Fuel System

GENERAL

EFJB0010

GENERAL SPECIFICATIONS

Items				Specifications
Throttle body	Throttle position sensor (TPS)	Type		Variable resistor
		Resistance at curb idle	2.4 I4	3.5 ~ 6.5 KΩ
			2.7 V6	1.6 ~ 2.4 KΩ
		Output voltage at curb idle	2.4 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	2.4 I4	Hot Film sensor
			2.7 V6	Hot Film sensor
	Intake air temperature (IAT) sensor	Type	2.4 I4 & 2.7 V6	Thermistor
		Resistance		2.33 ~ 2.97 KΩ at 20°C (68°F)
	Engine coolant temperature (ECT) sensor	Type		Thermistor
		Resistance		2.5 KΩ at 20°C (68°F)
				0.3 KΩ at 80°C (176°F)
	Heated oxygen sensor (HO2S)	Type	2.4 I4	Zirconium
			2.7 V6	Titanium
	Vehicle speed sensor	Type		Hall effect
	Camshaft position (CMP) sensor	Type		Hall effect
	Crankshaft position (CKP) sensor	Type		Hall effect
Actuators	Injectors	Type, number	2.4 I4	Electromagnetic type, 4
			2.7 V6	Electromagnetic type, 6
		Resistance		13 ~ 16Ω at 20°C (68°F)
	Evaporative emission purge control solenoid valve	Type		Duty cycle type
Fuel pressure regulator	Pressure regulator			300 ± 1.5 kPa (3.35 ± 0.06 kg/cm^2)
Fuel tank	Tank capacity Return system			65 lit (14.3 Imp.gal) 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

EFJB0030

Items			Standard value
Basic ignition timing	2.4 I4		BTDC 7° ± 5° at curb idle
	2.7 V6		BTDC 12° ± 5° at curb idle
Curb idle speed (rpm)	2.4 I4	D-range (A/T)	700 ± 100
		P,N-range (A/T, M/T)	800 ± 100 (A/C OFF)
			800 ± 100 (A/C ON)
	2.7 V6	D-range (A/T)	820 ± 100
		P,N-range (A/T, M/T)	700 ± 100 (A/C OFF)
			870 ± 100 (A/C 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 control solenoid valve resistance			20-32Ω

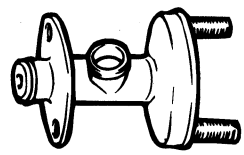
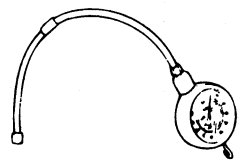
TIGHTENING TORQUE

EFJB0040

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 pipe	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
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 Fuel pressure gauge adapter	 EFA9005A	Connection of fuel pressure gauge to delivery pipe for measurement of fuel pressure.
09353-24100 Fuel pressure gauge & hose	 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										
Park/Neutral 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 rings			8		9						9			
Ignition timing					10						11	14		
Timing mark			9								12			
Injectors			10		13	8	8		7	4	13	15	4	
PCM			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 pedal 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

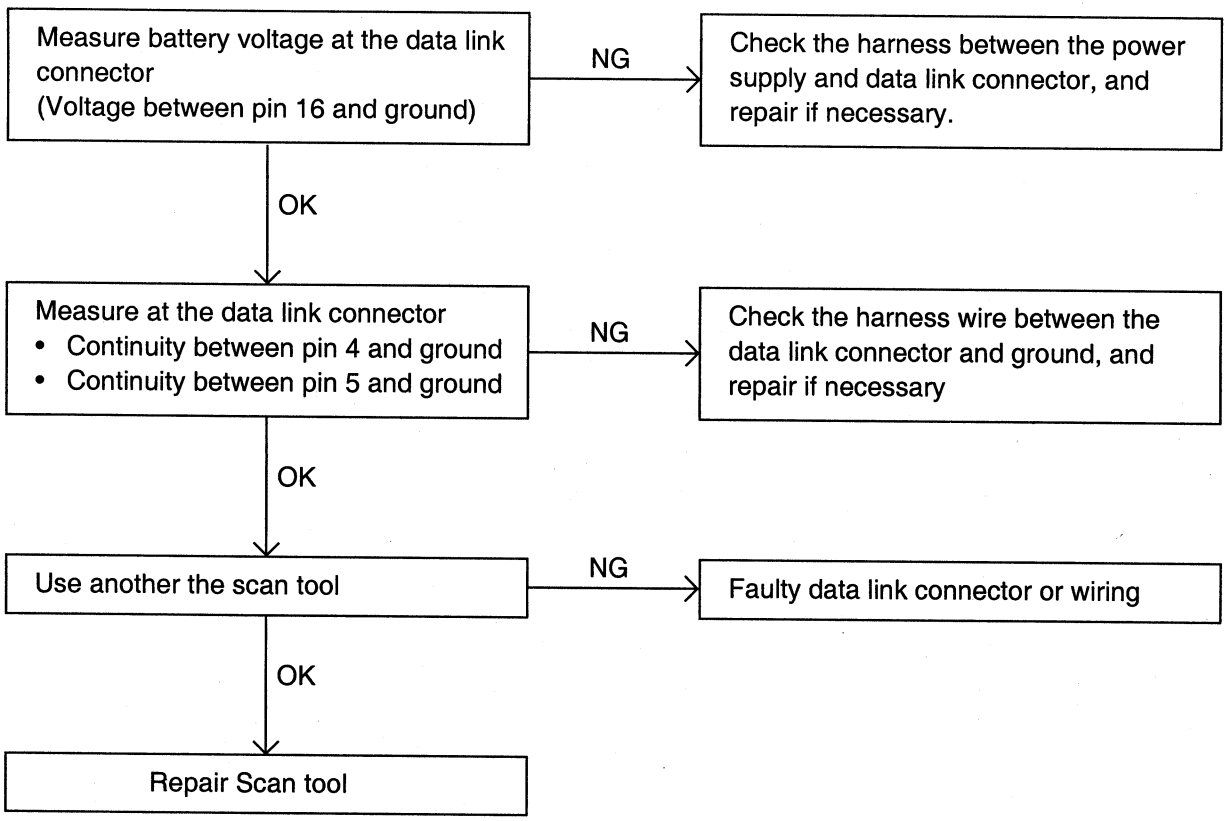
NOTE

The number herein means the check order.

MFI TROUBLESHOOTING PROCEDURES EFA90080

PROBLEM

Communication with scan tool is not possible.
(Cannot communicate with any system)

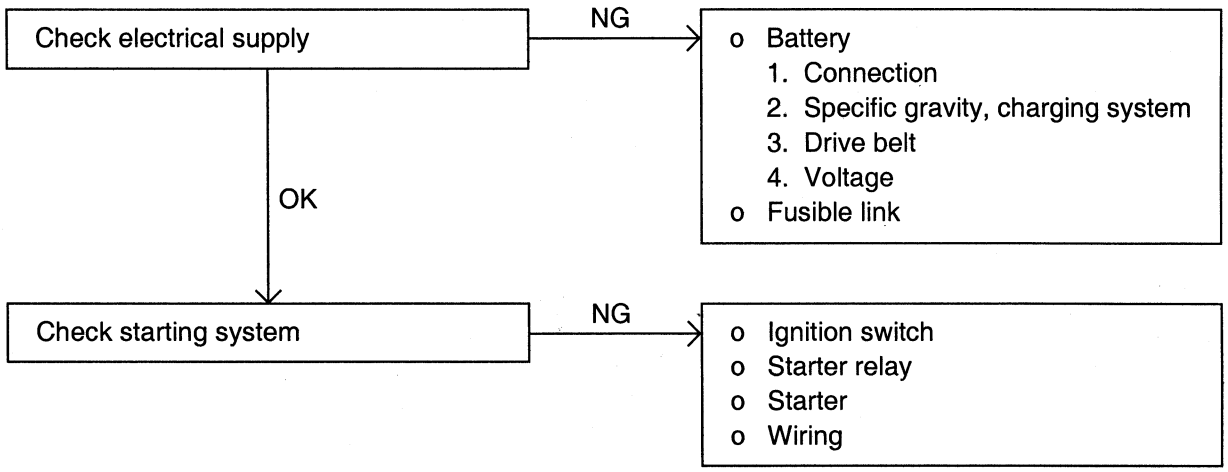


EFA9008A

SCAN TOOL COMMUNICATION WITH PCM IS NOT POSSIBLE EFA90090

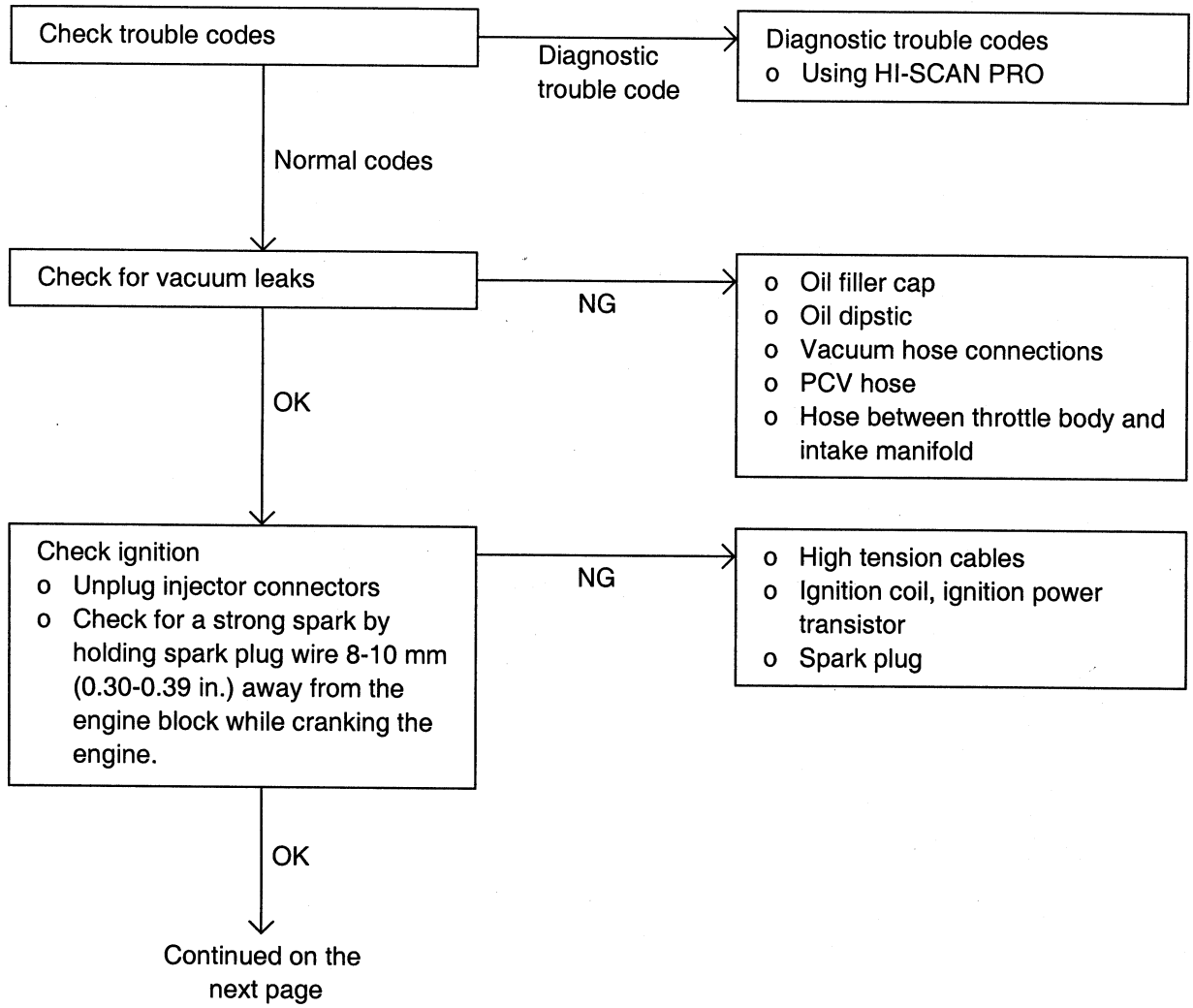
Comment	Probable cause
One of the following causes may be suspected • No power supply to PCM • Defective ground circuit of PCM • Defective PCM • Improper communication line between PCM and scan tool	• Malfunction of PCM power supply circuit. • Malfunction of the PCM. • Open circuit between PCM and DLC.

ENGINE WILL NOT START EFA90100

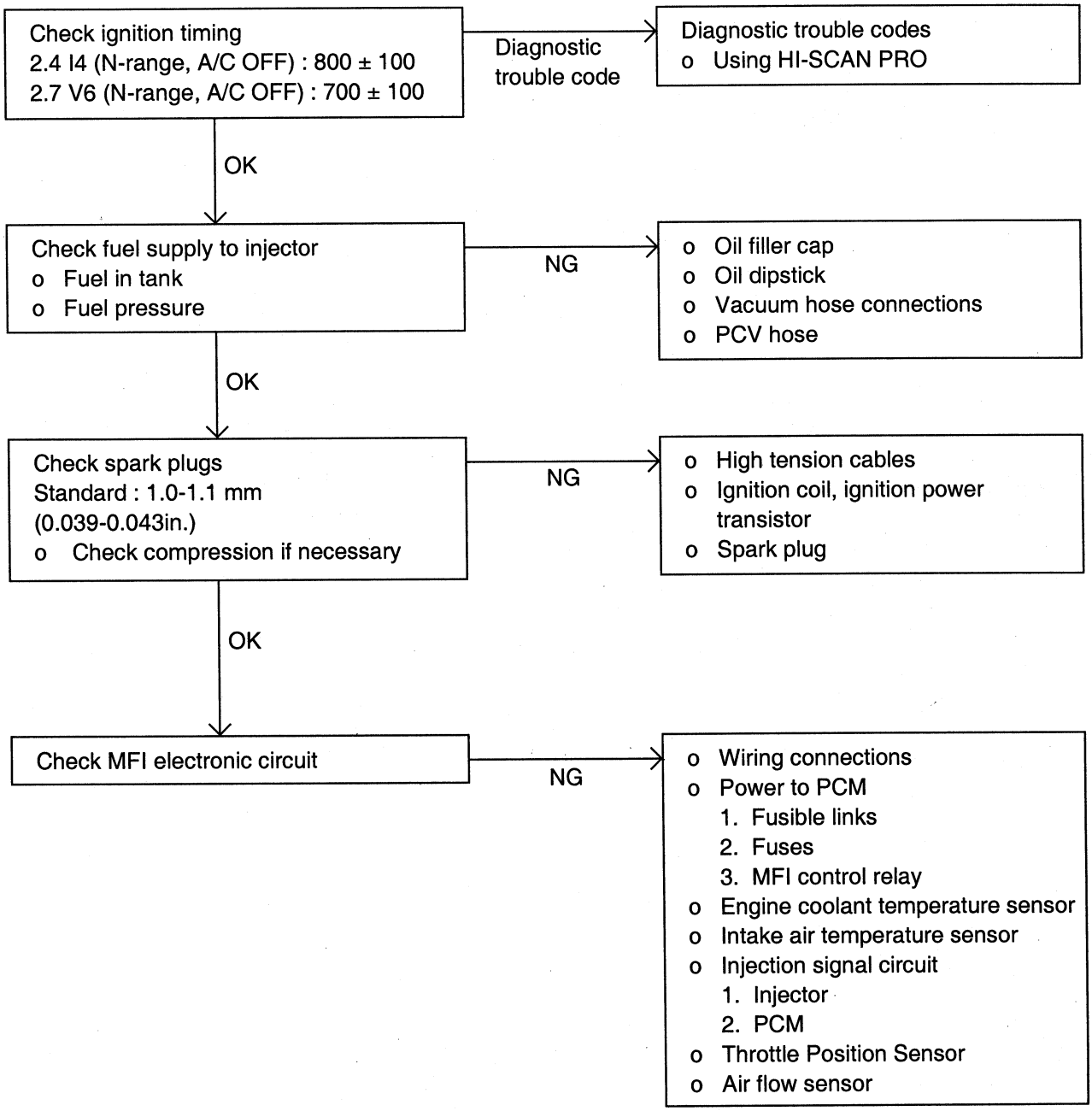


EFA9010A

DIFFICULT TO START (ENGINE CRANKS) EFJB0110

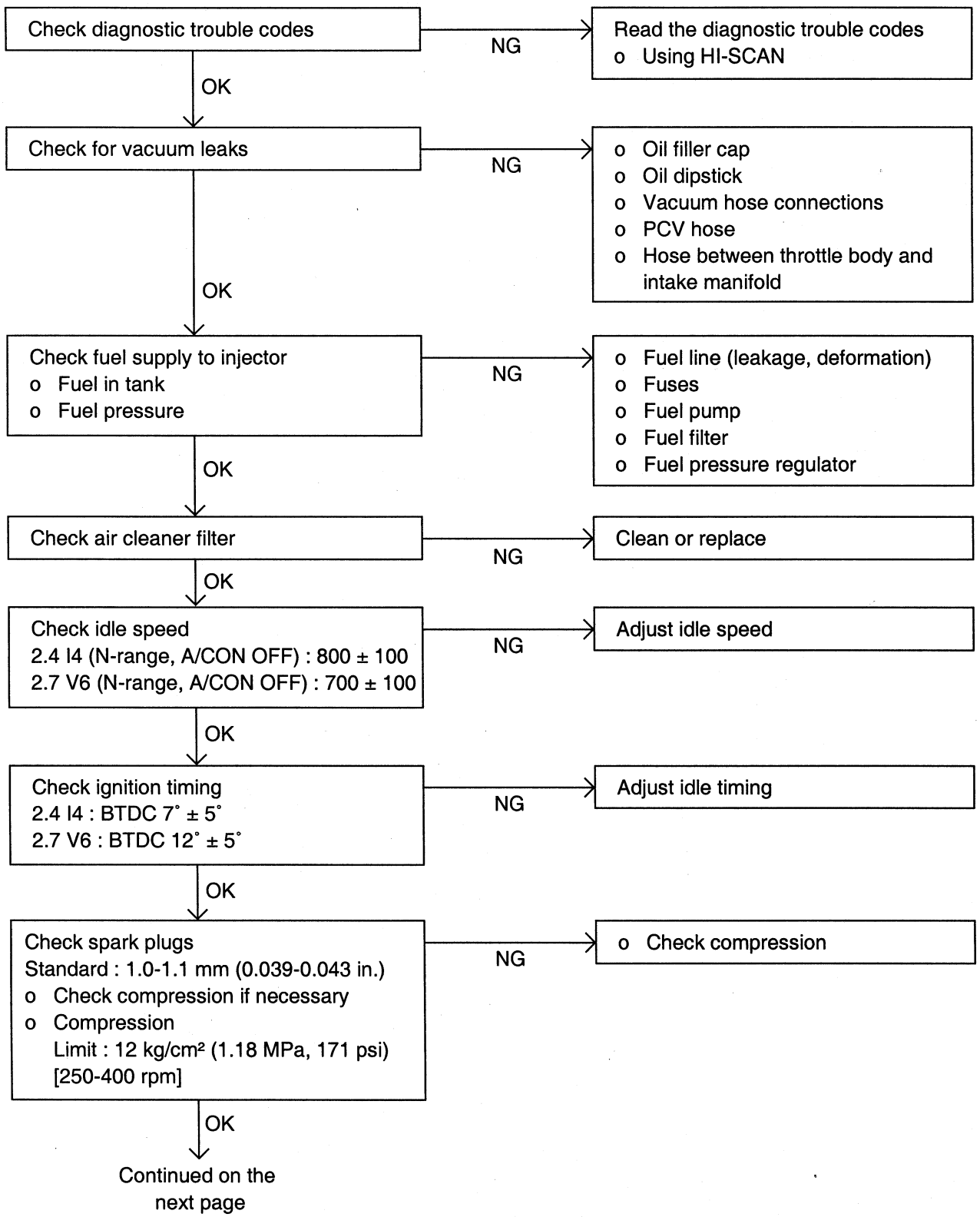


EFA9011A

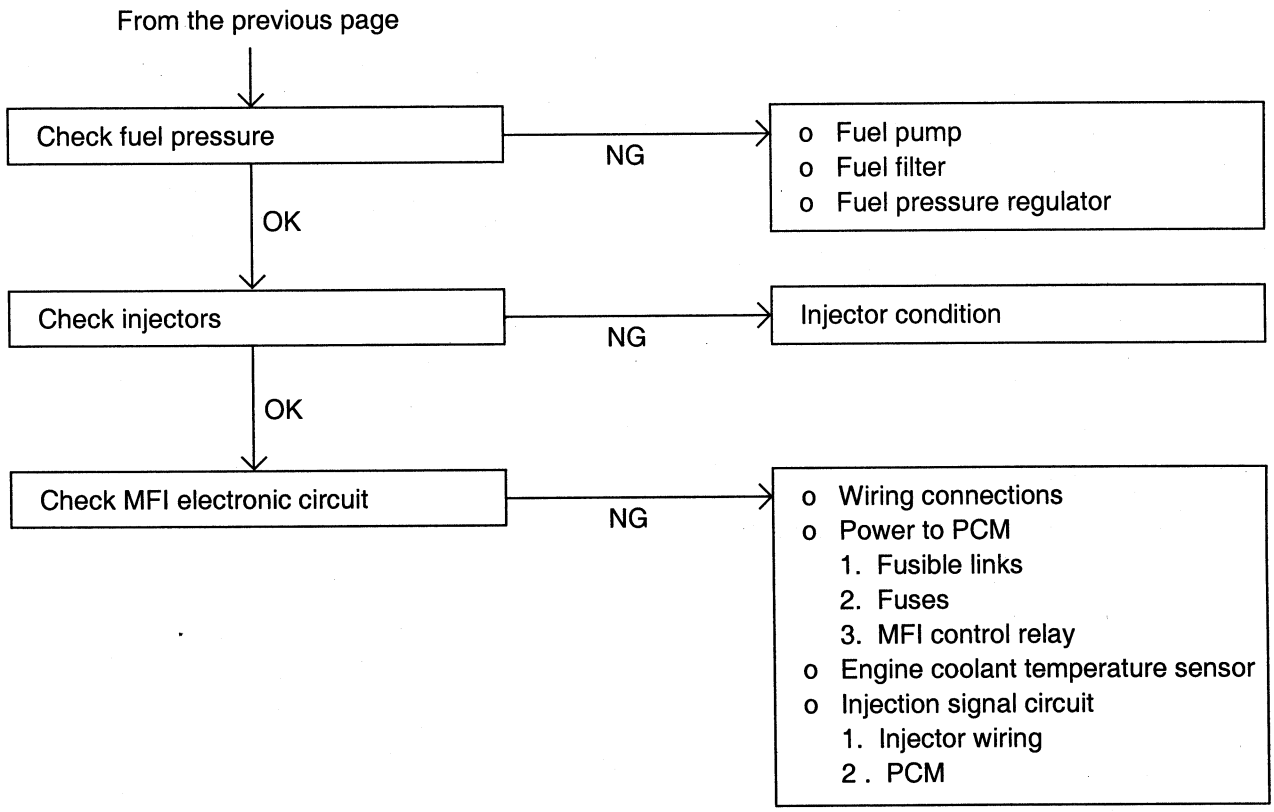

Check ignition timing
2.4 I4 (N-range, A/C OFF) : 800 ± 100
2.7 V6 (N-range, A/C OFF) : 700 ± 100
Diagnostic trouble code
Diagnostic trouble codes
o Using HI-SCAN PRO
OK
Check fuel supply to injector
o Fuel in tank
o Fuel pressure
NG
o Oil filler cap
o Oil dipstick
o Vacuum hose connections
o PCV hose
OK
Check spark plugs
Standard : 1.0-1.1 mm
(0.039-0.043in.)
o Check compression if necessary
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 PCM
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. PCM
o Throttle Position Sensor
o Air flow sensor

EFJB011B

ROUGH IDLE OR ENGINE STALLS EFJB0120

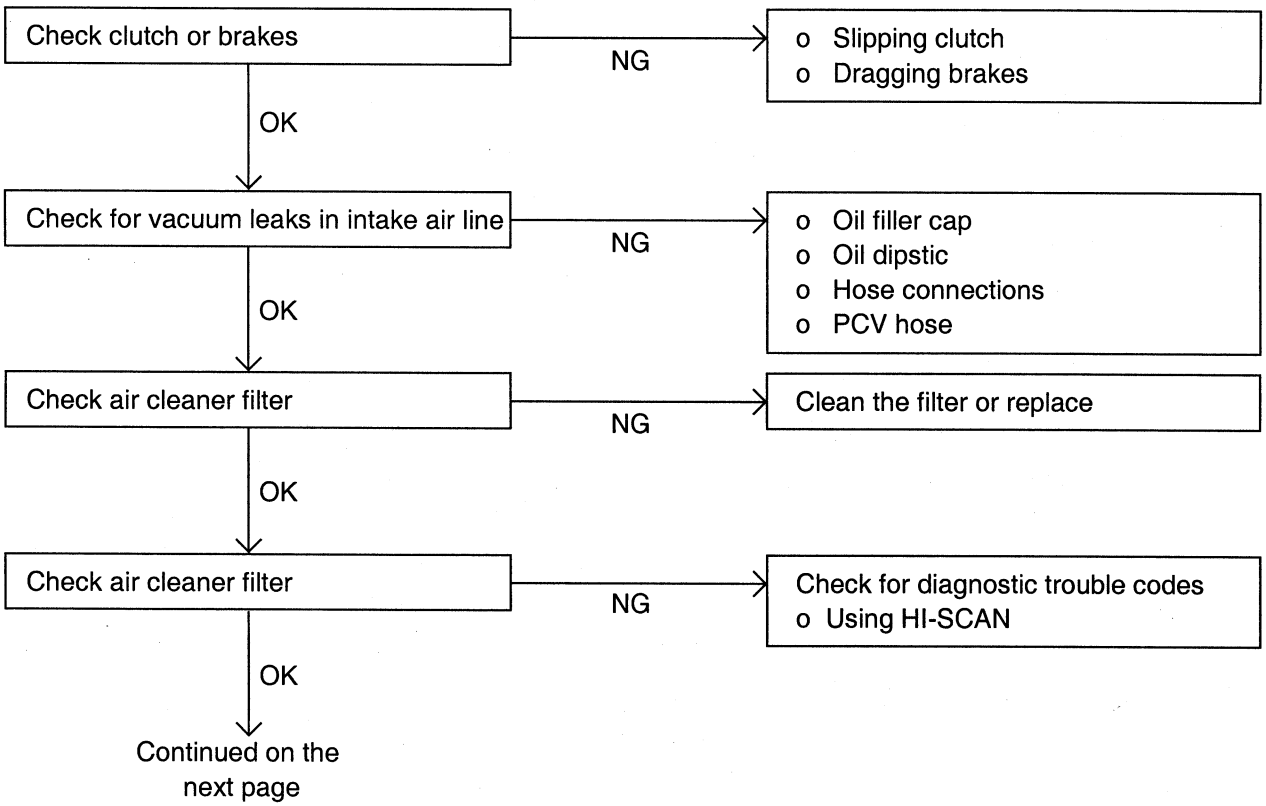


EFJB012A

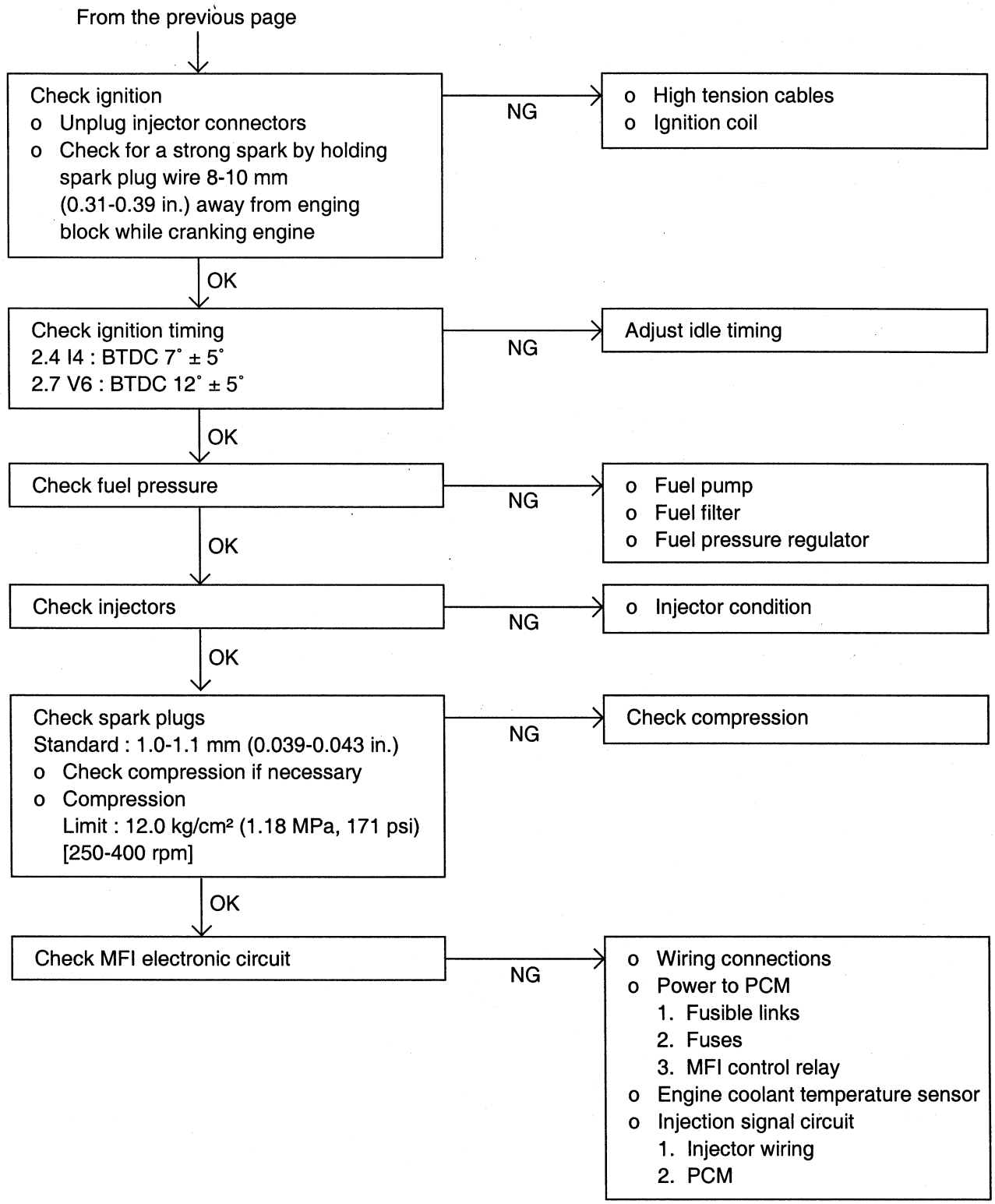

From the previous page
Check fuel pressure
NG
o Fuel pump
o Fuel filter
o Fuel pressure regulator
OK
Check injectors
NG
Injector condition
OK
Check MFI electronic circuit
NG
o Wiring connections
o Power to PCM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Injection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

EFA9012B

ENGINE HESITATES OR ACCELERATES POORLY EFJB0130



EFA9013A


From the previous page
Check ignition
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 while cranking engine
NG
o High tension cables
o Ignition coil
OK
Check ignition timing
2.4 I4 : BTDC 7° ± 5°
2.7 V6 : BTDC 12° ± 5°
NG
Adjust idle timing
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
Check compression
OK
Check MFI electronic circuit
NG
o Wiring connections
o Power to PCM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Injection signal circuit
1. Injector wiring
2. PCM

EFJB013B

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	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 malfunction (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

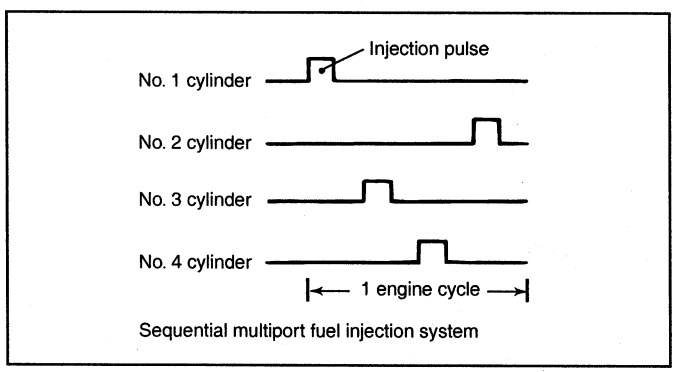
MULTIPORT FUEL INJECTION (MFI) EFJB0160

GENERAL INFORMATION

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

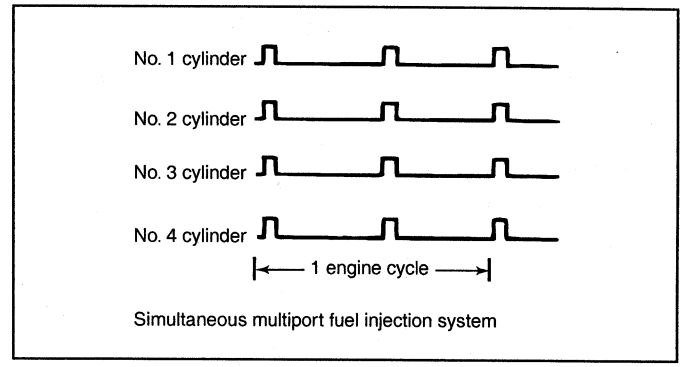
FUEL INJECTION CONTROL

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. This is called multiport. Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The PCM 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 PCM 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.



Sequential multiport fuel injection system

EFJB016A



Simultaneous multiport fuel injection system

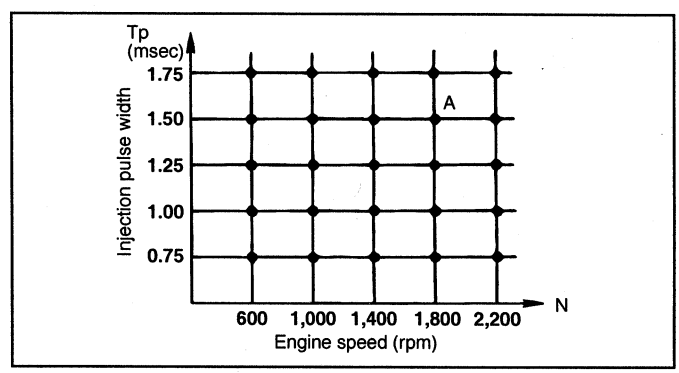
EFJB016B

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 PCM 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 PCM from the engine speed, intake air volume, engine coolant temperature and atmospheric pressure.



EFJB016C

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 deduced which condition exists.
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
   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 that the intermittent malfunction is eliminated. Repair the malfunctioning part and try to duplicate the condition(s) again to verify that 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 short somewhere between these switches and the load. If the resistance is not 0Ω, there is no short 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 crushed 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 EFJB0210

If the MFI system components (sensors, PCM, 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 check for

ON-BOARD DIAGNOSTICS

- Diagnostic trouble codes are set as follows:
  After the PCM first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. (The 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.
- Erasing diagnostic trouble codes:
  After recording the diagnostic trouble code, if the PCM does not re-detect the malfunction for 40 driving cycles, the diagnostic trouble code will be erased from the PCM memory. However, for fuel system rich/lean or misfiring, the diagnostic trouble code will be erased if both of the following conditions are met:
  - When driving conditions (engine speed, engine coolant temperature, etc.) are identical to those when the malfunction was first recorded.
  - When the PCM does not re-detect the malfunction for 80 driving cycles.

NOTE

A "driving cycle" is complete as soon as the vehicle goes into closed-loop operation.

MALFUNCTION INDICATOR LIGHT (MIL)

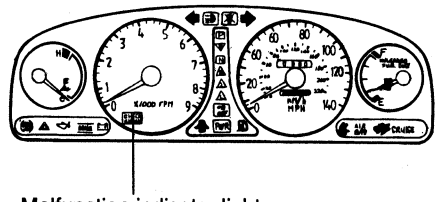
The MIL lights up to notify the driver that there is a problem with the vehicle.

However the 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 MIL is lit for 5 seconds to indicate that the light operates normally.

The following Items can 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)
- Front Oxygen Sensor
- Rear Oxygen Sensor Heater
- Rear Oxygen Sensor
- Front 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
- PCM
- Manifold Absolute Pressure (MAP) Sensor (Except 2.7L V6 engine)
- Idle Switch
- EGR System (Except 2.7L V6 engine).



EFA9021A

INSPECTING THE MALFUNCTION INDICATOR LAMP (MIL)

1. After turning the ignition key on, 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 the harness, blown fuse and blown bulb.

SELF-DIAGNOSIS

The PCM monitors the input/output signals (some signals at all times and others under specified conditions). When the PCM detects 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 a Generic Scan Tool (GST) or Hi-Scan Pro. A diagnostic trouble code (DTC) will remain in the PCM as long as battery power is maintained. The diagnostic trouble code will however be erased when the battery terminal or the powertrain control module (PCM) connector is disconnected or erased using the Generic Scan Tool.

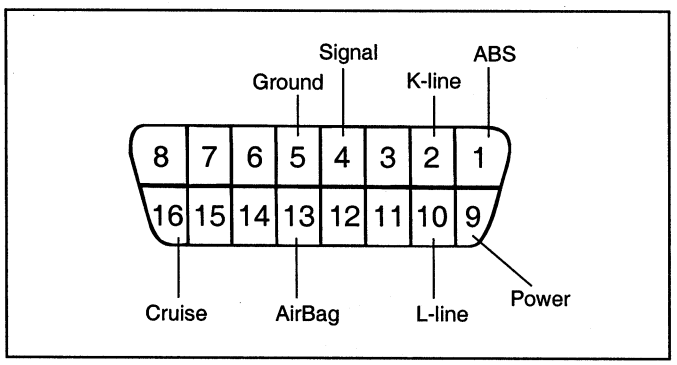
CHECKING PROCEDURE (SELF-DIAGNOSIS)

NOTE

1. **When battery voltage is excessively low, diagnostic trouble codes can not be read. Be sure to check the battery for voltage and the charging system before starting the test.**
2. **Codes are erased if the battery or the PCM 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 Hi-Scan Pro to check the diagnostic trouble code.
5. Repair the faulty part from the diagnosis chart.
6. Erase the diagnostic trouble code.
7. Disconnect the Hi-Scan Pro.

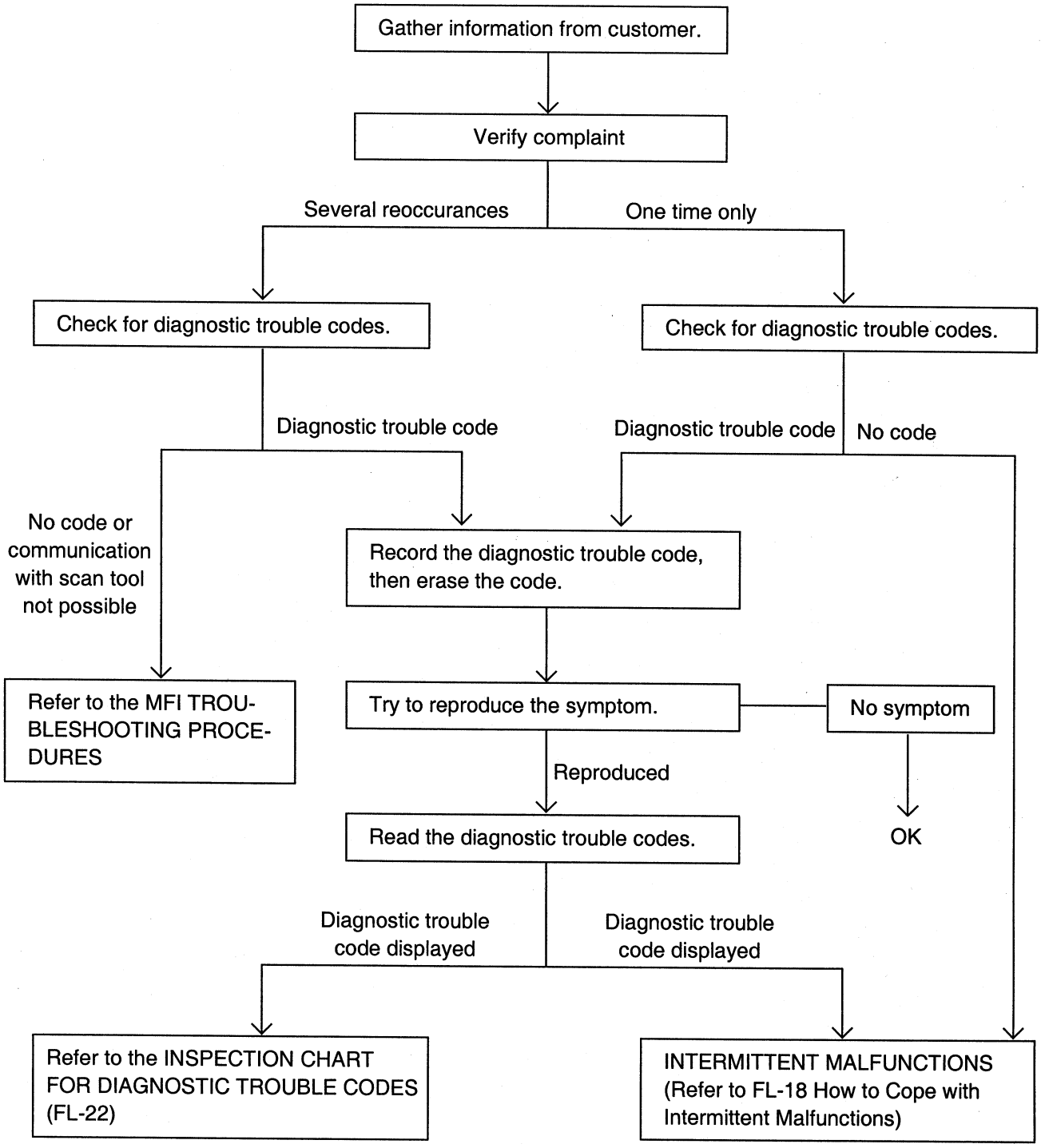


EFHA021B

MFI CONTROL SYSTEM

TROUBLESHOOTING EFJB0220

DIAGNOSTIC TROUBLESHOOTING FLOW



EFJB022A

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR 2.4 I4-EOBD)

EFJB0246

DTC NO.	CONTENT	Memory	MIL
P0101	Mass or Volume Air Flow Circuit Range/Performance Problem	O	O
P0102	Mass or Volume Air Flow Circuit Low Voltage	O	O
P0103	Mass or Volume Air Flow Circuit High Voltage	O	O
P0112	Intake Air Temp. Circuit Low Voltage	O	O
P0113	Intake Air Temp. Circuit High Voltage	O	O
P0115	Engine Coolant Temp. Circuit Malfunction (open/short)	O	O
P0116	Engine Coolant Temp. Circuit Drift	O	O
P0122	Throttle Position Sensor Circuit Low Voltage	O	O
P0123	Throttle Position Sensor Circuit High Voltage	O	O
P0125	Excessive Time to Enter Closed Loop Control (ECT sensor)	O	O
P0134	Oxygen Sensor Circuit Malfunction (No Activity)	O	O
P0133	Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1)	O	O
P0132	Oxygen Sensor Circuit Malfunction (Open) (Bank 1, Sensor 1)	O	O
P0135	Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 1)	O	O
P0136	Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 2)	O	O
P0140	Oxygen Sensor Circuit Malfunction (Short) (Bank 1, Sensor 2)	O	O
P0141	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	Injector Circuit Malfunction (Injector -1)	O	O
P0202	Injector Circuit Malfunction (Injector -2)	O	O
P0203	Injector Circuit Malfunction (Injector -3)	O	O
P0204	Injector Circuit Malfunction (Injector -4)	O	O
P0300	Random Misfire Detected	O	O
P0301	Misfire Detected (Cylinder -1)	O	O
P0302	Misfire Detected (Cylinder -2)	O	O
P0303	Misfire Detected (Cylinder -3)	O	O
P0304	Misfire Detected (Cylinder -4)	O	O
P0320	Ignition Failure Sensor Malfunction	O	X
P0325	Knock Sensor Circuit Malfunction	O	X
P0335	Crankshaft Position Sensor Circuit Malfunction	O	O
P0340	Camshaft Position Sensor Circuit Malfunction	O	O
P0350	Ignition Coil Malfunction	O	O
P0421	Warm-up Catalyst Efficiency Below Threshold	O	O

DTC NO.	CONTENT	Memory	MIL
P0403	EGR Solenoid Circuit Malfunction	O	O
P0443	Purge Control Solenoid Valve Malfunction	O	O
P0500	Vehicle Speed Sensor Malfunction	O	O
P0506	Idle Speed Control - Low RPM	O	O
P0507	Idle Speed Control - High RPM	O	O
P0700	PCM Malfunction with Transaxle control	O	O
P1330	Spark Timing Adjust Malfunction	O	O
P1609	Immobilizer system Malfunction	O	X

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR 2.4 I4-NON EOBD)

EFJB0247

DTC NO.	CONTENT	Memory	MIL
P0100	Mass or Volume Air Flow Circuit Malfunction	O	O
P0110	Intake Air Temperature Circuit Malfunction	O	X
P0115	Engine Coolant Temperature Circuit Malfunction	O	O
P0120	Throttle/Pedal Position Circuit Malfunction	O	O
P0130	O2 Sensor Circuit Malfunction (Bank 1 Sensor 1)	O	X
P0201	Injector Circuit Malfunction (Injector -1)	O	O
P0202	Injector Circuit Malfunction (Injector -2)	O	O
P0203	Injector Circuit Malfunction (Injector -3)	O	O
P0204	Injector Circuit Malfunction (Injector -4)	O	O
P0325	Knock Sensor Circuit Malfunction	O	X
P0335	Crankshaft Position Sensor Circuit Malfunction	O	X
P0340	Camshaft Position Sensor Circuit Malfunction	O	X
P0350	Ignition Coil Malfunction	O	O
P0500	Vehicle Speed Sensor Malfunction	O	X
P1330	Spark Timing Adjust Malfunction	O	O
P1609	Immobilizer system Malfunction	O	X

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR 2.7 V6-EOBD)

EFJB0248

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

DTC NO.	CONTENT	Memory	MIL
P0115	Engine Coolant Temperature Circuit Malfunction	O	O
P0116	Engine Coolant Temperature Circuit Range/Performance	O	X
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
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	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	O	O
P0160	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)	O	O
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
P0300	Multiple Cylinder Misfire Detected	O	O
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

DTC NO.	CONTENT	Memory	MIL
P0335	Crankshaft Position Sensor 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
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
P0506	Idle Speed Control RPM Lower Than Expected	O	X
P0507	Idle Speed Control RPM Higher Than Expected	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
P1521	Power Steering Switch Circuit Malfunction	O	X
P1529	TCU Request for MIL On/Freeze Frame to PCM via CAN	O	O
P1602	Serial Communication Problem With TCU (TIMEOUT)	O	O
P1613	PCM - 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
P1642	Non-Immobilizer-EMS connected to an Immobilizer	O	X

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR 2.7 V6-NON EOBD)

EFJB0249

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
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 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	Vehicle Speed Circuit Malfunction	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

DTC NO.	CONTENT	Memory	MIL
P1521	Power Steering Switch Circuit Malfunction	O	X
P1602	Serial Communication Problem With TCU (TIMEOUT)	O	X
P1613	PCM - Selftest Failed	O	X
P1616	Main Relay Malfunction	O	X
P1624	Cooling Fan Relay - Circuit Malfunction ("LOW" Circuit)	O	X
P1625	Cooling Fan Relay - Circuit Malfunction ("HIGH" Circuit)	O	X
P1642	Non-Immobilizer-EMS connected to an Immobilizer	O	X

TROUBLE AREA RELATED TO DTC (FOR 2.4 I4) EFJB0243

Note : Check items for each diagnostic items do not list all probable causes.

DTC No.	Diagnostic items	Check items (Remedy)
P0110	Intake Air Temperature Circuit Malfunction	• Harness and connector • Intake air temperature sensor • Open or short in intake air temp. sensor circuit • Intake air temp. sensor • PCM
P0115	Engine Coolant Temperature Circuit Malfunction	• Harness and connector • Engine coolant temperature sensor • Open or short in engine coolant temp. sensor circuit • PCM
P0120	Throttle Position Circuit Malfunction	• Harness and connector • Throttle position sensor • Open or short in throttle position sensor circuit • PCM
P0130	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Harness and connector • Oxygen sensor (front)
P0133	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	
P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Harness and connector • Oxygen sensor (rear)
P0201	Injector Circuit Malfunction - Cylinder 1	• Harness and connector • 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 PCM • Harness and connector • Knock sensor

DTC No.	Diagnostic items	Check items (Remedy)
P0335	Crankshaft Position Sensor Circuit Malfunction	• Harness and connector • Open or short in crankshaft position sensor • Crankshaft position sensor • PCM
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 • Vehicle speed sensor

TROUBLE AREA RELATED TO DTC (FOR 2.7 V6) EFJB0244

Note : Check items for each diagnostic items do not list all probable causes.

DTC No.	Diagnostic items	Check items (Check Point)
P0100	Mass or Volume Air Flow Circuit Malfunction	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor
P0101	Mass or Volume Air Flow Circuit Range/Performance Problem	• Foreign material deposit in the sensor • Bad connection of connectors/bad wiring
P0110	Intake Air Temperature Circuit Malfunction	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor
P0115	Engine Coolant Temperature Circuit Malfunction	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor
P0120	Throttle/Pedal Position Circuit Malfunction	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor
P0121	Throttle/Pedal Position Circuit Range/ Performance Problem	• Sensor's wearness or improper installation • Bad connection of connectors/bad wiring • Malfunction of the sensor
P0130	O2 Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor (B1/S1)
P0135	O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor (B1/S1)
P0150	O2 Sensor Circuit Malfunction (Bank 2 Sensor 1)	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor (B2/S1)
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Sensor deteriorated or contaminated • Sensor pin corrosion
P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	• Sensor deteriorated or contaminated (B2/S1) • Sensor pin corrosion

DTC No.	Diagnostic items	Check items (Check Point)
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	• Sensor deteriorated or contaminated (B1/S1) • Sensor pin corrosion
P0154	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	• Sensor deteriorated or foreign material deposit (B2/S1) • Sensor pin corrosion
P0136	O2 Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor (B1/S2)
P0155	O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor (B2/S1)
P0156	O2 Sensor Circuit Malfunction (Bank 2 Sensor 2)	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor (B2/S2)
P0140	Downstream O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	• Sensor deteriorated or contaminated
P0160	Downstream O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)	• Sensor deteriorated or contaminated
P0141	O2 Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor (B1/S2)
P0161	O2 Sensor Heater Circuit Malfunction (Bank 2 Sensor 2)	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Malfunction of the sensor (B2/S2)
P0170	Fuel Trim Malfunction (Bank 1)	• Fuel system (Fuel tank/Press. regulator/Fuel pump/PCSV) • Connection of the fuel line hose/sealing/cut • Sealing between the purge valve and fuel tank • Air leak in the exhaust system • Ignition system • Engine
P0173	Fuel Trim Malfunction (Bank 2)	• Fuel system (Fuel tank/Press. regulator/Fuel pump/PCSV) • Connection of the fuel line hose/seatling/cut • Sealing between the purge valve and fuel tank • Air leak in the exhaust system • Ignition system • Engine
P0201	Cylinder 1 - Injector Circuit Malfunction	• Open or short between the injector and PCM • Bad connection of connectors/bad wiring • Bad No.1 injector
P0202	Cylinder 2 - Injector Circuit Malfunction	• Open or short between the injector and PCM • Bad connection of connectors/bad wiring • Bad No.2 injector
P0203	Cylinder 3 - Injector Circuit Malfunction	• Open or short between the injector and PCM • Bad connection of connectors/bad wiring • Bad No.3 injector

DTC No.	Diagnostic items	Check items (Check Point)
P0204	Cylinder 4 - Injector Circuit Malfunction	• Open or short between the injector and PCM • Bad connection of connectors/bad wiring • Bad No.4 injector
P0205	Cylinder 5 - Injector Circuit Malfunction	• Open or short between the injector and PCM • Bad connection of connectors/bad wiring • Bad No.5 injector
P0206	Cylinder 6 - Injector Circuit Malfunction	• Open or short between the injector and PCM • Bad connection of connectors/bad wiring • Bad No.6 injector
P0230	Fuel Pump Circuit Malfunction	• Open or short between the pump and PCM • Bad connection of connectors/bad wiring • Bad pump relay
P0301	Cylinder 1 - Misfire Detected	• Bad ignition system (Spark plug to PCM) • Check the injector #1 • Check the condition of the HLA
P0302	Cylinder 2 - Misfire Detected	• Bad ignition system (Spark plug to PCM) • Check the injector #2 • Check the condition of the HLA
P0303	Cylinder 3 - Misfire Detected	• Bad ignition system (Spark plug to PCM) • Check the injector #3 • Check the condition of the HLA
P0304	Cylinder 4 - Misfire Detected	• Bad ignition system (Spark plug to PCM) • Check the injector #4 • Check the condition of the HLA
P0305	Cylinder 5 - Misfire Detected	• Bad ignition system (Spark plug to PCM) • Check the injector #5 • Check the condition of the HLA
P0306	Cylinder 6 - Misfire Detected	• Bad ignition system (Spark plug to PCM) • Check the injector #6 • Check the condition of the HLA
P0325	Knock Sensor 1 Circuit Malfunction	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Bad knock sensor in bank 1
P0330	Knock Sensor 2 Circuit Malfunction	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Bad knock sensor in bank 2
P0335	Crankshaft Position Sensor 'A' Circuit Malfunction	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Bad CKP sensor
P0340	Camshaft Position Sensor (TDC Sensor) Circuit Malfunction	• Open or short between the sensor and PCM • Bad connection of connectors/bad wiring • Bad CMP sensor
P0350	Ignition Coil Primary/Secondary Circuit Malfunction	• Bad ignition system (Spark plug to PCM) • Bad connection of connectors/bad wiring
P0351	Ignition Coil 'A' Primary/Secondary Circuit Malfunction	• Bad ignition system (Spark plug to PCM) • Bad connection of connectors/bad wiring

DTC No.	Diagnostic items	Check items (Check Point)
P0352	Ignition Coil 'B' Primary/Secondary Circuit Malfunction	• Bad ignition system (Spark plug to PCM) • Bad connection of connectors/bad wiring
P0353	Ignition Coil 'C' Primary/Secondary Circuit Malfunction	• Bad ignition system (Spark plug to PCM) • Bad connection of connectors/bad wiring
P0354	Ignition Coil 'D' Primary/Secondary Circuit Malfunction	• Bad ignition system (Spark plug to PCM) • Bad connection of connectors/bad wiring
P0355	Ignition Coil 'E' Primary/Secondary Circuit Malfunction	• Bad ignition system (Spark plug to PCM) • Bad connection of connectors/bad wiring
P0356	Ignition Coil 'F' Primary/Secondary Circuit Malfunction	• Bad ignition system (Spark plug to PCM) • Bad connection of connectors/bad wiring
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	• Catalytic converter melted/broken
P0430	Catalyst System Efficiency Below Threshold (Bank 2)	• Catalytic converter melted/broken
P0443	Evap. Emission Control System - Purge Control Valve Circuit Malfunction	• Open or short between the PCSV and PCM • Bad connection of connectors/bad wiring • Bad PCSV
P0500	For OBD2 Rough Road Detection, Vehicle Speed Malfunction From ABS/ TCS	• Open or short between the TCS or ABS and PCM • Check the connections of related parts • Check for opens or shorts • 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 • Check for opens or shorts • Bad wheel sensor
P0506	Idle Speed Control RPM Lower Than Expected	• Bad opening circuit of ISA or foreign material deposit
P0507	Idle Speed Control RPM Higher Than Expected	• Bad closing circuit of ISA or foreign material deposit
P1134	O2 Sensor circuit - Transition Switch Time Malfunction/Slop (B1/S1)	• O2 sensor deteriorated or foreign material deposit
P1154	O2 Sensor circuit - Transition Switch Time Malfunction/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) • Connection of the fuel line hose/sealing/cut • Sealing between the purge valve and fuel tank • Air leak in the exhaust system • Ignition system • Engine
P1167	O2 Sensor - Controller Adaption diagnosis Malfunction (Bank 2)	• Fuel system (Fuel tank/Press. regulator/Fuel pump/PCSV) • Connection of the fuel line hose/sealing/cut • Sealing between the purge valve and fuel tank • Air leak in the exhaust system • Ignition system • Engine

DTC No.	Diagnostic items	Check items (Check Point)
P1372	Segment Time Acquisition Incorrect	• Bad installation of tone wheel to crankshaft • Bad signal of the CKP sensor • Bad connection of connectors/bad wiring
P1510	Idle Speed Actuator Command Signal Incorrect (Coil 1)	• Open or short between the ISA and PCM • Bad connection of connectors/bad wiring • Bad ISA
P1511	Idle Speed Actuator Command Signal Incorrect (Coil 2)	• Open or short between the ISA and PCM • Bad connection of connectors/bad wiring • Bad ISA
P1529	Freeze Frame Request Via Can	• TCM error (check for TCM DTCs)
P1602	Serial Communication Problem With TCU (Timeout)	• Open or short of CAN wire • Bad TCM
P1616	Main Relay Malfunction	• Bad main relay • Open fusible link • Bad connection of connectors/bad wiring
P1623	Diagnostic Lamp Powerstage Malfunction	• Open or short between the MIL lamp and PCM • Bad MIL lamp • Bad connection of connectors/bad wiring
P1624	Cooling Fan Relay - Circuit Malfunction ("LOW" Circuit)	• Open or short between the cooling fan and PCM • Bad main relay • Bad connection of connectors/bad wiring
P1625	Cooling Fan Relay - Circuit Malfunction ("HIGH" Circuit)	• Open or short between the cooling fan and PCM • Bad main relay • Bad connection of connectors/bad wiring

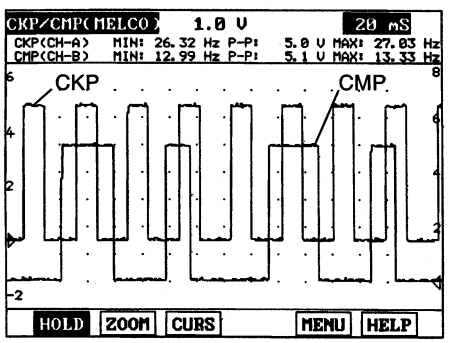
MAJOR SENSOR REFERENCE WAVEFORMS EFJB0245

The followings are the major sensor reference waveforms. Below is the data for CMP, Mass Air Flow Sensor, Throttle Position Sensor, Rear O2 Sensor, Front O2 Sensor and Injection Pulse when revving quickly up to 4800rpm under no load after warming up engine sufficiently. Each value is for reference, the exact values may vary.

* CMP AND CKP

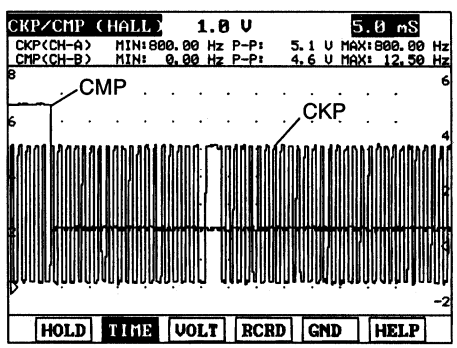
Should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop or rise.

[2.4 I4]



EFJB245A

[2.7 V6]



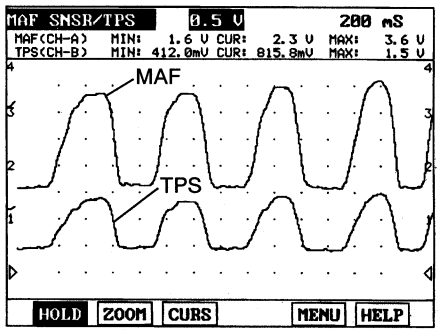
EFJB245B

* MAF SENSOR AND TPS

MAF should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).

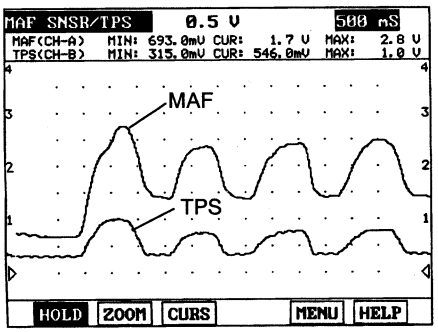
TPS should increase while depressing the accelerator pedal and should decrease while releasing it.

[2.4 I4]



EFJB245C

[2.7 V6]

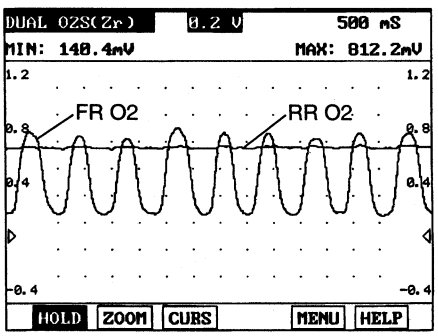


EFJB245D

* FR O2 SENSOR AND RR O2 SENSOR

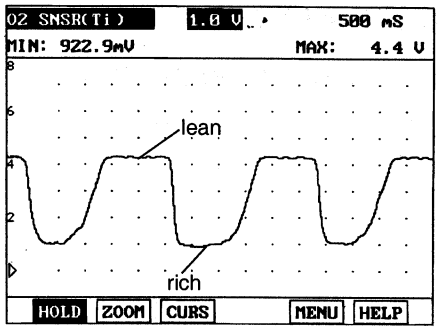
FR O2 and RR O2 sensor may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.

[2.4 I4]



EFJB245E

[2.7 V6]

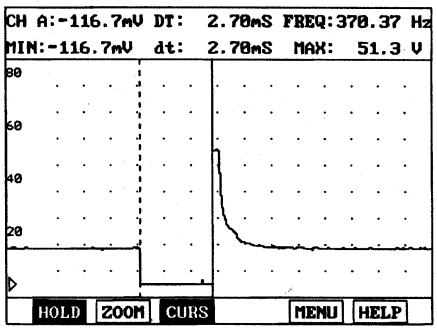


EFJB245F

* INJ PULSE

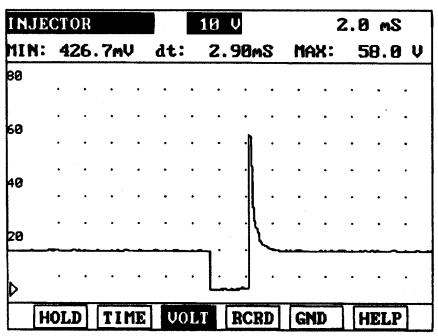
Should increase when depressing the accelerator pedal and should decrease when the pedal is released.

[2.4 I4]



EFJB245G

[2.7 V6]

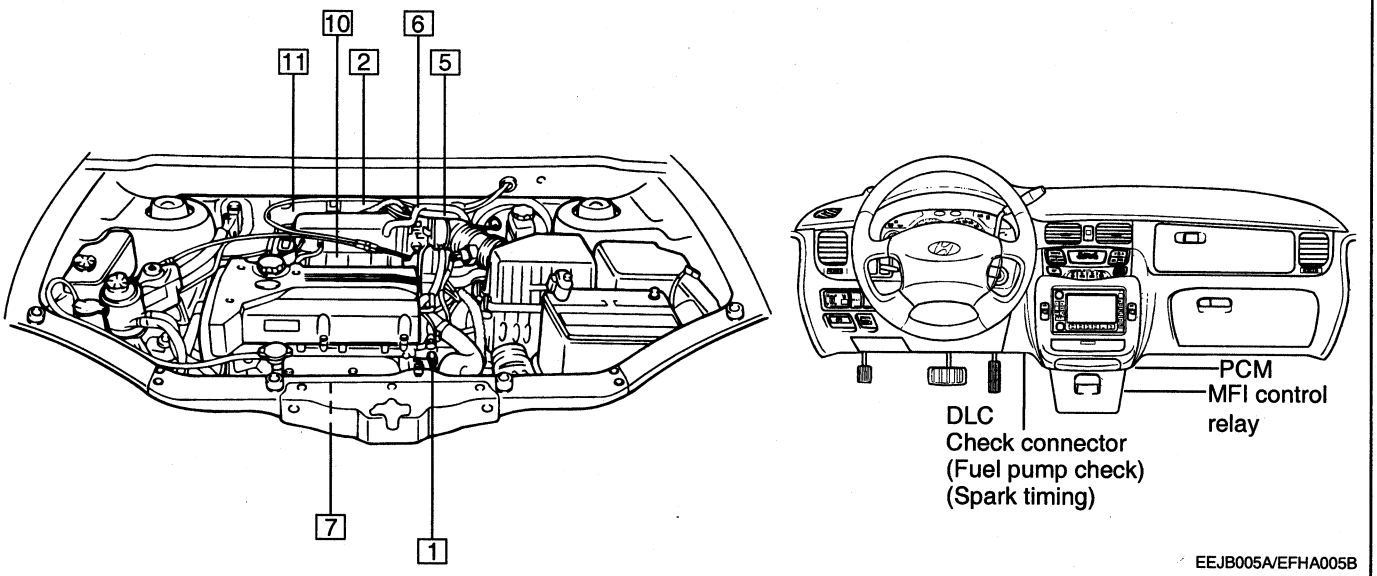


EFJB245H

MFI COMPONENT INSPECTION EFJB0250

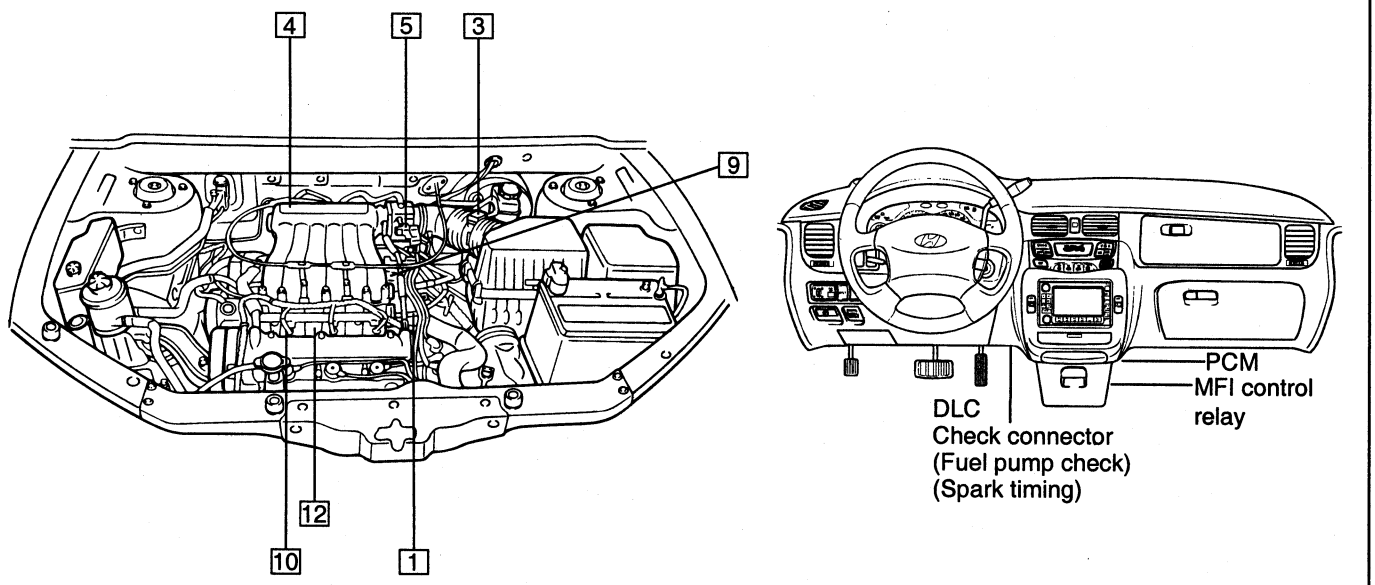
LOCATION OF MFI COMPONENTS

[2.4 I4]



EEJB005A/EFHA005B

[2.7 V6]

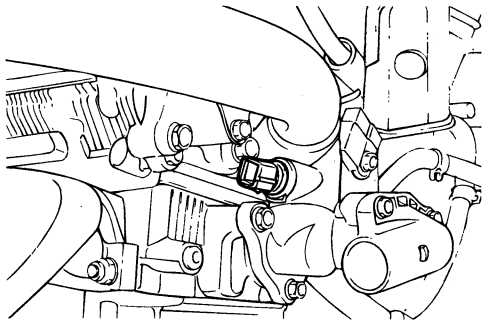


EEJB005C/EFHA005B

1 Engine coolant temperature (ECT) sensor. (FL-38)
2 Mass air flow sensor and Intake air temp. sensor for 2.4 I4. (FL-42)
3 Mass air flow sensor for 2.7 V6 (FL-46)
4 Intake air temp. (IAT) sensor for 2.7 V6 (FL-49)
5 Throttle position sensor (TPS) (FL-52)
6 Idle speed actuator (ISA) (FL-55)
7 Heated oxygen sensor (HO2S) (FL-58, 61)
8 Camshaft position sensor (CMP) (FL-64)
9 Crankshaft position sensor (CKP) (FL-68)
10 Injector (FL-72, 74)
11 Evap. canister purge control solenoid valve (PCSV) (FL-77)
12 Knock sensor (FL-80)
13 Power steering oil pressure switch (FL-83)

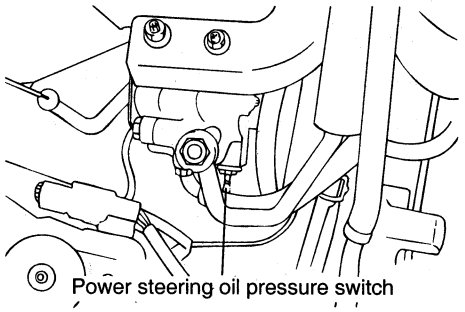
EFJB025B

ECT Sensor



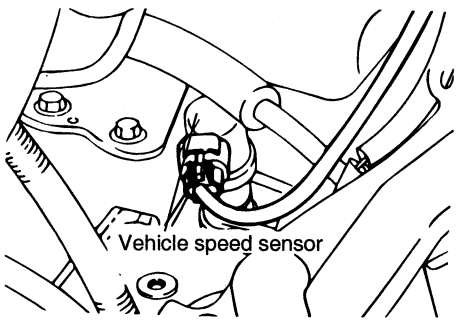
EFA9025C

Power Steering Oil Pressure Switch



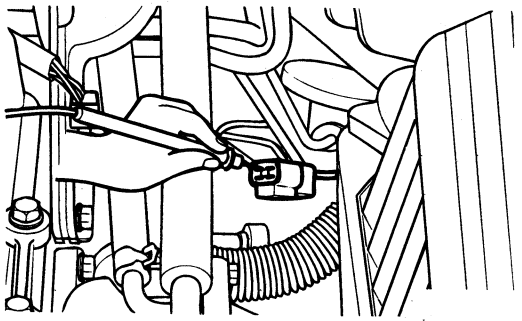
EFA9025D

Vehicle Speed Sensor



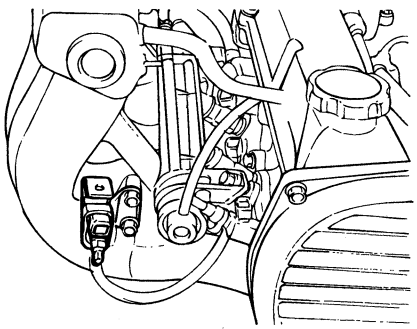
EFA9025E

Ignition Timing Adjustment Terminal



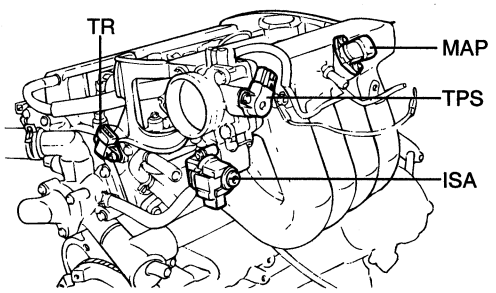
HEW31002

EVAP Solenoid Valve



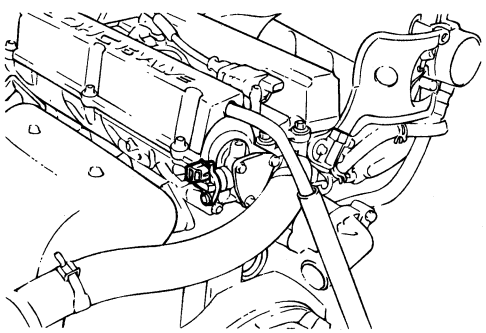
EFA9025G

MAP, TPS, ISA, TR



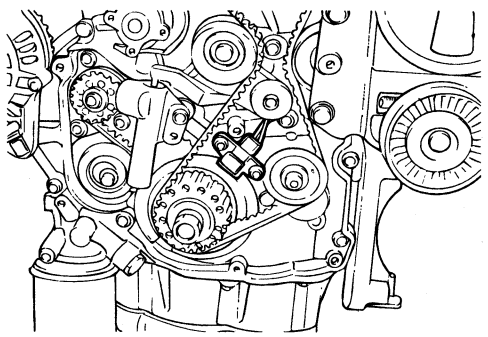
EFA9025H

CMP Sensor

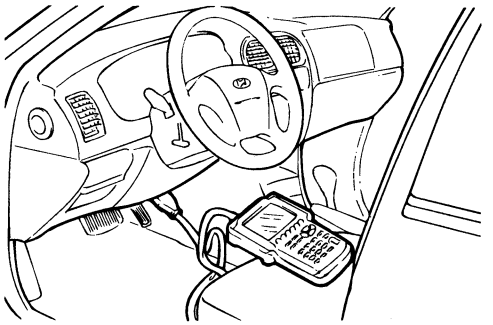
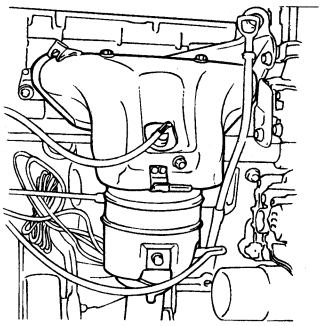
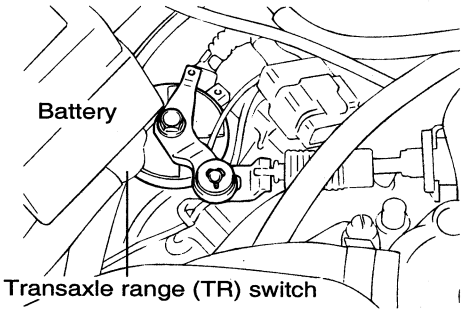
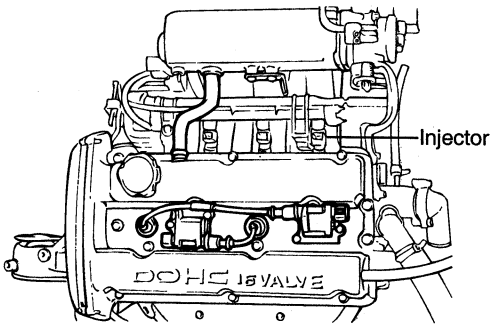
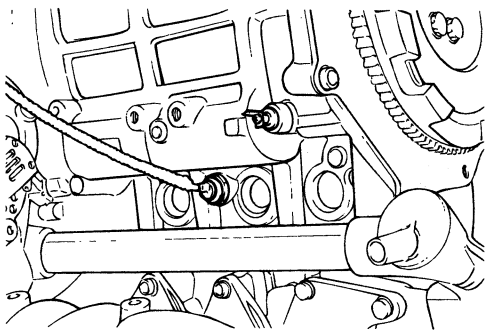


EFA9025I

CKP

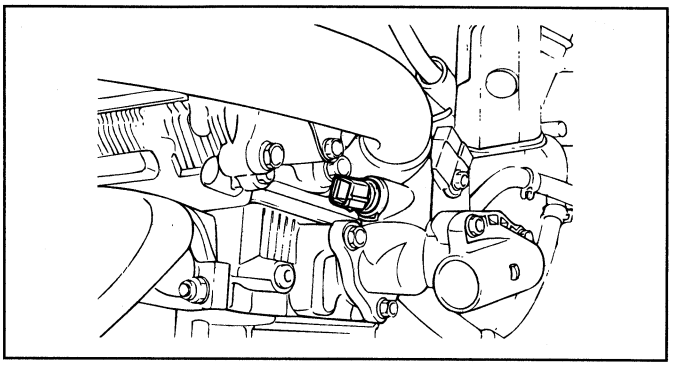


EFA9025J

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

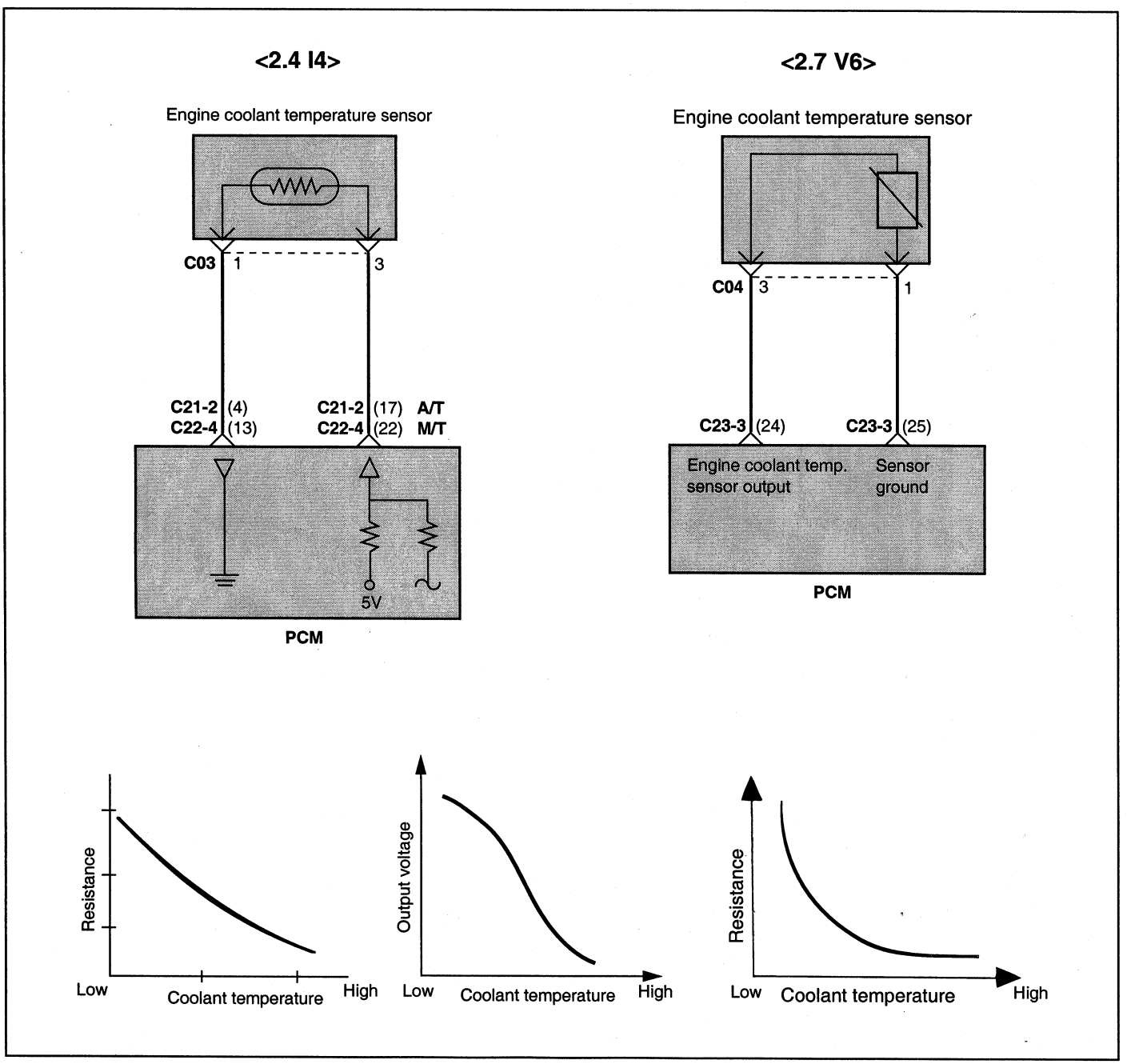
ENGINE COOLANT TEMPERATURE (ECT) SENSOR EFJB7030

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 PCM. 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 (NTC). The PCM determines engine coolant temperature by the sensor output voltage and provides optimum fuel enrichment when the engine is cold.



EFA9026A

CIRCUIT DIAGRAM



EFJB703A

SENSOR CHECKING

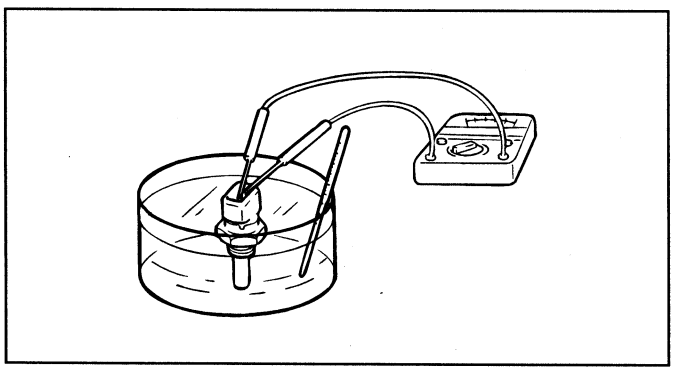
USING HI-SCAN PRO

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

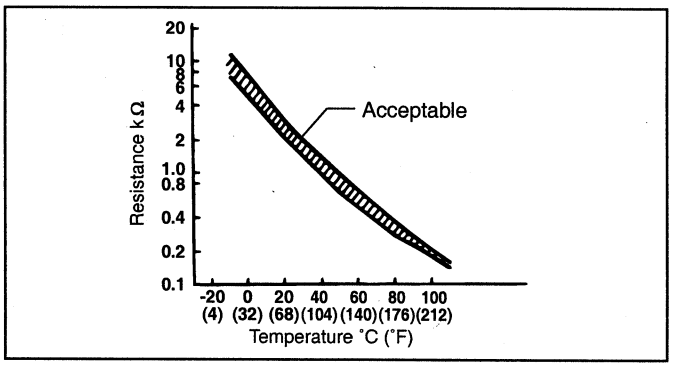
1. Remove the engine coolant temperature sensor from the intake manifold.
2. With the temperature sensing portion of the engine coolant temperature sensor immersed in hot engine coolant, check the resistance.

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



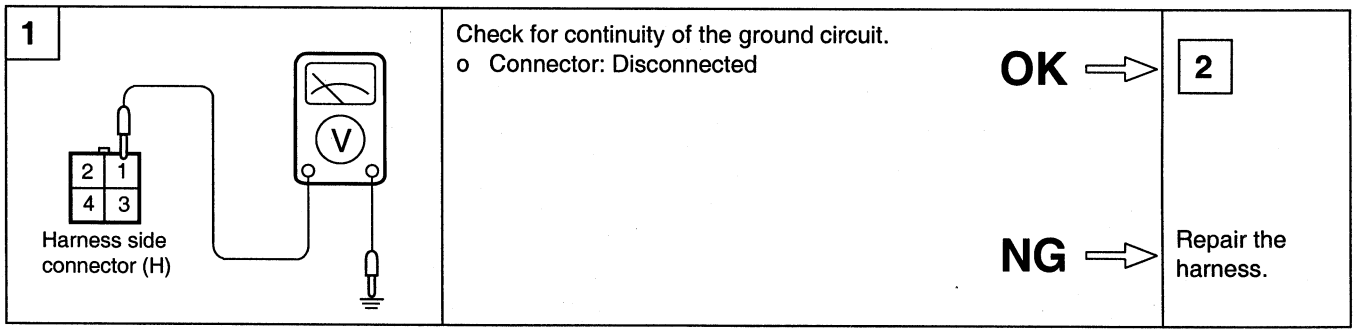
EFA9028A

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

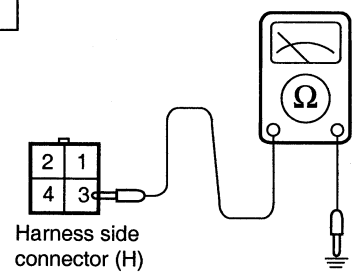


EFJB703D

HARNESS INSPECTION

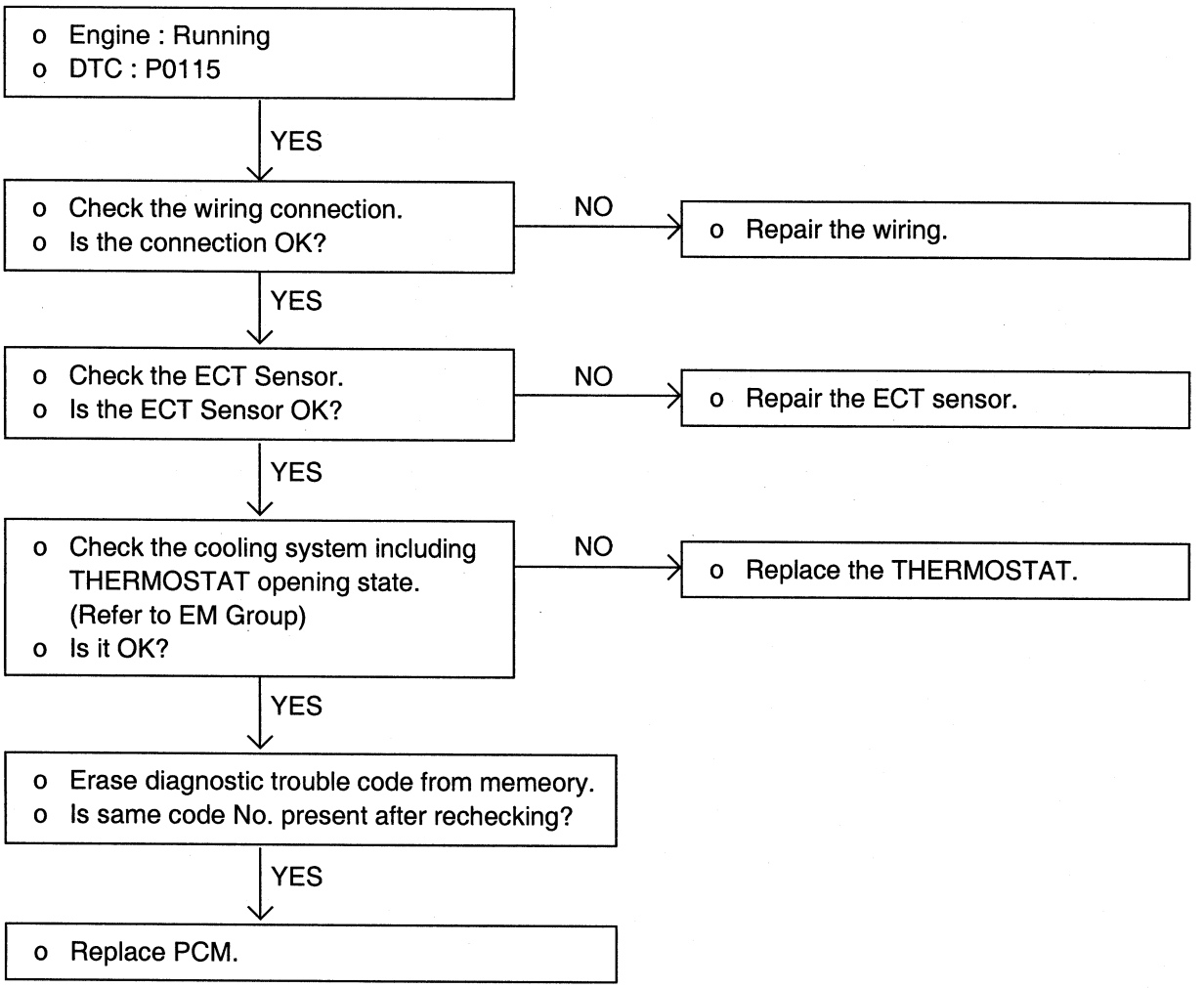


EFJB703B

2 	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.

EFJB703C

TROUBLESHOOTING PROCEDURES



DTC : Diagnosis Trouble Code
PCM : Powertrain 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 adequate or the engine gives off dark smoke during warm-up, the engine coolant temperature sensor might be the cause.

INSTALLATION

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

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

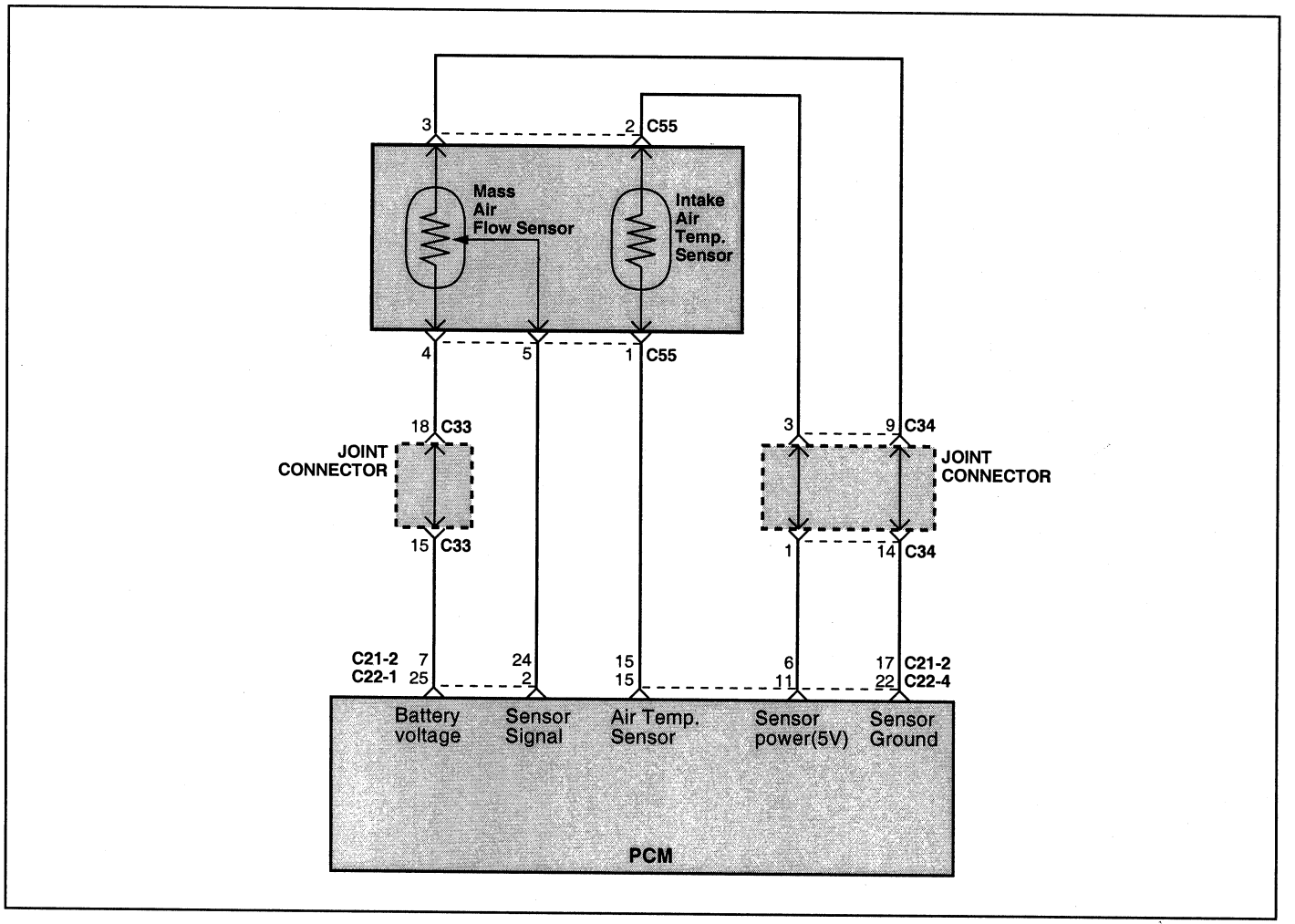
3. Securely connect the harness connector.

MASS AIR FLOW(MAF) SENSOR & INTAKE AIR TEMP.(IAT) SENSOR EFJB7050

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 because the change of the mass air flow rate causes a 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 powertrain control module.

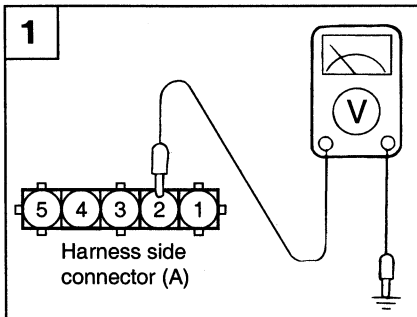
The intake air temperature sensor (IAT Sensor), located in the intake air hose, is a resistor-based sensor for detecting the intake air temperature. The intake air temperature information from the sensor helps the PCM provide the necessary fuel injection.

CIRCUIT DIAGRAM <2.4 I4>

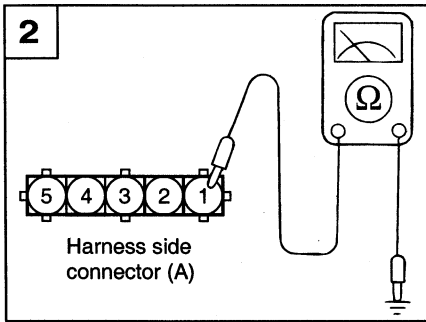


EFJB705A

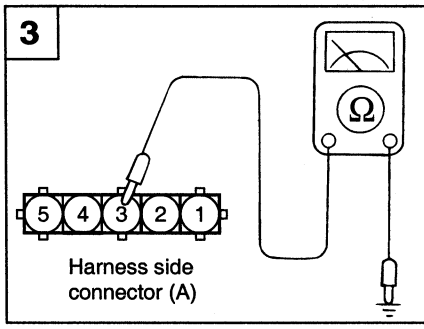
HARNESS INSPECTION PROCEDURE

1		Measure the power supply voltage for the IAT sensor. o Connector: Disconnected. o Ignition switch : ON. o Voltage (V) : 4.8-5.2 V.	OK ⇒ 2 NG ⇒ Repair the harness.

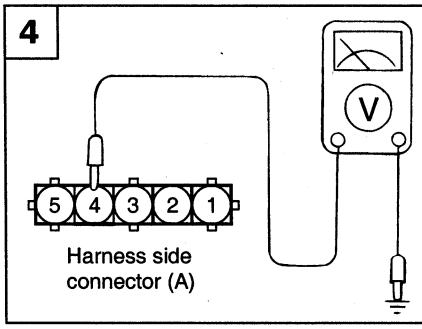
EFJB705B

2		Check for an open circuit, or a short circuit to ground between the powertrain control module and the IAT sensor. o Connector : Disconnected o PCM connector : Disconnected	OK ⇒ 3 NG ⇒ Repair the harness.

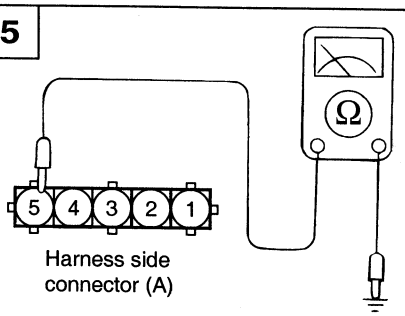
EFJB705C

3		Check for continuity of the ground circuit. o Connector : Disconnected.	OK ⇒ 4 NG ⇒ Repair the harness.

EFJB705D

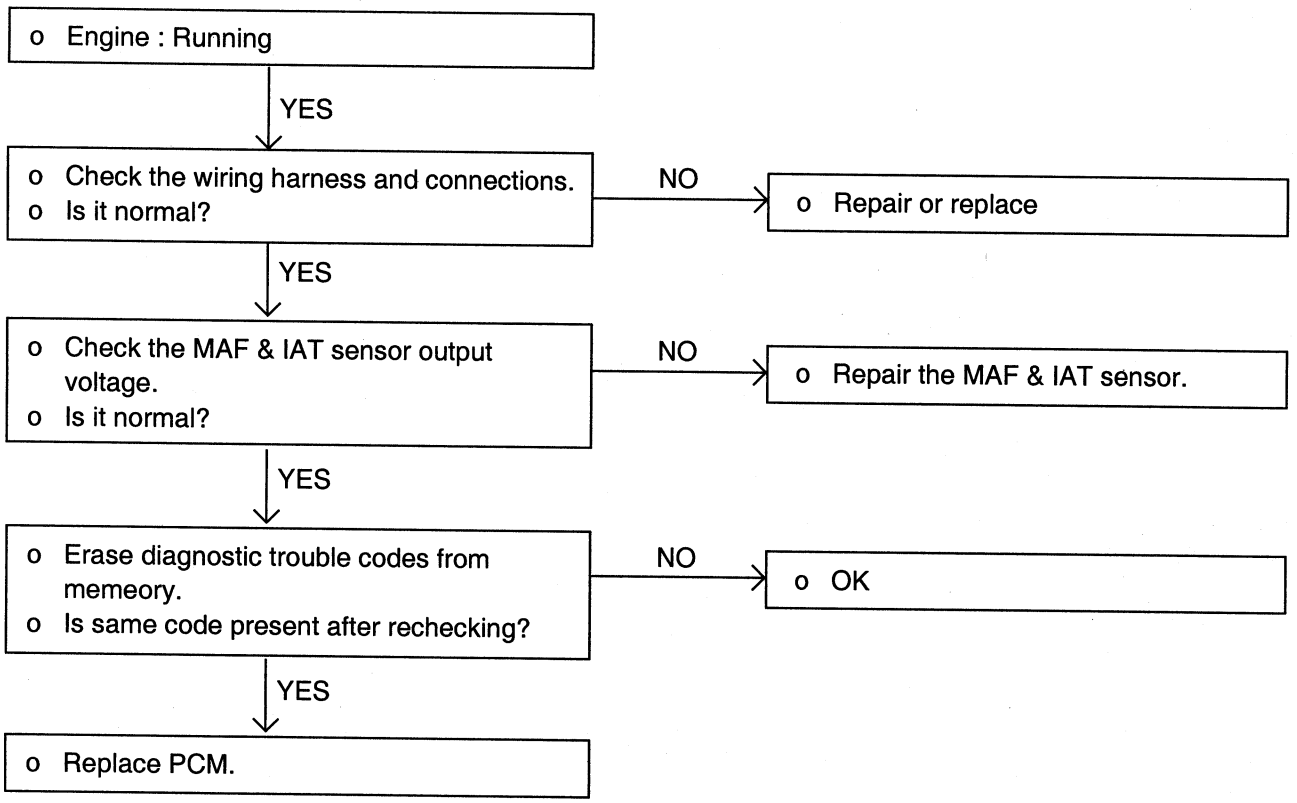
4		Check the power supply(Bat) voltage for MAF sensor. o Connector : Disconnected o PCM connector : Connected o Voltage : Battery voltage	OK ⇒ 5 NG ⇒ Repair the harness.

EFJB705E

5 	Check for an open-circuit, or a short-circuit to ground between the PCM and MAF sensor. o Connector : Disconnected o PCM connector : Disconnected	OK ⇨	END !
		NG ⇨	Repair the harness.

EFJB705F

TROUBLESHOOTING PROCEDURES



DTC : Diagnosis Trouble Code
PCM : Powertrain Control Module

EFJB705G

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 a faulty MAF sensor or PCM.
3. If the engine can 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.

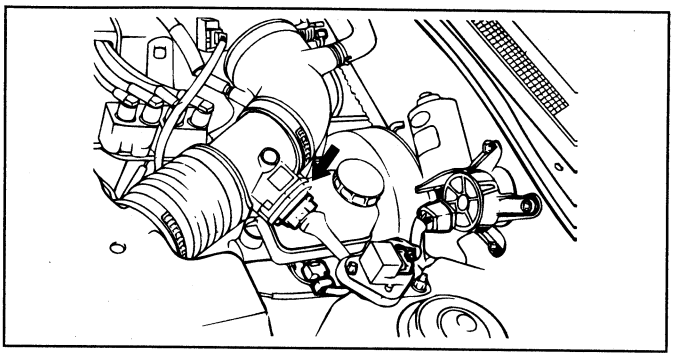
Check item	Check condition	Test specification
Mass air flow sensor output voltage	Idle rpm	0.5V
	2000 rpm	1.0V

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).**

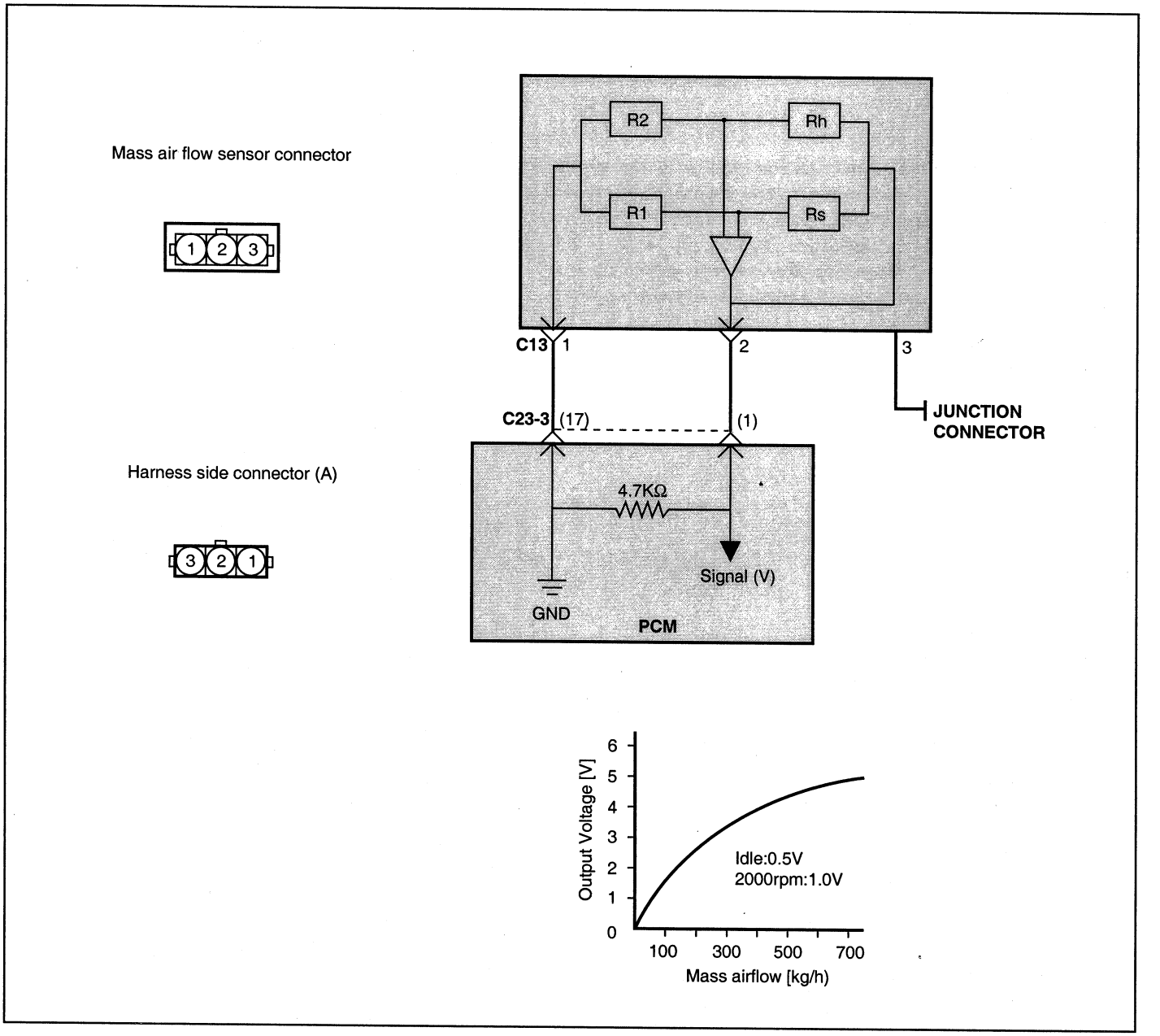
MASS AIR FLOW (MAF) SENSOR [2.7 V6] EFJB7090

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 because the change of the mass air flow rate causes 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 powertrain control module.



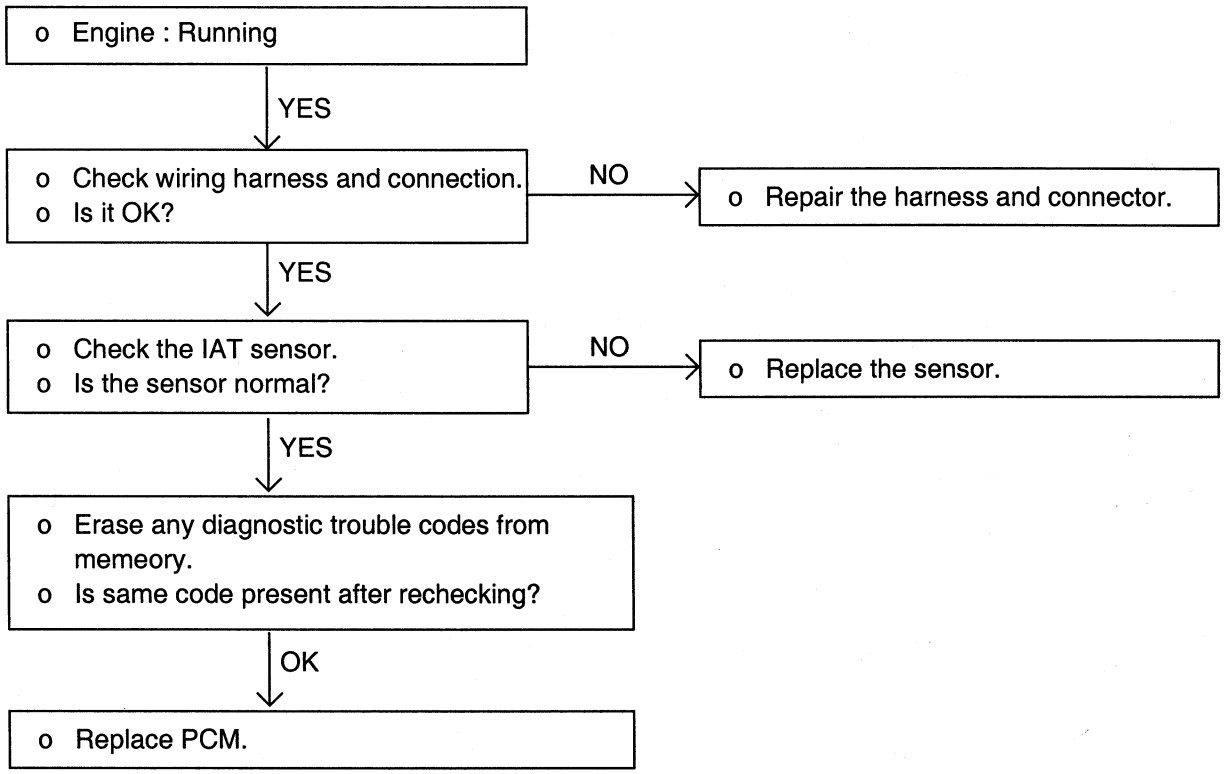
EFA9040A

CIRCUIT DIAGRAM <2.7 V6>



EFJB709A

TROUBLESHOOTING PROCEDURES



DTC : Diagnosis Trouble Code
PCM : Powertrain Control Module

EFAA709E

TROUBLESHOOTING HINTS

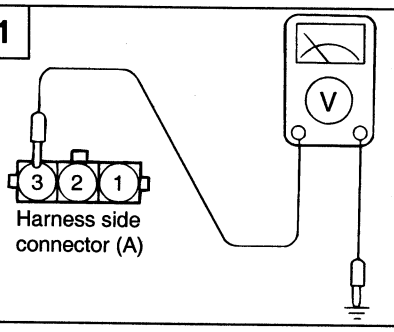
1. If the engine stalls occasionally, start the engine and shake the MAF sensor harness. If the engine stalls, check for poor contact at the MAF sensor connector.
2. If the MAF sensor output voltage is other than 0 when the ignition switch is turned on (do not start the engine), check for a faulty MAF sensor or PCM.
3. If the engine can 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 low compression.
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

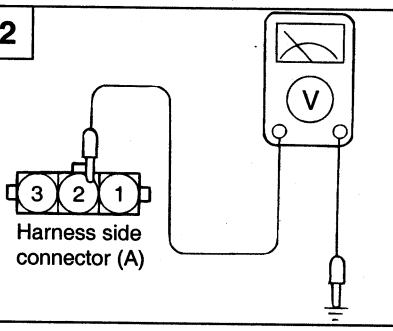
NOTE

1. **When the vehicle is new [within about 500 km (300 miles)], the mass air flow sensor reading 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).**

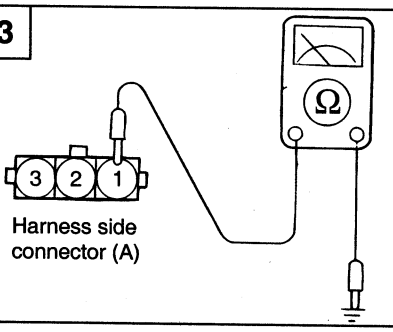
HARNESS INSPECTION PROCEDURE

1		Measure the power supply voltage. o Connector : Disconnected. o Ignition switch : ON. o Voltage (V) : Battery voltage.	**OK** ⇨ 2 **NG** ⇨ Repair the harness

EFHA709B

2		Check for an open circuit, or a short circuit to ground between the powertrain control module and the mass air flow sensor. o PCM connector : Disconnected. o Mass air sensor connector : Disconnected.	**OK** ⇨ 3 **NG** ⇨ Repair the harness

EFAA709C

3		Check for continuity of the ground circuit. o Connector : Disconnected.	**OK** ⇨ END ! **NG** ⇨ Repair the harness

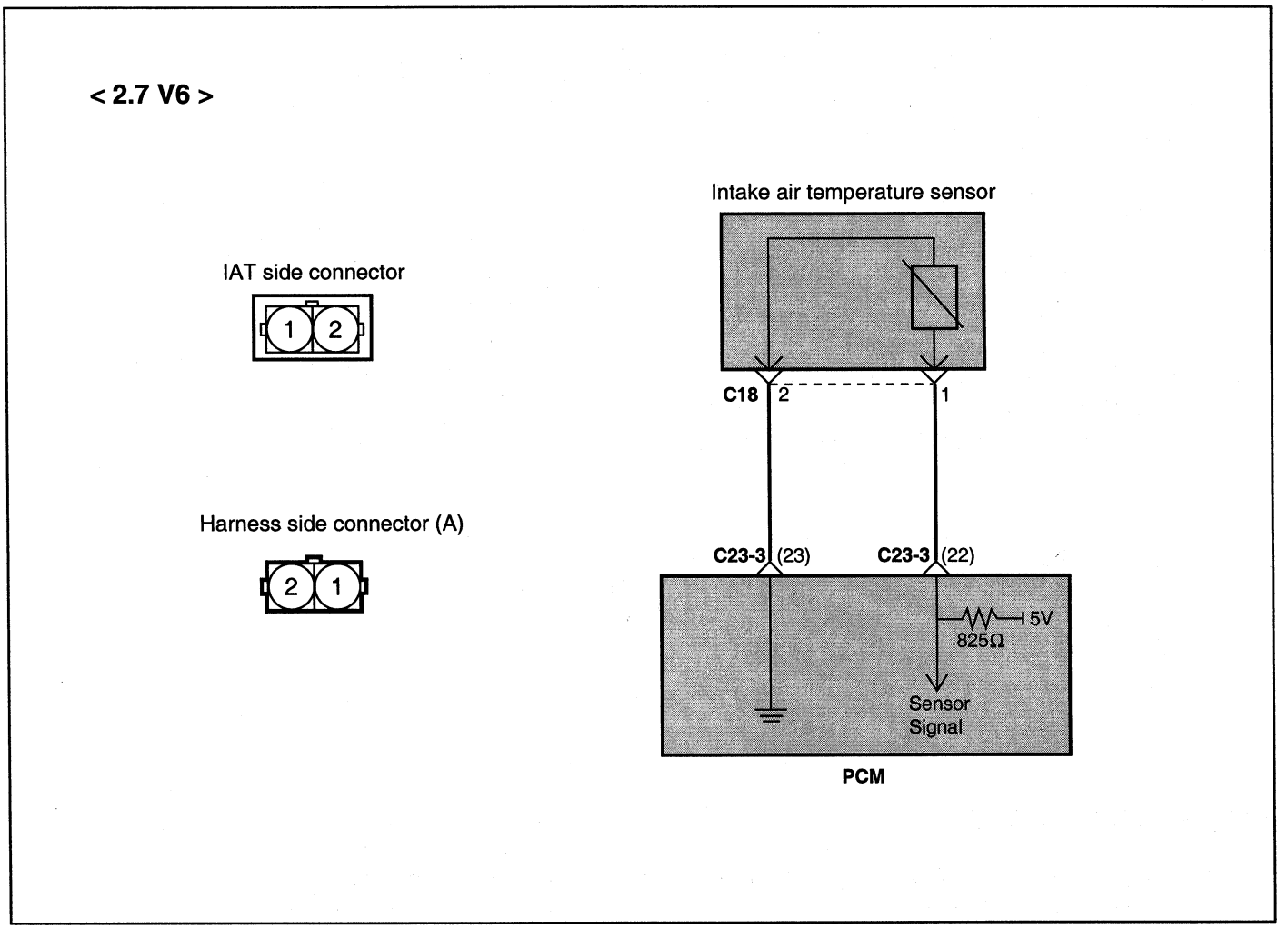
EFAA709D

INTAKE AIR TEMPERATURE (IAT) SENSOR EFJB7110

The intake air temperature sensor (IAT Sensor), located in the intake air hose, is a resistor-based sensor for detecting the intake air temperature. The intake air temperature information from the sensor helps the PCM provide the necessary fuel injection quantity.

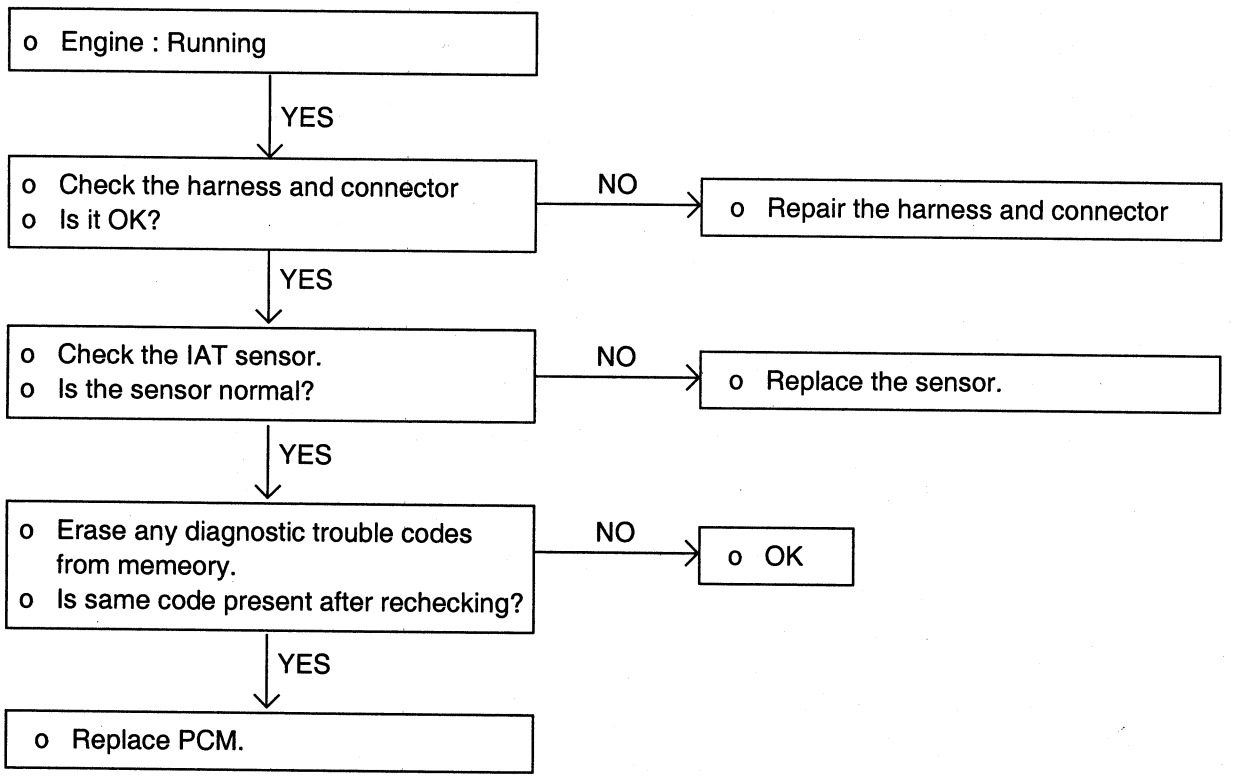
CIRCUIT DIAGRAM

< 2.7 V6 >



EFJB711A

TROUBLESHOOTING PROCEDURES



DTC : Diagnosis Trouble Code
PCM : Powertrain Control Module

EFAA711D

TROUBLESHOOTING HINTS

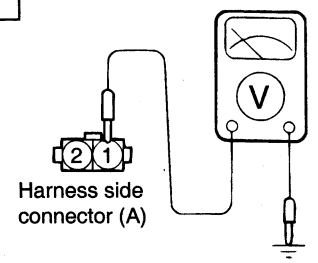
The MIL is ON or the DTC is displayed on the HI-SCAN under the following conditions:

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

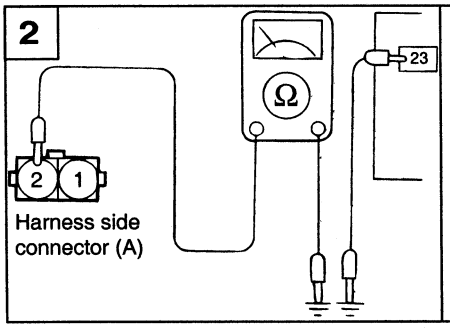
USING HI-SCAN

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. o Connector : Connected. o Ignition switch : ON. o Voltage : 4.8-5.2 V.	OK ⇒ 2 NG ⇒ Repair the harness.

EFJB711B

2		Check for an open circuit, or a short circuit to ground between the powertrain control module and the IAT sensor o PCM connector : Disconnected o IAT sensor connector : Disconnected	OK ⇒ END ! NG ⇒ Repair the harness.

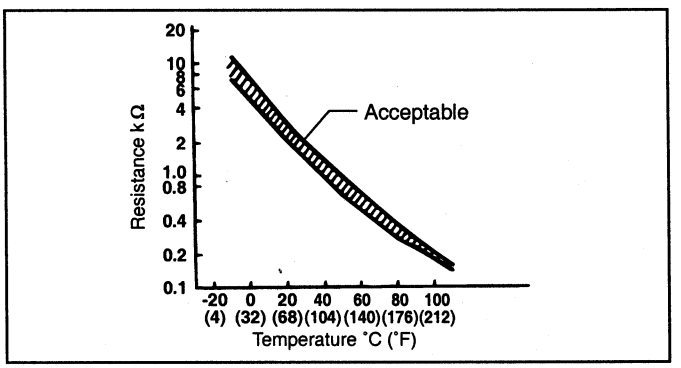
EFAA711C

SENSOR INSPECTION

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

IG.SW. ON	Temperature °C (°F)	Voltage (V)
	0 (32)	4.3V
	20 (68)	3.44V

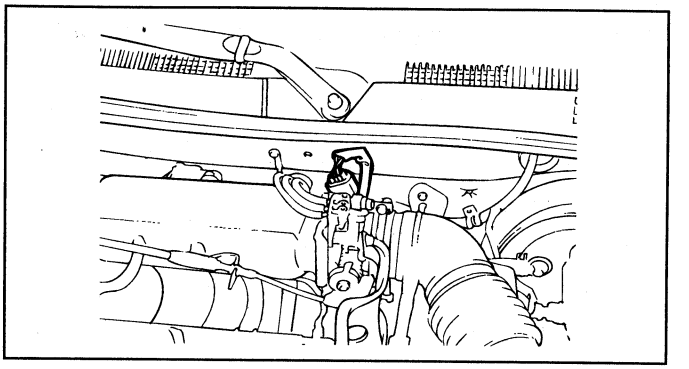
3. If the voltage deviates from the standard value, replace the intake air temperature sensor assembly.



EFJB703D

THROTTLE POSITION SENSOR (TPS) EFJB7130

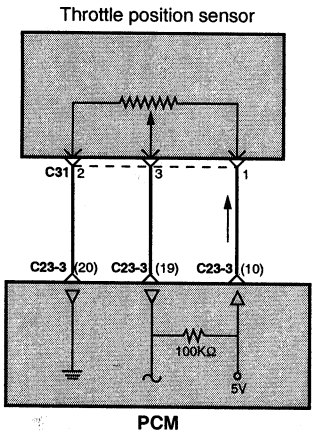
The TPS is a variable resistor type that rotates with the throttle shaft to sense the throttle valve angle. As the throttle shaft rotates, the output voltage of the TPS changes. The PCM detects the throttle valve opening based on this voltage change.

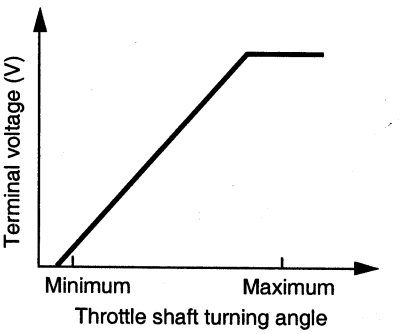


EFA9049A

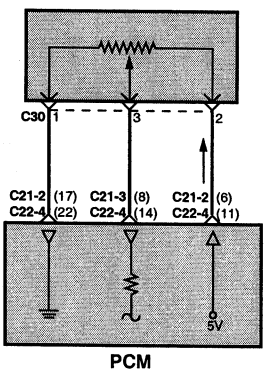
CIRCUIT DIAGRAM

< 2.7 V6>





< 2.4 I4 >



EFJB713A

SENSOR CHECKING

USING HI-SCAN

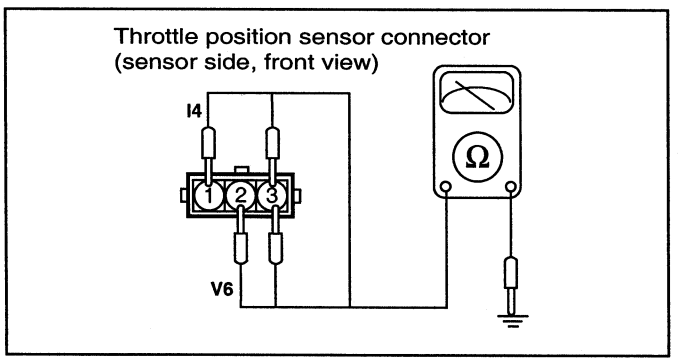
Check item	Data display	Check conditions	Throttle valve	Test specification
Throttle position sensor	Sensor voltage	Ignition switch : ON	At idle position	300-900 mV (2.4 I4) 250-800 mV (2.7 V6)
			Open slowly	Increases with valve opening
			Open wide	4,250-4,700 mV

Using voltmeter

1. Disconnect the throttle position sensor connector.
2. For 2.4 I4 measure the resistance between terminal 1 (sensor ground) and terminal 2 (sensor power), for 2.7 V6 between terminal 2 (sensor ground) and terminal 1 (sensor power).

Standard value : 3.5 - 6.5 kΩ

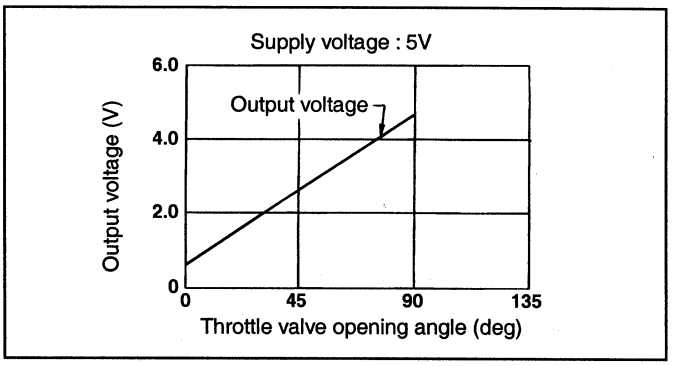
3. Connect a pointer type ohmmeter between terminal 1 (sensor ground) and terminal 3 (sensor output) for 2.4 I4 and between terminal 2 (sensor ground) and terminal 3 (sensor output) for 2.7 V6.



EFJB713E

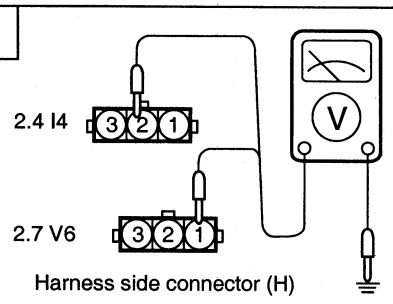
4. Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
5. If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

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

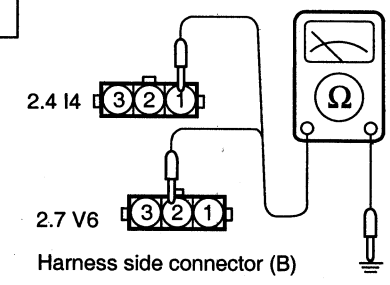


EFJB713F

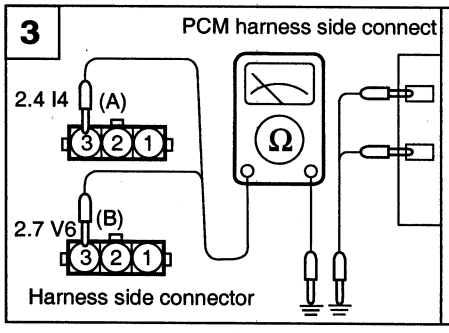
HARNESS INSPECTION

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

EFJB713B

2		Check for continuity of the ground circuit. o Connector : Disconnected	OK ⇒ 3 NG ⇒ Repair the harness.

EFJB713C

3		Check for an open-circuit, or a short-circuit or ground between the powertrain control module and the throttle position sensor. o Throttle position sensor connector : Disconnected o PCM connector : Disconnected	OK ⇒ END ! NG ⇒ Repair the harness. A3-C21-3 (8) A3-C22-4 (14) B3-C23-3 (19)

EFJB713D

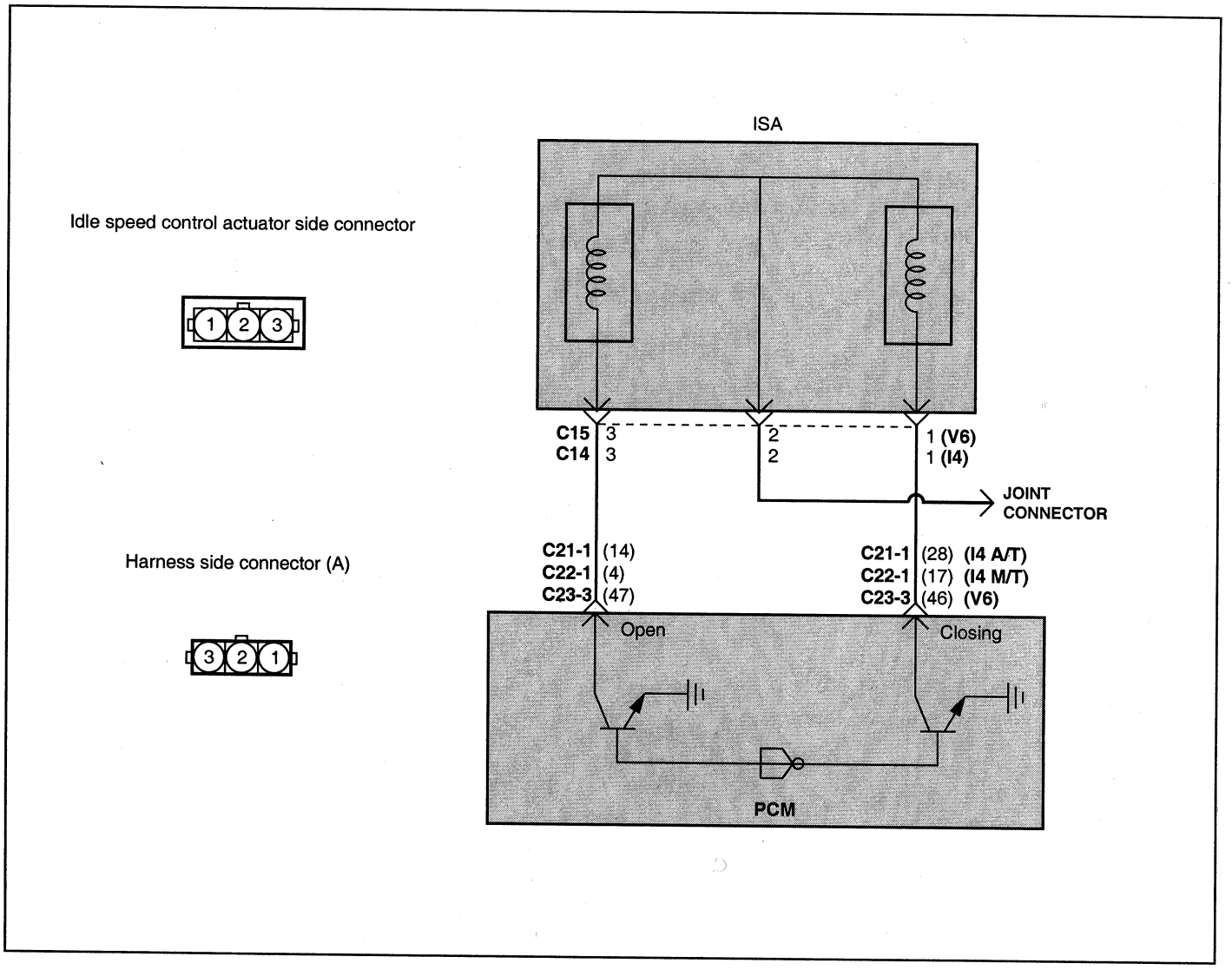
TROUBLESHOOTING HINTS

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 EFJB7170

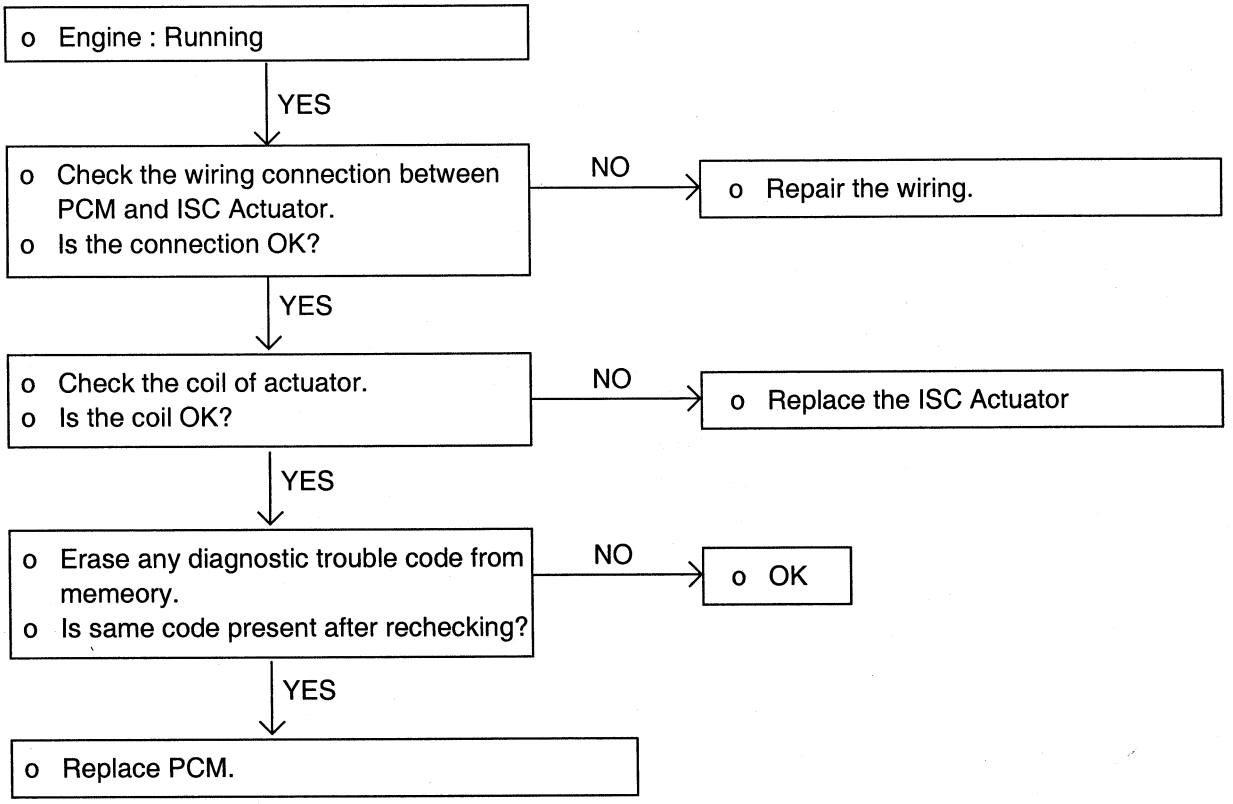
The idle speed control actuator is the double coil type. The two coils are driven by separate driver stages in the PCM. Depending on the pulse duty cycle, the equilibrium of the magnetic forces of the two coils will result in different angles of the motor. In parallel to the throttle valve, a bypass line is controlled by the idle speed actuator.

CIRCUIT DIAGRAM



EFJB717A

TROUBLESHOOTING PROCEDURES



DTC : Diagnosis Trouble Code
PCM : Powertrain Control Module

EFAA717E

TROUBLESHOOTING HINTS

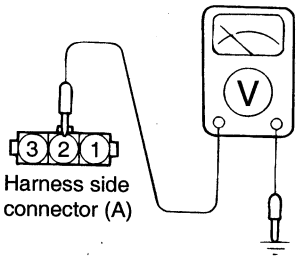
The MIL turns ON or the DTC is displayed on the HI-SCAN PRO under the following conditions;

- When the primary voltage side in PCM is in short or open circuit.
- The ignition control by the PCM is malfunctioning.
- Open or short circuit is observed in idle air control system when ignition switch is turned on.

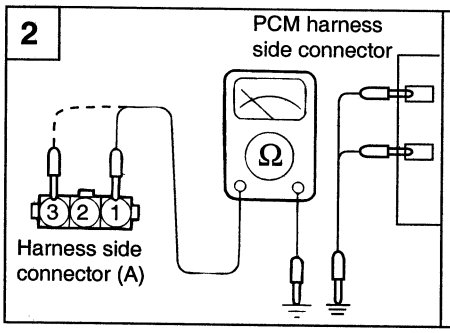
USING HI-SCAN

Check item	Check condition	HI-SCAN display	Type
Idle speed control actuator o Actuator	Start the engine	ISA	Activate Result: RPM should increase or decrease

HARNESS INSPECTION PROCEDURE

1		Measure the power supply voltage of the actuator. o Connector: Disconnected o Ignition switch: ON o Voltage (V): Battery voltage	OK ⇒ 2 NG ⇒ Repair the harness. Check the power supply

EFHA717B

2		Check for an open circuit, or a short circuit to ground between the PCM and the idle speed control actuator. o PCM connector : Disconnected o Idle speed actuator connector : Disconnected	OK ⇒ END ! NG ⇒ Repair the harness. <CLOSING> A1-C21-1(28) A1-C22-1(17) A1-C74-3(46) <OPEN> A3-C21-1(14) A3-C22-1(4) A3-C23-3(47)

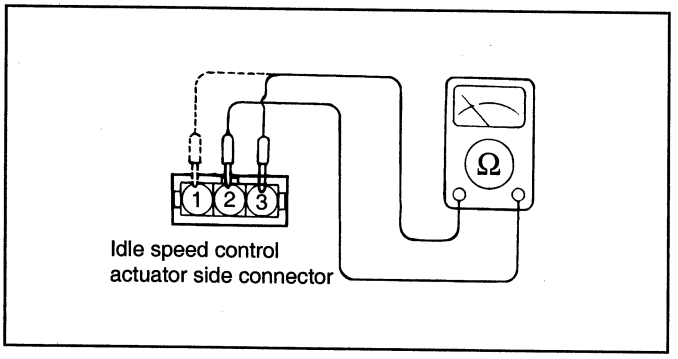
EFJB717C

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. Re-connect the connector to the idle speed control actuator



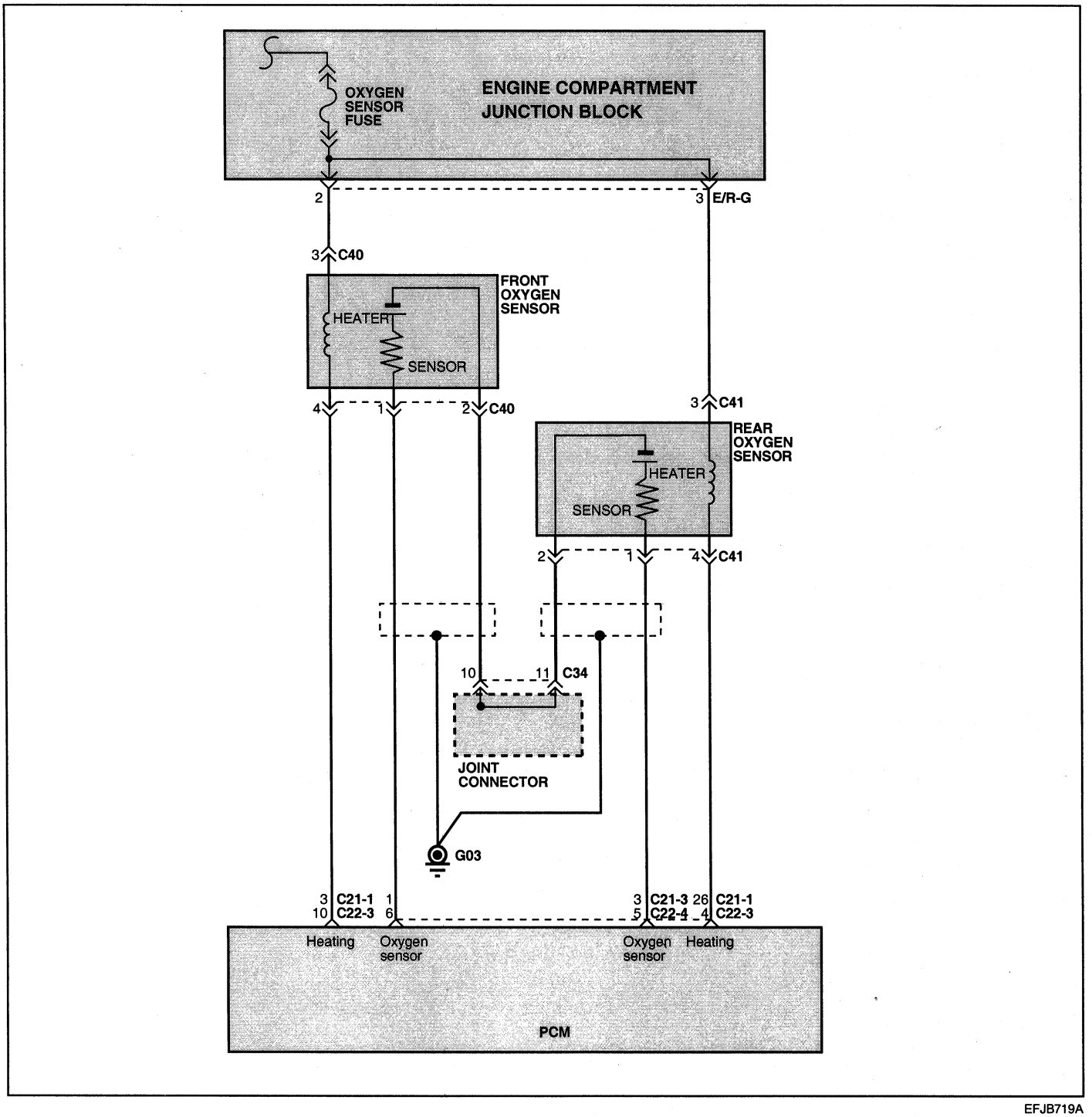
EFAA717D

HEATED OXYGEN SENSOR (HO2S)

- I4 EFJB7190

The heated oxygen sensor senses the oxygen concentration in exhaust gas and converts it into a voltage which is sent to the PCM. For Zirconium type sensors, (I4) 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 PCM controls the fuel injection ratio based on this signal so that the air fuel ratio is maintained at the stoichiometric ratio. The oxygen sensor has a heating element which ensures sensor performance during all driving conditions.

CIRCUIT DIAGRAM <2.4 I4>



EFJB719A

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 (I4)
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 PCM)	Idle	400 mV or lower - (oscilate) 600-1,000 mV
		2,000 rpm	

INSPECTION

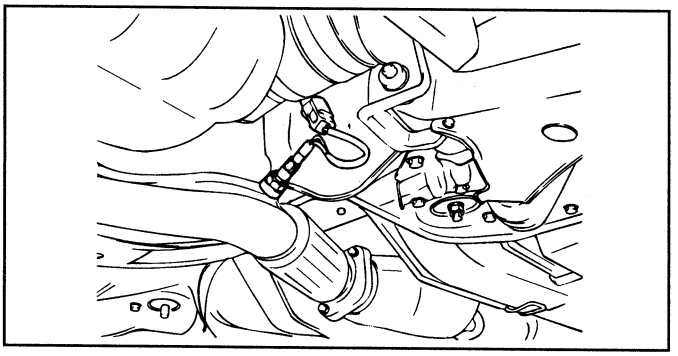
NOTE

- **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



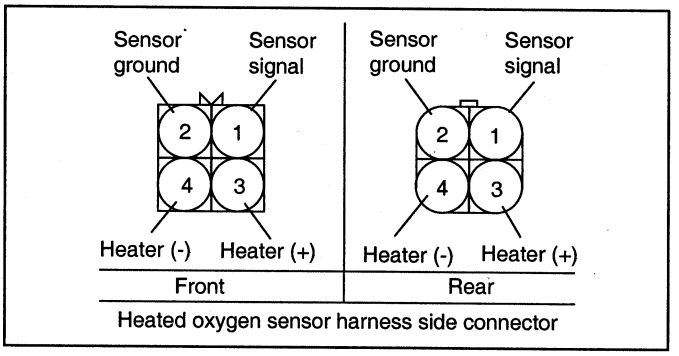
EFAA719E

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 terminals 1 and 2 are connected to any voltage.

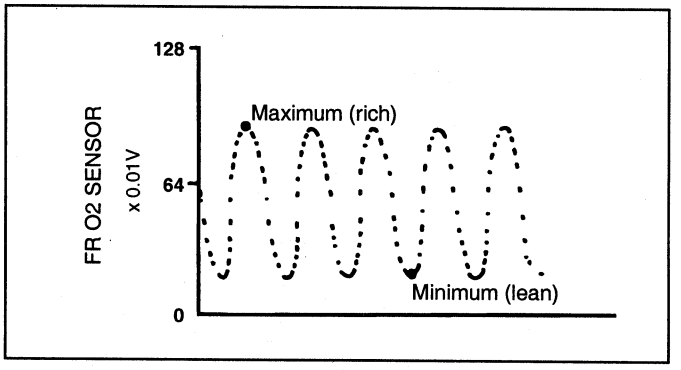
4. Connect a high-impedance digital-type volmeter between terminal 1 and terminal 2.



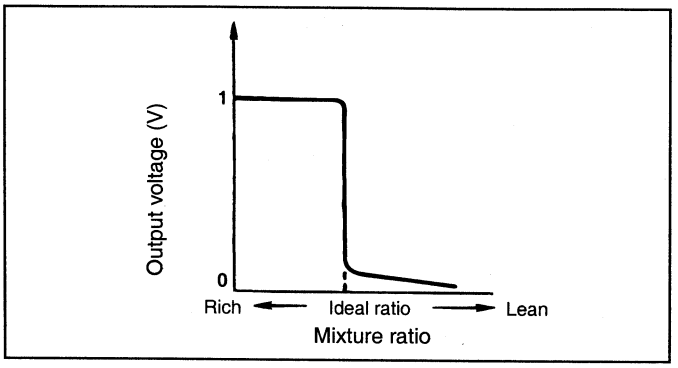
EFAA719F

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

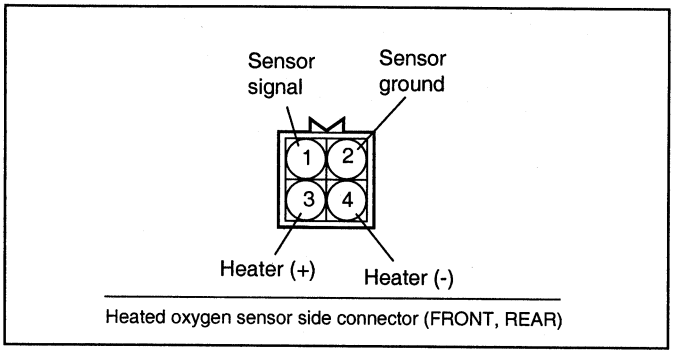
Engine	Oxygen sensor output voltage	Resistance (Ω)
Race	Min. 0.6V	30 or more



EFJB719H



EFJB719I



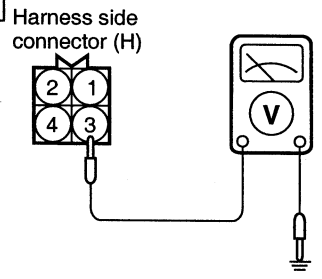
EFAA719G

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)

HARNESS INSPECTION PROCEDURES

1



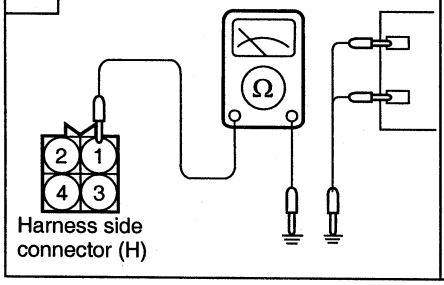
Measure the power supply voltage of the heated oxygen sensor.
o Connector: Disconnected
o Ignition switch: ON
o Voltage (V): Battery voltage

OK ⇒ **2**

NG ⇒ Repair the harness.

EFHA719B

2



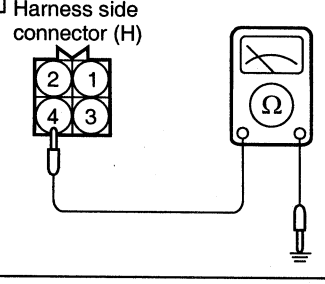
Check for open circuit, or a short circuit to ground between the PCM and the oxygen sensor.
o Oxygen sensor connector : Disconnected
o PCM connector : Disconnected

OK ⇒ **3**

NG ⇒ Repair the harness.

EFHA719C

3



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

OK ⇒ **END !**

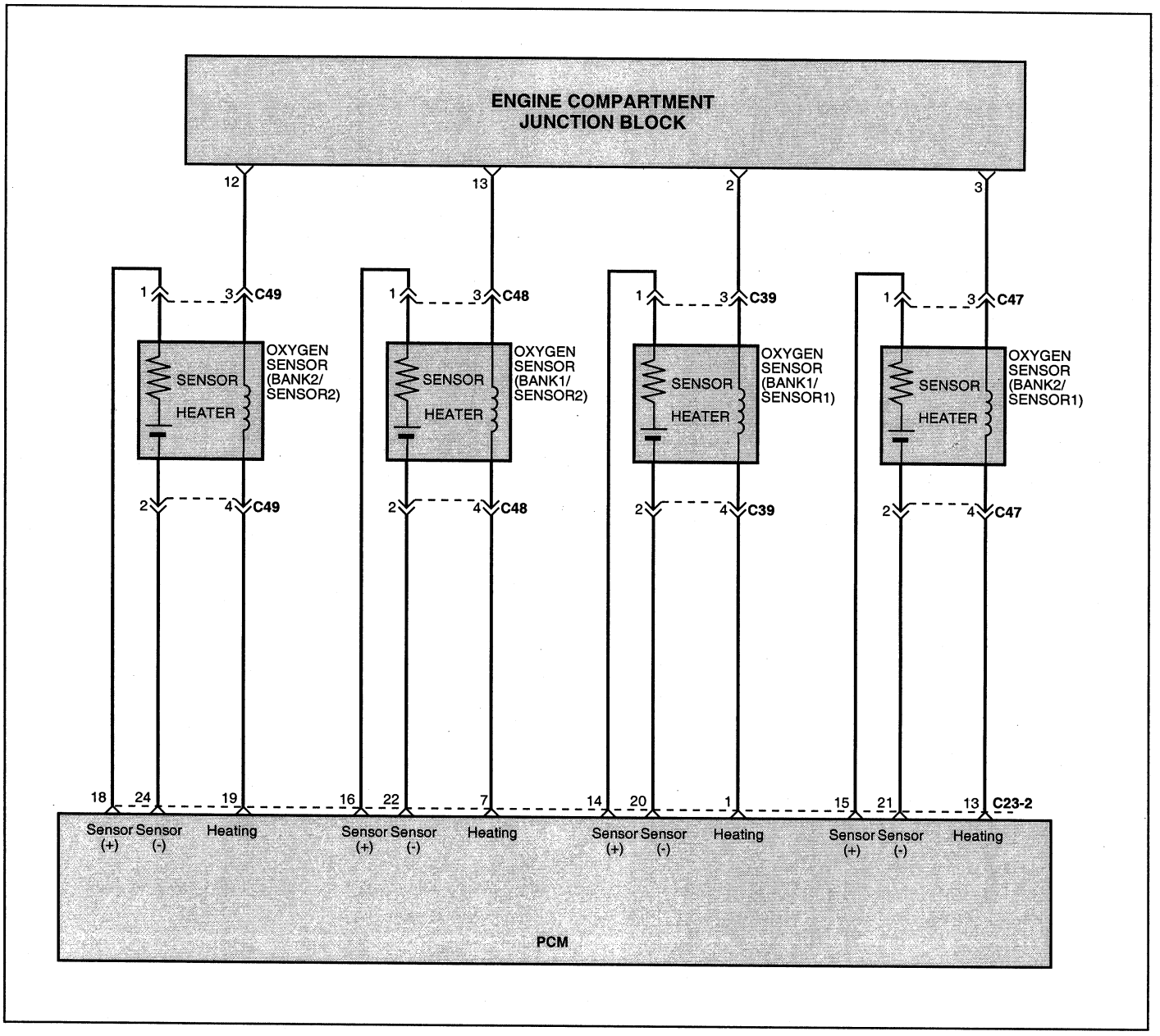
NG ⇒ Repair the harness.

EFHA719D

HEATED OXYGEN SENSOR (HO2S) [2.7 V6] EFJB7210

The heated oxygen sensor senses the oxygen concentration in exhaust gas and converts it into a voltage which is sent to the PCM. 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 PCM controls the fuel injection ratio based on this signal so that the air fuel ratio is maintained at the stoichiometric ratio. The oxygen sensor has a heating element which ensures sensor performance during all driving conditions.

CIRCUIT DIAGRAM



EFJB721A

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	4000-4500 mV
		When engine is suddenly raced	500-1000 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 PCM)	At Idle rpm	500-4500 mV
		2,000 rpm	500-4500 mV

INSPECTION (USING VOLTMETER)

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

Standard value

Temperature °C (°F)	Resistance (Ω)
23	4.0 - 5.2
400 (752)	8.2 - 11.1

NOTE

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

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

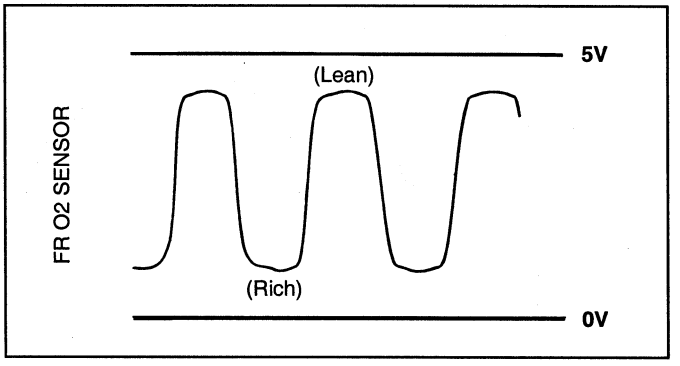
NOTE

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

3. Connect a digital-type voltmeter between terminal 1 and terminal 2.

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

Engine	Oxygen sensor output voltage	Remarks
Race	4000-4500mV	Makes the air/fuel mixture rich by increasing engine speed



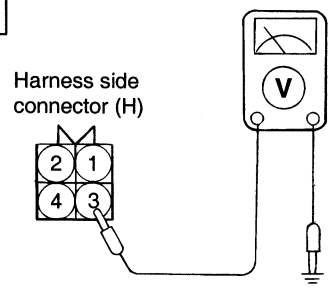
EFJB719X

5. 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



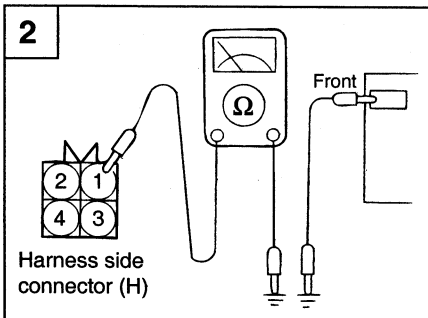
Measure the power supply voltage of the heated oxygen sensor.
- o Connector : Disconnected
- o Ignition switch : ON
- o Voltage (V) : Battery voltage

OK ⇨ **2**

NG ⇨ Repair the harness.

EFHA721B

2



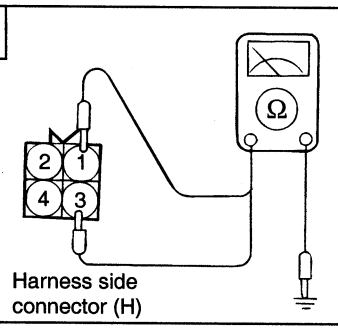
Check for open circuit, or a short circuit to ground between the powertrain control module and the heated oxygen sensor.
- o Heated oxygen sensor connector: Disconnected
- o PCM connector : Disconnected

OK ⇨ **3**

NG ⇨ Repair the harness.

EFJB721C

3



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

OK ⇨ **END !**

NG ⇨ Repair the harness.

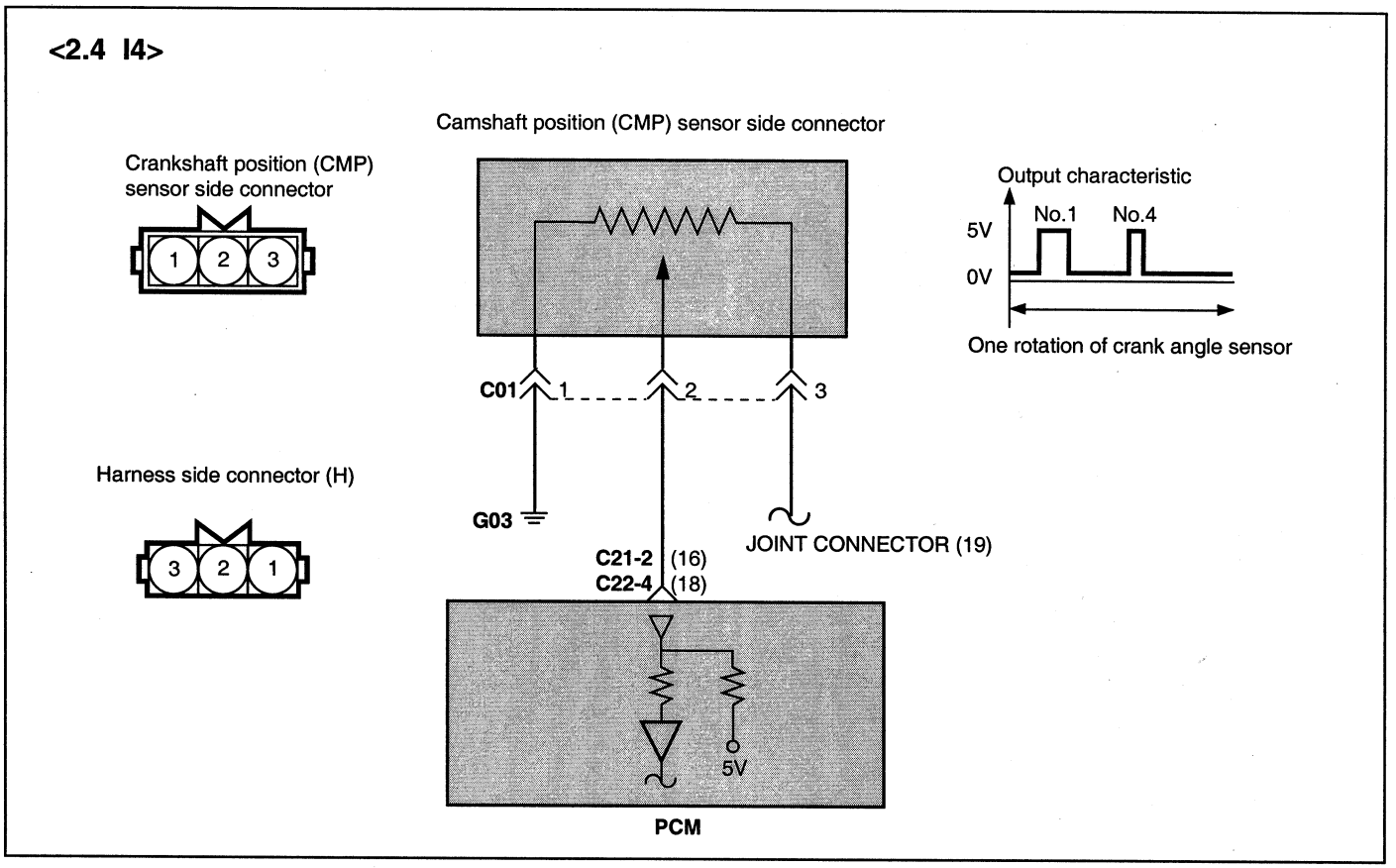
EFHA721D

CAMSHAFT POSITION SENSOR EFJB7230

The CMP is a Hall-effect sensor that detects the camshaft position on the compression stroke of the No.1 and No.4 cylinders, converts it into a pulse signal, and inputs it to the PCM. The PCM then computes the fuel injection sequence, etc. based on the input signal.

CIRCUIT DIAGRAM

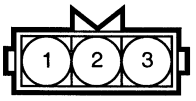
<2.4 I4>

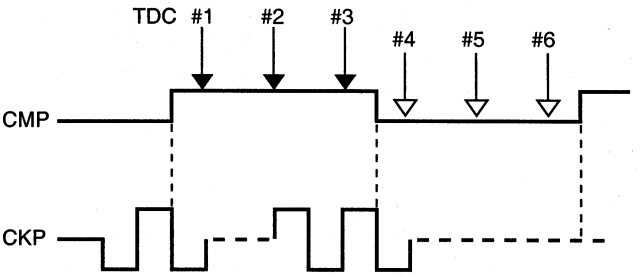


EFJB723A

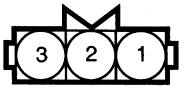
<2.7 V6>

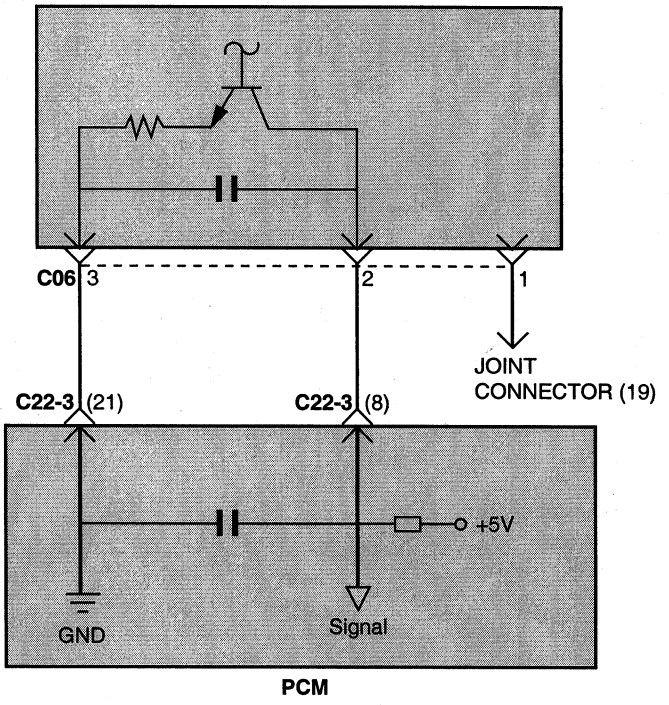
CMP Sensor side connector





Harness side connector (H)

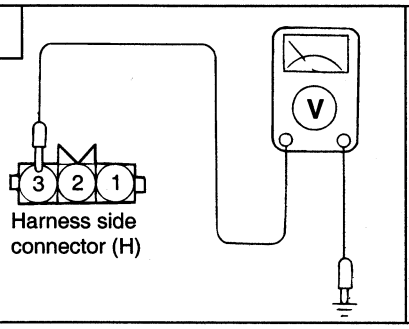




EFJB723E

HARNESS INSPECTION PROCEDURE [2.4 I4]

1



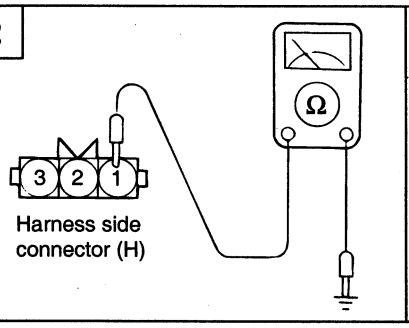
Measure the power supply voltage.
o Connector: Disconnected
o Ignition switch: ON
o Voltage (V): Battery voltage

OK ⇒ 2

NG ⇒ Repair the harness.

EFHA723B

2



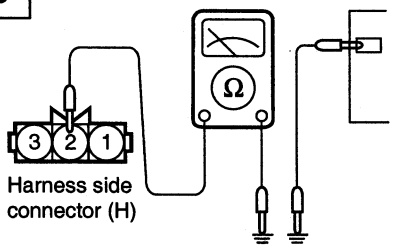
Check for continuity of the ground circuit.
o Connector : Disconnected

OK ⇒ 3

NG ⇒ Repair the harness.

EFHA723C

3



Check the signal voltage.
o Connector: Disconnected
o Ignition switch : ON
o Voltage : 4.8-5.2 V

OK ⇒ END !

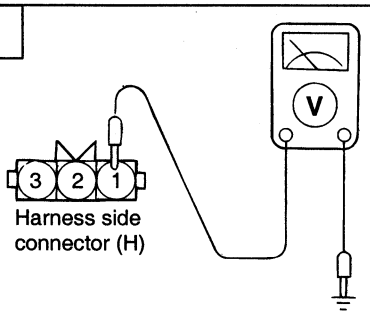
NG ⇒ Repair the harness.

EFHA723D

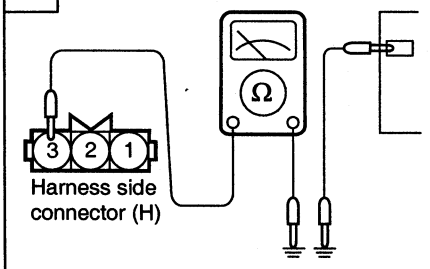
TROUBLESHOOTING HINTS

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

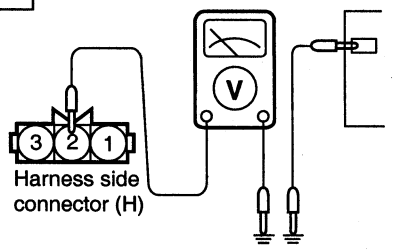
HARNESS INSPECTION PROCEDURE [2.7 V6]

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

EFAA723F

2		Check for continuity of the ground circuit. o Connector : Disconnected	OK ⇒ 3 NG ⇒ Repair the harness.

EFHA723G

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

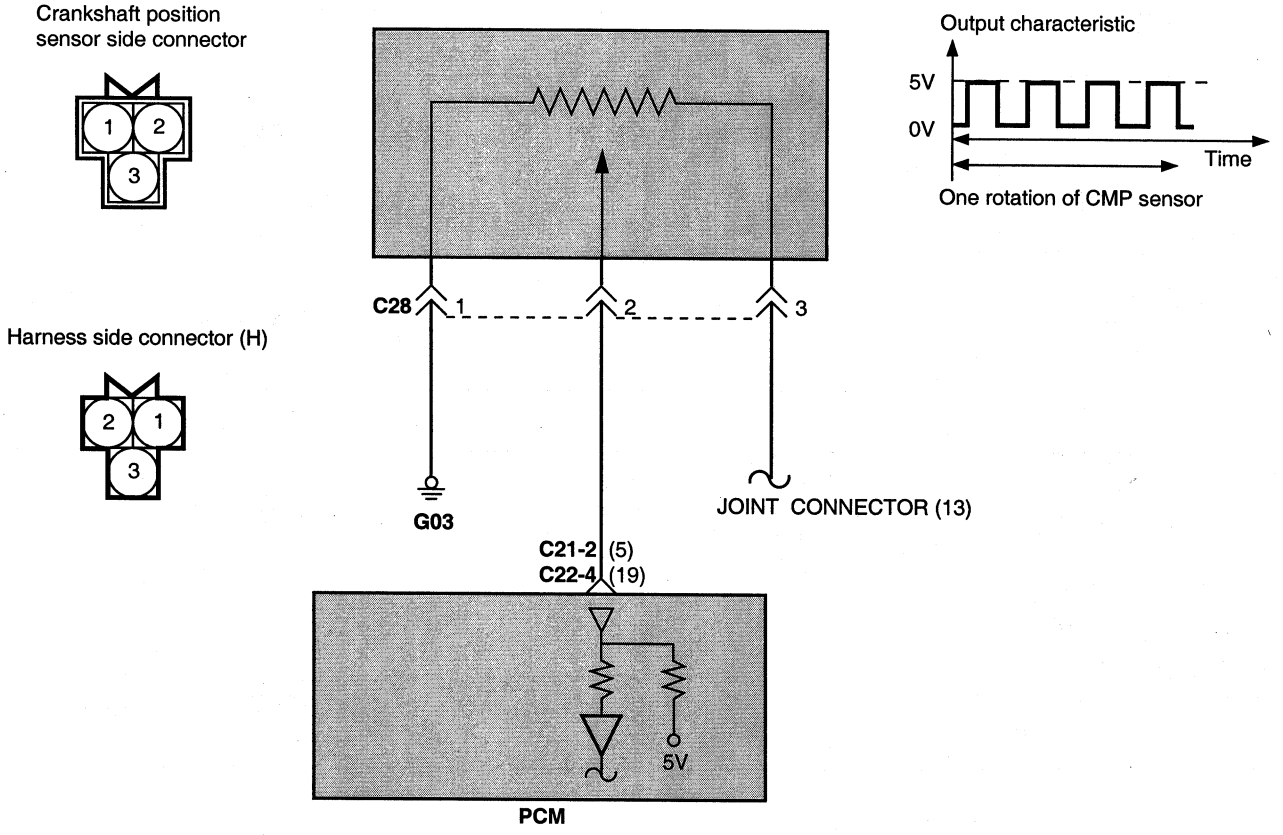
EFHA723H

CRANKSHAFT POSITION SENSOR EFJB7250

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

CIRCUIT DIAGRAM

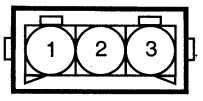
[2.4 I4]

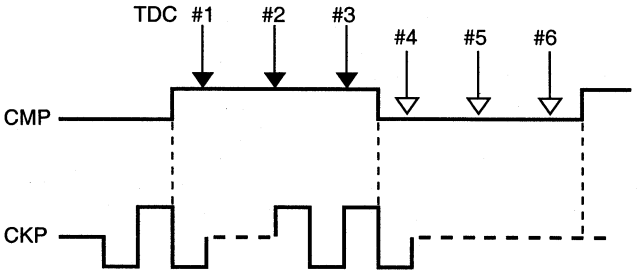


EFJB725A

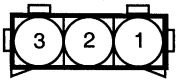
<2.7 V6>

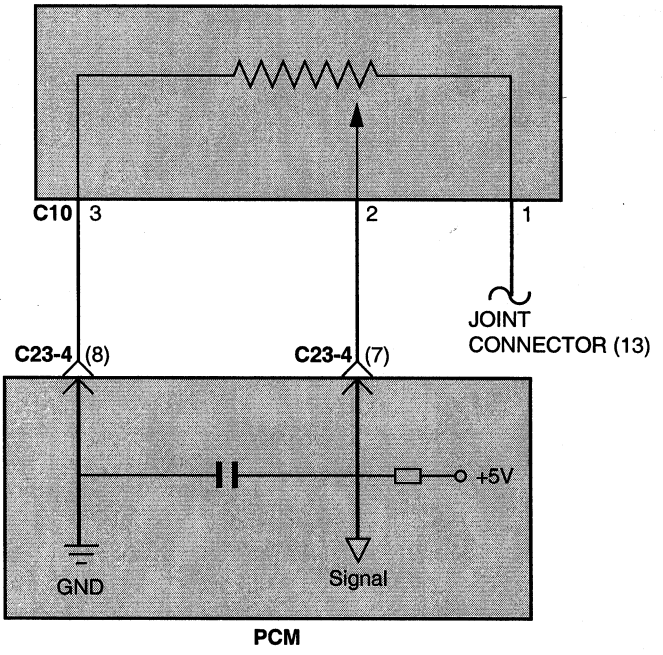
CMP Sensor side connector





Harness side connector (H)





EFJB725B

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
4. The engine will run without a crank angle sensor signal, but will not start. Once the sensor detects TDC, the data is stored until the next re-start.

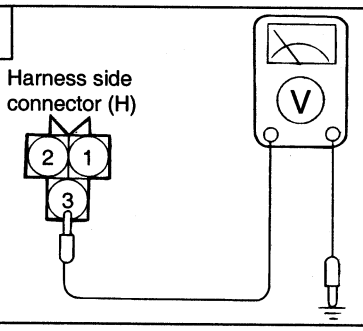
USING GST

Check Item	Check conditions	Check content	Normal state
Crankshaft position sensor	• Engine cranking • 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 • 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 <2.4 I4>

1



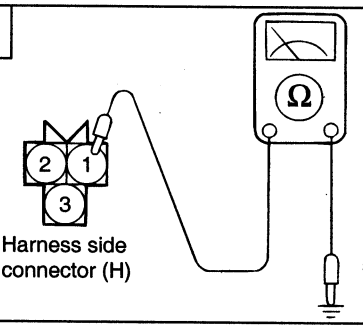
Measure the power supply voltage.
o Connector: Disconnected
o Ignition switch: ON
o Voltage (V): Battery voltage

OK ⇒ 2

NG ⇒ Repair the harness.

EFAA725C

2



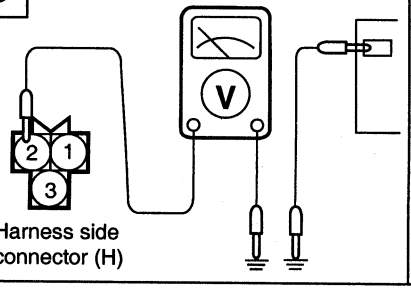
Check for continuity of the ground circuit.
o Connector : Disconnected

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

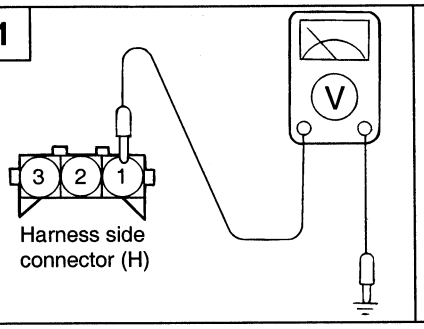
OK ⇒ **END !**

NG ⇒ Repair the harness.

EFHA725E

HARNESS INSPECTION PROCEDURE <2.7 V6>

1



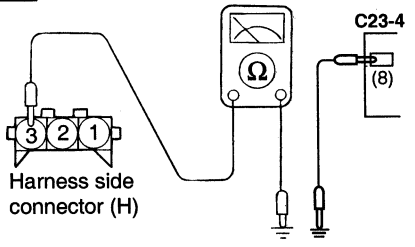
Measure the power supply voltage.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage (V): Battery voltage

OK ⇒ 2

NG ⇒ Repair the harness.

EFAA725F

2



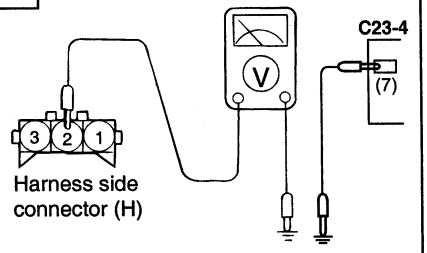
Check for continuity of the ground circuit.
- o Connector : Disconnected
- o Continuity

OK ⇒ 3

NG ⇒ Repair the harness.

EFJB725G

3



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

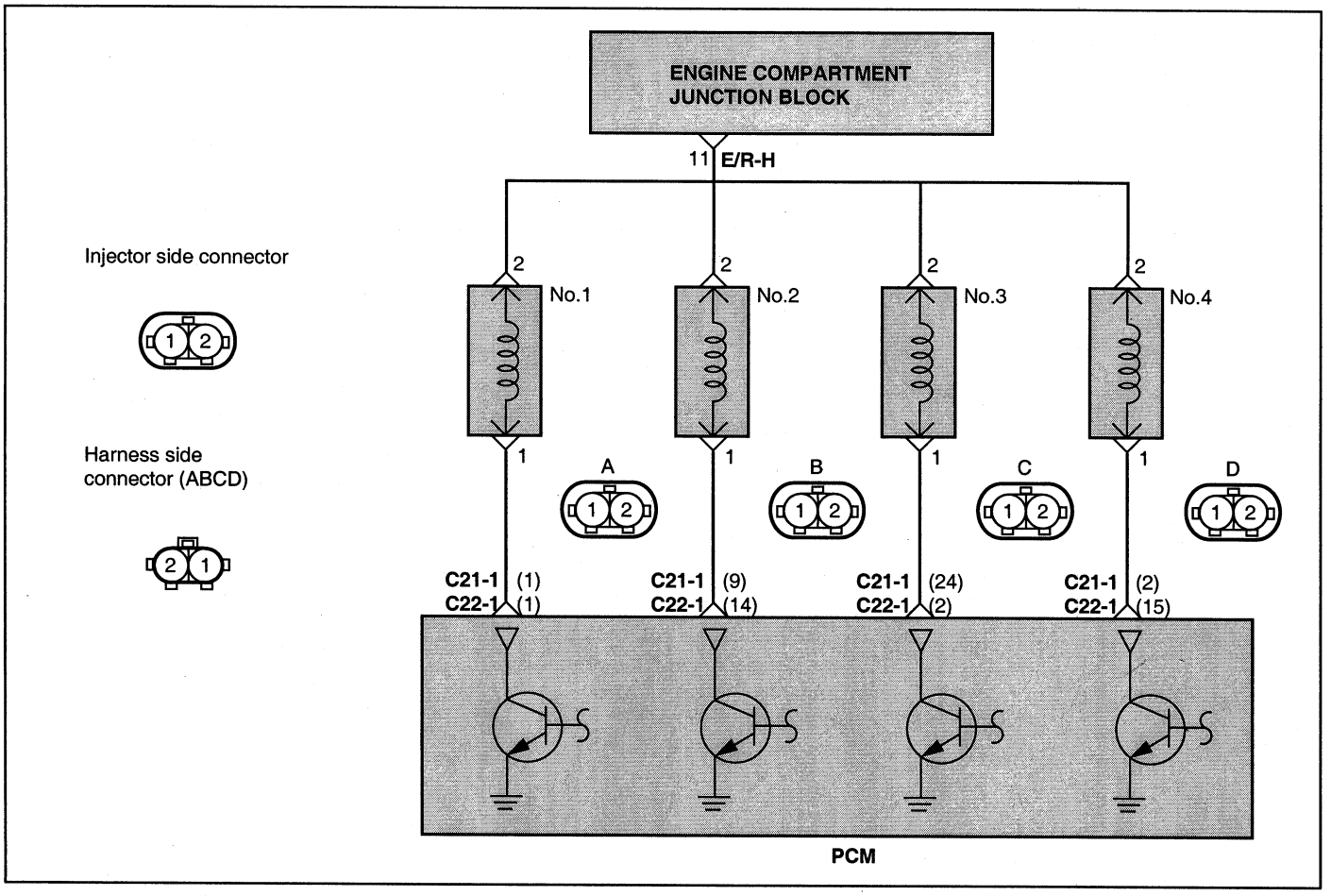
OK ⇒ END !

NG ⇒ Repair the harness.

EFJB725H

FUEL INJECTOR [2.4 I4] EFJB7270

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



EFJB727A

INJECTOR CHECKING

USING HI-SCAN PRO

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

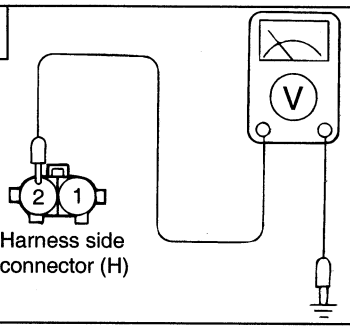
Check Item	Data display	Check conditions	Engine state	Test specification
Injector	Drive time	• Engine coolant temperature: 80 to 95°C (176 to 205°F) • Lamps, electric cooling fan, accessory modules: All OFF • Transaxle: Neutral (P range for vehicle with A/T) • Steering wheel: Neutral	Idle rpm	2.2-2.9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

NOTE

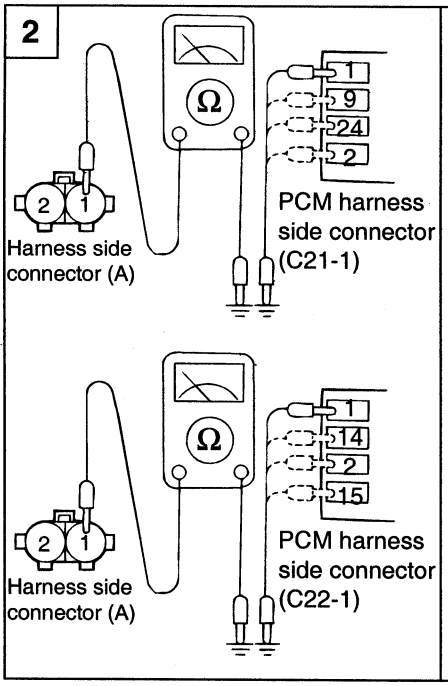
1. **The injector drive time is when the supply voltage is (greater than) 11V and the cranking speed is less than 250 rpm.**
2. **When the engine coolant temperature is lower than 0°C (32°F), the PCM fires all four cylinders simultaneously.**
3. **When the vehicle is new (within initial operation of 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 • 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		

HARNESS INSPECTION

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

EFAA727B

2 	Check for an open circuit, or a short circuit to ground between the powertrain control module and the injector. o PCM connector : Disconnected o Injector connector : Disconnected	OK ⇒ END ! NG ⇒ Repair the harness.

EFHA727C

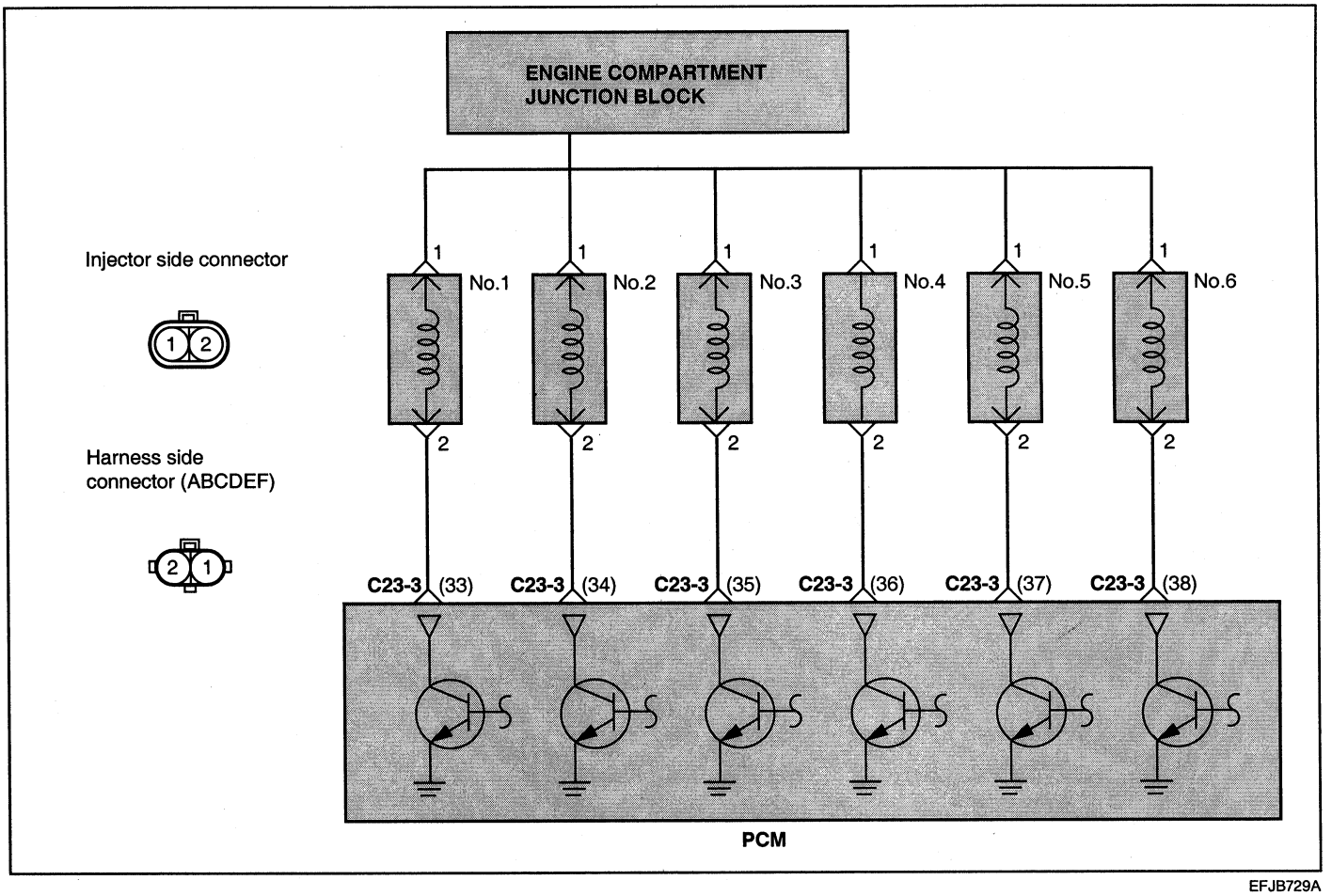
TROUBLESHOOTING HINTS

1. If the engine is hard to start when hot, check for fuel pressure and injector leaks.
2. If the injectors do not operate when the engine is cranked, then check the followings:
   - Defective power supply circuit to the PCM, faulty ground circuit
   - Defective control relay
   - Defective crankshaft position (CKP) sensor or camshaft position (CMP) sensor
3. If there is any cylinder whose idle state remains unchanged when the fuel injectors are cut one after another during idling, check for the following items about that 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] EFJB7290

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

CIRCUIT DIAGRAM



EFJB729A

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) • Lamps, electric cooling fan, accessory modules: All OFF • Transaxle: Neutral (P range for vehicle with A/T) • 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 PCM 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 • 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		

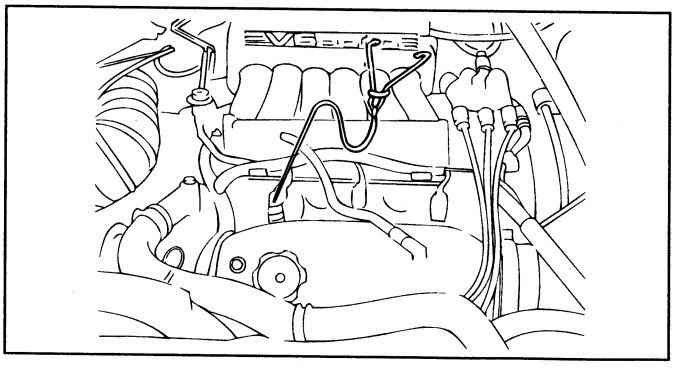
USING STETHOSCOPE AND VOLTMETER

Operation Sound Check

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

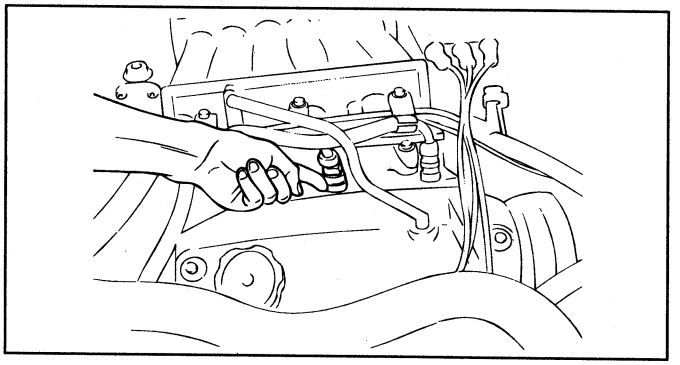
NOTE

Ensure that the sound from an adjacent injector is not being transmitted along 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 PCM.



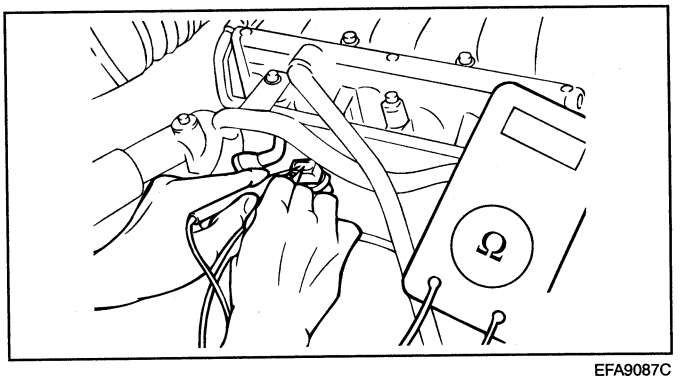
EFA9087B

Resistance Measurement Between Terminals

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

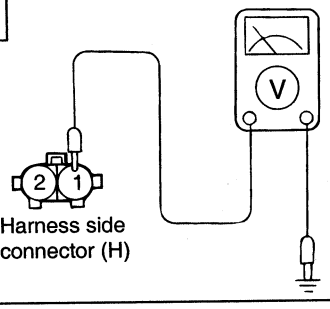
Standard value : 13–16Ω[at20°C(68°F)]

5. Re-connect the connector to the injector.

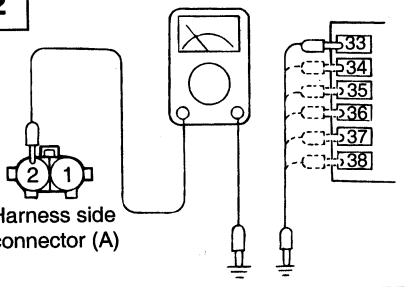


EFA9087C

HARNESS INSPECTION

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

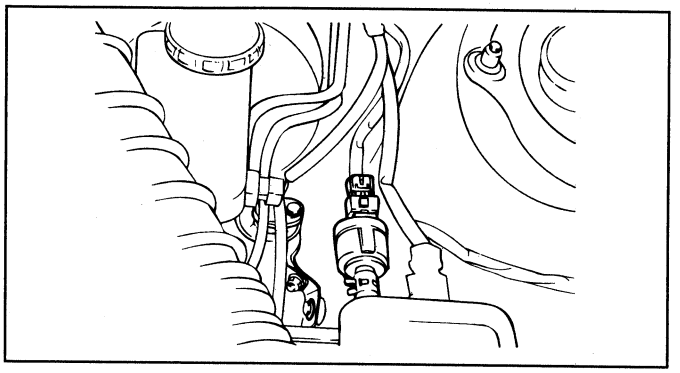
EFHA729B

2  Harness side connector (A)	Check for an open circuit, or a short circuit to ground between the powertrain control module and the injector. o PCM connector : Disconnected o Injector connector : Disconnected	OK ⇨	END !
		NG ⇨	Repair the harness.

EFHA729C

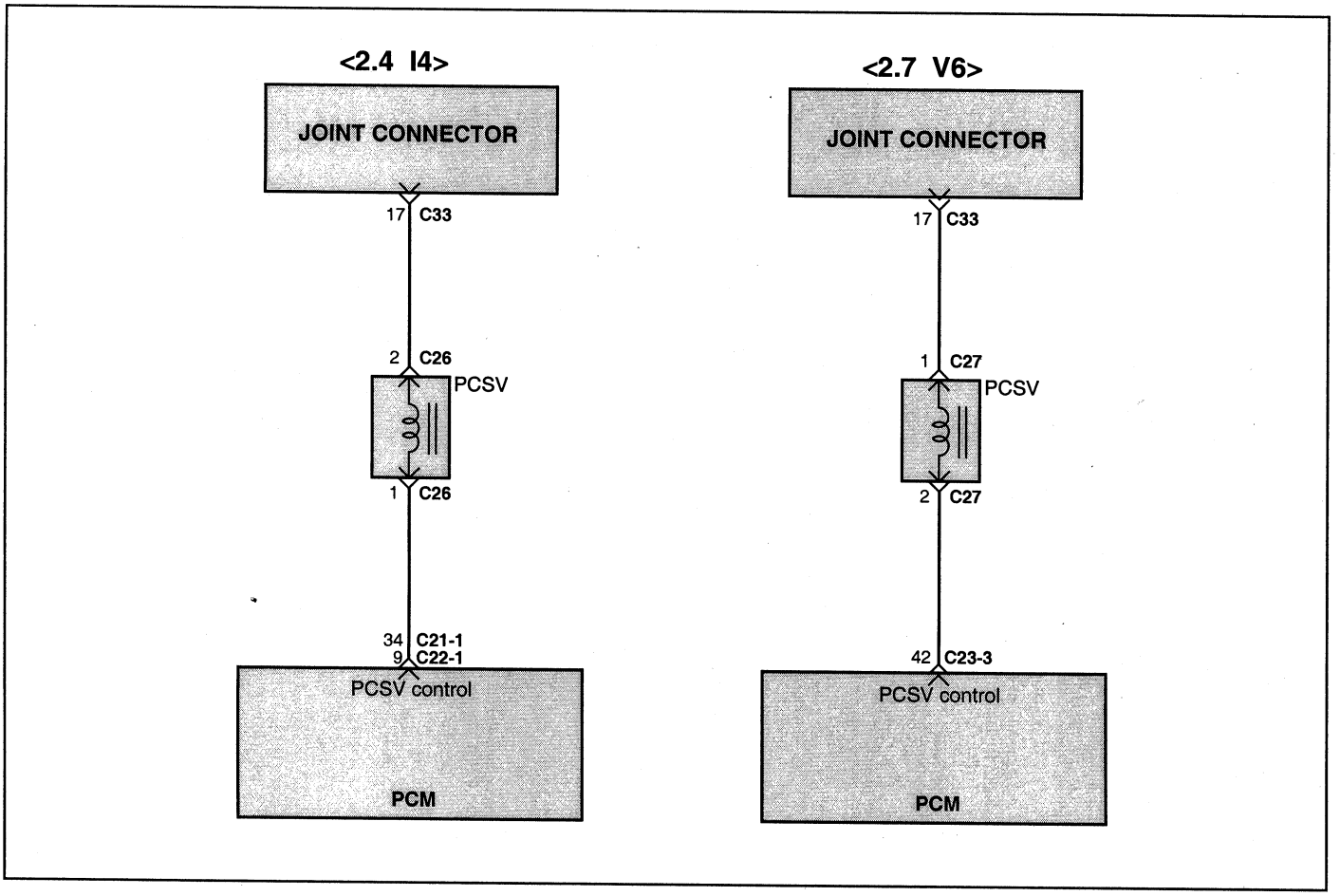
EVAPORATIVE EMISSION CANISTER PURGE CONTROL SOLENOID VALVE EFJB7310

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



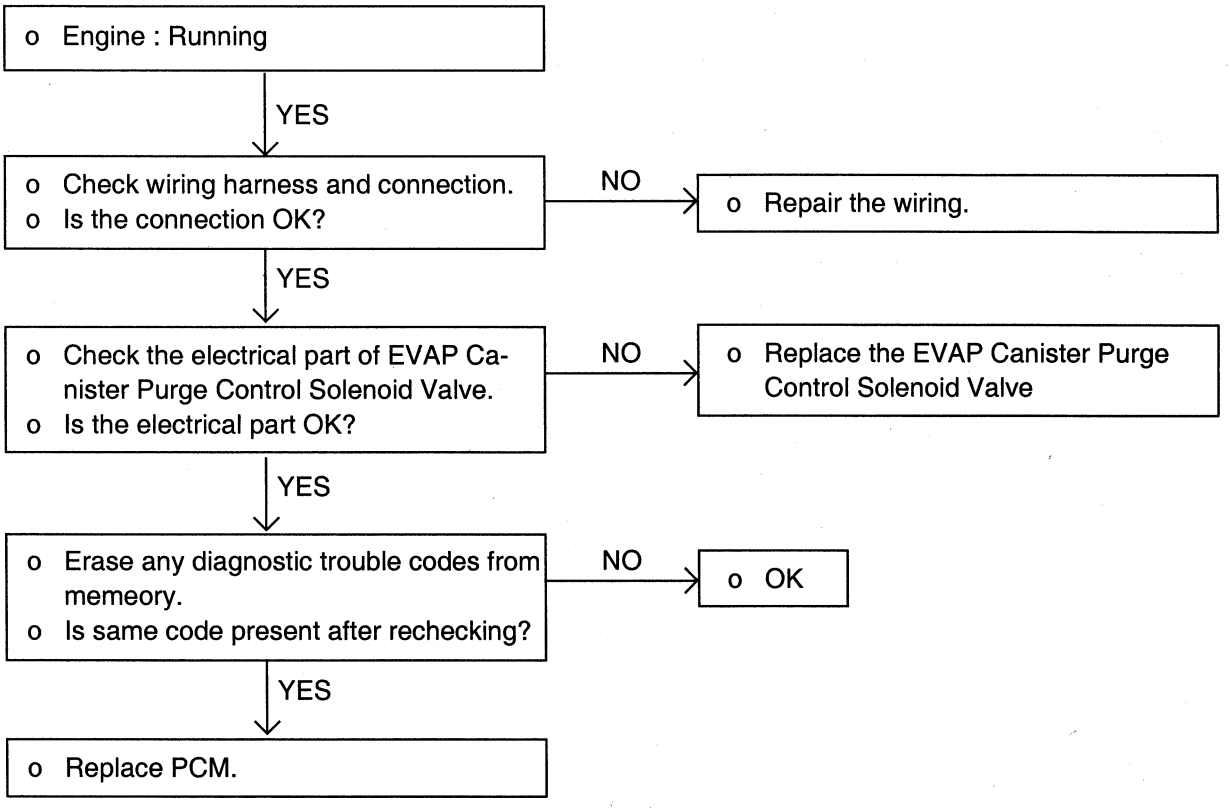
EFA9089A

CIRCUIT DIAGRAM



EFJB731A

TROUBLESHOOTING PROCEDURES

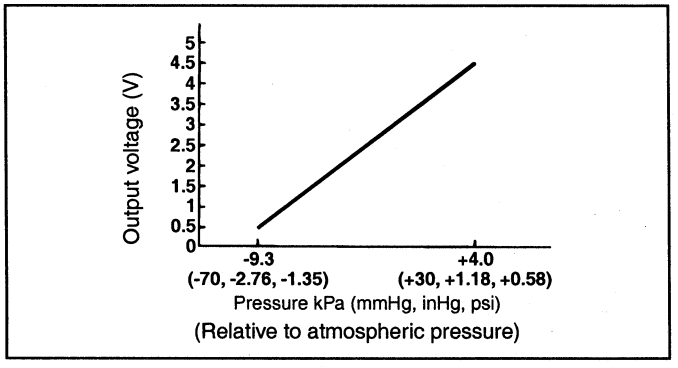


DTC : Diagnosis Trouble Code
PCM : Powertrain Control Module

EFAA731B

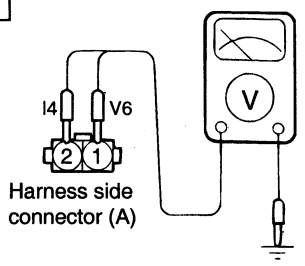
USING HI-SCAN

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

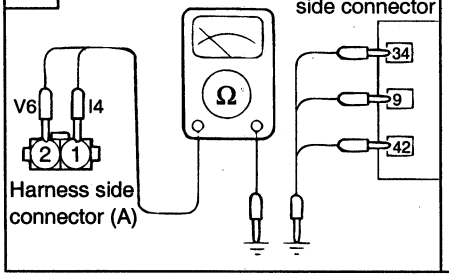


EFJB731E

HARNESS INSPECTION

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

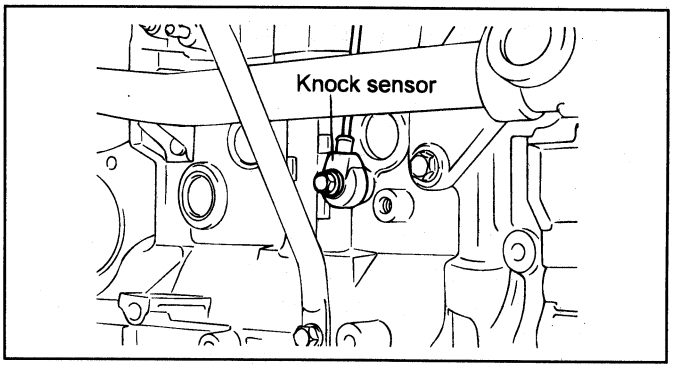
EFHA731C

2		Check for an open circuit, or a short circuit to ground between the evaporative emission canister purge solenoid valve and the powertrain control module. o PCM connector : Disconnected o Evaporative emission canister purge solenoid valve connector : Disconnected	OK ⇒ END ! NG ⇒ Repair the harness. H2-C21-1:34 H2-C22-1:9 H1-C23-3:42

EFJB731D

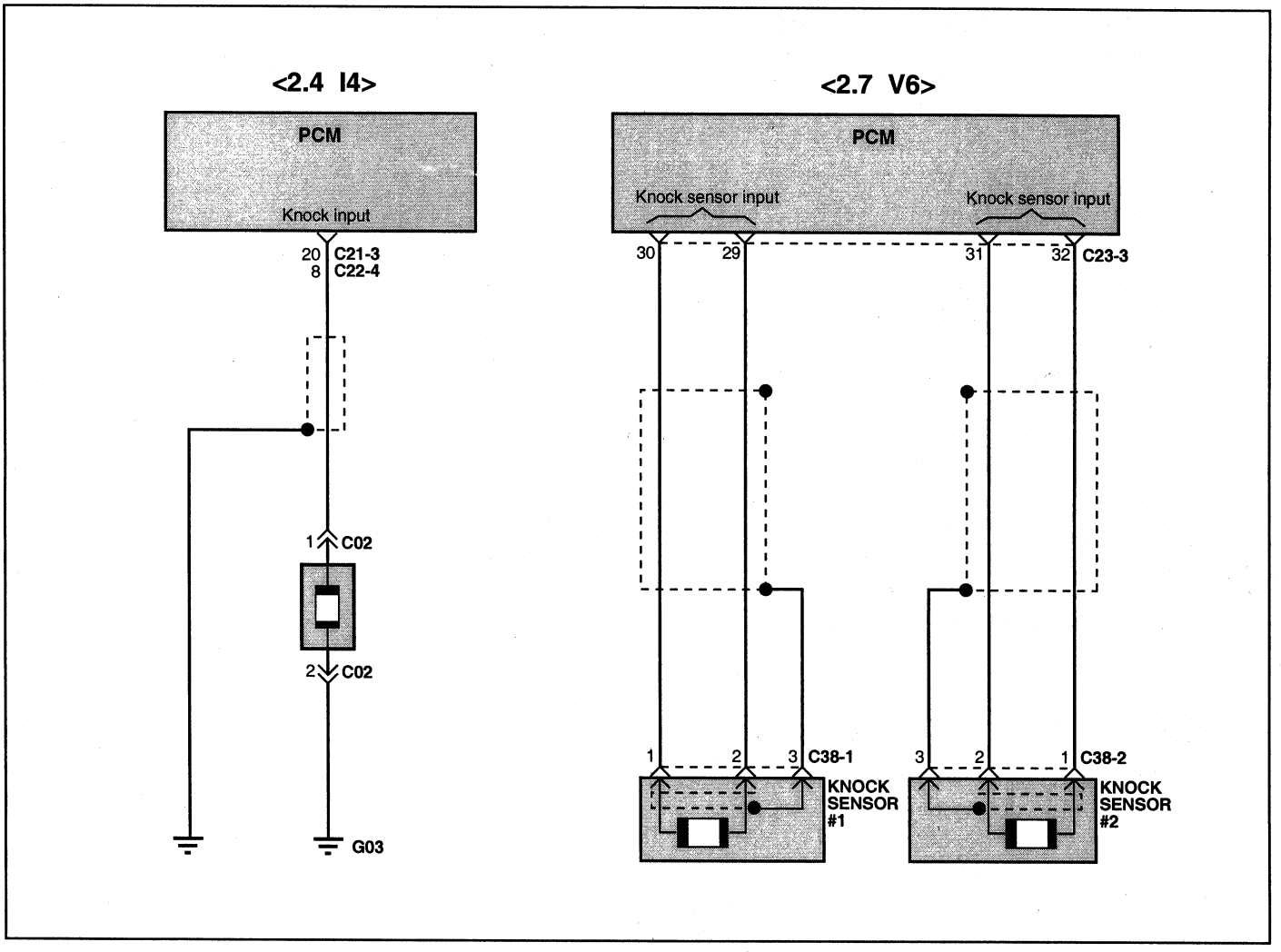
KNOCK SENSOR EFJB7330

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



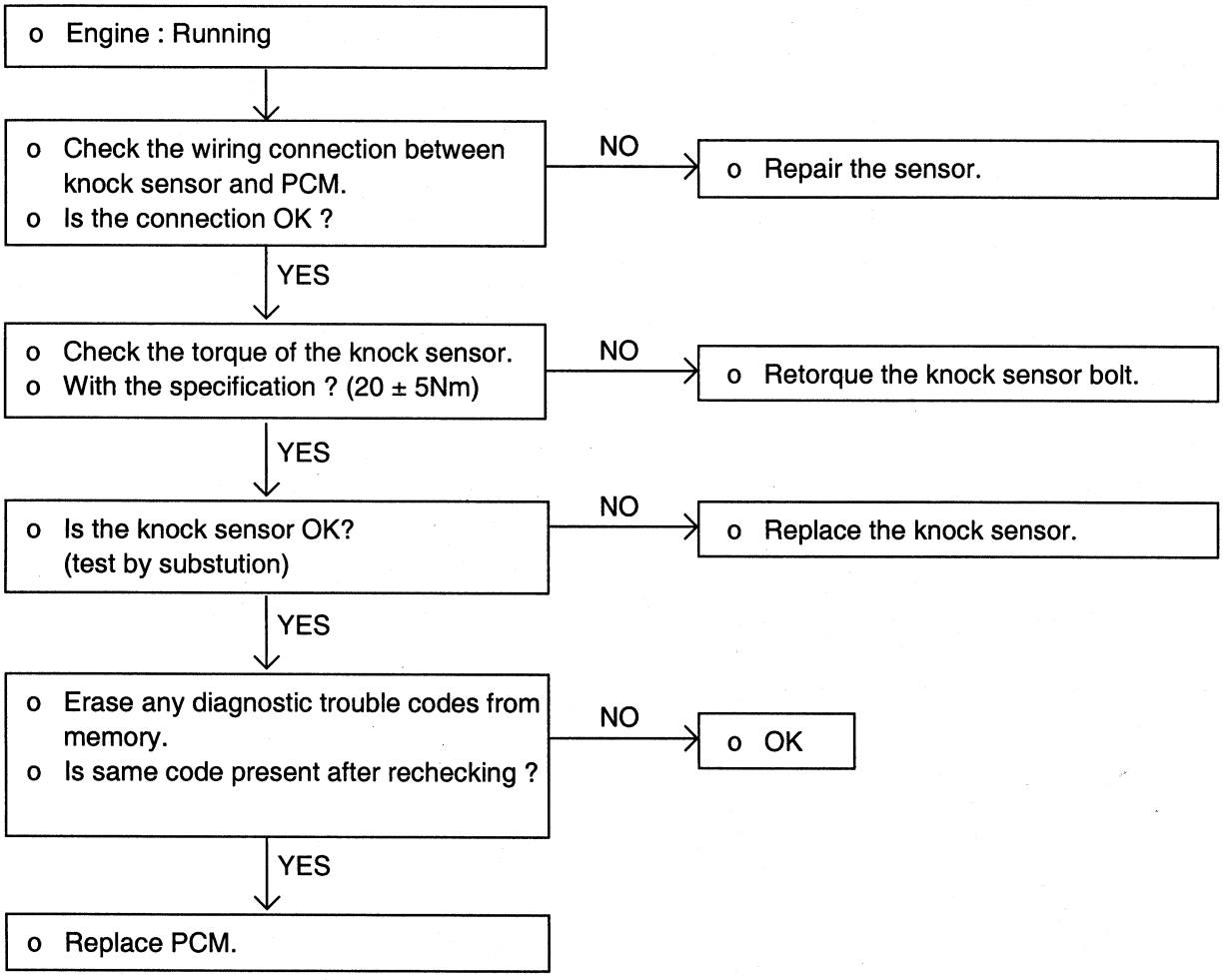
EFA9094A

CIRCUIT DIAGRAM



EFJB733A

TROUBLESHOOTING PROCEDURES



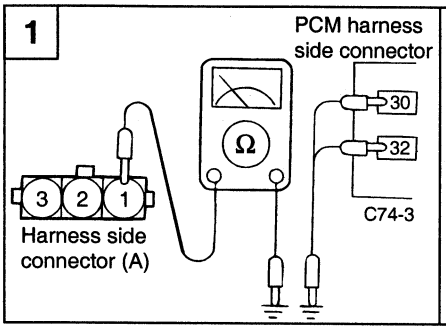
DTC : Diagnosis Trouble Code
PCM : Powertrain Control Module

EFAA733B

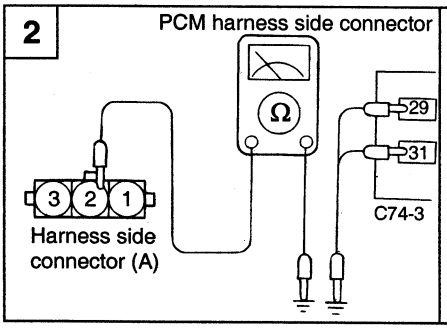
TROUBLESHOOTING HINTS

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

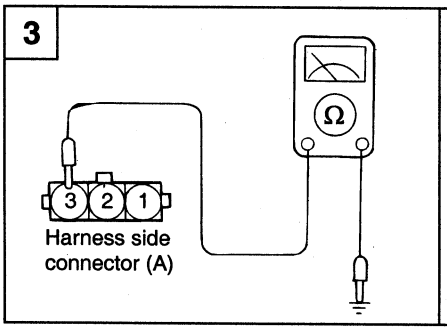
HARNESS INSPECTION PROCEDURE <2.7 V6>

1 	Check for an open circuit, or a short circuit to ground between the PCM and the knock sensor o PCM connector : Disconnected o Knock sensor connector : Disconnected	OK ⇒ NG ⇒	2 Repair the harness. A1 - C23-3 : 30 A1 - C23-3 : 32

EFJB733C

2 	Check for continuity of the ground circuit o PCM Connector : Disconnected o Knock sensor connector : Disconnected	OK ⇒ NG ⇒	3 Repair the harness.

EFHA733D

3 	Check for continuity of the ground circuit o Continuity	OK ⇒ NG ⇒	END ! Repair the harness.

EFHA733F

SENSOR INSPECTION

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

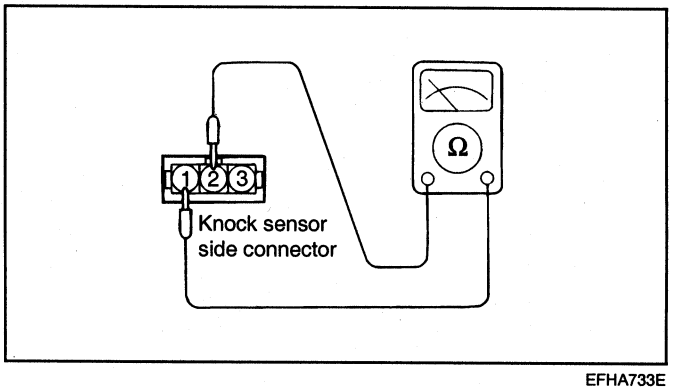
Standard value : about 5MΩ [at 20°C (68°F)]

3. If the resistance is zero, 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.

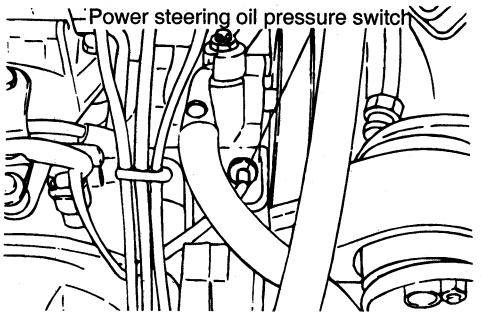
Standard value : 800-1600 pF



EFHA733E

POWER STEERING PRESSURE SWITCH EFJB7350

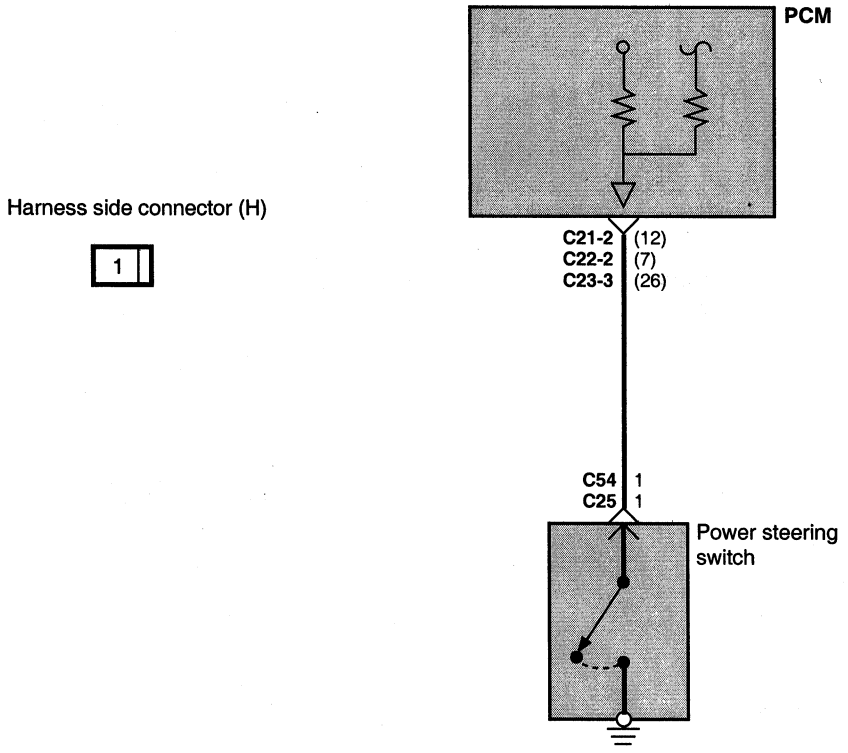
The power steering oil pressure switch senses the power steering load and inputs it to PCM, which then adjusts the idle speed control motor to maintain idle speed when the power steering pump puts a load on the engine.



EFA9103A

CIRCUIT DIAGRAM

<2.4 I4 / 2.7 V6>

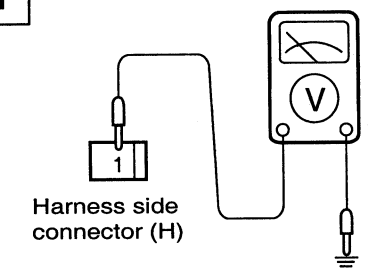


EFJB735A

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. o Connector: Disconnect o Ignition switch: ON o Voltage (V): Battery voltage	OK ⇨	END !
		NG ⇨	Repair the harness.

EFAA735B

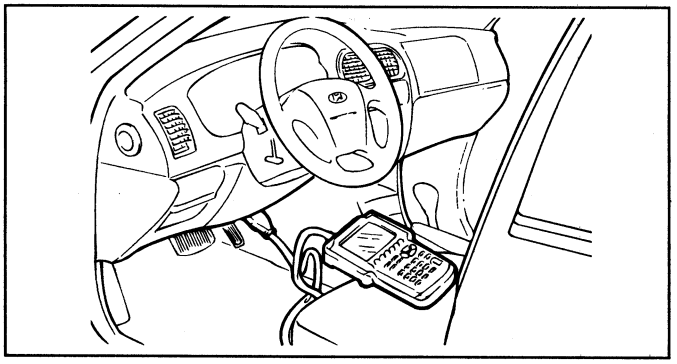
THROTTLE POSITION SENSOR(TPS)

INSPECTION EFJB1060

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

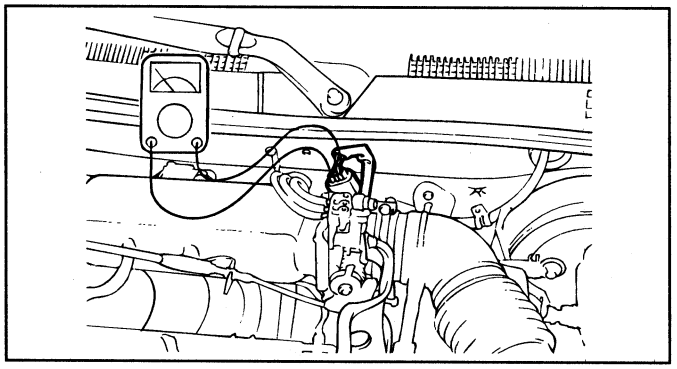
NOTE

Before inspecting 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 output 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 (2.4 I4)
250-800mV (2.7 V6)

4. If it is out of specification, check that the resistance between ground and TPS output terminal is as specified.

Standard value :
3.5 ~ 6.5 KΩ (2.4 I4)
1.6 ~ 2.4 KΩ (2.7 V6)

5. If it is out of specification, replace TPS with new one.

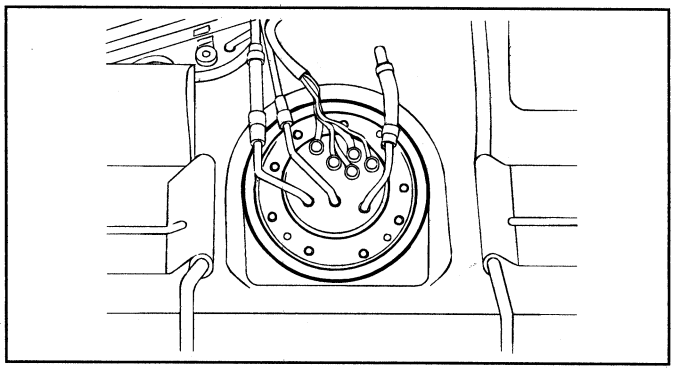
NOTE

Tighten the screws securely after replacement.

FUEL SENDER & FUEL FILTER

REPLACEMENT EFJB1070

1. Remove the fuel tank cap to lower the fuel tank's internal pressure.
2. Raise the vehicle and disconnect the fuel pump connector, then remove the fuel feed and return line from the fuel pump assembly.
3. Remove the fuel pump installation screws, then remove the fuel pump assembly from the fuel tank.



EFHA006A

4. Remove the fuel sender & fuel filter from the fuel pump assembly.
5. Inspect and replace, if necessary.

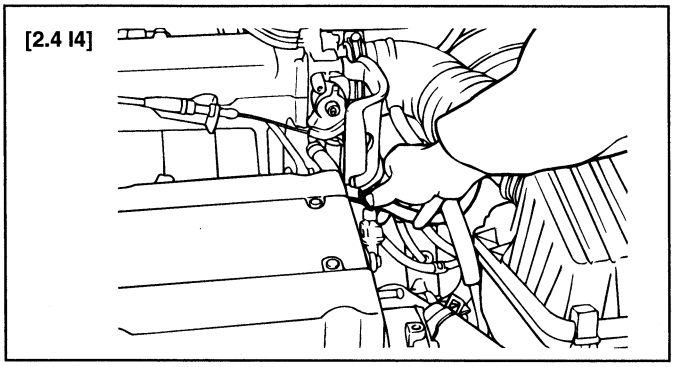
FUEL PUMP OPERATION CHECK EFHA1080

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.

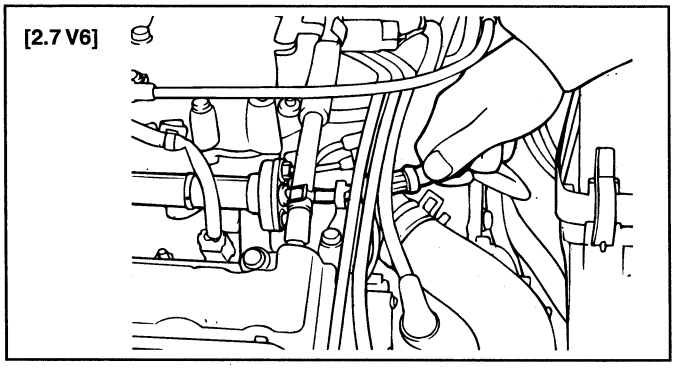
NOTE

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



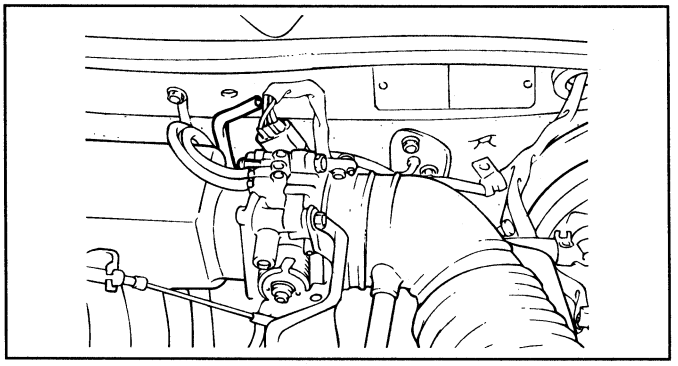
EFA9115A

EVAP CANISTER PURGE PORT VACUUM CHECK EFHA1090

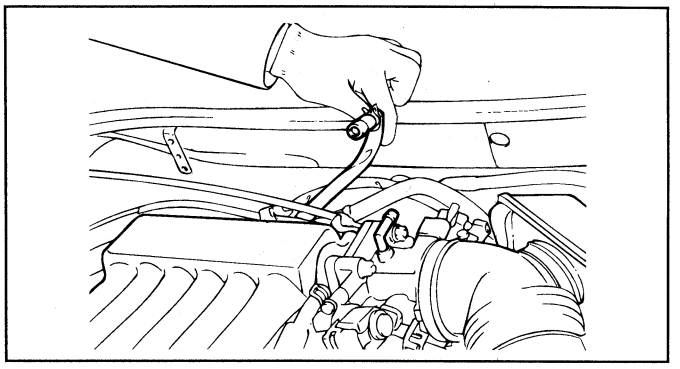
CHECKING CONDITION

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

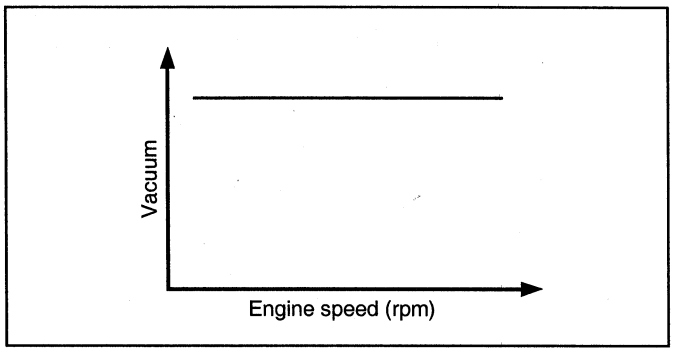


EFA9113A

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

NOTE

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



EFA9109B

FUEL PRESSURE TEST EFJB1100

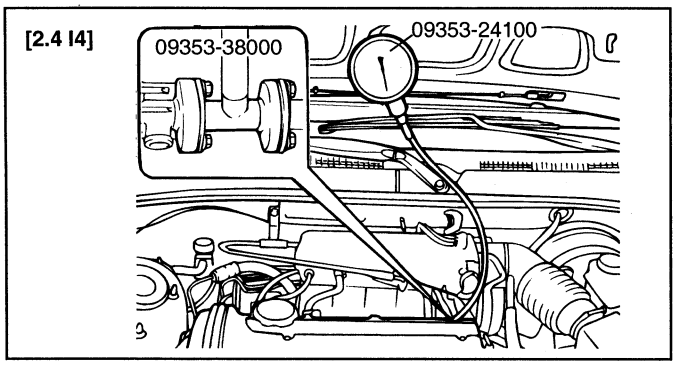
1. Reduce the internal pressure of the fuel lines and hoses:
   - Disconnect the fuel pump harness connector
   - Start the engine and after it stalls, turn the ignition switch to the OFF position
   - Disconnect the battery negative (-) terminal
   - Connect the fuel pump harness connector
2. Remove the bolt connecting the fuel line to the fuel delivery pipe.

CAUTION

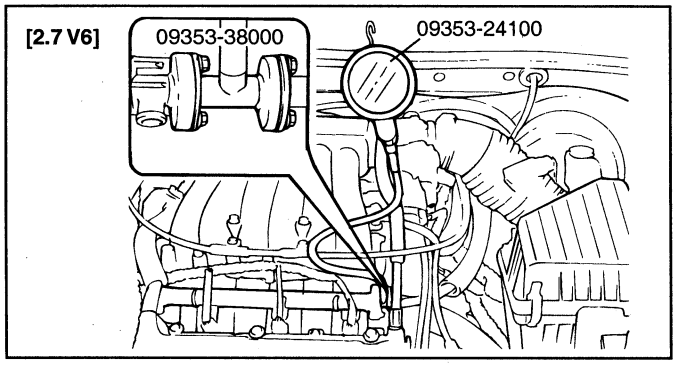
Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual pressure in the fuel line.

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

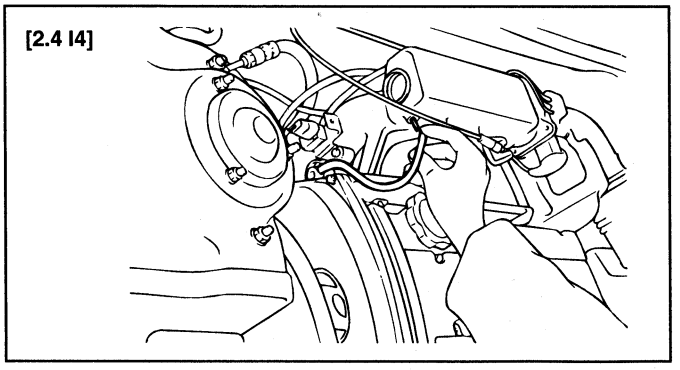
4. Connect the battery's negative (-) terminal.

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

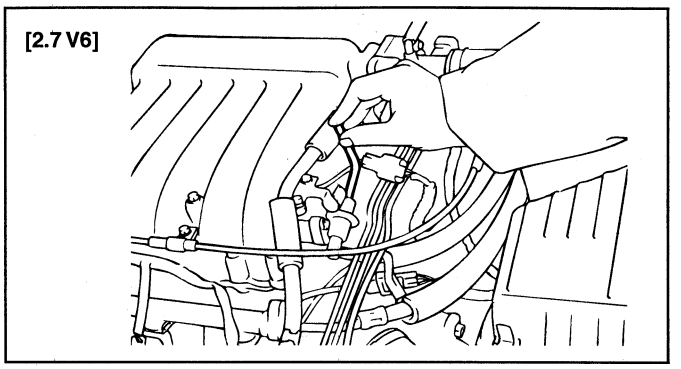
6. Start and run the engine at curb idle speed.

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

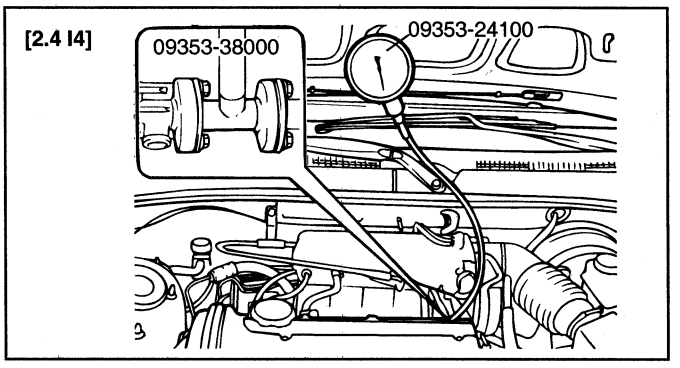


EFA9116C

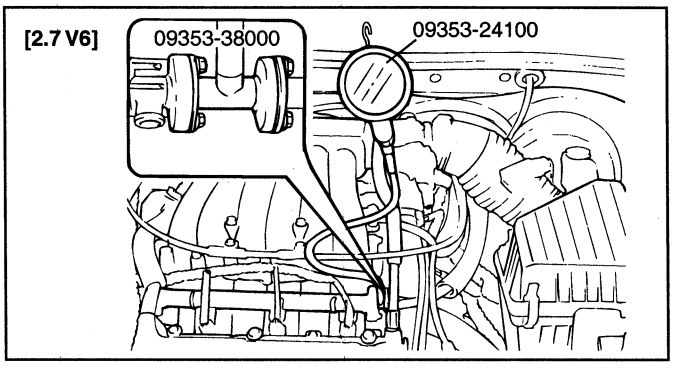
8. Measure the fuel pressure when the vacuum hose is connected to the pressure regulator.

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 • Fuel leakage to the return side, caused by poor seating of the fuel-pressure regulator	• Replace fuel filter • 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 • Clogged or bent fuel return hose or pipe	• Replace fuel pressure regulator • Repair or replace hose or pipe
There is no difference in fuel pressure when the vacuum hose is connected and when it is not.	• Clogged, or damaged vacuum hose or nipple • Sticking or poor seating of the fuel pressure regulator	• Repair or replace the vacuum hose or the nipple • 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 at the end of the hose.
14. Connect the fuel hose to the delivery pipe and tighten to the specified torque.
15. Check for fuel leakage.

THROTTLE BODY CLEANING EFJB1120

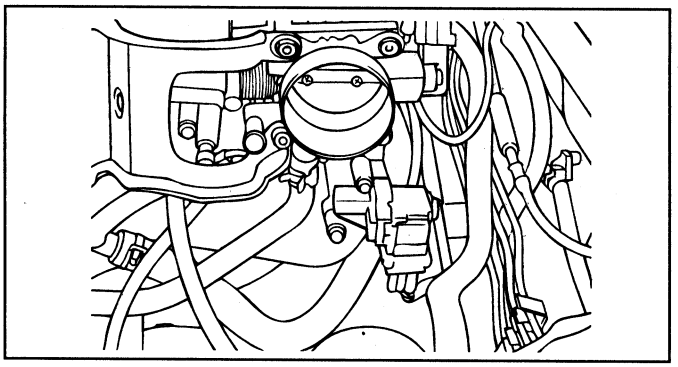
NOTE

Disconnect the intake air hose from the throttle body, and check the throttle valve surface for dirt. Spray cleaning solvent on the face of the valve to remove dirt.

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.



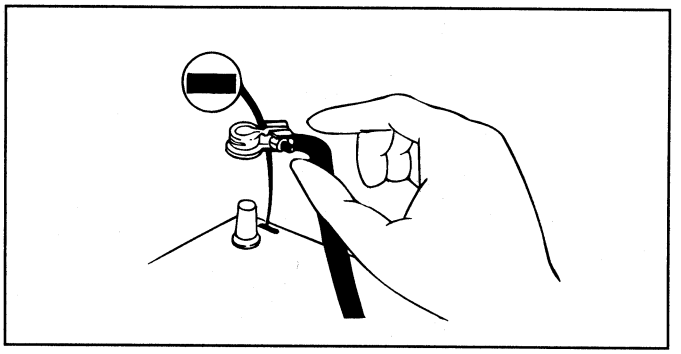
EFA9112A

4. Spray cleaning solvent into the valve through the throttle body intake port and let it soak for about 5 minutes. After 5 minutes open the valve and wipe it clean with a soft rag.

CAUTION

Keep the throttle valve closed while spraying to avoid charging the intake path with solvent.

5. Start the engine, race it several times and allow the engine to run near 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.



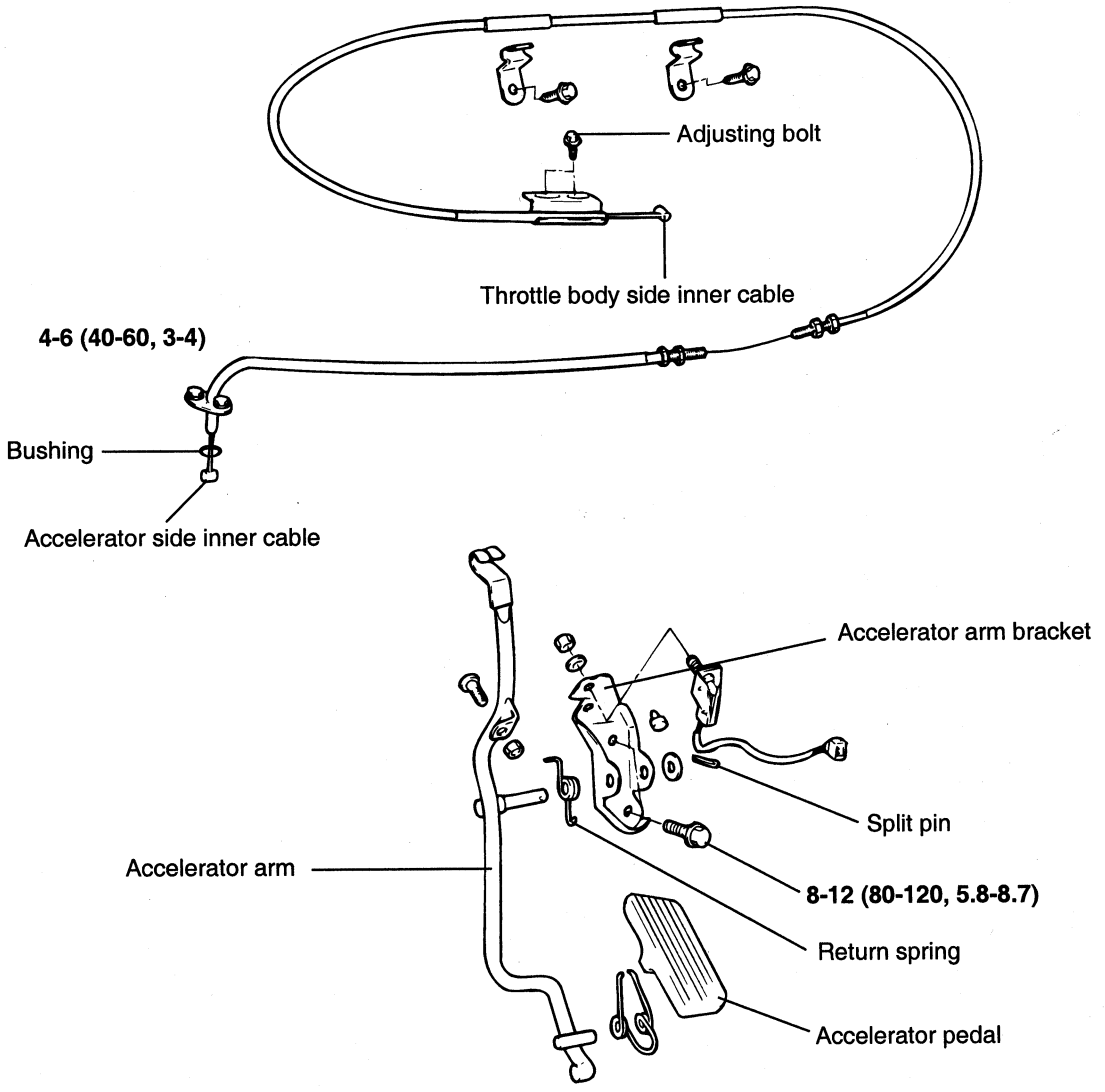
EFA9112B

FUEL DELIVERY SYSTEM

ACCELERATOR PEDAL EFA91190

COMPONENTS

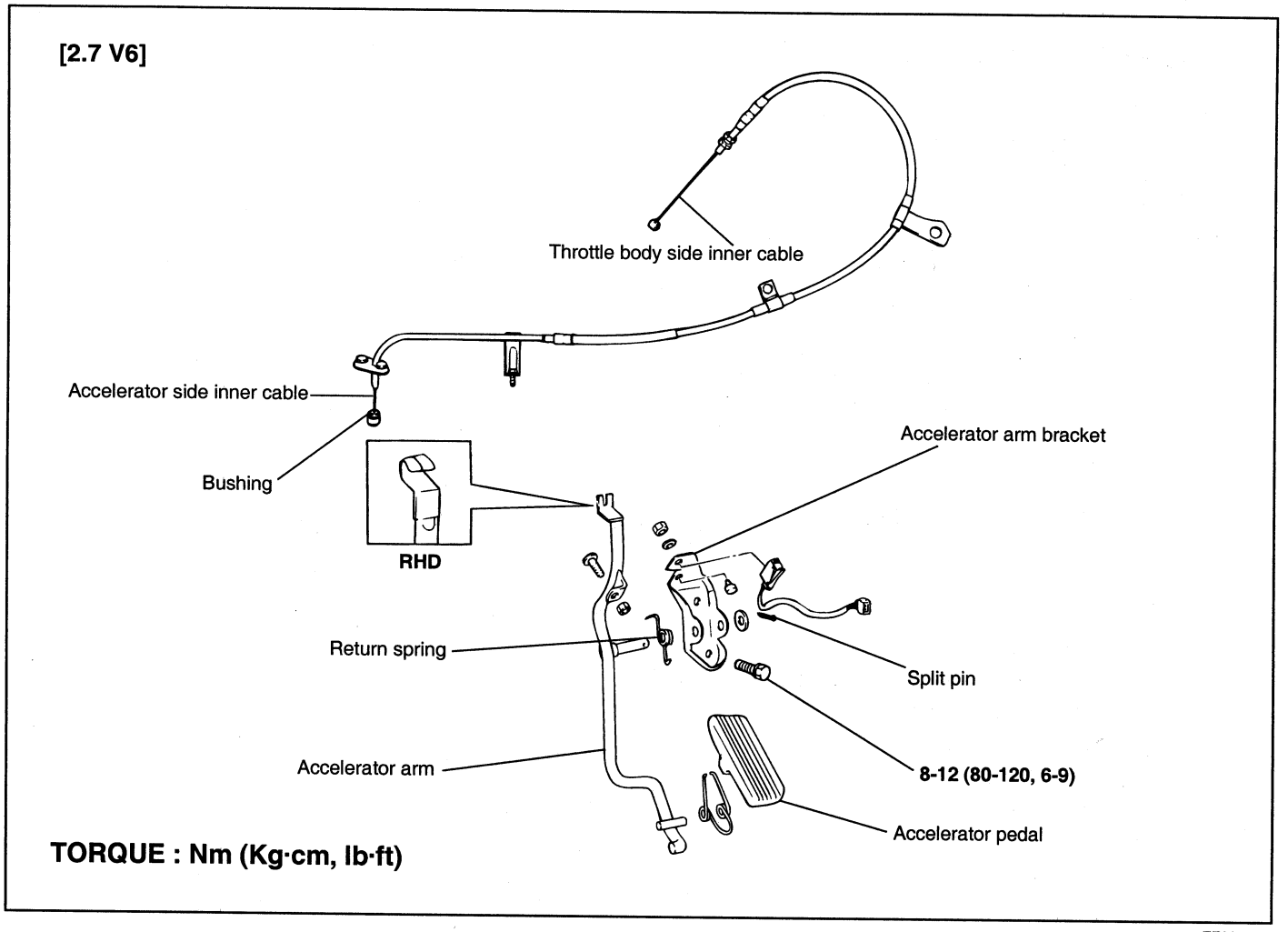
[2.4 I4]



TORQUE : Nm (Kg·cm, lb·ft)

EFA9119A

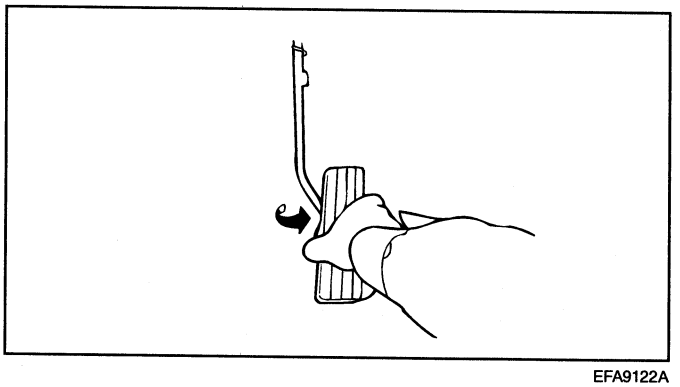
COMPONENTS EFA91200



EFA9120A

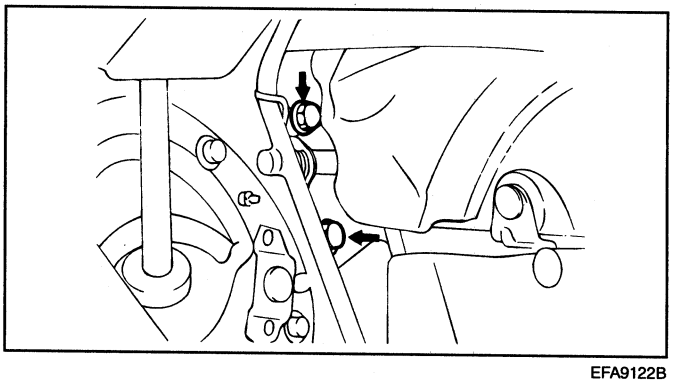
REMOVAL EFA91220

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.



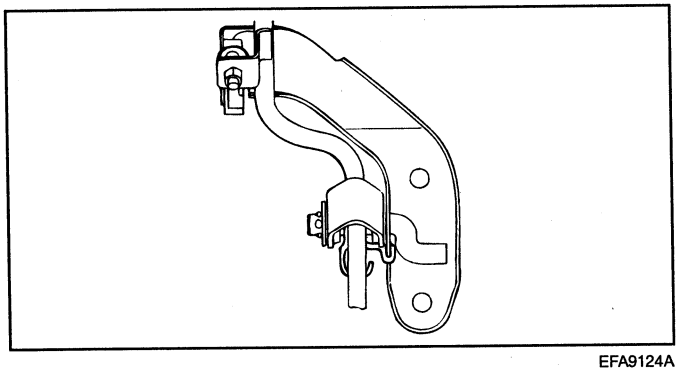
EFA9122B

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 the inner cable.
6. Check the accelerator for proper operation.

INSTALLATION EFA91240

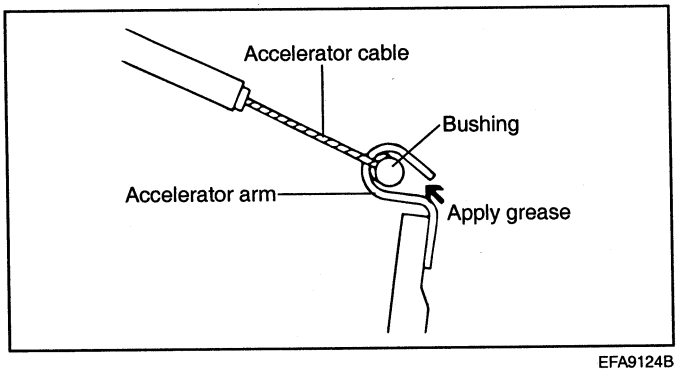
1. When installing the return spring and accelerator arm, apply multi-purpose grease around each moving point of the accelerator arm.



EFA9124A

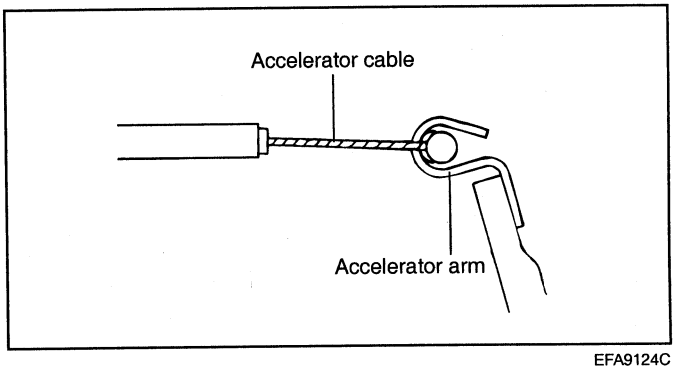
2. Apply sealant to the bolt mounting hole and tighten the accelerator arm bracket.

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

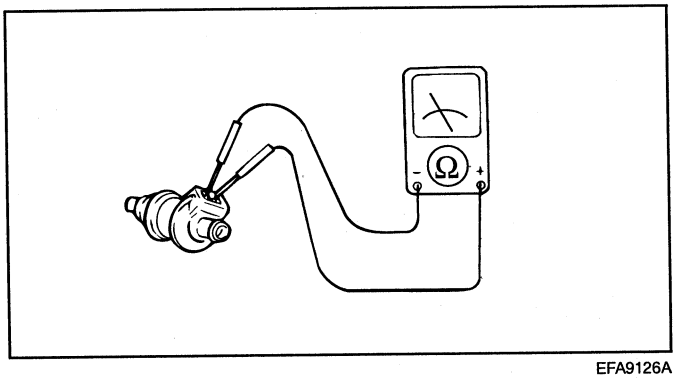
FUEL INJECTOR EFA91260

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.

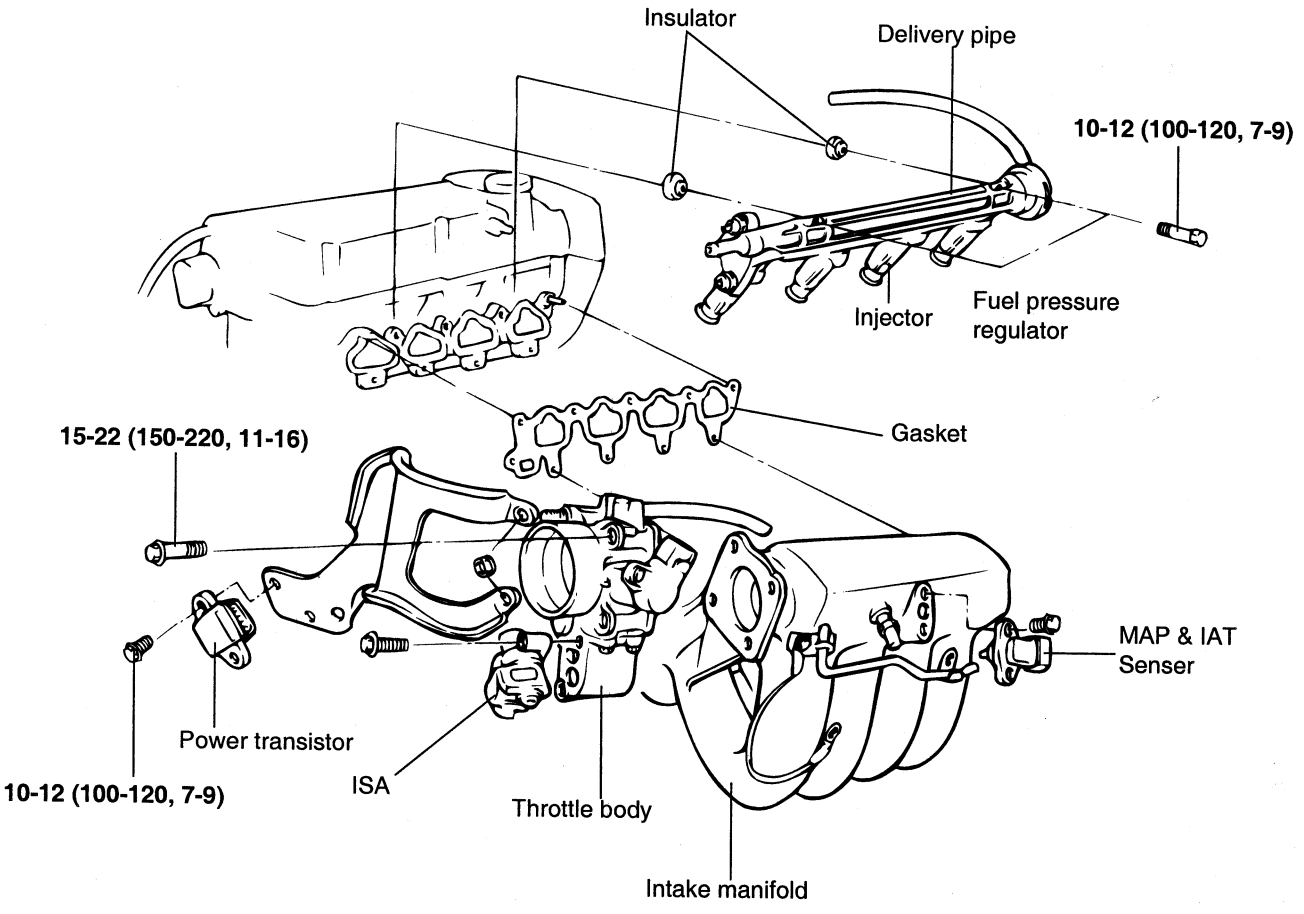


EFA9126A

FUEL LINE EFJB1270

COMPONENTS

<2.4 I4>

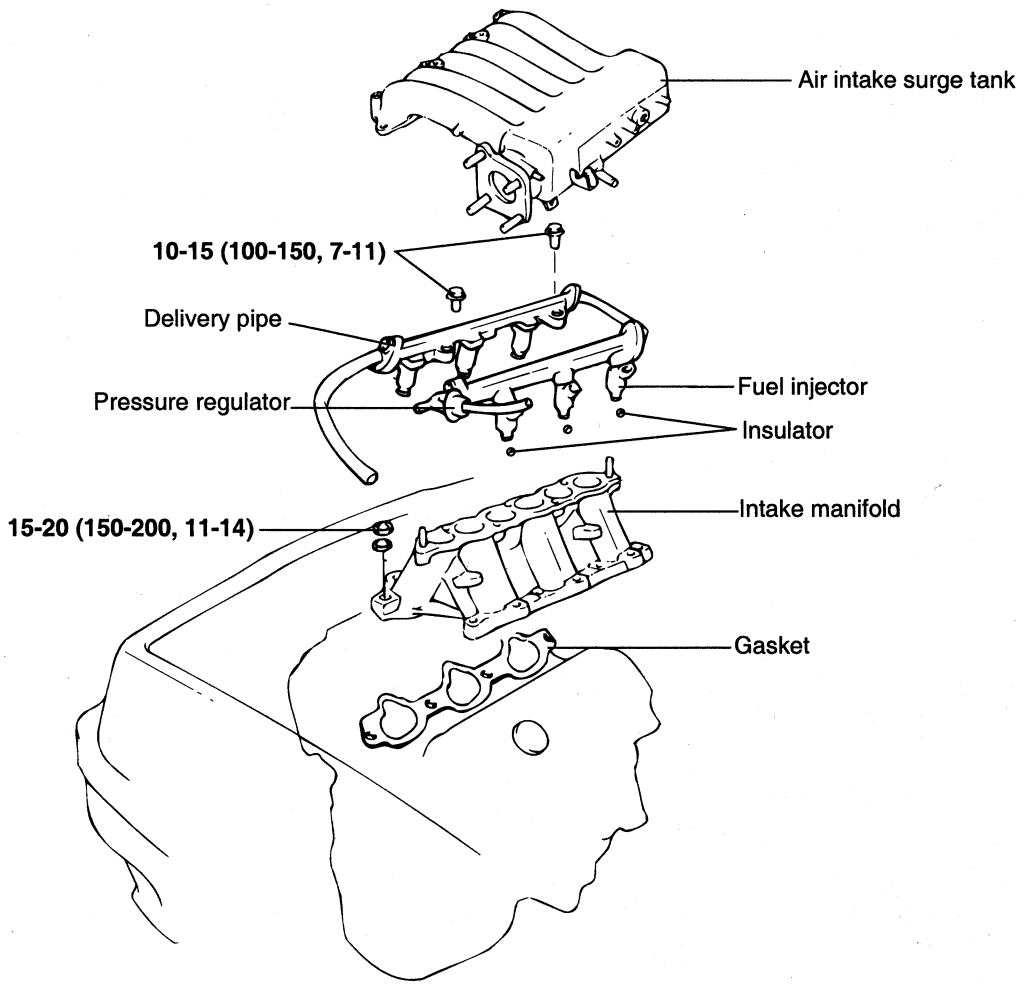


TORQUE : Nm (kg·cm, lb·ft)

EFJB127A

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.

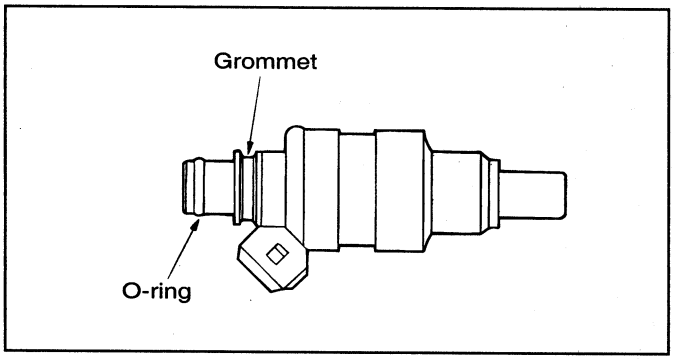
CAUTION

Cover the hose connection with rags to prevent splashing of fuel from 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.

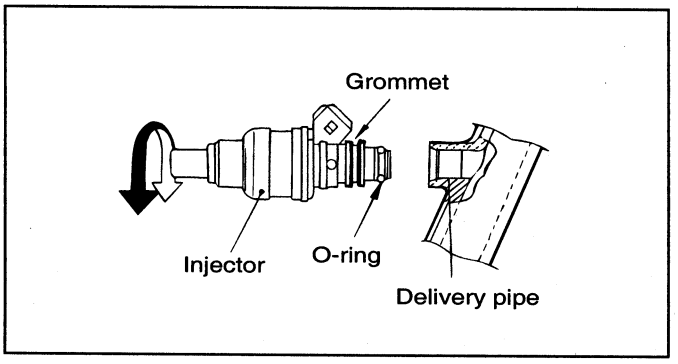


EFA9130A

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

NOTE

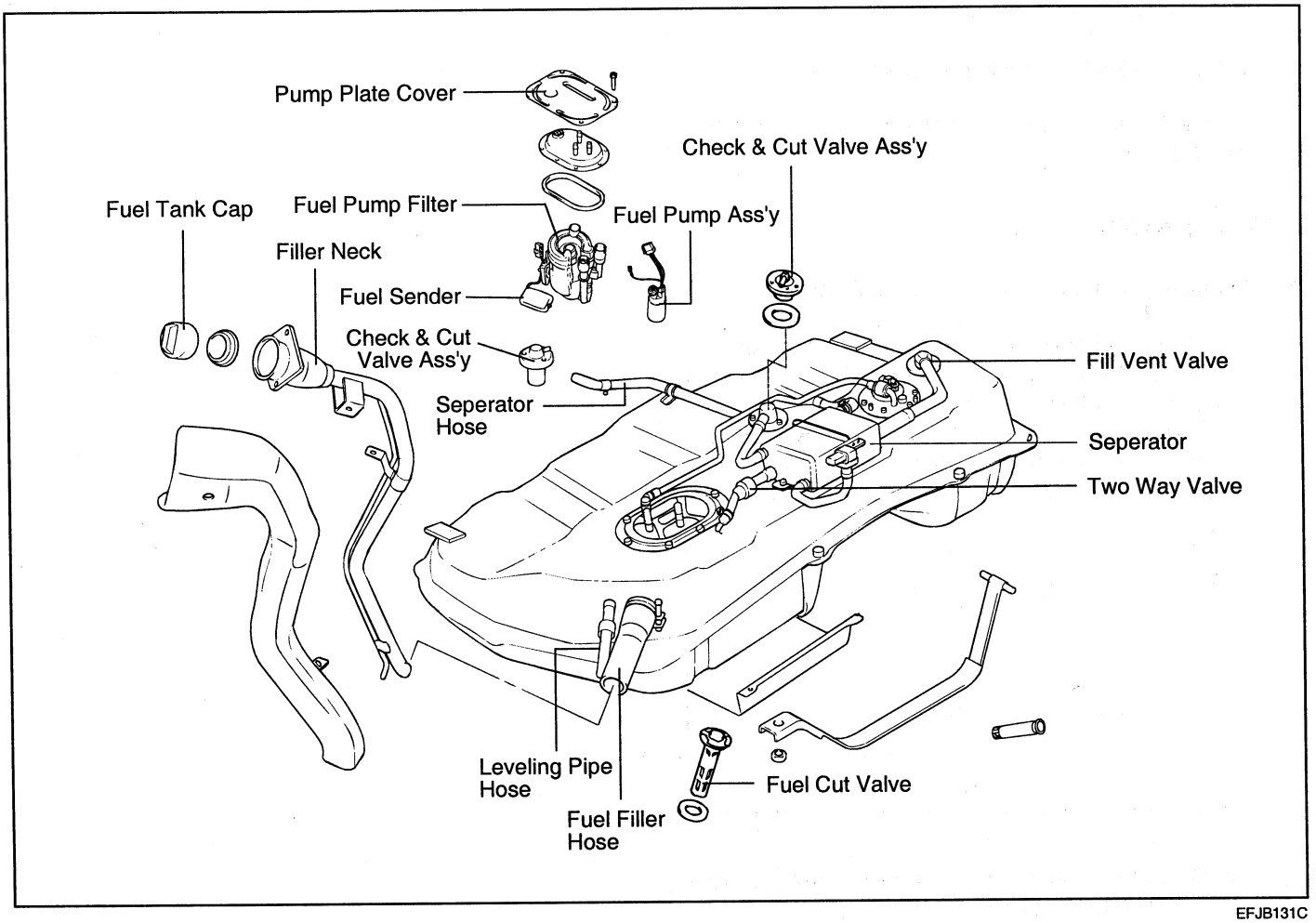
If injector does not turn smoothly, the O-ring may be jammed. Remove the injector and re-insert it into the delivery pipe and re-check.



EFA9130B

FUEL LINE AND VAPOR LINE EFJB1310

COMPONENTS



EFJB131C

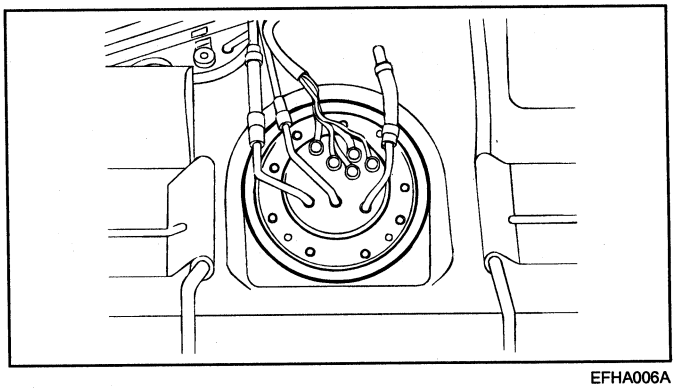
REMOVAL EFJB1320

1. Remove the fuel tank cap to lower the fuel tank's internal pressure. Raise the vehicle and disconnect the fuel pump connector.

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 from residual pressure in the fuel line.**

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



EFHA006A

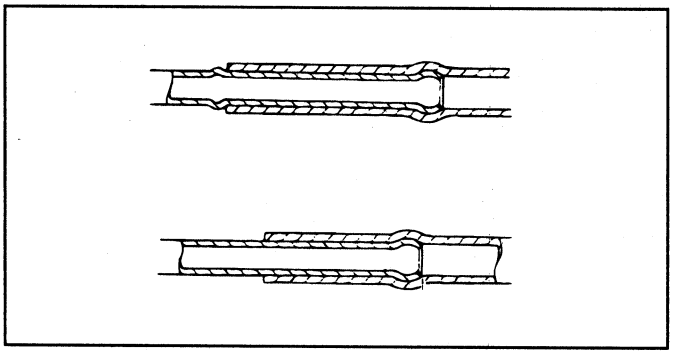
3. Remove the fuel return hose and line.
4. Remove the fuel vapor hose and line

INSPECTION EFJB1330

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

INSTALLATION EFJB1340

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.

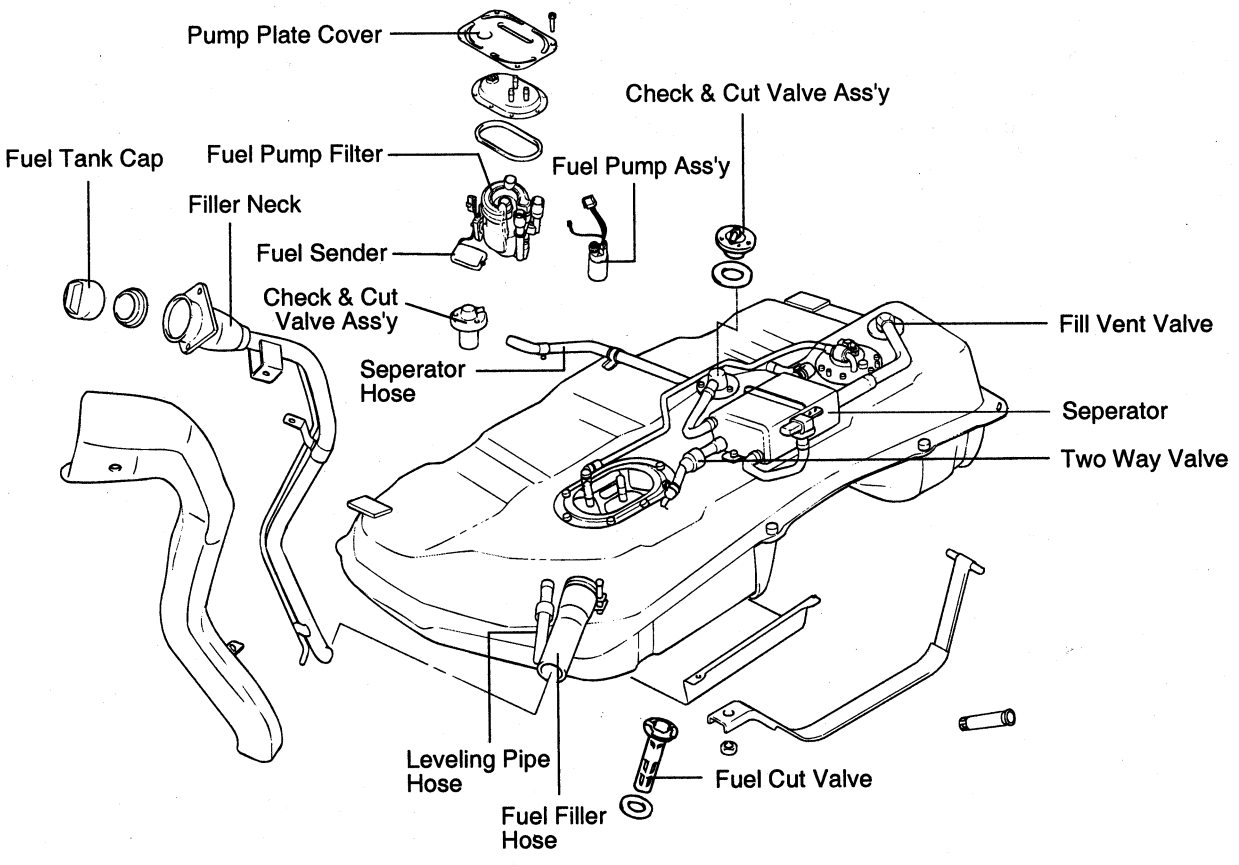


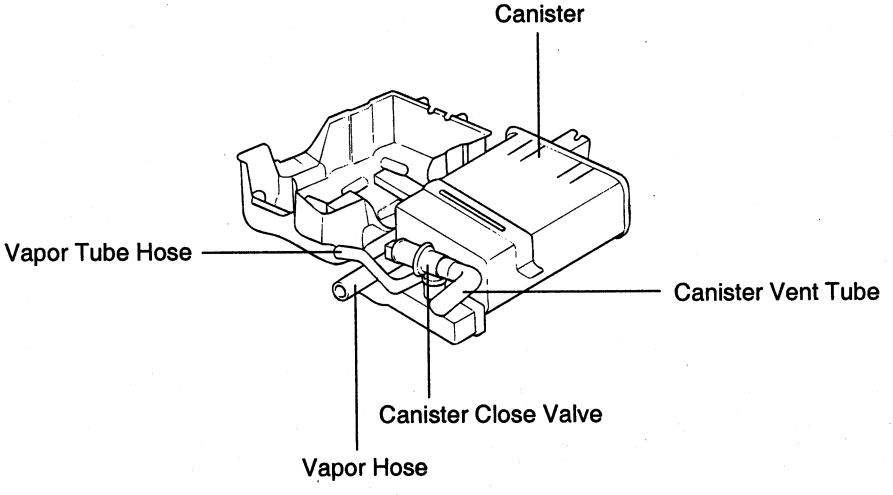
EFA9134A

2. Install the fuel pump assembly and tighten the fuel pump installation screws.

FUEL TANK EFJB1350

COMPONENTS





EFJB131C/EFJB131D

EFJB135A

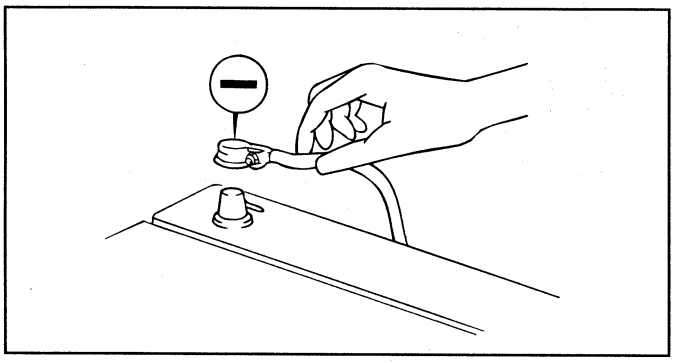
REMOVAL EFJB1360

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 tank.

CAUTION

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

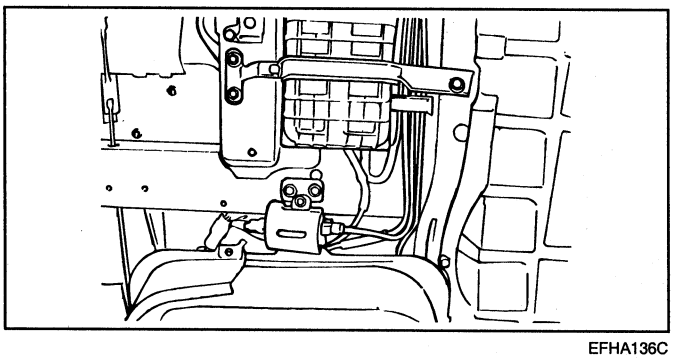
2. Disconnect the battery cable from the negative terminal of the battery.



EFA9136A

3. Remove the fuel tank cap.

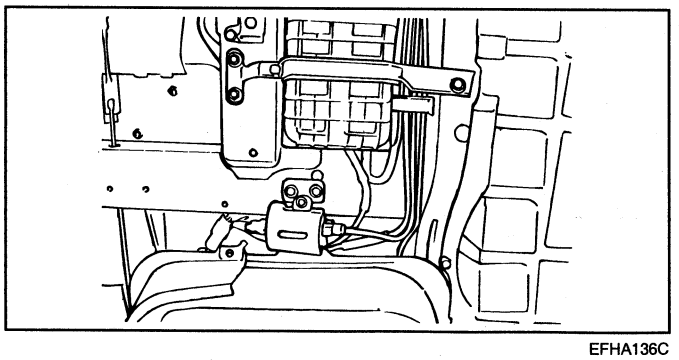
4. Disconnect the return hose and vapor hose.



EFHA136C

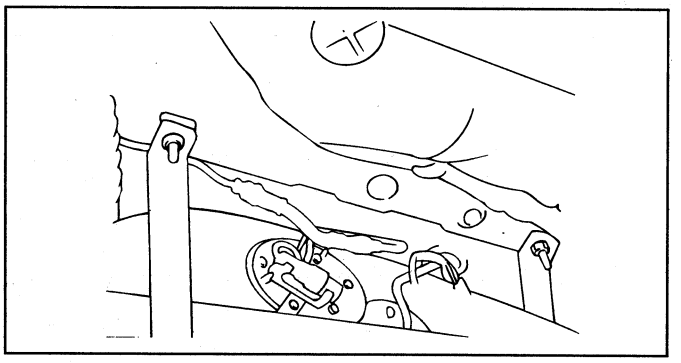
5. Disconnect the fuel pump connector.

6. Disconnect the high pressure hose from the fuel tank.



EFHA136C

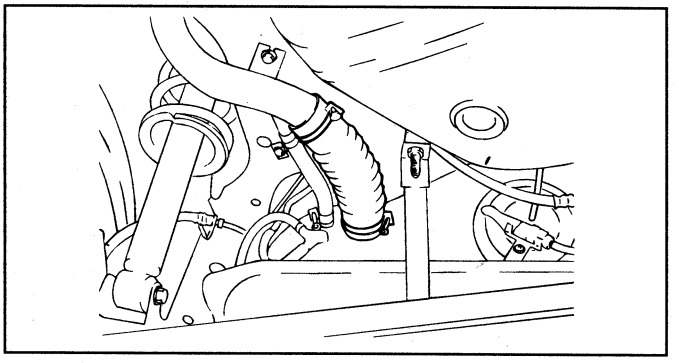
7. Loosen the two self-locking nuts that hold the tank in position and remove the two tank bands.



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.

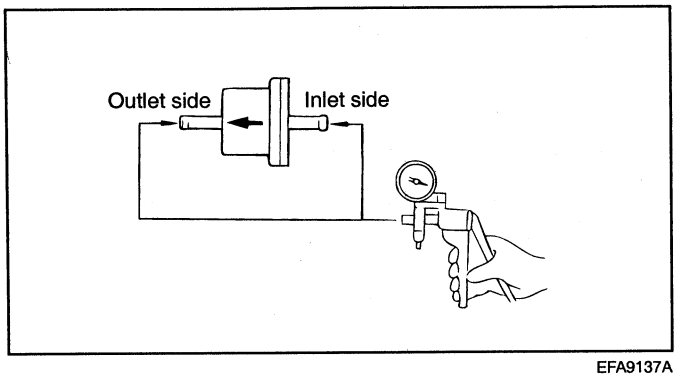
4. Check the fuel tank inside for dirt or contamination.

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.

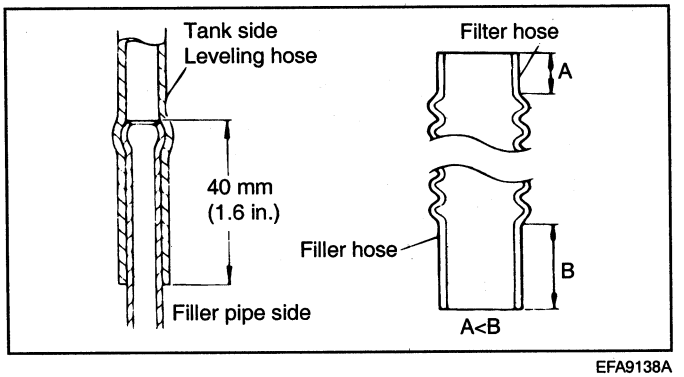
Valve pump	Guide lines for acceptance or rejection
When connected to inlet side	Negative pressure generated and vacuum maintained
When connected to outlet side	No negative pressure generated



EFA9137A

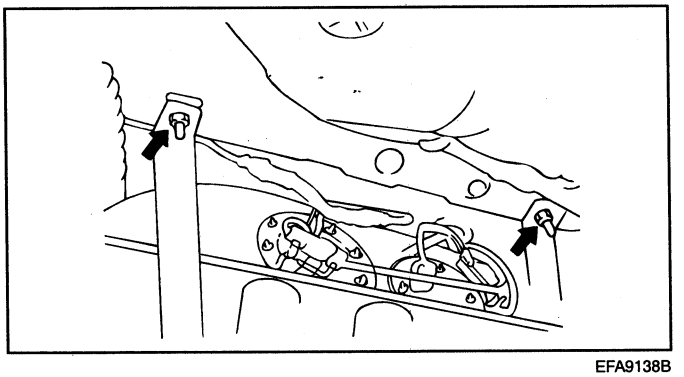
INSTALLATION EFJB1380

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.



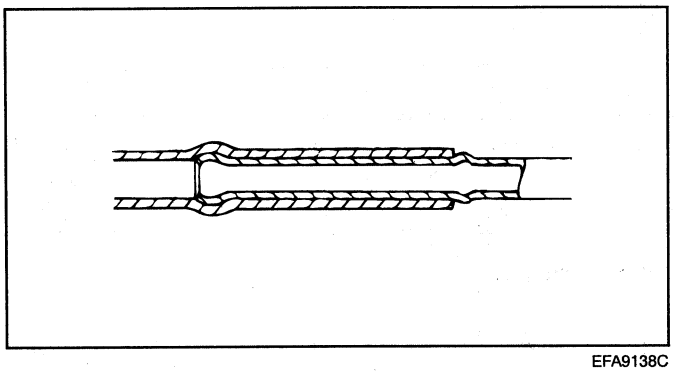
EFA9138A

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.



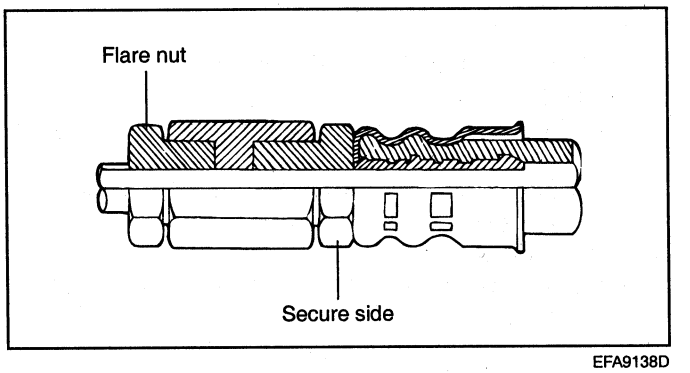
EFA9138C

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)

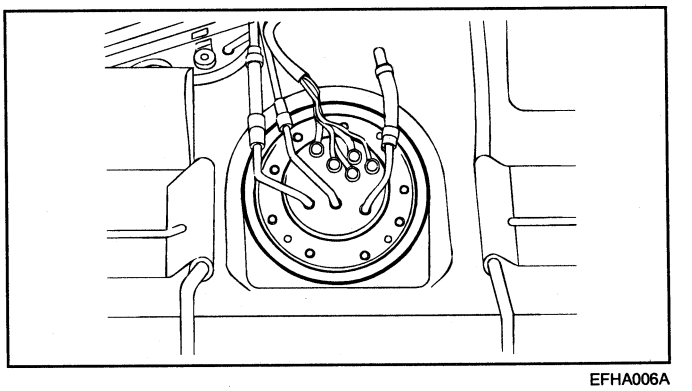
NOTE

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 assembly connector.



EFHA006A

TROUBLESHOOTING FOR DTC

EFJB5000

DIAGNOSTIC ITEM

DTC	Diagnostic item
P0101	Mass Air Flow Circuit Rang/Performance Problem
P0102	Mass Air Flow Circuit Low Voltage
P0103	Mass Air Flow Circuit High Voltage

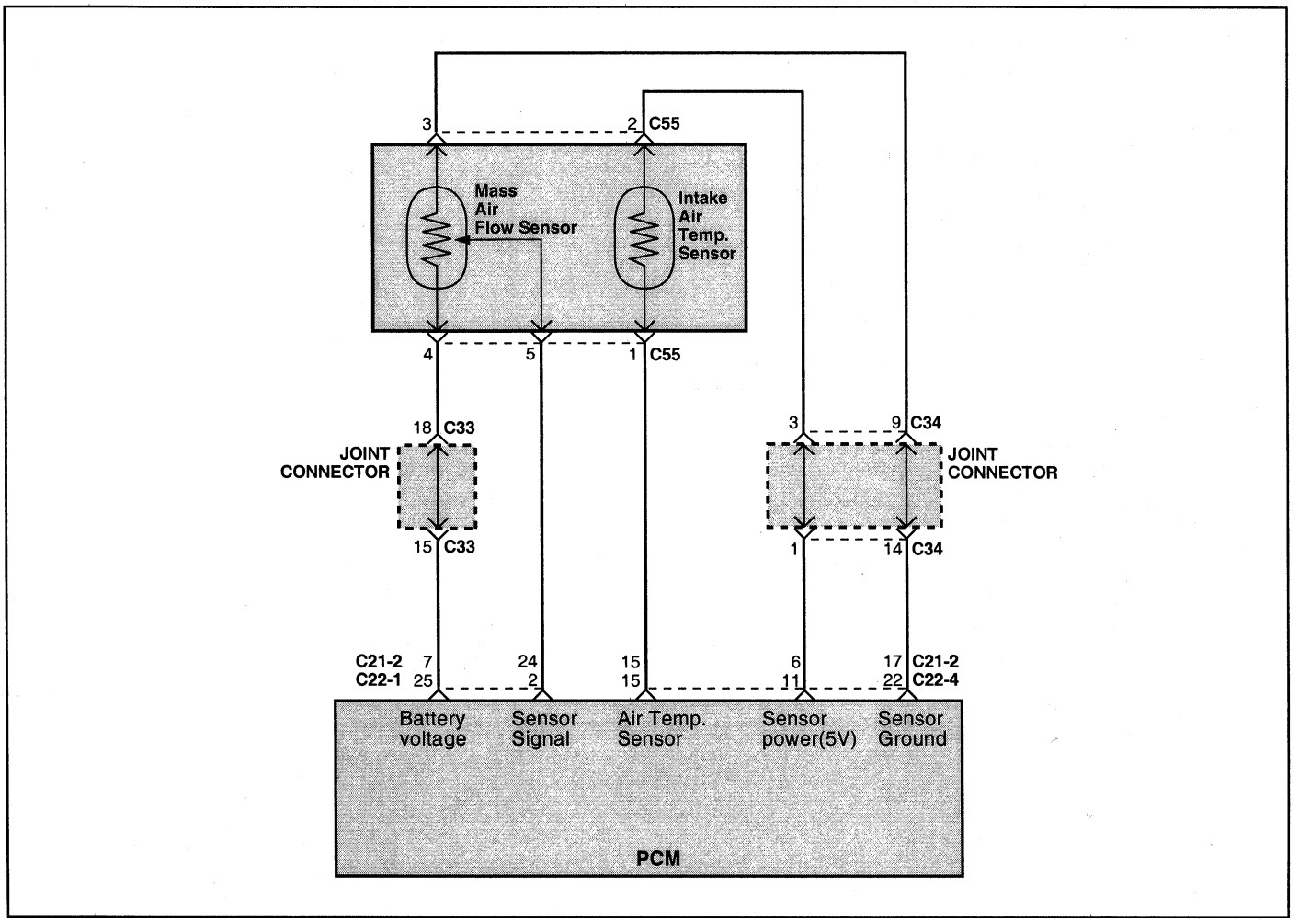
DESCRIPTION

The Mass Air Flow (MAF) sensor is located near the air cleaner.
The sensor measures the mass of air passing through the air intake and generates a voltage signal. The Engine Control Module(ECM) receives the voltage generated by the sensor and uses the signal to set fuel injector base pulse width and ignition timing.
The voltage of the sensor increases as mass air flow increases.

TROUBLESHOOTING GUIDE

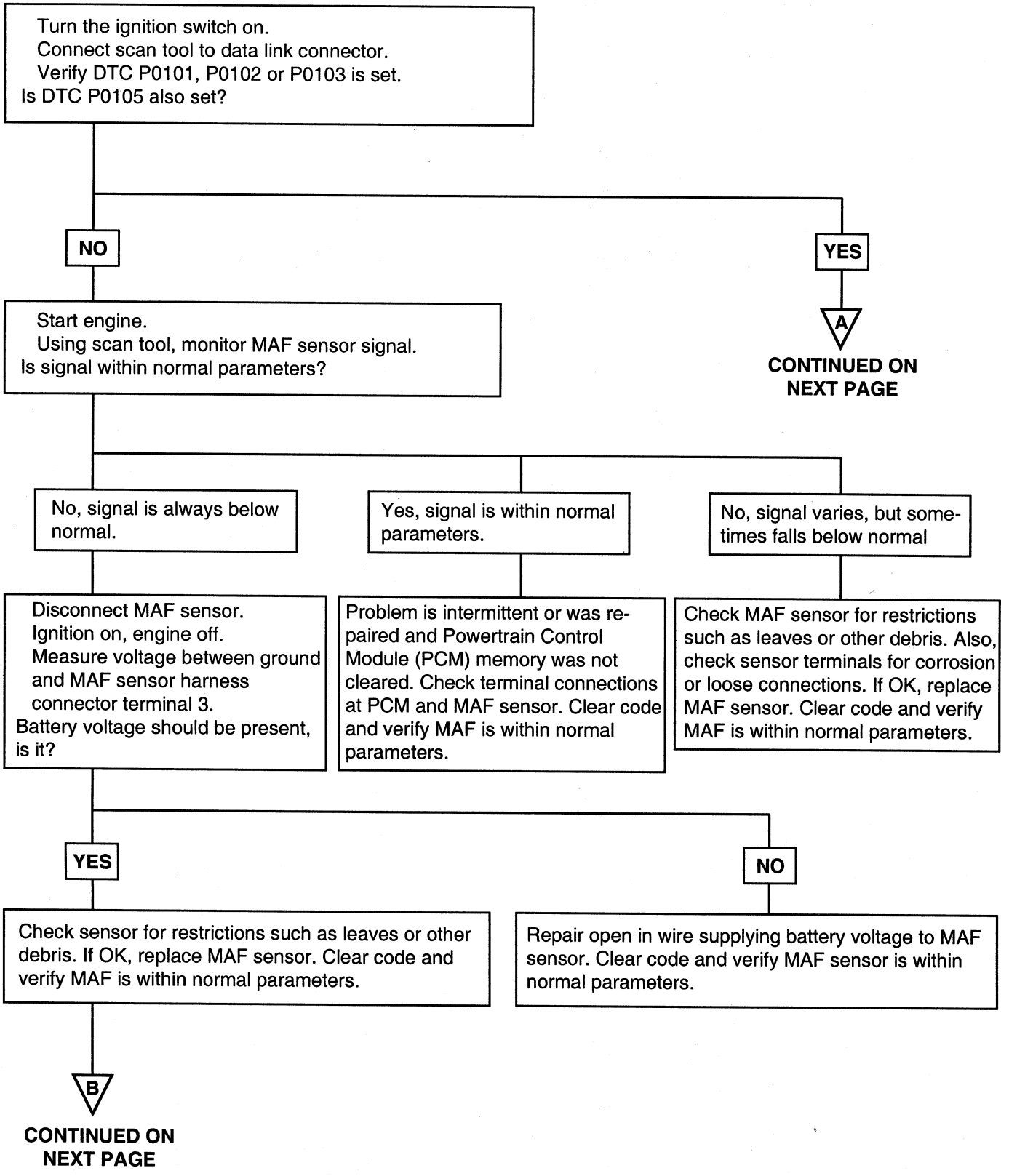
DTC detection condition	Probable cause
Background • While the engine is running, the mass air flow sensor outputs a voltage signal which corresponds to the mass of air flow. • The engine control module checks whether the voltage of this signal output by the mass air flow sensor while the engine is running at of above the set value. Check Area • At idle rpm • Or engine speed is 3000 r/min or more Judgment Criteria • Sensor output voltage has continued to be 0.5V or lower for 4 sec. Check Area • Throttle position sensor voltage is 12V or lower. • Engine speed is 2000 r/min or less. Judgment Criteria • Sensor output voltage has continued to be 4.5V or higher for 4 sec.	• Mass air flow sensor failed • Open or shorted mass air flow sensor circuit, or loose connector • Engine control module failed

CIRCUIT DIAGRAM



EFJB705A

TEST PROCEDURE



JP0101B

CONTINUED FROM PREVIOUS PAGE

Turn the ignition off.
Disconnect MAF sensor.
Measure resistance between ground and MAF sensor harness connector terminal 4.
Resistance should be approximately 1 ohm or less, is it?

YES

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

NO

Repair open in wire between MAF sensor harness connector terminal 4 and ground. Clear code and verify MAF is within normal parameters.

CONTINUED FROM PREVIOUS PAGE

YES

Ignition off, PCM and MAF sensor still disconnected.
Ground MAF sensor harness connector terminal 5.
A/T : Measure resistance between ground and ECM connector C21-3 terminal 22.
M/T : Measure resistance between ground and ECM connector C22-4 terminal 2.
Resistance should be approximately 1 ohm or less, is it?

YES

Verify PCM connectors are secure. If OK, replace MAF sensor with a known good component.
Clear code and verify MAF sensor is within normal parameters. If problem persists, replace ECM.

NO

Repair open in wire between MAF sensor harness connector terminal 5 and PCM. Clear code and verify MAF is within normal parameters.

JP0101C

EFJB5020

DTC	Diagnostic item
P0112 P0113	Intake Air temperature Circuit Low Voltage Intake Air temperature Circuit High Voltage

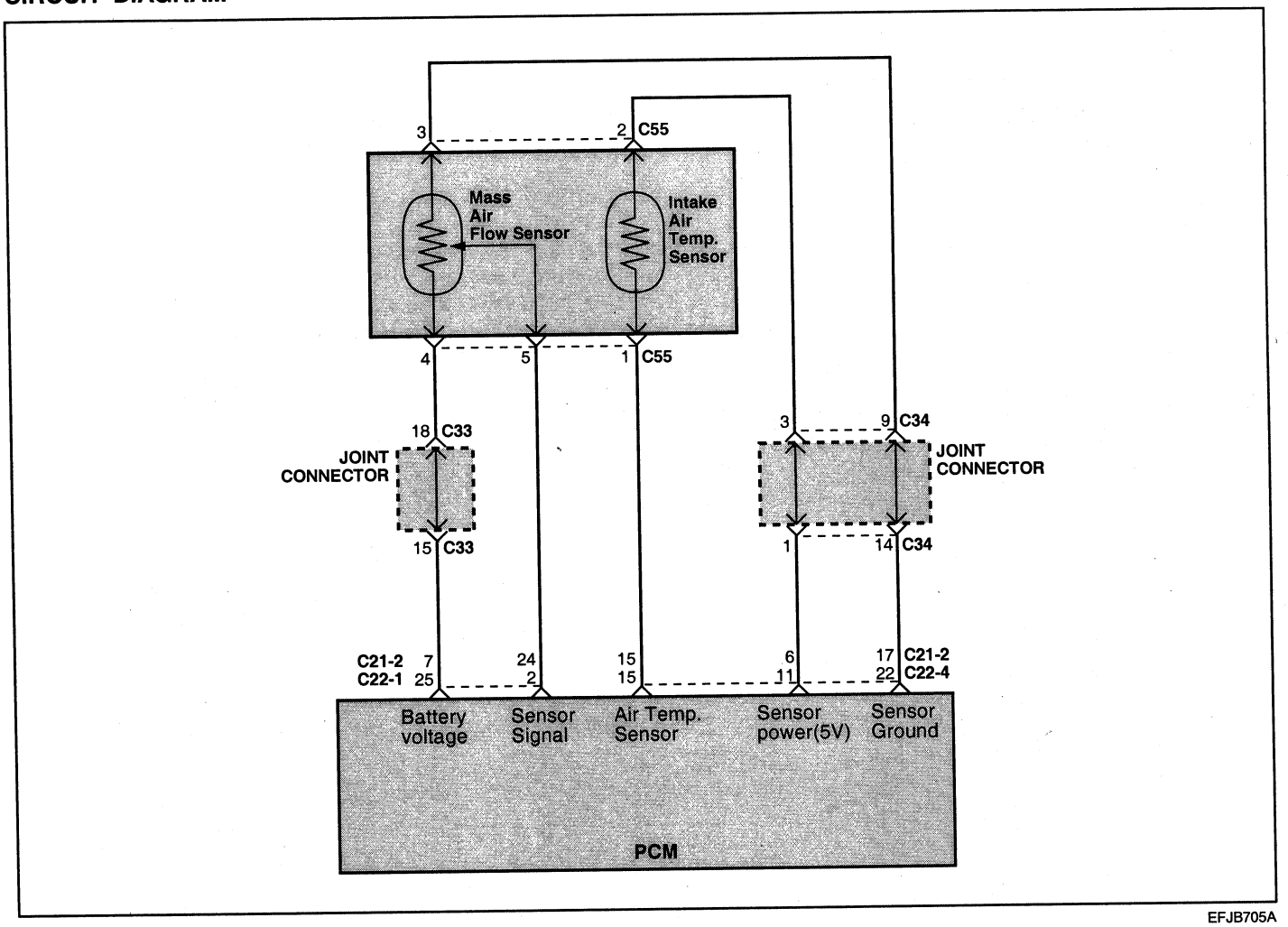
DESCRIPTION

The Intake Air Temperature (IAT) sensor is in the MAF 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

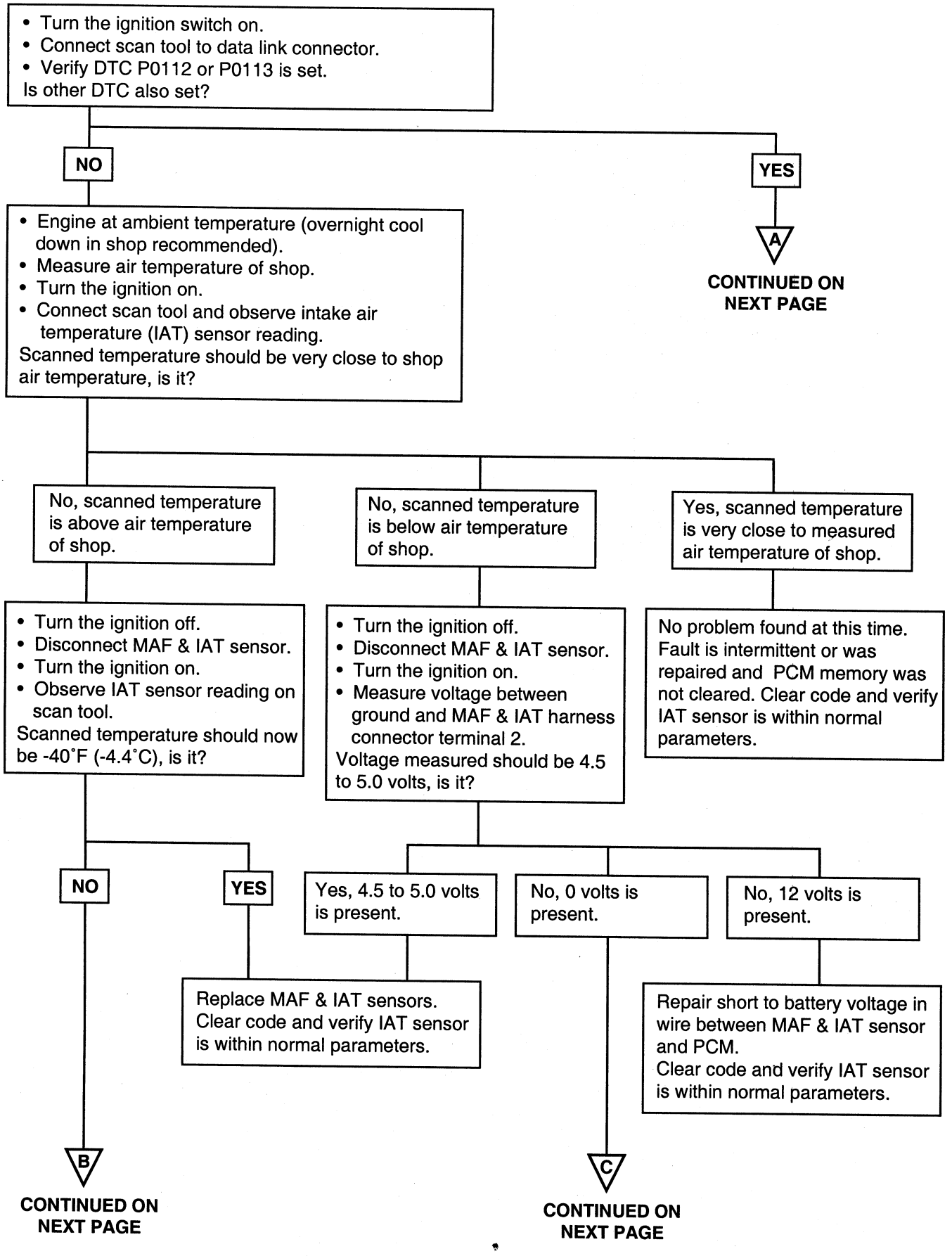
DTC detection condition	Probable cause
Background • The intake air temperature sensor converts the intake air temperature to a voltage and outputs it. • The engine control module checks whether the voltage is within a specified range. Check Area • Sixty seconds or more have passed since the starting sequence was completed. Judgment Criteria • 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. • 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.	• MAF sensor failed • Open or shorted mass air flow sensor circuit, or loose connector • Engine control module failed

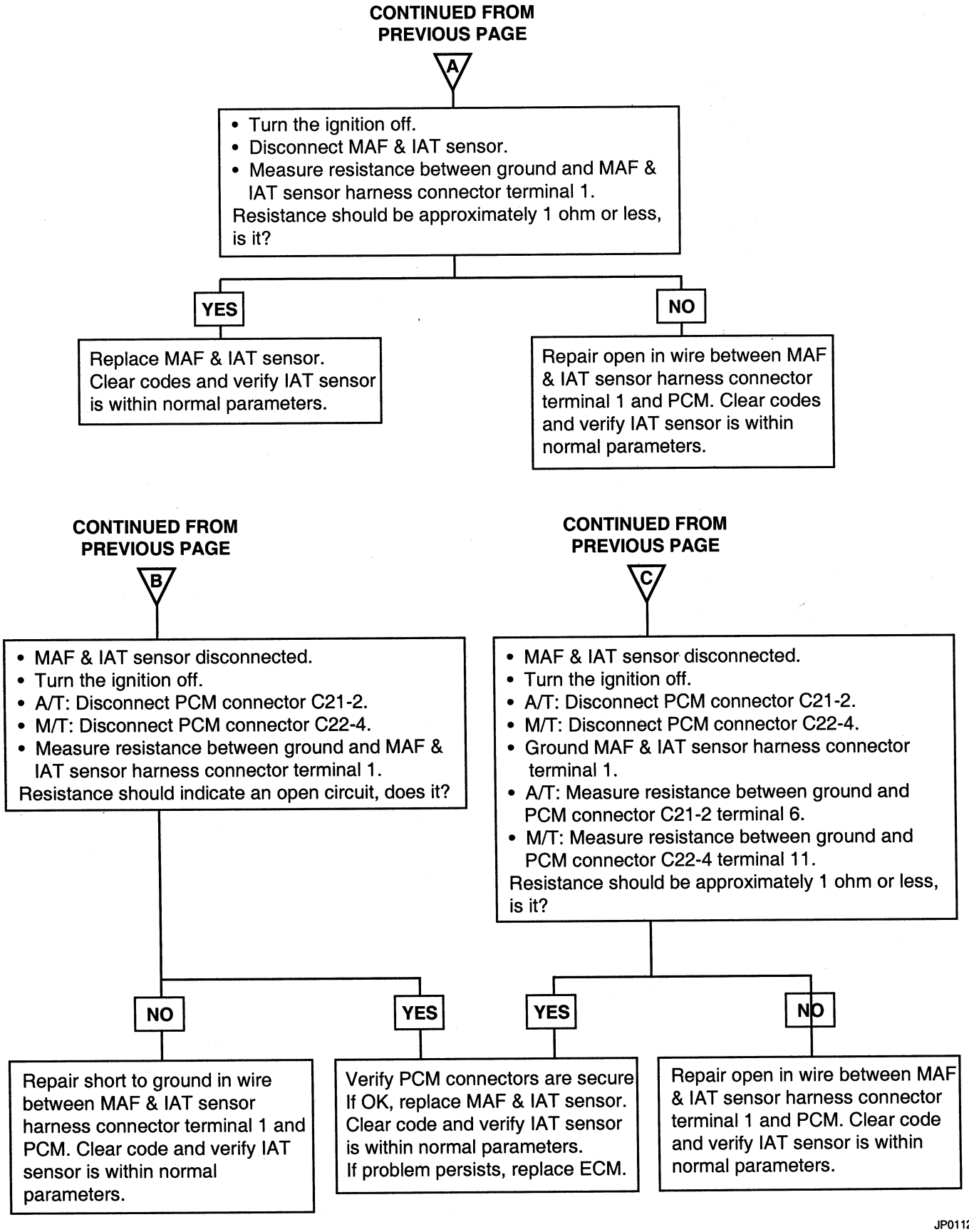
CIRCUIT DIAGRAM



EFJB705A

TEST PROCEDURE




CONTINUED FROM PREVIOUS PAGE
A
• Turn the ignition off.
• Disconnect MAF & IAT sensor.
• Measure resistance between ground and MAF & IAT sensor harness connector terminal 1.
Resistance should be approximately 1 ohm or less, is it?
YES
Replace MAF & IAT sensor. Clear codes and verify IAT sensor is within normal parameters.
NO
Repair open in wire between MAF & IAT sensor harness connector terminal 1 and PCM. Clear codes and verify IAT sensor is within normal parameters.
CONTINUED FROM PREVIOUS PAGE
B
• MAF & IAT sensor disconnected.
• Turn the ignition off.
• A/T: Disconnect PCM connector C21-2.
• M/T: Disconnect PCM connector C22-4.
• Measure resistance between ground and MAF & IAT sensor harness connector terminal 1.
Resistance should indicate an open circuit, does it?
NO
Repair short to ground in wire between MAF & IAT sensor harness connector terminal 1 and PCM. Clear code and verify IAT sensor is within normal parameters.
YES
Verify PCM connectors are secure
If OK, replace MAF & IAT sensor.
Clear code and verify IAT sensor is within normal parameters.
If problem persists, replace ECM.
CONTINUED FROM PREVIOUS PAGE
C
• MAF & IAT sensor disconnected.
• Turn the ignition off.
• A/T: Disconnect PCM connector C21-2.
• M/T: Disconnect PCM connector C22-4.
• Ground MAF & IAT sensor harness connector terminal 1.
• A/T: Measure resistance between ground and PCM connector C21-2 terminal 6.
• M/T: Measure resistance between ground and PCM connector C22-4 terminal 11.
Resistance should be approximately 1 ohm or less, is it?
YES
NO
Repair open in wire between MAF & IAT sensor harness connector terminal 1 and PCM. Clear code and verify IAT sensor is within normal parameters.

JP0112C

EFJB5030

DTC	Diagnostic item
P0115 P0116	Engine Coolant Temperature Circuit Malfunction (Open/Short) Engine Coolant Temperature Circuit Drift

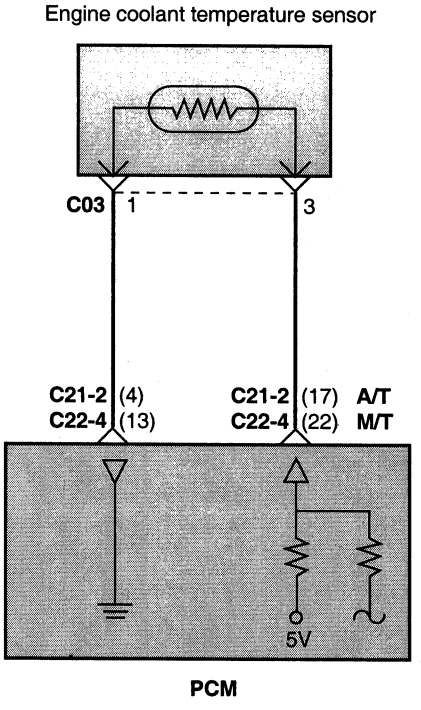
DESCRIPTION

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

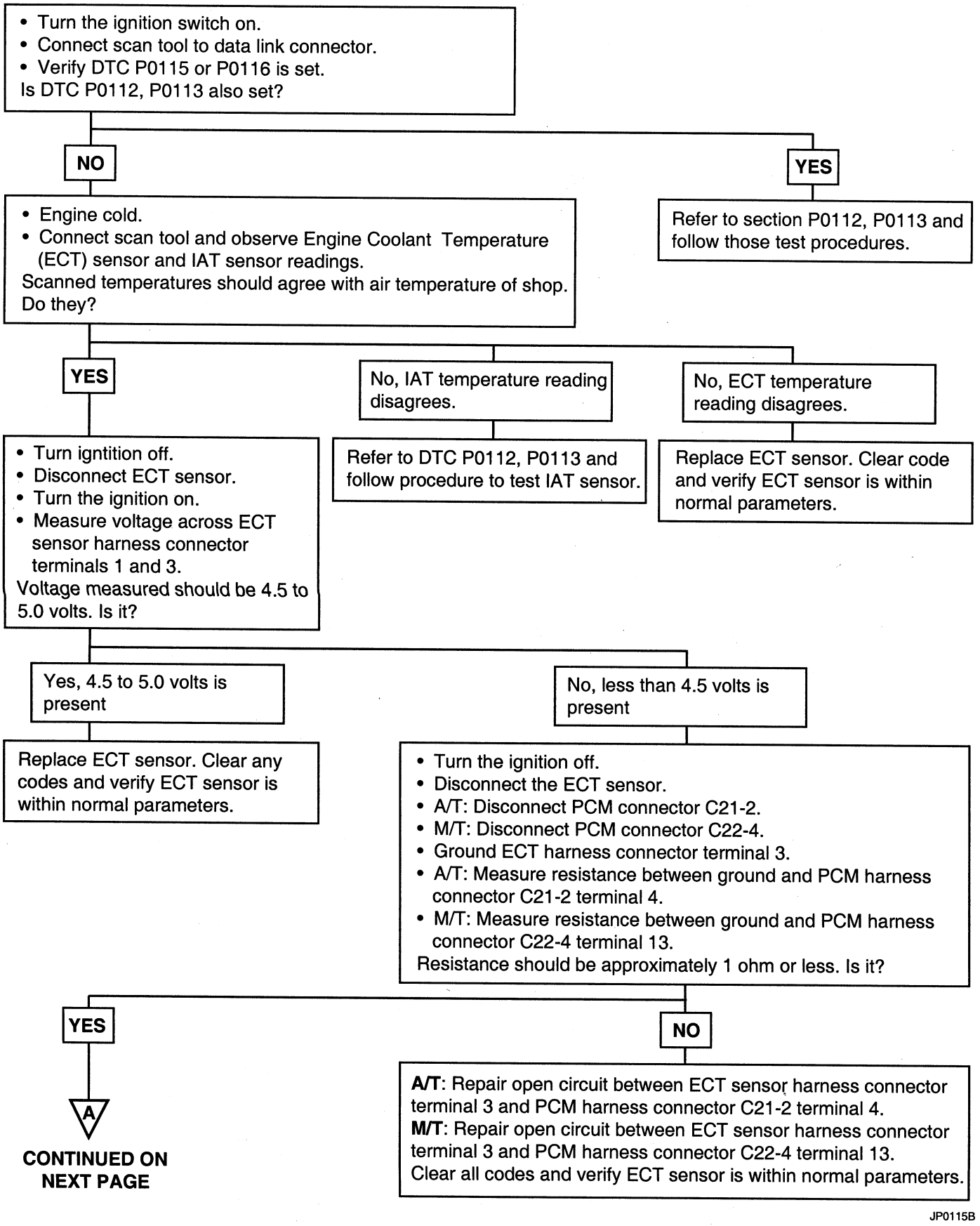
DTC detection condition	Probable cause
Background • The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it. • The Engine Control Module checks whether the voltage is within a specified range. In addition, it checks that the engine coolant temperature (signal) does not drop while the engine is warming up. Check Area, Judgment Criteria • 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. • 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. Check Area, Judgment Criteria • 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.]. • Then the sensor output voltage has continued to be 1.6V or higher for 5 min. Check Area • The Engine Coolant Temperature is approx. 40°C (104°F) or less after starting sequence is completed. Judgment Criteria • 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. • Open or shorted Engine Coolant Temperature sensor circuit, or loose connector. • Engine Control Module failed.

CIRCUIT DIAGRAM



JP0115A

TEST PROCEDURE



JP0115B

CONTINUED FROM PREVIOUS PAGE

A

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

Resistance should indicate an open circuit. Does it?

YES

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

Resistance should indicate an open circuit. Does it?

YES

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

NO

A/T: Repair open circuit between ECT sensor harness connector terminal 1 and PCM harness connector C21-2 terminal 4.
M/T: Repair open circuit between ECT sensor harness connector terminal 1 and PCM harness connector C22-4 terminal 13.
Clear any codes and verify ECT sensor is within normal parameters.

NO

A/T: Repair short to ground between ECT sensor harness connector terminal 3 and PCM harness connector C21-2 terminal 4.
M/T: Repair short to ground between ECT sensor harness connector terminal 3 and PCM harness connector C22-4 terminal 13.
Clear all codes and verify ECT sensor is within normal parameters.

HP0115C

EFJB5040

DTC	Diagnostic item
P0121	Throttle Position Circuit Range/Performance Problem
P0122	Throttle Position Circuit Low Voltage
P0123	Throttle Position Circuit High Voltage

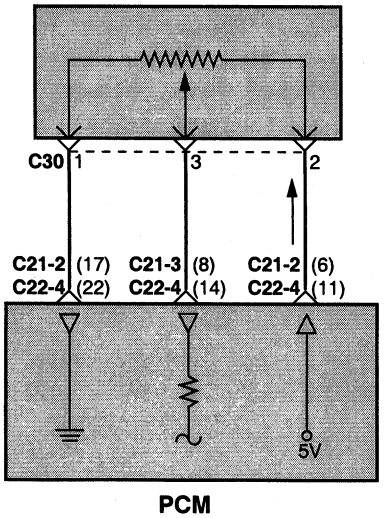
DESCRIPTION

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

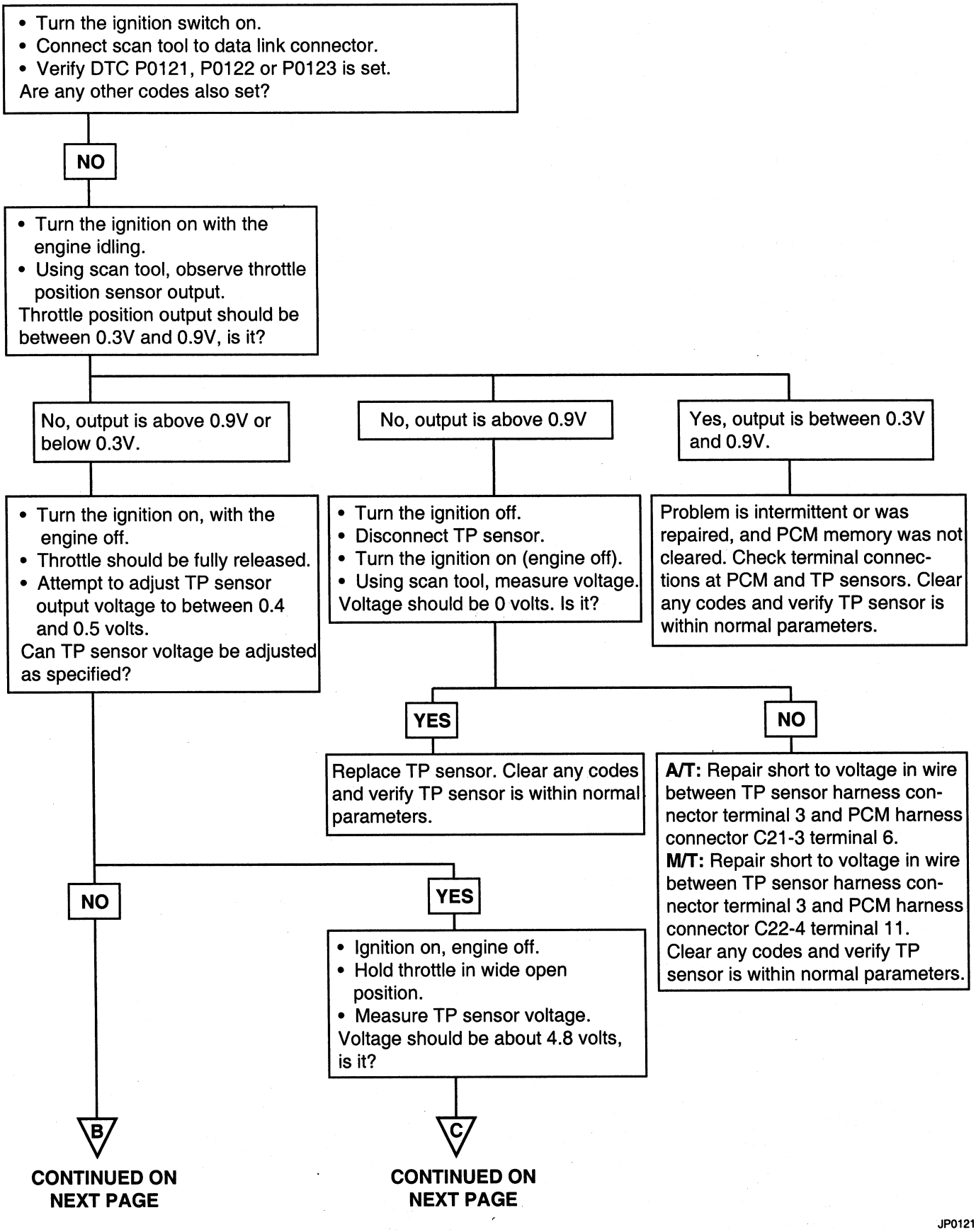
DTC detection condition	Probable cause
Background • The Throttle Position sensor outputs a voltage which is proportional to the throttle valve opening angle. • The Engine Control Module checks whether the voltage output by the throttle position sensor is within a specified range. In addition, it checks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

CIRCUIT DIAGRAM



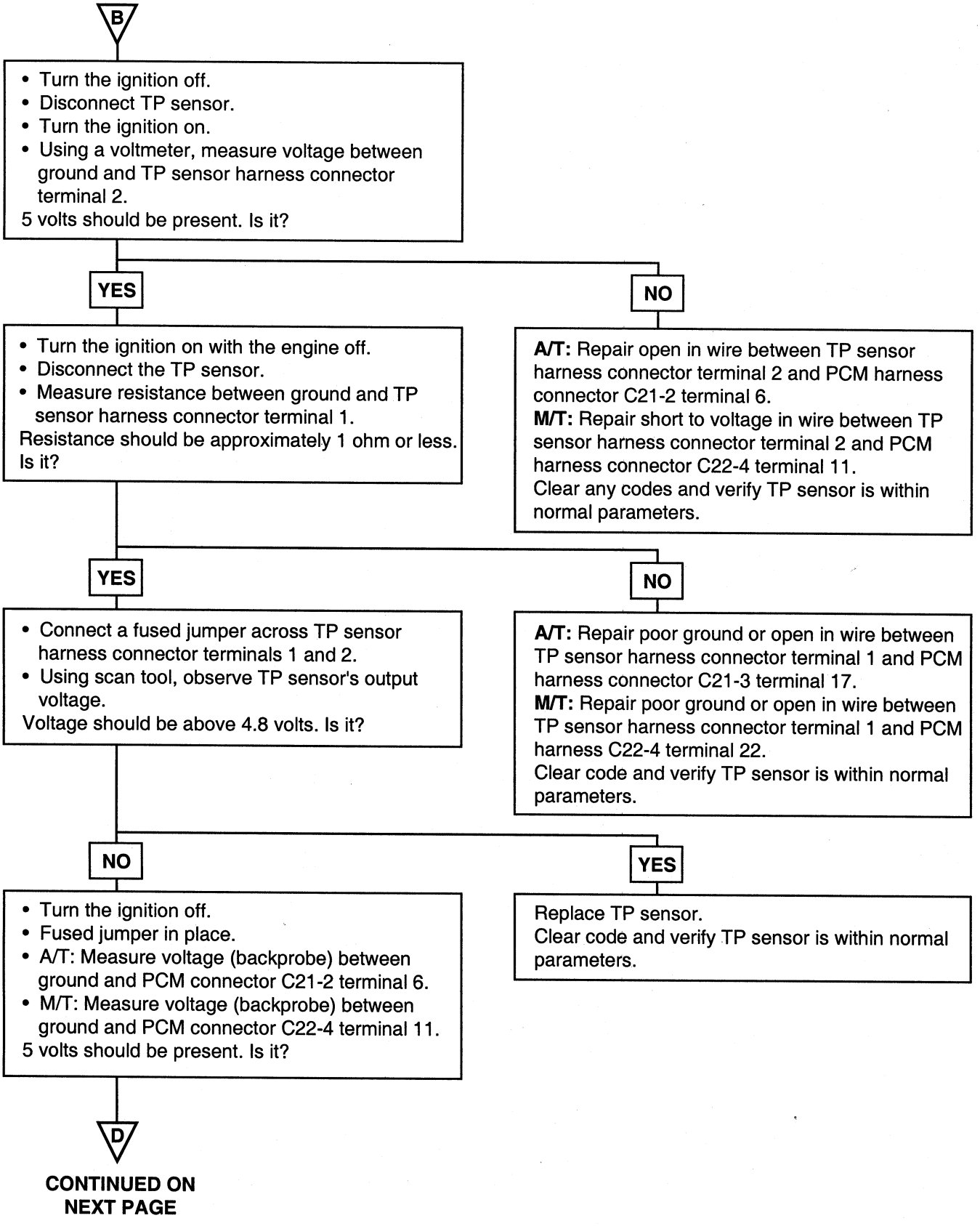
JP0121A

TEST PROCEDURE



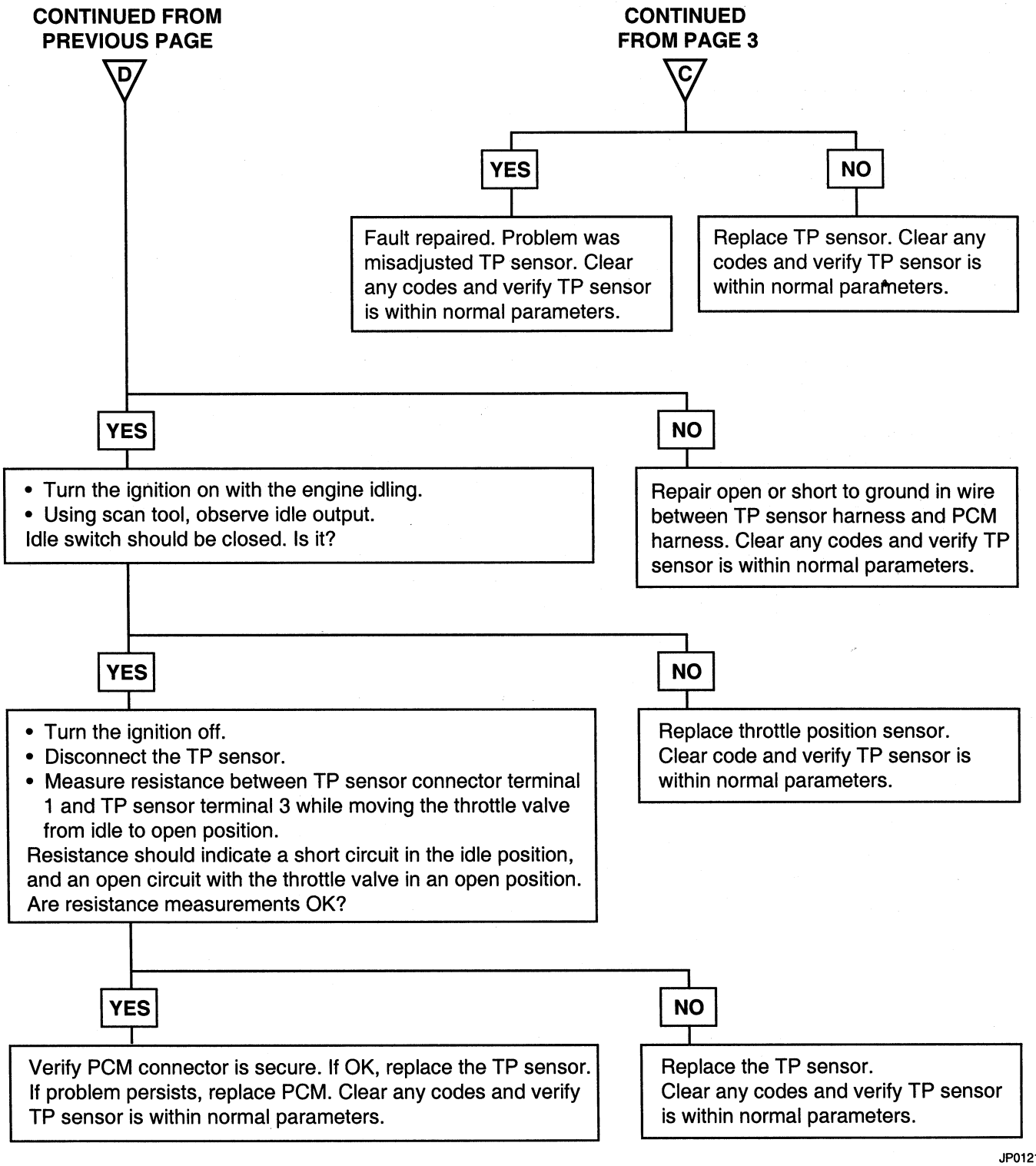
JP0121B

CONTINUED FROM PREVIOUS PAGE



CONTINUED ON NEXT PAGE

JP0121C


CONTINUED FROM PREVIOUS PAGE
D
CONTINUED FROM PAGE 3
C
YES
NO
Fault repaired. Problem was misadjusted TP sensor. Clear any codes and verify TP sensor is within normal parameters.
Replace TP sensor. Clear any codes and verify TP sensor is within normal parameters.
YES
NO
• Turn the ignition on with the engine idling.
• Using scan tool, observe idle output.
Idle switch should be closed. Is it?
Repair open or short to ground in wire between TP sensor harness and PCM harness. Clear any codes and verify TP sensor is within normal parameters.
YES
NO
• Turn the ignition off.
• Disconnect the TP sensor.
• 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 PCM connector is secure. If OK, replace the TP sensor. If problem persists, replace PCM. Clear any codes and verify TP sensor is within normal parameters.
Replace the TP sensor. Clear any codes and verify TP sensor is within normal parameters.

JP0121D

EFJB5060

DTC	Diagnostic item
P0132	Oxygen Sensor Circuit Malfunction (Open)
P0133	Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1)
P0134	Oxygen Sensor Circuit Malfunction (No Activity)

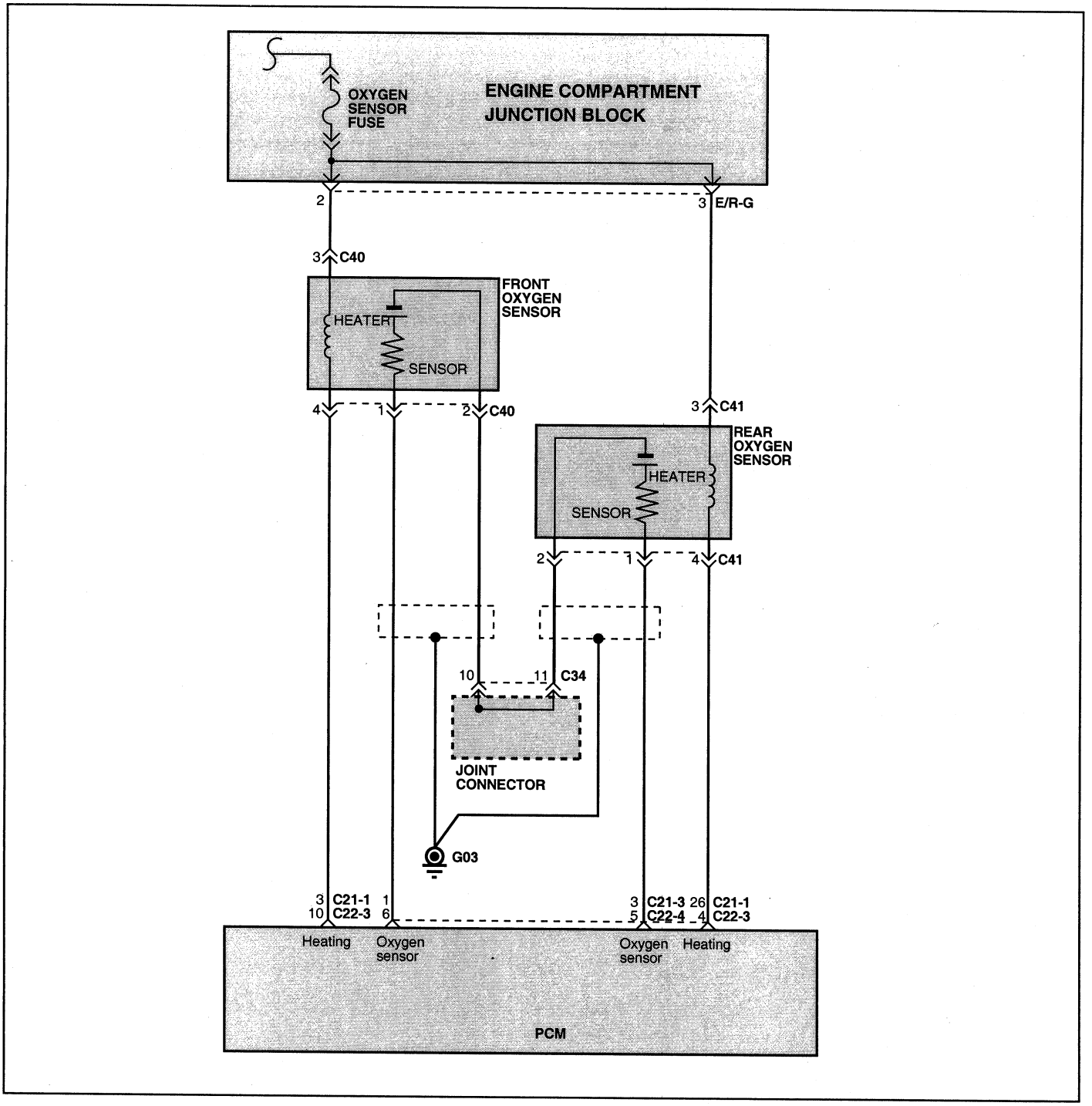
DESCRIPTION

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

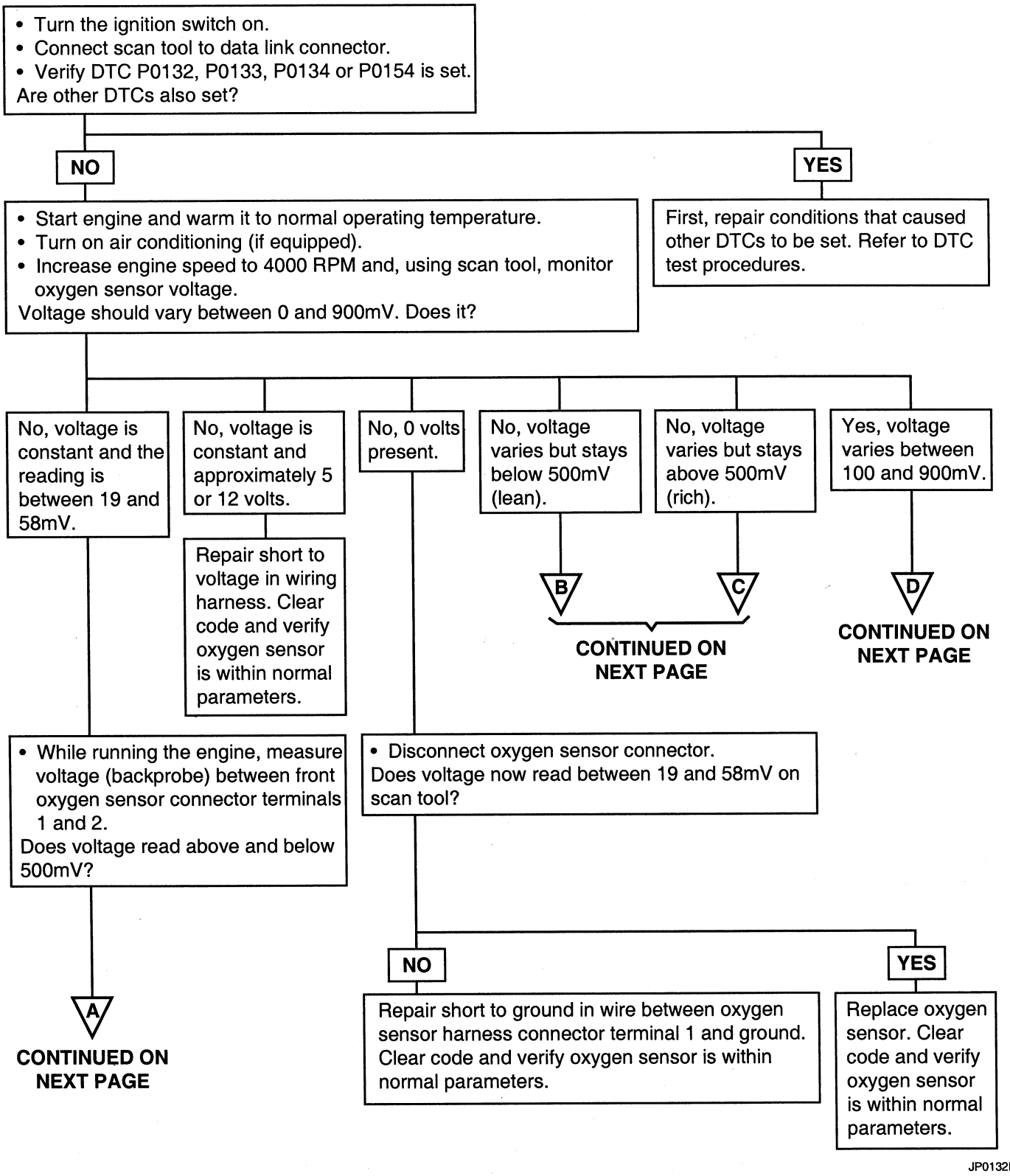
DTC detection condition	Probable cause
Background • When the heated oxygen sensor begins to deteriorate, the oxygen sensor signal response becomes poor. • The Engine Control Module forcibly varies the air/fuel mixture to make it leaner and richer and checks the response speed of the heated oxygen sensor. In addition, the Engine Control Module also checks for an open circuit in the heated oxygen sensor output line. Check Area • Coolant temperature sensor: Normal. • Heated oxygen sensor signal voltage has continued to be 0.1V or lower for 3 min. or more after the staring sequence was completed. • Engine Coolant Temperature is higher than 80°C (176°F). • Engine speed is higher than 1,200 r/min. • Engine load is 25% or more. Judgment Criteria • 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. Check Area • Coolant temperature sensor: Normal. • Engine Coolant Temperature is 50°C (122°F) or more. • Engine speed is between 1,500 and 3,000 r/min or 1,100 and 3,000 r/min. • Engine load is 25 - 60%. • Intake air temperature is -10°C (14°F) or more. • Under the closed loop air-fuel control. • Monitoring Time: 8sec. Judgment Criteria • 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. • Monitored only once per trip.	• Heated oxygen sensor deteriorated • Open circuit in heated oxygen sensor output line • Engine control module failed

CIRCUIT DIAGRAM

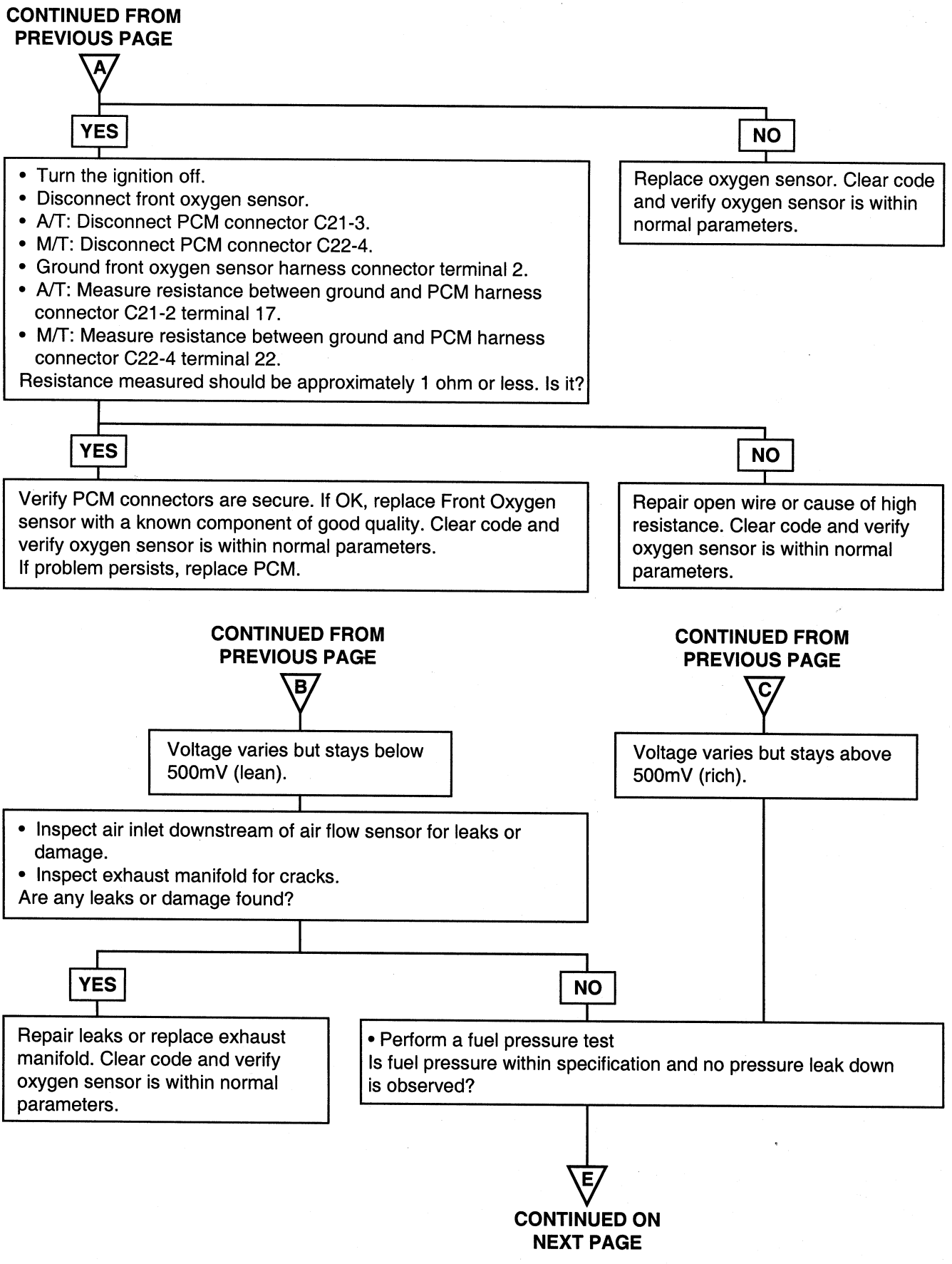


EFJB719A

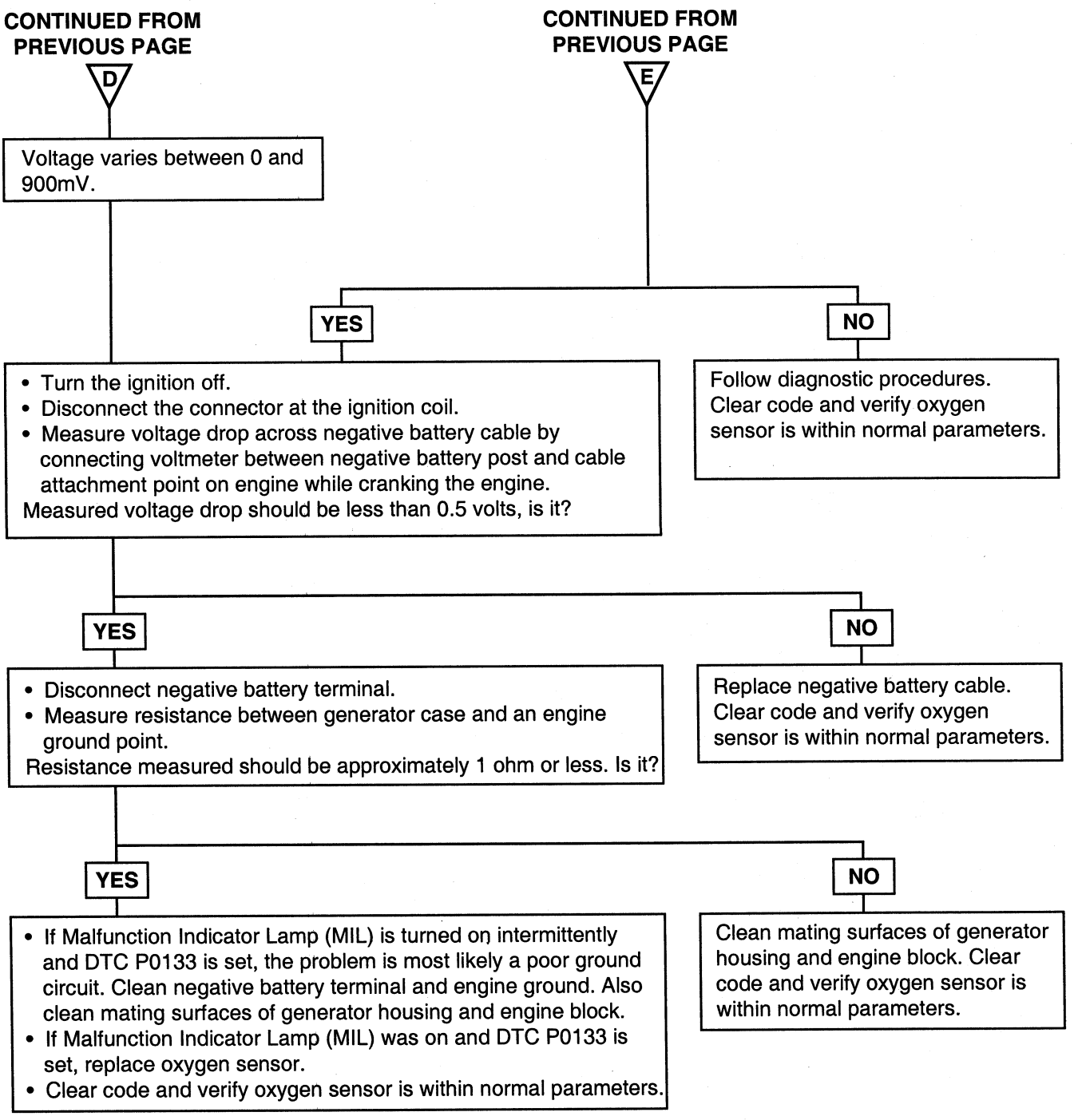
TEST PROCEDURE



JP0132B


CONTINUED FROM PREVIOUS PAGE
A
YES
NO
• Turn the ignition off.
• Disconnect front oxygen sensor.
• A/T: Disconnect PCM connector C21-3.
• M/T: Disconnect PCM connector C22-4.
• Ground front oxygen sensor harness connector terminal 2.
• A/T: Measure resistance between ground and PCM harness connector C21-2 terminal 17.
• M/T: Measure resistance between ground and PCM harness connector C22-4 terminal 22.
Resistance measured should be approximately 1 ohm or less. Is it?
Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.
YES
NO
Verify PCM 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 PCM.
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).
CONTINUED FROM PREVIOUS PAGE
C
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?
YES
NO
Repair leaks or replace exhaust manifold. Clear code and verify oxygen sensor is within normal parameters.
• Perform a fuel pressure test
Is fuel pressure within specification and no pressure leak down is observed?
E
CONTINUED ON NEXT PAGE

HP0133C


CONTINUED FROM PREVIOUS PAGE
D
Voltage varies between 0 and 900mV.
CONTINUED FROM PREVIOUS PAGE
E
YES
NO
• Turn the ignition off.
• Disconnect the connector at the ignition coil.
• 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. Clear code and verify oxygen sensor is within normal parameters.
YES
NO
• Disconnect negative battery terminal.
• Measure resistance between generator case and an 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

EFJB5070

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

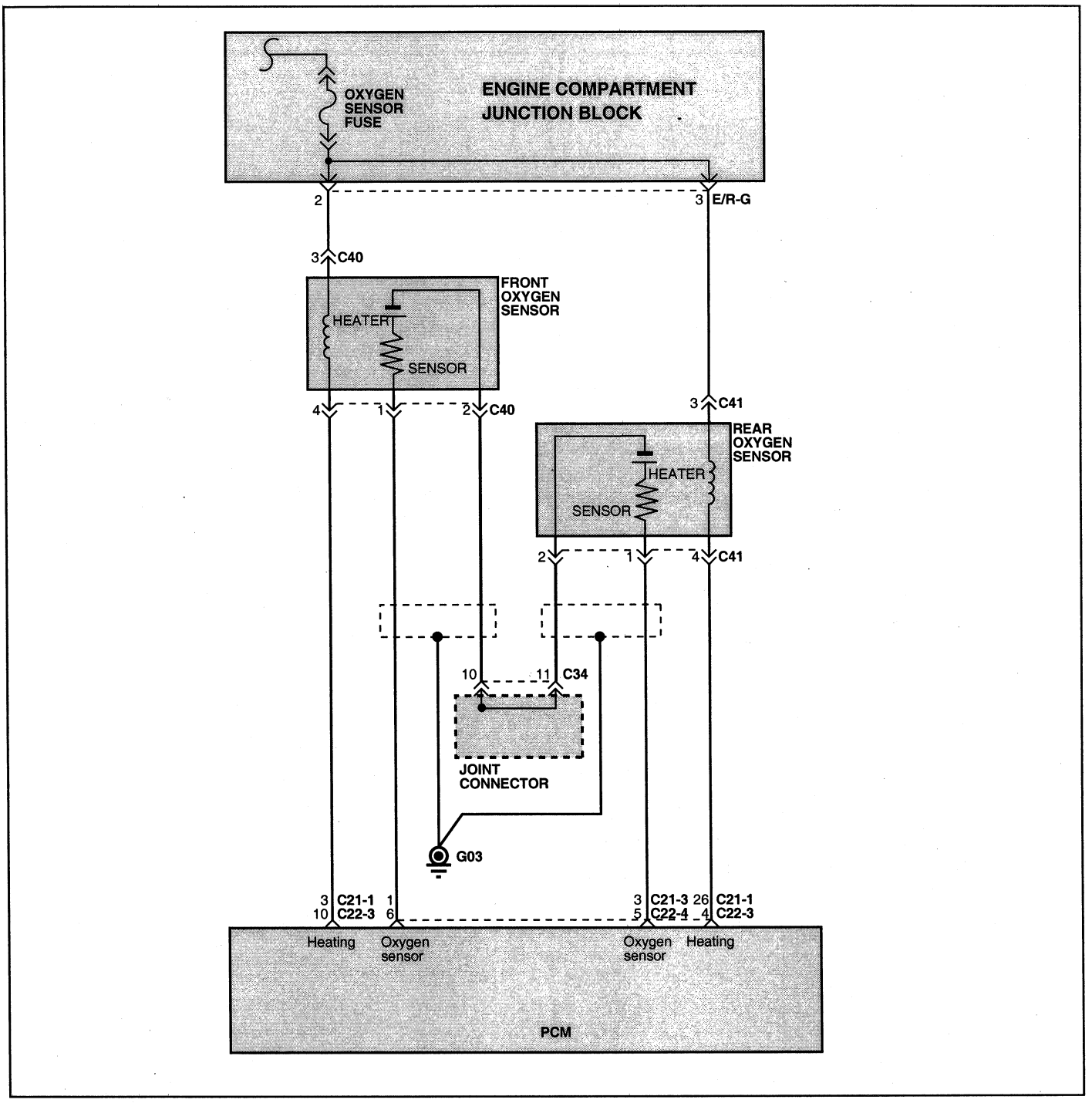
DESCRIPTION

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

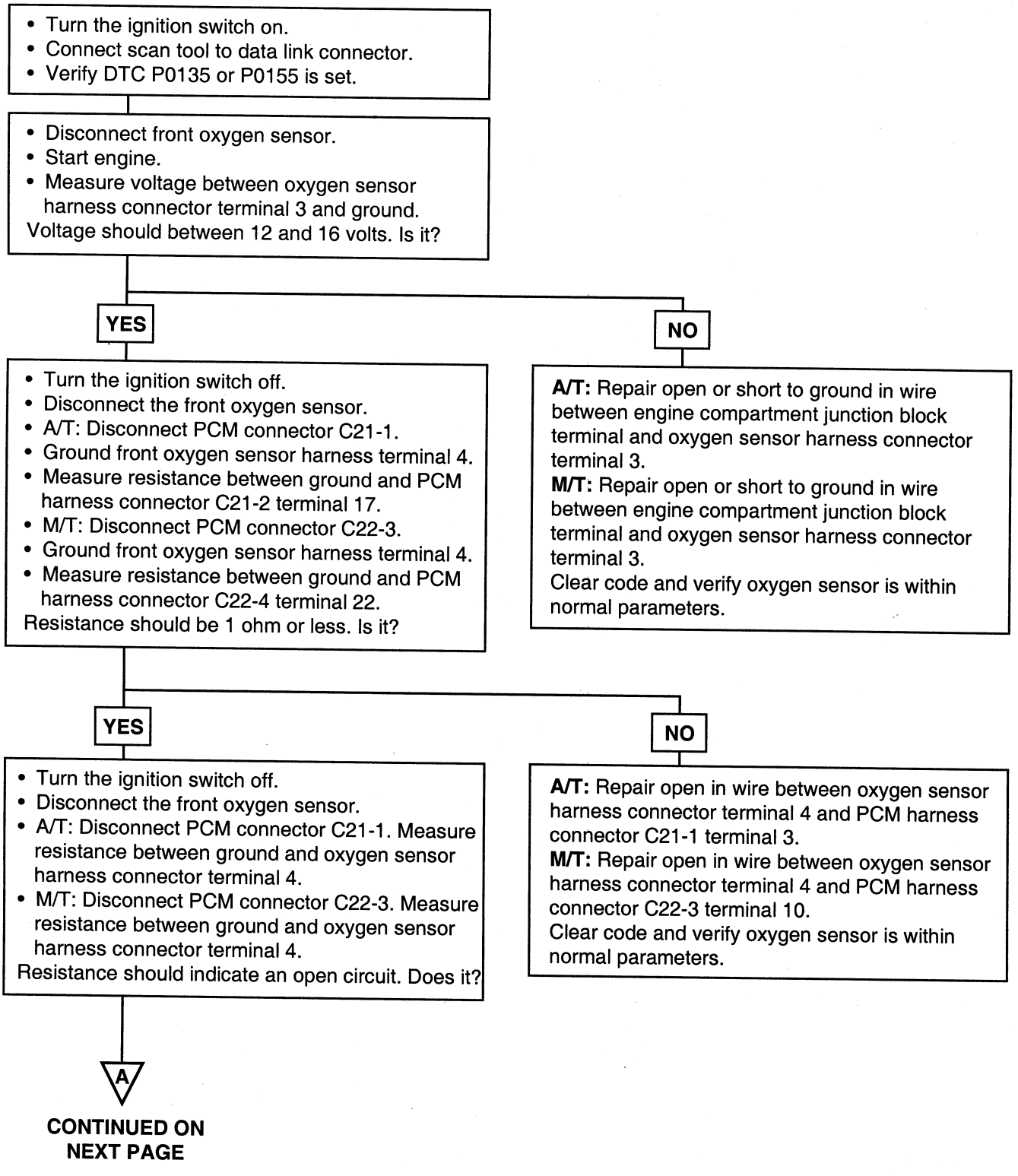
DTC detection condition	Probable cause
Background • The Engine Control Module checks whether the heater current is within a specified range when the heater is energized. Check Area • Battery voltage is between 12 and 16V. Judgment Criteria • Heater current of the front heated oxygen sensor heater (Bank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

CIRCUIT DIAGRAM



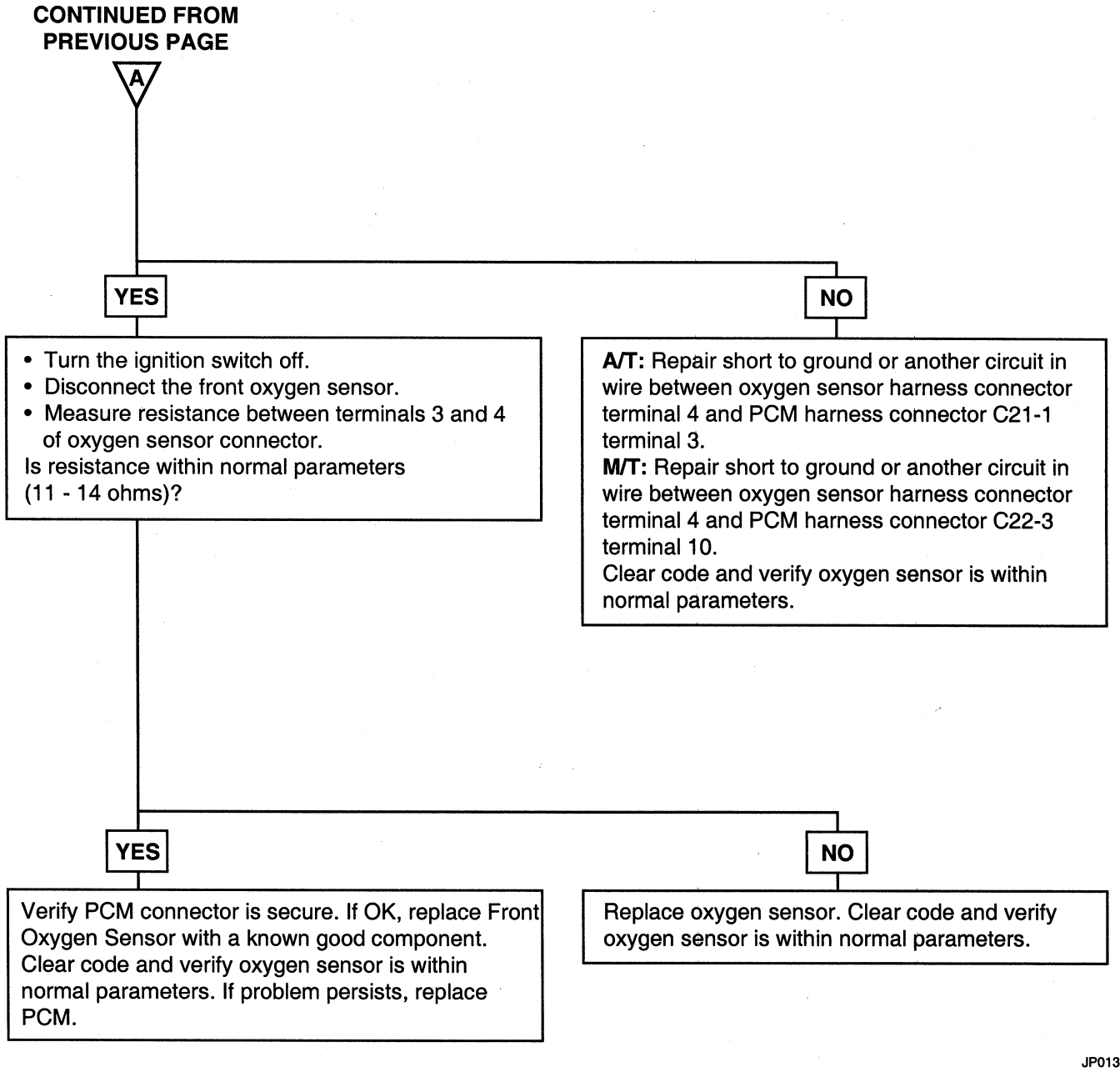
EFJB719A

TEST PROCEDURE



CONTINUED ON NEXT PAGE

JP0135B


CONTINUED FROM PREVIOUS PAGE
A
YES
NO
• Turn the ignition switch off.
• Disconnect the front oxygen sensor.
• Measure resistance between terminals 3 and 4 of oxygen sensor connector.
Is resistance within normal parameters (11 - 14 ohms)?
A/T: Repair short to ground or another circuit in wire between oxygen sensor harness connector terminal 4 and PCM harness connector C21-1 terminal 3.
M/T: Repair short to ground or another circuit in wire between oxygen sensor harness connector terminal 4 and PCM harness connector C22-3 terminal 10.
Clear code and verify oxygen sensor is within normal parameters.
YES
NO
Verify PCM connector is secure. If OK, replace Front Oxygen Sensor with a known good component. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace PCM.
Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.

JP0135C

EFJB5080

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

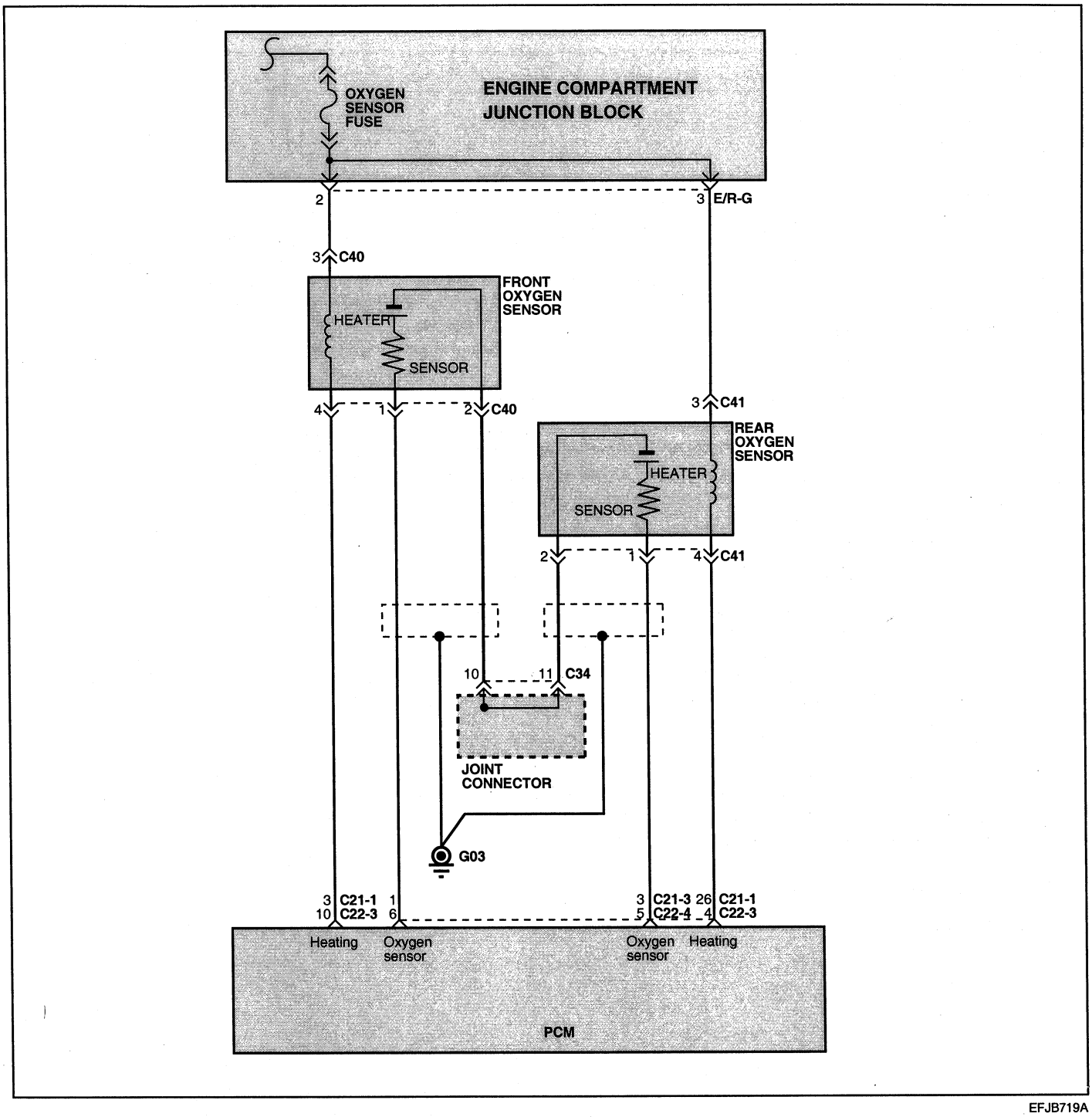
DESCRIPTION

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

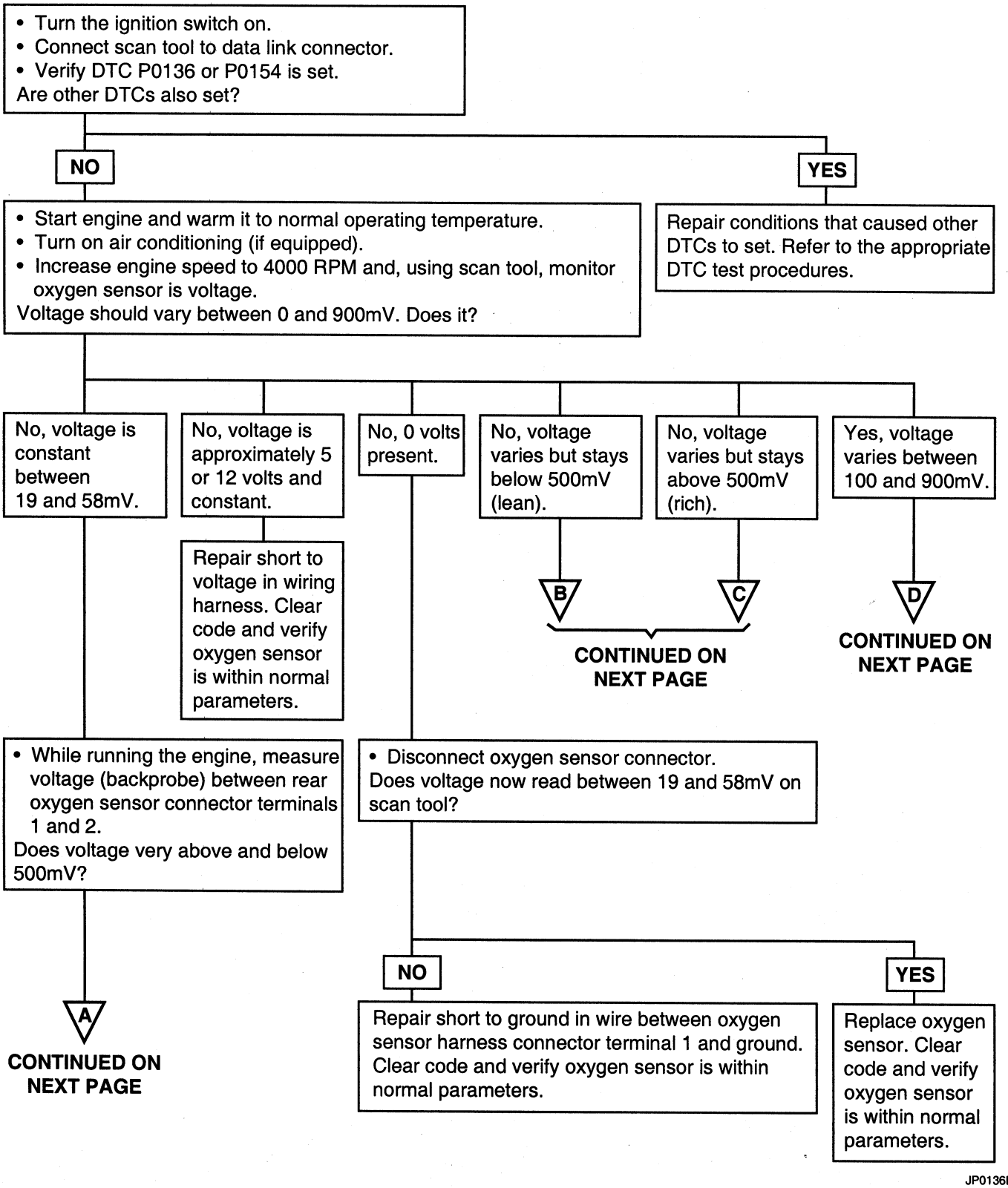
DTC detection condition	Probable cause
Background • The Engine Control Module checks for an open circuit in the heated oxygen sensor output line. Check Area • Coolant temperature sensor: Normal. • Heated oxygen sensor signal voltage has continued to be 0.1V or lower for 3 min. or more after the staring sequence was completed. • Engine coolant temperature is 80°C (176°F) or more. • Engine speed is higher than 1,200 r/min. • Engine load is 25% or more. • Monitoring Time: 7 - 10 sec. Judgment Criteria • 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. • 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 • Open circuit in heated oxygen sensor output line • Engine control module failed

CIRCUIT DIAGRAM

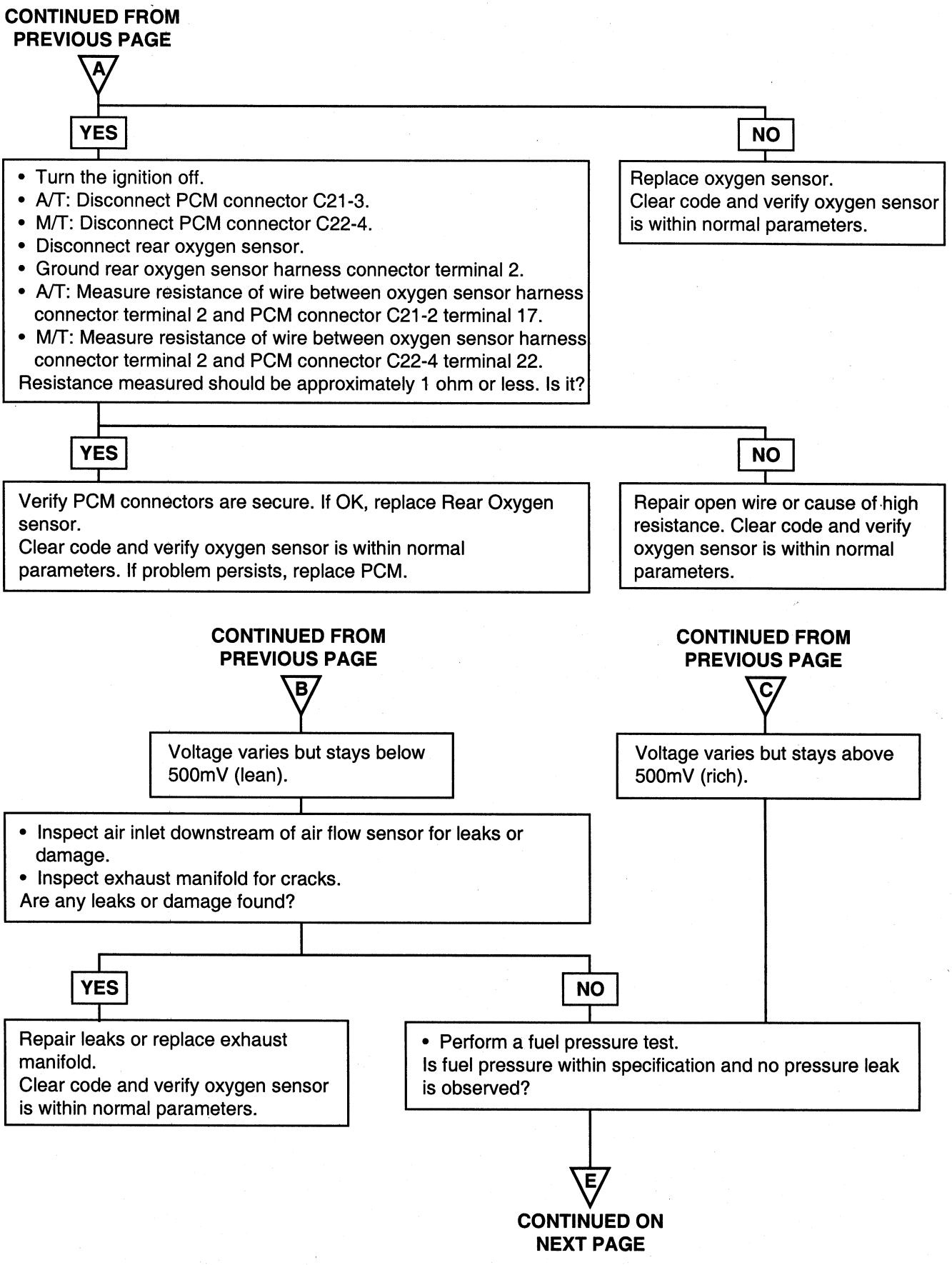


EFJB719A

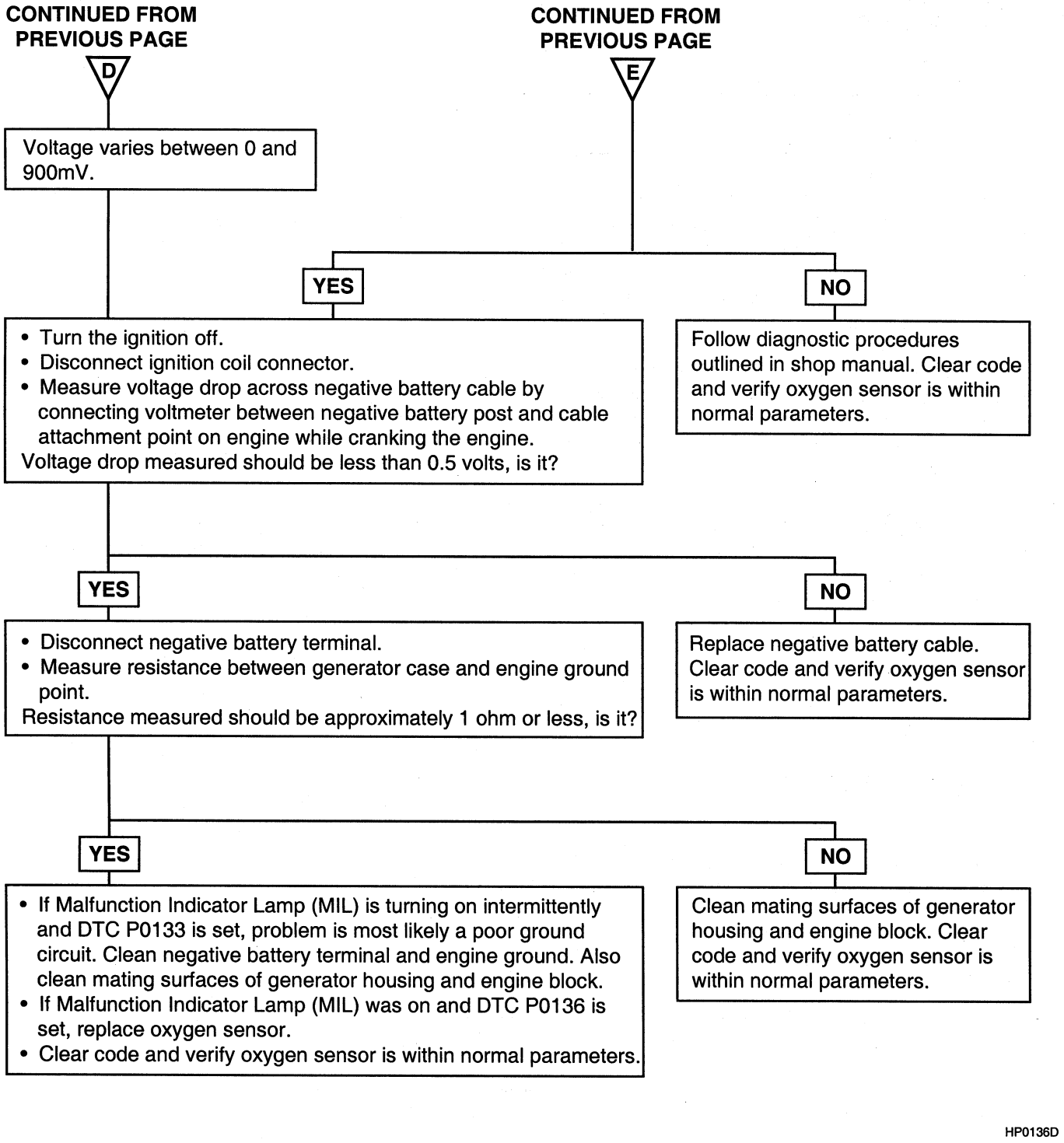
TEST PROCEDURE



JP0136B


CONTINUED FROM PREVIOUS PAGE
A
YES
NO
• Turn the ignition off.
• A/T: Disconnect PCM connector C21-3.
• M/T: Disconnect PCM 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 PCM connector C21-2 terminal 17.
• M/T: Measure resistance of wire between oxygen sensor harness connector terminal 2 and PCM connector C22-4 terminal 22.
Resistance measured should be approximately 1 ohm or less. Is it?
Replace oxygen sensor.
Clear code and verify oxygen sensor is within normal parameters.
YES
NO
Verify PCM connectors are secure. If OK, replace Rear Oxygen sensor.
Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace PCM.
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).
CONTINUED FROM PREVIOUS PAGE
C
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?
YES
NO
Repair leaks or replace exhaust manifold.
Clear code and verify oxygen sensor is within normal parameters.
• Perform a fuel pressure test.
Is fuel pressure within specification and no pressure leak is observed?
E
CONTINUED ON NEXT PAGE

HP0136C


CONTINUED FROM PREVIOUS PAGE
D
CONTINUED FROM PREVIOUS PAGE
E
Voltage varies between 0 and 900mV.
YES
NO
• Turn the 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

EFJB5090

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

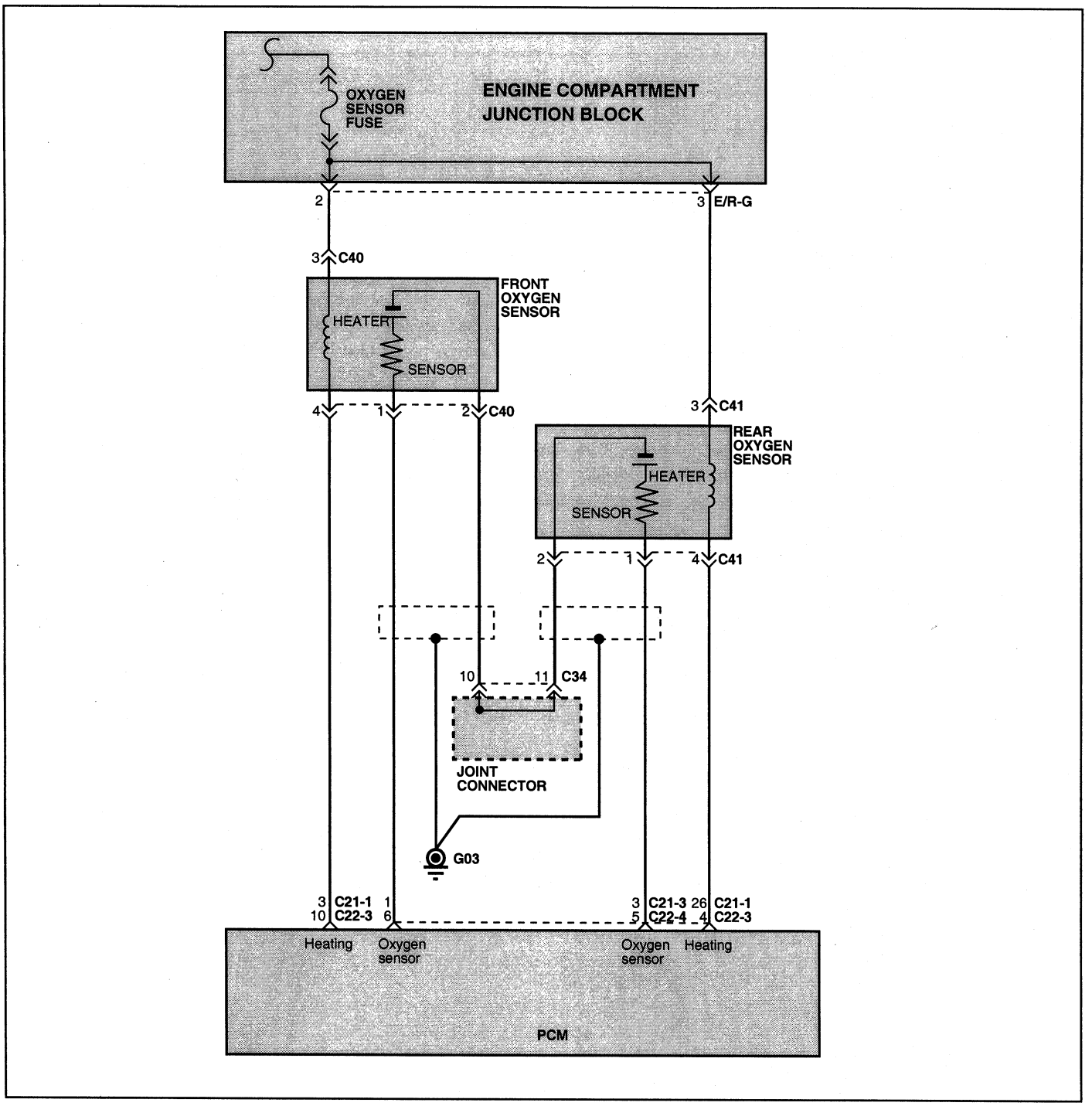
DESCRIPTION

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 • The Engine Control Module checks whether the heater current is within a specified range when the heater is energized. Check Area • Battery voltage is between 12 and 16V. Judgment Criteria • 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. • Monitored only once per trip.	• Open or shorted oxygen sensor heater circuit • Open circuit in oxygen sensor heater • Engine control module failed

CIRCUIT DIAGRAM



EFJB719A

TEST PROCEDURE

- Turn the 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 the ignition switch off.
- Disconnect the rear oxygen sensor disconnected.
- A/T: Disconnect PCM connector C21-1. Ground rear oxygen sensor harness connector terminal 4.
- Measure resistance between ground and PCM connector C21-2 terminal 17.
- M/T: Disconnect PCM connector C22-3. Ground rear oxygen sensor harness connector terminal 4.
- Measure resistance between ground and PCM connector C22-4 terminal 22.

Resistance measured should be approximately 1 ohm or less. Is it?

YES

- Turn the ignition switch off.
- Disconnect the rear oxygen sensor disconnected.
- A/T: Disconnect PCM connector C21-1. Measure resistance between ground and oxygen sensor harness connector terminal 4.
- M/T: Disconnect PCM 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 PCM connector is secure. If OK, replace Rear Oxygen sensor. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace PCM.

NO

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

NO

A/T: Repair short to ground or another circuit in wire betweenPCM harness connector C21-1 terminal 17 and oxygen sensor harness connector terminal 4.
M/T: Repair short to ground or another circuit in wire between PCM harness connector C22-4 terminal 22 and oxygen sensor harness connector terminal 4.
Clear code and verify oxygen sensor is within normal parameters.

NO

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

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.

JP0141B

EFJB5100

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

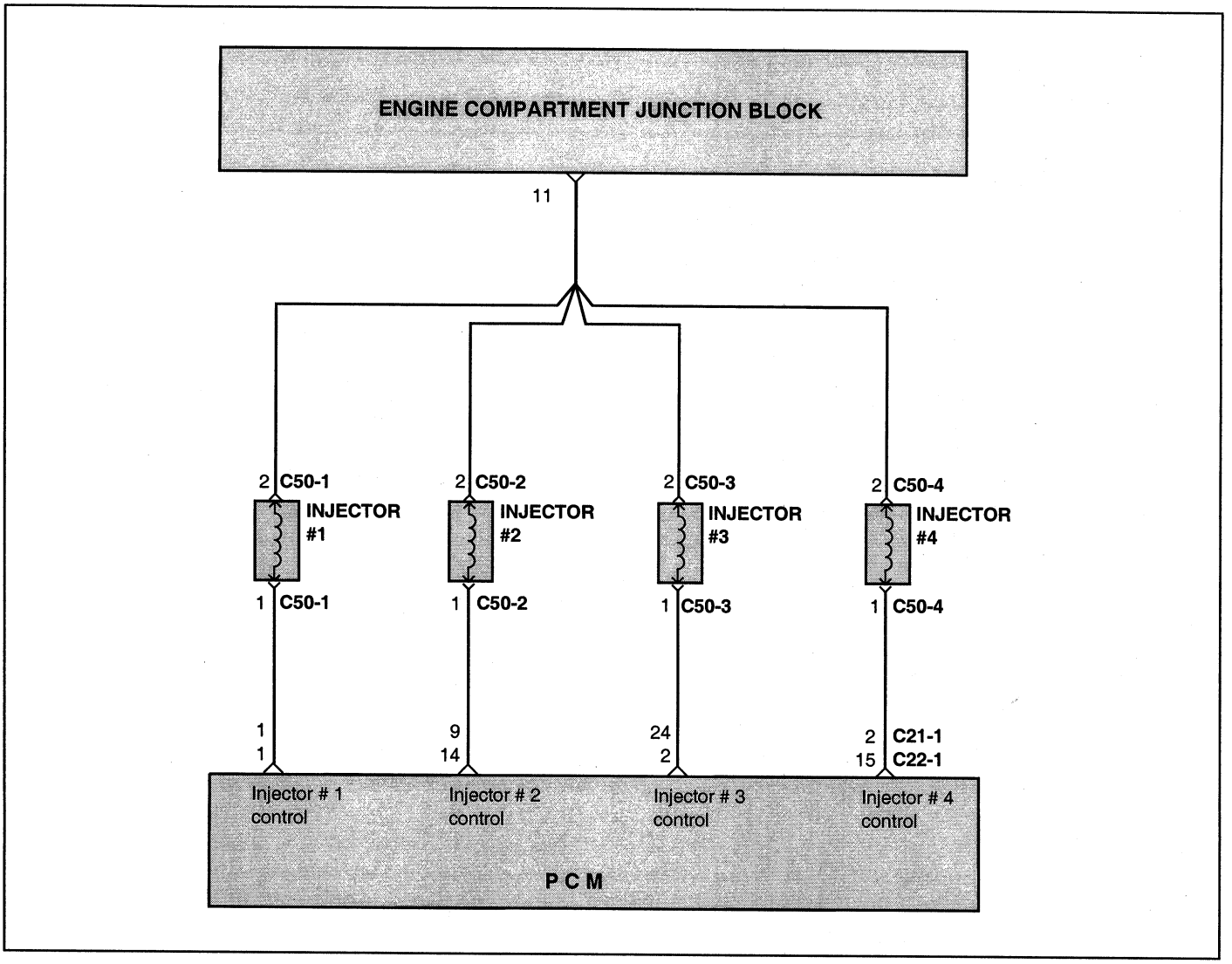
DESCRIPTION

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

CIRCUIT DIAGRAM



JP0201A

TEST PROCEDURE

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

Battery voltage should be present. Is it?

YES

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

Resistance measured should be approximately 1 ohm or less. Is it?

YES

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

Resistance should indicate an open circuit. Does it?

A

CONTINUED ON NEXT PAGE

YES

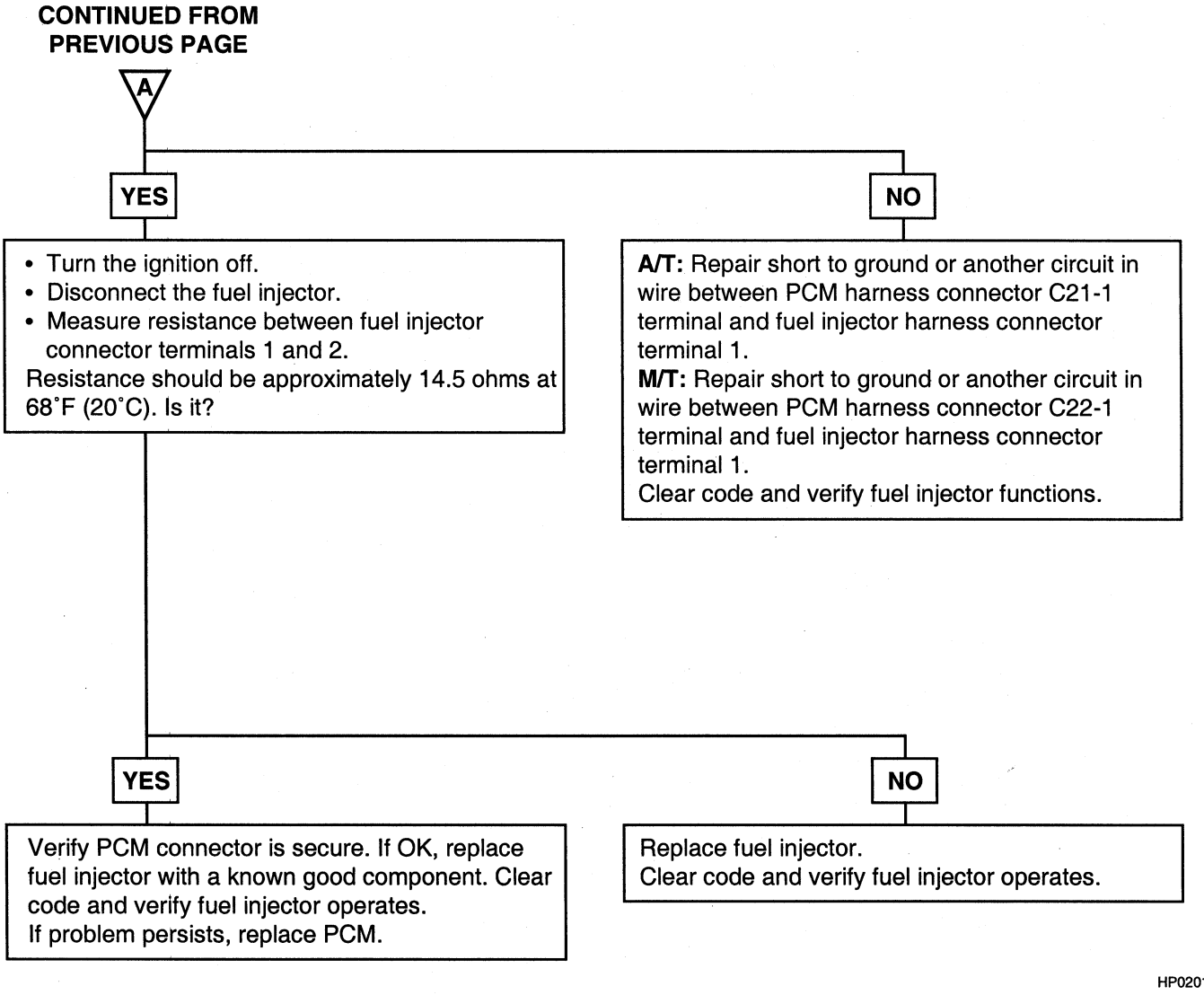
Problem is intermittent or was repaired and Engine Control Module (PCM) memory was not cleared. Clear code and verify fuel injector functions.

NO

Repair open in wire between engine compartment junction block terminal 11 and fuel injector's harness connector terminal 2.
Clear code and verify fuel injector functions.

NO

A/T: Repair open in wire between PCM harness connector C21-1 terminal and fuel injector harness connector terminal 1.
M/T: Repair open in wire between PCM harness connector C22-1 terminal and fuel injector harness connector terminal 1.
Clear code and verify fuel injector functions.


CONTINUED FROM PREVIOUS PAGE
A
YES
NO
• Turn the ignition off.
• Disconnect the fuel injector.
• 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 PCM harness connector C21-1 terminal and fuel injector harness connector terminal 1.
M/T: Repair short to ground or another circuit in wire between PCM harness connector C22-1 terminal and fuel injector harness connector terminal 1.
Clear code and verify fuel injector functions.
YES
NO
Verify PCM connector is secure. If OK, replace fuel injector with a known good component. Clear code and verify fuel injector operates.
If problem persists, replace PCM.
Replace fuel injector.
Clear code and verify fuel injector operates.

HP0201C

EFJB5110

DTC	Diagnostic item
P0300	Random Misfire Detected

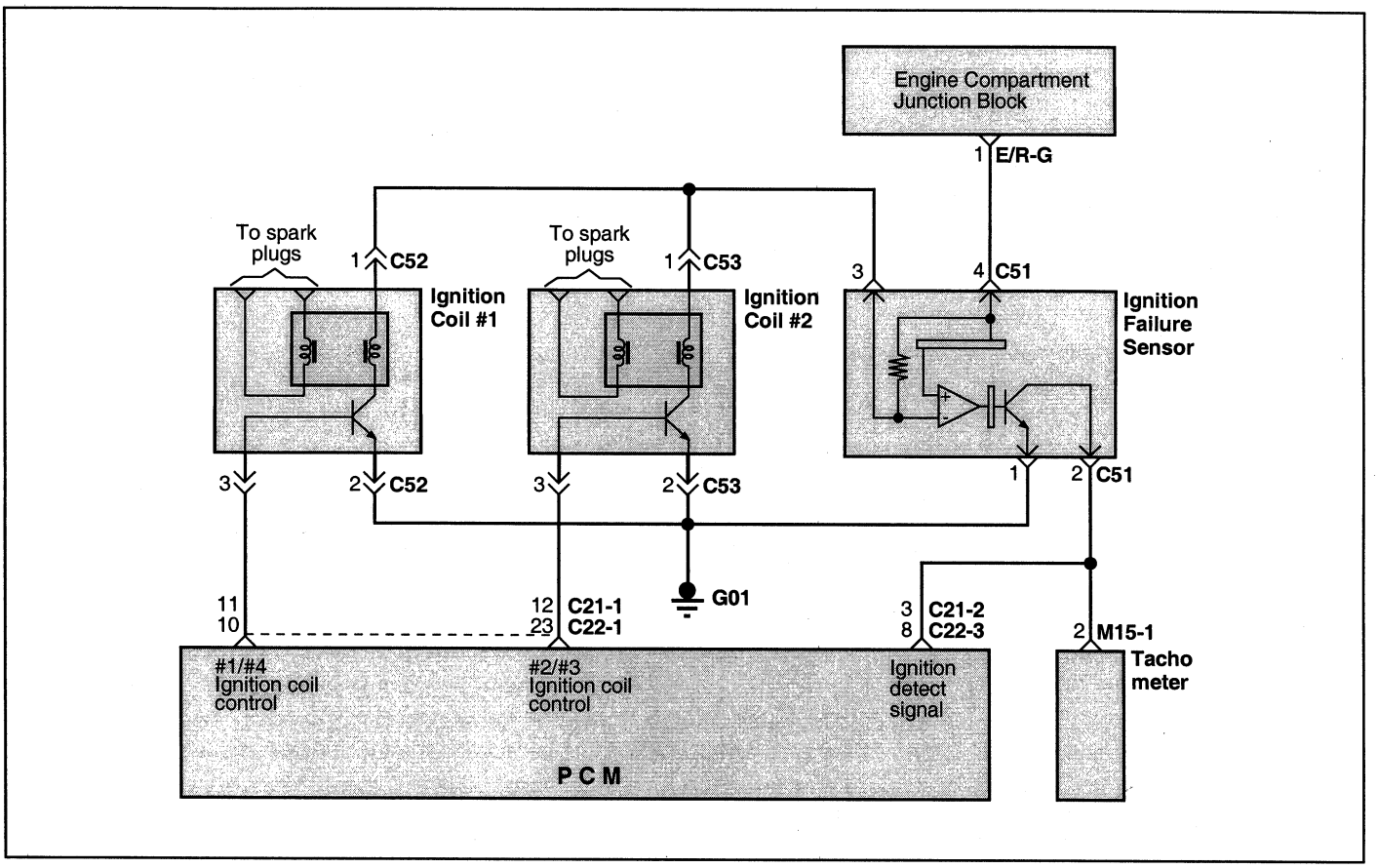
DESCRIPTION

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

CIRCUIT DIAGRAM



JP0300A

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?

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.

YES

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

Battery voltage should be present, is it?

NO

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

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?

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.

YES

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

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

A

CONTINUED ON NEXT PAGE

JP0300B

CONTINUED FROM PREVIOUS PAGE

A

YES

- Turn the ignition off.
- 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 1 and ignition coil connector terminal 2.
Clear code and verify code does not reappear.

YES

- Disconnect the ignition coil.
- Reconnect PCM connectors.
- Put the ignition switch in the start position.
- 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 PCM connector is secure. If OK, replace power transistor with a known good component. Clear code and verify code does not reappear. If problem persists, replace PCM.

YES

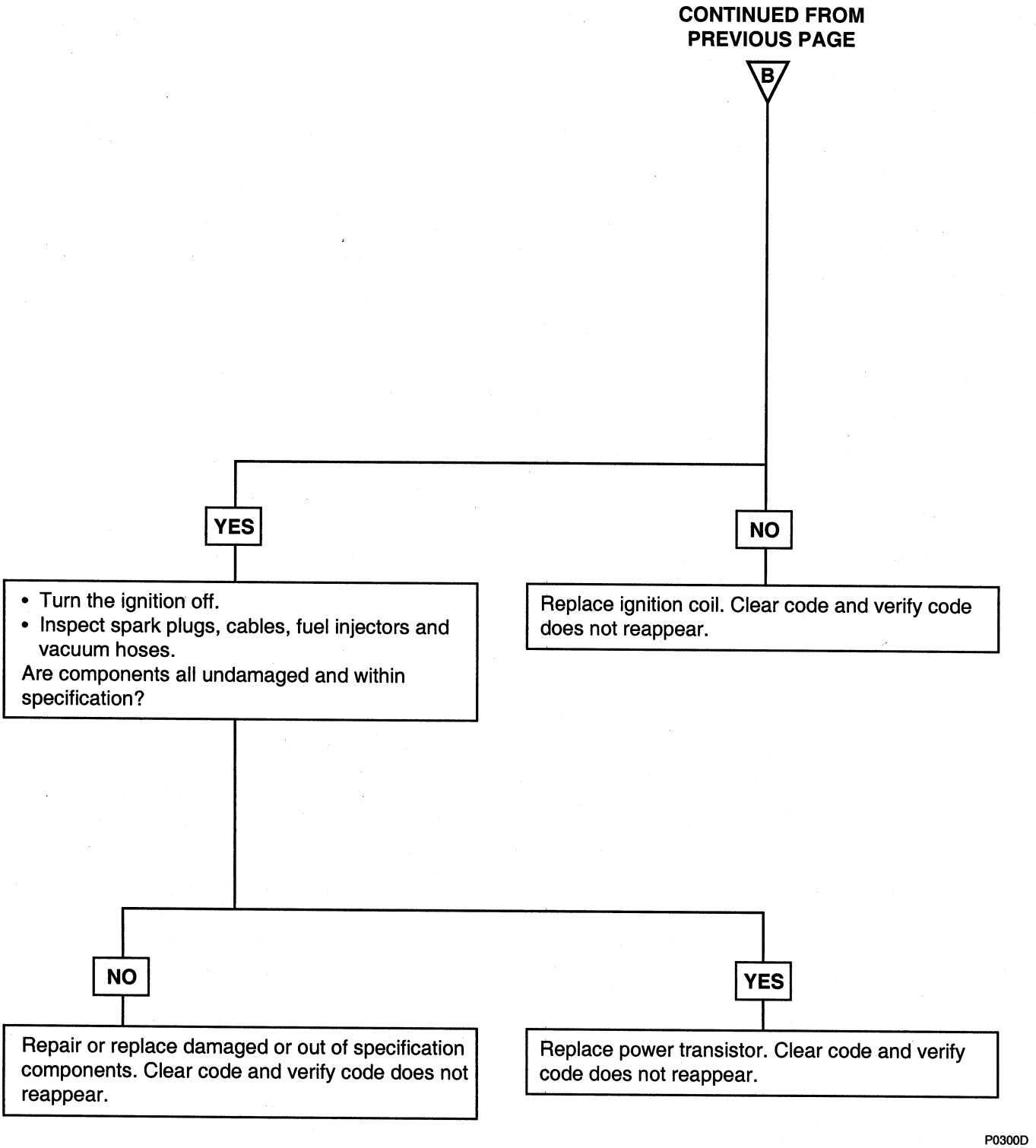
- Turn the ignition off.
- Disconnect the ignition coil.
- Measure resistance across ignition coil connector terminals 1 and 2. Note results for primary coil resistance.
- Measure resistance across ignition coil spark plug wire terminals 1 and 4. Measure resistance across ignition coil spark plug wire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

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

B

CONTINUED ON NEXT PAGE

JP0300C


CONTINUED FROM PREVIOUS PAGE
B
YES
NO
• Turn the 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

EFJB5120

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

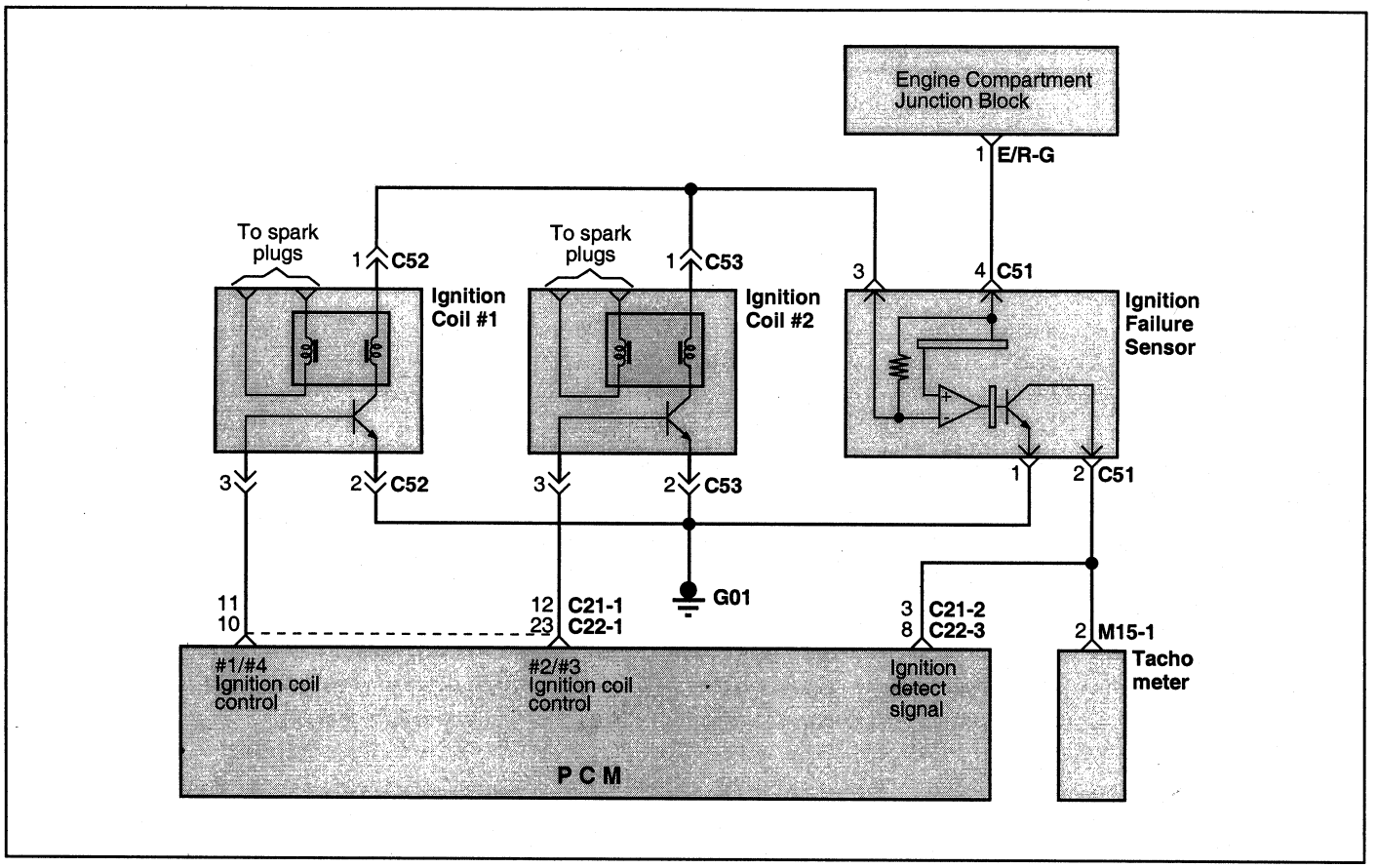
DESCRIPTION

Refer to Random Misfire Detected (P0300).

TROUBLESHOOTING GUIDE

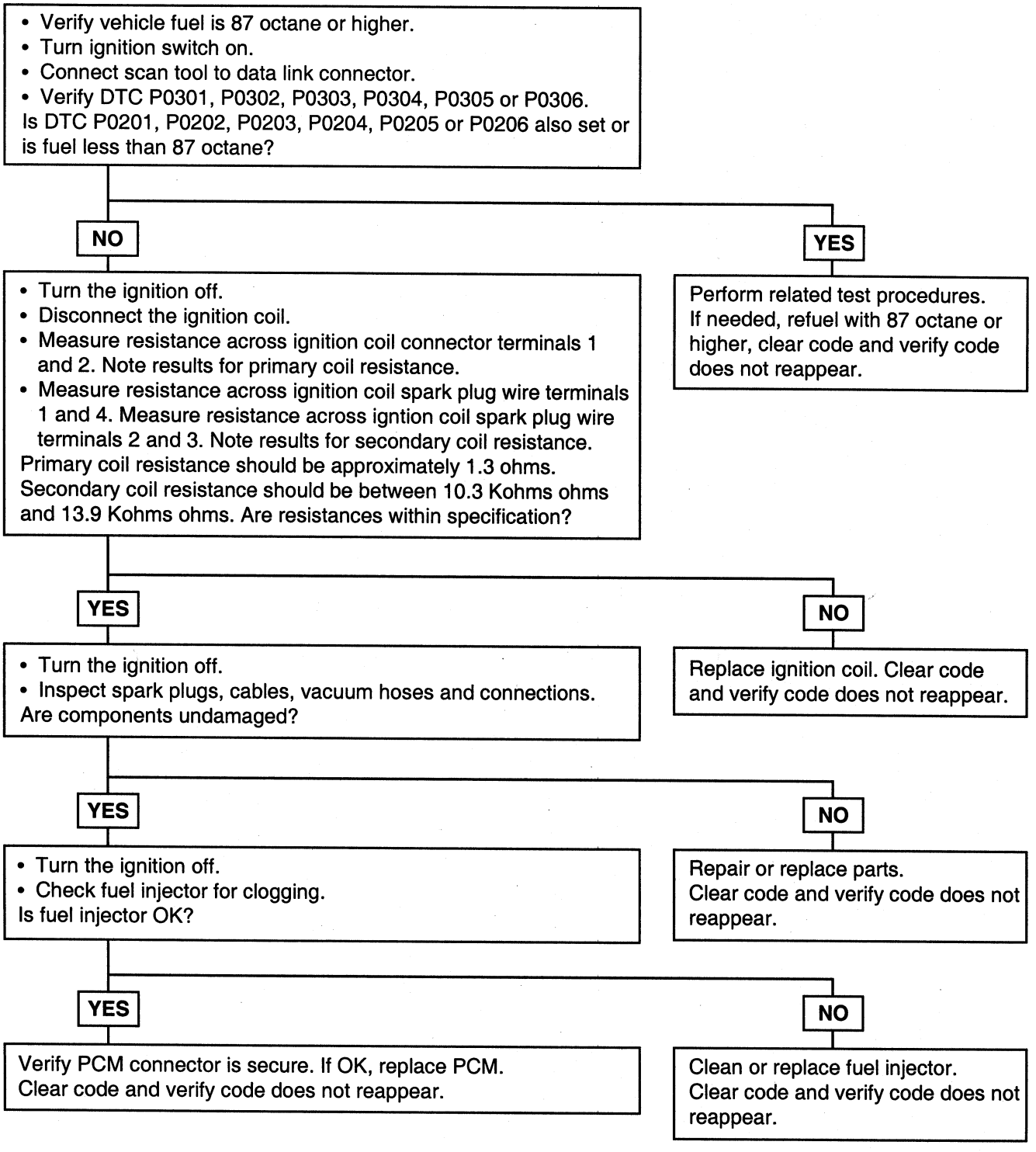
DTC detection condition	Probable cause
Background • If a misfiring occurs while the engine is running, the engine speed suddenly changes. • The Engine Control Module checks for changes in the engine speed. Check Area • Five seconds or more have passed after the engine was started. • Engine speed is between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

CIRCUIT DIAGRAM



JP0300A

TEST PROCEDURE



P0301B

EFJB5130

DTC	Diagnostic item
P0335	Crankshaft Position Sensor Circuit Malfunction

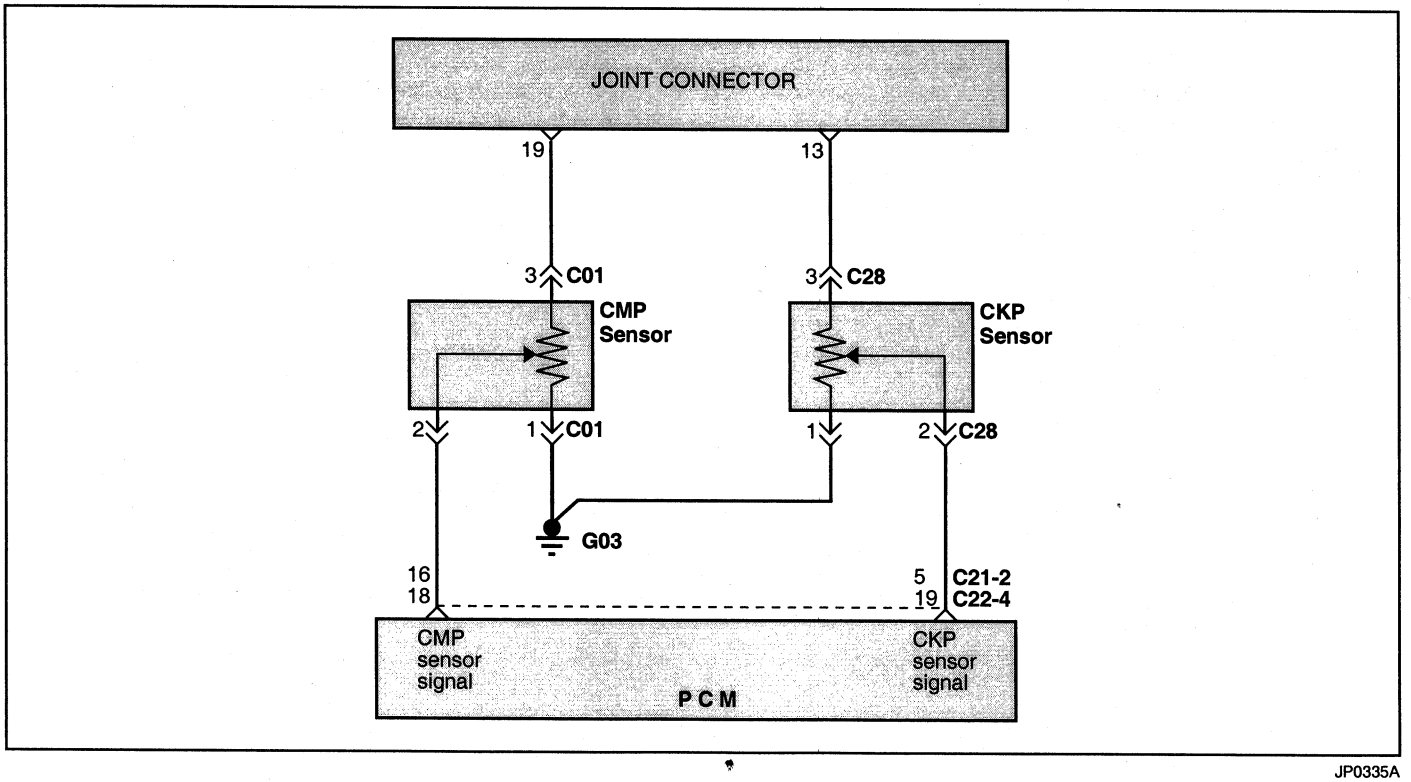
DESCRIPTION

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

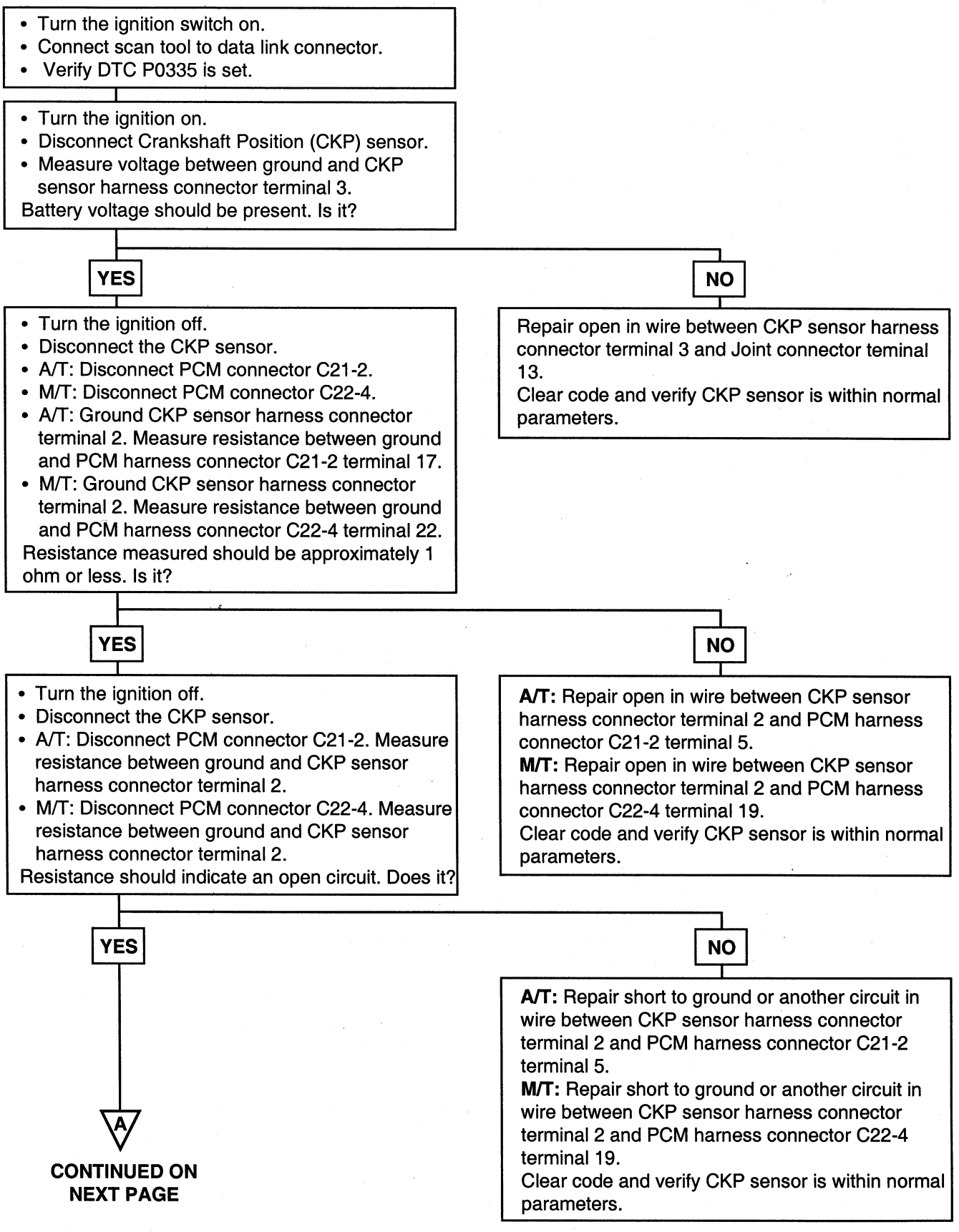
DTC detection condition	Probable cause
Background • When the engine is running, the Crankshaft Position sensor outputs a pulse signal. • The Engine Control Module checks whether the pulse signal is input while the engine is cranking. Check Area • Engine is being cranked. Judgment Criteria • Sensor output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

CIRCUIT DIAGRAM

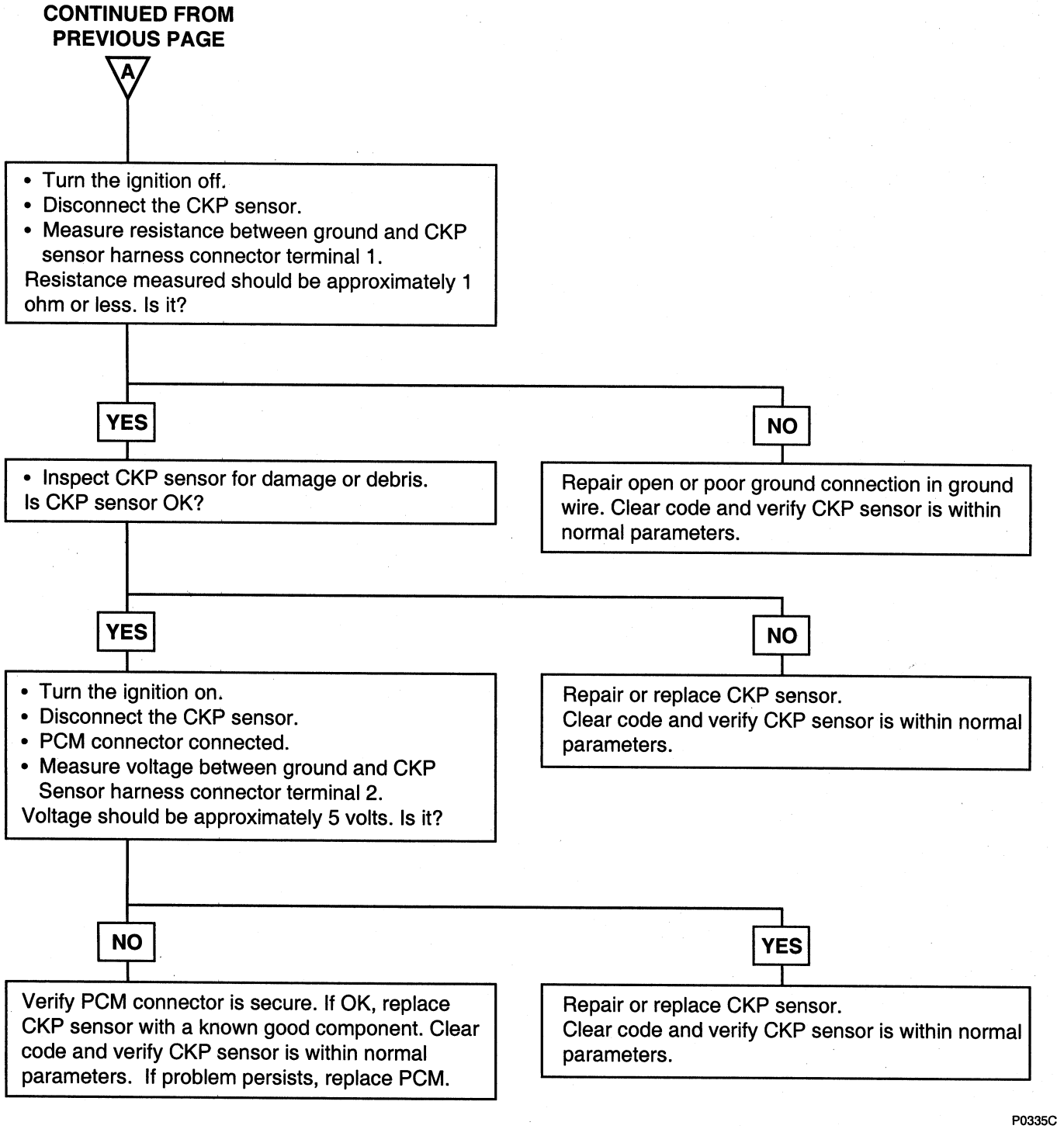


JP0335A

TEST PROCEDURE



JP0335B


CONTINUED FROM PREVIOUS PAGE
A
• Turn the ignition off.
• Disconnect the CKP sensor.
• 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
• Turn the ignition on.
• Disconnect the CKP sensor.
• PCM 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 PCM connector is secure. If OK, replace CKP sensor with a known good component. Clear code and verify CKP sensor is within normal parameters. If problem persists, replace PCM.
Repair or replace CKP sensor.
Clear code and verify CKP sensor is within normal parameters.

P0335C

EFJB5140

DTC	Diagnostic item
P0340	Camshaft Position Sensor Circuit Malfunction

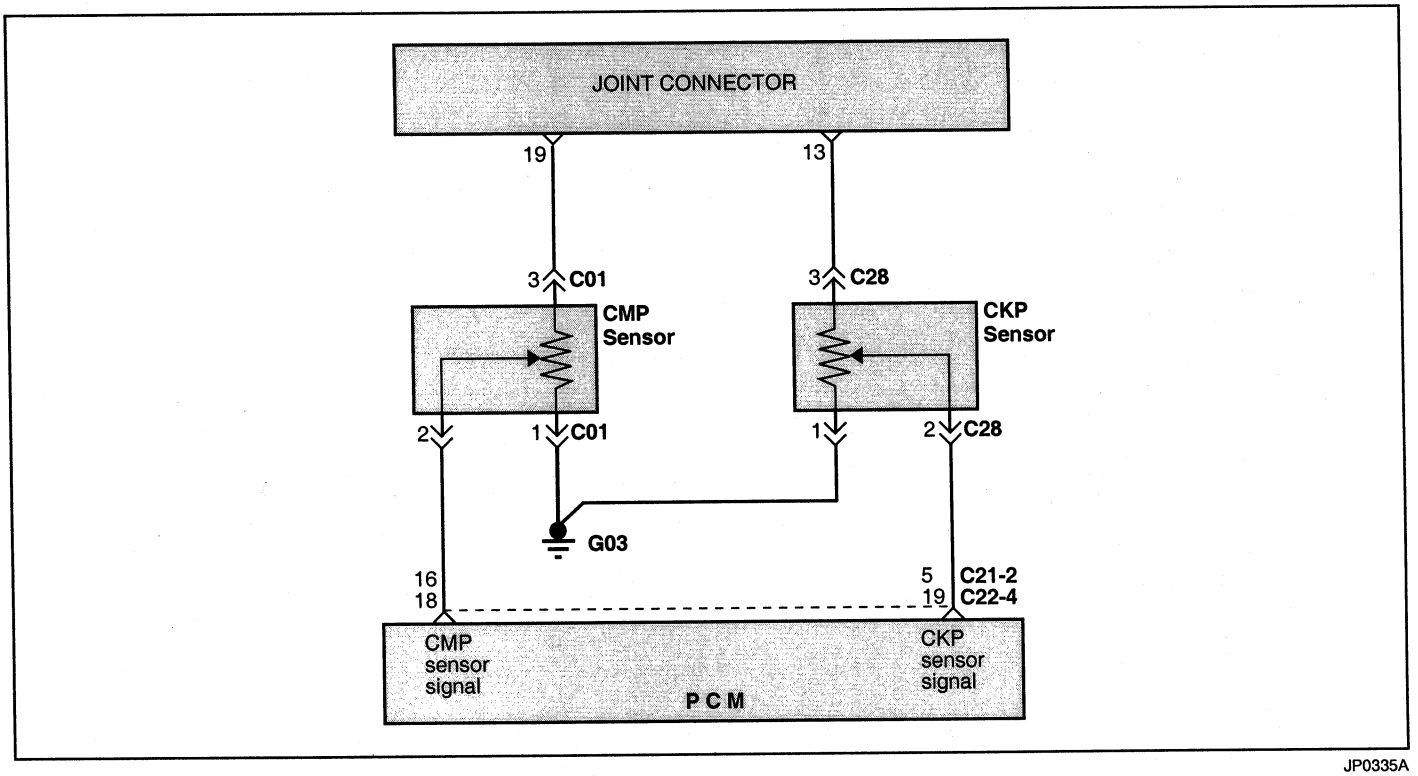
DESCRIPTION

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

CIRCUIT DIAGRAM



JP0335A

TEST PROCEDURE

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

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

Battery voltage should be present. Is it?

YES

- Turn the ignition off.
- Disconnect the CMP sensor.
- A/T: Disconnect PCM connector C21-2.
- M/T: Disconnect PCM connector C22-4.
- Ground CMP sensor harness connector terminal 2.
- Measure resistance between ground and PCM harness connector terminal 17 (for A/T) or 22 (for M/T).

Resistance measured should be approximately 1 ohm or less. Is it?

YES

- Turn the ignition off.
- Disconnect the CMP sensor.
- A/T: Disconnect PCM connector C21-2.
- M/T: Disconnect PCM connector C22-4.
- Measure resistance between ground and CMP sensor harness connector terminal 2.

Resistance should indicate an open circuit. Does it?

YES

- Turn the ignition off.
- Disconnect the CMP sensor.
- 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 PCM connector is secure. If OK, replace PCM. 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 PCM 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 PCM 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 Joint connector terminal 19. Clear code and verify CMP sensor signal is within normal parameters.

JP0340B

EFHA5170

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

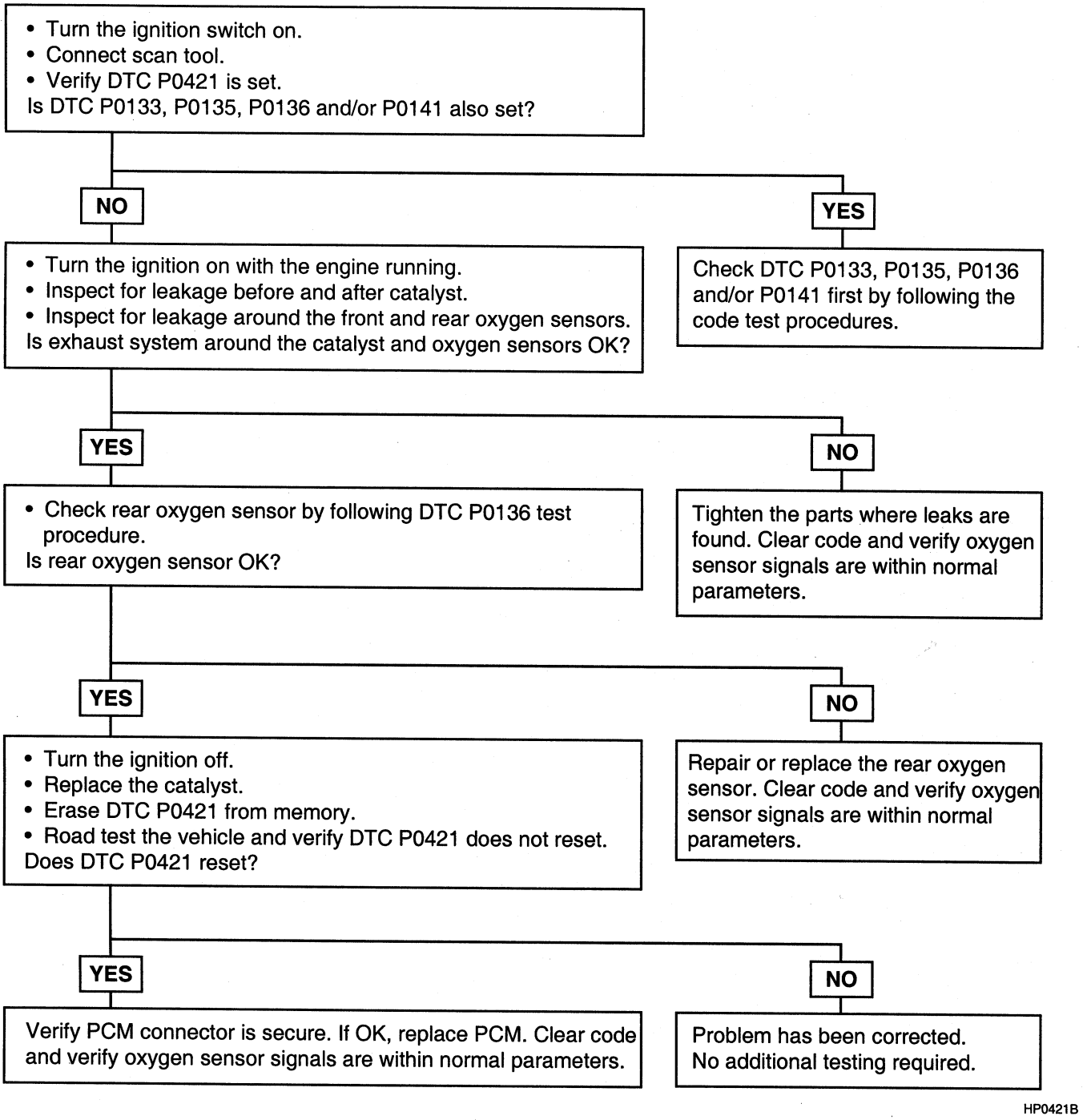
DESCRIPTION

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 • 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. • The Engine Control Module checks the outputs of the heated oxygen sensor signals. Check Area • Engine speed is 3,000 r/min or higher. • Closed throttle position switch: OFF • Under the closed loop air-fuel ratio control • Monitoring Time: 140 sec. Judgment Criteria • The front or rear heated oxygen sensor signal is abnormal.	• Catalytic converter deteriorated • Heated oxygen sensor failed • Engine control module failed

TEST PROCEDURE



HP0421B

EFJB5190

DTC	Diagnostic item
P0443	Purge Control Solenoid Valve Malfunction

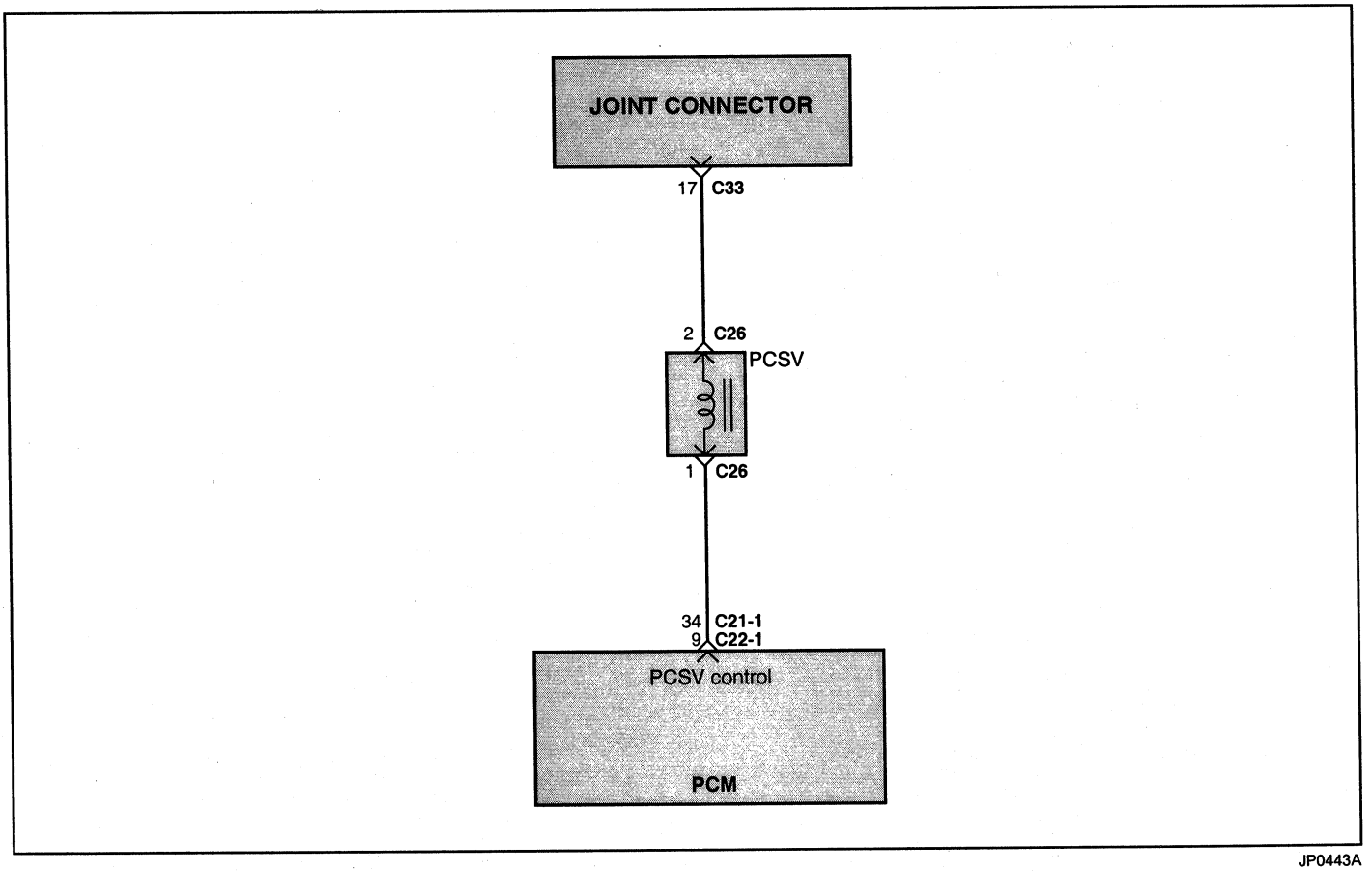
DESCRIPTION

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 • The engine control module checks current flows in the evaporative emission purge solenoid drive circuit when the solenoid is ON and OFF. Check Area • Battery voltage is 10V or higher. Judgment Criteria • 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 • Open or shorted evaporative emission purge solenoid circuit, or loose connector • Engine control module failed

CIRCUIT DIAGRAM



JP0443A

TEST PROCEDURE

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

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

Battery voltage should be present. is it?

YES

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

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

YES

- Turn the ignition off.
- Disconnect the PCM.
- Disconnect the PCSV solenoid valve.
- Measure resistance between ground and purge control solenoid valve harness connector terminal 1.

Resistance should indicate an open circuit. Does it?

A

CONTINUED ON NEXT PAGE

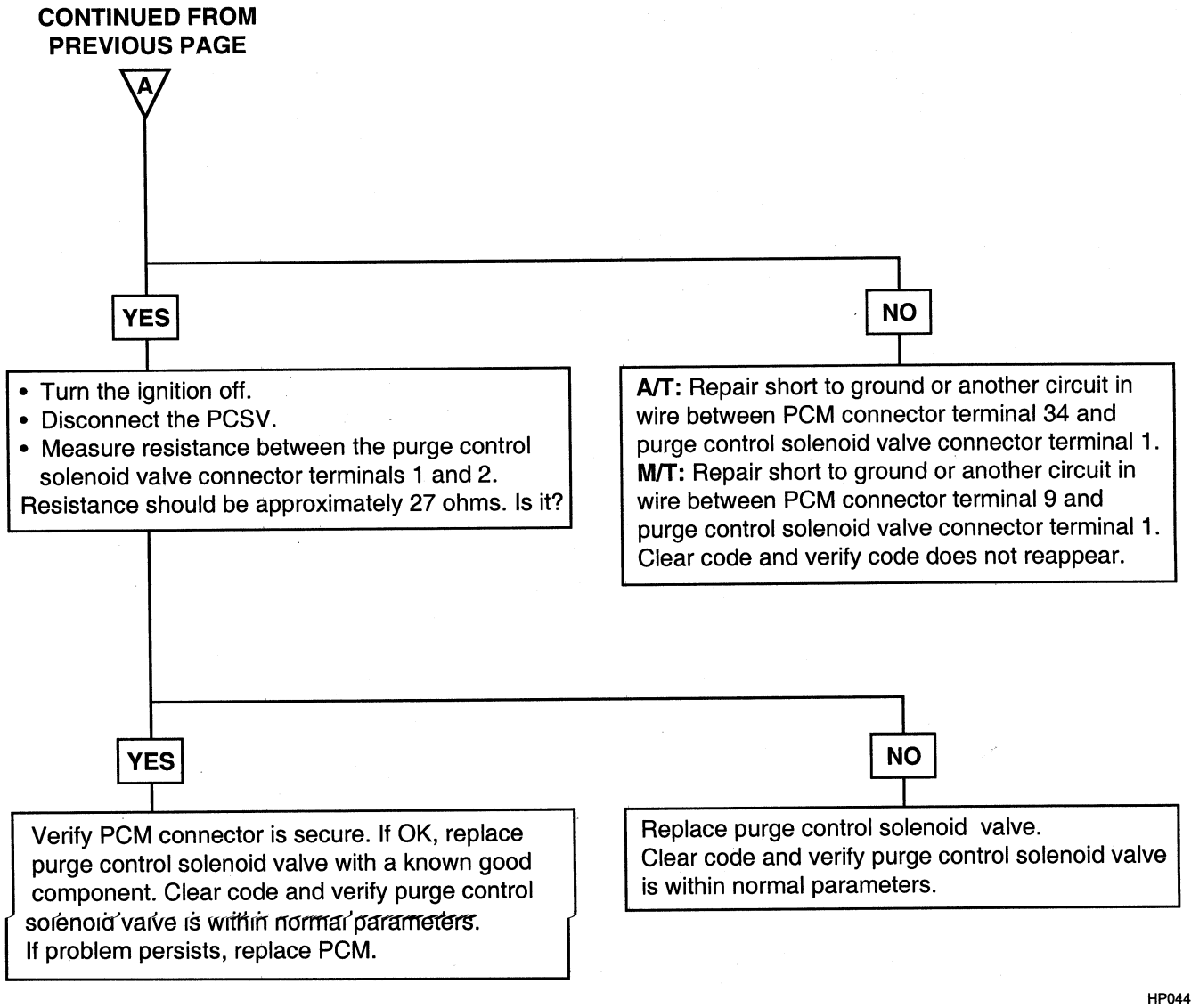
NO

Repair open or short to ground in wire between Joint connector terminal 17 and PCSV connector terminal 2.
Clear codes and verify PCSV is within normal parameters.

NO

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

JP0443B


CONTINUED FROM PREVIOUS PAGE
A
YES
NO
• Turn the ignition off.
• Disconnect the PCSV.
• 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 PCM connector terminal 34 and purge control solenoid valve connector terminal 1.
M/T: Repair short to ground or another circuit in wire between PCM connector terminal 9 and purge control solenoid valve connector terminal 1.
Clear code and verify code does not reappear.
YES
NO
Verify PCM connector is secure. If OK, replace purge control solenoid valve with a known good component. Clear code and verify purge control solenoid valve is within normal parameters.
If problem persists, replace PCM.
Replace purge control solenoid valve.
Clear code and verify purge control solenoid valve is within normal parameters.

HP0443C

EFJB5220

DTC	Diagnostic item
P0500	Vehicle Speed Sensor Malfunction

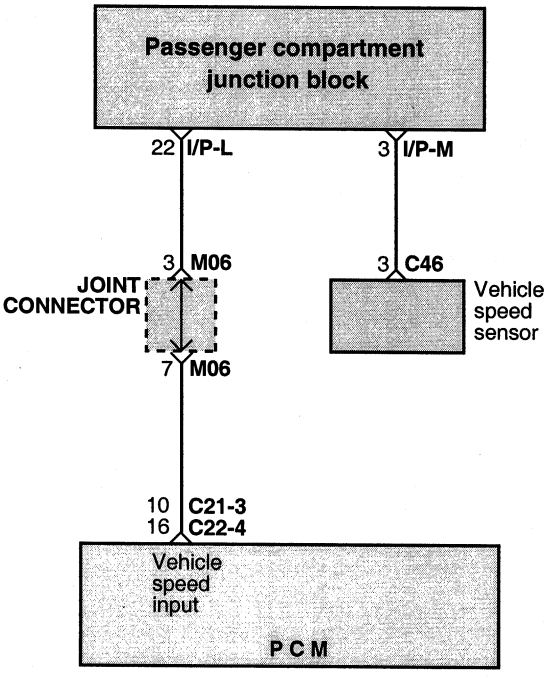
DESCRIPTION

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

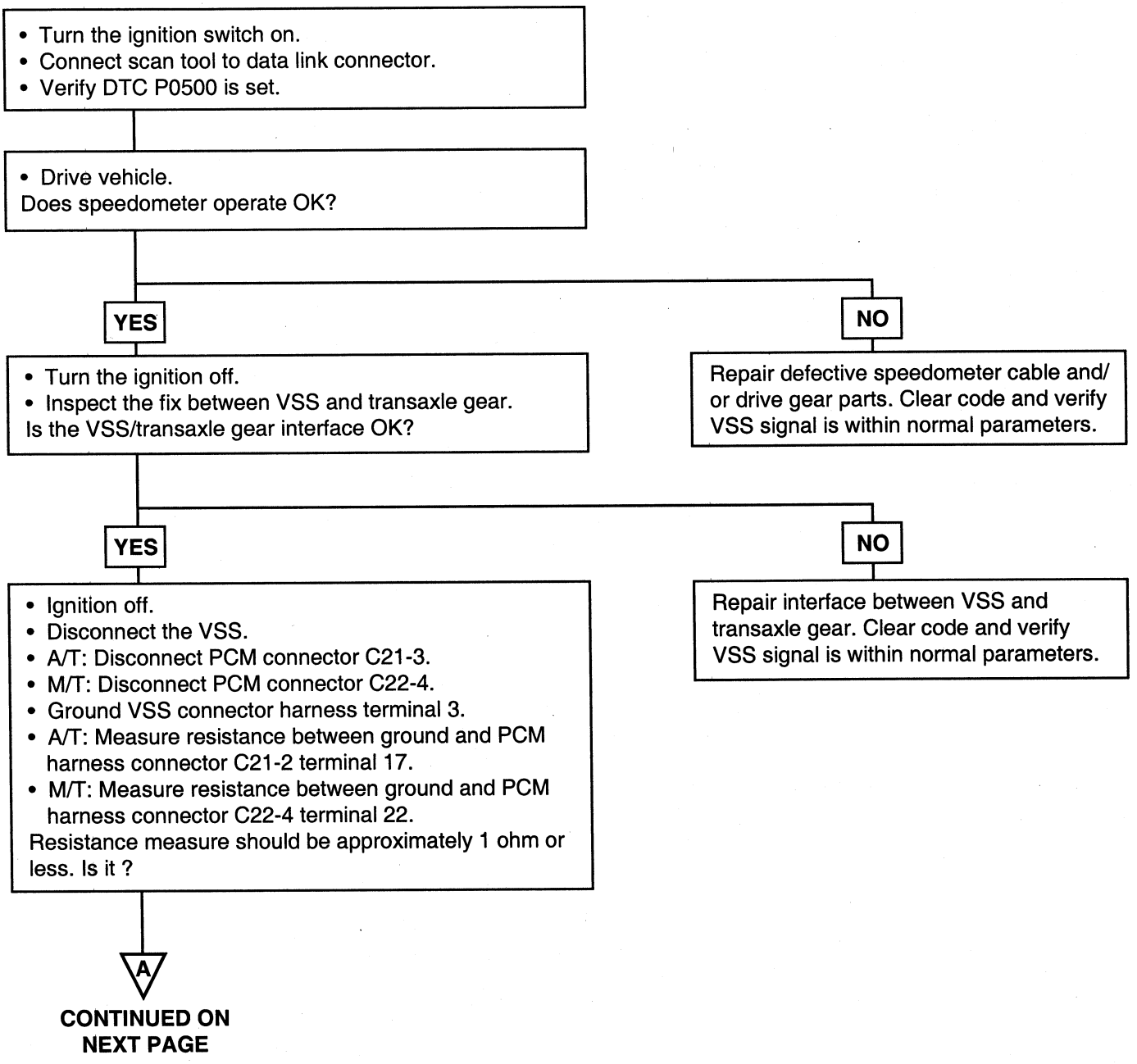
DTC detection condition	Probable cause
Background • The vehicle speed sensor outputs a pulse signal while the vehicle is driven. • The engine control module checks whether the pulse signal is outputted. Check Area • Closed throttle position switch: OFF • Engine speed is 3,000 r/min or more. • Engine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

CIRCUIT DIAGRAM



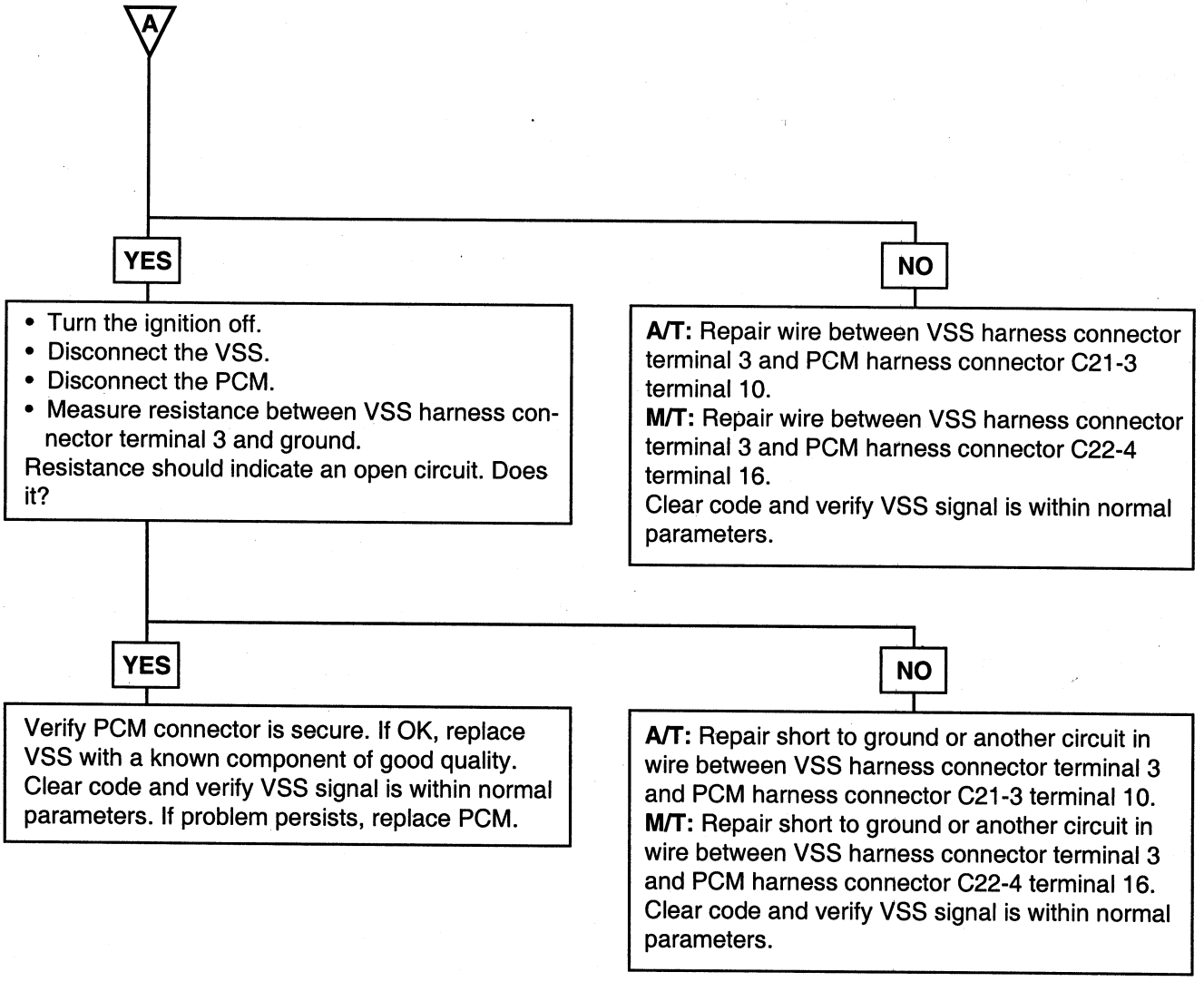
JP0500A

TEST PROCEDURE



JP0500B

CONTINUED FROM PREVIOUS PAGE



HP0500C