Fuel System [Gasoline]

GENERAL			. FL -2
MFI CONTROL SYSTEM			FL -21
		•	
TROUBLESHOOTING FO	R DTCS (MELCO EMS)		FL -64

GENERAL

GENERAL SPECIFICATIONS EFUC3010

erik Dia	ltems ,		Specifications
Throttle body	Throttle position sensor	Type - *	Variable resistor
	(TPS)	Resistance at curb idle	3.5 ~ 6.5 KΩ
		Output voltage at curb idle	300 ~ 900 mV
	Idle speed control (ISC)	Туре	Double Coil
	actuator	Resistance	90 ~ 110 Hz
Sensors	Air flow sensor	Type	Hot Film sensor
	Intake air temperature	Туре	Thermistor
	(IAT) sensor	Resistance	2.33 ~ 2.97 KΩ at 20°C (68°F)
	Engine coolant temperature	Type	Thermistor
	(ECT) sensor	Resistance	2.5 KΩ at 20°C (68°F)
			0.3 KΩ at 80°C (176°F)
Heated oxygen sensor (HO2S)	Туре	Zirconium	
	Vehicle speed sensor	Туре	Hall effect
	Camshaft position (CMP) sensor	Type	Hall effect
	Crankshaft position (CKP) sensor	Type	Magnetic type
Actuators	Injectors	Type, number	Electromagnetic type, 4
		Resistance	13 ~ 16Ω at 20°C (68°F)
Evaporative emission purge control solenoid valve		Туре	Duty cycle type
Fuel pressure egulator	Pressure regulator		300 ± 1.5 kPa (3.35 ± 0.06 kg/cm²)
Fuel tank	Tank capacity		65 lit (14.3 lmp.gal)
	Return system		Equipped
Canister	Volume/Nominal working cap	acity	3.0 liter/150g

SEALANT EFA90020

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

SERVICE STANDARDS EFUC3030

	Standard value	
Basic ignition timing	Basic ignition timing	BTDC 8° ± 5° at curb idle
	Spark timing grounded	BTDC 5° ± 5° at curb idle
Curb idle speed (rpm)	D-range (A/T)	700 ± 100
	P,N-range	750 ± 100 (A/C OFF)
	(A/T, M/T)	950 ± 100 (A/C ON)
Fuei 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	1.4-2.2
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	u, das Use
09353-38000 Fuel pressure gauge adapter		Connection of fuel pressure gauge to delivery pipe for measurement of fuel pressure.
09353-24100 Fuel pressure gauge & hose	EFA9005A	en de trata de la companya de la co
, state of the second of the s		
	EFA9005B	

TROUBLESHOOTING E

When troubleshooting an engine, 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

Malfunctions in the MFI system are often caused by poor connections in the harness connectors. It is important to check all harness connectors and verify that they are securely connected.

TROUBLESHOOTING GUIDE CHART EFDA0070

Main Symptoms		DOSTUM AND A SECOND	STA	ARTIN	G	,			D	oor Idl	ina		Po	
	Una	ble to s	tart		Difficu	It to st	art	, oor raining		Driv	ring			
Sub-Symptoms Check points	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 fastidle	peeds elpi ubiH	Low idle speed	Rough idling	Engine hesitates or accelerates poorly	Surging	Knocking
Starter relay	1											. 4		
Starter	2	2		1										
Park/Neutral SW [A/T] or Clutch start SW [M/T]	3												1 2	vi.
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	- 1. h	Marie III
Timing mark			9								12	, Kroenja	1, 4-4	
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			-17 kg - 17 A,	77 E4	
Connecting rod bearing				3								.536/0	100	-
Crankshaft bearing				4					2-					
Fuel quality					1	2	2	VARIETY I	garrenek		6 376 1 340 346 4	3	3	1.3890
Spark plugs					2		ing year	- (874%)	/E - 515	and th	3	4 4.	2	e Kir r
Fuel pump					6	6	6				5	12	grāvii ir ga	, 1983 k
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	Engine Stalls					Refueling		
Sub-Symptoms Check points	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	1,54	- 3			6	8		
A/C circuit	- 17			1	14			
Fuel leakage					1			
Accelerator pedal link					3			
Clutch [M/T]					4			
Brakes drag when pedal released					- 5	* :*		
Compression : 1999 (1997)		i e			7	Amirin Mil	Minister of the	· ·
Piston ring					8	-		
Ignition timing	-				9			
Oxygen sensor circuit					15	:		
Intake air temp. sensor circuit					- 16			
Coolant leakage					. 44 2 .	100	Ţ.	
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

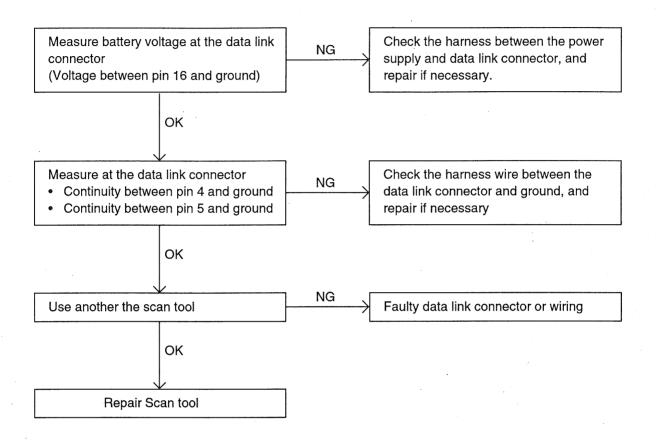


The number herein means the check order.

MFI TROUBLESHOOTING PROCEDURES EFA90080

PROBLEM

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



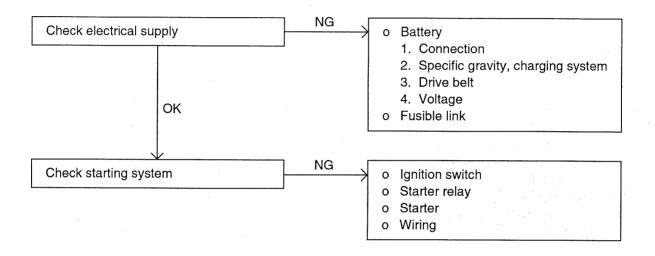
EFA9008A

SCAN TOOL COMMUNICATION WITH PCM

IS NOT POSSIBLE EFA90090

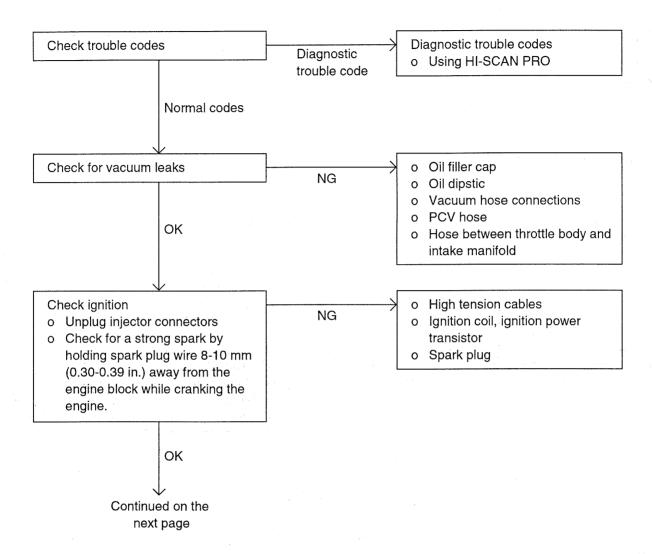
Comment	Probable cause
One of the following causes may be suspected No power supply to PCM Defective ground circuit of PCM Defective PCM Improper communication line between PCM and scan tool	 Malfunction of PCM power supply circuit. Malfunction of the PCM. Open circuit between PCM and DLC.

ENGINE WILL NOT START EFA90100

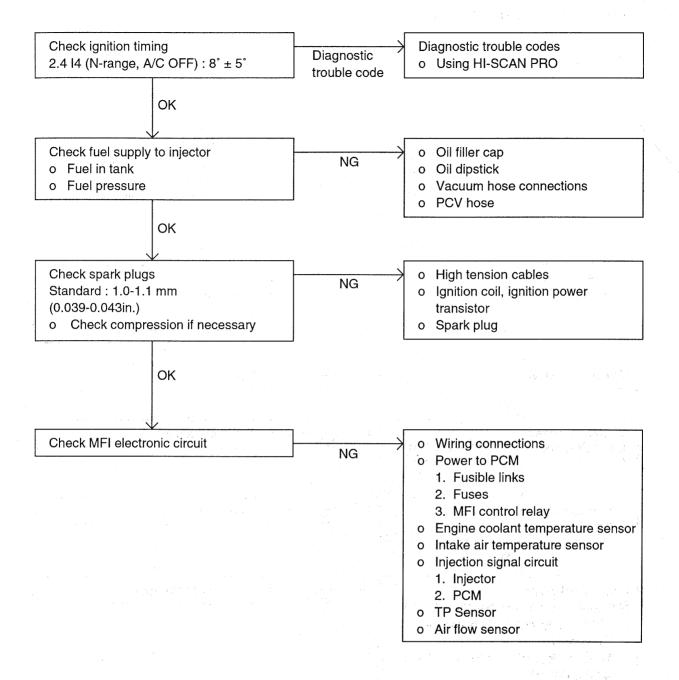


EFA9010A

DIFFICULT TO START (ENGINE CRANKS) EFAC3110

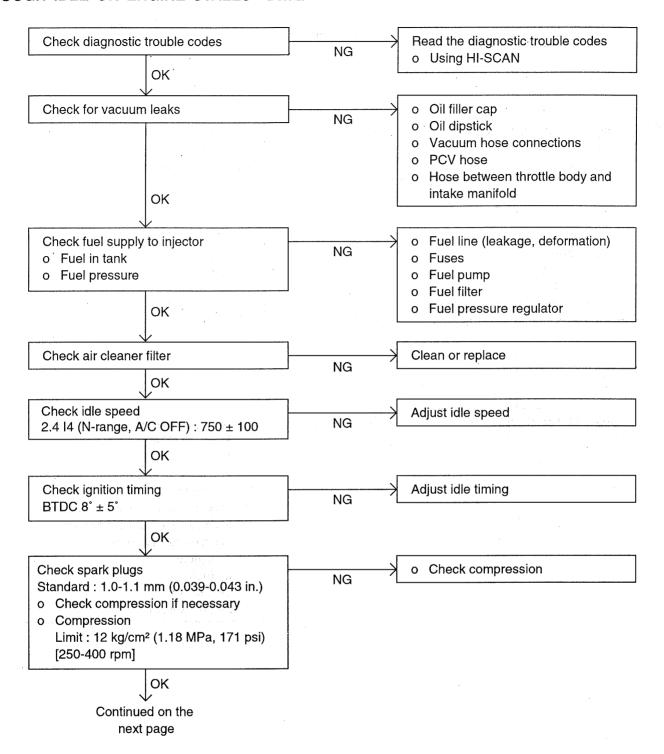


EFA9011A

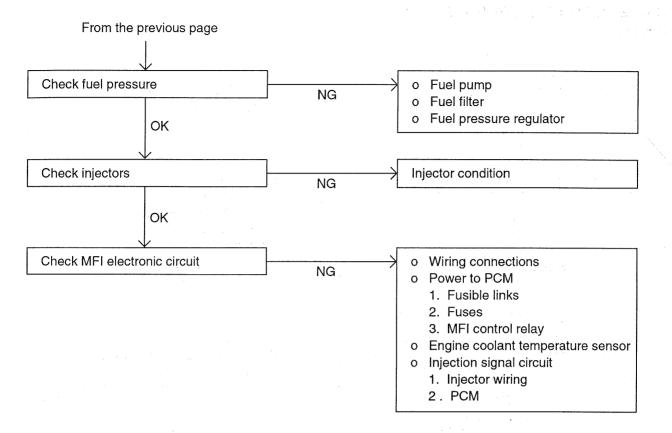


EFUC311B

ROUGH IDLE OR ENGINE STALLS EFUC312

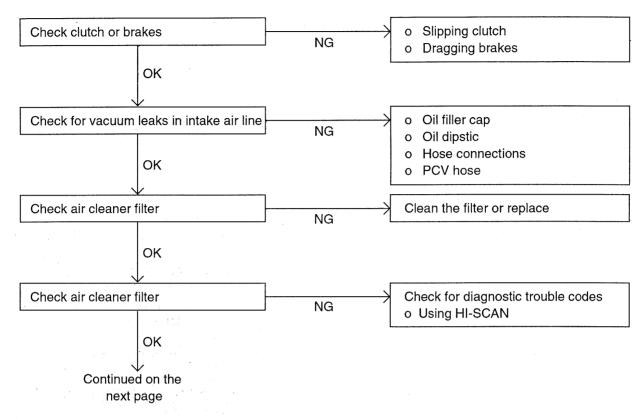


EFUC312A

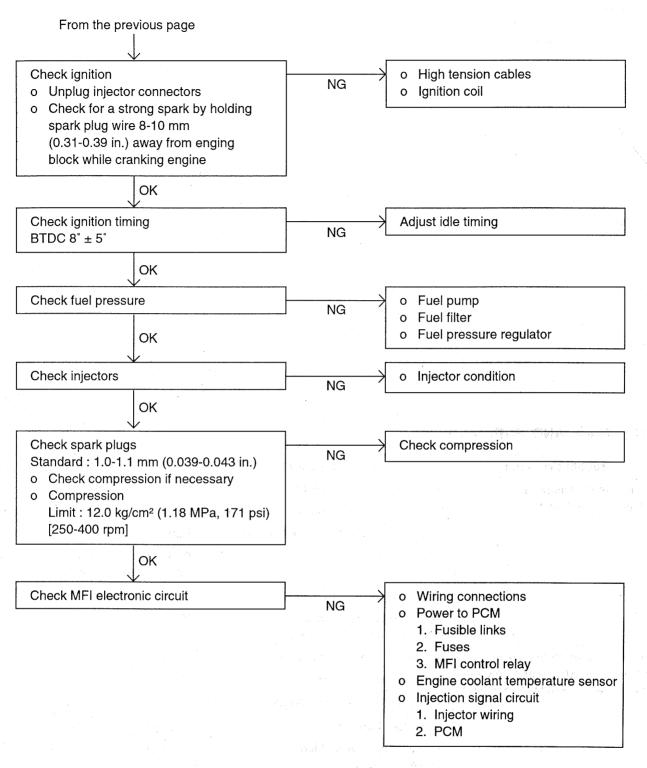


EFA9012B

ENGINE HESITATES OR ACCELERATES POORLY EFUC3130



EFA9013A



EFUC313B

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	Bent or kinked fuel pipe or hose	Repair or replace	
insufficient fuel supply	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	
en en de la companya de la companya La companya de la co	Dirty or rusted fuel tank interior	Clean or replace	
4 - 28; v	Malfunctioning fuel pump (clogged filter in the pump)	Replace	
Evaporative emission system	Incorrect routing of a vapor line	Correct	
malfunction (when fuel filler cap is removed, pressure is released)	Disconnected vapor line	Correct	
is removed, pressure is released)	Folded, bent, cracked or clogged vapor line	e Replace	
	Faulty fuel tank cap	Replace	
	Malfunctioning overfill limiter (two-way valve)	Replace	

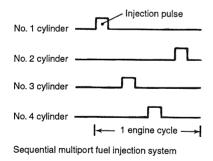
MULTIPORT FUEL INJECTION (MFI) EFACO1

GENERAL INFORMATION

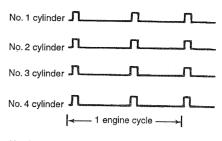
The Multiport Fuel Injection System consists of sensors which detect the engine conditions, the POWERTRAIN CONTROL MODULE (PCM) which controls the system based on signals from these sensors, and actuators which operate under the control of the PCM. The PCM carries out activities such as fuel injection 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.



EFJB016A



Simultaneous multiport fuel injection system

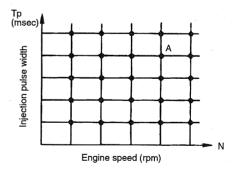
EFJB016B

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.



EFAC016C

OTHER CONTROL FUNCTIONS EFA9017

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 PCM 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:

- 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.
- 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. Run a simulation test

In the cases of vibration or poor connections, use the simulation tests below to attempt to duplicate the customer's complaint. Determine the most likely circuit(s) and perform the simulation tests on the connectors and parts of that circuit(s). Be sure to use the inspection procedures provided for diagnostic trouble codes

- and trouble symptoms. For temperature and/or moisture conditions related intermittent malfunctions, using common sense, try to change the conditions of the suspected circuit components, then use the simulation tests below.
- 4. 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 short 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 EFUC321

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 trouble codes and make basic engine checks (ignition system malfunction, incorrect engine adjustment, etc.). Then, inspect the MFI system components.

GENERAL FL -19

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.



A "driving cycle" is completed 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.

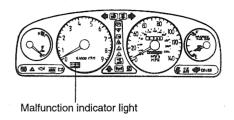
However the MIL will go off automatically after 3 subsequent sequential driving cycles that do not redetected the same malfunctions.

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



EFA9021A

INSPECTING THE MALFUNCTION INDICATOR LAMP (MIL)

- 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.

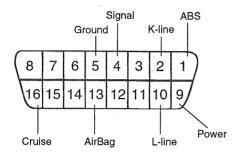
CHECKING PROCEDURE (SELF-DIAGNOSIS)



- 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.
- 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.
- Use the scan tool to check the diagnostic trouble code.
- 5. Repair the faulty part from the diagnosis chart.
- 6. Erase the diagnostic trouble code.
- 7. Disconnect the scan tool.



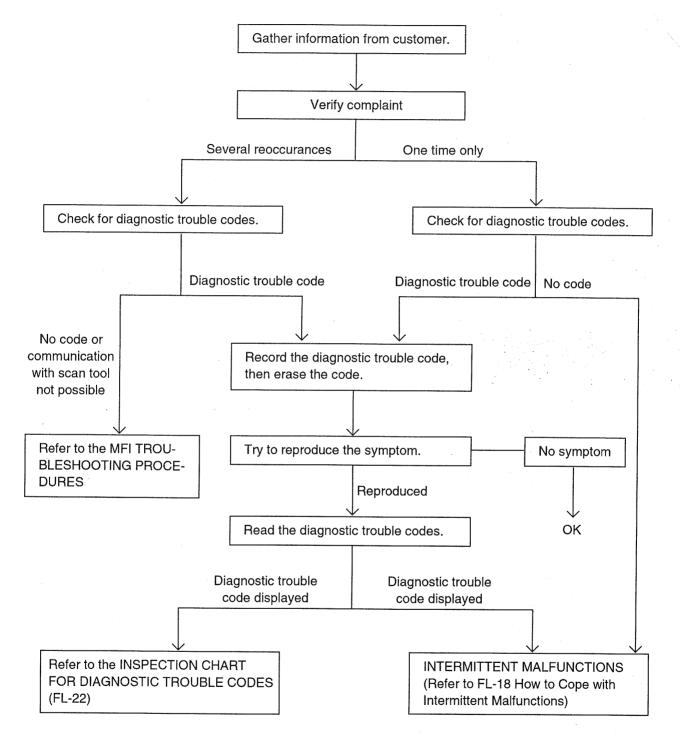
EFHA021B

MFI CONTROL SYSTEM

TROUBLESHOOTING

EI IC3330

DIAGNOSTIC TROUBLESHOOTING FLOW



EFUC322A

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR EOBD) EFUC3230

DTC NO.	CONTENT	MEMORY	MIL
P0101	Mass Air Flow Circuit Range/Performance Problem	0	0
P0102	Mass Air Flow Circuit Low Input	0	0
P0103	Mass Air Flow Circuit High Input	0	0 %
P0112	Intake Air Temperature Circuit Low Input	0	0
P0113	Intake Air Temperature Circuit High Input	0	0
P0115	Engine Coolant Temperature Circuit Malfunction	0	0
P0116	Engine Coolant Temperature Circuit Range/Performance Problem	0	0
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	0	0
P0122	Throttle Position Sensor Circuit Low Input	0	0
P0123	Throttle Position Sensor Circuit High Input	0	0
P0134	Excessive Time to Enter Closed Loop Fuel Control	0	0
P0133	Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1)	0	0
P0132	Oxygen Sensor Circuit Open (Bank 1, Sensor 1)	0	0
P0135	Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 1)	0	0
P0136	Oxygen Sensor Circuit Open (Bank 1, Sensor 2)	0	0
P0140	Oxygen Sensor Circuit Short (Bank 1, Sensor 2)	0	0
P0141	Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 2)	0	0
P0171	Fuel System Too Lean	0	0 %
P0172	Fuel System Too Rich	0	0
P0201	Injector Circuit Malfunction (Cylinder -1)	0	0
P0202	Injector Circuit Malfunction (Cylinder -2)	0	0
P0203	Injector Circuit Malfunction (Cylinder -3)	0	0
P0204	Injector Circuit Malfunction (Cylinder -4)	0	0
P0300	Random Misfire Detected	0	0
P0301	Misfire Detected (Cylinder -1)	0	0
P0302	Misfire Detected (Cylinder -2)	0	0
P0303	Misfire Detected (Cylinder -3)	0	0
P0304	Misfire Detected (Cylinder -4)	0	0
P0325	Knock Sensor Circuit Malfunction	0	Х
P0335	Crankshaft Position Sensor Circuit Malfunction	0	0
P0340	Camshaft Position Sensor Circuit Malfunction	0	0
P0350	Ignition coil Malfunction	0	0
P0320	Ignition Failure Sensor Malfunction	0	X
P0421	Warm-up Catalyst Efficiency Below Threshold	0	0
P0443	Evaporative Emission Control System - Purge Control Valve Circuit Malfunction	0	0
P0500	Vehicle Speed Sensor Malfunction	0	0

DTC NO.	CONTENT	MEMORY	MIL
P0507	Idle Speed Control - High RPM	0	0
P1330	Spark Timing Adjust Malfunction	0	0

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FOR NON-EOBD) EFUC3240

DTC NO.	CONTENT	Memory	MIL
P0100	Mass or Volume Air Flow Circuit Malfunction	0	0
P0110	Intake Air Temperature Circuit Malfunction	0	0
P0115	Engine Coolant Temperature Circuit Malfunction	0	0
P0120	Throttle Position Circuit Malfunction	0	0
P0130	O2 Sensor Circuit Malfunction (Bank 1, Sensor 1)	0	0
P0136	O2 Sensor Circuit Malfunction (Bank 1, Sensor 2)	0	0
P0201	Injector Circuit Malfunction (Cylinder -1,)	0	0
P0202	Injector Circuit Malfunction (Cylinder -2)	0	0
P0203	Injector Circuit Malfunction (Cylinder -3)	0	0
P0204	Injector Circuit Malfunction (Cylinder -4)	0	0
P0325	Knock Sensor Circuit Malfunction	0	Х
P0335	Crankshaft Position Sensor Circuit Malfunction	0	0
P0340	Camshaft Position Sensor Circuit Malfunction	0	0
P0350	Ignition Coil Malfunction	. O.	0
P0500	Vehicle Speed Sensor Malfunction	ο Ο	Х
P1330	Spark Timing Adjust Malfunction	0	0

TROUBLE AREA RELATED TO DTC EFUC3250

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

DTC No.	Diagnostic items	Trouble area	
P0100 P0101	Mass or Volume Air Flow Circuit Range/performance Problem	 Dirty air cleaner Oil cap or dipstick missing or not installed correctly Air leak in intake system Contaminated, deteriorated or damaged mass air flow sensor Faulty mass air flow sensor or throttle position sensor Poor connections between ECM and MAFS or TPS If any codes relating to MAFS are present, do all repairs associated with them before proceeding with this troubleshooting area. 	
P0102	Mass or Volume Air Flow Circuit Low Input	 Short to ground between MAFS and ECM Signal line open between MAFS and ECM Faulty MAFS 	
P0103	Mass or Volume Air Flow Circuit High Input	 Short to Battery between MAFS and ECM Ground open between MAFS and EGI main relay Ground open or Poor connections between open or short to battery between MAFS and ECM Faulty MAFS 	
P0110 P0112	Intake Air Temperature Circuit Low Input	 Short to ground between IAT sensor and ECM Short between IAT sensor wires Faulty IAT sensor 	
P0113	Intake Air Temperature Circuit High Input	Open or short to battery between IAT sensor and ECMFaulty IAT sensor	
P0115	Engine Coolant Temperature Circuit Malfunction	 Open or short to battery between ECTS and ECM Short to ground between ECTS and ECM Short between ECTS wires Faulty ECTS 	
P0116	Engine Coolant Temperature Sensor Circuit Range/Performance Problem	 After engine start-up, the measured coolant temperature shows no variation after detecting the calculated coolant temperature variation (engine coolant temperature sensor input is stuck.) Poor connections between ECT sensor and ECM Misplaced, loose or corroded terminals Foreign materials fouled ECTS Faulty ECTS 	
		If any codes relating to ECTS are present, do all repairs associated with them before proceeding with this troubleshooting area.	

DTC No.	Diagnostic items	Trouble area	
P0120	Throttle Position Sensor Circuit Malfunction	 Poor connections between TPS and ECM Misplaced, loose or corrodes terminals Contaminated, deteriorated TPS Open or short between TPS 5V reference and ECM Open or short between TPS signal and ECM Short between TPS wires Faulty TPS 	
P0122	Throttle Position Sensor Circuit Low Input	 Short to GND between TPS and ECM Open short to GND between TPS and ECM Short to RND between ECM and fuel tank pressure sensor (FTPS) Faulty TPS or FTPS 	
P0123	Throttle Position Sensor Circuit High Input	 Open or short to battery between TPS and ECM Open between and ECM Faulty TPS 	
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	 After engine start-up, the elapsed time before feedback operation is initiated is too long (engine coolant temperature sensor input is insufficient for closed loop operation) Poor connections between ECT sensor and ECM Faulty ECTS 	
P0130	HO2S Circuit Malfunction (Bank 1, Sensor 1)	Short to GND between HO2S and ECMFaulty front HO2S	
P0132	HO2S Circuit High Input (Bank 1, Sensor 1)	Short to battery between HO2S and ECMFaulty front HO2S	
P0133	HO2S Circuit Slow Responsive (Bank 1, Sensor 1)	 Front and rear HO2S connections reversed Faulty fuel delivery system Leak in intake system Leak in exhaust system Faulty MAFS ground circuit Faulty HO2S NOTE If any misfire, purge solenoid valve, MAFS or HO2S	
		heater codes are present, do all repairs associated with those codes before proceeding with this trouble area.	
P0134	HO2S Circuit No Activity Detected (Bank 1, Sensor 1)	 Contaminated, deteriorated or aged HO2S Misplaced, bent, loose or corroded connector terminals Faulty HO2S If no misfire, purge solenoid valve or HO2S heater codes are present, do all repairs associated with those codes before proceeding this trouble area. 	
P0135	HO2S Heater Circuit Malfunction (Bank 1, Sensor 1)	 Blown or missing HO2S fuse Short to battery between front HO2S and ECM Open between front HO2S and ECM Faulty front HO2S 	
P0136	HO2S Circuit Malfunction (Bank 1, Sensor 2)	Short between rear HO2S and ECMFaulty rear HO2S	

D.	TC No.	Diagnostic items	Trouble area	
F	20140	HO2S Circuit Short (Bank 1, Sensor 2)	Short to GND between HO2S and ECMFaulty front HO2S	
F	20141	HO2S Heater Circuit Malfunction (Bank 1, Sensor 2)	 blown or missing HO2S fuse Short to battery between rear HO2S and ECM Open between rear HO2S and ECM Faulty rear HO2S 	
	P0171	Fuel System Too Lean (Bank 1)	 Faulty ignition system (Ignition coil/spark plug/Ignition cable) Faulty fuel delivery system (Fuel tank/Pressure regulator/Canister purge valve) Clogged fuel injectors Faulty fuel injectors Leak in intake system Leak in exhaust system Faulty MAFS NOTE If any codes relating to injectors, HO2S, ECTS or MAFS are stored, do all repairs associated with those codes	
	P0172	Fuel System Too Rich (Bank 1)	 before proceeding with this trouble area. Faulty fuel delivery system (Fuel tank/Pressure regulator/Canister purge valve) 	
			 Faulty fuel injectors Faulty MAFS 	
			If any codes relating to injectors, HO2S, ECTS or MAFS are stored, do all repairs associated with those codes before proceeding with this trouble area.	
	P0201	Injector Circuit High Input (Cylinder -1)	Open between injector fuse and injector	
	P0202	Injector Circuit High Input (Cylinder -2)	 Open or short to battery between injector and ECM Faulty fuel injector 	
	P0203	Injector Circuit High Input (Cylinder -3)	auty fuel injector	
-	P0204	Injector Circuit High Input (Cylinder -4)		
-	P0300	Random Misfire Detected	Vacuum leak in air intake system	
	P0301	Misfire Detected (Cylinder -1)	 CKP sensor circuit malfunction Faulty CKP sensor 	
	P0302	Misfire Detected (Cylinder -2)	Ignition circuit malfunction	
	P0303	Misfire Detected (Cylinder -3)	Faulty ignition coil or plug wireSpark plug malfunction	
	P0304	Misfire Detected (Cylinder -4)	 Low compression due to blown head gasket, 	
			leaking valve or piston ring • Low/high fuel pressure due to faulty pressure regulator, restricted fuel lines, plugged fuel filter or faulty fuel pump • Fuel injector circuit malfunction • Faulty fuel injector	
			₩ NOTE	
			If any fuel injector codes (or pending codes) are present, do all repairs associated with those codes before proceeding with this trouble area.	

DTC No.	Diagnostic items	Trouble area
P0325	Knock Sensor Circuit Malfunction (Bank 1)	 Open or short to GND between knock sensor and ECM Source of high resistance between knock sensor and ECM Faulty knock sensor
P0335	Crankshaft Position Sensor Circuit Malfunction	 Short to GND between CKP sensor and ECM Open or short to battery between CKP and ECM Short between CKP sensor wires Poor connection between CKP connector & harness connector Out of allowable air gap Faulty target wheel tolerance Faulty CKP sensor
P0340	Camshaft Position Sensor Circuit Malfunction	 Short to GND between CMP sensor and ECM Open or short to battery between CMP and ECM Short between CMP sensor wires Poor connection between CMP connector & harness connector Faulty CMP sensor
P0350	Ignition Coil Primary/Secondary Circuit Malfunction	 Faulty ignition system Poor connection Faulty wires between ignition coil and ECM Faulty ignition coil
P0420	Main catalyst efficiency deterioration (Bank 1)	Catalytic converter deteriorated NOTE If any codes relating to HO2S sensor. MAFS, injectors, a P0170 or a P0173 are present, do all repairs associated with them before proceeding with this trouble area.
P0421	Main Catalyst Efficiency Deterioration (Bank 1)	Catalytic converter deteriorated NOTE If any codes relating to HO2S sensor. MAFS, injectors, a P0171 or a P0172 are present, do all repairs associated with them before proceeding with this trouble area.
P0443	EVAP Emission Control System Purge Control Valve Circuit Malfunction	Faulty PCSVOpen between PCSV and ECM
P0500	Vehicle Speed Sensor Circuit Malfunction	 Open between fuse and wheel speed sensor (WSS) used for wheel speed measurement Open between WSS and GND Open between WSS and ECM Short to battery or GND between WSS and ECM Faulty WSS

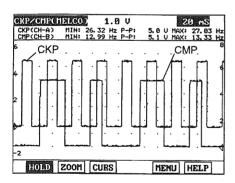
DTC No.	Diagnostic items	Trouble area
P0507	Idle Control System rpm Higher than Expected	 Improperly adjusted accelerator cable Air leak in intake system between head and throttle plate Faulty PCV valve or PSV Poor connections in TPS circuit or faulty TPS High resistance between IAC valve and ECM Faulty IAC valve
		If any codes relating to TPS, MAFS, fuel injector or IAC valve are present, do all repairs associated with them before proceeding with this troubleshooting area.
P1330	Spark Timing Adjustment	 Open or short to battery between ROM change tool and ECM Short to GND between ROM change tool and ECM Open between ROM change tool and ECM

MAJOR SENSOR REFERENCE WAVE-FORMS EFUC3260

The followings are the major sensor reference wave-forms. 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.

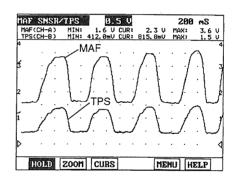


EFUC326A

* 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).

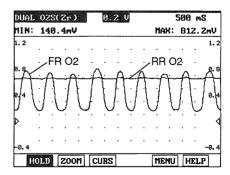
TPS should increase while depressing the accelerator pedal and should decrease while releasing it.



EFUC326B

* FR O2 SENSOR AND RR O2 SENSOR

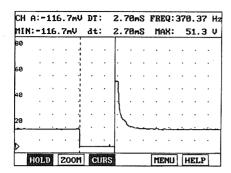
FR O2 and RR O2 sensor may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



EFUC326C

* INJ PULSE

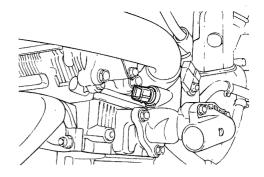
Should increase when depressing the accelerator pedal and should decrease when the pedal is released.



EFUC326D

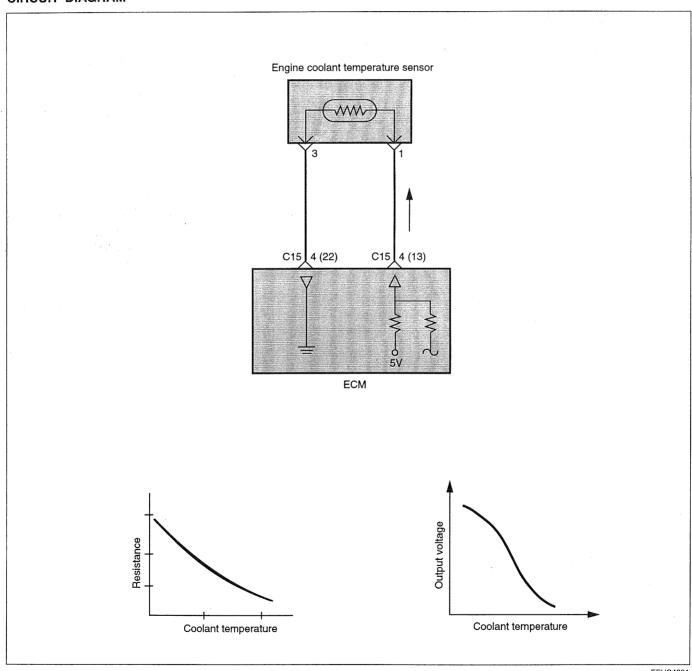
ENGINE COOLANT TEMPERATURE (ECT) SENSOR EFUC4030

This hot film type air flow sensor is composed of a hot film sensor, housing, and a metering duct (hybrid, sensor element). The mass air flow rate is measured by detection of heat transfer from a hot film probe. A change in the mass air flow rate will cause a change in the amount of heat being transferred from the hot film probe surface to the air flow. This results in a change in temperature of the hot film probe and a change of resistance.



EFA9026A

CIRCUIT DIAGRAM



EFUC403A

SENSOR CHECKING

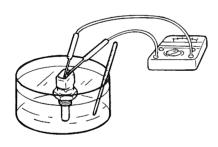
USING HI-SCAN

Check item	Data display	Check conditions	Intake air temperature	Test specification
Engine coolant	Sensor temperature	Ignition switch	When -20°C (-4°F)	-20°C
temperature sensor		: ON or engine running	When 0°C (32°F)	0°C
		, ranning	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 engine coolant temperature sensor from the intake manifold.
- With temperature sensing portion of engine coolant temperature sensor immersed in hot engine coolant, check resistance.

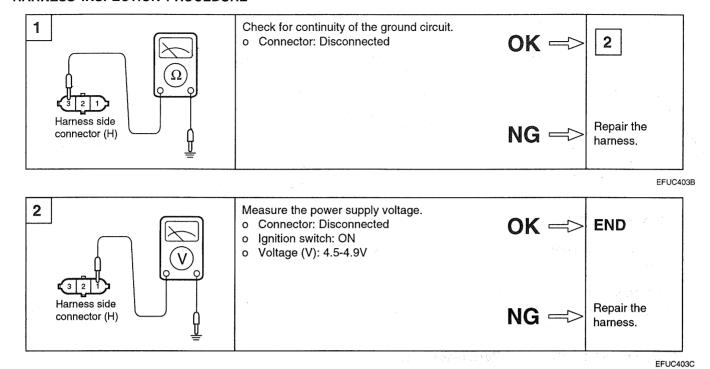
Temperature [°C (°F)]	Resistance (k Ω)
0 (32)	5.9
20 (68)	2.5
40 (104)	1.1
80 (176)	0.3



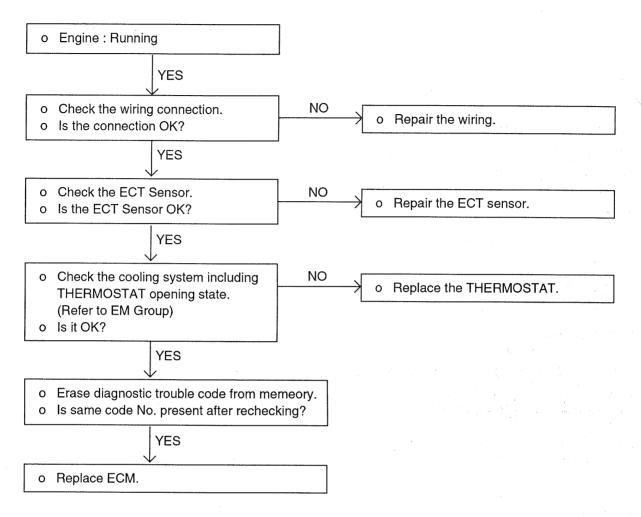
EFA9028A

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

HARNESS INSPECTION PROCEDURE



TROUBLESHOOTING PROCEDURES



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

EFUC403D

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

TROUBLESHOOTING HINTS

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

INSTALLATION

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

Tightening torque

Engine coolant temperature sensor:

20-40 Nm (200-400 kg.cm, 14-29 lb.ft)

3. Securely connect the harness connector.

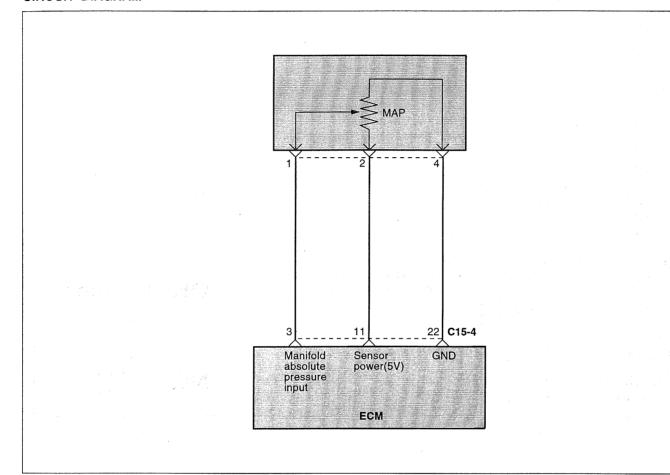
MANIFOLD ABSOLUTE PRESSURE(MAP) SENSOR EFUC4050

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

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

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

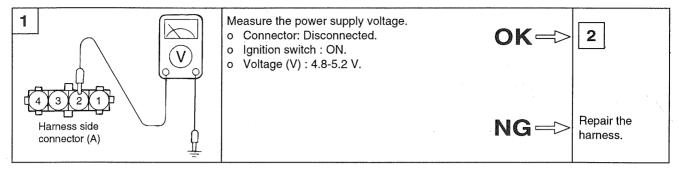
CIRCUIT DIAGRAM



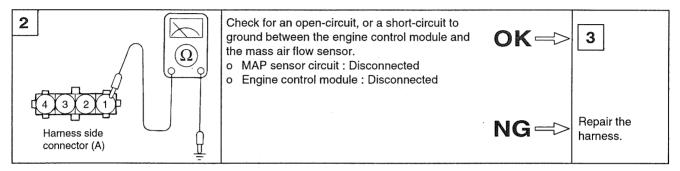
EFUC405A

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

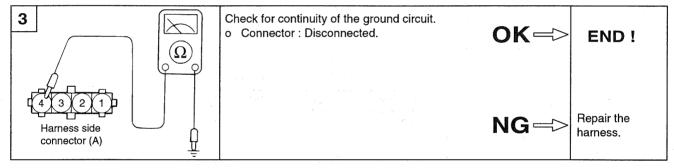
HARNESS INSPECTION PROCEDURE



EFAA705B

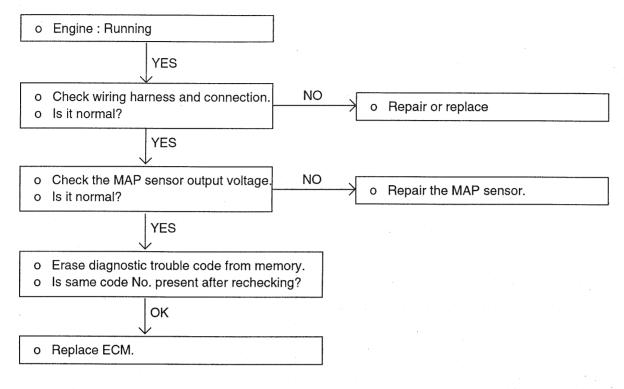


EFAA705C



EFAA705D

TROUBLESHOOTING PROCEDURES [MAP SENSOR]



DTC : Diagnosis Trouble Code ECM : Engine Control Module

EFAA705E

TROUBLESHOOTING HINTS

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

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

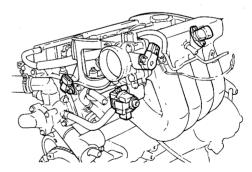
SENSOR INSPECTION [MAP SENSOR]

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

Terminal 4: MAP sensor ground Terminal 1: MAP sensor output

2. Measure the voltage of terminals.

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



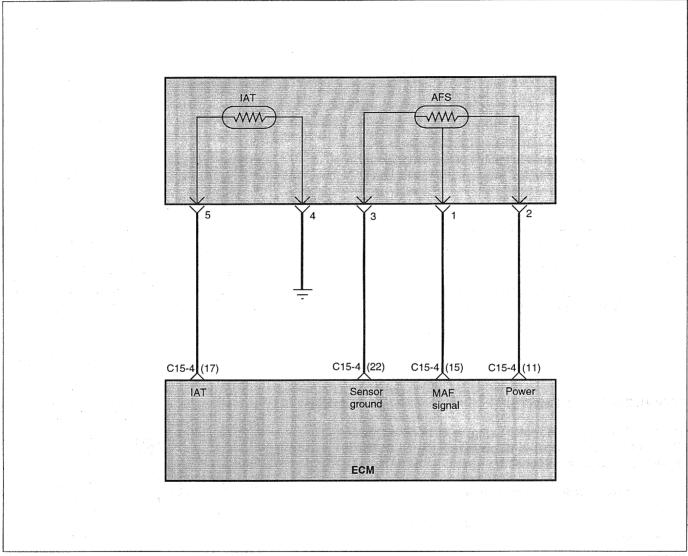
EFAA705F

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

MASS AIR FLOW (MAF) SENSOR & INTAKE AIR TEMPERATURE (IAT) SENSOR EFUC4060

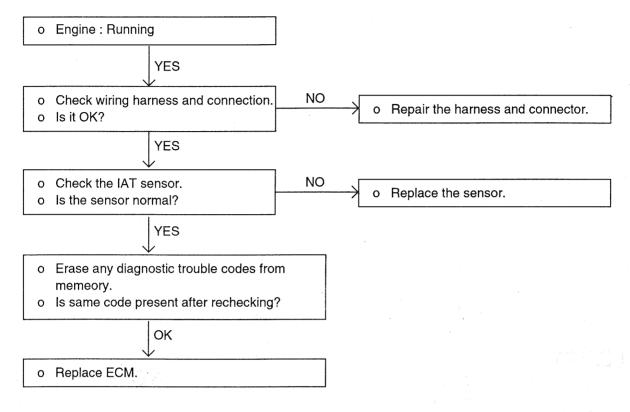
This hot film type air flow sensor is composed of a hot film sensor, housing, metering duct (hybrid, sensor element). Mass air flow rate is measured by detection of heat transfer from a hot film probe because the change of the mass air flow rate causes change in the amount of heat being transferred from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

CIRCUIT DIAGRAM



EFUC406A

TROUBLESHOOTING PROCEDURES



DTC: Diagnosis Trouble Code ECM: Engine Control Module

TROUBLESHOOTING HINTS

- 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 ECM.
- If the engine can be idle even if the MAF sensor output voltage is out of specification, check for the following conditions;

- Disturbed air flow to the MAF sensor, check for disconnected air duct, and clogged air cleaner filter.
- Poor combustion in the cylinder, check for faulty ignition plug, ignition coil, injector, and incorrect comparison.
- Check the mounting direction of AFS.

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

EFUC406E

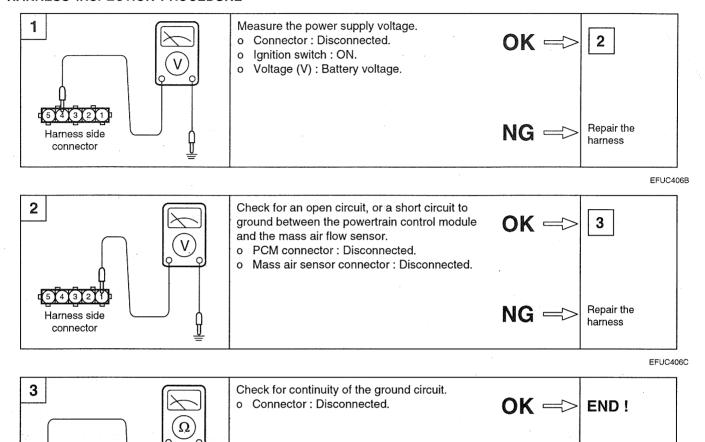
M NOTE

Harness side

connector

- 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.
- · Use an accurate digital voltmeter.
- Before checking, warm up the engine until the engine coolant temperature reaches 80 to 90°C (176 to 198°F)

HARNESS INSPECTION PROCEDURE



EFUC406D

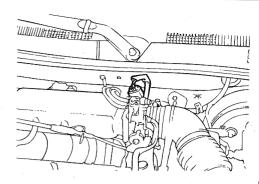
Repair the

harness

NG =

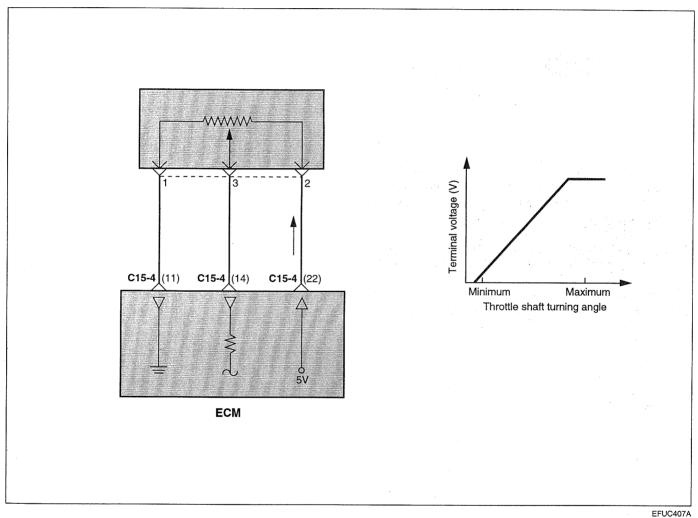
THROTTLE POSITION (TP) SENSOR

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



EFA9049A

CIRCUIT DIAGRAM



SENSOR CHECKING

USING HI-SCAN

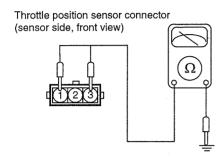
Check item	Data display	Check conditions	Throttle valve	Test specification
Throttle position	Sensor voltage	Ignition switch : ON	At idle position	300-900 mV (I4)
sensor			Open slowly	Increases with valve opening
			Open widely	4,250-4,700 mV

USING VOLTMETER

- 1. Disconnect the throttle position sensor connector.
- 2. Measure resistance between terminal 2 (sensor ground) and terminal 1 (sensor power).

Standard value : 3.5 - 6.5 k Ω

3. Connect a pointer type ohmmeter between terminal 2 (sensor ground) and terminal 3 (sensor output).



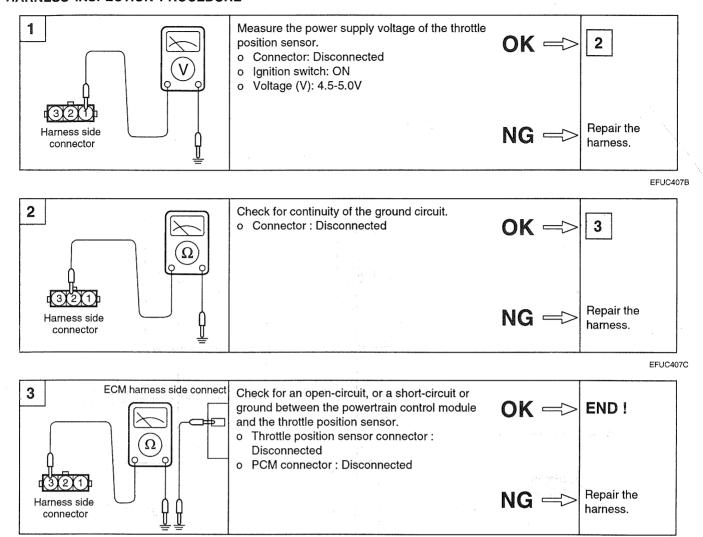
EFUC407E

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

Tightening torque

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

HARNESS INSPECTION PROCEDURE



EFUC407D

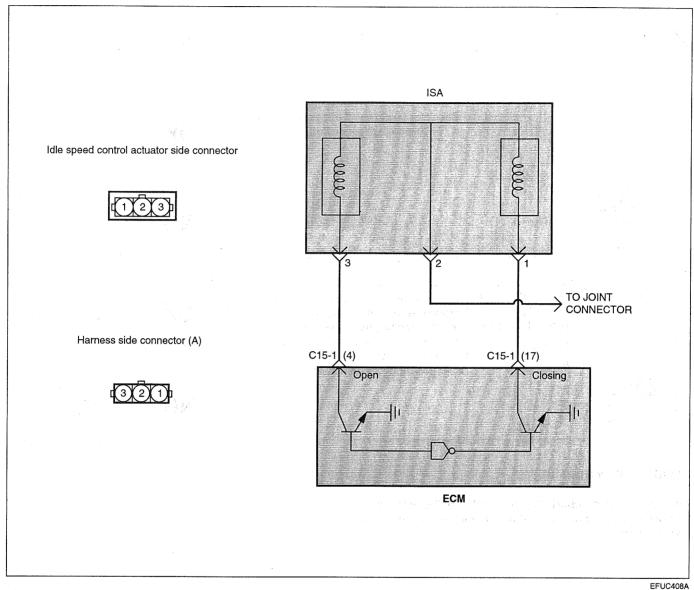
TROUBLESHOOTING HINTS

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

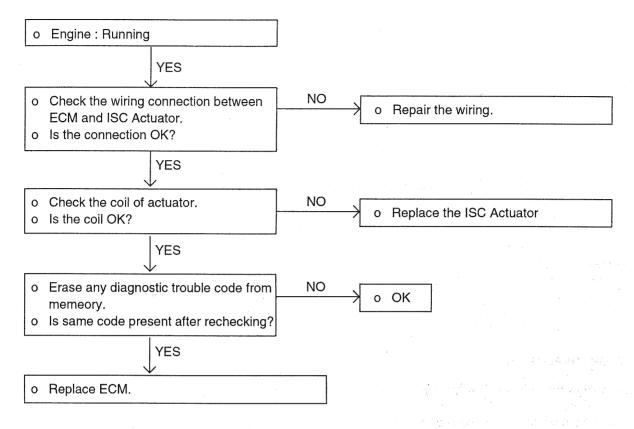
IDLE SPEED CONTROL ACTUATOR EFUC4080

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

CIRCUIT DIAGRAM



TROUBLESHOOTING PROCEDURES



DTC : Diagnosis Trouble Code ECM : Engine Control Module

TROUBLESHOOTING HINTS

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

• When the primary voltage side in ECM is in short or open circuit.

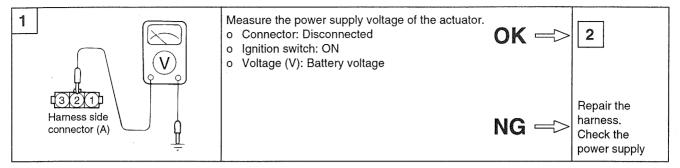
EFUC408E

- The ignition closed loop control in ECM is out of order.
- Open or short circuit is observed in idle air control system when ignition switch is turned onl.

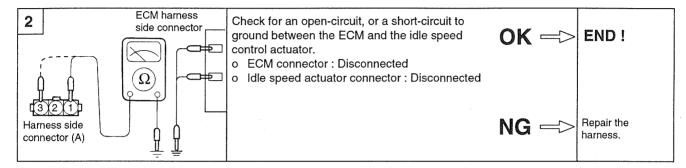
USING HI-SCAN

Check item	Check condition	HI-SCAN display	Туре
Idle speed control actuator o Actuator	Start the engine	ISCA	Activate

HARNESS INSPECTION PROCEDURE



EFUC408B



EFUC408C

ACTUATOR INSPECTION

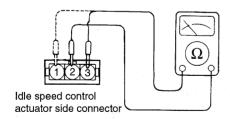
- Disconnect the connector at the idle speed control actuator.
- 2. Measure the resistance between terminals.

Standard value

Terminal 3 and 2 : 10.5 - 14 $\!\Omega$

Terminal 1 and 3 : 10 - 12.5 Ω [at 20°C (68°F)]

Connector the connector to the idle speed control actuator

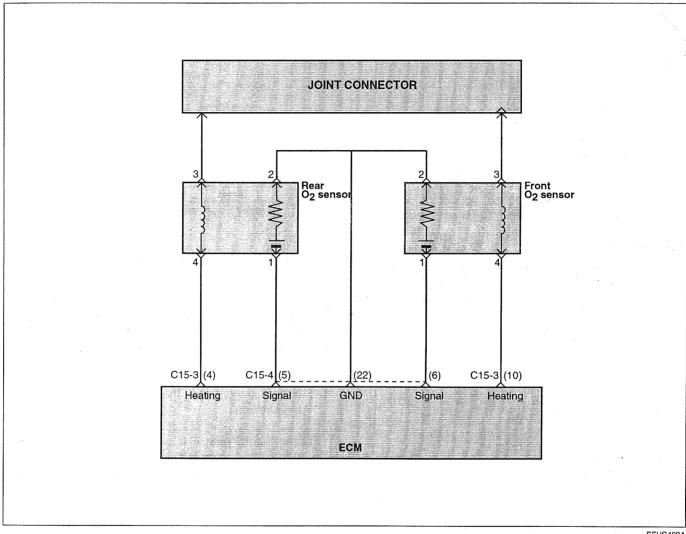


EFAA717D

HEATED OXYGEN SENSOR (HO2S)

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

CIRCUIT DIAGRAM



EFUC409A

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

Check item	Check conditions	Engine state	Test specification
Oxygen sensor	Dxygen 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	Idle	400 mV or lower - (oscilate) 600-1,000 mV
	air/fuel mixture ratio, and also check the condition of control by the ECU)	2,000 rpm	

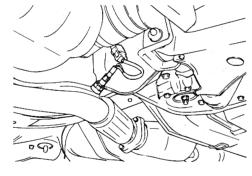
INSPECTION

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

Standard value

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



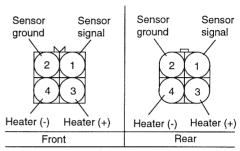
EFAA719E

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

NOTE

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

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



Heated oxygen sensor harness side connector

EFAA719F

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

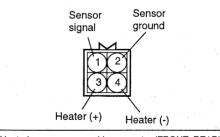
Engine	Oxygen sensor output voltage	Resistance (Ω)
Race	Min. 0.6V	30 or more

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

Tightening torque

Heated oxygen sensor:

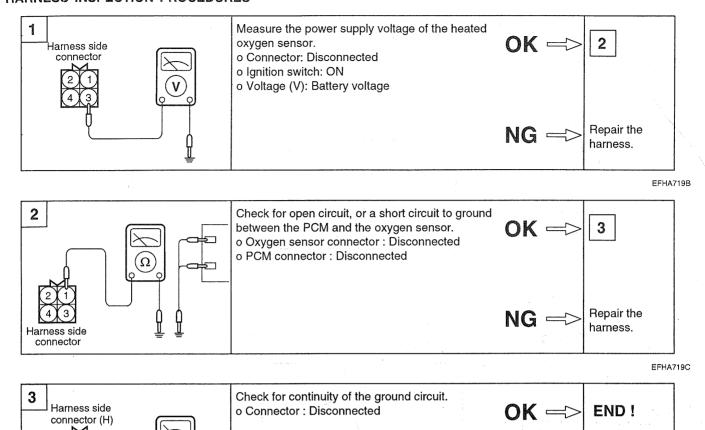
40-50 Nm (400-500 kg.cm, 29-36 lb.ft)



Heated oxygen sensor side connector (FRONT, REAR)

EFAA719G

HARNESS INSPECTION PROCEDURES



EFHA719D

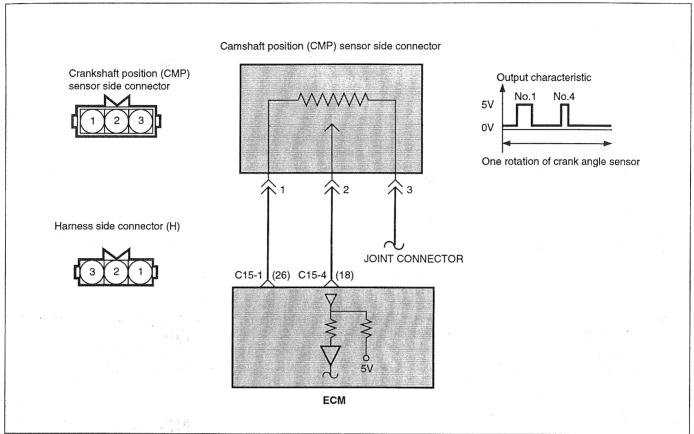
Repair the harness.

CAMSHAFT POSITION SENSOR EFUC4100

The CMP sensor senses the camshaft position sensor on compression stroke of the No.1 and No.4 cylinders,

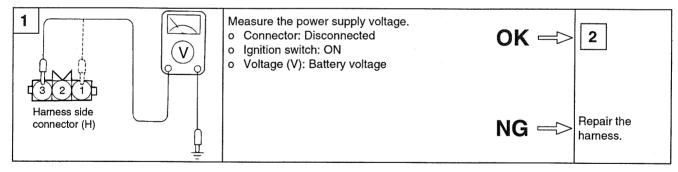
converts it into a pulse signal, and inputs it to the ECM. The ECM then computes the fuel injection sequence, etc. based on the input signal.

CIRCUIT DIAGRAM

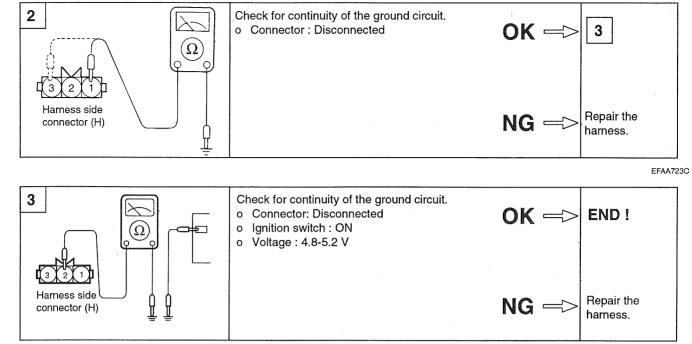


EFUC410A

HARNESS INSPECTION PROCEDURE



EFAA723B



EFUC410D

TROUBLESHOOTING HINTS

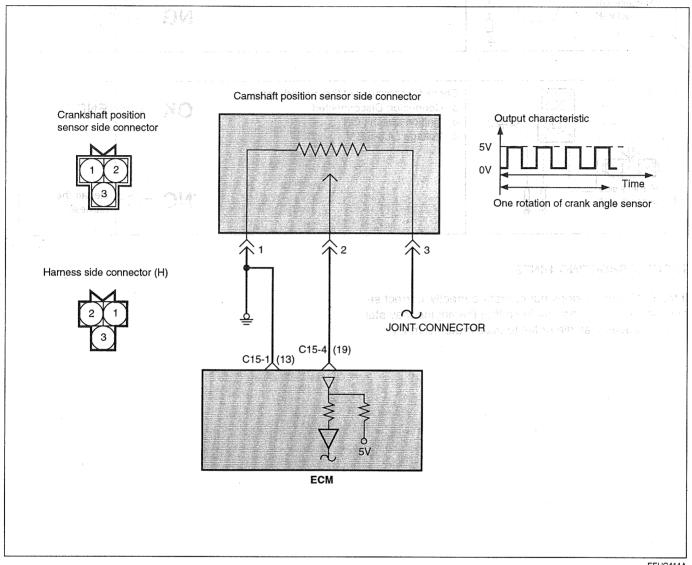
If the CMP Sensor does not operate correctly, correct sequential injection is not made so that the engine may stall or run irregularly at idle or fail to accelerate normally.

CRANKSHAFT POSITION SENSOR EFUC4110

The crankshaft position sensor senses the crank angle (piston position) of each cylinder and converts it into a

pulse signal. Based on the input signal, the ECM computes the engine speed and controls the fuel injection timing and ignition timing.

CIRCUIT DIAGRAM



EFUC411A

TROUBLESHOOTING HINTS

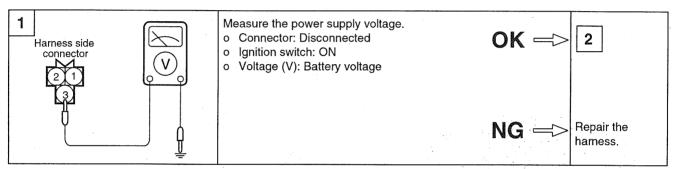
- If unexpected shocks are felt during driving or the engine stalls suddenly, shake the crankshaft position sensor harness. If this causes the engine to stall, check for poor sensor connector contact.
- 2. If the tachometer reads 0 rpm when the engine is cranked, check for faulty crank angle sensor,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

USING GST

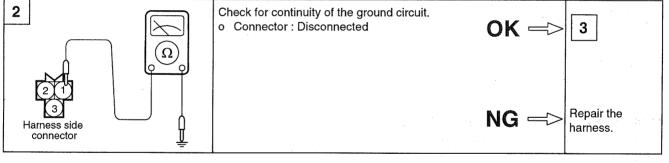
Check Item	Check conditions	Check content	Normal state
Crankshaft position sensor	 Engine cranking Tachometer connected (check on and off ignition coil by tachometer) 	Compare cranking speed and multi-tester reading	Indicated speed agrees

Check Item	Check conditions	Coolant temperature	Test specification
Crankshaft position	• Engine: Running at idle	When -20°C (-4°F)	1,500-1,700 rpm
sensor 2 y 2 2	 Idle position switch: ON 	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)	650-850 rpm

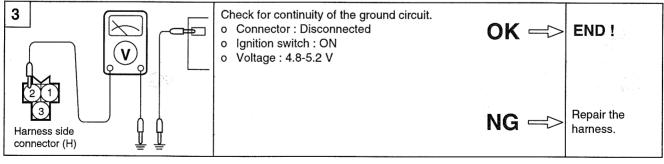
HARNESS INSPECTION PROCEDURE



EFAA725C



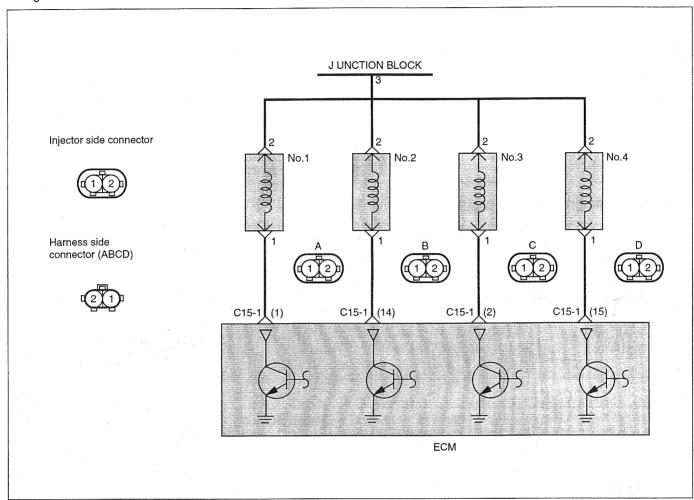
EFAA725D



EFUC411E

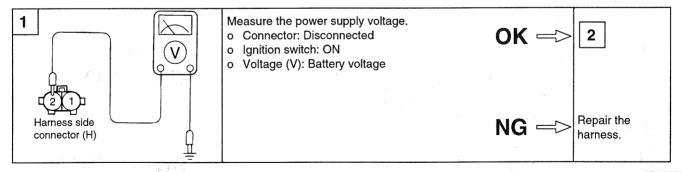
FUEL INJECTOR EFUC4120

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

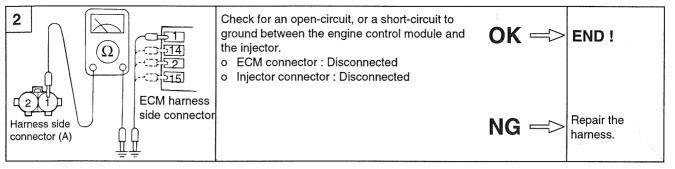


EFUC412A

HARNESS INSPECTION PROCEDURE



EFAA727B



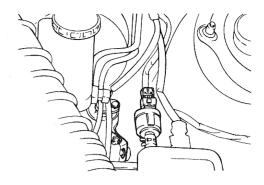
EFUC412C

TROUBLESHOOTING HINTS

- 1. If the engine is hard to start when hot, check for fuel pressure and injector leaks.
- 2. If the injector does not operate when the engine is cranked, then check the followings;
 - Faulty power supply circuit to the ECM, faulty ground circuit
 - · Faulty control relay
 - Faulty crankshaft position (CKP) sensor, camshaft position (CMP) sensor
- If there is any cylinder whose idle state remains unchanged when the fuel injection of injectors is cut one after another during idling, check for the following items about such 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.)

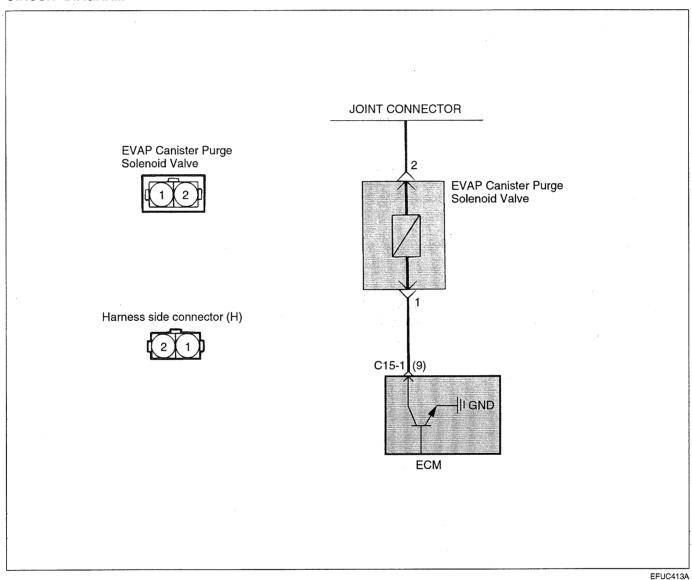
EVAPORATIVE EMISSION CANISTER PURGE SOLENOID VALVE EFUC4130

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

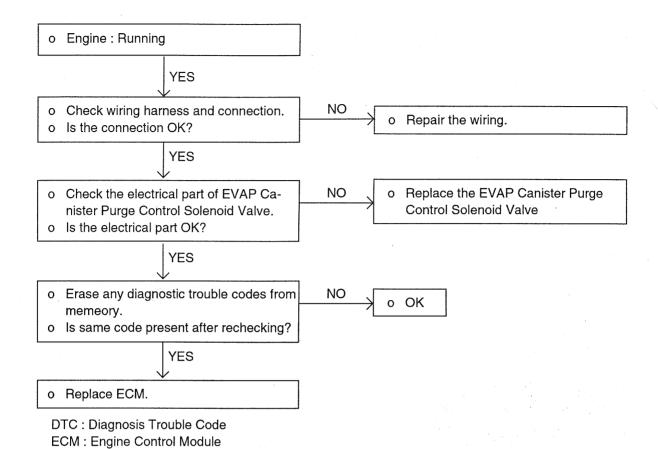


EFA9089A

CIRCUIT DIAGRAM



TROUBLESHOOTING PROCEDURES

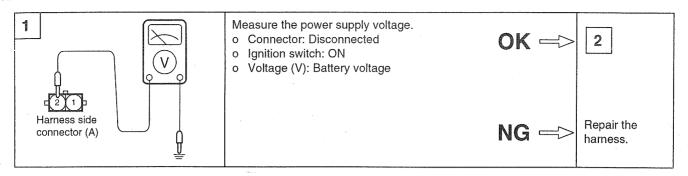


EFUC413B

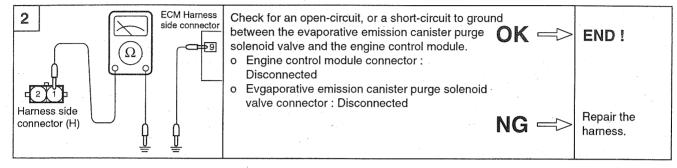
USING HI-SCAN

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

HARNESS INSPECTION PROCEDURE



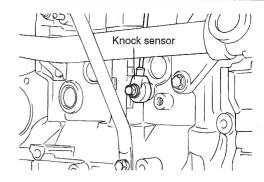
EFUC413C



EFUC413D

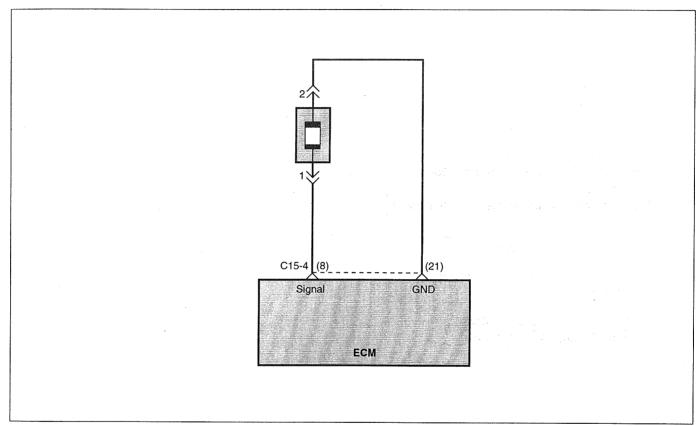
KNOCK SENSOR EFUC4140

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



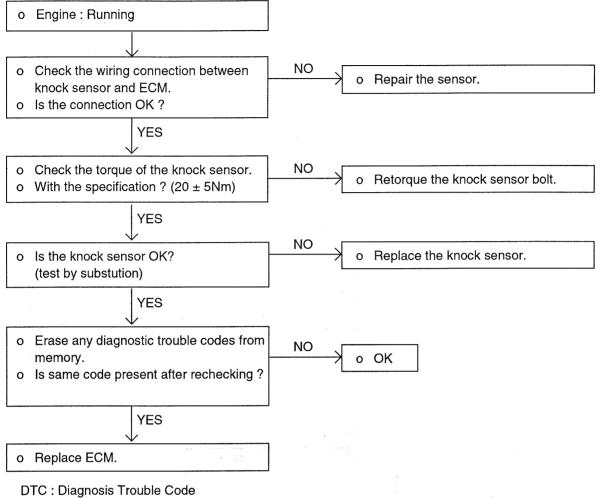
EFA9094A

CIRCUIT DIAGRAM



EFUC414A

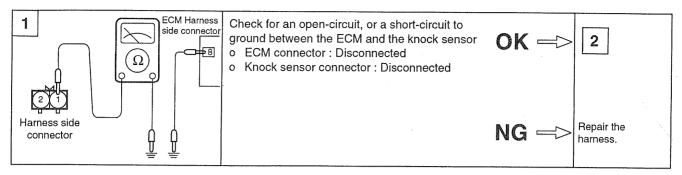
TROUBLESHOOTING PROCEDURES



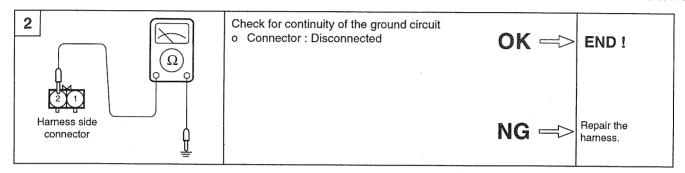
ECM : Engine Control Module

EFUC414B

HARNESS INSPECTION PROCEDURE



EFUC414C



EFUC414D

SENSOR INSPECTION

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

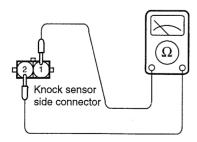
Standard value : about 5M Ω [at 20°C (68°F)]

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

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

 Measure the capacitance between the terminal 1 and 2.

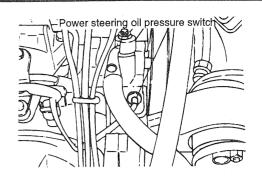
Standard value: 800-1600 pF



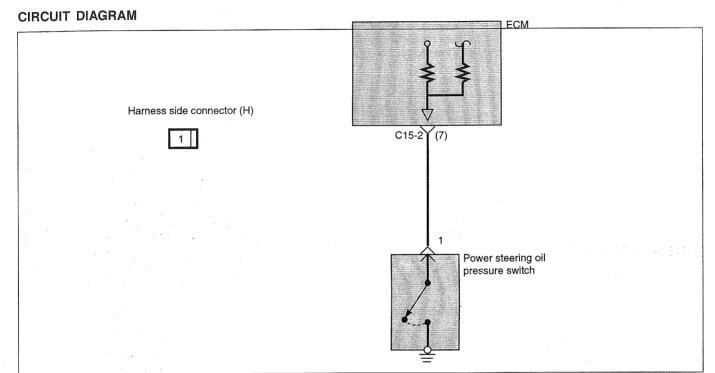
POWER STEERING PRESSURE (PSP)

SWITCH EFUC4150

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



EFA9103A

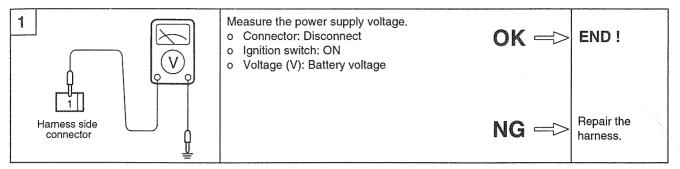


EFUC415A

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 PROCEDURE



EFAA735B

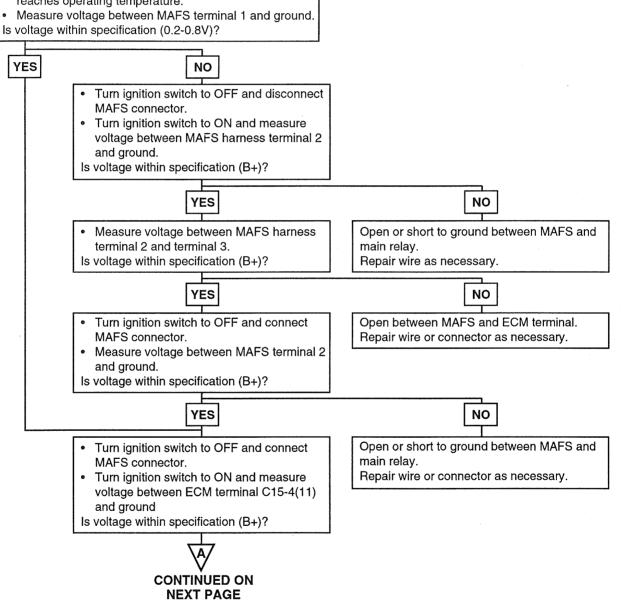
TROUBLESHOOTING FOR DTCS (MELCO EMS)

DIAGNOSTIC ITEM EFUC5010

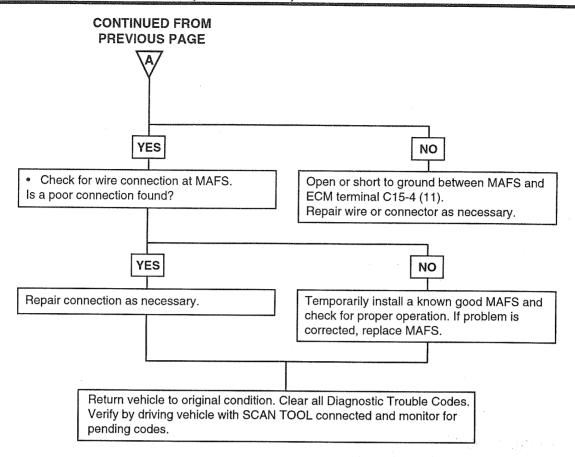
DTC	Diagnostic item
P0101	Mass Air Flow Circuit Range/Performance Problem
P0102	Mass Air Flow Circuit Low Voltage
P0103	Mass Air Flow Circuit High Voltage

TEST PROCEDURE

- Start engine and allow engine to idle until engine reaches operating temperature.



EFUC501A



EFUC501B

EFUC5020

DTC	Diagnostic item	
P0112	Intake Air Temperature Low Voltage	
P0113	Intake Air Temperature High Voltage	

DESCRIPTION

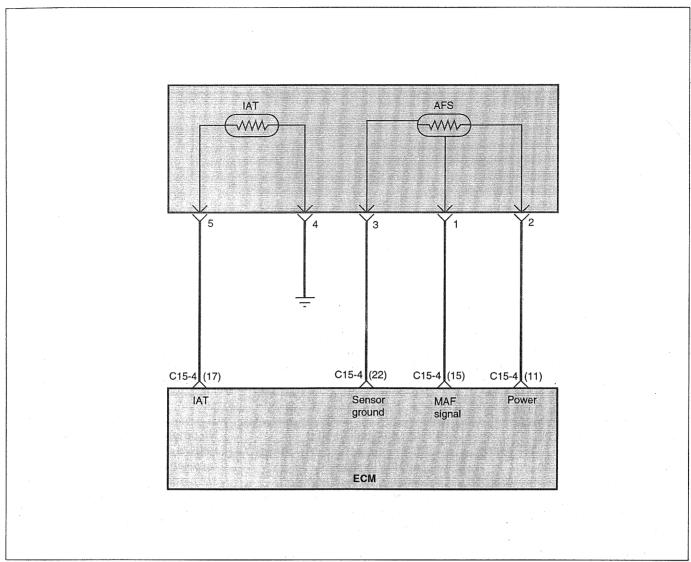
The Intake Air Temperature (IAT) sensor is in the MAF sensor. The IAT sensor is a variable resistor whose resistance changes as the temperature of the air flowing through the air intake changes. The Engine Control Module (ECM) uses the IAT sensor input to adjust fuel injector pulse width.

When the temperature sensed is cold, the PCM enriches fuel mixture by increasing injector pulse width; as the air warms, the injector pulse width time is shortened.

TROUBLESHOOTING GUIDE

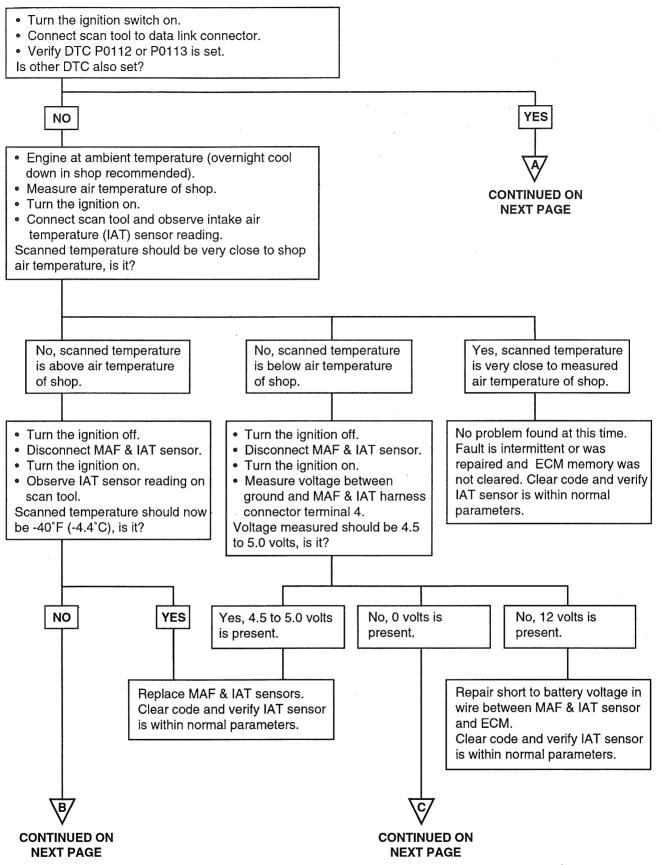
DTC detection condition	Probable cause
Background The intake air temperature sensor converts the intake air temperature to a voltage and outputs it. The powertrain control module checks whether the voltage is within a specified range. Check Area Sixty seconds or more have passed since the engine was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

CIRCUIT DIAGRAM



EFUC406A

TEST PROCEDURE



EFUC502B

CONTINUED FROM PREVIOUS PAGE • Turn the ignition off. Disconnect MAF & IAT sensor. Measure resistance between ground and MAF & IAT sensor harness connector terminal 4. Resistance should be approximately 1 ohm or less, is it? YES NO Replace MAF & IAT sensor. Repair open in wire between MAF Clear codes and verify IAT sensor & IAT sensor harness connector is within normal parameters. terminal 5 and ECM. Clear codes and verify IAT sensor is within normal parameters. **CONTINUED FROM CONTINUED FROM PREVIOUS PAGE PREVIOUS PAGE** · MAF & IAT sensor disconnected. MAF & IAT sensor disconnected. · Turn the ignition off. Turn the ignition off. • Disconnect ECM connector C15-4. Disconnect ECM connector C15-4. • Measure resistance between ground and MAF & Ground MAF & IAT sensor harness connector IAT sensor harness connector terminal 5. terminal 5. Resistance should indicate an open circuit, does it? · Measure resistance between ground and ECM connector C15-4 terminal 17. Resistance should be approximately 1 ohm or less, NO YES YES Repair short to ground in wire Repair open in wire between MAF Verify ECM connectors are secure between MAF & IAT sensor If OK, replace MAF & IAT sensor. & IAT sensor harness connector harness connector terminal 4 and Clear code and verify IAT sensor terminal 5 and ECM. Clear code ECM. Clear code and verify IAT is within normal parameters. and verify IAT sensor is within sensor is within normal If problem persists, replace ECM. normal parameters. parameters.

EFUC502C

EFUC5030

DTC	Diagnostic item	
	Engine Coolant Temperature Circuit Malfunction Engine Coolant Temperature Sensor Drift	

DESCRIPTION

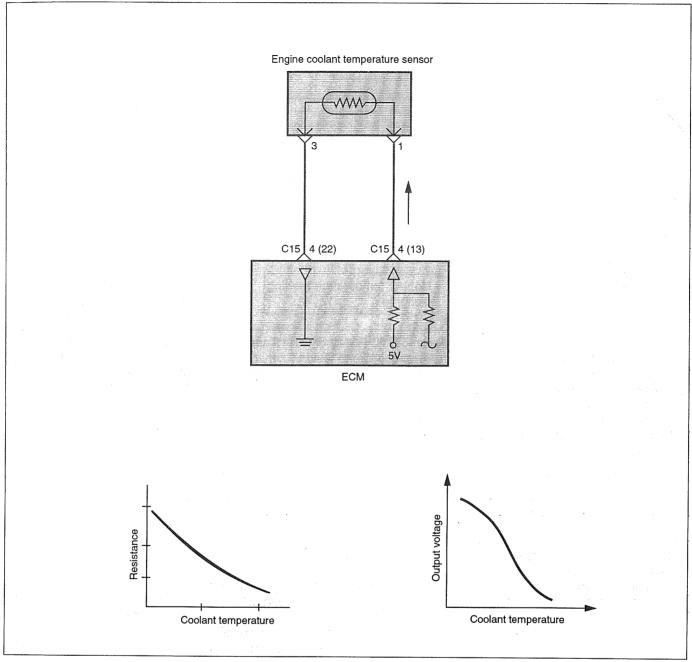
The Engine Coolant Temperature (ECT) sensor is located in the coolant passage of the cylinder head. The ECT sensor is a variable resistor whose resistance changes as the temperature of the engine coolant flowing past the sensor changes. When the coolant temperature is low, the sensor resistance is high; 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

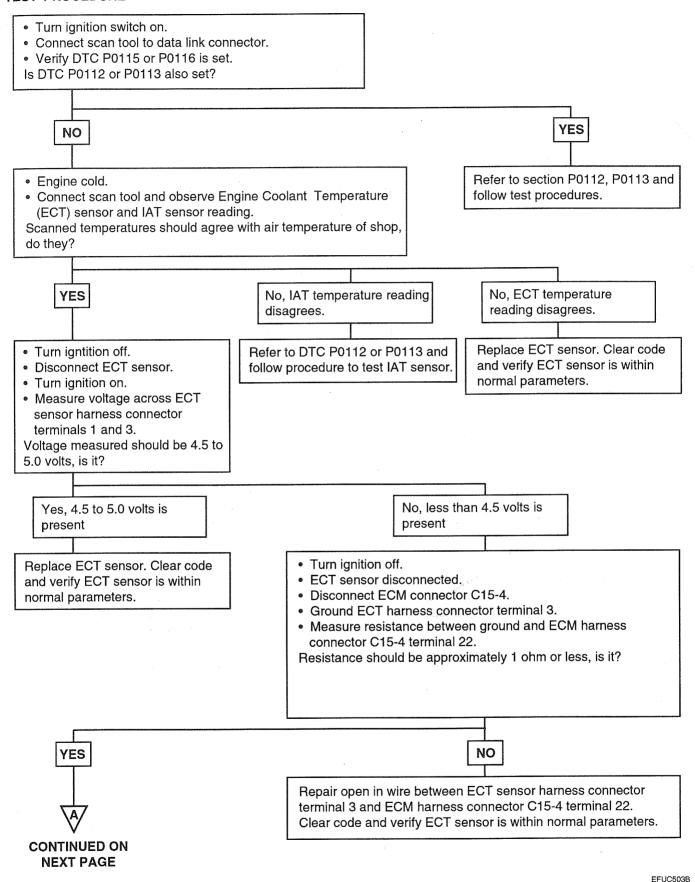
DTC detection condition	Probable cause
Background The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it. The Engine Control Module checks whether the voltage is within a specified range. In addition, it checks that the engine coolant temperature (signal) does not drop while the engine is warming up.	 Engine Coolant Temperature sensor failed. Open or shorted Engine Coolant Temperature sensor circuit, or loose connector. Engine Control Module failed.
 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. 	

CIRCUIT DIAGRAM



EFUC403A

TEST PROCEDURE



CONTINUED FROM PREVIOUS PAGE Turn ignition off. ECT sensor disconnected. • Disconnect ECM connector C15-4. · Measure resistance between ground and ECM harness connector C15-4 terminal 22. Resistance should indicate open circuit, does it? YES NO Repair short to ground in wire between ECT sensor harness connector terminal 3 and ECM harness connector C15-4 terminal 22. Clear code and verify ECT sensor is within normal parameters. · Turn ignition off. • ECT sensor disconnected. • Disconnect ECM connector C15-4. Resistance should indicate open circuit, does it? YES NO Repair open in wire between ECT sensor harness connector Verify ECM connector is secure. Replace ECT sensor with known terminal 1 and ECM harness connector C15-4 terminal 22. good component. If problem per-Clear code and verify ECT sensor is within normal parameters. sists, replace ECM. Clear code and verify ECT sensor is within normal parameters.

EFUC503C

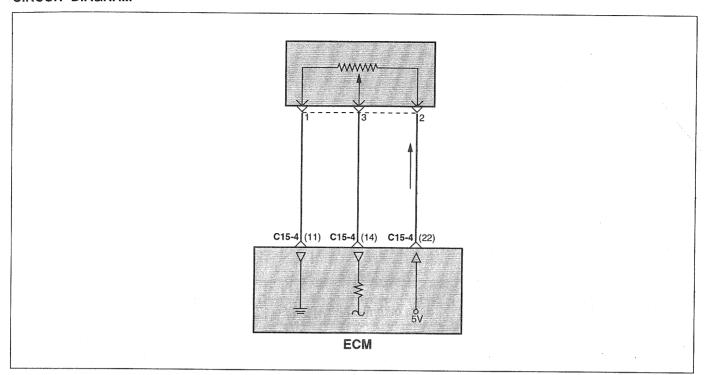
DTC	Diagnostic item	
i i	Throttle Position Sensor Low Voltage Throttle Position Sensor High Voltage	

DESCRIPTION

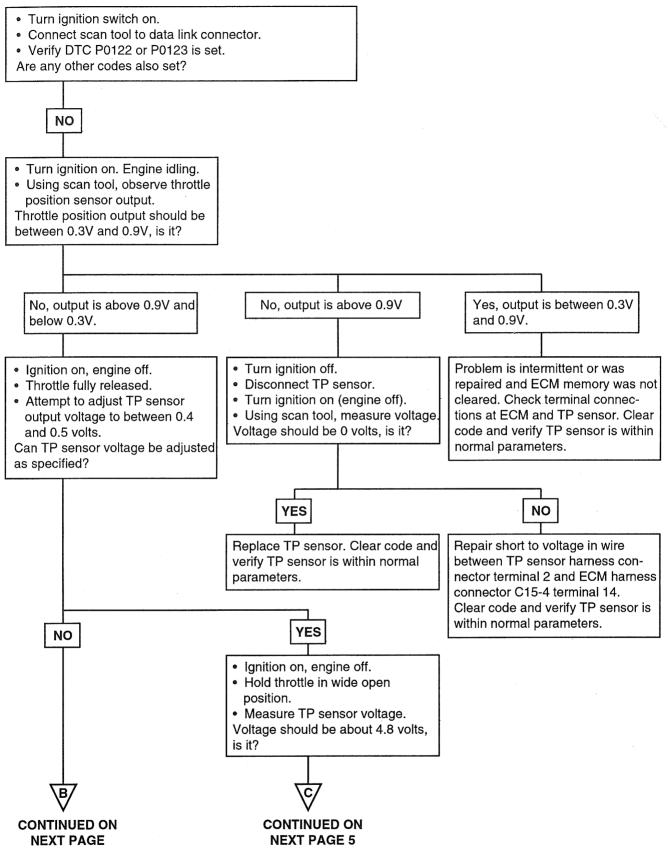
The throttle position (TP) sensor mounts on the side of the throttle body and is connected to the throttle blade shaft. The TP sensor is a variable resistor (potentiometer) whose resistance changes according to the throttle blade shaft position. During acceleration, the TP sensor resistance decreases; 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.

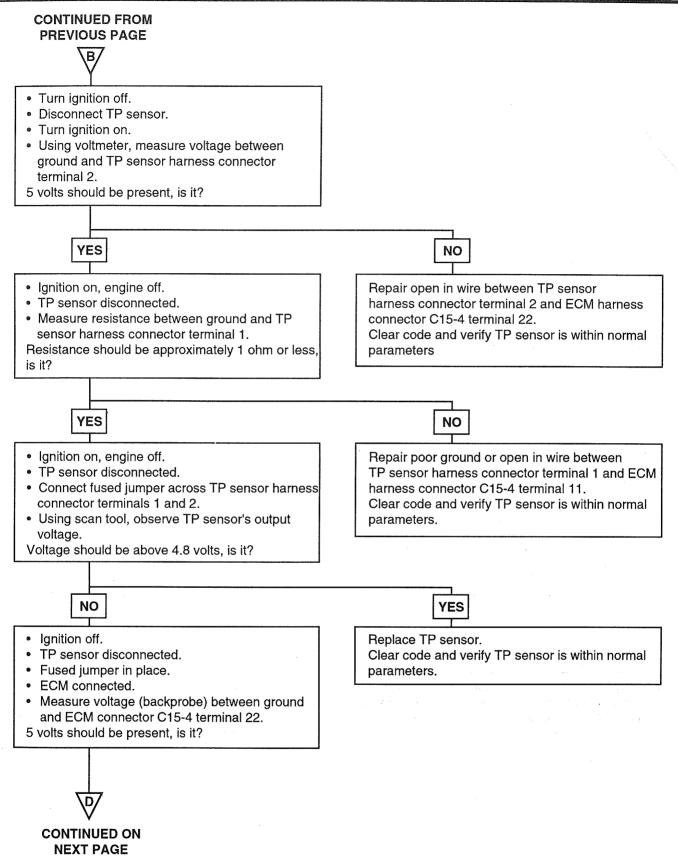
DTC detection condition	Probable cause
 Background The Throttle Position sensor outputs a voltage which is proportional to the throttle valve opening angle. The Engine Control Module checks whether the voltage output by the throttle position sensor is within a specified range. In addition, it checks that the voltage output does not become too large while the engine is idling. 	 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.
 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. 	Engine control module failed.
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.	



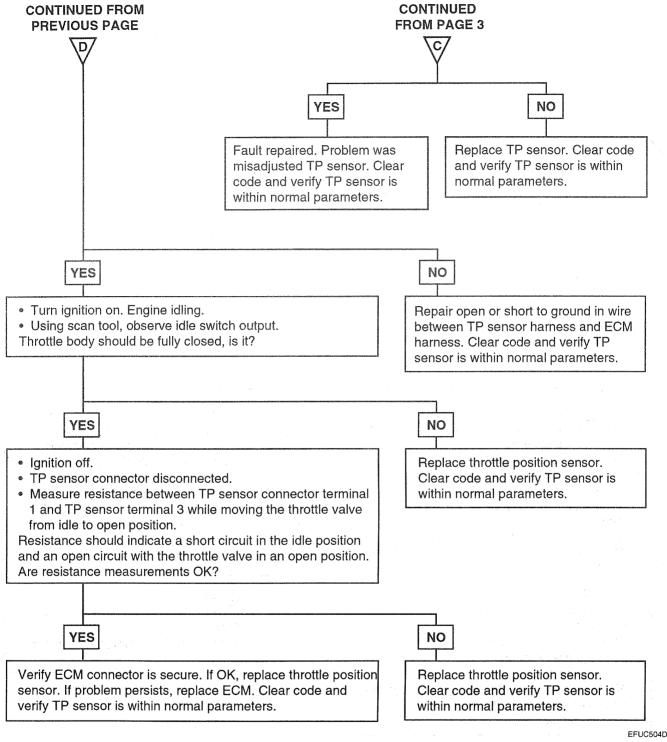
EFUC504A



EFUC504B



EFUC504C



FFUC5050

DTC	Diagnostic item
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control

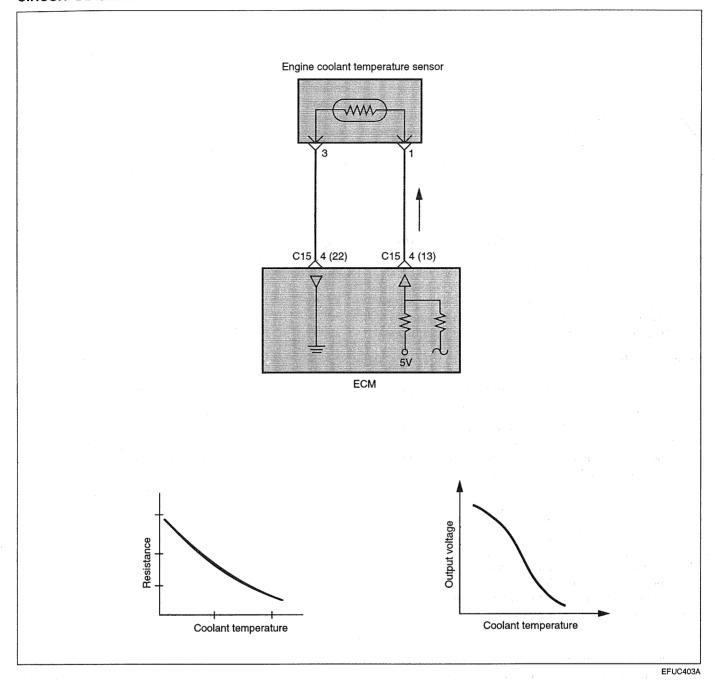
DESCRIPTION

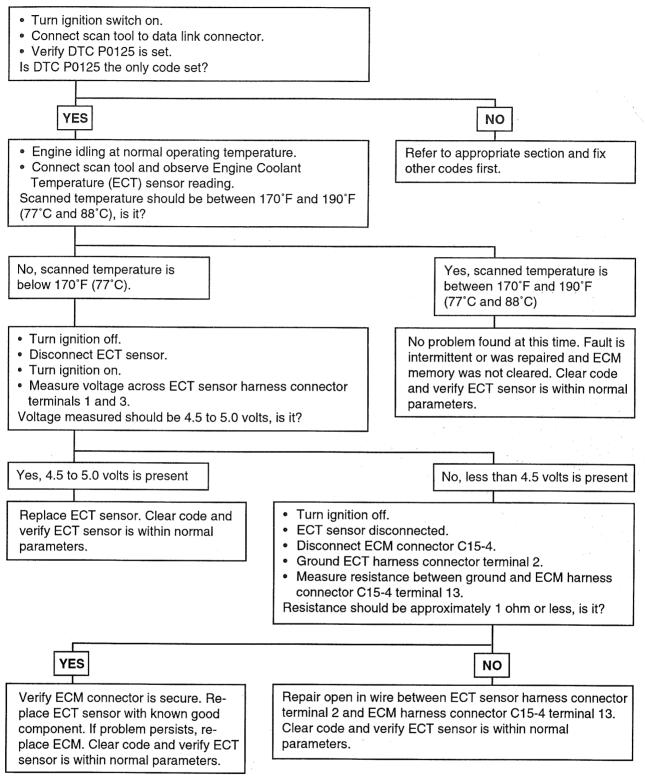
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three way catalytic converter is used, but for the most efficient use of the three-way catalytic inverter, the air ratio must be precisely controlled so that it is always close to the stoichiometric air-fuel ratio.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

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





EFUC505B

FFUC5060

DTC	Diagnostic item
1	Oxygen Sensor Circuit Malfunction (Bank 1, sensor 1) Oxygen Sensor Circuit Open (Bank 1, sensor 1) Excessive Time to Enter Closed Loop Fuel Control

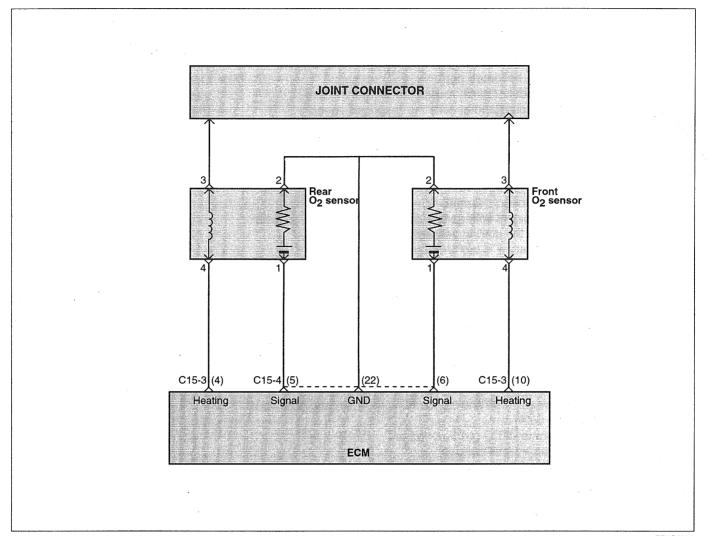
DESCRIPTION

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).

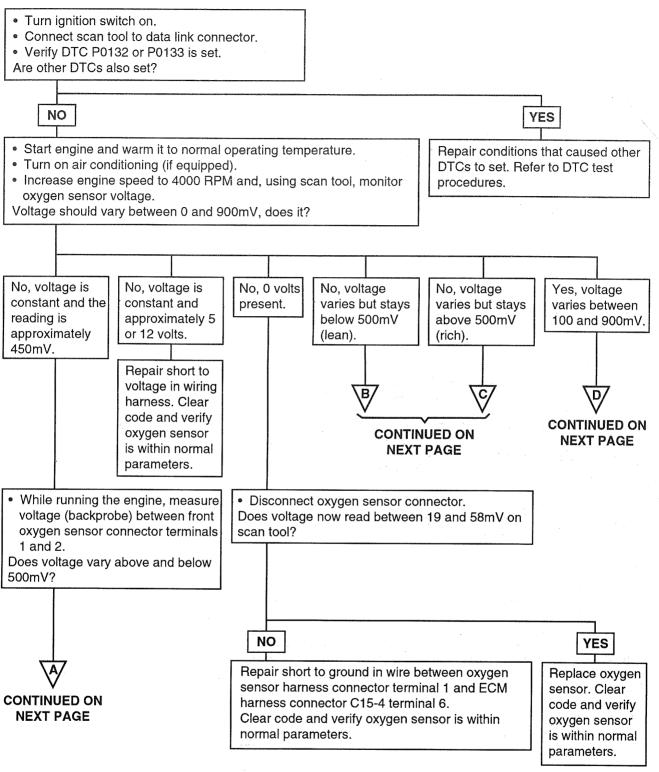
The ECM determined by the electromotive force from the oxygen sensor whether the air-fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform an accurate air-fuel ratio 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

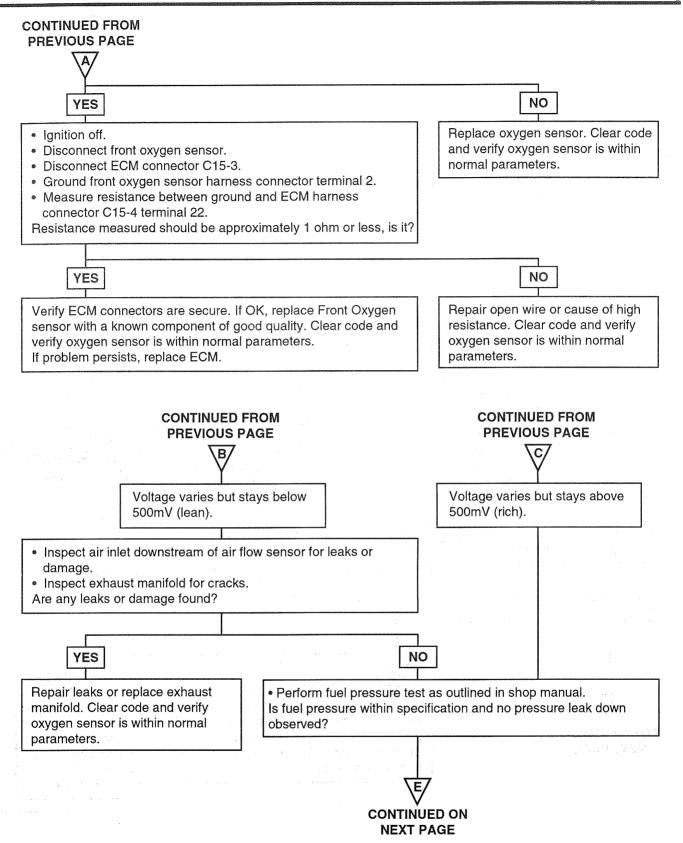
DTC detection condition Probable cause Background Heated oxygen sensor When the heated oxygen sensor begins to deteriorate, the oxygen deteriorated sensor signal response becomes poor. Open circuit in heated oxygen • The Engine Control Module forcibly varies the air/fuel mixture sensor output line to make it leaner and richer and checks the response speed · Engine control module failed 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.



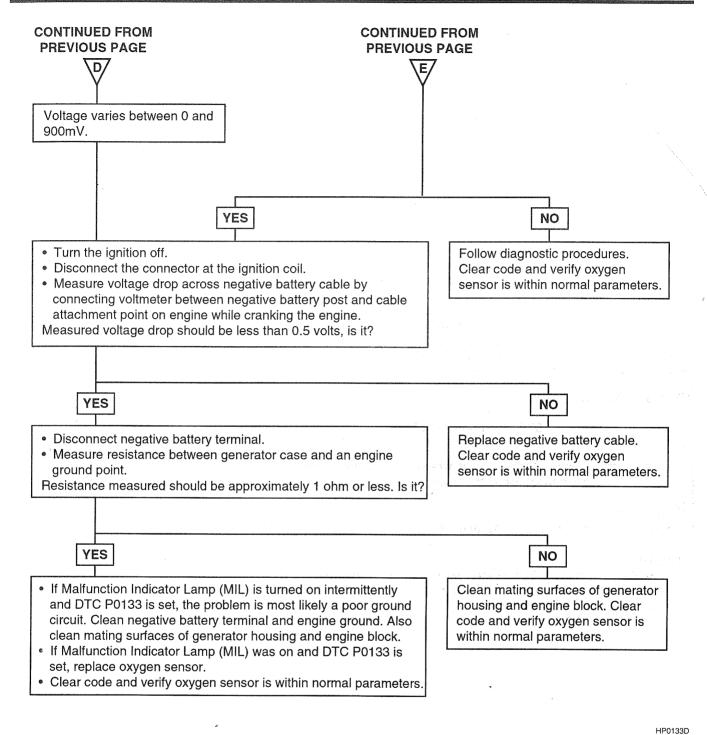
EFUC409A



EFUC506B



EFUC506C



HP0133D

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

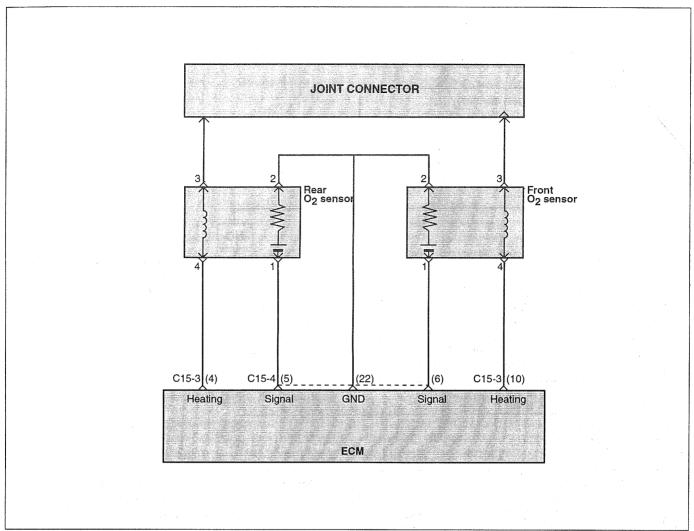
DESCRIPTION

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

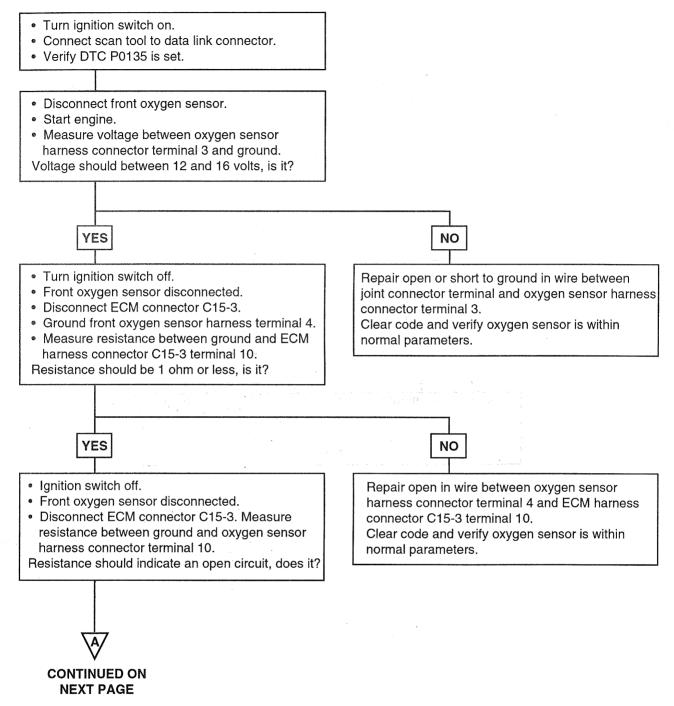
reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1V).

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.

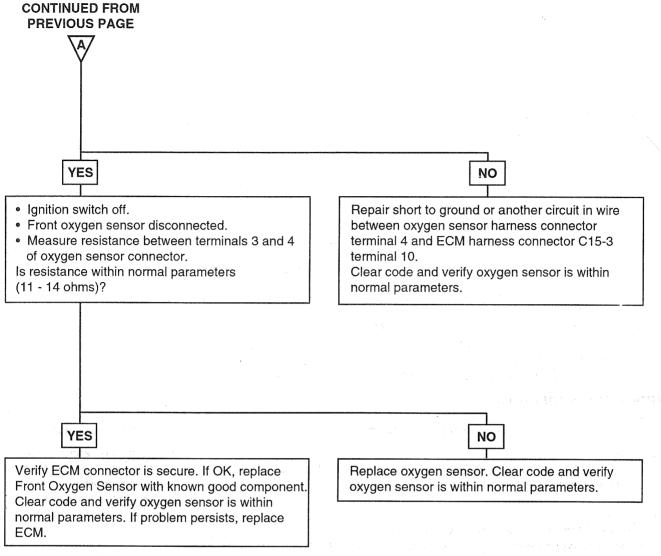
DTC detection condition	Probable cause
Background The Engine Control Module checks whether the heater current is within a specified range when the heater is energized.	 Open or shorted oxygen sensor heater circuit Open circuit in oxygen sensor heater
Check Area • Battery voltage is between 12 and 16V.	Engine control module failed
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.	



EFUC409A



EFUC507B



EFUC507C

DT	·c	Diagnostic item
P01 P01		Oxygen Sensor Circuit Open (Bank 1, Sensor 2) Oxygen Sensor Circuit Short (Bank 1, Sensor 2)

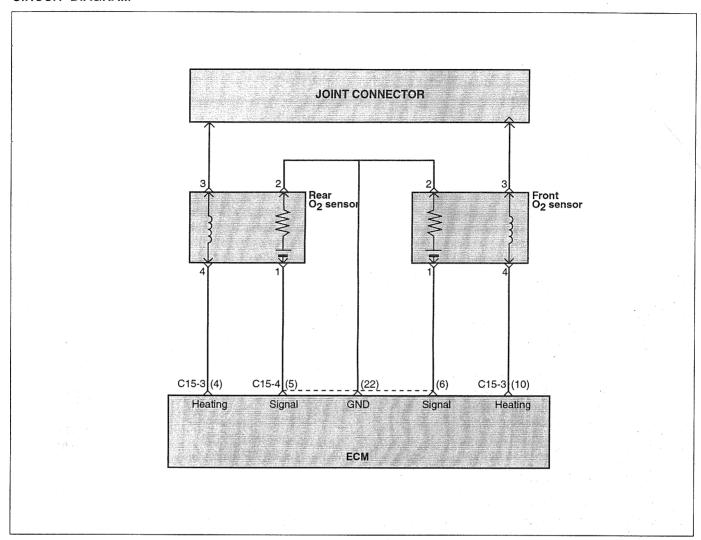
DESCRIPTION

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

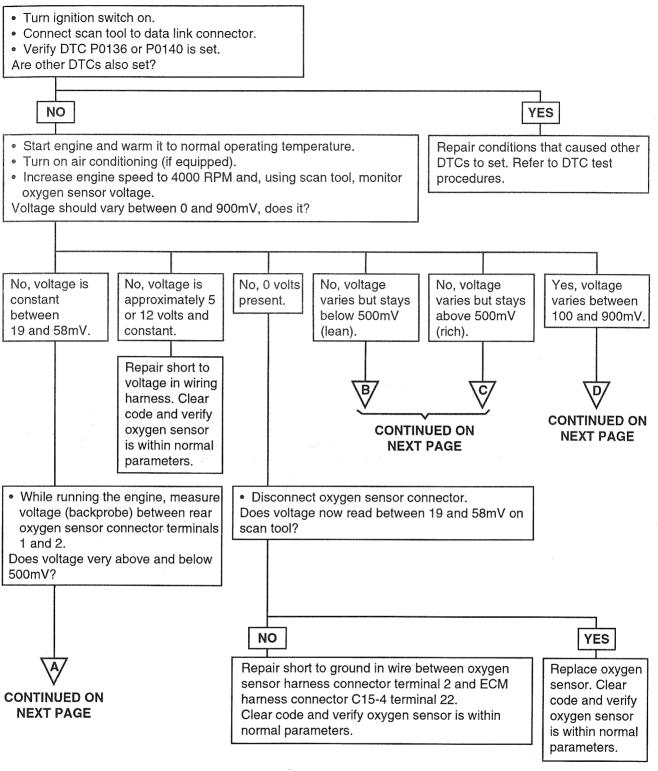
reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1V).

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.

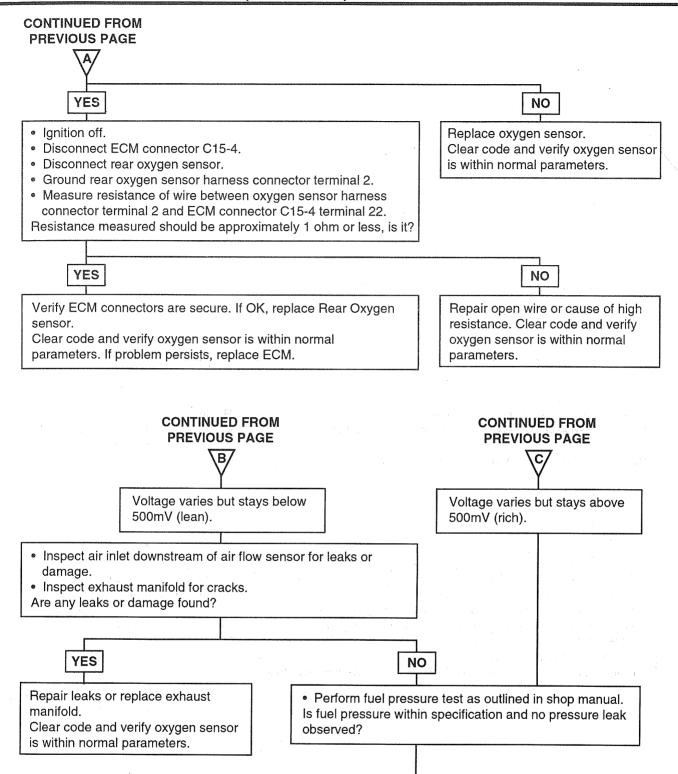
DTC detection condition	Probable cause
Background The Engine Control Module checks for an open circuit in the heated oxygen sensor output line.	 Heated oxygen sensor failed Open circuit in heated oxygen sensor output line Engine control module failed
 Check Area Coolant temperature sensor: Normal. Heated 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. 	



EFUC409A

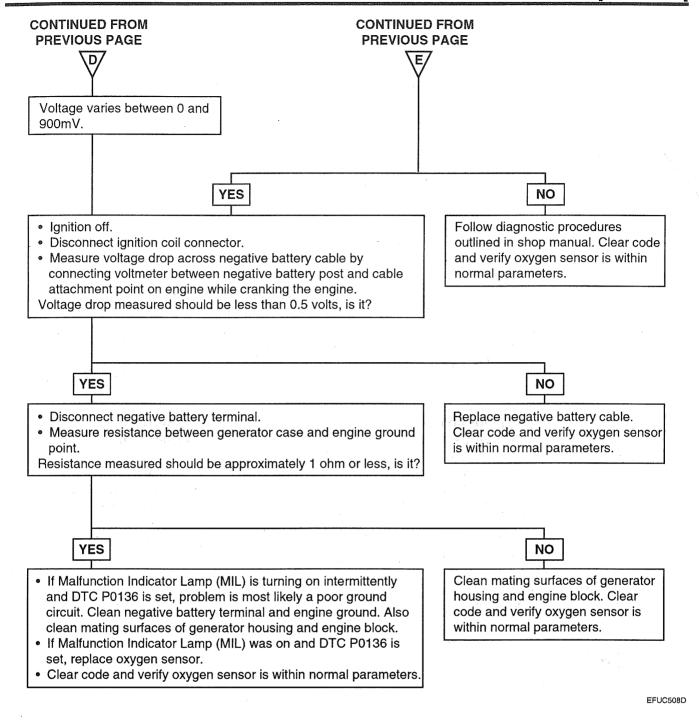


EFUC508B



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EFUC508C



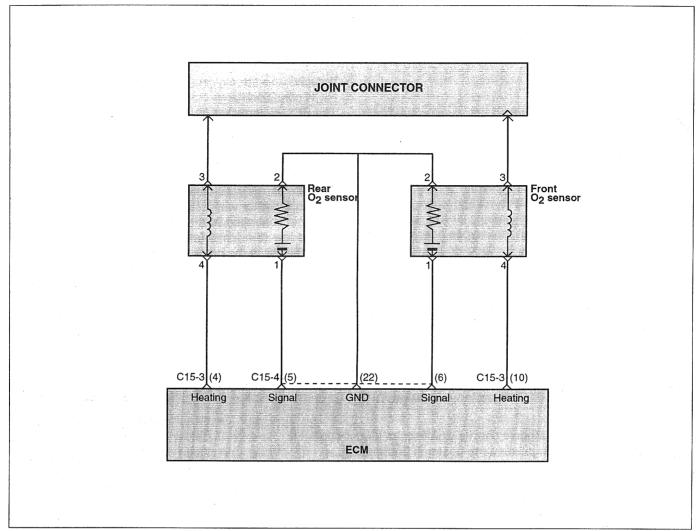
DTC	Diagnostic item
P0141	Oxygen Sensor Heater Circuit Malfunction (Bank 1, Sensor 2)

DESCRIPTION

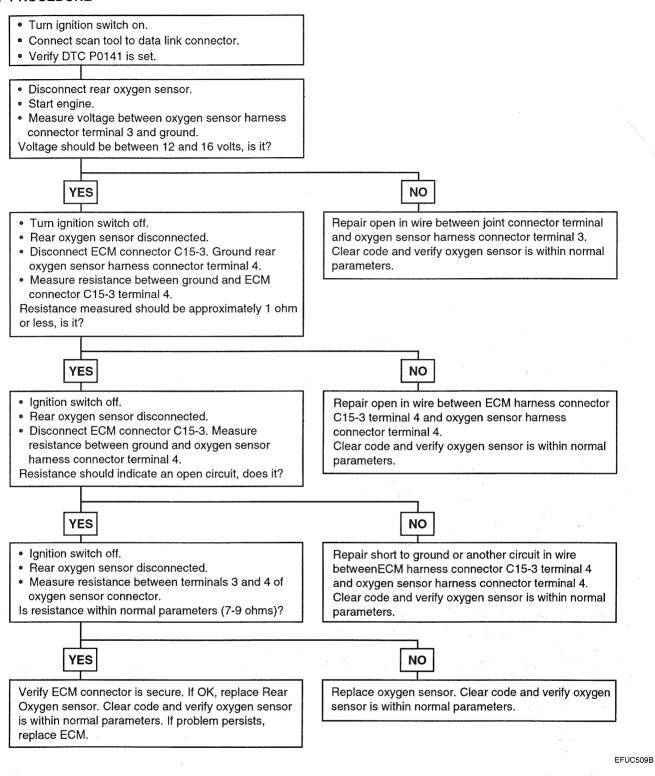
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three way catalytic converter is used, but for the most efficient use of the three-way catalytic inverter, the ratio of the air must be precisely controlled so that it is always close to the stoichiometric air-fuel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

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.	 Open or shorted oxygen sensor heater circuit Open circuit in oxygen sensor heater
Check Area • Battery voltage is between 12 and 16V.	Engine control module failed
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.	

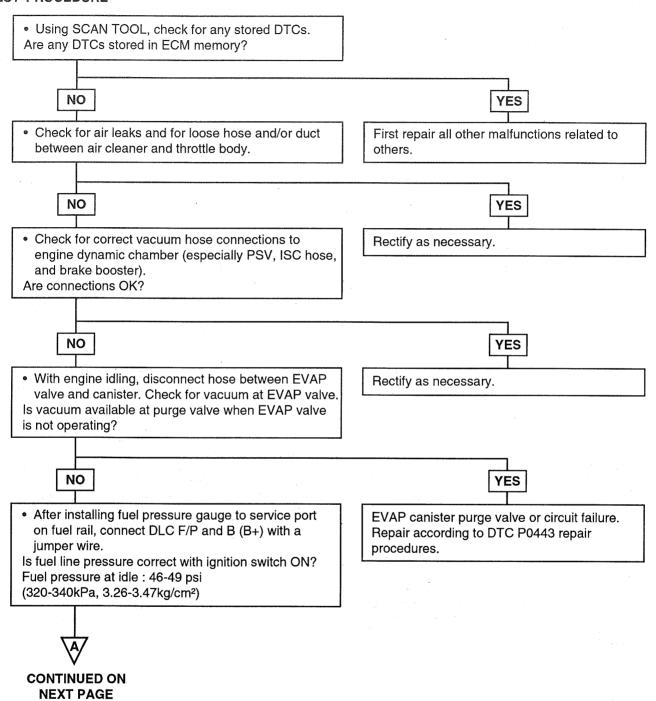


EFUC409A

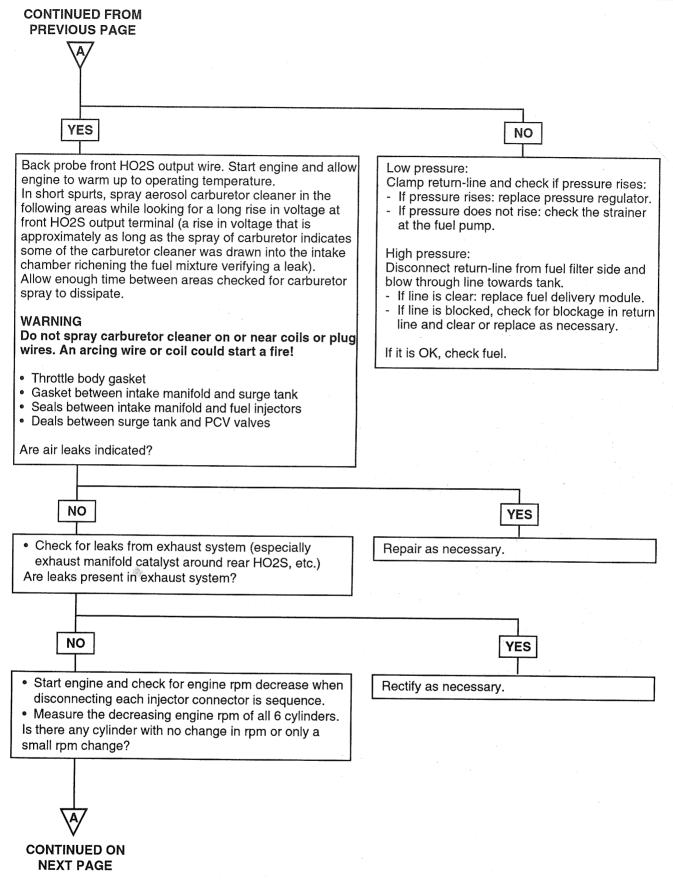


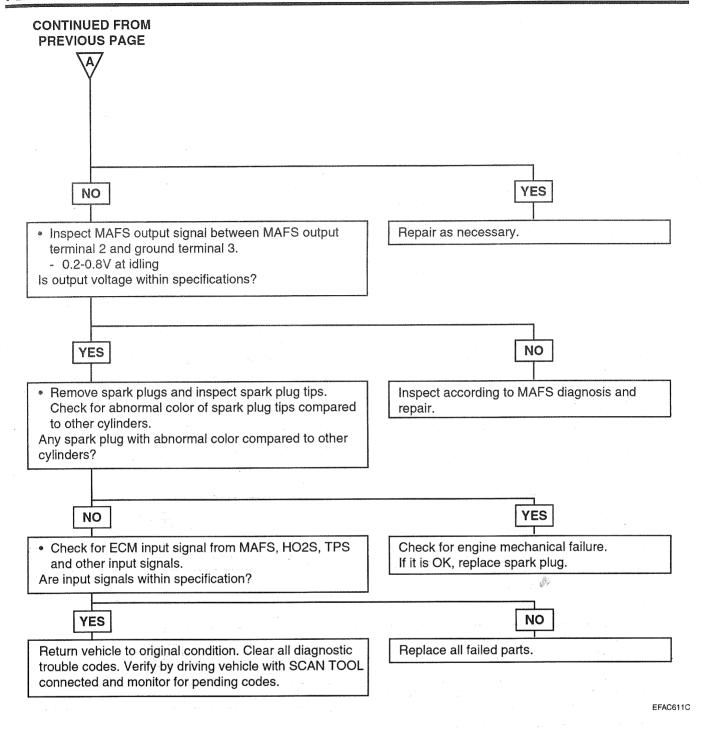
DTC	Diagnostic item	
P0171 P0172	Fuel System Too Lean (Bank 1) Fuel System Too Rich (Bank 1)	

TEST PROCEDURE



EFUC510B





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

DESCRIPTION

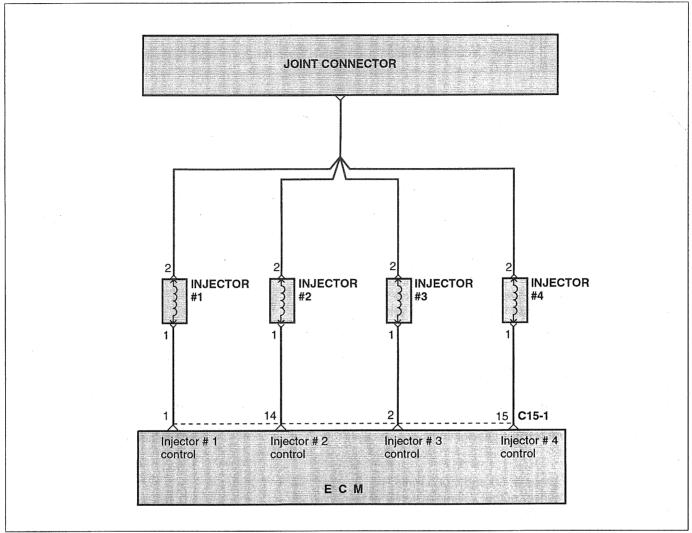
The fuel injectors are solenoid operated valves that are normally closed. When a fuel injector solenoid is energized (pulsed) the injector needle valve moves, allowing pressurized fuel to pass through the injector and mix with the air entering the engine. Each fuel injector (there is one for each engine 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

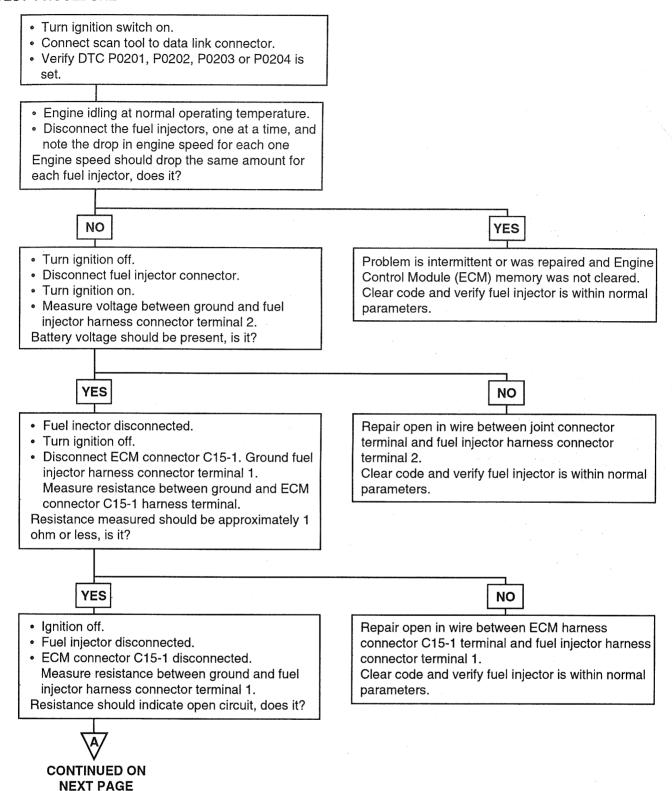
pulse the injectors. Engine coolant temperature, intake air temperature, air flow and throttle position data are all used by the ECM to calculate injector pulse width.

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.

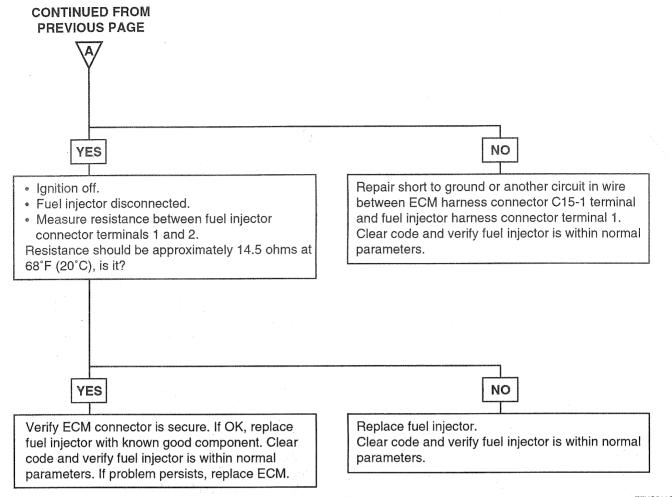
DTC detection condition	Probable cause
Background A surge voltage is generated when the injectors are driven and the current flowing to the injector coil, is shut off. The engine control module checks this surge voltage.	 Injector failed Open or shorted injector circuit, or loose connector Engine control module failed
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.	Telastini Telast
 Judgment Criteria Injector coil surge voltage (system voltage +2V) has not been detected for 4 sec. 	



EFUC511A



EFUC511B



EFUC511C

DTC	Diagnostic item
P0300	Random Misfire Detected

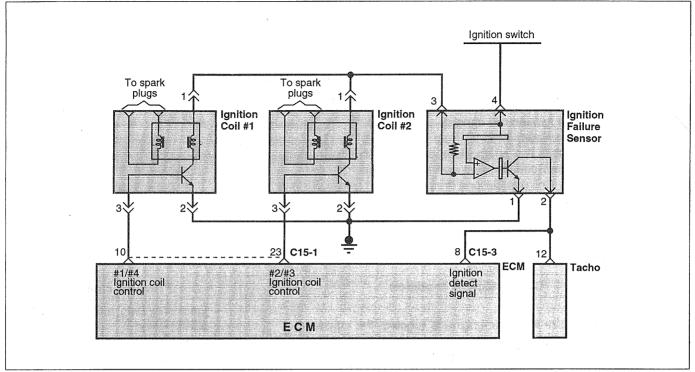
DESCRIPTION

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.

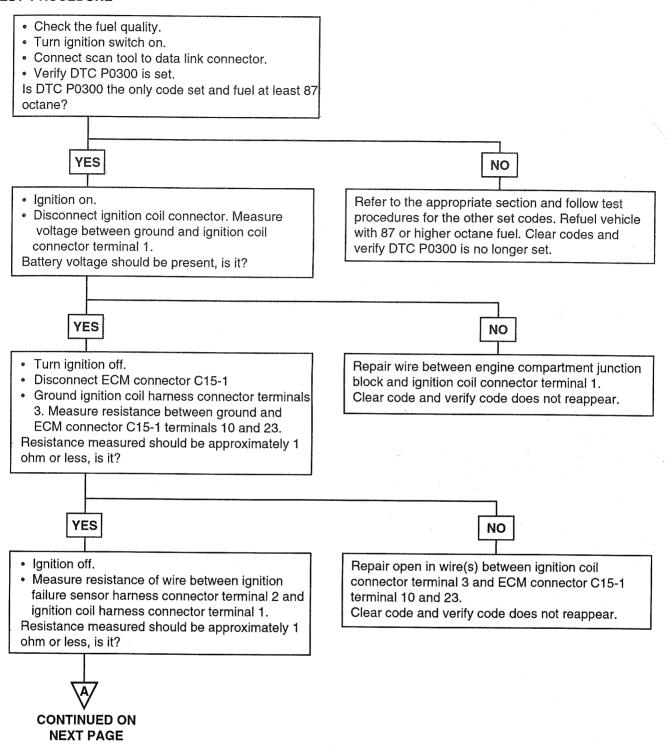
The ignition power transistor, controlled by the Engine Control Module (ECM), provides a switching circuit to

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.

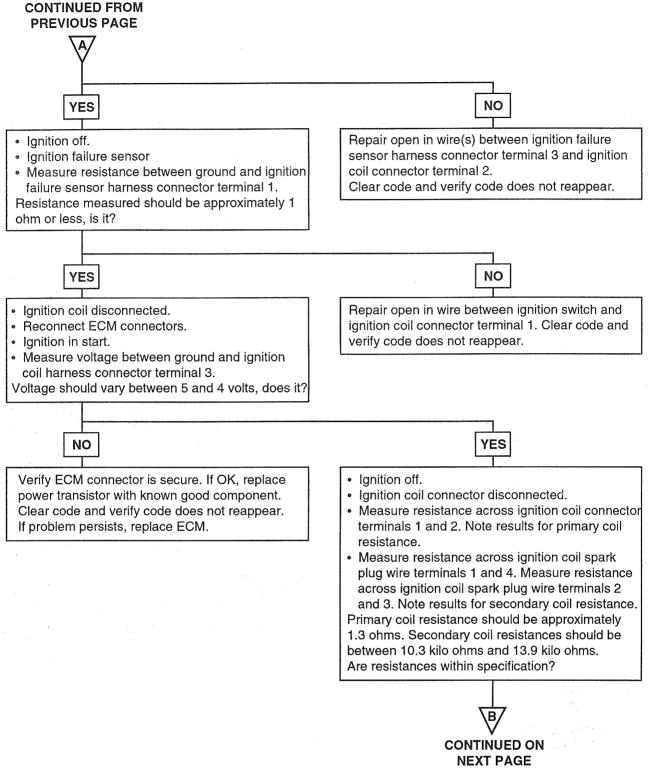
DTC detection condition	Probable cause
Background If a misfiring occurs while the engine is running, the engine speed suddenly changes. The Engine Control Module checks for changes in the engine speed.	Ignition system related part(s) failed Poor crankshaft position sensor signal
Check Area • Five seconds 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.	 Incorrect air/fuel ratio Low compression pressure Engine coolant temperature sensor failed Timing belt missing teeth Injector failed Engine control module failed
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.	



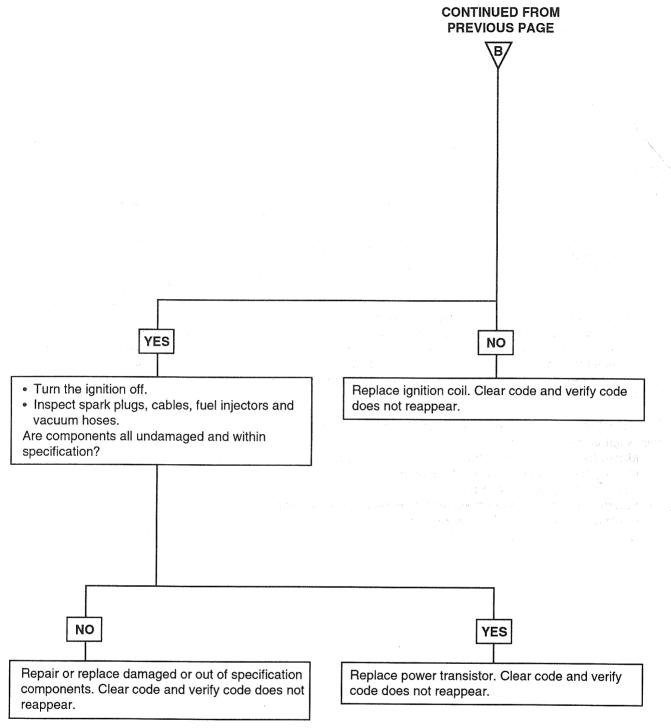
EFUC512A



EFUC512B



EFUC512C



P0300D

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

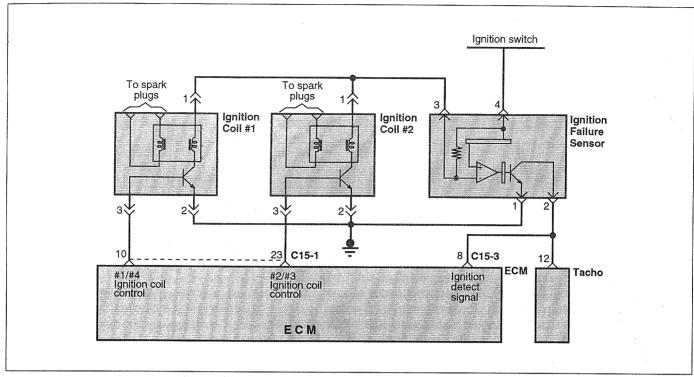
DESCRIPTION

Refer to Random Misfire Detected (P0300).

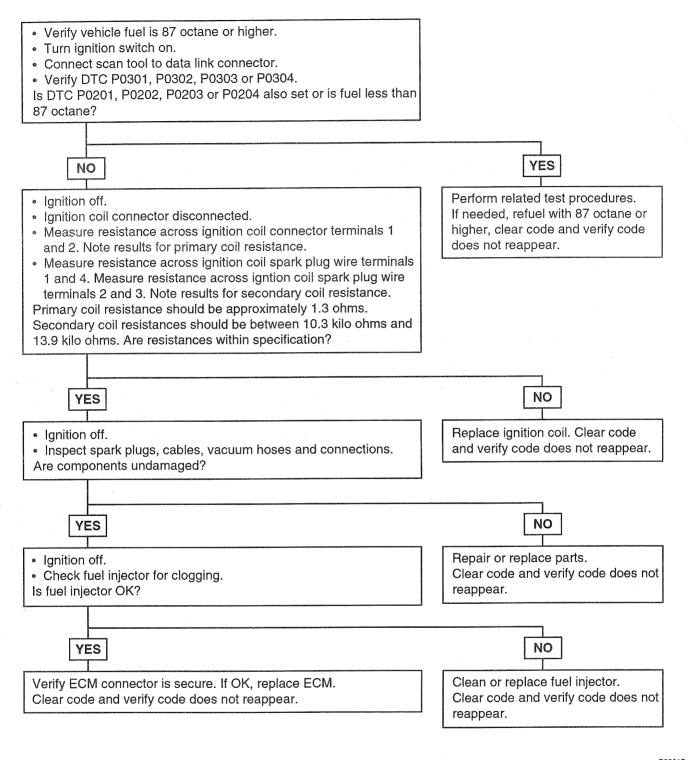
TROUBLESHOOTING GUIDE

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	 Ignition system related part(s) failed Poor crankshaft position sensor signal Incorrect air/fuel ratio
 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. 	 Low compression pressure Engine coolant temperature sensor failed Timing belt missing teeth Injector failed EGR valve failed Engine control module failed
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.	

CIRCUIT DIAGRAM



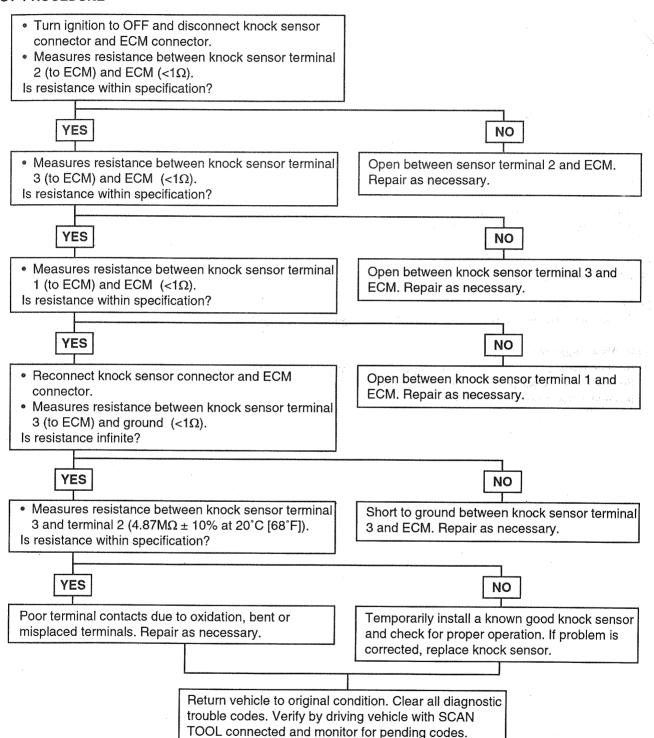
EFUC512A



P0301B

DTC	Diagnostic item
P0325	Knock Sensor Circuit Malfunction (Bank 1)

TEST PROCEDURE



EFUC514B

DTC	Diagnostic item
P0335	Crankshaft Position Sensor Circuit Malfunction

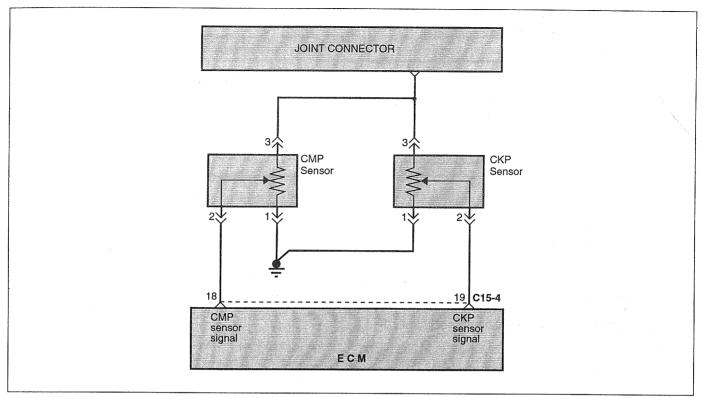
DESCRIPTION

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.

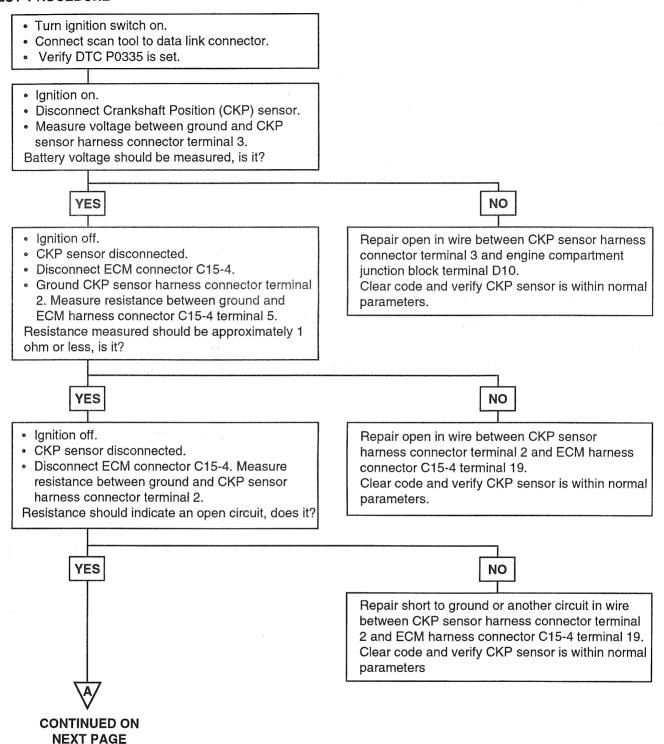
TROUBLESHOOTING GUIDE

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.	 Crankshaft position sensor failed Open or shorted crankshaft position sensor circuit Engine control module failed
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.	

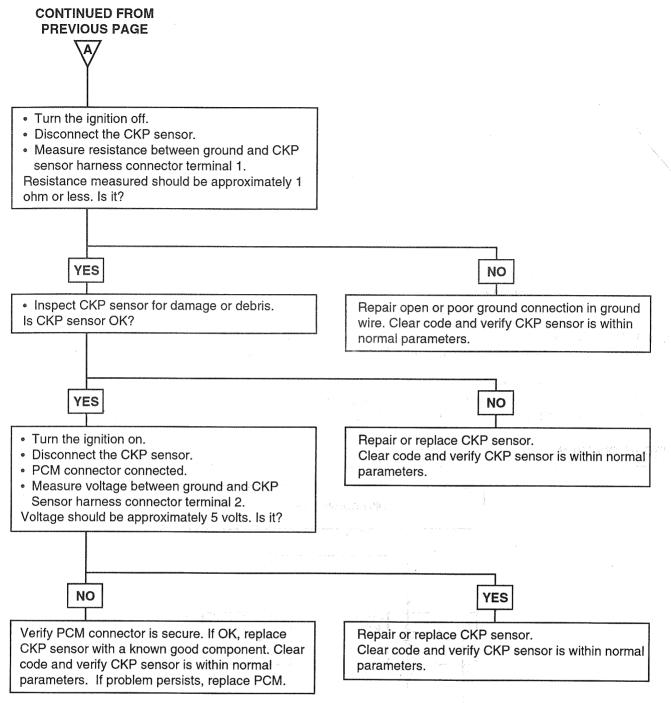
CIRCUIT DIAGRAM



EFUC515A



EFUC515B



P0335C

DTC	Diagnostic item
P0340	Camshaft Position Sensor Circuit Malfunction

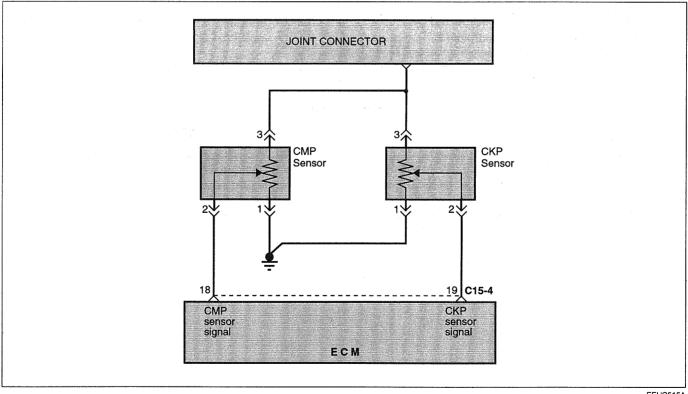
DESCRIPTION

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.

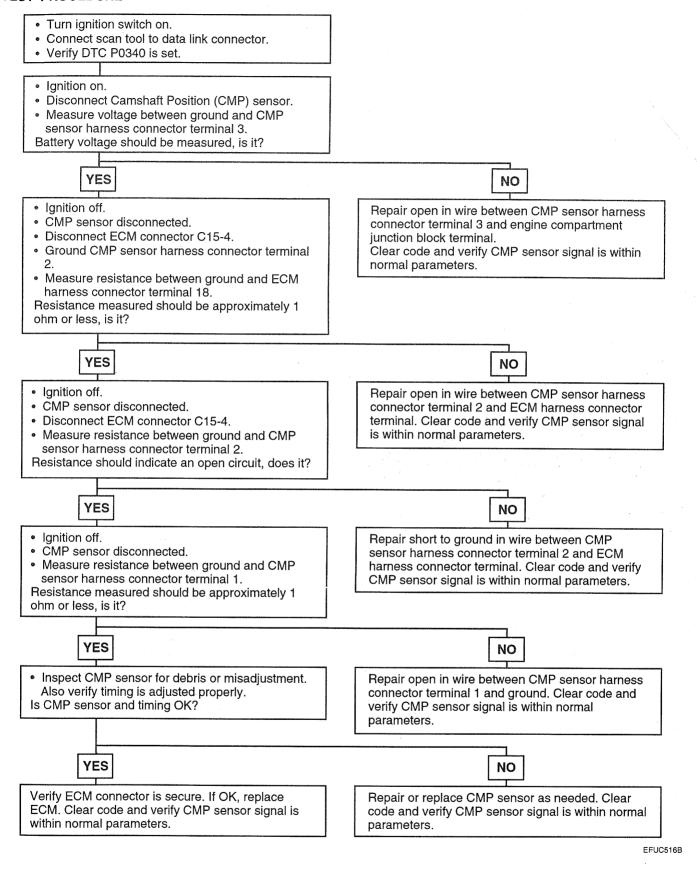
TROUBLESHOOTING GUIDE

DTC detection condition	Probable cause
 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

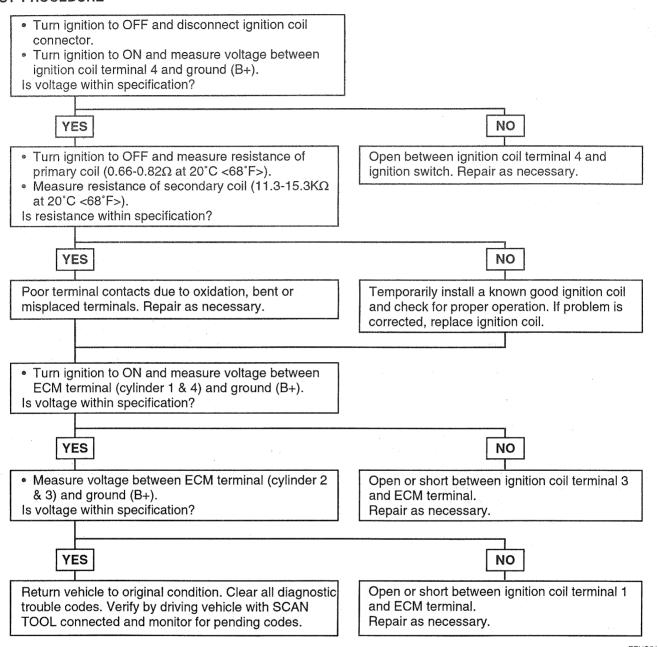


EFUC515A



DTC	Diagnostic item
P0350	Ignition Coil Primary/Secondary Circuit Malfunction

TEST PROCEDURE



EFUC517B

EFAC5850

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

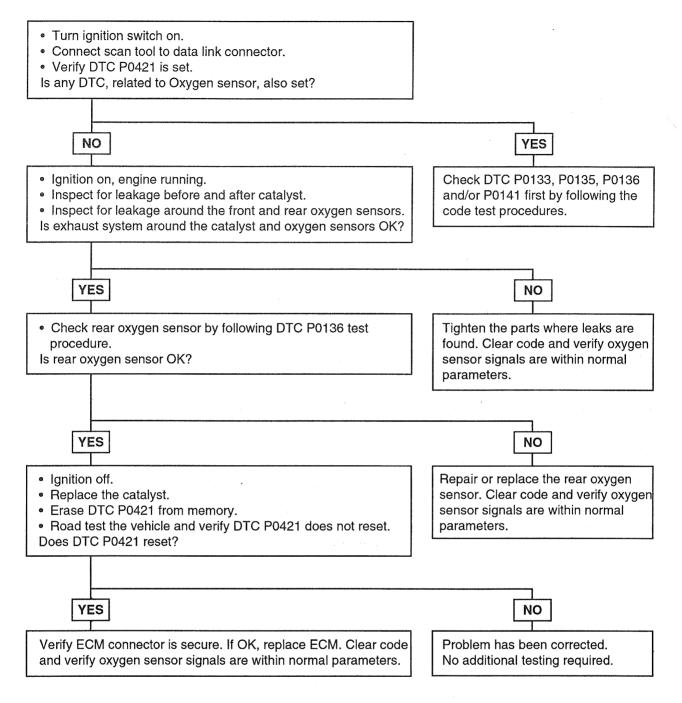
DESCRIPTION

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. 	Catalytic converter deteriorated Heated oxygen sensor failed Engine control module failed
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.	



EFAC585B

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

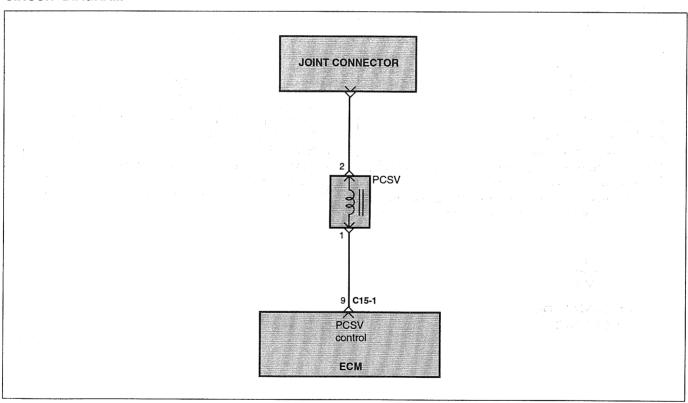
DESCRIPTION

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

TROUBLESHOOTING GUIDE

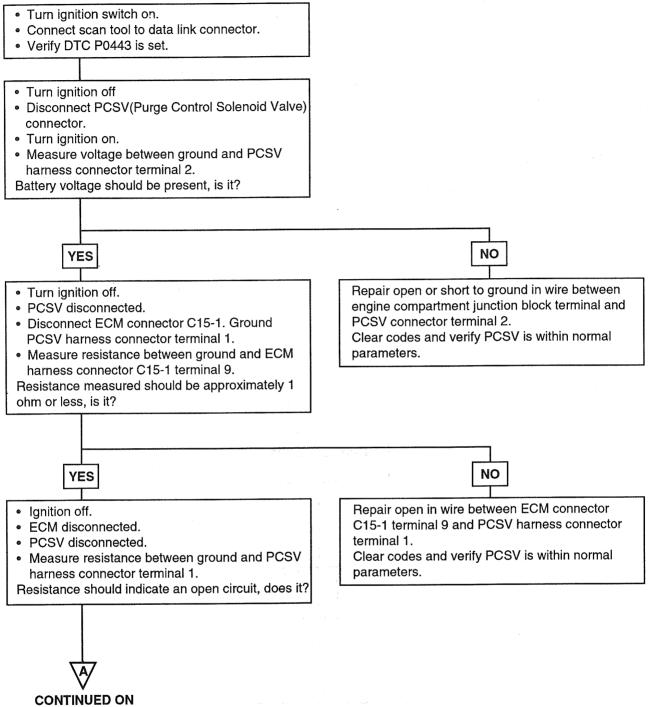
DTC detection condition	Probable cause	
Background The engine control module checks current flows in the evaporative emission purge solenoid drive circuit when the solenoid is ON and OFF. Check Area Battery voltage is 10V or higher.	 Evaporative emission purge solenoid failed Open or shorted evaporative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

CIRCUIT DIAGRAM

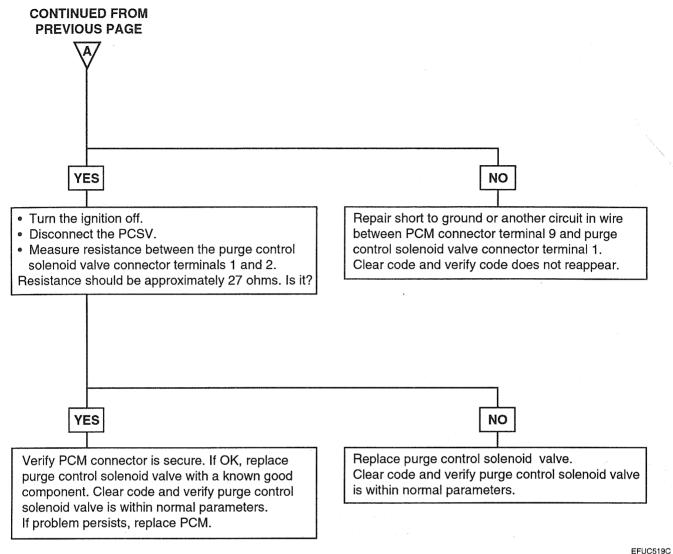


EFUC519A

NEXT PAGE



EFUC519B



EFUC519C

DTC	Diagnostic item	
P0500	Vehicle Speed Sensor Malfunction	

DESCRIPTION

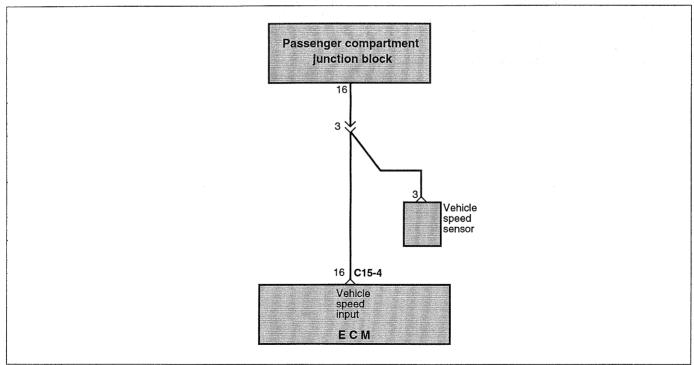
The vehicle speed sensor outputs a pulse signal while the vehicle is driven.

The engine control module checks whether the pulse signal is output.

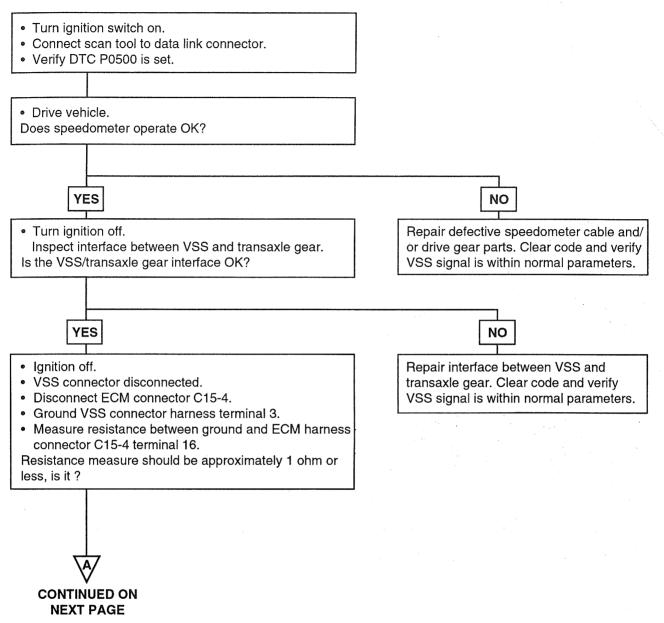
TROUBLESHOOTING GUIDE

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.	 Vehicle speed sensor failed Open or shorted vehicle-speed sensor circuit, or loose connector Engine control module failed
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.	

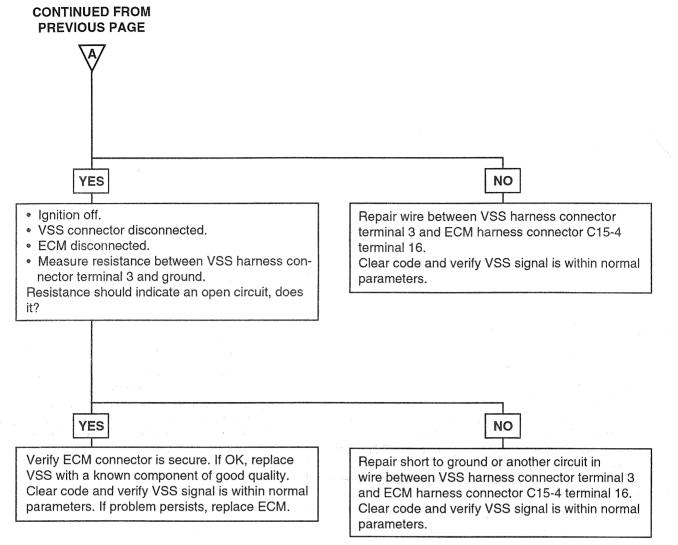
CIRCUIT DIAGRAM



EFUC520A



EFUC520B



EFUC520C

DTC	Diagnostic item	
P0507	Idle Speed Control - High RPM	

DESCRIPTION

The intake air volume at idle is controlled by opening or closing the idle speed control valve provided in the air path that bypasses the throttle valve.

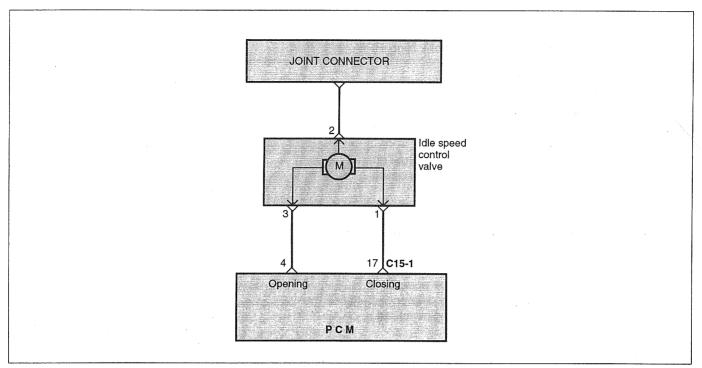
If there is a malfunction of the ISC system, the actual engine speed will not be identical to the target engine speed.

The engine control module checks the difference between the actual engine speed and the target engine speed.

TROUBLESHOOTING GUIDE

DTC detection condition	Probable cause	
Background If there is a malfunction of the ISC system, the actual engine speed will not be identical to the target engine speed. The engine control module checks the difference between the actual engine speed and the target engine speed.	Idle speed control motor failed Open or shorted idle speed control motor circuit, or loose connector Engine control module failed	
Check Area • Under the closed loop idle speed control.		
Judgment Criteria • Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec.		
 Check Area During idling speed closed-loop control The maximum atmospheric temperature is 45°C (113°F) or less at the last drive. Long term fuel trim is at -8% to +8%. Engine coolant temperature is approx. 80°C (176°F) or more. Battery voltage is 10V or more. Intake air temperature is -10°C (14°F) or more. 		
Judgment Criteria • Actual idle speed is 200 r/min or more higher than the target idle speed for 10 seconds.		
Check Area • During idle speed closed loop control. • Power steering pressure switch is off. • Engine load is 40% or less. • Intake air temperature is -10°C (14°F) or more.		
Judgment Criteria • Actual idle speed is 120 r/min or more lower than the target idle speed for 10 seconds.		

CIRCUIT DIAGRAM



EFUC521A