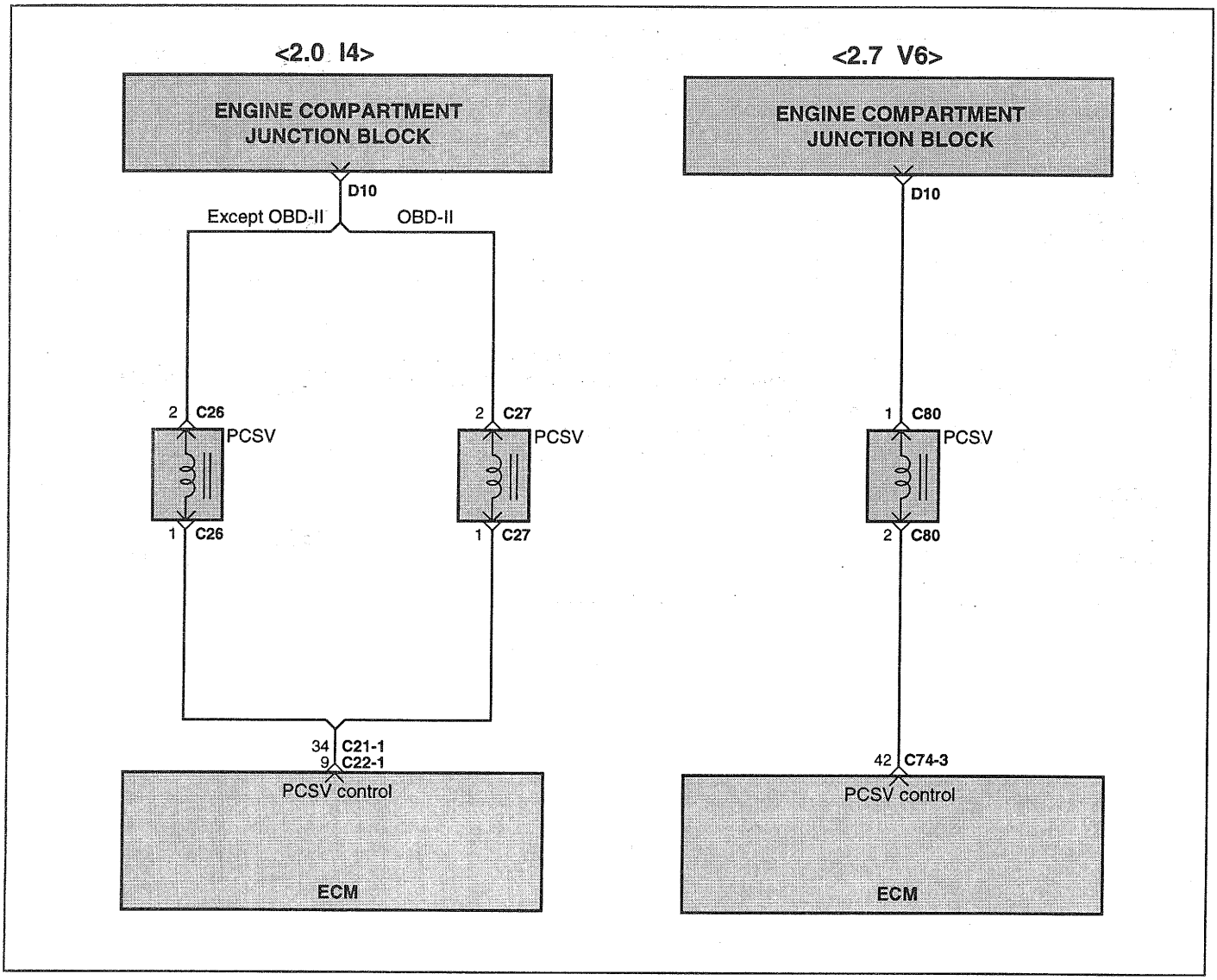
## EVAPORATIVE EMISSION CANISTER PURGE SOLENOID VALVE EFHA7310

The evaporative emission canister purge solenoid valve is a duty control type, which controls purge air from the evaporative emission canister.



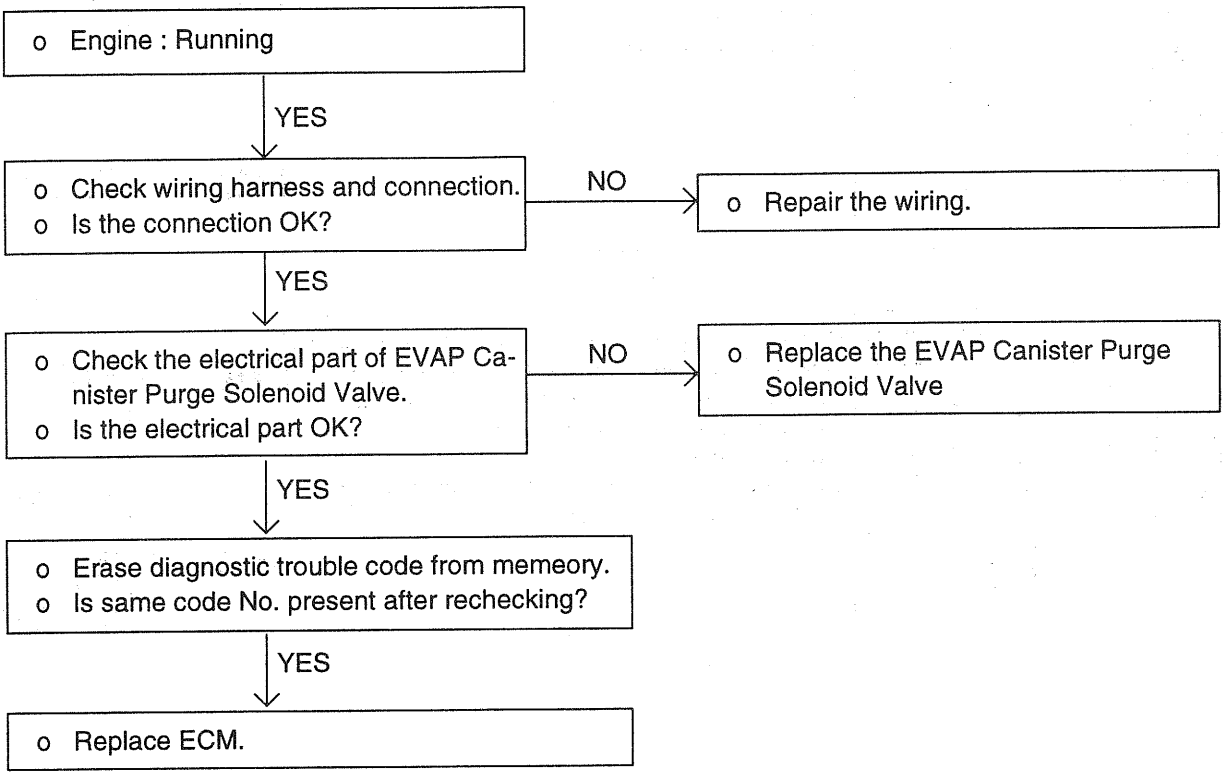
EFA9089A

### CIRCUIT DIAGRAM




EFHA731A

## TROUBLESHOOTING PROCEDURES



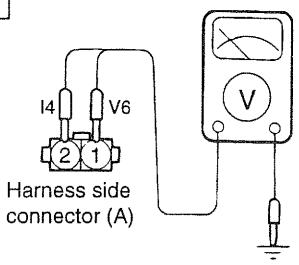

DTC : Diagnosis Trouble Code
ECM : Engine Control Module

EFAA731B

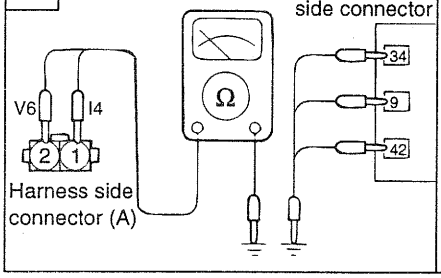
## USING HI-SCAN

| Check Item | Check conditions | HI-SCAN display | Type |
|---|---|---|---|
| Evaporative emission canister purge solenoid valve<br>• Actuator test | IG. S/W ON (Do not start) | PCSV | Activate |

## HARNESS INSPECTION

| | | | |
|---|---|---|---|
| 1   | Measure the power supply voltage.<br>o Connector: Disconnected<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage | OK ⇒<br><br>NG ⇒ | 2<br><br>Repair the harness. |

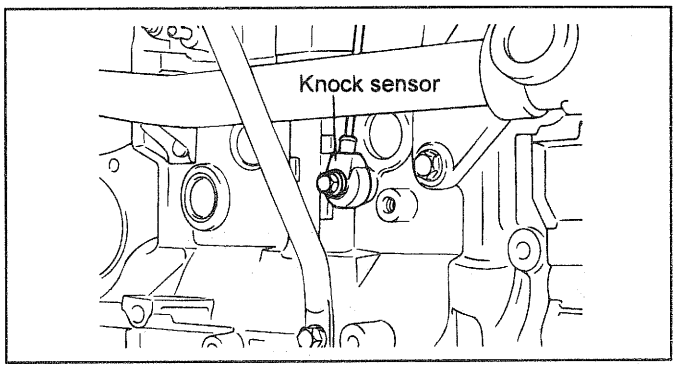
EFHA731C

| | | | |
|---|---|---|---|
| 2   | Check for an open-circuit, or a short-circuit to ground between the evaporative emission canister purge solenoid valve and the engine control module.<br>o Engine control module connector : Disconnected<br>o Evaporative emission canister purge solenoid valve connector : Disconnected | OK ⇒<br><br>NG ⇒ | END !<br><br>Repair the harness.<br>H2-C21-1:34<br>H2-C22-1:9<br>H1-C74-3:42 |

EFHA731D

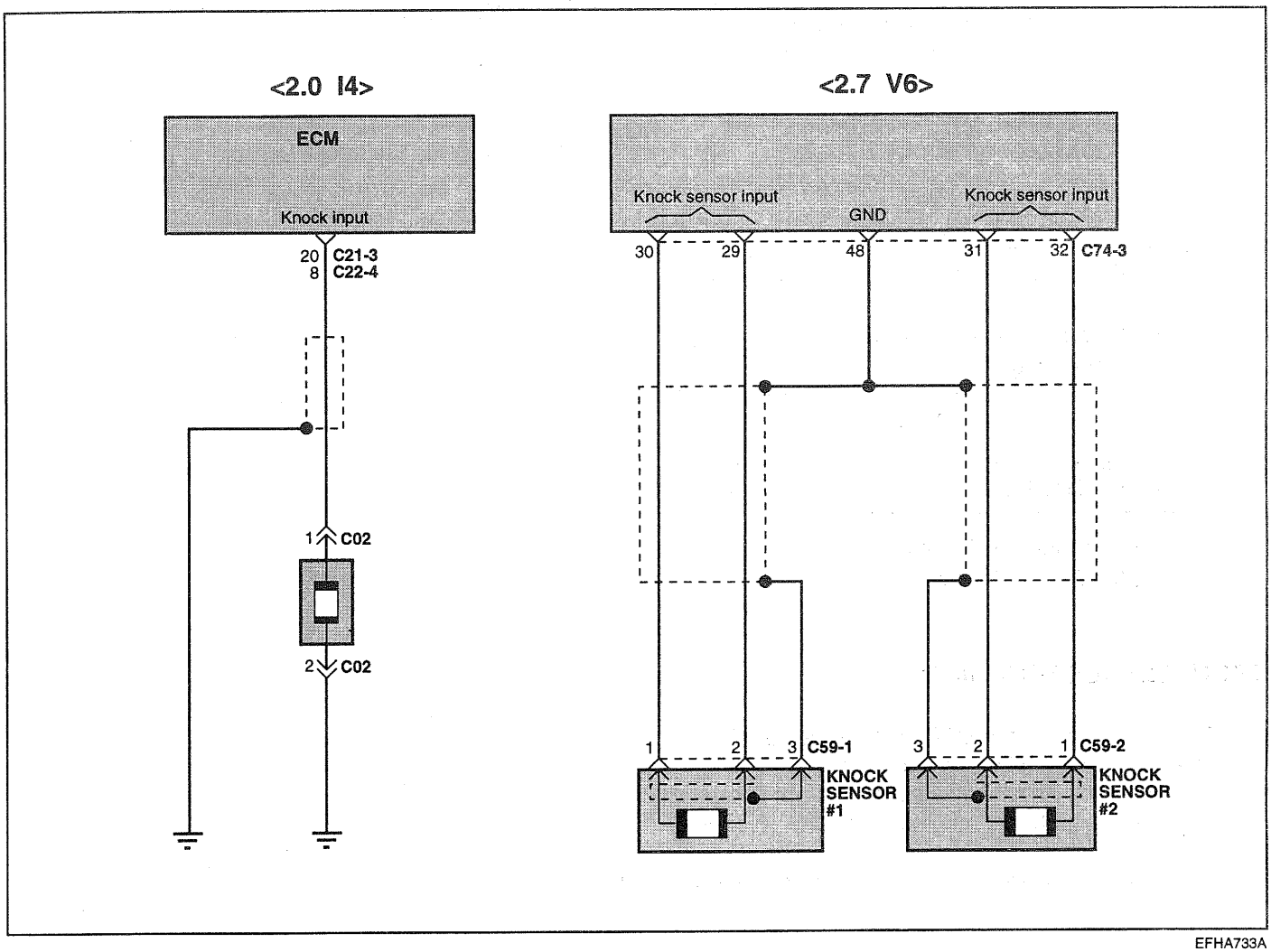
## KNOCK SENSOR EFHA7330

The knock sensor is attached to the cylinder block and senses engine knocking conditions. A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output. If engine knocking occurs, ignition timing is retarded to suppress it.



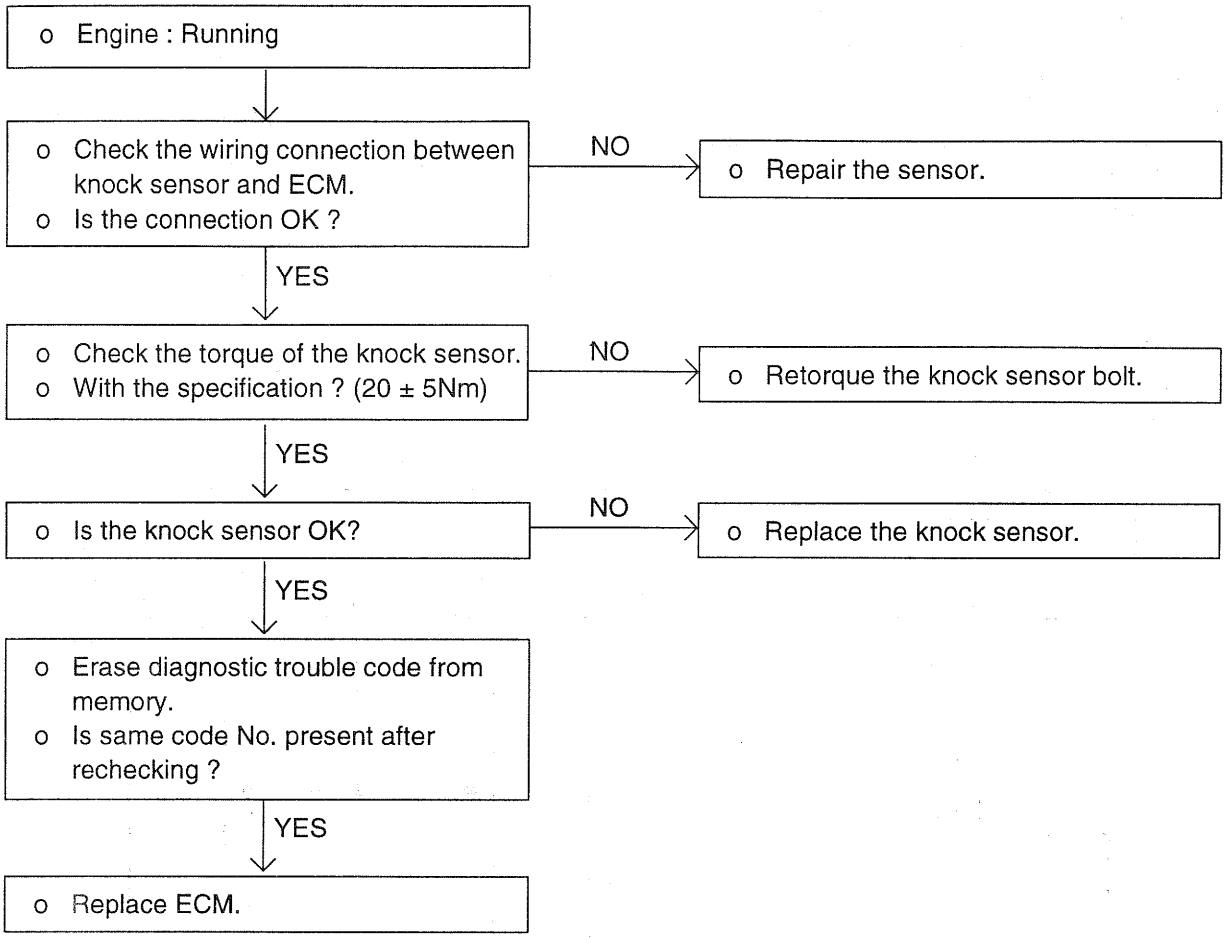

EFA9094A

### CIRCUIT DIAGRAM




EFHA733A

## TROUBLESHOOTING PROCEDURES




DTC : Diagnosis Trouble Code
ECM : Engine Control Module

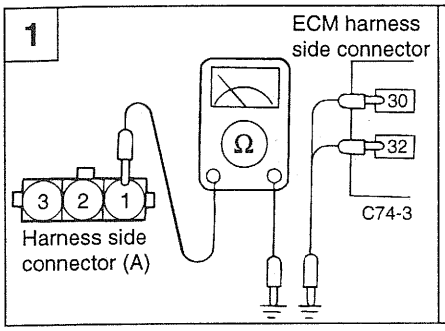
EFAA733B

## TROUBLESHOOTING HINTS

1. The MIL is ON or the DTC is displayed on the HI-SCAN under the following condition:
   - When the knock sensor signal is not detected, even though the engine is in the over load condition.
   - When knock sensor signal is abnormally low.

## HARNESS INSPECTION PROCEDURE <2.7 V6>

**1**



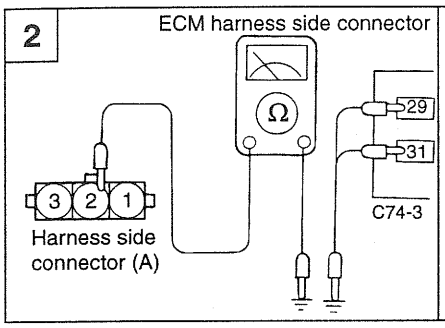

Check for an open-circuit, or a short-circuit to ground between the ECM and the knock sensor
- o ECM connector : Disconnected
- o Knock sensor connector : Disconnected

OK ⇒ 2

NG ⇒ Repair the harness.
A1 - C74-3 : 30
A1 - C74-3 : 32

EFHA733C

**2**



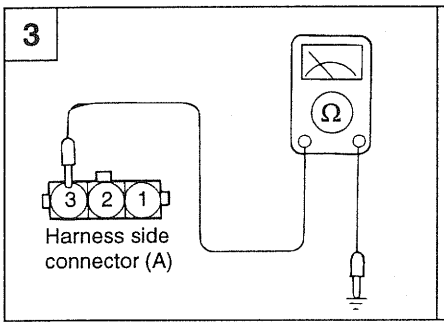

Check for continuity of the ground circuit
- o ECM Connector : Disconnected
- o Knock sensor connector : Disconnected

OK ⇒ 3

NG ⇒ Repair the harness.

EFHA733D

**3**




Check for continuity of the ground circuit
- o Continuity

OK ⇒ END !

NG ⇒ Repair the harness.

EFHA733F

## SENSOR INSPECTION

1. Disconnect the knock sensor connector.
2. Measure resistance between the terminal 2 and 3.

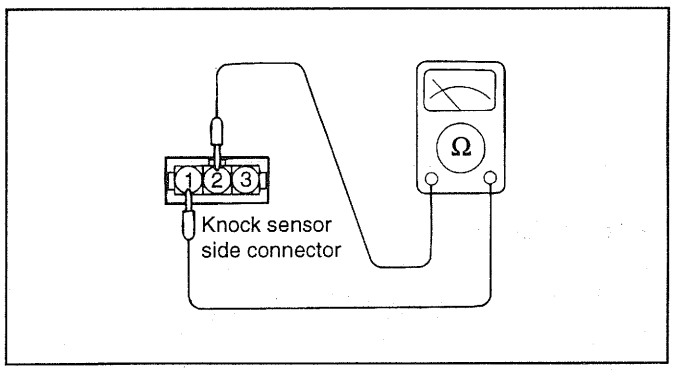
Standard value : about 5MΩ [at 20°C (68°F)]

3. If the resistance is continual, replace the knock sensor.

Knock sensor :
16-28Nm (160-250 kg·cm, 11.8-18.4 lb·ft)

4. Measure the capacitance between the terminal 2 and 3.

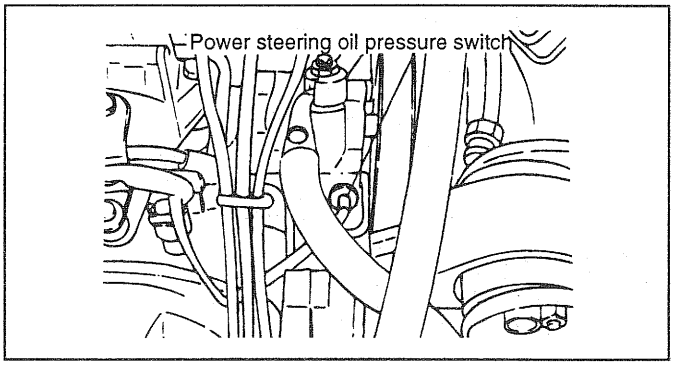
Standard value : 800-1600 pF




EFHA733E

## POWER STEERING PRESSURE SWITCH EFHA7350

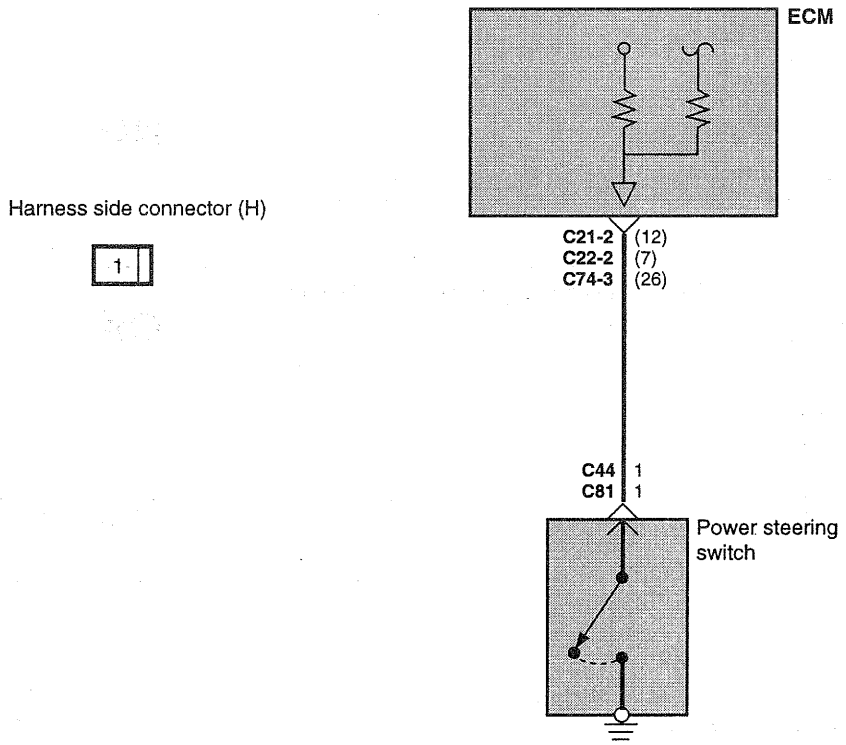
The power steering oil pressure switch senses the power steering load into low/high voltage and inputs it to ECM, which then controls the idle speed control motor based on this signal.




EFA9103A

### CIRCUIT DIAGRAM

<2.0 I4 / 2.7 V6>

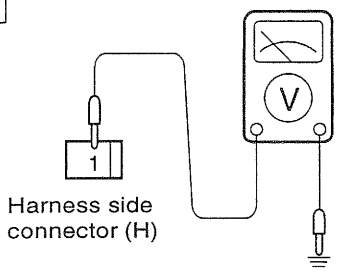



EFHA735A

### USING HI-SCAN

| Check item | Data display | Check conditions | Steering wheel | Normal indication |
|---|---|---|---|---|
| Power steering oil pressure switch | Switch state | Engine : Idling | Steering wheel neutral position (wheels straightahead direction) | OFF |
| | | | Steering wheel half turn | ON |

## HARNESS INSPECTION

| | | | |
|---|---|---|---|
| 1   Harness side connector (H) | Measure the power supply voltage.<br>o Connector: Disconnect<br>o Ignition switch: ON<br>o Voltage (V): Battery voltage | OK ⇨ | END ! |
| | | NG ⇨ | Repair the harness. |

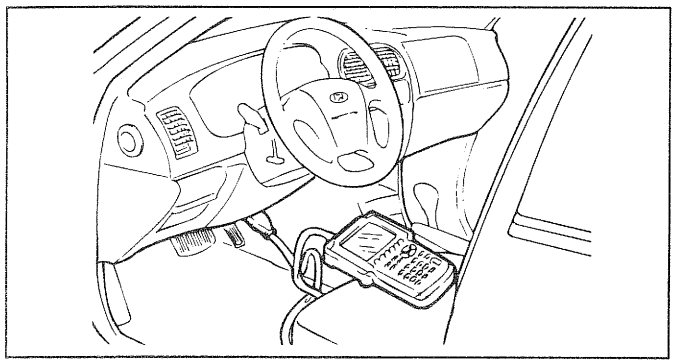
EFAA735B

## THROTTLE POSITION SENSOR(TPS) ADJUSTMENT EFHA1060

1. Connect a HI-SCAN to the data link connector.

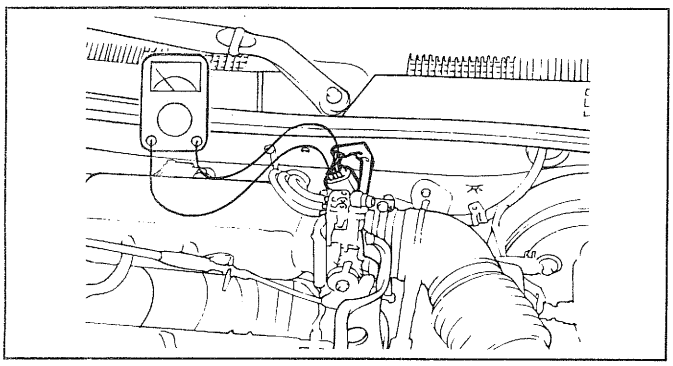
### NOTE

**Before adjusting the TPS, complete the basic idle speed adjustment.**



EFA9100A

2. If a HI-SCAN is not used, connect a digital type voltmeter between ground and TPS input terminal.



EFA9106A

3. Turn the ignition switch to the ON position(do not start engine) and check that TPS output voltage is as specified. If a HI-SCAN is used, read the TPS voltage.

Standard value :
300-900mV (2.0 I4)
250-800mV (2.7 V6)

4. If it is out of specification, loosen TPS mounting screw and adjust by turning TPS.

### NOTE

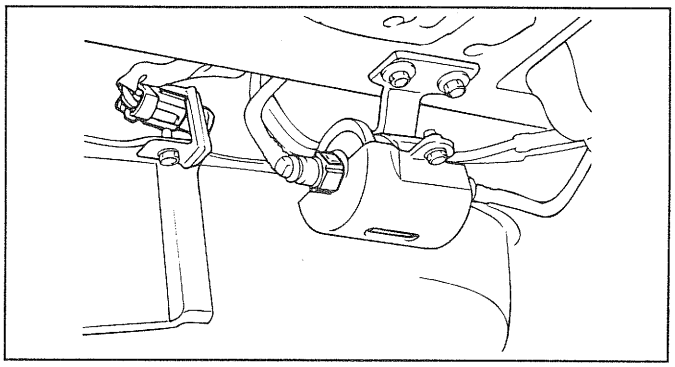
1. **Turning the TPS clockwise increases the output voltage.**
2. **Tighten the screws securely after adjustment.**

5. Turn the ignition switch to the OFF position.

## FUEL SENDER REPLACEMENT EFHA1070

1. Remove the fuel tank cap to lower the fuel tank's internal pressure.

2. Raise the vehicle and disconnect the fuel pump connector, remove the fuel feed and return line from the fuel pump assembly.

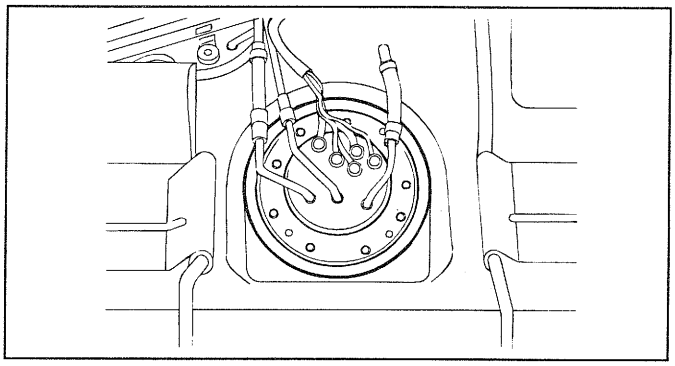


EFHA006B

3. Remove the fuel pump installation screws, then remove the fuel pump assembly from the fuel tank.

4. Remove the fuel sender from the fuel pump assembly.

5. Inspect and replace, if necessary.



EFHA006A

## FUEL PUMP OPERATION CHECK EFHA1080

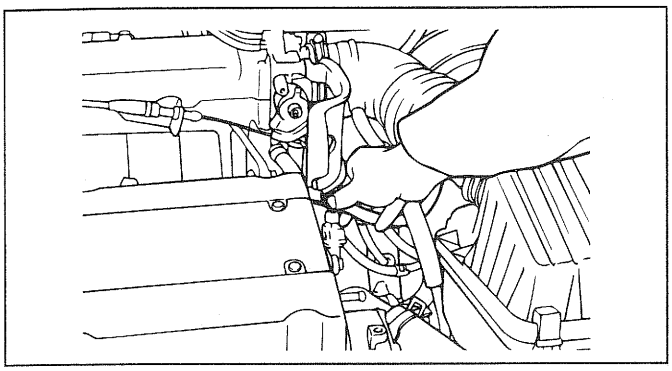
1. Turn the ignition switch to the OFF position.

2. Apply battery voltage to the fuel pump drive connector to check that the pump operates.

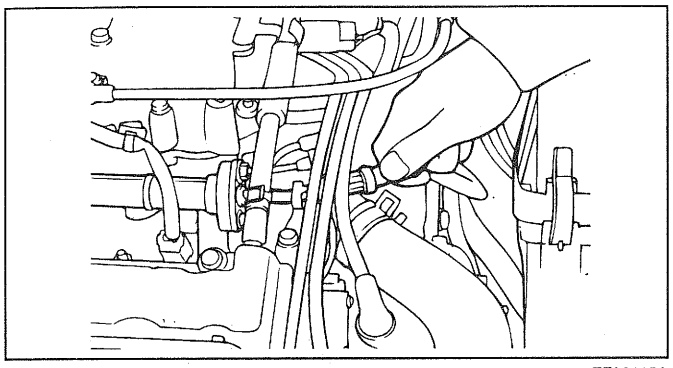
### NOTE

**The fuel pump is an in-tank type and its operating sound is hard to hear without removing the fuel tank cap.**

3. Pinch the hose to check that fuel pressure is felt.



EFA9108A



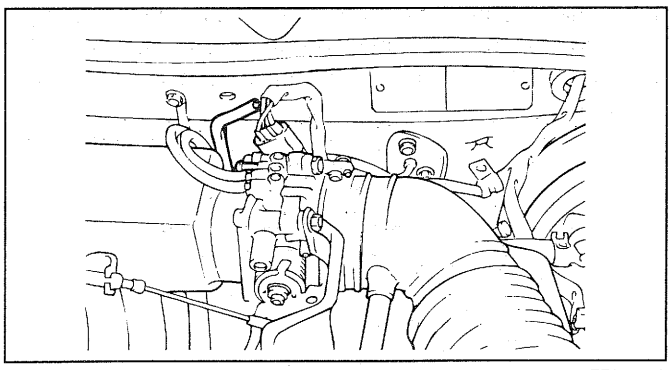
EFA9115A

## EVAP CANISTER PURGE PORT VACUUM CHECK EFHA1090

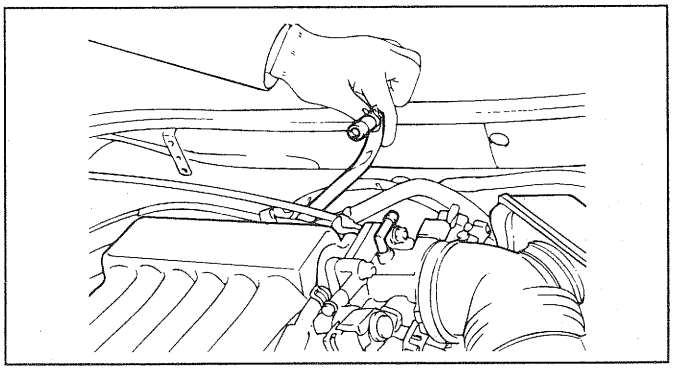
### CHECKING CONDITION

Engine coolant temperature : 80-95°C (176-205°F)

1. Disconnect the vacuum hose from the throttle body EVAP Canister purge hose fitting and connect a vacuum pump.



EFA9109A

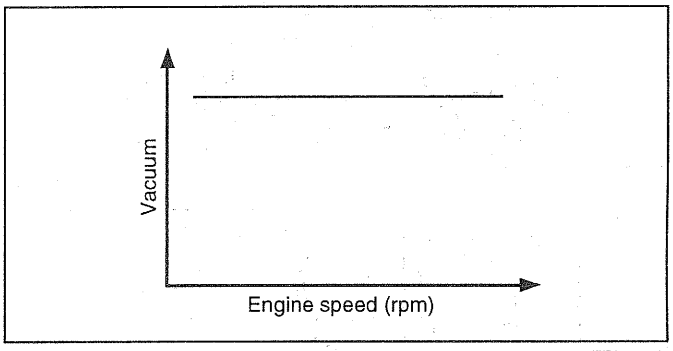


EFA9113A

2. Start the engine and check to see that, after increasing the engine speed, vacuum raises fairly constant.

### NOTE

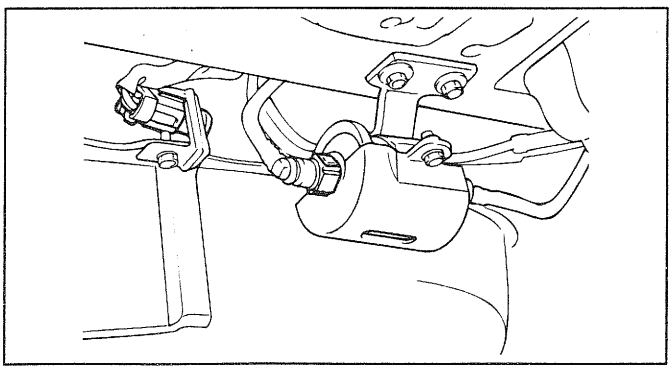
**If there is no vacuum created, it is possible that the throttle body port may be restricted and may require cleaning.**




EFA9109B

## FUEL PRESSURE TEST EFHA1100

1. Reduce the internal pressure of the fuel pipes and hoses by the following procedures:
   - Open the trunk door and disconnect the fuel pump harness connector.
   - Start the engine and after it stalls, turn the ignition switch to the OFF position.
   - Disconnect the battery negative (-) terminal.
   - Connect the fuel pump harness connector.



EFHA006B

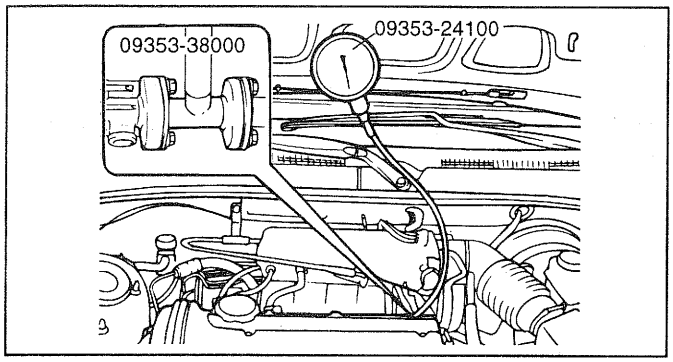
2. Remove the bolt connecting the fuel line to the fuel delivery pipe.

## CAUTION

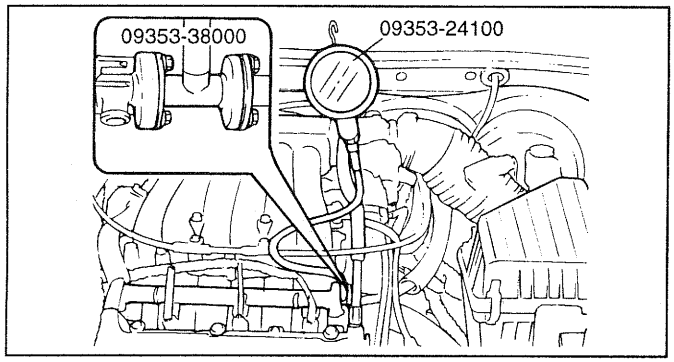
**Cover the hose connection with a shop towel to prevent splashing of fuel caused by fuel residual pressure in the fuel line.**

3. Using the fuel pressure gauge adapter, install the fuel-pressure gauge to the fuel pressure gauge adaptor. Tighten the bolt to the specified torque.

Fuel pressure gauge to fuel delivery pipe
25-35 Nm (250-350 kg·cm, 18-26 lb·ft)



EFA9110A



EFA9116B

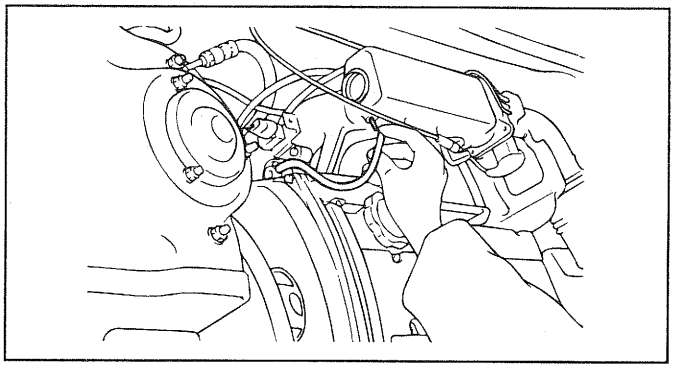
4. Connect the battery's negative (-) terminal.

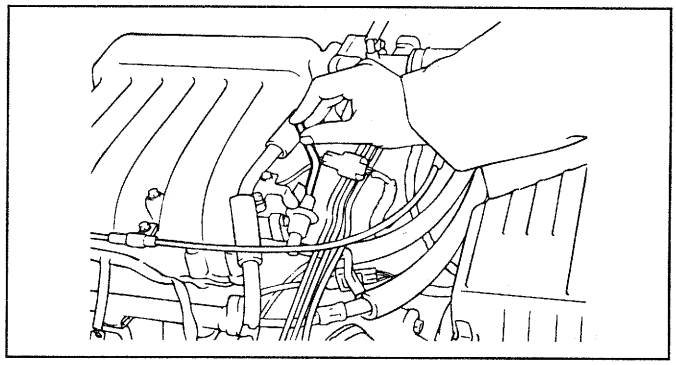
5. Apply battery voltage to the terminal for the pump drive and activate the fuel pump: then, with fuel pressure applied, check that there is no fuel leakage from the pressure gauge or connection part.

6. Start and run the engine at curb idle speed.

7. Disconnect the vacuum hose from the pressure regulator, and plug the hose end. Measure the fuel pressure at idle.

Standard value :
320-340 kPa (3.26-3.47 kg/cm$^2$, 46-49 psi)

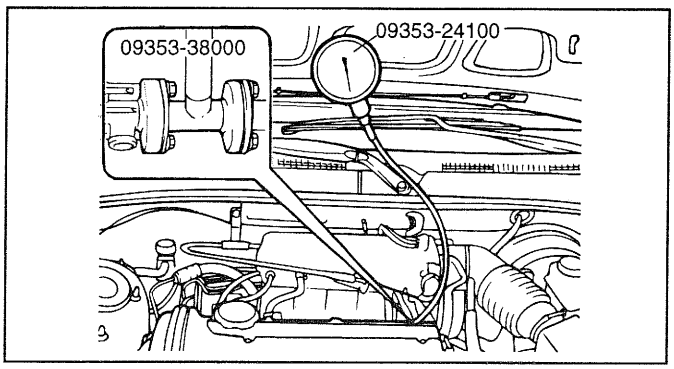

EFA9110B


EFA9116C

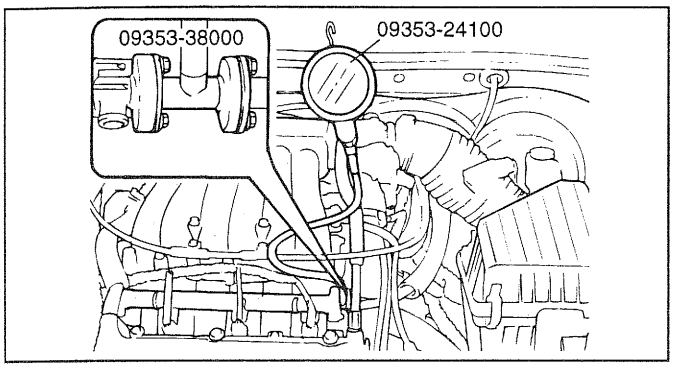
8. Measure the fuel pressure when the vacuum hose is connected to the pressure regulator.

Standard value :
Approx.255 kPa (2.57 kg/cm$^2$, 37 psi)

9. If the results of the measurements made in steps (7) and (8) are not within the standard value, use the table below to determine the probable cause, and make the necessary repairs.



EFA9110A




EFA9116B

| Condition | Probable cause | Remedy |
|---|---|---|
| Fuel pressure is too low | • Clogged fuel filter<br>• Fuel leakage to the return side, caused by poor seating of the fuel-pressure regulator | • Replace fuel filter<br>• Replace fuel pressure regulator |
| | • Low discharge pressure of the fuel pump | • Check the in-tank fuel hose for lage or replace the fuel pump |
| Fuel pressure is too high | • Sticking fuel-pressure regulator<br>• Clogged or bent fuel return hose or pipe | • Replace fuel pressure regulator<br>• Repair or replace hose or pipe |
| There is no difference in fuel pressure when the vacuum hose is connected and when it is not. | • Clogging, or damaged vacuum hose or the nipple<br>• Sticking or poor seating of the fuel pressure regulator | • Repair or replace the vacuum hose or the nipple<br>• Repair or replace hose or pipe |

10. Stop the engine and check for a change in the fuel pressure gauge reading, which should hold for approximately 5 minutes. If the gauge indication drops, observe the rate at which it drops. Determine and remove the causes according to the following table.

| Condition | Probable cause | Remedy |
|---|---|---|
| Fuel pressure drops slowly after engine is stopped | • Injector leakage | • Replace injector |
| Fuel pressure drops immediately after engine is stopped | • The check valve within the fuel pump is open | • Replace fuel pump |

11. Reduce the pressure in the fuel line.
12. Disconnect the hose and the gauge.

## CAUTION

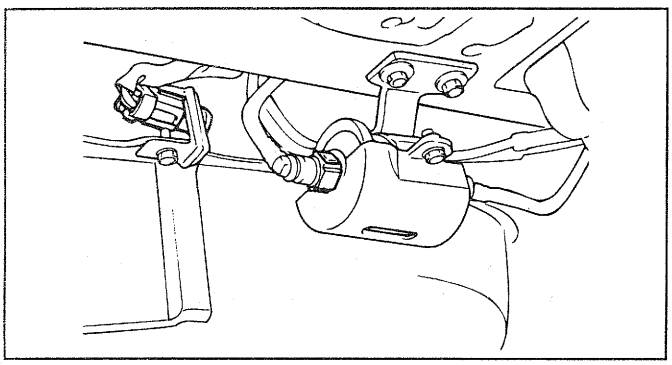
**Cover the hose connection with a shop towel to prevent splashing of fuel caused by fuel residual pressure in the fuel line.**

13. Replace the O-ring of the end of the hose.
14. Connect the fuel hose to the delivery pipe and tighten with the specified.
15. Check for fuel leakage.

## FUEL FILTER REPLACEMENT EFHA1110

1. Reduce the internal pressure of the fuel lines and hoses and perform the following operations.
   - Disconnect the fuel pump harness connector in the trunk room.
   - Start the engine and, after it stops, turn the ignition switch to OFF.
   - Disconnect the battery negative (-) terminal.
   - Connect the fuel pump harness connector.
2. Remove the two fitting nuts while holding the fuel filter nuts securely.
3. Remove the fuel filter mounting bolts, and then remove the fuel filter from the fuel filter clamp.

**Tightening torque**
Fuel filter fitting nut :
25-35 Nm (250-350 kg·cm, 18-25 lb·ft)



EFHA006B

## THROTTLE BODY CLEANING EFA91120

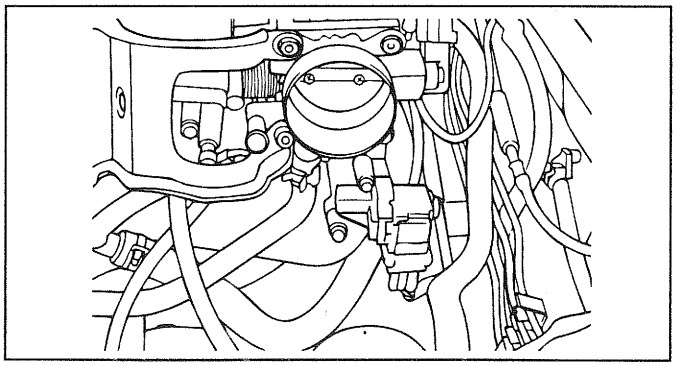
### NOTE

**Disconnect the intake air hose from the throttle body, and check the throttle valve surface for carbon deposits. Spray cleaning solvent on the valve to remove carbon deposits.**

1. Warm up the engine, then stop it.
2. Remove the intake air hose from the throttle body.
3. Plug the bypass passage inlet of the throttle body.

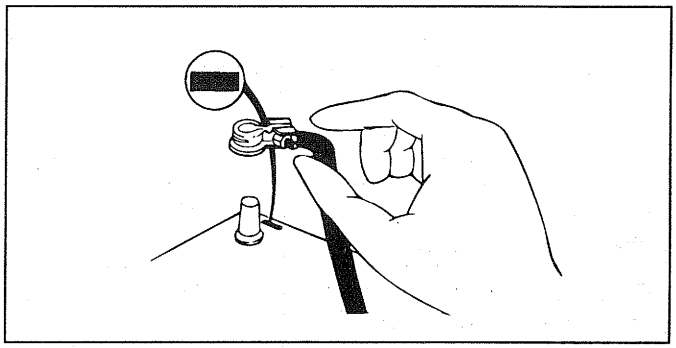
### NOTE

**Make sure the solvent does not enter the by-pass passage.**



EFA9112A

4. Spray cleaning solvent into the valve through the throttle body intake port and let it soak for about 5 minutes.
5. Start the engine, race it several times and allow the engine to idle for 1 minute.
6. Repeat Steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the intake air hose.
9. Disconnect the battery ground cable for more than 10 seconds.
10. Adjust the SAS (Speed Adjusting Screw).

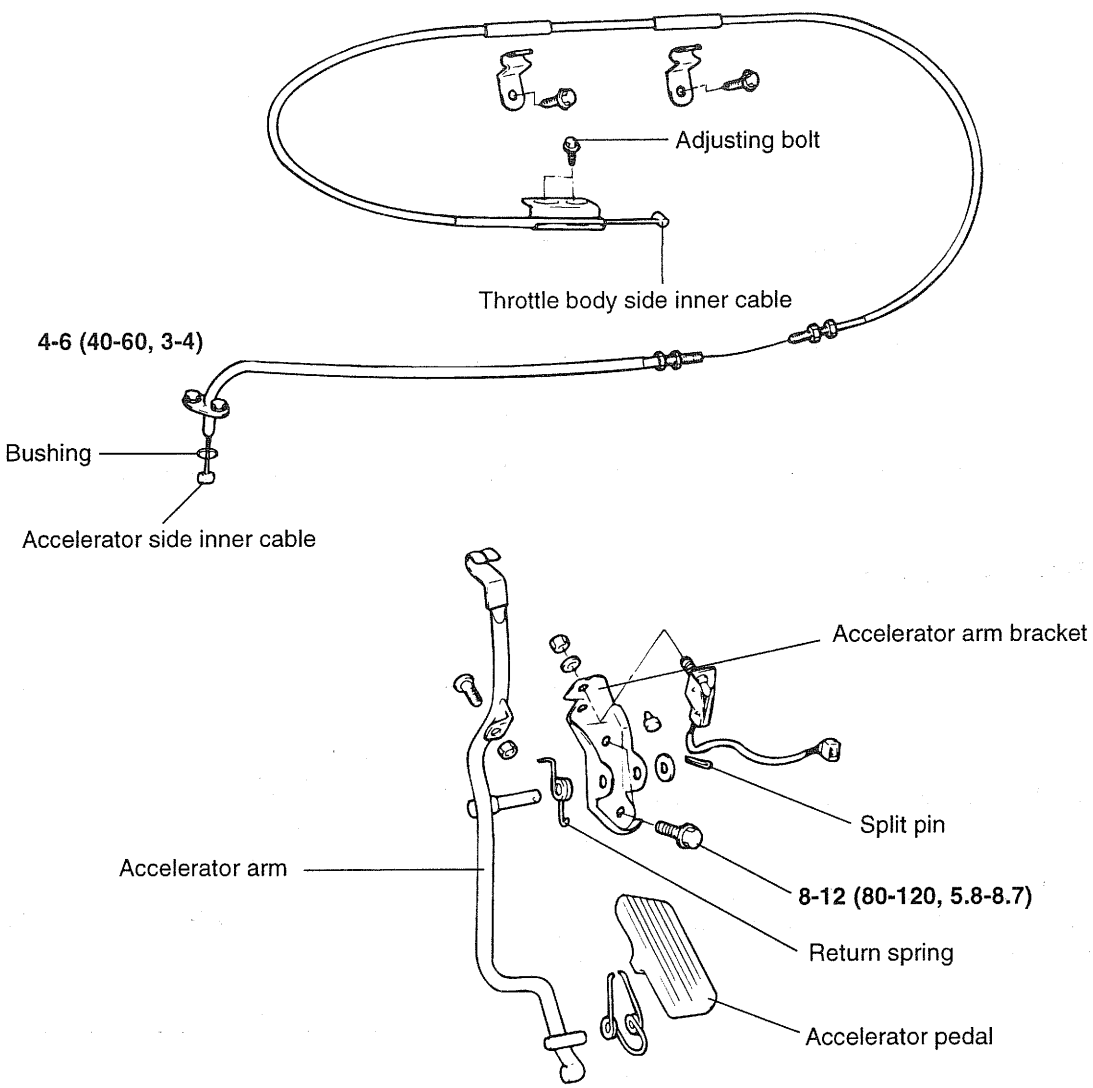


EFA9112B

# FUEL DELIVERY SYSTEM

## ACCELERATOR PEDAL EFA91190

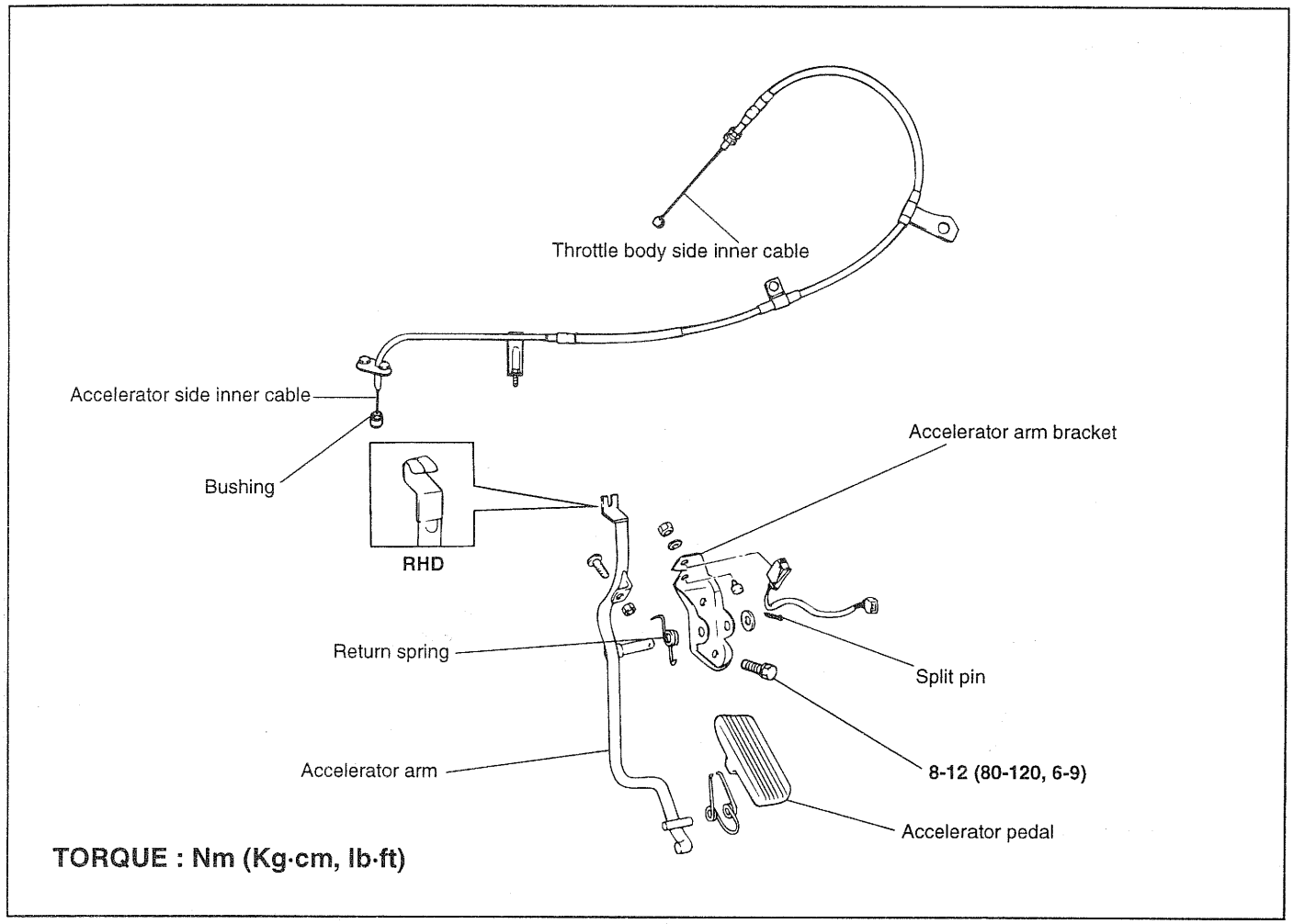
### COMPONENTS




**TORQUE : Nm (Kg·cm, lb·ft)**

EFA9119A

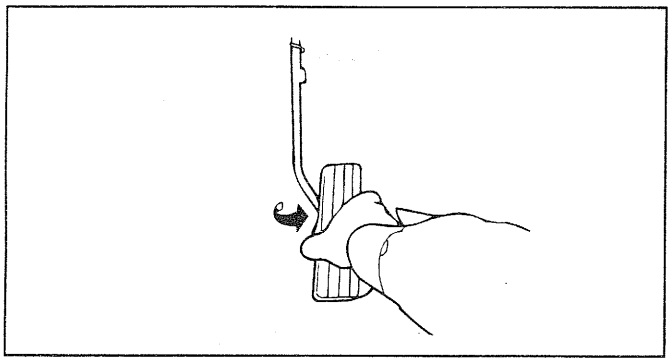
## COMPONENTS EFA91200




EFA9120A

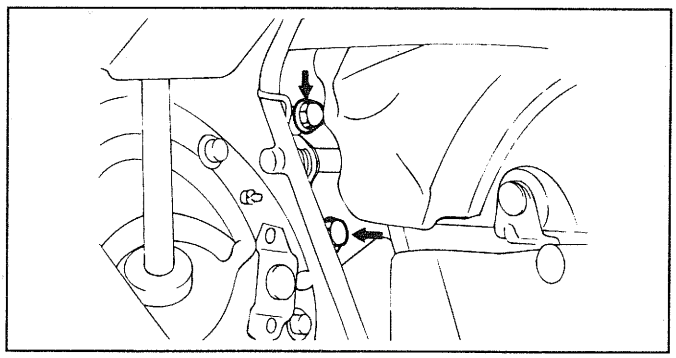
## REMOVAL EFA91220

1. Remove the bushing and inner cable of the accelerator arm.
2. Pull the left side of the accelerator pedal toward you, and then remove the accelerator pedal from the accelerator arm.



EFA9122A

3. Loosen the bolts of the accelerator arm bracket and remove.



EFA9122B

## INSPECTION EFA91230

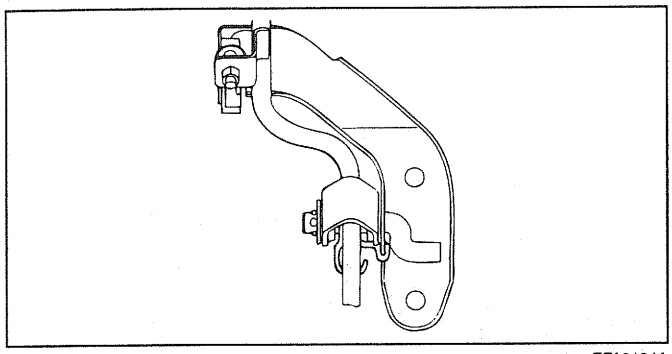
1. Check the inner and outer cable for damage.
2. Check the cable for smooth movement.
3. Check the accelerator arm for deformation.
4. Check the return spring for deterioration.

5. Check the connection of the bushing to end metal fitting.

6. Check the accelerator for proper operation.

## INSTALLATION EFA91240

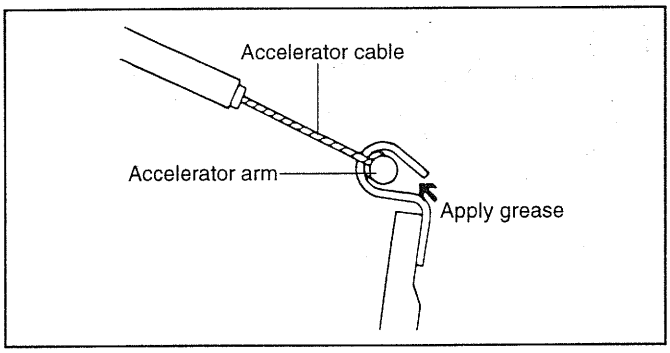
1. When installing the return spring and accelerator arm, apply multi-purpose grease around each moving point of the accelerator arm.



EFA9124A

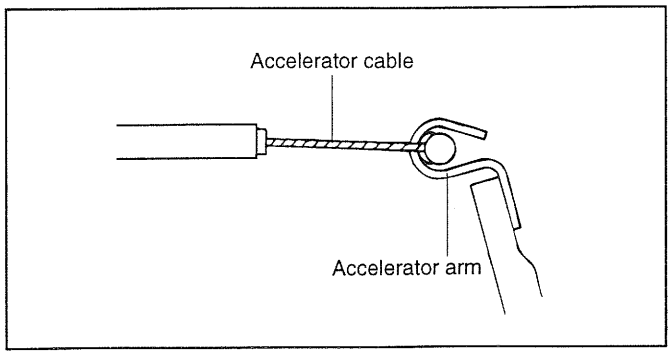
2. Apply sealant to the bolt mounting hole and tighten the accelerator arm bracket.

**Tightening torque**
Accelerator arm bracket bolts :
8–12 Nm(80–120 kg·cm, 6–7 lb·ft)




EFA9124B

3. Securely install the resin bushing of the accelerator cable on the end of the accelerator arm.




EFA9124C

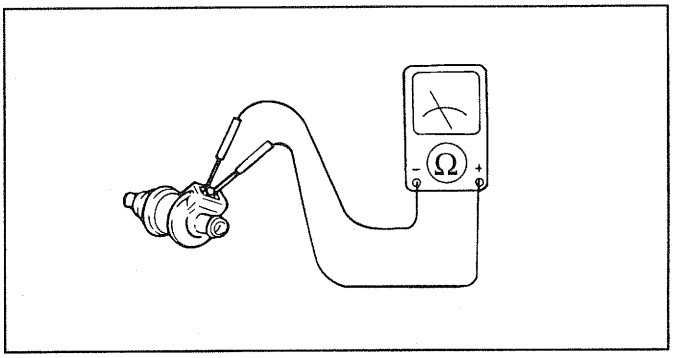
## FUEL INJECTOR EFA91260

### INSPECTION

1. Measure the resistance of the injectors between the terminals using an ohmmeter.

Resistance : 13–16Ω[at 20°C (68°F)]

2. If the resistance is not within specification, replace the injector.

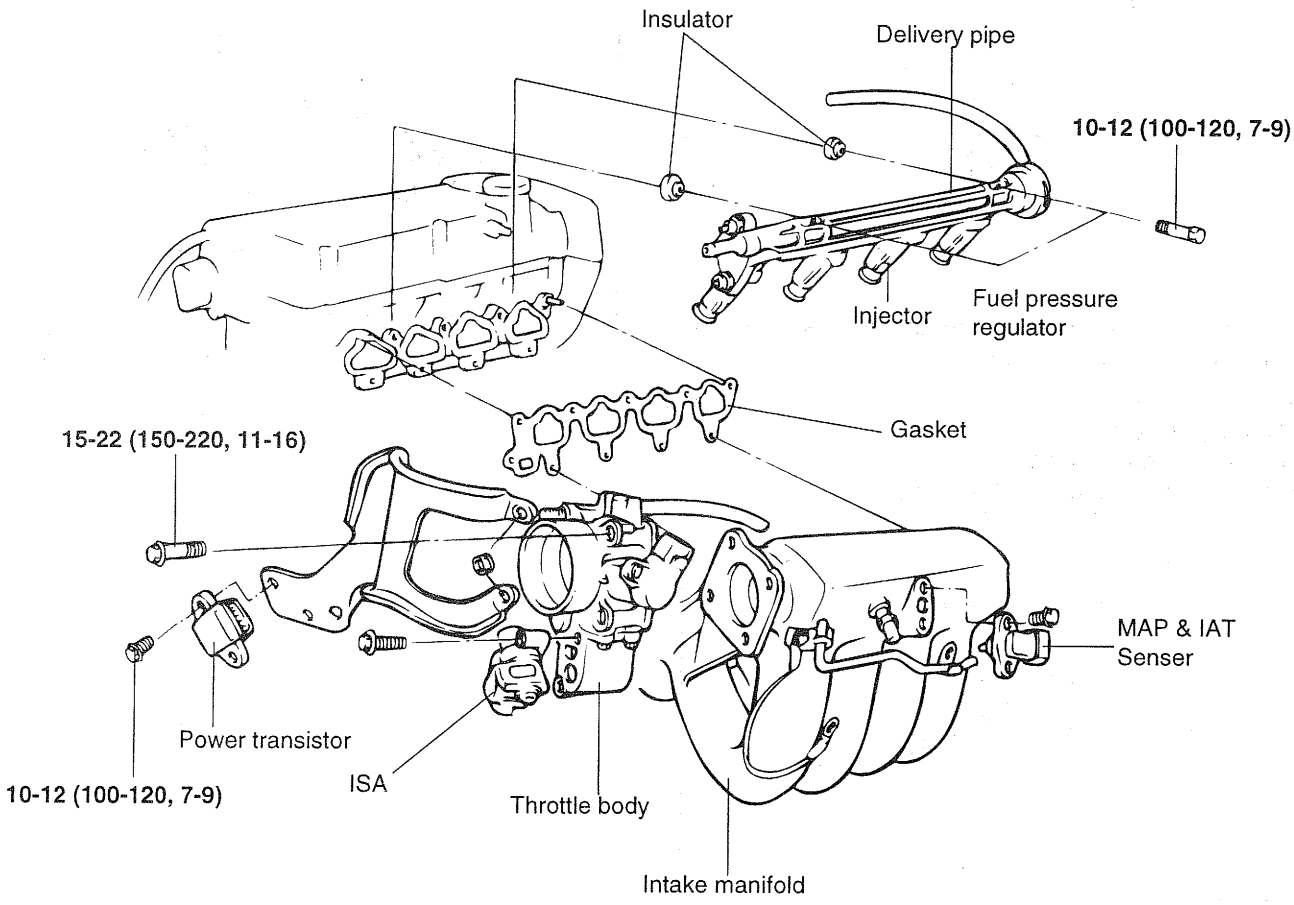



EFA9126A

## FUEL LINE EFHA1270

### COMPONENTS

<2.0 I4>

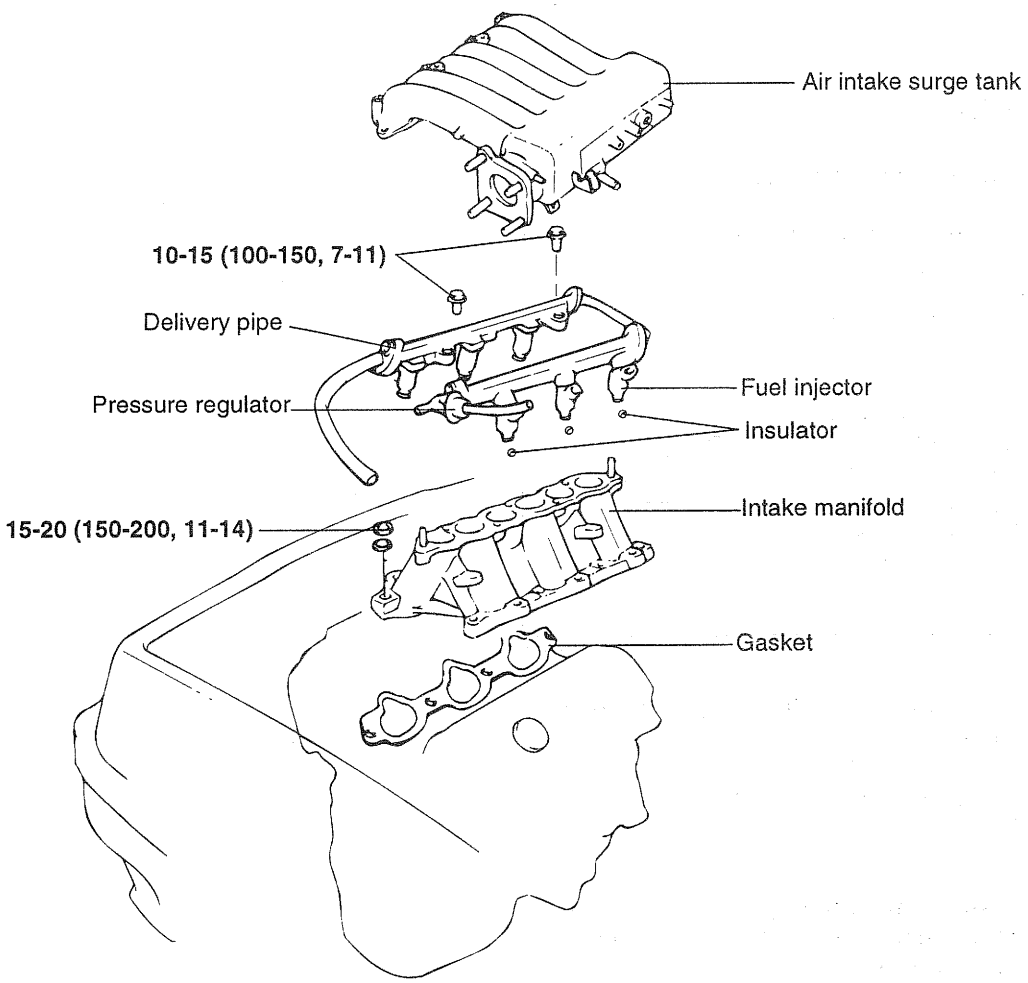



TORQUE : Nm (kg·cm, lb·ft)

EFHA127A

## COMPONENTS EFHA1280

<2.7 V6>




**TORQUE : Nm (kg·cm, lb·ft)**

EFHA128A

## REMOVAL EFA91290

1. Release residual pressure from the fuel line to prevent fuel from spilling.

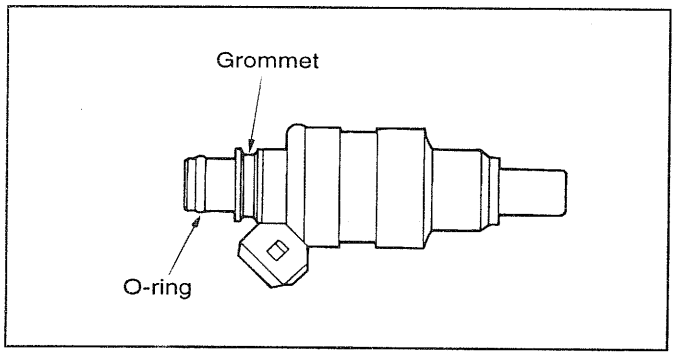
## CAUTION

**Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.**

2. Remove the delivery pipe with the fuel injector and pressure regulator.

## INSTALLATION EFA91300

1. Install a new grommet and O-ring to the injector.
2. Apply a coating of solvent, spindle oil or gasoline to the injector O-ring.

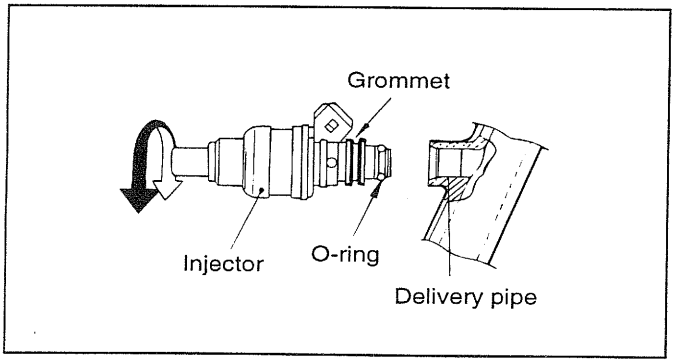



EFA9130A

3. While turning the injector left and right, install it on to the delivery pipe.
4. Be sure the injector turns smoothly.

## NOTE

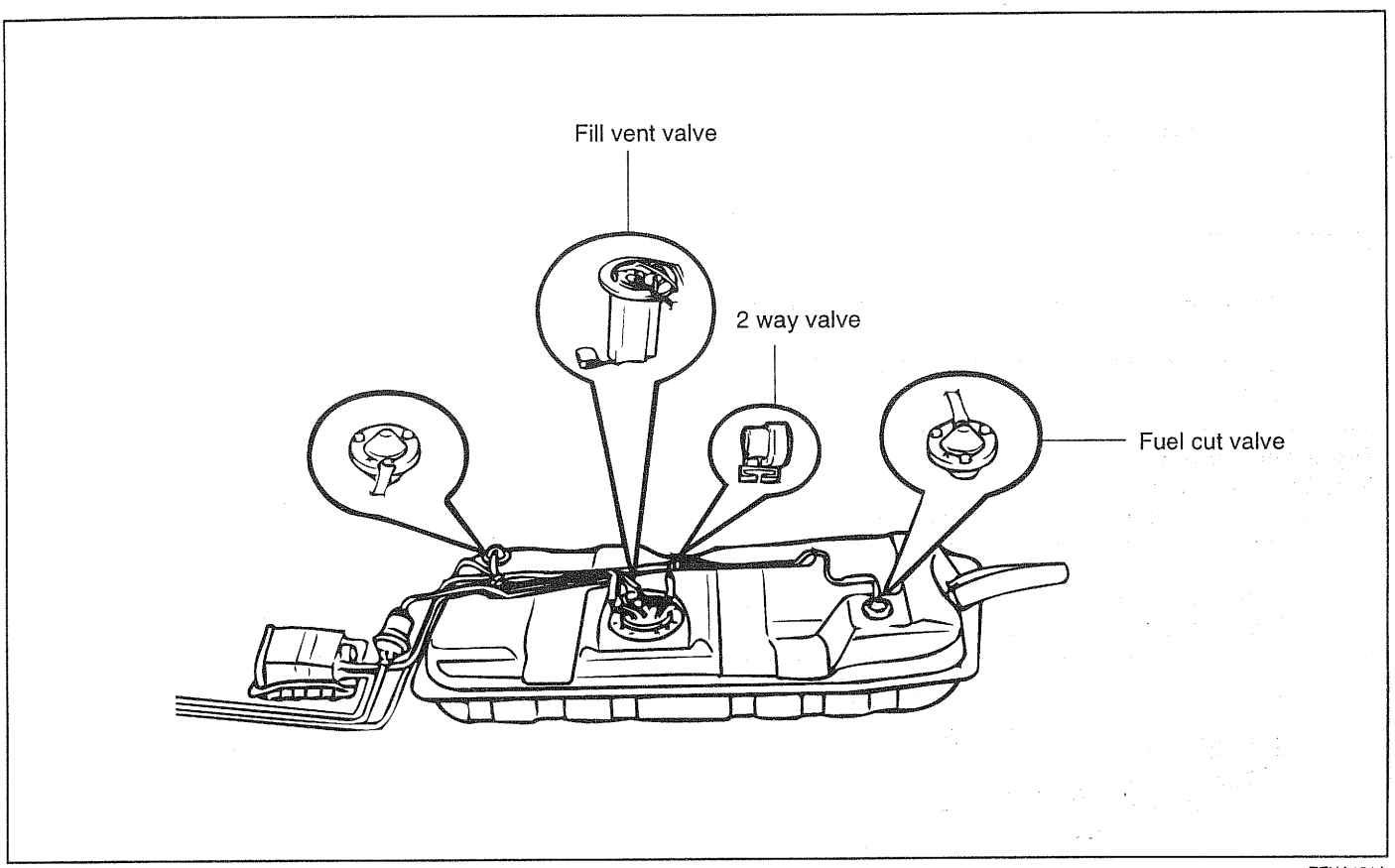
**If injector does not turn smoothly, the O-ring may be jammed. Remove the injector and re-insert it into the delivery pipe and re-check.**




EFA9130B

## FUEL LINE AND VAPOR LINE EFHA1310

### COMPONENTS



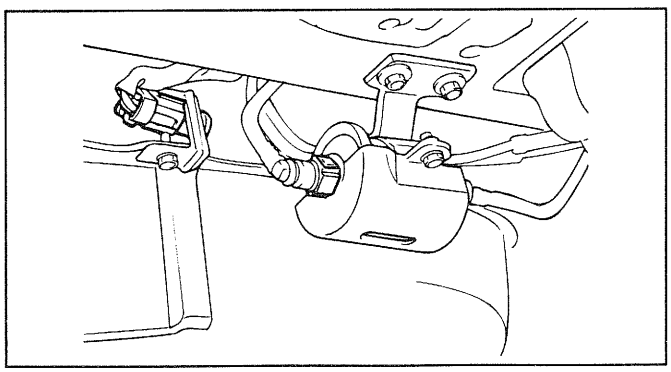

EFHA131A

### REMOVAL EFHA1320

1. Raise the vehicle and remove the two fitting nuts while holding the fuel filter nut securely.

### CAUTION

1. **Reduce the fuel pressure before disconnecting the fuel line and hose, or fuel will spill out.**
2. **Cover the pipe connection with a shop towel to prevent splashing of fuel that could be caused by residual pressure in the fuel line.**



EFHA006B

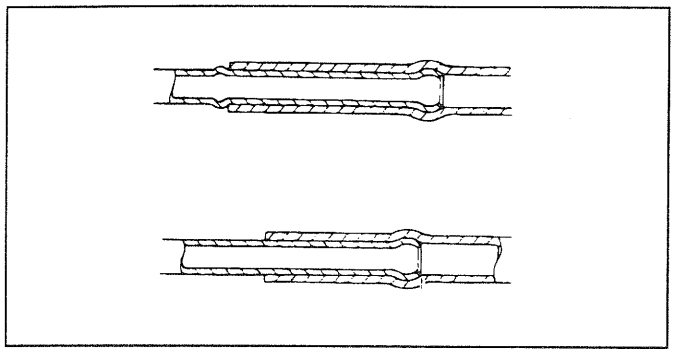
2. Remove the fuel filter mounting bolts, then remove the fuel filter from the bracket.
3. Remove the fuel return hose and line.
4. Remove the fuel vapor hose and line

### INSPECTION EFA91330

1. Check the hoses and pipes for cracking, bending, deformation or restrictions.
2. Check the EVAP Canister for restrictions.
3. Check the fuel filter for restrictions and damage.

### INSTALLATION EFHA1340

1. Install the fuel vapor hose and return hoses.
   - If the fuel line has a stepped section, connect the fuel hose to the line securely, as shown in the illustration.
   - If the fuel line does not have a stepped section, connect the fuel hose to the line securely.



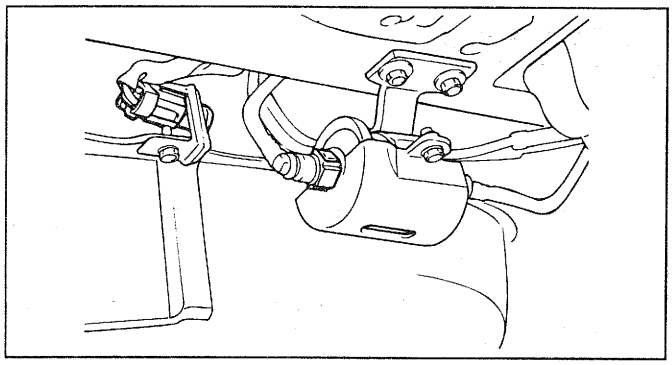
EFA9134A

2. Install the fuel filter and tighten the fuel filter bracket.

3. Tighten the two fitting nuts while holding the fuel filter nuts.

**Tightening torque**
Fuel filter fitting nuts :
30–40 Nm(300–400 kg·cm, 22.1–29.5 lb·ft)

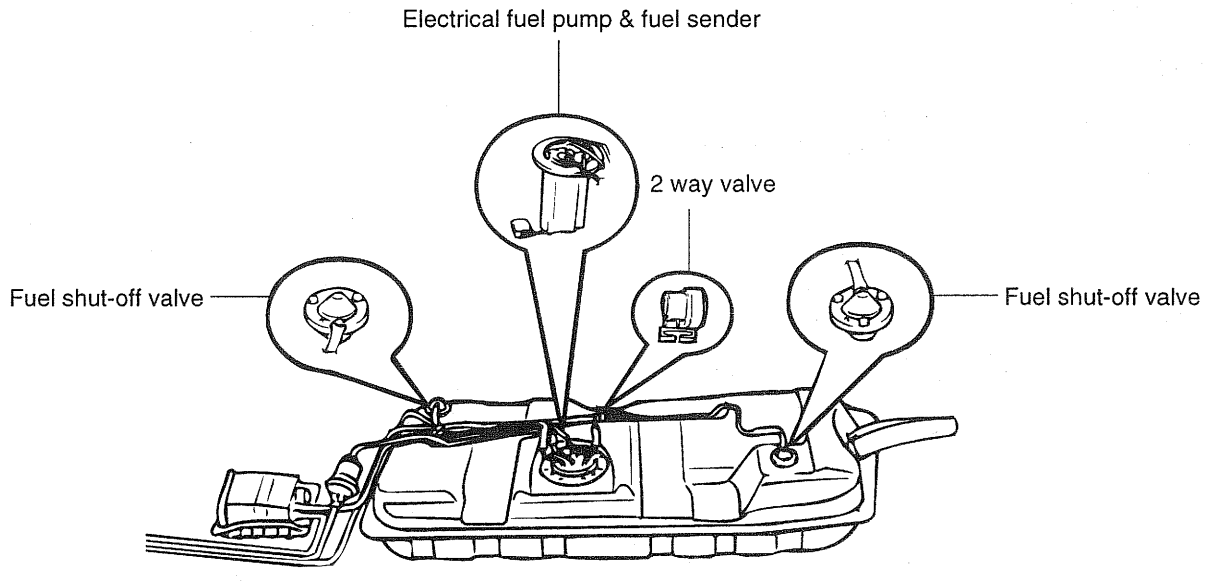
4. Install the clips and make sure that they do not interfere with other components.



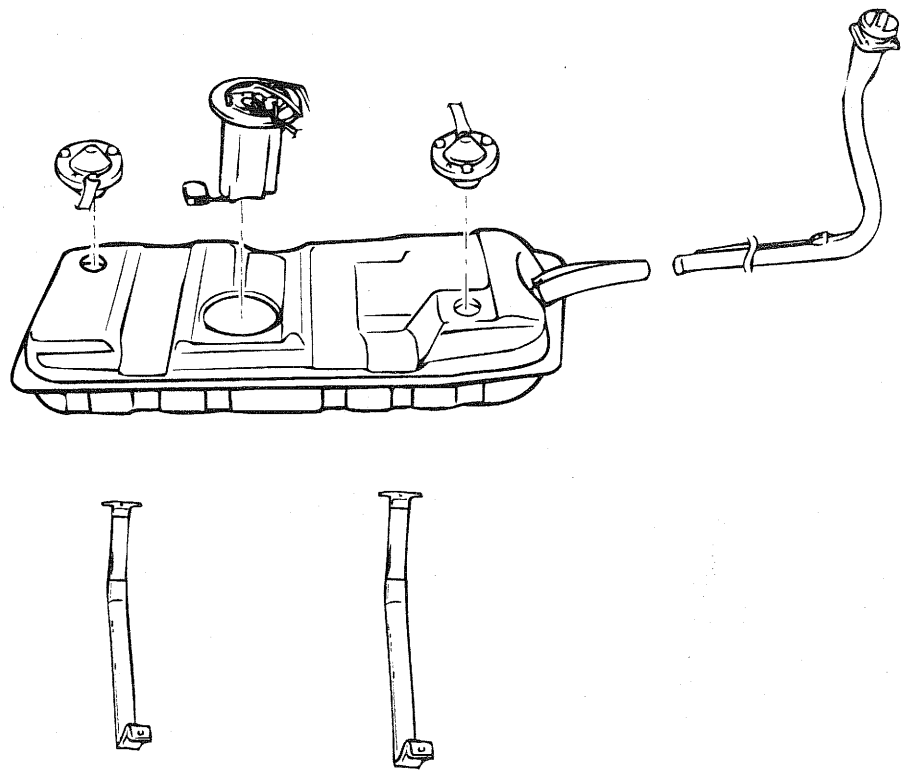
EFHA006B

## FUEL TANK EFHA1350

### COMPONENTS




EFHA131A



EFHA131B

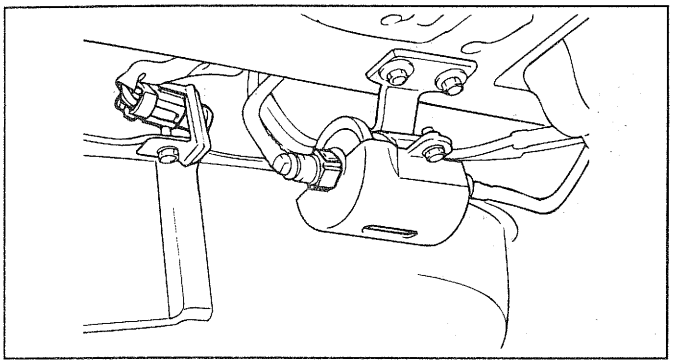
EFHA135A

## REMOVAL EFHA1360

1. To reduce the internal pressure of the fuel main pipes and hose, first start the engine and then disconnect the electrical fuel pump connector located near the fuel filter.

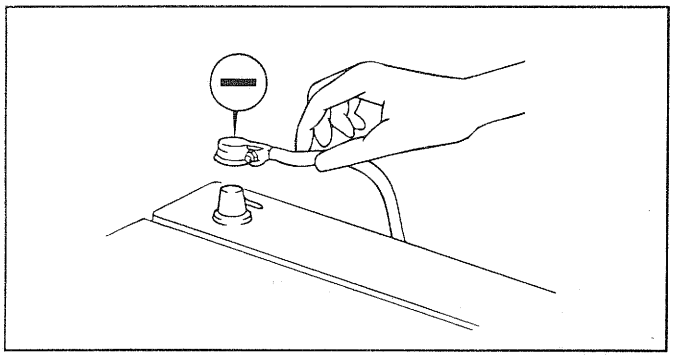
## CAUTION

**Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose otherwise fuel will spill out.**



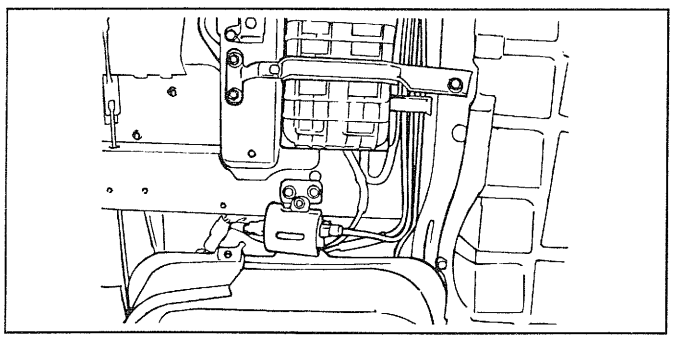
EFHA006B

2. Disconnect the battery cable from the negative terminal of the battery.



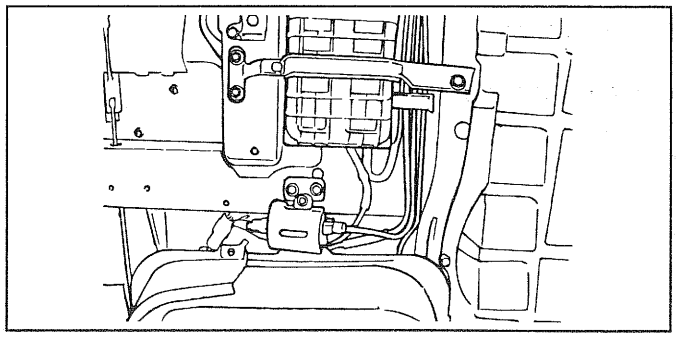
EFA9136A

3. Remove the fuel tank cap.
4. Disconnect the return hose and vapor hose.



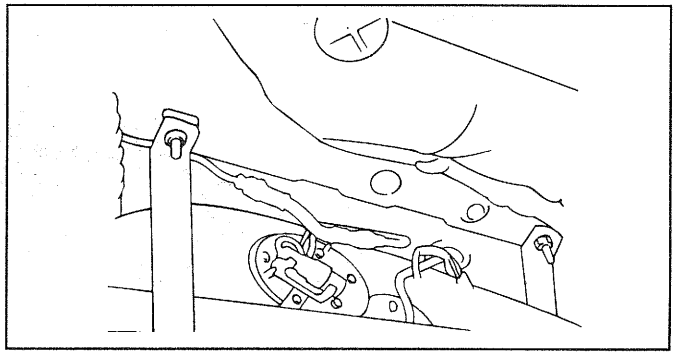
EFHA136C

5. Disconnect the fuel sender connector.
6. Disconnect the high pressure hose from the fuel tank.



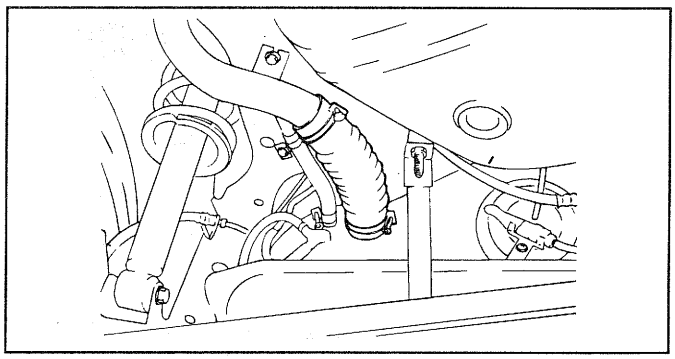
EFHA136C

7. Loosen the two self-locking nuts that hold the tank in position and remove the two tank bands.



EFA9136D

8. Detach the fuel filler hose and leveling hose.
9. Remove the fuel vapor hose and the fuel tank.



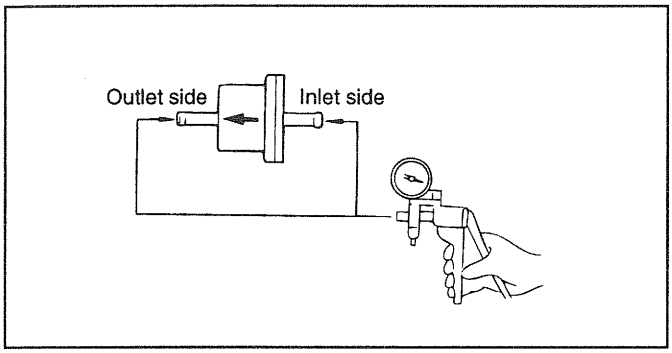
EFA9136E

## INSPECTION EFA91370

1. Check the hoses and the pipes for cracks or damage.
2. Check the fuel tank cap for proper operation.
3. Check the fuel tank for deformation, corrosion or cracking.
4. Check the fuel tank inside for dirt or contamination.
5. Check the in-tank fuel filter for damage or restriction.
6. Test the two-way valve for proper operation.

7. Using a vacuum hand pump, check the operation of the two-way valve.

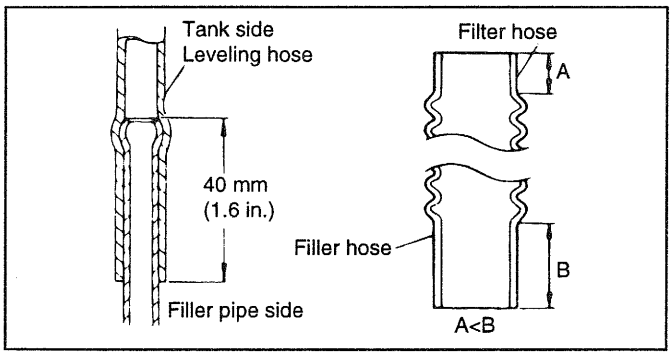
| Valve pump | Guide lines for acceptance or rejection |
|---|---|
| When connected to inlet side | Negative pressure generated and vacuum maintained |
| When connected to outlet side | No negative pressure generated |




EFA9137A

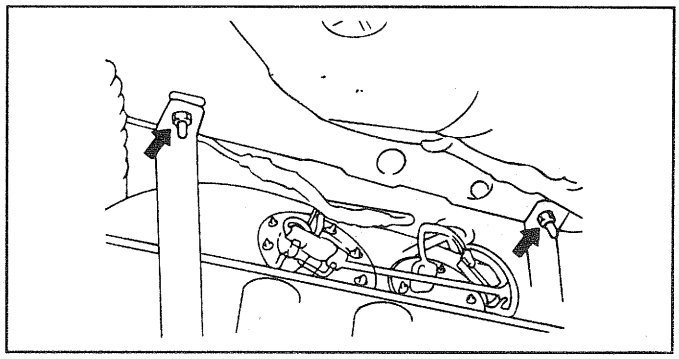
## INSTALLATION EFHA1380

1. Connect the leveling hose to the tank at approximately 40 mm (1.6 in.) of the filler neck.
2. When connecting the filler hose, connect the end with the shorter straight pipe to the tank side.



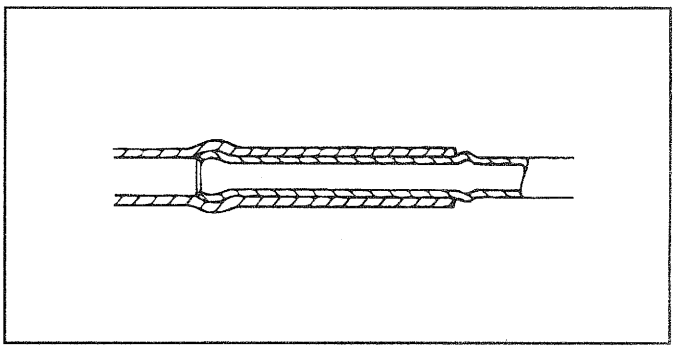

EFA9138A

3. Confirm that the pad is fully bonded to the fuel tank. Install the fuel tank by tightening the self-locking nuts to the tank bands until the rear end of the tank band contacts the body.



EFA9138B

4. Connect the vapor hose and return hose. Attach the fuel hose to the line as shown in the illustration.



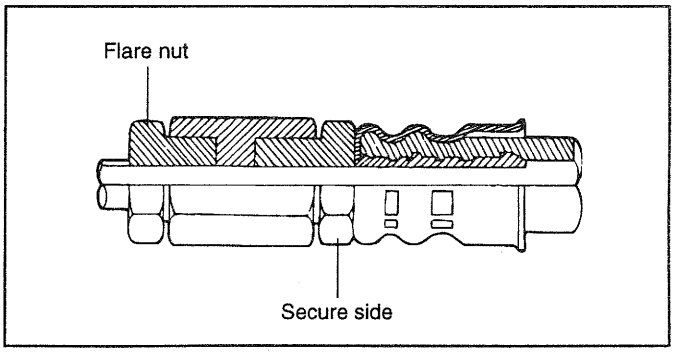
EFA9138C

5. To connect the high pressure hose to the fuel pump, temporarily tighten the flare nut by hand, and then tighten it to the specified torque. Be careful that the fuel hose does not twist.

**Tightening torque**
High pressure hose flare nut :
30–40 Nm(300–400 kg·cm, 22–29 lb·ft)

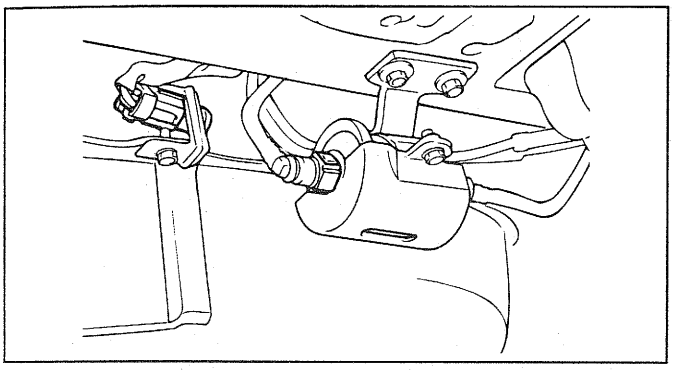
## NOTE

**When tightening the flare nut, be careful not to bend or twist the line to prevent damage to the fuel pump connection.**




EFA9138D

6. Connect the electrical fuel pump and fuel sender connector.



EFHA006B

# TROUBLESHOOTING FOR DTC

EFHA5010

## DIAGNOSTIC ITEM

| DTC | Diagnostic item |
|---|---|
| P0105 | Manifold Absolute Pressure Sensor Circuit Malfunction |

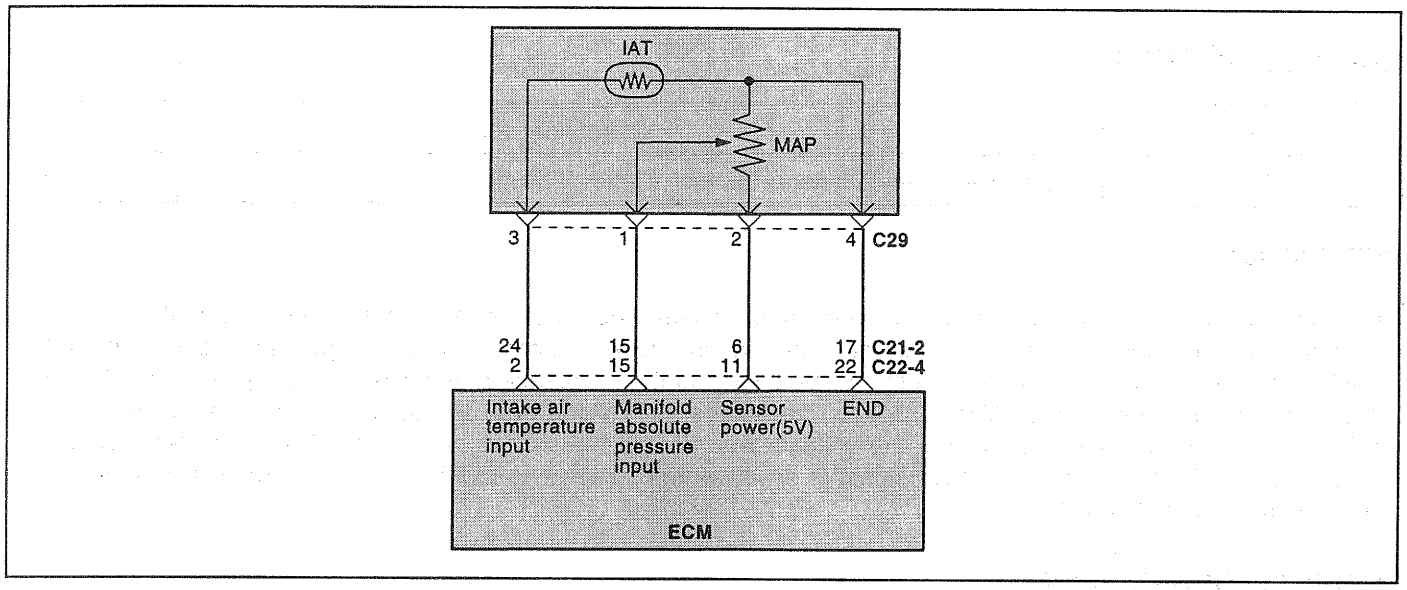
### DESCRIPTION

The MAP sensor is essentially a strain gauge used to measure the pressure in the surge tank. Inside the sensor is a metal diaphragm with a small wire attached. The diaphragm flexes according to changes in pressure. When the diaphragm flexes, the wire attached to it stretches, changing the resistance of the wire. The Engine Control Module (ECM) applies five volts to the MAP sensor and measures the voltage drop across the sensor. The sensor output is in volts and as pressure decreases, the voltage drop across the sensor increases. Since the MAP sensor is used as an air flow sensor, the sensor signal is an important input. The ECM uses the information to determine fuel amount and ignition timing.

### TROUBLESHOOTING GUIDE

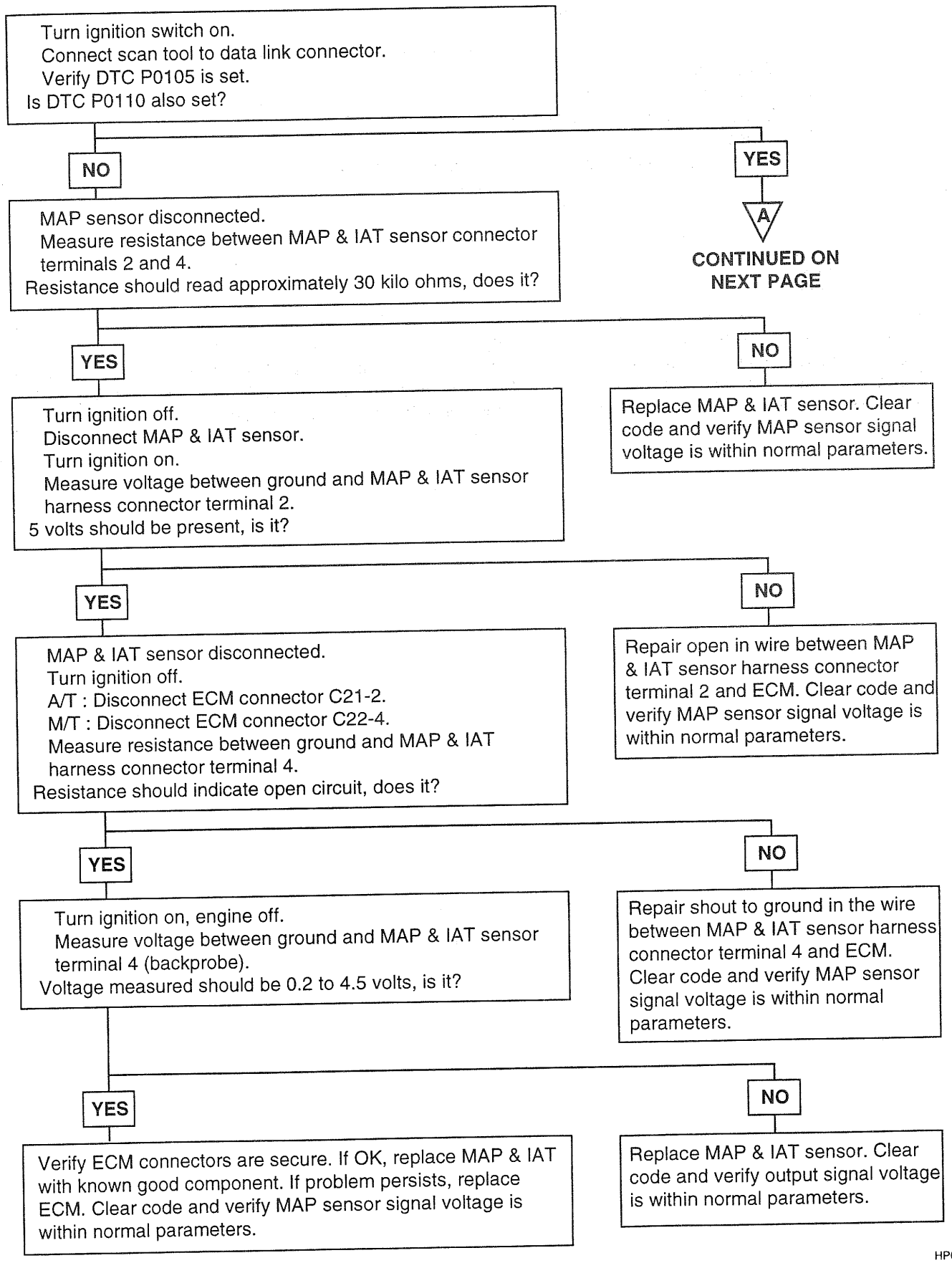
| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The MAP sensor outputs a voltage which corresponds to the pressure of surge tank.<br>• The Engine Control Module checks whether this voltage is within a specified range.<br>Check Area<br>• Ignition switch : ON<br>• Sixty seconds or more have passed since the staring sequence was completed.<br>• Battery voltage is 8V or more.<br>Judgment Criteria<br>• Sensor output voltage has continued to be 4.5V or higher [corresponding to a surge tank pressure of 114 kPa(17psi) or higher] for 4 sec.<br>• Sensor output voltage has continued to be 1.95V or lower [corresponding to a surge tank pressure of 50 kPa(7.4 psi) or lower] for 4 sec. | • MAP sensor failed<br>• Open or shorted MAP sensor circuit, or loose connector<br>• Engine control module failed |

## CIRCUIT DIAGRAM

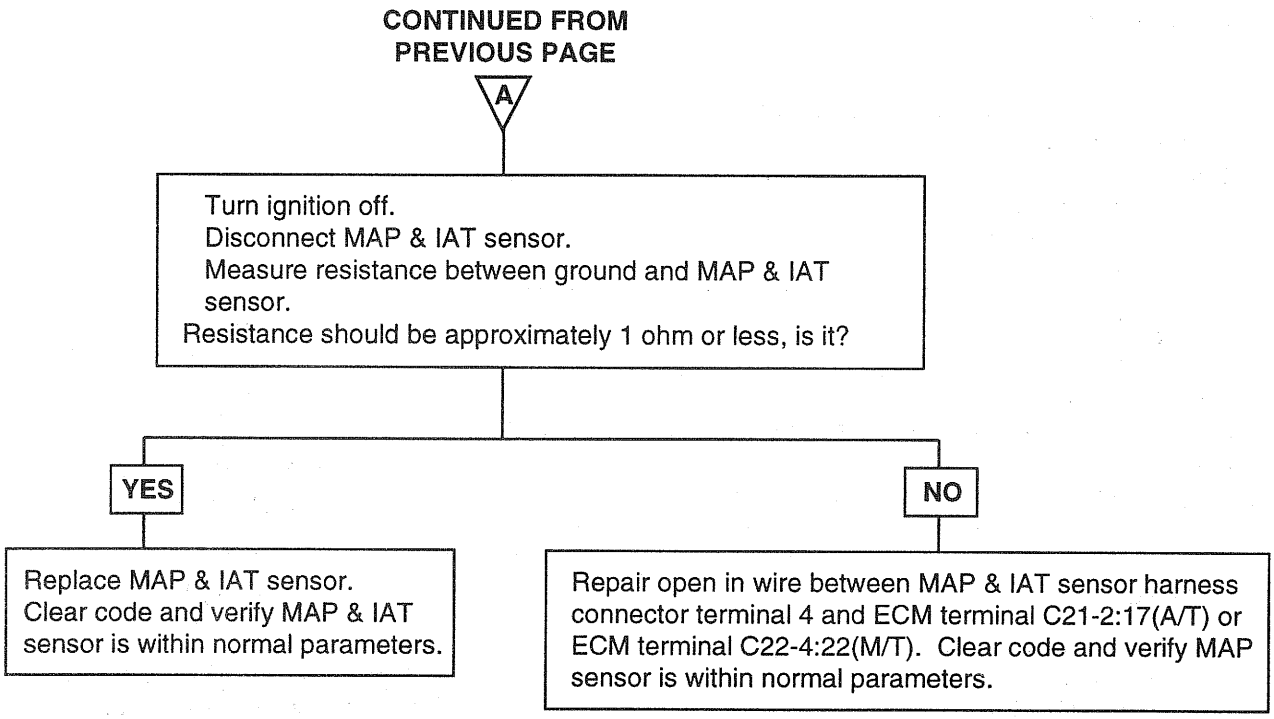



HP0105A

## TEST PROCEDURE




HP0105B


CONTINUED FROM
PREVIOUS PAGE
A
Turn ignition off.
Disconnect MAP & IAT sensor.
Measure resistance between ground and MAP & IAT sensor.
Resistance should be approximately 1 ohm or less, is it?
YES
NO
Replace MAP & IAT sensor.
Clear code and verify MAP & IAT sensor is within normal parameters.
Repair open in wire between MAP & IAT sensor harness connector terminal 4 and ECM terminal C21-2:17(A/T) or ECM terminal C22-4:22(M/T). Clear code and verify MAP sensor is within normal parameters.

HP0105C

EFHA5020

| DTC | Diagnostic item |
|---|---|
| P0110 | Intake Air temperature Circuit Malfunction |

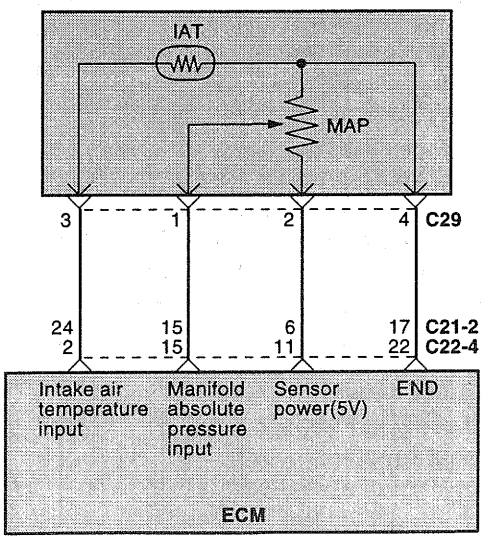
## DESCRIPTION

The Intake Air Temperature (IAT) sensor is in the MAP sensor. The IAT sensor is a variable resistor whose resistance changes as the temperature of the air flowing through the air intake changes. The Engine Control Module (ECM) uses the IAT sensor input to adjust fuel injector pulse width. When the temperature sensed is cold, the ECM enriches fuel mixture by increasing injector pulse width; as the air warms, the injector pulse width time is shortened.

## TROUBLESHOOTING GUIDE

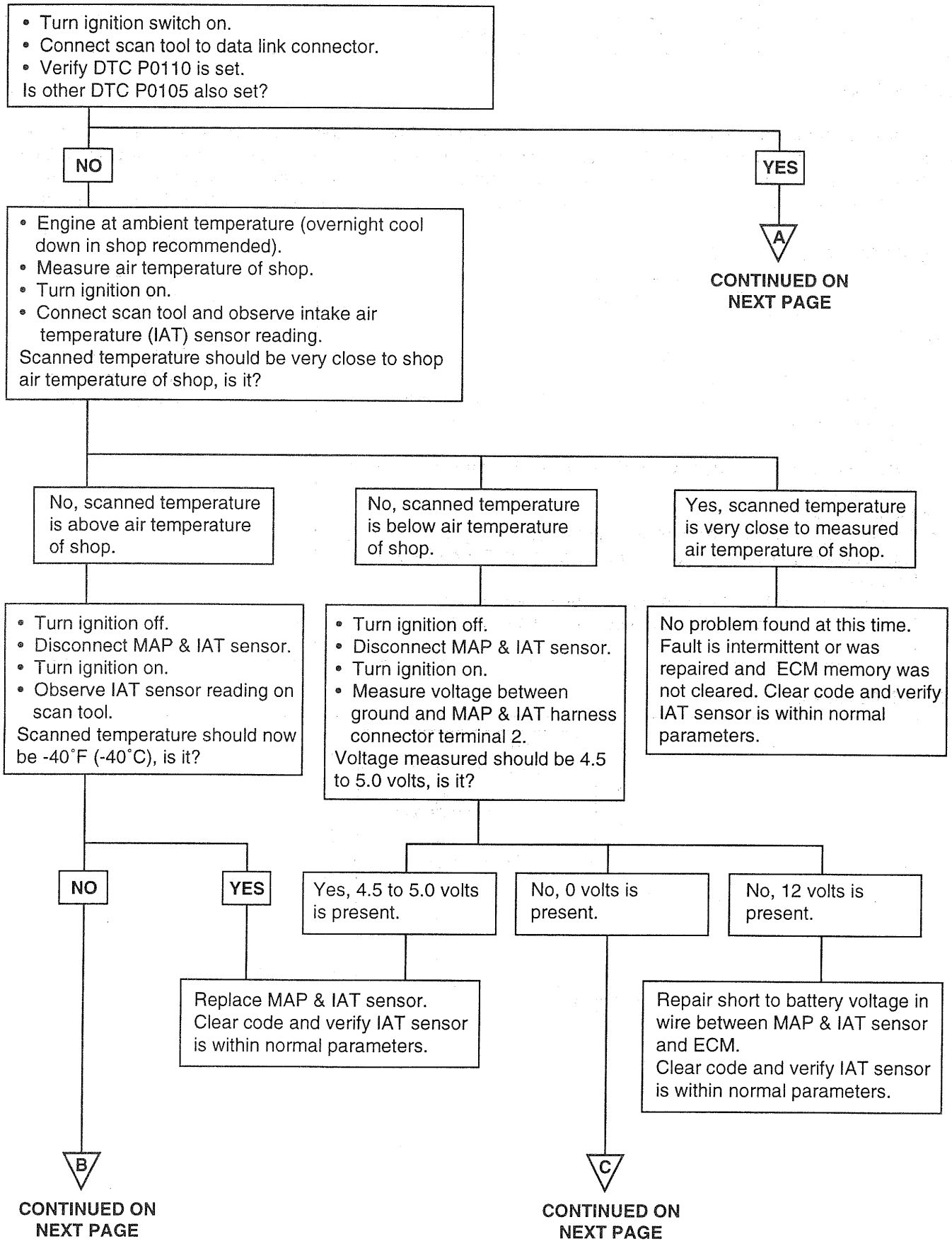
| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The intake air temperature sensor converts the intake air temperature to a voltage and outputs it.<br>• The engine control module checks whether the voltage is within a specified range.<br>Check Area<br>• Sixty seconds or more have passed since the starting sequence was completed.<br>Judgment Criteria<br>• Sensor output voltage has continued to be 4.6V or higher [corresponding to an intake air temperature of -45°C (-49°F) or lower] for 4 sec.<br>• Sensor output voltage has continued to be 0.2V or lower [corresponding to an intake air temperature of 125°C (257°F) or higher] for 4 sec. | • MAP sensor failed<br>• Open or shorted mass air flow sensor circuit, or loose connector<br>• Engine control module failed |

## CIRCUIT DIAGRAM

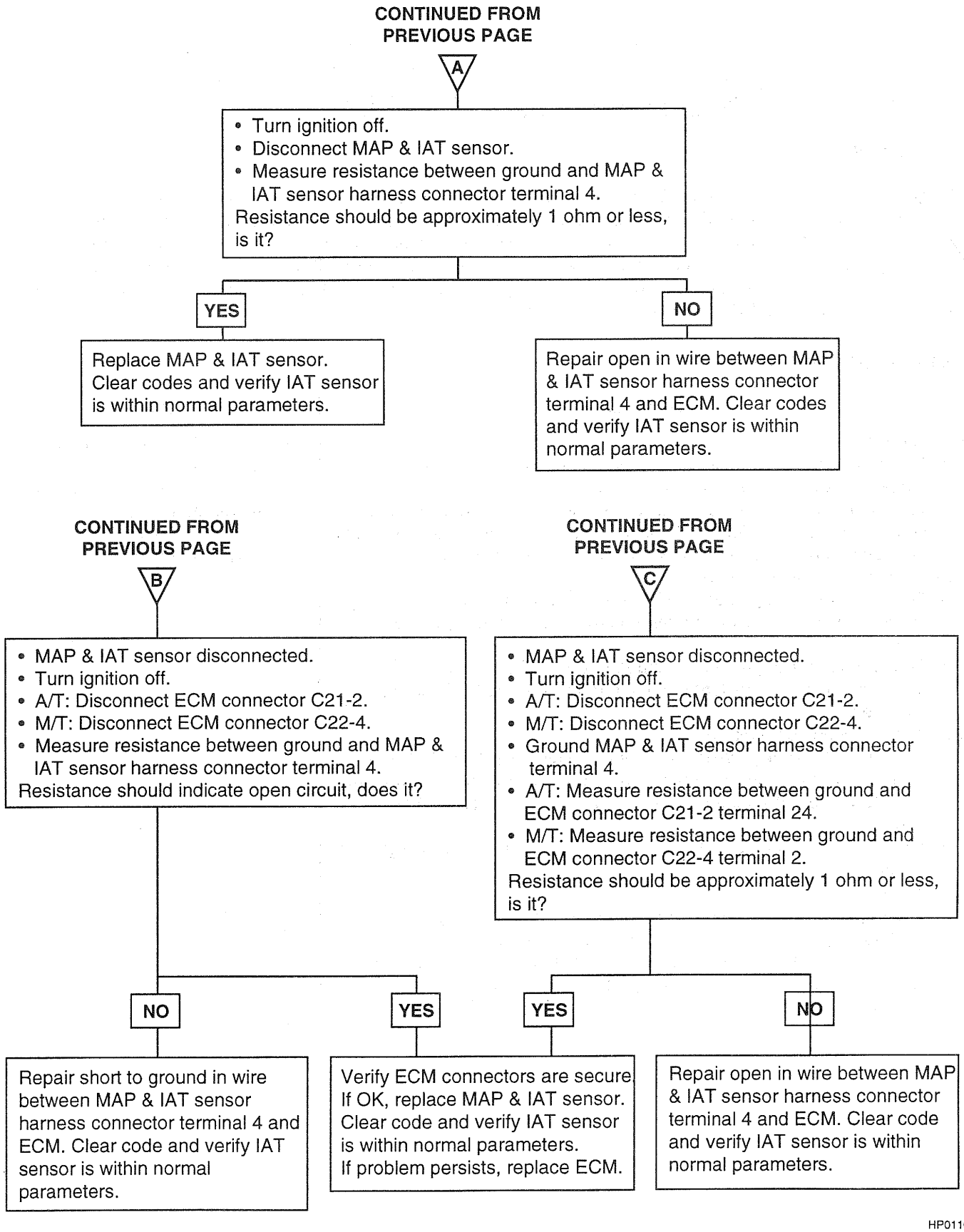



HP0105A

## TEST PROCEDURE




HP0110B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A
• Turn ignition off.
• Disconnect MAP & IAT sensor.
• Measure resistance between ground and MAP & IAT sensor harness connector terminal 4.
Resistance should be approximately 1 ohm or less, is it?
YES
NO
Replace MAP & IAT sensor. Clear codes and verify IAT sensor is within normal parameters.
Repair open in wire between MAP & IAT sensor harness connector terminal 4 and ECM. Clear codes and verify IAT sensor is within normal parameters.
CONTINUED FROM PREVIOUS PAGE
B
• MAP & IAT sensor disconnected.
• Turn ignition off.
• A/T: Disconnect ECM connector C21-2.
• M/T: Disconnect ECM connector C22-4.
• Measure resistance between ground and MAP & IAT sensor harness connector terminal 4.
Resistance should indicate open circuit, does it?
NO
YES
Repair short to ground in wire between MAP & IAT sensor harness connector terminal 4 and ECM. Clear code and verify IAT sensor is within normal parameters.
Verify ECM connectors are secure. If OK, replace MAP & IAT sensor. Clear code and verify IAT sensor is within normal parameters. If problem persists, replace ECM.
CONTINUED FROM PREVIOUS PAGE
C
• MAP & IAT sensor disconnected.
• Turn ignition off.
• A/T: Disconnect ECM connector C21-2.
• M/T: Disconnect ECM connector C22-4.
• Ground MAP & IAT sensor harness connector terminal 4.
• A/T: Measure resistance between ground and ECM connector C21-2 terminal 24.
• M/T: Measure resistance between ground and ECM connector C22-4 terminal 2.
Resistance should be approximately 1 ohm or less, is it?
YES
NO
Repair open in wire between MAP & IAT sensor harness connector terminal 4 and ECM. Clear code and verify IAT sensor is within normal parameters.

HP0110C

EFHA5030

| DTC | Diagnostic item |
|---|---|
| P0115 | Engine Coolant Temperature Circuit Malfunction |

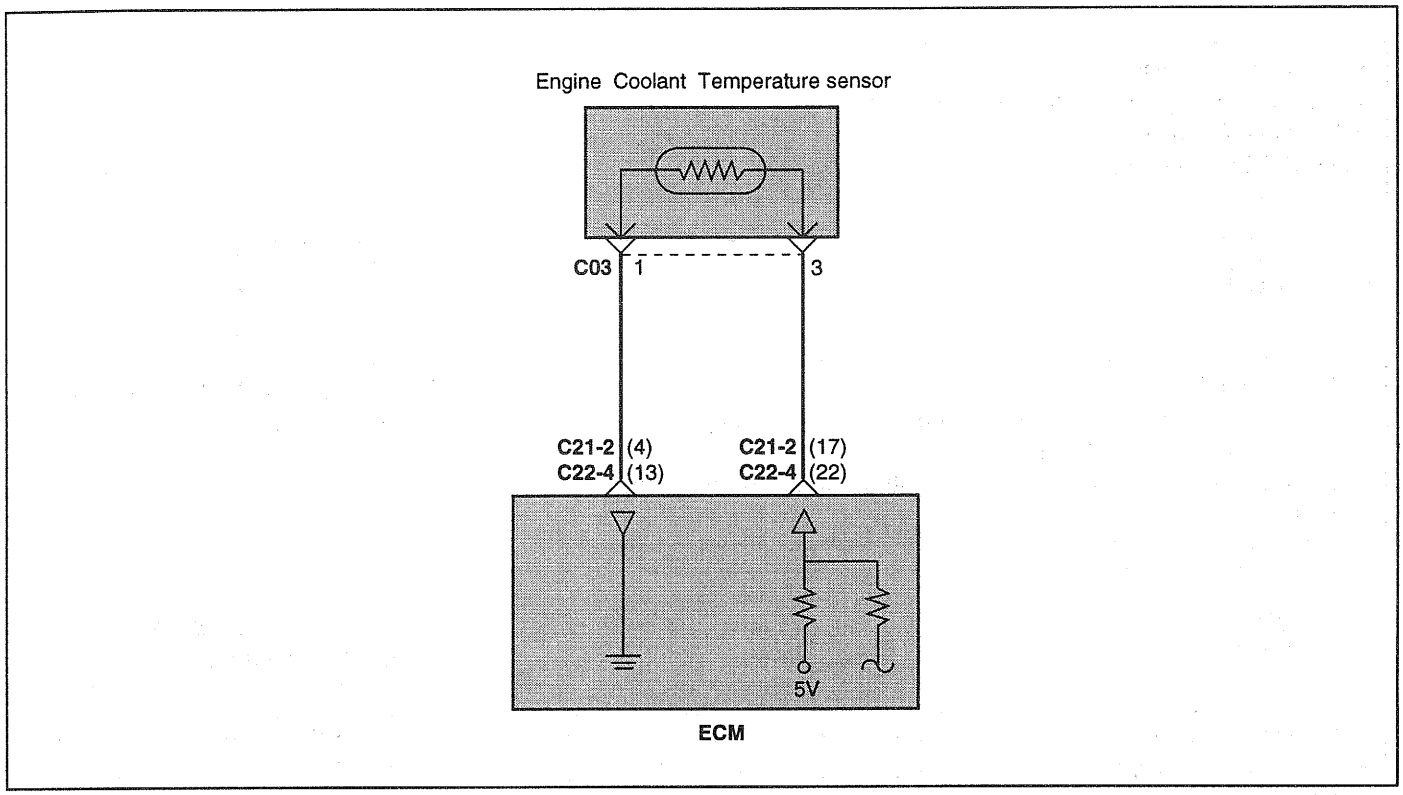
## DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is located in the coolant passage of the cylinder head. The ECT sensor is a variable resistor whose resistance changes as the temperature of the engine coolant flowing past the sensor changes. When the coolant temperature is low, the sensor resistance is high; when the coolant temperature is high, the sensor resistance is low. The Engine Control Module (ECM) checks ECT voltage fifty times per second and uses the information to adjust the fuel injector pulse width and ignition timing. When the temperature sensed is very cold, the ECM enriches the fuel mixture.

## TROUBLESHOOTING GUIDE

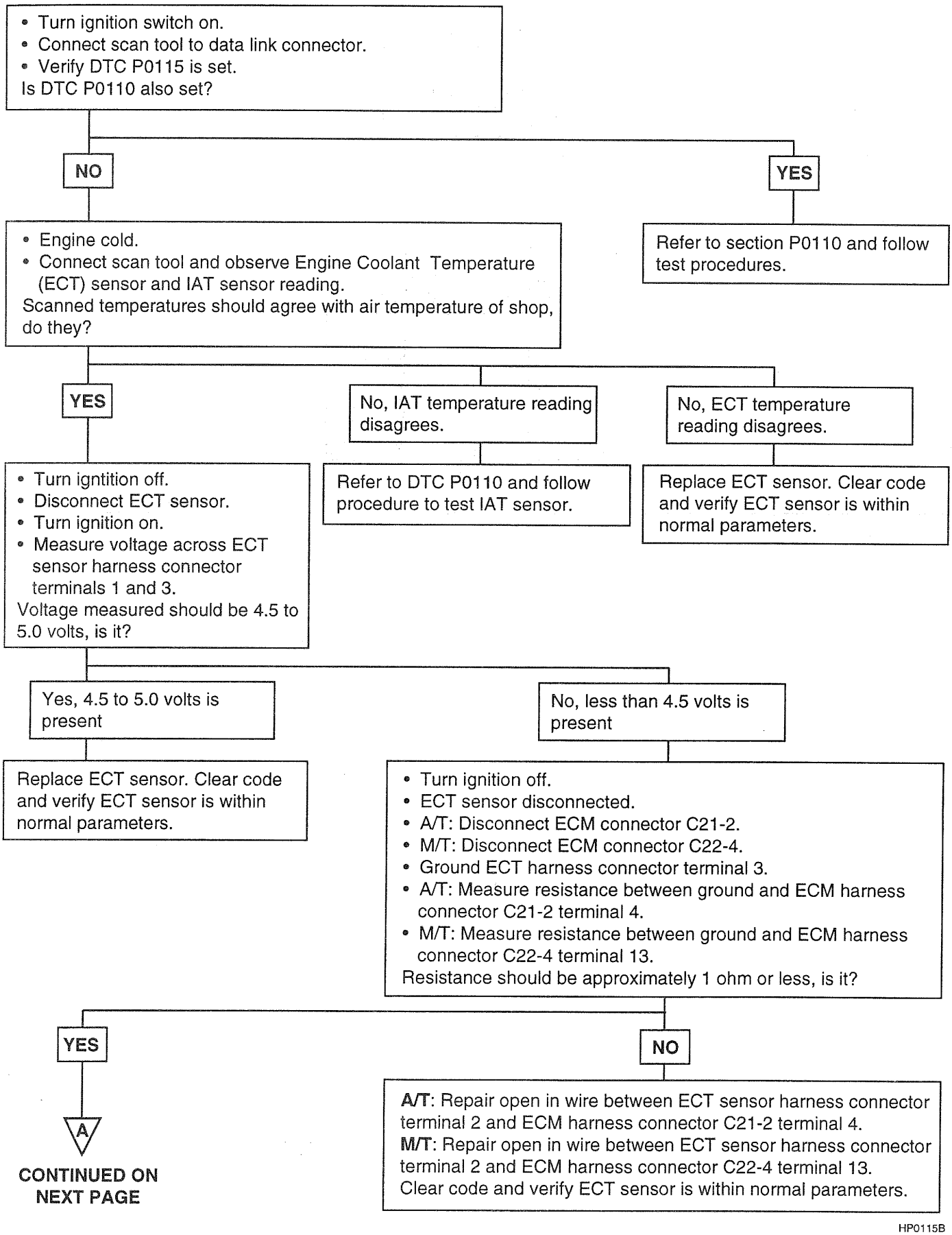
| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.<br>• The Engine Control Module checks whether the voltage is within a specified range. In addition, it checks that the engine coolant temperature (signal) does not drop while the engine is warming up.<br>Check Area, Judgment Criteria<br>• Sensor output voltage has continued to be 4.6V or higher [corresponding to a coolant temperature of -45°C (-49°F) or lower] for 4 sec.<br>• Sensor output voltage has continued to be 0.1V or lower [corresponding to a coolant temperature of 140°C (284°F) or higher] for 4 sec.<br>Check Area, Judgment Criteria<br>• Sensor output voltage increased from a value lower than 1.6V to a value higher than 1.6V [Coolant temperature decreases from a higher than 40°C (104°F) temperature to a lower than 40°C (104°F) temperature.].<br>• Then the sensor output voltage has continued to be 1.6V or higher for 5 min.<br>Check Area<br>• The Engine Coolant Temperature is approx. 40°C (104°F) or less after starting sequence is completed. Judgment Criteria<br>• Approx. 60 - 300 seconds have passed for the engine coolant temperature to rise to about 40°C (104°F) after starting sequence was completed. | • Engine Coolant Temperature sensor failed.<br>• Open or shorted Engine Coolant Temperature sensor circuit, or loose connector.<br>• Engine Control Module failed. |

## CIRCUIT DIAGRAM




HP0115A

## TEST PROCEDURE




HP0115B

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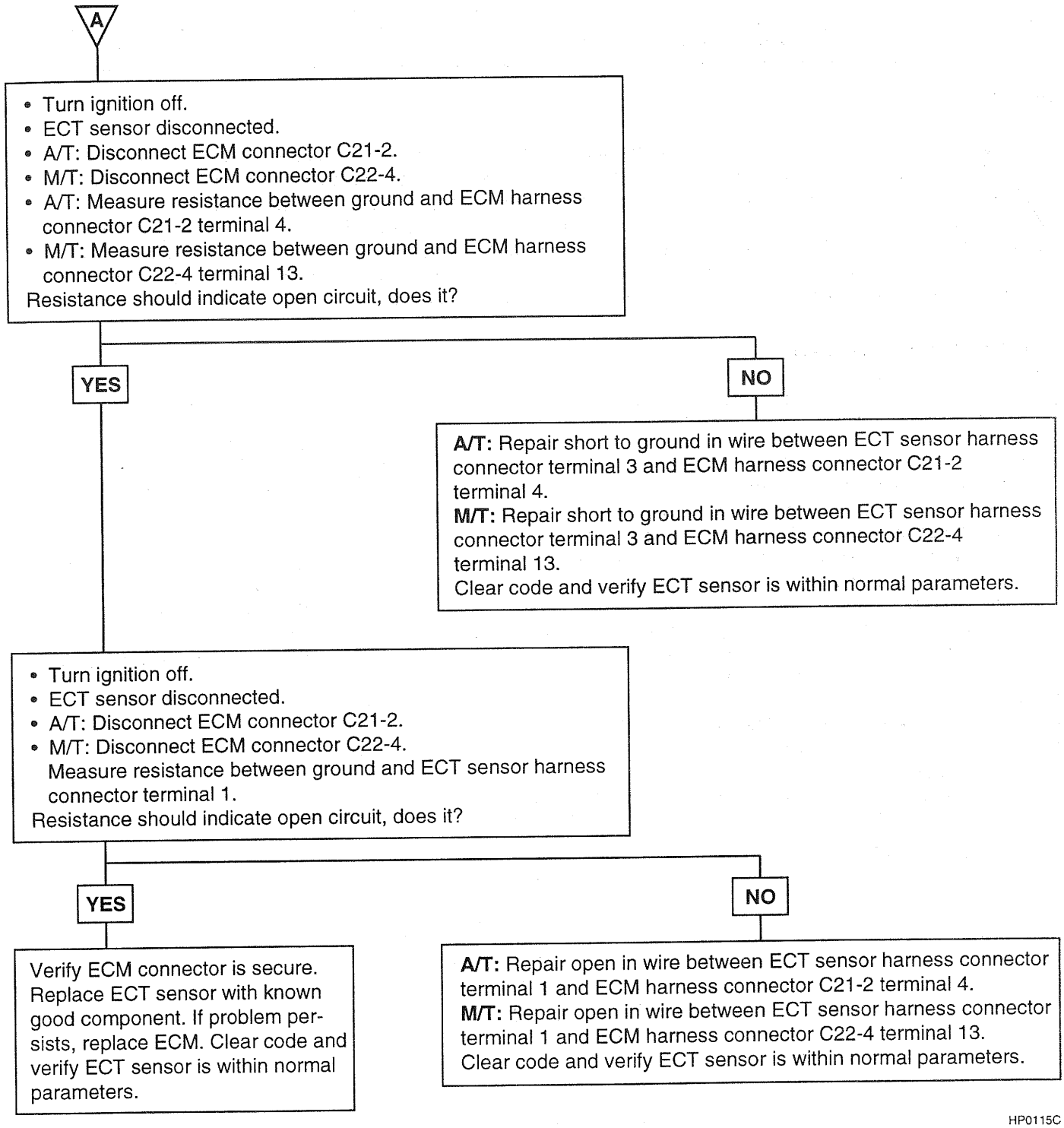



HP0115C

EFHA5040

| DTC | Diagnostic item |
|---|---|
| P0120 | Throttle Position Circuit Malfunction |

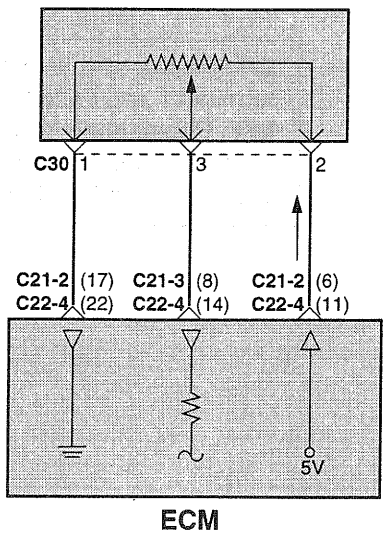
## DESCRIPTION

The throttle position (TP) sensor mounts on the side of the throttle body and is connected to the throttle blade shaft. The TP sensor is a variable resistor (potentiometer) whose resistance changes according to the throttle blade shaft position. During acceleration, the TP sensor resistance decreases; during deceleration, the TP sensor resistance increases. The TP sensor also includes an idle position switch. The switch is closed in the idle position. The Engine Control Module (ECM) applies a reference voltage to the TP sensor and then measures the voltage that is present on the TP sensor signal circuit. The ECM uses the TP sensor signal to adjust the timing and injector pulse width. The TP sensor signal along with the MAP sensor signal is used by the ECM to calculate the engine load.

## TROUBLESHOOTING GUIDE

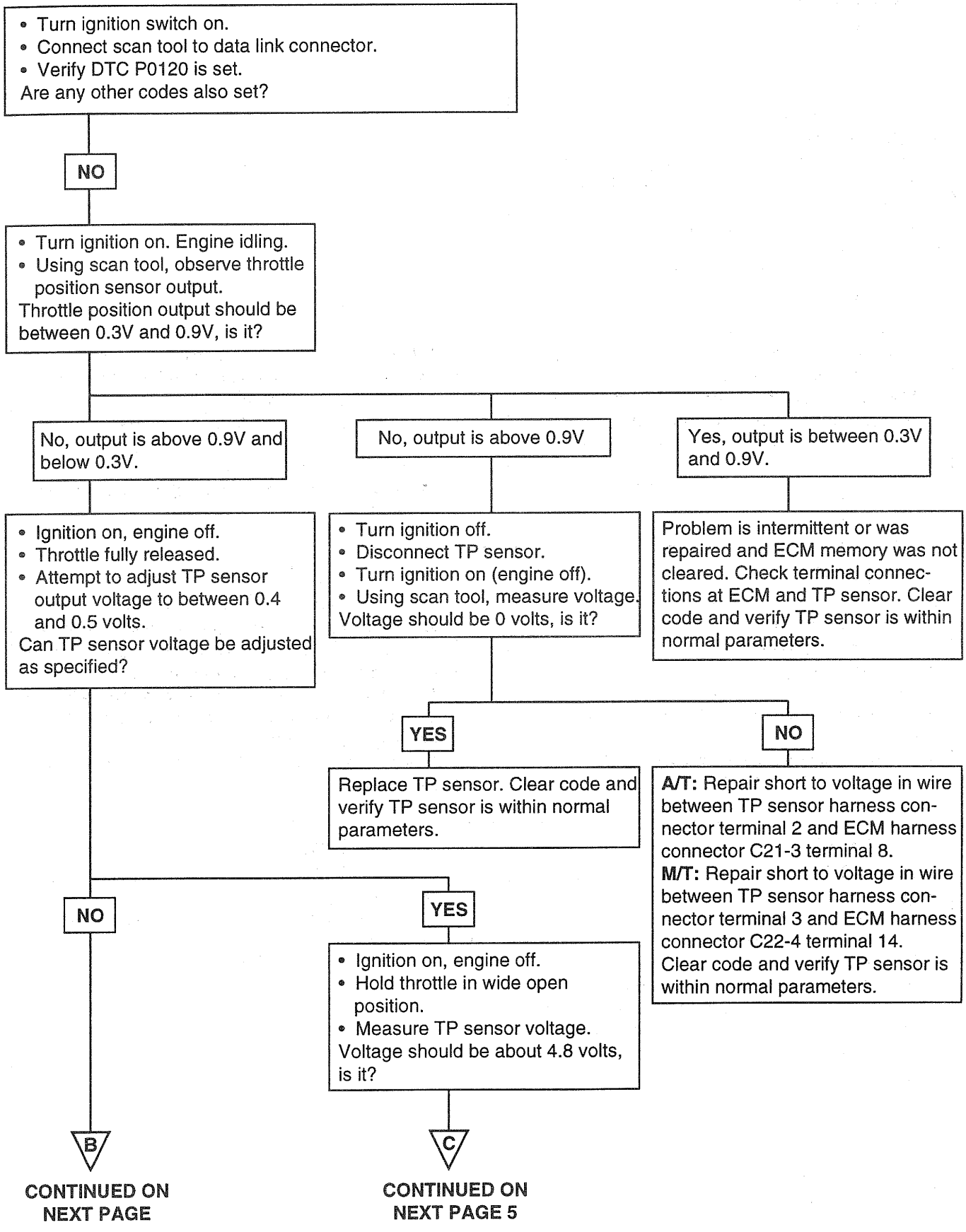
| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The Throttle Position sensor outputs a voltage which is proportional to the throttle valve opening angle.<br>• The Engine Control Module checks whether the voltage output by the throttle position sensor is within a specified range.<br>In addition, it checks that the voltage output does not become too large while the engine is idling.<br>Check Area, Judgment Criteria<br>• With the close Throttle Position switch se to ON, the sensor output voltage has continued to be 2V or higher for 4 sec.<br>• Sensor output voltage has continued to be 0.2V or lower for 4 sec.<br>Check Area<br>• Engine speed is between 500 and 3,000 r/min.<br>• Engine load is lower than 30%.<br>Judgment Criteria<br>• Sensor output voltage has continued to be 4.6V or higher for 4 sec. | • Throttle Position sensor failed or maladjusted.<br>• Open or shorted Throttle Position sensor circuit, or loose connector.<br>• Closed Throttle Position switch ON malfunction.<br>• Closed Throttle Position switch signal wire shorted.<br>• Engine control module failed. |

## CIRCUIT DIAGRAM




HP0120A

## TEST PROCEDURE




HP0120B

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B

- Turn ignition off.
- Disconnect TP sensor.
- Turn ignition on.
- Using voltmeter, measure voltage between ground and TP sensor harness connector terminal 2.

5 volts should be present, is it?

YES

- Ignition on, engine off.
- TP sensor disconnected.
- Measure resistance between ground and TP sensor harness connector terminal 1.

Resistance should be approximately 1 ohm or less, is it?

NO

**A/T:** Repair open in wire between TP sensor harness connector terminal 2 and ECM harness connector C21-2 terminal 6.
**M/T:** Repair short to voltage in wire between TP sensor harness connector terminal 2 and ECM harness connector C22-4 terminal 11.
Clear code and verify TP sensor is within normal parameters

YES

- Ignition on, engine off.
- TP sensor disconnected.
- Connect fused jumper across TP sensor harness connector terminals 1 and 2.
- Using scan tool, observe TP sensor's output voltage.

Voltage should be above 4.8 volts, is it?

NO

**A/T:** Repair poor ground or open in wire between TP sensor harness connector terminal 1 and ECM harness connector C21-3 terminal 17.
**M/T:** Repair poor ground or open in wire between TP sensor harness connector terminal 4 and ECM harness C22-4 terminal 13.
Clear code and verify TP sensor is within normal parameters.

NO

- Ignition off.
- TP sensor disconnected.
- Fused jumper in place.
- ECM connected.
- A/T: Measure voltage (backprobe) between ground and ECM connector C21-2 terminal 6.
- M/T: Measure voltage (backprobe) between ground and ECM connector C22-4 terminal 11.

5 volts should be present, is it?

YES

Replace TP sensor.
Clear code and verify TP sensor is within normal parameters.

D

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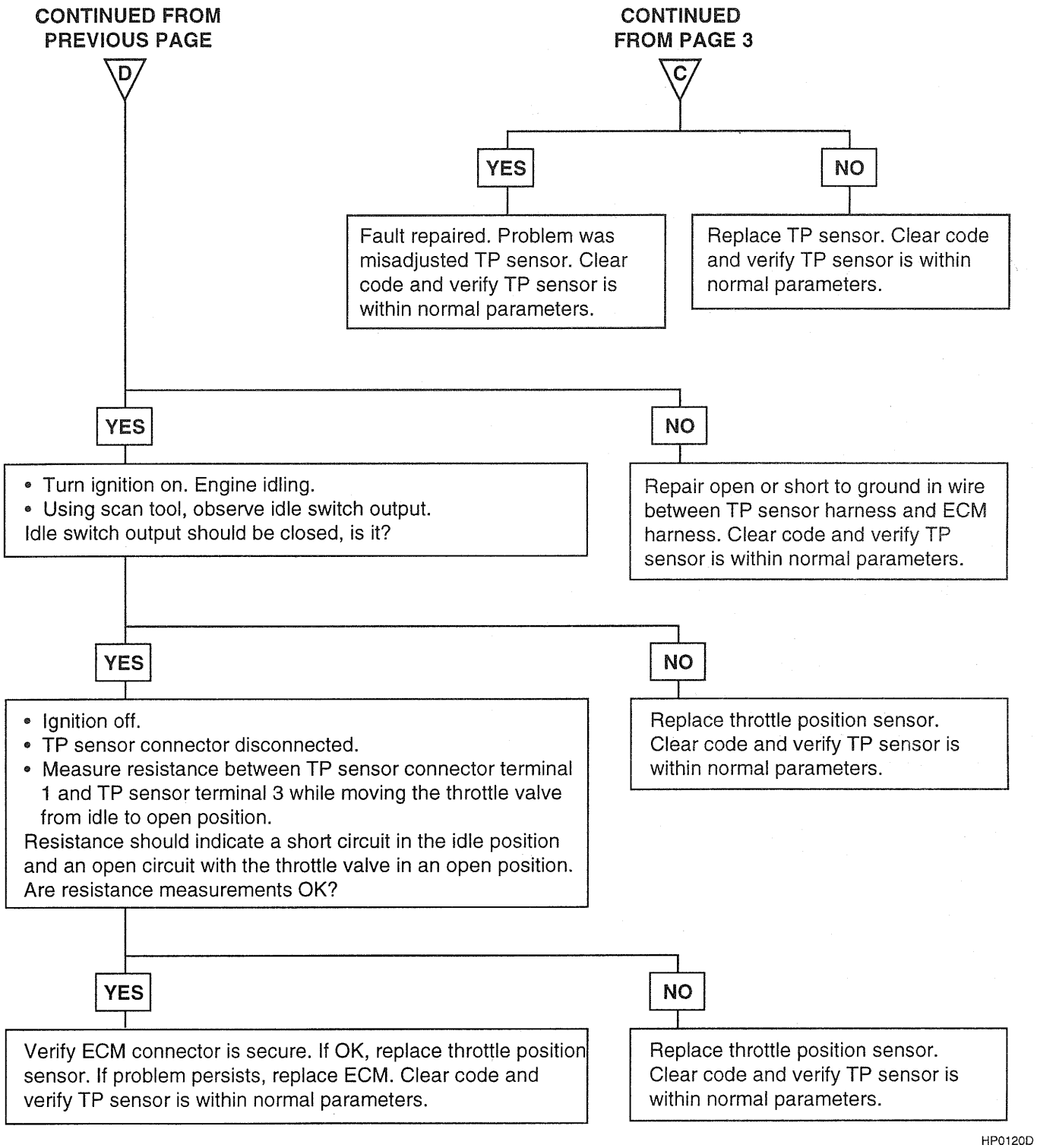
HP0120C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D
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C
YES
NO
Fault repaired. Problem was misadjusted TP sensor. Clear code and verify TP sensor is within normal parameters.
Replace TP sensor. Clear code and verify TP sensor is within normal parameters.
YES
NO
• Turn ignition on. Engine idling.
• Using scan tool, observe idle switch output.
Idle switch output should be closed, is it?
Repair open or short to ground in wire between TP sensor harness and ECM harness. Clear code and verify TP sensor is within normal parameters.
YES
NO
• Ignition off.
• TP sensor connector disconnected.
• Measure resistance between TP sensor connector terminal 1 and TP sensor terminal 3 while moving the throttle valve from idle to open position.
Resistance should indicate a short circuit in the idle position and an open circuit with the throttle valve in an open position.
Are resistance measurements OK?
Replace throttle position sensor. Clear code and verify TP sensor is within normal parameters.
YES
NO
Verify ECM connector is secure. If OK, replace throttle position sensor. If problem persists, replace ECM. Clear code and verify TP sensor is within normal parameters.
Replace throttle position sensor. Clear code and verify TP sensor is within normal parameters.

HP0120D

EFHA5060

| DTC | Diagnostic item |
|---|---|
| P0130, P0133 | Oxygen Sensor Circuit Malfunction (Bank 1, sensor 1) |

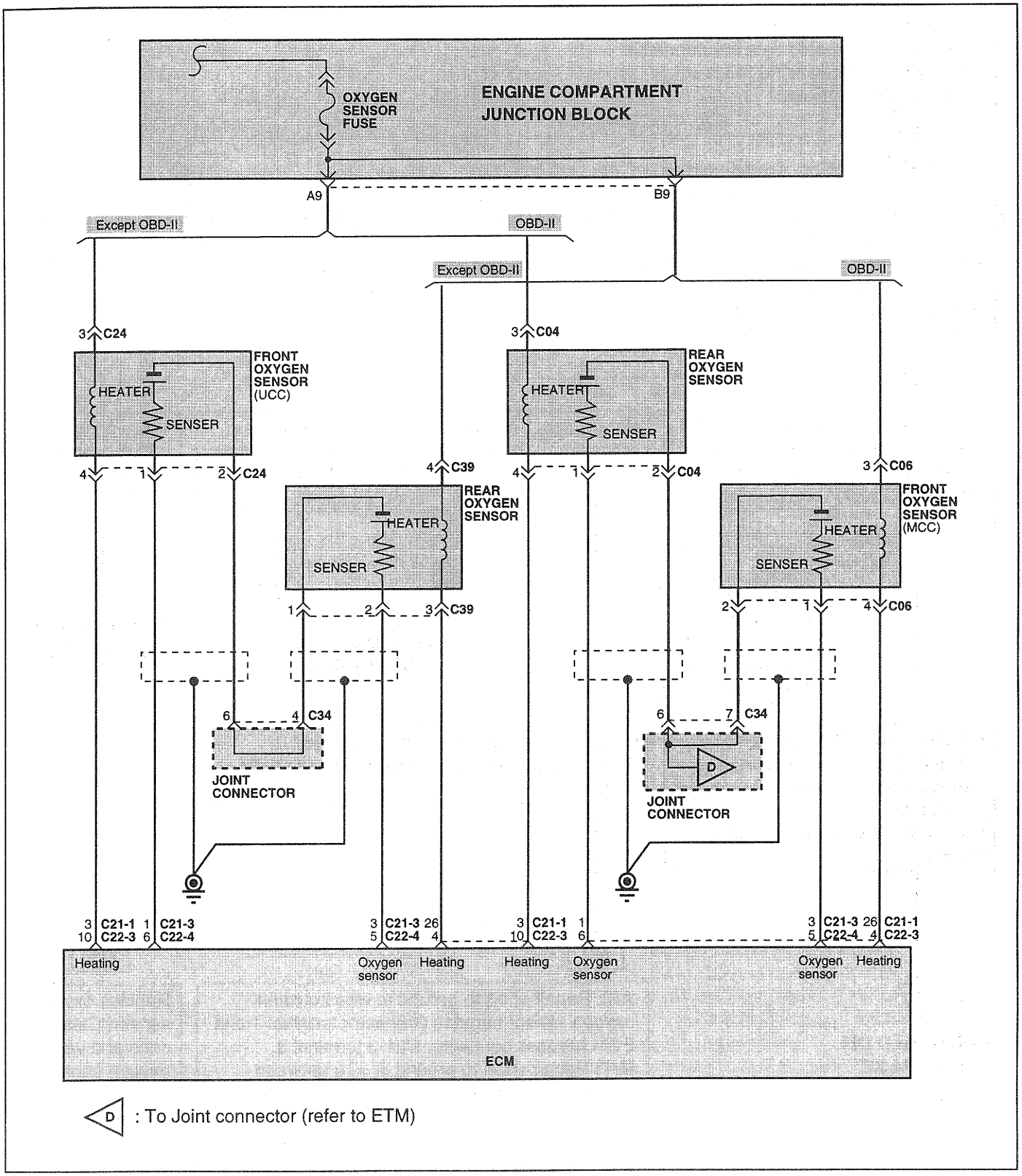
## DESCRIPTION

Refer to excessive time to enter closed loop fuel control (P0134).

## TROUBLESHOOTING GUIDE

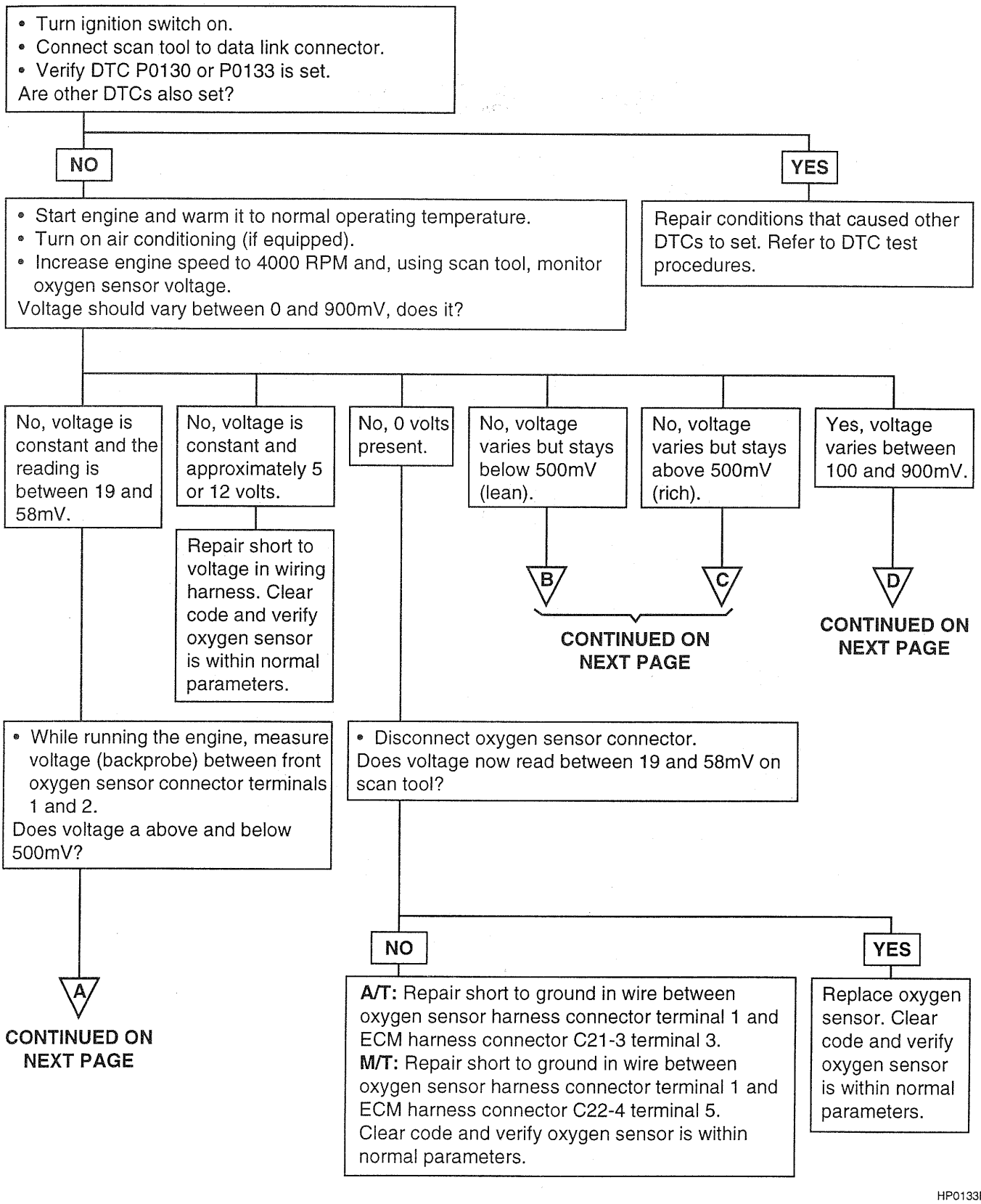
| DTC detection condition | Probable cause |
|---|---|
| Background<br>• When the heated oxygen sensor begins to deteriorate, the oxygen sensor signal response becomes poor.<br>• The Engine Control Module forcibly varies the air/fuel mixture to make it leaner and richer and checks the response speed of the heated oxygen sensor.<br>In addition, the Engine Control Module also checks for an open circuit in the heated oxygen sensor output line.<br>Check Area<br>• Coolant temperature sensor: Normal.<br>• Heated oxygen sensor signal voltage has continued to be 0.1V or lower for 3 min. or more after the staring sequence was completed.<br>• Engine Coolant Temperature is higher than 80°C (176°F).<br>• Engine speed is higher than 1,200 r/min.<br>• Engine load is 25% or more. Judgment Criteria<br>• Input voltage supplied to the engine control module interface circuit is 4.5V or more when 5V is applied to the heated oxygen sensor output line via a resistor.<br>Check Area<br>• Coolant temperature sensor: Normal.<br>• Engine Coolant Temperature is 50°C (122°F) or more.<br>• Engine speed is between 1,500 and 3,000 r/min or 1,100 and 3,000 r/min.<br>• Engine load is 25 - 60%.<br>• Intake air temperature is -10°C (14°F) or more.<br>• Under the closed loop air-fuel control.<br>• Monitoring Time: 8sec.<br>Judgment Criteria<br>• When the air-fuel ratio is focibly changed (lean to rich and rich to lean), the heated oxygen sensor signal doesn't provide response within 1.28 sec.<br>• Monitored only once per trip. | • Heated oxygen sensor deteriorated<br>• Open circuit in heated oxygen sensor output line<br>• Engine control module failed |

## CIRCUIT DIAGRAM

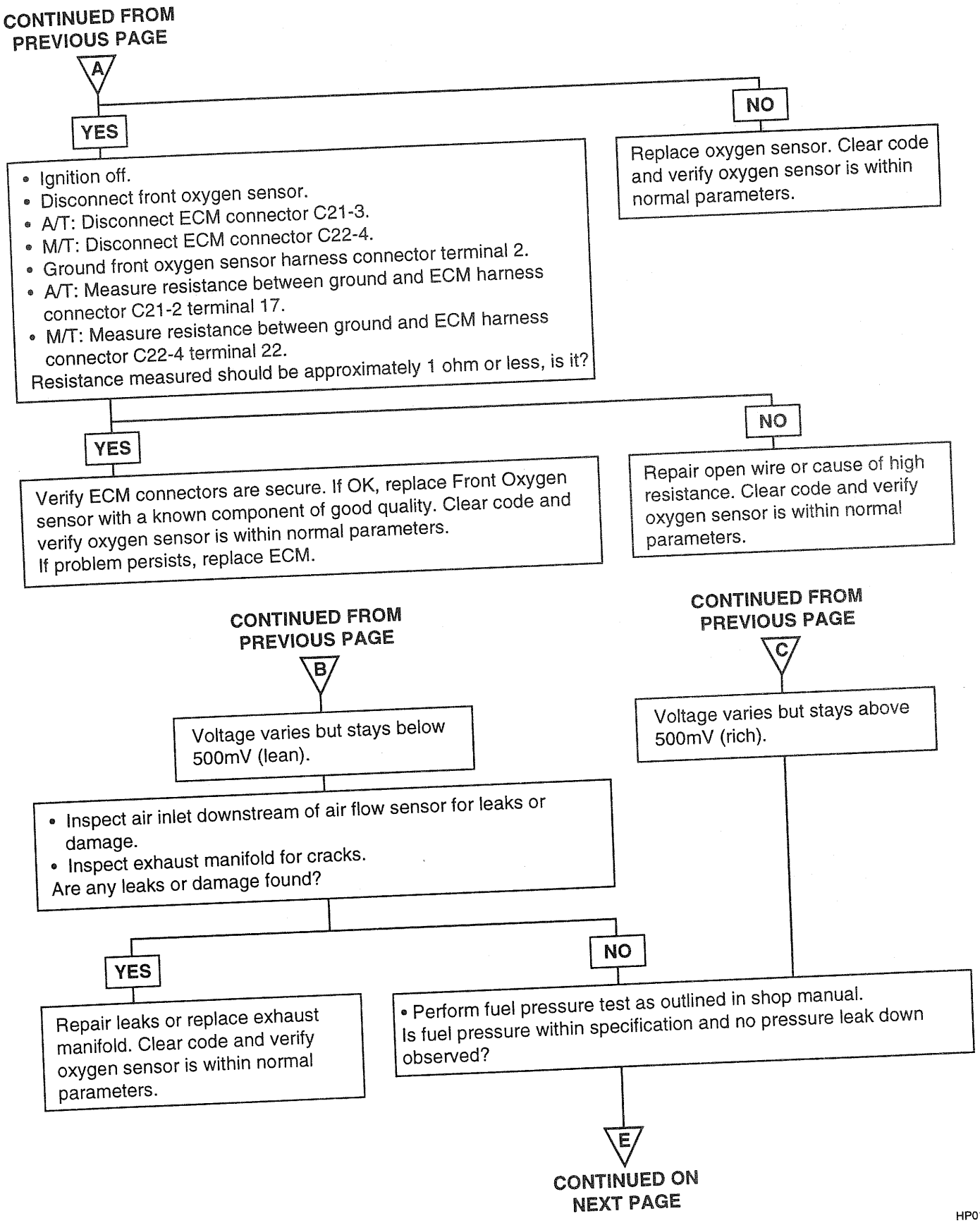



HP0134A

## TEST PROCEDURE




HP0133B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A
NO
YES
Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.
• Ignition off.
• Disconnect front oxygen sensor.
• A/T: Disconnect ECM connector C21-3.
• M/T: Disconnect ECM connector C22-4.
• Ground front oxygen sensor harness connector terminal 2.
• A/T: Measure resistance between ground and ECM harness connector C21-2 terminal 17.
• M/T: Measure resistance between ground and ECM harness connector C22-4 terminal 22.
Resistance measured should be approximately 1 ohm or less, is it?
NO
YES
Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.
Verify ECM connectors are secure. If OK, replace Front Oxygen sensor with a known component of good quality. Clear code and verify oxygen sensor is within normal parameters.
If problem persists, replace ECM.
CONTINUED FROM PREVIOUS PAGE
B
CONTINUED FROM PREVIOUS PAGE
C
Voltage varies but stays below 500mV (lean).
Voltage varies but stays above 500mV (rich).
• Inspect air inlet downstream of air flow sensor for leaks or damage.
• Inspect exhaust manifold for cracks.
Are any leaks or damage found?
NO
YES
Repair leaks or replace exhaust manifold. Clear code and verify oxygen sensor is within normal parameters.
• Perform fuel pressure test as outlined in shop manual.
Is fuel pressure within specification and no pressure leak down observed?
E
CONTINUED ON NEXT PAGE

HP013

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D

Voltage varies between 0 and 900mV.

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E

YES

NO

- Ignition off.
- Disconnect ignition coil connector.
- Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine.

Measured voltage drop should be less than 0.5 volts, is it?

Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parameters.

YES

NO

- Disconnect negative battery terminal.
- Measure resistance between generator case and engine ground point.

Resistance measured should be approximately 1 ohm or less, is it?

Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.

YES

NO

- If Malfunction Indicator Lamp (MIL) is turned on intermittently and DTC P0133 is set, the problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
- If Malfunction Indicator Lamp (MIL) was on and DTC P0133 is set, replace oxygen sensor.
- Clear code and verify oxygen sensor is within normal parameters.

Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

HP0133D

EFHA5050

| DTC | Diagnostic item |
|---|---|
| P0134 | No Activity of Oxygen Sensor (Bank 1, Sensor 1) |

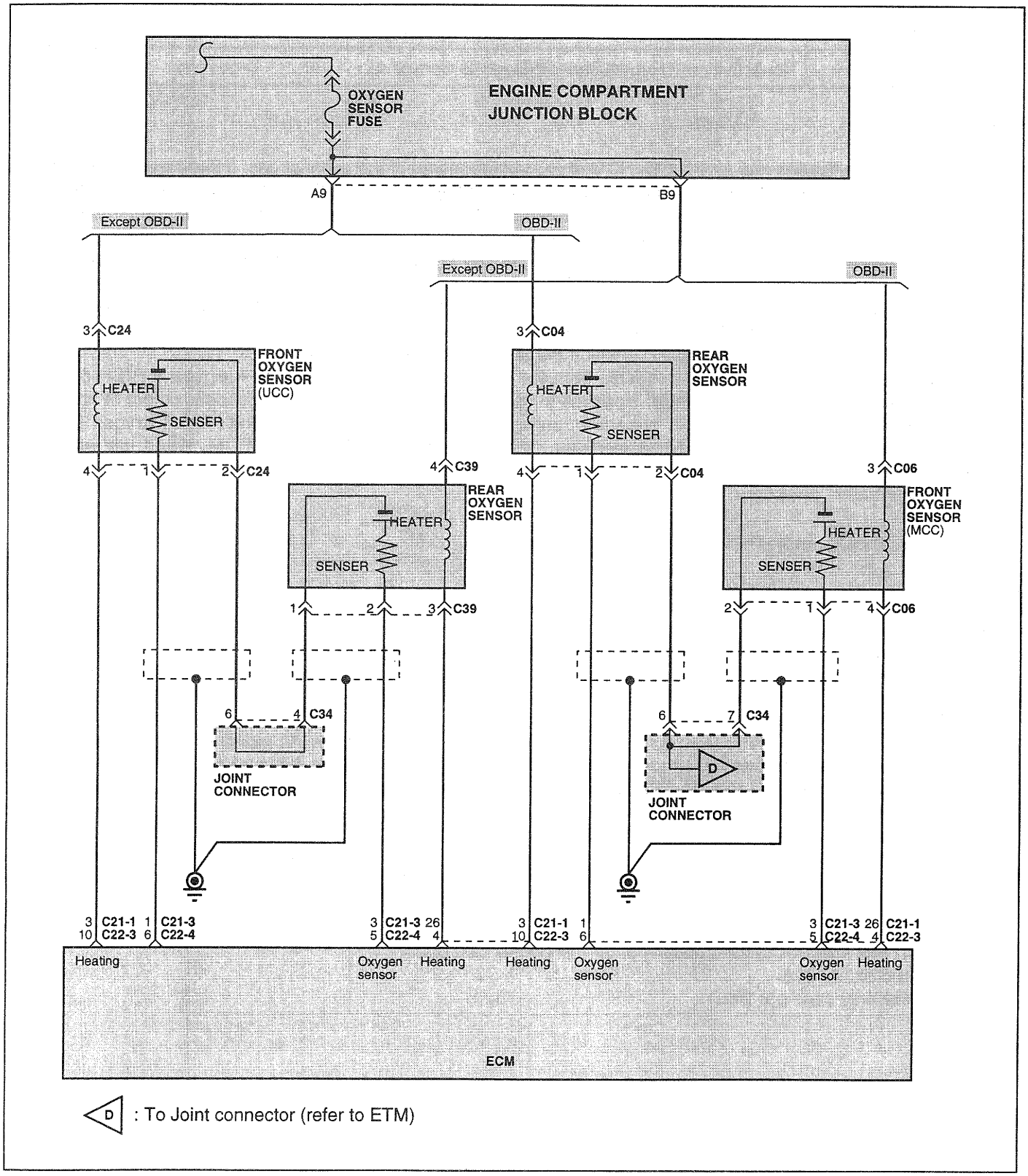
## DESCRIPTION

To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three way catalytic converter is used, but for the most efficient use of the three-way catalytic inverter, the ratio of the air must be precisely controlled so that it is always close to the stoichiometric air-fuel ratio. The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air-fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air-fuel ratio. When the air-fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0V). When the air-fuel ratio is RICHER than the stoichiometric air-fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1V).
The ECM determined by the electromotive force from the oxygen sensor whether the air-fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform an accurate air-fuel ratio control. The heated oxygen sensors include a heater which heats the Zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater to heat the sensor for accurate oxygen concentration detection.

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The MFI system reduces exhaust emissions by means of closed-loop fuel control.<br>• The Engine Control Module checks the time taken until closed-loop fuel control commences.<br>Check Area<br>• Engine coolant temperature is higher than 80°C (176°F)<br>• Intake air temperature is -10°C (14°F) or more.<br>• Atmospheric pressure is 76 kPa (11.0 psi) or more.<br>• Engine speed is between approx. 2,400 and 3,500 r/min.<br>• Engine load is 26 - 60%.<br>• In operation within air-fuel-ratio feeback zone.<br>• Monitoring time: 128 sec.<br>Judgment Criteria<br>• Multiport fuel injection system doesn't enter the closed loop control within approx. 30 sec.<br>• Monitored only once per trip. | • Heated oxygen sensor failed<br>• Injector failed<br>• Fuel pressure regulator failed<br>• Fuel pump failed<br>• Fuel filter clogged<br>• Air intake in exhaust system<br>• Exhaust gas leaks<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0134A

## TEST PROCEDURE

- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0134 is set.

Is DTC P0125 the only code set?

**YES**

- Engine idling at normal operating temperature.
- Connect scan tool and observe Engine Coolant Temperature (ECT) sensor reading.

Scanned temperature should be between 170°F and 190°F (77°C and 88°C), is it?

No, scanned temperature is below 170°F (77°C).

- Turn ignition off.
- Disconnect ECT sensor.
- Turn ignition on.
- Measure voltage across ECT sensor harness connector terminals 1 and 3.

Voltage measured should be 4.5 to 5.0 volts, is it?

Yes, 4.5 to 5.0 volts is present

Replace ECT sensor. Clear code and verify ECT sensor is within normal parameters.

Yes, scanned temperature is between 170°F and 190°F (77°C and 88°C)

No problem found at this time. Fault is intermittent or was repaired and ECM memory was not cleared. Clear code and verify ECT sensor is within normal parameters.

No, less than 4.5 volts is present

- Turn ignition off.
- ECT sensor disconnected.
- A/T: Disconnect ECM connector C21-2.
- M/T: Disconnect ECM connector C22-4.
- Ground ECT harness connector terminal 1.
- A/T: Measure resistance between ground and ECM harness connector C21-2 terminal 4.
- M/T: Measure resistance between ground and ECM harness connector C22-4 terminal 13.

Resistance should be approximately 1 ohm or less, is it?

**YES**

Verify ECM connector is secure. Replace ECT sensor with known good component. If problem persists, replace ECM. Clear code and verify ECT sensor is within normal parameters.

**NO**

A/T: Repair open in wire between ECT sensor harness connector terminal 1 and ECM harness connector C21-2 terminal 4.
M/T: Repair open in wire between ECT sensor harness connector terminal 1 and ECM harness connector C22-4 terminal 13.
Clear code and verify ECT sensor is within normal parameters.

**NO**

Refer to appropriate section and fix other codes first.

HP0134B

EFHA5070

| DTC | Diagnostic item |
|---|---|
| P0135 | Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 1) |

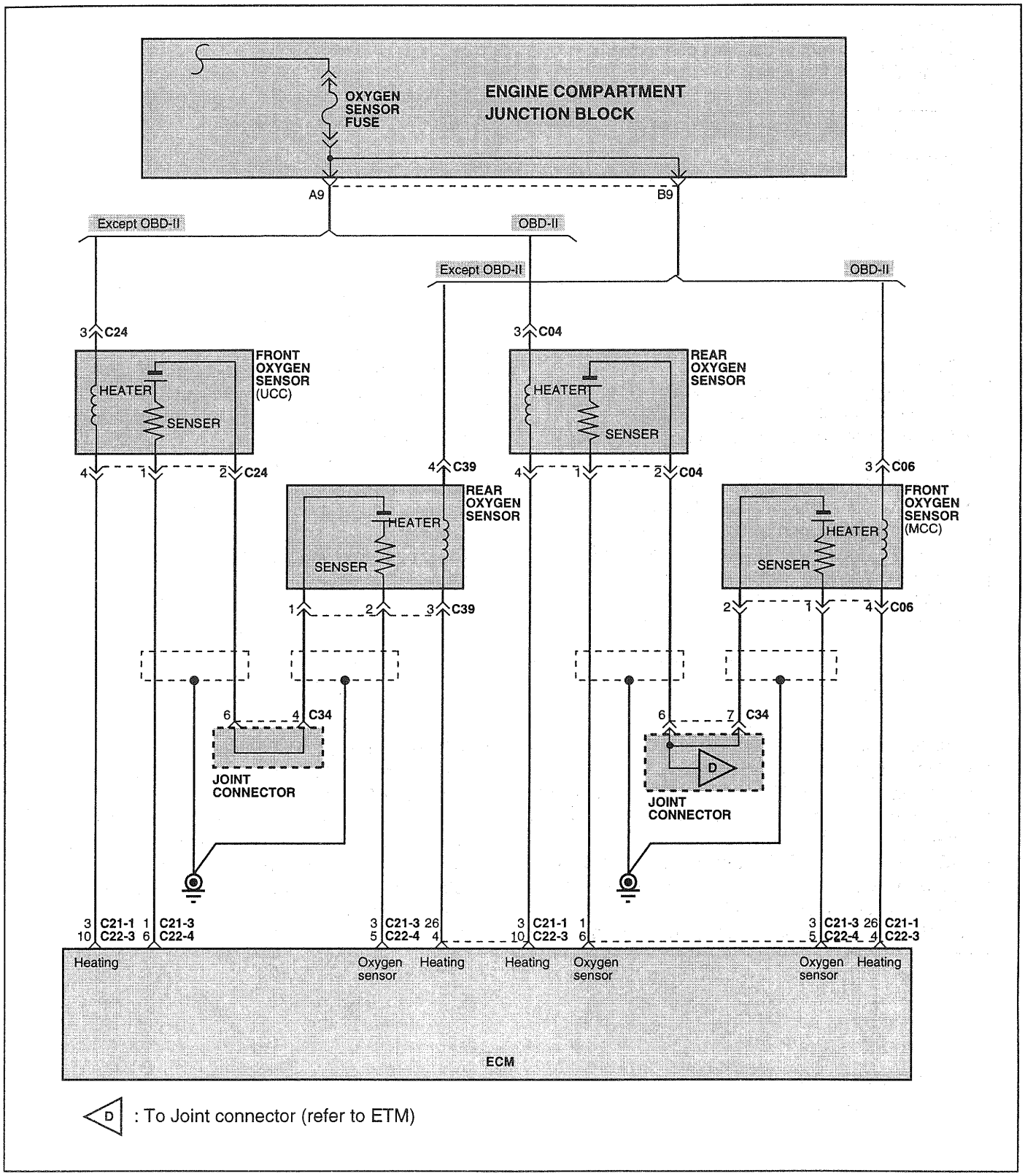
## DESCRIPTION

Refer to excessive time to enter closed loop fuel control (P0134).

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The Engine Control Module checks whether the heater current is within a specified range when the heater is energized.<br>Check Area<br>• Battery voltage is between 12 and 16V.<br>Judgment Criteria<br>• Heater current of the front heated oxygen sensor heater (Bank 1 Sensor 1) has continued to be 0.2 A or less, or 3.5 A or higher for 6 sec.<br>• Monitored only once per trip. | • Open or shorted oxygen sensor heater circuit<br>• Open circuit in oxygen sensor heater<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0134A

## TEST PROCEDURE

- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0135 is set.

- Disconnect front oxygen sensor.
- Start engine.
- Measure voltage between oxygen sensor harness connector terminal 3 and ground.

Voltage should between 12 and 16 volts, is it?

**YES**

- Turn ignition switch off.
- Front oxygen sensor disconnected.
- A/T: Disconnect ECM connector C21-1.
- Ground front oxygen sensor harness terminal 4.
- Measure resistance between ground and ECM harness connector C21-1 terminal 26.
- M/T: Disconnect ECM connector C22-3.
- Ground front oxygen sensor harness terminal 4.
- Measure resistance between ground and ECM harness connector C22-3 terminal 4.

Resistance should be 1 ohm or less, is it?

**YES**

- Ignition switch off.
- Front oxygen sensor disconnected.
- A/T: Disconnect ECM connector C21-1. Measure resistance between ground and oxygen sensor harness connector terminal 4.
- M/T: Disconnect ECM connector C22-3. Measure resistance between ground and oxygen sensor harness connector terminal 4.

Resistance should indicate an open circuit, does it?

A

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**NO**

**A/T:** Repair open or short to ground in wire between engine compartment junction block terminal and oxygen sensor harness connector terminal 3.
**M/T:** Repair open or short to ground in wire between engine compartment junction block terminal and oxygen sensor harness connector terminal 3.
Clear code and verify oxygen sensor is within normal parameters.

**NO**

**A/T:** Repair open in wire between oxygen sensor harness connector terminal 4 and ECM harness connector C21-1 terminal 26.
**M/T:** Repair open in wire between oxygen sensor harness connector terminal 4 and ECM harness connector C22-3 terminal 4.
Clear code and verify oxygen sensor is within normal parameters.

HP0135B

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A

YES

- Ignition switch off.
- Front oxygen sensor disconnected.
- Measure resistance between terminals 3 and 4 of oxygen sensor connector.

Is resistance within normal parameters (11 - 14 ohms)?

NO

**A/T:** Repair short to ground or another circuit in wire between oxygen sensor harness connector terminal 4 and ECM harness connector C21-1 terminal 26.
**M/T:** Repair short to ground or another circuit in wire between oxygen sensor harness connector terminal 4 and ECM harness connector C22-3 terminal 4.
Clear code and verify oxygen sensor is within normal parameters.

YES

Verify ECM connector is secure. If OK, replace Front Oxygen Sensor with known good component. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

NO

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.

HP0135C

EFHA5080

| DTC | Diagnostic item |
|---|---|
| P0136 | Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 2) |

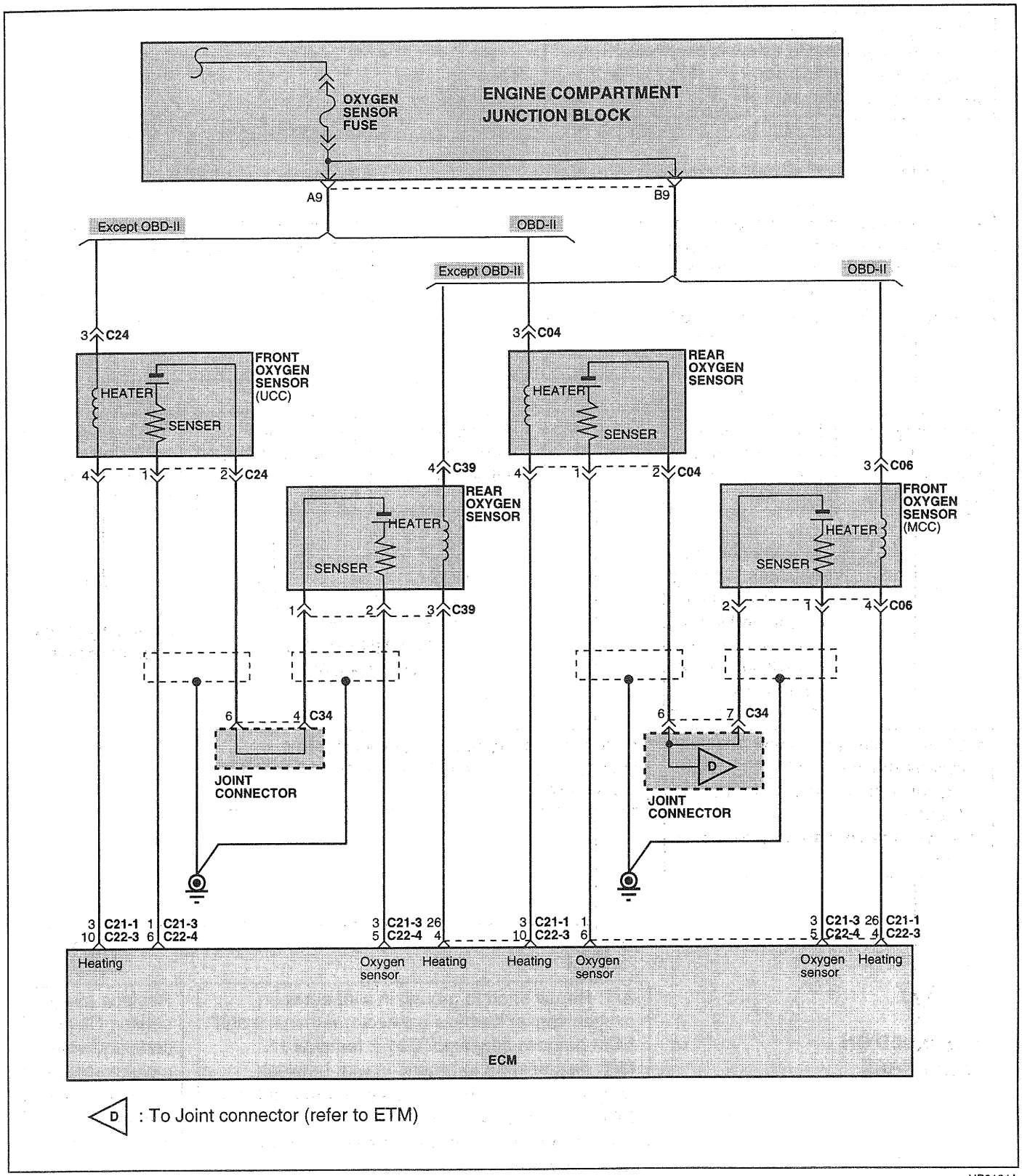
## DESCRIPTION

Refer to excessive time to enter closed loop fuel control (P0134).

## TROUBLESHOOTING GUIDE

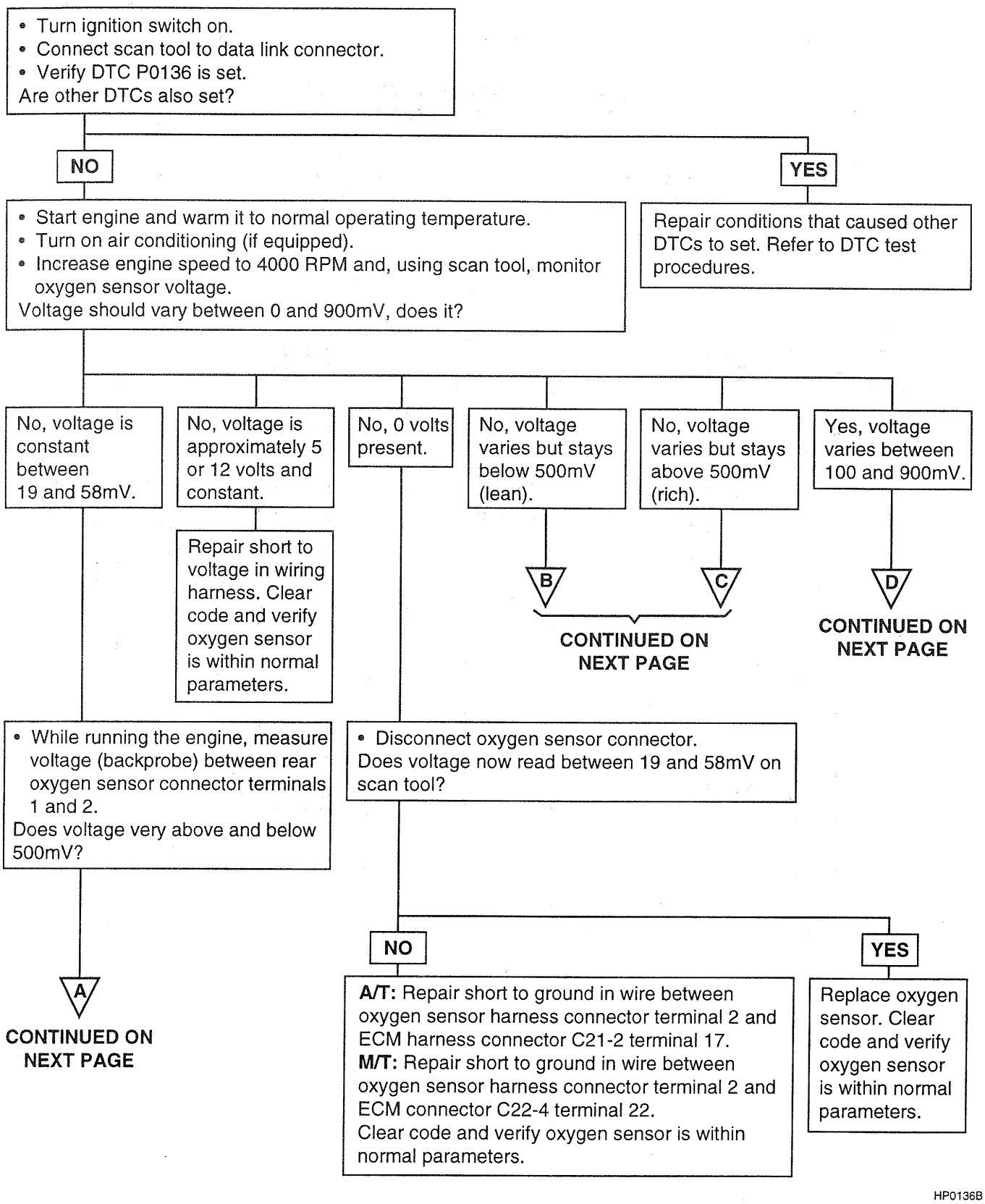
| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The Engine Control Module checks for an open circuit in the heated oxygen sensor output line.<br>Check Area<br>• Coolant temperature sensor: Normal.<br>• Heated oxygen sensor signal voltage has continued to be 0.1V or lower for 3 min. or more after the staring sequence was completed.<br>• Engine coolant temperature is 80°C (176°F) or more.<br>• Engine speed is higher than 1,200 r/min.<br>• Engine load is 25% or more.<br>• Monitoring Time: 7 - 10 sec.<br>Judgment Criteria<br>• Input voltage supplied to the engine control module interface circuit is 4.5V or more when 5V is applied to the heated oxygen sensor output line via a resistor.<br>• Making the air-fuel ratio 15% richer doesn't result in raising the heated oxygen sensor output voltage beyond 0.1V. | • Heated oxygen sensor failed<br>• Open circuit in heated oxygen sensor output line<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0134A

## TEST PROCEDURE



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A

YES

- Ignition off.
- A/T: Disconnect ECM connector C21-3.
- M/T: Disconnect ECM connector C22-4.
- Disconnect rear oxygen sensor.
- Ground rear oxygen sensor harness connector terminal 2.
- A/T: Measure resistance of wire between oxygen sensor harness connector terminal 2 and ECM connector C21-2 terminal 17.
- M/T: Measure resistance of wire between oxygen sensor harness connector terminal 2 and ECM connector C22-4 terminal 22.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Replace oxygen sensor.
Clear code and verify oxygen sensor is within normal parameters.

YES

Verify ECM connectors are secure. If OK, replace Rear Oxygen sensor.
Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

NO

Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.

CONTINUED FROM PREVIOUS PAGE

B

Voltage varies but stays below 500mV (lean).

- Inspect air inlet downstream of air flow sensor for leaks or damage.
- Inspect exhaust manifold for cracks.

Are any leaks or damage found?

YES

Repair leaks or replace exhaust manifold.
Clear code and verify oxygen sensor is within normal parameters.

NO

CONTINUED FROM PREVIOUS PAGE

C

Voltage varies but stays above 500mV (rich).

- Perform fuel pressure test as outlined in shop manual.

Is fuel pressure within specification and no pressure leak observed?

E

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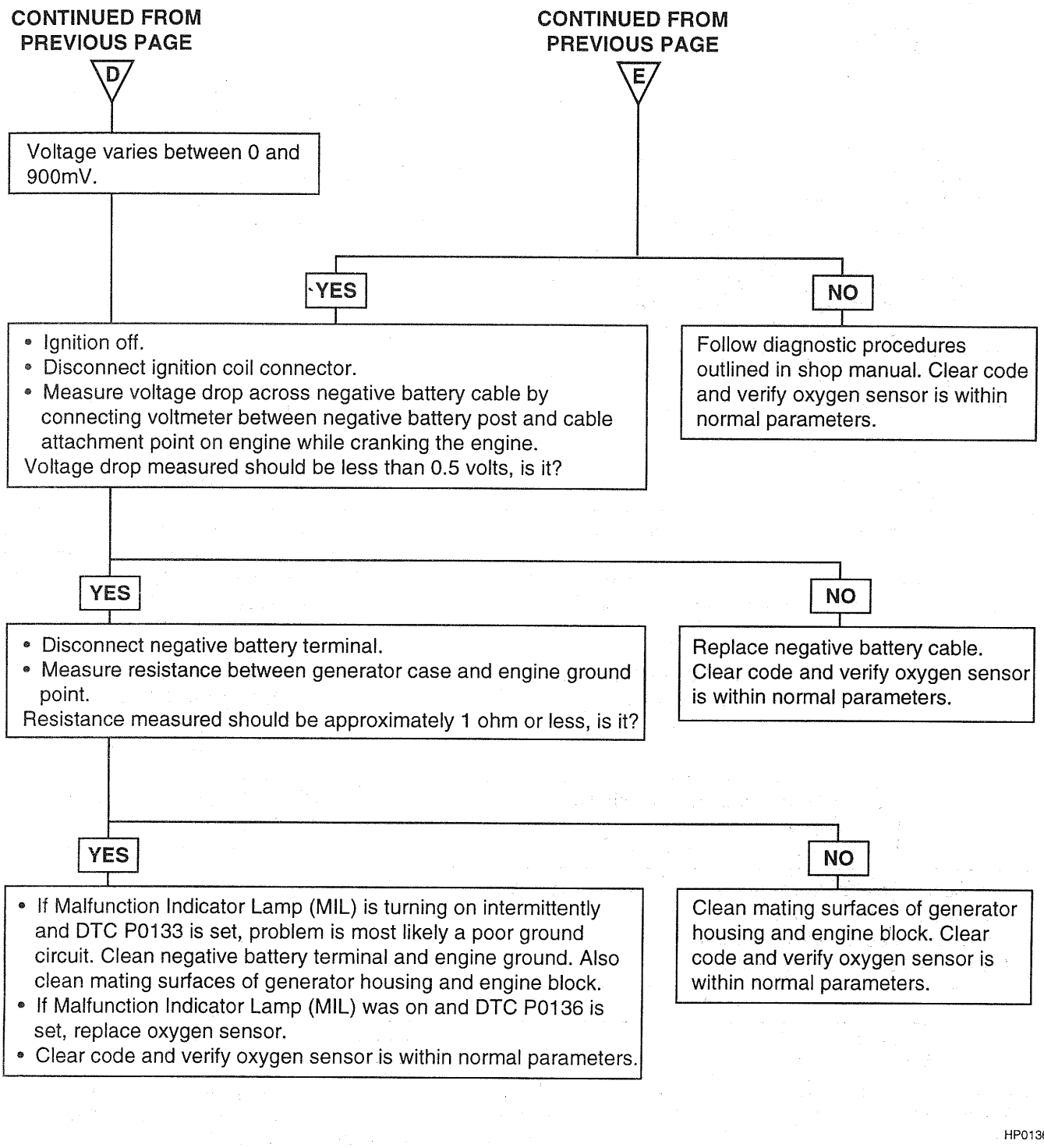
HP0136C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D
Voltage varies between 0 and 900mV.
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E
YES
NO
• Ignition off.
• Disconnect ignition coil connector.
• Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine.
Voltage drop measured should be less than 0.5 volts, is it?
Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parameters.
YES
NO
• Disconnect negative battery terminal.
• Measure resistance between generator case and engine ground point.
Resistance measured should be approximately 1 ohm or less, is it?
Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.
YES
NO
• If Malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0133 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
• If Malfunction Indicator Lamp (MIL) was on and DTC P0136 is set, replace oxygen sensor.
• Clear code and verify oxygen sensor is within normal parameters.
Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

HP0136D

EFHA5090

| DTC | Diagnostic item |
|---|---|
| P0141 | Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 2) |

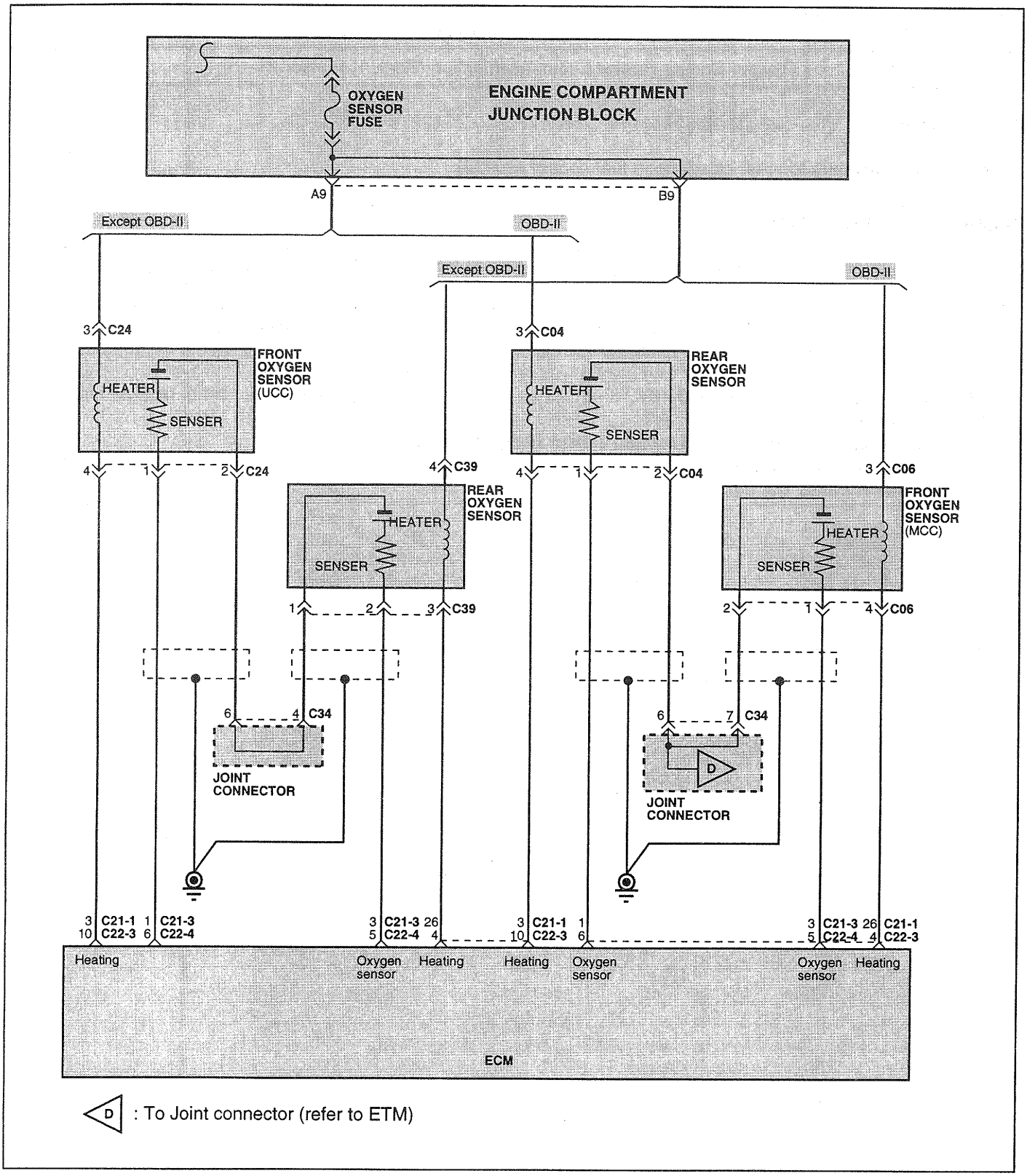
## DESCRIPTION

Refer to excessive time to enter closed loop fuel control (P0134).

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The Engine Control Module checks whether the heater current is within a specified range when the heater is energized.<br>Check Area<br>• Battery voltage is between 12 and 16V.<br>Judgment Criteria<br>• Heater current of the front heated oxygen sensor heater (Bank 1 Sensor 2) has continued to be 0.2 A or less, or 3.5 A or more for 6 sec.<br>• Monitored only once per trip. | • Open or shorted oxygen sensor heater circuit<br>• Open circuit in oxygen sensor heater<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0134A

## TEST PROCEDURE

- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0141 is set.

- Disconnect rear oxygen sensor.
- Start engine.
- Measure voltage between oxygen sensor harness connector terminal 3 and ground.

Voltage should be between 12 and 16 volts, is it?

**YES**

- Turn ignition switch off.
- Rear oxygen sensor disconnected.
- A/T: Disconnect ECM connector C21-1. Ground rear oxygen sensor harness connector terminal 4.
- Measure resistance between ground and ECM connector C21-1 terminal 3.
- M/T: Disconnect ECM connector C22-3. Ground rear oxygen sensor harness connector terminal 4.
- Measure resistance between ground and ECM connector C22-3 terminal 10.

Resistance measured should be approximately 1 ohm or less, is it?

**YES**

- Ignition switch off.
- Rear oxygen sensor disconnected.
- A/T: Disconnect ECM connector C21-1. Measure resistance between ground and oxygen sensor harness connector terminal 4.
- M/T: Disconnect ECM connector C22-3. Measure resistance between ground and oxygen sensor harness connector terminal 4.

Resistance should indicate an open circuit, does it?

**YES**

- Ignition switch off.
- Rear oxygen sensor disconnected.
- Measure resistance between terminals 3 and 4 of oxygen sensor connector.

Is resistance within normal parameters (7-9 ohms)?

**YES**

Verify ECM connector is secure. If OK, replace Rear Oxygen sensor. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

**NO**

**A/T:** Repair open in wire between engine comportment junction block terminal and oxygen sensor harness connector terminal 3.
**M/T:** Repair open in wire between engine comporment junction block terminal and oxygen sensor harness connector terminal 3.
Clear code and verify oxygen sensor is within normal parameters.

**NO**

**A/T:** Repair open in wire between ECM harness connector C21-1 terminal 3 and oxygen sensor harness connector terminal 4.
**M/T:** Repair open in wire between ECM harness connector C22-3 terminal 10 and oxygen sensor harness connector terminal 4.
Clear code and verify oxygen sensor is within normal parameters.

**NO**

**A/T:** Repair short to ground or another circuit in wire betweenECM harness connector C21-1 terminal 3 and oxygen sensor harness connector terminal 4.
**M/T:** Repair short to ground or another circuit in wire between ECM harness connector C22-3 terminal 10 and oxygen sensor harness connector terminal 4.
Clear code and verify oxygen sensor is within normal parameters.

**NO**

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.

HP0141B

EFHA5100

| DTC | Diagnostic item |
|---|---|
| P0201, P0202<br>P0203, P0204 | Injector Circuit Malfunction (Cylinder-1, Cylinder-2, Cylinder-3, Cylinder-4) |

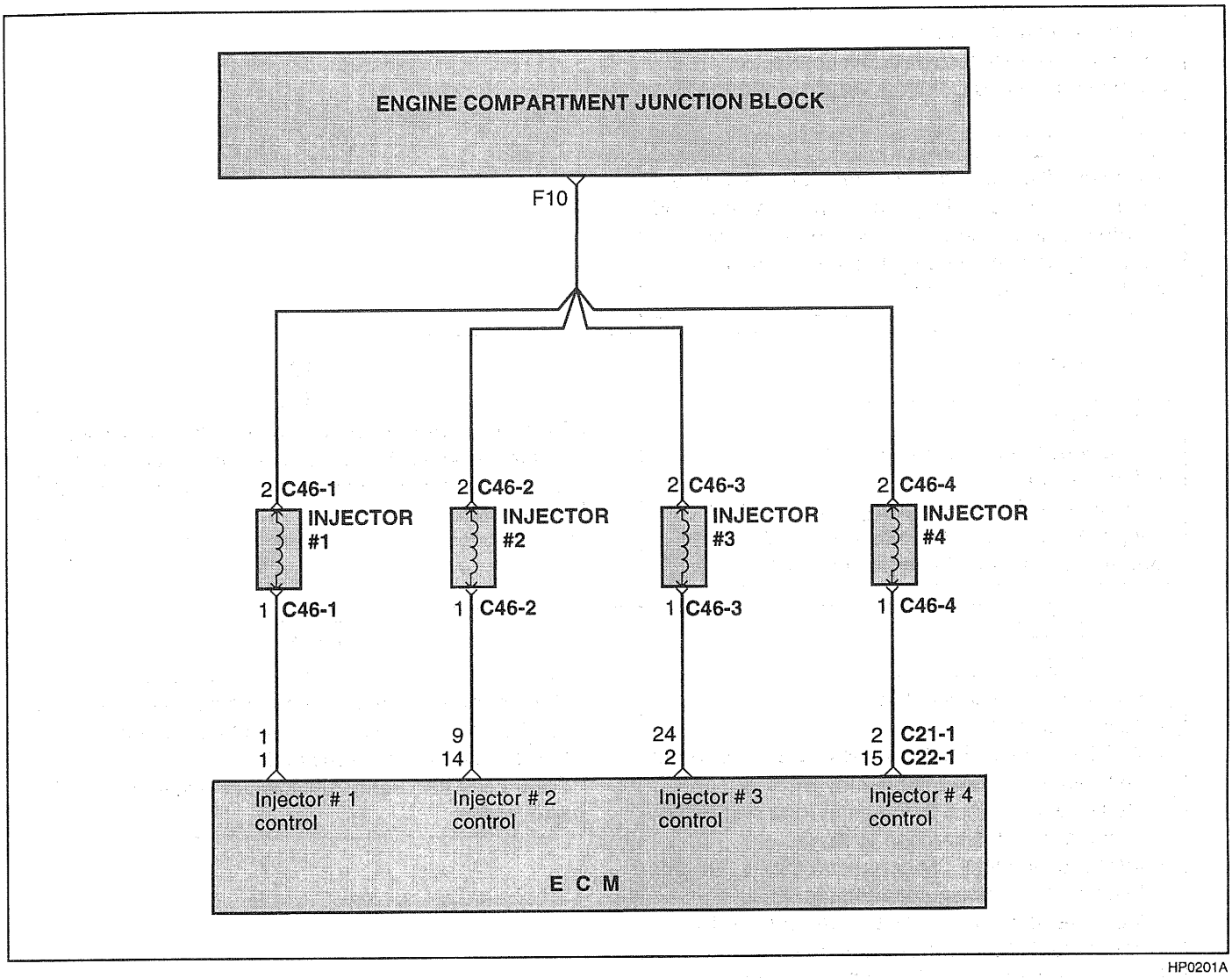
## DESCRIPTION

The fuel injectors are solenoid operated valves that are normally closed. When a fuel injector solenoid is energized (pulsed) the injector needle valve moves, allowing pressurized fuel to pass through the injector and mix with the air entering the engine. Each fuel injector (there is one for each engine cylinder) is mounted in the intake manifold and is positioned to spray fuel into a cylinder head intake port.
The Engine Control Module (ECM) controls injector timing and pulse width (how long the fuel injectors are turned on). The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow and throttle position data are all used by the ECM to calculate injector pulse width.
The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation and simultaneous injection may be used when the engine is being cranked.

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• A surge voltage is generated when the injectors are driven and the current flowing to the injector coil, is shut off.<br>• The engine control module checks this surge voltage.<br>Check Area<br>• Engine speed is between 50 and 1,000 r/min<br>• Throttle position sensor output voltage is 1.16V or less.<br>• Monitoring Time: 4 sec.<br>Judgment Criteria<br>• Injector coil surge voltage (system voltage +2V) has not been detected for 4 sec. | • Injector failed<br>• Open or shorted injector circuit, or loose connector<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0201A

## TEST PROCEDURE

- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0201, P0202, P0203 or P0204 is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one

Engine speed should drop the same amount for each fuel injector, does it?

**NO**

- Turn ignition off.
- Disconnect fuel injector connector.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 2.

Battery voltage should be present, is it?

**YES**

- Fuel inector disconnected.
- Turn ignition off.
- A/T: Disconnect ECM connector C21-1. Ground fuel injector harness connector terminal 1. Measure resistance between ground and ECM connector C21-1 harness terminal.
- M/T: Disconnect ECM connector C22-1. Ground fuel injector harness connector terminal 1. Measure resistance between ground and ECM connector C22-1 harness terminal.

Resistance measured should be approximately 1 ohm or less, is it?

**YES**

- Ignition off.
- Fuel injector disconnected.
- A/T: ECM connector C21-1 disconnected. Measure resistance between ground and fuel injector harness connector terminal 1.
- M/T: ECM connector C22-1 disconnected.
- Measure resistance between ground and fuel injector harness connector terminal 1.

Resistance should indicate open circuit, does it?

A

CONTINUED ON NEXT PAGE

**NO**

**A/T:** Repair open in wire between ECM harness connector C21-1 terminal and fuel injector harness connector terminal 1.
**M/T:** Repair open in wire between ECM harness connector C22-1 terminal and fuel injector harness connector terminal 1.
Clear code and verify fuel injector is within normal parameters.

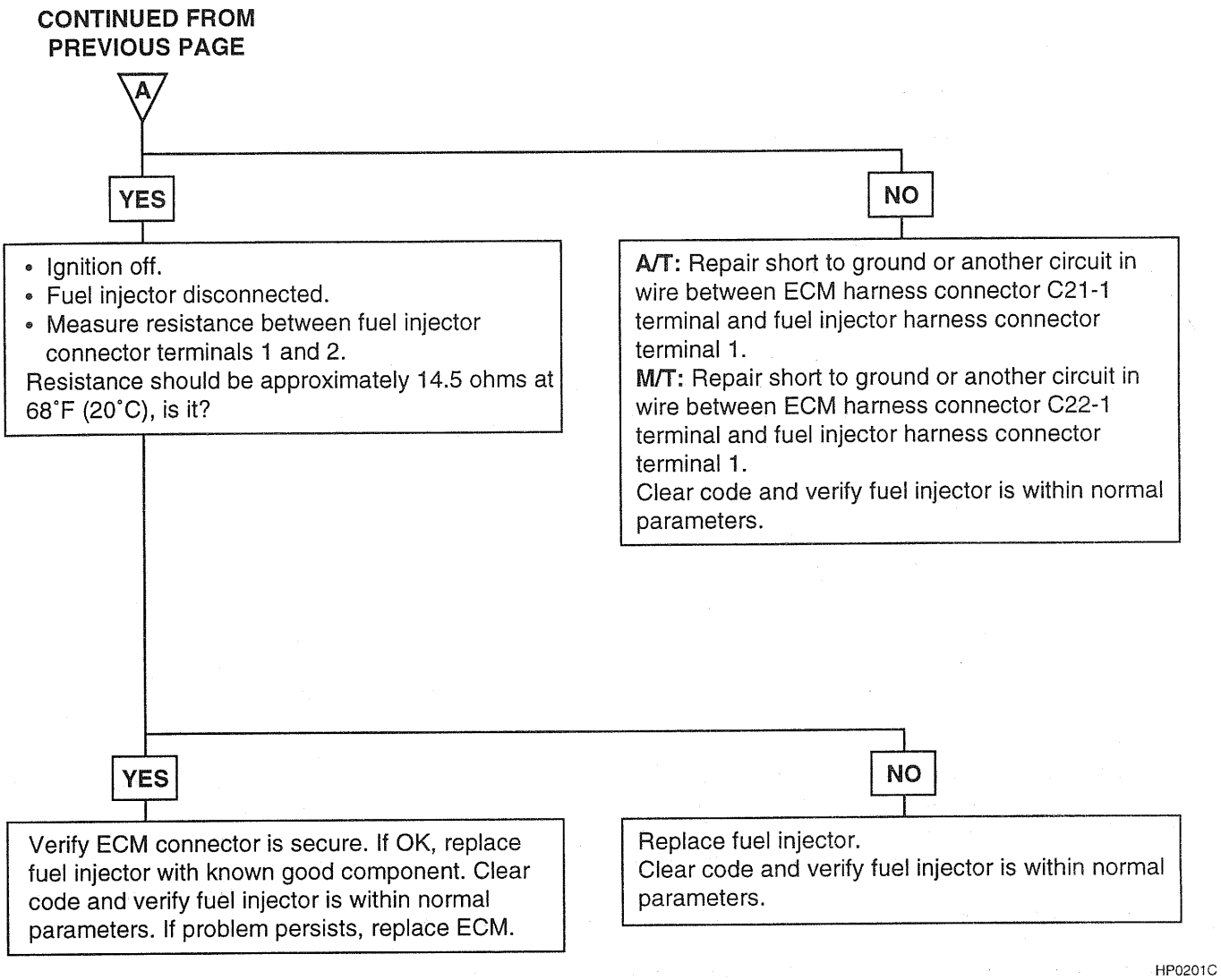
**NO**

Repair open in wire between engine compartment junction block terminal F10 and fuel injector harness connector terminal 2.
Clear code and verify fuel injector is within normal parameters.

**YES**

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared.
Clear code and verify fuel injector is within normal parameters.

HP0201B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A
YES
NO
• Ignition off.
• Fuel injector disconnected.
• Measure resistance between fuel injector connector terminals 1 and 2.
Resistance should be approximately 14.5 ohms at 68°F (20°C), is it?
A/T: Repair short to ground or another circuit in wire between ECM harness connector C21-1 terminal and fuel injector harness connector terminal 1.
M/T: Repair short to ground or another circuit in wire between ECM harness connector C22-1 terminal and fuel injector harness connector terminal 1.
Clear code and verify fuel injector is within normal parameters.
YES
NO
Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.
Replace fuel injector.
Clear code and verify fuel injector is within normal parameters.
HP0201C

EFHA5110

| DTC | Diagnostic item |
|---|---|
| P0300 | Random Misfire Detected |

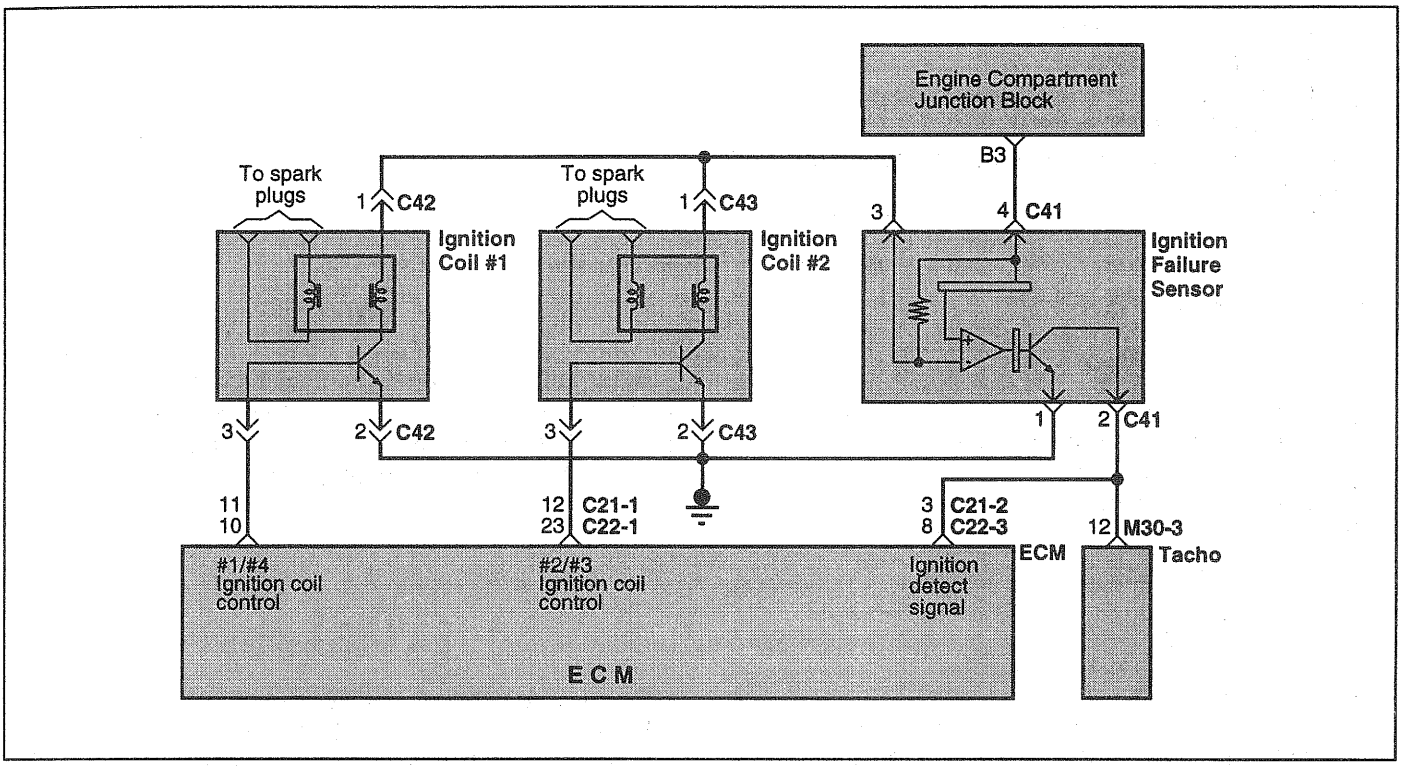
## DESCRIPTION

With the ignition switch ON or START, voltage is applied to the ignition coil. The ignition coil consists of two coils. High tension leads go to each cylinder from the ignition coil. The ignition coil fires two spark plugs every power stroke (the cylinder under compression and the cylinder on the exhaust stroke). Coil number one fires cylinders 1 and 4. Coil number two fires cylinders 2 and 3.
The ignition power transistor, controlled by the Engine Control Module (ECM), provides a switching circuit to ground for energizing the primary ignition coils. When a primary ignition coil is energized and deenergized, the secondary coil produces a high voltage spike across the attached spark plugs. At the same time, the tach interface (part of the ignition power transistor) provides the ECM and Transaxle Control Module (TCM) with an RPM signal.

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• If a misfiring occurs while the engine is running, the engine speed suddenly changes.<br>• The Engine Control Module checks for changes in the engine speed.<br>Check Area<br>• Five seconds or more have passed after the engine was started.<br>• Engine speed is between 500 and 6,000 r/min.<br>• Engine Coolant Temperature is higher than -10°C(14°F).<br>• Intake air temperature is higher than -10°C (14°F).<br>• Running free from sudden accelerations/decelerations such as shift change.<br>Judgment Criteria (change in the angular acceleration of the crankshaft is used for misfire detection.)<br>• Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1,742°F)].<br>• Misfire has occurred more frequently than the allowed number of times (2%) during 1,000 motor revolutions. | • Ignition system related part(s) failed<br>• Poor crankshaft position sensor signal<br>• Incorrect air/fuel ratio<br>• Low compression pressure<br>• Engine coolant temperature sensor failed<br>• Timing belt missing teeth<br>• Injector failed<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0300A

## TEST PROCEDURE

- Check the fuel quality.
- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0300 is set.

Is DTC P0300 the only code set and fuel at least 87 octane?

**YES**

- Ignition on.
- Disconnect ignition coil connector. Measure voltage between ground and ignition coil connector terminal 1.

Battery voltage should be present, is it?

**YES**

- Turn ignition off.
- A/T: Disconnect ECM connector C21-1
- M/T: Disconnect ECM connector C22-1
- A/T: Ground ignition coil harness connector terminals 3. Measure resistance between ground and ECM connector C21-1 terminals 11 and 12.
- M/T: Ground ignition coil harness connector terminal 3. Measure resistance between ground and ECM harness connector C22-1 terminal 10 and 23.

Resistance measured should be approximately 1 ohm or less, is it?

**YES**

- Ignition off.
- Measure resistance of wire between ignition failure sensor harness connector terminal 2 and ignition coil harness connector terminal 1.

Resistance measured should be approximately 1 ohm or less, is it?

A

CONTINUED ON NEXT PAGE

**NO**

Refer to the appropriate section and follow test procedures for the other set codes. Refuel vehicle with 87 or higher octane fuel. Clear codes and verify DTC P0300 is no longer set.

**NO**

Repair wire between engine compartment junction block and ignition coil connector terminal 1. Clear code and verify code does not reappear.

**NO**

**A/T:** Repair open in wire(s) between ignition coil connector terminal 3 and ECM connector C21-1 terminal 11 and 12.
**M/T:** Repair open in wire between ignition coil connector terminal 3 and ECM connector C22-1 connector terminal 10 and 23.
Clear code and verify code does not reappear.

HP0300B

CONTINUED FROM PREVIOUS PAGE

A

YES

- Ignition off.
- Ignition failure sensor
- Measure resistance between ground and ignition failure sensor harness connector terminal 1.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire(s) between ignition failure sensor harness connector terminal 3 and ignition coil connector terminal 2.
Clear code and verify code does not reappear.

YES

- Ignition coil disconnected.
- Reconnect ECM connectors.
- Ignition in start.
- Measure voltage between ground and ignition coil harness connector terminal 3.

Voltage should vary between 5 and 4 volts, does it?

NO

Repair open in wire between engine compartment junction block and ignition coil connector terminal 1. Clear code and verify code does not reappear.

NO

Verify ECM connector is secure. If OK, replace power transistor with known good component.
Clear code and verify code does not reappear.
If problem persists, replace ECM.

YES

- Ignition off.
- Ignition coil connector disconnected.
- Measure resistance across ignition coil connector terminals 1 and 2. Note results for primary coil resistance.
- Measure resistance across ignition coil spark plug wire terminals 1 and 4. Measure resistance across ignition coil spark plug wire terminals 2 and 3. Note results for secondary coil resistance.

Primary coil resistance should be approximately 1.3 ohms. Secondary coil resistances should be between 10.3 kilo ohms and 13.9 kilo ohms.
Are resistances within specification?

B

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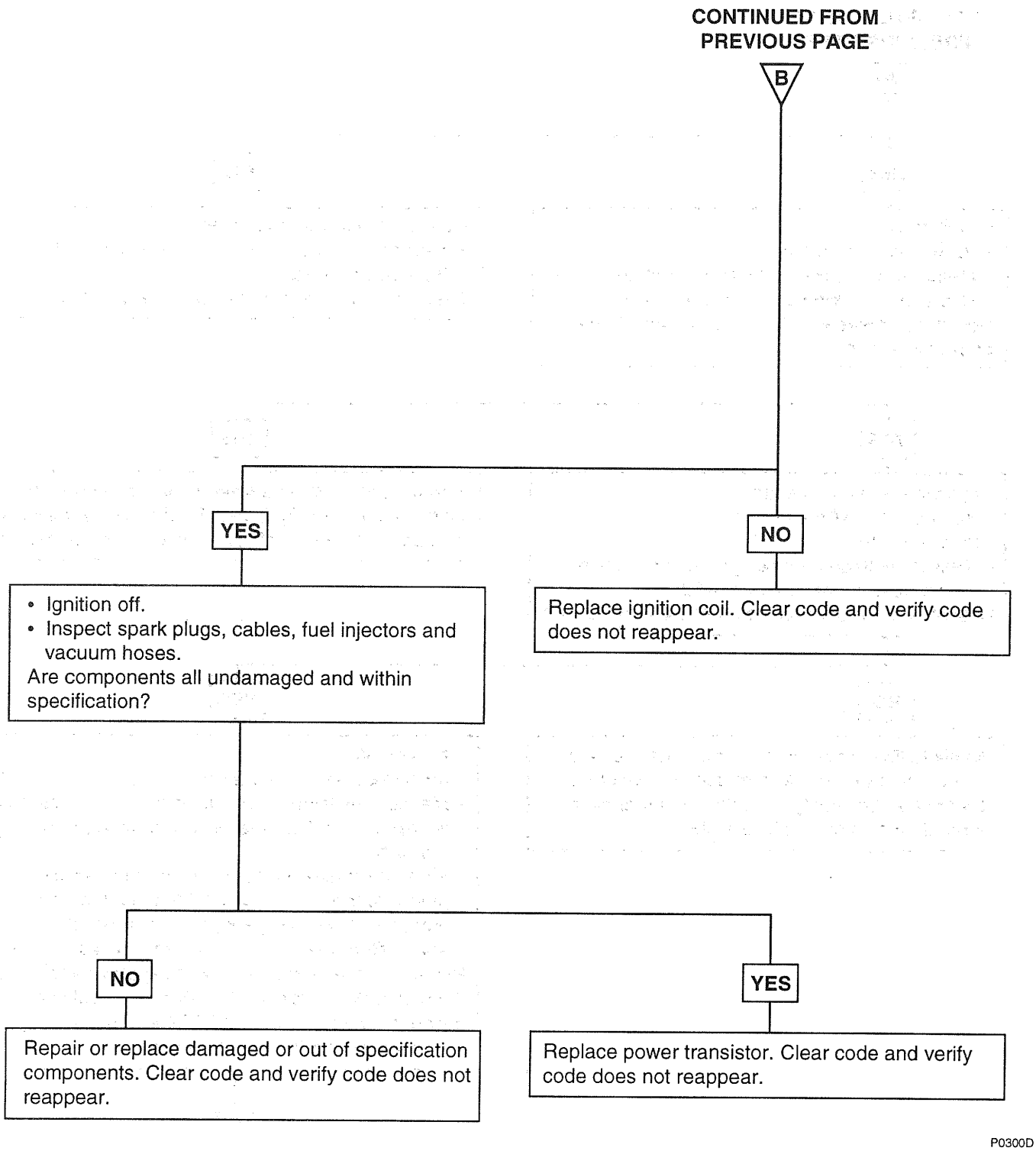
P0300C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B
YES
NO
• Ignition off.
• Inspect spark plugs, cables, fuel injectors and vacuum hoses.
Are components all undamaged and within specification?
Replace ignition coil. Clear code and verify code does not reappear.
NO
YES
Repair or replace damaged or out of specification components. Clear code and verify code does not reappear.
Replace power transistor. Clear code and verify code does not reappear.
P0300D

EFHA5120

| DTC | Diagnostic item |
|---|---|
| P0301, P0302, P0303, P0304, | Misfire detected (Cylinder-1, Cylinder-2, Cylinder-3, Cylinder-4) |

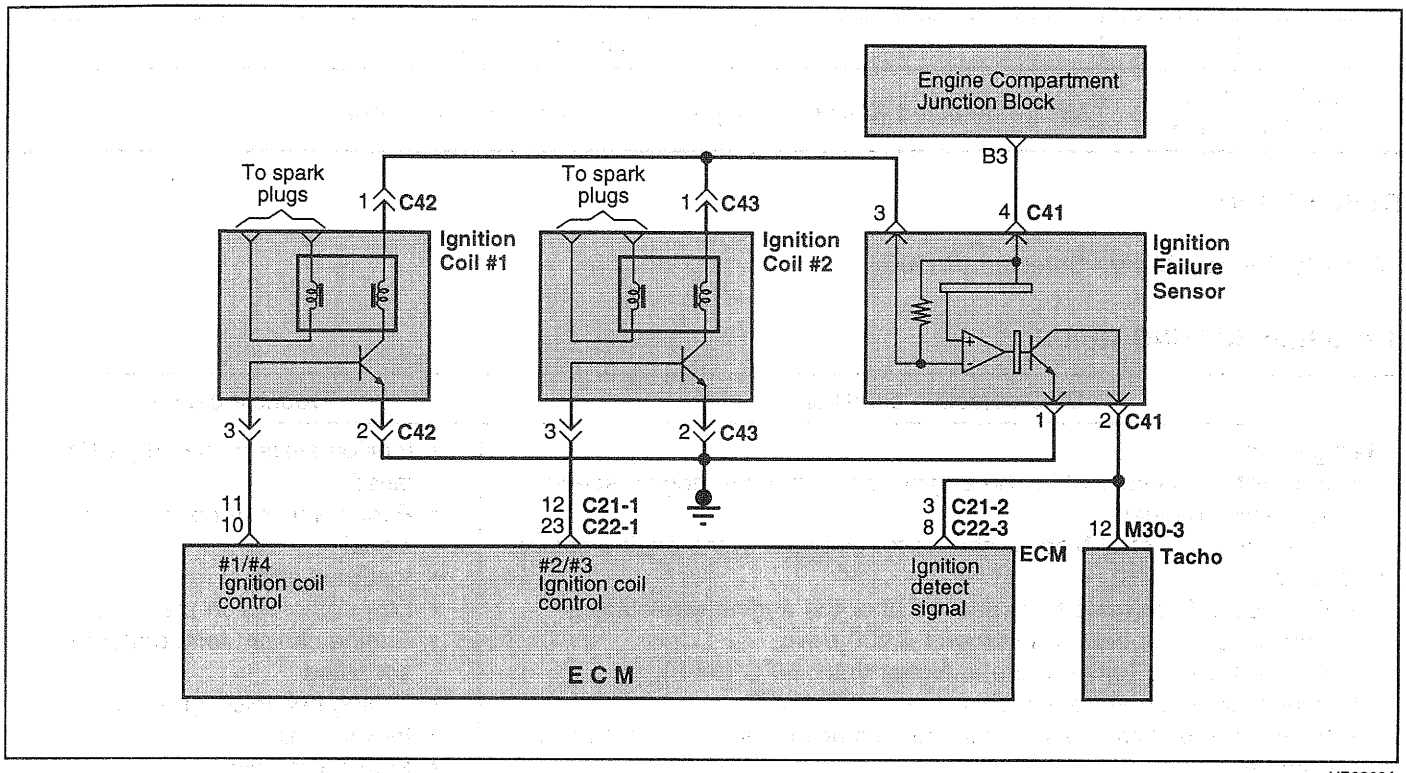
## DESCRIPTION

Refer to Random Misfire Detected (P0300).

## TROUBLESHOOTING GUIDE

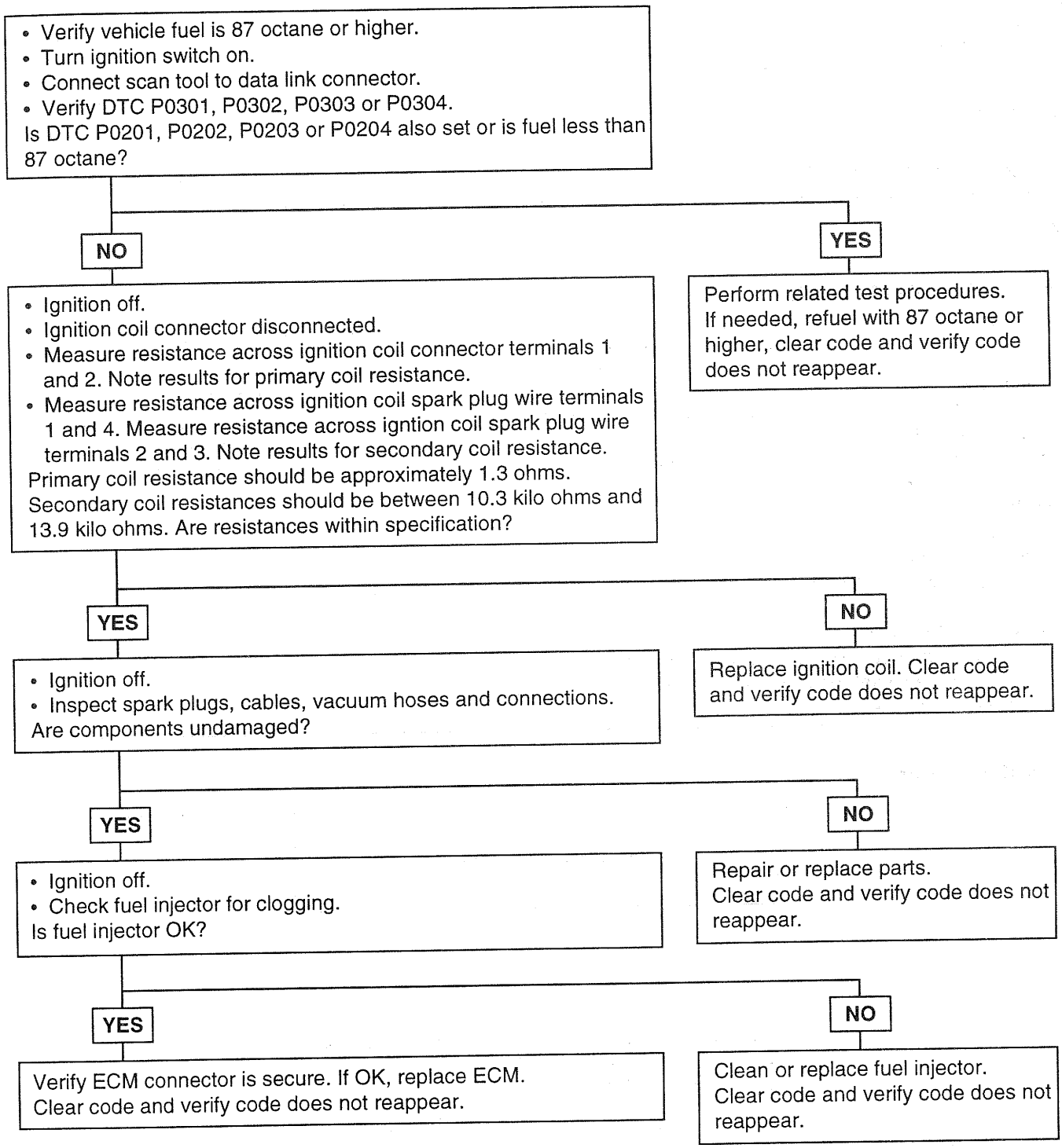
| DTC detection condition | Probable cause |
|---|---|
| Background<br>• If a misfiring occurs while the engine is running, the engine speed suddenly changes.<br>• The Engine Control Module checks for changes in the engine speed.<br>Check Area<br>• Five seconds or more have passed after the engine was started.<br>• Engine speed is between 500 and 6,000 r/min.<br>• Engine Coolant Temperature is higher than -10°C (14°F).<br>• Intake air temperature is higher than -10°C (14°F).<br>• Running free from sudden accelerations/decelerations such as shift change.<br>Judgment Criteria (change in the angular acceleration of the crankshaft is used for misfire detection.)<br>• Misfire has occurred more frequently than allowed for during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1,742°F)].<br>• Misfire has occurred more frequently than the allowed number of times (2%) during 1,000 motor revolutions. | • Ignition system related part(s) failed<br>• Poor crankshaft position sensor signal<br>• Incorrect air/fuel ratio<br>• Low compression pressure<br>• Engine coolant temperature sensor failed<br>• Timing belt missing teeth<br>• Injector failed<br>• EGR valve failed<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0300A

## TEST PROCEDURE




P0301B

EFHA5130

| DTC | Diagnostic item |
|---|---|
| P0335 | Crankshaft Position Sensor Circuit Malfunction |

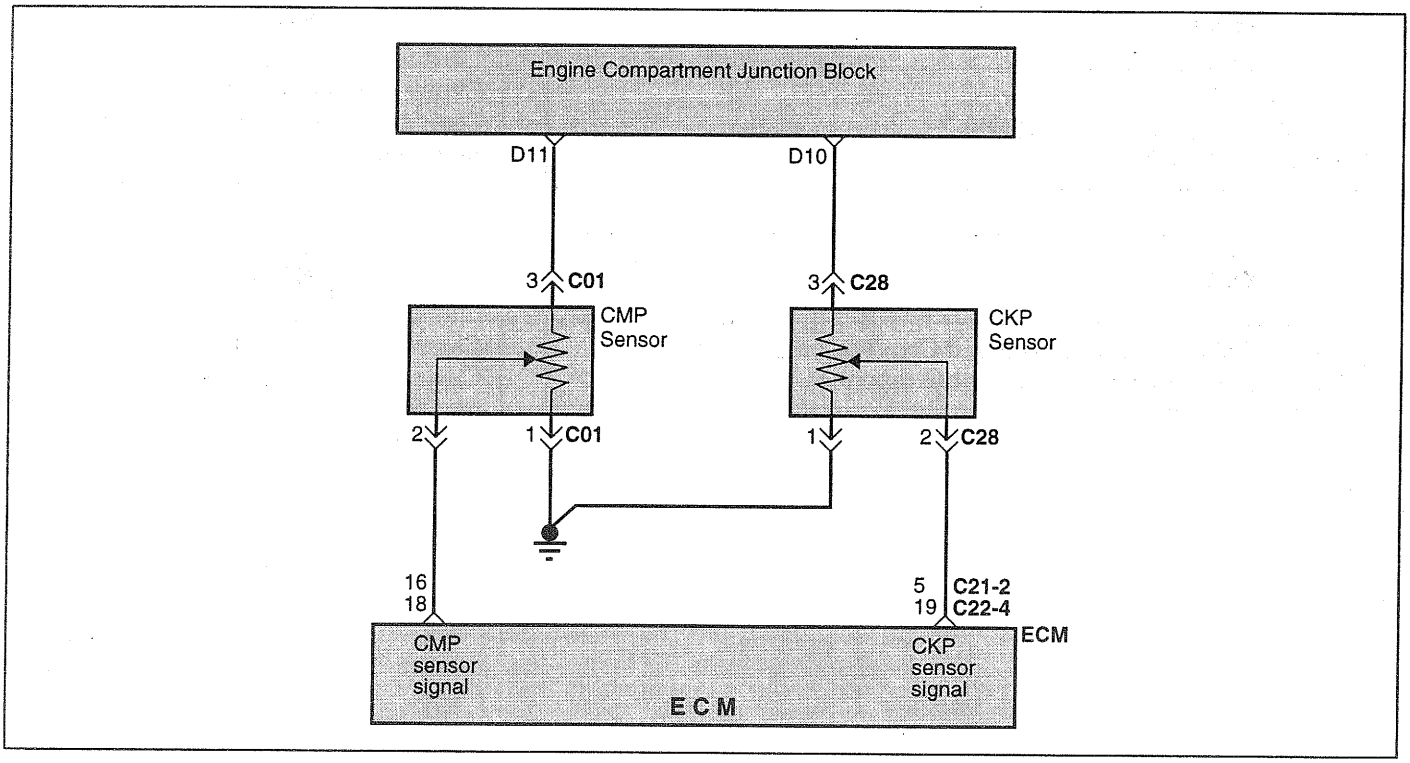
## DESCRIPTION

The Crankshaft Position (CKP) sensor consists of a magnet and coil located next to the flywheel. The voltage signal from the CKP sensor allows the Engine Control Module (ECM) to determine the engine of the RPM and Crankshaft Position.

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• When the engine is running, the Crankshaft Position sensor outputs a pulse signal.<br>• The Engine Control Module checks whether the pulse signal is input while the engine is cranking.<br>Check Area<br>• Engine is being cranked.<br>Judgment Criteria<br>• Sensor output voltage has not changed (no pulse signal is input) for 4 sec.<br>Check Area, Judgment<br>• Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 4 sec. | • Crankshaft position sensor failed<br>• Open or shorted crankshaft position sensor circuit<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0335A

## TEST PROCEDURE

- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0335 is set.

- Ignition on.
- Disconnect Crankshaft Position (CKP) sensor.
- Measure voltage between ground and CKP sensor harness connector terminal 3.

Battery voltage should be measured, is it?

**YES**

- Ignition off.
- CKP sensor disconnected.
- A/T: Disconnect ECM connector C21-2.
- M/T: Disconnect ECM connector C22-4.
- A/T: Ground CKP sensor harness connector terminal 2. Measure resistance between ground and ECM harness connector C21-2 terminal 5.
- M/T: Ground CKP sensor harness connector terminal 2. Measure resistance between ground and ECM harness connector C22-4 terminal 19.

Resistance measured should be approximately 1 ohm or less, is it?

**YES**

- Ignition off.
- CKP sensor disconnected.
- A/T: Disconnect ECM connector C21-2. Measure resistance between ground and CKP sensor harness connector terminal 2.
- M/T: Disconnect ECM connector C22-4. Measure resistance between ground and CKP sensor harness connector terminal 2.

Resistance should indicate an open circuit, does it?

**YES**

A

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**NO**

Repair open in wire between CKP sensor harness connector terminal 3 and engine compartment junction block terminal D10.
Clear code and verify CKP sensor is within normal parameters.

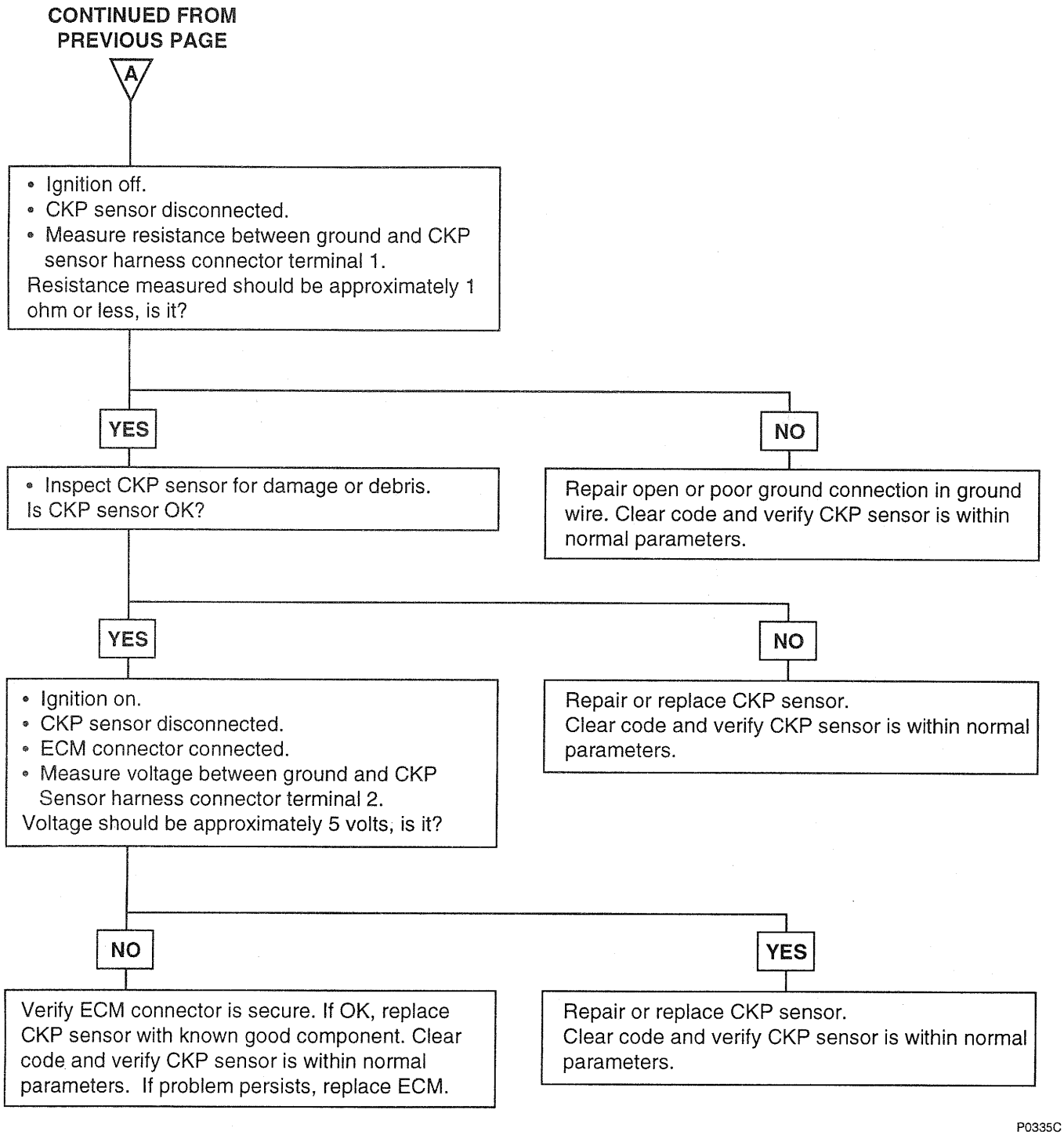
**NO**

**A/T:** Repair open in wire between CKP sensor harness connector terminal 2 and ECM harness connector C21-2 terminal 5.
**M/T:** Repair open in wire between CKP sensor harness connector terminal 2 and ECM harness connector C22-4 terminal 19.
Clear code and verify CKP sensor is within normal parameters.

**NO**

**A/T:** Repair short to ground or another circuit in wire between CKP sensor harness connector terminal 2 and ECM harness connector C21-2 terminal 5.
**M/T:** Repair short to ground or another circuit in wire between CKP sensor harness connector terminal 2 and ECM harness connector C22-4 terminal 19.
Clear code and verify CKP sensor is within normal parameters.

HP0335B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A
• Ignition off.
• CKP sensor disconnected.
• Measure resistance between ground and CKP sensor harness connector terminal 1.
Resistance measured should be approximately 1 ohm or less, is it?
YES
NO
• Inspect CKP sensor for damage or debris.
Is CKP sensor OK?
Repair open or poor ground connection in ground wire. Clear code and verify CKP sensor is within normal parameters.
YES
NO
• Ignition on.
• CKP sensor disconnected.
• ECM connector connected.
• Measure voltage between ground and CKP Sensor harness connector terminal 2.
Voltage should be approximately 5 volts, is it?
Repair or replace CKP sensor.
Clear code and verify CKP sensor is within normal parameters.
NO
YES
Verify ECM connector is secure. If OK, replace CKP sensor with known good component. Clear code and verify CKP sensor is within normal parameters. If problem persists, replace ECM.
Repair or replace CKP sensor.
Clear code and verify CKP sensor is within normal parameters.
P0335C

EFHA5140

| DTC | Diagnostic item |
|---|---|
| P0340 | Camshaft Position Sensor Circuit Malfunction |

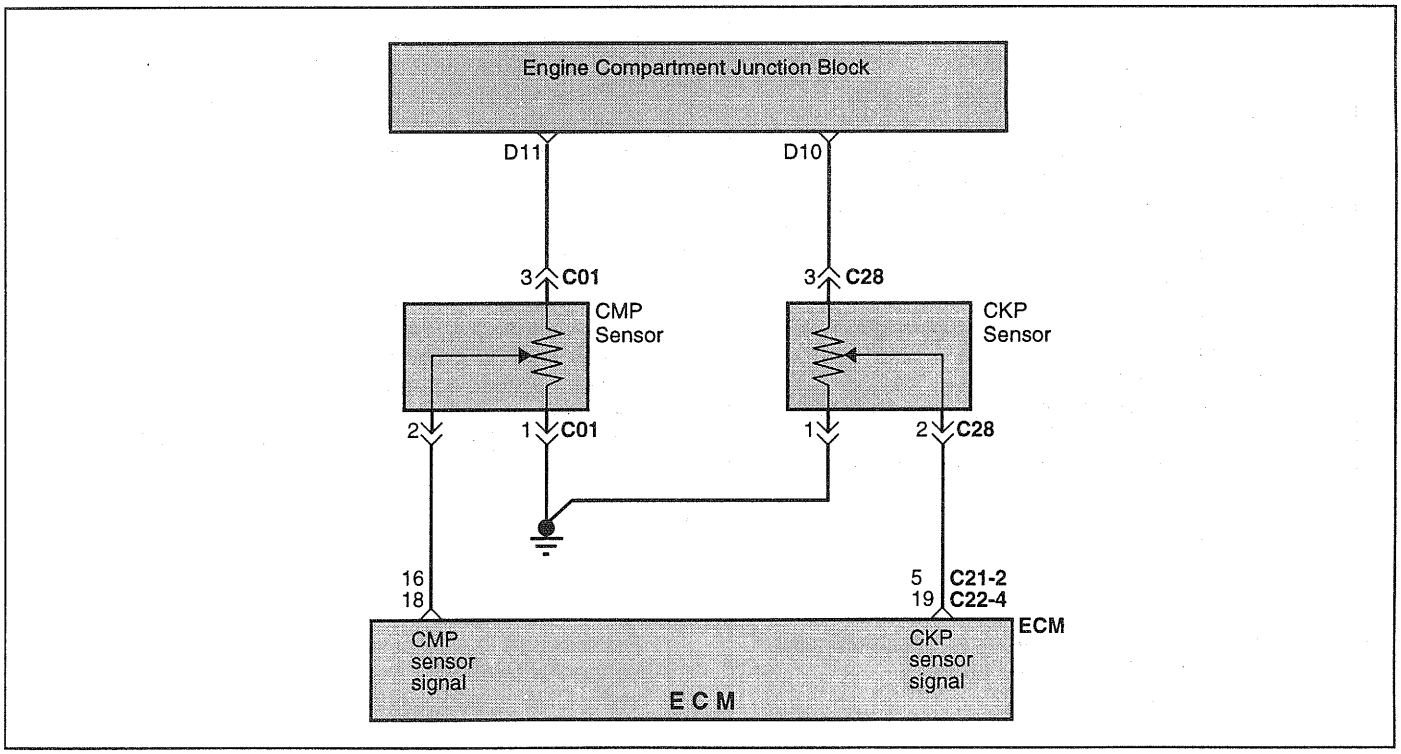
## DESCRIPTION

The Camshaft Position (CMP) sensor senses the Top Dead Center (TDC) point of the #1 cylinder in the compression stroke. The CMP sensor signal allows the ECM to determine the fuel injector sequence starting point.

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• When the engine is running, the Camshaft Position sensor outputs a pulse signal.<br>• The Engine Control Module checks whether the pulse signal is input.<br>Check Area, Judgement Criteria<br>• Sensor output voltage has not changed (no pulse signal is input) for 4 sec.<br>Check Area, Judgement Criteria<br>• Normal signal pattern has not been input for cylinder identification from the camshaft position sensor signal for 4 sec. | • Camshaft Position sensor malfunction<br>• Open or shorted camshaft position sensor circuit or loose connector<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0335A

## TEST PROCEDURE

- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0340 is set.

- Ignition on.
- Disconnect Camshaft Position (CMP) sensor.
- Measure voltage between ground and CMP sensor harness connector terminal 3.

Battery voltage should be measured, is it?

**YES**

- Ignition off.
- CMP sensor disconnected.
- A/T: Disconnect ECM connector C21-2.
- M/T: Disconnect ECM connector C22-4.
- Ground CMP sensor harness connector terminal 2.
- Measure resistance between ground and ECM harness connector terminal 8 (for A/T) or 18 (for M/T).

Resistance measured should be approximately 1 ohm or less, is it?

**YES**

- Ignition off.
- CMP sensor disconnected.
- A/T: Disconnect ECM connector C21-2.
- M/T: Disconnect ECM connector C22-4.
- Measure resistance between ground and CMP sensor harness connector terminal 2.

Resistance should indicate an open circuit, does it?

**YES**

- Ignition off.
- CMP sensor disconnected.
- Measure resistance between ground and CMP sensor harness connector terminal 1.

Resistance measured should be approximately 1 ohm or less, is it?

**YES**

- Inspect CMP sensor for debris or misadjustment. Also verify timing is adjusted properly.

Is CMP sensor and timing OK?

**YES**

Verify ECM connector is secure. If OK, replace ECM. Clear code and verify CMP sensor signal is within normal parameters.

**NO**

Repair or replace CMP sensor as needed. Clear code and verify CMP sensor signal is within normal parameters.

**NO**

Repair open in wire between CMP sensor harness connector terminal 1 and ground. Clear code and verify CMP sensor signal is within normal parameters.

**NO**

Repair short to ground in wire between CMP sensor harness connector terminal 2 and ECM harness connector terminal. Clear code and verify CMP sensor signal is within normal parameters.

**NO**

Repair open in wire between CMP sensor harness connector terminal 2 and ECM harness connector terminal. Clear code and verify CMP sensor signal is within normal parameters.

**NO**

Repair open in wire between CMP sensor harness connector terminal 3 and engine compartment junction block terminal D11.
Clear code and verify CMP sensor signal is within normal parameters.

HP0340B

EFHA5170

| DTC | Diagnostic item |
|---|---|
| P0421 | Warm Up Catalyst Efficiency Below Threshold (Bank 1) |

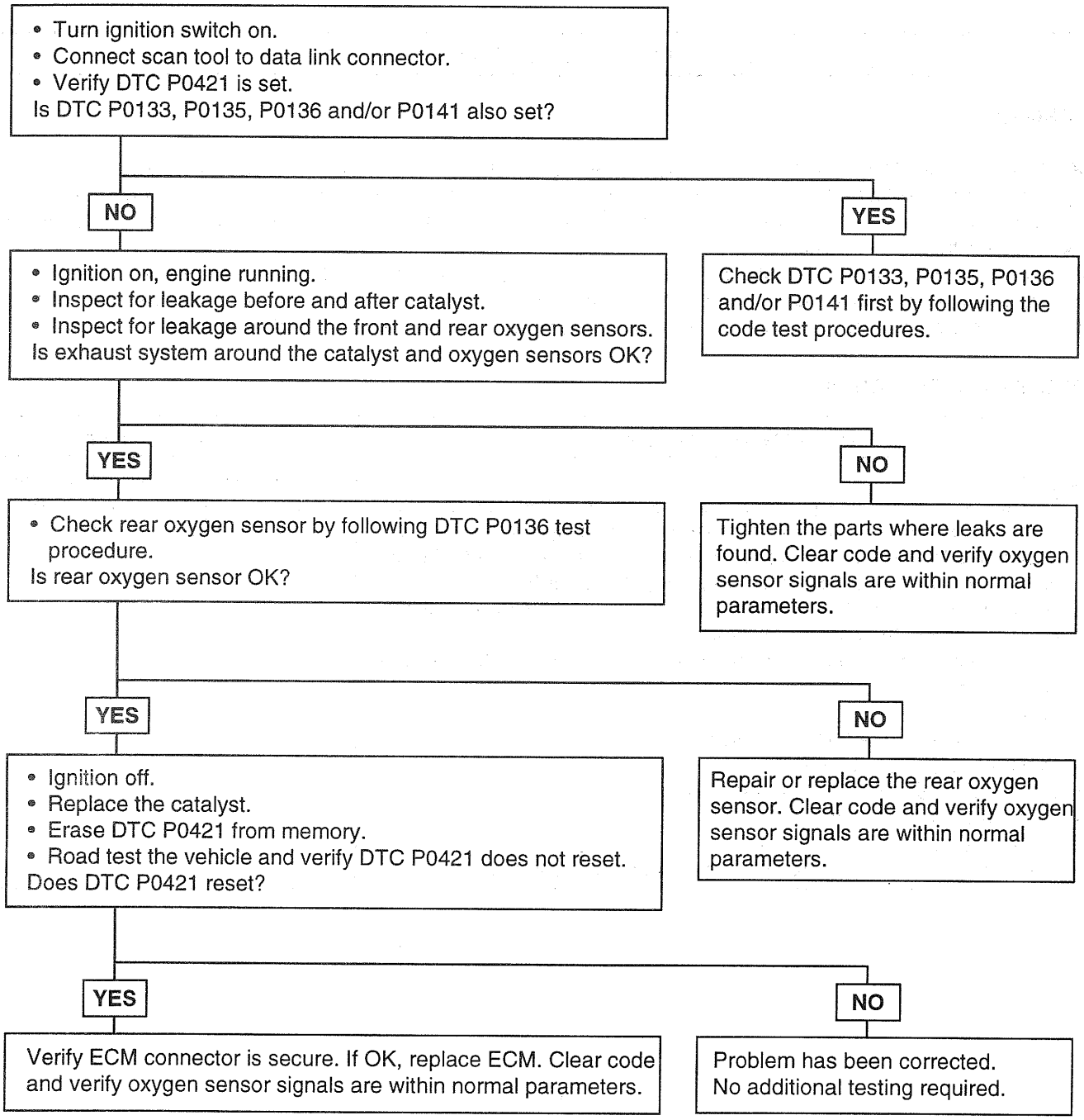
## DESCRIPTION

The ECM compares the waveform of the oxygen sensor located in front of the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteriorated. Air-fuel ratio feedback compensation keeps the waveform of the oxygen sensor in front of the catalyst repeatedly changing back and forth from rich to lean.
If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor in front of the catalyst. But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The signal from the heated oxygen sensor which follows the catalytic converter differs from that which precedes the catalytic converter. This is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the heated oxygen sensor which follows the catalytic converter becomes similar to that which precedes the catalytic converter.<br>• The Engine Control Module checks the outputs of the heated oxygen sensor signals.<br>Check Area<br>• Engine speed is 3,000 r/min or higher.<br>• Closed throttle position switch: OFF<br>• Under the closed loop air-fuel ratio control<br>• Monitoring Time: 140 sec.<br>Judgment Criteria<br>• The front or rear heated oxygen sensor signal is abnormal. | • Catalytic converter deteriorated<br>• Heated oxygen sensor failed<br>• Engine control module failed |

## TEST PROCEDURE




HP0421B

EFHA5190

| DTC | Diagnostic item |
|---|---|
| P0443 | Evaporative Emission Control System Purge Control Valve Circuit Malfunction |

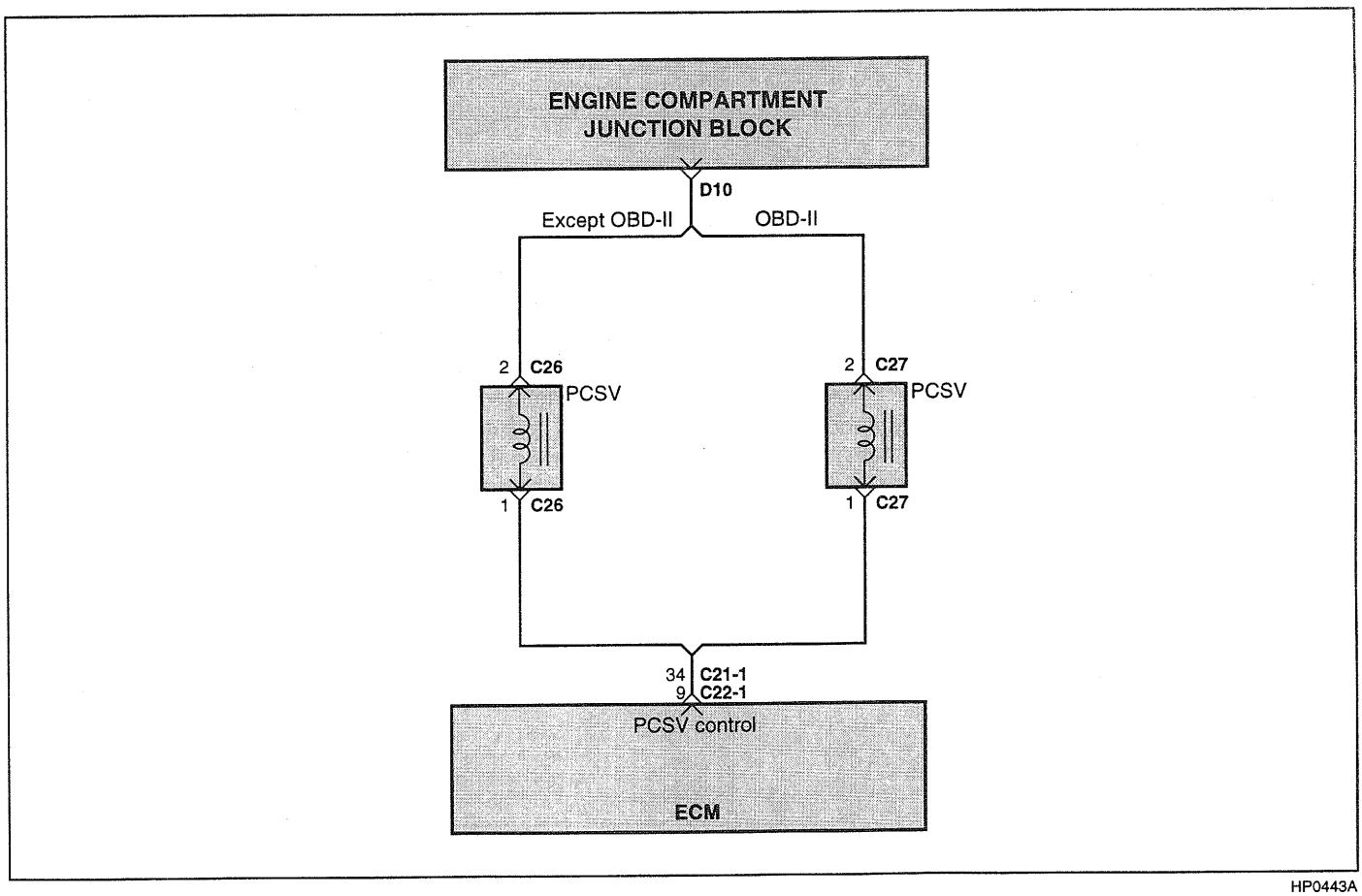
## DESCRIPTION

The evaporative system reduces hydrocarbon emission by trapping fuel tank vapors until they can be burned as part of the incoming fuel charge. Evaporating fuel is stored in a charcoal canister until it can be flushed into the intake manifold.

## TROUBLESHOOTING GUIDE

| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The engine control module checks current flows in the evaporative emission purge solenoid drive circuit when the solenoid is ON and OFF.<br>Check Area<br>• Battery voltage is 10V or higher.<br>Judgment Criteria<br>• Solenoid coil surge voltage (system voltage +2V) is not detected when the EVAP emission vent solenoid is turned on/off. | • Evaporative emission purge solenoid failed<br>• Open or shorted evaporative emission purge solenoid circuit, or loose connector<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0443A

## TEST PROCEDURE

- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0443 is set.

- Turn ignition off
- Disconnect PCSV(Purge Control Solenoid Valve) connector.
- Turn ignition on.
- Measure voltage between ground and PCSV harness connector terminal 2.

Battery voltage should be present, is it?

**YES**

- Turn ignition off.
- PCSV disconnected.
- A/T: Disconnect ECM connector C21-1. Ground PCSV harness connector terminal 1.
- Measure resistance between ground and ECM harness connector C21-1 terminal 34.
- M/T: Disconnect ECM connector C22-1. Ground PCSV harness connector terminal 1.
  Measure resistance between ground and ECM harness connector C22-1 terminal 9.

Resistance measured should be approximately 1 ohm or less, is it?

**YES**

- Ignition off.
- ECM disconnected.
- EGR solenoid valve disconnected.
- Measure resistance between ground and EGR control solenoid valve harness connector terminal 1.

Resistance should indicate an open circuit, does it?

A

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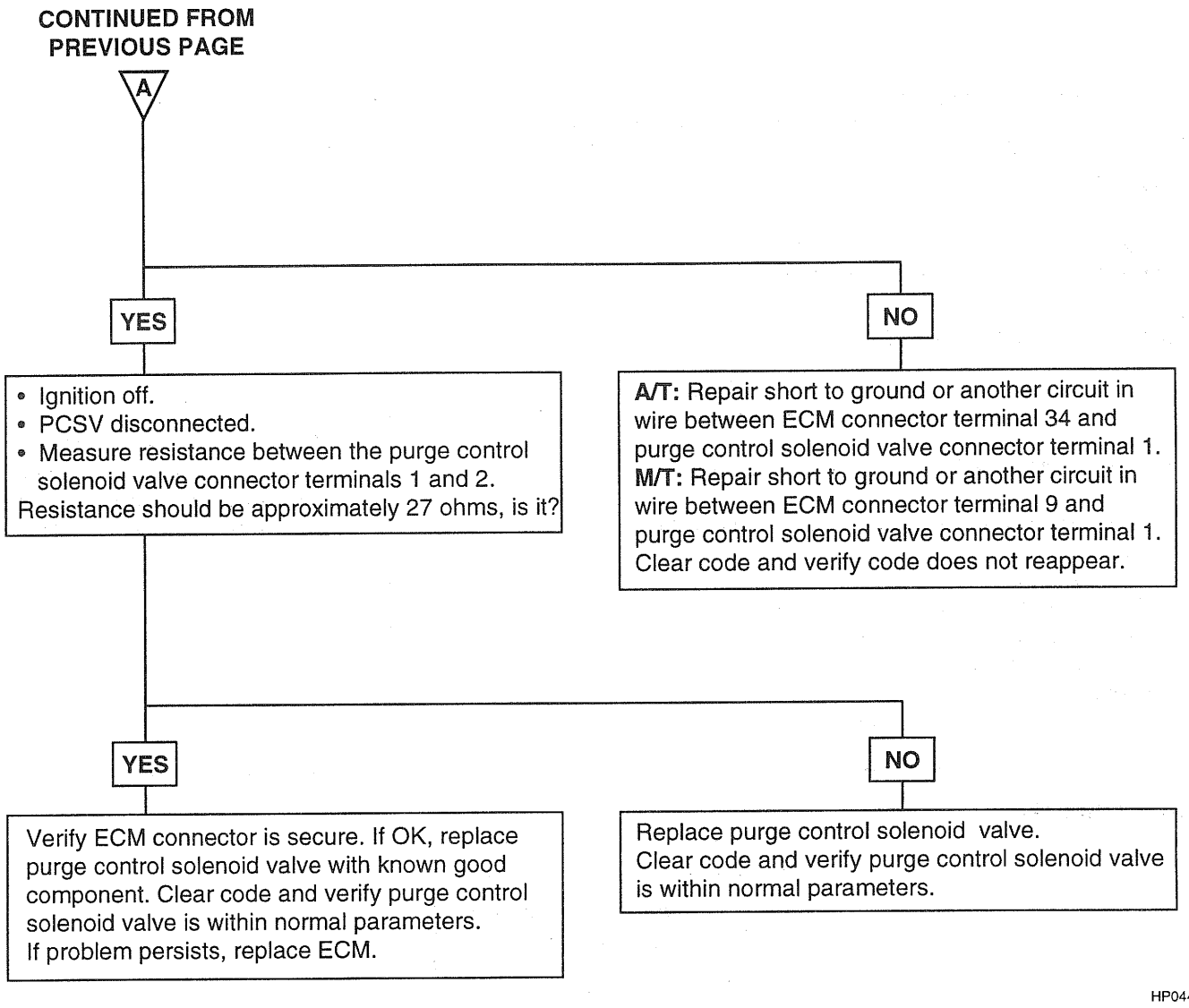
**NO**

Repair open or short to ground in wire between engine compartment junction block terminal D10 and PCSV connector terminal 2.
Clear codes and verify PCSV is within normal parameters.

**NO**

**A/T:** Repair open in wire between ECM connector C21-1 terminal 34 and PCSV harness connector terminal 1.
**M/T:** Repair open in wire between ECM connector C22-1 terminal 9 and PCSV harness connector terminal 1.
Clear codes and verify PCSV is within normal parameters.

HP0443B


CONTINUED FROM PREVIOUS PAGE
A
YES
NO
• Ignition off.
• PCSV disconnected.
• Measure resistance between the purge control solenoid valve connector terminals 1 and 2.
Resistance should be approximately 27 ohms, is it?
A/T: Repair short to ground or another circuit in wire between ECM connector terminal 34 and purge control solenoid valve connector terminal 1.
M/T: Repair short to ground or another circuit in wire between ECM connector terminal 9 and purge control solenoid valve connector terminal 1.
Clear code and verify code does not reappear.
YES
NO
Verify ECM connector is secure. If OK, replace purge control solenoid valve with known good component. Clear code and verify purge control solenoid valve is within normal parameters.
If problem persists, replace ECM.
Replace purge control solenoid valve.
Clear code and verify purge control solenoid valve is within normal parameters.
HP0443C

EFHA5220

| DTC | Diagnostic item |
|---|---|
| P0500 | Vehicle Speed Sensor Malfunction |

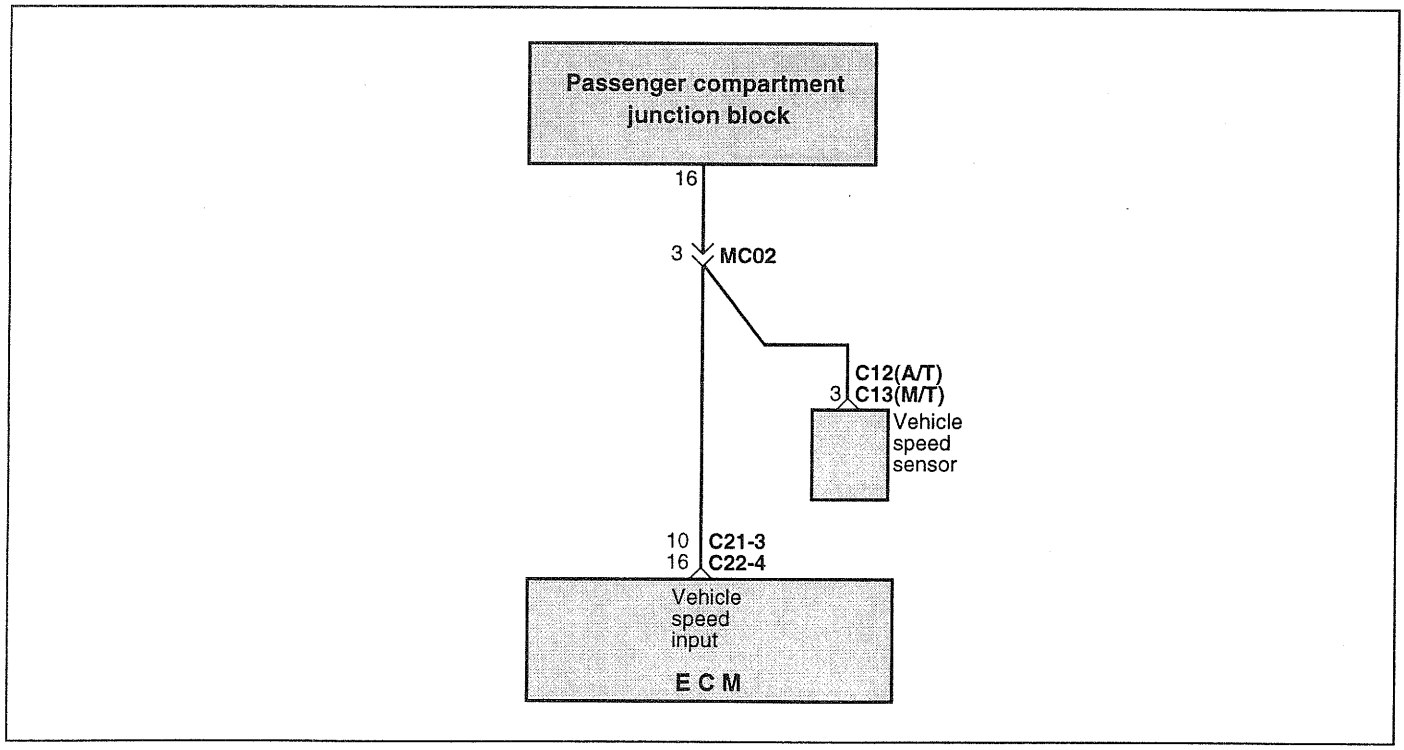
## DESCRIPTION

The vehicle speed sensor outputs a pulse signal while the vehicle is driven.
The engine control module checks whether the pulse signal is output.

## TROUBLESHOOTING GUIDE

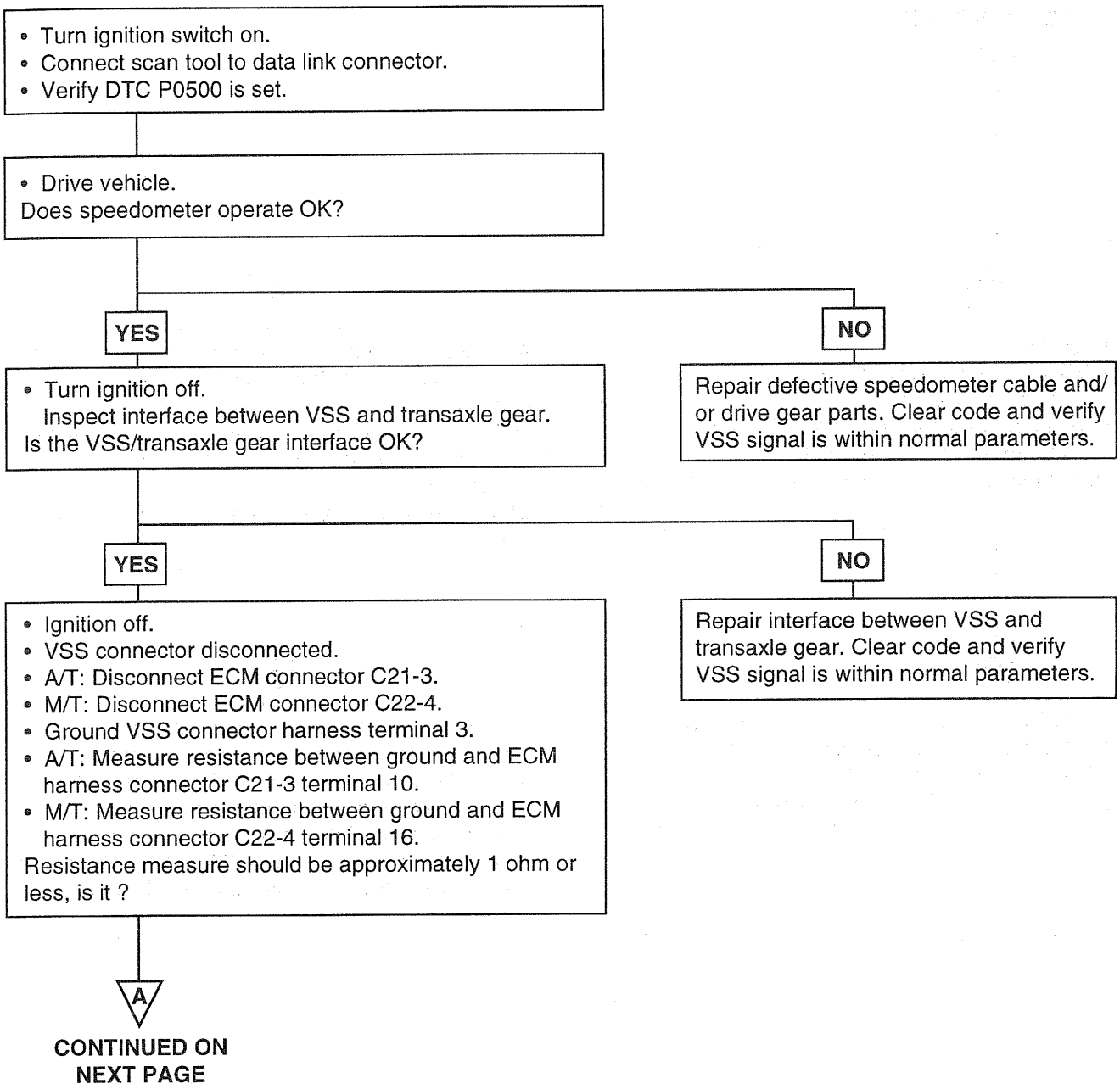
| DTC detection condition | Probable cause |
|---|---|
| Background<br>• The vehicle speed sensor outputs a pulse signal while the vehicle is driven.<br>• The engine control module checks whether the pulse signal is outputted.<br>Check Area<br>• Closed throttle position switch: OFF<br>• Engine speed is 3,000 r/min or more.<br>• Engine load is 70% or more.<br>Judgment Criteria<br>• Sensor output voltage has not changed (no pulse signal is input) for 4 sec. | • Vehicle speed sensor failed<br>• Open or shorted vehicle-speed sensor circuit, or loose connector<br>• Engine control module failed |

## CIRCUIT DIAGRAM




HP0500A

## TEST PROCEDURE




HP0500B

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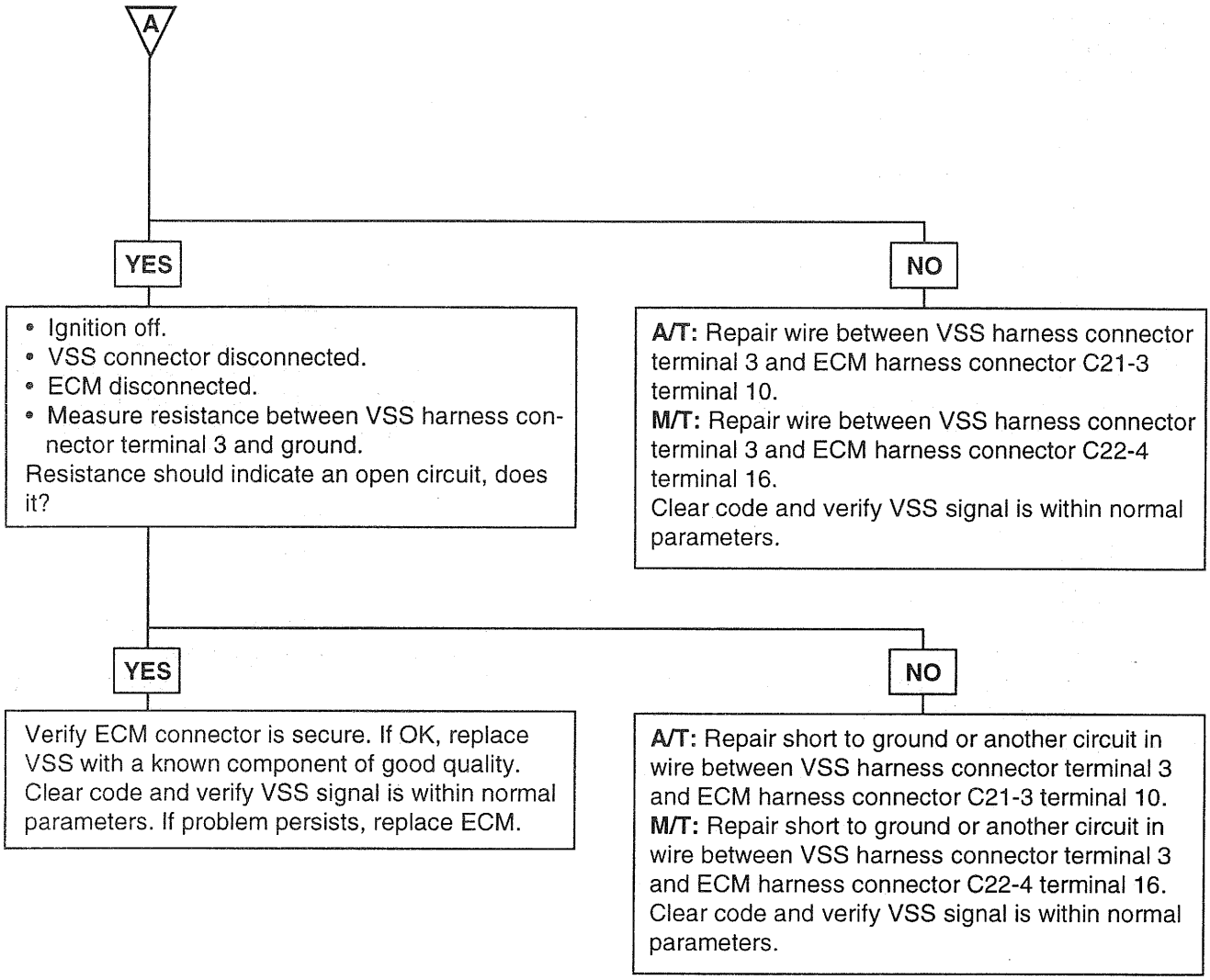


HP0500C